



# 2022 Annual Groundwater Monitoring Report and Corrective Action Report and Semi-Annual Remedy Selection and Design Progress Report

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for Compliance with the Coal Combustion  
Residuals (CCR) Rule

Erickson Station

*Lansing Board of Water & Light*

January 30, 2023





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## Table of Abbreviations and Acronyms

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Abbreviation	Definition
BTV	background threshold value
BWL	Board of Water & Light
cm/s	centimeters per second
CCR	coal combustion residuals
COC	constituents of concern
COI	constituent of interest
CWP	Clear Water Pond
EPA	Environmental Protection Agency
GPS	groundwater protection standard
LCL	lower confidence limit
LCS	laboratory control samples
MDL	method detection limit
MS/MSD	matrix spike/duplicate
QC	quality control
RPD	relative percent difference
SOP	standard operating procedure
SSI/SSL	statistically significant increase/statistically significant level
TDS	total dissolved solids
TSS	total suspended solids
UTL	upper tolerance limit



Summary of 40 CFR Section § 257.90(e)(6) Groundwater Monitoring System Requirements and Site-Specific Compliance at Erickson Station		
40 CFR Section § 257.90(e)(6) Requirement		CCR Impoundments Status
§ 257.90(e)(6) A section at the beginning of the annual report that provides an overview of the current status of groundwater monitoring and corrective action programs for the CCR unit. At a minimum, the summary must specify all of the following:		
§257.90(e)(6)(i)	At the start of the current annual reporting period, whether the CCR unit was operating under the detection monitoring program in § 257.94 or the assessment monitoring program in § 257.95.	Assessment Monitoring Program and Evaluation of Potential Remedies
§257.90(e)(6)(ii)	At the end of the current annual reporting period, whether the CCR unit was operating under the detection monitoring program in § 257.94 or the assessment monitoring program in § 257.95.	Assessment Monitoring Program and Evaluation of Potential Remedies
§257.90(e)(6)(iii)	If it was determined that there was a statistically significant increase over background for one or more constituents listed in appendix III to this part pursuant to § 257.94(e):	Yes
§257.90(e)(6)(iii)(A)	Identify those constituents listed in appendix III to this part and the names of the monitoring wells associated with such an increase. (These SSIs are from the original triggering event.)	<ul style="list-style-type: none"> <li>• MW-2 – boron, calcium, chloride, sulfate, total dissolved solids (TDS)</li> <li>• MW-5 – boron, calcium, sulfate, TDS</li> <li>• MW-6 - boron, sulfate, TDS</li> </ul>
§257.90(e)(6)(iii)(B)	Provide the date when the assessment monitoring program was initiated for the CCR unit.	November 19, 2020
§257.90(e)(6)(iv)	If it was determined that there was a statistically significant level above the groundwater protection standard for one or more constituents listed in appendix IV to this part pursuant to § 257.95(g) include all of the following:	Yes
§257.90(e)(6)(iv)(A)	Identify those constituents listed in appendix IV to this part and the names of the monitoring wells associated with such an increase. (These are SSLs through 2022.)	<ul style="list-style-type: none"> <li>• MW-2 – lithium</li> <li>• MW-5 – lithium</li> <li>• MW-6 – lithium</li> <li>• MW-7 – lithium and molybdenum</li> </ul>
§257.90(e)(6)(iv)(B)	Provide the date when the assessment of corrective measures was initiated for the CCR unit.	November 23, 2020
§257.90(e)(6)(iv)(C)	Provide the date when the public meeting was held for the assessment of corrective measures for the CCR unit.	Required 30 days prior to remedy selection
§257.90(e)(6)(iv)(D)	Provide the date when the assessment of corrective measures was completed for the CCR unit.	October 1, 2021
§257.90(e)(6)(v)	Whether a remedy was selected pursuant to § 257.97 during the current annual reporting period, and if so, the date of remedy selection.	Evaluation of potential remedies ongoing
§257.90(e)(6)(vi)	(vi) Whether remedial activities were initiated or are ongoing pursuant to § 257.98 during the current annual reporting period.	Evaluation of potential remedies ongoing

# 1.0 Introduction

The U.S. Environmental Protection Agency's (EPA) final Coal Combustion Residuals (CCR) Rule 40 CFR §257 establishes a comprehensive set of requirements for the management and disposal of CCR (or coal ash) in surface impoundments by electric utilities. Erickson Power Station (Erickson or Site), located in Delta Township, Michigan is owned and operated by Lansing Board of Water & Light (BWL) (**Figure 1**). Erickson has three CCR impoundments subject to the CCR Rule: the Forebay, Retention Basin, and Clear Water Pond (CWP) (**Figure 2**). The three CCR impoundments are currently inactive.

In 2019, BWL completed a hydrogeologic characterization study in order to develop a certified groundwater monitoring network, BWL installed monitoring wells that were sampled for CCR constituents of interest (COIs) background water quality between 2019 2020 and background threshold values (BTVs) were developed. Detection monitoring was completed in October 2020 and statistically significant increases (SSIs) of constituents of interest (COIs) over BTVs were identified (CCR Rule Part §257.94). The initial assessment monitoring event was in November 2020, and statistically significant levels (SSL) of COIs were observed over groundwater protection standards (GPS). The SSL over GPS triggered the assessment of corrective measures and BWL completed the Assessment of Corrective Measures (ACM) on October 1, 2021. This Annual Groundwater Monitoring Report presents the sampling and analysis completed in 2022:

- The status of the groundwater monitoring program for the ash impoundment multi-unit at the end of 2022 is assessment monitoring, and evaluation of potential remedies.

# 2.0 Facility Description

Erickson Power Station (Erickson or Site) is an electrical power generation facility located at 3725 South Canal Road in Delta Township, Eaton County, Michigan owned and operated by Lansing Board of Water & Light (BWL) (**Figure 1**). Erickson was retired from operations on November 27, 2022. During active operations, a single coal-fired generator was capable of producing 165 megawatts of electricity and CCR was stored in dewatering tanks (hydro-bins). After the majority of the CCR was removed from the waste stream at the hydro-bins, flow was discharged into three CCR impoundments in sequence: the Forebay, Retention Basin, and Clear Water Pond (CWP) (**Figure 2**). The plant pipelines were washed down and CCR waste disposal ceased to the CCR impoundments on December 29, 2022. The non-CCR stormwater flows to the impoundments ceased January 3, 2023. The CCR Impoundments Closure Work Plan for removal of CCR was completed in April 2022 and approved by the Michigan Department of Environment, Great Lakes, and Energy (EGLE) on January 17, 2023. A contractor has been selected and is scheduled to initiate dewatering for CCR excavation in February 2023. CCR removal is scheduled to be completed in October 2023.

The operation and monitoring of the CCR unit are described further in the Erickson Station Groundwater Monitoring System Certification (HDR, 2020).

## 2.1 Hydrogeology

The three CCR impoundments at Erickson Power Station are in areas underlain with unconsolidated clay, silt, sand, and gravel of glacial origin which rest upon approximately 10,000 feet of consolidated bedrock sediments composed of limestone, shale, siltstone, sandstone, salt, and gypsum. Depth to the uppermost aquifer under the impoundments is determined to be approximately 6 to 20 feet below surface. Given the bedrock surface between 36 and 61 feet below surface, the upper glacial aquifer thickness at the site is approximately between 16 and 47 feet thick. The groundwater flow direction is east-northeast under the impoundments and remains similar flow direction throughout the year.

## 2.2 Monitoring Well Network

In 2022, seven additional monitoring wells (MW-7B, MW-7C, MW-11, MW-11B, MW-12, MW-12B, and MW-13) were installed. To assess the potential for MW-1 to be impacted by the CWP, MW-11 was installed in the glacial aquifer further upgradient of the CWP. Well MW-13 was installed in the glacial aquifer northeast of the CCR impoundments to further evaluate the extent of GPS exceedances to the north. Three wells (MW-7B, MW-11B, and MW-12B) were installed to evaluate conditions in the bedrock aquifer. Well MW-7C was installed evaluate the potential for the silt layer to act as a confining unit for the glacial aquifer. Well MW-7C is screened in the silt layer and is considered a glacial aquifer well. Well MW-7B is screened at 110 to 120 feet bgs. Well MW-11B is screened 115 to 135 feet bgs. Well MW-12B is screened 105 to 120 feet bgs. During drilling of the three bedrock wells at Erickson, the uppermost bedrock below the deepest glacial units appeared dry, consolidated and unfractured shale bedrock. Therefore, these three bedrock wells were screened at the uppermost bedrock depth where damp shale with wet fractures were identified during drilling.

The groundwater flow direction is northeast under the impoundments and remains similar flow direction throughout the year (**Appendix A**). Monitoring wells MW-1, MW-4, MW-11, and MW-12 serve as upgradient wells in the glacial aquifer. Section §257.9 of the Rule states that the operator: *“...may install a multiunit groundwater monitoring system instead of separate groundwater monitoring systems for each CCR unit.”* In addition, the CCR Rule states that downgradient monitoring wells should be installed to: *“accurately represent the quality of groundwater passing the waste boundary of the CCR unit. The downgradient monitoring system must be installed at the waste boundary that ensures detection of groundwater contamination in the uppermost aquifer.”* The flow of groundwater under the CCR impoundments is east-northeast, such that waste boundary wells would have to be installed on the embankments to the east of the impoundments. Geotechnical engineers reviewed the embankment construction and recommended that monitoring wells should not be installed on the impoundment embankments. Therefore, the closest downgradient well locations (MW-2, MW-5, and MW-6) were on the east side of the Former Impoundment and serve as a multiunit groundwater monitoring system for the three impoundments (**Figure 3**). Wells MW-2, MW-3, MW-5, and MW-6, as downgradient wells in the glacial aquifer at the waste boundary. Well MW-3 is cross-gradient to the impoundments; however, it is sampled in compliance with the State groundwater compliance program and based on its proximity to the waste boundary is considered a waste boundary

compliance well. The well construction details are provided in the *Groundwater Monitoring System Certification* (HDR, 2020).

Four monitoring wells (MW-7, MW-8, MW-9, and MW-10) were installed June 2021 in response to statistical exceedances of GPS during assessment monitoring. The purpose of the wells was to delineate the extents of the GPS exceedances as close to the eastern, downgradient facility boundary of the station property as possible (due to wetlands and thick brush) to comply with §257.95(g)(1)(iii) (**Figure 3**). Wells MW-7, MW-7C, MW-8, MW-9, MW-10, and MW-13 serve as characterization wells to identify the nature and extent of the groundwater protection standard exceedances (**Figure 3**).

Monitoring wells MW-11B and MW-12B serve as upgradient wells in the bedrock aquifer, and well MW-7B is screened in the bedrock downgradient of the impoundments to evaluate the potential for bedrock aquifer to be impacted.

No wells were repaired or abandoned in 2022.





Figure 1. Vicinity Map for Erickson Station



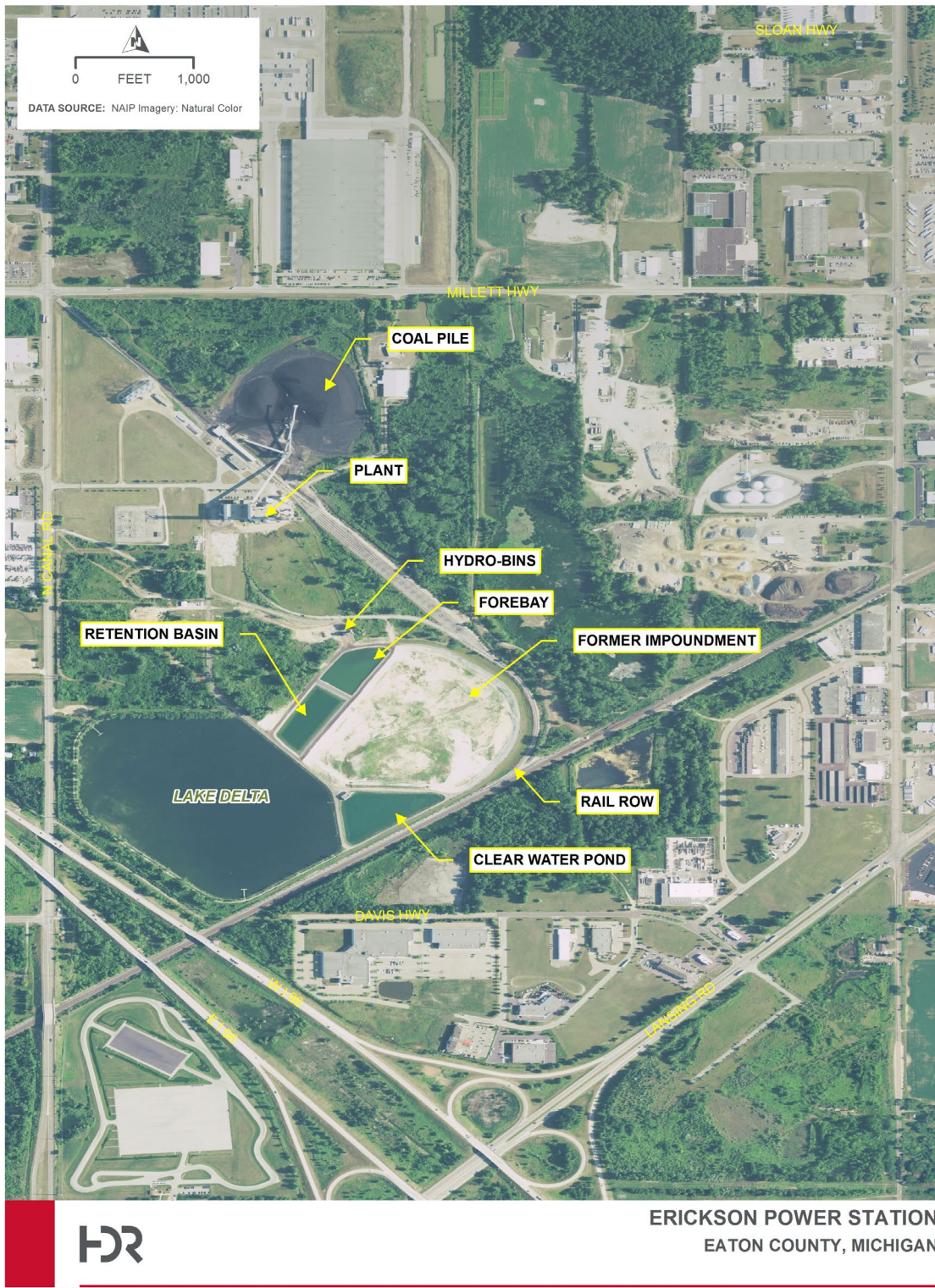


Figure 2. Erickson Station Facility Layout





Figure 3. Erickson Station CCR Units and Monitoring Wells





# 3.0 Monitoring

## 3.1 Groundwater

### 3.1.1 Frequency

The assessment monitoring schedule for the Federal groundwater compliance monitoring program was shifted to coincide with the State program and assessment monitoring occurred in February and August 2022. **Table 1** provides the well identification number, well location, the dates the samples were collected, and whether the sample was required by the CCR Rule for the background sampling, detection monitoring or assessment monitoring.

Beginning in February 2022, the seven new monitoring wells were installed onsite at Erickson (MW-7B, MW-7C, MW-11, MW-11B, MW-12, MW-12B, and MW-13). Well MW-13 was installed on February 14, 2022. Wells MW-11 and MW-12 were installed on February 17, 2022. Wells MW-7B, MW-12B, and MW-7C were installed on March 1, 3, and 8, 2022, respectively. After installation and development, samples were collected on a five-week frequency for to achieve statistical strength in the sampling data. Eight sampling events were completed for wells installed in 2022, however, the eighth sampling event laboratory report was not received in time to include in this report. This data will be included in the annual report for 2023.

**Table 1. Dates of Groundwater Samples Collected for each Well in 2022 and the Required Monitoring Programs for the Erickson Impoundments (§257.90(e)(3))**

Monitoring Well I.D.	Well Location	Dates Monitored	CCR Rule Monitoring Purpose
MW-1	Background/Upgradient Glacial Aquifer	February 1, 2022 August 2, 2022	Assessment Monitoring
MW-2	Downgradient Glacial Aquifer	February 1, 2022 August 2, 2022	Assessment Monitoring
MW-3	Cross-Gradient Glacial Aquifer	February 1, 2022 August 2, 2022	Assessment Monitoring
MW-4	Background/Upgradient Glacial Aquifer	February 1, 2022 August 2, 2022	Assessment Monitoring
MW-5	Downgradient Glacial Aquifer	February 1, 2022 August 2, 2022	Assessment Monitoring
MW-6	Downgradient Glacial Aquifer	February 1, 2022 August 2, 2022	Assessment Monitoring
MW-7	Downgradient Glacial Aquifer	January 11, 2022	Background Monitoring
		February 17, 2022	Background Monitoring and Assessment Monitoring
		August 2, 2022	Assessment Monitoring



Monitoring Well I.D.	Well Location	Dates Monitored	CCR Rule Monitoring Purpose
MW-7B	Downgradient Bedrock Aquifer	March 9, 2022 April 13, 2022 May 19, 2022 June 23, 2022 July 28, 2022 September 1, 2022 October 6, 2022 November 10, 2022	Background Monitoring
MW-7C	Downgradient Glacial Aquifer	March 10, 2022 April 14, 2022 May 19, 2022 June 23, 2022 July 28, 2022 September 1, 2022 October 6, 2022 November 10, 2022	Background Monitoring
MW-8	Downgradient Glacial Aquifer	January 11, 2022	Background Monitoring
		February 17, 2022	Background Monitoring and Assessment Monitoring
		August 2, 2022	Assessment Monitoring
MW-9	Downgradient Glacial Aquifer	January 11, 2022	Background Monitoring
		February 17, 2022	Background Monitoring and Assessment Monitoring
		August 2, 2022	Assessment Monitoring
MW-10	Downgradient Glacial Aquifer	January 11, 2022	Background Monitoring
		February 17, 2022	Background Monitoring and Assessment Monitoring
		August 2, 2022	Assessment Monitoring
MW-11	Background/Upgradient Glacial Aquifer	February 23, 2022 March 30, 2022 May 4, 2022 June 8, 2022 July 13, 2022 August 17, 2022 September 21, 2022 October 26, 2022	Background Monitoring



Monitoring Well I.D.	Well Location	Dates Monitored	CCR Rule Monitoring Purpose
MW-11B	Background/Upgradient Bedrock Aquifer	April 28, 2022 June 2, 2022 July 7, 2022 August 11, 2022 September 15, 2022 October 20, 2022 November 22, 2022 December 27, 2022*	Background Monitoring
MW-12	Background/Upgradient Glacial Aquifer	February 23, 2022 March 30, 2022 May 4, 2022 June 8, 2022 July 13, 2022 August 17, 2022 September 21, 2022 October 26, 2022	Background Monitoring
MW-12B	Background/Upgradient Bedrock Aquifer	March 8, 2022 April 14, 2022 May 19, 2022 June 23, 2022 July 28, 2022 September 1, 2022 October 6, 2022 November 10, 2022	Background Monitoring
MW-13	Downgradient Glacial Aquifer	February 23, 2022	Background Monitoring and Assessment Monitoring
		March 30, 2022 May 4, 2022 June 8, 2022 July 13, 2022	Background Monitoring
		August 17, 2022	Background Monitoring and Assessment Monitoring
		September 21, 2022* October 26, 2022*	Background Monitoring

\*Data analysis from this sampling event has yet to be completed and will be included with the annual report for 2023.

### 3.1.2 Water Levels and Sample Collection

Water levels were collected in each well following the Groundwater Level Monitoring Standard Operating Procedure (SOP) (HDR, 2019). Water levels were measured before purging of the wells began.

Wells were purged with a peristaltic pump until field parameters (pH, turbidity, conductivity, dissolved oxygen, temperature, and oxidation reduction potential) stabilized. The results of field measurements were recorded on a field data form, which is maintained as part of the field records. After field parameters stabilized, samples were collected and tested for the parameters listed in **Table 2**. For quality control, one field duplicate sample was collected during each sample event. Water samples were delivered under Chain of Custody to Merit Laboratories in East Lansing, Michigan.



### 3.1.3 Analytical Testing

Groundwater samples for each type of monitoring were analyzed for the COIs shown in **Table 2**. Background monitoring analyses included the parameters in Appendices III and IV of CCR Rule Part 257, plus TSS. Assessment monitoring and background monitoring samples are analyzed for all Appendix III and IV COIs plus the additional metals required under the State monitoring program (copper, iron, nickel, silver, vanadium, and zinc). The laboratory analyzed matrix spike/matrix spike duplicates at a rate of 5 percent, per laboratory quality control procedures.

**Table 2. Constituents of Interest**

<b>Appendix III Constituents</b>	<b>Appendix IV Constituents</b>
Boron	Antimony
Calcium	Arsenic
Chloride	Barium
Fluoride	Beryllium
pH	Cadmium
Sulfate	Chromium
Total Dissolved Solids (TDS)	Cobalt
Additional Parameters	Fluoride
Total Suspended Solids (TSS)	Lead
Copper	Lithium
Iron	Mercury
Nickel	Molybdenum
Silver	Selenium
Vanadium	Thallium
Zinc	Radium 226 and 228 combined

### 3.1.4 Data Validation and Data Management

Data validation and data management tasks were performed per the Data Management and Statistical Procedures Plan for Compliance with the Coal Combustion Residuals Rule (HDR, 2020a). Data validation was conducted to eliminate data that did not meet validation criteria and designate a data qualifier for data quality limitation discovered.

All samples and quality control (QC) were reviewed and evaluated, and no samples were rejected. Most QC analyses were within reportable limits; however, when QC was outside limit controls, samples were reported as estimated. Relative percent difference (RPD) failures for field duplicate analyses were less than the 20 percent limit criteria except for TSS (three instances), molybdenum (two instances), and Rad-226/228 (several instances). Laboratory Control Sample (LCS)/LCS duplicates and Matrix Spike/Duplicate (MS/MSD) duplicates %RPD recoveries were within control limits except boron (one instance). Data analyses required minimal qualifications, and data were usable, even when qualified. Data validation reports for 2022 are in **Appendix C**.

## 3.2 Wetland Sampling

In addition to the groundwater sampling, on March 30, 2022 BWL collected a surface water sample from the wetland at the eastern site boundary, downgradient of the CCR impoundments as shown on **Figure 3**. The wetland sample was delivered under Chain of Custody to Merit Laboratories and analyzed for the same parameters listed in **Table 2**.

## 3.3 Private Well Sampling

BWL completed a limited sampling of downgradient private wells completed in the bedrock aquifer in 2022. The bedrock private well evaluation will be reported under separate cover in second quarter 2023.

# 4.0 Monitoring Results

## 4.1 Water Levels and Groundwater Flow Direction

Water levels for Erickson Power Station are provided in **Table 3**. Groundwater beneath the area of the impoundments is between 861 to 876 feet amsl. Groundwater elevation fluctuated between 1.96 and 5.72 feet over the year. The three bedrock screened wells (MW-7B, MW-11B, and MW-12B) are installed adjacent to monitoring wells screened in the shallower, glacial sediments (sandy clay, gravelly sand, sand). Water levels in the paired wells is inconsistent between the three sets. As shown in **Table 3**, bedrock well MW-7B has historically had a slightly higher water level than glacial paired well MW-7, indicating an upward vertical gradient, however, this trend may be seasonally dependent based and the gradient has been inconsistent with recent data collected. Glacial wells MW-11 and MW-12 have higher water levels than the paired bedrock wells MW-11B and MW-12B, indicating a downward vertical gradient. Because the groundwater elevations differed between glacial wells and bedrock wells, two separate sets of potentiometric contour maps were developed, one for wells screened in the glacial aquifer



and one for the wells screened in the shale and sandstone bedrock aquifer. Potentiometric surface maps were developed for the glacial aquifer for the February, May, August, and November 2022 water level measurement dates. Potentiometric surface maps for the bedrock aquifer were developed for the May 2022 water level measurement date only. Maps displaying the groundwater elevations at the wells and the groundwater contours and are provided in **Appendix A**.

The water levels and contour maps confirm that the groundwater flow direction under the impoundments for both aquifers is to the east-northeast and is consistent year-round. The potentiometric surface maps for the indicate that monitoring wells MW-4, MW-11, MW-12B, and Delta-1 are located upgradient, in their respective aquifers, of the Forebay, Retention Pond, and CWP multi-unit and are appropriate to sample groundwater that represents background water quality.



**Table 3. Groundwater Elevations Measured in 2022**

Monitoring Well ID	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-7B	MW-7C	MW-8	MW-9	MW-10	MW-11	MW-11B	MW-12	MW-12B	MW-13
<b>TOC (ft amsl)</b>	891.53	885.80	884.81	893.07	885.19	885.20	870.74	870.28	871.53	873.74	872.60	875.65	885.64	885.58	886.19	886.27	871.8
<b>1/14/2022</b>	874.19	866.72	872.32	873.35	868.55	866.07	865.26	--	--	865.76	865.36	866.39	--	--	--	--	--
<b>2/1/2022</b>	873.98	866.29	871.26	872.33	867.85	865.69	866.01	--	--	866.59	866.70	866.48	--	--	--	--	--
<b>3/17/2022</b>	874.78	867.78	873.07	874.23	868.53	867.02	865.87	865.80	866.33	866.48	865.99	867.39	875.35	--	872.65	868.17	865.50
<b>4/15/2022</b>	874.86	868.32	873.73	874.79	869.27	868.03	866.05	866.25	866.63	866.83	866.22	868.48	875.22	--	873.46	868.70	866.01
<b>5/16/2022</b>	874.40	867.97	873.24	874.28	869.12	867.80	866.02	866.33	866.69	866.85	866.06	868.14	875.33	867.55	872.72	868.90	865.23
<b>6/17/2022</b>	874.33	867.29	872.04	873.02	868.72	866.95	865.66	866.03	866.37	866.43	865.57	867.20	875.12	867.19	872.03	868.34	864.13
<b>7/14/2022</b>	872.69	866.17	870.36	871.61	867.18	865.72	864.62	865.10	865.30	865.39	864.69	865.90	874.25	866.46	869.95	867.52	862.78
<b>8/15/2022</b>	873.56	865.51	870.09	871.44	866.15	865.16	864.21	864.46	864.79	864.84	864.55	865.41	874.85	865.80	869.95	866.98	862.91
<b>9/14/2022</b>	872.08	864.75	869.16	870.28	866.19	864.52	863.50	863.85	864.05	864.13	863.82	864.70	873.56	864.88	868.78	866.48	861.95
<b>10/13/2022</b>	871.99	864.55	868.53	869.78	865.75	864.31	863.56	863.67	864.06	864.14	863.96	864.44	873.39	865.00	868.31	866.14	861.95
<b>11/14/2022</b>	873.17	864.72	868.71	869.44	866.20	864.43	863.74	863.76	864.18	864.27	864.11	864.62	873.87	864.37	868.07	865.85	862.63
<b>12/13/2022</b>	873.29	864.71	868.21	869.07	866.07	864.39	863.75	863.75	864.20	864.26	864.55	864.62	873.88	864.64	867.85	865.73	862.69

Note: "--"denotes no measurement was taken.



## 4.2 Water Quality

### 4.2.1 Impoundments

A table summary of the analytical data is provided in **Appendix B** and laboratory reports are provided in **Appendix C**. **Table 4** lists the EPA established MCL from 40 CFR §141.62 and §141.66, the assessment monitoring BTV (upper tolerance limit (UTL)) for the Erickson impoundments, and the site-specific GPS for all detected Appendix IV constituents.

**Table 4. Groundwater Protection Standards for Detected Appendix IV COIs §257.95(d)(3)**

Constituent	Unit	MCL	BTV (UTL)	GPS <sup>^</sup>
Arsenic	mg/l	0.010	0.011	0.011
Barium	mg/l	2.0	0.19	2.0
Chromium	mg/l	0.10	0.00075	0.10
Lead	mg/l	0.015	0.00019	0.015
Lithium	mg/l	0.040*	0.039	0.040
Molybdenum	mg/l	0.10*	0.0050	0.10
Radium-226-228	pci/l	5.0*	4.3	5.0

\*EPA adopted health-based value in place of MCL

<sup>^</sup>Maximum of MCL and UTL

#### Glacial Aquifer Background Values

Water quality data collected at MW-1 showed a possible impact from the Clear Water Pond (CWP). The possible impact is observed when comparing historical sampling data from MW-1 to background well MW-4. Sample results show MW-1 is consistently higher in concentrations of iron, lithium, sulfate, radium, boron, TDS, and TSS. Therefore, wells MW-11 and MW-12 were installed in February 2022 west of MW-1 and northwest of MW-3, respectively, to provide water quality data unimpacted by nearby BWL facilities. Wells MW-11 and MW-12 are upgradient and, as of November 2022, eight background samples have been collected. However, at the time of this report, background threshold values have not yet been updated for the glacial aquifer to include these new wells. The updated background values for the glacial aquifer will be completed in first quarter of 2023.

#### Bedrock Aquifer Background Values

Wells MW-11B and MW-12B were installed upgradient of the CCR impoundments and were completed in shale and sandstone at approximately 120 feet below ground surface. These two wells are considered background bedrock aquifer wells. Eight background samples have been collected as of December 2022, however, at the time of this report, data analysis had not been completed for all the samples and background threshold values have not been calculated for these wells. The newly developed background values for the bedrock aquifer will be completed in first quarter of 2023.





**Assessment Monitoring Event – February 2022**

Eleven wells (MW-1 through MW-10, and MW-13) were sampled during February 2022 assessment monitoring event. The following wells had exceedances had concentrations of one or more COIs that exceeded GPS: MW-2, MW-3, MW-5, MW-6, and MW-7. Well MW-5 has also shown historical exceedances of lithium over GPS, and no explanation is available at this time for why concentrations dropped at MW-5 for this one sample event.

Therefore, in accordance with CCR Rule §257.95(g), downgradient well concentrations were statistically evaluated to determine if one or more constituents were detected at SSLs above the GPS for each assessment monitoring event. To determine if an exceedance of a GPS value was statistically significant, the 95% lower confidence limit (95LCL) was calculated for each of the downgradient wells. **Table 5** contains the statistical evaluation for comparison against GPS, with LCL values from the February 2022 sample event that exceeded GPS values. Statistical output files are in **Appendix D**. Wells MW-2, MW-5, MW-6, and MW-7 had SSLs of lithium over the GPS. Additionally, well MW-7 had SSLs of molybdenum over the GPS. While well MW-7 had concentrations of lithium and molybdenum over GPS on prior sample dates, the February 2022 assessment monitoring event was the eighth sample event for this well and therefore this is the first sample date for which the statistical comparison to GPS was completed. Well MW-3 also had LCL values greater than the GPS for lithium and molybdenum, but it was calculated based on only three sample events and is therefore not yet considered an SSL due to having less than eight sample events.

**Table 5. Statistical GPS Exceedances for detected Appendix IV Constituents for Erickson Surface Impoundment Wells – February 2022 Assessment Monitoring Event**

Monitoring Well	Appendix IV Constituent	Lithium	Molybdenum
	GPS	0.04 mg/l	0.100 mg/l
MW-2 <sup>1</sup>	95% LCL	0.0567	-
MW-5 <sup>1</sup>	95% LCL	0.0544	-
MW-6 <sup>1</sup>	95% LCL	0.0434	-
MW-7 <sup>1</sup>	95% LCL	0.0928	0.267

<sup>1</sup>95% Adjusted Gamma LCL

“-“ Denotes the LCL did not exceed GPS

**Assessment Monitoring Event – August 2022**

Eleven wells were sampled during the August 2022 assessment monitoring event (MW-1 through MW-10 and MW-13). The following wells had exceedances of concentrations of one or more COIs that exceeded GPS: MW-2, MW-3, MW-5, MW-6, MW-7.

Therefore, in accordance with CCR Rule §257.95(g), downgradient well concentrations were statistically evaluated to determine if one or more constituents were detected at SSLs above the GPS for each assessment monitoring event. **Table 6** contains the statistical evaluation for comparison against GPS, with LCL values from the August 2022 sample event that exceeded GPS values. Statistical output files are in **Appendix D**. Wells MW-2, MW-5, MW-6, and MW-7



had SSLs of lithium over the GPS. Additionally, well MW-7 had SSLs of molybdenum over the GPS. Well MW-3 also had LCL values greater than the GPS for lithium and molybdenum, but it was calculated based on only four sample events and is therefore not yet considered an SSL due to having less than eight sample events.

**Table 6. Statistical GPS Exceedances for detected Appendix IV Constituents for Erickson Surface Impoundment Wells – August 2022 Assessment Monitoring Event**

Monitoring Well	Appendix IV Constituent	Lithium	Molybdenum
	GPS	0.04 mg/l	0.100 mg/l
MW-2 <sup>1</sup>	95% LCL	0.056	-
MW-5 <sup>1</sup>	95% LCL	0.056	-
MW-6 <sup>1</sup>	95% LCL	0.044	-
MW-7 <sup>1</sup>	95% LCL	0.091	0.26

<sup>1</sup>95% Adjusted Gamma LCL

### **Background Monitoring Events**

#### Glacial Aquifer

As stated above, monitoring wells installed in June 2021 (MW-7, MW-8, MW-9, MW-10) and 2022 (MW-7C, MW-11, MW-12, and MW-13) were sampled on a five-week frequency after installation for the first eight sample events. As mentioned above, well MW-7 has consistently shown concentrations of lithium and molybdenum above the GPS. Well MW-7C has also consistently shown concentrations of lithium and molybdenum above the GPS. Well MW-8 had a concentration of radium-226-228 over the GPS at a single event in January 2022. To date, no concentrations of COIs have been detected in MW-9 or MW-10. For these background monitoring events, water quality was compared to GPS; however, these exceedances are single event exceedances and do not represent SSLs over GPS. Data from these wells compared to the GPS during the background monitoring events in 2022 may be found in **Appendix B**.

#### Bedrock Aquifer

Monitoring wells MW-7B, MW-11B, and MW-12B were installed into the bedrock aquifer in 2022 and sampled on a five-week frequency after installation. The location and upgradient or downgradient status of these wells is reported in **Table 1** and **Figure 3**. Upon comparison of water quality data obtained from these bedrock wells, it is evident that conditions differ from that of the glacial aquifer. Therefore, it is inappropriate to compare the bedrock water quality to the established glacial groundwater quality GPS. Eight samples were collected as of December 2022. Background values for the bedrock aquifer will be developed in first quarter of 2023.

### **4.2.2 Wetland Sampling**

BWL collected a surface water sample from the wetland at the eastern site boundary, downgradient of the CCR impoundments as shown on **Figure 3**. The laboratory report is provided in **Appendix C**. The wetland water quality had concentrations of COIs lower than the site-specific GPS.

### 4.2.3 Private Well Sampling

BWL completed a limited sampling of downgradient private wells completed in the bedrock aquifer in 2022. Data from this sampling is, at this time, inconsistent with data obtained from bedrock wells installed at Erickson Power Station. The bedrock private well evaluation will be reported under separate cover in second quarter 2023.

## 5.0 Remedy Selection Progress Update

BWL is moving forward with source removal to close the impoundments, and the groundwater measures evaluated in the Assessment of Corrective Measures (ACM) in November 2021 assumed the impoundment would be excavated and all source removed prior to implementation of groundwater remedy measures.

As discussed in the ACM, to select a groundwater remedy, additional data collection and analyses is ongoing to understand off-site plume transport and potential human or ecological receptors. Potential receptors were evaluated and, at this time, the risk to private wells is considered very low. The additional wells required to delineate the plume boundaries and characterization require offsite wells and private landowner agreements to the east and southeast of the impoundments, which has been ongoing throughout 2022. Eight new wells have been proposed and are anticipated to be installed in 2023, pending landowner agreements, to further assess conditions at Erickson Power Station:

- MW-14, installed immediately east of the CWP to further categorize impacts originating from the CWP.
- MW-15, installed northwest of MW-3 to further delineate the northern extents of the plume.
- MW-16A, MW-16B, and MW-16C, MW-16D installed on the eastern extent of the BWL property near the intersection of South Creyts Road and the railroad to delineate the eastern extent of the plume in the glacial and bedrock aquifers.
- MW-100A, MW-100B, and MW-100C, installed offsite on a parcel owned by Daylight Holdings LLC along Westland Way (Parcel No. 040-084-800-260-00) to the southwest from Erickson to delineate the southern extents of the plume in the glacial and bedrock aquifers.
- MW-101A, MW-101B, and MW-101C, installed offsite on a parcel owned by Reith-Riley to the east of Erickson to delineate the eastern extent of the plume in the glacial and bedrock aquifers.

After installation of the seven new monitoring wells that were installed in spring 2022, samples were collected on a five-week frequency for eight sample events in order to achieve statistical strength in the sampling data. After background wells have eight sample events completed statistical background values for the site will be updated, this is anticipated in approximately first quarter 2023.

In the second half of 2022, the groundwater flow and transport model has continued to be updated with information gathered from drilling new wells and the model has been calibrated for boron and lithium constituents of concern. The groundwater and contaminant transport modeling objectives are to simulate the rate of movement, the contaminant delineation, and the potential offsite migration of COCs within the local groundwater system. The modeled plume has helped to site appropriate drilling locations for the proposed additional plume characterization monitoring wells that are in landowner negotiations. Because new monitoring wells were installed at the site in 2022, this provided new information to update into the groundwater model, including lithology, hydraulic properties from additional slug testing, refinement of the potentiometric surface, and water quality. The groundwater flow and transport model will also serve as an addition evaluation tool and to model corrective measure scenarios for the selection of a remedy. Data collected from additional monitoring wells will be used to refine model accuracy and may influence selection of potential remedies.

Erickson Power Station was retired from operations on November 27, 2022. CCR waste disposal ceased to the CCR impoundments on December 29, 2022. The non-CCR stormwater flows to the impoundments ceased January 3, 2023. The CCR Impoundments Closure Work Plan for removal of CCR was completed in April 2022 and approved by the Michigan Department of Environment, Great Lakes, and Energy on January 17, 2023. A contractor has been selected and is scheduled to initiate dewatering for CCR excavation in February 2023

The source removal is scheduled to be complete in October 2023, at which time CCR removal verification will be completed following the Closure Work Plan. It is anticipated that the remedy selection process for addressing affected groundwater will proceed following the full implementation of the CCR source removal and evaluation of the impact of the source removal on groundwater elevations and groundwater quality.

Additionally, BWL will continue implementing CCR groundwater compliance schedule in conformance with §257.90 - §257.98, which includes semiannual assessment monitoring in accordance with §257.95 to monitor groundwater conditions and inform the remedy selection. The final remedy will be formally selected per §257.97 once the selected option is reviewed and commented on by EGLE and a public meeting is conducted at least 30-days prior to the final selection as required under §257.96(e).

The following activities are proposed to be completed or initiated in the next 6-month period:

- continued semiannual groundwater assessment monitoring,
- statistical reevaluation of background threshold values,
- installation of offsite monitoring wells pending landowner agreements to evaluate the potential extent of contamination,
- predictive modeling using the groundwater flow and transport model, and
- CCR impoundments will be dewatered and source removal will begin.

## 6.0 Summary

The following observations are based on CCR Rule compliance groundwater monitoring program development during 2022:

- Seven new monitoring wells were installed in 2022 (MW-7B, MW-7C, MW-11, MW-11B, MW-12, MW-12B, and MW-13).
- Water levels were measured during each sample event. Groundwater flow in the glacial aquifer is consistently east-northeast under the impoundments.
- Groundwater flow in the bedrock aquifer also shows an east-northeast flow direction under the impoundments, however contours are different than the glacial aquifer.
- Assessment monitoring was completed in February 2022. Monitoring data was statistically evaluated, and SSLs above the GPS were observed at MW-2, MW-5, MW-6, and MW-7 for lithium. Additionally, SSLs above the GPS was observed at MW-7 for molybdenum.
- Assessment monitoring was completed in August 2022. Monitoring data was statistically evaluated, and SSLs above the GPS were observed at MW-2, MW-5, MW-6, and MW-7 for lithium. Additionally, SSLs above the GPS was observed at MW-7 for molybdenum.
- Background monitoring at a five week frequency at the seven new monitoring wells (MW-7B, MW-7C, MW-11, MW-11B, MW-12, MW-12B, and MW-13) commenced in 2022. A statistically significant number of samples have been collected from all wells as of December 2022.
- New BTVs for the glacial aquifer and BTVs for the bedrock aquifer will be developed in 2023.
- Model calibration is complete for boron and lithium transport models and was used to help site proposed downgradient well locations for further plume delineation.
- Erickson Power Station was retired from operations on November 27, 2022. CCR waste disposal ceased to the CCR impoundments on December 29, 2022. The non-CCR stormwater flows to the impoundments ceased January 3, 2023. The CCR Impoundments Closure Work Plan for removal of CCR was completed in April 2022 and approved by EGLE on January 17, 2023. A contractor has been selected and is scheduled to initiate dewatering for CCR excavation in February 2023. The source removal is scheduled to be complete in October 2023, at which time CCR removal verification will be completed following the Closure Work Plan.
- Erickson Power Station impoundment monitoring status is assessment monitoring and assessment of corrective measures.

## 7.0 References

HDR, 2019. Groundwater Level Monitoring Standard Operating Procedure (SOP). November 18, 2019.

HDR, 2020. Groundwater Monitoring System Certification, Erickson Station. May 4, 2020.

HDR, 2020a. Erickson Power Station Statistical Procedures Plan. May 11, 2020.

HDR, 2020b. Determination of Statistically Significant Increases over Background per §257.93(h)(2). November 19, 2020.

HDR, 2021. Background Water Quality Statistical Certification. November 5, 2021.

HDR, 2021a. Conceptual Site Model and Assessment of Corrective Measures. November 5, 2021.

# **Appendix A**

## **Potentiometric Surface Maps**





ERICKSON POWER STATION  
 EATON COUNTY, MICHIGAN





**ERICKSON POWER STATION**  
 EATON COUNTY, MICHIGAN





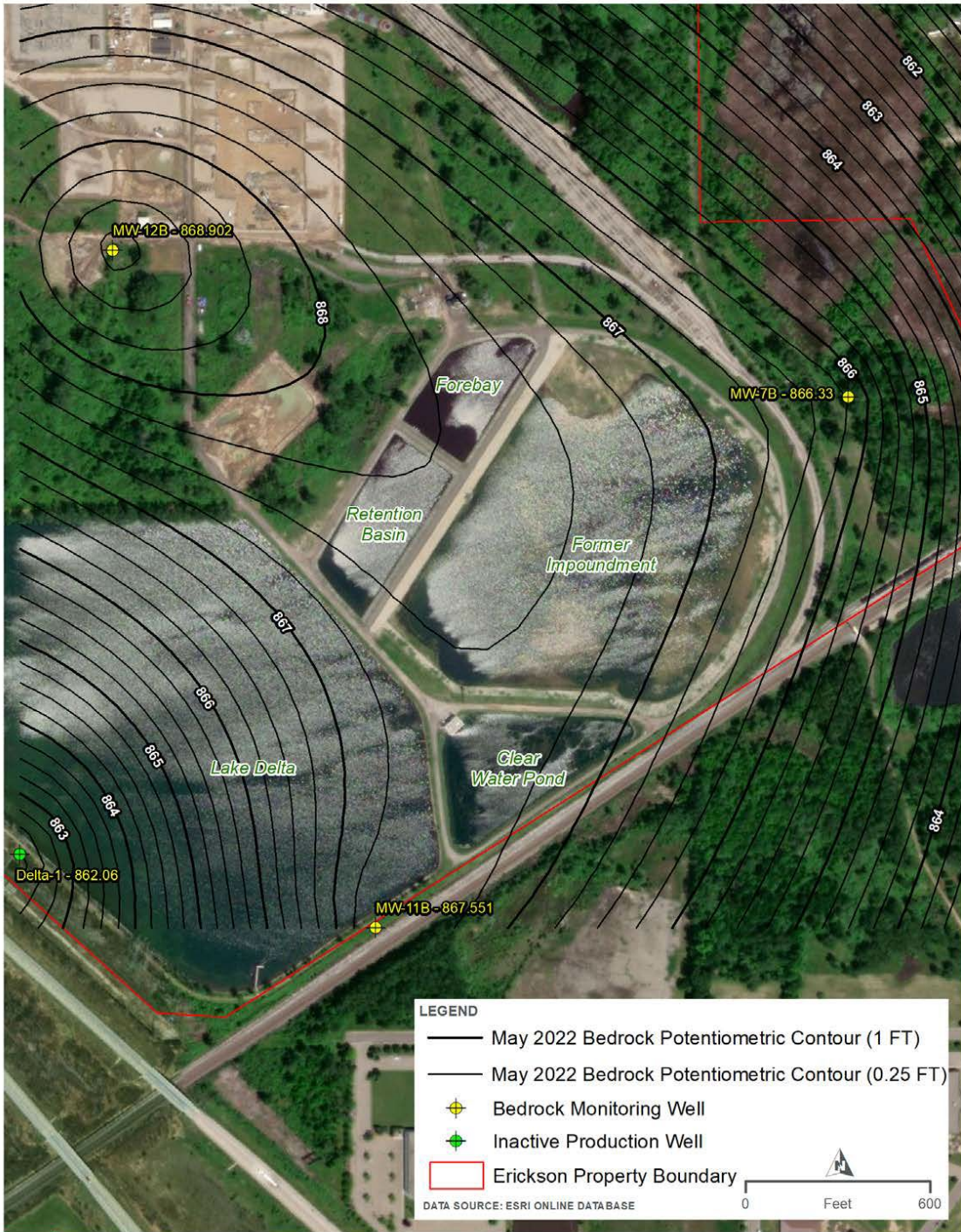
**ERICKSON POWER STATION**  
EATON COUNTY, MICHIGAN





**ERICKSON POWER STATION**  
EATON COUNTY, MICHIGAN





**ERICKSON POWER STATION**  
 EATON COUNTY, MICHIGAN

# **Appendix B**

## **Lab Results Summary Tables**

Sample Location:		MW-1																
Sample Type:		Background																
Sample Date:		4/28/2020	5/26/2020	6/23/2020	7/21/2020	8/18/2020	9/15/2020	9/28/2020	10/12/2020	10/19/2020	10/19/2020	11/6/2020	1/27/2021	5/4/2021	8/3/2021	2/1/2022	8/2/2022	
Constituent	Unit	State Program GPS	Background Monitoring										Initial A.M.	Assessment Monitoring				
<b>Field Parameters</b>																		
pH	su	-	6.81	6.62	6.75	6.85	6.89	6.90	6.77	6.78	7.15	7.15	6.87	6.82	6.7	6.73	6.77	6.84
Conductivity	mS/cm	-	1.175	1.199	1.218	1.209	1.220	1.215	1.177	1.185	1.210	1.210	1.205	1.240	1.2	1.185	1.188	1.208
Turbidity	NTU	-	28.20	40.21	17.10	32.30	21.45	15.61	7.32	7.05	8.64	8.64	8.02	9.95	8.5	7.95	5.51	5.85
Dissolved Oxygen	mg/L	-	0.00	0.01	0.08	0.05	0.52	0.01	0.05	0.30	0.09	0.09	0.21	0.09	0.1	0.08	0.07	0.14
Temperature	°C	-	11.3	15.2	13.5	16.5	15.6	15.5	13.8	15.1	13.9	13.9	15.9	9.8	12	15.7	11.7	14.6
Oxidation Reduction Potential	mV	-	-43.2	-28.5	-87.2	-53.0	-34.7	-109.8	-62.7	-59.4	-79.2	-79.2	-78.8	-27.5	-20.1	-63.4	-46.6	-95.2
<b>Part 115</b>																		
Copper	mg/L	1.00	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	mg/L	8.04	5.05	5.26	<b>8.44</b>	6.09	6.32	<b>8.04</b>	5.98	6.02	6.14	6.15	7.12	5.45	4.84	6.61	6.92	<b>12.0</b>
Nickel	mg/L	0.10	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Silver	mg/L	0.098	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Vanadium	mg/L	0.062	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc	mg/L	5.0	<0.005	0.036	<0.005	<0.005	<0.005	0.007	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
<b>Appendix III</b>																		
Boron	mg/L	0.50	0.48	0.27	0.39	0.38	0.41	0.44	0.45	0.37	0.41	0.39	-	0.21	0.19	0.22	0.27	0.34
Calcium	mg/L	170	162	<b>180</b>	165	156	161	<b>170</b>	153	167	156	150	-	<b>173</b>	156	153	166	158
Chloride	mg/L	250	74	52	70	64	65	59	61	59	52	53	-	44	48	46	52	66
Fluoride	mg/L	2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	<1.0	<1.0	<1.0	<1.0	<1.0
Sulfate	mg/L	250	38	69	59	75	75	77	80	81	84	85	-	78	65	57	49	37
Total Dissolved Solids	mg/L	794	728	<b>794</b>	774	782	776	768	<b>796</b>	774	<b>806</b>	784	-	776	760	748	746	742
<b>Appendix IV</b>																		
Antimony	mg/L	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Arsenic	mg/L	0.0112	0.004	0.005	0.007	0.004	0.006	0.006	0.006	0.006	0.005	0.006	0.007	0.005	0.005	0.005	0.007	0.007
Barium	mg/L	2.000	0.149	0.15	0.168	0.128	0.152	0.148	0.145	0.129	0.136	0.135	0.133	0.121	0.113	0.109	0.122	0.155
Beryllium	mg/L	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	mg/L	0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Chromium	mg/L	0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	mg/L	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Fluoride	mg/L	2.00	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Lead	mg/L	0.004	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Lithium	mg/L	0.040	0.036	0.023	0.032	0.033	0.034	<b>0.041</b>	0.037	0.036	0.036	0.034	0.019	0.015	0.016	0.021	0.027	
Mercury	mg/L	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Molybdenum	mg/L	0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Radium-226	pCi/L	-	1.1	0.34	0.518	0.299	0.4	0.618	-0.0627	0.717	0.812	0.464	0.533	0.504	0.560	0.301	0.816	0.715
Radium-228	pCi/L	-	0.518	0.457	-0.166	0.254	1.47	0.217	-0.778	0.031	0.00457	1.14	-0.0288	0.850	3.47	0.0172	1.76	0.891
Radium-226/228	pCi/L	5.00	1.61	0.796	0.518	0.553	1.87	0.889	0.00	0.748	0.816	1.610	0.533	1.35	4.03	0.318	2.58	1.61
Selenium	mg/L	0.050	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Thallium	mg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Total Suspended Solids	mg/L	-	31	45	43	37	48	55	19	20	31	32	19	14	14	11	13	36
Bicarbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	650
Carbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<10
Hardness	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	588
Magnesium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	43.1
Potassium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.14
Sodium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	40.4

**BOLD** values indicate GPS exceedance

"-" indicates no value

Sample Location:		MW-2															
Sample Type:		Downgradient															
Sample Date:		4/28/2020	5/26/2020	6/23/2020	7/21/2020	8/18/2020	9/15/2020	9/28/2020	10/12/2020	10/19/2020	11/6/2020	1/27/2021	5/4/2021	8/3/2021	2/1/2022	8/2/2022	
Constituent	Unit	State Program GPS	Background Monitoring									Initial A.M.	Assessment Monitoring				
<b>Field Parameters</b>																	
pH	su	-	6.77	6.54	6.69	6.75	6.80	6.83	6.70	6.72	7.08	6.83	6.76	6.70	6.65	6.73	6.86
Conductivity	mS/cm	-	1.602	1.556	1.699	1.744	1.762	1.794	1.761	1.762	1.798	1.792	1.734	1.700	1.655	1.614	1.395
Turbidity	NTU	-	72.31	8.27	8.95	9.42	5.95	4.15	7.11	9.56	6.28	11.27	10.15	10.00	9.62	9.95	9.01
Dissolved Oxygen	mg/L	-	0.02	0.02	0.07	0.19	0.15	0.12	0.03	0.34	0.03	0.19	0.08	0.21	0.02	0.20	1.01
Temperature	°C	-	11.6	14.2	12.9	15.0	13.9	13.7	12.7	14.5	12.3	14.3	9.1	12.0	14.3	11.7	15.4
Oxidation Reduction Potential	mV	-	-42.5	36.0	-40.2	32.5	38.2	-75.8	56.1	35.3	22.1	-29.0	55.9	181.8	94.5	46.6	21
<b>Part 115</b>																	
Copper	mg/L	1.00	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	mg/L	8.04	0.91	0.67	0.48	0.44	0.62	0.51	0.51	0.67	0.63	0.54	0.49	0.55	0.66	1.93	0.93
Nickel	mg/L	0.10	0.018	0.019	0.022	0.024	0.026	0.027	0.027	0.028	0.027	0.026	0.025	0.025	0.026	0.026	0.018
Silver	mg/L	0.098	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Vanadium	mg/L	0.062	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc	mg/L	5.0	<0.005	0.041	<0.005	<0.005	0.007	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.007	<0.005
<b>Appendix III</b>																	
Boron	mg/L	0.50	<b>3.56</b>	<b>3.38</b>	<b>4.05</b>	<b>4.61</b>	<b>5.19</b>	<b>5.97</b>	<b>5.94</b>	<b>5.97</b>	<b>5.97</b>	-	<b>5.80</b>	<b>5.04</b>	<b>6.17</b>	<b>5.33</b>	<b>4.76</b>
Calcium	mg/L	170	<b>251</b>	<b>256</b>	<b>268</b>	<b>271</b>	<b>272</b>	<b>270</b>	<b>265</b>	<b>270</b>	<b>270</b>	-	<b>260</b>	<b>254</b>	<b>226</b>	<b>237</b>	<b>204</b>
Chloride	mg/L	250	67	68	75	81	85	88	84	88	88	-	94	77	79	87	87
Fluoride	mg/L	2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	<1.0	<1.0	<1.0	<1.0	<1.0
Sulfate	mg/L	250	<b>386</b>	<b>386</b>	<b>484</b>	<b>549</b>	<b>580</b>	<b>560</b>	<b>586</b>	<b>560</b>	<b>560</b>	-	<b>506</b>	<b>505</b>	<b>504</b>	<b>398</b>	<b>330</b>
Total Dissolved Solids	mg/L	794	<b>1170</b>	<b>1180</b>	<b>1300</b>	<b>1390</b>	<b>1430</b>	<b>1390</b>	<b>1420</b>	<b>1390</b>	<b>1390</b>	-	<b>1320</b>	<b>1250</b>	<b>1300</b>	<b>1180</b>	<b>1020</b>
<b>Appendix IV</b>																	
Antimony	mg/L	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Arsenic	mg/L	0.0112	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.004	<0.002
Barium	mg/L	2.000	0.039	0.043	0.045	0.036	0.045	0.039	0.041	0.041	0.041	0.041	0.041	0.041	0.039	0.048	0.043
Beryllium	mg/L	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	mg/L	0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Chromium	mg/L	0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	mg/L	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Fluoride	mg/L	2.00	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Lead	mg/L	0.004	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Lithium	mg/L	0.040	<b>0.055</b>	<b>0.047</b>	<b>0.055</b>	<b>0.053</b>	<b>0.057</b>	<b>0.066</b>	<b>0.066</b>	<b>0.065</b>	<b>0.07</b>	<b>0.063</b>	<b>0.067</b>	<b>0.061</b>	<b>0.058</b>	<b>0.058</b>	<b>0.051</b>
Mercury	mg/L	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Molybdenum	mg/L	0.100	0.01	0.008	0.01	0.007	0.011	0.011	0.012	0.012	0.012	0.01	0.009	0.012	0.011	0.013	
Radium-226	pCi/L	-	0.813	0.0551	0.754	0.329	0.171	0.183	0.263	0.151	0.405	0.539	0.296	0.366	0.17	0.63	0.29
Radium-228	pCi/L	-	1.05	0.0833	-0.139	0.0326	0.573	-0.0154	0.0604	1.30	0.0896	0.874	0.713	0.150	1.02	1.49	-0.338
Radium-226/228	pCi/L	5.00	1.86	0.138	0.754	0.362	0.745	0.183	0.323	1.45	0.495	1.41	1.01	0.515	1.19	2.12	0.29
Selenium	mg/L	0.050	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Thallium	mg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Total Suspended Solids	mg/L	-	<3	1.0	<3	<3	14	<3	2.0	6.0	3.0	10	10	12	10	12	19
Bicarbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	410
Carbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<10
Hardness	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	654
Magnesium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	50.5
Potassium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.7
Sodium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	61.6

**BOLD** values indicate GPS exceedance

" - " indicates no value

Sample Location:			MW-3			
Sample Type:			Upgradient			
Sample Date:			5/4/2021	8/3/2021	2/1/2022	8/2/2022
Constituent	Unit	State Program GPS	Background Monitoring			
<b>Field Parameters</b>						
pH	su	-	7.20	7.15	7.23	7.27
Conductivity	mS/cm	-	1.800	1.796	1.815	1.829
Turbidity	NTU	-	2.10	8.01	4.83	5.19
Dissolved Oxygen	mg/L	-	0.10	0.03	0.16	0.17
Temperature	°C	-	12.0	14.1	10.6	14.2
Oxidation Reduction Potential	mV	-	-37.5	-65.2	-40.3	-92.1
<b>Part 115</b>						
Copper	mg/L	1.00	<0.005	<0.005	<0.005	<0.005
Iron	mg/L	8.04	2.01	2.05	1.94	1.8
Nickel	mg/L	0.10	<0.005	<0.005	<0.005	<0.005
Silver	mg/L	0.098	<0.0005	<0.0005	<0.0005	<0.0005
Vanadium	mg/L	0.062	<0.005	<0.005	<0.005	<0.005
Zinc	mg/L	5.0	<0.005	<0.005	<0.005	<0.005
<b>Appendix III</b>						
Boron	mg/L	0.50	<b>5.41</b>	<b>6.16</b>	<b>5.62</b>	<b>5.89</b>
Calcium	mg/L	170	<b>243</b>	<b>223</b>	<b>255</b>	<b>241</b>
Chloride	mg/L	250	89	92	94	101
Fluoride	mg/L	2.0	<1.0	<1.0	<1.0	<1.0
Sulfate	mg/L	250	<b>698</b>	<b>727</b>	<b>682</b>	<b>704</b>
Total Dissolved Solids	mg/L	794	<b>1490</b>	<b>1500</b>	<b>1480</b>	<b>1440</b>
<b>Appendix IV</b>						
Antimony	mg/L	0.006	<0.005	<0.005	<0.005	<0.005
Arsenic	mg/L	0.0112	0.003	0.003	0.003	0.003
Barium	mg/L	2.000	0.021	0.021	0.020	0.019
Beryllium	mg/L	0.004	<0.001	<0.001	<0.001	<0.001
Cadmium	mg/L	0.005	<0.0005	<0.0005	<0.0005	<0.0005
Chromium	mg/L	0.100	<0.005	<0.005	<0.005	<0.005
Cobalt	mg/L	0.006	<0.005	<0.005	<0.005	<0.005
Fluoride	mg/L	2.00	<1.0	<1.0	<1.0	<1.0
Lead	mg/L	0.004	<0.003	<0.003	<0.003	<0.003
Lithium	mg/L	0.040	<b>0.077</b>	<b>0.086</b>	<b>0.086</b>	<b>0.091</b>
Mercury	mg/L	0.002	<0.0002	<0.0002	<0.0002	<0.0002
Molybdenum	mg/L	0.100	<b>0.162</b>	<b>0.153</b>	<b>0.164</b>	<b>0.162</b>
Radium-226	pCi/L	-	0.437	0.152	0.554	0.355
Radium-228	pCi/L	-	0.760	0.963	1.90	2.56
Radium-226/228	pCi/L	5.00	1.20	1.11	2.45	2.92
Selenium	mg/L	0.050	<0.005	<0.005	<0.005	<0.005
Thallium	mg/L	0.002	<0.002	<0.002	<0.002	<0.002
Total Suspended Solids	mg/L	-	3.0	1.0	2.0	4.0
Bicarbonate	mg/L	-	-	-	-	210
Carbonate	mg/L	-	-	-	-	<10
Hardness	mg/L	-	-	-	-	784
Magnesium	mg/L	-	-	-	-	45.9
Potassium	mg/L	-	-	-	-	1.67
Sodium	mg/L	-	-	-	-	111

**BOLD** values indicate GPS exceedance

" - " indicates no value





Sample Location:			MW-5															
Sample Type:			Downgradient															
Sample Date:			4/28/2020	5/26/2020	6/23/2020	7/21/2020	8/18/2020	9/15/2020	9/28/2020	10/12/2020	10/19/2020	11/6/2020	1/27/2021	5/4/2021	8/3/2021	2/1/2022	8/2/2022	
Constituent	Unit	State Program GPS	Background Monitoring									Initial A.M.	Assessment Monitoring					
<b>Field Parameters</b>																		
pH	su	-	7.27	7.24	7.31	7.34	7.30	7.17	6.71	7.34	7.45	7.16	7.35	6.40	7.22	7.18	7.40	
Conductivity	mS/cm	-	1.576	1.882	1.970	1.869	1.750	1.893	1.945	2.493	1.425	2.234	1.295	1.600	1.772	1.238	1.643	
Turbidity	NTU	-	179.57	69.71	17.91	15.10	20.25	19.02	15.75	12.35	9.58	18.49	15.25	21.00	9.52	14.21	20.19	
Dissolved Oxygen	mg/L	-	0.55	0.65	2.61	3.85	2.50	0.64	1.27	3.49	4.25	1.02	2.34	2.45	2.45	3.21	5.42	
Temperature	°C	-	11.6	13.9	15.2	17.5	12.7	12.3	12.5	15.5	11.6	12.5	8.6	13.0	13.3	10.1	15.3	
Oxidation Reduction Potential	mV	-	-33.0	28.7	-34.8	58.4	69.5	-24.8	180.1	-31.2	130.2	17.5	191.2	248.4	132.6	59.1	28.6	
<b>Part 115</b>																		
Copper	mg/L	1.00	0.009	<0.005	<0.005	0.026	0.005	<0.005	<0.005	0.011	<0.005	<0.005	<0.005	<0.005	<0.005	0.019	<0.005	
Iron	mg/L	8.04	8.00	1.93	0.39	0.27	2.45	0.21	0.18	1.74	0.18 <sup>1</sup>	<0.02	0.63	0.9	1.12	4.69	0.75	
Nickel	mg/L	0.10	0.019	0.016	0.013	0.011	0.013	0.011	0.016	0.018	0.014	0.007	0.01	0.01	0.01	0.008	0.011	
Silver	mg/L	0.098	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Vanadium	mg/L	0.062	0.012	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.009	<0.005	
Zinc	mg/L	5.00	0.023	0.033	0.026	0.007	0.011	<0.005	0.006	0.014	<0.005	<0.005	0.098	<0.005	0.005	0.048	0.009	
<b>Appendix III</b>																		
Boron	mg/L	0.50	4.99	5.19	4.59	4.57	4.48	5.00	5.09	5.00	5.75	-	4.61	3.66	4.82	0.37	4.29	
Calcium	mg/L	170	245	320	289	251	266	266	283	372	319	-	245	221	229	70.1	223	
Chloride	mg/L	250	68	82	75	80	76	77	78	81	83	-	66	73	66	43	66	
Fluoride	mg/L	2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	<1.0	<1.0	<1.0	<1.0	<1.0	
Sulfate	mg/L	250	591	930	931	877	714	791	873	1,080	1,170	-	578	581	700	186	598	
Total Dissolved Solids	mg/L	794	1280	1770	1720	1640	1520	1540	1660	1960	2020	-	1220	1230	1390	592	1210	
<b>Appendix IV</b>																		
Antimony	mg/L	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Arsenic	mg/L	0.0112	0.005	0.002	0.002	0.002	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.007	0.002	
Barium	mg/L	2.000	0.064	0.056	0.049	0.041	0.056	0.043	0.043	0.048	0.042	0.033	0.039	0.038	0.04	0.055	0.044	
Beryllium	mg/L	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Cadmium	mg/L	0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Chromium	mg/L	0.100	0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.007	<0.005	
Cobalt	mg/L	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Fluoride	mg/L	2.00	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
Lead	mg/L	0.004	0.005	<0.003	<0.003	<0.003	0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.014	<0.003	
Lithium	mg/L	0.040	0.091	0.051	0.061	0.074	0.085	0.091	0.07	0.054	0.046	0.057	0.08	0.073	0.078	0.016	0.076	
Mercury	mg/L	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Molybdenum	mg/L	0.100	0.096	0.051	0.05	0.052	0.067	0.053	0.044	0.038	0.035	0.032	0.054	0.05	0.039	0.010	0.063	
Radium -226	pCi/L	-	1.1	1.08	0.223	0.811	0.30	0.773	0.759	0.709	0.600	3.30	0.787	0.349	0.374	0.252	0.525	
Radium -228	pCi/L	-	0.187	0.28	0.302	0.721	0.253	-0.641	1.47	1.38	-0.262	0.921	3.20	0.726	0.271	1.54	0.33	
Radium -226/228	pCi/L	5.00	1.29	1.36	0.524	1.53	0.552	0.773	2.23	2.09	0.600	4.22	3.99	1.08	0.644	1.79	0.855	
Selenium	mg/L	0.050	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Thallium	mg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Total Suspended Solids	mg/L	-	161	21	23	37	20	61	6.0	14	7.0	4.0	7.0	8.0	4.0	63	17	
Bicarbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	280	
Carbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<10	
Hardness	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	748	
Magnesium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	54.5	
Potassium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.77	
Sodium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	69.5	

BOLD values indicate GPS exceedance

"-" indicates no value

Sample Location:		MW-6																
Sample Type:		Downgradient																
Sample Date:		4/28/2020	5/26/2020	6/23/2020	7/21/2020	8/18/2020	9/15/2020	9/28/2020	10/12/2020	10/19/2020	11/6/2020	1/27/2021	5/4/2021	8/3/2021	2/1/2022	8/2/2022		
Constituent	Unit	State Program GPS	Background Monitoring										Initial I.A.M.	Assessment Monitoring				
<b>Field Parameters</b>																		
pH	su	-	6.64	6.35	6.68	6.76	6.80	6.85	6.69	6.71	7.11	6.76	6.72	7.00	6.51	6.69	6.79	
Conductivity	ms/cm	-	0.954	0.902	1.044	1.075	1.130	1.251	1.149	1.205	1.275	1.169	1.178	1.000	1.022	1.045	1.091	
Turbidity	NTU	-	16.71	17.80	33.60	6.61	8.99	6.95	5.42	8.45	8.35	9.69	1.19	8.00	8.74	4.52	2.65	
Dissolved Oxygen	mg/L	-	0.05	0.01	0.09	0.09	0.05	0.04	0.02	0.24	0.04	0.18	0.12	0.10	0.07	0.08	0.44	
Temperature	°C	-	10.5	14.2	11.7	13.4	13.0	13.6	12.6	14.3	12.8	15.2	11.0	12.0	13.2	13.4	14.4	
Oxidation Reduction Potential	mV	-	-26.9	102.4	-45.9	139.7	91.1	-66.5	59.5	88.9	91.2	12.0	122.9	70.8	168.5	68.6	18.3	
<b>Part 115</b>																		
Copper	mg/L	1.00	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Iron	mg/L	8.04	0.08	0.20	0.07	0.05	0.03	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.02	0.04	0.02	
Nickel	mg/L	0.10	0.005	<0.005	0.007	0.007	0.008	0.007	0.008	0.007	0.007	0.007	0.006	0.006	0.007	0.007	<0.005	
Silver	mg/L	0.098	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Vanadium	mg/L	0.062	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Zinc	mg/L	5.0	<0.005	0.034	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
<b>Appendix III</b>																		
Boron	mg/L	0.50	<b>0.56</b>	<b>0.49</b>	<b>0.65</b>	<b>0.75</b>	<b>0.86</b>	<b>1.05</b>	<b>0.97</b>	<b>0.99</b>	<b>1.09</b>	-	<b>0.91</b>	<b>0.64</b>	<b>0.76</b>	<b>0.68</b>	<b>0.80</b>	
Calcium	mg/L	170	142	143	154	161	170	<b>192</b>	<b>175</b>	<b>189</b>	<b>173</b>	-	<b>191</b>	149	146	160	169	
Chloride	mg/L	250	26	24	29	33	37	43	39	41	42	-	38	27	27	27	35	
Fluoride	mg/L	2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	<1.0	<1.0	<1.0	<1.0	<1.0	
Sulfate	mg/L	250	135	123	154	183	222	264	214	242	263	-	198	133	139	131	172	
Total Dissolved Solids	mg/L	794	642	598	706	738	<b>820</b>	<b>880</b>	<b>822</b>	<b>868</b>	<b>898</b>	-	<b>798</b>	658	692	688	728	
<b>Appendix IV</b>																		
Antimony	mg/L	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Arsenic	mg/L	0.0112	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Barium	mg/L	2.000	0.042	0.05	0.042	0.044	0.053	0.054	0.055	0.054	0.057	0.052	0.052	0.044	0.043	0.044	0.038	
Beryllium	mg/L	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Cadmium	mg/L	0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Chromium	mg/L	0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Cobalt	mg/L	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Fluoride	mg/L	2.00	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
Lead	mg/L	0.004	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	
Lithium	mg/L	0.040	0.037	0.038	0.037	<b>0.041</b>	<b>0.044</b>	<b>0.055</b>	<b>0.053</b>	<b>0.052</b>	<b>0.059</b>	<b>0.058</b>	<b>0.048</b>	<b>0.048</b>	<b>0.047</b>	<b>0.044</b>	<b>0.046</b>	
Mercury	mg/L	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Molybdenum	mg/L	0.100	0.021	0.021	0.026	0.025	0.030	0.031	0.028	0.029	0.034	0.028	0.024	0.024	0.029	0.036	0.016	
Radium-226	pCi/L	-	0.212	-0.0419	0.379	-0.0445	0.415	0.458	0.533	0.461	0.537	0.343	0.263	0.320	0.116	0.571	0.0773	
Radium-228	pCi/L	-	0.384	-0.481	-0.299	0.460	1.06	-0.00462	0.225	0.176	-0.866	1.36	1.72	1.13	1.30	2.04	0.324	
Radium-226/228	pCi/L	5.00	0.596	0.00	0.379	0.460	1.48	0.458	0.758	0.637	0.537	1.70	1.98	1.45	1.42	2.61	0.401	
Selenium	mg/L	0.050	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Thallium	mg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Total Suspended Solids	mg/L	-	<3	6.0	<3	<3	<3	<3	<3	<3	1.0	<3	<3	<3	2.0	32	<3	
Bicarbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	480	
Carbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<10	
Hardness	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	532	
Magnesium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	32.9	
Potassium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.4	
Sodium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	38.8	

**BOLD** values indicate GPS exceedance

" - " indicates no value

		MW-7									
		Downgradient									
		6/15/2021	7/20/2021	8/24/2021	9/28/2021	11/2/2021	12/7/2021	1/11/2022	2/17/2022	8/2/2022	
Constituent	Unit	State Program GPS	Background Monitoring								
<b>Field Parameters</b>											
pH	su	-	8.18	7.40	7.40	7.47	7.37	7.47	7.56	7.24	7.58
Conductivity	mS/cm	-	0.879	0.900	0.916	0.925	0.462	0.972	0.964	1.129	0.965
Turbidity	NTU	-	1.71	5.00	5.37	16.01	5.18	2.2	2.49	2.21	2.65
Dissolved Oxygen	mg/L	-	0.03	<0.1	0.01	0.02	0	0.02	0.49	0.01	0.16
Temperature	°C	-	12.9	14.0	17.0	14.3	13	11	9.1	6.2	14.6
Oxidation Reduction Potential	mV	-	-142.1	-117.2	-139.5	-128.3	-146.5	-157.1	-112.6	-36.9	-129
<b>Part 115</b>											
Copper	mg/L	1.00	< 0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	mg/L	8.04	1.34	1.25	1.31	1.37	1.49	1.50	1.52	2.81	1.19
Nickel	mg/L	0.10	< 0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Silver	mg/L	0.098	< 0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Vanadium	mg/L	0.062	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc	mg/L	5.0	< 0.005	0.007	0.014	<0.005	<0.005	<0.005	<0.005	<0.005	0.007
<b>Appendix III</b>											
Boron	mg/L	0.50	<b>1.88</b>	<b>1.78</b>	<b>1.89</b>	<b>1.81</b>	<b>2.12</b>	<b>2.19</b>	<b>2.14</b>	<b>2.75</b>	<b>1.43</b>
Calcium	mg/L	170	110	111	112	108	122	126	121	149	104
Chloride	mg/L	250	73	74	74	75	73	72.2	78	75	98
Fluoride	mg/L	2.0	< 1.0	<1.0	<1.0	<1.0	<1.0	0.338	<1.0	<1.0	<1.0
Sulfate	mg/L	250	189	181	184	191	212	203	214	<b>260</b>	175
Total Dissolved Solids	mg/L	794	586	574	592	588	622	634	624	758	590
<b>Appendix IV</b>											
Antimony	mg/L	0.006	< 0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Arsenic	mg/L	0.0112	0.006	0.006	0.007	0.006	0.005	0.006	0.006	0.005	0.004
Barium	mg/L	2.000	0.056	0.06	0.052	0.051	0.054	0.056	0.055	0.062	0.047
Beryllium	mg/L	0.004	< 0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	mg/L	0.005	< 0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Chromium	mg/L	0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	mg/L	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Fluoride	mg/L	2.00	< 1.0	<1.0	<1.0	<1.0	<1.0	0.338	<1.0	<1.0	<1.0
Lead	mg/L	0.004	< 0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Lithium	mg/L	0.040	<b>0.089</b>	<b>0.096</b>	<b>0.093</b>	<b>0.097</b>	<b>0.100</b>	<b>0.100</b>	<b>0.100</b>	<b>0.112</b>	<b>0.086</b>
Mercury	mg/L	0.002	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Molybdenum	mg/L	0.100	<b>0.259</b>	<b>0.260</b>	<b>0.292</b>	<b>0.276</b>	<b>0.276</b>	<b>0.293</b>	<b>0.296</b>	<b>0.284</b>	<b>0.146</b>
Radium-226	pCi/L	-	0.253	1.4	0.766	0.829	0.666	2.64	0.676	0.818	0.568
Radium-228	pCi/L	-	1.85	3.42	0.535	2.49	0.115	0.179	-0.650	1.51	1.27
Radium-226/228	pCi/L	5.00	2.11	4.82	1.30	3.32	0.781	2.82	0.676	2.33	1.84
Selenium	mg/L	0.050	< 0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Thallium	mg/L	0.002	< 0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Total Suspended Solids	mg/L	-	< 3	<3	<3	<3	<3	<3	<3	1.0	<3
Bicarbonate	mg/L	-	-	-	-	-	-	-	-	-	180
Carbonate	mg/L	-	-	-	-	-	-	-	-	-	<10
Hardness	mg/L	-	-	-	-	-	-	-	-	-	305
Magnesium	mg/L	-	-	-	-	-	-	-	-	-	12.3
Potassium	mg/L	-	-	-	-	-	-	-	-	-	9.53
Sodium	mg/L	-	-	-	-	-	-	-	-	-	71.1

**BOLD** values indicate GPS exceedance

"-" indicates no value

Sample Location:			MW-7B									
Sample Type:			Downgradient									
Sample Date:			3/9/2022	3/9/2022	4/13/2022	4/13/2022	5/19/2022	6/23/2022	7/28/2022	9/1/2022	10/6/2022	11/10/2022
Constituent	Unit	State Program GPS	Background Monitoring									
Field Parameters				Field Dupe		Field Dupe						
pH	su	-	8.14	8.14	8.04	8.04	8.07	7.73	7.81	7.90	7.80	7.85
Conductivity	mS/cm	-	0.73	0.73	0.588	0.588	0.589	0.586	0.588	0.580	0.587	0.577
Turbidity	NTU	-	0.02	0.02	7.01	7.01	6.25	6.01	4.05	4.20	5.25	6.01
Dissolved Oxygen	mg/L	-	0.85	0.85	0.26	0.26	0.1	0.09	0.11	0.67	0.16	0.12
Temperature	°C	-	11.7	11.7	11.0	11.0	13.1	13.3	14.1	14.0	13.3	13.4
Oxidation Reduction Potential	mV	-	19.2	19.2	-95.1	-95.1	-135.8	-38.8	-108.9	-117.5	-98.2	-106.9
Part 115												
Copper	mg/L	<b>1.00</b>	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	mg/L	8.04	0.06	0.06	0.03	0.03	0.05	0.04	0.05	0.06	0.07	
Nickel	mg/L	<b>0.10</b>	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Silver	mg/L	<b>0.098</b>	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Vanadium	mg/L	<b>0.062</b>	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc	mg/L	<b>5.0</b>	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Appendix III												
Boron	mg/L	0.50	3.07	3.09	2.90	2.88	3.02	3.04	2.98	3.17	2.91	2.94
Calcium	mg/L	1.70	10.2	10.4	9.59	9.28	8.24	9.22	9.25	9.14	8.73	9.24
Chloride	mg/L	<b>250</b>	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Fluoride	mg/L	<b>2.0</b>	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Sulfate	mg/L	<b>250</b>	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Total Dissolved Solids	mg/L	794	366	366	362	370	366	362	376	356	376	368
Appendix IV												
Antimony	mg/L	<b>0.006</b>	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Arsenic	mg/L	<b>0.0112</b>	<0.002	<0.002	<b>0.003</b>	<b>0.002</b>	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Barium	mg/L	2.000	0.01	0.009	0.011	0.011	0.01	0.009	0.009	0.009	0.01	0.008
Beryllium	mg/L	<b>0.004</b>	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	mg/L	<b>0.005</b>	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Chromium	mg/L	<b>0.100</b>	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	mg/L	<b>0.006</b>	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Fluoride	mg/L	<b>2.00</b>	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Lead	mg/L	<b>0.004</b>	<0.003	<0.003	<0.003	<0.003	<0.003	<b>0.012</b>	<0.003	<0.003	<0.003	<0.003
Lithium	mg/L	0.040	0.034	0.035	0.028	0.029	0.031	0.031	0.032	0.032	0.032	0.032
Mercury	mg/L	<b>0.002</b>	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Molybdenum	mg/L	<b>0.100</b>	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Radium-226	pCi/L	-	0.451	0.629	0.439	0.52	0.378	0.547	0.278	0.44	0.988	0.463
Radium-228	pCi/L	-	1.270	0.536	0.872	0.428	-0.123	1.88	0.136	0.286	0.103	1.3
Radium-226/228	pCi/L	5.00	1.720	1.160	1.31	0.948	0.378	2.43	0.414	0.726	1.09	1.77
Selenium	mg/L	<b>0.050</b>	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Thallium	mg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Total Suspended Solids	mg/L	-	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
Bicarbonate	mg/L	-	390	390	390	400	400	380	390	390	390	400
Carbonate	mg/L	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Hardness	mg/L	-	38	40	37	51	29	31	30	29	30	29
Magnesium	mg/L	-	2.93	3.00	2.99	2.93	2.43	2.75	2.79	2.84	2.75	2.78
Potassium	mg/L	-	5.48	5.57	5.64	5.57	4.8	5.57	5.72	5.61	5.53	5.85
Sodium	mg/L	-	132	131	136	133	116	135	138	140	138	137

BOLD values indicate GPS exceedance

" - " indicates no value

Sample Location:		MW-7C										
Sample Type:		Downgradient										
Sample Date:		3/10/2022	3/10/2022	4/14/2022	5/19/2022	6/23/2022	7/28/2022	9/1/2022	10/6/2022	11/10/2022		
Constituent	Unit	State Program GPS	Background Monitoring									
Field Parameters			Field Dupe									
pH	su	-	7.32	7.32	7.51	7.49	7.28	7.24	7.30	7.23	7.35	
Conductivity	mS/cm	-	2.01	2.01	1.811	1.758	1.651	1.672	1.700	1.330	1.678	
Turbidity	NTU	-	0.02	0.02	5.87	3.95	2.59	1.97	2.80	4.20	4.01	
Dissolved Oxygen	mg/L	-	1.77	1.77	0.23	0.07	0.08	0.09	0.61	0.12	0.09	
Temperature	°C	-	12.3	12.3	11.0	13.7	13.8	14.3	16.0	13.7	13.8	
Oxidation Reduction Potential	mV	-	-39	-39	-121.4	-182.8	-110.2	-151.5	-136.4	-128.8	-120.4	
<b>Part 115</b>												
Copper	mg/L	1.00	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Iron	mg/L	8.04	4.15	4.11	4.34	4.28	3.77	3.84	4.11	3.81	4.11	
Nickel	mg/L	0.10	0.01	0.011	0.008	0.008	0.007	0.008	0.008	0.007	0.007	
Silver	mg/L	0.098	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Vanadium	mg/L	0.062	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Zinc	mg/L	5.0	<0.005	0.007	<0.005	<0.005	<0.005	0.006	<0.005	<0.005	<0.005	
<b>Appendix III</b>												
Boron	mg/L	0.50	<b>6.54</b>	<b>6.55</b>	<b>6.44</b>	<b>6.74</b>	<b>6.46</b>	<b>6.7</b>	<b>7.24</b>	<b>6.29</b>	<b>6.62</b>	
Calcium	mg/L	170	<b>277</b>	<b>272</b>	<b>255</b>	<b>183</b>	<b>245</b>	<b>241</b>	<b>247</b>	<b>234</b>	<b>243</b>	
Chloride	mg/L	250	96	95	101	93	91	90	93	93	92	
Fluoride	mg/L	2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
Sulfate	mg/L	250	<b>751</b>	<b>761</b>	<b>736</b>	<b>723</b>	<b>668</b>	<b>660</b>	<b>703</b>	<b>675</b>	<b>685</b>	
Total Dissolved Solids	mg/L	794	<b>1500</b>	<b>1500</b>	<b>1450</b>	<b>1420</b>	<b>1360</b>	<b>1360</b>	<b>1370</b>	<b>1360</b>	<b>1360</b>	
<b>Appendix IV</b>												
Antimony	mg/L	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Arsenic	mg/L	0.0112	0.007	0.007	0.006	0.007	0.006	0.006	0.006	0.006	0.005	
Barium	mg/L	2.000	0.045	0.046	0.043	0.046	0.041	0.042	0.047	0.041	0.044	
Beryllium	mg/L	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Cadmium	mg/L	0.005	<0.0005	<0.0005	<0.0005	0.0007	<0.0005	<0.0005	0.0008	<0.0005	0.0009	
Chromium	mg/L	0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Cobalt	mg/L	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Fluoride	mg/L	2.00	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
Lead	mg/L	0.004	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	
Lithium	mg/L	0.040	<b>0.132</b>	<b>0.129</b>	<b>0.121</b>	<b>0.130</b>	<b>0.127</b>	<b>0.138</b>	<b>0.137</b>	<b>0.128</b>	<b>0.125</b>	
Mercury	mg/L	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Molybdenum	mg/L	0.100	<b>0.41</b>	<b>0.41</b>	<b>0.40</b>	<b>0.42</b>	<b>0.379</b>	<b>0.39</b>	<b>0.405</b>	<b>0.377</b>	<b>0.415</b>	
Radium-226	pCi/L	-	0.867	0.916	0.566	0.444	0.958	0.193	0.606	0.595	0.68	
Radium-228	pCi/L	-	2.790	2.110	3.090	0.550	2.35	0.58	0.204	1.39	1.08	
Radium-226/228	pCi/L	5.00	3.660	3.030	3.650	0.994	3.31	0.773	0.81	1.99	1.76	
Selenium	mg/L	0.050	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Thallium	mg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Total Suspended Solids	mg/L	-	27	13	10	9.0	8.0	<3	<3	<3	6.0	
Bicarbonate	mg/L	-	150	160	160	170	160	160	170	150	150	
Carbonate	mg/L	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	
Hardness	mg/L	-	840	860	812	812	777	740	764	750	754	
Magnesium	mg/L	-	44.1	44.9	43.1	33.7	40.0	40.0	42.2	42.1	41.0	
Potassium	mg/L	-	5.34	5.04	5.68	4.92	5.89	5.71	5.88	6.14	5.96	
Sodium	mg/L	-	97.9	97.1	96.8	79	94.2	95.7	99.1	95.7	98.7	

**BOLD** values indicate GPS exceedance

" - " indicates no value

Sample Location:			MW-8								
Sample Type:			Downgradient								
Sample Date:			6/15/2021	7/20/2021	8/24/2021	9/28/2021	11/2/2021	12/7/2021	1/11/2022	2/17/2022	8/2/2022
Constituent	Unit	State Program GPS	Background Monitoring								
<b>Field Parameters</b>											
pH	su	-	7.78	7.00	6.99	7.24	7.03	7.12	7.26	6.99	7.18
Conductivity	mS/cm	-	0.620	0.640	0.620	0.721	0.656	0.653	0.637	0.638	0.665
Turbidity	NTU	-	2.24	7.00	7.18	6.53	5.25	2.95	5.43	2	4.31
Dissolved Oxygen	mg/L	-	2.29	1.00	1.66	0.04	7.83	1.76	2.24	1.64	0.88
Temperature	°C	-	10.7	14.0	16.4	14.3	14	11.2	9.2	5.9	14.4
Oxidation Reduction Potential	mV	-	72.1	280.5	325.9	112.7	228.5	122	234.6	365.3	100.5
<b>Part 115</b>											
Copper	mg/L	1.00	< 0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	mg/L	8.04	< 0.02	<0.02	<0.02	<0.02	<0.02	0.02	<0.02	<0.02	<0.02
Nickel	mg/L	0.1	< 0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Silver	mg/L	0.098	< 0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Vanadium	mg/L	0.062	< 0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc	mg/L	5.0	< 0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
<b>Appendix III</b>											
Boron	mg/L	0.50	0.11	0.10	0.08	0.21	0.08	0.05	0.04	<0.04	0.08
Calcium	mg/L	170	91.2	94.6	89.8	86.5	93.0	98.5	98.6	100.0	95.3
Chloride	mg/L	250	11	17	10	59	8.0	4.45	<5	<5	15
Fluoride	mg/L	2.0	< 1.0	<1.0	<1.0	<1.0	<1.0	0.0587	<1.0	<1.0	<1.0
Sulfate	mg/L	250	25	35	17	48	16	13.8	11	11	15
Total Dissolved Solids	mg/L	794	392	384	362	414	368	370	372	382	382
<b>Appendix IV</b>											
Antimony	mg/L	0.006	< 0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Arsenic	mg/L	0.0112	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Barium	mg/L	2.000	0.028	0.021	0.022	0.026	0.021	0.021	0.018	0.017	0.019
Beryllium	mg/L	0.004	< 0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	mg/L	0.005	< 0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Chromium	mg/L	0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	mg/L	0.006	< 0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Fluoride	mg/L	2.00	< 1.0	<1.0	<1.0	<1.0	<1.0	0.0587	<1.0	<1.0	<1.0
Lead	mg/L	0.004	< 0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Lithium	mg/L	0.040	< 0.010	<0.005	<0.005	0.013	0.009	0.006	<0.005	<0.005	0.005
Mercury	mg/L	0.002	< 0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Molybdenum	mg/L	0.100	< 0.011	0.006	<0.005	0.013	<0.005	<0.005	<0.005	<0.005	<0.005
Radium-226	pCi/L	-	0.287	0.389	0.437	0.228	0.228	1.70	1.77	0.843	0.201
Radium-228	pCi/L	-	0.396	-0.103	0.114	0.469	1.71	0.583	4.44	2.00	3.04
Radium-226/228	pCi/L	5.00	0.683	0.389	0.551	0.697	1.93	2.28	<b>6.21</b>	2.84	3.24
Selenium	mg/L	0.050	< 0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Thallium	mg/L	0.002	< 0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Total Suspended Solids	mg/L	-	< 3	<3	<3	<3	<3	2	<3	<3	<3
Bicarbonate	mg/L	-	-	-	-	-	-	-	-	-	410
Carbonate	mg/L	-	-	-	-	-	-	-	-	-	<10
Hardness	mg/L	-	-	-	-	-	-	-	-	-	347
Magnesium	mg/L	-	-	-	-	-	-	-	-	-	28.9
Potassium	mg/L	-	-	-	-	-	-	-	-	-	0.57
Sodium	mg/L	-	-	-	-	-	-	-	-	-	12.7

**BOLD** values indicate GPS exceedance

" - " indicates no value



Sample Location:			MW-9																			
Sample Type:			Downgradient																			
Sample Date:			6/15/2021	7/20/2021	8/24/2021	9/28/2021	11/2/2021	12/7/2021	1/11/2022	2/17/2022	8/2/2022											
Constituent	Unit	State Program GPS	Background Monitoring																			
				Field Dupe		Field Dupe		Field Dupe		Field Dupe		Field Dupe		Field Dupe		Field Dupe		Field Dupe		Field Dupe		
<b>Field Parameters</b>																						
pH	su	-	7.74	7.74	7.20	7.20	7.21	7.21	7.28	7.28	7.14	7.14	7.27	7.27	7.35	7.35	7.16	7.16	7.44			
Conductivity	mS/cm	-	0.393	0.393	0.42	0.42	0.44	0.44	0.444	0.444	0.471	0.471	0.459	0.459	0.455	0.455	0.471	0.471	0.420			
Turbidity	NTU	-	1.60	1.60	6.7	6.7	6.15	6.15	5.25	5.25	5.61	5.61	2.21	2.21	2.89	2.89	1.6	1.6	3.44			
Dissolved Oxygen	mg/L	-	5.48	5.48	5.35	5.35	4.52	4.52	4.5	4.5	4.89	4.89	5.42	5.42	6.13	6.13	6.17	6.17	3.96			
Temperature	°C	-	12.9	12.9	17	17	19	19	17.1	17.1	13.8	13.8	9.5	9.5	7	7	4.7	4.7	19.2			
Oxidation Reduction Potential	mV	-	164.1	164.1	310.7	310.7	329.2	329.2	171.8	171.8	238.1	238.1	135.9	135.9	260.1	260.1	380.9	380.9	99.2			
<b>Part 115</b>																						
Copper	mg/L	1.00	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005		
Iron	mg/L	8.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02		
Nickel	mg/L	0.10	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005		
Silver	mg/L	0.098	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005		
Vanadium	mg/L	0.062	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005		
Zinc	mg/L	5.0	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.009	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005		
<b>Appendix III</b>																						
Boron	mg/L	0.50	< 0.04	< 0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04		
Calcium	mg/L	170	62.1	64.2	66.3	67.5	69.2	68.8	71.0	71.5	78.0	80.7	76.6	75.8	76.9	75.0	77.6	78.0	61.8			
Chloride	mg/L	250	< 5	< 5	<5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	1.11	1.07	< 5	< 5	< 5	< 5	< 5	< 5		
Fluoride	mg/L	2.0	< 1.0	< 1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	0.033	0.033	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0		
Sulfate	mg/L	250	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	3.58	3.52	< 5	< 5	< 5	< 5	5.00			
Total Dissolved Solids	mg/L	794	232	240	242	232	242	256	246	244	252	268	244	246	264	266	280	276	242			
<b>Appendix IV</b>																						
Antimony	mg/L	0.006	< 0.005	< 0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005		
Arsenic	mg/L	0.0112	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002		
Barium	mg/L	2.000	0.015	0.015	0.013	0.014	0.015	0.014	0.014	0.015	0.015	0.016	0.014	0.015	0.013	0.013	0.013	0.013	0.013	0.013		
Beryllium	mg/L	0.004	< 0.001	< 0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Cadmium	mg/L	0.005	< 0.0005	< 0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005		
Chromium	mg/L	0.100	< 0.005	< 0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005		
Cobalt	mg/L	0.006	< 0.005	< 0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005		
Fluoride	mg/L	2.00	< 1.0	< 1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	0.033	0.033	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0		
Lead	mg/L	0.004	< 0.003	< 0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003		
Lithium	mg/L	0.040	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005		
Mercury	mg/L	0.002	< 0.0002	< 0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002		
Molybdenum	mg/L	0.100	< 0.005	< 0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005		
Radium-226	pCi/L	-	0.625	0.646	0.189	0.166	0.266	0.421	0.797	0.368	0.177	0.534	1.67	1.69	0.838	1.22	0.533	0.657	0.0527			
Radium-228	pCi/L	-	0.218	0.171	0.286	-0.125	-0.359	1.65	0.453	0.846	-0.0915	0.483	0.666	0.826	1.53	-0.724	0.0438	0.283	1.88			
Radium-226/228	pCi/L	5.00	0.844	0.817	0.475	0.166	0.266	2.07	1.25	1.21	0.177	1.02	2.34	2.51	2.37	1.22	0.576	0.940	1.94			
Selenium	mg/L	0.050	< 0.005	< 0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005		
Thallium	mg/L	0.002	< 0.002	< 0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002		
Total Suspended Solids	mg/L	-	< 3	< 3	<3	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3		
Bicarbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	260		
Carbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<10		
Hardness	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	218		
Magnesium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15.2		
Potassium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.09		
Sodium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.41		

**BOLD** values indicate GPS exceedance

"-" indicates no value



		MW-10										
		Downgradient										
		6/15/2021	7/20/2021	8/24/2021	9/28/2021	11/2/2021	12/7/2021	1/11/2022	2/17/2022	8/2/2022		
Constituent	Unit	State Program GPS	Background Monitoring									
<b>Field Parameters</b>												
pH	su	-	7.30	6.60	6.70	6.89	6.57	6.69	6.68	6.49	6.85	
Conductivity	mS/cm	-	0.725	0.71	0.741	0.664	0.78	0.753	0.807	0.784	0.691	
Turbidity	NTU	-	1.79	2.3	1.95	5.99	1.29	2.09	2.98	3.76	3.57	
Dissolved Oxygen	mg/L	-	2.05	3.3	3.2	2.43	2.83	2.89	3.92	3.61	2.82	
Temperature	°C	-	12.0	14	15.5	15	14.2	11.6	9.7	8.6	15.4	
Oxidation Reduction Potential	mV	-	121.2	240.0	330.1	164.1	230.9	147.9	283.3	391.8	98.9	
<b>Part 115</b>												
Copper	mg/L	1.00	< 0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Iron	mg/L	8.04	< 0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	
Nickel	mg/L	0.1	< 0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Silver	mg/L	0.098	< 0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Vanadium	mg/L	0.062	< 0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Zinc	mg/L	5.0	< 0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.020	<0.005	0.009	
<b>Appendix III</b>												
Boron	mg/L	0.50	0.05	0.05	0.06	0.05	0.07	0.05	0.06	0.05	0.05	
Calcium	mg/L	170	132	128	129	113	137	128	141	142	117	
Chloride	mg/L	250	< 5	<5	<5	<5	<5	1.03	<5	<5	<5	
Fluoride	mg/L	2.0	< 1.0	<1.0	<1.0	<1.0	<1.0	0.0660	<1.0	<1.0	<1.0	
Sulfate	mg/L	250	12	15	14	9	17	14.5	18	16	10	
Total Dissolved Solids	mg/L	794	446	410	432	376	436	428	474	482	398	
<b>Appendix IV</b>												
Antimony	mg/L	0.006	< 0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Arsenic	mg/L	0.0112	< 0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Barium	mg/L	2.000	0.044	0.041	0.047	0.041	0.044	0.043	0.040	0.038	0.037	
Beryllium	mg/L	0.004	< 0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Cadmium	mg/L	0.005	< 0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Chromium	mg/L	0.100	< 0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Cobalt	mg/L	0.006	< 0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Fluoride	mg/L	2.00	< 1.0	<1.0	<1.0	<1.0	<1.0	0.0660	<1.0	<1.0	<1.0	
Lead	mg/L	0.004	< 0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	
Lithium	mg/L	0.040	< 0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Mercury	mg/L	0.002	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Molybdenum	mg/L	0.100	< 0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Radium-226	pCi/L	-	0.548	0.262	0.183	0.701	0.381	1.46	1.59	0.894	0.195	
Radium-228	pCi/L	-	0.123	-0.994	0.187	-0.076	0.225	0.929	0.142	-0.916	0.402	
Radium-226/228	pCi/L	5.00	0.671	0.262	0.371	0.701	0.605	2.39	1.73	0.894	0.597	
Selenium	mg/L	0.050	< 0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Thallium	mg/L	0.002	< 0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Total Suspended Solids	mg/L	-	< 3	<3	<3	<3	<3	<3	<3	<3	<3	
Bicarbonate	mg/L	-	-	-	-	-	-	-	-	-	440	
Carbonate	mg/L	-	-	-	-	-	-	-	-	-	<10	
Hardness	mg/L	-	-	-	-	-	-	-	-	-	382	
Magnesium	mg/L	-	-	-	-	-	-	-	-	-	23.6	
Potassium	mg/L	-	-	-	-	-	-	-	-	-	0.73	
Sodium	mg/L	-	-	-	-	-	-	-	-	-	2.24	

**BOLD** values indicate GPS exceedance

" - " indicates no value

Sample Location:			MW-11														
Sample Type:			Background														
Sample Date:			2/23/2022	2/23/2022	3/30/2022	3/30/2022	5/4/2022	6/8/2022	6/8/2022	7/13/2022	7/13/2022	8/17/2022	8/17/2022	9/21/2022	9/21/2022	10/26/2022	10/26/2022
Constituent	Unit	State Program GPS	Background Monitoring														
Field Parameters				Field Dup		Field Dup			Field Dup		Field Dup		Field Dup		Field Dup		Field Dup
pH	su	-	6.84	6.84	6.64	6.64	6.78	6.76	6.76	6.73	6.73	6.88	6.88	6.91	6.91	6.77	6.77
Conductivity	mS/cm	-	1.08	1.08	1.119	1.119	1.093	1.11	1.11	1.008	1.008	1.117	1.117	1.122	1.122	1.075	1.075
Turbidity	NTU	-	9.65	9.65	8.95	8.95	9.22	6.98	6.98	3.02	3.02	4.01	4.01	5.25	5.25	5.78	5.78
Dissolved Oxygen	mg/L	-	0.01	0.01	0.07	0.07	0.06	0.56	0.56	0.08	0.08	0.21	0.21	0.18	0.18	0.37	0.37
Temperature	°C	-	9.50	9.50	9.8	9.8	12	11.3	11.3	12.8	12.8	14.4	14.4	15.7	15.7	12.2	12.2
Oxidation Reduction Potential	mV	-	-88.90	-88.90	-83.9	-83.9	-103.4	-109.6	-109.6	-97.3	-97.3	-129.8	-129.8	-122.9	-122.1	-99.1	-99.1
Part 115																	
Copper	mg/L	1.00	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	mg/L	8.04	22.2	22.0	23.2	23.0	23.50	21.4	21.9	22.0	21.8	21.4	20.9	21.5	20.8	19.8	20.6
Nickel	mg/L	0.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.007	<0.005
Silver	mg/L	0.098	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Vanadium	mg/L	0.062	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc	mg/L	5	<0.005	<0.005	<0.005	<0.005	<0.005	0.009	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	0.006	0.018	0.006
Appendix III																	
Boron	mg/L	0.50	0.22	0.22	0.20	0.22	0.21	0.22	0.22	0.21	0.20	0.21	0.20	0.22	0.22	0.21	0.21
Calcium	mg/L	170	136	130	138	140	144	139	138	134	135	140	138	141	142	138	139
Chloride	mg/L	250	67	67	67	67	63	63	63	61	62	63	64	61	62	62	62
Fluoride	mg/L	2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Sulfate	mg/L	250	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Total Dissolved Solids	mg/L	794	632	532	642	636	612	644	654	666	644	368	344	652	658	664	664
Appendix IV																	
Antimony	mg/L	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Arsenic	mg/L	0.0112	0.018	0.018	0.018	0.017	0.02	0.018	0.018	0.019	0.018	0.021	0.019	0.021	0.020	0.020	0.020
Barium	mg/L	2.000	0.147	0.146	0.144	0.145	0.146	0.142	0.144	0.143	0.147	0.150	0.146	0.167	0.165	0.158	0.154
Beryllium	mg/L	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	mg/L	0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Chromium	mg/L	0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	mg/L	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Fluoride	mg/L	2.00	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Lead	mg/L	0.004	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Lithium	mg/L	0.040	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Mercury	mg/L	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Molybdenum	mg/L	0.100	<0.005	<0.005	<0.005	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	<0.005	<0.005
Radium-226	pCi/L	-	0.273	0.472	0.358	0.603	0.545	0.618	1.520	0.325	0.942	0.542	0.971	0.396	0.443	0.981	0.59
Radium-228	pCi/L	-	0.000	0.248	0.757	0.419	0.479	0.573	0.630	0.925	0.383	0.0495	0.835	0.0525	0.994	1.53	1.18
Radium-226/228	pCi/L	5.00	0.273	0.720	1.110	0.603	1.020	1.190	2.150	1.25	1.33	0.591	1.81	0.449	1.44	2.51	1.77
Selenium	mg/L	0.050	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Thallium	mg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Total Suspended Solids	mg/L	-	48	41	32	32	23	32	31	29	28	20	23	23	20	29	32
Other																	
Bicarbonate	mg/L	-	-	-	-	-	610	595	593	600	610	620	630	600	620	601	604
Carbonate	mg/L	-	-	-	-	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Hardness	mg/L	-	-	-	-	-	506	495	490	503	512	529	502	512	508	512	518
Magnesium	mg/L	-	-	-	39.0	37.8	40.80	39.4	39.1	38.8	38.3	39.8	39	40.8	39.6	39.4	39.3
Potassium	mg/L	-	-	-	1.47	1.45	1.38	1.3	1.32	1.31	1.3	1.38	1.34	1.55	1.52	1.47	1.45
Sodium	mg/L	-	-	-	40.4	39.6	39.70	37.5	38.8	38.9	37	38.7	37.8	39.7	38.5	39.1	38.3

BOLD values indicate GPS exceedance

" - " indicates no value

Sample Location:

MW-11B

Sample Type:

Background

Sample Date:

4/28/2022 4/28/2022 6/2/2022 6/2/2022 7/7/2022 7/7/2022 8/11/2022 8/11/2022 9/15/2022 9/15/2022 10/20/2022 10/20/2022 11/22/2022 11/22/2022

Constituent	Unit	State Program GPS	Background Monitoring													
			4/28/2022	4/28/2022	6/2/2022	6/2/2022	7/7/2022	7/7/2022	8/11/2022	8/11/2022	9/15/2022	9/15/2022	10/20/2022	10/20/2022	11/22/2022	11/22/2022
<b>Field Parameters</b>				<b>Field Dup</b>		<b>Field Dup</b>		<b>Field Dup</b>		<b>Field Dup</b>		<b>Field Dup</b>		<b>Field Dup</b>		<b>Field Dup</b>
pH	su	-	7.95	7.95	7.28	7.28	7.15	7.15	7.37	7.37	7.33	7.33	7.29	7.29	7.10	7.10
Conductivity	mS/cm	-	0.538	0.538	0.544	0.544	0.537	0.537	0.527	0.527	0.535	0.535	0.535	0.535	0.532	0.532
Turbidity	NTU	-	1.12	1.12	8.03	8.03	8.02	8.02	6.15	6.15	4.14	4.14	5.15	5.15	6.15	6.15
Dissolved Oxygen	mg/L	-	11.68	11.68	0.35	0.35	0.22	0.22	0.24	0.24	0.07	0.07	0.03	0.03	0.12	0.12
Temperature	°C	-	12.3	12.3	13.7	13.7	14.6	14.6	13.4	13.4	13.2	13.2	11.4	11.4	11.8	11.8
Oxidation Reduction Potential	mV	-	228	228	-74.2	-74.2	-110.4	-110.4	-158.4	-158.4	-189.3	-189.4	-138.1	-138.1	-92.6	-92.6
<b>Part 115</b>																
<b>Copper</b>	mg/L	<b>1.00</b>	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	mg/L	8.04	0.10	0.11	0.96	0.98	2.59	2.66	3.04	3.00	2.48	2.44	1.82	1.83	1.32	1.30
<b>Nickel</b>	mg/L	<b>0.10</b>	<0.005	<0.005	<0.005	<0.005	<b>0.011</b>	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
<b>Silver</b>	mg/L	<b>0.098</b>	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
<b>Vanadium</b>	mg/L	<b>0.062</b>	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc	mg/L	5.0	<0.005	<0.005	<0.005	<0.005	0.042	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
<b>Appendix III</b>																
Boron	mg/L	0.50	0.62	0.63	0.65	0.66	0.69	0.71	0.77	0.75	0.73	0.72	0.72	0.71	0.73	0.73
Calcium	mg/L	170	64.6	63.9	63.8	65	66.1	66.1	66.6	65.6	64	64.7	60.3	59.9	66.3	66.2
<b>Chloride</b>	mg/L	<b>250</b>	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<b>1.7</b>	<b>1.7</b>
<b>Fluoride</b>	mg/L	<b>2.0</b>	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<0.5	<1.0	<1.0	<1.0	<1.0	<1.0	<b>0.16</b>
<b>Sulfate</b>	mg/L	<b>250</b>	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<b>2.58</b>	<b>2.78</b>
Total Dissolved Solids	mg/L	794	304	294	300	308	296	306	308	288	300	300	304	314	294	268
<b>Appendix IV</b>																
<b>Antimony</b>	mg/L	<b>0.006</b>	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Arsenic	mg/L	0.0112	0.003	0.003	0.004	0.004	0.007	0.008	0.009	0.009	0.009	0.009	0.008	0.008	0.007	0.007
Barium	mg/L	2.000	0.081	0.08	0.07	0.072	0.07	0.071	0.068	0.069	0.068	0.069	0.066	0.066	0.059	0.06
<b>Beryllium</b>	mg/L	<b>0.004</b>	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
<b>Cadmium</b>	mg/L	<b>0.005</b>	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
<b>Chromium</b>	mg/L	<b>0.100</b>	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
<b>Cobalt</b>	mg/L	<b>0.006</b>	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
<b>Fluoride</b>	mg/L	<b>2.00</b>	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<0.5	<1.0	<1.0	<1.0	<1.0	<1.0	<b>0.16</b>
<b>Lead</b>	mg/L	<b>0.004</b>	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Lithium	mg/L	0.040	0.03	0.03	0.02	0.02	0.024	0.025	0.025	0.024	0.026	0.028	0.026	0.025	0.029	0.027
<b>Mercury</b>	mg/L	<b>0.002</b>	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
<b>Molybdenum</b>	mg/L	<b>0.100</b>	<0.005	<0.005	<b>0.01</b>	<b>0.01</b>	<b>0.007</b>	<b>0.007</b>	<b>0.007</b>	<b>0.006</b>	<b>0.006</b>	<b>0.006</b>	<0.005	<0.005	<0.005	<0.005
Radium-226	pCi/L	-	1.010	1.440	1.72	1.79	0.638	0.0501	0.702	1.06	0.518	0.509	0.633	0.527	0.919	1.07
Radium-228	pCi/L	-	1.680	2.140	0.633	1.68	0.753	0.445	-1.33	1.32	0.773	0.0951	1.33	2.6	2.4	0.745
Radium-226/228	pCi/L	5.00	2.690	3.590	2.35	3.47	1.39	0.495	0.702	2.38	1.29	0.604	1.96	3.13	3.32	1.81
<b>Selenium</b>	mg/L	<b>0.050</b>	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Thallium	mg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Total Suspended Solids	mg/L	-	1.7	2.7	<3	<3	3.0	4.0	<3	<b>4.0</b>	<b>5.0</b>	<b>5.0</b>	<b>4.0</b>	<b>3.0</b>	<3	<3
Other																
Bicarbonate	mg/L	-	350	350	350	350	350	360	370	370	350	360	360	360	360	360
Carbonate	mg/L	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Hardness	mg/L	-	265	265	260	260	260	260	261	258	261	258	261	260	260	260
Magnesium	mg/L	-	24.30	24.80	23.30	23.10	24.6	24.3	24.3	24.2	23.4	23.7	21.3	21.2	23.9	24.1
Potassium	mg/L	-	6.07	6.12	6.08	6.07	6.28	6.24	6.4	6.31	5.98	6.24	5.81	5.82	6.28	6.41
Sodium	mg/L	-	13.50	13.70	17.60	17.20	17.9	17.9	17.7	17.3	16	16.2	14.5	14.3	15.8	15.9

BOLD values indicate GPS exceedance

" - " indicates no value

Sample Location: MW-12  
 Sample Type: Upgradient  
 Sample Date: 2/23/2022 2/23/2022 3/30/2022 3/30/2022 5/4/2022 5/4/2022 6/8/2022 6/8/2022 7/13/2022 7/13/2022 8/17/2022 8/17/2022 9/21/2022 9/21/2022 10/26/2022 10/26/2022

Constituent	Unit	State Program GPS	Background Monitoring															
				Diss. Metals		Diss. Metals		Diss. Metals		Diss. Metals		Diss. Metals		Diss. Metals		Diss. Metals		Diss. Metals
Field Parameters																		
pH	su	-	7.22	7.22	6.81	6.81	7.26	7.26	7.24	7.24	7.02	7.02	7.24	7.24	7.38	7.38	7.05	7.05
Conductivity	mS/cm	-	0.75	0.75	1.648	1.648	1.734	1.734	1.797	1.797	1.686	1.686	1.586	1.586	1.600	1.600	1.387	1.387
Turbidity	NTU	-	65.25	65.25	44.12	44.12	16.45	16.45	31.26	31.26	30.26	30.26	45.15	45.15	46.25	46.25	26.2	26.2
Dissolved Oxygen	mg/L	-	5.45	5.45	3.95	3.95	3.34	3.34	5.25	5.25	3.20	3.20	4.64	4.64	1.95	1.96	3.57	3.57
Temperature	°C	-	8.40	8.40	8.5	8.5	12	12	15.4	15.4	16.8	16.8	16.9	16.9	15.9	15.9	11.8	11.8
Oxidation Reduction Potential	mV	-	-113.50	-113.50	188.2	188.2	-35	-35	140.2	140.2	14.2	14.2	-17.9	-17.9	15.2	15.2	155.8	155.8
Part 115																		
Copper	mg/L	1.00	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	mg/L	8.04	3.83	<0.02	2.24	<0.02	2.05	0.03	1.00	<0.02	1.82	0.05	1.37	0.03	<0.05	<0.02	0.96	0.19
Nickel	mg/L	0.10	0.02	0.02	0.02	0.02	0.02	0.02	0.018	0.015	0.017	0.017	0.018	0.016	0.018	0.017	0.018	0.015
Silver	mg/L	0.098	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Vanadium	mg/L	0.062	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc	mg/L	5.0	<0.005	0.008	0.009	0.006	0.005	<0.005	<0.005	<0.005	0.007	<0.005	0.006	<0.005	0.008	0.005	<0.005	<0.005
Appendix III																		
Boron	mg/L	0.50	0.05	0.05	0.09	0.09	0.08	0.08	0.10	0.10	0.07	0.07	0.07	0.07	0.08	0.08	0.08	0.08
Calcium	mg/L	170	185	188	157	147	149	143	149	144	147	143	157	148	154	148	156	136
Chloride	mg/L	250	90	-	94	-	90	-	82	-	83	-	83	-	80	-	78	-
Fluoride	mg/L	2.0	<1.0	-	<1.0	-	<1.0	-	<1.0	-	<1.0	-	<1.0	-	<1.0	-	<1.0	-
Sulfate	mg/L	250	344	-	308	-	283	-	254	-	250	-	256	-	255	-	252	-
Total Dissolved Solids	mg/L	794	1090	-	1110	-	1140	-	1080	-	1090	-	1050	-	1020	-	1020	-
Appendix IV																		
Antimony	mg/L	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Arsenic	mg/L	0.0112	<0.002	<0.002	0.003	<0.002	0.004	0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	0.002
Barium	mg/L	2.000	0.069	0.059	0.074	0.068	0.07	0.064	0.064	0.064	0.067	0.06	0.064	0.06	0.064	0.058	0.057	0.052
Beryllium	mg/L	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	mg/L	0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Chromium	mg/L	0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	mg/L	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Fluoride	mg/L	2.00	<1.0	-	<1.0	-	<1.0	-	<1.0	-	<1.0	-	<1.0	-	<1.0	-	<1.0	-
Lead	mg/L	0.004	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Lithium	mg/L	0.040	0.02	0.018	0.021	0.018	0.023	0.021	0.025	0.022	0.022	0.019	0.019	0.018	0.022	0.019	0.021	0.018
Mercury	mg/L	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Molybdenum	mg/L	0.100	0.013	0.011	0.024	0.024	0.023	0.024	0.019	0.018	0.017	0.017	0.014	0.014	0.015	0.014	0.013	0.012
Radium -226	pCi/l	-	0.252	-	0.783	-	1.23	-	1.9	-	0.394	-	0.398	-	0.739	-	0.628	-
Radium -228	pCi/l	-	0.948	-	2.33	-	0.237	-	0.721	-	1.23	-	1.8	-	-0.692	-	2.11	-
Radium -226/228	pCi/l	5.00	1.200	-	3.110	-	1.46	-	2.62	-	1.63	-	2.2	-	0.739	-	2.74	-
Selenium	mg/L	0.050	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Thallium	mg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Total Suspended Solids	mg/L	-	24	-	39	-	22	-	17	-	50	-	23	-	43	-	16	-
Other																		
Bicarbonate	mg/L	-	-	-	-	-	650	-	695	-	670	-	620	-	610	-	631	-
Carbonate	mg/L	-	-	-	-	-	<10	-	<10	-	<10	-	<10	-	<10	-	<10	-
Hardness	mg/L	-	-	-	-	-	572	-	565	-	566	-	609	-	611	-	618	-
Magnesium	mg/L	-	-	-	58.80	56.40	56.40	52.80	56.2	54.5	56.2	55.7	58.8	57.6	58.6	57.5	59.9	53.0
Potassium	mg/L	-	-	-	3.93	3.87	3.73	3.55	3.91	3.95	3.3	3.13	3.33	3.1	3.65	3.54	3.71	3.04
Sodium	mg/L	-	-	-	168	169	193	189	199	195	171	167	145	138	145	138	139	123

BOLD values indicate GPS exceedance  
 "- " indicates no value

Sample Location:			MW-12B														
Sample Type:			Background														
Sample Date:			3/8/2022	3/8/2022	4/14/2022	5/19/2022	5/19/2022	6/23/2022	6/23/2022	7/28/2022	7/28/2022	9/1/2022	9/1/2022	10/6/2022	10/6/2022	11/10/2022	11/10/2022
Constituent	Unit	State Program GPS	Background Monitoring														
Field Parameters				Field Dupe			Field Dupe		Field Dupe		Field Dupe		Field Dupe		Field Dupe		Field Dupe
pH	su	-	8.00	8.00	7.68	7.86	7.86	7.51	7.51	7.50	7.50	7.60	7.60	7.50	7.50	7.61	7.61
Conductivity	mS/cm	-	0.72	0.72	0.611	0.61	0.61	0.601	0.601	0.602	0.602	0.600	0.600	0.593	0.593	0.591	0.591
Turbidity	NTU	-	10.2	10.2	9.89	9.72	9.72	6.89	6.89	8.35	8.35	6.70	6.70	7.15	7.15	6.35	6.35
Dissolved Oxygen	mg/L	-	3.58	3.58	0.31	0.05	0.05	0.2	0.2	0.22	0.22	0.74	0.74	0.24	0.24	0.18	0.18
Temperature	°C	-	10.8	10.8	10.1	12	12	12.8	12.8	14	14	13.0	13.0	12.7	12.7	13.1	13.1
Oxidation Reduction Potential	mV	-	100.9	100.9	-80.1	-97.8	-97.8	-73.2	-73.2	-141.0	-141.0	-124.1	-124.1	-117.2	-117.2	-100.3	-100.3
Part 115																	
Copper	mg/L	<b>1.00</b>	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<b>0.007</b>	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	mg/L	8.04	0.34	0.36	0.24	0.33	0.33	0.3	0.28	0.29	0.3	0.37	0.37	0.41	0.34	0.31	0.30
Nickel	mg/L	<b>0.10</b>	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Silver	mg/L	<b>0.098</b>	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Vanadium	mg/L	<b>0.062</b>	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc	mg/L	5.0	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<b>0.015</b>	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Appendix III																	
Boron	mg/L	0.50	3.25	3.2	3.16	3.34	3.30	3.32	3.38	3.37	3.37	3.52	3.35	3.22	3.3	3.35	3.19
Calcium	mg/L	170	23.7	24.0	24.0	21.5	21.7	26.1	25.5	25.7	25.4	26.2	26.2	26.2	25.9	25.7	26.2
Chloride	mg/L	<b>250</b>	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Fluoride	mg/L	<b>2.0</b>	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Sulfate	mg/L	<b>250</b>	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Total Dissolved Solids	mg/L	794	380	374	376	370	372	364	372	380	374	360	370	362	374	358	356
Appendix IV																	
Antimony	mg/L	<b>0.006</b>	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Arsenic	mg/L	<b>0.0112</b>	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Barium	mg/L	2.000	0.025	0.025	0.026	0.027	0.026	0.026	0.025	0.023	0.024	0.028	0.028	0.027	0.026	0.025	0.025
Beryllium	mg/L	<b>0.004</b>	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	mg/L	<b>0.005</b>	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Chromium	mg/L	<b>0.100</b>	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	mg/L	<b>0.006</b>	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Fluoride	mg/L	<b>2.00</b>	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Lead	mg/L	<b>0.004</b>	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Lithium	mg/L	0.040	0.042	0.043	0.036	0.038	0.038	0.041	0.039	0.041	0.043	0.041	0.038	0.039	0.042	0.040	0.037
Mercury	mg/L	<b>0.002</b>	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<b>0.0002</b>	<b>0.0002</b>	<0.0002	<0.0002	<0.0002	<0.0002
Molybdenum	mg/L	<b>0.100</b>	<0.005	<0.005	<0.005	<b>0.011</b>	<b>0.005</b>	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Radium-226	pCi/L	-	0.48	0.302	0.264	0.611	0.657	1	1.89	0.581	2.17	0.398	0.519	0.37	0.615	0.608	0.619
Radium-228	pCi/L	-	0.275	1.03	0.116	0.421	1.1	0.209	1.47	-0.356	-1.12	-0.204	1.34	1.26	0.165	0.638	0.282
Radium-226/228	pCi/L	5.00	0.755	1.33	0.38	1.03	1.76	1.21	3.37	0.581	2.17	0.398	1.86	1.63	0.779	1.25	0.901
Selenium	mg/L	<b>0.050</b>	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Thallium	mg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Total Suspended Solids	mg/L	-	28	31	3.0	7.0	7.0	5.0	<3	<3	<3	<3	<b>3.0</b>	1.0	<3	<3	<3
Bicarbonate	mg/L	-	390	400	410	410	420	400	390	410	420	400	400	400	400	390	390
Carbonate	mg/L	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Hardness	mg/L	-	96	83	99	93	96	94	97	90	90	91	95	100	90	96	96
Magnesium	mg/L	-	7.5	7.36	8.12	6.63	6.68	8.31	8.14	8.22	8.02	8.33	8.65	8.39	8.33	8.2	8.15
Potassium	mg/L	-	8.99	8.61	8.26	6.93	7.07	8.27	8.15	8.28	8.07	8.18	8.36	8.32	8.14	8.19	8.15
Sodium	mg/L	-	116	117	109	90.9	92.4	111	107	107	107	113	115	112	109	109	110

BOLD values indicate GPS exceedance

" - " indicates no value

		MW-13									
		Downgradient									
		2/23/2022	3/30/2022	5/4/2022	5/4/2022	6/8/2022	7/13/2022	8/17/2022	9/21/2022	10/26/2022	
Sample Location:	Sample Type:										
Sample Date:	State Program GPS	Background Monitoring									
Constituent	Unit				Field Dupe						
<b>Field Parameters</b>											
pH	su	-	6.91	6.75	7.01	7.01	7.07	7.06	7.22	7.25	7.11
Conductivity	mS/cm	-	0.78	0.73	0.549	0.549	0.585	0.661	0.595	0.635	0.624
Turbidity	NTU	-	7.11	7.90	4.15	4.15	6.50	1.79	3.55	4.24	3.75
Dissolved Oxygen	mg/L	-	1.31	2.61	6.23	6.23	5.42	6.21	4.94	3.83	2.39
Temperature	°C	-	5.8	6.9	8.5	8.5	12.2	14.5	17.5	17.4	13.8
Oxidation Reduction Potential	mV	-	163.0	151.8	96.4	96.4	101.6	66.9	89.1	84.8	216.8
<b>Part 115</b>											
Copper	mg/L	1.00	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	mg/L	<b>8.04</b>	<b>0.04</b>	<b>0.02</b>	<b>&lt;0.02</b>	<b>0.02</b>	<b>0.08</b>	<b>0.03</b>	<b>0.02</b>	<b>0.03</b>	0.04
Nickel	mg/L	<b>0.10</b>	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Silver	mg/L	<b>0.098</b>	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Vanadium	mg/L	<b>0.062</b>	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc	mg/L	5.0	<0.005	<0.005	<0.005	<0.005	<0.005	0.01	<0.005	<0.005	<0.005
<b>Appendix III</b>											
Boron	mg/L	0.50	0.16	0.14	0.14	0.14	0.18	0.18	0.17	0.2	0.22
Calcium	mg/L	170	138	128.00	95.80	97.60	96.1	107	94.1	100	101
Chloride	mg/L	<b>250</b>	<5	<5	<b>9.00</b>	<b>9.00</b>	<b>13</b>	<b>16</b>	<b>16</b>	<b>20</b>	<b>32</b>
Fluoride	mg/L	<b>2.0</b>	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Sulfate	mg/L	250	32	45.00	16.00	16.00	17	55	33	30	22
Total Dissolved Solids	mg/L	794	478	430	336	342	354	396	380	384	386
<b>Appendix IV</b>											
Antimony	mg/L	<b>0.006</b>	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Arsenic	mg/L	<b>0.0112</b>	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Barium	mg/L	2.000	0.030	0.03	0.02	0.02	0.023	0.027	0.029	0.027	0.028
Beryllium	mg/L	<b>0.004</b>	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	mg/L	<b>0.005</b>	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Chromium	mg/L	<b>0.100</b>	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	mg/L	<b>0.006</b>	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Fluoride	mg/L	<b>2.00</b>	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Lead	mg/L	<b>0.004</b>	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Lithium	mg/L	<b>0.040</b>	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Mercury	mg/L	<b>0.002</b>	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Molybdenum	mg/L	<b>0.100</b>	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Radium-226	pCi/L	-	0.300	0.755	0.322	0.149	0.657	0.291	0.402	0.286	0.392
Radium-228	pCi/L	-	-0.842	1.320	0.054	0.893	1.66	1.35	0.0071	-0.0026	0.291
Radium-226/228	pCi/L	5.00	0.300	2.080	0.376	1.040	2.31	1.64	0.41	0.286	0.683
Selenium	mg/L	<b>0.050</b>	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Thallium	mg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Total Suspended Solids	mg/L	-	<3	<3	<3	<3	<3	<3	<3	<3	<3
Other											
Bicarbonate	mg/L	-	-	-	340	330	349	330	320	340	351
Carbonate	mg/L	-	-	-	<10	<10	<10	<10	<10	<10	<10
Hardness	mg/L	-	-	-	309	308	310	353	312	333	358
Magnesium	mg/L	-	-	26.30	19.70	20.10	20.7	23.1	20.6	21.9	23
Potassium	mg/L	-	-	0.75	0.69	0.70	0.83	0.779	0.78	0.82	0.81
Sodium	mg/L	-	-	3.05	2.45	2.51	2.59	5.59	4.6	5.7	4.99

BOLD values indicate GPS exceedance

" - " indicates no value

				Sample Location: Wet-1	
				Sample Type: Surface Water	
				Sample Date: 3/30/2022	3/30/2022
Constituent	Unit	State Non-Residential Drinking Water Cleanup Criteria	CCR Rule GPS		
<b>Field Parameters</b>					Field Dupe
pH	su	-	-	6.89	6.89
Conductivity	mS/cm	-	-	1.92	1.92
Turbidity	NTU	-	-	13.51	13.51
Dissolved Oxygen	mg/L	-	-	9.12	9.12
Temperature	°C	-	-	6.6	6.6
Oxidation Reduction Potential	mV	-	-	168.2	168.2
<b>Part 115</b>					
Copper	mg/L	1.0	1.0	<0.005	<0.005
Iron	mg/L	0.30	8.04	1.45	1.43
Nickel	mg/L	0.10	0.10	<0.005	<0.005
Silver	mg/L	0.098	0.098	<0.0005	<0.0005
Vanadium	mg/L	0.062	0.062	<0.005	<0.005
Zinc	mg/L	5.0	5.0	<0.005	<0.005
<b>Appendix III</b>					
Boron	mg/L	0.5	-	0.45	0.48
Calcium	mg/L	-	-	328	320
Chloride	mg/L	250	-	72	71
Fluoride	mg/L	2.0	-	<1.0	<1.0
Sulfate	mg/L	250	-	620	636
Total Dissolved Solids	mg/L	500	-	1510	1540
pH, Field	su		-	6.89	6.89
<b>Appendix IV</b>					
Antimony	mg/L	0.006	-	<0.005	<0.005
Arsenic	mg/L	0.01	0.0112	<0.002	<0.002
Barium	mg/L	2.00	2.000	0.047	0.047
Beryllium	mg/L	0.004	-	<0.001	<0.001
Cadmium	mg/L	0.005	-	<0.0005	<0.0005
Chromium	mg/L	0.1	-	<0.005	<0.005
Cobalt	mg/L	0.1	-	<0.005	<0.005
Fluoride	mg/L	2	-	<1.0	<1.0
Lead	mg/L	0.004	-	<0.003	<0.003
Lithium	mg/L	0.35	0.040	0.008	0.008
Mercury	mg/L	0.002	-	<0.0002	<0.0002
Molybdenum	mg/L	0.21	0.10	<0.005	<0.005
Radium-226	pCi/L	-	-	0.403	0.212
Radium-228	pCi/L	-	-	0.231	-0.0545
Radium-226/228	pCi/L	-	5.0	0.634	0.212
Selenium	mg/L	0.05	-	<0.005	<0.005
Thallium	mg/L	0.002	-	<0.002	<0.002
Total Suspended Solids	mg/L		-	7.0	8.0

**BOLD** values indicate GPS exceedance

" - " indicates no value



# **Appendix C**

## **Lab Reports and Data Validation Reports**



Lansing Board of Water and Light  
Environmental Services Laboratory (MI00079)  
1232 Haco Dr.  
Lansing, Michigan 48901

10 February 2022

BWL - Erickson Station  
Attn: Cheryl Louden  
3725 S. Canal  
Lansing, MI 48917

**Project: Erickson AM MI**

Dear Cheryl Louden,

Enclosed is a copy of the laboratory report for the following work order(s) received by Lansing Board of Water and Light Environmental Services Laboratory:

<b>Work Order</b>	<b>Received</b>	<b>Account Number</b>
L201036	1/11/2022 8:15:00AM	30926 10021

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in blue ink that reads "Jennifer Caporale".

Jennifer Caporale, Supervisor



Report ID: S31925.01(02)  
Generated on 02/09/2022  
Replaces report S31925.01(01) generated on 01/14/2022

**Report to**  
Attention: Jennifer Caporale  
Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901  
  
Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

**Report produced by**  
Merit Laboratories, Inc.  
2680 East Lansing Drive  
East Lansing, MI 48823

Phone: (517) 332-0167 FAX: (517) 332-6333

Contacts for report questions:  
John Lavery (johnlavery@meritlabs.com)  
Barbara Ball (bball@meritlabs.com)

**Report Summary**

Lab Sample ID(s): S31925.01-S31925.06  
Project: Erickson AM MI New Wells 7-10  
Collected Date(s): 01/11/2022  
Submitted Date/Time: 01/12/2022 09:20  
Sampled by: Marc Wahrer  
P.O. #:

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Maya Murshak  
Technical Director



## General Report Notes

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Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (\*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

## Report Narrative

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All analyses completed





Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Alaska CSLAP	#17-001
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



## Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1
SM2540C	Standard Method 2540 C 2011
SM2540D	Standard Method 2540 D 2011
SW3015A	SW 846 Method 3015A Revision 1 February 2007



## Sample Summary (6 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S31925.01	MW-7 L201036-01	Groundwater	01/11/22 14:46
S31925.02	MW-8 L201036-02	Groundwater	01/11/22 13:28
S31925.03	MW-9 L201036-03	Groundwater	01/11/22 11:46
S31925.04	MW-10 L201036-04	Groundwater	01/11/22 10:24
S31925.05	Field Dupe MW-9 L201036-05	Groundwater	01/11/22 11:46
S31925.06	Field Blank L201036-06	Water	01/11/22 09:15



# Analytical Laboratory Report

Lab Sample ID: S31925.01

Sample Tag: MW-7 L201036-01

Collected Date/Time: 01/11/2022 14:46

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	3.0	IR
2	1L Plastic	None	Yes	3.0	IR
1	125ml Plastic	HNO3	Yes	3.0	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	01/12/22 12:00	JRH	
Metal Digestion	Completed	SW3015A	01/13/22 11:00	CCM	

### Inorganics

Method: E300.0, Run Date: 01/12/22 11:20, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	

Method: E300.0, Run Date: 01/12/22 12:21, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	78	10	0.13	mg/L	10	16887-00-6	
Sulfate	214	10	1.0	mg/L	10	14808-79-8	

Method: SM2540C, Run Date: 01/12/22 19:50, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	624	20	10	mg/L	2		

Method: SM2540D, Run Date: 01/12/22 19:50, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1.00		

### Metals

Method: E200.8, Run Date: 01/13/22 14:40, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	121	0.50	0.0174	mg/L	2	7440-70-2	

Method: E200.8, Run Date: 01/13/22 12:16, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony	Not detected	0.005	0.00102	mg/L	2	7440-36-0	
Arsenic	0.006	0.002	0.000102	mg/L	2	7440-38-2	
Barium	0.055	0.005	0.0000648	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.0000862	mg/L	2	7440-41-7	
Boron	2.14	0.04	0.000702	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.0000760	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.0000386	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.0000434	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000150	mg/L	2	7440-50-8	
Iron	1.52	0.02	0.000768	mg/L	2	7439-89-6	
Lead	Not detected	0.003	0.0000760	mg/L	2	7439-92-1	
Lithium*	0.100	0.005	0.000654	mg/L	2	7439-93-2	





# Analytical Laboratory Report

Final Report

Lab Sample ID: S31925.01 (continued)

Sample Tag: MW-7 L201036-01

**Method: E200.8, Run Date: 01/13/22 12:16, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Molybdenum	0.296	0.005	0.0000868	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000100	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.000838	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.0000270	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.0000342	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.0000558	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.000292	mg/L	2	7440-66-6	

**Method: E245.1, Run Date: 01/12/22 14:27, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 02/09/22 16:51, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Final Report

Lab Sample ID: S31925.02

Sample Tag: MW-8 L201036-02

Collected Date/Time: 01/11/2022 13:28

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	3.0	IR
2	1L Plastic	None	Yes	3.0	IR
1	125ml Plastic	HNO3	Yes	3.0	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	01/12/22 12:00	JRH	
Metal Digestion	Completed	SW3015A	01/13/22 11:00	CCM	

### Inorganics

Method: E300.0, Run Date: 01/12/22 11:31, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	11	5	0.52	mg/L	5	14808-79-8	

Method: SM2540C, Run Date: 01/12/22 19:50, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	372	20	10	mg/L	2		

Method: SM2540D, Run Date: 01/12/22 19:50, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1.00		

### Metals

Method: E200.8, Run Date: 01/13/22 14:42, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	98.6	0.50	0.0174	mg/L	2	7440-70-2	

Method: E200.8, Run Date: 01/13/22 12:20, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony	Not detected	0.005	0.00102	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.000102	mg/L	2	7440-38-2	
Barium	0.018	0.005	0.0000648	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.0000862	mg/L	2	7440-41-7	
Boron	0.04	0.04	0.000702	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.0000760	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.0000386	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.0000434	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000150	mg/L	2	7440-50-8	
Iron	Not detected	0.02	0.000768	mg/L	2	7439-89-6	
Lead	Not detected	0.003	0.0000760	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000654	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.0000868	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000100	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.000838	mg/L	2	7782-49-2	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S31925.02 (continued)

Sample Tag: MW-8 L201036-02

Method: E200.8, Run Date: 01/13/22 12:20, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Silver	Not detected	0.0005	0.0000270	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.0000342	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.0000558	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.000292	mg/L	2	7440-66-6	

Method: E245.1, Run Date: 01/12/22 14:31, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

Method: , Run Date: 02/09/22 16:51, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Lab Sample ID: S31925.03

Sample Tag: MW-9 L201036-03

Collected Date/Time: 01/11/2022 11:46

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	3.0	IR
2	1L Plastic	None	Yes	3.0	IR
1	125ml Plastic	HNO3	Yes	3.0	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	01/12/22 12:00	JRH	
Metal Digestion	Completed	SW3015A	01/13/22 11:00	CCM	

### Inorganics

Method: E300.0, Run Date: 01/12/22 11:41, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.52	mg/L	5	14808-79-8	

Method: SM2540C, Run Date: 01/12/22 19:50, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	264	20	10	mg/L	2		

Method: SM2540D, Run Date: 01/12/22 19:50, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1.00		

### Metals

Method: E200.8, Run Date: 01/13/22 14:43, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	76.9	0.50	0.0174	mg/L	2	7440-70-2	

Method: E200.8, Run Date: 01/13/22 12:22, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony	Not detected	0.005	0.00102	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.000102	mg/L	2	7440-38-2	
Barium	0.013	0.005	0.0000648	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.0000862	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.000702	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.0000760	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.0000386	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.0000434	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000150	mg/L	2	7440-50-8	
Iron	Not detected	0.02	0.000768	mg/L	2	7439-89-6	
Lead	Not detected	0.003	0.0000760	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000654	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.0000868	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000100	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.000838	mg/L	2	7782-49-2	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S31925.03 (continued)

Sample Tag: MW-9 L201036-03

Method: E200.8, Run Date: 01/13/22 12:22, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Silver	Not detected	0.0005	0.0000270	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.0000342	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.0000558	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.000292	mg/L	2	7440-66-6	

Method: E245.1, Run Date: 01/12/22 14:34, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

Method: , Run Date: 02/09/22 16:51, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.





# Analytical Laboratory Report

Final Report

Lab Sample ID: S31925.04

Sample Tag: MW-10 L201036-04

Collected Date/Time: 01/11/2022 10:24

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	3.0	IR
2	1L Plastic	None	Yes	3.0	IR
1	125ml Plastic	HNO3	Yes	3.0	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	01/12/22 12:00	JRH	
Metal Digestion	Completed	SW3015A	01/13/22 11:00	CCM	

### Inorganics

Method: E300.0, Run Date: 01/12/22 11:51, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	18	5	0.52	mg/L	5	14808-79-8	

Method: SM2540C, Run Date: 01/12/22 19:50, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	474	20	10	mg/L	2		

Method: SM2540D, Run Date: 01/12/22 19:50, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1.00		

### Metals

Method: E200.8, Run Date: 01/13/22 14:45, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	141	0.50	0.0174	mg/L	2	7440-70-2	

Method: E200.8, Run Date: 01/13/22 12:24, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony	Not detected	0.005	0.00102	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.000102	mg/L	2	7440-38-2	
Barium	0.040	0.005	0.0000648	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.0000862	mg/L	2	7440-41-7	
Boron	0.06	0.04	0.000702	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.0000760	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.0000386	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.0000434	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000150	mg/L	2	7440-50-8	
Iron	Not detected	0.02	0.000768	mg/L	2	7439-89-6	
Lead	Not detected	0.003	0.0000760	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000654	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.0000868	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000100	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.000838	mg/L	2	7782-49-2	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S31925.04 (continued)

Sample Tag: MW-10 L201036-04

Method: E200.8, Run Date: 01/13/22 12:24, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Silver	Not detected	0.0005	0.0000270	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.0000342	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.0000558	mg/L	2	7440-62-2	
Zinc	0.020	0.005	0.000292	mg/L	2	7440-66-6	

Method: E245.1, Run Date: 01/12/22 14:37, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 02/09/22 16:51, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

**Lab Sample ID: S31925.05**

Sample Tag: Field Dupe MW-9 L201036-05

Collected Date/Time: 01/11/2022 11:46

Matrix: Groundwater

COC Reference:

**Sample Containers**

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	3.0	IR
2	1L Plastic	None	Yes	3.0	IR
1	125ml Plastic	HNO3	Yes	3.0	IR

**Extraction / Prep.**

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	01/12/22 12:00	JRH	
Metal Digestion	Completed	SW3015A	01/13/22 11:00	CCM	

**Inorganics**

**Method: E300.0, Run Date: 01/12/22 12:01, Analyst: JDP**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.52	mg/L	5	14808-79-8	

**Method: SM2540C, Run Date: 01/12/22 19:50, Analyst: SSM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	266	20	10	mg/L	2		

**Method: SM2540D, Run Date: 01/12/22 19:50, Analyst: SSM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1.00		

**Metals**

**Method: E200.8, Run Date: 01/13/22 14:47, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	75.0	0.50	0.0174	mg/L	2	7440-70-2	

**Method: E200.8, Run Date: 01/13/22 12:26, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony	Not detected	0.005	0.00102	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.000102	mg/L	2	7440-38-2	
Barium	0.013	0.005	0.0000648	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.0000862	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.000702	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.0000760	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.0000386	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.0000434	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000150	mg/L	2	7440-50-8	
Iron	Not detected	0.02	0.000768	mg/L	2	7439-89-6	
Lead	Not detected	0.003	0.0000760	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000654	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.0000868	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000100	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.000838	mg/L	2	7782-49-2	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S31925.05 (continued)

Sample Tag: Field Dupe MW-9 L201036-05

Method: E200.8, Run Date: 01/13/22 12:26, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Silver	Not detected	0.0005	0.0000270	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.0000342	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.0000558	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.000292	mg/L	2	7440-66-6	

Method: E245.1, Run Date: 01/12/22 14:41, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 02/09/22 16:51, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Final Report

Lab Sample ID: S31925.06

Sample Tag: Field Blank L201036-06

Collected Date/Time: 01/11/2022 09:15

Matrix: Water

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	3.0	IR
2	1L Plastic	None	Yes	3.0	IR
1	125ml Plastic	HNO3	Yes	3.0	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	01/12/22 12:00	JRH	
Metal Digestion	Completed	SW3015A	01/13/22 11:00	CCM	

### Inorganics

Method: E300.0, Run Date: 01/12/22 12:11, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	2.5	0.03	mg/L	2.5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.04	mg/L	2.5	16984-48-8	
Sulfate	Not detected	2.5	0.26	mg/L	2.5	14808-79-8	

Method: SM2540C, Run Date: 01/12/22 19:50, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	10	20	10	mg/L	2		b

Method: SM2540D, Run Date: 01/12/22 19:50, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1.00		

### Metals

Method: E200.8, Run Date: 01/13/22 14:48, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.0174	mg/L	2	7440-70-2	

Method: E200.8, Run Date: 01/13/22 12:27, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony	Not detected	0.005	0.00102	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.000102	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.0000648	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.0000862	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.000702	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.0000760	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.0000386	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.0000434	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000150	mg/L	2	7440-50-8	
Iron	Not detected	0.02	0.000768	mg/L	2	7439-89-6	
Lead	Not detected	0.003	0.0000760	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000654	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.0000868	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000100	mg/L	2	7440-02-0	

b-Value detected less than reporting limit, but greater than MDL





# Analytical Laboratory Report

Final Report

Lab Sample ID: S31925.06 (continued)

Sample Tag: Field Blank L201036-06

Method: E200.8, Run Date: 01/13/22 12:27, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Selenium	Not detected	0.005	0.000838	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.0000270	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.0000342	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.0000558	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.000292	mg/L	2	7440-66-6	

Method: E245.1, Run Date: 01/12/22 14:44, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 02/09/22 16:51, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

# Merit Laboratories Login Checklist

Lab Set ID:S31925

Client:BWL01 (Board of Water & Light)

Project: Erickson AM MI New Wells 7-10

Submitted:01/12/2022 09:20 Login User: PFD

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental\_Laboratory@LBWL.com

Selection	Description	Note
-----------	-------------	------

## Sample Receiving

- |     |  |  |
|-----|--|--|
| 01. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples are received at 4C +/- 2C Thermometer # IR 3.0 |
| 02. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Received on ice/ cooling process begun                 |
| 03. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples shipped  |
| 04. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples left in 24 hr. drop box                        |
| 05. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Are there custody seals/tape or is the drop box locked |

## Chain of Custody

- |     |  |  |
|-----|--|--|
| 06. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC adequately filled out  |
| 07. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC signed and relinquished to the lab                               |
| 08. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sample tag on bottles match COC                                      |
| 09. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Subcontracting needed? Subcontracted to: GEL UPS# 1Z4664770362913732 |

## Preservation

- |     |  |   |
|-----|--|---|
| 10. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Do sample have correct chemical preservation        |
| 11. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Completed pH checks on preserved samples? (no VOAs) |
| 12. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Did any samples need to be preserved in the lab?    |

## Bottle Conditions

- |     |  |   |
|-----|--|---|
| 13. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | All bottles intact                            |
| 14. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Appropriate analytical bottles are used       |
| 15. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Merit bottles used                            |
| 16. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sufficient sample volume received             |
| 17. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples require laboratory filtration         |
| 18. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples submitted within holding time         |
| 19. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Do water VOC or TOX bottles contain headspace |

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: \_\_\_\_\_ Date: \_\_\_\_\_

# Merit Laboratories Bottle Preservation Check

Lab Set ID: S31925 Submitted: 01/12/2022 09:20

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI New Wells 7-10

Attention: Jennifer Caporale  
Address: Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901

Initial Preservation Check: 01/12/2022 09:52 PFD

Preservation Recheck (E200.8): N/A

Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S31925.01	125ml Plastic HNO3	<2			
S31925.01	1L Plastic HNO3	<2			
S31925.01	1L Plastic HNO3	<2			
S31925.02	125ml Plastic HNO3	<2			
S31925.02	1L Plastic HNO3	<2			
S31925.02	1L Plastic HNO3	<2			
S31925.03	125ml Plastic HNO3	<2			
S31925.03	1L Plastic HNO3	<2			
S31925.03	1L Plastic HNO3	<2			
S31925.04	125ml Plastic HNO3	<2			
S31925.04	1L Plastic HNO3	<2			
S31925.04	1L Plastic HNO3	<2			
S31925.05	125ml Plastic HNO3	<2			
S31925.05	1L Plastic HNO3	<2			
S31925.05	1L Plastic HNO3	<2			
S31925.06	125ml Plastic HNO3	<2			
S31925.06	1L Plastic HNO3	<2			
S31925.06	1L Plastic HNO3	<2			



2680 East Lansing Dr., East Lansing, MI 48823  
 Phone (517) 332-0167 Fax (517) 332-4034  
 www.meritlabs.com

**REPORT TO** **CHAIN OF CUSTODY RECORD** **INVOICE TO**

CONTACT NAME Jennifer Caporale			CONTACT NAME Kelly Gleason			<input checked="" type="checkbox"/> SAME		
COMPANY Lansing Board of Water and Light			COMPANY					
ADDRESS PO Box 13007 48901-3007			ADDRESS					
CITY Lansing		STATE Mi	ZIP CODE 48901		CITY		STATE	ZIP CODE
PHONE NO. 517-702-6372	FAX NO.	P.O. NO.		PHONE NO.		E-MAIL ADDRESS Kelly.Gleason@lbwl.com		
E-MAIL ADDRESS Environmental_Laboratory@lbwl.com			QUOTE NO.					

PROJECT NO./NAME Erickson AM MI New Wells 7-10			SAMPLER(S) - PLEASE PRINT/SIGN NAME Marc Wahrer					ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)					Certifications	
TURNAROUND TIME REQUIRED <input type="checkbox"/> 1 DAY <input checked="" type="checkbox"/> 2 DAYS <input type="checkbox"/> 3 DAYS <input type="checkbox"/> STANDARD <input checked="" type="checkbox"/> OTHER ASAP													<input type="checkbox"/> OHIO VAP <input type="checkbox"/> Drinking Water	
DELIVERABLES REQUIRED <input type="checkbox"/> STD <input type="checkbox"/> LEVEL II <input checked="" type="checkbox"/> LEVEL III <input type="checkbox"/> LEVEL IV <input checked="" type="checkbox"/> EDD <input type="checkbox"/> OTHER													<input type="checkbox"/> DoD <input checked="" type="checkbox"/> NPDES	
MATRIX GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID CODE SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIPE A=AIR W=WASTE			# Containers & Preservatives										Project Locations	
													<input type="checkbox"/> Detroit <input type="checkbox"/> New York	
													<input type="checkbox"/> Other	
													Special Instructions	

MERIT LAB NO. <small>PORT LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION		MATRIX	# OF BOTTLES	NONE	HCl	HNO <sub>3</sub>	H <sub>2</sub> SO <sub>4</sub>	HNO <sub>2</sub>	MeOH	OTHER	Total Metals	F- undissilted, Cl-, SO <sub>4</sub> , TDS	Radium 226	Radium 228	TSS						
	DATE	TIME																						
31925.01	1/11/2022	1446	MW-7	L201036-01	GW	5	3	2						✓	✓	✓	✓	✓						Metals to analyse:
.02	1/11/2022	1328	MW-8	L201036-02	GW	5	3	2						✓	✓	✓	✓	✓						B, Ca, Sb, As, Ba, Be, Cd, Cr,
.03	1/11/2022	1146	MW-9	L201036-03	GW	5	3	2						✓	✓	✓	✓	✓						Co, Li, Hg, Mo, Pb, Se, Tl,
.04	1/11/2022	1024	MW-10	L201036-04	GW	5	3	2						✓	✓	✓	✓	✓						Fe, Cu, Ni, Ag, V, Zn
.05	1/11/2022	1146	Field Dupe MW-9	L201036-05	GW	5	3	2						✓	✓	✓	✓	✓						Please send a preliminary report
.06	1/11/2022	0915	Field Blank	L201036-06	DI	5	3	2						✓	✓	✓	✓	✓						

RELINQUISHED BY: SIGNATURE/ORGANIZATION	<i>[Signature]</i>	<input checked="" type="checkbox"/> Sampler	DATE TIME 1-12-22 0920	RELINQUISHED BY: SIGNATURE/ORGANIZATION		DATE TIME
RECEIVED BY: SIGNATURE/ORGANIZATION	<i>[Signature]</i>		DATE TIME 1/12/22 0920	RECEIVED BY: SIGNATURE/ORGANIZATION		DATE TIME
RELINQUISHED BY: SIGNATURE/ORGANIZATION			DATE TIME	SEAL NO.	SEAL INTACT YES <input type="checkbox"/> NO <input type="checkbox"/>	INITIALS
RECEIVED BY: SIGNATURE/ORGANIZATION			DATE TIME	SEAL NO.	SEAL INTACT YES <input type="checkbox"/> NO <input type="checkbox"/>	INITIALS
				NOTES: TEMP. ON ARRIVAL 3.0		

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

## Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total		250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.150
Be, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	2.5
Cl	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	10
Cr, total	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
F	Fluoride	250 mL plastic	mg/L	None	9056	28 d	1.0
Fe, total	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Pb, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Li, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Hg, total	Mercury	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Mo, total	Molybdenum	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
RA226/228	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	HNO3	SM 7500	6 mos	2.0 combined
Se, total	Selenium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ag, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
SO4	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	10
Tl, total	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
TDS	Total Dissolved Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TSS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540D	NA	3
V, total	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Zn, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005





February 08, 2022

John Laverty  
Merit Laboratories Inc.  
2680 East Lansing Drive  
East Lansing, Michigan 48823

Re: Routine Analysis  
Work Order: 567516  
SDG: S31925

Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on January 14, 2022. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at [www.gel.com](http://www.gel.com).

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 4523.

Sincerely,

Samuel Hogan  
Project Manager

Purchase Order: GELP20-0018  
Enclosures



## Table of Contents

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# Case Narrative

**Receipt Narrative  
for  
Merit Laboratories, Inc.  
SDG: S31925  
Work Order: 567516**

**February 08, 2022**

**Laboratory Identification:**

GEL Laboratories LLC  
2040 Savage Road  
Charleston, South Carolina 29407  
(843) 556-8171

**Summary:**

**Sample receipt:** The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on January 14, 2022 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

**Sample Identification:** The laboratory received the following samples:

<b><u>Laboratory ID</u></b>	<b><u>Client ID</u></b>
567516001	S31925.01
567516002	S31925.02
567516003	S31925.03
567516004	S31925.04
567516005	S31925.05
567516006	S31925.06

**Case Narrative:**

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.

A handwritten signature in black ink, appearing to read "Sam Hogan". The signature is written in a cursive, slightly slanted style.

Samuel Hogan  
Project Manager



# **Chain of Custody and Supporting Documentation**

5Le7516

C.O.C. PAGE # 1 OF 1

2680 East Lansing Dr., East Lansing, MI 48823  
Phone (517) 332-0167 Fax (517) 332-4034  
www.meritlabs.com



<b>REPORT TO</b>		<b>CHAIN OF CUSTODY RECORD</b>		<b>INVOICE TO</b>	
CONTACT NAME Project Management Team		CONTACT NAME Julie Teague		COMPANY Merit Labs	
COMPANY Merit Laboratories		COMPANY Merit Laboratories		ADDRESS 2680 East Lansing Drive	
ADDRESS 2680 East Lansing Drive		ADDRESS 2680 East Lansing Drive		CITY East Lansing	
CITY East Lansing		CITY East Lansing		STATE MI	
PHONE NO. 517-332-0167		PHONE NO. 517-332-0167		ZIP CODE 48823	
E-MAIL ADDRESS results@meritlabs.com		E-MAIL ADDRESS juliet@meritlabs.com		E-MAIL ADDRESS juliet@meritlabs.com	
PROJECT NO./NAME S31925		ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)			
TURNAROUND TIME REQUIRED <input type="checkbox"/> 1 DAY <input type="checkbox"/> 2 DAYS <input type="checkbox"/> 3 DAYS <input checked="" type="checkbox"/> STANDARD <input type="checkbox"/> OTHER DELIVERABLES REQUIRED <input type="checkbox"/> STD <input type="checkbox"/> LEVEL II <input type="checkbox"/> LEVEL III <input checked="" type="checkbox"/> LEVEL IV <input type="checkbox"/> EDD <input type="checkbox"/> OTHER					
MATRIX CODE: GW=GROUNDWATER WM=WASTEWATER S=SOIL L=LIQUID SD=SOLID SL=SLUDGE DW=DRINKING WATER O=OIL WP=WPE A=AIR W=WASTE SAMPLE TAG IDENTIFICATION-DESCRIPTION					
YEAR DATE TIME	IDENTIFICATION-DESCRIPTION	MATRIX CODE	BOTTLES NO.	CONTAINERS & PRESERVATIVES OTHER	CERTIFICATIONS <input type="checkbox"/> OHIO VAP <input type="checkbox"/> Drinking Water <input type="checkbox"/> DoD <input type="checkbox"/> NPDES Project Locations <input type="checkbox"/> Detroit <input type="checkbox"/> New York <input type="checkbox"/> Other Special Instructions * E903.1 Mod. ** E904.0/SW 9320 Mod.
1/11/22	1446 S31925.01	GW	2	2	Radium 226*
1/11/22	1328 S31925.02	GW	2	2	Radium 228**
1/11/22	1146 S31925.03	GW	2	2	
1/11/22	1024 S31925.04	GW	2	2	
1/11/22	1146 S31925.05	GW	2	2	
1/11/22	0915 S31925.06 (Field Blank)	Wa	2	2	
RELINQUISHED BY: SIGNATURE/ORGANIZATION RECEIVED BY: SIGNATURE/ORGANIZATION RECEIVED BY: SIGNATURE/ORGANIZATION RECEIVED BY: SIGNATURE/ORGANIZATION					
DATE: 1/12/22 TIME: 1700		DATE: 1/12/22 TIME: 1700		DATE: 1-14-22 TIME: 0935	
SIGNATURE: <i>[Signature]</i> ORGANIZATION: UPS		SIGNATURE: <i>[Signature]</i> ORGANIZATION: GEL		SIGNATURE: <i>[Signature]</i> ORGANIZATION: GEL	

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

SH

SAMPLE RECEIPT & REVIEW FORM

Client: <u>MERT</u>		SDG/AR/COC/Work Order: <u>567516</u>	
Received By: <u>DC</u>		Date Received: <u>1-14-22</u>	
Carrier and Tracking Number		FedEx Express    FedEx Ground <u>UPS</u> Field Services    Courier    Other <u>1Z4604770502913732</u>	
Suspected Hazard Information		Yes	No
*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.			
A) Shipped as a DOT Hazardous?		<input checked="" type="checkbox"/>	Hazard Class Shipped: _____ UN#: _____ If UN2910, Is the Radioactive Shipment Survey Compliant? Yes ___ No ___
B) Did the client designate the samples are to be received as radioactive?		<input checked="" type="checkbox"/>	COC notation or radioactive stickers on containers equal client designation.
C) Did the RSO classify the samples as radioactive?		<input checked="" type="checkbox"/>	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): <u>0</u> CPM / mR/Hr Classified as: Rad 1    Rad 2    Rad 3
D) Did the client designate samples are hazardous?		<input checked="" type="checkbox"/>	COC notation or hazard labels on containers equal client designation.
E) Did the RSO identify possible hazards?		<input checked="" type="checkbox"/>	If D or E is yes, select Hazards below. PCB's    Flammable    Foreign Soil    RCRA    Asbestos    Beryllium    Other:
Sample Receipt Criteria		Yes	NA
		NA	No
		Comments/Qualifiers (Required for Non-Conforming Items)	
1	Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>	Circle Applicable: Seals broken    Damaged container    Leaking container    Other (describe)
2	Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>	Circle Applicable: Client contacted and provided COC    COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*	<input checked="" type="checkbox"/>	Preservation Method: Wet Ice    Ice Packs    Dry ice <u>None</u> Other: *all temperatures are recorded in Celsius    TEMP: <u>129</u>
4	Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>	Temperature Device Serial #: <u>IR6-21</u> Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?	<input checked="" type="checkbox"/>	Circle Applicable: Seals broken    Damaged container    Leaking container    Other (describe)
6	Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>	Sample ID's and Containers Affected: If Preservation added, Lot#:
7	Do any samples require Volatile Analysis?	<input checked="" type="checkbox"/>	If Yes, are Encores or Soil Kits present for solids? Yes ___ No ___ NA ___ (If yes, take to VOA Freezer)
			Do liquid VOA vials contain acid preservation? Yes ___ No ___ NA ___ (If unknown, select No)
			Are liquid VOA vials free of headspace? Yes ___ No ___ NA ___
8	Samples received within holding time?	<input checked="" type="checkbox"/>	ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>	ID's and containers affected:
10	Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>	Circle Applicable: No dates on containers    No times on containers    COC missing info    Other (describe)
11	Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>	Circle Applicable: No container count on COC    Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?	<input checked="" type="checkbox"/>	
13	COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>	Circle Applicable: Not relinquished    Other (describe)
Comments (Use Continuation Form if needed):			

PM (or PMA) review: Initials NRL Date 1/17/22 Page 1 of 1

# **Laboratory Certifications**

**List of current GEL Certifications as of 08 February 2022**

<b>State</b>	<b>Certification</b>
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122021-1
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2019-165
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-21-19
Utah NELAP	SC000122021-36
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

# **Radiological Analysis**



# Case Narrative

**Radiochemistry  
Technical Case Narrative  
Merit Laboratories, Inc.  
SDG #: S31925  
Work Order #: 567516**

**Product: GFPC Ra228, Liquid**

**Analytical Method:** EPA 904.0/SW846 9320 Modified

**Analytical Procedure:** GL-RAD-A-063 REV# 5

**Analytical Batch:** 2219604

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
567516001	S31925.01
567516002	S31925.02
567516003	S31925.03
567516004	S31925.04
567516005	S31925.05
567516006	S31925.06
1205000478	Method Blank (MB)
1205000479	567516001(S31925.01) Sample Duplicate (DUP)
1205000480	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

**Product: Lucas Cell, Ra226, Liquid**

**Analytical Method:** EPA 903.1 Modified

**Analytical Procedure:** GL-RAD-A-008 REV# 15

**Analytical Batch:** 2219271

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
567516001	S31925.01
567516002	S31925.02
567516003	S31925.03
567516004	S31925.04
567516005	S31925.05
567516006	S31925.06
1204999831	Method Blank (MB)
1204999832	567585001(NonSDG) Sample Duplicate (DUP)
1204999833	567585001(NonSDG) Matrix Spike (MS)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

**Preparation Information**

**Homogenous Matrix**

Samples 1204999832 (Non SDG 567585001DUP) and 1204999833 (Non SDG 567585001MS) were non-homogenous matrix.

**Certification Statement**

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

## GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

### Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S31925 GEL Work Order: 567516

#### The Qualifiers in this report are defined as follows:

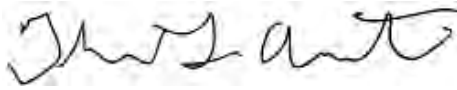
- \* A quality control analyte recovery is outside of specified acceptance criteria
- \*\* Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

#### Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature:



Name: Theresa Austin

Date: 09 FEB 2022

Title: Group Leader

# Sample Data Summary

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: February 8, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

Client Sample ID: S31925.01	Project: MERI00120
Sample ID: 567516001	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 11-JAN-22 14:46	
Receive Date: 14-JAN-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	-0.650	+/-0.795	1.67	3.00	pCi/L			JXC9	01/31/22	1238	2219604	1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		0.676	+/-0.885			pCi/L		1	NXL1	02/08/22	1556	2219963	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.676	+/-0.388	0.512	1.00	pCi/L			LXP1	01/25/22	0754	2219271	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			85.2	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit



# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: February 8, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
 East Lansing, Michigan 48823  
 Contact: John Lavery  
 Project: Routine Analysis

Client Sample ID: S31925.02	Project: MERI00120
Sample ID: 567516002	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 11-JAN-22 13:28	
Receive Date: 14-JAN-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228		4.44	+/-1.48	2.00	3.00	pCi/L			JXC9	01/31/22	1238	2219604	1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		6.21	+/-1.57			pCi/L			NXL1	02/08/22	1556	2219963	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		1.77	+/-0.538	0.417	1.00	pCi/L			LXP1	01/25/22	0754	2219271	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			86.3	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: February 8, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

Client Sample ID: S31925.03	Project: MERI00120
Sample ID: 567516003	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 11-JAN-22 11:46	
Receive Date: 14-JAN-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228		1.53	+/-0.911	1.35	3.00	pCi/L			JXC9	01/31/22	1238	2219604	1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		2.37	+/-1.02			pCi/L			NXL1	02/08/22	1556	2219963	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.838	+/-0.448	0.583	1.00	pCi/L			LXP1	01/25/22	0827	2219271	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			93.6	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: February 8, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

Client Sample ID: S31925.04	Project: MERI00120
Sample ID: 567516004	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 11-JAN-22 10:24	
Receive Date: 14-JAN-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	0.142	+/-0.733	1.35	3.00	pCi/L			JXC9	01/31/22	1238	2219604	1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		1.73	+/-0.898			pCi/L			NXL1	02/08/22	1556	2219963	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		1.59	+/-0.520	0.484	1.00	pCi/L			LXP1	01/25/22	0827	2219271	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			102	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: February 8, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

Client Sample ID: S31925.05	Project: MERI00120
Sample ID: 567516005	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 11-JAN-22 11:46	
Receive Date: 14-JAN-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	-0.724	+/-0.551	1.26	3.00	pCi/L			JXC9	01/31/22	1238	2219604	1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		1.22	+/-0.697			pCi/L			NXL1	02/08/22	1556	2219963	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		1.22	+/-0.427	0.282	1.00	pCi/L			LXP1	01/25/22	0827	2219271	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			105	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

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## Certificate of Analysis

Report Date: February 8, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Lavery  
 Project: Routine Analysis

Client Sample ID: S31925.06	Project: MERI00120
Sample ID: 567516006	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 11-JAN-22 09:15	
Receive Date: 14-JAN-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	-0.343	+/-0.574	1.25	3.00	pCi/L			JXC9	01/31/22	1238	2219604	1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		0.000	+/-0.612			pCi/L			NXL1	02/08/22	1556	2219963	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226	U	-0.0982	+/-0.213	0.501	1.00	pCi/L			LXP1	01/25/22	0827	2219271	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			90.6	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# Quality Control Summary

# GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

## QC Summary

Report Date: February 8, 2022

Page 1 of 2

**Merit Laboratories Inc.**  
**2680 East Lansing Drive**  
**East Lansing, Michigan**

**Contact: John Laverty**

**Workorder: 567516**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Rad Gas Flow</b>											
Batch	2219604										
QC1205000479	567516001	DUP									
Radium-228	U	-0.650	U	-0.0433	pCi/L	N/A		N/A	JXC9	01/31/22	12:37
	Uncertainty	+/-0.795		+/-0.892							
QC1205000480	LCS										
Radium-228	48.9			41.4	pCi/L		84.6	(75%-125%)		01/31/22	12:37
	Uncertainty			+/-3.23							
QC1205000478	MB										
Radium-228			U	0.307	pCi/L					01/31/22	12:38
	Uncertainty			+/-0.653							
<b>Rad Ra-226</b>											
Batch	2219271										
QC1204999832	567585001	DUP									
Radium-226	U	21.7	U	39.3	pCi/L	N/A		N/A	LXP1	01/25/22	08:27
	Uncertainty	+/-33.2		+/-37.7							
QC1204999834	LCS										
Radium-226	26.4			24.0	pCi/L		90.8	(75%-125%)		01/25/22	09:00
	Uncertainty			+/-1.83							
QC1204999831	MB										
Radium-226			U	0.177	pCi/L					01/25/22	08:27
	Uncertainty			+/-0.303							
QC1204999833	567585001	MS									
Radium-226	2420	U	21.7	2450	pCi/L		101	(75%-125%)		01/25/22	09:00
	Uncertainty	+/-33.2		+/-190							

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- \*\* Analyte is a Tracer compound
- < Result is less than value reported
- > Result is greater than value reported
- BD Results are either below the MDC or tracer recovery is low
- FA Failed analysis.
- H Analytical holding time was exceeded



# GEL LABORATORIES LLC

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## QC Summary

Workorder: 567516

Page 2 of 2

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
J											
J											
K											
L											
M											
M											
N/A											
N1											
ND											
NJ											
Q											
R											
U											
U											
UI											
UJ											
UL											
X											
Y											
^											
h											

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

\* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

# **Gas Flow Raw Data**

# Batch 2219604 Check-list

This check-list was completed on 01-FEB-22 by Nat Long

This batch was reviewed by Kenshalla Oston on 01-FEB-22 and Nat Long on 01-FEB-22.

**Batch ID:**  
2219604

**Product:**  
GFC28RAL

**Description:** Gas Flow Radium 228  
GL-RAD-A-063

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
11	Has the method required detection limit been met?	Yes		
<b>Miscellaneous Information</b>				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

# Prep Logbook

## Radium-228 in Liquid

**Batch ID:** 2219604

**Analyst:** Jasmine Conley (JXC9)

**Method:** EPA 904.0/SW846 9320 Modified

**Lab SOP:** GL-RAD-A-063 REV# 5

**Instrument:** LUCAS-C037036045

**Due Dates for Lab:** 08-FEB-2022

**Package:** 10-FEB-2022

**SDG:** 11-FEB-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205000480	Radium-228 SPIKE	1965-B	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	567516001	19-JAN-2022	3	300.25	300.25	01/20/22 12:30	01/31/22 10:32
2	567516002	19-JAN-2022	3	300.62	300.62	01/20/22 12:30	01/31/22 10:32
3	567516003	19-JAN-2022	3	301.1	301.1	01/20/22 12:30	01/31/22 10:32
4	567516004	19-JAN-2022	3	300.09	300.09	01/20/22 12:30	01/31/22 10:32
5	567516005	19-JAN-2022	3	300.44	300.44	01/20/22 12:30	01/31/22 10:32
6	567516006	19-JAN-2022	3	300.36	300.36	01/20/22 12:30	01/31/22 10:32
7	1205000478 MB	19-JAN-2022	3		301.1	01/20/22 12:30	01/31/22 10:32
8	1205000479 DUP (567516001)	19-JAN-2022	3	300.97	300.97	01/20/22 12:30	01/31/22 10:32
9	1205000480 LCS	19-JAN-2022	3		301.1	01/20/22 12:30	01/31/22 10:32

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1951-C	Barium-133	.1 mL	Pipet Id: RAD-GFC-1795419 Data Entry Date2: 19-JAN-2022 00:00
REGNT 3264545	RGF-7M Nitric Acid	25 mL	
REGNT 3290227	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3353921	RGF-1M Citric Acid	5 mL	
REGNT 3354444	RGF-Neodymium Substrate	5 mL	
REGNT 3357922	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	
REGNT 3365600	RGF-1.5M Ammonium Sulfate	10 mL	
REGNT 3371585.12	16M Nitric Acid	5 mL	
REGNT 3378803	2M HCl	20 mL	
REGNT 3385288.1	RGF-Hydrofluoric Acid	4 mL	
REGNT 3386380	Lot #DGA0027	2 g	
REGNT 3391529	RGF-50% Potassium Carbonate	2 mL	
REGNT 3392124	Barium Carrier Ra228 REG	1 mL	

### Radium-228 Liquid

Filename : RA228.XLS  
 File type : Excel  
 Version # : 1.4.2

Tracer S/N : 1951-C  
 Tracer Exp Date : 9/16/2022  
 Tracer Volume Added: 0.10

Batch : 2219604  
 Analyst : JAS02031  
 Prep Date : 1/19/2022  
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL  
 Parmname : Radium-228  
 Required MDA : 3 pCi/L  
 Ra-228 Abundance : 1.00  
 Halflife of Ra-228 : 5.75 years  
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	567516001.1	0.3003	1.8463E-05	1/11/2022 14:46	103.3	5.68%	88.0	6.15%	0.1	0.000200
2	567516002.1	0.3006	1.8470E-05	1/11/2022 13:28	103.3	5.68%	89.2	6.11%	0.1	0.000200
3	567516003.1	0.3011	1.8478E-05	1/11/2022 11:46	103.3	5.68%	96.7	5.87%	0.1	0.000200
4	567516004.1	0.3001	1.8461E-05	1/11/2022 10:24	103.3	5.68%	105.2	5.63%	0.1	0.000200
5	567516005.1	0.3004	1.8467E-05	1/11/2022 11:46	103.3	5.68%	108.8	5.53%	0.1	0.000200
6	567516006.1	0.3004	1.8465E-05	1/11/2022 9:15	103.3	5.68%	93.7	5.97%	0.1	0.000200
7	1205000478.1	0.3011	1.8478E-05	1/19/2022 0:00	103.3	5.68%	100.0	5.77%	0.1	0.000200
8	1205000479.1	0.3010	1.8475E-05	1/11/2022 14:46	103.3	5.68%	87.5	6.17%	0.1	0.000200
9	1205000480.1	0.3011	1.8478E-05	1/19/2022 0:00	103.3	5.68%	90.7	6.06%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063  
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated	Sample
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction	Recovery %	Recovery Error %
			Alpha	Beta										
1	9A	60	6	38	0.633	1/31/2022 12:38	1/20/2022 12:30	1/31/2022 10:32	0.993	0.788	1.000	1.057	85.2%	4.20%
2	9B	60	8	154	2.567	1/31/2022 12:38	1/20/2022 12:30	1/31/2022 10:32	0.993	0.788	1.000	1.057	86.3%	4.18%
3	9C	60	2	64	1.067	1/31/2022 12:38	1/20/2022 12:30	1/31/2022 10:32	0.993	0.788	1.000	1.057	93.6%	4.09%
4	9D	60	11	50	0.833	1/31/2022 12:38	1/20/2022 12:30	1/31/2022 10:32	0.993	0.788	1.000	1.057	102%	4.01%
5	10A	60	4	28	0.467	1/31/2022 12:38	1/20/2022 12:30	1/31/2022 10:32	0.993	0.788	1.000	1.057	105%	3.97%
6	10B	60	4	21	0.350	1/31/2022 12:38	1/20/2022 12:30	1/31/2022 10:32	0.993	0.788	1.000	1.057	90.6%	4.13%
7	10D	60	1	35	0.583	1/31/2022 12:38	1/20/2022 12:30	1/31/2022 10:32	0.996	0.788	1.000	1.057	96.8%	4.06%
8	11A	60	3	51	0.850	1/31/2022 12:37	1/20/2022 12:30	1/31/2022 10:32	0.993	0.789	1.000	1.057	84.7%	4.20%
9	11B	60	3	789	13.150	1/31/2022 12:37	1/20/2022 12:30	1/31/2022 10:32	0.996	0.789	1.000	1.057	87.8%	4.16%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2021	5/31/2022	0.6471	0.00758	0.810	1/29/2022 8:08	500
2	PIC	6/1/2021	5/31/2022	0.6635	0.00754	1.310	1/29/2022 8:08	500
3	PIC	6/1/2021	5/31/2022	0.6408	0.00584	0.612	1/29/2022 8:08	500
4	PIC	6/1/2021	5/31/2022	0.6629	0.02610	0.786	1/29/2022 8:08	500
5	PIC	6/1/2021	5/31/2022	0.6569	0.00651	0.714	1/29/2022 8:08	500
6	PIC	6/1/2021	5/31/2022	0.6263	0.00652	0.446	1/29/2022 8:08	500
7	PIC	6/1/2021	5/31/2022	0.6472	0.00557	0.488	1/29/2022 8:08	500
8	PIC	6/1/2021	5/31/2022	0.6604	0.01317	0.862	1/29/2022 8:07	500
9	PIC	6/1/2021	5/31/2022	0.6561	0.00697	1.314	1/29/2022 8:07	500

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

**Spike S/N :** N/A  
**Spike Exp Date :** N/A  
**Spike Activity (dpm/ml):** N/A  
**Spike Volume Added:** N/A

\* - RPD changed to 0% due to sample & dup activity below MDA

**LCS S/N :** 1965-B  
**LCS Exp Date :** 8/22/2022  
**LCS Activity (dpm/ml):** 326.77  
**LCS Volume Added:** 0.10

Results Pos.	Decision	Critical	Required	Sample Act.		Sample Act.	Net Count	Net Count	2 SIGMA	2 SIGMA	Sample	Sample	RPD	RER	Nominal	Recovery
	Level	Level	MDA	MDA	Conc.	Error	Rate	Rate Error	Counting	Total Prop.						
1	1.0538	0.7440	3	1.6719	<b>-0.6498</b>	62.60%	-0.1767	0.1103	0.7955	0.7956		SAMPLE				
2	1.2884	0.9096	3	1.9960	<b>4.4436</b>	17.48%	1.2567	0.2131	1.4767	1.8807		SAMPLE				
3	0.8396	0.5928	3	1.3541	<b>1.5329</b>	30.60%	0.4547	0.1378	0.9109	0.9952		SAMPLE				
4	0.8485	0.5990	3	1.3483	<b>0.1423</b>	262.74%	0.0473	0.1243	0.7327	0.7336		SAMPLE				
5	0.7875	0.5560	3	1.2584	<b>-0.7241</b>	39.00%	-0.2473	0.0959	0.5506	0.5507		SAMPLE				
6	0.7588	0.5357	3	1.2499	<b>-0.3426</b>	85.53%	-0.0960	0.0820	0.5737	0.5739		SAMPLE				
7	0.7159	0.5055	3	1.1719	<b>0.3069</b>	108.57%	0.0953	0.1034	0.6527	0.6576		MB				
8	1.0666	0.7530	3	1.6865	<b>-0.0433</b>	1050.49%	-0.0120	0.1261	0.8916	0.8918	567516001.1	DUP	* 0.0%			
9	1.2753	0.9004	3	1.9755	<b>41.3647</b>	5.80%	11.8360	0.4710	3.2259	11.3048		LCS			48.8846	84.6%



SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
567516001	9A	60	6	38	1/31/2022 12:38	1/31/2022 13:38	PIC	2219604
567516002	9B	60	8	154	1/31/2022 12:38	1/31/2022 13:38	PIC	2219604
567516003	9C	60	2	64	1/31/2022 12:38	1/31/2022 13:38	PIC	2219604
567516004	9D	60	11	50	1/31/2022 12:38	1/31/2022 13:38	PIC	2219604
567516005	10A	60	4	28	1/31/2022 12:38	1/31/2022 13:38	PIC	2219604
567516006	10B	60	4	21	1/31/2022 12:38	1/31/2022 13:38	PIC	2219604
1205000478	10D	60	1	35	1/31/2022 12:38	1/31/2022 13:38	PIC	2219604
1205000479	11A	60	3	51	1/31/2022 12:37	1/31/2022 13:37	PIC	2219604
1205000480	11B	60	3	789	1/31/2022 12:37	1/31/2022 13:37	PIC	2219604

ASSAY 31-Jan-22 11:43:33  
 Wizard 2480 s/n 46190630  
 Protocol id 9 Ba-133\_1  
 Time limit  
 Count limit  
 Isotope Ba-133\_1  
 Protocol date 1/31/2022  
 Run id. 4578

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	94	1	180	310	103.31	5.68	11:43:33
567516001	2	94	2	180	264	87.98	6.15	85.16	11:46:47
567516002	3	94	3	180	267.5	89.15	6.11	86.29	11:50:01
567516003	4	94	4	180	290	96.66	5.87	93.56	11:53:15
567516004	5	94	5	180	315.5	105.15	5.63	101.78	11:56:28
567516005	1	3	1	180	326.5	108.82	5.53	105.33	12:00:13
567516006	2	3	2	180	281	93.65	5.97	90.65	12:03:27
1205000478	3	3	3	180	300	99.98	5.77	96.78	12:06:41
1205000479	4	3	4	180	262.5	87.48	6.17	84.68	12:09:55
1205000480	5	3	5	180	272	90.66	6.06	87.76	12:13:08

END OF ASSAY

# **Continuing Calibration Data**

# Gas Flow Proportional Counter Checks for 31-Jan-2022

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
G5400W1X	Missing	Beta eff	31-Jan 09:17	5	14396	14110	14920	-0.88
G5400W1X	Missing	Beta XTalk	31-Jan 09:17	5	4.86E-4	1.63E-4	6.93E-4	+0.66
G5400W1Y	Missing	Beta eff	31-Jan 09:17	5	14429	13860	15380	-0.75
G5400W1Y	Missing	Beta XTalk	31-Jan 09:17	5	5.27E-4	1.60E-4	7.58E-4	+0.68
G5400W1Z	Missing	Beta eff	31-Jan 09:17	5	16477	16060	17760	-1.53
G5400W1Z	Missing	Beta XTalk	31-Jan 09:17	5	2.55E-4	1.40E-4	6.62E-4	-1.68
LB4100A2	Below	Alpha eff	31-Jan 04:34	5	7885	8195	11620	-3.54
LB4100A2	Above	Alpha XTalk	31-Jan 04:34	5	0.404	0.264	0.394	+3.47
LB4100F1	Above	Beta bkg	31-Jan 05:11	60	3.317	0.174	2.729	+4.38
LB4100F1	Below	Beta eff	31-Jan 05:02	5	38589	38640	44090	-3.06
LB4100F1	Above	Beta XTalk	31-Jan 05:02	5	3.68E-4	4.18E-5	2.00E-4	+9.40
LB4100F2	Above	Beta bkg	31-Jan 05:11	60	2.900	0.421	2.116	+5.77
LB4100F2	Above	Beta XTalk	31-Jan 05:02	5	5.67E-4	1.40E-4	5.65E-4	+3.03
LB4100F3	Above	Alpha bkg	31-Jan 05:11	60	0.333	-8.21E-2	0.542	+1.00
LB4100F3	Below	Alpha eff	31-Jan 04:54	5	12448	12820	17130	-3.52
LB4100F3	Above	Alpha XTalk	31-Jan 04:54	5	0.411	0.287	0.399	+3.63
LB4100F3	Above	Beta bkg	31-Jan 05:11	60	2.450	0.478	2.176	+3.97
LB4100F4	Above	Beta bkg	31-Jan 05:11	60	4.300	0.520	1.984	+12.49
LB4100F4	Above	Beta XTalk	31-Jan 05:02	5	3.33E-4	7.93E-5	3.06E-4	+3.72
LB4100G2	Below	Alpha eff	31-Jan 05:02	5	8133	9350	12920	-5.05
LB4100G2	Above	Alpha XTalk	31-Jan 05:02	5	0.387	0.212	0.351	+4.57
LB4100G3	Below	Alpha eff	31-Jan 05:02	5	6474	6620	7779	-3.75
LB4100G3	Above	Beta bkg	31-Jan 05:11	60	4.450	0.810	1.674	+22.28
LB4100G4	Above	Alpha bkg	31-Jan 05:11	60	0.500	-9.15E-2	0.224	+8.26
PIC2D	need 2nd	Beta bkg	31-Jan 04:26	60	1.683	0.004	2.015	+2.01
PIC6A	need 2nd	Beta bkg	31-Jan 04:27	60	1.950	0.669	2.752	+0.69
PIC6C	Above	Beta bkg	31-Jan 04:28	60	5.517	0.415	2.299	+13.25
PIC10C	Above	Alpha eff	31-Jan 06:08	5	21525	19060	20900	+5.04
PIC10C	Above	Beta bkg	31-Jan 04:29	60	2.517	-3.66E-1	2.303	+3.48
PIC12C	Above	Beta bkg	31-Jan 04:29	60	2.300	0.024	2.905	+1.74

PIC14C      need 2nd Beta bkg      31-Jan 04:30      60      1.717      -6.83E-2      2.816      +0.71

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

LB4100C1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by *A. Smith Dawson*

Date *1-31-28*

GEL Laboratories LLC

# Runlogs

# Instrument Run Log

Instrument Type: GFPC

Batch ID: 2219604

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205000479	DUP	JXC9	PIC11A	JAN-31-22 12:37:52	DONE	25mm Filter	01-JUN-21 00:00
1205000480	LCS	JXC9	PIC11B	JAN-31-22 12:37:52	DONE	25mm Filter	01-JUN-21 00:00
567516001	SAMPLE	JXC9	PIC9A	JAN-31-22 12:38:58	DONE	25mm Filter	01-JUN-21 00:00
567516002	SAMPLE	JXC9	PIC9B	JAN-31-22 12:38:58	DONE	25mm Filter	01-JUN-21 00:00
567516003	SAMPLE	JXC9	PIC9C	JAN-31-22 12:38:58	DONE	25mm Filter	01-JUN-21 00:00
567516004	SAMPLE	JXC9	PIC9D	JAN-31-22 12:38:59	DONE	25mm Filter	01-JUN-21 00:00
567516005	SAMPLE	JXC9	PIC10A	JAN-31-22 12:38:59	DONE	25mm Filter	01-JUN-21 00:00
567516006	SAMPLE	JXC9	PIC10B	JAN-31-22 12:38:59	DONE	25mm Filter	01-JUN-21 00:00
1205000478	MB	JXC9	PIC10D	JAN-31-22 12:38:59	DONE	25mm Filter	01-JUN-21 00:00

# Lucas Cell Raw Data



# Batch 2219271 Check-list

This check-list was completed on 25-JAN-22 by Lyndsey Pace

This batch was reviewed by Elizabeth Krouse on 25-JAN-22 and Lyndsey Pace on 25-JAN-22.

**Batch ID:**  
2219271

**Product:**  
LUC26RAL

**Description:** Lucas Cell Radium 226  
GL-RAD-A-008

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous		No	
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
<b>Miscellaneous Information</b>				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

# Prep Logbook

## Radium-226 in Liquid

**Batch ID:** 2219271

**Analyst:** Lyndsey Pace (LXP1)

**Method:** EPA 903.1 Modified

**Lab SOP:** GL-RAD-A-008 REV# 15

**Instrument:** LUCAS-C037036045

**Due Dates for Lab:** 26-JAN-2022

**Package:** 27-JAN-2022

**SDG:** 28-JAN-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1204999834	Radium-226 SPIKE	1715-G	.1	mL
MS	1204999833	Radium-226 SPIKE	1715-G	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	565659001	20-JAN-2022	1	500.86	500.86	01/21/22 09:55	102	01/25/22 04:56	01/25/22 07:54	4	11
2	565659002	20-JAN-2022	1	500.76	500.76	01/21/22 09:55	208	01/25/22 04:56	01/25/22 07:54	8	9
3	565662001	20-JAN-2022	1	500.74	500.74	01/21/22 09:55	307	01/25/22 04:56	01/25/22 07:54	3	16
4	565662002	20-JAN-2022	1	507.6	507.6	01/21/22 09:55	408	01/25/22 04:56	01/25/22 07:54	5	20
5	567143001	20-JAN-2022	1	500.01	500.01	01/21/22 09:55	503	01/25/22 04:56	01/25/22 07:54	8	19
6	567143002	20-JAN-2022	1	502.48	502.48	01/21/22 09:55	602	01/25/22 04:56	01/25/22 07:54	5	23
7	567516001	20-JAN-2022	1	500.81	500.81	01/21/22 09:55	703	01/25/22 04:56	01/25/22 07:54	6	25
8	567516002	20-JAN-2022	1	500.83	500.83	01/21/22 09:55	803	01/25/22 04:56	01/25/22 07:54	3	50
9	567516003	20-JAN-2022	1	500.54	500.54	01/21/22 09:55	105	01/25/22 05:25	01/25/22 08:27	7	29
10	567516004	20-JAN-2022	1	501.96	501.96	01/21/22 09:55	202	01/25/22 05:25	01/25/22 08:27	5	49
11	567516005	20-JAN-2022	1	500.8	500.8	01/21/22 09:55	305	01/25/22 05:25	01/25/22 08:27	1	34
12	567516006	20-JAN-2022	1	500.28	500.28	01/21/22 09:55	402	01/25/22 05:25	01/25/22 08:27	7	4
13	567570001	20-JAN-2022	1	502.2	502.2	01/21/22 09:55	502	01/25/22 05:25	01/25/22 08:27	1	9
14	567585001	20-JAN-2022	207	5	5	01/21/22 09:55	607	01/25/22 05:25	01/25/22 08:27	8	14
15	1204999831 MB	20-JAN-2022	1		507.6	01/21/22 09:55	707	01/25/22 05:25	01/25/22 08:27	7	12
16	1204999832 DUP (567585001)	20-JAN-2022	207	5.33	5.33	01/21/22 09:55	804	01/25/22 05:25	01/25/22 08:27	7	17
17	1204999833 MS (567585001)	20-JAN-2022	207	5.55	5.55	01/21/22 09:55	106	01/25/22 05:56	01/25/22 09:00	6	656
18	1204999834 LCS	20-JAN-2022	1		507.6	01/21/22 09:55	206	01/25/22 05:56	01/25/22 09:00	4	668

Reagent/Solvent Lot ID	Description	Amount
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**Comments:**

Data Entry Date2: 20-JAN-2022 00:00

### Radium-226 Liquid

Filename : RA226.XLS  
 File type : Excel  
 Version # : 1.3.2

Procedure Code : LUC26RAL  
 Parmname : Radium-226  
 Required MDA : 1 pCi/L  
 Halflife of Ra-226 : 1600 years  
 Ra-226 Abundance : 1.00  
 Halflife of Rn-222 : 3.8235 days

Batch : 2219271  
 Analyst : LIN01615  
 Prep Date : 1/20/2022  
 Ra-226 Method Uncertainty : 0.073648

Batch counted on : LUCAS CELL DETECTOR  
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Counting		Gross Counts	Gross CPM	Background Counts	Background CPM	Background Count Time (min.)	Cell Efficiency (cpm/dpm)
					Cell Number	Time (min.)						
1	565659001.1	0.5009	2.0259E-05	12/14/2021 10:10	102	30	11	0.367	4	0.133	30	1.5460
2	565659002.1	0.5008	2.0259E-05	12/14/2021 10:20	208	30	9	0.300	8	0.267	30	1.6950
3	565662001.1	0.5007	2.0259E-05	12/14/2021 12:40	307	30	16	0.533	3	0.100	30	1.8079
4	565662002.1	0.5076	2.0286E-05	12/14/2021 12:50	408	30	20	0.667	5	0.167	30	1.8790
5	567143001.1	0.5000	2.0256E-05	1/10/2022 10:10	503	30	19	0.633	8	0.267	30	1.9420
6	567143002.1	0.5025	2.0266E-05	1/10/2022 11:10	602	30	23	0.767	5	0.167	30	1.6150
7	567516001.1	0.5008	2.0259E-05	1/11/2022 14:46	703	30	25	0.833	6	0.200	30	1.7360
8	567516002.1	0.5008	2.0259E-05	1/11/2022 13:28	803	30	50	1.667	3	0.100	30	1.6400
9	567516003.1	0.5005	2.0258E-05	1/11/2022 11:46	105	30	29	0.967	7	0.233	30	1.6180
10	567516004.1	0.5020	2.0264E-05	1/11/2022 10:24	202	30	49	1.633	5	0.167	30	1.7020
11	567516005.1	0.5008	2.0259E-05	1/11/2022 11:46	305	30	34	1.133	1	0.033	30	1.6727
12	567516006.1	0.5003	2.0257E-05	1/11/2022 9:15	402	30	4	0.133	7	0.233	30	1.8830
13	567570001.1	0.5022	2.0265E-05	1/13/2022 9:26	502	30	9	0.300	1	0.033	30	1.8100
14	567585001.1	0.0050	3.7355E-06	1/13/2022 12:08	607	30	14	0.467	8	0.267	30	1.7080
15	1204999831.1	0.5076	2.0286E-05	1/20/2022 0:00	707	30	12	0.400	7	0.233	30	1.7120
16	1204999832.1	0.0053	3.7691E-06	1/13/2022 12:08	804	30	17	0.567	7	0.233	30	1.4740
17	1204999833.1	0.0056	3.7915E-06	1/13/2022 12:08	106	30	656	21.867	6	0.200	30	1.4690
18	1204999834.1	0.5076	2.0286E-05	1/20/2022 0:00	206	30	668	22.267	4	0.133	30	1.6770

Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008  
 Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrowth End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
2.800%	5/2/2021	4/30/2022	1/21/2022 9:55	1/25/2022 4:56	1/25/2022 7:54	0.497	0.978	1.002	1.000
2.600%	8/1/2021	7/31/2022	1/21/2022 9:55	1/25/2022 4:56	1/25/2022 7:54	0.497	0.978	1.002	1.000
8.129%	1/1/2022	12/31/2022	1/21/2022 9:55	1/25/2022 4:56	1/25/2022 7:54	0.497	0.978	1.002	1.000
5.500%	2/1/2021	1/31/2022	1/21/2022 9:55	1/25/2022 4:56	1/25/2022 7:54	0.497	0.978	1.002	1.000
4.800%	6/1/2021	5/31/2022	1/21/2022 9:55	1/25/2022 4:56	1/25/2022 7:54	0.497	0.978	1.002	1.000
3.900%	7/1/2021	6/30/2022	1/21/2022 9:55	1/25/2022 4:56	1/25/2022 7:54	0.497	0.978	1.002	1.000
5.000%	11/1/2021	10/31/2022	1/21/2022 9:55	1/25/2022 4:56	1/25/2022 7:54	0.497	0.978	1.002	1.000
6.100%	4/1/2021	3/31/2022	1/21/2022 9:55	1/25/2022 4:56	1/25/2022 7:54	0.497	0.978	1.002	1.000
1.700%	5/2/2021	4/30/2022	1/21/2022 9:55	1/25/2022 5:25	1/25/2022 8:27	0.499	0.977	1.002	1.000
4.100%	8/1/2021	7/31/2022	1/21/2022 9:55	1/25/2022 5:25	1/25/2022 8:27	0.499	0.977	1.002	1.000
6.292%	1/1/2022	12/31/2022	1/21/2022 9:55	1/25/2022 5:25	1/25/2022 8:27	0.499	0.977	1.002	1.000
9.400%	2/1/2021	1/31/2022	1/21/2022 9:55	1/25/2022 5:25	1/25/2022 8:27	0.499	0.977	1.002	1.000
9.900%	6/1/2021	5/31/2022	1/21/2022 9:55	1/25/2022 5:25	1/25/2022 8:27	0.499	0.977	1.002	1.000
4.600%	7/1/2021	6/30/2022	1/21/2022 9:55	1/25/2022 5:25	1/25/2022 8:27	0.499	0.977	1.002	1.000
3.000%	11/1/2021	10/31/2022	1/21/2022 9:55	1/25/2022 5:25	1/25/2022 8:27	0.499	0.977	1.002	1.000
3.700%	4/1/2021	3/31/2022	1/21/2022 9:55	1/25/2022 5:25	1/25/2022 8:27	0.499	0.977	1.002	1.000
4.200%	5/2/2021	4/30/2022	1/21/2022 9:55	1/25/2022 5:56	1/25/2022 9:00	0.501	0.977	1.002	1.000
5.600%	8/1/2021	7/31/2022	1/21/2022 9:55	1/25/2022 5:56	1/25/2022 9:00	0.501	0.977	1.002	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

**Spike S/N :** 1715-G  
**Spike Exp Date :** 9/15/2022  
**Spike Activity (dpm/ml):** 297.58  
**Spike Volume Added:** 0.10

\* - RPD changed to 0% due to sample & dup activity below MDA

**LCS S/N :** 1715-G  
**LCS Exp Date :** 9/15/2022  
**LCS Activity (dpm/ml):** 297.58  
**LCS Volume Added:** 0.10

<b>Results</b>																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.2634	0.1859	1	0.4918	<b>0.2797</b>	55.40%	0.2333	0.1291	0.3034	0.3064		SAMPLE				
2	0.3398	0.2399	1	0.5892	<b>0.0365</b>	412.32%	0.0333	0.1374	0.2946	0.2947		SAMPLE				
3	0.1951	0.1377	1	0.3780	<b>0.4444</b>	34.50%	0.4333	0.1453	0.2920	0.3073		SAMPLE				
4	0.2391	0.1688	1	0.4349	<b>0.4867</b>	33.78%	0.5000	0.1667	0.3180	0.3298		SAMPLE				
5	0.2970	0.2097	1	0.5150	<b>0.3505</b>	47.48%	0.3667	0.1732	0.3246	0.3301		SAMPLE				
6	0.2810	0.1984	1	0.5111	<b>0.6864</b>	29.65%	0.6000	0.1764	0.3955	0.4111		SAMPLE				
7	0.2873	0.2028	1	0.5124	<b>0.6763</b>	29.73%	0.6333	0.1856	0.3884	0.4059		SAMPLE				
8	0.2150	0.1518	1	0.4166	<b>1.7707</b>	16.65%	1.5667	0.2427	0.5376	0.6318		SAMPLE				
9	0.3320	0.2344	1	0.5831	<b>0.8379</b>	27.33%	0.7333	0.2000	0.4479	0.4648		SAMPLE				
10	0.2660	0.1878	1	0.4840	<b>1.5886</b>	17.20%	1.4667	0.2449	0.5200	0.5825		SAMPLE				
11	0.1213	0.0857	1	0.2818	<b>1.2151</b>	19.00%	1.1000	0.1972	0.4270	0.4853		SAMPLE				
12	0.2855	0.2015	1	0.5013	<b>-0.0982</b>	110.95%	-0.1000	0.1106	0.2129	0.2130		SAMPLE				
13	0.1118	0.0789	1	0.2597	<b>0.2715</b>	40.75%	0.2667	0.1054	0.2103	0.2203		SAMPLE				
14	33.6633	23.7666	207	58.3689	<b>21.6716</b>	78.31%	0.2000	0.1563	33.2053	33.4096		SAMPLE				
15	0.3094	0.2185	1	0.5434	<b>0.1775</b>	87.23%	0.1667	0.1453	0.3033	0.3045		MB				
16	34.2289	24.1659	207	60.1105	<b>39.2621</b>	49.13%	0.3333	0.1633	37.6995	38.2293	567585001.1	DUP	*	0.0%		
17	30.4260	21.4810	207	54.2708	<b>2450.2541</b>	5.77%	21.6667	0.8576	190.1003	449.3701	567585001.1	MS			2415.2126	101.5%
18	0.2379	0.1680	1	0.4443	<b>23.9730</b>	6.83%	22.1333	0.8641	1.8344	4.7185		LCS			26.4073	90.8%

# **Continuing Calibration Data**



# Ludlum Alpha Scintillation Counter Checks for 25-JAN-2022

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	05:00	1	1.20E+05	120361	-1.29		
LUCAS2	EFF	05:00	1	1.30E+05	129954	-0.44		
LUCAS3	EFF	05:00	1	1.30E+05	130216	-1.79		
LUCAS4	EFF	05:00	1	1.29E+05	128801	2		
LUCAS5	EFF	05:00	1	1.28E+05	127549	-1.99		
LUCAS6	EFF	05:00	1	1.30E+05	130157	-1.46		
LUCAS7	EFF	05:00	1	1.30E+05	130022	-2.29		
LUCAS8	EFF	05:00	1	1.18E+05	117693	-1.63		

**Reviewed by:**

Lyndsey Pace

**Date:** 25-JAN-22

GEL Laboratories LLC

# Runlogs



# Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2219271

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
565659001	SAMPLE	LXP1	LUCAS1	JAN-25-22 07:54:00	DONE	Lucas Cell	02-MAY-21 00:00
565659002	SAMPLE	LXP1	LUCAS2	JAN-25-22 07:54:00	DONE	Lucas Cell	01-AUG-21 00:00
565662001	SAMPLE	LXP1	LUCAS3	JAN-25-22 07:54:00	DONE	Lucas Cell	01-JAN-22 00:00
565662002	SAMPLE	LXP1	LUCAS4	JAN-25-22 07:54:00	DONE	Lucas Cell	01-FEB-21 00:00
567143001	SAMPLE	LXP1	LUCAS5	JAN-25-22 07:54:00	DONE	Lucas Cell	01-JUN-21 00:01
567143002	SAMPLE	LXP1	LUCAS6	JAN-25-22 07:54:00	DONE	Lucas Cell	01-JUL-21 00:00
567516001	SAMPLE	LXP1	LUCAS7	JAN-25-22 07:54:00	DONE	Lucas Cell	01-NOV-21 00:00
567516002	SAMPLE	LXP1	LUCAS8	JAN-25-22 07:54:00	DONE	Lucas Cell	01-APR-21 00:00
567516003	SAMPLE	LXP1	LUCAS1	JAN-25-22 08:27:00	DONE	Lucas Cell	02-MAY-21 00:00
567516004	SAMPLE	LXP1	LUCAS2	JAN-25-22 08:27:00	DONE	Lucas Cell	01-AUG-21 00:00
567516005	SAMPLE	LXP1	LUCAS3	JAN-25-22 08:27:00	DONE	Lucas Cell	01-JAN-22 00:00
567516006	SAMPLE	LXP1	LUCAS4	JAN-25-22 08:27:00	DONE	Lucas Cell	01-FEB-21 00:00
567570001	SAMPLE	LXP1	LUCAS5	JAN-25-22 08:27:00	DONE	Lucas Cell	01-JUN-21 00:01
567585001	SAMPLE	LXP1	LUCAS6	JAN-25-22 08:27:00	DONE	Lucas Cell	01-JUL-21 00:00
1204999831	MB	LXP1	LUCAS7	JAN-25-22 08:27:00	DONE	Lucas Cell	01-NOV-21 00:00
1204999832	DUP	LXP1	LUCAS8	JAN-25-22 08:27:00	DONE	Lucas Cell	01-APR-21 00:00
1204999833	MS	LXP1	LUCAS1	JAN-25-22 09:00:00	DONE	Lucas Cell	02-MAY-21 00:00
1204999834	LCS	LXP1	LUCAS2	JAN-25-22 09:00:00	DONE	Lucas Cell	01-AUG-21 00:00



Environmental Laboratory  
 1232 Haco Drive  
 Lansing  
 Michigan, 48910

CHAIN OF CUSTODY

Page 1 of 1

Phone: (517)702 6372

Lab Work Order Number L201036

Client Name BWL - Erickson Station		Project Name Erickson AM MI New Well 7-10		Requested Analyses								Requested Turn Around				
Client Contact Cheryl Louden		Project Number {none}		Ag: As: B: Ba: Be: Ca: Cd: Cr: Co: Cu: Fe: Hg: Li: Mo: Ni:  TSS	Cl: C: F: I: SE: SO4: TDS	Radium 226 and Radium 228									Rush requests subject to additional charge.  Rush requests subject to lab approval.	
Address 3725 S. Canal		Project Description														
City Lansing		PO Number 30926 10021														
State/Zip MI, 48917		Shipped By														
Phone (517) 702-6396	Fax (517) 702-6373	Tracking Number														
Sampler Marc Wahrer																

Sample Name or Field ID	Sampled Date	Sampled Time	Sample Type Grab/Composite	Matrix Code	Container Count	Preservation Code				Sample	Comments
						b	a	a	b		
MW-7	1/11/2022	1446	G	GW	5	1	1	1	2		
MW-8	1/11/2022	1328	G	GW	5	1	1	1	2		
MW-9	1/11/2022	1146	G	GW	5	1	1	1	2		
MW-10	1/11/2022	1024	G	GW	5	1	1	1	2		
Field Duplicate	1/11/2022	1146	G	GW	5	1	1	1	2		
Field Blank	1/11/2022	0915	G	DI	5	1	1	1	2		

Relinquished By 	Date/Time 1-12-22 0815	Received By J Caporale	Date/Time 01/12/22 0815	
Relinquished By	Date/Time	Received By	Date/Time	Comments
Relinquished By	Date/Time	Received By	Date/Time	
Cooler Numbers and Temperatures				

### Data Validation Checklist

Site Name: Erickson Personnel: M. Wahrer

Sample Date(s): 1/11/2022 Lab Drop-off Date(s): 1/12/2022

Lab Report Number: S31925.01

Lab Report Date: 2/15/2022

Reason for Sample Event: Assessment Monitoring - Wells 7-10

**Field Records:** Circle Yes/No unless Not Applicable – *Complete during sample event*

Item Description	Verification (Completeness)	Validation (Conformance to Specifications)
Field equipment calibration records	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Chain-of-Custody forms	<input checked="" type="radio"/> Yes / No	N/A
Field decontamination documentation	N/A	N/A
Sample collection field forms	<input checked="" type="radio"/> Yes / No	N/A
Drilling logs	<input checked="" type="radio"/> Yes / No	N/A
Well construction logs	<input checked="" type="radio"/> Yes / No	N/A
Well development field forms	<input checked="" type="radio"/> Yes / No	N/A

**Analytical Data Package:** Circle Yes/No unless N/A – *Complete when lab report is received*

Item Description	Verification (Completeness)	Validation (Conformance to Specifications)
Cover sheet (laboratory identifying information)	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Case narrative	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Internal laboratory Chain-of-Custody forms	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Sample chronology and consistency (that is, dates and times of receipt, preparation, and analysis)	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Communication records with laboratory	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
EDD format consistency	<input checked="" type="radio"/> Yes / No	N/A
Sample identification, results nomenclature, and data qualifier consistency	<input checked="" type="radio"/> Yes / No	N/A
RLs as requested; MDLs < RLs	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Instrument calibration records	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Laboratory Report	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Field QC sample results and calculation of accuracy and precision	<input checked="" type="radio"/> Yes / No Duplicate Well ID: MW-9	Yes / <input checked="" type="radio"/> No Duplicate RPD: 0-1% except Rad-226/228 at 32%

**Corrections Needed:** None; according to the Technical Case Narrative by GEL Laboratories, subcontracted laboratory for radium analysis, “[t]here are no exceptions, anomalies or deviations from the specified methods. All sample data provided in [the] report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.”

Sample	Parameter	Result	Uncertainty	MDC	Lab Qualifier	Validated Qualifier
MW-9	Rad-226	0.838	+/-0.448	0.583		J-
	Rad-228	1.53	+/-0.911	1.35		J+
	Rad-226/228	2.37	+/-1.02			J+
MW-9-Dup	Rad-226	1.22	+/-0.427	0.232		J+
	Rad-228	-0.724	+/-0.551	1.26	U	J-
	Rad-226/228	1.22	+/-0.697			J-

*U - Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.*

Since the laboratory processes indicated no issues with the analytical procedures, no corrective action was necessary. Since the RPD was above the 20% control limit, MW-9 has been qualified as estimated with potential for high bias (J+) and MW-9-Dup has been qualified as estimated with potential for low bias (J-). The component parts Rad-226 required qualification as estimated with low bias (J-) in MW-9 and estimated with high bias in MW-9-Dup and Rad-228 required qualification as estimated with high bias (J+) in MW-9 and estimated with low bias (J-) in MW-9-Dup.



Report ID: S32538.01(01)  
Generated on 02/04/2022

Report to

Attention: Jennifer Caporale  
Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901

Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

Report produced by

Merit Laboratories, Inc.  
2680 East Lansing Drive  
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Contacts for report questions:  
John Lavery (johnlavery@meritlabs.com)  
Barbara Ball (bball@meritlabs.com)

Report Summary

Lab Sample ID(s): S32538.01-S32538.08  
Project: Erickson AM MI New Wells 1-6  
Collected Date(s): 02/01/2022  
Submitted Date/Time: 02/02/2022 09:25  
Sampled by: Marc Wahrer  
P.O. #:

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Maya Murshak  
Technical Director



## General Report Notes

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Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (\*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

## Report Narrative

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Preliminary Report per client request



Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Alaska CSLAP	#17-001
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



## Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1
SM2540C	Standard Method 2540 C 2011
SM2540D	Standard Method 2540 D 2011
SW3015A	SW 846 Method 3015A Revision 1 February 2007





## Sample Summary (8 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S32538.01	MW-1 L202012-01	Groundwater	02/01/22 12:58
S32538.02	MW-2 L202012-02	Groundwater	02/01/22 15:58
S32538.03	MW-3 L202012-03	Groundwater	02/01/22 09:51
S32538.04	MW-4 L202012-04	Groundwater	02/01/22 11:16
S32538.05	MW-5 L202012-05	Groundwater	02/01/22 16:31
S32538.06	MW-6 L202012-06	Groundwater	02/01/22 14:21
S32538.07	Field Dupe MW-4 L202012-07	Groundwater	02/01/22 11:16
S32538.08	Field Blank L202012-08	Water	02/01/22 06:59



# Analytical Laboratory Report

Preliminary Report

Lab Sample ID: S32538.01

Sample Tag: MW-1 L202012-01

Collected Date/Time: 02/01/2022 12:58

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	5.5	IR
2	1L Plastic	None	Yes	5.5	IR
1	125ml Plastic	HNO3	Yes	5.5	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	02/03/22 12:00	JRH	
Metal Digestion	Completed	SW3015A	02/03/22 10:30	CCM	

### Inorganics

Method: E300.0, Run Date: 02/03/22 08:50, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	52	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	49	5	0.30	mg/L	5	14808-79-8	

Method: SM2540C, Run Date: 02/02/22 14:05, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	746	20	2	mg/L	2		

Method: SM2540D, Run Date: 02/02/22 15:54, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	13	3	1	mg/L	1.00		

### Metals

Method: E200.8, Run Date: 02/03/22 14:30, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	166	0.50	0.0435	mg/L	5	7440-70-2	

Method: E200.8, Run Date: 02/03/22 12:10, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.007	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.122	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.27	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	6.92	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.021	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	



# Analytical Laboratory Report

Preliminary Report

Lab Sample ID: S32538.01 (continued)

Sample Tag: MW-1 L202012-01

Method: E200.8, Run Date: 02/03/22 12:10, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E245.1, Run Date: 02/03/22 15:48, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

Method: , Run Date: / /, Analyst:

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Incomplete						



# Analytical Laboratory Report

Preliminary Report

Lab Sample ID: S32538.02

Sample Tag: MW-2 L202012-02

Collected Date/Time: 02/01/2022 15:58

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	5.5	IR
2	1L Plastic	None	Yes	5.5	IR
1	125ml Plastic	HNO3	Yes	5.5	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	02/03/22 12:00	JRH	
Metal Digestion	Completed	SW3015A	02/03/22 10:30	CCM	

### Inorganics

Method: E300.0, Run Date: 02/03/22 09:03, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	

Method: E300.0, Run Date: 02/03/22 11:12, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	87	25	0.40	mg/L	25	16887-00-6	
Sulfate	398	25	1.5	mg/L	25	14808-79-8	

Method: SM2540C, Run Date: 02/02/22 14:05, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	1,180	20	2	mg/L	2		

Method: SM2540D, Run Date: 02/02/22 15:54, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	12	3	1	mg/L	1.00		

### Metals

Method: E200.8, Run Date: 02/03/22 14:31, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	237	0.50	0.0435	mg/L	5	7440-70-2	

Method: E200.8, Run Date: 02/03/22 12:13, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.004	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.048	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	5.33	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	1.93	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.058	0.005	0.00163	mg/L	5	7439-93-2	



# Analytical Laboratory Report

Preliminary Report

Lab Sample ID: S32538.02 (continued)

Sample Tag: MW-2 L202012-02

Method: E200.8, Run Date: 02/03/22 12:13, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Molybdenum	0.011	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	0.026	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	0.007	0.005	0.000730	mg/L	5	7440-66-6	

Method: E245.1, Run Date: 02/03/22 15:51, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

Method: , Run Date: / /, Analyst:

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Incomplete						



# Analytical Laboratory Report

Preliminary Report

Lab Sample ID: S32538.03

Sample Tag: MW-3 L202012-03

Collected Date/Time: 02/01/2022 09:51

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	5.5	IR
2	1L Plastic	None	Yes	5.5	IR
1	125ml Plastic	HNO3	Yes	5.5	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	02/03/22 12:00	JRH	
Metal Digestion	Completed	SW3015A	02/03/22 10:30	CCM	

### Inorganics

Method: E300.0, Run Date: 02/03/22 09:16, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	

Method: E300.0, Run Date: 02/03/22 11:25, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	94	50	0.80	mg/L	50	16887-00-6	
Sulfate	682	50	3.0	mg/L	50	14808-79-8	

Method: SM2540C, Run Date: 02/02/22 14:05, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	1,480	20	2	mg/L	2		

Method: SM2540D, Run Date: 02/02/22 15:54, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	2	3	1	mg/L	1.00		b

### Metals

Method: E200.8, Run Date: 02/03/22 14:33, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	255	0.50	0.0435	mg/L	5	7440-70-2	

Method: E200.8, Run Date: 02/03/22 12:16, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.003	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.020	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	5.62	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	1.94	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	

b-Value detected less than reporting limit, but greater than MDL



# Analytical Laboratory Report

Preliminary Report

Lab Sample ID: S32538.03 (continued)

Sample Tag: MW-3 L202012-03

**Method: E200.8, Run Date: 02/03/22 12:16, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lithium*	0.086	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.164	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E245.1, Run Date: 02/03/22 16:09, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: / /, Analyst:**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Incomplete						



# Analytical Laboratory Report

Preliminary Report

Lab Sample ID: S32538.04

Sample Tag: MW-4 L202012-04

Collected Date/Time: 02/01/2022 11:16

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	5.5	IR
2	1L Plastic	None	Yes	5.5	IR
1	125ml Plastic	HNO3	Yes	5.5	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	02/03/22 12:00	JRH	
Metal Digestion	Completed	SW3015A	02/03/22 10:30	CCM	

### Inorganics

Method: E300.0, Run Date: 02/03/22 09:29, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	72	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	54	5	0.30	mg/L	5	14808-79-8	

Method: SM2540C, Run Date: 02/02/22 14:05, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	548	20	2	mg/L	2		

Method: SM2540D, Run Date: 02/02/22 15:54, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	2	3	1	mg/L	1.00		b

### Metals

Method: E200.8, Run Date: 02/03/22 14:35, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	110	0.50	0.0435	mg/L	5	7440-70-2	

Method: E200.8, Run Date: 02/03/22 12:21, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.008	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.163	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.07	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	1.26	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.010	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	

b-Value detected less than reporting limit, but greater than MDL





# Analytical Laboratory Report

Preliminary Report

Lab Sample ID: S32538.04 (continued)

Sample Tag: MW-4 L202012-04

**Method: E200.8, Run Date: 02/03/22 12:21, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E245.1, Run Date: 02/03/22 16:12, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: / /, Analyst:**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Incomplete						



# Analytical Laboratory Report

Preliminary Report

Lab Sample ID: S32538.05

Sample Tag: MW-5 L202012-05

Collected Date/Time: 02/01/2022 16:31

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	5.5	IR
2	1L Plastic	None	Yes	5.5	IR
1	125ml Plastic	HNO3	Yes	5.5	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	02/03/22 12:00	JRH	
Metal Digestion	Completed	SW3015A	02/03/22 10:30	CCM	

### Inorganics

Method: E300.0, Run Date: 02/03/22 11:50, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sulfate	186	10	0.59	mg/L	10	14808-79-8	

Method: E300.0, Run Date: 02/03/22 09:42, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	43	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	

Method: SM2540C, Run Date: 02/02/22 14:05, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	592	20	2	mg/L	2		

Method: SM2540D, Run Date: 02/02/22 15:54, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	63	3	1	mg/L	2.00		

### Metals

Method: E200.8, Run Date: 02/03/22 14:36, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	70.1	0.50	0.0435	mg/L	5	7440-70-2	

Method: E200.8, Run Date: 02/03/22 12:24, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.007	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.055	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.37	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	0.007	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	0.019	0.005	0.000377	mg/L	5	7440-50-8	
Iron	4.69	0.02	0.00192	mg/L	5	7439-89-6	
Lead	0.014	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.016	0.005	0.00163	mg/L	5	7439-93-2	



# Analytical Laboratory Report

Preliminary Report

Lab Sample ID: S32538.05 (continued)

Sample Tag: MW-5 L202012-05

Method: E200.8, Run Date: 02/03/22 12:24, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Molybdenum	0.010	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	0.008	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	0.009	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	0.048	0.005	0.000730	mg/L	5	7440-66-6	

Method: E245.1, Run Date: 02/03/22 16:15, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

Method: , Run Date: / /, Analyst:

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Incomplete						



# Analytical Laboratory Report

Preliminary Report

Lab Sample ID: S32538.06

Sample Tag: MW-6 L202012-06

Collected Date/Time: 02/01/2022 14:21

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	5.5	IR
2	1L Plastic	None	Yes	5.5	IR
1	125ml Plastic	HNO3	Yes	5.5	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	02/03/22 12:00	JRH	
Metal Digestion	Completed	SW3015A	02/03/22 10:30	CCM	

### Inorganics

Method: E300.0, Run Date: 02/03/22 12:03, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sulfate	131	10	0.59	mg/L	10	14808-79-8	

Method: E300.0, Run Date: 02/03/22 09:55, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	27	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	

Method: SM2540C, Run Date: 02/02/22 14:05, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	688	20	2	mg/L	2		

Method: SM2540D, Run Date: 02/02/22 15:54, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	32	3	1	mg/L	1.00		

### Metals

Method: E200.8, Run Date: 02/03/22 14:38, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	160	0.50	0.0435	mg/L	5	7440-70-2	

Method: E200.8, Run Date: 02/03/22 12:27, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.044	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.68	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.04	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.044	0.005	0.00163	mg/L	5	7439-93-2	



# Analytical Laboratory Report

Preliminary Report

Lab Sample ID: S32538.06 (continued)

Sample Tag: MW-6 L202012-06

Method: E200.8, Run Date: 02/03/22 12:27, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Molybdenum	0.036	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	0.007	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E245.1, Run Date: 02/03/22 16:18, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

Method: , Run Date: / /, Analyst:

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Incomplete						



# Analytical Laboratory Report

Preliminary Report

Lab Sample ID: S32538.07

Sample Tag: Field Dupe MW-4 L202012-07

Collected Date/Time: 02/01/2022 11:16

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	5.5	IR
2	1L Plastic	None	Yes	5.5	IR
1	125ml Plastic	HNO3	Yes	5.5	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	02/03/22 12:00	JRH	
Metal Digestion	Completed	SW3015A	02/03/22 10:30	CCM	

### Inorganics

Method: E300.0, Run Date: 02/03/22 10:07, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	74	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	53	5	0.30	mg/L	5	14808-79-8	

Method: SM2540C, Run Date: 02/02/22 14:05, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	540	20	2	mg/L	2		

Method: SM2540D, Run Date: 02/02/22 15:54, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	1	3	1	mg/L	1.00		b

### Metals

Method: E200.8, Run Date: 02/03/22 14:39, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	110	0.50	0.0435	mg/L	5	7440-70-2	

Method: E200.8, Run Date: 02/03/22 12:31, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.008	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.162	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.06	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	1.23	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.011	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	

b-Value detected less than reporting limit, but greater than MDL



# Analytical Laboratory Report

Preliminary Report

Lab Sample ID: S32538.07 (continued)

Sample Tag: Field Dupe MW-4 L202012-07

**Method: E200.8, Run Date: 02/03/22 12:31, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E245.1, Run Date: 02/03/22 16:22, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: / /, Analyst:**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Incomplete						



# Analytical Laboratory Report

Preliminary Report

Lab Sample ID: S32538.08

Sample Tag: Field Blank L202012-08

Collected Date/Time: 02/01/2022 06:59

Matrix: Water

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	5.5	IR
2	1L Plastic	None	Yes	5.5	IR
1	125ml Plastic	HNO3	Yes	5.5	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	02/03/22 12:00	JRH	
Metal Digestion	Completed	SW3015A	02/03/22 10:30	CCM	

### Inorganics

Method: E300.0, Run Date: 02/03/22 10:20, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	2.5	0.04	mg/L	2.5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.06	mg/L	2.5	16984-48-8	
Sulfate	Not detected	2.5	0.15	mg/L	2.5	14808-79-8	

Method: SM2540C, Run Date: 02/02/22 14:05, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	4	20	2	mg/L	2		b

Method: SM2540D, Run Date: 02/02/22 15:54, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1.00		

### Metals

Method: E200.8, Run Date: 02/03/22 14:27, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.0174	mg/L	2	7440-70-2	

Method: E200.8, Run Date: 02/03/22 12:59, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	Not detected	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	Not detected	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	Not detected	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	

b-Value detected less than reporting limit, but greater than MDL





# Analytical Laboratory Report

Preliminary Report

Lab Sample ID: S32538.08 (continued)

Sample Tag: Field Blank L202012-08

**Method: E200.8, Run Date: 02/03/22 12:59, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E245.1, Run Date: 02/03/22 16:25, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: / /, Analyst:**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Incomplete						

# Merit Laboratories Login Checklist

Lab Set ID:S32538

Client:BWL01 (Board of Water & Light)

Project: Erickson AM MI New Wells 1-6

Submitted:02/02/2022 09:25 Login User: JRM

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental\_Laboratory@LBWL.com

Selection	Description	Note
<b>Sample Receiving</b>		
01.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples are received at 4C +/- 2C Thermometer # IR 5.5
02.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Received on ice/ cooling process begun
03.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples shipped
04.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples left in 24 hr. drop box
05.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Are there custody seals/tape or is the drop box locked
<b>Chain of Custody</b>		
06.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC adequately filled out
07.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC signed and relinquished to the lab
08.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sample tag on bottles match COC
09.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Subcontracting needed? Subcontracted to: GEL; 1Z4664770363928331
<b>Preservation</b>		
10.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Do sample have correct chemical preservation
11.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Completed pH checks on preserved samples? (no VOAs)
12.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Did any samples need to be preserved in the lab?
<b>Bottle Conditions</b>		
13.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	All bottles intact
14.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Appropriate analytical bottles are used
15.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Merit bottles used
16.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sufficient sample volume received
17.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples require laboratory filtration
18.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples submitted within holding time
19.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Do water VOC or TOX bottles contain headspace

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: \_\_\_\_\_ Date: \_\_\_\_\_

## Merit Laboratories Bottle Preservation Check

Lab Set ID: S32538      Submitted: 02/02/2022 09:25

Attention: Jennifer Caporale  
 Address: Board of Water & Light  
 P.O. Box 13007  
 Lansing, MI 48901

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI New Wells 1-6

Initial Preservation Check: 02/02/2022 09:48 JRM

Phone: 517-702-6372      FAX:  
 Email: Environmental\_Laboratory@LBWL.com

Preservation Recheck (E200.8): N/A

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S32538.01	125ml Plastic HNO3	<2			
S32538.01	1L Plastic HNO3	<2			
S32538.01	1L Plastic HNO3	<2			
S32538.02	125ml Plastic HNO3	<2			
S32538.02	1L Plastic HNO3	<2			
S32538.02	1L Plastic HNO3	<2			
S32538.03	125ml Plastic HNO3	<2			
S32538.03	1L Plastic HNO3	<2			
S32538.03	1L Plastic HNO3	<2			
S32538.04	125ml Plastic HNO3	<2			
S32538.04	1L Plastic HNO3	<2			
S32538.04	1L Plastic HNO3	<2			
S32538.05	125ml Plastic HNO3	<2			
S32538.05	1L Plastic HNO3	<2			
S32538.05	1L Plastic HNO3	<2			
S32538.06	125ml Plastic HNO3	<2			
S32538.06	1L Plastic HNO3	<2			
S32538.06	1L Plastic HNO3	<2			
S32538.07	125ml Plastic HNO3	<2			
S32538.07	1L Plastic HNO3	<2			
S32538.07	1L Plastic HNO3	<2			
S32538.08	125ml Plastic HNO3	<2			
S32538.08	1L Plastic HNO3	<2			
S32538.08	1L Plastic HNO3	<2			



2680 East Lansing Dr., East Lansing, MI 48823  
 Phone (517) 332-0167 Fax (517) 332-4034  
 www.meritlabs.com

**REPORT TO** **CHAIN OF CUSTODY RECORD** **INVOICE TO**

CONTACT NAME Jennifer Caporale  
 COMPANY Lansing Board of Water and Light  
 ADDRESS PO Box 13007 48901-3007  
 CITY Lansing STATE MI ZIP CODE 48901  
 PHONE NO. 517-702-6372 FAX NO. P.O. NO.  
 E-MAIL ADDRESS Environmental\_Laboratory@lbwl.com QUOTE NO.

CONTACT NAME Kelly Gleason  SAME  
 COMPANY  
 ADDRESS  
 CITY STATE ZIP CODE  
 PHONE NO. E-MAIL ADDRESS Kelly.Gleason@lbwl.com

PROJECT NO./NAME Erickson AM MI Wells 1-6 SAMPLER(S) - PLEASE PRINT/SIGN NAME Marc Wahrer  
 TURNAROUND TIME REQUIRED  1 DAY  2 DAYS  3 DAYS  STANDARD  OTHER ASAP  
 DELIVERABLES REQUIRED  STD  LEVEL II  LEVEL III  LEVEL IV  EDD  OTHER

MATRIX GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID  
 CODE SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIPE A=AIR W=WASTE

# Containers & Preservatives

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION		MATRIX	# OF BOTTLES	NONE	HCl	HNO <sub>3</sub>	H <sub>2</sub> SO <sub>4</sub>	NH <sub>4</sub> OH	MHOH	OTHER	Total Metals	F- undistilled, Cl-, SO <sub>4</sub> , TDS	Radium 226	Radium 228	TSS
	DATE	TIME																
32538.01	02/01/22	1258	MW-1	L202012-01	GW	5	3	2						✓	✓	✓	✓	✓
.02		1558	MW-2	L202012-02	GW	5	3	2						✓	✓	✓	✓	✓
.03		0951	MW-3	L202012-03	GW	5	3	2						✓	✓	✓	✓	✓
.04		1116	MW-4	L202012-04	GW	5	3	2						✓	✓	✓	✓	✓
.05		1631	MW-5	L202012-05	GW	5	3	2						✓	✓	✓	✓	✓
.06		1421	MW-6	L202012-06	GW	5	3	2						✓	✓	✓	✓	✓
.07		1116	Field Dupe MW-4	L202012-07	GW	5	3	2						✓	✓	✓	✓	✓
.08	↓	0659	Field Blank	L202012-08	DI	5	3	2						✓	✓	✓	✓	✓

Certifications  
 OHIO VAP  Drinking Water  
 DoD  NPDES  
 Project Locations  
 Detroit  New York  
 Other \_\_\_\_\_  
 Special Instructions

RELINQUISHED BY: [Signature] DATE 2-2-22 TIME 0925  
 RECEIVED BY: Johanne Murray DATE 2/2/22 TIME 0925

RELINQUISHED BY: \_\_\_\_\_ DATE \_\_\_\_\_ TIME \_\_\_\_\_  
 RECEIVED BY: \_\_\_\_\_ DATE \_\_\_\_\_ TIME \_\_\_\_\_  
 SEAL NO. SEAL INTACT YES  NO  INITIALS \_\_\_\_\_  
 SEAL NO. SEAL INTACT YES  NO  INITIALS \_\_\_\_\_  
 NOTES: TEMP. ON ARRIVAL 5.5

## Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total		250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.150
Be, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	2.5
Cl	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	10
Cr, total	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
F	Fluoride	250 mL plastic	mg/L	None	9056	28 d	1.0
Fe, total	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Pb, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Li, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Hg, total	Mercury	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Mo, total	Molybdenum	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
RA226/228	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	HNO3	SM 7500	6 mos	2.0 combined
Se, total	Selenium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ag, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
SO4	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	10
Tl, total	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
TDS	Total Dissolved Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TSS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540D	NA	3
V, total	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Zn, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005

### Data Validation Checklist

Site Name: Erickson Personnel: M. Wahrer

Sample Date(s): 2/1/2022 Lab Drop-off Date(s): 2/2/2022

Lab Report Number: S32538.01

Lab Report Date: 3/16/2022

Reason for Sample Event: Assessment Monitoring - Wells 1-6

**Field Records:** Circle Yes/No unless Not Applicable – *Complete during sample event*

Item Description	Verification (Completeness)	Validation (Conformance to Specifications)
Field equipment calibration records	(Yes) No	(Yes) No
Chain-of-Custody forms	(Yes) No	N/A
Field decontamination documentation	N/A	N/A
Sample collection field forms	(Yes) No	N/A
Drilling logs	(Yes) No	N/A
Well construction logs	(Yes) No	N/A
Well development field forms	(Yes) No	N/A

**Analytical Data Package:** Circle Yes/No unless N/A – *Complete when lab report is received*

Item Description	Verification (Completeness)	Validation (Conformance to Specifications)
Cover sheet (laboratory identifying information)	(Yes) No	(Yes) No
Case narrative	(Yes) No	(Yes) No
Internal laboratory Chain-of-Custody forms	(Yes) No	(Yes) No
Sample chronology and consistency (that is, dates and times of receipt, preparation, and analysis)	(Yes) No	(Yes) No
Communication records with laboratory	(Yes) No	(Yes) No
EDD format consistency	(Yes) No	N/A
Sample identification, results nomenclature, and data qualifier consistency	(Yes) No	N/A
RLs as requested; MDLs<RLs	(Yes) No	(Yes) No
Instrument calibration records	(Yes) No	(Yes) No
Laboratory Report	(Yes) No	(Yes) No
Field QC sample results and calculation of accuracy and precision	(Yes) No Duplicate Well ID: MW-4	Yes (No) Duplicate RPD: 0-8% except TSS at 33% and Rad-226/228 at 23%

**Corrections Needed:** None; according to the Technical Case Narrative by GEL Laboratories, subcontracted laboratory for radium analysis, “[a]ll sample data provided in [the] report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Samples were re-eluted and recounted due to low recovery. The recounts are reported.”

Sample	Parameter	Result	Uncertainty	MDC	Lab Qualifier	Validated Qualifier
MW-4	Rad-226	0.606	+/-0.380	0.479		J+
	Rad-228	2.17	+/-0.922	1.25		J+
	Rad-226/228	2.78	+/-0.997			J+
MW-4-Dup	Rad-226	0.322	+/-0.325	0.508	U	J-
	Rad-228	1.41	+/-0.766	1.09		J-
	Rad-226/228	1.74	+/-0.832			J-

*U - Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.*

Since the laboratory processes indicated no issues with the analytical procedures, and samples were re-analyzed to verify results, no corrective action was necessary. Since the RPD was above the 20% control limit, Rad-226, Rad-228, and Rad-226/228 in MW-4 have been qualified as estimated with potential for high bias (J+) and those in MW-4-Dup have been qualified as estimated with potential for low bias (J-).

Although TSS RPD was above the 20% control limit, both results were below the reporting limit and required no qualification.

TSS for MW-3, MW-4, and MW-4-Dup were reported at a value between the MDL and RL. These results have been qualified as not detected above the RL (U).



Lansing Board of Water and Light  
Environmental Services Laboratory (MI00079)  
1232 Haco Dr.  
Lansing, Michigan 48901

23 March 2022

BWL - Erickson Station  
Attn: Cheryl Louden  
3725 S. Canal  
Lansing, MI 48917

**Project: Erickson AM MI**

Dear Cheryl Louden,

Enclosed is a copy of the laboratory report for the following work order(s) received by Lansing Board of Water and Light Environmental Services Laboratory:

<b>Work Order</b>	<b>Received</b>	<b>Account Number</b>
L202050	2/18/2022 8:24:00AM	30926 10021

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in blue ink that reads "Jennifer Caporale".

Jennifer Caporale, Supervisor





### Analytical Report

**Client:** BWL - Erickson Station  
**Address:** 3725 S. Canal  
Lansing MI, 48917

**Client Project Manager:** Cheryl Louden

**Report Date:** 03/23/2022

**Sample Name: MW-7**

**Lab #: L202050-01 Ground Water**

**Collected: 17-Feb-22 14:10**

**By: Marc Wahrer**

Analyte	Reporting			Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit	Units						
Conductivity	1100	1.0	uS/cm	1		17-Feb-22 14:10	maw	SM 2510B	
Dissolved oxygen	ND	0.100	mg/L	1		17-Feb-22 14:10	maw	FIELD	
Milliliters Purged	260		ml/min	1		17-Feb-22 14:10	maw	FIELD	
Oxidation Reduction Potential	-36.90	-999.0	mV	1		17-Feb-22 14:10	maw	FIELD	
pH	7.2	7.0	pH Units	1		17-Feb-22 14:10	maw	SM 4500H+B	
Temperature	6.2		°C	1		17-Feb-22 14:10	maw	SM 2550B	
Turbidity	2.2	0.10	NTU	1		17-Feb-22 14:10	maw	SM 2130B	

**Sample Name: MW-8**

**Lab #: L202050-02 Ground Water**

**Collected: 17-Feb-22 12:44**

**By: Marc Wahrer**

Analyte	Reporting			Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit	Units						
Conductivity	640	1.0	uS/cm	1		17-Feb-22 12:44	maw	SM 2510B	
Dissolved oxygen	1.64	0.100	mg/L	1		17-Feb-22 12:44	maw	FIELD	
Milliliters Purged	270		ml/min	1		17-Feb-22 12:44	maw	FIELD	
Oxidation Reduction Potential	365.3	-999.0	mV	1		17-Feb-22 12:44	maw	FIELD	
pH	7.0	7.0	pH Units	1		17-Feb-22 12:44	maw	SM 4500H+B	
Temperature	5.9		°C	1		17-Feb-22 12:44	maw	SM 2550B	
Turbidity	2.0	0.10	NTU	1		17-Feb-22 12:44	maw	SM 2130B	

**Sample Name: MW-9**

**Lab #: L202050-03 Ground Water**

**Collected: 17-Feb-22 10:56**

**By: Marc Wahrer**

Analyte	Reporting			Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit	Units						
Conductivity	470	1.0	uS/cm	1		17-Feb-22 10:56	maw	SM 2510B	
Dissolved oxygen	6.17	0.100	mg/L	1		17-Feb-22 10:56	maw	FIELD	
Milliliters Purged	270		ml/min	1		17-Feb-22 10:56	maw	FIELD	
Oxidation Reduction Potential	380.9	-999.0	mV	1		17-Feb-22 10:56	maw	FIELD	
pH	7.2	7.0	pH Units	1		17-Feb-22 10:56	maw	SM 4500H+B	
Temperature	4.7		°C	1		17-Feb-22 10:56	maw	SM 2550B	
Turbidity	1.6	0.10	NTU	1		17-Feb-22 10:56	maw	SM 2130B	



**Analytical Report**

**Client:** BWL - Erickson Station  
**Address:** 3725 S. Canal  
 Lansing MI, 48917

**Client Project Manager:** Cheryl Louden

**Report Date:** 03/23/2022

**Sample Name:** MW-10

**Lab #:** L202050-04 Ground Water

**Collected:** 17-Feb-22 09:12

**By:** Marc Wahrer

Analyte	Reporting			Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit	Units						
Conductivity	780	1.0	uS/cm	1		17-Feb-22 09:12	maw	SM 2510B	
Dissolved oxygen	3.61	0.100	mg/L	1		17-Feb-22 09:12	maw	FIELD	
Milliliters Purged	260		ml/min	1		17-Feb-22 09:12	maw	FIELD	
Oxidation Reduction Potential	391.8	-999.0	mV	1		17-Feb-22 09:12	maw	FIELD	
pH	6.5	7.0	pH Units	1		17-Feb-22 09:12	maw	SM 4500H+B	
Temperature	8.6		°C	1		17-Feb-22 09:12	maw	SM 2550B	
Turbidity	3.8	0.10	NTU	1		17-Feb-22 09:12	maw	SM 2130B	



## Analytical Report

**Client:** BWL - Erickson Station

**Client Project Manager:** Cheryl Louden

**Report Date:** 03/23/2022

**Address:** 3725 S. Canal  
Lansing MI, 48917

**Approved By:** \_\_\_\_\_

*Jennifer Caporale*

### Notes and Definitions

- AL Action Level (Action Level = Regulatory Limit)
  - MCL Maximum Contaminant Level
  - PEL Permissible Exposure Limit (Permissible Exposure Limit = Regulatory Limit)
  - RPD Relative Percent Difference
  - OT Odor Threshold
  - ND Non Detect is less than the reporting limit value
- All drinking water regulatory limits are MCL's with the exception of Lead and Copper unless otherwise noted.



Report ID: S33012.01(02)  
Generated on 03/21/2022  
Replaces report S33012.01(01) generated on 02/22/2022

**Report to**  
Attention: Jennifer Caporale  
Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901  
  
Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

**Report produced by**  
Merit Laboratories, Inc.  
2680 East Lansing Drive  
East Lansing, MI 48823  
  
Phone: (517) 332-0167 FAX: (517) 332-6333  
  
Contacts for report questions:  
John Lavery (johnlavery@meritlabs.com)  
Barbara Ball (bball@meritlabs.com)

**Report Summary**  
Lab Sample ID(s): S33012.01-S33012.06  
Project: Erickson AM MI New Wells 7-10  
Collected Date(s): 02/17/2022  
Submitted Date/Time: 02/18/2022 09:46  
Sampled by: Marc Wahrer  
P.O. #:

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Maya Murshak  
Technical Director



## General Report Notes

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Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (\*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

## Report Narrative

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All analyses completed



Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Alaska CSLAP	#17-001
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



## Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007



## Sample Summary (6 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S33012.01	MW-7 L202050-01	Groundwater	02/17/22 14:10
S33012.02	MW-8 L202050-02	Groundwater	02/17/22 12:44
S33012.03	MW-9 L202050-03	Groundwater	02/17/22 10:56
S33012.04	MW-10 L202050-04	Groundwater	02/17/22 09:12
S33012.05	Field Dupe MW- L202050-05	Groundwater	02/17/22 10:56
S33012.06	Field Blank L202050-06	Water	02/17/22 07:35





# Analytical Laboratory Report

Final Report

Lab Sample ID: S33012.01

Sample Tag: MW-7 L202050-01

Collected Date/Time: 02/17/2022 14:10

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	4.5	IR
2	1L Plastic	None	Yes	4.5	IR
1	125ml Plastic	HNO3	Yes	4.5	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	02/21/22 10:00	JRH	
Metal Digestion	Completed	SW3015A	02/21/22 12:30	CCM	

### Inorganics

Method: E300.0, Run Date: 02/18/22 12:42, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	

Method: E300.0, Run Date: 02/18/22 14:25, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	75	25	0.40	mg/L	25	16887-00-6	
Sulfate	260	25	1.5	mg/L	25	14808-79-8	

Method: SM2540C, Run Date: 02/18/22 18:05, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	758	20	2	mg/L	2		

Method: SM2540D, Run Date: 02/18/22 18:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	1	3	1	mg/L	1		b

### Metals

Method: E200.8, Run Date: 02/21/22 15:59, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	149	0.50	0.0435	mg/L	5	7440-70-2	

Method: E200.8, Run Date: 02/21/22 14:07, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.005	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.062	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	2.75	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	2.81	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	

b-Value detected less than reporting limit, but greater than MDL



# Analytical Laboratory Report

Final Report

Lab Sample ID: S33012.01 (continued)

Sample Tag: MW-7 L202050-01

**Method: E200.8, Run Date: 02/21/22 14:07, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lithium*	0.112	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.284	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E245.1, Run Date: 02/21/22 14:49, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 03/21/22 13:27, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Lab Sample ID: S33012.02

Sample Tag: MW-8 L202050-02

Collected Date/Time: 02/17/2022 12:44

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	4.5	IR
2	1L Plastic	None	Yes	4.5	IR
1	125ml Plastic	HNO3	Yes	4.5	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	02/21/22 10:00	JRH	
Metal Digestion	Completed	SW3015A	02/21/22 12:30	CCM	

### Inorganics

Method: E300.0, Run Date: 02/18/22 12:55, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	11	5	0.30	mg/L	5	14808-79-8	

Method: SM2540C, Run Date: 02/18/22 18:05, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	382	20	2	mg/L	2		

Method: SM2540D, Run Date: 02/18/22 18:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 02/21/22 16:00, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	100	0.50	0.0435	mg/L	5	7440-70-2	

Method: E200.8, Run Date: 02/21/22 14:15, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.017	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	Not detected	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	Not detected	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S33012.02 (continued)

Sample Tag: MW-8 L202050-02

Method: E200.8, Run Date: 02/21/22 14:15, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E245.1, Run Date: 02/21/22 14:52, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 03/21/22 13:27, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Final Report

Lab Sample ID: S33012.03

Sample Tag: MW-9 L202050-03

Collected Date/Time: 02/17/2022 10:56

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	4.5	IR
2	1L Plastic	None	Yes	4.5	IR
1	125ml Plastic	HNO3	Yes	4.5	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	02/21/22 10:00	JRH	
Metal Digestion	Completed	SW3015A	02/21/22 12:30	CCM	

### Inorganics

Method: E300.0, Run Date: 02/18/22 13:08, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2540C, Run Date: 02/18/22 18:05, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	280	20	2	mg/L	2		

Method: SM2540D, Run Date: 02/18/22 18:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 02/21/22 16:02, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	77.6	0.50	0.0435	mg/L	5	7440-70-2	

Method: E200.8, Run Date: 02/21/22 14:18, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.013	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	Not detected	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	Not detected	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S33012.03 (continued)

Sample Tag: MW-9 L202050-03

Method: E200.8, Run Date: 02/21/22 14:18, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E245.1, Run Date: 02/21/22 14:55, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 03/21/22 13:27, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Lab Sample ID: S33012.04

Sample Tag: MW-10 L202050-04

Collected Date/Time: 02/17/2022 09:12

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	4.5	IR
2	1L Plastic	None	Yes	4.5	IR
1	125ml Plastic	HNO3	Yes	4.5	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	02/21/22 10:00	JRH	
Metal Digestion	Completed	SW3015A	02/21/22 12:30	CCM	

### Inorganics

Method: E300.0, Run Date: 02/18/22 13:20, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	16	5	0.30	mg/L	5	14808-79-8	

Method: SM2540C, Run Date: 02/18/22 18:05, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	482	20	2	mg/L	2		

Method: SM2540D, Run Date: 02/18/22 18:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 02/21/22 16:04, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	142	0.50	0.0435	mg/L	5	7440-70-2	

Method: E200.8, Run Date: 02/21/22 14:21, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.038	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.05	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	Not detected	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S33012.04 (continued)

Sample Tag: MW-10 L202050-04

Method: E200.8, Run Date: 02/21/22 14:21, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E245.1, Run Date: 02/21/22 14:59, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 03/21/22 13:27, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.





# Analytical Laboratory Report

Lab Sample ID: S33012.05

Sample Tag: Field Dupe MW- L202050-05

Collected Date/Time: 02/17/2022 10:56

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	4.5	IR
2	1L Plastic	None	Yes	4.5	IR
1	125ml Plastic	HNO3	Yes	4.5	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	02/21/22 10:00	JRH	
Metal Digestion	Completed	SW3015A	02/21/22 12:30	CCM	

### Inorganics

Method: E300.0, Run Date: 02/18/22 14:38, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2540C, Run Date: 02/18/22 18:05, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	276	20	2	mg/L	2		

Method: SM2540D, Run Date: 02/18/22 18:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 02/21/22 16:05, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	78.0	0.50	0.0435	mg/L	5	7440-70-2	

Method: E200.8, Run Date: 02/21/22 14:24, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.013	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	Not detected	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	Not detected	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S33012.05 (continued)

Sample Tag: Field Dupe MW- L202050-05

Method: E200.8, Run Date: 02/21/22 14:24, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E245.1, Run Date: 02/21/22 15:02, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 03/21/22 13:27, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Final Report

Lab Sample ID: S33012.06

Sample Tag: Field Blank L202050-06

Collected Date/Time: 02/17/2022 07:35

Matrix: Water

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	4.5	IR
2	1L Plastic	None	Yes	4.5	IR
1	125ml Plastic	HNO3	Yes	4.5	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	02/21/22 10:00	JRH	
Metal Digestion	Completed	SW3015A	02/21/22 12:30	CCM	

### Inorganics

Method: E300.0, Run Date: 02/18/22 14:50, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	2.5	0.04	mg/L	2.5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.06	mg/L	2.5	16984-48-8	
Sulfate	Not detected	2.5	0.15	mg/L	2.5	14808-79-8	

Method: SM2540C, Run Date: 02/18/22 18:05, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	14	20	2	mg/L	2		b

Method: SM2540D, Run Date: 02/18/22 18:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 02/21/22 15:57, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.0174	mg/L	2	7440-70-2	

Method: E200.8, Run Date: 02/21/22 14:03, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony	Not detected	0.005	0.00102	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.000102	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.0000648	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.0000862	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.000702	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.0000760	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.0000386	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.0000434	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000150	mg/L	2	7440-50-8	
Iron	Not detected	0.02	0.000768	mg/L	2	7439-89-6	
Lead	Not detected	0.003	0.0000760	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000654	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.0000868	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000100	mg/L	2	7440-02-0	

b-Value detected less than reporting limit, but greater than MDL



# Analytical Laboratory Report

Final Report

Lab Sample ID: S33012.06 (continued)

Sample Tag: Field Blank L202050-06

**Method: E200.8, Run Date: 02/21/22 14:03, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Selenium	Not detected	0.005	0.000838	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.0000270	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.0000342	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.0000558	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.000292	mg/L	2	7440-66-6	

**Method: E245.1, Run Date: 02/21/22 15:12, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 03/21/22 13:27, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

# Merit Laboratories Login Checklist

Lab Set ID:S33012

Attention: Jennifer Caporale  
Address: Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901

Client:BWL01 (Board of Water & Light)

Project: Erickson AM MI New Wells 7-10

Submitted:02/18/2022 09:46 Login User: JRM

Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

Selection	Description	Note
-----------	-------------	------

## Sample Receiving

- |     |  |  |
|-----|--|--|
| 01. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples are received at 4C +/- 2C Thermometer # IR 4.5 |
| 02. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Received on ice/ cooling process begun                 |
| 03. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples shipped  |
| 04. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples left in 24 hr. drop box                        |
| 05. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Are there custody seals/tape or is the drop box locked |

## Chain of Custody

- |     |  |  |
|-----|--|--|
| 06. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC adequately filled out  |
| 07. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC signed and relinquished to the lab                           |
| 08. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sample tag on bottles match COC                                  |
| 09. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Subcontracting needed? Subcontracted to: GEL; 1Z4664770362116246 |

## Preservation

- |     |  |   |
|-----|--|---|
| 10. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Do sample have correct chemical preservation        |
| 11. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Completed pH checks on preserved samples? (no VOAs) |
| 12. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Did any samples need to be preserved in the lab?    |

## Bottle Conditions

- |     |  |   |
|-----|--|---|
| 13. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | All bottles intact                            |
| 14. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Appropriate analytical bottles are used       |
| 15. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Merit bottles used                            |
| 16. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sufficient sample volume received             |
| 17. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples require laboratory filtration         |
| 18. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples submitted within holding time         |
| 19. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Do water VOC or TOX bottles contain headspace |

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: \_\_\_\_\_ Date: \_\_\_\_\_

# Merit Laboratories Bottle Preservation Check

Lab Set ID: S33012 Submitted: 02/18/2022 09:46

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI New Wells 7-10

Attention: Jennifer Caporale  
Address: Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901

Initial Preservation Check: 02/18/2022 10:42 JRM

Preservation Recheck (E200.8): N/A

Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S33012.01	125ml Plastic HNO3	<2			
S33012.01	1L Plastic HNO3	<2			
S33012.01	1L Plastic HNO3	<2			
S33012.02	125ml Plastic HNO3	<2			
S33012.02	1L Plastic HNO3	<2			
S33012.02	1L Plastic HNO3	<2			
S33012.03	125ml Plastic HNO3	<2			
S33012.03	1L Plastic HNO3	<2			
S33012.03	1L Plastic HNO3	<2			
S33012.04	125ml Plastic HNO3	<2			
S33012.04	1L Plastic HNO3	<2			
S33012.04	1L Plastic HNO3	<2			
S33012.05	125ml Plastic HNO3	<2			
S33012.05	1L Plastic HNO3	<2			
S33012.05	1L Plastic HNO3	<2			
S33012.06	125ml Plastic HNO3	<2			
S33012.06	1L Plastic HNO3	<2			
S33012.06	1L Plastic HNO3	<2			



2680 East Lansing Dr., East Lansing, MI 48823  
 Phone (517) 332-0167 Fax (517) 332-4034  
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

**REPORT TO** **CHAIN OF CUSTODY RECORD** **INVOICE TO**

CONTACT NAME **Jennifer Caporale**  
 COMPANY **Lansing Board of Water and Light**  
 ADDRESS **PO Box 13007 48901-3007**  
 CITY **Lansing** STATE **Mi** ZIP CODE **48901**  
 PHONE NO. **517-702-6372** FAX NO. P.O. NO.  
 E-MAIL ADDRESS **Environmental\_Laboratory@lbwl.com** QUOTE NO.

CONTACT NAME **Kelly Gleason**  SAME  
 COMPANY  
 ADDRESS  
 CITY STATE ZIP CODE  
 PHONE NO. E-MAIL ADDRESS **Kelly.Gleason@lbwl.com**

PROJECT NO./NAME **Erickson AM MI Wells 7-10** SAMPLER(S) - PLEASE PRINT/SIGN NAME **Marc Wahrer**  
 TURNAROUND TIME REQUIRED  1 DAY  2 DAYS  3 DAYS  STANDARD  OTHER **ASAP**  
 DELIVERABLES REQUIRED  STD  LEVEL II  LEVEL III  LEVEL IV  EDD  OTHER

MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID  
 SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIFE A=AIR W=WASTE

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

Total Metals	F- undissisted, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	Certifications
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> OHIO VAP <input type="checkbox"/> Drinking Water
					<input type="checkbox"/> DoD <input checked="" type="checkbox"/> NPDES
					Project Locations
					<input type="checkbox"/> Detroit <input type="checkbox"/> New York
					<input type="checkbox"/> Other
					Special Instructions

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO3	H2SO4	NaOH	MeOH	OTHER	Total Metals	F- undissisted, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	Special Instructions
	DATE	TIME																
33012.01	01/17/22	1410	MW-7 LA02050-01	GW	5	3	2						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Metals to analyse:
.02		1244	MW-8 -02	GW	5	3	2						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	B, Ca, Sb, As, Ba, Be, Cd, Cr,
.03		1056	MW-9 -03	GW	5	3	2						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Co, Li, Hg, Mo, Pb, Se, Tl,
.04		0912	MW-10 -04	GW	5	3	2						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Fe, Cu, Ni, Ag, V, Zn
.05		1056	Field Dupe MW- -05	GW	5	3	2						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Please send a preliminary report
.06		0735	Field Blank -06	DI	5	3	2						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

RELINQUISHED BY: *[Signature]* DATE **2-18-22** TIME **0946**  
 RECEIVED BY: *[Signature]* DATE **2/18/22** TIME **0946**  
 RELINQUISHED BY: *[Signature]* DATE **1000**  
 RECEIVED BY: *[Signature]* DATE **1000**

RELINQUISHED BY: SIGNATURE/ORGANIZATION DATE TIME  
 RECEIVED BY: SIGNATURE/ORGANIZATION DATE TIME  
 SEAL NO. SEAL INTACT YES  NO  INITIALS  
 SEAL NO. SEAL INTACT YES  NO  INITIALS  
 NOTES: TEMP. ON ARRIVAL **4.5**

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

## Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6mos	0.150
Be, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	2.5
Cl	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cr, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Fluoride	250 mL plastic	mg/L	None	9056	28 d	1.0
F	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Fe, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Pb, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Li, total	Mercury	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Hg, total	Molybdenum	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Mo, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	HNO3	SM 7500	6 mos	2.0 combined
RA226/228	Selenium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Se, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ag, total	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	10
SO4	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Tl, total	Total Dissolved Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TDS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540D	NA	3
TSS	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
V, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Zn, total							



March 17, 2022

John Laverty  
Merit Laboratories Inc.  
2680 East Lansing Drive  
East Lansing, Michigan 48823

Re: Routine Analysis  
Work Order: 571098  
SDG: S33012

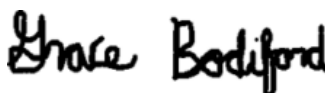
Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on February 22, 2022. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at [www.gel.com](http://www.gel.com).

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 4523.

Sincerely,



Grace Bodiford for  
Samuel Hogan  
Project Manager

Purchase Order: GELP20-0018  
Enclosures



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# Case Narrative

**Receipt Narrative  
for  
Merit Laboratories, Inc.  
SDG: S33012  
Work Order: 571098**

**March 17, 2022**

**Laboratory Identification:**

GEL Laboratories LLC  
2040 Savage Road  
Charleston, South Carolina 29407  
(843) 556-8171

**Summary:**

**Sample receipt:** The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on February 22, 2022 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

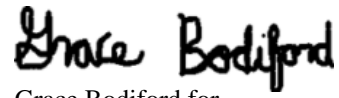
**Sample Identification:** The laboratory received the following samples:

<b><u>Laboratory ID</u></b>	<b><u>Client ID</u></b>
571098001	S33012.01
571098002	S33012.02
571098003	S33012.03
571098004	S33012.04
571098005	S33012.05 (Field Dupe)
571098006	S33012.06 (Field Blank)

**Case Narrative:**

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.

A handwritten signature in black ink that reads "Grace Bodiford". The script is cursive and somewhat stylized.

Grace Bodiford for  
Samuel Hogan  
Project Manager

# **Chain of Custody and Supporting Documentation**



2680 East Lansing Dr., East Lansing, MI 48823  
 Phone (517) 332-0167 Fax (517) 332-4034  
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

**REPORT TO**

CONTACT NAME: Project Management Team

COMPANY: Merit Laboratories

ADDRESS: 2680 East Lansing Drive

CITY: East Lansing

PHONE NO.: 517-332-0167

E-MAIL ADDRESS: results@meritlabs.com

**CHAIN OF CUSTODY RECORD**

CONTACT NAME: Julie Teague

COMPANY: Merit Laboratories

ADDRESS: 2680 East Lansing Drive

CITY: East Lansing

PHONE NO.: 517-332-0167

E-MAIL ADDRESS: juliet@meritlabs.com

**INVOICE TO**

STATE: MI

ZIP CODE: 48823

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

PROJECT NO./NAME: S33012

SAMPLER(S) - PLEASE PRINT/SIGN NAME

TURNAROUND TIME REQUIRED:  1 DAY  2 DAYS  3 DAYS  STANDARD  OTHER

DELIVERABLES REQUIRED:  STD  LEVEL II  LEVEL III  LEVEL IV  EDD  OTHER

MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOL L=LIQUID SD=SOLID  
 SL=SLUDGE DW=DRINKING WATER O=OIL WP=WPE A=AIR W=WASTE

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR	DATE	TIME	IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	# Containers & Preservatives								
							NONE	HNO <sub>3</sub>	H <sub>2</sub> SO <sub>4</sub>	NH <sub>4</sub> OH	NH <sub>3</sub> OH	OTHER			
	2/17/22	1410		S33012.01	GW	2		2							
	2/17/22	1244		S33012.02	GW	2		2							
	2/17/22	1056		S33012.03	GW	2		2							
	2/17/22	0912		S33012.04	GW	2		2							
	2/17/22	1056		S33012.05 (Field Dupe)	GW	2		2							
	2/17/22	0735		S33012.06 (Field Blank)	Wa	2		2							

RELINQUISHED BY:	SIGNATURE/Organization	DATE	TIME
RECEIVED BY:	<i>Johanna Murray</i>	2/18/22	1700
RELINQUISHED BY:	UPS	2/18/22	1700
RECEIVED BY:			

RELINQUISHED BY:	SIGNATURE/Organization	DATE	TIME
RECEIVED BY:	<i>Johanna Murray</i>	2/18/22	1700
RELINQUISHED BY:			
RECEIVED BY:			

Certifications	OHIO VAP	Drinking Water	DoD	NPDES	Project Locations	Detroit	New York	Other	Special Instructions
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	* E903.1 Mod.
									** E904.0/SW 9320 Mod.
									Please use calculation product & provide Radium 226/228 combined results on the report
									(No Ice needed)
									** Subcontracted to GEL Laboratories, Inc.
									2040 Savage Road
									Charleston, SC 29407

RELINQUISHED BY:	SIGNATURE/Organization	DATE	TIME
RECEIVED BY:	<i>Johanna Murray</i>	2/18/22	1700
RELINQUISHED BY:			
RECEIVED BY:			

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

SAMPLE RECEIPT & REVIEW FORM

Client: <b>MERT</b>		SDG/AR/COC/Work Order: <b>571098</b>	
Received By: <b>DC</b>		Date Received: <b>2-22-22</b>	
Carrier and Tracking Number		Circle Applicable: FedEx Express    FedEx Ground <b>UPS</b> Field Services    Courier    Other <b>1Z466477 03 62126 0556-200</b> <b>1Z466477 03 6211 6246-140</b>	
Suspected Hazard Information	Yes <input type="checkbox"/> No <input type="checkbox"/>	*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.	
A) Shipped as a DOT Hazardous?	<input checked="" type="checkbox"/>	Hazard Class Shipped: _____ UN#: _____ If UN2910, Is the Radioactive Shipment Survey Compliant? Yes ___ No ___	
B) Did the client designate the samples are to be received as radioactive?	<input checked="" type="checkbox"/>	COC notation or radioactive stickers on containers equal client designation.	
C) Did the RSO classify the samples as radioactive?	<input checked="" type="checkbox"/>	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): <b>0</b> CPM / mR/Hr Classified as: Rad 1    Rad 2    Rad 3	
D) Did the client designate samples are hazardous?	<input checked="" type="checkbox"/>	COC notation or hazard labels on containers equal client designation.	
E) Did the RSO identify possible hazards?	<input checked="" type="checkbox"/>	If D or E is yes, select Hazards below. PCB's    Flammable    Foreign Soil    RCRA    Asbestos    Beryllium    Other: _____	
Sample Receipt Criteria		Comments/Qualifiers (Required for Non-Conforming Items)	
1 Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>	Circle Applicable: Seals broken    Damaged container    Leaking container    Other (describe)	
2 Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>	Circle Applicable: Client contacted and provided COC    COC created upon receipt	
3 Samples requiring cold preservation within (0 ≤ 6 deg. C)?*	<input checked="" type="checkbox"/>	Preservation Method: Wet Ice    Ice Packs    Dry ice    None    Other: _____ *all temperatures are recorded in Celsius    TEMP: _____	
4 Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>	Temperature Device Serial #: <b>IR6-21</b> Secondary Temperature Device Serial # (If Applicable): _____	
5 Sample containers intact and sealed?	<input checked="" type="checkbox"/>	Circle Applicable: Seals broken    Damaged container    Leaking container    Other (describe)	
6 Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>	Sample ID's and Containers Affected: _____ If Preservation added, Lot#: _____	
7 Do any samples require Volatile Analysis?	<input checked="" type="checkbox"/>	If Yes, are Encores or Soil Kits present for solids? Yes ___ No ___ NA ___ (If yes, take to VOA Freezer)	
		Do liquid VOA vials contain acid preservation? Yes ___ No ___ NA ___ (If unknown, select No)	
		Are liquid VOA vials free of headspace? Yes ___ No ___ NA ___ Sample ID's and containers affected: _____	
8 Samples received within holding time?	<input checked="" type="checkbox"/>	ID's and tests affected: _____	
9 Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>	ID's and containers affected: _____	
10 Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>	Circle Applicable: No dates on containers    No times on containers    COC missing info    Other (describe)	
11 Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>	Circle Applicable: No container count on COC    Other (describe)	
12 Are sample containers identifiable as GEL provided by use of GEL labels?	<input checked="" type="checkbox"/>		
13 COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>	Circle Applicable: Not relinquished    Other (describe)	
Comments (Use Continuation Form if needed):			

PM (or PMA) review: Initials **GB** Date **2/23/22** Page **1** of **1**



# Laboratory Certifications

**List of current GEL Certifications as of 17 March 2022**

<b>State</b>	<b>Certification</b>
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122021-1
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2019-165
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-21-19
Utah NELAP	SC000122021-36
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

# **Radiological Analysis**

# Case Narrative

**Radiochemistry  
Technical Case Narrative  
Merit Laboratories, Inc.  
SDG #: S33012  
Work Order #: 571098**

**Product: GFPC Ra228, Liquid**

**Analytical Method:** EPA 904.0/SW846 9320 Modified

**Analytical Procedure:** GL-RAD-A-063 REV# 5

**Analytical Batch:** 2233677

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
571098001	S33012.01
571098002	S33012.02
571098003	S33012.03
571098004	S33012.04
571098005	S33012.05 (Field Dupe)
571098006	S33012.06 (Field Blank)
1205027604	Method Blank (MB)
1205027605	571108001(NonSDG) Sample Duplicate (DUP)
1205027606	Laboratory Control Sample (LCS)
1205027607	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

**Quality Control (QC) Information**

**Method Blank Criteria**

The blank result (See Below) is greater than the MDC but less than the required detection limit.

Sample	Analyte	Value
1205027604 (MB)	Radium-228	Result: 0.650 pCi/L > MDA: 0.650 pCi/L <= RDL: 3.00 pCi/L

**Product: Lucas Cell, Ra226, Liquid**

**Analytical Method:** EPA 903.1 Modified

**Analytical Procedure:** GL-RAD-A-008 REV# 15

**Analytical Batch:** 2233667

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
571098001	S33012.01
571098002	S33012.02
571098003	S33012.03
571098004	S33012.04
571098005	S33012.05 (Field Dupe)
571098006	S33012.06 (Field Blank)
1205027579	Method Blank (MB)
1205027580	570956001(NonSDG) Sample Duplicate (DUP)
1205027581	570956001(NonSDG) Matrix Spike (MS)
1205027582	Laboratory Control Sample (LCS)
1205027583	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

**Quality Control (QC) Information**

**Method Blank Criteria**

The blank result (See Below) is greater than the MDC but less than the required detection limit.

<b>Sample</b>	<b>Analyte</b>	<b>Value</b>
1205027579 (MB)	Radium-226	Result: 0.690 pCi/L > MDA: 0.656 pCi/L <= RDL: 1.00 pCi/L

**Miscellaneous Information**

**Additional Comments**

The matrix spike, 1205027581 (Non SDG 570956001MS), aliquot was reduced to conserve sample volume.

**Certification Statement**

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

## GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

### Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S33012 GEL Work Order: 571098

**The Qualifiers in this report are defined as follows:**

- \* A quality control analyte recovery is outside of specified acceptance criteria
- \*\* Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

**Review/Validation**

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature: 

Name: Kate Gellatly

Date: 21 MAR 2022

Title: Analyst I

# Sample Data Summary



# GEL LABORATORIES LLC

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## Certificate of Analysis

Report Date: March 21, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Lavery  
 Project: Routine Analysis

Client Sample ID: S33012.01	Project: MERI00120
Sample ID: 571098001	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 17-FEB-22 14:10	
Receive Date: 22-FEB-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228		1.51	+/-0.986	1.51	3.00	pCi/L			JXC9	03/04/22	1038	2233677	1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		2.33	+/-1.06			pCi/L			NXL1	03/17/22	1352	2235240	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.818	+/-0.388	0.438	1.00	pCi/L			LXP1	03/03/22	0939	2233667	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			88.9	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

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## Certificate of Analysis

Report Date: March 21, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

Client Sample ID: S33012.02	Project: MERI00120
Sample ID: 571098002	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 17-FEB-22 12:44	
Receive Date: 22-FEB-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	2.00	+/-1.32	2.09	3.00	pCi/L			JXC9	03/04/22	1038	2233677	1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		2.84	+/-1.37			pCi/L			NXL1	03/17/22	1352	2235240	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.843	+/-0.368	0.293	1.00	pCi/L			LXP1	03/03/22	0939	2233667	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			93.3	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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## Certificate of Analysis

Report Date: March 21, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Lavery  
 Project: Routine Analysis

Client Sample ID: S33012.03	Project: MERI00120
Sample ID: 571098003	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 17-FEB-22 10:56	
Receive Date: 22-FEB-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	0.0438	+/-0.873	1.64	3.00	pCi/L			JXC9	03/04/22	1039	2233677	1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		0.576	+/-0.946			pCi/L			NXL1	03/17/22	1352	2235240	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.533	+/-0.365	0.510	1.00	pCi/L			LXP1	03/03/22	0939	2233667	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			88.1	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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## Certificate of Analysis

Report Date: March 21, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Lavery  
 Project: Routine Analysis

Client Sample ID: S33012.04	Project: MERI00120
Sample ID: 571098004	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 17-FEB-22 09:12	
Receive Date: 22-FEB-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	-0.916	+/-0.789	1.68	3.00	pCi/L			JXC9	03/04/22	1039 2233677	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.894	+/-0.896			pCi/L			NXL1	03/17/22	1352 2235240	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.894	+/-0.426	0.499	1.00	pCi/L			LXP1	03/03/22	1012 2233667	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			99.2	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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## Certificate of Analysis

Report Date: March 21, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Lavery  
 Project: Routine Analysis

Client Sample ID: S33012.05 (Field Dupe)	Project: MERI00120
Sample ID: 571098005	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 17-FEB-22 10:56	
Receive Date: 22-FEB-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	0.283	+/-0.875	1.58	3.00	pCi/L			JXC9	03/04/22	1039	2233677	1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		0.940	+/-0.943			pCi/L			NXL1	03/17/22	1352	2235240	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.657	+/-0.350	0.403	1.00	pCi/L			LXP1	03/03/22	1012	2233667	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			93.1	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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## Certificate of Analysis

Report Date: March 21, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

Client Sample ID: S33012.06 (Field Blank)	Project: MERI00120
Sample ID: 571098006	Client ID: MERI001
Matrix: Water	
Collect Date: 17-FEB-22 07:35	
Receive Date: 22-FEB-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.237	+/-0.966	1.76	3.00	pCi/L			JXC9	03/04/22	1039 2233677	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.350	+/-0.991			pCi/L			NXL1	03/17/22	1352 2235240	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.113	+/-0.221	0.416	1.00	pCi/L			LXP1	03/03/22	1012 2233667	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			83.5	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# Quality Control Summary

# GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

## QC Summary

Report Date: March 21, 2022

Page 1 of 2

Merit Laboratories Inc.  
2680 East Lansing Drive  
East Lansing, Michigan

Contact: John Laverty

Workorder: 571098

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Rad Gas Flow</b>											
Batch	2233677										
QC1205027605	571108001	DUP									
Radium-228		1.02		1.27	pCi/L	22.1		(0% - 100%)	JXC9	03/04/22	10:38
	Uncertainty	+/-0.446		+/-0.447							
QC1205027606	LCS										
Radium-228		16.1		13.2	pCi/L		81.7	(75%-125%)		03/04/22	10:38
	Uncertainty			+/-0.978							
QC1205027607	LCSD										
Radium-228		16.1		14.5	pCi/L	9.5	89.9	(0%-20%)		03/04/22	10:38
	Uncertainty			+/-1.07							
QC1205027604	MB										
Radium-228				0.650	pCi/L					03/04/22	10:38
	Uncertainty			+/-0.416							
<b>Rad Ra-226</b>											
Batch	2233667										
QC1205027580	570956001	DUP									
Radium-226		0.435		0.315	pCi/L	32.1		(0% - 100%)	LXP1	03/03/22	10:44
	Uncertainty	+/-0.266		+/-0.244							
QC1205027582	LCS										
Radium-226		26.4		20.8	pCi/L		78.7	(75%-125%)		03/03/22	10:44
	Uncertainty			+/-1.75							
QC1205027583	LCSD										
Radium-226		26.4		25.0	pCi/L	18.4	94.7	(0%-20%)		03/03/22	10:44
	Uncertainty			+/-1.77							
QC1205027579	MB										
Radium-226				0.690	pCi/L					03/03/22	10:12
	Uncertainty			+/-0.457							
QC1205027581	570956001	MS									
Radium-226		132	0.435	113	pCi/L		85.5	(75%-125%)		03/03/22	10:44
	Uncertainty	+/-0.266		+/-8.29							

### Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:



# GEL LABORATORIES LLC

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## QC Summary

Workorder: 571098

Page 2 of 2

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
**	Analyte is a Tracer compound										
<	Result is less than value reported										
>	Result is greater than value reported										
BD	Results are either below the MDC or tracer recovery is low										
FA	Failed analysis.										
H	Analytical holding time was exceeded										
J	See case narrative for an explanation										
J	Value is estimated										
K	Analyte present. Reported value may be biased high. Actual value is expected to be lower.										
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.										
M	M if above MDC and less than LLD										
M	REMP Result > MDC/CL and < RDL										
N/A	RPD or %Recovery limits do not apply.										
NI	See case narrative										
ND	Analyte concentration is not detected above the detection limit										
NJ	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier										
Q	One or more quality control criteria have not been met. Refer to the applicable narrative or DER.										
R	Sample results are rejected										
U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.										
UI	Gamma Spectroscopy--Uncertain identification										
UJ	Gamma Spectroscopy--Uncertain identification										
UL	Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.										
X	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier										
Y	Other specific qualifiers were required to properly define the results. Consult case narrative.										
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.										
h	Preparation or preservation holding time was exceeded										

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.  
 ^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.  
 \* Indicates that a Quality Control parameter was not within specifications.  
 For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

# **Gas Flow Raw Data**

# Batch 2233677 Check-list

This check-list was completed on 04-MAR-22 by Kenshalla Oston

This batch was reviewed by Kenshalla Oston on 04-MAR-22 and Nat Long on 04-MAR-22.

**Batch ID:**  
2233677

**Product:**  
GFC28RAL

**Description:** Gas Flow Radium 228  
GL-RAD-A-063

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?		No	
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
<b>Miscellaneous Information</b>				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

# Prep Logbook

## Radium-228 in Liquid

**Batch ID:** 2233677

**Analyst:** Jasmine Conley (JXC9)

**Method:** EPA 904.0/SW846 9320 Modified

**Lab SOP:** GL-RAD-A-063 REV# 5

**Instrument:** LUCAS-C037036045

**Due Dates for Lab:** 08-MAR-2022

**Package:** 21-MAR-2022

**SDG:** 09-MAR-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205027606	Radium-228 SPIKE	1965-B	.1	mL
LCSD	1205027607	Radium-228 SPIKE	1965-B	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	570956001	27-FEB-2022	1	900.46	900.46	03/01/22 12:45	03/04/22 08:30
2	571098001	27-FEB-2022	3	300.96	300.96	03/01/22 12:45	03/04/22 08:30
3	571098002	27-FEB-2022	3	306.42	306.42	03/01/22 12:45	03/04/22 08:30
4	571098003	27-FEB-2022	3	300.53	300.53	03/01/22 12:45	03/04/22 08:30
5	571098004	27-FEB-2022	3	301.72	301.72	03/01/22 12:45	03/04/22 08:30
6	571098005	27-FEB-2022	3	307.61	307.61	03/01/22 12:45	03/04/22 08:30
7	571098006	27-FEB-2022	3	300.37	300.37	03/01/22 12:45	03/04/22 08:30
8	571108001	27-FEB-2022	1	900.89	900.89	03/01/22 12:45	03/04/22 08:30
9	571233001	27-FEB-2022	3	301.73	301.73	03/01/22 12:45	03/04/22 08:30
10	571237001	27-FEB-2022	3	307.72	307.72	03/01/22 12:45	03/04/22 08:30
11	1205027604 MB	27-FEB-2022	1		901.21	03/01/22 12:45	03/04/22 08:30
12	1205027605 DUP (571108001)	27-FEB-2022	1	901.21	901.21	03/01/22 12:45	03/04/22 08:30
13	1205027606 LCS	27-FEB-2022	1		901.21	03/01/22 12:45	03/04/22 08:30
14	1205027607 LCSD	27-FEB-2022	1		901.21	03/01/22 12:45	03/04/22 08:30

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1951-C	Barium-133	.1 mL	Pipet Id: RAD-GFC-1795419
REGNT 3290227	500 mg/mL Neodymium Carrier	.2 mL	Data Entry Date2: 27-FEB-2022 00:00
REGNT 3354444	RGF-Neodymium Substrate	5 mL	
REGNT 3355260.1	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	
REGNT 3371585.12	16M Nitric Acid	5 mL	
REGNT 3391529	RGF-50% Potassium Carbonate	2 mL	
REGNT 3392124	Barium Carrier Ra228 REG	1 mL	
REGNT 3396361	Lot #DGA0028	2 g	
REGNT 3400562	RGF-7M Nitric Acid	25 mL	
REGNT 3400892	2M HCl	20 mL	
REGNT 3407156	RGF-1M Citric Acid	5 mL	
REGNT 3407159	RGF-1.5M Ammonium Sulfate	10 mL	

### Radium-228 Liquid

Filename : RA228.XLS  
 File type : Excel  
 Version # : 1.4.2

Tracer S/N : 1951-C  
 Tracer Exp Date : 9/16/2022  
 Tracer Volume Added: 0.10

Batch : 2233677  
 Analyst : JAS02031  
 Prep Date : 2/27/2022  
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL  
 Parmname : Radium-228  
 Required MDA : 1 pCi/L  
 Ra-228 Abundance : 1.00  
 Halflife of Ra-228 : 5.75 years  
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	570956001.1	0.9005	2.0767E-05	2/17/2022 10:10	79.7	6.47%	63.7	7.24%	0.1	0.000200
2	571098001.1	0.3010	1.8475E-05	2/17/2022 14:10	79.7	6.47%	70.8	6.86%	0.1	0.000200
3	571098002.1	0.3064	1.8566E-05	2/17/2022 12:44	79.7	6.47%	74.3	6.70%	0.1	0.000200
4	571098003.1	0.3005	1.8468E-05	2/17/2022 10:56	79.7	6.47%	70.2	6.89%	0.1	0.000200
5	571098004.1	0.3017	1.8488E-05	2/17/2022 9:12	79.7	6.47%	79.0	6.50%	0.1	0.000200
6	571098005.1	0.3076	1.8585E-05	2/17/2022 10:56	79.7	6.47%	74.2	6.70%	0.1	0.000200
7	571098006.1	0.3004	1.8465E-05	2/17/2022 7:35	79.7	6.47%	66.5	7.08%	0.1	0.000200
8	571108001.1	0.9009	2.0766E-05	2/17/2022 9:13	79.7	6.47%	80.8	6.42%	0.1	0.000200
9	571233001.1	0.3017	1.8488E-05	2/21/2022 13:45	79.7	6.47%	61.8	7.34%	0.1	0.000200
10	571237001.1	0.3077	1.8587E-05	2/21/2022 14:00	79.7	6.47%	80.5	6.43%	0.1	0.000200
11	1205027604.1	0.9012	2.0765E-05	2/27/2022 0:00	79.7	6.47%	73.0	6.76%	0.1	0.000200
12	1205027605.1	0.9012	2.0765E-05	2/17/2022 9:13	79.7	6.47%	73.3	6.74%	0.1	0.000200
13	1205027606.1	0.9012	2.0765E-05	2/27/2022 0:00	79.7	6.47%	77.8	6.54%	0.1	0.000200
14	1205027607.1	0.9012	2.0765E-05	2/27/2022 0:00	79.7	6.47%	75.5	6.64%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063  
 Instrument SOP: GL-RAD-I-016

Count raw Data														
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction	Calculated Sample Recovery %	Sample Recovery Error %
			Alpha	Beta										
1	1A	60	4	42	0.700	3/4/2022 10:38	3/1/2022 12:45	3/4/2022 8:30	0.995	0.785	1.000	1.057	79.9%	4.86%
2	1B	60	5	67	1.117	3/4/2022 10:38	3/1/2022 12:45	3/4/2022 8:30	0.995	0.785	1.000	1.057	88.9%	4.72%
3	1D	60	5	137	2.283	3/4/2022 10:38	3/1/2022 12:45	3/4/2022 8:30	0.995	0.785	1.000	1.057	93.3%	4.67%
4	2A	60	5	48	0.800	3/4/2022 10:39	3/1/2022 12:45	3/4/2022 8:30	0.995	0.785	1.000	1.057	88.1%	4.73%
5	2B	60	9	47	0.783	3/4/2022 10:39	3/1/2022 12:45	3/4/2022 8:30	0.995	0.785	1.000	1.057	99.2%	4.59%
6	2C	60	17	58	0.967	3/4/2022 10:39	3/1/2022 12:45	3/4/2022 8:30	0.995	0.785	1.000	1.057	93.1%	4.67%
7	3C	60	1	56	0.933	3/4/2022 10:39	3/1/2022 12:45	3/4/2022 8:30	0.995	0.784	1.000	1.057	83.5%	4.80%
8	4A	60	12	166	2.767	3/4/2022 10:39	3/1/2022 12:45	3/4/2022 8:30	0.995	0.784	1.000	1.057	101%	4.57%
9	4B	60	2	65	1.083	3/4/2022 10:39	3/1/2022 12:45	3/4/2022 8:30	0.996	0.784	1.000	1.057	77.6%	4.90%
10	4C	60	8	60	1.000	3/4/2022 10:39	3/1/2022 12:45	3/4/2022 8:30	0.996	0.784	1.000	1.057	101%	4.57%
11	4D	60	7	105	1.750	3/4/2022 10:38	3/1/2022 12:45	3/4/2022 8:30	0.998	0.786	1.000	1.057	91.6%	4.69%
12	5B	60	6	138	2.300	3/4/2022 10:38	3/1/2022 12:45	3/4/2022 8:30	0.995	0.786	1.000	1.057	92.1%	4.68%
13	5C	60	10	829	13.817	3/4/2022 10:38	3/1/2022 12:45	3/4/2022 8:30	0.998	0.785	1.000	1.057	97.7%	4.61%
14	6A	60	7	860	14.333	3/4/2022 10:38	3/1/2022 12:45	3/4/2022 8:30	0.998	0.785	1.000	1.057	94.8%	4.64%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2021	5/31/2022	0.6325	0.00738	0.688	2/26/2022 8:38	500
2	PIC	6/1/2021	5/31/2022	0.6409	0.00711	0.692	2/26/2022 8:38	500
3	PIC	6/1/2021	5/31/2022	0.6466	0.00692	1.678	2/26/2022 8:38	500
4	PIC	6/1/2021	5/31/2022	0.6321	0.01914	0.788	2/26/2022 8:38	500
5	PIC	6/1/2021	5/31/2022	0.6248	0.02111	1.064	2/26/2022 8:38	500
6	PIC	6/1/2021	5/31/2022	0.6380	0.01274	0.882	2/26/2022 8:38	500
7	PIC	6/1/2021	5/31/2022	0.6497	0.00988	0.870	2/26/2022 8:38	500
8	PIC	6/1/2021	5/31/2022	0.6543	0.01123	1.772	2/26/2022 8:38	500
9	PIC	6/1/2021	5/31/2022	0.6421	0.01519	1.028	2/26/2022 8:38	500
10	PIC	6/1/2021	5/31/2022	0.6681	0.00889	0.806	2/26/2022 8:39	500
11	PIC	6/1/2021	5/31/2022	0.6156	0.00773	1.206	2/26/2022 8:39	500
12	PIC	6/1/2021	5/31/2022	0.6506	0.00426	1.178	2/26/2022 8:39	500
13	PIC	6/1/2021	5/31/2022	0.6672	0.00657	1.082	2/26/2022 8:39	500
14	PIC	6/1/2021	5/31/2022	0.6392	0.02228	1.320	2/26/2022 8:39	500

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

**Spike S/N :** N/A  
**Spike Exp Date :** N/A  
**Spike Activity (dpm/ml):** N/A  
**Spike Volume Added:** N/A

**LCS S/N :** 1965-B  
**LCS Exp Date :** 8/22/2022  
**LCS Activity (dpm/ml):** 322.59  
**LCS Volume Added:** 0.10

Results														2 SIGMA		2 SIGMA	
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	Counting Uncertainty pCi/L	Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery	
1	0.3539	0.2498	1	0.5667	<b>0.0161</b>	951.72%	0.0120	0.1142	0.3000	0.3001		SAMPLE					
2	0.9421	0.6651	3	1.5081	<b>1.5108</b>	33.64%	0.4247	0.1414	0.9860	1.0645		SAMPLE					
3	1.3612	0.9610	3	2.0870	<b>1.9981</b>	33.95%	0.6053	0.2035	1.3166	1.4192		SAMPLE					
4	1.0307	0.7277	3	1.6378	<b>0.0438</b>	1017.54%	0.0120	0.1221	0.8729	0.8731		SAMPLE					
5	1.0722	0.7570	3	1.6772	<b>-0.9164</b>	44.19%	-0.2807	0.1232	0.7886	0.7887		SAMPLE					
6	0.9987	0.7051	3	1.5772	<b>0.2828</b>	157.98%	0.0847	0.1337	0.8754	0.8786		SAMPLE					
7	1.1129	0.7857	3	1.7588	<b>0.2374</b>	207.71%	0.0633	0.1315	0.9661	0.9682		SAMPLE					
8	0.4326	0.3054	1	0.6619	<b>1.0155</b>	22.89%	0.9947	0.2228	0.4459	0.5208		SAMPLE					
9	1.3089	0.9241	3	2.0510	<b>0.2244</b>	256.34%	0.0553	0.1418	1.1272	1.1288		SAMPLE					
10	0.8393	0.5925	3	1.3319	<b>0.5697</b>	69.85%	0.1940	0.1352	0.7782	0.7926		SAMPLE					
11	0.4179	0.2950	1	0.6498	<b>0.6502</b>	33.01%	0.5440	0.1777	0.4163	0.4507		MB					
12	0.3903	0.2755	1	0.6076	<b>1.2674</b>	18.58%	1.1220	0.2017	0.4466	0.5588	571108001.1	DUP	22.1%				
13	0.3426	0.2419	1	0.5354	<b>13.1747</b>	6.00%	12.7347	0.4821	0.9776	3.6224		LCS			16.1238	81.7%	
14	0.4072	0.2875	1	0.6307	<b>14.4894</b>	6.39%	13.0133	0.4915	1.0725	4.0320		LCSD	9.5%		16.1238	89.9%	



SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
570956001	1A	60	4	42	3/4/2022 10:38	3/4/2022 11:38	PIC	2233677
571098001	1B	60	5	67	3/4/2022 10:38	3/4/2022 11:38	PIC	2233677
571098002	1D	60	5	137	3/4/2022 10:38	3/4/2022 11:38	PIC	2233677
571098003	2A	60	5	48	3/4/2022 10:39	3/4/2022 11:39	PIC	2233677
571098004	2B	60	9	47	3/4/2022 10:39	3/4/2022 11:39	PIC	2233677
571098005	2C	60	17	58	3/4/2022 10:39	3/4/2022 11:39	PIC	2233677
571098006	3C	60	1	56	3/4/2022 10:39	3/4/2022 11:39	PIC	2233677
571108001	4A	60	12	166	3/4/2022 10:39	3/4/2022 11:39	PIC	2233677
571233001	4B	60	2	65	3/4/2022 10:39	3/4/2022 11:39	PIC	2233677
571237001	4C	60	8	60	3/4/2022 10:39	3/4/2022 11:39	PIC	2233677
1205027604	4D	60	7	105	3/4/2022 10:38	3/4/2022 11:38	PIC	2233677
1205027605	5B	60	6	138	3/4/2022 10:38	3/4/2022 11:38	PIC	2233677
1205027606	5C	60	10	829	3/4/2022 10:38	3/4/2022 11:38	PIC	2233677
1205027607	6A	60	7	860	3/4/2022 10:38	3/4/2022 11:38	PIC	2233677

ASSAY 4-Mar-22 9:05:29  
 Wizard 2480 s/n 46190630  
 Protocol id 9 Ba-133\_1  
 Time limit  
 Count limit  
 Isotope Ba-133\_1  
 Protocol date 3/4/2022  
 Run id. 4708

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	94	1	180	239	79.65	6.47	09:05:29
570956001	2	94	2	180	191	63.65	7.24	79.91	09:08:43
571098001	3	94	3	180	212.5	70.82	6.86	88.91	09:11:57
571098002	4	94	4	180	223	74.32	6.7	93.31	09:15:11
571098003	5	94	5	180	210.5	70.15	6.89	88.07	09:18:25
571098004	1	1	1	180	237	78.98	6.5	99.16	09:22:08
571098005	2	1	2	180	222.5	74.16	6.7	93.11	09:25:22
571098006	3	1	3	180	199.5	66.49	7.08	83.48	09:28:36
571108001	4	1	4	180	242.5	80.82	6.42	101.47	09:31:50
571233001	5	1	5	180	185.5	61.83	7.34	77.63	09:35:04
571237001	1	3	1	180	241.5	80.48	6.43	101.04	09:38:40
1205027604	2	3	2	180	219	72.99	6.76	91.64	09:41:54
1205027605	3	3	3	180	220	73.32	6.74	92.05	09:45:08
1205027606	4	3	4	180	233.5	77.82	6.54	97.70	09:48:21
1205027607	5	3	5	180	226.5	75.49	6.64	94.78	09:51:36

END OF ASSAY

# **Continuing Calibration Data**

# Gas Flow Proportional Counter Checks for 04-Mar-2022

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100A2	Below	Alpha eff	04-Mar 06:49	5	7938	7965	11750	-3.04
LB4100A2	Above	Alpha XTalk	04-Mar 06:49	5	0.413	0.260	0.402	+3.48
LB4100E2	Above	Beta bkg	04-Mar 05:06	60	2.200	1.386	3.015	-0.00
LB4100F3	Above	Alpha bkg	04-Mar 05:06	60	0.317	-8.38E-2	0.560	+0.73
LB4100G1	Above	Beta bkg	04-Mar 05:06	60	78.467	0.380	1.675	+358.85
LB4100G2	Above	Beta bkg	04-Mar 05:06	60	2.183	1.159	2.203	+2.89
LB4100G3	Below	Alpha eff	04-Mar 06:09	5	5822	6620	7779	-7.13
LB4100G3	Above	Alpha XTalk	04-Mar 06:09	5	0.409	0.309	0.375	+6.11
LB4100G3	Above	Beta bkg	04-Mar 05:06	60	5.250	0.810	1.674	+27.83
PIC2D	need 2nd	Alpha bkg	04-Mar 05:31	60	0.100	-6.13E-2	0.350	-0.65
PIC2D	Above	Beta bkg	04-Mar 05:31	60	2.367	0.171	2.681	+2.25
PIC14C	Below	Beta eff	04-Mar 08:30	5	25007	25180	27090	-3.54

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

LB4100C1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by *d. Seal-Harmon*

Date 3-4-22

GEL Laboratories LLC

# Runlogs

# Instrument Run Log

Instrument Type: GFPC

Batch ID: 2233677

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205027604	MB	JXC9	PIC4D	MAR-04-22 10:38:25	DONE	25mm Filter	01-JUN-21 00:00
1205027605	DUP	JXC9	PIC5B	MAR-04-22 10:38:29	DONE	25mm Filter	01-JUN-21 00:00
1205027606	LCS	JXC9	PIC5C	MAR-04-22 10:38:33	DONE	25mm Filter	01-JUN-21 00:00
1205027607	LCSD	JXC9	PIC6A	MAR-04-22 10:38:40	DONE	25mm Filter	01-JUN-21 00:00
570956001	SAMPLE	JXC9	PIC1A	MAR-04-22 10:38:45	DONE	25mm Filter	01-JUN-21 00:00
571098001	SAMPLE	JXC9	PIC1B	MAR-04-22 10:38:55	DONE	25mm Filter	01-JUN-21 00:00
571098002	SAMPLE	JXC9	PIC1D	MAR-04-22 10:38:59	DONE	25mm Filter	01-JUN-21 00:00
571098003	SAMPLE	JXC9	PIC2A	MAR-04-22 10:39:03	DONE	25mm Filter	01-JUN-21 00:00
571098004	SAMPLE	JXC9	PIC2B	MAR-04-22 10:39:06	DONE	25mm Filter	01-JUN-21 00:00
571098005	SAMPLE	JXC9	PIC2C	MAR-04-22 10:39:12	DONE	25mm Filter	01-JUN-21 00:00
571098006	SAMPLE	JXC9	PIC3C	MAR-04-22 10:39:16	DONE	25mm Filter	01-JUN-21 00:00
571108001	SAMPLE	JXC9	PIC4A	MAR-04-22 10:39:22	DONE	25mm Filter	01-JUN-21 00:00
571233001	SAMPLE	JXC9	PIC4B	MAR-04-22 10:39:26	DONE	25mm Filter	01-JUN-21 00:00
571237001	SAMPLE	JXC9	PIC4C	MAR-04-22 10:39:31	DONE	25mm Filter	01-JUN-21 00:00

# Lucas Cell Raw Data

# Batch 2233667 Check-list

This check-list was completed on 03-MAR-22 by Lyndsey Pace

This batch was reviewed by Elizabeth Krouse on 03-MAR-22 and Lyndsey Pace on 03-MAR-22.

**Batch ID:**  
2233667

**Product:**  
LUC26RAL

**Description:** Lucas Cell Radium 226  
GL-RAD-A-008

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?		No	
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
11	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
12	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
13	Has the method required detection limit been met?	Yes		
<b>Miscellaneous Information</b>				
14	Are sample-specific MDA/MDC calculated and reported?	Yes		



# Prep Logbook

## Radium-226 in Liquid

**Batch ID:** 2233667

**Analyst:** Lyndsey Pace (LXP1)

**Method:** EPA 903.1 Modified

**Lab SOP:** GL-RAD-A-008 REV# 15

**Instrument:** LUCAS-C037036045

**Due Dates for Lab:** 07-MAR-2022

**Package:** 21-MAR-2022

**SDG:** 09-MAR-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205027582	Radium-226 SPIKE	1715-G	.1	mL
LCSD	1205027583	Radium-226 SPIKE	1715-G	.1	mL
MS	1205027581	Radium-226 SPIKE	1715-G	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	570956001	27-FEB-2022	1	500.81	500.81	02/27/22 10:12	505	03/03/22 06:23	03/03/22 09:39	1	13
2	571098001	27-FEB-2022	1	500.39	500.39	02/27/22 10:12	608	03/03/22 06:23	03/03/22 09:39	4	27
3	571098002	27-FEB-2022	1	503.14	503.14	02/27/22 10:12	708	03/03/22 06:23	03/03/22 09:39	1	23
4	571098003	27-FEB-2022	1	504.03	504.03	02/27/22 10:12	805	03/03/22 06:23	03/03/22 09:39	5	19
5	571098004	27-FEB-2022	1	508.44	508.44	02/27/22 10:12	105	03/03/22 06:51	03/03/22 10:12	5	29
6	571098005	27-FEB-2022	1	500.99	500.99	02/27/22 10:12	206	03/03/22 06:51	03/03/22 10:12	3	21
7	571098006	27-FEB-2022	1	502.59	502.59	02/27/22 10:12	403	03/03/22 06:51	03/03/22 10:12	3	6
8	571108001	27-FEB-2022	1	500.98	500.98	02/27/22 10:12	502	03/03/22 06:51	03/03/22 10:12	2	60
9	571233001	27-FEB-2022	1	500.64	500.64	02/27/22 10:12	602	03/03/22 06:51	03/03/22 10:12	6	29
10	571237001	27-FEB-2022	1	501.28	501.28	02/27/22 10:12	703	03/03/22 06:51	03/03/22 10:12	4	17
11	1205027579 MB	27-FEB-2022	1		508.44	02/27/22 10:12	801	03/03/22 06:51	03/03/22 10:12	8	25
12	1205027580 DUP (570956001)	27-FEB-2022	1	502.72	502.72	02/27/22 10:12	102	03/03/22 07:20	03/03/22 10:44	1	9
13	1205027581 MS (570956001)	27-FEB-2022	1	101.34	101.34	02/27/22 10:12	207	03/03/22 07:20	03/03/22 10:44	4	731
14	1205027582 LCS	27-FEB-2022	1		508.44	02/27/22 10:12	408	03/03/22 07:20	03/03/22 10:44	4	553
15	1205027583 LCSD	27-FEB-2022	1		508.44	02/27/22 10:12	507	03/03/22 07:20	03/03/22 10:44	5	778

Reagent/Solvent Lot ID	Description	Amount
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**Comments:**

Data Entry Date2: 27-FEB-2022 00:00

### Radium-226 Liquid

Filename : RA226.XLS  
 File type : Excel  
 Version # : 1.3.2

Procedure Code : LUC26RAL  
 Parmname : Radium-226  
 Required MDA : 1 pCi/L  
 Halflife of Ra-226 : 1600 years  
 Ra-226 Abundance : 1.00  
 Halflife of Rn-222 : 3.8235 days

Batch : 2233667  
 Analyst : LIN01615  
 Prep Date : 2/27/2022  
 Ra-226 Method Uncertainty : 0.073648

Batch counted on : LUCAS CELL DETECTOR  
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Count Time (min.)	Cell Efficiency (cpm/dpm)
1	570956001.1	0.5008	2.0259E-05	2/17/2022 10:10	505	30	13	0.433	1	0.033	30	1.6950
2	571098001.1	0.5004	2.0257E-05	2/17/2022 14:10	608	30	27	0.900	4	0.133	30	1.7270
3	571098002.1	0.5031	2.0269E-05	2/17/2022 12:44	708	30	23	0.767	1	0.033	30	1.5950
4	571098003.1	0.5040	2.0272E-05	2/17/2022 10:56	805	30	19	0.633	5	0.167	30	1.6030
5	571098004.1	0.5084	2.0290E-05	2/17/2022 9:12	105	30	29	0.967	5	0.167	30	1.6180
6	571098005.1	0.5010	2.0260E-05	2/17/2022 10:56	206	30	21	0.700	3	0.100	30	1.6770
7	571098006.1	0.5026	2.0266E-05	2/17/2022 7:35	403	30	6	0.200	3	0.100	30	1.6200
8	571108001.1	0.5010	2.0260E-05	2/17/2022 9:13	502	30	60	2.000	2	0.067	30	1.8100
9	571233001.1	0.5006	2.0259E-05	2/21/2022 13:45	602	30	29	0.967	6	0.200	30	1.6150
10	571237001.1	0.5013	2.0261E-05	2/21/2022 14:00	703	30	17	0.567	4	0.133	30	1.7360
11	1205027579.1	0.5084	2.0290E-05	2/27/2022 0:00	801	30	25	0.833	8	0.267	30	1.4860
12	1205027580.1	0.5027	2.0267E-05	2/17/2022 10:10	102	30	9	0.300	1	0.033	30	1.5460
13	1205027581.1	0.1013	1.1452E-05	2/17/2022 10:10	207	30	731	24.367	4	0.133	30	1.9320
14	1205027582.1	0.5084	2.0290E-05	2/27/2022 0:00	408	30	553	18.433	4	0.133	30	1.5900
15	1205027583.1	0.5084	2.0290E-05	2/27/2022 0:00	507	30	778	25.933	5	0.167	30	1.8610

Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008  
 Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrowth End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
9.600%	6/1/2021	5/31/2022	2/27/2022 10:12	3/3/2022 6:23	3/3/2022 9:39	0.502	0.976	1.002	1.000
7.400%	7/1/2021	6/30/2022	2/27/2022 10:12	3/3/2022 6:23	3/3/2022 9:39	0.502	0.976	1.002	1.000
2.200%	11/1/2021	10/31/2022	2/27/2022 10:12	3/3/2022 6:23	3/3/2022 9:39	0.502	0.976	1.002	1.000
4.700%	4/1/2021	3/31/2022	2/27/2022 10:12	3/3/2022 6:23	3/3/2022 9:39	0.502	0.976	1.002	1.000
1.700%	5/2/2021	4/30/2022	2/27/2022 10:12	3/3/2022 6:51	3/3/2022 10:12	0.503	0.975	1.002	1.000
5.600%	8/1/2021	7/31/2022	2/27/2022 10:12	3/3/2022 6:51	3/3/2022 10:12	0.503	0.975	1.002	1.000
9.700%	2/1/2022	1/31/2023	2/27/2022 10:12	3/3/2022 6:51	3/3/2022 10:12	0.503	0.975	1.002	1.000
9.900%	6/1/2021	5/31/2022	2/27/2022 10:12	3/3/2022 6:51	3/3/2022 10:12	0.503	0.975	1.002	1.000
3.900%	7/1/2021	6/30/2022	2/27/2022 10:12	3/3/2022 6:51	3/3/2022 10:12	0.503	0.975	1.002	1.000
5.000%	11/1/2021	10/31/2022	2/27/2022 10:12	3/3/2022 6:51	3/3/2022 10:12	0.503	0.975	1.002	1.000
1.000%	4/1/2021	3/31/2022	2/27/2022 10:12	3/3/2022 6:51	3/3/2022 10:12	0.503	0.975	1.002	1.000
2.800%	5/2/2021	4/30/2022	2/27/2022 10:12	3/3/2022 7:20	3/3/2022 10:44	0.505	0.975	1.002	1.000
9.200%	8/1/2021	7/31/2022	2/27/2022 10:12	3/3/2022 7:20	3/3/2022 10:44	0.505	0.975	1.002	1.000
1.200%	2/1/2022	1/31/2023	2/27/2022 10:12	3/3/2022 7:20	3/3/2022 10:44	0.505	0.975	1.002	1.000
3.300%	6/1/2021	5/31/2022	2/27/2022 10:12	3/3/2022 7:20	3/3/2022 10:44	0.505	0.975	1.002	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

**Spike S/N :** 1715-G  
**Spike Exp Date :** 9/15/2022  
**Spike Activity (dpm/ml):** 297.56  
**Spike Volume Added:** 0.10

**LCS S/N :** 1715-G  
**LCS Exp Date :** 9/15/2022  
**LCS Activity (dpm/ml):** 297.56  
**LCS Volume Added:** 0.10

<b>Results</b>																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.1193	0.0842	1	0.2771	<b>0.4346</b>	32.62%	0.4000	0.1247	0.2656	0.2849		SAMPLE				
2	0.2344	0.1655	1	0.4377	<b>0.8182</b>	25.31%	0.7667	0.1856	0.3882	0.4228		SAMPLE				
3	0.1262	0.0891	1	0.2932	<b>0.8428</b>	22.38%	0.7333	0.1633	0.3678	0.3891		SAMPLE				
4	0.2803	0.1979	1	0.5100	<b>0.5327</b>	35.31%	0.4667	0.1633	0.3653	0.3766		SAMPLE				
5	0.2745	0.1938	1	0.4995	<b>0.8943</b>	24.36%	0.8000	0.1944	0.4259	0.4460		SAMPLE				
6	0.2082	0.1470	1	0.4035	<b>0.6567</b>	27.79%	0.6000	0.1633	0.3503	0.3700		SAMPLE				
7	0.2149	0.1517	1	0.4164	<b>0.1129</b>	100.47%	0.1000	0.1000	0.2214	0.2230		SAMPLE				
8	0.1575	0.1112	1	0.3239	<b>1.9607</b>	16.80%	1.9333	0.2625	0.5217	0.7050		SAMPLE				
9	0.3060	0.2160	1	0.5458	<b>0.8720</b>	26.02%	0.7667	0.1972	0.4396	0.4621		SAMPLE				
10	0.2321	0.1639	1	0.4335	<b>0.4579</b>	35.60%	0.4333	0.1528	0.3164	0.3263		SAMPLE				
11	0.3781	0.2670	1	0.6556	<b>0.6897</b>	33.81%	0.5667	0.1915	0.4568	0.4677		MB				
12	0.1295	0.0915	1	0.3009	<b>0.3145</b>	39.63%	0.2667	0.1054	0.2437	0.2485	570956001.1	DUP	32.1%			
13	1.0285	0.7261	1	1.9204	<b>113.4579</b>	9.93%	24.2333	0.9037	8.2928	27.4874	570956001.1	MS			132.2664	85.5%
14	0.2491	0.1759	1	0.4651	<b>20.7500</b>	4.46%	18.3000	0.7867	1.7484	3.5024		LCS			26.3624	78.7%
15	0.2379	0.1680	1	0.4328	<b>24.9619</b>	4.90%	25.7667	0.9327	1.7711	4.3274		LCSD	18.4%		26.3624	94.7%

# **Continuing Calibration Data**



# Ludlum Alpha Scintillation Counter Checks for 03-MAR-2022

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	07:07	1	1.23E+05	123062	0.44		
LUCAS2	EFF	07:05	1	1.33E+05	133190	2.12		
LUCAS4	EFF	07:04	1	1.29E+05	128553	1.93		
LUCAS5	EFF	07:03	1	1.31E+05	131345	1.55		
LUCAS6	EFF	07:01	1	1.31E+05	130717	-0.47		
LUCAS7	EFF	06:58	1	1.35E+05	134536	2.21		
LUCAS8	EFF	06:56	1	1.33E+05	132740	1.35		

**Reviewed by:**

Lyndsey Pace

**Date:** 03-MAR-22

GEL Laboratories LLC

# Runlogs

# Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2233667

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
570956001	SAMPLE	LXP1	LUCAS5	MAR-03-22 09:39:00	DONE	Lucas Cell	01-JUN-21 00:01
571098001	SAMPLE	LXP1	LUCAS6	MAR-03-22 09:39:00	DONE	Lucas Cell	01-JUL-21 00:00
571098002	SAMPLE	LXP1	LUCAS7	MAR-03-22 09:39:00	DONE	Lucas Cell	01-NOV-21 00:00
571098003	SAMPLE	LXP1	LUCAS8	MAR-03-22 09:39:00	DONE	Lucas Cell	01-APR-21 00:01
571098004	SAMPLE	LXP1	LUCAS1	MAR-03-22 10:12:00	DONE	Lucas Cell	02-MAY-21 00:01
571098005	SAMPLE	LXP1	LUCAS2	MAR-03-22 10:12:00	DONE	Lucas Cell	01-AUG-21 00:00
571098006	SAMPLE	LXP1	LUCAS4	MAR-03-22 10:12:00	DONE	Lucas Cell	01-FEB-22 00:00
571108001	SAMPLE	LXP1	LUCAS5	MAR-03-22 10:12:00	DONE	Lucas Cell	01-JUN-21 00:01
571233001	SAMPLE	LXP1	LUCAS6	MAR-03-22 10:12:00	DONE	Lucas Cell	01-JUL-21 00:00
571237001	SAMPLE	LXP1	LUCAS7	MAR-03-22 10:12:00	DONE	Lucas Cell	01-NOV-21 00:00
1205027579	MB	LXP1	LUCAS8	MAR-03-22 10:12:00	DONE	Lucas Cell	01-APR-21 00:01
1205027580	DUP	LXP1	LUCAS1	MAR-03-22 10:44:00	DONE	Lucas Cell	02-MAY-21 00:01
1205027581	MS	LXP1	LUCAS2	MAR-03-22 10:44:00	DONE	Lucas Cell	01-AUG-21 00:00
1205027582	LCS	LXP1	LUCAS4	MAR-03-22 10:44:00	DONE	Lucas Cell	01-FEB-22 00:00
1205027583	LCSD	LXP1	LUCAS5	MAR-03-22 10:44:00	DONE	Lucas Cell	01-JUN-21 00:01





Environmental Laboratory  
1232 Haco Drive  
Lansing  
Michigan, 48910

CHAIN OF CUSTODY

Page 1 of 1

Phone: (517)702-6372

Lab Work Order Number L 202050

Client Name <b>BWL - Erickson Station</b>		Project Name <b>Erickson AM MI New Well 7-10</b>		Requested Analyses						Requested Turn Around		
Client Contact <b>Cheryl Louden</b>		Project Number [none]		Ag: As: B: Ba: Be: Ca: Cd: Cr: Co: Cu: Fe: Hg: Li: Mo: Ni:  TSS	Cl: IC: F-ISE: SO4: TDS	Radium 226 and Radium 228					Rush requests subject to additional charge.	
Address <b>3725 S. Canal</b>		Project Description									Rush requests subject to lab approval.	
City <b>Lansing</b>		PO Number <b>30926 10021</b>										
State/Zip <b>MI, 48917</b>		Shipped By										
Phone <b>(517) 702-6396</b>	Fax <b>(517) 702-6373</b>	Tracking Number										
Sampler <b>Marc Wahrer</b>												

Sample Name or Field ID	Sampled Date	Sampled Time	Sample Type Grab/Composite	Matrix Code	Container Count	Preservation Code				Sample	Comments
						b	a	a	b		
MW-7	2/17/22	1410	G	GW	5	1	1	1	2		
MW-8	↓	1244	G	GW	5	1	1	1	2		
MW-9		1056	G	GW	5	1	1	1	2		
MW-10		0912	G	GW	5	1	1	1	2		
Field Duplicate		1056	G	GW	5	1	1	1	2		
Field Blank		0735	G	DI	5	1	1	1	2		

Relinquished By 	Date/Time 02/17/22 1600	Received By J Caporale	Date/Time 02/18/22 0824	
Relinquished By	Date/Time	Received By	Date/Time	Comments
Relinquished By	Date/Time	Received By	Date/Time	
Cooler Numbers and Temperatures				

Matrix Codes: DI=Deionized Water, GW=Ground Water      Preserv Codes: a=None, b=0.5% HNO3

### Data Validation Checklist

Site Name: Erickson Personnel: M. Wahrer

Sample Date(s): 2/17/2022 Lab Drop-off Date(s): 2/18/2022

Lab Report Number: S33012.01(02)

Lab Report Date: 3/21/2022

Reason for Sample Event: Assessment Monitoring - Wells 7-10

**Field Records:** Circle Yes/No unless Not Applicable – *Complete during sample event*

Item Description	Verification (Completeness)	Validation (Conformance to Specifications)
Field equipment calibration records	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Chain-of-Custody forms	<input checked="" type="radio"/> Yes / No	N/A
Field decontamination documentation	N/A	N/A
Sample collection field forms	<input checked="" type="radio"/> Yes / No	N/A
Drilling logs	<input checked="" type="radio"/> Yes / No	N/A
Well construction logs	<input checked="" type="radio"/> Yes / No	N/A
Well development field forms	<input checked="" type="radio"/> Yes / No	N/A

**Analytical Data Package:** Circle Yes/No unless N/A – *Complete when lab report is received*

Item Description	Verification (Completeness)	Validation (Conformance to Specifications)
Cover sheet (laboratory identifying information)	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Case narrative	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Internal laboratory Chain-of-Custody forms	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Sample chronology and consistency (that is, dates and times of receipt, preparation, and analysis)	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Communication records with laboratory	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
EDD format consistency	<input checked="" type="radio"/> Yes / No	N/A
Sample identification, results nomenclature, and data qualifier consistency	<input checked="" type="radio"/> Yes / No	N/A
RLs as requested; MDLs < RLs	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Instrument calibration records	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Laboratory Report	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Field QC sample results and calculation of accuracy and precision	<input checked="" type="radio"/> Yes / No Duplicate Well ID: MW-9	Yes / <input checked="" type="radio"/> No Duplicate RPD: 0-1% except Rad-226/228 at 24%

**Corrections Needed:** None; according to the Technical Case Narrative by GEL Laboratories, subcontracted laboratory for radium analysis, “[a]ll sample data provided in [the] report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

The [method] blank result (See Below) is greater than the MDC but less than the required detection limit.”

Sample	Analyte	Value
1205027604 (MB)	Radium-228	Result: 0.650 pCi/L > MDA: 0.650 pCi/L <= RDL: 3.00 pCi/L
1205027579 (MB)	Radium-226	Result: 0.690 pCi/L > MDA: 0.656 pCi/L <= RDL: 1.00 pCi/L

Sample	Parameter	Result	Uncertainty	MDC	Lab Qualifier	Validated Qualifier
MW-9	Rad-226	0.533	+/-0.365	0.510		
	Rad-228	0.0438	+/-0.873	1.64	U	J-
	Rad-226/228	0.576	+/-0.946			J-
MW-9-Dup	Rad-226	0.657	+/-0.403	0.403		
	Rad-228	0.283	+/-0.875	1.58	U	J+
	Rad-226/228	0.940	+/-0.943			J+

*U - Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.*

Since the laboratory processes indicated no issues with the analytical procedures, no corrective action was necessary. Since the RPD was above the 20% control limit, Rad-228 and Rad-226/228 in MW-9 have been qualified as estimated with potential for low bias (J-) and those in MW-9-Dup have been qualified as estimated with potential for high bias (J+). However, detection of Rad-226 in the method blank removes the bias from the qualification of MW-9, so Rad-226 and Rad-226/228 have been qualified as estimated (J).

TSS for MW-7 was reported at a value between the MDL and RL. This result has been qualified as not detected above the RL (U).



Lansing Board of Water and Light  
Environmental Services Laboratory (MI00079)  
1232 Haco Dr.  
Lansing, Michigan 48901

11 April 2022

BWL - Erickson Station  
Attn: Cheryl Loudon  
3725 S. Canal  
Lansing, MI 48917

**Project: Erickson AM MI**

Dear Cheryl Loudon,

Enclosed is a copy of the laboratory report for the following work order(s) received by Lansing Board of Water and Light Environmental Services Laboratory:

<b>Work Order</b>	<b>Received</b>	<b>Account Number</b>
L202073	2/23/2022 4:05:00PM	30926 10021

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in blue ink that reads "Jennifer Caporale".

Jennifer Caporale, Supervisor



**Analytical Report**

**Client:** BWL - Erickson Station  
**Address:** 3725 S. Canal  
 Lansing MI, 48917

**Client Project Manager:** Cheryl Louden

**Report Date:** 04/11/2022

**Sample Name:** MW-11

**Lab #:** L202073-01 Ground Water

**Collected:** 23-Feb-22 12:22

**By:** Marc Wahrer

Analyte	Reporting			Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit	Units						
Conductivity	1100	1.0	uS/cm	1		23-Feb-22 12:22	maw	SM 2510B	
Dissolved oxygen	ND	0.100	mg/L	1		23-Feb-22 12:22	maw	FIELD	
Milliliters Purged	250		ml/min	1		23-Feb-22 12:22	maw	FIELD	
Oxidation Reduction Potential	-88.90	-999.0	mV	1		23-Feb-22 12:22	maw	FIELD	
pH	6.8	7.0	pH Units	1		23-Feb-22 12:22	maw	SM 4500H+B	
Temperature	9.5		°C	1		23-Feb-22 12:22	maw	SM 2550B	
Turbidity	9.6	0.10	NTU	1		23-Feb-22 12:22	maw	SM 2130B	

**Sample Name:** MW-12

**Lab #:** L202073-02 Ground Water

**Collected:** 23-Feb-22 09:50

**By:** Marc Wahrer

Analyte	Reporting			Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit	Units						
Conductivity	750	1.0	uS/cm	1		23-Feb-22 09:50	maw	SM 2510B	
Dissolved oxygen	5.45	0.100	mg/L	1		23-Feb-22 09:50	maw	FIELD	
Milliliters Purged	270		ml/min	1		23-Feb-22 09:50	maw	FIELD	
Oxidation Reduction Potential	-113.5	-999.0	mV	1		23-Feb-22 09:50	maw	FIELD	
pH	7.2	7.0	pH Units	1		23-Feb-22 09:50	maw	SM 4500H+B	
Temperature	8.4		°C	1		23-Feb-22 09:50	maw	SM 2550B	
Turbidity	65	0.10	NTU	1		23-Feb-22 09:50	maw	SM 2130B	

**Sample Name:** MW-13

**Lab #:** L202073-03 Ground Water

**Collected:** 23-Feb-22 14:44

**By:** Marc Wahrer

Analyte	Reporting			Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit	Units						
Conductivity	780	1.0	uS/cm	1		23-Feb-22 14:44	maw	SM 2510B	
Dissolved oxygen	1.31	0.100	mg/L	1		23-Feb-22 14:44	maw	FIELD	
Milliliters Purged	280		ml/min	1		23-Feb-22 14:44	maw	FIELD	
Oxidation Reduction Potential	163.0	-999.0	mV	1		23-Feb-22 14:44	maw	FIELD	
pH	6.9	7.0	pH Units	1		23-Feb-22 14:44	maw	SM 4500H+B	
Temperature	5.8		°C	1		23-Feb-22 14:44	maw	SM 2550B	
Turbidity	7.1	0.10	NTU	1		23-Feb-22 14:44	maw	SM 2130B	



## Analytical Report

**Client:** BWL - Erickson Station

**Client Project Manager:** Cheryl Louden

**Report Date:** 04/11/2022

**Address:** 3725 S. Canal  
Lansing MI, 48917

**Approved By:** \_\_\_\_\_

### Notes and Definitions

- AL Action Level (Action Level = Regulatory Limit)
  - MCL Maximum Contaminant Level
  - PEL Permissible Exposure Limit (Permissible Exposure Limit = Regulatory Limit)
  - RPD Relative Percent Difference
  - OT Odor Threshold
  - ND Non Detect is less than the reporting limit value
- All drinking water regulatory limits are MCL's with the exception of Lead and Copper unless otherwise noted.



Report ID: S33210.01(02)  
Generated on 03/30/2022  
Replaces report S33210.01(01) generated on 02/28/2022

**Report to**  
Attention: Jennifer Caporale  
Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901  
  
Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

**Report produced by**  
Merit Laboratories, Inc.  
2680 East Lansing Drive  
East Lansing, MI 48823  
  
Phone: (517) 332-0167 FAX: (517) 332-6333  
  
Contacts for report questions:  
John Lavery (johnlavery@meritlabs.com)  
Barbara Ball (bball@meritlabs.com)

**Report Summary**  
Lab Sample ID(s): S33210.01-S33210.05  
Project: Erickson AM MI New Wells 11-13  
Collected Date(s): 02/23/2022  
Submitted Date/Time: 02/24/2022 08:15  
Sampled by: Marc Wahrer  
P.O. #:

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Maya Murshak  
Technical Director



## General Report Notes

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Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (\*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

## Report Narrative

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All analyses completed





Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Alaska CSLAP	#17-001
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



## Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007



## Sample Summary (5 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S33210.01	MW-11 L202073-01	Groundwater	02/23/22 12:22
S33210.02	MW-12 L202073-02	Groundwater	02/23/22 09:50
S33210.03	MW-13 L202073-03	Groundwater	02/23/22 14:44
S33210.04	Field Dupe MW-11 L202073-04	Groundwater	02/23/22 12:22
S33210.05	Field Blank L202073-05	Water	02/23/22 09:30



# Analytical Laboratory Report

Lab Sample ID: S33210.01

Sample Tag: MW-11 L202073-01

Collected Date/Time: 02/23/2022 12:22

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	3.0	IR
2	1L Plastic	None	Yes	3.0	IR
1	125ml Plastic	HNO3	Yes	3.0	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	02/25/22 11:00	JRH	
Metal Digestion	Completed	SW3015A	02/24/22 11:00	CCM	

### Inorganics

Method: E300.0, Run Date: 02/25/22 06:51, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	67	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2540C, Run Date: 02/24/22 19:46, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	632	20	2	mg/L	2		

Method: SM2540D, Run Date: 02/25/22 13:03, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	48	3	1	mg/L	2		

### Metals

Method: E200.8, Run Date: 02/24/22 15:39, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	136	0.50	0.0435	mg/L	5	7440-70-2	

Method: E200.8, Run Date: 02/24/22 13:10, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.018	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.147	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.22	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	22.2	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S33210.01 (continued)

Sample Tag: MW-11 L202073-01

Method: E200.8, Run Date: 02/24/22 13:10, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E245.1, Run Date: 02/24/22 16:55, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 03/30/22 15:24, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Final Report

Lab Sample ID: S33210.02

Sample Tag: MW-12 L202073-02

Collected Date/Time: 02/23/2022 09:50

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	3.0	IR
2	1L Plastic	None	Yes	3.0	IR
1	125ml Plastic	HNO3	Yes	3.0	IR
1	500ml Plastic	None	Yes	3.0	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	02/24/22 11:15	JRH	
Mercury Digestion	Completed	E245.1	02/25/22 11:00	JRH	
Metal Digestion	Completed	SW3015A	02/24/22 11:00	CCM	
Metal Digestion	Completed	SW3015A	02/28/22 10:45	CCM	

### Inorganics

Method: E300.0, Run Date: 02/25/22 07:04, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	

Method: E300.0, Run Date: 02/25/22 09:15, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	90	25	0.40	mg/L	25	16887-00-6	
Sulfate	344	25	1.5	mg/L	25	14808-79-8	

Method: SM2540C, Run Date: 02/24/22 19:46, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	1,090	20	2	mg/L	2		

Method: SM2540D, Run Date: 02/25/22 13:03, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	24	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 02/28/22 15:54, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium, Dissolved*	188	0.50		mg/L	5	7440-70-2	f

Method: E200.8, Run Date: 02/24/22 15:41, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	185	0.50	0.0435	mg/L	5	7440-70-2	

Method: E200.8, Run Date: 02/24/22 12:52, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.069	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	

f-Filtered and preserved in lab



# Analytical Laboratory Report

Lab Sample ID: S33210.02 (continued)

Sample Tag: MW-12 L202073-02

**Method: E200.8, Run Date: 02/24/22 12:52, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Boron	0.05	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	3.83	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.020	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.013	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	0.021	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 02/28/22 12:44, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony, Dissolved	Not detected	0.005	0.00255	mg/L	5	7440-36-0	f
Arsenic, Dissolved	Not detected	0.002	0.000255	mg/L	5	7440-38-2	f
Barium, Dissolved	0.059	0.005	0.000162	mg/L	5	7440-39-3	f
Beryllium, Dissolved	Not detected	0.001	0.000215	mg/L	5	7440-41-7	f
Boron, Dissolved	0.05	0.04	0.00175	mg/L	5	7440-42-8	f
Cadmium, Dissolved	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	f
Chromium, Dissolved	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	f
Cobalt, Dissolved	Not detected	0.005	0.000108	mg/L	5	7440-48-4	f
Copper, Dissolved	Not detected	0.005	0.000377	mg/L	5	7440-50-8	f
Iron, Dissolved	Not detected	0.02	0.00192	mg/L	5	7439-89-6	f
Lead, Dissolved	Not detected	0.003	0.000190	mg/L	5	7439-92-1	f
Lithium, Dissolved*	0.018	0.005	0.00163	mg/L	5	7439-93-2	f
Molybdenum, Dissolved	0.011	0.005	0.000217	mg/L	5	7439-98-7	f
Nickel, Dissolved	0.020	0.005	0.000250	mg/L	5	7440-02-0	f
Selenium, Dissolved	Not detected	0.005	0.00209	mg/L	5	7782-49-2	f
Silver, Dissolved	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	f
Thallium, Dissolved	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	f
Vanadium, Dissolved	Not detected	0.005	0.000139	mg/L	5	7440-62-2	f
Zinc, Dissolved	0.008	0.005	0.000730	mg/L	5	7440-66-6	f

**Method: E245.1, Run Date: 02/25/22 14:29, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury, Dissolved	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	f

**Method: E245.1, Run Date: 02/24/22 16:58, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

f-Filtered and preserved in lab



# Analytical Laboratory Report

Final Report

Lab Sample ID: S33210.02 (continued)

Sample Tag: MW-12 L202073-02

**Other / Misc.**

**Method: , Run Date: 03/30/22 15:24, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.





# Analytical Laboratory Report

Final Report

Lab Sample ID: S33210.03

Sample Tag: MW-13 L202073-03

Collected Date/Time: 02/23/2022 14:44

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	3.0	IR
2	1L Plastic	None	Yes	3.0	IR
1	125ml Plastic	HNO3	Yes	3.0	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	02/24/22 11:15	JRH	
Metal Digestion	Completed	SW3015A	02/24/22 11:00	CCM	

### Inorganics

Method: E300.0, Run Date: 02/25/22 07:17, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	32	5	0.30	mg/L	5	14808-79-8	

Method: SM2540C, Run Date: 02/24/22 19:46, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	478	20	2	mg/L	2		

Method: SM2540D, Run Date: 02/25/22 13:03, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 02/24/22 15:43, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	138	0.50	0.0435	mg/L	5	7440-70-2	

Method: E200.8, Run Date: 02/24/22 13:04, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.030	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.16	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.04	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S33210.03 (continued)

Sample Tag: MW-13 L202073-03

Method: E200.8, Run Date: 02/24/22 13:04, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E245.1, Run Date: 02/25/22 14:33, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 03/30/22 15:24, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

**Lab Sample ID: S33210.04**

Sample Tag: Field Dupe MW-11 L202073-04

Collected Date/Time: 02/23/2022 12:22

Matrix: Groundwater

COC Reference:

## Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	3.0	IR
2	1L Plastic	None	Yes	3.0	IR
1	125ml Plastic	HNO3	Yes	3.0	IR

**Extraction / Prep.**

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	02/24/22 11:15	JRH	
Metal Digestion	Completed	SW3015A	02/24/22 11:00	CCM	

**Inorganics****Method: E300.0, Run Date: 02/25/22 07:30, Analyst: JDP**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	67	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

**Method: SM2540C, Run Date: 02/24/22 19:46, Analyst: SSM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	532	20	2	mg/L	2		

**Method: SM2540D, Run Date: 02/25/22 13:03, Analyst: SSM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	41	3	1	mg/L	1.333		

**Metals****Method: E200.8, Run Date: 02/24/22 15:44, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	130	0.50	0.0435	mg/L	5	7440-70-2	

**Method: E200.8, Run Date: 02/24/22 13:07, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.018	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.146	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.22	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	22.0	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S33210.04 (continued)

Sample Tag: Field Dupe MW-11 L202073-04

Method: E200.8, Run Date: 02/24/22 13:07, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E245.1, Run Date: 02/24/22 17:14, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

Method: , Run Date: 03/30/22 15:24, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Final Report

Lab Sample ID: S33210.05

Sample Tag: Field Blank L202073-05

Collected Date/Time: 02/23/2022 09:30

Matrix: Water

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	3.0	IR
2	1L Plastic	None	Yes	3.0	IR
1	125ml Plastic	HNO3	Yes	3.0	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	02/24/22 11:15	JRH	
Metal Digestion	Completed	SW3015A	02/24/22 11:00	CCM	

### Inorganics

Method: E300.0, Run Date: 02/25/22 07:43, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	2.5	0.04	mg/L	2.5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.06	mg/L	2.5	16984-48-8	
Sulfate	Not detected	2.5	0.15	mg/L	2.5	14808-79-8	

Method: SM2540C, Run Date: 02/24/22 19:46, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	4	20	2	mg/L	2		b

Method: SM2540D, Run Date: 02/25/22 13:03, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 02/24/22 15:46, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.0174	mg/L	2	7440-70-2	

Method: E200.8, Run Date: 02/24/22 12:59, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony	Not detected	0.005	0.00102	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.000102	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.0000648	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.0000862	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.000702	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.0000760	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.0000386	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.0000434	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000150	mg/L	2	7440-50-8	
Iron	Not detected	0.02	0.000768	mg/L	2	7439-89-6	
Lead	Not detected	0.003	0.0000760	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000654	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.0000868	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000100	mg/L	2	7440-02-0	

b-Value detected less than reporting limit, but greater than MDL



# Analytical Laboratory Report

Final Report

Lab Sample ID: S33210.05 (continued)

Sample Tag: Field Blank L202073-05

**Method: E200.8, Run Date: 02/24/22 12:59, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Selenium	Not detected	0.005	0.000838	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.0000270	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.0000342	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.0000558	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.000292	mg/L	2	7440-66-6	

**Method: E245.1, Run Date: 02/24/22 17:18, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 03/30/22 15:24, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

# Merit Laboratories Login Checklist

Lab Set ID:S33210

Client:BWL01 (Board of Water & Light)

Project: Erickson AM MI New Wells 11-13

Submitted:02/24/2022 08:15 Login User: PFD

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental\_Laboratory@LBWL.com

Selection	Description	Note
<b>Sample Receiving</b>		
01.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples are received at 4C +/- 2C Thermometer # IR 3.0
02.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Received on ice/ cooling process begun
03.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples shipped
04.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples left in 24 hr. drop box
05.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Are there custody seals/tape or is the drop box locked
<b>Chain of Custody</b>		
06.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC adequately filled out
07.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC signed and relinquished to the lab
08.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sample tag on bottles match COC
09.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Subcontracting needed? Subcontracted to: GEL; 1Z4664770363321361
<b>Preservation</b>		
10.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Do sample have correct chemical preservation
11.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Completed pH checks on preserved samples? (no VOAs)
12.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Did any samples need to be preserved in the lab? Dissolved Metals
<b>Bottle Conditions</b>		
13.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	All bottles intact
14.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Appropriate analytical bottles are used
15.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Merit bottles used
16.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sufficient sample volume received
17.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples require laboratory filtration Dissolved Metals
18.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples submitted within holding time
19.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Do water VOC or TOX bottles contain headspace

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: \_\_\_\_\_ Date: \_\_\_\_\_

# Merit Laboratories Bottle Preservation Check

Lab Set ID: S33210 Submitted: 02/24/2022 08:15

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI New Wells 11-13

Attention: Jennifer Caporale  
Address: Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901

Initial Preservation Check: 02/24/2022 09:01 PFD

Preservation Recheck (E200.8): N/A

Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S33210.01	125ml Plastic HNO3	<2			
S33210.01	1L Plastic HNO3	<2			
S33210.01	1L Plastic HNO3	<2			
S33210.02	125ml Plastic HNO3	<2			
S33210.02	1L Plastic HNO3	<2			
S33210.02	1L Plastic HNO3	<2			
S33210.03	125ml Plastic HNO3	<2			
S33210.03	1L Plastic HNO3	<2			
S33210.03	1L Plastic HNO3	<2			
S33210.04	125ml Plastic HNO3	<2			
S33210.04	1L Plastic HNO3	<2			
S33210.04	1L Plastic HNO3	<2			
S33210.05	125ml Plastic HNO3	<2			
S33210.05	1L Plastic HNO3	<2			
S33210.05	1L Plastic HNO3	<2			





2680 East Lansing Dr., East Lansing, MI 48823  
 Phone (517) 332-0167 Fax (517) 332-4034  
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

**REPORT TO**

**CHAIN OF CUSTODY RECORD**

**INVOICE TO**

CONTACT NAME **Jennifer Caporale**  
 COMPANY **Lansing Board of Water and Light**  
 ADDRESS **PO Box 13007 48901-3007**  
 CITY **Lansing** STATE **Mi** ZIP CODE **48901**  
 PHONE NO. **517-702-6372** FAX NO. \_\_\_\_\_ P.O. NO. \_\_\_\_\_  
 E-MAIL ADDRESS **Environmental\_Laboratory@lbwl.com** QUOTE NO. \_\_\_\_\_

CONTACT NAME **Kelly Gleason**  SAME  
 COMPANY \_\_\_\_\_  
 ADDRESS \_\_\_\_\_  
 CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP CODE \_\_\_\_\_  
 PHONE NO. \_\_\_\_\_ E-MAIL ADDRESS **Kelly.Gleason@lbwl.com**

**ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)**

PROJECT NO./NAME **Erickson AM MI Wells 11-13** SAMPLER(S) - PLEASE PRINT/SIGN NAME **Marc Wahrer**  
 TURNAROUND TIME REQUIRED  1 DAY  2 DAYS  3 DAYS  STANDARD  OTHER **ASAP**  
 DELIVERABLES REQUIRED  STD  LEVEL II  LEVEL III  LEVEL IV  EDD  OTHER \_\_\_\_\_

MATRIX GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID  
 CODE: SL=SLUDGE DW=DRINKING WATER O=OIL WP=WPE A=AIR W=WASTE

# Containers & Preservatives

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO <sub>3</sub>	H <sub>2</sub> SO <sub>4</sub>	NaOH	MHOH	OTHER	Total Metals	F- undistilled, Cl-, SO <sub>4</sub> , TDS	Radium 226	Radium 228	TSS	Dissolved Metals						Certifications	
	DATE	TIME																						<input type="checkbox"/> OHIO VAP	<input type="checkbox"/> Drinking Water
33210.01	02/23/22	1222	MW-11 L202073-01	GW	5	3		2					✓	✓	✓	✓	✓							<input type="checkbox"/> DoD	<input checked="" type="checkbox"/> NPDES
.02	↓	0950	MW-12 -02	GW	5	3		2					✓	✓	✓	✓	✓	✓						<input type="checkbox"/> Detroit	<input type="checkbox"/> New York
.03	↓	1444	MW-13 -03	GW	5	3		2					✓	✓	✓	✓	✓							<input type="checkbox"/> Other	
.04	↓	1222	Field Dupe MW- 11 -04	GW	5	3		2					✓	✓	✓	✓	✓							Special Instructions	
.05	↓	0930	Field Blank -05	DI	5	3		2					✓	✓	✓	✓	✓							Metals to analyse:	
																								B, Ca, Sb, As, Ba, Be, Cd, Cr,	
																								Co, Li, Hg, Mo, Pb, Se, Tl,	
																								Fe, Cu, Ni, Ag, V, Zn	
																								Please send a preliminary report	
																								(dissolved metals are the same as total) JSC 02/23/22	

RELINQUISHED BY: \_\_\_\_\_  Sampler DATE **2-24-22** TIME **0736**  
 RECEIVED BY: \_\_\_\_\_ DATE \_\_\_\_\_ TIME \_\_\_\_\_  
 SIGNATURE/ORGANIZATION \_\_\_\_\_

RELINQUISHED BY: \_\_\_\_\_ DATE **2/24/22** TIME **0815**  
 RECEIVED BY: **Merit Drop Box** DATE **2/24/22** TIME **0815**  
 SIGNATURE/ORGANIZATION **Patricia Gleason**

SEAL NO. \_\_\_\_\_ SEAL INTACT YES  NO  INITIALS \_\_\_\_\_  
 SEAL NO. \_\_\_\_\_ SEAL INTACT YES  NO  INITIALS \_\_\_\_\_

NOTES: TEMP. ON ARRIVAL **3.0**

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

→ JSC 02/23/22

## Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.150
Be, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	2.5
Cl	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cr, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Fluoride	250 mL plastic	mg/L	None	9056	28 d	1.0
F	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Fe, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Pb, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Li, total	Mercury	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Hg, total	Molybdenum	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Mo, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	HNO3	SM 7500	6 mos	2.0 combined
RA226/228	Selenium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Se, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ag, total	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	10
SO4	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Tl, total	Total Dissolved Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TDS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540D	NA	3
TSS	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
V, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Zn, total							

March 24, 2022

John Laverty  
Merit Laboratories Inc.  
2680 East Lansing Drive  
East Lansing, Michigan 48823

Re: Routine Analysis  
Work Order: 571888  
SDG: S33210

Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on March 02, 2022. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at [www.gel.com](http://www.gel.com).

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 4523.

Sincerely,



Samuel Hogan  
Project Manager

Purchase Order: GELP20-0018  
Enclosures



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# Case Narrative

**Receipt Narrative  
for  
Merit Laboratories, Inc.  
SDG: S33210  
Work Order: 571888**

**March 24, 2022**

**Laboratory Identification:**

GEL Laboratories LLC  
2040 Savage Road  
Charleston, South Carolina 29407  
(843) 556-8171

**Summary:**

**Sample receipt:** The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on March 02, 2022 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

**Sample Identification:** The laboratory received the following samples:

<b><u>Laboratory ID</u></b>	<b><u>Client ID</u></b>
571888001	S33210.01
571888002	S33210.02
571888003	S33210.03
571888004	S33210.04 (Field Dupe)
571888005	S33210.05 (Field Blank)

**Case Narrative:**

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.

A handwritten signature in black ink, appearing to read "Sam Hogan". The signature is written in a cursive, somewhat stylized font.

Samuel Hogan  
Project Manager

# **Chain of Custody and Supporting Documentation**





2680 East Lansing Dr., East Lansing, MI 48823  
Phone (517) 332-0167 Fax (517) 332-4034  
www.meritlabs.com

C.O.C. PAGE # 1 OF 1

571888

# REPORT TO

CONTACT NAME Project Management Team  
COMPANY Merit Laboratories  
ADDRESS 2680 East Lansing Drive  
CITY East Lansing  
PHONE NO. 517-332-0167 STATE MI ZIP CODE 48823  
E-MAIL ADDRESS results@meritlabs.com

# CHAIN OF CUSTODY RECORD

CONTACT NAME Julie Teague  
COMPANY Merit Laboratories  
ADDRESS 2680 East Lansing Drive  
CITY East Lansing  
PHONE NO. 517-332-0167 STATE MI ZIP CODE 48823  
E-MAIL ADDRESS juliet@meritlabs.com

# INVOICE TO

CONTACT NAME Project Management Team  
COMPANY Merit Laboratories  
ADDRESS 2680 East Lansing Drive  
CITY East Lansing  
PHONE NO. 517-332-0167 STATE MI ZIP CODE 48823  
E-MAIL ADDRESS results@meritlabs.com

PROJECT NO./NAME S33210 ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)  
SAMPLER(S) - PLEASE PRINT/SIGN NAME

TURNAROUND TIME REQUIRED  1 DAY  2 DAYS  3 DAYS  OTHER  
DELIVERABLES REQUIRED  STD  LEVEL I  LEVEL II  LEVEL III  LEVEL IV  EDD  OTHER

MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID W=WASTE  
SL=SLUDGE DW=DRINKING WATER O=OIL WP=WPIPE A=AIR

MERIT LAB NO. FOR LAB USE ONLY	YEAR		IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	# Containers & Preservatives														
	DATE	TIME				H <sub>2</sub> O	H <sub>2</sub> O <sub>2</sub>	H <sub>2</sub> SO <sub>4</sub>	NaOH	MeOH	OTHER									
	2/23/22	1222	S33210.01	GW	2															
	2/23/22	0950	S33210.02	GW	2															
	2/23/22	1444	S33210.03	GW	2															
	2/23/22	1222	S33210.04 (Field Dupe)	GW	2															
	2/23/22	0930	S33210.05 (Field Blank)	Wa	2															

Certifications  
 OHIO VAP  Drinking Water  
 DoD  NPDES  
Project Locations  
 Detroit  New York  
 Other \_\_\_\_\_  
Special Instructions  
\* E903.1 Mod.  
\*\* E904.0/SW 9320 Mod.

Please use calculation product & provide Radium 226/228 combined results on the report  
(No Ice needed)  
\*\* Subcontracted to  
GEL Laboratories, Inc.  
2040 Savage Road  
Charleston, SC 29407

RELINQUISHED BY:		DATE	TIME
SIGNATURE/Organization		2/25/22	1700
RECEIVED BY:		DATE	TIME
SIGNATURE/Organization		2/25/22	1700
RELINQUISHED BY:		DATE	TIME
SIGNATURE/Organization		3-2-22	1225

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

SAMPLE RECEIPT & REVIEW FORM

Client: <u>MERI</u>		SDG/AR/COC/Work Order: <u>571888</u>	
Received By: <u>DC</u>		Date Received: <u>3-2-22</u>	
Carrier and Tracking Number		FedEx Express   FedEx Ground <u>UPS</u> Field Services   Courier   Other <u>1Z 4600 47703 6332 1301</u>	
Suspected Hazard Information		Yes	No
*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.			
A) Shipped as a DOT Hazardous?		<input checked="" type="checkbox"/>	Hazard Class Shipped: _____ UN#: _____ If UN2910, Is the Radioactive Shipment Survey Compliant? Yes ___ No ___
B) Did the client designate the samples are to be received as radioactive?		<input checked="" type="checkbox"/>	COC notation or radioactive stickers on containers equal client designation.
C) Did the RSO classify the samples as radioactive?		<input checked="" type="checkbox"/>	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): <u>0</u> CPM / mR/Hr Classified as: Rad 1   Rad 2   Rad 3
D) Did the client designate samples are hazardous?		<input checked="" type="checkbox"/>	COC notation or hazard labels on containers equal client designation.
E) Did the RSO identify possible hazards?		<input checked="" type="checkbox"/>	If D or E is yes, select Hazards below. PCB's   Flammable   Foreign Soil   RCRA   Asbestos   Beryllium   Other: _____
Sample Receipt Criteria		Yes	NA
Comments/Qualifiers (Required for Non-Conforming Items)			
1	Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>	Circle Applicable: Seals broken   Damaged container   Leaking container   Other (describe)
2	Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>	Circle Applicable: Client contacted and provided COC <u>COC created upon receipt</u>
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*	<input checked="" type="checkbox"/>	Preservation Method: Wet Ice   Ice Packs   Dry ice <u>None</u> Other: _____ *all temperatures are recorded in Celsius   TEMP: <u>140</u>
4	Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>	Temperature Device Serial #: <u>IR6-21</u> Secondary Temperature Device Serial # (If Applicable): _____
5	Sample containers intact and sealed?	<input checked="" type="checkbox"/>	Circle Applicable: Seals broken   Damaged container   Leaking container   Other (describe)
6	Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>	Sample ID's and Containers Affected: _____ If Preservation added, Lot#: _____
7	Do any samples require Volatile Analysis?	<input checked="" type="checkbox"/>	If Yes, are Encores or Soil Kits present for solids? Yes ___ No ___ NA ___ (If yes, take to VOA Freezer) Do liquid VOA vials contain acid preservation? Yes ___ No ___ NA ___ (If unknown, select No) Are liquid VOA vials free of headspace? Yes ___ No ___ NA ___ Sample ID's and containers affected: _____
8	Samples received within holding time?	<input checked="" type="checkbox"/>	ID's and tests affected: _____
9	Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>	ID's and containers affected: _____
10	Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>	Circle Applicable: No dates on containers   No times on containers   COC missing info   Other (describe)
11	Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>	Circle Applicable: No container count on COC   Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?	<input checked="" type="checkbox"/>	
13	COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>	Circle Applicable: Not relinquished   Other (describe)
Comments (Use Continuation Form if needed):			

PM (or PMA) review: Initials GJS Date 3/3/22 Page 2 of 1

# Laboratory Certifications

**List of current GEL Certifications as of 24 March 2022**

<b>State</b>	<b>Certification</b>
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122021-1
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2019-165
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-21-19
Utah NELAP	SC000122021-36
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

# **Radiological Analysis**

# Case Narrative

**Radiochemistry  
Technical Case Narrative  
Merit Laboratories, Inc.  
SDG #: S33210  
Work Order #: 571888**

**Product:** GFPC Ra228, Liquid

**Analytical Method:** EPA 904.0/SW846 9320 Modified

**Analytical Procedure:** GL-RAD-A-063 REV# 5

**Analytical Batch:** 2236232

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
571888001	S33210.01
571888002	S33210.02
571888003	S33210.03
571888004	S33210.04 (Field Dupe)
571888005	S33210.05 (Field Blank)
1205032355	Method Blank (MB)
1205032356	571804001(NonSDG) Sample Duplicate (DUP)
1205032357	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

**Preparation Information**

**Homogenous Matrix**

Samples were non-homogenous matrix. Samples look yellow.

**Product:** Lucas Cell, Ra226, Liquid

**Analytical Method:** EPA 903.1 Modified

**Analytical Procedure:** GL-RAD-A-008 REV# 15

**Analytical Batch:** 2236224

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
571888001	S33210.01
571888002	S33210.02
571888003	S33210.03
571888004	S33210.04 (Field Dupe)
571888005	S33210.05 (Field Blank)

1205032331	Method Blank (MB)
1205032332	571804001(NonSDG) Sample Duplicate (DUP)
1205032333	571804001(NonSDG) Matrix Spike (MS)
1205032334	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

**Technical Information**

**Recounts**

Sample 1205032331 (MB) was recounted due to a suspected blank false positive. The recount is reported.

Sample 1205032332 (Non SDG 571804001DUP) was recounted due to high relative percent difference/relative error ratio. The recount is reported.

**Miscellaneous Information**

**Additional Comments**

The matrix spike, 1205032333 (Non SDG 571804001MS), aliquot was reduced to conserve sample volume.

**Certification Statement**

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.



## GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

### Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S33210 GEL Work Order: 571888

**The Qualifiers in this report are defined as follows:**

- \* A quality control analyte recovery is outside of specified acceptance criteria
- \*\* Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

**Review/Validation**

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature: 

Name: Kate Gellatly

Date: 25 MAR 2022

Title: Analyst I

# Sample Data Summary

# GEL LABORATORIES LLC

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## Certificate of Analysis

Report Date: March 25, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

Client Sample ID: S33210.01	Project: MERI00120
Sample ID: 571888001	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 23-FEB-22 12:22	
Receive Date: 02-MAR-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	0.000	+/-1.01	1.86	3.00	pCi/L		JXC9	03/23/22	1158	2236232		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		0.273	+/-1.03			pCi/L		NXL1	03/24/22	1401	2236231		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226	U	0.273	+/-0.230	0.299	1.00	pCi/L		LXP1	03/18/22	1007	2236224		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			94.3	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

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## Certificate of Analysis

Report Date: March 25, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Lavery  
 Project: Routine Analysis

Client Sample ID: S33210.02	Project: MERI00120
Sample ID: 571888002	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 23-FEB-22 09:50	
Receive Date: 02-MAR-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	0.948	+/-0.875	1.43	3.00	pCi/L			JXC9	03/23/22	1159	2236232	1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		1.20	+/-0.949			pCi/L			NXL1	03/24/22	1401	2236231	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226	U	0.252	+/-0.368	0.642	1.00	pCi/L			LXP1	03/18/22	1007	2236224	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			95.5	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: March 25, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Lavery  
 Project: Routine Analysis

Client Sample ID: S33210.03	Project: MERI00120
Sample ID: 571888003	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 23-FEB-22 14:44	
Receive Date: 02-MAR-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	-0.842	+/-0.969	1.95	3.00	pCi/L			JXC9	03/23/22	1159	2236232	1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		0.300	+/-1.00			pCi/L			NXL1	03/24/22	1401	2236231	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226	U	0.300	+/-0.255	0.359	1.00	pCi/L			LXP1	03/18/22	1040	2236224	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			96.2	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: March 25, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Lavery  
 Project: Routine Analysis

Client Sample ID: S33210.04 (Field Dupe)	Project: MERI00120
Sample ID: 571888004	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 23-FEB-22 12:22	
Receive Date: 02-MAR-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	0.248	+/-1.19	2.13	3.00	pCi/L			JXC9	03/23/22	1159	2236232	1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		0.720	+/-1.23			pCi/L			NXL1	03/24/22	1401	2236231	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.472	+/-0.326	0.447	1.00	pCi/L			LXP1	03/18/22	1042	2236224	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			96.3	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: March 25, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

---

Client Sample ID: S33210.05 (Field Blank)	Project: MERI00120
Sample ID: 571888005	Client ID: MERI001
Matrix: Water	
Collect Date: 23-FEB-22 09:30	
Receive Date: 02-MAR-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	0.0760	+/-0.627	1.21	3.00	pCi/L			JXC9	03/23/22	1159	2236232	1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		0.504	+/-0.693			pCi/L			NXL1	03/24/22	1401	2236231	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.428	+/-0.296	0.373	1.00	pCi/L			LXP1	03/18/22	1040	2236224	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			89.5	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# Quality Control Summary



# GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

## QC Summary

Report Date: March 25, 2022

Page 1 of 2

Merit Laboratories Inc.  
2680 East Lansing Drive  
East Lansing, Michigan

Contact: John Laverty

Workorder: 571888

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Rad Gas Flow</b>											
Batch	2236232										
QC1205032356	571804001	DUP									
Radium-228	U	0.765	U	1.04	pCi/L	N/A		N/A	JXC9	03/23/22	11:58
	Uncertainty	+/-1.00		+/-0.899							
QC1205032357	LCS										
Radium-228	47.0			43.2	pCi/L		91.9	(75%-125%)		03/23/22	11:58
	Uncertainty			+/-3.12							
QC1205032355	MB										
Radium-228			U	0.381	pCi/L					03/23/22	11:58
	Uncertainty			+/-0.775							
<b>Rad Ra-226</b>											
Batch	2236224										
QC1205032332	571804001	DUP									
Radium-226		0.511		0.603	pCi/L	16.4		(0% - 100%)	LXP1	03/18/22	11:45
	Uncertainty	+/-0.320		+/-0.313							
QC1205032334	LCS										
Radium-226	26.6			29.4	pCi/L		111	(75%-125%)		03/18/22	10:40
	Uncertainty			+/-2.03							
QC1205032331	MB										
Radium-226			U	0.256	pCi/L					03/18/22	11:45
	Uncertainty			+/-0.215							
QC1205032333	571804001	MS									
Radium-226	133	0.511		137	pCi/L		103	(75%-125%)		03/18/22	10:40
	Uncertainty	+/-0.320		+/-9.63							

### Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- \*\* Analyte is a Tracer compound
- < Result is less than value reported
- > Result is greater than value reported
- BD Results are either below the MDC or tracer recovery is low
- FA Failed analysis.
- H Analytical holding time was exceeded

# GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

## QC Summary

Workorder: 571888

Page 2 of 2

Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
J											
J											
K											
L											
M											
M											
N/A											
N1											
ND											
NJ											
Q											
R											
U											
UI											
UJ											
UL											
X											
Y											
^											
h											

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

\* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

# **Gas Flow Raw Data**

# Batch 2236232 Check-list

This check-list was completed on 23-MAR-22 by Nat Long

This batch was reviewed by Kenshalla Oston on 23-MAR-22 and Nat Long on 23-MAR-22.

**Batch ID:**  
2236232

**Product:**  
GFC28RAL

**Description:** Gas Flow Radium 228  
GL-RAD-A-063

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous		No	
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
11	Has the method required detection limit been met?	Yes		
<b>Miscellaneous Information</b>				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

# Prep Logbook

## Radium-228 in Liquid

**Batch ID:** 2236232

**Analyst:** Jasmine Conley (JXC9)  
Prep: Lyndsey Pace (LXP1)

**Method:** EPA 904.0/SW846 9320 Modified

**Lab SOP:** GL-RAD-A-063 REV# 5

**Instrument:** LUCAS-C037036045

**Due Dates for Lab:** 27-MAR-2022

**Package:** 29-MAR-2022

**SDG:** 29-MAR-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205032357	Radium-228	1965-C	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	571804001	14-MAR-2022	3	301.79	301.79	03/21/22 14:00	03/23/22 09:45
2	571804002	14-MAR-2022	3	300.84	300.84	03/21/22 14:00	03/23/22 09:45
3	571804003	14-MAR-2022	3	301.84	301.84	03/21/22 14:00	03/23/22 09:45
4	571804004	14-MAR-2022	3	300.48	300.48	03/21/22 14:00	03/23/22 09:45
5	571804005	14-MAR-2022	3	300.46	300.46	03/21/22 14:00	03/23/22 09:45
6	571804006	14-MAR-2022	3	300.75	300.75	03/21/22 14:00	03/23/22 09:45
7	571804007	14-MAR-2022	3	300.1	300.1	03/21/22 14:00	03/23/22 09:45
8	571804008	14-MAR-2022	3	303.67	303.67	03/21/22 14:00	03/23/22 09:45
9	571888001	14-MAR-2022	3	301.67	301.67	03/21/22 14:00	03/23/22 09:45
10	571888002	14-MAR-2022	3	301.16	301.16	03/21/22 14:00	03/23/22 09:45
11	571888003	14-MAR-2022	3	301.63	301.63	03/21/22 14:00	03/23/22 09:45
12	571888004	14-MAR-2022	3	300.56	300.56	03/21/22 14:00	03/23/22 09:45
13	571888005	14-MAR-2022	3	301.82	301.82	03/21/22 14:00	03/23/22 09:45
14	1205032355 MB	14-MAR-2022	3		303.67	03/21/22 14:00	03/23/22 09:45
15	1205032356 DUP (571804001)	14-MAR-2022	3	301.47	301.47	03/21/22 14:00	03/23/22 09:45
16	1205032357 LCS	14-MAR-2022	3		303.67	03/21/22 14:00	03/23/22 09:45

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1951-C	Barium-133	.1 mL	Pipet Id: RAD-GFC-1795419 Data Entry Date2: 14-MAR-2022 00:00
REGNT 3290227	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3354444	RGF-Neodymium Subtrate	5 mL	
REGNT 3355260.1	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	
REGNT 3371585.12	16M Nitric Acid	5 mL	
REGNT 3391529	RGF-50% Potassium Carbonate	2 mL	
REGNT 3400892	2M HCl	20 mL	
REGNT 3401161.34	Concentrated HF (48-51%)	4 mL	
REGNT 3407156	RGF-1M Citric Acid	5 mL	
REGNT 3407159	RGF-1.5M Ammonium Sulfate	10 mL	
REGNT 3409676	Lot #DGA0029	2 g	
REGNT 3410021	RGF-7M Nitric Acid	25 mL	
REGNT 3411398	Barium Carrier Ra228 REG	1 mL	

### Radium-228 Liquid

Filename : RA228.XLS  
 File type : Excel  
 Version # : 1.4.2

Tracer S/N : 1951-C  
 Tracer Exp Date : 9/16/2022  
 Tracer Volume Added: 0.10

Batch : 2236232  
 Analyst : LIN01615  
 Prep Date : 3/14/2022  
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL  
 Parmname : Radium-228  
 Required MDA : 3 pCi/L  
 Ra-228 Abundance : 1.00  
 Halflife of Ra-228 : 5.75 years  
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	571804001.1	0.3018	1.8489E-05	2/24/2022 10:27	1399.7	1.54%	1311.2	1.59%	0.1	0.000200
2	571804002.1	0.3008	1.8473E-05	2/24/2022 10:33	1399.7	1.54%	1332.8	1.58%	0.1	0.000200
3	571804003.1	0.3018	1.8490E-05	2/24/2022 11:44	1399.7	1.54%	1319.5	1.59%	0.1	0.000200
4	571804004.1	0.3005	1.8467E-05	2/24/2022 11:49	1399.7	1.54%	1235.6	1.64%	0.1	0.000200
5	571804005.1	0.3005	1.8467E-05	2/24/2022 13:37	1399.7	1.54%	1296.2	1.60%	0.1	0.000200
6	571804006.1	0.3008	1.8472E-05	2/24/2022 13:42	1399.7	1.54%	1323.5	1.59%	0.1	0.000200
7	571804007.1	0.3001	1.8461E-05	2/24/2022 14:59	1399.7	1.54%	1371.8	1.56%	0.1	0.000200
8	571804008.1	0.3037	1.8521E-05	2/24/2022 15:04	1399.7	1.54%	1336.6	1.58%	0.1	0.000200
9	571888001.1	0.3017	1.8487E-05	2/23/2022 12:22	1399.7	1.54%	1319.4	1.59%	0.1	0.000200
10	571888002.1	0.3012	1.8479E-05	2/23/2022 9:50	1399.7	1.54%	1336.9	1.58%	0.1	0.000200
11	571888003.1	0.3016	1.8487E-05	2/23/2022 14:44	1399.7	1.54%	1346.9	1.57%	0.1	0.000200
12	571888004.1	0.3006	1.8469E-05	2/23/2022 12:22	1399.7	1.54%	1347.4	1.57%	0.1	0.000200
13	571888005.1	0.3018	1.8490E-05	2/23/2022 9:30	1399.7	1.54%	1252.9	1.63%	0.1	0.000200
14	1205032355.1	0.3037	1.8521E-05	3/14/2022 0:00	1399.7	1.54%	1279.6	1.61%	0.1	0.000200
15	1205032356.1	0.3015	1.8484E-05	2/24/2022 10:27	1399.7	1.54%	1343.8	1.57%	0.1	0.000200
16	1205032357.1	0.3037	1.8521E-05	3/14/2022 0:00	1399.7	1.54%	1322.0	1.59%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063  
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated Sample Recovery %	Sample Recovery Error %
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction		
1	2C	60	17	72	1.200	3/23/2022 11:58	3/21/2022 14:00	3/23/2022 9:45	0.991	0.778	0.993	1.057	93.7%	1.14%
2	2D	60	6	149	2.483	3/23/2022 11:58	3/21/2022 14:00	3/23/2022 9:45	0.991	0.778	0.993	1.057	95.2%	1.14%
3	3B	60	4	35	0.583	3/23/2022 11:58	3/21/2022 14:00	3/23/2022 9:45	0.991	0.778	0.993	1.057	94.3%	1.14%
4	3C	60	3	63	1.050	3/23/2022 11:58	3/21/2022 14:00	3/23/2022 9:45	0.991	0.778	0.993	1.057	88.3%	1.16%
5	3D	60	2	44	0.733	3/23/2022 11:58	3/21/2022 14:00	3/23/2022 9:45	0.991	0.778	0.993	1.057	92.6%	1.15%
6	4B	60	8	112	1.867	3/23/2022 11:58	3/21/2022 14:00	3/23/2022 9:45	0.991	0.778	0.993	1.057	94.6%	1.14%
7	4C	60	8	56	0.933	3/23/2022 11:58	3/21/2022 14:00	3/23/2022 9:45	0.991	0.778	0.993	1.057	98.0%	1.13%
8	4D	60	4	77	1.283	3/23/2022 11:58	3/21/2022 14:00	3/23/2022 9:45	0.991	0.778	0.993	1.057	95.5%	1.14%
9	5B	60	5	75	1.250	3/23/2022 11:58	3/21/2022 14:00	3/23/2022 9:45	0.991	0.778	0.993	1.057	94.3%	1.14%
10	5D	60	4	59	0.983	3/23/2022 11:59	3/21/2022 14:00	3/23/2022 9:45	0.991	0.777	0.993	1.057	95.5%	1.14%
11	6A	60	8	68	1.133	3/23/2022 11:59	3/21/2022 14:00	3/23/2022 9:45	0.991	0.777	0.993	1.057	96.2%	1.14%
12	6B	60	4	104	1.733	3/23/2022 11:59	3/21/2022 14:00	3/23/2022 9:45	0.991	0.776	0.993	1.057	96.3%	1.14%
13	7A	60	6	26	0.433	3/23/2022 11:59	3/21/2022 14:00	3/23/2022 9:45	0.991	0.776	0.993	1.057	89.5%	1.16%
14	7B	60	5	43	0.717	3/23/2022 11:58	3/21/2022 14:00	3/23/2022 9:45	0.997	0.779	0.993	1.057	91.4%	1.15%
15	7C	60	10	65	1.083	3/23/2022 11:58	3/21/2022 14:00	3/23/2022 9:45	0.991	0.779	0.993	1.057	96.0%	1.14%
16	7D	60	15	816	13.600	3/23/2022 11:58	3/21/2022 14:00	3/23/2022 9:45	0.997	0.779	0.993	1.057	94.4%	1.14%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2021	5/31/2022	0.6380	0.01274	0.978	3/19/2022 7:15	500
2	PIC	6/1/2021	5/31/2022	0.6254	0.00745	1.812	3/19/2022 7:15	500
3	PIC	6/1/2021	5/31/2022	0.6428	0.01614	0.528	3/19/2022 7:15	500
4	PIC	6/1/2021	5/31/2022	0.6497	0.00988	0.886	3/19/2022 7:15	500
5	PIC	6/1/2021	5/31/2022	0.6259	0.02297	0.606	3/19/2022 7:15	500
6	PIC	6/1/2021	5/31/2022	0.6421	0.01519	1.132	3/19/2022 7:16	500
7	PIC	6/1/2021	5/31/2022	0.6681	0.00889	0.646	3/19/2022 7:16	500
8	PIC	6/1/2021	5/31/2022	0.6156	0.00773	1.152	3/19/2022 7:15	500
9	PIC	6/1/2021	5/31/2022	0.6506	0.00426	1.250	3/19/2022 7:17	500
10	PIC	6/1/2021	5/31/2022	0.6476	0.00925	0.700	3/19/2022 7:17	500
11	PIC	6/1/2021	5/31/2022	0.6392	0.02228	1.384	3/19/2022 7:17	500
12	PIC	6/1/2021	5/31/2022	0.6370	0.00851	1.660	3/19/2022 7:17	500
13	PIC	6/1/2021	5/31/2022	0.6479	0.00594	0.412	3/19/2022 7:17	500
14	PIC	6/1/2021	5/31/2022	0.6459	0.00627	0.606	3/19/2022 7:17	500
15	PIC	6/1/2021	5/31/2022	0.6553	0.00790	0.766	3/19/2022 7:17	500
16	PIC	6/1/2021	5/31/2022	0.6464	0.01113	0.652	3/19/2022 7:17	500



Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

**Spike S/N :** N/A  
**Spike Exp Date :** N/A  
**Spike Activity (dpm/ml):** N/A  
**Spike Volume Added:** N/A

\* - RPD changed to 0% due to sample & dup activity below MDA

**LCS S/N :** 1965-C  
**LCS Exp Date :** 8/5/2022  
**LCS Activity (dpm/ml):** 316.64  
**LCS Volume Added:** 0.10

Results														2 SIGMA	2 SIGMA		
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	Counting Uncertainty pCi/L	Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD RER	Nominal pCi/L	Recovery		
1	1.0854	0.7663	3	1.7051	<b>0.7654</b>	66.77%	0.2220	0.1482	1.0013	1.0196		SAMPLE					
2	1.4877	1.0503	3	2.2742	<b>2.3307</b>	31.63%	0.6713	0.2122	1.4437	1.5568		SAMPLE					
3	0.7867	0.5554	3	1.2808	<b>0.1882</b>	187.63%	0.0553	0.1038	0.6920	0.6936		SAMPLE					
4	1.0817	0.7637	3	1.7079	<b>0.5921</b>	84.66%	0.1640	0.1388	0.9823	0.9934		SAMPLE					
5	0.8854	0.6251	3	1.4288	<b>0.4549</b>	91.06%	0.1273	0.1159	0.8117	0.8198		SAMPLE					
6	1.1542	0.8149	3	1.8002	<b>2.5036</b>	24.94%	0.7347	0.1827	1.2202	1.3729		SAMPLE					
7	0.8104	0.5721	3	1.3026	<b>0.9100</b>	45.20%	0.2873	0.1298	0.8057	0.8373		SAMPLE					
8	1.1914	0.8411	3	1.8566	<b>0.4579</b>	117.21%	0.1313	0.1539	1.0520	1.0582		SAMPLE					
9	1.1979	0.8458	3	1.8598	<b>0.000E+00</b>	0.00%	0.0000	0.1528	1.0077	1.0078		SAMPLE					
10	0.8913	0.6292	3	1.4258	<b>0.9481</b>	47.10%	0.2833	0.1334	0.8748	0.9064		SAMPLE					
11	1.2586	0.8886	3	1.9452	<b>-0.8424</b>	58.76%	-0.2507	0.1472	0.9693	0.9694		SAMPLE					
12	1.3877	0.9797	3	2.1287	<b>0.2481</b>	244.73%	0.0733	0.1795	1.1902	1.1918		SAMPLE					
13	0.7282	0.5141	3	1.2064	<b>0.0760</b>	420.47%	0.0213	0.0897	0.6266	0.6268		SAMPLE					
14	0.8541	0.6030	3	1.3784	<b>0.3814</b>	103.65%	0.1107	0.1147	0.7749	0.7807		MB					
15	0.9133	0.6448	3	1.4535	<b>1.0402</b>	44.13%	0.3173	0.1400	0.8992	0.9361	571804001.1	DUP	* 0.0%				
16	0.8572	0.6052	3	1.3771	<b>43.1775</b>	4.02%	12.9480	0.4775	3.1207	11.2566		LCS		46.9688	91.9%		

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
571804001	2C	60	17	72	3/23/2022 11:58	3/23/2022 12:58	PIC	2236232
571804002	2D	60	6	149	3/23/2022 11:58	3/23/2022 12:58	PIC	2236232
571804003	3B	60	4	35	3/23/2022 11:58	3/23/2022 12:58	PIC	2236232
571804004	3C	60	3	63	3/23/2022 11:58	3/23/2022 12:58	PIC	2236232
571804005	3D	60	2	44	3/23/2022 11:58	3/23/2022 12:58	PIC	2236232
571804006	4B	60	8	112	3/23/2022 11:58	3/23/2022 12:58	PIC	2236232
571804007	4C	60	8	56	3/23/2022 11:58	3/23/2022 12:58	PIC	2236232
571804008	4D	60	4	77	3/23/2022 11:58	3/23/2022 12:58	PIC	2236232
571888001	5B	60	5	75	3/23/2022 11:58	3/23/2022 12:58	PIC	2236232
571888002	5D	60	4	59	3/23/2022 11:59	3/23/2022 12:59	PIC	2236232
571888003	6A	60	8	68	3/23/2022 11:59	3/23/2022 12:59	PIC	2236232
571888004	6B	60	4	104	3/23/2022 11:59	3/23/2022 12:59	PIC	2236232
571888005	7A	60	6	26	3/23/2022 11:59	3/23/2022 12:59	PIC	2236232
1205032355	7B	60	5	43	3/23/2022 11:58	3/23/2022 12:58	PIC	2236232
1205032356	7C	60	10	65	3/23/2022 11:58	3/23/2022 12:58	PIC	2236232
1205032357	7D	60	15	816	3/23/2022 11:58	3/23/2022 12:58	PIC	2236232

ASSAY 23-Mar-22 12:01:05  
 Wizard 2480 s/n 46190630  
 Protocol id 8 Ba-133  
 Time limit  
 Count limit  
 Isotope Ba-133  
 Protocol date 3/23/2022  
 Run id. 4808

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	93	1	180	4200	1399.74	1.54	12:01:05
571804001	2	93	2	180	3934	1311.2	1.59	93.67	12:04:19
571804002	3	93	3	180	3999.28	1332.84	1.58	95.22	12:07:33
571804003	4	93	4	180	3959.28	1319.52	1.59	94.27	12:10:47
571804004	5	93	5	180	3707.57	1235.62	1.64	88.27	12:14:01
571804005	1	2	1	180	3889.28	1296.19	1.6	92.60	12:17:37
571804006	2	2	2	180	3971	1323.54	1.59	94.56	12:20:51
571804007	3	2	3	180	4116	1371.75	1.56	98.00	12:24:05
571804008	4	2	4	180	4010.85	1336.58	1.58	95.49	12:27:18
571888001	5	2	5	180	3958.57	1319.39	1.59	94.26	12:30:33
571888002	1	1	1	180	4011.57	1336.94	1.58	95.51	12:34:09
571888003	2	1	2	180	4041.57	1346.94	1.57	96.23	12:37:22
571888004	3	1	3	180	4043	1347.41	1.57	96.26	12:40:36
571888005	4	1	4	180	3759.28	1252.85	1.63	89.51	12:43:50
1205032355	5	1	5	180	3839.28	1279.63	1.61	91.42	12:47:05
1205032356	1	6	1	180	4032.28	1343.84	1.57	96.01	12:50:54
1205032357	2	6	2	180	3966.28	1321.97	1.59	94.44	12:54:08

END OF ASSAY

# **Continuing Calibration Data**

# Gas Flow Proportional Counter Checks for 23-Mar-2022

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100E2	Above	Beta bkg	23-Mar 04:28	60	2.467	1.386	3.015	+0.98
LB4100F3	Above	Alpha bkg	23-Mar 04:28	60	0.383	-8.38E-2	0.560	+1.35
LB4100G1	Above	Alpha XTalk	23-Mar 05:32	5	0.992	0.088	0.447	+12.13
LB4100G1	Above	Beta bkg	23-Mar 04:28	60	2165	0.380	1.675	+10,028.76
LB4100G1	Above	Beta eff	23-Mar 05:46	5	21709	12880	18320	+6.74
LB4100G2	Above	Beta bkg	23-Mar 04:28	60	10.050	1.159	2.203	+48.10
LB4100G2	Below	Beta eff	23-Mar 05:46	5	13321	14190	15940	-5.98
LB4100G3	Below	Alpha eff	23-Mar 05:32	5	5875	6620	7779	-6.85
LB4100G3	Above	Alpha XTalk	23-Mar 05:32	5	0.388	0.309	0.375	+4.20
LB4100G3	Above	Beta bkg	23-Mar 04:28	60	7.483	0.810	1.674	+43.34
LB4100G3	Below	Beta eff	23-Mar 05:46	5	20378	21640	22870	-9.16
LB4100G4	Below	Alpha eff	23-Mar 05:32	5	9053	9065	10710	-3.04
LB4100G4	Below	Beta eff	23-Mar 05:46	5	14637	16330	19880	-5.86
PIC5C	Above	Alpha bkg	23-Mar 06:04	60	0.567	-3.69E-2	0.387	+5.54
PIC5C	Above	Beta bkg	23-Mar 06:04	60	2.050	-4.87E-1	2.075	+2.94
PIC6C	Above	Beta bkg	23-Mar 06:04	60	2.067	0.415	2.299	+2.26

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

LB4100C1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by 

Date 3/23/22

GEL Laboratories LLC

# Runlogs

# Instrument Run Log

Instrument Type: GFPC

Batch ID: 2236232

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205032355	MB	JXC9	PIC7B	MAR-23-22 11:58:08	DONE	25mm Filter	01-JUN-21 00:00
1205032356	DUP	JXC9	PIC7C	MAR-23-22 11:58:13	DONE	25mm Filter	01-JUN-21 00:00
1205032357	LCS	JXC9	PIC7D	MAR-23-22 11:58:17	DONE	25mm Filter	01-JUN-21 00:00
571804001	SAMPLE	JXC9	PIC2C	MAR-23-22 11:58:22	DONE	25mm Filter	01-JUN-21 00:00
571804002	SAMPLE	JXC9	PIC2D	MAR-23-22 11:58:26	DONE	25mm Filter	01-JUN-21 00:00
571804003	SAMPLE	JXC9	PIC3B	MAR-23-22 11:58:30	DONE	25mm Filter	01-JUN-21 00:00
571804004	SAMPLE	JXC9	PIC3C	MAR-23-22 11:58:34	DONE	25mm Filter	01-JUN-21 00:00
571804005	SAMPLE	JXC9	PIC3D	MAR-23-22 11:58:37	DONE	25mm Filter	01-JUN-21 00:00
571804006	SAMPLE	JXC9	PIC4B	MAR-23-22 11:58:41	DONE	25mm Filter	01-JUN-21 00:00
571804007	SAMPLE	JXC9	PIC4C	MAR-23-22 11:58:44	DONE	25mm Filter	01-JUN-21 00:00
571804008	SAMPLE	JXC9	PIC4D	MAR-23-22 11:58:48	DONE	25mm Filter	01-JUN-21 00:00
571888001	SAMPLE	JXC9	PIC5B	MAR-23-22 11:58:51	DONE	25mm Filter	01-JUN-21 00:00
571888002	SAMPLE	JXC9	PIC5D	MAR-23-22 11:59:28	DONE	25mm Filter	01-JUN-21 00:00
571888003	SAMPLE	JXC9	PIC6A	MAR-23-22 11:59:37	DONE	25mm Filter	01-JUN-21 00:00
571888004	SAMPLE	JXC9	PIC6B	MAR-23-22 11:59:40	DONE	25mm Filter	01-JUN-21 00:00
571888005	SAMPLE	JXC9	PIC7A	MAR-23-22 11:59:46	DONE	25mm Filter	01-JUN-21 00:00

# Lucas Cell Raw Data



# Batch 2236224 Check-list

This check-list was completed on 20-MAR-22 by Lyndsey Pace

This batch was reviewed by Elizabeth Krouse on 19-MAR-22 and Lyndsey Pace on 20-MAR-22.

**Batch ID:**  
2236224

**Product:**  
LUC26RAL

**Description:** Lucas Cell Radium 226  
GL-RAD-A-008

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
<b>Miscellaneous Information</b>				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

# Prep Logbook

## Radium-226 in Liquid

**Batch ID:** 2236224  
**Analyst:** Lyndsey Pace (LXP1)  
**Method:** EPA 903.1 Modified  
**Lab SOP:** GL-RAD-A-008 REV# 15  
**Instrument:** LUCAS-C037036045

Due Dates for Lab: 27-MAR-2022			Package: 29-MAR-2022	SDG: 29-MAR-2022		
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205032334	Radium-226 SPIKE	1715-G	.1	mL	
MS	1205032333	Radium-226 SPIKE	1715-G	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	571804001	14-MAR-2022	1	501.33	501.33	03/14/22 12:12	607	03/18/22 06:13	03/18/22 09:34	3	17
2	571804002	14-MAR-2022	1	501.62	501.62	03/14/22 12:12	707	03/18/22 06:13	03/18/22 09:34	4	32
3	571804003	14-MAR-2022	1	500.15	500.15	03/14/22 12:12	804	03/18/22 06:13	03/18/22 09:34	4	29
4	571804004	14-MAR-2022	1	501.82	501.82	03/14/22 12:12	101	03/18/22 06:44	03/18/22 10:07	1	16
5	571804005	14-MAR-2022	1	500.18	500.18	03/14/22 12:12	202	03/18/22 06:44	03/18/22 10:07	4	23
6	571804006	14-MAR-2022	1	500.09	500.09	03/14/22 12:12	402	03/18/22 06:44	03/18/22 10:07	3	15
7	571804007	14-MAR-2022	1	500.28	500.28	03/14/22 12:12	508	03/18/22 06:44	03/18/22 10:07	1	18
8	571804008	14-MAR-2022	1	500.43	500.43	03/14/22 12:12	608	03/18/22 06:44	03/18/22 10:07	2	15
9	571888001	14-MAR-2022	1	500.37	500.37	03/14/22 12:12	708	03/18/22 06:44	03/18/22 10:07	1	8
10	571888002	14-MAR-2022	1	500.09	500.09	03/14/22 12:12	801	03/18/22 06:44	03/18/22 10:07	7	13
11	571888003	14-MAR-2022	1	503.56	503.56	03/14/22 12:12	108	03/18/22 07:13	03/18/22 10:40	2	10
12	571888004	14-MAR-2022	1	504.66	504.66	03/14/22 12:12	208	03/18/22 07:13	03/18/22 10:42	4	17
13	571888005	14-MAR-2022	1	501.57	501.57	03/14/22 12:12	408	03/18/22 07:13	03/18/22 10:40	2	13
14	1205032331 MB	14-MAR-2022	1		504.66	03/14/22 12:12	505	03/18/22 07:13	03/18/22 11:45	1	8
15	1205032332 DUP (571804001)	14-MAR-2022	1	502.45	502.45	03/14/22 12:12	605	03/18/22 07:13	03/18/22 11:45	1	17
16	1205032333 MS (571804001)	14-MAR-2022	1	100.63	100.63	03/14/22 12:12	705	03/18/22 07:13	03/18/22 10:40	2	784
17	1205032334 LCS	14-MAR-2022	1		504.66	03/14/22 12:12	806	03/18/22 07:13	03/18/22 10:40	6	825

Reagent/Solvent Lot ID	Description	Amount	Comments:
			Data Entry Date2: 14-MAR-2022 00:00

### Radium-226 Liquid

Filename : RA226.XLS  
 File type : Excel  
 Version # : 1.3.2

Procedure Code : LUC26RAL  
 Parmname : Radium-226  
 Required MDA : 1 pCi/L  
 Halflife of Ra-226 : 1600 years  
 Ra-226 Abundance : 1.00  
 Halflife of Rn-222 : 3.8235 days

Batch : 2236224  
 Analyst : LIN01615  
 Prep Date : 3/14/2022  
 Ra-226 Method Uncertainty : 0.073648

Batch counted on : LUCAS CELL DETECTOR  
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Counting		Gross Counts	Gross CPM	Background Counts	Background CPM	Background Count Time (min.)	Cell Efficiency (cpm/dpm)
					Cell Number	Time (min.)						
1	571804001.1	0.5013	2.0261E-05	2/24/2022 10:27	607	30	17	0.567	3	0.100	30	1.7080
2	571804002.1	0.5016	2.0263E-05	2/24/2022 10:33	707	30	32	1.067	4	0.133	30	1.7120
3	571804003.1	0.5002	2.0256E-05	2/24/2022 11:44	804	30	29	0.967	4	0.133	30	1.4740
4	571804004.1	0.5018	2.0263E-05	2/24/2022 11:49	101	30	16	0.533	1	0.033	30	1.4260
5	571804005.1	0.5002	2.0257E-05	2/24/2022 13:37	202	30	23	0.767	4	0.133	30	1.7020
6	571804006.1	0.5001	2.0256E-05	2/24/2022 13:42	402	30	15	0.500	3	0.100	30	1.4480
7	571804007.1	0.5003	2.0257E-05	2/24/2022 14:59	508	30	18	0.600	1	0.033	30	1.7330
8	571804008.1	0.5004	2.0258E-05	2/24/2022 15:04	608	30	15	0.500	2	0.067	30	1.7270
9	571888001.1	0.5004	2.0257E-05	2/23/2022 12:22	708	30	8	0.267	1	0.033	30	1.5950
10	571888002.1	0.5001	2.0256E-05	2/23/2022 9:50	801	30	13	0.433	7	0.233	30	1.4860
11	571888003.1	0.5036	2.0270E-05	2/23/2022 14:44	108	30	10	0.333	2	0.067	30	1.6450
12	571888004.1	0.5047	2.0275E-05	2/23/2022 12:22	208	30	17	0.567	4	0.133	30	1.6950
13	571888005.1	0.5016	2.0262E-05	2/23/2022 9:30	408	30	13	0.433	2	0.067	30	1.5900
14	1205032331.1	0.5047	2.0275E-05	3/14/2022 0:00	505	30	8	0.267	1	0.033	30	1.6950
15	1205032332.1	0.5025	2.0266E-05	2/24/2022 10:27	605	30	17	0.567	1	0.033	30	1.6540
16	1205032333.1	0.1006	1.1409E-05	2/24/2022 10:27	705	30	784	26.133	2	0.067	30	1.7610
17	1205032334.1	0.5047	2.0275E-05	3/14/2022 0:00	806	30	825	27.500	6	0.200	30	1.7130

Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008  
 Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrow End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
4.600%	7/1/2021	6/30/2022	3/14/2022 12:12	3/18/2022 6:13	3/18/2022 9:34	0.493	0.975	1.002	1.000
3.000%	11/1/2021	10/31/2022	3/14/2022 12:12	3/18/2022 6:13	3/18/2022 9:34	0.493	0.975	1.002	1.000
3.700%	4/1/2021	3/31/2022	3/14/2022 12:12	3/18/2022 6:13	3/18/2022 9:34	0.493	0.975	1.002	1.000
2.400%	5/2/2021	4/30/2022	3/14/2022 12:12	3/18/2022 6:44	3/18/2022 10:07	0.495	0.975	1.002	1.000
4.100%	8/1/2021	7/31/2022	3/14/2022 12:12	3/18/2022 6:44	3/18/2022 10:07	0.495	0.975	1.002	1.000
2.300%	2/1/2022	1/31/2023	3/14/2022 12:12	3/18/2022 6:44	3/18/2022 10:07	0.495	0.975	1.002	1.000
2.600%	6/1/2021	5/31/2022	3/14/2022 12:12	3/18/2022 6:44	3/18/2022 10:07	0.495	0.975	1.002	1.000
7.400%	7/1/2021	6/30/2022	3/14/2022 12:12	3/18/2022 6:44	3/18/2022 10:07	0.495	0.975	1.002	1.000
2.200%	11/1/2021	10/31/2022	3/14/2022 12:12	3/18/2022 6:44	3/18/2022 10:07	0.495	0.975	1.002	1.000
1.000%	4/1/2021	3/31/2022	3/14/2022 12:12	3/18/2022 6:44	3/18/2022 10:07	0.495	0.975	1.002	1.000
6.000%	5/2/2021	4/30/2022	3/14/2022 12:12	3/18/2022 7:13	3/18/2022 10:40	0.497	0.974	1.002	1.000
2.600%	8/1/2021	7/31/2022	3/14/2022 12:12	3/18/2022 7:13	3/18/2022 10:42	0.497	0.974	1.002	1.000
1.200%	2/1/2022	1/31/2023	3/14/2022 12:12	3/18/2022 7:13	3/18/2022 10:40	0.497	0.974	1.002	1.000
9.600%	6/1/2021	5/31/2022	3/14/2022 12:12	3/18/2022 7:13	3/18/2022 11:45	0.497	0.966	1.002	1.000
5.000%	7/1/2021	6/30/2022	3/14/2022 12:12	3/18/2022 7:13	3/18/2022 11:45	0.497	0.966	1.002	1.000
3.000%	11/1/2021	10/31/2022	3/14/2022 12:12	3/18/2022 7:13	3/18/2022 10:40	0.497	0.974	1.002	1.000
1.500%	4/1/2021	3/31/2022	3/14/2022 12:12	3/18/2022 7:13	3/18/2022 10:40	0.497	0.974	1.002	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

**Spike S/N :** 1715-G  
**Spike Exp Date :** 9/15/2022  
**Spike Activity (dpm/ml):** 297.56  
**Spike Volume Added:** 0.10

**LCS S/N :** 1715-G  
**LCS Exp Date :** 9/15/2022  
**LCS Activity (dpm/ml):** 297.56  
**LCS Volume Added:** 0.10

<b>Results</b>																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.2085	0.1472	1	0.4039	<b>0.5113</b>	32.27%	0.4667	0.1491	0.3201	0.3318		SAMPLE				
2	0.2400	0.1694	1	0.4481	<b>1.0197</b>	21.64%	0.9333	0.2000	0.4283	0.4568		SAMPLE				
3	0.2796	0.1974	1	0.5220	<b>1.0605</b>	23.27%	0.8333	0.1915	0.4776	0.5074		SAMPLE				
4	0.1435	0.1013	1	0.3332	<b>0.6531</b>	27.59%	0.5000	0.1374	0.3519	0.3656		SAMPLE				
5	0.2412	0.1703	1	0.4504	<b>0.6954</b>	27.65%	0.6333	0.1732	0.3727	0.3900		SAMPLE				
6	0.2456	0.1734	1	0.4758	<b>0.5163</b>	35.43%	0.4000	0.1414	0.3578	0.3662		SAMPLE				
7	0.1184	0.0836	1	0.2750	<b>0.6109</b>	25.77%	0.5667	0.1453	0.3070	0.3210		SAMPLE				
8	0.1680	0.1186	1	0.3454	<b>0.4687</b>	32.57%	0.4333	0.1374	0.2913	0.3067		SAMPLE				
9	0.1286	0.0908	1	0.2988	<b>0.2733</b>	42.91%	0.2333	0.1000	0.2296	0.2332		SAMPLE				
10	0.3655	0.2581	1	0.6419	<b>0.2516</b>	74.54%	0.2000	0.1491	0.3675	0.3693		SAMPLE				
11	0.1747	0.1234	1	0.3592	<b>0.2999</b>	43.71%	0.2667	0.1155	0.2546	0.2606		SAMPLE				
12	0.2393	0.1690	1	0.4469	<b>0.4721</b>	35.35%	0.4333	0.1528	0.3262	0.3341		SAMPLE				
13	0.1815	0.1281	1	0.3731	<b>0.4284</b>	35.23%	0.3667	0.1291	0.2956	0.3022		SAMPLE				
14	0.1206	0.0852	1	0.2801	<b>0.2562</b>	43.92%	0.2333	0.1000	0.2152	0.2237		MB				
15	0.1242	0.0877	1	0.2883	<b>0.6029</b>	26.98%	0.5333	0.1414	0.3133	0.3305	571804001.1	DUP	16.4%	0.3831		
16	0.8167	0.5766	1	1.6790	<b>137.0528</b>	4.67%	26.0667	0.9345	9.6305	23.4325	571804001.1	MS			133.1985	102.5%
17	0.2900	0.2047	1	0.5172	<b>29.4230</b>	3.83%	27.3000	0.9609	2.0298	4.7862		LCS			26.5594	110.8%

# **Continuing Calibration Data**



# Ludlum Alpha Scintillation Counter Checks for 18-MAR-2022

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	07:23	1	1.22E+05	121569	-0.51		
LUCAS2	EFF	07:27	1	1.31E+05	131060	0.43		
LUCAS4	EFF	07:28	1	1.27E+05	126508	-1.41		
LUCAS5	EFF	07:30	1	1.30E+05	130027	0.32		
LUCAS6	EFF	07:31	1	1.29E+05	129341	-2.9		
LUCAS7	EFF	07:34	1	1.33E+05	133146	0.83		
LUCAS8	EFF	07:37	1	1.31E+05	130875	0.98		

**Reviewed by:**

Elizabeth Krouse

**Date:** 18-MAR-22

GEL Laboratories LLC

# Runlogs



# Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2236224

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
571804001	SAMPLE	LXP1	LUCAS6	MAR-18-22 09:34:00	DONE	Lucas Cell	01-JUL-21 00:00
571804002	SAMPLE	LXP1	LUCAS7	MAR-18-22 09:34:00	DONE	Lucas Cell	01-NOV-21 00:00
571804003	SAMPLE	LXP1	LUCAS8	MAR-18-22 09:34:00	DONE	Lucas Cell	01-APR-21 00:01
571804004	SAMPLE	LXP1	LUCAS1	MAR-18-22 10:07:00	DONE	Lucas Cell	02-MAY-21 00:01
571804005	SAMPLE	LXP1	LUCAS2	MAR-18-22 10:07:00	DONE	Lucas Cell	01-AUG-21 00:00
571804006	SAMPLE	LXP1	LUCAS4	MAR-18-22 10:07:00	DONE	Lucas Cell	01-FEB-22 00:00
571804007	SAMPLE	LXP1	LUCAS5	MAR-18-22 10:07:00	DONE	Lucas Cell	01-JUN-21 00:01
571804008	SAMPLE	LXP1	LUCAS6	MAR-18-22 10:07:00	DONE	Lucas Cell	01-JUL-21 00:00
571888001	SAMPLE	LXP1	LUCAS7	MAR-18-22 10:07:00	DONE	Lucas Cell	01-NOV-21 00:00
571888002	SAMPLE	LXP1	LUCAS8	MAR-18-22 10:07:00	DONE	Lucas Cell	01-APR-21 00:01
571888003	SAMPLE	LXP1	LUCAS1	MAR-18-22 10:40:00	DONE	Lucas Cell	02-MAY-21 00:01
571888005	SAMPLE	LXP1	LUCAS4	MAR-18-22 10:40:00	DONE	Lucas Cell	01-FEB-22 00:00
1205032333	MS	LXP1	LUCAS7	MAR-18-22 10:40:00	DONE	Lucas Cell	01-NOV-21 00:00
1205032334	LCS	LXP1	LUCAS8	MAR-18-22 10:40:00	DONE	Lucas Cell	01-APR-21 00:01
571888004	SAMPLE	LXP1	LUCAS2	MAR-18-22 10:42:00	DONE	Lucas Cell	01-AUG-21 00:00
1205032331	MB	LXP1	LUCAS5	MAR-18-22 11:45:00	DONE	Lucas Cell	01-JUN-21 00:01
1205032332	DUP	LXP1	LUCAS6	MAR-18-22 11:45:00	DONE	Lucas Cell	01-JUL-21 00:00



Environmental Laboratory  
1232 Haco Drive  
Lansing  
Michigan, 48910

CHAIN OF CUSTODY

Page 1 of 1

Phone: (517)702-6372

Lab Work Order Number LA02073

Client Name BWL - Erickson Station		Project Name Erickson AM MI Wells 78-13 <i>11</i>		Requested Analyses						Requested Turn Around	
Client Contact Cheryl Louden		Project Number [none]		Ag: As: B: Ba: Be: Ca: Cd: Cr: Co: Cu: Fe: Hg: Li: Mo: Ni: TSS	CHC: F-ISE: SO4: TDS	Radium 226 and Radium 228	<i>Dissolved Metals (see total Metals)</i>			Rush requests subject to additional charge.	
Address 3725 S. Canal		Project Description									
City Lansing		PO Number 30926 10021									
State/Zip MI, 48917		Shipped By									
Phone (517) 702-6396	Fax (517) 702-6373	Tracking Number									
Sampler Marc Wahrer											

Sample Name or Field ID	Sampled Date	Sampled Time	Sample Type Grab/Composite	Matrix Code	Container Count	Preservation Code					Sample	Comments
						b	a	a	b			
MW-11	<i>12/23/22</i>	<i>1222</i>	G	GW	5	1	1	1	2	0		
MW-12	↓	<i>0950</i>	G	GW	5	1	1	1	2	0		
MW-13	↓	<i>1444</i>	G	GW	5	1	1	1	2	0		
Field Duplicate - MW11	↓	<i>1222</i>	G	GW	5	1	1	1	2	0		
Field Blank	↓	<i>0930</i>	G	DI	5	1	1	1	2	0		

Relinquished By 	Date/Time <i>2-23-22</i> <i>1605</i>	Received By <i>J Caporale</i>	Date/Time <i>02/23/22</i> <i>1605</i>	
Relinquished By	Date/Time	Received By	Date/Time	Comments
Relinquished By	Date/Time	Received By	Date/Time	
Cooler Numbers and Temperatures				

Matrix Codes: DI=Deionized Water, GW=Ground Water      Preserv. Codes: a=None, b=0.5% HNO3

### Data Validation Checklist

Site Name: Erickson Personnel: M. Wahrer

Sample Date(s): 2/23/2022 Lab Drop-off Date(s): 2/24/2022

Lab Report Number: S33210.01

Lab Report Date: 3/30/2022

Reason for Sample Event: New Wells 11-13

**Field Records:** Circle Yes/No unless Not Applicable – *Complete during sample event*

Item Description	Verification (Completeness)	Validation (Conformance to Specifications)
Field equipment calibration records	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Chain-of-Custody forms	<input checked="" type="radio"/> Yes / No	N/A
Field decontamination documentation	N/A	N/A
Sample collection field forms	<input checked="" type="radio"/> Yes / No	N/A
Drilling logs	<input checked="" type="radio"/> Yes / No	N/A
Well construction logs	<input checked="" type="radio"/> Yes / No	N/A
Well development field forms	<input checked="" type="radio"/> Yes / No	N/A

**Analytical Data Package:** Circle Yes/No unless N/A – *Complete when lab report is received*

Item Description	Verification (Completeness)	Validation (Conformance to Specifications)
Cover sheet (laboratory identifying information)	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Case narrative	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Internal laboratory Chain-of-Custody forms	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Sample chronology and consistency (that is, dates and times of receipt, preparation, and analysis)	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Communication records with laboratory	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
EDD format consistency	<input checked="" type="radio"/> Yes / No	N/A
Sample identification, results nomenclature, and data qualifier consistency	<input checked="" type="radio"/> Yes / No	N/A
RLs as requested; MDLs < RLs	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Instrument calibration records	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Laboratory Report	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Field QC sample results and calculation of accuracy and precision	<input checked="" type="radio"/> Yes / No Duplicate Well ID: MW-11	Yes / <input checked="" type="radio"/> No Duplicate RPD: 0-9% except Rad-226/228 at 45%

**Corrections Needed:** None; according to the Technical Case Narrative by GEL Laboratories, subcontracted laboratory for radium analysis, “[a]ll sample data provided in [the] report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Samples were non-homogenous matrix. Samples look yellow.

Sample 1205032331 (MB) was recounted due to a suspected blank false positive. The recount is reported. Sample 1205032332 (Non SDG 571804001DUP) was recounted due to high relative percent difference/relative error ratio. The recount is reported.” This exception relates to laboratory QC only and did not affect sample results.

Sample	Parameter	Result	Uncertainty	MDC	Lab Qualifier	Validated Qualifier
MW-11	Rad-226	0.273	+/-0.230	0.299	U	J-
	Rad-228	0.000	+/-1.01	1.86	U	J-
	Rad-226/228	0.273	+/-1.03			J-
MW-11-Dup	Rad-226	0.472	+/-0.326	0.447		J+
	Rad-228	0.248	+/-1.19	2.13	U	J+
	Rad-226/228	0.720	+/-1.23			J+

*U - Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.*

Since the laboratory processes indicated no issues with the analytical procedures, no corrective action was necessary. Since the RPD was above the 20% control limit, Rad-226, Rad-228, and Rad-226/228 in MW-11 have been qualified as estimated with potential for low bias (J-) and those in MW-11-Dup have been qualified as estimated with potential for high bias (J+).



Lansing Board of Water and Light  
Environmental Services Laboratory (MI00079)  
1232 Haco Dr.  
Lansing, Michigan 48901

12 April 2022

BWL - Erickson Station  
Attn: Cheryl Louden  
3725 S. Canal  
Lansing, MI 48917

**Project: Erickson AM MI**

Dear Cheryl Louden,

Enclosed is a copy of the laboratory report for the following work order(s) received by Lansing Board of Water and Light Environmental Services Laboratory:

**Work Order**  
L203035

**Received**  
3/9/2022 4:52:00PM

**Account Number**  
30926 10021

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in blue ink that reads "Jennifer Caporale".

Jennifer Caporale, Supervisor



Report ID: S33699.01(03)  
Generated on 04/11/2022  
Replaces report S33699.01(02) generated on 03/14/2022

**Report to**  
Attention: Jennifer Caporale  
Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901  
  
Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

**Report produced by**  
Merit Laboratories, Inc.  
2680 East Lansing Drive  
East Lansing, MI 48823  
  
Phone: (517) 332-0167 FAX: (517) 332-6333  
  
Contacts for report questions:  
John Lavery (johnlavery@meritlabs.com)  
Barbara Ball (bball@meritlabs.com)

**Report Summary**

Lab Sample ID(s): S33699.01-S33699.03  
Project: Erickson AM MI New Wells 7B  
Collected Date(s): 03/09/2022  
Submitted Date/Time: 03/10/2022 08:46  
Sampled by: Marc Wahrer  
P.O. #:

**Table of Contents**

- Cover Page (Page 1)
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Maya Murshak  
Technical Director



## General Report Notes

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Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein, acrylonitrile, and 2-chlorovinylethyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (\*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

## Report Narrative

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All analyses completed



Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Alaska CSLAP	#17-001
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched





## Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1
SM2320B	Standard Method 2320 B 2011
SM2340C	Standard Method 2340 C 2011
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007



### Sample Summary (3 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S33699.01	MW-7B L203035-01	Groundwater	03/09/22 16:00
S33699.02	Field Dupe MW-7B L203035-02	Groundwater	03/09/22 16:00
S33699.03	Field Blank L203035-03	Water	03/09/22 15:45



# Analytical Laboratory Report

Final Report

Lab Sample ID: S33699.01

Sample Tag: MW-7B L203035-01

Collected Date/Time: 03/09/2022 16:00

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	4.1	IR
2	1L Plastic	None	Yes	4.1	IR
1	125ml Plastic	HNO3	Yes	4.1	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	03/10/22 10:00	JRH	
Metal Digestion	Completed	SW3015A	03/10/22 10:30	CCM	

### Inorganics

Method: E300.0, Run Date: 03/11/22 09:01, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: E300.0, Run Date: 03/11/22 08:48, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	

Method: SM2320B, Run Date: 03/10/22 11:24, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	390	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 03/10/22 10:20, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	38	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 03/10/22 19:10, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	366	20	1	mg/L	2		

Method: SM2540D, Run Date: 03/10/22 15:15, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1.00		

### Metals

Method: E200.8, Run Date: 03/10/22 12:42, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.010	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	3.07	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	



# Analytical Laboratory Report

Lab Sample ID: S33699.01 (continued)

Sample Tag: MW-7B L203035-01

**Method: E200.8, Run Date: 03/10/22 12:42, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.06	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.034	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 03/10/22 14:50, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	10.2	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	2.93	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	5.48	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	132	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 03/10/22 13:47, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 04/09/22 11:54, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Lab Sample ID: S33699.02

Sample Tag: Field Dupe MW-7B L203035-02

Collected Date/Time: 03/09/2022 16:00

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	4.1	IR
2	1L Plastic	None	Yes	4.1	IR
1	125ml Plastic	HNO3	Yes	4.1	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	03/10/22 10:00	JRH	
Metal Digestion	Completed	SW3015A	03/10/22 10:30	CCM	

### Inorganics

Method: E300.0, Run Date: 03/11/22 09:14, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 03/10/22 11:26, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	390	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 03/10/22 10:22, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	40	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 03/10/22 19:10, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	366	20	1	mg/L	2		

Method: SM2540D, Run Date: 03/10/22 15:15, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1.00		

### Metals

Method: E200.8, Run Date: 03/10/22 12:44, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.009	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	3.09	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.06	0.02	0.00192	mg/L	5	7439-89-6	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S33699.02 (continued)  
Sample Tag: Field Dupe MW-7B L203035-02

**Method: E200.8, Run Date: 03/10/22 12:44, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.035	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 03/10/22 14:51, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	10.4	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	3.00	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	5.57	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	131	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 03/10/22 13:51, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 04/09/22 11:54, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Final Report

Lab Sample ID: S33699.03

Sample Tag: Field Blank L203035-03

Collected Date/Time: 03/09/2022 15:45

Matrix: Water

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	4.1	IR
2	1L Plastic	None	Yes	4.1	IR
1	125ml Plastic	HNO3	Yes	4.1	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	03/10/22 10:00	JRH	
Metal Digestion	Completed	SW3015A	03/10/22 10:30	CCM	

### Inorganics

Method: E300.0, Run Date: 03/11/22 09:27, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	2.5	0.04	mg/L	2.5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.06	mg/L	2.5	16984-48-8	
Sulfate	Not detected	2.5	0.15	mg/L	2.5	14808-79-8	

Method: SM2320B, Run Date: 03/10/22 11:28, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	Not detected	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 03/10/22 10:24, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	Not detected	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 03/10/22 19:10, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	4	20	1	mg/L	2		b

Method: SM2540D, Run Date: 03/10/22 15:15, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1.00		

### Metals

Method: E200.8, Run Date: 03/10/22 12:31, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony	Not detected	0.005	0.00102	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.000102	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.0000648	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.0000862	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.000702	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.0000760	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.0000386	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.0000434	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000150	mg/L	2	7440-50-8	

b-Value detected less than reporting limit, but greater than MDL



# Analytical Laboratory Report

Final Report

Lab Sample ID: S33699.03 (continued)

Sample Tag: Field Blank L203035-03

**Method: E200.8, Run Date: 03/10/22 12:31, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Iron	Not detected	0.02	0.000768	mg/L	2	7439-89-6	
Lead	Not detected	0.003	0.0000760	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000654	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.0000868	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000100	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.000838	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.0000270	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.0000342	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.0000558	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.000292	mg/L	2	7440-66-6	

**Method: E200.8, Run Date: 03/10/22 14:45, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.0174	mg/L	2	7440-70-2	
Magnesium	Not detected	0.50	0.00480	mg/L	2	7439-95-4	
Potassium	Not detected	0.50	0.00920	mg/L	2	7440-09-7	
Sodium	Not detected	0.50	0.00340	mg/L	2	7440-23-5	

**Method: E245.1, Run Date: 03/10/22 13:54, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 04/09/22 11:54, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Merit Laboratories Login Checklist

Lab Set ID:S33699

Client:BWL01 (Board of Water & Light)

Project: Erickson AM MI New Wells 7B

Submitted:03/10/2022 08:46 Login User: JRM

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental\_Laboratory@LBWL.com

Selection	Description	Note
<b>Sample Receiving</b>		
01.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples are received at 4C +/- 2C Thermometer # IR 4.1
02.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Received on ice/ cooling process begun
03.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples shipped
04.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples left in 24 hr. drop box
05.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Are there custody seals/tape or is the drop box locked
<b>Chain of Custody</b>		
06.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC adequately filled out
07.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC signed and relinquished to the lab
08.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sample tag on bottles match COC
09.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Subcontracting needed? Subcontracted to: GEL; 1Z4664770362268663
<b>Preservation</b>		
10.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Do sample have correct chemical preservation
11.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Completed pH checks on preserved samples? (no VOAs)
12.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Did any samples need to be preserved in the lab?
<b>Bottle Conditions</b>		
13.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	All bottles intact
14.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Appropriate analytical bottles are used
15.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Merit bottles used
16.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sufficient sample volume received
17.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples require laboratory filtration
18.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples submitted within holding time
19.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Do water VOC or TOX bottles contain headspace

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: \_\_\_\_\_ Date: \_\_\_\_\_

# Merit Laboratories Bottle Preservation Check

Lab Set ID: S33699 Submitted: 03/10/2022 08:46

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI New Wells 7B

Initial Preservation Check: 03/10/2022 09:13 JRM

Preservation Recheck (E200.8): N/A

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: [Environmental\\_Laboratory@LBWL.com](mailto:Environmental_Laboratory@LBWL.com)

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S33699.01	125ml Plastic HNO3	<2			
S33699.01	1L Plastic HNO3	<2			
S33699.01	1L Plastic HNO3	<2			
S33699.02	125ml Plastic HNO3	<2			
S33699.02	1L Plastic HNO3	<2			
S33699.02	1L Plastic HNO3	<2			
S33699.03	125ml Plastic HNO3	<2			
S33699.03	1L Plastic HNO3	<2			
S33699.03	1L Plastic HNO3	<2			



2680 East Lansing Dr., East Lansing, MI 48823  
 Phone (517) 332-0167 Fax (517) 332-4034  
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

**REPORT TO**

**CHAIN OF CUSTODY RECORD**

**INVOICE TO**

CONTACT NAME **Jennifer Caporale**  
 COMPANY **Lansing Board of Water and Light**  
 ADDRESS **PO Box 13007 48901-3007**  
 CITY **Lansing** STATE **Mi** ZIP CODE **48901**  
 PHONE NO. **517-702-6372** FAX NO. \_\_\_\_\_ P.O. NO. \_\_\_\_\_  
 E-MAIL ADDRESS **Environmental\_Laboratory@lbwl.com** QUOTE NO. \_\_\_\_\_

CONTACT NAME **Kelly Gleason**  SAME  
 COMPANY \_\_\_\_\_  
 ADDRESS \_\_\_\_\_  
 CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP CODE \_\_\_\_\_  
 PHONE NO. \_\_\_\_\_ E-MAIL ADDRESS **Kelly.Gleason@lbwl.com**

**ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)**

PROJECT NO./NAME **Erickson AM MI Wells 7B** SAMPLER(S) - PLEASE PRINT/SIGN NAME **Marc Wahrer**  
 TURNAROUND TIME REQUIRED  1 DAY  2 DAYS  3 DAYS  STANDARD  OTHER **ASAP**  
 DELIVERABLES REQUIRED  STD  LEVEL II  LEVEL III  LEVEL IV  EDD  OTHER \_\_\_\_\_

Total Metals	F- undistilled, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	HCO3, CO3	Hardness
✓	✓	✓	✓	✓	✓	✓

Certifications  
 OHIO VAP  Drinking Water  
 DoD  NPDES  
 Project Locations  
 Detroit  New York  
 Other \_\_\_\_\_  
 Special Instructions

MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID  
 SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIFE A=AIR W=WASTE  
 # Containers & Preservatives

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO3	H2SO4	NaOH	MeOH	OTHER	Total Metals	F- undistilled, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	HCO3, CO3	Hardness	Certifications	Project Locations	Special Instructions
	DATE	TIME																				
33699.01	03/09/22	1600	MW-7B L203035-01	GW	5	3	2						✓	✓	✓	✓	✓	✓	✓			Metals to analyse: Na, Mg, K
.02	↓	↓	Field Dupe MW-7B ↓ -02	GW	5	3	2						✓	✓	✓	✓	✓	✓	✓			B, Ca, Sb, As, Ba, Be, Cd, Cr,
.03	↓	1545	Field Blank ↓ -03	DI	5	3	2						✓	✓	✓	✓	✓	✓	✓			Co, Li, Hg, Mo, Pb, Se, Tl, Fe, Cu, Ni, Ag, V, Zn Please send a preliminary report

RELINQUISHED BY: \_\_\_\_\_ DATE \_\_\_\_\_ TIME \_\_\_\_\_  
 SIGNATURE/Organization \_\_\_\_\_  
 RECEIVED BY: *Johanna Murray* DATE **3/10/22** TIME **0846**  
 SIGNATURE/Organization \_\_\_\_\_  
 RELINQUISHED BY: \_\_\_\_\_ DATE \_\_\_\_\_ TIME \_\_\_\_\_  
 SIGNATURE/Organization \_\_\_\_\_  
 RECEIVED BY: \_\_\_\_\_ DATE \_\_\_\_\_ TIME \_\_\_\_\_  
 SIGNATURE/Organization \_\_\_\_\_

RELINQUISHED BY: \_\_\_\_\_ DATE \_\_\_\_\_ TIME \_\_\_\_\_  
 SIGNATURE/Organization \_\_\_\_\_  
 RECEIVED BY: \_\_\_\_\_ DATE \_\_\_\_\_ TIME \_\_\_\_\_  
 SIGNATURE/Organization \_\_\_\_\_  
 SEAL NO. \_\_\_\_\_ SEAL INTACT YES  NO  INITIALS \_\_\_\_\_  
 SEAL NO. \_\_\_\_\_ SEAL INTACT YES  NO  INITIALS \_\_\_\_\_  
 NOTES: TEMP. ON ARRIVAL **4.1**

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

## Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.150
Be, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	2.5
Cl	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	10
Cr, total	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
F	Fluoride	250 mL plastic	mg/L	None	9056	28 d	1.0
Fe, total	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Pb, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Li, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Hg, total	Mercury	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Mo, total	Molybdenum	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
RA226/228	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	HNO3	SM 7500	6 mos	2.0 combined
Se, total	Selenium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ag, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
SO4	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	10
Tl, total	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
TDS	Total Dissolved Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TSS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540D	NA	3
V, total	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Zn, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005



April 08, 2022

John Laverty  
Merit Laboratories Inc.  
2680 East Lansing Drive  
East Lansing, Michigan 48823

Re: Routine Analysis  
Work Order: 573055  
SDG: S33699

Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on March 14, 2022. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at [www.gel.com](http://www.gel.com).

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,

Delaney Stone  
Project Manager

Purchase Order: GELP20-0018  
Enclosures



## Table of Contents

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# Case Narrative

**Receipt Narrative  
for  
Merit Laboratories, Inc.  
SDG: S33699  
Work Order: 573055**

**April 08, 2022**

**Laboratory Identification:**

GEL Laboratories LLC  
2040 Savage Road  
Charleston, South Carolina 29407  
(843) 556-8171

**Summary:**

**Sample receipt:** The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on March 14, 2022 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

**Sample Identification:** The laboratory received the following samples:

<b><u>Laboratory ID</u></b>	<b><u>Client ID</u></b>
573055001	S33699.01
573055002	S33699.02 (Field Dupe)
573055003	S33699.03 (Field Blank)

**Case Narrative:**

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.



Delaney Stone  
Project Manager



# **Chain of Custody and Supporting Documentation**

573055

C.O.C. PAGE # 1 OF 1

2680 East Lansing Dr., East Lansing, MI 48823  
Phone (517) 332-0167 Fax (517) 332-4034  
www.meritlabs.com



REPORT TO

CONTACT NAME: Project Management Team  
COMPANY: Merit Laboratories  
ADDRESS: 2680 East Lansing Drive  
CITY: East Lansing  
PHONE NO.: 517-332-0167  
FAX NO.:  
E-MAIL ADDRESS: results@meritlabs.com

CHAIN OF CUSTODY RECORD

CONTACT NAME: Julie Teague  
COMPANY: Merit Laboratories  
ADDRESS: 2680 East Lansing Drive  
CITY: East Lansing  
PHONE NO.: 517-332-0167  
E-MAIL ADDRESS: juliet@meritlabs.com

INVOICE TO

CONTACT NAME:  
COMPANY:  
ADDRESS:  
CITY:  
PHONE NO.:  
E-MAIL ADDRESS:

PROJECT NO./NAME: S33699

TURNAROUND TIME REQUIRED:  1 DAY  2 DAYS  3 DAYS  STANDARD  OTHER  
DELIVERABLES REQUIRED:  STD  LEVEL II  LEVEL III  LEVEL IV  EDD  OTHER

MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID  
SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIPE A=AIR W=WASTE

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR	DATE	TIME	IDENTIFICATION-DESCRIPTION	SAMPLE TAG	# OF BOTTLES		# Containers & Preservatives									
						MATRIX	NONE	H <sub>2</sub> O	MAOH	MAOH	OTHER	H <sub>2</sub> O	MAOH	OTHER			
	3/9/22	1600		S33699.01	GW	2	2										
	3/9/22	1600		S33699.02 (Field Dupe)	GW	2	2										
	3/9/22	1545		S33699.03 (Field Blank)	GW	2	2										

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

ANALYSIS	INITIALS	DATE	TIME	REMARKS
Radium 226*	✓			
Radium 228**	✓			
* E903.1 Mod.	✓			
** E904.0/SW 9320 Mod.	✓			
Please use calculation product & provide Radium 226/228 combined results on the report				
(No Ice needed)				
** Subcontracted to GEL Laboratories, Inc.				
2040 Savage Road				
Charleston, SC 29407				

RELINQUISHED BY: [Signature] DATE: 3/10/22 TIME: 1700  
 RECEIVED BY: [Signature] DATE: 3/10/22 TIME: 1700  
 RELINQUISHED BY: [Signature] DATE: 3/10/22 TIME: 1700  
 RECEIVED BY: [Signature] DATE: 3/10/22 TIME: 1700

RELINQUISHED BY: [Signature] DATE: [ ] TIME: [ ]  
 RECEIVED BY: [Signature] DATE: [ ] TIME: [ ]  
 RELINQUISHED BY: [Signature] DATE: [ ] TIME: [ ]  
 RECEIVED BY: [Signature] DATE: [ ] TIME: [ ]

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

SAMPLE RECEIPT & REVIEW FORM

Client: WERT SDG/AR/COC/Work Order: 573055 / 573056 811  
 Received By: TYE Date Received: 3/14/22

Carrier and Tracking Number  
 FedEx Express FedEx Ground UPS Field Services Courier Other  
124060 477 03 6153 4251

Suspected Hazard Information  Yes  No  
 \*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.  
 A) Shipped as a DOT Hazardous?  Hazard Class Shipped: \_\_\_\_\_ UN#: \_\_\_\_\_  
 If UN2910, Is the Radioactive Shipment Survey Compliant? Yes \_\_\_ No \_\_\_  
 B) Did the client designate the samples are to be received as radioactive?  COC notation or radioactive stickers on containers equal client designation.  
 C) Did the RSO classify the samples as radioactive?  Maximum Net Counts Observed\* (Observed Counts - Area Background Counts): 0 CPM/mR/Hr  
 Classified as: Rad 1 Rad 2 Rad 3  
 D) Did the client designate samples are hazardous?  COC notation or hazard labels on containers equal client designation.  
 E) Did the RSO identify possible hazards?  If D or E is yes, select Hazards below.  
 PCB's Flammable Foreign Soil RCRA Asbestos Beryllium Other: \_\_\_\_\_

Sample Receipt Criteria	Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1 Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2 Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Client contacted and provided COC COC created upon receipt
3 Samples requiring cold preservation within (0 ≤ 6 deg. C)?*	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Preservation Method: Wet Ice Ice Packs Dry ice <u>None</u> Other: _____ *all temperatures are recorded in Celsius. <span style="float: right;">TEMP: <u>16°C</u></span>
4 Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Temperature Device Serial #: <u>IR2-20</u> Secondary Temperature Device Serial # (If Applicable): _____
5 Sample containers intact and sealed?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6 Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Sample ID's and Containers Affected: _____ If Preservation added, Lot#: _____
7 Do any samples require Volatile Analysis?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	If Yes, are Encores or Soil Kits present for solids? Yes ___ No ___ NA ___ (If yes, take to VOA Freezer) Do liquid VOA vials contain acid preservation? Yes ___ No ___ NA ___ (If unknown, select No) Are liquid VOA vials free of headspace? Yes ___ No ___ NA ___ Sample ID's and containers affected: _____
8 Samples received within holding time?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	ID's and tests affected: _____
9 Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	ID's and containers affected: _____
10 Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: No dates on containers No times on containers COC missing info Other (describe)
11 Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: No container count on COC Other (describe)
12 Are sample containers identifiable as GEL provided by use of GEL labels?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
13 COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Not relinquished Other (describe)

Comments (Use Continuation Form if needed):  
124060 477 03 6372 7209

PM (or PMA) review: Initials NRU Date 3/15/22 Page 1 of 1

# Laboratory Certifications

**List of current GEL Certifications as of 08 April 2022**

<b>State</b>	<b>Certification</b>
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122021-1
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2019-165
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122021-36
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

# **Radiological Analysis**

# Case Narrative

**Radiochemistry  
Technical Case Narrative  
Merit Laboratories, Inc.  
SDG #: S33699  
Work Order #: 573055**

**Product: GFPC Ra228, Liquid**

**Analytical Method:** EPA 904.0/SW846 9320 Modified

**Analytical Procedure:** GL-RAD-A-063 REV# 5

**Analytical Batch:** 2241166

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
573055001	S33699.01
573055002	S33699.02 (Field Dupe)
573055003	S33699.03 (Field Blank)
1205041405	Method Blank (MB)
1205041406	573055001(S33699.01) Sample Duplicate (DUP)
1205041407	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

**Product: Lucas Cell, Ra226, Liquid**

**Analytical Method:** EPA 903.1 Modified

**Analytical Procedure:** GL-RAD-A-008 REV# 15

**Analytical Batch:** 2241158

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
573055001	S33699.01
573055002	S33699.02 (Field Dupe)
573055003	S33699.03 (Field Blank)
1205041397	Method Blank (MB)
1205041398	573055001(S33699.01) Sample Duplicate (DUP)
1205041399	573055001(S33699.01) Matrix Spike (MS)
1205041400	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.



**Data Summary:**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

**Miscellaneous Information****Additional Comments**

The matrix spike, 1205041399 (S33699.01MS), aliquot was reduced to conserve sample volume.

**Certification Statement**

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S33699 GEL Work Order: 573055

### The Qualifiers in this report are defined as follows:

- \* A quality control analyte recovery is outside of specified acceptance criteria
- \*\* Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

### Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature:



Name: Theresa Austin

Date: 09 APR 2022

Title: Group Leader

# Sample Data Summary

# GEL LABORATORIES LLC

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## Certificate of Analysis

Report Date: April 8, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Lavery  
 Project: Routine Analysis

Client Sample ID: S33699.01	Project: MERI00120
Sample ID: 573055001	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 09-MAR-22 16:00	
Receive Date: 14-MAR-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	1.27	+/-1.10	1.78	3.00	pCi/L		JXC9	04/06/22	1139	2241166	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.72	+/-1.15			pCi/L		NXL1	04/08/22	1426	2241165	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.451	+/-0.313	0.416	1.00	pCi/L		LXP1	04/08/22	0958	2241158	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			67.3	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

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## Certificate of Analysis

Report Date: April 8, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

Client Sample ID: S33699.02 (Field Dupe)	Project: MERI00120
Sample ID: 573055002	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 09-MAR-22 16:00	
Receive Date: 14-MAR-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	0.536	+/-0.885	1.54	3.00	pCi/L			JXC9	04/06/22	1139	2241166	1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		1.16	+/-0.940			pCi/L			NXL1	04/08/22	1426	2241165	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.629	+/-0.314	0.348	1.00	pCi/L			LXP1	04/08/22	0958	2241158	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			80.2	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

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## Certificate of Analysis

Report Date: April 8, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Lavery  
 Project: Routine Analysis

Client Sample ID: S33699.03 (Field Blank)	Project: MERI00120
Sample ID: 573055003	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 09-MAR-22 15:45	
Receive Date: 14-MAR-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.452	+/-0.981	1.75	3.00	pCi/L		JXC9	04/06/22	1139	2241166	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.644	+/-1.01			pCi/L		NXL1	04/08/22	1426	2241165	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.192	+/-0.234	0.393	1.00	pCi/L		LXP1	04/08/22	0958	2241158	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			70.2	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# Quality Control Summary

# GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

## QC Summary

Report Date: April 8, 2022

Page 1 of 2

**Merit Laboratories Inc.**  
**2680 East Lansing Drive**  
**East Lansing, Michigan**

**Contact: John Laverty**

**Workorder: 573055**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Rad Gas Flow</b>											
Batch	2241166										
QC1205041406	573055001	DUP									
Radium-228	U	1.27	U	0.535	pCi/L	N/A		N/A	JXC9	04/06/22	11:38
	Uncertainty	+/-1.10		+/-0.734							
QC1205041407	LCS										
Radium-228	46.9			40.9	pCi/L		87.4	(75%-125%)		04/06/22	11:38
	Uncertainty			+/-3.11							
QC1205041405	MB										
Radium-228			U	0.0306	pCi/L					04/06/22	11:38
	Uncertainty			+/-1.39							
<b>Rad Ra-226</b>											
Batch	2241158										
QC1205041398	573055001	DUP									
Radium-226		0.451		0.489	pCi/L	7.95		(0% - 100%)	LXP1	04/08/22	10:30
	Uncertainty	+/-0.313		+/-0.338							
QC1205041400	LCS										
Radium-226	26.4			25.4	pCi/L		96.1	(75%-125%)		04/08/22	10:30
	Uncertainty			+/-1.85							
QC1205041397	MB										
Radium-226			U	0.124	pCi/L					04/08/22	10:30
	Uncertainty			+/-0.258							
QC1205041399	573055001	MS									
Radium-226	131	0.451		98.7	pCi/L		75.3	(75%-125%)		04/08/22	10:30
	Uncertainty	+/-0.313		+/-7.91							

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- \*\* Analyte is a Tracer compound
- < Result is less than value reported
- > Result is greater than value reported
- BD Results are either below the MDC or tracer recovery is low
- FA Failed analysis.
- H Analytical holding time was exceeded



# GEL LABORATORIES LLC

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## QC Summary

Workorder: 573055

Page 2 of 2

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
J											
J											
K											
L											
M											
M											
N/A											
N1											
ND											
NJ											
Q											
R											
U											
UI											
UJ											
UL											
X											
Y											
^											
h											

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

\* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

# Gas Flow Raw Data

# Batch 2241166 Check-list

This check-list was completed on 06-APR-22 by Nat Long

This batch was reviewed by Nat Long on 06-APR-22 and Kenshalla Oston on 07-APR-22.

**Batch ID:**  
2241166

**Product:**  
GFC28RAL

**Description:** Gas Flow Radium 228  
GL-RAD-A-063

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
11	Has the method required detection limit been met?	Yes		
<b>Miscellaneous Information</b>				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

# Prep Logbook

## Radium-228 in Liquid

**Batch ID:** 2241166

**Analyst:** Jasmine Conley (JXC9)

**Method:** EPA 904.0/SW846 9320 Modified

**Lab SOP:** GL-RAD-A-063 REV# 5

**Instrument:** LUCAS-C037036045

**Due Dates for Lab:** 08-APR-2022

**Package:** 10-APR-2022

**SDG:** 11-APR-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205041407	Radium-228	1965-C	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	573055001	01-APR-2022	3	301.14	301.14	04/04/22 13:00	04/06/22 10:20
2	573055002	01-APR-2022	3	301.62	301.62	04/04/22 13:00	04/06/22 10:20
3	573055003	01-APR-2022	3	299.78	299.78	04/04/22 13:00	04/06/22 10:20
4	573056001	01-APR-2022	3	302.58	302.58	04/04/22 13:00	04/06/22 10:20
5	573056002	01-APR-2022	3	300.07	300.07	04/04/22 13:00	04/06/22 10:20
6	573056003	01-APR-2022	3	301.91	301.91	04/04/22 13:00	04/06/22 10:20
7	1205041405 MB	01-APR-2022	3		302.58	04/04/22 13:00	04/06/22 10:20
8	1205041406 DUP (573055001)	01-APR-2022	3	301.5	301.5	04/04/22 13:00	04/06/22 10:20
9	1205041407 LCS	01-APR-2022	3		302.58	04/04/22 13:00	04/06/22 10:20

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1951-C	Barium-133	.1 mL	Pipet Id: RAD-GFC-1795419 Data Entry Date2: 01-APR-2022 00:00
REGNT 3354444	RGF-Neodymium Substrate	5 mL	
REGNT 3371585.12	16M Nitric Acid	5 mL	
REGNT 3401161.34	Concentrated HF (48-51%)	4 mL	
REGNT 3411398	Barium Carrier Ra228 REG	1 mL	
REGNT 3412396.3	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	
REGNT 3413369	Lot #DGA0030	2 g	
REGNT 3413388	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3413919	RGF-50% Potassium Carbonate	2 mL	
REGNT 3416693	RGF-7M Nitric Acid	25 mL	
REGNT 3417370	2M HCl	20 mL	
REGNT 3417462	RGF-1.5M Ammonium Sulfate	10 mL	
REGNT 3417468	RGF-1M Citric Acid	5 mL	

### Radium-228 Liquid

Filename : RA228.XLS  
 File type : Excel  
 Version # : 1.4.2

Tracer S/N : 1951-C  
 Tracer Exp Date : 9/16/2022  
 Tracer Volume Added: 0.10

Batch : 2241166  
 Analyst : JAS02031  
 Prep Date : 4/1/2022  
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL  
 Parmname : Radium-228  
 Required MDA : 3 pCi/L  
 Ra-228 Abundance : 1.00  
 Halflife of Ra-228 : 5.75 years  
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	573055001.1	0.3011	1.8478E-05	3/9/2022 16:00	1459.1	1.51%	981.6	1.84%	0.1	0.000200
2	573055002.1	0.3016	1.8486E-05	3/9/2022 16:00	1459.1	1.51%	1169.8	1.69%	0.1	0.000200
3	573055003.1	0.2998	1.8455E-05	3/9/2022 15:45	1459.1	1.51%	1024.9	1.80%	0.1	0.000200
4	573056001.1	0.3026	1.8503E-05	3/8/2022 16:45	1459.1	1.51%	1267.0	1.62%	0.1	0.000200
5	573056002.1	0.3001	1.8460E-05	3/8/2022 16:45	1459.1	1.51%	1230.3	1.65%	0.1	0.000200
6	573056003.1	0.3019	1.8491E-05	3/8/2022 16:35	1459.1	1.51%	1216.9	1.65%	0.1	0.000200
7	1205041405.1	0.3026	1.8503E-05	4/1/2022 0:00	1459.1	1.51%	1121.2	1.72%	0.1	0.000200
8	1205041406.1	0.3015	1.8484E-05	3/9/2022 16:00	1459.1	1.51%	1210.0	1.66%	0.1	0.000200
9	1205041407.1	0.3026	1.8503E-05	4/1/2022 0:00	1459.1	1.51%	1216.2	1.66%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063  
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated	Sample
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction	Recovery %	Sample Recovery Error %
			Alpha	Beta										
1	1A	60	7	55	0.917	4/6/2022 11:39	4/4/2022 13:00	4/6/2022 10:20	0.991	0.862	0.994	1.057	67.3%	1.22%
2	1B	60	13	51	0.850	4/6/2022 11:39	4/4/2022 13:00	4/6/2022 10:20	0.991	0.862	0.994	1.057	80.2%	1.17%
3	1C	60	8	49	0.817	4/6/2022 11:39	4/4/2022 13:00	4/6/2022 10:20	0.991	0.862	0.994	1.057	70.2%	1.21%
4	2A	60	0	50	0.833	4/6/2022 11:39	4/4/2022 13:00	4/6/2022 10:20	0.991	0.862	0.994	1.057	86.8%	1.14%
5	2B	60	3	116	1.933	4/6/2022 11:39	4/4/2022 13:00	4/6/2022 10:20	0.991	0.862	0.994	1.057	84.3%	1.15%
6	2C	60	19	45	0.750	4/6/2022 11:39	4/4/2022 13:00	4/6/2022 10:20	0.991	0.862	0.994	1.057	83.4%	1.15%
7	2D	60	3	111	1.850	4/6/2022 11:38	4/4/2022 13:00	4/6/2022 10:20	0.998	0.862	0.994	1.057	76.8%	1.18%
8	3B	60	2	38	0.633	4/6/2022 11:38	4/4/2022 13:00	4/6/2022 10:20	0.991	0.862	0.994	1.057	82.9%	1.16%
9	3C	60	1	778	12.967	4/6/2022 11:38	4/4/2022 13:00	4/6/2022 10:20	0.998	0.862	0.994	1.057	83.4%	1.16%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2021	5/31/2022	0.6325	0.00738	0.626	4/2/2022 8:39	500
2	PIC	6/1/2021	5/31/2022	0.6409	0.00711	0.702	4/2/2022 8:40	500
3	PIC	6/1/2021	5/31/2022	0.6524	0.00847	0.706	4/2/2022 8:40	500
4	PIC	6/1/2021	5/31/2022	0.6321	0.01914	0.752	4/2/2022 8:40	500
5	PIC	6/1/2021	5/31/2022	0.6248	0.02111	1.644	4/2/2022 8:40	500
6	PIC	6/1/2021	5/31/2022	0.6380	0.01274	0.934	4/2/2022 8:40	500
7	PIC	6/1/2021	5/31/2022	0.6254	0.00745	1.842	4/2/2022 8:40	500
8	PIC	6/1/2021	5/31/2022	0.6428	0.01614	0.480	4/2/2022 8:40	500
9	PIC	6/1/2021	5/31/2022	0.6497	0.00988	0.918	4/2/2022 8:40	500

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

**Spike S/N :** N/A  
**Spike Exp Date :** N/A  
**Spike Activity (dpm/ml):** N/A  
**Spike Volume Added:** N/A

\* - RPD changed to 0% due to sample & dup activity below MDA

**LCS S/N :** 1965-C  
**LCS Exp Date :** 8/5/2022  
**LCS Activity (dpm/ml):** 314.76  
**LCS Volume Added:** 0.10

Results Pos.	Decision	Critical	Required	Sample Act.		Sample Act.	Net Count	Net Count	2 SIGMA	2 SIGMA	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
	Level pCi/L	Level pCi/L	MDA pCi/L	MDA pCi/L	Conc. pCi/L	Error %	Rate CPM	Rate Error CPM	Counting Uncertainty pCi/L	Total Prop. Uncertainty pCi/L						
1	1.1028	0.7786	3	1.7762	<b>1.2727</b>	44.26%	0.2907	0.1286	1.1034	1.1484		SAMPLE				
2	0.9656	0.6817	3	1.5445	<b>0.5358</b>	84.32%	0.1480	0.1248	0.8854	0.8955		SAMPLE				
3	1.0926	0.7714	3	1.7470	<b>0.4520</b>	110.76%	0.1107	0.1226	0.9813	0.9878		SAMPLE				
4	0.9331	0.6588	3	1.4866	<b>0.2749</b>	152.56%	0.0813	0.1241	0.8220	0.8249		SAMPLE				
5	1.4497	1.0235	3	2.2246	<b>1.0276</b>	65.17%	0.2893	0.1884	1.3118	1.3373		SAMPLE				
6	1.0753	0.7592	3	1.6932	<b>-0.6431</b>	65.17%	-0.1840	0.1199	0.8212	0.8213		SAMPLE				
7	1.6539	1.1677	3	2.5267	<b>0.0306</b>	2322.36%	0.0080	0.1858	1.3940	1.3941		MB				
8	0.7695	0.5433	3	1.2611	<b>0.5350</b>	70.01%	0.1533	0.1073	0.7339	0.7461	573055001.1	DUP	* 0.0%			
9	1.0363	0.7316	3	1.6332	<b>40.9368</b>	4.16%	12.0487	0.4668	3.1089	10.7081		LCS			46.8588	87.4%



SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
573055001	1A	60	7	55	4/6/2022 11:39	4/6/2022 12:39	PIC	2241166
573055002	1B	60	13	51	4/6/2022 11:39	4/6/2022 12:39	PIC	2241166
573055003	1C	60	8	49	4/6/2022 11:39	4/6/2022 12:39	PIC	2241166
573056001	2A	60	0	50	4/6/2022 11:39	4/6/2022 12:39	PIC	2241166
573056002	2B	60	3	116	4/6/2022 11:39	4/6/2022 12:39	PIC	2241166
573056003	2C	60	19	45	4/6/2022 11:39	4/6/2022 12:39	PIC	2241166
1205041405	2D	60	3	111	4/6/2022 11:38	4/6/2022 12:38	PIC	2241166
1205041406	3B	60	2	38	4/6/2022 11:38	4/6/2022 12:38	PIC	2241166
1205041407	3C	60	1	778	4/6/2022 11:38	4/6/2022 12:38	PIC	2241166

ASSAY 6-Apr-22 12:27:42  
 Wizard 2480 s/n 46190630  
 Protocol id 9 Ba-133\_1  
 Time limit  
 Count limit  
 Isotope Ba-133\_1  
 Protocol date 4/6/2022  
 Run id. 4875

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	92	1	180	4378.13	1459.11	1.51	12:27:42
573055001	2	92	2	180	2945.28	981.56	1.84	67.27	12:30:56
573055002	3	92	3	180	3509.85	1169.82	1.69	80.17	12:34:10
573055003	4	92	4	180	3075.28	1024.89	1.8	70.24	12:37:24
573056001	5	92	5	180	3801.57	1266.95	1.62	86.83	12:40:38
573056002	1	6	1	180	3691.13	1230.25	1.65	84.32	12:44:15
573056003	2	6	2	180	3651.28	1216.86	1.65	83.40	12:47:29
1205041405	3	6	3	180	3364.28	1121.21	1.72	76.84	12:50:43
1205041406	4	6	4	180	3630.28	1209.97	1.66	82.93	12:53:57
1205041407	5	6	5	180	3649	1216.2	1.66	83.35	12:57:10

END OF ASSAY

# **Continuing Calibration Data**

# Gas Flow Proportional Counter Checks for 06-Apr-2022

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100E2	Above	Beta bkg	06-Apr 06:46	60	2.050	1.386	3.015	-0.55
LB4100F3	need 2nd	Alpha bkg	06-Apr 05:13	60	0.267	-8.38E-2	0.560	+0.26
LB4100G1	Above	Alpha XTalk	06-Apr 06:16	5	1.449	0.088	0.447	+19.78
LB4100G1	Above	Beta bkg	06-Apr 05:13	60	11759	0.380	1.675	+54,485.12
LB4100G1	Above	Beta eff	06-Apr 06:30	5	25718	12880	18320	+11.16
LB4100G2	Above	Alpha eff	06-Apr 06:16	5	9885	7308	9581	+3.80
LB4100G2	Below	Alpha XTalk	06-Apr 06:16	5	0.318	0.324	0.423	-3.39
LB4100G2	Above	Beta bkg	06-Apr 05:13	60	4.700	1.159	2.203	+17.35
LB4100G3	need 2nd	Alpha eff	06-Apr 06:16	5	6728	6620	7779	-2.44
LB4100G3	Above	Beta bkg	06-Apr 05:13	60	6.750	0.810	1.674	+38.25
LB4100G3	need 2nd	Beta eff	06-Apr 06:30	5	22053	21640	22870	-0.98
LB4100H4	Above	Alpha eff	06-Apr 06:46	5	10193	6065	9898	+3.46
PIC5A	Above	Alpha bkg	06-Apr 06:57	60	0.433	0.017	0.370	+4.08
PIC5C	Above	Alpha bkg	06-Apr 06:57	60	0.317	-3.69E-2	0.387	+2.01
PIC5C	Above	Beta bkg	06-Apr 06:57	60	2.150	-4.87E-1	2.075	+3.18
PIC6B	need 2nd	Beta bkg	06-Apr 05:50	60	1.683	0.389	2.636	+0.46
PIC6C	Above	Beta bkg	06-Apr 06:58	60	2.200	0.415	2.299	+2.68
PIC8B	need 2nd	Alpha bkg	06-Apr 07:01	60	0.250	-1.16E-1	0.388	+1.36
PIC8B	Above	Beta bkg	06-Apr 07:01	60	2.433	-1.80E-1	2.341	+3.22
PIC8C	Above	Beta bkg	06-Apr 05:56	60	3.400	-2.96E-1	2.115	+6.20
PIC12D	Above	Beta bkg	06-Apr 06:07	60	2.017	0.003	2.352	+2.14

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

LB4100C1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

LB410013  
LB410014

Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by *R. Bink-Herman*

Date 4-6-22

GEL Laboratories LLC

# Runlogs

# Instrument Run Log

Instrument Type: GFPC

Batch ID: 2241166

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205041405	MB	JXC9	PIC2D	APR-06-22 11:38:47	DONE	25mm Filter	01-JUN-21 00:00
1205041406	DUP	JXC9	PIC3B	APR-06-22 11:38:47	DONE	25mm Filter	01-JUN-21 00:00
1205041407	LCS	JXC9	PIC3C	APR-06-22 11:38:51	DONE	25mm Filter	01-JUN-21 00:00
573055001	SAMPLE	JXC9	PIC1A	APR-06-22 11:39:01	DONE	25mm Filter	01-JUN-21 00:00
573055002	SAMPLE	JXC9	PIC1B	APR-06-22 11:39:04	DONE	25mm Filter	01-JUN-21 00:00
573055003	SAMPLE	JXC9	PIC1C	APR-06-22 11:39:08	DONE	25mm Filter	01-JUN-21 00:00
573056001	SAMPLE	JXC9	PIC2A	APR-06-22 11:39:12	DONE	25mm Filter	01-JUN-21 00:00
573056002	SAMPLE	JXC9	PIC2B	APR-06-22 11:39:15	DONE	25mm Filter	01-JUN-21 00:00
573056003	SAMPLE	JXC9	PIC2C	APR-06-22 11:39:19	DONE	25mm Filter	01-JUN-21 00:00

# Lucas Cell Raw Data



# Batch 2241158 Check-list

This check-list was completed on 08-APR-22 by Lyndsey Pace

This batch was reviewed by Elizabeth Krouse on 08-APR-22 and Lyndsey Pace on 08-APR-22.

**Batch ID:**  
2241158

**Product:**  
LUC26RAL

**Description:** Lucas Cell Radium 226  
GL-RAD-A-008

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
<b>Miscellaneous Information</b>				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

# Prep Logbook

## Radium-226 in Liquid

**Batch ID:** 2241158

**Analyst:** Lyndsey Pace (LXP1)  
Prep: Rochet Sanchez (RS2)

**Method:** EPA 903.1 Modified

**Lab SOP:** GL-RAD-A-008 REV# 15

**Instrument:** GFC-1795419-0.1mL

**Due Dates for Lab:** 08-APR-2022

**Package:** 10-APR-2022

**SDG:** 11-APR-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205041400	Radium-226 SPIKE	1715-G	.1	mL
MS	1205041399	Radium-226 SPIKE	1715-G	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	573055001	01-APR-2022	1	504.92	504.92	04/04/22 09:10	407	04/08/22 06:40	04/08/22 09:58	3	15
2	573055002	01-APR-2022	1	506.92	506.92	04/04/22 09:10	501	04/08/22 06:40	04/08/22 09:58	3	23
3	573055003	01-APR-2022	1	501.12	501.12	04/04/22 09:10	601	04/08/22 06:40	04/08/22 09:58	4	10
4	573056001	01-APR-2022	1	504.22	504.22	04/04/22 09:10	705	04/08/22 06:40	04/08/22 09:58	2	16
5	573056002	01-APR-2022	1	503.11	503.11	04/04/22 09:10	803	04/08/22 06:40	04/08/22 09:58	1	11
6	573056003	01-APR-2022	1	506.17	506.17	04/04/22 09:10	104	04/08/22 07:05	04/08/22 10:30	2	11
7	1205041397 MB	01-APR-2022	1		506.92	04/04/22 09:10	207	04/08/22 07:05	04/08/22 10:30	7	11
8	1205041398 DUP (573055001)	01-APR-2022	1	501.25	501.25	04/04/22 09:10	401	04/08/22 07:05	04/08/22 10:30	4	17
9	1205041399 MS (573055001)	01-APR-2022	1	102.69	102.69	04/04/22 09:10	502	04/08/22 07:05	04/08/22 10:30	3	607
10	1205041400 LCS	01-APR-2022	1		506.92	04/04/22 09:10	608	04/08/22 07:05	04/08/22 10:30	2	734

Reagent/Solvent Lot ID	Description	Amount	Comments:
			Data Entry Date2: 01-APR-2022 00:00

### Radium-226 Liquid

Filename : RA226.XLS  
 File type : Excel  
 Version # : 1.3.2

Procedure Code : LUC26RAL  
 Parmname : Radium-226  
 Required MDA : 1 pCi/L  
 Halflife of Ra-226 : 1600 years  
 Ra-226 Abundance : 1.00  
 Halflife of Rn-222 : 3.8235 days

Batch : 2241158  
 Analyst : LXP1  
 Prep Date : 4/1/2022  
 Ra-226 Method Uncertainty : 0.073648

Batch counted on : LUCAS CELL DETECTOR  
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Count Time (min.)	Cell Efficiency (cpm/dpm)
1	573055001.1	0.5049	2.0276E-05	3/9/2022 16:00	407	30	15	0.500	3	0.100	30	1.6030
2	573055002.1	0.5069	2.0284E-05	3/9/2022 16:00	501	30	23	0.767	3	0.100	30	1.9100
3	573055003.1	0.5011	2.0260E-05	3/9/2022 15:45	601	30	10	0.333	4	0.133	30	1.9010
4	573056001.1	0.5042	2.0273E-05	3/8/2022 16:45	705	30	16	0.533	2	0.067	30	1.7610
5	573056002.1	0.5031	2.0269E-05	3/8/2022 16:45	803	30	11	0.367	1	0.033	30	2.0020
6	573056003.1	0.5062	2.0281E-05	3/8/2022 16:35	104	30	11	0.367	2	0.067	30	1.5790
7	1205041397.1	0.5069	2.0284E-05	4/1/2022 0:00	207	30	11	0.367	7	0.233	30	1.9320
8	1205041398.1	0.5013	2.0261E-05	3/9/2022 16:00	401	30	17	0.567	4	0.133	30	1.6120
9	1205041399.1	0.1027	1.1534E-05	3/9/2022 16:00	502	30	607	20.233	3	0.100	30	1.8100
10	1205041400.1	0.5069	2.0284E-05	4/1/2022 0:00	608	30	734	24.467	2	0.067	30	1.7270

Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008  
 Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrowth End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
6.600%	2/1/2022	1/31/2023	4/4/2022 9:10	4/8/2022 6:40	4/8/2022 9:58	0.507	0.975	1.002	1.000
4.300%	6/1/2021	5/31/2022	4/4/2022 9:10	4/8/2022 6:40	4/8/2022 9:58	0.507	0.975	1.002	1.000
5.300%	7/1/2021	6/30/2022	4/4/2022 9:10	4/8/2022 6:40	4/8/2022 9:58	0.507	0.975	1.002	1.000
3.000%	11/1/2021	10/31/2022	4/4/2022 9:10	4/8/2022 6:40	4/8/2022 9:58	0.507	0.975	1.002	1.000
7.300%	4/1/2022	3/31/2023	4/4/2022 9:10	4/8/2022 6:40	4/8/2022 9:58	0.507	0.975	1.002	1.000
0.800%	5/2/2021	4/30/2022	4/4/2022 9:10	4/8/2022 7:05	4/8/2022 10:30	0.508	0.975	1.002	1.000
9.200%	8/1/2021	7/31/2022	4/4/2022 9:10	4/8/2022 7:05	4/8/2022 10:30	0.508	0.975	1.002	1.000
8.100%	2/1/2022	1/31/2023	4/4/2022 9:10	4/8/2022 7:05	4/8/2022 10:30	0.508	0.975	1.002	1.000
9.900%	6/1/2021	5/31/2022	4/4/2022 9:10	4/8/2022 7:05	4/8/2022 10:30	0.508	0.975	1.002	1.000
7.400%	7/1/2021	6/30/2022	4/4/2022 9:10	4/8/2022 7:05	4/8/2022 10:30	0.508	0.975	1.002	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

**Spike S/N :** 1715-G  
**Spike Exp Date :** 9/15/2022  
**Spike Activity (dpm/ml):** 297.55  
**Spike Volume Added:** 0.10

**LCS S/N :** 1715-G  
**LCS Exp Date :** 9/15/2022  
**LCS Activity (dpm/ml):** 297.55  
**LCS Volume Added:** 0.10

<b>Results</b>																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.2147	0.1516	1	0.4161	<b>0.4515</b>	35.97%	0.4000	0.1414	0.3128	0.3249		SAMPLE				
2	0.1795	0.1267	1	0.3478	<b>0.6290</b>	25.86%	0.6667	0.1700	0.3143	0.3314		SAMPLE				
3	0.2107	0.1487	1	0.3933	<b>0.1918</b>	62.59%	0.2000	0.1247	0.2344	0.2369		SAMPLE				
4	0.1598	0.1128	1	0.3285	<b>0.4801</b>	30.45%	0.4667	0.1414	0.2852	0.2948		SAMPLE				
5	0.0996	0.0703	1	0.2314	<b>0.3023</b>	35.40%	0.3333	0.1155	0.2053	0.2143		SAMPLE				
6	0.1772	0.1251	1	0.3642	<b>0.3421</b>	40.07%	0.3000	0.1202	0.2687	0.2732		SAMPLE				
7	0.2705	0.1910	1	0.4750	<b>0.1241</b>	106.46%	0.1333	0.1414	0.2580	0.2596		MB				
8	0.2478	0.1750	1	0.4627	<b>0.4888</b>	36.17%	0.4333	0.1528	0.3377	0.3537	573055001.1	DUP	8.0%			
9	0.9330	0.6587	1	1.8078	<b>98.7367</b>	10.71%	20.1333	0.8233	7.9134	25.1560	573055001.1	MS			130.5244	75.3%
10	0.1617	0.1142	1	0.3325	<b>25.4048</b>	8.28%	24.4000	0.9043	1.8454	5.5164		LCS			26.4405	96.1%

# **Continuing Calibration Data**



# Ludlum Alpha Scintillation Counter Checks for 08-APR-2022

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	07:01	1	1.22E+05	122477	0.07		
LUCAS2	EFF	07:02	1	1.33E+05	133481	1.55		
LUCAS4	EFF	06:57	1	1.28E+05	128247	1.43		
LUCAS5	EFF	06:39	1	1.31E+05	130592	0.84		
LUCAS6	EFF	06:38	1	1.32E+05	131716	1.3		
LUCAS7	EFF	06:37	1	1.35E+05	134809	2.49		
LUCAS8	EFF	06:34	1	1.19E+05	118681	-1.92		

**Reviewed by:**

Lyndsey Pace

**Date:** 08-APR-22

GEL Laboratories LLC

# Runlogs



# Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2241158

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
573055001	SAMPLE	LXP1	LUCAS4	APR-08-22 09:58:00	DONE	Lucas Cell	01-FEB-22 00:00
573055002	SAMPLE	LXP1	LUCAS5	APR-08-22 09:58:00	DONE	Lucas Cell	01-JUN-21 00:01
573055003	SAMPLE	LXP1	LUCAS6	APR-08-22 09:58:00	DONE	Lucas Cell	01-JUL-21 00:00
573056001	SAMPLE	LXP1	LUCAS7	APR-08-22 09:58:00	DONE	Lucas Cell	01-NOV-21 00:00
573056002	SAMPLE	LXP1	LUCAS8	APR-08-22 09:58:00	DONE	Lucas Cell	01-APR-22 00:00
573056003	SAMPLE	LXP1	LUCAS1	APR-08-22 10:30:00	DONE	Lucas Cell	02-MAY-21 00:01
1205041397	MB	LXP1	LUCAS2	APR-08-22 10:30:00	DONE	Lucas Cell	01-AUG-21 00:00
1205041398	DUP	LXP1	LUCAS4	APR-08-22 10:30:00	DONE	Lucas Cell	01-FEB-22 00:00
1205041399	MS	LXP1	LUCAS5	APR-08-22 10:30:00	DONE	Lucas Cell	01-JUN-21 00:01
1205041400	LCS	LXP1	LUCAS6	APR-08-22 10:30:00	DONE	Lucas Cell	01-JUL-21 00:00



Environmental Laboratory  
 1232 Haco Drive  
 Lansing  
 Michigan, 48910

CHAIN OF CUSTODY

Page 1 of 1

Phone: (517)702-6372

Lab Work Order Number L203035

Client Name BWL - Erickson Station		Project Name Erickson AM MI Wells 7B		Requested Analysis						Requested Turn Around	
Client Contact Cheryl Louden		Project Number [none]		Ag: As: B: Ba: Be: Ca: Cd: Ni: Mg Cr: Co: Cu: Fe: Hg: Li: Mo: Ni: K TSS HCO3, CO3, Hardness Cl-IC: F-ISE: SO4: TDS Radium 226 and Radium 228 HCO3, CO3, SSC 03/09/22 Hardness SSC 03/09/22							Rush requests subject to additional charge.  Rush requests subject to lab approval.
Address 3725 S. Canal		Project Description									
City Lansing		PO Number 30926 10021									
State/Zip MI, 48917		Shipped By									
Phone (517) 702-6396	Fax (517) 702-6373	Tracking Number									
Sampler Marc Wahrer											

Sample Name or Field ID	Sampled Date	Sampled Time	Sample Type Grab/Composite	Matrix Code	Container Count	Preservation Code				Sample	Comments
						b	a	a	b		
MW-7B	03/09/22	1555	G	GW	5	1	1	1	2		
Field Duplicate	↓	↓	G	GW	5	1	1	1	2		
Field Blank	+	1545	G	DI	5	1	1	1	2		

Relinquished By 	Date/Time 3-9-22 1652	Received By J Caporale	Date/Time 03/09/22 1652	
Relinquished By	Date/Time	Received By	Date/Time	Comments
Relinquished By	Date/Time	Received By	Date/Time	
Cooler Numbers and Temperatures				

Matrix Codes: DI=Deionized Water, GW=Ground Water Preserv. Codes: a=None, b=0.5% HNO3

\* SSC 03/09/22



Lansing Board of Water and Light  
Environmental Services Laboratory (MI00079)  
1232 Haco Dr.  
Lansing, Michigan 48901

12 April 2022

BWL - Erickson Station  
Attn: Cheryl Loudon  
3725 S. Canal  
Lansing, MI 48917

**Project: Erickson AM MI**

Dear Cheryl Loudon,

Enclosed is a copy of the laboratory report for the following work order(s) received by Lansing Board of Water and Light Environmental Services Laboratory:

<b>Work Order</b>	<b>Received</b>	<b>Account Number</b>
L203020	3/9/2022 7:00:00AM	30926 10021

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in blue ink that reads "Jennifer Caporale".

Jennifer Caporale, Supervisor



Report ID: S33650.01(04)  
Generated on 04/11/2022  
Replaces report S33650.01(03) generated on 03/14/2022

**Report to**  
Attention: Jennifer Caporale  
Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901  
  
Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

**Report produced by**  
Merit Laboratories, Inc.  
2680 East Lansing Drive  
East Lansing, MI 48823  
  
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Contacts for report questions:  
John Lavery (johnlavery@meritlabs.com)  
Barbara Ball (bball@meritlabs.com)

**Report Summary**  
Lab Sample ID(s): S33650.01-S33650.03  
Project: Erickson AM MI New Wells 7B-12B  
Collected Date(s): 03/08/2022  
Submitted Date/Time: 03/09/2022 08:15  
Sampled by: Marc Wahrer  
P.O. #:

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Maya Murshak  
Technical Director



## General Report Notes

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Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein, acrylonitrile, and 2-chlorovinylethyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (\*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

## Report Narrative

---

All analyses completed



### Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Alaska CSLAP	#17-001
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

### Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

### Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



## Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1
SM2320B	Standard Method 2320 B 2011
SM2340C	Standard Method 2340 C 2011
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007



### Sample Summary (3 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S33650.01	MW-12B L203020-02	Groundwater	03/08/22 16:45
S33650.02	Field Dupe MW-12B L203020-03	Groundwater	03/08/22 16:45
S33650.03	Field Blank L203020-04	Water	03/08/22 16:35





# Analytical Laboratory Report

Final Report

Lab Sample ID: S33650.01

Sample Tag: MW-12B L203020-02

Collected Date/Time: 03/08/2022 16:45

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	4.4	IR
2	1L Plastic	None	Yes	4.4	IR
1	125ml Plastic	HNO3	Yes	4.4	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	03/10/22 10:00	JRH	
Metal Digestion	Completed	SW3015A	03/10/22 10:30	CCM	

### Inorganics

Method: E300.0, Run Date: 03/09/22 10:19, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 03/10/22 11:10, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	390	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 03/10/22 10:08, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	96	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 03/10/22 18:40, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	380	20	1	mg/L	2		

Method: SM2540D, Run Date: 03/10/22 15:15, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	28	3	1	mg/L	1.00		

### Metals

Method: E200.8, Run Date: 03/10/22 12:35, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.025	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	3.25	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.34	0.02	0.00192	mg/L	5	7439-89-6	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S33650.01 (continued)

Sample Tag: MW-12B L203020-02

**Method: E200.8, Run Date: 03/10/22 12:35, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.042	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 03/10/22 14:58, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	23.7	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	7.50	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	8.99	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	116	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 03/10/22 13:38, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 04/09/22 11:53, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Lab Sample ID: S33650.02

Sample Tag: Field Dupe MW-12B L203020-03

Collected Date/Time: 03/08/2022 16:45

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	4.4	IR
2	1L Plastic	None	Yes	4.4	IR
1	125ml Plastic	HNO3	Yes	4.4	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	03/10/22 10:00	JRH	
Metal Digestion	Completed	SW3015A	03/10/22 10:30	CCM	

### Inorganics

Method: E300.0, Run Date: 03/09/22 10:32, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 03/10/22 11:14, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	400	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 03/10/22 10:12, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	83	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 03/10/22 18:40, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	374	20	1	mg/L	2		

Method: SM2540D, Run Date: 03/10/22 15:15, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	31	3	1	mg/L	1.00		

### Metals

Method: E200.8, Run Date: 03/10/22 12:38, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.025	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	3.20	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.36	0.02	0.00192	mg/L	5	7439-89-6	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S33650.02 (continued)  
Sample Tag: Field Dupe MW-12B L203020-03

**Method: E200.8, Run Date: 03/10/22 12:38, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.043	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 03/10/22 14:48, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	24.0	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	7.36	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	8.61	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	117	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 03/10/22 13:41, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 04/09/22 11:53, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Final Report

Lab Sample ID: S33650.03

Sample Tag: Field Blank L203020-04

Collected Date/Time: 03/08/2022 16:35

Matrix: Water

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	4.4	IR
2	1L Plastic	None	Yes	4.4	IR
1	125ml Plastic	HNO3	Yes	4.4	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	03/10/22 10:00	JRH	
Metal Digestion	Completed	SW3015A	03/10/22 10:30	CCM	

### Inorganics

Method: E300.0, Run Date: 03/09/22 10:45, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	2.5	0.04	mg/L	2.5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.06	mg/L	2.5	16984-48-8	
Sulfate	Not detected	2.5	0.15	mg/L	2.5	14808-79-8	

Method: SM2320B, Run Date: 03/10/22 11:20, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	Not detected	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 03/10/22 10:18, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	Not detected	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 03/10/22 18:40, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	10	20	1	mg/L	2		bB

Method: SM2540D, Run Date: 03/10/22 15:15, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1.00		

### Metals

Method: E200.8, Run Date: 03/10/22 12:29, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony	Not detected	0.005	0.00102	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.000102	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.0000648	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.0000862	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.000702	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.0000760	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.0000386	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.0000434	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000150	mg/L	2	7440-50-8	

b-Value detected less than reporting limit, but greater than MDL. B-Compound also found in associated method blank



# Analytical Laboratory Report

Final Report

Lab Sample ID: S33650.03 (continued)

Sample Tag: Field Blank L203020-04

**Method: E200.8, Run Date: 03/10/22 12:29, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Iron	Not detected	0.02	0.000768	mg/L	2	7439-89-6	
Lead	Not detected	0.003	0.0000760	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000654	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.0000868	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000100	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.000838	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.0000270	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.0000342	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.0000558	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.000292	mg/L	2	7440-66-6	

**Method: E200.8, Run Date: 03/10/22 14:44, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.0174	mg/L	2	7440-70-2	
Magnesium	Not detected	0.50	0.00480	mg/L	2	7439-95-4	
Potassium	Not detected	0.50	0.00920	mg/L	2	7440-09-7	
Sodium	Not detected	0.50	0.00340	mg/L	2	7440-23-5	

**Method: E245.1, Run Date: 03/10/22 13:44, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 04/09/22 11:53, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

# Merit Laboratories Login Checklist

Lab Set ID:S33650

Client:BWL01 (Board of Water & Light)

Project: Erickson AM MI New Wells 7B-12B

Submitted:03/09/2022 08:15 Login User: MMC

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental\_Laboratory@LBWL.com

Selection	Description	Note
<b>Sample Receiving</b>		
01.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples are received at 4C +/- 2C Thermometer # IR 4.4
02.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Received on ice/ cooling process begun
03.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples shipped
04.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples left in 24 hr. drop box
05.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Are there custody seals/tape or is the drop box locked
<b>Chain of Custody</b>		
06.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC adequately filled out
07.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC signed and relinquished to the lab
08.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sample tag on bottles match COC
09.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Subcontracting needed? Subcontracted to: GEL; 1Z4664770363727209
<b>Preservation</b>		
10.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Do sample have correct chemical preservation
11.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Completed pH checks on preserved samples? (no VOAs)
12.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Did any samples need to be preserved in the lab?
<b>Bottle Conditions</b>		
13.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	All bottles intact
14.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Appropriate analytical bottles are used
15.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Merit bottles used
16.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sufficient sample volume received
17.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples require laboratory filtration
18.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples submitted within holding time
19.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Do water VOC or TOX bottles contain headspace

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: \_\_\_\_\_ Date: \_\_\_\_\_

# Merit Laboratories Bottle Preservation Check

Lab Set ID: S33650 Submitted: 03/09/2022 08:15

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI New Wells 7B-12B

Initial Preservation Check: 03/09/2022 08:44 MMC

Preservation Recheck (E200.8): N/A

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: [Environmental\\_Laboratory@LBWL.com](mailto:Environmental_Laboratory@LBWL.com)

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S33650.01	125ml Plastic HNO3	<2			
S33650.01	1L Plastic HNO3	<2			
S33650.01	1L Plastic HNO3	<2			
S33650.02	125ml Plastic HNO3	<2			
S33650.02	1L Plastic HNO3	<2			
S33650.02	1L Plastic HNO3	<2			
S33650.03	125ml Plastic HNO3	<2			
S33650.03	1L Plastic HNO3	<2			
S33650.03	1L Plastic HNO3	<2			





2680 East Lansing Dr., East Lansing, MI 48823  
 Phone (517) 332-0167 Fax (517) 332-4034  
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

**REPORT TO**

**CHAIN OF CUSTODY RECORD**

**INVOICE TO**

CONTACT NAME Jennifer Caporale  
 COMPANY Lansing Board of Water and Light  
 ADDRESS PO Box 13007 48901-3007  
 CITY Lansing STATE Mi ZIP CODE 48901  
 PHONE NO. 517-702-6372 FAX NO. P.O. NO.  
 E-MAIL ADDRESS Environmental\_Laboratory@lbwl.com QUOTE NO.

CONTACT NAME Kelly Gleason  SAME  
 COMPANY  
 ADDRESS  
 CITY STATE ZIP CODE  
 PHONE NO. E-MAIL ADDRESS Kelly.Gleason@lbwl.com

**ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)**

PROJECT NO./NAME Erickson AM MI Wells 7B-12B SAMPLER(S) - PLEASE PRINT/SIGN NAME Marc Wahrer  
 TURNAROUND TIME REQUIRED  1 DAY  2 DAYS  3 DAYS  STANDARD  OTHER ASAP  
 DELIVERABLES REQUIRED  STD  LEVEL II  LEVEL III  LEVEL IV  EDD  OTHER

MATRIX GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID  
 CODE: SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIFE A=AIR W=WASTE

# Containers & Preservatives

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO <sub>3</sub>	H <sub>2</sub> SO <sub>4</sub>	NaOH	MeOH	OTHER	Total Metals	F- undistilled, Cl-, SO <sub>4</sub> , TDS	Radium 226	Radium 228	TSS	HCO <sub>3</sub> , CO <sub>3</sub>	Hardness	Certifications	
	DATE	TIME																		<input type="checkbox"/> OHIO VAP	<input type="checkbox"/> Drinking Water
	03/09/22		MW 7B L203020-01	GW	5	3	2						✓	✓	✓	✓	✓	✓	✓	<input type="checkbox"/> DoD	<input checked="" type="checkbox"/> NPDES
33650.01	3/8/22	1645	MW-12B L203020-02	GW	5	3	2						✓	✓	✓	✓	✓	✓	✓	<input type="checkbox"/> Detroit	<input type="checkbox"/> New York
.02		1645	Field Dupe MW-12B -03	GW	5	3	2						✓	✓	✓	✓	✓	✓	✓	<input type="checkbox"/> Other	
.03		1635	Field Blank -04	DI	5	3	2						✓	✓	✓	✓	✓	✓	✓		
																				Special Instructions	
																				Metals to analyse: Na, Mg, K	
																				B, Ca, Sb, As, Ba, Be, Cd, Cr,	
																				Co, Li, Hg, Mo, Pb, Se, Tl,	
																				Fe, Cu, Ni, Ag, V, Zn	
																				Please send a preliminary report	

RELINQUISHED BY: *[Signature]*  Sampler DATE 3-9-22 TIME 0740  
 RECEIVED BY: DATE TIME  
 SIGNATURE/ORGANIZATION  
 RELINQUISHED BY: DATE TIME  
 SIGNATURE/ORGANIZATION  
 RECEIVED BY: DATE TIME  
 SIGNATURE/ORGANIZATION

RELINQUISHED BY: Merit Drop Box DATE 3/9/22 TIME 0815  
 RECEIVED BY: M. Caporale DATE 3/9/22 TIME 0815  
 SEAL NO. SEAL INTACT YES  NO  INITIALS  
 SEAL NO. SEAL INTACT YES  NO  INITIALS  
 NOTES: TEMP. ON ARRIVAL 4.4

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

## Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total		250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.150
Be, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	2.5
Cl	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	10
Cr, total	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
F	Fluoride	250 mL plastic	mg/L	None	9056	28 d	1.0
Fe, total	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Pb, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Li, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Hg, total	Mercury	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Mo, total	Molybdenum	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
RA226/228	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	HNO3	SM 7500	6 mos	2.0 combined
Se, total	Selenium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ag, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
SO4	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	10
Tl, total	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
TDS	Total Dissolved Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TSS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540D	NA	3
V, total	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Zn, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005

April 08, 2022

John Laverty  
Merit Laboratories Inc.  
2680 East Lansing Drive  
East Lansing, Michigan 48823

Re: Routine Analysis  
Work Order: 573056  
SDG: S33650

Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on March 14, 2022. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at [www.gel.com](http://www.gel.com).

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,



Delaney Stone  
Project Manager

Purchase Order: GELP20-0018  
Enclosures



## Table of Contents

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# Case Narrative

**Receipt Narrative  
for  
Merit Laboratories, Inc.  
SDG: S33650  
Work Order: 573056**

**April 08, 2022**

**Laboratory Identification:**

GEL Laboratories LLC  
2040 Savage Road  
Charleston, South Carolina 29407  
(843) 556-8171

**Summary:**

**Sample receipt:** The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on March 14, 2022 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

**Sample Identification:** The laboratory received the following samples:

<b><u>Laboratory ID</u></b>	<b><u>Client ID</u></b>
573056001	S33650.01
573056002	S33650.02 (Field Dupe)
573056003	S33650.03 (Field Blank)

**Case Narrative:**

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.



Delaney Stone  
Project Manager

# **Chain of Custody and Supporting Documentation**

573056

C.O.C. PAGE # 1 OF 1

2680 East Lansing Dr., East Lansing, MI 48823  
Phone (517) 332-0167 Fax (517) 332-4034  
www.meritlabs.com



**REPORT TO**

CONTACT NAME Project Management Team

COMPANY Merit Laboratories

ADDRESS 2680 East Lansing Drive

CITY East Lansing

PHONE NO. 517-332-0167

E-MAIL ADDRESS results@meritlabs.com

**CHAIN OF CUSTODY RECORD**

CONTACT NAME Julie Teague

COMPANY Merit Laboratories

ADDRESS 2680 East Lansing Drive

CITY East Lansing

PHONE NO. 517-332-0167

E-MAIL ADDRESS juliet@meritlabs.com

**INVOICE TO**

CONTACT NAME  HOME

COMPANY Merit Laboratories

ADDRESS 2680 East Lansing Drive

CITY East Lansing

PHONE NO. 517-332-0167

E-MAIL ADDRESS juliet@meritlabs.com

PROJECT NO./NAME S33650

SAMPLER(S) - PLEASE PRINT/SIGN NAME

TURNAROUND TIME REQUIRED  1 DAY  2 DAYS  3 DAYS  STANDARD  OTHER

DELIVERABLES REQUIRED  STD  LEVEL II  LEVEL III  LEVEL IV  EDD  OTHER

MATRIX GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID  
SL=SLUDGE DW=DRINKING WATER O=OIL WP=WPIPE A=AIR W=WASTE

MATRIX CODE	YEAR	DATE	TIME	IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	# CONTAINERS & PRESERVATIVES
	3/8/22	1645		S33650.01	GW 2	2	2
	3/8/22	1645		S33650.02 (Field Dupe)	GW 2	2	2
	3/8/22	1635		S33650.03 (Field Blank)	GW 2	2	2

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

Certifications	Project Locations	Special Instructions
<input type="checkbox"/> OHIO VAP <input type="checkbox"/> Drinking Water	<input type="checkbox"/> Detroit <input type="checkbox"/> New York	* E903.1 Mod.
<input type="checkbox"/> DoD <input type="checkbox"/> NPDES	<input type="checkbox"/> Other	** E904.0/SW 9320 Mod.
Please use calculation product & provide Radium 226/228 combined results on the report		
(No Ice needed)		
** Subcontracted to GEL Laboratories, Inc.		
2040 Savage Road Charleston, SC 29407		

RELINQUISHED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME
<i>Johanna Murray</i>	3/9/22	1700	<i>Johanna Murray</i>	3/9/22	1700
<i>UPS</i>	3/9/22	1700	<i>UPS</i>	3/9/22	1700
<i>Dominica Padua</i>	3/14/22	9:00	<i>Dominica Padua</i>	3/14/22	9:00

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE



SAMPLE RECEIPT & REVIEW FORM

SAH

Client: MERIT SDG/AR/COC/Work Order: 573055 / 573056

Received By: TYE Date Received: 3/14/22

Carrier and Tracking Number

FedEx Express   
  FedEx Ground   
  UPS   
  Field Services   
  Courier   
  Other

124060 477 03 6153 4251

Suspected Hazard Information

Yes     No    \*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.

A) Shipped as a DOT Hazardous?     Hazard Class Shipped: \_\_\_\_\_ UN#: \_\_\_\_\_  
 If UN2910, Is the Radioactive Shipment Survey Compliant? Yes \_\_\_ No \_\_\_

B) Did the client designate the samples are to be received as radioactive?     COC notation or radioactive stickers on containers equal client designation.

C) Did the RSO classify the samples as radioactive?     Maximum Net Counts Observed\* (Observed Counts - Area Background Counts): 0 CPM / mR/Hr  
 Classified as: Rad 1    Rad 2    Rad 3

D) Did the client designate samples are hazardous?     COC notation or hazard labels on containers equal client designation.

E) Did the RSO identify possible hazards?     If D or E is yes, select Hazards below.  
 PCB's    Flammable    Foreign Soil    RCRA    Asbestos    Beryllium    Other:

Sample Receipt Criteria	Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1 Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable:    Seals broken    Damaged container    Leaking container    Other (describe)
2 Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable:    Client contacted and provided COC    COC created upon receipt
3 Samples requiring cold preservation within (0 ≤ 6 deg. C)?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Preservation Method: Wet Ice    Ice Packs    Dry ice <input checked="" type="checkbox"/> None    Other: _____ *all temperatures are recorded in Celsius <span style="float: right;">TEMP: <u>16°C</u></span>
4 Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Temperature Device Serial #: <u>IR2-20</u> Secondary Temperature Device Serial # (If Applicable): _____
5 Sample containers intact and sealed?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable:    Seals broken    Damaged container    Leaking container    Other (describe)
6 Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Sample ID's and Containers Affected: _____ If Preservation added, Lot#: _____
7 Do any samples require Volatile Analysis?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	If Yes, are Encores or Soil Kits present for solids? Yes ___ No ___ NA ___ (If yes, take to VOA Freezer)
				Do liquid VOA vials contain acid preservation? Yes ___ No ___ NA ___ (If unknown, select No)
				Are liquid VOA vials free of headspace? Yes ___ No ___ NA ___
8 Samples received within holding time?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	ID's and tests affected: _____
9 Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	ID's and containers affected: _____
10 Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable:    No dates on containers    No times on containers    COC missing info    Other (describe)
11 Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable:    No container count on COC    Other (describe)
12 Are sample containers identifiable as GEL provided by use of GEL labels?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
13 COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable:    Not relinquished    Other (describe)

Comments (Use Continuation Form if needed):

124060 477 03 6372 7209

PM (or PMA) review: Initials NRU Date 3/15/22 Page 1 of 1

# Laboratory Certifications

**List of current GEL Certifications as of 08 April 2022**

<b>State</b>	<b>Certification</b>
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122021-1
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2019-165
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122021-36
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

# **Radiological Analysis**

# Case Narrative

**Radiochemistry  
Technical Case Narrative  
Merit Laboratories, Inc.  
SDG #: S33650  
Work Order #: 573056**

**Product: GFPC Ra228, Liquid**

**Analytical Method:** EPA 904.0/SW846 9320 Modified

**Analytical Procedure:** GL-RAD-A-063 REV# 5

**Analytical Batch:** 2241166

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
573056001	S33650.01
573056002	S33650.02 (Field Dupe)
573056003	S33650.03 (Field Blank)
1205041405	Method Blank (MB)
1205041406	573055001(S33699.01) Sample Duplicate (DUP)
1205041407	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

**Product: Lucas Cell, Ra226, Liquid**

**Analytical Method:** EPA 903.1 Modified

**Analytical Procedure:** GL-RAD-A-008 REV# 15

**Analytical Batch:** 2241158

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
573056001	S33650.01
573056002	S33650.02 (Field Dupe)
573056003	S33650.03 (Field Blank)
1205041397	Method Blank (MB)
1205041398	573055001(S33699.01) Sample Duplicate (DUP)
1205041399	573055001(S33699.01) Matrix Spike (MS)
1205041400	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

**Miscellaneous Information****Additional Comments**

The matrix spike, 1205041399 (S33699.01MS), aliquot was reduced to conserve sample volume.

**Certification Statement**

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S33650 GEL Work Order: 573056

### The Qualifiers in this report are defined as follows:

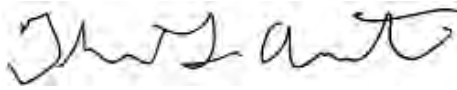
- \* A quality control analyte recovery is outside of specified acceptance criteria
- \*\* Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

### Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature:



Name: Theresa Austin

Date: 09 APR 2022

Title: Group Leader



# Sample Data Summary

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: April 8, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Lavery  
 Project: Routine Analysis

Client Sample ID: S33650.01	Project: MERI00120
Sample ID: 573056001	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 08-MAR-22 16:45	
Receive Date: 14-MAR-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	0.275	+/-0.822	1.49	3.00	pCi/L			JXC9	04/06/22	1139	2241166	1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		0.755	+/-0.870			pCi/L			NXL1	04/08/22	1426	2241165	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.480	+/-0.285	0.329	1.00	pCi/L			LXP1	04/08/22	0958	2241158	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			86.8	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: April 8, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Lavery  
 Project: Routine Analysis

Client Sample ID: S33650.02 (Field Dupe)	Project: MERI00120
Sample ID: 573056002	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 08-MAR-22 16:45	
Receive Date: 14-MAR-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	1.03	+/-1.31	2.22	3.00	pCi/L			JXC9	04/06/22	1139	2241166	1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		1.33	+/-1.33			pCi/L			NXL1	04/08/22	1426	2241165	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.302	+/-0.205	0.231	1.00	pCi/L			LXP1	04/08/22	0958	2241158	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			84.3	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: April 8, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

Client Sample ID: S33650.03 (Field Blank)	Project: MERI00120
Sample ID: 573056003	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 08-MAR-22 16:35	
Receive Date: 14-MAR-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	-0.643	+/-0.821	1.69	3.00	pCi/L			JXC9	04/06/22	1139 2241166	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.342	+/-0.864			pCi/L			NXL1	04/08/22	1426 2241165	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.342	+/-0.269	0.364	1.00	pCi/L			LXP1	04/08/22	1030 2241158	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			83.4	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# **Quality Control Summary**

# GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

## QC Summary

Report Date: April 8, 2022

Page 1 of 2

**Merit Laboratories Inc.**  
**2680 East Lansing Drive**  
**East Lansing, Michigan**

**Contact: John Laverty**

**Workorder: 573056**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Rad Gas Flow</b>											
Batch	2241166										
QC1205041406	573055001	DUP									
Radium-228	U	1.27	U	0.535	pCi/L	N/A		N/A	JXC9	04/06/22	11:38
	Uncertainty	+/-1.10		+/-0.734							
QC1205041407	LCS										
Radium-228	46.9			40.9	pCi/L		87.4	(75%-125%)		04/06/22	11:38
	Uncertainty			+/-3.11							
QC1205041405	MB										
Radium-228			U	0.0306	pCi/L					04/06/22	11:38
	Uncertainty			+/-1.39							
<b>Rad Ra-226</b>											
Batch	2241158										
QC1205041398	573055001	DUP									
Radium-226		0.451		0.489	pCi/L	7.95		(0% - 100%)	LXP1	04/08/22	10:30
	Uncertainty	+/-0.313		+/-0.338							
QC1205041400	LCS										
Radium-226	26.4			25.4	pCi/L		96.1	(75%-125%)		04/08/22	10:30
	Uncertainty			+/-1.85							
QC1205041397	MB										
Radium-226			U	0.124	pCi/L					04/08/22	10:30
	Uncertainty			+/-0.258							
QC1205041399	573055001	MS									
Radium-226	131	0.451		98.7	pCi/L		75.3	(75%-125%)		04/08/22	10:30
	Uncertainty	+/-0.313		+/-7.91							

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- \*\* Analyte is a Tracer compound
- < Result is less than value reported
- > Result is greater than value reported
- BD Results are either below the MDC or tracer recovery is low
- FA Failed analysis.
- H Analytical holding time was exceeded

# GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

## QC Summary

Workorder: 573056

Page 2 of 2

Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
J											
J											
K											
L											
M											
M											
N/A											
N1											
ND											
NJ											
Q											
R											
U											
UI											
UJ											
UL											
X											
Y											
^											
h											

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

\* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

# Gas Flow Raw Data



# Batch 2241166 Check-list

This check-list was completed on 06-APR-22 by Nat Long

This batch was reviewed by Nat Long on 06-APR-22 and Kenshalla Oston on 07-APR-22.

**Batch ID:**  
2241166

**Product:**  
GFC28RAL

**Description:** Gas Flow Radium 228  
GL-RAD-A-063

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
11	Has the method required detection limit been met?	Yes		
<b>Miscellaneous Information</b>				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

# Prep Logbook

## Radium-228 in Liquid

**Batch ID:** 2241166

**Analyst:** Jasmine Conley (JXC9)

**Method:** EPA 904.0/SW846 9320 Modified

**Lab SOP:** GL-RAD-A-063 REV# 5

**Instrument:** LUCAS-C037036045

**Due Dates for Lab:** 08-APR-2022

**Package:** 10-APR-2022

**SDG:** 11-APR-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205041407	Radium-228	1965-C	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	573055001	01-APR-2022	3	301.14	301.14	04/04/22 13:00	04/06/22 10:20
2	573055002	01-APR-2022	3	301.62	301.62	04/04/22 13:00	04/06/22 10:20
3	573055003	01-APR-2022	3	299.78	299.78	04/04/22 13:00	04/06/22 10:20
4	573056001	01-APR-2022	3	302.58	302.58	04/04/22 13:00	04/06/22 10:20
5	573056002	01-APR-2022	3	300.07	300.07	04/04/22 13:00	04/06/22 10:20
6	573056003	01-APR-2022	3	301.91	301.91	04/04/22 13:00	04/06/22 10:20
7	1205041405 MB	01-APR-2022	3		302.58	04/04/22 13:00	04/06/22 10:20
8	1205041406 DUP (573055001)	01-APR-2022	3	301.5	301.5	04/04/22 13:00	04/06/22 10:20
9	1205041407 LCS	01-APR-2022	3		302.58	04/04/22 13:00	04/06/22 10:20

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1951-C	Barium-133	.1 mL	Pipet Id: RAD-GFC-1795419 Data Entry Date2: 01-APR-2022 00:00
REGNT 3354444	RGF-Neodymium Substrate	5 mL	
REGNT 3371585.12	16M Nitric Acid	5 mL	
REGNT 3401161.34	Concentrated HF (48-51%)	4 mL	
REGNT 3411398	Barium Carrier Ra228 REG	1 mL	
REGNT 3412396.3	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	
REGNT 3413369	Lot #DGA0030	2 g	
REGNT 3413388	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3413919	RGF-50% Potassium Carbonate	2 mL	
REGNT 3416693	RGF-7M Nitric Acid	25 mL	
REGNT 3417370	2M HCl	20 mL	
REGNT 3417462	RGF-1.5M Ammonium Sulfate	10 mL	
REGNT 3417468	RGF-1M Citric Acid	5 mL	

### Radium-228 Liquid

Filename : RA228.XLS  
 File type : Excel  
 Version # : 1.4.2

Tracer S/N : 1951-C  
 Tracer Exp Date : 9/16/2022  
 Tracer Volume Added: 0.10

Batch : 2241166  
 Analyst : JAS02031  
 Prep Date : 4/1/2022  
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL  
 Parmname : Radium-228  
 Required MDA : 3 pCi/L  
 Ra-228 Abundance : 1.00  
 Halflife of Ra-228 : 5.75 years  
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	573055001.1	0.3011	1.8478E-05	3/9/2022 16:00	1459.1	1.51%	981.6	1.84%	0.1	0.000200
2	573055002.1	0.3016	1.8486E-05	3/9/2022 16:00	1459.1	1.51%	1169.8	1.69%	0.1	0.000200
3	573055003.1	0.2998	1.8455E-05	3/9/2022 15:45	1459.1	1.51%	1024.9	1.80%	0.1	0.000200
4	573056001.1	0.3026	1.8503E-05	3/8/2022 16:45	1459.1	1.51%	1267.0	1.62%	0.1	0.000200
5	573056002.1	0.3001	1.8460E-05	3/8/2022 16:45	1459.1	1.51%	1230.3	1.65%	0.1	0.000200
6	573056003.1	0.3019	1.8491E-05	3/8/2022 16:35	1459.1	1.51%	1216.9	1.65%	0.1	0.000200
7	1205041405.1	0.3026	1.8503E-05	4/1/2022 0:00	1459.1	1.51%	1121.2	1.72%	0.1	0.000200
8	1205041406.1	0.3015	1.8484E-05	3/9/2022 16:00	1459.1	1.51%	1210.0	1.66%	0.1	0.000200
9	1205041407.1	0.3026	1.8503E-05	4/1/2022 0:00	1459.1	1.51%	1216.2	1.66%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063  
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated	Sample
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction	Recovery %	Recovery Error %
			Alpha	Beta										
1	1A	60	7	55	0.917	4/6/2022 11:39	4/4/2022 13:00	4/6/2022 10:20	0.991	0.862	0.994	1.057	67.3%	1.22%
2	1B	60	13	51	0.850	4/6/2022 11:39	4/4/2022 13:00	4/6/2022 10:20	0.991	0.862	0.994	1.057	80.2%	1.17%
3	1C	60	8	49	0.817	4/6/2022 11:39	4/4/2022 13:00	4/6/2022 10:20	0.991	0.862	0.994	1.057	70.2%	1.21%
4	2A	60	0	50	0.833	4/6/2022 11:39	4/4/2022 13:00	4/6/2022 10:20	0.991	0.862	0.994	1.057	86.8%	1.14%
5	2B	60	3	116	1.933	4/6/2022 11:39	4/4/2022 13:00	4/6/2022 10:20	0.991	0.862	0.994	1.057	84.3%	1.15%
6	2C	60	19	45	0.750	4/6/2022 11:39	4/4/2022 13:00	4/6/2022 10:20	0.991	0.862	0.994	1.057	83.4%	1.15%
7	2D	60	3	111	1.850	4/6/2022 11:38	4/4/2022 13:00	4/6/2022 10:20	0.998	0.862	0.994	1.057	76.8%	1.18%
8	3B	60	2	38	0.633	4/6/2022 11:38	4/4/2022 13:00	4/6/2022 10:20	0.991	0.862	0.994	1.057	82.9%	1.16%
9	3C	60	1	778	12.967	4/6/2022 11:38	4/4/2022 13:00	4/6/2022 10:20	0.998	0.862	0.994	1.057	83.4%	1.16%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2021	5/31/2022	0.6325	0.00738	0.626	4/2/2022 8:39	500
2	PIC	6/1/2021	5/31/2022	0.6409	0.00711	0.702	4/2/2022 8:40	500
3	PIC	6/1/2021	5/31/2022	0.6524	0.00847	0.706	4/2/2022 8:40	500
4	PIC	6/1/2021	5/31/2022	0.6321	0.01914	0.752	4/2/2022 8:40	500
5	PIC	6/1/2021	5/31/2022	0.6248	0.02111	1.644	4/2/2022 8:40	500
6	PIC	6/1/2021	5/31/2022	0.6380	0.01274	0.934	4/2/2022 8:40	500
7	PIC	6/1/2021	5/31/2022	0.6254	0.00745	1.842	4/2/2022 8:40	500
8	PIC	6/1/2021	5/31/2022	0.6428	0.01614	0.480	4/2/2022 8:40	500
9	PIC	6/1/2021	5/31/2022	0.6497	0.00988	0.918	4/2/2022 8:40	500

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

**Spike S/N :** N/A  
**Spike Exp Date :** N/A  
**Spike Activity (dpm/ml):** N/A  
**Spike Volume Added:** N/A

\* - RPD changed to 0% due to sample & dup activity below MDA

**LCS S/N :** 1965-C  
**LCS Exp Date :** 8/5/2022  
**LCS Activity (dpm/ml):** 314.76  
**LCS Volume Added:** 0.10

Results																
Pos.	Decision	Critical	Required	Sample Act.		Sample Act.	Net Count	Net Count	2 SIGMA	2 SIGMA	Sample	Sample	RPD	RER	Nominal	Recovery
	Level	Level	MDA	MDA	Conc.	Error	Rate	Rate Error	Counting	Total Prop.						
	pCi/L	pCi/L	pCi/L	pCi/L	pCi/L	%	CPM	CPM	Uncertainty	Uncertainty						
1	1.1028	0.7786	3	1.7762	<b>1.2727</b>	44.26%	0.2907	0.1286	1.1034	1.1484		SAMPLE				
2	0.9656	0.6817	3	1.5445	<b>0.5358</b>	84.32%	0.1480	0.1248	0.8854	0.8955		SAMPLE				
3	1.0926	0.7714	3	1.7470	<b>0.4520</b>	110.76%	0.1107	0.1226	0.9813	0.9878		SAMPLE				
4	0.9331	0.6588	3	1.4866	<b>0.2749</b>	152.56%	0.0813	0.1241	0.8220	0.8249		SAMPLE				
5	1.4497	1.0235	3	2.2246	<b>1.0276</b>	65.17%	0.2893	0.1884	1.3118	1.3373		SAMPLE				
6	1.0753	0.7592	3	1.6932	<b>-0.6431</b>	65.17%	-0.1840	0.1199	0.8212	0.8213		SAMPLE				
7	1.6539	1.1677	3	2.5267	<b>0.0306</b>	2322.36%	0.0080	0.1858	1.3940	1.3941		MB				
8	0.7695	0.5433	3	1.2611	<b>0.5350</b>	70.01%	0.1533	0.1073	0.7339	0.7461	573055001.1	DUP	* 0.0%			
9	1.0363	0.7316	3	1.6332	<b>40.9368</b>	4.16%	12.0487	0.4668	3.1089	10.7081		LCS			46.8588	87.4%

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
573055001	1A	60	7	55	4/6/2022 11:39	4/6/2022 12:39	PIC	2241166
573055002	1B	60	13	51	4/6/2022 11:39	4/6/2022 12:39	PIC	2241166
573055003	1C	60	8	49	4/6/2022 11:39	4/6/2022 12:39	PIC	2241166
573056001	2A	60	0	50	4/6/2022 11:39	4/6/2022 12:39	PIC	2241166
573056002	2B	60	3	116	4/6/2022 11:39	4/6/2022 12:39	PIC	2241166
573056003	2C	60	19	45	4/6/2022 11:39	4/6/2022 12:39	PIC	2241166
1205041405	2D	60	3	111	4/6/2022 11:38	4/6/2022 12:38	PIC	2241166
1205041406	3B	60	2	38	4/6/2022 11:38	4/6/2022 12:38	PIC	2241166
1205041407	3C	60	1	778	4/6/2022 11:38	4/6/2022 12:38	PIC	2241166

ASSAY 6-Apr-22 12:27:42  
 Wizard 2480 s/n 46190630  
 Protocol id 9 Ba-133\_1  
 Time limit  
 Count limit  
 Isotope Ba-133\_1  
 Protocol date 4/6/2022  
 Run id. 4875

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	92	1	180	4378.13	1459.11	1.51	12:27:42
573055001	2	92	2	180	2945.28	981.56	1.84	67.27	12:30:56
573055002	3	92	3	180	3509.85	1169.82	1.69	80.17	12:34:10
573055003	4	92	4	180	3075.28	1024.89	1.8	70.24	12:37:24
573056001	5	92	5	180	3801.57	1266.95	1.62	86.83	12:40:38
573056002	1	6	1	180	3691.13	1230.25	1.65	84.32	12:44:15
573056003	2	6	2	180	3651.28	1216.86	1.65	83.40	12:47:29
1205041405	3	6	3	180	3364.28	1121.21	1.72	76.84	12:50:43
1205041406	4	6	4	180	3630.28	1209.97	1.66	82.93	12:53:57
1205041407	5	6	5	180	3649	1216.2	1.66	83.35	12:57:10

END OF ASSAY



# **Continuing Calibration Data**

# Gas Flow Proportional Counter Checks for 06-Apr-2022

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100E2	Above	Beta bkg	06-Apr 06:46	60	2.050	1.386	3.015	-0.55
LB4100F3	need 2nd	Alpha bkg	06-Apr 05:13	60	0.267	-8.38E-2	0.560	+0.26
LB4100G1	Above	Alpha XTalk	06-Apr 06:16	5	1.449	0.088	0.447	+19.78
LB4100G1	Above	Beta bkg	06-Apr 05:13	60	11759	0.380	1.675	+54,485.12
LB4100G1	Above	Beta eff	06-Apr 06:30	5	25718	12880	18320	+11.16
LB4100G2	Above	Alpha eff	06-Apr 06:16	5	9885	7308	9581	+3.80
LB4100G2	Below	Alpha XTalk	06-Apr 06:16	5	0.318	0.324	0.423	-3.39
LB4100G2	Above	Beta bkg	06-Apr 05:13	60	4.700	1.159	2.203	+17.35
LB4100G3	need 2nd	Alpha eff	06-Apr 06:16	5	6728	6620	7779	-2.44
LB4100G3	Above	Beta bkg	06-Apr 05:13	60	6.750	0.810	1.674	+38.25
LB4100G3	need 2nd	Beta eff	06-Apr 06:30	5	22053	21640	22870	-0.98
LB4100H4	Above	Alpha eff	06-Apr 06:46	5	10193	6065	9898	+3.46
PIC5A	Above	Alpha bkg	06-Apr 06:57	60	0.433	0.017	0.370	+4.08
PIC5C	Above	Alpha bkg	06-Apr 06:57	60	0.317	-3.69E-2	0.387	+2.01
PIC5C	Above	Beta bkg	06-Apr 06:57	60	2.150	-4.87E-1	2.075	+3.18
PIC6B	need 2nd	Beta bkg	06-Apr 05:50	60	1.683	0.389	2.636	+0.46
PIC6C	Above	Beta bkg	06-Apr 06:58	60	2.200	0.415	2.299	+2.68
PIC8B	need 2nd	Alpha bkg	06-Apr 07:01	60	0.250	-1.16E-1	0.388	+1.36
PIC8B	Above	Beta bkg	06-Apr 07:01	60	2.433	-1.80E-1	2.341	+3.22
PIC8C	Above	Beta bkg	06-Apr 05:56	60	3.400	-2.96E-1	2.115	+6.20
PIC12D	Above	Beta bkg	06-Apr 06:07	60	2.017	0.003	2.352	+2.14

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

LB4100C1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

LB410013  
LB410014

Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by *R. Smith-Harrison*

Date 4-6-22

GEL Laboratories LLC

# Runlogs

# Instrument Run Log

Instrument Type: GFPC

Batch ID: 2241166

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205041405	MB	JXC9	PIC2D	APR-06-22 11:38:47	DONE	25mm Filter	01-JUN-21 00:00
1205041406	DUP	JXC9	PIC3B	APR-06-22 11:38:47	DONE	25mm Filter	01-JUN-21 00:00
1205041407	LCS	JXC9	PIC3C	APR-06-22 11:38:51	DONE	25mm Filter	01-JUN-21 00:00
573055001	SAMPLE	JXC9	PIC1A	APR-06-22 11:39:01	DONE	25mm Filter	01-JUN-21 00:00
573055002	SAMPLE	JXC9	PIC1B	APR-06-22 11:39:04	DONE	25mm Filter	01-JUN-21 00:00
573055003	SAMPLE	JXC9	PIC1C	APR-06-22 11:39:08	DONE	25mm Filter	01-JUN-21 00:00
573056001	SAMPLE	JXC9	PIC2A	APR-06-22 11:39:12	DONE	25mm Filter	01-JUN-21 00:00
573056002	SAMPLE	JXC9	PIC2B	APR-06-22 11:39:15	DONE	25mm Filter	01-JUN-21 00:00
573056003	SAMPLE	JXC9	PIC2C	APR-06-22 11:39:19	DONE	25mm Filter	01-JUN-21 00:00

# Lucas Cell Raw Data

# Batch 2241158 Check-list

This check-list was completed on 08-APR-22 by Lyndsey Pace

This batch was reviewed by Elizabeth Krouse on 08-APR-22 and Lyndsey Pace on 08-APR-22.

**Batch ID:**  
2241158

**Product:**  
LUC26RAL

**Description:** Lucas Cell Radium 226  
GL-RAD-A-008

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
<b>Miscellaneous Information</b>				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

# Prep Logbook

## Radium-226 in Liquid

**Batch ID:** 2241158

**Analyst:** Lyndsey Pace (LXP1)  
Prep: Rochet Sanchez (RS2)

**Method:** EPA 903.1 Modified

**Lab SOP:** GL-RAD-A-008 REV# 15

**Instrument:** GFC-1795419-0.1mL

**Due Dates for Lab:** 08-APR-2022

**Package:** 10-APR-2022

**SDG:** 11-APR-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205041400	Radium-226 SPIKE	1715-G	.1	mL
MS	1205041399	Radium-226 SPIKE	1715-G	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	573055001	01-APR-2022	1	504.92	504.92	04/04/22 09:10	407	04/08/22 06:40	04/08/22 09:58	3	15
2	573055002	01-APR-2022	1	506.92	506.92	04/04/22 09:10	501	04/08/22 06:40	04/08/22 09:58	3	23
3	573055003	01-APR-2022	1	501.12	501.12	04/04/22 09:10	601	04/08/22 06:40	04/08/22 09:58	4	10
4	573056001	01-APR-2022	1	504.22	504.22	04/04/22 09:10	705	04/08/22 06:40	04/08/22 09:58	2	16
5	573056002	01-APR-2022	1	503.11	503.11	04/04/22 09:10	803	04/08/22 06:40	04/08/22 09:58	1	11
6	573056003	01-APR-2022	1	506.17	506.17	04/04/22 09:10	104	04/08/22 07:05	04/08/22 10:30	2	11
7	1205041397 MB	01-APR-2022	1		506.92	04/04/22 09:10	207	04/08/22 07:05	04/08/22 10:30	7	11
8	1205041398 DUP (573055001)	01-APR-2022	1	501.25	501.25	04/04/22 09:10	401	04/08/22 07:05	04/08/22 10:30	4	17
9	1205041399 MS (573055001)	01-APR-2022	1	102.69	102.69	04/04/22 09:10	502	04/08/22 07:05	04/08/22 10:30	3	607
10	1205041400 LCS	01-APR-2022	1		506.92	04/04/22 09:10	608	04/08/22 07:05	04/08/22 10:30	2	734

Reagent/Solvent Lot ID	Description	Amount	Comments:
			Data Entry Date2: 01-APR-2022 00:00



### Radium-226 Liquid

Filename : RA226.XLS  
 File type : Excel  
 Version # : 1.3.2

Procedure Code : LUC26RAL  
 Parmname : Radium-226  
 Required MDA : 1 pCi/L  
 Halflife of Ra-226 : 1600 years  
 Ra-226 Abundance : 1.00  
 Halflife of Rn-222 : 3.8235 days

Batch : 2241158  
 Analyst : LXP1  
 Prep Date : 4/1/2022  
 Ra-226 Method Uncertainty : 0.073648

Batch counted on : LUCAS CELL DETECTOR  
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Count Time (min.)	Cell Efficiency (cpm/dpm)
1	573055001.1	0.5049	2.0276E-05	3/9/2022 16:00	407	30	15	0.500	3	0.100	30	1.6030
2	573055002.1	0.5069	2.0284E-05	3/9/2022 16:00	501	30	23	0.767	3	0.100	30	1.9100
3	573055003.1	0.5011	2.0260E-05	3/9/2022 15:45	601	30	10	0.333	4	0.133	30	1.9010
4	573056001.1	0.5042	2.0273E-05	3/8/2022 16:45	705	30	16	0.533	2	0.067	30	1.7610
5	573056002.1	0.5031	2.0269E-05	3/8/2022 16:45	803	30	11	0.367	1	0.033	30	2.0020
6	573056003.1	0.5062	2.0281E-05	3/8/2022 16:35	104	30	11	0.367	2	0.067	30	1.5790
7	1205041397.1	0.5069	2.0284E-05	4/1/2022 0:00	207	30	11	0.367	7	0.233	30	1.9320
8	1205041398.1	0.5013	2.0261E-05	3/9/2022 16:00	401	30	17	0.567	4	0.133	30	1.6120
9	1205041399.1	0.1027	1.1534E-05	3/9/2022 16:00	502	30	607	20.233	3	0.100	30	1.8100
10	1205041400.1	0.5069	2.0284E-05	4/1/2022 0:00	608	30	734	24.467	2	0.067	30	1.7270

Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

**Analytical SOP:** GL-RAD-A-008  
**Instrument SOP:** GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrow End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
6.600%	2/1/2022	1/31/2023	4/4/2022 9:10	4/8/2022 6:40	4/8/2022 9:58	0.507	0.975	1.002	1.000
4.300%	6/1/2021	5/31/2022	4/4/2022 9:10	4/8/2022 6:40	4/8/2022 9:58	0.507	0.975	1.002	1.000
5.300%	7/1/2021	6/30/2022	4/4/2022 9:10	4/8/2022 6:40	4/8/2022 9:58	0.507	0.975	1.002	1.000
3.000%	11/1/2021	10/31/2022	4/4/2022 9:10	4/8/2022 6:40	4/8/2022 9:58	0.507	0.975	1.002	1.000
7.300%	4/1/2022	3/31/2023	4/4/2022 9:10	4/8/2022 6:40	4/8/2022 9:58	0.507	0.975	1.002	1.000
0.800%	5/2/2021	4/30/2022	4/4/2022 9:10	4/8/2022 7:05	4/8/2022 10:30	0.508	0.975	1.002	1.000
9.200%	8/1/2021	7/31/2022	4/4/2022 9:10	4/8/2022 7:05	4/8/2022 10:30	0.508	0.975	1.002	1.000
8.100%	2/1/2022	1/31/2023	4/4/2022 9:10	4/8/2022 7:05	4/8/2022 10:30	0.508	0.975	1.002	1.000
9.900%	6/1/2021	5/31/2022	4/4/2022 9:10	4/8/2022 7:05	4/8/2022 10:30	0.508	0.975	1.002	1.000
7.400%	7/1/2021	6/30/2022	4/4/2022 9:10	4/8/2022 7:05	4/8/2022 10:30	0.508	0.975	1.002	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

**Spike S/N :** 1715-G  
**Spike Exp Date :** 9/15/2022  
**Spike Activity (dpm/ml):** 297.55  
**Spike Volume Added:** 0.10

**LCS S/N :** 1715-G  
**LCS Exp Date :** 9/15/2022  
**LCS Activity (dpm/ml):** 297.55  
**LCS Volume Added:** 0.10

<b>Results</b>																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.2147	0.1516	1	0.4161	<b>0.4515</b>	35.97%	0.4000	0.1414	0.3128	0.3249		SAMPLE				
2	0.1795	0.1267	1	0.3478	<b>0.6290</b>	25.86%	0.6667	0.1700	0.3143	0.3314		SAMPLE				
3	0.2107	0.1487	1	0.3933	<b>0.1918</b>	62.59%	0.2000	0.1247	0.2344	0.2369		SAMPLE				
4	0.1598	0.1128	1	0.3285	<b>0.4801</b>	30.45%	0.4667	0.1414	0.2852	0.2948		SAMPLE				
5	0.0996	0.0703	1	0.2314	<b>0.3023</b>	35.40%	0.3333	0.1155	0.2053	0.2143		SAMPLE				
6	0.1772	0.1251	1	0.3642	<b>0.3421</b>	40.07%	0.3000	0.1202	0.2687	0.2732		SAMPLE				
7	0.2705	0.1910	1	0.4750	<b>0.1241</b>	106.46%	0.1333	0.1414	0.2580	0.2596		MB				
8	0.2478	0.1750	1	0.4627	<b>0.4888</b>	36.17%	0.4333	0.1528	0.3377	0.3537	573055001.1	DUP	8.0%			
9	0.9330	0.6587	1	1.8078	<b>98.7367</b>	10.71%	20.1333	0.8233	7.9134	25.1560	573055001.1	MS			130.5244	75.3%
10	0.1617	0.1142	1	0.3325	<b>25.4048</b>	8.28%	24.4000	0.9043	1.8454	5.5164		LCS			26.4405	96.1%

# **Continuing Calibration Data**



# Ludlum Alpha Scintillation Counter Checks for 08-APR-2022

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	07:01	1	1.22E+05	122477	0.07		
LUCAS2	EFF	07:02	1	1.33E+05	133481	1.55		
LUCAS4	EFF	06:57	1	1.28E+05	128247	1.43		
LUCAS5	EFF	06:39	1	1.31E+05	130592	0.84		
LUCAS6	EFF	06:38	1	1.32E+05	131716	1.3		
LUCAS7	EFF	06:37	1	1.35E+05	134809	2.49		
LUCAS8	EFF	06:34	1	1.19E+05	118681	-1.92		

**Reviewed by:**

Lyndsey Pace

**Date:** 08-APR-22

GEL Laboratories LLC

# Runlogs

# Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2241158

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
573055001	SAMPLE	LXP1	LUCAS4	APR-08-22 09:58:00	DONE	Lucas Cell	01-FEB-22 00:00
573055002	SAMPLE	LXP1	LUCAS5	APR-08-22 09:58:00	DONE	Lucas Cell	01-JUN-21 00:01
573055003	SAMPLE	LXP1	LUCAS6	APR-08-22 09:58:00	DONE	Lucas Cell	01-JUL-21 00:00
573056001	SAMPLE	LXP1	LUCAS7	APR-08-22 09:58:00	DONE	Lucas Cell	01-NOV-21 00:00
573056002	SAMPLE	LXP1	LUCAS8	APR-08-22 09:58:00	DONE	Lucas Cell	01-APR-22 00:00
573056003	SAMPLE	LXP1	LUCAS1	APR-08-22 10:30:00	DONE	Lucas Cell	02-MAY-21 00:01
1205041397	MB	LXP1	LUCAS2	APR-08-22 10:30:00	DONE	Lucas Cell	01-AUG-21 00:00
1205041398	DUP	LXP1	LUCAS4	APR-08-22 10:30:00	DONE	Lucas Cell	01-FEB-22 00:00
1205041399	MS	LXP1	LUCAS5	APR-08-22 10:30:00	DONE	Lucas Cell	01-JUN-21 00:01
1205041400	LCS	LXP1	LUCAS6	APR-08-22 10:30:00	DONE	Lucas Cell	01-JUL-21 00:00



Hometown People. Hometown Power.

Environmental Laboratory  
1232 Haco Drive  
Lansing  
Michigan, 48910

**CHAIN OF CUSTODY**

Page 1 of 1

Phone: (517)702-6372

Lab Work Order Number LA03030

Client Name BWL - Erickson Station	Project Name Erickson AM MI Wells 7B-12B	Requested Turn Around
Client Contact Cheryl Louden	Project Number [none]	Requested Analysis
Address 3725 S. Canal	Project Description	Radium 226 and Radium 228
City Lansing	PO Number 30926 10021	Chloride F-ISE; SO4; TDS
State/Zip MI, 48917	Shipped By	TSS
Phone (517) 702-6396	Tracking Number	Cr: Co: Cu: Fe: Hg: Li: Mo: Ni: Pb: Zn: Ag: As: B: Ba: Be: Bi: Cd: C: Cl: Ni: K: Na: S: Se: Tl: U: V: W: Y: Zn
Fax (517) 702-6373		
Sampler Marc Wahrer		Rush requests subject to additional charge Rush requests subject to lab approval

Sample Name or Field ID	Sampled Date	Sampled Time	Sample Type Grab/Composite	Matrix Code	Container Count	Preservation Code														
						a	b	a	b	a	b	a	b	a	b					
MMW-7B	3/8/22	1645	G	GW	5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
MMW-12B			G	GW	5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Field Duplicate			G	GW	5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Field Blank			G	DI	5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Relinquished By 	Date/Time 3-8-22 1715	Received By 	Date/Time 03/09/22 0700	Comments
Relinquished By	Date/Time	Received By	Date/Time	Comments
Relinquished By	Date/Time	Received By	Date/Time	Comments
Cooler Numbers and Temperatures				

Preserv. Codes: a=None, b=0.5% HNO3

Di=Deionized Water, GW=Ground Water

Matrix Codes:





Lansing Board of Water and Light  
Environmental Services Laboratory (MI00079)  
1232 Haco Dr.  
Lansing, Michigan 48901

12 April 2022

BWL - Erickson Station  
Attn: Cheryl Loudon  
3725 S. Canal  
Lansing, MI 48917

**Project: Erickson AM MI**

Dear Cheryl Loudon,

Enclosed is a copy of the laboratory report for the following work order(s) received by Lansing Board of Water and Light Environmental Services Laboratory:

<b>Work Order</b>	<b>Received</b>	<b>Account Number</b>
L203039	3/11/2022 8:30:00AM	30926 10021

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in blue ink that reads "Jennifer Caporale".

Jennifer Caporale, Supervisor



Report ID: S33751.01(03)  
Generated on 04/11/2022  
Replaces report S33751.01(02) generated on 03/14/2022

**Report to**  
Attention: Jennifer Caporale  
Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901  
  
Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

**Report produced by**  
Merit Laboratories, Inc.  
2680 East Lansing Drive  
East Lansing, MI 48823  
  
Phone: (517) 332-0167 FAX: (517) 332-6333  
  
Contacts for report questions:  
John Lavery (johnlavery@meritlabs.com)  
Barbara Ball (bball@meritlabs.com)

**Report Summary**  
Lab Sample ID(s): S33751.01-S33751.03  
Project: Erickson AM MI New Wells 7C  
Collected Date(s): 03/10/2022  
Submitted Date/Time: 03/11/2022 08:52  
Sampled by: Marc Wahrer  
P.O. #:

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Sample Summary (Page 5)

Maya Murshak  
Technical Director



## General Report Notes

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Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein, acrylonitrile, and 2-chlorovinylethyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (\*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

## Report Narrative

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All analyses completed



## Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Alaska CSLAP	#17-001
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

## Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

## Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



## Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1
SM2320B	Standard Method 2320 B 2011
SM2340C	Standard Method 2340 C 2011
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007



## Sample Summary (3 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S33751.01	MW-7C	Groundwater	03/10/22 16:35
S33751.02	Field Dupe MW-7C	Groundwater	03/10/22 16:35
S33751.03	Field Blank	Water	03/10/22 16:30



# Analytical Laboratory Report

Lab Sample ID: S33751.01

Sample Tag: MW-7C

Collected Date/Time: 03/10/2022 16:35

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	3.0	IR
2	1L Plastic	None	Yes	3.0	IR
1	125ml Plastic	HNO3	Yes	3.0	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	03/11/22 11:15	JRH	
Metal Digestion	Completed	SW3015A	03/14/22 10:20	CCM	

### Inorganics

Method: E300.0, Run Date: 03/11/22 10:44, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	96	10	0.16	mg/L	10	16887-00-6	

Method: E300.0, Run Date: 03/11/22 10:06, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	

Method: E300.0, Run Date: 03/11/22 11:10, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sulfate	751	50	3.0	mg/L	50	14808-79-8	

Method: SM2320B, Run Date: 03/14/22 11:06, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	150	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 03/14/22 12:14, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	840	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 03/10/22 19:10, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	1,500	20	1	mg/L	2		

Method: SM2540D, Run Date: 03/11/22 17:10, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	27	3	1	mg/L	1.00		

### Metals

Method: E200.8, Run Date: 03/14/22 12:09, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.007	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.045	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S33751.01 (continued)

Sample Tag: MW-7C

**Method: E200.8, Run Date: 03/14/22 12:09, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Boron	6.54	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	4.15	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.132	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.409	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	0.010	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 03/14/22 14:50, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	277	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	44.1	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	5.34	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	97.9	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 03/11/22 14:39, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 04/11/22 15:34, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.





# Analytical Laboratory Report

Final Report

Lab Sample ID: S33751.02

Sample Tag: Field Dupe MW-7C

Collected Date/Time: 03/10/2022 16:35

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	3.0	IR
2	1L Plastic	None	Yes	3.0	IR
1	125ml Plastic	HNO3	Yes	3.0	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	03/11/22 11:15	JRH	
Metal Digestion	Completed	SW3015A	03/14/22 10:20	CCM	

### Inorganics

Method: E300.0, Run Date: 03/11/22 10:57, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	95	10	0.16	mg/L	10	16887-00-6	

Method: E300.0, Run Date: 03/11/22 10:18, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	

Method: E300.0, Run Date: 03/11/22 11:23, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sulfate	761	50	3.0	mg/L	50	14808-79-8	

Method: SM2320B, Run Date: 03/14/22 11:14, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	160	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 03/14/22 12:20, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	860	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 03/10/22 19:10, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	1,500	20	1	mg/L	2		

Method: SM2540D, Run Date: 03/11/22 17:10, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	13	3	1	mg/L	1.00		

### Metals

Method: E200.8, Run Date: 03/14/22 12:14, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.007	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.046	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	



# Analytical Laboratory Report

Lab Sample ID: S33751.02 (continued)

Sample Tag: Field Dupe MW-7C

**Method: E200.8, Run Date: 03/14/22 12:14, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Boron	6.55	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	4.11	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.129	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.409	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	0.011	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	0.007	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 03/14/22 14:52, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	272	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	44.9	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	5.04	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	97.1	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 03/11/22 14:42, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 04/11/22 15:34, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Lab Sample ID: S33751.03

Sample Tag: Field Blank

Collected Date/Time: 03/10/2022 16:30

Matrix: Water

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	3.0	IR
2	1L Plastic	None	Yes	3.0	IR
1	125ml Plastic	HNO3	Yes	3.0	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	03/11/22 11:15	JRH	
Metal Digestion	Completed	SW3015A	03/14/22 10:20	CCM	

### Inorganics

Method: E300.0, Run Date: 03/11/22 10:31, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	2.5	0.04	mg/L	2.5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.06	mg/L	2.5	16984-48-8	
Sulfate	Not detected	2.5	0.15	mg/L	2.5	14808-79-8	

Method: SM2320B, Run Date: 03/14/22 11:16, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	Not detected	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 03/14/22 12:22, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	Not detected	2	0.238	mg/L	1		

Method: SM2540C, Run Date: 03/10/22 19:10, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	Not detected	20	1	mg/L	2		

Method: SM2540D, Run Date: 03/11/22 17:10, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1.00		

### Metals

Method: E200.8, Run Date: 03/14/22 12:00, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony	Not detected	0.005	0.00102	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.000102	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.0000648	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.0000862	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.000702	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.0000760	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.0000386	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.0000434	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000150	mg/L	2	7440-50-8	
Iron	Not detected	0.02	0.000768	mg/L	2	7439-89-6	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S33751.03 (continued)

Sample Tag: Field Blank

**Method: E200.8, Run Date: 03/14/22 12:00, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.0000760	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000654	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.0000868	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000100	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.000838	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.0000270	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.0000342	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.0000558	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.000292	mg/L	2	7440-66-6	

**Method: E200.8, Run Date: 03/14/22 14:49, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.0174	mg/L	2	7440-70-2	
Magnesium	Not detected	0.50	0.00480	mg/L	2	7439-95-4	
Potassium	Not detected	0.50	0.00920	mg/L	2	7440-09-7	
Sodium	Not detected	0.50	0.00340	mg/L	2	7440-23-5	

**Method: E245.1, Run Date: 03/11/22 15:10, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 04/11/22 15:34, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

# Merit Laboratories Login Checklist

Lab Set ID:S33751

Client:BWL01 (Board of Water & Light)

Project: Erickson AM MI New Wells 7C

Submitted:03/11/2022 08:52 Login User: PFD

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental\_Laboratory@LBWL.com

Selection	Description	Note
<b>Sample Receiving</b>		
01.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples are received at 4C +/- 2C Thermometer # IR 3.0
02.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Received on ice/ cooling process begun
03.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples shipped
04.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples left in 24 hr. drop box
05.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Are there custody seals/tape or is the drop box locked
<b>Chain of Custody</b>		
06.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC adequately filled out
07.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC signed and relinquished to the lab
08.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sample tag on bottles match COC
09.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Subcontracting needed? Subcontracted to: GEL
<b>Preservation</b>		
10.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Do sample have correct chemical preservation
11.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Completed pH checks on preserved samples? (no VOAs)
12.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Did any samples need to be preserved in the lab?
<b>Bottle Conditions</b>		
13.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	All bottles intact
14.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Appropriate analytical bottles are used
15.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Merit bottles used
16.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sufficient sample volume received
17.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples require laboratory filtration
18.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples submitted within holding time
19.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Do water VOC or TOX bottles contain headspace

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: \_\_\_\_\_ Date: \_\_\_\_\_

# Merit Laboratories Bottle Preservation Check

Lab Set ID: S33751 Submitted: 03/11/2022 08:52

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI New Wells 7C

Initial Preservation Check: 03/11/2022 09:25 PFD

Preservation Recheck (E200.8): N/A

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: [Environmental\\_Laboratory@LBWL.com](mailto:Environmental_Laboratory@LBWL.com)

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S33751.01	125ml Plastic HNO3	<2			
S33751.01	1L Plastic HNO3	<2			
S33751.01	1L Plastic HNO3	<2			
S33751.02	125ml Plastic HNO3	<2			
S33751.02	1L Plastic HNO3	<2			
S33751.02	1L Plastic HNO3	<2			
S33751.03	125ml Plastic HNO3	<2			
S33751.03	1L Plastic HNO3	<2			
S33751.03	1L Plastic HNO3	<2			



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 Phone (517) 332-0167 Fax (517) 332-4034  
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

**REPORT TO** **CHAIN OF CUSTODY RECORD** **INVOICE TO**

CONTACT NAME <b>Jennifer Caporale</b>			CONTACT NAME <b>Kelly Gleason</b> <input checked="" type="checkbox"/> SAME		
COMPANY <b>Lansing Board of Water and Light</b>			COMPANY		
ADDRESS <b>PO Box 13007 48901-3007</b>			ADDRESS		
CITY <b>Lansing</b>	STATE <b>Mi</b>	ZIP CODE <b>48901</b>	CITY	STATE	ZIP CODE
PHONE NO. <b>517-702-6372</b>	FAX NO.	P.O. NO.	PHONE NO.	E-MAIL ADDRESS <b>Kelly.Gleason@lbwl.com</b>	
E-MAIL ADDRESS <b>Environmental_Laboratory@lbwl.com</b>			QUOTE NO.		

PROJECT NO./NAME **Erickson AM MI Wells ~~7B-12B~~ 7C** SAMPLER(S) - PLEASE PRINT/SIGN NAME **Marc Wahrer**

TURNAROUND TIME REQUIRED  1 DAY  2 DAYS  3 DAYS  STANDARD  OTHER **ASAP**

DELIVERABLES REQUIRED  STD  LEVEL II  LEVEL III  LEVEL IV  EDD  OTHER

MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID  
 SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIPE A=AIR W=WASTE

# Containers & Preservatives

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO <sub>3</sub>	H <sub>2</sub> SO <sub>4</sub>	NaOH	MeOH	OTHER	Total Metals	F- undistilled, Cl-, SO <sub>4</sub> , TDS	Radium 226	Radium 228	TSS	HCO <sub>3</sub> , CO <sub>3</sub> , Hardness	Certifications		Project Locations		Special Instructions
	DATE	TIME																	<input type="checkbox"/> OHIO VAP	<input type="checkbox"/> Drinking Water	<input type="checkbox"/> DoD	<input checked="" type="checkbox"/> NPDES	
33751.01	03/10/22	1635	MW-7C	GW	5	3	2						✓	✓	✓	✓	✓	✓					Metals to analyse: Na, Mg, K
.02	↓	↓	Field Dupe MW-7C	GW	5	3	2						✓	✓	✓	✓	✓	✓					B, Ca, Sb, As, Ba, Be, Cd, Cr,
.03	↓	1630	Field Blank	DI	5	3	2						✓	✓	✓	✓	✓	✓					Co, Li, Hg, Mo, Pb, Se, Tl, Fe, Cu, Ni, Ag, V, Zn
																							Please send a preliminary report

RELINQUISHED BY: <i>[Signature]</i> <input checked="" type="checkbox"/> Sampler	DATE <b>3-11-22</b>	TIME <b>0852</b>	RELINQUISHED BY: _____	DATE _____	TIME _____
SIGNATURE/ORGANIZATION _____			SIGNATURE/ORGANIZATION _____		
RECEIVED BY: <i>[Signature]</i>	DATE <b>3/11/22</b>	TIME <b>0852</b>	RECEIVED BY: _____	DATE _____	TIME _____
SIGNATURE/ORGANIZATION _____			SIGNATURE/ORGANIZATION _____		
RELINQUISHED BY: _____	DATE _____	TIME _____	SEAL NO. _____	SEAL INTACT <input type="checkbox"/> YES <input type="checkbox"/> NO	INITIALS _____
SIGNATURE/ORGANIZATION _____			SEAL NO. _____	SEAL INTACT <input type="checkbox"/> YES <input type="checkbox"/> NO	INITIALS _____
RECEIVED BY: _____	DATE _____	TIME _____	NOTES: TEMP. ON ARRIVAL <b>3.0</b>		
SIGNATURE/ORGANIZATION _____					

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

## Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total		250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.150
Be, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	2.5
Cl	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	10
Cr, total	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
F	Fluoride	250 mL plastic	mg/L	None	9056	28 d	1.0
Fe, total	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Pb, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Li, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Hg, total	Mercury	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Mo, total	Molybdenum	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
RA226/228	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	HNO3	SM 7500	6 mos	2.0 combined
Se, total	Selenium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ag, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
SO4	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	10
Tl, total	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
TDS	Total Dissolved Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TSS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540D	NA	3
V, total	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Zn, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005



April 11, 2022

John Laverty  
Merit Laboratories Inc.  
2680 East Lansing Drive  
East Lansing, Michigan 48823

Re: Routine Analysis  
Work Order: 573155  
SDG: S33751

Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on March 15, 2022. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at [www.gel.com](http://www.gel.com).

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,



Delaney Stone  
Project Manager

Purchase Order: GELP20-0018  
Enclosures

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# Case Narrative

**Receipt Narrative  
for  
Merit Laboratories, Inc.  
SDG: S33751  
Work Order: 573155**

**April 11, 2022**

**Laboratory Identification:**

GEL Laboratories LLC  
2040 Savage Road  
Charleston, South Carolina 29407  
(843) 556-8171

**Summary:**

**Sample receipt:** The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on March 15, 2022 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

**Sample Identification:** The laboratory received the following samples:

<b><u>Laboratory ID</u></b>	<b><u>Client ID</u></b>
573155001	S33751.01
573155002	S33751.02 (Field Dupe)
573155003	S33751.03 (Field Blank)

**Case Narrative:**

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.



Delaney Stone  
Project Manager

# **Chain of Custody and Supporting Documentation**



2680 East Lansing Dr., East Lansing, MI 48823  
Phone (517) 332-0167 Fax (517) 332-4034  
www.meritlabs.com

C.O.C. PAGE # 1 OF 1

573155

REPORT TO

CONTACT NAME Project Management Team

COMPANY Merit Laboratories

ADDRESS 2680 East Lansing Drive

CITY East Lansing

PHONE NO. 517-332-0167

E-MAIL ADDRESS results@meritlabs.com

CHAIN OF CUSTODY RECORD

CONTACT NAME Julie Teague

COMPANY Merit Laboratories

ADDRESS 2680 East Lansing Drive

CITY East Lansing

PHONE NO. 517-332-0167

E-MAIL ADDRESS juliet@meritlabs.com

INVOICE TO

COMPANY

ADDRESS

CITY

STATE MI

ZIP CODE 48823

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

PROJECT NO./NAME S33751

SAMPLER(S) - PLEASE PRINT/SIGN NAME

TURNAROUND TIME REQUIRED  1 DAY  2 DAYS  3 DAYS  STANDARD  OTHER

DELIVERABLES REQUIRED  STD  LEVEL II  LEVEL III  LEVEL IV  EDD  OTHER

MATRIX CODE	GW=GROUNDWATER		WW=WASTEWATER		S=SOIL		L=LIQUID		SD=SOLID	
	SL=SLUDGE	DW=DRINKING WATER	Q=OIL	WP=WIPE	A=AIR	W=WASTE				

MERCIT LAB NO. FOR LAB USE ONLY	YEAR	DATE	TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	# OF BOTTLES		# Containers & Preservatives													
					MATRIX		NONE	ION	OM	M.S.O.	NOF	MACH	OTHER							
		3/10/22	1635	S33751.01	CW	2														
		3/10/22	1635	S33751.02 (Field Dupe)	CW	2														
		3/10/22	1630	S33751.03(Field Blank)	CW	2														

MATRIX CODE	YEAR	DATE	TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	# OF BOTTLES	MATRIX	NONE	ION	OM	M.S.O.	NOF	MACH	OTHER	Radium 226*	Radium 228**	Certifications
		3/10/22	1635	S33751.01	2	CW								<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	* E903.1 Mod. ** E904.0/SW 9320 Mod.
		3/10/22	1635	S33751.02 (Field Dupe)	2	CW								<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Please use calculation product & provide Radium 226/228 combined results on the report
		3/10/22	1630	S33751.03(Field Blank)	2	CW								<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	(No Ice needed) ** Subcontracted to GEL Laboratories, Inc. 2040 Savage Road Charleston, SC 29407

RELINQUISHED BY: SIGNATURE/ORGANIZATION	DATE	TIME
RECEIVED BY: SIGNATURE/ORGANIZATION	DATE	TIME
RELINQUISHED BY: SIGNATURE/ORGANIZATION	DATE	TIME
RECEIVED BY: SIGNATURE/ORGANIZATION	DATE	TIME

RELINQUISHED BY: SIGNATURE/ORGANIZATION	DATE	TIME
RECEIVED BY: SIGNATURE/ORGANIZATION	DATE	TIME
RELINQUISHED BY: SIGNATURE/ORGANIZATION	DATE	TIME
RECEIVED BY: SIGNATURE/ORGANIZATION	DATE	TIME

SEAL NO.	SEAL INTACT	INITIALS	DATE	TEMP. ON ARRIVAL
	<input checked="" type="checkbox"/>			
	<input checked="" type="checkbox"/>			

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

SA

SAMPLE RECEIPT & REVIEW FORM

Client: MERT SDG/AR/COC/Work Order: 573155

Received By: DC Date Received: 3-15-22

Carrier and Tracking Number: 12466477 03 6631 0484

Circle Applicable: FedEx Express, FedEx Ground, UPS, Field Services, Courier, Other

Suspected Hazard Information

\*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.

A) Shipped as a DOT Hazardous?  Yes  No Hazard Class Shipped: \_\_\_\_\_ UN#: \_\_\_\_\_  
If UN2910, Is the Radioactive Shipment Survey Compliant? Yes \_\_\_ No \_\_\_

B) Did the client designate the samples are to be received as radioactive?  Yes  No COC notation or radioactive stickers on containers equal client designation.

C) Did the RSO classify the samples as radioactive?  Yes  No Maximum Net Counts Observed\* (Observed Counts - Area Background Counts): 0 CPM / mR/hr  
Classified as: Rad 1 Rad 2 Rad 3

D) Did the client designate samples are hazardous?  Yes  No COC notation or hazard labels on containers equal client designation.

E) Did the RSO identify possible hazards?  Yes  No If D or E is yes, select Hazards below.  
PEB's Flammable Foreign Soil RCRA Asbestos Beryllium Other:

Sample Receipt Criteria	Yes	No	Comments/Qualifiers (Required for Non-Conforming Items)
1 Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2 Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Circle Applicable: Client contacted and provided COC COC created upon receipt
3 Samples requiring cold preservation within (0 ≤ 6 deg. C)?*	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Preservation Method: Wet Ice Ice Packs Dry ice <u>None</u> Other: _____ *all temperatures are recorded in Celsius TEMP: <u>160</u>
4 Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Temperature Device Serial #: <u>IR6-21</u> Secondary Temperature Device Serial # (If Applicable): _____
5 Sample containers intact and sealed?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6 Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Sample ID's and Containers Affected: _____ If Preservation added, Lot#: _____
7 Do any samples require Volatile Analysis?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	If Yes, are Encaps or Soil Kits present for solids? Yes ___ No ___ NA ___ (If yes, take to VOA Freezer)
			Do liquid VOA vials contain acid preservation? Yes ___ No ___ NA ___ (If unknown, select No)
			Are liquid VOA vials free of headspace? Yes ___ No ___ NA ___
8 Samples received within holding time?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Sample ID's and containers affected: _____
9 Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	ID's and tests affected: _____
10 Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	ID's and containers affected: _____
11 Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Circle Applicable: No dates on containers No times on containers COC missing info Other (describe)
12 Are sample containers identifiable as GEL provided by use of GEL labels?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Circle Applicable: No container count on COC Other (describe)
13 COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Circle Applicable: Not relinquished Other (describe)

Comments (Use Continuation Form if needed):

PM (or PMA) review: Initials GAB Date 3/16/22 Page 1 of 1

# Laboratory Certifications



**List of current GEL Certifications as of 11 April 2022**

<b>State</b>	<b>Certification</b>
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122021-1
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2019-165
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122021-36
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

# **Radiological Analysis**

# Case Narrative

**Radiochemistry  
Technical Case Narrative  
Merit Laboratories, Inc.  
SDG #: S33751  
Work Order #: 573155**

**Product: GFPC Ra228, Liquid**

**Analytical Method:** EPA 904.0/SW846 9320 Modified

**Analytical Procedure:** GL-RAD-A-063 REV# 5

**Analytical Batch:** 2242584

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
573155001	S33751.01
573155002	S33751.02 (Field Dupe)
573155003	S33751.03 (Field Blank)
1205043874	Method Blank (MB)
1205043875	573155001(S33751.01) Sample Duplicate (DUP)
1205043877	573281001(NonSDG) Matrix Spike (MS)
1205043878	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

**Quality Control (QC) Information**

**Method Blank Criteria**

The blank result (See Below) is greater than the MDC but less than the required detection limit.

Sample	Analyte	Value
1205043874 (MB)	Radium-228	Result: 2.29 pCi/L > MDA: 1.82 pCi/L <= RDL: 3.00 pCi/L

**Product: Lucas Cell, Ra226, Liquid**

**Analytical Method:** EPA 903.1 Modified

**Analytical Procedure:** GL-RAD-A-008 REV# 15

**Analytical Batch:** 2242575

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
573155001	S33751.01

573155002	S33751.02 (Field Dupe)
573155003	S33751.03 (Field Blank)
1205043862	Method Blank (MB)
1205043863	573129001(NonSDG) Sample Duplicate (DUP)
1205043864	573129001(NonSDG) Matrix Spike (MS)
1205043865	Laboratory Control Sample (LCS)
1205043866	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

**Quality Control (QC) Information**

**Duplication Criteria between LCS and LCSD**

The Laboratory Control Sample and Laboratory Control Sample Duplicate, (See Below), did not meet the relative percent difference requirement; however, they do meet the relative error ratio requirement with the value listed below and the spike recovery limit.

Sample	Analyte	Value
1205043865 (LCS) and 1205043866 (LCSD)	Radium-226	RPD 21.5* (0%-20%) RER 1.54 (0-3)

**Miscellaneous Information**

**Additional Comments**

The matrix spike, 1205043864 (Non SDG 573129001MS), aliquot was reduced to conserve sample volume.

**Certification Statement**

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

## GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

### Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S33751 GEL Work Order: 573155

**The Qualifiers in this report are defined as follows:**

- \* A quality control analyte recovery is outside of specified acceptance criteria
- \*\* Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

**Review/Validation**

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature: 

Name: Kenshalla Oston

Date: 11 APR 2022

Title: Analyst I

# Sample Data Summary

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: April 11, 2022

Company : Merit Laboratories Inc.  
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery  
Project: Routine Analysis

Client Sample ID: S33751.01      Project: MERI00120  
Sample ID: 573155001      Client ID: MERI001  
Matrix: Ground Water  
Collect Date: 10-MAR-22 16:35  
Receive Date: 15-MAR-22  
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228		2.79	+/-1.35	1.95	3.00	pCi/L			JXC9	04/07/22	1316 2242584	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		3.66	+/-1.42			pCi/L		1	NXL1	04/11/22	0901 2242583	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.867	+/-0.447	0.505	1.00	pCi/L			LXP1	03/24/22	0924 2242575	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			72.9	(15%-125%)

### Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor      Lc/LC: Critical Level  
DL: Detection Limit      PF: Prep Factor  
MDA: Minimum Detectable Activity      RL: Reporting Limit  
MDC: Minimum Detectable Concentration      SQL: Sample Quantitation Limit



# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: April 11, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

Client Sample ID: S33751.02 (Field Dupe)	Project: MERI00120
Sample ID: 573155002	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 10-MAR-22 16:35	
Receive Date: 15-MAR-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	2.11	+/-1.49	2.37	3.00	pCi/L			JXC9	04/07/22	1317 2242584	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		3.03	+/-1.57			pCi/L		1	NXL1	04/11/22	0901 2242583	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.916	+/-0.472	0.533	1.00	pCi/L			LXP1	03/24/22	0924 2242575	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			77.5	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: April 11, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

Client Sample ID: S33751.03 (Field Blank)	Project: MERI00120
Sample ID: 573155003	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 10-MAR-22 16:30	
Receive Date: 15-MAR-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228		3.24	+/-1.65	2.45	3.00	pCi/L			JXC9	04/07/22	1317 2242584	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		3.81	+/-1.70			pCi/L		1	NXL1	04/11/22	0901 2242583	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.567	+/-0.435	0.655	1.00	pCi/L			LXP1	03/24/22	0924 2242575	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			69.3	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# Quality Control Summary

# GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

## QC Summary

Report Date: April 11, 2022

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Merit Laboratories Inc.  
2680 East Lansing Drive  
East Lansing, Michigan

Contact: John Laverty

Workorder: 573155

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Rad Gas Flow</b>											
Batch	2242584										
QC1205043875	573155001	DUP									
Radium-228		2.79		1.90	pCi/L	37.8		(0% - 100%)	JXC9	04/07/22	13:17
	Uncertainty	+/-1.35		+/-1.23							
QC1205043878	LCS										
Radium-228	46.5			43.5	pCi/L		93.7	(75%-125%)		04/07/22	13:17
	Uncertainty			+/-3.72							
QC1205043874	MB										
Radium-228				2.29	pCi/L					04/07/22	13:17
	Uncertainty			+/-1.24							
QC1205043877	573281001	MS									
Radium-228	142	4.99		135	pCi/L		91.8	(75%-125%)		04/07/22	13:17
	Uncertainty	+/-1.81		+/-10.6							
<b>Rad Ra-226</b>											
Batch	2242575										
QC1205043863	573129001	DUP									
Radium-226	U	0.000	U	0.478	pCi/L	N/A		N/A	LXP1	03/24/22	10:27
	Uncertainty	+/-0.289		+/-0.419							
QC1205043865	LCS										
Radium-226	26.4			25.4	pCi/L		96.1	(75%-125%)		03/24/22	10:27
	Uncertainty			+/-2.12							
QC1205043866	LCSD										
Radium-226	26.4			31.5	pCi/L	21.5*	119	(0%-20%)		03/24/22	10:27
	Uncertainty			+/-2.31							
QC1205043862	MB										
Radium-226			U	0.335	pCi/L					03/24/22	10:27
	Uncertainty			+/-0.430							
QC1205043864	573129001	MS									
Radium-226	130 U	0.000		104	pCi/L		79.7	(75%-125%)		03/24/22	10:27
	Uncertainty	+/-0.289		+/-8.90							

### Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

# GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

## QC Summary

Workorder: 573155

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Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
**	Analyte is a Tracer compound										
<	Result is less than value reported										
>	Result is greater than value reported										
BD	Results are either below the MDC or tracer recovery is low										
FA	Failed analysis.										
H	Analytical holding time was exceeded										
J	See case narrative for an explanation										
J	Value is estimated										
K	Analyte present. Reported value may be biased high. Actual value is expected to be lower.										
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.										
M	M if above MDC and less than LLD										
M	REMP Result > MDC/CL and < RDL										
N/A	RPD or %Recovery limits do not apply.										
NI	See case narrative										
ND	Analyte concentration is not detected above the detection limit										
NJ	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier										
Q	One or more quality control criteria have not been met. Refer to the applicable narrative or DER.										
R	Sample results are rejected										
U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.										
UI	Gamma Spectroscopy--Uncertain identification										
UJ	Gamma Spectroscopy--Uncertain identification										
UL	Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.										
X	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier										
Y	Other specific qualifiers were required to properly define the results. Consult case narrative.										
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.										
h	Preparation or preservation holding time was exceeded										

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

\* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

# Gas Flow Raw Data

# Batch 2242584 Check-list

This check-list was completed on 08-APR-22 by Nat Long

This batch was reviewed by Kenshalla Oston on 08-APR-22 and Nat Long on 08-APR-22.

**Batch ID:**  
2242584

**Product:**  
GFC28RAL

**Description:** Gas Flow Radium 228  
GL-RAD-A-063

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?		No	
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
<b>Miscellaneous Information</b>				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

# Prep Logbook

## Radium-228 in Liquid

**Batch ID:** 2242584

**Analyst:** Jasmine Conley (JXC9)  
Prep: Lyndsey Pace (LXP1)

**Method:** EPA 904.0/SW846 9320 Modified

**Lab SOP:** GL-RAD-A-063 REV# 5

**Instrument:** LUCAS-C037036045

**Due Dates for Lab:** 09-APR-2022

**Package:** 11-APR-2022

**SDG:** 12-APR-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205043878	Radium-228	1965-C	.1	mL
MS	1205043877	Radium-228	1965-C	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	573155001	21-MAR-2022	3	300.41	300.41	03/25/22 13:00	04/07/22 11:00
2	573155002	21-MAR-2022	3	303.44	303.44	03/25/22 13:00	04/07/22 11:00
3	573155003	21-MAR-2022	3	302.06	302.06	03/25/22 13:00	04/07/22 11:00
4	573281001	21-MAR-2022	3	300.98	300.98	03/25/22 13:00	04/07/22 11:00
5	573281002	21-MAR-2022	3	301.82	301.82	03/25/22 13:00	04/07/22 11:00
6	573281003	21-MAR-2022	3	305.77	305.77	03/25/22 13:00	04/07/22 11:00
7	573281004	21-MAR-2022	3	301.07	301.07	03/25/22 13:00	04/07/22 11:00
8	573281005	21-MAR-2022	3	304.32	304.32	03/25/22 13:00	04/07/22 11:00
9	573281006	21-MAR-2022	3	302.62	302.62	03/25/22 13:00	04/07/22 11:00
10	573281007	21-MAR-2022	3	304.82	304.82	03/25/22 13:00	04/07/22 11:00
11	573281008	21-MAR-2022	3	303.73	303.73	03/25/22 13:00	04/07/22 11:00
12	573281009	21-MAR-2022	3	306.24	306.24	03/25/22 13:00	04/07/22 11:00
13	573281010	21-MAR-2022	3	300.77	300.77	03/25/22 13:00	04/07/22 11:00
14	1205043874 MB	21-MAR-2022	3		306.24	03/25/22 13:00	04/07/22 11:00
15	1205043875 DUP (573155001)	21-MAR-2022	3	300.31	300.31	03/25/22 13:00	04/07/22 11:00
16	1205043876 DUP (573281001)	21-MAR-2022	3	301.66	301.66	03/25/22 13:00	04/07/22 11:00
17	1205043877 MS (573281001)	21-MAR-2022	3	101.09	101.09	03/25/22 13:00	04/07/22 11:00
18	1205043878 LCS	21-MAR-2022	3		306.24	03/25/22 13:00	04/07/22 11:00

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1951-C	Barium-133	.1 mL	Pipet Id: RAD-GFC-1795419 Data Entry Date2: 21-MAR-2022 00:00
REGNT 3354444	RGF-Neodymium Substrate	5 mL	
REGNT 3355260.1	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	
REGNT 3371585.12	16M Nitric Acid	5 mL	
REGNT 3401161.34	Concentrated HF (48-51%)	4 mL	
REGNT 3407156	RGF-1M Citric Acid	5 mL	
REGNT 3407159	RGF-1.5M Ammonium Sulfate	10 mL	
REGNT 3410021	RGF-7M Nitric Acid	25 mL	
REGNT 3411398	Barium Carrier Ra228 REG	1 mL	
REGNT 3413369	Lot #DGA0030	2 g	
REGNT 3413388	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3413919	RGF-50% Potassium Carbonate	2 mL	
REGNT 3413921	2M HCl	20 mL	



### Radium-228 Liquid

Filename : RA228.XLS  
 File type : Excel  
 Version # : 1.4.2

Tracer S/N : 1951-C  
 Tracer Exp Date : 9/16/2022  
 Tracer Volume Added: 0.10

Batch : 2242584  
 Analyst : LIN01615  
 Prep Date : 3/21/2022  
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL  
 Parmname : Radium-228  
 Required MDA : 3 pCi/L  
 Ra-228 Abundance : 1.00  
 Halflife of Ra-228 : 5.75 years  
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	573155001.1	0.3004	1.8466E-05	3/10/2022 16:35	1434.9	1.52%	1046.6	1.78%	0.1	0.000200
2	573155002.1	0.3034	1.8517E-05	3/10/2022 16:35	1434.9	1.52%	1112.2	1.73%	0.1	0.000200
3	573155003.1	0.3021	1.8494E-05	3/10/2022 16:30	1434.9	1.52%	994.6	1.83%	0.1	0.000200
4	573281001.1	0.3010	1.8476E-05	3/3/2022 11:35	1434.9	1.52%	1036.7	1.79%	0.1	0.000200
5	573281002.1	0.3018	1.8490E-05	3/4/2022 10:55	1434.9	1.52%	1067.0	1.77%	0.1	0.000200
6	573281003.1	0.3058	1.8555E-05	3/3/2022 12:25	1434.9	1.52%	1023.6	1.80%	0.1	0.000200
7	573281004.1	0.3011	1.8477E-05	3/3/2022 13:25	1434.9	1.52%	1019.0	1.81%	0.1	0.000200
8	573281005.1	0.3043	1.8531E-05	3/3/2022 14:20	1434.9	1.52%	1007.0	1.82%	0.1	0.000200
9	573281006.1	0.3026	1.8503E-05	3/4/2022 11:30	1434.9	1.52%	986.5	1.84%	0.1	0.000200
10	573281007.1	0.3048	1.8540E-05	3/4/2022 12:25	1434.9	1.52%	1053.9	1.78%	0.1	0.000200
11	573281008.1	0.3037	1.8522E-05	3/4/2022 11:40	1434.9	1.52%	1096.7	1.74%	0.1	0.000200
12	573281009.1	0.3062	1.8563E-05	3/3/2022 9:40	1434.9	1.52%	1105.5	1.74%	0.1	0.000200
13	573281010.1	0.3008	1.8472E-05	3/4/2022 12:45	1434.9	1.52%	1041.1	1.79%	0.1	0.000200
14	1205043874.1	0.3062	1.8563E-05	3/21/2022 0:00	1434.9	1.52%	1007.1	1.82%	0.1	0.000200
15	1205043875.1	0.3003	1.8464E-05	3/10/2022 16:35	1434.9	1.52%	1074.1	1.76%	0.1	0.000200
16	1205043876.1	0.3017	1.8487E-05	3/3/2022 11:35	1434.9	1.52%	1068.2	1.77%	0.1	0.000200
17	1205043877.1	0.1011	1.1437E-05	3/3/2022 11:35	1434.9	1.52%	1110.2	1.73%	0.1	0.000200
18	1205043878.1	0.3062	1.8563E-05	3/21/2022 0:00	1434.9	1.52%	1054.3	1.78%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063  
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated Sample Recovery %	Sample Recovery Error %
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction		
1	4C	60	16	89	1.483	4/7/2022 13:16	3/25/2022 13:00	4/7/2022 11:00	0.991	0.773	1.000	1.057	72.9%	1.20%
2	4D	60	8	104	1.733	4/7/2022 13:17	3/25/2022 13:00	4/7/2022 11:00	0.991	0.772	1.000	1.057	77.5%	1.19%
3	5B	60	7	113	1.883	4/7/2022 13:17	3/25/2022 13:00	4/7/2022 11:00	0.991	0.772	1.000	1.057	69.3%	1.22%
4	5C	60	6	156	2.600	4/7/2022 13:17	3/25/2022 13:00	4/7/2022 11:00	0.988	0.772	1.000	1.057	72.3%	1.21%
5	1A	60	8	61	1.017	4/7/2022 14:46	3/25/2022 13:00	4/7/2022 11:00	0.989	0.653	1.000	1.057	74.4%	1.20%
6	6A	60	12	78	1.300	4/7/2022 13:17	3/25/2022 13:00	4/7/2022 11:00	0.988	0.772	1.000	1.057	71.3%	1.21%
7	7D	60	13	75	1.250	4/7/2022 13:18	3/25/2022 13:00	4/7/2022 11:00	0.989	0.772	1.000	1.057	71.0%	1.22%
8	8D	60	5	81	1.350	4/7/2022 13:18	3/25/2022 13:00	4/7/2022 11:00	0.989	0.771	1.000	1.057	70.2%	1.22%
9	11B	60	2	119	1.983	4/7/2022 13:17	3/25/2022 13:00	4/7/2022 11:00	0.989	0.772	1.000	1.057	68.8%	1.23%
10	11C	60	2	54	0.900	4/7/2022 13:17	3/25/2022 13:00	4/7/2022 11:00	0.989	0.772	1.000	1.057	73.4%	1.20%
11	11D	60	6	43	0.717	4/7/2022 13:17	3/25/2022 13:00	4/7/2022 11:00	0.989	0.772	1.000	1.057	76.4%	1.19%
12	12B	60	5	69	1.150	4/7/2022 13:17	3/25/2022 13:00	4/7/2022 11:00	0.988	0.772	1.000	1.057	77.0%	1.19%
13	12C	60	5	105	1.750	4/7/2022 13:17	3/25/2022 13:00	4/7/2022 11:00	0.989	0.772	1.000	1.057	72.6%	1.21%
14	13A	60	9	73	1.217	4/7/2022 13:17	3/25/2022 13:00	4/7/2022 11:00	0.994	0.773	1.000	1.057	70.2%	1.22%
15	13B	60	4	75	1.250	4/7/2022 13:17	3/25/2022 13:00	4/7/2022 11:00	0.991	0.773	1.000	1.057	74.9%	1.20%
16	13D	60	7	130	2.167	4/7/2022 13:17	3/25/2022 13:00	4/7/2022 11:00	0.988	0.773	1.000	1.057	74.4%	1.20%
17	14A	60	7	705	11.750	4/7/2022 13:17	3/25/2022 13:00	4/7/2022 11:00	0.988	0.773	1.000	1.057	77.4%	1.19%
18	14B	60	13	712	11.867	4/7/2022 13:17	3/25/2022 13:00	4/7/2022 11:00	0.994	0.772	1.000	1.057	73.5%	1.20%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2021	5/31/2022	0.6681	0.00889	0.826	4/2/2022 8:40	500
2	PIC	6/1/2021	5/31/2022	0.6156	0.00773	1.242	4/2/2022 8:40	500
3	PIC	6/1/2021	5/31/2022	0.6506	0.00426	1.174	4/2/2022 8:41	500
4	PIC	6/1/2021	5/31/2022	0.6672	0.00657	1.440	4/2/2022 8:41	500
5	PIC	6/1/2021	5/31/2022	0.6325	0.00738	0.626	4/2/2022 8:39	500
6	PIC	6/1/2021	5/31/2022	0.6392	0.02228	1.424	4/2/2022 8:41	500
7	PIC	6/1/2021	5/31/2022	0.6464	0.01113	0.596	4/2/2022 8:41	500
8	PIC	6/1/2021	5/31/2022	0.6443	0.00609	0.642	4/2/2022 8:41	500
9	PIC	6/1/2021	5/31/2022	0.6561	0.00697	1.394	4/2/2022 8:41	500
10	PIC	6/1/2021	5/31/2022	0.6428	0.01278	0.484	4/2/2022 8:41	500
11	PIC	6/1/2021	5/31/2022	0.6567	0.01068	0.644	4/2/2022 8:41	500
12	PIC	6/1/2021	5/31/2022	0.6654	0.01114	1.434	4/2/2022 8:41	500
13	PIC	6/1/2021	5/31/2022	0.6611	0.01666	0.808	4/2/2022 8:41	500
14	PIC	6/1/2021	5/31/2022	0.6689	0.00714	0.686	4/2/2022 8:41	500
15	PIC	6/1/2021	5/31/2022	0.6628	0.00967	0.794	4/2/2022 8:41	500
16	PIC	6/1/2021	5/31/2022	0.6574	0.01144	1.292	4/2/2022 8:41	500
17	PIC	6/1/2021	5/31/2022	0.6545	0.02119	0.672	4/2/2022 8:41	500
18	PIC	6/1/2021	5/31/2022	0.6514	0.01028	1.578	4/2/2022 8:41	500

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

**Spike S/N :** 1965-C  
**Spike Exp Date :** 8/5/2022  
**Spike Activity (dpm/ml):** 315.91  
**Spike Volume Added:** 0.10

**LCS S/N :** 1965-C  
**LCS Exp Date :** 8/5/2022  
**LCS Activity (dpm/ml):** 315.91  
**LCS Volume Added:** 0.10

Results Pos.	Decision	Critical	Required	Sample Act.		Sample Act.	Net Count	Net Count	2 SIGMA	2 SIGMA	Sample	Sample	Nominal				
	Level	Level	MDA	MDA	Conc.	Error	Rate	Rate Error	Counting	Total Prop.			QC	Type	RPD	RER	pCi/L
	pCi/L	pCi/L	pCi/L	pCi/L	pCi/L	%	CPM	CPM	Uncertainty	Uncertainty							
1	1.2288	0.8676	3	1.9475	<b>2.7919</b>	24.75%	0.6573	0.1624	1.3519	1.5218		SAMPLE					
2	1.5250	1.0767	3	2.3682	<b>2.1120</b>	36.08%	0.4913	0.1771	1.4923	1.5830		SAMPLE					
3	1.5762	1.1128	3	2.4540	<b>3.2414</b>	25.93%	0.7093	0.1837	1.6451	1.8336		SAMPLE					
4	1.6430	1.1600	3	2.5350	<b>4.9891</b>	18.58%	1.1600	0.2150	1.8122	2.1999		SAMPLE					
5	1.3087	0.9240	3	2.1077	<b>2.0299</b>	34.56%	0.3907	0.1349	1.3738	1.4646		SAMPLE					
6	1.7010	1.2009	3	2.6257	<b>-0.5552</b>	126.29%	-0.1240	0.1566	1.3741	1.3742		SAMPLE					
7	1.1104	0.7840	3	1.7939	<b>2.9550</b>	22.75%	0.6540	0.1484	1.3143	1.5086		SAMPLE					
8	1.1578	0.8174	3	1.8618	<b>3.2138</b>	21.83%	0.7080	0.1542	1.3721	1.5900		SAMPLE					
9	1.7177	1.2127	3	2.6539	<b>2.6933</b>	32.16%	0.5893	0.1893	1.6958	1.8247		SAMPLE					
10	0.9600	0.6778	3	1.5724	<b>1.8033</b>	30.43%	0.4160	0.1264	1.0736	1.1651		SAMPLE					
11	1.0457	0.7383	3	1.6812	<b>0.2974</b>	158.31%	0.0727	0.1150	0.9229	0.9259		SAMPLE					
12	1.5160	1.0703	3	2.3395	<b>-1.1294</b>	52.29%	-0.2840	0.1484	1.1570	1.1571		SAMPLE					
13	1.2379	0.8740	3	1.9642	<b>4.0751</b>	18.74%	0.9420	0.1754	1.4876	1.8071		SAMPLE					
14	1.1368	0.8026	3	1.8208	<b>2.2880</b>	27.76%	0.5307	0.1471	1.2434	1.3688		MB					
15	1.1843	0.8361	3	1.8810	<b>1.9038</b>	32.87%	0.4560	0.1497	1.2253	1.3147	573155001.1	DUP	37.8%				
16	1.5286	1.0792	3	2.3697	<b>3.6951</b>	22.55%	0.8747	0.1967	1.6288	1.8737	573281001.1	DUP	29.8%				
17	3.1795	2.2447	3	5.0987	<b>134.9724</b>	4.69%	11.0780	0.4440	10.6040	35.7624	573281001.1	MS			141.5827	91.8%	
18	1.6923	1.1948	3	2.6012	<b>43.5416</b>	4.64%	10.2887	0.4483	3.7182	11.5218		LCS			46.4671	93.7%	

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
573155001	4C	60	16	89	4/7/2022 13:16	4/7/2022 14:16	PIC	2242584
573155002	4D	60	8	104	4/7/2022 13:17	4/7/2022 14:17	PIC	2242584
573155003	5B	60	7	113	4/7/2022 13:17	4/7/2022 14:17	PIC	2242584
573281001	5C	60	6	156	4/7/2022 13:17	4/7/2022 14:17	PIC	2242584
573281002	1A	60	8	61	4/7/2022 14:46	4/7/2022 15:46	PIC	2242584
573281003	6A	60	12	78	4/7/2022 13:17	4/7/2022 14:17	PIC	2242584
573281004	7D	60	13	75	4/7/2022 13:18	4/7/2022 14:18	PIC	2242584
573281005	8D	60	5	81	4/7/2022 13:18	4/7/2022 14:18	PIC	2242584
573281006	11B	60	2	119	4/7/2022 13:17	4/7/2022 14:17	PIC	2242584
573281007	11C	60	2	54	4/7/2022 13:17	4/7/2022 14:17	PIC	2242584
573281008	11D	60	6	43	4/7/2022 13:17	4/7/2022 14:17	PIC	2242584
573281009	12B	60	5	69	4/7/2022 13:17	4/7/2022 14:17	PIC	2242584
573281010	12C	60	5	105	4/7/2022 13:17	4/7/2022 14:17	PIC	2242584
1205043874	13A	60	9	73	4/7/2022 13:17	4/7/2022 14:17	PIC	2242584
1205043875	13B	60	4	75	4/7/2022 13:17	4/7/2022 14:17	PIC	2242584
1205043876	13D	60	7	130	4/7/2022 13:17	4/7/2022 14:17	PIC	2242584
1205043877	14A	60	7	705	4/7/2022 13:17	4/7/2022 14:17	PIC	2242584
1205043878	14B	60	13	712	4/7/2022 13:17	4/7/2022 14:17	PIC	2242584

ASSAY 7-Apr-22 11:53:46  
 Wizard 2480 s/n 46190630  
 Protocol id 8 Ba-133  
 Time limit  
 Count limit  
 Isotope Ba-133  
 Protocol date 4/7/2022  
 Run id. 4880

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	95	1	180	4305.13	1434.91	1.52	11:53:46
573155001	2	95	2	180	3140.57	1046.64	1.78	72.94	11:57:00
573155002	3	95	3	180	3337.28	1112.21	1.73	77.51	12:00:14
573155003	4	95	4	180	2984.28	994.56	1.83	69.31	12:03:28
573281001	5	95	5	180	3110.85	1036.74	1.79	72.25	12:06:42
573281002	1	5	1	180	3201.57	1066.98	1.77	74.36	12:10:18
573281003	2	5	2	180	3071	1023.55	1.8	71.33	12:13:32
573281004	3	5	3	180	3057.57	1018.98	1.81	71.01	12:16:46
573281005	4	5	4	180	3021.57	1006.99	1.82	70.18	12:19:59
573281006	5	5	5	180	2960.13	986.52	1.84	68.75	12:23:14
573281007	1	10	1	180	3162.28	1053.88	1.78	73.45	12:26:49
573281008	2	10	2	180	3290.41	1096.68	1.74	76.43	12:30:03
573281009	3	10	3	180	3317	1105.45	1.74	77.04	12:33:17
573281010	4	10	4	180	3123.85	1041.07	1.79	72.55	12:36:31
1205043874	5	10	5	180	3021.57	1007.07	1.82	70.18	12:39:45
1205043875	1	6	1	180	3222.57	1074.06	1.76	74.85	12:43:33
1205043876	2	6	2	180	3205.28	1068.21	1.77	74.44	12:46:47
1205043877	3	6	3	180	3331.28	1110.21	1.73	77.37	12:50:01
1205043878	4	6	4	180	3163.13	1054.25	1.78	73.47	12:53:15

END OF ASSAY

# **Continuing Calibration Data**

# Gas Flow Proportional Counter Checks for 07-Apr-2022

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100E2	Above	Beta bkg	07-Apr 05:54	60	2.233	1.386	3.015	+0.12
LB4100F3	Above	Alpha bkg	07-Apr 05:54	60	0.367	-8.38E-2	0.560	+1.20
LB4100G1	Above	Alpha XTalk	07-Apr 06:59	5	1.782	0.088	0.447	+25.36
LB4100G1	Above	Beta bkg	07-Apr 05:55	60	13974	0.380	1.675	+64,750.03
LB4100G1	Above	Beta eff	07-Apr 07:12	5	26217	12880	18320	+11.71
LB4100G2	Above	Alpha eff	07-Apr 06:59	5	9963	7308	9581	+4.01
LB4100G2	Below	Alpha XTalk	07-Apr 06:59	5	0.311	0.324	0.423	-3.76
LB4100G2	Above	Beta bkg	07-Apr 05:55	60	5.283	1.159	2.203	+20.70
LB4100G3	Above	Beta bkg	07-Apr 05:55	60	6.683	0.810	1.674	+37.79
LB4100H4	Above	Alpha eff	07-Apr 06:59	5	10344	6065	9898	+3.70
PIC5A	Above	Alpha bkg	07-Apr 07:43	60	0.367	0.017	0.370	+2.94
PIC8C	Above	Beta bkg	07-Apr 06:46	60	2.583	-2.96E-1	2.115	+4.17
PIC10C	Above	Alpha XTalk	07-Apr 08:15	5	0.339	0.265	0.338	+3.04
PIC10C	Below	Beta eff	07-Apr 06:45	5	24296	24370	26540	-3.21
PIC12D	Above	Beta bkg	07-Apr 06:56	60	2.150	0.003	2.352	+2.48

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

LB4100C1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by *R. D. Smith - Harmon*

Date 4-8-22

GEL Laboratories LLC



# Runlogs

# Instrument Run Log

Instrument Type: GFPC

Batch ID: 2242584

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
573155001	SAMPLE	JXC9	PIC4C	APR-07-22 13:16:58	DONE	25mm Filter	01-JUN-21 00:00
1205043874	MB	JXC9	PIC13A	APR-07-22 13:17:11	DONE	25mm Filter	01-JUN-21 00:00
1205043875	DUP	JXC9	PIC13B	APR-07-22 13:17:14	DONE	25mm Filter	01-JUN-21 00:00
1205043876	DUP	JXC9	PIC13D	APR-07-22 13:17:18	DONE	25mm Filter	01-JUN-21 00:00
1205043877	MS	JXC9	PIC14A	APR-07-22 13:17:24	DONE	25mm Filter	01-JUN-21 00:00
573155002	SAMPLE	JXC9	PIC4D	APR-07-22 13:17:27	DONE	25mm Filter	01-JUN-21 00:00
1205043878	LCS	JXC9	PIC14B	APR-07-22 13:17:28	DONE	25mm Filter	01-JUN-21 00:00
573155003	SAMPLE	JXC9	PIC5B	APR-07-22 13:17:31	DONE	25mm Filter	01-JUN-21 00:00
573281006	SAMPLE	JXC9	PIC11B	APR-07-22 13:17:38	DONE	25mm Filter	01-JUN-21 00:00
573281001	SAMPLE	JXC9	PIC5C	APR-07-22 13:17:39	DONE	25mm Filter	01-JUN-21 00:00
573281007	SAMPLE	JXC9	PIC11C	APR-07-22 13:17:41	DONE	25mm Filter	01-JUN-21 00:00
573281008	SAMPLE	JXC9	PIC11D	APR-07-22 13:17:46	DONE	25mm Filter	01-JUN-21 00:00
573281009	SAMPLE	JXC9	PIC12B	APR-07-22 13:17:49	DONE	25mm Filter	01-JUN-21 00:00
573281003	SAMPLE	JXC9	PIC6A	APR-07-22 13:17:52	DONE	25mm Filter	01-JUN-21 00:00
573281010	SAMPLE	JXC9	PIC12C	APR-07-22 13:17:53	DONE	25mm Filter	01-JUN-21 00:00
573281004	SAMPLE	JXC9	PIC7D	APR-07-22 13:18:00	DONE	25mm Filter	01-JUN-21 00:00
573281005	SAMPLE	JXC9	PIC8D	APR-07-22 13:18:11	DONE	25mm Filter	01-JUN-21 00:00
573281002	SAMPLE	JXC9	PIC1A	APR-07-22 14:46:46	DONE	25mm Filter	01-JUN-21 00:00

# Lucas Cell Raw Data

# Batch 2242575 Check-list

This check-list was completed on 24-MAR-22 by Lyndsey Pace

This batch was reviewed by Lyndsey Pace on 24-MAR-22 and Elizabeth Krouse on 25-MAR-22.

**Batch ID:**  
2242575

**Product:**  
LUC26RAL

**Description:** Lucas Cell Radium 226  
GL-RAD-A-008

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?		No	
11	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
12	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
13	Has the method required detection limit been met?	Yes		
<b>Miscellaneous Information</b>				
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

# Prep Logbook

## Radium-226 in Liquid

**Batch ID:** 2242575

**Analyst:** Lyndsey Pace (LXP1)

**Method:** EPA 903.1 Modified

**Lab SOP:** GL-RAD-A-008 REV# 15

**Instrument:** LUCAS-C037036045

**Due Dates for Lab:** 27-MAR-2022

**Package:** 29-MAR-2022

**SDG:** 30-MAR-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205043865	Radium-226 SPIKE	1715-G	.1	mL
LCSD	1205043866	Radium-226 SPIKE	1715-G	.1	mL
MS	1205043864	Radium-226 SPIKE	1715-G	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	573129001	21-MAR-2022	1	503.93	503.93	03/21/22 11:16	108	03/24/22 06:22	03/24/22 09:24	5	5
2	573155001	21-MAR-2022	1	500.62	500.62	03/21/22 11:16	208	03/24/22 06:22	03/24/22 09:24	3	22
3	573155002	21-MAR-2022	1	500.98	500.98	03/21/22 11:16	407	03/24/22 06:22	03/24/22 09:24	3	22
4	573155003	21-MAR-2022	1	500.19	500.19	03/21/22 11:16	501	03/24/22 06:22	03/24/22 09:24	8	22
5	573168001	21-MAR-2022	1	500.71	500.71	03/21/22 11:16	605	03/24/22 06:22	03/24/22 09:24	3	20
6	573168002	21-MAR-2022	1	502.58	502.58	03/21/22 11:16	703	03/24/22 06:22	03/24/22 09:24	2	13
7	573281001	21-MAR-2022	1	501.1	501.1	03/21/22 11:16	804	03/24/22 06:22	03/24/22 09:24	6	10
8	573281002	21-MAR-2022	1	500.85	500.85	03/21/22 11:16	103	03/24/22 06:51	03/24/22 09:55	4	20
9	573281003	21-MAR-2022	1	500.69	500.69	03/21/22 11:16	204	03/24/22 06:51	03/24/22 09:55	6	24
10	573281004	21-MAR-2022	1	500.73	500.73	03/21/22 11:16	403	03/24/22 06:51	03/24/22 09:55	2	18
11	573281005	21-MAR-2022	1	506.25	506.25	03/21/22 11:16	506	03/24/22 06:51	03/24/22 09:55	5	20
12	573281006	21-MAR-2022	1	502.88	502.88	03/21/22 11:16	604	03/24/22 06:51	03/24/22 09:55	1	11
13	573281007	21-MAR-2022	1	503.05	503.05	03/21/22 11:16	706	03/24/22 06:51	03/24/22 09:55	6	18
14	573281008	21-MAR-2022	1	501.21	501.21	03/21/22 11:16	805	03/24/22 06:51	03/24/22 09:55	7	22
15	573281009	21-MAR-2022	1	502.3	502.3	03/21/22 11:16	107	03/24/22 07:21	03/24/22 10:27	1	19
16	573281010	21-MAR-2022	1	501.98	501.98	03/21/22 11:16	205	03/24/22 07:21	03/24/22 10:27	4	6
17	1205043862 MB	21-MAR-2022	1		507.73	03/21/22 11:16	406	03/24/22 07:21	03/24/22 10:27	7	14
18	1205043863 DUP (573129001)	21-MAR-2022	1	507.73	507.73	03/21/22 11:16	504	03/24/22 07:21	03/24/22 10:27	5	15
19	1205043864 MS (573129001)	21-MAR-2022	1	102.74	102.74	03/21/22 11:16	601	03/24/22 07:21	03/24/22 10:27	3	533
20	1205043865 LCS	21-MAR-2022	1		507.73	03/21/22 11:16	704	03/24/22 07:21	03/24/22 10:27	5	567
21	1205043866 LCSD	21-MAR-2022	1		507.73	03/21/22 11:16	806	03/24/22 07:21	03/24/22 10:27	2	717

Reagent/Solvent Lot ID	Description	Amount
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**Comments:**  
Data Entry Date2: 21-MAR-2022 00:00

### Radium-226 Liquid

Filename : RA226.XLS  
 File type : Excel  
 Version # : 1.3.2

Procedure Code : LUC26RAL  
 Parmname : Radium-226  
 Required MDA : 1 pCi/L  
 Halflife of Ra-226 : 1600 years  
 Ra-226 Abundance : 1.00  
 Halflife of Rn-222 : 3.8235 days

Batch : 2242575  
 Analyst : LIN01615  
 Prep Date : 3/21/2022  
 Ra-226 Method Uncertainty : 0.073648

Batch counted on : LUCAS CELL DETECTOR  
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Count Time (min.)	Cell Efficiency (cpm/dpm)
1	573129001.1	0.5039	2.0272E-05	3/14/2022 0:15	108	30	5	0.167	5	0.167	30	1.6450
2	573155001.1	0.5006	2.0258E-05	3/10/2022 16:35	208	30	22	0.733	3	0.100	30	1.6950
3	573155002.1	0.5010	2.0260E-05	3/10/2022 16:35	407	30	22	0.733	3	0.100	30	1.6030
4	573155003.1	0.5002	2.0257E-05	3/10/2022 16:30	501	30	22	0.733	8	0.267	30	1.9100
5	573168001.1	0.5007	2.0259E-05	3/11/2022 8:50	605	30	20	0.667	3	0.100	30	1.6540
6	573168002.1	0.5026	2.0266E-05	3/11/2022 10:30	703	30	13	0.433	2	0.067	30	1.7360
7	573281001.1	0.5011	2.0260E-05	3/3/2022 11:35	804	30	10	0.333	6	0.200	30	1.4740
8	573281002.1	0.5009	2.0259E-05	3/4/2022 10:55	103	30	20	0.667	4	0.133	30	1.5680
9	573281003.1	0.5007	2.0259E-05	3/3/2022 12:25	204	30	24	0.800	6	0.200	30	1.6950
10	573281004.1	0.5007	2.0259E-05	3/3/2022 13:25	403	30	18	0.600	2	0.067	30	1.6200
11	573281005.1	0.5063	2.0281E-05	3/3/2022 14:20	506	30	20	0.667	5	0.167	30	1.7790
12	573281006.1	0.5029	2.0268E-05	3/4/2022 11:30	604	30	11	0.367	1	0.033	30	1.6960
13	573281007.1	0.5031	2.0268E-05	3/4/2022 12:25	706	30	18	0.600	6	0.200	30	1.6340
14	573281008.1	0.5012	2.0261E-05	3/4/2022 11:40	805	30	22	0.733	7	0.233	30	1.6030
15	573281009.1	0.5023	2.0265E-05	3/3/2022 9:40	107	30	19	0.633	1	0.033	30	1.6610
16	573281010.1	0.5020	2.0264E-05	3/4/2022 12:45	205	30	6	0.200	4	0.133	30	1.6810
17	1205043862.1	0.5077	2.0287E-05	3/21/2022 0:00	406	30	14	0.467	7	0.233	30	1.5760
18	1205043863.1	0.5077	2.0287E-05	3/14/2022 0:15	504	30	15	0.500	5	0.167	30	1.5780
19	1205043864.1	0.1027	1.1537E-05	3/14/2022 0:15	601	30	533	17.767	3	0.100	30	1.9010
20	1205043865.1	0.5077	2.0287E-05	3/21/2022 0:00	704	30	567	18.900	5	0.167	30	1.6710
21	1205043866.1	0.5077	2.0287E-05	3/21/2022 0:00	806	30	717	23.900	2	0.067	30	1.7130

Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008  
 Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrow End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
6.000%	5/2/2021	4/30/2022	3/21/2022 11:16	3/24/2022 6:22	3/24/2022 9:24	0.398	0.977	1.002	1.000
2.600%	8/1/2021	7/31/2022	3/21/2022 11:16	3/24/2022 6:22	3/24/2022 9:24	0.398	0.977	1.002	1.000
6.600%	2/1/2022	1/31/2023	3/21/2022 11:16	3/24/2022 6:22	3/24/2022 9:24	0.398	0.977	1.002	1.000
4.300%	6/1/2021	5/31/2022	3/21/2022 11:16	3/24/2022 6:22	3/24/2022 9:24	0.398	0.977	1.002	1.000
5.000%	7/1/2021	6/30/2022	3/21/2022 11:16	3/24/2022 6:22	3/24/2022 9:24	0.398	0.977	1.002	1.000
5.000%	11/1/2021	10/31/2022	3/21/2022 11:16	3/24/2022 6:22	3/24/2022 9:24	0.398	0.977	1.002	1.000
3.700%	4/1/2021	3/31/2022	3/21/2022 11:16	3/24/2022 6:22	3/24/2022 9:24	0.398	0.977	1.002	1.000
6.400%	5/2/2021	4/30/2022	3/21/2022 11:16	3/24/2022 6:51	3/24/2022 9:55	0.400	0.977	1.002	1.000
7.800%	8/1/2021	7/31/2022	3/21/2022 11:16	3/24/2022 6:51	3/24/2022 9:55	0.400	0.977	1.002	1.000
9.700%	2/1/2022	1/31/2023	3/21/2022 11:16	3/24/2022 6:51	3/24/2022 9:55	0.400	0.977	1.002	1.000
8.200%	6/1/2021	5/31/2022	3/21/2022 11:16	3/24/2022 6:51	3/24/2022 9:55	0.400	0.977	1.002	1.000
6.400%	7/1/2021	6/30/2022	3/21/2022 11:16	3/24/2022 6:51	3/24/2022 9:55	0.400	0.977	1.002	1.000
6.400%	11/1/2021	10/31/2022	3/21/2022 11:16	3/24/2022 6:51	3/24/2022 9:55	0.400	0.977	1.002	1.000
4.700%	4/1/2021	3/31/2022	3/21/2022 11:16	3/24/2022 6:51	3/24/2022 9:55	0.400	0.977	1.002	1.000
8.500%	5/2/2021	4/30/2022	3/21/2022 11:16	3/24/2022 7:21	3/24/2022 10:27	0.402	0.977	1.002	1.000
2.800%	8/1/2021	7/31/2022	3/21/2022 11:16	3/24/2022 7:21	3/24/2022 10:27	0.402	0.977	1.002	1.000
2.800%	2/1/2022	1/31/2023	3/21/2022 11:16	3/24/2022 7:21	3/24/2022 10:27	0.402	0.977	1.002	1.000
8.500%	6/1/2021	5/31/2022	3/21/2022 11:16	3/24/2022 7:21	3/24/2022 10:27	0.402	0.977	1.002	1.000
5.300%	7/1/2021	6/30/2022	3/21/2022 11:16	3/24/2022 7:21	3/24/2022 10:27	0.402	0.977	1.002	1.000
8.000%	11/1/2021	10/31/2022	3/21/2022 11:16	3/24/2022 7:21	3/24/2022 10:27	0.402	0.977	1.002	1.000
1.500%	4/1/2021	3/31/2022	3/21/2022 11:16	3/24/2022 7:21	3/24/2022 10:27	0.402	0.977	1.002	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

**Spike S/N :** 1715-G  
**Spike Exp Date :** 9/15/2022  
**Spike Activity (dpm/ml):** 297.55  
**Spike Volume Added:** 0.10

\* - RPD changed to 0% due to sample & dup activity below MDA

**LCS S/N :** 1715-G  
**LCS Exp Date :** 9/15/2022  
**LCS Activity (dpm/ml):** 297.55  
**LCS Volume Added:** 0.10

<b>Results</b>																	
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery	
1	0.3441	0.2429	1	0.6260	<b>0.000E+00</b>	0.00%	0.0000	0.1054	0.2894	0.2896		SAMPLE					
2	0.2604	0.1838	1	0.5045	<b>0.8668</b>	26.44%	0.6333	0.1667	0.4471	0.4664		SAMPLE					
3	0.2751	0.1942	1	0.5331	<b>0.9159</b>	27.13%	0.6333	0.1667	0.4724	0.5047		SAMPLE					
4	0.3777	0.2666	1	0.6548	<b>0.5673</b>	39.36%	0.4667	0.1826	0.4350	0.4452		SAMPLE					
5	0.2668	0.1884	1	0.5169	<b>0.7946</b>	28.65%	0.5667	0.1599	0.4394	0.4607		SAMPLE					
6	0.2068	0.1460	1	0.4251	<b>0.4881</b>	35.56%	0.3667	0.1291	0.3368	0.3474		SAMPLE					
7	0.4230	0.2987	1	0.7546	<b>0.2096</b>	100.07%	0.1333	0.1333	0.4109	0.4123		SAMPLE					
8	0.3232	0.2282	1	0.6034	<b>0.7846</b>	31.28%	0.5333	0.1633	0.4708	0.4942		SAMPLE					
9	0.3662	0.2586	1	0.6533	<b>0.8168</b>	31.41%	0.6000	0.1826	0.4871	0.5165		SAMPLE					
10	0.2212	0.1562	1	0.4548	<b>0.7596</b>	29.59%	0.5333	0.1491	0.4161	0.4539		SAMPLE					
11	0.3151	0.2224	1	0.5731	<b>0.6414</b>	34.33%	0.5000	0.1667	0.4190	0.4414		SAMPLE					
12	0.1488	0.1050	1	0.3455	<b>0.4515</b>	35.23%	0.3333	0.1155	0.3066	0.3185		SAMPLE					
13	0.3781	0.2670	1	0.6745	<b>0.5622</b>	41.32%	0.4000	0.1633	0.4498	0.4625		SAMPLE					
14	0.4179	0.2950	1	0.7338	<b>0.7190</b>	36.21%	0.5000	0.1795	0.5059	0.5207		SAMPLE					
15	0.1513	0.1068	1	0.3513	<b>0.8264</b>	26.26%	0.6000	0.1491	0.4024	0.4417		SAMPLE					
16	0.2991	0.2112	1	0.5586	<b>0.0908</b>	158.14%	0.0667	0.1054	0.2813	0.2817		SAMPLE					
17	0.4173	0.2946	1	0.7328	<b>0.3351</b>	65.53%	0.2333	0.1528	0.4299	0.4330		MB					
18	0.3522	0.2487	1	0.6408	<b>0.4781</b>	45.52%	0.3333	0.1491	0.4190	0.4321	573129001.1	DUP	*	0.0%	1.8014		
19	1.1193	0.7902	1	2.1688	<b>103.9386</b>	6.87%	17.6667	0.7717	8.8990	20.5153	573129001.1	MS			130.4602	79.7%	
20	0.3326	0.2348	1	0.6051	<b>25.3715</b>	9.06%	18.7333	0.7972	2.1162	5.8067		LCS			26.3986	96.1%	
21	0.2052	0.1449	1	0.4219	<b>31.4873</b>	4.04%	23.8333	0.8938	2.3145	5.1839		LCSD		21.5%	1.5399	26.3986	119.3%



# **Continuing Calibration Data**



# Ludlum Alpha Scintillation Counter Checks for 24-MAR-2022

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	06:40	1	1.22E+05	121554	-0.52		
LUCAS2	EFF	06:39	1	1.33E+05	132974	1.95		
LUCAS4	EFF	06:37	1	1.28E+05	127675	0.49		
LUCAS5	EFF	06:36	1	1.31E+05	131434	1.63		
LUCAS6	EFF	06:34	1	1.30E+05	130443	-0.95		
LUCAS7	EFF	06:31	1	1.34E+05	133514	1.19		
LUCAS8	EFF	06:27	1	1.26E+05	125980	0.01		

**Reviewed by:**

Lyndsey Pace

**Date:** 24-MAR-22

GEL Laboratories LLC

# Runlogs

# Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2242575

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
573129001	SAMPLE	LXP1	LUCAS1	MAR-24-22 09:24:00	DONE	Lucas Cell	02-MAY-21 00:01
573155001	SAMPLE	LXP1	LUCAS2	MAR-24-22 09:24:00	DONE	Lucas Cell	01-AUG-21 00:00
573155002	SAMPLE	LXP1	LUCAS4	MAR-24-22 09:24:00	DONE	Lucas Cell	01-FEB-22 00:00
573155003	SAMPLE	LXP1	LUCAS5	MAR-24-22 09:24:00	DONE	Lucas Cell	01-JUN-21 00:01
573168001	SAMPLE	LXP1	LUCAS6	MAR-24-22 09:24:00	DONE	Lucas Cell	01-JUL-21 00:00
573168002	SAMPLE	LXP1	LUCAS7	MAR-24-22 09:24:00	DONE	Lucas Cell	01-NOV-21 00:00
573281001	SAMPLE	LXP1	LUCAS8	MAR-24-22 09:24:00	DONE	Lucas Cell	01-APR-21 00:01
573281002	SAMPLE	LXP1	LUCAS1	MAR-24-22 09:55:00	DONE	Lucas Cell	02-MAY-21 00:01
573281003	SAMPLE	LXP1	LUCAS2	MAR-24-22 09:55:00	DONE	Lucas Cell	01-AUG-21 00:00
573281004	SAMPLE	LXP1	LUCAS4	MAR-24-22 09:55:00	DONE	Lucas Cell	01-FEB-22 00:00
573281005	SAMPLE	LXP1	LUCAS5	MAR-24-22 09:55:00	DONE	Lucas Cell	01-JUN-21 00:01
573281006	SAMPLE	LXP1	LUCAS6	MAR-24-22 09:55:00	DONE	Lucas Cell	01-JUL-21 00:00
573281007	SAMPLE	LXP1	LUCAS7	MAR-24-22 09:55:00	DONE	Lucas Cell	01-NOV-21 00:00
573281008	SAMPLE	LXP1	LUCAS8	MAR-24-22 09:55:00	DONE	Lucas Cell	01-APR-21 00:01
573281009	SAMPLE	LXP1	LUCAS1	MAR-24-22 10:27:00	DONE	Lucas Cell	02-MAY-21 00:01
573281010	SAMPLE	LXP1	LUCAS2	MAR-24-22 10:27:00	DONE	Lucas Cell	01-AUG-21 00:00
1205043862	MB	LXP1	LUCAS4	MAR-24-22 10:27:00	DONE	Lucas Cell	01-FEB-22 00:00
1205043863	DUP	LXP1	LUCAS5	MAR-24-22 10:27:00	DONE	Lucas Cell	01-JUN-21 00:01
1205043864	MS	LXP1	LUCAS6	MAR-24-22 10:27:00	DONE	Lucas Cell	01-JUL-21 00:00
1205043865	LCS	LXP1	LUCAS7	MAR-24-22 10:27:00	DONE	Lucas Cell	01-NOV-21 00:00
1205043866	LCSD	LXP1	LUCAS8	MAR-24-22 10:27:00	DONE	Lucas Cell	01-APR-21 00:01



Environmental Laboratory  
 1232 Haco Drive  
 Lansing  
 Michigan, 48910

CHAIN OF CUSTODY

Page 1 of 1

Phone: (517)702-6372

Lab Work Order Number L203039

Client Name BWL - Erickson Station		Project Name Erickson AM MI Wells <sup>7C</sup> <del>7B-12B</del>		Requested Analyses						Requested Turn Around	
Client Contact Cheryl Louden		Project Number [none] <sup>by 3/11/22</sup>		Ag::Na, K, Mg As:: B: Be: Ber: Ca: Cd: Cr: Co: Cu: Fe: Hg: Li: Mo: Ni: Pb: Sb: Se: Si: Tl: V: Zn  TSS  Cl-IC: F-ISE: SO4: TDS, HCO3, CO3, Hardness  Radium 226 and Radium 228							Rush requests subject to additional charge.  Rush requests subject to lab approval.
Address 3725 S. Canal		Project Description									
City Lansing		PO Number 30926 10021									
State/Zip MI, 48917		Shipped By									
Phone (517) 702-6396	Fax (517) 702-6373	Tracking Number									
Sampler Marc Wahrer											

Sample Name or Field ID	Sampled Date	Sampled Time	Sample Type Grab/Composite	Matrix Code	Container Count	Preservation Code				Sample	Comments
						b	a	a	b		
MW-7C	03/10/22	1635	G	GW	5	1	1	1	2		
Field Duplicate	↓	↓	G	GW	5	1	1	1	2		
Field Blank	↓	1630	G	DI	5	1	1	1	2		

Relinquished By 	Date/Time 3-10-22 1715	Received By J Caporale	Date/Time 03/11/22 0830	
Relinquished By	Date/Time	Received By	Date/Time	Comments
Relinquished By	Date/Time	Received By	Date/Time	
Relinquished By	Date/Time	Received By	Date/Time	
Cooler Numbers and Temperatures				

Matrix Codes: DI=Deionized Water, GW=Ground Water      Preserv. Codes: a=None, b=0.5% HNO3

### Data Validation Checklist

Site Name: Erickson Personnel: M. Wahrer

Sample Date(s): 3/9/2022 (MW-7B), 3/10/2022 (MW-7C), 3/8/2022 (MW-12B)

Lab Drop-off Date(s): 3/10/2022 (MW-7B), 3/11/2022 (MW-7C), 3/9/2022 (MW-12B)

Lab Report Number: S33699.01(03) (MW-7B), S33751.01(03) (MW-7C), S33650.01(04) (MW-12B)

Lab Report Date: 4/11/2022 (MW-7B), 4/11/2022 (MW-7C), 4/11/2022 (MW-12B)

Reason for Sample Event: New Wells MW-7B, -7C, -12B

**Field Records:** Circle Yes/No unless Not Applicable – *Complete during sample event*

Item Description	Verification (Completeness)	Validation (Conformance to Specifications)
Field equipment calibration records	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Chain-of-Custody forms	<input checked="" type="radio"/> Yes / No	N/A
Field decontamination documentation	N/A	N/A
Sample collection field forms	<input checked="" type="radio"/> Yes / No	N/A
Drilling logs	<input checked="" type="radio"/> Yes / No	N/A
Well construction logs	<input checked="" type="radio"/> Yes / No	N/A
Well development field forms	<input checked="" type="radio"/> Yes / No	N/A

**Analytical Data Package:** Circle Yes/No unless N/A – *Complete when lab report is received*

Item Description	Verification (Completeness)	Validation (Conformance to Specifications)
Cover sheet (laboratory identifying information)	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Case narrative	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Internal laboratory Chain-of-Custody forms	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Sample chronology and consistency (that is, dates and times of receipt, preparation, and analysis)	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Communication records with laboratory	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
EDD format consistency	<input checked="" type="radio"/> Yes / No	N/A
Sample identification, results nomenclature, and data qualifier consistency	<input checked="" type="radio"/> Yes / No	N/A
RLs as requested; MDLs<RLs	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Instrument calibration records	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Laboratory Report	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No

Field QC sample results and calculation of accuracy and precision	(Yes) No	Yes (No)
	Duplicate Well ID: MW-7B MW-7C MW-12B	Duplicate RPD: MW-7B: 0-19% MW-7C: 0-5% except TSS at 35% MW-12B: 0-5% except Rad-226/228 at 28%

**MW-7B Corrections Needed:** None

**MW-7C Corrections Needed:** None; according to the Case Narrative, “[a]ll total suspended solids QC requirements were met according to the specifications in Method 2540 D.” Since the laboratory processes indicated no issues with the analytical procedures, no corrective action was necessary. Since the RPD was above the 20% control limit, TSS for MW-7C has been qualified as estimated with potential for high bias (J+) and MW-7C-Dup has been qualified as estimated with potential for low bias (J-).

**MW-12B Corrections Needed:** None; according to the Technical Case Narrative by GEL Laboratories, subcontracted laboratory for radium analysis, “[t]here are no exceptions, anomalies or deviations from the specified methods. All sample data provided in [the] report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.”

Sample	Parameter	Result	Uncertainty	MDC	Lab Qualifier	Validated Qualifier
MW-12B	Rad-226	0.480	+/-0.285	0.329		J+
	Rad-228	0.275	+/-0.822	1.49	U	J-
	Rad-226/228	0.755	+/-0.870			J-
MW-12B-Dup	Rad-226	0.302	+/-0.205	0.231		J-
	Rad-228	1.03	+/-1.31	2.22	U	J+
	Rad-226/228	1.33	+/-1.33			J+

*U - Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.*

Since the laboratory processes indicated no issues with the analytical procedures, no corrective action was necessary. Since the RPD was above the 20% control limit, MW-12B has been qualified as estimated with potential for low bias (J-) and MW-12B-Dup has been qualified as estimated with potential for high bias (J+). The component parts Rad-226 required qualification as estimated with high bias (J+) in MW-12B and estimated with low bias (J-) in MW-12B-Dup and Rad-228 required qualification as estimated with low bias (J-) in MW-12B and estimated with high bias (J+) in MW-12B-Dup.

The matrix spike (S33650.01) had low recovery for boron in run batch MT4-22-0310B. MW-12B required qualification as estimated (J).







Report ID: S34427.01(02)  
Generated on 05/02/2022  
Replaces report S34427.01(01) generated on 04/04/2022

Report to  
Attention: Jennifer Caporale  
Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901  
  
Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

Report produced by  
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Contacts for report questions:  
John Lavery (johnlavery@meritlabs.com)  
Barbara Ball (bball@meritlabs.com)

Report Summary  
Lab Sample ID(s): S34427.01-S34427.05  
Project: Erickson AM MI New Wells 11-13  
Collected Date(s): 03/30/2022  
Submitted Date/Time: 03/31/2022 08:57  
Sampled by: Marc Wahrer  
P.O. #:

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Maya Murshak  
Technical Director



## General Report Notes

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Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein, acrylonitrile, and 2-chlorovinylethyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (\*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

## Report Narrative

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All analyses completed

## Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Alaska CSLAP	#17-001
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

## Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

## Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



## Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1 (1993)
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007



## Sample Summary (5 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S34427.01	MW-11 L203073-01	Groundwater	03/30/22 11:41
S34427.02	MW-12 L203073-02	Groundwater	03/30/22 14:15
S34427.03	MW-13 L203073-03	Groundwater	03/30/22 13:47
S34427.04	Field Dupe MW-11 L203073-04	Groundwater	03/30/22 11:41
S34427.05	Field Blank L203073-05	Water	03/30/22 09:00



# Analytical Laboratory Report

Lab Sample ID: S34427.01

Sample Tag: MW-11 L203073-01

Collected Date/Time: 03/30/2022 11:41

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.8	IR
2	1L Plastic	None	Yes	2.8	IR
1	125ml Plastic	HNO3	Yes	2.8	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	04/01/22 09:20	JRH	
Metal Digestion	Completed	SW3015A	04/01/22 10:15	CCM	

### Inorganics

Method: E300.0, Run Date: 04/01/22 07:46, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	67	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2540C, Run Date: 03/31/22 16:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	642	50	10	mg/L	2		

Method: SM2540D, Run Date: 03/31/22 18:15, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	32	3	1	mg/L	1.33		

### Metals

Method: E200.8, Run Date: 04/01/22 12:30, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.018	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.144	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.20	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	23.2	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	



# Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S34427.01 (continued)

Sample Tag: MW-11 L203073-01

**Method: E200.8, Run Date: 04/01/22 14:50, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	138	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	39.0	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	1.47	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	40.4	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 04/01/22 13:17, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 04/25/22 12:22, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Lab Sample ID: S34427.02

Sample Tag: MW-12 L203073-02

Collected Date/Time: 03/30/2022 14:15

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.8	IR
2	1L Plastic	None	Yes	2.8	IR
1	125ml Plastic	HNO3	Yes	2.8	IR
1	500ml Plastic	None	Yes	2.8	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	04/01/22 09:20	JRH	
Mercury Digestion	Completed	E245.1	04/01/22 09:20	JRH	
Metal Digestion	Completed	SW3015A	04/01/22 10:15	CCM	
Metal Digestion	Completed	SW3015A	04/01/22 10:15	CCM	

### Inorganics

Method: E300.0, Run Date: 04/01/22 07:59, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	

Method: E300.0, Run Date: 04/01/22 09:29, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	94	25	0.40	mg/L	25	16887-00-6	
Sulfate	308	25	1.5	mg/L	25	14808-79-8	

Method: SM2540C, Run Date: 03/31/22 16:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	1,110	50	10	mg/L	2		

Method: SM2540D, Run Date: 03/31/22 18:15, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	39	3	1	mg/L	2		

### Metals

Method: E200.8, Run Date: 04/01/22 12:33, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.003	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.074	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.09	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	2.24	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.021	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.024	0.005	0.000217	mg/L	5	7439-98-7	





# Analytical Laboratory Report

Lab Sample ID: S34427.02 (continued)

Sample Tag: MW-12 L203073-02

**Method: E200.8, Run Date: 04/01/22 12:33, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Nickel	0.020	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	0.009	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 04/01/22 13:01, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony, Dissolved*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	f
Arsenic, Dissolved	Not detected	0.002	0.000255	mg/L	5	7440-38-2	f
Barium, Dissolved	0.068	0.005	0.000162	mg/L	5	7440-39-3	f
Beryllium, Dissolved	Not detected	0.001	0.000215	mg/L	5	7440-41-7	f
Boron, Dissolved	0.09	0.04	0.00175	mg/L	5	7440-42-8	f
Cadmium, Dissolved	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	f
Chromium, Dissolved	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	f
Cobalt, Dissolved	Not detected	0.005	0.000108	mg/L	5	7440-48-4	f
Copper, Dissolved	Not detected	0.005	0.000377	mg/L	5	7440-50-8	f
Iron, Dissolved	Not detected	0.02	0.00192	mg/L	5	7439-89-6	f
Lead, Dissolved	Not detected	0.003	0.000190	mg/L	5	7439-92-1	f
Lithium, Dissolved*	0.018	0.005	0.00163	mg/L	5	7439-93-2	f
Molybdenum, Dissolved	0.024	0.005	0.000217	mg/L	5	7439-98-7	f
Nickel, Dissolved	0.018	0.005	0.000250	mg/L	5	7440-02-0	f
Selenium, Dissolved	Not detected	0.005	0.00209	mg/L	5	7782-49-2	f
Silver, Dissolved	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	f
Thallium, Dissolved	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	f
Vanadium, Dissolved	Not detected	0.005	0.000139	mg/L	5	7440-62-2	f
Zinc, Dissolved	0.006	0.005	0.000730	mg/L	5	7440-66-6	f

**Method: E200.8, Run Date: 04/01/22 14:52, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	157	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	58.8	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	3.93	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	168	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E200.8, Run Date: 04/01/22 15:01, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium, Dissolved*	147	0.50		mg/L	5	7440-70-2	f
Magnesium, Dissolved	56.4	0.50		mg/L	5	7439-95-4	f
Potassium, Dissolved	3.87	0.50	0.0230	mg/L	5	7440-09-7	f
Sodium, Dissolved	169	0.50		mg/L	5	7440-23-5	f

**Method: E245.1, Run Date: 04/01/22 13:23, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury, Dissolved	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	f

f-Filtered and preserved in lab



Lab Sample ID: S34427.02 (continued)

Sample Tag: MW-12 L203073-02

Method: E245.1, Run Date: 04/01/22 13:20, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

*Other / Misc.*

Method: , Run Date: 04/25/22 12:22, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

**Lab Sample ID: S34427.03**

Sample Tag: MW-13 L203073-03

Collected Date/Time: 03/30/2022 13:47

Matrix: Groundwater

COC Reference:

**Sample Containers**

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.8	IR
2	1L Plastic	None	Yes	2.8	IR
1	125ml Plastic	HNO3	Yes	2.8	IR

**Extraction / Prep.**

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	04/01/22 09:20	JRH	
Metal Digestion	Completed	SW3015A	04/01/22 10:15	CCM	

**Inorganics****Method: E300.0, Run Date: 04/01/22 08:12, Analyst: JDP**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	45	5	0.30	mg/L	5	14808-79-8	

**Method: SM2540C, Run Date: 03/31/22 16:00, Analyst: SSM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	430	50	10	mg/L	2		

**Method: SM2540D, Run Date: 03/31/22 18:15, Analyst: SSM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

**Metals****Method: E200.8, Run Date: 04/01/22 12:36, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.026	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.14	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.02	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	



# Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S34427.03 (continued)

Sample Tag: MW-13 L203073-03

**Method: E200.8, Run Date: 04/01/22 14:53, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	128	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	26.3	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	0.75	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	3.05	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 04/01/22 13:26, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 04/25/22 12:22, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

**Lab Sample ID: S34427.04**

Sample Tag: Field Dupe MW-11 L203073-04

Collected Date/Time: 03/30/2022 11:41

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.8	IR
2	1L Plastic	None	Yes	2.8	IR
1	125ml Plastic	HNO3	Yes	2.8	IR

**Extraction / Prep.**

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	04/01/22 09:20	JRH	
Metal Digestion	Completed	SW3015A	04/01/22 10:15	CCM	

**Inorganics**

**Method: E300.0, Run Date: 04/01/22 08:25, Analyst: JDP**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	67	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

**Method: SM2540C, Run Date: 03/31/22 16:00, Analyst: SSM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	636	50	10	mg/L	2		

**Method: SM2540D, Run Date: 03/31/22 18:15, Analyst: SSM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	32	3	1	mg/L	1.33		

**Metals**

**Method: E200.8, Run Date: 04/01/22 12:57, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.017	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.145	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.22	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	23.0	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.005	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	



# Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S34427.04 (continued)

Sample Tag: Field Dupe MW-11 L203073-04

Method: E200.8, Run Date: 04/01/22 14:59, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	140	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	37.8	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	1.45	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	39.6	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 04/01/22 13:36, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 04/25/22 12:22, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S34427.05

Sample Tag: Field Blank L203073-05

Collected Date/Time: 03/30/2022 09:00

Matrix: Water

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.8	IR
2	1L Plastic	None	Yes	2.8	IR
1	125ml Plastic	HNO3	Yes	2.8	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	04/01/22 09:20	JRH	
Metal Digestion	Completed	SW3015A	04/01/22 10:15	CCM	

### Inorganics

Method: E300.0, Run Date: 04/01/22 08:38, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	2.5	0.04	mg/L	2.5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.06	mg/L	2.5	16984-48-8	
Sulfate	Not detected	2.5	0.15	mg/L	2.5	14808-79-8	

Method: SM2540C, Run Date: 03/31/22 16:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	Not detected	50	10	mg/L	2		

Method: SM2540D, Run Date: 03/31/22 18:15, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 04/01/22 12:09, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00102	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.000102	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.0000648	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.0000862	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.000702	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.0000760	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.0000386	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.0000434	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000150	mg/L	2	7440-50-8	
Iron	Not detected	0.02	0.000768	mg/L	2	7439-89-6	
Lead	Not detected	0.003	0.0000760	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000654	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.0000868	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000100	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.000838	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.0000270	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.0000342	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.0000558	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.000292	mg/L	2	7440-66-6	



# Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S34427.05 (continued)

Sample Tag: Field Blank L203073-05

**Method: E200.8, Run Date: 04/01/22 14:41, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.0174	mg/L	2	7440-70-2	
Magnesium	Not detected	0.50	0.00480	mg/L	2	7439-95-4	
Potassium	Not detected	0.50	0.00920	mg/L	2	7440-09-7	
Sodium	Not detected	0.50	0.00340	mg/L	2	7440-23-5	

**Method: E245.1, Run Date: 04/01/22 13:40, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 04/25/22 12:22, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Merit Laboratories Login Checklist

Lab Set ID:S34427

Client:BWL01 (Board of Water & Light)

Project: Erickson AM MI New Wells 11-13

Submitted:03/31/2022 08:57 Login User: PFD

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental\_Laboratory@LBWL.com

Selection	Description	Note
<b>Sample Receiving</b>		
01.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples are received at 4C +/- 2C Thermometer # IR 2.8
02.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Received on ice/ cooling process begun
03.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples shipped
04.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples left in 24 hr. drop box
05.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Are there custody seals/tape or is the drop box locked
<b>Chain of Custody</b>		
06.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC adequately filled out
07.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC signed and relinquished to the lab
08.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sample tag on bottles match COC
09.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Subcontracting needed? Subcontracted to: GEL; 1Z4664770361312366
<b>Preservation</b>		
10.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Do sample have correct chemical preservation
11.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Completed pH checks on preserved samples? (no VOAs)
12.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Did any samples need to be preserved in the lab? Dissolved Metals
<b>Bottle Conditions</b>		
13.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	All bottles intact
14.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Appropriate analytical bottles are used
15.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Merit bottles used
16.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sufficient sample volume received
17.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples require laboratory filtration Dissolved Metals
18.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples submitted within holding time
19.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Do water VOC or TOX bottles contain headspace

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: \_\_\_\_\_ Date: \_\_\_\_\_

# Merit Laboratories Bottle Preservation Check

Lab Set ID: S34427 Submitted: 03/31/2022 08:57

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI New Wells 11-13

Attention: Jennifer Caporale  
Address: Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901

Initial Preservation Check: 03/31/2022 09:14 PFD

Preservation Recheck (E200.8): N/A

Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S34427.01	125ml Plastic HNO3	<2			
S34427.01	1L Plastic HNO3	<2			
S34427.01	1L Plastic HNO3	<2			
S34427.02	125ml Plastic HNO3	<2			
S34427.02	1L Plastic HNO3	<2			
S34427.02	1L Plastic HNO3	<2			
S34427.03	125ml Plastic HNO3	<2			
S34427.03	1L Plastic HNO3	<2			
S34427.03	1L Plastic HNO3	<2			
S34427.04	125ml Plastic HNO3	<2			
S34427.04	1L Plastic HNO3	<2			
S34427.04	1L Plastic HNO3	<2			
S34427.05	125ml Plastic HNO3	<2			
S34427.05	1L Plastic HNO3	<2			
S34427.05	1L Plastic HNO3	<2			



2680 East Lansing Dr., East Lansing, MI 48823  
 Phone (517) 332-0167 Fax (517) 332-4034  
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

**REPORT TO**

**CHAIN OF CUSTODY RECORD**

**INVOICE TO**

CONTACT NAME Jennifer Caporale  
 COMPANY Lansing Board of Water and Light  
 ADDRESS PO Box 13007 48901-3007  
 CITY Lansing STATE Mi ZIP CODE 48901  
 PHONE NO. 517-702-6372 FAX NO. \_\_\_\_\_ P.O. NO. \_\_\_\_\_  
 E-MAIL ADDRESS Environmental\_Laboratory@lbwl.com QUOTE NO. \_\_\_\_\_

CONTACT NAME Kelly Gleason  SAME  
 COMPANY \_\_\_\_\_  
 ADDRESS \_\_\_\_\_  
 CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP CODE \_\_\_\_\_  
 PHONE NO. \_\_\_\_\_ E-MAIL ADDRESS Kelly.Gleason@lbwl.com

**ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)**

PROJECT NO./NAME Erickson AM MI Wells 11-13 SAMPLER(S) - PLEASE PRINT/SIGN NAME Marc Wahrer

TURNAROUND TIME REQUIRED  1 DAY  2 DAYS  3 DAYS  STANDARD  OTHER ASAP

DELIVERABLES REQUIRED  STD  LEVEL II  LEVEL III  LEVEL IV  EDD  OTHER \_\_\_\_\_

MATRIX GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID  
 CODE: SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIPE A=AIR W=WASTE

# Containers & Preservatives

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO <sub>3</sub>	H <sub>2</sub> SO <sub>4</sub>	NiOH	MeOH	OTHER	Total Metals	F- undistilled, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	Dissolved Metals	HCO <sub>3</sub> , CO <sub>3</sub> , Hardness	Certifications		Special Instructions
	DATE	TIME																		<input type="checkbox"/> OHIO VAP	<input type="checkbox"/> Drinking Water	
<u>34427.01</u>	<u>3/30/22</u>	<u>1141</u>	MW-11 L203073-01	GW	5	3	2						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> DoD	<input checked="" type="checkbox"/> NPDES	Metals to analyse: Na, Mg, K
<u>.02</u>		<u>1415</u>	MW-12 L203073-02	GW	6	4	2						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> Detroit	<input type="checkbox"/> New York	B, Ca, Sb, As, Ba, Be, Cd, Cr,
<u>.03</u>		<u>1347</u>	MW-13 L203073-03	GW	5	3	2						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> Other _____		Co, Li, Hg, Mo, Pb, Se, Tl,
<u>.04</u>		<u>1141</u>	Field Dupe MW-11 L203073-04	GW	5	3	2						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			Fe, Cu, Ni, Ag, V, Zn
<u>.05</u>		<u>0900</u>	Field Blank L203073-05	DI	5	3	2						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			Please send a preliminary report
																						The analytes for dissolved metals are same metals that are analysed for total.

RELINQUISHED BY: [Signature] DATE 3-31-22 TIME 0857  
 SIGNATURE/ORGANIZATION \_\_\_\_\_  
 RECEIVED BY: [Signature] DATE 3/30/22 TIME 0857  
 SIGNATURE/ORGANIZATION \_\_\_\_\_

RELINQUISHED BY: \_\_\_\_\_ DATE \_\_\_\_\_ TIME \_\_\_\_\_  
 SIGNATURE/ORGANIZATION \_\_\_\_\_  
 RECEIVED BY: \_\_\_\_\_ DATE \_\_\_\_\_ TIME \_\_\_\_\_  
 SIGNATURE/ORGANIZATION \_\_\_\_\_

SEAL NO. \_\_\_\_\_ SEAL INTACT YES  NO  INITIALS \_\_\_\_\_  
 SEAL NO. \_\_\_\_\_ SEAL INTACT YES  NO  INITIALS \_\_\_\_\_

NOTES: TEMP. ON ARRIVAL 2.8

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

## Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total		250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.150
Be, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	2.5
Cl	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	10
Cr, total	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
F	Fluoride	250 mL plastic	mg/L	None	9056	28 d	1.0
Fe, total	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Pb, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Li, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Hg, total	Mercury	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Mn, total	Molybdenum	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
RA226/228	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	HNO3	SM 7500	6 mos	2.0 combined
Se, total	Selenium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ag, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
SO4	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	10
Tl, total	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
TDS	Total Dissolved Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TSS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540D	NA	3
V, total	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Zn, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005



April 25, 2022

John Laverty  
Merit Laboratories Inc.  
2680 East Lansing Drive  
East Lansing, Michigan 48823

Re: Routine Analysis  
Work Order: 575362  
SDG: S34427

Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on April 04, 2022. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at [www.gel.com](http://www.gel.com).

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,

Delaney Stone  
Project Manager

Purchase Order: GELP20-0018  
Enclosures



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# Case Narrative

**Receipt Narrative  
for  
Merit Laboratories, Inc.  
SDG: S34427  
Work Order: 575362**

**April 25, 2022**

**Laboratory Identification:**

GEL Laboratories LLC  
2040 Savage Road  
Charleston, South Carolina 29407  
(843) 556-8171

**Summary:**

**Sample receipt:** The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on April 04, 2022 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

**Sample Identification:** The laboratory received the following samples:

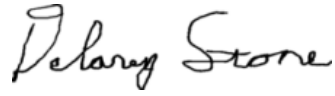
<b><u>Laboratory ID</u></b>	<b><u>Client ID</u></b>
575362001	S34427.01
575362002	S34427.02
575362003	S34427.03
575362004	S34427.04 (Field Dup)
575362005	S34427.04 (Field Blank)

**Case Narrative:**

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.



The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.

A handwritten signature in black ink that reads "Delaney Stone". The signature is written in a cursive style with a large initial 'D'.

Delaney Stone  
Project Manager

# **Chain of Custody and Supporting Documentation**



2680 East Lansing Dr., East Lansing, MI 48823  
 Phone (517) 332-0167 Fax (517) 332-4034  
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1  
 575362

**REPORT TO**

CONTACT NAME: Project Management Team  
 COMPANY: Merit Laboratories  
 ADDRESS: 2680 East Lansing Drive  
 CITY: East Lansing  
 PHONE NO.: 517-332-0167  
 E-MAIL ADDRESS: results@meritlabs.com

**CHAIN OF CUSTODY RECORD**

CONTACT NAME: Julie Teague  
 COMPANY: Merit Laboratories  
 ADDRESS: 2680 East Lansing Drive  
 CITY: East Lansing  
 PHONE NO.: 517-332-0167  
 E-MAIL ADDRESS: juliet@meritlabs.com

**INVOICE TO**

CONTACT NAME: [ ]  
 COMPANY: [ ]  
 ADDRESS: [ ]  
 CITY: [ ]  
 STATE: MI  
 ZIP CODE: 48823

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

PROJECT NO./NAME: S34427

TURNAROUND TIME REQUIRED:  1 DAY  2 DAYS  3 DAYS  STANDARD  OTHER  
 DELIVERABLES REQUIRED:  STD  LEVEL II  LEVEL III  LEVEL IV  EDD  OTHER

MATERIAL CODE	YEAR	DATE	TIME	IDENTIFICATION-DESCRIPTION	MATRIX	BOTTLES	# Containers & Preservatives							
							HO	SO	HO	HO	HO			
	3/30/22	1141	1141	S34427.01	GW	2	2							
	3/30/22	1415	1415	S34427.02	GW	2	2							
	3/30/22	1347	1347	S34427.03	GW	2	2							
	3/30/22	1141	1141	S34427.04 (Field Dupe)	GW	2	2							
	3/30/22	0900	0900	S34427.05 (Field Blank)	Wa	2	2							

MATERIAL CODE	YEAR	DATE	TIME	IDENTIFICATION-DESCRIPTION	MATRIX	BOTTLES	HO	SO	HO	HO	HO	OTHER	Certifications		Special Instructions
													OHIO VAP	Drinking Water	
	3/30/22	1141	1141	S34427.01	GW	2	2						<input type="checkbox"/> DoD	<input type="checkbox"/> NPDES	* E903.1 Mod.
	3/30/22	1415	1415	S34427.02	GW	2	2						<input type="checkbox"/> Detroit	<input type="checkbox"/> New York	** E904.0/SW 9320 Mod.
	3/30/22	1347	1347	S34427.03	GW	2	2						<input type="checkbox"/> Other		
	3/30/22	1141	1141	S34427.04 (Field Dupe)	GW	2	2								Please use calculation product & provide Radium 226/228 combined results on the report
	3/30/22	0900	0900	S34427.05 (Field Blank)	Wa	2	2								(No Ice needed)

RELINQUISHED BY: [Signature] DATE: 3/31/22 TIME: 1700  
 RECEIVED BY: [Signature] DATE: 3/31/22 TIME: 1700  
 RELINQUISHED BY: [Signature] DATE: [ ] TIME: [ ]  
 RECEIVED BY: [Signature] DATE: [ ] TIME: [ ]

RELINQUISHED BY: [Signature] DATE: 4-1-22 TIME: 9:00  
 RECEIVED BY: [Signature] DATE: [ ] TIME: [ ]  
 RELINQUISHED BY: [Signature] DATE: [ ] TIME: [ ]  
 RECEIVED BY: [Signature] DATE: [ ] TIME: [ ]

SEAL NO. [ ] SEAL INTACT YES [ ] NO [ ] INITIALS [ ]  
 SEAL NO. [ ] SEAL INTACT YES [ ] NO [ ] INITIALS [ ]

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

**SAMPLE RECEIPT & REVIEW FORM**

Client: MERI SDG/AR/COC/Work Order: 575362 D.S  
 Received By: TYE Date Received: 4/4/22

Carrier and Tracking Number  
 FedEx Express FedEx Ground UPS Field Services Courier Other  
124004770361312360

Suspected Hazard Information  
 \*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.  
 A) Shipped as a DOT Hazardous?  Yes  No Hazard Class Shipped: \_\_\_\_\_ UN#: \_\_\_\_\_  
 If UN2910, Is the Radioactive Shipment Survey Compliant? Yes \_\_\_ No \_\_\_  
 B) Did the client designate the samples are to be received as radioactive?  Yes  No COC notation or radioactive stickers on containers equal client designation.  
 C) Did the RSO classify the samples as radioactive?  Yes  No Maximum Net Counts Observed\* (Observed Counts - Area Background Counts): 0 CPM / mR/Hr  
 Classified as: Rad 1 Rad 2 Rad 3  
 D) Did the client designate samples are hazardous?  Yes  No COC notation or hazard labels on containers equal client designation.  
 E) Did the RSO identify possible hazards?  Yes  No If D or E is yes, select Hazards below.  
 PCB's Flammable Foreign Soil RCRA Asbestos Beryllium Other: \_\_\_\_\_

Sample Receipt Criteria		Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1	Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Client contacted and provided COC COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Preservation Method: Wet Ice Ice Packs Dry ice <u>None</u> Other: _____ *all temperatures are recorded in Celsius TEMP: <u>16C</u>
4	Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Temperature Device Serial #: <u>JR2-20</u> Secondary Temperature Device Serial # (If Applicable): _____
5	Sample containers intact and sealed?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Sample ID's and Containers Affected: _____ If Preservation added, Lot#: _____
7	Do any samples require Volatile Analysis?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	If Yes, are Encores or Soil Kits present for solids? Yes ___ No ___ NA ___ (If yes, take to VOA Freezer) Do liquid VOA vials contain acid preservation? Yes ___ No ___ NA ___ (If unknown, select No) Are liquid VOA vials free of headspace? Yes ___ No ___ NA ___ Sample ID's and containers affected: _____
8	Samples received within holding time?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	ID's and tests affected: _____
9	Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	ID's and containers affected: _____
10	Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: No dates on containers No times on containers COC missing info Other (describe)
11	Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: No container count on COC Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
13	COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Not relinquished Other (describe)

Comments (Use Continuation Form if needed):

PM (or PMA) review: Initials EM Date 4/5/22 Page 1 of 1

# Laboratory Certifications

**List of current GEL Certifications as of 25 April 2022**

<b>State</b>	<b>Certification</b>
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122021-1
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2019-165
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122021-36
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

# **Radiological Analysis**

# Case Narrative



**Radiochemistry  
Technical Case Narrative  
Merit Laboratories, Inc.  
SDG #: S34427  
Work Order #: 575362**

**Product:** GFPC Ra228, Liquid

**Analytical Method:** EPA 904.0/SW846 9320 Modified

**Analytical Procedure:** GL-RAD-A-063 REV# 5

**Analytical Batch:** 2251474

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
575362001	S34427.01
575362002	S34427.02
575362003	S34427.03
575362004	S34427.04 (Field Dup)
575362005	S34427.05 (Field Blank)
1205061590	Method Blank (MB)
1205061591	575362001(S34427.01) Sample Duplicate (DUP)
1205061593	575594002(NonSDG) Matrix Spike (MS)
1205061594	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

**Quality Control (QC) Information**

**RDL Met**

The blank (See Below) did not meet the detection limit due to keeping the blank volume consistent with the other sample aliquots.

<b>Sample</b>	<b>Analyte</b>	<b>Value</b>
1205061590 (MB)	Radium-228	Result -0.0456 < MDA 1.97 > RDL 1.5 pCi/L

**Technical Information**

**Recounts**

Sample 1205061590 (MB) was recounted due to high MDC. The recount is reported.

**Product:** Lucas Cell, Ra226, Liquid

**Analytical Method:** EPA 903.1 Modified

**Analytical Procedure:** GL-RAD-A-008 REV# 15

**Analytical Batch:** 2251465

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
575362001	S34427.01
575362002	S34427.02
575362003	S34427.03
575362004	S34427.04 (Field Dup)
575362005	S34427.05 (Field Blank)
1205061580	Method Blank (MB)
1205061581	575362001(S34427.01) Sample Duplicate (DUP)
1205061582	575362001(S34427.01) Matrix Spike (MS)
1205061583	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

**Technical Information**

**Recounts**

Sample 1205061582 (S34427.01MS) was recounted due to low recovery. The recount is reported.

**Miscellaneous Information**

**Additional Comments**

The matrix spike and matrix spike duplicate, 1205061582 (S34427.01MS), aliquots were reduced to conserve sample volume.

**Certification Statement**

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

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### Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S34427 GEL Work Order: 575362

**The Qualifiers in this report are defined as follows:**

- \* A quality control analyte recovery is outside of specified acceptance criteria
- \*\* Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

**Review/Validation**

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature: 

Name: Kenshalla Oston

Date: 28 APR 2022

Title: Analyst I

# Sample Data Summary

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## Certificate of Analysis

Report Date: April 28, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

Client Sample ID: S34427.01	Project: MERI00120
Sample ID: 575362001	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 30-MAR-22 11:41	
Receive Date: 04-APR-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	0.757	+/-0.903	1.52	3.00	pCi/L			JXC9	04/18/22	0908	2251474	1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		1.11	+/-0.940			pCi/L		1	NXL1	04/25/22	1222	2251473	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226	U	0.358	+/-0.261	0.367	1.00	pCi/L			LXP1	04/21/22	0940	2251465	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			83.4	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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## Certificate of Analysis

Report Date: April 28, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

Client Sample ID: S34427.02	Project: MERI00120
Sample ID: 575362002	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 30-MAR-22 14:15	
Receive Date: 04-APR-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228		2.33	+/-1.03	1.41	3.00	pCi/L			JXC9	04/18/22	0908	2251474	1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		3.11	+/-1.07			pCi/L		1	NXL1	04/25/22	1222	2251473	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.783	+/-0.280	0.187	1.00	pCi/L			LXP1	04/21/22	0940	2251465	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			88.5	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

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## Certificate of Analysis

Report Date: April 28, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
 East Lansing, Michigan 48823  
 Contact: John Lavery  
 Project: Routine Analysis

Client Sample ID: S34427.03	Project: MERI00120
Sample ID: 575362003	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 30-MAR-22 13:47	
Receive Date: 04-APR-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	1.32	+/-0.956	1.50	3.00	pCi/L			JXC9	04/18/22	0908	2251474	1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		2.08	+/-0.999			pCi/L		1	NXL1	04/25/22	1222	2251473	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.755	+/-0.290	0.206	1.00	pCi/L			LXP1	04/21/22	0940	2251465	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			88.7	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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## Certificate of Analysis

Report Date: April 28, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Lavery  
 Project: Routine Analysis

Client Sample ID: S34427.04 (Field Dup)	Project: MERI00120
Sample ID: 575362004	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 30-MAR-22 11:41	
Receive Date: 04-APR-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	-0.419	+/-1.20	2.26	3.00	pCi/L			JXC9	04/18/22	0908	2251474	1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		0.603	+/-1.23			pCi/L		1	NXL1	04/25/22	1222	2251473	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.603	+/-0.260	0.241	1.00	pCi/L			LXP1	04/21/22	0940	2251465	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			84.7	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit



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## Certificate of Analysis

Report Date: April 28, 2022

Company : Merit Laboratories Inc.  
Address : 2680 East Lansing Drive  
  
East Lansing, Michigan 48823  
Contact: John Lavery  
Project: Routine Analysis

Client Sample ID: S34427.05 (Field Blank) Project: MERI00120  
Sample ID: 575362005 Client ID: MERI001  
Matrix: Water  
Collect Date: 30-MAR-22 09:00  
Receive Date: 04-APR-22  
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	0.394	+/-0.941	1.68	3.00	pCi/L			JXC9	04/18/22	0908	2251474	1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		0.462	+/-0.959			pCi/L		1	NXL1	04/25/22	1222	2251473	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226	U	0.0684	+/-0.184	0.349	1.00	pCi/L			LXP1	04/21/22	0940	2251465	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			84.1	(15%-125%)

### Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor                      Lc/LC: Critical Level  
DL: Detection Limit                      PF: Prep Factor  
MDA: Minimum Detectable Activity      RL: Reporting Limit  
MDC: Minimum Detectable Concentration      SQL: Sample Quantitation Limit

# Quality Control Summary

# GEL LABORATORIES LLC

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## QC Summary

Report Date: April 28, 2022

Page 1 of 2

**Merit Laboratories Inc.**  
**2680 East Lansing Drive**  
**East Lansing, Michigan**

**Contact: John Laverty**

**Workorder: 575362**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Rad Gas Flow</b>											
Batch	2251474										
QC1205061591	575362001	DUP									
Radium-228	U	0.757	U	1.38	pCi/L	N/A		N/A	JXC9	04/18/22	09:07
	Uncertainty	+/-0.903		+/-0.933							
QC1205061594	LCS										
Radium-228	45.1			47.6	pCi/L		105	(75%-125%)		04/18/22	09:07
	Uncertainty			+/-3.40							
QC1205061590	MB										
Radium-228			U	-0.0456	pCi/L					04/18/22	13:59
	Uncertainty			+/-1.05							
QC1205061593	575594002	MS									
Radium-228	132 U	0.744		134	pCi/L		102	(75%-125%)		04/18/22	09:07
	Uncertainty	+/-0.859		+/-9.88							
<b>Rad Ra-226</b>											
Batch	2251465										
QC1205061581	575362001	DUP									
Radium-226	U	0.358		0.383	pCi/L	6.94		(0% - 100%)	LXP1	04/21/22	10:44
	Uncertainty	+/-0.261		+/-0.238							
QC1205061583	LCS										
Radium-226	26.2			21.5	pCi/L		82.3	(75%-125%)		04/21/22	10:44
	Uncertainty			+/-1.43							
QC1205061580	MB										
Radium-226			U	0.200	pCi/L					04/21/22	10:12
	Uncertainty			+/-0.209							
QC1205061582	575362001	MS									
Radium-226	134 U	0.358		101	pCi/L		75.7	(75%-125%)		04/21/22	11:19
	Uncertainty	+/-0.261		+/-7.07							

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- \*\* Analyte is a Tracer compound
- < Result is less than value reported
- > Result is greater than value reported

# GEL LABORATORIES LLC

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## QC Summary

Workorder: 575362

Page 2 of 2

Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
BD		Results are either below the MDC or tracer recovery is low									
FA		Failed analysis.									
H		Analytical holding time was exceeded									
J		See case narrative for an explanation									
J		Value is estimated									
K		Analyte present. Reported value may be biased high. Actual value is expected to be lower.									
L		Analyte present. Reported value may be biased low. Actual value is expected to be higher.									
M		M if above MDC and less than LLD									
M		REMP Result > MDC/CL and < RDL									
N/A		RPD or %Recovery limits do not apply.									
NI		See case narrative									
ND		Analyte concentration is not detected above the detection limit									
NJ		Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier									
Q		One or more quality control criteria have not been met. Refer to the applicable narrative or DER.									
R		Sample results are rejected									
U		Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.									
UI		Gamma Spectroscopy--Uncertain identification									
UJ		Gamma Spectroscopy--Uncertain identification									
UL		Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.									
X		Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier									
Y		Other specific qualifiers were required to properly define the results. Consult case narrative.									
^		RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.									
h		Preparation or preservation holding time was exceeded									

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where the duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

\* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

# Gas Flow Raw Data

# Batch 2251474 Check-list

This check-list was completed on 20-APR-22 by Kenshalla Oston

This batch was reviewed by Rhonda Birch on 19-APR-22 and Kenshalla Oston on 20-APR-22.

**Batch ID:**  
2251474

**Product:**  
GFC28RAL

**Description:** Gas Flow Radium 228  
GL-RAD-A-063

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?		No	
<b>Miscellaneous Information</b>				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

# Prep Logbook

## Radium-228 in Liquid

**Batch ID:** 2251474

**Analyst:** Jasmine Conley (JXC9)

**Method:** EPA 904.0/SW846 9320 Modified

**Lab SOP:** GL-RAD-A-063 REV# 5

**Instrument:** LUCAS-C037036045

**Due Dates for Lab:** 29-APR-2022

**Package:** 01-MAY-2022

**SDG:** 02-MAY-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205061594	Radium-228	1965-C	.1	mL
MS	1205061593	Radium-228	1965-C	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	575362001	12-APR-2022	3	311.28	311.28	04/13/22 12:40	04/18/22 06:50
2	575362002	12-APR-2022	3	312.96	312.96	04/13/22 12:40	04/18/22 06:50
3	575362003	12-APR-2022	3	310.83	310.83	04/13/22 12:40	04/18/22 06:50
4	575362004	12-APR-2022	3	309.58	309.58	04/13/22 12:40	04/18/22 06:50
5	575362005	12-APR-2022	3	306.1	306.1	04/13/22 12:40	04/18/22 06:50
6	575363001	12-APR-2022	3	302.61	302.61	04/13/22 12:40	04/18/22 06:50
7	575363002	12-APR-2022	3	306.07	306.07	04/13/22 12:40	04/18/22 06:50
8	575363003	12-APR-2022	3	301.79	301.79	04/13/22 12:40	04/18/22 06:50
9	575594002	12-APR-2022	1.5	304.75	304.75	04/13/22 12:40	04/18/22 06:50
10	575594003	12-APR-2022	1.5	307.25	307.25	04/13/22 12:40	04/18/22 06:50
11	1205061590 MB	12-APR-2022	1.5		312.96	04/13/22 12:40	04/18/22 06:50
12	1205061591 DUP (575362001)	12-APR-2022	3	305.91	305.91	04/13/22 12:40	04/18/22 06:50
13	1205061592 DUP (575594002)	12-APR-2022	1.5	301.54	301.54	04/13/22 12:40	04/18/22 06:50
14	1205061593 MS (575594002)	12-APR-2022	1.5	106.92	106.92	04/13/22 12:40	04/18/22 06:50
15	1205061594 LCS	12-APR-2022	1.5		312.96	04/13/22 12:40	04/18/22 06:50

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1951-C	Barium-133	.1 mL	Pipet Id: RAD-GFC-1795419 Data Entry Date2: 12-APR-2022 00:00
REGNT 3371585.12	16M Nitric Acid	5 mL	
REGNT 3408863.6	29M HF (48-50%)	4 mL	
REGNT 3411398	Barium Carrier Ra228 REG	1 mL	
REGNT 3412402.6	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	
REGNT 3413369	Lot #DGA0030	2 g	
REGNT 3413388	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3413919	RGF-50% Potassium Carbonate	2 mL	
REGNT 3417468	RGF-1M Citric Acid	5 mL	
REGNT 3422841	2M HCl	20 mL	
REGNT 3424040	7M Nitric Acid	25 mL	
REGNT 3424228	RGF-Neodymium Substrate	5 mL	
REGNT 3424307	RGF-1.5M Ammonium Sulfate	10 mL	

### Radium-228 Liquid

Filename : RA228.XLS  
 File type : Excel  
 Version # : 1.4.2

Tracer S/N : 1951-C  
 Tracer Exp Date : 9/16/2022  
 Tracer Volume Added: 0.10

Batch : 2251474  
 Analyst : JAS02031  
 Prep Date : 4/12/2022  
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL  
 Parmname : Radium-228  
 Required MDA : 1.5 pCi/L  
 Ra-228 Abundance : 1.00  
 Halflife of Ra-228 : 5.75 years  
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	575362001.1	0.3113	1.8644E-05	3/30/2022 11:41	1468.6	1.51%	1224.9	1.65%	0.1	0.000200
2	575362002.1	0.3130	1.8670E-05	3/30/2022 14:15	1468.6	1.51%	1299.8	1.60%	0.1	0.000200
3	575362003.1	0.3108	1.8637E-05	3/30/2022 13:47	1468.6	1.51%	1302.4	1.60%	0.1	0.000200
4	575362004.1	0.3096	1.8617E-05	3/30/2022 11:41	1468.6	1.51%	1244.2	1.64%	0.1	0.000200
5	575362005.1	0.3061	1.8561E-05	3/30/2022 9:00	1468.6	1.51%	1234.5	1.64%	0.1	0.000200
6	575363001.1	0.3026	1.8503E-05	3/30/2022 15:06	1468.6	1.51%	1305.2	1.60%	0.1	0.000200
7	575363002.1	0.3061	1.8560E-05	3/30/2022 15:06	1468.6	1.51%	1313.1	1.59%	0.1	0.000200
8	575363003.1	0.3018	1.8489E-05	3/30/2022 14:55	1468.6	1.51%	1090.3	1.75%	0.1	0.000200
9	575594002.1	0.3048	1.8539E-05	4/4/2022 13:20	1468.6	1.51%	1263.4	1.62%	0.1	0.000200
10	575594003.1	0.3073	1.8579E-05	4/4/2022 9:10	1468.6	1.51%	1279.2	1.61%	0.1	0.000200
11	1205061590.1	0.3130	1.8670E-05	4/12/2022 0:00	1468.6	1.51%	1305.1	1.60%	0.1	0.000200
12	1205061591.1	0.3059	1.8558E-05	3/30/2022 11:41	1468.6	1.51%	1282.2	1.61%	0.1	0.000200
13	1205061592.1	0.3015	1.8485E-05	4/4/2022 13:20	1468.6	1.51%	1319.0	1.59%	0.1	0.000200
14	1205061593.1	0.1069	1.1787E-05	4/4/2022 13:20	1468.6	1.51%	1187.4	1.68%	0.1	0.000200
15	1205061594.1	0.3130	1.8670E-05	4/12/2022 0:00	1468.6	1.51%	1286.8	1.61%	0.1	0.000200



Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063  
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated	Sample
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction	Recovery %	Sample Recovery Error %
			Alpha	Beta										
1	1A	60	6	51	0.850	4/18/2022 9:08	4/13/2022 12:40	4/18/2022 6:50	0.994	0.772	1.000	1.057	83.4%	1.15%
2	1B	60	7	79	1.317	4/18/2022 9:08	4/13/2022 12:40	4/18/2022 6:50	0.994	0.771	1.000	1.057	88.5%	1.14%
3	1C	60	5	69	1.150	4/18/2022 9:08	4/13/2022 12:40	4/18/2022 6:50	0.994	0.771	1.000	1.057	88.7%	1.14%
4	1D	60	7	94	1.567	4/18/2022 9:08	4/13/2022 12:40	4/18/2022 6:50	0.994	0.771	1.000	1.057	84.7%	1.15%
5	2A	60	7	54	0.900	4/18/2022 9:08	4/13/2022 12:40	4/18/2022 6:50	0.994	0.771	1.000	1.057	84.1%	1.15%
6	2C	60	8	58	0.967	4/18/2022 9:08	4/13/2022 12:40	4/18/2022 6:50	0.994	0.771	1.000	1.057	88.9%	1.14%
7	2D	60	10	105	1.750	4/18/2022 9:08	4/13/2022 12:40	4/18/2022 6:50	0.994	0.771	1.000	1.057	89.4%	1.13%
8	3B	60	4	43	0.717	4/18/2022 9:08	4/13/2022 12:40	4/18/2022 6:50	0.994	0.771	1.000	1.057	74.2%	1.19%
9	3C	90	2	103	1.144	4/18/2022 9:08	4/13/2022 12:40	4/18/2022 6:50	0.995	0.770	1.000	1.087	86.0%	1.14%
10	3D	90	2	76	0.844	4/18/2022 9:08	4/13/2022 12:40	4/18/2022 6:50	0.995	0.770	1.000	1.087	87.1%	1.14%
11	14A	90	3	58	0.644	4/18/2022 13:59	4/13/2022 12:40	4/18/2022 6:50	0.998	0.446	1.000	1.087	88.9%	1.14%
12	4C	60	6	65	1.083	4/18/2022 9:07	4/13/2022 12:40	4/18/2022 6:50	0.994	0.773	1.000	1.057	87.3%	1.14%
13	9A	60	6	56	0.933	4/18/2022 11:56	4/13/2022 12:40	4/18/2022 6:50	0.995	0.562	1.000	1.057	89.8%	1.13%
14	5A	60	14	767	12.783	4/18/2022 9:07	4/13/2022 12:40	4/18/2022 6:50	0.995	0.772	1.000	1.057	80.9%	1.16%
15	5B	60	15	897	14.950	4/18/2022 9:07	4/13/2022 12:40	4/18/2022 6:50	0.998	0.772	1.000	1.057	87.6%	1.14%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2021	5/31/2022	0.6325	0.00738	0.650	4/16/2022 13:48	1000
2	PIC	6/1/2021	5/31/2022	0.6409	0.00711	0.651	4/16/2022 13:48	1000
3	PIC	6/1/2021	5/31/2022	0.6524	0.00847	0.768	4/16/2022 13:48	1000
4	PIC	6/1/2021	5/31/2022	0.6466	0.00692	1.681	4/16/2022 13:48	1000
5	PIC	6/1/2021	5/31/2022	0.6321	0.01914	0.797	4/16/2022 13:48	1000
6	PIC	6/1/2021	5/31/2022	0.6380	0.01274	0.903	4/16/2022 13:49	1000
7	PIC	6/1/2021	5/31/2022	0.6254	0.00745	1.765	4/16/2022 13:49	1000
8	PIC	6/1/2021	5/31/2022	0.6428	0.01614	0.508	4/16/2022 13:49	1000
9	PIC	6/1/2021	5/31/2022	0.6497	0.00988	0.946	4/16/2022 13:49	1000
10	PIC	6/1/2021	5/31/2022	0.6259	0.02297	0.736	4/16/2022 13:49	1000
11	PIC	6/1/2021	5/31/2022	0.6545	0.02119	0.652	4/16/2022 12:39	1000
12	PIC	6/1/2021	5/31/2022	0.6681	0.00889	0.687	4/16/2022 13:50	1000
13	PIC	6/1/2021	5/31/2022	0.6471	0.00758	0.810	4/16/2022 13:46	1000
14	PIC	6/1/2021	5/31/2022	0.6571	0.00851	0.464	4/16/2022 13:50	1000
15	PIC	6/1/2021	5/31/2022	0.6506	0.00426	1.228	4/16/2022 13:50	1000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

\* - RPD changed to 0% due to sample & dup activity below MDA

**Spike S/N :** 1965-C  
**Spike Exp Date :** 8/5/2022  
**Spike Activity (dpm/ml):** 313.62  
**Spike Volume Added:** 0.10

**LCS S/N :** 1965-C  
**LCS Exp Date :** 8/5/2022  
**LCS Activity (dpm/ml):** 313.62  
**LCS Volume Added:** 0.10

Results Pos.	Decision	Critical	Required	Sample Act.		Sample Act.	Net Count	Net Count	2 SIGMA	2 SIGMA	Sample	Sample	RPD	RER	Nominal	Recovery
	Level	Level	MDA	MDA	Conc.	Error	Rate	Rate Error	Counting	Total Prop.						
	pCi/L	pCi/L	pCi/L	pCi/L	pCi/L	%	CPM	CPM	Uncertainty	Uncertainty						
1	0.9446	0.6669	3	1.5229	<b>0.7566</b>	60.88%	0.2000	0.1217	0.9026	0.9222		SAMPLE				
2	0.8746	0.6174	3	1.4099	<b>2.3298</b>	22.62%	0.6657	0.1503	1.0312	1.1842		SAMPLE				
3	0.9377	0.6620	3	1.4969	<b>1.3199</b>	36.99%	0.3820	0.1412	0.9561	1.0115		SAMPLE				
4	1.4717	1.0390	3	2.2613	<b>-0.4191</b>	145.82%	-0.1143	0.1667	1.1976	1.1977		SAMPLE				
5	1.0567	0.7460	3	1.6831	<b>0.3936</b>	122.05%	0.1030	0.1257	0.9415	0.9467		SAMPLE				
6	1.0661	0.7526	3	1.6864	<b>0.2306</b>	204.88%	0.0637	0.1304	0.9261	0.9279		SAMPLE				
7	1.4945	1.0551	3	2.2918	<b>-0.0545</b>	1172.49%	-0.0150	0.1759	1.2521	1.2522		SAMPLE				
8	0.9531	0.6729	3	1.5617	<b>0.9010</b>	53.52%	0.2087	0.1116	0.9444	0.9712		SAMPLE				
9	0.9347	0.6599	1.5	1.4447	<b>0.7437</b>	58.92%	0.1984	0.1169	0.8586	0.8786		SAMPLE				
10	0.8386	0.5920	1.5	1.3112	<b>0.4134</b>	92.79%	0.1084	0.1006	0.7516	0.7589		SAMPLE				
11	1.2509	0.8832	1.5	1.9678	<b>-0.0456</b>	1169.85%	-0.0076	0.0884	1.0467	1.0468		MB				
12	0.8925	0.6301	3	1.4341	<b>1.3781</b>	34.57%	0.3963	0.1369	0.9330	0.9946	575362001.1	DUP	* 0.0%			
13	1.3546	0.9564	1.5	2.1558	<b>0.5994</b>	103.73%	0.1233	0.1279	1.2186	1.2278	575594002.1	DUP	* 0.0%			
14	2.3022	1.6254	1.5	3.7964	<b>134.4426</b>	4.02%	12.3193	0.4621	9.8838	35.0506	575594002.1	MS			132.4532	101.5%
15	1.1899	0.8401	1.5	1.8535	<b>47.5771</b>	3.84%	13.7220	0.5004	3.4005	12.3557		LCS			45.1404	105.4%

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
575362001	1A	60	6	51	4/18/2022 9:08	4/18/2022 10:08	PIC	2251474
575362002	1B	60	7	79	4/18/2022 9:08	4/18/2022 10:08	PIC	2251474
575362003	1C	60	5	69	4/18/2022 9:08	4/18/2022 10:08	PIC	2251474
575362004	1D	60	7	94	4/18/2022 9:08	4/18/2022 10:08	PIC	2251474
575362005	2A	60	7	54	4/18/2022 9:08	4/18/2022 10:08	PIC	2251474
575363001	2C	60	8	58	4/18/2022 9:08	4/18/2022 10:08	PIC	2251474
575363002	2D	60	10	105	4/18/2022 9:08	4/18/2022 10:08	PIC	2251474
575363003	3B	60	4	43	4/18/2022 9:08	4/18/2022 10:08	PIC	2251474
575594002	3C	90	2	103	4/18/2022 9:08	4/18/2022 10:38	PIC	2251474
575594003	3D	90	2	76	4/18/2022 9:08	4/18/2022 10:38	PIC	2251474
1205061590	14A	90	3	58	4/18/2022 13:59	4/18/2022 15:29	PIC	2251474
1205061591	4C	60	6	65	4/18/2022 9:07	4/18/2022 10:07	PIC	2251474
1205061592	9A	60	6	56	4/18/2022 11:56	4/18/2022 12:56	PIC	2251474
1205061593	5A	60	14	767	4/18/2022 9:07	4/18/2022 10:07	PIC	2251474
1205061594	5B	60	15	897	4/18/2022 9:07	4/18/2022 10:07	PIC	2251474

ASSAY 18-Apr-22 7:21:37  
 Wizard 2480 s/n 46190630  
 Protocol id 9 Ba-133\_1  
 Time limit  
 Count limit  
 Isotope Ba-133\_1  
 Protocol date 4/18/2022  
 Run id. 4913

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	92	1	180	4406.57	1468.58	1.51	07:21:37
575362001	2	92	2	180	3675.28	1224.89	1.65	83.41	07:24:51
575362002	3	92	3	180	3899.85	1299.76	1.6	88.50	07:28:05
575362003	4	92	4	180	3907.57	1302.39	1.6	88.68	07:31:19
575362004	5	92	5	180	3733.28	1244.19	1.64	84.72	07:34:33
575362005	1	2	1	180	3704.28	1234.52	1.64	84.06	07:38:09
575363001	2	2	2	180	3916.28	1305.18	1.6	88.87	07:41:23
575363002	3	2	3	180	3940	1313.08	1.59	89.41	07:44:37
575363003	4	2	4	180	3271.28	1090.31	1.75	74.24	07:47:51
575594002	5	2	5	180	3790.85	1263.37	1.62	86.03	07:51:05
575594003	1	98	1	180	3838.28	1279.18	1.61	87.10	07:54:41
1205061590	2	98	2	180	3916	1305.09	1.6	88.87	07:57:54
1205061591	3	98	3	180	3847.28	1282.18	1.61	87.31	08:01:08
1205061592	4	98	4	180	3957.85	1319.04	1.59	89.82	08:04:22
1205061593	5	98	5	180	3563	1187.44	1.68	80.86	08:07:37
1205061594	1	6	1	180	3861	1286.75	1.61	87.62	08:11:25

END OF ASSAY

# **Continuing Calibration Data**

# Gas Flow Proportional Counter Checks for 18-Apr-2022

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100E2	need 2nd	Beta bkg	18-Apr 04:40	60	1.833	1.386	3.015	-1.35
LB4100F3	Above	Alpha bkg	18-Apr 09:16	1.54	0.649	0.119	0.404	+8.18
LB4100F3	Below	Beta bkg	18-Apr 09:16	1.54	0.00E+0	0.854	1.842	-8.18
LB4100G1	Above	Alpha XTalk	18-Apr 05:43	5	2.963	0.088	0.447	+45.12
LB4100G1	Above	Beta bkg	18-Apr 04:41	60	16231	0.380	1.675	+75,209.48
LB4100G1	need 2nd	Beta eff	18-Apr 05:56	5	15117	12880	18320	-0.53
LB4100G2	Above	Alpha eff	18-Apr 05:43	5	9599	7308	9581	+3.05
LB4100G2	Below	Alpha XTalk	18-Apr 05:43	5	0.321	0.324	0.423	-3.15
LB4100G2	Above	Beta bkg	18-Apr 04:41	60	5.017	1.159	2.203	+19.17
LB4100G3	Below	Alpha bkg	18-Apr 04:41	60	0.00E+0	0.002	0.276	-3.05
LB4100G3	Below	Alpha eff	18-Apr 05:43	5	6554	6620	7779	-3.34
LB4100G3	Above	Beta bkg	18-Apr 04:41	60	6.667	0.810	1.674	+37.67
PIC13A	need 2nd	Alpha bkg	18-Apr 06:53	1000	0.064	-9.05E-2	0.347	-0.88
PIC13A	need 2nd	Beta bkg	18-Apr 06:53	1000	0.684	-8.16E-2	2.573	-1.27

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

LB4100C1 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
 LB4100C2 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
 LB4100C3 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
 LB4100C4 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
 LB4100I1 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
 LB4100I2 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
 LB4100I3 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
 LB4100I4 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by 

Date 4/19/22

GEL Laboratories LLC

# Runlogs



# Instrument Run Log

Instrument Type: GFPC

Batch ID: 2251474

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205061591	DUP	JXC9	PIC4C	APR-18-22 09:07:23	DONE	25mm Filter	01-JUN-21 00:00
1205061593	MS	JXC9	PIC5A	APR-18-22 09:07:53	DONE	25mm Filter	01-JUN-21 00:00
1205061594	LCS	JXC9	PIC5B	APR-18-22 09:07:58	DONE	25mm Filter	01-JUN-21 00:00
575362001	SAMPLE	JXC9	PIC1A	APR-18-22 09:08:04	DONE	25mm Filter	01-JUN-21 00:00
575362002	SAMPLE	JXC9	PIC1B	APR-18-22 09:08:09	DONE	25mm Filter	01-JUN-21 00:00
575362003	SAMPLE	JXC9	PIC1C	APR-18-22 09:08:13	DONE	25mm Filter	01-JUN-21 00:00
575362004	SAMPLE	JXC9	PIC1D	APR-18-22 09:08:21	DONE	25mm Filter	01-JUN-21 00:00
575362005	SAMPLE	JXC9	PIC2A	APR-18-22 09:08:25	DONE	25mm Filter	01-JUN-21 00:00
575363001	SAMPLE	JXC9	PIC2C	APR-18-22 09:08:25	DONE	25mm Filter	01-JUN-21 00:00
575363002	SAMPLE	JXC9	PIC2D	APR-18-22 09:08:29	DONE	25mm Filter	01-JUN-21 00:00
575363003	SAMPLE	JXC9	PIC3B	APR-18-22 09:08:41	DONE	25mm Filter	01-JUN-21 00:00
575594002	SAMPLE	JXC9	PIC3C	APR-18-22 09:08:48	DONE	25mm Filter	01-JUN-21 00:00
575594003	SAMPLE	JXC9	PIC3D	APR-18-22 09:08:54	DONE	25mm Filter	01-JUN-21 00:00
1205061592	DUP	JXC9	PIC9A	APR-18-22 11:56:59	DONE	25mm Filter	01-JUN-21 00:00
1205061590	MB	JXC9	PIC14A	APR-18-22 13:59:42	DONE	25mm Filter	01-JUN-21 00:00

# Lucas Cell Raw Data

# Batch 2251465 Check-list

This check-list was completed on 21-APR-22 by Lyndsey Pace

This batch was reviewed by Lyndsey Pace on 21-APR-22 and Elizabeth Krouse on 22-APR-22.

**Batch ID:**  
2251465

**Product:**  
LUC26RAL

**Description:** Lucas Cell Radium 226  
GL-RAD-A-008

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
<b>Miscellaneous Information</b>				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

# Prep Logbook

## Radium-226 in Liquid

**Batch ID:** 2251465  
**Analyst:** Lyndsey Pace (LXP1)  
**Method:** EPA 903.1 Modified  
**Lab SOP:** GL-RAD-A-008 REV# 15  
**Instrument:** LUCAS-C037036045

Due Dates for Lab: 29-APR-2022			Package: 01-MAY-2022	SDG: 02-MAY-2022		
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205061583	Radium-226 SPIKE	1715-G	.1	mL	
MS	1205061582	Radium-226 SPIKE	1715-G	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	575362001	12-APR-2022	1	504.92	504.92	04/14/22 11:45	402	04/21/22 06:27	04/21/22 09:40	4	16
2	575362002	12-APR-2022	1	500.43	500.43	04/14/22 11:45	506	04/21/22 06:27	04/21/22 09:40	1	33
3	575362003	12-APR-2022	1	500.13	500.13	04/14/22 11:45	602	04/21/22 06:27	04/21/22 09:40	1	29
4	575362004	12-APR-2022	1	506.95	506.95	04/14/22 11:45	707	04/21/22 06:27	04/21/22 09:40	2	26
5	575362005	12-APR-2022	1	501.67	501.67	04/14/22 11:45	804	04/21/22 06:27	04/21/22 09:40	7	10
6	575363001	12-APR-2022	1	507.02	507.02	04/14/22 11:45	202	04/21/22 07:00	04/21/22 10:12	7	23
7	575363002	12-APR-2022	1	512.35	512.35	04/14/22 11:45	407	04/21/22 07:00	04/21/22 10:12	4	12
8	575363003	12-APR-2022	1	501.14	501.14	04/14/22 11:45	508	04/21/22 07:00	04/21/22 10:12	2	12
9	575594002	12-APR-2022	1	508.16	508.16	04/14/22 11:45	607	04/21/22 07:00	04/21/22 10:12	3	20
10	575594003	12-APR-2022	1	507.58	507.58	04/14/22 11:45	705	04/21/22 07:00	04/21/22 10:12	6	16
11	1205061580 MB	12-APR-2022	1	512.35	512.35	04/14/22 11:45	805	04/21/22 07:00	04/21/22 10:12	7	16
12	1205061581 DUP (575362001)	12-APR-2022	1	504.52	504.52	04/14/22 11:45	501	04/21/22 07:28	04/21/22 10:44	6	23
13	1205061582 MS (575362001)	12-APR-2022	1	100.21	100.21	04/14/22 11:45	604	04/21/22 07:28	04/21/22 11:19	1	789
14	1205061583 LCS	12-APR-2022	1	512.35	512.35	04/14/22 11:45	701	04/21/22 07:28	04/21/22 10:44	2	872

Reagent/Solvent Lot ID	Description	Amount	Comments:
------------------------	-------------	--------	-----------

### Radium-226 Liquid

Filename : RA226.XLS  
 File type : Excel  
 Version # : 1.3.2

Procedure Code : LUC26RAL  
 Parmname : Radium-226  
 Required MDA : 1 pCi/L  
 Halflife of Ra-226 : 1600 years  
 Ra-226 Abundance : 1.00  
 Halflife of Rn-222 : 3.8235 days

Batch : 2251465  
 Analyst : LIN01615  
 Prep Date : 4/12/2022  
 Ra-226 Method Uncertainty : 0.073648

Batch counted on : LUCAS CELL DETECTOR  
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Count Time (min.)	Cell Efficiency (cpm/dpm)
1	575362001.1	0.5049	2.0276E-05	3/30/2022 11:41	402	30	16	0.533	4	0.133	30	1.4480
2	575362002.1	0.5004	2.0258E-05	3/30/2022 14:15	506	30	33	1.100	1	0.033	30	1.7790
3	575362003.1	0.5001	2.0256E-05	3/30/2022 13:47	602	30	29	0.967	1	0.033	30	1.6150
4	575362004.1	0.5070	2.0284E-05	3/30/2022 11:41	707	30	26	0.867	2	0.067	30	1.7120
5	575362005.1	0.5017	2.0263E-05	3/30/2022 9:00	804	30	10	0.333	7	0.233	30	1.9050
6	575363001.1	0.5070	2.0284E-05	3/30/2022 15:06	202	30	23	0.767	7	0.233	30	1.7020
7	575363002.1	0.5124	2.0305E-05	3/30/2022 15:06	407	30	12	0.400	4	0.133	30	1.6030
8	575363003.1	0.5011	2.0261E-05	3/30/2022 14:55	508	30	12	0.400	2	0.067	30	1.7330
9	575594002.1	0.5082	2.0289E-05	4/4/2022 13:20	607	30	20	0.667	3	0.100	30	1.7080
10	575594003.1	0.5076	2.0286E-05	4/4/2022 9:10	705	30	16	0.533	6	0.200	30	1.7610
11	1205061580.1	0.5124	2.0305E-05	4/12/2022 0:00	805	30	16	0.533	7	0.233	30	1.9080
12	1205061581.1	0.5045	2.0274E-05	3/30/2022 11:41	501	30	23	0.767	6	0.200	30	1.9100
13	1205061582.1	0.1002	1.1383E-05	3/30/2022 11:41	604	30	789	26.300	1	0.033	30	1.6960
14	1205061583.1	0.5124	2.0305E-05	4/12/2022 0:00	701	30	872	29.067	2	0.067	30	1.7130

Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008  
 Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrowth End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
2.300%	2/1/2022	1/31/2023	4/14/2022 11:45	4/21/2022 6:27	4/21/2022 9:40	0.707	0.976	1.002	1.000
8.200%	6/1/2021	5/31/2022	4/14/2022 11:45	4/21/2022 6:27	4/21/2022 9:40	0.707	0.976	1.002	1.000
3.900%	7/1/2021	6/30/2022	4/14/2022 11:45	4/21/2022 6:27	4/21/2022 9:40	0.707	0.976	1.002	1.000
3.000%	11/1/2021	10/31/2022	4/14/2022 11:45	4/21/2022 6:27	4/21/2022 9:40	0.707	0.976	1.002	1.000
9.900%	4/1/2022	3/31/2023	4/14/2022 11:45	4/21/2022 6:27	4/21/2022 9:40	0.707	0.976	1.002	1.000
4.100%	8/1/2021	7/31/2022	4/14/2022 11:45	4/21/2022 7:00	4/21/2022 10:12	0.709	0.976	1.002	1.000
6.600%	2/1/2022	1/31/2023	4/14/2022 11:45	4/21/2022 7:00	4/21/2022 10:12	0.709	0.976	1.002	1.000
2.600%	6/1/2021	5/31/2022	4/14/2022 11:45	4/21/2022 7:00	4/21/2022 10:12	0.709	0.976	1.002	1.000
4.600%	7/1/2021	6/30/2022	4/14/2022 11:45	4/21/2022 7:00	4/21/2022 10:12	0.709	0.976	1.002	1.000
3.000%	11/1/2021	10/31/2022	4/14/2022 11:45	4/21/2022 7:00	4/21/2022 10:12	0.709	0.976	1.002	1.000
7.400%	4/1/2022	3/31/2023	4/14/2022 11:45	4/21/2022 7:00	4/21/2022 10:12	0.709	0.976	1.002	1.000
4.300%	6/1/2021	5/31/2022	4/14/2022 11:45	4/21/2022 7:28	4/21/2022 10:44	0.710	0.976	1.002	1.000
6.400%	7/1/2021	6/30/2022	4/14/2022 11:45	4/21/2022 7:28	4/21/2022 11:19	0.710	0.971	1.002	1.000
5.900%	11/1/2021	10/31/2022	4/14/2022 11:45	4/21/2022 7:28	4/21/2022 10:44	0.710	0.976	1.002	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

**Spike S/N :** 1715-G  
**Spike Exp Date :** 9/15/2022  
**Spike Activity (dpm/ml):** 297.55  
**Spike Volume Added:** 0.10

**LCS S/N :** 1715-G  
**LCS Exp Date :** 9/15/2022  
**LCS Activity (dpm/ml):** 297.55  
**LCS Volume Added:** 0.10

<b>Results</b>																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.1964	0.1387	1	0.3667	<b>0.3576</b>	37.34%	0.4000	0.1491	0.2612	0.2668		SAMPLE				
2	0.0806	0.0569	1	0.1873	<b>0.7832</b>	19.98%	1.0667	0.1944	0.2797	0.3269		SAMPLE				
3	0.0889	0.0628	1	0.2064	<b>0.7553</b>	19.95%	0.9333	0.1826	0.2896	0.3148		SAMPLE				
4	0.1170	0.0826	1	0.2405	<b>0.6025</b>	22.25%	0.8000	0.1764	0.2604	0.2768		SAMPLE				
5	0.1988	0.1403	1	0.3491	<b>0.0684</b>	137.79%	0.1000	0.1374	0.1842	0.1850		SAMPLE				
6	0.2197	0.1551	1	0.3859	<b>0.4032</b>	34.48%	0.5333	0.1826	0.2706	0.2786		SAMPLE				
7	0.1745	0.1232	1	0.3259	<b>0.2118</b>	50.43%	0.2667	0.1333	0.2076	0.2116		SAMPLE				
8	0.1167	0.0824	1	0.2399	<b>0.2504</b>	37.51%	0.3333	0.1247	0.1837	0.1876		SAMPLE				
9	0.1430	0.1010	1	0.2771	<b>0.4260</b>	28.58%	0.5667	0.1599	0.2355	0.2464		SAMPLE				
10	0.1964	0.1387	1	0.3503	<b>0.2433</b>	47.00%	0.3333	0.1563	0.2237	0.2269		SAMPLE				
11	0.1940	0.1369	1	0.3406	<b>0.2002</b>	53.80%	0.3000	0.1599	0.2091	0.2131		MB				
12	0.1820	0.1285	1	0.3246	<b>0.3833</b>	31.97%	0.5667	0.1795	0.2380	0.2465	575362001.1	DUP	6.9%			
13	0.4231	0.2987	1	0.9827	<b>101.1887</b>	7.33%	26.2667	0.9369	7.0742	20.6037	575362001.1	MS			133.7513	75.7%
14	0.1154	0.0815	1	0.2372	<b>21.5386</b>	6.81%	29.0000	0.9854	1.4345	4.2342		LCS			26.1599	82.3%

# **Continuing Calibration Data**





# Ludlum Alpha Scintillation Counter Checks for 21-APR-2022

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	06:14	1	1.22E+05	122101	-0.17		
LUCAS2	EFF	06:13	1	1.34E+05	133589	1.62		
LUCAS4	EFF	06:11	1	1.28E+05	127534	0.26		
LUCAS5	EFF	06:10	1	1.30E+05	130466	0.73		
LUCAS6	EFF	06:08	1	1.30E+05	130375	-1.07		
LUCAS7	EFF	06:06	1	1.35E+05	135221	2.9		
LUCAS8	EFF	06:05	1	1.25E+05	125115	-0.47		

**Reviewed by:**

Lyndsey Pace

**Date:** 21-APR-22

GEL Laboratories LLC

# Runlogs

# Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2251465

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
575362001	SAMPLE	LXP1	LUCAS4	APR-21-22 09:40:51	DONE	Lucas Cell	01-FEB-22 00:00
575362002	SAMPLE	LXP1	LUCAS5	APR-21-22 09:40:52	DONE	Lucas Cell	01-JUN-21 00:01
575362003	SAMPLE	LXP1	LUCAS6	APR-21-22 09:40:53	DONE	Lucas Cell	01-JUL-21 00:00
575362004	SAMPLE	LXP1	LUCAS7	APR-21-22 09:40:54	DONE	Lucas Cell	01-NOV-21 00:00
575362005	SAMPLE	LXP1	LUCAS8	APR-21-22 09:40:55	DONE	Lucas Cell	01-APR-22 00:00
575363001	SAMPLE	LXP1	LUCAS2	APR-21-22 10:12:19	DONE	Lucas Cell	01-AUG-21 00:00
575363002	SAMPLE	LXP1	LUCAS4	APR-21-22 10:12:20	DONE	Lucas Cell	01-FEB-22 00:00
575363003	SAMPLE	LXP1	LUCAS5	APR-21-22 10:12:20	DONE	Lucas Cell	01-JUN-21 00:01
575594002	SAMPLE	LXP1	LUCAS6	APR-21-22 10:12:21	DONE	Lucas Cell	01-JUL-21 00:00
575594003	SAMPLE	LXP1	LUCAS7	APR-21-22 10:12:22	DONE	Lucas Cell	01-NOV-21 00:00
1205061580	MB	LXP1	LUCAS8	APR-21-22 10:12:23	DONE	Lucas Cell	01-APR-22 00:00
1205061581	DUP	LXP1	LUCAS5	APR-21-22 10:44:36	DONE	Lucas Cell	01-JUN-21 00:01
1205061583	LCS	LXP1	LUCAS7	APR-21-22 10:44:38	DONE	Lucas Cell	01-NOV-21 00:00
1205061582	MS	LXP1	LUCAS6	APR-21-22 11:19:00	DONE	Lucas Cell	01-JUL-21 00:00



2680 East Lansing Dr., East Lansing, MI 48823  
 Phone (517) 332-0167 Fax (517) 332-4034  
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

**REPORT TO**

**CHAIN OF CUSTODY RECORD**

**INVOICE TO**

CONTACT NAME Jennifer Caporale  
 COMPANY Lansing Board of Water and Light  
 ADDRESS PO Box 13007 48901-3007  
 CITY Lansing STATE Mi ZIP CODE 48901  
 PHONE NO. 517-702-6372 FAX NO. \_\_\_\_\_ P.O. NO. \_\_\_\_\_  
 E-MAIL ADDRESS Environmental\_Laboratory@lbwl.com QUOTE NO. \_\_\_\_\_

CONTACT NAME Kelly Gleason  SAME  
 COMPANY \_\_\_\_\_  
 ADDRESS \_\_\_\_\_  
 CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP CODE \_\_\_\_\_  
 PHONE NO. \_\_\_\_\_ E-MAIL ADDRESS Kelly.Gleason@lbwl.com

**ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)**

PROJECT NO./NAME Erickson AM MI Wells 11-13 SAMPLER(S) - PLEASE PRINT/SIGN NAME Marc Wahrer

TURNAROUND TIME REQUIRED  1 DAY  2 DAYS  3 DAYS  STANDARD  OTHER ASAP

DELIVERABLES REQUIRED  STD  LEVEL II  LEVEL III  LEVEL IV  EDD  OTHER \_\_\_\_\_

MATRIX GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID  
 CODE: SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIPE A=AIR W=WASTE

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	# Containers & Preservatives								Total Metals	F- undistilled, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	Dissolved Metals	HCO3, CO3, Hardness	Certifications	Project Locations	Special Instructions
	DATE	TIME		MATRIX	# OF BOTTLES	NONE	HCl	HNO3	H2SO4	NaOH	MeOH										

34427.01	3/30/22	1141	MW-11	L203073-01	GW	5	3	2												Metals to analyse: Na, Mg, K
.02		1415	MW-12	L203073-02	GW	6	4	2												B, Ca, Sb, As, Ba, Be, Cd, Cr,
.03		1347	MW-13	L203073-03	GW	5	3	2												Co, Li, Hg, Mo, Pb, Se, Tl,
.04		1141	Field Dupe MW-11	L203073-04	GW	5	3	2												Fe, Cu, Ni, Ag, V, Zn
.05		0900	Field Blank	L203073-05	DI	5	3	2												Please send a preliminary report
																				The analytes for dissolved metals are same metals that are analysed for total.

RELINQUISHED BY: [Signature] DATE 3-31-22 TIME 0857  
 SIGNATURE/ORGANIZATION \_\_\_\_\_  
 RECEIVED BY: [Signature] DATE 3/30/22 TIME 0857  
 SIGNATURE/ORGANIZATION \_\_\_\_\_

RELINQUISHED BY: \_\_\_\_\_ DATE \_\_\_\_\_ TIME \_\_\_\_\_  
 SIGNATURE/ORGANIZATION \_\_\_\_\_  
 RECEIVED BY: \_\_\_\_\_ DATE \_\_\_\_\_ TIME \_\_\_\_\_  
 SIGNATURE/ORGANIZATION \_\_\_\_\_

SEAL NO. \_\_\_\_\_ SEAL INTACT YES  NO  INITIALS \_\_\_\_\_  
 SEAL NO. \_\_\_\_\_ SEAL INTACT YES  NO  INITIALS \_\_\_\_\_

NOTES: TEMP. ON ARRIVAL 2.8

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

## Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total		250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.150
Be, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	2.5
Cl	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	10
Cr, total	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
F	Fluoride	250 mL plastic	mg/L	None	9056	28 d	1.0
Fe, total	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Pb, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Li, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Hg, total	Mercury	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Mo, total	Molybdenum	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
RA226/228	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	HNO3	SM 7500	6 mos	2.0 combined
Se, total	Selenium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ag, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
SO4	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	10
Tl, total	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
TDS	Total Dissolved Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TSS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540D	NA	3
V, total	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Zn, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005

### Data Validation Checklist

Site Name: Erickson Personnel: M. Wahrer

Sample Date(s): 3/30/2022 Lab Drop-off Date(s): 3/31/2022

Lab Report Number: S34427.01

Lab Report Date: 5/18/2022

Reason for Sample Event: New Wells - 11-13

**Field Records:** Circle Yes/No unless Not Applicable – *Complete during sample event*

Item Description	Verification (Completeness)	Validation (Conformance to Specifications)
Field equipment calibration records	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Chain-of-Custody forms	<input checked="" type="radio"/> Yes / No	N/A
Field decontamination documentation	N/A	N/A
Sample collection field forms	<input checked="" type="radio"/> Yes / No	N/A
Drilling logs	<input checked="" type="radio"/> Yes / No	N/A
Well construction logs	<input checked="" type="radio"/> Yes / No	N/A
Well development field forms	<input checked="" type="radio"/> Yes / No	N/A

**Analytical Data Package:** Circle Yes/No unless N/A – *Complete when lab report is received*

Item Description	Verification (Completeness)	Validation (Conformance to Specifications)
Cover sheet (laboratory identifying information)	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Case narrative	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Internal laboratory Chain-of-Custody forms	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Sample chronology and consistency (that is, dates and times of receipt, preparation, and analysis)	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Communication records with laboratory	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
EDD format consistency	<input checked="" type="radio"/> Yes / No	N/A
Sample identification, results nomenclature, and data qualifier consistency	<input checked="" type="radio"/> Yes / No	N/A
RLs as requested; MDLs < RLs	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Instrument calibration records	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Laboratory Report	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Field QC sample results and calculation of accuracy and precision	<input checked="" type="radio"/> Yes / No Duplicate Well ID: MW-11	<input checked="" type="radio"/> Yes / No Duplicate RPD: 0-5% except Rad-226/228 at 30%

**Corrections Needed:** None; according to the Technical Case Narrative by GEL Laboratories, subcontracted laboratory for radium analysis, “[a]ll sample data provided in [the] report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

The [method] blank (See Below) did not meet the detection limit due to keeping the blank volume consistent with the other sample aliquots. Sample 1205061590 (MB) was recounted due to high MDC. The recount is reported.”

Sample	Analyte	Value
1205061590 (MB)	Radium-228	Result -0.0456 < MDA 1.97 > RDL 1.5 pCi/L

Sample	Parameter	Result	Uncertainty	MDC	Lab Qualifier	Validated Qualifier
MW-13	Rad-226	0.358	+/-0.261	0.367	U	J-
	Rad-228	0.757	+/-0.903	1.52	U	J+
	Rad-226/228	1.11	+/-0.940			J+
MW-11-Dup	Rad-226	0.603	+/-0.260	0.241		J+
	Rad-228	-0.419	+/-1.20	2.26	U	J-
	Rad-226/228	0.603	+/-1.23			J-

*U - Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.*

Since the laboratory processes indicated no issues with the analytical procedures, no corrective action was necessary. Since the RPD was above the 20% control limit, MW-11 has been qualified as estimated with potential for high bias (J+) and MW-11-Dup has been qualified as estimated with potential for low bias (J-). The component parts Rad-226 required qualification as estimated with low bias (J-) in MW-11 and estimated with high bias (J+) in MW-11-Dup and Rad-228 required qualification as estimated with high bias (J+) in MW-11 and estimated with low bias (J-) in MW-11-Dup. However, the detection of Rad-228 in the method blank required Rad-228 in MW-11-Dup to be qualified as estimated (J) without bias.



Report ID: S34428.01(03)  
Generated on 05/02/2022  
Replaces report S34428.01(02) generated on 04/04/2022

Report to

Attention: Jennifer Caporale  
Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901

Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

Report produced by

Merit Laboratories, Inc.  
2680 East Lansing Drive  
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Contacts for report questions:  
John Lavery (johnlavery@meritlabs.com)  
Barbara Ball (bball@meritlabs.com)

Report Summary

Lab Sample ID(s): S34428.01-S34428.03  
Project: Wetland  
Collected Date(s): 03/30/2022  
Submitted Date/Time: 03/31/2022 08:57  
Sampled by: Marc Wahrer  
P.O. #:

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Maya Murshak  
Technical Director





## General Report Notes

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Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein, acrylonitrile, and 2-chlorovinylethyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (\*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

## Report Narrative

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All analyses completed



Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Alaska CSLAP	#17-001
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



## Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1 (1993)
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007



## Sample Summary (3 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S34428.01	Wet-1 L203077-01	Groundwater	03/30/22 15:06
S34428.02	Field Dupe Wet-1 L203077-02	Groundwater	03/30/22 15:06
S34428.03	Field Blank L203077-03	Groundwater	03/30/22 14:55



# Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S34428.01

Sample Tag: Wet-1 L203077-01

Collected Date/Time: 03/30/2022 15:06

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.8	IR
2	1L Plastic	None	Yes	2.8	IR
1	125ml Plastic	HNO3	Yes	2.8	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	04/01/22 09:20	JRH	
Metal Digestion	Completed	SW3015A	04/01/22 10:15	CCM	

### Inorganics

Method: E300.0, Run Date: 04/01/22 10:21, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sulfate	620	50	3.0	mg/L	50	14808-79-8	

Method: E300.0, Run Date: 04/01/22 08:51, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	72	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	

Method: SM2540C, Run Date: 03/31/22 16:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	1,510	50	10	mg/L	2		

Method: SM2540D, Run Date: 03/31/22 18:15, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	7	3	1	mg/L	1.33		

### Metals

Method: E200.8, Run Date: 04/01/22 15:02, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	328	0.50	0.0435	mg/L	5	7440-70-2	

Method: E200.8, Run Date: 04/01/22 13:04, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.047	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.45	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	1.45	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.008	0.005	0.00163	mg/L	5	7439-93-2	



# Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S34428.01 (continued)

Sample Tag: Wet-1 L203077-01

**Method: E200.8, Run Date: 04/01/22 13:04, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E245.1, Run Date: 04/01/22 12:50, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 04/25/22 12:22, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S34428.02

Sample Tag: Field Dupe Wet-1 L203077-02

Collected Date/Time: 03/30/2022 15:06

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.8	IR
2	1L Plastic	None	Yes	2.8	IR
1	125ml Plastic	HNO3	Yes	2.8	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	04/01/22 09:20	JRH	
Metal Digestion	Completed	SW3015A	04/01/22 10:15	CCM	

### Inorganics

Method: E300.0, Run Date: 04/01/22 10:34, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sulfate	636	50	3.0	mg/L	50	14808-79-8	

Method: E300.0, Run Date: 04/01/22 09:04, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	71	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	

Method: SM2540C, Run Date: 03/31/22 16:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	1,540	50	10	mg/L	2		

Method: SM2540D, Run Date: 03/31/22 18:15, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	8	3	1	mg/L	1.33		

### Metals

Method: E200.8, Run Date: 04/01/22 15:06, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	320	0.50	0.0435	mg/L	5	7440-70-2	

Method: E200.8, Run Date: 04/01/22 13:07, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.047	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.48	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	1.43	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.008	0.005	0.00163	mg/L	5	7439-93-2	



# Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S34428.02 (continued)

Sample Tag: Field Dupe Wet-1 L203077-02

**Method: E200.8, Run Date: 04/01/22 13:07, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E245.1, Run Date: 04/01/22 12:53, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 04/25/22 12:22, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.





# Analytical Laboratory Report

Lab Sample ID: S34428.03

Sample Tag: Field Blank L203077-03

Collected Date/Time: 03/30/2022 14:55

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.8	IR
2	1L Plastic	None	Yes	2.8	IR
1	125ml Plastic	HNO3	Yes	2.8	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	04/01/22 09:20	JRH	
Metal Digestion	Completed	SW3015A	04/01/22 10:15	CCM	

### Inorganics

Method: E300.0, Run Date: 04/01/22 09:16, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	2.5	0.04	mg/L	2.5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.06	mg/L	2.5	16984-48-8	
Sulfate	Not detected	2.5	0.15	mg/L	2.5	14808-79-8	

Method: SM2540C, Run Date: 03/31/22 16:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	Not detected	50	10	mg/L	2		

Method: SM2540D, Run Date: 03/31/22 18:15, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 04/01/22 14:42, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.0174	mg/L	2	7440-70-2	

Method: E200.8, Run Date: 04/01/22 12:11, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00102	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.000102	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.0000648	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.0000862	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.000702	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.0000760	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.0000386	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.0000434	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000150	mg/L	2	7440-50-8	
Iron	Not detected	0.02	0.000768	mg/L	2	7439-89-6	
Lead	Not detected	0.003	0.0000760	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000654	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.0000868	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000100	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.000838	mg/L	2	7782-49-2	



# Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S34428.03 (continued)

Sample Tag: Field Blank L203077-03

**Method: E200.8, Run Date: 04/01/22 12:11, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Silver	Not detected	0.0005	0.0000270	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.0000342	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.0000558	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.000292	mg/L	2	7440-66-6	

**Method: E245.1, Run Date: 04/01/22 12:57, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 04/25/22 12:22, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

# Merit Laboratories Login Checklist

Lab Set ID:S34428

Client:BWL01 (Board of Water & Light)

Project: Wetland

Submitted:03/31/2022 08:57 Login User: PFD

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental\_Laboratory@LBWL.com

Selection	Description	Note
<b>Sample Receiving</b>		
01.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples are received at 4C +/- 2C Thermometer # IR 2.8
02.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Received on ice/ cooling process begun
03.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples shipped
04.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples left in 24 hr. drop box
05.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Are there custody seals/tape or is the drop box locked
<b>Chain of Custody</b>		
06.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC adequately filled out
07.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC signed and relinquished to the lab
08.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sample tag on bottles match COC
09.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Subcontracting needed? Subcontracted to: GEL; 1Z4664770361312366
<b>Preservation</b>		
10.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Do sample have correct chemical preservation
11.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Completed pH checks on preserved samples? (no VOAs)
12.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Did any samples need to be preserved in the lab?
<b>Bottle Conditions</b>		
13.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	All bottles intact
14.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Appropriate analytical bottles are used
15.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Merit bottles used
16.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sufficient sample volume received
17.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples require laboratory filtration
18.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples submitted within holding time
19.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Do water VOC or TOX bottles contain headspace

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: \_\_\_\_\_ Date: \_\_\_\_\_



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C.O.C. PAGE # 1 OF 1

**REPORT TO**

**CHAIN OF CUSTODY RECORD**

**INVOICE TO**

CONTACT NAME **Jennifer Caporale**  
 COMPANY **Lansing Board of Water and Light**  
 ADDRESS **PO Box 13007 48901-3007**  
 CITY **Lansing** STATE **Mi** ZIP CODE **48901**  
 PHONE NO. **517-702-6372** FAX NO. P.O. NO.  
 E-MAIL ADDRESS **Environmental\_Laboratory@lbwl.com** QUOTE NO.

CONTACT NAME **Kelly Gleason**  SAME  
 COMPANY  
 ADDRESS  
 CITY STATE ZIP CODE  
 PHONE NO. E-MAIL ADDRESS **Kelly.Gleason@lbwl.com**

**ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)**

PROJECT NO./NAME **Wetland** SAMPLER(S) - PLEASE PRINT/SIGN NAME **Marc Wahrer**  
 TURNAROUND TIME REQUIRED  1 DAY  2 DAYS  3 DAYS  STANDARD  OTHER **ASAP**  
 DELIVERABLES REQUIRED  STD  LEVEL II  LEVEL III  LEVEL IV  EDD  OTHER

MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID  
 SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIPE A=AIR W=WASTE

# Containers & Preservatives

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO <sub>3</sub>	H <sub>2</sub> SO <sub>4</sub>	NiOH	MnOH	OTHER	Total Metals	F- undistilled, Cl-, SO <sub>4</sub> , TDS	Radium 226	Radium 228	TSS	HCO <sub>3</sub> , CO <sub>3</sub> , Hardness	Certifications		
	DATE	TIME																	<input type="checkbox"/> OHIO VAP	<input type="checkbox"/> Drinking Water	
<b>34428.01</b>	<b>3/30/22</b>	<b>1506</b>	Wet-1 L203077-01	GW	5	3	2						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> DoD	<input checked="" type="checkbox"/> NPDES	
<b>.02</b>	↓	↓	Field Dupe Wet-1 ↓ 02	GW	5	3	2						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> Detroit	<input type="checkbox"/> New York	
<b>.03</b>	↓	<b>1455</b>	Field Blank ↓ 03	DI	5	3	2						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> Other		
																				Special Instructions	
																				Metals to analyse: Na, Mg, K	
																				B, Ca, Sb, As, Ba, Be, Cd, Cr,	
																				Co, Li, Hg, Mo, Pb, Se, Tl,	
																				Fe, Cu, Ni, Ag, V, Zn	
																				Please send a preliminary report	

RELINQUISHED BY: *[Signature]* DATE **3-31-22** TIME **0857**  
 RECEIVED BY: *[Signature]* DATE **3/31/22** TIME **0857**

RELINQUISHED BY: DATE TIME  
 RECEIVED BY: DATE TIME  
 SEAL NO. SEAL INTACT YES  NO  INITIALS  
 SEAL NO. SEAL INTACT YES  NO  INITIALS

NOTES: TEMP. ON ARRIVAL **2.8**

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

## Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total		250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.150
Be, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	2.5
Cl	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	10
Cr, total	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
F	Fluoride	250 mL plastic	mg/L	None	9056	28 d	1.0
Fe, total	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Pb, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Li, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Hg, total	Mercury	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Mo, total	Molybdenum	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
RA226/228	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	HNO3	SM 7500	6 mos	2.0 combined
Se, total	Selenium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ag, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
SO4	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	10
Tl, total	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
TDS	Total Dissolved Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TSS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540D	NA	3
V, total	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Zn, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005



April 25, 2022

John Laverty  
Merit Laboratories Inc.  
2680 East Lansing Drive  
East Lansing, Michigan 48823

Re: Routine Analysis  
Work Order: 575363  
SDG: S34428

Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on April 04, 2022. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at [www.gel.com](http://www.gel.com).

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,

Delaney Stone  
Project Manager

Purchase Order: GELP20-0018  
Enclosures



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# Case Narrative



**Receipt Narrative  
for  
Merit Laboratories, Inc.  
SDG: S34428  
Work Order: 575363**

**April 25, 2022**

**Laboratory Identification:**

GEL Laboratories LLC  
2040 Savage Road  
Charleston, South Carolina 29407  
(843) 556-8171

**Summary:**

**Sample receipt:** The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on April 04, 2022 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

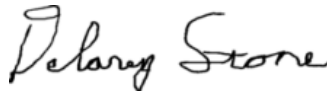
**Sample Identification:** The laboratory received the following samples:

<b><u>Laboratory ID</u></b>	<b><u>Client ID</u></b>
575363001	S34428.01
575363002	S34428.02 (Field Dup)
575363003	S34428.03 (Field Blank)

**Case Narrative:**

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.



Delaney Stone  
Project Manager

# **Chain of Custody and Supporting Documentation**



2680 East Lansing Dr, East Lansing, MI 48823  
 Phone (517) 332-0167 Fax (517) 332-4034  
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1  
 575363

**REPORT TO**

**CHAIN OF CUSTODY RECORD**

**INVOICE TO**

CONTACT NAME: Project Management Team  
 COMPANY: Merit Laboratories  
 ADDRESS: 2680 East Lansing Drive  
 CITY: East Lansing  
 STATE: MI ZIP CODE: 48823  
 PHONE NO.: 517-332-0167  
 E-MAIL ADDRESS: results@meritlabs.com

CONTACT NAME: Julie Teague  
 COMPANY: Merit Laboratories  
 ADDRESS: 2680 East Lansing Drive  
 CITY: East Lansing  
 STATE: MI ZIP CODE: 48823  
 PHONE NO.: 517-332-0167  
 E-MAIL ADDRESS: juliet@meritlabs.com

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR	DATE	TIME	IDENTIFICATION-DESCRIPTION	MTRIX	# OF BOTTLES	# Containers & Preservatives						OTHER	CERTIFICATIONS
							NONE	HO	H <sub>2</sub> O	H <sub>2</sub> SO <sub>4</sub>	HNO <sub>3</sub>	HCl		
	3/30/22	1506		S34428.01	GW	2		2						Radium 226*
	3/30/22	1506		S34428.02 (Field Dupe)	GW	2		2						Radium 228**
	3/30/22	1455		S34428.03 (Field Blank)	GW	2		2						* E903.1 Mod. ** E904.0/SW 9320 Mod.

TURNAROUND TIME REQUIRED:  1 DAY  2 DAYS  3 DAYS  STANDARD  OTHER

DELIVERABLES REQUIRED:  STD  LEVEL II  LEVEL III  LEVEL IV  EDD  OTHER

MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID  
 SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIPE A=AIR W=WASTE

SAMPLER(S) - PLEASE PRINT/SIGN NAME

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

Certifications:  
 OHIO VAP  Drinking Water  
 DoD  NPDES  
 Project Locations:  
 Detroit  New York  
 Other  
 Special Instructions:  
 \* E903.1 Mod.  
 \*\* E904.0/SW 9320 Mod.

Please use calculation product & provide Radium 226/228 combined results on the report

(No Ice needed)  
 \*\* Subcontracted to  
 GEL Laboratories, Inc.  
 2040 Savage Road  
 Charleston, SC 29407

RELINQUISHED BY: [Signature] DATE: 3/31/22 TIME: 1700  
 SIGNATURE/Organization: UPS

RECEIVED BY: [Signature] DATE: 3/31/22 TIME: 1700  
 SIGNATURE/Organization: UPS

RELINQUISHED BY: [Signature] DATE: 4/4/22 TIME: 900  
 SIGNATURE/Organization: [Signature]

RECEIVED BY: [Signature] DATE: 4/4/22 TIME: 900  
 SIGNATURE/Organization: [Signature]

NOTES: TEMP. ON ARRIVAL

SEAL NO. SEAL INTACT YES  NO  INITIALS: [Signature]

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

**SAMPLE RECEIPT & REVIEW FORM**

Client: MERT SDG/AR/COC/Work Order: 575363 D.S

Received By: TYE Date Received: 4/4/22

Carrier and Tracking Number

Circle Applicable:  
 FedEx Express    FedEx Ground    UPS    Field Services    Courier    Other

12 466 477 036131 2360

Suspected Hazard Information	Yes	No	*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.
A) Shipped as a DOT Hazardous?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Hazard Class Shipped: _____ UN#: _____ If UN2910, Is the Radioactive Shipment Survey Compliant? Yes ___ No ___
B) Did the client designate the samples are to be received as radioactive?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	COC notation or radioactive stickers on containers equal client designation.
C) Did the RSO classify the samples as radioactive?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): <u>0</u> CPM / mR/Hr Classified as: Rad 1 Rad 2 Rad 3
D) Did the client designate samples are hazardous?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	COC notation or hazard labels on containers equal client designation.
E) Did the RSO identify possible hazards?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	If D or E is yes, select Hazards below: PCB's    Flammable    Foreign Soil    RCRA    Asbestos    Beryllium    Other:

Sample Receipt Criteria	Yes	No	Comments/Qualifiers (Required for Non-Conforming Items)
1 Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Seals broken    Damaged container    Leaking container    Other (describe)
2 Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Client contacted and provided COC    COC created upon receipt
3 Samples requiring cold preservation within (0 ≤ 6 deg. C)?*	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Preservation Method: Wet Ice    Ice Packs    Dry ice <u>(None)</u> Other: *all temperatures are recorded in Celsius    TEMP: <u>16C</u>
4 Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Temperature Device Serial #: <u>IR2-20</u> Secondary Temperature Device Serial # (If Applicable):
5 Sample containers intact and sealed?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Seals broken    Damaged container    Leaking container    Other (describe)
6 Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Sample ID's and Containers Affected: If Preservation added, Lot#:
7 Do any samples require Volatile Analysis?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	If Yes, are Encores or Soil Kits present for solids? Yes ___ No ___ NA ___ (If yes, take to VOA Freezer)
	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Do liquid VOA vials contain acid preservation? Yes ___ No ___ NA ___ (If unknown, select NA)
	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Are liquid VOA vials free of headspace? Yes ___ No ___ NA ___ Sample ID's and containers affected:
8 Samples received within holding time?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	ID's and tests affected:
9 Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	ID's and containers affected:
10 Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: No dates on containers    No times on containers    COC missing info    Other (describe)
11 Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: No container count on COC    Other (describe)
12 Are sample containers identifiable as GEL provided by use of GEL labels?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
13 COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Not relinquished    Other (describe)

Comments (Use Continuation Form if needed):

# Laboratory Certifications

**List of current GEL Certifications as of 25 April 2022**

<b>State</b>	<b>Certification</b>
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122021-1
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2019-165
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122021-36
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

# **Radiological Analysis**

# Case Narrative



**Radiochemistry  
Technical Case Narrative  
Merit Laboratories, Inc.  
SDG #: S34428  
Work Order #: 575363**

**Product:** GFPC Ra228, Liquid

**Analytical Method:** EPA 904.0/SW846 9320 Modified

**Analytical Procedure:** GL-RAD-A-063 REV# 5

**Analytical Batch:** 2251474

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
575363001	S34428.01
575363002	S34428.02 (Field Dup)
575363003	S34428.03 (Field Blank)
1205061590	Method Blank (MB)
1205061591	575362001(S34427.01) Sample Duplicate (DUP)
1205061593	575594002(NonSDG) Matrix Spike (MS)
1205061594	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

**Quality Control (QC) Information**

**RDL Met**

The blank (See Below) did not meet the detection limit due to keeping the blank volume consistent with the other sample aliquots.

Sample	Analyte	Value
1205061590 (MB)	Radium-228	Result -0.0456 < MDA 1.97 > RDL 1.5 pCi/L

**Technical Information**

**Recounts**

Sample 1205061590 (MB) was recounted due to high MDC. The recount is reported.

**Product:** Lucas Cell, Ra226, Liquid

**Analytical Method:** EPA 903.1 Modified

**Analytical Procedure:** GL-RAD-A-008 REV# 15

**Analytical Batch:** 2251465

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
575363001	S34428.01
575363002	S34428.02 (Field Dup)
575363003	S34428.03 (Field Blank)
1205061580	Method Blank (MB)
1205061581	575362001(S34427.01) Sample Duplicate (DUP)
1205061582	575362001(S34427.01) Matrix Spike (MS)
1205061583	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

**Technical Information**

**Recounts**

Sample 1205061582 (S34427.01MS) was recounted due to low recovery. The recount is reported.

**Miscellaneous Information**

**Additional Comments**

The matrix spike and matrix spike duplicate, 1205061582 (S34427.01MS), aliquots were reduced to conserve sample volume.

**Certification Statement**

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

## GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

### Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S34428 GEL Work Order: 575363

**The Qualifiers in this report are defined as follows:**

- \* A quality control analyte recovery is outside of specified acceptance criteria
- \*\* Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

**Review/Validation**

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature: 

Name: Kenshalla Oston

Date: 28 APR 2022

Title: Analyst I

# Sample Data Summary

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: April 28, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

Client Sample ID: S34428.01	Project: MERI00120
Sample ID: 575363001	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 30-MAR-22 15:06	
Receive Date: 04-APR-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.231	+/-0.926	1.69	3.00	pCi/L			JXC9	04/18/22	0908 2251474	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.634	+/-0.965			pCi/L		1	NXL1	04/25/22	1222 2251473	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.403	+/-0.271	0.386	1.00	pCi/L			LXP1	04/21/22	1012 2251465	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			88.9	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: April 28, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

Client Sample ID: S34428.02 (Field Dup)	Project: MERI00120
Sample ID: 575363002	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 30-MAR-22 15:06	
Receive Date: 04-APR-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	-0.0545	+/-1.25	2.29	3.00	pCi/L			JXC9	04/18/22	0908 2251474	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.212	+/-1.27			pCi/L		1	NXL1	04/25/22	1222 2251473	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.212	+/-0.208	0.326	1.00	pCi/L			LXP1	04/21/22	1012 2251465	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			89.4	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: April 28, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

Client Sample ID: S34428.03 (Field Blank)	Project: MERI00120
Sample ID: 575363003	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 30-MAR-22 14:55	
Receive Date: 04-APR-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.901	+/-0.944	1.56	3.00	pCi/L			JXC9	04/18/22	0908 2251474	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.15	+/-0.962			pCi/L		1	NXL1	04/25/22	1222 2251473	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.250	+/-0.184	0.240	1.00	pCi/L			LXP1	04/21/22	1012 2251465	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			74.2	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# Quality Control Summary



# GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

## QC Summary

Report Date: April 28, 2022

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**Merit Laboratories Inc.**  
**2680 East Lansing Drive**  
**East Lansing, Michigan**

**Contact: John Laverty**

**Workorder: 575363**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Rad Gas Flow</b>											
Batch	2251474										
QC1205061591	575362001	DUP									
Radium-228	U	0.757	U	1.38	pCi/L	N/A		N/A	JXC9	04/18/22	09:07
	Uncertainty	+/-0.903		+/-0.933							
QC1205061594	LCS										
Radium-228	45.1			47.6	pCi/L		105	(75%-125%)		04/18/22	09:07
	Uncertainty			+/-3.40							
QC1205061590	MB										
Radium-228			U	-0.0456	pCi/L					04/18/22	13:59
	Uncertainty			+/-1.05							
QC1205061593	575594002	MS									
Radium-228	132 U	0.744		134	pCi/L		102	(75%-125%)		04/18/22	09:07
	Uncertainty	+/-0.859		+/-9.88							
<b>Rad Ra-226</b>											
Batch	2251465										
QC1205061581	575362001	DUP									
Radium-226	U	0.358		0.383	pCi/L	6.94		(0% - 100%)	LXP1	04/21/22	10:44
	Uncertainty	+/-0.261		+/-0.238							
QC1205061583	LCS										
Radium-226	26.2			21.5	pCi/L		82.3	(75%-125%)		04/21/22	10:44
	Uncertainty			+/-1.43							
QC1205061580	MB										
Radium-226			U	0.200	pCi/L					04/21/22	10:12
	Uncertainty			+/-0.209							
QC1205061582	575362001	MS									
Radium-226	134 U	0.358		101	pCi/L		75.7	(75%-125%)		04/21/22	11:19
	Uncertainty	+/-0.261		+/-7.07							

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- \*\* Analyte is a Tracer compound
- < Result is less than value reported
- > Result is greater than value reported

# GEL LABORATORIES LLC

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Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
BD		Results are either below the MDC or tracer recovery is low									
FA		Failed analysis.									
H		Analytical holding time was exceeded									
J		See case narrative for an explanation									
J		Value is estimated									
K		Analyte present. Reported value may be biased high. Actual value is expected to be lower.									
L		Analyte present. Reported value may be biased low. Actual value is expected to be higher.									
M		M if above MDC and less than LLD									
M		REMP Result > MDC/CL and < RDL									
N/A		RPD or %Recovery limits do not apply.									
NI		See case narrative									
ND		Analyte concentration is not detected above the detection limit									
NJ		Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier									
Q		One or more quality control criteria have not been met. Refer to the applicable narrative or DER.									
R		Sample results are rejected									
U		Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.									
UI		Gamma Spectroscopy--Uncertain identification									
UJ		Gamma Spectroscopy--Uncertain identification									
UL		Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.									
X		Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier									
Y		Other specific qualifiers were required to properly define the results. Consult case narrative.									
^		RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.									
h		Preparation or preservation holding time was exceeded									

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where the duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

\* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

# **Gas Flow Raw Data**

# Batch 2251474 Check-list

This check-list was completed on 20-APR-22 by Kenshalla Oston

This batch was reviewed by Rhonda Birch on 19-APR-22 and Kenshalla Oston on 20-APR-22.

**Batch ID:**  
2251474

**Product:**  
GFC28RAL

**Description:** Gas Flow Radium 228  
GL-RAD-A-063

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?		No	
<b>Miscellaneous Information</b>				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

# Prep Logbook

## Radium-228 in Liquid

**Batch ID:** 2251474

**Analyst:** Jasmine Conley (JXC9)

**Method:** EPA 904.0/SW846 9320 Modified

**Lab SOP:** GL-RAD-A-063 REV# 5

**Instrument:** LUCAS-C037036045

**Due Dates for Lab:** 29-APR-2022

**Package:** 01-MAY-2022

**SDG:** 02-MAY-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205061594	Radium-228	1965-C	.1	mL
MS	1205061593	Radium-228	1965-C	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	575362001	12-APR-2022	3	311.28	311.28	04/13/22 12:40	04/18/22 06:50
2	575362002	12-APR-2022	3	312.96	312.96	04/13/22 12:40	04/18/22 06:50
3	575362003	12-APR-2022	3	310.83	310.83	04/13/22 12:40	04/18/22 06:50
4	575362004	12-APR-2022	3	309.58	309.58	04/13/22 12:40	04/18/22 06:50
5	575362005	12-APR-2022	3	306.1	306.1	04/13/22 12:40	04/18/22 06:50
6	575363001	12-APR-2022	3	302.61	302.61	04/13/22 12:40	04/18/22 06:50
7	575363002	12-APR-2022	3	306.07	306.07	04/13/22 12:40	04/18/22 06:50
8	575363003	12-APR-2022	3	301.79	301.79	04/13/22 12:40	04/18/22 06:50
9	575594002	12-APR-2022	1.5	304.75	304.75	04/13/22 12:40	04/18/22 06:50
10	575594003	12-APR-2022	1.5	307.25	307.25	04/13/22 12:40	04/18/22 06:50
11	1205061590 MB	12-APR-2022	1.5		312.96	04/13/22 12:40	04/18/22 06:50
12	1205061591 DUP (575362001)	12-APR-2022	3	305.91	305.91	04/13/22 12:40	04/18/22 06:50
13	1205061592 DUP (575594002)	12-APR-2022	1.5	301.54	301.54	04/13/22 12:40	04/18/22 06:50
14	1205061593 MS (575594002)	12-APR-2022	1.5	106.92	106.92	04/13/22 12:40	04/18/22 06:50
15	1205061594 LCS	12-APR-2022	1.5		312.96	04/13/22 12:40	04/18/22 06:50

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1951-C	Barium-133	.1 mL	Pipet Id: RAD-GFC-1795419 Data Entry Date2: 12-APR-2022 00:00
REGNT 3371585.12	16M Nitric Acid	5 mL	
REGNT 3408863.6	29M HF (48-50%)	4 mL	
REGNT 3411398	Barium Carrier Ra228 REG	1 mL	
REGNT 3412402.6	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	
REGNT 3413369	Lot #DGA0030	2 g	
REGNT 3413388	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3413919	RGF-50% Potassium Carbonate	2 mL	
REGNT 3417468	RGF-1M Citric Acid	5 mL	
REGNT 3422841	2M HCl	20 mL	
REGNT 3424040	7M Nitric Acid	25 mL	
REGNT 3424228	RGF-Neodymium Substrate	5 mL	
REGNT 3424307	RGF-1.5M Ammonium Sulfate	10 mL	

### Radium-228 Liquid

Filename : RA228.XLS  
 File type : Excel  
 Version # : 1.4.2

Tracer S/N : 1951-C  
 Tracer Exp Date : 9/16/2022  
 Tracer Volume Added: 0.10

Batch : 2251474  
 Analyst : JAS02031  
 Prep Date : 4/12/2022  
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL  
 Parmname : Radium-228  
 Required MDA : 1.5 pCi/L  
 Ra-228 Abundance : 1.00  
 Halflife of Ra-228 : 5.75 years  
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	575362001.1	0.3113	1.8644E-05	3/30/2022 11:41	1468.6	1.51%	1224.9	1.65%	0.1	0.000200
2	575362002.1	0.3130	1.8670E-05	3/30/2022 14:15	1468.6	1.51%	1299.8	1.60%	0.1	0.000200
3	575362003.1	0.3108	1.8637E-05	3/30/2022 13:47	1468.6	1.51%	1302.4	1.60%	0.1	0.000200
4	575362004.1	0.3096	1.8617E-05	3/30/2022 11:41	1468.6	1.51%	1244.2	1.64%	0.1	0.000200
5	575362005.1	0.3061	1.8561E-05	3/30/2022 9:00	1468.6	1.51%	1234.5	1.64%	0.1	0.000200
6	575363001.1	0.3026	1.8503E-05	3/30/2022 15:06	1468.6	1.51%	1305.2	1.60%	0.1	0.000200
7	575363002.1	0.3061	1.8560E-05	3/30/2022 15:06	1468.6	1.51%	1313.1	1.59%	0.1	0.000200
8	575363003.1	0.3018	1.8489E-05	3/30/2022 14:55	1468.6	1.51%	1090.3	1.75%	0.1	0.000200
9	575594002.1	0.3048	1.8539E-05	4/4/2022 13:20	1468.6	1.51%	1263.4	1.62%	0.1	0.000200
10	575594003.1	0.3073	1.8579E-05	4/4/2022 9:10	1468.6	1.51%	1279.2	1.61%	0.1	0.000200
11	1205061590.1	0.3130	1.8670E-05	4/12/2022 0:00	1468.6	1.51%	1305.1	1.60%	0.1	0.000200
12	1205061591.1	0.3059	1.8558E-05	3/30/2022 11:41	1468.6	1.51%	1282.2	1.61%	0.1	0.000200
13	1205061592.1	0.3015	1.8485E-05	4/4/2022 13:20	1468.6	1.51%	1319.0	1.59%	0.1	0.000200
14	1205061593.1	0.1069	1.1787E-05	4/4/2022 13:20	1468.6	1.51%	1187.4	1.68%	0.1	0.000200
15	1205061594.1	0.3130	1.8670E-05	4/12/2022 0:00	1468.6	1.51%	1286.8	1.61%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063

Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated Sample Recovery %	Sample Recovery Error %
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction		
1	1A	60	6	51	0.850	4/18/2022 9:08	4/13/2022 12:40	4/18/2022 6:50	0.994	0.772	1.000	1.057	83.4%	1.15%
2	1B	60	7	79	1.317	4/18/2022 9:08	4/13/2022 12:40	4/18/2022 6:50	0.994	0.771	1.000	1.057	88.5%	1.14%
3	1C	60	5	69	1.150	4/18/2022 9:08	4/13/2022 12:40	4/18/2022 6:50	0.994	0.771	1.000	1.057	88.7%	1.14%
4	1D	60	7	94	1.567	4/18/2022 9:08	4/13/2022 12:40	4/18/2022 6:50	0.994	0.771	1.000	1.057	84.7%	1.15%
5	2A	60	7	54	0.900	4/18/2022 9:08	4/13/2022 12:40	4/18/2022 6:50	0.994	0.771	1.000	1.057	84.1%	1.15%
6	2C	60	8	58	0.967	4/18/2022 9:08	4/13/2022 12:40	4/18/2022 6:50	0.994	0.771	1.000	1.057	88.9%	1.14%
7	2D	60	10	105	1.750	4/18/2022 9:08	4/13/2022 12:40	4/18/2022 6:50	0.994	0.771	1.000	1.057	89.4%	1.13%
8	3B	60	4	43	0.717	4/18/2022 9:08	4/13/2022 12:40	4/18/2022 6:50	0.994	0.771	1.000	1.057	74.2%	1.19%
9	3C	90	2	103	1.144	4/18/2022 9:08	4/13/2022 12:40	4/18/2022 6:50	0.995	0.770	1.000	1.087	86.0%	1.14%
10	3D	90	2	76	0.844	4/18/2022 9:08	4/13/2022 12:40	4/18/2022 6:50	0.995	0.770	1.000	1.087	87.1%	1.14%
11	14A	90	3	58	0.644	4/18/2022 13:59	4/13/2022 12:40	4/18/2022 6:50	0.998	0.446	1.000	1.087	88.9%	1.14%
12	4C	60	6	65	1.083	4/18/2022 9:07	4/13/2022 12:40	4/18/2022 6:50	0.994	0.773	1.000	1.057	87.3%	1.14%
13	9A	60	6	56	0.933	4/18/2022 11:56	4/13/2022 12:40	4/18/2022 6:50	0.995	0.562	1.000	1.057	89.8%	1.13%
14	5A	60	14	767	12.783	4/18/2022 9:07	4/13/2022 12:40	4/18/2022 6:50	0.995	0.772	1.000	1.057	80.9%	1.16%
15	5B	60	15	897	14.950	4/18/2022 9:07	4/13/2022 12:40	4/18/2022 6:50	0.998	0.772	1.000	1.057	87.6%	1.14%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2021	5/31/2022	0.6325	0.00738	0.650	4/16/2022 13:48	1000
2	PIC	6/1/2021	5/31/2022	0.6409	0.00711	0.651	4/16/2022 13:48	1000
3	PIC	6/1/2021	5/31/2022	0.6524	0.00847	0.768	4/16/2022 13:48	1000
4	PIC	6/1/2021	5/31/2022	0.6466	0.00692	1.681	4/16/2022 13:48	1000
5	PIC	6/1/2021	5/31/2022	0.6321	0.01914	0.797	4/16/2022 13:48	1000
6	PIC	6/1/2021	5/31/2022	0.6380	0.01274	0.903	4/16/2022 13:49	1000
7	PIC	6/1/2021	5/31/2022	0.6254	0.00745	1.765	4/16/2022 13:49	1000
8	PIC	6/1/2021	5/31/2022	0.6428	0.01614	0.508	4/16/2022 13:49	1000
9	PIC	6/1/2021	5/31/2022	0.6497	0.00988	0.946	4/16/2022 13:49	1000
10	PIC	6/1/2021	5/31/2022	0.6259	0.02297	0.736	4/16/2022 13:49	1000
11	PIC	6/1/2021	5/31/2022	0.6545	0.02119	0.652	4/16/2022 12:39	1000
12	PIC	6/1/2021	5/31/2022	0.6681	0.00889	0.687	4/16/2022 13:50	1000
13	PIC	6/1/2021	5/31/2022	0.6471	0.00758	0.810	4/16/2022 13:46	1000
14	PIC	6/1/2021	5/31/2022	0.6571	0.00851	0.464	4/16/2022 13:50	1000
15	PIC	6/1/2021	5/31/2022	0.6506	0.00426	1.228	4/16/2022 13:50	1000



Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

\* - RPD changed to 0% due to sample & dup activity below MDA

**Spike S/N :** 1965-C  
**Spike Exp Date :** 8/5/2022  
**Spike Activity (dpm/ml):** 313.62  
**Spike Volume Added:** 0.10

**LCS S/N :** 1965-C  
**LCS Exp Date :** 8/5/2022  
**LCS Activity (dpm/ml):** 313.62  
**LCS Volume Added:** 0.10

Results Pos.	Decision	Critical	Required	Sample Act.		Sample Act.	Net Count	Net Count	2 SIGMA	2 SIGMA	Sample	Sample	RPD	RER	Nominal	Recovery
	Level	Level	MDA	MDA	Conc.	Error	Rate	Rate Error	Counting	Total Prop.						
	pCi/L	pCi/L	pCi/L	pCi/L	pCi/L	%	CPM	CPM	Uncertainty	Uncertainty						
1	0.9446	0.6669	3	1.5229	<b>0.7566</b>	60.88%	0.2000	0.1217	0.9026	0.9222		SAMPLE				
2	0.8746	0.6174	3	1.4099	<b>2.3298</b>	22.62%	0.6657	0.1503	1.0312	1.1842		SAMPLE				
3	0.9377	0.6620	3	1.4969	<b>1.3199</b>	36.99%	0.3820	0.1412	0.9561	1.0115		SAMPLE				
4	1.4717	1.0390	3	2.2613	<b>-0.4191</b>	145.82%	-0.1143	0.1667	1.1976	1.1977		SAMPLE				
5	1.0567	0.7460	3	1.6831	<b>0.3936</b>	122.05%	0.1030	0.1257	0.9415	0.9467		SAMPLE				
6	1.0661	0.7526	3	1.6864	<b>0.2306</b>	204.88%	0.0637	0.1304	0.9261	0.9279		SAMPLE				
7	1.4945	1.0551	3	2.2918	<b>-0.0545</b>	1172.49%	-0.0150	0.1759	1.2521	1.2522		SAMPLE				
8	0.9531	0.6729	3	1.5617	<b>0.9010</b>	53.52%	0.2087	0.1116	0.9444	0.9712		SAMPLE				
9	0.9347	0.6599	1.5	1.4447	<b>0.7437</b>	58.92%	0.1984	0.1169	0.8586	0.8786		SAMPLE				
10	0.8386	0.5920	1.5	1.3112	<b>0.4134</b>	92.79%	0.1084	0.1006	0.7516	0.7589		SAMPLE				
11	1.2509	0.8832	1.5	1.9678	<b>-0.0456</b>	1169.85%	-0.0076	0.0884	1.0467	1.0468		MB				
12	0.8925	0.6301	3	1.4341	<b>1.3781</b>	34.57%	0.3963	0.1369	0.9330	0.9946	575362001.1	DUP	* 0.0%			
13	1.3546	0.9564	1.5	2.1558	<b>0.5994</b>	103.73%	0.1233	0.1279	1.2186	1.2278	575594002.1	DUP	* 0.0%			
14	2.3022	1.6254	1.5	3.7964	<b>134.4426</b>	4.02%	12.3193	0.4621	9.8838	35.0506	575594002.1	MS			132.4532	101.5%
15	1.1899	0.8401	1.5	1.8535	<b>47.5771</b>	3.84%	13.7220	0.5004	3.4005	12.3557		LCS			45.1404	105.4%

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
575362001	1A	60	6	51	4/18/2022 9:08	4/18/2022 10:08	PIC	2251474
575362002	1B	60	7	79	4/18/2022 9:08	4/18/2022 10:08	PIC	2251474
575362003	1C	60	5	69	4/18/2022 9:08	4/18/2022 10:08	PIC	2251474
575362004	1D	60	7	94	4/18/2022 9:08	4/18/2022 10:08	PIC	2251474
575362005	2A	60	7	54	4/18/2022 9:08	4/18/2022 10:08	PIC	2251474
575363001	2C	60	8	58	4/18/2022 9:08	4/18/2022 10:08	PIC	2251474
575363002	2D	60	10	105	4/18/2022 9:08	4/18/2022 10:08	PIC	2251474
575363003	3B	60	4	43	4/18/2022 9:08	4/18/2022 10:08	PIC	2251474
575594002	3C	90	2	103	4/18/2022 9:08	4/18/2022 10:38	PIC	2251474
575594003	3D	90	2	76	4/18/2022 9:08	4/18/2022 10:38	PIC	2251474
1205061590	14A	90	3	58	4/18/2022 13:59	4/18/2022 15:29	PIC	2251474
1205061591	4C	60	6	65	4/18/2022 9:07	4/18/2022 10:07	PIC	2251474
1205061592	9A	60	6	56	4/18/2022 11:56	4/18/2022 12:56	PIC	2251474
1205061593	5A	60	14	767	4/18/2022 9:07	4/18/2022 10:07	PIC	2251474
1205061594	5B	60	15	897	4/18/2022 9:07	4/18/2022 10:07	PIC	2251474

ASSAY 18-Apr-22 7:21:37  
 Wizard 2480 s/n 46190630  
 Protocol id 9 Ba-133\_1  
 Time limit  
 Count limit  
 Isotope Ba-133\_1  
 Protocol date 4/18/2022  
 Run id. 4913

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	92	1	180	4406.57	1468.58	1.51	07:21:37
575362001	2	92	2	180	3675.28	1224.89	1.65	83.41	07:24:51
575362002	3	92	3	180	3899.85	1299.76	1.6	88.50	07:28:05
575362003	4	92	4	180	3907.57	1302.39	1.6	88.68	07:31:19
575362004	5	92	5	180	3733.28	1244.19	1.64	84.72	07:34:33
575362005	1	2	1	180	3704.28	1234.52	1.64	84.06	07:38:09
575363001	2	2	2	180	3916.28	1305.18	1.6	88.87	07:41:23
575363002	3	2	3	180	3940	1313.08	1.59	89.41	07:44:37
575363003	4	2	4	180	3271.28	1090.31	1.75	74.24	07:47:51
575594002	5	2	5	180	3790.85	1263.37	1.62	86.03	07:51:05
575594003	1	98	1	180	3838.28	1279.18	1.61	87.10	07:54:41
1205061590	2	98	2	180	3916	1305.09	1.6	88.87	07:57:54
1205061591	3	98	3	180	3847.28	1282.18	1.61	87.31	08:01:08
1205061592	4	98	4	180	3957.85	1319.04	1.59	89.82	08:04:22
1205061593	5	98	5	180	3563	1187.44	1.68	80.86	08:07:37
1205061594	1	6	1	180	3861	1286.75	1.61	87.62	08:11:25

END OF ASSAY

# **Continuing Calibration Data**

# Gas Flow Proportional Counter Checks for 18-Apr-2022

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100E2	need 2nd	Beta bkg	18-Apr 04:40	60	1.833	1.386	3.015	-1.35
LB4100F3	Above	Alpha bkg	18-Apr 09:16	1.54	0.649	0.119	0.404	+8.18
LB4100F3	Below	Beta bkg	18-Apr 09:16	1.54	0.00E+0	0.854	1.842	-8.18
LB4100G1	Above	Alpha XTalk	18-Apr 05:43	5	2.963	0.088	0.447	+45.12
LB4100G1	Above	Beta bkg	18-Apr 04:41	60	16231	0.380	1.675	+75,209.48
LB4100G1	need 2nd	Beta eff	18-Apr 05:56	5	15117	12880	18320	-0.53
LB4100G2	Above	Alpha eff	18-Apr 05:43	5	9599	7308	9581	+3.05
LB4100G2	Below	Alpha XTalk	18-Apr 05:43	5	0.321	0.324	0.423	-3.15
LB4100G2	Above	Beta bkg	18-Apr 04:41	60	5.017	1.159	2.203	+19.17
LB4100G3	Below	Alpha bkg	18-Apr 04:41	60	0.00E+0	0.002	0.276	-3.05
LB4100G3	Below	Alpha eff	18-Apr 05:43	5	6554	6620	7779	-3.34
LB4100G3	Above	Beta bkg	18-Apr 04:41	60	6.667	0.810	1.674	+37.67
PIC13A	need 2nd	Alpha bkg	18-Apr 06:53	1000	0.064	-9.05E-2	0.347	-0.88
PIC13A	need 2nd	Beta bkg	18-Apr 06:53	1000	0.684	-8.16E-2	2.573	-1.27

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

LB4100C1 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
 LB4100C2 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
 LB4100C3 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
 LB4100C4 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
 LB4100I1 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
 LB4100I2 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
 LB4100I3 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
 LB4100I4 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by 

Date 4/19/22

GEL Laboratories LLC

# Runlogs

# Instrument Run Log

Instrument Type: GFPC

Batch ID: 2251474

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205061591	DUP	JXC9	PIC4C	APR-18-22 09:07:23	DONE	25mm Filter	01-JUN-21 00:00
1205061593	MS	JXC9	PIC5A	APR-18-22 09:07:53	DONE	25mm Filter	01-JUN-21 00:00
1205061594	LCS	JXC9	PIC5B	APR-18-22 09:07:58	DONE	25mm Filter	01-JUN-21 00:00
575362001	SAMPLE	JXC9	PIC1A	APR-18-22 09:08:04	DONE	25mm Filter	01-JUN-21 00:00
575362002	SAMPLE	JXC9	PIC1B	APR-18-22 09:08:09	DONE	25mm Filter	01-JUN-21 00:00
575362003	SAMPLE	JXC9	PIC1C	APR-18-22 09:08:13	DONE	25mm Filter	01-JUN-21 00:00
575362004	SAMPLE	JXC9	PIC1D	APR-18-22 09:08:21	DONE	25mm Filter	01-JUN-21 00:00
575362005	SAMPLE	JXC9	PIC2A	APR-18-22 09:08:25	DONE	25mm Filter	01-JUN-21 00:00
575363001	SAMPLE	JXC9	PIC2C	APR-18-22 09:08:25	DONE	25mm Filter	01-JUN-21 00:00
575363002	SAMPLE	JXC9	PIC2D	APR-18-22 09:08:29	DONE	25mm Filter	01-JUN-21 00:00
575363003	SAMPLE	JXC9	PIC3B	APR-18-22 09:08:41	DONE	25mm Filter	01-JUN-21 00:00
575594002	SAMPLE	JXC9	PIC3C	APR-18-22 09:08:48	DONE	25mm Filter	01-JUN-21 00:00
575594003	SAMPLE	JXC9	PIC3D	APR-18-22 09:08:54	DONE	25mm Filter	01-JUN-21 00:00
1205061592	DUP	JXC9	PIC9A	APR-18-22 11:56:59	DONE	25mm Filter	01-JUN-21 00:00
1205061590	MB	JXC9	PIC14A	APR-18-22 13:59:42	DONE	25mm Filter	01-JUN-21 00:00

# Lucas Cell Raw Data



# Batch 2251465 Check-list

This check-list was completed on 21-APR-22 by Lyndsey Pace

This batch was reviewed by Lyndsey Pace on 21-APR-22 and Elizabeth Krouse on 22-APR-22.

**Batch ID:**  
2251465

**Product:**  
LUC26RAL

**Description:** Lucas Cell Radium 226  
GL-RAD-A-008

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
<b>Miscellaneous Information</b>				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

# Prep Logbook

## Radium-226 in Liquid

**Batch ID:** 2251465  
**Analyst:** Lyndsey Pace (LXP1)  
**Method:** EPA 903.1 Modified  
**Lab SOP:** GL-RAD-A-008 REV# 15  
**Instrument:** LUCAS-C037036045

Due Dates for Lab: 29-APR-2022			Package: 01-MAY-2022	SDG: 02-MAY-2022		
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205061583	Radium-226 SPIKE	1715-G	.1	mL	
MS	1205061582	Radium-226 SPIKE	1715-G	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	575362001	12-APR-2022	1	504.92	504.92	04/14/22 11:45	402	04/21/22 06:27	04/21/22 09:40	4	16
2	575362002	12-APR-2022	1	500.43	500.43	04/14/22 11:45	506	04/21/22 06:27	04/21/22 09:40	1	33
3	575362003	12-APR-2022	1	500.13	500.13	04/14/22 11:45	602	04/21/22 06:27	04/21/22 09:40	1	29
4	575362004	12-APR-2022	1	506.95	506.95	04/14/22 11:45	707	04/21/22 06:27	04/21/22 09:40	2	26
5	575362005	12-APR-2022	1	501.67	501.67	04/14/22 11:45	804	04/21/22 06:27	04/21/22 09:40	7	10
6	575363001	12-APR-2022	1	507.02	507.02	04/14/22 11:45	202	04/21/22 07:00	04/21/22 10:12	7	23
7	575363002	12-APR-2022	1	512.35	512.35	04/14/22 11:45	407	04/21/22 07:00	04/21/22 10:12	4	12
8	575363003	12-APR-2022	1	501.14	501.14	04/14/22 11:45	508	04/21/22 07:00	04/21/22 10:12	2	12
9	575594002	12-APR-2022	1	508.16	508.16	04/14/22 11:45	607	04/21/22 07:00	04/21/22 10:12	3	20
10	575594003	12-APR-2022	1	507.58	507.58	04/14/22 11:45	705	04/21/22 07:00	04/21/22 10:12	6	16
11	1205061580 MB	12-APR-2022	1	512.35	512.35	04/14/22 11:45	805	04/21/22 07:00	04/21/22 10:12	7	16
12	1205061581 DUP (575362001)	12-APR-2022	1	504.52	504.52	04/14/22 11:45	501	04/21/22 07:28	04/21/22 10:44	6	23
13	1205061582 MS (575362001)	12-APR-2022	1	100.21	100.21	04/14/22 11:45	604	04/21/22 07:28	04/21/22 11:19	1	789
14	1205061583 LCS	12-APR-2022	1	512.35	512.35	04/14/22 11:45	701	04/21/22 07:28	04/21/22 10:44	2	872

Reagent/Solvent Lot ID	Description	Amount	Comments:
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### Radium-226 Liquid

Filename : RA226.XLS  
 File type : Excel  
 Version # : 1.3.2

Procedure Code : LUC26RAL  
 Parmname : Radium-226  
 Required MDA : 1 pCi/L  
 Halflife of Ra-226 : 1600 years  
 Ra-226 Abundance : 1.00  
 Halflife of Rn-222 : 3.8235 days

Batch : 2251465  
 Analyst : LIN01615  
 Prep Date : 4/12/2022  
 Ra-226 Method Uncertainty : 0.073648

Batch counted on : LUCAS CELL DETECTOR  
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Count Time (min.)	Cell Efficiency (cpm/dpm)
1	575362001.1	0.5049	2.0276E-05	3/30/2022 11:41	402	30	16	0.533	4	0.133	30	1.4480
2	575362002.1	0.5004	2.0258E-05	3/30/2022 14:15	506	30	33	1.100	1	0.033	30	1.7790
3	575362003.1	0.5001	2.0256E-05	3/30/2022 13:47	602	30	29	0.967	1	0.033	30	1.6150
4	575362004.1	0.5070	2.0284E-05	3/30/2022 11:41	707	30	26	0.867	2	0.067	30	1.7120
5	575362005.1	0.5017	2.0263E-05	3/30/2022 9:00	804	30	10	0.333	7	0.233	30	1.9050
6	575363001.1	0.5070	2.0284E-05	3/30/2022 15:06	202	30	23	0.767	7	0.233	30	1.7020
7	575363002.1	0.5124	2.0305E-05	3/30/2022 15:06	407	30	12	0.400	4	0.133	30	1.6030
8	575363003.1	0.5011	2.0261E-05	3/30/2022 14:55	508	30	12	0.400	2	0.067	30	1.7330
9	575594002.1	0.5082	2.0289E-05	4/4/2022 13:20	607	30	20	0.667	3	0.100	30	1.7080
10	575594003.1	0.5076	2.0286E-05	4/4/2022 9:10	705	30	16	0.533	6	0.200	30	1.7610
11	1205061580.1	0.5124	2.0305E-05	4/12/2022 0:00	805	30	16	0.533	7	0.233	30	1.9080
12	1205061581.1	0.5045	2.0274E-05	3/30/2022 11:41	501	30	23	0.767	6	0.200	30	1.9100
13	1205061582.1	0.1002	1.1383E-05	3/30/2022 11:41	604	30	789	26.300	1	0.033	30	1.6960
14	1205061583.1	0.5124	2.0305E-05	4/12/2022 0:00	701	30	872	29.067	2	0.067	30	1.7130

Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008  
 Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrow End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
2.300%	2/1/2022	1/31/2023	4/14/2022 11:45	4/21/2022 6:27	4/21/2022 9:40	0.707	0.976	1.002	1.000
8.200%	6/1/2021	5/31/2022	4/14/2022 11:45	4/21/2022 6:27	4/21/2022 9:40	0.707	0.976	1.002	1.000
3.900%	7/1/2021	6/30/2022	4/14/2022 11:45	4/21/2022 6:27	4/21/2022 9:40	0.707	0.976	1.002	1.000
3.000%	11/1/2021	10/31/2022	4/14/2022 11:45	4/21/2022 6:27	4/21/2022 9:40	0.707	0.976	1.002	1.000
9.900%	4/1/2022	3/31/2023	4/14/2022 11:45	4/21/2022 6:27	4/21/2022 9:40	0.707	0.976	1.002	1.000
4.100%	8/1/2021	7/31/2022	4/14/2022 11:45	4/21/2022 7:00	4/21/2022 10:12	0.709	0.976	1.002	1.000
6.600%	2/1/2022	1/31/2023	4/14/2022 11:45	4/21/2022 7:00	4/21/2022 10:12	0.709	0.976	1.002	1.000
2.600%	6/1/2021	5/31/2022	4/14/2022 11:45	4/21/2022 7:00	4/21/2022 10:12	0.709	0.976	1.002	1.000
4.600%	7/1/2021	6/30/2022	4/14/2022 11:45	4/21/2022 7:00	4/21/2022 10:12	0.709	0.976	1.002	1.000
3.000%	11/1/2021	10/31/2022	4/14/2022 11:45	4/21/2022 7:00	4/21/2022 10:12	0.709	0.976	1.002	1.000
7.400%	4/1/2022	3/31/2023	4/14/2022 11:45	4/21/2022 7:00	4/21/2022 10:12	0.709	0.976	1.002	1.000
4.300%	6/1/2021	5/31/2022	4/14/2022 11:45	4/21/2022 7:28	4/21/2022 10:44	0.710	0.976	1.002	1.000
6.400%	7/1/2021	6/30/2022	4/14/2022 11:45	4/21/2022 7:28	4/21/2022 11:19	0.710	0.971	1.002	1.000
5.900%	11/1/2021	10/31/2022	4/14/2022 11:45	4/21/2022 7:28	4/21/2022 10:44	0.710	0.976	1.002	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

**Spike S/N :** 1715-G  
**Spike Exp Date :** 9/15/2022  
**Spike Activity (dpm/ml):** 297.55  
**Spike Volume Added:** 0.10

**LCS S/N :** 1715-G  
**LCS Exp Date :** 9/15/2022  
**LCS Activity (dpm/ml):** 297.55  
**LCS Volume Added:** 0.10

<b>Results</b>																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.1964	0.1387	1	0.3667	<b>0.3576</b>	37.34%	0.4000	0.1491	0.2612	0.2668		SAMPLE				
2	0.0806	0.0569	1	0.1873	<b>0.7832</b>	19.98%	1.0667	0.1944	0.2797	0.3269		SAMPLE				
3	0.0889	0.0628	1	0.2064	<b>0.7553</b>	19.95%	0.9333	0.1826	0.2896	0.3148		SAMPLE				
4	0.1170	0.0826	1	0.2405	<b>0.6025</b>	22.25%	0.8000	0.1764	0.2604	0.2768		SAMPLE				
5	0.1988	0.1403	1	0.3491	<b>0.0684</b>	137.79%	0.1000	0.1374	0.1842	0.1850		SAMPLE				
6	0.2197	0.1551	1	0.3859	<b>0.4032</b>	34.48%	0.5333	0.1826	0.2706	0.2786		SAMPLE				
7	0.1745	0.1232	1	0.3259	<b>0.2118</b>	50.43%	0.2667	0.1333	0.2076	0.2116		SAMPLE				
8	0.1167	0.0824	1	0.2399	<b>0.2504</b>	37.51%	0.3333	0.1247	0.1837	0.1876		SAMPLE				
9	0.1430	0.1010	1	0.2771	<b>0.4260</b>	28.58%	0.5667	0.1599	0.2355	0.2464		SAMPLE				
10	0.1964	0.1387	1	0.3503	<b>0.2433</b>	47.00%	0.3333	0.1563	0.2237	0.2269		SAMPLE				
11	0.1940	0.1369	1	0.3406	<b>0.2002</b>	53.80%	0.3000	0.1599	0.2091	0.2131		MB				
12	0.1820	0.1285	1	0.3246	<b>0.3833</b>	31.97%	0.5667	0.1795	0.2380	0.2465	575362001.1	DUP	6.9%			
13	0.4231	0.2987	1	0.9827	<b>101.1887</b>	7.33%	26.2667	0.9369	7.0742	20.6037	575362001.1	MS			133.7513	75.7%
14	0.1154	0.0815	1	0.2372	<b>21.5386</b>	6.81%	29.0000	0.9854	1.4345	4.2342		LCS			26.1599	82.3%

# **Continuing Calibration Data**



# Ludlum Alpha Scintillation Counter Checks for 21-APR-2022

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	06:14	1	1.22E+05	122101	-0.17		
LUCAS2	EFF	06:13	1	1.34E+05	133589	1.62		
LUCAS4	EFF	06:11	1	1.28E+05	127534	0.26		
LUCAS5	EFF	06:10	1	1.30E+05	130466	0.73		
LUCAS6	EFF	06:08	1	1.30E+05	130375	-1.07		
LUCAS7	EFF	06:06	1	1.35E+05	135221	2.9		
LUCAS8	EFF	06:05	1	1.25E+05	125115	-0.47		

**Reviewed by:**

Lyndsey Pace

**Date:** 21-APR-22

GEL Laboratories LLC

# Runlogs



# Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2251465

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
575362001	SAMPLE	LXP1	LUCAS4	APR-21-22 09:40:51	DONE	Lucas Cell	01-FEB-22 00:00
575362002	SAMPLE	LXP1	LUCAS5	APR-21-22 09:40:52	DONE	Lucas Cell	01-JUN-21 00:01
575362003	SAMPLE	LXP1	LUCAS6	APR-21-22 09:40:53	DONE	Lucas Cell	01-JUL-21 00:00
575362004	SAMPLE	LXP1	LUCAS7	APR-21-22 09:40:54	DONE	Lucas Cell	01-NOV-21 00:00
575362005	SAMPLE	LXP1	LUCAS8	APR-21-22 09:40:55	DONE	Lucas Cell	01-APR-22 00:00
575363001	SAMPLE	LXP1	LUCAS2	APR-21-22 10:12:19	DONE	Lucas Cell	01-AUG-21 00:00
575363002	SAMPLE	LXP1	LUCAS4	APR-21-22 10:12:20	DONE	Lucas Cell	01-FEB-22 00:00
575363003	SAMPLE	LXP1	LUCAS5	APR-21-22 10:12:20	DONE	Lucas Cell	01-JUN-21 00:01
575594002	SAMPLE	LXP1	LUCAS6	APR-21-22 10:12:21	DONE	Lucas Cell	01-JUL-21 00:00
575594003	SAMPLE	LXP1	LUCAS7	APR-21-22 10:12:22	DONE	Lucas Cell	01-NOV-21 00:00
1205061580	MB	LXP1	LUCAS8	APR-21-22 10:12:23	DONE	Lucas Cell	01-APR-22 00:00
1205061581	DUP	LXP1	LUCAS5	APR-21-22 10:44:36	DONE	Lucas Cell	01-JUN-21 00:01
1205061583	LCS	LXP1	LUCAS7	APR-21-22 10:44:38	DONE	Lucas Cell	01-NOV-21 00:00
1205061582	MS	LXP1	LUCAS6	APR-21-22 11:19:00	DONE	Lucas Cell	01-JUL-21 00:00

### Data Validation Checklist

Site Name: Erickson Personnel: M. Wahrer

Sample Date(s): 3/30/2022 Lab Drop-off Date(s): 3/31/2022

Lab Report Number: S34428.01

Lab Report Date: 5/18/2022

Reason for Sample Event: Wetland-1

**Field Records:** Circle Yes/No unless Not Applicable – *Complete during sample event*

Item Description	Verification (Completeness)	Validation (Conformance to Specifications)
Field equipment calibration records	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Chain-of-Custody forms	<input checked="" type="radio"/> Yes / No	N/A
Field decontamination documentation	N/A	N/A
Sample collection field forms	<input checked="" type="radio"/> Yes / No	N/A
Drilling logs	<input checked="" type="radio"/> Yes / No	N/A
Well construction logs	<input checked="" type="radio"/> Yes / No	N/A
Well development field forms	<input checked="" type="radio"/> Yes / No	N/A

**Analytical Data Package:** Circle Yes/No unless N/A – *Complete when lab report is received*

Item Description	Verification (Completeness)	Validation (Conformance to Specifications)
Cover sheet (laboratory identifying information)	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Case narrative	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Internal laboratory Chain-of-Custody forms	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Sample chronology and consistency (that is, dates and times of receipt, preparation, and analysis)	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Communication records with laboratory	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
EDD format consistency	<input checked="" type="radio"/> Yes / No	N/A
Sample identification, results nomenclature, and data qualifier consistency	<input checked="" type="radio"/> Yes / No	N/A
RLs as requested; MDLs < RLs	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Instrument calibration records	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Laboratory Report	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Field QC sample results and calculation of accuracy and precision	<input checked="" type="radio"/> Yes / No Duplicate Well ID: Wet-1	Yes / <input checked="" type="radio"/> No Duplicate RPD: 0-7% except Rad-226/228 at 50%

**Corrections Needed:** None; according to the Technical Case Narrative by GEL Laboratories, subcontracted laboratory for radium analysis, “[a]ll sample data provided in [the] report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

The [method] blank (See Below) did not meet the detection limit due to keeping the blank volume consistent with the other sample aliquots.

Sample	Analyte	Value
1205061590 (MB)	Radium-228	Result -0.0456 < MDA 1.97 > RDL 1.5 pCi/L

Sample 1205061590 (MB) was recounted due to high MDC. The recount is reported.”

Sample	Parameter	Result	Uncertainty	MDC	Lab Qualifier	Validated Qualifier
Wet-1	Rad-226	0.403	+/-0.271	0.386		J+
	Rad-228	0.231	+/-0.926	1.69	U	J+
	Rad-226/228	0.634	+/-0.965			J+
Wet-1-Dup	Rad-226	0.212	+/-0.208	0.326	U	J-
	Rad-228	-0.0545	+/-1.25	2.29	U	J-
	Rad-226/228	0.212	+/-1.27			J-

*U - Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.*

Since the laboratory processes indicated no issues with the analytical procedures, no corrective action was necessary. Since the RPD was above the 20% control limit, Rad-226, Rad-228, and Rad-226/228 in Wet-1 have been qualified as estimated with potential for high bias (J+) and those in Wet-1-Dup have been qualified as estimated with potential for low bias (J-). However, the detection of Rad-228 in a method blank required qualification of Rad-228 in Wet-1-Dup as estimated (J) without bias.

The matrix spike (S34428.02) had low recovery for the compound calcium in run batch MT4-22-0401B. Calcium in Wet-1-Dup required qualification as estimated (J).



Lansing Board of Water and Light  
Environmental Services Laboratory (MI00079)  
1232 Haco Dr.  
Lansing, Michigan 48901

03 June 2022

BWL - Erickson Station

Attn: Cheryl Loudon

3725 S. Canal

Lansing, MI 48917

**Project: Erickson AM MI**

Dear Cheryl Loudon,

Enclosed is a copy of the laboratory report for the following work order(s) received by Lansing Board of Water and Light Environmental Services Laboratory:

**Work Order**  
L204045

**Received**  
4/15/2022 7:25:00AM

**Account Number**  
30926 10021

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in blue ink that reads "Jennifer Caporale".

Jennifer Caporale, Supervisor



Report ID: S34962.01(03)  
Generated on 05/17/2022  
Replaces report S34962.01(02) generated on 04/26/2022

Report to

Attention: Jennifer Caporale  
Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901

Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

Report produced by

Merit Laboratories, Inc.  
2680 East Lansing Drive  
East Lansing, MI 48823

Phone: (517) 332-0167 FAX: (517) 332-6333

Contacts for report questions:  
John Lavery (johnlavery@meritlabs.com)  
Barbara Ball (bball@meritlabs.com)

Report Summary

Lab Sample ID(s): S34962.01-S34962.05  
Project: Erickson AM MI New Wells 7B, 7C & 12B  
Collected Date(s): 04/14/2022  
Submitted Date/Time: 04/15/2022 08:15  
Sampled by: Marc Wahrer  
P.O. #:

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Maya Murshak  
Technical Director



## General Report Notes

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Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein, acrylonitrile, and 2-chlorovinylethyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (\*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

## Report Narrative

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All analyses completed



Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Alaska CSLAP	#17-001
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



## Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1 (1993)
SM2320B	Standard Method 2320 B 2011
SM2340C	Standard Method 2340 C 2011
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007





## Sample Summary (5 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S34962.01	MW-7B L204045-01	Groundwater	04/14/22 11:45
S34962.02	MW-7C L204045-02	Groundwater	04/14/22 13:30
S34962.03	MW-12B L204045-03	Groundwater	04/14/22 09:32
S34962.04	Field Dupe MW-7B L204045-04	Groundwater	04/14/22 11:45
S34962.05	Field Blank L204045-05	Water	04/14/22 08:20



# Analytical Laboratory Report

Final Report

Lab Sample ID: S34962.01

Sample Tag: MW-7B L204045-01

Collected Date/Time: 04/14/2022 11:45

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.4	IR
2	1L Plastic	None	Yes	2.4	IR
1	125ml Plastic	HNO3	Yes	2.4	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	04/18/22 09:00	JRH	
Metal Digestion	Completed	SW3015A	04/18/22 10:10	CCM	

### Inorganics

Method: E300.0, Run Date: 04/15/22 12:37, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 04/25/22 16:06, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	390	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 04/25/22 12:08, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	37	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 04/15/22 13:25, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	362	50	10	mg/L	2		

Method: SM2540D, Run Date: 04/18/22 15:15, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1.00		

### Metals

Method: E200.8, Run Date: 04/18/22 11:49, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.003	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.011	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	2.90	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.03	0.02	0.00192	mg/L	5	7439-89-6	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S34962.01 (continued)

Sample Tag: MW-7B L204045-01

**Method: E200.8, Run Date: 04/18/22 11:49, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.028	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 04/18/22 16:18, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	9.59	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	2.99	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	5.64	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	136	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 04/18/22 15:03, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 05/13/22 12:00, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Lab Sample ID: S34962.02

Sample Tag: MW-7C L204045-02

Collected Date/Time: 04/14/2022 13:30

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.4	IR
2	1L Plastic	None	Yes	2.4	IR
1	125ml Plastic	HNO3	Yes	2.4	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	04/18/22 09:00	JRH	
Metal Digestion	Completed	SW3015A	04/18/22 10:10	CCM	

### Inorganics

Method: E300.0, Run Date: 04/15/22 14:20, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	101	10	0.16	mg/L	10	16887-00-6	

Method: E300.0, Run Date: 04/15/22 12:49, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	

Method: E300.0, Run Date: 04/15/22 14:32, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sulfate	736	100	5.9	mg/L	100	14808-79-8	

Method: SM2320B, Run Date: 04/25/22 16:10, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	160	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 04/25/22 12:12, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	812	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 04/15/22 13:25, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	1,450	50	10	mg/L	2		

Method: SM2540D, Run Date: 04/18/22 15:15, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	10	3	1	mg/L	1.00		

### Metals

Method: E200.8, Run Date: 04/18/22 12:07, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Boron	6.44	0.4	0.0175	mg/L	50	7440-42-8	



# Analytical Laboratory Report

Lab Sample ID: S34962.02 (continued)

Sample Tag: MW-7C L204045-02

**Method: E200.8, Run Date: 04/18/22 11:53, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.006	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.043	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	4.34	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.121	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.402	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	0.008	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 04/18/22 16:20, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	255	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	43.1	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	5.68	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	96.8	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 04/18/22 15:06, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 05/13/22 12:00, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Lab Sample ID: S34962.03

Sample Tag: MW-12B L204045-03

Collected Date/Time: 04/14/2022 09:32

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.4	IR
2	1L Plastic	None	Yes	2.4	IR
1	125ml Plastic	HNO3	Yes	2.4	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	04/18/22 09:00	JRH	
Metal Digestion	Completed	SW3015A	04/18/22 10:10	CCM	

### Inorganics

Method: E300.0, Run Date: 04/15/22 13:02, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 04/25/22 16:16, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	410	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 04/25/22 12:16, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	99	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 04/15/22 13:25, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	376	50	10	mg/L	2		

Method: SM2540D, Run Date: 04/18/22 15:15, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	3	3	1	mg/L	1.00		b

### Metals

Method: E200.8, Run Date: 04/18/22 11:58, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.026	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	3.16	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	

b-Value detected less than reporting limit, but greater than MDL



# Analytical Laboratory Report

Final Report

Lab Sample ID: S34962.03 (continued)

Sample Tag: MW-12B L204045-03

**Method: E200.8, Run Date: 04/18/22 11:58, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Iron	0.24	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.036	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 04/18/22 16:23, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	24.0	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	8.12	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	8.26	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	109	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 04/18/22 15:09, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 05/13/22 12:00, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Lab Sample ID: S34962.04

Sample Tag: Field Dupe MW-7B L204045-04

Collected Date/Time: 04/14/2022 11:45

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.4	IR
2	1L Plastic	None	Yes	2.4	IR
1	125ml Plastic	HNO3	Yes	2.4	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	04/18/22 09:00	JRH	
Metal Digestion	Completed	SW3015A	04/18/22 10:10	CCM	

### Inorganics

Method: E300.0, Run Date: 04/15/22 13:15, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 04/25/22 16:18, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	400	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 04/25/22 12:18, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	51	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 04/15/22 13:25, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	370	50	10	mg/L	2		

Method: SM2540D, Run Date: 04/18/22 15:15, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1.00		

### Metals

Method: E200.8, Run Date: 04/18/22 12:02, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.002	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.011	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	2.88	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.03	0.02	0.00192	mg/L	5	7439-89-6	





# Analytical Laboratory Report

Final Report

Lab Sample ID: S34962.04 (continued)  
Sample Tag: Field Dupe MW-7B L204045-04

**Method: E200.8, Run Date: 04/18/22 12:02, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.029	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 04/18/22 16:25, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	9.28	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	2.93	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	5.57	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	133	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 04/18/22 15:13, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 05/13/22 12:00, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Lab Sample ID: S34962.05

Sample Tag: Field Blank L204045-05

Collected Date/Time: 04/14/2022 08:20

Matrix: Water

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.4	IR
2	1L Plastic	None	Yes	2.4	IR
1	125ml Plastic	HNO3	Yes	2.4	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	04/18/22 09:00	JRH	
Metal Digestion	Completed	SW3015A	04/18/22 10:10	CCM	

### Inorganics

Method: E300.0, Run Date: 04/15/22 13:28, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	2.5	0.04	mg/L	2.5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.06	mg/L	2.5	16984-48-8	
Sulfate	Not detected	2.5	0.15	mg/L	2.5	14808-79-8	

Method: SM2320B, Run Date: 04/25/22 16:20, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	Not detected	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 04/25/22 12:20, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	Not detected	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 04/15/22 13:25, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	Not detected	50	10	mg/L	2		

Method: SM2540D, Run Date: 04/18/22 15:15, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1.00		

### Metals

Method: E200.8, Run Date: 04/18/22 11:42, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00102	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.000102	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.0000648	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.0000862	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.000702	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.0000760	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.0000386	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.0000434	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000150	mg/L	2	7440-50-8	
Iron	Not detected	0.02	0.000768	mg/L	2	7439-89-6	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S34962.05 (continued)

Sample Tag: Field Blank L204045-05

**Method: E200.8, Run Date: 04/18/22 11:42, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.0000760	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000654	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.0000868	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000100	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.000838	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.0000270	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.0000342	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.0000558	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.000292	mg/L	2	7440-66-6	

**Method: E200.8, Run Date: 04/18/22 16:16, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.0174	mg/L	2	7440-70-2	
Magnesium	Not detected	0.50	0.00480	mg/L	2	7439-95-4	
Potassium	Not detected	0.50	0.00920	mg/L	2	7440-09-7	
Sodium	Not detected	0.50	0.00340	mg/L	2	7440-23-5	

**Method: E245.1, Run Date: 04/18/22 15:16, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 05/13/22 12:00, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

# Merit Laboratories Login Checklist

Lab Set ID:S34962

Client:BWL01 (Board of Water & Light)

Project: Erickson AM MI New Wells 7B, 7C & 12B

Submitted:04/15/2022 08:15 Login User: MMC

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental\_Laboratory@LBWL.com

Selection	Description	Note
<b>Sample Receiving</b>		
01.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples are received at 4C +/- 2C Thermometer # IR 2.4
02.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Received on ice/ cooling process begun
03.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples shipped
04.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples left in 24 hr. drop box
05.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Are there custody seals/tape or is the drop box locked
<b>Chain of Custody</b>		
06.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC adequately filled out
07.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC signed and relinquished to the lab
08.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sample tag on bottles match COC
09.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Subcontracting needed? Subcontracted to: GEL; 1Z4664770361170582
<b>Preservation</b>		
10.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Do sample have correct chemical preservation
11.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Completed pH checks on preserved samples? (no VOAs)
12.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Did any samples need to be preserved in the lab?
<b>Bottle Conditions</b>		
13.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	All bottles intact
14.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Appropriate analytical bottles are used
15.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Merit bottles used
16.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sufficient sample volume received
17.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples require laboratory filtration
18.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples submitted within holding time
19.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Do water VOC or TOX bottles contain headspace

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: \_\_\_\_\_ Date: \_\_\_\_\_

# Merit Laboratories Bottle Preservation Check

Lab Set ID: S34962 Submitted: 04/15/2022 08:15

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI New Wells 7B, 7C & 12B

Initial Preservation Check: 04/15/2022 08:42 MMC

Preservation Recheck (E200.8): N/A

Attention: Jennifer Caporale  
Address: Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901

Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S34962.01	125ml Plastic HNO3	<2			
S34962.01	1L Plastic HNO3	<2			
S34962.01	1L Plastic HNO3	<2			
S34962.02	125ml Plastic HNO3	<2			
S34962.02	1L Plastic HNO3	<2			
S34962.02	1L Plastic HNO3	<2			
S34962.03	125ml Plastic HNO3	<2			
S34962.03	1L Plastic HNO3	<2			
S34962.03	1L Plastic HNO3	<2			
S34962.04	125ml Plastic HNO3	<2			
S34962.04	1L Plastic HNO3	<2			
S34962.04	1L Plastic HNO3	<2			
S34962.05	125ml Plastic HNO3	<2			
S34962.05	1L Plastic HNO3	<2			
S34962.05	1L Plastic HNO3	<2			



2680 East Lansing Dr., East Lansing, MI 48823  
 Phone (517) 332-0167 Fax (517) 332-4034  
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

**REPORT TO** **CHAIN OF CUSTODY RECORD** **INVOICE TO**

CONTACT NAME <b>Jennifer Caporale</b>			CONTACT NAME <b>Kelly Gleason</b>			<input checked="" type="checkbox"/> SAME		
COMPANY <b>Lansing Board of Water and Light</b>			COMPANY					
ADDRESS <b>PO Box 13007 48901-3007</b>			ADDRESS					
CITY <b>Lansing</b>		STATE <b>Mi</b>	ZIP CODE <b>48901</b>		CITY	STATE	ZIP CODE	
PHONE NO. <b>517-702-6372</b>	FAX NO.	P.O. NO.		PHONE NO.		E-MAIL ADDRESS <b>Kelly.Gleason@lbwl.com</b>		
E-MAIL ADDRESS <b>Environmental_Laboratory@lbwl.com</b>		QUOTE NO.						

PROJECT NO./NAME <b>Erickson AM MI Wells 7B,7C&amp;12B</b>				SAMPLER(S) - PLEASE PRINT/SIGN NAME <b>Marc Wahrer</b>						ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)														
TURNAROUND TIME REQUIRED <input type="checkbox"/> 1 DAY <input checked="" type="checkbox"/> 2 DAYS <input type="checkbox"/> 3 DAYS <input type="checkbox"/> STANDARD <input checked="" type="checkbox"/> OTHER <b>ASAP</b>										Total Metals	F- undistilled, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	HCO3, CO3, Hardness	Certifications								
DELIVERABLES REQUIRED <input type="checkbox"/> STD <input type="checkbox"/> LEVEL II <input checked="" type="checkbox"/> LEVEL III <input type="checkbox"/> LEVEL IV <input checked="" type="checkbox"/> EDD <input type="checkbox"/> OTHER																<input type="checkbox"/> OHIO VAP <input type="checkbox"/> Drinking Water <input type="checkbox"/> DoD <input checked="" type="checkbox"/> NPDES Project Locations <input type="checkbox"/> Detroit <input type="checkbox"/> New York <input type="checkbox"/> Other _____ Special Instructions								
MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIPE A=AIR W=WASTE				# Containers & Preservatives																				
MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION		MATRIX	# OF BOTTLES	NONE	HCl	HNO3	H2SO4	NaOH	MeOH	OTHER											
	DATE	TIME																						
34962.01	4/14/22	1145	MW-7B	L204045-01	GW	5	3	2																Metals to analyse: Na, Mg, K
.02		1330	MW-7C	02	GW	5	3	2																B, Ca, Sb, As, Ba, Be, Cd, Cr,
.03		0932	MW-12B	03	GW	5	3	2																Co, Li, Hg, Mo, Pb, Se, Tl,
.04		1145	Field Dupe MW-7B	04	GW	5	3	2																Fe, Cu, Ni, Ag, V, Zn
.05		0820	Field Blank	05	DI	5	3	2																Please send a preliminary report

RELINQUISHED BY: <i>[Signature]</i> <b>Sampler</b> SIGNATURE/ORGANIZATION	DATE <b>4-15-22</b> TIME <b>0757</b>	RELINQUISHED BY: <b>Merit Drop Box</b> SIGNATURE/ORGANIZATION	DATE <b>4/15/22</b> TIME <b>0815</b>
RECEIVED BY:	DATE TIME	RECEIVED BY: <i>[Signature]</i>	DATE TIME <b>4/15/22 0815</b>
RELINQUISHED BY:	DATE TIME	SEAL NO.	SEAL INTACT YES <input type="checkbox"/> NO <input type="checkbox"/>
RECEIVED BY:	DATE TIME	SEAL NO.	SEAL INTACT YES <input type="checkbox"/> NO <input type="checkbox"/>

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

## Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.150
Be, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	2.5
Cl	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	10
Cr, total	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
F	Fluoride	250 mL plastic	mg/L	None	9056	28 d	1.0
Fe, total	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Pb, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Li, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Hg, total	Mercury	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Mo, total	Molybdenum	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
RA226/228	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	HNO3	SM 7500	6 mos	2.0 combined
Se, total	Selenium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ag, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
SO4	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	10
Tl, total	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
TDS	Total Dissolved Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TSS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540D	NA	3
V, total	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Zn, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005



May 13, 2022

John Laverty  
Merit Laboratories Inc.  
2680 East Lansing Drive  
East Lansing, Michigan 48823

Re: Routine Analysis  
Work Order: 577105  
SDG: S34962

Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on April 20, 2022. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

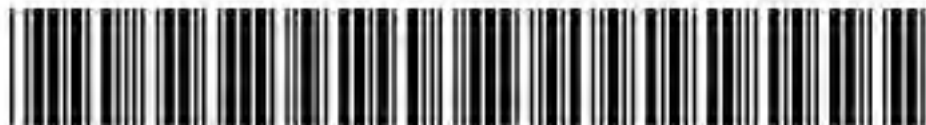
Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at [www.gel.com](http://www.gel.com).

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,

Joanne Harley for  
Delaney Stone  
Project Manager

Purchase Order: GELP20-0018  
Enclosures





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# Case Narrative

**Receipt Narrative  
for  
Merit Laboratories, Inc.  
SDG: S34962  
Work Order: 577105**

**May 13, 2022**

**Laboratory Identification:**

GEL Laboratories LLC  
2040 Savage Road  
Charleston, South Carolina 29407  
(843) 556-8171

**Summary:**

**Sample receipt:** The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on April 20, 2022 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

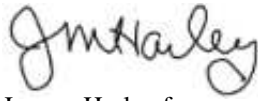
**Sample Identification:** The laboratory received the following samples:

<b><u>Laboratory ID</u></b>	<b><u>Client ID</u></b>
577105001	S34962.01
577105002	S34962.02
577105003	S34962.03
577105004	S34962.04 (Field Dupe)
577105005	S34962.05 (Field Blank)

**Case Narrative:**

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.

A handwritten signature in black ink, appearing to read "Joanne Harley". The signature is written in a cursive, flowing style.

Joanne Harley for  
Delaney Stone  
Project Manager

# **Chain of Custody and Supporting Documentation**

57105

C.O.C. PAGE # 1 OF 1

2680 East Lansing Dr., East Lansing, MI 48823  
 Phone (517) 332-0167 Fax (517) 332-4034  
 www.meritlabs.com



**REPORT TO**

CONTACT NAME: Project Management Team  
 COMPANY: Merit Laboratories  
 ADDRESS: 2680 East Lansing Drive  
 CITY: East Lansing  
 PHONE NO.: 517-332-0167  
 E-MAIL ADDRESS: results@meritlabs.com

**CHAIN OF CUSTODY RECORD**

CONTACT NAME: Julie Teague  
 COMPANY: Merit Laboratories  
 ADDRESS: 2680 East Lansing Drive  
 CITY: East Lansing  
 PHONE NO.: 517-332-0167  
 E-MAIL ADDRESS: juliet@meritlabs.com

**INVOICE TO**

CONTACT NAME: [ ]  
 COMPANY: [ ]  
 ADDRESS: [ ]  
 CITY: [ ]  
 PHONE NO.: [ ]  
 E-MAIL ADDRESS: [ ]

PROJECT NO./NAME: S34962

TURNAROUND TIME REQUIRED:  1 DAY  2 DAYS  3 DAYS  STANDARD  OTHER  
 DELIVERABLES REQUIRED:  STD  LEVEL I  LEVEL II  LEVEL III  LEVEL IV  EDD  OTHER

MATRIX CODE: GW=GROUNDWATER, WW=WASTEWATER, S=SOIL, L=LIQUID, SD=SOLID, SL=SLUDGE, DW=DRINKING WATER, O=OIL, WP=WIPE, A=AIR, W=WASTE

MERIT LAB NO.	DATE	YEAR	TIME	IDENTIFICATION-DESCRIPTION	SAMPLE TAG	# OF BOTTLES	# Containers & Preservatives											
							NONE	H <sub>2</sub> O	HNO <sub>3</sub>	H <sub>2</sub> SO <sub>4</sub>	NaOH	HCl	MeOH	OTHER				
	4/14/22	1145		S34962.01	GW	2		2										
	4/14/22	1330		S34962.02	GW	2		2										
	4/14/22	0932		S34962.03	GW	2		2										
	4/14/22	1145		S34962.04 (Field Dupe)	GW	2		2										
	4/14/22	0820		S34962.05 (Field Blank)	Wa	2		2										

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

Certifications	Notes
<input type="checkbox"/> OHIO VAP <input type="checkbox"/> Drinking Water	
<input type="checkbox"/> DoD <input type="checkbox"/> NPDES	
Project Locations	
<input type="checkbox"/> Detroit <input type="checkbox"/> New York	
<input type="checkbox"/> Other	
Special Instructions	
* E903.1 Mod.	
** E904.0/SW 9320 Mod.	
	Please use calculation product & provide Radium 226/228 combined results on the report
	(No Ice needed)
	** Subcontracted to
	GEL Laboratories, Inc.
	2040 Savage Road
	Charleston, SC 29407

RELINQUISHED BY: [Signature] DATE: 4/18/22 TIME: 1700  
 RECEIVED BY: [Signature] DATE: 4/18/22 TIME: 1706  
 SEAL NO. [ ] INITIALS [ ]

RELINQUISHED BY: [Signature] DATE: [ ] TIME: [ ]  
 RECEIVED BY: [Signature] DATE: [ ] TIME: [ ]  
 SEAL NO. [ ] INITIALS [ ]

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

DS

SAMPLE RECEIPT & REVIEW FORM

Client: <u>MERI</u>		SDG/AR/COC/Work Order: <u>577105</u>	
Received By: <u>BE</u>		Date Received: <u>4-20-22</u>	
Carrier and Tracking Number		FedEx Express    FedEx Ground <u>UPS</u> Field Services    Courier    Other <u>1Z 466 477 03 6117 0582</u>	
Suspected Hazard Information		Yes	No
		*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.	
A) Shipped as a DOT Hazardous?			Hazard Class Shipped: _____ UN#: _____ If UN2910, Is the Radioactive Shipment Survey Compliant? Yes ___ No ___
B) Did the client designate the samples are to be received as radioactive?			COC notation or radioactive stickers on containers equal client designation.
C) Did the RSO classify the samples as radioactive?			Maximum Net Counts Observed* (Observed Counts - Area Background Counts): <u>0</u> CPM /mR/Hr Classified as: Rad 1    Rad 2    Rad 3
D) Did the client designate samples are hazardous?			COC notation or hazard labels on containers equal client designation.
E) Did the RSO identify possible hazards?			If D or E is yes, select Hazards below. PCB's    Flammable    Foreign Soil    RCRA    Asbestos    Beryllium    Other: _____
Sample Receipt Criteria		Yes	NA
		No	
1	Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
		Circle Applicable:    Seals broken    Damaged container    Leaking container    Other (describe)	
2	Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
		Circle Applicable:    Client contacted and provided COC    COC created upon receipt	
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*	<input checked="" type="checkbox"/>	<input type="checkbox"/>
		Preservation Method: Wet Ice    Ice Packs    Dry Ice <u>None</u> Other: _____ *all temperatures are recorded in Celsius    TEMP: <u>21</u>	
4	Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
		Temperature Device Serial #: <u>IR2-21</u> Secondary Temperature Device Serial # (If Applicable): _____	
5	Sample containers intact and sealed?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
		Circle Applicable:    Seals broken    Damaged container    Leaking container    Other (describe)	
6	Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
		Sample ID's and Containers Affected: _____ If Preservation added, Lot#: _____	
7	Do any samples require Volatile Analysis?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
		If Yes, are Encores or Soil Kits present for solids? Yes ___ No ___ NA ___ (If yes, take to VOA Freezer) Do liquid VOA vials contain acid preservation? Yes ___ No ___ NA ___ (If unknown, select Nc) Are liquid VOA vials free of headspace? Yes ___ No ___ NA ___ Sample ID's and containers affected: _____	
8	Samples received within holding time?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
		ID's and tests affected: _____	
9	Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
		ID's and containers affected: _____	
10	Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
		Circle Applicable:    No dates on containers    No times on containers    COC missing info    Other (describe)	
11	Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
		Circle Applicable:    No container count on COC    Other (describe)	
12	Are sample containers identifiable as GEL provided by use of GEL labels?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
13	COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
		Circle Applicable:    Not relinquished    Other (describe)	
Comments (Use Continuation Form if needed):			

PM (or PMA) review: Initials NPL Date 4/22/22 Page 1 of 1

# Laboratory Certifications



**List of current GEL Certifications as of 13 May 2022**

<b>State</b>	<b>Certification</b>
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122022-4
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2019-165
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122021-36
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

# **Radiological Analysis**

# Case Narrative

**Radiochemistry**  
**Technical Case Narrative**  
**Merit Laboratories, Inc.**  
**SDG #: S34962**  
**Work Order #: 577105**

**Product:** Radium-226+Radium-228 Calculation

**Analytical Method:** Calculation

**Analytical Procedure:** GL-RAD-D-003 REV# 44

**Analytical Batch:** 2260481

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
577105001	S34962.01
577105002	S34962.02
577105003	S34962.03
577105004	S34962.04 (Field Dupe)
577105005	S34962.05 (Field Blank)

**Data Summary:**

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

**Product:** GFPC Ra228, Liquid

**Analytical Method:** EPA 904.0/SW846 9320 Modified

**Analytical Procedure:** GL-RAD-A-063 REV# 5

**Analytical Batch:** 2260482

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
577105001	S34962.01
577105002	S34962.02
577105003	S34962.03
577105004	S34962.04 (Field Dupe)
577105005	S34962.05 (Field Blank)
1205080050	Method Blank (MB)
1205080051	577105001(S34962.01) Sample Duplicate (DUP)
1205080052	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where

applicable, with the following exceptions.

### **Technical Information**

#### **Recounts**

Sample 1205080052 (LCS) was recounted due to high recovery. The recount is reported. Sample 577105004 (S34962.04 (Field Dupe)) was recounted due to results more negative than the three sigma TPU. The second count is reported.

#### **Product: Lucas Cell, Ra226, Liquid**

**Analytical Method:** EPA 903.1 Modified

**Analytical Procedure:** GL-RAD-A-008 REV# 15

**Analytical Batch:** 2260455

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
577105001	S34962.01
577105002	S34962.02
577105003	S34962.03
577105004	S34962.04 (Field Dupe)
577105005	S34962.05 (Field Blank)
1205079967	Method Blank (MB)
1205079968	577105001(S34962.01) Sample Duplicate (DUP)
1205079970	577105001(S34962.01) Matrix Spike (MS)
1205079972	577512003(NonSDG) Matrix Spike Duplicate (MSD)
1205079973	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

#### **Data Summary:**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

#### **Miscellaneous Information**

##### **Additional Comments**

The matrix spike and matrix spike duplicate, 1205079970 (S34962.01MS) and 1205079972 (Non SDG 577512003MSD), aliquots were reduced to conserve sample volume.

#### **Certification Statement**

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

## GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

### Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S34962 GEL Work Order: 577105

#### The Qualifiers in this report are defined as follows:

- \* A quality control analyte recovery is outside of specified acceptance criteria
- \*\* Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

#### Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature: 

Name: Kenshalla Oston

Date: 17 MAY 2022

Title: Analyst I

# Sample Data Summary

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: May 17, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

Client Sample ID: S34962.01	Project: MERI00120
Sample ID: 577105001	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 14-APR-22 11:45	
Receive Date: 20-APR-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.872	+/-1.24	2.13	3.00	pCi/L			JXC9	05/12/22	1018 2260482	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.31	+/-1.26			pCi/L		1	TON1	05/13/22	1237 2260481	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.439	+/-0.228	0.210	1.00	pCi/L			LXP1	05/12/22	0843 2260455	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			58.3	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit



# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: May 17, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

Client Sample ID: S34962.02	Project: MERI00120
Sample ID: 577105002	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 14-APR-22 13:30	
Receive Date: 20-APR-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228		3.09	+/-1.43	2.08	3.00	pCi/L			JXC9	05/12/22	1018 2260482	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		3.65	+/-1.45			pCi/L		1	TON1	05/13/22	1237 2260481	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.566	+/-0.267	0.284	1.00	pCi/L			LXP1	05/12/22	0843 2260455	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			76.3	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: May 17, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Lavery  
 Project: Routine Analysis

Client Sample ID: S34962.03	Project: MERI00120
Sample ID: 577105003	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 14-APR-22 09:32	
Receive Date: 20-APR-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.116	+/-0.983	1.83	3.00	pCi/L			JXC9	05/12/22	1019 2260482	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.380	+/-1.01			pCi/L		1	TON1	05/13/22	1237 2260481	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.264	+/-0.219	0.325	1.00	pCi/L			LXP1	05/12/22	0843 2260455	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			75.8	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: May 17, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
 East Lansing, Michigan 48823  
 Contact: John Lavery  
 Project: Routine Analysis

Client Sample ID: S34962.04 (Field Dupe)	Project: MERI00120
Sample ID: 577105004	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 14-APR-22 11:45	
Receive Date: 20-APR-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	0.428	+/-0.971	1.74	3.00	pCi/L			JXC9	05/12/22	1136	2260482	1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		0.948	+/-0.997			pCi/L		1	TON1	05/13/22	1237	2260481	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.520	+/-0.230	0.217	1.00	pCi/L			LXP1	05/12/22	0843	2260455	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			81.5	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: May 17, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

Client Sample ID: S34962.05 (Field Blank)	Project: MERI00120
Sample ID: 577105005	Client ID: MERI001
Matrix: Water	
Collect Date: 14-APR-22 08:20	
Receive Date: 20-APR-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.346	+/-1.47	2.63	3.00	pCi/L			JXC9	05/12/22	1019 2260482	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.948	+/-1.50			pCi/L		1	TON1	05/13/22	1237 2260481	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.602	+/-0.284	0.303	1.00	pCi/L			LXP1	05/12/22	0915 2260455	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			71.8	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# Quality Control Summary

# GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

## QC Summary

Report Date: May 17, 2022

Page 1 of 2

**Merit Laboratories Inc.**  
**2680 East Lansing Drive**  
**East Lansing, Michigan**

**Contact: John Laverty**

**Workorder: 577105**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Rad Gas Flow</b>											
Batch	2260482										
QC1205080051	577105001	DUP									
Radium-228	U	0.872	U	1.26	pCi/L	N/A		N/A	JXC9	05/12/22	10:18
	Uncertainty	+/-1.24		+/-1.33							
QC1205080052	LCS										
Radium-228	45.8			56.9	pCi/L		124	(75%-125%)		05/12/22	11:36
	Uncertainty			+/-4.33							
QC1205080050	MB										
Radium-228			U	0.0349	pCi/L					05/12/22	10:18
	Uncertainty			+/-0.979							
<b>Rad Ra-226</b>											
Batch	2260455										
QC1205079968	577105001	DUP									
Radium-226			U	0.354	pCi/L	21.5		(0% - 100%)	LXP1	05/12/22	10:51
	Uncertainty	+/-0.228		+/-0.256							
QC1205079973	LCS										
Radium-226	26.4			24.8	pCi/L		94.2	(75%-125%)		05/12/22	10:51
	Uncertainty			+/-1.55							
QC1205079967	MB										
Radium-226			U	0.252	pCi/L					05/12/22	09:48
	Uncertainty			+/-0.242							
QC1205079970	577105001	MS									
Radium-226	131	0.439		114	pCi/L		86.9	(75%-125%)		05/12/22	10:51
	Uncertainty	+/-0.228		+/-7.38							
QC1205079972	577512003	MSD									
Radium-226	131	0.272		113	pCi/L	11.2	86	(0%-20%)		05/12/22	10:51
	Uncertainty	+/-0.199		+/-7.37							

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- \*\* Analyte is a Tracer compound
- < Result is less than value reported
- > Result is greater than value reported

# GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

## QC Summary

Workorder: 577105

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Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
BD											
Results are either below the MDC or tracer recovery is low											
FA											
Failed analysis.											
H											
Analytical holding time was exceeded											
J											
See case narrative for an explanation											
J											
Value is estimated											
K											
Analyte present. Reported value may be biased high. Actual value is expected to be lower.											
L											
Analyte present. Reported value may be biased low. Actual value is expected to be higher.											
M											
M if above MDC and less than LLD											
M											
REMP Result > MDC/CL and < RDL											
N/A											
RPD or %Recovery limits do not apply.											
NI											
See case narrative											
ND											
Analyte concentration is not detected above the detection limit											
NJ											
Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier											
Q											
One or more quality control criteria have not been met. Refer to the applicable narrative or DER.											
R											
Sample results are rejected											
U											
Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.											
UI											
Gamma Spectroscopy--Uncertain identification											
UJ											
Gamma Spectroscopy--Uncertain identification											
UL											
Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.											
X											
Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier											
Y											
Other specific qualifiers were required to properly define the results. Consult case narrative.											
^											
RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.											
h											
Preparation or preservation holding time was exceeded											

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where the duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

\* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

# Gas Flow Raw Data



# Batch 2260482 Check-list

This check-list was completed on 13-MAY-22 by Rhonda Birch

This batch was reviewed by Kenshalla Oston on 13-MAY-22 and Rhonda Birch on 13-MAY-22.

**Batch ID:**  
2260482

**Product:**  
GFC28RAL

**Description:** Gas Flow Radium 228  
GL-RAD-A-063

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
11	Has the method required detection limit been met?	Yes		
<b>Miscellaneous Information</b>				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

# Prep Logbook

## Radium-228 in Liquid

**Batch ID:** 2260482

**Analyst:** Jasmine Conley (JXC9)

**Method:** EPA 904.0/SW846 9320 Modified

**Lab SOP:** GL-RAD-A-063 REV# 5

**Instrument:** LUCAS-C037036045

**Due Dates for Lab:** 15-MAY-2022

**Package:** 17-MAY-2022

**SDG:** 18-MAY-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205080052	Radium-228	1965-C	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	577105001	05-MAY-2022	3	301.46	301.46	05/06/22 16:08	05/12/22 08:35
2	577105002	05-MAY-2022	3	305	305	05/06/22 16:08	05/12/22 08:35
3	577105003	05-MAY-2022	3	304.24	304.24	05/06/22 16:08	05/12/22 08:35
4	577105004	05-MAY-2022	3	306.09	306.09	05/06/22 16:08	05/12/22 08:35
5	577105005	05-MAY-2022	3	304.53	304.53	05/06/22 16:08	05/12/22 08:35
6	577640001	05-MAY-2022	3	303.11	303.11	05/06/22 16:08	05/12/22 08:35
7	577640002	05-MAY-2022	3	300.28	300.28	05/06/22 16:08	05/12/22 08:35
8	577640003	05-MAY-2022	3	302.02	302.02	05/06/22 16:08	05/12/22 08:35
9	577640004	05-MAY-2022	3	302.84	302.84	05/06/22 16:08	05/12/22 08:35
10	577641001	05-MAY-2022	3	300.49	300.49	05/06/22 16:08	05/12/22 08:35
11	1205080050 MB	05-MAY-2022	3		306.09	05/06/22 16:08	05/12/22 08:35
12	1205080051 DUP (577105001)	05-MAY-2022	3	301.62	301.62	05/06/22 16:08	05/12/22 08:35
13	1205080052 LCS	05-MAY-2022	3		306.09	05/06/22 16:08	05/12/22 08:35

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1951-C	Barium-133	.1 mL	Pipet Id: RAD-GFC-1795419 Data Entry Date2: 05-MAY-2022 00:00
REGNT 3411398	Barium Carrier Ra228 REG	1 mL	
REGNT 3413388	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3413919	RGF-50% Potassium Carbonate	2 mL	
REGNT 3417468	RGF-1M Citric Acid	5 mL	
REGNT 3418268.2	29M HF (48-50%)	4 mL	
REGNT 3424040	7M Nitric Acid	25 mL	
REGNT 3424228	RGF-Neodymium Subtrate	5 mL	
REGNT 3424307	RGF-1.5M Ammonium Sulfate	10 mL	
REGNT 3424651.3	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	
REGNT 3426198	2M HCl	20 mL	
REGNT 3431618.7	Nitric Acid	5 mL	
REGNT 3432370	Test batches: 2259234	2 g	

### Radium-228 Liquid

Filename : RA228.XLS  
 File type : Excel  
 Version # : 1.4.2

Tracer S/N : 1951-C  
 Tracer Exp Date : 9/16/2022  
 Tracer Volume Added: 0.10

Batch : 2260482  
 Analyst : JAS02031  
 Prep Date : 5/5/2022  
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL  
 Parmname : Radium-228  
 Required MDA : 3 pCi/L  
 Ra-228 Abundance : 1.00  
 Halflife of Ra-228 : 5.75 years  
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	577105001.1	0.3015	1.8484E-05	4/14/2022 11:45	1401.2	1.54%	816.5	2.02%	0.1	0.000200
2	577105002.1	0.3050	1.8543E-05	4/14/2022 13:30	1401.2	1.54%	1069.1	1.77%	0.1	0.000200
3	577105003.1	0.3042	1.8530E-05	4/14/2022 9:32	1401.2	1.54%	1061.6	1.77%	0.1	0.000200
4	577105004.1	0.3061	1.8561E-05	4/14/2022 11:45	1401.2	1.54%	1142.2	1.71%	0.1	0.000200
5	577105005.1	0.3045	1.8535E-05	4/14/2022 8:20	1401.2	1.54%	1005.9	1.82%	0.1	0.000200
6	577640001.1	0.3031	1.8511E-05	4/21/2022 11:58	1401.2	1.54%	1052.7	1.78%	0.1	0.000200
7	577640002.1	0.3003	1.8464E-05	4/21/2022 11:58	1401.2	1.54%	1073.7	1.76%	0.1	0.000200
8	577640003.1	0.3020	1.8493E-05	4/21/2022 8:50	1401.2	1.54%	1137.5	1.71%	0.1	0.000200
9	577640004.1	0.3028	1.8507E-05	4/21/2022 9:00	1401.2	1.54%	1050.1	1.78%	0.1	0.000200
10	577641001.1	0.3005	1.8467E-05	4/21/2022 10:37	1401.2	1.54%	1089.9	1.75%	0.1	0.000200
11	1205080050.1	0.3061	1.8561E-05	5/5/2022 0:00	1401.2	1.54%	772.3	2.08%	0.1	0.000200
12	1205080051.1	0.3016	1.8486E-05	4/14/2022 11:45	1401.2	1.54%	1007.9	1.82%	0.1	0.000200
13	1205080052.1	0.3061	1.8561E-05	5/5/2022 0:00	1401.2	1.54%	1021.9	1.81%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063  
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated	Sample
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction	Recovery %	Recovery Error %
			Alpha	Beta										
1	1B	60	4	51	0.850	5/12/2022 10:18	5/6/2022 16:08	5/12/2022 8:35	0.991	0.823	1.000	1.057	58.3%	1.30%
2	1D	60	3	122	2.033	5/12/2022 10:18	5/6/2022 16:08	5/12/2022 8:35	0.991	0.823	1.000	1.057	76.3%	1.21%
3	2B	60	8	52	0.867	5/12/2022 10:19	5/6/2022 16:08	5/12/2022 8:35	0.991	0.822	1.000	1.057	75.8%	1.21%
4	1B	60	6	47	0.783	5/12/2022 11:36	5/6/2022 16:08	5/12/2022 8:35	0.991	0.712	1.000	1.057	81.5%	1.18%
5	2D	60	5	105	1.750	5/12/2022 10:19	5/6/2022 16:08	5/12/2022 8:35	0.991	0.822	1.000	1.057	71.8%	1.23%
6	3B	60	6	52	0.867	5/12/2022 10:19	5/6/2022 16:08	5/12/2022 8:35	0.993	0.822	1.000	1.057	75.1%	1.21%
7	3C	60	5	81	1.350	5/12/2022 10:19	5/6/2022 16:08	5/12/2022 8:35	0.993	0.822	1.000	1.057	76.6%	1.20%
8	3D	60	6	46	0.767	5/12/2022 10:19	5/6/2022 16:08	5/12/2022 8:35	0.993	0.822	1.000	1.057	81.2%	1.18%
9	4B	60	7	67	1.117	5/12/2022 10:19	5/6/2022 16:08	5/12/2022 8:35	0.993	0.822	1.000	1.057	74.9%	1.21%
10	4C	60	12	42	0.700	5/12/2022 10:19	5/6/2022 16:08	5/12/2022 8:35	0.993	0.822	1.000	1.057	77.8%	1.20%
11	5A	60	14	31	0.517	5/12/2022 10:18	5/6/2022 16:08	5/12/2022 8:35	0.998	0.823	1.000	1.057	55.1%	1.32%
12	5B	60	9	92	1.533	5/12/2022 10:18	5/6/2022 16:08	5/12/2022 8:35	0.991	0.823	1.000	1.057	71.9%	1.23%
13	1D	60	21	809	13.483	5/12/2022 11:36	5/6/2022 16:08	5/12/2022 8:35	0.998	0.712	1.000	1.057	72.9%	1.22%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2021	5/31/2022	0.6409	0.00711	0.682	5/7/2022 11:36	1000
2	PIC	6/1/2021	5/31/2022	0.6466	0.00692	1.238	5/7/2022 11:36	1000
3	PIC	6/1/2021	5/31/2022	0.6248	0.02111	0.838	5/7/2022 11:36	1000
4	PIC	6/1/2021	5/31/2022	0.6409	0.00711	0.682	5/7/2022 11:36	1000
5	PIC	6/1/2021	5/31/2022	0.6254	0.00745	1.669	5/7/2022 11:36	1000
6	PIC	6/1/2021	5/31/2022	0.6428	0.01614	0.563	5/7/2022 11:36	1000
7	PIC	6/1/2021	5/31/2022	0.6497	0.00988	1.034	5/7/2022 11:36	1000
8	PIC	6/1/2021	5/31/2022	0.6259	0.02297	0.767	5/7/2022 11:36	1000
9	PIC	6/1/2021	5/31/2022	0.6421	0.01519	1.180	5/7/2022 11:37	1000
10	PIC	6/1/2021	5/31/2022	0.6681	0.00889	0.688	5/7/2022 11:37	1000
11	PIC	6/1/2021	5/31/2022	0.6571	0.00851	0.510	5/7/2022 11:37	1000
12	PIC	6/1/2021	5/31/2022	0.6506	0.00426	1.230	5/7/2022 11:37	1000
13	PIC	6/1/2021	5/31/2022	0.6466	0.00692	1.238	5/7/2022 11:36	1000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A  
 Spike Exp Date : N/A  
 Spike Activity (dpm/ml): N/A  
 Spike Volume Added: N/A

\* - RPD changed to 0% due to sample & dup activity below MDA

LCS S/N : 1965-C  
 LCS Exp Date : 8/5/2022  
 LCS Activity (dpm/ml): 311.25  
 LCS Volume Added: 0.10

Results Pos.	Decision	Critical	Required	Sample Act.		Sample Act.	Net Count	Net Count	2 SIGMA	2 SIGMA	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
	Level pCi/L	Level pCi/L	MDA pCi/L	MDA pCi/L	Conc. pCi/L	Error %	Rate CPM	Rate Error CPM	Counting Uncertainty pCi/L	Total Prop. Uncertainty pCi/L						
1	1.3275	0.9372	3	2.1340	<b>0.8720</b>	72.55%	0.1680	0.1219	1.2397	1.2587		SAMPLE				
2	1.3382	0.9448	3	2.0837	<b>3.0887</b>	23.61%	0.7953	0.1874	1.4266	1.6222		SAMPLE				
3	1.1507	0.8124	3	1.8277	<b>0.1163</b>	431.25%	0.0287	0.1236	0.9834	0.9839		SAMPLE				
4	1.0805	0.7629	3	1.7370	<b>0.4281</b>	115.67%	0.1013	0.1172	0.9706	0.9764		SAMPLE				
5	1.7108	1.2079	3	2.6295	<b>0.3464</b>	216.80%	0.0810	0.1756	1.4717	1.4743		SAMPLE				
6	0.9261	0.6539	3	1.5070	<b>1.2103</b>	40.39%	0.3037	0.1225	0.9570	1.0043		SAMPLE				
7	1.2292	0.8678	3	1.9308	<b>1.2334</b>	48.57%	0.3160	0.1534	1.1736	1.2136		SAMPLE				
8	1.0313	0.7281	3	1.6464	<b>-1.267E-03</b>	34914.61%	-0.0003	0.1164	0.8674	0.8675		SAMPLE				
9	1.3473	0.9512	3	2.1026	<b>-0.2536</b>	222.14%	-0.0633	0.1407	1.1043	1.1044		SAMPLE				
10	0.9603	0.6780	3	1.5428	<b>0.0449</b>	926.26%	0.0120	0.1112	0.8144	0.8145		SAMPLE				
11	1.1570	0.8169	3	1.8953	<b>0.0349</b>	1432.57%	0.0067	0.0955	0.9793	0.9795		MB				
12	1.4211	1.0033	3	2.2135	<b>1.2551</b>	53.97%	0.3033	0.1637	1.3272	1.3638	577105001.1	DUP	* 0.0%			
13	1.6018	1.1309	3	2.4943	<b>56.9242</b>	4.13%	12.2453	0.4754	4.3311	14.8781		LCS			45.8045	124.3%

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
577105001	1B	60	4	51	5/12/2022 10:18	5/12/2022 11:18	PIC	2260482
577105002	1D	60	3	122	5/12/2022 10:18	5/12/2022 11:18	PIC	2260482
577105003	2B	60	8	52	5/12/2022 10:19	5/12/2022 11:19	PIC	2260482
577105004	1B	60	6	47	5/12/2022 11:36	5/12/2022 12:36	PIC	2260482
577105005	2D	60	5	105	5/12/2022 10:19	5/12/2022 11:19	PIC	2260482
577640001	3B	60	6	52	5/12/2022 10:19	5/12/2022 11:19	PIC	2260482
577640002	3C	60	5	81	5/12/2022 10:19	5/12/2022 11:19	PIC	2260482
577640003	3D	60	6	46	5/12/2022 10:19	5/12/2022 11:19	PIC	2260482
577640004	4B	60	7	67	5/12/2022 10:19	5/12/2022 11:19	PIC	2260482
577641001	4C	60	12	42	5/12/2022 10:19	5/12/2022 11:19	PIC	2260482
1205080050	5A	60	14	31	5/12/2022 10:18	5/12/2022 11:18	PIC	2260482
1205080051	5B	60	9	92	5/12/2022 10:18	5/12/2022 11:18	PIC	2260482
1205080052	1D	60	21	809	5/12/2022 11:36	5/12/2022 12:36	PIC	2260482

ASSAY 12-May-22 16:24:49  
 Wizard 2480 s/n 46190630  
 Protocol id 9 Ba-133\_1  
 Time limit  
 Count limit  
 Isotope Ba-133\_1  
 Protocol date 5/12/2022  
 Run id. 5000

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	94	1	180	4204.28	1401.17	1.54	04:24:49
577105001	2	94	2	180	2450	816.49	2.02	58.27	04:28:03
577105002	3	94	3	180	3208	1069.12	1.77	76.30	04:31:17
577105003	4	94	4	180	3185.28	1061.55	1.77	75.76	04:34:31
577105004	5	94	5	180	3427.28	1142.21	1.71	81.52	04:37:45
577105005	1	5	1	180	3018.28	1005.88	1.82	71.79	04:41:21
577640001	2	5	2	180	3158.28	1052.65	1.78	75.13	04:44:35
577640002	3	5	3	180	3221.57	1073.65	1.76	76.63	04:47:49
577640003	4	5	4	180	3412.85	1137.5	1.71	81.18	04:51:03
577640004	5	5	5	180	3151	1050.13	1.78	74.95	04:54:17
577641001	1	3	1	180	3270.28	1089.88	1.75	77.78	04:57:52
1205080050	2	3	2	180	2317.28	772.34	2.08	55.12	05:01:06
1205080051	3	3	3	180	3024.28	1007.9	1.82	71.93	05:04:20
1205080052	4	3	4	180	3066	1021.89	1.81	72.93	05:07:34

END OF ASSAY



# **Continuing Calibration Data**

# Gas Flow Proportional Counter Checks for 12-May-2022

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z


Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100E2	Above	Beta bkg	12-May 03:29	60	2.683	1.386	3.015	+1.78
LB4100F3	Above	Alpha bkg	12-May 05:03	60	0.500	0.119	0.404	+5.03
LB4100G2	Above	Alpha eff	12-May 04:31	5	9663	7308	9581	+3.22
LB4100G2	Above	Beta bkg	12-May 03:29	60	3.333	1.159	2.203	+9.50
LB4100G3	Below	Alpha eff	12-May 04:31	5	6537	6620	7779	-3.43
LB4100G3	Above	Beta bkg	12-May 03:29	60	5.433	0.810	1.674	+29.11
LB4100H1	need 2nd	Alpha bkg	12-May 06:11	60	0.067	-5.70E-2	0.192	-0.02
PIC1A	Above	Beta bkg	12-May 06:06	60	2.200	-7.65E-1	2.862	+1.90
PIC1C	Above	Beta bkg	12-May 06:06	60	2.000	-4.43E-1	1.751	+3.68
PIC4A	Above	Beta bkg	12-May 06:06	60	2.633	0.750	2.058	+5.64
PIC4D	Above	Beta bkg	12-May 07:14	60	2.117	0.232	1.952	+3.57
PIC6A	Above	Beta bkg	12-May 05:04	60	2.083	0.669	2.752	+1.07
PIC6B	Above	Beta bkg	12-May 05:04	60	9.067	0.389	2.636	+20.17
PIC6C	Above	Beta bkg	12-May 05:04	60	7.300	0.415	2.299	+18.93
PIC8B	Above	Beta bkg	12-May 06:12	60	4.700	-1.80E-1	2.341	+8.61
PIC8C	Above	Beta bkg	12-May 06:13	60	2.033	-2.96E-1	2.115	+2.80
PIC8D	Above	Beta bkg	12-May 06:13	60	2.633	-1.07E-1	2.328	+3.75
PIC12D	Above	Beta bkg	12-May 06:29	60	2.517	0.003	2.352	+3.42
PIC14B	need 2nd	Alpha bkg	12-May 06:30	60	0.150	-1.04E-1	0.352	+0.34
PIC14B	Above	Beta bkg	12-May 06:30	60	24.700	-2.13E-1	2.672	+48.82

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

LB4100C1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

LB4100C4            Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
LB410011           Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
LB410012           Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
LB410013           Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
LB410014           Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by 

Date 5/12/22

GEL Laboratories LLC

# Runlogs

# Instrument Run Log

Instrument Type: GFPC

Batch ID: 2260482

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205080050	MB	JXC9	PIC5A	MAY-12-22 10:18:33	DONE	25mm Filter	01-JUN-21 00:00
1205080051	DUP	JXC9	PIC5B	MAY-12-22 10:18:37	DONE	25mm Filter	01-JUN-21 00:00
577105001	SAMPLE	JXC9	PIC1B	MAY-12-22 10:18:55	DONE	25mm Filter	01-JUN-21 00:00
577105002	SAMPLE	JXC9	PIC1D	MAY-12-22 10:18:55	DONE	25mm Filter	01-JUN-21 00:00
577105003	SAMPLE	JXC9	PIC2B	MAY-12-22 10:19:03	DONE	25mm Filter	01-JUN-21 00:00
577105005	SAMPLE	JXC9	PIC2D	MAY-12-22 10:19:10	DONE	25mm Filter	01-JUN-21 00:00
577640001	SAMPLE	JXC9	PIC3B	MAY-12-22 10:19:17	DONE	25mm Filter	01-JUN-21 00:00
577640002	SAMPLE	JXC9	PIC3C	MAY-12-22 10:19:21	DONE	25mm Filter	01-JUN-21 00:00
577640003	SAMPLE	JXC9	PIC3D	MAY-12-22 10:19:21	DONE	25mm Filter	01-JUN-21 00:00
577640004	SAMPLE	JXC9	PIC4B	MAY-12-22 10:19:28	DONE	25mm Filter	01-JUN-21 00:00
577641001	SAMPLE	JXC9	PIC4C	MAY-12-22 10:19:34	DONE	25mm Filter	01-JUN-21 00:00
1205080052	LCS	JXC9	PIC1D	MAY-12-22 11:36:05	DONE	25mm Filter	01-JUN-21 00:00
577105004	SAMPLE	JXC9	PIC1B	MAY-12-22 11:36:09	DONE	25mm Filter	01-JUN-21 00:00

# Lucas Cell Raw Data

# Batch 2260455 Check-list

This check-list was completed on 12-MAY-22 by Lyndsey Pace

This batch was reviewed by Lyndsey Pace on 12-MAY-22 and Elizabeth Krouse on 13-MAY-22.

**Batch ID:**  
2260455

**Product:**  
LUC26RAL

**Description:** Lucas Cell Radium 226  
GL-RAD-A-008

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences (RPD) between the MS and MSD recoveries within the acceptance limits?	Yes		
12	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
13	Has the method required detection limit been met?	Yes		
<b>Miscellaneous Information</b>				
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

# Prep Logbook

## Radium-226 in Liquid

**Batch ID:** 2260455

**Analyst:** Lyndsey Pace (LXP1)

**Method:** EPA 903.1 Modified

**Lab SOP:** GL-RAD-A-008 REV# 15

**Instrument:** LUCAS-C037036045

**Due Dates for Lab:** 14-MAY-2022

**Package:** 17-MAY-2022

**SDG:** 18-MAY-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205079973	Radium-226 SPIKE	1715-G	.1	mL
MS	1205079970	Radium-226 SPIKE	1715-G	.1	mL
MS	1205079971	Radium-226 SPIKE	1715-G	.1	mL
MSD	1205079972	Radium-226 SPIKE	1715-G	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	577105001	05-MAY-2022	1	501.2	501.2	05/05/22 11:33	504	05/12/22 06:04	05/12/22 08:43	1	17
2	577105002	05-MAY-2022	1	504.72	504.72	05/05/22 11:33	603	05/12/22 06:04	05/12/22 08:43	3	25
3	577105003	05-MAY-2022	1	503.63	503.63	05/05/22 11:33	706	05/12/22 06:04	05/12/22 08:43	4	14
4	577105004	05-MAY-2022	1	503.45	503.45	05/05/22 11:33	805	05/12/22 06:04	05/12/22 08:43	2	25
5	577105005	05-MAY-2022	1	500.87	500.87	05/05/22 11:33	105	05/12/22 06:30	05/12/22 09:15	3	25
6	577512001	05-MAY-2022	1	501.01	501.01	05/05/22 11:33	205	05/12/22 06:30	05/12/22 09:15	5	23
7	577512003	05-MAY-2022	1	508.61	508.61	05/05/22 11:33	406	05/12/22 06:30	05/12/22 09:48	2	12
8	577640001	05-MAY-2022	1	505.87	505.87	05/05/22 11:33	508	05/12/22 06:30	05/12/22 09:48	7	103
9	577640002	05-MAY-2022	1	501.65	501.65	05/05/22 11:33	607	05/12/22 06:30	05/12/22 09:48	8	42
10	577640003	05-MAY-2022	1	500.77	500.77	05/05/22 11:33	705	05/12/22 06:30	05/12/22 09:48	6	18
11	577640004	05-MAY-2022	1	502.85	502.85	05/05/22 11:33	804	05/12/22 06:30	05/12/22 09:48	8	11
12	577641001	05-MAY-2022	1	501.33	501.33	05/05/22 11:33	108	05/12/22 06:56	05/12/22 09:48	2	37
13	1205079967 MB	05-MAY-2022	1		508.61	05/05/22 11:33	208	05/12/22 06:56	05/12/22 09:48	7	17
14	1205079968 DUP (577105001)	05-MAY-2022	1	504.95	504.95	05/05/22 11:33	408	05/12/22 06:56	05/12/22 10:51	5	18
15	1205079969 DUP (577512003)	05-MAY-2022	1	504.75	504.75	05/05/22 11:33	506	05/12/22 06:56	05/12/22 10:51	5	17
16	1205079970 MS (577105001)	05-MAY-2022	1	102.48	102.48	05/05/22 11:33	608	05/12/22 06:56	05/12/22 10:51	3	927
17	1205079971 MS (577512003)	05-MAY-2022	1	102.63	102.63	05/05/22 11:33	703	05/12/22 06:56	05/12/22 10:51	7	1035
18	1205079972 MSD (577512003)	05-MAY-2022	1	102.48	102.48	05/05/22 11:33	801	05/12/22 06:56	05/12/22 10:51	5	913
19	1205079973 LCS	05-MAY-2022	1		508.61	05/05/22 11:33	107	05/12/22 07:23	05/12/22 10:51	3	989

Reagent/Solvent Lot ID	Description	Amount
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**Comments:**  
Data Entry Date2: 05-MAY-2022 00:00



### Radium-226 Liquid

Filename : RA226.XLS  
 File type : Excel  
 Version # : 1.3.2

Procedure Code : LUC26RAL  
 Parmname : Radium-226  
 Required MDA : 1 pCi/L  
 Halflife of Ra-226 : 1600 years  
 Ra-226 Abundance : 1.00  
 Halflife of Rn-222 : 3.8235 days

Batch : 2260455  
 Analyst : LIN01615  
 Prep Date : 5/5/2022  
 Ra-226 Method Uncertainty : 0.073648

Batch counted on : LUCAS CELL DETECTOR  
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Count Time (min.)	Cell Efficiency (cpm/dpm)
1	577105001.1	0.5012	2.0261E-05	4/14/2022 11:45	504	30	17	0.567	1	0.033	30	1.5780
2	577105002.1	0.5047	2.0275E-05	4/14/2022 13:30	603	30	25	0.833	3	0.100	30	1.6730
3	577105003.1	0.5036	2.0271E-05	4/14/2022 9:32	706	30	14	0.467	4	0.133	30	1.6340
4	577105004.1	0.5035	2.0270E-05	4/14/2022 11:45	805	30	25	0.833	2	0.067	30	1.9080
5	577105005.1	0.5009	2.0259E-05	4/14/2022 8:20	105	30	25	0.833	3	0.100	30	1.5830
6	577512001.1	0.5010	2.0260E-05	4/12/2022 8:28	205	30	23	0.767	5	0.167	30	1.6810
7	577512003.1	0.5086	2.0290E-05	4/13/2022 11:53	406	30	12	0.400	2	0.067	30	1.5760
8	577640001.1	0.5059	2.0280E-05	4/21/2022 11:58	508	30	103	3.433	7	0.233	30	1.7330
9	577640002.1	0.5017	2.0263E-05	4/21/2022 11:58	607	30	42	1.400	8	0.267	30	1.7080
10	577640003.1	0.5008	2.0259E-05	4/21/2022 8:50	705	30	18	0.600	6	0.200	30	1.7610
11	577640004.1	0.5029	2.0268E-05	4/21/2022 9:00	804	30	11	0.367	8	0.267	30	1.9050
12	577641001.1	0.5013	2.0261E-05	4/21/2022 10:37	108	30	37	1.233	2	0.067	30	1.5830
13	1205079967.1	0.5086	2.0290E-05	5/5/2022 0:00	208	30	17	0.567	7	0.233	30	1.6950
14	1205079968.1	0.5050	2.0276E-05	4/14/2022 11:45	408	30	18	0.600	5	0.167	30	1.5900
15	1205079969.1	0.5048	2.0275E-05	4/13/2022 11:53	506	30	17	0.567	5	0.167	30	1.7790
16	1205079970.1	0.1025	1.1521E-05	4/14/2022 11:45	608	30	927	30.900	3	0.100	30	1.7270
17	1205079971.1	0.1026	1.1530E-05	4/13/2022 11:53	703	30	1035	34.500	7	0.233	30	1.7360
18	1205079972.1	0.1025	1.1521E-05	4/13/2022 11:53	801	30	913	30.433	5	0.167	30	1.7180
19	1205079973.1	0.5086	2.0290E-05	5/5/2022 0:00	107	30	989	32.967	3	0.100	30	1.6990

Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008  
 Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrowth End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
8.500%	6/1/2021	5/31/2022	5/5/2022 11:33	5/12/2022 6:04	5/12/2022 8:43	0.707	0.980	1.002	1.000
5.500%	7/1/2021	6/30/2022	5/5/2022 11:33	5/12/2022 6:04	5/12/2022 8:43	0.707	0.980	1.002	1.000
6.400%	11/1/2021	10/31/2022	5/5/2022 11:33	5/12/2022 6:04	5/12/2022 8:43	0.707	0.980	1.002	1.000
7.400%	4/1/2022	3/31/2023	5/5/2022 11:33	5/12/2022 6:04	5/12/2022 8:43	0.707	0.980	1.002	1.000
0.500%	4/28/2022	4/30/2023	5/5/2022 11:33	5/12/2022 6:30	5/12/2022 9:15	0.708	0.979	1.002	1.000
2.800%	8/1/2021	7/31/2022	5/5/2022 11:33	5/12/2022 6:30	5/12/2022 9:15	0.708	0.979	1.002	1.000
2.800%	2/1/2022	1/31/2023	5/5/2022 11:33	5/12/2022 6:30	5/12/2022 9:48	0.708	0.975	1.002	1.000
2.600%	6/1/2021	5/31/2022	5/5/2022 11:33	5/12/2022 6:30	5/12/2022 9:48	0.708	0.975	1.002	1.000
4.600%	7/1/2021	6/30/2022	5/5/2022 11:33	5/12/2022 6:30	5/12/2022 9:48	0.708	0.975	1.002	1.000
3.000%	11/1/2021	10/31/2022	5/5/2022 11:33	5/12/2022 6:30	5/12/2022 9:48	0.708	0.975	1.002	1.000
9.900%	4/1/2022	3/31/2023	5/5/2022 11:33	5/12/2022 6:30	5/12/2022 9:48	0.708	0.975	1.002	1.000
2.800%	4/28/2022	4/30/2023	5/5/2022 11:33	5/12/2022 6:56	5/12/2022 9:48	0.709	0.979	1.002	1.000
2.600%	8/1/2021	7/31/2022	5/5/2022 11:33	5/12/2022 6:56	5/12/2022 9:48	0.709	0.979	1.002	1.000
1.200%	2/1/2022	1/31/2023	5/5/2022 11:33	5/12/2022 6:56	5/12/2022 10:51	0.709	0.971	1.002	1.000
8.200%	6/1/2021	5/31/2022	5/5/2022 11:33	5/12/2022 6:56	5/12/2022 10:51	0.709	0.971	1.002	1.000
7.400%	7/1/2021	6/30/2022	5/5/2022 11:33	5/12/2022 6:56	5/12/2022 10:51	0.709	0.971	1.002	1.000
5.000%	11/1/2021	10/31/2022	5/5/2022 11:33	5/12/2022 6:56	5/12/2022 10:51	0.709	0.971	1.002	1.000
5.000%	4/1/2022	3/31/2023	5/5/2022 11:33	5/12/2022 6:56	5/12/2022 10:51	0.709	0.971	1.002	1.000
3.900%	4/28/2022	4/30/2023	5/5/2022 11:33	5/12/2022 7:23	5/12/2022 10:51	0.710	0.974	1.002	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

**Spike S/N :** 1715-G  
**Spike Exp Date :** 9/15/2022  
**Spike Activity (dpm/ml):** 297.54  
**Spike Volume Added:** 0.10

**LCS S/N :** 1715-G  
**LCS Exp Date :** 9/15/2022  
**LCS Activity (dpm/ml):** 297.54  
**LCS Volume Added:** 0.10

<b>Results</b>																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.0904	0.0639	1	0.2101	<b>0.4392</b>	27.85%	0.5333	0.1414	0.2282	0.2479		SAMPLE				
2	0.1467	0.1036	1	0.2843	<b>0.5656</b>	24.67%	0.7333	0.1764	0.2666	0.2854		SAMPLE				
3	0.1738	0.1227	1	0.3246	<b>0.2638</b>	42.91%	0.3333	0.1414	0.2194	0.2251		SAMPLE				
4	0.1053	0.0744	1	0.2165	<b>0.5198</b>	23.77%	0.7667	0.1732	0.2302	0.2536		SAMPLE				
5	0.1562	0.1103	1	0.3026	<b>0.6020</b>	24.06%	0.7333	0.1764	0.2838	0.2969		SAMPLE				
6	0.1898	0.1340	1	0.3453	<b>0.4637</b>	29.53%	0.6000	0.1764	0.2672	0.2766		SAMPLE				
7	0.1267	0.0894	1	0.2604	<b>0.2718</b>	37.52%	0.3333	0.1247	0.1993	0.2037		SAMPLE				
8	0.2166	0.1530	1	0.3805	<b>2.3856</b>	11.23%	3.2000	0.3496	0.5108	0.6280		SAMPLE				
9	0.2370	0.1673	1	0.4109	<b>0.8645</b>	21.30%	1.1333	0.2357	0.3524	0.3819		SAMPLE				
10	0.1994	0.1408	1	0.3557	<b>0.2965</b>	40.93%	0.4000	0.1633	0.2372	0.2417		SAMPLE				
11	0.2120	0.1496	1	0.3675	<b>0.0682</b>	145.63%	0.1000	0.1453	0.1943	0.1950		SAMPLE				
12	0.1273	0.0899	1	0.2618	<b>0.9564</b>	18.06%	1.1667	0.2082	0.3345	0.3656		SAMPLE				
13	0.2193	0.1548	1	0.3851	<b>0.2515</b>	49.06%	0.3333	0.1633	0.2415	0.2446		MB				
14	0.2006	0.1416	1	0.3649	<b>0.3539</b>	36.91%	0.4333	0.1599	0.2559	0.2611	577105001.1	DUP	21.5%			
15	0.1794	0.1266	1	0.3263	<b>0.2921</b>	39.94%	0.4000	0.1563	0.2238	0.2325	577512003.1	DUP	7.2%			
16	0.7049	0.4976	1	1.3658	<b>114.1177</b>	8.10%	30.8000	1.0165	7.3821	24.4910	577105001.1	MS			130.7863	86.9%
17	1.0696	0.7551	1	1.8783	<b>126.1195</b>	5.90%	34.2667	1.0760	7.7621	23.3334	577512003.1	MS			130.5953	96.4%
18	0.9148	0.6458	1	1.6641	<b>112.7293</b>	6.01%	30.2667	1.0100	7.3727	21.0047	577512003.1	MSD	11.2%		130.7865	86.0%
19	0.1437	0.1014	1	0.2784	<b>24.8210</b>	5.04%	32.8667	1.0499	1.5540	4.3419		LCS			26.3515	94.2%

# **Continuing Calibration Data**



# Ludlum Alpha Scintillation Counter Checks for 12-MAY-2022

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	06:58	1	1.20E+05	119745	-2.75		
LUCAS2	EFF	06:53	1	1.34E+05	134417	2.18		
LUCAS4	EFF	06:46	1	1.29E+05	128767	2.28		
LUCAS5	EFF	06:43	1	1.31E+05	130894	1.13		
LUCAS6	EFF	06:38	1	1.31E+05	131204	0.39		
LUCAS7	EFF	06:35	1	1.34E+05	134151	1.83		
LUCAS8	EFF	06:33	1	1.24E+05	124325	-0.65		

**Reviewed by:**

Lyndsey Pace

**Date:** 12-MAY-22

GEL Laboratories LLC

# Runlogs

# Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2260455

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
577105001	SAMPLE	LXP1	LUCAS5	MAY-12-22 08:43:00	DONE	Lucas Cell	01-JUN-21 00:01
577105002	SAMPLE	LXP1	LUCAS6	MAY-12-22 08:43:00	DONE	Lucas Cell	01-JUL-21 00:00
577105003	SAMPLE	LXP1	LUCAS7	MAY-12-22 08:43:00	DONE	Lucas Cell	01-NOV-21 00:00
577105004	SAMPLE	LXP1	LUCAS8	MAY-12-22 08:43:00	DONE	Lucas Cell	01-APR-22 00:00
577105005	SAMPLE	LXP1	LUCAS1	MAY-12-22 09:15:00	DONE	Lucas Cell	28-APR-22 00:00
577512001	SAMPLE	LXP1	LUCAS2	MAY-12-22 09:15:00	DONE	Lucas Cell	01-AUG-21 00:00
577512003	SAMPLE	LXP1	LUCAS4	MAY-12-22 09:48:00	DONE	Lucas Cell	01-FEB-22 00:00
577640001	SAMPLE	LXP1	LUCAS5	MAY-12-22 09:48:00	DONE	Lucas Cell	01-JUN-21 00:01
577640002	SAMPLE	LXP1	LUCAS6	MAY-12-22 09:48:00	DONE	Lucas Cell	01-JUL-21 00:00
577640003	SAMPLE	LXP1	LUCAS7	MAY-12-22 09:48:00	DONE	Lucas Cell	01-NOV-21 00:00
577640004	SAMPLE	LXP1	LUCAS8	MAY-12-22 09:48:00	DONE	Lucas Cell	01-APR-22 00:00
577641001	SAMPLE	LXP1	LUCAS1	MAY-12-22 09:48:00	DONE	Lucas Cell	28-APR-22 00:00
1205079967	MB	LXP1	LUCAS2	MAY-12-22 09:48:00	DONE	Lucas Cell	01-AUG-21 00:00
1205079968	DUP	LXP1	LUCAS4	MAY-12-22 10:51:00	DONE	Lucas Cell	01-FEB-22 00:00
1205079969	DUP	LXP1	LUCAS5	MAY-12-22 10:51:00	DONE	Lucas Cell	01-JUN-21 00:01
1205079970	MS	LXP1	LUCAS6	MAY-12-22 10:51:00	DONE	Lucas Cell	01-JUL-21 00:00
1205079971	MS	LXP1	LUCAS7	MAY-12-22 10:51:00	DONE	Lucas Cell	01-NOV-21 00:00
1205079972	MSD	LXP1	LUCAS8	MAY-12-22 10:51:00	DONE	Lucas Cell	01-APR-22 00:00
1205079973	LCS	LXP1	LUCAS1	MAY-12-22 10:51:00	DONE	Lucas Cell	28-APR-22 00:00



Environmental Laboratory  
1232 Haco Drive  
Lansing  
Michigan, 48910

**CHAIN OF CUSTODY**

Phone: (517)702-6372

Lab Work Order Number

L204045

Client Name BWL - Erickson Station		Project Name Erickson AM MI Wells 7B, 7C & 12B		Requested Analyses		Requested Turn Around	
Client Contact Cheryl Loudon		Project Number [none]		Radium 226 and Radium 228		Rush requests subject to additional charge.	
Address 3725 S. Canal		Project Description		ChC: FISE: SO4: TDS		Rush requests subject to lab approval	
City Lansing		PO Number 30926 10021		TSS, HCO3, CO3, Hardness			
State/Zip MI, 48917		Shipped By		Ag: As: B: Ba: Be: Ca: Cd: Cr: Co: Cu: Fe: Hg: Li: Mo: Ni: Pb: Sb: Se: Ti: V: Zn: Na: K: Mg			
Phone (517) 702-6396		Tracking Number					
Fax (517) 702-6373							
Sampler Marc Wahrer							

Sample Name or Field ID	Sampled Date	Sampled Time	Sample Type	Grab/Composite	Matrix Code	Container Count	Ag	As	Ba	Be	Ca	Cd	Cr	Co	Cu	Fe	Hg	Li	Mo	Ni	Pb	Sb	Se	Ti	V	Zn	Na	K	Mg	TSS, HCO3, CO3, Hardness	ChC: FISE: SO4: TDS	Radium 226 and Radium 228	Requested Turn Around	Sample	Comments	
MW-7B	4/14/22	1145	G	G	GW	5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2				
MW-7C		1330	G	G	GW	5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2				
MW-12B		0932	G	G	GW	5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2				
Field Duplicate MW-7B		1145	G	G	GW	5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2				
Field Blank		0820	G	G	DI	5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2				

Relinquished By 	Date/Time 4-14-22 1500	Received By Keferson	Date/Time 4/15/22 0725	Comments
Relinquished By	Date/Time	Received By	Date/Time	Comments
Relinquished By	Date/Time	Received By	Date/Time	Comments
Cooler Numbers and Temperatures				
Matrix Codes				

Di=Deionized Water, GW=Ground Water  
Preserv. Codes: a=None, b=0.5% HNO3



### Data Validation Checklist

Site Name: Erickson Personnel: M. Wahrer

Sample Date(s): 4/14/2022 Lab Drop-off Date(s): 4/15/2022

Lab Report Number: S34962.01(02)

Lab Report Date: 6/3/2022

Reason for Sample Event: Wells MW-7B, MW-7C, MW-12B

**Field Records:** Circle Yes/No unless Not Applicable – *Complete during sample event*

Item Description	Verification (Completeness)	Validation (Conformance to Specifications)
Field equipment calibration records	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Chain-of-Custody forms	<input checked="" type="radio"/> Yes / No	N/A
Field decontamination documentation	N/A	N/A
Sample collection field forms	<input checked="" type="radio"/> Yes / No	N/A
Drilling logs	<input checked="" type="radio"/> Yes / No	N/A
Well construction logs	<input checked="" type="radio"/> Yes / No	N/A
Well development field forms	<input checked="" type="radio"/> Yes / No	N/A

**Analytical Data Package:** Circle Yes/No unless N/A – *Complete when lab report is received*

Item Description	Verification (Completeness)	Validation (Conformance to Specifications)
Cover sheet (laboratory identifying information)	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Case narrative	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Internal laboratory Chain-of-Custody forms	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Sample chronology and consistency (that is, dates and times of receipt, preparation, and analysis)	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Communication records with laboratory	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
EDD format consistency	<input checked="" type="radio"/> Yes / No	N/A
Sample identification, results nomenclature, and data qualifier consistency	<input checked="" type="radio"/> Yes / No	N/A
RLs as requested; MDLs < RLs	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Instrument calibration records	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Laboratory Report	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Field QC sample results and calculation of accuracy and precision	<input checked="" type="radio"/> Yes / No Duplicate Well ID: MW-7B	<input checked="" type="radio"/> Yes / No Duplicate RPD: 0-20%

**Corrections Needed:** None; TSS for MW-12B was reported at a value between the MDL and RL. This result has been qualified as not detected above the RL (U).

On Case Narrative: "Sample 1205080052 (LCS) was recounted due to high recovery. The recount is reported. Sample 577105004 (S34962.04 (Field Dupe)) was recounted due to results more negative than the three sigma TPU. The second count is reported."



Lansing Board of Water and Light  
Environmental Services Laboratory (MI00079)  
1232 Haco Dr.  
Lansing, Michigan 48901

02 June 2022

BWL - Erickson Station  
Attn: Cheryl Loudon  
3725 S. Canal  
Lansing, MI 48917

**Project: Erickson AM MI**

Dear Cheryl Loudon,

Enclosed is a copy of the laboratory report for the following work order(s) received by Lansing Board of Water and Light Environmental Services Laboratory:

<b>Work Order</b>	<b>Received</b>	<b>Account Number</b>
L203075	4/28/2022 1:35:00PM	30926 10021

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in blue ink that reads "Jennifer Caporale".

Jennifer Caporale, Supervisor



### Analytical Report

**Client:** BWL - Erickson Station  
**Address:** 3725 S. Canal  
Lansing MI, 48917

**Client Project Manager:** Cheryl Louden

**Report Date:** 06/02/2022

**Sample Name:** MW-11B

**Lab #:** L203075-01 Ground Water

**Collected:** 28-Apr-22 12:45

**By:** Marc Wahrer

Analyte	Reporting		Units	Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit							
Conductivity	540	1.0	uS/cm	1		28-Apr-22 12:45	maw	SM 2510B	
Dissolved oxygen	11.7	0.100	mg/L	1		28-Apr-22 12:45	maw	FIELD	
gal/min	1.75		Gallons	1		28-Apr-22 12:45	maw	FIELD	
Oxidation Reduction Potential	228.0	-999.0	mV	1		28-Apr-22 12:45	maw	FIELD	
pH	8.0	7.0	pH Units	1		28-Apr-22 12:45	maw	SM 4500H+B	
Temperature	12		°C	1		28-Apr-22 12:45	maw	SM 2550B	
Turbidity	1.1	0.10	NTU	1		28-Apr-22 12:45	maw	SM 2130B	



### Analytical Report

**Client:** BWL - Erickson Station  
**Address:** 3725 S. Canal  
Lansing MI, 48917

**Client Project Manager:** Cheryl Louden

**Report Date:** 06/02/2022

**Approved By:** \_\_\_\_\_

#### Notes and Definitions

- AL Action Level (Action Level = Regulatory Limit)
  - MCL Maximum Contaminant Level
  - PEL Permissible Exposure Limit (Permissible Exposure Limit = Regulatory Limit)
  - RPD Relative Percent Difference
  - OT Odor Threshold
  - ND Non Detect is less than the reporting limit value
- All drinking water regulatory limits are MCL's with the exception of Lead and Copper unless otherwise noted.



Report ID: S35411.01(03)  
Generated on 06/02/2022  
Replaces report S35411.01(02) generated on 05/02/2022

**Report to**  
Attention: Jennifer Caporale  
Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901  
  
Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

**Report produced by**  
Merit Laboratories, Inc.  
2680 East Lansing Drive  
East Lansing, MI 48823  
  
Phone: (517) 332-0167 FAX: (517) 332-6333  
  
Contacts for report questions:  
John Lavery (johnlavery@meritlabs.com)  
Barbara Ball (bball@meritlabs.com)

**Report Summary**

Lab Sample ID(s): S35411.01-S35411.03  
Project: Erickson AM MI New Wells 11B  
Collected Date(s): 04/28/2022  
Submitted Date/Time: 04/28/2022 14:07  
Sampled by: Marc Wahrer  
P.O. #:

**Table of Contents**

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Maya Murshak  
Technical Director



## General Report Notes

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Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile, and 2-chloroethylvinyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (\*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

## Report Narrative

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All analyses completed



Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Alaska CSLAP	#17-001
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched





## Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1 (1993)
SM2320B	Standard Method 2320 B 2011
SM2340C	Standard Method 2340 C 2011
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007



## Sample Summary (3 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S35411.01	MW-11B L203075-01	Groundwater	04/28/22 12:45
S35411.02	Field Dupe MW-11B L203075-02	Groundwater	04/28/22 12:45
S35411.03	Field Blank L203075-03	Groundwater	04/28/22 12:40



# Analytical Laboratory Report

Final Report

Lab Sample ID: S35411.01

Sample Tag: MW-11B L203075-01

Collected Date/Time: 04/28/2022 12:45

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	4.3	IR
2	1L Plastic	None	Yes	4.3	IR
1	125ml Plastic	HNO3	Yes	4.3	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	04/29/22 10:00	JRH	
Metal Digestion	Completed	SW3015A	04/29/22 10:15	CCM	

### Inorganics

Method: E300.0, Run Date: 04/29/22 11:32, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 04/29/22 13:20, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	350	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 04/29/22 11:08, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	265	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 04/29/22 15:05, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	304	50	10	mg/L	2		

Method: SM2540D, Run Date: 04/28/22 19:20, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	1.7	3	1	mg/L	1		b

### Metals

Method: E200.8, Run Date: 04/29/22 12:11, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.003	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.081	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.62	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	

b-Value detected less than reporting limit, but greater than MDL



# Analytical Laboratory Report

Final Report

Lab Sample ID: S35411.01 (continued)

Sample Tag: MW-11B L203075-01

**Method: E200.8, Run Date: 04/29/22 12:11, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Iron	0.10	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.032	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 04/29/22 14:15, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	64.6	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	24.3	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	6.07	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	13.5	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 04/29/22 13:03, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 05/27/22 12:00, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Final Report

Lab Sample ID: S35411.02

Sample Tag: Field Dupe MW-11B L203075-02

Collected Date/Time: 04/28/2022 12:45

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	4.3	IR
2	1L Plastic	None	Yes	4.3	IR
1	125ml Plastic	HNO3	Yes	4.3	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	04/29/22 10:00	JRH	
Metal Digestion	Completed	SW3015A	04/29/22 10:15	CCM	

### Inorganics

Method: E300.0, Run Date: 04/29/22 11:45, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 04/29/22 13:22, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	350	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 04/29/22 11:12, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	265	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 04/29/22 15:05, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	294	50	10	mg/L	2		

Method: SM2540D, Run Date: 04/28/22 19:20, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	2.7	3	1	mg/L	1		b

### Metals

Method: E200.8, Run Date: 04/29/22 12:14, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.003	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.080	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.63	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	

b-Value detected less than reporting limit, but greater than MDL



# Analytical Laboratory Report

Final Report

Lab Sample ID: S35411.02 (continued)  
Sample Tag: Field Dupe MW-11B L203075-02

**Method: E200.8, Run Date: 04/29/22 12:14, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Iron	0.11	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.032	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 04/29/22 14:17, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	63.9	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	24.8	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	6.12	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	13.7	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 04/29/22 13:06, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 05/27/22 12:00, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Final Report

Lab Sample ID: S35411.03

Sample Tag: Field Blank L203075-03

Collected Date/Time: 04/28/2022 12:40

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	4.3	IR
2	1L Plastic	None	Yes	4.3	IR
1	125ml Plastic	HNO3	Yes	4.3	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	04/29/22 10:00	JRH	
Metal Digestion	Completed	SW3015A	04/29/22 10:15	CCM	

### Inorganics

Method: E300.0, Run Date: 04/29/22 12:24, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	2.5	0.04	mg/L	2.5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.06	mg/L	2.5	16984-48-8	
Sulfate	Not detected	2.5	0.15	mg/L	2.5	14808-79-8	

Method: SM2320B, Run Date: 04/29/22 13:24, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	Not detected	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 04/29/22 11:18, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	Not detected	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 04/29/22 15:05, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	10	50	10	mg/L	2		b

Method: SM2540D, Run Date: 04/28/22 19:20, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 04/29/22 11:50, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00102	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.000102	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.0000648	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.0000862	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.000702	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.0000760	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.0000386	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.0000434	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000150	mg/L	2	7440-50-8	

b-Value detected less than reporting limit, but greater than MDL



# Analytical Laboratory Report

Final Report

Lab Sample ID: S35411.03 (continued)

Sample Tag: Field Blank L203075-03

**Method: E200.8, Run Date: 04/29/22 11:50, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Iron	Not detected	0.02	0.000768	mg/L	2	7439-89-6	
Lead	Not detected	0.003	0.0000760	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000654	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.0000868	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000100	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.000838	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.0000270	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.0000342	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.0000558	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.000292	mg/L	2	7440-66-6	

**Method: E200.8, Run Date: 04/29/22 14:09, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.0174	mg/L	2	7440-70-2	
Magnesium	Not detected	0.50	0.00480	mg/L	2	7439-95-4	
Potassium	Not detected	0.50	0.00920	mg/L	2	7440-09-7	
Sodium	Not detected	0.50	0.00340	mg/L	2	7440-23-5	

**Method: E245.1, Run Date: 04/29/22 13:10, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 05/27/22 12:00, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Merit Laboratories Login Checklist

Lab Set ID:S35411

Attention: Jennifer Caporale  
Address: Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901

Client:BWL01 (Board of Water & Light)

Project: Erickson AM MI New Wells 11B

Submitted:04/28/2022 14:07 Login User: PFD

Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

Selection	Description	Note
-----------	-------------	------

## Sample Receiving

- |     |  |  |
|-----|--|--|
| 01. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples are received at 4C +/- 2C Thermometer # IR 4.3 |
| 02. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Received on ice/ cooling process begun                 |
| 03. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples shipped  |
| 04. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples left in 24 hr. drop box                        |
| 05. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Are there custody seals/tape or is the drop box locked |

## Chain of Custody

- |     |  |  |
|-----|--|--|
| 06. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC adequately filled out  |
| 07. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC signed and relinquished to the lab                                 |
| 08. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sample tag on bottles match COC  |
| 09. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Subcontracting needed? Subcontracted to: GEL - UPS# 1Z4664770363854269 |

## Preservation

- |     |  |   |
|-----|--|---|
| 10. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Do sample have correct chemical preservation        |
| 11. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Completed pH checks on preserved samples? (no VOAs) |
| 12. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Did any samples need to be preserved in the lab?    |

## Bottle Conditions

- |     |  |   |
|-----|--|---|
| 13. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | All bottles intact                            |
| 14. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Appropriate analytical bottles are used       |
| 15. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Merit bottles used                            |
| 16. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sufficient sample volume received             |
| 17. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples require laboratory filtration         |
| 18. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples submitted within holding time         |
| 19. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Do water VOC or TOX bottles contain headspace |

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: \_\_\_\_\_ Date: \_\_\_\_\_

# Merit Laboratories Bottle Preservation Check

Lab Set ID: S35411 Submitted: 04/28/2022 14:07

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI New Wells 11B

Initial Preservation Check: 04/28/2022 15:13 PFD

Preservation Recheck (E200.8): N/A

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental\_Laboratory@LBWL.com

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S35411.01	125ml Plastic HNO3	<2			
S35411.01	1L Plastic HNO3	<2			
S35411.01	1L Plastic HNO3	<2			
S35411.02	125ml Plastic HNO3	<2			
S35411.02	1L Plastic HNO3	<2			
S35411.02	1L Plastic HNO3	<2			
S35411.03	125ml Plastic HNO3	<2			
S35411.03	1L Plastic HNO3	<2			
S35411.03	1L Plastic HNO3	<2			



2680 East Lansing Dr., East Lansing, MI 48823  
 Phone (517) 332-0167 Fax (517) 332-4034  
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

**REPORT TO** **CHAIN OF CUSTODY RECORD** **INVOICE TO**

CONTACT NAME **Jennifer Caporale**  
 COMPANY **Lansing Board of Water and Light**  
 ADDRESS **PO Box 13007 48901-3007**  
 CITY **Lansing** STATE **Mi** ZIP CODE **48901**  
 PHONE NO. **517-702-6372** FAX NO. P.O. NO.  
 E-MAIL ADDRESS **Environmental\_Laboratory@lbwl.com** QUOTE NO.

CONTACT NAME **Kelly Gleason**  SAME  
 COMPANY  
 ADDRESS  
 CITY STATE ZIP CODE  
 PHONE NO. E-MAIL ADDRESS **Kelly.Gleason@lbwl.com**

PROJECT NO./NAME **Erickson AM MI Wells 11B** SAMPLER(S) - PLEASE PRINT/SIGN NAME **Marc Wahrer**  
 TURNAROUND TIME REQUIRED  1 DAY  2 DAYS  3 DAYS  STANDARD  OTHER **ASAP**  
 DELIVERABLES REQUIRED  STD  LEVEL II  LEVEL III  LEVEL IV  EDD  OTHER

MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID  
 SL=SLUDGE DW=DRINKING WATER O=OIL WP=WPE A=AIR W=WASTE

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	# Containers & Preservatives							Total Metals	F- undistilled, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	HCO3, CO3, Hardness	Certifications	Project Locations	Special Instructions
	DATE	TIME				NONE	HCl	HNO3	H2SO4	NiOH	MeOH	OTHER									
35411.01	04/28/22	1245	MW-11B L203075-01	GW	5	3	2											<input type="checkbox"/> OHIO VAP <input type="checkbox"/> Drinking Water	<input type="checkbox"/> Detroit <input type="checkbox"/> New York	Metals to analyse: Na, Mg, K	
.02	↓	1245	Field Dupe MW- 11B -02	GW	5	3	2											<input type="checkbox"/> DoD <input checked="" type="checkbox"/> NPDES		B, Ca, Sb, As, Ba, Be, Cd, Cr,	
.03	↓	1240	Field Blank -03	DI	5	3	2													Co, Li, Hg, Mo, Pb, Se, Tl, Fe, Cu, Ni, Ag, V, Zn	
																				Please send a preliminary report	

RELINQUISHED BY: *[Signature]*  Sampler DATE **4-28-22** TIME **1407**  
 RECEIVED BY: *[Signature]* DATE **4/28/22** TIME **1407**

RELINQUISHED BY: DATE TIME  
 RECEIVED BY: DATE TIME  
 SEAL NO. SEAL INTACT YES  NO  INITIALS  
 SEAL NO. SEAL INTACT YES  NO  INITIALS  
 NOTES: TEMP. ON ARRIVAL **4.3**

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

## Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.150
Be, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	2.5
Cl	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cr, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Fluoride	250 mL plastic	mg/L	None	9056	28 d	1.0
F	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Fe, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Pb, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Li, total	Mercury	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Hg, total	Molybdenum	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Mo, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	HNO3	SM 7500	6 mos	2.0 combined
RA226/228	Selenium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Se, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ag, total	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	10
SO4	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Tl, total	Total Dissolved Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TDS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540D	NA	3
TSS	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
V, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Zn, total							



May 27, 2022

John Laverty  
Merit Laboratories Inc.  
2680 East Lansing Drive  
East Lansing, Michigan 48823

Re: Routine Analysis  
Work Order: 578683  
SDG: S35411

Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on May 04, 2022. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at [www.gel.com](http://www.gel.com).

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,

Delaney Stone  
Project Manager

Purchase Order: GELP20-0018  
Enclosures



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# Case Narrative

**Receipt Narrative  
for  
Merit Laboratories, Inc.  
SDG: S35411  
Work Order: 578683**

**May 27, 2022**

**Laboratory Identification:**

GEL Laboratories LLC  
2040 Savage Road  
Charleston, South Carolina 29407  
(843) 556-8171

**Summary:**

**Sample receipt:** The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on May 04, 2022 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

**Sample Identification:** The laboratory received the following samples:

<b><u>Laboratory ID</u></b>	<b><u>Client ID</u></b>
578683001	S35411.01
578683002	S35411.02 Field Dupe
578683003	S35411.03 Field Blank

**Case Narrative:**

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.



Delaney Stone  
Project Manager



# **Chain of Custody and Supporting Documentation**



2680 East Lansing Dr., East Lansing, MI 48823  
 Phone (517) 332-0167 Fax (517) 332-4034  
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

578683

**REPORT TO**

CONTACT NAME Project Management Team

COMPANY Merit Laboratories

ADDRESS 2680 East Lansing Drive

CITY East Lansing

PHONE NO. 517-332-0167

E-MAIL ADDRESS results@meritlabs.com

**CHAIN OF CUSTODY RECORD**

CONTACT NAME Julie Teague

COMPANY Merit Laboratories

ADDRESS 2680 East Lansing Drive

CITY East Lansing

PHONE NO. 517-332-0167

E-MAIL ADDRESS juliet@meritlabs.com

STATE MI ZIP CODE 48823

**INVOICE TO**

BEARER

**ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)**

PROJECT NO./NAME S35411

TURNAROUND TIME REQUIRED  1 DAY  2 DAYS  3 DAYS  STANDARD  OTHER  
 DELIVERABLES REQUIRED  STD  LEVEL II  LEVEL III  LEVEL IV  EDD  OTHER

SAMPLER(S) - PLEASE PRINT/SIGN NAME

MERIT LAB NO. FOR LAB USE ONLY	YEAR	DATE	TIME	IDENTIFICATION-DESCRIPTION	MATRIX	# BOTTLES	# Containers & Preservatives			
							None	HO	HO	OTHER
	4/28/22	1245		S35411.01	GW	2	2			
	4/28/22	1245		S35411.02 Field Dupe	GW	2	2			
	4/28/22	1240		S35411.03 Field Blank	DI	2	2			

Certifications  
 OHIO VAP  Drinking Water  
 DoD  NPDES  
 Project Locations  
 Detroit  New York  
 Other \_\_\_\_\_  
 Special Instructions  
 \* E903.1 Mod.  
 \*\* E904.0/SW 9320 Mod.

Please use calculation product & provide Radium 226/228 combined results on the report

(No Ice needed)  
 \*\* Subcontracted to  
 GEL Laboratories, Inc.  
 2040 Savage Road  
 Charleston, SC 29407

RELINQUISHED BY: SIGNATURE/Organization <i>Tehanna Murray</i>	DATE 5/12/22	TIME 1700
RECEIVED BY: SIGNATURE/Organization <i>UPS</i>	DATE 5/12/22	TIME 1700
RELINQUISHED BY: SIGNATURE/Organization	DATE	TIME
RECEIVED BY: SIGNATURE/Organization	DATE	TIME

RELINQUISHED BY: SIGNATURE/Organization <i>Julie Teague</i>	DATE 5/12/22	TIME 1700
RECEIVED BY: SIGNATURE/Organization	DATE	TIME
RELINQUISHED BY: SIGNATURE/Organization	DATE	TIME
RECEIVED BY: SIGNATURE/Organization	DATE	TIME

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

05

**SAMPLE RECEIPT & REVIEW FORM**

Client: <b>MER I</b>		SDG/AR/COC/Work Order: <b>578683/578683</b>	
Received By: <b>DC</b>		Date Received: <b>5-4-11</b>	
Carrier and Tracking Number		FedEx Express    FedEx Ground <u>UPS</u> Field Services    Courier    Other <b>12466477 0363854269</b>	
Suspected Hazard Information		Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.			
A) Shipped as a DOT Hazardous?		Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
B) Did the client designate the samples are to be received as radioactive?		Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
C) Did the RSO classify the samples as radioactive?		Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
D) Did the client designate samples are hazardous?		Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
E) Did the RSO identify possible hazards?		Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
Sample Receipt Criteria		Yes	NA
Comments/Qualifiers (Required for Non-Conforming Items)			
1	Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Circle Applicable: Seals broken    Damaged container    Leaking container    Other (describe)			
2	Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Circle Applicable: Client contacted and provided COC    COC created upon receipt			
3	Samples requiring cold preservation within (0 < 6 deg. C)?*	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Preservation Method: Wet Ice    Ice Packs    Dry ice <u>None</u> Other: *all temperatures are recorded in Celsius    TEMP: <b>22°</b>			
4	Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Temperature Device Serial #: <b>IR2-22</b> Secondary Temperature Device Serial # (If Applicable):			
5	Sample containers intact and sealed?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Circle Applicable: Seals broken    Damaged container    Leaking container    Other (describe)			
6	Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Sample ID's and Containers Affected:			
If Preservation added, Lot#:			
7	Do any samples require Volatile Analysis?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
If Yes, are Encores or Soil Kits present for solids? Yes ___ No ___ NA ___ (If yes, take to VOA Freezer) Do liquid VOA vials contain acid preservation? Yes ___ No ___ NA ___ (If unknown, select No) Are liquid VOA vials free of headspace? Yes ___ No ___ NA ___ Sample ID's and containers affected:			
8	Samples received within holding time?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
ID's and tests affected:			
9	Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
ID's and containers affected:			
10	Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Circle Applicable: No dates on containers    No times on containers    COC missing info    Other (describe)			
11	Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Circle Applicable: No container count on COC    Other (describe)			
12	Are sample containers identifiable as GEL provided by use of GEL labels?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
13	COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Circle Applicable: Not relinquished    Other (describe)			
Comments (Use Continuation Form if needed):			

PM (or PMA) review: Initials **MLC** Date **5/5/11** Page **1** of **1**

# Laboratory Certifications

**List of current GEL Certifications as of 27 May 2022**

<b>State</b>	<b>Certification</b>
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122022-4
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2019-165
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122021-36
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

# **Radiological Analysis**

# Case Narrative

**Radiochemistry  
Technical Case Narrative  
Merit Laboratories, Inc.  
SDG #: S35411  
Work Order #: 578683**

**Product: Radium-226+Radium-228 Calculation**

**Analytical Method:** Calculation

**Analytical Procedure:** GL-RAD-D-003 REV# 44

**Analytical Batch:** 2264118

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
578683001	S35411.01
578683002	S35411.02 Field Dupe
578683003	S35411.03 Field Blank

**Data Summary:**

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

**Product: GFPC Ra228, Liquid**

**Analytical Method:** EPA 904.0/SW846 9320 Modified

**Analytical Procedure:** GL-RAD-A-063 REV# 5

**Analytical Batch:** 2264119

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
578683001	S35411.01
578683002	S35411.02 Field Dupe
578683003	S35411.03 Field Blank
1205087888	Method Blank (MB)
1205087889	578683001(S35411.01) Sample Duplicate (DUP)
1205087890	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

**Quality Control (QC) Information**



**Method Blank Criteria**

The blank result (See Below) is greater than the MDC but less than the required detection limit.

Sample	Analyte	Value
1205087888 (MB)	Radium-228	Result: 1.98 pCi/L > MDA: 1.44 pCi/L <= RDL: 3.00 pCi/L

**Product: Lucas Cell, Ra226, Liquid**

**Analytical Method:** EPA 903.1 Modified

**Analytical Procedure:** GL-RAD-A-008 REV# 15

**Analytical Batch:** 2264106

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
578683001	S35411.01
578683002	S35411.02 Field Dupe
578683003	S35411.03 Field Blank
1205087874	Method Blank (MB)
1205087875	578683001(S35411.01) Sample Duplicate (DUP)
1205087876	578683001(S35411.01) Matrix Spike (MS)
1205087877	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

**Miscellaneous Information****Additional Comments**

The matrix spike, 1205087876 (S35411.01MS), aliquot was reduced to conserve sample volume.

**Certification Statement**

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

## GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

### Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S35411 GEL Work Order: 578683

**The Qualifiers in this report are defined as follows:**

- \* A quality control analyte recovery is outside of specified acceptance criteria
- \*\* Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

**Review/Validation**

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature: 

Name: Kenshalla Oston

Date: 01 JUN 2022

Title: Analyst I

# Sample Data Summary

# GEL LABORATORIES LLC

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## Certificate of Analysis

Report Date: June 1, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Lavery  
 Project: Routine Analysis

Client Sample ID: S35411.01	Project: MERI00120
Sample ID: 578683001	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 28-APR-22 12:45	
Receive Date: 04-MAY-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	1.68	+/-1.14	1.78	3.00	pCi/L			JXC9	05/27/22	0913	2264119	1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		2.69	+/-1.21			pCi/L		1	TON1	05/27/22	1449	2264118	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		1.01	+/-0.403	0.297	1.00	pCi/L			LXP1	05/24/22	0930	2264106	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			84.6	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: June 1, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Lavery  
 Project: Routine Analysis

Client Sample ID: S35411.02 Field Dupe	Project: MERI00120
Sample ID: 578683002	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 28-APR-22 12:45	
Receive Date: 04-MAY-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228		2.14	+/-1.11	1.60	3.00	pCi/L			JXC9	05/27/22	0913 2264119	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		3.59	+/-1.20			pCi/L		1	TON1	05/27/22	1449 2264118	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		1.44	+/-0.467	0.380	1.00	pCi/L			LXP1	05/24/22	0930 2264106	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			83.3	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

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## Certificate of Analysis

Report Date: June 1, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Lavery  
 Project: Routine Analysis

Client Sample ID: S35411.03 Field Blank	Project: MERI00120
Sample ID: 578683003	Client ID: MERI001
Matrix: Water	
Collect Date: 28-APR-22 12:40	
Receive Date: 04-MAY-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	0.882	+/-0.803	1.30	3.00	pCi/L			JXC9	05/27/22	0914	2264119	1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		0.882	+/-0.855			pCi/L		1	TON1	05/27/22	1449	2264118	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226	U	0.000	+/-0.293	0.603	1.00	pCi/L			LXP1	05/24/22	0930	2264106	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			86.3	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# **Quality Control Summary**

# GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

## QC Summary

Report Date: June 1, 2022

Page 1 of 2

**Merit Laboratories Inc.**  
**2680 East Lansing Drive**  
**East Lansing, Michigan**

**Contact: John Laverty**

**Workorder: 578683**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Rad Gas Flow</b>											
Batch	2264119										
QC1205087889	578683001	DUP									
Radium-228	U	1.68		2.10	pCi/L	22.3		(0% - 100%)	JXC9	05/27/22	09:13
	Uncertainty	+/-1.14		+/-1.09							
QC1205087890	LCS										
Radium-228	45.8			44.0	pCi/L		95.9	(75%-125%)		05/27/22	09:13
	Uncertainty			+/-3.09							
QC1205087888	MB										
Radium-228				1.98	pCi/L					05/27/22	09:13
	Uncertainty			+/-1.00							
<b>Rad Ra-226</b>											
Batch	2264106										
QC1205087875	578683001	DUP									
Radium-226		1.01		1.19	pCi/L	16.4		(0% - 100%)	LXP1	05/24/22	10:34
	Uncertainty	+/-0.403		+/-0.461							
QC1205087877	LCS										
Radium-226	26.5			24.7	pCi/L		93.5	(75%-125%)		05/24/22	10:34
	Uncertainty			+/-1.78							
QC1205087874	MB										
Radium-226			U	0.0763	pCi/L					05/24/22	10:34
	Uncertainty			+/-0.299							
QC1205087876	578683001	MS									
Radium-226	133	1.01		104	pCi/L		77.4	(75%-125%)		05/24/22	10:34
	Uncertainty	+/-0.403		+/-8.75							

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- \*\* Analyte is a Tracer compound
- < Result is less than value reported
- > Result is greater than value reported
- BD Results are either below the MDC or tracer recovery is low
- FA Failed analysis.
- H Analytical holding time was exceeded



# GEL LABORATORIES LLC

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## QC Summary

Workorder: 578683

Page 2 of 2

Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
J											
J											
K											
L											
M											
M											
N/A											
NI											
ND											
NJ											
Q											
R											
U											
UI											
UJ											
UL											
X											
Y											
^											
h											

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where the duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

\* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

# Gas Flow Raw Data

# Batch 2264119 Check-list

This check-list was completed on 27-MAY-22 by Nat Long

This batch was reviewed by Kenshalla Oston on 27-MAY-22 and Nat Long on 27-MAY-22.

**Batch ID:**  
2264119

**Product:**  
GFC28RAL

**Description:** Gas Flow Radium 228  
GL-RAD-A-063

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous		No	
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?		No	
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
11	Has the method required detection limit been met?	Yes		
<b>Miscellaneous Information</b>				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

# Prep Logbook

## Radium-228 in Liquid

**Batch ID:** 2264119

**Analyst:** Jasmine Conley (JXC9)

**Method:** EPA 904.0/SW846 9320 Modified

**Lab SOP:** GL-RAD-A-063 REV# 5

**Instrument:** LUCAS-C037036045

**Due Dates for Lab:** 31-MAY-2022

**Package:** 01-JUN-2022

**SDG:** 02-JUN-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205087890	Radium-228	1965-C	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	578683001	23-MAY-2022	3	304.15	304.15	05/25/22 12:43	05/27/22 07:20
2	578683002	23-MAY-2022	3	301.23	301.23	05/25/22 12:43	05/27/22 07:20
3	578683003	23-MAY-2022	3	302.39	302.39	05/25/22 12:43	05/27/22 07:20
4	578685001	23-MAY-2022	3	301.44	301.44	05/25/22 12:43	05/27/22 07:20
5	578685002	23-MAY-2022	3	301.42	301.42	05/25/22 12:43	05/27/22 07:20
6	578685003	23-MAY-2022	3	300.87	300.87	05/25/22 12:43	05/27/22 07:20
7	578685004	23-MAY-2022	3	301.56	301.56	05/25/22 12:43	05/27/22 07:20
8	579283001	23-MAY-2022	3	301.37	301.37	05/25/22 12:43	05/27/22 07:20
9	579283002	23-MAY-2022	3	301.17	301.17	05/25/22 12:43	05/27/22 07:20
10	579283003	23-MAY-2022	3	302.71	302.71	05/25/22 12:43	05/27/22 07:20
11	579283004	23-MAY-2022	3	300.58	300.58	05/25/22 12:43	05/27/22 07:20
12	579283005	23-MAY-2022	3	301.26	301.26	05/25/22 12:43	05/27/22 07:20
13	1205087888 MB	23-MAY-2022	3		304.15	05/25/22 12:43	05/27/22 07:20
14	1205087889 DUP (578683001)	23-MAY-2022	3	302.07	302.07	05/25/22 12:43	05/27/22 07:20
15	1205087890 LCS	23-MAY-2022	3		304.15	05/25/22 12:43	05/27/22 07:20

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1951-C	Barium-133	.1 mL	Pipet Id: RAD-GFC-1795419
REGNT 3411398	Barium Carrier Ra228 REG	1 mL	Data Entry Date2: 23-MAY-2022 00:00
REGNT 3413388	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3413919	RGF-50% Potassium Carbonate	2 mL	
REGNT 3417468	RGF-1M Citric Acid	5 mL	
REGNT 3424040	7M Nitric Acid	25 mL	
REGNT 3424228	RGF-Neodymium Substrate	5 mL	
REGNT 3424651.3	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	
REGNT 3426198	2M HCl	20 mL	
REGNT 3430182.12	HF (48-50%)	4 mL	
REGNT 3431618.7	Nitric Acid	5 mL	
REGNT 3432370	Test batches: 2259234	2 g	
REGNT 3435259	RGF-1.5M Ammonium Sulfate	10 mL	

### Radium-228 Liquid

Filename : RA228.XLS  
 File type : Excel  
 Version # : 1.4.2

Tracer S/N : 1951-C  
 Tracer Exp Date : 9/16/2022  
 Tracer Volume Added: 0.10

Batch : 2264119  
 Analyst : JAS02031  
 Prep Date : 5/23/2022  
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL  
 Parmname : Radium-228  
 Required MDA : 3 pCi/L  
 Ra-228 Abundance : 1.00  
 Halflife of Ra-228 : 5.75 years  
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	578683001.1	0.3042	1.8529E-05	4/28/2022 12:45	1394.6	1.55%	1179.5	1.68%	0.1	0.000200
2	578683002.1	0.3012	1.8480E-05	4/28/2022 12:45	1394.6	1.55%	1161.9	1.69%	0.1	0.000200
3	578683003.1	0.3024	1.8499E-05	4/28/2022 12:40	1394.6	1.55%	1204.0	1.66%	0.1	0.000200
4	578685001.1	0.3014	1.8483E-05	4/28/2022 11:37	1394.6	1.55%	1269.5	1.62%	0.1	0.000200
5	578685002.1	0.3014	1.8483E-05	4/28/2022 11:37	1394.6	1.55%	1258.8	1.63%	0.1	0.000200
6	578685003.1	0.3009	1.8474E-05	4/28/2022 10:15	1394.6	1.55%	1231.2	1.65%	0.1	0.000200
7	578685004.1	0.3016	1.8485E-05	4/28/2022 10:20	1394.6	1.55%	1221.8	1.65%	0.1	0.000200
8	579283001.1	0.3014	1.8482E-05	5/4/2022 14:06	1394.6	1.55%	1201.4	1.67%	0.1	0.000200
9	579283002.1	0.3012	1.8479E-05	5/4/2022 14:55	1394.6	1.55%	1181.1	1.68%	0.1	0.000200
10	579283003.1	0.3027	1.8505E-05	5/4/2022 12:01	1394.6	1.55%	1246.0	1.64%	0.1	0.000200
11	579283004.1	0.3006	1.8469E-05	5/4/2022 12:01	1394.6	1.55%	1261.9	1.63%	0.1	0.000200
12	579283005.1	0.3013	1.8480E-05	5/4/2022 9:05	1394.6	1.55%	1216.2	1.66%	0.1	0.000200
13	1205087888.1	0.3042	1.8529E-05	5/23/2022 0:00	1394.6	1.55%	1240.8	1.64%	0.1	0.000200
14	1205087889.1	0.3021	1.8494E-05	4/28/2022 12:45	1394.6	1.55%	1172.3	1.69%	0.1	0.000200
15	1205087890.1	0.3042	1.8529E-05	5/23/2022 0:00	1394.6	1.55%	1273.2	1.62%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063  
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated Sample Recovery %	Sample Recovery Error %
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction		
1	1A	60	21	83	1.383	5/27/2022 9:13	5/25/2022 12:43	5/27/2022 7:20	0.991	0.808	0.992	1.057	84.6%	1.18%
2	1B	60	23	77	1.283	5/27/2022 9:13	5/25/2022 12:43	5/27/2022 7:20	0.991	0.807	0.992	1.057	83.3%	1.18%
3	1C	60	18	45	0.750	5/27/2022 9:14	5/25/2022 12:43	5/27/2022 7:20	0.991	0.807	0.992	1.057	86.3%	1.17%
4	1D	60	21	83	1.383	5/27/2022 9:14	5/25/2022 12:43	5/27/2022 7:20	0.990	0.807	0.992	1.057	91.0%	1.16%
5	2A	60	24	96	1.600	5/27/2022 9:14	5/25/2022 12:43	5/27/2022 7:20	0.990	0.807	0.992	1.057	90.3%	1.16%
6	2B	60	22	79	1.317	5/27/2022 9:14	5/25/2022 12:43	5/27/2022 7:20	0.990	0.807	0.992	1.057	88.3%	1.17%
7	2C	60	33	51	0.850	5/27/2022 9:14	5/25/2022 12:43	5/27/2022 7:20	0.990	0.807	0.992	1.057	87.6%	1.17%
8	3B	60	29	35	0.583	5/27/2022 9:14	5/25/2022 12:43	5/27/2022 7:20	0.992	0.807	0.992	1.057	86.1%	1.17%
9	3C	60	25	68	1.133	5/27/2022 9:14	5/25/2022 12:43	5/27/2022 7:20	0.993	0.807	0.992	1.057	84.7%	1.18%
10	3D	60	15	44	0.733	5/27/2022 9:14	5/25/2022 12:43	5/27/2022 7:20	0.992	0.806	0.992	1.057	89.3%	1.16%
11	4A	60	20	52	0.867	5/27/2022 9:14	5/25/2022 12:43	5/27/2022 7:20	0.992	0.806	0.992	1.057	90.5%	1.16%
12	4B	60	19	97	1.617	5/27/2022 9:14	5/25/2022 12:43	5/27/2022 7:20	0.992	0.806	0.992	1.057	87.2%	1.17%
13	4C	60	27	81	1.350	5/27/2022 9:13	5/25/2022 12:43	5/27/2022 7:20	0.999	0.808	0.992	1.057	89.0%	1.16%
14	4D	60	30	71	1.183	5/27/2022 9:13	5/25/2022 12:43	5/27/2022 7:20	0.991	0.808	0.992	1.057	84.1%	1.18%
15	5A	60	36	838	13.967	5/27/2022 9:13	5/25/2022 12:43	5/27/2022 7:20	0.999	0.808	0.992	1.057	91.3%	1.16%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2021	5/31/2022	0.6325	0.00738	0.928	5/20/2022 19:03	500
2	PIC	6/1/2021	5/31/2022	0.6409	0.00711	0.710	5/20/2022 19:04	500
3	PIC	6/1/2021	5/31/2022	0.6524	0.00847	0.500	5/20/2022 19:04	500
4	PIC	6/1/2021	5/31/2022	0.6466	0.00692	0.722	5/20/2022 19:04	500
5	PIC	6/1/2021	5/31/2022	0.6321	0.01914	0.938	5/20/2022 19:04	500
6	PIC	6/1/2021	5/31/2022	0.6248	0.02111	1.380	5/20/2022 19:04	500
7	PIC	6/1/2021	5/31/2022	0.6380	0.01274	0.828	5/20/2022 19:04	500
8	PIC	6/1/2021	5/31/2022	0.6428	0.01614	0.450	5/20/2022 19:04	500
9	PIC	6/1/2021	5/31/2022	0.6497	0.00988	1.068	5/20/2022 19:04	500
10	PIC	6/1/2021	5/31/2022	0.6259	0.02297	0.718	5/20/2022 19:04	500
11	PIC	6/1/2021	5/31/2022	0.6543	0.01123	0.602	5/20/2022 19:04	500
12	PIC	6/1/2021	5/31/2022	0.6421	0.01519	1.178	5/20/2022 19:04	500
13	PIC	6/1/2021	5/31/2022	0.6681	0.00889	0.748	5/20/2022 19:04	500
14	PIC	6/1/2021	5/31/2022	0.6156	0.00773	0.636	5/20/2022 19:05	500
15	PIC	6/1/2021	5/31/2022	0.6571	0.00851	0.496	5/20/2022 19:05	500

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

**Spike S/N :** N/A  
**Spike Exp Date :** N/A  
**Spike Activity (dpm/ml):** N/A  
**Spike Volume Added:** N/A

**LCS S/N :** 1965-C  
**LCS Exp Date :** 8/5/2022  
**LCS Activity (dpm/ml):** 309.41  
**LCS Volume Added:** 0.10

Results																
Pos.	Decision	Critical	Required	Sample Act.		Sample Act.	Net Count	Net Count	2 SIGMA	2 SIGMA	Sample	Sample	RPD	RER	Nominal	Recovery
	Level	Level	MDA	MDA	Conc.	Error	Rate	Rate Error	Counting	Total Prop.						
	pCi/L	pCi/L	pCi/L	pCi/L	pCi/L	%	CPM	CPM	Uncertainty	Uncertainty						
1	1.1317	0.7990	3	1.7825	<b>1.6804</b>	34.69%	0.4553	0.1578	1.1417	1.2165		SAMPLE				
2	1.0015	0.7071	3	1.6009	<b>2.1407</b>	26.38%	0.5733	0.1510	1.1052	1.2280		SAMPLE				
3	0.7939	0.5605	3	1.2973	<b>0.8817</b>	46.50%	0.2500	0.1162	0.8032	0.8329		SAMPLE				
4	0.9159	0.6467	3	1.4626	<b>2.2394</b>	23.71%	0.6613	0.1565	1.0388	1.1800		SAMPLE				
5	1.0772	0.7605	3	1.6958	<b>2.3130</b>	25.62%	0.6620	0.1689	1.1570	1.2959		SAMPLE				
6	1.3542	0.9561	3	2.0932	<b>-0.2293</b>	248.19%	-0.0633	0.1572	1.1156	1.1157		SAMPLE				
7	1.0328	0.7291	3	1.6365	<b>0.0784</b>	571.77%	0.0220	0.1258	0.8790	0.8792		SAMPLE				
8	0.7676	0.5419	3	1.2636	<b>0.4793</b>	77.32%	0.1333	0.1031	0.7261	0.7361		SAMPLE				
9	1.1911	0.8409	3	1.8629	<b>0.2365</b>	221.94%	0.0653	0.1450	1.0290	1.0307		SAMPLE				
10	0.9563	0.6751	3	1.5275	<b>0.0544</b>	762.19%	0.0153	0.1169	0.8120	0.8122		SAMPLE				
11	0.8330	0.5881	3	1.3449	<b>0.8926</b>	47.29%	0.2647	0.1251	0.8269	0.8566		SAMPLE				
12	1.2295	0.8681	3	1.9140	<b>1.5610</b>	39.07%	0.4387	0.1712	1.1939	1.2567		SAMPLE				
13	0.9065	0.6400	3	1.4447	<b>1.9822</b>	25.77%	0.6020	0.1549	0.9997	1.1159		MB				
14	0.9748	0.6882	3	1.5685	<b>2.1017</b>	26.51%	0.5473	0.1449	1.0905	1.2105	578683001.1	DUP	22.3%			
15	0.7317	0.5166	3	1.1963	<b>43.9627</b>	3.87%	13.4707	0.4835	3.0928	11.4224		LCS			45.8237	95.9%



SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
578683001	1A	60	21	83	5/27/2022 9:13	5/27/2022 10:13	PIC	2264119
578683002	1B	60	23	77	5/27/2022 9:13	5/27/2022 10:13	PIC	2264119
578683003	1C	60	18	45	5/27/2022 9:14	5/27/2022 10:14	PIC	2264119
578685001	1D	60	21	83	5/27/2022 9:14	5/27/2022 10:14	PIC	2264119
578685002	2A	60	24	96	5/27/2022 9:14	5/27/2022 10:14	PIC	2264119
578685003	2B	60	22	79	5/27/2022 9:14	5/27/2022 10:14	PIC	2264119
578685004	2C	60	33	51	5/27/2022 9:14	5/27/2022 10:14	PIC	2264119
579283001	3B	60	29	35	5/27/2022 9:14	5/27/2022 10:14	PIC	2264119
579283002	3C	60	25	68	5/27/2022 9:14	5/27/2022 10:14	PIC	2264119
579283003	3D	60	15	44	5/27/2022 9:14	5/27/2022 10:14	PIC	2264119
579283004	4A	60	20	52	5/27/2022 9:14	5/27/2022 10:14	PIC	2264119
579283005	4B	60	19	97	5/27/2022 9:14	5/27/2022 10:14	PIC	2264119
1205087888	4C	60	27	81	5/27/2022 9:13	5/27/2022 10:13	PIC	2264119
1205087889	4D	60	30	71	5/27/2022 9:13	5/27/2022 10:13	PIC	2264119
1205087890	5A	60	36	838	5/27/2022 9:13	5/27/2022 10:13	PIC	2264119

ASSAY 27-May-22 7:48:46  
 Wizard 2480 s/n 46190630  
 Protocol id 9 Ba-133\_1  
 Time limit  
 Count limit  
 Isotope Ba-133\_1  
 Protocol date 5/27/2022  
 Run id. 5055

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	94	1	180	4184.57	1394.61	1.55	07:48:46
	578683001	2	94	2	180	3539.57	1179.53	1.68	84.58 07:52:00
	578683002	3	94	3	180	3486.28	1161.87	1.69	83.31 07:55:13
	578683003	4	94	4	180	3612.57	1203.96	1.66	86.33 07:58:27
	578685001	5	94	5	180	3808.85	1269.49	1.62	91.03 08:01:42
	578685002	1	1	1	180	3777	1258.76	1.63	90.26 08:05:25
	578685003	2	1	2	180	3694.28	1231.2	1.65	88.28 08:08:39
	578685004	3	1	3	180	3666	1221.77	1.65	87.61 08:11:53
	579283001	4	1	4	180	3605	1201.44	1.67	86.15 08:15:06
	579283002	5	1	5	180	3543.57	1181.07	1.68	84.69 08:18:21
	579283003	1	19	1	180	3738.28	1245.97	1.64	89.34 08:21:57
	579283004	2	19	2	180	3786.28	1261.85	1.63	90.48 08:25:10
	579283005	3	19	3	180	3649.28	1216.2	1.66	87.21 08:28:24
	1205087888	4	19	4	180	3723	1240.77	1.64	88.97 08:31:38
	1205087889	5	19	5	180	3517.57	1172.3	1.69	84.06 08:34:53
	1205087890	1	3	1	180	3820	1273.21	1.62	91.30 08:38:36

END OF ASSAY

# **Continuing Calibration Data**

# Gas Flow Proportional Counter Checks for 27-May-2022

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100E2	need 2nd	Alpha bkg	27-May 03:59	60	0.117	-1.22E-1	0.368	-0.08
LB4100E2	Above	Beta bkg	27-May 03:59	60	2.167	1.386	3.015	-0.12
LB4100F3	Above	Alpha bkg	27-May 03:59	60	0.333	0.119	0.404	+1.51
LB4100F3	Above	Beta bkg	27-May 03:59	60	72.567	0.854	1.842	+432.42
LB4100G1	need 2nd	Alpha XTalk	27-May 05:02	5	0.293	0.088	0.447	+0.42
LB4100G1	Above	Beta bkg	27-May 04:00	60	611	0.380	1.675	+2,827.57
LB4100G1	Above	Beta eff	27-May 05:15	5	24018	12880	18320	+9.28
LB4100G2	Above	Alpha eff	27-May 05:02	5	9648	7308	9581	+3.18
LB4100G2	Above	Beta bkg	27-May 04:00	60	4.550	1.159	2.203	+16.49
LB4100G3	Below	Alpha bkg	27-May 04:00	60	0.00E+0	0.002	0.276	-3.05
LB4100G3	Above	Beta bkg	27-May 04:00	60	6.767	0.810	1.674	+38.37
PIC2D	Above	Alpha bkg	27-May 07:12	60	0.350	-6.13E-2	0.350	+2.99
PIC2D	Above	Beta bkg	27-May 07:12	60	2.483	0.171	2.681	+2.53
PIC6C	Above	Beta bkg	27-May 07:01	60	2.200	0.415	2.299	+2.68
PIC7D	Above	Alpha bkg	27-May 07:01	60	0.350	-1.70E-2	0.435	+1.87
PIC10B	Above	Beta bkg	27-May 07:01	60	2.150	-1.04E-1	2.645	+1.92
PIC12B	Above	Alpha bkg	27-May 07:13	60	0.733	-4.23E-2	0.379	+8.05

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

LB4100C1 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
 LB4100C2 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
 LB4100C3 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
 LB4100C4 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
 LB4100I1 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
 LB4100I2 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
 LB4100I3 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
 LB4100I4 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by *Janine Priskin*

Date 5/27/22

GEL Laboratories LLC

# Runlogs

# Instrument Run Log

Instrument Type: GFPC

Batch ID: 2264119

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205087888	MB	JXC9	PIC4C	MAY-27-22 09:13:30	DONE	25mm Filter	01-JUN-21 00:00
1205087889	DUP	JXC9	PIC4D	MAY-27-22 09:13:35	DONE	25mm Filter	01-JUN-21 00:00
1205087890	LCS	JXC9	PIC5A	MAY-27-22 09:13:43	DONE	25mm Filter	01-JUN-21 00:00
578683001	SAMPLE	JXC9	PIC1A	MAY-27-22 09:13:49	DONE	25mm Filter	01-JUN-21 00:00
578683002	SAMPLE	JXC9	PIC1B	MAY-27-22 09:13:54	DONE	25mm Filter	01-JUN-21 00:00
578683003	SAMPLE	JXC9	PIC1C	MAY-27-22 09:14:02	DONE	25mm Filter	01-JUN-21 00:00
578685001	SAMPLE	JXC9	PIC1D	MAY-27-22 09:14:06	DONE	25mm Filter	01-JUN-21 00:00
578685002	SAMPLE	JXC9	PIC2A	MAY-27-22 09:14:13	DONE	25mm Filter	01-JUN-21 00:00
578685003	SAMPLE	JXC9	PIC2B	MAY-27-22 09:14:17	DONE	25mm Filter	01-JUN-21 00:00
578685004	SAMPLE	JXC9	PIC2C	MAY-27-22 09:14:17	DONE	25mm Filter	01-JUN-21 00:00
579283001	SAMPLE	JXC9	PIC3B	MAY-27-22 09:14:25	DONE	25mm Filter	01-JUN-21 00:00
579283002	SAMPLE	JXC9	PIC3C	MAY-27-22 09:14:28	DONE	25mm Filter	01-JUN-21 00:00
579283003	SAMPLE	JXC9	PIC3D	MAY-27-22 09:14:32	DONE	25mm Filter	01-JUN-21 00:00
579283004	SAMPLE	JXC9	PIC4A	MAY-27-22 09:14:39	DONE	25mm Filter	01-JUN-21 00:00
579283005	SAMPLE	JXC9	PIC4B	MAY-27-22 09:14:43	DONE	25mm Filter	01-JUN-21 00:00

# Lucas Cell Raw Data



# Batch 2264106 Check-list

This check-list was completed on 24-MAY-22 by Lyndsey Pace

This batch was reviewed by Lyndsey Pace on 24-MAY-22 and Elizabeth Krouse on 25-MAY-22.

**Batch ID:**  
2264106

**Product:**  
LUC26RAL

**Description:** Lucas Cell Radium 226  
GL-RAD-A-008

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
<b>Miscellaneous Information</b>				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

# Prep Logbook

## Radium-226 in Liquid

**Batch ID:** 2264106  
**Analyst:** Lyndsey Pace (LXP1)  
**Method:** EPA 903.1 Modified  
**Lab SOP:** GL-RAD-A-008 REV# 15  
**Instrument:** LUCAS-C037036045

Due Dates for Lab: 30-MAY-2022			Package: 01-JUN-2022	SDG: 02-JUN-2022		
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205087877	Radium-226 SPIKE	1715-G	.1	mL	
MS	1205087876	Radium-226 SPIKE	1715-G	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	578683001	20-MAY-2022	1	500.2	500.2	05/20/22 12:25	401	05/24/22 06:12	05/24/22 09:30	1	27
2	578683002	20-MAY-2022	1	503	503	05/20/22 12:25	502	05/24/22 06:12	05/24/22 09:30	3	45
3	578683003	20-MAY-2022	1	501.53	501.53	05/20/22 12:25	603	05/24/22 06:12	05/24/22 09:30	8	8
4	578685001	20-MAY-2022	1	501.26	501.26	05/20/22 12:25	703	05/24/22 06:12	05/24/22 09:30	5	36
5	578685002	20-MAY-2022	1	502.49	502.49	05/20/22 12:25	806	05/24/22 06:12	05/24/22 09:30	1	38
6	578685003	20-MAY-2022	1	500.21	500.21	05/20/22 12:25	108	05/24/22 06:35	05/24/22 10:01	3	93
7	578685004	20-MAY-2022	1	500.98	500.98	05/20/22 12:25	204	05/24/22 06:35	05/24/22 10:01	4	14
8	579283001	20-MAY-2022	1	500.63	500.63	05/20/22 12:25	407	05/24/22 06:35	05/24/22 10:01	1	15
9	579283002	20-MAY-2022	1	500.59	500.59	05/20/22 12:25	504	05/24/22 06:35	05/24/22 10:01	4	35
10	579283003	20-MAY-2022	1	506.34	506.34	05/20/22 12:25	608	05/24/22 06:35	05/24/22 10:01	1	10
11	579283004	20-MAY-2022	1	502.49	502.49	05/20/22 12:25	704	05/24/22 06:35	05/24/22 10:01	8	12
12	579283005	20-MAY-2022	1	505.33	505.33	05/20/22 12:25	803	05/24/22 06:35	05/24/22 10:01	8	38
13	1205087874 MB	20-MAY-2022	1	506.34	506.34	05/20/22 12:25	104	05/24/22 06:58	05/24/22 10:34	7	9
14	1205087875 DUP (578683001)	20-MAY-2022	1	500.05	500.05	05/20/22 12:25	206	05/24/22 06:58	05/24/22 10:34	4	36
15	1205087876 MS (578683001)	20-MAY-2022	1	100.96	100.96	05/20/22 12:25	403	05/24/22 06:58	05/24/22 10:34	2	546
16	1205087877 LCS	20-MAY-2022	1		506.34	05/20/22 12:25	507	05/24/22 06:58	05/24/22 10:34	4	751

Reagent/Solvent Lot ID	Description	Amount	Comments:
			Data Entry Date2: 20-MAY-2022 00:00

## Radium-226 Liquid

Filename : RA226.XLS  
 File type : Excel  
 Version # : 1.3.2

Procedure Code : LUC26RAL  
 Parmname : Radium-226  
 Required MDA : 1 pCi/L  
 Halflife of Ra-226 : 1600 years  
 Ra-226 Abundance : 1.00  
 Halflife of Rn-222 : 3.8235 days

Batch : 2264106  
 Analyst : LIN01615  
 Prep Date : 5/20/2022  
 Ra-226 Method Uncertainty : 0.073648

Batch counted on : LUCAS CELL DETECTOR  
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Count Time (min.)	Cell Efficiency (cpm/dpm)
1	578683001.1	0.5002	2.0257E-05	4/28/2022 12:45	401	30	27	0.900	1	0.033	30	1.6120
2	578683002.1	0.5030	2.0268E-05	4/28/2022 12:45	502	30	45	1.500	3	0.100	30	1.8100
3	578683003.1	0.5015	2.0262E-05	4/28/2022 12:40	603	30	8	0.267	8	0.267	30	1.6730
4	578685001.1	0.5013	2.0261E-05	4/28/2022 11:37	703	30	36	1.200	5	0.167	30	1.7360
5	578685002.1	0.5025	2.0266E-05	4/28/2022 11:37	806	30	38	1.267	1	0.033	30	1.9460
6	578685003.1	0.5002	2.0257E-05	4/28/2022 10:15	108	30	93	3.100	3	0.100	30	1.5830
7	578685004.1	0.5010	2.0260E-05	4/28/2022 10:20	204	30	14	0.467	4	0.133	30	1.6950
8	579283001.1	0.5006	2.0258E-05	5/4/2022 14:06	407	30	15	0.500	1	0.033	30	1.6030
9	579283002.1	0.5006	2.0258E-05	5/4/2022 14:55	504	30	35	1.167	4	0.133	30	1.5780
10	579283003.1	0.5063	2.0281E-05	5/4/2022 12:01	608	30	10	0.333	1	0.033	30	1.7270
11	579283004.1	0.5025	2.0266E-05	5/4/2022 12:01	704	30	12	0.400	8	0.267	30	1.6710
12	579283005.1	0.5053	2.0277E-05	5/4/2022 9:05	803	30	38	1.267	8	0.267	30	2.0020
13	1205087874.1	0.5063	2.0281E-05	5/20/2022 0:00	104	30	9	0.300	7	0.233	30	1.6160
14	1205087875.1	0.5001	2.0256E-05	4/28/2022 12:45	206	30	36	1.200	4	0.133	30	1.6770
15	1205087876.1	0.1010	1.1429E-05	4/28/2022 12:45	403	30	546	18.200	2	0.067	30	1.6200
16	1205087877.1	0.5063	2.0281E-05	5/20/2022 0:00	507	30	751	25.033	4	0.133	30	1.8610

Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008  
 Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrowth End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
8.100%	2/1/2022	1/31/2023	5/20/2022 12:25	5/24/2022 6:12	5/24/2022 9:30	0.492	0.975	1.002	1.000
9.900%	6/1/2021	5/31/2022	5/20/2022 12:25	5/24/2022 6:12	5/24/2022 9:30	0.492	0.975	1.002	1.000
5.500%	7/1/2021	6/30/2022	5/20/2022 12:25	5/24/2022 6:12	5/24/2022 9:30	0.492	0.975	1.002	1.000
5.000%	11/1/2021	10/31/2022	5/20/2022 12:25	5/24/2022 6:12	5/24/2022 9:30	0.492	0.975	1.002	1.000
7.300%	4/1/2022	3/31/2023	5/20/2022 12:25	5/24/2022 6:12	5/24/2022 9:30	0.492	0.975	1.002	1.000
2.800%	4/28/2022	4/30/2023	5/20/2022 12:25	5/24/2022 6:35	5/24/2022 10:01	0.494	0.974	1.002	1.000
7.800%	8/1/2021	7/31/2022	5/20/2022 12:25	5/24/2022 6:35	5/24/2022 10:01	0.494	0.974	1.002	1.000
6.600%	2/1/2022	1/31/2023	5/20/2022 12:25	5/24/2022 6:35	5/24/2022 10:01	0.494	0.974	1.002	1.000
8.500%	6/1/2021	5/31/2022	5/20/2022 12:25	5/24/2022 6:35	5/24/2022 10:01	0.494	0.974	1.002	1.000
7.400%	7/1/2021	6/30/2022	5/20/2022 12:25	5/24/2022 6:35	5/24/2022 10:01	0.494	0.974	1.002	1.000
8.000%	11/1/2021	10/31/2022	5/20/2022 12:25	5/24/2022 6:35	5/24/2022 10:01	0.494	0.974	1.002	1.000
7.300%	4/1/2022	3/31/2023	5/20/2022 12:25	5/24/2022 6:35	5/24/2022 10:01	0.494	0.974	1.002	1.000
2.000%	4/28/2022	4/30/2023	5/20/2022 12:25	5/24/2022 6:58	5/24/2022 10:34	0.495	0.973	1.002	1.000
5.600%	8/1/2021	7/31/2022	5/20/2022 12:25	5/24/2022 6:58	5/24/2022 10:34	0.495	0.973	1.002	1.000
9.700%	2/1/2022	1/31/2023	5/20/2022 12:25	5/24/2022 6:58	5/24/2022 10:34	0.495	0.973	1.002	1.000
3.300%	6/1/2021	5/31/2022	5/20/2022 12:25	5/24/2022 6:58	5/24/2022 10:34	0.495	0.973	1.002	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

**Spike S/N :** 1715-G  
**Spike Exp Date :** 9/15/2022  
**Spike Activity (dpm/ml):** 297.53  
**Spike Volume Added:** 0.10

**LCS S/N :** 1715-G  
**LCS Exp Date :** 9/15/2022  
**LCS Activity (dpm/ml):** 297.53  
**LCS Volume Added:** 0.10

<b>Results</b>																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.1280	0.0904	1	0.2972	<b>1.0099</b>	21.90%	0.8667	0.1764	0.4028	0.4574		SAMPLE				
2	0.1963	0.1386	1	0.3804	<b>1.4448</b>	19.24%	1.4000	0.2309	0.4671	0.5834		SAMPLE				
3	0.3479	0.2456	1	0.6032	<b>0.000E+00</b>	0.00%	0.0000	0.1333	0.2926	0.2927		SAMPLE				
4	0.2652	0.1872	1	0.4824	<b>1.1157</b>	21.25%	1.0333	0.2134	0.4517	0.4919		SAMPLE				
5	0.1055	0.0745	1	0.2451	<b>1.1851</b>	18.39%	1.2333	0.2082	0.3920	0.4601		SAMPLE				
6	0.2253	0.1591	1	0.4365	<b>3.5527</b>	11.24%	3.0000	0.3266	0.7581	0.9358		SAMPLE				
7	0.2426	0.1713	1	0.4530	<b>0.3681</b>	43.14%	0.3333	0.1414	0.3061	0.3157		SAMPLE				
8	0.1283	0.0906	1	0.2981	<b>0.5453</b>	29.32%	0.4667	0.1333	0.3054	0.3231		SAMPLE				
9	0.2608	0.1841	1	0.4869	<b>1.2267</b>	21.86%	1.0333	0.2082	0.4843	0.5547		SAMPLE				
10	0.1178	0.0832	1	0.2735	<b>0.3217</b>	37.59%	0.3000	0.1106	0.2324	0.2415		SAMPLE				
11	0.3469	0.2449	1	0.6016	<b>0.1489</b>	112.09%	0.1333	0.1491	0.3263	0.3278		SAMPLE				
12	0.2880	0.2033	1	0.4993	<b>0.9269</b>	23.76%	1.0000	0.2261	0.4107	0.4519		SAMPLE				
13	0.3325	0.2347	1	0.5838	<b>0.0763</b>	200.01%	0.0667	0.1333	0.2990	0.2992		MB				
14	0.2452	0.1731	1	0.4579	<b>1.1907</b>	20.54%	1.0667	0.2108	0.4613	0.5093	578683001.1	DUP	16.4%			
15	0.8891	0.6277	1	1.8278	<b>103.7888</b>	10.61%	18.1333	0.7803	8.7538	26.2765	578683001.1	MS			132.7532	77.4%
16	0.2182	0.1541	1	0.4075	<b>24.7364</b>	4.94%	24.9000	0.9159	1.7834	4.3000		LCS			26.4692	93.5%

# **Continuing Calibration Data**



# Ludlum Alpha Scintillation Counter Checks for 24-MAY-2022

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	07:03	1	1.20E+05	119773	-2.72		
LUCAS2	EFF	07:02	1	1.35E+05	134751	2.41		
LUCAS4	EFF	07:01	1	1.27E+05	126776	-0.98		
LUCAS5	EFF	06:59	1	1.31E+05	131097	1.31		
LUCAS6	EFF	07:11	1	1.30E+05	129963	-1.8		
LUCAS7	EFF	06:47	1	1.35E+05	134536	2.21		
LUCAS8	EFF	07:05	1	1.31E+05	130938	0.84		

**Reviewed by:**

Lyndsey Pace

**Date:** 24-MAY-22

GEL Laboratories LLC

# Runlogs



# Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2264106

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
578683001	SAMPLE	LXP1	LUCAS4	MAY-24-22 09:30:00	DONE	Lucas Cell	01-FEB-22 00:00
578683002	SAMPLE	LXP1	LUCAS5	MAY-24-22 09:30:00	DONE	Lucas Cell	01-JUN-21 00:01
578683003	SAMPLE	LXP1	LUCAS6	MAY-24-22 09:30:00	DONE	Lucas Cell	01-JUL-21 00:00
578685001	SAMPLE	LXP1	LUCAS7	MAY-24-22 09:30:00	DONE	Lucas Cell	01-NOV-21 00:00
578685002	SAMPLE	LXP1	LUCAS8	MAY-24-22 09:30:00	DONE	Lucas Cell	01-APR-22 00:00
578685003	SAMPLE	LXP1	LUCAS1	MAY-24-22 10:01:00	DONE	Lucas Cell	28-APR-22 00:00
578685004	SAMPLE	LXP1	LUCAS2	MAY-24-22 10:01:00	DONE	Lucas Cell	01-AUG-21 00:00
579283001	SAMPLE	LXP1	LUCAS4	MAY-24-22 10:01:00	DONE	Lucas Cell	01-FEB-22 00:00
579283002	SAMPLE	LXP1	LUCAS5	MAY-24-22 10:01:00	DONE	Lucas Cell	01-JUN-21 00:01
579283003	SAMPLE	LXP1	LUCAS6	MAY-24-22 10:01:00	DONE	Lucas Cell	01-JUL-21 00:00
579283004	SAMPLE	LXP1	LUCAS7	MAY-24-22 10:01:00	DONE	Lucas Cell	01-NOV-21 00:00
579283005	SAMPLE	LXP1	LUCAS8	MAY-24-22 10:01:00	DONE	Lucas Cell	01-APR-22 00:00
1205087874	MB	LXP1	LUCAS1	MAY-24-22 10:34:00	DONE	Lucas Cell	28-APR-22 00:00
1205087875	DUP	LXP1	LUCAS2	MAY-24-22 10:34:00	DONE	Lucas Cell	01-AUG-21 00:00
1205087876	MS	LXP1	LUCAS4	MAY-24-22 10:34:00	DONE	Lucas Cell	01-FEB-22 00:00
1205087877	LCS	LXP1	LUCAS5	MAY-24-22 10:34:00	DONE	Lucas Cell	01-JUN-21 00:01



Environmental Laboratory  
 1232 Haco Drive  
 Lansing  
 Michigan, 48910

**CHAIN OF CUSTODY**

Phone: (517)702-6372  
 Lab Work Order Number L203075

Client Name BWL - Erickson Station			Project Name Erickson AM MI Well 11B		
Client Contact Cheryl Louden			Project Number [none]		
Address 3725 S. Canal			Project Description		
City Lansing			PO Number 30926 10021		
State/Zip MI, 48917			Shipped By		
Phone (517) 702-6396			Tracking Number		
Fax (517) 702-6373					
Sampler Marc Wahrer					
Ag: Na, K, Mg As: B, Ba: Be: Ca: Cd: Cr: Co: Cu: Fe: Hg: Li: Mo: Ni: Pb: Sb: Se: Tl: V: Zn		TSS		Hardness	
Requested Analyses		Requested Turn Around		Radium 226 and Radium 228	
Rush requests subject to additional charge		Rush requests subject to lab approval			

Sample Name or Field ID	Sampled Date	Sampled Time	Sample Type Grab/Composite	Matrix Code	Container Count	b	a	a	b	Preservation Code	Sample	Comments
MW-11B	04/28/22	1845	G	GW	5	1	1	1	2			
Field Dupe MW-11B		1845	G	GW	5	1	1	1	2			
Field Blank		1840	G	DI	5	1	1	1	2			

Relinquished By	Date/Time 4-28-22 1335	Received By Cheryl Louden	Date/Time 04/28/22 1335	Comments
Relinquished By	Date/Time	Received By	Date/Time	Comments
Relinquished By	Date/Time	Received By	Date/Time	Comments
Cooler Numbers and Temperatures				
Matrix Codes: Di=Disinfectant Water, GW=Ground Water				
Preserv Codes: a=None, b=0.5% HNO3				

### Data Validation Checklist

Site Name: Erickson Personnel: M. Wahrer

Sample Date(s): 4/28/2022 Lab Drop-off Date(s): 4/28/2022

Lab Report Number: S35411.01(02)

Lab Report Date: 7/11/2022

Reason for Sample Event: New Well MW-11B

**Field Records:** Circle Yes/No unless Not Applicable – *Complete during sample event*

Item Description	Verification (Completeness)	Validation (Conformance to Specifications)
Field equipment calibration records	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No
Chain-of-Custody forms	<input checked="" type="radio"/> Yes <input type="radio"/> No	N/A
Field decontamination documentation	N/A	N/A
Sample collection field forms	<input checked="" type="radio"/> Yes <input type="radio"/> No	N/A
Drilling logs	<input checked="" type="radio"/> Yes <input type="radio"/> No	N/A
Well construction logs	<input checked="" type="radio"/> Yes <input type="radio"/> No	N/A
Well development field forms	<input checked="" type="radio"/> Yes <input type="radio"/> No	N/A

**Analytical Data Package:** Circle Yes/No unless N/A – *Complete when lab report is received*

Item Description	Verification (Completeness)	Validation (Conformance to Specifications)
Cover sheet (laboratory identifying information)	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No
Case narrative	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No
Internal laboratory Chain-of-Custody forms	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No
Sample chronology and consistency (that is, dates and times of receipt, preparation, and analysis)	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No
Communication records with laboratory	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No
EDD format consistency	<input checked="" type="radio"/> Yes <input type="radio"/> No	N/A
Sample identification, results nomenclature, and data qualifier consistency	<input checked="" type="radio"/> Yes <input type="radio"/> No	N/A
RLs as requested; MDLs < RLs	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No
Instrument calibration records	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No
Laboratory Report	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No
Field QC sample results and calculation of accuracy and precision	<input checked="" type="radio"/> Yes <input type="radio"/> No Duplicate Well ID: MW-11B	<input checked="" type="radio"/> Yes <input type="radio"/> No Duplicate RPD: 0-14% except TSS at 23%

**Corrections Needed:** None; although the RPD for TSS exceeds 20%, both are below the reporting limit. No qualification is required.

TSS for MW-11B was reported at a value between the MDL and RL. This result has been qualified as not detected above the RL (U).



Lansing Board of Water and Light  
Environmental Services Laboratory (MI00079)  
1232 Haco Dr.  
Lansing, Michigan 48901

07 June 2022

BWL - Erickson Station  
Attn: Cheryl Louden  
3725 S. Canal  
Lansing, MI 48917

**Project: Erickson AM MI**

Dear Cheryl Louden,

Enclosed is a copy of the laboratory report for the following work order(s) received by Lansing Board of Water and Light Environmental Services Laboratory:

<b>Work Order</b>	<b>Received</b>	<b>Account Number</b>
L205151	5/5/2022 7:35:00AM	30926 10021

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in blue ink that reads "Jennifer Caporale".

Jennifer Caporale, Supervisor



Report ID: S35631.01(02)  
Generated on 06/06/2022  
Replaces report S35631.01(01) generated on 05/09/2022

Report to  
Attention: Jennifer Caporale  
Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901  
  
Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

Report produced by  
Merit Laboratories, Inc.  
2680 East Lansing Drive  
East Lansing, MI 48823  
  
Phone: (517) 332-0167 FAX: (517) 332-6333  
  
Contacts for report questions:  
John Lavery (johnlavery@meritlabs.com)  
Barbara Ball (bball@meritlabs.com)

Report Summary  
Lab Sample ID(s): S35631.01-S35631.05  
Project: Erickson AM MI New Wells 11-13  
Collected Date(s): 05/04/2022  
Submitted Date/Time: 05/05/2022 08:33  
Sampled by: Marc Wahrer  
P.O. #:

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Sample Summary (Page 5)

Maya Murshak  
Technical Director



## General Report Notes

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Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile, and 2-chloroethylvinyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (\*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

## Report Narrative

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All analyses completed



Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Alaska CSLAP	#17-001
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched





## Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1 (1993)
SM2320B	Standard Method 2320 B 2011
SM2340C	Standard Method 2340 C 2011
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007



### Sample Summary (5 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S35631.01	MW-11 L205151-01	Groundwater	05/04/22 14:06
S35631.02	MW-12 L205151-02	Groundwater	05/04/22 14:55
S35631.03	MW-13 L205151-03	Groundwater	05/04/22 12:01
S35631.04	Field Dupe MW-13 L205151-04	Groundwater	05/04/22 12:01
S35631.05	Field Blank L205151-05	Water	05/04/22 09:05



Lab Sample ID: S35631.01

Sample Tag: MW-11 L205151-01

Collected Date/Time: 05/04/2022 14:06

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.8	IR
2	1L Plastic	None	Yes	2.8	IR
1	125ml Plastic	HNO3	Yes	2.8	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	05/09/22 09:30	JRH	
Metal Digestion	Completed	SW3015A	05/06/22 10:00	CCM	

### Inorganics

Method: E300.0, Run Date: 05/05/22 11:58, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	63	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 05/05/22 16:06, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	610	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 05/05/22 14:22, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	506	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 05/06/22 16:15, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	612	50	10	mg/L	2		

Method: SM2540D, Run Date: 05/05/22 14:40, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	23	3	1	mg/L	1.33		

### Metals

Method: E200.8, Run Date: 05/06/22 11:34, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.020	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.146	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.21	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	23.5	0.02	0.00192	mg/L	5	7439-89-6	



# Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S35631.01 (continued)

Sample Tag: MW-11 L205151-01

**Method: E200.8, Run Date: 05/06/22 11:34, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 05/06/22 15:41, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	144	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	40.8	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	1.38	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	39.7	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 05/09/22 12:59, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 06/06/22 11:21, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

**Lab Sample ID: S35631.02**

Sample Tag: MW-12 L205151-02

Collected Date/Time: 05/04/2022 14:55

Matrix: Groundwater

COC Reference:

**Sample Containers**

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.8	IR
2	1L Plastic	None	Yes	2.8	IR
1	125ml Plastic	HNO3	Yes	2.8	IR
1	500ml Plastic	None	Yes	2.8	IR

**Extraction / Prep.**

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	05/09/22 09:30	JRH	
Mercury Digestion	Completed	E245.1	05/09/22 09:30	JRH	
Metal Digestion	Completed	SW3015A	05/06/22 10:00	CCM	
Metal Digestion	Completed	SW3015A	05/06/22 10:00	CCM	

**Inorganics****Method: E300.0, Run Date: 05/05/22 12:11, Analyst: JDP**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	

**Method: E300.0, Run Date: 05/05/22 13:41, Analyst: JDP**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	90	25	0.40	mg/L	25	16887-00-6	
Sulfate	283	25	1.5	mg/L	25	14808-79-8	

**Method: SM2320B, Run Date: 05/05/22 16:10, Analyst: JKB**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	650	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

**Method: SM2340C, Run Date: 05/05/22 14:24, Analyst: JKB**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	572	10	2.38	mg/L	10		

**Method: SM2540C, Run Date: 05/06/22 16:15, Analyst: SSM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	1,140	50	10	mg/L	2		

**Method: SM2540D, Run Date: 05/05/22 14:40, Analyst: SSM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	22	3	1	mg/L	1		

**Metals****Method: E200.8, Run Date: 05/06/22 11:40, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.004	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.070	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	



# Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S35631.02 (continued)

Sample Tag: MW-12 L205151-02

**Method: E200.8, Run Date: 05/06/22 11:40, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Boron	0.08	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	2.05	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.023	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.023	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	0.018	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	0.005	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 05/06/22 11:43, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony, Dissolved*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	f
Arsenic, Dissolved	0.002	0.002	0.000255	mg/L	5	7440-38-2	f
Barium, Dissolved	0.064	0.005	0.000162	mg/L	5	7440-39-3	f
Beryllium, Dissolved	Not detected	0.001	0.000215	mg/L	5	7440-41-7	f
Boron, Dissolved	0.08	0.04	0.00175	mg/L	5	7440-42-8	f
Cadmium, Dissolved	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	f
Chromium, Dissolved	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	f
Cobalt, Dissolved	Not detected	0.005	0.000108	mg/L	5	7440-48-4	f
Copper, Dissolved	Not detected	0.005	0.000377	mg/L	5	7440-50-8	f
Iron, Dissolved	0.03	0.02	0.00192	mg/L	5	7439-89-6	f
Lead, Dissolved	Not detected	0.003	0.000190	mg/L	5	7439-92-1	f
Lithium, Dissolved*	0.021	0.005	0.00163	mg/L	5	7439-93-2	f
Molybdenum, Dissolved	0.024	0.005	0.000217	mg/L	5	7439-98-7	f
Nickel, Dissolved	0.018	0.005	0.000250	mg/L	5	7440-02-0	f
Selenium, Dissolved	Not detected	0.005	0.00209	mg/L	5	7782-49-2	f
Silver, Dissolved	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	f
Thallium, Dissolved	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	f
Vanadium, Dissolved	Not detected	0.005	0.000139	mg/L	5	7440-62-2	f
Zinc, Dissolved	Not detected	0.005	0.000730	mg/L	5	7440-66-6	f

**Method: E200.8, Run Date: 05/06/22 15:43, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	149	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	56.4	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	3.73	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	193	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E200.8, Run Date: 05/06/22 15:45, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium, Dissolved*	143	0.50	0.0435	mg/L	5	7440-70-2	f
Magnesium, Dissolved	52.8	0.50	0.0120	mg/L	5	7439-95-4	f

f-Filtered and preserved in lab



# Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S35631.02 (continued)

Sample Tag: MW-12 L205151-02

**Method: E200.8, Run Date: 05/06/22 15:45, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Potassium, Dissolved	3.55	0.50	0.0230	mg/L	5	7440-09-7	f
Sodium, Dissolved	189	0.50	0.00850	mg/L	5	7440-23-5	f

**Method: E245.1, Run Date: 05/09/22 13:12, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury, Dissolved	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	f

**Method: E245.1, Run Date: 05/09/22 13:09, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 06/06/22 11:21, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Completed				1		O

f-Filtered and preserved in lab

O-Analysis performed by outside laboratory. See attached report.



Lab Sample ID: S35631.03

Sample Tag: MW-13 L205151-03

Collected Date/Time: 05/04/2022 12:01

Matrix: Groundwater

COC Reference:

Sample Containers

Table with 6 columns: #, Type, Preservative(s), Refrigerated?, Arrival Temp. (C), Thermometer #. Rows include 1L Plastic and 125ml Plastic containers.

Extraction / Prep.

Table with 6 columns: Parameter, Result, Method, Run Date, Analyst, Flags. Rows include Mercury Digestion and Metal Digestion.

Inorganics

Method: E300.0, Run Date: 05/05/22 12:24, Analyst: JDP

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Rows include Chloride, Fluoride (Undistilled), and Sulfate.

Method: SM2320B, Run Date: 05/05/22 16:12, Analyst: JKB

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Rows include Bicarbonate\* and Carbonate\*.

Method: SM2340C, Run Date: 05/05/22 14:26, Analyst: JKB

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Row includes Hardness.

Method: SM2540C, Run Date: 05/06/22 16:15, Analyst: SSM

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Row includes Total Dissolved Solids.

Method: SM2540D, Run Date: 05/05/22 14:40, Analyst: SSM

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Row includes Total Suspended Solids.

Metals

Method: E200.8, Run Date: 05/06/22 11:46, Analyst: CCM

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Rows include Antimony\*, Arsenic, Barium, Beryllium, Boron, Cadmium, Chromium, Cobalt, Copper, and Iron.





# Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S35631.03 (continued)

Sample Tag: MW-13 L205151-03

**Method: E200.8, Run Date: 05/06/22 11:46, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 05/06/22 15:47, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	95.8	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	19.7	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	0.69	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	2.45	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 05/09/22 13:15, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 06/06/22 11:21, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

**Lab Sample ID: S35631.04**

Sample Tag: Field Dupe MW-13 L205151-04

Collected Date/Time: 05/04/2022 12:01

Matrix: Groundwater

COC Reference:

**Sample Containers**

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.8	IR
2	1L Plastic	None	Yes	2.8	IR
1	125ml Plastic	HNO3	Yes	2.8	IR

**Extraction / Prep.**

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	05/09/22 09:30	JRH	
Metal Digestion	Completed	SW3015A	05/06/22 10:00	CCM	

**Inorganics****Method: E300.0, Run Date: 05/05/22 12:37, Analyst: JDP**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	9	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	16	5	0.30	mg/L	5	14808-79-8	

**Method: SM2320B, Run Date: 05/05/22 16:18, Analyst: JKB**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	330	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

**Method: SM2340C, Run Date: 05/05/22 14:28, Analyst: JKB**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	308	10	2.38	mg/L	10		

**Method: SM2540C, Run Date: 05/06/22 16:15, Analyst: SSM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	342	50	10	mg/L	2		

**Method: SM2540D, Run Date: 05/05/22 14:40, Analyst: SSM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

**Metals****Method: E200.8, Run Date: 05/06/22 11:49, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.019	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.14	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.02	0.02	0.00192	mg/L	5	7439-89-6	



# Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S35631.04 (continued)  
Sample Tag: Field Dupe MW-13 L205151-04

**Method: E200.8, Run Date: 05/06/22 11:49, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 05/06/22 15:48, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	97.6	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	20.1	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	0.70	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	2.51	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 05/09/22 13:19, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 06/06/22 11:21, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S35631.05

Sample Tag: Field Blank L205151-05

Collected Date/Time: 05/04/2022 09:05

Matrix: Water

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.8	IR
2	1L Plastic	None	Yes	2.8	IR
1	125ml Plastic	HNO3	Yes	2.8	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	05/09/22 09:30	JRH	
Metal Digestion	Completed	SW3015A	05/06/22 10:00	CCM	

### Inorganics

Method: E300.0, Run Date: 05/05/22 12:50, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	2.5	0.04	mg/L	2.5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.06	mg/L	2.5	16984-48-8	
Sulfate	Not detected	2.5	0.15	mg/L	2.5	14808-79-8	

Method: SM2320B, Run Date: 05/05/22 16:20, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	Not detected	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 05/05/22 14:30, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	Not detected	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 05/06/22 16:15, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	Not detected	50	10	mg/L	2		

Method: SM2540D, Run Date: 05/05/22 14:40, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 05/06/22 11:30, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00102	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.000102	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.0000648	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.0000862	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.000702	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.0000760	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.0000386	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.0000434	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000150	mg/L	2	7440-50-8	
Iron	Not detected	0.02	0.000768	mg/L	2	7439-89-6	



Lab Sample ID: S35631.05 (continued)

Sample Tag: Field Blank L205151-05

**Method: E200.8, Run Date: 05/06/22 11:30, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.0000760	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000654	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.0000868	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000100	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.000838	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.0000270	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.0000342	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.0000558	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.000292	mg/L	2	7440-66-6	

**Method: E200.8, Run Date: 05/06/22 15:40, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.0174	mg/L	2	7440-70-2	
Magnesium	Not detected	0.50	0.00480	mg/L	2	7439-95-4	
Potassium	Not detected	0.50	0.00920	mg/L	2	7440-09-7	
Sodium	Not detected	0.50	0.00340	mg/L	2	7440-23-5	

**Method: E245.1, Run Date: 05/09/22 13:22, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 06/06/22 11:21, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

# Merit Laboratories Login Checklist

Lab Set ID:S35631

Client:BWL01 (Board of Water & Light)

Project: Erickson AM MI New Wells 11-13

Submitted:05/05/2022 08:33 Login User: PFD

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental\_Laboratory@LBWL.com

Selection	Description	Note
<b>Sample Receiving</b>		
01.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples are received at 4C +/- 2C Thermometer # IR 3.0
02.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Received on ice/ cooling process begun
03.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples shipped
04.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples left in 24 hr. drop box
05.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Are there custody seals/tape or is the drop box locked
<b>Chain of Custody</b>		
06.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC adequately filled out
07.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC signed and relinquished to the lab
08.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sample tag on bottles match COC
09.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Subcontracting needed? Subcontracted to: GEL - UPS# 1Z4664770361654283
<b>Preservation</b>		
10.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Do sample have correct chemical preservation
11.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Completed pH checks on preserved samples? (no VOAs)
12.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Did any samples need to be preserved in the lab? Diss metals
<b>Bottle Conditions</b>		
13.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	All bottles intact
14.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Appropriate analytical bottles are used
15.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Merit bottles used
16.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sufficient sample volume received
17.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples require laboratory filtration Diss metals
18.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples submitted within holding time
19.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Do water VOC or TOX bottles contain headspace

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: \_\_\_\_\_ Date: \_\_\_\_\_

# Merit Laboratories Bottle Preservation Check

Lab Set ID: S35631 Submitted: 05/05/2022 08:33

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI New Wells 11-13

Attention: Jennifer Caporale  
Address: Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901

Initial Preservation Check: 05/05/2022 09:16 PFD

Preservation Recheck (E200.8): N/A

Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S35631.01	125ml Plastic HNO3	<2			
S35631.01	1L Plastic HNO3	<2			
S35631.01	1L Plastic HNO3	<2			
S35631.02	125ml Plastic HNO3	<2			
S35631.02	1L Plastic HNO3	<2			
S35631.02	1L Plastic HNO3	<2			
S35631.03	125ml Plastic HNO3	<2			
S35631.03	1L Plastic HNO3	<2			
S35631.03	1L Plastic HNO3	<2			
S35631.04	125ml Plastic HNO3	<2			
S35631.04	1L Plastic HNO3	<2			
S35631.04	1L Plastic HNO3	<2			
S35631.05	125ml Plastic HNO3	<2			
S35631.05	1L Plastic HNO3	<2			
S35631.05	1L Plastic HNO3	<2			



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 Phone (517) 332-0167 Fax (517) 332-4034  
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

**REPORT TO** **CHAIN OF CUSTODY RECORD** **INVOICE TO**

CONTACT NAME <b>Jennifer Caporale</b>			CONTACT NAME <b>Kelly Gleason</b>			<input checked="" type="checkbox"/> SAME		
COMPANY <b>Lansing Board of Water and Light</b>			COMPANY					
ADDRESS <b>PO Box 13007 48901-3007</b>			ADDRESS					
CITY <b>Lansing</b>		STATE <b>Mi</b>	ZIP CODE <b>48901</b>		CITY		STATE	ZIP CODE
PHONE NO. <b>517-702-6372</b>	FAX NO.	P.O. NO.		PHONE NO.		E-MAIL ADDRESS <b>Kelly.Gleason@lbwl.com</b>		
E-MAIL ADDRESS <b>Environmental_Laboratory@lbwl.com</b>			QUOTE NO.					

PROJECT NO./NAME **Erickson AM MI Wells 11-13**      SAMPLER(S) - PLEASE PRINT/SIGN NAME **Marc Wahrer**

TURNAROUND TIME REQUIRED  1 DAY  2 DAYS  3 DAYS  STANDARD  OTHER **ASAP**

DELIVERABLES REQUIRED  STD  LEVEL II  LEVEL III  LEVEL IV  EDD  OTHER

MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID  
 SL=SLUDGE DW=DRINKING WATER O=OIL WP=WPE A=AIR W=WASTE

# Containers & Preservatives

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION		MATRIX	# OF BOTTLES	NONE	HCl	HNO <sub>3</sub>	H <sub>2</sub> SO <sub>4</sub>	NaOH	MeOH	OTHER	Total Metals	F- undistilled, Cl-, SO <sub>4</sub> , TDS	Radium 226	Radium 228	TSS	Dissolved Metals	HCO <sub>3</sub> , CO <sub>3</sub> , Hardness	Certifications
	DATE	TIME																			
<b>35831.01</b>	<b>5/4/22</b>	<b>1406</b>	<b>MW-11</b>	<b>L 205151-01</b>	GW	5	2	3						✓	✓	✓	✓	✓	✓	✓	Project Locations <input type="checkbox"/> Detroit <input type="checkbox"/> New York <input type="checkbox"/> Other
<b>.02</b>		<b>1455</b>	<b>MW-12</b>	<b>-02</b>	GW	6	3	3						✓	✓	✓	✓	✓	✓	✓	Metals to analyse: Na, Mg, K
<b>.03</b>		<b>1201</b>	<b>MW-13</b>	<b>03</b>	GW	5	2	3						✓	✓	✓	✓	✓	✓	✓	B, Ca, Sb, As, Ba, Be, Cd, Cr,
<b>.04</b>		<b>1201</b>	<b>Field Dupe MW-13</b>	<b>04</b>	GW	5	2	3						✓	✓	✓	✓	✓	✓	✓	Co, Li, Hg, Mo, Pb, Se, Tl,
<b>.05</b>		<b>0905</b>	<b>Field Blank</b>	<b>05</b>	DI	5	2	3						✓	✓	✓	✓	✓	✓	✓	Fe, Cu, Ni, Ag, V, Zn
																					Please send a preliminary report
																					The analytes for dissolved metals are same metals that are analysed for total.

RELINQUISHED BY: SIGNATURE/ORGANIZATION <i>[Signature]</i>	Sampler	DATE <b>5-5-22</b>	TIME <b>0833</b>	RELINQUISHED BY: SIGNATURE/ORGANIZATION	DATE	TIME
RECEIVED BY: SIGNATURE/ORGANIZATION <i>[Signature]</i>		DATE <b>5/5/22</b>	TIME <b>0833</b>	RECEIVED BY: SIGNATURE/ORGANIZATION	DATE	TIME
RELINQUISHED BY: SIGNATURE/ORGANIZATION		DATE	TIME	SEAL NO.	SEAL INTACT YES <input type="checkbox"/> NO <input type="checkbox"/>	INITIALS
RECEIVED BY: SIGNATURE/ORGANIZATION		DATE	TIME	SEAL NO.	SEAL INTACT YES <input type="checkbox"/> NO <input type="checkbox"/>	INITIALS

NOTES: TEMP. ON ARRIVAL **3.0**

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE



## Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total		250 mL plastic	mg/L	Nitric Acid	200.8	6mos	0.150
Be, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	2.5
Cl	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	10
Cr, total	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
F	Fluoride	250 mL plastic	mg/L	None	9056	28 d	1.0
Fe, total	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Pb, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Li, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Hg, total	Mercury	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Mo, total	Molybdenum	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
RA226/228	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	HNO3	SM 7500	6 mos	2.0 combined
Se, total	Selenium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ag, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
SO4	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	10
Tl, total	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
TDS	Total Dissolved Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TSS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540D	NA	3
V, total	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Zn, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005



May 27, 2022

John Laverty  
Merit Laboratories Inc.  
2680 East Lansing Drive  
East Lansing, Michigan 48823

Re: Routine Analysis  
Work Order: 579283  
SDG: S35631

Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on May 09, 2022. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at [www.gel.com](http://www.gel.com).

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,

Delaney Stone  
Project Manager

Purchase Order: GELP20-0018  
Enclosures



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# Case Narrative

**Receipt Narrative  
for  
Merit Laboratories, Inc.  
SDG: S35631  
Work Order: 579283**

**May 27, 2022**

**Laboratory Identification:**

GEL Laboratories LLC  
2040 Savage Road  
Charleston, South Carolina 29407  
(843) 556-8171

**Summary:**

**Sample receipt:** The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on May 09, 2022 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

**Sample Identification:** The laboratory received the following samples:

<b><u>Laboratory ID</u></b>	<b><u>Client ID</u></b>
579283001	S35631.01
579283002	S35631.02
579283003	S35631.03
579283004	S35631.04 (Field Dupe)
579283005	S35631.05 (Field Blank)

**Case Narrative:**

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.

A handwritten signature in black ink that reads "Delaney Stone". The signature is written in a cursive style with a large initial 'D'.

Delaney Stone  
Project Manager

# **Chain of Custody and Supporting Documentation**



2680 East Lansing Dr., East Lansing, MI 48823  
 Phone (517) 332-0167 Fax (517) 332-4034  
 www.meritlabs.com

579283

C.O.C. PAGE # 1 OF 1

**REPORT TO** **CHAIN OF CUSTODY RECORD** **INVOICE TO**

CONTACT NAME **Project Management Team**  
 COMPANY **Merit Laboratories**  
 ADDRESS **2680 East Lansing Drive**  
 CITY **East Lansing** STATE **MI** ZIP CODE **48823**  
 PHONE NO. **517-332-0167** FAX NO. P.O. NO.  
 E-MAIL ADDRESS **results@meritlabs.com** QUOTE NO.

CONTACT NAME **Julie Teague**  NAME  
 COMPANY **Merit Laboratories**  
 ADDRESS **2680 East Lansing Drive**  
 CITY **East Lansing** STATE **MI** ZIP CODE **48823**  
 PHONE NO. **517-332-0167** E-MAIL ADDRESS **juliet@meritlabs.com**

**ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)**

PROJECT NO./NAME **S35631** SAMPLER(S) - PLEASE PRINT/SIGN NAME  
 TURNAROUND TIME REQUIRED  1 DAY  2 DAYS  3 DAYS  STANDARD  OTHER  
 DELIVERABLES REQUIRED  STD  LEVEL II  LEVEL III  LEVEL IV  EDD  OTHER

MATRIX CODE GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID  
 SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIPE A=AIR W=WASTE

# Containers & Preservatives

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HC	HNO3	H2SO4	HNOH	H2O2	OTHER	Radium 226*	Radium 228**
	DATE	TIME												
	5/4/22	1406	S35631.01	GW	2		2						✓	✓
	5/4/22	1455	S35631.02	GW	2		2						✓	✓
	5/4/22	1201	S35631.03	GW	2		2						✓	✓
	5/4/22	1201	S35631.04 (Field Dupe)	GW	2		2						✓	✓
	5/4/22	0905	S35631.05 (Field Blank)	Wa	2		2						✓	✓

**Certifications**  
 OHIO VAP  Drinking Water  
 DoD  NPDES  
**Project Locations**  
 Detroit  New York  
 Other

**Special Instructions**  
 \* E903.1 Mod.  
 \*\* E904.0/SW 9320 Mod.  
 Please use calculation product & provide Radium 226/228 combined results on the report

(No Ice needed)  
 \*\* Subcontracted to  
 GEL Laboratories, Inc.  
 2040 Savage Road  
 Charleston, SC 29407

RELINQUISHED BY: *Johanna Murray*  Sampler DATE **5/5/22** TIME **1700**  
 RECEIVED BY: **UPS** DATE **5/5/22** TIME **1700**  
 RELINQUISHED BY: DATE TIME  
 RECEIVED BY: *[Signature]* DATE **5/9/2020** TIME

RELINQUISHED BY: DATE TIME  
 RECEIVED BY: DATE TIME  
 SEAL NO. SEAL INTACT YES  NO  INITIALS  
 SEAL NO. SEAL INTACT YES  NO  INITIALS  
 NOTES: TEMP. ON ARRIVAL

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE



**SAMPLE RECEIPT & REVIEW FORM**

Client: <u>MEI/EL</u>		SDG/AR/COC/Work Order: <u>519283</u>			
Received By: <u>BE</u>		Date Received: <u>5/19/22</u>			
Carrier and Tracking Number		FedEx Express    FedEx Ground <u>UPS</u> Field Services    Courier    Other <u>12 466 477 03 616 54283</u>			
Suspected Hazard Information		*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.			
A) Shipped as a DOT Hazardous?		Hazard Class Shipped: _____ UN#: _____ If UN2910, Is the Radioactive Shipment Survey Compliant? Yes ___ No ___			
B) Did the client designate the samples are to be received as radioactive?		COC notation or radioactive stickers on containers equal client designation.			
C) Did the RSO classify the samples as radioactive?		Maximum Net Counts Observed* (Observed Counts - Area Background Counts): <u>90</u> CPM/mR/Hr Classified as: Rad 1 Rad 2 Rad 3			
D) Did the client designate samples are hazardous?		COC notation or hazard labels on containers equal client designation.			
E) Did the RSO identify possible hazards?		If D or E is yes, select Hazards below. PCB's    Flammable    Foreign Soil    RCA    Asbestos    Beryllium    Other:			
Sample Receipt Criteria		Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1	Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Seals broken    Damaged container    Leaking container    Other (describe)
2	Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Client contacted and provided COC    COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Preservation Method: Wet Ice    Ice Packs    Dry Ice    None    Other: *all temperatures are recorded in Celsius <u>TEMP: 24</u>
4	Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Temperature Device Serial #: <u>IR2-21</u> Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Seals broken    Damaged container    Leaking container    Other (describe)
6	Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Sample ID's and Containers Affected: If Preservation added, Lot#:
7	Do any samples require Volatile Analysis?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	If Yes, are Encores or Soil Kits present for solids? Yes ___ No ___ NA ___ (If yes, take to VOA Freezer)
					Do liquid VOA vials contain acid preservation? Yes ___ No ___ NA ___ (If unknown, select No)
					Are liquid VOA vials free of headspace? Yes ___ No ___ NA ___
8	Samples received within holding time?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	ID's and containers affected:
10	Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: No dates on containers    No times on containers    COC missing info    Other (describe)
11	Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: No container count on COC    Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
13	COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Not relinquished    Other (describe)
Comments (Use Continuation Form if needed):					

PM (or PMA) review: Initials ML Date 5/19/22 Page 1 of 1

# Laboratory Certifications

**List of current GEL Certifications as of 27 May 2022**

<b>State</b>	<b>Certification</b>
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122022-4
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2019-165
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122021-36
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

# **Radiological Analysis**

# Case Narrative

**Radiochemistry  
Technical Case Narrative  
Merit Laboratories, Inc.  
SDG #: S35631  
Work Order #: 579283**

**Product:** Radium-226+Radium-228 Calculation

**Analytical Method:** Calculation

**Analytical Procedure:** GL-RAD-D-003 REV# 44

**Analytical Batch:** 2264118

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
579283001	S35631.01
579283002	S35631.02
579283003	S35631.03
579283004	S35631.04 (Field Dupe)
579283005	S35631.05 (Field Blank)

**Data Summary:**

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

**Product:** GFPC Ra228, Liquid

**Analytical Method:** EPA 904.0/SW846 9320 Modified

**Analytical Procedure:** GL-RAD-A-063 REV# 5

**Analytical Batch:** 2264119

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
579283001	S35631.01
579283002	S35631.02
579283003	S35631.03
579283004	S35631.04 (Field Dupe)
579283005	S35631.05 (Field Blank)
1205087888	Method Blank (MB)
1205087889	578683001(S35411.01) Sample Duplicate (DUP)
1205087890	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where

applicable, with the following exceptions.

**Preparation Information**

**Homogenous Matrix**

Sample 579283001 (S35631.01) was non-homogenous matrix. Sample 579283001 (S35631.01) has a yellow tint.

**Quality Control (QC) Information**

**Method Blank Criteria**

The blank result (See Below) is greater than the MDC but less than the required detection limit.

Sample	Analyte	Value
1205087888 (MB)	Radium-228	Result: 1.98 pCi/L > MDA: 1.44 pCi/L <= RDL: 3.00 pCi/L

**Product: Lucas Cell, Ra226, Liquid**

**Analytical Method:** EPA 903.1 Modified

**Analytical Procedure:** GL-RAD-A-008 REV# 15

**Analytical Batch:** 2264106

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
579283001	S35631.01
579283002	S35631.02
579283003	S35631.03
579283004	S35631.04 (Field Dupe)
579283005	S35631.05 (Field Blank)
1205087874	Method Blank (MB)
1205087875	578683001(S35411.01) Sample Duplicate (DUP)
1205087876	578683001(S35411.01) Matrix Spike (MS)
1205087877	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

**Miscellaneous Information**

**Additional Comments**

The matrix spike, 1205087876 (S35411.01MS), aliquot was reduced to conserve sample volume.

**Certification Statement**

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.



## GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

### Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S35631 GEL Work Order: 579283

#### The Qualifiers in this report are defined as follows:

- \* A quality control analyte recovery is outside of specified acceptance criteria
- \*\* Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

#### Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature: 

Name: Kate Gellatly

Date: 03 JUN 2022

Title: Analyst I

# Sample Data Summary

# GEL LABORATORIES LLC

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## Certificate of Analysis

Report Date: June 3, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

Client Sample ID: S35631.01	Project: MERI00120
Sample ID: 579283001	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 04-MAY-22 14:06	
Receive Date: 09-MAY-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.479	+/-0.726	1.26	3.00	pCi/L			JXC9	05/27/22	0914 2264119	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.02	+/-0.788			pCi/L		1	TON1	05/27/22	1449 2264118	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.545	+/-0.305	0.298	1.00	pCi/L			LXP1	05/24/22	1001 2264106	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			86.1	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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## Certificate of Analysis

Report Date: June 3, 2022

Company : Merit Laboratories Inc.  
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery  
Project: Routine Analysis

Client Sample ID: S35631.02      Project: MERI00120  
Sample ID: 579283002      Client ID: MERI001  
Matrix: Ground Water  
Collect Date: 04-MAY-22 14:55  
Receive Date: 09-MAY-22  
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.237	+/-1.03	1.86	3.00	pCi/L			JXC9	05/27/22	0914 2264119	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.46	+/-1.14			pCi/L		1	TON1	05/27/22	1449 2264118	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		1.23	+/-0.484	0.487	1.00	pCi/L			LXP1	05/24/22	1001 2264106	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			84.7	(15%-125%)

### Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor      Lc/LC: Critical Level  
DL: Detection Limit      PF: Prep Factor  
MDA: Minimum Detectable Activity      RL: Reporting Limit  
MDC: Minimum Detectable Concentration      SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

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## Certificate of Analysis

Report Date: June 3, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

Client Sample ID: S35631.03	Project: MERI00120
Sample ID: 579283003	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 04-MAY-22 12:01	
Receive Date: 09-MAY-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.0544	+/-0.812	1.53	3.00	pCi/L			JXC9	05/27/22	0914 2264119	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.376	+/-0.845			pCi/L		1	TON1	05/27/22	1449 2264118	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.322	+/-0.232	0.274	1.00	pCi/L			LXP1	05/24/22	1001 2264106	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			89.3	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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## Certificate of Analysis

Report Date: June 3, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

Client Sample ID: S35631.04 (Field Dupe)	Project: MERI00120
Sample ID: 579283004	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 04-MAY-22 12:01	
Receive Date: 09-MAY-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.893	+/-0.827	1.34	3.00	pCi/L			JXC9	05/27/22	0914 2264119	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.04	+/-0.889			pCi/L		1	TON1	05/27/22	1449 2264118	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.149	+/-0.326	0.602	1.00	pCi/L			LXP1	05/24/22	1001 2264106	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			90.5	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

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## Certificate of Analysis

Report Date: June 3, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
 East Lansing, Michigan 48823  
 Contact: John Lavery  
 Project: Routine Analysis

Client Sample ID: S35631.05 (Field Blank)	Project: MERI00120
Sample ID: 579283005	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 04-MAY-22 09:05	
Receive Date: 09-MAY-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	1.56	+/-1.19	1.91	3.00	pCi/L		JXC9	05/27/22	0914	2264119	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		2.49	+/-1.26			pCi/L		1 TON1	05/27/22	1449	2264118	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.927	+/-0.411	0.499	1.00	pCi/L		LXP1	05/24/22	1001	2264106	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			87.2	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# **Quality Control Summary**



# GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

## QC Summary

Report Date: June 3, 2022

Page 1 of 2

Merit Laboratories Inc.  
2680 East Lansing Drive  
East Lansing, Michigan

Contact: John Laverty

Workorder: 579283

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Rad Gas Flow</b>											
Batch	2264119										
QC1205087889	578683001	DUP									
Radium-228	U	1.68		2.10	pCi/L	22.3		(0% - 100%)	JXC9	05/27/22	09:13
	Uncertainty	+/-1.14		+/-1.09							
QC1205087890	LCS										
Radium-228	45.8			44.0	pCi/L		95.9	(75%-125%)		05/27/22	09:13
	Uncertainty			+/-3.09							
QC1205087888	MB										
Radium-228				1.98	pCi/L					05/27/22	09:13
	Uncertainty			+/-1.00							
<b>Rad Ra-226</b>											
Batch	2264106										
QC1205087875	578683001	DUP									
Radium-226		1.01		1.19	pCi/L	16.4		(0% - 100%)	LXP1	05/24/22	10:34
	Uncertainty	+/-0.403		+/-0.461							
QC1205087877	LCS										
Radium-226	26.5			24.7	pCi/L		93.5	(75%-125%)		05/24/22	10:34
	Uncertainty			+/-1.78							
QC1205087874	MB										
Radium-226			U	0.0763	pCi/L					05/24/22	10:34
	Uncertainty			+/-0.299							
QC1205087876	578683001	MS									
Radium-226	133	1.01		104	pCi/L		77.4	(75%-125%)		05/24/22	10:34
	Uncertainty	+/-0.403		+/-8.75							

### Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- \*\* Analyte is a Tracer compound
- < Result is less than value reported
- > Result is greater than value reported
- BD Results are either below the MDC or tracer recovery is low
- FA Failed analysis.
- H Analytical holding time was exceeded

# GEL LABORATORIES LLC

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## QC Summary

Workorder: 579283

Page 2 of 2

Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
J											
J											
K											
L											
M											
M											
N/A											
NI											
ND											
NJ											
Q											
R											
U											
UI											
UJ											
UL											
X											
Y											
^											
h											

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where the duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

\* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

# Gas Flow Raw Data

# Batch 2264119 Check-list

This check-list was completed on 03-JUN-22 by Kate Gellatly

This batch was reviewed by Kenshalla Oston on 27-MAY-22 and Nat Long on 27-MAY-22.

**Batch ID:**  
2264119

**Product:**  
GFC28RAL

**Description:** Gas Flow Radium 228  
GL-RAD-A-063

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous		No	
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?		No	
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
11	Has the method required detection limit been met?	Yes		
<b>Miscellaneous Information</b>				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

# Prep Logbook

## Radium-228 in Liquid

**Batch ID:** 2264119

**Analyst:** Jasmine Conley (JXC9)

**Method:** EPA 904.0/SW846 9320 Modified

**Lab SOP:** GL-RAD-A-063 REV# 5

**Instrument:** LUCAS-C037036045

**Due Dates for Lab:** 31-MAY-2022

**Package:** 01-JUN-2022

**SDG:** 02-JUN-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205087890	Radium-228	1965-C	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	578683001	23-MAY-2022	3	304.15	304.15	05/25/22 12:43	05/27/22 07:20
2	578683002	23-MAY-2022	3	301.23	301.23	05/25/22 12:43	05/27/22 07:20
3	578683003	23-MAY-2022	3	302.39	302.39	05/25/22 12:43	05/27/22 07:20
4	578685001	23-MAY-2022	3	301.44	301.44	05/25/22 12:43	05/27/22 07:20
5	578685002	23-MAY-2022	3	301.42	301.42	05/25/22 12:43	05/27/22 07:20
6	578685003	23-MAY-2022	3	300.87	300.87	05/25/22 12:43	05/27/22 07:20
7	578685004	23-MAY-2022	3	301.56	301.56	05/25/22 12:43	05/27/22 07:20
8	579283001	23-MAY-2022	3	301.37	301.37	05/25/22 12:43	05/27/22 07:20
9	579283002	23-MAY-2022	3	301.17	301.17	05/25/22 12:43	05/27/22 07:20
10	579283003	23-MAY-2022	3	302.71	302.71	05/25/22 12:43	05/27/22 07:20
11	579283004	23-MAY-2022	3	300.58	300.58	05/25/22 12:43	05/27/22 07:20
12	579283005	23-MAY-2022	3	301.26	301.26	05/25/22 12:43	05/27/22 07:20
13	1205087888 MB	23-MAY-2022	3		304.15	05/25/22 12:43	05/27/22 07:20
14	1205087889 DUP (578683001)	23-MAY-2022	3	302.07	302.07	05/25/22 12:43	05/27/22 07:20
15	1205087890 LCS	23-MAY-2022	3		304.15	05/25/22 12:43	05/27/22 07:20

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1951-C	Barium-133	.1 mL	Pipet Id: RAD-GFC-1795419
REGNT 3411398	Barium Carrier Ra228 REG	1 mL	Data Entry Date2: 23-MAY-2022 00:00
REGNT 3413388	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3413919	RGF-50% Potassium Carbonate	2 mL	
REGNT 3417468	RGF-1M Citric Acid	5 mL	
REGNT 3424040	7M Nitric Acid	25 mL	
REGNT 3424228	RGF-Neodymium Substrate	5 mL	
REGNT 3424651.3	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	
REGNT 3426198	2M HCl	20 mL	
REGNT 3430182.12	HF (48-50%)	4 mL	
REGNT 3431618.7	Nitric Acid	5 mL	
REGNT 3432370	Test batches: 2259234	2 g	
REGNT 3435259	RGF-1.5M Ammonium Sulfate	10 mL	

### Radium-228 Liquid

Filename : RA228.XLS  
 File type : Excel  
 Version # : 1.4.2

Tracer S/N : 1951-C  
 Tracer Exp Date : 9/16/2022  
 Tracer Volume Added: 0.10

Batch : 2264119  
 Analyst : JAS02031  
 Prep Date : 5/23/2022  
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL  
 Parmname : Radium-228  
 Required MDA : 3 pCi/L  
 Ra-228 Abundance : 1.00  
 Halflife of Ra-228 : 5.75 years  
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	578683001.1	0.3042	1.8529E-05	4/28/2022 12:45	1394.6	1.55%	1179.5	1.68%	0.1	0.000200
2	578683002.1	0.3012	1.8480E-05	4/28/2022 12:45	1394.6	1.55%	1161.9	1.69%	0.1	0.000200
3	578683003.1	0.3024	1.8499E-05	4/28/2022 12:40	1394.6	1.55%	1204.0	1.66%	0.1	0.000200
4	578685001.1	0.3014	1.8483E-05	4/28/2022 11:37	1394.6	1.55%	1269.5	1.62%	0.1	0.000200
5	578685002.1	0.3014	1.8483E-05	4/28/2022 11:37	1394.6	1.55%	1258.8	1.63%	0.1	0.000200
6	578685003.1	0.3009	1.8474E-05	4/28/2022 10:15	1394.6	1.55%	1231.2	1.65%	0.1	0.000200
7	578685004.1	0.3016	1.8485E-05	4/28/2022 10:20	1394.6	1.55%	1221.8	1.65%	0.1	0.000200
8	579283001.1	0.3014	1.8482E-05	5/4/2022 14:06	1394.6	1.55%	1201.4	1.67%	0.1	0.000200
9	579283002.1	0.3012	1.8479E-05	5/4/2022 14:55	1394.6	1.55%	1181.1	1.68%	0.1	0.000200
10	579283003.1	0.3027	1.8505E-05	5/4/2022 12:01	1394.6	1.55%	1246.0	1.64%	0.1	0.000200
11	579283004.1	0.3006	1.8469E-05	5/4/2022 12:01	1394.6	1.55%	1261.9	1.63%	0.1	0.000200
12	579283005.1	0.3013	1.8480E-05	5/4/2022 9:05	1394.6	1.55%	1216.2	1.66%	0.1	0.000200
13	1205087888.1	0.3042	1.8529E-05	5/23/2022 0:00	1394.6	1.55%	1240.8	1.64%	0.1	0.000200
14	1205087889.1	0.3021	1.8494E-05	4/28/2022 12:45	1394.6	1.55%	1172.3	1.69%	0.1	0.000200
15	1205087890.1	0.3042	1.8529E-05	5/23/2022 0:00	1394.6	1.55%	1273.2	1.62%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063  
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated	Sample
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction	Recovery %	Sample Recovery Error %
			Alpha	Beta										
1	1A	60	21	83	1.383	5/27/2022 9:13	5/25/2022 12:43	5/27/2022 7:20	0.991	0.808	0.992	1.057	84.6%	1.18%
2	1B	60	23	77	1.283	5/27/2022 9:13	5/25/2022 12:43	5/27/2022 7:20	0.991	0.807	0.992	1.057	83.3%	1.18%
3	1C	60	18	45	0.750	5/27/2022 9:14	5/25/2022 12:43	5/27/2022 7:20	0.991	0.807	0.992	1.057	86.3%	1.17%
4	1D	60	21	83	1.383	5/27/2022 9:14	5/25/2022 12:43	5/27/2022 7:20	0.990	0.807	0.992	1.057	91.0%	1.16%
5	2A	60	24	96	1.600	5/27/2022 9:14	5/25/2022 12:43	5/27/2022 7:20	0.990	0.807	0.992	1.057	90.3%	1.16%
6	2B	60	22	79	1.317	5/27/2022 9:14	5/25/2022 12:43	5/27/2022 7:20	0.990	0.807	0.992	1.057	88.3%	1.17%
7	2C	60	33	51	0.850	5/27/2022 9:14	5/25/2022 12:43	5/27/2022 7:20	0.990	0.807	0.992	1.057	87.6%	1.17%
8	3B	60	29	35	0.583	5/27/2022 9:14	5/25/2022 12:43	5/27/2022 7:20	0.992	0.807	0.992	1.057	86.1%	1.17%
9	3C	60	25	68	1.133	5/27/2022 9:14	5/25/2022 12:43	5/27/2022 7:20	0.993	0.807	0.992	1.057	84.7%	1.18%
10	3D	60	15	44	0.733	5/27/2022 9:14	5/25/2022 12:43	5/27/2022 7:20	0.992	0.806	0.992	1.057	89.3%	1.16%
11	4A	60	20	52	0.867	5/27/2022 9:14	5/25/2022 12:43	5/27/2022 7:20	0.992	0.806	0.992	1.057	90.5%	1.16%
12	4B	60	19	97	1.617	5/27/2022 9:14	5/25/2022 12:43	5/27/2022 7:20	0.992	0.806	0.992	1.057	87.2%	1.17%
13	4C	60	27	81	1.350	5/27/2022 9:13	5/25/2022 12:43	5/27/2022 7:20	0.999	0.808	0.992	1.057	89.0%	1.16%
14	4D	60	30	71	1.183	5/27/2022 9:13	5/25/2022 12:43	5/27/2022 7:20	0.991	0.808	0.992	1.057	84.1%	1.18%
15	5A	60	36	838	13.967	5/27/2022 9:13	5/25/2022 12:43	5/27/2022 7:20	0.999	0.808	0.992	1.057	91.3%	1.16%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2021	5/31/2022	0.6325	0.00738	0.928	5/20/2022 19:03	500
2	PIC	6/1/2021	5/31/2022	0.6409	0.00711	0.710	5/20/2022 19:04	500
3	PIC	6/1/2021	5/31/2022	0.6524	0.00847	0.500	5/20/2022 19:04	500
4	PIC	6/1/2021	5/31/2022	0.6466	0.00692	0.722	5/20/2022 19:04	500
5	PIC	6/1/2021	5/31/2022	0.6321	0.01914	0.938	5/20/2022 19:04	500
6	PIC	6/1/2021	5/31/2022	0.6248	0.02111	1.380	5/20/2022 19:04	500
7	PIC	6/1/2021	5/31/2022	0.6380	0.01274	0.828	5/20/2022 19:04	500
8	PIC	6/1/2021	5/31/2022	0.6428	0.01614	0.450	5/20/2022 19:04	500
9	PIC	6/1/2021	5/31/2022	0.6497	0.00988	1.068	5/20/2022 19:04	500
10	PIC	6/1/2021	5/31/2022	0.6259	0.02297	0.718	5/20/2022 19:04	500
11	PIC	6/1/2021	5/31/2022	0.6543	0.01123	0.602	5/20/2022 19:04	500
12	PIC	6/1/2021	5/31/2022	0.6421	0.01519	1.178	5/20/2022 19:04	500
13	PIC	6/1/2021	5/31/2022	0.6681	0.00889	0.748	5/20/2022 19:04	500
14	PIC	6/1/2021	5/31/2022	0.6156	0.00773	0.636	5/20/2022 19:05	500
15	PIC	6/1/2021	5/31/2022	0.6571	0.00851	0.496	5/20/2022 19:05	500



Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A  
 Spike Exp Date : N/A  
 Spike Activity (dpm/ml): N/A  
 Spike Volume Added: N/A

LCS S/N : 1965-C  
 LCS Exp Date : 8/5/2022  
 LCS Activity (dpm/ml): 309.41  
 LCS Volume Added: 0.10

Results																
Pos.	Decision	Critical	Required	Sample Act.		Sample Act.	Net Count	Net Count	2 SIGMA	2 SIGMA	Sample	Sample	RPD	RER	Nominal	Recovery
	Level	Level	MDA	MDA	Conc.	Error	Rate	Rate Error	Counting	Total Prop.						
	pCi/L	pCi/L	pCi/L	pCi/L	pCi/L	%	CPM	CPM	Uncertainty	Uncertainty						
1	1.1317	0.7990	3	1.7825	<b>1.6804</b>	34.69%	0.4553	0.1578	1.1417	1.2165		SAMPLE				
2	1.0015	0.7071	3	1.6009	<b>2.1407</b>	26.38%	0.5733	0.1510	1.1052	1.2280		SAMPLE				
3	0.7939	0.5605	3	1.2973	<b>0.8817</b>	46.50%	0.2500	0.1162	0.8032	0.8329		SAMPLE				
4	0.9159	0.6467	3	1.4626	<b>2.2394</b>	23.71%	0.6613	0.1565	1.0388	1.1800		SAMPLE				
5	1.0772	0.7605	3	1.6958	<b>2.3130</b>	25.62%	0.6620	0.1689	1.1570	1.2959		SAMPLE				
6	1.3542	0.9561	3	2.0932	<b>-0.2293</b>	248.19%	-0.0633	0.1572	1.1156	1.1157		SAMPLE				
7	1.0328	0.7291	3	1.6365	<b>0.0784</b>	571.77%	0.0220	0.1258	0.8790	0.8792		SAMPLE				
8	0.7676	0.5419	3	1.2636	<b>0.4793</b>	77.32%	0.1333	0.1031	0.7261	0.7361		SAMPLE				
9	1.1911	0.8409	3	1.8629	<b>0.2365</b>	221.94%	0.0653	0.1450	1.0290	1.0307		SAMPLE				
10	0.9563	0.6751	3	1.5275	<b>0.0544</b>	762.19%	0.0153	0.1169	0.8120	0.8122		SAMPLE				
11	0.8330	0.5881	3	1.3449	<b>0.8926</b>	47.29%	0.2647	0.1251	0.8269	0.8566		SAMPLE				
12	1.2295	0.8681	3	1.9140	<b>1.5610</b>	39.07%	0.4387	0.1712	1.1939	1.2567		SAMPLE				
13	0.9065	0.6400	3	1.4447	<b>1.9822</b>	25.77%	0.6020	0.1549	0.9997	1.1159		MB				
14	0.9748	0.6882	3	1.5685	<b>2.1017</b>	26.51%	0.5473	0.1449	1.0905	1.2105	578683001.1	DUP	22.3%			
15	0.7317	0.5166	3	1.1963	<b>43.9627</b>	3.87%	13.4707	0.4835	3.0928	11.4224		LCS			45.8237	95.9%

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
578683001	1A	60	21	83	5/27/2022 9:13	5/27/2022 10:13	PIC	2264119
578683002	1B	60	23	77	5/27/2022 9:13	5/27/2022 10:13	PIC	2264119
578683003	1C	60	18	45	5/27/2022 9:14	5/27/2022 10:14	PIC	2264119
578685001	1D	60	21	83	5/27/2022 9:14	5/27/2022 10:14	PIC	2264119
578685002	2A	60	24	96	5/27/2022 9:14	5/27/2022 10:14	PIC	2264119
578685003	2B	60	22	79	5/27/2022 9:14	5/27/2022 10:14	PIC	2264119
578685004	2C	60	33	51	5/27/2022 9:14	5/27/2022 10:14	PIC	2264119
579283001	3B	60	29	35	5/27/2022 9:14	5/27/2022 10:14	PIC	2264119
579283002	3C	60	25	68	5/27/2022 9:14	5/27/2022 10:14	PIC	2264119
579283003	3D	60	15	44	5/27/2022 9:14	5/27/2022 10:14	PIC	2264119
579283004	4A	60	20	52	5/27/2022 9:14	5/27/2022 10:14	PIC	2264119
579283005	4B	60	19	97	5/27/2022 9:14	5/27/2022 10:14	PIC	2264119
1205087888	4C	60	27	81	5/27/2022 9:13	5/27/2022 10:13	PIC	2264119
1205087889	4D	60	30	71	5/27/2022 9:13	5/27/2022 10:13	PIC	2264119
1205087890	5A	60	36	838	5/27/2022 9:13	5/27/2022 10:13	PIC	2264119

ASSAY 27-May-22 7:48:46  
 Wizard 2480 s/n 46190630  
 Protocol id 9 Ba-133\_1  
 Time limit  
 Count limit  
 Isotope Ba-133\_1  
 Protocol date 5/27/2022  
 Run id. 5055

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	94	1	180	4184.57	1394.61	1.55	07:48:46
578683001		2	94	2	180	3539.57	1179.53	1.68	84.58 07:52:00
578683002		3	94	3	180	3486.28	1161.87	1.69	83.31 07:55:13
578683003		4	94	4	180	3612.57	1203.96	1.66	86.33 07:58:27
578685001		5	94	5	180	3808.85	1269.49	1.62	91.03 08:01:42
578685002		1	1	1	180	3777	1258.76	1.63	90.26 08:05:25
578685003		2	1	2	180	3694.28	1231.2	1.65	88.28 08:08:39
578685004		3	1	3	180	3666	1221.77	1.65	87.61 08:11:53
579283001		4	1	4	180	3605	1201.44	1.67	86.15 08:15:06
579283002		5	1	5	180	3543.57	1181.07	1.68	84.69 08:18:21
579283003		1	19	1	180	3738.28	1245.97	1.64	89.34 08:21:57
579283004		2	19	2	180	3786.28	1261.85	1.63	90.48 08:25:10
579283005		3	19	3	180	3649.28	1216.2	1.66	87.21 08:28:24
1205087888		4	19	4	180	3723	1240.77	1.64	88.97 08:31:38
1205087889		5	19	5	180	3517.57	1172.3	1.69	84.06 08:34:53
1205087890		1	3	1	180	3820	1273.21	1.62	91.30 08:38:36

END OF ASSAY

# **Continuing Calibration Data**

# Gas Flow Proportional Counter Checks for 27-May-2022

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100E2	need 2nd	Alpha bkg	27-May 03:59	60	0.117	-1.22E-1	0.368	-0.08
LB4100E2	Above	Beta bkg	27-May 03:59	60	2.167	1.386	3.015	-0.12
LB4100F3	Above	Alpha bkg	27-May 03:59	60	0.333	0.119	0.404	+1.51
LB4100F3	Above	Beta bkg	27-May 03:59	60	72.567	0.854	1.842	+432.42
LB4100G1	need 2nd	Alpha XTalk	27-May 05:02	5	0.293	0.088	0.447	+0.42
LB4100G1	Above	Beta bkg	27-May 04:00	60	611	0.380	1.675	+2,827.57
LB4100G1	Above	Beta eff	27-May 05:15	5	24018	12880	18320	+9.28
LB4100G2	Above	Alpha eff	27-May 05:02	5	9648	7308	9581	+3.18
LB4100G2	Above	Beta bkg	27-May 04:00	60	4.550	1.159	2.203	+16.49
LB4100G3	Below	Alpha bkg	27-May 04:00	60	0.00E+0	0.002	0.276	-3.05
LB4100G3	Above	Beta bkg	27-May 04:00	60	6.767	0.810	1.674	+38.37
PIC2D	Above	Alpha bkg	27-May 07:12	60	0.350	-6.13E-2	0.350	+2.99
PIC2D	Above	Beta bkg	27-May 07:12	60	2.483	0.171	2.681	+2.53
PIC6C	Above	Beta bkg	27-May 07:01	60	2.200	0.415	2.299	+2.68
PIC7D	Above	Alpha bkg	27-May 07:01	60	0.350	-1.70E-2	0.435	+1.87
PIC10B	Above	Beta bkg	27-May 07:01	60	2.150	-1.04E-1	2.645	+1.92
PIC12B	Above	Alpha bkg	27-May 07:13	60	0.733	-4.23E-2	0.379	+8.05

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

LB4100C1 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
 LB4100C2 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
 LB4100C3 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
 LB4100C4 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
 LB4100I1 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
 LB4100I2 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
 LB4100I3 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
 LB4100I4 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by *Janine Priskin*

Date 5/27/22

GEL Laboratories LLC

# Runlogs

# Instrument Run Log

Instrument Type: GFPC

Batch ID: 2264119

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205087888	MB	JXC9	PIC4C	MAY-27-22 09:13:30	DONE	25mm Filter	01-JUN-21 00:00
1205087889	DUP	JXC9	PIC4D	MAY-27-22 09:13:35	DONE	25mm Filter	01-JUN-21 00:00
1205087890	LCS	JXC9	PIC5A	MAY-27-22 09:13:43	DONE	25mm Filter	01-JUN-21 00:00
578683001	SAMPLE	JXC9	PIC1A	MAY-27-22 09:13:49	DONE	25mm Filter	01-JUN-21 00:00
578683002	SAMPLE	JXC9	PIC1B	MAY-27-22 09:13:54	DONE	25mm Filter	01-JUN-21 00:00
578683003	SAMPLE	JXC9	PIC1C	MAY-27-22 09:14:02	DONE	25mm Filter	01-JUN-21 00:00
578685001	SAMPLE	JXC9	PIC1D	MAY-27-22 09:14:06	DONE	25mm Filter	01-JUN-21 00:00
578685002	SAMPLE	JXC9	PIC2A	MAY-27-22 09:14:13	DONE	25mm Filter	01-JUN-21 00:00
578685003	SAMPLE	JXC9	PIC2B	MAY-27-22 09:14:17	DONE	25mm Filter	01-JUN-21 00:00
578685004	SAMPLE	JXC9	PIC2C	MAY-27-22 09:14:17	DONE	25mm Filter	01-JUN-21 00:00
579283001	SAMPLE	JXC9	PIC3B	MAY-27-22 09:14:25	DONE	25mm Filter	01-JUN-21 00:00
579283002	SAMPLE	JXC9	PIC3C	MAY-27-22 09:14:28	DONE	25mm Filter	01-JUN-21 00:00
579283003	SAMPLE	JXC9	PIC3D	MAY-27-22 09:14:32	DONE	25mm Filter	01-JUN-21 00:00
579283004	SAMPLE	JXC9	PIC4A	MAY-27-22 09:14:39	DONE	25mm Filter	01-JUN-21 00:00
579283005	SAMPLE	JXC9	PIC4B	MAY-27-22 09:14:43	DONE	25mm Filter	01-JUN-21 00:00



# Lucas Cell Raw Data

# Batch 2264106 Check-list

This check-list was completed on 24-MAY-22 by Lyndsey Pace

This batch was reviewed by Lyndsey Pace on 24-MAY-22 and Elizabeth Krouse on 25-MAY-22.

**Batch ID:**  
2264106

**Product:**  
LUC26RAL

**Description:** Lucas Cell Radium 226  
GL-RAD-A-008

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
<b>Miscellaneous Information</b>				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

# Prep Logbook

## Radium-226 in Liquid

**Batch ID:** 2264106  
**Analyst:** Lyndsey Pace (LXP1)  
**Method:** EPA 903.1 Modified  
**Lab SOP:** GL-RAD-A-008 REV# 15  
**Instrument:** LUCAS-C037036045

Due Dates for Lab: 30-MAY-2022			Package: 01-JUN-2022	SDG: 02-JUN-2022		
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205087877	Radium-226 SPIKE	1715-G	.1	mL	
MS	1205087876	Radium-226 SPIKE	1715-G	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	578683001	20-MAY-2022	1	500.2	500.2	05/20/22 12:25	401	05/24/22 06:12	05/24/22 09:30	1	27
2	578683002	20-MAY-2022	1	503	503	05/20/22 12:25	502	05/24/22 06:12	05/24/22 09:30	3	45
3	578683003	20-MAY-2022	1	501.53	501.53	05/20/22 12:25	603	05/24/22 06:12	05/24/22 09:30	8	8
4	578685001	20-MAY-2022	1	501.26	501.26	05/20/22 12:25	703	05/24/22 06:12	05/24/22 09:30	5	36
5	578685002	20-MAY-2022	1	502.49	502.49	05/20/22 12:25	806	05/24/22 06:12	05/24/22 09:30	1	38
6	578685003	20-MAY-2022	1	500.21	500.21	05/20/22 12:25	108	05/24/22 06:35	05/24/22 10:01	3	93
7	578685004	20-MAY-2022	1	500.98	500.98	05/20/22 12:25	204	05/24/22 06:35	05/24/22 10:01	4	14
8	579283001	20-MAY-2022	1	500.63	500.63	05/20/22 12:25	407	05/24/22 06:35	05/24/22 10:01	1	15
9	579283002	20-MAY-2022	1	500.59	500.59	05/20/22 12:25	504	05/24/22 06:35	05/24/22 10:01	4	35
10	579283003	20-MAY-2022	1	506.34	506.34	05/20/22 12:25	608	05/24/22 06:35	05/24/22 10:01	1	10
11	579283004	20-MAY-2022	1	502.49	502.49	05/20/22 12:25	704	05/24/22 06:35	05/24/22 10:01	8	12
12	579283005	20-MAY-2022	1	505.33	505.33	05/20/22 12:25	803	05/24/22 06:35	05/24/22 10:01	8	38
13	1205087874 MB	20-MAY-2022	1	506.34	506.34	05/20/22 12:25	104	05/24/22 06:58	05/24/22 10:34	7	9
14	1205087875 DUP (578683001)	20-MAY-2022	1	500.05	500.05	05/20/22 12:25	206	05/24/22 06:58	05/24/22 10:34	4	36
15	1205087876 MS (578683001)	20-MAY-2022	1	100.96	100.96	05/20/22 12:25	403	05/24/22 06:58	05/24/22 10:34	2	546
16	1205087877 LCS	20-MAY-2022	1		506.34	05/20/22 12:25	507	05/24/22 06:58	05/24/22 10:34	4	751

Reagent/Solvent Lot ID	Description	Amount	Comments:
			Data Entry Date2: 20-MAY-2022 00:00

### Radium-226 Liquid

Filename : RA226.XLS  
 File type : Excel  
 Version # : 1.3.2

Procedure Code : LUC26RAL  
 Parmname : Radium-226  
 Required MDA : 1 pCi/L  
 Halflife of Ra-226 : 1600 years  
 Ra-226 Abundance : 1.00  
 Halflife of Rn-222 : 3.8235 days

Batch : 2264106  
 Analyst : LIN01615  
 Prep Date : 5/20/2022  
 Ra-226 Method Uncertainty : 0.073648

Batch counted on : LUCAS CELL DETECTOR  
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Count Time (min.)	Cell Efficiency (cpm/dpm)
1	578683001.1	0.5002	2.0257E-05	4/28/2022 12:45	401	30	27	0.900	1	0.033	30	1.6120
2	578683002.1	0.5030	2.0268E-05	4/28/2022 12:45	502	30	45	1.500	3	0.100	30	1.8100
3	578683003.1	0.5015	2.0262E-05	4/28/2022 12:40	603	30	8	0.267	8	0.267	30	1.6730
4	578685001.1	0.5013	2.0261E-05	4/28/2022 11:37	703	30	36	1.200	5	0.167	30	1.7360
5	578685002.1	0.5025	2.0266E-05	4/28/2022 11:37	806	30	38	1.267	1	0.033	30	1.9460
6	578685003.1	0.5002	2.0257E-05	4/28/2022 10:15	108	30	93	3.100	3	0.100	30	1.5830
7	578685004.1	0.5010	2.0260E-05	4/28/2022 10:20	204	30	14	0.467	4	0.133	30	1.6950
8	579283001.1	0.5006	2.0258E-05	5/4/2022 14:06	407	30	15	0.500	1	0.033	30	1.6030
9	579283002.1	0.5006	2.0258E-05	5/4/2022 14:55	504	30	35	1.167	4	0.133	30	1.5780
10	579283003.1	0.5063	2.0281E-05	5/4/2022 12:01	608	30	10	0.333	1	0.033	30	1.7270
11	579283004.1	0.5025	2.0266E-05	5/4/2022 12:01	704	30	12	0.400	8	0.267	30	1.6710
12	579283005.1	0.5053	2.0277E-05	5/4/2022 9:05	803	30	38	1.267	8	0.267	30	2.0020
13	1205087874.1	0.5063	2.0281E-05	5/20/2022 0:00	104	30	9	0.300	7	0.233	30	1.6160
14	1205087875.1	0.5001	2.0256E-05	4/28/2022 12:45	206	30	36	1.200	4	0.133	30	1.6770
15	1205087876.1	0.1010	1.1429E-05	4/28/2022 12:45	403	30	546	18.200	2	0.067	30	1.6200
16	1205087877.1	0.5063	2.0281E-05	5/20/2022 0:00	507	30	751	25.033	4	0.133	30	1.8610

Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008  
 Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrowth End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
8.100%	2/1/2022	1/31/2023	5/20/2022 12:25	5/24/2022 6:12	5/24/2022 9:30	0.492	0.975	1.002	1.000
9.900%	6/1/2021	5/31/2022	5/20/2022 12:25	5/24/2022 6:12	5/24/2022 9:30	0.492	0.975	1.002	1.000
5.500%	7/1/2021	6/30/2022	5/20/2022 12:25	5/24/2022 6:12	5/24/2022 9:30	0.492	0.975	1.002	1.000
5.000%	11/1/2021	10/31/2022	5/20/2022 12:25	5/24/2022 6:12	5/24/2022 9:30	0.492	0.975	1.002	1.000
7.300%	4/1/2022	3/31/2023	5/20/2022 12:25	5/24/2022 6:12	5/24/2022 9:30	0.492	0.975	1.002	1.000
2.800%	4/28/2022	4/30/2023	5/20/2022 12:25	5/24/2022 6:35	5/24/2022 10:01	0.494	0.974	1.002	1.000
7.800%	8/1/2021	7/31/2022	5/20/2022 12:25	5/24/2022 6:35	5/24/2022 10:01	0.494	0.974	1.002	1.000
6.600%	2/1/2022	1/31/2023	5/20/2022 12:25	5/24/2022 6:35	5/24/2022 10:01	0.494	0.974	1.002	1.000
8.500%	6/1/2021	5/31/2022	5/20/2022 12:25	5/24/2022 6:35	5/24/2022 10:01	0.494	0.974	1.002	1.000
7.400%	7/1/2021	6/30/2022	5/20/2022 12:25	5/24/2022 6:35	5/24/2022 10:01	0.494	0.974	1.002	1.000
8.000%	11/1/2021	10/31/2022	5/20/2022 12:25	5/24/2022 6:35	5/24/2022 10:01	0.494	0.974	1.002	1.000
7.300%	4/1/2022	3/31/2023	5/20/2022 12:25	5/24/2022 6:35	5/24/2022 10:01	0.494	0.974	1.002	1.000
2.000%	4/28/2022	4/30/2023	5/20/2022 12:25	5/24/2022 6:58	5/24/2022 10:34	0.495	0.973	1.002	1.000
5.600%	8/1/2021	7/31/2022	5/20/2022 12:25	5/24/2022 6:58	5/24/2022 10:34	0.495	0.973	1.002	1.000
9.700%	2/1/2022	1/31/2023	5/20/2022 12:25	5/24/2022 6:58	5/24/2022 10:34	0.495	0.973	1.002	1.000
3.300%	6/1/2021	5/31/2022	5/20/2022 12:25	5/24/2022 6:58	5/24/2022 10:34	0.495	0.973	1.002	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

**Spike S/N :** 1715-G  
**Spike Exp Date :** 9/15/2022  
**Spike Activity (dpm/ml):** 297.53  
**Spike Volume Added:** 0.10

**LCS S/N :** 1715-G  
**LCS Exp Date :** 9/15/2022  
**LCS Activity (dpm/ml):** 297.53  
**LCS Volume Added:** 0.10

<b>Results</b>																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.1280	0.0904	1	0.2972	<b>1.0099</b>	21.90%	0.8667	0.1764	0.4028	0.4574		SAMPLE				
2	0.1963	0.1386	1	0.3804	<b>1.4448</b>	19.24%	1.4000	0.2309	0.4671	0.5834		SAMPLE				
3	0.3479	0.2456	1	0.6032	<b>0.000E+00</b>	0.00%	0.0000	0.1333	0.2926	0.2927		SAMPLE				
4	0.2652	0.1872	1	0.4824	<b>1.1157</b>	21.25%	1.0333	0.2134	0.4517	0.4919		SAMPLE				
5	0.1055	0.0745	1	0.2451	<b>1.1851</b>	18.39%	1.2333	0.2082	0.3920	0.4601		SAMPLE				
6	0.2253	0.1591	1	0.4365	<b>3.5527</b>	11.24%	3.0000	0.3266	0.7581	0.9358		SAMPLE				
7	0.2426	0.1713	1	0.4530	<b>0.3681</b>	43.14%	0.3333	0.1414	0.3061	0.3157		SAMPLE				
8	0.1283	0.0906	1	0.2981	<b>0.5453</b>	29.32%	0.4667	0.1333	0.3054	0.3231		SAMPLE				
9	0.2608	0.1841	1	0.4869	<b>1.2267</b>	21.86%	1.0333	0.2082	0.4843	0.5547		SAMPLE				
10	0.1178	0.0832	1	0.2735	<b>0.3217</b>	37.59%	0.3000	0.1106	0.2324	0.2415		SAMPLE				
11	0.3469	0.2449	1	0.6016	<b>0.1489</b>	112.09%	0.1333	0.1491	0.3263	0.3278		SAMPLE				
12	0.2880	0.2033	1	0.4993	<b>0.9269</b>	23.76%	1.0000	0.2261	0.4107	0.4519		SAMPLE				
13	0.3325	0.2347	1	0.5838	<b>0.0763</b>	200.01%	0.0667	0.1333	0.2990	0.2992		MB				
14	0.2452	0.1731	1	0.4579	<b>1.1907</b>	20.54%	1.0667	0.2108	0.4613	0.5093	578683001.1	DUP	16.4%			
15	0.8891	0.6277	1	1.8278	<b>103.7888</b>	10.61%	18.1333	0.7803	8.7538	26.2765	578683001.1	MS			132.7532	77.4%
16	0.2182	0.1541	1	0.4075	<b>24.7364</b>	4.94%	24.9000	0.9159	1.7834	4.3000		LCS			26.4692	93.5%

# **Continuing Calibration Data**



# Ludlum Alpha Scintillation Counter Checks for 24-MAY-2022

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	07:03	1	1.20E+05	119773	-2.72		
LUCAS2	EFF	07:02	1	1.35E+05	134751	2.41		
LUCAS4	EFF	07:01	1	1.27E+05	126776	-0.98		
LUCAS5	EFF	06:59	1	1.31E+05	131097	1.31		
LUCAS6	EFF	07:11	1	1.30E+05	129963	-1.8		
LUCAS7	EFF	06:47	1	1.35E+05	134536	2.21		
LUCAS8	EFF	07:05	1	1.31E+05	130938	0.84		

**Reviewed by:**

Lyndsey Pace

**Date:** 24-MAY-22

GEL Laboratories LLC



# Runlogs

# Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2264106

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
578683001	SAMPLE	LXP1	LUCAS4	MAY-24-22 09:30:00	DONE	Lucas Cell	01-FEB-22 00:00
578683002	SAMPLE	LXP1	LUCAS5	MAY-24-22 09:30:00	DONE	Lucas Cell	01-JUN-21 00:01
578683003	SAMPLE	LXP1	LUCAS6	MAY-24-22 09:30:00	DONE	Lucas Cell	01-JUL-21 00:00
578685001	SAMPLE	LXP1	LUCAS7	MAY-24-22 09:30:00	DONE	Lucas Cell	01-NOV-21 00:00
578685002	SAMPLE	LXP1	LUCAS8	MAY-24-22 09:30:00	DONE	Lucas Cell	01-APR-22 00:00
578685003	SAMPLE	LXP1	LUCAS1	MAY-24-22 10:01:00	DONE	Lucas Cell	28-APR-22 00:00
578685004	SAMPLE	LXP1	LUCAS2	MAY-24-22 10:01:00	DONE	Lucas Cell	01-AUG-21 00:00
579283001	SAMPLE	LXP1	LUCAS4	MAY-24-22 10:01:00	DONE	Lucas Cell	01-FEB-22 00:00
579283002	SAMPLE	LXP1	LUCAS5	MAY-24-22 10:01:00	DONE	Lucas Cell	01-JUN-21 00:01
579283003	SAMPLE	LXP1	LUCAS6	MAY-24-22 10:01:00	DONE	Lucas Cell	01-JUL-21 00:00
579283004	SAMPLE	LXP1	LUCAS7	MAY-24-22 10:01:00	DONE	Lucas Cell	01-NOV-21 00:00
579283005	SAMPLE	LXP1	LUCAS8	MAY-24-22 10:01:00	DONE	Lucas Cell	01-APR-22 00:00
1205087874	MB	LXP1	LUCAS1	MAY-24-22 10:34:00	DONE	Lucas Cell	28-APR-22 00:00
1205087875	DUP	LXP1	LUCAS2	MAY-24-22 10:34:00	DONE	Lucas Cell	01-AUG-21 00:00
1205087876	MS	LXP1	LUCAS4	MAY-24-22 10:34:00	DONE	Lucas Cell	01-FEB-22 00:00
1205087877	LCS	LXP1	LUCAS5	MAY-24-22 10:34:00	DONE	Lucas Cell	01-JUN-21 00:01



Environmental Laboratory  
1232 Haco Drive  
Lansing  
Michigan, 48910



**CHAIN OF CUSTODY**

Phone: (517)702-6372

Lab Work Order Number L205151

Client Name <b>BWL - Erickson Station</b>		Project Name <b>Erickson AM MI Wells 11 13</b>		Requested Analyses								Requested Turn Around		
Client Contact <b>Cheryl Louden</b>		Project Number <b>[none]</b>		Ag:: As:: B:: Ba:: Be:: Bi:: Cd:: Cr::Co:: Cu:: Fe:: Hg::Li:: Mo:: Ni:: Pb:: Sb:: Se:: Tl:: V:: Zn::Mg::Na::K	TSS, HCO3, CO3, T. Hardness	CHC:: F:ISE:: SO4:: TDS	Radium 226 and Radium 228	Metals Dissolved (same metals as total)						Rush requests subject to additional charge  Rush requests subject to lab approval.
Address <b>3725 S. Canal</b>		Project Description												
City <b>Lansing</b>		PO Number <b>30926 10021</b>												
State/Zip <b>MI, 48917</b>		Shipped By												
Phone <b>(517) 702-6396</b>	Fax <b>(517) 702-6373</b>	Tracking Number												
Sampler <b>Marc Wahrer</b>														

Sample Name or Field ID	Sampled Date	Sampled Time	Sample Type Grab/Composite	Matrix Code	Container Count	Preservation Code					Sample	Comments
						b	a	a	b	a		
MW-11	5/4/22	1406	G	GW	5	1	1	1	2	0		
MW-12		1455	G	GW	6	1	1	1	2	1		
MW-13		1201	G	GW	5	1	1	1	2	0		
Field Duplicate MW-13		1201	G	GW	5	1	1	1	2	0		
Field Blank		0905	G	DI	5	1	1	1	2	0		

Relinquished By 	Date/Time <b>5-4-22 1615</b>	Received By 	Date/Time <b>5/5/22 0735</b>	
Relinquished By	Date/Time	Received By	Date/Time	Comments
Relinquished By	Date/Time	Received By	Date/Time	
Cooler Numbers and Temperatures				

Matrix Codes: DI=Deionized Water, GW=Ground Water      Preserv Codes: a=None, b=0.5% HNO3

### Data Validation Checklist

Site Name: Erickson Personnel: M. Wahrer

Sample Date(s): 5/4/2022 Lab Drop-off Date(s): 5/5/2022

Lab Report Number: S35631.01(02)

Lab Report Date: 7/11/2022

Reason for Sample Event: Wells 11-13

**Field Records:** Circle Yes/No unless Not Applicable – *Complete during sample event*

Item Description	Verification (Completeness)	Validation (Conformance to Specifications)
Field equipment calibration records	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Chain-of-Custody forms	<input checked="" type="radio"/> Yes / No	N/A
Field decontamination documentation	N/A	N/A
Sample collection field forms	<input checked="" type="radio"/> Yes / No	N/A
Drilling logs	<input checked="" type="radio"/> Yes / No	N/A
Well construction logs	<input checked="" type="radio"/> Yes / No	N/A
Well development field forms	<input checked="" type="radio"/> Yes / No	N/A

**Analytical Data Package:** Circle Yes/No unless N/A – *Complete when lab report is received*

Item Description	Verification (Completeness)	Validation (Conformance to Specifications)
Cover sheet (laboratory identifying information)	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Case narrative	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Internal laboratory Chain-of-Custody forms	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Sample chronology and consistency (that is, dates and times of receipt, preparation, and analysis)	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Communication records with laboratory	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
EDD format consistency	<input checked="" type="radio"/> Yes / No	N/A
Sample identification, results nomenclature, and data qualifier consistency	<input checked="" type="radio"/> Yes / No	N/A
RLs as requested; MDLs < RLs	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Instrument calibration records	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Laboratory Report	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Field QC sample results and calculation of accuracy and precision	<input checked="" type="radio"/> Yes / No Duplicate Well ID: MW-13	Yes / <input checked="" type="radio"/> No Duplicate RPD: 1-3% except Rad-226/228 at 47%

**Corrections Needed:** None; according to the Technical Case Narrative by GEL Laboratories, subcontracted laboratory for radium analysis, “[a]ll sample data provided in [the] report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Sample 579283001 (S35631.01) was non-homogenous matrix. Sample 579283001 (S35631.01) has a yellow tint.

The [method] blank result (See Below) is greater than the MDC but less than the required detection limit.”

Sample	Analyte	Value
1205087888 (MB)	Radium-228	Result: 1.98 pCi/L > MDA: 1.44 pCi/L <= RDL: 3.00 pCi/L

Sample	Parameter	Result	Uncertainty	MDC	Lab Qualifier	Validated Qualifier
MW-13	Rad-226	0.322	+/-0.232	0.274		J+
	Rad-228	0.0544	+/-0.812	1.53	U	J-
	Rad-226/228	0.376	+/-0.845			J-
MW-13-Dup	Rad-226	0.149	+/-0.326	0.602	U	J-
	Rad-228	0.893	+/-0.827	1.34	U	J+
	Rad-226/228	1.04	+/-0.889			J+

*U - Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.*

Since the laboratory processes indicated no issues with the analytical procedures, no corrective action was necessary. Since the RPD was above the 20% control limit, MW-13 has been qualified as estimated with potential for low bias (J-) and MW-13-Dup has been qualified as estimated with potential for high bias (J+). The component parts Rad-226 required qualification as estimated with high bias (J+) in MW-13 and estimated with low bias (J-) in MW-13-Dup and Rad-228 required qualification as estimated with low bias (J-) in MW-13 and estimated with high bias (J+) in MW-13-Dup. However, the detection of Rad-228 in the method blank required Rad-228 in MW-13 to be qualified as estimated (J) without bias.

Rad-228 in MW-11 required qualification as estimated (J) due to non-homogenous matrix.



Lansing Board of Water and Light  
Environmental Services Laboratory (MI00079)  
1232 Haco Dr.  
Lansing, Michigan 48901

27 June 2022

BWL - Erickson Station  
Attn: Cheryl Louden  
3725 S. Canal  
Lansing, MI 48917

**Project: Erickson AM MI**

Dear Cheryl Louden,

Enclosed is a copy of the laboratory report for the following work order(s) received by Lansing Board of Water and Light Environmental Services Laboratory:

<b>Work Order</b>	<b>Received</b>	<b>Account Number</b>
L205215	5/20/2022 8:00:00AM	30926 10021

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in blue ink that reads "Jennifer Caporale".

Jennifer Caporale, Supervisor



Report ID: S36211.01(02)  
Generated on 06/23/2022  
Replaces report S36211.01(01) generated on 05/24/2022

**Report to**  
Attention: Jennifer Caporale  
Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901  
  
Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

**Report produced by**  
Merit Laboratories, Inc.  
2680 East Lansing Drive  
East Lansing, MI 48823  
  
Phone: (517) 332-0167 FAX: (517) 332-6333  
  
Contacts for report questions:  
John Lavery (johnlavery@meritlabs.com)  
Barbara Ball (bball@meritlabs.com)

**Report Summary**

Lab Sample ID(s): S36211.01-S36211.05  
Project: Erickson AM MI New Wells 7B, 7C & 12B  
Collected Date(s): 05/19/2022  
Submitted Date/Time: 05/20/2022 10:44  
Sampled by: Marc Wahrer  
P.O. #:

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Maya Murshak  
Technical Director



## General Report Notes

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Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile, and 2-chloroethylvinyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (\*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

## Report Narrative

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All analyses completed





Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Alaska CSLAP	#17-001
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



## Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1 (1993)
SM2320B	Standard Method 2320 B 2011
SM2340C	Standard Method 2340 C 2011
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007



## Sample Summary (5 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S36211.01	MW-7B L205215-01	Groundwater	05/19/22 12:14
S36211.02	MW-7C L205215-02	Groundwater	05/19/22 13:58
S36211.03	MW-12B L205215-03	Groundwater	05/19/22 10:08
S36211.04	Field Dupe MW-12B L205215-04	Groundwater	05/19/22 10:08
S36211.05	Field Blank L205215-05	Water	05/19/22 08:45



# Analytical Laboratory Report

Final Report

Lab Sample ID: S36211.01

Sample Tag: MW-7B L205215-01

Collected Date/Time: 05/19/2022 12:14

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	4.7	IR
2	1L Plastic	None	Yes	4.7	IR
1	125ml Plastic	HNO3	Yes	4.7	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	05/21/22 16:48	JRH	
Metal Digestion	Completed	SW3015A	05/21/22 10:30	JRH	

### Inorganics

Method: E300.0, Run Date: 05/20/22 13:44, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 05/20/22 14:06, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	400	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 05/20/22 11:44, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	29	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 05/21/22 15:50, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	366	50	10	mg/L	2		

Method: SM2540D, Run Date: 05/23/22 19:50, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1.00		

### Metals

Method: E200.8, Run Date: 05/21/22 13:14, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.0026	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.00026	mg/L	5	7440-38-2	
Barium	0.010	0.005	0.00016	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.00022	mg/L	5	7440-41-7	
Boron	3.02	0.04	0.0018	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.00019	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.000097	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.00011	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.00038	mg/L	5	7440-50-8	
Iron	0.03	0.02	0.0019	mg/L	5	7439-89-6	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S36211.01 (continued)

Sample Tag: MW-7B L205215-01

**Method: E200.8, Run Date: 05/21/22 13:14, Analyst: JRH (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.00019	mg/L	5	7439-92-1	
Lithium*	0.031	0.005	0.0016	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.00022	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.00025	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.0021	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.000068	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.000086	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.00014	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.00073	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 05/24/22 13:17, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	8.24	0.50	0.044	mg/L	5	7440-70-2	
Magnesium	2.43	0.50	0.012	mg/L	5	7439-95-4	
Potassium	4.80	0.50	0.023	mg/L	5	7440-09-7	
Sodium	116	0.50	0.0085	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 05/21/22 20:53, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 06/16/22 08:06, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Lab Sample ID: S36211.02

Sample Tag: MW-7C L205215-02

Collected Date/Time: 05/19/2022 13:58

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	4.7	IR
2	1L Plastic	None	Yes	4.7	IR
1	125ml Plastic	HNO3	Yes	4.7	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	05/21/22 16:48	JRH	
Metal Digestion	Completed	SW3015A	05/21/22 10:30	JRH	

### Inorganics

Method: E300.0, Run Date: 05/20/22 13:57, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	

Method: E300.0, Run Date: 05/20/22 15:27, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	93	50	0.80	mg/L	50	16887-00-6	
Sulfate	723	50	3.0	mg/L	50	14808-79-8	

Method: SM2320B, Run Date: 05/20/22 14:10, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	170	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 05/20/22 11:46, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	812	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 05/21/22 15:50, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	1,420	50	10	mg/L	2		

Method: SM2540D, Run Date: 05/23/22 19:50, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	9	3	1	mg/L	1.00		

### Metals

Method: E200.8, Run Date: 05/24/22 13:27, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	183	0.50	0.044	mg/L	5	7440-70-2	

Method: E200.8, Run Date: 05/21/22 13:16, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.0026	mg/L	5	7440-36-0	
Arsenic	0.007	0.002	0.00026	mg/L	5	7440-38-2	
Barium	0.046	0.005	0.00016	mg/L	5	7440-39-3	



# Analytical Laboratory Report

Lab Sample ID: S36211.02 (continued)

Sample Tag: MW-7C L205215-02

**Method: E200.8, Run Date: 05/21/22 13:16, Analyst: JRH (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Beryllium	Not detected	0.001	0.00022	mg/L	5	7440-41-7	
Boron	6.74	0.04	0.0018	mg/L	5	7440-42-8	
Cadmium	0.0007	0.0005	0.00019	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.000097	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.00011	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.00038	mg/L	5	7440-50-8	
Iron	4.28	0.02	0.0019	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.00019	mg/L	5	7439-92-1	
Lithium*	0.130	0.005	0.0016	mg/L	5	7439-93-2	
Molybdenum	0.422	0.005	0.00022	mg/L	5	7439-98-7	
Nickel	0.008	0.005	0.00025	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.0021	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.000068	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.000086	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.00014	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.00073	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 05/24/22 13:19, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Magnesium	33.7	0.50	0.012	mg/L	5	7439-95-4	
Potassium	4.92	0.50	0.023	mg/L	5	7440-09-7	
Sodium	79.0	0.50	0.0085	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 05/21/22 21:05, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 06/16/22 08:06, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Lab Sample ID: S36211.03

Sample Tag: MW-12B L205215-03

Collected Date/Time: 05/19/2022 10:08

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	4.7	IR
2	1L Plastic	None	Yes	4.7	IR
1	125ml Plastic	HNO3	Yes	4.7	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	05/21/22 16:48	JRH	
Metal Digestion	Completed	SW3015A	05/21/22 10:30	JRH	

### Inorganics

Method: E300.0, Run Date: 05/20/22 14:10, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 05/20/22 14:16, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	410	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 05/20/22 11:48, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	93	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 05/21/22 15:50, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	370	50	10	mg/L	2		

Method: SM2540D, Run Date: 05/23/22 19:50, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	7	3	1	mg/L	1.00		

### Metals

Method: E200.8, Run Date: 05/21/22 13:18, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.0026	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.00026	mg/L	5	7440-38-2	
Barium	0.027	0.005	0.00016	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.00022	mg/L	5	7440-41-7	
Boron	3.34	0.04	0.0018	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.00019	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.000097	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.00011	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.00038	mg/L	5	7440-50-8	
Iron	0.33	0.02	0.0019	mg/L	5	7439-89-6	





# Analytical Laboratory Report

Lab Sample ID: S36211.03 (continued)

Sample Tag: MW-12B L205215-03

**Method: E200.8, Run Date: 05/21/22 13:18, Analyst: JRH (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.00019	mg/L	5	7439-92-1	
Lithium*	0.038	0.005	0.0016	mg/L	5	7439-93-2	
Molybdenum	0.011	0.005	0.00022	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.00025	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.0021	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.000068	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.000086	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.00014	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.00073	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 05/24/22 13:20, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	21.5	0.50	0.044	mg/L	5	7440-70-2	
Magnesium	6.63	0.50	0.012	mg/L	5	7439-95-4	
Potassium	6.93	0.50	0.023	mg/L	5	7440-09-7	
Sodium	90.9	0.50	0.0085	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 05/21/22 21:09, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 06/16/22 08:06, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Lab Sample ID: S36211.04

Sample Tag: Field Dupe MW-12B L205215-04

Collected Date/Time: 05/19/2022 10:08

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	4.7	IR
2	1L Plastic	None	Yes	4.7	IR
1	125ml Plastic	HNO3	Yes	4.7	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	05/21/22 16:48	JRH	
Metal Digestion	Completed	SW3015A	05/21/22 10:30	JRH	

### Inorganics

Method: E300.0, Run Date: 05/20/22 14:23, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 05/20/22 14:18, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	420	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 05/20/22 11:50, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	96	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 05/21/22 15:50, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	372	50	10	mg/L	2		

Method: SM2540D, Run Date: 05/23/22 19:50, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	7	3	1	mg/L	1.00		

### Metals

Method: E200.8, Run Date: 05/21/22 13:21, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.0026	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.00026	mg/L	5	7440-38-2	
Barium	0.026	0.005	0.00016	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.00022	mg/L	5	7440-41-7	
Boron	3.30	0.04	0.0018	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.00019	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.000097	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.00011	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.00038	mg/L	5	7440-50-8	
Iron	0.33	0.02	0.0019	mg/L	5	7439-89-6	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S36211.04 (continued)  
Sample Tag: Field Dupe MW-12B L205215-04

**Method: E200.8, Run Date: 05/21/22 13:21, Analyst: JRH (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.00019	mg/L	5	7439-92-1	
Lithium*	0.038	0.005	0.0016	mg/L	5	7439-93-2	
Molybdenum	0.005	0.005	0.00022	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.00025	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.0021	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.000068	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.000086	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.00014	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.00073	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 05/24/22 13:21, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	21.7	0.50	0.044	mg/L	5	7440-70-2	
Magnesium	6.68	0.50	0.012	mg/L	5	7439-95-4	
Potassium	7.07	0.50	0.023	mg/L	5	7440-09-7	
Sodium	92.4	0.50	0.0085	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 05/21/22 21:13, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 06/16/22 08:06, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Lab Sample ID: S36211.05

Sample Tag: Field Blank L205215-05

Collected Date/Time: 05/19/2022 08:45

Matrix: Water

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	4.7	IR
2	1L Plastic	None	Yes	4.7	IR
1	125ml Plastic	HNO3	Yes	4.7	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	05/21/22 16:48	JRH	
Metal Digestion	Completed	SW3015A	05/21/22 10:30	JRH	

### Inorganics

Method: E300.0, Run Date: 05/20/22 14:36, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	2.5	0.04	mg/L	2.5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.06	mg/L	2.5	16984-48-8	
Sulfate	Not detected	2.5	0.15	mg/L	2.5	14808-79-8	

Method: SM2320B, Run Date: 05/20/22 14:20, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	Not detected	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 05/20/22 11:52, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	Not detected	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 05/21/22 15:50, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	Not detected	50	10	mg/L	2		

Method: SM2540D, Run Date: 05/23/22 19:50, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1.00		

### Metals

Method: E200.8, Run Date: 05/21/22 13:08, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.0010	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.00010	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.000065	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.000086	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.00070	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.000076	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.000039	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.000043	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.00015	mg/L	2	7440-50-8	
Iron	Not detected	0.02	0.00077	mg/L	2	7439-89-6	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S36211.05 (continued)

Sample Tag: Field Blank L205215-05

**Method: E200.8, Run Date: 05/21/22 13:08, Analyst: JRH (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000076	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.00065	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.000087	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.00010	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.00084	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.000027	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.000034	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.000056	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.00029	mg/L	2	7440-66-6	

**Method: E200.8, Run Date: 05/24/22 13:14, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.017	mg/L	2	7440-70-2	
Magnesium	Not detected	0.50	0.0048	mg/L	2	7439-95-4	
Potassium	Not detected	0.50	0.0092	mg/L	2	7440-09-7	
Sodium	Not detected	0.50	0.0034	mg/L	2	7440-23-5	

**Method: E245.1, Run Date: 05/21/22 21:17, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 06/16/22 08:06, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

# Merit Laboratories Login Checklist

Lab Set ID:S36211

Attention: Jennifer Caporale  
Address: Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901

Client:BWL01 (Board of Water & Light)

Project: Erickson AM MI New Wells 7B, 7C & 12B

Submitted:05/20/2022 10:44 Login User: JRM

Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

Selection	Description	Note
-----------	-------------	------

## Sample Receiving

- |     |  |  |
|-----|--|--|
| 01. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples are received at 4C +/- 2C Thermometer # IR 4.7 |
| 02. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Received on ice/ cooling process begun                 |
| 03. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples shipped  |
| 04. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples left in 24 hr. drop box                        |
| 05. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Are there custody seals/tape or is the drop box locked |

## Chain of Custody

- |     |  |  |
|-----|--|--|
| 06. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC adequately filled out                    |
| 07. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC signed and relinquished to the lab       |
| 08. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sample tag on bottles match COC              |
| 09. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Subcontracting needed? Subcontracted to: GEL |

## Preservation

- |     |  |   |
|-----|--|---|
| 10. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Do sample have correct chemical preservation        |
| 11. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Completed pH checks on preserved samples? (no VOAs) |
| 12. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Did any samples need to be preserved in the lab?    |

## Bottle Conditions

- |     |  |   |
|-----|--|---|
| 13. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | All bottles intact                            |
| 14. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Appropriate analytical bottles are used       |
| 15. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Merit bottles used                            |
| 16. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sufficient sample volume received             |
| 17. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples require laboratory filtration         |
| 18. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples submitted within holding time         |
| 19. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Do water VOC or TOX bottles contain headspace |

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: \_\_\_\_\_ Date: \_\_\_\_\_

# Merit Laboratories Bottle Preservation Check

Lab Set ID: S36211 Submitted: 05/20/2022 10:44

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI New Wells 7B, 7C & 12B

Initial Preservation Check: 05/20/2022 11:20 JRM

Preservation Recheck (E200.8): N/A

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental\_Laboratory@LBWL.com

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S36211.01	125ml Plastic HNO3	<2			
S36211.01	1L Plastic HNO3	<2			
S36211.01	1L Plastic HNO3	<2			
S36211.02	125ml Plastic HNO3	<2			
S36211.02	1L Plastic HNO3	<2			
S36211.02	1L Plastic HNO3	<2			
S36211.03	125ml Plastic HNO3	<2			
S36211.03	1L Plastic HNO3	<2			
S36211.03	1L Plastic HNO3	<2			
S36211.04	125ml Plastic HNO3	<2			
S36211.04	1L Plastic HNO3	<2			
S36211.04	1L Plastic HNO3	<2			
S36211.05	125ml Plastic HNO3	<2			
S36211.05	1L Plastic HNO3	<2			
S36211.05	1L Plastic HNO3	<2			



2680 East Lansing Dr., East Lansing, MI 48823  
 Phone (517) 332-0167 Fax (517) 332-4034  
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

**REPORT TO** **CHAIN OF CUSTODY RECORD** **INVOICE TO**

CONTACT NAME **Jennifer Caporale**  
 COMPANY **Lansing Board of Water and Light**  
 ADDRESS **PO Box 13007 48901-3007**  
 CITY **Lansing** STATE **Mi** ZIP CODE **48901**  
 PHONE NO. **517-702-6372** FAX NO. P.O. NO.  
 E-MAIL ADDRESS **Environmental\_Laboratory@lbwl.com** QUOTE NO.

CONTACT NAME **Kelly Gleason**  SAME  
 COMPANY  
 ADDRESS  
 CITY STATE ZIP CODE  
 PHONE NO. E-MAIL ADDRESS **Kelly.Gleason@lbwl.com**

PROJECT NO./NAME **Erickson AM MI Wells 7B,7C&12B** SAMPLER(S) - PLEASE PRINT/SIGN NAME **Marc Wahrer**  
 TURNAROUND TIME REQUIRED  1 DAY  2 DAYS  3 DAYS  STANDARD  OTHER **ASAP**  
 DELIVERABLES REQUIRED  STD  LEVEL II  LEVEL III  LEVEL IV  EDD  OTHER

MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID  
 SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIPE A=AIR W=WASTE  
 # Containers & Preservatives

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO <sub>3</sub>	H <sub>2</sub> SO <sub>4</sub>	NaOH	MnOH	OTHER	Total Metals	F- undistilled, Cl-, SO <sub>4</sub> , TDS	Radium 226	Radium 228	TSS	HCO <sub>3</sub> , CO <sub>3</sub> , Hardness							Certifications	Project Locations	Special Instructions	
	DATE	TIME																										
36211.01	5/19/22	1214	MW-7B L205215-01	GW	5	2	3						✓	✓	✓	✓	✓	✓										Metals to analyse: Na, Mg, K
.02		1358	MW-7C -02	GW	5	2	3						✓	✓	✓	✓	✓	✓										B, Ca, Sb, As, Ba, Be, Cd, Cr,
.03		1008	MW-12B -03	GW	5	2	3						✓	✓	✓	✓	✓	✓										Co, Li, Hg, Mo, Pb, Se, Tl,
.04		1008	Field Dupe MW-12B -04	GW	5	2	3						✓	✓	✓	✓	✓	✓										Fe, Cu, Ni, Ag, V, Zn
.05		0845	Field Blank -05	DI	5	2	3						✓	✓	✓	✓	✓	✓										Please send a preliminary report

RELINQUISHED BY: *[Signature]*  Sampler DATE **5-20-22** TIME **1044**  
 RECEIVED BY: *Johanna Murray* DATE **5/20/22** TIME **1044**  
 RELINQUISHED BY: DATE TIME  
 RECEIVED BY: DATE TIME

RELINQUISHED BY: DATE TIME  
 RECEIVED BY: DATE TIME  
 SEAL NO. SEAL INTACT YES  NO  INITIALS  
 SEAL NO. SEAL INTACT YES  NO  INITIALS  
 NOTES: TEMP. ON ARRIVAL **4.7**



## Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.150
Be, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	2.5
Cl	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	10
Cr, total	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
F	Fluoride	250 mL plastic	mg/L	None	9056	28 d	1.0
Fe, total	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Pb, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Li, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Hg, total	Mercury	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Mo, total	Molybdenum	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
RA226/228	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	HNO3	SM 7500	6 mos	2.0 combined
Se, total	Selenium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ag, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
SO4	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	10
Tl, total	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
TDS	Total Dissolved Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TSS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540D	NA	3
V, total	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Zn, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005

June 16, 2022

John Laverty  
Merit Laboratories Inc.  
2680 East Lansing Drive  
East Lansing, Michigan 48823

Re: Routine Analysis  
Work Order: 581006  
SDG: S36211

Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on May 25, 2022. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at [www.gel.com](http://www.gel.com).

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,



Delaney Stone  
Project Manager

Purchase Order: GELP20-0018  
Enclosures



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# Case Narrative

**Receipt Narrative  
for  
Merit Laboratories, Inc.  
SDG: S36211  
Work Order: 581006**

**June 16, 2022**

**Laboratory Identification:**

GEL Laboratories LLC  
2040 Savage Road  
Charleston, South Carolina 29407  
(843) 556-8171

**Summary:**

**Sample receipt:** The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on May 25, 2022 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

**Sample Identification:** The laboratory received the following samples:

<b><u>Laboratory ID</u></b>	<b><u>Client ID</u></b>
581006001	S36211.01
581006002	S36211.02
581006003	S36211.03
581006004	S36211.04 (Field Dupe)
581006005	S36211.05 (Field Blank)

**Case Narrative:**

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.

A handwritten signature in black ink that reads "Delaney Stone". The signature is written in a cursive style with a large initial 'D'.

Delaney Stone  
Project Manager

# **Chain of Custody and Supporting Documentation**

581006



2680 East Lansing Dr., East Lansing, MI 48823  
Phone (517) 332-0167 Fax (517) 332-4034  
www.meritlabs.com

REPORT TO PROJECT MANAGEMENT TEAM INVOICE TO

CONTACT NAME: Julie Teague  
COMPANY: Merit Laboratories  
ADDRESS: 2680 East Lansing Drive  
CITY: East Lansing  
PHONE NO.: 517-332-0167  
STATE: MI ZIP CODE: 48823  
E-MAIL ADDRESS: result@meritlabs.com

CHAIN OF CUSTODY RECORD

CONTACT NAME: Julie Teague  
COMPANY: Merit Laboratories  
ADDRESS: 2680 East Lansing Drive  
CITY: East Lansing  
PHONE NO.: 517-332-0167  
STATE: MI ZIP CODE: 48823  
E-MAIL ADDRESS: juliet@meritlabs.com

PROJECT NO./NAME: S36211  
SAMPLE(S) - PLEASE PRINT/SIGN NAME

TURNAROUND TIME REQUIRED: 1 DAY 02 DAYS 3 DAYS STANDARD OTHER  
DELIVERABLES REQUIRED: STD LEVEL I LEVEL II LEVEL III LEVEL IV EDD OTHER

CONTAINERS & PRESERVATIVES

Table with 7 columns: MATRIX CODE, YEAR, DATE, TIME, IDENTIFICATION-DESCRIPTION, # OF BOTTLES, MATRIX

Table with columns for ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED), Certifications, and various checkboxes for testing procedures.

RELINQUISHED BY: SIGNATURE/Organization, RECEIVED BY: SIGNATURE/Organization, SEAL NO., DATE, TIME

REINQUISHED BY: SIGNATURE/Organization, RECEIVED BY: SIGNATURE/Organization, SEAL NO., DATE, TIME





# **Laboratory Certifications**

**List of current GEL Certifications as of 16 June 2022**

<b>State</b>	<b>Certification</b>
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122022-4
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2019-165
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122021-36
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

# **Radiological Analysis**

# Case Narrative

**Radiochemistry  
Technical Case Narrative  
Merit Laboratories, Inc.  
SDG #: S36211  
Work Order #: 581006**

**Product:** GFPC Ra228, Liquid

**Analytical Method:** EPA 904.0/SW846 9320 Modified

**Analytical Procedure:** GL-RAD-A-063 REV# 5

**Analytical Batch:** 2271752

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
581006001	S36211.01
581006002	S36211.02
581006003	S36211.03
581006004	S36211.04 (Field Dupe)
581006005	S36211.05 (Field Blank)
1205103510	Method Blank (MB)
1205103511	580913001(NonSDG) Sample Duplicate (DUP)
1205103512	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

**Product:** Lucas Cell, Ra226, Liquid

**Analytical Method:** EPA 903.1 Modified

**Analytical Procedure:** GL-RAD-A-008 REV# 15

**Analytical Batch:** 2271748

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
581006001	S36211.01
581006002	S36211.02
581006003	S36211.03
581006004	S36211.04 (Field Dupe)
581006005	S36211.05 (Field Blank)
1205103502	Method Blank (MB)
1205103503	580913001(NonSDG) Sample Duplicate (DUP)
1205103504	580913001(NonSDG) Matrix Spike (MS)
1205103505	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

**Miscellaneous Information**

**Additional Comments**

The matrix spike, 1205103504 (Non SDG 580913001MS), aliquot was reduced to conserve sample volume.

**Certification Statement**

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

## GEL LABORATORIES LLC

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### Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S36211 GEL Work Order: 581006

**The Qualifiers in this report are defined as follows:**

- \* A quality control analyte recovery is outside of specified acceptance criteria
- \*\* Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

**Review/Validation**

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature: 

Name: Kenshalla Oston

Date: 22 JUN 2022

Title: Analyst I



# Sample Data Summary

# GEL LABORATORIES LLC

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## Certificate of Analysis

Report Date: June 22, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Lavery  
 Project: Routine Analysis

Client Sample ID: S36211.01	Project: MERI00120
Sample ID: 581006001	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 19-MAY-22 12:14	
Receive Date: 25-MAY-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	-0.123	+/-1.06	2.00	3.00	pCi/L			JXC9	06/09/22	1032 2271752	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.378	+/-1.08			pCi/L			NXL1	06/16/22	0806 2271751	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.378	+/-0.215	0.241	1.00	pCi/L			LXP1	06/15/22	0746 2271748	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			80	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

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## Certificate of Analysis

Report Date: June 22, 2022

Company : Merit Laboratories Inc.  
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery  
Project: Routine Analysis

Client Sample ID: S36211.02      Project: MERI00120  
Sample ID: 581006002      Client ID: MERI001  
Matrix: Ground Water  
Collect Date: 19-MAY-22 13:58  
Receive Date: 25-MAY-22  
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.550	+/-1.05	1.84	3.00	pCi/L			JXC9	06/09/22	1032 2271752	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.994	+/-1.10			pCi/L			NXL1	06/16/22	0806 2271751	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.444	+/-0.301	0.426	1.00	pCi/L			LXP1	06/15/22	0746 2271748	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			83	(15%-125%)

### Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor      Lc/LC: Critical Level  
DL: Detection Limit      PF: Prep Factor  
MDA: Minimum Detectable Activity      RL: Reporting Limit  
MDC: Minimum Detectable Concentration      SQL: Sample Quantitation Limit

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## Certificate of Analysis

Report Date: June 22, 2022

Company : Merit Laboratories Inc.  
Address : 2680 East Lansing Drive  
  
East Lansing, Michigan 48823  
Contact: John Lavery  
Project: Routine Analysis

Client Sample ID: S36211.03      Project: MERI00120  
Sample ID: 581006003      Client ID: MERI001  
Matrix: Ground Water  
Collect Date: 19-MAY-22 10:08  
Receive Date: 25-MAY-22  
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.421	+/-1.22	2.16	3.00	pCi/L			JXC9	06/09/22	1032 2271752	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.03	+/-1.26			pCi/L			NXL1	06/16/22	0806 2271751	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.611	+/-0.307	0.395	1.00	pCi/L			LXP1	06/15/22	0746 2271748	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			88.4	(15%-125%)

### Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor      Lc/LC: Critical Level  
DL: Detection Limit      PF: Prep Factor  
MDA: Minimum Detectable Activity      RL: Reporting Limit  
MDC: Minimum Detectable Concentration      SQL: Sample Quantitation Limit

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## Certificate of Analysis

Report Date: June 22, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Lavery  
 Project: Routine Analysis

Client Sample ID: S36211.04 (Field Dupe)	Project: MERI00120
Sample ID: 581006004	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 19-MAY-22 10:08	
Receive Date: 25-MAY-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	1.10	+/-1.19	1.99	3.00	pCi/L			JXC9	06/09/22	1032 2271752	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.76	+/-1.23			pCi/L			NXL1	06/16/22	0806 2271751	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.657	+/-0.310	0.330	1.00	pCi/L			LXP1	06/15/22	0818 2271748	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			84.7	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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## Certificate of Analysis

Report Date: June 22, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Lavery  
 Project: Routine Analysis

Client Sample ID: S36211.05 (Field Blank)	Project: MERI00120
Sample ID: 581006005	Client ID: MERI001
Matrix: Water	
Collect Date: 19-MAY-22 08:45	
Receive Date: 25-MAY-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.386	+/-0.928	1.66	3.00	pCi/L		JXC9	06/09/22	1032	2271752	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.526	+/-0.962			pCi/L		NXL1	06/16/22	0806	2271751	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.140	+/-0.252	0.454	1.00	pCi/L		LXP1	06/15/22	0818	2271748	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			83.2	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# **Quality Control Summary**

# GEL LABORATORIES LLC

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## QC Summary

Report Date: June 22, 2022

Page 1 of 2

**Merit Laboratories Inc.**  
**2680 East Lansing Drive**  
**East Lansing, Michigan**

**Contact: John Laverty**

**Workorder: 581006**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Rad Gas Flow</b>											
Batch	2271752										
QC1205103511	580913001	DUP									
Radium-228			3.98	1.60	pCi/L	85.2		(0% - 100%)	JXC9	06/09/22	10:31
	Uncertainty		+/-1.43	+/-1.01							
QC1205103512	LCS										
Radium-228			45.4	49.2	pCi/L		109	(75%-125%)		06/09/22	10:32
	Uncertainty			+/-3.47							
QC1205103510	MB										
Radium-228				U	-0.546	pCi/L				06/09/22	10:31
	Uncertainty				+/-0.961						
<b>Rad Ra-226</b>											
Batch	2271748										
QC1205103503	580913001	DUP									
Radium-226			0.717	0.733	pCi/L	2.16		(0% - 100%)	LXP1	06/15/22	08:18
	Uncertainty		+/-0.299	+/-0.332							
QC1205103505	LCS										
Radium-226			26.4	24.6	pCi/L		93.3	(75%-125%)		06/15/22	08:18
	Uncertainty			+/-1.61							
QC1205103502	MB										
Radium-226				U	0.205	pCi/L				06/15/22	08:18
	Uncertainty				+/-0.237						
QC1205103504	580913001	MS									
Radium-226			125	0.717	122	pCi/L		97.5	(75%-125%)	06/15/22	08:18
	Uncertainty		+/-0.299	+/-7.94							

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- \*\* Analyte is a Tracer compound
- < Result is less than value reported
- > Result is greater than value reported
- BD Results are either below the MDC or tracer recovery is low
- FA Failed analysis.
- H Analytical holding time was exceeded



# GEL LABORATORIES LLC

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## QC Summary

Workorder: 581006

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Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
J											
J											
K											
L											
M											
M											
N/A											
NI											
ND											
NJ											
Q											
R											
U											
UI											
UJ											
UL											
X											
Y											
^											
h											

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where the duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

\* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

# Gas Flow Raw Data

# Batch 2271752 Check-list

This check-list was completed on 09-JUN-22 by Nat Long

This batch was reviewed by Kenshalla Oston on 09-JUN-22 and Nat Long on 09-JUN-22.

**Batch ID:**  
2271752

**Product:**  
GFC28RAL

**Description:** Gas Flow Radium 228  
GL-RAD-A-063

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous		No	
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
11	Has the method required detection limit been met?	Yes		
<b>Miscellaneous Information</b>				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

# Prep Logbook

## Radium-228 in Liquid

**Batch ID:** 2271752

**Analyst:** Jasmine Conley (JXC9)

**Method:** EPA 904.0/SW846 9320 Modified

**Lab SOP:** GL-RAD-A-063 REV# 5

**Instrument:** LUCAS-C037036045

**Due Dates for Lab:** 20-JUN-2022

**Package:** 22-JUN-2022

**SDG:** 22-JUN-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205103512	Radium-228	1965-C	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	580913001	02-JUN-2022	3	301.11	301.11	06/07/22 12:10	06/09/22 08:40
2	580913002	02-JUN-2022	3	300.42	300.42	06/07/22 12:10	06/09/22 08:40
3	580913003	02-JUN-2022	3	305.82	305.82	06/07/22 12:10	06/09/22 08:40
4	581006001	02-JUN-2022	3	302.27	302.27	06/07/22 12:10	06/09/22 08:40
5	581006002	02-JUN-2022	3	305.14	305.14	06/07/22 12:10	06/09/22 08:40
6	581006003	02-JUN-2022	3	304.19	304.19	06/07/22 12:10	06/09/22 08:40
7	581006004	02-JUN-2022	3	301.27	301.27	06/07/22 12:10	06/09/22 08:40
8	581006005	02-JUN-2022	3	306.24	306.24	06/07/22 12:10	06/09/22 08:40
9	1205103510 MB	02-JUN-2022	3		306.24	06/07/22 12:10	06/09/22 08:40
10	1205103511 DUP (580913001)	02-JUN-2022	3	302.87	302.87	06/07/22 12:10	06/09/22 08:40
11	1205103512 LCS	02-JUN-2022	3		306.24	06/07/22 12:10	06/09/22 08:40

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1951-C	Barium-133	.1 mL	Pipet Id: RAD-GFC-1795419
REGNT 3411398	Barium Carrier Ra228 REG	1 mL	Data Entry Date2: 02-JUN-2022 00:00
REGNT 3413388	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3413919	RGF-50% Potassium Carbonate	2 mL	
REGNT 3417468	RGF-1M Citric Acid	5 mL	
REGNT 3424040	7M Nitric Acid	25 mL	
REGNT 3424228	RGF-Neodymium Substrate	5 mL	
REGNT 3424653.4	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	
REGNT 3426198	2M HCl	20 mL	
REGNT 3430182.12	HF (48-50%)	4 mL	
REGNT 3431618.7	Nitric Acid	5 mL	
REGNT 3432370	Test batches: 2259234 Lot 0032	2 g	
REGNT 3435259	RGF-1.5M Ammonium Sulfate	10 mL	

### Radium-228 Liquid

Filename : RA228.XLS  
 File type : Excel  
 Version # : 1.4.2

Tracer S/N : 1951-C  
 Tracer Exp Date : 9/16/2022  
 Tracer Volume Added: 0.10

Batch : 2271752  
 Analyst : JAS02031  
 Prep Date : 6/2/2022  
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL  
 Parmname : Radium-228  
 Required MDA : 3 pCi/L  
 Ra-228 Abundance : 1.00  
 Halflife of Ra-228 : 5.75 years  
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	580913001.1	0.3011	1.8478E-05	5/17/2022 10:47	1400.1	1.54%	1180.1	1.68%	0.1	0.000200
2	580913002.1	0.3004	1.8466E-05	5/17/2022 12:19	1400.1	1.54%	1127.5	1.72%	0.1	0.000200
3	580913003.1	0.3058	1.8556E-05	5/17/2022 12:24	1400.1	1.54%	1208.8	1.66%	0.1	0.000200
4	581006001.1	0.3023	1.8497E-05	5/19/2022 12:14	1400.1	1.54%	1120.5	1.72%	0.1	0.000200
5	581006002.1	0.3051	1.8545E-05	5/19/2022 13:58	1400.1	1.54%	1162.1	1.69%	0.1	0.000200
6	581006003.1	0.3042	1.8529E-05	5/19/2022 10:08	1400.1	1.54%	1238.0	1.64%	0.1	0.000200
7	581006004.1	0.3013	1.8481E-05	5/19/2022 10:08	1400.1	1.54%	1186.4	1.68%	0.1	0.000200
8	581006005.1	0.3062	1.8563E-05	5/19/2022 8:45	1400.1	1.54%	1164.2	1.69%	0.1	0.000200
9	1205103510.1	0.3062	1.8563E-05	6/2/2022 0:00	1400.1	1.54%	1143.5	1.71%	0.1	0.000200
10	1205103511.1	0.3029	1.8507E-05	5/17/2022 10:47	1400.1	1.54%	1225.6	1.65%	0.1	0.000200
11	1205103512.1	0.3062	1.8563E-05	6/2/2022 0:00	1400.1	1.54%	1176.8	1.68%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063  
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated Sample Recovery %	Sample Recovery Error %
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction		
1	4B	60	16	138	2.300	6/9/2022 10:32	6/7/2022 12:10	6/9/2022 8:40	0.992	0.810	0.993	1.057	84.3%	1.17%
2	4C	60	18	95	1.583	6/9/2022 10:32	6/7/2022 12:10	6/9/2022 8:40	0.992	0.810	0.993	1.057	80.5%	1.19%
3	6B	60	17	112	1.867	6/9/2022 10:32	6/7/2022 12:10	6/9/2022 8:40	0.992	0.810	0.993	1.057	86.3%	1.17%
4	7A	60	15	64	1.067	6/9/2022 10:32	6/7/2022 12:10	6/9/2022 8:40	0.993	0.809	0.993	1.057	80.0%	1.19%
5	7C	60	20	73	1.217	6/9/2022 10:32	6/7/2022 12:10	6/9/2022 8:40	0.993	0.809	0.993	1.057	83.0%	1.18%
6	8C	60	10	107	1.783	6/9/2022 10:32	6/7/2022 12:10	6/9/2022 8:40	0.993	0.809	0.993	1.057	88.4%	1.16%
7	8D	60	14	93	1.550	6/9/2022 10:32	6/7/2022 12:10	6/9/2022 8:40	0.993	0.809	0.993	1.057	84.7%	1.17%
8	9A	60	16	56	0.933	6/9/2022 10:32	6/7/2022 12:10	6/9/2022 8:40	0.993	0.809	0.993	1.057	83.2%	1.18%
9	9C	60	10	55	0.917	6/9/2022 10:31	6/7/2022 12:10	6/9/2022 8:40	0.998	0.810	0.993	1.057	81.7%	1.18%
10	9D	60	12	73	1.217	6/9/2022 10:31	6/7/2022 12:10	6/9/2022 8:40	0.992	0.810	0.993	1.057	87.5%	1.16%
11	10A	60	15	863	14.383	6/9/2022 10:32	6/7/2022 12:10	6/9/2022 8:40	0.998	0.810	0.993	1.057	84.1%	1.17%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2022	5/31/2023	0.6400	0.01519	1.217	6/4/2022 8:43	1000
2	PIC	6/1/2022	5/31/2023	0.6359	0.00889	0.784	6/4/2022 8:43	1000
3	PIC	6/1/2022	5/31/2023	0.6280	0.00851	0.814	6/4/2022 8:41	1000
4	PIC	6/1/2022	5/31/2023	0.6257	0.00594	1.098	6/4/2022 8:41	1000
5	PIC	6/1/2022	5/31/2023	0.6407	0.00790	1.067	6/4/2022 8:41	1000
6	PIC	6/1/2022	5/31/2023	0.6294	0.01955	1.664	6/4/2022 8:41	1000
7	PIC	6/1/2022	5/31/2023	0.6347	0.00609	1.251	6/4/2022 8:41	1000
8	PIC	6/1/2022	5/31/2023	0.6336	0.00758	0.829	6/4/2022 8:41	1000
9	PIC	6/1/2022	5/31/2023	0.6184	0.00584	1.059	6/4/2022 8:41	1000
10	PIC	6/1/2022	5/31/2023	0.6330	0.02610	0.766	6/4/2022 8:41	1000
11	PIC	6/1/2022	5/31/2023	0.6384	0.00651	0.744	6/4/2022 8:41	1000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

**Spike S/N :** N/A  
**Spike Exp Date :** N/A  
**Spike Activity (dpm/ml):** N/A  
**Spike Volume Added:** N/A

**LCS S/N :** 1965-C  
**LCS Exp Date :** 8/5/2022  
**LCS Activity (dpm/ml):** 308.39  
**LCS Volume Added:** 0.10

<b>Results</b>																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	1.2547	0.8858	3	1.9553	<b>3.9773</b>	18.46%	1.0830	0.1989	1.4315	1.7460		SAMPLE				
2	1.0634	0.7507	3	1.6954	<b>3.0997</b>	20.68%	0.7993	0.1648	1.2529	1.4735		SAMPLE				
3	1.0057	0.7100	3	1.6001	<b>3.7890</b>	17.04%	1.0527	0.1787	1.2605	1.5771		SAMPLE				
4	1.2788	0.9028	3	2.0027	<b>-0.1235</b>	438.48%	-0.0313	0.1374	1.0611	1.0613		SAMPLE				
5	1.1760	0.8303	3	1.8444	<b>0.5502</b>	97.63%	0.1497	0.1461	1.0527	1.0617		SAMPLE				
6	1.4082	0.9942	3	2.1646	<b>0.4206</b>	148.48%	0.1193	0.1772	1.2240	1.2286		SAMPLE				
7	1.2758	0.9007	3	1.9857	<b>1.1013</b>	55.06%	0.2990	0.1646	1.1881	1.2195		SAMPLE				
8	1.0434	0.7366	3	1.6582	<b>0.3861</b>	122.69%	0.1043	0.1280	0.9283	0.9333		SAMPLE				
9	1.2220	0.8628	3	1.9173	<b>-0.5458</b>	89.81%	-0.1423	0.1278	0.9606	0.9607		MB				
10	0.9629	0.6798	3	1.5373	<b>1.6010</b>	32.32%	0.4507	0.1451	1.0101	1.0893	580913001.1	DUP	85.2%			
11	0.9645	0.6809	3	1.5424	<b>49.2462</b>	3.84%	13.6393	0.4904	3.4703	12.7874		LCS			45.3610	108.6%



SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
580913001	4B	60	16	138	6/9/2022 10:32	6/9/2022 11:32	PIC	2271752
580913002	4C	60	18	95	6/9/2022 10:32	6/9/2022 11:32	PIC	2271752
580913003	6B	60	17	112	6/9/2022 10:32	6/9/2022 11:32	PIC	2271752
581006001	7A	60	15	64	6/9/2022 10:32	6/9/2022 11:32	PIC	2271752
581006002	7C	60	20	73	6/9/2022 10:32	6/9/2022 11:32	PIC	2271752
581006003	8C	60	10	107	6/9/2022 10:32	6/9/2022 11:32	PIC	2271752
581006004	8D	60	14	93	6/9/2022 10:32	6/9/2022 11:32	PIC	2271752
581006005	9A	60	16	56	6/9/2022 10:32	6/9/2022 11:32	PIC	2271752
1205103510	9C	60	10	55	6/9/2022 10:31	6/9/2022 11:31	PIC	2271752
1205103511	9D	60	12	73	6/9/2022 10:31	6/9/2022 11:31	PIC	2271752
1205103512	10A	60	15	863	6/9/2022 10:32	6/9/2022 11:32	PIC	2271752

ASSAY 9-Jun-22 9:01:58  
 Wizard 2480 s/n 46190630  
 Protocol id 8 Ba-133  
 Time limit  
 Count limit  
 Isotope Ba-133  
 Protocol date 6/9/2022  
 Run id. 5110

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	93	1	180	4201	1400.07	1.54	09:01:58
580913001	2	93	2	180	3540.98	1180.1	1.68	84.29	09:05:12
580913002	3	93	3	180	3383	1127.45	1.72	80.53	09:08:26
580913003	4	93	4	180	3627	1208.77	1.66	86.34	09:11:40
581006001	5	93	5	180	3362.28	1120.54	1.72	80.03	09:14:54
581006002	1	1	1	180	3487	1162.11	1.69	83.00	09:18:31
581006003	2	1	2	180	3714.57	1237.96	1.64	88.42	09:21:45
581006004	3	1	3	180	3560	1186.44	1.68	84.74	09:24:59
581006005	4	1	4	180	3493	1164.21	1.69	83.15	09:28:13
1205103510	5	1	5	180	3431.28	1143.54	1.71	81.68	09:31:27
1205103511	1	6	1	180	3677.28	1225.64	1.65	87.54	09:35:03
1205103512	2	6	2	180	3531	1176.78	1.68	84.05	09:38:17

END OF ASSAY

# **Continuing Calibration Data**

# Gas Flow Proportional Counter Checks for 09-Jun-2022

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100A2	Above	Beta eff	09-Jun 04:44	5	23348	19870	23260	+3.15
LB4100E1	Below	Beta eff	09-Jun 05:14	5	13808	13920	15150	-3.55
LB4100E2	Above	Alpha bkg	09-Jun 02:49	60	0.383	-1.22E-1	0.368	+3.19
LB4100E2	Above	Beta bkg	09-Jun 02:49	60	2.533	1.386	3.015	+1.23
LB4100F3	need 2nd	Beta bkg	09-Jun 02:49	60	1.067	0.854	1.842	-1.71
LB4100G1	need 2nd	Alpha XTalk	09-Jun 03:50	5	0.288	0.088	0.447	+0.34
LB4100G1	need 2nd	Beta bkg	09-Jun 02:49	60	0.900	0.380	1.675	-0.59
LB4100G1	need 2nd	Beta eff	09-Jun 03:57	5	14886	12880	18320	-0.79
LB4100G2	Above	Alpha eff	09-Jun 03:51	5	9686	7308	9581	+3.28
LB4100G2	Below	Alpha XTalk	09-Jun 03:51	5	0.317	0.324	0.423	-3.43
LB4100G2	Above	Beta bkg	09-Jun 02:49	60	4.767	1.159	2.203	+17.73
LB4100G3	Above	Beta bkg	09-Jun 02:49	60	6.433	0.810	1.674	+36.05
LB4100H1	Above	Beta bkg	09-Jun 04:07	60	2.067	0.216	2.462	+1.94
LB4100H2	Above	Beta bkg	09-Jun 04:07	60	3.083	-4.25E-1	2.832	+3.46
LB4100H4	Above	Alpha eff	09-Jun 06:17	5	9913	6065	9898	+3.02
PIC2D	Above	Beta bkg	09-Jun 13:08	60	2.250	0.171	2.681	+1.97
PIC6A	Above	Alpha bkg	09-Jun 14:10	60	0.450	0.001	0.390	+3.92
PIC6A	Below	Alpha eff	09-Jun 04:12	5	8417	8586	10460	-3.54
PIC8B	need 2nd	Alpha bkg	09-Jun 13:09	60	0.083	-1.16E-1	0.388	-0.63
PIC8B	Above	Beta bkg	09-Jun 13:09	60	5659	-1.80E-1	2.341	+13,462.92
PIC12B	Above	Alpha bkg	09-Jun 14:08	60	0.783	-4.23E-2	0.379	+8.76

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

LB4100C1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

LB410012            Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
LB410013            Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
LB410014            Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by     *L. Smith-Harman*    

Date     *6-10-22*    

GEL Laboratories LLC

# Runlogs

# Instrument Run Log

Instrument Type: GFPC

Batch ID: 2271752

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205103510	MB	JXC9	PIC9C	JUN-09-22 10:31:56	DONE	25mm Filter	01-JUN-22 00:00
1205103511	DUP	JXC9	PIC9D	JUN-09-22 10:31:59	DONE	25mm Filter	01-JUN-22 00:00
1205103512	LCS	JXC9	PIC10A	JUN-09-22 10:32:05	DONE	25mm Filter	01-JUN-22 00:00
580913001	SAMPLE	JXC9	PIC4B	JUN-09-22 10:32:15	DONE	25mm Filter	01-JUN-22 00:00
580913002	SAMPLE	JXC9	PIC4C	JUN-09-22 10:32:18	DONE	25mm Filter	01-JUN-22 00:00
580913003	SAMPLE	JXC9	PIC6B	JUN-09-22 10:32:29	DONE	25mm Filter	01-JUN-22 00:00
581006001	SAMPLE	JXC9	PIC7A	JUN-09-22 10:32:35	DONE	25mm Filter	01-JUN-22 00:00
581006002	SAMPLE	JXC9	PIC7C	JUN-09-22 10:32:38	DONE	25mm Filter	01-JUN-22 00:00
581006003	SAMPLE	JXC9	PIC8C	JUN-09-22 10:32:46	DONE	25mm Filter	01-JUN-22 00:00
581006004	SAMPLE	JXC9	PIC8D	JUN-09-22 10:32:51	DONE	25mm Filter	01-JUN-22 00:00
581006005	SAMPLE	JXC9	PIC9A	JUN-09-22 10:32:58	DONE	25mm Filter	01-JUN-22 00:00

# Lucas Cell Raw Data



# Batch 2271748 Check-list

This check-list was completed on 15-JUN-22 by Lyndsey Pace

This batch was reviewed by Elizabeth Krouse on 15-JUN-22 and Lyndsey Pace on 15-JUN-22.

**Batch ID:**  
2271748

**Product:**  
LUC26RAL

**Description:** Lucas Cell Radium 226  
GL-RAD-A-008

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
<b>Miscellaneous Information</b>				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

# Prep Logbook

## Radium-226 in Liquid

**Batch ID:** 2271748  
**Analyst:** Lyndsey Pace (LXP1)  
**Method:** EPA 903.1 Modified  
**Lab SOP:** GL-RAD-A-008 REV# 15  
**Instrument:** LUCAS-C037036045

Due Dates for Lab: 20-JUN-2022			Package: 22-JUN-2022	SDG: 22-JUN-2022		
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205103505	Radium-226 SPIKE	1715-G	.1	mL	
MS	1205103504	Radium-226 SPIKE	1715-G	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	580913001	03-JUN-2022	1	500.48	500.48	06/09/22 09:25	102	06/15/22 04:41	06/15/22 07:46	1	25
2	580913002	03-JUN-2022	1	506.63	506.63	06/09/22 09:25	207	06/15/22 04:41	06/15/22 07:46	7	32
3	580913003	03-JUN-2022	1	504.86	504.86	06/09/22 09:25	402	06/15/22 04:41	06/15/22 07:46	5	17
4	581006001	03-JUN-2022	1	504.65	504.65	06/09/22 09:25	502	06/15/22 04:41	06/15/22 07:46	2	17
5	581006002	03-JUN-2022	1	501.14	501.14	06/09/22 09:25	708	06/15/22 04:41	06/15/22 07:46	6	21
6	581006003	03-JUN-2022	1	507.82	507.82	06/09/22 09:25	804	06/15/22 04:41	06/15/22 07:46	8	33
7	581006004	03-JUN-2022	1	503.59	503.59	06/09/22 09:25	101	06/15/22 05:08	06/15/22 08:18	3	25
8	581006005	03-JUN-2022	1	500.74	500.74	06/09/22 09:25	205	06/15/22 05:08	06/15/22 08:18	8	13
9	1205103502 MB	03-JUN-2022	1		507.82	06/09/22 09:25	408	06/15/22 05:08	06/15/22 08:18	5	12
10	1205103503 DUP (580913001)	03-JUN-2022	1	504.94	504.94	06/09/22 09:25	507	06/15/22 05:08	06/15/22 08:18	8	37
11	1205103504 MS (580913001)	03-JUN-2022	1	107.37	107.37	06/09/22 09:25	605	06/15/22 05:08	06/15/22 08:18	3	923
12	1205103505 LCS	03-JUN-2022	1		507.82	06/09/22 09:25	703	06/15/22 05:08	06/15/22 08:18	8	926

Reagent/Solvent Lot ID	Description	Amount
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**Comments:**  
 Data Entry Date2: 03-JUN-2022 00:00

### Radium-226 Liquid

Filename : RA226.XLS  
 File type : Excel  
 Version # : 1.3.2

Procedure Code : LUC26RAL  
 Parmname : Radium-226  
 Required MDA : 1 pCi/L  
 Halflife of Ra-226 : 1600 years  
 Ra-226 Abundance : 1.00  
 Halflife of Rn-222 : 3.8235 days

Batch : 2271748  
 Analyst : LIN01615  
 Prep Date : 6/3/2022  
 Ra-226 Method Uncertainty : 0.073648

Batch counted on : LUCAS CELL DETECTOR  
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Count Time (min.)	Cell Efficiency (cpm/dpm)
1	580913001.1	0.5005	2.0258E-05	5/17/2022 10:47	102	30	25	0.833	1	0.033	30	1.5820
2	580913002.1	0.5066	2.0283E-05	5/17/2022 12:19	207	30	32	1.067	7	0.233	30	1.9320
3	580913003.1	0.5049	2.0276E-05	5/17/2022 12:24	402	30	17	0.567	5	0.167	30	1.4480
4	581006001.1	0.5047	2.0275E-05	5/19/2022 12:14	502	30	17	0.567	2	0.067	30	1.8630
5	581006002.1	0.5011	2.0261E-05	5/19/2022 13:58	708	30	21	0.700	6	0.200	30	1.5950
6	581006003.1	0.5078	2.0287E-05	5/19/2022 10:08	804	30	33	1.100	8	0.267	30	1.9050
7	581006004.1	0.5036	2.0271E-05	5/19/2022 10:08	101	30	25	0.833	3	0.100	30	1.5720
8	581006005.1	0.5007	2.0259E-05	5/19/2022 8:45	205	30	13	0.433	8	0.267	30	1.6810
9	1205103502.1	0.5078	2.0287E-05	6/3/2022 0:00	408	30	12	0.400	5	0.167	30	1.5900
10	1205103503.1	0.5049	2.0276E-05	5/17/2022 10:47	507	30	37	1.233	8	0.267	30	1.8520
11	1205103504.1	0.1074	1.1813E-05	5/17/2022 10:47	605	30	923	30.767	3	0.100	30	1.6540
12	1205103505.1	0.5078	2.0287E-05	6/3/2022 0:00	703	30	926	30.867	8	0.267	30	1.7360

Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008  
 Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrowth End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
6.300%	4/28/2022	4/30/2023	6/9/2022 9:25	6/15/2022 4:41	6/15/2022 7:46	0.651	0.977	1.002	1.000
9.200%	8/1/2021	7/31/2022	6/9/2022 9:25	6/15/2022 4:41	6/15/2022 7:46	0.651	0.977	1.002	1.000
2.300%	2/1/2022	1/31/2023	6/9/2022 9:25	6/15/2022 4:41	6/15/2022 7:46	0.651	0.977	1.002	1.000
6.700%	6/1/2022	5/31/2023	6/9/2022 9:25	6/15/2022 4:41	6/15/2022 7:46	0.651	0.977	1.002	1.000
2.200%	11/1/2021	10/31/2022	6/9/2022 9:25	6/15/2022 4:41	6/15/2022 7:46	0.651	0.977	1.002	1.000
9.900%	4/1/2022	3/31/2023	6/9/2022 9:25	6/15/2022 4:41	6/15/2022 7:46	0.651	0.977	1.002	1.000
1.200%	4/28/2022	4/30/2023	6/9/2022 9:25	6/15/2022 5:08	6/15/2022 8:18	0.652	0.976	1.002	1.000
2.800%	8/1/2021	7/31/2022	6/9/2022 9:25	6/15/2022 5:08	6/15/2022 8:18	0.652	0.976	1.002	1.000
1.200%	2/1/2022	1/31/2023	6/9/2022 9:25	6/15/2022 5:08	6/15/2022 8:18	0.652	0.976	1.002	1.000
4.000%	6/1/2022	5/31/2023	6/9/2022 9:25	6/15/2022 5:08	6/15/2022 8:18	0.652	0.976	1.002	1.000
5.000%	7/1/2021	6/30/2022	6/9/2022 9:25	6/15/2022 5:08	6/15/2022 8:18	0.652	0.976	1.002	1.000
5.000%	11/1/2021	10/31/2022	6/9/2022 9:25	6/15/2022 5:08	6/15/2022 8:18	0.652	0.976	1.002	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

**Spike S/N :** 1715-G  
**Spike Exp Date :** 9/15/2022  
**Spike Activity (dpm/ml):** 297.53  
**Spike Volume Added:** 0.10

**LCS S/N :** 1715-G  
**LCS Exp Date :** 9/15/2022  
**LCS Activity (dpm/ml):** 297.53  
**LCS Volume Added:** 0.10

<b>Results</b>																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.0985	0.0695	1	0.2287	<b>0.7173</b>	22.16%	0.8000	0.1700	0.2987	0.3283		SAMPLE				
2	0.2108	0.1488	1	0.3701	<b>0.6044</b>	26.62%	0.8333	0.2082	0.2959	0.3272		SAMPLE				
3	0.2385	0.1684	1	0.4339	<b>0.3884</b>	39.15%	0.4000	0.1563	0.2976	0.3033		SAMPLE				
4	0.1173	0.0828	1	0.2411	<b>0.3775</b>	29.82%	0.5000	0.1453	0.2150	0.2273		SAMPLE				
5	0.2389	0.1687	1	0.4262	<b>0.4440</b>	34.71%	0.5000	0.1732	0.3015	0.3088		SAMPLE				
6	0.2280	0.1609	1	0.3953	<b>0.6115</b>	27.46%	0.8333	0.2134	0.3070	0.3407		SAMPLE				
7	0.1704	0.1203	1	0.3302	<b>0.6568</b>	24.08%	0.7333	0.1764	0.3096	0.3242		SAMPLE				
8	0.2617	0.1848	1	0.4537	<b>0.1404</b>	91.69%	0.1667	0.1528	0.2522	0.2531		SAMPLE				
9	0.2157	0.1523	1	0.3923	<b>0.2049</b>	58.91%	0.2333	0.1374	0.2365	0.2384		MB				
10	0.2355	0.1663	1	0.4084	<b>0.7329</b>	23.48%	0.9667	0.2236	0.3323	0.3534	580913001.1	DUP	2.2%			
11	0.7595	0.5362	1	1.4717	<b>122.4367</b>	6.00%	30.6667	1.0143	7.9375	22.7890	580913001.1	MS			124.8250	97.5%
12	0.2499	0.1764	1	0.4332	<b>24.6103</b>	6.01%	30.6000	1.0187	1.6058	4.5843		LCS			26.3916	93.3%

# **Continuing Calibration Data**



# Ludlum Alpha Scintillation Counter Checks for 15-JUN-2022

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	07:43	1	1.22E+05	122337	0.56		
LUCAS2	EFF	07:40	1	1.35E+05	135419	2.86		
LUCAS4	EFF	07:35	1	1.28E+05	128333	1.57		
LUCAS5	EFF	07:32	1	1.33E+05	132642	2.09		
LUCAS6	EFF	07:27	1	1.30E+05	130127	-1.51		
LUCAS7	EFF	07:26	1	1.35E+05	135146	2.82		
LUCAS8	EFF	07:24	1	1.25E+05	124756	-0.55		

**Reviewed by:**

Lyndsey Pace

**Date:** 15-JUN-22

GEL Laboratories LLC

# Runlogs



# Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2271748

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
580913001	SAMPLE	LXP1	LUCAS1	JUN-15-22 07:46:00	DONE	Lucas Cell	28-APR-22 00:00
580913002	SAMPLE	LXP1	LUCAS2	JUN-15-22 07:46:00	DONE	Lucas Cell	01-AUG-21 00:00
580913003	SAMPLE	LXP1	LUCAS4	JUN-15-22 07:46:00	DONE	Lucas Cell	01-FEB-22 00:00
581006001	SAMPLE	LXP1	LUCAS5	JUN-15-22 07:46:00	DONE	Lucas Cell	01-JUN-22 00:00
581006002	SAMPLE	LXP1	LUCAS7	JUN-15-22 07:46:00	DONE	Lucas Cell	01-NOV-21 00:00
581006003	SAMPLE	LXP1	LUCAS8	JUN-15-22 07:46:00	DONE	Lucas Cell	01-APR-22 00:00
581006004	SAMPLE	LXP1	LUCAS1	JUN-15-22 08:18:00	DONE	Lucas Cell	28-APR-22 00:00
581006005	SAMPLE	LXP1	LUCAS2	JUN-15-22 08:18:00	DONE	Lucas Cell	01-AUG-21 00:00
1205103502	MB	LXP1	LUCAS4	JUN-15-22 08:18:00	DONE	Lucas Cell	01-FEB-22 00:00
1205103503	DUP	LXP1	LUCAS5	JUN-15-22 08:18:00	DONE	Lucas Cell	01-JUN-22 00:00
1205103504	MS	LXP1	LUCAS6	JUN-15-22 08:18:00	DONE	Lucas Cell	01-JUL-21 00:00
1205103505	LCS	LXP1	LUCAS7	JUN-15-22 08:18:00	DONE	Lucas Cell	01-NOV-21 00:00



Environmental Laboratory  
 1232 Haco Drive  
 Lansing  
 Michigan, 48910

**CHAIN OF CUSTODY**

Phone: (517)702-6372

Lab Work Order Number

L205215

Client Name BWL - Erickson Station		Project Name Erickson AM MI Wells 7B,7C&12B		Requested Turn Around	
Client Contact Cheryl Louden		Project Number [none]		Requested Analyses	
Address 3725 S. Canal		Project Description		Radium 226 and Radium 228	
City Lansing		PO Number 30926 10021		Chloride, Fluoride, Sulfate, Total Dissolved Solids	
State/Zip MI, 48917		Shipped By		Total Suspended Solids, HCO3, CO3, Hardness	
Phone (517) 702-6396		Tracking Number		Arsenic, Barium, Beryllium, Cadmium, Chromium, Copper, Ferric Iron, Lead, Manganese, Mercury, Nickel, Selenium, Silver, Vanadium, Zinc	
Fax (517) 702-6373					
Sampler Marc Wahrer					

Rush requests subject to additional charge  
 Rush requests subject to lab approval

Sample Name or Field ID	Sampled Date	Sampled Time	Sample Type	Matrix Code	Container Count	Preservation Code														
						a	b	a	b	a	b	a	b	a	b					
MW-7B	5/19/22	1214	G	GW	5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
MW-7C		1358	G	GW	5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
MW-12B		1008	G	GW	5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Field Duplicate MW-12B		1008	G	GW	5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Field Blank		0845	G	DI	5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Relinquished By		Date/Time	5-19-22	Received By		Date/Time	5/20/22
Relinquished By		Date/Time	1545	Received By		Date/Time	0800
Relinquished By		Date/Time		Received By		Date/Time	
Cooler Numbers and Temperatures							
Matrix Codes: DI=Deionized Water, GW=Ground Water							
Preserv. Codes: a=None, b=0.5% HNO3							

### Data Validation Checklist

Site Name: Erickson Personnel: M. Wahrer

Sample Date(s): 5/19/2022 Lab Drop-off Date(s): 5/20/2022

Lab Report Number: S36211.01(02)

Lab Report Date: 7/21/2022

Reason for Sample Event: Wells MW-7B, MW-7C, MW-12B

**Field Records:** Circle Yes/No unless Not Applicable – *Complete during sample event*

Item Description	Verification (Completeness)	Validation (Conformance to Specifications)
Field equipment calibration records	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Chain-of-Custody forms	<input checked="" type="radio"/> Yes / No	N/A
Field decontamination documentation	N/A	N/A
Sample collection field forms	<input checked="" type="radio"/> Yes / No	N/A
Drilling logs	<input checked="" type="radio"/> Yes / No	N/A
Well construction logs	<input checked="" type="radio"/> Yes / No	N/A
Well development field forms	<input checked="" type="radio"/> Yes / No	N/A

**Analytical Data Package:** Circle Yes/No unless N/A – *Complete when lab report is received*

Item Description	Verification (Completeness)	Validation (Conformance to Specifications)
Cover sheet (laboratory identifying information)	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Case narrative	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Internal laboratory Chain-of-Custody forms	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Sample chronology and consistency (that is, dates and times of receipt, preparation, and analysis)	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Communication records with laboratory	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
EDD format consistency	<input checked="" type="radio"/> Yes / No	N/A
Sample identification, results nomenclature, and data qualifier consistency	<input checked="" type="radio"/> Yes / No	N/A
RLs as requested; MDLs < RLs	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Instrument calibration records	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Laboratory Report	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Field QC sample results and calculation of accuracy and precision	<input checked="" type="radio"/> Yes / No Duplicate Well ID: MW-12B	Yes / <input checked="" type="radio"/> No Duplicate RPD: 0-2% except Rad-226/228 at 26% and

		molybdenum at 38%
--	--	-------------------

**Corrections Needed:** None.

Sample	Parameter	Result	Uncertainty	MDC	Lab Qualifier	Validated Qualifier
MW-12B	Rad-226	0.611	+/-0.307	0.395		
	Rad-228	0.421	+/-1.22	2.16	U	J-
	Rad-226/228	1.03	+/-1.26			J-
MW-12B-Dup	Rad-226	0.657	+/-0.310	0.330		
	Rad-228	1.10	+/-1.19	1.99	U	J+
	Rad-226/228	1.76	+/-1.23			J+

*U - Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.*

Since the laboratory processes indicated no issues with the analytical procedures, no corrective action was necessary. Since the RPD was above the 20% control limit, Rad-228 and Rad-226/228 in MW-12B have been qualified as estimated with potential for low bias (J-) and those in MW-12B-Dup have been qualified as estimated with potential for high bias (J+).

Molybdenum required qualification as estimated with high bias (J+) in MW-12B and estimated with low bias (J-) in MW-12B-Dup.



Lansing Board of Water and Light  
Environmental Services Laboratory (MI00079)  
1232 Haco Dr.  
Lansing, Michigan 48901

11 July 2022

BWL - Erickson Station  
Attn: Cheryl Louden  
3725 S. Canal  
Lansing, MI 48917

**Project: Erickson AM MI**

Dear Cheryl Louden,

Enclosed is a copy of the laboratory report for the following work order(s) received by Lansing Board of Water and Light Environmental Services Laboratory:

**Work Order**  
L206152

**Received**  
6/3/2022 8:36:00AM

**Account Number**  
30926 10021

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in blue ink that reads "Jennifer Caporale".

Jennifer Caporale, Supervisor



Report ID: S36642.01(02)  
Generated on 07/07/2022  
Replaces report S36642.01(01) generated on 06/07/2022

**Report to**  
Attention: Jennifer Caporale  
Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901  
  
Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

**Report produced by**  
Merit Laboratories, Inc.  
2680 East Lansing Drive  
East Lansing, MI 48823  
  
Phone: (517) 332-0167 FAX: (517) 332-6333  
  
Contacts for report questions:  
John Lavery (johnlavery@meritlabs.com)  
Barbara Ball (bball@meritlabs.com)

**Report Summary**  
Lab Sample ID(s): S36642.01-S36642.03  
Project: Erickson AM MI New Wells 11B  
Collected Date(s): 06/02/2022  
Submitted Date/Time: 06/03/2022 09:12  
Sampled by: Marc Wahrer  
P.O. #:

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Maya Murshak  
Technical Director



## General Report Notes

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Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile, and 2-chloroethylvinyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (\*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

## Report Narrative

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All analyses completed

## Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Alaska CSLAP	#17-001
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

## Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

## Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched





## Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1 (1993)
SM2320B	Standard Method 2320 B 2011
SM2340C	Standard Method 2340 C 2011
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007



### Sample Summary (3 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S36642.01	MW-11B L206152-01	Groundwater	06/02/22 13:08
S36642.02	Field Dupe MW-11B L206152-02	Groundwater	06/02/22 13:08
S36642.03	Field Blank L206152-03	Water	06/02/22 11:40



# Analytical Laboratory Report

Final Report

Lab Sample ID: S36642.01

Sample Tag: MW-11B L206152-01

Collected Date/Time: 06/02/2022 13:08

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.0	IR
2	1L Plastic	None	Yes	2.0	IR
1	125ml Plastic	HNO3	Yes	2.0	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	06/07/22 09:00	JRH	
Metal Digestion	Completed	SW3015A	06/07/22 11:00	CCM	

### Inorganics

Method: E300.0, Run Date: 06/07/22 10:01, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 06/06/22 11:06, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	350	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 06/06/22 14:20, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	260	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 06/03/22 17:50, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	300	50	10	mg/L	2		

Method: SM2540D, Run Date: 06/03/22 17:20, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 06/07/22 12:40, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.004	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.070	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.65	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.96	0.02	0.00192	mg/L	5	7439-89-6	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S36642.01 (continued)

Sample Tag: MW-11B L206152-01

**Method: E200.8, Run Date: 06/07/22 12:40, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.024	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.005	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 06/07/22 14:57, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	63.8	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	23.3	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	6.08	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	17.6	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 06/07/22 13:51, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 06/29/22 15:49, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Final Report

Lab Sample ID: S36642.02

Sample Tag: Field Dupe MW-11B L206152-02

Collected Date/Time: 06/02/2022 13:08

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.0	IR
2	1L Plastic	None	Yes	2.0	IR
1	125ml Plastic	HNO3	Yes	2.0	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	06/07/22 09:00	JRH	
Metal Digestion	Completed	SW3015A	06/07/22 11:00	CCM	

### Inorganics

Method: E300.0, Run Date: 06/07/22 10:13, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 06/06/22 11:14, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	350	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 06/06/22 14:22, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	260	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 06/03/22 17:50, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	308	50	10	mg/L	2		

Method: SM2540D, Run Date: 06/03/22 17:20, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 06/07/22 12:44, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.004	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.072	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.66	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.98	0.02	0.00192	mg/L	5	7439-89-6	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S36642.02 (continued)  
Sample Tag: Field Dupe MW-11B L206152-02

**Method: E200.8, Run Date: 06/07/22 12:44, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.024	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.005	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 06/07/22 14:59, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	65.0	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	23.1	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	6.07	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	17.2	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 06/07/22 13:54, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 06/29/22 15:49, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Lab Sample ID: S36642.03

Sample Tag: Field Blank L206152-03

Collected Date/Time: 06/02/2022 11:40

Matrix: Water

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.0	IR
2	1L Plastic	None	Yes	2.0	IR
1	125ml Plastic	HNO3	Yes	2.0	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	06/07/22 09:00	JRH	
Metal Digestion	Completed	SW3015A	06/07/22 11:00	CCM	

### Inorganics

Method: E300.0, Run Date: 06/07/22 10:26, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	2.5	0.04	mg/L	2.5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.06	mg/L	2.5	16984-48-8	
Sulfate	Not detected	2.5	0.15	mg/L	2.5	14808-79-8	

Method: SM2320B, Run Date: 06/06/22 11:16, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	Not detected	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 06/06/22 14:24, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	Not detected	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 06/03/22 17:50, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	Not detected	50	10	mg/L	2		

Method: SM2540D, Run Date: 06/03/22 17:20, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 06/07/22 12:34, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00102	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.000102	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.0000648	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.0000862	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.000702	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.0000760	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.0000386	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.0000434	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000150	mg/L	2	7440-50-8	
Iron	Not detected	0.02	0.000768	mg/L	2	7439-89-6	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S36642.03 (continued)

Sample Tag: Field Blank L206152-03

**Method: E200.8, Run Date: 06/07/22 12:34, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.0000760	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000654	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.0000868	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000100	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.000838	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.0000270	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.0000342	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.0000558	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.000292	mg/L	2	7440-66-6	

**Method: E200.8, Run Date: 06/07/22 14:56, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.0174	mg/L	2	7440-70-2	
Magnesium	Not detected	0.50	0.00480	mg/L	2	7439-95-4	
Potassium	Not detected	0.50	0.00920	mg/L	2	7440-09-7	
Sodium	Not detected	0.50	0.00340	mg/L	2	7440-23-5	

**Method: E245.1, Run Date: 06/07/22 13:57, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 06/29/22 15:49, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Merit Laboratories Login Checklist

Lab Set ID:S36642

Attention: Jennifer Caporale  
Address: Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901

Client:BWL01 (Board of Water & Light)

Project: Erickson AM MI New Wells 11B

Submitted:06/03/2022 09:12 Login User: PFD

Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

Selection	Description	Note
-----------	-------------	------

### Sample Receiving

- |     |  |  |
|-----|--|--|
| 01. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples are received at 4C +/- 2C Thermometer # IR 2.0 |
| 02. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Received on ice/ cooling process begun                 |
| 03. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples shipped  |
| 04. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples left in 24 hr. drop box                        |
| 05. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Are there custody seals/tape or is the drop box locked |

### Chain of Custody

- |     |  |  |
|-----|--|--|
| 06. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC adequately filled out  |
| 07. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC signed and relinquished to the lab                           |
| 08. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sample tag on bottles match COC                                  |
| 09. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Subcontracting needed? Subcontracted to: GEL; 1Z4664770362207086 |

### Preservation

- |     |  |   |
|-----|--|---|
| 10. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Do sample have correct chemical preservation        |
| 11. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Completed pH checks on preserved samples? (no VOAs) |
| 12. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Did any samples need to be preserved in the lab?    |

### Bottle Conditions

- |     |  |   |
|-----|--|---|
| 13. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | All bottles intact                            |
| 14. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Appropriate analytical bottles are used       |
| 15. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Merit bottles used                            |
| 16. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sufficient sample volume received             |
| 17. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples require laboratory filtration         |
| 18. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples submitted within holding time         |
| 19. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Do water VOC or TOX bottles contain headspace |

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: \_\_\_\_\_ Date: \_\_\_\_\_

# Merit Laboratories Bottle Preservation Check

Lab Set ID: S36642 Submitted: 06/03/2022 09:12

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI New Wells 11B

Initial Preservation Check: 06/03/2022 12:33 MMC

Preservation Recheck (E200.8): N/A

Attention: Jennifer Caporale  
Address: Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901

Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S36642.01	125ml Plastic HNO3	<2			
S36642.01	1L Plastic HNO3	<2			
S36642.01	1L Plastic HNO3	<2			
S36642.02	125ml Plastic HNO3	<2			
S36642.02	1L Plastic HNO3	<2			
S36642.02	1L Plastic HNO3	<2			
S36642.03	125ml Plastic HNO3	<2			
S36642.03	1L Plastic HNO3	<2			
S36642.03	1L Plastic HNO3	<2			



2680 East Lansing Dr., East Lansing, MI 48823  
 Phone (517) 332-0167 Fax (517) 332-4034  
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

**REPORT TO** **CHAIN OF CUSTODY RECORD** **INVOICE TO**

CONTACT NAME <b>Jennifer Caporale</b>			CONTACT NAME <b>Kelly Gleason</b> <input checked="" type="checkbox"/> SAME		
COMPANY <b>Lansing Board of Water and Light</b>			COMPANY		
ADDRESS <b>PO Box 13007 48901-3007</b>			ADDRESS		
CITY <b>Lansing</b>	STATE <b>MI</b>	ZIP CODE <b>48901</b>	CITY	STATE	ZIP CODE
PHONE NO. <b>517-702-6372</b>	FAX NO.	P.O. NO.	PHONE NO.	E-MAIL ADDRESS <b>Kelly.Gleason@lbwl.com</b>	
E-MAIL ADDRESS <b>Environmental_Laboratory@lbwl.com</b>		QUOTE NO.			

PROJECT NO./NAME <b>Erickson AM MI Wells 11B</b>	SAMPLER(S) - PLEASE PRINT/SIGN NAME <b>Marc Wahrer</b>
TURNAROUND TIME REQUIRED <input checked="" type="checkbox"/> 1 DAY <input type="checkbox"/> 2 DAYS <input type="checkbox"/> 3 DAYS <input type="checkbox"/> STANDARD <input checked="" type="checkbox"/> OTHER <b>ASAP</b>	
DELIVERABLES REQUIRED <input type="checkbox"/> STD <input type="checkbox"/> LEVEL II <input checked="" type="checkbox"/> LEVEL III <input type="checkbox"/> LEVEL IV <input checked="" type="checkbox"/> EDD <input type="checkbox"/> OTHER	
MATRIX CODE: <b>GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIFE A=AIR W=WASTE</b>	# Containers & Preservatives

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO <sub>3</sub>	H <sub>2</sub> SO <sub>4</sub>	NaOH	MeOH	OTHER	Total Metals	F- undissisted, Cl-, SO <sub>4</sub> , TDS	Radium 226	Radium 228	TSS	HCO <sub>3</sub> , CO <sub>3</sub> , Hardness	Certifications
	DATE	TIME																	
<b>36642.01</b>	<b>6/2/22</b>	<b>1308</b>	<b>MW-11B L206152-01</b>	<b>GW</b>	<b>5</b>	<b>2</b>	<b>3</b>						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Project Locations <input type="checkbox"/> Detroit <input type="checkbox"/> New York
<b>.02</b>	↓	↓	<b>Field Dupe MW- 11B 02</b>	<b>GW</b>	<b>5</b>	<b>2</b>	<b>3</b>						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Special Instructions <b>Metals to analyse: Na, Mg, K</b>
<b>.03</b>	↓	<b>1140</b>	<b>Field Blank 03</b>	<b>DI</b>	<b>5</b>	<b>2</b>	<b>3</b>						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<b>B, Ca, Sb, As, Ba, Be, Cd, Cr, Co, Li, Hg, Mo, Pb, Se, Tl, Fe, Cu, Ni, Ag, V, Zn</b>
																			<b>Please send a preliminary report</b>

RELINQUISHED BY: <b>Sampler</b>	DATE <b>6-3-22</b>	TIME <b>0912</b>	RELINQUISHED BY: _____	DATE _____	TIME _____
SIGNATURE/ORGANIZATION			SIGNATURE/ORGANIZATION		
RECEIVED BY:	DATE <b>6/3/22</b>	TIME <b>0912</b>	RECEIVED BY: _____	DATE _____	TIME _____
SIGNATURE/ORGANIZATION			SIGNATURE/ORGANIZATION		
RELINQUISHED BY: _____	DATE _____	TIME _____	SEAL NO. _____	SEAL INTACT YES <input type="checkbox"/> NO <input type="checkbox"/>	INITIALS _____
SIGNATURE/ORGANIZATION			SEAL NO. _____	SEAL INTACT YES <input type="checkbox"/> NO <input type="checkbox"/>	INITIALS _____
RELINQUISHED BY: _____	DATE _____	TIME _____	NOTES: TEMP. ON ARRIVAL <b>2.0</b>		
SIGNATURE/ORGANIZATION					

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

## Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total		250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.150
Be, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	2.5
Cl	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	10
Cr, total	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
F	Fluoride	250 mL plastic	mg/L	None	9056	28 d	1.0
Fe, total	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Pb, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Li, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Hg, total	Mercury	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Mn, total	Molybdenum	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
RA226/228	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	HNO3	SM 7500	6 mos	2.0 combined
Se, total	Selenium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ag, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
SO4	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	10
Tl, total	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
TDS	Total Dissolved Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TSS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540D	NA	3
V, total	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Zn, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005



June 29, 2022

John Laverty  
Merit Laboratories Inc.  
2680 East Lansing Drive  
East Lansing, Michigan 48823

Re: Routine Analysis  
Work Order: 582300  
SDG: S36642

Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on June 08, 2022. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at [www.gel.com](http://www.gel.com).

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,

Heather Millar for  
Delaney Stone  
Project Manager

Purchase Order: GELP20-0018  
Enclosures



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# Case Narrative

**Receipt Narrative  
for  
Merit Laboratories, Inc.  
SDG: S36642  
Work Order: 582300**

**June 29, 2022**

**Laboratory Identification:**

GEL Laboratories LLC  
2040 Savage Road  
Charleston, South Carolina 29407  
(843) 556-8171

**Summary:**

**Sample receipt:** The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on June 08, 2022 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

**Sample Identification:** The laboratory received the following samples:

<b><u>Laboratory ID</u></b>	<b><u>Client ID</u></b>
582300001	S36642.01
582300002	S36642.02 Field Dupe
582300003	S36642.03 Field Blank

**Case Narrative:**

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.



Heather Millar for  
Delaney Stone  
Project Manager



# **Chain of Custody and Supporting Documentation**

582300

2680 East Lansing Dr., East Lansing, MI 48823  
Phone (517) 332-0167 Fax (517) 332-4034  
www.meritlabs.com

C.O.C. PAGE # 1 OF 1



**REPORT TO**

CONTACT NAME: Project Management Team  
COMPANY: Merit Laboratories  
ADDRESS: 2680 East Lansing Drive  
CITY: East Lansing  
STATE: MI ZIP CODE: 48823  
PHONE NO.: 517-332-0167  
FAX NO.:  
E-MAIL ADDRESS: results@meritlabs.com

**CHAIN OF CUSTODY RECORD**

CONTACT NAME: Julie Teague  
COMPANY: Merit Laboratories  
ADDRESS: 2680 East Lansing Drive  
CITY: East Lansing  
STATE: MI ZIP CODE: 48823  
PHONE NO.: 517-332-0167  
E-MAIL ADDRESS: juliet@meritlabs.com

**INVOICE TO**

PROJECT NO./NAME: S36642

TURNAROUND TIME REQUIRED:  1 DAY  2 DAYS  3 DAYS  STANDARD  OTHER

DELIVERABLES REQUIRED:  STD  LEVEL II  LEVEL III  LEVEL IV  EDD  OTHER

MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOL L=LIQUID SD=SOLID  
SL=SLUDGE DW=DRINKING WATER O=OIL WP=WPE A=AIR W=WASTE

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR	DATE	TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	# Containers & Preservatives													
							None	HO	H <sub>2</sub> O	H <sub>2</sub> SO <sub>4</sub>	NaOH	MdOH	OTHER							
		6/2/22	1308	S36642.01	GW	2														
		6/2/22	1308	S36642.02 Field Dupe	GW	2														
		6/2/22	1140	S36642.03 Field Blank	DI	2														

SAMPLER(S) - PLEASE PRINT/SIGN NAME

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

Certifications  
 OHIO VAP  Drinking Water  
 DoD  NPDES  
 Project Locations  
 Detroit  New York  
 Other  
 Special Instructions  
 \* E903.1 Mod.  
 \*\* E904.0/SW 9320 Mod.

Please use calculation product & provide Radium 226/228 combined results on the report

(No Ice needed)  
 \*\* Subcontracted to  
 GEL Laboratories, Inc.  
 2040 Savage Road  
 Charleston, SC 29407

RELINQUISHED BY: *Arthur Murray* DATE: 6/6/22 TIME: 1700  
 RECEIVED BY: *Ups* DATE: 6/6/22 TIME: 1700

RELINQUISHED BY: *Julie Teague* DATE: 6/8/22 TIME: 1045  
 RECEIVED BY: *Julie Teague* DATE: 6/8/22 TIME: 1045

SEAL NO. YES  NO

INITIALS: *Julie Teague*

TEMP. ON ARRIVAL:

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

**SAMPLE RECEIPT & REVIEW FORM**

Client: <b>MERI</b>			SDG/AR/COC/Work Order: <b>S82300</b>		
Received By: <b>MUH</b>			Date Received: <b>6/10/22</b>		
Carrier and Tracking Number			FedEx Express   FedEx Ground <input checked="" type="radio"/> UPS   Field Services   Courier   Other <b>124664770362207086</b>		
Suspected Hazard Information		Yes	No	*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.	
A) Shipped as a DOT Hazardous?		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Hazard Class Shipped: _____ UN#: _____ If UN2910, Is the Radioactive Shipment Survey Compliant? Yes ___ No ___	
B) Did the client designate the samples are to be received as radioactive?		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	COC notation or radioactive stickers on containers equal client designation.	
C) Did the RSO classify the samples as radioactive?		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): <u>0</u> CPM / mR/Hr Classified as: Rad 1   Rad 2   Rad 3	
D) Did the client designate samples are hazardous?		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	COC notation or hazard labels on containers equal client designation.	
E) Did the RSO identify possible hazards?		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	If D or E is yes, select Hazards below. PCB's   Flammable   Foreign Soil   RCRA   Asbestos   Beryllium   Other:	
Sample Receipt Criteria		Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1	Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Circle Applicable:   Seals broken   Damaged container   Leaking container   Other (describe)
2	Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Circle Applicable:   Client contacted and provided COC   COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Preservation Method: Wet Ice   Ice Packs   Dry ice <input checked="" type="checkbox"/> None   Other: _____ *all temperatures are recorded in Celsius      TEMP: <u>20</u>
4	Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Temperature Device Serial #: <u>10221</u> Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Circle Applicable:   Seals broken   Damaged container   Leaking container   Other (describe)
6	Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Sample ID's and Containers Affected: If Preservation added, Lot#:
7	Do any samples require Volatile Analysis?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	If Yes, are Encores or Soil Kits present for solids? Yes ___ No ___ NA ___ (If yes, take to VOA Freezer) Do liquid VOA vials contain acid preservation? Yes ___ No ___ NA ___ (If unknown, select No) Are liquid VOA vials free of headspace? Yes ___ No ___ NA ___ Sample ID's and containers affected:
8	Samples received within holding time?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	ID's and containers affected:
10	Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Circle Applicable:   No dates on containers   No times on containers   COC missing info   Other (describe)
11	Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Circle Applicable:   No container count on COC   Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
13	COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Circle Applicable:   Not relinquished   Other (describe)
Comments (Use Continuation Form if needed):					

PM (or PMA) review: Initials RW Date 6/8/22 Page \_\_\_ of \_\_\_

# Laboratory Certifications

**List of current GEL Certifications as of 29 June 2022**

<b>State</b>	<b>Certification</b>
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122022-5
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2019-165
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122021-36
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

# **Radiological Analysis**

# Case Narrative

**Radiochemistry  
Technical Case Narrative  
Merit Laboratories, Inc.  
SDG #: S36642  
Work Order #: 582300**

**Product:** GFPC Ra228, Liquid

**Analytical Method:** EPA 904.0/SW846 9320 Modified

**Analytical Procedure:** GL-RAD-A-063 REV# 5

**Analytical Batch:** 2275833

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
582300001	S36642.01
582300002	S36642.02 Field Dupe
582300003	S36642.03 Field Blank
1205111720	Method Blank (MB)
1205111721	582300001(S36642.01) Sample Duplicate (DUP)
1205111722	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

**Quality Control (QC) Information**

**Duplication Criteria between QC Sample and Duplicate Sample**

The Sample and the Duplicate, (See Below), did not meet the relative percent difference requirement; however, they do meet the relative error ratio requirement with the value listed below.

<b>Sample</b>	<b>Analyte</b>	<b>Value</b>
1205111721 (S36642.01DUP)	Radium-228	RPD 134* (0.0%-100.0%) RER 2.74 (0-3)

**Technical Information**

**Recounts**

Sample 1205111720 (MB) was recounted due to a suspected blank false positive. The recount is reported.

**Product:** Lucas Cell, Ra226, Liquid

**Analytical Method:** EPA 903.1 Modified

**Analytical Procedure:** GL-RAD-A-008 REV# 15

**Analytical Batch:** 2275824



The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
582300001	S36642.01
582300002	S36642.02 Field Dupe
582300003	S36642.03 Field Blank
1205111700	Method Blank (MB)
1205111701	582300001(S36642.01) Sample Duplicate (DUP)
1205111702	582300001(S36642.01) Matrix Spike (MS)
1205111703	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

**Technical Information**

**Recounts**

Samples 1205111700 (MB) and 1205111703 (LCS) were degassed and recounted due to an analyst error while transferring. The second counts are reported.

**Miscellaneous Information**

**Additional Comments**

The matrix spike, 1205111702 (S36642.01MS), aliquot was reduced to conserve sample volume.

**Certification Statement**

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

## GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

### Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S36642 GEL Work Order: 582300

**The Qualifiers in this report are defined as follows:**

- \* A quality control analyte recovery is outside of specified acceptance criteria
- \*\* Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

**Review/Validation**

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature: 

Name: Kenshalla Oston

Date: 07 JUL 2022

Title: Analyst I

# Sample Data Summary

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: July 7, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

Client Sample ID: S36642.01	Project: MERI00120
Sample ID: 582300001	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 02-JUN-22 13:08	
Receive Date: 08-JUN-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.633	+/-0.996	1.73	3.00	pCi/L			JXC9	06/15/22	0858 2275833	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		2.35	+/-1.17			pCi/L		1	NXL1	06/29/22	1549 2275832	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		1.72	+/-0.620	0.587	1.00	pCi/L			LXP1	06/16/22	0751 2275824	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			86.2	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: July 7, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

Client Sample ID: S36642.02 Field Dupe	Project: MERI00120
Sample ID: 582300002	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 02-JUN-22 13:08	
Receive Date: 08-JUN-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228		1.68	+/-1.00	1.48	3.00	pCi/L			JXC9	06/15/22	0858 2275833	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		3.47	+/-1.15			pCi/L		1	NXL1	06/29/22	1549 2275832	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		1.79	+/-0.574	0.418	1.00	pCi/L			LXP1	06/16/22	0751 2275824	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			83.6	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: July 7, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

Client Sample ID: S36642.03 Field Blank	Project: MERI00120
Sample ID: 582300003	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 02-JUN-22 11:40	
Receive Date: 08-JUN-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228		3.71	+/-1.84	2.80	3.00	pCi/L			JXC9	06/15/22	0858 2275833	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		4.48	+/-1.89			pCi/L		1	NXL1	06/29/22	1549 2275832	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.769	+/-0.425	0.561	1.00	pCi/L			LXP1	06/16/22	0751 2275824	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			76.7	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# **Quality Control Summary**

# GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

## QC Summary

Report Date: July 7, 2022

Page 1 of 2

Merit Laboratories Inc.  
2680 East Lansing Drive  
East Lansing, Michigan

Contact: John Laverty

Workorder: 582300

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Rad Gas Flow</b>											
Batch	2275833										
QC1205111721	582300001	DUP									
Radium-228	U	0.633		3.21	pCi/L	134*		(0% - 100%)	JXC9	06/15/22	08:58
	Uncertainty	+/-0.996		+/-1.32							
QC1205111722	LCS										
Radium-228	45.5			38.4	pCi/L		84.5	(75%-125%)		06/15/22	08:58
	Uncertainty			+/-3.18							
QC1205111720	MB										
Radium-228			U	1.88	pCi/L					06/15/22	11:26
	Uncertainty			+/-1.78							
<b>Rad Ra-226</b>											
Batch	2275824										
QC1205111701	582300001	DUP									
Radium-226		1.72		1.53	pCi/L	11.6		(0% - 100%)	LXP1	06/16/22	08:56
	Uncertainty	+/-0.620		+/-0.592							
QC1205111703	LCS										
Radium-226	26.6			22.9	pCi/L		86	(75%-125%)		06/21/22	07:52
	Uncertainty			+/-1.68							
QC1205111700	MB										
Radium-226			U	0.365	pCi/L					06/21/22	07:52
	Uncertainty			+/-0.316							
QC1205111702	582300001	MS									
Radium-226	130	1.72		150	pCi/L		114	(75%-125%)		06/16/22	08:56
	Uncertainty	+/-0.620		+/-11.2							

### Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- \*\* Analyte is a Tracer compound
- < Result is less than value reported
- > Result is greater than value reported
- BD Results are either below the MDC or tracer recovery is low
- FA Failed analysis.
- H Analytical holding time was exceeded



# GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

## QC Summary

Workorder: 582300

Page 2 of 2

Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
J											
J											
K											
L											
M											
M											
N/A											
NI											
ND											
NJ											
Q											
R											
U											
UI											
UJ											
UL											
X											
Y											
^											
h											

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where the duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

\* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

# **Gas Flow Raw Data**

# Batch 2275833 Check-list

This check-list was completed on 15-JUN-22 by Rhonda Birch

This batch was reviewed by Kenshalla Oston on 15-JUN-22 and Rhonda Birch on 15-JUN-22.

**Batch ID:**  
2275833

**Product:**  
GFC28RAL

**Description:** Gas Flow Radium 228  
GL-RAD-A-063

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?		No	
11	Has the method required detection limit been met?	Yes		
<b>Miscellaneous Information</b>				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

# Prep Logbook

## Radium-228 in Liquid

**Batch ID:** 2275833

**Analyst:** Jasmine Conley (JXC9)

**Method:** EPA 904.0/SW846 9320 Modified

**Lab SOP:** GL-RAD-A-063 REV# 5

**Instrument:** LUCAS-C037036045

**Due Dates for Lab:** 25-JUN-2022

**Package:** 27-JUN-2022

**SDG:** 28-JUN-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205111722	Radium-228	1965-C	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	582300001	10-JUN-2022	3	301.53	301.53	06/13/22 12:30	06/15/22 07:05
2	582300002	10-JUN-2022	3	303.65	303.65	06/13/22 12:30	06/15/22 07:05
3	582300003	10-JUN-2022	3	304.06	304.06	06/13/22 12:30	06/15/22 07:05
4	582314001	10-JUN-2022	3	301.22	301.22	06/13/22 12:30	06/15/22 07:05
5	582314002	10-JUN-2022	3	301.53	301.53	06/13/22 12:30	06/15/22 07:05
6	582314003	10-JUN-2022	3	304.75	304.75	06/13/22 12:30	06/15/22 07:05
7	582314004	10-JUN-2022	3	301.35	301.35	06/13/22 12:30	06/15/22 07:05
8	582314005	10-JUN-2022	3	300.61	300.61	06/13/22 12:30	06/15/22 07:05
9	582314006	10-JUN-2022	3	303.72	303.72	06/13/22 12:30	06/15/22 07:05
10	1205111720 MB	10-JUN-2022	3		304.75	06/13/22 12:30	06/15/22 07:05
11	1205111721 DUP (582300001)	10-JUN-2022	3	304.49	304.49	06/13/22 12:30	06/15/22 07:05
12	1205111722 LCS	10-JUN-2022	3		304.75	06/13/22 12:30	06/15/22 07:05

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1951-C	Barium-133	.1 mL	Pipet Id: RAD-GFC-1795419 Data Entry Date2: 10-JUN-2022 00:00
REGNT 3411398	Barium Carrier Ra228 REG	1 mL	
REGNT 3413388	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3413919	RGF-50% Potassium Carbonate	2 mL	
REGNT 3417468	RGF-1M Citric Acid	5 mL	
REGNT 3424040	7M Nitric Acid	25 mL	
REGNT 3424228	RGF-Neodymium Substrate	5 mL	
REGNT 3424653.4	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	
REGNT 3426198	2M HCl	20 mL	
REGNT 3430182.12	HF (48-50%)	4 mL	
REGNT 3435259	RGF-1.5M Ammonium Sulfate	10 mL	
REGNT 3441138.12	Nitric Acid	5 mL	
REGNT 3446017	ICPMS batch: 2273441 Lot 0033	2 g	

### Radium-228 Liquid

Filename : RA228.XLS  
 File type : Excel  
 Version # : 1.4.2

Tracer S/N : 1951-C  
 Tracer Exp Date : 9/16/2022  
 Tracer Volume Added: 0.10

Batch : 2275833  
 Analyst : JAS02031  
 Prep Date : 6/10/2022  
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL  
 Parmname : Radium-228  
 Required MDA : 3 pCi/L  
 Ra-228 Abundance : 1.00  
 Halflife of Ra-228 : 5.75 years  
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations					
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	582300001.1	0.3015	1.8485E-05	6/2/2022 13:08	1314.0	1.59%	1133.0	1.72%	0.1	0.000200
2	582300002.1	0.3037	1.8520E-05	6/2/2022 13:08	1314.0	1.59%	1099.0	1.74%	0.1	0.000200
3	582300003.1	0.3041	1.8527E-05	6/2/2022 11:40	1314.0	1.59%	1007.6	1.82%	0.1	0.000200
4	582314001.1	0.3012	1.8480E-05	6/7/2022 10:40	1314.0	1.59%	1108.9	1.73%	0.1	0.000200
5	582314002.1	0.3015	1.8485E-05	6/7/2022 11:34	1314.0	1.59%	1091.9	1.75%	0.1	0.000200
6	582314003.1	0.3048	1.8539E-05	6/7/2022 13:18	1314.0	1.59%	1083.7	1.75%	0.1	0.000200
7	582314004.1	0.3014	1.8482E-05	6/7/2022 14:02	1314.0	1.59%	1021.6	1.81%	0.1	0.000200
8	582314005.1	0.3006	1.8469E-05	6/7/2022 14:06	1314.0	1.59%	1121.6	1.72%	0.1	0.000200
9	582314006.1	0.3037	1.8522E-05	6/7/2022 15:03	1314.0	1.59%	1096.6	1.74%	0.1	0.000200
10	1205111720.1	0.3048	1.8539E-05	6/10/2022 0:00	1314.0	1.59%	1047.8	1.78%	0.1	0.000200
11	1205111721.1	0.3045	1.8534E-05	6/2/2022 13:08	1314.0	1.59%	1145.1	1.71%	0.1	0.000200
12	1205111722.1	0.3048	1.8539E-05	6/10/2022 0:00	1314.0	1.59%	1049.5	1.78%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063  
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated	Sample
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction	Recovery %	Recovery Error %
1	1B	60	10	59	0.983	6/15/2022 8:58	6/13/2022 12:30	6/15/2022 7:05	0.996	0.808	0.992	1.057	86.2%	1.20%
2	1C	60	10	61	1.017	6/15/2022 8:58	6/13/2022 12:30	6/15/2022 7:05	0.996	0.808	0.992	1.057	83.6%	1.21%
3	2D	60	17	163	2.717	6/15/2022 8:58	6/13/2022 12:30	6/15/2022 7:05	0.996	0.808	0.992	1.057	76.7%	1.24%
4	4A	60	14	28	0.467	6/15/2022 8:58	6/13/2022 12:30	6/15/2022 7:05	0.997	0.807	0.992	1.057	84.4%	1.21%
5	4B	60	10	94	1.567	6/15/2022 8:59	6/13/2022 12:30	6/15/2022 7:05	0.997	0.807	0.992	1.057	83.1%	1.22%
6	4D	60	12	40	0.667	6/15/2022 8:59	6/13/2022 12:30	6/15/2022 7:05	0.997	0.807	0.992	1.057	82.5%	1.22%
7	5A	60	6	85	1.417	6/15/2022 8:59	6/13/2022 12:30	6/15/2022 7:05	0.997	0.807	0.992	1.057	77.7%	1.24%
8	5B	60	9	86	1.433	6/15/2022 8:59	6/13/2022 12:30	6/15/2022 7:05	0.997	0.807	0.992	1.057	85.4%	1.20%
9	5D	60	4	57	0.950	6/15/2022 8:59	6/13/2022 12:30	6/15/2022 7:05	0.997	0.807	0.992	1.057	83.4%	1.21%
10	8D	60	15	104	1.733	6/15/2022 11:26	6/13/2022 12:30	6/15/2022 7:05	0.998	0.612	0.992	1.057	79.7%	1.23%
11	7A	60	9	119	1.983	6/15/2022 8:58	6/13/2022 12:30	6/15/2022 7:05	0.996	0.808	0.992	1.057	87.1%	1.20%
12	7B	60	7	638	10.633	6/15/2022 8:58	6/13/2022 12:30	6/15/2022 7:05	0.998	0.808	0.992	1.057	79.9%	1.23%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2022	5/31/2023	0.6068	0.00711	0.816	6/11/2022 12:43	500
2	PIC	6/1/2022	5/31/2023	0.6190	0.00847	0.574	6/11/2022 12:43	500
3	PIC	6/1/2022	5/31/2023	0.6046	0.00745	1.840	6/11/2022 12:43	500
4	PIC	6/1/2022	5/31/2023	0.6013	0.01123	0.508	6/11/2022 12:43	500
5	PIC	6/1/2022	5/31/2023	0.6400	0.01519	1.510	6/11/2022 12:43	500
6	PIC	6/1/2022	5/31/2023	0.5954	0.00773	0.654	6/11/2022 12:43	500
7	PIC	6/1/2022	5/31/2023	0.6332	0.00851	0.992	6/11/2022 12:44	500
8	PIC	6/1/2022	5/31/2023	0.6336	0.00426	1.204	6/11/2022 12:44	500
9	PIC	6/1/2022	5/31/2023	0.6236	0.00925	0.900	6/11/2022 12:44	500
10	PIC	6/1/2022	5/31/2023	0.6347	0.00609	1.364	6/11/2022 12:44	500
11	PIC	6/1/2022	5/31/2023	0.6257	0.00594	1.090	6/11/2022 12:44	500
12	PIC	6/1/2022	5/31/2023	0.6366	0.00627	0.634	6/11/2022 12:44	500

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

**Spike S/N :** N/A  
**Spike Exp Date :** N/A  
**Spike Activity (dpm/ml):** N/A  
**Spike Volume Added:** N/A

**LCS S/N :** 1965-C  
**LCS Exp Date :** 8/5/2022  
**LCS Activity (dpm/ml):** 307.57  
**LCS Volume Added:** 0.10

Results																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	1.0881	0.7682	3	1.7257	<b>0.6332</b>	80.24%	0.1673	0.1342	0.9956	1.0081		SAMPLE				
2	0.9163	0.6469	3	1.4838	<b>1.6818</b>	30.42%	0.4427	0.1345	1.0016	1.0864		SAMPLE				
3	1.8297	1.2918	3	2.7954	<b>3.7145</b>	25.28%	0.8767	0.2213	1.8375	2.0591		SAMPLE				
4	0.8853	0.6251	3	1.4452	<b>-0.1613</b>	226.88%	-0.0413	0.0938	0.7172	0.7174		SAMPLE				
5	1.4551	1.0273	3	2.2406	<b>0.2108</b>	301.20%	0.0567	0.1707	1.2444	1.2455		SAMPLE				
6	1.0262	0.7245	3	1.6484	<b>0.0505</b>	879.80%	0.0127	0.1114	0.8707	0.8709		SAMPLE				
7	1.2755	0.9005	3	2.0021	<b>1.7083</b>	37.70%	0.4247	0.1600	1.2614	1.3319		SAMPLE				
8	1.2825	0.9055	3	1.9945	<b>0.8420</b>	70.72%	0.2293	0.1622	1.1670	1.1858		SAMPLE				
9	1.1407	0.8054	3	1.7996	<b>0.1889</b>	265.59%	0.0500	0.1328	0.9831	0.9842		SAMPLE				
10	1.8963	1.3388	3	2.9326	<b>1.8838</b>	48.16%	0.3693	0.1778	1.7776	1.8389		MB				
11	1.1943	0.8432	3	1.8660	<b>3.2101</b>	21.06%	0.8933	0.1877	1.3221	1.5464	582300001.1	DUP	134.1%	2.7360		
12	0.9738	0.6875	3	1.5671	<b>38.4160</b>	4.44%	9.9993	0.4225	3.1813	10.1168		LCS			45.4626	84.5%



SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
582300001	1B	60	10	59	6/15/2022 8:58	6/15/2022 9:58	PIC	2275833
582300002	1C	60	10	61	6/15/2022 8:58	6/15/2022 9:58	PIC	2275833
582300003	2D	60	17	163	6/15/2022 8:58	6/15/2022 9:58	PIC	2275833
582314001	4A	60	14	28	6/15/2022 8:58	6/15/2022 9:58	PIC	2275833
582314002	4B	60	10	94	6/15/2022 8:59	6/15/2022 9:59	PIC	2275833
582314003	4D	60	12	40	6/15/2022 8:59	6/15/2022 9:59	PIC	2275833
582314004	5A	60	6	85	6/15/2022 8:59	6/15/2022 9:59	PIC	2275833
582314005	5B	60	9	86	6/15/2022 8:59	6/15/2022 9:59	PIC	2275833
582314006	5D	60	4	57	6/15/2022 8:59	6/15/2022 9:59	PIC	2275833
1205111720	8D	60	15	104	6/15/2022 11:26	6/15/2022 12:26	PIC	2275833
1205111721	7A	60	9	119	6/15/2022 8:58	6/15/2022 9:58	PIC	2275833
1205111722	7B	60	7	638	6/15/2022 8:58	6/15/2022 9:58	PIC	2275833

ASSAY 15-Jun-22 7:33:18  
 Wizard 2480 s/n 46190630  
 Protocol id 9 Ba-133\_1  
 Time limit  
 Count limit  
 Isotope Ba-133\_1  
 Protocol date 6/15/2022  
 Run id. 5133

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	94	1	180	3942.85	1314.03	1.59	07:33:18
582300001	2	94	2	180	3399.57	1133.01	1.72	86.22	07:36:32
582300002	3	94	3	180	3297.57	1098.95	1.74	83.63	07:39:46
582300003	4	94	4	180	3023.28	1007.56	1.82	76.68	07:43:00
582314001	5	94	5	180	3327	1108.88	1.73	84.39	07:46:14
582314002	1	2	1	180	3276.28	1091.88	1.75	83.09	07:49:50
582314003	2	2	2	180	3252.13	1083.73	1.75	82.47	07:53:04
582314004	3	2	3	180	3065	1021.56	1.81	77.74	07:56:18
582314005	4	2	4	180	3365.28	1121.55	1.72	85.35	07:59:31
582314006	5	2	5	180	3290.28	1096.55	1.74	83.45	08:02:46
1205111720	1	1	1	180	3144.28	1047.8	1.78	79.74	08:06:22
1205111721	2	1	2	180	3436	1145.11	1.71	87.14	08:09:35
1205111722	3	1	3	180	3149	1049.46	1.78	79.87	08:12:49

END OF ASSAY

# **Continuing Calibration Data**

# Gas Flow Proportional Counter Checks for 15-Jun-2022

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100A1	Above	Beta eff	15-Jun 06:40	5	25828	18840	22950	+7.20
LB4100A2	Above	Beta bkg	15-Jun 05:12	60	2.167	-2.15E-1	2.577	+2.12
LB4100A2	Above	Beta eff	15-Jun 06:40	5	26801	19870	23260	+9.27
LB4100A3	Above	Beta eff	15-Jun 06:40	5	25904	18790	23540	+5.99
LB4100E2	Above	Alpha bkg	15-Jun 04:31	60	0.433	-1.22E-1	0.368	+3.80
LB4100E2	Above	Beta bkg	15-Jun 04:31	60	2.850	1.386	3.015	+2.39
LB4100E2	Below	Beta eff	15-Jun 05:35	5	14179	14390	15890	-3.85
LB4100E3	Above	Beta bkg	15-Jun 05:55	60	2.017	0.506	2.576	+1.38
LB4100F3	need 2nd	Alpha bkg	15-Jun 04:31	60	0.267	0.119	0.404	+0.11
LB4100G1	Above	Alpha XTalk	15-Jun 05:34	5	1.127	0.088	0.447	+14.38
LB4100G1	Above	Beta bkg	15-Jun 04:32	60	8666	0.380	1.675	+40,154.88
LB4100G1	Above	Beta eff	15-Jun 05:41	5	21421	12880	18320	+6.42
LB4100G2	Above	Alpha eff	15-Jun 05:35	5	9873	7308	9581	+3.77
LB4100G2	Below	Alpha XTalk	15-Jun 05:35	5	0.312	0.324	0.423	-3.73
LB4100G2	Above	Beta bkg	15-Jun 04:32	60	5.050	1.159	2.203	+19.36
LB4100G3	Above	Beta bkg	15-Jun 04:32	60	7.100	0.810	1.674	+40.68
LB4100H2	Above	Beta bkg	15-Jun 04:31	60	2.267	-4.25E-1	2.832	+1.96
PIC2A	Above	Beta bkg	15-Jun 07:01	60	2.317	-2.04E-1	2.426	+2.75
PIC6A	Above	Alpha bkg	15-Jun 07:14	60	0.483	0.001	0.390	+4.44
PIC8B	Above	Alpha bkg	15-Jun 06:17	60	0.933	-1.16E-1	0.388	+9.51
PIC8B	Above	Beta bkg	15-Jun 06:17	60	3.850	-1.80E-1	2.341	+6.59
PIC8C	Above	Beta bkg	15-Jun 07:26	60	2.133	-2.96E-1	2.115	+3.05
PIC12B	Above	Alpha bkg	15-Jun 06:28	60	0.867	-4.23E-2	0.379	+9.95

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

LB4100C1                   Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
 LB4100C2                   Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by *Janet Disher*

Date 6/15/22

GEL Laboratories LLC

# Runlogs

# Instrument Run Log

Instrument Type: GFPC

Batch ID: 2275833

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205111721	DUP	JXC9	PIC7A	JUN-15-22 08:58:15	DONE	25mm Filter	01-JUN-22 00:00
1205111722	LCS	JXC9	PIC7B	JUN-15-22 08:58:20	DONE	25mm Filter	01-JUN-22 00:00
582300001	SAMPLE	JXC9	PIC1B	JUN-15-22 08:58:34	DONE	25mm Filter	01-JUN-22 00:00
582300002	SAMPLE	JXC9	PIC1C	JUN-15-22 08:58:43	DONE	25mm Filter	01-JUN-22 00:00
582300003	SAMPLE	JXC9	PIC2D	JUN-15-22 08:58:47	DONE	25mm Filter	01-JUN-22 00:00
582314001	SAMPLE	JXC9	PIC4A	JUN-15-22 08:58:52	DONE	25mm Filter	01-JUN-22 00:00
582314002	SAMPLE	JXC9	PIC4B	JUN-15-22 08:59:00	DONE	25mm Filter	01-JUN-22 00:00
582314003	SAMPLE	JXC9	PIC4D	JUN-15-22 08:59:04	DONE	25mm Filter	01-JUN-22 00:00
582314004	SAMPLE	JXC9	PIC5A	JUN-15-22 08:59:16	DONE	25mm Filter	01-JUN-22 00:00
582314005	SAMPLE	JXC9	PIC5B	JUN-15-22 08:59:23	DONE	25mm Filter	01-JUN-22 00:00
582314006	SAMPLE	JXC9	PIC5D	JUN-15-22 08:59:27	DONE	25mm Filter	01-JUN-22 00:00
1205111720	MB	JXC9	PIC8D	JUN-15-22 11:26:45	DONE	25mm Filter	01-JUN-22 00:00

# Lucas Cell Raw Data



# Batch 2275824 Check-list

This check-list was completed on 21-JUN-22 by Lyndsey Pace

This batch was reviewed by Lyndsey Pace on 21-JUN-22 and Elizabeth Krouse on 22-JUN-22.

**Batch ID:**  
2275824

**Product:**  
LUC26RAL

**Description:** Lucas Cell Radium 226  
GL-RAD-A-008

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
<b>Miscellaneous Information</b>				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

# Prep Logbook

## Radium-226 in Liquid

**Batch ID:** 2275824  
**Analyst:** Lyndsey Pace (LXP1)  
**Method:** EPA 903.1 Modified  
**Lab SOP:** GL-RAD-A-008 REV# 15  
**Instrument:** LUCAS-C037036045

Due Dates for Lab: 25-JUN-2022			Package: 27-JUN-2022		SDG: 28-JUN-2022	
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205111703	Radium-226 SPIKE	1715-G	.1	mL	
MS	1205111702	Radium-226 SPIKE	1715-G	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	582300001	10-JUN-2022	1	500.54	500.54	06/13/22 09:32	602	06/16/22 04:57	06/16/22 07:51	4	40
2	582300002	10-JUN-2022	1	501.52	501.52	06/13/22 09:32	705	06/16/22 04:57	06/16/22 07:51	2	43
3	582300003	10-JUN-2022	1	503.05	503.05	06/13/22 09:32	802	06/16/22 04:57	06/16/22 07:51	7	28
4	582314001	10-JUN-2022	1	502.86	502.86	06/16/22 06:08	103	06/21/22 04:59	06/21/22 07:52	6	23
5	582314002	10-JUN-2022	1	500.14	500.14	06/13/22 09:32	205	06/16/22 05:33	06/16/22 08:23	1	71
6	582314003	10-JUN-2022	1	500.3	500.3	06/13/22 09:32	401	06/16/22 05:33	06/16/22 08:23	2	32
7	582314004	10-JUN-2022	1	500.86	500.86	06/13/22 09:32	508	06/16/22 05:33	06/16/22 08:23	1	59
8	582314005	10-JUN-2022	1	500.17	500.17	06/13/22 09:32	607	06/16/22 05:33	06/16/22 08:24	7	71
9	582314006	10-JUN-2022	1	501.06	501.06	06/13/22 09:32	703	06/16/22 05:33	06/16/22 08:24	5	39
10	1205111700 MB	10-JUN-2022	1		503.05	06/16/22 06:08	204	06/21/22 04:59	06/21/22 07:52	8	20
11	1205111701 DUP (582300001)	10-JUN-2022	1	502.87	502.87	06/13/22 09:32	105	06/16/22 06:08	06/16/22 08:56	4	36
12	1205111702 MS (582300001)	10-JUN-2022	1	103.05	103.05	06/13/22 09:32	208	06/16/22 06:08	06/16/22 08:56	3	692
13	1205111703 LCS	10-JUN-2022	1		503.05	06/16/22 06:08	401	06/21/22 04:59	06/21/22 07:52	2	718

Reagent/Solvent Lot ID	Description	Amount	Comments:
			Data Entry Date2: 10-JUN-2022 00:00

### Radium-226 Liquid

Filename : RA226.XLS  
 File type : Excel  
 Version # : 1.3.2

Procedure Code : LUC26RAL  
 Parmname : Radium-226  
 Required MDA : 1 pCi/L  
 Halfife of Ra-226 : 1600 years  
 Ra-226 Abundance : 1.00  
 Halfife of Rn-222: 3.8235 days

Batch : 2275824  
 Analyst : LIN01615  
 Prep Date : 6/10/2022  
 Ra-226 Method Uncertainty : 0.073648

Batch counted on : LUCAS CELL DETECTOR  
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Count Time (min.)	Cell Efficiency (cpm/dpm)
1	582300001.1	0.5005	2.0258E-05	6/2/2022 13:08	602	30	40	1.333	4	0.133	30	1.6150
2	582300002.1	0.5015	2.0262E-05	6/2/2022 13:08	705	30	43	1.433	2	0.067	30	1.7610
3	582300003.1	0.5031	2.0268E-05	6/2/2022 11:40	802	30	28	0.933	7	0.233	30	2.0910
4	582314001.1	0.5029	2.0268E-05	6/7/2022 10:40	103	30	23	0.767	6	0.200	30	1.5190
5	582314002.1	0.5001	2.0256E-05	6/7/2022 11:34	205	30	71	2.367	1	0.033	30	1.6810
6	582314003.1	0.5003	2.0257E-05	6/7/2022 13:18	401	30	32	1.067	2	0.067	30	1.6120
7	582314004.1	0.5009	2.0259E-05	6/7/2022 14:02	508	30	59	1.967	1	0.033	30	1.8020
8	582314005.1	0.5002	2.0257E-05	6/7/2022 14:06	607	30	71	2.367	7	0.233	30	1.7080
9	582314006.1	0.5011	2.0260E-05	6/7/2022 15:03	703	30	39	1.300	5	0.167	30	1.7360
10	1205111700.1	0.5031	2.0268E-05	6/10/2022 0:00	204	30	20	0.667	8	0.267	30	1.6950
11	1205111701.1	0.5029	2.0268E-05	6/2/2022 13:08	105	30	36	1.200	4	0.133	30	1.5830
12	1205111702.1	0.1031	1.1556E-05	6/2/2022 13:08	208	30	692	23.067	3	0.100	30	1.6950
13	1205111703.1	0.5031	2.0268E-05	6/10/2022 0:00	401	30	718	23.933	2	0.067	30	1.6120

Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008  
 Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrow End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
3.900%	7/1/2021	6/30/2022	6/13/2022 9:32	6/16/2022 4:57	6/16/2022 7:51	0.399	0.978	1.002	1.000
3.000%	11/1/2021	10/31/2022	6/13/2022 9:32	6/16/2022 4:57	6/16/2022 7:51	0.399	0.978	1.002	1.000
8.000%	4/1/2022	3/31/2023	6/13/2022 9:32	6/16/2022 4:57	6/16/2022 7:51	0.399	0.978	1.002	1.000
5.600%	4/28/2022	4/30/2023	6/16/2022 6:08	6/21/2022 4:59	6/21/2022 7:52	0.593	0.978	1.002	1.000
2.800%	8/1/2021	7/31/2022	6/13/2022 9:32	6/16/2022 5:33	6/16/2022 8:23	0.402	0.979	1.002	1.000
8.100%	2/1/2022	1/31/2023	6/13/2022 9:32	6/16/2022 5:33	6/16/2022 8:23	0.402	0.979	1.002	1.000
4.500%	6/1/2022	5/31/2023	6/13/2022 9:32	6/16/2022 5:33	6/16/2022 8:23	0.402	0.979	1.002	1.000
4.600%	7/1/2021	6/30/2022	6/13/2022 9:32	6/16/2022 5:33	6/16/2022 8:24	0.402	0.979	1.002	1.000
5.000%	11/1/2021	10/31/2022	6/13/2022 9:32	6/16/2022 5:33	6/16/2022 8:24	0.402	0.979	1.002	1.000
7.800%	8/1/2021	7/31/2022	6/16/2022 6:08	6/21/2022 4:59	6/21/2022 7:52	0.593	0.978	1.002	1.000
0.500%	4/28/2022	4/30/2023	6/13/2022 9:32	6/16/2022 6:08	6/16/2022 8:56	0.404	0.979	1.002	1.000
2.600%	8/1/2021	7/31/2022	6/13/2022 9:32	6/16/2022 6:08	6/16/2022 8:56	0.404	0.979	1.002	1.000
8.100%	2/1/2022	1/31/2023	6/16/2022 6:08	6/21/2022 4:59	6/21/2022 7:52	0.593	0.978	1.002	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

**Spike S/N :** 1715-G  
**Spike Exp Date :** 9/15/2022  
**Spike Activity (dpm/ml):** 297.53  
**Spike Volume Added:** 0.10

**LCS S/N :** 1715-G  
**LCS Exp Date :** 9/15/2022  
**LCS Activity (dpm/ml):** 297.53  
**LCS Volume Added:** 0.10

<b>Results</b>																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.3141	0.2218	1	0.5866	<b>1.7161</b>	18.83%	1.2000	0.2211	0.6197	0.6802		SAMPLE				
2	0.2033	0.1435	1	0.4180	<b>1.7889</b>	16.63%	1.3667	0.2236	0.5737	0.6378		SAMPLE				
3	0.3194	0.2255	1	0.5609	<b>0.7693</b>	29.29%	0.7000	0.1972	0.4248	0.4553		SAMPLE				
4	0.2742	0.1936	1	0.4891	<b>0.5775</b>	32.17%	0.5667	0.1795	0.3586	0.3735		SAMPLE				
5	0.1499	0.1059	1	0.3482	<b>3.1850</b>	12.44%	2.3333	0.2828	0.7567	0.9025		SAMPLE				
6	0.2210	0.1561	1	0.4544	<b>1.4230</b>	21.06%	1.0000	0.1944	0.5421	0.6222		SAMPLE				
7	0.1397	0.0986	1	0.3244	<b>2.4583</b>	14.09%	1.9333	0.2582	0.6435	0.7662		SAMPLE				
8	0.3904	0.2756	1	0.6856	<b>2.8662</b>	14.55%	2.1333	0.2944	0.7752	0.9159		SAMPLE				
9	0.3241	0.2288	1	0.5895	<b>1.4954</b>	20.14%	1.1333	0.2211	0.5718	0.6285		SAMPLE				
10	0.2836	0.2002	1	0.4918	<b>0.3652</b>	44.78%	0.4000	0.1764	0.3156	0.3248		MB				
11	0.3146	0.2221	1	0.5873	<b>1.5274</b>	19.77%	1.0667	0.2108	0.5917	0.6316	582300001.1	DUP	11.6%			
12	1.2415	0.8765	1	2.4056	<b>149.8764</b>	4.63%	22.9667	0.8788	11.2399	25.5486	582300001.1	MS			130.0553	113.9%
13	0.1491	0.1053	1	0.3065	<b>22.9112</b>	8.92%	23.8667	0.8944	1.6829	5.1962		LCS			26.6417	86.0%

# **Continuing Calibration Data**



# Ludlum Alpha Scintillation Counter Checks for 16-JUN-2022

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	06:58	1	1.23E+05	123290	1.77		
LUCAS2	EFF	06:55	1	1.35E+05	135429	2.87		
LUCAS4	EFF	06:54	1	1.29E+05	128671	2.12		
LUCAS5	EFF	06:52	1	1.33E+05	132516	1.95		
LUCAS6	EFF	06:50	1	1.31E+05	130654	-0.58		
LUCAS7	EFF	06:49	1	1.35E+05	134962	2.64		
LUCAS8	EFF	06:47	1	1.30E+05	130350	0.71		

**Reviewed by:**

Lyndsey Pace

**Date:** 16-JUN-22

GEL Laboratories LLC



# Ludlum Alpha Scintillation Counter Checks for 21-JUN-2022

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	07:13	1	1.22E+05	121778	-0.16		
LUCAS2	EFF	07:08	1	1.35E+05	134943	2.54		
LUCAS4	EFF	07:05	1	1.29E+05	128685	2.14		
LUCAS5	EFF	07:04	1	1.32E+05	132150	1.55		
LUCAS6	EFF	07:02	1	1.31E+05	130643	-0.6		
LUCAS7	EFF	06:55	1	1.35E+05	134847	2.52		
LUCAS8	EFF	06:50	1	1.31E+05	130962	0.85		

**Reviewed by:**

Lyndsey Pace

**Date:** 21-JUN-22

GEL Laboratories LLC



# Runlogs

# Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2275824

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
582300001	SAMPLE	LXP1	LUCAS6	JUN-16-22 07:51:00	DONE	Lucas Cell	01-JUL-21 00:00
582300002	SAMPLE	LXP1	LUCAS7	JUN-16-22 07:51:00	DONE	Lucas Cell	01-NOV-21 00:00
582300003	SAMPLE	LXP1	LUCAS8	JUN-16-22 07:51:00	DONE	Lucas Cell	01-APR-22 00:00
582314002	SAMPLE	LXP1	LUCAS2	JUN-16-22 08:23:00	DONE	Lucas Cell	01-AUG-21 00:00
582314003	SAMPLE	LXP1	LUCAS4	JUN-16-22 08:23:00	DONE	Lucas Cell	01-FEB-22 00:00
582314004	SAMPLE	LXP1	LUCAS5	JUN-16-22 08:23:00	DONE	Lucas Cell	01-JUN-22 00:00
582314005	SAMPLE	LXP1	LUCAS6	JUN-16-22 08:24:00	DONE	Lucas Cell	01-JUL-21 00:00
582314006	SAMPLE	LXP1	LUCAS7	JUN-16-22 08:24:00	DONE	Lucas Cell	01-NOV-21 00:00
1205111701	DUP	LXP1	LUCAS1	JUN-16-22 08:56:00	DONE	Lucas Cell	28-APR-22 00:00
1205111702	MS	LXP1	LUCAS2	JUN-16-22 08:56:00	DONE	Lucas Cell	01-AUG-21 00:00
582314001	SAMPLE	LXP1	LUCAS1	JUN-21-22 07:52:00	DONE	Lucas Cell	28-APR-22 00:00
1205111700	MB	LXP1	LUCAS2	JUN-21-22 07:52:00	DONE	Lucas Cell	01-AUG-21 00:00
1205111703	LCS	LXP1	LUCAS4	JUN-21-22 07:52:00	DONE	Lucas Cell	01-FEB-22 00:00



Environmental Laboratory  
1232 Haco Drive  
Lansing  
Michigan, 48910

**CHAIN OF CUSTODY**

Phone: (517)702-6372

Lab Work Order Number

L206152

Client Name BWL - Erickson Station		Project Name Erickson AM MI Well 11B		Requested Analyses Radium 226 and Radium 228		Requested Turn Around	
Client Contact Cheryl Loudon		Project Number [none]		Hardness		Rush requests subject to additional charge	
Address 3725 S. Canal		Project Description		TSS		Rush requests subject to lab approval	
City Lansing		PO Number 30926 10021		Cd::Cr::Co::Cu::Fe::Hg::Li::Mo::			
State/Zip MI, 48917		Shipped By		Ni::Pb::Sb::Se::Th::V::Zn			
Phone (517) 702-6396		Tracking Number		Ag::Na, K, Mg As:: B:: Ba:: Be:: Ca			
Fax (517) 702-6373							
Sampler Marc Wahrer							

Sample Name or Field ID	Sampled Date	Sampled Time	Sample Type	Matrix Code	Container Count	Ag	Na	K	Mg	As	B	Ba	Be	Ca	Cd	Cr	Co	Cu	Fe	Hg	Li	Mo	Ni	Pb	Sb	Se	Th	V	Zn	TSS	Chl	HC	F	ISE	S04	TDS	HCO3	CO3	Hardness	Sample	Comments	
MW-11B	6/2/22	1308	G	GW	5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2			
Field Dupe MW-11B		↓	G	GW	5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2		
Field Blank		↓	G	DI	5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2		

Relinquished By		Date/Time	6-2-22 1530	Received By		Date/Time	6/3/22 0836	Comments
Relinquished By		Date/Time		Received By		Date/Time		
Relinquished By		Date/Time		Received By		Date/Time		
Cooler Numbers and Temperatures								
Matrix Codes: a=None, b=0.5% HNO3								

Di=Deionized Water, GW=Ground Water

### Data Validation Checklist

Site Name: Erickson Personnel: M. Wahrer

Sample Date(s): 6/2/2022 Lab Drop-off Date(s): 6/3/2022

Lab Report Number: S36642.01(02)

Lab Report Date: 7/21/2022

Reason for Sample Event: New Well MW-11B

**Field Records:** Circle Yes/No unless Not Applicable – *Complete during sample event*

Item Description	Verification (Completeness)	Validation (Conformance to Specifications)
Field equipment calibration records	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Chain-of-Custody forms	<input checked="" type="radio"/> Yes / No	N/A
Field decontamination documentation	N/A	N/A
Sample collection field forms	<input checked="" type="radio"/> Yes / No	N/A
Drilling logs	<input checked="" type="radio"/> Yes / No	N/A
Well construction logs	<input checked="" type="radio"/> Yes / No	N/A
Well development field forms	<input checked="" type="radio"/> Yes / No	N/A

**Analytical Data Package:** Circle Yes/No unless N/A – *Complete when lab report is received*

Item Description	Verification (Completeness)	Validation (Conformance to Specifications)
Cover sheet (laboratory identifying information)	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Case narrative	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Internal laboratory Chain-of-Custody forms	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Sample chronology and consistency (that is, dates and times of receipt, preparation, and analysis)	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Communication records with laboratory	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
EDD format consistency	<input checked="" type="radio"/> Yes / No	N/A
Sample identification, results nomenclature, and data qualifier consistency	<input checked="" type="radio"/> Yes / No	N/A
RLs as requested; MDLs < RLs	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Instrument calibration records	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Laboratory Report	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Field QC sample results and calculation of accuracy and precision	<input checked="" type="radio"/> Yes / No Duplicate Well ID: MW-11B	<input checked="" type="radio"/> Yes / No Duplicate RPD: 0-19%

**Corrections Needed:** None; according to the Technical Case Narrative by GEL Laboratories, subcontracted laboratory for radium analysis, “[a]ll sample data provided in [the] report met the

acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Rad-228 - The Sample and the Duplicate, (See Below), did not meet the relative percent difference requirement; however, they do meet the relative error ratio requirement with the value listed below. No qualification was required.

Sample	Analyte	Value
1205111721 (S36642.01DUP)	Radium-226	RPD 134* (0.0%-100.0%) RER 2.74 (0-3)

Sample 1205111720 (MB) was recounted due to a suspected blank false positive. The recount is reported.

Rad-226 - Samples 1205111700 (MB) and 1205111703 (LCS) were degassed and recounted due to an analyst error while transferring. The second counts are reported.



Lansing Board of Water and Light  
Environmental Services Laboratory (MI00079)  
1232 Haco Dr.  
Lansing, Michigan 48901

12 July 2022

BWL - Erickson Station  
Attn: Cheryl Loudon  
3725 S. Canal  
Lansing, MI 48917

**Project: Erickson AM MI**

Dear Cheryl Loudon,

Enclosed is a copy of the laboratory report for the following work order(s) received by Lansing Board of Water and Light Environmental Services Laboratory:

<b>Work Order</b>	<b>Received</b>	<b>Account Number</b>
<b>L206153</b>	<b>6/8/2022 3:31:00PM</b>	<b>30926 10021</b>

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in blue ink that reads "Jennifer Caporale".

Jennifer Caporale, Supervisor



**Analytical Report**

**Client:** BWL - Erickson Station  
**Address:** 3725 S. Canal  
 Lansing MI, 48917

**Client Project Manager:** Cheryl Louden

**Report Date:** 07/12/2022

**Sample Name:** MW-11

**Lab #:** L206153-01 Ground Water

**Collected:** 08-Jun-22 10:36

**By:** Marc Wahrer

Analyte	Reporting			Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit	Units						
Conductivity	1100	1.0	uS/cm	1		08-Jun-22 10:36	maw	SM 2510B	
Dissolved oxygen	0.560	0.100	mg/L	1		08-Jun-22 10:36	maw	FIELD	
Milliliters Purged	250		ml/min	1		08-Jun-22 10:36	maw	FIELD	
Oxidation Reduction Potential	-109.6	-999.0	mV	1		08-Jun-22 10:36	maw	FIELD	
pH	6.8	7.0	pH Units	1		08-Jun-22 10:36	maw	SM 4500H+B	
Temperature	11		°C	1		08-Jun-22 10:36	maw	SM 2550B	
Turbidity	7.0	0.10	NTU	1		08-Jun-22 10:36	maw	SM 2130B	

**Sample Name:** MW-12

**Lab #:** L206153-02 Ground Water

**Collected:** 08-Jun-22 13:40

**By:** Marc Wahrer

Analyte	Reporting			Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit	Units						
Conductivity	1800	1.0	uS/cm	1		08-Jun-22 13:40	maw	SM 2510B	
Dissolved oxygen	5.25	0.100	mg/L	1		08-Jun-22 13:40	maw	FIELD	
Milliliters Purged	240		ml/min	1		08-Jun-22 13:40	maw	FIELD	
Oxidation Reduction Potential	140.2	-999.0	mV	1		08-Jun-22 13:40	maw	FIELD	
pH	7.2	7.0	pH Units	1		08-Jun-22 13:40	maw	SM 4500H+B	
Temperature	15		°C	1		08-Jun-22 13:40	maw	SM 2550B	
Turbidity	31	0.10	NTU	1		08-Jun-22 13:40	maw	SM 2130B	

**Sample Name:** MW-13

**Lab #:** L206153-03 Ground Water

**Collected:** 08-Jun-22 12:56

**By:** Marc Wahrer

Analyte	Reporting			Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit	Units						
Conductivity	580	1.0	uS/cm	1		08-Jun-22 12:56	maw	SM 2510B	
Dissolved oxygen	5.42	0.100	mg/L	1		08-Jun-22 12:56	maw	FIELD	
Milliliters Purged	250		ml/min	1		08-Jun-22 12:56	maw	FIELD	
Oxidation Reduction Potential	101.6	-999.0	mV	1		08-Jun-22 12:56	maw	FIELD	
pH	7.1	7.0	pH Units	1		08-Jun-22 12:56	maw	SM 4500H+B	
Temperature	12		°C	1		08-Jun-22 12:56	maw	SM 2550B	
Turbidity	6.5	0.10	NTU	1		08-Jun-22 12:56	maw	SM 2130B	



## Analytical Report

**Client:** BWL - Erickson Station

**Client Project Manager:** Cheryl Louden

**Report Date:** 07/12/2022

**Address:** 3725 S. Canal  
Lansing MI, 48917

**Approved By:** \_\_\_\_\_

### Notes and Definitions

- AL Action Level (Action Level = Regulatory Limit)
  - MCL Maximum Contaminant Level
  - PEL Permissible Exposure Limit (Permissible Exposure Limit = Regulatory Limit)
  - RPD Relative Percent Difference
  - OT Odor Threshold
  - ND Non Detect is less than the reporting limit value
- All drinking water regulatory limits are MCL's with the exception of Lead and Copper unless otherwise noted.





Report ID: S36862.01(03)  
Generated on 07/11/2022  
Replaces report S36862.01(02) generated on 07/11/2022

**Report to**  
Attention: Jennifer Caporale  
Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901  
  
Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

**Report produced by**  
Merit Laboratories, Inc.  
2680 East Lansing Drive  
East Lansing, MI 48823

Phone: (517) 332-0167 FAX: (517) 332-6333

Contacts for report questions:  
John Lavery (johnlavery@meritlabs.com)  
Barbara Ball (bball@meritlabs.com)

**Report Summary**

Lab Sample ID(s): S36862.01-S36862.05  
Project: Erickson AM MI New Wells 11-13  
Collected Date(s): 06/08/2022  
Submitted Date/Time: 06/08/2022 16:07  
Sampled by: Marc Wahrer  
P.O. #:

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Maya Murshak  
Technical Director



## General Report Notes

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Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile, and 2-chloroethylvinyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (\*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

## Report Narrative

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All analyses completed



### Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Alaska CSLAP	#17-001
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

### Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

### Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



## Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1 (1993)
SM2320B	Standard Method 2320 B 2011
SM2340C	Standard Method 2340 C 2011
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007



### Sample Summary (5 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S36862.01	MW-11 L206153-01	Groundwater	06/08/22 10:36
S36862.02	MW-12 L206153-02	Groundwater	06/08/22 13:40
S36862.03	MW-13 L206153-03	Groundwater	06/08/22 12:56
S36862.04	Field Dupe MW-11 L206153-04	Groundwater	06/08/22 10:36
S36862.05	Field Blank L206153-05	Water	06/08/22 08:20



# Analytical Laboratory Report

Lab Sample ID: S36862.01

Sample Tag: MW-11 L206153-01

Collected Date/Time: 06/08/2022 10:36

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	4.6	IR
2	1L Plastic	None	Yes	4.6	IR
1	125ml Plastic	HNO3	Yes	4.6	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	06/09/22 11:30	JRH	
Metal Digestion	Completed	SW3015A	06/10/22 10:00	CCM	

### Inorganics

Method: E300.0, Run Date: 06/10/22 09:13, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	63	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 06/13/22 08:15, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	595	10	5	mg/L	1	71-52-3	
Carbonate*	Not detected	10	5	mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 06/13/22 14:38, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	495	100	2.4	mg/L	10		

Method: SM2540C, Run Date: 06/09/22 11:25, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	644	50	10	mg/L	2		

Method: SM2540D, Run Date: 06/09/22 17:35, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	32	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 06/10/22 11:53, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.018	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.142	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.22	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	21.4	0.02	0.00192	mg/L	5	7439-89-6	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S36862.01 (continued)

Sample Tag: MW-11 L206153-01

**Method: E200.8, Run Date: 06/10/22 11:53, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	0.009	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 06/10/22 13:50, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	139	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	39.4	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	1.30	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	37.5	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 06/09/22 15:27, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 07/05/22 08:22, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Lab Sample ID: S36862.02

Sample Tag: MW-12 L206153-02

Collected Date/Time: 06/08/2022 13:40

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	4.6	IR
2	1L Plastic	None	Yes	4.6	IR
1	125ml Plastic	HNO3	Yes	4.6	IR
1	125ml Plastic	None	Yes	4.6	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	06/10/22 09:00	JRH	
Mercury Digestion	Completed	E245.1	06/10/22 09:00	JRH	
Metal Digestion	Completed	SW3015A	06/10/22 10:00	CCM	
Metal Digestion	Completed	SW3015A	06/10/22 10:00	CCM	

### Inorganics

Method: E300.0, Run Date: 06/10/22 09:26, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	

Method: E300.0, Run Date: 06/10/22 10:17, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	82	25	0.40	mg/L	25	16887-00-6	
Sulfate	254	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 06/13/22 08:20, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	695	10	5	mg/L	1	71-52-3	
Carbonate*	Not detected	10	5	mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 06/13/22 14:40, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	565	100	2.4	mg/L	10		

Method: SM2540C, Run Date: 06/09/22 11:25, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	1,080	50	10	mg/L	2		

Method: SM2540D, Run Date: 06/09/22 17:35, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	17	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 06/10/22 11:59, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.064	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	





# Analytical Laboratory Report

Lab Sample ID: S36862.02 (continued)

Sample Tag: MW-12 L206153-02

**Method: E200.8, Run Date: 06/10/22 11:59, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Boron	0.10	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	1.00	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.025	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.019	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	0.018	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 06/10/22 12:02, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony, Dissolved*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic, Dissolved	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium, Dissolved	0.064	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium, Dissolved	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron, Dissolved	0.10	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium, Dissolved	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium, Dissolved	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt, Dissolved	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper, Dissolved	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron, Dissolved	Not detected	0.02	0.00192	mg/L	5	7439-89-6	
Lead, Dissolved	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium, Dissolved*	0.022	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum, Dissolved	0.018	0.005	0.000217	mg/L	5	7439-98-7	
Nickel, Dissolved	0.015	0.005	0.000250	mg/L	5	7440-02-0	
Selenium, Dissolved	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver, Dissolved	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium, Dissolved	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium, Dissolved	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc, Dissolved	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 06/10/22 13:53, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	149	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	56.2	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	3.91	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	199	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E200.8, Run Date: 06/10/22 13:55, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium, Dissolved*	144	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium, Dissolved	54.5	0.50	0.0120	mg/L	5	7439-95-4	
Potassium, Dissolved	3.95	0.50	0.0230	mg/L	5	7440-09-7	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S36862.02 (continued)

Sample Tag: MW-12 L206153-02

Method: E200.8, Run Date: 06/10/22 13:55, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sodium, Dissolved	195	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 06/10/22 14:13, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury, Dissolved	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Method: E245.1, Run Date: 06/10/22 14:10, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

Method: , Run Date: 07/05/22 08:22, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Lab Sample ID: S36862.03

Sample Tag: MW-13 L206153-03

Collected Date/Time: 06/08/2022 12:56

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	4.6	IR
2	1L Plastic	None	Yes	4.6	IR
1	125ml Plastic	HNO3	Yes	4.6	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	06/09/22 11:30	JRH	
Metal Digestion	Completed	SW3015A	06/10/22 10:00	CCM	

### Inorganics

Method: E300.0, Run Date: 06/10/22 09:39, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	13	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	17	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 06/13/22 08:30, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	349	10	5	mg/L	1	71-52-3	
Carbonate*	Not detected	10	5	mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 06/13/22 14:42, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	310	100	2.4	mg/L	10		

Method: SM2540C, Run Date: 06/09/22 11:25, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	354	50	10	mg/L	2		

Method: SM2540D, Run Date: 06/09/22 17:35, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 06/10/22 12:05, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.023	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.18	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.08	0.02	0.00192	mg/L	5	7439-89-6	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S36862.03 (continued)

Sample Tag: MW-13 L206153-03

**Method: E200.8, Run Date: 06/10/22 12:05, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 06/10/22 13:56, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	96.1	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	20.7	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	0.83	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	2.59	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 06/09/22 15:29, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 07/05/22 08:22, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Lab Sample ID: S36862.04

Sample Tag: Field Dupe MW-11 L206153-04

Collected Date/Time: 06/08/2022 10:36

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	4.6	IR
2	1L Plastic	None	Yes	4.6	IR
1	125ml Plastic	HNO3	Yes	4.6	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	06/09/22 11:30	JRH	
Metal Digestion	Completed	SW3015A	06/10/22 10:00	CCM	

### Inorganics

Method: E300.0, Run Date: 06/10/22 09:52, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	63	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 06/13/22 08:40, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	593	10	5	mg/L	1	71-52-3	
Carbonate*	Not detected	10	5	mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 06/13/22 14:50, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	490	100	2.4	mg/L	10		

Method: SM2540C, Run Date: 06/09/22 11:25, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	654	50	10	mg/L	2		

Method: SM2540D, Run Date: 06/09/22 17:35, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	31	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 06/10/22 12:08, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.018	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.144	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.22	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	21.9	0.02	0.00192	mg/L	5	7439-89-6	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S36862.04 (continued)  
Sample Tag: Field Dupe MW-11 L206153-04

**Method: E200.8, Run Date: 06/10/22 12:08, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 06/10/22 13:58, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	138	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	39.1	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	1.32	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	38.8	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 06/09/22 15:30, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 07/05/22 08:22, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Lab Sample ID: S36862.05

Sample Tag: Field Blank L206153-05

Collected Date/Time: 06/08/2022 08:20

Matrix: Water

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	4.6	IR
2	1L Plastic	None	Yes	4.6	IR
1	125ml Plastic	HNO3	Yes	4.6	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	06/09/22 11:30	JRH	
Metal Digestion	Completed	SW3015A	06/10/22 10:00	CCM	

### Inorganics

Method: E300.0, Run Date: 06/10/22 10:05, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	2.5	0.04	mg/L	2.5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.06	mg/L	2.5	16984-48-8	
Sulfate	Not detected	2.5	0.15	mg/L	2.5	14808-79-8	

Method: SM2320B, Run Date: 06/13/22 08:45, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	Not detected	10	5	mg/L	1	71-52-3	
Carbonate*	Not detected	10	5	mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 06/13/22 14:52, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	Not detected	10	0.24	mg/L	1		

Method: SM2540C, Run Date: 06/09/22 11:25, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	Not detected	50	10	mg/L	2		

Method: SM2540D, Run Date: 06/09/22 17:35, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 06/10/22 11:39, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00102	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.000102	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.0000648	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.0000862	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.000702	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.0000760	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.0000386	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.0000434	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000150	mg/L	2	7440-50-8	
Iron	Not detected	0.02	0.000768	mg/L	2	7439-89-6	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S36862.05 (continued)

Sample Tag: Field Blank L206153-05

**Method: E200.8, Run Date: 06/10/22 11:39, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.0000760	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000654	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.0000868	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000100	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.000838	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.0000270	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.0000342	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.0000558	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.000292	mg/L	2	7440-66-6	

**Method: E200.8, Run Date: 06/10/22 13:48, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.0174	mg/L	2	7440-70-2	
Magnesium	Not detected	0.50	0.00480	mg/L	2	7439-95-4	
Potassium	Not detected	0.50	0.00920	mg/L	2	7440-09-7	
Sodium	Not detected	0.50	0.00340	mg/L	2	7440-23-5	

**Method: E245.1, Run Date: 06/09/22 15:32, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 07/05/22 08:22, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Merit Laboratories Login Checklist

Lab Set ID:S36862

Attention: Jennifer Caporale  
Address: Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901

Client:BWL01 (Board of Water & Light)

Project: Erickson AM MI New Wells 11-13

Submitted:06/08/2022 16:07 Login User: MMC

Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

Selection	Description	Note
-----------	-------------	------

## Sample Receiving

- |     |  |  |
|-----|--|--|
| 01. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples are received at 4C +/- 2C Thermometer # IR 4.6 |
| 02. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Received on ice/ cooling process begun                 |
| 03. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples shipped  |
| 04. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples left in 24 hr. drop box                        |
| 05. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Are there custody seals/tape or is the drop box locked |

## Chain of Custody

- |     |  |   |
|-----|--|---|
| 06. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC adequately filled out                                       |
| 07. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC signed and relinquished to the lab                          |
| 08. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sample tag on bottles match COC                                 |
| 09. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Subcontracting needed? Subcontracted to: GEL 1Z4664770362611102 |

## Preservation

- |     |  |   |
|-----|--|---|
| 10. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Do sample have correct chemical preservation        |
| 11. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Completed pH checks on preserved samples? (no VOAs) |
| 12. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Did any samples need to be preserved in the lab?    |

## Bottle Conditions

- |     |  |   |
|-----|--|---|
| 13. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | All bottles intact                            |
| 14. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Appropriate analytical bottles are used       |
| 15. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Merit bottles used                            |
| 16. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sufficient sample volume received             |
| 17. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples require laboratory filtration         |
| 18. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples submitted within holding time         |
| 19. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Do water VOC or TOX bottles contain headspace |

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: \_\_\_\_\_ Date: \_\_\_\_\_

# Merit Laboratories Bottle Preservation Check

Lab Set ID: S36862 Submitted: 06/08/2022 16:07

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI New Wells 11-13

Attention: Jennifer Caporale  
Address: Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901

Initial Preservation Check: 06/08/2022 16:54 MMC

Preservation Recheck (E200.8): N/A

Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S36862.01	125ml Plastic HNO3	<2			
S36862.01	1L Plastic HNO3	<2			
S36862.01	1L Plastic HNO3	<2			
S36862.02	125ml Plastic HNO3	<2			
S36862.02	1L Plastic HNO3	<2			
S36862.02	1L Plastic HNO3	<2			
S36862.03	125ml Plastic HNO3	<2			
S36862.03	1L Plastic HNO3	<2			
S36862.03	1L Plastic HNO3	<2			
S36862.04	125ml Plastic HNO3	<2			
S36862.04	1L Plastic HNO3	<2			
S36862.04	1L Plastic HNO3	<2			
S36862.05	125ml Plastic HNO3	<2			
S36862.05	1L Plastic HNO3	<2			
S36862.05	1L Plastic HNO3	<2			



2680 East Lansing Dr., East Lansing, MI 48823  
 Phone (517) 332-0167 Fax (517) 332-4034  
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

**REPORT TO**

**CHAIN OF CUSTODY RECORD**

**INVOICE TO**

CONTACT NAME **Jennifer Caporale**  
 COMPANY **Lansing Board of Water and Light**  
 ADDRESS **PO Box 13007 48901-3007**  
 CITY **Lansing** STATE **Mi** ZIP CODE **48901**  
 PHONE NO. **517-702-6372** FAX NO. P.O. NO.  
 E-MAIL ADDRESS **Environmental\_Laboratory@lbwl.com** QUOTE NO.

CONTACT NAME **Kelly Gleason**  SAME  
 COMPANY  
 ADDRESS  
 CITY STATE ZIP CODE  
 PHONE NO. E-MAIL ADDRESS **Kelly.Gleason@lbwl.com**

**ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)**

PROJECT NO./NAME **Erickson AM MI Wells 11-13** SAMPLER(S) - PLEASE PRINT/SIGN NAME **Marc Wahrer**  
 TURNAROUND TIME REQUIRED  1 DAY  2 DAYS  3 DAYS  STANDARD  OTHER **ASAP**  
 DELIVERABLES REQUIRED  STD  LEVEL II  LEVEL III  LEVEL IV  EDD  OTHER

MATRIX GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID  
 CODE: SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIPE A=AIR W=WASTE

# Containers & Preservatives

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	# Containers & Preservatives							Total Metals	F- undistilled, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	Dissolved Metals	HCO3, CO3, Hardness	Certifications	Project Locations	Special Instructions
	DATE	TIME				NONE	HCl	HNO3	H2SO4	NI(OH)	NI(OH)	OTHER										
36862.01	6/8/22	1036	MW-11 L206153-01	GW	5	2	3														Metals to analyse: Na, Mg, K	
.02	6/8/22	1340	MW-12 L206153-02	GW	6	3	3														B, Ca, Sb, As, Ba, Be, Cd, Cr,	
.03	6/8/22	1256	MW-13 L206153-03	GW	5	2	3														Co, Li, Hg, Mo, Pb, Se, Tl,	
.04	6/8/22	1036	Field Dupe MW-11 L206153-04	GW	5	2	3														Fe, Cu, Ni, Ag, V, Zn	
.05	6/8/22	820	Field Blank L206153-05	DI	5	2	3														Please send a preliminary report	
																					The analytes for dissolved metals are same metals that are analysed for total.	

RELINQUISHED BY: *[Signature]* \*Sampler DATE **6-8-22** TIME **1607**  
 RECEIVED BY: *[Signature]* DATE **6/8/22** TIME **1657**  
 RELINQUISHED BY: DATE TIME  
 RECEIVED BY: DATE TIME

RELINQUISHED BY: DATE TIME  
 RECEIVED BY: DATE TIME  
 SEAL NO. SEAL INTACT YES  NO  INITIALS  
 SEAL NO. SEAL INTACT YES  NO  INITIALS  
 NOTES: TEMP. ON ARRIVAL **4.6**

## Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total		250 mL plastic	mg/L	Nitric Acid	200.8	6mos	0.150
Be, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	2.5
Cl	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	10
Cr, total	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
F	Fluoride	250 mL plastic	mg/L	None	9056	28 d	1.0
Fe, total	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Pb, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Li, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Hg, total	Mercury	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Mo, total	Molybdenum	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
RA226/228	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	HNO3	SM 7500	6 mos	2.0 combined
Se, total	Selenium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ag, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
SO4	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	10
Tl, total	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
TDS	Total Dissolved Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TSS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540D	NA	3
V, total	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Zn, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005



July 05, 2022

John Laverty  
Merit Laboratories Inc.  
2680 East Lansing Drive  
East Lansing, Michigan 48823

Re: Routine Analysis  
Work Order: 582809  
SDG: S36862

Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on June 13, 2022. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at [www.gel.com](http://www.gel.com).

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,

Heather Millar for  
Delaney Stone  
Project Manager

Purchase Order: GELP20-0018  
Enclosures



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# Case Narrative

**Receipt Narrative  
for  
Merit Laboratories, Inc.  
SDG: S36862  
Work Order: 582809**

**July 05, 2022**

**Laboratory Identification:**

GEL Laboratories LLC  
2040 Savage Road  
Charleston, South Carolina 29407  
(843) 556-8171

**Summary:**

**Sample receipt:** The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on June 13, 2022 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

**Sample Identification:** The laboratory received the following samples:

<b><u>Laboratory ID</u></b>	<b><u>Client ID</u></b>
582809001	S36862.01
582809002	S36862.02
582809003	S36862.03
582809004	S36862.04 Field Dupe
582809005	S36862.05 Field Blank

**Case Narrative:**

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.



The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.

A handwritten signature in black ink that reads "Heather Millar". The signature is written in a cursive style with a vertical line on the left side of the word "Heather".

Heather Millar for  
Delaney Stone  
Project Manager

# **Chain of Custody and Supporting Documentation**

Page 5 of 46  
SDG: S36862



2680 East Lansing Dr., East Lansing, MI 48823  
Phone (517) 332-0167 Fax (517) 332-4034  
www.meritlabs.com

C.O.C. PAGE # 1 OF 1

**REPORT TO**

**CHAIN OF CUSTODY RECORD**

**INVOICE TO**

CONTACT NAME **Project Management Team**  
 COMPANY **Merit Laboratories**  
 ADDRESS **2680 East Lansing Drive**  
 CITY **East Lansing** STATE **MI** ZIP CODE **48823**  
 PHONE NO. **517-332-0167** FAX NO. \_\_\_\_\_ P.O. NO. \_\_\_\_\_  
 E-MAIL ADDRESS **results@meritlabs.com** QUOTE NO. \_\_\_\_\_

CONTACT NAME **Julie Teague**  BAME  
 COMPANY **Merit Laboratories**  
 ADDRESS **2680 East Lansing Drive**  
 CITY **East Lansing** STATE **MI** ZIP CODE **48823**  
 PHONE NO. **517-332-0167** E-MAIL ADDRESS **juliet@meritlabs.com**

**ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)**

PROJECT NO./NAME		SAMPLER(S) - PLEASE PRINT/SIGN NAME												
S36862														
TURNAROUND TIME REQUIRED <input type="checkbox"/> 1 DAY <input type="checkbox"/> 2 DAYS <input type="checkbox"/> 3 DAYS <input checked="" type="checkbox"/> STANDARD <input type="checkbox"/> OTHER _____														
DELIVERABLES REQUIRED <input type="checkbox"/> STD <input type="checkbox"/> LEVEL II <input type="checkbox"/> LEVEL III <input checked="" type="checkbox"/> LEVEL IV <input type="checkbox"/> EDD <input type="checkbox"/> OTHER _____														
MATRIX CODE:		# Containers & Preservatives												
GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIFE A=AIR W=WASTE														
MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO <sub>3</sub>	H <sub>2</sub> SO <sub>4</sub>	HNOH	MNOH	OTHER	Radium 226*	Radium 228**
	DATE	TIME												
	6/8/22	1036	S36862.01	GW	2			2					✓	✓
	6/8/22	1340	S36862.02	GW	2			2					✓	✓
	6/8/22	1256	S36862.03	GW	2			2					✓	✓
	6/8/22	1036	S36862.04 Field Dupe	GW	2			2					✓	✓
	6/8/22	0820	S36862.05 Field Blank	DI	2			2					✓	✓

**Certifications**  
 OHIO VAP  Drinking Water  
 DoD  NPDES

**Project Locations**  
 Detroit  New York  
 Other \_\_\_\_\_

**Special Instructions**  
 \* E903.1 Mod.  
 \*\* E904.0/SW 9320 Mod.  
 Please use calculation product & provide Radium 226/228 combined results on the report  
 (No Ice needed)  
 \*\* Subcontracted to  
**GEL Laboratories, Inc.**  
**2040 Savage Road**  
**Charleston, SC 29407**

RELINQUISHED BY: *Patrick [Signature]*  Sampler DATE **6/9/22** TIME **1700**  
 RECEIVED BY: *[Signature]* DATE **6/9/22** TIME **1700**

RELINQUISHED BY: \_\_\_\_\_ DATE \_\_\_\_\_ TIME \_\_\_\_\_  
 RECEIVED BY: *Supriya [Signature]* DATE **6/13/22** TIME **930**

RELINQUISHED BY: \_\_\_\_\_ DATE \_\_\_\_\_ TIME \_\_\_\_\_  
 RECEIVED BY: \_\_\_\_\_ DATE \_\_\_\_\_ TIME \_\_\_\_\_

SEAL NO. \_\_\_\_\_ SEAL INTACT YES  NO  INITIALS \_\_\_\_\_  
 SEAL NO. \_\_\_\_\_ SEAL INTACT YES  NO  INITIALS \_\_\_\_\_

NOTES: \_\_\_\_\_ TEMP. ON ARRIVAL \_\_\_\_\_

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

SAMPLE RECEIPT & REVIEW FORM

Client: MERT SDG/AR/COC/Work Order: 582809/2810 P.S.

Received By: Tye Date Received: 6/13/22

Carrier and Tracking Number  
 FedEx Express FedEx Ground UPS Field Services Courier Other  
1246647703 6201102

Suspected Hazard Information	Yes	No	*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.
A) Shipped as a DOT Hazardous?		<input checked="" type="checkbox"/>	Hazard Class Shipped: _____ UN#: _____ If UN2910, Is the Radioactive Shipment Survey Compliant? Yes ___ No ___
B) Did the client designate the samples to be received as radioactive?		<input checked="" type="checkbox"/>	COC notation or radioactive stickers on containers equal client designation.
C) Did the RSO classify the samples as radioactive?		<input checked="" type="checkbox"/>	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): <u>0</u> CPM / mR/Hr Classified as: Rad 1 Rad 2 Rad 3
D) Did the client designate samples are hazardous?		<input checked="" type="checkbox"/>	COC notation or hazard labels on containers equal client designation.
E) Did the RSO identify possible hazards?		<input checked="" type="checkbox"/>	If D or E is yes, select Hazards below. PCB's Flammable Foreign Soil RCRA Asbestos Beryllium Other:

Sample Receipt Criteria	Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1 Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2 Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		Circle Applicable: Client contacted and provided COC COG created upon receipt
3 Samples requiring cold preservation within (0 ≤ 6 deg. C)?*	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		Preservation Method: Wet Ice Ice Packs Dry ice None Other: <u>0</u> *all temperatures are recorded in Celsius <span style="float: right;">TEMP: <u>16°C</u></span>
4 Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		Temperature Device Serial #: <u>IR2-20</u> Secondary Temperature Device Serial # (If Applicable):
5 Sample containers intact and sealed?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6 Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		Sample ID's and Containers Affected:
7 Do any samples require Volatile Analysis?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		If Preservation added, Lot#:
				If Yes, are Encores or Soil Kits present for solids? Yes ___ No ___ NA ___ (If yes, take to VOA Freezer)
				Do liquid VOA vials contain acid preservation? Yes ___ No ___ NA ___ (If unknown, select No)
8 Samples received within holding time?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		Are liquid VOA vials free of headspace? Yes ___ No ___ NA ___ Sample ID's and containers affected:
9 Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		ID's and tests affected:
10 Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		ID's and containers affected:
11 Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		Circle Applicable: No dates on containers No times on containers COC missing info Other (describe)
12 Are sample containers identifiable as GEL provided by use of GEL labels?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		Circle Applicable: No container count on COC Other (describe)
13 COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		Circle Applicable: Not relinquished Other (describe)

Comments (Use Continuation Form if needed):

PM (or PMA) review: Initials KW Date 6/14/22 Page \_\_\_ of \_\_\_

# **Laboratory Certifications**

**List of current GEL Certifications as of 05 July 2022**

<b>State</b>	<b>Certification</b>
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122022-5
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2019-165
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122021-36
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

# **Radiological Analysis**

# Case Narrative



**Radiochemistry  
Technical Case Narrative  
Merit Laboratories, Inc.  
SDG #: S36862  
Work Order #: 582809**

**Product:** GFPC Ra228, Liquid

**Analytical Method:** EPA 904.0/SW846 9320 Modified

**Analytical Procedure:** GL-RAD-A-063 REV# 5

**Analytical Batch:** 2277741

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
582809001	S36862.01
582809002	S36862.02
582809003	S36862.03
582809004	S36862.04 Field Dupe
582809005	S36862.05 Field Blank
1205115699	Method Blank (MB)
1205115700	582809001(S36862.01) Sample Duplicate (DUP)
1205115701	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

**Preparation Information**

**Homogenous Matrix**

Samples 1205115700 (S36862.01DUP), 582809001 (S36862.01) and 582809004 (S36862.04 Field Dupe) were non-homogenous matrix. Samples were tinted yellow. 1205115700 (S36862.01DUP), 582809001 (S36862.01) and 582809004 (S36862.04 Field Dupe).

**Product:** Lucas Cell, Ra226, Liquid

**Analytical Method:** EPA 903.1 Modified

**Analytical Procedure:** GL-RAD-A-008 REV# 15

**Analytical Batch:** 2277735

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
582809001	S36862.01
582809002	S36862.02
582809003	S36862.03

582809004	S36862.04 Field Dupe
582809005	S36862.05 Field Blank
1205115683	Method Blank (MB)
1205115684	582809001(S36862.01) Sample Duplicate (DUP)
1205115685	582809001(S36862.01) Matrix Spike (MS)
1205115686	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

**Preparation Information**

**Homogenous Matrix**

Samples 1205115684 (S36862.01DUP), 582809001 (S36862.01) and 582809004 (S36862.04 Field Dupe) were non-homogenous matrix.

**Quality Control (QC) Information**

**Method Blank Criteria**

The blank result (See Below) is greater than the MDC but less than the required detection limit.

Sample	Analyte	Value
1205115683 (MB)	Radium-226	Result: 0.564 pCi/L > MDA: 0.480 pCi/L <= RDL: 1.00 pCi/L

**Miscellaneous Information**

**Additional Comments**

The matrix spike, 1205115685 (S36862.01MS), aliquot was reduced to conserve sample volume.

**Certification Statement**

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

## GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

### Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S36862 GEL Work Order: 582809

#### The Qualifiers in this report are defined as follows:

- \* A quality control analyte recovery is outside of specified acceptance criteria
- \*\* Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

#### Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature:



Name: Theresa Austin

Date: 11 JUL 2022

Title: Group Leader

# Sample Data Summary

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: July 11, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

Client Sample ID: S36862.01	Project: MERI00120
Sample ID: 582809001	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 08-JUN-22 10:36	
Receive Date: 13-JUN-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.573	+/-1.22	2.15	3.00	pCi/L			JXC9	06/27/22	1258 2277741	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.19	+/-1.30			pCi/L		1	NXL1	07/05/22	0822 2277740	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.618	+/-0.452	0.634	1.00	pCi/L			RS2	06/24/22	0906 2277735	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			86.4	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

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## Certificate of Analysis

Report Date: July 11, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

Client Sample ID: S36862.02	Project: MERI00120
Sample ID: 582809002	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 08-JUN-22 13:40	
Receive Date: 13-JUN-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.721	+/-0.972	1.66	3.00	pCi/L			JXC9	06/27/22	1258 2277741	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		2.62	+/-1.12			pCi/L		1	NXL1	07/05/22	0822 2277740	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		1.90	+/-0.550	0.304	1.00	pCi/L			RS2	06/24/22	0906 2277735	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			86.3	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

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## Certificate of Analysis

Report Date: July 11, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Lavery  
 Project: Routine Analysis

Client Sample ID: S36862.03	Project: MERI00120
Sample ID: 582809003	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 08-JUN-22 12:56	
Receive Date: 13-JUN-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	1.66	+/-1.12	1.74	3.00	pCi/L			JXC9	06/27/22	1258 2277741	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		2.31	+/-1.17			pCi/L		1	NXL1	07/05/22	0822 2277740	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.657	+/-0.354	0.335	1.00	pCi/L			RS2	06/24/22	0906 2277735	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			91.5	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: July 11, 2022

Company : Merit Laboratories Inc.  
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery  
Project: Routine Analysis

Client Sample ID: S36862.04 Field Dupe  
Sample ID: 582809004  
Matrix: Ground Water  
Collect Date: 08-JUN-22 10:36  
Receive Date: 13-JUN-22  
Collector: Client

Project: MERI00120  
Client ID: MERI001

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.630	+/-1.09	1.89	3.00	pCi/L			JXC9	06/27/22	1258 2277741	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		2.15	+/-1.21			pCi/L		1	NXL1	07/05/22	0822 2277740	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		1.52	+/-0.531	0.416	1.00	pCi/L			RS2	06/24/22	0906 2277735	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			89.6	(15%-125%)

### Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor  
DL: Detection Limit  
MDA: Minimum Detectable Activity  
MDC: Minimum Detectable Concentration

Lc/LC: Critical Level  
PF: Prep Factor  
RL: Reporting Limit  
SQL: Sample Quantitation Limit



# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: July 11, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
 East Lansing, Michigan 48823  
 Contact: John Lavery  
 Project: Routine Analysis

Client Sample ID: S36862.05 Field Blank	Project: MERI00120
Sample ID: 582809005	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 08-JUN-22 08:20	
Receive Date: 13-JUN-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228		2.36	+/-1.44	2.23	3.00	pCi/L			JXC9	06/27/22	1258 2277741	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		2.70	+/-1.48			pCi/L		1	NXL1	07/05/22	0822 2277740	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.347	+/-0.340	0.534	1.00	pCi/L			RS2	06/24/22	0906 2277735	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			82.9	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# **Quality Control Summary**

# GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

## QC Summary

Report Date: July 11, 2022

Page 1 of 2

**Merit Laboratories Inc.**  
**2680 East Lansing Drive**  
**East Lansing, Michigan**

**Contact: John Laverty**

**Workorder: 582809**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Rad Gas Flow</b>											
Batch	2277741										
QC1205115700	582809001	DUP									
Radium-228	U	0.573	U	-0.427	pCi/L	N/A		N/A	JXC9	06/27/22	12:58
	Uncertainty	+/-1.22		+/-1.29							
QC1205115701	LCS										
Radium-228	45.2			43.3	pCi/L		95.7	(75%-125%)		06/27/22	12:58
	Uncertainty			+/-3.66							
QC1205115699	MB										
Radium-228			U	0.373	pCi/L					06/27/22	12:58
	Uncertainty			+/-1.02							
<b>Rad Ra-226</b>											
Batch	2277735										
QC1205115684	582809001	DUP									
Radium-226	U	0.618		1.24	pCi/L	66.7		(0% - 100%)	RS2	06/24/22	09:39
	Uncertainty	+/-0.452		+/-0.561							
QC1205115686	LCS										
Radium-226	26.5			20.2	pCi/L		76.2	(75%-125%)		06/24/22	09:39
	Uncertainty			+/-1.87							
QC1205115683	MB										
Radium-226				0.564	pCi/L					06/24/22	09:39
	Uncertainty			+/-0.371							
QC1205115685	582809001	MS									
Radium-226	130 U	0.618		132	pCi/L		102	(75%-125%)		06/24/22	09:39
	Uncertainty	+/-0.452		+/-9.82							

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- \*\* Analyte is a Tracer compound
- < Result is less than value reported
- > Result is greater than value reported
- BD Results are either below the MDC or tracer recovery is low
- FA Failed analysis.
- H Analytical holding time was exceeded

# GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

## QC Summary

Workorder: 582809

Page 2 of 2

Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
J											
J											
K											
L											
M											
M											
N/A											
NI											
ND											
NJ											
Q											
R											
U											
UI											
UJ											
UL											
X											
Y											
^											
h											

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where the duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

\* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

# Gas Flow Raw Data

# Batch 2277741 Check-list

This check-list was completed on 27-JUN-22 by Nat Long

This batch was reviewed by Kenshalla Oston on 27-JUN-22 and Nat Long on 27-JUN-22.

**Batch ID:**  
2277741

**Product:**  
GFC28RAL

**Description:** Gas Flow Radium 228  
GL-RAD-A-063

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous		No	
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
11	Has the method required detection limit been met?	Yes		
<b>Miscellaneous Information</b>				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

# Prep Logbook

## Radium-228 in Liquid

**Batch ID:** 2277741

**Analyst:** Jasmine Conley (JXC9)  
Prep: Rochet Sanchez (RS2)

**Method:** EPA 904.0/SW846 9320 Modified

**Lab SOP:** GL-RAD-A-063 REV# 5

**Instrument:** LUCAS-C037036045

**Due Dates for Lab:** 09-JUL-2022

**Package:** 11-JUL-2022

**SDG:** 12-JUL-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205115701	Radium-228	1965-C	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	582809001	17-JUN-2022	3	303.14	303.14	06/23/22 12:30	06/27/22 10:15
2	582809002	17-JUN-2022	3	305.09	305.09	06/23/22 12:30	06/27/22 10:15
3	582809003	17-JUN-2022	3	301.25	301.25	06/23/22 12:30	06/27/22 10:15
4	582809004	17-JUN-2022	3	305.99	305.99	06/23/22 12:30	06/27/22 10:15
5	582809005	17-JUN-2022	3	301.06	301.06	06/23/22 12:30	06/27/22 10:15
6	582810001	17-JUN-2022	3	304.95	304.95	06/23/22 12:30	06/27/22 10:15
7	1205115699 MB	17-JUN-2022	3		305.99	06/23/22 12:30	06/27/22 10:15
8	1205115700 DUP (582809001)	17-JUN-2022	3	300.77	300.77	06/23/22 12:30	06/27/22 10:15
9	1205115701 LCS	17-JUN-2022	3		305.99	06/23/22 12:30	06/27/22 10:15

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1951-C	Barium-133	.1 mL	Pipet Id: RAD-GFC-1795419
REGNT 3411398	Barium Carrier Ra228 REG	1 mL	Data Entry Date2: 17-JUN-2022 00:00
REGNT 3413388	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3413919	RGF-50% Potassium Carbonate	2 mL	
REGNT 3418276.6	29M HF (48-50%)	4 mL	
REGNT 3424040	7M Nitric Acid	25 mL	
REGNT 3424228	RGF-Neodymium Substrate	5 mL	
REGNT 3424651.3	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	
REGNT 3426198	2M HCl	20 mL	
REGNT 3441138.12	Nitric Acid	5 mL	
REGNT 3446017	ICPMS batch: 2273441 Lot 0033	2 g	
REGNT 3450318	RGF-1M Citric Acid	5 mL	
REGNT 3450331	RGF-1.5M Ammonium Sulfate	10 mL	

### Radium-228 Liquid

Filename : RA228.XLS  
 File type : Excel  
 Version # : 1.4.2

Tracer S/N : 1951-C  
 Tracer Exp Date : 9/16/2022  
 Tracer Volume Added: 0.10

Batch : 2277741  
 Analyst : ROC02433  
 Prep Date : 6/17/2022  
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL  
 Parmname : Radium-228  
 Required MDA : 3 pCi/L  
 Ra-228 Abundance : 1.00  
 Halflife of Ra-228 : 5.75 years  
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	582809001.1	0.3031	1.8512E-05	6/8/2022 10:36	1303.2	1.60%	1125.7	1.72%	0.1	0.000200
2	582809002.1	0.3051	1.8544E-05	6/8/2022 13:40	1303.2	1.60%	1124.2	1.72%	0.1	0.000200
3	582809003.1	0.3013	1.8480E-05	6/8/2022 12:56	1303.2	1.60%	1193.0	1.67%	0.1	0.000200
4	582809004.1	0.3060	1.8559E-05	6/8/2022 10:36	1303.2	1.60%	1167.9	1.69%	0.1	0.000200
5	582809005.1	0.3011	1.8477E-05	6/8/2022 8:20	1303.2	1.60%	1079.9	1.76%	0.1	0.000200
6	582810001.1	0.3050	1.8542E-05	6/7/2022 11:00	1303.2	1.60%	1164.3	1.69%	0.1	0.000200
7	1205115699.1	0.3060	1.8559E-05	6/17/2022 0:00	1303.2	1.60%	1065.1	1.77%	0.1	0.000200
8	1205115700.1	0.3008	1.8472E-05	6/8/2022 10:36	1303.2	1.60%	1146.9	1.70%	0.1	0.000200
9	1205115701.1	0.3060	1.8559E-05	6/17/2022 0:00	1303.2	1.60%	1105.1	1.74%	0.1	0.000200



Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063  
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated	Sample
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction	Recovery %	Recovery Error %
			Alpha	Beta										
1	11B	60	2	86	1.433	6/27/2022 12:58	6/23/2022 12:30	6/27/2022 10:15	0.994	0.736	1.000	1.057	86.4%	1.21%
2	11C	60	8	52	0.867	6/27/2022 12:58	6/23/2022 12:30	6/27/2022 10:15	0.994	0.736	1.000	1.057	86.3%	1.21%
3	11D	60	10	79	1.317	6/27/2022 12:58	6/23/2022 12:30	6/27/2022 10:15	0.994	0.736	1.000	1.057	91.5%	1.19%
4	12D	60	11	71	1.183	6/27/2022 12:58	6/23/2022 12:30	6/27/2022 10:15	0.994	0.736	1.000	1.057	89.6%	1.20%
5	13A	60	8	106	1.767	6/27/2022 12:58	6/23/2022 12:30	6/27/2022 10:15	0.994	0.735	1.000	1.057	82.9%	1.22%
6	13D	60	3	85	1.417	6/27/2022 12:58	6/23/2022 12:30	6/27/2022 10:15	0.993	0.735	1.000	1.057	89.3%	1.20%
7	14A	60	5	50	0.833	6/27/2022 12:58	6/23/2022 12:30	6/27/2022 10:15	0.997	0.736	1.000	1.057	81.7%	1.23%
8	14B	60	8	89	1.483	6/27/2022 12:58	6/23/2022 12:30	6/27/2022 10:15	0.994	0.736	1.000	1.057	88.0%	1.20%
9	14C	60	12	717	11.950	6/27/2022 12:58	6/23/2022 12:30	6/27/2022 10:15	0.997	0.736	1.000	1.057	84.8%	1.22%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2022	5/31/2023	0.6481	0.00697	1.284	6/25/2022 9:32	500
2	PIC	6/1/2022	5/31/2023	0.6276	0.01278	0.684	6/25/2022 9:32	500
3	PIC	6/1/2022	5/31/2023	0.6372	0.01068	0.870	6/25/2022 9:32	500
4	PIC	6/1/2022	5/31/2023	0.6310	0.01845	1.016	6/25/2022 9:32	500
5	PIC	6/1/2022	5/31/2023	0.6349	0.00714	1.194	6/25/2022 9:33	500
6	PIC	6/1/2022	5/31/2023	0.6348	0.01144	0.772	6/25/2022 9:33	500
7	PIC	6/1/2022	5/31/2023	0.6215	0.02119	0.744	6/25/2022 9:33	500
8	PIC	6/1/2022	5/31/2023	0.6266	0.01028	1.592	6/25/2022 9:33	500
9	PIC	6/1/2022	5/31/2023	0.6029	0.01828	1.534	6/25/2022 9:33	500

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

**Spike S/N :** N/A  
**Spike Exp Date :** N/A  
**Spike Activity (dpm/ml):** N/A  
**Spike Volume Added:** N/A

\* - RPD changed to 0% due to sample & dup activity below MDA

**LCS S/N :** 1965-C  
**LCS Exp Date :** 8/5/2022  
**LCS Activity (dpm/ml):** 306.86  
**LCS Volume Added:** 0.10

Results Pos.	Decision	Critical	Required	Sample Act.		Sample Act.	Net Count	Net Count	2 SIGMA	2 SIGMA	Sample	Sample	RPD	RER	Nominal	Recovery
	Level	Level	MDA	MDA	Conc.	Error	Rate	Rate Error	Counting	Total Prop.						
	pCi/L	pCi/L	pCi/L	pCi/L	pCi/L	%	CPM	CPM	Uncertainty	Uncertainty	QC	Type			pCi/L	
1	1.3848	0.9777	3	2.1473	<b>0.5733</b>	108.93%	0.1493	0.1627	1.2239	1.2323		SAMPLE				
2	1.0385	0.7332	3	1.6637	<b>0.7206</b>	68.86%	0.1827	0.1257	0.9722	0.9889		SAMPLE				
3	1.1011	0.7774	3	1.7401	<b>1.6563</b>	34.49%	0.4467	0.1539	1.1186	1.1930		SAMPLE				
4	1.2086	0.8532	3	1.8948	<b>0.6302</b>	88.17%	0.1673	0.1475	1.0888	1.1004		SAMPLE				
5	1.4313	1.0105	3	2.2267	<b>2.3563</b>	31.19%	0.5727	0.1784	1.4389	1.5549		SAMPLE				
6	1.0544	0.7444	3	1.6773	<b>2.4302</b>	24.66%	0.6447	0.1586	1.1718	1.3207		SAMPLE				
7	1.1469	0.8097	3	1.8283	<b>0.3731</b>	138.83%	0.0893	0.1240	1.0152	1.0196		MB				
8	1.5769	1.1133	3	2.4230	<b>-0.4266</b>	153.74%	-0.1087	0.1671	1.2855	1.2856	582809001.1	DUP	* 0.0%			
9	1.6372	1.1558	3	2.5193	<b>43.2504</b>	4.84%	10.4160	0.4497	3.6599	11.5064		LCS			45.1738	95.7%

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
582809001	11B	60	2	86	6/27/2022 12:58	6/27/2022 13:58	PIC	2277741
582809002	11C	60	8	52	6/27/2022 12:58	6/27/2022 13:58	PIC	2277741
582809003	11D	60	10	79	6/27/2022 12:58	6/27/2022 13:58	PIC	2277741
582809004	12D	60	11	71	6/27/2022 12:58	6/27/2022 13:58	PIC	2277741
582809005	13A	60	8	106	6/27/2022 12:58	6/27/2022 13:58	PIC	2277741
582810001	13D	60	3	85	6/27/2022 12:58	6/27/2022 13:58	PIC	2277741
1205115699	14A	60	5	50	6/27/2022 12:58	6/27/2022 13:58	PIC	2277741
1205115700	14B	60	8	89	6/27/2022 12:58	6/27/2022 13:58	PIC	2277741
1205115701	14C	60	12	717	6/27/2022 12:58	6/27/2022 13:58	PIC	2277741

ASSAY 27-Jun-22 11:53:25  
 Wizard 2480 s/n 46190630  
 Protocol id 8 Ba-133  
 Time limit  
 Count limit  
 Isotope Ba-133  
 Protocol date 6/27/2022  
 Run id. 5186

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	87	1	180	3910.28	1303.19	1.6	11:53:25
582809001	2	87	2	180	3378	1125.68	1.72	86.38	11:56:39
582809002	3	87	3	180	3373.28	1124.21	1.72	86.27	11:59:53
582809003	4	87	4	180	3579.28	1192.97	1.67	91.54	12:03:07
582809004	5	87	5	180	3504.28	1167.87	1.69	89.62	12:06:21
582809005	1	6	1	180	3240.28	1079.88	1.76	82.86	12:10:05
582810001	2	6	2	180	3493.57	1164.3	1.69	89.34	12:13:20
1205115699	3	6	3	180	3196	1065.13	1.77	81.73	12:16:33
1205115700	4	6	4	180	3441	1146.88	1.7	88.01	12:19:47
1205115701	5	6	5	180	3316	1105.11	1.74	84.80	12:23:01

END OF ASSAY

# **Continuing Calibration Data**

# Gas Flow Proportional Counter Checks for 27-Jun-2022

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100A1	Above	Beta eff	27-Jun 05:34	5	24322	18840	22950	+5.00
LB4100A2	need 2nd	Alpha eff	27-Jun 05:24	5	9933	7607	11950	+0.21
LB4100A2	Above	Beta eff	27-Jun 05:34	5	24807	19870	23260	+5.74
LB4100A3	need 2nd	Alpha eff	27-Jun 05:24	5	8493	6855	9448	+0.79
LB4100A3	Above	Beta eff	27-Jun 05:34	5	24215	18790	23540	+3.85
LB4100E1	Below	Beta eff	27-Jun 16:22	5	13804	13920	15150	-3.56
LB4100E2	Above	Alpha bkg	27-Jun 05:59	500	0.316	-1.63E-1	0.406	+2.05
LB4100E2	need 2nd	Alpha eff	27-Jun 05:49	5	8467	6589	9855	+0.45
LB4100E2	Above	Beta bkg	27-Jun 05:59	500	3.190	1.385	3.072	+3.42
LB4100F3	Above	Alpha bkg	27-Jun 05:59	500	0.316	0.119	0.404	+1.15
LB4100G1	Above	Alpha XTalk	27-Jun 05:40	5	0.911	0.088	0.447	+10.77
LB4100G1	Above	Beta bkg	27-Jun 06:05	500	16130	0.380	1.675	+74,742.62
LB4100G1	Above	Beta eff	27-Jun 05:49	5	40551	12880	18320	+27.52
LB4100G2	Above	Alpha eff	27-Jun 05:40	5	10022	7308	9581	+4.16
LB4100G2	Below	Alpha XTalk	27-Jun 05:40	5	0.312	0.324	0.423	-3.73
LB4100G2	Above	Beta bkg	27-Jun 06:03	500	45.810	1.159	2.203	+253.61
LB4100G3	need 2nd	Alpha eff	27-Jun 05:40	5	6862	6620	7779	-1.75
LB4100G3	Above	Beta bkg	27-Jun 06:03	500	6.786	0.810	1.674	+38.50
LB4100G3	Above	Beta XTalk	27-Jun 05:49	5	4.27E-4	7.49E-5	4.02E-4	+3.46
LB4100H4	Above	Alpha eff	27-Jun 16:12	5	9926	6065	9898	+3.04
PIC8B	Above	Alpha bkg	27-Jun 06:18	60	0.733	-1.16E-1	0.388	+7.12
PIC8B	Below	Alpha XTalk	27-Jun 06:03	5	0.258	0.262	0.306	-3.51
PIC8B	Above	Beta bkg	27-Jun 06:18	60	2.133	-1.80E-1	2.341	+2.51
PIC8B	Above	Beta eff	27-Jun 06:11	5	22133	20290	21980	+3.54
PIC8B	Above	Beta XTalk	27-Jun 06:11	5	0.010	2.00E-4	9.31E-4	+74.78
PIC8D	Above	Alpha bkg	27-Jun 06:19	60	0.533	-4.22E-2	0.367	+5.43
PIC12C	Above	Alpha bkg	27-Jun 07:32	60	0.317	-6.64E-2	0.384	+2.10
PIC12C	need 2nd	Beta bkg	27-Jun 07:32	60	0.883	0.142	2.845	-1.35

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

LB4100A1 Alpha bkg, Beta bkg  
LB4100A2 Alpha bkg, Beta bkg  
LB4100A3 Alpha bkg, Beta bkg  
LB4100C1 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
LB4100C2 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
LB4100C3 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
LB4100C4 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
LB4100I1 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
LB4100I2 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
LB4100I3 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
LB4100I4 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by 

Date 6/27/22

GEL Laboratories LLC



# Runlogs

# Instrument Run Log

Instrument Type: GFPC

Batch ID: 2277741

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205115699	MB	JXC9	PIC14A	JUN-27-22 12:58:01	DONE	25mm Filter	01-JUN-22 00:00
1205115700	DUP	JXC9	PIC14B	JUN-27-22 12:58:04	DONE	25mm Filter	01-JUN-22 00:00
1205115701	LCS	JXC9	PIC14C	JUN-27-22 12:58:19	DONE	25mm Filter	01-JUN-22 00:00
582809001	SAMPLE	JXC9	PIC11B	JUN-27-22 12:58:21	DONE	25mm Filter	01-JUN-22 00:00
582809002	SAMPLE	JXC9	PIC11C	JUN-27-22 12:58:24	DONE	25mm Filter	01-JUN-22 00:00
582809003	SAMPLE	JXC9	PIC11D	JUN-27-22 12:58:27	DONE	25mm Filter	01-JUN-22 00:00
582809004	SAMPLE	JXC9	PIC12D	JUN-27-22 12:58:30	DONE	25mm Filter	01-JUN-22 00:00
582809005	SAMPLE	JXC9	PIC13A	JUN-27-22 12:58:33	DONE	25mm Filter	01-JUN-22 00:00
582810001	SAMPLE	JXC9	PIC13D	JUN-27-22 12:58:35	DONE	25mm Filter	01-JUN-22 00:00

# Lucas Cell Raw Data

# Batch 2277735 Check-list

This check-list was completed on 27-JUN-22 by Lyndsey Pace

This batch was reviewed by Lyndsey Pace on 27-JUN-22 and Elizabeth Krouse on 29-JUN-22.

**Batch ID:**  
2277735

**Product:**  
LUC26RAL

**Description:** Lucas Cell Radium 226  
GL-RAD-A-008

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous		No	
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?		No	
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
<b>Miscellaneous Information</b>				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

# Prep Logbook

## Radium-226 in Liquid

**Batch ID:** 2277735  
**Analyst:** Rochet Sanchez (RS2)  
**Method:** EPA 903.1 Modified  
**Lab SOP:** GL-RAD-A-008 REV# 15  
**Instrument:** LUCAS-C037036045

Due Dates for Lab: 10-JUL-2022			Package: 11-JUL-2022	SDG: 12-JUL-2022		
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205115686	Radium-226 SPIKE	1715-G	.1	mL	
MS	1205115685	Radium-226 SPIKE	1715-G	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	582809001	17-JUN-2022	1	500.24	500.24	06/21/22 07:25	402	06/24/22 05:55	06/24/22 09:06	4	16
2	582809002	17-JUN-2022	1	504.96	504.96	06/21/22 07:25	502	06/24/22 05:55	06/24/22 09:06	1	49
3	582809003	17-JUN-2022	1	502.58	502.58	06/21/22 07:25	604	06/24/22 05:55	06/24/22 09:06	1	16
4	582809004	17-JUN-2022	1	502.01	502.01	06/21/22 07:25	701	06/24/22 05:55	06/24/22 09:06	2	37
5	582809005	17-JUN-2022	1	500.88	500.88	06/21/22 07:25	801	06/24/22 05:55	06/24/22 09:06	4	12
6	582810001	17-JUN-2022	1	502.63	502.63	06/21/22 07:25	102	06/24/22 06:26	06/24/22 09:39	1	31
7	1205115683 MB	17-JUN-2022	1		504.96	06/21/22 07:25	204	06/24/22 06:26	06/24/22 09:39	3	16
8	1205115684 DUP (582809001)	17-JUN-2022	1	502.64	502.64	06/21/22 07:25	401	06/24/22 06:26	06/24/22 09:39	6	33
9	1205115685 MS (582809001)	17-JUN-2022	1	103.28	103.28	06/21/22 07:25	504	06/24/22 06:26	06/24/22 09:39	5	709
10	1205115686 LCS	17-JUN-2022	1		504.96	06/21/22 07:25	605	06/24/22 06:26	06/24/22 09:39	4	459

Reagent/Solvent Lot ID	Description	Amount	Comments:
			Data Entry Date2: 17-JUN-2022 00:00

### Radium-226 Liquid

Filename : RA226.XLS  
 File type : Excel  
 Version # : 1.3.2

Procedure Code : LUC26RAL  
 Parmname : Radium-226  
 Required MDA : 1 pCi/L  
 Halfife of Ra-226 : 1600 years  
 Ra-226 Abundance : 1.00  
 Halfife of Rn-222: 3.8235 days

Batch : 2277735  
 Analyst : ROC02433  
 Prep Date : 6/17/2022  
 Ra-226 Method Uncertainty : 0.073648

Batch counted on : LUCAS CELL DETECTOR  
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Count Time (min.)	Cell Efficiency (cpm/dpm)
1	582809001.1	0.5002	2.0257E-05	6/8/2022 10:36	402	30	16	0.533	4	0.133	30	1.4480
2	582809002.1	0.5050	2.0276E-05	6/8/2022 13:40	502	30	49	1.633	1	0.033	30	1.8630
3	582809003.1	0.5026	2.0266E-05	6/8/2022 12:56	604	30	16	0.533	1	0.033	30	1.6960
4	582809004.1	0.5020	2.0264E-05	6/8/2022 10:36	701	30	37	1.233	2	0.067	30	1.7130
5	582809005.1	0.5009	2.0259E-05	6/8/2022 8:20	801	30	12	0.400	4	0.133	30	1.7180
6	582810001.1	0.5026	2.0267E-05	6/7/2022 11:00	102	30	31	1.033	1	0.033	30	1.5820
7	1205115683.1	0.5050	2.0276E-05	6/17/2022 0:00	204	30	16	0.533	3	0.100	30	1.6950
8	1205115684.1	0.5026	2.0267E-05	6/8/2022 10:36	401	30	33	1.100	6	0.200	30	1.6120
9	1205115685.1	0.1033	1.1570E-05	6/8/2022 10:36	504	30	709	23.633	5	0.167	30	1.9180
10	1205115686.1	0.5050	2.0276E-05	6/17/2022 0:00	605	30	459	15.300	4	0.133	30	1.6540

Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008  
 Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrowth End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
2.300%	2/1/2022	1/31/2023	6/21/2022 7:25	6/24/2022 5:55	6/24/2022 9:06	0.413	0.976	1.002	1.000
6.700%	6/1/2022	5/31/2023	6/21/2022 7:25	6/24/2022 5:55	6/24/2022 9:06	0.413	0.976	1.002	1.000
6.400%	7/1/2021	6/30/2022	6/21/2022 7:25	6/24/2022 5:55	6/24/2022 9:06	0.413	0.976	1.002	1.000
5.900%	11/1/2021	10/31/2022	6/21/2022 7:25	6/24/2022 5:55	6/24/2022 9:06	0.413	0.976	1.002	1.000
5.000%	4/1/2022	3/31/2023	6/21/2022 7:25	6/24/2022 5:55	6/24/2022 9:06	0.413	0.976	1.002	1.000
6.300%	4/28/2022	4/30/2023	6/21/2022 7:25	6/24/2022 6:26	6/24/2022 9:39	0.415	0.976	1.002	1.000
7.800%	8/1/2021	7/31/2022	6/21/2022 7:25	6/24/2022 6:26	6/24/2022 9:39	0.415	0.976	1.002	1.000
8.100%	2/1/2022	1/31/2023	6/21/2022 7:25	6/24/2022 6:26	6/24/2022 9:39	0.415	0.976	1.002	1.000
7.000%	6/1/2022	5/31/2023	6/21/2022 7:25	6/24/2022 6:26	6/24/2022 9:39	0.415	0.976	1.002	1.000
5.000%	7/1/2021	6/30/2022	6/21/2022 7:25	6/24/2022 6:26	6/24/2022 9:39	0.415	0.976	1.002	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

**Spike S/N :** 1715-G  
**Spike Exp Date :** 9/15/2022  
**Spike Activity (dpm/ml):** 297.52  
**Spike Volume Added:** 0.10

**LCS S/N :** 1715-G  
**LCS Exp Date :** 9/15/2022  
**LCS Activity (dpm/ml):** 297.52  
**LCS Volume Added:** 0.10

<b>Results</b>																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.3396	0.2397	1	0.6340	<b>0.6183</b>	37.34%	0.4000	0.1491	0.4516	0.4612		SAMPLE				
2	0.1307	0.0923	1	0.3036	<b>1.9043</b>	16.18%	1.6000	0.2357	0.5498	0.6637		SAMPLE				
3	0.1443	0.1019	1	0.3351	<b>0.6568</b>	28.22%	0.5000	0.1374	0.3539	0.3755		SAMPLE				
4	0.2022	0.1428	1	0.4158	<b>1.5190</b>	18.79%	1.1667	0.2082	0.5312	0.6010		SAMPLE				
5	0.2858	0.2018	1	0.5337	<b>0.3470</b>	50.25%	0.2667	0.1333	0.3400	0.3454		SAMPLE				
6	0.1538	0.1086	1	0.3573	<b>1.4007</b>	19.88%	1.0000	0.1886	0.5177	0.5821		SAMPLE				
7	0.2476	0.1748	1	0.4797	<b>0.5639</b>	34.43%	0.4333	0.1453	0.3706	0.3891		MB				
8	0.3698	0.2611	1	0.6597	<b>1.2372</b>	24.51%	0.9000	0.2082	0.5609	0.6205	582809001.1	DUP	66.7%			
9	1.3809	0.9749	1	2.5122	<b>131.9437</b>	7.96%	23.4667	0.8907	9.8157	28.0501	582809001.1	MS			129.7648	101.7%
10	0.2929	0.2068	1	0.5470	<b>20.2253</b>	6.88%	15.1667	0.7172	1.8747	3.9958		LCS			26.5407	76.2%




# **Continuing Calibration Data**



# Ludlum Alpha Scintillation Counter Checks for 24-JUN-2022

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	07:16	1	1.22E+05				
LUCAS2	EFF	07:19	1	1.33E+05				
LUCAS4	EFF	07:21	1	1.28E+05				
LUCAS5	EFF	07:23	1	1.31E+05				
LUCAS6	EFF	07:24	1	1.30E+05				
LUCAS7	EFF	07:27	1	1.34E+05				
LUCAS8	EFF	07:29	1	1.32E+05				

**Reviewed by:**   
Elizabeth Krouse

**Date:** 24-JUN-22

GEL Laboratories LLC

# Runlogs

# Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2277735

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
582809001	SAMPLE	RS2	LUCAS4	JUN-24-22 09:06:00	DONE	Lucas Cell	01-FEB-22 00:00
582809002	SAMPLE	RS2	LUCAS5	JUN-24-22 09:06:00	DONE	Lucas Cell	01-JUN-22 00:00
582809003	SAMPLE	RS2	LUCAS6	JUN-24-22 09:06:00	DONE	Lucas Cell	01-JUL-21 00:00
582809004	SAMPLE	RS2	LUCAS7	JUN-24-22 09:06:00	DONE	Lucas Cell	01-NOV-21 00:00
582809005	SAMPLE	RS2	LUCAS8	JUN-24-22 09:06:00	DONE	Lucas Cell	01-APR-22 00:00
582810001	SAMPLE	RS2	LUCAS1	JUN-24-22 09:39:00	DONE	Lucas Cell	28-APR-22 00:00
1205115683	MB	RS2	LUCAS2	JUN-24-22 09:39:00	DONE	Lucas Cell	01-AUG-21 00:00
1205115684	DUP	RS2	LUCAS4	JUN-24-22 09:39:00	DONE	Lucas Cell	01-FEB-22 00:00
1205115685	MS	RS2	LUCAS5	JUN-24-22 09:39:00	DONE	Lucas Cell	01-JUN-22 00:00
1205115686	LCS	RS2	LUCAS6	JUN-24-22 09:39:00	DONE	Lucas Cell	01-JUL-21 00:00



Environmental Laboratory  
 1232 Haco Drive  
 Lansing  
 Michigan, 48910

CHAIN OF CUSTODY

Page 1 of 1

Phone: (517)702-6372

Lab Work Order Number L206153

Client Name <b>BWL - Erickson Station</b>		Project Name <b>Erickson AM MI Wells 11-13</b>		Requested Analyses					Requested Turn Around		
Client Contact <b>Cheryl Louden</b>		Project Number <b>{none}</b>		Ag:: As:: B:: Ba:: Be:: Ca:: Cd:: Cr:: Cu:: Fe:: K:: Li:: Mg:: Mo:: Na:: Ni:: Cl-IC:: F-ISE:: Hard.T:: p-Alk:: SO4:: T- Alk:: TDS:: TSS							Rush requests subject to additional charge.  Rush requests subject to lab approval.
Address <b>3725 S. Canal</b>		Project Description <b>Erickson GW Sampling Part 115</b>									
City <b>Lansing</b>		PID Number <b>30926 10021</b>									
State/Zip <b>MI, 48917</b>		Shipped By									
Phone <b>(517) 702-6396</b>	Fax <b>(517) 702-6373</b>	Tracking Number									
Sampler <b>Marc Wahrer</b>											

Sample Name or Field ID	Sampled Date	Sampled Time	Sample Type Grab/Composite	Matrix Code	Container Count	Preservation Code				Sample	Comments
						b	a				
MW-11	06/08/2022	10:36	G	GW	5	3	2				
MW-12	06/08/2022	13:40	G	GW	6	4	2				
MW-13	06/08/2022	12:56	G	GW	5	3	2				
MW-11 Field Duplicate	06/08/2022	10:36	G	GW	5	3	2				
Field Blank	06/08/2022	08:20	G	DI	5	3	2				

Relinquished By 	Date/Time 6/8/2022 15:31	Received By <b>Beth Zimpfer</b>	Date/Time 6/8/2022 15:31	
Relinquished By	Date/Time	Received By	Date/Time	Comments
Relinquished By	Date/Time	Received By	Date/Time	

Cooler Numbers and Temperatures  
 E0776 at 1.4 °C

### Data Validation Checklist

Site Name: Erickson Personnel: M. Wahrer

Sample Date(s): 6/8/2022 Lab Drop-off Date(s): 6/8/2022

Lab Report Number: S36862.01(03)

Lab Report Date: 7/21/2022

Reason for Sample Event: Wells 11-13

**Field Records:** Circle Yes/No unless Not Applicable – *Complete during sample event*

Item Description	Verification (Completeness)	Validation (Conformance to Specifications)
Field equipment calibration records	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Chain-of-Custody forms	<input checked="" type="radio"/> Yes / No	N/A
Field decontamination documentation	N/A	N/A
Sample collection field forms	<input checked="" type="radio"/> Yes / No	N/A
Drilling logs	<input checked="" type="radio"/> Yes / No	N/A
Well construction logs	<input checked="" type="radio"/> Yes / No	N/A
Well development field forms	<input checked="" type="radio"/> Yes / No	N/A

**Analytical Data Package:** Circle Yes/No unless N/A – *Complete when lab report is received*

Item Description	Verification (Completeness)	Validation (Conformance to Specifications)
Cover sheet (laboratory identifying information)	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Case narrative	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Internal laboratory Chain-of-Custody forms	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Sample chronology and consistency (that is, dates and times of receipt, preparation, and analysis)	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Communication records with laboratory	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
EDD format consistency	<input checked="" type="radio"/> Yes / No	N/A
Sample identification, results nomenclature, and data qualifier consistency	<input checked="" type="radio"/> Yes / No	N/A
RLs as requested; MDLs < RLs	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Instrument calibration records	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Laboratory Report	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Field QC sample results and calculation of accuracy and precision	<input checked="" type="radio"/> Yes / No Duplicate Well ID: MW-11	Yes / <input checked="" type="radio"/> No Duplicate RPD: 0-2% except Rad-226/228 at 29%

**Corrections Needed:** None; according to the Technical Case Narrative by GEL Laboratories, subcontracted laboratory for radium analysis, “[a]ll sample data provided in [the] report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Rad-228 - Samples 1205115700 (S36862.01DUP), 582809001 (S36862.01) and 582809004 (S36862.04 Field Dupe) were non-homogenous matrix. Samples were tinted yellow.  
1205115700 (S36862.01DUP), 582809001 (S36862.01) and 582809004 (S36862.04 Field Dupe).

Rad-226 - Samples 1205115684 (S36862.01DUP), 582809001 (S36862.01) and 582809004 (S36862.04 Field Dupe) were non-homogenous matrix.

The [method] blank result (See Below) is greater than the MDC but less than the required detection limit.”

Sample	Analyte	Value
1205115683 (MB)	Radium-226	Result: 0.564 pCi/L > MDA: 0.480 pCi/L <= RDL: 1.00 pCi/L

Sample	Parameter	Result	Uncertainty	MDC	Lab Qualifier	Validated Qualifier
MW-11	Rad-226	0.618	+/-0.452	0.634	U	J-
	Rad-228	0.573	+/-1.22	2.15	U	
	Rad-226/228	1.19	+/-1.30			J-
MW-11-Dup	Rad-226	1.52	+/-0.531	0.416		J+
	Rad-228	0.630	+/-1.09	1.89	U	
	Rad-226/228	2.15	+/-1.21			J+

*U - Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.*

Since the laboratory processes indicated no issues with the analytical procedures, no corrective action was necessary. Since the RPD was above the 20% control limit, Rad-226 and Rad-226/228 in MW-11 have been qualified as estimated with potential for low bias (J-) and those in MW-11-Dup have been qualified as estimated with potential for high bias (J+). However, the detection of Rad-226 in the method blank required Rad-226 in MW-11 to be qualified as estimated (J) without bias.

Rad-226, Rad-228, and Rad-226/228 in MW-11 and MW-11-Dup required qualification as estimated (J) due to non-homogenous matrix.



Report ID: S37459.01(01)  
Generated on 06/28/2022

Report to

Attention: Jennifer Caporale  
Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901

Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

Report produced by

Merit Laboratories, Inc.  
2680 East Lansing Drive  
East Lansing, MI 48823

Phone: (517) 332-0167 FAX: (517) 332-6333

Contacts for report questions:  
John Lavery (johnlavery@meritlabs.com)  
Barbara Ball (bball@meritlabs.com)

Report Summary

Lab Sample ID(s): S37459.01-S37459.05  
Project: Erickson AM MI New Wells 7B, 7C & 12B  
Collected Date(s): 06/23/2022  
Submitted Date/Time: 06/24/2022 10:34  
Sampled by: Marc Wahrer  
P.O. #:

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Maya Murshak  
Technical Director





## General Report Notes

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Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile, and 2-chloroethylvinyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (\*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

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Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

## Report Narrative

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Subcontracting results unavailable at this time

TSS results unavailable at this time

## Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Alaska CSLAP	#17-001
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

## Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

## Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



## Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1 (1993)
SM2320B	Standard Method 2320 B 2011
SM2340C	Standard Method 2340 C 2011
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007



### Sample Summary (5 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S37459.01	MW-7B L206214-01	Groundwater	06/23/22 12:05
S37459.02	MW-7C L206214-02	Groundwater	06/23/22 13:36
S37459.03	MW-12B L206214-03	Groundwater	06/23/22 09:46
S37459.04	Field Dupe MW-12B L206214-04	Groundwater	06/23/22 09:46
S37459.05	Field Blank L206214-05	Water	06/23/22 08:35



# Analytical Laboratory Report

Preliminary Report

Lab Sample ID: S37459.01

Sample Tag: MW-7B L206214-01

Collected Date/Time: 06/23/2022 12:05

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.4	IR
2	1L Plastic	None	Yes	2.4	IR
1	125ml Plastic	HNO3	Yes	2.4	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	06/27/22 09:30	JRH	
Metal Digestion	Completed	SW3015A	06/27/22 10:10	CCM	

### Inorganics

Method: E300.0, Run Date: 06/27/22 09:13, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 06/28/22 13:06, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	380	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 06/28/22 12:18, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	31	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 06/24/22 16:10, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	362	50	10	mg/L	2		

Method: SM2540D, Run Date: 06/27/22 15:30, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 06/27/22 11:51, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.009	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	3.04	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.05	0.02	0.00192	mg/L	5	7439-89-6	



# Analytical Laboratory Report

Preliminary Report

Lab Sample ID: S37459.01 (continued)

Sample Tag: MW-7B L206214-01

**Method: E200.8, Run Date: 06/27/22 11:51, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	0.012	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.031	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 06/27/22 15:07, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	9.22	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	2.75	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	5.57	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	135	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 06/27/22 14:44, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: / / , Analyst:**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Incomplete						



# Analytical Laboratory Report

Preliminary Report

Lab Sample ID: S37459.02

Sample Tag: MW-7C L206214-02

Collected Date/Time: 06/23/2022 13:36

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.4	IR
2	1L Plastic	None	Yes	2.4	IR
1	125ml Plastic	HNO3	Yes	2.4	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	06/27/22 09:30	JRH	
Metal Digestion	Completed	SW3015A	06/27/22 10:10	CCM	

### Inorganics

Method: E300.0, Run Date: 06/27/22 10:56, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	91	10	0.16	mg/L	10	16887-00-6	

Method: E300.0, Run Date: 06/27/22 09:26, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	

Method: E300.0, Run Date: 06/27/22 11:08, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sulfate	668	100	5.9	mg/L	100	14808-79-8	

Method: SM2320B, Run Date: 06/28/22 13:10, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	160	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 06/28/22 12:24, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	777	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 06/24/22 16:10, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	1,360	50	10	mg/L	2		

Method: SM2540D, Run Date: 06/27/22 15:30, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	8	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 06/27/22 11:55, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.006	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.041	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	



# Analytical Laboratory Report

Preliminary Report

Lab Sample ID: S37459.02 (continued)

Sample Tag: MW-7C L206214-02

**Method: E200.8, Run Date: 06/27/22 11:55, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Boron	6.46	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	3.77	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.127	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.379	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	0.007	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 06/27/22 15:10, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	245	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	40.0	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	5.89	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	94.2	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 06/27/22 14:48, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: / / , Analyst:**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Incomplete						





# Analytical Laboratory Report

Preliminary Report

Lab Sample ID: S37459.03

Sample Tag: MW-12B L206214-03

Collected Date/Time: 06/23/2022 09:46

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.4	IR
2	1L Plastic	None	Yes	2.4	IR
1	125ml Plastic	HNO3	Yes	2.4	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	06/27/22 09:30	JRH	
Metal Digestion	Completed	SW3015A	06/27/22 10:10	CCM	

### Inorganics

Method: E300.0, Run Date: 06/27/22 09:38, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 06/28/22 13:16, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	400	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 06/28/22 12:26, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	94	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 06/24/22 16:10, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	364	50	10	mg/L	2		

Method: SM2540D, Run Date: 06/27/22 15:30, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	5	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 06/27/22 12:09, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.026	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	3.32	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.30	0.02	0.00192	mg/L	5	7439-89-6	



# Analytical Laboratory Report

Preliminary Report

Lab Sample ID: S37459.03 (continued)

Sample Tag: MW-12B L206214-03

**Method: E200.8, Run Date: 06/27/22 12:09, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.041	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 06/27/22 15:11, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	26.1	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	8.31	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	8.27	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	111	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 06/27/22 14:51, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: / /, Analyst:**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Incomplete						



# Analytical Laboratory Report

Preliminary Report

Lab Sample ID: S37459.04

Sample Tag: Field Dupe MW-12B L206214-04

Collected Date/Time: 06/23/2022 09:46

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.4	IR
2	1L Plastic	None	Yes	2.4	IR
1	125ml Plastic	HNO3	Yes	2.4	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	06/27/22 09:30	JRH	
Metal Digestion	Completed	SW3015A	06/27/22 10:10	CCM	

### Inorganics

Method: E300.0, Run Date: 06/27/22 09:51, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 06/28/22 13:18, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	390	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 06/28/22 12:28, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	97	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 06/24/22 16:10, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	372	50	10	mg/L	2		

Method: SM2540D, Run Date: 06/27/22 15:30, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 06/27/22 12:13, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.025	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	3.38	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.28	0.02	0.00192	mg/L	5	7439-89-6	



# Analytical Laboratory Report

Preliminary Report

Lab Sample ID: S37459.04 (continued)  
Sample Tag: Field Dupe MW-12B L206214-04

**Method: E200.8, Run Date: 06/27/22 12:13, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.039	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 06/27/22 15:13, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	25.5	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	8.14	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	8.15	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	107	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 06/27/22 14:54, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: / / , Analyst:**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Incomplete						



# Analytical Laboratory Report

Preliminary Report

Lab Sample ID: S37459.05

Sample Tag: Field Blank L206214-05

Collected Date/Time: 06/23/2022 08:35

Matrix: Water

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.4	IR
2	1L Plastic	None	Yes	2.4	IR
1	125ml Plastic	HNO3	Yes	2.4	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	06/27/22 09:30	JRH	
Metal Digestion	Completed	SW3015A	06/27/22 10:10	CCM	

### Inorganics

Method: E300.0, Run Date: 06/27/22 10:04, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	2.5	0.04	mg/L	2.5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.06	mg/L	2.5	16984-48-8	
Sulfate	Not detected	2.5	0.15	mg/L	2.5	14808-79-8	

Method: SM2320B, Run Date: 06/28/22 13:20, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	Not detected	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 06/28/22 12:30, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	Not detected	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 06/24/22 16:10, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	Not detected	50	10	mg/L	2		

Method: SM2540D, Run Date: 06/27/22 15:30, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 06/27/22 11:45, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00102	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.000102	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.0000648	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.0000862	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.000702	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.0000760	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.0000386	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.0000434	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000150	mg/L	2	7440-50-8	
Iron	Not detected	0.02	0.000768	mg/L	2	7439-89-6	



# Analytical Laboratory Report

Preliminary Report

Lab Sample ID: S37459.05 (continued)

Sample Tag: Field Blank L206214-05

**Method: E200.8, Run Date: 06/27/22 11:45, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.0000760	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000654	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.0000868	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000100	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.000838	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.0000270	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.0000342	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.0000558	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.000292	mg/L	2	7440-66-6	

**Method: E200.8, Run Date: 06/27/22 15:05, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.0174	mg/L	2	7440-70-2	
Magnesium	Not detected	0.50	0.00480	mg/L	2	7439-95-4	
Potassium	Not detected	0.50	0.00920	mg/L	2	7440-09-7	
Sodium	Not detected	0.50	0.00340	mg/L	2	7440-23-5	

**Method: E245.1, Run Date: 06/27/22 15:04, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: / /, Analyst:**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Incomplete						

# Merit Laboratories Login Checklist

Lab Set ID:S37459

Attention: Jennifer Caporale  
Address: Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901

Client:BWL01 (Board of Water & Light)

Project: Erickson AM MI New Wells 7B, 7C & 12B

Submitted:06/24/2022 10:34 Login User: PFD

Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

Selection	Description	Note
-----------	-------------	------

## Sample Receiving

- |     |  |  |
|-----|--|--|
| 01. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples are received at 4C +/- 2C Thermometer # IR 2.4 |
| 02. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Received on ice/ cooling process begun                 |
| 03. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples shipped  |
| 04. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples left in 24 hr. drop box                        |
| 05. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Are there custody seals/tape or is the drop box locked |

## Chain of Custody

- |     |  |   |
|-----|--|---|
| 06. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC adequately filled out                                       |
| 07. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC signed and relinquished to the lab                          |
| 08. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sample tag on bottles match COC                                 |
| 09. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Subcontracting needed? Subcontracted to: GEL 1Z4664770361280249 |

## Preservation

- |     |  |   |
|-----|--|---|
| 10. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Do sample have correct chemical preservation        |
| 11. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Completed pH checks on preserved samples? (no VOAs) |
| 12. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Did any samples need to be preserved in the lab?    |

## Bottle Conditions

- |     |  |   |
|-----|--|---|
| 13. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | All bottles intact                            |
| 14. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Appropriate analytical bottles are used       |
| 15. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Merit bottles used                            |
| 16. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sufficient sample volume received             |
| 17. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples require laboratory filtration         |
| 18. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples submitted within holding time         |
| 19. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Do water VOC or TOX bottles contain headspace |

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: \_\_\_\_\_ Date: \_\_\_\_\_

# Merit Laboratories Bottle Preservation Check

Lab Set ID: S37459 Submitted: 06/24/2022 10:34

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI New Wells 7B, 7C & 12B

Initial Preservation Check: 06/24/2022 11:10 PFD

Preservation Recheck (E200.8): N/A

Attention: Jennifer Caporale  
Address: Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901

Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S37459.01	125ml Plastic HNO3	<2			
S37459.01	1L Plastic HNO3	<2			
S37459.01	1L Plastic HNO3	<2			
S37459.02	125ml Plastic HNO3	<2			
S37459.02	1L Plastic HNO3	<2			
S37459.02	1L Plastic HNO3	<2			
S37459.03	125ml Plastic HNO3	<2			
S37459.03	1L Plastic HNO3	<2			
S37459.03	1L Plastic HNO3	<2			
S37459.04	125ml Plastic HNO3	<2			
S37459.04	1L Plastic HNO3	<2			
S37459.04	1L Plastic HNO3	<2			
S37459.05	125ml Plastic HNO3	<2			
S37459.05	1L Plastic HNO3	<2			
S37459.05	1L Plastic HNO3	<2			





2680 East Lansing Dr., East Lansing, MI 48823  
 Phone (517) 332-0167 Fax (517) 332-4034  
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

**REPORT TO**

**CHAIN OF CUSTODY RECORD**

**INVOICE TO**

CONTACT NAME **Jennifer Caporale**  
 COMPANY **Lansing Board of Water and Light**  
 ADDRESS **PO Box 13007 48901-3007**  
 CITY **Lansing** STATE **MI** ZIP CODE **48901**  
 PHONE NO. **517-702-6372** FAX NO. P.O. NO.  
 E-MAIL ADDRESS **Environmental\_Laboratory@lbwl.com** QUOTE NO.

CONTACT NAME **Kelly Gleason**  SAME  
 COMPANY  
 ADDRESS  
 CITY STATE ZIP CODE  
 PHONE NO. E-MAIL ADDRESS **Kelly.Gleason@lbwl.com**

PROJECT NO./NAME **Erickson AM MI Wells 7B,7C&12B** SAMPLER(S) - PLEASE PRINT/SIGN NAME **Marc Wahrer**  
 TURNAROUND TIME REQUIRED  1 DAY  2 DAYS  3 DAYS  STANDARD  OTHER **ASAP**  
 DELIVERABLES REQUIRED  STD  LEVEL II  LEVEL III  LEVEL IV  EDD  OTHER

MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID  
 SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIFE A=AIR W=WASTE

# Containers & Preservatives

Total Metals	F- undissilted, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	HCO3, CO3, Hardness	Certifications	
						<input type="checkbox"/> OHIO VAP	<input type="checkbox"/> Drinking Water
						<input type="checkbox"/> DoD	<input checked="" type="checkbox"/> NPDES
						Project Locations	
						<input type="checkbox"/> Detroit	<input type="checkbox"/> New York
						<input type="checkbox"/> Other _____	
						Special Instructions	

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO3	H2SO4	NH4OH	MeOH	OTHER	Total Metals	F- undissilted, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	HCO3, CO3, Hardness							
	DATE	TIME																							
<b>37459.01</b>	<b>6/23/22</b>	<b>1205</b>	<b>MW-7B L206214-01</b>	<b>GW</b>	<b>5</b>	<b>2</b>	<b>3</b>						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>							<b>Metals to analyse: Na, Mg, K</b>
<b>.02</b>		<b>1336</b>	<b>MW-7C -02</b>	<b>GW</b>	<b>5</b>	<b>2</b>	<b>3</b>						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>							<b>B, Ca, Sb, As, Ba, Be, Cd, Cr,</b>
<b>.03</b>		<b>0946</b>	<b>MW-12B -03</b>	<b>GW</b>	<b>5</b>	<b>2</b>	<b>3</b>						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>							<b>Co, Li, Hg, Mo, Pb, Se, Tl,</b>
<b>.04</b>			<b>Field Dupe MW- 12B -04</b>	<b>GW</b>	<b>5</b>	<b>2</b>	<b>3</b>						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>							<b>Fe, Cu, Ni, Ag, V, Zn</b>
<b>.05</b>		<b>0835</b>	<b>Field Blank -05</b>	<b>DI</b>	<b>5</b>	<b>2</b>	<b>3</b>						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>							<b>Please send a preliminary report</b>

RELINQUISHED BY: *[Signature]* DATE **6/24/22** TIME **1034**  
 RECEIVED BY: *[Signature]* DATE **6/24/22** TIME **1030**

RELINQUISHED BY: DATE TIME  
 RECEIVED BY: DATE TIME  
 SEAL NO. SEAL INTACT YES  NO  INITIALS  
 SEAL NO. SEAL INTACT YES  NO  INITIALS  
 NOTES: TEMP. ON ARRIVAL **2.4**

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

## Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	5 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	5 mos	0.002
Ba, total		250 mL plastic	mg/L	Nitric Acid	200.8	5 mos	0.150
Be, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	5 mos	0.001
B, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	5 mos	0.04
Cd, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	5 mos	0.0005
Ca	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	5 mos	2.5
Cl	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	10
Cr, total	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	5 mos	0.005
Co, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	5 mos	0.005
Cu, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	5 mos	0.005
F	Fluoride	250 mL plastic	mg/L	None	9056	28 d	1.0
Fe, total	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	5 mos	0.02
Pb, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	5 mos	0.003
Li, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	5 mos	0.005
Hg, total	Mercury	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Mo, total	Molybdenum	250 mL plastic	mg/L	Nitric Acid	200.8	5 mos	0.005
Ni, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	5 mos	0.005
RA226/228	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	HNO3	SM 7500	5 mos	2.0 combined
Se, total	Selenium	250 mL plastic	mg/L	Nitric Acid	200.8	5 mos	0.005
Ag, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	5 mos	0.0005
SO4	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	10
Tl, total	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	5 mos	0.002
TDS	Total Dissolved Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TSS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540D	NA	3
V, total	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	5 mos	0.005
Zn, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	5 mos	0.005

### Data Validation Checklist

Site Name: Erickson Personnel: M. Wahrer

Sample Date(s): 6/23/2022 Lab Drop-off Date(s): 6/24/2022

Lab Report Number: S37459.01(02)

Lab Report Date: 8/20/2022

Reason for Sample Event: Wells MW-7B, MW-7C, MW-12B

**Field Records:** Circle Yes/No unless Not Applicable – *Complete during sample event*

Item Description	Verification (Completeness)	Validation (Conformance to Specifications)
Field equipment calibration records	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Chain-of-Custody forms	<input checked="" type="radio"/> Yes / No	N/A
Field decontamination documentation	N/A	N/A
Sample collection field forms	<input checked="" type="radio"/> Yes / No	N/A
Drilling logs	<input checked="" type="radio"/> Yes / No	N/A
Well construction logs	<input checked="" type="radio"/> Yes / No	N/A
Well development field forms	<input checked="" type="radio"/> Yes / No	N/A

**Analytical Data Package:** Circle Yes/No unless N/A – *Complete when lab report is received*

Item Description	Verification (Completeness)	Validation (Conformance to Specifications)
Cover sheet (laboratory identifying information)	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Case narrative	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Internal laboratory Chain-of-Custody forms	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Sample chronology and consistency (that is, dates and times of receipt, preparation, and analysis)	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Communication records with laboratory	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
EDD format consistency	<input checked="" type="radio"/> Yes / No	N/A
Sample identification, results nomenclature, and data qualifier consistency	<input checked="" type="radio"/> Yes / No	N/A
RLs as requested; MDLs < RLs	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Instrument calibration records	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Laboratory Report	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No
Field QC sample results and calculation of accuracy and precision	<input checked="" type="radio"/> Yes / No Duplicate Well ID: MW-12B	Yes / <input checked="" type="radio"/> No Duplicate RPD: 1-3% except Rad-226/228 at 47%

**Corrections Needed:** None; according to the Technical Case Narrative by GEL Laboratories, subcontracted laboratory for radium analysis, “[a]ll sample data provided in [the] report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Rad-228 - The Sample and the Duplicate, (See Below), did not meet the relative percent difference requirement; however, they do meet the relative error ratio requirement with the value listed below. No qualification was required.

Sample	Analyte	Value
1205130561 (S37459.01DUP)	Radium-228	RPD 107* (0.0%-100.0%) RER 1.61 (0-3)

Rad-226 – The [method] blank (See Below) result is greater than 1.65 times the CSU but less than the MDC.

Sample	Analyte	Value
1205130540 (MB)	Radium-226	Blank result > 1.65 CSU

Sample	Parameter	Result	Uncertainty	MDC	Lab Qualifier	Validated Qualifier
MW-12B	Rad-226	1.00	+/-0.472	0.503		J-
	Rad-228	0.209	+/-1.11	2.02	U	J-
	Rad-226/228	1.21	+/-1.21			J-
MW-12B-Dup	Rad-226	1.89	+/-0.699	0.705		J+
	Rad-228	1.47	+/-1.33	2.18	U	J+
	Rad-226/228	3.37	+/-1.50			J+

*U - Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.*

Since the laboratory processes indicated no issues with the analytical procedures, no corrective action was necessary. Since the RPD was above the 20% control limit, Rad-226, Rad-228, and Rad-226/228 in MW-12B have been qualified as estimated with potential for low bias (J-) and those in MW-12B-Dup have been qualified as estimated with potential for high bias (J+).

The matrix spike (37459.02) had high recovery for iron in run batch MT4-22-0627A. Iron required qualification as estimated (J) in all samples.



Lansing Board of Water and Light  
Environmental Services Laboratory  
1232 Haco Dr.  
Lansing, Michigan 48901

11 August 2022

BWL - Erickson Station

Attn: Cheryl Louden

3725 S. Canal

Lansing, MI 48917

**Project: Erickson AM MI**

Dear Cheryl Louden,

Enclosed is a copy of the laboratory report for the following work order(s) received by Lansing Board of Water and Light Environmental Services Laboratory:

**Work Order**

**L207189**

**Received**

**7/7/2022 1:20:00PM**

**Account Number**

**30926 10021**

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in blue ink that reads "Jennifer Caporale".

Jennifer Caporale, Supervisor



### Analytical Report

**Client:** BWL - Erickson Station  
**Address:** 3725 S. Canal  
Lansing MI, 48917

**Client Project Manager:** Cheryl Louden

**Report Date:** 08/11/2022

**Sample Name:** MW-11B

**Lab #:** L207189-01 Ground Water

**Collected:** 07-Jul-22 11:48

**By:** Marc Wahrer

Analyte	Reporting		Units	Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit							
Conductivity	540	1.0	uS/cm	1		07-Jul-22 11:48	maw	SM 2510B	
Dissolved oxygen	0.220	0.100	mg/L	1		07-Jul-22 11:48	maw	FIELD	
Milliliters Purged	210		ml/min	1		07-Jul-22 11:48	maw	FIELD	
Oxidation Reduction Potential	-110.4	-999.0	mV	1		07-Jul-22 11:48	maw	FIELD	
pH	7.2	7.0	pH Units	1		07-Jul-22 11:48	maw	SM 4500H+B	
Temperature	15		°C	1		07-Jul-22 11:48	maw	SM 2550B	
Turbidity	8.0	0.10	NTU	1		07-Jul-22 11:48	maw	SM 2130B	



## Analytical Report

**Client:** BWL - Erickson Station

**Client Project Manager:** Cheryl Louden

**Report Date:** 08/11/2022

**Address:** 3725 S. Canal  
Lansing MI, 48917

**Approved By:** \_\_\_\_\_

*Jennifer Caporale*

### Notes and Definitions

AL Action Level (Action Level = Regulatory Limit)  
MCL Maximum Contaminant Level  
PEL Permissible Exposure Limit (Permissible Exposure Limit = Regulatory Limit)  
RPD Relative Percent Difference  
OT Odor Threshold  
ND Non Detect

All drinking water regulatory limits are MCL's with the exception of Lead and Copper unless otherwise noted.



Report ID: S37856.01(03)  
Generated on 08/10/2022  
Replaces report S37856.01(02) generated on 07/13/2022

**Report to**  
Attention: Jennifer Caporale  
Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901  
  
Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

**Report produced by**  
Merit Laboratories, Inc.  
2680 East Lansing Drive  
East Lansing, MI 48823

Phone: (517) 332-0167 FAX: (517) 332-6333

Contacts for report questions:  
John Lavery (johnlavery@meritlabs.com)  
Barbara Ball (bball@meritlabs.com)

**Report Summary**

Lab Sample ID(s): S37856.01-S37856.03  
Project: Erickson AM MI Wells 11B  
Collected Date(s): 07/07/2022  
Submitted Date/Time: 07/07/2022 15:00  
Sampled by: Marc Wahrer  
P.O. #:

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- General Report Notes (Page 2)
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Maya Murshak  
Technical Director





## General Report Notes

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Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile, and 2-chloroethylvinyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (\*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

## Report Narrative

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All analyses completed



Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Alaska CSLAP	#17-001
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



## Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1 (1993)
SM2320B	Standard Method 2320 B 2011
SM2340C	Standard Method 2340 C 2011
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007



## Sample Summary (3 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S37856.01	MW-11B L207189-01	Groundwater	07/07/22 11:48
S37856.02	Field Dupe MW-11B L207189-02	Groundwater	07/07/22 11:48
S37856.03	Field Blank L207189-03	Water	07/07/22 10:40



# Analytical Laboratory Report

Final Report

Lab Sample ID: S37856.01

Sample Tag: MW-11B L207189-01

Collected Date/Time: 07/07/2022 11:48

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.0	IR
2	1L Plastic	None	Yes	2.0	IR
1	125ml Plastic	HNO3	Yes	2.0	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	07/08/22 10:15	JRH	
Metal Digestion	Completed	SW3015A	07/08/22 10:15	CCM	

### Inorganics

Method: E300.0, Run Date: 07/08/22 09:47, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 07/11/22 13:10, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	350	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 07/08/22 14:16, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	260	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 07/12/22 10:30, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	296	50	10	mg/L	2		

Method: SM2540D, Run Date: 07/07/22 16:50, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	3	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 07/08/22 11:30, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.007	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.070	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.69	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	2.59	0.02	0.00192	mg/L	5	7439-89-6	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S37856.01 (continued)

Sample Tag: MW-11B L207189-01

**Method: E200.8, Run Date: 07/08/22 11:30, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.024	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.007	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	0.011	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	0.042	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 07/08/22 13:46, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	66.1	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	24.6	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	6.28	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	17.9	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 07/08/22 13:21, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 08/09/22 09:28, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Final Report

Lab Sample ID: S37856.02

Sample Tag: Field Dupe MW-11B L207189-02

Collected Date/Time: 07/07/2022 11:48

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.0	IR
2	1L Plastic	None	Yes	2.0	IR
1	125ml Plastic	HNO3	Yes	2.0	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	07/08/22 10:15	JRH	
Metal Digestion	Completed	SW3015A	07/08/22 10:15	CCM	

### Inorganics

Method: E300.0, Run Date: 07/08/22 09:59, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 07/11/22 13:16, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	360	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 07/08/22 14:18, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	260	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 07/12/22 10:30, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	306	50	10	mg/L	2		

Method: SM2540D, Run Date: 07/07/22 16:50, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	4	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 07/08/22 11:37, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.008	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.071	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.71	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	2.66	0.02	0.00192	mg/L	5	7439-89-6	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S37856.02 (continued)  
Sample Tag: Field Dupe MW-11B L207189-02

**Method: E200.8, Run Date: 07/08/22 11:37, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.025	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.007	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 07/08/22 13:48, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	66.1	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	24.3	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	6.24	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	17.9	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 07/08/22 13:24, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 08/09/22 09:28, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.





# Analytical Laboratory Report

Final Report

Lab Sample ID: S37856.03

Sample Tag: Field Blank L207189-03

Collected Date/Time: 07/07/2022 10:40

Matrix: Water

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.0	IR
2	1L Plastic	None	Yes	2.0	IR
1	125ml Plastic	HNO3	Yes	2.0	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	07/08/22 10:15	JRH	
Metal Digestion	Completed	SW3015A	07/08/22 10:15	CCM	

### Inorganics

Method: E300.0, Run Date: 07/08/22 10:12, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	2.5	0.04	mg/L	2.5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.06	mg/L	2.5	16984-48-8	
Sulfate	Not detected	2.5	0.15	mg/L	2.5	14808-79-8	

Method: SM2320B, Run Date: 07/11/22 13:18, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	Not detected	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 07/08/22 14:20, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	Not detected	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 07/12/22 10:30, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	Not detected	50	10	mg/L	2		

Method: SM2540D, Run Date: 07/07/22 16:50, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 07/08/22 11:26, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00102	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.000102	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.0000648	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.0000862	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.000702	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.0000760	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.0000386	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.0000434	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000150	mg/L	2	7440-50-8	
Iron	Not detected	0.02	0.000768	mg/L	2	7439-89-6	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S37856.03 (continued)

Sample Tag: Field Blank L207189-03

**Method: E200.8, Run Date: 07/08/22 11:26, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.0000760	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000654	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.0000868	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000100	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.000838	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.0000270	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.0000342	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.0000558	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.000292	mg/L	2	7440-66-6	

**Method: E200.8, Run Date: 07/08/22 13:45, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.0174	mg/L	2	7440-70-2	
Magnesium	Not detected	0.50	0.00480	mg/L	2	7439-95-4	
Potassium	Not detected	0.50	0.00920	mg/L	2	7440-09-7	
Sodium	Not detected	0.50	0.00340	mg/L	2	7440-23-5	

**Method: E245.1, Run Date: 07/08/22 13:34, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 08/09/22 09:28, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

# Merit Laboratories Login Checklist

Lab Set ID:S37856

Client:BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 11B

Submitted:07/07/2022 15:00 Login User: MMC

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental\_Laboratory@LBWL.com

Selection	Description	Note
-----------	-------------	------

## Sample Receiving

- |     |  |  |
|-----|--|--|
| 01. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples are received at 4C +/- 2C Thermometer # IR 2.0 |
| 02. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Received on ice/ cooling process begun                 |
| 03. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples shipped  |
| 04. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples left in 24 hr. drop box                        |
| 05. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Are there custody seals/tape or is the drop box locked |

## Chain of Custody

- |     |  |  |
|-----|--|--|
| 06. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC adequately filled out                    |
| 07. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC signed and relinquished to the lab       |
| 08. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sample tag on bottles match COC              |
| 09. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Subcontracting needed? Subcontracted to: GEL |

## Preservation

- |     |  |   |
|-----|--|---|
| 10. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Do sample have correct chemical preservation        |
| 11. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Completed pH checks on preserved samples? (no VOAs) |
| 12. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Did any samples need to be preserved in the lab?    |

## Bottle Conditions

- |     |  |   |
|-----|--|---|
| 13. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | All bottles intact                            |
| 14. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Appropriate analytical bottles are used       |
| 15. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Merit bottles used                            |
| 16. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sufficient sample volume received             |
| 17. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples require laboratory filtration         |
| 18. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples submitted within holding time         |
| 19. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Do water VOC or TOX bottles contain headspace |

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: \_\_\_\_\_ Date: \_\_\_\_\_

# Merit Laboratories Bottle Preservation Check

Lab Set ID: S37856 Submitted: 07/07/2022 15:00

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 11B

Initial Preservation Check: 07/07/2022 15:54 MMC

Preservation Recheck (E200.8): N/A

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: [Environmental\\_Laboratory@LBWL.com](mailto:Environmental_Laboratory@LBWL.com)

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S37856.01	125ml Plastic HNO3	<2			
S37856.01	1L Plastic HNO3	<2			
S37856.01	1L Plastic HNO3	<2			
S37856.02	125ml Plastic HNO3	<2			
S37856.02	1L Plastic HNO3	<2			
S37856.02	1L Plastic HNO3	<2			
S37856.03	125ml Plastic HNO3	<2			
S37856.03	1L Plastic HNO3	<2			
S37856.03	1L Plastic HNO3	<2			



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 Phone (517) 332-0167 Fax (517) 332-4034  
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

**REPORT TO** **CHAIN OF CUSTODY RECORD** **INVOICE TO**

CONTACT NAME **Jennifer Caporale**  
 COMPANY **Lansing Board of Water and Light**  
 ADDRESS **PO Box 13007 48901-3007**  
 CITY **Lansing** STATE **Mi** ZIP CODE **48901**  
 PHONE NO. **517-702-6372** FAX NO. \_\_\_\_\_ P.O. NO. \_\_\_\_\_  
 E-MAIL ADDRESS **Environmental\_Laboratory@lbwl.com** QUOTE NO. \_\_\_\_\_

CONTACT NAME **Kelly Gleason**  SAME  
 COMPANY \_\_\_\_\_  
 ADDRESS \_\_\_\_\_  
 CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP CODE \_\_\_\_\_  
 PHONE NO. \_\_\_\_\_ E-MAIL ADDRESS **Kelly.Gleason@lbwl.com**

**ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)**

PROJECT NO./NAME **Erickson AM MI Wells 11B** SAMPLER(S) - PLEASE PRINT/SIGN NAME **Marc Wahrer**

TURNAROUND TIME REQUIRED  1 DAY  2 DAYS  3 DAYS  STANDARD  OTHER **ASAP**  
 DELIVERABLES REQUIRED  STD  LEVEL II  LEVEL III  LEVEL IV  EDD  OTHER \_\_\_\_\_

MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID  
 SL=SLUDGE DW=DRINKING WATER O=OIL WP=WPE A=AIR W=WASTE

# Containers & Preservatives

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	# Containers & Preservatives							Total Metals	F- undistilled, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	HCO3, CO3, Hardness	Certifications	Project Locations	Special Instructions
	DATE	TIME				NONE	HCl	HNO3	H2SO4	NiOH	MeOH	OTHER									
37856.01	7/7/22	1148	MW-11B L207189-01	GW	5	2	3											<input type="checkbox"/> OHIO VAP <input type="checkbox"/> Drinking Water	<input type="checkbox"/> Detroit <input type="checkbox"/> New York	Metals to analyse: Na, Mg, K	
.02	↓	↓	Field Dupe MW- 11B ↓ -02	GW	5	2	3											<input type="checkbox"/> DoD <input checked="" type="checkbox"/> NPDES		B, Ca, Sb, As, Ba, Be, Cd, Cr,	
.03	↓	1040	Field Blank ↓ -03	DI	5	2	3													Co, Li, Hg, Mo, Pb, Se, Tl,	
																				Fe, Cu, Ni, Ag, V, Zn	
																				Please send a preliminary report	

RELINQUISHED BY: *[Signature]* \*Sampler DATE **7/7/22** TIME **1500**  
 RECEIVED BY: *M. Chilcote* DATE **7/7/22** TIME **1500**

RELINQUISHED BY: \_\_\_\_\_ DATE \_\_\_\_\_ TIME \_\_\_\_\_  
 RECEIVED BY: \_\_\_\_\_ DATE \_\_\_\_\_ TIME \_\_\_\_\_  
 SEAL NO. SEAL INTACT YES  NO  INITIALS \_\_\_\_\_  
 SEAL NO. SEAL INTACT YES  NO  INITIALS \_\_\_\_\_  
 NOTES: TEMP. ON ARRIVAL **2.0**

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

## Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.150
Be, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	2.5
Cl	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	10
Cr, total	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
F	Fluoride	250 mL plastic	mg/L	None	9056	28 d	1.0
Fe, total	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Pb, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Li, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Hg, total	Mercury	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Mo, total	Molybdenum	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
RA226/228	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	HNO3	SM 7500	6 mos	2.0 combined
Se, total	Selenium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ag, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
SO4	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	10
Tl, total	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
TDS	Total Dissolved Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TSS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540D	NA	3
V, total	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Zn, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005



August 09, 2022

John Laverty  
Merit Laboratories Inc.  
2680 East Lansing Drive  
East Lansing, Michigan 48823

Re: Routine Analysis  
Work Order: 585909  
SDG: S37856

Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on July 13, 2022. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at [www.gel.com](http://www.gel.com).

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,

Delaney Stone  
Project Manager

Purchase Order: GELP20-0018  
Enclosures



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# Case Narrative

**Receipt Narrative  
for  
Merit Laboratories, Inc.  
SDG: S37856  
Work Order: 585909**

**August 09, 2022**

**Laboratory Identification:**

GEL Laboratories LLC  
2040 Savage Road  
Charleston, South Carolina 29407  
(843) 556-8171

**Summary:**

**Sample receipt:** The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on July 13, 2022 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

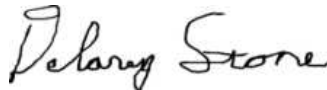
**Sample Identification:** The laboratory received the following samples:

<b><u>Laboratory ID</u></b>	<b><u>Client ID</u></b>
585909001	S37856.01
585909002	S37856.02 Duplicate
585909003	S37856.03 Field Blank

**Case Narrative:**

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.



Delaney Stone  
Project Manager

# **Chain of Custody and Supporting Documentation**



2680 East Lansing Dr., East Lansing, MI 48823  
 Phone (517) 332-0167 Fax (517) 332-4034  
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1  
**585909**

<b>REPORT TO</b>		<b>INVOICE TO</b>	
CONTACT NAME	Project Management Team	CONTACT NAME	Julie Teague
COMPANY	Merit Laboratories	COMPANY	Merit Laboratories
ADDRESS	2680 East Lansing Drive	ADDRESS	2680 East Lansing Drive
CITY	East Lansing	CITY	East Lansing
STATE	MI	STATE	MI
ZIP CODE	48823	ZIP CODE	48823
PHONE NO.	517-332-0167	PHONE NO.	517-332-0167
FAX NO.		E-MAIL ADDRESS	juliet@meritlabs.com
E-MAIL ADDRESS	results@meritlabs.com	QUOTE NO.	

**CHAIN OF CUSTODY RECORD**

PROJECT NO./NAME: **S37856** ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

TURNAROUND TIME REQUIRED:  1 DAY  2 DAYS  3 DAYS  STANDARD  OTHER

DELIVERABLES REQUIRED:  STD  LEVEL II  LEVEL III  LEVEL IV  EDD  OTHER

SAMPLER(S) - PLEASE PRINT/SIGN NAME

MERCIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR	DATE	TIME	IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	# Containers & Preservatives					CERTIFICATIONS	
							None	HO	HNO <sub>3</sub>	H <sub>2</sub> SO <sub>4</sub>	H <sub>2</sub> O		MOH
	07/07/22	1148		S37856.01	GW	2		2				Radium 226*	<input type="checkbox"/> OHIO VAP <input type="checkbox"/> Drinking Water <input type="checkbox"/> DoD <input type="checkbox"/> NPDES Project Locations <input type="checkbox"/> Detroit <input type="checkbox"/> New York <input type="checkbox"/> Other Special Instructions
	07/07/22	1148		S37856.02 Duplicate	GW	2		2				Radium 228**	* E903.1 Mod. ** E904.0/SW 9320 Mod.
	07/07/22	1040		S37856.03 Field Blank	DI	2		2					Please use calculation product & provide Radium 226/228 combined results on the report
													(No Ice needed) ** Subcontracted to GEL Laboratories, Inc. 2040 Savage Road Charleston, SC 29407

RELINQUISHED BY: SIGNATURE/Organization	DATE	TIME	RELINQUISHED BY: SIGNATURE/Organization	DATE	TIME
RECEIVED BY:			RECEIVED BY:		
RELINQUISHED BY: SIGNATURE/Organization	DATE	TIME	RELINQUISHED BY: SIGNATURE/Organization	DATE	TIME
RECEIVED BY:			RECEIVED BY:		

SEAL NO. YES  NO  INITIALS

SEAL NO. YES  NO  INITIALS

NOTES: TEMP. ON ARRIVAL

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

**SAMPLE RECEIPT & REVIEW FORM**

Client: <u>MERI</u>		SDG/AR/COC/Work Order: <u>585909</u>	
Received By: <u>PG</u>		Date Received: <u>7/13/22</u>	
Carrier and Tracking Number		Circle-Applicable: FedEx Express    FedEx Ground <u>(UPS)</u> Field Services    Courier    Other  <u>1Z 220 003 01 4948 5205</u>	
Suspected Hazard Information		Yes	No
			*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.
A) Shipped as a DOT Hazardous?			Hazard Class Shipped: _____ UN#: _____ If UN2910, Is the Radioactive Shipment Survey Compliant? Yes ___ No ___
B) Did the client designate the samples are to be received as radioactive?			COC notation or radioactive stickers on containers equal client designation.
C) Did the RSO classify the samples as radioactive?			Maximum Net Counts Observed* (Observed Counts - Area Background Counts): _____ CPM / mR/Hr Classified as: Rad 1    Rad 2    Rad 3
D) Did the client designate samples are hazardous?			COC notation or hazard labels on containers equal client designation.
E) Did the RSO identify possible hazards? :			If D or E is yes, select Hazards below. PCB's    Flammable    Foreign Soil    RCRA    Asbestos    Beryllium    Other: _____
Sample Receipt Criteria		Yes	NA
			No
		Comments/Qualifiers (Required for Non-Conforming Items)	
1	Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>	Circle Applicable: Seals broken    Damaged container    Leaking container    Other (describe)
2	Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>	Circle Applicable: Client contacted and provided COC    COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*	<input checked="" type="checkbox"/>	Preservation Method: Wet Ice    Ice Packs    Dry ice    None    Other: *all temperatures are recorded in Celsius    TEMP: <u>27</u>
4	Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>	Temperature Device Serial #: <u>1102-22</u> Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?	<input checked="" type="checkbox"/>	Circle Applicable: Seals broken    Damaged container    Leaking container    Other (describe)
6	Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>	Sample ID's and Containers Affected: If Preservation added, Lot#:
7	Do any samples require Volatile Analysis?	<input checked="" type="checkbox"/>	If Yes, are Encores or Soil Kits present for solids? Yes ___ No ___ NA ___ (If yes, take to VOA Freezer)
			Do liquid VOA vials contain acid preservation? Yes ___ No ___ NA ___ (If unknown, select No)
			Are liquid VOA vials free of headspace? Yes ___ No ___ NA ___ Sample ID's and containers affected:
8	Samples received within holding time?	<input checked="" type="checkbox"/>	ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>	ID's and containers affected:
10	Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>	Circle Applicable: No dates on containers    No times on containers    COC missing info    Other (describe)
11	Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>	Circle Applicable: No container count on COC    Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?	<input checked="" type="checkbox"/>	
13	COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>	Circle Applicable: <u>Not Relinquished</u> Other (describe)
Comments (Use Continuation Form if needed):			

PM (or PMA) review: Initials SW    Date 7/14/22    Page 1 of 1

# **Laboratory Certifications**

**List of current GEL Certifications as of 09 August 2022**

<b>State</b>	<b>Certification</b>
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122022-5
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2019-165
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122021-36
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

# **Radiological Analysis**



# Case Narrative

**Radiochemistry  
Technical Case Narrative  
Merit Laboratories, Inc.  
SDG #: S37856  
Work Order #: 585909**

**Product:** GFPC Ra228, Liquid

**Analytical Method:** EPA 904.0/SW846 9320 Modified

**Analytical Procedure:** GL-RAD-A-063 REV# 5

**Analytical Batch:** 2289734

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
585909001	S37856.01
585909002	S37856.02 Duplicate
585909003	S37856.03 Field Blank
1205139231	Method Blank (MB)
1205139232	585859003(NonSDG) Sample Duplicate (DUP)
1205139233	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

**Product:** Lucas Cell, Ra226, Liquid

**Analytical Method:** EPA 903.1 Modified

**Analytical Procedure:** GL-RAD-A-008 REV# 15

**Analytical Batch:** 2289697

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
585909001	S37856.01
585909002	S37856.02 Duplicate
585909003	S37856.03 Field Blank
1205139157	Method Blank (MB)
1205139158	585859001(NonSDG) Sample Duplicate (DUP)
1205139159	585859001(NonSDG) Matrix Spike (MS)
1205139160	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

**Technical Information****Recounts**

Samples 1205139157 (MB) and 1205139160 (LCS) were degassed and recounted to verify sample results. The second counts are reported.

**Miscellaneous Information****Additional Comments**

The matrix spike, 1205139159 (Non SDG 585859001MS), aliquot was reduced to conserve sample volume.

**Certification Statement**

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

## GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

### Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S37856 GEL Work Order: 585909

**The Qualifiers in this report are defined as follows:**

- \* A quality control analyte recovery is outside of specified acceptance criteria
- \*\* Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

**Review/Validation**

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature: 

Name: Kate Gellatly

Date: 10 AUG 2022

Title: Analyst I

# Sample Data Summary

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: August 10, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

Client Sample ID: S37856.01	Project: MERI00120
Sample ID: 585909001	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 07-JUL-22 11:48	
Receive Date: 13-JUL-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.753	+/-1.23	2.15	3.00	pCi/L			JXC9	08/02/22	1124 2289734	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.39	+/-1.27			pCi/L		1	NXL1	08/09/22	0928 2289737	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.638	+/-0.282	0.266	1.00	pCi/L			LXP1	08/03/22	0950 2289697	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			64.7	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: August 10, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Lavery  
 Project: Routine Analysis

Client Sample ID: S37856.02 Duplicate	Project: MERI00120
Sample ID: 585909002	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 07-JUL-22 11:48	
Receive Date: 13-JUL-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.445	+/-1.19	2.12	3.00	pCi/L			JXC9	08/02/22	1124 2289734	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.495	+/-1.20			pCi/L		1	NXL1	08/09/22	0928 2289737	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.0501	+/-0.139	0.277	1.00	pCi/L			LXP1	08/03/22	0950 2289697	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			67.5	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: August 10, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

Client Sample ID: S37856.03 Field Blank	Project: MERI00120
Sample ID: 585909003	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 07-JUL-22 10:40	
Receive Date: 13-JUL-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.634	+/-1.03	1.81	3.00	pCi/L			JXC9	08/02/22	1124 2289734	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.961	+/-1.06			pCi/L		1	NXL1	08/09/22	0928 2289737	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.327	+/-0.254	0.366	1.00	pCi/L			LXP1	08/03/22	0950 2289697	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			59.7	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit



# Quality Control Summary

# GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

## QC Summary

Report Date: August 10, 2022

Page 1 of 2

**Merit Laboratories Inc.**  
**2680 East Lansing Drive**  
**East Lansing, Michigan**

**Contact: John Laverty**

**Workorder: 585909**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Rad Gas Flow</b>											
Batch	2289734										
QC1205139232	585859003	DUP									
Radium-228	U	-0.0129	U	0.409	pCi/L	N/A		N/A	JXC9	08/02/22	11:24
	Uncertainty	+/-0.291		+/-0.511							
QC1205139233	LCS										
Radium-228	15.2			13.3	pCi/L		87.5	(75%-125%)		08/02/22	11:24
	Uncertainty			+/-1.10							
QC1205139231	MB										
Radium-228			U	0.0796	pCi/L					08/02/22	11:24
	Uncertainty			+/-0.430							
<b>Rad Ra-226</b>											
Batch	2289697										
QC1205139158	585859001	DUP									
Radium-226		2.19		2.62	pCi/L	18		(0%-20%)	LXP1	08/03/22	09:50
	Uncertainty	+/-0.670		+/-0.692							
QC1205139160	LCS										
Radium-226	26.6			25.0	pCi/L		94	(75%-125%)		08/08/22	12:05
	Uncertainty			+/-1.73							
QC1205139157	MB										
Radium-226			U	0.256	pCi/L					08/08/22	11:31
	Uncertainty			+/-0.279							
QC1205139159	585859001	MS									
Radium-226	128	2.19		120	pCi/L		91.9	(75%-125%)		08/03/22	09:49
	Uncertainty	+/-0.670		+/-7.69							

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- \*\* Analyte is a Tracer compound
- < Result is less than value reported
- > Result is greater than value reported
- BD Results are either below the MDC or tracer recovery is low
- FA Failed analysis.
- H Analytical holding time was exceeded

# GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

## QC Summary

Workorder: 585909

Page 2 of 2

Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
J											
J											
K											
L											
M											
M											
N/A											
NI											
ND											
NJ											
Q											
R											
U											
UI											
UJ											
UL											
X											
Y											
^											
h											

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where the duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

\* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

# Gas Flow Raw Data

# Batch 2289734 Check-list

This check-list was completed on 02-AUG-22 by Nat Long

This batch was reviewed by Kenshalla Oston on 02-AUG-22 and Nat Long on 02-AUG-22.

**Batch ID:**  
2289734

**Product:**  
GFC28RAL

**Description:** Gas Flow Radium 228  
GL-RAD-A-063

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
11	Has the method required detection limit been met?	Yes		
<b>Miscellaneous Information</b>				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

# Prep Logbook

## Radium-228 in Liquid

**Batch ID:** 2289734

**Analyst:** Jasmine Conley (JXC9)

**Method:** EPA 904.0/SW846 9320 Modified

**Lab SOP:** GL-RAD-A-063 REV# 5

**Instrument:** LUCAS-C037036045

**Due Dates for Lab:** 07-AUG-2022

**Package:** 09-AUG-2022

**SDG:** 10-AUG-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205139233	Radium-228	1965-C	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	585859003	18-JUL-2022	1	900.86	900.86	07/22/22 14:44	08/02/22 09:52
2	585909001	18-JUL-2022	3	304.81	304.81	07/22/22 14:44	08/02/22 09:52
3	585909002	18-JUL-2022	3	302.49	302.49	07/22/22 14:44	08/02/22 09:52
4	585909003	18-JUL-2022	3	302.12	302.12	07/22/22 14:44	08/02/22 09:52
5	1205139231 MB	18-JUL-2022	1		902.76	07/22/22 14:44	08/02/22 09:52
6	1205139232 DUP (585859003)	18-JUL-2022	1	902.76	902.76	07/22/22 14:44	08/02/22 09:52
7	1205139233 LCS	18-JUL-2022	1		902.76	07/22/22 14:44	08/02/22 09:52

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1951-D	Ba-133	.1 mL	Pipet Id: RAD-GFC-1795419 Data Entry Date2: 18-JUL-2022 00:00
REGNT 3413388	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3413919	RGF-50% Potassium Carbonate	2 mL	
REGNT 3418276.6	29M HF (48-50%)	4 mL	
REGNT 3424084.4	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	
REGNT 3424228	RGF-Neodymium Substrate	5 mL	
REGNT 3426198	2M HCl	20 mL	
REGNT 3450331	RGF-1.5M Ammonium Sulfate	10 mL	
REGNT 3454293	Barium Carrier Ra228 REG	1 mL	
REGNT 3454370.1	Nitric Acid	5 mL	
REGNT 3455703	RGF-7M Nitric Acid	25 mL	
REGNT 3461476	RGF-1M Citric Acid	5 mL	
REGNT DGA0035	2281828	2 g	

### Radium-228 Liquid

Filename : RA228.XLS  
 File type : Excel  
 Version # : 1.4.2

Tracer S/N : 1951-D  
 Tracer Exp Date : 6/2/2023  
 Tracer Volume Added: 0.10

Batch : 2289734  
 Analyst : JAS02031  
 Prep Date : 7/18/2022  
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL  
 Parmname : Radium-228  
 Required MDA : 1 pCi/L  
 Ra-228 Abundance : 1.00  
 Halflife of Ra-228 : 5.75 years  
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	585859003.1	0.9009	2.0766E-05	7/12/2022 9:53	1314.9	1.59%	898.6	1.93%	0.1	0.000200
2	585909001.1	0.3048	1.8540E-05	7/7/2022 11:48	1314.9	1.59%	850.4	1.98%	0.1	0.000200
3	585909002.1	0.3025	1.8501E-05	7/7/2022 11:48	1314.9	1.59%	888.0	1.94%	0.1	0.000200
4	585909003.1	0.3021	1.8495E-05	7/7/2022 10:40	1314.9	1.59%	785.5	2.06%	0.1	0.000200
5	1205139231.1	0.9028	2.0761E-05	7/18/2022 0:00	1314.9	1.59%	798.7	2.04%	0.1	0.000200
6	1205139232.1	0.9028	2.0761E-05	7/12/2022 9:53	1314.9	1.59%	680.6	2.21%	0.1	0.000200
7	1205139233.1	0.9028	2.0761E-05	7/18/2022 0:00	1314.9	1.59%	1071.3	1.76%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063  
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated	Sample
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction	Recovery %	Recovery Error %
			Alpha	Beta										
1	5C	60	20	32	0.533	8/2/2022 11:24	7/22/2022 14:44	8/2/2022 9:52	0.993	0.840	1.000	1.057	68.3%	1.28%
2	5D	60	18	60	1.000	8/2/2022 11:24	7/22/2022 14:44	8/2/2022 9:52	0.991	0.840	1.000	1.057	64.7%	1.30%
3	6A	60	19	61	1.017	8/2/2022 11:24	7/22/2022 14:44	8/2/2022 9:52	0.991	0.840	1.000	1.057	67.5%	1.29%
4	8C	60	15	36	0.600	8/2/2022 11:24	7/22/2022 14:44	8/2/2022 9:52	0.991	0.840	1.000	1.057	59.7%	1.33%
5	8D	60	22	58	0.967	8/2/2022 11:24	7/22/2022 14:44	8/2/2022 9:52	0.995	0.841	1.000	1.057	60.7%	1.32%
6	9D	60	13	60	1.000	8/2/2022 11:24	7/22/2022 14:44	8/2/2022 9:52	0.993	0.841	1.000	1.057	51.8%	1.39%
7	5B	60	30	744	12.400	8/2/2022 11:24	7/22/2022 14:44	8/2/2022 9:52	0.995	0.841	1.000	1.057	81.5%	1.22%



Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2022	5/31/2023	0.6242	0.00657	0.542	7/30/2022 11:19	500
2	PIC	6/1/2022	5/31/2023	0.6236	0.00925	0.838	7/30/2022 11:19	500
3	PIC	6/1/2022	5/31/2023	0.6328	0.02228	0.916	7/30/2022 11:19	500
4	PIC	6/1/2022	5/31/2023	0.6294	0.01955	0.474	7/30/2022 11:19	500
5	PIC	6/1/2022	5/31/2023	0.6347	0.00609	0.918	7/30/2022 11:19	500
6	PIC	6/1/2022	5/31/2023	0.6330	0.02610	0.788	7/30/2022 11:21	500
7	PIC	6/1/2022	5/31/2023	0.6336	0.00426	1.544	7/30/2022 11:19	500

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

**Spike S/N :** N/A  
**Spike Exp Date :** N/A  
**Spike Activity (dpm/ml):** N/A  
**Spike Volume Added:** N/A

\* - RPD changed to 0% due to sample & dup activity below MDA

**LCS S/N :** 1965-C  
**LCS Exp Date :** 8/5/2022  
**LCS Activity (dpm/ml):** 303.74  
**LCS Volume Added:** 0.10

Results Pos.	Decision	Critical	Required	Sample Act.		Sample Act.	Net Count	Net Count	2 SIGMA	2 SIGMA	Sample	Sample	RPD	RER	Nominal	Recovery
	Level	Level	MDA	MDA	Conc.	Error	Rate	Rate Error	Counting	Total Prop.						
1	0.3481	0.2458	1	0.5658	<b>-0.0129</b>	1152.28%	-0.0087	0.0999	0.2907	0.2908		SAMPLE				
2	1.3553	0.9569	3	2.1463	<b>0.7534</b>	83.62%	0.1620	0.1354	1.2346	1.2489		SAMPLE				
3	1.3477	0.9515	3	2.1241	<b>0.4453</b>	136.14%	0.1007	0.1370	1.1880	1.1933		SAMPLE				
4	1.1034	0.7790	3	1.8098	<b>0.6344</b>	83.08%	0.1260	0.1046	1.0325	1.0449		SAMPLE				
5	0.4990	0.3523	1	0.7865	<b>0.0796</b>	275.28%	0.0487	0.1340	0.4296	0.4301		MB				
6	0.5451	0.3848	1	0.8661	<b>0.4089</b>	63.78%	0.2120	0.1351	0.5106	0.5212	585859003.1	DUP	* 0.0%			
7	0.4834	0.3413	1	0.7437	<b>13.2676</b>	4.41%	10.8560	0.4580	1.0971	3.4913		LCS			15.1558	87.5%

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
585859003	5C	60	20	32	8/2/2022 11:24	8/2/2022 12:24	PIC	2289734
585909001	5D	60	18	60	8/2/2022 11:24	8/2/2022 12:24	PIC	2289734
585909002	6A	60	19	61	8/2/2022 11:24	8/2/2022 12:24	PIC	2289734
585909003	8C	60	15	36	8/2/2022 11:24	8/2/2022 12:24	PIC	2289734
1205139231	8D	60	22	58	8/2/2022 11:24	8/2/2022 12:24	PIC	2289734
1205139232	9D	60	13	60	8/2/2022 11:24	8/2/2022 12:24	PIC	2289734
1205139233	5B	60	30	744	8/2/2022 11:24	8/2/2022 12:24	PIC	2289734

ASSAY 2-Aug-22 11:16:05  
 Wizard 2480 s/n 46190630  
 Protocol id 9 Ba-133\_1  
 Time limit  
 Count limit  
 Isotope Ba-133\_1  
 Protocol date 8/2/2022  
 Run id. 5325

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	92	1	180	3945	1314.87	1.59	11:16:05
585859003	2	92	2	180	2696.28	898.58	1.93	68.34	11:19:19
585909001	3	92	3	180	2551.85	850.36	1.98	64.67	11:22:33
585909002	4	92	4	180	2664.57	888	1.94	67.54	11:25:47
585909003	5	92	5	180	2357	785.5	2.06	59.74	11:29:01
1205139231	1	1	1	180	2396.57	798.69	2.04	60.74	11:32:48
1205139232	2	1	2	180	2042	680.58	2.21	51.76	11:36:02
1205139233	3	1	3	180	3214.57	1071.31	1.76	81.48	11:39:16

END OF ASSAY

# **Continuing Calibration Data**

# Gas Flow Proportional Counter Checks for 02-Aug-2022

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z

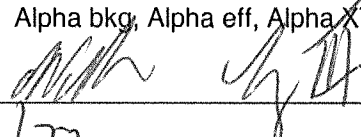
Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100A2	Above	Beta bkg	02-Aug 04:51	60	2.183	-2.15E-1	2.577	+2.15
LB4100A2	Above	Beta eff	02-Aug 07:56	5	23946	19870	23260	+4.21
LB4100E2	Above	Beta bkg	02-Aug 04:21	60	3.583	1.385	3.072	+4.82
LB4100E3	Above	Beta bkg	02-Aug 04:21	60	2.200	0.506	2.576	+1.91
LB4100F3	Above	Alpha bkg	02-Aug 04:21	60	0.317	0.119	0.404	+1.16
LB4100G1	Above	Beta bkg	02-Aug 04:21	60	433	0.380	1.675	+2,002.96
LB4100G2	Above	Alpha eff	02-Aug 05:38	5	9613	7308	9581	+3.08
LB4100G2	Below	Alpha XTalk	02-Aug 05:38	5	0.323	0.324	0.423	-3.06
LB4100G2	Above	Beta bkg	02-Aug 04:21	60	2.483	1.159	2.203	+4.61
LB4100G3	Below	Alpha eff	02-Aug 05:38	5	6587	6620	7779	-3.17
LB4100G3	Above	Beta bkg	02-Aug 04:21	60	2.233	0.810	1.674	+6.88
PIC1A	Above	Beta bkg	02-Aug 07:53	60	3.033	-7.65E-1	2.862	+3.28
PIC8A	Above	Beta bkg	02-Aug 05:11	60	2.400	-2.72E-1	2.644	+2.50
PIC8B	Above	Alpha bkg	02-Aug 05:11	60	1.083	-1.16E-1	0.388	+11.30
PIC8B	Above	Beta bkg	02-Aug 05:11	60	2.517	-1.80E-1	2.341	+3.42
PIC8B	Above	Beta eff	02-Aug 05:03	5	22131	20290	21980	+3.54
PIC12A	need 2nd	Alpha eff	02-Aug 06:28	5	9428	9234	10510	-2.09
PIC12A	Above	Alpha XTalk	02-Aug 06:28	5	0.362	0.262	0.356	+3.38
PIC12A	Below	Beta eff	02-Aug 06:40	5	32522	33010	39260	-3.47
PIC14B	Above	Beta bkg	02-Aug 10:43	60	2.683	-2.13E-1	2.672	+3.02
PIC14C	Above	Beta bkg	02-Aug 09:20	60	2.267	0.197	2.388	+2.67

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

G5400W1W	Alpha bkg, Beta bkg
G5400W1X	Alpha bkg, Beta bkg
G5400W1Y	Alpha bkg, Beta bkg
G5400W1Z	Alpha bkg, Beta bkg
LB4100C1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

LB4100C3 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
LB4100C4 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
LB4100I1 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
LB4100I2 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
LB4100I3 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
LB4100I4 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by 

Date 8/2/22

GEL Laboratories LLC

# Runlogs



# Instrument Run Log

Instrument Type: GFPC

Batch ID: 2289734

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205139231	MB	JXC9	PIC8D	AUG-02-22 11:24:22	DONE	25mm Filter	01-JUN-22 00:00
1205139232	DUP	JXC9	PIC9D	AUG-02-22 11:24:26	DONE	25mm Filter	01-JUN-22 00:00
1205139233	LCS	JXC9	PIC5B	AUG-02-22 11:24:30	DONE	25mm Filter	01-JUN-22 00:00
585859003	SAMPLE	JXC9	PIC5C	AUG-02-22 11:24:34	DONE	25mm Filter	01-JUN-22 00:00
585909001	SAMPLE	JXC9	PIC5D	AUG-02-22 11:24:37	DONE	25mm Filter	01-JUN-22 00:00
585909002	SAMPLE	JXC9	PIC6A	AUG-02-22 11:24:41	DONE	25mm Filter	01-JUN-22 00:00
585909003	SAMPLE	JXC9	PIC8C	AUG-02-22 11:24:49	DONE	25mm Filter	01-JUN-22 00:00

# Lucas Cell Raw Data

# Batch 2289697 Check-list

This check-list was completed on 09-AUG-22 by Lyndsey Pace

This batch was reviewed by Gregory Ramsay on 09-AUG-22 and Lyndsey Pace on 09-AUG-22.

**Batch ID:**  
2289697

**Product:**  
LUC26RAL

**Description:** Lucas Cell Radium 226  
GL-RAD-A-008

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
<b>Miscellaneous Information</b>				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

# Prep Logbook

## Radium-226 in Liquid

**Batch ID:** 2289697

**Analyst:** Lyndsey Pace (LXP1)

**Method:** EPA 903.1 Modified

**Lab SOP:** GL-RAD-A-008 REV# 15

**Instrument:** LUCAS-C037036045

**Due Dates for Lab:** 08-AUG-2022

**Package:** 09-AUG-2022

**SDG:** 10-AUG-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205139160	Radium-226 SPIKE	1715-G	.1	mL
MS	1205139159	Radium-226 SPIKE	1715-G	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	585859001	18-JUL-2022	5	303.95	303.95	07/28/22 09:45	804	08/03/22 05:21	08/03/22 12:30	7	59
2	585859003	18-JUL-2022	5	302.4	302.4	07/28/22 09:45	102	08/03/22 05:52	08/03/22 09:16	1	6
3	585859004	18-JUL-2022	5	301.25	301.25	07/28/22 09:45	204	08/03/22 05:52	08/03/22 09:16	3	17
4	585874001	18-JUL-2022	5	303.33	303.33	08/03/22 06:24	403	08/08/22 07:33	08/08/22 11:31	4	67
5	585874003	18-JUL-2022	5	303.89	303.89	08/03/22 06:24	505	08/08/22 07:33	08/08/22 11:31	1	93
6	585874005	18-JUL-2022	5	302.05	302.05	07/28/22 09:45	608	08/03/22 05:52	08/03/22 09:16	4	41
7	585874008	18-JUL-2022	5	300.36	300.36	07/28/22 09:45	703	08/03/22 05:52	08/03/22 09:16	6	28
8	585874013	18-JUL-2022	5	303.27	303.27	07/28/22 09:45	802	08/03/22 05:52	08/03/22 09:16	6	33
9	585909001	18-JUL-2022	1	500.83	500.83	07/28/22 09:45	107	08/03/22 06:24	08/03/22 09:50	2	25
10	585909002	18-JUL-2022	1	502.26	502.26	07/28/22 09:45	206	08/03/22 06:24	08/03/22 09:50	3	5
11	585909003	18-JUL-2022	1	503.56	503.56	07/28/22 09:45	406	08/03/22 06:24	08/03/22 09:50	4	15
12	1205139157 MB	18-JUL-2022	1		503.56	08/03/22 06:24	607	08/08/22 07:33	08/08/22 11:31	8	17
13	1205139158 DUP (585859001)	18-JUL-2022	5	305.15	305.15	07/28/22 09:45	604	08/03/22 06:24	08/03/22 09:50	1	58
14	1205139159 MS (585859001)	18-JUL-2022	5	104.78	104.78	07/28/22 09:45	705	08/03/22 06:24	08/03/22 09:49	2	939
15	1205139160 LCS	18-JUL-2022	1		503.56	08/03/22 06:24	704	08/08/22 07:33	08/08/22 12:05	5	816

Reagent/Solvent Lot ID	Description	Amount
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**Comments:**

Data Entry Date2: 18-JUL-2022 00:00

### Radium-226 Liquid

Filename : RA226.XLS  
 File type : Excel  
 Version # : 1.3.2

Procedure Code : LUC26RAL  
 Parmname : Radium-226  
 Required MDA : 1 pCi/L  
 Halflife of Ra-226 : 1600 years  
 Ra-226 Abundance : 1.00  
 Halflife of Rn-222: 3.8235 days

Batch : 2289697  
 Analyst : LIN01615  
 Prep Date : 7/18/2022  
 Ra-226 Method Uncertainty : 0.073648

Batch counted on : LUCAS CELL DETECTOR  
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Count Time (min.)	Cell Efficiency (cpm/dpm)
1	585859001.1	0.3040	1.8525E-05	7/12/2022 8:58	804	30	59	1.967	7	0.233	30	1.9050
2	585859003.1	0.3024	1.8500E-05	7/12/2022 9:53	102	30	6	0.200	1	0.033	30	1.5820
3	585859004.1	0.3013	1.8480E-05	7/12/2022 8:03	204	30	17	0.567	3	0.100	30	1.8470
4	585874001.1	0.3033	1.8515E-05	7/12/2022 13:21	403	30	67	2.233	4	0.133	30	1.6200
5	585874003.1	0.3039	1.8524E-05	7/12/2022 11:56	505	30	93	3.100	1	0.033	30	1.8130
6	585874005.1	0.3021	1.8494E-05	7/12/2022 11:41	608	30	41	1.367	4	0.133	30	1.7970
7	585874008.1	0.3004	1.8465E-05	7/12/2022 8:46	703	30	28	0.933	6	0.200	30	1.7360
8	585874013.1	0.3033	1.8514E-05	7/12/2022 10:59	802	30	33	1.100	6	0.200	30	2.0910
9	585909001.1	0.5008	2.0259E-05	7/7/2022 11:48	107	30	25	0.833	2	0.067	30	1.6990
10	585909002.1	0.5023	2.0265E-05	7/7/2022 11:48	206	30	5	0.167	3	0.100	30	1.8770
11	585909003.1	0.5036	2.0270E-05	7/7/2022 10:40	406	30	15	0.500	4	0.133	30	1.5760
12	1205139157.1	0.5036	2.0270E-05	7/18/2022 0:00	607	30	17	0.567	8	0.267	30	1.8040
13	1205139158.1	0.3052	1.8545E-05	7/12/2022 8:58	604	30	58	1.933	1	0.033	30	1.6810
14	1205139159.1	0.1048	1.1660E-05	7/12/2022 8:58	705	30	939	31.300	2	0.067	30	1.7610
15	1205139160.1	0.5036	2.0270E-05	7/18/2022 0:00	704	30	816	27.200	5	0.167	30	1.6710

Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008  
 Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrow End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
9.900%	4/1/2022	3/31/2023	7/28/2022 9:45	8/3/2022 5:21	8/3/2022 12:30	0.652	0.947	1.002	1.000
6.300%	4/28/2022	4/30/2023	7/28/2022 9:45	8/3/2022 5:52	8/3/2022 9:16	0.653	0.975	1.002	1.000
7.400%	8/1/2022	7/31/2023	7/28/2022 9:45	8/3/2022 5:52	8/3/2022 9:16	0.653	0.975	1.002	1.000
9.700%	2/1/2022	1/31/2023	8/3/2022 6:24	8/8/2022 7:33	8/8/2022 11:31	0.600	0.970	1.002	1.000
1.200%	6/1/2022	5/31/2023	8/3/2022 6:24	8/8/2022 7:33	8/8/2022 11:31	0.600	0.970	1.002	1.000
6.300%	7/1/2022	6/30/2023	7/28/2022 9:45	8/3/2022 5:52	8/3/2022 9:16	0.653	0.975	1.002	1.000
5.000%	11/1/2021	10/31/2022	7/28/2022 9:45	8/3/2022 5:52	8/3/2022 9:16	0.653	0.975	1.002	1.000
8.000%	4/1/2022	3/31/2023	7/28/2022 9:45	8/3/2022 5:52	8/3/2022 9:16	0.653	0.975	1.002	1.000
3.900%	4/28/2022	4/30/2023	7/28/2022 9:45	8/3/2022 6:24	8/3/2022 9:50	0.654	0.974	1.002	1.000
2.800%	8/1/2022	7/31/2023	7/28/2022 9:45	8/3/2022 6:24	8/3/2022 9:50	0.654	0.974	1.002	1.000
2.800%	2/1/2022	1/31/2023	7/28/2022 9:45	8/3/2022 6:24	8/3/2022 9:50	0.654	0.974	1.002	1.000
3.400%	7/1/2022	6/30/2023	8/3/2022 6:24	8/8/2022 7:33	8/8/2022 11:31	0.600	0.970	1.002	1.000
6.700%	7/1/2022	6/30/2023	7/28/2022 9:45	8/3/2022 6:24	8/3/2022 9:50	0.654	0.974	1.002	1.000
3.000%	11/1/2021	10/31/2022	7/28/2022 9:45	8/3/2022 6:24	8/3/2022 9:49	0.654	0.975	1.002	1.000
8.000%	11/1/2021	10/31/2022	8/3/2022 6:24	8/8/2022 7:33	8/8/2022 12:05	0.600	0.966	1.002	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

**Spike S/N :** 1715-G  
**Spike Exp Date :** 9/15/2022  
**Spike Activity (dpm/ml):** 297.51  
**Spike Volume Added:** 0.10

**LCS S/N :** 1715-G  
**LCS Exp Date :** 9/15/2022  
**LCS Activity (dpm/ml):** 297.51  
**LCS Volume Added:** 0.10

<b>Results</b>																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.3669	0.2590	5	0.6443	<b>2.1883</b>	18.50%	1.7333	0.2708	0.6701	0.8539		SAMPLE				
2	0.1628	0.1149	5	0.3781	<b>0.2471</b>	53.29%	0.1667	0.0882	0.2562	0.2605		SAMPLE				
3	0.2425	0.1712	5	0.4698	<b>0.5948</b>	32.79%	0.4667	0.1491	0.3724	0.3918		SAMPLE				
4	0.3468	0.2448	5	0.6475	<b>3.3149</b>	16.52%	2.1000	0.2809	0.8690	1.1753		SAMPLE				
5	0.1546	0.1092	5	0.3591	<b>4.3175</b>	10.61%	3.0667	0.3232	0.8918	1.0927		SAMPLE				
6	0.2870	0.2026	5	0.5359	<b>1.6113</b>	19.19%	1.2333	0.2236	0.5726	0.6493		SAMPLE				
7	0.3659	0.2583	5	0.6527	<b>0.9973</b>	26.97%	0.7333	0.1944	0.5181	0.5465		SAMPLE				
8	0.3009	0.2124	5	0.5366	<b>1.0064</b>	24.47%	0.9000	0.2082	0.4563	0.5042		SAMPLE				
9	0.1292	0.0912	1	0.2656	<b>0.6377</b>	22.93%	0.7667	0.1732	0.2824	0.3010		SAMPLE				
10	0.1428	0.1008	1	0.2768	<b>0.0501</b>	141.45%	0.0667	0.0943	0.1387	0.1390		SAMPLE				
11	0.1959	0.1383	1	0.3658	<b>0.3270</b>	39.73%	0.3667	0.1453	0.2540	0.2590		SAMPLE				
12	0.2653	0.1873	1	0.4599	<b>0.2562</b>	55.66%	0.3000	0.1667	0.2789	0.2819		MB				
13	0.1516	0.1070	5	0.3520	<b>2.6217</b>	15.05%	1.9000	0.2560	0.6925	0.8609	585859001.1	DUP	18.0%			
14	0.5958	0.4206	5	1.2248	<b>119.7939</b>	4.44%	31.2333	1.0225	7.6868	20.1922	585859001.1	MS			127.9020	91.9%
15	0.2274	0.1605	1	0.4136	<b>25.0269</b>	8.75%	27.0333	0.9551	1.7331	5.6084		LCS			26.6135	94.0%

# **Continuing Calibration Data**





# Ludlum Alpha Scintillation Counter Checks for 03-AUG-2022

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	07:05	1	1.24E+05	123547	2.1		
LUCAS2	EFF	07:10	1	1.35E+05	134974	2.56		
LUCAS4	EFF	07:11	1	1.29E+05	128657	2.1		
LUCAS5	EFF	07:13	1	1.33E+05	133112	2.6		
LUCAS6	EFF	07:15	1	1.31E+05	131031	0.19		
LUCAS7	EFF	12:30	1	1.34E+05	134415	2.09		
LUCAS8	EFF	07:21	1	1.32E+05	132048	1.09		

**Reviewed by:**

Lyndsey Pace

**Date:** 07-AUG-22

GEL Laboratories LLC



# Ludlum Alpha Scintillation Counter Checks for 08-AUG-2022

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	05:36	1	1.23E+05	122738	1.07		
LUCAS2	EFF	05:35	1	1.35E+05	135363	2.82		
LUCAS4	EFF	05:34	1	1.26E+05	126463	-1.49		
LUCAS5	EFF	05:30	1	1.32E+05	132007	1.4		
LUCAS6	EFF	05:29	1	1.32E+05	132489	1.75		
LUCAS7	EFF	05:27	1	1.34E+05	134468	2.15		
LUCAS8	EFF	05:23	1	1.18E+05	117926	-2.09		

**Reviewed by:**

Lyndsey Pace

**Date:** 08-AUG-22

GEL Laboratories LLC

# Runlogs

# Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2289697

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
585859003	SAMPLE	LXP1	LUCAS1	AUG-03-22 09:16:00	DONE	Lucas Cell	28-APR-22 00:00
585859004	SAMPLE	LXP1	LUCAS2	AUG-03-22 09:16:00	DONE	Lucas Cell	01-AUG-22 00:00
585874005	SAMPLE	LXP1	LUCAS6	AUG-03-22 09:16:00	DONE	Lucas Cell	01-JUL-22 00:00
585874008	SAMPLE	LXP1	LUCAS7	AUG-03-22 09:16:00	DONE	Lucas Cell	01-NOV-21 00:00
585874013	SAMPLE	LXP1	LUCAS8	AUG-03-22 09:16:00	DONE	Lucas Cell	01-APR-22 00:00
1205139159	MS	LXP1	LUCAS7	AUG-03-22 09:49:00	DONE	Lucas Cell	01-NOV-21 00:00
585909001	SAMPLE	LXP1	LUCAS1	AUG-03-22 09:50:00	DONE	Lucas Cell	28-APR-22 00:00
585909002	SAMPLE	LXP1	LUCAS2	AUG-03-22 09:50:00	DONE	Lucas Cell	01-AUG-22 00:00
585909003	SAMPLE	LXP1	LUCAS4	AUG-03-22 09:50:00	DONE	Lucas Cell	01-FEB-22 00:00
1205139158	DUP	LXP1	LUCAS6	AUG-03-22 09:50:00	DONE	Lucas Cell	01-JUL-22 00:00
585859001	SAMPLE	LXP1	LUCAS8	AUG-03-22 12:30:00	DONE	Lucas Cell	01-APR-22 00:00
585874001	SAMPLE	LXP1	LUCAS4	AUG-08-22 11:31:00	DONE	Lucas Cell	01-FEB-22 00:00
585874003	SAMPLE	LXP1	LUCAS5	AUG-08-22 11:31:00	DONE	Lucas Cell	01-JUN-22 00:00
1205139157	MB	LXP1	LUCAS6	AUG-08-22 11:31:00	DONE	Lucas Cell	01-JUL-22 00:00
1205139160	LCS	LXP1	LUCAS7	AUG-08-22 12:05:00	DONE	Lucas Cell	01-NOV-21 00:00



Environmental Laboratory  
1232 Haco Drive  
Lansing  
Michigan, 48910

**CHAIN OF CUSTODY**

Phone: (517)702-6372

Lab Work Order Number L207189

<b>Client Name</b> BWL - Erickson Station	<b>Project Name</b> Erickson AM MI Well 11B	<b>Requested Analysis</b>	<b>Requested Turn Around</b>
<b>Client Contact</b> Cheryl Louden	<b>Project Number</b> [none]		
<b>Address</b> 3725 S. Canal	<b>Project Description</b>		
<b>City</b> Lansing	<b>PO Number</b> 30926 10021		
<b>State/Zip</b> MI, 48917	<b>Shipped By</b>		
<b>Phone</b> (517) 702-6396	<b>Tracking Number</b>		
<b>Fax</b> (517) 702-6373			
<b>Sampler</b> Marc Wahrer			

Sample Name or Field ID	Sampled Date	Sampled Time	Sample Type Grab/Composite	Matrix Code	Container Count	Preservation Code								
						a	b	a	b	a	b			
MW-11B	7/7/22	1148	G	GW	5	1	1	1	1	2				
Field Dupe MW-11B		↓	G	GW	5	1	1	1	1	2				
Field Blank		↓	G	DI	5	1	1	1	1	2				

<b>Relinquished By</b> 	<b>Date/Time</b> 7/7/22 1320	<b>Received By</b> K. Keaton	<b>Date/Time</b> 7/7/22 1320	<b>Comments</b>
<b>Relinquished By</b>	<b>Date/Time</b>	<b>Received By</b>	<b>Date/Time</b>	<b>Comments</b>
<b>Relinquished By</b>	<b>Date/Time</b>	<b>Received By</b>	<b>Date/Time</b>	<b>Comments</b>
<b>Cooler Numbers and Temperatures</b>				
<b>Matrix Codes</b>				

D=Deionized Water, GW=Ground Water  
Preserv Codes: a=None, b=0.5% HNO3



## Data Verification & Validation Report

### Lansing Board of Water & Light – Erickson Power Station

**Sampling Event (dates and purpose):** New Well MW-11B Background Round 3 – July 2022

Data Package Number: S37856.01

Lab Report Date: 08/20/2022

Data Validator: Aryka Thomson

Data Validation Completion Date: 10/10/2022

General Overall Assessment:

Data are usable without qualification.

Data are usable with qualification (as noted below).

Some or all data are unusable (as noted below).

Wells planned for sampling:

Well ID	Planned for Sampling
MW-1	
MW-2	
MW-3	
MW-4	
MW-5	
MW-6	
MW-7	
MW-7B	
MW-7C	
MW-8	
MW-9	
MW-10	
MW-11	
MW-11B	X
MW-12	
MW-12B	
MW-13	

### Data Summary

Sample ID	Matrix	Lab ID	Date Collected	App III Metals	App IV Metals	Part 115 Metals	Anions	TDS TSS	Rad-226 Rad-228	Diss. Metals
MW-11B	GW	S37856.01	07/07/2022	X	X	X	X	X	X	
MW-11B Dup	QC	S37856.02	07/07/2022	X	X	X	X	X	X	

Other analytes requested for analysis: Na, Mg, K, HCO<sub>3</sub>, CO<sub>3</sub>, hardness

Any planned sampling or analysis NOT completed? If yes, explain: \_\_\_\_\_

### Data Verification & Validation Checklist

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
<b><i>Field Data</i></b>							
Sample Collection Field Forms	X		Purging performed as required in the Groundwater Monitoring Plan	X			
Field Calibration Records	X		Field instruments calibrated daily according to manufacturer specifications	X			
Chain of Custody	X		Accurately reflect samples, collection dates/times, analyses, bottles, etc.	X			
Field decontamination documentation	N/A		Record of decontamination for non-dedicated sampling equipment			X	
Drilling logs	X		N/A	-	-	-	
Well construction logs	X		N/A	-	-	-	
Well development field forms	X		N/A	-	-	-	
<b><i>Analytical Data Package</i></b>							
Cover Sheet	X		N/A	-	-	-	
Case Narrative	X		Summarizes sample receipt and any exceptions to QC acceptance criteria	X			
Internal Laboratory Chain of Custody forms	X		Analyses as requested; accurate transcription of field COC	X			
Sample Chronology and Consistency	X		Accurate representation of dates, times of receipt, preparation, and analysis	X			
Communication Records with Lab	X		N/A	-	-	-	
EDD Format Consistency	X		EDD format and content as requested	X			
Sample Identification, Results Nomenclature, and Data Qualifier Consistency	X		All included in final report	X			
Method Detection Limit Consistency	X		MDLs consistent between samples	X			
Instrument Calibration Records	X		Present and no nonconformance noted	X			
Laboratory Report Complete	X		Includes QC component	X			
Holding Times	X		Analyses performed within allowed holding time	X			

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Method	X		Method as requested	X			
Reporting Limits	X		RLs as requested		X		RLs for TDS was not met
			MDLs<RLs	X			
			MDLs<GPS			X	
<b>QC Validation</b>							
<b>Evaluate Accuracy</b>							
Matrix Spike (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Laboratory Control Sample (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
<b>Evaluate Precision</b>							
Matrix Spike Duplicate (RPD)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Field Duplicate (RPD)	X		RPD ≤ 20%		X		Rad-226+228 RPD is 47% Nickel and zinc detected in parent and ND in duplicate
<b>Evaluate Representativeness</b>							
Equipment Blanks (if applicable)	N/A		Non-detect (<RL)			X	
<b>QC Verification</b>							
<b>Verify Instrument Calibration &amp; Analytical Process</b>							
Initial Calibration Verification	X		Laboratory-determined	-	-	-	
Continuing Calibration Verification	X		Laboratory-determined	-	-	-	
Initial Calibration Blank	X		Laboratory-determined	-	-	-	
Continuing Calibration Blank	X		Laboratory-determined	-	-	-	
Serial Dilutions	X		Laboratory-determined	-	-	-	High %D for Al, As, Mo, and Zn
Post-Digestion Spikes	X		Laboratory-determined	-	-	-	
Internal Standards	X		Laboratory-determined	-	-	-	
Laboratory Duplicate (RPD)	X		Laboratory-determined	-	-	-	Laboratory duplicate for TSS outside control limits
Method Blanks	X		Laboratory-determined	-	-	-	
<b>Evaluate Completeness (# usable measurements/ # unusable measurements)</b>							
Completeness	X		100%	X			

Other instances of nonconformance to QC control limits noted on case narrative:

Rad-226 - Samples 1205139157 (MB) and 1205139160 (LCS) were degassed and recounted to verify sample results. The second counts are reported.

Comments: Rad-226, Rad-228, Rad-226/228, nickel, and zinc required qualification as estimated with high bias (J+) in the parent sample MW-11B and estimated with low bias (J-) or estimated but not detected (UJ) in the field duplicate MW-11B-Dup.





Lansing Board of Water and Light  
Environmental Services Laboratory  
1232 Haco Dr.  
Lansing, Michigan 48901

15 August 2022

BWL - Erickson Station  
Attn: Cheryl Loudon  
3725 S. Canal  
Lansing, MI 48917

**Project: Erickson AM MI**

Dear Cheryl Loudon,

Enclosed is a copy of the laboratory report for the following work order(s) received by Lansing Board of Water and Light Environmental Services Laboratory:

<b>Work Order</b>	<b>Received</b>	<b>Account Number</b>
L207215	7/13/2022 2:07:00PM	30926 10021

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in blue ink that reads "Jennifer Caporale".

Jennifer Caporale, Supervisor



Report ID: S38054.01(03)  
Generated on 08/12/2022  
Replaces report S38054.01(02) generated on 07/15/2022

Report to  
Attention: Jennifer Caporale  
Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901  
  
Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

Report produced by  
Merit Laboratories, Inc.  
2680 East Lansing Drive  
East Lansing, MI 48823  
  
Phone: (517) 332-0167 FAX: (517) 332-6333  
  
Contacts for report questions:  
John Lavery (johnlavery@meritlabs.com)  
Barbara Ball (bball@meritlabs.com)

Report Summary  
Lab Sample ID(s): S38054.01-S38054.05  
Project: Erickson AM MI New Wells 11-13  
Collected Date(s): 07/13/2022  
Submitted Date/Time: 07/13/2022 14:31  
Sampled by: Marc Wahrer  
P.O. #:

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Maya Murshak  
Technical Director



## General Report Notes

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Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile, and 2-chloroethylvinyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (\*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

## Report Narrative

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All analyses completed



### Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Alaska CSLAP	#17-001
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

### Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

### Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



## Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1 (1993)
SM2320B	Standard Method 2320 B 2011
SM2340C	Standard Method 2340 C 2011
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007



## Sample Summary (5 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S38054.01	MW-11 L207215-01	Groundwater	07/13/22 10:22
S38054.02	MW-12 L207215-02	Groundwater	07/13/22 12:58
S38054.03	MW-13 L207215-03	Groundwater	07/13/22 12:26
S38054.04	Field Dupe MW-11 L207215-04	Groundwater	07/13/22 10:22
S38054.05	Field Blank L207215-05	Water	07/13/22 08:20



# Analytical Laboratory Report

Lab Sample ID: S38054.01

Sample Tag: MW-11 L207215-01

Collected Date/Time: 07/13/2022 10:22

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.0	IR
2	1L Plastic	None	Yes	2.0	IR
1	125ml Plastic	HNO3	Yes	2.0	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	07/14/22 11:00	JRH	
Metal Digestion	Completed	SW3015A	07/14/22 10:15	CCM	

### Inorganics

Method: E300.0, Run Date: 07/14/22 09:33, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	61	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 07/14/22 13:06, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	600	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 07/14/22 13:18, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	503	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 07/13/22 17:35, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	666	50	10	mg/L	2		

Method: SM2540D, Run Date: 07/14/22 15:15, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	29	3	3	mg/L	1.00		

### Metals

Method: E200.8, Run Date: 07/14/22 11:42, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.019	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.143	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.21	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	0.005	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	22.0	0.02	0.00192	mg/L	5	7439-89-6	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S38054.01 (continued)

Sample Tag: MW-11 L207215-01

**Method: E200.8, Run Date: 07/14/22 11:42, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 07/14/22 13:27, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	134	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	38.8	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	1.31	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	38.9	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 07/14/22 15:30, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 08/08/22 12:23, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.





# Analytical Laboratory Report

Lab Sample ID: S38054.02

Sample Tag: MW-12 L207215-02

Collected Date/Time: 07/13/2022 12:58

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.0	IR
2	1L Plastic	None	Yes	2.0	IR
1	125ml Plastic	HNO3	Yes	2.0	IR
1	125ml Plastic	None	Yes	2.0	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	07/14/22 11:00	JRH	
Mercury Digestion	Completed	E245.1	07/14/22 11:00	JRH	
Metal Digestion	Completed	SW3015A	07/14/22 10:15	CCM	
Metal Digestion	Completed	SW3015A	07/14/22 10:15	CCM	

### Inorganics

Method: E300.0, Run Date: 07/14/22 09:46, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	

Method: E300.0, Run Date: 07/14/22 11:16, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	83	20	0.32	mg/L	20	16887-00-6	
Sulfate	250	20	1.2	mg/L	20	14808-79-8	

Method: SM2320B, Run Date: 07/14/22 13:10, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	670	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 07/14/22 13:20, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	566	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 07/13/22 17:35, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	1,090	50	10	mg/L	2		

Method: SM2540D, Run Date: 07/14/22 15:15, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	50	3	3	mg/L	1.33		

### Metals

Method: E200.8, Run Date: 07/14/22 11:47, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.002	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.067	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	



# Analytical Laboratory Report

Lab Sample ID: S38054.02 (continued)

Sample Tag: MW-12 L207215-02

**Method: E200.8, Run Date: 07/14/22 11:47, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Boron	0.07	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	1.82	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.022	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.017	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	0.017	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	0.007	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 07/14/22 11:50, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony, Dissolved*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	f
Arsenic, Dissolved	Not detected	0.002	0.000255	mg/L	5	7440-38-2	f
Barium, Dissolved	0.060	0.005	0.000162	mg/L	5	7440-39-3	f
Beryllium, Dissolved	Not detected	0.001	0.000215	mg/L	5	7440-41-7	f
Boron, Dissolved	0.07	0.04	0.00175	mg/L	5	7440-42-8	f
Cadmium, Dissolved	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	f
Chromium, Dissolved	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	f
Cobalt, Dissolved	Not detected	0.005	0.000108	mg/L	5	7440-48-4	f
Copper, Dissolved	Not detected	0.005	0.000377	mg/L	5	7440-50-8	f
Iron, Dissolved	0.05	0.02	0.00192	mg/L	5	7439-89-6	f
Lead, Dissolved	Not detected	0.003	0.000190	mg/L	5	7439-92-1	f
Lithium, Dissolved*	0.019	0.005	0.00163	mg/L	5	7439-93-2	f
Molybdenum, Dissolved	0.017	0.005	0.000217	mg/L	5	7439-98-7	f
Nickel, Dissolved	0.017	0.005	0.000250	mg/L	5	7440-02-0	f
Selenium, Dissolved	Not detected	0.005	0.00209	mg/L	5	7782-49-2	f
Silver, Dissolved	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	f
Thallium, Dissolved	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	f
Vanadium, Dissolved	Not detected	0.005	0.000139	mg/L	5	7440-62-2	f
Zinc, Dissolved	Not detected	0.005	0.000730	mg/L	5	7440-66-6	f

**Method: E200.8, Run Date: 07/14/22 13:29, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	147	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	56.2	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	3.30	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	171	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E200.8, Run Date: 07/14/22 13:30, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium, Dissolved*	143	0.50	0.0435	mg/L	5	7440-70-2	f
Magnesium, Dissolved	55.7	0.50	0.0120	mg/L	5	7439-95-4	f

f-Filtered and preserved in lab



# Analytical Laboratory Report

Final Report

Lab Sample ID: S38054.02 (continued)

Sample Tag: MW-12 L207215-02

**Method: E200.8, Run Date: 07/14/22 13:30, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Potassium, Dissolved	3.13	0.50	0.0230	mg/L	5	7440-09-7	f
Sodium, Dissolved	167	0.50	0.00850	mg/L	5	7440-23-5	f

**Method: E245.1, Run Date: 07/14/22 15:36, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury, Dissolved	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	f

**Method: E245.1, Run Date: 07/14/22 15:33, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 08/08/22 12:23, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

f-Filtered and preserved in lab

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Lab Sample ID: S38054.03

Sample Tag: MW-13 L207215-03

Collected Date/Time: 07/13/2022 12:26

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.0	IR
2	1L Plastic	None	Yes	2.0	IR
1	125ml Plastic	HNO3	Yes	2.0	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	07/14/22 11:00	JRH	
Metal Digestion	Completed	SW3015A	07/14/22 10:15	CCM	

### Inorganics

Method: E300.0, Run Date: 07/14/22 09:59, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	16	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	55	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 07/14/22 13:16, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	330	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 07/14/22 13:22, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	353	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 07/13/22 17:35, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	396	50	10	mg/L	2		

Method: SM2540D, Run Date: 07/14/22 15:15, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	3	mg/L	1.00		

### Metals

Method: E200.8, Run Date: 07/14/22 11:54, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.027	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.18	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.03	0.02	0.00192	mg/L	5	7439-89-6	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S38054.03 (continued)

Sample Tag: MW-13 L207215-03

**Method: E200.8, Run Date: 07/14/22 11:54, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	0.010	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 07/14/22 13:32, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	107	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	23.1	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	0.779	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	5.59	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 07/14/22 15:40, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 08/08/22 12:23, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Lab Sample ID: S38054.04

Sample Tag: Field Dupe MW-11 L207215-04

Collected Date/Time: 07/13/2022 10:22

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.0	IR
2	1L Plastic	None	Yes	2.0	IR
1	125ml Plastic	HNO3	Yes	2.0	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	07/14/22 11:00	JRH	
Metal Digestion	Completed	SW3015A	07/14/22 10:15	CCM	

### Inorganics

Method: E300.0, Run Date: 07/14/22 10:12, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	62	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 07/14/22 13:18, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	610	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 07/14/22 13:24, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	512	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 07/13/22 17:35, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	644	50	10	mg/L	2		

Method: SM2540D, Run Date: 07/14/22 15:15, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	28	3	3	mg/L	1.00		

### Metals

Method: E200.8, Run Date: 07/14/22 11:57, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.018	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.147	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.20	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	21.8	0.02	0.00192	mg/L	5	7439-89-6	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S38054.04 (continued)

Sample Tag: Field Dupe MW-11 L207215-04

**Method: E200.8, Run Date: 07/14/22 11:57, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 07/14/22 13:34, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	135	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	38.3	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	1.30	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	37.0	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 07/14/22 15:43, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 08/08/22 12:23, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Lab Sample ID: S38054.05

Sample Tag: Field Blank L207215-05

Collected Date/Time: 07/13/2022 08:20

Matrix: Water

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.0	IR
2	1L Plastic	None	Yes	2.0	IR
1	125ml Plastic	HNO3	Yes	2.0	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	07/14/22 11:00	JRH	
Metal Digestion	Completed	SW3015A	07/14/22 10:15	CCM	

### Inorganics

Method: E300.0, Run Date: 07/14/22 10:25, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	2.5	0.04	mg/L	2.5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.06	mg/L	2.5	16984-48-8	
Sulfate	Not detected	2.5	0.15	mg/L	2.5	14808-79-8	

Method: SM2320B, Run Date: 07/14/22 13:20, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	Not detected	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 07/14/22 13:26, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	Not detected	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 07/13/22 17:35, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	Not detected	50	10	mg/L	2		

Method: SM2540D, Run Date: 07/14/22 15:15, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	3	mg/L	1.00		

### Metals

Method: E200.8, Run Date: 07/14/22 11:38, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00102	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.000102	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.0000648	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.0000862	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.000702	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.0000760	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.0000386	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.0000434	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000150	mg/L	2	7440-50-8	
Iron	Not detected	0.02	0.000768	mg/L	2	7439-89-6	





# Analytical Laboratory Report

Final Report

Lab Sample ID: S38054.05 (continued)

Sample Tag: Field Blank L207215-05

**Method: E200.8, Run Date: 07/14/22 11:38, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.0000760	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000654	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.0000868	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000100	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.000838	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.0000270	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.0000342	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.0000558	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.000292	mg/L	2	7440-66-6	

**Method: E200.8, Run Date: 07/14/22 13:25, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.0174	mg/L	2	7440-70-2	
Magnesium	Not detected	0.50	0.00480	mg/L	2	7439-95-4	
Potassium	Not detected	0.50	0.00920	mg/L	2	7440-09-7	
Sodium	Not detected	0.50	0.00340	mg/L	2	7440-23-5	

**Method: E245.1, Run Date: 07/14/22 15:46, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 08/08/22 12:23, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

# Merit Laboratories Login Checklist

Lab Set ID:S38054

Attention: Jennifer Caporale  
Address: Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901

Client:BWL01 (Board of Water & Light)

Project: Erickson AM MI New Wells 11-13

Submitted:07/13/2022 14:31 Login User: MMC

Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

Selection	Description	Note
-----------	-------------	------

## Sample Receiving

- |     |  |  |
|-----|--|--|
| 01. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples are received at 4C +/- 2C Thermometer # IR 2.0 |
| 02. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Received on ice/ cooling process begun                 |
| 03. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples shipped  |
| 04. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples left in 24 hr. drop box                        |
| 05. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Are there custody seals/tape or is the drop box locked |

## Chain of Custody

- |     |  |  |
|-----|--|--|
| 06. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC adequately filled out                                      |
| 07. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC signed and relinquished to the lab                         |
| 08. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sample tag on bottles match COC                                |
| 09. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Subcontracting needed? Subcontracted to: GEL 1Z466477016175550 |

## Preservation

- |     |  |   |
|-----|--|---|
| 10. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Do sample have correct chemical preservation                      |
| 11. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Completed pH checks on preserved samples? (no VOAs)               |
| 12. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Did any samples need to be preserved in the lab? Dissolved metals |

## Bottle Conditions

- |     |  |  |
|-----|--|--|
| 13. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | All bottles intact                                     |
| 14. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Appropriate analytical bottles are used                |
| 15. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Merit bottles used                                     |
| 16. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sufficient sample volume received                      |
| 17. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples require laboratory filtration Dissolved metals |
| 18. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples submitted within holding time                  |
| 19. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Do water VOC or TOX bottles contain headspace          |

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: \_\_\_\_\_ Date: \_\_\_\_\_

# Merit Laboratories Bottle Preservation Check

Lab Set ID: S38054 Submitted: 07/13/2022 14:31

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI New Wells 11-13

Initial Preservation Check: 07/13/2022 14:56 MMC

Preservation Recheck (E200.8): N/A

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: [Environmental\\_Laboratory@LBWL.com](mailto:Environmental_Laboratory@LBWL.com)

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S38054.01	125ml Plastic HNO3	<2			
S38054.01	1L Plastic HNO3	<2			
S38054.01	1L Plastic HNO3	<2			
S38054.02	125ml Plastic HNO3	<2			
S38054.02	1L Plastic HNO3	<2			
S38054.02	1L Plastic HNO3	<2			
S38054.03	125ml Plastic HNO3	<2			
S38054.03	1L Plastic HNO3	<2			
S38054.03	1L Plastic HNO3	<2			
S38054.04	125ml Plastic HNO3	<2			
S38054.04	1L Plastic HNO3	<2			
S38054.04	1L Plastic HNO3	<2			
S38054.05	125ml Plastic HNO3	<2			
S38054.05	1L Plastic HNO3	<2			
S38054.05	1L Plastic HNO3	<2			



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 Phone (517) 332-0167 Fax (517) 332-4034  
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

**REPORT TO** **CHAIN OF CUSTODY RECORD** **INVOICE TO**

CONTACT NAME Jennifer Caporale  
 COMPANY Lansing Board of Water and Light  
 ADDRESS PO Box 13007 48901-3007  
 CITY Lansing STATE MI ZIP CODE 48901  
 PHONE NO. 517-702-6372 FAX NO. P.O. NO.  
 E-MAIL ADDRESS Environmental\_Laboratory@lbwl.com QUOTE NO.

CONTACT NAME Kelly Gleason  SAME  
 COMPANY  
 ADDRESS  
 CITY STATE ZIP CODE  
 PHONE NO. E-MAIL ADDRESS Kelly.Gleason@lbwl.com

PROJECT NO./NAME Erickson AM MI Wells 11-13 SAMPLER(S) - PLEASE PRINT/SIGN NAME Marc Wahrer

TURNAROUND TIME REQUIRED  1 DAY  2 DAYS  3 DAYS  STANDARD  OTHER ASAP  
 DELIVERABLES REQUIRED  STD  LEVEL II  LEVEL III  LEVEL IV  EDD  OTHER

MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID SL=SLUDGE DW=DRINKING WATER O=OIL WP=WPIE A=AIR W=WASTE  
 # Containers & Preservatives

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION		MATRIX	# OF BOTTLES	NONE	HCl	HNO <sub>3</sub>	H <sub>2</sub> SO <sub>4</sub>	NaOH	MeOH	OTHER	Total Metals	F- undistilled, Cl <sup>-</sup> , SO <sub>4</sub> , TDS	Radium 226	Radium 228	TSS	Dissolved Metals	HCO <sub>3</sub> , CO <sub>3</sub> , Hardness			Certifications	Project Locations	Special Instructions
	DATE	TIME																							
38054.01	7/13/22	1022	MW-11	L207215-01	GW	5	2	3						✓	✓	✓	✓	✓	✓						Metals to analyse: Na, Mg, K
.02	7/13/22	1258	MW-12	L207215-02	GW	6	3	3						✓	✓	✓	✓	✓	✓	✓					B, Ca, Sb, As, Ba, Be, Cd, Cr,
.03	7/13/22	1226	MW-13	L207215-03	GW	5	2	3						✓	✓	✓	✓	✓	✓	✓					Co, Li, Hg, Mo, Pb, Se, Tl,
.04	7/13/22	1022	Field Dupe MW-11	L207215-04	GW	5	2	3						✓	✓	✓	✓	✓	✓	✓					Fe, Cu, Ni, Ag, V, Zn
.05	7/13/22	0820	Field Blank	L207215-05	DI	5	2	3						✓	✓	✓	✓	✓	✓	✓					Please send a preliminary report
																									The analytes for dissolved metals are same metals that are analysed for total.

RELINQUISHED BY: *[Signature]* DATE 7/13/22 TIME 1431  
 RECEIVED BY: *[Signature]* DATE 7/13/22 TIME 1431  
 RELINQUISHED BY: DATE TIME  
 RECEIVED BY: DATE TIME

RELINQUISHED BY: DATE TIME  
 RECEIVED BY: DATE TIME  
 SEAL NO. SEAL INTACT YES  NO  INITIALS  
 SEAL NO. SEAL INTACT YES  NO  INITIALS  
 NOTES: TEMP. ON ARRIVAL 2.0

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

## Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.150
Be, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	2.5
Cl	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	10
Cr, total	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
F	Fluoride	250 mL plastic	mg/L	None	9056	28 d	1.0
Fe, total	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Pb, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Li, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Hg, total	Mercury	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Mo, total	Molybdenum	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
RA226/228	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	HNO3	SM 7500	6 mos	2.0 combined
Se, total	Selenium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ag, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
SO4	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	10
Tl, total	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
TDS	Total Dissolved Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TSS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540D	NA	3
V, total	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Zn, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005

August 08, 2022

John Laverty  
Merit Laboratories Inc.  
2680 East Lansing Drive  
East Lansing, Michigan 48823

Re: Routine Analysis  
Work Order: 586206  
SDG: S38054

Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on July 15, 2022. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at [www.gel.com](http://www.gel.com).

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,



Delaney Stone  
Project Manager

Purchase Order: GELP20-0018  
Enclosures



## Table of Contents

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# Case Narrative



**Receipt Narrative  
for  
Merit Laboratories, Inc.  
SDG: S38054  
Work Order: 586206**

**August 08, 2022**

**Laboratory Identification:**

GEL Laboratories LLC  
2040 Savage Road  
Charleston, South Carolina 29407  
(843) 556-8171

**Summary:**

**Sample receipt:** The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on July 15, 2022 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

**Sample Identification:** The laboratory received the following samples:

<b><u>Laboratory ID</u></b>	<b><u>Client ID</u></b>
586206001	S38054.01
586206002	S38054.02
586206003	S38054.03
586206004	S38054.04 Field Dupe
586206005	S38054.05 Field Blank

**Case Narrative:**

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.

A handwritten signature in black ink that reads "Delaney Stone". The signature is written in a cursive style with a large, looped initial 'D'.

Delaney Stone  
Project Manager

# **Chain of Custody and Supporting Documentation**

586206



2680 East Lansing Dr., East Lansing, MI 48823  
Phone (517) 332-0167 Fax (517) 332-4034  
www.meritlabs.com

C.O.C. PAGE # 1 OF 1

**REPORT TO**  
**CHAIN OF CUSTODY RECORD**  
**INVOICE TO**

**CONTACT NAME** Project Management Team  
**CONTACT NAME** Julie Teague  
**COMPANY** Merit Laboratories  
**COMPANY** Merit Laboratories  
**ADDRESS** 2680 East Lansing Drive  
**ADDRESS** 2680 East Lansing Drive  
**CITY** East Lansing  
**CITY** East Lansing  
**PHONE NO.** 517-332-0167  
**PHONE NO.** 517-332-0167  
**E-MAIL ADDRESS** results@meritlabs.com  
**E-MAIL ADDRESS** juliet@meritlabs.com  
**STATE** MI  
**STATE** MI  
**ZIP CODE** 48823  
**ZIP CODE** 48823

**PROJECT NO./NAME** S38054

**TURNAROUND TIME REQUIRED**  1 DAY  2 DAYS  3 DAYS  STANDARD  OTHER

**DELIVERABLES REQUIRED**  STD  LEVEL I  LEVEL II  LEVEL III  LEVEL IV  EDD  OTHER

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR	DATE	TIME	IDENTIFICATION-DESCRIPTION	SAMPLE TAG	MATRIX	# Containers & Preservatives											
							BOTTLES	NONE	HO	HNO <sub>3</sub>	H <sub>2</sub> SO <sub>4</sub>	NaOH	MeOH	OTHER				
	7/13/22	1022		S38054.01		GW	2		2									
	7/13/22	1258		S38054.02		GW	2		2									
	7/13/22	1226		S38054.03		GW	2		2									
	7/13/22	1022		S38054.04 Field Dupe		GW	2		2									
	7/13/22	0820		S38054.05 Field Blank		DI	2		2									

**Certifications**  
 OHIO VAP  Drinking Water  
 DoD  NFDDES  
**Project Locations**  
 Detroit  New York  
 Other  
**Special Instructions**  
 \* E903.1 Mod.  
 \*\* E904.0/SW 9320 Mod.  
 Please use calculation product & provide Radium 226/228 combined results on the report  
 (No Ice needed)  
 \*\* Subcontracted to  
 GEL Laboratories, Inc.  
 2040 Savage Road  
 Charleston, SC 29407

**RELINQUISHED BY:** SIGNATURE/ORGANIZATION: Patrick Seban WPS DATE: 7/19/22 TIME: 1700  
**RECEIVED BY:** SIGNATURE/ORGANIZATION: WPS DATE: 7/19/22 TIME: 1700  
**RELINQUISHED BY:** SIGNATURE/ORGANIZATION: Julie Teague DATE: 7/15/22 TIME: 1015  
**RECEIVED BY:** SIGNATURE/ORGANIZATION: WPS DATE: 7/15/22 TIME: 1015

**SEAL NO.** SEAL INTACT YES  NO   
**INITIALS** INITIALS  
**NOTES:** Radium 226\* Radium 228\*\*

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

**SAMPLE RECEIPT & REVIEW FORM** *DS*

Client: <u>MERI</u>		SDG/AR/COC/Work Order: <u>586206</u>	
Received By: <u>MVH</u>		Date Received: <u>7/19/22</u>	
Carrier and Tracking Number		Circle Applicable: <input checked="" type="checkbox"/> FedEx Express <input type="checkbox"/> FedEx Ground <input checked="" type="checkbox"/> UPS <input type="checkbox"/> Field Services <input type="checkbox"/> Courier <input type="checkbox"/> Other	
		<u>124669770161715550</u>	
Suspected Hazard Information		Yes	No
A) Shipped as a DOT Hazardous?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
B) Did the client designate the samples are to be received as radioactive?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
C) Did the RSO classify the samples as radioactive?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
D) Did the client designate samples are hazardous?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
E) Did the RSO identify possible hazards?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.			
Hazard Class Shipped: _____ UN#: _____		If UN2910, Is the Radioactive Shipment Survey Compliant? Yes ___ No ___	
COC notation or radioactive stickers on containers equal client designation.			
Maximum Net Counts Observed* (Observed Counts - Area Background Counts): <u>0</u> CPM / mR/Hr		Classified as: Rad 1 Rad 2 Rad 3	
COC notation or hazard labels on containers equal client designation.			
If D or E is yes, select Hazards below.			
PCB's Flammable Foreign Soil RCRA Asbestos Beryllium Other:			

Sample Receipt Criteria		Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1	Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Client contacted and provided COC COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Preservation Method: Wet Ice Ice Packs Dry ice <input checked="" type="checkbox"/> None Other: _____ *all temperatures are recorded in Celsius      TEMP: <u>22</u>
4	Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Temperature Device Serial #: <u>IR2-21</u> Secondary Temperature Device Serial # (If Applicable): _____
5	Sample containers intact and sealed?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Sample ID's and Containers Affected: _____ If Preservation added, Lot#: _____
7	Do any samples require Volatile Analysis?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	If Yes, are Encores or Soil Kits present for solids? Yes ___ No ___ NA ___ (If yes, take to VOA Freezer) Do liquid VOA vials contain acid preservation? Yes ___ No ___ NA ___ (If unknown, select No) Are liquid VOA vials free of headspace? Yes ___ No ___ NA ___ Sample ID's and containers affected: _____
8	Samples received within holding time?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	ID's and tests affected: _____
9	Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	ID's and containers affected: _____
10	Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: No dates on containers No times on containers COC missing info Other (describe)
11	Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: No container count on COC Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
13	COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Not relinquished Other (describe)

Comments (Use Continuation Form if needed):

PM (or PMA) review: Initials HM Date 7/19/22 Page 1 of 1

# **Laboratory Certifications**

**List of current GEL Certifications as of 08 August 2022**

<b>State</b>	<b>Certification</b>
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122022-5
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2019-165
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122021-36
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

# **Radiological Analysis**



# Case Narrative

**Radiochemistry  
Technical Case Narrative  
Merit Laboratories, Inc.  
SDG #: S38054  
Work Order #: 586206**

**Product: GFPC Ra228, Liquid**

**Analytical Method:** EPA 904.0/SW846 9320 Modified

**Analytical Procedure:** GL-RAD-A-063 REV# 5

**Analytical Batch:** 2290962

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
586206001	S38054.01
586206002	S38054.02
586206003	S38054.03
586206004	S38054.04 Field Dupe
586206005	S38054.05 Field Blank
1205141711	Method Blank (MB)
1205141712	586206001(S38054.01) Sample Duplicate (DUP)
1205141713	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

**Product: Lucas Cell, Ra226, Liquid**

**Analytical Method:** EPA 903.1 Modified

**Analytical Procedure:** GL-RAD-A-008 REV# 15

**Analytical Batch:** 2290885

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
586206001	S38054.01
586206002	S38054.02
586206003	S38054.03
586206004	S38054.04 Field Dupe
586206005	S38054.05 Field Blank
1205141535	Method Blank (MB)
1205141536	586206001(S38054.01) Sample Duplicate (DUP)
1205141537	586206001(S38054.01) Matrix Spike (MS)
1205141538	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

**Quality Control (QC) Information**

**Method Blank Criteria**

The blank result (See Below) is greater than the MDC but less than the required detection limit.

Sample	Analyte	Value
1205141535 (MB)	Radium-226	Result: 0.367 pCi/L > MDA: 0.271 pCi/L <= RDL: 1.00 pCi/L

**Certification Statement**

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

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### Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S38054 GEL Work Order: 586206

#### The Qualifiers in this report are defined as follows:

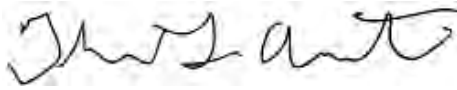
- \* A quality control analyte recovery is outside of specified acceptance criteria
- \*\* Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

#### Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature:



Name: Theresa Austin

Date: 12 AUG 2022

Title: Group Leader

# Sample Data Summary

# GEL LABORATORIES LLC

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## Certificate of Analysis

Report Date: August 12, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

Client Sample ID: S38054.01	Project: MERI00120
Sample ID: 586206001	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 13-JUL-22 10:22	
Receive Date: 15-JUL-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	0.925	+/-1.01	1.69	3.00	pCi/L			JXC9	08/08/22	0845	2290962	1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		1.25	+/-1.04			pCi/L			NXL1	08/08/22	1223	2290963	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226	U	0.325	+/-0.237	0.333	1.00	pCi/L			LXP1	08/04/22	0748	2290885	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			72.2	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

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## Certificate of Analysis

Report Date: August 12, 2022

Company : Merit Laboratories Inc.  
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery  
Project: Routine Analysis

Client Sample ID: S38054.02      Project: MERI00120  
Sample ID: 586206002      Client ID: MERI001  
Matrix: Ground Water  
Collect Date: 13-JUL-22 12:58  
Receive Date: 15-JUL-22  
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	1.23	+/-1.15	1.86	3.00	pCi/L			JXC9	08/08/22	0845	2290962	1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		1.63	+/-1.17			pCi/L			NXL1	08/08/22	1223	2290963	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.394	+/-0.244	0.333	1.00	pCi/L			LXP1	08/04/22	0748	2290885	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			62.9	(15%-125%)

### Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor      Lc/LC: Critical Level  
DL: Detection Limit      PF: Prep Factor  
MDA: Minimum Detectable Activity      RL: Reporting Limit  
MDC: Minimum Detectable Concentration      SQL: Sample Quantitation Limit

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## Certificate of Analysis

Report Date: August 12, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

Client Sample ID: S38054.03	Project: MERI00120
Sample ID: 586206003	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 13-JUL-22 12:26	
Receive Date: 15-JUL-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	1.35	+/-1.14	1.79	3.00	pCi/L		JXC9	08/08/22	0845	2290962	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.64	+/-1.16			pCi/L		NXL1	08/08/22	1223	2290963	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.291	+/-0.201	0.254	1.00	pCi/L		LXP1	08/04/22	0748	2290885	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			53.9	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit



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## Certificate of Analysis

Report Date: August 12, 2022

Company : Merit Laboratories Inc.  
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery  
Project: Routine Analysis

Client Sample ID: S38054.04 Field Dupe  
Sample ID: 586206004  
Matrix: Ground Water  
Collect Date: 13-JUL-22 10:22  
Receive Date: 15-JUL-22  
Collector: Client

Project: MERI00120  
Client ID: MERI001

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.383	+/-1.29	2.35	3.00	pCi/L			JXC9	08/08/22	0845 2290962	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.33	+/-1.33			pCi/L			NXL1	08/08/22	1223 2290963	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.942	+/-0.313	0.261	1.00	pCi/L			LXP1	08/04/22	0748 2290885	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			55.4	(15%-125%)

### Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor  
DL: Detection Limit  
MDA: Minimum Detectable Activity  
MDC: Minimum Detectable Concentration

Lc/LC: Critical Level  
PF: Prep Factor  
RL: Reporting Limit  
SQL: Sample Quantitation Limit

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## Certificate of Analysis

Report Date: August 12, 2022

Company : Merit Laboratories Inc.  
Address : 2680 East Lansing Drive  
  
East Lansing, Michigan 48823  
Contact: John Lavery  
Project: Routine Analysis

Client Sample ID: S38054.05 Field Blank  
Sample ID: 586206005  
Matrix: Ground Water  
Collect Date: 13-JUL-22 08:20  
Receive Date: 15-JUL-22  
Collector: Client  
Project: MERI00120  
Client ID: MERI001

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	-0.749	+/-1.12	2.35	3.00	pCi/L			JXC9	08/08/22	0845 2290962	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.638	+/-1.15			pCi/L			NXL1	08/08/22	1223 2290963	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.638	+/-0.258	0.226	1.00	pCi/L			LXP1	08/04/22	0748 2290885	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			53.8	(15%-125%)

### Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor  
DL: Detection Limit  
MDA: Minimum Detectable Activity  
MDC: Minimum Detectable Concentration  
Lc/LC: Critical Level  
PF: Prep Factor  
RL: Reporting Limit  
SQL: Sample Quantitation Limit

# Quality Control Summary

# GEL LABORATORIES LLC

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## QC Summary

Report Date: August 12, 2022

Page 1 of 2

**Merit Laboratories Inc.**  
**2680 East Lansing Drive**  
**East Lansing, Michigan**

**Contact: John Laverty**

**Workorder: 586206**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Rad Gas Flow</b>											
Batch	2290962										
QC1205141712	586206001	DUP									
Radium-228	U	0.925	U	1.31	pCi/L	N/A		N/A	JXC9	08/08/22	08:44
	Uncertainty	+/-1.01		+/-1.54							
QC1205141713	LCS										
Radium-228	45.0			48.4	pCi/L		108	(75%-125%)		08/08/22	08:44
	Uncertainty			+/-4.41							
QC1205141711	MB										
Radium-228			U	1.37	pCi/L					08/08/22	08:44
	Uncertainty			+/-1.42							
<b>Rad Ra-226</b>											
Batch	2290885										
QC1205141536	586206001	DUP									
Radium-226	U	0.325		0.385	pCi/L	17		(0% - 100%)	LXP1	08/04/22	07:48
	Uncertainty	+/-0.237		+/-0.197							
QC1205141538	LCS										
Radium-226	26.5			20.6	pCi/L		77.6	(75%-125%)		08/04/22	08:20
	Uncertainty			+/-1.35							
QC1205141535	MB										
Radium-226				0.367	pCi/L					08/04/22	07:48
	Uncertainty			+/-0.220							
QC1205141537	586206001	MS									
Radium-226	266 U	0.325		219	pCi/L		82.4	(75%-125%)		08/04/22	08:20
	Uncertainty	+/-0.237		+/-10.7							

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- \*\* Analyte is a Tracer compound
- < Result is less than value reported
- > Result is greater than value reported
- BD Results are either below the MDC or tracer recovery is low
- FA Failed analysis.
- H Analytical holding time was exceeded

# GEL LABORATORIES LLC

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## QC Summary

Workorder: 586206

Page 2 of 2

Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
J											
J											
K											
L											
M											
M											
N/A											
N1											
ND											
NJ											
Q											
R											
U											
UI											
UJ											
UL											
X											
Y											
^											
h											

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where the duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

\* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

# Gas Flow Raw Data

# Batch 2290962 Check-list

This check-list was completed on 08-AUG-22 by Rhonda Birch

This batch was reviewed by Kenshalla Oston on 08-AUG-22 and Rhonda Birch on 08-AUG-22.

**Batch ID:**  
2290962

**Product:**  
GFC28RAL

**Description:** Gas Flow Radium 228  
GL-RAD-A-063

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
11	Has the method required detection limit been met?	Yes		
<b>Miscellaneous Information</b>				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

# Prep Logbook

## Radium-228 in Liquid

**Batch ID:** 2290962

**Analyst:** Jasmine Conley (JXC9)

**Method:** EPA 904.0/SW846 9320 Modified

**Lab SOP:** GL-RAD-A-063 REV# 5

**Instrument:** LUCAS-C037036045

**Due Dates for Lab:** 09-AUG-2022

**Package:** 11-AUG-2022

**SDG:** 12-AUG-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205141713	Radium-228	1965-C	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	586206001	20-JUL-2022	3	300.34	300.34	07/22/22 14:45	08/08/22 07:00
2	586206002	20-JUL-2022	3	301.44	301.44	07/22/22 14:45	08/08/22 07:00
3	586206003	20-JUL-2022	3	301.76	301.76	07/22/22 14:45	08/08/22 07:00
4	586206004	20-JUL-2022	3	300.12	300.12	07/22/22 14:45	08/08/22 07:00
5	586206005	20-JUL-2022	3	304.05	304.05	07/22/22 14:45	08/08/22 07:00
6	1205141711 MB	20-JUL-2022	3		304.05	07/22/22 14:45	08/08/22 07:00
7	1205141712 DUP (586206001)	20-JUL-2022	3	302.67	302.67	07/22/22 14:45	08/08/22 07:00
8	1205141713 LCS	20-JUL-2022	3		304.05	07/22/22 14:45	08/08/22 07:00

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1951-C	Barium-133	.1 mL	Pipet Id: RAD-GFC-1795419 Data Entry Date2: 20-JUL-2022 00:00
REGNT 3413388	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3413919	RGF-50% Potassium Carbonate	2 mL	
REGNT 3418276.6	29M HF (48-50%)	4 mL	
REGNT 3424084.4	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	
REGNT 3424228	RGF-Neodymium Substrate	5 mL	
REGNT 3426198	2M HCl	20 mL	
REGNT 3450331	RGF-1.5M Ammonium Sulfate	10 mL	
REGNT 3454293	Barium Carrier Ra228 REG	1 mL	
REGNT 3454370.1	Nitric Acid	5 mL	
REGNT 3455703	RGF-7M Nitric Acid	25 mL	
REGNT 3461476	RGF-1M Citric Acid	5 mL	
REGNT DGA0035	2281828	2 g	



### Radium-228 Liquid

Filename : RA228.XLS  
 File type : Excel  
 Version # : 1.4.2

Tracer S/N : 1951-C  
 Tracer Exp Date : 9/16/2022  
 Tracer Volume Added: 0.10

Batch : 2290962  
 Analyst : JAS02031  
 Prep Date : 7/20/2022  
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL  
 Parmname : Radium-228  
 Required MDA : 3 pCi/L  
 Ra-228 Abundance : 1.00  
 Halflife of Ra-228 : 5.75 years  
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	586206001.1	0.3003	1.8465E-05	7/13/2022 10:22	1189.8	1.67%	858.6	1.97%	0.1	0.000200
2	586206002.1	0.3014	1.8483E-05	7/13/2022 12:58	1189.8	1.67%	748.8	2.11%	0.1	0.000200
3	586206003.1	0.3018	1.8489E-05	7/13/2022 12:26	1189.8	1.67%	641.5	2.28%	0.1	0.000200
4	586206004.1	0.3001	1.8461E-05	7/13/2022 10:22	1189.8	1.67%	659.5	2.25%	0.1	0.000200
5	586206005.1	0.3041	1.8527E-05	7/13/2022 8:20	1189.8	1.67%	640.5	2.28%	0.1	0.000200
6	1205141711.1	0.3041	1.8527E-05	7/20/2022 0:00	1189.8	1.67%	662.3	2.24%	0.1	0.000200
7	1205141712.1	0.3027	1.8504E-05	7/13/2022 10:22	1189.8	1.67%	609.9	2.34%	0.1	0.000200
8	1205141713.1	0.3041	1.8527E-05	7/20/2022 0:00	1189.8	1.67%	642.4	2.28%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063  
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated	Sample
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction	Recovery %	Recovery Error %
			Alpha	Beta										
1	7B	60	17	51	0.850	8/8/2022 8:45	7/22/2022 14:45	8/8/2022 7:00	0.991	0.821	1.000	1.057	72.2%	1.32%
2	7D	60	23	49	0.817	8/8/2022 8:45	7/22/2022 14:45	8/8/2022 7:00	0.992	0.821	1.000	1.057	62.9%	1.37%
3	8A	60	24	37	0.617	8/8/2022 8:45	7/22/2022 14:45	8/8/2022 7:00	0.991	0.821	1.000	1.057	53.9%	1.44%
4	9A	60	19	48	0.800	8/8/2022 8:45	7/22/2022 14:45	8/8/2022 7:00	0.991	0.821	1.000	1.057	55.4%	1.43%
5	9B	60	19	34	0.567	8/8/2022 8:45	7/22/2022 14:45	8/8/2022 7:00	0.991	0.820	1.000	1.057	53.8%	1.44%
6	9C	60	18	58	0.967	8/8/2022 8:44	7/22/2022 14:45	8/8/2022 7:00	0.994	0.822	1.000	1.057	55.7%	1.43%
7	9D	60	22	60	1.000	8/8/2022 8:44	7/22/2022 14:45	8/8/2022 7:00	0.991	0.822	1.000	1.057	51.3%	1.46%
8	7C	60	28	588	9.800	8/8/2022 8:44	7/22/2022 14:45	8/8/2022 7:00	0.994	0.821	1.000	1.057	54.0%	1.44%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2022	5/31/2023	0.6366	0.00627	0.632	8/6/2022 11:23	1000
2	PIC	6/1/2022	5/31/2023	0.6270	0.01113	0.566	8/6/2022 11:23	1000
3	PIC	6/1/2022	5/31/2023	0.6398	0.01579	0.376	8/5/2022 18:47	1000
4	PIC	6/1/2022	5/31/2023	0.6336	0.00758	0.731	8/6/2022 11:23	1000
5	PIC	6/1/2022	5/31/2023	0.6318	0.00754	0.699	8/6/2022 11:23	1000
6	PIC	6/1/2022	5/31/2023	0.6184	0.00584	0.720	8/6/2022 11:23	1000
7	PIC	6/1/2022	5/31/2023	0.6330	0.02610	0.780	8/6/2022 11:23	1000
8	PIC	6/1/2022	5/31/2023	0.6407	0.00790	1.079	8/6/2022 11:23	1000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

**Spike S/N :** N/A  
**Spike Exp Date :** N/A  
**Spike Activity (dpm/ml):** N/A  
**Spike Volume Added:** N/A

\* - RPD changed to 0% due to sample & dup activity below MDA

**LCS S/N :** 1965-C  
**LCS Exp Date :** 8/5/2022  
**LCS Activity (dpm/ml):** 303.54  
**LCS Volume Added:** 0.10

Results																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	1.0442	0.7372	3	1.6865	<b>0.9246</b>	55.82%	0.2180	0.1216	1.0113	1.0374		SAMPLE				
2	1.1463	0.8093	3	1.8645	<b>1.2332</b>	47.53%	0.2507	0.1191	1.1481	1.1891		SAMPLE				
3	1.0679	0.7539	3	1.7890	<b>1.3533</b>	42.94%	0.2407	0.1032	1.1376	1.1877		SAMPLE				
4	1.4707	1.0384	3	2.3544	<b>0.3833</b>	171.88%	0.0690	0.1186	1.2911	1.2947		SAMPLE				
5	1.4662	1.0351	3	2.3534	<b>-0.7494</b>	76.12%	-0.1323	0.1007	1.1178	1.1181		SAMPLE				
6	1.4644	1.0339	3	2.3464	<b>1.3746</b>	52.62%	0.2467	0.1297	1.4170	1.4582		MB				
7	1.6284	1.1496	3	2.5969	<b>1.3098</b>	60.11%	0.2200	0.1321	1.5413	1.5772	586206001.1	DUP	* 0.0%			
8	1.7847	1.2600	3	2.7974	<b>48.3828</b>	4.93%	8.7210	0.4055	4.4091	12.9018		LCS			44.9696	107.6%

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
586206001	7B	60	17	51	8/8/2022 8:45	8/8/2022 9:45	PIC	2290962
586206002	7D	60	23	49	8/8/2022 8:45	8/8/2022 9:45	PIC	2290962
586206003	8A	60	24	37	8/8/2022 8:45	8/8/2022 9:45	PIC	2290962
586206004	9A	60	19	48	8/8/2022 8:45	8/8/2022 9:45	PIC	2290962
586206005	9B	60	19	34	8/8/2022 8:45	8/8/2022 9:45	PIC	2290962
1205141711	9C	60	18	58	8/8/2022 8:44	8/8/2022 9:44	PIC	2290962
1205141712	9D	60	22	60	8/8/2022 8:44	8/8/2022 9:44	PIC	2290962
1205141713	7C	60	28	588	8/8/2022 8:44	8/8/2022 9:44	PIC	2290962

ASSAY 8-Aug-22 8:10:59  
 Wizard 2480 s/n 46190630  
 Protocol id 9 Ba-133\_1  
 Time limit  
 Count limit  
 Isotope Ba-133\_1  
 Protocol date 8/8/2022  
 Run id. 5342

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	92	1	180	3570	1189.77	1.67	08:10:59
586206001	2	92	2	180	2576.28	858.59	1.97	72.16	08:14:13
586206002	3	92	3	180	2247	748.84	2.11	62.94	08:17:27
586206003	4	92	4	180	1925	641.53	2.28	53.92	08:20:40
586206004	5	92	5	180	1979	659.52	2.25	55.43	08:23:54
586206005	1	3	1	180	1922	640.53	2.28	53.84	08:27:32
1205141711	2	3	2	180	1987.28	662.28	2.24	55.66	08:30:46
1205141712	3	3	3	180	1830	609.87	2.34	51.26	08:34:00
1205141713	4	3	4	180	1927.57	642.44	2.28	54.00	08:37:13

END OF ASSAY

# **Continuing Calibration Data**

# Gas Flow Proportional Counter Checks for 08-Aug-2022

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100A1	Above	Alpha bkg	08-Aug 08:05	60	0.167	-3.20E-2	0.137	+4.05
LB4100A1	Missing	Alpha eff	08-Aug 07:03	5	8109	7456	10530	-1.73
LB4100A1	Missing	Alpha XTalk	08-Aug 07:03	5	0.364	0.330	0.364	+3.08
LB4100A1	Missing	Beta eff	08-Aug 07:22	5	22972	18560	28110	-0.23
LB4100A1	Missing	Beta XTalk	08-Aug 07:22	5	4.33E-4	2.13E-4	5.73E-4	+0.66
LB4100A2	Missing	Alpha eff	08-Aug 07:03	5	9049	7607	11950	-1.01
LB4100A2	Missing	Alpha XTalk	08-Aug 07:03	5	0.398	0.249	0.419	+2.28
LB4100A2	Above	Beta bkg	08-Aug 08:05	60	2.383	-2.15E-1	2.577	+2.58
LB4100A2	Missing	Beta eff	08-Aug 07:22	5	23631	19870	23260	+3.66
LB4100A2	Missing	Beta XTalk	08-Aug 07:22	5	3.22E-4	8.02E-5	5.15E-4	+0.33
LB4100A3	Missing	Alpha eff	08-Aug 07:03	5	8014	6725	9536	-0.25
LB4100A3	Missing	Alpha XTalk	08-Aug 07:03	5	0.317	0.206	0.348	+1.69
LB4100A3	Missing	Beta eff	08-Aug 07:22	5	21104	18490	23930	-0.12
LB4100A3	Missing	Beta XTalk	08-Aug 07:22	5	2.35E-4	6.39E-5	4.56E-4	-0.37
LB4100E2	Above	Beta bkg	08-Aug 04:50	60	2.983	1.385	3.072	+2.68
LB4100E3	Above	Beta bkg	08-Aug 04:50	60	2.450	0.506	2.576	+2.63
LB4100E3	need 2nd	Beta eff	08-Aug 05:56	5	14502	14210	15500	-1.64
LB4100E4	need 2nd	Beta eff	08-Aug 05:56	5	17109	16550	18500	-1.28
LB4100F3	Above	Alpha bkg	08-Aug 04:50	60	0.333	0.119	0.404	+1.51
LB4100G1	Above	Alpha XTalk	08-Aug 05:56	5	0.453	0.088	0.447	+3.10
LB4100G1	Above	Beta bkg	08-Aug 04:51	60	8432	0.380	1.675	+39,066.45
LB4100G3	Below	Alpha eff	08-Aug 05:56	5	6263	6620	7779	-4.85
LB4100G3	Above	Alpha XTalk	08-Aug 05:56	5	0.378	0.309	0.375	+3.32
LB4100G3	Above	Beta bkg	08-Aug 04:51	60	1.983	0.810	1.674	+5.15
PIC6C	Above	Beta bkg	08-Aug 05:19	60	2.917	0.415	2.299	+4.97
PIC8B	Above	Alpha bkg	08-Aug 05:28	60	0.417	-1.16E-1	0.388	+3.35
PIC8B	Above	Beta bkg	08-Aug 05:28	60	2.467	-1.80E-1	2.341	+3.30
PIC12C	Above	Alpha bkg	08-Aug 11:43	60	0.367	-6.64E-2	0.384	+2.77

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system



LB4100C1 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
LB4100C2 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
LB4100C3 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
LB4100C4 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
LB4100I1 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
LB4100I2 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
LB4100I3 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
LB4100I4 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by 

Date 8/8/22

GEL Laboratories LLC

# Runlogs

# Instrument Run Log

Instrument Type: GFPC

Batch ID: 2290962

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205141711	MB	JXC9	PIC9C	AUG-08-22 08:44:28	DONE	25mm Filter	01-JUN-22 00:00
1205141712	DUP	JXC9	PIC9D	AUG-08-22 08:44:36	DONE	25mm Filter	01-JUN-22 00:00
1205141713	LCS	JXC9	PIC7C	AUG-08-22 08:44:43	DONE	25mm Filter	01-JUN-22 00:00
586206001	SAMPLE	JXC9	PIC7B	AUG-08-22 08:45:02	DONE	25mm Filter	01-JUN-22 00:00
586206002	SAMPLE	JXC9	PIC7D	AUG-08-22 08:45:05	DONE	25mm Filter	01-JUN-22 00:00
586206003	SAMPLE	JXC9	PIC8A	AUG-08-22 08:45:14	DONE	25mm Filter	01-JUN-22 00:00
586206004	SAMPLE	JXC9	PIC9A	AUG-08-22 08:45:17	DONE	25mm Filter	01-JUN-22 00:00
586206005	SAMPLE	JXC9	PIC9B	AUG-08-22 08:45:24	DONE	25mm Filter	01-JUN-22 00:00

# Lucas Cell Raw Data

# Batch 2290885 Check-list

This check-list was completed on 04-AUG-22 by Elizabeth Krouse

This batch was reviewed by Elizabeth Krouse on 04-AUG-22 and Gregory Ramsay on 05-AUG-22.

**Batch ID:**  
2290885

**Product:**  
LUC26RAL

**Description:** Lucas Cell Radium 226  
GL-RAD-A-008

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?		No	
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
<b>Miscellaneous Information</b>				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

# Prep Logbook

## Radium-226 in Liquid

**Batch ID:** 2290885  
**Analyst:** Lyndsey Pace (LXP1)  
**Method:** EPA 903.1 Modified  
**Lab SOP:** GL-RAD-A-008 REV# 15  
**Instrument:** LUCAS-C037036045

Due Dates for Lab: 09-AUG-2022			Package: 11-AUG-2022	SDG: 12-AUG-2022		
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205141538	Radium-226 SPIKE	1715-G	.1	mL	
MS	1205141537	Radium-226 SPIKE	1715-G	.2	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	586206001	20-JUL-2022	1	501.86	501.86	07/28/22 06:10	108	08/04/22 04:45	08/04/22 07:48	4	16
2	586206002	20-JUL-2022	1	505.67	505.67	07/28/22 06:10	202	08/04/22 04:45	08/04/22 07:48	6	23
3	586206003	20-JUL-2022	1	503.46	503.46	07/28/22 06:10	401	08/04/22 04:45	08/04/22 07:48	2	13
4	586206004	20-JUL-2022	1	500.96	500.96	07/28/22 06:10	501	08/04/22 04:45	08/04/22 07:48	3	43
5	586206005	20-JUL-2022	1	504.62	504.62	07/28/22 06:10	607	08/04/22 04:45	08/04/22 07:48	2	29
6	1205141535 MB	20-JUL-2022	1		505.67	07/28/22 06:10	703	08/04/22 04:45	08/04/22 07:48	3	18
7	1205141536 DUP (586206001)	20-JUL-2022	1	501.92	501.92	07/28/22 06:10	803	08/04/22 04:45	08/04/22 07:48	2	20
8	1205141537 MS (586206001)	20-JUL-2022	1	100.8	100.8	07/28/22 06:10	101	08/04/22 05:22	08/04/22 08:20	2	1621
9	1205141538 LCS	20-JUL-2022	1		505.67	07/28/22 06:10	204	08/04/22 05:22	08/04/22 08:20	5	901

Reagent/Solvent Lot ID	Description	Amount	Comments:
			Data Entry Date2: 20-JUL-2022 00:00

### Radium-226 Liquid

Filename : RA226.XLS  
 File type : Excel  
 Version # : 1.3.2

Procedure Code : LUC26RAL  
 Parmname : Radium-226  
 Required MDA : 1 pCi/L  
 Halflife of Ra-226 : 1600 years  
 Ra-226 Abundance : 1.00  
 Halflife of Rn-222 : 3.8235 days

Batch : 2290885  
 Analyst : LIN01615  
 Prep Date : 7/20/2022  
 Ra-226 Method Uncertainty : 0.073648

Batch counted on : LUCAS CELL DETECTOR  
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Count Time (min.)	Cell Efficiency (cpm/dpm)
1	586206001.1	0.5019	2.0263E-05	7/13/2022 10:22	108	30	16	0.533	4	0.133	30	1.5830
2	586206002.1	0.5057	2.0279E-05	7/13/2022 12:58	202	30	23	0.767	6	0.200	30	1.8360
3	586206003.1	0.5035	2.0270E-05	7/13/2022 12:26	401	30	13	0.433	2	0.067	30	1.6120
4	586206004.1	0.5010	2.0260E-05	7/13/2022 10:22	501	30	43	1.433	3	0.100	30	1.8220
5	586206005.1	0.5046	2.0275E-05	7/13/2022 8:20	607	30	29	0.967	2	0.067	30	1.8040
6	1205141535.1	0.5057	2.0279E-05	7/20/2022 0:00	703	30	18	0.600	3	0.100	30	1.7360
7	1205141536.1	0.5019	2.0264E-05	7/13/2022 10:22	803	30	20	0.667	2	0.067	30	2.0020
8	1205141537.1	0.1008	1.1419E-05	7/13/2022 10:22	101	30	1621	54.033	2	0.067	30	1.5720
9	1205141538.1	0.5057	2.0279E-05	7/20/2022 0:00	204	30	901	30.033	5	0.167	30	1.8470

Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

**Analytical SOP:** GL-RAD-A-008  
**Instrument SOP:** GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrowth End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
2.800%	4/28/2022	4/30/2023	7/28/2022 6:10	8/4/2022 4:45	8/4/2022 7:48	0.716	0.977	1.002	1.000
5.100%	8/1/2022	7/31/2023	7/28/2022 6:10	8/4/2022 4:45	8/4/2022 7:48	0.716	0.977	1.002	1.000
8.100%	2/1/2022	1/31/2023	7/28/2022 6:10	8/4/2022 4:45	8/4/2022 7:48	0.716	0.977	1.002	1.000
7.900%	6/1/2022	5/31/2023	7/28/2022 6:10	8/4/2022 4:45	8/4/2022 7:48	0.716	0.977	1.002	1.000
3.400%	7/1/2022	6/30/2023	7/28/2022 6:10	8/4/2022 4:45	8/4/2022 7:48	0.716	0.977	1.002	1.000
5.000%	11/1/2021	10/31/2022	7/28/2022 6:10	8/4/2022 4:45	8/4/2022 7:48	0.716	0.977	1.002	1.000
7.300%	4/1/2022	3/31/2023	7/28/2022 6:10	8/4/2022 4:45	8/4/2022 7:48	0.716	0.977	1.002	1.000
1.200%	4/28/2022	4/30/2023	7/28/2022 6:10	8/4/2022 5:22	8/4/2022 8:20	0.717	0.978	1.002	1.000
7.400%	8/1/2022	7/31/2023	7/28/2022 6:10	8/4/2022 5:22	8/4/2022 8:20	0.717	0.978	1.002	1.000



Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

**Spike S/N :** 1715-G  
**Spike Exp Date :** 9/15/2022  
**Spike Activity (dpm/ml):** 297.51  
**Spike Volume Added:** 0.20

**LCS S/N :** 1715-G  
**LCS Exp Date :** 9/15/2022  
**LCS Activity (dpm/ml):** 297.51  
**LCS Volume Added:** 0.10

<b>Results</b>																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.1784	0.1259	1	0.3331	<b>0.3248</b>	37.37%	0.4000	0.1491	0.2373	0.2425		SAMPLE				
2	0.1870	0.1320	1	0.3335	<b>0.3938</b>	32.09%	0.5667	0.1795	0.2445	0.2541		SAMPLE				
3	0.1235	0.0872	1	0.2538	<b>0.2915</b>	36.13%	0.3667	0.1291	0.2011	0.2106		SAMPLE				
4	0.1345	0.0949	1	0.2605	<b>0.9424</b>	18.71%	1.3333	0.2261	0.3132	0.3713		SAMPLE				
5	0.1101	0.0777	1	0.2263	<b>0.6378</b>	20.90%	0.9000	0.1856	0.2578	0.2770		SAMPLE				
6	0.1398	0.0987	1	0.2709	<b>0.3675</b>	30.96%	0.5000	0.1528	0.2200	0.2292		MB				
7	0.0997	0.0704	1	0.2050	<b>0.3852</b>	27.06%	0.6000	0.1563	0.1967	0.2117	586206001.1	DUP	17.0%			
8	0.6309	0.4454	1	1.2969	<b>219.1737</b>	2.76%	53.9667	1.3429	10.6895	33.7904	586206001.1	MS			265.9038	82.4%
9	0.1692	0.1195	1	0.3079	<b>20.5790</b>	8.13%	29.8667	1.0033	1.3550	4.4237		LCS			26.5024	77.6%

# **Continuing Calibration Data**



# Ludlum Alpha Scintillation Counter Checks for 04-AUG-2022

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	04:52	1	1.23E+05	122617	0.91		
LUCAS2	EFF	05:04	1	1.36E+05	135502	2.91		
LUCAS4	EFF	05:07	1	1.28E+05	128427	1.72		
LUCAS5	EFF	05:36	1	1.33E+05	132958	2.43		
LUCAS6	EFF	05:14	1	1.32E+05	132387	1.64		
LUCAS7	EFF	06:23	1	1.35E+05	135265	2.94		
LUCAS8	EFF	05:26	1	1.34E+05	134007	1.53		

**Reviewed by:**

Elizabeth Krouse

**Date:** 04-AUG-22

GEL Laboratories LLC

# Runlogs

# Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2290885

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
586206001	SAMPLE	LXP1	LUCAS1	AUG-04-22 07:48:00	DONE	Lucas Cell	28-APR-22 00:00
586206002	SAMPLE	LXP1	LUCAS2	AUG-04-22 07:48:00	DONE	Lucas Cell	01-AUG-22 00:00
586206003	SAMPLE	LXP1	LUCAS4	AUG-04-22 07:48:00	DONE	Lucas Cell	01-FEB-22 00:00
586206004	SAMPLE	LXP1	LUCAS5	AUG-04-22 07:48:00	DONE	Lucas Cell	01-JUN-22 00:00
586206005	SAMPLE	LXP1	LUCAS6	AUG-04-22 07:48:00	DONE	Lucas Cell	01-JUL-22 00:00
1205141535	MB	LXP1	LUCAS7	AUG-04-22 07:48:00	DONE	Lucas Cell	01-NOV-21 00:00
1205141536	DUP	LXP1	LUCAS8	AUG-04-22 07:48:00	DONE	Lucas Cell	01-APR-22 00:00
1205141537	MS	LXP1	LUCAS1	AUG-04-22 08:20:00	DONE	Lucas Cell	28-APR-22 00:00
1205141538	LCS	LXP1	LUCAS2	AUG-04-22 08:20:00	DONE	Lucas Cell	01-AUG-22 00:00



Hometown People. Hometown Power.

Environmental Laboratory  
1232 Haco Drive  
Lansing  
Michigan, 48910

CHAIN OF CUSTODY

Phone: (517)702 6372

Lab Work Order Number L207215

Client Name BWL - Erickson Station	Project Name Erickson AM MI Wells 11-13	Requested Turn Around
Client Contact Cheryl Loudon	Project Number [none]	Rush requests subject to additional charge Rush requests subject to lab approval.
Address 3725 S. Canal	Project Description	
City Lansing	PO Number 30926 10021	
State/Zip MI, 48917	Shipped By	
Phone (517) 702-6396	Tracking Number	
Fax (517) 702-6373		
Sampler Marc Wahrer		

Sample Name or Field ID	Sampled Date	Sampled Time	Sample Type Gmb/Composite	Matrix Code	Container Count	Preservation Code																
						Ag: As: Ba: Be: Bi: Cd: Cr: Co: Cu: Fe: Hg: Li: Mo: Ni: Pb: Sb: Se: Tl: V: Zn: Mg: Na: K	TSS, HCO3, CO3, T, Hardness	Cl: F: F-ISE: SO4: TDS	Radium 226 and Radium 228	Metals Dissolved (same metals as total)	Requested Analyzes	Requested Turn Around										
MW-11	7/13/2022	1022	G	GW	5	b	1	a	1	a	1	b	2	a	0							
MW-12	7/13/2022	1258	G	GW	6	b	1	a	1	a	1	b	2	a	1							
MW-13	7/13/2022	1226	G	GW	5	b	1	a	1	a	1	b	2	a	0							
Field Duplicate MW-11	7/13/2022	1022	G	GW	5	b	1	a	1	a	1	b	2	a	0							
Field Blank	7/13/2022	0820	G	DI	5	b	1	a	1	a	1	b	2	a	0							

Relinquished By 	Date/Time 7/13/22 1407	Received By K. Kelleman	Date/Time 7/13/22 1407	Comments
Relinquished By	Date/Time	Received By	Date/Time	Comments
Relinquished By	Date/Time	Received By	Date/Time	Comments

Cooler Numbers and Temperatures

Matrix Codes: DI=Deionized Water, GW=Ground Water

Preserv. Codes: a=None, b=0.5% HNO3



## Data Verification & Validation Report

### Lansing Board of Water & Light – Erickson Power Station

**Sampling Event (dates and purpose):** New Wells 11-13 Background Round 5 – July 2022

Data Package Number: S38054.01

Lab Report Date: 08/20/2022

Data Validator: Aryka Thomson

Data Validation Completion Date: 10/10/2022

General Overall Assessment:

Data are usable without qualification.

Data are usable with qualification (as noted below).

Some or all data are unusable (as noted below).

Wells planned for sampling:

Well ID	Planned for Sampling
MW-1	
MW-2	
MW-3	
MW-4	
MW-5	
MW-6	
MW-7	
MW-7B	
MW-7C	
MW-8	
MW-9	
MW-10	
MW-11	X
MW-11B	
MW-12	X
MW-12B	
MW-13	X

### Data Summary

Sample ID	Matrix	Lab ID	Date Collected	App III Metals	App IV Metals	Part 115 Metals	Anions	TDS TSS	Rad-226 Rad-228	Diss. Metals
MW-11	GW	S38054.01	07/13/2022	X	X	X	X	X	X	
MW-12	GW	S38054.02	07/13/2022	X	X	X	X	X	X	X
MW-13	GW	S38054.03	07/13/2022	X	X	X	X	X	X	
MW-11 Dup	QC	S38054.04	07/13/2022	X	X	X	X	X	X	

Other analytes requested for analysis: Na, Mg, K, HCO<sub>3</sub>, CO<sub>3</sub>, hardness

Any planned sampling or analysis NOT completed? If yes, explain: \_\_\_\_\_

### Data Verification & Validation Checklist

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
<b>Field Data</b>							
Sample Collection Field Forms	X		Purging performed as required in the Groundwater Monitoring Plan		X		MW-12 turbidity > 10 NTU – collected dissolved metals sample
Field Calibration Records	X		Field instruments calibrated daily according to manufacturer specifications	X			
Chain of Custody	X		Accurately reflect samples, collection dates/times, analyses, bottles, etc.	X			
Field decontamination documentation	N/A		Record of decontamination for non-dedicated sampling equipment			X	
Drilling logs	X		N/A	-	-	-	
Well construction logs	X		N/A	-	-	-	
Well development field forms	X		N/A	-	-	-	
<b>Analytical Data Package</b>							
Cover Sheet	X		N/A	-	-	-	
Case Narrative	X		Summarizes sample receipt and any exceptions to QC acceptance criteria	X			
Internal Laboratory Chain of Custody forms	X		Analyses as requested; accurate transcription of field COC	X			
Sample Chronology and Consistency	X		Accurate representation of dates, times of receipt, preparation, and analysis	X			
Communication Records with Lab	X		N/A	-	-	-	
EDD Format Consistency	X		EDD format and content as requested	X			
Sample Identification, Results Nomenclature, and Data Qualifier Consistency	X		All included in final report	X			
Method Detection Limit Consistency	X		MDLs consistent between samples		X		Dilution varies between samples
Instrument Calibration Records	X		Present and no nonconformance noted	X			
Laboratory Report Complete	X		Includes QC component	X			
Holding Times	X		Analyses performed within allowed holding time	X			



Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Method	X		Method as requested	X			
Reporting Limits	X		RLs as requested		X		RLs for TDS, chloride, and sulfate were not met
			MDLs<RLs		X		RL=MDL for TSS
			MDLs<GPS			X	
<b>QC Validation</b>							
<b>Evaluate Accuracy</b>							
Matrix Spike (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table		X		MS in run batch MT4-22-0714A recovered high for iron
Laboratory Control Sample (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
<b>Evaluate Precision</b>							
Matrix Spike Duplicate (RPD)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Field Duplicate (RPD)	X		RPD ≤ 20%	X			
<b>Evaluate Representativeness</b>							
Equipment Blanks (if applicable)	N/A		Non-detect (<RL)			X	
<b>QC Verification</b>							
<b>Verify Instrument Calibration &amp; Analytical Process</b>							
Initial Calibration Verification	X		Laboratory-determined	-	-	-	
Continuing Calibration Verification	X		Laboratory-determined	-	-	-	
Initial Calibration Blank	X		Laboratory-determined	-	-	-	
Continuing Calibration Blank	X		Laboratory-determined	-	-	-	
Serial Dilutions	X		Laboratory-determined	-	-	-	High %D for Al and Cr
Post-Digestion Spikes	X		Laboratory-determined	-	-	-	
Internal Standards	X		Laboratory-determined	-	-	-	
Laboratory Duplicate (RPD)	X		Laboratory-determined	-	-	-	
Method Blanks	X		Laboratory-determined	-	-	-	Rad-228 detected in MB
<b>Evaluate Completeness (# usable measurements/ # unusable measurements)</b>							
Completeness	X		100%	X			

Other instances of nonconformance to QC control limits noted on case narrative:

The matrix spike (38054.04) had high recovery for iron. MW-11-Dup required qualification as estimated (J) for iron.

Rad-226 was detected at 0.367 pCi/L in method blank 1205141535 at a level greater than the MDC (0.271 pCi/L) but less than the required detection limit (3.00 pCi/L). Rad-226 and Rad-226/228 required qualification as estimated with high bias in all samples (J+).

Comments: None.



Lansing Board of Water and Light  
Environmental Services Laboratory  
1232 Haco Dr.  
Lansing, Michigan 48901

12 September 2022

BWL - Erickson Station  
Attn: Cheryl Louden  
3725 S. Canal  
Lansing, MI 48917

**Project: Erickson AM MI**

Dear Cheryl Louden,

Enclosed is a copy of the laboratory report for the following work order(s) received by Lansing Board of Water and Light Environmental Services Laboratory:

<b>Work Order</b>	<b>Received</b>	<b>Account Number</b>
L207247	7/28/2022 2:35:00PM	30926 10021

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in blue ink that reads "Jennifer Caporale".

Jennifer Caporale, Supervisor



### Analytical Report

**Client:** BWL - Erickson Station  
**Address:** 3725 S. Canal  
 Lansing MI, 48917

**Client Project Manager:** Cheryl Louden

**Report Date:** 09/12/2022

**Sample Name:** MW-7B

**Lab #:** L207247-01 Ground Water

**Collected:** 28-Jul-22 12:02

**By:** Marc Wahrer

Analyte	Reporting			Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit	Units						
Conductivity	590	1.0	uS/cm	1		28-Jul-22 12:02	maw	SM 2510B	
Dissolved oxygen	0.110	0.100	mg/L	1		28-Jul-22 12:02	maw	FIELD	
Milliliters Purged	260		ml/min	1		28-Jul-22 12:02	maw	FIELD	
Oxidation Reduction Potential	-108.9	-999.0	mV	1		28-Jul-22 12:02	maw	FIELD	
pH	7.8	7.0	pH Units	1		28-Jul-22 12:02	maw	SM 4500H+B	
Temperature	14		°C	1		28-Jul-22 12:02	maw	SM 2550B	
Turbidity	4.0	0.10	NTU	1		28-Jul-22 12:02	maw	SM 2130B	

**Sample Name:** MW-7C

**Lab #:** L207247-02 Ground Water

**Collected:** 28-Jul-22 13:32

**By:** Marc Wahrer

Analyte	Reporting			Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit	Units						
Conductivity	1700	1.0	uS/cm	1		28-Jul-22 13:32	maw	SM 2510B	
Dissolved oxygen	ND	0.100	mg/L	1		28-Jul-22 13:32	maw	FIELD	
Milliliters Purged	240		ml/min	1		28-Jul-22 13:32	maw	FIELD	
Oxidation Reduction Potential	-151.5	-999.0	mV	1		28-Jul-22 13:32	maw	FIELD	
pH	7.2	7.0	pH Units	1		28-Jul-22 13:32	maw	SM 4500H+B	
Temperature	14		°C	1		28-Jul-22 13:32	maw	SM 2550B	
Turbidity	2.0	0.10	NTU	1		28-Jul-22 13:32	maw	SM 2130B	

**Sample Name:** MW-12B

**Lab #:** L207247-03 Ground Water

**Collected:** 28-Jul-22 09:47

**By:** Marc Wahrer

Analyte	Reporting			Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit	Units						
Conductivity	600	1.0	uS/cm	1		28-Jul-22 09:47	maw	SM 2510B	
Dissolved oxygen	0.220	0.100	mg/L	1		28-Jul-22 09:47	maw	FIELD	
Milliliters Purged	220		ml/min	1		28-Jul-22 09:47	maw	FIELD	
Oxidation Reduction Potential	-141.0	-999.0	mV	1		28-Jul-22 09:47	maw	FIELD	
pH	7.5	7.0	pH Units	1		28-Jul-22 09:47	maw	SM 4500H+B	
Temperature	14		°C	1		28-Jul-22 09:47	maw	SM 2550B	
Turbidity	8.4	0.10	NTU	1		28-Jul-22 09:47	maw	SM 2130B	



## Analytical Report

**Client:** BWL - Erickson Station

**Client Project Manager:** Cheryl Louden

**Report Date:** 09/12/2022

**Address:** 3725 S. Canal  
Lansing MI, 48917

**Approved By:** \_\_\_\_\_

*Jennifer Caporale*

### Notes and Definitions

AL Action Level (Action Level = Regulatory Limit)  
MCL Maximum Contaminant Level  
PEL Permissible Exposure Limit (Permissible Exposure Limit = Regulatory Limit)  
RPD Relative Percent Difference  
OT Odor Threshold  
ND Non Detect

All drinking water regulatory limits are MCL's with the exception of Lead and Copper unless otherwise noted.



Report ID: S38615.01(02)  
Generated on 08/30/2022  
Replaces report S38615.01(01) generated on 08/01/2022

Report to  
Attention: Jennifer Caporale  
Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901  
  
Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

Report produced by  
Merit Laboratories, Inc.  
2680 East Lansing Drive  
East Lansing, MI 48823  
  
Phone: (517) 332-0167 FAX: (517) 332-6333  
  
Contacts for report questions:  
John Lavery (johnlavery@meritlabs.com)  
Barbara Ball (bball@meritlabs.com)

Report Summary  
Lab Sample ID(s): S38615.01-S38615.05  
Project: Erickson AM MI New Wells 7B, 7C & 12B  
Collected Date(s): 07/28/2022  
Submitted Date/Time: 07/28/2022 15:08  
Sampled by: Marc Wahrer  
P.O. #:

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Maya Murshak  
Technical Director



## General Report Notes

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Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile, and 2-chloroethylvinyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (\*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

## Report Narrative

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All analyses completed



## Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Alaska CSLAP	#17-001
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

## Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

## Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



## Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1 (1993)
SM2320B	Standard Method 2320 B 2011
SM2340C	Standard Method 2340 C 2011
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007





## Sample Summary (5 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S38615.01	MW-7B L207247-01	Groundwater	07/28/22 12:02
S38615.02	MW-7C L207247-02	Groundwater	07/28/22 13:32
S38615.03	MW-12B L207247-03	Groundwater	07/28/22 09:47
S38615.04	Field Dupe MW-12B L207247-04	Groundwater	07/28/22 09:47
S38615.05	Field Blank L207247-05	Water	07/28/22 08:40



# Analytical Laboratory Report

Final Report

Lab Sample ID: S38615.01

Sample Tag: MW-7B L207247-01

Collected Date/Time: 07/28/2022 12:02

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	0.2	IR
2	1L Plastic	None	Yes	0.2	IR
1	125ml Plastic	HNO3	Yes	0.2	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	08/01/22 09:30	JRH	
Metal Digestion	Completed	SW3015A	07/29/22 10:30	CCM	

### Inorganics

Method: E300.0, Run Date: 07/29/22 09:25, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 08/01/22 13:16, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	390	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 07/29/22 14:49, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	30	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 07/29/22 17:30, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	376	50	10	mg/L	2		

Method: SM2540D, Run Date: 07/28/22 18:00, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	3	mg/L	1.00		

### Metals

Method: E200.8, Run Date: 07/29/22 12:30, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.009	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	2.98	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.04	0.02	0.00192	mg/L	5	7439-89-6	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S38615.01 (continued)

Sample Tag: MW-7B L207247-01

**Method: E200.8, Run Date: 07/29/22 12:30, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.032	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 07/29/22 14:00, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	9.25	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	2.79	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	5.72	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	138	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 08/01/22 12:06, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 08/29/22 12:09, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Lab Sample ID: S38615.02

Sample Tag: MW-7C L207247-02

Collected Date/Time: 07/28/2022 13:32

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	0.2	IR
2	1L Plastic	None	Yes	0.2	IR
1	125ml Plastic	HNO3	Yes	0.2	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	08/01/22 09:30	JRH	
Metal Digestion	Completed	SW3015A	07/29/22 10:30	CCM	

### Inorganics

Method: E300.0, Run Date: 07/29/22 09:38, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	

Method: E300.0, Run Date: 07/29/22 11:08, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	90	50	0.80	mg/L	50	16887-00-6	
Sulfate	660	50	3.0	mg/L	50	14808-79-8	

Method: SM2320B, Run Date: 08/01/22 13:18, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	160	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 07/29/22 15:03, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	740	50	4.77	mg/L	50		

Method: SM2540C, Run Date: 07/29/22 17:30, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	1,360	50	10	mg/L	2		

Method: SM2540D, Run Date: 07/28/22 18:00, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	3	mg/L	1.00		

### Metals

Method: E200.8, Run Date: 07/29/22 12:33, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.006	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.042	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	6.70	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S38615.02 (continued)

Sample Tag: MW-7C L207247-02

**Method: E200.8, Run Date: 07/29/22 12:33, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	3.84	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.138	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.390	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	0.008	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	0.006	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 07/29/22 14:02, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	241	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	40.0	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	5.71	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	95.7	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 08/01/22 12:10, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 08/29/22 12:09, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Final Report

Lab Sample ID: S38615.03

Sample Tag: MW-12B L207247-03

Collected Date/Time: 07/28/2022 09:47

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	0.2	IR
2	1L Plastic	None	Yes	0.2	IR
1	125ml Plastic	HNO3	Yes	0.2	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	08/01/22 09:30	JRH	
Metal Digestion	Completed	SW3015A	07/29/22 10:30	CCM	

### Inorganics

Method: E300.0, Run Date: 07/29/22 09:51, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 08/01/22 13:20, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	410	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 07/29/22 15:06, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	90	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 07/29/22 17:30, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	380	50	10	mg/L	2		

Method: SM2540D, Run Date: 07/28/22 18:00, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	3	mg/L	1.00		

### Metals

Method: E200.8, Run Date: 07/29/22 12:40, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.023	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	3.37	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.29	0.02	0.00192	mg/L	5	7439-89-6	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S38615.03 (continued)

Sample Tag: MW-12B L207247-03

**Method: E200.8, Run Date: 07/29/22 12:40, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.041	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 07/29/22 14:04, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	25.7	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	8.22	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	8.28	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	107	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 08/01/22 12:20, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 08/29/22 12:09, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Lab Sample ID: S38615.04

Sample Tag: Field Dupe MW-12B L207247-04

Collected Date/Time: 07/28/2022 09:47

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	0.2	IR
2	1L Plastic	None	Yes	0.2	IR
1	125ml Plastic	HNO3	Yes	0.2	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	08/01/22 09:30	JRH	
Metal Digestion	Completed	SW3015A	07/29/22 10:30	CCM	

### Inorganics

Method: E300.0, Run Date: 07/29/22 10:04, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 08/01/22 13:22, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	420	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 07/29/22 15:20, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	90	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 07/29/22 17:30, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	374	50	10	mg/L	2		

Method: SM2540D, Run Date: 07/28/22 18:00, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	3	mg/L	1.00		

### Metals

Method: E200.8, Run Date: 07/29/22 12:43, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.024	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	3.37	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	0.007	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.30	0.02	0.00192	mg/L	5	7439-89-6	





# Analytical Laboratory Report

Final Report

Lab Sample ID: S38615.04 (continued)  
Sample Tag: Field Dupe MW-12B L207247-04

**Method: E200.8, Run Date: 07/29/22 12:43, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.043	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	0.015	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 07/29/22 14:05, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	25.4	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	8.02	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	8.07	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	107	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 08/01/22 12:23, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 08/29/22 12:09, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Lab Sample ID: S38615.05

Sample Tag: Field Blank L207247-05

Collected Date/Time: 07/28/2022 08:40

Matrix: Water

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	0.2	IR
2	1L Plastic	None	Yes	0.2	IR
1	125ml Plastic	HNO3	Yes	0.2	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	08/01/22 09:30	JRH	
Metal Digestion	Completed	SW3015A	07/29/22 10:30	CCM	

### Inorganics

Method: E300.0, Run Date: 07/29/22 10:17, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	2.5	0.04	mg/L	2.5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.06	mg/L	2.5	16984-48-8	
Sulfate	Not detected	2.5	0.15	mg/L	2.5	14808-79-8	

Method: SM2320B, Run Date: 08/01/22 13:24, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	Not detected	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 07/29/22 15:22, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	Not detected	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 07/29/22 17:30, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	Not detected	50	10	mg/L	2		

Method: SM2540D, Run Date: 07/28/22 18:00, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	3	mg/L	1.00		

### Metals

Method: E200.8, Run Date: 07/29/22 12:07, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00102	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.000102	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.0000648	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.0000862	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.000702	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.0000760	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.0000386	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.0000434	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000150	mg/L	2	7440-50-8	
Iron	Not detected	0.02	0.000768	mg/L	2	7439-89-6	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S38615.05 (continued)

Sample Tag: Field Blank L207247-05

**Method: E200.8, Run Date: 07/29/22 12:07, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.0000760	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000654	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.0000868	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000100	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.000838	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.0000270	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.0000342	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.0000558	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.000292	mg/L	2	7440-66-6	

**Method: E200.8, Run Date: 07/29/22 13:53, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.0174	mg/L	2	7440-70-2	
Magnesium	Not detected	0.50	0.00480	mg/L	2	7439-95-4	
Potassium	Not detected	0.50	0.00920	mg/L	2	7440-09-7	
Sodium	Not detected	0.50	0.00340	mg/L	2	7440-23-5	

**Method: E245.1, Run Date: 08/01/22 12:26, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 08/29/22 12:09, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

# Merit Laboratories Login Checklist

Lab Set ID:S38615

Client:BWL01 (Board of Water & Light)

Project: Erickson AM MI New Wells 7B, 7C & 12B

Submitted:07/28/2022 15:08 Login User: MMC

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental\_Laboratory@LBWL.com

Selection	Description	Note
-----------	-------------	------

**Sample Receiving**

- |     |  |  |        |
|-----|--|--|--------|
| 01. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples are received at 4C +/- 2C Thermometer #        | IR 0.2 |
| 02. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Received on ice/ cooling process begun                 |        |
| 03. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples shipped  |        |
| 04. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples left in 24 hr. drop box                        |        |
| 05. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Are there custody seals/tape or is the drop box locked |        |

**Chain of Custody**

- |     |  |  |                        |
|-----|--|--|------------------------|
| 06. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC adequately filled out                |                        |
| 07. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC signed and relinquished to the lab   |                        |
| 08. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sample tag on bottles match COC          |                        |
| 09. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Subcontracting needed? Subcontracted to: | GEL 1Z4664770362227288 |

**Preservation**

- |     |  |   |  |
|-----|--|---|--|
| 10. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Do sample have correct chemical preservation        |  |
| 11. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Completed pH checks on preserved samples? (no VOAs) |  |
| 12. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Did any samples need to be preserved in the lab?    |  |

**Bottle Conditions**

- |     |  |   |  |
|-----|--|---|--|
| 13. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | All bottles intact                            |  |
| 14. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Appropriate analytical bottles are used       |  |
| 15. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Merit bottles used                            |  |
| 16. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sufficient sample volume received             |  |
| 17. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples require laboratory filtration         |  |
| 18. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples submitted within holding time         |  |
| 19. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Do water VOC or TOX bottles contain headspace |  |

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: \_\_\_\_\_ Date: \_\_\_\_\_

# Merit Laboratories Bottle Preservation Check

Lab Set ID: S38615 Submitted: 07/28/2022 15:08

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI New Wells 7B, 7C & 12B

Initial Preservation Check: 07/28/2022 15:48 MMC

Preservation Recheck (E200.8): N/A

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental\_Laboratory@LBWL.com

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S38615.01	125ml Plastic HNO3	<2			
S38615.01	1L Plastic HNO3	<2			
S38615.01	1L Plastic HNO3	<2			
S38615.02	125ml Plastic HNO3	<2			
S38615.02	1L Plastic HNO3	<2			
S38615.02	1L Plastic HNO3	<2			
S38615.03	125ml Plastic HNO3	<2			
S38615.03	1L Plastic HNO3	<2			
S38615.03	1L Plastic HNO3	<2			
S38615.04	125ml Plastic HNO3	<2			
S38615.04	1L Plastic HNO3	<2			
S38615.04	1L Plastic HNO3	<2			
S38615.05	125ml Plastic HNO3	<2			
S38615.05	1L Plastic HNO3	<2			
S38615.05	1L Plastic HNO3	<2			



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 Phone (517) 332-0167 Fax (517) 332-4034  
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C.O.C. PAGE # 1 OF 1

**REPORT TO** **CHAIN OF CUSTODY RECORD** **INVOICE TO**

CONTACT NAME Jennifer Caporale  
 COMPANY Lansing Board of Water and Light  
 ADDRESS PO Box 13007 48901-3007  
 CITY Lansing STATE Mi ZIP CODE 48901  
 PHONE NO. 517-702-6372 FAX NO. P.O. NO.  
 E-MAIL ADDRESS Environmental\_Laboratory@lbwl.com QUOTE NO.

CONTACT NAME Kelly Gleason  SAME  
 COMPANY  
 ADDRESS  
 CITY STATE ZIP CODE  
 PHONE NO. E-MAIL ADDRESS Kelly.Gleason@lbwl.com

**ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)**

PROJECT NO./NAME Erickson AM MI Wells 7B,7C&12B SAMPLER(S) - PLEASE PRINT/SIGN NAME Marc Wahrer  
 TURNAROUND TIME REQUIRED  1 DAY  2 DAYS  3 DAYS  STANDARD  OTHER ASAP  
 DELIVERABLES REQUIRED  STD  LEVEL II  LEVEL III  LEVEL IV  EDD  OTHER

MATRIX GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID  
 CODE: SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIPE A=AIR W=WASTE

# Containers & Preservatives

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	# Containers & Preservatives							Total Metals	F- undistilled, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	HCO3, CO3, Hardness			Certifications	Project Locations	Special Instructions
	DATE	TIME				NONE	HCl	HNO3	H2SO4	NaOH	MeOH	OTHER											
38615.01	7/28/22	1202	MW-7B L207247-01	GW	5	2	3															Metals to analyse: Na, Mg, K	
.02		1332	MW-7C -02	GW	5	2	3															B, Ca, Sb, As, Ba, Be, Cd, Cr,	
.03		0947	MW-12B -03	GW	5	2	3															Co, Li, Hg, Mo, Pb, Se, Tl,	
.04		↓	Field Dupe MW-12B -04	GW	5	2	3															Fe, Cu, Ni, Ag, V, Zn	
.05		0840	Field Blank -05	DI	5	2	3															Please send a preliminary report	

RELINQUISHED BY: *[Signature]* \*Sampler DATE 7-28-22 TIME 1508  
 SIGNATURE/ORGANIZATION  
 RECEIVED BY: *[Signature]* DATE 7/28/22 TIME 1508  
 SIGNATURE/ORGANIZATION  
 RELINQUISHED BY: DATE TIME  
 SIGNATURE/ORGANIZATION  
 RECEIVED BY: DATE TIME  
 SIGNATURE/ORGANIZATION

RELINQUISHED BY: DATE TIME  
 SIGNATURE/ORGANIZATION  
 RECEIVED BY: DATE TIME  
 SIGNATURE/ORGANIZATION  
 SEAL NO. SEAL INTACT INITIALS NOTES: TEMP. ON ARRIVAL  
 YES  NO   
 SEAL NO. SEAL INTACT INITIALS  
 YES  NO  0.2°C

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

## Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.150
Be, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	2.5
Cl	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cr, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Fluoride	250 mL plastic	mg/L	None	9056	28 d	1.0
F	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Fe, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Pb, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Li, total	Mercury	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Hg, total	Molybdenum	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Mo, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	HNO3	SM 7500	6 mos	2.0 combined
RA226/228	Selenium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Se, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ag, total	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	10
SO4	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Tl, total	Total Dissolved Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TDS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540D	NA	3
TSS	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
V, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Zn, total							



August 29, 2022

John Laverty  
Merit Laboratories Inc.  
2680 East Lansing Drive  
East Lansing, Michigan 48823

Re: Routine Analysis  
Work Order: 588224  
SDG: S38615

Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on August 03, 2022. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at [www.gel.com](http://www.gel.com).

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,

Delaney Stone  
Project Manager

Purchase Order: GELP20-0018  
Enclosures





## Table of Contents

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# Case Narrative

**Receipt Narrative  
for  
Merit Laboratories, Inc.  
SDG: S38615  
Work Order: 588224**

**August 29, 2022**

**Laboratory Identification:**

GEL Laboratories LLC  
2040 Savage Road  
Charleston, South Carolina 29407  
(843) 556-8171

**Summary:**

**Sample receipt:** The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on August 03, 2022 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

**Sample Identification:** The laboratory received the following samples:

<b><u>Laboratory ID</u></b>	<b><u>Client ID</u></b>
588224001	S38615.01
588224002	S38615.02
588224003	S38615.03
588224004	S38615.04 Field Dupe
588224005	S38615.05 Field Blank

**Case Narrative:**

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.

A handwritten signature in black ink that reads "Delaney Stone". The signature is written in a cursive, flowing style.

Delaney Stone  
Project Manager

# **Chain of Custody and Supporting Documentation**

588224

C.O.C. PAGE # 1 OF 1

2680 East Lansing Dr., East Lansing, MI 48823  
 Phone (517) 332-0167 Fax (517) 332-4034  
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REPORT TO		CHAIN OF CUSTODY RECORD		INVOICE TO	
CONTACT NAME Project Management Team		CONTACT NAME Julie Teague		COMPANY Merit Laboratories	
COMPANY Merit Laboratories		ADDRESS 2680 East Lansing Drive		ADDRESS 2680 East Lansing Drive	
CITY East Lansing		STATE MI		ZIP CODE 48823	
PHONE NO. 517-332-0167		E-MAIL ADDRESS results@meritlabs.com		E-MAIL ADDRESS juliet@meritlabs.com	
PROJECT NO./NAME S38615		ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)			
TURNAROUND TIME REQUIRED <input type="checkbox"/> 1 DAY <input type="checkbox"/> 2 DAYS <input type="checkbox"/> 3 DAYS <input checked="" type="checkbox"/> STANDARD <input type="checkbox"/> OTHER					
DELIVERABLES REQUIRED <input type="checkbox"/> STD <input type="checkbox"/> LEVEL I <input type="checkbox"/> LEVEL II <input checked="" type="checkbox"/> LEVEL III <input type="checkbox"/> EDD <input type="checkbox"/> OTHER					
MATRIX CODE GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID SL=SLUDGE DW=DRINKING WATER O=OIL WP=WPE A=AIR W=WASTE					
SAMPLE TAG IDENTIFICATION-DESCRIPTION		# Containers & Preservatives			
YEAR DATE TIME		NONE BOTTLES # OF MATRIX			
7/28/22 1202 S38615.01		GW 2			
7/28/22 1332 S38615.02		GW 2			
7/28/22 0947 S38615.03		GW 2			
7/28/22 0947 S38615.04 Field Dupe		GW 2			
7/28/22 0840 S38615.05 Field Blank		DI 2			
CERTIFICATIONS		OHIO VAP <input type="checkbox"/> Drinking Water <input type="checkbox"/> DoD <input type="checkbox"/> NPDES <input type="checkbox"/> Project Locations <input type="checkbox"/> Detroit <input type="checkbox"/> New York <input type="checkbox"/> Other <input type="checkbox"/> Special Instructions * E903.1 Mod. ** E904.0/SW 9320 Mod.			
Please use calculation product & provide Radium 226/228 combined results on the report		Radium 226* <input checked="" type="checkbox"/> Radium 228* <input checked="" type="checkbox"/> Radium 226* <input checked="" type="checkbox"/> Radium 228* <input checked="" type="checkbox"/> Radium 226* <input checked="" type="checkbox"/> Radium 228* <input checked="" type="checkbox"/> Radium 226* <input checked="" type="checkbox"/> Radium 228* <input checked="" type="checkbox"/>			
(No Ice needed)					
** Subcontracted to		GEL Laboratories, Inc. 2040 Savage Road Charleston, SC 29407			
RELINQUISHED BY: SIGNATURE/ORGANIZATION		RELINQUISHED BY: SIGNATURE/ORGANIZATION		DATE TIME	
RECEIVED BY: SIGNATURE/ORGANIZATION		RECEIVED BY: SIGNATURE/ORGANIZATION		DATE TIME	
RELINQUISHED BY: SIGNATURE/ORGANIZATION		RELINQUISHED BY: SIGNATURE/ORGANIZATION		DATE TIME	
RECEIVED BY: SIGNATURE/ORGANIZATION		RECEIVED BY: SIGNATURE/ORGANIZATION		DATE TIME	
SEAL NO.		SEAL NO.		INITIALS	
SEAL INTACT YES <input type="checkbox"/> NO <input type="checkbox"/>		SEAL INTACT YES <input type="checkbox"/> NO <input type="checkbox"/>		INITIALS	
NOTES:		DATE TIME 8/1/22 1700 8/1/22 1700			

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

SAMPLE RECEIPT & REVIEW FORM

Client: <b>MERI</b>	SDG/AR/COC/Work Order: <b>588224</b>
Received By: <b>AA</b>	Date Received: <b>8/3/22</b>
Carrier and Tracking Number	FedEx Express   FedEx Ground <input checked="" type="radio"/> UPS   Field Services   Courier   Other <b>1Z 466 477 03 6222 7288</b>

Suspected Hazard Information	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.
A) Shipped as a DOT Hazardous?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Hazard Class Shipped: _____ UN#: _____ If UN2910, Is the Radioactive Shipment Survey Compliant? Yes ___ No ___
B) Did the client designate the samples are to be received as radioactive?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	COC notation or radioactive stickers on containers equal client designation.
C) Did the RSO classify the samples as radioactive?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): <u>0</u> CPM / mR/Hr Classified as: Rad 1 Rad 2 Rad 3
D) Did the client designate samples are hazardous?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	COC notation or hazard labels on containers equal client designation.
E) Did the RSO identify possible hazards?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	If D or E is yes, select Hazards below. PCB's Flammable Foreign Soil RCRA Asbestos Beryllium Other: _____

Sample Receipt Criteria	Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1 Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2 Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Client contacted and provided COC COC created upon receipt
3 Samples requiring cold preservation within (0 ≤ 6 deg. C)?*	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Preservation Method: Wet Ice Ice Packs Dry Ice <input checked="" type="radio"/> None Other: _____ *all temperatures are recorded in Celsius      TEMP: <b>23°</b>
4 Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Temperature Device Serial #: <b>LR3-22</b> Secondary Temperature Device Serial # (If Applicable): _____
5 Sample containers intact and sealed?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6 Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Sample ID's and Containers Affected: _____ If Preservation added, Lot#: _____
7 Do any samples require Volatile Analysis?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	If Yes, are Encores or Soil Kits present for solids? Yes ___ No ___ NA ___ (If yes, take to VOA Freezer)
				Do liquid VOA vials contain acid preservation? Yes ___ No ___ NA ___ (If unknown, select No)
				Are liquid VOA vials free of headspace? Yes ___ No ___ NA ___ Sample ID's and containers affected: _____
8 Samples received within holding time?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	ID's and tests affected: _____
9 Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	ID's and containers affected: _____
10 Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: No dates on containers No times on containers COC missing info Other (describe)
11 Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: No container count on COC Other (describe)
12 Are sample containers identifiable as GEL provided by use of GEL labels?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
13 COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Not relinquished Other (describe)

Comments (Use Continuation Form if needed):

PM (or PMA) review: Initials **fw** Date **8/5/22** Page **1** of **1**

# **Laboratory Certifications**



**List of current GEL Certifications as of 29 August 2022**

<b>State</b>	<b>Certification</b>
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122023-3
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2019-165
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122021-36
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

# **Radiological Analysis**

# Case Narrative

**Radiochemistry  
 Technical Case Narrative  
 Merit Laboratories, Inc.  
 SDG #: S38615  
 Work Order #: 588224**

**Product:** GFPC Ra228, Liquid

**Analytical Method:** EPA 904.0/SW846 9320 Modified

**Analytical Procedure:** GL-RAD-A-063 REV# 5

**Analytical Batch:** 2300100

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
588224001	S38615.01
588224002	S38615.02
588224003	S38615.03
588224004	S38615.04 Field Dupe
588224005	S38615.05 Field Blank
1205158468	Method Blank (MB)
1205158469	588224001(S38615.01) Sample Duplicate (DUP)
1205158470	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

**Quality Control (QC) Information**

**Method Blank Criteria**

The blank result (See Below) is greater than the MDC but less than the required detection limit.

Sample	Analyte	Value
1205158468 (MB)	Radium-228	Result: 2.29 pCi/L > MDA: 1.90 pCi/L <= RDL: 3.00 pCi/L

**Duplication Criteria between QC Sample and Duplicate Sample**

The Sample and the Duplicate, (See Below), did not meet the relative percent difference requirement; however, they do meet the relative error ratio requirement with the value listed below.

Sample	Analyte	Value
1205158469 (S38615.01DUP)	Radium-228	RPD 178* (0.0%-100.0%) RER 2.57 (0-3)

**Product:** Lucas Cell, Ra226, Liquid

**Analytical Method:** EPA 903.1 Modified

**Analytical Procedure:** GL-RAD-A-008 REV# 15

**Analytical Batch:** 2300087

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
588224001	S38615.01
588224002	S38615.02
588224003	S38615.03
588224004	S38615.04 Field Dupe
588224005	S38615.05 Field Blank
1205158421	Method Blank (MB)
1205158422	588224001(S38615.01) Sample Duplicate (DUP)
1205158423	588224001(S38615.01) Matrix Spike (MS)
1205158424	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

**Miscellaneous Information**

**Additional Comments**

The matrix spike, 1205158423 (S38615.01MS), aliquot was reduced to conserve sample volume.

**Certification Statement**

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

## GEL LABORATORIES LLC

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### Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S38615 GEL Work Order: 588224

#### The Qualifiers in this report are defined as follows:

- \* A quality control analyte recovery is outside of specified acceptance criteria
- \*\* Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

#### Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature: 

Name: Kenshalla Oston

Date: 30 AUG 2022

Title: Analyst I

# Sample Data Summary

# GEL LABORATORIES LLC

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## Certificate of Analysis

Report Date: August 30, 2022

Company : Merit Laboratories Inc.  
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery  
Project: Routine Analysis

Client Sample ID: S38615.01      Project: MERI00120  
Sample ID: 588224001      Client ID: MERI001  
Matrix: Ground Water  
Collect Date: 28-JUL-22 12:02  
Receive Date: 03-AUG-22  
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	0.136	+/-1.07	1.99	3.00	pCi/L			JXC9	08/26/22	1050	2300100	1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		0.414	+/-1.09			pCi/L			NXL1	08/29/22	1209	2300099	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.278	+/-0.178	0.193	1.00	pCi/L			LXP1	08/24/22	0923	2300087	3

The following Analytical Methods were performed:

Method	Description	Analyst	Comments
1	EPA 904.0/SW846 9320 Modified		
2	Calculation		
3	EPA 903.1 Modified		

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			78.8	(15%-125%)

### Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor      Lc/LC: Critical Level  
DL: Detection Limit      PF: Prep Factor  
MDA: Minimum Detectable Activity      RL: Reporting Limit  
MDC: Minimum Detectable Concentration      SQL: Sample Quantitation Limit



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## Certificate of Analysis

Report Date: August 30, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Lavery  
 Project: Routine Analysis

Client Sample ID: S38615.02	Project: MERI00120
Sample ID: 588224002	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 28-JUL-22 13:32	
Receive Date: 03-AUG-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.580	+/-1.11	1.97	3.00	pCi/L		JXC9	08/26/22	1051	2300100	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.773	+/-1.13			pCi/L		NXL1	08/29/22	1209	2300099	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.193	+/-0.179	0.264	1.00	pCi/L		LXP1	08/24/22	0923	2300087	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			76.8	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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## Certificate of Analysis

Report Date: August 30, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

Client Sample ID: S38615.03	Project: MERI00120
Sample ID: 588224003	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 28-JUL-22 09:47	
Receive Date: 03-AUG-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	-0.356	+/-0.791	1.64	3.00	pCi/L			JXC9	08/26/22	1051 2300100	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.581	+/-0.834			pCi/L			NXL1	08/29/22	1209 2300099	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.581	+/-0.264	0.253	1.00	pCi/L			LXP1	08/24/22	0923 2300087	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			80.9	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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## Certificate of Analysis

Report Date: August 30, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Lavery  
 Project: Routine Analysis

Client Sample ID: S38615.04 Field Dupe	Project: MERI00120
Sample ID: 588224004	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 28-JUL-22 09:47	
Receive Date: 03-AUG-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	-1.12	+/-0.838	1.93	3.00	pCi/L			JXC9	08/26/22	1051 2300100	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		2.17	+/-0.954			pCi/L			NXL1	08/29/22	1209 2300099	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		2.17	+/-0.455	0.228	1.00	pCi/L			LXP1	08/24/22	0923 2300087	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			78.4	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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## Certificate of Analysis

Report Date: August 30, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

Client Sample ID: S38615.05 Field Blank	Project: MERI00120
Sample ID: 588224005	Client ID: MERI001
Matrix: Water	
Collect Date: 28-JUL-22 08:40	
Receive Date: 03-AUG-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	-0.345	+/-1.23	2.36	3.00	pCi/L			JXC9	08/26/22	1052	2300100	1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		0.175	+/-1.25			pCi/L			NXL1	08/29/22	1209	2300099	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226	U	0.175	+/-0.214	0.359	1.00	pCi/L			LXP1	08/24/22	0955	2300087	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			75.2	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# **Quality Control Summary**

# GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

## QC Summary

Report Date: August 30, 2022

Page 1 of 2

**Merit Laboratories Inc.**  
**2680 East Lansing Drive**  
**East Lansing, Michigan**

**Contact: John Laverty**

**Workorder: 588224**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Rad Gas Flow</b>											
Batch	2300100										
QC1205158469	588224001	DUP									
Radium-228	U	0.136		2.37	pCi/L	178*		(0% - 100%)	JXC9	08/26/22	10:46
	Uncertainty	+/-1.07		+/-1.18							
QC1205158470	LCS										
Radium-228	44.5			52.5	pCi/L		118	(75%-125%)		08/26/22	10:46
	Uncertainty			+/-3.92							
QC1205158468	MB										
Radium-228				2.29	pCi/L					08/26/22	10:46
	Uncertainty			+/-1.28							
<b>Rad Ra-226</b>											
Batch	2300087										
QC1205158422	588224001	DUP									
Radium-226		0.278	U	0.353	pCi/L	23.8		(0% - 100%)	LXP1	08/24/22	11:01
	Uncertainty	+/-0.178		+/-0.258							
QC1205158424	LCS										
Radium-226	26.5			21.8	pCi/L		82.1	(75%-125%)		08/24/22	11:01
	Uncertainty			+/-1.47							
QC1205158421	MB										
Radium-226			U	0.169	pCi/L					08/24/22	10:29
	Uncertainty			+/-0.228							
QC1205158423	588224001	MS									
Radium-226	128	0.278		122	pCi/L		95.3	(75%-125%)		08/24/22	11:01
	Uncertainty	+/-0.178		+/-7.63							

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- \*\* Analyte is a Tracer compound
- < Result is less than value reported
- > Result is greater than value reported
- BD Results are either below the MDC or tracer recovery is low
- FA Failed analysis.
- H Analytical holding time was exceeded

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## QC Summary

Workorder: 588224

Page 2 of 2

Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
J											
J											
K											
L											
M											
M											
N/A											
NI											
ND											
NJ											
Q											
R											
U											
UI											
UJ											
UL											
X											
Y											
^											
h											

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where the duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

\* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

# Gas Flow Raw Data



# Batch 2300100 Check-list

This check-list was completed on 26-AUG-22 by Nat Long

This batch was reviewed by Kenshalla Oston on 26-AUG-22 and Nat Long on 26-AUG-22.

**Batch ID:**  
2300100

**Product:**  
GFC28RAL

**Description:** Gas Flow Radium 228  
GL-RAD-A-063

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?		No	
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?		No	
11	Has the method required detection limit been met?	Yes		
<b>Miscellaneous Information</b>				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

# Prep Logbook

## Radium-228 in Liquid

**Batch ID:** 2300100

**Analyst:** Jasmine Conley (JXC9)

**Method:** EPA 904.0/SW846 9320 Modified

**Lab SOP:** GL-RAD-A-063 REV# 5

**Instrument:** LUCAS-C037036045

**Due Dates for Lab:** 28-AUG-2022

**Package:** 30-AUG-2022

**SDG:** 31-AUG-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205158470	Radium-228	1965-C	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	588224001	11-AUG-2022	3	303.2	303.2	08/13/22 15:30	08/26/22 08:15
2	588224002	11-AUG-2022	3	300.28	300.28	08/13/22 15:30	08/26/22 08:15
3	588224003	11-AUG-2022	3	303.12	303.12	08/13/22 15:30	08/26/22 08:15
4	588224004	11-AUG-2022	3	301.82	301.82	08/13/22 15:30	08/26/22 08:15
5	588224005	11-AUG-2022	3	300.07	300.07	08/13/22 15:30	08/26/22 08:15
6	588589001	11-AUG-2022	3	305.07	305.07	08/13/22 15:30	08/26/22 08:15
7	588589002	11-AUG-2022	3	300.83	300.83	08/13/22 15:30	08/26/22 08:15
8	588589003	11-AUG-2022	3	303.18	303.18	08/13/22 15:30	08/26/22 08:15
9	588589004	11-AUG-2022	3	304.2	304.2	08/13/22 15:30	08/26/22 08:15
10	588594001	11-AUG-2022	3	300.42	300.42	08/13/22 15:30	08/26/22 08:15
11	588594002	11-AUG-2022	3	304.52	304.52	08/13/22 15:30	08/26/22 08:15
12	588594003	11-AUG-2022	3	300.94	300.94	08/13/22 15:30	08/26/22 08:15
13	588594004	11-AUG-2022	3	300.72	300.72	08/13/22 15:30	08/26/22 08:15
14	588594005	11-AUG-2022	3	302.08	302.08	08/13/22 15:30	08/26/22 08:15
15	588594006	11-AUG-2022	3	303.56	303.56	08/13/22 15:30	08/26/22 08:15
16	588594007	11-AUG-2022	3	300.73	300.73	08/13/22 15:30	08/26/22 08:15
17	588594008	11-AUG-2022	3	303.93	303.93	08/13/22 15:30	08/26/22 08:15
18	1205158468 MB	11-AUG-2022	3		305.07	08/13/22 15:30	08/26/22 08:15
19	1205158469 DUP (588224001)	11-AUG-2022	3	303.1	303.1	08/13/22 15:30	08/26/22 08:15
20	1205158470 LCS	11-AUG-2022	3		305.07	08/13/22 15:30	08/26/22 08:15

Reagent/Solvent Lot ID	Description	Amount
WORK 1951-D	Ba-133	.1 mL
REGNT 3413919	RGF-50% Potassium Carbonate	2 mL
REGNT 3418276.6	29M HF (48-50%)	4 mL
REGNT 3424228	RGF-Neodymium Subtrate	5 mL
REGNT 3454370.1	Nitric Acid	5 mL
REGNT 3460110.5	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL
REGNT 3465466	Barium Carrier Ra228 REG	1 mL
REGNT 3466250	RGF-7M Nitric Acid	25 mL
REGNT 3466286	RGF-1M Citric Acid	5 mL
REGNT 3466687	500 mg/mL Neodymium Carrier	.2 mL
REGNT 3471758	RGF-1.5M Ammonium Sulfate	10 mL
REGNT 3472801	2M HCl	20 mL
REGNT DGA0036	2294962	2 g

**Comments:**

Pipet Id: RAD-GFC-1795419  
 Data Entry Date2: 12-AUG-2022 13:16 LUCAS-C037036045 Jasmine Conley  
 Data Entry Date3: 11-AUG-2022 00:00

### Radium-228 Liquid

Filename : RA228.XLS  
 File type : Excel  
 Version # : 1.4.2

Tracer S/N : 1951-D  
 Tracer Exp Date : 6/2/2023  
 Tracer Volume Added: 0.10

Batch : 2300100  
 Analyst : JAS02031  
 Prep Date : 8/11/2022  
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL  
 Parmname : Radium-228  
 Required MDA : 3 pCi/L  
 Ra-228 Abundance : 1.00  
 Halflife of Ra-228 : 5.75 years  
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer Aliquot	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	588224001.1	0.3032	1.8513E-05	7/28/2022 12:02	1303.3	1.60%	1027.5	1.80%	0.1	0.000200
2	588224002.1	0.3003	1.8464E-05	7/28/2022 13:32	1303.3	1.60%	1001.1	1.82%	0.1	0.000200
3	588224003.1	0.3031	1.8512E-05	7/28/2022 9:47	1303.3	1.60%	1054.8	1.78%	0.1	0.000200
4	588224004.1	0.3018	1.8490E-05	7/28/2022 9:47	1303.3	1.60%	1021.5	1.81%	0.1	0.000200
5	588224005.1	0.3001	1.8460E-05	7/28/2022 8:40	1303.3	1.60%	979.6	1.84%	0.1	0.000200
6	588589001.1	0.3051	1.8544E-05	8/2/2022 21:41	1303.3	1.60%	926.2	1.90%	0.1	0.000200
7	588589002.1	0.3008	1.8473E-05	8/2/2022 20:25	1303.3	1.60%	1049.2	1.78%	0.1	0.000200
8	588589003.1	0.3032	1.8513E-05	8/2/2022 19:13	1303.3	1.60%	860.6	1.97%	0.1	0.000200
9	588589004.1	0.3042	1.8529E-05	8/2/2022 17:56	1303.3	1.60%	1032.1	1.80%	0.1	0.000200
10	588594001.1	0.3004	1.8466E-05	8/2/2022 12:42	1303.3	1.60%	1068.7	1.77%	0.1	0.000200
11	588594002.1	0.3045	1.8535E-05	8/2/2022 15:43	1303.3	1.60%	1034.2	1.80%	0.1	0.000200
12	588594003.1	0.3009	1.8475E-05	8/2/2022 9:21	1303.3	1.60%	932.2	1.89%	0.1	0.000200
13	588594004.1	0.3007	1.8471E-05	8/2/2022 10:55	1303.3	1.60%	814.7	2.02%	0.1	0.000200
14	588594005.1	0.3021	1.8494E-05	8/2/2022 16:21	1303.3	1.60%	880.8	1.95%	0.1	0.000200
15	588594006.1	0.3036	1.8519E-05	8/2/2022 14:09	1303.3	1.60%	886.2	1.94%	0.1	0.000200
16	588594007.1	0.3007	1.8471E-05	8/2/2022 10:55	1303.3	1.60%	800.5	2.04%	0.1	0.000200
17	588594008.1	0.3039	1.8525E-05	8/2/2022 6:55	1303.3	1.60%	1010.7	1.82%	0.1	0.000200
18	1205158468.1	0.3051	1.8544E-05	8/11/2022 0:00	1303.3	1.60%	994.9	1.83%	0.1	0.000200
19	1205158469.1	0.3031	1.8511E-05	7/28/2022 12:02	1303.3	1.60%	997.0	1.83%	0.1	0.000200
20	1205158470.1	0.3051	1.8544E-05	8/11/2022 0:00	1303.3	1.60%	1026.2	1.80%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063  
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated	Sample
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction	Recovery %	Recovery Error %
			Alpha	Beta										
1	1B	60	9	49	0.817	8/26/2022 10:50	8/13/2022 15:30	8/26/2022 8:15	0.990	0.746	1.000	1.057	78.8%	1.24%
2	2A	60	16	52	0.867	8/26/2022 10:51	8/13/2022 15:30	8/26/2022 8:15	0.991	0.746	1.000	1.057	76.8%	1.24%
3	3B	60	14	29	0.483	8/26/2022 10:51	8/13/2022 15:30	8/26/2022 8:15	0.990	0.746	1.000	1.057	80.9%	1.23%
4	4A	60	8	27	0.450	8/26/2022 10:51	8/13/2022 15:30	8/26/2022 8:15	0.990	0.746	1.000	1.057	78.4%	1.24%
5	4C	60	14	62	1.033	8/26/2022 10:52	8/13/2022 15:30	8/26/2022 8:15	0.990	0.745	1.000	1.057	75.2%	1.25%
6	5A	60	11	67	1.117	8/26/2022 10:52	8/13/2022 15:30	8/26/2022 8:15	0.992	0.744	1.000	1.057	71.1%	1.27%
7	7B	60	19	83	1.383	8/26/2022 10:52	8/13/2022 15:30	8/26/2022 8:15	0.992	0.743	1.000	1.057	80.5%	1.23%
8	7C	60	9	87	1.450	8/26/2022 10:52	8/13/2022 15:30	8/26/2022 8:15	0.992	0.743	1.000	1.057	66.0%	1.30%
9	7D	60	26	39	0.650	8/26/2022 10:52	8/13/2022 15:30	8/26/2022 8:15	0.992	0.743	1.000	1.057	79.2%	1.24%
10	8A	60	18	44	0.733	8/26/2022 10:52	8/13/2022 15:30	8/26/2022 8:15	0.992	0.743	1.000	1.057	82.0%	1.23%
11	9A	60	10	45	0.750	8/26/2022 10:53	8/13/2022 15:30	8/26/2022 8:15	0.992	0.743	1.000	1.057	79.4%	1.24%
12	9B	60	11	80	1.333	8/26/2022 10:53	8/13/2022 15:30	8/26/2022 8:15	0.992	0.743	1.000	1.057	71.5%	1.27%
13	9C	60	26	47	0.783	8/26/2022 10:53	8/13/2022 15:30	8/26/2022 8:15	0.992	0.743	1.000	1.057	62.5%	1.32%
14	9D	60	9	54	0.900	8/26/2022 10:53	8/13/2022 15:30	8/26/2022 8:15	0.992	0.743	1.000	1.057	67.6%	1.29%
15	10A	60	17	57	0.950	8/26/2022 10:53	8/13/2022 15:30	8/26/2022 8:15	0.992	0.743	1.000	1.057	68.0%	1.29%
16	10C	60	13	100	1.667	8/26/2022 10:53	8/13/2022 15:30	8/26/2022 8:15	0.992	0.743	1.000	1.057	61.4%	1.33%
17	10D	60	11	61	1.017	8/26/2022 10:53	8/13/2022 15:30	8/26/2022 8:15	0.992	0.743	1.000	1.057	77.5%	1.24%
18	11A	60	13	78	1.300	8/26/2022 10:46	8/13/2022 15:30	8/26/2022 8:15	0.995	0.752	1.000	1.057	76.3%	1.25%
19	11C	60	11	64	1.067	8/26/2022 10:46	8/13/2022 15:30	8/26/2022 8:15	0.990	0.752	1.000	1.057	76.5%	1.25%
20	11D	60	19	824	13.733	8/26/2022 10:46	8/13/2022 15:30	8/26/2022 8:15	0.995	0.752	1.000	1.057	78.7%	1.24%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2022	5/31/2023	0.6068	0.00711	0.786	8/20/2022 6:37	500
2	PIC	6/1/2022	5/31/2023	0.6201	0.01914	0.738	8/20/2022 6:36	500
3	PIC	6/1/2022	5/31/2023	0.6245	0.01614	0.568	8/20/2022 6:37	500
4	PIC	6/1/2022	5/31/2023	0.6013	0.01123	0.696	8/20/2022 6:37	500
5	PIC	6/1/2022	5/31/2023	0.6359	0.00889	1.110	8/20/2022 6:37	500
6	PIC	6/1/2022	5/31/2023	0.6332	0.00851	0.846	8/20/2022 6:38	500
7	PIC	6/1/2022	5/31/2023	0.6366	0.00627	0.658	8/20/2022 6:38	500
8	PIC	6/1/2022	5/31/2023	0.6407	0.00790	1.076	8/20/2022 6:38	500
9	PIC	6/1/2022	5/31/2023	0.6270	0.01113	0.556	8/20/2022 6:38	500
10	PIC	6/1/2022	5/31/2023	0.6398	0.01579	0.516	8/20/2022 6:38	500
11	PIC	6/1/2022	5/31/2023	0.6336	0.00758	0.830	8/20/2022 6:39	500
12	PIC	6/1/2022	5/31/2023	0.6318	0.00754	0.794	8/20/2022 6:39	500
13	PIC	6/1/2022	5/31/2023	0.6184	0.00584	0.926	8/20/2022 6:39	500
14	PIC	6/1/2022	5/31/2023	0.6330	0.02610	0.834	8/20/2022 6:39	500
15	PIC	6/1/2022	5/31/2023	0.6384	0.00651	0.884	8/20/2022 6:39	500
16	PIC	6/1/2022	5/31/2023	0.6321	0.00638	1.146	8/20/2022 6:39	500
17	PIC	6/1/2022	5/31/2023	0.6148	0.00557	0.644	8/20/2022 6:39	500
18	PIC	6/1/2022	5/31/2023	0.6371	0.01317	0.766	8/20/2022 6:37	500
19	PIC	6/1/2022	5/31/2023	0.6276	0.01278	0.528	8/20/2022 6:37	500
20	PIC	6/1/2022	5/31/2023	0.6372	0.01068	1.110	8/20/2022 6:37	500

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

**Spike S/N :** N/A  
**Spike Exp Date :** N/A  
**Spike Activity (dpm/ml):** N/A  
**Spike Volume Added:** N/A

**LCS S/N :** 1965-C  
**LCS Exp Date :** 8/5/2023  
**LCS Activity (dpm/ml):** 301.34  
**LCS Volume Added:** 0.10

Results Pos.	Decision	Critical	Required	Sample Act.		Sample Act.	Net Count	Net Count	2 SIGMA	2 SIGMA	Sample	Sample	RPD	RER	Nominal	Recovery
	Level	Level	MDA	MDA	Conc.	Error	Rate	Rate Error	Counting	Total Prop.						
1	1.2541	0.8854	3	1.9930	<b>0.1363</b>	401.81%	0.0307	0.1232	1.0732	1.0737		SAMPLE				
2	1.2326	0.8702	3	1.9658	<b>0.5799</b>	98.09%	0.1287	0.1262	1.1146	1.1242		SAMPLE				
3	1.0098	0.7129	3	1.6362	<b>-0.3563</b>	113.25%	-0.0847	0.0959	0.7909	0.7911		SAMPLE				
4	1.2042	0.8502	3	1.9270	<b>-1.1154</b>	38.37%	-0.2460	0.0943	0.8380	0.8382		SAMPLE				
5	1.5103	1.0663	3	2.3577	<b>-0.3452</b>	181.88%	-0.0767	0.1394	1.2307	1.2308		SAMPLE				
6	1.3761	0.9715	3	2.1781	<b>1.2721</b>	52.67%	0.2707	0.1425	1.3125	1.3506		SAMPLE				
7	1.0814	0.7635	3	1.7363	<b>3.0375</b>	21.57%	0.7253	0.1561	1.2814	1.4895		SAMPLE				
8	1.6623	1.1736	3	2.5989	<b>1.8827</b>	43.40%	0.3740	0.1622	1.6007	1.6686		SAMPLE				
9	1.0147	0.7164	3	1.6466	<b>0.4018</b>	116.28%	0.0940	0.1093	0.9158	0.9213		SAMPLE				
10	0.9371	0.6616	3	1.5282	<b>0.8907</b>	53.01%	0.2173	0.1151	0.9247	0.9515		SAMPLE				
11	1.2237	0.8639	3	1.9388	<b>-0.3375</b>	148.75%	-0.0800	0.1190	0.9841	0.9842		SAMPLE				
12	1.3477	0.9515	3	2.1406	<b>2.5625</b>	28.65%	0.5393	0.1543	1.4369	1.5735		SAMPLE				
13	1.7026	1.2021	3	2.6821	<b>-0.7930</b>	85.59%	-0.1427	0.1221	1.3301	1.3303		SAMPLE				
14	1.4535	1.0262	3	2.3023	<b>0.3300</b>	195.63%	0.0660	0.1291	1.2651	1.2679		SAMPLE				
15	1.4679	1.0363	3	2.3179	<b>0.3237</b>	201.02%	0.0660	0.1327	1.2753	1.2778		SAMPLE				
16	1.8867	1.3320	3	2.9409	<b>2.8826</b>	33.34%	0.5207	0.1734	1.8817	2.0152		SAMPLE				
17	1.1399	0.8048	3	1.8327	<b>1.6629</b>	36.26%	0.3727	0.1350	1.1809	1.2519		SAMPLE				
18	1.1956	0.8441	3	1.9027	<b>2.2915</b>	28.58%	0.5340	0.1523	1.2810	1.4043		MB				
19	1.0167	0.7178	3	1.6553	<b>2.3675</b>	25.54%	0.5387	0.1372	1.1822	1.3231	588224001.1	DUP	178.2%	2.5664		
20	1.3951	0.9850	3	2.1779	<b>52.5098</b>	4.14%	12.6233	0.4807	3.9195	13.7294		LCS			44.4950	118.0%

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
588224001	1B	60	9	49	8/26/2022 10:50	8/26/2022 11:50	PIC	2300100
588224002	2A	60	16	52	8/26/2022 10:51	8/26/2022 11:51	PIC	2300100
588224003	3B	60	14	29	8/26/2022 10:51	8/26/2022 11:51	PIC	2300100
588224004	4A	60	8	27	8/26/2022 10:51	8/26/2022 11:51	PIC	2300100
588224005	4C	60	14	62	8/26/2022 10:52	8/26/2022 11:52	PIC	2300100
588589001	5A	60	11	67	8/26/2022 10:52	8/26/2022 11:52	PIC	2300100
588589002	7B	60	19	83	8/26/2022 10:52	8/26/2022 11:52	PIC	2300100
588589003	7C	60	9	87	8/26/2022 10:52	8/26/2022 11:52	PIC	2300100
588589004	7D	60	26	39	8/26/2022 10:52	8/26/2022 11:52	PIC	2300100
588594001	8A	60	18	44	8/26/2022 10:52	8/26/2022 11:52	PIC	2300100
588594002	9A	60	10	45	8/26/2022 10:53	8/26/2022 11:53	PIC	2300100
588594003	9B	60	11	80	8/26/2022 10:53	8/26/2022 11:53	PIC	2300100
588594004	9C	60	26	47	8/26/2022 10:53	8/26/2022 11:53	PIC	2300100
588594005	9D	60	9	54	8/26/2022 10:53	8/26/2022 11:53	PIC	2300100
588594006	10A	60	17	57	8/26/2022 10:53	8/26/2022 11:53	PIC	2300100
588594007	10C	60	13	100	8/26/2022 10:53	8/26/2022 11:53	PIC	2300100
588594008	10D	60	11	61	8/26/2022 10:53	8/26/2022 11:53	PIC	2300100
1205158468	11A	60	13	78	8/26/2022 10:46	8/26/2022 11:46	PIC	2300100
1205158469	11C	60	11	64	8/26/2022 10:46	8/26/2022 11:46	PIC	2300100
1205158470	11D	60	19	824	8/26/2022 10:46	8/26/2022 11:46	PIC	2300100

ASSAY 26-Aug-22 12:01:08  
 Wizard 2480 s/n 46190630  
 Protocol id 9 Ba-133\_1  
 Time limit  
 Count limit  
 Isotope Ba-133\_1  
 Protocol date 8/26/2022  
 Run id. 5443

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	92	1	180	3910.28	1303.29	1.6	12:01:08
588224001	2	92	2	180	3083	1027.46	1.8	78.84	12:04:22
588224002	3	92	3	180	3004	1001.13	1.82	76.82	12:07:36
588224003	4	92	4	180	3165	1054.79	1.78	80.93	12:10:50
588224004	5	92	5	180	3065	1021.47	1.81	78.38	12:14:04
588224005	1	15	1	180	2939.28	979.56	1.84	75.16	12:17:40
588589001	2	15	2	180	2779	926.22	1.9	71.07	12:20:54
588589002	3	15	3	180	3148.28	1049.22	1.78	80.51	12:24:08
588589003	4	15	4	180	2582	860.57	1.97	66.03	12:27:22
588589004	5	15	5	180	3097	1032.12	1.8	79.19	12:30:36
588594001	1	19	1	180	3206.57	1068.65	1.77	82.00	12:34:12
588594002	2	19	2	180	3103	1034.22	1.8	79.35	12:37:25
588594003	3	19	3	180	2797	932.15	1.89	71.52	12:40:39
588594004	4	19	4	180	2444.57	814.69	2.02	62.51	12:43:53
588594005	5	19	5	180	2643	880.82	1.95	67.58	12:47:07
588594006	1	10	1	180	2659.28	886.24	1.94	68.00	12:50:53
588594007	2	10	2	180	2402	800.5	2.04	61.42	12:54:07
588594008	3	10	3	180	3032.57	1010.66	1.82	77.55	12:57:21
1205158468	4	10	4	180	2985	994.9	1.83	76.34	01:00:35
1205158469	5	10	5	180	2991.28	996.99	1.83	76.50	01:03:49
1205158470	1	5	1	180	3079.28	1026.22	1.8	78.74	01:07:37

END OF ASSAY



# **Continuing Calibration Data**

# Gas Flow Proportional Counter Checks for 26-Aug-2022

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100A2	need 2nd	Beta bkg	26-Aug 06:32	60	1.900	-2.15E-1	2.577	+1.55
LB4100E2	Above	Beta bkg	26-Aug 06:30	60	2.950	1.385	3.072	+2.57
LB4100E3	Above	Beta bkg	26-Aug 06:30	60	2.500	0.506	2.576	+2.78
LB4100F2	Above	Alpha eff	26-Aug 08:00	5	6619	3944	6286	+3.85
LB4100F2	Above	Beta XTalk	26-Aug 10:18	5	5.91E-4	1.40E-4	5.65E-4	+3.36
LB4100F3	need 2nd	Beta bkg	26-Aug 10:38	60	1.650	0.854	1.842	+1.83
LB4100F4	Above	Alpha eff	26-Aug 08:00	5	11080	5098	9867	+4.53
LB4100F4	Below	Alpha XTalk	26-Aug 08:00	5	0.384	0.384	0.757	-3.01
LB4100G1	Above	Alpha XTalk	26-Aug 10:05	5	0.829	0.088	0.447	+9.39
LB4100G1	Above	Beta bkg	26-Aug 06:31	60	1503	0.380	1.675	+6,960.56
LB4100G1	need 2nd	Beta eff	26-Aug 08:24	5	16452	12880	18320	+0.94
LB4100G3	Above	Beta bkg	26-Aug 06:31	60	1.950	0.810	1.674	+4.92
LB4100H2	Below	Alpha eff	26-Aug 10:04	5	4819	5513	8976	-4.20
LB4100H2	Above	Alpha XTalk	26-Aug 10:04	5	0.442	0.269	0.396	+5.21
PIC8B	Above	Alpha bkg	26-Aug 07:51	60	0.683	-1.16E-1	0.388	+6.53
PIC8B	Above	Beta bkg	26-Aug 07:51	60	2.917	-1.80E-1	2.341	+4.37
PIC8B	Above	Beta eff	26-Aug 07:44	5	23555	20290	21980	+8.59
PIC8C	Above	Beta bkg	26-Aug 09:10	60	8.300	-2.96E-1	2.115	+18.39
PIC8D	Above	Beta bkg	26-Aug 09:10	60	9.200	-1.07E-1	2.328	+19.93
PIC14C	Above	Beta bkg	26-Aug 09:08	60	2.033	0.197	2.388	+2.03

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

G5400W1W	Alpha eff, Alpha XTalk, Beta eff, Beta XTalk
G5400W1X	Alpha eff, Alpha XTalk, Beta eff, Beta XTalk
G5400W1Y	Alpha eff, Alpha XTalk, Beta eff, Beta XTalk
G5400W1Z	Alpha eff, Alpha XTalk, Beta eff, Beta XTalk
LB4100C1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

LB4100C4            Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
LB4100I1            Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
LB4100I2            Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
LB4100I3            Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
LB4100I4            Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by 

Date 8/26/22

GEL Laboratories LLC

# Runlogs

# Instrument Run Log

Instrument Type: GFPC

Batch ID: 2300100

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205158468	MB	JXC9	PIC11A	AUG-26-22 10:46:45	DONE	25mm Filter	01-JUN-22 00:00
1205158469	DUP	JXC9	PIC11C	AUG-26-22 10:46:46	DONE	25mm Filter	01-JUN-22 00:00
1205158470	LCS	JXC9	PIC11D	AUG-26-22 10:46:46	DONE	25mm Filter	01-JUN-22 00:00
588224001	SAMPLE	JXC9	PIC1B	AUG-26-22 10:50:56	DONE	25mm Filter	01-JUN-22 00:00
588224002	SAMPLE	JXC9	PIC2A	AUG-26-22 10:51:04	DONE	25mm Filter	01-JUN-22 00:00
588224003	SAMPLE	JXC9	PIC3B	AUG-26-22 10:51:08	DONE	25mm Filter	01-JUN-22 00:00
588224004	SAMPLE	JXC9	PIC4A	AUG-26-22 10:51:12	DONE	25mm Filter	01-JUN-22 00:00
588224005	SAMPLE	JXC9	PIC4C	AUG-26-22 10:52:00	DONE	25mm Filter	01-JUN-22 00:00
588589001	SAMPLE	JXC9	PIC5A	AUG-26-22 10:52:27	DONE	25mm Filter	01-JUN-22 00:00
588589002	SAMPLE	JXC9	PIC7B	AUG-26-22 10:52:47	DONE	25mm Filter	01-JUN-22 00:00
588589003	SAMPLE	JXC9	PIC7C	AUG-26-22 10:52:48	DONE	25mm Filter	01-JUN-22 00:00
588589004	SAMPLE	JXC9	PIC7D	AUG-26-22 10:52:48	DONE	25mm Filter	01-JUN-22 00:00
588594001	SAMPLE	JXC9	PIC8A	AUG-26-22 10:52:55	DONE	25mm Filter	01-JUN-22 00:00
588594002	SAMPLE	JXC9	PIC9A	AUG-26-22 10:53:01	DONE	25mm Filter	01-JUN-22 00:00
588594003	SAMPLE	JXC9	PIC9B	AUG-26-22 10:53:04	DONE	25mm Filter	01-JUN-22 00:00
588594004	SAMPLE	JXC9	PIC9C	AUG-26-22 10:53:08	DONE	25mm Filter	01-JUN-22 00:00
588594005	SAMPLE	JXC9	PIC9D	AUG-26-22 10:53:10	DONE	25mm Filter	01-JUN-22 00:00
588594006	SAMPLE	JXC9	PIC10A	AUG-26-22 10:53:16	DONE	25mm Filter	01-JUN-22 00:00
588594007	SAMPLE	JXC9	PIC10C	AUG-26-22 10:53:22	DONE	25mm Filter	01-JUN-22 00:00
588594008	SAMPLE	JXC9	PIC10D	AUG-26-22 10:53:25	DONE	25mm Filter	01-JUN-22 00:00

# Lucas Cell Raw Data

# Batch 2300087 Check-list

This check-list was completed on 24-AUG-22 by Elizabeth Krouse

This batch was reviewed by Elizabeth Krouse on 24-AUG-22 and Lyndsey Pace on 24-AUG-22.

**Batch ID:**  
2300087

**Product:**  
LUC26RAL

**Description:** Lucas Cell Radium 226  
GL-RAD-A-008

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
<b>Miscellaneous Information</b>				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

# Prep Logbook

## Radium-226 in Liquid

**Batch ID:** 2300087

**Analyst:** Lyndsey Pace (LXP1)

**Method:** EPA 903.1 Modified

**Lab SOP:** GL-RAD-A-008 REV# 15

**Instrument:** LUCAS-C037036045

**Due Dates for Lab:** 28-AUG-2022

**Package:** 30-AUG-2022

**SDG:** 31-AUG-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205158424	Radium-226 SPIKE	1715-G	.1	mL
MS	1205158423	Radium-226 SPIKE	1715-G	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	588224001	11-AUG-2022	1	500.34	500.34	08/18/22 08:15	507	08/24/22 06:18	08/24/22 09:23	1	12
2	588224002	11-AUG-2022	1	505.41	505.41	08/18/22 08:15	604	08/24/22 06:18	08/24/22 09:23	2	9
3	588224003	11-AUG-2022	1	503.15	503.15	08/18/22 08:15	705	08/24/22 06:18	08/24/22 09:23	2	24
4	588224004	11-AUG-2022	1	504.9	504.9	08/18/22 08:15	806	08/24/22 06:18	08/24/22 09:23	2	93
5	588224005	11-AUG-2022	1	505.45	505.45	08/18/22 08:15	105	08/24/22 06:46	08/24/22 09:55	4	10
6	588589001	11-AUG-2022	1	503.78	503.78	08/18/22 08:15	206	08/24/22 06:46	08/24/22 09:55	1	24
7	588589002	11-AUG-2022	1	502.93	502.93	08/18/22 08:15	403	08/24/22 06:46	08/24/22 09:55	5	12
8	588589003	11-AUG-2022	1	500.82	500.82	08/18/22 08:15	506	08/24/22 06:46	08/24/22 09:55	8	10
9	588589004	11-AUG-2022	1	504.31	504.31	08/18/22 08:15	605	08/24/22 06:46	08/24/22 09:55	5	13
10	588594001	11-AUG-2022	1	500.13	500.13	08/18/22 08:15	706	08/24/22 06:46	08/24/22 09:55	7	32
11	588594002	11-AUG-2022	1	500.33	500.33	08/18/22 08:15	802	08/24/22 06:46	08/24/22 09:55	8	21
12	588594003	11-AUG-2022	1	503.87	503.87	08/18/22 08:15	106	08/24/22 07:13	08/24/22 10:29	3	16
13	588594004	11-AUG-2022	1	502.01	502.01	08/18/22 08:15	208	08/24/22 07:13	08/24/22 10:29	5	20
14	588594005	11-AUG-2022	1	503.61	503.61	08/18/22 08:15	408	08/24/22 07:13	08/24/22 10:29	5	23
15	588594006	11-AUG-2022	1	502.61	502.61	08/18/22 08:15	508	08/24/22 07:13	08/24/22 10:29	7	10
16	588594007	11-AUG-2022	1	501.34	501.34	08/18/22 08:15	606	08/24/22 07:13	08/24/22 10:29	3	22
17	588594008	11-AUG-2022	1	503.64	503.64	08/18/22 08:15	707	08/24/22 07:13	08/24/22 10:29	4	12
18	1205158421 MB	11-AUG-2022	1	505.45	505.45	08/18/22 08:15	805	08/24/22 07:13	08/24/22 10:29	8	15
19	1205158422 DUP (588224001)	11-AUG-2022	1	500.85	500.85	08/18/22 08:15	108	08/24/22 07:40	08/24/22 11:01	4	16
20	1205158423 MS (588224001)	11-AUG-2022	1	104.91	104.91	08/18/22 08:15	505	08/24/22 07:40	08/24/22 11:01	6	1001
21	1205158424 LCS	11-AUG-2022	1		505.45	08/18/22 08:15	607	08/24/22 07:40	08/24/22 11:01	6	857

Reagent/Solvent Lot ID	Description	Amount
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**Comments:**  
Data Entry Date2: 11-AUG-2022 00:00



### Radium-226 Liquid

Filename : RA226.XLS  
 File type : Excel  
 Version # : 1.3.2

Procedure Code : LUC26RAL  
 Parmname : Radium-226  
 Required MDA : 1 pCi/L  
 Halflife of Ra-226 : 1600 years  
 Ra-226 Abundance : 1.00  
 Halflife of Rn-222 : 3.8235 days

Batch : 2300087  
 Analyst : LIN01615  
 Prep Date : 8/11/2022  
 Ra-226 Method Uncertainty : 0.073648

Batch counted on : LUCAS CELL DETECTOR  
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Counting		Gross Counts	Gross CPM	Background Counts	Background CPM	Background Count Time (min.)	Cell Efficiency (cpm/dpm)
					Cell Number	Time (min.)						
1	588224001.1	0.5003	2.0257E-05	7/28/2022 12:02	507	30	12	0.400	1	0.033	30	1.8520
2	588224002.1	0.5054	2.0278E-05	7/28/2022 13:32	604	30	9	0.300	2	0.067	30	1.6810
3	588224003.1	0.5032	2.0269E-05	7/28/2022 9:47	705	30	24	0.800	2	0.067	30	1.7610
4	588224004.1	0.5049	2.0276E-05	7/28/2022 9:47	806	30	93	3.100	2	0.067	30	1.9460
5	588224005.1	0.5055	2.0278E-05	7/28/2022 8:40	105	30	10	0.333	4	0.133	30	1.5830
6	588589001.1	0.5038	2.0271E-05	8/2/2022 21:41	206	30	24	0.800	1	0.033	30	1.8770
7	588589002.1	0.5029	2.0268E-05	8/2/2022 20:25	403	30	12	0.400	5	0.167	30	1.6200
8	588589003.1	0.5008	2.0259E-05	8/2/2022 19:13	506	30	10	0.333	8	0.267	30	1.7710
9	588589004.1	0.5043	2.0273E-05	8/2/2022 17:56	605	30	13	0.433	5	0.167	30	1.9020
10	588594001.1	0.5001	2.0256E-05	8/2/2022 12:42	706	30	32	1.067	7	0.233	30	1.6340
11	588594002.1	0.5003	2.0257E-05	8/2/2022 15:43	802	30	21	0.700	8	0.267	30	2.0910
12	588594003.1	0.5039	2.0272E-05	8/2/2022 9:21	106	30	16	0.533	3	0.100	30	1.6990
13	588594004.1	0.5020	2.0264E-05	8/2/2022 10:55	208	30	20	0.667	5	0.167	30	1.7740
14	588594005.1	0.5036	2.0271E-05	8/2/2022 16:21	408	30	23	0.767	5	0.167	30	1.5900
15	588594006.1	0.5026	2.0267E-05	8/2/2022 14:09	508	30	10	0.333	7	0.233	30	1.8020
16	588594007.1	0.5013	2.0261E-05	8/2/2022 10:55	606	30	22	0.733	3	0.100	30	1.9360
17	588594008.1	0.5036	2.0271E-05	8/2/2022 6:55	707	30	12	0.400	4	0.133	30	1.7120
18	1205158421.1	0.5055	2.0278E-05	8/11/2022 0:00	805	30	15	0.500	8	0.267	30	1.9080
19	1205158422.1	0.5009	2.0259E-05	7/28/2022 12:02	108	30	16	0.533	4	0.133	30	1.5830
20	1205158423.1	0.1049	1.1667E-05	7/28/2022 12:02	505	30	1001	33.367	6	0.200	30	1.8130
21	1205158424.1	0.5055	2.0278E-05	8/11/2022 0:00	607	30	857	28.567	6	0.200	30	1.8040

Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008  
 Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrow End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
4.000%	6/1/2022	5/31/2023	8/18/2022 8:15	8/24/2022 6:18	8/24/2022 9:23	0.658	0.977	1.002	1.000
6.700%	7/1/2022	6/30/2023	8/18/2022 8:15	8/24/2022 6:18	8/24/2022 9:23	0.658	0.977	1.002	1.000
3.000%	11/1/2021	10/31/2022	8/18/2022 8:15	8/24/2022 6:18	8/24/2022 9:23	0.658	0.977	1.002	1.000
7.300%	4/1/2022	3/31/2023	8/18/2022 8:15	8/24/2022 6:18	8/24/2022 9:23	0.658	0.977	1.002	1.000
0.500%	4/28/2022	4/30/2023	8/18/2022 8:15	8/24/2022 6:46	8/24/2022 9:55	0.659	0.976	1.002	1.000
2.800%	8/1/2022	7/31/2023	8/18/2022 8:15	8/24/2022 6:46	8/24/2022 9:55	0.659	0.976	1.002	1.000
9.700%	2/1/2022	1/31/2023	8/18/2022 8:15	8/24/2022 6:46	8/24/2022 9:55	0.659	0.976	1.002	1.000
5.300%	6/1/2022	5/31/2023	8/18/2022 8:15	8/24/2022 6:46	8/24/2022 9:55	0.659	0.976	1.002	1.000
7.500%	7/1/2022	6/30/2023	8/18/2022 8:15	8/24/2022 6:46	8/24/2022 9:55	0.659	0.976	1.002	1.000
6.400%	11/1/2021	10/31/2022	8/18/2022 8:15	8/24/2022 6:46	8/24/2022 9:55	0.659	0.976	1.002	1.000
8.000%	4/1/2022	3/31/2023	8/18/2022 8:15	8/24/2022 6:46	8/24/2022 9:55	0.659	0.976	1.002	1.000
8.800%	4/28/2022	4/30/2023	8/18/2022 8:15	8/24/2022 7:13	8/24/2022 10:29	0.660	0.976	1.002	1.000
5.500%	8/1/2022	7/31/2023	8/18/2022 8:15	8/24/2022 7:13	8/24/2022 10:29	0.660	0.976	1.002	1.000
1.200%	2/1/2022	1/31/2023	8/18/2022 8:15	8/24/2022 7:13	8/24/2022 10:29	0.660	0.976	1.002	1.000
4.500%	6/1/2022	5/31/2023	8/18/2022 8:15	8/24/2022 7:13	8/24/2022 10:29	0.660	0.976	1.002	1.000
8.200%	7/1/2022	6/30/2023	8/18/2022 8:15	8/24/2022 7:13	8/24/2022 10:29	0.660	0.976	1.002	1.000
3.000%	11/1/2021	10/31/2022	8/18/2022 8:15	8/24/2022 7:13	8/24/2022 10:29	0.660	0.976	1.002	1.000
7.400%	4/1/2022	3/31/2023	8/18/2022 8:15	8/24/2022 7:13	8/24/2022 10:29	0.660	0.976	1.002	1.000
2.800%	4/28/2022	4/30/2023	8/18/2022 8:15	8/24/2022 7:40	8/24/2022 11:01	0.662	0.975	1.002	1.000
1.200%	6/1/2022	5/31/2023	8/18/2022 8:15	8/24/2022 7:40	8/24/2022 11:01	0.662	0.975	1.002	1.000
3.400%	7/1/2022	6/30/2023	8/18/2022 8:15	8/24/2022 7:40	8/24/2022 11:01	0.662	0.975	1.002	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

**Spike S/N :** 1715-G  
**Spike Exp Date :** 9/15/2022  
**Spike Activity (dpm/ml):** 297.50  
**Spike Volume Added:** 0.10

**LCS S/N :** 1715-G  
**LCS Exp Date :** 9/15/2022  
**LCS Activity (dpm/ml):** 297.50  
**LCS Volume Added:** 0.10

<b>Results</b>																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.0832	0.0588	1	0.1933	<b>0.2778</b>	33.02%	0.3667	0.1202	0.1785	0.1842		SAMPLE				
2	0.1284	0.0906	1	0.2639	<b>0.1928</b>	47.85%	0.2333	0.1106	0.1791	0.1830		SAMPLE				
3	0.1231	0.0869	1	0.2530	<b>0.5810</b>	23.37%	0.7333	0.1700	0.2640	0.2791		SAMPLE				
4	0.1110	0.0784	1	0.2282	<b>2.1673</b>	12.96%	3.0333	0.3249	0.4550	0.6333		SAMPLE				
5	0.1925	0.1359	1	0.3594	<b>0.1752</b>	62.36%	0.2000	0.1247	0.2142	0.2157		SAMPLE				
6	0.0814	0.0575	1	0.1891	<b>0.5684</b>	21.92%	0.7667	0.1667	0.2422	0.2576		SAMPLE				
7	0.2113	0.1492	1	0.3845	<b>0.2008</b>	59.69%	0.2333	0.1374	0.2318	0.2367		SAMPLE				
8	0.2456	0.1734	1	0.4258	<b>0.0527</b>	212.20%	0.0667	0.1414	0.2191	0.2193		SAMPLE				
9	0.1795	0.1267	1	0.3266	<b>0.1949</b>	53.56%	0.2667	0.1414	0.2026	0.2065		SAMPLE				
10	0.2493	0.1760	1	0.4378	<b>0.7149</b>	25.79%	0.8333	0.2082	0.3500	0.3758		SAMPLE				
11	0.2082	0.1470	1	0.3610	<b>0.2904</b>	42.19%	0.4333	0.1795	0.2358	0.2438		SAMPLE				
12	0.1557	0.1099	1	0.3016	<b>0.3546</b>	34.67%	0.4333	0.1453	0.2330	0.2463		SAMPLE				
13	0.1932	0.1364	1	0.3514	<b>0.3933</b>	33.78%	0.5000	0.1667	0.2569	0.2665		SAMPLE				
14	0.2149	0.1517	1	0.3909	<b>0.5249</b>	29.42%	0.6000	0.1764	0.3024	0.3120		SAMPLE				
15	0.2248	0.1587	1	0.3947	<b>0.0773</b>	137.51%	0.1000	0.1374	0.2083	0.2088		SAMPLE				
16	0.1373	0.0969	1	0.2660	<b>0.4571</b>	27.56%	0.6333	0.1667	0.2358	0.2556		SAMPLE				
17	0.1785	0.1260	1	0.3332	<b>0.2166</b>	50.09%	0.2667	0.1333	0.2123	0.2150		SAMPLE				
18	0.2256	0.1593	1	0.3913	<b>0.1695</b>	68.91%	0.2333	0.1599	0.2276	0.2302		MB				
19	0.1939	0.1369	1	0.3620	<b>0.3530</b>	37.37%	0.4000	0.1491	0.2579	0.2636	588224001.1	DUP	23.8%			
20	0.9898	0.6988	1	1.7654	<b>122.0133</b>	3.41%	33.1667	1.0578	7.6270	19.4065	588224001.1	MS			127.7411	95.3%
21	0.2065	0.1458	1	0.3683	<b>21.7674</b>	4.85%	28.3667	0.9792	1.4728	3.7611		LCS			26.5132	82.1%

# **Continuing Calibration Data**



# Ludlum Alpha Scintillation Counter Checks for 24-AUG-2022

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	06:50	1	1.21E+05	121045	-1.09		
LUCAS2	EFF	06:48	1	1.35E+05	134597	2.3		
LUCAS4	EFF	06:54	1	1.28E+05	128368	1.62		
LUCAS5	EFF	06:46	1	1.33E+05	132695	2.15		
LUCAS6	EFF	06:55	1	1.31E+05	130570	-0.31		
LUCAS7	EFF	06:57	1	1.30E+05	129556	-2.76		
LUCAS8	EFF	06:43	1	1.29E+05	129038	0.42		

**Reviewed by:**

Lyndsey Pace

**Date:** 24-AUG-22

GEL Laboratories LLC

# Runlogs

# Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2300087

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
588224001	SAMPLE	LXP1	LUCAS5	AUG-24-22 09:23:00	DONE	Lucas Cell	01-JUN-22 00:00
588224002	SAMPLE	LXP1	LUCAS6	AUG-24-22 09:23:00	DONE	Lucas Cell	01-JUL-22 00:00
588224003	SAMPLE	LXP1	LUCAS7	AUG-24-22 09:23:00	DONE	Lucas Cell	01-NOV-21 00:00
588224004	SAMPLE	LXP1	LUCAS8	AUG-24-22 09:23:00	DONE	Lucas Cell	01-APR-22 00:00
588224005	SAMPLE	LXP1	LUCAS1	AUG-24-22 09:55:00	DONE	Lucas Cell	28-APR-22 00:00
588589001	SAMPLE	LXP1	LUCAS2	AUG-24-22 09:55:00	DONE	Lucas Cell	01-AUG-22 00:00
588589002	SAMPLE	LXP1	LUCAS4	AUG-24-22 09:55:00	DONE	Lucas Cell	01-FEB-22 00:00
588589003	SAMPLE	LXP1	LUCAS5	AUG-24-22 09:55:00	DONE	Lucas Cell	01-JUN-22 00:00
588589004	SAMPLE	LXP1	LUCAS6	AUG-24-22 09:55:00	DONE	Lucas Cell	01-JUL-22 00:00
588594001	SAMPLE	LXP1	LUCAS7	AUG-24-22 09:55:00	DONE	Lucas Cell	01-NOV-21 00:00
588594002	SAMPLE	LXP1	LUCAS8	AUG-24-22 09:55:00	DONE	Lucas Cell	01-APR-22 00:00
588594003	SAMPLE	LXP1	LUCAS1	AUG-24-22 10:29:00	DONE	Lucas Cell	28-APR-22 00:00
588594004	SAMPLE	LXP1	LUCAS2	AUG-24-22 10:29:00	DONE	Lucas Cell	01-AUG-22 00:00
588594005	SAMPLE	LXP1	LUCAS4	AUG-24-22 10:29:00	DONE	Lucas Cell	01-FEB-22 00:00
588594006	SAMPLE	LXP1	LUCAS5	AUG-24-22 10:29:00	DONE	Lucas Cell	01-JUN-22 00:00
588594007	SAMPLE	LXP1	LUCAS6	AUG-24-22 10:29:00	DONE	Lucas Cell	01-JUL-22 00:00
588594008	SAMPLE	LXP1	LUCAS7	AUG-24-22 10:29:00	DONE	Lucas Cell	01-NOV-21 00:00
1205158421	MB	LXP1	LUCAS8	AUG-24-22 10:29:00	DONE	Lucas Cell	01-APR-22 00:00
1205158422	DUP	LXP1	LUCAS1	AUG-24-22 11:01:00	DONE	Lucas Cell	28-APR-22 00:00
1205158423	MS	LXP1	LUCAS5	AUG-24-22 11:01:00	DONE	Lucas Cell	01-JUN-22 00:00
1205158424	LCS	LXP1	LUCAS6	AUG-24-22 11:01:00	DONE	Lucas Cell	01-JUL-22 00:00



Environmental Laboratory  
1232 Haco Drive  
Lansing  
Michigan, 48910

CHAIN OF CUSTODY

Phone: (517) 702-6372

Lab Work Order Number L207247

Client Name: BWL - Erickson Station  
 Client Contact: Cheryll Louden  
 Address: 3725 S. Canal  
 City: Lansing  
 State/Zip: MI 48917  
 Phone: (517) 702-6396  
 Fax: (517) 702-6373  
 Project Name: Erickson AM MI Wells 7B, 7C & 12B  
 Project Number: [none]  
 Project Description:  
 PO Number: 30926 10021  
 Shipped By:  
 Tracking Number:  
 Sampler: Marc Wahrer

Requested Analyzes	Requested Turn Around
TSS, HCO3, CO3, Hardness Chl-a, F-ISE, SO4, TDS	Rush requests subject to additional charge Rush requests subject to lab approval.

Sample Name or Field ID	Sampled Date	Sampled Time	Sample Type	Matrix Code	Container Count	Ag: As: Ba: Be: Bi: Bk: Cd: Cr: Co: Cu: Fe: Hg: Li: Mo: Ni: Pb: Sb: Se: Tl: V: Zn: Na: K: Mg	Ag: As: Ba: Be: Bi: Bk: Cd: Cr: Co: Cu: Fe: Hg: Li: Mo: Ni: Pb: Sb: Se: Tl: V: Zn: Na: K: Mg	Requested Analyzes	Requested Turn Around
MW-7B	7/28/22	1202	G	GW	5	b 1	b 1		
MW-7C	↓	1332	G	GW	5	b 1	b 1		
MW-12B	↓	0947	G	GW	5	b 1	b 1		
Field Duplicate MW-12B	↓		G	GW	5	b 1	b 1		
Field Blank	↓	0840	G	DI	5	b 1	b 1		

Relinquished By	Date/Time	Received By	Date/Time	Comments
	7-28-22 1435	K. Kean	7/28/22 1435	
Relinquished By	Date/Time	Received By	Date/Time	Comments
Relinquished By	Date/Time	Received By	Date/Time	Comments

Matrix Codes: a=None, b=0.5% HNO3

D=Deionized Water, GW=Ground Water

Cooler Numbers and Temperatures





## Data Verification & Validation Report

### Lansing Board of Water & Light – Erickson Power Station

**Sampling Event (dates and purpose):** New Wells 7B, 7C, 12B Background Round 5 – July 2022

Data Package Number: S38615.01

Lab Report Date: 10/04/2022

Data Validator: Aryka Thomson

Data Validation Completion Date: 10/10/2022

General Overall Assessment:

Data are usable without qualification.

Data are usable with qualification (as noted below).

Some or all data are unusable (as noted below).

Wells planned for sampling:

Well ID	Planned for Sampling
MW-1	
MW-2	
MW-3	
MW-4	
MW-5	
MW-6	
MW-7	
MW-7B	X
MW-7C	X
MW-8	
MW-9	
MW-10	
MW-11	
MW-11B	
MW-12	
MW-12B	X
MW-13	

### Data Summary

Sample ID	Matrix	Lab ID	Date Collected	App III Metals	App IV Metals	Part 115 Metals	Anions	TDS TSS	Rad-226 Rad-228	Diss. Metals
MW-7B	GW	S38615.01	07/28/2022	X	X	X	X	X	X	
MW-7C	GW	S38615.02	07/28/2022	X	X	X	X	X	X	
MW-12B	GW	S38615.03	07/28/2022	X	X	X	X	X	X	
MW-12B Dup	QC	S38615.04	07/28/2022	X	X	X	X	X	X	

Other analytes requested for analysis: Na, Mg, K, HCO<sub>3</sub>, CO<sub>3</sub>, hardness

Any planned sampling or analysis NOT completed? If yes, explain: \_\_\_\_\_

### Data Verification & Validation Checklist

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
<b>Field Data</b>							
Sample Collection Field Forms	X		Purging performed as required in the Groundwater Monitoring Plan	X			
Field Calibration Records	X		Field instruments calibrated daily according to manufacturer specifications	X			
Chain of Custody	X		Accurately reflect samples, collection dates/times, analyses, bottles, etc.	X			
Field decontamination documentation	N/A		Record of decontamination for non-dedicated sampling equipment			X	
Drilling logs	X		N/A	-	-	-	
Well construction logs	X		N/A	-	-	-	
Well development field forms	X		N/A	-	-	-	
<b>Analytical Data Package</b>							
Cover Sheet	X		N/A	-	-	-	
Case Narrative	X		Summarizes sample receipt and any exceptions to QC acceptance criteria	X			
Internal Laboratory Chain of Custody forms	X		Analyses as requested; accurate transcription of field COC	X			
Sample Chronology and Consistency	X		Accurate representation of dates, times of receipt, preparation, and analysis	X			
Communication Records with Lab	X		N/A	-	-	-	
EDD Format Consistency	X		EDD format and content as requested	X			
Sample Identification, Results Nomenclature, and Data Qualifier Consistency	X		All included in final report	X			
Method Detection Limit Consistency	X		MDLs consistent between samples		X		Dilution varies between samples
Instrument Calibration Records	X		Present and no nonconformance noted	X			
Laboratory Report Complete	X		Includes QC component	X			
Holding Times	X		Analyses performed within allowed holding time	X			

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Method	X		Method as requested	X			
Reporting Limits	X		RLs as requested	X			RLs for TDS were not met
			MDLs<RLs		X		RL=MDL for TSS
			MDLs<GPS			X	
<b>QC Validation</b>							
<b>Evaluate Accuracy</b>							
Matrix Spike (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Laboratory Control Sample (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
<b>Evaluate Precision</b>							
Matrix Spike Duplicate (RPD)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Field Duplicate (RPD)	X		RPD ≤ 20%		X		Radium-226+228 RPD is 58%
<b>Evaluate Representativeness</b>							
Equipment Blanks (if applicable)	N/A		Non-detect (<RL)			X	
<b>QC Verification</b>							
<b>Verify Instrument Calibration &amp; Analytical Process</b>							
Initial Calibration Verification	X		Laboratory-determined	-	-	-	
Continuing Calibration Verification	X		Laboratory-determined	-	-	-	
Initial Calibration Blank	X		Laboratory-determined	-	-	-	
Continuing Calibration Blank	X		Laboratory-determined	-	-	-	
Serial Dilutions	X		Laboratory-determined	-	-	-	High recovery for Fe and Ca
Post-Digestion Spikes	X		Laboratory-determined	-	-	-	
Internal Standards	X		Laboratory-determined	-	-	-	
Laboratory Duplicate (RPD)	X		Laboratory-determined	-	-	-	Laboratory-generated duplicate for Rad-228 was outside control limits
Method Blanks	X		Laboratory-determined	-	-	-	Rad-228 detected in MB
<b>Evaluate Completeness (# usable measurements/ # unusable measurements)</b>							
Completeness	X		100%	X			

Other instances of nonconformance to QC control limits noted on case narrative:

Rad-228 was detected at 2.29 pCi/L in method blank 1205158468 at a level greater than the MDC (1.90 pCi/L) but less than the required detection limit (3.00 pCi/L). Rad-228 required qualification as estimated with high bias in all samples (J+).

The laboratory-generated duplicate sample did not meet the relative percent difference requirement for Rad-228; however, they do meet the relative error ratio requirement. No qualification was required.

Comments:

Combined Radium-226+228 field duplicate RPD is 58%. Rad-228 required qualification as estimated with high bias (J+) in the parent sample MW-12B and as estimated with low bias (J-) in the field duplicate MW-12B-Dup. However, qualification with high bias due to detection in the method blank has been resolved by qualifying Rad-228 as estimated (J) with no bias indication in MW-12B-Dup. Rad-226 required qualification as estimated with low bias (J-) in the parent sample and estimated with high bias in the field duplicate (J+).

Copper and zinc required qualification as estimated with high bias (J+) in the field duplicate and estimated but not detected in the parent sample (UJ) since they were non-detect in the parent but detected in the field duplicate and RPD cannot be evaluated.



Lansing Board of Water and Light  
Environmental Services Laboratory  
1232 Haco Dr.  
Lansing, Michigan 48901

12 September 2022

BWL - Erickson Station  
Attn: Cheryl Loudon  
3725 S. Canal  
Lansing, MI 48917

**Project: Erickson AM MI**

Dear Cheryl Loudon,

Enclosed is a copy of the laboratory report for the following work order(s) received by Lansing Board of Water and Light Environmental Services Laboratory:

<b>Work Order</b>	<b>Received</b>	<b>Account Number</b>
L208170	8/3/2022 9:17:00AM	30926 10021

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in blue ink that reads "Jennifer Caporale".

Jennifer Caporale, Supervisor



### Analytical Report

**Client:** BWL - Erickson Station  
**Address:** 3725 S. Canal  
 Lansing MI, 48917

**Client Project Manager:** Cheryl Louden

**Report Date:** 09/12/2022

**Sample Name:** MW-1

**Lab #:** L208170-01 Ground Water

**Collected:** 02-Aug-22 12:42

**By:** Marc Wahrer

Analyte	Reporting			Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit	Units						
Conductivity	1200	1.0	uS/cm	1		02-Aug-22 12:42	maw	SM 2510B	
Dissolved oxygen	0.140	0.100	mg/L	1		02-Aug-22 12:42	maw	FIELD	
Milliliters Purged	220		ml/min	1		02-Aug-22 12:42	maw	FIELD	
Oxidation Reduction Potential	-95.20	-999.0	mV	1		02-Aug-22 12:42	maw	FIELD	
pH	6.8	7.0	pH Units	1		02-Aug-22 12:42	maw	SM 4500H+B	
Temperature	15		°C	1		02-Aug-22 12:42	maw	SM 2550B	
Turbidity	5.8	0.10	NTU	1		02-Aug-22 12:42	maw	SM 2130B	

**Sample Name:** MW-2

**Lab #:** L208170-02 Ground Water

**Collected:** 02-Aug-22 15:43

**By:** Marc Wahrer

Analyte	Reporting			Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit	Units						
Conductivity	1400	1.0	uS/cm	1		02-Aug-22 15:43	maw	SM 2510B	
Dissolved oxygen	1.01	0.100	mg/L	1		02-Aug-22 15:43	maw	FIELD	
Milliliters Purged	220		ml/min	1		02-Aug-22 15:43	maw	FIELD	
Oxidation Reduction Potential	21.00	-999.0	mV	1		02-Aug-22 15:43	maw	FIELD	
pH	6.9	7.0	pH Units	1		02-Aug-22 15:43	maw	SM 4500H+B	
Temperature	15		°C	1		02-Aug-22 15:43	maw	SM 2550B	
Turbidity	9.0	0.10	NTU	1		02-Aug-22 15:43	maw	SM 2130B	

**Sample Name:** MW-3

**Lab #:** L208170-03 Ground Water

**Collected:** 02-Aug-22 09:21

**By:** Marc Wahrer

Analyte	Reporting			Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit	Units						
Conductivity	1800	1.0	uS/cm	1		02-Aug-22 09:21	maw	SM 2510B	
Dissolved oxygen	0.170	0.100	mg/L	1		02-Aug-22 09:21	maw	FIELD	
Milliliters Purged	215		ml/min	1		02-Aug-22 09:21	maw	FIELD	
Oxidation Reduction Potential	-92.10	-999.0	mV	1		02-Aug-22 09:21	maw	FIELD	
pH	7.3	7.0	pH Units	1		02-Aug-22 09:21	maw	SM 4500H+B	
Temperature	14		°C	1		02-Aug-22 09:21	maw	SM 2550B	
Turbidity	5.2	0.10	NTU	1		02-Aug-22 09:21	maw	SM 2130B	



### Analytical Report

**Client:** BWL - Erickson Station  
**Address:** 3725 S. Canal  
 Lansing MI, 48917

**Client Project Manager:** Cheryl Louden

**Report Date:** 09/12/2022

**Sample Name:** MW-4

**Lab #:** L208170-04 Ground Water

**Collected:** 02-Aug-22 10:55

**By:** Marc Wahrer

Analyte	Reporting			Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit	Units						
Conductivity	930	1.0	uS/cm	1		02-Aug-22 10:55	maw	SM 2510B	
Dissolved oxygen	0.120	0.100	mg/L	1		02-Aug-22 10:55	maw	FIELD	
Milliliters Purged	240		ml/min	1		02-Aug-22 10:55	maw	FIELD	
Oxidation Reduction Potential	-88.80	-999.0	mV	1		02-Aug-22 10:55	maw	FIELD	
pH	7.2	7.0	pH Units	1		02-Aug-22 10:55	maw	SM 4500H+B	
Temperature	14		°C	1		02-Aug-22 10:55	maw	SM 2550B	
Turbidity	0.75	0.10	NTU	1		02-Aug-22 10:55	maw	SM 2130B	

**Sample Name:** MW-5

**Lab #:** L208170-05 Ground Water

**Collected:** 02-Aug-22 16:21

**By:** Marc Wahrer

Analyte	Reporting			Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit	Units						
Conductivity	1600	1.0	uS/cm	1		02-Aug-22 16:21	maw	SM 2510B	
Dissolved oxygen	5.42	0.100	mg/L	1		02-Aug-22 16:21	maw	FIELD	
Milliliters Purged	250		ml/min	1		02-Aug-22 16:21	maw	FIELD	
Oxidation Reduction Potential	28.60	-999.0	mV	1		02-Aug-22 16:21	maw	FIELD	
pH	7.4	7.0	pH Units	1		02-Aug-22 16:21	maw	SM 4500H+B	
Temperature	15		°C	1		02-Aug-22 16:21	maw	SM 2550B	
Turbidity	20	0.10	NTU	1		02-Aug-22 16:21	maw	SM 2130B	

**Sample Name:** MW-6

**Lab #:** L208170-06 Ground Water

**Collected:** 02-Aug-22 14:09

**By:** Marc Wahrer

Analyte	Reporting			Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit	Units						
Conductivity	1100	1.0	uS/cm	1		02-Aug-22 14:09	maw	SM 2510B	
Dissolved oxygen	0.440	0.100	mg/L	1		02-Aug-22 14:09	maw	FIELD	
Milliliters Purged	240		ml/min	1		02-Aug-22 14:09	maw	FIELD	
Oxidation Reduction Potential	18.30	-999.0	mV	1		02-Aug-22 14:09	maw	FIELD	
pH	6.8	7.0	pH Units	1		02-Aug-22 14:09	maw	SM 4500H+B	
Temperature	14		°C	1		02-Aug-22 14:09	maw	SM 2550B	
Turbidity	2.6	0.10	NTU	1		02-Aug-22 14:09	maw	SM 2130B	



## Analytical Report

**Client:** BWL - Erickson Station

**Client Project Manager:** Cheryl Louden

**Report Date:** 09/12/2022

**Address:** 3725 S. Canal  
Lansing MI, 48917

**Approved By:** \_\_\_\_\_

*Jennifer Caporale*

### Notes and Definitions

- AL Action Level (Action Level = Regulatory Limit)
  - MCL Maximum Contaminant Level
  - PEL Permissible Exposure Limit (Permissible Exposure Limit = Regulatory Limit)
  - RPD Relative Percent Difference
  - OT Odor Threshold
  - ND Non Detect
- All drinking water regulatory limits are MCL's with the exception of Lead and Copper unless otherwise noted.





Report ID: S38760.01(02)  
Generated on 08/30/2022  
Replaces report S38760.01(01) generated on 08/05/2022

Report to  
Attention: Jennifer Caporale  
Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901  
  
Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

Report produced by  
Merit Laboratories, Inc.  
2680 East Lansing Drive  
East Lansing, MI 48823

Phone: (517) 332-0167 FAX: (517) 332-6333

Contacts for report questions:  
John Lavery (johnlavery@meritlabs.com)  
Barbara Ball (bball@meritlabs.com)

Report Summary

Lab Sample ID(s): S38760.01-S38760.08  
Project: Erickson AM MI Wells 1-6  
Collected Date(s): 08/02/2022  
Submitted Date/Time: 08/03/2022 10:19  
Sampled by: Marc Wahrer  
P.O. #:

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Maya Murshak  
Technical Director



## General Report Notes

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Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile, and 2-chloroethylvinyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (\*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

## Report Narrative

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All analyses completed



Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Alaska CSLAP	#17-001
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



## Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1 (1993)
SM2320B	Standard Method 2320 B 2011
SM2340C	Standard Method 2340 C 2011
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007



## Sample Summary (8 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S38760.01	MW-1 L208170-01	Groundwater	08/02/22 12:42
S38760.02	MW-2 L208170-02	Groundwater	08/02/22 15:43
S38760.03	MW-3 L208170-03	Groundwater	08/02/22 09:21
S38760.04	MW-4 L208170-04	Groundwater	08/02/22 10:55
S38760.05	MW-5 L208170-05	Groundwater	08/02/22 16:21
S38760.06	MW-6 L208170-06	Groundwater	08/02/22 14:09
S38760.07	Field Dupe MW-4 L208170-07	Groundwater	08/02/22 10:55
S38760.08	Field Blank L208170-08	Water	08/02/22 06:55



# Analytical Laboratory Report

Final Report

Lab Sample ID: S38760.01

Sample Tag: MW-1 L208170-01

Collected Date/Time: 08/02/2022 12:42

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.5	IR
2	1L Plastic	None	Yes	2.5	IR
1	125ml Plastic	HNO3	Yes	2.5	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	08/04/22 09:30	JRH	
Metal Digestion	Completed	SW3015A	08/04/22 10:20	CCM	

### Inorganics

Method: E300.0, Run Date: 08/04/22 08:45, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	66	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	37	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 08/03/22 15:25, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	650	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 08/03/22 14:38, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	588	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 08/03/22 18:20, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	742	50	10	mg/L	2		

Method: SM2540D, Run Date: 08/04/22 17:05, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	36	3	3	mg/L	1.00		

### Metals

Method: E200.8, Run Date: 08/04/22 12:50, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.007	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.155	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.34	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	12.0	0.02	0.00192	mg/L	5	7439-89-6	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S38760.01 (continued)

Sample Tag: MW-1 L208170-01

**Method: E200.8, Run Date: 08/04/22 12:50, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.027	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 08/04/22 15:08, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	158	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	43.1	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	1.14	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	40.4	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 08/04/22 12:40, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 08/29/22 12:09, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Lab Sample ID: S38760.02

Sample Tag: MW-2 L208170-02

Collected Date/Time: 08/02/2022 15:43

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.5	IR
2	1L Plastic	None	Yes	2.5	IR
1	125ml Plastic	HNO3	Yes	2.5	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	08/04/22 09:30	JRH	
Metal Digestion	Completed	SW3015A	08/04/22 10:20	CCM	

### Inorganics

Method: E300.0, Run Date: 08/04/22 08:55, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	

Method: E300.0, Run Date: 08/04/22 11:02, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	87	25	0.32	mg/L	25	16887-00-6	
Sulfate	330	25	2.6	mg/L	25	14808-79-8	

Method: SM2320B, Run Date: 08/03/22 15:27, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	410	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 08/03/22 14:40, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	654	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 08/03/22 18:20, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	1,020	50	10	mg/L	2		

Method: SM2540D, Run Date: 08/04/22 17:05, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	19	3	3	mg/L	1.00		

### Metals

Method: E200.8, Run Date: 08/04/22 12:55, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.043	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	4.76	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	





# Analytical Laboratory Report

Lab Sample ID: S38760.02 (continued)

Sample Tag: MW-2 L208170-02

**Method: E200.8, Run Date: 08/04/22 12:55, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.93	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.051	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.013	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	0.018	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 08/04/22 15:10, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	204	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	50.5	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	2.70	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	61.6	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 08/04/22 12:43, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 08/29/22 12:09, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Lab Sample ID: S38760.03

Sample Tag: MW-3 L208170-03

Collected Date/Time: 08/02/2022 09:21

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.5	IR
2	1L Plastic	None	Yes	2.5	IR
1	125ml Plastic	HNO3	Yes	2.5	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	08/04/22 09:30	JRH	
Metal Digestion	Completed	SW3015A	08/04/22 10:20	CCM	

### Inorganics

Method: E300.0, Run Date: 08/04/22 09:05, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	

Method: E300.0, Run Date: 08/04/22 11:12, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	101	50	0.65	mg/L	50	16887-00-6	
Sulfate	704	50	5.2	mg/L	50	14808-79-8	

Method: SM2320B, Run Date: 08/03/22 15:29, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	210	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 08/03/22 14:42, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	784	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 08/03/22 18:20, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	1,440	50	10	mg/L	2		

Method: SM2540D, Run Date: 08/04/22 17:05, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	4	3	3	mg/L	1.00		

### Metals

Method: E200.8, Run Date: 08/04/22 13:00, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.003	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.019	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	5.89	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S38760.03 (continued)

Sample Tag: MW-3 L208170-03

**Method: E200.8, Run Date: 08/04/22 13:00, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	1.80	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.091	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.162	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 08/04/22 15:11, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	241	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	45.9	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	1.67	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	111	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 08/04/22 12:47, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 08/29/22 12:09, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Final Report

Lab Sample ID: S38760.04

Sample Tag: MW-4 L208170-04

Collected Date/Time: 08/02/2022 10:55

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.5	IR
2	1L Plastic	None	Yes	2.5	IR
1	125ml Plastic	HNO3	Yes	2.5	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	08/04/22 09:30	JRH	
Metal Digestion	Completed	SW3015A	08/04/22 10:20	CCM	

### Inorganics

Method: E300.0, Run Date: 08/04/22 11:22, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	75	10	0.13	mg/L	10	16887-00-6	

Method: E300.0, Run Date: 08/04/22 09:15, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	51	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 08/03/22 15:31, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	400	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 08/03/22 14:44, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	412	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 08/03/22 18:20, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	554	50	10	mg/L	2		

Method: SM2540D, Run Date: 08/04/22 17:05, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	3	3	3	mg/L	1.00		

### Metals

Method: E200.8, Run Date: 08/04/22 13:18, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.008	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.167	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.06	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S38760.04 (continued)

Sample Tag: MW-4 L208170-04

**Method: E200.8, Run Date: 08/04/22 13:18, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	1.53	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.009	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 08/04/22 15:25, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	110	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	39.3	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	1.41	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	28.9	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 08/04/22 12:50, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 08/29/22 12:09, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Lab Sample ID: S38760.05

Sample Tag: MW-5 L208170-05

Collected Date/Time: 08/02/2022 16:21

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.5	IR
2	1L Plastic	None	Yes	2.5	IR
1	125ml Plastic	HNO3	Yes	2.5	IR
1	250ml Plastic	None	Yes	2.5	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	08/04/22 09:30	JRH	
Mercury Digestion	Completed	E245.1	08/04/22 09:30	JRH	
Metal Digestion	Completed	SW3015A	08/04/22 10:20	CCM	
Metal Digestion	Completed	SW3015A	08/04/22 10:20	CCM	

### Inorganics

Method: E300.0, Run Date: 08/04/22 11:32, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sulfate	598	25	2.6	mg/L	25	14808-79-8	

Method: E300.0, Run Date: 08/04/22 09:25, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	66	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	

Method: SM2320B, Run Date: 08/03/22 15:33, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	280	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 08/03/22 14:46, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	748	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 08/03/22 18:20, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	1,210	50	10	mg/L	2		

Method: SM2540D, Run Date: 08/04/22 17:05, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	17	3	3	mg/L	1.00		

### Metals

Method: E200.8, Run Date: 08/04/22 13:25, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.044	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	



# Analytical Laboratory Report

Lab Sample ID: S38760.05 (continued)

Sample Tag: MW-5 L208170-05

**Method: E200.8, Run Date: 08/04/22 13:25, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Boron	4.29	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.75	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.076	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.063	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	0.011	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	0.009	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 08/04/22 13:29, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony, Dissolved*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	f
Arsenic, Dissolved	Not detected	0.002	0.000255	mg/L	5	7440-38-2	f
Barium, Dissolved	0.042	0.005	0.000162	mg/L	5	7440-39-3	f
Beryllium, Dissolved	Not detected	0.001	0.000215	mg/L	5	7440-41-7	f
Boron, Dissolved	3.97	0.04	0.00175	mg/L	5	7440-42-8	f
Cadmium, Dissolved	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	f
Chromium, Dissolved	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	f
Cobalt, Dissolved	Not detected	0.005	0.000108	mg/L	5	7440-48-4	f
Copper, Dissolved	Not detected	0.005	0.000377	mg/L	5	7440-50-8	f
Iron, Dissolved	Not detected	0.02	0.00192	mg/L	5	7439-89-6	f
Lead, Dissolved	Not detected	0.003	0.000190	mg/L	5	7439-92-1	f
Lithium, Dissolved*	0.072	0.005	0.00163	mg/L	5	7439-93-2	f
Molybdenum, Dissolved	0.063	0.005	0.000217	mg/L	5	7439-98-7	f
Nickel, Dissolved	0.010	0.005	0.000250	mg/L	5	7440-02-0	f
Selenium, Dissolved	Not detected	0.005	0.00209	mg/L	5	7782-49-2	f
Silver, Dissolved	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	f
Thallium, Dissolved	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	f
Vanadium, Dissolved	Not detected	0.005	0.000139	mg/L	5	7440-62-2	f
Zinc, Dissolved	Not detected	0.005	0.000730	mg/L	5	7440-66-6	f

**Method: E200.8, Run Date: 08/04/22 15:26, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	223	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	54.5	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	3.77	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	69.5	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E200.8, Run Date: 08/04/22 15:28, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium, Dissolved*	212	0.50		mg/L	5	7440-70-2	f
Magnesium, Dissolved	50.7	0.50		mg/L	5	7439-95-4	f

f-Filtered and preserved in lab



# Analytical Laboratory Report

Final Report

Lab Sample ID: S38760.05 (continued)

Sample Tag: MW-5 L208170-05

**Method: E200.8, Run Date: 08/04/22 15:28, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Potassium, Dissolved	3.46	0.50	0.0230	mg/L	5	7440-09-7	f
Sodium, Dissolved	65.1	0.50		mg/L	5	7440-23-5	f

**Method: E245.1, Run Date: 08/04/22 12:57, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury, Dissolved	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	f

**Method: E245.1, Run Date: 08/04/22 12:53, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 08/29/22 12:09, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

f-Filtered and preserved in lab

O-Analysis performed by outside laboratory. See attached report.





# Analytical Laboratory Report

Lab Sample ID: S38760.06

Sample Tag: MW-6 L208170-06

Collected Date/Time: 08/02/2022 14:09

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.5	IR
2	1L Plastic	None	Yes	2.5	IR
1	125ml Plastic	HNO3	Yes	2.5	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	08/04/22 09:30	JRH	
Metal Digestion	Completed	SW3015A	08/04/22 10:20	CCM	

### Inorganics

Method: E300.0, Run Date: 08/04/22 11:42, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sulfate	172	10	1.0	mg/L	10	14808-79-8	

Method: E300.0, Run Date: 08/04/22 09:35, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	35	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	

Method: SM2320B, Run Date: 08/03/22 15:37, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	480	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 08/03/22 14:48, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	532	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 08/03/22 18:20, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	728	50	10	mg/L	2		

Method: SM2540D, Run Date: 08/04/22 17:05, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	3	mg/L	1.00		

### Metals

Method: E200.8, Run Date: 08/04/22 13:38, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.038	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.80	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S38760.06 (continued)

Sample Tag: MW-6 L208170-06

**Method: E200.8, Run Date: 08/04/22 13:38, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.02	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.046	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.016	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 08/04/22 15:30, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	169	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	32.9	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	6.40	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	38.8	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 08/04/22 13:07, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 08/29/22 12:09, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Final Report

Lab Sample ID: S38760.07

Sample Tag: Field Dupe MW-4 L208170-07

Collected Date/Time: 08/02/2022 10:55

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.5	IR
2	1L Plastic	None	Yes	2.5	IR
1	125ml Plastic	HNO3	Yes	2.5	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	08/04/22 09:30	JRH	
Metal Digestion	Completed	SW3015A	08/04/22 10:20	CCM	

### Inorganics

Method: E300.0, Run Date: 08/04/22 11:52, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	76	10	0.13	mg/L	10	16887-00-6	

Method: E300.0, Run Date: 08/04/22 09:45, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	52	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 08/03/22 15:39, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	410	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 08/03/22 14:50, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	426	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 08/03/22 18:20, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	574	50	10	mg/L	2		

Method: SM2540D, Run Date: 08/04/22 17:05, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	3	mg/L	1.00		

### Metals

Method: E200.8, Run Date: 08/04/22 13:45, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.008	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.165	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.07	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S38760.07 (continued)  
Sample Tag: Field Dupe MW-4 L208170-07

**Method: E200.8, Run Date: 08/04/22 13:45, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	1.54	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.009	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 08/04/22 15:31, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	109	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	38.8	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	1.41	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	28.3	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 08/04/22 13:17, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 08/29/22 12:09, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Final Report

Lab Sample ID: S38760.08

Sample Tag: Field Blank L208170-08

Collected Date/Time: 08/02/2022 06:55

Matrix: Water

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.5	IR
2	1L Plastic	None	Yes	2.5	IR
1	125ml Plastic	HNO3	Yes	2.5	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	08/04/22 09:30	JRH	
Metal Digestion	Completed	SW3015A	08/04/22 10:20	CCM	

### Inorganics

Method: E300.0, Run Date: 08/04/22 09:55, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	2.5	0.03	mg/L	2.5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.04	mg/L	2.5	16984-48-8	
Sulfate	Not detected	2.5	0.26	mg/L	2.5	14808-79-8	

Method: SM2320B, Run Date: 08/03/22 15:41, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	Not detected	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 08/03/22 14:52, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	Not detected	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 08/03/22 18:20, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	Not detected	50	10	mg/L	2		

Method: SM2540D, Run Date: 08/04/22 17:05, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	3	mg/L	1.00		

### Metals

Method: E200.8, Run Date: 08/04/22 12:12, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00102	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.000102	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.0000648	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.0000862	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.000702	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.0000760	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.0000386	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.0000434	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000150	mg/L	2	7440-50-8	
Iron	Not detected	0.02	0.000768	mg/L	2	7439-89-6	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S38760.08 (continued)

Sample Tag: Field Blank L208170-08

**Method: E200.8, Run Date: 08/04/22 12:12, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.0000760	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000654	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.0000868	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000100	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.000838	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.0000270	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.0000342	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.0000558	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.000292	mg/L	2	7440-66-6	

**Method: E200.8, Run Date: 08/04/22 14:56, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.0174	mg/L	2	7440-70-2	
Magnesium	Not detected	0.50	0.00480	mg/L	2	7439-95-4	
Potassium	Not detected	0.50	0.00920	mg/L	2	7440-09-7	
Sodium	Not detected	0.50	0.00340	mg/L	2	7440-23-5	

**Method: E245.1, Run Date: 08/04/22 13:20, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 08/29/22 12:09, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

# Merit Laboratories Login Checklist

Lab Set ID:S38760

Client:BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 1-6

Submitted:08/03/2022 10:19 Login User: MMC

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental\_Laboratory@LBWL.com

Selection	Description	Note
-----------	-------------	------

## Sample Receiving

- |     |  |  |        |
|-----|--|--|--------|
| 01. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples are received at 4C +/- 2C Thermometer #        | IR 2.5 |
| 02. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Received on ice/ cooling process begun                 |        |
| 03. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples shipped  |        |
| 04. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples left in 24 hr. drop box                        |        |
| 05. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Are there custody seals/tape or is the drop box locked |        |

## Chain of Custody

- |     |  |  |     |
|-----|--|--|-----|
| 06. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC adequately filled out                |     |
| 07. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC signed and relinquished to the lab   |     |
| 08. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sample tag on bottles match COC          |     |
| 09. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Subcontracting needed? Subcontracted to: | GEL |

## Preservation

- |     |  |   |             |
|-----|--|---|-------------|
| 10. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Do sample have correct chemical preservation        |             |
| 11. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Completed pH checks on preserved samples? (no VOAs) |             |
| 12. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Did any samples need to be preserved in the lab?    | Diss metals |

## Bottle Conditions

- |     |  |   |             |
|-----|--|---|-------------|
| 13. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | All bottles intact                            |             |
| 14. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Appropriate analytical bottles are used       |             |
| 15. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Merit bottles used                            |             |
| 16. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sufficient sample volume received             |             |
| 17. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples require laboratory filtration         | Diss metals |
| 18. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples submitted within holding time         |             |
| 19. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Do water VOC or TOX bottles contain headspace |             |

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: \_\_\_\_\_ Date: \_\_\_\_\_

## Merit Laboratories Bottle Preservation Check

Lab Set ID: S38760      Submitted: 08/03/2022 10:19

Attention: Jennifer Caporale  
Address: Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 1-6

Initial Preservation Check: 08/03/2022 12:07 MMC

Phone: 517-702-6372      FAX:  
Email: Environmental\_Laboratory@LBWL.com

Preservation Recheck (E200.8): N/A

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S38760.01	125ml Plastic HNO3	<2			
S38760.01	1L Plastic HNO3	<2			
S38760.01	1L Plastic HNO3	<2			
S38760.02	125ml Plastic HNO3	<2			
S38760.02	1L Plastic HNO3	<2			
S38760.02	1L Plastic HNO3	<2			
S38760.03	125ml Plastic HNO3	<2			
S38760.03	1L Plastic HNO3	<2			
S38760.03	1L Plastic HNO3	<2			
S38760.04	125ml Plastic HNO3	<2			
S38760.04	1L Plastic HNO3	<2			
S38760.04	1L Plastic HNO3	<2			
S38760.05	125ml Plastic HNO3	<2			
S38760.05	1L Plastic HNO3	<2			
S38760.05	1L Plastic HNO3	<2			
S38760.06	125ml Plastic HNO3	<2			
S38760.06	1L Plastic HNO3	<2			
S38760.06	1L Plastic HNO3	<2			
S38760.07	125ml Plastic HNO3	<2			
S38760.07	1L Plastic HNO3	<2			
S38760.07	1L Plastic HNO3	<2			
S38760.08	125ml Plastic HNO3	<2			
S38760.08	1L Plastic HNO3	<2			
S38760.08	1L Plastic HNO3	<2			





2680 East Lansing Dr., East Lansing, MI 48823  
 Phone (517) 332-0167 Fax (517) 332-4034  
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

**REPORT TO** **CHAIN OF CUSTODY RECORD** **INVOICE TO**

CONTACT NAME Jennifer Caporale  
 COMPANY Lansing Board of Water and Light  
 ADDRESS PO Box 13007 48901-3007  
 CITY Lansing STATE Mi ZIP CODE 48901  
 PHONE NO. 517-702-6372 FAX NO. \_\_\_\_\_ P.O. NO. \_\_\_\_\_  
 E-MAIL ADDRESS Environmental\_Laboratory@lbwl.com QUOTE NO. \_\_\_\_\_

CONTACT NAME Kelly Gleason  SAME  
 COMPANY \_\_\_\_\_  
 ADDRESS \_\_\_\_\_  
 CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP CODE \_\_\_\_\_  
 PHONE NO. \_\_\_\_\_ E-MAIL ADDRESS Kelly.Gleason@lbwl.com

PROJECT NO./NAME Erickson AM MI Wells 1-6 SAMPLER(S) - PLEASE PRINT/SIGN NAME Marc Wahrer

TURNAROUND TIME REQUIRED  1 DAY  2 DAYS  3 DAYS  STANDARD  OTHER ASAP  
 DELIVERABLES REQUIRED  STD  LEVEL II  LEVEL III  LEVEL IV  EDD  OTHER \_\_\_\_\_

MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID  
 SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIPE A=AIR W=WASTE

# Containers & Preservatives

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	# Containers & Preservatives							Total Metals	F- undistilled, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	HCO3, CO3, Hardness	dissolved Metals	Certifications
	DATE	TIME				NONE	HCl	HNO3	H2SO4	NaOH	MeOH	OTHER								
<u>38760.01</u>	<u>08/02/08</u>	<u>1242</u>	<u>MW-1 L208170-01</u>	<u>GW</u>	<u>5</u>	<u>2</u>	<u>3</u>						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> OHIO VAP <input type="checkbox"/> Drinking Water	
<u>.02</u>		<u>1543</u>	<u>MW-2 -02</u>	<u>GW</u>	<u>5</u>	<u>2</u>	<u>3</u>						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> DoD <input checked="" type="checkbox"/> NPDES	
<u>.03</u>		<u>0921</u>	<u>MW-3 -03</u>	<u>GW</u>	<u>5</u>	<u>2</u>	<u>3</u>						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Project Locations	
<u>.04</u>		<u>1055</u>	<u>MW-4 -04</u>	<u>GW</u>	<u>5</u>	<u>2</u>	<u>3</u>						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> Detroit <input type="checkbox"/> New York	
<u>.05</u>		<u>1621</u>	<u>MW-5 -05</u>	<u>GW</u>	<u>5</u>	<u>2</u>	<u>3</u>						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> Other _____	
<u>.06</u>		<u>1409</u>	<u>MW-6 -06</u>	<u>GW</u>	<u>5</u>	<u>2</u>	<u>3</u>						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Special Instructions	
<u>.07</u>		<u>1055</u>	<u>Field Dupe MW-4 -07</u>	<u>GW</u>	<u>5</u>	<u>2</u>	<u>3</u>						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Metals to analyse: Na, Mg, K	
<u>.08</u>	<input checked="" type="checkbox"/>	<u>0655</u>	<u>Field Blank -08</u>	<u>DI</u>	<u>5</u>	<u>2</u>	<u>3</u>						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	B, Ca, Sb, As, Ba, Be, Cd, Cr, Co, Li, Hg, Mo, Pb, Se, Tl, Fe, Cu, Ni, Ag, V, Zn	

RELINQUISHED BY: [Signature] DATE 8-5-22 TIME 1019  
 RECEIVED BY: [Signature] DATE 8/3/22 TIME 1019

RELINQUISHED BY: \_\_\_\_\_ DATE \_\_\_\_\_ TIME \_\_\_\_\_  
 RECEIVED BY: \_\_\_\_\_ DATE \_\_\_\_\_ TIME \_\_\_\_\_  
 SEAL NO. SEAL INTACT YES  NO  INITIALS \_\_\_\_\_  
 SEAL NO. SEAL INTACT YES  NO  INITIALS \_\_\_\_\_  
 NOTES: TEMP. ON ARRIVAL 2.5

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

## Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.150
Be, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	2.5
Cl	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cr, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Fluoride	250 mL plastic	mg/L	None	9056	28 d	1.0
F	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Fe, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Pb, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Li, total	Mercury	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Hg, total	Molybdenum	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Mo, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	HNO3	\$M 7500	6 mos	2.0 combined
RA226/228	Selenium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Se, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ag, total	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	10
SO4	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Tl, total	Total Dissolved Solids	1 L plastic	mg/L	None	\$M 2540C	NA	20
TDS	Total Suspended Solids	1 L plastic	mg/L	None	\$M 2540D	NA	3
TSS	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
V, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005



August 29, 2022

John Laverty  
Merit Laboratories Inc.  
2680 East Lansing Drive  
East Lansing, Michigan 48823

Re: Routine Analysis  
Work Order: 588594  
SDG: S38760

Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on August 05, 2022. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at [www.gel.com](http://www.gel.com).

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,

Delaney Stone  
Project Manager

Purchase Order: GELP20-0018  
Enclosures



## Table of Contents

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# Case Narrative

**Receipt Narrative  
for  
Merit Laboratories, Inc.  
SDG: S38760  
Work Order: 588594**

**August 29, 2022**

**Laboratory Identification:**

GEL Laboratories LLC  
2040 Savage Road  
Charleston, South Carolina 29407  
(843) 556-8171

**Summary:**

**Sample receipt:** The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on August 05, 2022 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

**Sample Identification:** The laboratory received the following samples:

<b><u>Laboratory ID</u></b>	<b><u>Client ID</u></b>
588594001	S38760.01
588594002	S38760.02
588594003	S38760.03
588594004	S38760.04
588594005	S38760.05
588594006	S38760.06
588594007	S38760.07 (DUPLICATE)
588594008	S38760.08 (FIELD BLANK)

**Case Narrative:**

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.

A handwritten signature in black ink that reads "Delaney Stone". The signature is written in a cursive, flowing style.

Delaney Stone  
Project Manager

# **Chain of Custody and Supporting Documentation**





2680 East Lansing Dr, East Lansing, MI 48823  
 Phone (517) 332-0167 Fax (517) 332-4034  
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

**REPORT TO**

CONTACT NAME Project Management Team  
 COMPANY Merit Laboratories  
 ADDRESS 2680 East Lansing Drive  
 CITY East Lansing  
 PHONE NO. 517-332-0167  
 E-MAIL ADDRESS results@meritlabs.com

**CHAIN OF CUSTODY RECORD**

CONTACT NAME Julie Teague  
 COMPANY Merit Laboratories  
 ADDRESS 2680 East Lansing Drive  
 CITY East Lansing  
 PHONE NO. 517-332-0167  
 E-MAIL ADDRESS julict@meritlabs.com

**INVOICE TO**

CONTACT NAME [EPAME]  
 COMPANY  
 ADDRESS  
 CITY  
 STATE MI  
 ZIP CODE 48823

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

PROJECT NO./NAME	SAMPLER(S) - PLEASE PRINT/SIGN NAME	TURNAROUND TIME REQUIRED	DELIVERABLES REQUIRED	YEAR	DATE	TIME	IDENTIFICATION-DESCRIPTION	MATRIX	# BOTTLES	NONE	HCl	HNO <sub>3</sub>	H <sub>2</sub> SO <sub>4</sub>	HNO <sub>3</sub> /H <sub>2</sub> SO <sub>4</sub>	OTHER PRESERVATIVES	CERTIFICATIONS	
																OHIO VAP	Drinking Water
S38760		<input type="checkbox"/> 1 DAY <input type="checkbox"/> 2 DAYS <input checked="" type="checkbox"/> 3 DAYS <input type="checkbox"/> STANDARD <input type="checkbox"/> OTHER	<input type="checkbox"/> STD <input type="checkbox"/> LEVEL # <input checked="" type="checkbox"/> LEVEL III <input type="checkbox"/> LEVEL IV <input type="checkbox"/> EDD <input type="checkbox"/> OTHER		8/2/22	1242	S38760.01	GW	2							<input type="checkbox"/> DoD <input type="checkbox"/> NPDES	
					8/2/22	1543	S38760.02	GW	2							<input type="checkbox"/> Detroit <input type="checkbox"/> New York	
					8/2/22	0921	S38760.03	GW	2							<input type="checkbox"/> Other	
					8/2/22	1055	S38760.04	GW	2							Special Instructions	
					8/2/22	1621	S38760.05	GW	2							# E903.1 Mod.	
					8/2/22	1409	S38760.06	GW	2							** E904.0/SW 9320 Mod.	
					8/2/22	1055	S38760.07 (Duplicate)	GW	2							Please use calculation product & provide Radium 226/228 combined results on the report	
					8/2/22	0655	S38760.08 (Field Blank)	W	2							(No Ice needed)	
																** Subcontracted to	
																GEL Laboratories, Inc.	
																2040 Savage Road	
																Charleston, SC 29407	

RELINQUISHED BY:	SIGNATURE/Organization	DATE	TIME
		8/2/22	17:00
		8/2/22	17:00

RECEIVED BY:	SIGNATURE/Organization	DATE	TIME
		8/2/22	17:00

SEAL NO.	SEAL INTACT	INITIALS	TEMP. ON ARRIVAL
	YES/NO		
	YES/NO		

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

**SAMPLE RECEIPT & REVIEW FORM**

Client: <u>MERI</u>	SDG/AR/COC/Work Order: <u>588589 / 8594</u>
Received By: <u>PG</u>	Date Received: <u>8/5/22</u>
Carrier and Tracking Number	Circle Applicable: FedEx Express    FedEx Ground <u>UPS</u> Field Services    Courier    Other  <u>1Z 466 477 03 6268 2205</u>

<b>Suspected Hazard Information</b>	<b>Yes</b>	<b>No</b>	*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.
A) Shipped as a DOT Hazardous?		<input checked="" type="checkbox"/>	Hazard Class Shipped: _____ UN#: _____ If UN2910, Is the Radioactive Shipment Survey Compliant? Yes ___ No ___
B) Did the client designate the samples are to be received as radioactive?		<input checked="" type="checkbox"/>	COC notation or radioactive stickers on containers equal client designation.
C) Did the RSO classify the samples as radioactive?		<input checked="" type="checkbox"/>	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): <u>0</u> <u>CPM</u> / mR/Hr Classified as: Rad 1 Rad 2 Rad 3
D) Did the client designate samples are hazardous?		<input checked="" type="checkbox"/>	COC notation or hazard labels on containers equal client designation.
E) Did the RSO identify possible hazards?		<input checked="" type="checkbox"/>	If D or E is yes, select Hazards below. PCB's    Flammable    Foreign Soil    RCRA    Asbestos    Beryllium    Other: _____

Sample Receipt Criteria		Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1	Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>			Circle Applicable: Seals broken    Damaged container    Leaking container    Other (describe)
2	Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>			Circle Applicable: Client contacted and provided COC    COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*		<input checked="" type="checkbox"/>		Preservation Method: Wet Ice    Ice Packs    Dry ice <u>None</u> Other: *all temperatures are recorded in Celsius    TEMP: <u>24</u>
4	Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>			Temperature Device Serial #: <u>IR 2-24</u> Secondary Temperature Device Serial # (If Applicable): _____
5	Sample containers intact and sealed?	<input checked="" type="checkbox"/>			Circle Applicable: Seals broken    Damaged container    Leaking container    Other (describe)
6	Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>			Sample ID's and Containers Affected: If Preservation added, Lot#: _____
7	Do any samples require Volatile Analysis?			<input checked="" type="checkbox"/>	If Yes, are Encoros or Soil Kits present for solids? Yes ___ No ___ NA ___ (If yes, take to VOA Freezer)
					Do liquid VOA vials contain acid preservation? Yes ___ No ___ NA ___ (If unknown, select No)
					Are liquid VOA vials free of headspace? Yes ___ No ___ NA ___
8	Samples received within holding time?	<input checked="" type="checkbox"/>			ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>			ID's and containers affected:
10	Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>			Circle Applicable: No dates on containers    No times on containers    COC missing info    Other (describe)
11	Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>			Circle Applicable: No container count on COC    Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?	<input checked="" type="checkbox"/>			
13	COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>			Circle Applicable: Not relinquished    Other (describe)

Comments (Use Continuation Form if needed):

# **Laboratory Certifications**

**List of current GEL Certifications as of 29 August 2022**

<b>State</b>	<b>Certification</b>
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122023-3
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2019-165
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122021-36
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

# **Radiological Analysis**

# Case Narrative

**Radiochemistry  
 Technical Case Narrative  
 Merit Laboratories, Inc.  
 SDG #: S38760  
 Work Order #: 588594**

**Product: GFPC Ra228, Liquid**

**Analytical Method:** EPA 904.0/SW846 9320 Modified

**Analytical Procedure:** GL-RAD-A-063 REV# 5

**Analytical Batch:** 2300100

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
588594001	S38760.01
588594002	S38760.02
588594003	S38760.03
588594004	S38760.04
588594005	S38760.05
588594006	S38760.06
588594007	S38760.07 (DUPLICATE)
588594008	S38760.08 (FIELD BLANK)
1205158468	Method Blank (MB)
1205158469	588224001(S38615.01) Sample Duplicate (DUP)
1205158470	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

**Quality Control (QC) Information**

**Method Blank Criteria**

The blank result (See Below) is greater than the MDC but less than the required detection limit.

Sample	Analyte	Value
1205158468 (MB)	Radium-228	Result: 2.29 pCi/L > MDA: 1.90 pCi/L <= RDL: 3.00 pCi/L

**Duplication Criteria between QC Sample and Duplicate Sample**

The Sample and the Duplicate, (See Below), did not meet the relative percent difference requirement; however, they do meet the relative error ratio requirement with the value listed below.

Sample	Analyte	Value
1205158469 (S38615.01DUP)	Radium-228	RPD 178* (0.0%-100.0%) RER 2.57 (0-3)

**Product:** Lucas Cell, Ra226, Liquid

**Analytical Method:** EPA 903.1 Modified

**Analytical Procedure:** GL-RAD-A-008 REV# 15

**Analytical Batch:** 2300087

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
588594001	S38760.01
588594002	S38760.02
588594003	S38760.03
588594004	S38760.04
588594005	S38760.05
588594006	S38760.06
588594007	S38760.07 (DUPLICATE)
588594008	S38760.08 (FIELD BLANK)
1205158421	Method Blank (MB)
1205158422	588224001(S38615.01) Sample Duplicate (DUP)
1205158423	588224001(S38615.01) Matrix Spike (MS)
1205158424	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

**Miscellaneous Information**

**Additional Comments**

The matrix spike, 1205158423 (S38615.01MS), aliquot was reduced to conserve sample volume.

**Certification Statement**

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.



## GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

### Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S38760 GEL Work Order: 588594

#### The Qualifiers in this report are defined as follows:

- \* A quality control analyte recovery is outside of specified acceptance criteria
- \*\* Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

#### Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature: 

Name: Kate Gellatly

Date: 30 AUG 2022

Title: Analyst I

# Sample Data Summary

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: August 30, 2022

Company : Merit Laboratories Inc.  
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty  
Project: Routine Analysis

Client Sample ID: S38760.01      Project: MERI00120  
Sample ID: 588594001      Client ID: MERI001  
Matrix: Ground Water  
Collect Date: 02-AUG-22 12:42  
Receive Date: 05-AUG-22  
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	0.891	+/-0.925	1.53	3.00	pCi/L			JXC9	08/26/22	1052	2300100	1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		1.61	+/-0.989			pCi/L			NXL1	08/29/22	1209	2300099	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.715	+/-0.350	0.438	1.00	pCi/L			LXP1	08/24/22	0955	2300087	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			82	(15%-125%)

### Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor      Lc/LC: Critical Level  
DL: Detection Limit      PF: Prep Factor  
MDA: Minimum Detectable Activity      RL: Reporting Limit  
MDC: Minimum Detectable Concentration      SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: August 30, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Lavery  
 Project: Routine Analysis

Client Sample ID: S38760.02	Project: MERI00120
Sample ID: 588594002	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 02-AUG-22 15:43	
Receive Date: 05-AUG-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	-0.338	+/-0.984	1.94	3.00	pCi/L			JXC9	08/26/22	1053	2300100	1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		0.290	+/-1.01			pCi/L			NXL1	08/29/22	1209	2300099	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226	U	0.290	+/-0.236	0.361	1.00	pCi/L			LXP1	08/24/22	0955	2300087	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			79.4	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

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## Certificate of Analysis

Report Date: August 30, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Lavery  
 Project: Routine Analysis

Client Sample ID: S38760.03	Project: MERI00120
Sample ID: 588594003	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 02-AUG-22 09:21	
Receive Date: 05-AUG-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228		2.56	+/-1.44	2.14	3.00	pCi/L		JXC9	08/26/22	1053	2300100	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		2.92	+/-1.46			pCi/L		NXL1	08/29/22	1209	2300099	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.355	+/-0.233	0.302	1.00	pCi/L		LXP1	08/24/22	1029	2300087	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			71.5	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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## Certificate of Analysis

Report Date: August 30, 2022

Company : Merit Laboratories Inc.  
Address : 2680 East Lansing Drive  
  
East Lansing, Michigan 48823  
Contact: John Lavery  
Project: Routine Analysis

Client Sample ID: S38760.04      Project: MERI00120  
Sample ID: 588594004      Client ID: MERI001  
Matrix: Ground Water  
Collect Date: 02-AUG-22 10:55  
Receive Date: 05-AUG-22  
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	-0.793	+/-1.33	2.68	3.00	pCi/L			JXC9	08/26/22	1053 2300100	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.393	+/-1.35			pCi/L			NXL1	08/29/22	1209 2300099	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.393	+/-0.257	0.351	1.00	pCi/L			LXP1	08/24/22	1029 2300087	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			62.5	(15%-125%)

### Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor      Lc/LC: Critical Level  
DL: Detection Limit      PF: Prep Factor  
MDA: Minimum Detectable Activity      RL: Reporting Limit  
MDC: Minimum Detectable Concentration      SQL: Sample Quantitation Limit

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## Certificate of Analysis

Report Date: August 30, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Lavery  
 Project: Routine Analysis

Client Sample ID: S38760.05	Project: MERI00120
Sample ID: 588594005	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 02-AUG-22 16:21	
Receive Date: 05-AUG-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.330	+/-1.27	2.30	3.00	pCi/L		JXC9	08/26/22	1053	2300100	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.855	+/-1.30			pCi/L		NXL1	08/29/22	1209	2300099	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.525	+/-0.302	0.391	1.00	pCi/L		LXP1	08/24/22	1029	2300087	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			67.6	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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## Certificate of Analysis

Report Date: August 30, 2022

Company : Merit Laboratories Inc.  
Address : 2680 East Lansing Drive  
  
East Lansing, Michigan 48823  
Contact: John Lavery  
Project: Routine Analysis

Client Sample ID: S38760.06      Project: MERI00120  
Sample ID: 588594006      Client ID: MERI001  
Matrix: Ground Water  
Collect Date: 02-AUG-22 14:09  
Receive Date: 05-AUG-22  
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.324	+/-1.28	2.32	3.00	pCi/L		JXC9	08/26/22	1053	2300100	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.401	+/-1.29			pCi/L		NXL1	08/29/22	1209	2300099	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.0773	+/-0.208	0.395	1.00	pCi/L		LXP1	08/24/22	1029	2300087	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			68	(15%-125%)

### Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor      Lc/LC: Critical Level  
DL: Detection Limit      PF: Prep Factor  
MDA: Minimum Detectable Activity      RL: Reporting Limit  
MDC: Minimum Detectable Concentration      SQL: Sample Quantitation Limit



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## Certificate of Analysis

Report Date: August 30, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

Client Sample ID: S38760.07 (DUPLICATE)	Project: MERI00120
Sample ID: 588594007	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 02-AUG-22 10:55	
Receive Date: 05-AUG-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	2.88	+/-1.88	2.94	3.00	pCi/L		JXC9	08/26/22	1053	2300100	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		3.34	+/-1.90			pCi/L		NXL1	08/29/22	1209	2300099	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.457	+/-0.236	0.266	1.00	pCi/L		LXP1	08/24/22	1029	2300087	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			61.4	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

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## Certificate of Analysis

Report Date: August 30, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

Client Sample ID: S38760.08 (FIELD BLANK)	Project: MERI00120
Sample ID: 588594008	Client ID: MERI001
Matrix: Water	
Collect Date: 02-AUG-22 06:55	
Receive Date: 05-AUG-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	1.66	+/-1.18	1.83	3.00	pCi/L			JXC9	08/26/22	1053	2300100	1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		1.88	+/-1.20			pCi/L			NXL1	08/29/22	1209	2300099	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226	U	0.217	+/-0.212	0.333	1.00	pCi/L			LXP1	08/24/22	1029	2300087	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			77.5	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# **Quality Control Summary**

# GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

## QC Summary

Report Date: August 30, 2022

Page 1 of 2

**Merit Laboratories Inc.**  
**2680 East Lansing Drive**  
**East Lansing, Michigan**

**Contact: John Laverty**

**Workorder: 588594**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Rad Gas Flow</b>											
Batch	2300100										
QC1205158469	588224001	DUP									
Radium-228	U	0.136		2.37	pCi/L	178*		(0% - 100%)	JXC9	08/26/22	10:46
	Uncertainty	+/-1.07		+/-1.18							
QC1205158470	LCS										
Radium-228	44.5			52.5	pCi/L		118	(75%-125%)		08/26/22	10:46
	Uncertainty			+/-3.92							
QC1205158468	MB										
Radium-228				2.29	pCi/L					08/26/22	10:46
	Uncertainty			+/-1.28							
<b>Rad Ra-226</b>											
Batch	2300087										
QC1205158422	588224001	DUP									
Radium-226		0.278	U	0.353	pCi/L	23.8		(0% - 100%)	LXP1	08/24/22	11:01
	Uncertainty	+/-0.178		+/-0.258							
QC1205158424	LCS										
Radium-226	26.5			21.8	pCi/L		82.1	(75%-125%)		08/24/22	11:01
	Uncertainty			+/-1.47							
QC1205158421	MB										
Radium-226			U	0.169	pCi/L					08/24/22	10:29
	Uncertainty			+/-0.228							
QC1205158423	588224001	MS									
Radium-226	128	0.278		122	pCi/L		95.3	(75%-125%)		08/24/22	11:01
	Uncertainty	+/-0.178		+/-7.63							

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- \*\* Analyte is a Tracer compound
- < Result is less than value reported
- > Result is greater than value reported
- BD Results are either below the MDC or tracer recovery is low
- FA Failed analysis.
- H Analytical holding time was exceeded

# GEL LABORATORIES LLC

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## QC Summary

Workorder: 588594

Page 2 of 2

Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
J											
J											
K											
L											
M											
M											
N/A											
NI											
ND											
NJ											
Q											
R											
U											
UI											
UJ											
UL											
X											
Y											
^											
h											

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where the duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

\* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

# Gas Flow Raw Data

# Batch 2300100 Check-list

This check-list was completed on 26-AUG-22 by Nat Long

This batch was reviewed by Kenshalla Oston on 26-AUG-22 and Nat Long on 26-AUG-22.

**Batch ID:**  
2300100

**Product:**  
GFC28RAL

**Description:** Gas Flow Radium 228  
GL-RAD-A-063

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?		No	
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?		No	
11	Has the method required detection limit been met?	Yes		
<b>Miscellaneous Information</b>				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

# Prep Logbook

## Radium-228 in Liquid

**Batch ID:** 2300100

**Analyst:** Jasmine Conley (JXC9)

**Method:** EPA 904.0/SW846 9320 Modified

**Lab SOP:** GL-RAD-A-063 REV# 5

**Instrument:** LUCAS-C037036045

**Due Dates for Lab:** 28-AUG-2022

**Package:** 30-AUG-2022

**SDG:** 31-AUG-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205158470	Radium-228	1965-C	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	588224001	11-AUG-2022	3	303.2	303.2	08/13/22 15:30	08/26/22 08:15
2	588224002	11-AUG-2022	3	300.28	300.28	08/13/22 15:30	08/26/22 08:15
3	588224003	11-AUG-2022	3	303.12	303.12	08/13/22 15:30	08/26/22 08:15
4	588224004	11-AUG-2022	3	301.82	301.82	08/13/22 15:30	08/26/22 08:15
5	588224005	11-AUG-2022	3	300.07	300.07	08/13/22 15:30	08/26/22 08:15
6	588589001	11-AUG-2022	3	305.07	305.07	08/13/22 15:30	08/26/22 08:15
7	588589002	11-AUG-2022	3	300.83	300.83	08/13/22 15:30	08/26/22 08:15
8	588589003	11-AUG-2022	3	303.18	303.18	08/13/22 15:30	08/26/22 08:15
9	588589004	11-AUG-2022	3	304.2	304.2	08/13/22 15:30	08/26/22 08:15
10	588594001	11-AUG-2022	3	300.42	300.42	08/13/22 15:30	08/26/22 08:15
11	588594002	11-AUG-2022	3	304.52	304.52	08/13/22 15:30	08/26/22 08:15
12	588594003	11-AUG-2022	3	300.94	300.94	08/13/22 15:30	08/26/22 08:15
13	588594004	11-AUG-2022	3	300.72	300.72	08/13/22 15:30	08/26/22 08:15
14	588594005	11-AUG-2022	3	302.08	302.08	08/13/22 15:30	08/26/22 08:15
15	588594006	11-AUG-2022	3	303.56	303.56	08/13/22 15:30	08/26/22 08:15
16	588594007	11-AUG-2022	3	300.73	300.73	08/13/22 15:30	08/26/22 08:15
17	588594008	11-AUG-2022	3	303.93	303.93	08/13/22 15:30	08/26/22 08:15
18	1205158468 MB	11-AUG-2022	3		305.07	08/13/22 15:30	08/26/22 08:15
19	1205158469 DUP (588224001)	11-AUG-2022	3	303.1	303.1	08/13/22 15:30	08/26/22 08:15
20	1205158470 LCS	11-AUG-2022	3		305.07	08/13/22 15:30	08/26/22 08:15

Reagent/Solvent Lot ID	Description	Amount
WORK 1951-D	Ba-133	.1 mL
REGNT 3413919	RGF-50% Potassium Carbonate	2 mL
REGNT 3418276.6	29M HF (48-50%)	4 mL
REGNT 3424228	RGF-Neodymium Subtrate	5 mL
REGNT 3454370.1	Nitric Acid	5 mL
REGNT 3460110.5	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL
REGNT 3465466	Barium Carrier Ra228 REG	1 mL
REGNT 3466250	RGF-7M Nitric Acid	25 mL
REGNT 3466286	RGF-1M Citric Acid	5 mL
REGNT 3466687	500 mg/mL Neodymium Carrier	.2 mL
REGNT 3471758	RGF-1.5M Ammonium Sulfate	10 mL
REGNT 3472801	2M HCl	20 mL
REGNT DGA0036	2294962	2 g

**Comments:**

Pipet Id: RAD-GFC-1795419  
 Data Entry Date2: 12-AUG-2022 13:16 LUCAS-C037036045 Jasmine Conley  
 Data Entry Date3: 11-AUG-2022 00:00



### Radium-228 Liquid

Filename : RA228.XLS  
 File type : Excel  
 Version # : 1.4.2

Tracer S/N : 1951-D  
 Tracer Exp Date : 6/2/2023  
 Tracer Volume Added: 0.10

Batch : 2300100  
 Analyst : JAS02031  
 Prep Date : 8/11/2022  
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL  
 Parmname : Radium-228  
 Required MDA : 3 pCi/L  
 Ra-228 Abundance : 1.00  
 Halflife of Ra-228 : 5.75 years  
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer Aliquot	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	588224001.1	0.3032	1.8513E-05	7/28/2022 12:02	1303.3	1.60%	1027.5	1.80%	0.1	0.000200
2	588224002.1	0.3003	1.8464E-05	7/28/2022 13:32	1303.3	1.60%	1001.1	1.82%	0.1	0.000200
3	588224003.1	0.3031	1.8512E-05	7/28/2022 9:47	1303.3	1.60%	1054.8	1.78%	0.1	0.000200
4	588224004.1	0.3018	1.8490E-05	7/28/2022 9:47	1303.3	1.60%	1021.5	1.81%	0.1	0.000200
5	588224005.1	0.3001	1.8460E-05	7/28/2022 8:40	1303.3	1.60%	979.6	1.84%	0.1	0.000200
6	588589001.1	0.3051	1.8544E-05	8/2/2022 21:41	1303.3	1.60%	926.2	1.90%	0.1	0.000200
7	588589002.1	0.3008	1.8473E-05	8/2/2022 20:25	1303.3	1.60%	1049.2	1.78%	0.1	0.000200
8	588589003.1	0.3032	1.8513E-05	8/2/2022 19:13	1303.3	1.60%	860.6	1.97%	0.1	0.000200
9	588589004.1	0.3042	1.8529E-05	8/2/2022 17:56	1303.3	1.60%	1032.1	1.80%	0.1	0.000200
10	588594001.1	0.3004	1.8466E-05	8/2/2022 12:42	1303.3	1.60%	1068.7	1.77%	0.1	0.000200
11	588594002.1	0.3045	1.8535E-05	8/2/2022 15:43	1303.3	1.60%	1034.2	1.80%	0.1	0.000200
12	588594003.1	0.3009	1.8475E-05	8/2/2022 9:21	1303.3	1.60%	932.2	1.89%	0.1	0.000200
13	588594004.1	0.3007	1.8471E-05	8/2/2022 10:55	1303.3	1.60%	814.7	2.02%	0.1	0.000200
14	588594005.1	0.3021	1.8494E-05	8/2/2022 16:21	1303.3	1.60%	880.8	1.95%	0.1	0.000200
15	588594006.1	0.3036	1.8519E-05	8/2/2022 14:09	1303.3	1.60%	886.2	1.94%	0.1	0.000200
16	588594007.1	0.3007	1.8471E-05	8/2/2022 10:55	1303.3	1.60%	800.5	2.04%	0.1	0.000200
17	588594008.1	0.3039	1.8525E-05	8/2/2022 6:55	1303.3	1.60%	1010.7	1.82%	0.1	0.000200
18	1205158468.1	0.3051	1.8544E-05	8/11/2022 0:00	1303.3	1.60%	994.9	1.83%	0.1	0.000200
19	1205158469.1	0.3031	1.8511E-05	7/28/2022 12:02	1303.3	1.60%	997.0	1.83%	0.1	0.000200
20	1205158470.1	0.3051	1.8544E-05	8/11/2022 0:00	1303.3	1.60%	1026.2	1.80%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063  
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated	Sample
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction	Recovery %	Recovery Error %
			Alpha	Beta										
1	1B	60	9	49	0.817	8/26/2022 10:50	8/13/2022 15:30	8/26/2022 8:15	0.990	0.746	1.000	1.057	78.8%	1.24%
2	2A	60	16	52	0.867	8/26/2022 10:51	8/13/2022 15:30	8/26/2022 8:15	0.991	0.746	1.000	1.057	76.8%	1.24%
3	3B	60	14	29	0.483	8/26/2022 10:51	8/13/2022 15:30	8/26/2022 8:15	0.990	0.746	1.000	1.057	80.9%	1.23%
4	4A	60	8	27	0.450	8/26/2022 10:51	8/13/2022 15:30	8/26/2022 8:15	0.990	0.746	1.000	1.057	78.4%	1.24%
5	4C	60	14	62	1.033	8/26/2022 10:52	8/13/2022 15:30	8/26/2022 8:15	0.990	0.745	1.000	1.057	75.2%	1.25%
6	5A	60	11	67	1.117	8/26/2022 10:52	8/13/2022 15:30	8/26/2022 8:15	0.992	0.744	1.000	1.057	71.1%	1.27%
7	7B	60	19	83	1.383	8/26/2022 10:52	8/13/2022 15:30	8/26/2022 8:15	0.992	0.743	1.000	1.057	80.5%	1.23%
8	7C	60	9	87	1.450	8/26/2022 10:52	8/13/2022 15:30	8/26/2022 8:15	0.992	0.743	1.000	1.057	66.0%	1.30%
9	7D	60	26	39	0.650	8/26/2022 10:52	8/13/2022 15:30	8/26/2022 8:15	0.992	0.743	1.000	1.057	79.2%	1.24%
10	8A	60	18	44	0.733	8/26/2022 10:52	8/13/2022 15:30	8/26/2022 8:15	0.992	0.743	1.000	1.057	82.0%	1.23%
11	9A	60	10	45	0.750	8/26/2022 10:53	8/13/2022 15:30	8/26/2022 8:15	0.992	0.743	1.000	1.057	79.4%	1.24%
12	9B	60	11	80	1.333	8/26/2022 10:53	8/13/2022 15:30	8/26/2022 8:15	0.992	0.743	1.000	1.057	71.5%	1.27%
13	9C	60	26	47	0.783	8/26/2022 10:53	8/13/2022 15:30	8/26/2022 8:15	0.992	0.743	1.000	1.057	62.5%	1.32%
14	9D	60	9	54	0.900	8/26/2022 10:53	8/13/2022 15:30	8/26/2022 8:15	0.992	0.743	1.000	1.057	67.6%	1.29%
15	10A	60	17	57	0.950	8/26/2022 10:53	8/13/2022 15:30	8/26/2022 8:15	0.992	0.743	1.000	1.057	68.0%	1.29%
16	10C	60	13	100	1.667	8/26/2022 10:53	8/13/2022 15:30	8/26/2022 8:15	0.992	0.743	1.000	1.057	61.4%	1.33%
17	10D	60	11	61	1.017	8/26/2022 10:53	8/13/2022 15:30	8/26/2022 8:15	0.992	0.743	1.000	1.057	77.5%	1.24%
18	11A	60	13	78	1.300	8/26/2022 10:46	8/13/2022 15:30	8/26/2022 8:15	0.995	0.752	1.000	1.057	76.3%	1.25%
19	11C	60	11	64	1.067	8/26/2022 10:46	8/13/2022 15:30	8/26/2022 8:15	0.990	0.752	1.000	1.057	76.5%	1.25%
20	11D	60	19	824	13.733	8/26/2022 10:46	8/13/2022 15:30	8/26/2022 8:15	0.995	0.752	1.000	1.057	78.7%	1.24%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2022	5/31/2023	0.6068	0.00711	0.786	8/20/2022 6:37	500
2	PIC	6/1/2022	5/31/2023	0.6201	0.01914	0.738	8/20/2022 6:36	500
3	PIC	6/1/2022	5/31/2023	0.6245	0.01614	0.568	8/20/2022 6:37	500
4	PIC	6/1/2022	5/31/2023	0.6013	0.01123	0.696	8/20/2022 6:37	500
5	PIC	6/1/2022	5/31/2023	0.6359	0.00889	1.110	8/20/2022 6:37	500
6	PIC	6/1/2022	5/31/2023	0.6332	0.00851	0.846	8/20/2022 6:38	500
7	PIC	6/1/2022	5/31/2023	0.6366	0.00627	0.658	8/20/2022 6:38	500
8	PIC	6/1/2022	5/31/2023	0.6407	0.00790	1.076	8/20/2022 6:38	500
9	PIC	6/1/2022	5/31/2023	0.6270	0.01113	0.556	8/20/2022 6:38	500
10	PIC	6/1/2022	5/31/2023	0.6398	0.01579	0.516	8/20/2022 6:38	500
11	PIC	6/1/2022	5/31/2023	0.6336	0.00758	0.830	8/20/2022 6:39	500
12	PIC	6/1/2022	5/31/2023	0.6318	0.00754	0.794	8/20/2022 6:39	500
13	PIC	6/1/2022	5/31/2023	0.6184	0.00584	0.926	8/20/2022 6:39	500
14	PIC	6/1/2022	5/31/2023	0.6330	0.02610	0.834	8/20/2022 6:39	500
15	PIC	6/1/2022	5/31/2023	0.6384	0.00651	0.884	8/20/2022 6:39	500
16	PIC	6/1/2022	5/31/2023	0.6321	0.00638	1.146	8/20/2022 6:39	500
17	PIC	6/1/2022	5/31/2023	0.6148	0.00557	0.644	8/20/2022 6:39	500
18	PIC	6/1/2022	5/31/2023	0.6371	0.01317	0.766	8/20/2022 6:37	500
19	PIC	6/1/2022	5/31/2023	0.6276	0.01278	0.528	8/20/2022 6:37	500
20	PIC	6/1/2022	5/31/2023	0.6372	0.01068	1.110	8/20/2022 6:37	500

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

**Spike S/N :** N/A  
**Spike Exp Date :** N/A  
**Spike Activity (dpm/ml):** N/A  
**Spike Volume Added:** N/A

**LCS S/N :** 1965-C  
**LCS Exp Date :** 8/5/2023  
**LCS Activity (dpm/ml):** 301.34  
**LCS Volume Added:** 0.10

Results														2 SIGMA		2 SIGMA			
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	Counting Uncertainty pCi/L	Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery			
1	1.2541	0.8854	3	1.9930	<b>0.1363</b>	401.81%	0.0307	0.1232	1.0732	1.0737		SAMPLE							
2	1.2326	0.8702	3	1.9658	<b>0.5799</b>	98.09%	0.1287	0.1262	1.1146	1.1242		SAMPLE							
3	1.0098	0.7129	3	1.6362	<b>-0.3563</b>	113.25%	-0.0847	0.0959	0.7909	0.7911		SAMPLE							
4	1.2042	0.8502	3	1.9270	<b>-1.1154</b>	38.37%	-0.2460	0.0943	0.8380	0.8382		SAMPLE							
5	1.5103	1.0663	3	2.3577	<b>-0.3452</b>	181.88%	-0.0767	0.1394	1.2307	1.2308		SAMPLE							
6	1.3761	0.9715	3	2.1781	<b>1.2721</b>	52.67%	0.2707	0.1425	1.3125	1.3506		SAMPLE							
7	1.0814	0.7635	3	1.7363	<b>3.0375</b>	21.57%	0.7253	0.1561	1.2814	1.4895		SAMPLE							
8	1.6623	1.1736	3	2.5989	<b>1.8827</b>	43.40%	0.3740	0.1622	1.6007	1.6686		SAMPLE							
9	1.0147	0.7164	3	1.6466	<b>0.4018</b>	116.28%	0.0940	0.1093	0.9158	0.9213		SAMPLE							
10	0.9371	0.6616	3	1.5282	<b>0.8907</b>	53.01%	0.2173	0.1151	0.9247	0.9515		SAMPLE							
11	1.2237	0.8639	3	1.9388	<b>-0.3375</b>	148.75%	-0.0800	0.1190	0.9841	0.9842		SAMPLE							
12	1.3477	0.9515	3	2.1406	<b>2.5625</b>	28.65%	0.5393	0.1543	1.4369	1.5735		SAMPLE							
13	1.7026	1.2021	3	2.6821	<b>-0.7930</b>	85.59%	-0.1427	0.1221	1.3301	1.3303		SAMPLE							
14	1.4535	1.0262	3	2.3023	<b>0.3300</b>	195.63%	0.0660	0.1291	1.2651	1.2679		SAMPLE							
15	1.4679	1.0363	3	2.3179	<b>0.3237</b>	201.02%	0.0660	0.1327	1.2753	1.2778		SAMPLE							
16	1.8867	1.3320	3	2.9409	<b>2.8826</b>	33.34%	0.5207	0.1734	1.8817	2.0152		SAMPLE							
17	1.1399	0.8048	3	1.8327	<b>1.6629</b>	36.26%	0.3727	0.1350	1.1809	1.2519		SAMPLE							
18	1.1956	0.8441	3	1.9027	<b>2.2915</b>	28.58%	0.5340	0.1523	1.2810	1.4043		MB							
19	1.0167	0.7178	3	1.6553	<b>2.3675</b>	25.54%	0.5387	0.1372	1.1822	1.3231	588224001.1	DUP	178.2%	2.5664					
20	1.3951	0.9850	3	2.1779	<b>52.5098</b>	4.14%	12.6233	0.4807	3.9195	13.7294		LCS			44.4950	118.0%			

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
588224001	1B	60	9	49	8/26/2022 10:50	8/26/2022 11:50	PIC	2300100
588224002	2A	60	16	52	8/26/2022 10:51	8/26/2022 11:51	PIC	2300100
588224003	3B	60	14	29	8/26/2022 10:51	8/26/2022 11:51	PIC	2300100
588224004	4A	60	8	27	8/26/2022 10:51	8/26/2022 11:51	PIC	2300100
588224005	4C	60	14	62	8/26/2022 10:52	8/26/2022 11:52	PIC	2300100
588589001	5A	60	11	67	8/26/2022 10:52	8/26/2022 11:52	PIC	2300100
588589002	7B	60	19	83	8/26/2022 10:52	8/26/2022 11:52	PIC	2300100
588589003	7C	60	9	87	8/26/2022 10:52	8/26/2022 11:52	PIC	2300100
588589004	7D	60	26	39	8/26/2022 10:52	8/26/2022 11:52	PIC	2300100
588594001	8A	60	18	44	8/26/2022 10:52	8/26/2022 11:52	PIC	2300100
588594002	9A	60	10	45	8/26/2022 10:53	8/26/2022 11:53	PIC	2300100
588594003	9B	60	11	80	8/26/2022 10:53	8/26/2022 11:53	PIC	2300100
588594004	9C	60	26	47	8/26/2022 10:53	8/26/2022 11:53	PIC	2300100
588594005	9D	60	9	54	8/26/2022 10:53	8/26/2022 11:53	PIC	2300100
588594006	10A	60	17	57	8/26/2022 10:53	8/26/2022 11:53	PIC	2300100
588594007	10C	60	13	100	8/26/2022 10:53	8/26/2022 11:53	PIC	2300100
588594008	10D	60	11	61	8/26/2022 10:53	8/26/2022 11:53	PIC	2300100
1205158468	11A	60	13	78	8/26/2022 10:46	8/26/2022 11:46	PIC	2300100
1205158469	11C	60	11	64	8/26/2022 10:46	8/26/2022 11:46	PIC	2300100
1205158470	11D	60	19	824	8/26/2022 10:46	8/26/2022 11:46	PIC	2300100

ASSAY 26-Aug-22 12:01:08  
 Wizard 2480 s/n 46190630  
 Protocol id 9 Ba-133\_1  
 Time limit  
 Count limit  
 Isotope Ba-133\_1  
 Protocol date 8/26/2022  
 Run id. 5443

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	92	1	180	3910.28	1303.29	1.6	12:01:08
588224001		2	92	2	180	3083	1027.46	1.8	78.84 12:04:22
588224002		3	92	3	180	3004	1001.13	1.82	76.82 12:07:36
588224003		4	92	4	180	3165	1054.79	1.78	80.93 12:10:50
588224004		5	92	5	180	3065	1021.47	1.81	78.38 12:14:04
588224005		1	15	1	180	2939.28	979.56	1.84	75.16 12:17:40
588589001		2	15	2	180	2779	926.22	1.9	71.07 12:20:54
588589002		3	15	3	180	3148.28	1049.22	1.78	80.51 12:24:08
588589003		4	15	4	180	2582	860.57	1.97	66.03 12:27:22
588589004		5	15	5	180	3097	1032.12	1.8	79.19 12:30:36
588594001		1	19	1	180	3206.57	1068.65	1.77	82.00 12:34:12
588594002		2	19	2	180	3103	1034.22	1.8	79.35 12:37:25
588594003		3	19	3	180	2797	932.15	1.89	71.52 12:40:39
588594004		4	19	4	180	2444.57	814.69	2.02	62.51 12:43:53
588594005		5	19	5	180	2643	880.82	1.95	67.58 12:47:07
588594006		1	10	1	180	2659.28	886.24	1.94	68.00 12:50:53
588594007		2	10	2	180	2402	800.5	2.04	61.42 12:54:07
588594008		3	10	3	180	3032.57	1010.66	1.82	77.55 12:57:21
1205158468		4	10	4	180	2985	994.9	1.83	76.34 01:00:35
1205158469		5	10	5	180	2991.28	996.99	1.83	76.50 01:03:49
1205158470		1	5	1	180	3079.28	1026.22	1.8	78.74 01:07:37

END OF ASSAY

# **Continuing Calibration Data**

# Gas Flow Proportional Counter Checks for 26-Aug-2022

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100A2	need 2nd	Beta bkg	26-Aug 06:32	60	1.900	-2.15E-1	2.577	+1.55
LB4100E2	Above	Beta bkg	26-Aug 06:30	60	2.950	1.385	3.072	+2.57
LB4100E3	Above	Beta bkg	26-Aug 06:30	60	2.500	0.506	2.576	+2.78
LB4100F2	Above	Alpha eff	26-Aug 08:00	5	6619	3944	6286	+3.85
LB4100F2	Above	Beta XTalk	26-Aug 10:18	5	5.91E-4	1.40E-4	5.65E-4	+3.36
LB4100F3	need 2nd	Beta bkg	26-Aug 10:38	60	1.650	0.854	1.842	+1.83
LB4100F4	Above	Alpha eff	26-Aug 08:00	5	11080	5098	9867	+4.53
LB4100F4	Below	Alpha XTalk	26-Aug 08:00	5	0.384	0.384	0.757	-3.01
LB4100G1	Above	Alpha XTalk	26-Aug 10:05	5	0.829	0.088	0.447	+9.39
LB4100G1	Above	Beta bkg	26-Aug 06:31	60	1503	0.380	1.675	+6,960.56
LB4100G1	need 2nd	Beta eff	26-Aug 08:24	5	16452	12880	18320	+0.94
LB4100G3	Above	Beta bkg	26-Aug 06:31	60	1.950	0.810	1.674	+4.92
LB4100H2	Below	Alpha eff	26-Aug 10:04	5	4819	5513	8976	-4.20
LB4100H2	Above	Alpha XTalk	26-Aug 10:04	5	0.442	0.269	0.396	+5.21
PIC8B	Above	Alpha bkg	26-Aug 07:51	60	0.683	-1.16E-1	0.388	+6.53
PIC8B	Above	Beta bkg	26-Aug 07:51	60	2.917	-1.80E-1	2.341	+4.37
PIC8B	Above	Beta eff	26-Aug 07:44	5	23555	20290	21980	+8.59
PIC8C	Above	Beta bkg	26-Aug 09:10	60	8.300	-2.96E-1	2.115	+18.39
PIC8D	Above	Beta bkg	26-Aug 09:10	60	9.200	-1.07E-1	2.328	+19.93
PIC14C	Above	Beta bkg	26-Aug 09:08	60	2.033	0.197	2.388	+2.03

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

G5400W1W	Alpha eff, Alpha XTalk, Beta eff, Beta XTalk
G5400W1X	Alpha eff, Alpha XTalk, Beta eff, Beta XTalk
G5400W1Y	Alpha eff, Alpha XTalk, Beta eff, Beta XTalk
G5400W1Z	Alpha eff, Alpha XTalk, Beta eff, Beta XTalk
LB4100C1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk



LB4100C4            Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
LB4100I1            Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
LB4100I2            Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
LB4100I3            Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
LB4100I4            Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by 

Date 8/26/22

GEL Laboratories LLC

# Runlogs

# Instrument Run Log

Instrument Type: GFPC

Batch ID: 2300100

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205158468	MB	JXC9	PIC11A	AUG-26-22 10:46:45	DONE	25mm Filter	01-JUN-22 00:00
1205158469	DUP	JXC9	PIC11C	AUG-26-22 10:46:46	DONE	25mm Filter	01-JUN-22 00:00
1205158470	LCS	JXC9	PIC11D	AUG-26-22 10:46:46	DONE	25mm Filter	01-JUN-22 00:00
588224001	SAMPLE	JXC9	PIC1B	AUG-26-22 10:50:56	DONE	25mm Filter	01-JUN-22 00:00
588224002	SAMPLE	JXC9	PIC2A	AUG-26-22 10:51:04	DONE	25mm Filter	01-JUN-22 00:00
588224003	SAMPLE	JXC9	PIC3B	AUG-26-22 10:51:08	DONE	25mm Filter	01-JUN-22 00:00
588224004	SAMPLE	JXC9	PIC4A	AUG-26-22 10:51:12	DONE	25mm Filter	01-JUN-22 00:00
588224005	SAMPLE	JXC9	PIC4C	AUG-26-22 10:52:00	DONE	25mm Filter	01-JUN-22 00:00
588589001	SAMPLE	JXC9	PIC5A	AUG-26-22 10:52:27	DONE	25mm Filter	01-JUN-22 00:00
588589002	SAMPLE	JXC9	PIC7B	AUG-26-22 10:52:47	DONE	25mm Filter	01-JUN-22 00:00
588589003	SAMPLE	JXC9	PIC7C	AUG-26-22 10:52:48	DONE	25mm Filter	01-JUN-22 00:00
588589004	SAMPLE	JXC9	PIC7D	AUG-26-22 10:52:48	DONE	25mm Filter	01-JUN-22 00:00
588594001	SAMPLE	JXC9	PIC8A	AUG-26-22 10:52:55	DONE	25mm Filter	01-JUN-22 00:00
588594002	SAMPLE	JXC9	PIC9A	AUG-26-22 10:53:01	DONE	25mm Filter	01-JUN-22 00:00
588594003	SAMPLE	JXC9	PIC9B	AUG-26-22 10:53:04	DONE	25mm Filter	01-JUN-22 00:00
588594004	SAMPLE	JXC9	PIC9C	AUG-26-22 10:53:08	DONE	25mm Filter	01-JUN-22 00:00
588594005	SAMPLE	JXC9	PIC9D	AUG-26-22 10:53:10	DONE	25mm Filter	01-JUN-22 00:00
588594006	SAMPLE	JXC9	PIC10A	AUG-26-22 10:53:16	DONE	25mm Filter	01-JUN-22 00:00
588594007	SAMPLE	JXC9	PIC10C	AUG-26-22 10:53:22	DONE	25mm Filter	01-JUN-22 00:00
588594008	SAMPLE	JXC9	PIC10D	AUG-26-22 10:53:25	DONE	25mm Filter	01-JUN-22 00:00

# Lucas Cell Raw Data

# Batch 2300087 Check-list

This check-list was completed on 24-AUG-22 by Elizabeth Krouse

This batch was reviewed by Elizabeth Krouse on 24-AUG-22 and Lyndsey Pace on 24-AUG-22.

**Batch ID:**  
2300087

**Product:**  
LUC26RAL

**Description:** Lucas Cell Radium 226  
GL-RAD-A-008

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
<b>Miscellaneous Information</b>				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

# Prep Logbook

## Radium-226 in Liquid

**Batch ID: 2300087**

Analyst: Lyndsey Pace (LXP1)

Method: EPA 903.1 Modified

Lab SOP: GL-RAD-A-008 REV# 15

Instrument: LUCAS-C037036045

**Due Dates for Lab: 28-AUG-2022**

**Package: 30-AUG-2022**

**SDG: 31-AUG-2022**

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205158424	Radium-226 SPIKE	1715-G	.1	mL
MS	1205158423	Radium-226 SPIKE	1715-G	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	588224001	11-AUG-2022	1	500.34	500.34	08/18/22 08:15	507	08/24/22 06:18	08/24/22 09:23	1	12
2	588224002	11-AUG-2022	1	505.41	505.41	08/18/22 08:15	604	08/24/22 06:18	08/24/22 09:23	2	9
3	588224003	11-AUG-2022	1	503.15	503.15	08/18/22 08:15	705	08/24/22 06:18	08/24/22 09:23	2	24
4	588224004	11-AUG-2022	1	504.9	504.9	08/18/22 08:15	806	08/24/22 06:18	08/24/22 09:23	2	93
5	588224005	11-AUG-2022	1	505.45	505.45	08/18/22 08:15	105	08/24/22 06:46	08/24/22 09:55	4	10
6	588589001	11-AUG-2022	1	503.78	503.78	08/18/22 08:15	206	08/24/22 06:46	08/24/22 09:55	1	24
7	588589002	11-AUG-2022	1	502.93	502.93	08/18/22 08:15	403	08/24/22 06:46	08/24/22 09:55	5	12
8	588589003	11-AUG-2022	1	500.82	500.82	08/18/22 08:15	506	08/24/22 06:46	08/24/22 09:55	8	10
9	588589004	11-AUG-2022	1	504.31	504.31	08/18/22 08:15	605	08/24/22 06:46	08/24/22 09:55	5	13
10	588594001	11-AUG-2022	1	500.13	500.13	08/18/22 08:15	706	08/24/22 06:46	08/24/22 09:55	7	32
11	588594002	11-AUG-2022	1	500.33	500.33	08/18/22 08:15	802	08/24/22 06:46	08/24/22 09:55	8	21
12	588594003	11-AUG-2022	1	503.87	503.87	08/18/22 08:15	106	08/24/22 07:13	08/24/22 10:29	3	16
13	588594004	11-AUG-2022	1	502.01	502.01	08/18/22 08:15	208	08/24/22 07:13	08/24/22 10:29	5	20
14	588594005	11-AUG-2022	1	503.61	503.61	08/18/22 08:15	408	08/24/22 07:13	08/24/22 10:29	5	23
15	588594006	11-AUG-2022	1	502.61	502.61	08/18/22 08:15	508	08/24/22 07:13	08/24/22 10:29	7	10
16	588594007	11-AUG-2022	1	501.34	501.34	08/18/22 08:15	606	08/24/22 07:13	08/24/22 10:29	3	22
17	588594008	11-AUG-2022	1	503.64	503.64	08/18/22 08:15	707	08/24/22 07:13	08/24/22 10:29	4	12
18	1205158421 MB	11-AUG-2022	1	505.45	505.45	08/18/22 08:15	805	08/24/22 07:13	08/24/22 10:29	8	15
19	1205158422 DUP (588224001)	11-AUG-2022	1	500.85	500.85	08/18/22 08:15	108	08/24/22 07:40	08/24/22 11:01	4	16
20	1205158423 MS (588224001)	11-AUG-2022	1	104.91	104.91	08/18/22 08:15	505	08/24/22 07:40	08/24/22 11:01	6	1001
21	1205158424 LCS	11-AUG-2022	1		505.45	08/18/22 08:15	607	08/24/22 07:40	08/24/22 11:01	6	857

Reagent/Solvent Lot ID	Description	Amount
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**Comments:**  
Data Entry Date2: 11-AUG-2022 00:00

### Radium-226 Liquid

Filename : RA226.XLS  
 File type : Excel  
 Version # : 1.3.2

Procedure Code : LUC26RAL  
 Parmname : Radium-226  
 Required MDA : 1 pCi/L  
 Halflife of Ra-226 : 1600 years  
 Ra-226 Abundance : 1.00  
 Halflife of Rn-222 : 3.8235 days

Batch : 2300087  
 Analyst : LIN01615  
 Prep Date : 8/11/2022  
 Ra-226 Method Uncertainty : 0.073648

Batch counted on : LUCAS CELL DETECTOR  
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Counting		Gross Counts	Gross CPM	Background Counts	Background CPM	Background Count Time (min.)	Cell Efficiency (cpm/dpm)
					Cell Number	Time (min.)						
1	588224001.1	0.5003	2.0257E-05	7/28/2022 12:02	507	30	12	0.400	1	0.033	30	1.8520
2	588224002.1	0.5054	2.0278E-05	7/28/2022 13:32	604	30	9	0.300	2	0.067	30	1.6810
3	588224003.1	0.5032	2.0269E-05	7/28/2022 9:47	705	30	24	0.800	2	0.067	30	1.7610
4	588224004.1	0.5049	2.0276E-05	7/28/2022 9:47	806	30	93	3.100	2	0.067	30	1.9460
5	588224005.1	0.5055	2.0278E-05	7/28/2022 8:40	105	30	10	0.333	4	0.133	30	1.5830
6	588589001.1	0.5038	2.0271E-05	8/2/2022 21:41	206	30	24	0.800	1	0.033	30	1.8770
7	588589002.1	0.5029	2.0268E-05	8/2/2022 20:25	403	30	12	0.400	5	0.167	30	1.6200
8	588589003.1	0.5008	2.0259E-05	8/2/2022 19:13	506	30	10	0.333	8	0.267	30	1.7710
9	588589004.1	0.5043	2.0273E-05	8/2/2022 17:56	605	30	13	0.433	5	0.167	30	1.9020
10	588594001.1	0.5001	2.0256E-05	8/2/2022 12:42	706	30	32	1.067	7	0.233	30	1.6340
11	588594002.1	0.5003	2.0257E-05	8/2/2022 15:43	802	30	21	0.700	8	0.267	30	2.0910
12	588594003.1	0.5039	2.0272E-05	8/2/2022 9:21	106	30	16	0.533	3	0.100	30	1.6990
13	588594004.1	0.5020	2.0264E-05	8/2/2022 10:55	208	30	20	0.667	5	0.167	30	1.7740
14	588594005.1	0.5036	2.0271E-05	8/2/2022 16:21	408	30	23	0.767	5	0.167	30	1.5900
15	588594006.1	0.5026	2.0267E-05	8/2/2022 14:09	508	30	10	0.333	7	0.233	30	1.8020
16	588594007.1	0.5013	2.0261E-05	8/2/2022 10:55	606	30	22	0.733	3	0.100	30	1.9360
17	588594008.1	0.5036	2.0271E-05	8/2/2022 6:55	707	30	12	0.400	4	0.133	30	1.7120
18	1205158421.1	0.5055	2.0278E-05	8/11/2022 0:00	805	30	15	0.500	8	0.267	30	1.9080
19	1205158422.1	0.5009	2.0259E-05	7/28/2022 12:02	108	30	16	0.533	4	0.133	30	1.5830
20	1205158423.1	0.1049	1.1667E-05	7/28/2022 12:02	505	30	1001	33.367	6	0.200	30	1.8130
21	1205158424.1	0.5055	2.0278E-05	8/11/2022 0:00	607	30	857	28.567	6	0.200	30	1.8040

Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008  
 Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrowth End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
4.000%	6/1/2022	5/31/2023	8/18/2022 8:15	8/24/2022 6:18	8/24/2022 9:23	0.658	0.977	1.002	1.000
6.700%	7/1/2022	6/30/2023	8/18/2022 8:15	8/24/2022 6:18	8/24/2022 9:23	0.658	0.977	1.002	1.000
3.000%	11/1/2021	10/31/2022	8/18/2022 8:15	8/24/2022 6:18	8/24/2022 9:23	0.658	0.977	1.002	1.000
7.300%	4/1/2022	3/31/2023	8/18/2022 8:15	8/24/2022 6:18	8/24/2022 9:23	0.658	0.977	1.002	1.000
0.500%	4/28/2022	4/30/2023	8/18/2022 8:15	8/24/2022 6:46	8/24/2022 9:55	0.659	0.976	1.002	1.000
2.800%	8/1/2022	7/31/2023	8/18/2022 8:15	8/24/2022 6:46	8/24/2022 9:55	0.659	0.976	1.002	1.000
9.700%	2/1/2022	1/31/2023	8/18/2022 8:15	8/24/2022 6:46	8/24/2022 9:55	0.659	0.976	1.002	1.000
5.300%	6/1/2022	5/31/2023	8/18/2022 8:15	8/24/2022 6:46	8/24/2022 9:55	0.659	0.976	1.002	1.000
7.500%	7/1/2022	6/30/2023	8/18/2022 8:15	8/24/2022 6:46	8/24/2022 9:55	0.659	0.976	1.002	1.000
6.400%	11/1/2021	10/31/2022	8/18/2022 8:15	8/24/2022 6:46	8/24/2022 9:55	0.659	0.976	1.002	1.000
8.000%	4/1/2022	3/31/2023	8/18/2022 8:15	8/24/2022 6:46	8/24/2022 9:55	0.659	0.976	1.002	1.000
8.800%	4/28/2022	4/30/2023	8/18/2022 8:15	8/24/2022 7:13	8/24/2022 10:29	0.660	0.976	1.002	1.000
5.500%	8/1/2022	7/31/2023	8/18/2022 8:15	8/24/2022 7:13	8/24/2022 10:29	0.660	0.976	1.002	1.000
1.200%	2/1/2022	1/31/2023	8/18/2022 8:15	8/24/2022 7:13	8/24/2022 10:29	0.660	0.976	1.002	1.000
4.500%	6/1/2022	5/31/2023	8/18/2022 8:15	8/24/2022 7:13	8/24/2022 10:29	0.660	0.976	1.002	1.000
8.200%	7/1/2022	6/30/2023	8/18/2022 8:15	8/24/2022 7:13	8/24/2022 10:29	0.660	0.976	1.002	1.000
3.000%	11/1/2021	10/31/2022	8/18/2022 8:15	8/24/2022 7:13	8/24/2022 10:29	0.660	0.976	1.002	1.000
7.400%	4/1/2022	3/31/2023	8/18/2022 8:15	8/24/2022 7:13	8/24/2022 10:29	0.660	0.976	1.002	1.000
2.800%	4/28/2022	4/30/2023	8/18/2022 8:15	8/24/2022 7:40	8/24/2022 11:01	0.662	0.975	1.002	1.000
1.200%	6/1/2022	5/31/2023	8/18/2022 8:15	8/24/2022 7:40	8/24/2022 11:01	0.662	0.975	1.002	1.000
3.400%	7/1/2022	6/30/2023	8/18/2022 8:15	8/24/2022 7:40	8/24/2022 11:01	0.662	0.975	1.002	1.000



Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

**Spike S/N :** 1715-G  
**Spike Exp Date :** 9/15/2022  
**Spike Activity (dpm/ml):** 297.50  
**Spike Volume Added:** 0.10

**LCS S/N :** 1715-G  
**LCS Exp Date :** 9/15/2022  
**LCS Activity (dpm/ml):** 297.50  
**LCS Volume Added:** 0.10

<b>Results</b>																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.0832	0.0588	1	0.1933	<b>0.2778</b>	33.02%	0.3667	0.1202	0.1785	0.1842		SAMPLE				
2	0.1284	0.0906	1	0.2639	<b>0.1928</b>	47.85%	0.2333	0.1106	0.1791	0.1830		SAMPLE				
3	0.1231	0.0869	1	0.2530	<b>0.5810</b>	23.37%	0.7333	0.1700	0.2640	0.2791		SAMPLE				
4	0.1110	0.0784	1	0.2282	<b>2.1673</b>	12.96%	3.0333	0.3249	0.4550	0.6333		SAMPLE				
5	0.1925	0.1359	1	0.3594	<b>0.1752</b>	62.36%	0.2000	0.1247	0.2142	0.2157		SAMPLE				
6	0.0814	0.0575	1	0.1891	<b>0.5684</b>	21.92%	0.7667	0.1667	0.2422	0.2576		SAMPLE				
7	0.2113	0.1492	1	0.3845	<b>0.2008</b>	59.69%	0.2333	0.1374	0.2318	0.2367		SAMPLE				
8	0.2456	0.1734	1	0.4258	<b>0.0527</b>	212.20%	0.0667	0.1414	0.2191	0.2193		SAMPLE				
9	0.1795	0.1267	1	0.3266	<b>0.1949</b>	53.56%	0.2667	0.1414	0.2026	0.2065		SAMPLE				
10	0.2493	0.1760	1	0.4378	<b>0.7149</b>	25.79%	0.8333	0.2082	0.3500	0.3758		SAMPLE				
11	0.2082	0.1470	1	0.3610	<b>0.2904</b>	42.19%	0.4333	0.1795	0.2358	0.2438		SAMPLE				
12	0.1557	0.1099	1	0.3016	<b>0.3546</b>	34.67%	0.4333	0.1453	0.2330	0.2463		SAMPLE				
13	0.1932	0.1364	1	0.3514	<b>0.3933</b>	33.78%	0.5000	0.1667	0.2569	0.2665		SAMPLE				
14	0.2149	0.1517	1	0.3909	<b>0.5249</b>	29.42%	0.6000	0.1764	0.3024	0.3120		SAMPLE				
15	0.2248	0.1587	1	0.3947	<b>0.0773</b>	137.51%	0.1000	0.1374	0.2083	0.2088		SAMPLE				
16	0.1373	0.0969	1	0.2660	<b>0.4571</b>	27.56%	0.6333	0.1667	0.2358	0.2556		SAMPLE				
17	0.1785	0.1260	1	0.3332	<b>0.2166</b>	50.09%	0.2667	0.1333	0.2123	0.2150		SAMPLE				
18	0.2256	0.1593	1	0.3913	<b>0.1695</b>	68.91%	0.2333	0.1599	0.2276	0.2302		MB				
19	0.1939	0.1369	1	0.3620	<b>0.3530</b>	37.37%	0.4000	0.1491	0.2579	0.2636	588224001.1	DUP	23.8%			
20	0.9898	0.6988	1	1.7654	<b>122.0133</b>	3.41%	33.1667	1.0578	7.6270	19.4065	588224001.1	MS			127.7411	95.3%
21	0.2065	0.1458	1	0.3683	<b>21.7674</b>	4.85%	28.3667	0.9792	1.4728	3.7611		LCS			26.5132	82.1%

# **Continuing Calibration Data**



# Ludlum Alpha Scintillation Counter Checks for 24-AUG-2022

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	06:50	1	1.21E+05	121045	-1.09		
LUCAS2	EFF	06:48	1	1.35E+05	134597	2.3		
LUCAS4	EFF	06:54	1	1.28E+05	128368	1.62		
LUCAS5	EFF	06:46	1	1.33E+05	132695	2.15		
LUCAS6	EFF	06:55	1	1.31E+05	130570	-0.31		
LUCAS7	EFF	06:57	1	1.30E+05	129556	-2.76		
LUCAS8	EFF	06:43	1	1.29E+05	129038	0.42		

**Reviewed by:**

Lyndsey Pace

**Date:** 24-AUG-22

GEL Laboratories LLC

# Runlogs

# Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2300087

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
588224001	SAMPLE	LXP1	LUCAS5	AUG-24-22 09:23:00	DONE	Lucas Cell	01-JUN-22 00:00
588224002	SAMPLE	LXP1	LUCAS6	AUG-24-22 09:23:00	DONE	Lucas Cell	01-JUL-22 00:00
588224003	SAMPLE	LXP1	LUCAS7	AUG-24-22 09:23:00	DONE	Lucas Cell	01-NOV-21 00:00
588224004	SAMPLE	LXP1	LUCAS8	AUG-24-22 09:23:00	DONE	Lucas Cell	01-APR-22 00:00
588224005	SAMPLE	LXP1	LUCAS1	AUG-24-22 09:55:00	DONE	Lucas Cell	28-APR-22 00:00
588589001	SAMPLE	LXP1	LUCAS2	AUG-24-22 09:55:00	DONE	Lucas Cell	01-AUG-22 00:00
588589002	SAMPLE	LXP1	LUCAS4	AUG-24-22 09:55:00	DONE	Lucas Cell	01-FEB-22 00:00
588589003	SAMPLE	LXP1	LUCAS5	AUG-24-22 09:55:00	DONE	Lucas Cell	01-JUN-22 00:00
588589004	SAMPLE	LXP1	LUCAS6	AUG-24-22 09:55:00	DONE	Lucas Cell	01-JUL-22 00:00
588594001	SAMPLE	LXP1	LUCAS7	AUG-24-22 09:55:00	DONE	Lucas Cell	01-NOV-21 00:00
588594002	SAMPLE	LXP1	LUCAS8	AUG-24-22 09:55:00	DONE	Lucas Cell	01-APR-22 00:00
588594003	SAMPLE	LXP1	LUCAS1	AUG-24-22 10:29:00	DONE	Lucas Cell	28-APR-22 00:00
588594004	SAMPLE	LXP1	LUCAS2	AUG-24-22 10:29:00	DONE	Lucas Cell	01-AUG-22 00:00
588594005	SAMPLE	LXP1	LUCAS4	AUG-24-22 10:29:00	DONE	Lucas Cell	01-FEB-22 00:00
588594006	SAMPLE	LXP1	LUCAS5	AUG-24-22 10:29:00	DONE	Lucas Cell	01-JUN-22 00:00
588594007	SAMPLE	LXP1	LUCAS6	AUG-24-22 10:29:00	DONE	Lucas Cell	01-JUL-22 00:00
588594008	SAMPLE	LXP1	LUCAS7	AUG-24-22 10:29:00	DONE	Lucas Cell	01-NOV-21 00:00
1205158421	MB	LXP1	LUCAS8	AUG-24-22 10:29:00	DONE	Lucas Cell	01-APR-22 00:00
1205158422	DUP	LXP1	LUCAS1	AUG-24-22 11:01:00	DONE	Lucas Cell	28-APR-22 00:00
1205158423	MS	LXP1	LUCAS5	AUG-24-22 11:01:00	DONE	Lucas Cell	01-JUN-22 00:00
1205158424	LCS	LXP1	LUCAS6	AUG-24-22 11:01:00	DONE	Lucas Cell	01-JUL-22 00:00



Environmental Laboratory  
 1232 Haco Drive  
 Lansing  
 Michigan, 48910

CHAIN OF CUSTODY

Page 1 of 1

Phone: (517)702-6372

Lab Work Order Number L208170

Client Name <b>BWL - Erickson Station</b>		Project Name <b>Erickson AM MI Wells 1-6</b>		Requested Analyses								Requested Turn Around		
Client Contact <b>Cheryl Louden</b>		Project Number [none]		Ag: As: B: Ba: Be: Ca: Cd: Cr: Co: Cu: Fe: Hg: Li: Mo: Ni: Pb: Sb: Se: Ti: V: Zn: Na: Mg: K	TSS, HCO3, CO3, T. Hardness	CH-C: F-ISE: SO4: TDS	Radium 226 and Radium 228	dissolved Metals						Rush requests subject to additional charge.  Rush requests subject to lab approval.
Address <b>3725 S. Canal</b>		Project Description												
City <b>Lansing</b>		PO Number <b>30926 10021</b>												
State/Zip <b>MI, 48917</b>		Shipped By												
Phone <b>(517) 702-6396</b>	Fax <b>(517) 702-6373</b>	Tracking Number												
Sampler <b>Marc Wahrer</b>														

Sample Name or Field ID	Sampled Date	Sampled Time	Sample Type Grab/Composita	Matrix Code	Container Count	Preservation Code				Sample	Comments
						b	a	a	b		
MW-1	08/02/22	1242	G	GW	5	1	1	1	2		
MW-2	↓	1543	G	GW	5	1	1	1	2		
MW-3		0921	G	GW	5	1	1	1	2		
MW-4		1055	G	GW	5	1	1	1	2		
MW-5		1621	G	GW	5	1	1	1	2		
MW-6		1409	G	GW	5	1	1	1	2		
Field Duplicate MW4		0655	G	GW	5	1	1	1	2		
Field Blank		0655	G	DI	5	1	1	1	2		

Relinquished By 	Date/Time 8-2-22 1025pm	Received By <i>J. Caporale</i>	Date/Time 0917 08/03/22	
Relinquished By	Date/Time	Received By	Date/Time	Comments
Relinquished By	Date/Time	Received By	Date/Time	
Cooler Numbers and Temperatures				

Matrix Codes: DI=Deionized Water, GW=Ground Water      Preserv. Codes: a=None, b=0.5% HNO3

## Data Verification & Validation Report

### Lansing Board of Water & Light – Erickson Power Station

**Sampling Event (dates and purpose):** Semiannual Assessment Monitoring – Wells 1-6 – August 2022

Data Package Number: S38760.01

Lab Report Date: 10/05/2022

Data Validator: Aryka Thomson

Data Validation Completion Date: 10/10/2022

General Overall Assessment:

Data are usable without qualification.

Data are usable with qualification (as noted below).

Some or all data are unusable (as noted below).

Wells planned for sampling:

Well ID	Planned for Sampling
MW-1	X
MW-2	X
MW-3	X
MW-4	X
MW-5	X
MW-6	X
MW-7	
MW-7B	
MW-7C	
MW-8	
MW-9	
MW-10	
MW-11	
MW-11B	
MW-12	
MW-12B	
MW-13	

### Data Summary

Sample ID	Matrix	Lab ID	Date Collected	App III Metals	App IV Metals	Part 115 Metals	Anions	TDS TSS	Rad-226 Rad-228	Diss. Metals
MW-1	GW	S38760.01	08/02/2022	X	X	X	X	X	X	
MW-2	GW	S38760.02	08/02/2022	X	X	X	X	X	X	
MW-3	GW	S38760.03	08/02/2022	X	X	X	X	X	X	
MW-4	GW	S38760.04	08/02/2022	X	X	X	X	X	X	
MW-5	GW	S38760.05	08/02/2022	X	X	X	X	X	X	X
MW-6	GW	S38760.06	08/02/2022	X	X	X	X	X	X	
MW-4 Dup	QC	S38760.07	08/02/2022	X	X	X	X	X	X	

Other analytes requested for analysis: Na, Mg, K, HCO<sub>3</sub>, CO<sub>3</sub>, hardness

Any planned sampling or analysis NOT completed? If yes, explain: \_\_\_\_\_

### Data Verification & Validation Checklist

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
<b>Field Data</b>							
Sample Collection Field Forms	X		Purging performed as required in the Groundwater Monitoring Plan		X		MW-5 turbidity > 10 NTU; collected additional container for dissolved metals
Field Calibration Records	X		Field instruments calibrated daily according to manufacturer specifications	X			
Chain of Custody	X		Accurately reflect samples, collection dates/times, analyses, bottles, etc.	X			
Field decontamination documentation	N/A		Record of decontamination for non-dedicated sampling equipment			X	
Drilling logs	X		N/A	-	-	-	
Well construction logs	X		N/A	-	-	-	
Well development field forms	X		N/A	-	-	-	
<b>Analytical Data Package</b>							
Cover Sheet	X		N/A	-	-	-	
Case Narrative	X		Summarizes sample receipt and any exceptions to QC acceptance criteria	X			
Internal Laboratory Chain of Custody forms	X		Analyses as requested; accurate transcription of field COC	X			
Sample Chronology and Consistency	X		Accurate representation of dates, times of receipt, preparation, and analysis	X			
Communication Records with Lab	X		N/A	-	-	-	
EDD Format Consistency	X		EDD format and content as requested	X			
Sample Identification, Results Nomenclature, and Data Qualifier Consistency	X		All included in final report	X			
Method Detection Limit Consistency	X		MDLs consistent between samples		X		Dilution varies between samples
Instrument Calibration Records	X		Present and no nonconformance noted	X			
Laboratory Report Complete	X		Includes QC component	X			
Holding Times	X		Analyses performed within allowed holding time	X			



Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Method	X		Method as requested	X			
Reporting Limits	X		RLs as requested	X			RLs for chloride, sulfate, TDS, and hardness were not met
			MDLs<RLs		X		RL=MDL for carbonate and TSS
			MDLs<GPS	X			
<b>QC Validation</b>							
<b>Evaluate Accuracy</b>							
Matrix Spike (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Laboratory Control Sample (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
<b>Evaluate Precision</b>							
Matrix Spike Duplicate (RPD)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Field Duplicate (RPD)	X		RPD ≤ 20%		X		Radium-226+228 RPD is 79%
<b>Evaluate Representativeness</b>							
Equipment Blanks (if applicable)	N/A		Non-detect (<RL)			X	
<b>QC Verification</b>							
<b>Verify Instrument Calibration &amp; Analytical Process</b>							
Initial Calibration Verification	X		Laboratory-determined	-	-	-	
Continuing Calibration Verification	X		Laboratory-determined	-	-	-	
Initial Calibration Blank	X		Laboratory-determined	-	-	-	
Continuing Calibration Blank	X		Laboratory-determined	-	-	-	
Serial Dilutions	X		Laboratory-determined	-	-	-	High recovery for Al and Zn
Post-Digestion Spikes	X		Laboratory-determined	-	-	-	
Internal Standards	X		Laboratory-determined	-	-	-	
Laboratory Duplicate (RPD)	X		Laboratory-determined	-	-	-	Laboratory-generated duplicate for Rad-228 was outside control limits
Method Blanks	X		Laboratory-determined	-	-	-	Rad-228 detected in MB
<b>Evaluate Completeness (# usable measurements/ # unusable measurements)</b>							
Completeness	X		100%	X			

Other instances of nonconformance to QC control limits noted on case narrative:

Rad-228 was detected at 2.29 pCi/L in method blank 1205158468 at a level greater than the MDC (1.90 pCi/L) but less than the required detection limit (3.00 pCi/L). Rad-228 required qualification as estimated with high bias in all samples (J+).

The laboratory-generated duplicate sample did not meet the relative percent difference requirement for Rad-228; however, they do meet the relative error ratio requirement. No qualification was required.

Comments:

Combined Radium-226+228 field duplicate RPD is 79%. Rad-228 required qualification as estimated with low bias (J-) in the parent sample MW-4 and as estimated with high bias (J+) in the field duplicate MW-4-Dup. However, qualification with high bias due to detection in the method blank has been resolved by qualifying Rad-228 as estimated (J) with no bias indication in MW-4.

TSS required qualification as estimated with high bias (J+) in the parent sample and estimated but not detected in the field duplicate (UJ) since they were detected in the parent sample but not detected in the field duplicate and RPD cannot be evaluated.



Lansing Board of Water and Light  
Environmental Services Laboratory  
1232 Haco Dr.  
Lansing, Michigan 48901

12 September 2022

BWL - Erickson Station  
Attn: Cheryl Louden  
3725 S. Canal  
Lansing, MI 48917

**Project: Erickson AM MI**

Dear Cheryl Louden,

Enclosed is a copy of the laboratory report for the following work order(s) received by Lansing Board of Water and Light Environmental Services Laboratory:

<b>Work Order</b>	<b>Received</b>	<b>Account Number</b>
L208171	8/3/2022 9:17:00AM	30926 10021

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in blue ink that reads "Jennifer Caporale".

Jennifer Caporale, Supervisor



### Analytical Report

**Client:** BWL - Erickson Station  
**Address:** 3725 S. Canal  
 Lansing MI, 48917

**Client Project Manager:** Cheryl Louden

**Report Date:** 09/12/2022

**Sample Name:** MW-7

**Lab #:** L208171-01 Ground Water

**Collected:** 02-Aug-22 21:41

**By:** Marc Wahrer

Analyte	Reporting			Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit	Units						
Conductivity	960	1.0	uS/cm	1		02-Aug-22 21:41	maw	SM 2510B	
Dissolved oxygen	0.160	0.100	mg/L	1		02-Aug-22 21:41	maw	FIELD	
Milliliters Purged	260		ml/min	1		02-Aug-22 21:41	maw	FIELD	
Oxidation Reduction Potential	-129.0	-999.0	mV	1		02-Aug-22 21:41	maw	FIELD	
pH	7.6	7.0	pH Units	1		02-Aug-22 21:41	maw	SM 4500H+B	
Temperature	15		°C	1		02-Aug-22 21:41	maw	SM 2550B	
Turbidity	2.6	0.10	NTU	1		02-Aug-22 21:41	maw	SM 2130B	

**Sample Name:** MW-8

**Lab #:** L208171-02 Ground Water

**Collected:** 02-Aug-22 20:25

**By:** Marc Wahrer

Analyte	Reporting			Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit	Units						
Conductivity	660	1.0	uS/cm	1		02-Aug-22 20:25	maw	SM 2510B	
Dissolved oxygen	0.880	0.100	mg/L	1		02-Aug-22 20:25	maw	FIELD	
Milliliters Purged	270		ml/min	1		02-Aug-22 20:25	maw	FIELD	
Oxidation Reduction Potential	100.5	-999.0	mV	1		02-Aug-22 20:25	maw	FIELD	
pH	7.2	7.0	pH Units	1		02-Aug-22 20:25	maw	SM 4500H+B	
Temperature	14		°C	1		02-Aug-22 20:25	maw	SM 2550B	
Turbidity	4.3	0.10	NTU	1		02-Aug-22 20:25	maw	SM 2130B	

**Sample Name:** MW-9

**Lab #:** L208171-03 Ground Water

**Collected:** 02-Aug-22 19:13

**By:** Marc Wahrer

Analyte	Reporting			Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit	Units						
Conductivity	420	1.0	uS/cm	1		02-Aug-22 19:13	maw	SM 2510B	
Dissolved oxygen	3.96	0.100	mg/L	1		02-Aug-22 19:13	maw	FIELD	
Milliliters Purged	260		ml/min	1		02-Aug-22 19:13	maw	FIELD	
Oxidation Reduction Potential	99.20	-999.0	mV	1		02-Aug-22 19:13	maw	FIELD	
pH	7.4	7.0	pH Units	1		02-Aug-22 19:13	maw	SM 4500H+B	
Temperature	19		°C	1		02-Aug-22 19:13	maw	SM 2550B	
Turbidity	3.4	0.10	NTU	1		02-Aug-22 19:13	maw	SM 2130B	



### Analytical Report

**Client:** BWL - Erickson Station  
**Address:** 3725 S. Canal  
Lansing MI, 48917

**Client Project Manager:** Cheryl Louden

**Report Date:** 09/12/2022

**Sample Name:** MW-10

**Lab #:** L208171-04 Ground Water

**Collected:** 02-Aug-22 17:56

**By:** Marc Wahrer

Analyte	Reporting			Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit	Units						
Conductivity	690	1.0	uS/cm	1		02-Aug-22 17:56	maw	SM 2510B	
Dissolved oxygen	2.82	0.100	mg/L	1		02-Aug-22 17:56	maw	FIELD	
Milliliters Purged	260		ml/min	1		02-Aug-22 17:56	maw	FIELD	
Oxidation Reduction Potential	98.90	-999.0	mV	1		02-Aug-22 17:56	maw	FIELD	
pH	6.8	7.0	pH Units	1		02-Aug-22 17:56	maw	SM 4500H+B	
Temperature	15		°C	1		02-Aug-22 17:56	maw	SM 2550B	
Turbidity	3.6	0.10	NTU	1		02-Aug-22 17:56	maw	SM 2130B	



## Analytical Report

**Client:** BWL - Erickson Station

**Client Project Manager:** Cheryl Louden

**Report Date:** 09/12/2022

**Address:** 3725 S. Canal  
Lansing MI, 48917

**Approved By:** \_\_\_\_\_

*Jennifer Caporale*

### Notes and Definitions

AL Action Level (Action Level = Regulatory Limit)  
MCL Maximum Contaminant Level  
PEL Permissible Exposure Limit (Permissible Exposure Limit = Regulatory Limit)  
RPD Relative Percent Difference  
OT Odor Threshold  
ND Non Detect

All drinking water regulatory limits are MCL's with the exception of Lead and Copper unless otherwise noted.



Report ID: S38759.01(02)  
Generated on 09/02/2022  
Replaces report S38759.01(01) generated on 08/05/2022

Report to  
Attention: Jennifer Caporale  
Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901  
  
Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

Report produced by  
Merit Laboratories, Inc.  
2680 East Lansing Drive  
East Lansing, MI 48823  
  
Phone: (517) 332-0167 FAX: (517) 332-6333  
  
Contacts for report questions:  
John Lavery (johnlavery@meritlabs.com)  
Barbara Ball (bball@meritlabs.com)

Report Summary  
Lab Sample ID(s): S38759.01-S38759.04  
Project: Erickson AM MI Wells 7-10  
Collected Date(s): 08/02/2022  
Submitted Date/Time: 08/03/2022 10:19  
Sampled by: Marc Wahrer  
P.O. #:

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Maya Murshak  
Technical Director



## General Report Notes

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Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile, and 2-chloroethylvinyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (\*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

## Report Narrative

---

All analyses completed





Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Alaska CSLAP	#17-001
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



## Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1 (1993)
SM2320B	Standard Method 2320 B 2011
SM2340C	Standard Method 2340 C 2011
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007



## Sample Summary (4 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S38759.01	MW-7 L208171-01	Groundwater	08/02/22 21:41
S38759.02	MW-8 L208171-02	Groundwater	08/02/22 20:25
S38759.03	MW-9 L208171-03	Groundwater	08/02/22 19:13
S38759.04	MW-10 L208171-04	Groundwater	08/02/22 17:56



# Analytical Laboratory Report

Lab Sample ID: S38759.01

Sample Tag: MW-7 L208171-01

Collected Date/Time: 08/02/2022 21:41

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.5	IR
2	1L Plastic	None	Yes	2.5	IR
1	125ml Plastic	HNO3	Yes	2.5	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	08/04/22 09:30	JRH	
Metal Digestion	Completed	SW3015A	08/04/22 10:20	CCM	

### Inorganics

Method: E300.0, Run Date: 08/04/22 08:42, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	

Method: E300.0, Run Date: 08/04/22 09:33, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	98	10	0.16	mg/L	10	16887-00-6	
Sulfate	175	10	0.59	mg/L	10	14808-79-8	

Method: SM2320B, Run Date: 08/03/22 15:11, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	180	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 08/03/22 14:30, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	305	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 08/03/22 18:20, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	590	50	10	mg/L	2		

Method: SM2540D, Run Date: 08/04/22 17:05, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	3	mg/L	1.00		

### Metals

Method: E200.8, Run Date: 08/04/22 12:17, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.004	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.047	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	1.43	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	



# Analytical Laboratory Report

Lab Sample ID: S38759.01 (continued)

Sample Tag: MW-7 L208171-01

**Method: E200.8, Run Date: 08/04/22 12:17, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	1.19	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.086	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.146	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	0.007	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 08/04/22 14:58, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	104	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	12.3	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	9.53	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	71.1	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 08/04/22 12:20, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 08/29/22 12:09, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Final Report

Lab Sample ID: S38759.02

Sample Tag: MW-8 L208171-02

Collected Date/Time: 08/02/2022 20:25

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.5	IR
2	1L Plastic	None	Yes	2.5	IR
1	125ml Plastic	HNO3	Yes	2.5	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	08/04/22 09:30	JRH	
Metal Digestion	Completed	SW3015A	08/04/22 10:20	CCM	

### Inorganics

Method: E300.0, Run Date: 08/04/22 08:55, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	15	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	15	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 08/03/22 15:15, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	410	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 08/03/22 14:32, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	347	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 08/03/22 18:20, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	382	50	10	mg/L	2		

Method: SM2540D, Run Date: 08/04/22 17:05, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	3	mg/L	1.00		

### Metals

Method: E200.8, Run Date: 08/04/22 12:36, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.019	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.08	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	Not detected	0.02	0.00192	mg/L	5	7439-89-6	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S38759.02 (continued)

Sample Tag: MW-8 L208171-02

**Method: E200.8, Run Date: 08/04/22 12:36, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.005	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 08/04/22 15:03, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	95.3	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	28.9	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	0.57	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	12.7	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 08/04/22 12:30, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 08/29/22 12:09, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Lab Sample ID: S38759.03

Sample Tag: MW-9 L208171-03

Collected Date/Time: 08/02/2022 19:13

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.5	IR
2	1L Plastic	None	Yes	2.5	IR
1	125ml Plastic	HNO3	Yes	2.5	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	08/04/22 09:30	JRH	
Metal Digestion	Completed	SW3015A	08/04/22 10:20	CCM	

### Inorganics

Method: E300.0, Run Date: 08/04/22 09:07, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	5	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 08/03/22 15:21, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	260	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 08/03/22 14:34, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	218	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 08/03/22 18:20, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	242	50	10	mg/L	2		

Method: SM2540D, Run Date: 08/04/22 17:05, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	3	mg/L	1.00		

### Metals

Method: E200.8, Run Date: 08/04/22 12:42, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.013	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	Not detected	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	Not detected	0.02	0.00192	mg/L	5	7439-89-6	





# Analytical Laboratory Report

Final Report

Lab Sample ID: S38759.03 (continued)

Sample Tag: MW-9 L208171-03

**Method: E200.8, Run Date: 08/04/22 12:42, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 08/04/22 15:05, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	61.8	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	15.2	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	1.09	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	2.41	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 08/04/22 12:33, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 08/29/22 12:09, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Lab Sample ID: S38759.04

Sample Tag: MW-10 L208171-04

Collected Date/Time: 08/02/2022 17:56

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.5	IR
2	1L Plastic	None	Yes	2.5	IR
1	125ml Plastic	HNO3	Yes	2.5	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	08/04/22 09:30	JRH	
Metal Digestion	Completed	SW3015A	08/04/22 10:20	CCM	

### Inorganics

Method: E300.0, Run Date: 08/04/22 09:20, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	10	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 08/03/22 15:23, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	440	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 08/03/22 14:36, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	382	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 08/03/22 18:20, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	398	50	10	mg/L	2		

Method: SM2540D, Run Date: 08/04/22 17:05, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	3	mg/L	1.00		

### Metals

Method: E200.8, Run Date: 08/04/22 12:46, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.037	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.05	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	Not detected	0.02	0.00192	mg/L	5	7439-89-6	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S38759.04 (continued)

Sample Tag: MW-10 L208171-04

**Method: E200.8, Run Date: 08/04/22 12:46, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	0.009	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 08/04/22 15:06, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	117	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	23.6	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	0.73	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	2.24	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 08/04/22 12:37, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 08/29/22 12:09, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

# Merit Laboratories Login Checklist

Lab Set ID:S38759

Client:BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 7-10

Submitted:08/03/2022 10:19 Login User: MMC

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental\_Laboratory@LBWL.com

Selection	Description	Note
-----------	-------------	------

## Sample Receiving

- |     |  |  |
|-----|--|--|
| 01. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples are received at 4C +/- 2C Thermometer # IR 2.5 |
| 02. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Received on ice/ cooling process begun                 |
| 03. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples shipped  |
| 04. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples left in 24 hr. drop box                        |
| 05. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Are there custody seals/tape or is the drop box locked |

## Chain of Custody

- |     |  |  |
|-----|--|--|
| 06. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC adequately filled out                    |
| 07. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC signed and relinquished to the lab       |
| 08. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sample tag on bottles match COC              |
| 09. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Subcontracting needed? Subcontracted to: GEL |

## Preservation

- |     |  |   |
|-----|--|---|
| 10. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Do sample have correct chemical preservation        |
| 11. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Completed pH checks on preserved samples? (no VOAs) |
| 12. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Did any samples need to be preserved in the lab?    |

## Bottle Conditions

- |     |  |   |
|-----|--|---|
| 13. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | All bottles intact                            |
| 14. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Appropriate analytical bottles are used       |
| 15. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Merit bottles used                            |
| 16. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sufficient sample volume received             |
| 17. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples require laboratory filtration         |
| 18. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples submitted within holding time         |
| 19. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Do water VOC or TOX bottles contain headspace |

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: \_\_\_\_\_ Date: \_\_\_\_\_

# Merit Laboratories Bottle Preservation Check

Lab Set ID: S38759 Submitted: 08/03/2022 10:19

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 7-10

Initial Preservation Check: 08/03/2022 12:04 MMC

Preservation Recheck (E200.8): N/A

Attention: Jennifer Caporale  
Address: Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901

Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S38759.01	125ml Plastic HNO3	<2			
S38759.01	1L Plastic HNO3	<2			
S38759.01	1L Plastic HNO3	<2			
S38759.02	125ml Plastic HNO3	<2			
S38759.02	1L Plastic HNO3	<2			
S38759.02	1L Plastic HNO3	<2			
S38759.03	125ml Plastic HNO3	<2			
S38759.03	1L Plastic HNO3	<2			
S38759.03	1L Plastic HNO3	<2			
S38759.04	125ml Plastic HNO3	<2			
S38759.04	1L Plastic HNO3	<2			
S38759.04	1L Plastic HNO3	<2			



2680 East Lansing Dr., East Lansing, MI 48823  
 Phone (517) 332-0167 Fax (517) 332-4034  
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

**REPORT TO** **CHAIN OF CUSTODY RECORD** **INVOICE TO**

CONTACT NAME Jennifer Caporale  
 COMPANY Lansing Board of Water and Light  
 ADDRESS PO Box 13007 48901-3007  
 CITY Lansing STATE MI ZIP CODE 48901  
 PHONE NO. 517-702-6372 FAX NO. P.O. NO.  
 E-MAIL ADDRESS Environmental\_Laboratory@lbwl.com QUOTE NO.

CONTACT NAME Kelly Gleason  SAME  
 COMPANY  
 ADDRESS  
 CITY STATE ZIP CODE  
 PHONE NO. E-MAIL ADDRESS Kelly.Gleason@lbwl.com

**ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)**

PROJECT NO./NAME Erickson AM MI Wells 7-10 SAMPLER(S) - PLEASE PRINT/SIGN NAME Marc Wahrer  
 TURNAROUND TIME REQUIRED  1 DAY  2 DAYS  3 DAYS  STANDARD  OTHER ASAP  
 DELIVERABLES REQUIRED  STD  LEVEL II  LEVEL III  LEVEL IV  EDD  OTHER

MATRIX GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID  
 CODE: SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIPE A=AIR W=WASTE

# Containers & Preservatives

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO <sub>3</sub>	H <sub>2</sub> SO <sub>4</sub>	NaOH	MBOH	OTHER	Total Metals	F- undistilled, Cl-, SO <sub>4</sub> , TDS	Radium 226	Radium 228	TSS	HCO <sub>3</sub> , CO <sub>3</sub> , Hardness	Certifications		Project Locations		Special Instructions	
	DATE	TIME																	<input type="checkbox"/> OHIO VAP	<input type="checkbox"/> Drinking Water	<input type="checkbox"/> Detroit	<input type="checkbox"/> New York		
387591.01	08/27/19	2141	MW-7 L208171-01	GW	5	2	3						✓	✓	✓	✓	✓	✓		<input type="checkbox"/> DoD	<input checked="" type="checkbox"/> NPDES			Metals to analyse: Na, Mg, K
.02	↓	2025	MW-8 -02	GW	5	2	3						✓	✓	✓	✓	✓	✓		<input type="checkbox"/> DoD	<input checked="" type="checkbox"/> NPDES			B, Ca, Sb, As, Ba, Be, Cd, Cr,
.03	↓	1913	MW-9 -03	GW	5	2	3						✓	✓	✓	✓	✓	✓		<input type="checkbox"/> DoD	<input checked="" type="checkbox"/> NPDES			Co, Li, Hg, Mo, Pb, Se, Tl,
.04	↓	1756	MW-10 -04	GW	5	2	3						✓	✓	✓	✓	✓	✓		<input type="checkbox"/> DoD	<input checked="" type="checkbox"/> NPDES			Fe, Cu, Ni, Ag, V, Zn
			Field Dupe MW -05	GW	5	2	3						✓	✓	✓	✓	✓	✓		<input type="checkbox"/> DoD	<input checked="" type="checkbox"/> NPDES			Please send a preliminary report
			Field Blank -06	DI	5	2	3						✓	✓	✓	✓	✓	✓		<input type="checkbox"/> DoD	<input checked="" type="checkbox"/> NPDES			

RELINQUISHED BY: *[Signature]* \*Sampler DATE 8-3-22 TIME 10:19  
 RECEIVED BY: *[Signature]* DATE 8/3/22 TIME 10:19

RELINQUISHED BY: DATE TIME  
 RECEIVED BY: DATE TIME  
 SEAL NO. SEAL INTACT YES  NO  INITIALS  
 SEAL NO. SEAL INTACT YES  NO  INITIALS  
 NOTES: TEMP. ON ARRIVAL 2.5

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

## Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.150
Be, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	2.5
Cl	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	10
Cr, total	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
F	Fluoride	250 mL plastic	mg/L	None	9056	28 d	1.0
Fe, total	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Pb, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Li, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Hg, total	Mercury	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Mo, total	Molybdenum	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
RA226/228	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	HNO3	\$M 7500	6 mos	2.0 combined
Se, total	Selenium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ag, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
SO4	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	10
Tl, total	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
TDS	Total Dissolved Solids	1 L plastic	mg/L	None	\$M 2540C	NA	20
TSS	Total Suspended Solids	1 L plastic	mg/L	None	\$M 2540D	NA	3
V, total	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Zn, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005

August 29, 2022

John Laverty  
Merit Laboratories Inc.  
2680 East Lansing Drive  
East Lansing, Michigan 48823

Re: Routine Analysis  
Work Order: 588589  
SDG: S38759

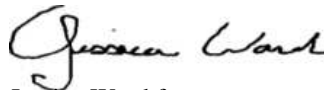
Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on August 05, 2022. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at [www.gel.com](http://www.gel.com).

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,



Jessica Ward for  
Delaney Stone  
Project Manager

Purchase Order: GELP20-0018  
Enclosures





## Table of Contents

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# Case Narrative

**Receipt Narrative  
for  
Merit Laboratories, Inc.  
SDG: S38759  
Work Order: 588589**

**August 29, 2022**

**Laboratory Identification:**

GEL Laboratories LLC  
2040 Savage Road  
Charleston, South Carolina 29407  
(843) 556-8171

**Summary:**

**Sample receipt:** The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on August 05, 2022 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

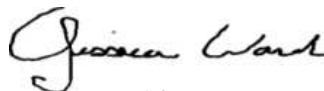
**Sample Identification:** The laboratory received the following samples:

<b><u>Laboratory ID</u></b>	<b><u>Client ID</u></b>
588589001	S38759.01
588589002	S38759.02
588589003	S38759.03
588589004	S38759.04

**Case Narrative:**

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.



Jessica Ward for  
Delaney Stone  
Project Manager

# **Chain of Custody and Supporting Documentation**



2680 East Lansing Dr., East Lansing, MI 48823  
 Phone (517) 332-0167 Fax (517) 332-4034  
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

**REPORT TO**

CONTACT NAME: Project Management Team  
 COMPANY: Merit Laboratories  
 ADDRESS: 2680 East Lansing Drive  
 CITY: East Lansing  
 STATE: MI ZIP CODE: 48823  
 PHONE NO.: 517-332-0167  
 E-MAIL ADDRESS: results@meritlabs.com

**CHAIN OF CUSTODY RECORD**

CONTACT NAME: Julie Teague  
 COMPANY: Merit Laboratories  
 ADDRESS: 2680 East Lansing Drive  
 CITY: East Lansing  
 STATE: MI ZIP CODE: 48823  
 PHONE NO.: 517-332-0167  
 E-MAIL ADDRESS: juliet@meritlabs.com

**INVOICE TO**

CONTACT NAME: [ ]  
 COMPANY: [ ]  
 ADDRESS: [ ]  
 CITY: [ ] STATE: MI ZIP CODE: 48823  
 PHONE NO.: [ ] E-MAIL ADDRESS: [ ]

PROJECT NO./NAME: S38759  
 ANALYSIS(ATTACH LIST IF MORE SPACE IS REQUIRED)

TURNAROUND TIME REQUIRED:  1 DAY  2 DAYS  3 DAYS  STANDARD  OTHER  
 DELIVERABLES REQUIRED:  STD  LEVEL I  LEVEL II  LEVEL III  LEVEL IV  EDD  OTHER

MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID  
 SL=SLUDGE DW=DRINKING WATER O=OIL WP=WPE A=AIR W=WASTE

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR	DATE	TIME	IDENTIFICATION-DESCRIPTION	MATRIX	# BOTTLES	# Containers & Preservatives							
							NONE	HO	H <sub>2</sub> O	H <sub>2</sub> SO <sub>4</sub>	NaOH	MOH	OTHER	
		8/2/22	2141	S38759.01	GW	2			2					
		8/2/22	2025	S38759.02	GW	2			2					
		8/2/22	1913	S38759.03	GW	2			2					
		8/2/22	1756	S38759.04	GW	2			2					

Certifications  
 OHIO VAP  Drinking Water  
 DoD  NPDES  
 Project Locations  
 Detroit  New York  
 Other  
 Special Instructions  
 \* E903.1 Mod.  
 \*\* E904.0/SW 9320 Mod.

Please use calculation product & provide Radium 226/228 combined results on the report  
 (No Ice needed)  
 \*\* Subcontracted to  
 GEL Laboratories, Inc.  
 2040 Savage Road  
 Charleston, SC 29407

RELINQUISHED BY: [Signature] DATE: 8/3/22 TIME: 17:00  
 RECEIVED BY: [Signature] DATE: 8/3/22 TIME: 17:00  
 SEAL NO. [ ] SEAL INTACT YES [ ] NO [ ] INITIALS [ ]  
 SEAL NO. [ ] SEAL INTACT YES [ ] NO [ ] INITIALS [ ]

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

**SAMPLE RECEIPT & REVIEW FORM**

Client: <b>MERI</b>	SDG/AR/COC/Work Order: <b>588589 / 8594</b>
Received By: <b>PL</b>	Date Received: <b>8/5/22</b>
Carrier and Tracking Number	Circle Applicable: FedEx Express    FedEx Ground <input checked="" type="radio"/> UPS    Field Services    Courier    Other  <b>1Z 466 477 03 6268 2205</b>

<b>Suspected Hazard Information</b>	<b>Yes</b>	<b>No</b>	*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.
A) Shipped as a DOT Hazardous?		<input checked="" type="checkbox"/>	Hazard Class Shipped: _____ UN#: _____ If UN2910, Is the Radioactive Shipment Survey Compliant? Yes ___ No ___
B) Did the client designate the samples are to be received as radioactive?		<input checked="" type="checkbox"/>	COC notation or radioactive stickers on containers equal client designation.
C) Did the RSO classify the samples as radioactive?		<input checked="" type="checkbox"/>	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): <u>0</u> <input checked="" type="radio"/> CPM/mR/Hr Classified as: Rad 1    Rad 2    Rad 3
D) Did the client designate samples are hazardous?		<input checked="" type="checkbox"/>	COC notation or hazard labels on containers equal client designation.
E) Did the RSO identify possible hazards?		<input checked="" type="checkbox"/>	IF D or E is yes, select Hazards below. PCB's    Flammable    Foreign Soil    RCRA    Asbestos    Beryllium    Other: _____

	Sample Receipt Criteria	Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1	Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>			Circle Applicable: Seals broken    Damaged container    Leaking container    Other (describe)
2	Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>			Circle Applicable: Client contacted and provided COC    COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*		<input checked="" type="checkbox"/>		Preservation Method: Wet Ice    Ice Packs    Dry ice <input checked="" type="radio"/> None    Other: _____ *all temperatures are recorded in Celsius <b>TEMP: 24</b>
4	Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>			Temperature Device Serial #: <b>182-21</b> Secondary Temperature Device Serial # (If Applicable): _____
5	Sample containers intact and sealed?	<input checked="" type="checkbox"/>			Circle Applicable: Seals broken    Damaged container    Leaking container    Other (describe)
6	Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>			Sample ID's and Containers Affected: _____ If Preservation added, Lot#: _____
7	Do any samples require Volatile Analysis?			<input checked="" type="checkbox"/>	If Yes, are Encores or Soil Kits present for solids? Yes ___ No ___ NA ___ (If yes, take to VOA Freezer)
					Do liquid VOA vials contain acid preservation? Yes ___ No ___ NA ___ (If unknown, select No)
					Are liquid VOA vials free of headspace? Yes ___ No ___ NA ___ Sample ID's and containers affected: _____
8	Samples received within holding time?	<input checked="" type="checkbox"/>			ID's and tests affected: _____
9	Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>			ID's and containers affected: _____
10	Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>			Circle Applicable: No dates on containers    No times on containers    COC missing info    Other (describe)
11	Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>			Circle Applicable: No container count on COC    Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?	<input checked="" type="checkbox"/>			
13	COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>			Circle Applicable: Not relinquished    Other (describe)

Comments (Use Continuation Form if needed):

---

# Laboratory Certifications

**List of current GEL Certifications as of 29 August 2022**

<b>State</b>	<b>Certification</b>
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122023-3
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2019-165
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122021-36
Vermont	VT87156
Virginia NELAP	460202
Washington	C780



# Radiological Analysis

# Case Narrative

**Radiochemistry  
 Technical Case Narrative  
 Merit Laboratories, Inc.  
 SDG #: S38759  
 Work Order #: 588589**

**Product: GFPC Ra228, Liquid**

**Analytical Method:** EPA 904.0/SW846 9320 Modified

**Analytical Procedure:** GL-RAD-A-063 REV# 5

**Analytical Batch:** 2300100

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
588589001	S38759.01
588589002	S38759.02
588589003	S38759.03
588589004	S38759.04
1205158468	Method Blank (MB)
1205158469	588224001(S38615.01) Sample Duplicate (DUP)
1205158470	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

**Quality Control (QC) Information**

**Method Blank Criteria**

The blank result (See Below) is greater than the MDC but less than the required detection limit.

Sample	Analyte	Value
1205158468 (MB)	Radium-228	Result: 2.29 pCi/L > MDA: 1.90 pCi/L <= RDL: 3.00 pCi/L

**Duplication Criteria between QC Sample and Duplicate Sample**

The Sample and the Duplicate, (See Below), did not meet the relative percent difference requirement; however, they do meet the relative error ratio requirement with the value listed below.

Sample	Analyte	Value
1205158469 (S38615.01DUP)	Radium-228	RPD 178* (0.0%-100.0%) RER 2.57 (0-3)

**Product:** Lucas Cell, Ra226, Liquid

**Analytical Method:** EPA 903.1 Modified

**Analytical Procedure:** GL-RAD-A-008 REV# 15

**Analytical Batch:** 2300087

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
588589001	S38759.01
588589002	S38759.02
588589003	S38759.03
588589004	S38759.04
1205158421	Method Blank (MB)
1205158422	588224001(S38615.01) Sample Duplicate (DUP)
1205158423	588224001(S38615.01) Matrix Spike (MS)
1205158424	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

**Miscellaneous Information**

**Additional Comments**

The matrix spike, 1205158423 (S38615.01MS), aliquot was reduced to conserve sample volume.

**Certification Statement**

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

## GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

### Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S38759 GEL Work Order: 588589

**The Qualifiers in this report are defined as follows:**

- \* A quality control analyte recovery is outside of specified acceptance criteria
- \*\* Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

**Review/Validation**

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

**Signature:**



**Name: Theresa Austin**

**Date: 30 AUG 2022**

**Title: Group Leader**

# Sample Data Summary

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: August 29, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

Client Sample ID: S38759.01	Project: MERI00120
Sample ID: 588589001	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 02-AUG-22 21:41	
Receive Date: 05-AUG-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	1.27	+/-1.31	2.18	3.00	pCi/L			JXC9	08/26/22	1052	2300100	1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		1.84	+/-1.33			pCi/L			NXL1	08/29/22	1209	2300099	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.568	+/-0.242	0.189	1.00	pCi/L			LXP1	08/24/22	0955	2300087	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			71.1	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: August 29, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Lavery  
 Project: Routine Analysis

Client Sample ID: S38759.02	Project: MERI00120
Sample ID: 588589002	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 02-AUG-22 20:25	
Receive Date: 05-AUG-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228		3.04	+/-1.28	1.74	3.00	pCi/L			JXC9	08/26/22	1052 2300100	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		3.24	+/-1.30			pCi/L			NXL1	08/29/22	1209 2300099	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.201	+/-0.232	0.384	1.00	pCi/L			LXP1	08/24/22	0955 2300087	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			80.5	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit



# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: August 29, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

Client Sample ID: S38759.03	Project: MERI00120
Sample ID: 588589003	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 02-AUG-22 19:13	
Receive Date: 05-AUG-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	1.88	+/-1.60	2.60	3.00	pCi/L		JXC9	08/26/22	1052	2300100		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		1.94	+/-1.62			pCi/L		NXL1	08/29/22	1209	2300099		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226	U	0.0527	+/-0.219	0.426	1.00	pCi/L		LXP1	08/24/22	0955	2300087		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			66	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: August 29, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Lavery  
 Project: Routine Analysis

Client Sample ID: S38759.04	Project: MERI00120
Sample ID: 588589004	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 02-AUG-22 17:56	
Receive Date: 05-AUG-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.402	+/-0.916	1.65	3.00	pCi/L		JXC9	08/26/22	1052	2300100	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.597	+/-0.938			pCi/L		NXL1	08/29/22	1209	2300099	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.195	+/-0.203	0.327	1.00	pCi/L		LXP1	08/24/22	0955	2300087	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			79.2	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# Quality Control Summary

# GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

## QC Summary

Report Date: August 29, 2022

Page 1 of 2

**Merit Laboratories Inc.**  
**2680 East Lansing Drive**  
**East Lansing, Michigan**

**Contact: John Laverty**

**Workorder: 588589**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Rad Gas Flow</b>											
Batch	2300100										
QC1205158469	588224001	DUP									
Radium-228	U	0.136		2.37	pCi/L	178*		(0% - 100%)	JXC9	08/26/22	10:46
	Uncertainty	+/-1.07		+/-1.18							
QC1205158470	LCS										
Radium-228	44.5			52.5	pCi/L		118	(75%-125%)		08/26/22	10:46
	Uncertainty			+/-3.92							
QC1205158468	MB										
Radium-228				2.29	pCi/L					08/26/22	10:46
	Uncertainty			+/-1.28							
<b>Rad Ra-226</b>											
Batch	2300087										
QC1205158422	588224001	DUP									
Radium-226		0.278	U	0.353	pCi/L	23.8		(0% - 100%)	LXP1	08/24/22	11:01
	Uncertainty	+/-0.178		+/-0.258							
QC1205158424	LCS										
Radium-226	26.5			21.8	pCi/L		82.1	(75%-125%)		08/24/22	11:01
	Uncertainty			+/-1.47							
QC1205158421	MB										
Radium-226			U	0.169	pCi/L					08/24/22	10:29
	Uncertainty			+/-0.228							
QC1205158423	588224001	MS									
Radium-226	128	0.278		122	pCi/L		95.3	(75%-125%)		08/24/22	11:01
	Uncertainty	+/-0.178		+/-7.63							

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- \*\* Analyte is a Tracer compound
- < Result is less than value reported
- > Result is greater than value reported
- BD Results are either below the MDC or tracer recovery is low
- FA Failed analysis.
- H Analytical holding time was exceeded

# GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

## QC Summary

Workorder: 588589

Page 2 of 2

Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
J											
J											
K											
L											
M											
M											
N/A											
NI											
ND											
NJ											
Q											
R											
U											
UI											
UJ											
UL											
X											
Y											
^											
h											

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where the duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

\* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

# **Gas Flow Raw Data**

# Batch 2300100 Check-list

This check-list was completed on 26-AUG-22 by Nat Long

This batch was reviewed by Kenshalla Oston on 26-AUG-22 and Nat Long on 26-AUG-22.

**Batch ID:**  
2300100

**Product:**  
GFC28RAL

**Description:** Gas Flow Radium 228  
GL-RAD-A-063

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?		No	
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?		No	
11	Has the method required detection limit been met?	Yes		
<b>Miscellaneous Information</b>				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

# Prep Logbook

## Radium-228 in Liquid

**Batch ID:** 2300100

**Analyst:** Jasmine Conley (JXC9)

**Method:** EPA 904.0/SW846 9320 Modified

**Lab SOP:** GL-RAD-A-063 REV# 5

**Instrument:** LUCAS-C037036045

**Due Dates for Lab:** 28-AUG-2022

**Package:** 30-AUG-2022

**SDG:** 31-AUG-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205158470	Radium-228	1965-C	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	588224001	11-AUG-2022	3	303.2	303.2	08/13/22 15:30	08/26/22 08:15
2	588224002	11-AUG-2022	3	300.28	300.28	08/13/22 15:30	08/26/22 08:15
3	588224003	11-AUG-2022	3	303.12	303.12	08/13/22 15:30	08/26/22 08:15
4	588224004	11-AUG-2022	3	301.82	301.82	08/13/22 15:30	08/26/22 08:15
5	588224005	11-AUG-2022	3	300.07	300.07	08/13/22 15:30	08/26/22 08:15
6	588589001	11-AUG-2022	3	305.07	305.07	08/13/22 15:30	08/26/22 08:15
7	588589002	11-AUG-2022	3	300.83	300.83	08/13/22 15:30	08/26/22 08:15
8	588589003	11-AUG-2022	3	303.18	303.18	08/13/22 15:30	08/26/22 08:15
9	588589004	11-AUG-2022	3	304.2	304.2	08/13/22 15:30	08/26/22 08:15
10	588594001	11-AUG-2022	3	300.42	300.42	08/13/22 15:30	08/26/22 08:15
11	588594002	11-AUG-2022	3	304.52	304.52	08/13/22 15:30	08/26/22 08:15
12	588594003	11-AUG-2022	3	300.94	300.94	08/13/22 15:30	08/26/22 08:15
13	588594004	11-AUG-2022	3	300.72	300.72	08/13/22 15:30	08/26/22 08:15
14	588594005	11-AUG-2022	3	302.08	302.08	08/13/22 15:30	08/26/22 08:15
15	588594006	11-AUG-2022	3	303.56	303.56	08/13/22 15:30	08/26/22 08:15
16	588594007	11-AUG-2022	3	300.73	300.73	08/13/22 15:30	08/26/22 08:15
17	588594008	11-AUG-2022	3	303.93	303.93	08/13/22 15:30	08/26/22 08:15
18	1205158468 MB	11-AUG-2022	3		305.07	08/13/22 15:30	08/26/22 08:15
19	1205158469 DUP (588224001)	11-AUG-2022	3	303.1	303.1	08/13/22 15:30	08/26/22 08:15
20	1205158470 LCS	11-AUG-2022	3		305.07	08/13/22 15:30	08/26/22 08:15

Reagent/Solvent Lot ID	Description	Amount
WORK 1951-D	Ba-133	.1 mL
REGNT 3413919	RGF-50% Potassium Carbonate	2 mL
REGNT 3418276.6	29M HF (48-50%)	4 mL
REGNT 3424228	RGF-Neodymium Subtrate	5 mL
REGNT 3454370.1	Nitric Acid	5 mL
REGNT 3460110.5	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL
REGNT 3465466	Barium Carrier Ra228 REG	1 mL
REGNT 3466250	RGF-7M Nitric Acid	25 mL
REGNT 3466286	RGF-1M Citric Acid	5 mL
REGNT 3466687	500 mg/mL Neodymium Carrier	.2 mL
REGNT 3471758	RGF-1.5M Ammonium Sulfate	10 mL
REGNT 3472801	2M HCl	20 mL
REGNT DGA0036	2294962	2 g

**Comments:**

Pipet Id: RAD-GFC-1795419  
 Data Entry Date2: 12-AUG-2022 13:16 LUCAS-C037036045 Jasmine Conley  
 Data Entry Date3: 11-AUG-2022 00:00



### Radium-228 Liquid

Filename : RA228.XLS  
 File type : Excel  
 Version # : 1.4.2

Tracer S/N : 1951-D  
 Tracer Exp Date : 6/2/2023  
 Tracer Volume Added: 0.10

Batch : 2300100  
 Analyst : JAS02031  
 Prep Date : 8/11/2022  
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL  
 Parmname : Radium-228  
 Required MDA : 3 pCi/L  
 Ra-228 Abundance : 1.00  
 Halflife of Ra-228 : 5.75 years  
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer Aliquot	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	588224001.1	0.3032	1.8513E-05	7/28/2022 12:02	1303.3	1.60%	1027.5	1.80%	0.1	0.000200
2	588224002.1	0.3003	1.8464E-05	7/28/2022 13:32	1303.3	1.60%	1001.1	1.82%	0.1	0.000200
3	588224003.1	0.3031	1.8512E-05	7/28/2022 9:47	1303.3	1.60%	1054.8	1.78%	0.1	0.000200
4	588224004.1	0.3018	1.8490E-05	7/28/2022 9:47	1303.3	1.60%	1021.5	1.81%	0.1	0.000200
5	588224005.1	0.3001	1.8460E-05	7/28/2022 8:40	1303.3	1.60%	979.6	1.84%	0.1	0.000200
6	588589001.1	0.3051	1.8544E-05	8/2/2022 21:41	1303.3	1.60%	926.2	1.90%	0.1	0.000200
7	588589002.1	0.3008	1.8473E-05	8/2/2022 20:25	1303.3	1.60%	1049.2	1.78%	0.1	0.000200
8	588589003.1	0.3032	1.8513E-05	8/2/2022 19:13	1303.3	1.60%	860.6	1.97%	0.1	0.000200
9	588589004.1	0.3042	1.8529E-05	8/2/2022 17:56	1303.3	1.60%	1032.1	1.80%	0.1	0.000200
10	588594001.1	0.3004	1.8466E-05	8/2/2022 12:42	1303.3	1.60%	1068.7	1.77%	0.1	0.000200
11	588594002.1	0.3045	1.8535E-05	8/2/2022 15:43	1303.3	1.60%	1034.2	1.80%	0.1	0.000200
12	588594003.1	0.3009	1.8475E-05	8/2/2022 9:21	1303.3	1.60%	932.2	1.89%	0.1	0.000200
13	588594004.1	0.3007	1.8471E-05	8/2/2022 10:55	1303.3	1.60%	814.7	2.02%	0.1	0.000200
14	588594005.1	0.3021	1.8494E-05	8/2/2022 16:21	1303.3	1.60%	880.8	1.95%	0.1	0.000200
15	588594006.1	0.3036	1.8519E-05	8/2/2022 14:09	1303.3	1.60%	886.2	1.94%	0.1	0.000200
16	588594007.1	0.3007	1.8471E-05	8/2/2022 10:55	1303.3	1.60%	800.5	2.04%	0.1	0.000200
17	588594008.1	0.3039	1.8525E-05	8/2/2022 6:55	1303.3	1.60%	1010.7	1.82%	0.1	0.000200
18	1205158468.1	0.3051	1.8544E-05	8/11/2022 0:00	1303.3	1.60%	994.9	1.83%	0.1	0.000200
19	1205158469.1	0.3031	1.8511E-05	7/28/2022 12:02	1303.3	1.60%	997.0	1.83%	0.1	0.000200
20	1205158470.1	0.3051	1.8544E-05	8/11/2022 0:00	1303.3	1.60%	1026.2	1.80%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063  
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated	Sample
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction	Recovery %	Recovery Error %
			Alpha	Beta										
1	1B	60	9	49	0.817	8/26/2022 10:50	8/13/2022 15:30	8/26/2022 8:15	0.990	0.746	1.000	1.057	78.8%	1.24%
2	2A	60	16	52	0.867	8/26/2022 10:51	8/13/2022 15:30	8/26/2022 8:15	0.991	0.746	1.000	1.057	76.8%	1.24%
3	3B	60	14	29	0.483	8/26/2022 10:51	8/13/2022 15:30	8/26/2022 8:15	0.990	0.746	1.000	1.057	80.9%	1.23%
4	4A	60	8	27	0.450	8/26/2022 10:51	8/13/2022 15:30	8/26/2022 8:15	0.990	0.746	1.000	1.057	78.4%	1.24%
5	4C	60	14	62	1.033	8/26/2022 10:52	8/13/2022 15:30	8/26/2022 8:15	0.990	0.745	1.000	1.057	75.2%	1.25%
6	5A	60	11	67	1.117	8/26/2022 10:52	8/13/2022 15:30	8/26/2022 8:15	0.992	0.744	1.000	1.057	71.1%	1.27%
7	7B	60	19	83	1.383	8/26/2022 10:52	8/13/2022 15:30	8/26/2022 8:15	0.992	0.743	1.000	1.057	80.5%	1.23%
8	7C	60	9	87	1.450	8/26/2022 10:52	8/13/2022 15:30	8/26/2022 8:15	0.992	0.743	1.000	1.057	66.0%	1.30%
9	7D	60	26	39	0.650	8/26/2022 10:52	8/13/2022 15:30	8/26/2022 8:15	0.992	0.743	1.000	1.057	79.2%	1.24%
10	8A	60	18	44	0.733	8/26/2022 10:52	8/13/2022 15:30	8/26/2022 8:15	0.992	0.743	1.000	1.057	82.0%	1.23%
11	9A	60	10	45	0.750	8/26/2022 10:53	8/13/2022 15:30	8/26/2022 8:15	0.992	0.743	1.000	1.057	79.4%	1.24%
12	9B	60	11	80	1.333	8/26/2022 10:53	8/13/2022 15:30	8/26/2022 8:15	0.992	0.743	1.000	1.057	71.5%	1.27%
13	9C	60	26	47	0.783	8/26/2022 10:53	8/13/2022 15:30	8/26/2022 8:15	0.992	0.743	1.000	1.057	62.5%	1.32%
14	9D	60	9	54	0.900	8/26/2022 10:53	8/13/2022 15:30	8/26/2022 8:15	0.992	0.743	1.000	1.057	67.6%	1.29%
15	10A	60	17	57	0.950	8/26/2022 10:53	8/13/2022 15:30	8/26/2022 8:15	0.992	0.743	1.000	1.057	68.0%	1.29%
16	10C	60	13	100	1.667	8/26/2022 10:53	8/13/2022 15:30	8/26/2022 8:15	0.992	0.743	1.000	1.057	61.4%	1.33%
17	10D	60	11	61	1.017	8/26/2022 10:53	8/13/2022 15:30	8/26/2022 8:15	0.992	0.743	1.000	1.057	77.5%	1.24%
18	11A	60	13	78	1.300	8/26/2022 10:46	8/13/2022 15:30	8/26/2022 8:15	0.995	0.752	1.000	1.057	76.3%	1.25%
19	11C	60	11	64	1.067	8/26/2022 10:46	8/13/2022 15:30	8/26/2022 8:15	0.990	0.752	1.000	1.057	76.5%	1.25%
20	11D	60	19	824	13.733	8/26/2022 10:46	8/13/2022 15:30	8/26/2022 8:15	0.995	0.752	1.000	1.057	78.7%	1.24%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2022	5/31/2023	0.6068	0.00711	0.786	8/20/2022 6:37	500
2	PIC	6/1/2022	5/31/2023	0.6201	0.01914	0.738	8/20/2022 6:36	500
3	PIC	6/1/2022	5/31/2023	0.6245	0.01614	0.568	8/20/2022 6:37	500
4	PIC	6/1/2022	5/31/2023	0.6013	0.01123	0.696	8/20/2022 6:37	500
5	PIC	6/1/2022	5/31/2023	0.6359	0.00889	1.110	8/20/2022 6:37	500
6	PIC	6/1/2022	5/31/2023	0.6332	0.00851	0.846	8/20/2022 6:38	500
7	PIC	6/1/2022	5/31/2023	0.6366	0.00627	0.658	8/20/2022 6:38	500
8	PIC	6/1/2022	5/31/2023	0.6407	0.00790	1.076	8/20/2022 6:38	500
9	PIC	6/1/2022	5/31/2023	0.6270	0.01113	0.556	8/20/2022 6:38	500
10	PIC	6/1/2022	5/31/2023	0.6398	0.01579	0.516	8/20/2022 6:38	500
11	PIC	6/1/2022	5/31/2023	0.6336	0.00758	0.830	8/20/2022 6:39	500
12	PIC	6/1/2022	5/31/2023	0.6318	0.00754	0.794	8/20/2022 6:39	500
13	PIC	6/1/2022	5/31/2023	0.6184	0.00584	0.926	8/20/2022 6:39	500
14	PIC	6/1/2022	5/31/2023	0.6330	0.02610	0.834	8/20/2022 6:39	500
15	PIC	6/1/2022	5/31/2023	0.6384	0.00651	0.884	8/20/2022 6:39	500
16	PIC	6/1/2022	5/31/2023	0.6321	0.00638	1.146	8/20/2022 6:39	500
17	PIC	6/1/2022	5/31/2023	0.6148	0.00557	0.644	8/20/2022 6:39	500
18	PIC	6/1/2022	5/31/2023	0.6371	0.01317	0.766	8/20/2022 6:37	500
19	PIC	6/1/2022	5/31/2023	0.6276	0.01278	0.528	8/20/2022 6:37	500
20	PIC	6/1/2022	5/31/2023	0.6372	0.01068	1.110	8/20/2022 6:37	500

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

**Spike S/N :** N/A  
**Spike Exp Date :** N/A  
**Spike Activity (dpm/ml):** N/A  
**Spike Volume Added:** N/A

**LCS S/N :** 1965-C  
**LCS Exp Date :** 8/5/2023  
**LCS Activity (dpm/ml):** 301.34  
**LCS Volume Added:** 0.10

Results														2 SIGMA		2 SIGMA			
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	Counting Uncertainty pCi/L	Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery			
1	1.2541	0.8854	3	1.9930	<b>0.1363</b>	401.81%	0.0307	0.1232	1.0732	1.0737		SAMPLE							
2	1.2326	0.8702	3	1.9658	<b>0.5799</b>	98.09%	0.1287	0.1262	1.1146	1.1242		SAMPLE							
3	1.0098	0.7129	3	1.6362	<b>-0.3563</b>	113.25%	-0.0847	0.0959	0.7909	0.7911		SAMPLE							
4	1.2042	0.8502	3	1.9270	<b>-1.1154</b>	38.37%	-0.2460	0.0943	0.8380	0.8382		SAMPLE							
5	1.5103	1.0663	3	2.3577	<b>-0.3452</b>	181.88%	-0.0767	0.1394	1.2307	1.2308		SAMPLE							
6	1.3761	0.9715	3	2.1781	<b>1.2721</b>	52.67%	0.2707	0.1425	1.3125	1.3506		SAMPLE							
7	1.0814	0.7635	3	1.7363	<b>3.0375</b>	21.57%	0.7253	0.1561	1.2814	1.4895		SAMPLE							
8	1.6623	1.1736	3	2.5989	<b>1.8827</b>	43.40%	0.3740	0.1622	1.6007	1.6686		SAMPLE							
9	1.0147	0.7164	3	1.6466	<b>0.4018</b>	116.28%	0.0940	0.1093	0.9158	0.9213		SAMPLE							
10	0.9371	0.6616	3	1.5282	<b>0.8907</b>	53.01%	0.2173	0.1151	0.9247	0.9515		SAMPLE							
11	1.2237	0.8639	3	1.9388	<b>-0.3375</b>	148.75%	-0.0800	0.1190	0.9841	0.9842		SAMPLE							
12	1.3477	0.9515	3	2.1406	<b>2.5625</b>	28.65%	0.5393	0.1543	1.4369	1.5735		SAMPLE							
13	1.7026	1.2021	3	2.6821	<b>-0.7930</b>	85.59%	-0.1427	0.1221	1.3301	1.3303		SAMPLE							
14	1.4535	1.0262	3	2.3023	<b>0.3300</b>	195.63%	0.0660	0.1291	1.2651	1.2679		SAMPLE							
15	1.4679	1.0363	3	2.3179	<b>0.3237</b>	201.02%	0.0660	0.1327	1.2753	1.2778		SAMPLE							
16	1.8867	1.3320	3	2.9409	<b>2.8826</b>	33.34%	0.5207	0.1734	1.8817	2.0152		SAMPLE							
17	1.1399	0.8048	3	1.8327	<b>1.6629</b>	36.26%	0.3727	0.1350	1.1809	1.2519		SAMPLE							
18	1.1956	0.8441	3	1.9027	<b>2.2915</b>	28.58%	0.5340	0.1523	1.2810	1.4043		MB							
19	1.0167	0.7178	3	1.6553	<b>2.3675</b>	25.54%	0.5387	0.1372	1.1822	1.3231	588224001.1	DUP	178.2%	2.5664					
20	1.3951	0.9850	3	2.1779	<b>52.5098</b>	4.14%	12.6233	0.4807	3.9195	13.7294		LCS			44.4950	118.0%			

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
588224001	1B	60	9	49	8/26/2022 10:50	8/26/2022 11:50	PIC	2300100
588224002	2A	60	16	52	8/26/2022 10:51	8/26/2022 11:51	PIC	2300100
588224003	3B	60	14	29	8/26/2022 10:51	8/26/2022 11:51	PIC	2300100
588224004	4A	60	8	27	8/26/2022 10:51	8/26/2022 11:51	PIC	2300100
588224005	4C	60	14	62	8/26/2022 10:52	8/26/2022 11:52	PIC	2300100
588589001	5A	60	11	67	8/26/2022 10:52	8/26/2022 11:52	PIC	2300100
588589002	7B	60	19	83	8/26/2022 10:52	8/26/2022 11:52	PIC	2300100
588589003	7C	60	9	87	8/26/2022 10:52	8/26/2022 11:52	PIC	2300100
588589004	7D	60	26	39	8/26/2022 10:52	8/26/2022 11:52	PIC	2300100
588594001	8A	60	18	44	8/26/2022 10:52	8/26/2022 11:52	PIC	2300100
588594002	9A	60	10	45	8/26/2022 10:53	8/26/2022 11:53	PIC	2300100
588594003	9B	60	11	80	8/26/2022 10:53	8/26/2022 11:53	PIC	2300100
588594004	9C	60	26	47	8/26/2022 10:53	8/26/2022 11:53	PIC	2300100
588594005	9D	60	9	54	8/26/2022 10:53	8/26/2022 11:53	PIC	2300100
588594006	10A	60	17	57	8/26/2022 10:53	8/26/2022 11:53	PIC	2300100
588594007	10C	60	13	100	8/26/2022 10:53	8/26/2022 11:53	PIC	2300100
588594008	10D	60	11	61	8/26/2022 10:53	8/26/2022 11:53	PIC	2300100
1205158468	11A	60	13	78	8/26/2022 10:46	8/26/2022 11:46	PIC	2300100
1205158469	11C	60	11	64	8/26/2022 10:46	8/26/2022 11:46	PIC	2300100
1205158470	11D	60	19	824	8/26/2022 10:46	8/26/2022 11:46	PIC	2300100

ASSAY 26-Aug-22 12:01:08  
 Wizard 2480 s/n 46190630  
 Protocol id 9 Ba-133\_1  
 Time limit  
 Count limit  
 Isotope Ba-133\_1  
 Protocol date 8/26/2022  
 Run id. 5443

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	92	1	180	3910.28	1303.29	1.6	12:01:08
588224001	2	92	2	180	3083	1027.46	1.8	78.84	12:04:22
588224002	3	92	3	180	3004	1001.13	1.82	76.82	12:07:36
588224003	4	92	4	180	3165	1054.79	1.78	80.93	12:10:50
588224004	5	92	5	180	3065	1021.47	1.81	78.38	12:14:04
588224005	1	15	1	180	2939.28	979.56	1.84	75.16	12:17:40
588589001	2	15	2	180	2779	926.22	1.9	71.07	12:20:54
588589002	3	15	3	180	3148.28	1049.22	1.78	80.51	12:24:08
588589003	4	15	4	180	2582	860.57	1.97	66.03	12:27:22
588589004	5	15	5	180	3097	1032.12	1.8	79.19	12:30:36
588594001	1	19	1	180	3206.57	1068.65	1.77	82.00	12:34:12
588594002	2	19	2	180	3103	1034.22	1.8	79.35	12:37:25
588594003	3	19	3	180	2797	932.15	1.89	71.52	12:40:39
588594004	4	19	4	180	2444.57	814.69	2.02	62.51	12:43:53
588594005	5	19	5	180	2643	880.82	1.95	67.58	12:47:07
588594006	1	10	1	180	2659.28	886.24	1.94	68.00	12:50:53
588594007	2	10	2	180	2402	800.5	2.04	61.42	12:54:07
588594008	3	10	3	180	3032.57	1010.66	1.82	77.55	12:57:21
1205158468	4	10	4	180	2985	994.9	1.83	76.34	01:00:35
1205158469	5	10	5	180	2991.28	996.99	1.83	76.50	01:03:49
1205158470	1	5	1	180	3079.28	1026.22	1.8	78.74	01:07:37

END OF ASSAY

# **Continuing Calibration Data**

# Gas Flow Proportional Counter Checks for 26-Aug-2022

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100A2	need 2nd	Beta bkg	26-Aug 06:32	60	1.900	-2.15E-1	2.577	+1.55
LB4100E2	Above	Beta bkg	26-Aug 06:30	60	2.950	1.385	3.072	+2.57
LB4100E3	Above	Beta bkg	26-Aug 06:30	60	2.500	0.506	2.576	+2.78
LB4100F2	Above	Alpha eff	26-Aug 08:00	5	6619	3944	6286	+3.85
LB4100F2	Above	Beta XTalk	26-Aug 10:18	5	5.91E-4	1.40E-4	5.65E-4	+3.36
LB4100F3	need 2nd	Beta bkg	26-Aug 10:38	60	1.650	0.854	1.842	+1.83
LB4100F4	Above	Alpha eff	26-Aug 08:00	5	11080	5098	9867	+4.53
LB4100F4	Below	Alpha XTalk	26-Aug 08:00	5	0.384	0.384	0.757	-3.01
LB4100G1	Above	Alpha XTalk	26-Aug 10:05	5	0.829	0.088	0.447	+9.39
LB4100G1	Above	Beta bkg	26-Aug 06:31	60	1503	0.380	1.675	+6,960.56
LB4100G1	need 2nd	Beta eff	26-Aug 08:24	5	16452	12880	18320	+0.94
LB4100G3	Above	Beta bkg	26-Aug 06:31	60	1.950	0.810	1.674	+4.92
LB4100H2	Below	Alpha eff	26-Aug 10:04	5	4819	5513	8976	-4.20
LB4100H2	Above	Alpha XTalk	26-Aug 10:04	5	0.442	0.269	0.396	+5.21
PIC8B	Above	Alpha bkg	26-Aug 07:51	60	0.683	-1.16E-1	0.388	+6.53
PIC8B	Above	Beta bkg	26-Aug 07:51	60	2.917	-1.80E-1	2.341	+4.37
PIC8B	Above	Beta eff	26-Aug 07:44	5	23555	20290	21980	+8.59
PIC8C	Above	Beta bkg	26-Aug 09:10	60	8.300	-2.96E-1	2.115	+18.39
PIC8D	Above	Beta bkg	26-Aug 09:10	60	9.200	-1.07E-1	2.328	+19.93
PIC14C	Above	Beta bkg	26-Aug 09:08	60	2.033	0.197	2.388	+2.03

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

G5400W1W	Alpha eff, Alpha XTalk, Beta eff, Beta XTalk
G5400W1X	Alpha eff, Alpha XTalk, Beta eff, Beta XTalk
G5400W1Y	Alpha eff, Alpha XTalk, Beta eff, Beta XTalk
G5400W1Z	Alpha eff, Alpha XTalk, Beta eff, Beta XTalk
LB4100C1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk



LB4100C4            Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
LB4100I1            Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
LB4100I2            Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
LB4100I3            Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk  
LB4100I4            Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by 

Date 8/26/22

GEL Laboratories LLC

# Runlogs

# Instrument Run Log

Instrument Type: GFPC

Batch ID: 2300100

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205158468	MB	JXC9	PIC11A	AUG-26-22 10:46:45	DONE	25mm Filter	01-JUN-22 00:00
1205158469	DUP	JXC9	PIC11C	AUG-26-22 10:46:46	DONE	25mm Filter	01-JUN-22 00:00
1205158470	LCS	JXC9	PIC11D	AUG-26-22 10:46:46	DONE	25mm Filter	01-JUN-22 00:00
588224001	SAMPLE	JXC9	PIC1B	AUG-26-22 10:50:56	DONE	25mm Filter	01-JUN-22 00:00
588224002	SAMPLE	JXC9	PIC2A	AUG-26-22 10:51:04	DONE	25mm Filter	01-JUN-22 00:00
588224003	SAMPLE	JXC9	PIC3B	AUG-26-22 10:51:08	DONE	25mm Filter	01-JUN-22 00:00
588224004	SAMPLE	JXC9	PIC4A	AUG-26-22 10:51:12	DONE	25mm Filter	01-JUN-22 00:00
588224005	SAMPLE	JXC9	PIC4C	AUG-26-22 10:52:00	DONE	25mm Filter	01-JUN-22 00:00
588589001	SAMPLE	JXC9	PIC5A	AUG-26-22 10:52:27	DONE	25mm Filter	01-JUN-22 00:00
588589002	SAMPLE	JXC9	PIC7B	AUG-26-22 10:52:47	DONE	25mm Filter	01-JUN-22 00:00
588589003	SAMPLE	JXC9	PIC7C	AUG-26-22 10:52:48	DONE	25mm Filter	01-JUN-22 00:00
588589004	SAMPLE	JXC9	PIC7D	AUG-26-22 10:52:48	DONE	25mm Filter	01-JUN-22 00:00
588594001	SAMPLE	JXC9	PIC8A	AUG-26-22 10:52:55	DONE	25mm Filter	01-JUN-22 00:00
588594002	SAMPLE	JXC9	PIC9A	AUG-26-22 10:53:01	DONE	25mm Filter	01-JUN-22 00:00
588594003	SAMPLE	JXC9	PIC9B	AUG-26-22 10:53:04	DONE	25mm Filter	01-JUN-22 00:00
588594004	SAMPLE	JXC9	PIC9C	AUG-26-22 10:53:08	DONE	25mm Filter	01-JUN-22 00:00
588594005	SAMPLE	JXC9	PIC9D	AUG-26-22 10:53:10	DONE	25mm Filter	01-JUN-22 00:00
588594006	SAMPLE	JXC9	PIC10A	AUG-26-22 10:53:16	DONE	25mm Filter	01-JUN-22 00:00
588594007	SAMPLE	JXC9	PIC10C	AUG-26-22 10:53:22	DONE	25mm Filter	01-JUN-22 00:00
588594008	SAMPLE	JXC9	PIC10D	AUG-26-22 10:53:25	DONE	25mm Filter	01-JUN-22 00:00

# Lucas Cell Raw Data

# Batch 2300087 Check-list

This check-list was completed on 24-AUG-22 by Elizabeth Krouse

This batch was reviewed by Elizabeth Krouse on 24-AUG-22 and Lyndsey Pace on 24-AUG-22.

**Batch ID:**  
2300087

**Product:**  
LUC26RAL

**Description:** Lucas Cell Radium 226  
GL-RAD-A-008

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
<b>Miscellaneous Information</b>				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

# Prep Logbook

## Radium-226 in Liquid

**Batch ID:** 2300087

**Analyst:** Lyndsey Pace (LXP1)

**Method:** EPA 903.1 Modified

**Lab SOP:** GL-RAD-A-008 REV# 15

**Instrument:** LUCAS-C037036045

**Due Dates for Lab:** 28-AUG-2022

**Package:** 30-AUG-2022

**SDG:** 31-AUG-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205158424	Radium-226 SPIKE	1715-G	.1	mL
MS	1205158423	Radium-226 SPIKE	1715-G	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	588224001	11-AUG-2022	1	500.34	500.34	08/18/22 08:15	507	08/24/22 06:18	08/24/22 09:23	1	12
2	588224002	11-AUG-2022	1	505.41	505.41	08/18/22 08:15	604	08/24/22 06:18	08/24/22 09:23	2	9
3	588224003	11-AUG-2022	1	503.15	503.15	08/18/22 08:15	705	08/24/22 06:18	08/24/22 09:23	2	24
4	588224004	11-AUG-2022	1	504.9	504.9	08/18/22 08:15	806	08/24/22 06:18	08/24/22 09:23	2	93
5	588224005	11-AUG-2022	1	505.45	505.45	08/18/22 08:15	105	08/24/22 06:46	08/24/22 09:55	4	10
6	588589001	11-AUG-2022	1	503.78	503.78	08/18/22 08:15	206	08/24/22 06:46	08/24/22 09:55	1	24
7	588589002	11-AUG-2022	1	502.93	502.93	08/18/22 08:15	403	08/24/22 06:46	08/24/22 09:55	5	12
8	588589003	11-AUG-2022	1	500.82	500.82	08/18/22 08:15	506	08/24/22 06:46	08/24/22 09:55	8	10
9	588589004	11-AUG-2022	1	504.31	504.31	08/18/22 08:15	605	08/24/22 06:46	08/24/22 09:55	5	13
10	588594001	11-AUG-2022	1	500.13	500.13	08/18/22 08:15	706	08/24/22 06:46	08/24/22 09:55	7	32
11	588594002	11-AUG-2022	1	500.33	500.33	08/18/22 08:15	802	08/24/22 06:46	08/24/22 09:55	8	21
12	588594003	11-AUG-2022	1	503.87	503.87	08/18/22 08:15	106	08/24/22 07:13	08/24/22 10:29	3	16
13	588594004	11-AUG-2022	1	502.01	502.01	08/18/22 08:15	208	08/24/22 07:13	08/24/22 10:29	5	20
14	588594005	11-AUG-2022	1	503.61	503.61	08/18/22 08:15	408	08/24/22 07:13	08/24/22 10:29	5	23
15	588594006	11-AUG-2022	1	502.61	502.61	08/18/22 08:15	508	08/24/22 07:13	08/24/22 10:29	7	10
16	588594007	11-AUG-2022	1	501.34	501.34	08/18/22 08:15	606	08/24/22 07:13	08/24/22 10:29	3	22
17	588594008	11-AUG-2022	1	503.64	503.64	08/18/22 08:15	707	08/24/22 07:13	08/24/22 10:29	4	12
18	1205158421 MB	11-AUG-2022	1	505.45	505.45	08/18/22 08:15	805	08/24/22 07:13	08/24/22 10:29	8	15
19	1205158422 DUP (588224001)	11-AUG-2022	1	500.85	500.85	08/18/22 08:15	108	08/24/22 07:40	08/24/22 11:01	4	16
20	1205158423 MS (588224001)	11-AUG-2022	1	104.91	104.91	08/18/22 08:15	505	08/24/22 07:40	08/24/22 11:01	6	1001
21	1205158424 LCS	11-AUG-2022	1		505.45	08/18/22 08:15	607	08/24/22 07:40	08/24/22 11:01	6	857

Reagent/Solvent Lot ID	Description	Amount
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**Comments:**  
Data Entry Date2: 11-AUG-2022 00:00

### Radium-226 Liquid

Filename : RA226.XLS  
 File type : Excel  
 Version # : 1.3.2

Procedure Code : LUC26RAL  
 Parmname : Radium-226  
 Required MDA : 1 pCi/L  
 Halflife of Ra-226 : 1600 years  
 Ra-226 Abundance : 1.00  
 Halflife of Rn-222 : 3.8235 days

Batch : 2300087  
 Analyst : LIN01615  
 Prep Date : 8/11/2022  
 Ra-226 Method Uncertainty : 0.073648

Batch counted on : LUCAS CELL DETECTOR  
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Counting		Gross Counts	Gross CPM	Background Counts	Background CPM	Background Count Time (min.)	Cell Efficiency (cpm/dpm)
					Cell Number	Time (min.)						
1	588224001.1	0.5003	2.0257E-05	7/28/2022 12:02	507	30	12	0.400	1	0.033	30	1.8520
2	588224002.1	0.5054	2.0278E-05	7/28/2022 13:32	604	30	9	0.300	2	0.067	30	1.6810
3	588224003.1	0.5032	2.0269E-05	7/28/2022 9:47	705	30	24	0.800	2	0.067	30	1.7610
4	588224004.1	0.5049	2.0276E-05	7/28/2022 9:47	806	30	93	3.100	2	0.067	30	1.9460
5	588224005.1	0.5055	2.0278E-05	7/28/2022 8:40	105	30	10	0.333	4	0.133	30	1.5830
6	588589001.1	0.5038	2.0271E-05	8/2/2022 21:41	206	30	24	0.800	1	0.033	30	1.8770
7	588589002.1	0.5029	2.0268E-05	8/2/2022 20:25	403	30	12	0.400	5	0.167	30	1.6200
8	588589003.1	0.5008	2.0259E-05	8/2/2022 19:13	506	30	10	0.333	8	0.267	30	1.7710
9	588589004.1	0.5043	2.0273E-05	8/2/2022 17:56	605	30	13	0.433	5	0.167	30	1.9020
10	588594001.1	0.5001	2.0256E-05	8/2/2022 12:42	706	30	32	1.067	7	0.233	30	1.6340
11	588594002.1	0.5003	2.0257E-05	8/2/2022 15:43	802	30	21	0.700	8	0.267	30	2.0910
12	588594003.1	0.5039	2.0272E-05	8/2/2022 9:21	106	30	16	0.533	3	0.100	30	1.6990
13	588594004.1	0.5020	2.0264E-05	8/2/2022 10:55	208	30	20	0.667	5	0.167	30	1.7740
14	588594005.1	0.5036	2.0271E-05	8/2/2022 16:21	408	30	23	0.767	5	0.167	30	1.5900
15	588594006.1	0.5026	2.0267E-05	8/2/2022 14:09	508	30	10	0.333	7	0.233	30	1.8020
16	588594007.1	0.5013	2.0261E-05	8/2/2022 10:55	606	30	22	0.733	3	0.100	30	1.9360
17	588594008.1	0.5036	2.0271E-05	8/2/2022 6:55	707	30	12	0.400	4	0.133	30	1.7120
18	1205158421.1	0.5055	2.0278E-05	8/11/2022 0:00	805	30	15	0.500	8	0.267	30	1.9080
19	1205158422.1	0.5009	2.0259E-05	7/28/2022 12:02	108	30	16	0.533	4	0.133	30	1.5830
20	1205158423.1	0.1049	1.1667E-05	7/28/2022 12:02	505	30	1001	33.367	6	0.200	30	1.8130
21	1205158424.1	0.5055	2.0278E-05	8/11/2022 0:00	607	30	857	28.567	6	0.200	30	1.8040

Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008  
 Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrowth End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
4.000%	6/1/2022	5/31/2023	8/18/2022 8:15	8/24/2022 6:18	8/24/2022 9:23	0.658	0.977	1.002	1.000
6.700%	7/1/2022	6/30/2023	8/18/2022 8:15	8/24/2022 6:18	8/24/2022 9:23	0.658	0.977	1.002	1.000
3.000%	11/1/2021	10/31/2022	8/18/2022 8:15	8/24/2022 6:18	8/24/2022 9:23	0.658	0.977	1.002	1.000
7.300%	4/1/2022	3/31/2023	8/18/2022 8:15	8/24/2022 6:18	8/24/2022 9:23	0.658	0.977	1.002	1.000
0.500%	4/28/2022	4/30/2023	8/18/2022 8:15	8/24/2022 6:46	8/24/2022 9:55	0.659	0.976	1.002	1.000
2.800%	8/1/2022	7/31/2023	8/18/2022 8:15	8/24/2022 6:46	8/24/2022 9:55	0.659	0.976	1.002	1.000
9.700%	2/1/2022	1/31/2023	8/18/2022 8:15	8/24/2022 6:46	8/24/2022 9:55	0.659	0.976	1.002	1.000
5.300%	6/1/2022	5/31/2023	8/18/2022 8:15	8/24/2022 6:46	8/24/2022 9:55	0.659	0.976	1.002	1.000
7.500%	7/1/2022	6/30/2023	8/18/2022 8:15	8/24/2022 6:46	8/24/2022 9:55	0.659	0.976	1.002	1.000
6.400%	11/1/2021	10/31/2022	8/18/2022 8:15	8/24/2022 6:46	8/24/2022 9:55	0.659	0.976	1.002	1.000
8.000%	4/1/2022	3/31/2023	8/18/2022 8:15	8/24/2022 6:46	8/24/2022 9:55	0.659	0.976	1.002	1.000
8.800%	4/28/2022	4/30/2023	8/18/2022 8:15	8/24/2022 7:13	8/24/2022 10:29	0.660	0.976	1.002	1.000
5.500%	8/1/2022	7/31/2023	8/18/2022 8:15	8/24/2022 7:13	8/24/2022 10:29	0.660	0.976	1.002	1.000
1.200%	2/1/2022	1/31/2023	8/18/2022 8:15	8/24/2022 7:13	8/24/2022 10:29	0.660	0.976	1.002	1.000
4.500%	6/1/2022	5/31/2023	8/18/2022 8:15	8/24/2022 7:13	8/24/2022 10:29	0.660	0.976	1.002	1.000
8.200%	7/1/2022	6/30/2023	8/18/2022 8:15	8/24/2022 7:13	8/24/2022 10:29	0.660	0.976	1.002	1.000
3.000%	11/1/2021	10/31/2022	8/18/2022 8:15	8/24/2022 7:13	8/24/2022 10:29	0.660	0.976	1.002	1.000
7.400%	4/1/2022	3/31/2023	8/18/2022 8:15	8/24/2022 7:13	8/24/2022 10:29	0.660	0.976	1.002	1.000
2.800%	4/28/2022	4/30/2023	8/18/2022 8:15	8/24/2022 7:40	8/24/2022 11:01	0.662	0.975	1.002	1.000
1.200%	6/1/2022	5/31/2023	8/18/2022 8:15	8/24/2022 7:40	8/24/2022 11:01	0.662	0.975	1.002	1.000
3.400%	7/1/2022	6/30/2023	8/18/2022 8:15	8/24/2022 7:40	8/24/2022 11:01	0.662	0.975	1.002	1.000



Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

**Spike S/N :** 1715-G  
**Spike Exp Date :** 9/15/2022  
**Spike Activity (dpm/ml):** 297.50  
**Spike Volume Added:** 0.10

**LCS S/N :** 1715-G  
**LCS Exp Date :** 9/15/2022  
**LCS Activity (dpm/ml):** 297.50  
**LCS Volume Added:** 0.10

<b>Results</b>																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.0832	0.0588	1	0.1933	<b>0.2778</b>	33.02%	0.3667	0.1202	0.1785	0.1842		SAMPLE				
2	0.1284	0.0906	1	0.2639	<b>0.1928</b>	47.85%	0.2333	0.1106	0.1791	0.1830		SAMPLE				
3	0.1231	0.0869	1	0.2530	<b>0.5810</b>	23.37%	0.7333	0.1700	0.2640	0.2791		SAMPLE				
4	0.1110	0.0784	1	0.2282	<b>2.1673</b>	12.96%	3.0333	0.3249	0.4550	0.6333		SAMPLE				
5	0.1925	0.1359	1	0.3594	<b>0.1752</b>	62.36%	0.2000	0.1247	0.2142	0.2157		SAMPLE				
6	0.0814	0.0575	1	0.1891	<b>0.5684</b>	21.92%	0.7667	0.1667	0.2422	0.2576		SAMPLE				
7	0.2113	0.1492	1	0.3845	<b>0.2008</b>	59.69%	0.2333	0.1374	0.2318	0.2367		SAMPLE				
8	0.2456	0.1734	1	0.4258	<b>0.0527</b>	212.20%	0.0667	0.1414	0.2191	0.2193		SAMPLE				
9	0.1795	0.1267	1	0.3266	<b>0.1949</b>	53.56%	0.2667	0.1414	0.2026	0.2065		SAMPLE				
10	0.2493	0.1760	1	0.4378	<b>0.7149</b>	25.79%	0.8333	0.2082	0.3500	0.3758		SAMPLE				
11	0.2082	0.1470	1	0.3610	<b>0.2904</b>	42.19%	0.4333	0.1795	0.2358	0.2438		SAMPLE				
12	0.1557	0.1099	1	0.3016	<b>0.3546</b>	34.67%	0.4333	0.1453	0.2330	0.2463		SAMPLE				
13	0.1932	0.1364	1	0.3514	<b>0.3933</b>	33.78%	0.5000	0.1667	0.2569	0.2665		SAMPLE				
14	0.2149	0.1517	1	0.3909	<b>0.5249</b>	29.42%	0.6000	0.1764	0.3024	0.3120		SAMPLE				
15	0.2248	0.1587	1	0.3947	<b>0.0773</b>	137.51%	0.1000	0.1374	0.2083	0.2088		SAMPLE				
16	0.1373	0.0969	1	0.2660	<b>0.4571</b>	27.56%	0.6333	0.1667	0.2358	0.2556		SAMPLE				
17	0.1785	0.1260	1	0.3332	<b>0.2166</b>	50.09%	0.2667	0.1333	0.2123	0.2150		SAMPLE				
18	0.2256	0.1593	1	0.3913	<b>0.1695</b>	68.91%	0.2333	0.1599	0.2276	0.2302		MB				
19	0.1939	0.1369	1	0.3620	<b>0.3530</b>	37.37%	0.4000	0.1491	0.2579	0.2636	588224001.1	DUP	23.8%			
20	0.9898	0.6988	1	1.7654	<b>122.0133</b>	3.41%	33.1667	1.0578	7.6270	19.4065	588224001.1	MS			127.7411	95.3%
21	0.2065	0.1458	1	0.3683	<b>21.7674</b>	4.85%	28.3667	0.9792	1.4728	3.7611		LCS			26.5132	82.1%

# **Continuing Calibration Data**



# Ludlum Alpha Scintillation Counter Checks for 24-AUG-2022

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	06:50	1	1.21E+05	121045	-1.09		
LUCAS2	EFF	06:48	1	1.35E+05	134597	2.3		
LUCAS4	EFF	06:54	1	1.28E+05	128368	1.62		
LUCAS5	EFF	06:46	1	1.33E+05	132695	2.15		
LUCAS6	EFF	06:55	1	1.31E+05	130570	-0.31		
LUCAS7	EFF	06:57	1	1.30E+05	129556	-2.76		
LUCAS8	EFF	06:43	1	1.29E+05	129038	0.42		

**Reviewed by:**

Lyndsey Pace

**Date:** 24-AUG-22

GEL Laboratories LLC

# Runlogs

# Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2300087

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
588224001	SAMPLE	LXP1	LUCAS5	AUG-24-22 09:23:00	DONE	Lucas Cell	01-JUN-22 00:00
588224002	SAMPLE	LXP1	LUCAS6	AUG-24-22 09:23:00	DONE	Lucas Cell	01-JUL-22 00:00
588224003	SAMPLE	LXP1	LUCAS7	AUG-24-22 09:23:00	DONE	Lucas Cell	01-NOV-21 00:00
588224004	SAMPLE	LXP1	LUCAS8	AUG-24-22 09:23:00	DONE	Lucas Cell	01-APR-22 00:00
588224005	SAMPLE	LXP1	LUCAS1	AUG-24-22 09:55:00	DONE	Lucas Cell	28-APR-22 00:00
588589001	SAMPLE	LXP1	LUCAS2	AUG-24-22 09:55:00	DONE	Lucas Cell	01-AUG-22 00:00
588589002	SAMPLE	LXP1	LUCAS4	AUG-24-22 09:55:00	DONE	Lucas Cell	01-FEB-22 00:00
588589003	SAMPLE	LXP1	LUCAS5	AUG-24-22 09:55:00	DONE	Lucas Cell	01-JUN-22 00:00
588589004	SAMPLE	LXP1	LUCAS6	AUG-24-22 09:55:00	DONE	Lucas Cell	01-JUL-22 00:00
588594001	SAMPLE	LXP1	LUCAS7	AUG-24-22 09:55:00	DONE	Lucas Cell	01-NOV-21 00:00
588594002	SAMPLE	LXP1	LUCAS8	AUG-24-22 09:55:00	DONE	Lucas Cell	01-APR-22 00:00
588594003	SAMPLE	LXP1	LUCAS1	AUG-24-22 10:29:00	DONE	Lucas Cell	28-APR-22 00:00
588594004	SAMPLE	LXP1	LUCAS2	AUG-24-22 10:29:00	DONE	Lucas Cell	01-AUG-22 00:00
588594005	SAMPLE	LXP1	LUCAS4	AUG-24-22 10:29:00	DONE	Lucas Cell	01-FEB-22 00:00
588594006	SAMPLE	LXP1	LUCAS5	AUG-24-22 10:29:00	DONE	Lucas Cell	01-JUN-22 00:00
588594007	SAMPLE	LXP1	LUCAS6	AUG-24-22 10:29:00	DONE	Lucas Cell	01-JUL-22 00:00
588594008	SAMPLE	LXP1	LUCAS7	AUG-24-22 10:29:00	DONE	Lucas Cell	01-NOV-21 00:00
1205158421	MB	LXP1	LUCAS8	AUG-24-22 10:29:00	DONE	Lucas Cell	01-APR-22 00:00
1205158422	DUP	LXP1	LUCAS1	AUG-24-22 11:01:00	DONE	Lucas Cell	28-APR-22 00:00
1205158423	MS	LXP1	LUCAS5	AUG-24-22 11:01:00	DONE	Lucas Cell	01-JUN-22 00:00
1205158424	LCS	LXP1	LUCAS6	AUG-24-22 11:01:00	DONE	Lucas Cell	01-JUL-22 00:00



Environmental Laboratory  
 1232 Haco Drive  
 Lansing  
 Michigan, 48910



CHAIN OF CUSTODY

Phone: (517)702-6372

Lab Work Order Number L208171

Client Name <b>BWL - Erickson Station</b>		Project Name <b>Erickson AM MI Wells 7-10</b>		Requested Analyses								Requested Turn Around		
Client Contact <b>Cheryl Loudon</b>		Project Number <b>[none]</b>		Ag: As: B: Ba: Be: Bi: Ca: Cd: Cr: Co: Cu: Fe: Hg: Li: Mo: Ni: Pb: Sb: Se: Si: Tl: V: Zn: Na: Mg: K	TSS, HCO3, CO3, T. Hardness	Cl-IC: F-ISE: SO4: TDS	Radium 226 and Radium 228							Rush requests subject to additional charge
Address <b>3725 S. Canal</b>		Project Description												
City <b>Lansing</b>		PO Number <b>30926 10021</b>												
State/Zip <b>MI, 48917</b>		Shipped By												
Phone <b>(517) 702-6396</b>	Fax <b>(517) 702-6373</b>	Tracking Number												
Sampler <b>Marc Wahrer</b>												Rush requests subject to lab approval		

Sample Name or Field ID	Sampled Date	Sampled Time	Sample Type Grab/Composite	Matrix Code	Container Count	Preservation Code				Sample	Comments
						b	a	a	b		
MW-7	08/02/22	2141	G	GW	5	1	1	1	2		
MW-8	↓	2025	G	GW	5	1	1	1	2		
MW-9		1913	G	GW	5	1	1	1	2		
MW-10		1756	G	GW	5	1	1	1	2		
Field Duplicate - JSC 08/04/22				G	GW	5	1	1	1	2	
Field Blank - JSC 08/04/22			G	DI	5	1	1	1	2		

Relinquished By 	Date/Time <b>8.2.22 1025pm</b>	Received By 	Date/Time <b>0917 08/03/22</b>	
Relinquished By	Date/Time	Received By	Date/Time	Comments
Relinquished By	Date/Time	Received By	Date/Time	
Cooler Numbers and Temperatures				

Matrix Codes: DI=Deionized Water, GW=Ground Water      Preserv. Codes: a=None, b=0.5% HNO3

## Data Verification & Validation Report

### Lansing Board of Water & Light – Erickson Power Station

**Sampling Event (dates and purpose):** Semiannual Assessment Monitoring – Wells 7-10 – August 2022

Data Package Number: S38759.01

Lab Report Date: 10/04/2022

Data Validator: Aryka Thomson

Data Validation Completion Date: 10/10/2022

General Overall Assessment:

Data are usable without qualification.

Data are usable with qualification (as noted below).

Some or all data are unusable (as noted below).

Wells planned for sampling:

Well ID	Planned for Sampling
MW-1	
MW-2	
MW-3	
MW-4	
MW-5	
MW-6	
MW-7	X
MW-7B	
MW-7C	
MW-8	X
MW-9	X
MW-10	X
MW-11	
MW-11B	
MW-12	
MW-12B	
MW-13	

### Data Summary

Sample ID	Matrix	Lab ID	Date Collected	App III Metals	App IV Metals	Part 115 Metals	Anions	TDS TSS	Rad-226 Rad-228	Diss. Metals
MW-7	GW	S38759.01	08/02/2022	X	X	X	X	X	X	
MW-8	GW	S38759.02	08/02/2022	X	X	X	X	X	X	
MW-9	GW	S38759.03	08/02/2022	X	X	X	X	X	X	
MW-10	GW	S38759.04	08/02/2022	X	X	X	X	X	X	

Other analytes requested for analysis: Na, Mg, K, HCO<sub>3</sub>, CO<sub>3</sub>, hardness

Any planned sampling or analysis NOT completed? If yes, explain: \_\_\_\_\_

### Data Verification & Validation Checklist

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
<b>Field Data</b>							
Sample Collection Field Forms	X		Purging performed as required in the Groundwater Monitoring Plan	X			
Field Calibration Records	X		Field instruments calibrated daily according to manufacturer specifications	X			
Chain of Custody	X		Accurately reflect samples, collection dates/times, analyses, bottles, etc.	X			
Field decontamination documentation	N/A		Record of decontamination for non-dedicated sampling equipment			X	
Drilling logs	X		N/A	-	-	-	
Well construction logs	X		N/A	-	-	-	
Well development field forms	X		N/A	-	-	-	
<b>Analytical Data Package</b>							
Cover Sheet	X		N/A	-	-	-	
Case Narrative	X		Summarizes sample receipt and any exceptions to QC acceptance criteria	X			
Internal Laboratory Chain of Custody forms	X		Analyses as requested; accurate transcription of field COC	X			
Sample Chronology and Consistency	X		Accurate representation of dates, times of receipt, preparation, and analysis	X			
Communication Records with Lab	X		N/A	-	-	-	
EDD Format Consistency	X		EDD format and content as requested	X			
Sample Identification, Results Nomenclature, and Data Qualifier Consistency	X		All included in final report	X			
Method Detection Limit Consistency	X		MDLs consistent between samples		X		Dilution varies between samples
Instrument Calibration Records	X		Present and no nonconformance noted	X			
Laboratory Report Complete	X		Includes QC component	X			
Holding Times	X		Analyses performed within allowed holding time	X			



Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Method	X		Method as requested	X			
Reporting Limits	X		RLs as requested	X			RLs for TDS were not met
			MDLs<RLs		X		RL=MDL for carbonate and TSS
			MDLs<GPS	X			
<b>QC Validation</b>							
<b>Evaluate Accuracy</b>							
Matrix Spike (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Laboratory Control Sample (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
<b>Evaluate Precision</b>							
Matrix Spike Duplicate (RPD)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Field Duplicate (RPD)		X	RPD ≤ 20%			X	Completed with data package S38760
<b>Evaluate Representativeness</b>							
Equipment Blanks (if applicable)	N/A		Non-detect (<RL)			X	
<b>QC Verification</b>							
<b>Verify Instrument Calibration &amp; Analytical Process</b>							
Initial Calibration Verification	X		Laboratory-determined	-	-	-	
Continuing Calibration Verification	X		Laboratory-determined	-	-	-	
Initial Calibration Blank	X		Laboratory-determined	-	-	-	
Continuing Calibration Blank	X		Laboratory-determined	-	-	-	
Serial Dilutions	X		Laboratory-determined	-	-	-	High recovery for Al and Zn
Post-Digestion Spikes	X		Laboratory-determined	-	-	-	
Internal Standards	X		Laboratory-determined	-	-	-	
Laboratory Duplicate (RPD)	X		Laboratory-determined	-	-	-	Laboratory-generated duplicate for Rad-228 was outside control limits
Method Blanks	X		Laboratory-determined	-	-	-	Rad-228 detected in MB
<b>Evaluate Completeness (# usable measurements/ # unusable measurements)</b>							
Completeness	X		100%	X			

Other instances of nonconformance to QC control limits noted on case narrative:

Rad-228 was detected at 2.29 pCi/L in method blank 1205158468 at a level greater than the MDC (1.90 pCi/L) but less than the required detection limit (3.00 pCi/L). Rad-228 required qualification as estimated with high bias in all samples (J+).

The laboratory-generated duplicate sample did not meet the relative percent difference requirement for Rad-228; however, they do meet the relative error ratio requirement. No qualification was required.

Comments: None



Lansing Board of Water and Light  
Environmental Services Laboratory  
1232 Haco Dr.  
Lansing, Michigan 48901

15 September 2022

BWL - Erickson Station

Attn: Cheryl Louden

3725 S. Canal

Lansing, MI 48917

**Project: Erickson AM MI**

Dear Cheryl Louden,

Enclosed is a copy of the laboratory report for the following work order(s) received by Lansing Board of Water and Light Environmental Services Laboratory:

**Work Order**

**L208172**

**Received**

**8/11/2022 11:48:00AM**

**Account Number**

**30926 10021**

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in blue ink that reads "Jennifer Caporale".

Jennifer Caporale, Supervisor



### Analytical Report

**Client:** BWL - Erickson Station  
**Address:** 3725 S. Canal  
Lansing MI, 48917

**Client Project Manager:** Cheryl Louden

**Report Date:** 09/15/2022

**Sample Name:** MW-11B

**Lab #:** L208172-01 Ground Water

**Collected:** 11-Aug-22 10:05

**By:** Marc Wahrer

Analyte	Reporting		Units	Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit							
Conductivity	530	1.0	uS/cm	1		11-Aug-22 10:05	maw	SM 2510B	
Dissolved oxygen	0.240	0.100	mg/L	1		11-Aug-22 10:05	maw	FIELD	
Milliliters Purged	210		ml/min	1		11-Aug-22 10:05	maw	FIELD	
Oxidation Reduction Potential	-158.4	-999.0	mV	1		11-Aug-22 10:05	maw	FIELD	
pH	7.4	7.0	pH Units	1		11-Aug-22 10:05	maw	SM 4500H+B	
Temperature	13		°C	1		11-Aug-22 10:05	maw	SM 2550B	
Turbidity	6.2	0.10	NTU	1		11-Aug-22 10:05	maw	SM 2130B	



## Analytical Report

**Client:** BWL - Erickson Station

**Client Project Manager:** Cheryl Louden

**Report Date:** 09/15/2022

**Address:** 3725 S. Canal  
Lansing MI, 48917

**Approved By:** \_\_\_\_\_

*Jennifer Caporale*

### Notes and Definitions

AL Action Level (Action Level = Regulatory Limit)  
MCL Maximum Contaminant Level  
PEL Permissible Exposure Limit (Permissible Exposure Limit = Regulatory Limit)  
RPD Relative Percent Difference  
OT Odor Threshold  
ND Non Detect

All drinking water regulatory limits are MCL's with the exception of Lead and Copper unless otherwise noted.



Report ID: S39103.01(02)  
Generated on 09/14/2022  
Replaces report S39103.01(01) generated on 08/15/2022

**Report to**  
Attention: Jennifer Caporale  
Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901  
  
Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

**Report produced by**  
Merit Laboratories, Inc.  
2680 East Lansing Drive  
East Lansing, MI 48823  
  
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Contacts for report questions:  
John Lavery (johnlavery@meritlabs.com)  
Barbara Ball (bball@meritlabs.com)

**Report Summary**  
Lab Sample ID(s): S39103.01-S39103.03  
Project: Erickson AM MI New Wells 11B  
Collected Date(s): 08/11/2022  
Submitted Date/Time: 08/11/2022 12:23  
Sampled by: Marc Wahrer  
P.O. #:

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Maya Murshak  
Technical Director



## General Report Notes

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Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile, and 2-chloroethylvinyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (\*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

## Report Narrative

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All analyses completed



Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Alaska CSLAP	#17-001
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



## Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1 (1993)
SM2320B	Standard Method 2320 B 2011
SM2340C	Standard Method 2340 C 2011
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007





## Sample Summary (3 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S39103.01	MW-11B L208172-01	Groundwater	08/11/22 10:05
S39103.02	Field Dupe MW-11B L208172-02	Groundwater	08/11/22 10:05
S39103.03	Field Blank L208172-03	Water	08/11/22 09:00



# Analytical Laboratory Report

Final Report

Lab Sample ID: S39103.01

Sample Tag: MW-11B L208172-01

Collected Date/Time: 08/11/2022 10:05

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	5.1	IR
2	1L Plastic	None	Yes	5.1	IR
1	125ml Plastic	HNO3	Yes	5.1	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	08/12/22 09:30	JRH	
Metal Digestion	Completed	SW3015A	08/11/22 13:15	CCM	

### Inorganics

Method: E300.0, Run Date: 08/11/22 16:15, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 08/11/22 13:31, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	370	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 08/11/22 16:26, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	261	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 08/12/22 17:40, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	308	50	10	mg/L	2		

Method: SM2540D, Run Date: 08/11/22 17:17, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 08/11/22 14:16, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.009	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.068	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.77	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	3.04	0.02	0.00192	mg/L	5	7439-89-6	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S39103.01 (continued)

Sample Tag: MW-11B L208172-01

**Method: E200.8, Run Date: 08/11/22 14:16, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.025	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.007	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 08/11/22 15:22, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	66.6	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	24.3	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	6.40	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	17.7	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 08/12/22 14:09, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 09/12/22 16:18, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Final Report

Lab Sample ID: S39103.02

Sample Tag: Field Dupe MW-11B L208172-02

Collected Date/Time: 08/11/2022 10:05

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	5.1	IR
2	1L Plastic	None	Yes	5.1	IR
1	125ml Plastic	HNO3	Yes	5.1	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	08/12/22 09:30	JRH	
Metal Digestion	Completed	SW3015A	08/11/22 13:15	CCM	

### Inorganics

Method: E300.0, Run Date: 08/11/22 16:28, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 08/11/22 13:33, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	370	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 08/11/22 16:28, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	258	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 08/12/22 17:40, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	288	50	10	mg/L	2		

Method: SM2540D, Run Date: 08/11/22 17:17, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	4	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 08/11/22 14:20, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.009	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.069	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.75	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	3.00	0.02	0.00192	mg/L	5	7439-89-6	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S39103.02 (continued)  
Sample Tag: Field Dupe MW-11B L208172-02

**Method: E200.8, Run Date: 08/11/22 14:20, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.024	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.006	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 08/11/22 15:23, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	65.6	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	24.2	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	6.31	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	17.3	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 08/12/22 14:12, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 09/12/22 16:18, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Final Report

Lab Sample ID: S39103.03

Sample Tag: Field Blank L208172-03

Collected Date/Time: 08/11/2022 09:00

Matrix: Water

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	5.1	IR
2	1L Plastic	None	Yes	5.1	IR
1	125ml Plastic	HNO3	Yes	5.1	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	08/12/22 09:30	JRH	
Metal Digestion	Completed	SW3015A	08/11/22 13:15	CCM	

### Inorganics

Method: E300.0, Run Date: 08/11/22 16:54, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 08/11/22 13:35, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	Not detected	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 08/11/22 16:30, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	Not detected	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 08/12/22 17:40, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	Not detected	50	10	mg/L	2		

Method: SM2540D, Run Date: 08/11/22 17:17, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 08/11/22 14:10, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00102	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.000102	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.0000648	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.0000862	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.000702	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.0000760	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.0000386	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.0000434	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000150	mg/L	2	7440-50-8	
Iron	Not detected	0.02	0.000768	mg/L	2	7439-89-6	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S39103.03 (continued)

Sample Tag: Field Blank L208172-03

**Method: E200.8, Run Date: 08/11/22 14:10, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.0000760	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000654	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.0000868	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000100	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.000838	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.0000270	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.0000342	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.0000558	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.000292	mg/L	2	7440-66-6	

**Method: E200.8, Run Date: 08/11/22 15:20, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.0174	mg/L	2	7440-70-2	
Magnesium	Not detected	0.50	0.00480	mg/L	2	7439-95-4	
Potassium	Not detected	0.50	0.00920	mg/L	2	7440-09-7	
Sodium	Not detected	0.50	0.00340	mg/L	2	7440-23-5	

**Method: E245.1, Run Date: 08/12/22 14:16, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 09/12/22 16:18, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

# Merit Laboratories Login Checklist

Lab Set ID:S39103

Client:BWL01 (Board of Water & Light)

Project: Erickson AM MI New Wells 11B

Submitted:08/11/2022 12:23 Login User: MMC

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental\_Laboratory@LBWL.com

Selection	Description	Note
-----------	-------------	------

## Sample Receiving

- |     |  |  |        |
|-----|--|--|--------|
| 01. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples are received at 4C +/- 2C Thermometer #        | IR 5.1 |
| 02. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Received on ice/ cooling process begun                 |        |
| 03. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples shipped  |        |
| 04. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples left in 24 hr. drop box                        |        |
| 05. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Are there custody seals/tape or is the drop box locked |        |

## Chain of Custody

- |     |  |  |     |
|-----|--|--|-----|
| 06. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC adequately filled out                |     |
| 07. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC signed and relinquished to the lab   |     |
| 08. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sample tag on bottles match COC          |     |
| 09. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Subcontracting needed? Subcontracted to: | GEL |

## Preservation

- |     |  |   |  |
|-----|--|---|--|
| 10. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Do sample have correct chemical preservation        |  |
| 11. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Completed pH checks on preserved samples? (no VOAs) |  |
| 12. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Did any samples need to be preserved in the lab?    |  |

## Bottle Conditions

- |     |  |   |  |
|-----|--|---|--|
| 13. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | All bottles intact                            |  |
| 14. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Appropriate analytical bottles are used       |  |
| 15. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Merit bottles used                            |  |
| 16. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sufficient sample volume received             |  |
| 17. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples require laboratory filtration         |  |
| 18. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples submitted within holding time         |  |
| 19. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Do water VOC or TOX bottles contain headspace |  |

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: \_\_\_\_\_ Date: \_\_\_\_\_



# Merit Laboratories Bottle Preservation Check

Lab Set ID: S39103 Submitted: 08/11/2022 12:23

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI New Wells 11B

Initial Preservation Check: 08/11/2022 13:01 MMC

Preservation Recheck (E200.8): N/A

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: [Environmental\\_Laboratory@LBWL.com](mailto:Environmental_Laboratory@LBWL.com)

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S39103.01	125ml Plastic HNO3	<2			
S39103.01	1L Plastic HNO3	<2			
S39103.01	1L Plastic HNO3	<2			
S39103.02	125ml Plastic HNO3	<2			
S39103.02	1L Plastic HNO3	<2			
S39103.02	1L Plastic HNO3	<2			
S39103.03	125ml Plastic HNO3	<2			
S39103.03	1L Plastic HNO3	<2			
S39103.03	1L Plastic HNO3	<2			



2680 East Lansing Dr., East Lansing, MI 48823  
 Phone (517) 332-0167 Fax (517) 332-4034  
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

**REPORT TO** **CHAIN OF CUSTODY RECORD** **INVOICE TO**

CONTACT NAME Jennifer Caporale  
 COMPANY Lansing Board of Water and Light  
 ADDRESS PO Box 13007 48901-3007  
 CITY Lansing STATE MI ZIP CODE 48901  
 PHONE NO. 517-702-6372 FAX NO. P.O. NO.  
 E-MAIL ADDRESS Environmental\_Laboratory@lbwl.com QUOTE NO.

CONTACT NAME Kelly Gleason  SAME  
 COMPANY  
 ADDRESS  
 CITY STATE ZIP CODE  
 PHONE NO. E-MAIL ADDRESS Kelly.Gleason@lbwl.com

**ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)**

PROJECT NO./NAME Erickson AM MI Wells 11B SAMPLER(S) - PLEASE PRINT/SIGN NAME Marc Wahrer  
 TURNAROUND TIME REQUIRED  1 DAY  2 DAYS  3 DAYS  STANDARD  OTHER ASAP  
 DELIVERABLES REQUIRED  STD  LEVEL II  LEVEL III  LEVEL IV  EDD  OTHER

MATRIX GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID  
 CODE: SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIPE A=AIR W=WASTE

# Containers & Preservatives

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO <sub>3</sub>	H <sub>2</sub> SO <sub>4</sub>	NaOH	MeOH	OTHER	Total Metals	F- undistilled, Cl-, SO <sub>4</sub> , TDS	Radium 226	Radium 228	TSS	HCO <sub>3</sub> , CO <sub>3</sub> , Hardness	Certifications		
	DATE	TIME																	<input type="checkbox"/> OHIO VAP	<input type="checkbox"/> Drinking Water	
39103.01	8/11/22	1005	MW-11B L208172-01	GW	5	2	3						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> DoD	<input checked="" type="checkbox"/> NPDES	
.02	↓	↓	Field Dupe MW- 11B ↓ -02	GW	5	2	3						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> Detroit	<input type="checkbox"/> New York	
.03	↓	900	Field Blank ↓ -03	DI	5	2	3						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> Other		
																				Special Instructions	
																				Metals to analyse: Na, Mg, K	
																				B, Ca, Sb, As, Ba, Be, Cd, Cr,	
																				Co, Li, Hg, Mo, Pb, Se, Tl,	
																				Fe, Cu, Ni, Ag, V, Zn	
																				Please send a preliminary report	

RELINQUISHED BY: *[Signature]*  Sampler DATE 8-11-22 TIME 1223  
 RECEIVED BY: *M. Calcutt* DATE 8/11/22 TIME 1223

RELINQUISHED BY: DATE TIME  
 RECEIVED BY: DATE TIME  
 SEAL NO. SEAL INTACT INITIALS  
 YES  NO   
 SEAL NO. SEAL INTACT INITIALS  
 YES  NO   
 NOTES: TEMP. ON ARRIVAL 5.1

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

## Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total		250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.150
Be, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	2.5
Cl	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	10
Cr, total	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
F	Fluoride	250 mL plastic	mg/L	None	9056	28 d	1.0
Fe, total	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Pb, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Li, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Hg, total	Mercury	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Mn, total	Molybdenum	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
RA226/228	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	HNO3	SM 7500	6 mos	2.0 combined
Se, total	Selenium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ag, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
SO4	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	10
Tl, total	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
TDS	Total Dissolved Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TSS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540D	NA	3
V, total	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Zn, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005



September 12, 2022

John Laverty  
Merit Laboratories Inc.  
2680 East Lansing Drive  
East Lansing, Michigan 48823

Re: Routine Analysis  
Work Order: 589793  
SDG: S39103

Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on August 16, 2022. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at [www.gel.com](http://www.gel.com).

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,

Jessica Ward for  
Delaney Stone  
Project Manager

Purchase Order: GELP20-0018  
Enclosures



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# Case Narrative

**Receipt Narrative  
for  
Merit Laboratories, Inc.  
SDG: S39103  
Work Order: 589793**

**September 12, 2022**

**Laboratory Identification:**

GEL Laboratories LLC  
2040 Savage Road  
Charleston, South Carolina 29407  
(843) 556-8171

**Summary:**

**Sample receipt:** The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on August 16, 2022 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.


**Sample Identification:** The laboratory received the following samples:

<b><u>Laboratory ID</u></b>	<b><u>Client ID</u></b>
589793001	S39103.01
589793002	S39103.02 Field Dupe
589793003	S39103.03 Field Blank

**Case Narrative:**

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.



Jessica Ward for  
Delaney Stone  
Project Manager

# **Chain of Custody and Supporting Documentation**



2680 East Lansing Dr., East Lansing, MI 48823  
 Phone (517) 332-0167 Fax (517) 332-4034  
 www.meritlabs.com



**CHAIN OF CUSTODY RECORD**

<b>REPORT TO</b>		<b>INVOICE TO</b>	
CONTACT NAME Project Management Team	CONTACT NAME Julie Teague	COMPANY Merit Laboratories	COMPANY Merit Laboratories
ADDRESS 2680 East Lansing Drive	ADDRESS 2680 East Lansing Drive	CITY East Lansing	CITY East Lansing
CITY East Lansing	STATE MI	ZIP CODE 48823	STATE MI
PHONE NO. 517-332-0167	FAX NO.	PHONE NO. 517-332-0167	ZIP CODE 48823
E-MAIL ADDRESS results@meritlabs.com	QUOTE NO.	E-MAIL ADDRESS juliet@meritlabs.com	
PROJECT NO./NAME S39103	SAMPLER(S) - PLEASE PRINT/SIGN NAME Marc Wahrer	ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)	

MATRIX CODE	YEAR	DATE	TIME	IDENTIFICATION-DESCRIPTION	MATRIX	BOTTLES	OTHER	# Containers & Preservatives	Certifications
	8/11/22	1005	S39103.01		GW	2		Radium 226*	* E903.1 Mod.
	8/11/22	1005	S39103.02	Field Dupe	GW	2		Radium 226**	** E904.0/SW 9320 Mod.
	8/11/22	0900	S39103.03	Field Blank	DI	2			
Turnaround Time Required: <input type="checkbox"/> 1 DAY <input type="checkbox"/> 2 DAYS <input type="checkbox"/> 3 DAYS <input checked="" type="checkbox"/> STANDARD <input type="checkbox"/> OTHER Deliverables Required: <input type="checkbox"/> STD <input type="checkbox"/> LEVEL I <input type="checkbox"/> LEVEL II <input type="checkbox"/> LEVEL III <input type="checkbox"/> LEVEL IV <input type="checkbox"/> EDD <input type="checkbox"/> OTHER									

RELINQUISHED BY: SIGNATURE/ORGANIZATION	DATE 8/16/22	TIME 1700
RECEIVED BY: SIGNATURE/ORGANIZATION	DATE 8/16/22	TIME 1700
RELINQUISHED BY: SIGNATURE/ORGANIZATION	DATE 8/16/22	TIME 1700
RECEIVED BY: SIGNATURE/ORGANIZATION	DATE 8/16/22	TIME 1700

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

SAMPLE RECEIPT & REVIEW FORM

DS

Client: <u>MERT</u>		SDG/AR/COC/Work Order: <u>589793</u>	
Received By: <u>S.P</u>		Date Received: <u>8/16/22</u>	
Carrier and Tracking Number		Circle Applicable: FedEx Express    FedEx Ground <u>UPS</u> Field Services    Courier    Other <u>12 466 477 03 6366 6554</u>	
Suspected Hazard Information		Yes	No
A) Shipped as a DOT Hazardous?			<input checked="" type="checkbox"/>
B) Did the client designate the samples to be received as radioactive?			<input checked="" type="checkbox"/>
C) Did the RSO classify the samples as radioactive?			<input checked="" type="checkbox"/>
D) Did the client designate samples are hazardous?			<input checked="" type="checkbox"/>
E) Did the RSO identify possible hazards?			<input checked="" type="checkbox"/>
Sample Receipt Criteria		Yes	NA
1	Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
2	Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
4	Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
5	Sample containers intact and sealed?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
6	Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
7	Do any samples require Volatile Analysis?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
8	Samples received within holding time?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
9	Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
10	Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
11	Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
12	Are sample containers identifiable as GEL provided by use of GEL labels?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
13	COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Comments (Use Continuation Form if needed):			

PM (or PMA) review: Initials SL Date 8/17/22 Page 1 of 1

# **Laboratory Certifications**

**List of current GEL Certifications as of 12 September 2022**

<b>State</b>	<b>Certification</b>
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122023-3
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2022-137
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122021-36
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

# **Radiological Analysis**

# Case Narrative

**Radiochemistry  
Technical Case Narrative  
Merit Laboratories, Inc.  
SDG #: S39103  
Work Order #: 589793**

**Product:** Radium-226+Radium-228 Calculation

**Analytical Method:** Calculation

**Analytical Procedure:** GL-RAD-D-003 REV# 45

**Analytical Batch:** 2306609

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
589793001	S39103.01
589793002	S39103.02 Field Dupe
589793003	S39103.03 Field Blank

**Data Summary:**

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

**Product:** GFPC Ra228, Liquid

**Analytical Method:** EPA 904.0/SW846 9320 Modified

**Analytical Procedure:** GL-RAD-A-063 REV# 5

**Analytical Batch:** 2306610

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
589793001	S39103.01
589793002	S39103.02 Field Dupe
589793003	S39103.03 Field Blank
1205170982	Method Blank (MB)
1205170983	589793001(S39103.01) Sample Duplicate (DUP)
1205170984	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

**Product:** Lucas Cell, Ra226, Liquid

**Analytical Method:** EPA 903.1 Modified

**Analytical Procedure:** GL-RAD-A-008 REV# 15

**Analytical Batch:** 2306592

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
589793001	S39103.01
589793002	S39103.02 Field Dupe
589793003	S39103.03 Field Blank
1205170943	Method Blank (MB)
1205170944	589793001(S39103.01) Sample Duplicate (DUP)
1205170945	589793001(S39103.01) Matrix Spike (MS)
1205170946	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

**Miscellaneous Information**

**Additional Comments**

The matrix spike, 1205170945 (S39103.01MS), aliquot was reduced to conserve sample volume.

**Certification Statement**

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.



## GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

### Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S39103 GEL Work Order: 589793

**The Qualifiers in this report are defined as follows:**

- \* A quality control analyte recovery is outside of specified acceptance criteria
- \*\* Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

**Review/Validation**

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature: 

Name: Kenshalla Oston

Date: 14 SEP 2022

Title: Analyst I

# Sample Data Summary

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: September 14, 2022

Company : Merit Laboratories Inc.  
Address : 2680 East Lansing Drive  
  
East Lansing, Michigan 48823  
Contact: John Lavery  
Project: Routine Analysis

Client Sample ID: S39103.01      Project: MERI00120  
Sample ID: 589793001      Client ID: MERI001  
Matrix: Ground Water  
Collect Date: 11-AUG-22 10:05  
Receive Date: 16-AUG-22  
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	-1.33	+/-1.18	2.34	3.00	pCi/L		JE1	09/09/22	1352	2306610	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.702	+/-1.21			pCi/L		1 TON1	09/12/22	1618	2306609	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.702	+/-0.284	0.304	1.00	pCi/L		LXP1	09/08/22	0815	2306592	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			79.9	(15%-125%)

### Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor      Lc/LC: Critical Level  
DL: Detection Limit      PF: Prep Factor  
MDA: Minimum Detectable Activity      RL: Reporting Limit  
MDC: Minimum Detectable Concentration      SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: September 14, 2022

Company : Merit Laboratories Inc.  
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery  
Project: Routine Analysis

Client Sample ID: S39103.02 Field Dupe  
Sample ID: 589793002  
Matrix: Ground Water  
Collect Date: 11-AUG-22 10:05  
Receive Date: 16-AUG-22  
Collector: Client

Project: MERI00120  
Client ID: MERI001

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	1.32	+/-1.18	1.92	3.00	pCi/L		JE1	09/09/22	1352	2306610	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		2.38	+/-1.23			pCi/L		1 TON1	09/12/22	1618	2306609	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		1.06	+/-0.350	0.261	1.00	pCi/L		LXP1	09/08/22	0848	2306592	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			80.6	(15%-125%)

### Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor  
DL: Detection Limit  
MDA: Minimum Detectable Activity  
MDC: Minimum Detectable Concentration

Lc/LC: Critical Level  
PF: Prep Factor  
RL: Reporting Limit  
SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: September 14, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

Client Sample ID: S39103.03 Field Blank	Project: MERI00120
Sample ID: 589793003	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 11-AUG-22 09:00	
Receive Date: 16-AUG-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	1.42	+/-1.44	2.39	3.00	pCi/L		JE1	09/09/22	1352	2306610	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.52	+/-1.45			pCi/L		1 TON1	09/12/22	1618	2306609	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.101	+/-0.185	0.338	1.00	pCi/L		LXP1	09/08/22	0848	2306592	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			78	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# Quality Control Summary

# GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

## QC Summary

Report Date: September 14, 2022

Page 1 of 2

**Merit Laboratories Inc.**  
**2680 East Lansing Drive**  
**East Lansing, Michigan**

**Contact: John Laverty**

**Workorder: 589793**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Rad Gas Flow</b>											
Batch	2306610										
QC1205170983	589793001	DUP									
Radium-228	U	-1.33	U	1.05	pCi/L	N/A		N/A	JE1	09/09/22	13:52
	Uncertainty	+/-1.18		+/-0.974							
QC1205170984	LCS										
Radium-228	44.5			44.7	pCi/L		100	(75%-125%)		09/09/22	13:52
	Uncertainty			+/-3.69							
QC1205170982	MB										
Radium-228			U	-1.49	pCi/L					09/09/22	13:52
	Uncertainty			+/-1.35							
<b>Rad Ra-226</b>											
Batch	2306592										
QC1205170944	589793001	DUP									
Radium-226		0.702		0.895	pCi/L	24.2		(0% - 100%)	LXP1	09/08/22	09:20
	Uncertainty	+/-0.284		+/-0.349							
QC1205170946	LCS										
Radium-226	16.7			14.2	pCi/L		84.9	(75%-125%)		09/08/22	09:20
	Uncertainty			+/-0.957							
QC1205170943	MB										
Radium-226			U	0.0282	pCi/L					09/08/22	08:48
	Uncertainty			+/-0.117							
QC1205170945	589793001	MS									
Radium-226	132	0.702		101	pCi/L		75.7	(75%-125%)		09/08/22	09:20
	Uncertainty	+/-0.284		+/-6.64							

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- \*\* Analyte is a Tracer compound
- < Result is less than value reported
- > Result is greater than value reported
- BD Results are either below the MDC or tracer recovery is low
- FA Failed analysis.
- H Analytical holding time was exceeded

# GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

## QC Summary

Workorder: 589793

Page 2 of 2

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
J											
J											
K											
L											
M											
M											
N/A											
NI											
ND											
NJ											
Q											
R											
U											
UI											
UJ											
UL											
X											
Y											
^											
h											

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where the duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

\* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.



# Gas Flow Raw Data

# Batch 2306610 Check-list

This check-list was completed on 12-SEP-22 by Nat Long

This batch was reviewed by Kenshalla Oston on 12-SEP-22 and Nat Long on 12-SEP-22.

**Batch ID:**  
2306610

**Product:**  
GFC28RAL

**Description:** Gas Flow Radium 228  
GL-RAD-A-063

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
11	Has the method required detection limit been met?	Yes		
<b>Miscellaneous Information</b>				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

# Prep Logbook

## Radium-228 in Liquid

**Batch ID:** 2306610

**Analyst:** Jacqueline Emond (JE1)

**Method:** EPA 904.0/SW846 9320 Modified

**Lab SOP:** GL-RAD-A-063 REV# 5

**Instrument:** SP-C018367602

**Due Dates for Lab:** 12-SEP-2022

**Package:** 13-SEP-2022

**SDG:** 14-SEP-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205170984	Radium-228	1965-C	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	589793001	31-AUG-2022	3	302.4	302.4	09/06/22 16:14	09/09/22 11:50
2	589793002	31-AUG-2022	3	301.9	301.9	09/06/22 16:14	09/09/22 11:50
3	589793003	31-AUG-2022	3	302.9	302.9	09/06/22 16:14	09/09/22 11:50
4	1205170982 MB	31-AUG-2022	3		302.9	09/06/22 16:14	09/09/22 11:50
5	1205170983 DUP (589793001)	31-AUG-2022	3	302	302	09/06/22 16:14	09/09/22 11:50
6	1205170984 LCS	31-AUG-2022	3		302.9	09/06/22 16:14	09/09/22 11:50

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1951-D	Ba-133	.1 mL	Pipet Id: RAD-GFC-1795419
REGNT 3413919	RGF-50% Potassium Carbonate	2 mL	Data Entry Date2: 02-SEP-2022 11:59 SP-C018367602 Jacqueline Emond
REGNT 3418276.6	29M HF (48-50%)	4 mL	Data Entry Date3: 31-AUG-2022 00:00
REGNT 3454370.1	Nitric Acid	5 mL	
REGNT 3457746.6	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	
REGNT 3465466	Barium Carrier Ra228 REG	1 mL	
REGNT 3466687	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3475414	RGF-7M Nitric Acid	25 mL	
REGNT 3478594	2M HCl	20 mL	
REGNT 3478604	RGF-Neodymium Substrate	5 mL	
REGNT 3481329	RGF-1M Citric Acid	5 mL	
REGNT 3481821	RGF-1.5M Ammonium Sulfate	10 mL	
REGNT DGA0037	2304168	2 g	

### Radium-228 Liquid

Filename : RA228.XLS  
 File type : Excel  
 Version # : 1.4.2

Tracer S/N : 1951-D  
 Tracer Exp Date : 6/2/2023  
 Tracer Volume Added: 0.10

Batch : 2306610  
 Analyst : JAC02417  
 Prep Date : 8/31/2022  
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL  
 Parmname : Radium-228  
 Required MDA : 3 pCi/L  
 Ra-228 Abundance : 1.00  
 Halflife of Ra-228 : 5.75 years  
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	589793001.1	0.3024	1.8500E-05	8/11/2022 10:05	1229.9	1.65%	982.6	1.84%	0.1	0.000200
2	589793002.1	0.3019	1.8491E-05	8/11/2022 10:05	1229.9	1.65%	991.8	1.83%	0.1	0.000200
3	589793003.1	0.3029	1.8508E-05	8/11/2022 9:00	1229.9	1.65%	958.9	1.86%	0.1	0.000200
4	1205170982.1	0.3029	1.8508E-05	8/31/2022 0:00	1229.9	1.65%	934.4	1.89%	0.1	0.000200
5	1205170983.1	0.3020	1.8493E-05	8/11/2022 10:05	1229.9	1.65%	995.2	1.83%	0.1	0.000200
6	1205170984.1	0.3029	1.8508E-05	8/31/2022 0:00	1229.9	1.65%	927.9	1.90%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063  
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated	Sample
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction	Recovery %	Recovery Error %
			Alpha	Beta										
1	4B	70	21	104	1.486	9/9/2022 13:52	9/6/2022 16:14	9/9/2022 11:50	0.990	0.794	1.000	1.067	79.9%	1.27%
2	4C	60	17	81	1.350	9/9/2022 13:52	9/6/2022 16:14	9/9/2022 11:50	0.990	0.794	1.000	1.057	80.6%	1.26%
3	4D	60	10	100	1.667	9/9/2022 13:52	9/6/2022 16:14	9/9/2022 11:50	0.990	0.794	1.000	1.057	78.0%	1.27%
4	6C	60	14	87	1.450	9/9/2022 13:52	9/6/2022 16:14	9/9/2022 11:50	0.997	0.795	1.000	1.057	76.0%	1.29%
5	8C	60	18	55	0.917	9/9/2022 13:52	9/6/2022 16:14	9/9/2022 11:50	0.990	0.795	1.000	1.057	80.9%	1.26%
6	8D	60	21	736	12.267	9/9/2022 13:52	9/6/2022 16:14	9/9/2022 11:50	0.997	0.795	1.000	1.057	75.4%	1.29%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2022	5/31/2023	0.6400	0.01519	1.822	9/2/2022 15:36	1000
2	PIC	6/1/2022	5/31/2023	0.6359	0.00889	1.012	9/2/2022 15:36	1000
3	PIC	6/1/2022	5/31/2023	0.5954	0.00773	1.338	9/2/2022 15:36	1000
4	PIC	6/1/2022	5/31/2023	0.6123	0.01970	1.798	9/2/2022 15:33	1000
5	PIC	6/1/2022	5/31/2023	0.6294	0.01955	0.651	9/2/2022 15:33	1000
6	PIC	6/1/2022	5/31/2023	0.6347	0.00609	1.490	9/2/2022 15:34	1000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

**Spike S/N :** N/A  
**Spike Exp Date :** N/A  
**Spike Activity (dpm/ml):** N/A  
**Spike Volume Added:** N/A

\* - RPD changed to 0% due to sample & dup activity below MDA

**LCS S/N :** 1965-C  
**LCS Exp Date :** 8/5/2023  
**LCS Activity (dpm/ml):** 299.36  
**LCS Volume Added:** 0.10

Results Pos.	Decision	Critical	Required	Sample Act.		Sample Act.	Net Count	Net Count	2 SIGMA	2 SIGMA	Sample	Sample	RPD	RER	Nominal	Recovery
	Level	Level	MDA	MDA	Conc.	Error	Rate	Rate Error	Counting	Total Prop.						
1	1.5371	1.0852	3	2.3398	-1.3294	45.19%	-0.3363	0.1518	1.1762	1.1763		SAMPLE				
2	1.2188	0.8605	3	1.9166	1.3223	45.39%	0.3380	0.1533	1.1757	1.2215		SAMPLE				
3	1.5432	1.0895	3	2.3945	1.4159	51.94%	0.3287	0.1706	1.4408	1.4837		SAMPLE				
4	1.7723	1.2513	3	2.7160	-1.4852	46.36%	-0.3480	0.1611	1.3479	1.3480		MB				
5	0.9834	0.6943	3	1.5854	1.0456	47.56%	0.2657	0.1262	0.9736	1.0088	589793001.1	DUP	* 0.0%			
6	1.5680	1.1070	3	2.4214	44.6989	4.45%	10.7767	0.4538	3.6892	11.7720		LCS			44.5189	100.4%

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
589793001	4B	70	21	104	9/9/2022 13:52	9/9/2022 15:02	PIC	2306610
589793002	4C	60	17	81	9/9/2022 13:52	9/9/2022 14:52	PIC	2306610
589793003	4D	60	10	100	9/9/2022 13:52	9/9/2022 14:52	PIC	2306610
1205170982	6C	60	14	87	9/9/2022 13:52	9/9/2022 14:52	PIC	2306610
1205170983	8C	60	18	55	9/9/2022 13:52	9/9/2022 14:52	PIC	2306610
1205170984	8D	60	21	736	9/9/2022 13:52	9/9/2022 14:52	PIC	2306610



ASSAY 9-Sep-22 13:38:14  
 Wizard 2480 s/n 46190630  
 Protocol id 9 Ba-133\_1  
 Time limit  
 Count limit  
 Isotope Ba-133\_1  
 Protocol date 9/9/2022  
 Run id. 5515

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	94	1	180	3690.28	1229.86	1.65	01:38:14
589793001	2	94	2	180	2948.28	982.55	1.84	79.89	01:41:28
589793002	3	94	3	180	2976	991.8	1.83	80.64	01:44:42
589793003	4	94	4	180	2877	958.89	1.86	77.97	01:47:56
1205170982	5	94	5	180	2803.57	934.41	1.89	75.98	01:51:10
1205170983	1	3	1	180	2986.28	995.22	1.83	80.92	01:54:46
1205170984	2	3	2	180	2784.28	927.9	1.9	75.45	01:58:00

END OF ASSAY

# **Continuing Calibration Data**

# Gas Flow Proportional Counter Checks for 09-Sep-2022

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
G5400W1Z	Above	Beta XTalk	09-Sep 06:19	5	6.71E-4	1.40E-4	6.62E-4	+3.10
LB4100A2	Above	Beta eff	09-Sep 06:13	5	23922	19870	23260	+4.17
LB4100E2	Above	Beta bkg	09-Sep 04:42	60	2.867	1.385	3.072	+2.27
LB4100E3	need 2nd	Beta bkg	09-Sep 04:42	60	1.783	0.506	2.576	+0.70
LB4100F3	need 2nd	Alpha bkg	09-Sep 04:42	60	0.283	0.119	0.404	+0.46
LB4100G1	Above	Beta bkg	09-Sep 04:43	60	178	0.380	1.675	+819.07
LB4100G2	need 2nd	Alpha XTalk	09-Sep 05:44	5	0.350	0.324	0.423	-1.40
LB4100G2	Above	Beta bkg	09-Sep 04:43	60	106	1.159	2.203	+599.44
LB4100G3	Above	Beta bkg	09-Sep 04:43	60	1.900	0.810	1.674	+4.57
LB4100H1	Above	Beta bkg	09-Sep 04:42	60	2.067	0.216	2.462	+1.94
LB4100H2	Below	Alpha eff	09-Sep 05:44	5	5080	5513	8976	-3.75
LB4100H2	Above	Alpha XTalk	09-Sep 05:44	5	0.416	0.269	0.396	+4.00
PIC1A	Above	Beta bkg	09-Sep 07:45	60	4.917	-7.65E-1	2.862	+6.40
PIC1C	Above	Beta bkg	09-Sep 07:45	60	2.117	-6.21E-1	2.214	+2.79
PIC2B	Above	Beta bkg	09-Sep 07:45	60	9.100	-5.22E-1	2.315	+17.35
PIC7A	Below	Alpha eff	09-Sep 05:25	5	10076	10340	11210	-4.82
PIC7A	Above	Beta XTalk	09-Sep 05:32	5	0.001	2.49E-4	0.001	+5.06
PIC8B	Above	Alpha bkg	09-Sep 05:39	60	0.817	-1.16E-1	0.388	+8.12
PIC8B	Above	Alpha eff	09-Sep 05:25	5	9398	8349	9361	+3.22
PIC8B	Below	Alpha XTalk	09-Sep 05:25	5	0.244	0.262	0.306	-5.52
PIC8B	Above	Beta bkg	09-Sep 05:39	60	3.183	-1.80E-1	2.341	+5.00
PIC8B	Above	Beta XTalk	09-Sep 05:32	5	0.021	2.00E-4	9.31E-4	+171.04
PIC9B	Above	Beta XTalk	09-Sep 05:38	5	0.003	1.90E-4	0.003	+3.00
PIC13A	Above	Beta bkg	09-Sep 07:38	60	2.133	-8.16E-2	2.573	+2.01
PIC14B	Above	Beta bkg	09-Sep 09:01	60	2.200	-2.13E-1	2.672	+2.02
PIC14C	Above	Beta bkg	09-Sep 06:29	60	2.817	0.197	2.388	+4.17

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

LB4100C1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by  \_\_\_\_\_

Date 09/09/22 \_\_\_\_\_

GEL Laboratories LLC

# Runlogs

# Instrument Run Log

Instrument Type: GFPC

Batch ID: 2306610

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205170982	MB	JE1	PIC6C	SEP-09-22 13:52:11	DONE	25mm Filter	01-JUN-22 00:00
1205170983	DUP	JE1	PIC8C	SEP-09-22 13:52:16	DONE	25mm Filter	01-JUN-22 00:00
1205170984	LCS	JE1	PIC8D	SEP-09-22 13:52:24	DONE	25mm Filter	01-JUN-22 00:00
589793001	SAMPLE	JE1	PIC4B	SEP-09-22 13:52:30	DONE	25mm Filter	01-JUN-22 00:00
589793002	SAMPLE	JE1	PIC4C	SEP-09-22 13:52:33	DONE	25mm Filter	01-JUN-22 00:00
589793003	SAMPLE	JE1	PIC4D	SEP-09-22 13:52:37	DONE	25mm Filter	01-JUN-22 00:00

# Lucas Cell Raw Data

# Batch 2306592 Check-list

This check-list was completed on 08-SEP-22 by Lyndsey Pace

This batch was reviewed by Elizabeth Krouse on 08-SEP-22 and Lyndsey Pace on 08-SEP-22.

**Batch ID:**  
2306592

**Product:**  
LUC26RAL

**Description:** Lucas Cell Radium 226  
GL-RAD-A-008

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
<b>Miscellaneous Information</b>				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		



# Prep Logbook

## Radium-226 in Liquid

**Batch ID:** 2306592  
**Analyst:** Lyndsey Pace (LXP1)  
**Method:** EPA 903.1 Modified  
**Lab SOP:** GL-RAD-A-008 REV# 15  
**Instrument:** SP-C018367602

Due Dates for Lab: 11-SEP-2022			Package: 13-SEP-2022		SDG: 14-SEP-2022	
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205170946	Radium-226 SPIKE	1715-G	.1	mL	
MS	1205170945	Radium-226 SPIKE	1715-G	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	589793001	31-AUG-2022	1	501.1	501.1	09/01/22 08:45	804	09/08/22 05:19	09/08/22 08:15	5	36
2	589793002	31-AUG-2022	1	501.4	501.4	09/01/22 08:45	105	09/08/22 05:47	09/08/22 08:48	2	41
3	589793003	31-AUG-2022	1	500.5	500.5	09/01/22 08:45	201	09/08/22 05:47	09/08/22 08:48	5	9
4	590172001	31-AUG-2022	.25	801.5	801.5	09/01/22 08:45	401	09/08/22 05:47	09/08/22 08:48	6	7
5	590172002	31-AUG-2022	.25	800.6	800.6	09/01/22 08:45	507	09/08/22 05:47	09/08/22 08:48	4	16
6	590172003	31-AUG-2022	.25	801.4	801.4	09/01/22 08:45	606	09/08/22 05:47	09/08/22 08:48	4	15
7	590172004	31-AUG-2022	.25	801.6	801.6	09/01/22 08:45	704	09/08/22 05:47	09/08/22 08:48	2	25
8	1205170943 MB	31-AUG-2022	.25	801.6	801.6	09/01/22 08:45	805	09/08/22 05:47	09/08/22 08:48	8	10
9	1205170944 DUP (589793001)	31-AUG-2022	1	502.9	502.9	09/01/22 08:45	108	09/08/22 06:13	09/08/22 09:20	5	38
10	1205170945 MS (589793001)	31-AUG-2022	1	101.5	101.5	09/01/22 08:45	205	09/08/22 06:13	09/08/22 09:20	6	901
11	1205170946 LCS	31-AUG-2022	.25		801.6	09/01/22 08:45	403	09/08/22 06:13	09/08/22 09:20	4	858

Reagent/Solvent Lot ID	Description	Amount	Comments:
			Data Entry Date2: 31-AUG-2022 00:00

### Radium-226 Liquid

Filename : RA226.XLS  
 File type : Excel  
 Version # : 1.3.2

Procedure Code : LUC26RAL  
 Parmname : Radium-226  
 Required MDA : 0.25 pCi/L  
 Halflife of Ra-226 : 1600 years  
 Ra-226 Abundance : 1.00  
 Halflife of Rn-222: 3.8235 days

Batch : 2306592  
 Analyst : LIN01615  
 Prep Date : 8/31/2022  
 Ra-226 Method Uncertainty : 0.073648

Batch counted on : LUCAS CELL DETECTOR  
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Count Time (min.)	Cell Efficiency (cpm/dpm)
1	589793001.1	0.5011	2.0260E-05	8/11/2022 10:05	804	30	36	1.200	5	0.167	30	1.9050
2	589793002.1	0.5014	2.0262E-05	8/11/2022 10:05	105	30	41	1.367	2	0.067	30	1.5830
3	589793003.1	0.5005	2.0258E-05	8/11/2022 9:00	201	30	9	0.300	5	0.167	30	1.7110
4	590172001.1	0.8015	2.0861E-05	8/16/2022 10:00	401	30	7	0.233	6	0.200	30	1.6120
5	590172002.1	0.8006	2.0861E-05	8/16/2022 10:45	507	30	16	0.533	4	0.133	30	1.8520
6	590172003.1	0.8014	2.0861E-05	8/16/2022 12:30	606	30	15	0.500	4	0.133	30	1.9360
7	590172004.1	0.8016	2.0861E-05	8/16/2022 13:30	704	30	25	0.833	2	0.067	30	1.6710
8	1205170943.1	0.8016	2.0861E-05	8/31/2022 0:00	805	30	10	0.333	8	0.267	30	1.9080
9	1205170944.1	0.5029	2.0268E-05	8/11/2022 10:05	108	30	38	1.267	5	0.167	30	1.5830
10	1205170945.1	0.1015	1.1462E-05	8/11/2022 10:05	205	30	901	30.033	6	0.200	30	1.8920
11	1205170946.1	0.8016	2.0861E-05	8/31/2022 0:00	403	30	858	28.600	4	0.133	30	1.6200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008  
 Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrow End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
9.900%	4/1/2022	3/31/2023	9/1/2022 8:45	9/8/2022 5:19	9/8/2022 8:15	0.712	0.978	1.002	1.000
0.500%	4/28/2022	4/30/2023	9/1/2022 8:45	9/8/2022 5:47	9/8/2022 8:48	0.713	0.977	1.002	1.000
8.900%	8/1/2022	7/31/2023	9/1/2022 8:45	9/8/2022 5:47	9/8/2022 8:48	0.713	0.977	1.002	1.000
8.100%	2/1/2022	1/31/2023	9/1/2022 8:45	9/8/2022 5:47	9/8/2022 8:48	0.713	0.977	1.002	1.000
4.000%	6/1/2022	5/31/2023	9/1/2022 8:45	9/8/2022 5:47	9/8/2022 8:48	0.713	0.977	1.002	1.000
8.200%	7/1/2022	6/30/2023	9/1/2022 8:45	9/8/2022 5:47	9/8/2022 8:48	0.713	0.977	1.002	1.000
8.000%	11/1/2021	10/31/2022	9/1/2022 8:45	9/8/2022 5:47	9/8/2022 8:48	0.713	0.977	1.002	1.000
7.400%	4/1/2022	3/31/2023	9/1/2022 8:45	9/8/2022 5:47	9/8/2022 8:48	0.713	0.977	1.002	1.000
2.800%	4/28/2022	4/30/2023	9/1/2022 8:45	9/8/2022 6:13	9/8/2022 9:20	0.713	0.977	1.002	1.000
3.900%	8/1/2022	7/31/2023	9/1/2022 8:45	9/8/2022 6:13	9/8/2022 9:20	0.713	0.977	1.002	1.000
9.700%	2/1/2022	1/31/2023	9/1/2022 8:45	9/8/2022 6:13	9/8/2022 9:20	0.713	0.977	1.002	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

**Spike S/N :** 1715-G  
**Spike Exp Date :** 9/15/2022  
**Spike Activity (dpm/ml):** 297.50  
**Spike Volume Added:** 0.10

**LCS S/N :** 1715-G  
**LCS Exp Date :** 9/15/2022  
**LCS Activity (dpm/ml):** 297.50  
**LCS Volume Added:** 0.10

<b>Results</b>																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.1669	0.1178	1	0.3035	<b>0.7020</b>	22.91%	1.0333	0.2134	0.2842	0.3311		SAMPLE				
2	0.1268	0.0895	1	0.2607	<b>1.0613</b>	16.82%	1.3000	0.2186	0.3498	0.3820		SAMPLE				
3	0.1858	0.1312	1	0.3381	<b>0.1009</b>	93.96%	0.1333	0.1247	0.1850	0.1864		SAMPLE				
4	0.1349	0.0953	0.25	0.2407	<b>0.0167</b>	360.65%	0.0333	0.1202	0.1181	0.1182		SAMPLE				
5	0.0960	0.0678	0.25	0.1793	<b>0.1748</b>	37.48%	0.4000	0.1491	0.1277	0.1309		SAMPLE				
6	0.0917	0.0648	0.25	0.1713	<b>0.1531</b>	40.47%	0.3667	0.1453	0.1189	0.1235		SAMPLE				
7	0.0751	0.0531	0.25	0.1545	<b>0.3709</b>	23.97%	0.7667	0.1732	0.1642	0.1823		SAMPLE				
8	0.1316	0.0929	0.25	0.2282	<b>0.0282</b>	212.26%	0.0667	0.1414	0.1174	0.1176		MB				
9	0.1998	0.1411	1	0.3635	<b>0.8949</b>	20.07%	1.1000	0.2186	0.3485	0.3749	589793001.1	DUP	24.2%	0.2732		
10	0.9073	0.6406	1	1.6184	<b>100.6117</b>	5.15%	29.8333	1.0039	6.6357	17.7231	589793001.1	MS			132.0305	75.7%
11	0.1096	0.0773	0.25	0.2046	<b>14.1967</b>	10.29%	28.4667	0.9787	0.9566	3.5213		LCS			16.7175	84.9%

# **Continuing Calibration Data**



# Ludlum Alpha Scintillation Counter Checks for 08-SEP-2022

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	07:23	1	1.21E+05	120663	-1.58		
LUCAS2	EFF	07:21	1	1.32E+05	132320	0.76		
LUCAS4	EFF	07:18	1	1.28E+05	128185	1.33		
LUCAS5	EFF	07:13	1	1.33E+05	132536	1.97		
LUCAS6	EFF	07:09	1	1.30E+05	129608	-1.34		
LUCAS7	EFF	06:59	1	1.31E+05	130521	-1.79		
LUCAS8	EFF	06:58	1	1.25E+05	125398	-0.4		

**Reviewed by:**

Lyndsey Pace

**Date:** 08-SEP-22

GEL Laboratories LLC

# Runlogs

# Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2306592

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
589793001	SAMPLE	LXP1	LUCAS8	SEP-08-22 08:15:00	DONE	Lucas Cell	01-APR-22 00:00
589793002	SAMPLE	LXP1	LUCAS1	SEP-08-22 08:48:00	DONE	Lucas Cell	28-APR-22 00:00
589793003	SAMPLE	LXP1	LUCAS2	SEP-08-22 08:48:00	DONE	Lucas Cell	01-AUG-22 00:00
590172001	SAMPLE	LXP1	LUCAS4	SEP-08-22 08:48:00	DONE	Lucas Cell	01-FEB-22 00:00
590172002	SAMPLE	LXP1	LUCAS5	SEP-08-22 08:48:00	DONE	Lucas Cell	01-JUN-22 00:00
590172003	SAMPLE	LXP1	LUCAS6	SEP-08-22 08:48:00	DONE	Lucas Cell	01-JUL-22 00:00
590172004	SAMPLE	LXP1	LUCAS7	SEP-08-22 08:48:00	DONE	Lucas Cell	01-NOV-21 00:00
1205170943	MB	LXP1	LUCAS8	SEP-08-22 08:48:00	DONE	Lucas Cell	01-APR-22 00:00
1205170944	DUP	LXP1	LUCAS1	SEP-08-22 09:20:00	DONE	Lucas Cell	28-APR-22 00:00
1205170945	MS	LXP1	LUCAS2	SEP-08-22 09:20:00	DONE	Lucas Cell	01-AUG-22 00:00
1205170946	LCS	LXP1	LUCAS4	SEP-08-22 09:20:00	DONE	Lucas Cell	01-FEB-22 00:00





Environmental Laboratory  
1232 Haco Drive  
Lansing  
Michigan, 48910

CHAIN OF CUSTODY

Page 1 of 1

Phone: (517)702-6372

Lab Work Order Number LA08172

Client Name BWL - Erickson Station		Project Name Erickson AM MI Well 11B		Requested Analyses							Requested Turn Around		
Client Contact Cheryl Louden		Project Number [none]		Ag::Na, K, Mg As:: B:: Ba:: Be:: Ca:: Cd:: Cr::Co:: Cu:: Fe:: Hg::Li:: Mo:: Ni:: Pb:: Sb:: Se:: Ti:: V:: Zn	TSS	Cl::C:: F::ISE:: SO4:: TDS, HCO3, CO3, Hardness	Radium 226 and Radium 228						Rush requests subject to additional charge
Address 3725 S. Canal		Project Description											
City Lansing		PO Number 30926 10021											
State/Zip MI, 48917		Shipped By											
Phone (517) 702-6396	Fax (517) 702-6373	Tracking Number											
Sampler Marc Wahrer											Rush requests subject to lab approval.		

Sample Name or Field ID	Sampled Date	Sampled Time	Sample Type Grab/Composite	Matrix Code	Container Count	Preservation Code								Sample	Comments
						b	a	a	b						
MW-11B	8/11/22	1005	G	GW	5	1	1	1	2						
Field Dupe MW-11B		1005	G	GW	5	1	1	1	2						
Field Blank		903	G	DI	5	1	1	1	2						

Relinquished By 	Date/Time 8-11-22 1178	Received By 	Date/Time 8/11/22 1178	Comments
Relinquished By	Date/Time	Received By	Date/Time	
Relinquished By	Date/Time	Received By	Date/Time	
Cooler Numbers and Temperatures				

Matrix Codes: DI=Deionized Water, GW=Ground Water      Preserv. Codes: a=None, b=0.5% HNO3



## Data Verification & Validation Report

### Lansing Board of Water & Light – Erickson Power Station

**Sampling Event (dates and purpose):** New Well MW-11B – Background Round 4 – August 2022

Data Package Number: S39103.01

Lab Report Date: 10/05/2022

Data Validator: Aryka Thomson

Data Validation Completion Date: 10/10/2022

General Overall Assessment:

Data are usable without qualification.

Data are usable with qualification (as noted below).

Some or all data are unusable (as noted below).

Wells planned for sampling:

Well ID	Planned for Sampling
MW-1	
MW-2	
MW-3	
MW-4	
MW-5	
MW-6	
MW-7	
MW-7B	
MW-7C	
MW-8	
MW-9	
MW-10	
MW-11	
MW-11B	X
MW-12	
MW-12B	
MW-13	

### Data Summary

Sample ID	Matrix	Lab ID	Date Collected	App III Metals	App IV Metals	Part 115 Metals	Anions	TDS TSS	Rad-226 Rad-228	Diss. Metals
MW-11B	GW	S39103.01	08/11/2022	X	X	X	X	X	X	
MW-11B Dup	QC	S39103.02	08/11/2022	X	X	X	X	X	X	

Other analytes requested for analysis: Na, Mg, K, HCO<sub>3</sub>, CO<sub>3</sub>, hardness

Any planned sampling or analysis NOT completed? If yes, explain: \_\_\_\_\_

### Data Verification & Validation Checklist

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
<b>Field Data</b>							
Sample Collection Field Forms	X		Purging performed as required in the Groundwater Monitoring Plan	X			
Field Calibration Records	X		Field instruments calibrated daily according to manufacturer specifications	X			
Chain of Custody	X		Accurately reflect samples, collection dates/times, analyses, bottles, etc.	X			
Field decontamination documentation	N/A		Record of decontamination for non-dedicated sampling equipment			X	
Drilling logs	X		N/A	-	-	-	
Well construction logs	X		N/A	-	-	-	
Well development field forms	X		N/A	-	-	-	
<b>Analytical Data Package</b>							
Cover Sheet	X		N/A	-	-	-	
Case Narrative	X		Summarizes sample receipt and any exceptions to QC acceptance criteria	X			
Internal Laboratory Chain of Custody forms	X		Analyses as requested; accurate transcription of field COC	X			
Sample Chronology and Consistency	X		Accurate representation of dates, times of receipt, preparation, and analysis	X			
Communication Records with Lab	X		N/A	-	-	-	
EDD Format Consistency	X		EDD format and content as requested	X			
Sample Identification, Results Nomenclature, and Data Qualifier Consistency	X		All included in final report	X			
Method Detection Limit Consistency	X		MDLs consistent between samples	X			
Instrument Calibration Records	X		Present and no nonconformance noted	X			
Laboratory Report Complete	X		Includes QC component	X			
Holding Times	X		Analyses performed within allowed holding time	X			

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Method	X		Method as requested	X			
Reporting Limits	X		RLs as requested	X			RLs for TDS were not met
			MDLs<RLs		X		RL=MDL for carbonate
			MDLs<GPS			X	
<b>QC Validation</b>							
<b>Evaluate Accuracy</b>							
Matrix Spike (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Laboratory Control Sample (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
<b>Evaluate Precision</b>							
Matrix Spike Duplicate (RPD)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Field Duplicate (RPD)	X		RPD ≤ 20%		X		Radium-226+228 RPD is 54%
<b>Evaluate Representativeness</b>							
Equipment Blanks (if applicable)	N/A		Non-detect (<RL)			X	
<b>QC Verification</b>							
<b>Verify Instrument Calibration &amp; Analytical Process</b>							
Initial Calibration Verification	X		Laboratory-determined	-	-	-	
Continuing Calibration Verification	X		Laboratory-determined	-	-	-	
Initial Calibration Blank	X		Laboratory-determined	-	-	-	
Continuing Calibration Blank	X		Laboratory-determined	-	-	-	
Serial Dilutions	X		Laboratory-determined	-	-	-	High recovery for Li, Al, Zn, As, and Mo
Post-Digestion Spikes	X		Laboratory-determined	-	-	-	
Internal Standards	X		Laboratory-determined	-	-	-	
Laboratory Duplicate (RPD)	X		Laboratory-determined	-	-	-	
Method Blanks	X		Laboratory-determined	-	-	-	
<b>Evaluate Completeness (# usable measurements/ # unusable measurements)</b>							
Completeness	X		100%	X			

Other instances of nonconformance to QC control limits noted on case narrative: None

Comments:

Combined Radium-226+228 field duplicate RPD is 54%. Rad-228 required qualification as estimated with low bias (J-) in the parent sample MW-11B and as estimated with high bias (J+) in the field duplicate MW-11B-Dup.

TSS required qualification as estimated but not detected (UJ) in the parent sample MW-11B and estimated with high bias (J+) in the field duplicate MW-11B-Dup since it was not detected in the parent sample but detected in the field duplicate and RPD cannot be evaluated.



Report ID: S39343.01(02)  
Generated on 09/19/2022  
Replaces report S39343.01(01) generated on 08/19/2022

Report to  
Attention: Jennifer Caporale  
Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901  
  
Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

Report produced by  
Merit Laboratories, Inc.  
2680 East Lansing Drive  
East Lansing, MI 48823  
  
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Contacts for report questions:  
John Lavery (johnlavery@meritlabs.com)  
Barbara Ball (bball@meritlabs.com)

Report Summary  
Lab Sample ID(s): S39343.01-S39343.05  
Project: Erickson AM MI Wells 11-13  
Collected Date(s): 08/17/2022  
Submitted Date/Time: 08/17/2022 15:18  
Sampled by: Marc Wahrer  
P.O. #:

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Sample Summary (Page 5)

Maya Murshak  
Technical Director



## General Report Notes

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Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile, and 2-chloroethylvinyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (\*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

## Report Narrative

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All analyses completed



Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Alaska CSLAP	#17-001
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



## Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1 (1993)
SM2320B	Standard Method 2320 B 2011
SM2340C	Standard Method 2340 C 2011
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007





## Sample Summary (5 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S39343.01	MW-11 L208173-01	Groundwater	08/17/22 10:43
S39343.02	MW-12 L208173-02	Groundwater	08/17/22 13:22
S39343.03	MW-13 L208173-03	Groundwater	08/17/22 12:44
S39343.04	Field Dupe MW-11 L208173-04	Groundwater	08/17/22 10:43
S39343.05	Field Blank L208173-05	Water	08/17/22 08:30



# Analytical Laboratory Report

Final Report

Lab Sample ID: S39343.01

Sample Tag: MW-11 L208173-01

Collected Date/Time: 08/17/2022 10:43

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	1.0	IR
2	1L Plastic	None	Yes	1.0	IR
1	125ml Plastic	HNO3	Yes	1.0	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	08/19/22 09:15	JRH	
Metal Digestion	Completed	SW3015A	08/19/22 10:00	CCM	

### Inorganics

Method: E300.0, Run Date: 08/18/22 09:32, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	63	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 08/18/22 12:27, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	620	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 08/18/22 11:08, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	529	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 08/19/22 16:00, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	368	50	10	mg/L	2		

Method: SM2540D, Run Date: 08/18/22 18:00, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	20	3	1	mg/L	1.00		

### Metals

Method: E200.8, Run Date: 08/19/22 11:30, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.021	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.150	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.21	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	21.4	0.02	0.00192	mg/L	5	7439-89-6	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S39343.01 (continued)

Sample Tag: MW-11 L208173-01

**Method: E200.8, Run Date: 08/19/22 11:30, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 08/19/22 12:53, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	140	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	39.8	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	1.38	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	38.7	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 08/19/22 12:58, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 09/12/22 16:19, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Final Report

Lab Sample ID: S39343.02

Sample Tag: MW-12 L208173-02

Collected Date/Time: 08/17/2022 13:22

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	1.0	IR
2	1L Plastic	None	Yes	1.0	IR
1	125ml Plastic	HNO3	Yes	1.0	IR
1	125ml Plastic	None	Yes	1.0	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	08/19/22 09:15	JRH	
Mercury Digestion	Completed	E245.1	08/19/22 09:15	JRH	
Metal Digestion	Completed	SW3015A	08/19/22 10:00	CCM	
Metal Digestion	Completed	SW3015A	08/19/22 10:00	CCM	

### Inorganics

Method: E300.0, Run Date: 08/18/22 09:45, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	

Method: E300.0, Run Date: 08/18/22 10:49, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	83	20	0.32	mg/L	20	16887-00-6	
Sulfate	256	20	1.2	mg/L	20	14808-79-8	

Method: SM2320B, Run Date: 08/18/22 12:29, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	620	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 08/18/22 11:12, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	609	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 08/19/22 16:00, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	1,050	50	10	mg/L	2		

Method: SM2540D, Run Date: 08/18/22 18:00, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	23	3	1	mg/L	1.33		

### Metals

Method: E200.8, Run Date: 08/19/22 11:35, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.002	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.064	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	



# Analytical Laboratory Report

Lab Sample ID: S39343.02 (continued)

Sample Tag: MW-12 L208173-02

**Method: E200.8, Run Date: 08/19/22 11:35, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Boron	0.07	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	1.37	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.019	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.014	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	0.018	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	0.006	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 08/19/22 11:39, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony, Dissolved*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic, Dissolved	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium, Dissolved	0.060	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium, Dissolved	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron, Dissolved	0.07	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium, Dissolved	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium, Dissolved	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt, Dissolved	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper, Dissolved	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron, Dissolved	0.03	0.02	0.00192	mg/L	5	7439-89-6	
Lead, Dissolved	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium, Dissolved*	0.018	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum, Dissolved	0.014	0.005	0.000217	mg/L	5	7439-98-7	
Nickel, Dissolved	0.016	0.005	0.000250	mg/L	5	7440-02-0	
Selenium, Dissolved	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver, Dissolved	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium, Dissolved	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium, Dissolved	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc, Dissolved	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 08/19/22 12:56, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	157	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	58.8	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	3.33	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	145	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E200.8, Run Date: 08/19/22 12:57, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium, Dissolved*	148	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium, Dissolved	57.6	0.50	0.0120	mg/L	5	7439-95-4	
Potassium, Dissolved	3.10	0.50	0.0230	mg/L	5	7440-09-7	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S39343.02 (continued)

Sample Tag: MW-12 L208173-02

Method: E200.8, Run Date: 08/19/22 12:57, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sodium, Dissolved	138	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 08/19/22 13:12, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury, Dissolved	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Method: E245.1, Run Date: 08/19/22 13:02, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

Method: , Run Date: 09/12/22 16:19, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Lab Sample ID: S39343.03

Sample Tag: MW-13 L208173-03

Collected Date/Time: 08/17/2022 12:44

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	1.0	IR
2	1L Plastic	None	Yes	1.0	IR
1	125ml Plastic	HNO3	Yes	1.0	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	08/19/22 09:15	JRH	
Metal Digestion	Completed	SW3015A	08/19/22 10:00	CCM	

### Inorganics

Method: E300.0, Run Date: 08/18/22 09:58, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	16	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	33	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 08/18/22 12:31, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	320	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 08/18/22 11:18, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	312	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 08/19/22 16:00, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	380	50	10	mg/L	2		

Method: SM2540D, Run Date: 08/18/22 18:00, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1.00		

### Metals

Method: E200.8, Run Date: 08/19/22 11:42, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.029	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.17	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.02	0.02	0.00192	mg/L	5	7439-89-6	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S39343.03 (continued)

Sample Tag: MW-13 L208173-03

**Method: E200.8, Run Date: 08/19/22 11:42, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 08/19/22 12:59, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	94.1	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	20.6	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	0.78	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	4.60	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 08/19/22 13:15, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 09/12/22 16:19, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.





# Analytical Laboratory Report

Lab Sample ID: S39343.04

Sample Tag: Field Dupe MW-11 L208173-04

Collected Date/Time: 08/17/2022 10:43

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	1.0	IR
2	1L Plastic	None	Yes	1.0	IR
1	125ml Plastic	HNO3	Yes	1.0	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	08/19/22 09:15	JRH	
Metal Digestion	Completed	SW3015A	08/19/22 10:00	CCM	

### Inorganics

Method: E300.0, Run Date: 08/18/22 10:11, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	64	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 08/18/22 12:33, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	630	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 08/18/22 11:20, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	502	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 08/19/22 16:00, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	344	50	10	mg/L	2		

Method: SM2540D, Run Date: 08/18/22 18:00, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	23	3	1	mg/L	1.00		

### Metals

Method: E200.8, Run Date: 08/19/22 11:46, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.019	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.146	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.20	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	20.9	0.02	0.00192	mg/L	5	7439-89-6	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S39343.04 (continued)  
Sample Tag: Field Dupe MW-11 L208173-04

**Method: E200.8, Run Date: 08/19/22 11:46, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 08/19/22 13:00, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	138	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	39.0	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	1.34	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	37.8	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 08/19/22 13:18, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 09/12/22 16:19, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Final Report

Lab Sample ID: S39343.05

Sample Tag: Field Blank L208173-05

Collected Date/Time: 08/17/2022 08:30

Matrix: Water

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	1.0	IR
2	1L Plastic	None	Yes	1.0	IR
1	125ml Plastic	HNO3	Yes	1.0	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	08/19/22 09:15	JRH	
Metal Digestion	Completed	SW3015A	08/19/22 10:00	CCM	

### Inorganics

Method: E300.0, Run Date: 08/18/22 10:24, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	2.5	0.04	mg/L	2.5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.06	mg/L	2.5	16984-48-8	
Sulfate	Not detected	2.5	0.15	mg/L	2.5	14808-79-8	

Method: SM2320B, Run Date: 08/18/22 12:35, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	Not detected	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 08/18/22 11:22, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	Not detected	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 08/19/22 16:00, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	Not detected	50	10	mg/L	2		

Method: SM2540D, Run Date: 08/18/22 18:00, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1.00		

### Metals

Method: E200.8, Run Date: 08/19/22 11:23, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00102	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.000102	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.0000648	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.0000862	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.000702	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.0000760	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.0000386	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.0000434	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000150	mg/L	2	7440-50-8	
Iron	Not detected	0.02	0.000768	mg/L	2	7439-89-6	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S39343.05 (continued)

Sample Tag: Field Blank L208173-05

**Method: E200.8, Run Date: 08/19/22 11:23, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.0000760	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000654	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.0000868	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000100	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.000838	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.0000270	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.0000342	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.0000558	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.000292	mg/L	2	7440-66-6	

**Method: E200.8, Run Date: 08/19/22 12:50, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.0174	mg/L	2	7440-70-2	
Magnesium	Not detected	0.50	0.00480	mg/L	2	7439-95-4	
Potassium	Not detected	0.50	0.00920	mg/L	2	7440-09-7	
Sodium	Not detected	0.50	0.00340	mg/L	2	7440-23-5	

**Method: E245.1, Run Date: 08/19/22 13:21, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 09/12/22 16:19, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

# Merit Laboratories Login Checklist

Lab Set ID:S39343

Client:BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 11-13

Submitted:08/17/2022 15:18 Login User: MMC

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental\_Laboratory@LBWL.com

Selection	Description	Note
-----------	-------------	------

## Sample Receiving

- |     |  |  |
|-----|--|--|
| 01. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples are received at 4C +/- 2C Thermometer # IR 1.0 |
| 02. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Received on ice/ cooling process begun                 |
| 03. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples shipped  |
| 04. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples left in 24 hr. drop box                        |
| 05. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Are there custody seals/tape or is the drop box locked |

## Chain of Custody

- |     |  |  |
|-----|--|--|
| 06. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC adequately filled out                    |
| 07. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC signed and relinquished to the lab       |
| 08. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sample tag on bottles match COC              |
| 09. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Subcontracting needed? Subcontracted to: GEL |

## Preservation

- |     |  |   |
|-----|--|---|
| 10. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Do sample have correct chemical preservation        |
| 11. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Completed pH checks on preserved samples? (no VOAs) |
| 12. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Did any samples need to be preserved in the lab?    |

## Bottle Conditions

- |     |  |   |
|-----|--|---|
| 13. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | All bottles intact                            |
| 14. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Appropriate analytical bottles are used       |
| 15. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Merit bottles used                            |
| 16. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sufficient sample volume received             |
| 17. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples require laboratory filtration         |
| 18. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples submitted within holding time         |
| 19. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Do water VOC or TOX bottles contain headspace |

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: \_\_\_\_\_ Date: \_\_\_\_\_

# Merit Laboratories Bottle Preservation Check

Lab Set ID: S39343 Submitted: 08/17/2022 15:18

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 11-13

Attention: Jennifer Caporale  
Address: Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901

Initial Preservation Check: 08/17/2022 16:36 MMC

Preservation Recheck (E200.8): N/A

Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S39343.01	125ml Plastic HNO3	<2			
S39343.01	1L Plastic HNO3	<2			
S39343.01	1L Plastic HNO3	<2			
S39343.02	125ml Plastic HNO3	<2			
S39343.02	1L Plastic HNO3	<2			
S39343.02	1L Plastic HNO3	<2			
S39343.03	125ml Plastic HNO3	<2			
S39343.03	1L Plastic HNO3	<2			
S39343.03	1L Plastic HNO3	<2			
S39343.04	125ml Plastic HNO3	<2			
S39343.04	1L Plastic HNO3	<2			
S39343.04	1L Plastic HNO3	<2			
S39343.05	125ml Plastic HNO3	<2			
S39343.05	1L Plastic HNO3	<2			
S39343.05	1L Plastic HNO3	<2			



2680 East Lansing Dr., East Lansing, MI 48823  
 Phone (517) 332-0167 Fax (517) 332-4034  
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

**REPORT TO**

**CHAIN OF CUSTODY RECORD**

**INVOICE TO**

CONTACT NAME Jennifer Caporale  
 COMPANY Lansing Board of Water and Light  
 ADDRESS PO Box 13007 48901-3007  
 CITY Lansing STATE Mi ZIP CODE 48901  
 PHONE NO. 517-702-6372 FAX NO. \_\_\_\_\_ P.O. NO. \_\_\_\_\_  
 E-MAIL ADDRESS Environmental\_Laboratory@lbwl.com QUOTE NO. \_\_\_\_\_

CONTACT NAME Kelly Gleason  SAME  
 COMPANY \_\_\_\_\_  
 ADDRESS \_\_\_\_\_  
 CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP CODE \_\_\_\_\_  
 PHONE NO. \_\_\_\_\_ E-MAIL ADDRESS Kelly.Gleason@lbwl.com

**ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)**

PROJECT NO./NAME Erickson AM MI Wells 11-13 SAMPLER(S) - PLEASE PRINT/SIGN NAME Marc Wahrer  
 TURNAROUND TIME REQUIRED  1 DAY  2 DAYS  3 DAYS  STANDARD  OTHER ASAP  
 DELIVERABLES REQUIRED  STD  LEVEL II  LEVEL III  LEVEL IV  EDD  OTHER \_\_\_\_\_

MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID  
 SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIFE A=AIR W=WASTE  
 # Containers & Preservatives

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO <sub>3</sub>	H <sub>2</sub> SO <sub>4</sub>	NaOH	MeOH	OTHER	Total Metals	F- undissolved, Cl <sup>-</sup> , SO <sub>4</sub> , TDS	Radium 226	Radium 228	TSS	Dissolved Metals	HCO <sub>3</sub> , CO <sub>3</sub> , Hardness	Certifications		Project Locations	Special Instructions
	DATE	TIME																		<input type="checkbox"/> OHIO VAP	<input type="checkbox"/> Drinking Water		
<u>39343.01</u>	<u>08/17/22</u>	<u>1043</u>	<u>MW-11 L208173-01</u>	<u>GW</u>	<u>5</u>	<u>2</u>	<u>3</u>						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<u>Metals to analyse: Na, Mg, K</u>
<u>.02</u>		<u>1320</u>	<u>MW-12 -02</u>	<u>GW</u>	<u>6</u>	<u>3</u>	<u>3</u>						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<u>B, Ca, Sb, As, Ba, Be, Cd, Cr,</u>
<u>.03</u>		<u>1244</u>	<u>MW-13 -03</u>	<u>GW</u>	<u>5</u>	<u>2</u>	<u>3</u>						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<u>Co, Li, Hg, Mo, Pb, Se, Tl,</u>
<u>.04</u>		<u>1043</u>	<u>Field Dupe MW-11 -04</u>	<u>GW</u>	<u>5</u>	<u>2</u>	<u>3</u>						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<u>Fe, Cu, Ni, Ag, V, Zn</u>
<u>.05</u>		<u>0830</u>	<u>Field Blank -05</u>	<u>DI</u>	<u>5</u>	<u>2</u>	<u>3</u>						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<u>Please send a preliminary report</u>
																					<input type="checkbox"/>	<input type="checkbox"/>	<u>The analytes for dissolved metals are same metals that are analysed for total.</u>

RELINQUISHED BY: [Signature] Sampler DATE 8/17/22 TIME 1518  
 SIGNATURE/ORGANIZATION \_\_\_\_\_  
 RECEIVED BY: [Signature] DATE 8/17/22 TIME 1518  
 SIGNATURE/ORGANIZATION \_\_\_\_\_  
 RELINQUISHED BY: \_\_\_\_\_ DATE \_\_\_\_\_ TIME \_\_\_\_\_  
 SIGNATURE/ORGANIZATION \_\_\_\_\_  
 RECEIVED BY: \_\_\_\_\_ DATE \_\_\_\_\_ TIME \_\_\_\_\_  
 SIGNATURE/ORGANIZATION \_\_\_\_\_

RELINQUISHED BY: \_\_\_\_\_ DATE \_\_\_\_\_ TIME \_\_\_\_\_  
 SIGNATURE/ORGANIZATION \_\_\_\_\_  
 RECEIVED BY: \_\_\_\_\_ DATE \_\_\_\_\_ TIME \_\_\_\_\_  
 SIGNATURE/ORGANIZATION \_\_\_\_\_  
 SEAL NO. SEAL INTACT YES  NO  INITIALS \_\_\_\_\_  
 SEAL NO. SEAL INTACT YES  NO  INITIALS \_\_\_\_\_  
 NOTES: TEMP. ON ARRIVAL 1.0°C

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

## Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.150
Be, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	2.5
Cl	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cr, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Fluoride	250 mL plastic	mg/L	None	9056	28 d	1.0
F	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Fe, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Pb, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Li, total	Mercury	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Hg, total	Molybdenum	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Mo, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	HNO3	SM 7500	6 mos	2.0 combined
RA226/228	Selenium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Se, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ag, total	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	10
SO4	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Tl, total	Total Dissolved Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TDS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540D	NA	3
TSS	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
V, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Zn, total							





September 12, 2022

John Laverty  
Merit Laboratories Inc.  
2680 East Lansing Drive  
East Lansing, Michigan 48823

Re: Routine Analysis  
Work Order: 590564  
SDG: S39343

Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on August 22, 2022. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at [www.gel.com](http://www.gel.com).

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,

Jessica Ward for  
Delaney Stone  
Project Manager

Purchase Order: GELP20-0018  
Enclosures



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# Case Narrative

**Receipt Narrative  
for  
Merit Laboratories, Inc.  
SDG: S39343  
Work Order: 590564**

**September 12, 2022**

**Laboratory Identification:**

GEL Laboratories LLC  
2040 Savage Road  
Charleston, South Carolina 29407  
(843) 556-8171

**Summary:**

**Sample receipt:** The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on August 22, 2022 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

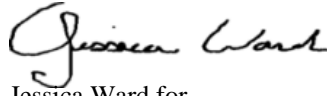
**Sample Identification:** The laboratory received the following samples:

<b><u>Laboratory ID</u></b>	<b><u>Client ID</u></b>
590564001	S39343.01
590564002	S39343.02
590564003	S39343.03
590564004	S39343.04 Field Dupe
590564005	S39343.05 Field Blank

**Case Narrative:**

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.

A handwritten signature in black ink that reads "Jessica Ward". The signature is written in a cursive style with a large initial "J".

Jessica Ward for  
Delaney Stone  
Project Manager

# **Chain of Custody and Supporting Documentation**



2680 East Lansing Dr., East Lansing, MI 48823  
 Phone (517) 332-0167 Fax (517) 332-4034  
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

**REPORT TO**

CONTACT NAME: Project Management Team  
 COMPANY: Merit Laboratories  
 ADDRESS: 2680 East Lansing Drive  
 CITY: East Lansing  
 PHONE NO.: 517-332-0167  
 E-MAIL ADDRESS: results@meritlabs.com

**CHAIN OF CUSTODY RECORD**

CONTACT NAME: Julie Teague  
 COMPANY: Merit Laboratories  
 ADDRESS: 2680 East Lansing Drive  
 CITY: East Lansing  
 PHONE NO.: 517-332-0167  
 E-MAIL ADDRESS: juliet@meritlabs.com

**INVOICE TO**

CONTACT NAME: Julie Teague  
 COMPANY: Merit Laboratories  
 ADDRESS: 2680 East Lansing Drive  
 CITY: East Lansing  
 PHONE NO.: 517-332-0167  
 E-MAIL ADDRESS: juliet@meritlabs.com

PROJECT NO./NAME: S39343  
 SAMPLER(S) - PLEASE PRINT/SIGN NAME

TURNAROUND TIME REQUIRED:  1 DAY  2 DAYS  3 DAYS  STANDARD  OTHER  
 DELIVERABLES REQUIRED:  STD  LEVEL II  LEVEL III  LEVEL IV  EDD  OTHER

MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID  
 SL=SLUDGE DW=DRINKING WATER O=OIL WP=WPIPE A=AIR W=WASTE

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR	DATE	TIME	IDENTIFICATION-DESCRIPTION	SAMPLE TAG	# OF BOTTLES		# Containers & Preservatives													
						MATRIX	OTHER	NONE	HCl	HNO <sub>3</sub>	H <sub>2</sub> SO <sub>4</sub>	NaOH	MeOH	OTHER							
	8/17/22	1043		S39343.01	GW	2	2														
	8/17/22	1322		S39343.02	GW	2	2														
	8/17/22	1244		S39343.03	GW	2	2														
	8/17/22	1043		S39343.04 Field Dupe	GW	2	2														
	8/17/22	0830		S39343.05 Field Blank	DI	2	2														

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

Certifications	Project Locations	Special Instructions
<input type="checkbox"/> OHIO VAP <input type="checkbox"/> Drinking Water	<input type="checkbox"/> DoD <input type="checkbox"/> NPDES	* E903.1 Mod.
<input type="checkbox"/> Detroit <input type="checkbox"/> New York		** E904.0/SW 9320 Mod.
<input type="checkbox"/> Other		Please use calculation product & provide Radium 226/228 combined results on the report
		(No Ice needed)
		** Subcontracted to GEL Laboratories, Inc.
		2040 Savage Road
		Charleston, SC 29407

RELINQUISHED BY: [Signature] DATE: 8/18/22 TIME: 1700  
 RECEIVED BY: [Signature] DATE: 8/18/22 TIME: 1700  
 RELINQUISHED BY: [Signature] DATE: 8/18/22 TIME: 1700  
 RECEIVED BY: [Signature] DATE: 8/18/22 TIME: 1700

RELINQUISHED BY: [Signature] DATE: 08/22/22 TIME: 09:05  
 RECEIVED BY: [Signature] DATE: 08/22/22 TIME: 09:05  
 SEAL NO. [ ] INITIALS [ ]  
 SEAL NO. [ ] INITIALS [ ]

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE



SAMPLE RECEIPT & REVIEW FORM **MB**

Client: <b>meri</b>		SDG/AR/COC/Work Order: <b>590564</b>			
Received By: <b>MVH</b>		Date Received: <b>08/22/2022</b>			
Carrier and Tracking Number		Circle Applicable: FedEx Express    FedEx Ground <b>UPS</b> Field Services    Courier    Other <b>124664770361818267</b>			
Suspected Hazard Information		*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.			
A) Shipped as a DOT Hazardous?		Hazard Class Shipped: _____ UN#: _____ If UN2910, Is the Radioactive Shipment Survey Compliant? Yes ___ No ___			
B) Did the client designate the samples are to be received as radioactive?		COC notation or radioactive stickers on containers equal client designation.			
C) Did the RSO classify the samples as radioactive?		Maximum Net Counts Observed* (Observed Counts - Area Background Counts): <b>0</b> CPM / mR/Hr Classified as: Rad 1    Rad 2    Rad 3			
D) Did the client designate samples are hazardous?		COC notation or hazard labels on containers equal client designation.			
E) Did the RSO identify possible hazards?		If D or E is yes, select Hazards below. PCB's    Flammable    Foreign Soil    RCRA    Asbestos    Beryllium    Other: _____			
Sample Receipt Criteria		Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1	Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Seals broken    Damaged container    Leaking container    Other (describe)
2	Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Client contacted and provided COC    COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Preservation Method: Wet Ice    Ice Packs    Dry ice <b>None</b> Other: _____ *all temperatures are recorded in Celsius <b>TEMP: 27</b>
4	Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Temperature Device Serial #: <b>IR2-21</b> Secondary Temperature Device Serial # (If Applicable): _____
5	Sample containers intact and sealed?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Seals broken    Damaged container    Leaking container    Other (describe)
6	Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Sample ID's and Containers Affected: _____ If Preservation added, Lot#: _____
7	Do any samples require Volatile Analysis?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	If Yes, are Encores or Soil Kits present for solids? Yes ___ No ___ NA ___ (If yes, take to VOA Freezer) Do liquid VOA vials contain acid preservation? Yes ___ No ___ NA ___ (If unknown, select No) Are liquid VOA vials free of headspace? Yes ___ No ___ NA ___ Sample ID's and containers affected: _____
8	Samples received within holding time?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	ID's and tests affected: _____
9	Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	ID's and containers affected: _____
10	Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: No dates on containers    No times on containers    COC missing info    Other (describe)
11	Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: No container count on COC    Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
13	COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Not relinquished    Other (describe)
Comments (Use Continuation Form if needed):					

PM (or PMA) review: Initials **MVH** Date **8/25/22** Page **1** of **1**



# Laboratory Certifications

**List of current GEL Certifications as of 12 September 2022**

<b>State</b>	<b>Certification</b>
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122023-3
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2022-137
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122021-36
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

# **Radiological Analysis**

# Case Narrative

**Radiochemistry  
Technical Case Narrative  
Merit Laboratories, Inc.  
SDG #: S39343  
Work Order #: 590564**

**Product: Radium-226+Radium-228 Calculation**

**Analytical Method: Calculation**

**Analytical Procedure: GL-RAD-D-003 REV# 45**

**Analytical Batch: 2306942**

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
590564001	S39343.01
590564002	S39343.02
590564003	S39343.03
590564004	S39343.04 Field Dupe
590564005	S39343.05 Field Blank

**Data Summary:**

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

**Product: GFPC Ra228, Liquid**

**Analytical Method: EPA 904.0/SW846 9320 Modified**

**Analytical Procedure: GL-RAD-A-063 REV# 5**

**Analytical Batch: 2306932**

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
590564001	S39343.01
590564002	S39343.02
590564003	S39343.03
590564004	S39343.04 Field Dupe
590564005	S39343.05 Field Blank
1205171802	Method Blank (MB)
1205171803	590564001(S39343.01) Sample Duplicate (DUP)
1205171804	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration,

continuing calibration, instrument controls and process controls where applicable.

**Product: Lucas Cell, Ra226, Liquid**

**Analytical Method:** EPA 903.1 Modified

**Analytical Procedure:** GL-RAD-A-008 REV# 15

**Analytical Batch:** 2306941

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
590564001	S39343.01
590564002	S39343.02
590564003	S39343.03
590564004	S39343.04 Field Dupe
590564005	S39343.05 Field Blank
1205171805	Method Blank (MB)
1205171806	590564001(S39343.01) Sample Duplicate (DUP)
1205171807	590564001(S39343.01) Matrix Spike (MS)
1205171808	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

**Miscellaneous Information**

**Additional Comments**

The matrix spike, 1205171807 (S39343.01MS), aliquot was reduced to conserve sample volume.

**Certification Statement**

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

## GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

### Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S39343 GEL Work Order: 590564

**The Qualifiers in this report are defined as follows:**

- \* A quality control analyte recovery is outside of specified acceptance criteria
- \*\* Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

**Review/Validation**

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature: 

Name: Kenshalla Oston

Date: 19 SEP 2022

Title: Analyst I

# Sample Data Summary



# GEL LABORATORIES LLC

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## Certificate of Analysis

Report Date: September 19, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Lavery  
 Project: Routine Analysis

Client Sample ID: S39343.01	Project: MERI00120
Sample ID: 590564001	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 17-AUG-22 10:43	
Receive Date: 22-AUG-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	0.0495	+/-0.826	1.56	3.00	pCi/L			JE1	09/09/22	1207	2306932	1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		0.591	+/-0.863			pCi/L		1	TON1	09/12/22	1619	2306942	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.542	+/-0.252	0.307	1.00	pCi/L			LXP1	09/08/22	0920	2306941	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			84.1	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

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## Certificate of Analysis

Report Date: September 19, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Lavery  
 Project: Routine Analysis

Client Sample ID: S39343.02	Project: MERI00120
Sample ID: 590564002	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 17-AUG-22 13:22	
Receive Date: 22-AUG-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	1.80	+/-1.49	2.42	3.00	pCi/L		JE1	09/09/22	1207	2306932		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		2.20	+/-1.51			pCi/L		1 TON1	09/12/22	1619	2306942		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.398	+/-0.256	0.359	1.00	pCi/L		LXP1	09/08/22	0920	2306941		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			81.3	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

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## Certificate of Analysis

Report Date: September 19, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Lavery  
 Project: Routine Analysis

---

Client Sample ID: S39343.03	Project: MERI00120
Sample ID: 590564003	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 17-AUG-22 12:44	
Receive Date: 22-AUG-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	0.00710	+/-0.827	1.56	3.00	pCi/L			JE1	09/09/22	1207	2306932	1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		0.410	+/-0.858			pCi/L		1	TON1	09/12/22	1619	2306942	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.402	+/-0.229	0.257	1.00	pCi/L			LXP1	09/08/22	0920	2306941	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			87.9	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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## Certificate of Analysis

Report Date: September 19, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

Client Sample ID: S39343.04 Field Dupe	Project: MERI00120
Sample ID: 590564004	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 17-AUG-22 10:43	
Receive Date: 22-AUG-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	0.835	+/-0.784	1.27	3.00	pCi/L			JE1	09/09/22	1207	2306932	1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		1.81	+/-0.863			pCi/L		1	TON1	09/12/22	1619	2306942	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.971	+/-0.362	0.402	1.00	pCi/L			LXP1	09/08/22	0920	2306941	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			83.1	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

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## Certificate of Analysis

Report Date: September 19, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

Client Sample ID: S39343.05 Field Blank	Project: MERI00120
Sample ID: 590564005	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 17-AUG-22 08:30	
Receive Date: 22-AUG-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.306	+/-1.30	2.35	3.00	pCi/L		JE1	09/09/22	1207	2306932	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.457	+/-1.31			pCi/L		1 TON1	09/12/22	1619	2306942	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.151	+/-0.156	0.241	1.00	pCi/L		LXP1	09/08/22	0951	2306941	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			70.6	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# Quality Control Summary

# GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

## QC Summary

Report Date: September 19, 2022

Page 1 of 2

**Merit Laboratories Inc.**  
**2680 East Lansing Drive**  
**East Lansing, Michigan**

**Contact: John Laverty**

**Workorder: 590564**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Rad Gas Flow</b>											
Batch	2306932										
QC1205171803	590564001	DUP									
Radium-228	U	0.0495	U	0.245	pCi/L	N/A		N/A	JE1	09/09/22	12:06
	Uncertainty	+/-0.826		+/-0.781							
QC1205171804	LCS										
Radium-228	44.5			40.9	pCi/L		91.9	(75%-125%)		09/09/22	12:07
	Uncertainty			+/-3.06							
QC1205171802	MB										
Radium-228			U	0.961	pCi/L					09/09/22	12:06
	Uncertainty			+/-1.02							
<b>Rad Ra-226</b>											
Batch	2306941										
QC1205171806	590564001	DUP									
Radium-226		0.542	U	0.350	pCi/L	43		(0% - 100%)	LXP1	09/08/22	09:51
	Uncertainty	+/-0.252		+/-0.264							
QC1205171808	LCS										
Radium-226	26.7			23.8	pCi/L		89.1	(75%-125%)		09/08/22	09:51
	Uncertainty			+/-1.48							
QC1205171805	MB										
Radium-226			U	0.208	pCi/L					09/08/22	09:51
	Uncertainty			+/-0.198							
QC1205171807	590564001	MS									
Radium-226	132	0.542		137	pCi/L		103	(75%-125%)		09/08/22	09:55
	Uncertainty	+/-0.252		+/-7.91							

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- \*\* Analyte is a Tracer compound
- < Result is less than value reported
- > Result is greater than value reported
- BD Results are either below the MDC or tracer recovery is low
- FA Failed analysis.
- H Analytical holding time was exceeded

# GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

## QC Summary

Workorder: 590564

Page 2 of 2

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
J											
J											
K											
L											
M											
M											
N/A											
N1											
ND											
NJ											
Q											
R											
U											
UI											
UJ											
UL											
X											
Y											
^											
h											

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where the duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

\* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.



# Gas Flow Raw Data

# Batch 2306932 Check-list

This check-list was completed on 12-SEP-22 by Nat Long

This batch was reviewed by Kenshalla Oston on 12-SEP-22 and Nat Long on 12-SEP-22.

**Batch ID:**  
2306932

**Product:**  
GFC28RAL

**Description:** Gas Flow Radium 228  
GL-RAD-A-063

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
11	Has the method required detection limit been met?	Yes		
<b>Miscellaneous Information</b>				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

# Prep Logbook

## Radium-228 in Liquid

**Batch ID:** 2306932

**Analyst:** Jacqueline Emond (JE1)

**Method:** EPA 904.0/SW846 9320 Modified

**Lab SOP:** GL-RAD-A-063 REV# 5

**Instrument:** SP-C018367602

**Due Dates for Lab:** 17-SEP-2022

**Package:** 19-SEP-2022

**SDG:** 20-SEP-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205171804	Radium-228	1965-C	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	590564001	31-AUG-2022	3	301.11	301.11	09/06/22 16:03	09/09/22 10:37
2	590564002	31-AUG-2022	3	301.21	301.21	09/06/22 16:03	09/09/22 10:37
3	590564003	31-AUG-2022	3	301.61	301.61	09/06/22 16:03	09/09/22 10:37
4	590564004	31-AUG-2022	3	302.11	302.11	09/06/22 16:03	09/09/22 10:37
5	590564005	31-AUG-2022	3	300.71	300.71	09/06/22 16:03	09/09/22 10:37
6	1205171802 MB	31-AUG-2022	3		302.91	09/06/22 16:03	09/09/22 10:37
7	1205171803 DUP (590564001)	31-AUG-2022	3	302.91	302.91	09/06/22 16:03	09/09/22 10:37
8	1205171804 LCS	31-AUG-2022	3		302.91	09/06/22 16:03	09/09/22 10:37

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1951-D	Ba-133	.1 mL	Pipet Id: RAD-GFC-1795419
REGNT 3413919	RGF-50% Potassium Carbonate	2 mL	Data Entry Date2: 02-SEP-2022 13:54 SP-C018367602 Jacqueline Emond
REGNT 3418276.6	29M HF (48-50%)	4 mL	Data Entry Date3: 31-AUG-2022 00:00
REGNT 3454370.1	Nitric Acid	5 mL	
REGNT 3457746.6	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	
REGNT 3465466	Barium Carrier Ra228 REG	1 mL	
REGNT 3466687	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3475414	RGF-7M Nitric Acid	25 mL	
REGNT 3478594	2M HCl	20 mL	
REGNT 3478604	RGF-Neodymium Substrate	5 mL	
REGNT 3481329	RGF-1M Citric Acid	5 mL	
REGNT 3481821	RGF-1.5M Ammonium Sulfate	10 mL	
REGNT DGA0037	2304168	2 g	

### Radium-228 Liquid

Filename : RA228.XLS  
 File type : Excel  
 Version # : 1.4.2

Tracer S/N : 1951-D  
 Tracer Exp Date : 6/2/2023  
 Tracer Volume Added: 0.10

Batch : 2306932  
 Analyst : JAC02417  
 Prep Date : 8/31/2022  
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL  
 Parmname : Radium-228  
 Required MDA : 3 pCi/L  
 Ra-228 Abundance : 1.00  
 Halflife of Ra-228 : 5.75 years  
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	590564001.1	0.3011	1.8478E-05	8/17/2022 10:43	1252.0	1.63%	1053.3	1.78%	0.1	0.000200
2	590564002.1	0.3012	1.8480E-05	8/17/2022 13:22	1252.0	1.63%	1017.9	1.81%	0.1	0.000200
3	590564003.1	0.3016	1.8486E-05	8/17/2022 12:44	1252.0	1.63%	1100.9	1.74%	0.1	0.000200
4	590564004.1	0.3021	1.8495E-05	8/17/2022 10:43	1252.0	1.63%	1040.7	1.79%	0.1	0.000200
5	590564005.1	0.3007	1.8471E-05	8/17/2022 8:30	1252.0	1.63%	884.2	1.94%	0.1	0.000200
6	1205171802.1	0.3029	1.8508E-05	8/31/2022 0:00	1252.0	1.63%	1021.9	1.81%	0.1	0.000200
7	1205171803.1	0.3029	1.8508E-05	8/17/2022 10:43	1252.0	1.63%	1061.9	1.77%	0.1	0.000200
8	1205171804.1	0.3029	1.8508E-05	8/31/2022 0:00	1252.0	1.63%	1115.5	1.73%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063  
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated	Sample
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction	Recovery %	Recovery Error %
			Alpha	Beta										
1	2A	60	11	46	0.767	9/9/2022 12:07	9/6/2022 16:03	9/9/2022 10:37	0.992	0.844	0.999	1.057	84.1%	1.24%
2	2C	60	21	133	2.217	9/9/2022 12:07	9/6/2022 16:03	9/9/2022 10:37	0.992	0.844	0.999	1.057	81.3%	1.25%
3	2D	60	10	48	0.800	9/9/2022 12:07	9/6/2022 16:03	9/9/2022 10:37	0.992	0.844	0.999	1.057	87.9%	1.23%
4	3B	60	14	42	0.700	9/9/2022 12:07	9/6/2022 16:03	9/9/2022 10:37	0.992	0.844	0.999	1.057	83.1%	1.24%
5	3C	60	9	85	1.417	9/9/2022 12:07	9/6/2022 16:03	9/9/2022 10:37	0.992	0.844	0.999	1.057	70.6%	1.30%
6	3D	60	8	64	1.067	9/9/2022 12:06	9/6/2022 16:03	9/9/2022 10:37	0.997	0.845	0.999	1.057	81.6%	1.25%
7	4A	60	15	40	0.667	9/9/2022 12:06	9/6/2022 16:03	9/9/2022 10:37	0.992	0.845	0.999	1.057	84.8%	1.24%
8	4C	60	26	805	13.417	9/9/2022 12:07	9/6/2022 16:03	9/9/2022 10:37	0.997	0.844	0.999	1.057	89.1%	1.22%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2022	5/31/2023	0.6201	0.01914	0.753	9/2/2022 15:35	1000
2	PIC	6/1/2022	5/31/2023	0.6022	0.01274	1.750	9/2/2022 15:35	1000
3	PIC	6/1/2022	5/31/2023	0.6046	0.00745	0.798	9/2/2022 15:35	1000
4	PIC	6/1/2022	5/31/2023	0.6245	0.01614	0.470	9/2/2022 15:35	1000
5	PIC	6/1/2022	5/31/2023	0.6365	0.00988	1.344	9/2/2022 15:35	1000
6	PIC	6/1/2022	5/31/2023	0.5999	0.02297	0.815	9/2/2022 15:35	1000
7	PIC	6/1/2022	5/31/2023	0.6013	0.01123	0.600	9/2/2022 15:35	1000
8	PIC	6/1/2022	5/31/2023	0.6359	0.00889	1.012	9/2/2022 15:36	1000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

**Spike S/N :** N/A  
**Spike Exp Date :** N/A  
**Spike Activity (dpm/ml):** N/A  
**Spike Volume Added:** N/A

\* - RPD changed to 0% due to sample & dup activity below MDA

**LCS S/N :** 1965-C  
**LCS Exp Date :** 8/5/2023  
**LCS Activity (dpm/ml):** 299.36  
**LCS Volume Added:** 0.10

Results Pos.	Decision	Critical	Required	Sample Act.		Sample Act.	Net Count	Net Count	2 SIGMA	2 SIGMA	Sample	Sample	RPD	RER	Nominal	Recovery
	Level	Level	MDA	MDA	Conc.	Error	Rate	Rate Error	Counting	Total Prop.						
1	0.9732	0.6871	3	1.5552	<b>0.0495</b>	851.14%	0.0137	0.1163	0.8256	0.8258		SAMPLE				
2	1.5805	1.1158	3	2.4245	<b>1.8003</b>	42.19%	0.4667	0.1967	1.4874	1.5545		SAMPLE				
3	0.9817	0.6931	3	1.5637	<b>7.097E-03</b>	5943.76%	0.0020	0.1189	0.8268	0.8270		SAMPLE				
4	0.7705	0.5440	3	1.2694	<b>0.8347</b>	47.94%	0.2300	0.1102	0.7836	0.8113		SAMPLE				
5	1.5118	1.0673	3	2.3452	<b>0.3060</b>	217.40%	0.0727	0.1580	1.3037	1.3060		SAMPLE				
6	1.0671	0.7534	3	1.6976	<b>0.9605</b>	54.24%	0.2517	0.1364	1.0200	1.0488		MB				
7	0.8831	0.6235	3	1.4310	<b>0.2454</b>	162.34%	0.0667	0.1082	0.7808	0.7833	590564001.1	DUP	* 0.0%			
8	1.0278	0.7256	3	1.6162	<b>40.9239</b>	4.11%	12.4047	0.4739	3.0646	10.6913		LCS			44.5175	91.9%

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
590564001	2A	60	11	46	9/9/2022 12:07	9/9/2022 13:07	PIC	2306932
590564002	2C	60	21	133	9/9/2022 12:07	9/9/2022 13:07	PIC	2306932
590564003	2D	60	10	48	9/9/2022 12:07	9/9/2022 13:07	PIC	2306932
590564004	3B	60	14	42	9/9/2022 12:07	9/9/2022 13:07	PIC	2306932
590564005	3C	60	9	85	9/9/2022 12:07	9/9/2022 13:07	PIC	2306932
1205171802	3D	60	8	64	9/9/2022 12:06	9/9/2022 13:06	PIC	2306932
1205171803	4A	60	15	40	9/9/2022 12:06	9/9/2022 13:06	PIC	2306932
1205171804	4C	60	26	805	9/9/2022 12:07	9/9/2022 13:07	PIC	2306932



ASSAY 9-Sep-22 11:34:40  
 Wizard 2480 s/n 46190630  
 Protocol id 9 Ba-133\_1  
 Time limit  
 Count limit  
 Isotope Ba-133\_1  
 Protocol date 9/9/2022  
 Run id. 5512

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	92	1	180	3756.85	1252.04	1.63	11:34:40
590564001	2	92	2	180	3160.57	1053.3	1.78	84.13	11:37:54
590564002	3	92	3	180	3054	1017.88	1.81	81.30	11:41:08
590564003	4	92	4	180	3303.28	1100.88	1.74	87.93	11:44:21
590564004	5	92	5	180	3122.57	1040.65	1.79	83.12	11:47:35
590564005	1	14	1	180	2653.28	884.24	1.94	70.62	11:51:13
1205171802	2	14	2	180	3066	1021.88	1.81	81.62	11:54:27
1205171803	3	14	3	180	3186.28	1061.88	1.77	84.81	11:57:40
1205171804	4	14	4	180	3347	1115.45	1.73	89.09	12:00:54

END OF ASSAY

# **Continuing Calibration Data**

# Gas Flow Proportional Counter Checks for 09-Sep-2022

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
G5400W1Z	Above	Beta XTalk	09-Sep 06:19	5	6.71E-4	1.40E-4	6.62E-4	+3.10
LB4100A2	Above	Beta eff	09-Sep 06:13	5	23922	19870	23260	+4.17
LB4100E2	Above	Beta bkg	09-Sep 04:42	60	2.867	1.385	3.072	+2.27
LB4100E3	need 2nd	Beta bkg	09-Sep 04:42	60	1.783	0.506	2.576	+0.70
LB4100F3	need 2nd	Alpha bkg	09-Sep 04:42	60	0.283	0.119	0.404	+0.46
LB4100G1	Above	Beta bkg	09-Sep 04:43	60	178	0.380	1.675	+819.07
LB4100G2	need 2nd	Alpha XTalk	09-Sep 05:44	5	0.350	0.324	0.423	-1.40
LB4100G2	Above	Beta bkg	09-Sep 04:43	60	106	1.159	2.203	+599.44
LB4100G3	Above	Beta bkg	09-Sep 04:43	60	1.900	0.810	1.674	+4.57
LB4100H1	Above	Beta bkg	09-Sep 04:42	60	2.067	0.216	2.462	+1.94
LB4100H2	Below	Alpha eff	09-Sep 05:44	5	5080	5513	8976	-3.75
LB4100H2	Above	Alpha XTalk	09-Sep 05:44	5	0.416	0.269	0.396	+4.00
PIC1A	Above	Beta bkg	09-Sep 07:45	60	4.917	-7.65E-1	2.862	+6.40
PIC1C	Above	Beta bkg	09-Sep 07:45	60	2.117	-6.21E-1	2.214	+2.79
PIC2B	Above	Beta bkg	09-Sep 07:45	60	9.100	-5.22E-1	2.315	+17.35
PIC7A	Below	Alpha eff	09-Sep 05:25	5	10076	10340	11210	-4.82
PIC7A	Above	Beta XTalk	09-Sep 05:32	5	0.001	2.49E-4	0.001	+5.06
PIC8B	Above	Alpha bkg	09-Sep 05:39	60	0.817	-1.16E-1	0.388	+8.12
PIC8B	Above	Alpha eff	09-Sep 05:25	5	9398	8349	9361	+3.22
PIC8B	Below	Alpha XTalk	09-Sep 05:25	5	0.244	0.262	0.306	-5.52
PIC8B	Above	Beta bkg	09-Sep 05:39	60	3.183	-1.80E-1	2.341	+5.00
PIC8B	Above	Beta XTalk	09-Sep 05:32	5	0.021	2.00E-4	9.31E-4	+171.04
PIC9B	Above	Beta XTalk	09-Sep 05:38	5	0.003	1.90E-4	0.003	+3.00
PIC13A	Above	Beta bkg	09-Sep 07:38	60	2.133	-8.16E-2	2.573	+2.01
PIC14B	Above	Beta bkg	09-Sep 09:01	60	2.200	-2.13E-1	2.672	+2.02
PIC14C	Above	Beta bkg	09-Sep 06:29	60	2.817	0.197	2.388	+4.17

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

LB4100C1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by  \_\_\_\_\_

Date 09/09/22 \_\_\_\_\_

GEL Laboratories LLC

# Runlogs

# Instrument Run Log

Instrument Type: GFPC

Batch ID: 2306932

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205171802	MB	JE1	PIC3D	SEP-09-22 12:06:58	DONE	25mm Filter	01-JUN-22 00:00
1205171803	DUP	JE1	PIC4A	SEP-09-22 12:06:58	DONE	25mm Filter	01-JUN-22 00:00
1205171804	LCS	JE1	PIC4C	SEP-09-22 12:07:03	DONE	25mm Filter	01-JUN-22 00:00
590564001	SAMPLE	JE1	PIC2A	SEP-09-22 12:07:10	DONE	25mm Filter	01-JUN-22 00:00
590564002	SAMPLE	JE1	PIC2C	SEP-09-22 12:07:14	DONE	25mm Filter	01-JUN-22 00:00
590564003	SAMPLE	JE1	PIC2D	SEP-09-22 12:07:18	DONE	25mm Filter	01-JUN-22 00:00
590564004	SAMPLE	JE1	PIC3B	SEP-09-22 12:07:23	DONE	25mm Filter	01-JUN-22 00:00
590564005	SAMPLE	JE1	PIC3C	SEP-09-22 12:07:26	DONE	25mm Filter	01-JUN-22 00:00

# Lucas Cell Raw Data

# Batch 2306941 Check-list

This check-list was completed on 08-SEP-22 by Elizabeth Krouse

This batch was reviewed by Elizabeth Krouse on 08-SEP-22 and Lyndsey Pace on 08-SEP-22.

**Batch ID:**  
2306941

**Product:**  
LUC26RAL

**Description:** Lucas Cell Radium 226  
GL-RAD-A-008

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
<b>Miscellaneous Information</b>				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		



# Prep Logbook

## Radium-226 in Liquid

**Batch ID:** 2306941  
**Analyst:** Prep: Jacqueline Emond (JE1)  
 Lyndsey Pace (LXP1)  
**Method:** EPA 903.1 Modified  
**Lab SOP:** GL-RAD-A-008 REV# 15  
**Instrument:** SP-C018367602

Due Dates for Lab: 17-SEP-2022			Package: 19-SEP-2022		SDG: 20-SEP-2022	
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205171808	Radium-226 SPIKE	1715-G	.1	mL	
MS	1205171807	Radium-226 SPIKE	1715-G	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	590564001	31-AUG-2022	1	500.3	500.3	09/01/22 07:00	503	09/08/22 06:13	09/08/22 09:20	7	34
2	590564002	31-AUG-2022	1	500.11	500.11	09/01/22 07:00	603	09/08/22 06:13	09/08/22 09:20	7	24
3	590564003	31-AUG-2022	1	501.81	501.81	09/01/22 07:00	708	09/08/22 06:13	09/08/22 09:20	2	17
4	590564004	31-AUG-2022	1	502.01	502.01	09/01/22 07:00	801	09/08/22 06:13	09/08/22 09:20	8	47
5	590564005	31-AUG-2022	1	501.11	501.11	09/01/22 07:00	107	09/08/22 06:41	09/08/22 09:51	2	8
6	1205171805 MB	31-AUG-2022	1		502.01	09/01/22 07:00	204	09/08/22 06:41	09/08/22 09:51	5	14
7	1205171806 DUP (590564001)	31-AUG-2022	1	501.11	501.11	09/01/22 07:00	408	09/08/22 06:41	09/08/22 09:51	6	19
8	1205171807 MS (590564001)	31-AUG-2022	1	101.31	101.31	09/01/22 07:00	508	09/08/22 06:41	09/08/22 09:55	6	1173
9	1205171808 LCS	31-AUG-2022	1		502.01	09/01/22 07:00	608	09/08/22 06:41	09/08/22 09:51	5	1005

Reagent/Solvent Lot ID	Description	Amount
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**Comments:**  
 Data Entry Date2: 31-AUG-2022 00:00

### Radium-226 Liquid

Filename : RA226.XLS  
 File type : Excel  
 Version # : 1.3.2

Procedure Code : LUC26RAL  
 Parmname : Radium-226  
 Required MDA : 1 pCi/L  
 Halfife of Ra-226 : 1600 years  
 Ra-226 Abundance : 1.00  
 Halfife of Rn-222: 3.8235 days

Batch : 2306941  
 Analyst : LXP1  
 Prep Date : 8/31/2022  
 Ra-226 Method Uncertainty : 0.073648

Batch counted on : LUCAS CELL DETECTOR  
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Count Time (min.)	Cell Efficiency (cpm/dpm)
1	590564001.1	0.5003	2.0257E-05	8/17/2022 10:43	503	30	34	1.133	7	0.233	30	2.1390
2	590564002.1	0.5001	2.0256E-05	8/17/2022 13:22	603	30	24	0.800	7	0.233	30	1.8330
3	590564003.1	0.5018	2.0263E-05	8/17/2022 12:44	708	30	17	0.567	2	0.067	30	1.5950
4	590564004.1	0.5020	2.0264E-05	8/17/2022 10:43	801	30	47	1.567	8	0.267	30	1.7180
5	590564005.1	0.5011	2.0260E-05	8/17/2022 8:30	107	30	8	0.267	2	0.067	30	1.6990
6	1205171805.1	0.5020	2.0264E-05	8/31/2022 0:00	204	30	14	0.467	5	0.167	30	1.8470
7	1205171806.1	0.5011	2.0260E-05	8/17/2022 10:43	408	30	19	0.633	6	0.200	30	1.5900
8	1205171807.1	0.1013	1.1450E-05	8/17/2022 10:43	508	30	1173	39.100	6	0.200	30	1.8020
9	1205171808.1	0.5020	2.0264E-05	8/31/2022 0:00	608	30	1005	33.500	5	0.167	30	1.7970

Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

**Analytical SOP:** GL-RAD-A-008  
**Instrument SOP:** GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrow End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
5.000%	6/1/2022	5/31/2023	9/1/2022 7:00	9/8/2022 6:13	9/8/2022 9:20	0.717	0.977	1.002	1.000
3.400%	7/1/2022	6/30/2023	9/1/2022 7:00	9/8/2022 6:13	9/8/2022 9:20	0.717	0.977	1.002	1.000
2.200%	11/1/2021	10/31/2022	9/1/2022 7:00	9/8/2022 6:13	9/8/2022 9:20	0.717	0.977	1.002	1.000
5.000%	4/1/2022	3/31/2023	9/1/2022 7:00	9/8/2022 6:13	9/8/2022 9:20	0.717	0.977	1.002	1.000
3.900%	4/28/2022	4/30/2023	9/1/2022 7:00	9/8/2022 6:41	9/8/2022 9:51	0.718	0.976	1.002	1.000
7.400%	8/1/2022	7/31/2023	9/1/2022 7:00	9/8/2022 6:41	9/8/2022 9:51	0.718	0.976	1.002	1.000
1.200%	2/1/2022	1/31/2023	9/1/2022 7:00	9/8/2022 6:41	9/8/2022 9:51	0.718	0.976	1.002	1.000
4.500%	6/1/2022	5/31/2023	9/1/2022 7:00	9/8/2022 6:41	9/8/2022 9:55	0.718	0.976	1.002	1.000
6.300%	7/1/2022	6/30/2023	9/1/2022 7:00	9/8/2022 6:41	9/8/2022 9:51	0.718	0.976	1.002	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

**Spike S/N :** 1715-G  
**Spike Exp Date :** 9/15/2022  
**Spike Activity (dpm/ml):** 297.50  
**Spike Volume Added:** 0.10

**LCS S/N :** 1715-G  
**LCS Exp Date :** 9/15/2022  
**LCS Activity (dpm/ml):** 297.50  
**LCS Volume Added:** 0.10

<b>Results</b>																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.1749	0.1235	1	0.3072	<b>0.5418</b>	24.24%	0.9000	0.2134	0.2518	0.2690		SAMPLE				
2	0.2042	0.1442	1	0.3587	<b>0.3982</b>	32.93%	0.5667	0.1856	0.2556	0.2634		SAMPLE				
3	0.1250	0.0883	1	0.2570	<b>0.4025</b>	29.14%	0.5000	0.1453	0.2292	0.2371		SAMPLE				
4	0.2321	0.1638	1	0.4024	<b>0.9711</b>	19.66%	1.3000	0.2472	0.3619	0.3996		SAMPLE				
5	0.1174	0.0829	1	0.2414	<b>0.1512</b>	52.85%	0.2000	0.1054	0.1562	0.1581		SAMPLE				
6	0.1705	0.1204	1	0.3101	<b>0.2082</b>	48.99%	0.3000	0.1453	0.1977	0.2022		MB				
7	0.2173	0.1534	1	0.3876	<b>0.3500</b>	38.48%	0.4333	0.1667	0.2639	0.2688	590564001.1	DUP	43.0%			
8	0.9490	0.6700	1	1.6927	<b>137.2049</b>	5.38%	38.9000	1.1446	7.9125	24.5217	590564001.1	MS			132.2771	103.3%
9	0.1752	0.1237	1	0.3188	<b>23.7804</b>	7.06%	33.3333	1.0593	1.4813	4.7540		LCS			26.6943	89.1%

# **Continuing Calibration Data**



# Ludlum Alpha Scintillation Counter Checks for 08-SEP-2022

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	07:23	1	1.21E+05	120663	-1.58		
LUCAS2	EFF	07:21	1	1.32E+05	132320	0.76		
LUCAS4	EFF	07:18	1	1.28E+05	128185	1.33		
LUCAS5	EFF	07:13	1	1.33E+05	132536	1.97		
LUCAS6	EFF	07:09	1	1.30E+05	129608	-1.34		
LUCAS7	EFF	06:59	1	1.31E+05	130521	-1.79		
LUCAS8	EFF	06:58	1	1.25E+05	125398	-0.4		

**Reviewed by:**

Lyndsey Pace

**Date:** 08-SEP-22

GEL Laboratories LLC

# Runlogs

# Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2306941

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
590564001	SAMPLE	LXP1	LUCAS5	SEP-08-22 09:20:00	DONE	Lucas Cell	01-JUN-22 00:00
590564002	SAMPLE	LXP1	LUCAS6	SEP-08-22 09:20:00	DONE	Lucas Cell	01-JUL-22 00:00
590564003	SAMPLE	LXP1	LUCAS7	SEP-08-22 09:20:00	DONE	Lucas Cell	01-NOV-21 00:00
590564004	SAMPLE	LXP1	LUCAS8	SEP-08-22 09:20:00	DONE	Lucas Cell	01-APR-22 00:00
590564005	SAMPLE	LXP1	LUCAS1	SEP-08-22 09:51:00	DONE	Lucas Cell	28-APR-22 00:00
1205171805	MB	LXP1	LUCAS2	SEP-08-22 09:51:00	DONE	Lucas Cell	01-AUG-22 00:00
1205171806	DUP	LXP1	LUCAS4	SEP-08-22 09:51:00	DONE	Lucas Cell	01-FEB-22 00:00
1205171808	LCS	LXP1	LUCAS6	SEP-08-22 09:51:00	DONE	Lucas Cell	01-JUL-22 00:00
1205171807	MS	LXP1	LUCAS5	SEP-08-22 09:55:00	DONE	Lucas Cell	01-JUN-22 00:00





## Data Verification & Validation Report

### Lansing Board of Water & Light – Erickson Power Station

**Sampling Event (dates and purpose):** New Wells 11-13 – Background Round 6 – August 2022

Data Package Number: S39343.01

Lab Report Date: 10/05/2022

Data Validator: Aryka Thomson

Data Validation Completion Date: 10/10/2022

General Overall Assessment:

Data are usable without qualification.

Data are usable with qualification (as noted below).

Some or all data are unusable (as noted below).

Wells planned for sampling:

Well ID	Planned for Sampling
MW-1	
MW-2	
MW-3	
MW-4	
MW-5	
MW-6	
MW-7	
MW-7B	
MW-7C	
MW-8	
MW-9	
MW-10	
MW-11	X
MW-11B	
MW-12	X
MW-12B	
MW-13	X

### Data Summary

Sample ID	Matrix	Lab ID	Date Collected	App III Metals	App IV Metals	Part 115 Metals	Anions	TDS TSS	Rad-226 Rad-228	Diss. Metals
MW-11	GW	S39343.01	08/17/2022	X	X	X	X	X	X	
MW-12	GW	S39343.02	08/17/2022	X	X	X	X	X	X	X
MW-13	GW	S39343.03	08/17/2022	X	X	X	X	X	X	
MW-11 Dup	QC	S39343.04	08/17/2022	X	X	X	X	X	X	

Other analytes requested for analysis: Na, Mg, K, HCO<sub>3</sub>, CO<sub>3</sub>, hardness

Any planned sampling or analysis NOT completed? If yes, explain: \_\_\_\_\_

### Data Verification & Validation Checklist

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
<b>Field Data</b>							
Sample Collection Field Forms	X		Purging performed as required in the Groundwater Monitoring Plan		X		MW-12 turbidity > 10 NTU; collected additional container for dissolved metals
Field Calibration Records	X		Field instruments calibrated daily according to manufacturer specifications	X			
Chain of Custody	X		Accurately reflect samples, collection dates/times, analyses, bottles, etc.	X			
Field decontamination documentation	N/A		Record of decontamination for non-dedicated sampling equipment			X	
Drilling logs	X		N/A	-	-	-	
Well construction logs	X		N/A	-	-	-	
Well development field forms	X		N/A	-	-	-	
<b>Analytical Data Package</b>							
Cover Sheet	X		N/A	-	-	-	
Case Narrative	X		Summarizes sample receipt and any exceptions to QC acceptance criteria	X			
Internal Laboratory Chain of Custody forms	X		Analyses as requested; accurate transcription of field COC	X			
Sample Chronology and Consistency	X		Accurate representation of dates, times of receipt, preparation, and analysis	X			
Communication Records with Lab	X		N/A	-	-	-	
EDD Format Consistency	X		EDD format and content as requested	X			
Sample Identification, Results Nomenclature, and Data Qualifier Consistency	X		All included in final report	X			
Method Detection Limit Consistency	X		MDLs consistent between samples		X		Dilutions vary between samples
Instrument Calibration Records	X		Present and no nonconformance noted	X			
Laboratory Report Complete	X		Includes QC component	X			
Holding Times	X		Analyses performed within allowed holding time	X			

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Method	X		Method as requested	X			
Reporting Limits	X		RLs as requested	X			RLs for chloride, sulfate, and TDS were not met
			MDLs<RLs		X		RL=MDL for carbonate
			MDLs<GPS			X	
<b>QC Validation</b>							
<b>Evaluate Accuracy</b>							
Matrix Spike (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Laboratory Control Sample (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
<b>Evaluate Precision</b>							
Matrix Spike Duplicate (RPD)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Field Duplicate (RPD)	X		RPD ≤ 20%		X		Radium-226+228 RPD is 51%
<b>Evaluate Representativeness</b>							
Equipment Blanks (if applicable)	N/A		Non-detect (<RL)			X	
<b>QC Verification</b>							
<b>Verify Instrument Calibration &amp; Analytical Process</b>							
Initial Calibration Verification	X		Laboratory-determined	-	-	-	
Continuing Calibration Verification	X		Laboratory-determined	-	-	-	
Initial Calibration Blank	X		Laboratory-determined	-	-	-	
Continuing Calibration Blank	X		Laboratory-determined	-	-	-	
Serial Dilutions	X		Laboratory-determined	-	-	-	High recovery for Al, As, and K
Post-Digestion Spikes	X		Laboratory-determined	-	-	-	
Internal Standards	X		Laboratory-determined	-	-	-	
Laboratory Duplicate (RPD)	X		Laboratory-determined	-	-	-	
Method Blanks	X		Laboratory-determined	-	-	-	
<b>Evaluate Completeness (# usable measurements/ # unusable measurements)</b>							
Completeness	X		100%	X			

Other instances of nonconformance to QC control limits noted on case narrative: None

Comments:

Combined Radium-226+228 field duplicate RPD is 51%. Both Rad-226 and Rad-228 required qualification as estimated with low bias (J-) in the parent sample MW-11 and as estimated with high bias (J+) in the field duplicate MW-11-Dup.



Lansing Board of Water and Light  
Environmental Services Laboratory (MI00079)  
1232 Haco Dr.  
Lansing, Michigan 48901

06 October 2022

BWL - Erickson Station  
Attn: Cheryl Louden  
3725 S. Canal  
Lansing, MI 48917

**Project: Erickson AM MI**

Dear Cheryl Louden,

Enclosed is a copy of the laboratory report for the following work order(s) received by Lansing Board of Water and Light Environmental Services Laboratory:

<b>Work Order</b>	<b>Received</b>	<b>Account Number</b>
L209143	9/1/2022 2:45:00PM	30926 10021

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in blue ink that reads "Jennifer Caporale".

Jennifer Caporale, Supervisor



Report ID: S39891.01(02)  
Generated on 10/05/2022  
Replaces report S39891.01(01) generated on 09/06/2022

**Report to**  
Attention: Jennifer Caporale  
Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901  
  
Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

**Report produced by**  
Merit Laboratories, Inc.  
2680 East Lansing Drive  
East Lansing, MI 48823  
  
Phone: (517) 332-0167 FAX: (517) 332-6333  
  
Contacts for report questions:  
John Lavery (johnlavery@meritlabs.com)  
Barbara Ball (bball@meritlabs.com)

**Report Summary**  
Lab Sample ID(s): S39891.01-S39891.05  
Project: Erickson AM MI New Wells 7B, 7C & 12B  
Collected Date(s): 09/01/2022  
Submitted Date/Time: 09/01/2022 15:15  
Sampled by: Marc Wahrer  
P.O. #:

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Maya Murshak  
Technical Director



## General Report Notes

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Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile, and 2-chloroethylvinyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (\*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

## Report Narrative

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All analyses completed

## Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Alaska CSLAP	#17-001
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

## Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

## Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



## Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1 (1993)
SM2320B	Standard Method 2320 B 2011
SM2340C	Standard Method 2340 C 2011
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007





## Sample Summary (5 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S39891.01	MW-7B L209143-01	Groundwater	09/01/22 11:56
S39891.02	MW-7C L209143-02	Groundwater	09/01/22 13:21
S39891.03	MW-12B L209143-03	Groundwater	09/01/22 09:41
S39891.04	Field Dupe MW-12B L209143-04	Groundwater	09/01/22 09:41
S39891.05	Field Blank L209143-05	Water	09/01/22 08:35



# Analytical Laboratory Report

Lab Sample ID: S39891.01

Sample Tag: MW-7B L209143-01

Collected Date/Time: 09/01/2022 11:56

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	4.5	IR
2	1L Plastic	None	Yes	4.5	IR
1	125ml Plastic	HNO3	Yes	4.5	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	09/06/22 09:30	JRH	
Metal Digestion	Completed	SW3015A	09/02/22 09:50	CCM	

### Inorganics

Method: E300.0, Run Date: 09/02/22 09:01, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 09/02/22 10:16, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	390	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 09/02/22 11:22, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	29	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 09/02/22 17:10, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	356	50	10	mg/L	2		

Method: SM2540D, Run Date: 09/01/22 17:10, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 09/02/22 11:47, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.009	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	3.17	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.05	0.02	0.00192	mg/L	5	7439-89-6	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S39891.01 (continued)

Sample Tag: MW-7B L209143-01

**Method: E200.8, Run Date: 09/02/22 11:47, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.032	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 09/02/22 15:22, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	9.14	1.0	0.0435	mg/L	5	7440-70-2	
Magnesium	2.84	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	5.61	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	140	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 09/06/22 13:39, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.0000160	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 09/20/22 11:45, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Lab Sample ID: S39891.02

Sample Tag: MW-7C L209143-02

Collected Date/Time: 09/01/2022 13:21

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	4.5	IR
2	1L Plastic	None	Yes	4.5	IR
1	125ml Plastic	HNO3	Yes	4.5	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	09/06/22 09:30	JRH	
Metal Digestion	Completed	SW3015A	09/02/22 09:50	CCM	

### Inorganics

Method: E300.0, Run Date: 09/02/22 10:01, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	93	25	0.32	mg/L	25	16887-00-6	

Method: E300.0, Run Date: 09/02/22 09:11, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	

Method: E300.0, Run Date: 09/02/22 10:45, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sulfate	703	50	5.2	mg/L	50	14808-79-8	

Method: SM2320B, Run Date: 09/02/22 10:18, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	170	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 09/02/22 11:24, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	764	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 09/02/22 17:10, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	1,370	50	10	mg/L	2		

Method: SM2540D, Run Date: 09/01/22 17:10, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 09/02/22 11:51, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.006	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.047	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	



# Analytical Laboratory Report

Lab Sample ID: S39891.02 (continued)

Sample Tag: MW-7C L209143-02

**Method: E200.8, Run Date: 09/02/22 11:51, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Boron	7.24	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	0.0008	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	4.11	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.137	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.405	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	0.008	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 09/02/22 15:23, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	247	1.0	0.0435	mg/L	5	7440-70-2	
Magnesium	42.2	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	5.88	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	99.1	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 09/06/22 13:42, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.0000160	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 09/20/22 11:45, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Lab Sample ID: S39891.03

Sample Tag: MW-12B L209143-03

Collected Date/Time: 09/01/2022 09:41

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	4.5	IR
2	1L Plastic	None	Yes	4.5	IR
1	125ml Plastic	HNO3	Yes	4.5	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	09/06/22 09:30	JRH	
Metal Digestion	Completed	SW3015A	09/02/22 09:50	CCM	

### Inorganics

Method: E300.0, Run Date: 09/02/22 09:21, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 09/02/22 10:20, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	400	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 09/02/22 11:26, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	91	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 09/02/22 17:10, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	360	50	10	mg/L	2		

Method: SM2540D, Run Date: 09/01/22 17:10, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 09/02/22 11:57, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.028	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	3.52	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.37	0.02	0.00192	mg/L	5	7439-89-6	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S39891.03 (continued)

Sample Tag: MW-12B L209143-03

**Method: E200.8, Run Date: 09/02/22 11:57, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.041	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 09/02/22 15:25, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	26.2	1.0	0.0435	mg/L	5	7440-70-2	
Magnesium	8.33	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	8.18	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	113	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 09/06/22 13:45, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	0.0002	0.0002	0.0000160	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 09/20/22 11:45, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Lab Sample ID: S39891.04

Sample Tag: Field Dupe MW-12B L209143-04

Collected Date/Time: 09/01/2022 09:41

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	4.5	IR
2	1L Plastic	None	Yes	4.5	IR
1	125ml Plastic	HNO3	Yes	4.5	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	09/06/22 09:30	JRH	
Metal Digestion	Completed	SW3015A	09/02/22 09:50	CCM	

### Inorganics

Method: E300.0, Run Date: 09/02/22 09:31, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 09/02/22 10:22, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	400	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 09/02/22 11:28, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	95	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 09/02/22 17:10, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	370	50	10	mg/L	2		

Method: SM2540D, Run Date: 09/01/22 17:10, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	3	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 09/02/22 12:03, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.028	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	3.35	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.37	0.02	0.00192	mg/L	5	7439-89-6	





# Analytical Laboratory Report

Final Report

Lab Sample ID: S39891.04 (continued)  
Sample Tag: Field Dupe MW-12B L209143-04

**Method: E200.8, Run Date: 09/02/22 12:03, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.038	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 09/02/22 15:26, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	26.2	1.0	0.0435	mg/L	5	7440-70-2	
Magnesium	8.65	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	8.36	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	115	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 09/06/22 13:49, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	0.0002	0.0002	0.0000160	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 09/20/22 11:45, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Lab Sample ID: S39891.05

Sample Tag: Field Blank L209143-05

Collected Date/Time: 09/01/2022 08:35

Matrix: Water

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	4.5	IR
2	1L Plastic	None	Yes	4.5	IR
1	125ml Plastic	HNO3	Yes	4.5	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	09/06/22 09:30	JRH	
Metal Digestion	Completed	SW3015A	09/02/22 09:50	CCM	

### Inorganics

Method: E300.0, Run Date: 09/02/22 09:41, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	2.5	0.03	mg/L	2.5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.04	mg/L	2.5	16984-48-8	
Sulfate	Not detected	2.5	0.26	mg/L	2.5	14808-79-8	

Method: SM2320B, Run Date: 09/02/22 10:24, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	Not detected	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 09/02/22 11:30, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	Not detected	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 09/02/22 17:10, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	Not detected	50	10	mg/L	2		

Method: SM2540D, Run Date: 09/01/22 17:10, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 09/02/22 11:40, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00102	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.000102	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.0000648	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.0000862	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.000702	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.0000760	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.0000386	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.0000434	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000150	mg/L	2	7440-50-8	
Iron	Not detected	0.02	0.000768	mg/L	2	7439-89-6	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S39891.05 (continued)

Sample Tag: Field Blank L209143-05

**Method: E200.8, Run Date: 09/02/22 11:40, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.0000760	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000654	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.0000868	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000100	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.000838	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.0000270	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.0000342	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.0000558	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.000292	mg/L	2	7440-66-6	

**Method: E200.8, Run Date: 09/02/22 15:18, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	1.0	0.0174	mg/L	2	7440-70-2	
Magnesium	Not detected	0.50	0.00480	mg/L	2	7439-95-4	
Potassium	Not detected	0.50	0.00920	mg/L	2	7440-09-7	
Sodium	Not detected	0.50	0.00340	mg/L	2	7440-23-5	

**Method: E245.1, Run Date: 09/06/22 13:52, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.0000160	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 09/20/22 11:45, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

# Merit Laboratories Login Checklist

Lab Set ID:S39891

Client:BWL01 (Board of Water & Light)

Project: Erickson AM MI New Wells 7B, 7C & 12B

Submitted:09/01/2022 15:15 Login User: PFD

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental\_Laboratory@LBWL.com

Selection	Description	Note
-----------	-------------	------

## Sample Receiving

- |     |  |  |        |
|-----|--|--|--------|
| 01. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples are received at 4C +/- 2C Thermometer #        | IR 4.5 |
| 02. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Received on ice/ cooling process begun                 |        |
| 03. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples shipped  |        |
| 04. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples left in 24 hr. drop box                        |        |
| 05. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Are there custody seals/tape or is the drop box locked |        |

## Chain of Custody

- |     |  |  |     |
|-----|--|--|-----|
| 06. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC adequately filled out                |     |
| 07. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC signed and relinquished to the lab   |     |
| 08. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sample tag on bottles match COC          |     |
| 09. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Subcontracting needed? Subcontracted to: | GEL |

## Preservation

- |     |  |   |  |
|-----|--|---|--|
| 10. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Do sample have correct chemical preservation        |  |
| 11. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Completed pH checks on preserved samples? (no VOAs) |  |
| 12. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Did any samples need to be preserved in the lab?    |  |

## Bottle Conditions

- |     |  |   |  |
|-----|--|---|--|
| 13. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | All bottles intact                            |  |
| 14. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Appropriate analytical bottles are used       |  |
| 15. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Merit bottles used                            |  |
| 16. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sufficient sample volume received             |  |
| 17. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples require laboratory filtration         |  |
| 18. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples submitted within holding time         |  |
| 19. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Do water VOC or TOX bottles contain headspace |  |

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: \_\_\_\_\_ Date: \_\_\_\_\_

# Merit Laboratories Bottle Preservation Check

Lab Set ID: S39891 Submitted: 09/01/2022 15:15

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI New Wells 7B, 7C & 12B

Initial Preservation Check: 09/01/2022 15:55 PFD

Preservation Recheck (E200.8): N/A

Attention: Jennifer Caporale  
Address: Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901

Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S39891.01	125ml Plastic HNO3	<2			
S39891.01	1L Plastic HNO3	<2			
S39891.01	1L Plastic HNO3	<2			
S39891.02	125ml Plastic HNO3	<2			
S39891.02	1L Plastic HNO3	<2			
S39891.02	1L Plastic HNO3	<2			
S39891.03	125ml Plastic HNO3	<2			
S39891.03	1L Plastic HNO3	<2			
S39891.03	1L Plastic HNO3	<2			
S39891.04	125ml Plastic HNO3	<2			
S39891.04	1L Plastic HNO3	<2			
S39891.04	1L Plastic HNO3	<2			
S39891.05	125ml Plastic HNO3	<2			
S39891.05	1L Plastic HNO3	<2			
S39891.05	1L Plastic HNO3	<2			



2680 East Lansing Dr., East Lansing, MI 48823  
 Phone (517) 332-0167 Fax (517) 332-4034  
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

**REPORT TO** **CHAIN OF CUSTODY RECORD** **INVOICE TO**

CONTACT NAME <b>Jennifer Caporale</b>			CONTACT NAME <b>Kelly Gleason</b> <input checked="" type="checkbox"/> SAME		
COMPANY <b>Lansing Board of Water and Light</b>			COMPANY		
ADDRESS <b>PO Box 13007 48901-3007</b>			ADDRESS		
CITY <b>Lansing</b>	STATE <b>Mi</b>	ZIP CODE <b>48901</b>	CITY	STATE	ZIP CODE
PHONE NO. <b>517-702-6372</b>	FAX NO.	P.O. NO.	PHONE NO.	E-MAIL ADDRESS <b>Kelly.Gleason@lbwl.com</b>	
E-MAIL ADDRESS <b>Environmental_Laboratory@lbwl.com</b>		QUOTE NO.			

PROJECT NO./NAME <b>Erickson AM MI Wells 7B,7C&amp;12B</b>	SAMPLER(S) - PLEASE PRINT/SIGN NAME <b>Marc Wahrer</b>
TURNAROUND TIME REQUIRED <input type="checkbox"/> 1 DAY <input checked="" type="checkbox"/> 2 DAYS <input type="checkbox"/> 3 DAYS <input type="checkbox"/> STANDARD <input checked="" type="checkbox"/> OTHER <b>ASAP</b>	
DELIVERABLES REQUIRED <input type="checkbox"/> STD <input type="checkbox"/> LEVEL II <input checked="" type="checkbox"/> LEVEL III <input type="checkbox"/> LEVEL IV <input checked="" type="checkbox"/> EDD <input type="checkbox"/> OTHER	
MATRIX CODE: <b>GW</b> -GROUNDWATER <b>WW</b> -WASTEWATER <b>S</b> -SOIL <b>L</b> -LIQUID <b>SD</b> -SOLID <b>SL</b> -SLUDGE <b>DW</b> -DRINKING WATER <b>O</b> -OIL <b>WP</b> -WIPE <b>A</b> -AIR <b>W</b> -WASTE	# Containers & Preservatives

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO <sub>3</sub>	H <sub>2</sub> SO <sub>4</sub>	HNOH	MHOH	OTHER	Total Metals	F- undistilled, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	HCO <sub>3</sub> , CO <sub>3</sub> , Hardness	Certifications		Project Locations	Special Instructions	
	DATE	TIME																	<input type="checkbox"/> OHIO VAP	<input type="checkbox"/> Drinking Water			
<b>39889/01</b>	<b>9/1/22</b>	<b>1156</b>	MW-7B <b>L209143-01</b>	GW	5	2	3						✓	✓	✓	✓	✓	✓	<input type="checkbox"/> DoD	<input checked="" type="checkbox"/> NPDES	<input type="checkbox"/> Detroit	<input type="checkbox"/> New York	Metals to analyse: Na, Mg, K
<b>.02</b>		<b>1321</b>	MW-7C <b>-02</b>	GW	5	2	3						✓	✓	✓	✓	✓	✓	<input type="checkbox"/> Other		<input type="checkbox"/> Other		B, Ca, Sb, As, Ba, Be, Cd, Cr,
<b>.03</b>		<b>941</b>	MW-12B <b>-03</b>	GW	5	2	3						✓	✓	✓	✓	✓	✓			<input type="checkbox"/> Other		Co, Li, Hg, Mo, Pb, Se, Tl,
<b>.04</b>		<b>941</b>	Field Dupe MW-12B <b>-04</b>	GW	5	2	3						✓	✓	✓	✓	✓	✓			<input type="checkbox"/> Other		Fe, Cu, Ni, Ag, V, Zn
<b>.05</b>		<b>835</b>	Field Blank <b>-05</b>	DI	5	2	3						✓	✓	✓	✓	✓	✓			<input type="checkbox"/> Other		Please send a preliminary report

RELINQUISHED BY: SIGNATURE/ORGANIZATION <i>[Signature]</i> <b>Sampler</b>	DATE <b>9-1-22</b> TIME <b>1515</b>	RELINQUISHED BY: SIGNATURE/ORGANIZATION	DATE	TIME		
RECEIVED BY: SIGNATURE/ORGANIZATION <i>[Signature]</i>	DATE <b>9/1/22</b> TIME <b>1515</b>	RECEIVED BY: SIGNATURE/ORGANIZATION	DATE	TIME		
RELINQUISHED BY: SIGNATURE/ORGANIZATION	DATE	TIME	SEAL NO.	SEAL INTACT YES <input type="checkbox"/> NO <input type="checkbox"/>	INITIALS	NOTES <b>TEMP ON ARRIVAL</b> <b>4.9</b>
RECEIVED BY: SIGNATURE/ORGANIZATION	DATE	TIME	SEAL NO.	SEAL INTACT YES <input type="checkbox"/> NO <input type="checkbox"/>	INITIALS	

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

## Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total	Baryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6mos	0.150
Be, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Chloride	250 mL plastic	mg/L	Chill	300.0	6 mos	2.5
Cl	Chromium	250 mL plastic	mg/L	Chill	200.8	28 d	10
Cr, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Fluoride	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
F	Iron	250 mL plastic	mg/L	None	9056	28 d	1.0
Fe, total	Lead	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Pb, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Li, total	Mercury	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Hg, total	Molybdenum	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Mo, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Radium 226 and 228 combined	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
RA226/228	Selenium	(2) 1 L plastic	pCi/L	HNO3	SM 7500	6 mos	2.0 combined
Se, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ag, total	Sulfate	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
SO4	Thallium	250 mL plastic	mg/L	Chill	300.0	28 d	10
Tl, total	Total Dissolved Solids	1 L plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
TDS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TSS	Vanadium	250 mL plastic	mg/L	Nitric Acid	SM 2540D	NA	3
V, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Zn, total				Nitric Acid	200.8	6 mos	0.005



September 20, 2022

John Laverty  
Merit Laboratories Inc.  
2680 East Lansing Drive  
East Lansing, Michigan 48823

Re: Routine Analysis  
Work Order: 592371  
SDG: S39891

Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on September 08, 2022. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at [www.gel.com](http://www.gel.com).

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,

Heather Millar for  
Delaney Stone  
Project Manager

Purchase Order: GELP20-0018  
Enclosures





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# Case Narrative

**Receipt Narrative  
for  
Merit Laboratories, Inc.  
SDG: S39891  
Work Order: 592371**

**September 20, 2022**

**Laboratory Identification:**

GEL Laboratories LLC  
2040 Savage Road  
Charleston, South Carolina 29407  
(843) 556-8171

**Summary:**

**Sample receipt:** The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on September 08, 2022 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

**Sample Identification:** The laboratory received the following samples:

<b><u>Laboratory ID</u></b>	<b><u>Client ID</u></b>
592371001	S39891.01
592371002	S39891.02
592371003	S39891.03
592371004	S39891.04 Field Dupe
592371005	S39891.05 Field Blank

**Case Narrative:**

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.

A handwritten signature in black ink that reads "Heather Millar". The signature is written in a cursive style with a vertical line on the left side of the word "Heather".

Heather Millar for  
Delaney Stone  
Project Manager

# **Chain of Custody and Supporting Documentation**



2680 East Lansing Dr., East Lansing, MI 48823  
 Phone (517) 332-0167 Fax (517) 332-4034  
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

592371

**REPORT TO**

CONTACT NAME: Project Management Team  
 COMPANY: Merit Laboratories  
 ADDRESS: 2680 East Lansing Drive  
 CITY: East Lansing  
 PHONE NO.: 517-332-0167  
 E-MAIL ADDRESS: results@meritlabs.com

**CHAIN OF CUSTODY RECORD**

CONTACT NAME: Julie Teague  
 COMPANY: Merit Laboratories  
 ADDRESS: 2680 East Lansing Drive  
 CITY: East Lansing  
 PHONE NO.: 517-332-0167  
 E-MAIL ADDRESS: juliet@meritlabs.com

**INVOICE TO**

CONTACT NAME:  HOME  
 COMPANY: Merit Laboratories  
 ADDRESS: 2680 East Lansing Drive  
 CITY: East Lansing  
 PHONE NO.: 517-332-0167  
 E-MAIL ADDRESS: juliet@meritlabs.com  
 STATE: MI  
 ZIP CODE: 48823

PROJECT NO./NAME: S39891

SAMPLER(S) - PLEASE PRINT/SIGN NAME: \_\_\_\_\_  
 TURNAROUND TIME REQUIRED:  1 DAY  2 DAYS  3 DAYS  STANDARD  OTHER  
 DELIVERABLES REQUIRED:  STD  LEVEL II  LEVEL III  LEVEL IV  EDD  OTHER

MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID  
 SL=SLUDGE DW=DRINKING WATER O=OIL WP=WPE A=AIR W=WASTE

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR	DATE	TIME	IDENTIFICATION-DESCRIPTION	SAMPLE TAG	MATRIX	# OF BOTTLES	# Containers & Preservatives															
								NONE	HCl	HNO3	H2SO4	NaOH	MeOH	OTHER									
	9/1/22	1156		S39891.01	GW	2	2																
	9/1/22	1321		S39891.02	GW	2	2																
	9/1/22	0941		S39891.03	GW	2	2																
	9/1/22	0941		S39891.04 Field Dupe	GW	2	2																
	9/1/22	0835		S39891.05 Field Blank	DI	2	2																

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

Certifications	OHIO VAP	Drinking Water	DoD	NPDES	Project Locations	Detroit	New York	Other	Special Instructions
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	* E903.1 Mod.
									** E904.0/SW 9320 Mod.
									Please use calculation product & provide Radium 226/228 combined results on the report
									(No Ice needed)
									** Subcontracted to
									GEL Laboratories, Inc.
									2040 Savage Road
									Charleston, SC 29407

RELINQUISHED BY: SIGNATURE/Organization: *M. Gilbert* DATE: 9/6/22 TIME: 1700  
 RECEIVED BY: SIGNATURE/Organization: *WPS* DATE: 9/6/22 TIME: 1700  
 RELINQUISHED BY: SIGNATURE/Organization: \_\_\_\_\_ DATE: \_\_\_\_\_ TIME: \_\_\_\_\_  
 RECEIVED BY: SIGNATURE/Organization: \_\_\_\_\_ DATE: \_\_\_\_\_ TIME: \_\_\_\_\_

RELINQUISHED BY: SIGNATURE/Organization: \_\_\_\_\_ DATE: \_\_\_\_\_ TIME: \_\_\_\_\_  
 RECEIVED BY: SIGNATURE/Organization: \_\_\_\_\_ DATE: 9/22/22 TIME: 1100  
 SEAL NO.: \_\_\_\_\_ SEAL INTACT: YES  NO   
 INITIALS: \_\_\_\_\_ INITIALS: \_\_\_\_\_  
 NOTES: \_\_\_\_\_ TEMP. ON ARRIVAL: \_\_\_\_\_

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE



**SAMPLE RECEIPT & REVIEW FORM**

DB

Client: <u>MERI</u>		SDG/AR/COC/Work Order: <u>592371/592365/592369</u>			
Received By: <u>MVH</u>		Date Received: <u>09-08-2022</u>			
Carrier and Tracking Number		Circle Applicable: FedEx Express    FedEx Ground <u>UPS</u> Field Services    Courier    Other <u>124664770362236652</u>			
Suspected Hazard Information		*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.			
A) Shipped as a DOT Hazardous?		Hazard Class Shipped: _____ UN#: _____ If UN2910, Is the Radioactive Shipment Survey Compliant? Yes ___ No ___			
B) Did the client designate the samples are to be received as radioactive?		COC notation or radioactive stickers on containers equal client designation.			
C) Did the RSO classify the samples as radioactive?		Maximum Net Counts Observed* (Observed Counts - Area Background Counts): <u>0</u> CPM / mR/Hr Classified as: Rad 1    Rad 2    Rad 3			
D) Did the client designate samples are hazardous?		COC notation or hazard labels on containers equal client designation.			
E) Did the RSO identify possible hazards?		If D or E is yes, select Hazards below. PCB's    Flammable    Foreign Soil    RCRA    Asbestos    Beryllium    Other:			
Sample Receipt Criteria		Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1	Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable:    Seals broken    Damaged container    Leaking container    Other (describe)
2	Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable:    Client contacted and provided COC    COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Preservation Method: Wet Ice    Ice Packs    Dry ice <u>None</u> Other: *all temperatures are recorded in Celsius    TEMP: <u>22</u>
4	Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Temperature Device Serial #: <u>IR2-21</u> Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable:    Seals broken    Damaged container    Leaking container    Other (describe)
6	Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Sample ID's and Containers Affected: If Preservation added, Lot#:
7	Do any samples require Volatile Analysis?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	If Yes, are Encores or Soil Kits present for solids? Yes ___ No ___ NA ___ (If yes, take to VOA Freezer) Do liquid VOA vials contain acid preservation? Yes ___ No ___ NA ___ (If unknown, select No) Are liquid VOA vials free of headspace? Yes ___ No ___ NA ___ Sample ID's and containers affected:
8	Samples received within holding time?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	ID's and containers affected:
10	Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable:    No dates on containers    No times on containers    COC missing info    Other (describe)
11	Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable:    No container count on COC    Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
13	COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable:    Not relinquished    Other (describe)
Comments (Use Continuation Form if needed):					

PM (or PMA) review: Initials SW Date 9/9/22 Page 1 of 1

# Laboratory Certifications



**List of current GEL Certifications as of 20 September 2022**

<b>State</b>	<b>Certification</b>
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122023-3
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2022-137
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122021-36
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

# **Radiological Analysis**

# Case Narrative

**Radiochemistry  
Technical Case Narrative  
Merit Laboratories, Inc.  
SDG #: S39891  
Work Order #: 592371**

**Product:** GFPC Ra228, Liquid

**Analytical Method:** EPA 904.0/SW846 9320 Modified

**Analytical Procedure:** GL-RAD-A-063 REV# 5

**Analytical Batch:** 2314939

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
592371001	S39891.01
592371002	S39891.02
592371003	S39891.03
592371004	S39891.04 Field Dupe
592371005	S39891.05 Field Blank
1205187899	Method Blank (MB)
1205187900	592371001(S39891.01) Sample Duplicate (DUP)
1205187901	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

**Technical Information**

**Recounts**

Sample 592371001 (S39891.01) was recounted to verify sample results. Recount is reported.

**Product:** Lucas Cell, Ra226, Liquid

**Analytical Method:** EPA 903.1 Modified

**Analytical Procedure:** GL-RAD-A-008 REV# 15

**Analytical Batch:** 2314930

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
592371001	S39891.01
592371002	S39891.02
592371003	S39891.03
592371004	S39891.04 Field Dupe
592371005	S39891.05 Field Blank

1205187875	Method Blank (MB)
1205187876	592371001(S39891.01) Sample Duplicate (DUP)
1205187877	592371001(S39891.01) Matrix Spike (MS)
1205187878	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

**Miscellaneous Information**

**Additional Comments**

The matrix spike, 1205187877 (S39891.01MS), aliquot was reduced to conserve sample volume.

**Certification Statement**

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

## GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

### Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S39891 GEL Work Order: 592371

#### The Qualifiers in this report are defined as follows:

- \* A quality control analyte recovery is outside of specified acceptance criteria
- \*\* Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

#### Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature: 

Name: Kenshalla Oston

Date: 05 OCT 2022

Title: Analyst I

# Sample Data Summary

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: October 5, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

Client Sample ID: S39891.01	Project: MERI00120
Sample ID: 592371001	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 01-SEP-22 11:56	
Receive Date: 08-SEP-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.286	+/-1.36	2.49	3.00	pCi/L		JXC9	09/19/22	1507	2314939	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.726	+/-1.38			pCi/L		NXL1	09/20/22	1145	2314938	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.440	+/-0.251	0.281	1.00	pCi/L		LXP1	09/19/22	1010	2314930	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			72.9	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit



# GEL LABORATORIES LLC

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## Certificate of Analysis

Report Date: October 5, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Lavery  
 Project: Routine Analysis

Client Sample ID: S39891.02	Project: MERI00120
Sample ID: 592371002	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 01-SEP-22 13:21	
Receive Date: 08-SEP-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.204	+/-1.01	1.85	3.00	pCi/L		JXC9	09/19/22	1332	2314939	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.810	+/-1.05			pCi/L		NXL1	09/20/22	1145	2314938	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.606	+/-0.291	0.290	1.00	pCi/L		LXP1	09/19/22	1010	2314930	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			81.9	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

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## Certificate of Analysis

Report Date: October 5, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Lavery  
 Project: Routine Analysis

Client Sample ID: S39891.03	Project: MERI00120
Sample ID: 592371003	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 01-SEP-22 09:41	
Receive Date: 08-SEP-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	-0.204	+/-1.05	2.03	3.00	pCi/L			JXC9	09/19/22	1332 2314939	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.398	+/-1.09			pCi/L			NXL1	09/20/22	1145 2314938	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.398	+/-0.280	0.407	1.00	pCi/L			LXP1	09/19/22	1010 2314930	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			78.8	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

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## Certificate of Analysis

Report Date: October 5, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

Client Sample ID: S39891.04 Field Dupe	Project: MERI00120
Sample ID: 592371004	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 01-SEP-22 09:41	
Receive Date: 08-SEP-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	1.34	+/-1.09	1.74	3.00	pCi/L		JXC9	09/19/22	1332	2314939	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.86	+/-1.12			pCi/L		NXL1	09/20/22	1145	2314938	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.519	+/-0.274	0.293	1.00	pCi/L		LXP1	09/19/22	1044	2314930	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			85.5	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

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## Certificate of Analysis

Report Date: October 5, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Lavery  
 Project: Routine Analysis

Client Sample ID: S39891.05 Field Blank	Project: MERI00120
Sample ID: 592371005	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 01-SEP-22 08:35	
Receive Date: 08-SEP-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	-0.201	+/-0.689	1.43	3.00	pCi/L		JXC9	09/19/22	1332	2314939	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.355	+/-0.723			pCi/L		NXL1	09/20/22	1145	2314938	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.355	+/-0.221	0.262	1.00	pCi/L		LXP1	09/19/22	1044	2314930	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			80.9	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# **Quality Control Summary**

# GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

## QC Summary

Report Date: October 5, 2022

Page 1 of 2

**Merit Laboratories Inc.**  
**2680 East Lansing Drive**  
**East Lansing, Michigan**

**Contact: John Laverty**

**Workorder: 592371**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Rad Gas Flow</b>											
Batch	2314939										
QC1205187900	592371001	DUP									
Radium-228	U	0.286	U	-0.445	pCi/L	N/A		N/A	JXC9	09/19/22	13:31
	Uncertainty	+/-1.36		+/-1.17							
QC1205187901	LCS										
Radium-228	44.0			41.0	pCi/L		93.1	(75%-125%)		09/19/22	13:31
	Uncertainty			+/-3.50							
QC1205187899	MB										
Radium-228			U	-0.158	pCi/L					09/19/22	13:31
	Uncertainty			+/-0.763							
<b>Rad Ra-226</b>											
Batch	2314930										
QC1205187876	592371001	DUP									
Radium-226		0.440		0.523	pCi/L	17.2		(0% - 100%)	LXP1	09/19/22	10:44
	Uncertainty	+/-0.251		+/-0.276							
QC1205187878	LCS										
Radium-226	26.5			22.2	pCi/L		83.8	(75%-125%)		09/19/22	10:44
	Uncertainty			+/-1.61							
QC1205187875	MB										
Radium-226			U	0.368	pCi/L					09/19/22	10:44
	Uncertainty			+/-0.288							
QC1205187877	592371001	MS									
Radium-226	127	0.440		110	pCi/L		86.1	(75%-125%)		09/19/22	10:44
	Uncertainty	+/-0.251		+/-7.69							

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- \*\* Analyte is a Tracer compound
- < Result is less than value reported
- > Result is greater than value reported
- BD Results are either below the MDC or tracer recovery is low
- FA Failed analysis.
- H Analytical holding time was exceeded

# GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

## QC Summary

Workorder: 592371

Page 2 of 2

Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
J											
J											
K											
L											
M											
M											
N/A											
NI											
ND											
NJ											
Q											
R											
U											
UI											
UJ											
UL											
X											
Y											
^											
h											

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where the duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

\* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

# Gas Flow Raw Data



# Batch 2314939 Check-list

This check-list was completed on 20-SEP-22 by Nat Long

This batch was reviewed by Gregory Ramsay on 20-SEP-22 and Nat Long on 20-SEP-22.

**Batch ID:**  
2314939

**Product:**  
GFC28RAL

**Description:** Gas Flow Radium 228  
GL-RAD-A-063

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
11	Has the method required detection limit been met?	Yes		
<b>Miscellaneous Information</b>				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

# Prep Logbook

## Radium-228 in Liquid

**Batch ID:** 2314939

**Analyst:** Jasmine Conley (JXC9)

**Method:** EPA 904.0/SW846 9320 Modified

**Lab SOP:** GL-RAD-A-063 REV# 5

**Instrument:** GFC-C142774667

**Due Dates for Lab:** 21-SEP-2022

**Package:** 05-OCT-2022

**SDG:** 23-SEP-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205187901	Radium-228	1965-C	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	592371001	11-SEP-2022	3	302.94	302.94	09/15/22 13:30	09/19/22 11:16
2	592371002	11-SEP-2022	3	304.75	304.75	09/15/22 13:30	09/19/22 11:16
3	592371003	11-SEP-2022	3	305.1	305.1	09/15/22 13:30	09/19/22 11:16
4	592371004	11-SEP-2022	3	300.82	300.82	09/15/22 13:30	09/19/22 11:16
5	592371005	11-SEP-2022	3	304.12	304.12	09/15/22 13:30	09/19/22 11:16
6	592620001	11-SEP-2022	3	300.14	300.14	09/15/22 13:30	09/19/22 11:16
7	1205187899 MB	11-SEP-2022	3		305.1	09/15/22 13:30	09/19/22 11:16
8	1205187900 DUP (592371001)	11-SEP-2022	3	300.35	300.35	09/15/22 13:30	09/19/22 11:16
9	1205187901 LCS	11-SEP-2022	3		305.1	09/15/22 13:30	09/19/22 11:16

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1951-D	Ba-133	.1 mL	Pipet Id: RAD-GFC-1795419 Data Entry Date2: 11-SEP-2022 00:00
REGNT 3413921	2M HCl	20 mL	
REGNT 3418276.6	29M HF (48-50%)	4 mL	
REGNT 3454370.1	Nitric Acid	5 mL	
REGNT 3465466	Barium Carrier Ra228 REG	1 mL	
REGNT 3466687	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3478604	RGF-Neodymium Substrate	5 mL	
REGNT 3481329	RGF-1M Citric Acid	5 mL	
REGNT 3483563	RGF-7M Nitric Acid	25 mL	
REGNT 3484017	RGF-50% Potassium Carbonate	2 mL	
REGNT 3484760	RGF-1.5M Ammonium Sulfate	10 mL	
REGNT 3485080.2	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	
REGNT DGA0037	2304168	2 g	

### Radium-228 Liquid

Filename : RA228.XLS  
 File type : Excel  
 Version # : 1.4.2

Tracer S/N : 1951-D  
 Tracer Exp Date : 6/2/2023  
 Tracer Volume Added: 0.10

Batch : 2314939  
 Analyst : JAS02031  
 Prep Date : 9/11/2022  
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL  
 Parmname : Radium-228  
 Required MDA : 3 pCi/L  
 Ra-228 Abundance : 1.00  
 Halflife of Ra-228 : 5.75 years  
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	592371001.1	0.3029	1.8509E-05	9/1/2022 11:56	1271.8	1.62%	927.7	1.90%	0.1	0.000200
2	592371002.1	0.3048	1.8539E-05	9/1/2022 13:21	1271.8	1.62%	1041.6	1.79%	0.1	0.000200
3	592371003.1	0.3051	1.8544E-05	9/1/2022 9:41	1271.8	1.62%	1002.4	1.82%	0.1	0.000200
4	592371004.1	0.3008	1.8473E-05	9/1/2022 9:41	1271.8	1.62%	1086.9	1.75%	0.1	0.000200
5	592371005.1	0.3041	1.8528E-05	9/1/2022 8:35	1271.8	1.62%	1029.3	1.80%	0.1	0.000200
6	592620001.1	0.3001	1.8461E-05	9/8/2022 11:45	1271.8	1.62%	1050.9	1.78%	0.1	0.000200
7	1205187899.1	0.3051	1.8544E-05	9/11/2022 0:00	1271.8	1.62%	1007.9	1.82%	0.1	0.000200
8	1205187900.1	0.3004	1.8465E-05	9/1/2022 11:56	1271.8	1.62%	1004.2	1.82%	0.1	0.000200
9	1205187901.1	0.3051	1.8544E-05	9/11/2022 0:00	1271.8	1.62%	1009.0	1.82%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063  
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated	Sample
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction	Recovery %	Recovery Error %
			Alpha	Beta										
1	4A	60	14	50	0.833	9/19/2022 15:07	9/15/2022 13:30	9/19/2022 11:16	0.994	0.647	1.000	1.057	72.9%	1.28%
2	1B	60	12	51	0.850	9/19/2022 13:32	9/15/2022 13:30	9/19/2022 11:16	0.994	0.774	1.000	1.057	81.9%	1.24%
3	1D	60	6	51	0.850	9/19/2022 13:32	9/15/2022 13:30	9/19/2022 11:16	0.994	0.774	1.000	1.057	78.8%	1.25%
4	2A	60	9	68	1.133	9/19/2022 13:32	9/15/2022 13:30	9/19/2022 11:16	0.994	0.774	1.000	1.057	85.5%	1.23%
5	2B	60	11	23	0.383	9/19/2022 13:32	9/15/2022 13:30	9/19/2022 11:16	0.994	0.774	1.000	1.057	80.9%	1.24%
6	2D	60	10	65	1.083	9/19/2022 13:32	9/15/2022 13:30	9/19/2022 11:16	0.996	0.774	1.000	1.057	82.6%	1.24%
7	3B	60	7	29	0.483	9/19/2022 13:31	9/15/2022 13:30	9/19/2022 11:16	0.997	0.775	1.000	1.057	79.3%	1.25%
8	3C	60	17	68	1.133	9/19/2022 13:31	9/15/2022 13:30	9/19/2022 11:16	0.994	0.775	1.000	1.057	79.0%	1.25%
9	3D	60	21	629	10.483	9/19/2022 13:31	9/15/2022 13:30	9/19/2022 11:16	0.997	0.775	1.000	1.057	79.3%	1.25%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2022	5/31/2023	0.6013	0.01123	0.782	9/17/2022 12:42	500
2	PIC	6/1/2022	5/31/2023	0.6068	0.00711	0.800	9/17/2022 12:42	500
3	PIC	6/1/2022	5/31/2023	0.6048	0.00692	0.898	9/17/2022 12:42	500
4	PIC	6/1/2022	5/31/2023	0.6201	0.01914	0.788	9/17/2022 12:42	500
5	PIC	6/1/2022	5/31/2023	0.6097	0.02111	0.432	9/17/2022 12:42	500
6	PIC	6/1/2022	5/31/2023	0.6046	0.00745	0.816	9/17/2022 12:42	500
7	PIC	6/1/2022	5/31/2023	0.6245	0.01614	0.522	9/17/2022 12:42	500
8	PIC	6/1/2022	5/31/2023	0.6365	0.00988	1.242	9/17/2022 12:42	500
9	PIC	6/1/2022	5/31/2023	0.5999	0.02297	0.826	9/17/2022 12:42	500

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

**Spike S/N :** N/A  
**Spike Exp Date :** N/A  
**Spike Activity (dpm/ml):** N/A  
**Spike Volume Added:** N/A

\* - RPD changed to 0% due to sample & dup activity below MDA

**LCS S/N :** 1965-C  
**LCS Exp Date :** 8/5/2023  
**LCS Activity (dpm/ml):** 298.28  
**LCS Volume Added:** 0.10

Results Pos.	Decision	Critical	Required	Sample Act.		Sample Act.	Net Count	Net Count	2 SIGMA	2 SIGMA	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
	Level pCi/L	Level pCi/L	MDA pCi/L	MDA pCi/L	Conc. pCi/L	Error %	Rate CPM	Rate Error CPM	Counting Uncertainty pCi/L	Total Prop. Uncertainty pCi/L						
1	1.5690	1.1077	3	2.4941	<b>0.2861</b>	242.17%	0.0513	0.1243	1.3579	1.3598		SAMPLE				
2	1.1634	0.8214	3	1.8470	<b>0.2043</b>	251.13%	0.0500	0.1256	1.0056	1.0069		SAMPLE				
3	1.2839	0.9064	3	2.0257	<b>-0.2043</b>	263.22%	-0.0480	0.1263	1.0539	1.0541		SAMPLE				
4	1.0973	0.7747	3	1.7435	<b>1.3409</b>	41.49%	0.3453	0.1431	1.0887	1.1402		SAMPLE				
5	0.8633	0.6095	3	1.4252	<b>-0.2008</b>	175.01%	-0.0487	0.0852	0.6887	0.6889		SAMPLE				
6	1.1849	0.8365	3	1.8791	<b>1.1015</b>	52.51%	0.2673	0.1403	1.1331	1.1662		SAMPLE				
7	0.9390	0.6630	3	1.5300	<b>-0.1579</b>	246.71%	-0.0387	0.0954	0.7633	0.7635		MB				
8	1.4537	1.0263	3	2.2575	<b>-0.4453</b>	134.54%	-0.1087	0.1462	1.1741	1.1743	592371001.1	DUP	* 0.0%			
9	1.2284	0.8673	3	1.9469	<b>41.0046</b>	5.07%	9.6573	0.4200	3.4950	10.9766		LCS			44.0378	93.1%

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
592371001	4A	60	14	50	9/19/2022 15:07	9/19/2022 16:07	PIC	2314939
592371002	1B	60	12	51	9/19/2022 13:32	9/19/2022 14:32	PIC	2314939
592371003	1D	60	6	51	9/19/2022 13:32	9/19/2022 14:32	PIC	2314939
592371004	2A	60	9	68	9/19/2022 13:32	9/19/2022 14:32	PIC	2314939
592371005	2B	60	11	23	9/19/2022 13:32	9/19/2022 14:32	PIC	2314939
592620001	2D	60	10	65	9/19/2022 13:32	9/19/2022 14:32	PIC	2314939
1205187899	3B	60	7	29	9/19/2022 13:31	9/19/2022 14:31	PIC	2314939
1205187900	3C	60	17	68	9/19/2022 13:31	9/19/2022 14:31	PIC	2314939
1205187901	3D	60	21	629	9/19/2022 13:31	9/19/2022 14:31	PIC	2314939

ASSAY 19-Sep-22 12:49:41  
 Wizard 2480 s/n 46190630  
 Protocol id 9 Ba-133\_1  
 Time limit  
 Count limit  
 Isotope Ba-133\_1  
 Protocol date 9/19/2022  
 Run id. 5566

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	94	1	180	3816	1271.76	1.62	12:49:41
	592371001	2	94	2	180	2783.57	927.67	1.9	72.94 12:52:55
	592371002	3	94	3	180	3125	1041.55	1.79	81.90 12:56:09
	592371003	4	94	4	180	3007.57	1002.41	1.82	78.82 12:59:23
	592371004	5	94	5	180	3261.57	1086.88	1.75	85.46 01:02:37
	592371005	1	21	1	180	3088.28	1029.31	1.8	80.94 01:06:24
	592620001	2	21	2	180	3153	1050.88	1.78	82.63 01:09:38
	1205187899	3	21	3	180	3024.28	1007.89	1.82	79.25 01:12:52
	1205187900	4	21	4	180	3013.28	1004.23	1.82	78.96 01:16:06
	1205187901	5	21	5	180	3027.28	1008.98	1.82	79.34 01:19:20

END OF ASSAY



# **Continuing Calibration Data**

# Gas Flow Proportional Counter Checks for 19-Sep-2022

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100A2	Above	Beta bkg	19-Sep 08:05	60	2.283	-2.15E-1	2.577	+2.37
LB4100E2	Above	Beta bkg	19-Sep 05:36	60	2.633	1.385	3.072	+1.44
LB4100E3	Above	Beta bkg	19-Sep 05:36	60	2.700	0.506	2.576	+3.36
LB4100F3	Above	Beta bkg	19-Sep 05:37	60	12.983	0.854	1.842	+70.65
LB4100G1	Above	Alpha XTalk	19-Sep 06:51	5	2.600	0.088	0.447	+39.03
LB4100G1	Above	Beta bkg	19-Sep 05:37	60	69052	0.380	1.675	+319,978.09
LB4100G1	need 2nd	Beta eff	19-Sep 06:41	5	13955	12880	18320	-1.81
LB4100G2	Above	Alpha XTalk	19-Sep 06:51	5	0.428	0.324	0.423	+3.30
LB4100G2	Above	Beta bkg	19-Sep 05:36	60	1073	1.159	2.203	+6,157.87
LB4100G3	Below	Alpha bkg	19-Sep 05:36	60	0.00E+0	0.002	0.276	-3.05
LB4100G3	Below	Alpha eff	19-Sep 06:51	5	6307	6620	7779	-4.62
LB4100G3	Above	Beta bkg	19-Sep 05:36	60	2.050	0.810	1.674	+5.61
LB4100G3	Below	Beta eff	19-Sep 06:41	5	21309	21640	22870	-4.61
LB4100H1	Above	Beta bkg	19-Sep 05:36	60	2.383	0.216	2.462	+2.79
LB4100H2	Below	Alpha eff	19-Sep 07:47	5	5050	5513	8976	-3.80
LB4100H2	Above	Alpha XTalk	19-Sep 07:47	5	0.420	0.269	0.396	+4.17
PIC1C	Above	Beta bkg	19-Sep 07:08	60	2.200	-6.21E-1	2.214	+2.97
PIC2C	Below	Alpha eff	19-Sep 07:41	5	19669	19770	21520	-3.34
PIC5C	Above	Alpha bkg	19-Sep 07:23	60	0.317	-3.69E-2	0.387	+2.01
PIC7D	Below	Alpha eff	19-Sep 05:57	5	10100	10270	10720	-5.27
PIC8B	Above	Alpha bkg	19-Sep 06:12	60	0.550	-1.16E-1	0.388	+4.94
PIC8B	Above	Beta bkg	19-Sep 06:12	60	3.100	-1.80E-1	2.341	+4.81
PIC8B	Above	Beta XTalk	19-Sep 06:04	5	0.005	2.00E-4	9.31E-4	+36.93
PIC12B	Above	Beta eff	19-Sep 06:15	5	22262	20640	22160	+3.40
PIC14B	Above	Beta bkg	19-Sep 06:28	60	2.217	-2.13E-1	2.672	+2.05

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

G5400W1W	Alpha eff, Alpha XTalk, Beta eff, Beta XTalk
G5400W1X	Alpha eff, Alpha XTalk, Beta eff, Beta XTalk
G5400W1Y	Alpha eff, Alpha XTalk, Beta eff, Beta XTalk
G5400W1Z	Alpha eff, Alpha XTalk, Beta eff, Beta XTalk
LB4100C1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
PIC12A	Alpha bkg, Beta bkg
PIC12B	Alpha bkg, Beta bkg
PIC12C	Alpha bkg, Beta bkg

Reviewed by  \_\_\_\_\_

Date 09/19/22 \_\_\_\_\_

GEL Laboratories LLC

# Runlogs

# Instrument Run Log

Instrument Type: GFPC

Batch ID: 2314939

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205187899	MB	JXC9	PIC3B	SEP-19-22 13:31:49	DONE	25mm Filter	01-JUN-22 00:00
1205187900	DUP	JXC9	PIC3C	SEP-19-22 13:31:54	DONE	25mm Filter	01-JUN-22 00:00
1205187901	LCS	JXC9	PIC3D	SEP-19-22 13:31:54	DONE	25mm Filter	01-JUN-22 00:00
592371002	SAMPLE	JXC9	PIC1B	SEP-19-22 13:32:10	DONE	25mm Filter	01-JUN-22 00:00
592371003	SAMPLE	JXC9	PIC1D	SEP-19-22 13:32:15	DONE	25mm Filter	01-JUN-22 00:00
592371004	SAMPLE	JXC9	PIC2A	SEP-19-22 13:32:19	DONE	25mm Filter	01-JUN-22 00:00
592371005	SAMPLE	JXC9	PIC2B	SEP-19-22 13:32:27	DONE	25mm Filter	01-JUN-22 00:00
592620001	SAMPLE	JXC9	PIC2D	SEP-19-22 13:32:31	DONE	25mm Filter	01-JUN-22 00:00
592371001	SAMPLE	JXC9	PIC4A	SEP-19-22 15:07:42	DONE	25mm Filter	01-JUN-22 00:00

# Lucas Cell Raw Data

# Batch 2314930 Check-list

This check-list was completed on 19-SEP-22 by Lyndsey Pace

This batch was reviewed by Gregory Ramsay on 19-SEP-22 and Lyndsey Pace on 19-SEP-22.

**Batch ID:**  
2314930

**Product:**  
LUC26RAL

**Description:** Lucas Cell Radium 226  
GL-RAD-A-008

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
<b>Miscellaneous Information</b>				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

# Prep Logbook

## Radium-226 in Liquid

**Batch ID:** 2314930  
**Analyst:** Lyndsey Pace (LXP1)  
**Method:** EPA 903.1 Modified  
**Lab SOP:** GL-RAD-A-008 REV# 15  
**Instrument:** GFC-C142774667

Due Dates for Lab: 21-SEP-2022			Package: 05-OCT-2022	SDG: 23-SEP-2022		
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205187878	Radium-226 SPIKE	1715-G	.1	mL	
MS	1205187877	Radium-226 SPIKE	1715-G	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	592371001	11-SEP-2022	1	504.99	504.99	09/14/22 08:20	601	09/19/22 06:50	09/19/22 10:10	2	17
2	592371002	11-SEP-2022	1	502.6	502.6	09/14/22 08:20	701	09/19/22 06:50	09/19/22 10:10	2	22
3	592371003	11-SEP-2022	1	504.65	504.65	09/14/22 08:20	806	09/19/22 06:50	09/19/22 10:10	7	22
4	592371004	11-SEP-2022	1	501.54	501.54	09/14/22 08:20	107	09/19/22 07:19	09/19/22 10:44	2	19
5	592371005	11-SEP-2022	1	503.73	503.73	09/14/22 08:20	205	09/19/22 07:19	09/19/22 10:44	2	15
6	592620001	11-SEP-2022	1	501.05	501.05	09/14/22 08:20	403	09/19/22 07:19	09/19/22 10:44	1	230
7	1205187875 MB	11-SEP-2022	1		504.99	09/14/22 08:20	501	09/19/22 07:19	09/19/22 10:44	7	20
8	1205187876 DUP (592371001)	11-SEP-2022	1	503.73	503.73	09/14/22 08:20	604	09/19/22 07:19	09/19/22 10:44	2	19
9	1205187877 MS (592371001)	11-SEP-2022	1	105.78	105.78	09/14/22 08:20	705	09/19/22 07:19	09/19/22 10:44	2	786
10	1205187878 LCS	11-SEP-2022	1		504.99	09/14/22 08:20	801	09/19/22 07:19	09/19/22 10:44	4	745

Reagent/Solvent Lot ID	Description	Amount	Comments:
			Data Entry Date2: 11-SEP-2022 00:00



### Radium-226 Liquid

Filename : RA226.XLS  
 File type : Excel  
 Version # : 1.3.2

**Batch** : 2314930  
**Analyst** : LIN01615  
**Prep Date** : 9/11/2022  
**Ra-226 Method Uncertainty** : 0.073648

**Procedure Code** : LUC26RAL  
**Parmname** : Radium-226  
**Required MDA** : 1 pCi/L  
**Halfife of Ra-226** : 1600 years  
**Ra-226 Abundance** : 1.00  
**Halfife of Rn-222** : 3.8235 days

**Batch counted on** : LUCAS CELL DETECTOR  
**BKG Count time** : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Count Time (min.)	Cell Efficiency (cpm/dpm)
1	592371001.1	0.5050	2.0276E-05	9/1/2022 11:56	601	30	17	0.567	2	0.067	30	1.7610
2	592371002.1	0.5026	2.0266E-05	9/1/2022 13:21	701	30	22	0.733	2	0.067	30	1.7130
3	592371003.1	0.5047	2.0275E-05	9/1/2022 9:41	806	30	22	0.733	7	0.233	30	1.9460
4	592371004.1	0.5015	2.0262E-05	9/1/2022 9:41	107	30	19	0.633	2	0.067	30	1.6990
5	592371005.1	0.5037	2.0271E-05	9/1/2022 8:35	205	30	15	0.500	2	0.067	30	1.8920
6	592620001.1	0.5011	2.0260E-05	9/8/2022 11:45	403	30	230	7.667	1	0.033	30	1.6200
7	1205187875.1	0.5050	2.0276E-05	9/11/2022 0:00	501	30	20	0.667	7	0.233	30	1.8220
8	1205187876.1	0.5037	2.0271E-05	9/1/2022 11:56	604	30	19	0.633	2	0.067	30	1.6810
9	1205187877.1	0.1058	1.1719E-05	9/1/2022 11:56	705	30	786	26.200	2	0.067	30	1.7610
10	1205187878.1	0.5050	2.0276E-05	9/11/2022 0:00	801	30	745	24.833	4	0.133	30	1.7180

Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

**Analytical SOP:** GL-RAD-A-008  
**Instrument SOP:** GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrowth End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
9.400%	7/1/2022	6/30/2023	9/14/2022 8:20	9/19/2022 6:50	9/19/2022 10:10	0.591	0.975	1.002	1.000
5.900%	11/1/2021	10/31/2022	9/14/2022 8:20	9/19/2022 6:50	9/19/2022 10:10	0.591	0.975	1.002	1.000
7.300%	4/1/2022	3/31/2023	9/14/2022 8:20	9/19/2022 6:50	9/19/2022 10:10	0.591	0.975	1.002	1.000
3.900%	4/28/2022	4/30/2023	9/14/2022 8:20	9/19/2022 7:19	9/19/2022 10:44	0.593	0.975	1.002	1.000
3.900%	8/1/2022	7/31/2023	9/14/2022 8:20	9/19/2022 7:19	9/19/2022 10:44	0.593	0.975	1.002	1.000
9.700%	2/1/2022	1/31/2023	9/14/2022 8:20	9/19/2022 7:19	9/19/2022 10:44	0.593	0.975	1.002	1.000
7.900%	6/1/2022	5/31/2023	9/14/2022 8:20	9/19/2022 7:19	9/19/2022 10:44	0.593	0.975	1.002	1.000
6.700%	7/1/2022	6/30/2023	9/14/2022 8:20	9/19/2022 7:19	9/19/2022 10:44	0.593	0.975	1.002	1.000
3.000%	11/1/2021	10/31/2022	9/14/2022 8:20	9/19/2022 7:19	9/19/2022 10:44	0.593	0.975	1.002	1.000
5.000%	4/1/2022	3/31/2023	9/14/2022 8:20	9/19/2022 7:19	9/19/2022 10:44	0.593	0.975	1.002	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

**Spike S/N :** 1715-G  
**Spike Exp Date :** 9/15/2022  
**Spike Activity (dpm/ml):** 297.49  
**Spike Volume Added:** 0.10

**LCS S/N :** 1715-G  
**LCS Exp Date :** 9/15/2022  
**LCS Activity (dpm/ml):** 297.49  
**LCS Volume Added:** 0.10

<b>Results</b>																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.1367	0.0965	1	0.2810	<b>0.4400</b>	30.54%	0.5000	0.1453	0.2506	0.2709		SAMPLE				
2	0.1412	0.0997	1	0.2902	<b>0.6059</b>	25.20%	0.6667	0.1633	0.2909	0.3118		SAMPLE				
3	0.2316	0.1635	1	0.4067	<b>0.3984</b>	36.64%	0.5000	0.1795	0.2804	0.2918		SAMPLE				
4	0.1424	0.1005	1	0.2927	<b>0.5194</b>	27.24%	0.5667	0.1528	0.2744	0.2872		SAMPLE				
5	0.1273	0.0899	1	0.2617	<b>0.3551</b>	31.96%	0.4333	0.1374	0.2208	0.2283		SAMPLE				
6	0.1057	0.0746	1	0.2455	<b>7.3451</b>	11.75%	7.6333	0.5066	0.9555	1.9968		SAMPLE				
7	0.2467	0.1742	1	0.4332	<b>0.3678</b>	40.74%	0.4333	0.1732	0.2882	0.2985		MB				
8	0.1433	0.1012	1	0.2946	<b>0.5227</b>	27.78%	0.5667	0.1528	0.2762	0.2944	592371001.1	DUP	17.2%			
9	0.6513	0.4598	1	1.3390	<b>109.5762</b>	4.67%	26.1333	0.9357	7.6899	18.7306	592371001.1	MS			126.6852	86.1%
10	0.1978	0.1396	1	0.3693	<b>22.2367</b>	6.22%	24.7000	0.9123	1.6097	4.2004		LCS			26.5364	83.8%

# **Continuing Calibration Data**



# Ludlum Alpha Scintillation Counter Checks for 19-SEP-2022

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	07:08	1	1.21E+05	120703	-1.53		
LUCAS2	EFF	07:07	1	1.31E+05	130727	-0.32		
LUCAS4	EFF	07:05	1	1.29E+05	128632	2.06		
LUCAS5	EFF	07:04	1	1.30E+05	129831	-0.98		
LUCAS6	EFF	07:03	1	1.33E+05	132872	2.16		
LUCAS7	EFF	07:02	1	1.29E+05	129385	-2.93		
LUCAS8	EFF	07:00	1	1.29E+05	128547	0.3		

**Reviewed by:**

Lyndsey Pace

**Date:** 19-SEP-22

GEL Laboratories LLC

# Runlogs

# Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2314930

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
592371001	SAMPLE	LXP1	LUCAS6	SEP-19-22 10:10:00	DONE	Lucas Cell	01-JUL-22 00:00
592371002	SAMPLE	LXP1	LUCAS7	SEP-19-22 10:10:00	DONE	Lucas Cell	01-NOV-21 00:00
592371003	SAMPLE	LXP1	LUCAS8	SEP-19-22 10:10:00	DONE	Lucas Cell	01-APR-22 00:00
592371004	SAMPLE	LXP1	LUCAS1	SEP-19-22 10:44:00	DONE	Lucas Cell	28-APR-22 00:00
592371005	SAMPLE	LXP1	LUCAS2	SEP-19-22 10:44:00	DONE	Lucas Cell	01-AUG-22 00:00
592620001	SAMPLE	LXP1	LUCAS4	SEP-19-22 10:44:00	DONE	Lucas Cell	01-FEB-22 00:00
1205187875	MB	LXP1	LUCAS5	SEP-19-22 10:44:00	DONE	Lucas Cell	01-JUN-22 00:00
1205187876	DUP	LXP1	LUCAS6	SEP-19-22 10:44:00	DONE	Lucas Cell	01-JUL-22 00:00
1205187877	MS	LXP1	LUCAS7	SEP-19-22 10:44:00	DONE	Lucas Cell	01-NOV-21 00:00
1205187878	LCS	LXP1	LUCAS8	SEP-19-22 10:44:00	DONE	Lucas Cell	01-APR-22 00:00



Environmental Laboratory  
 1232 Haco Drive  
 Lansing  
 Michigan, 48910

**CHAIN OF CUSTODY**

Phone: (517)702-6372

Lab Work Order Number

**L209143**

Client Name BWL - Erickson Station		Project Name Erickson AM MI Wells 7B,7C&12B		Requested Turn Around	
Client Contact Cheryl Louden		Project Number [none]		Requested Analyses	
Address 3725 S. Canal		Project Description		Radium 226 and Radium 228	
City Lansing		PO Number 30926 10021		C-14, F-15, S-04, TDS	
State/Zip MI, 48917		Shipped By		TSS, HCO <sub>3</sub> , CO <sub>3</sub> , Hardness	
Phone (517) 702-6396		Tracking Number		Pb, Sb, Se, Ti, V, Zn, Na, K, Mg	
Fax (517) 702-6373				Cr, Co, Cu, Fe, Hg, Li, Mo, Ni	
Sampler Marc Wahrer				Ag, As, B, Ba, Be, Ca, Cd	

Sample Name or Field ID	Sampled Date	Sampled Time	Sample Type Grab/Composite	Matrix Code	Container Count	Preservation Code						Sample	Comments
						a	b	a	b	a	b		
MW-7B	9/1/22	1156	G	GW	5	1	1	1	1	2			
MW-7C	↓	1321	G	GW	5	1	1	1	1	2			
MW-12B	↓	0941	G	GW	5	1	1	1	1	2			
Field Duplicate MW-12B	↓	0941	G	GW	5	1	1	1	1	2			
Field Blank	↓	0835	G	DI	5	1	1	1	1	2			

Relinquished By 	Date/Time 9/1/22 1445	Received By K. Hession	Date/Time 9/1/22 1445	Comments
Relinquished By	Date/Time	Received By	Date/Time	Comments
Relinquished By	Date/Time	Received By	Date/Time	Comments

Cooler Numbers and Temperatures

Matrix Codes: Dis-Deionised Water, GW=Ground Water

Preserv Codes: a=None, b=0.5% HNO3



## Data Verification & Validation Report

### Lansing Board of Water & Light – Erickson Power Station

**Sampling Event (dates and purpose):** New Wells 7B, 7C, 12B Background Round 6 – September 2022

Data Package Number: S39891.01(02)

Lab Report Date: 10/05/2022

Data Validator: Aryka Thomson

Data Validation Completion Date: 11/14/2022

General Overall Assessment:

Data are usable without qualification.

Data are usable with qualification (as noted below).

Some or all data are unusable (as noted below).

Wells planned for sampling:

Well ID	Planned for Sampling
MW-1	
MW-2	
MW-3	
MW-4	
MW-5	
MW-6	
MW-7	
MW-7B	X
MW-7C	X
MW-8	
MW-9	
MW-10	
MW-11	
MW-11B	
MW-12	
MW-12B	X
MW-13	

### Data Summary

Sample ID	Matrix	Lab ID	Date Collected	App III Metals	App IV Metals	Part 115 Metals	Anions	TDS TSS	Rad-226 Rad-228	Diss. Metals
MW-7B	GW	S39891.01	09/01/2022	X	X	X	X	X	X	
MW-7C	GW	S39891.02	09/01/2022	X	X	X	X	X	X	
MW-12B	GW	S39891.03	09/01/2022	X	X	X	X	X	X	
MW-12B Dup	QC	S39891.04	09/01/2022	X	X	X	X	X	X	

Other analytes requested for analysis: Na, Mg, K, HCO<sub>3</sub>, CO<sub>3</sub>, hardness

Any planned sampling or analysis NOT completed? If yes, explain: \_\_\_\_\_

**Data Verification & Validation Checklist**

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
<b>Field Data</b>							
Sample Collection Field Forms	X		Purging performed as required in the Groundwater Monitoring Plan	X			
Field Calibration Records	X		Field instruments calibrated daily according to manufacturer specifications	X			
Chain of Custody	X		Accurately reflect samples, collection dates/times, analyses, bottles, etc.	X			
Field decontamination documentation	N/A		Record of decontamination for non-dedicated sampling equipment			X	
Drilling logs	X		N/A	-	-	-	
Well construction logs	X		N/A	-	-	-	
Well development field forms	X		N/A	-	-	-	
<b>Analytical Data Package</b>							
Cover Sheet	X		N/A	-	-	-	
Case Narrative	X		Summarizes sample receipt and any exceptions to QC acceptance criteria	X			
Internal Laboratory Chain of Custody forms	X		Analyses as requested; accurate transcription of field COC	X			
Sample Chronology and Consistency	X		Accurate representation of dates, times of receipt, preparation, and analysis	X			
Communication Records with Lab	X		N/A	-	-	-	
EDD Format Consistency	X		EDD format and content as requested	X			
Sample Identification, Results Nomenclature, and Data Qualifier Consistency	X		All included in final report	X			
Method Detection Limit Consistency	X		MDLs consistent between samples		X		Dilution varies between samples
Instrument Calibration Records	X		Present and no nonconformance noted	X			
Laboratory Report Complete	X		Includes QC component	X			
Holding Times	X		Analyses performed within allowed holding time	X			

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Method	X		Method as requested	X			
Reporting Limits			RLs as requested	X			RLs for chloride, sulfate, hardness, TDS were not met
	X		MDLs<RLs	X			
			MDLs<GPS			X	
<b>QC Validation</b>							
<b>Evaluate Accuracy</b>							
Matrix Spike (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Laboratory Control Sample (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
<b>Evaluate Precision</b>							
Matrix Spike Duplicate (RPD)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Field Duplicate (RPD)	X		RPD ≤ 20%		X		Radium-226+228 RPD is 65% TSS non-detect in parent, detected in field dup
<b>Evaluate Representativeness</b>							
Equipment Blanks (if applicable)	N/A		Non-detect (<RL)			X	
<b>QC Verification</b>							
<b>Verify Instrument Calibration &amp; Analytical Process</b>							
Initial Calibration Verification	X		Laboratory-determined	-	-	-	
Continuing Calibration Verification	X		Laboratory-determined	-	-	-	
Initial Calibration Blank	X		Laboratory-determined	-	-	-	
Continuing Calibration Blank	X		Laboratory-determined	-	-	-	
Serial Dilutions	X		Laboratory-determined	-	-	-	High recovery for Al, As, Ca, Cd, Fe, Li, and Mn
Post-Digestion Spikes	X		Laboratory-determined	-	-	-	
Internal Standards	X		Laboratory-determined	-	-	-	
Laboratory Duplicate (RPD)	X		Laboratory-determined	-	-	-	
Method Blanks	X		Laboratory-determined	-	-	-	
<b>Evaluate Completeness (# usable measurements/ # unusable measurements)</b>							
Completeness	X		100%	X			

Other instances of nonconformance to QC control limits noted on case narrative:

Rad-228 - Sample 592371001 (S39891.01) was recounted to verify sample results. Recount is reported.

Comments:

Combined Radium-226+228 field duplicate RPD is 65%. Combined Radium and Rad-228 required qualification as estimated with low bias (J-) in the parent sample MW-12B and as estimated with high bias (J+) in the field duplicate MW-12B-Dup.

TSS required qualification as estimated with high bias (J+) in the field duplicate and estimated but not detected in the parent sample (UJ) since it was non-detect in the parent but detected in the field duplicate and RPD cannot be evaluated.



Lansing Board of Water and Light  
Environmental Services Laboratory (MI00079)  
1232 Haco Dr.  
Lansing, Michigan 48901

24 October 2022

BWL - Erickson Station  
Attn: Cheryl Loudon  
3725 S. Canal  
Lansing, MI 48917

**Project: Erickson AM MI**

Dear Cheryl Loudon,

Enclosed is a copy of the laboratory report for the following work order(s) received by Lansing Board of Water and Light Environmental Services Laboratory:

<b>Work Order</b>	<b>Received</b>	<b>Account Number</b>
L209219	9/21/2022 3:12:00PM	30926 10021

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in blue ink that reads "Jennifer Caporale".

Jennifer Caporale, Supervisor



**Analytical Report**

**Client:** BWL - Erickson Station  
**Address:** 3725 S. Canal  
 Lansing MI, 48917

**Client Project Manager:** Cheryl Louden

**Report Date:** 10/24/2022

**Sample Name:** MW-11

**Lab #:** L209219-01 Ground Water

**Collected:** 21-Sep-22 11:40

**By:** Marc Wahrer

Analyte	Reporting			Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit	Units						
Conductivity	1100	1.0	uS/cm	1		21-Sep-22 11:40	maw	SM 2510B	
Dissolved oxygen	0.180	0.100	mg/L	1		21-Sep-22 11:40	maw	FIELD	
Milliliters Purged	250		ml/min	1		21-Sep-22 11:40	maw	FIELD	
Oxidation Reduction Potential	-122.9	-999.0	mV	1		21-Sep-22 11:40	maw	FIELD	
pH	6.9	7.0	pH Units	1		21-Sep-22 11:40	maw	SM 4500H+B	
Temperature	16		°C	1		21-Sep-22 11:40	maw	SM 2550B	
Turbidity	5.2	0.10	NTU	1		21-Sep-22 11:40	maw	SM 2130B	

**Sample Name:** MW-12

**Lab #:** L209219-02 Ground Water

**Collected:** 21-Sep-22 14:10

**By:** Marc Wahrer

Analyte	Reporting			Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit	Units						
Conductivity	1600	1.0	uS/cm	1		21-Sep-22 14:10	maw	SM 2510B	
Dissolved oxygen	1.95	0.100	mg/L	1		21-Sep-22 14:10	maw	FIELD	
Milliliters Purged	240		ml/min	1		21-Sep-22 14:10	maw	FIELD	
Oxidation Reduction Potential	15.20	-999.0	mV	1		21-Sep-22 14:10	maw	FIELD	
pH	7.4	7.0	pH Units	1		21-Sep-22 14:10	maw	SM 4500H+B	
Temperature	16		°C	1		21-Sep-22 14:10	maw	SM 2550B	
Turbidity	46	0.10	NTU	1		21-Sep-22 14:10	maw	SM 2130B	

**Sample Name:** MW-13

**Lab #:** L209219-03 Ground Water

**Collected:** 21-Sep-22 13:38

**By:** Marc Wahrer

Analyte	Reporting			Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit	Units						
Conductivity	640	1.0	uS/cm	1		21-Sep-22 13:38	maw	SM 2510B	
Dissolved oxygen	3.83	0.100	mg/L	1		21-Sep-22 13:38	maw	FIELD	
Milliliters Purged	270		ml/min	1		21-Sep-22 13:38	maw	FIELD	
Oxidation Reduction Potential	84.80	-999.0	mV	1		21-Sep-22 13:38	maw	FIELD	
pH	7.2	7.0	pH Units	1		21-Sep-22 13:38	maw	SM 4500H+B	
Temperature	17		°C	1		21-Sep-22 13:38	maw	SM 2550B	
Turbidity	4.2	0.10	NTU	1		21-Sep-22 13:38	maw	SM 2130B	



## Analytical Report

**Client:** BWL - Erickson Station

**Client Project Manager:** Cheryl Louden

**Report Date:** 10/24/2022

**Address:** 3725 S. Canal  
Lansing MI, 48917

**Approved By:** \_\_\_\_\_

*Jennifer Caporale*

### Notes and Definitions

- AL Action Level (Action Level = Regulatory Limit)
  - MCL Maximum Contaminant Level
  - PEL Permissible Exposure Limit (Permissible Exposure Limit = Regulatory Limit)
  - RPD Relative Percent Difference
  - OT Odor Threshold
  - ND Non Detect is less than the reporting limit value
- All drinking water regulatory limits are MCL's with the exception of Lead and Copper unless otherwise noted.



Report ID: S40562.01(03)  
Generated on 10/21/2022  
Replaces report S40562.01(02) generated on 09/27/2022

**Report to**  
Attention: Jennifer Caporale  
Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901  
  
Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

**Report produced by**  
Merit Laboratories, Inc.  
2680 East Lansing Drive  
East Lansing, MI 48823  
  
Phone: (517) 332-0167 FAX: (517) 332-6333  
  
Contacts for report questions:  
John Lavery (johnlavery@meritlabs.com)  
Barbara Ball (bball@meritlabs.com)

**Report Summary**  
Lab Sample ID(s): S40562.01-S40562.05  
Project: Erickson AM MI Wells 11-13  
Collected Date(s): 09/21/2022  
Submitted Date/Time: 09/21/2022 15:50  
Sampled by: Marc Wahrer  
P.O. #:

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Maya Murshak  
Technical Director





## General Report Notes

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Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile, and 2-chloroethylvinyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (\*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

## Report Narrative

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All analyses completed

## Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Alaska CSLAP	#17-001
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

## Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

## Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



## Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1 (1993)
SM2320B	Standard Method 2320 B 2011
SM2340C	Standard Method 2340 C 2011
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007



### Sample Summary (5 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S40562.01	MW-11 L209219-01	Groundwater	09/21/22 11:40
S40562.02	MW-12 L209219-02	Groundwater	09/21/22 14:10
S40562.03	MW-13 L209219-03	Groundwater	09/21/22 13:38
S40562.04	Field Dupe MW-11 L209219-04	Groundwater	09/21/22 11:40
S40562.05	Field Blank L209219-05	Water	09/21/22 08:20



Lab Sample ID: S40562.01

Sample Tag: MW-11 L209219-01

Collected Date/Time: 09/21/2022 11:40

Matrix: Groundwater

COC Reference:

Sample Containers

Table with 6 columns: #, Type, Preservative(s), Refrigerated?, Arrival Temp. (C), Thermometer #. Rows include 1L Plastic, 125ml Plastic with HNO3 preservative.

Extraction / Prep.

Table with 6 columns: Parameter, Result, Method, Run Date, Analyst, Flags. Rows include Mercury Digestion, Metal Digestion.

Inorganics

Method: E300.0, Run Date: 09/22/22 08:49, Analyst: JDP

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Rows include Chloride, Fluoride (Undistilled), Sulfate.

Method: SM2320B, Run Date: 09/22/22 10:06, Analyst: JKB

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Rows include Bicarbonate\*, Carbonate\*.

Method: SM2340C, Run Date: 09/22/22 12:22, Analyst: JKB

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Row includes Hardness.

Method: SM2540C, Run Date: 09/21/22 18:15, Analyst: SSM

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Row includes Total Dissolved Solids.

Method: SM2540D, Run Date: 09/22/22 17:45, Analyst: SSM

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Row includes Total Suspended Solids.

Metals

Method: E200.8, Run Date: 09/23/22 11:59, Analyst: CCM

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Rows include Antimony\*, Arsenic, Barium, Beryllium, Boron, Cadmium, Chromium, Cobalt, Copper, Iron.



# Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S40562.01 (continued)

Sample Tag: MW-11 L209219-01

**Method: E200.8, Run Date: 09/23/22 11:59, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	0.005	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 09/23/22 14:02, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	141	1.0	0.0435	mg/L	5	7440-70-2	
Magnesium	40.8	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	1.55	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	39.7	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 09/22/22 15:43, Analyst: CTV**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 10/20/22 12:15, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



**Lab Sample ID: S40562.02**

Sample Tag: MW-12 L209219-02

Collected Date/Time: 09/21/2022 14:10

Matrix: Groundwater

COC Reference:

**Sample Containers**

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.1	IR
2	1L Plastic	None	Yes	2.1	IR
1	125ml Plastic	HNO3	Yes	2.1	IR
1	125ml Plastic	None	Yes	2.1	IR

**Extraction / Prep.**

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	09/23/22 12:18	CTV	
Mercury Digestion	Completed	E245.1	09/23/22 12:18	CTV	
Metal Digestion	Completed	SW3015A	09/23/22 10:20	CCM	
Metal Digestion	Completed	SW3015A	09/23/22 10:20	CCM	

**Inorganics**

**Method: E300.0, Run Date: 09/22/22 09:02, Analyst: JDP**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	

**Method: E300.0, Run Date: 09/22/22 09:54, Analyst: JDP**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	80	20	0.32	mg/L	20	16887-00-6	
Sulfate	255	20	1.2	mg/L	20	14808-79-8	

**Method: SM2320B, Run Date: 09/22/22 10:10, Analyst: JKB**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	610	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

**Method: SM2340C, Run Date: 09/22/22 12:24, Analyst: JKB**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	611	10	2.38	mg/L	1		

**Method: SM2540C, Run Date: 09/21/22 18:15, Analyst: SSM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	1,020	50	10	mg/L	2		

**Method: SM2540D, Run Date: 09/22/22 17:45, Analyst: SSM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	43	3	1	mg/L	1.54		

**Metals**

**Method: E200.8, Run Date: 09/23/22 12:05, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.002	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.064	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	



# Analytical Laboratory Report

Lab Sample ID: S40562.02 (continued)

Sample Tag: MW-12 L209219-02

**Method: E200.8, Run Date: 09/23/22 12:05, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Boron	0.08	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	1.25	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.022	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.015	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	0.018	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	0.008	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 09/23/22 12:09, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony, Dissolved*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic, Dissolved	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium, Dissolved	0.058	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium, Dissolved	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron, Dissolved	0.08	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium, Dissolved	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium, Dissolved	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt, Dissolved	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper, Dissolved	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron, Dissolved	Not detected	0.02	0.00192	mg/L	5	7439-89-6	
Lead, Dissolved	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium, Dissolved*	0.019	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum, Dissolved	0.014	0.005	0.000217	mg/L	5	7439-98-7	
Nickel, Dissolved	0.017	0.005	0.000250	mg/L	5	7440-02-0	
Selenium, Dissolved	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver, Dissolved	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium, Dissolved	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium, Dissolved	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc, Dissolved	0.005	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 09/23/22 14:05, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	154	1.0	0.0435	mg/L	5	7440-70-2	
Magnesium	58.6	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	3.65	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	145	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E200.8, Run Date: 09/23/22 14:06, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium, Dissolved*	148	1.0	0.0435	mg/L	5	7440-70-2	
Magnesium, Dissolved	57.5	0.50	0.0120	mg/L	5	7439-95-4	
Potassium, Dissolved	3.54	0.50	0.0230	mg/L	5	7440-09-7	





# Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S40562.02 (continued)

Sample Tag: MW-12 L209219-02

Method: E200.8, Run Date: 09/23/22 14:06, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sodium, Dissolved	138	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 09/23/22 13:48, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury, Dissolved	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Method: E245.1, Run Date: 09/23/22 13:45, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

Method: , Run Date: 10/20/22 12:15, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Lab Sample ID: S40562.03

Sample Tag: MW-13 L209219-03

Collected Date/Time: 09/21/2022 13:38

Matrix: Groundwater

COC Reference:

Sample Containers

Table with 6 columns: #, Type, Preservative(s), Refrigerated?, Arrival Temp. (C), Thermometer #. Rows include 1L Plastic, 125ml Plastic with HNO3 preservative.

Extraction / Prep.

Table with 6 columns: Parameter, Result, Method, Run Date, Analyst, Flags. Rows include Mercury Digestion, Metal Digestion.

Inorganics

Method: E300.0, Run Date: 09/22/22 09:15, Analyst: JDP

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Rows include Chloride, Fluoride (Undistilled), Sulfate.

Method: SM2320B, Run Date: 09/22/22 10:16, Analyst: JKB

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Rows include Bicarbonate\*, Carbonate\*.

Method: SM2340C, Run Date: 09/22/22 12:26, Analyst: JKB

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Row includes Hardness.

Method: SM2540C, Run Date: 09/21/22 18:15, Analyst: SSM

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Row includes Total Dissolved Solids.

Method: SM2540D, Run Date: 09/22/22 17:45, Analyst: SSM

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Row includes Total Suspended Solids.

Metals

Method: E200.8, Run Date: 09/23/22 12:13, Analyst: CCM

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Rows include Antimony\*, Arsenic, Barium, Beryllium, Boron, Cadmium, Chromium, Cobalt, Copper, Iron.



# Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S40562.03 (continued)

Sample Tag: MW-13 L209219-03

**Method: E200.8, Run Date: 09/23/22 12:13, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 09/23/22 14:08, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	100	1.0	0.0435	mg/L	5	7440-70-2	
Magnesium	21.9	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	0.82	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	5.70	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 09/22/22 15:47, Analyst: CTV**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 10/20/22 12:15, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Lab Sample ID: S40562.04

Sample Tag: Field Dupe MW-11 L209219-04

Collected Date/Time: 09/21/2022 11:40

Matrix: Groundwater

COC Reference:

Sample Containers

Table with 6 columns: #, Type, Preservative(s), Refrigerated?, Arrival Temp. (C), Thermometer #. Rows include 1L Plastic, 125ml Plastic containers with HNO3 and None preservatives.

Extraction / Prep.

Table with 6 columns: Parameter, Result, Method, Run Date, Analyst, Flags. Rows include Mercury Digestion and Metal Digestion.

Inorganics

Method: E300.0, Run Date: 09/22/22 09:28, Analyst: JDP

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Rows include Chloride, Fluoride (Undistilled), Sulfate.

Method: SM2320B, Run Date: 09/22/22 10:18, Analyst: JKB

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Rows include Bicarbonate\*, Carbonate\*.

Method: SM2340C, Run Date: 09/22/22 12:28, Analyst: JKB

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Row includes Hardness.

Method: SM2540C, Run Date: 09/21/22 18:15, Analyst: SSM

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Row includes Total Dissolved Solids.

Method: SM2540D, Run Date: 09/22/22 17:45, Analyst: SSM

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Row includes Total Suspended Solids.

Metals

Method: E200.8, Run Date: 09/23/22 12:19, Analyst: CCM

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Rows include Antimony\*, Arsenic, Barium, Beryllium, Boron, Cadmium, Chromium, Cobalt, Copper, Iron.



# Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S40562.04 (continued)  
Sample Tag: Field Dupe MW-11 L209219-04

**Method: E200.8, Run Date: 09/23/22 12:19, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.005	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	0.006	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 09/23/22 14:09, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	142	1.0	0.0435	mg/L	5	7440-70-2	
Magnesium	39.6	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	1.52	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	38.5	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 09/22/22 15:50, Analyst: CTV**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 10/20/22 12:15, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Lab Sample ID: S40562.05

Sample Tag: Field Blank L209219-05

Collected Date/Time: 09/21/2022 08:20

Matrix: Water

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.1	IR
2	1L Plastic	None	Yes	2.1	IR
1	125ml Plastic	HNO3	Yes	2.1	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	09/22/22 12:59	CTV	
Metal Digestion	Completed	SW3015A	09/23/22 10:20	CCM	

### Inorganics

Method: E300.0, Run Date: 09/22/22 09:41, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	2.5	0.04	mg/L	2.5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.06	mg/L	2.5	16984-48-8	
Sulfate	Not detected	2.5	0.15	mg/L	2.5	14808-79-8	

Method: SM2320B, Run Date: 09/22/22 10:20, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	Not detected	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 09/22/22 12:30, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	Not detected	10	2.38	mg/L	1		

Method: SM2540C, Run Date: 09/21/22 18:15, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	Not detected	50	10	mg/L	2		

Method: SM2540D, Run Date: 09/22/22 17:45, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 09/23/22 11:54, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00102	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.000102	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.0000648	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.0000862	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.000702	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.0000760	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.0000386	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.0000434	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000150	mg/L	2	7440-50-8	
Iron	Not detected	0.02	0.000768	mg/L	2	7439-89-6	



Lab Sample ID: S40562.05 (continued)

Sample Tag: Field Blank L209219-05

Method: E200.8, Run Date: 09/23/22 11:54, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.0000760	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000654	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.0000868	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000100	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.000838	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.0000270	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.0000342	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.0000558	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.000292	mg/L	2	7440-66-6	

Method: E200.8, Run Date: 09/23/22 14:00, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	1.0	0.0174	mg/L	2	7440-70-2	
Magnesium	Not detected	0.50	0.00480	mg/L	2	7439-95-4	
Potassium	Not detected	0.50	0.00920	mg/L	2	7440-09-7	
Sodium	Not detected	0.50	0.00340	mg/L	2	7440-23-5	

Method: E245.1, Run Date: 09/22/22 15:53, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 10/20/22 12:15, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

# Merit Laboratories Login Checklist

Lab Set ID:S40562

Client:BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 11-13

Submitted:09/21/2022 15:50 Login User: MMC

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental\_Laboratory@LBWL.com

Selection	Description	Note
-----------	-------------	------

## Sample Receiving

- |     |  |  |
|-----|--|--|
| 01. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples are received at 4C +/- 2C Thermometer # IR 2.1 |
| 02. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Received on ice/ cooling process begun                 |
| 03. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples shipped  |
| 04. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples left in 24 hr. drop box                        |
| 05. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Are there custody seals/tape or is the drop box locked |

## Chain of Custody

- |     |  |   |
|-----|--|---|
| 06. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC adequately filled out                                       |
| 07. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC signed and relinquished to the lab                          |
| 08. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sample tag on bottles match COC                                 |
| 09. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Subcontracting needed? Subcontracted to: GEL 1Z4664770362316584 |

## Preservation

- |     |  |   |
|-----|--|---|
| 10. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Do sample have correct chemical preservation        |
| 11. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Completed pH checks on preserved samples? (no VOAs) |
| 12. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Did any samples need to be preserved in the lab?    |

## Bottle Conditions

- |     |  |   |
|-----|--|---|
| 13. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | All bottles intact                            |
| 14. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Appropriate analytical bottles are used       |
| 15. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Merit bottles used                            |
| 16. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sufficient sample volume received             |
| 17. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples require laboratory filtration         |
| 18. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples submitted within holding time         |
| 19. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Do water VOC or TOX bottles contain headspace |

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: \_\_\_\_\_ Date: \_\_\_\_\_



# Merit Laboratories Bottle Preservation Check

Lab Set ID: S40562 Submitted: 09/21/2022 15:50

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 11-13

Attention: Jennifer Caporale  
Address: Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901

Initial Preservation Check: 09/21/2022 16:44 MMC

Preservation Recheck (E200.8): N/A

Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S40562.01	125ml Plastic HNO3	<2			
S40562.01	1L Plastic HNO3	<2			
S40562.01	1L Plastic HNO3	<2			
S40562.02	125ml Plastic HNO3	<2			
S40562.02	1L Plastic HNO3	<2			
S40562.02	1L Plastic HNO3	<2			
S40562.03	125ml Plastic HNO3	<2			
S40562.03	1L Plastic HNO3	<2			
S40562.03	1L Plastic HNO3	<2			
S40562.04	125ml Plastic HNO3	<2			
S40562.04	1L Plastic HNO3	<2			
S40562.04	1L Plastic HNO3	<2			
S40562.05	125ml Plastic HNO3	<2			
S40562.05	1L Plastic HNO3	<2			
S40562.05	1L Plastic HNO3	<2			



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 Phone (517) 332-0167 Fax (517) 332-4034  
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

**REPORT TO** **CHAIN OF CUSTODY RECORD** **INVOICE TO**

CONTACT NAME **Jennifer Caporale**  
 COMPANY **Lansing Board of Water and Light**  
 ADDRESS **PO Box 13007 48901-3007**  
 CITY **Lansing** STATE **Mi** ZIP CODE **48901**  
 PHONE NO. **517-702-6372** FAX NO. P.O. NO.  
 E-MAIL ADDRESS **Environmental\_Laboratory@lbwl.com** QUOTE NO.

CONTACT NAME **Kelly Gleason**  SAME  
 COMPANY  
 ADDRESS  
 CITY STATE ZIP CODE  
 PHONE NO. E-MAIL ADDRESS **Kelly.Gleason@lbwl.com**

**ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)**

PROJECT NO./NAME **Erickson AM MI Wells 11-13** SAMPLER(S) - PLEASE PRINT/SIGN NAME **Marc Wahrer**

TURNAROUND TIME REQUIRED  1 DAY  2 DAYS  3 DAYS  STANDARD  OTHER **ASAP**  
 DELIVERABLES REQUIRED  STD  LEVEL II  LEVEL III  LEVEL IV  EDD  OTHER


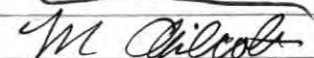
MATRIX GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID  
 CODE: SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIPE A=AIR W=WASTE

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	# Containers & Preservatives								Total Metals	F- undistilled, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	Dissolved Metals	HCO3, CO3, Hardness	
	DATE	TIME				NONE	HCl	HNO3	H2SO4	NaOH	MeOH	OTHER									
40562.01	09/21/22	1140	MW-11 L209219-01	GW	5	2	3							✓	✓	✓	✓	✓	✓		
.02	09/21/22	1410	MW-12 L209219-02	GW	6	3	3							✓	✓	✓	✓	✓	✓		
.03	09/21/22	1338	MW-13 L209219-03	GW	5	2	3							✓	✓	✓	✓	✓	✓		
.04	09/21/22	1140	Field Dupe MW-   \ L209219-04	GW	5	2	3							✓	✓	✓	✓	✓	✓		
.05	09/21/22	0820	Field Blank L209219-05	DI	5	2	3							✓	✓	✓	✓	✓	✓		

**Certifications**  
 OHIO VAP  Drinking Water  
 DoD  NPDES  
**Project Locations**  
 Detroit  New York  
 Other \_\_\_\_\_  
**Special Instructions**

Metals to analyse: Na, Mg, K  
 B, Ca, Sb, As, Ba, Be, Cd, Cr,  
 Co, Li, Hg, Mo, Pb, Se, Tl,  
 Fe, Cu, Ni, Ag, V, Zn  
 Please send a preliminary report

The analytes for dissolved metals are  
 same metals that are analysed for total.

RELINQUISHED BY:   Sampler DATE **9-21-22** TIME **1550**  
 RECEIVED BY:  DATE **9/21/22** TIME **1550**  
 RELINQUISHED BY: DATE TIME  
 RECEIVED BY: DATE TIME

RELINQUISHED BY: DATE TIME  
 RECEIVED BY: DATE TIME  
 SEAL NO. SEAL INTACT INITIALS  
 YES  NO   
 SEAL NO. SEAL INTACT INITIALS  
 YES  NO   
 NOTES: TEMP. ON ARRIVAL **2.1**

## Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.150
Be, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	2.5
Cl	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	10
Cr, total	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
F	Fluoride	250 mL plastic	mg/L	None	9056	28 d	1.0
Fe, total	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Pb, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Li, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Hg, total	Mercury	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Mo, total	Molybdenum	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
RA226/228	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	HNO3	SM 7500	6 mos	2.0 combined
Se, total	Selenium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ag, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
SO4	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	10
Tl, total	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
TDS	Total Dissolved Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TSS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540D	NA	3
V, total	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Zn, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005



October 20, 2022

John Laverty  
Merit Laboratories Inc.  
2680 East Lansing Drive  
East Lansing, Michigan 48823

Re: Routine Analysis  
Work Order: 594438  
SDG: S40562

Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on September 26, 2022. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at [www.gel.com](http://www.gel.com).

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,

Jordan Melton for  
Delaney Stone  
Project Manager

Purchase Order: GELP20-0018  
Enclosures



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# Case Narrative

**Receipt Narrative  
for  
Merit Laboratories, Inc.  
SDG: S40562  
Work Order: 594438**

**October 20, 2022**

**Laboratory Identification:**

GEL Laboratories LLC  
2040 Savage Road  
Charleston, South Carolina 29407  
(843) 556-8171

**Summary:**

**Sample receipt:** The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on September 26, 2022 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

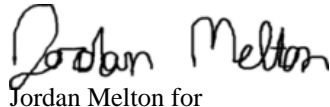
**Sample Identification:** The laboratory received the following samples:

<b><u>Laboratory ID</u></b>	<b><u>Client ID</u></b>
594438001	S40562.01
594438002	S40562.02
594438003	S40562.03
594438004	S40562.04 Field Dupe
594438005	S40562.05 Field Blank

**Case Narrative:**

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.

A handwritten signature in black ink that reads "Jordan Melton". The signature is written in a cursive style with a large initial "J" and "M".

Jordan Melton for  
Delaney Stone  
Project Manager



# **Chain of Custody and Supporting Documentation**



2680 East Lansing Dr., East Lansing, MI 48823  
 Phone (517) 332-0167 Fax (517) 332-4034  
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

594438

**REPORT TO**

CONTACT NAME: Project Management Team  
 COMPANY: Merit Laboratories  
 ADDRESS: 2680 East Lansing Drive  
 CITY: East Lansing  
 PHONE NO.: 517-332-0167 FAX NO.:  
 E-MAIL ADDRESS: results@meritlabs.com

**CHAIN OF CUSTODY RECORD**

CONTACT NAME: Julie Teague  
 COMPANY: Merit Laboratories  
 ADDRESS: 2680 East Lansing Drive  
 CITY: East Lansing  
 PHONE NO.: 517-332-0167  
 E-MAIL ADDRESS: juliet@meritlabs.com

**INVOICE TO**

CONTACT NAME: [ ]  
 COMPANY:  
 ADDRESS:  
 CITY: East Lansing  
 PHONE NO.: 517-332-0167  
 E-MAIL ADDRESS:  
 STATE: MI ZIP CODE: 48823

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

PROJECT NO./NAME	SAMPLER(S) - PLEASE PRINT/SIGN NAME	TURNAROUND TIME REQUIRED				MATRIX	# Containers & Preservatives	CERTIFICATIONS
		1 DAY	2 DAYS	3 DAYS	OTHER			
S40562		<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		Drinking Water <input type="checkbox"/> NPDES <input type="checkbox"/> Project Locations <input type="checkbox"/> Detroit <input type="checkbox"/> New York <input type="checkbox"/> Other <input type="checkbox"/> Special Instructions: * E903.1 Mod. ** E904.0/SW 9320 Mod.	
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Radium 226* <input checked="" type="checkbox"/>		
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Radium 228* <input checked="" type="checkbox"/>		
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>		

**DELIVERABLES REQUIRED** STD  LEVEL II  LEVEL III  LEVEL IV  EDD  OTHER

MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID  
 SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIPE A=AIR W=WASTE

YEAR	DATE	TIME	IDENTIFICATION-DESCRIPTION	MATRIX	BOTTLES	OTHER
9/21/22	1140	1140	S40562.01	GW	2	
9/21/22	1410	1410	S40562.02	GW	2	
9/21/22	1338	1338	S40562.03	GW	2	
9/21/22	1140	1140	S40562.04 Field Dupe	GW	2	
9/21/22	0820	0820	S40562.05 Field Blank	DI	2	

**RELIQUISHED BY:** SIGNATURE/Organization: [Signature] DATE: 9/26/22 TIME: 1700

**RECEIVED BY:** SIGNATURE/Organization: [Signature] DATE: 9/27/22 TIME: 1700

**RELINQUISHED BY:** SIGNATURE/Organization: [Signature] DATE: 09-26-22 TIME: 0916

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE



SAMPLE RECEIPT & REVIEW FORM

PS

Client: <b>MERI</b>		SDG/AR/COC/Work Order: <b>594438</b>	
Received By: <b>Thyasias Tatum</b>		Date Received: <b>9-26-22</b>	
Carrier and Tracking Number		FedEx Express    FedEx Ground <u>UPS</u> Field Services    Courier    Other <b>12 4000 477 03 60231 6584</b>	
Suspected Hazard Information		Yes	No
			<input checked="" type="checkbox"/>
A) Shipped as a DOT Hazardous?			<input checked="" type="checkbox"/>
B) Did the client designate the samples to be received as radioactive?			<input checked="" type="checkbox"/>
C) Did the RSO classify the samples as radioactive?			<input checked="" type="checkbox"/>
D) Did the client designate samples are hazardous?			<input checked="" type="checkbox"/>
E) Did the RSO identify possible hazards?			<input checked="" type="checkbox"/>
Sample Receipt Criteria		Yes	NA
			<input checked="" type="checkbox"/>
1 Shipping containers received intact and sealed?		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
2 Chain of custody documents included with shipment?		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
3 Samples requiring cold preservation within (0 ≤ 6 deg. C)?*		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
4 Daily check performed and passed on IR temperature gun?		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
5 Sample containers intact and sealed?		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
6 Samples requiring chemical preservation at proper pH?		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
7 Do any samples require Volatile Analysis?		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
8 Samples received within holding time?		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
9 Sample ID's on COC match ID's on bottles?		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
10 Date & time on COC match date & time on bottles?		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
11 Number of containers received match number indicated on COC?		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
12 Are sample containers identifiable as GEL provided by use of GEL labels?		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
13 COC form is properly signed in relinquished/received sections?		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Comments (Use Continuation Form if needed):			

PM (or PMA) review: Initials **slm** Date **9/27/22** Page **1** of **1**

# Laboratory Certifications

**List of current GEL Certifications as of 20 October 2022**

<b>State</b>	<b>Certification</b>
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122023-3
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2022-160
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122021-36
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

# **Radiological Analysis**

# Case Narrative

**Radiochemistry  
Technical Case Narrative  
Merit Laboratories, Inc.  
SDG #: S40562  
Work Order #: 594438**

**Product: GFPC Ra228, Liquid**

**Analytical Method:** EPA 904.0/SW846 9320 Modified

**Analytical Procedure:** GL-RAD-A-063 REV# 5

**Analytical Batch:** 2322352

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
594438001	S40562.01
594438002	S40562.02
594438003	S40562.03
594438004	S40562.04 Field Dupe
594438005	S40562.05 Field Blank
1205202802	Method Blank (MB)
1205202803	594438001(S40562.01) Sample Duplicate (DUP)
1205202804	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

**Product: Lucas Cell, Ra226, Liquid**

**Analytical Method:** EPA 903.1 Modified

**Analytical Procedure:** GL-RAD-A-008 REV# 15

**Analytical Batch:** 2322339

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
594438001	S40562.01
594438002	S40562.02
594438003	S40562.03
594438004	S40562.04 Field Dupe
594438005	S40562.05 Field Blank
1205202764	Method Blank (MB)
1205202765	594438001(S40562.01) Sample Duplicate (DUP)
1205202766	594438001(S40562.01) Matrix Spike (MS)
1205202767	Laboratory Control Sample (LCS)



The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

**Miscellaneous Information**

**Additional Comments**

The matrix spike, 1205202766 (S40562.01MS), aliquot was reduced to conserve sample volume.

**Certification Statement**

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

## GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

### Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S40562 GEL Work Order: 594438

#### The Qualifiers in this report are defined as follows:

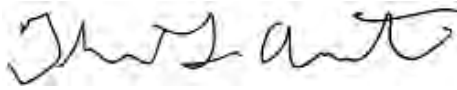
- \* A quality control analyte recovery is outside of specified acceptance criteria
- \*\* Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

#### Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature:



Name: Theresa Austin

Date: 21 OCT 2022

Title: Group Leader

# Sample Data Summary

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: October 20, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

Client Sample ID: S40562.01	Project: MERI00120
Sample ID: 594438001	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 21-SEP-22 11:40	
Receive Date: 26-SEP-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.0525	+/-0.700	1.33	3.00	pCi/L		JE1	10/11/22	1332	2322352	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.449	+/-0.746			pCi/L		NXL1	10/20/22	1215	2322350	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.396	+/-0.260	0.348	1.00	pCi/L		LXP1	10/17/22	0954	2322339	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			96.9	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: October 20, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Lavery  
 Project: Routine Analysis

Client Sample ID: S40562.02	Project: MERI00120
Sample ID: 594438002	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 21-SEP-22 14:10	
Receive Date: 26-SEP-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	-0.692	+/-0.964	1.96	3.00	pCi/L		JE1	10/11/22	1332	2322352	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.739	+/-1.02			pCi/L		NXL1	10/20/22	1215	2322350	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.739	+/-0.327	0.308	1.00	pCi/L		LXP1	10/17/22	0954	2322339	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			83.4	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: October 20, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Lavery  
 Project: Routine Analysis

Client Sample ID: S40562.03	Project: MERI00120
Sample ID: 594438003	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 21-SEP-22 13:38	
Receive Date: 26-SEP-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	-0.00260	+/-0.725	1.41	3.00	pCi/L		JE1	10/11/22	1332	2322352	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.286	+/-0.763			pCi/L		NXL1	10/20/22	1215	2322350	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.286	+/-0.238	0.352	1.00	pCi/L		LXP1	10/17/22	0954	2322339	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			85	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: October 20, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Lavery  
 Project: Routine Analysis

Client Sample ID: S40562.04 Field Dupe	Project: MERI00120
Sample ID: 594438004	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 21-SEP-22 11:40	
Receive Date: 26-SEP-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.994	+/-0.833	1.32	3.00	pCi/L		JE1	10/11/22	1332	2322352	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.44	+/-0.874			pCi/L		NXL1	10/20/22	1215	2322350	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.443	+/-0.265	0.326	1.00	pCi/L		LXP1	10/17/22	0954	2322339	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			88.8	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: October 20, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Lavery  
 Project: Routine Analysis

Client Sample ID: S40562.05 Field Blank	Project: MERI00120
Sample ID: 594438005	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 21-SEP-22 08:20	
Receive Date: 26-SEP-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	2.20	+/-1.57	2.48	3.00	pCi/L		JE1	10/11/22	1332	2322352	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		2.53	+/-1.60			pCi/L		NXL1	10/20/22	1215	2322350	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.333	+/-0.309	0.490	1.00	pCi/L		LXP1	10/17/22	0954	2322339	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			70.8	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit



# **Quality Control Summary**

# GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

## QC Summary

Report Date: October 20, 2022

Page 1 of 2

**Merit Laboratories Inc.**  
**2680 East Lansing Drive**  
**East Lansing, Michigan**

**Contact: John Laverty**

**Workorder: 594438**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Rad Gas Flow</b>											
Batch	2322352										
QC1205202803	594438001 DUP										
Radium-228	U	0.0525	U	0.553	pCi/L	N/A		N/A	JE1	10/11/22	13:32
	Uncertainty	+/-0.700		+/-1.01							
QC1205202804	LCS										
Radium-228		44.1		33.1	pCi/L		75.1	(75%-125%)		10/11/22	13:32
	Uncertainty			+/-3.12							
QC1205202802	MB										
Radium-228			U	-0.114	pCi/L					10/11/22	13:32
	Uncertainty			+/-0.951							
<b>Rad Ra-226</b>											
Batch	2322339										
QC1205202765	594438001 DUP										
Radium-226		0.396	U	0.355	pCi/L	10.9		(0% - 100%)	LXP1	10/17/22	10:27
	Uncertainty	+/-0.260		+/-0.268							
QC1205202767	LCS										
Radium-226		26.7		25.3	pCi/L		94.9	(75%-125%)		10/17/22	10:27
	Uncertainty			+/-1.67							
QC1205202764	MB										
Radium-226			U	0.136	pCi/L					10/17/22	10:27
	Uncertainty			+/-0.189							
QC1205202766	594438001 MS										
Radium-226	133	0.396		156	pCi/L		117	(75%-125%)		10/17/22	10:27
	Uncertainty	+/-0.260		+/-10.4							

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- \*\* Analyte is a Tracer compound
- < Result is less than value reported
- > Result is greater than value reported
- BD Results are either below the MDC or tracer recovery is low
- FA Failed analysis.
- H Analytical holding time was exceeded

# GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

## QC Summary

Workorder: 594438

Page 2 of 2

Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
J											
J											
K											
L											
M											
M											
N/A											
NI											
ND											
NJ											
Q											
R											
U											
UI											
UJ											
UL											
X											
Y											
^											
h											

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where the duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

\* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

# Gas Flow Raw Data

# Batch 2322352 Check-list

This check-list was completed on 17-OCT-22 by Nat Long

This batch was reviewed by Lois Buist on 17-OCT-22 and Nat Long on 17-OCT-22.

**Batch ID:**  
2322352

**Product:**  
GFC28RAL

**Description:** Gas Flow Radium 228  
GL-RAD-A-063

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
11	Has the method required detection limit been met?	Yes		
<b>Miscellaneous Information</b>				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

# Prep Logbook

## Radium-228 in Liquid

**Batch ID:** 2322352

**Analyst:** Jacqueline Emond (JE1)

**Method:** EPA 904.0/SW846 9320 Modified

**Lab SOP:** GL-RAD-A-063 REV# 5

**Instrument:** SP-C018367602

**Due Dates for Lab:** 16-OCT-2022

**Package:** 23-OCT-2022

**SDG:** 18-OCT-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205202804	Radium-228	1965-C	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	594438001	05-OCT-2022	3	302.21	302.21	10/07/22 14:34	10/11/22 11:00
2	594438002	05-OCT-2022	3	300.51	300.51	10/07/22 14:34	10/11/22 11:00
3	594438003	05-OCT-2022	3	301.31	301.31	10/07/22 14:34	10/11/22 11:00
4	594438004	05-OCT-2022	3	301.11	301.11	10/07/22 14:34	10/11/22 11:00
5	594438005	05-OCT-2022	3	300.61	300.61	10/07/22 14:34	10/11/22 11:00
6	594650001	05-OCT-2022	3	302.31	302.31	10/13/22 11:16	10/17/22 07:06
7	1205202802 MB	05-OCT-2022	3		302.31	10/07/22 14:34	10/11/22 11:00
8	1205202803 DUP (594438001)	05-OCT-2022	3	300.81	300.81	10/07/22 14:34	10/11/22 11:00
9	1205202804 LCS	05-OCT-2022	3		302.31	10/07/22 14:34	10/11/22 11:00

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1951-D	Ba-133	.1 mL	Pipet Id: RAD-GFC-1795419 Data Entry Date2: 05-OCT-2022 00:00
REGNT 3418276.6	29M HF (48-50%)	4 mL	
REGNT 3454370.1	Nitric Acid	5 mL	
REGNT 3465466	Barium Carrier Ra228 REG	1 mL	
REGNT 3466687	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3478604	RGF-Neodymium Substrate	5 mL	
REGNT 3481329	RGF-1M Citric Acid	5 mL	
REGNT 3484017	RGF-50% Potassium Carbonate	2 mL	
REGNT 3485088.6	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	
REGNT 3489658	RGF-7M Nitric Acid	25 mL	
REGNT 3492475	2M HCl	20 mL	
REGNT 3493319	RGF-1.5M Ammonium Sulfate	10 mL	
REGNT DGA0037	2304168	2 g	

### Radium-228 Liquid

Filename : RA228.XLS  
 File type : Excel  
 Version # : 1.4.2

Tracer S/N : 1951-D  
 Tracer Exp Date : 6/2/2023  
 Tracer Volume Added: 0.10

Batch : 2322352  
 Analyst : JAC02417  
 Prep Date : 10/5/2022  
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL  
 Parmname : Radium-228  
 Required MDA : 3 pCi/L  
 Ra-228 Abundance : 1.00  
 Halflife of Ra-228 : 5.75 years  
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	594438001.1	0.3022	1.8496E-05	9/21/2022 11:40	1269.5	1.62%	1229.8	1.65%	0.1	0.000200
2	594438002.1	0.3005	1.8468E-05	9/21/2022 14:10	1269.5	1.62%	1058.3	1.77%	0.1	0.000200
3	594438003.1	0.3013	1.8481E-05	9/21/2022 13:38	1269.5	1.62%	1079.4	1.76%	0.1	0.000200
4	594438004.1	0.3011	1.8478E-05	9/21/2022 11:40	1269.5	1.62%	1127.4	1.72%	0.1	0.000200
5	594438005.1	0.3006	1.8469E-05	9/21/2022 8:20	1269.5	1.62%	899.2	1.93%	0.1	0.000200
6	594650001.1	0.3023	1.8498E-05	9/13/2022 9:40	1235.3	1.64%	1098.9	1.74%	0.1	0.000200
7	1205202802.1	0.3023	1.8498E-05	10/5/2022 0:00	1269.5	1.62%	1029.9	1.80%	0.1	0.000200
8	1205202803.1	0.3008	1.8473E-05	9/21/2022 11:40	1269.5	1.62%	1158.8	1.70%	0.1	0.000200
9	1205202804.1	0.3023	1.8498E-05	10/5/2022 0:00	1269.5	1.62%	1013.5	1.81%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063  
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated	Sample
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction	Recovery %	Recovery Error %
			Alpha	Beta										
1	7B	60	7	35	0.583	10/11/2022 13:32	10/7/2022 14:34	10/11/2022 11:00	0.993	0.751	1.000	1.057	96.9%	1.19%
2	7C	60	10	48	0.800	10/11/2022 13:32	10/7/2022 14:34	10/11/2022 11:00	0.993	0.751	1.000	1.057	83.4%	1.23%
3	8A	60	4	29	0.483	10/11/2022 13:32	10/7/2022 14:34	10/11/2022 11:00	0.993	0.751	1.000	1.057	85.0%	1.23%
4	8C	60	9	42	0.700	10/11/2022 13:32	10/7/2022 14:34	10/11/2022 11:00	0.993	0.751	1.000	1.057	88.8%	1.21%
5	8D	60	5	95	1.583	10/11/2022 13:32	10/7/2022 14:34	10/11/2022 11:00	0.993	0.751	1.000	1.057	70.8%	1.29%
6	9C	60	32	1819	30.317	10/17/2022 9:11	10/13/2022 11:16	10/17/2022 7:06	0.989	0.789	1.000	1.057	89.0%	1.23%
7	9C	60	9	43	0.717	10/11/2022 13:32	10/7/2022 14:34	10/11/2022 11:00	0.998	0.751	1.000	1.057	81.1%	1.24%
8	9D	60	3	64	1.067	10/11/2022 13:32	10/7/2022 14:34	10/11/2022 11:00	0.993	0.751	1.000	1.057	91.3%	1.21%
9	10A	60	7	529	8.817	10/11/2022 13:32	10/7/2022 14:34	10/11/2022 11:00	0.998	0.751	1.000	1.057	79.8%	1.25%



Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2022	5/31/2023	0.6366	0.00627	0.568	10/8/2022 9:33	500
2	PIC	6/1/2022	5/31/2023	0.6407	0.00790	0.974	10/8/2022 9:33	500
3	PIC	6/1/2022	5/31/2023	0.6398	0.01579	0.484	10/8/2022 9:34	500
4	PIC	6/1/2022	5/31/2023	0.6294	0.01955	0.438	10/8/2022 9:34	500
5	PIC	6/1/2022	5/31/2023	0.6347	0.00609	1.118	10/8/2022 9:34	500
6	PIC	6/1/2022	5/31/2023	0.6184	0.00584	0.710	10/14/2022 19:10	500
7	PIC	6/1/2022	5/31/2023	0.6184	0.00584	0.744	10/8/2022 9:35	500
8	PIC	6/1/2022	5/31/2023	0.6330	0.02610	0.916	10/8/2022 9:35	500
9	PIC	6/1/2022	5/31/2023	0.6384	0.00651	0.784	10/8/2022 9:35	500

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

**Spike S/N :** N/A  
**Spike Exp Date :** N/A  
**Spike Activity (dpm/ml):** N/A  
**Spike Volume Added:** N/A

\* - RPD changed to 0% due to sample & dup activity below MDA

**LCS S/N :** 1965-C  
**LCS Exp Date :** 8/5/2023  
**LCS Activity (dpm/ml):** 295.92  
**LCS Volume Added:** 0.10

Results Pos.	Decision	Critical	Required	Sample Act.		Sample Act.	Net Count	Net Count	2 SIGMA	2 SIGMA	Sample	Sample	RPD	RER	Nominal	Recovery
	Level	Level	MDA	MDA	Conc.	Error	Rate	Rate Error	Counting	Total Prop.						
	pCi/L	pCi/L	pCi/L	pCi/L	pCi/L	%	CPM	CPM	Uncertainty	Uncertainty						
1	0.8217	0.5801	3	1.3315	<b>0.0525</b>	679.58%	0.0153	0.1042	0.6995	0.6996		SAMPLE				
2	1.2497	0.8823	3	1.9635	<b>-0.6921</b>	71.06%	-0.1740	0.1236	0.9638	0.9639		SAMPLE				
3	0.8628	0.6091	3	1.4131	<b>-2.597E-03</b>	14248.86%	-0.0007	0.0950	0.7253	0.7255		SAMPLE				
4	0.7995	0.5644	3	1.3186	<b>0.9942</b>	42.81%	0.2620	0.1120	0.8330	0.8700		SAMPLE				
5	1.5911	1.1233	3	2.4830	<b>2.1996</b>	36.39%	0.4653	0.1692	1.5675	1.6612		SAMPLE				
6	0.9842	0.6948	3	1.5731	<b>108.6260</b>	2.76%	29.6067	0.7118	5.1189	27.6298		SAMPLE				
7	1.1500	0.8119	3	1.8332	<b>-0.1145</b>	424.02%	-0.0273	0.1159	0.9513	0.9515		MB				
8	1.1185	0.7897	3	1.7629	<b>0.5531</b>	92.99%	0.1507	0.1400	1.0076	1.0174	594438001.1	DUP	* 0.0%			
9	1.1625	0.8207	3	1.8476	<b>33.1274</b>	5.00%	8.0327	0.3854	3.1150	8.8499		LCS			44.0935	75.1%

ASSAY 11-Oct-22 12:32:07  
 Wizard 2480 s/n 46190630  
 Protocol id 9 Ba-133\_1  
 Time limit  
 Count limit  
 Isotope Ba-133\_1  
 Protocol date 10/11/2022  
 Run id. 5667

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	94	1	180	3809	1269.48	1.62	12:32:07
594438001	2	94	2	180	3690	1229.78	1.65	96.87	12:35:21
594438002	3	94	3	180	3175.57	1058.31	1.77	83.37	12:38:35
594438003	4	94	4	180	3239	1079.39	1.76	85.03	12:41:49
594438004	5	94	5	180	3382.57	1127.42	1.72	88.81	12:45:03
594438005	1	3	1	180	2698	899.22	1.93	70.83	12:48:39
<del>594650001</del>	<del>2</del>	<del>3</del>	<del>2</del>	<del>180</del>	<del>3466.28</del>	<del>1155.23</del>	<del>1.7</del>	<del>91.00</del>	<del>12:51:52</del>
1205202802	3	3	3	180	3090.28	1029.91	1.8	81.13	12:55:07
1205202803	4	3	4	180	3477	1158.8	1.7	91.28	12:58:21
1205202804	5	3	5	180	3041	1013.47	1.81	79.83	01:01:35

NL 10/13/22

END OF ASSAY

ASSAY 17-Oct-22 8:48:27  
 Wizard 2480 s/n 46190630  
 Protocol id 9 Ba-133\_1  
 Time limit  
 Count limit  
 Isotope Ba-133\_1  
 Protocol date 10/17/2022  
 Run id. 5687

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	94	1	180	3706.28	1235.31	1.64	08:48:27
	594650001	2	94	2	180	3297	1098.89	1.74	88.96 08:51:42

END OF ASSAY

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
594438001	7B	60	7	35	10/11/2022 13:32	10/11/2022 14:32	PIC	2322352
594438002	7C	60	10	48	10/11/2022 13:32	10/11/2022 14:32	PIC	2322352
594438003	8A	60	4	29	10/11/2022 13:32	10/11/2022 14:32	PIC	2322352
594438004	8C	60	9	42	10/11/2022 13:32	10/11/2022 14:32	PIC	2322352
594438005	8D	60	5	95	10/11/2022 13:32	10/11/2022 14:32	PIC	2322352
594650001	9C	60	32	1819	10/17/2022 9:11	10/17/2022 10:11	PIC	2322352
1205202802	9C	60	9	43	10/11/2022 13:32	10/11/2022 14:32	PIC	2322352
1205202803	9D	60	3	64	10/11/2022 13:32	10/11/2022 14:32	PIC	2322352
1205202804	10A	60	7	529	10/11/2022 13:32	10/11/2022 14:32	PIC	2322352

# **Continuing Calibration Data**

# Gas Flow Proportional Counter Checks for 11-Oct-2022

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z

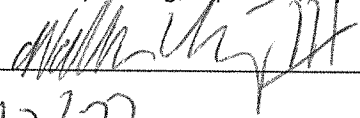
Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
G5400W1X	Below	Beta eff	11-Oct 05:52	5	14209	14210	14820	-3.01
LB4100A2	Above	Alpha eff	11-Oct 06:43	5	12596	7607	11950	+3.89
LB4100A2	need 2nd	Beta bkg	11-Oct 05:37	60	1.967	-2.15E-1	2.577	+1.69
LB4100A2	need 2nd	Beta eff	11-Oct 06:53	5	21017	19870	23260	-0.97
LB4100E2	Above	Beta bkg	11-Oct 04:58	60	3.283	1.385	3.072	+3.75
LB4100E3	Above	Beta bkg	11-Oct 04:58	60	2.033	0.506	2.576	+1.43
LB4100E3	Below	Beta eff	11-Oct 06:19	5	14111	14210	15500	-3.46
LB4100F2	Above	Alpha eff	11-Oct 06:11	5	6964	3944	6286	+4.74
LB4100F2	Below	Alpha XTalk	11-Oct 06:11	5	0.339	0.348	0.584	-3.24
LB4100F3	need 2nd	Alpha bkg	11-Oct 04:58	60	0.217	0.119	0.404	-0.95
LB4100F3	Above	Alpha eff	11-Oct 06:11	5	16866	11460	15350	+5.34
LB4100F3	Below	Alpha XTalk	11-Oct 06:11	5	0.300	0.328	0.439	-4.48
LB4100F4	Above	Alpha eff	11-Oct 06:11	5	13182	5098	9867	+7.17
LB4100F4	Below	Alpha XTalk	11-Oct 06:11	5	0.323	0.384	0.757	-3.99
LB4100F4	Below	Beta eff	11-Oct 06:04	5	29389	29440	34370	-3.06
LB4100G1	Above	Alpha XTalk	11-Oct 06:04	5	0.645	0.088	0.447	+6.31
LB4100G1	Above	Beta bkg	11-Oct 04:59	60	5850	0.380	1.675	+27,104.60
LB4100G1	Above	Beta eff	11-Oct 06:11	5	20079	12880	18320	+4.94
LB4100G2	Above	Alpha eff	11-Oct 06:04	5	10983	7308	9581	+6.70
LB4100G2	Below	Alpha XTalk	11-Oct 06:04	5	0.282	0.324	0.423	-5.51
LB4100G3	Above	Beta bkg	11-Oct 04:59	60	2.200	0.810	1.674	+6.65
LB4100H4	Above	Alpha eff	11-Oct 06:04	5	10940	6065	9898	+4.63
LB4100H4	Below	Alpha XTalk	11-Oct 06:04	5	0.368	0.394	0.613	-3.69
PIC1A	Above	Alpha bkg	11-Oct 12:04	60	0.483	-1.13E-1	0.365	+4.48
PIC1A	Above	Beta bkg	11-Oct 12:04	60	2.150	-7.65E-1	2.862	+1.82
PIC4B	Below	Alpha XTalk	11-Oct 05:09	5	0.293	0.295	0.417	-3.12
PIC4B	Above	Beta bkg	11-Oct 12:04	60	2.333	-3.01E-1	2.244	+3.21
PIC4C	Above	Beta bkg	11-Oct 12:04	60	7.483	-2.21E-1	1.560	+22.95
PIC8B	Above	Alpha bkg	11-Oct 12:04	60	0.383	-1.16E-1	0.388	+2.95
PIC8B	Above	Beta bkg	11-Oct 12:04	60	2.417	-1.80E-1	2.341	+3.18
PIC8B	Above	Beta XTalk	11-Oct 05:28	5	0.005	2.00E-4	9.31E-4	+35.78

PIC12C	need 2nd Alpha bkg	11-Oct 12:03	60	0.067	-6.64E-2	0.384	-1.23
PIC12C	Above Beta bkg	11-Oct 12:03	60	3.050	0.142	2.845	+3.45

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

LB4100C1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by 

Date 10/12/22

GEL Laboratories LLC



# Runlogs

# Instrument Run Log

Instrument Type: GFPC

Batch ID: 2322352

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205202802	MB	JE1	PIC9C	OCT-11-22 13:32:06	DONE	25mm Filter	01-JUN-22 00:00
1205202803	DUP	JE1	PIC9D	OCT-11-22 13:32:09	DONE	25mm Filter	01-JUN-22 00:00
1205202804	LCS	JE1	PIC10A	OCT-11-22 13:32:16	DONE	25mm Filter	01-JUN-22 00:00
594438001	SAMPLE	JE1	PIC7B	OCT-11-22 13:32:18	DONE	25mm Filter	01-JUN-22 00:00
594438002	SAMPLE	JE1	PIC7C	OCT-11-22 13:32:28	DONE	25mm Filter	01-JUN-22 00:00
594438003	SAMPLE	JE1	PIC8A	OCT-11-22 13:32:31	DONE	25mm Filter	01-JUN-22 00:00
594438004	SAMPLE	JE1	PIC8C	OCT-11-22 13:32:38	DONE	25mm Filter	01-JUN-22 00:00
594438005	SAMPLE	JE1	PIC8D	OCT-11-22 13:32:44	DONE	25mm Filter	01-JUN-22 00:00
594650001	SAMPLE	JE1	PIC9C	OCT-17-22 09:11:53	DONE	25mm Filter	01-JUN-22 00:00

# Lucas Cell Raw Data

# Batch 2322339 Check-list

This check-list was completed on 17-OCT-22 by Lyndsey Pace

This batch was reviewed by Gregory Ramsay on 17-OCT-22 and Lyndsey Pace on 17-OCT-22.

**Batch ID:**  
2322339

**Product:**  
LUC26RAL

**Description:** Lucas Cell Radium 226  
GL-RAD-A-008

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
<b>Miscellaneous Information</b>				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

# Prep Logbook

## Radium-226 in Liquid

**Batch ID:** 2322339  
**Analyst:** Lyndsey Pace (LXP1)  
**Method:** EPA 903.1 Modified  
**Lab SOP:** GL-RAD-A-008 REV# 15  
**Instrument:** SP-C018367602

Due Dates for Lab: 16-OCT-2022			Package: 23-OCT-2022		SDG: 18-OCT-2022	
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205202767	Radium-226 SPIKE	1715-G	.1	mL	
MS	1205202766	Radium-226 SPIKE	1715-G	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	594438001	05-OCT-2022	1	500.61	500.61	10/12/22 08:18	202	10/17/22 06:52	10/17/22 09:54	4	18
2	594438002	05-OCT-2022	1	502.21	502.21	10/12/22 08:18	401	10/17/22 06:52	10/17/22 09:54	2	25
3	594438003	05-OCT-2022	1	502.31	502.31	10/12/22 08:18	505	10/17/22 06:52	10/17/22 09:54	4	14
4	594438004	05-OCT-2022	1	500.71	500.71	10/12/22 08:18	601	10/17/22 06:52	10/17/22 09:54	3	18
5	594438005	05-OCT-2022	1	501.11	501.11	10/12/22 08:18	701	10/17/22 06:52	10/17/22 09:54	8	19
6	594650001	05-OCT-2022	1	501.71	501.71	10/12/22 08:18	802	10/17/22 06:52	10/17/22 09:54	6	967
7	1205202764 MB	05-OCT-2022	1		502.31	10/12/22 08:18	103	10/17/22 07:21	10/17/22 10:27	2	6
8	1205202765 DUP (594438001)	05-OCT-2022	1	502.01	502.01	10/12/22 08:18	205	10/17/22 07:21	10/17/22 10:27	6	19
9	1205202766 MS (594438001)	05-OCT-2022	1	100.51	100.51	10/12/22 08:18	402	10/17/22 07:21	10/17/22 10:27	4	881
10	1205202767 LCS	05-OCT-2022	1		502.31	10/12/22 08:18	501	10/17/22 07:21	10/17/22 10:27	4	896

Reagent/Solvent Lot ID	Description	Amount	Comments:
			Data Entry Date2: 05-OCT-2022 00:00

### Radium-226 Liquid

Filename : RA226.XLS  
 File type : Excel  
 Version # : 1.3.2

Procedure Code : LUC26RAL  
 Parmname : Radium-226  
 Required MDA : 1 pCi/L  
 Halflife of Ra-226 : 1600 years  
 Ra-226 Abundance : 1.00  
 Halflife of Rn-222 : 3.8235 days

Batch : 2322339  
 Analyst : LIN01615  
 Prep Date : 10/5/2022  
 Ra-226 Method Uncertainty : 0.073648

Batch counted on : LUCAS CELL DETECTOR  
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Count Time (min.)	Cell Efficiency (cpm/dpm)
1	594438001.1	0.5006	2.0258E-05	9/21/2022 11:40	202	30	18	0.600	4	0.133	30	1.8360
2	594438002.1	0.5022	2.0265E-05	9/21/2022 14:10	401	30	25	0.833	2	0.067	30	1.6120
3	594438003.1	0.5023	2.0265E-05	9/21/2022 13:38	505	30	14	0.467	4	0.133	30	1.8130
4	594438004.1	0.5007	2.0259E-05	9/21/2022 11:40	601	30	18	0.600	3	0.100	30	1.7610
5	594438005.1	0.5011	2.0260E-05	9/21/2022 8:20	701	30	19	0.633	8	0.267	30	1.7130
6	594650001.1	0.5017	2.0263E-05	9/13/2022 9:40	802	30	967	32.233	6	0.200	30	2.0910
7	1205202764.1	0.5023	2.0265E-05	10/5/2022 0:00	103	30	6	0.200	2	0.067	30	1.5190
8	1205202765.1	0.5020	2.0264E-05	9/21/2022 11:40	205	30	19	0.633	6	0.200	30	1.8920
9	1205202766.1	0.1005	1.1401E-05	9/21/2022 11:40	402	30	881	29.367	4	0.133	30	1.4480
10	1205202767.1	0.5023	2.0265E-05	10/5/2022 0:00	501	30	896	29.867	4	0.133	30	1.8220

Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008  
 Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrow End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
5.100%	8/1/2022	7/31/2023	10/12/2022 8:18	10/17/2022 6:52	10/17/2022 9:54	0.592	0.977	1.002	1.000
8.100%	2/1/2022	1/31/2023	10/12/2022 8:18	10/17/2022 6:52	10/17/2022 9:54	0.592	0.977	1.002	1.000
1.200%	6/1/2022	5/31/2023	10/12/2022 8:18	10/17/2022 6:52	10/17/2022 9:54	0.592	0.977	1.002	1.000
9.400%	7/1/2022	6/30/2023	10/12/2022 8:18	10/17/2022 6:52	10/17/2022 9:54	0.592	0.977	1.002	1.000
5.900%	11/1/2021	10/31/2022	10/12/2022 8:18	10/17/2022 6:52	10/17/2022 9:54	0.592	0.977	1.002	1.000
8.000%	4/1/2022	3/31/2023	10/12/2022 8:18	10/17/2022 6:52	10/17/2022 9:54	0.592	0.977	1.002	1.000
5.600%	4/28/2022	4/30/2023	10/12/2022 8:18	10/17/2022 7:21	10/17/2022 10:27	0.593	0.977	1.002	1.000
3.900%	8/1/2022	7/31/2023	10/12/2022 8:18	10/17/2022 7:21	10/17/2022 10:27	0.593	0.977	1.002	1.000
2.300%	2/1/2022	1/31/2023	10/12/2022 8:18	10/17/2022 7:21	10/17/2022 10:27	0.593	0.977	1.002	1.000
7.900%	6/1/2022	5/31/2023	10/12/2022 8:18	10/17/2022 7:21	10/17/2022 10:27	0.593	0.977	1.002	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

**Spike S/N :** 1715-G  
**Spike Exp Date :** 9/8/2023  
**Spike Activity (dpm/ml):** 297.49  
**Spike Volume Added:** 0.10

**LCS S/N :** 1715-G  
**LCS Exp Date :** 9/8/2023  
**LCS Activity (dpm/ml):** 297.49  
**LCS Volume Added:** 0.10

<b>Results</b>																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.1865	0.1317	1	0.3483	<b>0.3963</b>	33.89%	0.4667	0.1563	0.2602	0.2694		SAMPLE				
2	0.1498	0.1057	1	0.3079	<b>0.7391</b>	24.00%	0.7667	0.1732	0.3273	0.3637		SAMPLE				
3	0.1883	0.1329	1	0.3515	<b>0.2857</b>	42.44%	0.3333	0.1414	0.2376	0.2412		SAMPLE				
4	0.1684	0.1189	1	0.3263	<b>0.4426</b>	31.96%	0.5000	0.1528	0.2650	0.2845		SAMPLE				
5	0.2825	0.1994	1	0.4898	<b>0.3334</b>	47.60%	0.3667	0.1732	0.3087	0.3148		SAMPLE				
6	0.2002	0.1413	1	0.3570	<b>23.8326</b>	8.63%	32.0333	1.0398	1.5162	5.3008		SAMPLE				
7	0.1586	0.1120	1	0.3260	<b>0.1361</b>	70.93%	0.1333	0.0943	0.1886	0.1903		MB				
8	0.2206	0.1558	1	0.3936	<b>0.3554</b>	38.66%	0.4333	0.1667	0.2679	0.2741	594438001.1	DUP	10.9%			
9	1.1757	0.8301	1	2.1953	<b>156.4588</b>	4.10%	29.2333	0.9916	10.4023	25.8463	594438001.1	MS			133.3244	117.1%
10	0.1870	0.1320	1	0.3491	<b>25.3056</b>	8.59%	29.7333	1.0000	1.6681	5.6106		LCS			26.6772	94.9%



# **Continuing Calibration Data**



# Ludlum Alpha Scintillation Counter Checks for 17-OCT-2022

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	05:42	1	1.22E+05	122068	-0.42		
LUCAS2	EFF	05:40	1	1.33E+05	132513	-0.92		
LUCAS4	EFF	05:31	1	1.29E+05	129400	2.27		
LUCAS5	EFF	05:26	1	1.34E+05	134102	2.35		
LUCAS6	EFF	05:24	1	1.33E+05	133019	1.86		
LUCAS7	EFF	05:23	1	1.29E+05	129338	-2.46		
LUCAS8	EFF	05:21	1	1.36E+05	135538	1.21		

**Reviewed by:**

Lyndsey Pace

**Date:** 17-OCT-22

GEL Laboratories LLC

# Runlogs

# Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2322339

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
594438001	SAMPLE	LXP1	LUCAS2	OCT-17-22 09:54:00	DONE	Lucas Cell	01-AUG-22 00:00
594438002	SAMPLE	LXP1	LUCAS4	OCT-17-22 09:54:00	DONE	Lucas Cell	01-FEB-22 00:00
594438003	SAMPLE	LXP1	LUCAS5	OCT-17-22 09:54:00	DONE	Lucas Cell	01-JUN-22 00:00
594438004	SAMPLE	LXP1	LUCAS6	OCT-17-22 09:54:00	DONE	Lucas Cell	01-JUL-22 00:00
594438005	SAMPLE	LXP1	LUCAS7	OCT-17-22 09:54:00	DONE	Lucas Cell	01-NOV-21 00:00
594650001	SAMPLE	LXP1	LUCAS8	OCT-17-22 09:54:00	DONE	Lucas Cell	01-APR-22 00:00
1205202764	MB	LXP1	LUCAS1	OCT-17-22 10:27:00	DONE	Lucas Cell	28-APR-22 00:00
1205202765	DUP	LXP1	LUCAS2	OCT-17-22 10:27:00	DONE	Lucas Cell	01-AUG-22 00:00
1205202766	MS	LXP1	LUCAS4	OCT-17-22 10:27:00	DONE	Lucas Cell	01-FEB-22 00:00
1205202767	LCS	LXP1	LUCAS5	OCT-17-22 10:27:00	DONE	Lucas Cell	01-JUN-22 00:00



Environmental Laboratory  
 1232 Haco Drive  
 Lansing  
 Michigan, 48910



CHAIN OF CUSTODY

Phone: (517)702-6372

Lab Work Order Number L209219

Client Name <b>BWL - Erickson Station</b>		Project Name <b>Erickson AM MI Wells 11-13</b>		Requested Analyses					Requested Turn Around	
Client Contact <b>Cheryl Louden</b>		Project Number <b>[none]</b>		Ag:: As:: B:: Ba:: Be:: Ca:: Cd:: Cr:: Co:: Cu:: Fe:: Hg:: Li:: Mo:: Ni:: Pb:: Sb:: Se:: Ti:: V:: Zn:: Mg:: Na:: K	TSS, HCO3, CO3, T, Hardness	Cl-IC:: F-ISE:: SO4:: TDS	Radium 226 and Radium 228 Metals Dissolved (same metals as total)			Rush requests subject to additional charge.  Rush requests subject to lab approval.
Address <b>3725 S. Canal</b>		Project Description								
City <b>Lansing</b>		PO Number <b>30926 10021</b>								
State/Zip <b>MI, 48917</b>		Shipped By								
Phone <b>(517) 702-6396</b>	Fax <b>(517) 702-6373</b>	Tracking Number								
Sampler <b>Marc Wahrer</b>										

Sample Name or Field ID	Sampled Date	Sampled Time	Sample Type Grab/Composite	Matrix Code	Container Count	Preservation Code					Sample	Comments
						b	a	a	b	a		
MW-11	9/21/2022	1140	G	GW	5	1	1	1	2	0		
MW-12	9/21/2022	1410	G	GW	6	1	1	1	2	1		
MW-13	9/21/2022	1338	G	GW	5	1	1	1	2	0		
Field Duplicate	9/21/2022	1140	G	GW	5	1	1	1	2	0		
Field Blank	9/21/2022	0820	G	DI	5	1	1	1	2	0		

Relinquished By 	Date/Time <b>9-21-22 1512</b>	Received By 	Date/Time <b>09/21/22 1512</b>	
Relinquished By	Date/Time	Received By	Date/Time	Comments
Relinquished By	Date/Time	Received By	Date/Time	
Cooler Numbers and Temperatures				

Matrix Codes: DI=Deionized Water, GW=Ground Water      Preserv. Codes: a=None, b=0.5% HNO3



## Data Verification & Validation Report

### Lansing Board of Water & Light – Erickson Power Station

**Sampling Event (dates and purpose):** New Wells 11-13 – Background Round 7 – September 2022

Data Package Number: S40562.01

Lab Report Date: 12/13/2022

Data Validator: Aryka Thomson

Data Validation Completion Date: 12/24/2022

General Overall Assessment:

Data are usable without qualification.

Data are usable with qualification (as noted below).

Some or all data are unusable (as noted below).

Wells planned for sampling:

Well ID	Planned for Sampling
MW-1	
MW-2	
MW-3	
MW-4	
MW-5	
MW-6	
MW-7	
MW-7B	
MW-7C	
MW-8	
MW-9	
MW-10	
MW-11	X
MW-11B	
MW-12	X
MW-12B	
MW-13	X

### Data Summary

Sample ID	Matrix	Lab ID	Date Collected	App III Metals	App IV Metals	Part 115 Metals	Anions	TDS TSS	Rad-226 Rad-228	Diss. Metals
MW-11	GW	S40562.01	09/21/2022	X	X	X	X	X	X	
MW-12	GW	S40562.02	09/21/2022	X	X	X	X	X	X	X
MW-13	GW	S40562.03	09/21/2022	X	X	X	X	X	X	
MW-11 Dup	QC	S40562.04	09/21/2022	X	X	X	X	X	X	

Other analytes requested for analysis: Na, Mg, K, HCO<sub>3</sub>, CO<sub>3</sub>, hardness

Any planned sampling or analysis NOT completed? If yes, explain: \_\_\_\_\_

### Data Verification & Validation Checklist

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
<b>Field Data</b>							
Sample Collection Field Forms	X		Purging performed as required in the Groundwater Monitoring Plan		X		MW-12 turbidity > 10 NTU; collected additional container for dissolved metals
Field Calibration Records	X		Field instruments calibrated daily according to manufacturer specifications	X			
Chain of Custody	X		Accurately reflect samples, collection dates/times, analyses, bottles, etc.	X			
Field decontamination documentation	N/A		Record of decontamination for non-dedicated sampling equipment			X	
Drilling logs	X		N/A	-	-	-	
Well construction logs	X		N/A	-	-	-	
Well development field forms	X		N/A	-	-	-	
<b>Analytical Data Package</b>							
Cover Sheet	X		N/A	-	-	-	
Case Narrative	X		Summarizes sample receipt and any exceptions to QC acceptance criteria	X			
Internal Laboratory Chain of Custody forms	X		Analyses as requested; accurate transcription of field COC	X			
Sample Chronology and Consistency	X		Accurate representation of dates, times of receipt, preparation, and analysis	X			
Communication Records with Lab	X		N/A	-	-	-	
EDD Format Consistency	X		EDD format and content as requested	X			
Sample Identification, Results Nomenclature, and Data Qualifier Consistency	X		All included in final report	X			
Method Detection Limit Consistency	X		MDLs consistent between samples		X		Dilutions vary between samples
Instrument Calibration Records	X		Present and no nonconformance noted	X			
Laboratory Report Complete	X		Includes QC component	X			
Holding Times	X		Analyses performed within allowed holding time	X			

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Method	X		Method as requested	X			
Reporting Limits	X		RLs as requested	X			RLs for chloride, sulfate, and TDS were not met
			MDLs<RLs		X		RL=MDL for carbonate
			MDLs<GPS			X	
<b>QC Validation</b>							
<b>Evaluate Accuracy</b>							
Matrix Spike (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Laboratory Control Sample (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
<b>Evaluate Precision</b>							
Matrix Spike Duplicate (RPD)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Field Duplicate (RPD)	X		RPD ≤ 20%		X		Radium-226+228 RPD is 52% Molybdenum is non-detect in the parent and detected in the field duplicate
<b>Evaluate Representativeness</b>							
Equipment Blanks (if applicable)	N/A		Non-detect (<RL)			X	
<b>QC Verification</b>							
<b>Verify Instrument Calibration &amp; Analytical Process</b>							
Initial Calibration Verification	X		Laboratory-determined	-	-	-	
Continuing Calibration Verification	X		Laboratory-determined	-	-	-	
Initial Calibration Blank	X		Laboratory-determined	-	-	-	
Continuing Calibration Blank	X		Laboratory-determined	-	-	-	
Serial Dilutions	X		Laboratory-determined	-	-	-	High recovery for Al, Zn, and K
Post-Digestion Spikes	X		Laboratory-determined	-	-	-	
Internal Standards	X		Laboratory-determined	-	-	-	
Laboratory Duplicate (RPD)	X		Laboratory-determined	-	-	-	
Method Blanks	X		Laboratory-determined	-	-	-	
<b>Evaluate Completeness (# usable measurements/ # unusable measurements)</b>							
Completeness	X		100%	X			

Other instances of nonconformance to QC control limits noted on case narrative: None

Comments:

Combined Radium-226+228 field duplicate RPD is 52%. Rad-228 and consequently combined radium required qualification as estimated with low bias (J-) in the parent sample MW-11 and as estimated with high bias (J+) in the field duplicate MW-11-Dup.



Molybdenum required qualification as estimated but not detected (UJ) in the parent sample MW-11 and as estimated with high bias (J+) in the field duplicate MW-11-Dup.



Lansing Board of Water and Light  
Environmental Services Laboratory (MI00079)  
1232 Haco Dr.  
Lansing, Michigan 48901

24 October 2022

BWL - Erickson Station  
Attn: Cheryl Loudon  
3725 S. Canal  
Lansing, MI 48917

**Project: Erickson AM MI**

Dear Cheryl Loudon,

Enclosed is a copy of the laboratory report for the following work order(s) received by Lansing Board of Water and Light Environmental Services Laboratory:

<b>Work Order</b>	<b>Received</b>	<b>Account Number</b>
L209154	9/15/2022 11:35:00AM	30926 10021

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in blue ink that reads "Jennifer Caporale".

Jennifer Caporale, Supervisor



### Analytical Report

**Client:** BWL - Erickson Station  
**Address:** 3725 S. Canal  
Lansing MI, 48917

**Client Project Manager:** Cheryl Louden

**Report Date:** 10/24/2022

**Sample Name:** MW-11B

**Lab #:** L209154-01 Ground Water

**Collected:** 15-Sep-22 09:51

**By:** Marc Wahrer

Analyte	Reporting			Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit	Units						
Conductivity	540	1.0	uS/cm	1		15-Sep-22 09:51	maw	SM 2510B	
Dissolved oxygen	ND	0.100	mg/L	1		15-Sep-22 09:51	maw	FIELD	
Milliliters Purged	200		ml/min	1		15-Sep-22 09:51	maw	FIELD	
Oxidation Reduction Potential	-189.3	-999.0	mV	1		15-Sep-22 09:51	maw	FIELD	
pH	7.3	7.0	pH Units	1		15-Sep-22 09:51	maw	SM 4500H+B	
Temperature	13		°C	1		15-Sep-22 09:51	maw	SM 2550B	
Turbidity	4.1	0.10	NTU	1		15-Sep-22 09:51	maw	SM 2130B	



## Analytical Report

**Client:** BWL - Erickson Station

**Client Project Manager:** Cheryl Louden

**Report Date:** 10/24/2022

**Address:** 3725 S. Canal  
Lansing MI, 48917

**Approved By:** \_\_\_\_\_

*Jennifer Caporale*

### Notes and Definitions

- AL Action Level (Action Level = Regulatory Limit)
  - MCL Maximum Contaminant Level
  - PEL Permissible Exposure Limit (Permissible Exposure Limit = Regulatory Limit)
  - RPD Relative Percent Difference
  - OT Odor Threshold
  - ND Non Detect is less than the reporting limit value
- All drinking water regulatory limits are MCL's with the exception of Lead and Copper unless otherwise noted.



Report ID: S40350.01(02)  
Generated on 10/19/2022  
Replaces report S40350.01(01) generated on 09/19/2022

**Report to**  
Attention: Jennifer Caporale  
Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901  
  
Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

**Report produced by**  
Merit Laboratories, Inc.  
2680 East Lansing Drive  
East Lansing, MI 48823  
  
Phone: (517) 332-0167 FAX: (517) 332-6333  
  
Contacts for report questions:  
John Lavery (johnlavery@meritlabs.com)  
Barbara Ball (bball@meritlabs.com)

**Report Summary**  
Lab Sample ID(s): S40350.01-S40350.03  
Project: Erickson AM MI New Wells 11B  
Collected Date(s): 09/15/2022  
Submitted Date/Time: 09/15/2022 12:15  
Sampled by: Marc Wahrer  
P.O. #:

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Maya Murshak  
Technical Director



## General Report Notes

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Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile, and 2-chloroethylvinyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (\*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

## Report Narrative

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All analyses completed



## Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Alaska CSLAP	#17-001
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

## Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

## Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



## Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1 (1993)
SM2320B	Standard Method 2320 B 2011
SM2340C	Standard Method 2340 C 2011
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007





## Sample Summary (3 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S40350.01	MW-11B L209154-01	Groundwater	09/15/22 09:51
S40350.02	Field Dupe MW-11B L209154-02	Groundwater	09/15/22 09:51
S40350.03	Field Blank L209154-03	DI	09/15/22 08:45



# Analytical Laboratory Report

Final Report

Lab Sample ID: S40350.01

Sample Tag: MW-11B L209154-01

Collected Date/Time: 09/15/2022 09:51

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	4.4	IR
2	1L Plastic	None	Yes	4.4	IR
1	125ml Plastic	HNO3	Yes	4.4	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	09/16/22 13:30	CTV	
Metal Digestion	Completed	SW3015A	09/16/22 11:00	CCM	

### Inorganics

Method: E300.0, Run Date: 09/16/22 09:09, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 09/19/22 10:06, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	350	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 09/19/22 11:08, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	261	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 09/17/22 12:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	300	50	10	mg/L	2		

Method: SM2540D, Run Date: 09/15/22 17:30, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	5	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 09/16/22 13:00, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.009	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.068	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.73	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	2.48	0.02	0.00192	mg/L	5	7439-89-6	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S40350.01 (continued)

Sample Tag: MW-11B L209154-01

**Method: E200.8, Run Date: 09/16/22 13:00, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.026	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.006	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 09/16/22 15:29, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	64.0	1.0	0.0435	mg/L	5	7440-70-2	
Magnesium	23.4	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	5.98	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	16.0	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 09/16/22 15:30, Analyst: CTV**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 10/18/22 14:25, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Final Report

Lab Sample ID: S40350.02

Sample Tag: Field Dupe MW-11B L209154-02

Collected Date/Time: 09/15/2022 09:51

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	4.4	IR
2	1L Plastic	None	Yes	4.4	IR
1	125ml Plastic	HNO3	Yes	4.4	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	09/16/22 13:30	CTV	
Metal Digestion	Completed	SW3015A	09/16/22 11:00	CCM	

### Inorganics

Method: E300.0, Run Date: 09/16/22 09:22, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 09/19/22 10:14, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	360	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 09/19/22 11:16, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	258	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 09/17/22 12:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	300	50	10	mg/L	2		

Method: SM2540D, Run Date: 09/15/22 17:30, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	5	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 09/16/22 13:04, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.009	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.069	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.72	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	2.44	0.02	0.00192	mg/L	5	7439-89-6	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S40350.02 (continued)  
Sample Tag: Field Dupe MW-11B L209154-02

**Method: E200.8, Run Date: 09/16/22 13:04, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.028	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.006	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 09/16/22 15:30, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	64.7	1.0	0.0435	mg/L	5	7440-70-2	
Magnesium	23.7	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	6.24	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	16.2	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 09/16/22 15:40, Analyst: CTV**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 10/18/22 14:25, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Lab Sample ID: S40350.03

Sample Tag: Field Blank L209154-03

Collected Date/Time: 09/15/2022 08:45

Matrix: DI

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	4.4	IR
2	1L Plastic	None	Yes	4.4	IR
1	125ml Plastic	HNO3	Yes	4.4	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion*	Completed	E245.1	09/16/22 13:30	CTV	
Metal Digestion*	Completed	SW3015A	09/16/22 11:00	CCM	

### Inorganics

Method: E300.0, Run Date: 09/16/22 09:35, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride*	Not detected	2.5	0.04	mg/L	2.5	16887-00-6	
Fluoride (Undistilled)*	Not detected	0.5	0.06	mg/L	2.5	16984-48-8	
Sulfate*	Not detected	2.5	0.15	mg/L	2.5	14808-79-8	

Method: SM2320B, Run Date: 09/19/22 10:16, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	Not detected	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 09/19/22 11:18, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness*	Not detected	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 09/17/22 12:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids*	Not detected	50	10	mg/L	2		

Method: SM2540D, Run Date: 09/15/22 17:30, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids*	Not detected	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 09/16/22 12:56, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00102	mg/L	2	7440-36-0	
Arsenic*	Not detected	0.002	0.000102	mg/L	2	7440-38-2	
Barium*	Not detected	0.005	0.0000648	mg/L	2	7440-39-3	
Beryllium*	Not detected	0.001	0.0000862	mg/L	2	7440-41-7	
Boron*	Not detected	0.04	0.000702	mg/L	2	7440-42-8	
Cadmium*	Not detected	0.0005	0.0000760	mg/L	2	7440-43-9	
Chromium*	Not detected	0.005	0.0000386	mg/L	2	7440-47-3	
Cobalt*	Not detected	0.005	0.0000434	mg/L	2	7440-48-4	
Copper*	Not detected	0.005	0.000150	mg/L	2	7440-50-8	
Iron*	Not detected	0.02	0.000768	mg/L	2	7439-89-6	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S40350.03 (continued)

Sample Tag: Field Blank L209154-03

**Method: E200.8, Run Date: 09/16/22 12:56, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead*	Not detected	0.003	0.0000760	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000654	mg/L	2	7439-93-2	
Molybdenum*	Not detected	0.005	0.0000868	mg/L	2	7439-98-7	
Nickel*	Not detected	0.005	0.000100	mg/L	2	7440-02-0	
Selenium*	Not detected	0.005	0.000838	mg/L	2	7782-49-2	
Silver*	Not detected	0.0005	0.0000270	mg/L	2	7440-22-4	
Thallium*	Not detected	0.002	0.0000342	mg/L	2	7440-28-0	
Vanadium*	Not detected	0.005	0.0000558	mg/L	2	7440-62-2	
Zinc*	Not detected	0.005	0.000292	mg/L	2	7440-66-6	

**Method: E200.8, Run Date: 09/16/22 15:26, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	1.0	0.0174	mg/L	2	7440-70-2	
Magnesium*	Not detected	0.50	0.00480	mg/L	2	7439-95-4	
Potassium*	Not detected	0.50	0.00920	mg/L	2	7440-09-7	
Sodium*	Not detected	0.50	0.00340	mg/L	2	7440-23-5	

**Method: E245.1, Run Date: 09/16/22 15:43, Analyst: CTV**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury*	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 10/18/22 14:25, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

# Merit Laboratories Login Checklist

Lab Set ID:S40350

Client:BWL01 (Board of Water & Light)

Project: Erickson AM MI New Wells 11B

Submitted:09/15/2022 12:15 Login User: BJB

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental\_Laboratory@LBWL.com

Selection	Description	Note
-----------	-------------	------

## Sample Receiving

01.  Yes  No  N/A Samples are received at 4C +/- 2C Thermometer #

02.  Yes  No  N/A Received on ice/ cooling process begun

03.  Yes  No  N/A Samples shipped

04.  Yes  No  N/A Samples left in 24 hr. drop box

05.  Yes  No  N/A Are there custody seals/tape or is the drop box locked

## Chain of Custody

06.  Yes  No  N/A COC adequately filled out

07.  Yes  No  N/A COC signed and relinquished to the lab

08.  Yes  No  N/A Sample tag on bottles match COC

09.  Yes  No  N/A Subcontracting needed? Subcontracted to: GEL 1Z4664770363609284

## Preservation

10.  Yes  No  N/A Do sample have correct chemical preservation

11.  Yes  No  N/A Completed pH checks on preserved samples? (no VOAs)

12.  Yes  No  N/A Did any samples need to be preserved in the lab?

## Bottle Conditions

13.  Yes  No  N/A All bottles intact

14.  Yes  No  N/A Appropriate analytical bottles are used

15.  Yes  No  N/A Merit bottles used

16.  Yes  No  N/A Sufficient sample volume received

17.  Yes  No  N/A Samples require laboratory filtration

18.  Yes  No  N/A Samples submitted within holding time

19.  Yes  No  N/A Do water VOC or TOX bottles contain headspace

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: \_\_\_\_\_ Date: \_\_\_\_\_



# Merit Laboratories Bottle Preservation Check

Lab Set ID: S40350 Submitted: 09/15/2022 12:15

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI New Wells 11B

Initial Preservation Check: 09/15/2022 12:48 BJB

Preservation Recheck (E200.8): N/A

Attention: Jennifer Caporale  
Address: Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901

Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S40350.01	125ml Plastic HNO3	<2			
S40350.01	1L Plastic HNO3	<2			
S40350.01	1L Plastic HNO3	<2			
S40350.02	125ml Plastic HNO3	<2			
S40350.02	1L Plastic HNO3	<2			
S40350.02	1L Plastic HNO3	<2			
S40350.03	125ml Plastic HNO3	<2			
S40350.03	1L Plastic HNO3	<2			
S40350.03	1L Plastic HNO3	<2			



## Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.150
Be, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Chloride	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Chromium	250 mL plastic	mg/L	Chill	300.0	28 d	2.5
Cl	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	10
Cr, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Fluoride	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Iron	250 mL plastic	mg/L	None	9056	28 d	1.0
F	Lead	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Fe, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Pb, total	Mercury	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Li, total	Molybdenum	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Hg, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Mo, total	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	Nitric Acid	SM 7500	6 mos	2.0 combined
Mn, total	Selenium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
RA226/228	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Se, total	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	0.0005
Ag, total	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	10
SO4	Total Dissolved Solids	1 L plastic	mg/L	None	SM 2540C	NA	0.002
TI, total	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540D	NA	20
TDS	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	3
TSS	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
V, total							
Zn, total							

October 18, 2022

John Laverty  
Merit Laboratories Inc.  
2680 East Lansing Drive  
East Lansing, Michigan 48823

Re: Routine Analysis  
Work Order: 593945  
SDG: S40350

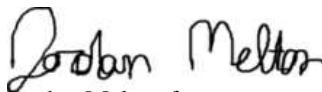
Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on September 21, 2022. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at [www.gel.com](http://www.gel.com).

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,



Jordan Melton for  
Delaney Stone  
Project Manager

Purchase Order: GELP20-0018  
Enclosures



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# Case Narrative

**Receipt Narrative  
for  
Merit Laboratories, Inc.  
SDG: S40350  
Work Order: 593945**

**October 18, 2022**

**Laboratory Identification:**

GEL Laboratories LLC  
2040 Savage Road  
Charleston, South Carolina 29407  
(843) 556-8171

**Summary:**

**Sample receipt:** The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on September 21, 2022 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

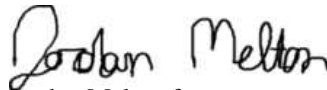
**Sample Identification:** The laboratory received the following samples:

<b><u>Laboratory ID</u></b>	<b><u>Client ID</u></b>
593945001	S40350.01
593945002	S40350.02 Field Dupe
593945003	S40350.03 Field Blank

**Case Narrative:**

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.



Jordan Melton for  
Delaney Stone  
Project Manager

# **Chain of Custody and Supporting Documentation**





2680 East Lansing Dr., East Lansing, MI 48823  
 Phone (517) 332-0167 Fax (517) 332-4034  
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

**REPORT TO** Project Management Team  
 Merit Laboratories  
 2680 East Lansing Drive  
 East Lansing MI 48823

**CHAIN OF CUSTODY RECORD**  
 CONTACT NAME: Julie Teague  
 COMPANY: Merit Laboratories  
 ADDRESS: 2680 East Lansing Drive  
 CITY: East Lansing STATE: MI ZIP CODE: 48823  
 PHONE NO.: 517-332-0167 E-MAIL ADDRESS: juliet@meritlabs.com

**INVOICE TO**

CONTACT NAME: Julie Teague  
 COMPANY: Merit Laboratories  
 ADDRESS: 2680 East Lansing Drive  
 CITY: East Lansing STATE: MI ZIP CODE: 48823  
 PHONE NO.: 517-332-0167 P.O. NO.:  
 E-MAIL ADDRESS: results@meritlabs.com

PROJECT NO./NAME: S40350 SAMPLER(S) - PLEASE PRINT/SIGN NAME:

TURNAROUND TIME REQUIRED:  1 DAY  2 DAYS  3 DAYS  STANDARD  OTHER  
 DELIVERABLES REQUIRED:  STD  LEVEL I  LEVEL II  LEVEL III  EDD  OTHER

MATRIX CODE: SL=SLUDGE WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID  
 DW=DRINKING WATER O=OIL WP=WPE A=AIR W=WASTE  
 YEAR: 2022 DATE: 9/15/22 TIME: 0951 IDENTIFICATION-DESCRIPTION: S40350.01  
 YEAR: 2022 DATE: 9/15/22 TIME: 0951 IDENTIFICATION-DESCRIPTION: S40350.02 Field Dupe  
 YEAR: 2022 DATE: 9/15/22 TIME: 0845 IDENTIFICATION-DESCRIPTION: S40350.03 Field Blank

# Containers & Preservatives

OTHER	MEQH	NaOH	H <sub>2</sub> SO <sub>4</sub>	HNO <sub>3</sub>	HCl	NONE	# OF BOTTLES	MATRIX
							2	GW
							2	GW
							2	GW

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

Certifications	<input type="checkbox"/> OHIO VAP	<input type="checkbox"/> Drinking Water
	<input type="checkbox"/> DoD	<input type="checkbox"/> NPDES
Project Locations	<input type="checkbox"/> Detroit	<input type="checkbox"/> New York
	<input type="checkbox"/> Other	
Special Instructions	* E903.1 Mod. ** E904.0/SW 9320 Mod.	
Please use calculation product & provide Radium 226/228 combined results on the report		
(No Ice needed)		
** Subcontracted to	GEL Laboratories, Inc.	
	2040 Savage Road	
	Charleston, SC 29407	

RELINQUISHED BY: SIGNATURE/Organization	DATE	TIME
<i>Patent Miller</i>	9/15/22	1700
RECEIVED BY: SIGNATURE/Organization	DATE	TIME
<i>WPS</i>	9/15/22	1720
RELINQUISHED BY: SIGNATURE/Organization	DATE	TIME
<i>West</i>	9/21/22	1005
RECEIVED BY: SIGNATURE/Organization	DATE	TIME

RELINQUISHED BY: SIGNATURE/Organization	DATE	TIME
RECEIVED BY: SIGNATURE/Organization	DATE	TIME
SEAL NO. YES <input type="checkbox"/> NO <input type="checkbox"/>	SEAL INTACT YES <input type="checkbox"/> NO <input type="checkbox"/>	INITIALS
		INITIALS
NOTES:	TEMP. ON ARRIVAL	

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE



**SAMPLE RECEIPT & REVIEW FORM** <sup>DS</sup>

Client: <u>MERI</u>		SDG/AR/COC/Work Order: <u>593945</u>	
Received By: <u>MVH</u>		Date Received: <u>09-21-2022</u>	
Carrier and Tracking Number		Circle Applicable: FedEx Express   FedEx Ground <u>UPS</u> Field Services   Courier   Other	
		<u>124664770363609284</u>	
<b>Suspected Hazard Information</b>		Yes	No
*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.			
A) Shipped as a DOT Hazardous?		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
B) Did the client designate the samples are to be received as radioactive?		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
C) Did the RSO classify the samples as radioactive?		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
D) Did the client designate samples are hazardous?		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
E) Did the RSO identify possible hazards?		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Hazard Class Shipped:		UN#:	
If UN2910, Is the Radioactive Shipment Survey Compliant? Yes ___ No ___		COC notation or radioactive stickers on containers equal client designation.	
Maximum Net Counts Observed* (Observed Counts - Area Background Counts):		Classified as: Rad 1   Rad 2   Rad 3	
COC notation or hazard labels on containers equal client designation.		If D or E is yes, select Hazards below.	
PCB's   Flammable   Foreign Soil   RCRA   Asbestos   Beryllium   Other:		Circle Applicable: Seals broken   Damaged container   Leaking container   Other (describe)	
<b>Sample Receipt Criteria</b>		Yes	NA
<b>Comments/Qualifiers (Required for Non-Conforming Items)</b>			
1	Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
2	Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
4	Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
5	Sample containers intact and sealed?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
6	Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
7	Do any samples require Volatile Analysis?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
8	Samples received within holding time?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
9	Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
10	Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
11	Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
12	Are sample containers identifiable as GEL provided by use of GEL labels?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
13	COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Comments (Use Continuation Form if needed) <u>MVH 9-21-22</u>			

PM (or PMA) review: Initials JM Date 9-22-22 Page 1 of 1

# Laboratory Certifications

**List of current GEL Certifications as of 18 October 2022**

<b>State</b>	<b>Certification</b>
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122023-3
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2022-160
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122021-36
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

# **Radiological Analysis**

# Case Narrative

**Radiochemistry  
Technical Case Narrative  
Merit Laboratories, Inc.  
SDG #: S40350  
Work Order #: 593945**

**Product: GFPC Ra228, Liquid**

**Analytical Method:** EPA 904.0/SW846 9320 Modified

**Analytical Procedure:** GL-RAD-A-063 REV# 5

**Analytical Batch:** 2320020

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
593945001	S40350.01
593945002	S40350.02 Field Dupe
593945003	S40350.03 Field Blank
1205198398	Method Blank (MB)
1205198399	593945001(S40350.01) Sample Duplicate (DUP)
1205198400	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

**Quality Control (QC) Information**

**Method Blank Criteria**

The blank result (See Below) is greater than the MDC but less than the required detection limit.

Sample	Analyte	Value
1205198398 (MB)	Radium-228	Result: 1.55 pCi/L > MDA: 1.22 pCi/L <= RDL: 3.00 pCi/L

**Product: Lucas Cell, Ra226, Liquid**

**Analytical Method:** EPA 903.1 Modified

**Analytical Procedure:** GL-RAD-A-008 REV# 15

**Analytical Batch:** 2320009

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
593945001	S40350.01
593945002	S40350.02 Field Dupe

593945003	S40350.03 Field Blank
1205198386	Method Blank (MB)
1205198387	593893001(NonSDG) Sample Duplicate (DUP)
1205198388	593893001(NonSDG) Matrix Spike (MS)
1205198389	593893001(NonSDG) Matrix Spike Duplicate (MSD)
1205198390	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

**Miscellaneous Information**

**Additional Comments**

The matrix spike and matrix spike duplicate, 1205198388 (Non SDG 593893001MS) and 1205198389 (Non SDG 593893001MSD), aliquots were reduced to conserve sample volume.

**Certification Statement**

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.



## GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

### Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S40350 GEL Work Order: 593945

**The Qualifiers in this report are defined as follows:**

- \* A quality control analyte recovery is outside of specified acceptance criteria
- \*\* Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

**Review/Validation**

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature: 

Name: Kate Gellatly

Date: 19 OCT 2022

Title: Analyst I

# Sample Data Summary

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: October 19, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

Client Sample ID: S40350.01	Project: MERI00120
Sample ID: 593945001	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 15-SEP-22 09:51	
Receive Date: 21-SEP-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	0.773	+/-0.990	1.68	3.00	pCi/L		JE1	10/12/22	1150	2320020		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		1.29	+/-1.03			pCi/L		NXL1	10/18/22	1425	2325174		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.518	+/-0.278	0.335	1.00	pCi/L		LXP1	10/18/22	0951	2320009		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			85.4	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: October 19, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Lavery  
 Project: Routine Analysis

Client Sample ID: S40350.02 Field Dupe	Project: MERI00120
Sample ID: 593945002	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 15-SEP-22 09:51	
Receive Date: 21-SEP-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.0951	+/-0.778	1.46	3.00	pCi/L		JE1	10/12/22	1150	2320020	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.604	+/-0.841			pCi/L		NXL1	10/18/22	1425	2325174	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.509	+/-0.319	0.417	1.00	pCi/L		LXP1	10/18/22	1024	2320009	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			87.8	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: October 19, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

Client Sample ID: S40350.03 Field Blank	Project: MERI00120
Sample ID: 593945003	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 15-SEP-22 08:45	
Receive Date: 21-SEP-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	0.387	+/-0.852	1.53	3.00	pCi/L		JE1	10/12/22	1150	2320020		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		0.843	+/-0.890			pCi/L		NXL1	10/18/22	1425	2325174		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.456	+/-0.260	0.291	1.00	pCi/L		LXP1	10/18/22	1024	2320009		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			79.4	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# **Quality Control Summary**

# GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

## QC Summary

Report Date: October 19, 2022

Page 1 of 2

Merit Laboratories Inc.  
2680 East Lansing Drive  
East Lansing, Michigan

Contact: John Laverty

Workorder: 593945

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Rad Gas Flow</b>											
Batch	2320020										
QC1205198399	593945001	DUP									
Radium-228	U	0.773	U	0.0575	pCi/L	N/A		N/A	JE1	10/12/22	11:50
	Uncertainty	+/-0.990		+/-0.680							
QC1205198400	LCS										
Radium-228	43.8			44.9	pCi/L		103	(75%-125%)		10/12/22	11:50
	Uncertainty			+/-3.38							
QC1205198398	MB										
Radium-228				1.55	pCi/L					10/12/22	11:50
	Uncertainty			+/-0.863							
<b>Rad Ra-226</b>											
Batch	2320009										
QC1205198387	593893001	DUP									
Radium-226	U	0.160	U	0.0880	pCi/L	N/A		N/A	LXP1	10/18/22	10:24
	Uncertainty	+/-0.166		+/-0.237							
QC1205198390	LCS										
Radium-226	26.5			25.4	pCi/L		95.8	(75%-125%)		10/18/22	10:56
	Uncertainty			+/-1.67							
QC1205198386	MB										
Radium-226			U	0.227	pCi/L					10/18/22	10:24
	Uncertainty			+/-0.249							
QC1205198388	593893001	MS									
Radium-226	128 U	0.160		102	pCi/L		79.4	(75%-125%)		10/18/22	10:24
	Uncertainty	+/-0.166		+/-6.87							
QC1205198389	593893001	MSD									
Radium-226	131 U	0.160		108	pCi/L	6.2	82.5	(0%-20%)		10/18/22	10:56
	Uncertainty	+/-0.166		+/-8.16							

### Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- \*\* Analyte is a Tracer compound
- < Result is less than value reported
- > Result is greater than value reported

# GEL LABORATORIES LLC

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## QC Summary

Workorder: 593945

Page 2 of 2

Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
BD											
Results are either below the MDC or tracer recovery is low											
FA											
Failed analysis.											
H											
Analytical holding time was exceeded											
J											
See case narrative for an explanation											
J											
Value is estimated											
K											
Analyte present. Reported value may be biased high. Actual value is expected to be lower.											
L											
Analyte present. Reported value may be biased low. Actual value is expected to be higher.											
M											
M if above MDC and less than LLD											
M											
REMP Result > MDC/CL and < RDL											
N/A											
RPD or %Recovery limits do not apply.											
NI											
See case narrative											
ND											
Analyte concentration is not detected above the detection limit											
NJ											
Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier											
Q											
One or more quality control criteria have not been met. Refer to the applicable narrative or DER.											
R											
Sample results are rejected											
U											
Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.											
UI											
Gamma Spectroscopy--Uncertain identification											
UJ											
Gamma Spectroscopy--Uncertain identification											
UL											
Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.											
X											
Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier											
Y											
Other specific qualifiers were required to properly define the results. Consult case narrative.											
^											
RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.											
h											
Preparation or preservation holding time was exceeded											

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where the duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

\* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.



# Gas Flow Raw Data

# Batch 2320020 Check-list

This check-list was completed on 12-OCT-22 by Nat Long

This batch was reviewed by Nat Long on 12-OCT-22 and Kenshalla Oston on 13-OCT-22.

**Batch ID:**  
2320020

**Product:**  
GFC28RAL

**Description:** Gas Flow Radium 228  
GL-RAD-A-063

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?		No	
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
11	Has the method required detection limit been met?	Yes		
<b>Miscellaneous Information</b>				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

# Prep Logbook

## Radium-228 in Liquid

**Batch ID:** 2320020

**Analyst:** Jacqueline Emond (JE1)

**Method:** EPA 904.0/SW846 9320 Modified

**Lab SOP:** GL-RAD-A-063 REV# 5

**Instrument:** LUCAS-C202389980

**Due Dates for Lab:** 16-OCT-2022

**Package:** 18-OCT-2022

**SDG:** 19-OCT-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205198400	Radium-228	1965-C	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	593945001	06-OCT-2022	3	300	300	10/10/22 15:38	10/12/22 10:00
2	593945002	06-OCT-2022	3	304.14	304.14	10/10/22 15:38	10/12/22 10:00
3	593945003	06-OCT-2022	3	300.29	300.29	10/10/22 15:38	10/12/22 10:00
4	593955001	06-OCT-2022	3	301.3	301.3	10/10/22 15:38	10/12/22 10:00
5	1205198398 MB	06-OCT-2022	3		304.14	10/10/22 15:38	10/12/22 10:00
6	1205198399 DUP (593945001)	06-OCT-2022	3	302.84	302.84	10/10/22 15:38	10/12/22 10:00
7	1205198400 LCS	06-OCT-2022	3		304.14	10/10/22 15:38	10/12/22 10:00

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1951-D	Ba-133	.1 mL	Pipet Id: RAD-GFC-1795419 Data Entry Date2: 06-OCT-2022 00:00
REGNT 3418276.6	29M HF (48-50%)	4 mL	
REGNT 3454370.1	Nitric Acid	5 mL	
REGNT 3465466	Barium Carrier Ra228 REG	1 mL	
REGNT 3466687	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3478604	RGF-Neodymium Substrate	5 mL	
REGNT 3481329	RGF-1M Citric Acid	5 mL	
REGNT 3485088.6	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	
REGNT 3489658	RGF-7M Nitric Acid	25 mL	
REGNT 3492475	2M HCl	20 mL	
REGNT 3493319	RGF-1.5M Ammonium Sulfate	10 mL	
REGNT 3495034	RGF-50% Potassium Carbonate	2 mL	
REGNT DGA0037	2304168	2 g	

### Radium-228 Liquid

Filename : RA228.XLS  
 File type : Excel  
 Version # : 1.4.2

Tracer S/N : 1951-D  
 Tracer Exp Date : 6/2/2023  
 Tracer Volume Added: 0.10

Batch : 2320020  
 Analyst : JAC02417  
 Prep Date : 10/6/2022  
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL  
 Parmname : Radium-228  
 Required MDA : 3 pCi/L  
 Ra-228 Abundance : 1.00  
 Halflife of Ra-228 : 5.75 years  
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	593945001.1	0.3000	1.8459E-05	9/15/2022 9:51	1264.2	1.62%	1079.2	1.76%	0.1	0.000200
2	593945002.1	0.3041	1.8529E-05	9/15/2022 9:51	1264.2	1.62%	1110.6	1.73%	0.1	0.000200
3	593945003.1	0.3003	1.8464E-05	9/15/2022 8:45	1264.2	1.62%	1004.0	1.82%	0.1	0.000200
4	593955001.1	0.3013	1.8481E-05	9/13/2022 9:00	1264.2	1.62%	1182.3	1.68%	0.1	0.000200
5	1205198398.1	0.3041	1.8529E-05	10/6/2022 0:00	1264.2	1.62%	1092.0	1.75%	0.1	0.000200
6	1205198399.1	0.3028	1.8507E-05	9/15/2022 9:51	1264.2	1.62%	1082.2	1.75%	0.1	0.000200
7	1205198400.1	0.3041	1.8529E-05	10/6/2022 0:00	1264.2	1.62%	1023.0	1.81%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063  
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated	Sample
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction	Recovery %	Recovery Error %
			Alpha	Beta										
1	6B	60	9	61	1.017	10/12/2022 11:50	10/10/2022 15:38	10/12/2022 10:00	0.991	0.813	0.992	1.057	85.4%	1.23%
2	7A	60	8	40	0.667	10/12/2022 11:50	10/10/2022 15:38	10/12/2022 10:00	0.991	0.813	0.992	1.057	87.8%	1.22%
3	7B	60	15	40	0.667	10/12/2022 11:50	10/10/2022 15:38	10/12/2022 10:00	0.991	0.813	0.992	1.057	79.4%	1.25%
4	7C	60	15	56	0.933	10/12/2022 11:50	10/10/2022 15:38	10/12/2022 10:00	0.990	0.813	0.992	1.057	93.5%	1.20%
5	7D	60	12	51	0.850	10/12/2022 11:50	10/10/2022 15:38	10/12/2022 10:00	0.998	0.813	0.992	1.057	86.4%	1.23%
6	8A	60	7	30	0.500	10/12/2022 11:50	10/10/2022 15:38	10/12/2022 10:00	0.991	0.813	0.992	1.057	85.6%	1.23%
7	8C	60	24	731	12.183	10/12/2022 11:50	10/10/2022 15:38	10/12/2022 10:00	0.998	0.813	0.992	1.057	80.9%	1.25%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2022	5/31/2023	0.6280	0.00851	0.808	10/8/2022 9:33	500
2	PIC	6/1/2022	5/31/2023	0.6257	0.00594	0.640	10/8/2022 9:33	500
3	PIC	6/1/2022	5/31/2023	0.6366	0.00627	0.568	10/8/2022 9:33	500
4	PIC	6/1/2022	5/31/2023	0.6407	0.00790	0.974	10/8/2022 9:33	500
5	PIC	6/1/2022	5/31/2023	0.6270	0.01113	0.418	10/8/2022 9:33	500
6	PIC	6/1/2022	5/31/2023	0.6398	0.01579	0.484	10/8/2022 9:34	500
7	PIC	6/1/2022	5/31/2023	0.6294	0.01955	0.438	10/8/2022 9:34	500

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

**Spike S/N :** N/A  
**Spike Exp Date :** N/A  
**Spike Activity (dpm/ml):** N/A  
**Spike Volume Added:** N/A

\* - RPD changed to 0% due to sample & dup activity below MDA

**LCS S/N :** 1965-C  
**LCS Exp Date :** 8/5/2023  
**LCS Activity (dpm/ml):** 295.83  
**LCS Volume Added:** 0.10

Results Pos.	Decision	Critical	Required	Sample Act.		Sample Act.	Net Count	Net Count	2 SIGMA	2 SIGMA	Sample	Sample	RPD	RER	Nominal	Recovery
	Level	Level	MDA	MDA	Conc.	Error	Rate	Rate Error	Counting	Total Prop.						
1	1.0604	0.7487	3	1.6826	<b>0.7733</b>	65.31%	0.2087	0.1362	0.9896	1.0083		SAMPLE				
2	0.9080	0.6411	3	1.4604	<b>0.0951</b>	417.43%	0.0267	0.1113	0.7779	0.7783		SAMPLE				
3	0.9420	0.6651	3	1.5265	<b>0.3874</b>	112.17%	0.0987	0.1107	0.8517	0.8572		SAMPLE				
4	1.0381	0.7329	3	1.6311	<b>-0.1344</b>	325.33%	-0.0407	0.1323	0.8568	0.8569		SAMPLE				
5	0.7400	0.5224	3	1.2246	<b>1.5532</b>	28.40%	0.4320	0.1225	0.8631	0.9469		MB				
6	0.7962	0.5621	3	1.3040	<b>0.0575</b>	602.77%	0.0160	0.0964	0.6796	0.6797	593945001.1	DUP	* 0.0%			
7	0.8056	0.5688	3	1.3287	<b>44.9109</b>	4.49%	11.7453	0.4516	3.3844	11.8407		LCS			43.8138	102.5%

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
593945001	6B	60	9	61	10/12/2022 11:50	10/12/2022 12:50	PIC	2320020
593945002	7A	60	8	40	10/12/2022 11:50	10/12/2022 12:50	PIC	2320020
593945003	7B	60	15	40	10/12/2022 11:50	10/12/2022 12:50	PIC	2320020
593955001	7C	60	15	56	10/12/2022 11:50	10/12/2022 12:50	PIC	2320020
1205198398	7D	60	12	51	10/12/2022 11:50	10/12/2022 12:50	PIC	2320020
1205198399	8A	60	7	30	10/12/2022 11:50	10/12/2022 12:50	PIC	2320020
1205198400	8C	60	24	731	10/12/2022 11:50	10/12/2022 12:50	PIC	2320020



ASSAY 12-Oct-22 10:57:28  
 Wizard 2480 s/n 46190630  
 Protocol id 9 Ba-133\_1  
 Time limit  
 Count limit  
 Isotope Ba-133\_1  
 Protocol date 10/12/2022  
 Run id. 5672

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	94	1	180	3793.28	1264.2	1.62	10:57:28
593945001	2	94	2	180	3238.28	1079.22	1.76	85.37	11:00:41
593945002	3	94	3	180	3332	1110.56	1.73	87.85	11:03:55
593945003	4	94	4	180	3012.57	1004	1.82	79.42	11:07:09
593955001	5	94	5	180	3547.57	1182.3	1.68	93.52	11:10:23
1205198398	1	21	1	180	3276.57	1091.98	1.75	86.38	11:14:11
1205198399	2	21	2	180	3247.28	1082.22	1.75	85.61	11:17:25
1205198400	3	21	3	180	3069.28	1022.99	1.81	80.92	11:20:39

END OF ASSAY

# **Continuing Calibration Data**

# Gas Flow Proportional Counter Checks for 12-Oct-2022

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
G5400W1X	Below	Beta eff	12-Oct 05:34	5	14208	14210	14820	-3.02
LB4100A2	Above	Alpha eff	12-Oct 06:02	5	12909	7607	11950	+4.32
LB4100A2	Above	Beta eff	12-Oct 06:12	5	24520	19870	23260	+5.23
LB4100E2	Above	Beta bkg	12-Oct 04:39	60	3.300	1.385	3.072	+3.81
LB4100E3	Above	Beta bkg	12-Oct 04:39	60	2.283	0.506	2.576	+2.15
LB4100E3	Below	Beta eff	12-Oct 05:46	5	14141	14210	15500	-3.32
LB4100F2	Above	Alpha eff	12-Oct 05:53	5	6977	3944	6286	+4.77
LB4100F2	Below	Alpha XTalk	12-Oct 05:53	5	0.336	0.348	0.584	-3.30
LB4100F3	Above	Alpha eff	12-Oct 05:53	5	16978	11460	15350	+5.51
LB4100F3	Below	Alpha XTalk	12-Oct 05:53	5	0.295	0.328	0.439	-4.74
LB4100F4	Above	Alpha eff	12-Oct 05:53	5	13117	5098	9867	+7.09
LB4100F4	Below	Alpha XTalk	12-Oct 05:53	5	0.320	0.384	0.757	-4.03
LB4100F4	Below	Beta eff	12-Oct 08:08	5	29384	29440	34370	-3.07
LB4100G1	Above	Alpha XTalk	12-Oct 05:46	5	0.649	0.088	0.447	+6.39
LB4100G1	Above	Beta bkg	12-Oct 04:39	60	5029	0.380	1.675	+23,299.92
LB4100G1	Above	Beta eff	12-Oct 05:53	5	18488	12880	18320	+3.19
LB4100G2	Above	Alpha eff	12-Oct 08:07	5	10882	7308	9581	+6.43
LB4100G2	Below	Alpha XTalk	12-Oct 08:07	5	0.284	0.324	0.423	-5.43
LB4100G3	Above	Beta bkg	12-Oct 04:39	60	2.483	0.810	1.674	+8.62
LB4100H4	Above	Alpha eff	12-Oct 08:51	5	10792	6065	9898	+4.40
LB4100H4	Below	Alpha XTalk	12-Oct 08:51	5	0.377	0.394	0.613	-3.46
PIC1A	Above	Alpha bkg	12-Oct 05:00	60	0.350	-1.13E-1	0.365	+2.81
PIC1A	Above	Beta bkg	12-Oct 05:00	60	2.500	-7.65E-1	2.862	+2.40
PIC1C	Above	Beta bkg	12-Oct 05:00	60	2.183	-6.21E-1	2.214	+2.94
PIC2C	Below	Alpha eff	12-Oct 08:07	5	19487	19590	21630	-3.30
PIC4B	need 2nd	Alpha XTalk	12-Oct 04:52	5	0.297	0.295	0.417	-2.89
PIC4B	Above	Beta bkg	12-Oct 05:06	60	2.367	-3.01E-1	2.244	+3.29
PIC4C	Above	Beta bkg	12-Oct 05:06	60	8.233	-2.21E-1	1.560	+25.48
PIC8B	Above	Alpha bkg	12-Oct 05:18	60	0.783	-1.16E-1	0.388	+7.72

PIC8B	Below	Alpha XTalk	12-Oct 05:04	5	0.261	0.262	0.306	-3.14
PIC8B	Above	Beta bkg	12-Oct 05:18	60	3.283	-1.80E-1	2.341	+5.24
PIC8B	Above	Beta XTalk	12-Oct 05:11	5	0.006	2.00E-4	9.31E-4	+43.26
PIC11B	Above	Alpha bkg	12-Oct 06:45	60	0.533	-1.80E-1	0.522	+3.10
PIC11B	Above	Beta bkg	12-Oct 06:45	60	2.067	-2.97E-1	3.063	+1.22
PIC12C	Above	Alpha bkg	12-Oct 06:45	60	0.383	-6.64E-2	0.384	+2.99
PIC12C	Above	Beta bkg	12-Oct 06:45	60	3.650	0.142	2.845	+4.79
PIC14C	Below	Alpha eff	12-Oct 07:17	5	18178	18290	20300	-3.34
PIC14C	Above	Alpha XTalk	12-Oct 07:17	5	0.355	0.278	0.339	+4.51
PIC14C	Below	Beta eff	12-Oct 08:20	5	24598	24750	26790	-3.45

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

LB4100C1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by  \_\_\_\_\_

Date 10/12/22 \_\_\_\_\_

GEL Laboratories LLC

# Runlogs

# Instrument Run Log

Instrument Type: GFPC

Batch ID: 2320020

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
593945001	SAMPLE	JE1	PIC6B	OCT-12-22 11:50:04	DONE	25mm Filter	01-JUN-22 00:00
593945002	SAMPLE	JE1	PIC7A	OCT-12-22 11:50:08	DONE	25mm Filter	01-JUN-22 00:00
593945003	SAMPLE	JE1	PIC7B	OCT-12-22 11:50:09	DONE	25mm Filter	01-JUN-22 00:00
593955001	SAMPLE	JE1	PIC7C	OCT-12-22 11:50:12	DONE	25mm Filter	01-JUN-22 00:00
1205198398	MB	JE1	PIC7D	OCT-12-22 11:50:16	DONE	25mm Filter	01-JUN-22 00:00
1205198399	DUP	JE1	PIC8A	OCT-12-22 11:50:19	DONE	25mm Filter	01-JUN-22 00:00
1205198400	LCS	JE1	PIC8C	OCT-12-22 11:50:23	DONE	25mm Filter	01-JUN-22 00:00

# Lucas Cell Raw Data

# Batch 2320009 Check-list

This check-list was completed on 18-OCT-22 by Lyndsey Pace

This batch was reviewed by Gregory Ramsay on 18-OCT-22 and Lyndsey Pace on 18-OCT-22.

**Batch ID:**  
2320009

**Product:**  
LUC26RAL

**Description:** Lucas Cell Radium 226  
GL-RAD-A-008

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences (RPD) between the MS and MSD recoveries within the acceptance limits?	Yes		
12	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
13	Has the method required detection limit been met?	Yes		
<b>Miscellaneous Information</b>				
14	Are sample-specific MDA/MDC calculated and reported?	Yes		



# Prep Logbook

## Radium-226 in Liquid

**Batch ID:** 2320009

**Analyst:** Prep: Charles Taibi (CT2)  
Lyndsey Pace (LXP1)

**Method:** EPA 903.1 Modified

**Lab SOP:** GL-RAD-A-008 REV# 15

**Instrument:** LUCAS-C202389980

**Due Dates for Lab:** 16-OCT-2022

**Package:** 18-OCT-2022

**SDG:** 19-OCT-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205198390	Radium-226 SPIKE	1715-G	.1	mL
MS	1205198388	Radium-226 SPIKE	1715-G	.1	mL
MSD	1205198389	Radium-226 SPIKE	1715-G	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	593893001	06-OCT-2022	1	505.27	505.27	10/13/22 09:04	401	10/18/22 06:30	10/18/22 09:18	1	6
2	593893002	06-OCT-2022	1	503.89	503.89	10/13/22 09:04	506	10/18/22 06:30	10/18/22 09:18	1	20
3	593893003	06-OCT-2022	1	505.64	505.64	10/13/22 09:04	607	10/18/22 06:30	10/18/22 09:18	8	17
4	593899001	06-OCT-2022	1	500.52	500.52	10/13/22 09:04	801	10/18/22 06:30	10/18/22 09:18	6	13
5	593899002	06-OCT-2022	1	504.26	504.26	10/13/22 09:04	105	10/18/22 06:59	10/18/22 09:51	5	13
6	593899003	06-OCT-2022	1	501.46	501.46	10/13/22 09:04	202	10/18/22 06:59	10/18/22 09:51	1	35
7	593899004	06-OCT-2022	1	502.21	502.21	10/13/22 09:04	402	10/18/22 06:59	10/18/22 09:51	5	16
8	593899005	06-OCT-2022	1	501.79	501.79	10/13/22 09:04	508	10/18/22 06:59	10/18/22 09:51	3	15
9	593899006	06-OCT-2022	1	505.69	505.69	10/13/22 09:04	602	10/18/22 06:59	10/18/22 09:51	6	5
10	593945001	06-OCT-2022	1	501.33	501.33	10/13/22 09:04	805	10/18/22 06:59	10/18/22 09:51	4	23
11	593945002	06-OCT-2022	1	504.91	504.91	10/13/22 09:04	103	10/18/22 07:29	10/18/22 10:24	4	19
12	593945003	06-OCT-2022	1	500.22	500.22	10/13/22 09:04	201	10/18/22 07:29	10/18/22 10:24	2	17
13	593955001	06-OCT-2022	1	502.82	502.82	10/13/22 09:04	408	10/18/22 07:29	10/18/22 10:24	4	9
14	1205198386 MB	06-OCT-2022	1		505.69	10/13/22 09:04	505	10/18/22 07:29	10/18/22 10:24	6	14
15	1205198387 DUP (593893001)	06-OCT-2022	1	503.65	503.65	10/13/22 09:04	601	10/18/22 07:29	10/18/22 10:24	7	10
16	1205198388 MS (593893001)	06-OCT-2022	1	104.33	104.33	10/13/22 09:04	802	10/18/22 07:29	10/18/22 10:24	4	859
17	1205198389 MSD (593893001)	06-OCT-2022	1	101.92	101.92	10/13/22 09:04	104	10/18/22 07:56	10/18/22 10:56	5	693
18	1205198390 LCS	06-OCT-2022	1		505.69	10/13/22 09:04	501	10/18/22 07:56	10/18/22 10:56	6	907

Reagent/Solvent Lot ID	Description	Amount
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**Comments:**  
Data Entry Date2: 06-OCT-2022 00:00

### Radium-226 Liquid

Filename : RA226.XLS  
 File type : Excel  
 Version # : 1.3.2

Procedure Code : LUC26RAL  
 Parmname : Radium-226  
 Required MDA : 1 pCi/L  
 Halflife of Ra-226 : 1600 years  
 Ra-226 Abundance : 1.00  
 Halflife of Rn-222 : 3.8235 days

Batch : 2320009  
 Analyst : LIN01615  
 Prep Date : 10/6/2022  
 Ra-226 Method Uncertainty : 0.073648

Batch counted on : LUCAS CELL DETECTOR  
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Count Time (min.)	Cell Efficiency (cpm/dpm)
1	593893001.1	0.5053	2.0277E-05	9/7/2022 12:35	401	30	6	0.200	1	0.033	30	1.6120
2	593893002.1	0.5039	2.0272E-05	9/7/2022 12:40	506	30	20	0.667	1	0.033	30	1.7710
3	593893003.1	0.5056	2.0279E-05	9/7/2022 12:45	607	30	17	0.567	8	0.267	30	1.8040
4	593899001.1	0.5005	2.0258E-05	9/9/2022 14:05	801	30	13	0.433	6	0.200	30	1.7180
5	593899002.1	0.5043	2.0273E-05	9/10/2022 9:10	105	30	13	0.433	5	0.167	30	1.5830
6	593899003.1	0.5015	2.0262E-05	9/10/2022 10:20	202	30	35	1.167	1	0.033	30	1.8360
7	593899004.1	0.5022	2.0265E-05	9/12/2022 13:55	402	30	16	0.533	5	0.167	30	1.4480
8	593899005.1	0.5018	2.0263E-05	9/12/2022 14:00	508	30	15	0.500	3	0.100	30	1.8020
9	593899006.1	0.5057	2.0279E-05	9/14/2022 14:00	602	30	5	0.167	6	0.200	30	1.8620
10	593945001.1	0.5013	2.0261E-05	9/15/2022 9:51	805	30	23	0.767	4	0.133	30	1.9080
11	593945002.1	0.5049	2.0276E-05	9/15/2022 9:51	103	30	19	0.633	4	0.133	30	1.5190
12	593945003.1	0.5002	2.0257E-05	9/15/2022 8:45	201	30	17	0.567	2	0.067	30	1.7110
13	593955001.1	0.5028	2.0267E-05	9/13/2022 9:00	408	30	9	0.300	4	0.133	30	1.5900
14	1205198386.1	0.5057	2.0279E-05	10/6/2022 0:00	505	30	14	0.467	6	0.200	30	1.8130
15	1205198387.1	0.5037	2.0271E-05	9/7/2022 12:35	601	30	10	0.333	7	0.233	30	1.7610
16	1205198388.1	0.1043	1.1633E-05	9/7/2022 12:35	802	30	859	28.633	4	0.133	30	2.0910
17	1205198389.1	0.1019	1.1487E-05	9/7/2022 12:35	104	30	693	23.100	5	0.167	30	1.6160
18	1205198390.1	0.5057	2.0279E-05	10/6/2022 0:00	501	30	907	30.233	6	0.200	30	1.8220

Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008  
 Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrowth End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
8.100%	2/1/2022	1/31/2023	10/13/2022 9:04	10/18/2022 6:30	10/18/2022 9:18	0.588	0.979	1.002	1.000
5.300%	6/1/2022	5/31/2023	10/13/2022 9:04	10/18/2022 6:30	10/18/2022 9:18	0.588	0.979	1.002	1.000
3.400%	7/1/2022	6/30/2023	10/13/2022 9:04	10/18/2022 6:30	10/18/2022 9:18	0.588	0.979	1.002	1.000
5.000%	4/1/2022	3/31/2023	10/13/2022 9:04	10/18/2022 6:30	10/18/2022 9:18	0.588	0.979	1.002	1.000
0.500%	4/28/2022	4/30/2023	10/13/2022 9:04	10/18/2022 6:59	10/18/2022 9:51	0.590	0.979	1.002	1.000
5.100%	8/1/2022	7/31/2023	10/13/2022 9:04	10/18/2022 6:59	10/18/2022 9:51	0.590	0.979	1.002	1.000
2.300%	2/1/2022	1/31/2023	10/13/2022 9:04	10/18/2022 6:59	10/18/2022 9:51	0.590	0.979	1.002	1.000
4.500%	6/1/2022	5/31/2023	10/13/2022 9:04	10/18/2022 6:59	10/18/2022 9:51	0.590	0.979	1.002	1.000
5.700%	7/1/2022	6/30/2023	10/13/2022 9:04	10/18/2022 6:59	10/18/2022 9:51	0.590	0.979	1.002	1.000
7.400%	4/1/2022	3/31/2023	10/13/2022 9:04	10/18/2022 6:59	10/18/2022 9:51	0.590	0.979	1.002	1.000
5.600%	4/28/2022	4/30/2023	10/13/2022 9:04	10/18/2022 7:29	10/18/2022 10:24	0.591	0.978	1.002	1.000
8.900%	8/1/2022	7/31/2023	10/13/2022 9:04	10/18/2022 7:29	10/18/2022 10:24	0.591	0.978	1.002	1.000
1.200%	2/1/2022	1/31/2023	10/13/2022 9:04	10/18/2022 7:29	10/18/2022 10:24	0.591	0.978	1.002	1.000
1.200%	6/1/2022	5/31/2023	10/13/2022 9:04	10/18/2022 7:29	10/18/2022 10:24	0.591	0.978	1.002	1.000
9.400%	7/1/2022	6/30/2023	10/13/2022 9:04	10/18/2022 7:29	10/18/2022 10:24	0.591	0.978	1.002	1.000
8.000%	4/1/2022	3/31/2023	10/13/2022 9:04	10/18/2022 7:29	10/18/2022 10:24	0.591	0.978	1.002	1.000
2.000%	4/28/2022	4/30/2023	10/13/2022 9:04	10/18/2022 7:56	10/18/2022 10:56	0.593	0.978	1.002	1.000
7.900%	6/1/2022	5/31/2023	10/13/2022 9:04	10/18/2022 7:56	10/18/2022 10:56	0.593	0.978	1.002	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

**Spike S/N :** 1715-G  
**Spike Exp Date :** 9/8/2023  
**Spike Activity (dpm/ml):** 297.48  
**Spike Volume Added:** 0.10

\* - RPD changed to 0% due to sample & dup activity below MDA

**LCS S/N :** 1715-G  
**LCS Exp Date :** 9/8/2023  
**LCS Activity (dpm/ml):** 297.48  
**LCS Volume Added:** 0.10

<b>Results</b>																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.1057	0.0746	1	0.2455	<b>0.1604</b>	53.53%	0.1667	0.0882	0.1663	0.1699		SAMPLE				
2	0.0965	0.0681	1	0.2240	<b>0.5563</b>	24.69%	0.6333	0.1528	0.2630	0.2810		SAMPLE				
3	0.2669	0.1885	1	0.4629	<b>0.2578</b>	55.66%	0.3000	0.1667	0.2807	0.2837		SAMPLE				
4	0.2452	0.1731	1	0.4374	<b>0.2127</b>	62.47%	0.2333	0.1453	0.2596	0.2622		SAMPLE				
5	0.2407	0.1699	1	0.4378	<b>0.2613</b>	53.04%	0.2667	0.1414	0.2716	0.2742		SAMPLE				
6	0.0933	0.0659	1	0.2167	<b>0.9628</b>	18.37%	1.1333	0.2000	0.3330	0.3735		SAMPLE				
7	0.2642	0.1865	1	0.4806	<b>0.3944</b>	41.72%	0.3667	0.1528	0.3220	0.3275		SAMPLE				
8	0.1646	0.1162	1	0.3189	<b>0.3460</b>	35.64%	0.4000	0.1414	0.2398	0.2468		SAMPLE				
9	0.2235	0.1578	1	0.3986	<b>-0.0277</b>	331.71%	-0.0333	0.1106	0.1800	0.1801		SAMPLE				
10	0.1796	0.1268	1	0.3354	<b>0.5179</b>	28.33%	0.6333	0.1732	0.2776	0.2971		SAMPLE				
11	0.2235	0.1578	1	0.4174	<b>0.5088</b>	32.46%	0.5000	0.1599	0.3188	0.3319		SAMPLE				
12	0.1416	0.1000	1	0.2912	<b>0.4559</b>	30.39%	0.5000	0.1453	0.2597	0.2794		SAMPLE				
13	0.2144	0.1514	1	0.4004	<b>0.1627</b>	72.12%	0.1667	0.1202	0.2299	0.2312		SAMPLE				
14	0.2290	0.1617	1	0.4085	<b>0.2270</b>	55.91%	0.2667	0.1491	0.2487	0.2509		MB				
15	0.2557	0.1805	1	0.4491	<b>0.0880</b>	137.76%	0.1000	0.1374	0.2370	0.2379	593893001.1	DUP	*	0.0%		
16	0.7859	0.5548	1	1.4674	<b>101.9573</b>	8.71%	28.5000	0.9792	6.8662	22.7889	593893001.1	MS			128.4450	79.4%
17	1.1618	0.8202	1	2.1135	<b>108.4822</b>	4.33%	22.9333	0.8807	8.1650	18.1650	593893001.1	MSD		6.2%	131.4822	82.5%
18	0.2275	0.1606	1	0.4058	<b>25.3950</b>	8.58%	30.0333	1.0072	1.6692	5.6290		LCS			26.4989	95.8%

# **Continuing Calibration Data**



# Ludlum Alpha Scintillation Counter Checks for 18-OCT-2022

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	07:19	1	1.23E+05	123475	1.36		
LUCAS2	EFF	07:18	1	1.33E+05	132878	-0.64		
LUCAS4	EFF	07:14	1	1.30E+05	129540	2.49		
LUCAS5	EFF	07:06	1	1.34E+05	133903	2.13		
LUCAS6	EFF	07:02	1	1.33E+05	133107	1.96		
LUCAS7	EFF	07:00	1	1.31E+05	131123	-1.38		
LUCAS8	EFF	06:58	1	1.32E+05	132335	0.57		

**Reviewed by:**

Lyndsey Pace

**Date:** 18-OCT-22

GEL Laboratories LLC

# Runlogs

# Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2320009

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
593893001	SAMPLE	LXP1	LUCAS4	OCT-18-22 09:18:00	DONE	Lucas Cell	01-FEB-22 00:00
593893002	SAMPLE	LXP1	LUCAS5	OCT-18-22 09:18:00	DONE	Lucas Cell	01-JUN-22 00:00
593893003	SAMPLE	LXP1	LUCAS6	OCT-18-22 09:18:00	DONE	Lucas Cell	01-JUL-22 00:00
593899001	SAMPLE	LXP1	LUCAS8	OCT-18-22 09:18:00	DONE	Lucas Cell	01-APR-22 00:00
593899002	SAMPLE	LXP1	LUCAS1	OCT-18-22 09:51:00	DONE	Lucas Cell	28-APR-22 00:00
593899003	SAMPLE	LXP1	LUCAS2	OCT-18-22 09:51:00	DONE	Lucas Cell	01-AUG-22 00:00
593899004	SAMPLE	LXP1	LUCAS4	OCT-18-22 09:51:00	DONE	Lucas Cell	01-FEB-22 00:00
593899005	SAMPLE	LXP1	LUCAS5	OCT-18-22 09:51:00	DONE	Lucas Cell	01-JUN-22 00:00
593899006	SAMPLE	LXP1	LUCAS6	OCT-18-22 09:51:00	DONE	Lucas Cell	01-JUL-22 00:00
593945001	SAMPLE	LXP1	LUCAS8	OCT-18-22 09:51:00	DONE	Lucas Cell	01-APR-22 00:00
593945002	SAMPLE	LXP1	LUCAS1	OCT-18-22 10:24:00	DONE	Lucas Cell	28-APR-22 00:00
593945003	SAMPLE	LXP1	LUCAS2	OCT-18-22 10:24:00	DONE	Lucas Cell	01-AUG-22 00:00
593955001	SAMPLE	LXP1	LUCAS4	OCT-18-22 10:24:00	DONE	Lucas Cell	01-FEB-22 00:00
1205198386	MB	LXP1	LUCAS5	OCT-18-22 10:24:00	DONE	Lucas Cell	01-JUN-22 00:00
1205198387	DUP	LXP1	LUCAS6	OCT-18-22 10:24:00	DONE	Lucas Cell	01-JUL-22 00:00
1205198388	MS	LXP1	LUCAS8	OCT-18-22 10:24:00	DONE	Lucas Cell	01-APR-22 00:00
1205198389	MSD	LXP1	LUCAS1	OCT-18-22 10:56:00	DONE	Lucas Cell	28-APR-22 00:00
1205198390	LCS	LXP1	LUCAS5	OCT-18-22 10:56:00	DONE	Lucas Cell	01-JUN-22 00:00





Environmental Laboratory  
 1232 Haco Drive  
 Lansing  
 Michigan, 48910

CHAIN OF CUSTODY

Page 1 of 1

Phone: (517)702-6372

Lab Work Order Number L209154

Client Name <b>BWL - Erickson Station</b>		Project Name <b>Erickson AM MI Well 118</b>		Requested Analyses								Requested Turn Around		
Client Contact <b>Cheryl Louden</b>		Project Number <b>[none]</b>		Ag::Na, K, Mg As:: B:: Ba:: Be:: Bi:: Cd:: Cr:: Co:: Cu:: Fe:: Hg:: Li:: Mo:: Ni:: Pb:: Sb:: Se:: Si:: Ti:: V:: Zn	TSS	Cl-IC:: F-ISE:: SO4:: TDS, HCO3, CO3, Hardness	Radium 226 and Radium 228							Rush requests subject to additional charge.  Rush requests subject to lab approval.
Address <b>3725 S. Canal</b>		Project Description												
City <b>Lansing</b>		PO Number <b>30926 10021</b>												
State/Zip <b>MI, 48917</b>		Shipped By												
Phone <b>(517) 702-6396</b>	Fax <b>(517) 702-6373</b>	Tracking Number												
Sampler <b>Marc Wahrer</b>														

Sample Name or Field ID	Sampled Date	Sampled Time	Sample Type Grab/Composite	Matrix Code	Container Count	Preservation Code								Sample	Comments
						b	a	a	b						
MW-11B	09/15/22	07:15:00	G	GW	5	1	1	1	2						
Field Dupe MW-11B	+		G	GW	5	1	1	1	2						
Field Blank	0845	↓	G	DI	5	1	1	1	2						

Relinquished By 	Date/Time <b>9-15-22 1135</b>	Received By <b>J. Caporale</b>	Date/Time <b>09/15/22 1135</b>	Comments
Relinquished By	Date/Time	Received By	Date/Time	
Relinquished By	Date/Time	Received By	Date/Time	
Cooler Numbers and Temperatures				



## Data Verification & Validation Report

### Lansing Board of Water & Light – Erickson Power Station

**Sampling Event (dates and purpose):** New Well MW-11B – Background Round 5 – September 2022

Data Package Number: S40350.01

Lab Report Date: 12/13/2022

Data Validator: Aryka Thomson

Data Validation Completion Date: 12/23/2022

General Overall Assessment:

Data are usable without qualification.

Data are usable with qualification (as noted below).

Some or all data are unusable (as noted below).

Wells planned for sampling:

Well ID	Planned for Sampling
MW-1	
MW-2	
MW-3	
MW-4	
MW-5	
MW-6	
MW-7	
MW-7B	
MW-7C	
MW-8	
MW-9	
MW-10	
MW-11	
MW-11B	X
MW-12	
MW-12B	
MW-13	

### Data Summary

Sample ID	Matrix	Lab ID	Date Collected	App III Metals	App IV Metals	Part 115 Metals	Anions	TDS TSS	Rad-226 Rad-228	Diss. Metals
MW-11B	GW	S40350.01	09/15/2022	X	X	X	X	X	X	
MW-11B Dup	QC	S40350.02	09/15/2022	X	X	X	X	X	X	

Other analytes requested for analysis: Na, Mg, K, HCO<sub>3</sub>, CO<sub>3</sub>, hardness

Any planned sampling or analysis NOT completed? If yes, explain: \_\_\_\_\_

### Data Verification & Validation Checklist

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
<b><i>Field Data</i></b>							
Sample Collection Field Forms	X		Purging performed as required in the Groundwater Monitoring Plan	X			
Field Calibration Records	X		Field instruments calibrated daily according to manufacturer specifications	X			
Chain of Custody	X		Accurately reflect samples, collection dates/times, analyses, bottles, etc.	X			
Field decontamination documentation	N/A		Record of decontamination for non-dedicated sampling equipment			X	
Drilling logs	X		N/A	-	-	-	
Well construction logs	X		N/A	-	-	-	
Well development field forms	X		N/A	-	-	-	
<b><i>Analytical Data Package</i></b>							
Cover Sheet	X		N/A	-	-	-	
Case Narrative	X		Summarizes sample receipt and any exceptions to QC acceptance criteria	X			
Internal Laboratory Chain of Custody forms	X		Analyses as requested; accurate transcription of field COC	X			
Sample Chronology and Consistency	X		Accurate representation of dates, times of receipt, preparation, and analysis	X			
Communication Records with Lab	X		N/A	-	-	-	
EDD Format Consistency	X		EDD format and content as requested	X			
Sample Identification, Results Nomenclature, and Data Qualifier Consistency	X		All included in final report	X			
Method Detection Limit Consistency	X		MDLs consistent between samples	X			
Instrument Calibration Records	X		Present and no nonconformance noted	X			
Laboratory Report Complete	X		Includes QC component	X			
Holding Times	X		Analyses performed within allowed holding time	X			

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Method	X		Method as requested	X			
Reporting Limits	X		RLs as requested	X			RLs for TDS were not met
			MDLs<RLs		X		RL=MDL for carbonate
			MDLs<GPS			X	
<b>QC Validation</b>							
<b>Evaluate Accuracy</b>							
Matrix Spike (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Laboratory Control Sample (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
<b>Evaluate Precision</b>							
Matrix Spike Duplicate (RPD)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Field Duplicate (RPD)	X		RPD ≤ 20%		X		Radium-226+228 RPD is 36%
<b>Evaluate Representativeness</b>							
Equipment Blanks (if applicable)	N/A		Non-detect (<RL)			X	
<b>QC Verification</b>							
<b>Verify Instrument Calibration &amp; Analytical Process</b>							
Initial Calibration Verification	X		Laboratory-determined	-	-	-	
Continuing Calibration Verification	X		Laboratory-determined	-	-	-	
Initial Calibration Blank	X		Laboratory-determined	-	-	-	
Continuing Calibration Blank	X		Laboratory-determined	-	-	-	
Serial Dilutions	X		Laboratory-determined	-	-	-	High recovery for Li, Al, As, and Mo
Post-Digestion Spikes	X		Laboratory-determined	-	-	-	
Internal Standards	X		Laboratory-determined	-	-	-	
Laboratory Duplicate (RPD)	X		Laboratory-determined	-	-	-	
Method Blanks	X		Laboratory-determined	-	-	-	
<b>Evaluate Completeness (# usable measurements/ # unusable measurements)</b>							
Completeness	X		100%	X			

Other instances of nonconformance to QC control limits noted on case narrative:

Rad-228 was detected at 1.55 pCi/L in method blank 1205198398 at a level greater than the MDC (1.22 pCi/L) but less than the required detection limit (3.00 pCi/L). Rad-228 and consequently combined radium required qualification as estimated with high bias in all samples (J+).

Comments:

Combined Radium-226+228 field duplicate RPD is 36%. Rad-228 and combined radium required qualification as estimated with high bias (J+) in the parent sample MW-11B and as estimated with low bias (J-) in the field duplicate MW-11B-Dup. The detection in the method blank requiring qualification as

estimated with low bias (J-) in the field duplicate was resolved by qualifying Rad-228 and combined radium as estimated without bias (J).



Lansing Board of Water and Light  
Environmental Services Laboratory (MI00079)  
1232 Haco Dr.  
Lansing, Michigan 48901

08 November 2022

BWL - Erickson Station  
Attn: Cheryl Louden  
3725 S. Canal  
Lansing, MI 48917

**Project: Erickson AM MI**

Dear Cheryl Louden,

Enclosed is a copy of the laboratory report for the following work order(s) received by Lansing Board of Water and Light Environmental Services Laboratory:

<b>Work Order</b>	<b>Received</b>	<b>Account Number</b>
L210196	10/6/2022 2:20:00PM	30926 10021

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in blue ink that reads "Jennifer Caporale".

Jennifer Caporale, Supervisor



Report ID: S41124.01(02)  
Generated on 11/07/2022  
Replaces report S41124.01(01) generated on 10/10/2022

**Report to**  
Attention: Jennifer Caporale  
Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901  
  
Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

**Report produced by**  
Merit Laboratories, Inc.  
2680 East Lansing Drive  
East Lansing, MI 48823  
  
Phone: (517) 332-0167 FAX: (517) 332-6333  
  
Contacts for report questions:  
John Lavery (johnlavery@meritlabs.com)  
Barbara Ball (bball@meritlabs.com)

**Report Summary**  
Lab Sample ID(s): S41124.01-S41124.05  
Project: Erickson AM MI New Wells 7B, 7C & 12B  
Collected Date(s): 10/06/2022  
Submitted Date/Time: 10/06/2022 14:40  
Sampled by: Marc Wahrer  
P.O. #:

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Maya Murshak  
Technical Director



## General Report Notes

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Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile, and 2-chloroethylvinyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (\*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

## Report Narrative

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All analyses completed





Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Alaska CSLAP	#17-001
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



## Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1 (1993)
SM2320B	Standard Method 2320 B 2011
SM2340C	Standard Method 2340 C 2011
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007



### Sample Summary (5 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S41124.01	MW-7B L210196-01	Groundwater	10/06/22 11:49
S41124.02	MW-7C L210196-02	Groundwater	10/06/22 13:07
S41124.03	MW-12B L210196-03	Groundwater	10/06/22 09:34
S41124.04	Field Dupe MW-12B L210196-04	Groundwater	10/06/22 09:34
S41124.05	Field Blank L210196-05	Water	10/06/22 08:35



# Analytical Laboratory Report

Lab Sample ID: S41124.01

Sample Tag: MW-7B L210196-01

Collected Date/Time: 10/06/2022 11:49

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	1.6	IR
2	1L Plastic	None	Yes	1.6	IR
1	125ml Plastic	HNO3	Yes	1.6	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	10/07/22 12:19	CTV	
Metal Digestion	Completed	SW3015A	10/07/22 09:30	CCM	

### Inorganics

Method: E300.0, Run Date: 10/07/22 09:28, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 10/10/22 13:20, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	390	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 10/10/22 11:46, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	30	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 10/07/22 18:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	376	50	10	mg/L	2		

Method: SM2540D, Run Date: 10/06/22 18:20, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 10/07/22 11:03, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.010	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	2.91	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.06	0.02	0.00192	mg/L	5	7439-89-6	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S41124.01 (continued)

Sample Tag: MW-7B L210196-01

**Method: E200.8, Run Date: 10/07/22 11:03, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.032	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 10/07/22 13:38, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	8.73	1.0	0.0435	mg/L	5	7440-70-2	
Magnesium	2.75	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	5.53	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	138	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 10/07/22 13:31, Analyst: CTV**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 11/03/22 07:35, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Lab Sample ID: S41124.02

Sample Tag: MW-7C L210196-02

Collected Date/Time: 10/06/2022 13:07

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	1.6	IR
2	1L Plastic	None	Yes	1.6	IR
1	125ml Plastic	HNO3	Yes	1.6	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	10/07/22 12:19	CTV	
Metal Digestion	Completed	SW3015A	10/07/22 09:30	CCM	

### Inorganics

Method: E300.0, Run Date: 10/07/22 11:11, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	93	10	0.16	mg/L	10	16887-00-6	

Method: E300.0, Run Date: 10/07/22 09:41, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	

Method: E300.0, Run Date: 10/07/22 11:24, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sulfate	675	50	3.0	mg/L	50	14808-79-8	

Method: SM2320B, Run Date: 10/10/22 13:22, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	150	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 10/10/22 11:48, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	750	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 10/07/22 18:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	1,360	50	10	mg/L	2		

Method: SM2540D, Run Date: 10/06/22 18:20, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 10/07/22 11:08, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.006	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.041	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S41124.02 (continued)

Sample Tag: MW-7C L210196-02

**Method: E200.8, Run Date: 10/07/22 11:08, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Boron	6.29	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	3.81	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.128	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.377	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	0.007	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 10/07/22 13:40, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	234	1.0	0.0435	mg/L	5	7440-70-2	
Magnesium	42.1	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	6.14	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	95.7	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 10/07/22 13:34, Analyst: CTV**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 11/03/22 07:35, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Final Report

Lab Sample ID: S41124.03

Sample Tag: MW-12B L210196-03

Collected Date/Time: 10/06/2022 09:34

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	1.6	IR
2	1L Plastic	None	Yes	1.6	IR
1	125ml Plastic	HNO3	Yes	1.6	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	10/07/22 12:19	CTV	
Metal Digestion	Completed	SW3015A	10/07/22 09:30	CCM	

### Inorganics

Method: E300.0, Run Date: 10/07/22 09:54, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 10/10/22 13:24, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	400	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 10/10/22 11:50, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	100	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 10/07/22 18:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	362	50	10	mg/L	2		

Method: SM2540D, Run Date: 10/06/22 18:20, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	1	3	1	mg/L	1		b

### Metals

Method: E200.8, Run Date: 10/07/22 11:14, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.027	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	3.22	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	

b-Value detected less than reporting limit, but greater than MDL





# Analytical Laboratory Report

Final Report

Lab Sample ID: S41124.03 (continued)

Sample Tag: MW-12B L210196-03

**Method: E200.8, Run Date: 10/07/22 11:14, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Iron	0.41	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.039	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 10/07/22 13:42, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	26.2	1.0	0.0435	mg/L	5	7440-70-2	
Magnesium	8.39	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	8.32	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	112	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 10/07/22 13:37, Analyst: CTV**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 11/03/22 07:35, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Final Report

Lab Sample ID: S41124.04

Sample Tag: Field Dupe MW-12B L210196-04

Collected Date/Time: 10/06/2022 09:34

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	1.6	IR
2	1L Plastic	None	Yes	1.6	IR
1	125ml Plastic	HNO3	Yes	1.6	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	10/07/22 12:19	CTV	
Metal Digestion	Completed	SW3015A	10/07/22 09:30	CCM	

### Inorganics

Method: E300.0, Run Date: 10/07/22 10:07, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 10/10/22 13:26, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	400	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 10/10/22 11:52, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	90	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 10/07/22 18:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	374	50	10	mg/L	2		

Method: SM2540D, Run Date: 10/06/22 18:20, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 10/07/22 11:18, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.026	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	3.30	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.34	0.02	0.00192	mg/L	5	7439-89-6	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S41124.04 (continued)  
Sample Tag: Field Dupe MW-12B L210196-04

**Method: E200.8, Run Date: 10/07/22 11:18, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.042	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 10/07/22 13:43, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	25.9	1.0	0.0435	mg/L	5	7440-70-2	
Magnesium	8.33	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	8.14	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	109	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 10/07/22 13:40, Analyst: CTV**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 11/03/22 07:35, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Final Report

Lab Sample ID: S41124.05

Sample Tag: Field Blank L210196-05

Collected Date/Time: 10/06/2022 08:35

Matrix: Water

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	1.6	IR
2	1L Plastic	None	Yes	1.6	IR
1	125ml Plastic	HNO3	Yes	1.6	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	10/07/22 12:19	CTV	
Metal Digestion	Completed	SW3015A	10/07/22 09:30	CCM	

### Inorganics

Method: E300.0, Run Date: 10/07/22 10:19, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	2.5	0.04	mg/L	2.5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.06	mg/L	2.5	16984-48-8	
Sulfate	Not detected	2.5	0.15	mg/L	2.5	14808-79-8	

Method: SM2320B, Run Date: 10/10/22 13:28, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	Not detected	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 10/10/22 11:54, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	Not detected	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 10/07/22 18:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	Not detected	50	10	mg/L	2		

Method: SM2540D, Run Date: 10/06/22 18:20, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 10/07/22 10:58, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00102	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.000102	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.0000648	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.0000862	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.000702	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.0000760	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.0000386	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.0000434	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000150	mg/L	2	7440-50-8	
Iron	Not detected	0.02	0.000768	mg/L	2	7439-89-6	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S41124.05 (continued)

Sample Tag: Field Blank L210196-05

**Method: E200.8, Run Date: 10/07/22 10:58, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.0000760	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000654	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.0000868	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000100	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.000838	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.0000270	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.0000342	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.0000558	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.000292	mg/L	2	7440-66-6	

**Method: E200.8, Run Date: 10/07/22 13:36, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.0174	mg/L	2	7440-70-2	
Magnesium	Not detected	0.50	0.00480	mg/L	2	7439-95-4	
Potassium	Not detected	0.50	0.00920	mg/L	2	7440-09-7	
Sodium	Not detected	0.50	0.00340	mg/L	2	7440-23-5	

**Method: E245.1, Run Date: 10/07/22 13:47, Analyst: CTV**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 11/03/22 07:35, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

# Merit Laboratories Login Checklist

Lab Set ID:S41124

Client:BWL01 (Board of Water & Light)

Project: Erickson AM MI New Wells 7B, 7C & 12B

Submitted: 10/06/2022 14:40 Login User: MMC

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental\_Laboratory@LBWL.com

Selection	Description	Note
-----------	-------------	------

## Sample Receiving

- |     |  |  |
|-----|--|--|
| 01. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples are received at 4C +/- 2C Thermometer # IR 1.6 |
| 02. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Received on ice/ cooling process begun                 |
| 03. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples shipped  |
| 04. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples left in 24 hr. drop box                        |
| 05. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Are there custody seals/tape or is the drop box locked |

## Chain of Custody

- |     |  |   |
|-----|--|---|
| 06. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC adequately filled out                                       |
| 07. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC signed and relinquished to the lab                          |
| 08. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sample tag on bottles match COC                                 |
| 09. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Subcontracting needed? Subcontracted to: GEL 1Z4664770363409133 |

## Preservation

- |     |  |   |
|-----|--|---|
| 10. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Do sample have correct chemical preservation        |
| 11. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Completed pH checks on preserved samples? (no VOAs) |
| 12. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Did any samples need to be preserved in the lab?    |

## Bottle Conditions

- |     |  |   |
|-----|--|---|
| 13. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | All bottles intact                            |
| 14. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Appropriate analytical bottles are used       |
| 15. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Merit bottles used                            |
| 16. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sufficient sample volume received             |
| 17. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples require laboratory filtration         |
| 18. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples submitted within holding time         |
| 19. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Do water VOC or TOX bottles contain headspace |

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: \_\_\_\_\_ Date: \_\_\_\_\_

# Merit Laboratories Bottle Preservation Check

Lab Set ID: S41124 Submitted: 10/06/2022 14:40

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI New Wells 7B, 7C & 12B

Initial Preservation Check: 10/06/2022 15:19 MMC

Preservation Recheck (E200.8): N/A

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental\_Laboratory@LBWL.com

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S41124.01	125ml Plastic HNO3	<2			
S41124.01	1L Plastic HNO3	<2			
S41124.01	1L Plastic HNO3	<2			
S41124.02	125ml Plastic HNO3	<2			
S41124.02	1L Plastic HNO3	<2			
S41124.02	1L Plastic HNO3	<2			
S41124.03	125ml Plastic HNO3	<2			
S41124.03	1L Plastic HNO3	<2			
S41124.03	1L Plastic HNO3	<2			
S41124.04	125ml Plastic HNO3	<2			
S41124.04	1L Plastic HNO3	<2			
S41124.04	1L Plastic HNO3	<2			
S41124.05	125ml Plastic HNO3	<2			
S41124.05	1L Plastic HNO3	<2			
S41124.05	1L Plastic HNO3	<2			



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 Phone (517) 332-0167 Fax (517) 332-4034  
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

**REPORT TO**

**CHAIN OF CUSTODY RECORD**

**INVOICE TO**

CONTACT NAME **Jennifer Caporale**  
 COMPANY **Lansing Board of Water and Light**  
 ADDRESS **PO Box 13007 48901-3007**  
 CITY **Lansing** STATE **MI** ZIP CODE **48901**  
 PHONE NO. **517-702-6372** FAX NO. P.O. NO.  
 E-MAIL ADDRESS **Environmental\_Laboratory@lbwl.com** QUOTE NO.

CONTACT NAME **Kelly Gleason**  SAME  
 COMPANY  
 ADDRESS  
 CITY STATE ZIP CODE  
 PHONE NO. E-MAIL ADDRESS **Kelly.Gleason@lbwl.com**

**ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)**

PROJECT NO./NAME **Erickson AM MI Wells 7B,7C&12B** SAMPLER(S) - PLEASE PRINT/SIGN NAME **Marc Wahrer**  
 TURNAROUND TIME REQUIRED  1 DAY  2 DAYS  3 DAYS  STANDARD  OTHER **ASAP**  
 DELIVERABLES REQUIRED  STD  LEVEL II  LEVEL III  LEVEL IV  EDD  OTHER

MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID  
 SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIFE A=AIR W=WASTE

**# Containers & Preservatives**

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION		MATRIX	# OF BOTTLES	NONE	HCl	HNO <sub>3</sub>	H <sub>2</sub> SO <sub>4</sub>	HNOH	MnOH	OTHER	Total Metals	F- undistilled, Cl-, SO <sub>4</sub> , TDS	Radium 226	Radium 228	TSS	HCO <sub>3</sub> , CO <sub>3</sub> , Hardness	Certifications		Project Locations		Special Instructions
	DATE	TIME																		<input type="checkbox"/> OHIO VAP	<input type="checkbox"/> Drinking Water	<input type="checkbox"/> Detroit	<input type="checkbox"/> New York	
41124.01	10/06/22	1149	MW-7B	L210196-01	GW	5	2	3						✓	✓	✓	✓	✓	✓	<input type="checkbox"/> DoD	<input checked="" type="checkbox"/> NPDES	<input type="checkbox"/> Detroit	<input type="checkbox"/> New York	Metals to analyse: Na, Mg, K
.02	10/06/22	1307	MW-7C	L210196-02	GW	5	2	3						✓	✓	✓	✓	✓	✓	<input type="checkbox"/> Other				B, Ca, Sb, As, Ba, Be, Cd, Cr,
.03	10/06/22	0934	MW-12B	L210196-03	GW	5	2	3						✓	✓	✓	✓	✓	✓					Co, Li, Hg, Mo, Pb, Se, Tl,
.04	10/06/22	0934	Field Dupe MW-	L210196-04	GW	5	2	3						✓	✓	✓	✓	✓	✓					Fe, Cu, Ni, Ag, V, Zn
.05	10/06/22	0835	Field Blank	L210196-05	DI	5	2	3						✓	✓	✓	✓	✓	✓					Please send a preliminary report

RELINQUISHED BY: *[Signature]*  Sampler DATE **10-6-22** TIME **1440**  
 RECEIVED BY: *[Signature]* DATE **10/6/22** TIME **1440**  
 RELINQUISHED BY: DATE TIME  
 RECEIVED BY: DATE TIME

RELINQUISHED BY: DATE TIME  
 RECEIVED BY: DATE TIME  
 SEAL NO. SEAL INTACT YES  NO  INITIALS  
 SEAL NO. SEAL INTACT YES  NO  INITIALS  
 NOTES: TEMP. ON ARRIVAL **1.6**

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE



## Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.150
Be, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	2.5
Cl	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cr, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Fluoride	250 mL plastic	mg/L	None	9056	28 d	1.0
F	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Fe, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Pb, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Li, total	Mercury	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Hg, total	Molybdenum	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Mn, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	HNO3	SM 7500	6 mos	2.0 combined
RA226/228	Selenium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Se, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ag, total	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	10
SO4	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Tl, total	Total Dissolved Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TDS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540D	NA	3
TSS	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
V, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Zn, total							



November 03, 2022

John Laverty  
Merit Laboratories Inc.  
2680 East Lansing Drive  
East Lansing, Michigan 48823

Re: Routine Analysis  
Work Order: 596340  
SDG: S41124

Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on October 11, 2022. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at [www.gel.com](http://www.gel.com).

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,

Jordan Melton for  
Delaney Stone  
Project Manager

Purchase Order: GELP20-0018  
Enclosures



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# Case Narrative

**Receipt Narrative  
for  
Merit Laboratories, Inc.  
SDG: S41124  
Work Order: 596340**

**November 03, 2022**

**Laboratory Identification:**

GEL Laboratories LLC  
2040 Savage Road  
Charleston, South Carolina 29407  
(843) 556-8171

**Summary:**

**Sample receipt:** The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on October 11, 2022 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

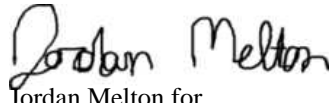
**Sample Identification:** The laboratory received the following samples:

<b><u>Laboratory ID</u></b>	<b><u>Client ID</u></b>
596340001	S41124.01
596340002	S41124.02
596340003	S41124.03
596340004	S41124.04 Field Dupe
596340005	S41124.05 Field Blank

**Case Narrative:**

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.

A handwritten signature in black ink that reads "Jordan Melton". The signature is written in a cursive style with a large initial 'J'.

Jordan Melton for  
Delaney Stone  
Project Manager

# **Chain of Custody and Supporting Documentation**



596340  
5464392

C.O.C. PAGE # 1 OF 1

2680 East Lansing Dr., East Lansing, MI 48823  
Phone (517) 332-0167 Fax (517) 332-4034  
www.meritlabs.com



<b>REPORT TO</b>		<b>CHAIN OF CUSTODY RECORD</b>		<b>INVOICE TO</b>	
CONTACT NAME Project Management Team		CONTACT NAME Julie Teague		CONTACT NAME [ ]	
COMPANY Merit Laboratories		COMPANY Merit Laboratories		COMPANY [ ]	
ADDRESS 2680 East Lansing Drive		ADDRESS 2680 East Lansing Drive		ADDRESS [ ]	
CITY East Lansing		CITY East Lansing		CITY [ ]	
PHONE NO. 517-332-0167		PHONE NO. 517-332-0167		PHONE NO. [ ]	
E-MAIL ADDRESS results@meritlabs.com		E-MAIL ADDRESS juliet@meritlabs.com		E-MAIL ADDRESS [ ]	
STATE MI ZIP CODE 48823		STATE MI ZIP CODE 48823		STATE MI ZIP CODE 48823	
P.O. NO. QUOTE NO.		P.O. NO. QUOTE NO.		P.O. NO. QUOTE NO.	
PROJECT NO./NAME S41124		PROJECT NO./NAME S41124		PROJECT NO./NAME [ ]	
SAMPLER(S) - PLEASE PRINT/SIGN NAME		SAMPLER(S) - PLEASE PRINT/SIGN NAME		SAMPLER(S) - PLEASE PRINT/SIGN NAME	
TURNAROUND TIME REQUIRED <input type="checkbox"/> 1 DAY <input type="checkbox"/> 2 DAYS <input type="checkbox"/> 3 DAYS <input checked="" type="checkbox"/> STANDARD <input type="checkbox"/> OTHER		TURNAROUND TIME REQUIRED <input type="checkbox"/> 1 DAY <input type="checkbox"/> 2 DAYS <input type="checkbox"/> 3 DAYS <input checked="" type="checkbox"/> STANDARD <input type="checkbox"/> OTHER		TURNAROUND TIME REQUIRED <input type="checkbox"/> 1 DAY <input type="checkbox"/> 2 DAYS <input type="checkbox"/> 3 DAYS <input checked="" type="checkbox"/> STANDARD <input type="checkbox"/> OTHER	
DELIVERABLES REQUIRED <input type="checkbox"/> STD <input type="checkbox"/> LEVEL II <input type="checkbox"/> LEVEL III <input checked="" type="checkbox"/> LEVEL IV <input type="checkbox"/> EDD <input type="checkbox"/> OTHER		DELIVERABLES REQUIRED <input type="checkbox"/> STD <input type="checkbox"/> LEVEL II <input type="checkbox"/> LEVEL III <input checked="" type="checkbox"/> LEVEL IV <input type="checkbox"/> EDD <input type="checkbox"/> OTHER		DELIVERABLES REQUIRED <input type="checkbox"/> STD <input type="checkbox"/> LEVEL II <input type="checkbox"/> LEVEL III <input checked="" type="checkbox"/> LEVEL IV <input type="checkbox"/> EDD <input type="checkbox"/> OTHER	
MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID SL=SLUDGE DW=DRINKING WATER O=OIL WP=WPIPE A=AIR W=WASTE		MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID SL=SLUDGE DW=DRINKING WATER O=OIL WP=WPIPE A=AIR W=WASTE		MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID SL=SLUDGE DW=DRINKING WATER O=OIL WP=WPIPE A=AIR W=WASTE	
YEAR		YEAR		YEAR	
DATE	TIME	DATE	TIME	DATE	TIME
10/06/22	1149	10/06/22	1307	10/06/22	0934
10/06/22	0934	10/06/22	0934	10/06/22	0934
10/06/22	0835	10/06/22	0835	10/06/22	0835
IDENTIFICATION-DESCRIPTION		IDENTIFICATION-DESCRIPTION		IDENTIFICATION-DESCRIPTION	
S41124.01		S41124.02		S41124.03	
S41124.04 Field Dupe		S41124.05 Field Blank		S41124.05 Field Blank	
SAMPLE TAG		SAMPLE TAG		SAMPLE TAG	
MTRX		MTRX		MTRX	
BTL		BTL		BTL	
# OF BTL		# OF BTL		# OF BTL	
NONE		NONE		NONE	
HCl		HCl		HCl	
HNO3		HNO3		HNO3	
H2SO4		H2SO4		H2SO4	
NaOH		NaOH		NaOH	
MOSH		MOSH		MOSH	
OTHER		OTHER		OTHER	
# Containers & Preservatives		# Containers & Preservatives		# Containers & Preservatives	
2		2		2	
2		2		2	
2		2		2	
2		2		2	
2		2		2	
Radium 226*		Radium 226*		Radium 226**	
✓		✓		✓	
✓		✓		✓	
✓		✓		✓	
✓		✓		✓	
✓		✓		✓	
Please use calculation product & provide Radium 226/228 combined results on the report		Please use calculation product & provide Radium 226/228 combined results on the report		Please use calculation product & provide Radium 226/228 combined results on the report	
* E903.1 Mod.		* E903.1 Mod.		* E903.1 Mod.	
** E904.0/SW 9320 Mod.		** E904.0/SW 9320 Mod.		** E904.0/SW 9320 Mod.	
Certifications		Certifications		Certifications	
<input type="checkbox"/> OHIO VAP <input type="checkbox"/> Drinking Water		<input type="checkbox"/> OHIO VAP <input type="checkbox"/> Drinking Water		<input type="checkbox"/> OHIO VAP <input type="checkbox"/> Drinking Water	
<input type="checkbox"/> DoD <input type="checkbox"/> NPDES		<input type="checkbox"/> DoD <input type="checkbox"/> NPDES		<input type="checkbox"/> DoD <input type="checkbox"/> NPDES	
Project Locations		Project Locations		Project Locations	
<input type="checkbox"/> Detroit <input type="checkbox"/> New York		<input type="checkbox"/> Detroit <input type="checkbox"/> New York		<input type="checkbox"/> Detroit <input type="checkbox"/> New York	
<input type="checkbox"/> Other		<input type="checkbox"/> Other		<input type="checkbox"/> Other	
Special Instructions		Special Instructions		Special Instructions	
GEL Laboratories, Inc. 2040 Savage Road Charleston, SC 29407		GEL Laboratories, Inc. 2040 Savage Road Charleston, SC 29407		GEL Laboratories, Inc. 2040 Savage Road Charleston, SC 29407	

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

RELINQUISHED BY: SIGNATURE/ORGANIZATION	DATE	TIME	RELINQUISHED BY: SIGNATURE/ORGANIZATION	DATE	TIME
<i>Petrucci</i>	10/17/20	1700	<i>Petrucci</i>	10/17/20	1700
RECEIVED BY: SIGNATURE/ORGANIZATION	DATE	TIME	RECEIVED BY: SIGNATURE/ORGANIZATION	DATE	TIME
<i>WPS</i>	10/17/20	1700	<i>WPS</i>	10/17/20	1700
RELINQUISHED BY: SIGNATURE/ORGANIZATION	DATE	TIME	RELINQUISHED BY: SIGNATURE/ORGANIZATION	DATE	TIME
RECEIVED BY: SIGNATURE/ORGANIZATION	DATE	TIME	RECEIVED BY: SIGNATURE/ORGANIZATION	DATE	TIME
SEAL NO.	SEAL INTACT	INITIALS	SEAL NO.	SEAL INTACT	INITIALS
	YES <input type="checkbox"/> NO <input type="checkbox"/>			YES <input type="checkbox"/> NO <input type="checkbox"/>	
NOTES:	TEMP. ON ARRIVAL				
	10/17/20				





Laboratories LLC

## SAMPLE RECEIPT &amp; REVIEW FORM

*596340 / 596341*

Client: <b>MERI</b>		SDG/AR/COC/Work Order: <i>55910430 / 596431</i>		
Received By: <i>Stacy L. Boon</i>		Date Received: <i>11-Oct-22</i>		
Carrier and Tracking Number		Circle Applicable: FedEx Express    FedEx Ground <u>UPS</u> Field Services    Courier    Other  <i>1Z 466 477 03 6340 9133 17c</i> <i>  "  "  "  "  6282 9495 15c</i>		
Suspected Hazard Information	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.		
A) Shipped as a DOT Hazardous?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Hazard Class Shipped: _____ UN#: _____ If UN2910, Is the Radioactive Shipment Survey Compliant? Yes ___ No ___		
B) Did the client designate the samples are to be received as radioactive?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	COC notation or radioactive stickers on containers equal client designation.		
C) Did the RSO classify the samples as radioactive?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): <u>  0  </u> CPM / mR/Hr Classified as: Rad 1    Rad 2    Rad 3		
D) Did the client designate samples are hazardous?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	COC notation or hazard labels on containers equal client designation.		
E) Did the RSO identify possible hazards?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	If D or E is yes, select Hazards below. PCBs    Flammable    Foreign Soil    RCRA    Asbestos    Beryllium    Other: _____		
Sample Receipt Criteria	Yes <input type="checkbox"/>	NA <input type="checkbox"/>	No <input type="checkbox"/>	Comments/Qualifiers (Required for Non-Conforming Items)
1 Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Circle Applicable:    Seals broken    Damaged container    Leaking container    Other (describe)
2 Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Circle Applicable:    Client contacted and provided COC    COC created upon receipt
3 Samples requiring cold preservation within (0 ≤ 6 deg. C)?*	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Preservation Method:    Wet Ice    Ice Packs    Dry ice <u>None</u> Other: _____ *all temperatures are recorded in Celsius    TEMP: _____
4 Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Temperature Device Serial #: _____ Secondary Temperature Device Serial # (If Applicable): _____
5 Sample containers intact and sealed?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Circle Applicable:    Seals broken    Damaged container    Leaking container    Other (describe)
6 Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Sample ID's and Containers Affected: _____ If Preservation added, Lot#: _____
7 Do any samples require Volatile Analysis?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	If Yes, are Encores or Soil Kits present for solids? Yes ___ No ___ NA___ (If yes, take to VOA Freezer)
				Do liquid VOA vials contain acid preservation? Yes ___ No ___ NA___ (If unknown, select No)
				Are liquid VOA vials free of headspace? Yes ___ No ___ NA___ Sample ID's and containers affected: _____
8 Samples received within holding time?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	ID's and tests affected: _____
9 Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	ID's and containers affected: _____
10 Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Circle Applicable:    No dates on containers    No times on containers    COC missing info    Other (describe)
11 Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Circle Applicable:    No container count on COC    Other (describe)
12 Are sample containers identifiable as GEL provided by use of GEL labels?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
13 COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Circle Applicable:    Not relinquished    Other (describe)
Comments (Use Continuation Form if needed):				

PM (or PMA) review: Initials *sgw* Date *10/12/22* Page *1* of *1*

# **Laboratory Certifications**

**List of current GEL Certifications as of 03 November 2022**

<b>State</b>	<b>Certification</b>
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122023-3
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2022-160
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122022-37
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

# **Radiological Analysis**

# Case Narrative

**Radiochemistry  
Technical Case Narrative  
Merit Laboratories, Inc.  
SDG #: S41124  
Work Order #: 596340**

**Product: GFPC Ra228, Liquid**

**Analytical Method:** EPA 904.0/SW846 9320 Modified

**Analytical Procedure:** GL-RAD-A-063 REV# 5

**Analytical Batch:** 2331093

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
596340001	S41124.01
596340002	S41124.02
596340003	S41124.03
596340004	S41124.04 Field Dupe
596340005	S41124.05 Field Blank
1205221400	Method Blank (MB)
1205221401	596340001(S41124.01) Sample Duplicate (DUP)
1205221402	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

**Product: Lucas Cell, Ra226, Liquid**

**Analytical Method:** EPA 903.1 Modified

**Analytical Procedure:** GL-RAD-A-008 REV# 15

**Analytical Batch:** 2331060

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
596340001	S41124.01
596340002	S41124.02
596340003	S41124.03
596340004	S41124.04 Field Dupe
596340005	S41124.05 Field Blank
1205221306	Method Blank (MB)
1205221307	596340001(S41124.01) Sample Duplicate (DUP)
1205221308	596340001(S41124.01) Matrix Spike (MS)
1205221309	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

**Miscellaneous Information**

**Additional Comments**

The matrix spike, 1205221308 (S41124.01MS), aliquot was reduced to conserve sample volume.

**Certification Statement**

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

## GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

### Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S41124 GEL Work Order: 596340

#### The Qualifiers in this report are defined as follows:

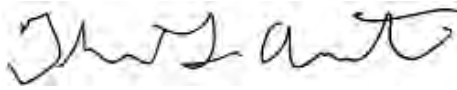
- \* A quality control analyte recovery is outside of specified acceptance criteria
- \*\* Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

#### Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature:



Name: Theresa Austin

Date: 07 NOV 2022

Title: Group Leader



# Sample Data Summary

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: November 7, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

Client Sample ID: S41124.01	Project: MERI00120
Sample ID: 596340001	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 06-OCT-22 11:49	
Receive Date: 11-OCT-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.103	+/-1.31	2.42	3.00	pCi/L		JE1	10/31/22	0924	2331093	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.09	+/-1.39			pCi/L		NXL1	11/03/22	0735	2331091	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.988	+/-0.459	0.547	1.00	pCi/L		LXP1	10/31/22	0901	2331060	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			71.3	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: November 7, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Lavery  
 Project: Routine Analysis

Client Sample ID: S41124.02	Project: MERI00120
Sample ID: 596340002	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 06-OCT-22 13:07	
Receive Date: 11-OCT-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	1.39	+/-1.42	2.36	3.00	pCi/L		JE1	10/31/22	0924	2331093	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.99	+/-1.48			pCi/L		NXL1	11/03/22	0735	2331091	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.595	+/-0.399	0.569	1.00	pCi/L		LXP1	10/31/22	0901	2331060	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			73.9	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: November 7, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Lavery  
 Project: Routine Analysis

Client Sample ID: S41124.03	Project: MERI00120
Sample ID: 596340003	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 06-OCT-22 09:34	
Receive Date: 11-OCT-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	1.26	+/-1.61	2.74	3.00	pCi/L		JE1	10/31/22	0924	2331093		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		1.63	+/-1.64			pCi/L		NXL1	11/03/22	0735	2331091		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.370	+/-0.256	0.322	1.00	pCi/L		LXP1	10/31/22	0901	2331060		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			76	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

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## Certificate of Analysis

Report Date: November 7, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

Client Sample ID: S41124.04 Field Dupe	Project: MERI00120
Sample ID: 596340004	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 06-OCT-22 09:34	
Receive Date: 11-OCT-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.165	+/-1.29	2.35	3.00	pCi/L		JE1	10/31/22	0924	2331093	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.779	+/-1.33			pCi/L		NXL1	11/03/22	0735	2331091	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.615	+/-0.314	0.327	1.00	pCi/L		LXP1	10/31/22	0901	2331060	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			78	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

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## Certificate of Analysis

Report Date: November 7, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Lavery  
 Project: Routine Analysis

Client Sample ID: S41124.05 Field Blank	Project: MERI00120
Sample ID: 596340005	Client ID: MERI001
Matrix: Water	
Collect Date: 06-OCT-22 08:35	
Receive Date: 11-OCT-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.511	+/-1.17	2.09	3.00	pCi/L		JE1	10/31/22	0924	2331093	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.893	+/-1.21			pCi/L		NXL1	11/03/22	0735	2331091	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.382	+/-0.312	0.466	1.00	pCi/L		LXP1	10/31/22	0901	2331060	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			73.7	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# **Quality Control Summary**

# GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

## QC Summary

Report Date: November 7, 2022

Page 1 of 2

**Merit Laboratories Inc.**  
**2680 East Lansing Drive**  
**East Lansing, Michigan**

**Contact: John Laverty**

**Workorder: 596340**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Rad Gas Flow</b>											
Batch	2331093										
QC1205221401	596340001	DUP									
Radium-228	U	0.103	U	1.16	pCi/L	N/A		N/A	JE1	10/31/22	09:24
	Uncertainty	+/-1.31		+/-1.23							
QC1205221402	LCS										
Radium-228	65.8			66.4	pCi/L		101	(75%-125%)		10/31/22	09:24
	Uncertainty			+/-4.45							
QC1205221400	MB										
Radium-228			U	0.712	pCi/L					10/31/22	09:23
	Uncertainty			+/-1.55							
<b>Rad Ra-226</b>											
Batch	2331060										
QC1205221307	596340001	DUP									
Radium-226		0.988		0.642	pCi/L	42.4		(0% - 100%)	LXP1	10/31/22	10:06
	Uncertainty	+/-0.459		+/-0.369							
QC1205221309	LCS										
Radium-226	26.5			32.1	pCi/L		121	(75%-125%)		10/31/22	10:07
	Uncertainty			+/-2.26							
QC1205221306	MB										
Radium-226			U	0.157	pCi/L					10/31/22	10:06
	Uncertainty			+/-0.345							
QC1205221308	596340001	MS									
Radium-226	127	0.988		115	pCi/L		90.1	(75%-125%)		10/31/22	10:07
	Uncertainty	+/-0.459		+/-8.59							

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- \*\* Analyte is a Tracer compound
- < Result is less than value reported
- > Result is greater than value reported
- BD Results are either below the MDC or tracer recovery is low
- FA Failed analysis.
- H Analytical holding time was exceeded



# GEL LABORATORIES LLC

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## QC Summary

Workorder: 596340

Page 2 of 2

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
J											
J											
K											
L											
M											
M											
N/A											
NI											
ND											
NJ											
Q											
R											
U											
UI											
UJ											
UL											
X											
Y											
^											
h											

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where the duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

\* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

# Gas Flow Raw Data

# Batch 2331093 Check-list

This check-list was completed on 07-NOV-22 by Kenshalla Oston

This batch was reviewed by Kenshalla Oston on 31-OCT-22 and Nat Long on 31-OCT-22.

**Batch ID:**  
2331093

**Product:**  
GFC28RAL

**Description:** Gas Flow Radium 228  
GL-RAD-A-063

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous		No	
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
11	Has the method required detection limit been met?	Yes		
<b>Miscellaneous Information</b>				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

# Prep Logbook

## Radium-228 in Liquid

**Batch ID:** 2331093

**Analyst:** Jacqueline Emond (JE1)

**Method:** EPA 904.0/SW846 9320 Modified

**Lab SOP:** GL-RAD-A-063 REV# 5

**Instrument:** LUCAS-C202389980

**Due Dates for Lab:** 05-NOV-2022

**Package:** 07-NOV-2022

**SDG:** 07-NOV-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205221402	228 DW spike	1952-B	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	596340001	25-OCT-2022	3	301.52	301.52	10/26/22 16:44	10/31/22 07:04
2	596340002	25-OCT-2022	3	301.83	301.83	10/26/22 16:44	10/31/22 07:04
3	596340003	25-OCT-2022	3	301.86	301.86	10/26/22 16:44	10/31/22 07:04
4	596340004	25-OCT-2022	3	300.78	300.78	10/26/22 16:44	10/31/22 07:04
5	596340005	25-OCT-2022	3	304.35	304.35	10/26/22 16:44	10/31/22 07:04
6	596375001	25-OCT-2022	3	300.54	300.54	10/26/22 16:44	10/31/22 07:04
7	596375002	25-OCT-2022	3	304.4	304.4	10/26/22 16:44	10/31/22 07:04
8	596375003	25-OCT-2022	3	303.01	303.01	10/26/22 16:44	10/31/22 07:04
9	596375004	25-OCT-2022	3	300.52	300.52	10/26/22 16:44	10/31/22 07:04
10	1205221400 MB	25-OCT-2022	3		304.4	10/26/22 16:44	10/31/22 07:04
11	1205221401 DUP (596340001)	25-OCT-2022	3	301.68	301.68	10/26/22 16:44	10/31/22 07:04
12	1205221402 LCS	25-OCT-2022	3		304.4	10/26/22 16:44	10/31/22 07:04

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1951-D	Ba-133	.1 mL	Pipet Id: RAD-GFC-1795419
REGNT 3418276.6	29M HF (48-50%)	4 mL	Data Entry Date2: 25-OCT-2022 00:00
REGNT 3454370.1	Nitric Acid	5 mL	
REGNT 3465466	Barium Carrier Ra228 REG	1 mL	
REGNT 3466687	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3481329	RGF-1M Citric Acid	5 mL	
REGNT 3485721.6	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	
REGNT 3517376	2M HCl	20 mL	
REGNT 3517402	RGF-7M Nitric Acid	25 mL	
REGNT 3521227	RGF-50% Potassium Carbonate	2 mL	
REGNT 3521298	RGF-Neodymium Substrate	5 mL	
REGNT 3523298	RGF-1.5M Ammonium Sulfate	10 mL	
REGNT DGA0038	2327498	2 g	

### Radium-228 Liquid

Filename : RA228.XLS  
 File type : Excel  
 Version # : 1.4.2

Tracer S/N : 1951-D  
 Tracer Exp Date : 6/2/2023  
 Tracer Volume Added: 0.10

Batch : 2331093  
 Analyst : JAC02417  
 Prep Date : 10/25/2022  
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL  
 Parmname : Radium-228  
 Required MDA : 3 pCi/L  
 Ra-228 Abundance : 1.00  
 Halflife of Ra-228 : 5.75 years  
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	596340001.1	0.3015	1.8485E-05	10/6/2022 11:49	1310.2	1.59%	934.6	1.89%	0.1	0.000200
2	596340002.1	0.3018	1.8490E-05	10/6/2022 13:07	1310.2	1.59%	968.8	1.85%	0.1	0.000200
3	596340003.1	0.3019	1.8491E-05	10/6/2022 9:34	1310.2	1.59%	995.5	1.83%	0.1	0.000200
4	596340004.1	0.3008	1.8472E-05	10/6/2022 9:34	1310.2	1.59%	1022.2	1.81%	0.1	0.000200
5	596340005.1	0.3044	1.8532E-05	10/6/2022 8:35	1310.2	1.59%	966.3	1.86%	0.1	0.000200
6	596375001.1	0.3005	1.8468E-05	9/28/2022 9:20	1310.2	1.59%	1108.7	1.73%	0.1	0.000200
7	596375002.1	0.3044	1.8533E-05	9/28/2022 10:45	1310.2	1.59%	1137.6	1.71%	0.1	0.000200
8	596375003.1	0.3030	1.8510E-05	9/28/2022 12:15	1310.2	1.59%	1167.8	1.69%	0.1	0.000200
9	596375004.1	0.3005	1.8468E-05	9/28/2022 12:00	1310.2	1.59%	1110.7	1.73%	0.1	0.000200
10	1205221400.1	0.3044	1.8533E-05	10/25/2022 0:00	1310.2	1.59%	984.2	1.84%	0.1	0.000200
11	1205221401.1	0.3017	1.8487E-05	10/6/2022 11:49	1310.2	1.59%	1003.2	1.82%	0.1	0.000200
12	1205221402.1	0.3044	1.8533E-05	10/25/2022 0:00	1310.2	1.59%	945.7	1.88%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063  
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated	Sample
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction	Recovery %	Recovery Error %
			Alpha	Beta										
1	1A	60	6	66	1.100	10/31/2022 9:24	10/26/2022 16:44	10/31/2022 7:04	0.992	0.768	1.000	1.057	71.3%	1.27%
2	2A	60	7	85	1.417	10/31/2022 9:24	10/26/2022 16:44	10/31/2022 7:04	0.992	0.768	1.000	1.057	73.9%	1.25%
3	2B	60	6	111	1.850	10/31/2022 9:24	10/26/2022 16:44	10/31/2022 7:04	0.992	0.768	1.000	1.057	76.0%	1.24%
4	3C	60	10	80	1.333	10/31/2022 9:24	10/26/2022 16:44	10/31/2022 7:04	0.992	0.768	1.000	1.057	78.0%	1.24%
5	3D	60	17	54	0.900	10/31/2022 9:24	10/26/2022 16:44	10/31/2022 7:04	0.992	0.768	1.000	1.057	73.7%	1.26%
6	5A	60	7	67	1.117	10/31/2022 9:24	10/26/2022 16:44	10/31/2022 7:04	0.989	0.768	1.000	1.057	84.6%	1.21%
7	5B	60	17	96	1.600	10/31/2022 9:24	10/26/2022 16:44	10/31/2022 7:04	0.989	0.768	1.000	1.057	86.8%	1.20%
8	5D	60	11	67	1.117	10/31/2022 9:24	10/26/2022 16:44	10/31/2022 7:04	0.989	0.768	1.000	1.057	89.1%	1.19%
9	6A	60	9	70	1.167	10/31/2022 9:25	10/26/2022 16:44	10/31/2022 7:04	0.989	0.767	1.000	1.057	84.8%	1.21%
10	6C	60	9	103	1.717	10/31/2022 9:23	10/26/2022 16:44	10/31/2022 7:04	0.998	0.769	1.000	1.057	75.1%	1.25%
11	7C	60	15	73	1.217	10/31/2022 9:24	10/26/2022 16:44	10/31/2022 7:04	0.992	0.769	1.000	1.057	76.6%	1.24%
12	8A	60	18	947	15.783	10/31/2022 9:24	10/26/2022 16:44	10/31/2022 7:04	0.998	0.769	1.000	1.057	72.2%	1.26%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2022	5/31/2023	0.6209	0.00738	1.078	10/29/2022 8:04	500
2	PIC	6/1/2022	5/31/2023	0.6201	0.01914	1.108	10/29/2022 8:04	500
3	PIC	6/1/2022	5/31/2023	0.6097	0.02111	1.568	10/29/2022 8:04	500
4	PIC	6/1/2022	5/31/2023	0.6365	0.00988	1.294	10/29/2022 8:03	500
5	PIC	6/1/2022	5/31/2023	0.5999	0.02297	0.790	10/29/2022 8:04	500
6	PIC	6/1/2022	5/31/2023	0.6332	0.00851	1.014	10/29/2022 8:05	500
7	PIC	6/1/2022	5/31/2023	0.6336	0.00426	1.458	10/29/2022 8:05	500
8	PIC	6/1/2022	5/31/2023	0.6236	0.00925	1.092	10/29/2022 8:05	500
9	PIC	6/1/2022	5/31/2023	0.6328	0.02228	1.102	10/29/2022 8:05	500
10	PIC	6/1/2022	5/31/2023	0.6123	0.01970	1.556	10/29/2022 8:05	500
11	PIC	6/1/2022	5/31/2023	0.6407	0.00790	0.942	10/29/2022 8:05	500
12	PIC	6/1/2022	5/31/2023	0.6398	0.01579	0.758	10/29/2022 8:05	500

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

**Spike S/N :** N/A  
**Spike Exp Date :** N/A  
**Spike Activity (dpm/ml):** N/A  
**Spike Volume Added:** N/A

\* - RPD changed to 0% due to sample & dup activity below MDA

**LCS S/N :** 1952-B  
**LCS Exp Date :** 8/9/2023  
**LCS Activity (dpm/ml):** 444.41  
**LCS Volume Added:** 0.10

Results														2 SIGMA		2 SIGMA			
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	Counting Uncertainty pCi/L	Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery			
1	1.5467	1.0920	3	2.4180	<b>0.1030</b>	650.64%	0.0220	0.1431	1.3129	1.3132		SAMPLE							
2	1.5133	1.0684	3	2.3626	<b>1.3940</b>	52.12%	0.3087	0.1607	1.4225	1.4654		SAMPLE							
3	1.7821	1.2581	3	2.7398	<b>1.2607</b>	65.40%	0.2820	0.1843	1.6149	1.6462		SAMPLE							
4	1.5160	1.0703	3	2.3499	<b>0.1647</b>	400.46%	0.0393	0.1575	1.2924	1.2931		SAMPLE							
5	1.3140	0.9277	3	2.0876	<b>0.5108</b>	117.09%	0.1100	0.1288	1.1720	1.1792		SAMPLE							
6	1.2485	0.8814	3	1.9576	<b>0.3998</b>	139.94%	0.1027	0.1437	1.0967	1.1012		SAMPLE							
7	1.4398	1.0165	3	2.2204	<b>0.5319</b>	121.13%	0.1420	0.1720	1.2628	1.2697		SAMPLE							
8	1.2391	0.8748	3	1.9359	<b>0.0919</b>	584.62%	0.0247	0.1442	1.0528	1.0531		SAMPLE							
9	1.3010	0.9185	3	2.0317	<b>0.2518</b>	227.54%	0.0647	0.1471	1.1227	1.1245		SAMPLE							
10	1.7607	1.2431	3	2.7079	<b>0.7124</b>	110.88%	0.1607	0.1781	1.5479	1.5583		MB							
11	1.3042	0.9208	3	2.0526	<b>1.1594</b>	54.22%	0.2747	0.1489	1.2316	1.2653	596340001.1	DUP	* 0.0%						
12	1.2244	0.8644	3	1.9498	<b>66.3781</b>	3.98%	15.0253	0.5144	4.4538	17.2888		LCS			65.7644	100.9%			



SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
596340001	1A	60	6	66	10/31/2022 9:24	10/31/2022 10:24	PIC	2331093
596340002	2A	60	7	85	10/31/2022 9:24	10/31/2022 10:24	PIC	2331093
596340003	2B	60	6	111	10/31/2022 9:24	10/31/2022 10:24	PIC	2331093
596340004	3C	60	10	80	10/31/2022 9:24	10/31/2022 10:24	PIC	2331093
596340005	3D	60	17	54	10/31/2022 9:24	10/31/2022 10:24	PIC	2331093
596375001	5A	60	7	67	10/31/2022 9:24	10/31/2022 10:24	PIC	2331093
596375002	5B	60	17	96	10/31/2022 9:24	10/31/2022 10:24	PIC	2331093
596375003	5D	60	11	67	10/31/2022 9:24	10/31/2022 10:24	PIC	2331093
596375004	6A	60	9	70	10/31/2022 9:25	10/31/2022 10:25	PIC	2331093
1205221400	6C	60	9	103	10/31/2022 9:23	10/31/2022 10:23	PIC	2331093
1205221401	7C	60	15	73	10/31/2022 9:24	10/31/2022 10:24	PIC	2331093
1205221402	8A	60	18	947	10/31/2022 9:24	10/31/2022 10:24	PIC	2331093

ASSAY 31-Oct-22 7:36:09  
 Wizard 2480 s/n 46190630  
 Protocol id 8 Ba-133  
 Time limit  
 Count limit  
 Isotope Ba-133  
 Protocol date 10/31/2022  
 Run id. 5751

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	95	1	180	3931.28	1310.2	1.59	07:36:09
596340001	2	95	2	180	2804.57	934.64	1.89	71.34	07:39:23
596340002	3	95	3	180	2907	968.81	1.85	73.94	07:42:37
596340003	4	95	4	180	2987	995.45	1.83	75.98	07:45:50
596340004	5	95	5	180	3067.28	1022.24	1.81	78.02	07:49:05
596340005	1	14	1	180	2899.28	966.25	1.86	73.75	07:52:38
596375001	2	14	2	180	3326.57	1108.65	1.73	84.62	07:55:52
596375002	3	14	3	180	3413.28	1137.55	1.71	86.82	07:59:06
596375003	4	14	4	180	3504	1167.79	1.69	89.13	08:02:20
596375004	5	14	5	180	3332.57	1110.66	1.73	84.77	08:05:34
1205221400	1	15	1	180	2953	984.15	1.84	75.11	08:09:10
1205221401	2	15	2	180	3010	1003.24	1.82	76.57	08:12:23
1205221402	3	15	3	180	2837.57	945.68	1.88	72.18	08:15:37

END OF ASSAY

# **Continuing Calibration Data**

# Gas Flow Proportional Counter Checks for 31-Oct-2022

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z


Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100A1	need 2nd	Beta bkg	31-Oct 05:07	60	1.417	0.674	1.891	+0.66
LB4100A2	Above	Alpha bkg	31-Oct 05:07	60	0.183	-3.73E-2	0.175	+3.22
LB4100A2	Above	Beta bkg	31-Oct 05:07	60	2.017	1.377	2.444	+0.60
LB4100A3	need 2nd	Beta bkg	31-Oct 05:07	60	1.367	0.242	2.307	+0.27
LB4100E2	Above	Beta bkg	31-Oct 04:48	60	2.650	1.385	3.072	+1.50
LB4100E4	Above	Beta bkg	31-Oct 04:48	60	2.500	0.976	2.268	+4.08
LB4100F2	Above	Alpha eff	31-Oct 06:38	5	8360	6533	7372	+10.06
LB4100F2	Above	Alpha XTalk	31-Oct 06:38	5	0.391	0.318	0.366	+6.11
LB4100F2	Above	Beta bkg	31-Oct 04:48	60	29.167	1.173	1.833	+251.49
LB4100F3	Below	Alpha eff	31-Oct 06:38	5	7579	11460	15350	-8.99
LB4100F3	Below	Alpha XTalk	31-Oct 06:38	5	0.307	0.328	0.439	-4.10
LB4100F3	need 2nd	Beta XTalk	31-Oct 06:01	5	3.20E-4	1.16E-4	4.63E-4	+0.54
LB4100F4	Below	Alpha eff	31-Oct 06:38	5	7322	12140	14390	-15.85
LB4100F4	Above	Alpha XTalk	31-Oct 06:38	5	0.364	0.287	0.347	+4.67
LB4100G1	Above	Alpha XTalk	31-Oct 06:15	5	0.692	0.088	0.447	+7.11
LB4100G1	Above	Beta bkg	31-Oct 04:48	60	5043	0.380	1.675	+23,362.79
LB4100G1	Above	Beta eff	31-Oct 06:08	5	20227	12880	18320	+5.10
LB4100G3	Above	Beta bkg	31-Oct 04:48	60	2.117	0.810	1.674	+6.07
LB4100H1	Above	Beta bkg	31-Oct 04:48	60	2.867	0.216	2.462	+4.08
PIC4D	Above	Alpha bkg	31-Oct 05:10	60	0.317	-4.40E-2	0.433	+1.54
PIC4D	Above	Beta bkg	31-Oct 05:10	60	2.183	0.100	2.482	+2.25
PIC8B	Above	Alpha bkg	31-Oct 05:22	60	0.800	-1.16E-1	0.388	+7.92
PIC8B	Above	Beta bkg	31-Oct 05:22	60	3.300	-1.80E-1	2.341	+5.28
PIC8B	Above	Beta XTalk	31-Oct 05:15	5	0.002	2.00E-4	9.31E-4	+7.96
PIC8D	Above	Beta bkg	31-Oct 05:22	60	2.233	-1.07E-1	2.328	+2.77
PIC10B	Above	Beta bkg	31-Oct 05:28	60	3.067	-1.04E-1	2.645	+3.92
PIC11B	Above	Alpha bkg	31-Oct 12:02	60	0.383	-1.80E-1	0.522	+1.82
PIC12B	Above	Beta bkg	31-Oct 05:32	60	3.083	0.269	2.358	+5.08

PIC14B      Above   Beta bkg      31-Oct 05:37    60      2.467    -2.13E-1    2.672      +2.57

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

LB4100C1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by 

Date 11/1/22

GEL Laboratories LLC

# Runlogs

# Instrument Run Log

Instrument Type: GFPC

Batch ID: 2331093

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205221400	MB	JE1	PIC6C	OCT-31-22 09:23:53	DONE	25mm Filter	01-JUN-22 00:00
1205221401	DUP	JE1	PIC7C	OCT-31-22 09:24:01	DONE	25mm Filter	01-JUN-22 00:00
1205221402	LCS	JE1	PIC8A	OCT-31-22 09:24:05	DONE	25mm Filter	01-JUN-22 00:00
596340001	SAMPLE	JE1	PIC1A	OCT-31-22 09:24:13	DONE	25mm Filter	01-JUN-22 00:00
596340002	SAMPLE	JE1	PIC2A	OCT-31-22 09:24:17	DONE	25mm Filter	01-JUN-22 00:00
596340003	SAMPLE	JE1	PIC2B	OCT-31-22 09:24:21	DONE	25mm Filter	01-JUN-22 00:00
596340004	SAMPLE	JE1	PIC3C	OCT-31-22 09:24:28	DONE	25mm Filter	01-JUN-22 00:00
596340005	SAMPLE	JE1	PIC3D	OCT-31-22 09:24:31	DONE	25mm Filter	01-JUN-22 00:00
596375001	SAMPLE	JE1	PIC5A	OCT-31-22 09:24:41	DONE	25mm Filter	01-JUN-22 00:00
596375002	SAMPLE	JE1	PIC5B	OCT-31-22 09:24:47	DONE	25mm Filter	01-JUN-22 00:00
596375003	SAMPLE	JE1	PIC5D	OCT-31-22 09:24:50	DONE	25mm Filter	01-JUN-22 00:00
596375004	SAMPLE	JE1	PIC6A	OCT-31-22 09:25:02	DONE	25mm Filter	01-JUN-22 00:00

# Lucas Cell Raw Data



# Batch 2331060 Check-list

This check-list was completed on 31-OCT-22 by Lyndsey Pace

This batch was reviewed by Lyndsey Pace on 31-OCT-22 and Elizabeth Krouse on 01-NOV-22.

**Batch ID:**  
2331060

**Product:**  
LUC26RAL

**Description:** Lucas Cell Radium 226  
GL-RAD-A-008

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous		No	
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
<b>Miscellaneous Information</b>				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

# Prep Logbook

## Radium-226 in Liquid

**Batch ID:** 2331060

**Analyst:** Prep: Charles Taibi (CT2)  
Lyndsey Pace (LXP1)

**Method:** EPA 903.1 Modified

**Lab SOP:** GL-RAD-A-008 REV# 15

**Instrument:** LUCAS-C202389980

**Due Dates for Lab:** 30-OCT-2022

**Package:** 01-NOV-2022

**SDG:** 02-NOV-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205221309	Radium-226 SPIKE	1715-G	.1	mL
MS	1205221308	Radium-226 SPIKE	1715-G	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	596340001	25-OCT-2022	1	500.23	500.23	10/27/22 08:00	308	10/31/22 05:50	10/31/22 09:01	6	32
2	596340002	25-OCT-2022	1	504.14	504.14	10/27/22 08:00	403	10/31/22 05:50	10/31/22 09:01	7	23
3	596340003	25-OCT-2022	1	500.32	500.32	10/27/22 08:00	508	10/31/22 05:50	10/31/22 09:01	2	13
4	596340004	25-OCT-2022	1	504.72	504.72	10/27/22 08:00	601	10/31/22 05:50	10/31/22 09:01	2	20
5	596340005	25-OCT-2022	1	502.97	502.97	10/27/22 08:00	703	10/31/22 05:50	10/31/22 09:01	5	16
6	596375001	25-OCT-2022	1	504.81	504.81	10/27/22 08:00	805	10/31/22 05:50	10/31/22 09:01	3	15
7	596375002	25-OCT-2022	1	504.01	504.01	10/27/22 08:00	104	10/31/22 06:20	10/31/22 09:32	6	7
8	596375003	25-OCT-2022	1	504.5	504.5	10/27/22 08:00	205	10/31/22 06:20	10/31/22 09:32	3	16
9	596375004	25-OCT-2022	1	502.52	502.52	10/27/22 08:00	302	10/31/22 06:20	10/31/22 09:32	4	16
10	596445001	25-OCT-2022	1	504.97	504.97	10/27/22 08:00	408	10/31/22 06:20	10/31/22 09:32	3	13
11	596445002	25-OCT-2022	1	503.18	503.18	10/27/22 08:00	506	10/31/22 06:20	10/31/22 09:32	8	33
12	596445003	25-OCT-2022	1	503.47	503.47	10/27/22 08:00	608	10/31/22 06:20	10/31/22 09:32	1	13
13	596748001	25-OCT-2022	1	502.6	502.6	10/27/22 08:00	701	10/31/22 06:20	10/31/22 09:32	5	8
14	596748002	25-OCT-2022	1	503.44	503.44	10/27/22 08:00	804	10/31/22 06:20	10/31/22 09:32	7	11
15	1205221306 MB	25-OCT-2022	1		504.97	10/27/22 08:00	103	10/31/22 06:50	10/31/22 10:06	8	12
16	1205221307 DUP (596340001)	25-OCT-2022	1	502.75	502.75	10/27/22 08:00	208	10/31/22 06:50	10/31/22 10:06	6	25
17	1205221308 MS (596340001)	25-OCT-2022	1	105.64	105.64	10/27/22 08:00	303	10/31/22 06:50	10/31/22 10:07	2	697
18	1205221309 LCS	25-OCT-2022	1		504.97	10/27/22 08:00	402	10/31/22 06:50	10/31/22 10:07	3	782

Reagent/Solvent Lot ID	Description	Amount
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**Comments:**

Data Entry Date2: 25-OCT-2022 00:00

### Radium-226 Liquid

Filename : RA226.XLS  
 File type : Excel  
 Version # : 1.3.2

Procedure Code : LUC26RAL  
 Parmname : Radium-226  
 Required MDA : 1 pCi/L  
 Halflife of Ra-226 : 1600 years  
 Ra-226 Abundance : 1.00  
 Halflife of Rn-222 : 3.8235 days

Batch : 2331060  
 Analyst : LXP1  
 Prep Date : 10/25/2022  
 Ra-226 Method Uncertainty : 0.073648

Batch counted on : LUCAS CELL DETECTOR  
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Count Time (min.)	Cell Efficiency (cpm/dpm)
1	596340001.1	0.5002	2.0257E-05	10/6/2022 11:49	308	30	32	1.067	6	0.200	30	1.5970
2	596340002.1	0.5041	2.0273E-05	10/6/2022 13:07	403	30	23	0.767	7	0.233	30	1.6200
3	596340003.1	0.5003	2.0257E-05	10/6/2022 9:34	508	30	13	0.433	2	0.067	30	1.8020
4	596340004.1	0.5047	2.0275E-05	10/6/2022 9:34	601	30	20	0.667	2	0.067	30	1.7610
5	596340005.1	0.5030	2.0268E-05	10/6/2022 8:35	703	30	16	0.533	5	0.167	30	1.7360
6	596375001.1	0.5048	2.0275E-05	9/28/2022 9:20	805	30	15	0.500	3	0.100	30	1.9080
7	596375002.1	0.5040	2.0272E-05	9/28/2022 10:45	104	30	7	0.233	6	0.200	30	1.6160
8	596375003.1	0.5045	2.0274E-05	9/28/2022 12:15	205	30	16	0.533	3	0.100	30	1.8920
9	596375004.1	0.5025	2.0266E-05	9/28/2022 12:00	302	30	16	0.533	4	0.133	30	1.7980
10	596445001.1	0.5050	2.0276E-05	10/7/2022 12:05	408	30	13	0.433	3	0.100	30	1.5900
11	596445002.1	0.5032	2.0269E-05	10/7/2022 15:15	506	30	33	1.100	8	0.267	30	1.7710
12	596445003.1	0.5035	2.0270E-05	10/7/2022 15:15	608	30	13	0.433	1	0.033	30	1.7970
13	596748001.1	0.5026	2.0266E-05	10/11/2022 12:48	701	30	8	0.267	5	0.167	30	1.7130
14	596748002.1	0.5034	2.0270E-05	10/11/2022 12:48	804	30	11	0.367	7	0.233	30	1.9050
15	1205221306.1	0.5050	2.0276E-05	10/25/2022 0:00	103	30	12	0.400	8	0.267	30	1.5190
16	1205221307.1	0.5028	2.0267E-05	10/6/2022 11:49	208	30	25	0.833	6	0.200	30	1.7740
17	1205221308.1	0.1056	1.1711E-05	10/6/2022 11:49	303	30	697	23.233	2	0.067	30	1.7210
18	1205221309.1	0.5050	2.0276E-05	10/25/2022 0:00	402	30	782	26.067	3	0.100	30	1.4480

Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008  
 Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrow End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
9.600%	10/25/2022	10/31/2023	10/27/2022 8:00	10/31/2022 5:50	10/31/2022 9:01	0.508	0.976	1.002	1.000
9.700%	2/1/2022	1/31/2023	10/27/2022 8:00	10/31/2022 5:50	10/31/2022 9:01	0.508	0.976	1.002	1.000
4.500%	6/1/2022	5/31/2023	10/27/2022 8:00	10/31/2022 5:50	10/31/2022 9:01	0.508	0.976	1.002	1.000
9.400%	7/1/2022	6/30/2023	10/27/2022 8:00	10/31/2022 5:50	10/31/2022 9:01	0.508	0.976	1.002	1.000
5.000%	11/1/2021	10/31/2022	10/27/2022 8:00	10/31/2022 5:50	10/31/2022 9:01	0.508	0.976	1.002	1.000
7.400%	4/1/2022	3/31/2023	10/27/2022 8:00	10/31/2022 5:50	10/31/2022 9:01	0.508	0.976	1.002	1.000
2.000%	4/28/2022	4/30/2023	10/27/2022 8:00	10/31/2022 6:20	10/31/2022 9:32	0.510	0.976	1.002	1.000
3.900%	8/1/2022	7/31/2023	10/27/2022 8:00	10/31/2022 6:20	10/31/2022 9:32	0.510	0.976	1.002	1.000
3.300%	10/25/2022	10/31/2023	10/27/2022 8:00	10/31/2022 6:20	10/31/2022 9:32	0.510	0.976	1.002	1.000
1.200%	2/1/2022	1/31/2023	10/27/2022 8:00	10/31/2022 6:20	10/31/2022 9:32	0.510	0.976	1.002	1.000
5.300%	6/1/2022	5/31/2023	10/27/2022 8:00	10/31/2022 6:20	10/31/2022 9:32	0.510	0.976	1.002	1.000
6.300%	7/1/2022	6/30/2023	10/27/2022 8:00	10/31/2022 6:20	10/31/2022 9:32	0.510	0.976	1.002	1.000
5.900%	11/1/2021	10/31/2022	10/27/2022 8:00	10/31/2022 6:20	10/31/2022 9:32	0.510	0.976	1.002	1.000
9.900%	4/1/2022	3/31/2023	10/27/2022 8:00	10/31/2022 6:20	10/31/2022 9:32	0.510	0.976	1.002	1.000
5.600%	4/28/2022	4/30/2023	10/27/2022 8:00	10/31/2022 6:50	10/31/2022 10:06	0.511	0.976	1.002	1.000
5.500%	8/1/2022	7/31/2023	10/27/2022 8:00	10/31/2022 6:50	10/31/2022 10:06	0.511	0.976	1.002	1.000
7.400%	10/25/2022	10/31/2023	10/27/2022 8:00	10/31/2022 6:50	10/31/2022 10:07	0.511	0.976	1.002	1.000
2.300%	2/1/2022	1/31/2023	10/27/2022 8:00	10/31/2022 6:50	10/31/2022 10:07	0.511	0.976	1.002	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

**Spike S/N :** 1715-G  
**Spike Exp Date :** 9/8/2023  
**Spike Activity (dpm/ml):** 297.48  
**Spike Volume Added:** 0.10

**LCS S/N :** 1715-G  
**LCS Exp Date :** 9/8/2023  
**LCS Activity (dpm/ml):** 297.48  
**LCS Volume Added:** 0.10

<b>Results</b>																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.3066	0.2165	1	0.5469	<b>0.9877</b>	25.58%	0.8667	0.2055	0.4590	0.5153		SAMPLE				
2	0.3240	0.2287	1	0.5689	<b>0.5946</b>	35.58%	0.5333	0.1826	0.3989	0.4234		SAMPLE				
3	0.1569	0.1107	1	0.3225	<b>0.3703</b>	35.50%	0.3667	0.1291	0.2555	0.2631		SAMPLE				
4	0.1591	0.1123	1	0.3271	<b>0.6146</b>	27.70%	0.6000	0.1563	0.3139	0.3453		SAMPLE				
5	0.2561	0.1808	1	0.4659	<b>0.3823</b>	41.96%	0.3667	0.1528	0.3122	0.3192		SAMPLE				
6	0.1798	0.1270	1	0.3485	<b>0.3781</b>	36.12%	0.4000	0.1414	0.2620	0.2732		SAMPLE				
7	0.2997	0.2116	1	0.5346	<b>0.0371</b>	360.56%	0.0333	0.1202	0.2624	0.2625		SAMPLE				
8	0.1808	0.1277	1	0.3504	<b>0.4119</b>	33.76%	0.4333	0.1453	0.2707	0.2789		SAMPLE				
9	0.2206	0.1557	1	0.4119	<b>0.4017</b>	37.41%	0.4000	0.1491	0.2934	0.3002		SAMPLE				
10	0.2150	0.1518	1	0.4165	<b>0.3767</b>	40.02%	0.3333	0.1333	0.2953	0.3004		SAMPLE				
11	0.3163	0.2233	1	0.5484	<b>0.8484</b>	26.16%	0.8333	0.2134	0.4259	0.4519		SAMPLE				
12	0.1101	0.0778	1	0.2558	<b>0.4011</b>	31.81%	0.4000	0.1247	0.2451	0.2567		SAMPLE				
13	0.2588	0.1827	1	0.4708	<b>0.1054</b>	120.33%	0.1000	0.1202	0.2482	0.2490		SAMPLE				
14	0.2749	0.1941	1	0.4828	<b>0.1261</b>	106.53%	0.1333	0.1414	0.2622	0.2640		SAMPLE				
15	0.3663	0.2586	1	0.6351	<b>0.1572</b>	111.94%	0.1333	0.1491	0.3445	0.3457		MB				
16	0.2728	0.1926	1	0.4867	<b>0.6423</b>	29.82%	0.6333	0.1856	0.3689	0.3866	596340001.1	DUP	42.4%			
17	0.7728	0.5456	1	1.5888	<b>115.2636</b>	8.32%	23.1667	0.8813	8.5941	25.1034	596340001.1	MS			126.8478	90.1%
18	0.2353	0.1662	1	0.4560	<b>32.1226</b>	4.27%	25.9667	0.9339	2.2645	5.3596		LCS			26.5360	121.1%

# **Continuing Calibration Data**



# Ludlum Alpha Scintillation Counter Checks for 31-OCT-2022

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	07:54	1	1.21E+05	121364	-1.31		
LUCAS2	EFF	07:53	1	1.34E+05	134292	0.46		
LUCAS3	EFF	07:51	1	1.24E+05	124117	-1.91		
LUCAS4	EFF	07:48	1	1.28E+05	127895	-0.01		
LUCAS5	EFF	07:44	1	1.33E+05	133423	1.59		
LUCAS6	EFF	07:41	1	1.32E+05	131627	0.35		
LUCAS7	EFF	07:40	1	1.30E+05	129947	-2.09		
LUCAS8	EFF	07:35	1	1.30E+05	129836	0.07		

**Reviewed by:**

Lyndsey Pace

**Date:** 31-OCT-22

GEL Laboratories LLC

# Runlogs



# Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2331060

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
596340001	SAMPLE	LXP1	LUCAS3	OCT-31-22 09:01:00	DONE	Lucas Cell	25-OCT-22 00:00
596340002	SAMPLE	LXP1	LUCAS4	OCT-31-22 09:01:00	DONE	Lucas Cell	01-FEB-22 00:00
596340003	SAMPLE	LXP1	LUCAS5	OCT-31-22 09:01:00	DONE	Lucas Cell	01-JUN-22 00:00
596340004	SAMPLE	LXP1	LUCAS6	OCT-31-22 09:01:00	DONE	Lucas Cell	01-JUL-22 00:00
596340005	SAMPLE	LXP1	LUCAS7	OCT-31-22 09:01:00	DONE	Lucas Cell	01-NOV-21 00:00
596375001	SAMPLE	LXP1	LUCAS8	OCT-31-22 09:01:00	DONE	Lucas Cell	01-APR-22 00:00
596375002	SAMPLE	LXP1	LUCAS1	OCT-31-22 09:32:00	DONE	Lucas Cell	28-APR-22 00:00
596375003	SAMPLE	LXP1	LUCAS2	OCT-31-22 09:32:00	DONE	Lucas Cell	01-AUG-22 00:00
596375004	SAMPLE	LXP1	LUCAS3	OCT-31-22 09:32:00	DONE	Lucas Cell	25-OCT-22 00:00
596445001	SAMPLE	LXP1	LUCAS4	OCT-31-22 09:32:00	DONE	Lucas Cell	01-FEB-22 00:00
596445002	SAMPLE	LXP1	LUCAS5	OCT-31-22 09:32:00	DONE	Lucas Cell	01-JUN-22 00:00
596445003	SAMPLE	LXP1	LUCAS6	OCT-31-22 09:32:00	DONE	Lucas Cell	01-JUL-22 00:00
596748001	SAMPLE	LXP1	LUCAS7	OCT-31-22 09:32:00	DONE	Lucas Cell	01-NOV-21 00:00
596748002	SAMPLE	LXP1	LUCAS8	OCT-31-22 09:32:00	DONE	Lucas Cell	01-APR-22 00:00
1205221306	MB	LXP1	LUCAS1	OCT-31-22 10:06:00	DONE	Lucas Cell	28-APR-22 00:00
1205221307	DUP	LXP1	LUCAS2	OCT-31-22 10:06:00	DONE	Lucas Cell	01-AUG-22 00:00
1205221308	MS	LXP1	LUCAS3	OCT-31-22 10:07:00	DONE	Lucas Cell	25-OCT-22 00:00
1205221309	LCS	LXP1	LUCAS4	OCT-31-22 10:07:00	DONE	Lucas Cell	01-FEB-22 00:00



Environmental Laboratory  
 1232 Haco Drive  
 Lansing  
 Michigan, 48910


CHAIN OF CUSTODY

Phone: (517)702-6372

Lab Work Order Number L210196

Client Name <b>BWL - Erickson Station</b>		Project Name <b>Erickson AM MI Wells 7B,7C&amp;12B</b>		Requested Analyses								Requested Turn Around		
Client Contact <b>Cheryl Louden</b>		Project Number <b>[none]</b>		Ag:: As:: B:: Ba:: Be:: Ca:: Cd:: Cr:: Co:: Cu:: Fe:: Hg:: Li:: Mo:: Ni:: Pb:: Sb:: Se:: Ti:: V:: Zn:: Na:: K:: Mg	TSS, HCO3, CO3, Hardness	CH-C: F-ISE:: SO4:: TDS	Radium 226 and Radium 228							Rush requests subject to additional charge.  Rush requests subject to lab approval.
Address <b>3725 S. Canal</b>		Project Description												
City <b>Lansing</b>		PO Number <b>30926 10021</b>												
State/Zip <b>MI, 48917</b>		Shipped By												
Phone <b>(517) 702-6396</b>	Fax <b>(517) 702-6373</b>	Tracking Number												
Sampler <b>Marc Wahrer</b>														

Sample Name or Field ID	Sampled Date	Sampled Time	Sample Type Grab/Composite	Matrix Code	Container Count	Preservation Code				Sample	Comments
						b	a	a	b		
MW-7B	10/6/2022	1149	G	GW	5	1	1	1	2		
MW-7C	10/6/2022	1307	G	GW	5	1	1	1	2		
MW-12B	10/6/2022	0934	G	GW	5	1	1	1	2		
Field Duplicate MW-12B	10/6/2022	0934	G	GW	5	1	1	1	2		
Field Blank	10/6/2022	0835	G	DI	5	1	1	1	2		

Relinquished By 	Date/Time <b>10-6-22 1420</b>	Received By <b>J Caporale</b>	Date/Time <b>10/6/22 1420</b>	
Relinquished By	Date/Time	Received By	Date/Time	Comments
Relinquished By	Date/Time	Received By	Date/Time	
Cooler Numbers and Temperatures				

Matrix Codes: DI=Deionized Water, GW=Ground Water      Preserv. Codes: a=None b=0.5% HNO3



## Data Verification & Validation Report

### Lansing Board of Water & Light – Erickson Power Station

**Sampling Event (dates and purpose):** New Wells 7B, 7C, 12B Background Round 7 – October 2022

Data Package Number: S41124.01

Lab Report Date: 12/13/2022

Data Validator: Aryka Thomson

Data Validation Completion Date: 12/24/2022

General Overall Assessment:

Data are usable without qualification.

Data are usable with qualification (as noted below).

Some or all data are unusable (as noted below).

Wells planned for sampling:

Well ID	Planned for Sampling
MW-1	
MW-2	
MW-3	
MW-4	
MW-5	
MW-6	
MW-7	
MW-7B	X
MW-7C	X
MW-8	
MW-9	
MW-10	
MW-11	
MW-11B	
MW-12	
MW-12B	X
MW-13	

### Data Summary

Sample ID	Matrix	Lab ID	Date Collected	App III Metals	App IV Metals	Part 115 Metals	Anions	TDS TSS	Rad-226 Rad-228	Diss. Metals
MW-7B	GW	S41124.01	10/06/2022	X	X	X	X	X	X	
MW-7C	GW	S41124.02	10/06/2022	X	X	X	X	X	X	
MW-12B	GW	S41124.03	10/06/2022	X	X	X	X	X	X	
MW-12B Dup	QC	S41124.04	10/06/2022	X	X	X	X	X	X	

Other analytes requested for analysis: Na, Mg, K, HCO<sub>3</sub>, CO<sub>3</sub>, hardness

Any planned sampling or analysis NOT completed? If yes, explain: \_\_\_\_\_

### Data Verification & Validation Checklist

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
<b>Field Data</b>							
Sample Collection Field Forms	X		Purging performed as required in the Groundwater Monitoring Plan	X			
Field Calibration Records	X		Field instruments calibrated daily according to manufacturer specifications	X			
Chain of Custody	X		Accurately reflect samples, collection dates/times, analyses, bottles, etc.	X			
Field decontamination documentation	N/A		Record of decontamination for non-dedicated sampling equipment			X	
Drilling logs	X		N/A	-	-	-	
Well construction logs	X		N/A	-	-	-	
Well development field forms	X		N/A	-	-	-	
<b>Analytical Data Package</b>							
Cover Sheet	X		N/A	-	-	-	
Case Narrative	X		Summarizes sample receipt and any exceptions to QC acceptance criteria	X			
Internal Laboratory Chain of Custody forms	X		Analyses as requested; accurate transcription of field COC	X			
Sample Chronology and Consistency	X		Accurate representation of dates, times of receipt, preparation, and analysis	X			
Communication Records with Lab	X		N/A	-	-	-	
EDD Format Consistency	X		EDD format and content as requested	X			
Sample Identification, Results Nomenclature, and Data Qualifier Consistency	X		All included in final report	X			
Method Detection Limit Consistency	X		MDLs consistent between samples		X		Dilution varies between samples
Instrument Calibration Records	X		Present and no nonconformance noted	X			
Laboratory Report Complete	X		Includes QC component	X			
Holding Times	X		Analyses performed within allowed holding time	X			

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Method	X		Method as requested	X			
Reporting Limits	X		RLs as requested	X			RLs for TDS were not met
			MDLs<RLs		X		RL=MDL for carbonate
			MDLs<GPS			X	
<b>QC Validation</b>							
<b>Evaluate Accuracy</b>							
Matrix Spike (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Laboratory Control Sample (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
<b>Evaluate Precision</b>							
Matrix Spike Duplicate (RPD)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Field Duplicate (RPD)	X		RPD ≤ 20%		X		Radium-226+228 RPD is 35%
<b>Evaluate Representativeness</b>							
Equipment Blanks (if applicable)	N/A		Non-detect (<RL)			X	
<b>QC Verification</b>							
<b>Verify Instrument Calibration &amp; Analytical Process</b>							
Initial Calibration Verification	X		Laboratory-determined	-	-	-	
Continuing Calibration Verification	X		Laboratory-determined	-	-	-	
Initial Calibration Blank	X		Laboratory-determined	-	-	-	
Continuing Calibration Blank	X		Laboratory-determined	-	-	-	
Serial Dilutions	X		Laboratory-determined	-	-	-	High recovery for Ba, Ca, Fe, Li, and Mn
Post-Digestion Spikes	X		Laboratory-determined	-	-	-	
Internal Standards	X		Laboratory-determined	-	-	-	
Laboratory Duplicate (RPD)	X		Laboratory-determined	-	-	-	
Method Blanks	X		Laboratory-determined	-	-	-	
<b>Evaluate Completeness (# usable measurements/ # unusable measurements)</b>							
Completeness	X		100%	X			

Other instances of nonconformance to QC control limits noted on case narrative: None.

Comments:

Combined Radium-226+228 field duplicate RPD is 35%. Combined Radium and Rad-228 required qualification as estimated with low bias (J-) in the parent sample MW-12B and as estimated with high bias (J+) in the field duplicate MW-12B-Dup. Rad-226 required qualification as estimated with low bias (J-) in the parent sample and as estimated with high bias (J+) in the field duplicate.

TSS for MW-12B was reported at values between the MDL and RL. This result has been qualified as not detected above the RL (U).



Lansing Board of Water and Light  
Environmental Services Laboratory (MI00079)  
1232 Haco Dr.  
Lansing, Michigan 48901

30 November 2022

BWL - Erickson Station  
Attn: Cheryl Louden  
3725 S. Canal  
Lansing, MI 48917

**Project: Erickson AM MI**

Dear Cheryl Louden,

Enclosed is a copy of the laboratory report for the following work order(s) received by Lansing Board of Water and Light Environmental Services Laboratory:

**Work Order**  
L210212

**Received**  
10/20/2022 12:50:00PM

**Account Number**  
30926 10021

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in blue ink that reads "Jennifer Caporale".

Jennifer Caporale, Supervisor



Report ID: S41627.01(02)  
Generated on 11/23/2022  
Replaces report S41627.01(01) generated on 10/24/2022

Report to  
Attention: Jennifer Caporale  
Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901  
  
Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

Report produced by  
Merit Laboratories, Inc.  
2680 East Lansing Drive  
East Lansing, MI 48823  
  
Phone: (517) 332-0167 FAX: (517) 332-6333  
  
Contacts for report questions:  
John Lavery (johnlavery@meritlabs.com)  
Barbara Ball (bball@meritlabs.com)

Report Summary  
Lab Sample ID(s): S41627.01-S41627.03  
Project: Erickson AM MI New Wells 11B  
Collected Date(s): 10/20/2022  
Submitted Date/Time: 10/20/2022 13:22  
Sampled by: Marc Wahrer  
P.O. #:

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Maya Murshak  
Technical Director



## General Report Notes

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Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile, and 2-chloroethylvinyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (\*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

## Report Narrative

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All analyses completed





Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Alaska CSLAP	#17-001
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



## Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1 (1993)
SM2320B	Standard Method 2320 B 2011
SM2340C	Standard Method 2340 C 2011
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007



### Sample Summary (3 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S41627.01	MW-11B L210212-01	Groundwater	10/20/22 10:25
S41627.02	Field Dupe MW-11B L210212-02	Groundwater	10/20/22 10:25
S41627.03	Field Blank L210212-03	Water	10/20/22 09:18

**Lab Sample ID: S41627.01**

Sample Tag: MW-11B L210212-01

Collected Date/Time: 10/20/2022 10:25

Matrix: Groundwater

COC Reference:

**Sample Containers**

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.0	IR
2	1L Plastic	None	Yes	2.0	IR
1	125ml Plastic	HNO3	Yes	2.0	IR

**Extraction / Prep.**

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	10/24/22 12:17	CTV	
Metal Digestion	Completed	SW3015A	10/24/22 11:35	JRH	

**Inorganics****Method: E300.0, Run Date: 10/21/22 07:39, Analyst: JDP**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

**Method: SM2320B, Run Date: 10/21/22 15:06, Analyst: JKB**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	360	10	0.504	mg/L	1	71-52-3	

**Method: SM2320B, Run Date: 10/20/22 15:06, Analyst: JKB**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

**Method: SM2340C, Run Date: 10/20/22 16:23, Analyst: JKB**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	261	10	2.38	mg/L	10		

**Method: SM2540C, Run Date: 10/21/22 17:30, Analyst: SSM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	304	50	10	mg/L	2		

**Method: SM2540D, Run Date: 10/20/22 21:00, Analyst: SSM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	4	3	1	mg/L	1		

**Metals****Method: E200.8, Run Date: 10/24/22 12:43, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.0026	mg/L	5	7440-36-0	
Arsenic	0.008	0.002	0.00026	mg/L	5	7440-38-2	
Barium	0.066	0.005	0.00016	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.00022	mg/L	5	7440-41-7	
Boron	0.72	0.04	0.0018	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.00019	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.000097	mg/L	5	7440-47-3	



# Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S41627.01 (continued)

Sample Tag: MW-11B L210212-01

**Method: E200.8, Run Date: 10/24/22 12:43, Analyst: JRH (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.00011	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.00038	mg/L	5	7440-50-8	
Iron	1.82	0.02	0.0019	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.00019	mg/L	5	7439-92-1	
Lithium*	0.026	0.005	0.0016	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.00022	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.00025	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.0021	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.000068	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.000086	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.00014	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.00073	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 10/24/22 14:59, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	60.3	0.50	0.044	mg/L	5	7440-70-2	
Magnesium	21.3	0.50	0.012	mg/L	5	7439-95-4	
Potassium	5.81	0.50	0.023	mg/L	5	7440-09-7	
Sodium	14.5	0.50	0.0085	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 10/24/22 13:44, Analyst: CTV**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 11/23/22 11:20, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Lab Sample ID: S41627.02

Sample Tag: Field Dupe MW-11B L210212-02

Collected Date/Time: 10/20/2022 10:25

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.0	IR
2	1L Plastic	None	Yes	2.0	IR
1	125ml Plastic	HNO3	Yes	2.0	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	10/24/22 12:17	CTV	
Metal Digestion	Completed	SW3015A	10/24/22 11:35	JRH	

Inorganics

Method: E300.0, Run Date: 10/21/22 07:51, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 10/21/22 15:14, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	360	10	0.504	mg/L	1	71-52-3	

Method: SM2320B, Run Date: 10/20/22 15:14, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 10/20/22 16:31, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	260	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 10/21/22 17:30, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	314	50	10	mg/L	2		

Method: SM2540D, Run Date: 10/20/22 21:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	3	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 10/24/22 12:46, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.0026	mg/L	5	7440-36-0	
Arsenic	0.008	0.002	0.00026	mg/L	5	7440-38-2	
Barium	0.066	0.005	0.00016	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.00022	mg/L	5	7440-41-7	
Boron	0.71	0.04	0.0018	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.00019	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.000097	mg/L	5	7440-47-3	



# Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S41627.02 (continued)  
Sample Tag: Field Dupe MW-11B L210212-02

**Method: E200.8, Run Date: 10/24/22 12:46, Analyst: JRH (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.00011	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.00038	mg/L	5	7440-50-8	
Iron	1.83	0.02	0.0019	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.00019	mg/L	5	7439-92-1	
Lithium*	0.025	0.005	0.0016	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.00022	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.00025	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.0021	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.000068	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.000086	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.00014	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.00073	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 10/24/22 15:01, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	59.9	0.50	0.044	mg/L	5	7440-70-2	
Magnesium	21.2	0.50	0.012	mg/L	5	7439-95-4	
Potassium	5.82	0.50	0.023	mg/L	5	7440-09-7	
Sodium	14.3	0.50	0.0085	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 10/24/22 13:47, Analyst: CTV**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 11/23/22 11:20, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S41627.03

Sample Tag: Field Blank L210212-03

Collected Date/Time: 10/20/2022 09:18

Matrix: Water

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.0	IR
2	1L Plastic	None	Yes	2.0	IR
1	125ml Plastic	HNO3	Yes	2.0	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	10/24/22 12:17	CTV	
Metal Digestion	Completed	SW3015A	10/24/22 11:35	JRH	

### Inorganics

Method: E300.0, Run Date: 10/21/22 08:04, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	2.5	0.04	mg/L	2.5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.06	mg/L	2.5	16984-48-8	
Sulfate	Not detected	2.5	0.15	mg/L	2.5	14808-79-8	

Method: SM2320B, Run Date: 10/21/22 15:16, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	Not detected	10	0.504	mg/L	1	71-52-3	

Method: SM2320B, Run Date: 10/20/22 15:16, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 10/20/22 16:33, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	Not detected	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 10/21/22 17:30, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	Not detected	50	10	mg/L	2		

Method: SM2540D, Run Date: 10/20/22 21:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 10/24/22 12:38, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.0010	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.00010	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.000065	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.000086	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.00070	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.000076	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.000039	mg/L	2	7440-47-3	





# Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S41627.03 (continued)

Sample Tag: Field Blank L210212-03

**Method: E200.8, Run Date: 10/24/22 12:38, Analyst: JRH (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.000043	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.00015	mg/L	2	7440-50-8	
Iron	Not detected	0.02	0.00077	mg/L	2	7439-89-6	
Lead	Not detected	0.003	0.000076	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.00065	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.000087	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.00010	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.00084	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.000027	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.000034	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.000056	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.00029	mg/L	2	7440-66-6	

**Method: E200.8, Run Date: 10/24/22 14:54, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.017	mg/L	2	7440-70-2	
Magnesium	Not detected	0.50	0.0048	mg/L	2	7439-95-4	
Potassium	Not detected	0.50	0.0092	mg/L	2	7440-09-7	
Sodium	Not detected	0.50	0.0034	mg/L	2	7440-23-5	

**Method: E245.1, Run Date: 10/24/22 13:51, Analyst: CTV**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 11/23/22 11:20, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

# Merit Laboratories Login Checklist

Lab Set ID:S41627

Client:BWL01 (Board of Water & Light)

Project: Erickson AM MI New Wells 11B

Submitted: 10/20/2022 13:22 Login User: MMC

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental\_Laboratory@LBWL.com

Selection	Description	Note
<b>Sample Receiving</b>		
01.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples are received at 4C +/- 2C Thermometer # IR 2.0
02.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Received on ice/ cooling process begun
03.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples shipped
04.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples left in 24 hr. drop box
05.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Are there custody seals/tape or is the drop box locked
<b>Chain of Custody</b>		
06.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC adequately filled out
07.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC signed and relinquished to the lab
08.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sample tag on bottles match COC
09.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Subcontracting needed? Subcontracted to: GEL
<b>Preservation</b>		
10.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Do sample have correct chemical preservation
11.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Completed pH checks on preserved samples? (no VOAs)
12.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Did any samples need to be preserved in the lab?
<b>Bottle Conditions</b>		
13.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	All bottles intact
14.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Appropriate analytical bottles are used
15.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Merit bottles used
16.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sufficient sample volume received
17.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples require laboratory filtration
18.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples submitted within holding time
19.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Do water VOC or TOX bottles contain headspace

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: \_\_\_\_\_ Date: \_\_\_\_\_

# Merit Laboratories Bottle Preservation Check

Lab Set ID: S41627 Submitted: 10/20/2022 13:22

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI New Wells 11B

Initial Preservation Check: 10/20/2022 13:51 MMC

Preservation Recheck (E200.8): N/A

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental\_Laboratory@LBWL.com

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S41627.01	125ml Plastic HNO3	<2			
S41627.01	1L Plastic HNO3	<2			
S41627.01	1L Plastic HNO3	<2			
S41627.02	125ml Plastic HNO3	<2			
S41627.02	1L Plastic HNO3	<2			
S41627.02	1L Plastic HNO3	<2			
S41627.03	125ml Plastic HNO3	<2			
S41627.03	1L Plastic HNO3	<2			
S41627.03	1L Plastic HNO3	<2			



2680 East Lansing Dr., East Lansing, MI 48823  
 Phone (517) 332-0167 Fax (517) 332-4034  
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

**REPORT TO**

**CHAIN OF CUSTODY RECORD**

**INVOICE TO**

CONTACT NAME **Jennifer Caporale**  
 COMPANY **Lansing Board of Water and Light**  
 ADDRESS **PO Box 13007 48901-3007**  
 CITY **Lansing** STATE **Mi** ZIP CODE **48901**  
 PHONE NO. **517-702-6372** FAX NO. P.O. NO.  
 E-MAIL ADDRESS **Environmental\_Laboratory@lbwl.com** QUOTE NO.

CONTACT NAME **Kelly Gleason**  SAME  
 COMPANY  
 ADDRESS  
 CITY STATE ZIP CODE  
 PHONE NO. E-MAIL ADDRESS **Kelly.Gleason@lbwl.com**

**ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)**

PROJECT NO./NAME **Erickson AM MI Wells 11B** SAMPLER(S) - PLEASE PRINT/SIGN NAME **Marc Wahrer**  
 TURNAROUND TIME REQUIRED  1 DAY  2 DAYS  3 DAYS  STANDARD  OTHER **ASAP**  
 DELIVERABLES REQUIRED  STD  LEVEL II  LEVEL III  LEVEL IV  EDD  OTHER

MATRIX GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID  
 CODE: SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIPE A=AIR W=WASTE

# Containers & Preservatives

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	# Containers & Preservatives							Total Metals	F- undistilled, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	HCO3, CO3, Hardness	Certifications	Project Locations	Special Instructions
	DATE	TIME				NONE	HCl	HNO3	H2SO4	NaOH	MeOH	OTHER									
41627.01	10/20/22	1025	MW-11B L210212-01	GW	5	2	3											<input type="checkbox"/> OHIO VAP <input type="checkbox"/> Drinking Water	<input type="checkbox"/> Detroit <input type="checkbox"/> New York	Metals to analyse: Na, Mg, K	
.02	10/20/22	1025	Field Dupe MW- 11B L210212-02	GW	5	2	3											<input type="checkbox"/> DoD <input checked="" type="checkbox"/> NPDES		B, Ca, Sb, As, Ba, Be, Cd, Cr,	
.03	10/20/22	918	Field Blank L210212-03	DI	5	2	3											<input type="checkbox"/> Other		Co, Li, Hg, Mo, Pb, Se, Tl,	
																				Fe, Cu, Ni, Ag, V, Zn	
																				Please send a preliminary report	

RELINQUISHED BY: *[Signature]* \*Sampler DATE **10-20-22** TIME **1322**  
 RECEIVED BY: *[Signature]* DATE **10/20/22** TIME **1322**  
 SIGNATURE/ORGANIZATION

RELINQUISHED BY: DATE TIME  
 RECEIVED BY: DATE TIME  
 SIGNATURE/ORGANIZATION

SEAL NO. SEAL INTACT YES  NO  INITIALS  
 SEAL NO. SEAL INTACT YES  NO  INITIALS

NOTES: TEMP. ON ARRIVAL **2,0**

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

## Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.150
Be, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	10
Cr, total	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
F	Fluoride	250 mL plastic	mg/L	None	9056	28 d	1.0
Fe, total	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Pb, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Li, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Hg, total	Mercury	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Mo, total	Molybdenum	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
RA226/228	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	HNO3	SM 7500	6 mos	2.0 combined
Se, total	Selenium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ag, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
SO4	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	10
Tl, total	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
TDS	Total Dissolved Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TSS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540D	NA	3
V, total	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Zn, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005



November 22, 2022

John Laverty  
Merit Laboratories Inc.  
2680 East Lansing Drive  
East Lansing, Michigan 48823

Re: Routine Analysis  
Work Order: 598978  
SDG: S41627

Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on October 26, 2022. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at [www.gel.com](http://www.gel.com).

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,

Jordan Melton for  
Delaney Stone  
Project Manager

Purchase Order: GELP20-0018  
Enclosures



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# Case Narrative



**Receipt Narrative  
for  
Merit Laboratories, Inc.  
SDG: S41627  
Work Order: 598978**

**November 22, 2022**

**Laboratory Identification:**

GEL Laboratories LLC  
2040 Savage Road  
Charleston, South Carolina 29407  
(843) 556-8171

**Summary:**

**Sample receipt:** The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on October 26, 2022 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

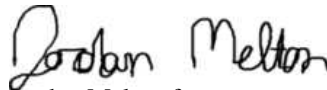
**Sample Identification:** The laboratory received the following samples:

<b><u>Laboratory ID</u></b>	<b><u>Client ID</u></b>
598978001	S41627.01
598978002	S41627.02 Field Dupe
598978003	S41627.03 Field Blank

**Case Narrative:**

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.



Jordan Melton for  
Delaney Stone  
Project Manager

# **Chain of Custody and Supporting Documentation**

\* Correct Chain\*

598978

2680 East Lansing Dr., East Lansing, MI 48823  
 Phone (517) 332-0167 Fax (517) 332-4034  
 www.meritlabs.com



C.O.C. PAGE # 1 OF 1

**REPORT TO** CONTACT NAME: Project Management Team  
 COMPANY: Merit Laboratories  
 ADDRESS: 2680 East Lansing Drive  
 CITY: East Lansing STATE: MI ZIP CODE: 48823  
 PHONE NO.: 517-332-0167 FAX NO.:  
 E-MAIL ADDRESS: results@meritlabs.com

**CHAIN OF CUSTODY RECORD** CONTACT NAME: Julie Teague  
 COMPANY: Merit Laboratories  
 ADDRESS: 2680 East Lansing Drive  
 CITY: East Lansing STATE: MI ZIP CODE: 48823  
 PHONE NO.: 517-332-0167 E-MAIL ADDRESS: juliet@meritlabs.com

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

MATRIX CODE	YEAR	DATE	TIME	IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	OTHER	# Containers & Preservatives	Certifications	Project Locations	Special Instructions
GW=GROUNDWATER SU=SLUDGE	10/20/22	0951	S41627.01		GW	2			<input type="checkbox"/> PHIC VAP <input type="checkbox"/> DoD	<input type="checkbox"/> Drinking Water <input type="checkbox"/> NPDES	* E903.1 Mod.
	10/20/22	0951	S41627.02	Field Dupe	GW	2			<input type="checkbox"/> Detroit <input type="checkbox"/> Other	<input type="checkbox"/> New York	** E904.0/SW 9320 Mod.
	10/20/22	0845	S41627.03	Field Blank	GW	2					Please use calculation product & provide Radium 226/228 combined results on the report

**INVOICE TO**

RELINQUISHED BY: [Signature] DATE: 10/24/22 TIME: 1700  
 RECEIVED BY: [Signature] DATE: 10/24/22 TIME: 1700  
 SEAL NO. [Signature] SEAL INTACT YES [ ] NO [ ]  
 INITIALS [Signature] INITIALS [Signature]  
 NOTES: 10/24/22 1200  
 TEMP ON ARRIVAL: [ ]

RELINQUISHED BY: [Signature] DATE: 10/24/22 TIME: 1700  
 RECEIVED BY: [Signature] DATE: 10/24/22 TIME: 1700  
 SEAL NO. [Signature] SEAL INTACT YES [ ] NO [ ]  
 INITIALS [Signature] INITIALS [Signature]

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

**SAMPLE RECEIPT & REVIEW FORM**

Client: **MERI** SDG/AR/COC/Work Order: **598978**

Received By: **StacyBoone**

Date Received: **NOV 1, 2022**

Carrier and Tracking Number

Circle Applicable:  
 FedEx Express    FedEx Ground    UPS    Field Services    Courier    Other

**1Z 466 477 03 6284 0276**

Suspected Hazard Information	Yes	No	*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.
A) Shipped as a DOT Hazardous?		<input checked="" type="checkbox"/>	Hazard Class Shipped: _____ UN#: _____ If UN2910, Is the Radioactive Shipment Survey Compliant? Yes ___ No ___
B) Did the client designate the samples are to be received as radioactive?		<input checked="" type="checkbox"/>	COC notation or radioactive stickers on containers equal client designation.
C) Did the RSO classify the samples as radioactive?		<input checked="" type="checkbox"/>	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): <u>  8  </u> CPM / mR/Hr Classified as: Rad 1    Rad 2    Rad 3
D) Did the client designate samples are hazardous?		<input checked="" type="checkbox"/>	COC notation or hazard labels on containers equal client designation.
E) Did the RSO identify possible hazards?		<input checked="" type="checkbox"/>	If D or E is yes, select Hazards below. PCB's    Flammable    Foreign Soil    RCRA    Asbestos    Beryllium    Other: _____

Sample Receipt Criteria	Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1 Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>			Circle Applicable: Seals broken    Damaged container    Leaking container    Other (describe)
2 Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>			Circle Applicable: Client contacted and provided COC    COC created upon receipt
3 Samples requiring cold preservation within (0 ≤ 6 deg. C)?*	<input checked="" type="checkbox"/>			Preservation Method: Wet Ice    Ice Packs    Dry ice    None    Other: _____ *all temperatures are recorded in Celsius    TEMP: <u>21°C</u>
4 Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>			Temperature Device Serial #: <u>JR4-22</u> Secondary Temperature Device Serial # (If Applicable): _____
5 Sample containers intact and sealed?	<input checked="" type="checkbox"/>			Circle Applicable: Seals broken    Damaged container    Leaking container    Other (describe)
6 Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>			Sample ID's and Containers Affected: _____ If Preservation added, Lot#: _____
7 Do any samples require Volatile Analysis?	<input checked="" type="checkbox"/>			If Yes, are Encores or Soil Kits present for solids? Yes ___ No ___ NA ___ (If yes, take to VOA Freezer)
				Do liquid VOA vials contain acid preservation? Yes ___ No ___ NA ___ (If unknown, select No)
8 Samples received within holding time?	<input checked="" type="checkbox"/>			Are liquid VOA vials free of headspace? Yes ___ No ___ NA ___
				Sample ID's and containers affected: _____
9 Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>			ID's and tests affected: _____
				ID's and containers affected: _____
10 Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>			Circle Applicable: No dates on containers    No times on containers    COC missing info    Other (describe)
11 Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>			Circle Applicable: No container count on COC    Other (describe)
12 Are sample containers identifiable as GEL provided by use of GEL labels?	<input checked="" type="checkbox"/>			
13 COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>			Circle Applicable: Not relinquished    Other (describe)

Comments (Use Continuation Form if needed):

# **Laboratory Certifications**

**List of current GEL Certifications as of 22 November 2022**

<b>State</b>	<b>Certification</b>
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122023-3
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2022-160
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122022-37
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

# **Radiological Analysis**

# Case Narrative



**Radiochemistry  
Technical Case Narrative  
Merit Laboratories, Inc.  
SDG #: S41627  
Work Order #: 598978**

**Product: Radium-226+Radium-228 Calculation**

**Analytical Method:** Calculation

**Analytical Procedure:** GL-RAD-D-003 REV# 45

**Analytical Batch:** 2338825

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
598978001	S41627.01
598978002	S41627.02 Field Dupe
598978003	S41627.03 Field Blank

**Data Summary:**

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

**Product: GFPC Ra228, Liquid**

**Analytical Method:** EPA 904.0/SW846 9320 Modified

**Analytical Procedure:** GL-RAD-A-063 REV# 5

**Analytical Batch:** 2338824

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
598978001	S41627.01
598978002	S41627.02 Field Dupe
598978003	S41627.03 Field Blank
1205237469	Method Blank (MB)
1205237470	598125001(NonSDG) Sample Duplicate (DUP)
1205237471	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

**Quality Control (QC) Information**

**RDL Met**

The blank (See Below) did not meet the detection limit due to keeping the blank volume consistent with the other sample aliquots.

Sample	Analyte	Value
1205237469 (MB)	Radium-228	Result 1.64 < MDA 3.16 > RDL 3 pCi/L

**Technical Information****Recounts**

Sample 1205237469 (MB) was recounted due to a suspected blank false positive. The recount is reported.

**Product: Lucas Cell, Ra226, Liquid**

**Analytical Method:** EPA 903.1 Modified

**Analytical Procedure:** GL-RAD-A-008 REV# 15

**Analytical Batch:** 2338812

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
598978001	S41627.01
598978002	S41627.02 Field Dupe
598978003	S41627.03 Field Blank
1205237443	Method Blank (MB)
1205237444	598125001(NonSDG) Sample Duplicate (DUP)
1205237445	598125001(NonSDG) Matrix Spike (MS)
1205237446	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

**Miscellaneous Information****Additional Comments**

The matrix spike, 1205237445 (Non SDG 598125001MS), aliquot was reduced to conserve sample volume.

**Certification Statement**

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S41627 GEL Work Order: 598978

### The Qualifiers in this report are defined as follows:

- \* A quality control analyte recovery is outside of specified acceptance criteria
- \*\* Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

### Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature:



Name: Theresa Austin

Date: 23 NOV 2022

Title: Group Leader

# Sample Data Summary

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: November 23, 2022

Company : Merit Laboratories Inc.  
Address : 2680 East Lansing Drive  
  
East Lansing, Michigan 48823  
Contact: John Lavery  
Project: Routine Analysis

Client Sample ID: S41627.01      Project: MERI00120  
Sample ID: 598978001      Client ID: MERI001  
Matrix: Ground Water  
Collect Date: 20-OCT-22 09:51  
Receive Date: 26-OCT-22  
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	1.33	+/-1.13	1.82	3.00	pCi/L		JE1	11/16/22	0908	2338824		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		1.96	+/-1.17			pCi/L		1 LXP1	11/23/22	1120	2338825		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.633	+/-0.318	0.371	1.00	pCi/L		LXP1	11/23/22	0928	2338812		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			80.4	(15%-125%)

### Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor      Lc/LC: Critical Level  
DL: Detection Limit      PF: Prep Factor  
MDA: Minimum Detectable Activity      RL: Reporting Limit  
MDC: Minimum Detectable Concentration      SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: November 23, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

Client Sample ID: S41627.02 Field Dupe	Project: MERI00120
Sample ID: 598978002	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 20-OCT-22 09:51	
Receive Date: 26-OCT-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228		2.60	+/-1.22	1.73	3.00	pCi/L		JE1	11/16/22	0907	2338824	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		3.13	+/-1.25			pCi/L		1 LXP1	11/23/22	1120	2338825	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.527	+/-0.282	0.341	1.00	pCi/L		LXP1	11/23/22	0928	2338812	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			81.6	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: November 23, 2022

Company : Merit Laboratories Inc.  
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery  
Project: Routine Analysis

Client Sample ID: S41627.03 Field Blank      Project: MERI00120  
Sample ID: 598978003      Client ID: MERI001  
Matrix: Ground Water  
Collect Date: 20-OCT-22 08:45  
Receive Date: 26-OCT-22  
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	1.03	+/-1.05	1.74	3.00	pCi/L		JE1	11/16/22	0907	2338824		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		1.35	+/-1.08			pCi/L		1 LXP1	11/23/22	1120	2338825		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.327	+/-0.240	0.314	1.00	pCi/L		LXP1	11/23/22	1000	2338812		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			74.6	(15%-125%)

### Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor      Lc/LC: Critical Level  
DL: Detection Limit      PF: Prep Factor  
MDA: Minimum Detectable Activity      RL: Reporting Limit  
MDC: Minimum Detectable Concentration      SQL: Sample Quantitation Limit

# **Quality Control Summary**



# GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

## QC Summary

Report Date: November 23, 2022

Page 1 of 2

**Merit Laboratories Inc.**  
**2680 East Lansing Drive**  
**East Lansing, Michigan**

**Contact: John Laverty**

**Workorder: 598978**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Rad Gas Flow</b>											
Batch	2338824										
QC1205237470	598125001	DUP									
Radium-228	U	1.25	U	0.672	pCi/L	N/A		N/A	JE1	11/16/22	09:09
	Uncertainty	+/-1.10		+/-1.11							
QC1205237471	LCS										
Radium-228	65.5			66.4	pCi/L		101	(75%-125%)		11/16/22	09:09
	Uncertainty			+/-4.27							
QC1205237469	MB										
Radium-228			U	1.64	pCi/L					11/16/22	11:02
	Uncertainty			+/-1.88							
<b>Rad Ra-226</b>											
Batch	2338812										
QC1205237444	598125001	DUP									
Radium-226		0.870		1.32	pCi/L	41.1		(0% - 100%)	LXP1	11/23/22	10:00
	Uncertainty	+/-0.355		+/-0.448							
QC1205237446	LCS										
Radium-226	26.5			24.5	pCi/L		92.5	(75%-125%)		11/23/22	10:00
	Uncertainty			+/-1.63							
QC1205237443	MB										
Radium-226			U	0.111	pCi/L					11/23/22	10:00
	Uncertainty			+/-0.203							
QC1205237445	598125001	MS									
Radium-226	132	0.870		114	pCi/L		85.9	(75%-125%)		11/23/22	10:00
	Uncertainty	+/-0.355		+/-8.49							

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- \*\* Analyte is a Tracer compound
- < Result is less than value reported
- > Result is greater than value reported
- BD Results are either below the MDC or tracer recovery is low
- FA Failed analysis.
- H Analytical holding time was exceeded

# GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

## QC Summary

Workorder: 598978

Page 2 of 2

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
J											
J											
K											
L											
M											
M											
N/A											
NI											
ND											
NJ											
Q											
R											
U											
UI											
UJ											
UL											
X											
Y											
^											
h											

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where the duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

\* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

# Gas Flow Raw Data

# Batch 2338824 Check-list

This check-list was completed on 16-NOV-22 by Nat Long

This batch was reviewed by Nat Long on 16-NOV-22 and Rhonda Birch on 16-NOV-22.

**Batch ID:**  
2338824

**Product:**  
GFC28RAL

**Description:** Gas Flow Radium 228  
GL-RAD-A-063

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
11	Has the method required detection limit been met?		No	
<b>Miscellaneous Information</b>				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

# Prep Logbook

## Radium-228 in Liquid

**Batch ID:** 2338824

**Analyst:** Jacqueline Emond (JE1)

**Method:** EPA 904.0/SW846 9320 Modified

**Lab SOP:** GL-RAD-A-063 REV# 5

**Instrument:** ASP-33005595

**Due Dates for Lab:** 20-NOV-2022

**Package:** 22-NOV-2022

**SDG:** 22-NOV-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205237471	228 DW spike	1952-B	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	598125001	11-NOV-2022	3	301.3	301.3	11/12/22 13:58	11/16/22 07:05
2	598125002	11-NOV-2022	3	300.8	300.8	11/12/22 13:58	11/16/22 07:05
3	598125003	11-NOV-2022	3	302.3	302.3	11/12/22 13:58	11/16/22 07:05
4	598125004	11-NOV-2022	3	300.9	300.9	11/12/22 13:58	11/16/22 07:05
5	598125005	11-NOV-2022	3	303.7	303.7	11/12/22 13:58	11/16/22 07:05
6	598125006	11-NOV-2022	3	300.9	300.9	11/12/22 13:58	11/16/22 07:05
7	598125007	11-NOV-2022	3	301.6	301.6	11/12/22 13:58	11/16/22 07:05
8	598125008	11-NOV-2022	3	301.9	301.9	11/12/22 13:58	11/16/22 07:05
9	598125009	11-NOV-2022	3	300.6	300.6	11/12/22 13:58	11/16/22 07:05
10	598125010	11-NOV-2022	3	302.7	302.7	11/12/22 13:58	11/16/22 07:05
11	598125011	11-NOV-2022	3	300.1	300.1	11/12/22 13:58	11/16/22 07:05
12	598125012	11-NOV-2022	3	301.6	301.6	11/12/22 13:58	11/16/22 07:05
13	598125013	11-NOV-2022	3	301.7	301.7	11/12/22 13:58	11/16/22 07:05
14	598125014	11-NOV-2022	3	301.5	301.5	11/12/22 13:58	11/16/22 07:05
15	598978001	11-NOV-2022	3	302.8	302.8	11/12/22 13:58	11/16/22 07:05
16	598978002	11-NOV-2022	3	301.4	301.4	11/12/22 13:58	11/16/22 07:05
17	598978003	11-NOV-2022	3	301	301	11/12/22 13:58	11/16/22 07:05
18	1205237469 MB	11-NOV-2022	3		303.7	11/12/22 13:58	11/16/22 07:05
19	1205237470 DUP (598125001)	11-NOV-2022	3	302	302	11/12/22 13:58	11/16/22 07:05
20	1205237471 LCS	11-NOV-2022	3		303.7	11/12/22 13:58	11/16/22 07:05

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1951-D	Ba-133	.1 mL	Pipet Id: RAD-GFC-1795419 Data Entry Date2: 11-NOV-2022 00:00
REGNT 3418276.6	29M HF (48-50%)	4 mL	
REGNT 3454370.1	Nitric Acid	5 mL	
REGNT 3465466	Barium Carrier Ra228 REG	1 mL	
REGNT 3481329	RGF-1M Citric Acid	5 mL	
REGNT 3485721.6	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	
REGNT 3521298	RGF-Neodymium Substrate	5 mL	
REGNT 3525003	RGF-7M Nitric Acid	25 mL	
REGNT 3527556	2M HCl	20 mL	
REGNT 3528039	RGF-50% Potassium Carbonate	2 mL	
REGNT 3528714	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3529957	RGF-1.5M Ammonium Sulfate	10 mL	
REGNT DGA0039	2339762	2 g	

### Radium-228 Liquid

Filename : RA228.XLS  
 File type : Excel  
 Version # : 1.4.2

Tracer S/N : 1951-D  
 Tracer Exp Date : 6/3/2023  
 Tracer Volume Added: 0.10

Batch : 2338824  
 Analyst : JAC02417  
 Prep Date : 11/11/2022  
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL  
 Parmname : Radium-228  
 Required MDA : 3 pCi/L  
 Ra-228 Abundance : 1.00  
 Halflife of Ra-228 : 5.75 years  
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	598125001.1	0.3013	1.8481E-05	10/19/2022 9:40	1285.7	1.61%	817.5	2.02%	0.1	0.000200
2	598125002.1	0.3008	1.8473E-05	10/19/2022 9:40	1285.7	1.61%	983.9	1.84%	0.1	0.000200
3	598125003.1	0.3023	1.8498E-05	10/19/2022 9:40	1285.7	1.61%	1070.9	1.76%	0.1	0.000200
4	598125004.1	0.3009	1.8474E-05	10/19/2022 9:40	1285.7	1.61%	1014.7	1.81%	0.1	0.000200
5	598125005.1	0.3037	1.8521E-05	10/19/2022 10:40	1285.7	1.61%	916.5	1.91%	0.1	0.000200
6	598125006.1	0.3009	1.8474E-05	10/19/2022 10:40	1285.7	1.61%	1003.7	1.82%	0.1	0.000200
7	598125007.1	0.3016	1.8486E-05	10/19/2022 11:10	1285.7	1.61%	1097.9	1.74%	0.1	0.000200
8	598125008.1	0.3019	1.8491E-05	10/19/2022 11:10	1285.7	1.61%	1024.6	1.80%	0.1	0.000200
9	598125009.1	0.3006	1.8469E-05	10/19/2022 10:50	1285.7	1.61%	1048.7	1.78%	0.1	0.000200
10	598125010.1	0.3027	1.8505E-05	10/19/2022 10:50	1285.7	1.61%	1016.1	1.81%	0.1	0.000200
11	598125011.1	0.3001	1.8461E-05	10/19/2022 11:25	1285.7	1.61%	956.7	1.87%	0.1	0.000200
12	598125012.1	0.3016	1.8486E-05	10/19/2022 11:25	1285.7	1.61%	975.6	1.85%	0.1	0.000200
13	598125013.1	0.3017	1.8488E-05	10/19/2022 12:05	1285.7	1.61%	1003.3	1.82%	0.1	0.000200
14	598125014.1	0.3015	1.8484E-05	10/19/2022 12:05	1285.7	1.61%	872.2	1.95%	0.1	0.000200
15	598978001.1	0.3028	1.8506E-05	10/20/2022 9:51	1285.7	1.61%	1034.0	1.80%	0.1	0.000200
16	598978002.1	0.3014	1.8483E-05	10/20/2022 9:51	1285.7	1.61%	1048.9	1.78%	0.1	0.000200
17	598978003.1	0.3010	1.8476E-05	10/20/2022 8:45	1285.7	1.61%	959.3	1.86%	0.1	0.000200
18	1205237469.1	0.3037	1.8521E-05	11/11/2022 0:00	1285.7	1.61%	945.2	1.88%	0.1	0.000200
19	1205237470.1	0.3020	1.8493E-05	10/19/2022 9:40	1285.7	1.61%	1068.4	1.77%	0.1	0.000200
20	1205237471.1	0.3037	1.8521E-05	11/11/2022 0:00	1285.7	1.61%	980.2	1.84%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063  
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated Sample Recovery %	Sample Recovery Error %
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction		
1	1B	60	10	39	0.650	11/16/2022 9:07	11/12/2022 13:58	11/16/2022 7:05	0.991	0.795	1.000	1.057	63.6%	1.32%
2	1C	60	15	50	0.833	11/16/2022 9:07	11/12/2022 13:58	11/16/2022 7:05	0.991	0.795	1.000	1.057	76.5%	1.25%
3	1D	60	13	47	0.783	11/16/2022 9:07	11/12/2022 13:58	11/16/2022 7:05	0.991	0.795	1.000	1.057	83.3%	1.23%
4	2A	60	20	50	0.833	11/16/2022 9:07	11/12/2022 13:58	11/16/2022 7:05	0.991	0.794	1.000	1.057	78.9%	1.24%
5	2B	60	8	46	0.767	11/16/2022 9:07	11/12/2022 13:58	11/16/2022 7:05	0.991	0.794	1.000	1.057	71.3%	1.28%
6	2C	60	12	79	1.317	11/16/2022 9:07	11/12/2022 13:58	11/16/2022 7:05	0.991	0.794	1.000	1.057	78.1%	1.25%
7	3B	60	13	61	1.017	11/16/2022 9:07	11/12/2022 13:58	11/16/2022 7:05	0.991	0.794	1.000	1.057	85.4%	1.22%
8	6B	60	7	66	1.100	11/16/2022 9:07	11/12/2022 13:58	11/16/2022 7:05	0.991	0.794	1.000	1.057	79.7%	1.24%
9	7A	60	7	76	1.267	11/16/2022 9:08	11/12/2022 13:58	11/16/2022 7:05	0.991	0.794	1.000	1.057	81.6%	1.23%
10	7B	60	10	55	0.917	11/16/2022 9:08	11/12/2022 13:58	11/16/2022 7:05	0.991	0.794	1.000	1.057	79.0%	1.24%
11	7C	60	11	87	1.450	11/16/2022 9:08	11/12/2022 13:58	11/16/2022 7:05	0.991	0.794	1.000	1.057	74.4%	1.27%
12	9C	60	14	82	1.367	11/16/2022 9:08	11/12/2022 13:58	11/16/2022 7:05	0.991	0.793	1.000	1.057	75.9%	1.26%
13	11A	60	13	77	1.283	11/16/2022 9:06	11/12/2022 13:58	11/16/2022 7:05	0.991	0.796	1.000	1.057	78.0%	1.25%
14	11C	60	15	107	1.783	11/16/2022 9:06	11/12/2022 13:58	11/16/2022 7:05	0.991	0.796	1.000	1.057	67.8%	1.30%
15	10A	60	14	72	1.200	11/16/2022 9:08	11/12/2022 13:58	11/16/2022 7:05	0.991	0.793	1.000	1.057	80.4%	1.24%
16	14A	60	19	84	1.400	11/16/2022 9:07	11/12/2022 13:58	11/16/2022 7:05	0.991	0.795	1.000	1.057	81.6%	1.23%
17	14C	60	23	48	0.800	11/16/2022 9:07	11/12/2022 13:58	11/16/2022 7:05	0.991	0.795	1.000	1.057	74.6%	1.26%
18	13D	60	10	109	1.817	11/16/2022 11:02	11/12/2022 13:58	11/16/2022 7:05	0.998	0.641	1.000	1.057	73.5%	1.27%
19	5A	60	11	72	1.200	11/16/2022 9:09	11/12/2022 13:58	11/16/2022 7:05	0.991	0.792	1.000	1.057	83.1%	1.23%
20	5C	60	38	981	16.350	11/16/2022 9:09	11/12/2022 13:58	11/16/2022 7:05	0.998	0.792	1.000	1.057	76.2%	1.25%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2022	5/31/2023	0.6068	0.00711	0.410	11/14/2022 16:12	500
2	PIC	6/1/2022	5/31/2023	0.6190	0.00847	0.546	11/12/2022 10:10	500
3	PIC	6/1/2022	5/31/2023	0.6048	0.00692	0.538	11/14/2022 16:12	500
4	PIC	6/1/2022	5/31/2023	0.6201	0.01914	0.340	11/14/2022 16:12	500
5	PIC	6/1/2022	5/31/2023	0.6097	0.02111	0.482	11/14/2022 16:12	500
6	PIC	6/1/2022	5/31/2023	0.6022	0.01274	0.982	11/12/2022 10:10	500
7	PIC	6/1/2022	5/31/2023	0.6245	0.01614	0.564	11/12/2022 10:10	500
8	PIC	6/1/2022	5/31/2023	0.6280	0.00851	1.404	11/14/2022 16:13	500
9	PIC	6/1/2022	5/31/2023	0.6257	0.00594	0.430	11/12/2022 10:11	500
10	PIC	6/1/2022	5/31/2023	0.6366	0.00627	0.784	11/12/2022 10:11	500
11	PIC	6/1/2022	5/31/2023	0.6407	0.00790	0.912	11/12/2022 10:11	500
12	PIC	6/1/2022	5/31/2023	0.6184	0.00584	0.838	11/12/2022 10:13	500
13	PIC	6/1/2022	5/31/2023	0.6371	0.01317	0.836	11/12/2022 10:11	500
14	PIC	6/1/2022	5/31/2023	0.6276	0.01278	1.652	11/12/2022 10:12	500
15	PIC	6/1/2022	5/31/2023	0.6384	0.00651	0.860	11/12/2022 10:13	500
16	PIC	6/1/2022	5/31/2023	0.6215	0.02119	0.742	11/14/2022 16:09	500
17	PIC	6/1/2022	5/31/2023	0.6029	0.01828	0.570	11/12/2022 10:12	500
18	PIC	6/1/2022	5/31/2023	0.6348	0.01144	1.504	11/12/2022 10:12	500
19	PIC	6/1/2022	5/31/2023	0.6332	0.00851	1.024	11/12/2022 10:11	500
20	PIC	6/1/2022	5/31/2023	0.6242	0.00657	0.416	11/14/2022 16:12	500



Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A  
 Spike Exp Date : N/A  
 Spike Activity (dpm/ml): N/A  
 Spike Volume Added: N/A

\* - RPD changed to 0% due to sample & dup activity below MDA

LCS S/N : 1952-B  
 LCS Exp Date : 8/9/2023  
 LCS Activity (dpm/ml): 441.93  
 LCS Volume Added: 0.10

Results Pos.	Decision	Critical	Required	Sample Act.		Sample Act.	Net Count	Net Count	2 SIGMA	2 SIGMA	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
	Level pCi/L	Level pCi/L	MDA pCi/L	MDA pCi/L	Conc. pCi/L	Error %	Rate CPM	Rate Error CPM	Counting Uncertainty pCi/L	Total Prop. Uncertainty pCi/L						
1	1.0608	0.7489	3	1.7580	<b>1.2489</b>	45.00%	0.2400	0.1080	1.1011	1.1446		SAMPLE				
2	0.9987	0.7051	3	1.6225	<b>1.2200</b>	42.62%	0.2873	0.1224	1.0186	1.0633		SAMPLE				
3	0.9276	0.6549	3	1.5084	<b>0.9746</b>	48.48%	0.2453	0.1189	0.9256	0.9571		SAMPLE				
4	0.7627	0.5385	3	1.2824	<b>2.0270</b>	24.57%	0.4933	0.1207	0.9720	1.0986		SAMPLE				
5	1.0131	0.7153	3	1.6597	<b>1.3049</b>	41.25%	0.2847	0.1172	1.0532	1.1038		SAMPLE				
6	1.3495	0.9528	3	2.1195	<b>1.4317</b>	46.24%	0.3347	0.1546	1.2965	1.3454		SAMPLE				
7	0.8996	0.6351	3	1.4584	<b>1.7033</b>	29.77%	0.4527	0.1344	0.9915	1.0802		SAMPLE				
8	1.5113	1.0670	3	2.3344	<b>-1.2180</b>	47.85%	-0.3040	0.1454	1.1419	1.1420		SAMPLE				
9	0.8241	0.5818	3	1.3611	<b>3.3031</b>	17.77%	0.8367	0.1482	1.1470	1.4132		SAMPLE				
10	1.1210	0.7914	3	1.7817	<b>0.5276</b>	97.84%	0.1327	0.1298	1.0117	1.0203		SAMPLE				
11	1.2872	0.9088	3	2.0293	<b>2.2780</b>	30.00%	0.5380	0.1612	1.3379	1.4543		SAMPLE				
12	1.2478	0.8809	3	1.9760	<b>2.2637</b>	29.61%	0.5287	0.1564	1.3124	1.4292		SAMPLE				
13	1.1725	0.8278	3	1.8570	<b>1.8020</b>	34.00%	0.4473	0.1519	1.1990	1.2815		SAMPLE				
14	1.9261	1.3598	3	2.9551	<b>0.6182</b>	138.39%	0.1313	0.1817	1.6768	1.6839		SAMPLE				
15	1.1510	0.8126	3	1.8202	<b>1.3256</b>	43.37%	0.3400	0.1474	1.1263	1.1740		SAMPLE				
16	1.0845	0.7656	3	1.7290	<b>2.6023</b>	24.07%	0.6580	0.1575	1.2211	1.3875		SAMPLE				
17	1.0728	0.7574	3	1.7380	<b>1.0267</b>	52.35%	0.2300	0.1203	1.0525	1.0839		SAMPLE				
18	2.0520	1.4487	3	3.1603	<b>1.6434</b>	58.38%	0.3127	0.1824	1.8795	1.9242		MB				
19	1.2304	0.8687	3	1.9283	<b>0.6722</b>	84.38%	0.1760	0.1485	1.1116	1.1242	598125001.1	DUP	* 0.0%			
20	0.8561	0.6044	3	1.4173	<b>66.4374</b>	3.57%	15.9340	0.5228	4.2726	17.1548		LCS			65.5472	101.4%

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
598125001	1B	60	10	39	11/16/2022 9:07	11/16/2022 10:07	PIC	2338824
598125002	1C	60	15	50	11/16/2022 9:07	11/16/2022 10:07	PIC	2338824
598125003	1D	60	13	47	11/16/2022 9:07	11/16/2022 10:07	PIC	2338824
598125004	2A	60	20	50	11/16/2022 9:07	11/16/2022 10:07	PIC	2338824
598125005	2B	60	8	46	11/16/2022 9:07	11/16/2022 10:07	PIC	2338824
598125006	2C	60	12	79	11/16/2022 9:07	11/16/2022 10:07	PIC	2338824
598125007	3B	60	13	61	11/16/2022 9:07	11/16/2022 10:07	PIC	2338824
598125008	6B	60	7	66	11/16/2022 9:07	11/16/2022 10:07	PIC	2338824
598125009	7A	60	7	76	11/16/2022 9:08	11/16/2022 10:08	PIC	2338824
598125010	7B	60	10	55	11/16/2022 9:08	11/16/2022 10:08	PIC	2338824
598125011	7C	60	11	87	11/16/2022 9:08	11/16/2022 10:08	PIC	2338824
598125012	9C	60	14	82	11/16/2022 9:08	11/16/2022 10:08	PIC	2338824
598125013	11A	60	13	77	11/16/2022 9:06	11/16/2022 10:06	PIC	2338824
598125014	11C	60	15	107	11/16/2022 9:06	11/16/2022 10:06	PIC	2338824
598978001	10A	60	14	72	11/16/2022 9:08	11/16/2022 10:08	PIC	2338824
598978002	14A	60	19	84	11/16/2022 9:07	11/16/2022 10:07	PIC	2338824
598978003	14C	60	23	48	11/16/2022 9:07	11/16/2022 10:07	PIC	2338824
1205237469	13D	60	10	109	11/16/2022 11:02	11/16/2022 12:02	PIC	2338824
1205237470	5A	60	11	72	11/16/2022 9:09	11/16/2022 10:09	PIC	2338824
1205237471	5C	60	38	981	11/16/2022 9:09	11/16/2022 10:09	PIC	2338824

ASSAY 16-Nov-22 7:33:32  
 Wizard 2480 s/n 46190630  
 Protocol id 8 Ba-133  
 Time limit  
 Count limit  
 Isotope Ba-133  
 Protocol date 11/16/2022  
 Run id. 5832

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	95	1	180	3857.57	1285.66	1.61	07:33:32
598125001	2	95	2	180	2453	817.46	2.02	63.58	07:36:46
598125002	3	95	3	180	2952.28	983.94	1.84	76.53	07:40:00
598125003	4	95	4	180	3213	1070.87	1.76	83.29	07:43:14
598125004	5	95	5	180	3045	1014.72	1.81	78.93	07:46:29
598125005	1	2	1	180	2750	916.5	1.91	71.29	07:50:04
598125006	2	2	2	180	3011.57	1003.67	1.82	78.07	07:53:18
598125007	3	2	3	180	3294.28	1097.9	1.74	85.40	07:56:32
598125008	4	2	4	180	3074.28	1024.57	1.8	79.69	07:59:46
598125009	5	2	5	180	3146.57	1048.67	1.78	81.57	08:03:00
598125010	1	19	1	180	3049	1016.14	1.81	79.04	08:06:36
598125011	2	19	2	180	2870.57	956.67	1.87	74.41	08:09:50
598125012	3	19	3	180	2927	975.56	1.85	75.88	08:13:04
598125013	4	19	4	180	3010.28	1003.3	1.82	78.04	08:16:18
598125014	5	19	5	180	2617	872.24	1.95	67.84	08:19:32
598978001	1	6	1	180	3102.28	1033.99	1.8	80.42	08:23:20
598978002	2	6	2	180	3147.28	1048.89	1.78	81.58	08:26:34
598978003	3	6	3	180	2878.57	959.34	1.86	74.62	08:29:48
1205237469	4	6	4	180	2836.28	945.22	1.88	73.52	08:33:02
1205237470	5	6	5	180	3205.85	1068.42	1.77	83.10	08:36:16
1205237471	1	15	1	180	2941	980.15	1.84	76.24	08:40:04

END OF ASSAY

# **Continuing Calibration Data**

# Gas Flow Proportional Counter Checks for 16-Nov-2022

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100E2	Above	Beta bkg	16-Nov 05:04	60	2.517	1.385	3.072	+1.02
LB4100E3	Above	Beta bkg	16-Nov 05:04	60	2.117	0.282	3.189	+0.79
LB4100E4	Above	Beta bkg	16-Nov 05:04	60	2.067	0.976	2.268	+2.06
LB4100F2	need 2nd	Alpha eff	16-Nov 06:14	5	6556	6533	7372	-2.84
LB4100F2	Above	Beta bkg	16-Nov 05:04	60	40.017	1.173	1.833	+350.12
LB4100F3	Above	Alpha bkg	16-Nov 05:04	60	0.383	0.119	0.404	+2.57
LB4100F3	Above	Alpha eff	16-Nov 06:14	5	15800	11460	15350	+3.69
LB4100F3	Below	Alpha XTalk	16-Nov 06:14	5	0.323	0.328	0.439	-3.23
LB4100G1	need 2nd	Alpha XTalk	16-Nov 06:05	5	0.259	0.088	0.447	-0.15
LB4100G1	need 2nd	Beta bkg	16-Nov 05:04	60	1.067	0.380	1.675	+0.18
LB4100G2	Above	Beta bkg	16-Nov 05:04	60	2.633	-2.58E+3	2837	-0.14
LB4100G3	Above	Beta bkg	16-Nov 05:04	60	1.933	0.810	1.674	+4.80
LB4100H1	Above	Beta bkg	16-Nov 05:04	60	2.683	0.216	2.462	+3.59
LB4100H4	need 2nd	Alpha bkg	16-Nov 05:04	60	0.067	0.010	0.123	+0.02
LB4100H4	need 2nd	Beta bkg	16-Nov 05:04	60	1.800	0.674	1.825	+2.87
PIC1A	Below	Alpha XTalk	16-Nov 05:16	5	0.202	0.223	0.327	-4.21
PIC1A	Below	Beta eff	16-Nov 05:22	5	19664	19770	21540	-3.36
PIC1A	Above	Beta XTalk	16-Nov 05:22	5	0.058	-1.15E-2	0.019	+10.60
PIC4A	Above	Alpha bkg	16-Nov 05:36	60	2.350	-5.84E-2	0.311	+36.11
PIC4A	Above	Beta bkg	16-Nov 05:36	60	2.000	-1.95E-2	1.504	+4.95
PIC5B	Above	Alpha eff	16-Nov 05:27	5	12476	11250	12470	+3.03
PIC5B	Above	Beta XTalk	16-Nov 05:35	5	0.004	-3.91E-4	0.003	+4.81
PIC8B	Above	Alpha bkg	16-Nov 05:48	60	2.083	-1.16E-1	0.388	+23.22
PIC8B	Above	Beta bkg	16-Nov 05:48	60	3.933	-1.80E-1	2.341	+6.79
PIC8B	Above	Beta XTalk	16-Nov 05:41	5	0.001	2.00E-4	9.31E-4	+6.56
PIC8C	Above	Alpha bkg	16-Nov 09:26	60	0.383	-1.61E-2	0.410	+2.62
PIC8C	Above	Beta bkg	16-Nov 09:26	60	4.017	-2.96E-1	2.115	+7.73
PIC8D	Below	Alpha eff	16-Nov 05:33	5	0.00E+0	15020	17360	-41.51
PIC8D	Above	Alpha XTalk	16-Nov 05:33	5	1.000	0.245	0.295	+87.11
PIC8D	Below	Beta eff	16-Nov 05:41	5	0.589	40460	43520	-82.33

PIC11B	Above	Beta bkg	16-Nov 08:19	60	22.967	-2.97E-1	3.063	+38.54
PIC12A	Above	Beta bkg	16-Nov 05:59	60	8.717	-2.98E-1	2.649	+15.35
PIC12A	Above	Beta XTalk	16-Nov 05:52	5	2.39E-4	5.24E-5	2.34E-4	+3.16
PIC12B	Above	Alpha bkg	16-Nov 05:59	60	3.067	-4.23E-2	0.379	+41.28
PIC12B	Above	Beta bkg	16-Nov 05:59	60	2.850	0.269	2.358	+4.41
PIC12B	Above	Beta XTalk	16-Nov 05:52	5	7.00E-4	2.09E-4	6.96E-4	+3.04
PIC14B	need 2nd	Alpha bkg	16-Nov 06:06	60	0.167	-1.08E-1	0.400	+0.24
PIC14B	Below	Alpha XTalk	16-Nov 05:50	5	0.278	0.279	0.316	-3.18
PIC14B	Above	Beta bkg	16-Nov 06:06	60	5.083	0.370	3.004	+7.74
PIC14B	need 2nd	Beta XTalk	16-Nov 05:58	5	7.83E-4	1.39E-4	8.60E-4	+2.36

**INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS**

The following detectors may not have properly transferred to the LIMS system

LB4100A1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100A2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100A3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by 

Date 11/17/2022

GEL Laboratories LLC

# Runlogs

# Instrument Run Log

Instrument Type: GFPC

Batch ID: 2338824

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
598125013	SAMPLE	JE1	PIC11A	NOV-16-22 09:06:43	DONE	25mm Filter	01-JUN-22 00:00
598125014	SAMPLE	JE1	PIC11C	NOV-16-22 09:06:45	DONE	25mm Filter	01-JUN-22 00:00
598978002	SAMPLE	JE1	PIC14A	NOV-16-22 09:07:01	DONE	25mm Filter	01-JUN-22 00:00
598978003	SAMPLE	JE1	PIC14C	NOV-16-22 09:07:04	DONE	25mm Filter	01-JUN-22 00:00
598125003	SAMPLE	JE1	PIC1D	NOV-16-22 09:07:18	DONE	25mm Filter	01-JUN-22 00:00
598125001	SAMPLE	JE1	PIC1B	NOV-16-22 09:07:21	DONE	25mm Filter	01-JUN-22 00:00
598125002	SAMPLE	JE1	PIC1C	NOV-16-22 09:07:21	DONE	25mm Filter	01-JUN-22 00:00
598125004	SAMPLE	JE1	PIC2A	NOV-16-22 09:07:28	DONE	25mm Filter	01-JUN-22 00:00
598125005	SAMPLE	JE1	PIC2B	NOV-16-22 09:07:28	DONE	25mm Filter	01-JUN-22 00:00
598125006	SAMPLE	JE1	PIC2C	NOV-16-22 09:07:32	DONE	25mm Filter	01-JUN-22 00:00
598125007	SAMPLE	JE1	PIC3B	NOV-16-22 09:07:35	DONE	25mm Filter	01-JUN-22 00:00
598125008	SAMPLE	JE1	PIC6B	NOV-16-22 09:07:42	DONE	25mm Filter	01-JUN-22 00:00
598125009	SAMPLE	JE1	PIC7A	NOV-16-22 09:08:00	DONE	25mm Filter	01-JUN-22 00:00
598125010	SAMPLE	JE1	PIC7B	NOV-16-22 09:08:00	DONE	25mm Filter	01-JUN-22 00:00
598125011	SAMPLE	JE1	PIC7C	NOV-16-22 09:08:05	DONE	25mm Filter	01-JUN-22 00:00
598125012	SAMPLE	JE1	PIC9C	NOV-16-22 09:08:17	DONE	25mm Filter	01-JUN-22 00:00
598978001	SAMPLE	JE1	PIC10A	NOV-16-22 09:08:35	DONE	25mm Filter	01-JUN-22 00:00
1205237470	DUP	JE1	PIC5A	NOV-16-22 09:09:08	DONE	25mm Filter	01-JUN-22 00:00
1205237471	LCS	JE1	PIC5C	NOV-16-22 09:09:11	DONE	25mm Filter	01-JUN-22 00:00
1205237469	MB	JE1	PIC13D	NOV-16-22 11:02:09	DONE	25mm Filter	01-JUN-22 00:00



# Lucas Cell Raw Data

# Batch 2338812 Check-list

This check-list was completed on 23-NOV-22 by Lyndsey Pace

This batch was reviewed by Elizabeth Krouse on 23-NOV-22 and Lyndsey Pace on 23-NOV-22.

**Batch ID:**  
2338812

**Product:**  
LUC26RAL

**Description:** Lucas Cell Radium 226  
GL-RAD-A-008

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous		No	
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
<b>Miscellaneous Information</b>				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

# Prep Logbook

## Radium-226 in Liquid

**Batch ID:** 2338812  
**Analyst:** Lyndsey Pace (LXP1)  
**Method:** EPA 903.1 Modified  
**Lab SOP:** GL-RAD-A-008 REV# 15  
**Instrument:** LUCAS-C202389980

Due Dates for Lab: 20-NOV-2022			Package: 22-NOV-2022	SDG: 22-NOV-2022		
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205237446	Radium-226 SPIKE	1715-G	.1	mL	
MS	1205237445	Radium-226 SPIKE	1715-G	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	598125001	13-NOV-2022	1	504.08	504.08	11/18/22 09:10	107	11/23/22 04:56	11/23/22 08:55	3	31
2	598125002	13-NOV-2022	1	501.31	501.31	11/18/22 09:10	208	11/23/22 04:56	11/23/22 08:55	1	36
3	598125003	13-NOV-2022	1	501.59	501.59	11/18/22 09:10	304	11/23/22 04:56	11/23/22 08:55	7	25
4	598125004	13-NOV-2022	1	503.79	503.79	11/18/22 09:10	406	11/23/22 04:56	11/23/22 08:55	2	40
5	598125005	13-NOV-2022	1	500.16	500.16	11/18/22 09:10	501	11/23/22 04:56	11/23/22 08:55	5	28
6	598125006	13-NOV-2022	1	501.51	501.51	11/18/22 09:10	604	11/23/22 04:56	11/23/22 08:55	3	12
7	598125007	13-NOV-2022	1	504.94	504.94	11/18/22 09:10	703	11/23/22 04:56	11/23/22 08:55	6	23
8	598125008	13-NOV-2022	1	504.92	504.92	11/18/22 09:10	805	11/23/22 04:56	11/23/22 08:55	2	19
9	598125009	13-NOV-2022	1	501.01	501.01	11/18/22 09:10	101	11/23/22 05:26	11/23/22 09:28	5	37
10	598125010	13-NOV-2022	1	501.89	501.89	11/18/22 09:10	201	11/23/22 05:26	11/23/22 09:28	2	36
11	598125011	13-NOV-2022	1	503.83	503.83	11/18/22 09:10	301	11/23/22 05:26	11/23/22 09:28	2	22
12	598125012	13-NOV-2022	1	501.83	501.83	11/18/22 09:10	407	11/23/22 05:26	11/23/22 09:28	7	14
13	598125013	13-NOV-2022	1	502.39	502.39	11/18/22 09:10	508	11/23/22 05:26	11/23/22 09:28	8	21
14	598125014	13-NOV-2022	1	503.03	503.03	11/18/22 09:10	602	11/23/22 05:26	11/23/22 09:28	1	21
15	598978001	13-NOV-2022	1	504.99	504.99	11/18/22 09:10	701	11/23/22 05:26	11/23/22 09:28	4	25
16	598978002	13-NOV-2022	1	502.42	502.42	11/18/22 09:10	804	11/23/22 05:26	11/23/22 09:28	4	23
17	598978003	13-NOV-2022	1	500.17	500.17	11/18/22 09:10	104	11/23/22 05:56	11/23/22 10:00	2	12
18	1205237443 MB	13-NOV-2022	1		504.99	11/18/22 09:10	205	11/23/22 05:56	11/23/22 10:00	5	9
19	1205237444 DUP (598125001)	13-NOV-2022	1	502.52	502.52	11/18/22 09:10	308	11/23/22 05:56	11/23/22 10:00	4	44
20	1205237445 MS (598125001)	13-NOV-2022	1	101.45	101.45	11/18/22 09:10	401	11/23/22 05:56	11/23/22 10:00	5	711
21	1205237446 LCS	13-NOV-2022	1		504.99	11/18/22 09:10	502	11/23/22 05:56	11/23/22 10:00	1	873

Reagent/Solvent Lot ID	Description	Amount	Comments:
			Data Entry Date2: 13-NOV-2022 00:00

### Radium-226 Liquid

Filename : RA226.XLS  
 File type : Excel  
 Version # : 1.3.2

Procedure Code : LUC26RAL  
 Parmname : Radium-226  
 Required MDA : 1 pCi/L  
 Halflife of Ra-226 : 1600 years  
 Ra-226 Abundance : 1.00  
 Halflife of Rn-222 : 3.8235 days

Batch : 2338812  
 Analyst : LIN01615  
 Prep Date : 11/13/2022  
 Ra-226 Method Uncertainty : 0.073648

Batch counted on : LUCAS CELL DETECTOR  
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Count Time (min.)	Cell Efficiency (cpm/dpm)
1	598125001.1	0.5041	2.0272E-05	10/19/2022 9:40	107	30	31	1.033	3	0.100	30	1.6990
2	598125002.1	0.5013	2.0261E-05	10/19/2022 9:40	208	30	36	1.200	1	0.033	30	1.7740
3	598125003.1	0.5016	2.0262E-05	10/19/2022 9:40	304	30	25	0.833	7	0.233	30	1.8850
4	598125004.1	0.5038	2.0271E-05	10/19/2022 9:40	406	30	40	1.333	2	0.067	30	1.5760
5	598125005.1	0.5002	2.0257E-05	10/19/2022 10:40	501	30	28	0.933	5	0.167	30	1.8220
6	598125006.1	0.5015	2.0262E-05	10/19/2022 10:40	604	30	12	0.400	3	0.100	30	1.6810
7	598125007.1	0.5049	2.0276E-05	10/19/2022 11:10	703	30	23	0.767	6	0.200	30	1.6440
8	598125008.1	0.5049	2.0276E-05	10/19/2022 11:10	805	30	19	0.633	2	0.067	30	1.9080
9	598125009.1	0.5010	2.0260E-05	10/19/2022 10:50	101	30	37	1.233	5	0.167	30	1.5720
10	598125010.1	0.5019	2.0264E-05	10/19/2022 10:50	201	30	36	1.200	2	0.067	30	1.7110
11	598125011.1	0.5038	2.0271E-05	10/19/2022 11:25	301	30	22	0.733	2	0.067	30	1.6430
12	598125012.1	0.5018	2.0263E-05	10/19/2022 11:25	407	30	14	0.467	7	0.233	30	1.6030
13	598125013.1	0.5024	2.0266E-05	10/19/2022 12:05	508	30	21	0.700	8	0.267	30	1.8020
14	598125014.1	0.5030	2.0268E-05	10/19/2022 12:05	602	30	21	0.700	1	0.033	30	1.8620
15	598978001.1	0.5050	2.0276E-05	10/20/2022 9:51	701	30	25	0.833	4	0.133	30	1.7440
16	598978002.1	0.5024	2.0266E-05	10/20/2022 9:51	804	30	23	0.767	4	0.133	30	1.9050
17	598978003.1	0.5002	2.0257E-05	10/20/2022 8:45	104	30	12	0.400	2	0.067	30	1.6160
18	1205237443.1	0.5050	2.0276E-05	11/13/2022 0:00	205	30	9	0.300	5	0.167	30	1.8920
19	1205237444.1	0.5025	2.0266E-05	10/19/2022 9:40	308	30	44	1.467	4	0.133	30	1.5970
20	1205237445.1	0.1015	1.1459E-05	10/19/2022 9:40	401	30	711	23.700	5	0.167	30	1.6120
21	1205237446.1	0.5050	2.0276E-05	11/13/2022 0:00	502	30	873	29.100	1	0.033	30	1.8630

Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008  
 Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrow End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
3.900%	4/28/2022	4/30/2023	11/18/2022 9:10	11/23/2022 4:56	11/23/2022 8:55	0.583	0.970	1.002	1.000
5.500%	8/1/2022	7/31/2023	11/18/2022 9:10	11/23/2022 4:56	11/23/2022 8:55	0.583	0.970	1.002	1.000
8.900%	10/25/2022	10/31/2023	11/18/2022 9:10	11/23/2022 4:56	11/23/2022 8:55	0.583	0.970	1.002	1.000
2.800%	2/1/2022	1/31/2023	11/18/2022 9:10	11/23/2022 4:56	11/23/2022 8:55	0.583	0.970	1.002	1.000
7.900%	6/1/2022	5/31/2023	11/18/2022 9:10	11/23/2022 4:56	11/23/2022 8:55	0.583	0.970	1.002	1.000
6.700%	7/1/2022	6/30/2023	11/18/2022 9:10	11/23/2022 4:56	11/23/2022 8:55	0.583	0.970	1.002	1.000
9.000%	11/1/2022	10/31/2023	11/18/2022 9:10	11/23/2022 4:56	11/23/2022 8:55	0.583	0.970	1.002	1.000
7.400%	4/1/2022	3/31/2023	11/18/2022 9:10	11/23/2022 4:56	11/23/2022 8:55	0.583	0.970	1.002	1.000
1.200%	4/28/2022	4/30/2023	11/18/2022 9:10	11/23/2022 5:26	11/23/2022 9:28	0.584	0.970	1.002	1.000
8.900%	8/1/2022	7/31/2023	11/18/2022 9:10	11/23/2022 5:26	11/23/2022 9:28	0.584	0.970	1.002	1.000
4.500%	10/25/2022	10/31/2023	11/18/2022 9:10	11/23/2022 5:26	11/23/2022 9:28	0.584	0.970	1.002	1.000
6.600%	2/1/2022	1/31/2023	11/18/2022 9:10	11/23/2022 5:26	11/23/2022 9:28	0.584	0.970	1.002	1.000
4.500%	6/1/2022	5/31/2023	11/18/2022 9:10	11/23/2022 5:26	11/23/2022 9:28	0.584	0.970	1.002	1.000
5.700%	7/1/2022	6/30/2023	11/18/2022 9:10	11/23/2022 5:26	11/23/2022 9:28	0.584	0.970	1.002	1.000
6.200%	11/1/2022	10/31/2023	11/18/2022 9:10	11/23/2022 5:26	11/23/2022 9:28	0.584	0.970	1.002	1.000
9.900%	4/1/2022	3/31/2023	11/18/2022 9:10	11/23/2022 5:26	11/23/2022 9:28	0.584	0.970	1.002	1.000
2.000%	4/28/2022	4/30/2023	11/18/2022 9:10	11/23/2022 5:56	11/23/2022 10:00	0.586	0.970	1.002	1.000
3.900%	8/1/2022	7/31/2023	11/18/2022 9:10	11/23/2022 5:56	11/23/2022 10:00	0.586	0.970	1.002	1.000
9.600%	10/25/2022	10/31/2023	11/18/2022 9:10	11/23/2022 5:56	11/23/2022 10:00	0.586	0.970	1.002	1.000
8.100%	2/1/2022	1/31/2023	11/18/2022 9:10	11/23/2022 5:56	11/23/2022 10:00	0.586	0.970	1.002	1.000
6.700%	6/1/2022	5/31/2023	11/18/2022 9:10	11/23/2022 5:56	11/23/2022 10:00	0.586	0.970	1.002	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

**Spike S/N :** 1715-G  
**Spike Exp Date :** 9/8/2023  
**Spike Activity (dpm/ml):** 297.47  
**Spike Volume Added:** 0.10

**LCS S/N :** 1715-G  
**LCS Exp Date :** 9/8/2023  
**LCS Activity (dpm/ml):** 297.47  
**LCS Volume Added:** 0.10

<b>Results</b>																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.1772	0.1251	1	0.3434	<b>0.8695</b>	21.19%	0.9333	0.1944	0.3549	0.3823		SAMPLE				
2	0.0985	0.0696	1	0.2289	<b>1.0467</b>	18.23%	1.1667	0.2028	0.3566	0.4034		SAMPLE				
3	0.2452	0.1731	1	0.4307	<b>0.5063</b>	32.66%	0.6000	0.1886	0.3119	0.3323		SAMPLE				
4	0.1561	0.1102	1	0.3209	<b>1.2729</b>	17.28%	1.2667	0.2160	0.4255	0.4687		SAMPLE				
5	0.2150	0.1518	1	0.3912	<b>0.6713</b>	26.20%	0.7667	0.1915	0.3286	0.3580		SAMPLE				
6	0.1801	0.1271	1	0.3489	<b>0.2839</b>	43.55%	0.3000	0.1291	0.2395	0.2458		SAMPLE				
7	0.2586	0.1826	1	0.4613	<b>0.5447</b>	32.93%	0.5667	0.1795	0.3382	0.3602		SAMPLE				
8	0.1287	0.0908	1	0.2645	<b>0.4693</b>	27.95%	0.5667	0.1528	0.2480	0.2659		SAMPLE				
9	0.2482	0.1753	1	0.4516	<b>1.0781</b>	20.29%	1.0667	0.2160	0.4280	0.4561		SAMPLE				
10	0.1440	0.1017	1	0.2960	<b>1.0506</b>	20.20%	1.1333	0.2055	0.3733	0.4427		SAMPLE				
11	0.1494	0.1055	1	0.3071	<b>0.6411</b>	24.90%	0.6667	0.1633	0.3078	0.3263		SAMPLE				
12	0.2876	0.2030	1	0.5050	<b>0.2309</b>	65.80%	0.2333	0.1528	0.2963	0.2996		SAMPLE				
13	0.2732	0.1929	1	0.4737	<b>0.3810</b>	41.67%	0.4333	0.1795	0.3094	0.3160		SAMPLE				
14	0.0934	0.0659	1	0.2168	<b>0.5666</b>	24.13%	0.6667	0.1563	0.2604	0.2802		SAMPLE				
15	0.1986	0.1402	1	0.3708	<b>0.6327</b>	26.38%	0.7000	0.1795	0.3180	0.3397		SAMPLE				
16	0.1827	0.1290	1	0.3412	<b>0.5268</b>	29.08%	0.6333	0.1732	0.2824	0.3098		SAMPLE				
17	0.1526	0.1077	1	0.3137	<b>0.3275</b>	37.47%	0.3333	0.1247	0.2402	0.2451		SAMPLE				
18	0.2041	0.1441	1	0.3713	<b>0.1108</b>	93.62%	0.1333	0.1247	0.2032	0.2040		MB				
19	0.2174	0.1535	1	0.4059	<b>1.3194</b>	19.80%	1.3333	0.2309	0.4479	0.5464	598125001.1	DUP	41.1%			
20	1.1926	0.8420	1	2.1696	<b>114.2761</b>	8.94%	23.5333	0.8919	8.4891	25.9485	598125001.1	MS			132.0847	85.9%
21	0.0927	0.0655	1	0.2153	<b>24.5344</b>	7.51%	29.0667	0.9854	1.6303	5.0578		LCS			26.5344	92.5%

# **Continuing Calibration Data**



# Ludlum Alpha Scintillation Counter Checks for 23-NOV-2022

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	08:04	1	1.21E+05	120694	-2.16		
LUCAS2	EFF	08:01	1	1.34E+05	133571	-0.1		
LUCAS3	EFF	07:59	1	1.16E+05	116189	-2.18		
LUCAS4	EFF	07:57	1	1.27E+05	126770	-1.71		
LUCAS5	EFF	07:55	1	1.34E+05	133514	1.69		
LUCAS6	EFF	07:50	1	1.30E+05	130376	-01		
LUCAS7	EFF	07:48	1	1.30E+05	129962	-2.08		
LUCAS8	EFF	07:46	1	1.31E+05	130503	0.2		

**Reviewed by:**

Lyndsey Pace

**Date:** 23-NOV-22

GEL Laboratories LLC



# Runlogs

# Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2338812

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
598125001	SAMPLE	LXP1	LUCAS1	NOV-23-22 08:55:00	DONE	Lucas Cell	28-APR-22 00:00
598125002	SAMPLE	LXP1	LUCAS2	NOV-23-22 08:55:00	DONE	Lucas Cell	01-AUG-22 00:00
598125003	SAMPLE	LXP1	LUCAS3	NOV-23-22 08:55:00	DONE	Lucas Cell	25-OCT-22 00:00
598125004	SAMPLE	LXP1	LUCAS4	NOV-23-22 08:55:00	DONE	Lucas Cell	01-FEB-22 00:00
598125005	SAMPLE	LXP1	LUCAS5	NOV-23-22 08:55:00	DONE	Lucas Cell	01-JUN-22 00:00
598125006	SAMPLE	LXP1	LUCAS6	NOV-23-22 08:55:00	DONE	Lucas Cell	01-JUL-22 00:00
598125007	SAMPLE	LXP1	LUCAS7	NOV-23-22 08:55:00	DONE	Lucas Cell	01-NOV-22 00:00
598125008	SAMPLE	LXP1	LUCAS8	NOV-23-22 08:55:00	DONE	Lucas Cell	01-APR-22 00:00
598125009	SAMPLE	LXP1	LUCAS1	NOV-23-22 09:28:00	DONE	Lucas Cell	28-APR-22 00:00
598125010	SAMPLE	LXP1	LUCAS2	NOV-23-22 09:28:00	DONE	Lucas Cell	01-AUG-22 00:00
598125011	SAMPLE	LXP1	LUCAS3	NOV-23-22 09:28:00	DONE	Lucas Cell	25-OCT-22 00:00
598125012	SAMPLE	LXP1	LUCAS4	NOV-23-22 09:28:00	DONE	Lucas Cell	01-FEB-22 00:00
598125013	SAMPLE	LXP1	LUCAS5	NOV-23-22 09:28:00	DONE	Lucas Cell	01-JUN-22 00:00
598125014	SAMPLE	LXP1	LUCAS6	NOV-23-22 09:28:00	DONE	Lucas Cell	01-JUL-22 00:00
598978001	SAMPLE	LXP1	LUCAS7	NOV-23-22 09:28:00	DONE	Lucas Cell	01-NOV-22 00:00
598978002	SAMPLE	LXP1	LUCAS8	NOV-23-22 09:28:00	DONE	Lucas Cell	01-APR-22 00:00
598978003	SAMPLE	LXP1	LUCAS1	NOV-23-22 10:00:00	DONE	Lucas Cell	28-APR-22 00:00
1205237443	MB	LXP1	LUCAS2	NOV-23-22 10:00:00	DONE	Lucas Cell	01-AUG-22 00:00
1205237444	DUP	LXP1	LUCAS3	NOV-23-22 10:00:00	DONE	Lucas Cell	25-OCT-22 00:00
1205237445	MS	LXP1	LUCAS4	NOV-23-22 10:00:00	DONE	Lucas Cell	01-FEB-22 00:00
1205237446	LCS	LXP1	LUCAS5	NOV-23-22 10:00:00	DONE	Lucas Cell	01-JUN-22 00:00



Environmental Laboratory  
1232 Haco Drive  
Lansing  
Michigan, 48910

**CHAIN OF CUSTODY**

Phone: (517)702-6372

Lab Work Order Number L210212

Client Name BWL - Erickson Station	Project Name Erickson AM MI Well 11B	Requested Analyzes	Requested Turn Around
Client Contact Cheryl Louden	Project Number [none]	Radium 226 and Radium 228	Rush requests subject to additional charge. Rush requests subject to lab approval.
Address 3725 S. Canal	Project Description		
City Lansing	PO Number 30926 10021	Cl::C: F::SE::S04:: TDS, HCO3, CO3, Hardness	
State/Zip MI, 48917	Shipped By	TSS	
Phone (517) 702-6396	Tracking Number	Ni:: Pb:: Sb:: Se:: Ti:: V:: Zn	
Fax (517) 702-6373		Cd:: Cr:: Co:: Cu:: Fe:: Hg:: Li:: Mo::	
Sampler Marc Wahr		Ag:: Na, K, Mg As:: B:: Ba:: Be:: Ca::	

Sample Name or Field ID	Sampled Date	Sampled Time	Sample Type Grab/Composite	Matrix Code	Container Count	Preservation Code														
						a	b	a	b	a	b									
MW-11B	10/20/2022	1025	G	GW	5	1	1	1	1	2										
Field Dupe MW-11B	10/20/2022	1025	G	GW	5	1	1	1	1	2										
Field Blank	10/20/2022	918	G	DI	5	1	1	1	1	2										

Relinquished By 	Date/Time 10/20/22	Received By K Kleason	Date/Time 10/20/22	Comments
Relinquished By	Date/Time 1250	Received By	Date/Time 1250	
Relinquished By	Date/Time	Received By	Date/Time	
Cooler Numbers and Temperatures				

Matrix Codes: Die/Deionized Water, GW=Ground Water Preserv. Codes: a=None, b=0.5% HHO3



## Data Verification & Validation Report

### Lansing Board of Water & Light – Erickson Power Station

**Sampling Event (dates and purpose):** New Well MW-11B – Background Round 6 – October 2022

Data Package Number: S41627.01

Lab Report Date: 12/13/2022

Data Validator: Aryka Thomson

Data Validation Completion Date: 12/24/2022

General Overall Assessment:

Data are usable without qualification.

Data are usable with qualification (as noted below).

Some or all data are unusable (as noted below).

Wells planned for sampling:

Well ID	Planned for Sampling
MW-1	
MW-2	
MW-3	
MW-4	
MW-5	
MW-6	
MW-7	
MW-7B	
MW-7C	
MW-8	
MW-9	
MW-10	
MW-11	
MW-11B	X
MW-12	
MW-12B	
MW-13	

### Data Summary

Sample ID	Matrix	Lab ID	Date Collected	App III Metals	App IV Metals	Part 115 Metals	Anions	TDS TSS	Rad-226 Rad-228	Diss. Metals
MW-11B	GW	S41627.01	10/20/2022	X	X	X	X	X	X	
MW-11B Dup	QC	S41627.02	10/20/2022	X	X	X	X	X	X	

Other analytes requested for analysis: Na, Mg, K, HCO<sub>3</sub>, CO<sub>3</sub>, hardness

Any planned sampling or analysis NOT completed? If yes, explain: \_\_\_\_\_

### Data Verification & Validation Checklist

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
<b>Field Data</b>							
Sample Collection Field Forms	X		Purging performed as required in the Groundwater Monitoring Plan	X			
Field Calibration Records	X		Field instruments calibrated daily according to manufacturer specifications	X			
Chain of Custody	X		Accurately reflect samples, collection dates/times, analyses, bottles, etc.	X			
Field decontamination documentation	N/A		Record of decontamination for non-dedicated sampling equipment			X	
Drilling logs	X		N/A	-	-	-	
Well construction logs	X		N/A	-	-	-	
Well development field forms	X		N/A	-	-	-	
<b>Analytical Data Package</b>							
Cover Sheet	X		N/A	-	-	-	
Case Narrative	X		Summarizes sample receipt and any exceptions to QC acceptance criteria	X			
Internal Laboratory Chain of Custody forms	X		Analyses as requested; accurate transcription of field COC	X			
Sample Chronology and Consistency	X		Accurate representation of dates, times of receipt, preparation, and analysis	X			
Communication Records with Lab	X		N/A	-	-	-	
EDD Format Consistency	X		EDD format and content as requested	X			
Sample Identification, Results Nomenclature, and Data Qualifier Consistency	X		All included in final report	X			
Method Detection Limit Consistency	X		MDLs consistent between samples	X			
Instrument Calibration Records	X		Present and no nonconformance noted	X			
Laboratory Report Complete	X		Includes QC component	X			
Holding Times	X		Analyses performed within allowed holding time	X			

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Method	X		Method as requested	X			
Reporting Limits	X		RLs as requested	X			RLs for TDS were not met
			MDLs<RLs		X		RL=MDL for carbonate
			MDLs<GPS			X	
<b>QC Validation</b>							
<b>Evaluate Accuracy</b>							
Matrix Spike (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Laboratory Control Sample (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
<b>Evaluate Precision</b>							
Matrix Spike Duplicate (RPD)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Field Duplicate (RPD)	X		RPD ≤ 20%		X		Radium-226+228 RPD is 23%
<b>Evaluate Representativeness</b>							
Equipment Blanks (if applicable)	N/A		Non-detect (<RL)			X	
<b>QC Verification</b>							
<b>Verify Instrument Calibration &amp; Analytical Process</b>							
Initial Calibration Verification	X		Laboratory-determined	-	-	-	
Continuing Calibration Verification	X		Laboratory-determined	-	-	-	
Initial Calibration Blank	X		Laboratory-determined	-	-	-	
Continuing Calibration Blank	X		Laboratory-determined	-	-	-	
Serial Dilutions	X		Laboratory-determined	-	-	-	High recovery for Al, As, Ba, Mn, and Zn
Post-Digestion Spikes	X		Laboratory-determined	-	-	-	
Internal Standards	X		Laboratory-determined	-	-	-	
Laboratory Duplicate (RPD)	X		Laboratory-determined	-	-	-	
Method Blanks	X		Laboratory-determined	-	-	-	
<b>Evaluate Completeness (# usable measurements/ # unusable measurements)</b>							
Completeness	X		100%	X			

Other instances of nonconformance to QC control limits noted on case narrative:

Rad-228 was detected at 1.64 pCi/L in method blank 1205237469 at a level less than the required detection limit (3.00 pCi/L). Rad-228 and consequently combined radium required qualification as estimated with high bias in all samples (J+).

Sample 1205237469 (MB) was recounted due to a suspected blank false positive. The recount is reported.

Comments:

Several analytes' MDLs were rounded up from the value provided by the laboratory. The laboratory has been notified. No GPS values were affected.

Combined Radium-226+228 field duplicate RPD is 23%. Rad-228 and combined radium required qualification as estimated with low bias (J-) in the parent sample MW-11B and as estimated with high bias (J+) in the field duplicate MW-11B-Dup. The detection in the method blank requiring qualification as estimated with low bias (J-) in the parent sample was resolved by qualifying Rad-228 and combined radium as estimated without bias (J).



Lansing Board of Water and Light  
Environmental Services Laboratory (MI00079)  
1232 Haco Dr.  
Lansing, Michigan 48901

07 December 2022

BWL - Erickson Station  
Attn: Cheryl Loudon  
3725 S. Canal  
Lansing, MI 48917

**Project: Erickson AM MI**

Dear Cheryl Loudon,

Enclosed is a copy of the laboratory report for the following work order(s) received by Lansing Board of Water and Light Environmental Services Laboratory:

<b>Work Order</b>	<b>Received</b>	<b>Account Number</b>
L210250	10/26/2022 2:55:00PM	30926 10021

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in blue ink that reads "Jennifer Caporale".

Jennifer Caporale, Supervisor





Report ID: S41869.01(02)  
Generated on 11/29/2022  
Replaces report S41869.01(01) generated on 10/28/2022

Report to  
Attention: Jennifer Caporale  
Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901  
  
Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

Report produced by  
Merit Laboratories, Inc.  
2680 East Lansing Drive  
East Lansing, MI 48823  
  
Phone: (517) 332-0167 FAX: (517) 332-6333  
  
Contacts for report questions:  
John Lavery (johnlavery@meritlabs.com)  
Barbara Ball (bball@meritlabs.com)

Report Summary  
Lab Sample ID(s): S41869.01-S41869.05  
Project: Erickson AM MI Wells 11-13  
Collected Date(s): 10/26/2022  
Submitted Date/Time: 10/26/2022 15:28  
Sampled by: Marc Wahrer  
P.O. #:

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Maya Murshak  
Technical Director



## General Report Notes

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Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile, and 2-chloroethylvinyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (\*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

## Report Narrative

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All analyses completed



### Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Alaska CSLAP	#17-001
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

### Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

### Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



## Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1 (1993)
SM2320B	Standard Method 2320 B 2011
SM2340C	Standard Method 2340 C 2011
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007



## Sample Summary (5 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S41869.01	MW-11 L210250-01	Groundwater	10/26/22 10:42
S41869.02	MW-12 L210250-02	Groundwater	10/26/22 13:24
S41869.03	MW-13 L210250-03	Groundwater	10/26/22 12:51
S41869.04	Field Dupe MW-11 L210250-04	Groundwater	10/26/22 10:42
S41869.05	Field Blank L210250-05	Water	10/26/22 08:45



# Analytical Laboratory Report

Final Report

Lab Sample ID: S41869.01

Sample Tag: MW-11 L210250-01

Collected Date/Time: 10/26/2022 10:42

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	3.1	IR
2	1L Plastic	None	Yes	3.1	IR
1	125ml Plastic	HNO3	Yes	3.1	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	10/28/22 12:42	CTV	
Metal Digestion	Completed	SW3015A	10/27/22 09:50	CCM	

### Inorganics

Method: E300.0, Run Date: 10/27/22 10:52, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	62	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 10/28/22 07:45, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	601	10	0.5	mg/L	1	71-52-3	
Carbonate*	Not detected	10	0.5	mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 10/28/22 13:44, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	512	10	4.76	mg/L	20		

Method: SM2540C, Run Date: 10/26/22 17:50, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	664	50	10	mg/L	2		

Method: SM2540D, Run Date: 10/27/22 19:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	29	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 10/27/22 11:17, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.020	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.158	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.21	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	19.8	0.02	0.00192	mg/L	5	7439-89-6	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S41869.01 (continued)

Sample Tag: MW-11 L210250-01

**Method: E200.8, Run Date: 10/27/22 11:17, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	0.007	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	0.018	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 10/27/22 13:25, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	138	1.0	0.0435	mg/L	5	7440-70-2	
Magnesium	39.4	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	1.47	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	39.1	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 10/28/22 14:27, Analyst: CTV**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 11/29/22 13:12, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Lab Sample ID: S41869.02

Sample Tag: MW-12 L210250-02

Collected Date/Time: 10/26/2022 13:24

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	3.1	IR
2	1L Plastic	None	Yes	3.1	IR
1	125ml Plastic	HNO3	Yes	3.1	IR
1	125ml Plastic	None	Yes	3.1	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	10/28/22 12:42	CTV	
Mercury Digestion	Completed	E245.1	10/28/22 12:42	CTV	
Metal Digestion	Completed	SW3015A	10/27/22 09:50	CCM	
Metal Digestion	Completed	SW3015A	10/27/22 09:50	CCM	

### Inorganics

Method: E300.0, Run Date: 10/27/22 11:05, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	

Method: E300.0, Run Date: 10/27/22 11:56, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	78	20	0.32	mg/L	20	16887-00-6	
Sulfate	252	20	1.2	mg/L	20	14808-79-8	

Method: SM2320B, Run Date: 10/28/22 07:50, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	631	10	0.5	mg/L	1	71-52-3	
Carbonate*	Not detected	10	0.5	mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 10/28/22 13:50, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	618	10	4.76	mg/L	20		

Method: SM2540C, Run Date: 10/26/22 17:50, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	1,020	50	10	mg/L	2		

Method: SM2540D, Run Date: 10/27/22 19:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	16	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 10/27/22 11:22, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.002	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.057	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	





# Analytical Laboratory Report

Lab Sample ID: S41869.02 (continued)

Sample Tag: MW-12 L210250-02

**Method: E200.8, Run Date: 10/27/22 11:22, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Boron	0.08	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.96	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.021	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.013	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	0.018	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 10/27/22 11:25, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony, Dissolved*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	f
Arsenic, Dissolved	0.002	0.002	0.000255	mg/L	5	7440-38-2	f
Barium, Dissolved	0.052	0.005	0.000162	mg/L	5	7440-39-3	f
Beryllium, Dissolved	Not detected	0.001	0.000215	mg/L	5	7440-41-7	f
Boron, Dissolved	0.08	0.04	0.00175	mg/L	5	7440-42-8	f
Cadmium, Dissolved	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	f
Chromium, Dissolved	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	f
Cobalt, Dissolved	Not detected	0.005	0.000108	mg/L	5	7440-48-4	f
Copper, Dissolved	Not detected	0.005	0.000377	mg/L	5	7440-50-8	f
Iron, Dissolved	0.19	0.02	0.00192	mg/L	5	7439-89-6	f
Lead, Dissolved	Not detected	0.003	0.000190	mg/L	5	7439-92-1	f
Lithium, Dissolved*	0.018	0.005	0.00163	mg/L	5	7439-93-2	f
Molybdenum, Dissolved	0.012	0.005	0.000217	mg/L	5	7439-98-7	f
Nickel, Dissolved	0.015	0.005	0.000250	mg/L	5	7440-02-0	f
Selenium, Dissolved	Not detected	0.005	0.00209	mg/L	5	7782-49-2	f
Silver, Dissolved	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	f
Thallium, Dissolved	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	f
Vanadium, Dissolved	Not detected	0.005	0.000139	mg/L	5	7440-62-2	f
Zinc, Dissolved	Not detected	0.005	0.000730	mg/L	5	7440-66-6	f

**Method: E200.8, Run Date: 10/27/22 13:27, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	156	1.0	0.0435	mg/L	5	7440-70-2	
Magnesium	59.9	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	3.71	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	139	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E200.8, Run Date: 10/27/22 13:28, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium, Dissolved*	136	1.0	0.0435	mg/L	5	7440-70-2	f
Magnesium, Dissolved	53.0	0.50	0.0120	mg/L	5	7439-95-4	f

f-Filtered and preserved in lab



# Analytical Laboratory Report

Final Report

Lab Sample ID: S41869.02 (continued)

Sample Tag: MW-12 L210250-02

**Method: E200.8, Run Date: 10/27/22 13:28, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Potassium, Dissolved	3.04	0.50	0.0230	mg/L	5	7440-09-7	f
Sodium, Dissolved	123	0.50	0.00850	mg/L	5	7440-23-5	f

**Method: E245.1, Run Date: 10/28/22 14:34, Analyst: CTV**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury, Dissolved	Not detected	0.0002	0.0000160	mg/L	1	7439-97-6	f

**Method: E245.1, Run Date: 10/28/22 14:31, Analyst: CTV**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 11/29/22 13:12, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

f-Filtered and preserved in lab

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Final Report

Lab Sample ID: S41869.03

Sample Tag: MW-13 L210250-03

Collected Date/Time: 10/26/2022 12:51

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	3.1	IR
2	1L Plastic	None	Yes	3.1	IR
1	125ml Plastic	HNO3	Yes	3.1	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	10/28/22 12:42	CTV	
Metal Digestion	Completed	SW3015A	10/27/22 09:50	CCM	

### Inorganics

Method: E300.0, Run Date: 10/27/22 11:18, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	32	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	22	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 10/28/22 07:55, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	351	10	0.5	mg/L	1	71-52-3	
Carbonate*	Not detected	10	0.5	mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 10/28/22 13:55, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	358	10	4.76	mg/L	20		

Method: SM2540C, Run Date: 10/26/22 17:50, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	386	50	10	mg/L	2		

Method: SM2540D, Run Date: 10/27/22 19:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 10/27/22 11:29, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.028	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.22	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.04	0.02	0.00192	mg/L	5	7439-89-6	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S41869.03 (continued)

Sample Tag: MW-13 L210250-03

**Method: E200.8, Run Date: 10/27/22 11:29, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 10/27/22 13:30, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	101	1.0	0.0435	mg/L	5	7440-70-2	
Magnesium	23.0	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	0.81	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	4.99	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 10/28/22 14:37, Analyst: CTV**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 11/29/22 13:12, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Final Report

Lab Sample ID: S41869.04

Sample Tag: Field Dupe MW-11 L210250-04

Collected Date/Time: 10/26/2022 10:42

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	3.1	IR
2	1L Plastic	None	Yes	3.1	IR
1	125ml Plastic	HNO3	Yes	3.1	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	10/28/22 12:42	CTV	
Metal Digestion	Completed	SW3015A	10/27/22 09:50	CCM	

### Inorganics

Method: E300.0, Run Date: 10/27/22 11:30, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	62	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 10/28/22 08:15, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	604	10	0.5	mg/L	1	71-52-3	
Carbonate*	Not detected	10	0.5	mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 10/28/22 13:59, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	518	10	4.76	mg/L	20		

Method: SM2540C, Run Date: 10/26/22 17:50, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	664	50	10	mg/L	2		

Method: SM2540D, Run Date: 10/27/22 19:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	32	3	1	mg/L	2		

### Metals

Method: E200.8, Run Date: 10/27/22 11:32, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.020	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.154	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.21	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	20.6	0.02	0.00192	mg/L	5	7439-89-6	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S41869.04 (continued)  
Sample Tag: Field Dupe MW-11 L210250-04

**Method: E200.8, Run Date: 10/27/22 11:32, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	0.006	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 10/27/22 13:31, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	139	1.0	0.0435	mg/L	5	7440-70-2	
Magnesium	39.3	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	1.45	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	38.3	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 10/28/22 14:41, Analyst: CTV**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 11/29/22 13:12, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Lab Sample ID: S41869.05

Sample Tag: Field Blank L210250-05

Collected Date/Time: 10/26/2022 08:45

Matrix: Water

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	3.1	IR
2	1L Plastic	None	Yes	3.1	IR
1	125ml Plastic	HNO3	Yes	3.1	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	10/28/22 12:42	CTV	
Metal Digestion	Completed	SW3015A	10/27/22 09:50	CCM	

### Inorganics

Method: E300.0, Run Date: 10/27/22 11:43, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	2.5	0.04	mg/L	2.5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.06	mg/L	2.5	16984-48-8	
Sulfate	Not detected	2.5	0.15	mg/L	2.5	14808-79-8	

Method: SM2320B, Run Date: 10/28/22 08:20, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	Not detected	10	0.5	mg/L	1	71-52-3	
Carbonate*	Not detected	10	0.5	mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 10/28/22 14:03, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	Not detected	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 10/26/22 17:50, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	Not detected	50	10	mg/L	2		

Method: SM2540D, Run Date: 10/27/22 19:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 10/27/22 11:12, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00102	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.000102	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.0000648	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.0000862	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.000702	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.0000760	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.0000386	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.0000434	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000150	mg/L	2	7440-50-8	
Iron	Not detected	0.02	0.000768	mg/L	2	7439-89-6	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S41869.05 (continued)

Sample Tag: Field Blank L210250-05

**Method: E200.8, Run Date: 10/27/22 11:12, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.0000760	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000654	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.0000868	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000100	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.000838	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.0000270	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.0000342	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.0000558	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.000292	mg/L	2	7440-66-6	

**Method: E200.8, Run Date: 10/27/22 13:23, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.0174	mg/L	2	7440-70-2	
Magnesium	Not detected	0.50	0.00480	mg/L	2	7439-95-4	
Potassium	Not detected	0.50	0.00920	mg/L	2	7440-09-7	
Sodium	Not detected	0.50	0.00340	mg/L	2	7440-23-5	

**Method: E245.1, Run Date: 10/28/22 14:44, Analyst: CTV**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 11/29/22 13:12, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Merit Laboratories Login Checklist

Lab Set ID:S41869

Attention: Jennifer Caporale  
Address: Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901

Client:BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 11-13

Submitted: 10/26/2022 15:28 Login User: MMC

Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

Selection	Description	Note
-----------	-------------	------

## Sample Receiving

- |     |  |  |
|-----|--|--|
| 01. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples are received at 4C +/- 2C Thermometer # IR 3.1 |
| 02. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Received on ice/ cooling process begun                 |
| 03. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples shipped  |
| 04. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples left in 24 hr. drop box                        |
| 05. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Are there custody seals/tape or is the drop box locked |

## Chain of Custody

- |     |  |  |
|-----|--|--|
| 06. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC adequately filled out                    |
| 07. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC signed and relinquished to the lab       |
| 08. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sample tag on bottles match COC              |
| 09. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Subcontracting needed? Subcontracted to: GEL |

## Preservation

- |     |  |   |
|-----|--|---|
| 10. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Do sample have correct chemical preservation                      |
| 11. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Completed pH checks on preserved samples? (no VOAs)               |
| 12. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Did any samples need to be preserved in the lab? Dissolved Metals |

## Bottle Conditions

- |     |  |  |
|-----|--|--|
| 13. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | All bottles intact                                     |
| 14. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Appropriate analytical bottles are used                |
| 15. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Merit bottles used                                     |
| 16. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sufficient sample volume received                      |
| 17. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples require laboratory filtration Dissolved Metals |
| 18. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples submitted within holding time                  |
| 19. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Do water VOC or TOX bottles contain headspace          |

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: \_\_\_\_\_ Date: \_\_\_\_\_

# Merit Laboratories Bottle Preservation Check

Lab Set ID: S41869 Submitted: 10/26/2022 15:28

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 11-13

Attention: Jennifer Caporale  
Address: Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901

Initial Preservation Check: 10/26/2022 15:53 MMC

Preservation Recheck (E200.8): N/A

Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S41869.01	125ml Plastic HNO3	<2			
S41869.01	1L Plastic HNO3	<2			
S41869.01	1L Plastic HNO3	<2			
S41869.02	125ml Plastic HNO3	<2			
S41869.02	1L Plastic HNO3	<2			
S41869.02	1L Plastic HNO3	<2			
S41869.03	125ml Plastic HNO3	<2			
S41869.03	1L Plastic HNO3	<2			
S41869.03	1L Plastic HNO3	<2			
S41869.04	125ml Plastic HNO3	<2			
S41869.04	1L Plastic HNO3	<2			
S41869.04	1L Plastic HNO3	<2			
S41869.05	125ml Plastic HNO3	<2			
S41869.05	1L Plastic HNO3	<2			
S41869.05	1L Plastic HNO3	<2			



2680 East Lansing Dr., East Lansing, MI 48823  
 Phone (517) 332-0167 Fax (517) 332-4034  
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

**REPORT TO**

**CHAIN OF CUSTODY RECORD**

**INVOICE TO**

CONTACT NAME **Jennifer Caporale**  
 COMPANY **Lansing Board of Water and Light**  
 ADDRESS **PO Box 13007 48901-3007**  
 CITY **Lansing** STATE **Mi** ZIP CODE **48901**  
 PHONE NO. **517-702-6372** FAX NO. P.O. NO.  
 E-MAIL ADDRESS **Environmental\_Laboratory@lbwl.com** QUOTE NO.

CONTACT NAME **Kelly Gleason**  SAME  
 COMPANY  
 ADDRESS  
 CITY STATE ZIP CODE  
 PHONE NO. E-MAIL ADDRESS **Kelly.Gleason@lbwl.com**

**ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)**

PROJECT NO./NAME **Erickson AM MI Wells 11-13** SAMPLER(S) - PLEASE PRINT/SIGN NAME **Marc Wahrer**  
 TURNAROUND TIME REQUIRED  1 DAY  2 DAYS  3 DAYS  STANDARD  OTHER **ASAP**  
 DELIVERABLES REQUIRED  STD  LEVEL II  LEVEL III  LEVEL IV  EDD  OTHER

MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID  
 SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIPE A=AIR W=WASTE

# Containers & Preservatives

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	# Containers & Preservatives						Total Metals	F- undistilled, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	Dissolved Metals	HCO3, CO3, Hardness	Certifications	Project Locations	Special Instructions
	DATE	TIME				NONE	HCl	HNO3	H2SO4	NaOH	MeOH										
41869.01	10/26/22	1042	MW-11 L210250-01	GW	5	2	3														Metals to analyse: Na, Mg, K
.02	10/26/22	1324	MW-12 -02	GW	6	3	3														B, Ca, Sb, As, Ba, Be, Cd, Cr,
.03	10/26/22	1251	MW-13 -03	GW	5	2	3														Co, Li, Hg, Mo, Pb, Se, Tl,
.04	10/26/22	1042	Field Dupe MW-11 -04	GW	5	2	3														Fe, Cu, Ni, Ag, V, Zn
.05	10/26/22	0845	Field Blank -05	DI	5	2	3														Please send a preliminary report
																					The analytes for dissolved metals are same metals that are analysed for total.

RELINQUISHED BY: *[Signature]*  Sampler DATE **10/26/22** TIME **1528**  
 RECEIVED BY: *[Signature]* DATE **10/26/22** TIME **1528**

RELINQUISHED BY: DATE TIME  
 RECEIVED BY: DATE TIME  
 SEAL NO. SEAL INTACT YES  NO  INITIALS  
 SEAL NO. SEAL INTACT YES  NO  INITIALS  
 NOTES: TEMP. ON ARRIVAL **3.1**

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

## Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total		250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.150
Be, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	2.5
Cl	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	10
Cr, total	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
F	Fluoride	250 mL plastic	mg/L	None	9056	28 d	1.0
Fe, total	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Pb, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Li, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Hg, total	Mercury	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Mo, total	Molybdenum	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
RA226/228	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	HNO3	SM 7500	6 mos	2.0 combined
Se, total	Selenium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ag, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
SO4	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	10
Tl, total	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
TDS	Total Dissolved Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TSS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540D	NA	3
V, total	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Zn, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005



November 22, 2022

John Laverty  
Merit Laboratories Inc.  
2680 East Lansing Drive  
East Lansing, Michigan 48823

Re: Routine Analysis  
Work Order: 598830  
SDG: S41869

Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on October 31, 2022. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at [www.gel.com](http://www.gel.com).

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,

Jordan Melton for  
Delaney Stone  
Project Manager

Purchase Order: GELP20-0018  
Enclosures



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# Case Narrative

**Receipt Narrative  
for  
Merit Laboratories, Inc.  
SDG: S41869  
Work Order: 598830**

**November 22, 2022**

**Laboratory Identification:**

GEL Laboratories LLC  
2040 Savage Road  
Charleston, South Carolina 29407  
(843) 556-8171

**Summary:**

**Sample receipt:** The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on October 31, 2022 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

**Sample Identification:** The laboratory received the following samples:

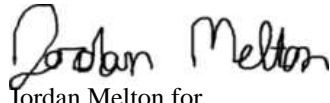
<b><u>Laboratory ID</u></b>	<b><u>Client ID</u></b>
598830001	S41869.01
598830002	S41869.02
598830003	S41869.03
598830004	S41869.02 Field Dupe
598830005	S41869.03 Field Blank

**Case Narrative:**

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.



The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.

A handwritten signature in black ink that reads "Jordan Melton". The signature is written in a cursive style with a large initial 'J'.

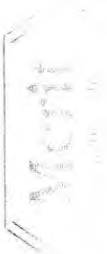
Jordan Melton for  
Delaney Stone  
Project Manager

# **Chain of Custody and Supporting Documentation**

548830

2680 East Lansing Dr., East Lansing, MI 48823  
PHONE (517) 332-0167 FAX (517) 332-4034  
www.meritlabs.com

C.O.C. PAGE # 1 OF 1



### CHAIN OF CUSTODY RECORD

### INVOICE TO

REPORT TO: Project Management Team  
 COMPANY: Merit Laboratories  
 ADDRESS: 2680 East Lansing Drive  
 CITY: East Lansing  
 STATE: MI ZIP CODE: 48823  
 PHONE NO.: 517-332-0167  
 FAX NO.:  
 E-MAIL: results@meritlabs.com  
 E-MAIL ADDRESS: juliet@meritlabs.com  
 ZIP CODE: 48823

PROJECT NAME: S41869 ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

MERIT LAB NO. <small>NO. FOR USE ONLY</small>	YEAR	DATE	TIME	IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NON	CONTAINERS & PRESERVATIVES	CERTIFICATIONS	SPECIAL INSTRUCTIONS
10/26/22	1042	10/26/22	1042	S41869.01	GW	2	2	Radium 226*	<input type="checkbox"/> OHIO VAP <input type="checkbox"/> Drinking Water <input type="checkbox"/> DoC <input type="checkbox"/> NPDES Project Locations <input type="checkbox"/> Detroit <input type="checkbox"/> New York <input type="checkbox"/> Other	* E903.1 Mod.
10/26/22	1324	10/26/22	1324	S41869.02	GW	2	2	Radium 226*		** E904.0/SW 9320 Mod.
10/26/22	1251	10/26/22	1251	S41869.03	GW	2	2			
10/26/22	1042	10/26/22	1042	S41869.02 Field Dupc	GW	2	2			Please use calculation product & provide Radium 226/228 combined results on the report
10/26/22	0845	10/26/22	0845	S41869.03 Field Blank	GW	2	2			(No Ice needed) ** Subcontracted to GEL Laboratories, Inc. 2040 Savage Road Charleston, SC 29407

TURNAROUND TIME REQUIRED:  1 DAY  2 DAYS  3 DAYS  STANDARD  OTHER

DELIVERABLES REQUIRED:  STD  LEVEL I  LEVEL II  LEVEL III  LEVEL IV  EDD  OTHER

MATRIX: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID  
 SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIPE A=AIR W=WASTE

RELINQUISHED BY: M. Carls  
 RECEIVED BY: UPS  
 SIGNATURE/Organization: M. Carls  
 DATE: 10/27/22  
 TIME: 1700

RELINQUISHED BY: Julie Teague  
 RECEIVED BY: Julie Teague  
 SIGNATURE/Organization: Julie Teague  
 DATE: 10/31/22  
 TIME: 905

TEMP ON ARRIVAL: 10.31.22.905

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE



SAMPLE RECEIPT & REVIEW FORM DS

Client: <b>MEZ</b>	SDG/AR/COC/Work Order: <b>548830</b>
Received By: <b>MVH</b>	Date Received: <b>10-31-2022</b>
Carrier and Tracking Number	Circle Applicable: FedEx Express    FedEx Ground <b>UPS</b> Field Services    Courier    Other  <b>124664770362193065</b>

Suspected Hazard Information	Yes	No	*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.
A) Shipped as a DOT Hazardous?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Hazard Class Shipped: _____ UN#: _____ If UN2910, Is the Radioactive Shipment Survey Compliant? Yes ___ No ___
B) Did the client designate the samples are to be received as radioactive?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	COC notation or radioactive stickers on containers equal client designation.
C) Did the RSO classify the samples as radioactive?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): <u>9</u> <b>CPM</b> /mR/Hr Classified as: Rad 1    Rad 2    Rad 3
D) Did the client designate samples are hazardous?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	COC notation or hazard labels on containers equal client designation.
E) Did the RSO identify possible hazards?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	If D or E is yes, select Hazards below. PCB's    Flammable    Foreign Soil    RCRA    Asbestos    Beryllium    Other:

Sample Receipt Criteria	Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1 Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Seals broken    Damaged container    Leaking container    Other (describe)
2 Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Client contacted and provided COC    COC created upon receipt
3 Samples requiring cold preservation within (0 ≤ 6 deg. C)?*	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Preservation Method: Wet Ice    Ice Packs    Dry ice <b>None</b> Other: *all temperatures are recorded in Celsius    TEMP: <b>20</b>
4 Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Temperature Device Serial #: <b>IR2-21</b> Secondary Temperature Device Serial # (If Applicable):
5 Sample containers intact and sealed?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Seals broken    Damaged container    Leaking container    Other (describe)
6 Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Sample ID's and Containers Affected: If Preservation added, Lot#:
7 Do any samples require Volatile Analysis?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	If Yes, are Encores or Soil Kits present for solids? Yes ___ No ___ NA ___ (If yes, take to VOA Freezer)
				Do liquid VOA vials contain acid preservation? Yes ___ No ___ NA ___ (If unknown, select No)
				Are liquid VOA vials free of headspace? Yes ___ No ___ NA ___
8 Samples received within holding time?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	ID's and tests affected:
9 Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	ID's and containers affected: <b>COC ID does not match bottle ID *</b>
10 Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: No dates on containers    No times on containers    COC missing info    Other (describe)
11 Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: No container count on COC    Other (describe)
12 Are sample containers identifiable as GEL provided by use of GEL labels?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
13 COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: <b>Not relinquished</b> Other (describe)

Comments (Use Continuation Form if needed):  
**\*Bottle ID says 841869.04, 841869.05**

PM (or PMA) review: Initials **MVH** Date **10/31/22** Page **1** of **1**

# Laboratory Certifications

**List of current GEL Certifications as of 22 November 2022**

<b>State</b>	<b>Certification</b>
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122023-3
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2022-160
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122022-37
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

# **Radiological Analysis**

# Case Narrative



**Radiochemistry  
Technical Case Narrative  
Merit Laboratories, Inc.  
SDG #: S41869  
Work Order #: 598830**

**Product:** Radium-226+Radium-228 Calculation

**Analytical Method:** Calculation

**Analytical Procedure:** GL-RAD-D-003 REV# 45

**Analytical Batch:** 2343193

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
598830001	S41869.01
598830002	S41869.02
598830003	S41869.03
598830004	S41869.02 Field Dupe
598830005	S41869.03 Field Blank

**Data Summary:**

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

**Product:** GFPC Ra228, Liquid

**Analytical Method:** EPA 904.0/SW846 9320 Modified

**Analytical Procedure:** GL-RAD-A-063 REV# 5

**Analytical Batch:** 2343191

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
598830001	S41869.01
598830002	S41869.02
598830003	S41869.03
598830004	S41869.02 Field Dupe
598830005	S41869.03 Field Blank
1205246234	Method Blank (MB)
1205246235	599036001(NonSDG) Sample Duplicate (DUP)
1205246236	Laboratory Control Sample (LCS)
1205246237	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

**Product:** Lucas Cell, Ra226, Liquid

**Analytical Method:** EPA 903.1 Modified

**Analytical Procedure:** GL-RAD-A-008 REV# 15

**Analytical Batch:** 2343171

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
598830001	S41869.01
598830002	S41869.02
598830003	S41869.03
598830004	S41869.02 Field Dupe
598830005	S41869.03 Field Blank
1205246197	Method Blank (MB)
1205246198	599036001(NonSDG) Sample Duplicate (DUP)
1205246199	599036001(NonSDG) Matrix Spike (MS)
1205246200	Laboratory Control Sample (LCS)
1205246201	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

**Certification Statement**

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

## GEL LABORATORIES LLC

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### Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S41869 GEL Work Order: 598830

#### The Qualifiers in this report are defined as follows:

- \* A quality control analyte recovery is outside of specified acceptance criteria
- \*\* Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

#### Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature:



Name: Theresa Austin

Date: 29 NOV 2022

Title: Group Leader

# Sample Data Summary

# GEL LABORATORIES LLC

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## Certificate of Analysis

Report Date: November 29, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

Client Sample ID: S41869.01	Project: MERI00120
Sample ID: 598830001	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 26-OCT-22 10:42	
Receive Date: 31-OCT-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	1.53	+/-1.24	1.98	3.00	pCi/L		JE1	11/28/22	1043	2343191		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		2.51	+/-1.32			pCi/L		1 TON1	11/29/22	1312	2343193		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.981	+/-0.456	0.543	1.00	pCi/L		LXP1	11/29/22	0921	2343171		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			77.5	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

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## Certificate of Analysis

Report Date: November 29, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Lavery  
 Project: Routine Analysis

Client Sample ID: S41869.02	Project: MERI00120
Sample ID: 598830002	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 26-OCT-22 13:24	
Receive Date: 31-OCT-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	2.11	+/-1.40	2.21	3.00	pCi/L		JE1	11/28/22	1043	2343191	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		2.74	+/-1.44			pCi/L		1 TON1	11/29/22	1312	2343193	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.628	+/-0.337	0.407	1.00	pCi/L		LXP1	11/29/22	0953	2343171	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			87.8	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

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## Certificate of Analysis

Report Date: November 29, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

Client Sample ID: S41869.03	Project: MERI00120
Sample ID: 598830003	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 26-OCT-22 12:51	
Receive Date: 31-OCT-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.291	+/-1.20	2.16	3.00	pCi/L		JE1	11/28/22	1043	2343191	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.683	+/-1.23			pCi/L		1 TON1	11/29/22	1312	2343193	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.392	+/-0.252	0.273	1.00	pCi/L		LXP1	11/29/22	0953	2343171	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			83.3	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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## Certificate of Analysis

Report Date: November 29, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

Client Sample ID: S41869.02 Field Dupe	Project: MERI00120
Sample ID: 598830004	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 26-OCT-22 10:42	
Receive Date: 31-OCT-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	1.18	+/-1.17	1.94	3.00	pCi/L		JE1	11/28/22	1043	2343191		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		1.77	+/-1.25			pCi/L		1 TON1	11/29/22	1312	2343193		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226	U	0.590	+/-0.421	0.607	1.00	pCi/L		LXP1	11/29/22	0953	2343171		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			79.7	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit



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## Certificate of Analysis

Report Date: November 29, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

Client Sample ID: S41869.03 Field Blank	Project: MERI00120
Sample ID: 598830005	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 26-OCT-22 08:45	
Receive Date: 31-OCT-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.310	+/-0.976	1.80	3.00	pCi/L			JE1	11/28/22	1043 2343191	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.30	+/-1.05			pCi/L		1	TON1	11/29/22	1312 2343193	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.995	+/-0.374	0.263	1.00	pCi/L			LXP1	11/29/22	0921 2343171	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			65.3	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# Quality Control Summary

# GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

## QC Summary

Report Date: November 29, 2022

Page 1 of 2

**Merit Laboratories Inc.**  
**2680 East Lansing Drive**  
**East Lansing, Michigan**

**Contact: John Laverty**

**Workorder: 598830**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Rad Gas Flow</b>											
Batch	2343191										
QC1205246235	599036001	DUP									
Radium-228	U	1.20	U	2.07	pCi/L	N/A		N/A	JE1	11/28/22	10:43
	Uncertainty	+/-1.14		+/-1.36							
QC1205246236	LCS										
Radium-228	65.5			62.4	pCi/L		95.4	(75%-125%)		11/28/22	10:43
	Uncertainty			+/-4.59							
QC1205246237	LCSD										
Radium-228	65.5			52.9	pCi/L	16.5	80.8	(0%-20%)		11/28/22	10:43
	Uncertainty			+/-4.25							
QC1205246234	MB										
Radium-228			U	0.505	pCi/L					11/28/22	10:43
	Uncertainty			+/-0.910							
<b>Rad Ra-226</b>											
Batch	2343171										
QC1205246198	599036001	DUP									
Radium-226		1.25		1.43	pCi/L	13.4		(0% - 100%)	LXP1	11/29/22	10:25
	Uncertainty	+/-0.431		+/-0.456							
QC1205246200	LCS										
Radium-226	26.6			21.3	pCi/L		80	(75%-125%)		11/29/22	10:56
	Uncertainty			+/-1.71							
QC1205246201	LCSD										
Radium-226	26.6			21.9	pCi/L	2.75	82.3	(0%-20%)		11/29/22	10:56
	Uncertainty			+/-1.65							
QC1205246197	MB										
Radium-226			U	0.113	pCi/L					11/29/22	10:56
	Uncertainty			+/-0.195							
QC1205246199	599036001	MS									
Radium-226	134	1.25		106	pCi/L		78.4	(75%-125%)		11/29/22	10:56
	Uncertainty	+/-0.431		+/-8.36							

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

# GEL LABORATORIES LLC

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## QC Summary

Workorder: 598830

Page 2 of 2

Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
**	Analyte is a Tracer compound										
<	Result is less than value reported										
>	Result is greater than value reported										
BD	Results are either below the MDC or tracer recovery is low										
FA	Failed analysis.										
H	Analytical holding time was exceeded										
J	See case narrative for an explanation										
J	Value is estimated										
K	Analyte present. Reported value may be biased high. Actual value is expected to be lower.										
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.										
M	M if above MDC and less than LLD										
M	REMP Result > MDC/CL and < RDL										
N/A	RPD or %Recovery limits do not apply.										
NI	See case narrative										
ND	Analyte concentration is not detected above the detection limit										
NJ	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier										
Q	One or more quality control criteria have not been met. Refer to the applicable narrative or DER.										
R	Sample results are rejected										
U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.										
UI	Gamma Spectroscopy--Uncertain identification										
UJ	Gamma Spectroscopy--Uncertain identification										
UL	Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.										
X	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier										
Y	Other specific qualifiers were required to properly define the results. Consult case narrative.										
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.										
h	Preparation or preservation holding time was exceeded										

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where the duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

\* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

# Gas Flow Raw Data

# Batch 2343191 Check-list

This check-list was completed on 28-NOV-22 by Rhonda Birch

This batch was reviewed by Kenshalla Oston on 28-NOV-22 and Rhonda Birch on 28-NOV-22.

**Batch ID:**  
2343191

**Product:**  
GFC28RAL

**Description:** Gas Flow Radium 228  
GL-RAD-A-063

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
<b>Miscellaneous Information</b>				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

# Prep Logbook

## Radium-228 in Liquid

**Batch ID:** 2343191

**Analyst:** Jacqueline Emond (JE1)

**Method:** EPA 904.0/SW846 9320 Modified

**Lab SOP:** GL-RAD-A-063 REV# 5

**Instrument:** SP-C018367602

**Due Dates for Lab:** 26-NOV-2022

**Package:** 28-NOV-2022

**SDG:** 29-NOV-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205246236	228 DW spike	1952-B	.1	mL
LCSD	1205246237	228 DW spike	1952-B	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	598830001	21-NOV-2022	3	301.41	301.41	11/22/22 12:21	11/28/22 08:26
2	598830002	21-NOV-2022	3	301.01	301.01	11/22/22 12:21	11/28/22 08:26
3	598830003	21-NOV-2022	3	300.71	300.71	11/22/22 12:21	11/28/22 08:26
4	598830004	21-NOV-2022	3	301.31	301.31	11/22/22 12:21	11/28/22 08:26
5	598830005	21-NOV-2022	3	300.01	300.01	11/22/22 12:21	11/28/22 08:26
6	598903001	21-NOV-2022	3	300.71	300.71	11/22/22 12:21	11/28/22 08:26
7	598904001	21-NOV-2022	3	300.01	300.01	11/22/22 12:21	11/28/22 08:26
8	599036001	21-NOV-2022	3	300.31	300.31	11/22/22 12:21	11/28/22 08:26
9	599036002	21-NOV-2022	3	301.21	301.21	11/22/22 12:21	11/28/22 08:26
10	599036003	21-NOV-2022	3	300.71	300.71	11/22/22 12:21	11/28/22 08:26
11	599036004	21-NOV-2022	3	301.61	301.61	11/22/22 12:21	11/28/22 08:26
12	599036005	21-NOV-2022	3	300.51	300.51	11/22/22 12:21	11/28/22 08:26
13	599036006	21-NOV-2022	3	302.01	302.01	11/22/22 12:21	11/28/22 08:26
14	599904001	21-NOV-2022	3	300.81	300.81	11/22/22 12:21	11/28/22 08:26
15	599904002	21-NOV-2022	3	300.41	300.41	11/22/22 12:21	11/28/22 08:26
16	599904003	21-NOV-2022	3	300.21	300.21	11/22/22 12:21	11/28/22 08:26
17	599904004	21-NOV-2022	3	301.71	301.71	11/22/22 12:21	11/28/22 08:26
18	599904005	21-NOV-2022	3	301.81	301.81	11/22/22 12:21	11/28/22 08:26
19	599904006	21-NOV-2022	3	300.91	300.91	11/22/22 12:21	11/28/22 08:26
20	1205246234 MB	21-NOV-2022	3		303.11	11/22/22 12:21	11/28/22 08:26
21	1205246235 DUP (599036001)	21-NOV-2022	3	303.11	303.11	11/22/22 12:21	11/28/22 08:26
22	1205246236 LCS	21-NOV-2022	3		303.11	11/22/22 12:21	11/28/22 08:26
23	1205246237 LCSD	21-NOV-2022	3		303.11	11/22/22 12:21	11/28/22 08:26

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1951-D	Ba-133	.1 mL	Pipet Id: RAD-GFC-1795419
REGNT 3418276.6	29M HF (48-50%)	4 mL	Data Entry Date2: 21-NOV-2022 00:00
REGNT 3454370.1	Nitric Acid	5 mL	
REGNT 3465466	Barium Carrier Ra228 REG	1 mL	
REGNT 3485721.6	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	
REGNT 3521298	RGF-Neodymium Substrate	5 mL	
REGNT 3528714	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3532382	RGF-7M Nitric Acid	25 mL	
REGNT 3532398	RGF-1M Citric Acid	5 mL	
REGNT 3532415	RGF-50% Potassium Carbonate	2 mL	
REGNT 3533722	2M HCl	20 mL	
REGNT 3535103	RGF-1.5M Ammonium Sulfate	10 mL	
REGNT DGA0039	2339762	2 g	

## Prep Logbook

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
	Reagent/Solvent Lot ID		Description		Amount	Comments:	



### Radium-228 Liquid

Filename : RA228.XLS  
 File type : Excel  
 Version # : 1.4.2

Tracer S/N : 1951-D  
 Tracer Exp Date : 6/3/2023  
 Tracer Volume Added: 0.10

Batch : 2343191  
 Analyst : JAC02417  
 Prep Date : 11/21/2022  
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL  
 Parmname : Radium-228  
 Required MDA : 3 pCi/L  
 Ra-228 Abundance : 1.00  
 Halflife of Ra-228 : 5.75 years  
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	598830001.1	0.3014	1.8483E-05	10/26/2022 10:42	1306.5	1.60%	1012.2	1.81%	0.1	0.000200
2	598830002.1	0.3010	1.8476E-05	10/26/2022 13:24	1306.5	1.60%	1147.6	1.70%	0.1	0.000200
3	598830003.1	0.3007	1.8471E-05	10/26/2022 12:51	1306.5	1.60%	1088.4	1.75%	0.1	0.000200
4	598830004.1	0.3013	1.8481E-05	10/26/2022 10:42	1306.5	1.60%	1041.9	1.79%	0.1	0.000200
5	598830005.1	0.3000	1.8459E-05	10/26/2022 8:45	1306.5	1.60%	852.9	1.98%	0.1	0.000200
6	598903001.1	0.3007	1.8471E-05	10/18/2022 11:00	1306.5	1.60%	977.7	1.85%	0.1	0.000200
7	598904001.1	0.3000	1.8459E-05	10/18/2022 9:28	1306.5	1.60%	1039.9	1.79%	0.1	0.000200
8	599036001.1	0.3003	1.8464E-05	10/31/2022 10:13	1306.5	1.60%	979.2	1.84%	0.1	0.000200
9	599036002.1	0.3012	1.8480E-05	10/31/2022 11:27	1306.5	1.60%	984.7	1.84%	0.1	0.000200
10	599036003.1	0.3007	1.8471E-05	10/31/2022 11:32	1306.5	1.60%	913.6	1.91%	0.1	0.000200
11	599036004.1	0.3016	1.8486E-05	10/31/2022 12:40	1306.5	1.60%	1065.2	1.77%	0.1	0.000200
12	599036005.1	0.3005	1.8468E-05	10/31/2022 13:42	1306.5	1.60%	1051.3	1.78%	0.1	0.000200
13	599036006.1	0.3020	1.8493E-05	10/31/2022 14:32	1306.5	1.60%	1038.5	1.79%	0.1	0.000200
14	599904001.1	0.3008	1.8473E-05	11/3/2022 8:50	1306.5	1.60%	655.5	2.25%	0.1	0.000200
15	599904002.1	0.3004	1.8466E-05	11/3/2022 9:57	1306.5	1.60%	1065.4	1.77%	0.1	0.000200
16	599904003.1	0.3002	1.8463E-05	11/3/2022 10:45	1306.5	1.60%	864.5	1.96%	0.1	0.000200
17	599904004.1	0.3017	1.8488E-05	11/3/2022 12:24	1306.5	1.60%	1004.8	1.82%	0.1	0.000200
18	599904005.1	0.3018	1.8490E-05	11/3/2022 13:25	1306.5	1.60%	704.3	2.18%	0.1	0.000200
19	599904006.1	0.3009	1.8474E-05	11/3/2022 14:20	1306.5	1.60%	1001.8	1.82%	0.1	0.000200
20	1205246234.1	0.3031	1.8511E-05	11/21/2022 0:00	1306.5	1.60%	962.2	1.86%	0.1	0.000200
21	1205246235.1	0.3031	1.8511E-05	10/31/2022 10:13	1306.5	1.60%	1127.5	1.72%	0.1	0.000200
22	1205246236.1	0.3031	1.8511E-05	11/21/2022 0:00	1306.5	1.60%	932.7	1.89%	0.1	0.000200
23	1205246237.1	0.3031	1.8511E-05	11/21/2022 0:00	1306.5	1.60%	900.3	1.92%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063  
 Instrument SOP: GL-RAD-I-016

Count raw Data														Calculated	Sample
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction	Recovery %	Error %	
			Alpha	Beta											
1	4D	60	16	66	1.100	11/28/2022 10:43	11/22/2022 12:21	11/28/2022 8:26	0.989	0.772	1.000	1.057	77.5%	1.24%	
2	13D	60	12	122	2.033	11/28/2022 10:43	11/22/2022 12:21	11/28/2022 8:26	0.989	0.773	1.000	1.057	87.8%	1.20%	
3	6B	60	7	77	1.283	11/28/2022 10:43	11/22/2022 12:21	11/28/2022 8:26	0.989	0.772	1.000	1.057	83.3%	1.22%	
4	13A	60	11	71	1.183	11/28/2022 10:43	11/22/2022 12:21	11/28/2022 8:26	0.989	0.772	1.000	1.057	79.7%	1.23%	
5	5C	60	9	31	0.517	11/28/2022 10:43	11/22/2022 12:21	11/28/2022 8:26	0.989	0.772	1.000	1.057	65.3%	1.30%	
6	7B	60	11	40	0.667	11/28/2022 10:44	11/22/2022 12:21	11/28/2022 8:26	0.987	0.772	1.000	1.057	74.8%	1.26%	
7	14D	60	9	76	1.267	11/28/2022 10:43	11/22/2022 12:21	11/28/2022 8:26	0.987	0.772	1.000	1.057	79.6%	1.23%	
8	12D	60	7	58	0.967	11/28/2022 10:43	11/22/2022 12:21	11/28/2022 8:26	0.991	0.772	1.000	1.057	75.0%	1.25%	
9	10C	60	7	69	1.150	11/28/2022 10:44	11/22/2022 12:21	11/28/2022 8:26	0.991	0.771	1.000	1.057	75.4%	1.25%	
10	4B	60	12	62	1.033	11/28/2022 10:44	11/22/2022 12:21	11/28/2022 8:26	0.991	0.771	1.000	1.057	69.9%	1.28%	
11	5A	60	6	78	1.300	11/28/2022 10:44	11/22/2022 12:21	11/28/2022 8:26	0.991	0.771	1.000	1.057	81.5%	1.23%	
12	5D	60	6	67	1.117	11/28/2022 10:44	11/22/2022 12:21	11/28/2022 8:26	0.991	0.771	1.000	1.057	80.5%	1.23%	
13	8A	60	11	84	1.400	11/28/2022 10:44	11/22/2022 12:21	11/28/2022 8:26	0.991	0.771	1.000	1.057	79.5%	1.23%	
14	7D	60	10	49	0.817	11/28/2022 10:44	11/22/2022 12:21	11/28/2022 8:26	0.992	0.771	1.000	1.057	50.2%	1.41%	
15	7C	60	25	124	2.067	11/28/2022 10:44	11/22/2022 12:21	11/28/2022 8:26	0.992	0.771	1.000	1.057	81.5%	1.23%	
16	10D	60	9	68	1.133	11/28/2022 10:44	11/22/2022 12:21	11/28/2022 8:26	0.992	0.771	1.000	1.057	66.2%	1.30%	
17	3D	60	5	100	1.667	11/28/2022 10:44	11/22/2022 12:21	11/28/2022 8:26	0.992	0.770	1.000	1.057	76.9%	1.24%	
18	7A	60	4	50	0.833	11/28/2022 10:45	11/22/2022 12:21	11/28/2022 8:26	0.992	0.770	1.000	1.057	53.9%	1.38%	
19	14A	60	13	93	1.550	11/28/2022 10:43	11/22/2022 12:21	11/28/2022 8:26	0.992	0.772	1.000	1.057	76.7%	1.24%	
20	3B	60	13	36	0.600	11/28/2022 10:43	11/22/2022 12:21	11/28/2022 8:26	0.998	0.773	1.000	1.057	73.6%	1.26%	
21	6A	60	14	113	1.883	11/28/2022 10:43	11/22/2022 12:21	11/28/2022 8:26	0.991	0.773	1.000	1.057	86.3%	1.21%	
22	6C	60	11	896	14.933	11/28/2022 10:43	11/22/2022 12:21	11/28/2022 8:26	0.998	0.772	1.000	1.057	71.4%	1.27%	
23	13B	60	23	797	13.283	11/28/2022 10:43	11/22/2022 12:21	11/28/2022 8:26	0.998	0.773	1.000	1.057	68.9%	1.28%	

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2022	5/31/2023	0.5954	0.00773	0.760	11/26/2022 10:13	500
2	PIC	6/1/2022	5/31/2023	0.6348	0.01144	1.464	11/26/2022 10:13	500
3	PIC	6/1/2022	5/31/2023	0.6280	0.00851	1.210	11/26/2022 10:13	500
4	PIC	6/1/2022	5/31/2023	0.6349	0.00714	0.894	11/26/2022 10:13	500
5	PIC	6/1/2022	5/31/2023	0.6242	0.00657	0.456	11/26/2022 10:13	500
6	PIC	6/1/2022	5/31/2023	0.6366	0.00627	0.512	11/26/2022 10:14	500
7	PIC	6/1/2022	5/31/2023	0.6391	0.00738	0.936	11/26/2022 10:13	500
8	PIC	6/1/2022	5/31/2023	0.6310	0.01845	0.692	11/26/2022 10:13	500
9	PIC	6/1/2022	5/31/2023	0.6321	0.00638	0.732	11/26/2022 10:14	500
10	PIC	6/1/2022	5/31/2023	0.6400	0.01519	0.510	11/26/2022 10:13	500
11	PIC	6/1/2022	5/31/2023	0.6332	0.00851	0.988	11/26/2022 10:13	500
12	PIC	6/1/2022	5/31/2023	0.6236	0.00925	0.952	11/26/2022 10:13	500
13	PIC	6/1/2022	5/31/2023	0.6398	0.01579	0.974	11/26/2022 10:14	500
14	PIC	6/1/2022	5/31/2023	0.6270	0.01113	0.412	11/26/2022 10:14	500
15	PIC	6/1/2022	5/31/2023	0.6407	0.00790	1.226	11/26/2022 10:14	500
16	PIC	6/1/2022	5/31/2023	0.6148	0.00557	0.468	11/26/2022 10:14	500
17	PIC	6/1/2022	5/31/2023	0.5999	0.02297	0.742	11/26/2022 10:13	500
18	PIC	6/1/2022	5/31/2023	0.6257	0.00594	0.458	11/26/2022 10:14	500
19	PIC	6/1/2022	5/31/2023	0.6215	0.02119	0.730	11/26/2022 10:13	500
20	PIC	6/1/2022	5/31/2023	0.6245	0.01614	0.486	11/26/2022 10:13	500
21	PIC	6/1/2022	5/31/2023	0.6328	0.02228	1.334	11/26/2022 10:13	500
22	PIC	6/1/2022	5/31/2023	0.6123	0.01970	1.550	11/26/2022 10:14	500
23	PIC	6/1/2022	5/31/2023	0.6470	0.00967	1.712	11/26/2022 10:13	500

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A  
 Spike Exp Date : N/A  
 Spike Activity (dpm/ml): N/A  
 Spike Volume Added: N/A

\* - RPD changed to 0% due to sample & dup activity below MDA

LCS S/N : 1952-B  
 LCS Exp Date : 8/9/2023  
 LCS Activity (dpm/ml): 440.47  
 LCS Volume Added: 0.10

Results																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	Sample Act. MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	1.2448	0.8788	3	1.9819	<b>1.5250</b>	41.47%	0.3400	0.1409	1.2387	1.2961		SAMPLE				
2	1.4303	1.0098	3	2.2053	<b>2.1141</b>	33.74%	0.5693	0.1919	1.3965	1.4937		SAMPLE				
3	1.3885	0.9803	3	2.1588	<b>0.2908</b>	210.42%	0.0733	0.1543	1.1992	1.2014		SAMPLE				
4	1.2300	0.8684	3	1.9410	<b>1.1823</b>	50.71%	0.2893	0.1467	1.1747	1.2113		SAMPLE				
5	1.0973	0.7747	3	1.8047	<b>0.3097</b>	160.86%	0.0607	0.0976	0.9764	0.9794		SAMPLE				
6	0.9949	0.7024	3	1.6232	<b>0.6755</b>	71.24%	0.1547	0.1102	0.9431	0.9581		SAMPLE				
7	1.2618	0.8908	3	1.9865	<b>1.3547</b>	45.87%	0.3307	0.1516	1.2174	1.2636		SAMPLE				
8	1.1611	0.8197	3	1.8587	<b>1.2043</b>	48.21%	0.2747	0.1323	1.1366	1.1766		SAMPLE				
9	1.1827	0.8350	3	1.8871	<b>1.8151</b>	34.39%	0.4180	0.1436	1.2224	1.3040		SAMPLE				
10	1.0527	0.7432	3	1.7180	<b>2.4234</b>	25.88%	0.5233	0.1351	1.2259	1.3691		SAMPLE				
11	1.2665	0.8942	3	1.9885	<b>1.2488</b>	49.31%	0.3120	0.1538	1.2063	1.2461		SAMPLE				
12	1.2840	0.9065	3	2.0197	<b>0.6807</b>	87.00%	0.1647	0.1432	1.1605	1.1730		SAMPLE				
13	1.2753	0.9004	3	2.0038	<b>1.7293</b>	37.38%	0.4260	0.1590	1.2651	1.3378		SAMPLE				
14	1.3452	0.9498	3	2.2287	<b>2.6642</b>	29.74%	0.4047	0.1201	1.5503	1.6884		SAMPLE				
15	1.3993	0.9879	3	2.1743	<b>3.3373</b>	22.90%	0.8407	0.1921	1.4946	1.7120		SAMPLE				
16	1.1113	0.7846	3	1.8243	<b>3.3950</b>	21.21%	0.6653	0.1408	1.4082	1.6443		SAMPLE				
17	1.2278	0.8669	3	1.9576	<b>4.1403</b>	18.68%	0.9247	0.1711	1.5013	1.8324		SAMPLE				
18	1.3195	0.9315	3	2.1693	<b>2.2987</b>	32.45%	0.3753	0.1217	1.4606	1.5698		SAMPLE				
19	1.1800	0.8331	3	1.8830	<b>3.5574</b>	20.30%	0.8200	0.1652	1.4047	1.6686		SAMPLE				
20	0.9837	0.6945	3	1.6106	<b>0.5053</b>	91.91%	0.1140	0.1047	0.9100	0.9189		MB				
21	1.3823	0.9759	3	2.1399	<b>2.0653</b>	33.69%	0.5493	0.1845	1.3599	1.4571	599036001.1	DUP	*	0.0%		
22	1.8491	1.3055	3	2.8442	<b>62.4408</b>	4.42%	13.3833	0.5020	4.5904	16.4354		LCS			65.4584	95.4%
23	1.9046	1.3446	3	2.9179	<b>52.9100</b>	4.40%	11.5713	0.4741	4.2493	13.9191		LCSD	16.5%		65.4584	80.8%

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
598830001	4D	60	16	66	11/28/2022 10:43	11/28/2022 11:43	PIC	2343191
598830002	13D	60	12	122	11/28/2022 10:43	11/28/2022 11:43	PIC	2343191
598830003	6B	60	7	77	11/28/2022 10:43	11/28/2022 11:43	PIC	2343191
598830004	13A	60	11	71	11/28/2022 10:43	11/28/2022 11:43	PIC	2343191
598830005	5C	60	9	31	11/28/2022 10:43	11/28/2022 11:43	PIC	2343191
598903001	7B	60	11	40	11/28/2022 10:44	11/28/2022 11:44	PIC	2343191
598904001	14D	60	9	76	11/28/2022 10:43	11/28/2022 11:43	PIC	2343191
599036001	12D	60	7	58	11/28/2022 10:43	11/28/2022 11:43	PIC	2343191
599036002	10C	60	7	69	11/28/2022 10:44	11/28/2022 11:44	PIC	2343191
599036003	4B	60	12	62	11/28/2022 10:44	11/28/2022 11:44	PIC	2343191
599036004	5A	60	6	78	11/28/2022 10:44	11/28/2022 11:44	PIC	2343191
599036005	5D	60	6	67	11/28/2022 10:44	11/28/2022 11:44	PIC	2343191
599036006	8A	60	11	84	11/28/2022 10:44	11/28/2022 11:44	PIC	2343191
599904001	7D	60	10	49	11/28/2022 10:44	11/28/2022 11:44	PIC	2343191
599904002	7C	60	25	124	11/28/2022 10:44	11/28/2022 11:44	PIC	2343191
599904003	10D	60	9	68	11/28/2022 10:44	11/28/2022 11:44	PIC	2343191
599904004	3D	60	5	100	11/28/2022 10:44	11/28/2022 11:44	PIC	2343191
599904005	7A	60	4	50	11/28/2022 10:45	11/28/2022 11:45	PIC	2343191
599904006	14A	60	13	93	11/28/2022 10:43	11/28/2022 11:43	PIC	2343191
1205246234	3B	60	13	36	11/28/2022 10:43	11/28/2022 11:43	PIC	2343191
1205246235	6A	60	14	113	11/28/2022 10:43	11/28/2022 11:43	PIC	2343191
1205246236	6C	60	11	896	11/28/2022 10:43	11/28/2022 11:43	PIC	2343191
1205246237	13B	60	23	797	11/28/2022 10:43	11/28/2022 11:43	PIC	2343191

ASSAY 28-Nov-22 9:06:45  
 Wizard 2480 s/n 46190630  
 Protocol id 8 Ba-133  
 Time limit  
 Count limit  
 Isotope Ba-133  
 Protocol date 11/28/2022  
 Run id. 5874

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	93	1	180	3920	1306.45	1.6	09:06:45
598830001	2	93	2	180	3037	1012.16	1.81	77.47	09:09:59
598830002	3	93	3	180	3443.41	1147.58	1.7	87.84	09:13:12
598830003	4	93	4	180	3266	1088.43	1.75	83.31	09:16:27
598830004	5	93	5	180	3126.28	1041.87	1.79	79.75	09:19:41
598830005	1	1	1	180	2559.13	852.87	1.98	65.28	09:23:25
598903001	2	1	2	180	2933.85	977.71	1.85	74.84	09:26:39
598904001	3	1	3	180	3119.85	1039.86	1.79	79.59	09:29:53
599036001	4	1	4	180	2938	979.19	1.84	74.95	09:33:07
599036002	5	1	5	180	2954.85	984.67	1.84	75.37	09:36:21
599036003	1	6	1	180	2741.28	913.59	1.91	69.93	09:40:06
599036004	2	6	2	180	3196.28	1065.23	1.77	81.54	09:43:19
599036005	3	6	3	180	3154.57	1051.33	1.78	80.47	09:46:33
599036006	4	6	4	180	3116	1038.47	1.79	79.49	09:49:48
599904001	5	6	5	180	1967	655.53	2.25	50.18	09:53:01
599904002	1	5	1	180	3196.28	1065.36	1.77	81.55	09:56:46
599904003	2	5	2	180	2594	864.46	1.96	66.17	10:00:00
599904004	3	5	3	180	3015	1004.83	1.82	76.91	10:03:14
599904005	4	5	4	180	2113.28	704.29	2.18	53.91	10:06:28
599904006	5	5	5	180	3006.13	1001.83	1.82	76.68	10:09:42
1205246234	1	19	1	180	2887	962.15	1.86	73.65	10:13:26
1205246235	2	19	2	180	3383.28	1127.47	1.72	86.30	10:16:40
1205246236	3	19	3	180	2798.85	932.72	1.89	71.39	10:19:54
1205246237	4	19	4	180	2701.57	900.3	1.92	68.91	10:23:08

END OF ASSAY

# **Continuing Calibration Data**

# Gas Flow Proportional Counter Checks for 28-Nov-2022

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100E2	need 2nd	Alpha eff	28-Nov 07:07	5	9220	6589	9855	+1.83
LB4100E2	Above	Beta bkg	28-Nov 05:14	60	2.317	1.385	3.072	+0.31
LB4100F2	Below	Alpha eff	28-Nov 07:07	5	6114	6533	7372	-6.00
LB4100F2	Above	Alpha XTalk	28-Nov 07:07	5	0.389	0.318	0.366	+5.93
LB4100F2	Above	Beta bkg	28-Nov 05:15	60	25.967	1.173	1.833	+222.40
LB4100F3	Above	Alpha bkg	28-Nov 05:15	60	0.333	0.119	0.404	+1.51
LB4100G1	Above	Alpha XTalk	28-Nov 07:17	5	0.652	0.088	0.447	+6.43
LB4100G1	Above	Beta bkg	28-Nov 05:15	60	3384	0.380	1.675	+15,675.11
LB4100G1	need 2nd	Beta eff	28-Nov 07:25	5	17715	12880	18320	+2.33
LB4100G1	need 2nd	Beta XTalk	28-Nov 07:25	5	3.50E-4	1.53E-4	7.21E-4	-0.92
LB4100G3	Above	Alpha eff	28-Nov 07:18	5	7811	6620	7779	+3.17
LB4100G3	Below	Alpha XTalk	28-Nov 07:18	5	0.299	0.309	0.375	-3.90
LB4100H1	Above	Beta bkg	28-Nov 05:14	60	3.000	0.216	2.462	+4.44
PIC1A	Below	Alpha XTalk	28-Nov 07:49	5	0.199	0.223	0.327	-4.41
PIC1A	Above	Beta XTalk	28-Nov 06:31	5	0.055	-1.15E-2	0.019	+9.97
PIC2C	Above	Beta bkg	28-Nov 07:32	60	3.600	0.030	2.148	+7.11
PIC4A	Above	Alpha bkg	28-Nov 07:32	60	1.050	-5.84E-2	0.311	+15.00
PIC4C	Below	Alpha XTalk	28-Nov 09:05	5	0.258	0.259	0.285	-3.19
PIC5B	Above	Alpha bkg	28-Nov 06:36	5	12326	-1.21E-1	0.423	+135,971.86
PIC5B	Above	Beta bkg	28-Nov 06:36	5	3234	-4.30E-2	2.192	+8,678.46
PIC5B	Above	Beta XTalk	28-Nov 07:50	5	0.004	-4.40E-4	0.003	+4.21
PIC8B	Above	Alpha bkg	28-Nov 05:13	60	2.150	-1.16E-1	0.388	+24.02
PIC8B	Above	Beta bkg	28-Nov 05:13	60	2.300	-1.80E-1	2.341	+2.90
PIC8B	Above	Beta XTalk	28-Nov 06:51	5	0.001	2.00E-4	9.31E-4	+6.44
PIC8C	Above	Alpha bkg	28-Nov 05:13	60	0.550	-1.61E-2	0.410	+4.97
PIC8C	Above	Beta bkg	28-Nov 05:13	60	3.683	-2.96E-1	2.115	+6.90
PIC8D	Below	Alpha eff	28-Nov 07:57	5	0.00E+0	15020	17360	-41.51
PIC8D	Below	Alpha XTalk	28-Nov 07:57	5	0.00E+0	0.245	0.295	-32.18
PIC8D	Below	Beta eff	28-Nov 06:51	5	0.00E+0	40460	43520	-82.33
PIC11B	Above	Alpha bkg	28-Nov 07:38	60	0.367	-1.80E-1	0.522	+1.68
PIC11B	Above	Beta bkg	28-Nov 07:38	60	12.200	-2.97E-1	3.063	+19.32



PIC11B	need 2nd Beta	XTalk	28-Nov 07:03	5	3.86E-4	1.35E-4	5.61E-4	+0.54
PIC12A	Above	Beta bkg	28-Nov 07:38	60	8.917	-2.98E-1	2.649	+15.76
PIC12B	Above	Alpha bkg	28-Nov 07:38	60	2.767	-4.23E-2	0.379	+37.01
PIC12B	Above	Beta bkg	28-Nov 07:38	60	2.367	0.269	2.358	+3.02
PIC14B	Above	Alpha bkg	28-Nov 07:38	60	0.450	-1.08E-1	0.400	+3.59
PIC14B	Below	Alpha XTalk	28-Nov 06:58	5	0.277	0.279	0.316	-3.23
PIC14B	Above	Beta bkg	28-Nov 07:38	60	13.733	0.370	3.004	+27.44

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

G5400W1W	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
G5400W1X	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
G5400W1Y	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
G5400W1Z	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100A1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100A2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100A3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by  \_\_\_\_\_

Date 11/28/22 \_\_\_\_\_

GEL Laboratories LLC

# Runlogs

# Instrument Run Log

Instrument Type: GFPC

Batch ID: 2343191

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205246234	MB	JE1	PIC3B	NOV-28-22 10:43:15	DONE	25mm Filter	01-JUN-22 00:00
1205246237	LCSD	JE1	PIC13B	NOV-28-22 10:43:17	DONE	25mm Filter	01-JUN-22 00:00
598830002	SAMPLE	JE1	PIC13D	NOV-28-22 10:43:23	DONE	25mm Filter	01-JUN-22 00:00
1205246235	DUP	JE1	PIC6A	NOV-28-22 10:43:24	DONE	25mm Filter	01-JUN-22 00:00
1205246236	LCS	JE1	PIC6C	NOV-28-22 10:43:29	DONE	25mm Filter	01-JUN-22 00:00
598830004	SAMPLE	JE1	PIC13A	NOV-28-22 10:43:30	DONE	25mm Filter	01-JUN-22 00:00
598904001	SAMPLE	JE1	PIC14D	NOV-28-22 10:43:37	DONE	25mm Filter	01-JUN-22 00:00
598830001	SAMPLE	JE1	PIC4D	NOV-28-22 10:43:41	DONE	25mm Filter	01-JUN-22 00:00
599036001	SAMPLE	JE1	PIC12D	NOV-28-22 10:43:43	DONE	25mm Filter	01-JUN-22 00:00
598830003	SAMPLE	JE1	PIC6B	NOV-28-22 10:43:50	DONE	25mm Filter	01-JUN-22 00:00
599904006	SAMPLE	JE1	PIC14A	NOV-28-22 10:43:50	DONE	25mm Filter	01-JUN-22 00:00
598830005	SAMPLE	JE1	PIC5C	NOV-28-22 10:43:58	DONE	25mm Filter	01-JUN-22 00:00
598903001	SAMPLE	JE1	PIC7B	NOV-28-22 10:44:03	DONE	25mm Filter	01-JUN-22 00:00
599036002	SAMPLE	JE1	PIC10C	NOV-28-22 10:44:08	DONE	25mm Filter	01-JUN-22 00:00
599036003	SAMPLE	JE1	PIC4B	NOV-28-22 10:44:13	DONE	25mm Filter	01-JUN-22 00:00
599036004	SAMPLE	JE1	PIC5A	NOV-28-22 10:44:17	DONE	25mm Filter	01-JUN-22 00:00
599036005	SAMPLE	JE1	PIC5D	NOV-28-22 10:44:21	DONE	25mm Filter	01-JUN-22 00:00
599036006	SAMPLE	JE1	PIC8A	NOV-28-22 10:44:26	DONE	25mm Filter	01-JUN-22 00:00
599904001	SAMPLE	JE1	PIC7D	NOV-28-22 10:44:32	DONE	25mm Filter	01-JUN-22 00:00
599904002	SAMPLE	JE1	PIC7C	NOV-28-22 10:44:36	DONE	25mm Filter	01-JUN-22 00:00
599904003	SAMPLE	JE1	PIC10D	NOV-28-22 10:44:40	DONE	25mm Filter	01-JUN-22 00:00
599904004	SAMPLE	JE1	PIC3D	NOV-28-22 10:44:51	DONE	25mm Filter	01-JUN-22 00:00
599904005	SAMPLE	JE1	PIC7A	NOV-28-22 10:45:00	DONE	25mm Filter	01-JUN-22 00:00

# Lucas Cell Raw Data

# Batch 2343171 Check-list

This check-list was completed on 21-NOV-22 by Lauren Disher

This batch was reviewed by Gregory Ramsay on 29-NOV-22 and Lyndsey Pace on 29-NOV-22.

**Batch ID:**  
2343171

**Product:**  
LUC26RAL

**Description:** Lucas Cell Radium 226  
GL-RAD-A-008

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?			
4	Has an Aliquot Correction been completed for this batch?			
5	Have sample historical results been reviewed for this batch?			
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?			
7	Are any sample results more negative than 3xTPU?			
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?			
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?			
10	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?			
11	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?			
12	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?			
13	Has the method required detection limit been met?			
<b>Miscellaneous Information</b>				
14	Are sample-specific MDA/MDC calculated and reported?			

# Prep Logbook

## Radium-226 in Liquid

**Batch ID:** 2343171

**Analyst:** Lyndsey Pace (LXP1)

**Method:** EPA 903.1 Modified

**Lab SOP:** GL-RAD-A-008 REV# 15

**Instrument:** SP-C018367602

**Due Dates for Lab:** 26-NOV-2022

**Package:** 28-NOV-2022

**SDG:** 29-NOV-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205246200	Radium-226 SPIKE	1715-G	.1	mL
LCSD	1205246201	Radium-226 SPIKE	1715-G	.1	mL
MS	1205246199	Radium-226 SPIKE	1715-G	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	598830001	21-NOV-2022	1	501.51	501.51	11/25/22 08:47	104	11/29/22 05:55	11/29/22 09:21	6	32
2	598830002	21-NOV-2022	1	502.81	502.81	11/25/22 08:47	204	11/29/22 05:55	11/29/22 09:53	4	23
3	598830003	21-NOV-2022	1	500.71	500.71	11/25/22 08:47	303	11/29/22 05:55	11/29/22 09:53	1	12
4	598830004	21-NOV-2022	1	502.81	502.81	11/25/22 08:47	402	11/29/22 05:55	11/29/22 09:53	6	20
5	598830005	21-NOV-2022	1	502.91	502.91	11/25/22 08:47	506	11/29/22 05:55	11/29/22 09:21	1	30
6	598903001	21-NOV-2022	1	502.31	502.31	11/25/22 08:47	605	11/29/22 05:55	11/29/22 09:53	7	9
7	598904001	21-NOV-2022	1	500.71	500.71	11/25/22 08:47	704	11/29/22 05:55	11/29/22 09:53	5	19
8	599036001	21-NOV-2022	1	501.71	501.71	11/25/22 08:47	805	11/29/22 05:55	11/29/22 09:53	4	43
9	599036002	21-NOV-2022	1	501.31	501.31	11/25/22 08:47	106	11/29/22 06:24	11/29/22 09:53	3	16
10	599036003	21-NOV-2022	1	501.91	501.91	11/25/22 08:47	201	11/29/22 06:24	11/29/22 10:25	4	20
11	599036004	21-NOV-2022	1	502.71	502.71	11/25/22 08:47	302	11/29/22 06:24	11/29/22 10:25	1	8
12	599036005	21-NOV-2022	1	501.91	501.91	11/25/22 08:47	403	11/29/22 06:24	11/29/22 10:25	2	17
13	599036006	21-NOV-2022	1	501.31	501.31	11/25/22 08:47	503	11/29/22 06:24	11/29/22 09:53	1	27
14	599904001	21-NOV-2022	1	501.11	501.11	11/25/22 08:47	601	11/29/22 06:24	11/29/22 10:25	5	59
15	599904002	21-NOV-2022	1	500.51	500.51	11/25/22 08:47	703	11/29/22 06:24	11/29/22 10:25	5	54
16	599904003	21-NOV-2022	1	501.31	501.31	11/25/22 08:47	803	11/29/22 06:24	11/29/22 10:25	2	58
17	599904004	21-NOV-2022	1	500.71	500.71	11/25/22 08:47	102	11/29/22 06:55	11/29/22 10:25	1	62
18	599904005	21-NOV-2022	1	500.31	500.31	11/25/22 08:47	206	11/29/22 06:55	11/29/22 10:56	5	55
19	599904006	21-NOV-2022	1	502.61	502.61	11/25/22 08:47	308	11/29/22 06:55	11/29/22 10:56	6	75
20	1205246197 MB	21-NOV-2022	1		502.91	11/25/22 08:47	401	11/29/22 06:55	11/29/22 10:56	2	5
21	1205246198 DUP (599036001)	21-NOV-2022	1	500.91	500.91	11/25/22 08:47	501	11/29/22 06:55	11/29/22 10:25	3	46
22	1205246199 MS (599036001)	21-NOV-2022	1	100.21	100.21	11/25/22 08:47	608	11/29/22 06:55	11/29/22 10:56	4	631
23	1205246200 LCS	21-NOV-2022	1		502.91	11/25/22 08:47	707	11/29/22 06:55	11/29/22 10:56	6	614
24	1205246201 LCSD	21-NOV-2022	1		502.91	11/25/22 08:47	804	11/29/22 06:55	11/29/22 10:56	6	695

Reagent/Solvent Lot ID	Description	Amount	Comments:
			Data Entry Date2: 21-NOV-2022 00:00

### Radium-226 Liquid

Filename : RA226.XLS  
 File type : Excel  
 Version # : 1.3.2

Procedure Code : LUC26RAL  
 Parmname : Radium-226  
 Required MDA : 1 pCi/L  
 Halflife of Ra-226 : 1600 years  
 Ra-226 Abundance : 1.00  
 Halflife of Rn-222 : 3.8235 days

Batch : 2343171  
 Analyst : LIN01615  
 Prep Date : 11/21/2022  
 Ra-226 Method Uncertainty : 0.073648

Batch counted on : LUCAS CELL DETECTOR  
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Count Time (min.)	Cell Efficiency (cpm/dpm)
1	598830001.1	0.5015	2.0262E-05	10/26/2022 10:42	104	30	32	1.067	6	0.200	30	1.6160
2	598830002.1	0.5028	2.0267E-05	10/26/2022 13:24	204	30	23	0.767	4	0.133	30	1.8470
3	598830003.1	0.5007	2.0259E-05	10/26/2022 12:51	303	30	12	0.400	1	0.033	30	1.7210
4	598830004.1	0.5028	2.0267E-05	10/26/2022 10:42	402	30	20	0.667	6	0.200	30	1.4480
5	598830005.1	0.5029	2.0268E-05	10/26/2022 8:45	506	30	30	1.000	1	0.033	30	1.7710
6	598903001.1	0.5023	2.0265E-05	10/18/2022 11:00	605	30	9	0.300	7	0.233	30	1.9020
7	598904001.1	0.5007	2.0259E-05	10/18/2022 9:28	704	30	19	0.633	5	0.167	30	1.5870
8	599036001.1	0.5017	2.0263E-05	10/31/2022 10:13	805	30	43	1.433	4	0.133	30	1.9080
9	599036002.1	0.5013	2.0261E-05	10/31/2022 11:27	106	30	16	0.533	3	0.100	30	1.6990
10	599036003.1	0.5019	2.0264E-05	10/31/2022 11:32	201	30	20	0.667	4	0.133	30	1.7110
11	599036004.1	0.5027	2.0267E-05	10/31/2022 12:40	302	30	8	0.267	1	0.033	30	1.7980
12	599036005.1	0.5019	2.0264E-05	10/31/2022 13:42	403	30	17	0.567	2	0.067	30	1.6200
13	599036006.1	0.5013	2.0261E-05	10/31/2022 14:32	503	30	27	0.900	1	0.033	30	2.1390
14	599904001.1	0.5011	2.0260E-05	11/3/2022 8:50	601	30	59	1.967	5	0.167	30	1.7610
15	599904002.1	0.5005	2.0258E-05	11/3/2022 9:57	703	30	54	1.800	5	0.167	30	1.6440
16	599904003.1	0.5013	2.0261E-05	11/3/2022 10:45	803	30	58	1.933	2	0.067	30	2.0020
17	599904004.1	0.5007	2.0259E-05	11/3/2022 12:24	102	30	62	2.067	1	0.033	30	1.5820
18	599904005.1	0.5003	2.0257E-05	11/3/2022 13:25	206	30	55	1.833	5	0.167	30	1.8770
19	599904006.1	0.5026	2.0267E-05	11/3/2022 14:20	308	30	75	2.500	6	0.200	30	1.5970
20	1205246197.1	0.5029	2.0268E-05	11/21/2022 0:00	401	30	5	0.167	2	0.067	30	1.6120
21	1205246198.1	0.5009	2.0260E-05	10/31/2022 10:13	501	30	46	1.533	3	0.100	30	1.8220
22	1205246199.1	0.1002	1.1383E-05	10/31/2022 10:13	608	30	631	21.033	4	0.133	30	1.7970
23	1205246200.1	0.5029	2.0268E-05	11/21/2022 0:00	707	30	614	20.467	6	0.200	30	1.7280
24	1205246201.1	0.5029	2.0268E-05	11/21/2022 0:00	804	30	695	23.167	6	0.200	30	1.9050

Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008  
 Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrow End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
2.000%	4/28/2022	4/30/2023	11/25/2022 8:47	11/29/2022 5:55	11/29/2022 9:21	0.505	0.974	1.002	1.000
7.400%	8/1/2022	7/31/2023	11/25/2022 8:47	11/29/2022 5:55	11/29/2022 9:53	0.505	0.970	1.002	1.000
7.400%	10/25/2022	10/31/2023	11/25/2022 8:47	11/29/2022 5:55	11/29/2022 9:53	0.505	0.970	1.002	1.000
2.300%	2/1/2022	1/31/2023	11/25/2022 8:47	11/29/2022 5:55	11/29/2022 9:53	0.505	0.970	1.002	1.000
5.300%	6/1/2022	5/31/2023	11/25/2022 8:47	11/29/2022 5:55	11/29/2022 9:21	0.505	0.974	1.002	1.000
7.500%	7/1/2022	6/30/2023	11/25/2022 8:47	11/29/2022 5:55	11/29/2022 9:53	0.505	0.970	1.002	1.000
4.200%	11/1/2022	10/31/2023	11/25/2022 8:47	11/29/2022 5:55	11/29/2022 9:53	0.505	0.970	1.002	1.000
7.400%	4/1/2022	3/31/2023	11/25/2022 8:47	11/29/2022 5:55	11/29/2022 9:53	0.505	0.970	1.002	1.000
8.800%	4/28/2022	4/30/2023	11/25/2022 8:47	11/29/2022 6:24	11/29/2022 9:53	0.507	0.974	1.002	1.000
8.900%	8/1/2022	7/31/2023	11/25/2022 8:47	11/29/2022 6:24	11/29/2022 10:25	0.507	0.970	1.002	1.000
3.300%	10/25/2022	10/31/2023	11/25/2022 8:47	11/29/2022 6:24	11/29/2022 10:25	0.507	0.970	1.002	1.000
9.700%	2/1/2022	1/31/2023	11/25/2022 8:47	11/29/2022 6:24	11/29/2022 10:25	0.507	0.970	1.002	1.000
5.000%	6/1/2022	5/31/2023	11/25/2022 8:47	11/29/2022 6:24	11/29/2022 9:53	0.507	0.974	1.002	1.000
9.400%	7/1/2022	6/30/2023	11/25/2022 8:47	11/29/2022 6:24	11/29/2022 10:25	0.507	0.970	1.002	1.000
9.000%	11/1/2022	10/31/2023	11/25/2022 8:47	11/29/2022 6:24	11/29/2022 10:25	0.507	0.970	1.002	1.000
7.300%	4/1/2022	3/31/2023	11/25/2022 8:47	11/29/2022 6:24	11/29/2022 10:25	0.507	0.970	1.002	1.000
6.300%	4/28/2022	4/30/2023	11/25/2022 8:47	11/29/2022 6:55	11/29/2022 10:25	0.509	0.974	1.002	1.000
2.800%	8/1/2022	7/31/2023	11/25/2022 8:47	11/29/2022 6:55	11/29/2022 10:56	0.509	0.970	1.002	1.000
9.600%	10/25/2022	10/31/2023	11/25/2022 8:47	11/29/2022 6:55	11/29/2022 10:56	0.509	0.970	1.002	1.000
8.100%	2/1/2022	1/31/2023	11/25/2022 8:47	11/29/2022 6:55	11/29/2022 10:56	0.509	0.970	1.002	1.000
7.900%	6/1/2022	5/31/2023	11/25/2022 8:47	11/29/2022 6:55	11/29/2022 10:25	0.509	0.974	1.002	1.000
6.300%	7/1/2022	6/30/2023	11/25/2022 8:47	11/29/2022 6:55	11/29/2022 10:56	0.509	0.970	1.002	1.000
2.200%	11/1/2022	10/31/2023	11/25/2022 8:47	11/29/2022 6:55	11/29/2022 10:56	0.509	0.970	1.002	1.000
9.900%	4/1/2022	3/31/2023	11/25/2022 8:47	11/29/2022 6:55	11/29/2022 10:56	0.509	0.970	1.002	1.000



Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

**Spike S/N :** 1715-G  
**Spike Exp Date :** 9/8/2023  
**Spike Activity (dpm/ml):** 297.47  
**Spike Volume Added:** 0.10

**LCS S/N :** 1715-G  
**LCS Exp Date :** 9/8/2023  
**LCS Activity (dpm/ml):** 297.47  
**LCS Volume Added:** 0.10

<b>Results</b>																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.3044	0.2149	1	0.5429	<b>0.9805</b>	23.79%	0.8667	0.2055	0.4557	0.4787		SAMPLE				
2	0.2178	0.1537	1	0.4066	<b>0.6278</b>	28.33%	0.6333	0.1732	0.3365	0.3602		SAMPLE				
3	0.1173	0.0828	1	0.2725	<b>0.3917</b>	33.60%	0.3667	0.1202	0.2517	0.2641		SAMPLE				
4	0.3402	0.2402	1	0.6068	<b>0.5901</b>	36.49%	0.4667	0.1700	0.4212	0.4306		SAMPLE				
5	0.1131	0.0798	1	0.2626	<b>0.9952</b>	19.92%	0.9667	0.1856	0.3745	0.4142		SAMPLE				
6	0.2800	0.1977	1	0.4918	<b>0.0642</b>	200.14%	0.0667	0.1333	0.2518	0.2522		SAMPLE				
7	0.2845	0.2009	1	0.5176	<b>0.5407</b>	35.24%	0.4667	0.1633	0.3708	0.3815		SAMPLE				
8	0.2113	0.1492	1	0.3945	<b>1.2502</b>	19.07%	1.3000	0.2285	0.4308	0.5010		SAMPLE				
9	0.2042	0.1441	1	0.3956	<b>0.4650</b>	34.67%	0.4333	0.1453	0.3056	0.3230		SAMPLE				
10	0.2347	0.1657	1	0.4383	<b>0.5699</b>	31.89%	0.5333	0.1633	0.3420	0.3656		SAMPLE				
11	0.1115	0.0787	1	0.2590	<b>0.2369</b>	42.98%	0.2333	0.1000	0.1990	0.2025		SAMPLE				
12	0.1753	0.1238	1	0.3604	<b>0.5643</b>	30.64%	0.5000	0.1453	0.3214	0.3485		SAMPLE				
13	0.0936	0.0661	1	0.2174	<b>0.7387</b>	20.96%	0.8667	0.1764	0.2947	0.3216		SAMPLE				
14	0.2554	0.1803	1	0.4646	<b>1.8719</b>	17.55%	1.8000	0.2667	0.5435	0.6981		SAMPLE				
15	0.2739	0.1934	1	0.4983	<b>1.8216</b>	18.08%	1.6333	0.2560	0.5597	0.6969		SAMPLE				
16	0.1420	0.1003	1	0.2920	<b>1.7068</b>	15.64%	1.8667	0.2582	0.4627	0.5783		SAMPLE				
17	0.1263	0.0891	1	0.2933	<b>2.3376</b>	14.46%	2.0333	0.2646	0.5962	0.7434		SAMPLE				
18	0.2391	0.1688	1	0.4350	<b>1.6225</b>	15.74%	1.6667	0.2582	0.4927	0.5527		SAMPLE				
19	0.3064	0.2163	1	0.5466	<b>2.6196</b>	16.20%	2.3000	0.3000	0.6697	0.9135		SAMPLE				
20	0.1752	0.1237	1	0.3601	<b>0.1128</b>	88.56%	0.1000	0.0882	0.1949	0.1964		MB				
21	0.1898	0.1340	1	0.3678	<b>1.4302</b>	18.09%	1.4333	0.2333	0.4563	0.5476	599036001.1	DUP	13.4%			
22	1.1152	0.7874	1	2.0824	<b>106.1054</b>	7.47%	20.9000	0.8400	8.3582	21.8199	599036001.1	MS			133.7172	78.4%
23	0.2830	0.1998	1	0.5048	<b>21.3200</b>	4.65%	20.2667	0.8300	1.7113	3.6394		LCS			26.6439	80.0%
24	0.2567	0.1813	1	0.4579	<b>21.9156</b>	10.62%	22.9667	0.8825	1.6506	5.5512		LCSD	2.8%		26.6439	82.3%

# **Continuing Calibration Data**



# Ludlum Alpha Scintillation Counter Checks for 29-NOV-2022

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	07:31	1	1.22E+05	122068	-0.42		
LUCAS2	EFF	07:29	1	1.34E+05	133934	0.18		
LUCAS3	EFF	07:27	1	1.16E+05	115802	-2.28		
LUCAS4	EFF	07:26	1	1.28E+05	127730	-0.26		
LUCAS5	EFF	07:25	1	1.33E+05	133184	1.32		
LUCAS6	EFF	07:24	1	1.31E+05	130940	-0.39		
LUCAS7	EFF	07:23	1	1.32E+05	131586	-1.1		
LUCAS8	EFF	07:21	1	1.32E+05	132123	0.52		

**Reviewed by:**

Lyndsey Pace

**Date:** 29-NOV-22

GEL Laboratories LLC

# Runlogs

# Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2343171

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
598830001	SAMPLE	LXP1	LUCAS1	NOV-29-22 09:21:00	DONE	Lucas Cell	28-APR-22 00:00
598830005	SAMPLE	LXP1	LUCAS5	NOV-29-22 09:21:00	DONE	Lucas Cell	01-JUN-22 00:00
598830002	SAMPLE	LXP1	LUCAS2	NOV-29-22 09:53:00	DONE	Lucas Cell	01-AUG-22 00:00
598830003	SAMPLE	LXP1	LUCAS3	NOV-29-22 09:53:00	DONE	Lucas Cell	25-OCT-22 00:00
598830004	SAMPLE	LXP1	LUCAS4	NOV-29-22 09:53:00	DONE	Lucas Cell	01-FEB-22 00:00
598903001	SAMPLE	LXP1	LUCAS6	NOV-29-22 09:53:00	DONE	Lucas Cell	01-JUL-22 00:00
598904001	SAMPLE	LXP1	LUCAS7	NOV-29-22 09:53:00	DONE	Lucas Cell	01-NOV-22 00:00
599036001	SAMPLE	LXP1	LUCAS8	NOV-29-22 09:53:00	DONE	Lucas Cell	01-APR-22 00:00
599036002	SAMPLE	LXP1	LUCAS1	NOV-29-22 09:53:00	DONE	Lucas Cell	28-APR-22 00:00
599036006	SAMPLE	LXP1	LUCAS5	NOV-29-22 09:53:00	DONE	Lucas Cell	01-JUN-22 00:00
599036003	SAMPLE	LXP1	LUCAS2	NOV-29-22 10:25:00	DONE	Lucas Cell	01-AUG-22 00:00
599036004	SAMPLE	LXP1	LUCAS3	NOV-29-22 10:25:00	DONE	Lucas Cell	25-OCT-22 00:00
599036005	SAMPLE	LXP1	LUCAS4	NOV-29-22 10:25:00	DONE	Lucas Cell	01-FEB-22 00:00
599904001	SAMPLE	LXP1	LUCAS6	NOV-29-22 10:25:00	DONE	Lucas Cell	01-JUL-22 00:00
599904002	SAMPLE	LXP1	LUCAS7	NOV-29-22 10:25:00	DONE	Lucas Cell	01-NOV-22 00:00
599904003	SAMPLE	LXP1	LUCAS8	NOV-29-22 10:25:00	DONE	Lucas Cell	01-APR-22 00:00
599904004	SAMPLE	LXP1	LUCAS1	NOV-29-22 10:25:00	DONE	Lucas Cell	28-APR-22 00:00
1205246198	DUP	LXP1	LUCAS5	NOV-29-22 10:25:00	DONE	Lucas Cell	01-JUN-22 00:00
599904005	SAMPLE	LXP1	LUCAS2	NOV-29-22 10:56:00	DONE	Lucas Cell	01-AUG-22 00:00
599904006	SAMPLE	LXP1	LUCAS3	NOV-29-22 10:56:00	DONE	Lucas Cell	25-OCT-22 00:00
1205246197	MB	LXP1	LUCAS4	NOV-29-22 10:56:00	DONE	Lucas Cell	01-FEB-22 00:00
1205246199	MS	LXP1	LUCAS6	NOV-29-22 10:56:00	DONE	Lucas Cell	01-JUL-22 00:00
1205246200	LCS	LXP1	LUCAS7	NOV-29-22 10:56:00	DONE	Lucas Cell	01-NOV-22 00:00
1205246201	LCSD	LXP1	LUCAS8	NOV-29-22 10:56:00	DONE	Lucas Cell	01-APR-22 00:00



Environmental Laboratory  
 1232 Haco Drive  
 Lansing  
 Michigan, 48910

CHAIN OF CUSTODY

Page 1 of 1

Phone: (517)702-6372

Lab Work Order Number L210250

Client Name BWL - Erickson Station		Project Name Erickson AM MI Wells 11-13		Requested Analyses						Requested Turn Around	
Client Contact Cheryl Louden		Project Number [none]		Ag:: As:: B:: Ba:: Be:: Ca:: Cd:: Cr:: Co:: Cu:: Fe:: Hg:: Li:: Mo:: Ni:: Pb:: Sb:: Se:: Tl:: V:: Zn:: Mg:: Na:: K	TSS, HCO3, CO3, T. Hardness	Cl-IC:: F-ISE:: SO4:: TDS	Radium 226 and Radium 228	Metals Dissolved (same metals as total)	Rush requests subject to additional charge.		
Address 3725 S. Canal		Project Description							Rush requests subject to lab approval.		
City Lansing		PO Number 30926 10021									
State/Zip MI, 48917		Shipped By									
Phone (517) 702-6396	Fax (517) 702-6373	Tracking Number									
Sampler Marc Wahrer											

Sample Name or Field ID	Sampled Date	Sampled Time	Sample Type Grab/Composite	Matrix Code	Container Count	Preservation Code					Sample	Comments
						b	a	a	b	a		
MW-11	10/26/02	1042	G	GW	5	1	1	1	2	0		
MW-12	↓	1324	G	GW	6	1	1	1	2	1		
MW-13	↓	1251	G	GW	5	1	1	1	2	0		
Field Duplicate MW11	↓	1042	G	GW	5	1	1	1	2	0		
Field Blank	↓	0845	G	DI	5	1	1	1	2	0		

Relinquished By 	Date/Time 10/26/02 1455	Received By J. Caporale	Date/Time 10/26/02 1455	Comments
Relinquished By	Date/Time	Received By	Date/Time	
Relinquished By	Date/Time	Received By	Date/Time	
Cooler Numbers and Temperatures				

Matrix Codes: DI=Deionized Water, GW=Ground Water      Preserv. Codes: a=None, b=0.5% HNO3



## Data Verification & Validation Report

### Lansing Board of Water & Light – Erickson Power Station

**Sampling Event (dates and purpose):** New Wells 11-13 – Background Round 8 – October 2022

Data Package Number: S41869.01

Lab Report Date: 12/27/2022

Data Validator: Aryka Thomson

Data Validation Completion Date: 01/01/2023

General Overall Assessment:

Data are usable without qualification.

Data are usable with qualification (as noted below).

Some or all data are unusable (as noted below).

Wells planned for sampling:

Well ID	Planned for Sampling
MW-1	
MW-2	
MW-3	
MW-4	
MW-5	
MW-6	
MW-7	
MW-7B	
MW-7C	
MW-8	
MW-9	
MW-10	
MW-11	X
MW-11B	
MW-12	X
MW-12B	
MW-13	X

### Data Summary

Sample ID	Matrix	Lab ID	Date Collected	App III Metals	App IV Metals	Part 115 Metals	Anions	TDS TSS	Rad-226 Rad-228	Diss. Metals
MW-11	GW	S41869.01	10/26/2022	X	X	X	X	X	X	
MW-12	GW	S41869.02	10/26/2022	X	X	X	X	X	X	X
MW-13	GW	S41869.03	10/26/2022	X	X	X	X	X	X	
MW-11 Dup	QC	S41869.04	10/26/2022	X	X	X	X	X	X	

Other analytes requested for analysis: Na, Mg, K, HCO<sub>3</sub>, CO<sub>3</sub>, hardness

Any planned sampling or analysis NOT completed? If yes, explain: \_\_\_\_\_

### Data Verification & Validation Checklist

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
<b>Field Data</b>							
Sample Collection Field Forms	X		Purging performed as required in the Groundwater Monitoring Plan		X		MW-12 turbidity > 10 NTU; collected additional container for dissolved metals
Field Calibration Records	X		Field instruments calibrated daily according to manufacturer specifications	X			
Chain of Custody	X		Accurately reflect samples, collection dates/times, analyses, bottles, etc.	X			
Field decontamination documentation	N/A		Record of decontamination for non-dedicated sampling equipment			X	
Drilling logs	X		N/A	-	-	-	
Well construction logs	X		N/A	-	-	-	
Well development field forms	X		N/A	-	-	-	
<b>Analytical Data Package</b>							
Cover Sheet	X		N/A	-	-	-	
Case Narrative	X		Summarizes sample receipt and any exceptions to QC acceptance criteria	X			
Internal Laboratory Chain of Custody forms	X		Analyses as requested; accurate transcription of field COC	X			
Sample Chronology and Consistency	X		Accurate representation of dates, times of receipt, preparation, and analysis	X			
Communication Records with Lab	X		N/A	-	-	-	
EDD Format Consistency	X		EDD format and content as requested	X			
Sample Identification, Results Nomenclature, and Data Qualifier Consistency	X		All included in final report	X			
Method Detection Limit Consistency	X		MDLs consistent between samples		X		Dilutions vary between samples
Instrument Calibration Records	X		Present and no nonconformance noted	X			
Laboratory Report Complete	X		Includes QC component	X			
Holding Times	X		Analyses performed within allowed holding time	X			



Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Method	X		Method as requested	X			
Reporting Limits	X		RLs as requested	X			RLs for chloride, sulfate, and TDS were not met
			MDLs<RLs	X			
			MDLs<GPS			X	
<b>QC Validation</b>							
<b>Evaluate Accuracy</b>							
Matrix Spike (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Laboratory Control Sample (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
<b>Evaluate Precision</b>							
Matrix Spike Duplicate (RPD)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Field Duplicate (RPD)	X		RPD ≤ 20%		X		Zinc RPD is 50% Nickel is detected in the parent and non-detect in the field duplicate
<b>Evaluate Representativeness</b>							
Equipment Blanks (if applicable)	N/A		Non-detect (<RL)			X	
<b>QC Verification</b>							
<b>Verify Instrument Calibration &amp; Analytical Process</b>							
Initial Calibration Verification	X		Laboratory-determined	-	-	-	
Continuing Calibration Verification	X		Laboratory-determined	-	-	-	
Initial Calibration Blank	X		Laboratory-determined	-	-	-	
Continuing Calibration Blank	X		Laboratory-determined	-	-	-	
Serial Dilutions	X		Laboratory-determined	-	-	-	High recovery for Al, Ni, and Zn
Post-Digestion Spikes	X		Laboratory-determined	-	-	-	
Internal Standards	X		Laboratory-determined	-	-	-	
Laboratory Duplicate (RPD)	X		Laboratory-determined	-	-	-	
Method Blanks	X		Laboratory-determined	-	-	-	
<b>Evaluate Completeness (# usable measurements/ # unusable measurements)</b>							
Completeness	X		100%	X			

Other instances of nonconformance to QC control limits noted on case narrative: None

Comments:

Zinc field duplicate RPD is 50%. Zinc required qualification as estimated with high bias (J+) in the parent sample MW-11 and as estimated with low bias (J-) in the field duplicate MW-11-Dup.

Nickel required qualification as estimated with high bias (J+) in the parent sample MW-11 and as estimated but not detected (UJ) in the field duplicate MW-11-Dup.



Report ID: S42439.01(02)  
Generated on 12/15/2022  
Replaces report S42439.01(01) generated on 11/14/2022

**Report to**  
Attention: Jennifer Caporale  
Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901  
  
Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

**Report produced by**  
Merit Laboratories, Inc.  
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Contacts for report questions:  
John Lavery (johnlavery@meritlabs.com)  
Barbara Ball (bball@meritlabs.com)

**Report Summary**

Lab Sample ID(s): S42439.01-S42439.05  
Project: Erickson AM MI New Wells 7B, 7C & 12B  
Collected Date(s): 11/10/2022  
Submitted Date/Time: 11/10/2022 15:30  
Sampled by: Marc Wahrer  
P.O. #:

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- Method Summary (Page 4)
- Sample Summary (Page 5)

Maya Murshak  
Technical Director



## General Report Notes

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Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile, and 2-chloroethylvinyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (\*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

## Report Narrative

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All analyses completed



Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Alaska CSLAP	#17-001
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



## Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1 (1993)
SM2320B	Standard Method 2320 B 2011
SM2340C	Standard Method 2340 C 2011
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007



## Sample Summary (5 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S42439.01	MW-7B L211175-01	Groundwater	11/10/22 11:43
S42439.02	MW-7C L211175-02	Groundwater	11/10/22 13:09
S42439.03	MW-12B L211175-03	Groundwater	11/10/22 09:44
S42439.04	Field Dupe MW-12B L211175-04	Groundwater	11/10/22 09:44
S42439.05	Field Blank L211175-05	Water	11/10/22 08:40



# Analytical Laboratory Report

Final Report

Lab Sample ID: S42439.01

Sample Tag: MW-7B L211175-01

Collected Date/Time: 11/10/2022 11:43

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.1	IR
2	1L Plastic	None	Yes	2.1	IR
1	125ml Plastic	HNO3	Yes	2.1	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	11/14/22 13:13	CTV	
Metal Digestion	Completed	SW3015A	11/11/22 10:00	CCM	

### Inorganics

Method: E300.0, Run Date: 11/11/22 09:00, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 11/14/22 12:22, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	400	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 11/14/22 11:08, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	29	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 11/14/22 21:15, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	368	50	10	mg/L	2		

Method: SM2540D, Run Date: 11/11/22 15:51, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 11/11/22 11:39, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.008	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	2.94	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.07	0.02	0.00192	mg/L	5	7439-89-6	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S42439.01 (continued)

Sample Tag: MW-7B L211175-01

**Method: E200.8, Run Date: 11/11/22 11:39, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.032	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 11/11/22 13:31, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	9.24	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	2.78	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	5.85	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	137	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 11/14/22 15:33, Analyst: CTV**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 12/14/22 12:08, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.





# Analytical Laboratory Report

Lab Sample ID: S42439.02

Sample Tag: MW-7C L211175-02

Collected Date/Time: 11/10/2022 13:09

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.1	IR
2	1L Plastic	None	Yes	2.1	IR
1	125ml Plastic	HNO3	Yes	2.1	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	11/14/22 13:13	CTV	
Metal Digestion	Completed	SW3015A	11/11/22 10:00	CCM	

### Inorganics

Method: E300.0, Run Date: 11/11/22 09:13, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	

Method: E300.0, Run Date: 11/11/22 10:04, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	92	50	0.80	mg/L	50	16887-00-6	
Sulfate	685	50	3.0	mg/L	50	14808-79-8	

Method: SM2320B, Run Date: 11/14/22 12:24, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	150	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 11/14/22 11:12, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	754	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 11/14/22 21:15, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	1,360	50	10	mg/L	2		

Method: SM2540D, Run Date: 11/11/22 15:51, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	6	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 11/11/22 11:46, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.005	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.044	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	6.62	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	0.0009	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	



# Analytical Laboratory Report

Lab Sample ID: S42439.02 (continued)

Sample Tag: MW-7C L211175-02

**Method: E200.8, Run Date: 11/11/22 11:46, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	4.11	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.125	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.415	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	0.007	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 11/11/22 13:33, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	243	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	41.0	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	5.96	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	98.7	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 11/14/22 15:49, Analyst: CTV**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 12/14/22 12:08, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Final Report

Lab Sample ID: S42439.03

Sample Tag: MW-12B L211175-03

Collected Date/Time: 11/10/2022 09:44

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.1	IR
2	1L Plastic	None	Yes	2.1	IR
1	125ml Plastic	HNO3	Yes	2.1	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	11/14/22 13:13	CTV	
Metal Digestion	Completed	SW3015A	11/11/22 10:00	CCM	

### Inorganics

Method: E300.0, Run Date: 11/11/22 09:26, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 11/14/22 12:26, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	390	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 11/14/22 11:14, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	96	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 11/14/22 21:15, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	358	50	10	mg/L	2		

Method: SM2540D, Run Date: 11/11/22 15:51, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 11/11/22 11:53, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.025	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	3.35	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.31	0.02	0.00192	mg/L	5	7439-89-6	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S42439.03 (continued)

Sample Tag: MW-12B L211175-03

**Method: E200.8, Run Date: 11/11/22 11:53, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.040	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 11/11/22 13:35, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	25.7	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	8.20	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	8.19	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	109	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 11/14/22 15:52, Analyst: CTV**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 12/14/22 12:08, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Final Report

Lab Sample ID: S42439.04

Sample Tag: Field Dupe MW-12B L211175-04

Collected Date/Time: 11/10/2022 09:44

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.1	IR
2	1L Plastic	None	Yes	2.1	IR
1	125ml Plastic	HNO3	Yes	2.1	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	11/14/22 13:13	CTV	
Metal Digestion	Completed	SW3015A	11/11/22 10:00	CCM	

### Inorganics

Method: E300.0, Run Date: 11/11/22 09:38, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 11/14/22 12:28, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	390	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 11/14/22 11:20, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	96	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 11/14/22 21:15, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	356	50	10	mg/L	2		

Method: SM2540D, Run Date: 11/11/22 15:51, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 11/11/22 11:56, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.025	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	3.19	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.30	0.02	0.00192	mg/L	5	7439-89-6	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S42439.04 (continued)

Sample Tag: Field Dupe MW-12B L211175-04

**Method: E200.8, Run Date: 11/11/22 11:56, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.037	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 11/11/22 13:36, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	26.2	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	8.15	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	8.15	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	110	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 11/14/22 15:56, Analyst: CTV**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 12/14/22 12:08, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Final Report

Lab Sample ID: S42439.05

Sample Tag: Field Blank L211175-05

Collected Date/Time: 11/10/2022 08:40

Matrix: Water

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.1	IR
2	1L Plastic	None	Yes	2.1	IR
1	125ml Plastic	HNO3	Yes	2.1	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	11/14/22 13:13	CTV	
Metal Digestion	Completed	SW3015A	11/11/22 10:00	CCM	

### Inorganics

Method: E300.0, Run Date: 11/11/22 09:51, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	2.5	0.04	mg/L	2.5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.06	mg/L	2.5	16984-48-8	
Sulfate	Not detected	2.5	0.15	mg/L	2.5	14808-79-8	

Method: SM2320B, Run Date: 11/14/22 12:30, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	Not detected	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 11/14/22 11:22, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	Not detected	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 11/14/22 21:15, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	Not detected	50	10	mg/L	2		

Method: SM2540D, Run Date: 11/11/22 15:51, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 11/11/22 11:34, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00102	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.000102	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.0000648	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.0000862	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.000702	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.0000760	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.0000386	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.0000434	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000150	mg/L	2	7440-50-8	
Iron	Not detected	0.02	0.000768	mg/L	2	7439-89-6	



# Analytical Laboratory Report

Final Report

Lab Sample ID: S42439.05 (continued)

Sample Tag: Field Blank L211175-05

**Method: E200.8, Run Date: 11/11/22 11:34, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.0000760	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000654	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.0000868	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000100	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.000838	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.0000270	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.0000342	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.0000558	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.000292	mg/L	2	7440-66-6	

**Method: E200.8, Run Date: 11/11/22 13:30, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.0174	mg/L	2	7440-70-2	
Magnesium	Not detected	0.50	0.00480	mg/L	2	7439-95-4	
Potassium	Not detected	0.50	0.00920	mg/L	2	7440-09-7	
Sodium	Not detected	0.50	0.00340	mg/L	2	7440-23-5	

**Method: E245.1, Run Date: 11/14/22 15:59, Analyst: CTV**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 12/14/22 12:08, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Merit Laboratories Login Checklist

Lab Set ID:S42439

Client:BWL01 (Board of Water & Light)

Project: Erickson AM MI New Wells 7B, 7C & 12B

Submitted: 11/10/2022 15:30 Login User: MMC

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental\_Laboratory@LBWL.com

Selection	Description	Note
-----------	-------------	------

## Sample Receiving

- |     |  |  |
|-----|--|--|
| 01. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples are received at 4C +/- 2C Thermometer # IR 2.1 |
| 02. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Received on ice/ cooling process begun                 |
| 03. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples shipped  |
| 04. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples left in 24 hr. drop box                        |
| 05. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Are there custody seals/tape or is the drop box locked |

## Chain of Custody

- |     |  |  |
|-----|--|--|
| 06. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC adequately filled out                    |
| 07. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC signed and relinquished to the lab       |
| 08. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sample tag on bottles match COC              |
| 09. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Subcontracting needed? Subcontracted to: GEL |

## Preservation

- |     |  |   |
|-----|--|---|
| 10. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Do sample have correct chemical preservation        |
| 11. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Completed pH checks on preserved samples? (no VOAs) |
| 12. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Did any samples need to be preserved in the lab?    |

## Bottle Conditions

- |     |  |   |
|-----|--|---|
| 13. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | All bottles intact                            |
| 14. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Appropriate analytical bottles are used       |
| 15. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Merit bottles used                            |
| 16. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sufficient sample volume received             |
| 17. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples require laboratory filtration         |
| 18. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples submitted within holding time         |
| 19. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Do water VOC or TOX bottles contain headspace |

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: \_\_\_\_\_ Date: \_\_\_\_\_

# Merit Laboratories Bottle Preservation Check

Lab Set ID: S42439 Submitted: 11/10/2022 15:30

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI New Wells 7B, 7C & 12B

Initial Preservation Check: 11/10/2022 16:41 MMC

Preservation Recheck (E200.8): N/A

Attention: Jennifer Caporale  
Address: Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901

Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S42439.01	125ml Plastic HNO3	<2			
S42439.01	1L Plastic HNO3	<2			
S42439.01	1L Plastic HNO3	<2			
S42439.02	125ml Plastic HNO3	<2			
S42439.02	1L Plastic HNO3	<2			
S42439.02	1L Plastic HNO3	<2			
S42439.03	125ml Plastic HNO3	<2			
S42439.03	1L Plastic HNO3	<2			
S42439.03	1L Plastic HNO3	<2			
S42439.04	125ml Plastic HNO3	<2			
S42439.04	1L Plastic HNO3	<2			
S42439.04	1L Plastic HNO3	<2			
S42439.05	125ml Plastic HNO3	<2			
S42439.05	1L Plastic HNO3	<2			
S42439.05	1L Plastic HNO3	<2			



2680 East Lansing Dr., East Lansing, MI 48823  
 Phone (517) 332-0167 Fax (517) 332-4034  
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

**REPORT TO**

**CHAIN OF CUSTODY RECORD**

**INVOICE TO**

CONTACT NAME **Jennifer Caporale**  
 COMPANY **Lansing Board of Water and Light**  
 ADDRESS **PO Box 13007 48901-3007**  
 CITY **Lansing** STATE **Mi** ZIP CODE **48901**  
 PHONE NO. **517-702-6372** FAX NO. \_\_\_\_\_ P.O. NO. \_\_\_\_\_  
 E-MAIL ADDRESS **Environmental\_Laboratory@lbwl.com** QUOTE NO. \_\_\_\_\_

CONTACT NAME **Kelly Gleason**  SAME  
 COMPANY \_\_\_\_\_  
 ADDRESS \_\_\_\_\_  
 CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP CODE \_\_\_\_\_  
 PHONE NO. \_\_\_\_\_ E-MAIL ADDRESS **Kelly.Gleason@lbwl.com**

**ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)**

PROJECT NO./NAME **Erickson AM MI Wells 7B,7C&12B** SAMPLER(S) - PLEASE PRINT/SIGN NAME **Marc Wahrer**  
 TURNAROUND TIME REQUIRED  1 DAY  2 DAYS  3 DAYS  STANDARD  OTHER **ASAP**  
 DELIVERABLES REQUIRED  STD  LEVEL II  LEVEL III  LEVEL IV  EDD  OTHER \_\_\_\_\_

MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID  
 SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIFE A=AIR W=WASTE

Total Metals	F-undistilled, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	HCO3, CO3, Hardness					# Containers & Preservatives	
										NOVE	HCl
✓	✓	✓	✓	✓	✓						
✓	✓	✓	✓	✓	✓						
✓	✓	✓	✓	✓	✓						
✓	✓	✓	✓	✓	✓						
✓	✓	✓	✓	✓	✓						

**Certifications**  
 OHIO VAP  Drinking Water  
 DoD  NPDES  
**Project Locations**  
 Detroit  New York  
 Other \_\_\_\_\_  
**Special Instructions**

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION		MATRIX	# OF BOTTLES	NOVE	HCl	HNO3	H2SO4	NaOH	MtOH	OTHER
	DATE	TIME											
42439.01	11/10/22	1143	MW-7B	L211175-01	GW	5	2	3					
.02		1309	MW-7C	L211175-02	GW	5	2	3					
.03		0944	MW-12B	L211175-03	GW	5	2	3					
.04		↓	Field Dupe MW-12B	L211175-04	GW	5	2	3					
.05		0840	Field Blank	L211175-05	DI	5	2	3					

RELINQUISHED BY: *[Signature]*  Sampler DATE **11-10-22** TIME **1530**  
 RECEIVED BY: *[Signature]* DATE **11/10/22** TIME **1530**

RELINQUISHED BY: \_\_\_\_\_ DATE \_\_\_\_\_ TIME \_\_\_\_\_  
 RECEIVED BY: \_\_\_\_\_ DATE \_\_\_\_\_ TIME \_\_\_\_\_  
 SEAL NO. \_\_\_\_\_ SEAL INTACT YES  NO  INITIALS \_\_\_\_\_  
 SEAL NO. \_\_\_\_\_ SEAL INTACT YES  NO  INITIALS \_\_\_\_\_  
 NOTES: TEMP. ON ARRIVAL **2.1**

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

## Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.150
Be, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	2.5
Cl	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cr, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Fluoride	250 mL plastic	mg/L	None	9056	28 d	1.0
F	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Fe, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Pb, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Li, total	Mercury	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Hg, total	Molybdenum	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Mo, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	HNO3	SM 7500	6 mos	2.0 combined
RA226/228	Selenium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Se, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ag, total	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	10
SO4	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Tl, total	Total Dissolved Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TDS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540D	NA	3
TSS	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
V, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Zn, total							



December 08, 2022

John Laverty  
Merit Laboratories Inc.  
2680 East Lansing Drive  
East Lansing, Michigan 48823

Re: Routine Analysis  
Work Order: 600981  
SDG: S42439

Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on November 16, 2022. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at [www.gel.com](http://www.gel.com).

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,

Jordan Melton for  
Delaney Stone  
Project Manager

Purchase Order: GELP20-0018  
Enclosures



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# Case Narrative

**Receipt Narrative  
for  
Merit Laboratories, Inc.  
SDG: S42439  
Work Order: 600981**

**December 08, 2022**

**Laboratory Identification:**

GEL Laboratories LLC  
2040 Savage Road  
Charleston, South Carolina 29407  
(843) 556-8171

**Summary:**

**Sample receipt:** The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on November 16, 2022 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

**Sample Identification:** The laboratory received the following samples:

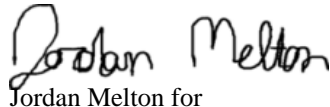
<b><u>Laboratory ID</u></b>	<b><u>Client ID</u></b>
600981001	S42439.01
600981002	S42439.02
600981003	S42439.03
600981004	S42439.02 Field Dupe
600981005	S42439.03 Field Blank

**Case Narrative:**

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.



The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.

A handwritten signature in black ink that reads "Jordan Melton". The signature is written in a cursive style with a large initial 'J'.

Jordan Melton for  
Delaney Stone  
Project Manager

# **Chain of Custody and Supporting Documentation**



INVOICE TO

CHAIN OF CUSTODY RECORD

REPORT TO

CONTACT NAME Julie Teague  SAME

COMPANY Merit Laboratories

ADDRESS 2680 East Lansing Drive

CITY East Lansing STATE MI ZIP CODE 48823

PHONE NO. 517-332-0167

E-MAIL ADDRESS juliet@meritlabs.com

PROJECT NO./NAME S42439

SAMPLER(S) - PLEASE PRINT/SIGN NAME \_\_\_\_\_

TURNAROUND TIME REQUIRED  1 DAY  2 DAYS  3 DAYS  STANDARD  OTHER \_\_\_\_\_

DELIVERABLES REQUIRED  STD  LEVEL II  LEVEL III  LEVEL IV  EDD  OTHER \_\_\_\_\_

MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID  
SL=SLUDGE DW=DRINKING WATER O=OIL WP=WPIPE A=AIR W=WASTE

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR	DATE	TIME	IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	# Containers & Preservatives								Certifications											
							NONE	HCl	HNO <sub>3</sub>	H <sub>2</sub> SO <sub>4</sub>	NaOH	MeOH	OTHER	OHIO VAP		Drinking Water	DoD	NPDES								
		11/10/22	1143	S42439.01	GW	2																				
		11/10/22	1309	S42439.02	GW	2																				
		11/10/22	0944	S42439.03	GW	2																				
		11/10/22	0944	S42439.02 Field Dupe	GW	2																				
		11/10/22	0844	S42439.03 Field Blank	GW	2																				

RELINQUISHED BY: SIGNATURE/ORGANIZATION \_\_\_\_\_ DATE 11/14/22 TIME 1700

RECEIVED BY: SIGNATURE/ORGANIZATION \_\_\_\_\_ DATE 11/16/22 TIME 1035

RELINQUISHED BY: SIGNATURE/ORGANIZATION \_\_\_\_\_ DATE \_\_\_\_\_ TIME \_\_\_\_\_

RECEIVED BY: SIGNATURE/ORGANIZATION \_\_\_\_\_ DATE \_\_\_\_\_ TIME \_\_\_\_\_

INITIALS: J. Teague SEAL INTACT: YES  NO  INITIALS: \_\_\_\_\_ SEAL INTACT: YES  NO  INITIALS: \_\_\_\_\_

NOTES: Julie Teague TEMP. ON ARRIVAL: \_\_\_\_\_

DATE: 11/16/22 TIME: 1035

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE



**SAMPLE RECEIPT & REVIEW FORM**

Client: MERI SDG/AR/COC/Work Order: 600981 D.S  
 Received By: Thyasia Tatum Date Received: 11-16-22

Carrier and Tracking Number  
 FedEx Express FedEx Ground UPS Field Services Courier Other  
12 400 477 03 0345 7797

Suspected Hazard Information	Yes	No	*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.
A) Shipped as a DOT Hazardous?		<input checked="" type="checkbox"/>	Hazard Class Shipped: _____ UN#: _____ If UN2910, Is the Radioactive Shipment Survey Compliant? Yes ___ No ___
B) Did the client designate the samples are to be received as radioactive?		<input checked="" type="checkbox"/>	COC notation or radioactive stickers on containers equal client designation.
C) Did the RSO classify the samples as radioactive?		<input checked="" type="checkbox"/>	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): <u>0</u> CPM / mR/Hr Classified as: Rad 1 Rad 2 Rad 3
D) Did the client designate samples are hazardous?		<input checked="" type="checkbox"/>	COC notation or hazard labels on containers equal client designation.
E) Did the RSO identify possible hazards?		<input checked="" type="checkbox"/>	If D or E is yes, select Hazards below. PCB's Flammable Foreign Soil RCRA Asbestos Beryllium Other:

Sample Receipt Criteria	Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1 Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2 Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>			Circle Applicable: Client contacted and provided COC COC created upon receipt
3 Samples requiring cold preservation within (0 ≤ 6 deg. C)?*			<input checked="" type="checkbox"/>	Preservation Method: Wet Ice Ice Packs Dry ice <u>None</u> Other: _____ *all temperatures are recorded in Celsius <span style="float: right;">TEMP: <u>16°C</u></span>
4 Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>			Temperature Device Serial #: <u>IR2-20</u> Secondary Temperature Device Serial # (If Applicable): _____
5 Sample containers intact and sealed?	<input checked="" type="checkbox"/>			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6 Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>			Sample ID's and Containers Affected: If Preservation added, Lot#:
7 Do any samples require Volatile Analysis?			<input checked="" type="checkbox"/>	If Yes, are Encores or Soil Kits present for solids? Yes ___ No ___ NA ___ (If yes, take to VOA Freezer)
				Do liquid VOA vials contain acid preservation? Yes ___ No ___ NA ___ (If unknown, select No)
				Are liquid VOA vials free of headspace? Yes ___ No ___ NA ___
8 Samples received within holding time?	<input checked="" type="checkbox"/>			ID's and tests affected:
9 Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>			ID's and containers affected:
10 Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>			Circle Applicable: No dates on containers No times on containers COC missing info Other (describe)
11 Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>			Circle Applicable: No container count on COC Other (describe)
12 Are sample containers identifiable as GEL provided by use of GEL labels?			<input checked="" type="checkbox"/>	
13 COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>			Circle Applicable: Not relinquished Other (describe)

Comments (Use Continuation Form if needed):

PM (or PMA) review: Initials SW Date 11/17/22 Page 1 of 1

# Laboratory Certifications

**List of current GEL Certifications as of 08 December 2022**

<b>State</b>	<b>Certification</b>
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122023-3
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2022-160
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122022-37
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

# **Radiological Analysis**

# Case Narrative



**Radiochemistry  
Technical Case Narrative  
Merit Laboratories, Inc.  
SDG #: S42439  
Work Order #: 600981**

**Product:** GFPC Ra228, Liquid

**Analytical Method:** EPA 904.0/SW846 9320 Modified

**Analytical Procedure:** GL-RAD-A-063 REV# 5

**Analytical Batch:** 2349085

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
600981001	S42439.01
600981002	S42439.02
600981003	S42439.03
600981004	S42439.02 Field Dupe
600981005	S42439.03 Field Blank
1205257831	Method Blank (MB)
1205257832	600981001(S42439.01) Sample Duplicate (DUP)
1205257833	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

**Technical Information**

**Recounts**

Sample 600981005 (S42439.03 Field Blank) was recounted to verify sample results. Recount is reported.

**Product:** Lucas Cell, Ra226, Liquid

**Analytical Method:** EPA 903.1 Modified

**Analytical Procedure:** GL-RAD-A-008 REV# 15

**Analytical Batch:** 2349072

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
600981001	S42439.01
600981002	S42439.02
600981003	S42439.03
600981004	S42439.02 Field Dupe
600981005	S42439.03 Field Blank

1205257800	Method Blank (MB)
1205257801	600981001(S42439.01) Sample Duplicate (DUP)
1205257802	600981001(S42439.01) Matrix Spike (MS)
1205257803	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

**Miscellaneous Information**

**Additional Comments**

The matrix spike, 1205257802 (S42439.01MS), aliquot was reduced to conserve sample volume.

**Certification Statement**

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

## GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

### Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S42439 GEL Work Order: 600981

#### The Qualifiers in this report are defined as follows:

- \* A quality control analyte recovery is outside of specified acceptance criteria
- \*\* Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

#### Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature:



Name: Theresa Austin

Date: 15 DEC 2022

Title: Group Leader

# Sample Data Summary

# GEL LABORATORIES LLC

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## Certificate of Analysis

Report Date: December 14, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

Client Sample ID: S42439.01	Project: MERI00120
Sample ID: 600981001	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 10-NOV-22 11:43	
Receive Date: 16-NOV-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	1.30	+/-0.883	1.32	3.00	pCi/L		JE1	12/08/22	1040	2349085		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		1.77	+/-0.937			pCi/L		NXL1	12/14/22	1208	2349084		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.463	+/-0.314	0.444	1.00	pCi/L		LXP1	12/14/22	0741	2349072		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			82.1	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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## Certificate of Analysis

Report Date: December 14, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Lavery  
 Project: Routine Analysis

Client Sample ID: S42439.02	Project: MERI00120
Sample ID: 600981002	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 10-NOV-22 13:09	
Receive Date: 16-NOV-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	1.08	+/-0.983	1.58	3.00	pCi/L		JE1	12/08/22	1040	2349085		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		1.76	+/-1.04			pCi/L		NXL1	12/14/22	1208	2349084		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.680	+/-0.333	0.408	1.00	pCi/L		LXP1	12/14/22	0741	2349072		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			71.3	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

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## Certificate of Analysis

Report Date: December 14, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
 East Lansing, Michigan 48823  
 Contact: John Lavery  
 Project: Routine Analysis

Client Sample ID: S42439.03	Project: MERI00120
Sample ID: 600981003	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 10-NOV-22 09:44	
Receive Date: 16-NOV-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	0.638	+/-0.910	1.57	3.00	pCi/L		JE1	12/08/22	1040	2349085		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		1.25	+/-0.948			pCi/L		NXL1	12/14/22	1208	2349084		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.608	+/-0.265	0.211	1.00	pCi/L		LXP1	12/14/22	0741	2349072		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			80.5	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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## Certificate of Analysis

Report Date: December 14, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

Client Sample ID: S42439.02 Field Dupe	Project: MERI00120
Sample ID: 600981004	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 10-NOV-22 09:44	
Receive Date: 16-NOV-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.282	+/-0.714	1.31	3.00	pCi/L		JE1	12/08/22	1040	2349085	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.901	+/-0.782			pCi/L		NXL1	12/14/22	1208	2349084	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.619	+/-0.319	0.360	1.00	pCi/L		LXP1	12/14/22	0741	2349072	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			82.2	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit



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## Certificate of Analysis

Report Date: December 14, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Lavery  
 Project: Routine Analysis

Client Sample ID: S42439.03 Field Blank	Project: MERI00120
Sample ID: 600981005	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 10-NOV-22 08:44	
Receive Date: 16-NOV-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.325	+/-1.43	2.61	3.00	pCi/L		JE1	12/08/22	1216	2349085	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.731	+/-1.46			pCi/L		NXL1	12/14/22	1208	2349084	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.407	+/-0.301	0.445	1.00	pCi/L		LXP1	12/14/22	0741	2349072	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			66.1	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# Quality Control Summary

# GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

## QC Summary

Report Date: December 14, 2022

Page 1 of 2

**Merit Laboratories Inc.**  
**2680 East Lansing Drive**  
**East Lansing, Michigan**

**Contact: John Laverty**

**Workorder: 600981**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Rad Gas Flow</b>											
Batch	2349085										
QC1205257832	600981001 DUP										
Radium-228	U	1.30	U	0.310	pCi/L	N/A		N/A	JE1	12/08/22	10:40
	Uncertainty	+/-0.883		+/-1.10							
QC1205257833	LCS										
Radium-228	64.7			50.5	pCi/L		78.1	(75%-125%)		12/08/22	10:40
	Uncertainty			+/-3.87							
QC1205257831	MB										
Radium-228			U	1.87	pCi/L					12/08/22	10:40
	Uncertainty			+/-1.35							
<b>Rad Ra-226</b>											
Batch	2349072										
QC1205257801	600981001 DUP										
Radium-226		0.463		0.373	pCi/L	21.6		(0% - 100%)	LXP1	12/14/22	08:46
	Uncertainty	+/-0.314		+/-0.243							
QC1205257803	LCS										
Radium-226	26.5			23.3	pCi/L		87.8	(75%-125%)		12/14/22	08:46
	Uncertainty			+/-1.57							
QC1205257800	MB										
Radium-226			U	0.0285	pCi/L					12/14/22	08:45
	Uncertainty			+/-0.168							
QC1205257802	600981001 MS										
Radium-226	128	0.463		120	pCi/L		92.7	(75%-125%)		12/14/22	08:46
	Uncertainty	+/-0.314		+/-8.24							

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- \*\* Analyte is a Tracer compound
- < Result is less than value reported
- > Result is greater than value reported
- BD Results are either below the MDC or tracer recovery is low
- FA Failed analysis.
- H Analytical holding time was exceeded

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## QC Summary

Workorder: 600981

Page 2 of 2

Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
J											
J											
K											
L											
M											
M											
N/A											
NI											
ND											
NJ											
Q											
R											
U											
UI											
UJ											
UL											
X											
Y											
^											
h											

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where the duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

\* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

# Gas Flow Raw Data

# Batch 2349085 Check-list

This check-list was completed on 08-DEC-22 by Nat Long

This batch was reviewed by Kenshalla Oston on 08-DEC-22 and Nat Long on 08-DEC-22.

**Batch ID:**  
2349085

**Product:**  
GFC28RAL

**Description:** Gas Flow Radium 228  
GL-RAD-A-063

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
11	Has the method required detection limit been met?	Yes		
<b>Miscellaneous Information</b>				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

# Prep Logbook

## Radium-228 in Liquid

**Batch ID:** 2349085

**Analyst:** Jacqueline Emond (JE1)

**Method:** EPA 904.0/SW846 9320 Modified

**Lab SOP:** GL-RAD-A-063 REV# 5

**Instrument:** LUCAS-C202389980

**Due Dates for Lab:** 12-DEC-2022

**Package:** 14-DEC-2022

**SDG:** 15-DEC-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205257833	228 DW spike	1952-B	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	600981001	05-DEC-2022	3	300.49	300.49	12/06/22 13:30	12/08/22 08:40
2	600981002	05-DEC-2022	3	302.16	302.16	12/06/22 13:30	12/08/22 08:40
3	600981003	05-DEC-2022	3	300.69	300.69	12/06/22 13:30	12/08/22 08:40
4	600981004	05-DEC-2022	3	301.09	301.09	12/06/22 13:30	12/08/22 08:40
5	600981005	05-DEC-2022	3	303.95	303.95	12/06/22 13:30	12/08/22 08:40
6	601018001	05-DEC-2022	3	303.69	303.69	12/06/22 13:30	12/08/22 08:40
7	601018002	05-DEC-2022	3	300.22	300.22	12/06/22 13:30	12/08/22 08:40
8	601018003	05-DEC-2022	3	300.28	300.28	12/06/22 13:30	12/08/22 08:40
9	601018004	05-DEC-2022	3	301.55	301.55	12/06/22 13:30	12/08/22 08:40
10	601018005	05-DEC-2022	3	301.06	301.06	12/06/22 13:30	12/08/22 08:40
11	601018006	05-DEC-2022	3	302.24	302.24	12/06/22 13:30	12/08/22 08:40
12	601018007	05-DEC-2022	3	304.55	304.55	12/06/22 13:30	12/08/22 08:40
13	601018008	05-DEC-2022	3	305.2	305.2	12/06/22 13:30	12/08/22 08:40
14	601018009	05-DEC-2022	3	301.23	301.23	12/06/22 13:30	12/08/22 08:40
15	601018010	05-DEC-2022	3	302.16	302.16	12/06/22 13:30	12/08/22 08:40
16	601018011	05-DEC-2022	3	301.53	301.53	12/06/22 13:30	12/08/22 08:40
17	601018012	05-DEC-2022	3	301.22	301.22	12/06/22 13:30	12/08/22 08:40
18	601018013	05-DEC-2022	3	302.27	302.27	12/06/22 13:30	12/08/22 08:40
19	601018014	05-DEC-2022	3	301	301	12/06/22 13:30	12/08/22 08:40
20	601024001	05-DEC-2022	3	305.43	305.43	12/06/22 13:30	12/08/22 08:40
21	1205257831 MB	05-DEC-2022	3		305.43	12/06/22 13:30	12/08/22 08:40
22	1205257832 DUP (600981001)	05-DEC-2022	3	300.25	300.25	12/06/22 13:30	12/08/22 08:40
23	1205257833 LCS	05-DEC-2022	3		305.43	12/06/22 13:30	12/08/22 08:40

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1951-D	Ba-133	.1 mL	Pipet Id: RAD-GFC-1795419
REGNT 3418276.6	29M HF (48-50%)	4 mL	Data Entry Date2: 05-DEC-2022 00:00
REGNT 3454370.1	Nitric Acid	5 mL	
REGNT 3465466	Barium Carrier Ra228 REG	1 mL	
REGNT 3485721.6	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	
REGNT 3521298	RGF-Neodymium Substrate	5 mL	
REGNT 3528714	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3532398	RGF-1M Citric Acid	5 mL	
REGNT 3533722	2M HCl	20 mL	
REGNT 3643467	RGF-50% Potassium Carbonate	2 mL	
REGNT 3644548	RGF-1.5M Ammonium Sulfate	10 mL	
REGNT 3644723	RGF-7M Nitric Acid	25 mL	
REGNT DGA0040	2346736	2 g	

# Prep Logbook

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#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
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Reagent/Solvent Lot ID	Description	Amount	Comments:
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### Radium-228 Liquid

Filename : RA228.XLS  
 File type : Excel  
 Version # : 1.4.2

Tracer S/N : 1951-D  
 Tracer Exp Date : 6/2/2023  
 Tracer Volume Added: 0.10

Batch : 2349085  
 Analyst : JAC02417  
 Prep Date : 12/5/2022  
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL  
 Parmname : Radium-228  
 Required MDA : 3 pCi/L  
 Ra-228 Abundance : 1.00  
 Halflife of Ra-228 : 5.75 years  
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	600981001.1	0.3005	1.8467E-05	11/10/2022 11:43	1296.2	1.60%	1064.5	1.77%	0.1	0.000200
2	600981002.1	0.3022	1.8496E-05	11/10/2022 13:09	1296.2	1.60%	924.8	1.90%	0.1	0.000200
3	600981003.1	0.3007	1.8471E-05	11/10/2022 9:44	1296.2	1.60%	1042.9	1.79%	0.1	0.000200
4	600981004.1	0.3011	1.8478E-05	11/10/2022 9:44	1296.2	1.60%	1065.6	1.77%	0.1	0.000200
5	600981005.1	0.3040	1.8525E-05	11/10/2022 8:44	1296.2	1.60%	856.2	1.97%	0.1	0.000200
6	601018001.1	0.3037	1.8521E-05	11/2/2022 15:23	1296.2	1.60%	971.5	1.85%	0.1	0.000200
7	601018002.1	0.3002	1.8463E-05	11/3/2022 10:09	1296.2	1.60%	1099.9	1.74%	0.1	0.000200
8	601018003.1	0.3003	1.8464E-05	11/7/2022 9:52	1296.2	1.60%	932.9	1.89%	0.1	0.000200
9	601018004.1	0.3016	1.8485E-05	11/7/2022 13:18	1296.2	1.60%	1015.4	1.81%	0.1	0.000200
10	601018005.1	0.3011	1.8477E-05	11/7/2022 15:39	1296.2	1.60%	1005.0	1.82%	0.1	0.000200
11	601018006.1	0.3022	1.8497E-05	11/8/2022 8:04	1296.2	1.60%	980.2	1.84%	0.1	0.000200
12	601018007.1	0.3046	1.8535E-05	11/8/2022 10:22	1296.2	1.60%	1054.7	1.78%	0.1	0.000200
13	601018008.1	0.3052	1.8546E-05	11/9/2022 10:30	1296.2	1.60%	951.6	1.87%	0.1	0.000200
14	601018009.1	0.3012	1.8480E-05	11/9/2022 12:48	1296.2	1.60%	956.8	1.87%	0.1	0.000200
15	601018010.1	0.3022	1.8496E-05	11/10/2022 7:47	1296.2	1.60%	933.0	1.89%	0.1	0.000200
16	601018011.1	0.3015	1.8485E-05	11/14/2022 9:34	1296.2	1.60%	937.0	1.89%	0.1	0.000200
17	601018012.1	0.3012	1.8480E-05	11/14/2022 12:11	1296.2	1.60%	1073.5	1.76%	0.1	0.000200
18	601018013.1	0.3023	1.8497E-05	11/14/2022 15:29	1296.2	1.60%	1038.5	1.79%	0.1	0.000200
19	601018014.1	0.3010	1.8476E-05	11/15/2022 6:25	1296.2	1.60%	999.6	1.83%	0.1	0.000200
20	601024001.1	0.3054	1.8550E-05	11/3/2022 13:25	1296.2	1.60%	963.2	1.86%	0.1	0.000200
21	1205257831.1	0.3054	1.8550E-05	12/5/2022 0:00	1296.2	1.60%	922.8	1.90%	0.1	0.000200
22	1205257832.1	0.3003	1.8463E-05	11/10/2022 11:43	1296.2	1.60%	826.3	2.01%	0.1	0.000200
23	1205257833.1	0.3054	1.8550E-05	12/5/2022 0:00	1296.2	1.60%	946.9	1.88%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063  
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated	Sample
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction	Recovery %	Recovery Error %
			Alpha	Beta										
1	1B	60	15	43	0.717	12/8/2022 10:40	12/6/2022 13:30	12/8/2022 8:40	0.991	0.798	0.992	1.057	82.1%	1.23%
2	1C	60	11	42	0.700	12/8/2022 10:40	12/6/2022 13:30	12/8/2022 8:40	0.991	0.798	0.992	1.057	71.3%	1.27%
3	1D	60	7	43	0.717	12/8/2022 10:40	12/6/2022 13:30	12/8/2022 8:40	0.991	0.797	0.992	1.057	80.5%	1.23%
4	2A	60	9	29	0.483	12/8/2022 10:40	12/6/2022 13:30	12/8/2022 8:40	0.991	0.797	0.992	1.057	82.2%	1.23%
5	9D	60	21	55	0.917	12/8/2022 12:16	12/6/2022 13:30	12/8/2022 8:40	0.991	0.665	0.992	1.057	66.1%	1.30%
6	2D	60	3	84	1.400	12/8/2022 10:40	12/6/2022 13:30	12/8/2022 8:40	0.988	0.797	0.992	1.057	74.9%	1.26%
7	3B	60	14	55	0.917	12/8/2022 10:40	12/6/2022 13:30	12/8/2022 8:40	0.989	0.797	0.992	1.057	84.9%	1.22%
8	3D	60	17	68	1.133	12/8/2022 10:40	12/6/2022 13:30	12/8/2022 8:40	0.990	0.797	0.992	1.057	72.0%	1.27%
9	4B	60	2	51	0.850	12/8/2022 10:40	12/6/2022 13:30	12/8/2022 8:40	0.990	0.797	0.992	1.057	78.3%	1.24%
10	4C	60	9	24	0.400	12/8/2022 10:40	12/6/2022 13:30	12/8/2022 8:40	0.990	0.797	0.992	1.057	77.5%	1.24%
11	4D	60	15	77	1.283	12/8/2022 10:41	12/6/2022 13:30	12/8/2022 8:40	0.990	0.797	0.992	1.057	75.6%	1.25%
12	5A	60	8	69	1.150	12/8/2022 10:41	12/6/2022 13:30	12/8/2022 8:40	0.990	0.797	0.992	1.057	81.4%	1.23%
13	5B	60	16	57	0.950	12/8/2022 10:42	12/6/2022 13:30	12/8/2022 8:40	0.990	0.795	0.992	1.057	73.4%	1.26%
14	5C	60	10	43	0.717	12/8/2022 10:42	12/6/2022 13:30	12/8/2022 8:40	0.990	0.795	0.992	1.057	73.8%	1.26%
15	5D	60	11	74	1.233	12/8/2022 10:42	12/6/2022 13:30	12/8/2022 8:40	0.991	0.795	0.992	1.057	72.0%	1.27%
16	6B	60	10	64	1.067	12/8/2022 10:42	12/6/2022 13:30	12/8/2022 8:40	0.992	0.794	0.992	1.057	72.3%	1.27%
17	6C	60	6	94	1.567	12/8/2022 10:42	12/6/2022 13:30	12/8/2022 8:40	0.992	0.794	0.992	1.057	82.8%	1.22%
18	7A	60	3	40	0.667	12/8/2022 10:42	12/6/2022 13:30	12/8/2022 8:40	0.992	0.794	0.992	1.057	80.1%	1.23%
19	7B	60	12	46	0.767	12/8/2022 10:42	12/6/2022 13:30	12/8/2022 8:40	0.992	0.794	0.992	1.057	77.1%	1.25%
20	7C	60	14	67	1.117	12/8/2022 10:42	12/6/2022 13:30	12/8/2022 8:40	0.989	0.794	0.992	1.057	74.3%	1.26%
21	8A	60	9	87	1.450	12/8/2022 10:40	12/6/2022 13:30	12/8/2022 8:40	0.999	0.798	0.992	1.057	71.2%	1.27%
22	9B	60	8	43	0.717	12/8/2022 10:40	12/6/2022 13:30	12/8/2022 8:40	0.991	0.798	0.992	1.057	63.7%	1.32%
23	9C	60	24	735	12.250	12/8/2022 10:40	12/6/2022 13:30	12/8/2022 8:40	0.999	0.798	0.992	1.057	73.0%	1.27%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2022	5/31/2023	0.6068	0.00711	0.395	12/3/2022 13:16	1000
2	PIC	6/1/2022	5/31/2023	0.6190	0.00847	0.463	12/3/2022 13:16	1000
3	PIC	6/1/2022	5/31/2023	0.6048	0.00692	0.563	12/3/2022 13:16	1000
4	PIC	6/1/2022	5/31/2023	0.6201	0.01914	0.412	12/3/2022 13:16	1000
5	PIC	6/1/2022	5/31/2023	0.6330	0.02610	0.860	12/3/2022 13:16	1000
6	PIC	6/1/2022	5/31/2023	0.6046	0.00745	0.961	12/3/2022 13:48	1000
7	PIC	6/1/2022	5/31/2023	0.6245	0.01614	0.601	12/3/2022 13:16	1000
8	PIC	6/1/2022	5/31/2023	0.5999	0.02297	0.774	12/3/2022 13:16	1000
9	PIC	6/1/2022	5/31/2023	0.6400	0.01519	0.546	12/3/2022 13:16	1000
10	PIC	6/1/2022	5/31/2023	0.6359	0.00889	0.338	12/3/2022 13:16	1000
11	PIC	6/1/2022	5/31/2023	0.5954	0.00773	0.816	12/3/2022 13:16	1000
12	PIC	6/1/2022	5/31/2023	0.6332	0.00851	1.091	12/3/2022 13:16	1000
13	PIC	6/1/2022	5/31/2023	0.6336	0.00426	0.838	12/3/2022 13:16	1000
14	PIC	6/1/2022	5/31/2023	0.6242	0.00657	0.527	12/3/2022 13:16	1000
15	PIC	6/1/2022	5/31/2023	0.6236	0.00925	0.949	12/3/2022 13:16	1000
16	PIC	6/1/2022	5/31/2023	0.6280	0.00851	0.810	12/3/2022 13:16	1000
17	PIC	6/1/2022	5/31/2023	0.6123	0.01970	1.450	12/3/2022 13:16	1000
18	PIC	6/1/2022	5/31/2023	0.6257	0.00594	0.493	12/3/2022 13:16	1000
19	PIC	6/1/2022	5/31/2023	0.6366	0.00627	0.608	12/3/2022 13:16	1000
20	PIC	6/1/2022	5/31/2023	0.6407	0.00790	0.877	12/3/2022 13:16	1000
21	PIC	6/1/2022	5/31/2023	0.6398	0.01579	1.019	12/3/2022 13:16	1000
22	PIC	6/1/2022	5/31/2023	0.6318	0.00754	0.655	12/3/2022 13:16	1000
23	PIC	6/1/2022	5/31/2023	0.6184	0.00584	0.685	12/3/2022 13:16	1000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

**Spike S/N :** N/A  
**Spike Exp Date :** N/A  
**Spike Activity (dpm/ml):** N/A  
**Spike Volume Added:** N/A

\* - RPD changed to 0% due to sample & dup activity below MDA

**LCS S/N :** 1952-B  
**LCS Exp Date :** 8/9/2023  
**LCS Activity (dpm/ml):** 438.44  
**LCS Volume Added:** 0.10

Results																
Pos.	Decision	Critical	Required	Sample Act.		Sample Act.	Net Count	Net Count	2 SIGMA	2 SIGMA	Sample	Sample	RPD	RER	Nominal	Recovery
	Level	Level	MDA	MDA	Conc.	Error	Rate	Rate Error	Counting	Total Prop.						
	pCi/L	pCi/L	pCi/L	pCi/L	pCi/L	%	CPM	CPM	Uncertainty	Uncertainty						
1	0.7895	0.5574	3	1.3176	<b>1.3047</b>	34.56%	0.3217	0.1111	0.8831	0.9415		SAMPLE				
2	0.9592	0.6772	3	1.5819	<b>1.0787</b>	46.50%	0.2370	0.1101	0.9825	1.0190		SAMPLE				
3	0.9649	0.6813	3	1.5701	<b>0.6381</b>	72.79%	0.1537	0.1118	0.9102	0.9241		SAMPLE				
4	0.7869	0.5556	3	1.3091	<b>0.2824</b>	129.02%	0.0713	0.0920	0.7140	0.7175		SAMPLE				
5	1.6453	1.1616	3	2.6097	<b>0.3246</b>	224.20%	0.0567	0.1270	1.4264	1.4288		SAMPLE				
6	1.3443	0.9491	3	2.1196	<b>1.9439</b>	35.53%	0.4390	0.1559	1.3527	1.4375		SAMPLE				
7	0.9194	0.6491	3	1.4897	<b>1.2089</b>	39.97%	0.3157	0.1260	0.9458	0.9936		SAMPLE				
8	1.2788	0.9028	3	2.0403	<b>1.6865</b>	39.11%	0.3593	0.1402	1.2899	1.3591		SAMPLE				
9	0.9211	0.6503	3	1.5019	<b>1.2237</b>	39.95%	0.3040	0.1213	0.9570	1.0052		SAMPLE				
10	0.7382	0.5212	3	1.2473	<b>0.2542</b>	135.00%	0.0620	0.0837	0.6726	0.6756		SAMPLE				
11	1.2510	0.8832	3	1.9900	<b>2.0898</b>	31.92%	0.4673	0.1490	1.3060	1.4068		SAMPLE				
12	1.2547	0.8858	3	1.9656	<b>0.2288</b>	241.24%	0.0590	0.1423	1.0821	1.0836		SAMPLE				
13	1.2174	0.8595	3	1.9337	<b>0.4809</b>	115.29%	0.1120	0.1291	1.0867	1.0934		SAMPLE				
14	0.9877	0.6973	3	1.6143	<b>0.8333</b>	58.90%	0.1897	0.1117	0.9616	0.9840		SAMPLE				
15	1.3561	0.9574	3	2.1396	<b>1.2781</b>	51.60%	0.2843	0.1466	1.2919	1.3310		SAMPLE				
16	1.2401	0.8755	3	1.9735	<b>1.1419</b>	53.14%	0.2567	0.1363	1.1889	1.2228		SAMPLE				
17	1.4869	1.0498	3	2.2989	<b>0.4652</b>	142.32%	0.1167	0.1660	1.2974	1.3027		SAMPLE				
18	0.8740	0.6171	3	1.4351	<b>0.6981</b>	62.04%	0.1737	0.1077	0.8487	0.8664		SAMPLE				
19	0.9954	0.7028	3	1.6116	<b>0.6540</b>	72.93%	0.1587	0.1157	0.9347	0.9489		SAMPLE				
20	1.2197	0.8611	3	1.9325	<b>1.0079</b>	58.27%	0.2397	0.1396	1.1507	1.1780		SAMPLE				
21	1.3531	0.9553	3	2.1270	<b>1.8655</b>	36.88%	0.4310	0.1587	1.3463	1.4258		MB				
22	1.2584	0.8885	3	2.0280	<b>0.3096</b>	182.03%	0.0617	0.1122	1.1046	1.1073	600981001.1	DUP	* 0.0%			
23	1.1189	0.7899	3	1.7981	<b>50.4825</b>	4.15%	11.5650	0.4526	3.8723	13.2026		LCS			64.6617	78.1%

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
600981001	1B	60	15	43	12/8/2022 10:40	12/8/2022 11:40	PIC	2349085
600981002	1C	60	11	42	12/8/2022 10:40	12/8/2022 11:40	PIC	2349085
600981003	1D	60	7	43	12/8/2022 10:40	12/8/2022 11:40	PIC	2349085
600981004	2A	60	9	29	12/8/2022 10:40	12/8/2022 11:40	PIC	2349085
600981005	9D	60	21	55	12/8/2022 12:16	12/8/2022 13:16	PIC	2349085
601018001	2D	60	3	84	12/8/2022 10:40	12/8/2022 11:40	PIC	2349085
601018002	3B	60	14	55	12/8/2022 10:40	12/8/2022 11:40	PIC	2349085
601018003	3D	60	17	68	12/8/2022 10:40	12/8/2022 11:40	PIC	2349085
601018004	4B	60	2	51	12/8/2022 10:40	12/8/2022 11:40	PIC	2349085
601018005	4C	60	9	24	12/8/2022 10:40	12/8/2022 11:40	PIC	2349085
601018006	4D	60	15	77	12/8/2022 10:41	12/8/2022 11:41	PIC	2349085
601018007	5A	60	8	69	12/8/2022 10:41	12/8/2022 11:41	PIC	2349085
601018008	5B	60	16	57	12/8/2022 10:42	12/8/2022 11:42	PIC	2349085
601018009	5C	60	10	43	12/8/2022 10:42	12/8/2022 11:42	PIC	2349085
601018010	5D	60	11	74	12/8/2022 10:42	12/8/2022 11:42	PIC	2349085
601018011	6B	60	10	64	12/8/2022 10:42	12/8/2022 11:42	PIC	2349085
601018012	6C	60	6	94	12/8/2022 10:42	12/8/2022 11:42	PIC	2349085
601018013	7A	60	3	40	12/8/2022 10:42	12/8/2022 11:42	PIC	2349085
601018014	7B	60	12	46	12/8/2022 10:42	12/8/2022 11:42	PIC	2349085
601024001	7C	60	14	67	12/8/2022 10:42	12/8/2022 11:42	PIC	2349085
1205257831	8A	60	9	87	12/8/2022 10:40	12/8/2022 11:40	PIC	2349085
1205257832	9B	60	8	43	12/8/2022 10:40	12/8/2022 11:40	PIC	2349085
1205257833	9C	60	24	735	12/8/2022 10:40	12/8/2022 11:40	PIC	2349085

ASSAY 8-Dec-22 9:19:55  
 Wizard 2480 s/n 46190630  
 Protocol id 8 Ba-133  
 Time limit  
 Count limit  
 Isotope Ba-133  
 Protocol date 12/8/2022  
 Run id. 5929

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	87	1	180	3889	1296.22	1.6	09:19:55
600981001	2	87	2	180	3194	1064.46	1.77	82.12	09:23:09
600981002	3	87	3	180	2775	924.83	1.9	71.35	09:26:22
600981003	4	87	4	180	3129.28	1042.9	1.79	80.46	09:29:36
600981004	5	87	5	180	3197	1065.57	1.77	82.21	09:32:51
600981005	1	1	1	180	2569	856.24	1.97	66.06	09:36:23
601018001	2	1	2	180	2915	971.49	1.85	74.95	09:39:37
601018002	3	1	3	180	3300.28	1099.89	1.74	84.85	09:42:50
601018003	4	1	4	180	2799.28	932.91	1.89	71.97	09:46:04
601018004	5	1	5	180	3046.57	1015.37	1.81	78.33	09:49:19
601018005	1	98	1	180	3015.57	1005	1.82	77.53	09:52:54
601018006	2	98	2	180	2941	980.15	1.84	75.62	09:56:08
601018007	3	98	3	180	3164.85	1054.67	1.78	81.37	09:59:22
601018008	4	98	4	180	2855.28	951.58	1.87	73.41	10:02:36
601018009	5	98	5	180	2871.28	956.83	1.87	73.82	10:05:50
601018010	1	6	1	180	2799.57	933.03	1.89	71.98	10:09:33
601018011	2	6	2	180	2811.57	937.01	1.89	72.29	10:12:47
601018012	3	6	3	180	3220.85	1073.5	1.76	82.82	10:16:01
601018013	4	6	4	180	3116	1038.51	1.79	80.12	10:19:14
601018014	5	6	5	180	2999.28	999.56	1.83	77.11	10:22:29
601024001	1	19	1	180	2890	963.15	1.86	74.30	10:26:13
1205257831	2	19	2	180	2769	922.82	1.9	71.19	10:29:27
1205257832	3	19	3	180	2479.28	826.29	2.01	63.75	10:32:41
1205257833	4	19	4	180	2841.28	946.88	1.88	73.05	10:35:55

END OF ASSAY

# **Continuing Calibration Data**

# Gas Flow Proportional Counter Checks for 08-Dec-2022

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100E2	Above	Beta bkg	08-Dec 04:58	60	2.967	1.385	3.072	+2.63
LB4100F2	Below	Alpha eff	08-Dec 06:16	5	5956	6533	7372	-7.12
LB4100F2	Above	Alpha XTalk	08-Dec 06:16	5	0.403	0.318	0.366	+7.66
LB4100F2	Above	Beta bkg	08-Dec 04:58	60	43.233	1.173	1.833	+379.37
LB4100F3	Above	Alpha bkg	08-Dec 04:58	60	0.350	0.119	0.404	+1.87
LB4100G1	Above	Alpha XTalk	08-Dec 06:08	5	0.716	0.088	0.447	+7.50
LB4100G1	Above	Beta bkg	08-Dec 04:58	60	4139	0.380	1.675	+19,173.57
LB4100G1	Above	Beta eff	08-Dec 06:15	5	22256	12880	18320	+7.34
LB4100G3	Above	Beta bkg	08-Dec 04:57	60	1.983	0.810	1.674	+5.15
LB4100G3	Below	Beta eff	08-Dec 06:15	5	18951	21640	22870	-16.12
LB4100G3	Above	Beta XTalk	08-Dec 06:15	5	4.82E-4	7.49E-5	4.02E-4	+4.48
LB4100H1	Above	Beta bkg	08-Dec 04:58	60	3.050	0.216	2.462	+4.57
PIC1A	Below	Alpha XTalk	08-Dec 05:04	5	0.199	0.223	0.327	-4.36
PIC1A	Above	Beta XTalk	08-Dec 05:11	5	0.051	-1.15E-2	0.019	+9.24
PIC2C	need 2nd	Alpha bkg	08-Dec 05:19	60	0.267	-1.83E-2	0.433	+0.79
PIC2C	Above	Beta bkg	08-Dec 05:19	60	3.483	0.030	2.148	+6.78
PIC4A	Above	Alpha bkg	08-Dec 05:26	60	0.867	-5.84E-2	0.311	+12.02
PIC8B	Above	Alpha bkg	08-Dec 05:38	60	2.133	-1.16E-1	0.388	+23.82
PIC8B	Above	Beta bkg	08-Dec 05:38	60	3.433	-1.80E-1	2.341	+5.60
PIC8B	Above	Beta XTalk	08-Dec 05:32	5	0.001	2.00E-4	9.31E-4	+4.08
PIC8C	Above	Alpha bkg	08-Dec 05:38	60	0.433	-1.61E-2	0.410	+3.32
PIC8C	Above	Beta bkg	08-Dec 05:38	60	4.783	-2.96E-1	2.115	+9.64
PIC8D	Missing	Alpha bkg	08-Dec 05:38	60	0.00E+0	-4.22E-2	0.367	-2.38
PIC8D	Missing	Alpha eff	08-Dec 05:13	5	0.00E+0	15020	17360	-41.51
PIC8D	Missing	Alpha XTalk	08-Dec 05:13	5	0.00E+0	0.245	0.295	-32.18
PIC8D	Missing	Beta bkg	08-Dec 05:38	60	0.00E+0	-1.07E-1	2.328	-2.74
PIC8D	Missing	Beta eff	08-Dec 05:31	5	0.295	40460	43520	-82.33
PIC8D	Missing	Beta XTalk	08-Dec 05:31	5	0.00E+0	-3.65E-3	0.015	-1.84
PIC9A	Below	Alpha eff	08-Dec 07:19	5	10094	10270	11360	-3.97
PIC12A	Above	Alpha bkg	08-Dec 05:49	60	0.383	-8.91E-2	0.333	+3.72
PIC12A	Above	Beta bkg	08-Dec 05:49	60	9.783	-2.98E-1	2.649	+17.52



PIC12B	Above	Alpha bkg	08-Dec 05:49	60	2.767	-4.23E-2	0.379	+37.01
PIC12B	Above	Beta bkg	08-Dec 05:49	60	2.133	0.269	2.358	+2.35

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

LB4100A1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100A2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100A3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by 

Date 12/15/22

GEL Laboratories LLC

# Runlogs

# Instrument Run Log

Instrument Type: GFPC

Batch ID: 2349085

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205257831	MB	JE1	PIC8A	DEC-08-22 10:40:04	DONE	25mm Filter	01-JUN-22 00:00
1205257832	DUP	JE1	PIC9B	DEC-08-22 10:40:09	DONE	25mm Filter	01-JUN-22 00:00
1205257833	LCS	JE1	PIC9C	DEC-08-22 10:40:13	DONE	25mm Filter	01-JUN-22 00:00
600981001	SAMPLE	JE1	PIC1B	DEC-08-22 10:40:22	DONE	25mm Filter	01-JUN-22 00:00
600981002	SAMPLE	JE1	PIC1C	DEC-08-22 10:40:22	DONE	25mm Filter	01-JUN-22 00:00
600981003	SAMPLE	JE1	PIC1D	DEC-08-22 10:40:30	DONE	25mm Filter	01-JUN-22 00:00
600981004	SAMPLE	JE1	PIC2A	DEC-08-22 10:40:34	DONE	25mm Filter	01-JUN-22 00:00
601018001	SAMPLE	JE1	PIC2D	DEC-08-22 10:40:42	DONE	25mm Filter	01-JUN-22 00:00
601018002	SAMPLE	JE1	PIC3B	DEC-08-22 10:40:46	DONE	25mm Filter	01-JUN-22 00:00
601018003	SAMPLE	JE1	PIC3D	DEC-08-22 10:40:50	DONE	25mm Filter	01-JUN-22 00:00
601018004	SAMPLE	JE1	PIC4B	DEC-08-22 10:40:53	DONE	25mm Filter	01-JUN-22 00:00
601018005	SAMPLE	JE1	PIC4C	DEC-08-22 10:40:57	DONE	25mm Filter	01-JUN-22 00:00
601018006	SAMPLE	JE1	PIC4D	DEC-08-22 10:41:00	DONE	25mm Filter	01-JUN-22 00:00
601018007	SAMPLE	JE1	PIC5A	DEC-08-22 10:41:07	DONE	25mm Filter	01-JUN-22 00:00
601018008	SAMPLE	JE1	PIC5B	DEC-08-22 10:42:10	DONE	25mm Filter	01-JUN-22 00:00
601018009	SAMPLE	JE1	PIC5C	DEC-08-22 10:42:16	DONE	25mm Filter	01-JUN-22 00:00
601018010	SAMPLE	JE1	PIC5D	DEC-08-22 10:42:19	DONE	25mm Filter	01-JUN-22 00:00
601018011	SAMPLE	JE1	PIC6B	DEC-08-22 10:42:28	DONE	25mm Filter	01-JUN-22 00:00
601018012	SAMPLE	JE1	PIC6C	DEC-08-22 10:42:31	DONE	25mm Filter	01-JUN-22 00:00
601018013	SAMPLE	JE1	PIC7A	DEC-08-22 10:42:37	DONE	25mm Filter	01-JUN-22 00:00
601018014	SAMPLE	JE1	PIC7B	DEC-08-22 10:42:42	DONE	25mm Filter	01-JUN-22 00:00
601024001	SAMPLE	JE1	PIC7C	DEC-08-22 10:42:45	DONE	25mm Filter	01-JUN-22 00:00
600981005	SAMPLE	JE1	PIC9D	DEC-08-22 12:16:53	DONE	25mm Filter	01-JUN-22 00:00

# Lucas Cell Raw Data

# Batch 2349072 Check-list

This check-list was completed on 14-DEC-22 by Lyndsey Pace

This batch was reviewed by Elizabeth Krouse on 14-DEC-22 and Lyndsey Pace on 14-DEC-22.

**Batch ID:**  
2349072

**Product:**  
LUC26RAL

**Description:** Lucas Cell Radium 226  
GL-RAD-A-008

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
<b>Miscellaneous Information</b>				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

# Prep Logbook

## Radium-226 in Liquid

**Batch ID:** 2349072  
**Analyst:** Lyndsey Pace (LXP1)  
**Method:** EPA 903.1 Modified  
**Lab SOP:** GL-RAD-A-008 REV# 15  
**Instrument:** LUCAS-C202389980

Due Dates for Lab: 12-DEC-2022			Package: 14-DEC-2022		SDG: 15-DEC-2022	
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205257803	Radium-226 SPIKE	1715-G	.1	mL	
MS	1205257802	Radium-226 SPIKE	1715-G	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	600981001	05-DEC-2022	1	500.5	500.5	12/09/22 08:00	106	12/14/22 04:48	12/14/22 07:41	6	21
2	600981002	05-DEC-2022	1	504.21	504.21	12/09/22 08:00	202	12/14/22 04:48	12/14/22 07:41	6	30
3	600981003	05-DEC-2022	1	503.52	503.52	12/09/22 08:00	304	12/14/22 04:48	12/14/22 07:41	1	23
4	600981004	05-DEC-2022	1	502.66	502.66	12/09/22 08:00	407	12/14/22 04:48	12/14/22 07:41	3	22
5	600981005	05-DEC-2022	1	500.97	500.97	12/09/22 08:00	508	12/14/22 04:48	12/14/22 07:41	7	21
6	601018001	05-DEC-2022	1	502.09	502.09	12/09/22 08:00	601	12/14/22 04:48	12/14/22 07:41	6	28
7	601018002	05-DEC-2022	1	502.02	502.02	12/09/22 08:00	701	12/14/22 04:48	12/14/22 07:41	2	36
8	601018003	05-DEC-2022	1	502.69	502.69	12/09/22 08:00	803	12/14/22 04:48	12/14/22 07:41	1	7
9	601018004	05-DEC-2022	1	503.17	503.17	12/09/22 08:00	105	12/14/22 05:16	12/14/22 08:13	4	17
10	601018005	05-DEC-2022	1	502.6	502.6	12/09/22 08:00	204	12/14/22 05:16	12/14/22 08:13	3	19
11	601018006	05-DEC-2022	1	500.21	500.21	12/09/22 08:00	301	12/14/22 05:16	12/14/22 08:13	1	37
12	601018007	05-DEC-2022	1	505.16	505.16	12/09/22 08:00	402	12/14/22 05:16	12/14/22 08:13	6	19
13	601018008	05-DEC-2022	1	501.99	501.99	12/09/22 08:00	504	12/14/22 05:16	12/14/22 08:13	5	57
14	601018009	05-DEC-2022	1	501.24	501.24	12/09/22 08:00	602	12/14/22 05:16	12/14/22 08:13	5	20
15	601018010	05-DEC-2022	1	500.75	500.75	12/09/22 08:00	703	12/14/22 05:16	12/14/22 08:13	3	32
16	601018011	05-DEC-2022	1	502.2	502.2	12/09/22 08:00	801	12/14/22 05:16	12/14/22 08:13	3	52
17	601018012	05-DEC-2022	1	500.92	500.92	12/09/22 08:00	104	12/14/22 05:45	12/14/22 08:45	3	34
18	601018013	05-DEC-2022	1	504.86	504.86	12/09/22 08:00	205	12/14/22 05:45	12/14/22 08:45	5	38
19	601018014	05-DEC-2022	1	503.08	503.08	12/09/22 08:00	302	12/14/22 05:45	12/14/22 08:45	2	16
20	601024001	05-DEC-2022	1	505.39	505.39	12/09/22 08:00	403	12/14/22 05:45	12/14/22 08:45	2	21
21	1205257800 MB	05-DEC-2022	1		505.39	12/09/22 08:00	505	12/14/22 05:45	12/14/22 08:45	4	5
22	1205257801 DUP (600981001)	05-DEC-2022	1	500.5	500.5	12/09/22 08:00	604	12/14/22 05:45	12/14/22 08:46	2	14
23	1205257802 MS (600981001)	05-DEC-2022	1	104.35	104.35	12/09/22 08:00	707	12/14/22 05:45	12/14/22 08:46	8	833
24	1205257803 LCS	05-DEC-2022	1		505.39	12/09/22 08:00	804	12/14/22 05:45	12/14/22 08:46	7	865

Reagent/Solvent Lot ID	Description	Amount	Comments:
			Data Entry Date2: 05-DEC-2022 00:00

### Radium-226 Liquid

Filename : RA226.XLS  
 File type : Excel  
 Version # : 1.3.2

Procedure Code : LUC26RAL  
 Parmname : Radium-226  
 Required MDA : 1 pCi/L  
 Halflife of Ra-226 : 1600 years  
 Ra-226 Abundance : 1.00  
 Halflife of Rn-222 : 3.8235 days

Batch : 2349072  
 Analyst : LIN01615  
 Prep Date : 12/5/2022  
 Ra-226 Method Uncertainty : 0.073648

Batch counted on : LUCAS CELL DETECTOR  
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Count Time (min.)	Cell Efficiency (cpm/dpm)
1	600981001.1	0.5005	2.0258E-05	11/10/2022 11:43	106	30	21	0.700	6	0.200	30	1.6990
2	600981002.1	0.5042	2.0273E-05	11/10/2022 13:09	202	30	30	1.000	6	0.200	30	1.8360
3	600981003.1	0.5035	2.0270E-05	11/10/2022 9:44	304	30	23	0.767	1	0.033	30	1.8850
4	600981004.1	0.5027	2.0267E-05	11/10/2022 9:44	407	30	22	0.733	3	0.100	30	1.6030
5	600981005.1	0.5010	2.0260E-05	11/10/2022 8:44	508	30	21	0.700	7	0.233	30	1.8020
6	601018001.1	0.5021	2.0264E-05	11/2/2022 15:23	601	30	28	0.933	6	0.200	30	1.7610
7	601018002.1	0.5020	2.0264E-05	11/3/2022 10:09	701	30	36	1.200	2	0.067	30	1.7440
8	601018003.1	0.5027	2.0267E-05	11/7/2022 9:52	803	30	7	0.233	1	0.033	30	2.0020
9	601018004.1	0.5032	2.0269E-05	11/7/2022 13:18	105	30	17	0.567	4	0.133	30	1.5830
10	601018005.1	0.5026	2.0266E-05	11/7/2022 15:39	204	30	19	0.633	3	0.100	30	1.8470
11	601018006.1	0.5002	2.0257E-05	11/8/2022 8:04	301	30	37	1.233	1	0.033	30	1.6430
12	601018007.1	0.5052	2.0277E-05	11/8/2022 10:22	402	30	19	0.633	6	0.200	30	1.4480
13	601018008.1	0.5020	2.0264E-05	11/9/2022 10:30	504	30	57	1.900	5	0.167	30	1.9180
14	601018009.1	0.5012	2.0261E-05	11/9/2022 12:48	602	30	20	0.667	5	0.167	30	1.8620
15	601018010.1	0.5008	2.0259E-05	11/10/2022 7:47	703	30	32	1.067	3	0.100	30	1.6440
16	601018011.1	0.5022	2.0265E-05	11/14/2022 9:34	801	30	52	1.733	3	0.100	30	1.7180
17	601018012.1	0.5009	2.0260E-05	11/14/2022 12:11	104	30	34	1.133	3	0.100	30	1.6160
18	601018013.1	0.5049	2.0276E-05	11/14/2022 15:29	205	30	38	1.267	5	0.167	30	1.8920
19	601018014.1	0.5031	2.0268E-05	11/15/2022 6:25	302	30	16	0.533	2	0.067	30	1.7980
20	601024001.1	0.5054	2.0278E-05	11/3/2022 13:25	403	30	21	0.700	2	0.067	30	1.6200
21	1205257800.1	0.5054	2.0278E-05	12/5/2022 0:00	505	30	5	0.167	4	0.133	30	1.8130
22	1205257801.1	0.5005	2.0258E-05	11/10/2022 11:43	604	30	14	0.467	2	0.067	30	1.6810
23	1205257802.1	0.1044	1.1634E-05	11/10/2022 11:43	707	30	833	27.767	8	0.267	30	1.7280
24	1205257803.1	0.5054	2.0278E-05	12/5/2022 0:00	804	30	865	28.833	7	0.233	30	1.9050

Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008  
 Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrow End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
8.800%	4/28/2022	4/30/2023	12/9/2022 8:00	12/14/2022 4:48	12/14/2022 7:41	0.586	0.978	1.002	1.000
5.100%	8/1/2022	7/31/2023	12/9/2022 8:00	12/14/2022 4:48	12/14/2022 7:41	0.586	0.978	1.002	1.000
8.900%	10/25/2022	10/31/2023	12/9/2022 8:00	12/14/2022 4:48	12/14/2022 7:41	0.586	0.978	1.002	1.000
6.600%	2/1/2022	1/31/2023	12/9/2022 8:00	12/14/2022 4:48	12/14/2022 7:41	0.586	0.978	1.002	1.000
4.500%	6/1/2022	5/31/2023	12/9/2022 8:00	12/14/2022 4:48	12/14/2022 7:41	0.586	0.978	1.002	1.000
9.400%	7/1/2022	6/30/2023	12/9/2022 8:00	12/14/2022 4:48	12/14/2022 7:41	0.586	0.978	1.002	1.000
6.200%	11/1/2022	10/31/2023	12/9/2022 8:00	12/14/2022 4:48	12/14/2022 7:41	0.586	0.978	1.002	1.000
7.300%	4/1/2022	3/31/2023	12/9/2022 8:00	12/14/2022 4:48	12/14/2022 7:41	0.586	0.978	1.002	1.000
0.500%	4/28/2022	4/30/2023	12/9/2022 8:00	12/14/2022 5:16	12/14/2022 8:13	0.588	0.978	1.002	1.000
7.400%	8/1/2022	7/31/2023	12/9/2022 8:00	12/14/2022 5:16	12/14/2022 8:13	0.588	0.978	1.002	1.000
4.500%	10/25/2022	10/31/2023	12/9/2022 8:00	12/14/2022 5:16	12/14/2022 8:13	0.588	0.978	1.002	1.000
2.300%	2/1/2022	1/31/2023	12/9/2022 8:00	12/14/2022 5:16	12/14/2022 8:13	0.588	0.978	1.002	1.000
7.000%	6/1/2022	5/31/2023	12/9/2022 8:00	12/14/2022 5:16	12/14/2022 8:13	0.588	0.978	1.002	1.000
5.700%	7/1/2022	6/30/2023	12/9/2022 8:00	12/14/2022 5:16	12/14/2022 8:13	0.588	0.978	1.002	1.000
9.000%	11/1/2022	10/31/2023	12/9/2022 8:00	12/14/2022 5:16	12/14/2022 8:13	0.588	0.978	1.002	1.000
5.000%	4/1/2022	3/31/2023	12/9/2022 8:00	12/14/2022 5:16	12/14/2022 8:13	0.588	0.978	1.002	1.000
2.000%	4/28/2022	4/30/2023	12/9/2022 8:00	12/14/2022 5:45	12/14/2022 8:45	0.589	0.978	1.002	1.000
3.900%	8/1/2022	7/31/2023	12/9/2022 8:00	12/14/2022 5:45	12/14/2022 8:45	0.589	0.978	1.002	1.000
3.300%	10/25/2022	10/31/2023	12/9/2022 8:00	12/14/2022 5:45	12/14/2022 8:45	0.589	0.978	1.002	1.000
9.700%	2/1/2022	1/31/2023	12/9/2022 8:00	12/14/2022 5:45	12/14/2022 8:45	0.589	0.978	1.002	1.000
1.200%	6/1/2022	5/31/2023	12/9/2022 8:00	12/14/2022 5:45	12/14/2022 8:45	0.589	0.978	1.002	1.000
6.700%	7/1/2022	6/30/2023	12/9/2022 8:00	12/14/2022 5:45	12/14/2022 8:46	0.589	0.977	1.002	1.000
2.200%	11/1/2022	10/31/2023	12/9/2022 8:00	12/14/2022 5:45	12/14/2022 8:46	0.589	0.977	1.002	1.000
9.900%	4/1/2022	3/31/2023	12/9/2022 8:00	12/14/2022 5:45	12/14/2022 8:46	0.589	0.977	1.002	1.000



Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

**Spike S/N :** 1715-G  
**Spike Exp Date :** 9/8/2023  
**Spike Activity (dpm/ml):** 297.46  
**Spike Volume Added:** 0.10

**LCS S/N :** 1715-G  
**LCS Exp Date :** 9/8/2023  
**LCS Activity (dpm/ml):** 297.46  
**LCS Volume Added:** 0.10

<b>Results</b>																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.2490	0.1758	1	0.4441	<b>0.4627</b>	35.74%	0.5000	0.1732	0.3142	0.3309		SAMPLE				
2	0.2287	0.1615	1	0.4079	<b>0.6800</b>	25.51%	0.8000	0.2000	0.3332	0.3540		SAMPLE				
3	0.0911	0.0643	1	0.2115	<b>0.6080</b>	23.98%	0.7333	0.1633	0.2654	0.2989		SAMPLE				
4	0.1858	0.1312	1	0.3600	<b>0.6185</b>	27.13%	0.6333	0.1667	0.3190	0.3408		SAMPLE				
5	0.2533	0.1788	1	0.4449	<b>0.4068</b>	38.06%	0.4667	0.1764	0.3014	0.3091		SAMPLE				
6	0.2395	0.1691	1	0.4271	<b>0.6527</b>	28.12%	0.7333	0.1944	0.3391	0.3719		SAMPLE				
7	0.1396	0.0986	1	0.2870	<b>1.0186</b>	19.16%	1.1333	0.2055	0.3620	0.4099		SAMPLE				
8	0.0859	0.0606	1	0.1995	<b>0.1564</b>	47.70%	0.2000	0.0943	0.1445	0.1479		SAMPLE				
9	0.2166	0.1529	1	0.4044	<b>0.4273</b>	35.25%	0.4333	0.1528	0.2952	0.3016		SAMPLE				
10	0.1610	0.1136	1	0.3119	<b>0.4512</b>	30.23%	0.5333	0.1563	0.2593	0.2752		SAMPLE				
11	0.1050	0.0741	1	0.2438	<b>1.1467</b>	17.70%	1.2000	0.2055	0.3849	0.4310		SAMPLE				
12	0.2889	0.2039	1	0.5153	<b>0.4653</b>	38.53%	0.4333	0.1667	0.3507	0.3577		SAMPLE				
13	0.2003	0.1414	1	0.3644	<b>1.4139</b>	16.68%	1.7333	0.2625	0.4196	0.5053		SAMPLE				
14	0.2067	0.1459	1	0.3760	<b>0.4207</b>	33.82%	0.5000	0.1667	0.2749	0.2854		SAMPLE				
15	0.1815	0.1281	1	0.3517	<b>0.9222</b>	22.30%	0.9667	0.1972	0.3687	0.4244		SAMPLE				
16	0.1732	0.1223	1	0.3355	<b>1.4868</b>	15.94%	1.6333	0.2472	0.4410	0.5117		SAMPLE				
17	0.1842	0.1300	1	0.3569	<b>1.0004</b>	19.72%	1.0333	0.2028	0.3847	0.4128		SAMPLE				
18	0.2015	0.1423	1	0.3666	<b>0.9025</b>	20.25%	1.1000	0.2186	0.3515	0.3811		SAMPLE				
19	0.1346	0.0950	1	0.2767	<b>0.4043</b>	30.48%	0.4667	0.1414	0.2401	0.2485		SAMPLE				
20	0.1487	0.1050	1	0.3057	<b>0.6062</b>	27.04%	0.6333	0.1599	0.2999	0.3330		SAMPLE				
21	0.1879	0.1326	1	0.3508	<b>0.0285</b>	300.00%	0.0333	0.1000	0.1676	0.1677		MB				
22	0.1447	0.1022	1	0.2975	<b>0.3726</b>	34.00%	0.4000	0.1333	0.2434	0.2541	600981001.1	DUP	21.6%			
23	1.3503	0.9533	1	2.3413	<b>119.5299</b>	4.15%	27.5000	0.9667	8.2352	19.8013	600981001.1	MS			128.4106	92.7%
24	0.2366	0.1670	1	0.4154	<b>23.2815</b>	10.48%	28.6000	0.9843	1.5705	5.8454		LCS			26.5127	87.8%

# **Continuing Calibration Data**



# Ludlum Alpha Scintillation Counter Checks for 14-DEC-2022

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	07:28	1	1.22E+05	121762	-0.81		
LUCAS2	EFF	07:26	1	1.35E+05	134645	0.73		
LUCAS3	EFF	07:25	1	1.12E+05	111632	-1.7		
LUCAS4	EFF	07:22	1	1.28E+05	127809	-0.14		
LUCAS5	EFF	07:20	1	1.34E+05	133802	0.45		
LUCAS6	EFF	07:18	1	1.31E+05	130745	-0.6		
LUCAS7	EFF	07:17	1	1.31E+05	131098	0.21		
LUCAS8	EFF	07:13	1	1.32E+05	132166	0.53		

**Reviewed by:**

Lyndsey Pace

**Date:** 14-DEC-22

GEL Laboratories LLC

# Runlogs

# Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2349072

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
600981001	SAMPLE	LXP1	LUCAS1	DEC-14-22 07:41:00	DONE	Lucas Cell	28-APR-22 00:00
600981002	SAMPLE	LXP1	LUCAS2	DEC-14-22 07:41:00	DONE	Lucas Cell	01-AUG-22 00:00
600981003	SAMPLE	LXP1	LUCAS3	DEC-14-22 07:41:00	DONE	Lucas Cell	25-OCT-22 00:00
600981004	SAMPLE	LXP1	LUCAS4	DEC-14-22 07:41:00	DONE	Lucas Cell	01-FEB-22 00:00
600981005	SAMPLE	LXP1	LUCAS5	DEC-14-22 07:41:00	DONE	Lucas Cell	01-JUN-22 00:00
601018001	SAMPLE	LXP1	LUCAS6	DEC-14-22 07:41:00	DONE	Lucas Cell	01-JUL-22 00:00
601018002	SAMPLE	LXP1	LUCAS7	DEC-14-22 07:41:00	DONE	Lucas Cell	01-NOV-22 00:00
601018003	SAMPLE	LXP1	LUCAS8	DEC-14-22 07:41:00	DONE	Lucas Cell	01-APR-22 00:00
601018004	SAMPLE	LXP1	LUCAS1	DEC-14-22 08:13:00	DONE	Lucas Cell	28-APR-22 00:00
601018005	SAMPLE	LXP1	LUCAS2	DEC-14-22 08:13:00	DONE	Lucas Cell	01-AUG-22 00:00
601018006	SAMPLE	LXP1	LUCAS3	DEC-14-22 08:13:00	DONE	Lucas Cell	25-OCT-22 00:00
601018007	SAMPLE	LXP1	LUCAS4	DEC-14-22 08:13:00	DONE	Lucas Cell	01-FEB-22 00:00
601018008	SAMPLE	LXP1	LUCAS5	DEC-14-22 08:13:00	DONE	Lucas Cell	01-JUN-22 00:00
601018009	SAMPLE	LXP1	LUCAS6	DEC-14-22 08:13:00	DONE	Lucas Cell	01-JUL-22 00:00
601018010	SAMPLE	LXP1	LUCAS7	DEC-14-22 08:13:00	DONE	Lucas Cell	01-NOV-22 00:00
601018011	SAMPLE	LXP1	LUCAS8	DEC-14-22 08:13:00	DONE	Lucas Cell	01-APR-22 00:00
601018012	SAMPLE	LXP1	LUCAS1	DEC-14-22 08:45:00	DONE	Lucas Cell	28-APR-22 00:00
601018013	SAMPLE	LXP1	LUCAS2	DEC-14-22 08:45:00	DONE	Lucas Cell	01-AUG-22 00:00
601018014	SAMPLE	LXP1	LUCAS3	DEC-14-22 08:45:00	DONE	Lucas Cell	25-OCT-22 00:00
601024001	SAMPLE	LXP1	LUCAS4	DEC-14-22 08:45:00	DONE	Lucas Cell	01-FEB-22 00:00
1205257800	MB	LXP1	LUCAS5	DEC-14-22 08:45:00	DONE	Lucas Cell	01-JUN-22 00:00
1205257801	DUP	LXP1	LUCAS6	DEC-14-22 08:46:00	DONE	Lucas Cell	01-JUL-22 00:00
1205257802	MS	LXP1	LUCAS7	DEC-14-22 08:46:00	DONE	Lucas Cell	01-NOV-22 00:00
1205257803	LCS	LXP1	LUCAS8	DEC-14-22 08:46:00	DONE	Lucas Cell	01-APR-22 00:00



## Data Verification & Validation Report

### Lansing Board of Water & Light – Erickson Power Station

**Sampling Event (dates and purpose):** New Wells 7B, 7C, 12B Background Round 8 – November 2022

Data Package Number: S42439.01

Lab Report Date: 12/27/2022

Data Validator: Aryka Thomson

Data Validation Completion Date: 01/01/2023

General Overall Assessment:

- Data are usable without qualification.
- Data are usable with qualification (as noted below).
- Some or all data are unusable (as noted below).

Wells planned for sampling:

Well ID	Planned for Sampling
MW-1	
MW-2	
MW-3	
MW-4	
MW-5	
MW-6	
MW-7	
MW-7B	X
MW-7C	X
MW-8	
MW-9	
MW-10	
MW-11	
MW-11B	
MW-12	
MW-12B	X
MW-13	

### Data Summary

Sample ID	Matrix	Lab ID	Date Collected	App III Metals	App IV Metals	Part 115 Metals	Anions	TDS TSS	Rad-226 Rad-228	Diss. Metals
MW-7B	GW	S42439.01	11/10/2022	X	X	X	X	X	X	
MW-7C	GW	S42439.02	11/10/2022	X	X	X	X	X	X	
MW-12B	GW	S42439.03	11/10/2022	X	X	X	X	X	X	
MW-12B Dup	QC	S42439.04	11/10/2022	X	X	X	X	X	X	

Other analytes requested for analysis: Na, Mg, K, HCO<sub>3</sub>, CO<sub>3</sub>, hardness

Any planned sampling or analysis NOT completed? If yes, explain: \_\_\_\_\_

### Data Verification & Validation Checklist

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
<b>Field Data</b>							
Sample Collection Field Forms	X		Purging performed as required in the Groundwater Monitoring Plan	X			
Field Calibration Records	X		Field instruments calibrated daily according to manufacturer specifications	X			
Chain of Custody	X		Accurately reflect samples, collection dates/times, analyses, bottles, etc.	X			
Field decontamination documentation	N/A		Record of decontamination for non-dedicated sampling equipment			X	
Drilling logs	X		N/A	-	-	-	
Well construction logs	X		N/A	-	-	-	
Well development field forms	X		N/A	-	-	-	
<b>Analytical Data Package</b>							
Cover Sheet	X		N/A	-	-	-	
Case Narrative	X		Summarizes sample receipt and any exceptions to QC acceptance criteria	X			
Internal Laboratory Chain of Custody forms	X		Analyses as requested; accurate transcription of field COC	X			
Sample Chronology and Consistency	X		Accurate representation of dates, times of receipt, preparation, and analysis	X			
Communication Records with Lab	X		N/A	-	-	-	
EDD Format Consistency	X		EDD format and content as requested	X			
Sample Identification, Results Nomenclature, and Data Qualifier Consistency	X		All included in final report	X			
Method Detection Limit Consistency	X		MDLs consistent between samples		X		Dilution varies between samples
Instrument Calibration Records	X		Present and no nonconformance noted	X			
Laboratory Report Complete	X		Includes QC component	X			
Holding Times	X		Analyses performed within allowed holding time	X			

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Method	X		Method as requested	X			
Reporting Limits	X		RLs as requested	X			RLs for chloride, sulfate, TDS were not met
			MDLs<RLs		X		RL=MDL for carbonate
			MDLs<GPS			X	
<b>QC Validation</b>							
<b>Evaluate Accuracy</b>							
Matrix Spike (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Laboratory Control Sample (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
<b>Evaluate Precision</b>							
Matrix Spike Duplicate (RPD)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Field Duplicate (RPD)	X		RPD ≤ 20%	X			
<b>Evaluate Representativeness</b>							
Equipment Blanks (if applicable)	N/A		Non-detect (<RL)			X	
<b>QC Verification</b>							
<b>Verify Instrument Calibration &amp; Analytical Process</b>							
Initial Calibration Verification	X		Laboratory-determined	-	-	-	
Continuing Calibration Verification	X		Laboratory-determined	-	-	-	
Initial Calibration Blank	X		Laboratory-determined	-	-	-	
Continuing Calibration Blank	X		Laboratory-determined	-	-	-	
Serial Dilutions	X		Laboratory-determined	-	-	-	High recovery for Al, Ba, Fe, Li, and Mn
Post-Digestion Spikes	X		Laboratory-determined	-	-	-	
Internal Standards	X		Laboratory-determined	-	-	-	
Laboratory Duplicate (RPD)	X		Laboratory-determined	-	-	-	
Method Blanks	X		Laboratory-determined	-	-	-	
<b>Evaluate Completeness (# usable measurements/ # unusable measurements)</b>							
Completeness	X		100%	X			

Other instances of nonconformance to QC control limits noted on case narrative: None.

Comments: None.





Report ID: S42756.01(03)  
Generated on 12/27/2022  
Replaces report S42756.01(02) generated on 12/15/2022

**Report to**  
Attention: Jennifer Caporale  
Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901  
  
Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

**Report produced by**  
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Barbara Ball (bball@meritlabs.com)

**Report Summary**  
Lab Sample ID(s): S42756.01-S42756.03  
Project: Erickson AM MI Wells 11B  
Collected Date(s): 11/22/2022  
Submitted Date/Time: 11/22/2022 13:13  
Sampled by: Marc Wahrer  
P.O. #:

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Maya Murshak  
Technical Director



## General Report Notes

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Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile, and 2-chloroethylvinyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (\*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

## Report Narrative

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All analyses completed



Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Alaska CSLAP	#17-001
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



## Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1 (1993)
SM2320B	Standard Method 2320 B 2011
SM2340C	Standard Method 2340 C 2011
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007



### Sample Summary (3 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S42756.01	MW-11B L211187-01	Groundwater	11/22/22 10:52
S42756.02	Field Dupe MW-11B L211187-02	Groundwater	11/22/22 10:52
S42756.03	Field Blank L211187-03	Water	11/22/22 09:50



# Analytical Laboratory Report

Final Report

Lab Sample ID: S42756.01

Sample Tag: MW-11B L211187-01

Collected Date/Time: 11/22/2022 10:52

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.0	IR
2	1L Plastic	None	Yes	2.0	IR
1	125ml Plastic	HNO3	Yes	2.0	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	11/23/22 11:42	CTV	
Metal Digestion	Completed	SW3015A	11/23/22 09:50	CCM	

### Inorganics

Method: E300.0, Run Date: 11/23/22 12:52, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	1.7	5.0	0.65	mg/L	5	16887-00-6	b
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	2.58	5.0	0.30	mg/L	5	14808-79-8	b

Method: SM2320B, Run Date: 11/28/22 12:06, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	360	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 11/28/22 11:08, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	260	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 11/25/22 15:35, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	294	50	10	mg/L	2		

Method: SM2540D, Run Date: 11/23/22 18:30, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 11/23/22 11:13, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.007	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.059	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.73	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	

b-Value detected less than reporting limit, but greater than MDL



# Analytical Laboratory Report

Final Report

Lab Sample ID: S42756.01 (continued)

Sample Tag: MW-11B L211187-01

**Method: E200.8, Run Date: 11/23/22 11:13, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Iron	1.32	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.029	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 11/23/22 12:14, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	66.3	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	23.9	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	6.28	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	15.8	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 11/23/22 12:33, Analyst: CTV**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 12/16/22 06:52, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Lab Sample ID: S42756.02

Sample Tag: Field Dupe MW-11B L211187-02

Collected Date/Time: 11/22/2022 10:52

Matrix: Groundwater

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.0	IR
2	1L Plastic	None	Yes	2.0	IR
1	125ml Plastic	HNO3	Yes	2.0	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	11/23/22 11:42	CTV	
Metal Digestion	Completed	SW3015A	11/23/22 09:50	CCM	

### Inorganics

Method: E300.0, Run Date: 11/23/22 13:18, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	1.7	5.0	0.65	mg/L	5	16887-00-6	b
Fluoride (Undistilled)	0.16	1.0	0.13	mg/L	5	16984-48-8	b
Sulfate	2.78	5.0	0.30	mg/L	5	14808-79-8	b

Method: SM2320B, Run Date: 11/28/22 12:10, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	360	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 11/28/22 11:12, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	260	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 11/25/22 15:35, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	268	50	10	mg/L	2		

Method: SM2540D, Run Date: 11/23/22 18:30, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 11/23/22 11:17, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.007	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.060	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.73	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	

b-Value detected less than reporting limit, but greater than MDL





# Analytical Laboratory Report

Final Report

Lab Sample ID: S42756.02 (continued)  
Sample Tag: Field Dupe MW-11B L211187-02

**Method: E200.8, Run Date: 11/23/22 11:17, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Iron	1.30	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.027	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

**Method: E200.8, Run Date: 11/23/22 12:16, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	66.2	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	24.1	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	6.41	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	15.9	0.50	0.00850	mg/L	5	7440-23-5	

**Method: E245.1, Run Date: 11/23/22 12:36, Analyst: CTV**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 12/16/22 06:52, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



# Analytical Laboratory Report

Final Report

Lab Sample ID: S42756.03

Sample Tag: Field Blank L211187-03

Collected Date/Time: 11/22/2022 09:50

Matrix: Water

COC Reference:

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.0	IR
2	1L Plastic	None	Yes	2.0	IR
1	125ml Plastic	HNO3	Yes	2.0	IR

### Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	11/23/22 11:42	CTV	
Metal Digestion	Completed	SW3015A	11/23/22 09:50	CCM	

### Inorganics

Method: E300.0, Run Date: 11/23/22 13:31, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	1.3	5.0	0.65	mg/L	5	16887-00-6	b
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	0.61	5.0	0.30	mg/L	5	14808-79-8	b

Method: SM2320B, Run Date: 11/28/22 12:16, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	Not detected	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 11/28/22 11:18, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	Not detected	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 11/25/22 15:35, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	Not detected	50	10	mg/L	2		

Method: SM2540D, Run Date: 11/23/22 18:30, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

### Metals

Method: E200.8, Run Date: 11/23/22 11:09, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00102	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.000102	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.0000648	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.0000862	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.000702	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.0000760	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.0000386	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.0000434	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000150	mg/L	2	7440-50-8	

b-Value detected less than reporting limit, but greater than MDL



# Analytical Laboratory Report

Final Report

Lab Sample ID: S42756.03 (continued)

Sample Tag: Field Blank L211187-03

**Method: E200.8, Run Date: 11/23/22 11:09, Analyst: CCM (continued)**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Iron	Not detected	0.02	0.000768	mg/L	2	7439-89-6	
Lead	Not detected	0.003	0.0000760	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000654	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.0000868	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000100	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.000838	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.0000270	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.0000342	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.0000558	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.000292	mg/L	2	7440-66-6	

**Method: E200.8, Run Date: 11/23/22 12:12, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.0174	mg/L	2	7440-70-2	
Magnesium	Not detected	0.50	0.00480	mg/L	2	7439-95-4	
Potassium	Not detected	0.50	0.00920	mg/L	2	7440-09-7	
Sodium	Not detected	0.50	0.00340	mg/L	2	7440-23-5	

**Method: E245.1, Run Date: 11/23/22 12:40, Analyst: CTV**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

**Other / Misc.**

**Method: , Run Date: 12/16/22 06:52, Analyst: GEL**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

# Merit Laboratories Login Checklist

Lab Set ID:S42756

Client:BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 11B

Submitted: 11/22/2022 13:13 Login User: MMC

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental\_Laboratory@LBWL.com

Selection	Description	Note
<b>Sample Receiving</b>		
01.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples are received at 4C +/- 2C Thermometer # IR 2.0
02.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Received on ice/ cooling process begun
03.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples shipped
04.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples left in 24 hr. drop box
05.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Are there custody seals/tape or is the drop box locked
<b>Chain of Custody</b>		
06.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC adequately filled out
07.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC signed and relinquished to the lab
08.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sample tag on bottles match COC
09.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Subcontracting needed? Subcontracted to: GEL
<b>Preservation</b>		
10.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Do sample have correct chemical preservation
11.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Completed pH checks on preserved samples? (no VOAs)
12.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Did any samples need to be preserved in the lab?
<b>Bottle Conditions</b>		
13.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	All bottles intact
14.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Appropriate analytical bottles are used
15.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Merit bottles used
16.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sufficient sample volume received
17.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples require laboratory filtration
18.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples submitted within holding time
19.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Do water VOC or TOX bottles contain headspace

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: \_\_\_\_\_ Date: \_\_\_\_\_

# Merit Laboratories Bottle Preservation Check

Lab Set ID: S42756 Submitted: 11/22/2022 13:13

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 11B

Initial Preservation Check: 11/22/2022 14:01 MMC

Preservation Recheck (E200.8): N/A

Attention: Jennifer Caporale  
Address: Board of Water & Light  
P.O. Box 13007  
Lansing, MI 48901

Phone: 517-702-6372 FAX:  
Email: Environmental\_Laboratory@LBWL.com

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S42756.01	125ml Plastic HNO3	<2			
S42756.01	1L Plastic HNO3	<2			
S42756.01	1L Plastic HNO3	<2			
S42756.02	125ml Plastic HNO3	<2			
S42756.02	1L Plastic HNO3	<2			
S42756.02	1L Plastic HNO3	<2			
S42756.03	125ml Plastic HNO3	<2			
S42756.03	1L Plastic HNO3	<2			
S42756.03	1L Plastic HNO3	<2			



2680 East Lansing Dr., East Lansing, MI 48823  
 Phone (517) 332-0167 Fax (517) 332-4034  
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

**REPORT TO**

**CHAIN OF CUSTODY RECORD**

**INVOICE TO**

CONTACT NAME Jennifer Caporale  
 COMPANY Lansing Board of Water and Light  
 ADDRESS PO Box 13007 48901-3007  
 CITY Lansing STATE Mi ZIP CODE 48901  
 PHONE NO. 517-702-6372 FAX NO. \_\_\_\_\_ P.O. NO. \_\_\_\_\_  
 E-MAIL ADDRESS Environmental\_Laboratory@lbwl.com QUOTE NO. \_\_\_\_\_

CONTACT NAME Kelly Gleason  SAME  
 COMPANY \_\_\_\_\_  
 ADDRESS \_\_\_\_\_  
 CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP CODE \_\_\_\_\_  
 PHONE NO. \_\_\_\_\_ E-MAIL ADDRESS Kelly.Gleason@lbwl.com

**ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)**

PROJECT NO./NAME Erickson AM MI Wells 11B SAMPLER(S) - PLEASE PRINT/SIGN NAME Marc Wahrer  
 TURNAROUND TIME REQUIRED  1 DAY  2 DAYS  3 DAYS  STANDARD  OTHER ASAP  
 DELIVERABLES REQUIRED  STD  LEVEL II  LEVEL III  LEVEL IV  EDD  OTHER \_\_\_\_\_

MATRIX GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID  
 CODE: SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIFE A=AIR W=WASTE

# Containers & Preservatives

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO <sub>3</sub>	H <sub>2</sub> SO <sub>4</sub>	NaOH	MeOH	OTHER	Total Metals	F- undistilled, Cl-, SO <sub>4</sub> , TDS	Radium 226	Radium 228	TSS	HCO <sub>3</sub> , CO <sub>3</sub> , Hardness							Certifications		Project Locations		Special Instructions
	DATE	TIME																							<input type="checkbox"/> OHIO VAP	<input type="checkbox"/> Drinking Water	<input type="checkbox"/> DoD	<input checked="" type="checkbox"/> NPDES	
<u>42756.01</u>	<u>11/22/22</u>	<u>1052</u>	<u>MW-11B</u>										<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>							<input type="checkbox"/>	<input type="checkbox"/>		<u>Metals to analyse: Na, Mg, K</u>	
<u>.02</u>	<u>↓</u>	<u>1052</u>	<u>Field Dupe MW- 11B</u>										<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>							<input type="checkbox"/>	<input type="checkbox"/>		<u>B, Ca, Sb, As, Ba, Be, Cd, Cr,</u>	
<u>.03</u>	<u>↓</u>	<u>0950</u>	<u>Field Blank</u>										<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>							<input type="checkbox"/>	<input type="checkbox"/>		<u>Co, Li, Hg, Mo, Pb, Se, Tl,</u>	
																									<input type="checkbox"/>	<input type="checkbox"/>		<u>Fe, Cu, Ni, Ag, V, Zn</u>	
																									<input type="checkbox"/>	<input type="checkbox"/>		<u>Please send a preliminary report</u>	

RELINQUISHED BY: \_\_\_\_\_  Sampler DATE 11-22-22 TIME 1313  
 SIGNATURE/ORGANIZATION: \_\_\_\_\_  
 RECEIVED BY: M. Cilco DATE 11/22/22 TIME 1313  
 SIGNATURE/ORGANIZATION: \_\_\_\_\_  
 RELINQUISHED BY: \_\_\_\_\_ DATE \_\_\_\_\_ TIME \_\_\_\_\_  
 RECEIVED BY: \_\_\_\_\_ DATE \_\_\_\_\_ TIME \_\_\_\_\_

RELINQUISHED BY: \_\_\_\_\_ DATE \_\_\_\_\_ TIME \_\_\_\_\_  
 SIGNATURE/ORGANIZATION: \_\_\_\_\_  
 RECEIVED BY: \_\_\_\_\_ DATE \_\_\_\_\_ TIME \_\_\_\_\_  
 SIGNATURE/ORGANIZATION: \_\_\_\_\_  
 SEAL NO. SEAL INTACT INITIALS NOTES: TEMP. ON ARRIVAL  
 YES  NO   
 SEAL NO. SEAL INTACT INITIALS  
 YES  NO   
2.0°C

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

## Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.150
Be, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	2.5
Cl	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cr, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Fluoride	250 mL plastic	mg/L	None	9056	28 d	1.0
F	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Fe, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Pb, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Li, total	Mercury	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Hg, total	Molybdenum	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Mn, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	HNO3	SM 7500	6 mos	2.0 combined
RA226/228	Selenium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Se, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ag, total	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	10
SO4	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Tl, total	Total Dissolved Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TDS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540D	NA	3
TSS	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
V, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005

December 08, 2022

John Laverty  
Merit Laboratories Inc.  
2680 East Lansing Drive  
East Lansing, Michigan 48823

Re: Routine Analysis  
Work Order: 602141  
SDG: S42756

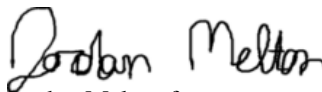
Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on November 28, 2022. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at [www.gel.com](http://www.gel.com).

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,



Jordan Melton for  
Delaney Stone  
Project Manager

Purchase Order: GELP20-0018  
Enclosures





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# Case Narrative

**Receipt Narrative  
for  
Merit Laboratories, Inc.  
SDG: S42756  
Work Order: 602141**

**December 08, 2022**

**Laboratory Identification:**

GEL Laboratories LLC  
2040 Savage Road  
Charleston, South Carolina 29407  
(843) 556-8171

**Summary:**

**Sample receipt:** The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on November 28, 2022 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

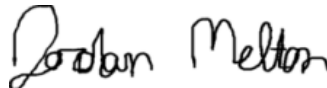
**Sample Identification:** The laboratory received the following samples:

<b><u>Laboratory ID</u></b>	<b><u>Client ID</u></b>
602141001	S42756.01
602141002	S42756.02 Field Dupe
602141003	S42756.03 Field Blank

**Case Narrative:**

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.



Jordan Melton for  
Delaney Stone  
Project Manager

# **Chain of Custody and Supporting Documentation**

602146

C.O.C. PAGE # 1 OF 1

2680 East Lansing Dr., East Lansing, MI 48823  
 Phone (517) 332-0167 Fax (517) 332-4034  
 www.meritlabs.com



**REPORT TO**  
 CONTACT NAME Project Management Team  
 COMPANY Merit Laboratories  
 ADDRESS 2680 East Lansing Drive  
 CITY East Lansing  
 STATE MI ZIP CODE 48823  
 PHONE NO. 517-332-0167  
 E-MAIL ADDRESS results@meritlabs.com

**CHAIN OF CUSTODY RECORD**  
 CONTACT NAME Julie Teague  
 COMPANY Merit Laboratories  
 ADDRESS 2680 East Lansing Drive  
 CITY East Lansing  
 STATE MI ZIP CODE 48823  
 PHONE NO. 517-332-0167  
 E-MAIL ADDRESS juliet@meritlabs.com

**INVOICE TO**

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

PROJECT NO./NAME S42756  
 TURNAROUND TIME REQUIRED  1 DAY  2 DAYS  3 DAYS  STANDARD  OTHER  
 DELIVERABLES REQUIRED  STD  LEVEL II  LEVEL III  LEVEL IV  EDD  OTHER

MERCIT LAB NO. FOR LAB USE ONLY	YEAR	DATE	TIME	IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	# Containers & Preservatives								
							H <sub>2</sub> O	HNO <sub>3</sub>	H <sub>2</sub> SO <sub>4</sub>	NaOH	MeOH	OTHER			
	11/22/22	1052		S42756.01	GW	2		2							
	11/22/22	1052		S42756.02 Field Dupe	GW	2		2							
	11/22/22	0950		S42756.03 Field Blank	GW	2		2							

Certifications  
 OHIO VAP  Drinking Water  
 DoD  NPDES  
 Project Locations  
 Detroit  New York  
 Other \_\_\_\_\_  
 Special Instructions  
 \* E903.1 Mod.  
 \*\* E904.0/SW 9320 Mod.  
 Please use calculation product & provide Radium 226/228 combined results on the report  
 (No Ice needed)  
 \*\* Subcontracted to  
 GEL Laboratories, Inc.  
 2040 Savage Road  
 Charleston, SC 29407

RELINQUISHED BY: M. Clark  
 SIGNATURE/Organization  
 RECEIVED BY: WPS  
 SIGNATURE/Organization  
 DATE 11/22/22  
 TIME 1700  
 DATE 11/22/22  
 TIME 1700

RELINQUISHED BY: M. Clark  
 SIGNATURE/Organization  
 RECEIVED BY: WPS  
 SIGNATURE/Organization  
 DATE 11/22/22  
 TIME 1700  
 DATE 11/22/22  
 TIME 1700

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE



SAMPLE RECEIPT & REVIEW FORM

Client: MERI SDG/AR/COC/Work Order: 602141 D.S.  
 Received By: Thyasia Tatum Date Received: 11.28.22  
 Carrier and Tracking Number: \_\_\_\_\_  
 FedEx Express FedEx Ground UPS Field Services Courier Other  
124604770302523323

Suspected Hazard Information	Yes	No	*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.
A) Shipped as a DOT Hazardous?		<input checked="" type="checkbox"/>	Hazard Class Shipped: _____ UN#: _____ If UN2910, Is the Radioactive Shipment Survey Compliant? Yes ___ No ___
B) Did the client designate the samples are to be received as radioactive?		<input checked="" type="checkbox"/>	COC notation or radioactive stickers on containers equal client designation.
C) Did the RSO classify the samples as radioactive?		<input checked="" type="checkbox"/>	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): <u>0</u> CPM / mR/Hr Classified as: Rad 1 Rad 2 Rad 3
D) Did the client designate samples are hazardous?		<input checked="" type="checkbox"/>	COC notation or hazard labels on containers equal client designation.
E) Did the RSO identify possible hazards?		<input checked="" type="checkbox"/>	If D or E is yes, select Hazards below. PCB's Flammable Foreign Soil RCRA Asbestos Beryllium Other:

Sample Receipt Criteria	Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1 Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2 Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>			Circle Applicable: Client contacted and provided COC COC created upon receipt
3 Samples requiring cold preservation within (0 ≤ 6 deg. C)?*	<input checked="" type="checkbox"/>			Preservation Method: Wet Ice Ice Packs Dry ice <u>None</u> Other: _____ *all temperatures are recorded in Celsius <span style="float: right;">TEMP: <u>10°C</u></span>
4 Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>			Temperature Device Serial #: <u>IR2-20</u> Secondary Temperature Device Serial # (If Applicable): _____
5 Sample containers intact and sealed?	<input checked="" type="checkbox"/>			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6 Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>			Sample ID's and Containers Affected: _____ If Preservation added, Lot#: _____
7 Do any samples require Volatile Analysis?	<input checked="" type="checkbox"/>			If Yes, are Encores or Soil Kits present for solids? Yes ___ No ___ NA ___ (If yes, take to VOA Freezer)
				Do liquid VOA vials contain acid preservation? Yes ___ No ___ NA ___ (If unknown, select No)
				Are liquid VOA vials free of headspace? Yes ___ No ___ NA ___ Sample ID's and containers affected: _____
8 Samples received within holding time?	<input checked="" type="checkbox"/>			ID's and tests affected: _____
9 Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>			ID's and containers affected: _____
10 Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>			Circle Applicable: No dates on containers No times on containers COC missing info Other (describe)
11 Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>			Circle Applicable: No container count on COC Other (describe)
12 Are sample containers identifiable as GEL provided by use of GEL labels?	<input checked="" type="checkbox"/>			
13 COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>			Circle Applicable: Not relinquished Other (describe)

Comments (Use Continuation Form if needed): \_\_\_\_\_

PM (or PMA) review: Initials STW Date 11/29/22 Page 1 of 1



602141

C.O.C. PAGE # 1 OF 1

2680 East Lansing Dr., East Lansing, MI 48823  
 Phone (517) 332-0167 Fax (517) 332-4034  
 www.meritlabs.com



**REPORT TO**

CONTACT NAME: Project Management Team  
 COMPANY: Merit Laboratories  
 ADDRESS: 2680 East Lansing Drive  
 CITY: East Lansing  
 STATE: MI ZIP CODE: 48823

PHONE NO.: 517-332-0167  
 FAX NO.:  
 E-MAIL ADDRESS: results@meritlabs.com

CONTACT NAME: Julie Teague  
 COMPANY: Merit Laboratories  
 ADDRESS: 2680 East Lansing Drive  
 CITY: East Lansing  
 STATE: MI ZIP CODE: 48823

PHONE NO.: 517-332-0167  
 E-MAIL ADDRESS: juliet@meritlabs.com

**CHAIN OF CUSTODY RECORD**

PROJECT NO./NAME: S42756

TURNAROUND TIME REQUIRED:  1 DAY  2 DAYS  3 DAYS  STANDARD  OTHER

DELIVERABLES REQUIRED:  STD  LEVEL II  LEVEL III  LEVEL IV  EDD  OTHER

MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID  
 SL=SLUDGE DW=DRINKING WATER O=OIL WP=WPIPE A=AIR W=WASTE

SAMPLER(S) - PLEASE PRINT/SIGN NAME: \_\_\_\_\_

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR	DATE	TIME	IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	# Containers & Preservatives						OTHER									
							NONE	HCl	HNO <sub>3</sub>	H <sub>2</sub> SO <sub>4</sub>	NaOH	MeOH										
	11/22/22	1052		S42756.01	GW	2			2													
	11/22/22	1052		S42756.02 Field Dupe	GW	2			2													
	11/22/22	0950		S42756.03 Field Blank	GW	2			2													

**INVOICE TO**

RELINQUISHED BY: SIGNATURE/Organization: *M. Clark* DATE: 11/22/22 TIME: 1700

RECEIVED BY: SIGNATURE/Organization: *MPS* DATE: 11/22/22 TIME: 1700

RELINQUISHED BY: SIGNATURE/Organization: *Julie Teague* DATE: 11/22/22 TIME: 9:00

RECEIVED BY: SIGNATURE/Organization: *Julie Teague* DATE: 11/22/22 TIME: 9:00

SEAL NO. YES  NO  INITIALS: \_\_\_\_\_

SEAL NO. YES  NO  INITIALS: \_\_\_\_\_

NOTES: \_\_\_\_\_

TEMP ON ARRIVAL: \_\_\_\_\_

DATE: \_\_\_\_\_ TIME: \_\_\_\_\_

DATE: \_\_\_\_\_ TIME: \_\_\_\_\_

DATE: \_\_\_\_\_ TIME: \_\_\_\_\_

DATE: \_\_\_\_\_ TIME: \_\_\_\_\_

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE



SAMPLE RECEIPT & REVIEW FORM

Client: MERI SDG/AR/COC/Work Order: 602141 D.S.  
 Received By: Thyasia Tatum Date Received: 11.28.22  
 Carrier and Tracking Number: \_\_\_\_\_  
 FedEx Express    FedEx Ground    UPS    Field Services    Courier    Other  
124604770302523323

<b>Suspected Hazard Information</b>	Yes	No	*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.
A) Shipped as a DOT Hazardous?		<input checked="" type="checkbox"/>	Hazard Class Shipped: _____ UN#: _____ If UN2910, Is the Radioactive Shipment Survey Compliant? Yes ___ No ___
B) Did the client designate the samples are to be received as radioactive?		<input checked="" type="checkbox"/>	COC notation or radioactive stickers on containers equal client designation.
C) Did the RSO classify the samples as radioactive?		<input checked="" type="checkbox"/>	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): <u>0</u> CPM / mR/Hr Classified as: Rad 1    Rad 2    Rad 3
D) Did the client designate samples are hazardous?		<input checked="" type="checkbox"/>	COC notation or hazard labels on containers equal client designation.
E) Did the RSO identify possible hazards?		<input checked="" type="checkbox"/>	If D or E is yes, select Hazards below. PCB's    Flammable    Foreign Soil    RCRA    Asbestos    Beryllium    Other:

Sample Receipt Criteria	Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1 Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>			Circle Applicable: Seals broken    Damaged container    Leaking container    Other (describe)
2 Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>			Circle Applicable: Client contacted and provided COC    COC created upon receipt
3 Samples requiring cold preservation within (0 ≤ 6 deg. C)?*	<input checked="" type="checkbox"/>			Preservation Method: Wet Ice    Ice Packs    Dry ice <u>None</u> Other: _____ *all temperatures are recorded in Celsius <span style="float: right;">TEMP: <u>10°C</u></span>
4 Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>			Temperature Device Serial #: <u>IR2-20</u> Secondary Temperature Device Serial # (If Applicable): _____
5 Sample containers intact and sealed?	<input checked="" type="checkbox"/>			Circle Applicable: Seals broken    Damaged container    Leaking container    Other (describe)
6 Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>			Sample ID's and Containers Affected: _____ If Preservation added, Lot#: _____
7 Do any samples require Volatile Analysis?	<input checked="" type="checkbox"/>			If Yes, are Encores or Soil Kits present for solids? Yes ___ No ___ NA ___ (If yes, take to VOA Freezer)
				Do liquid VOA vials contain acid preservation? Yes ___ No ___ NA ___ (If unknown, select No)
				Are liquid VOA vials free of headspace? Yes ___ No ___ NA ___ Sample ID's and containers affected: _____
8 Samples received within holding time?	<input checked="" type="checkbox"/>			ID's and tests affected: _____
9 Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>			ID's and containers affected: _____
10 Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>			Circle Applicable: No dates on containers    No times on containers    COC missing info    Other (describe)
11 Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>			Circle Applicable: No container count on COC    Other (describe)
12 Are sample containers identifiable as GEL provided by use of GEL labels?	<input checked="" type="checkbox"/>			
13 COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>			Circle Applicable: Not relinquished    Other (describe)

Comments (Use Continuation Form if needed): \_\_\_\_\_

PM (or PMA) review: Initials STW Date 11/29/22 Page 1 of 1



# **Laboratory Certifications**

**List of current GEL Certifications as of 08 December 2022**

<b>State</b>	<b>Certification</b>
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122023-3
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2022-160
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122022-37
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

# **Radiological Analysis**

# Case Narrative

**Radiochemistry  
Technical Case Narrative  
Merit Laboratories, Inc.  
SDG #: S42756  
Work Order #: 602141**

**Product: Radium-226+Radium-228 Calculation**

**Analytical Method:** Calculation

**Analytical Procedure:** GL-RAD-D-003 REV# 45

**Analytical Batch:** 2351338

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
602141001	S42756.01
602141002	S42756.02 Field Dupe
602141003	S42756.03 Field Blank

**Data Summary:**

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

**Product: GFPC Ra228, Liquid**

**Analytical Method:** EPA 904.0/SW846 9320 Modified

**Analytical Procedure:** GL-RAD-A-063 REV# 5

**Analytical Batch:** 2351339

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
602141001	S42756.01
602141002	S42756.02 Field Dupe
602141003	S42756.03 Field Blank
1205262045	Method Blank (MB)
1205262046	601580001(NonSDG) Sample Duplicate (DUP)
1205262047	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

**Product:** Lucas Cell, Ra226, Liquid

**Analytical Method:** EPA 903.1 Modified

**Analytical Procedure:** GL-RAD-A-008 REV# 15

**Analytical Batch:** 2351334

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
602141001	S42756.01
602141002	S42756.02 Field Dupe
602141003	S42756.03 Field Blank
1205262029	Method Blank (MB)
1205262030	601779001(NonSDG) Sample Duplicate (DUP)
1205262031	601779001(NonSDG) Matrix Spike (MS)
1205262032	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**Data Summary:**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

**Quality Control (QC) Information**

**Duplication Criteria between QC Sample and Duplicate Sample**

The Sample and the Duplicate, (See Below), did not meet the relative percent difference requirement; however, they do meet the relative error ratio requirement with the value listed below.

<b>Sample</b>	<b>Analyte</b>	<b>Value</b>
1205262030 (Non SDG 601779001DUP)	Radium-226	RPD 29.7* (0%-20%) RER 1.25 (0-3)

**Miscellaneous Information**

**Additional Comments**

The matrix spike, 1205262031 (Non SDG 601779001MS), aliquot was reduced to conserve sample volume.

**Certification Statement**

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

## GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

### Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S42756 GEL Work Order: 602141

#### The Qualifiers in this report are defined as follows:

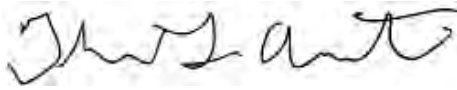
- \* A quality control analyte recovery is outside of specified acceptance criteria
- \*\* Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

#### Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature:



Name: Theresa Austin

Date: 26 DEC 2022

Title: Group Leader

# Sample Data Summary



# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: December 26, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Lavery  
 Project: Routine Analysis

Client Sample ID: S42756.01	Project: MERI00120
Sample ID: 602141001	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 22-NOV-22 10:52	
Receive Date: 28-NOV-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	2.40	+/-1.53	2.41	3.00	pCi/L		JE1	12/13/22	0909	2351339		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		3.32	+/-1.63			pCi/L		1 TON1	12/16/22	0652	2351338		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.919	+/-0.546	0.629	1.00	pCi/L		LXP1	12/13/22	1038	2351334		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			79.8	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: December 26, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Laverty  
 Project: Routine Analysis

Client Sample ID: S42756.02 Field Dupe	Project: MERI00120
Sample ID: 602141002	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 22-NOV-22 10:52	
Receive Date: 28-NOV-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.745	+/-1.23	2.14	3.00	pCi/L		JE1	12/13/22	0909	2351339	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.81	+/-1.35			pCi/L		1 TON1	12/16/22	0652	2351338	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		1.07	+/-0.551	0.622	1.00	pCi/L		LXP1	12/13/22	1038	2351334	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			77.2	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Report Date: December 26, 2022

Company : Merit Laboratories Inc.  
 Address : 2680 East Lansing Drive  
  
 East Lansing, Michigan 48823  
 Contact: John Lavery  
 Project: Routine Analysis

Client Sample ID: S42756.03 Field Blank	Project: MERI00120
Sample ID: 602141003	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 22-NOV-22 09:50	
Receive Date: 28-NOV-22	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.884	+/-1.06	1.79	3.00	pCi/L		JE1	12/13/22	0909	2351339	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.23	+/-1.18			pCi/L		1 TON1	12/16/22	0652	2351338	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.350	+/-0.512	0.894	1.00	pCi/L		LXP1	12/13/22	1038	2351334	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			73.8	(15%-125%)

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

# Quality Control Summary

# GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

## QC Summary

Report Date: December 26, 2022

Page 1 of 2

**Merit Laboratories Inc.**  
**2680 East Lansing Drive**  
**East Lansing, Michigan**

**Contact: John Laverty**

**Workorder: 602141**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Rad Gas Flow</b>											
Batch	2351339										
QC1205262046	601580001	DUP									
Radium-228	U	0.694	U	0.680	pCi/L	N/A		N/A	JE1	12/13/22	09:09
	Uncertainty	+/-0.899		+/-0.961							
QC1205262047	LCS										
Radium-228	64.8			52.8	pCi/L		81.5	(75%-125%)		12/13/22	09:09
	Uncertainty			+/-3.91							
QC1205262045	MB										
Radium-228			U	1.18	pCi/L					12/13/22	09:09
	Uncertainty			+/-0.896							
<b>Rad Ra-226</b>											
Batch	2351334										
QC1205262030	601779001	DUP									
Radium-226		3.22		2.39	pCi/L	29.7*		(0%-20%)	LXP1	12/13/22	10:38
	Uncertainty	+/-0.841		+/-0.721							
QC1205262032	LCS										
Radium-226	26.7			24.8	pCi/L		93.1	(75%-125%)		12/13/22	10:38
	Uncertainty			+/-1.90							
QC1205262029	MB										
Radium-226			U	0.231	pCi/L					12/13/22	10:38
	Uncertainty			+/-0.320							
QC1205262031	601779001	MS									
Radium-226	131	3.22		110	pCi/L		81.4	(75%-125%)		12/13/22	10:38
	Uncertainty	+/-0.841		+/-8.40							

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- \*\* Analyte is a Tracer compound
- < Result is less than value reported
- > Result is greater than value reported
- BD Results are either below the MDC or tracer recovery is low
- FA Failed analysis.
- H Analytical holding time was exceeded

# GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

## QC Summary

Workorder: 602141

Page 2 of 2

Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
J											
J											
K											
L											
M											
M											
N/A											
NI											
ND											
NJ											
Q											
R											
U											
UI											
UJ											
UL											
X											
Y											
^											
h											

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where the duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

\* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

# **Gas Flow Raw Data**

# Batch 2351339 Check-list

This check-list was completed on 14-DEC-22 by Nat Long

This batch was reviewed by Kenshalla Oston on 14-DEC-22 and Nat Long on 14-DEC-22.

**Batch ID:**  
2351339

**Product:**  
GFC28RAL

**Description:** Gas Flow Radium 228  
GL-RAD-A-063

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
11	Has the method required detection limit been met?	Yes		
<b>Miscellaneous Information</b>				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		



# Prep Logbook

## Radium-228 in Liquid

**Batch ID:** 2351339

**Analyst:** Jacqueline Emond (JE1)

**Method:** EPA 904.0/SW846 9320 Modified

**Lab SOP:** GL-RAD-A-063 REV# 5

**Instrument:** LUCAS-C202389980

**Due Dates for Lab:** 17-DEC-2022

**Package:** 26-DEC-2022

**SDG:** 19-DEC-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205262047	228 DW spike	1952-B	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	601580001	07-DEC-2022	3	302.4	302.4	12/08/22 14:23	12/13/22 07:16
2	602006001	07-DEC-2022	3	304.27	304.27	12/08/22 14:23	12/13/22 07:16
3	602006002	07-DEC-2022	3	302.26	302.26	12/08/22 14:23	12/13/22 07:16
4	602141001	07-DEC-2022	3	301.72	301.72	12/08/22 14:23	12/13/22 07:16
5	602141002	07-DEC-2022	3	300.55	300.55	12/08/22 14:23	12/13/22 07:16
6	602141003	07-DEC-2022	3	302.24	302.24	12/08/22 14:23	12/13/22 07:16
7	1205262045 MB	07-DEC-2022	3		304.74	12/08/22 14:23	12/13/22 07:16
8	1205262046 DUP (601580001)	07-DEC-2022	3	304.74	304.74	12/08/22 14:23	12/13/22 07:16
9	1205262047 LCS	07-DEC-2022	3		304.74	12/08/22 14:23	12/13/22 07:16

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1951-D	Ba-133	.1 mL	Pipet Id: RAD-GFC-1795419
REGNT 3418276.6	29M HF (48-50%)	4 mL	Data Entry Date2: 07-DEC-2022 00:00
REGNT 3454370.1	Nitric Acid	5 mL	
REGNT 3465466	Barium Carrier Ra228 REG	1 mL	
REGNT 3485721.6	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	
REGNT 3521298	RGF-Neodymium Subtrate	5 mL	
REGNT 3528714	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3532398	RGF-1M Citric Acid	5 mL	
REGNT 3533722	2M HCl	20 mL	
REGNT 3643467	RGF-50% Potassium Carbonate	2 mL	
REGNT 3644548	RGF-1.5M Ammonium Sulfate	10 mL	
REGNT 3644723	RGF-7M Nitric Acid	25 mL	
REGNT DGA0040	2346736	2 g	

### Radium-228 Liquid

Filename : RA228.XLS  
 File type : Excel  
 Version # : 1.4.2

Tracer S/N : 1951-D  
 Tracer Exp Date : 6/2/2023  
 Tracer Volume Added: 0.10

Batch : 2351339  
 Analyst : JAC02417  
 Prep Date : 12/7/2022  
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL  
 Parmname : Radium-228  
 Required MDA : 3 pCi/L  
 Ra-228 Abundance : 1.00  
 Halflife of Ra-228 : 5.75 years  
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer Aliquot	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	601580001.1	0.3024	1.8500E-05	11/14/2022 9:00	1364.4	1.56%	1102.0	1.74%	0.1	0.000200
2	602006001.1	0.3043	1.8531E-05	11/22/2022 15:30	1364.4	1.56%	1088.3	1.75%	0.1	0.000200
3	602006002.1	0.3023	1.8497E-05	11/22/2022 15:03	1364.4	1.56%	1078.0	1.76%	0.1	0.000200
4	602141001.1	0.3017	1.8488E-05	11/22/2022 10:52	1364.4	1.56%	1088.7	1.75%	0.1	0.000200
5	602141002.1	0.3006	1.8468E-05	11/22/2022 10:52	1364.4	1.56%	1053.7	1.78%	0.1	0.000200
6	602141003.1	0.3022	1.8497E-05	11/22/2022 9:50	1364.4	1.56%	1007.2	1.82%	0.1	0.000200
7	1205262045.1	0.3047	1.8538E-05	12/7/2022 0:00	1364.4	1.56%	991.3	1.83%	0.1	0.000200
8	1205262046.1	0.3047	1.8538E-05	11/14/2022 9:00	1364.4	1.56%	958.8	1.86%	0.1	0.000200
9	1205262047.1	0.3047	1.8538E-05	12/7/2022 0:00	1364.4	1.56%	970.0	1.85%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063  
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated	Sample
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction	Recovery %	Recovery Error %
			Alpha	Beta										
1	1B	60	20	43	0.717	12/13/2022 9:09	12/8/2022 14:23	12/13/2022 7:16	0.990	0.808	1.000	1.057	80.8%	1.20%
2	1C	60	13	82	1.367	12/13/2022 9:09	12/8/2022 14:23	12/13/2022 7:16	0.993	0.808	1.000	1.057	79.8%	1.21%
3	2A	60	12	85	1.417	12/13/2022 9:09	12/8/2022 14:23	12/13/2022 7:16	0.993	0.808	1.000	1.057	79.0%	1.21%
4	2B	60	9	124	2.067	12/13/2022 9:09	12/8/2022 14:23	12/13/2022 7:16	0.993	0.808	1.000	1.057	79.8%	1.21%
5	2D	60	11	72	1.200	12/13/2022 9:09	12/8/2022 14:23	12/13/2022 7:16	0.993	0.807	1.000	1.057	77.2%	1.22%
6	3B	60	15	53	0.883	12/13/2022 9:09	12/8/2022 14:23	12/13/2022 7:16	0.993	0.807	1.000	1.057	73.8%	1.23%
7	4C	60	5	40	0.667	12/13/2022 9:09	12/8/2022 14:23	12/13/2022 7:16	0.998	0.808	1.000	1.057	72.7%	1.24%
8	5C	60	13	40	0.667	12/13/2022 9:09	12/8/2022 14:23	12/13/2022 7:16	0.990	0.808	1.000	1.057	70.3%	1.25%
9	7A	60	7	752	12.533	12/13/2022 9:09	12/8/2022 14:23	12/13/2022 7:16	0.998	0.808	1.000	1.057	71.1%	1.24%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2022	5/31/2023	0.6068	0.00711	0.544	12/9/2022 19:43	500
2	PIC	6/1/2022	5/31/2023	0.6190	0.00847	0.486	12/9/2022 19:43	500
3	PIC	6/1/2022	5/31/2023	0.6201	0.01914	0.530	12/10/2022 19:31	500
4	PIC	6/1/2022	5/31/2023	0.6097	0.02111	1.474	12/9/2022 19:44	500
5	PIC	6/1/2022	5/31/2023	0.6046	0.00745	1.024	12/9/2022 19:44	500
6	PIC	6/1/2022	5/31/2023	0.6245	0.01614	0.676	12/9/2022 19:44	500
7	PIC	6/1/2022	5/31/2023	0.6359	0.00889	0.386	12/9/2022 19:45	500
8	PIC	6/1/2022	5/31/2023	0.6242	0.00657	0.514	12/10/2022 16:46	500
9	PIC	6/1/2022	5/31/2023	0.6257	0.00594	0.420	12/9/2022 19:45	500

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

**Spike S/N :** N/A  
**Spike Exp Date :** N/A  
**Spike Activity (dpm/ml):** N/A  
**Spike Volume Added:** N/A

\* - RPD changed to 0% due to sample & dup activity below MDA

**LCS S/N :** 1952-B  
**LCS Exp Date :** 8/9/2023  
**LCS Activity (dpm/ml):** 438.15  
**LCS Volume Added:** 0.10

Results																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	Sample Act. MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.9430	0.6658	3	1.5324	<b>0.6935</b>	66.13%	0.1727	0.1142	0.8987	0.9153		SAMPLE				
2	0.8771	0.6193	3	1.4362	<b>3.4808</b>	17.56%	0.8807	0.1541	1.1938	1.4777		SAMPLE				
3	0.9294	0.6561	3	1.5128	<b>3.5557</b>	17.86%	0.8867	0.1571	1.2346	1.5264		SAMPLE				
4	1.5638	1.1041	3	2.4105	<b>2.3981</b>	32.72%	0.5927	0.1934	1.5336	1.6493		SAMPLE				
5	1.3637	0.9628	3	2.1372	<b>0.7450</b>	84.38%	0.1760	0.1485	1.2320	1.2460		SAMPLE				
6	1.1159	0.7879	3	1.7889	<b>0.8840</b>	61.18%	0.2073	0.1268	1.0595	1.0826		SAMPLE				
7	0.8296	0.5857	3	1.3811	<b>1.1772</b>	38.87%	0.2807	0.1090	0.8962	0.9434		MB				
8	1.0162	0.7174	3	1.6574	<b>0.6797</b>	72.18%	0.1527	0.1102	0.9615	0.9764	601580001.1	DUP	* 0.0%			
9	0.8990	0.6347	3	1.4873	<b>52.7862</b>	4.02%	12.1133	0.4580	3.9115	13.7635		LCS			64.7653	81.5%

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
601580001	1B	60	20	43	12/13/2022 9:09	12/13/2022 10:09	PIC	2351339
602006001	1C	60	13	82	12/13/2022 9:09	12/13/2022 10:09	PIC	2351339
602006002	2A	60	12	85	12/13/2022 9:09	12/13/2022 10:09	PIC	2351339
602141001	2B	60	9	124	12/13/2022 9:09	12/13/2022 10:09	PIC	2351339
602141002	2D	60	11	72	12/13/2022 9:09	12/13/2022 10:09	PIC	2351339
602141003	3B	60	15	53	12/13/2022 9:09	12/13/2022 10:09	PIC	2351339
1205262045	4C	60	5	40	12/13/2022 9:09	12/13/2022 10:09	PIC	2351339
1205262046	5C	60	13	40	12/13/2022 9:09	12/13/2022 10:09	PIC	2351339
1205262047	7A	60	7	752	12/13/2022 9:09	12/13/2022 10:09	PIC	2351339

ASSAY 13-Dec-22 17:20:47  
 Wizard 2480 s/n 46190630  
 Protocol id 9 Ba-133\_1  
 Time limit  
 Count limit  
 Isotope Ba-133\_1  
 Protocol date 12/13/2022  
 Run id. 5944

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	94	1	180	4094	1364.42	1.56	05:20:47
601580001	2	94	2	180	3306.57	1101.98	1.74	80.77	05:24:01
602006001	3	94	3	180	3265.57	1088.31	1.75	79.76	05:27:15
602006002	4	94	4	180	3234.28	1077.98	1.76	79.01	05:30:29
602141001	5	94	5	180	3267	1088.7	1.75	79.79	05:33:43
602141002	1	15	1	180	3161.28	1053.67	1.78	77.22	05:37:20
602141003	2	15	2	180	3022.28	1007.24	1.82	73.82	05:40:34
1205262045	3	15	3	180	2974.28	991.34	1.83	72.66	05:43:48
1205262046	4	15	4	180	2877	958.8	1.86	70.27	05:47:02
1205262047	5	15	5	180	2910.57	970	1.85	71.09	05:50:16

END OF ASSAY

# **Continuing Calibration Data**



# Gas Flow Proportional Counter Checks for 13-Dec-2022

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100E2	Above	Beta bkg	13-Dec 04:49	60	2.200	1.385	3.072	-0.10
LB4100F2	Below	Alpha eff	13-Dec 05:59	5	5522	6533	7372	-10.23
LB4100F2	Above	Alpha XTalk	13-Dec 05:59	5	0.434	0.318	0.366	+11.49
LB4100F2	Above	Beta bkg	13-Dec 04:49	60	28.233	1.173	1.833	+243.00
LB4100F2	need 2nd	Beta eff	13-Dec 05:51	5	15473	15040	15710	+0.88
LB4100F3	Above	Alpha bkg	13-Dec 07:18	60	0.350	0.119	0.404	+1.87
LB4100F4	Above	Beta bkg	13-Dec 04:49	60	3.100	0.791	2.007	+8.39
LB4100G3	Above	Beta bkg	13-Dec 04:49	60	1.817	0.810	1.674	+3.99
LB4100H1	Above	Beta bkg	13-Dec 04:49	60	2.867	0.216	2.462	+4.08
PIC1D	Above	Alpha bkg	13-Dec 07:22	60	0.333	-1.03E-1	0.386	+2.36
PIC4D	Above	Alpha bkg	13-Dec 05:18	60	0.867	-4.55E-2	0.433	+8.43
PIC5D	Above	Alpha bkg	13-Dec 11:50	60	0.433	-9.04E-2	0.400	+3.41
PIC5D	Above	Beta bkg	13-Dec 11:50	60	2.150	-5.44E-4	2.454	+2.26
PIC5D	need 2nd	Beta eff	13-Dec 05:16	5	25160	23720	26280	+0.37
PIC6C	Above	Alpha bkg	13-Dec 05:23	60	0.800	-8.68E-2	0.350	+9.19
PIC8A	Above	Alpha bkg	13-Dec 05:30	60	3.600	-7.00E-2	0.356	+48.69
PIC8A	Above	Beta bkg	13-Dec 05:30	60	2.067	-2.72E-1	2.644	+1.81
PIC8B	Above	Alpha bkg	13-Dec 05:30	60	2.017	-1.16E-1	0.388	+22.43
PIC8B	Above	Beta bkg	13-Dec 05:30	60	2.600	-1.80E-1	2.341	+3.62
PIC8B	Above	Beta XTalk	13-Dec 05:22	5	0.001	2.00E-4	9.31E-4	+5.53
PIC8C	need 2nd	Alpha bkg	13-Dec 05:30	60	0.183	-1.61E-2	0.410	-0.19
PIC8C	Above	Beta bkg	13-Dec 05:30	60	3.150	-2.96E-1	2.115	+5.58
PIC9A	Below	Alpha eff	13-Dec 12:07	5	10209	10230	11410	-3.11
PIC11B	Above	Alpha bkg	13-Dec 11:48	60	0.783	-1.80E-1	0.522	+5.24
PIC12B	Above	Alpha bkg	13-Dec 05:40	60	0.517	-4.23E-2	0.379	+4.96
PIC14A	Above	Alpha bkg	13-Dec 05:51	60	0.900	-8.85E-2	0.451	+8.00
PIC14B	Above	Alpha bkg	13-Dec 05:51	60	0.917	-1.08E-1	0.400	+9.09
PIC14B	Above	Alpha eff	13-Dec 05:32	5	9017	8474	8989	+3.33

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

G5400W1W	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
G5400W1X	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
G5400W1Y	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
G5400W1Z	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100A1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100A2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100A3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
PIC8D	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by



Date

12/13/22

GEL Laboratories LLC

# Runlogs

# Instrument Run Log

Instrument Type: GFPC

Batch ID: 2351339

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205262045	MB	JE1	PIC4C	DEC-13-22 09:09:22	DONE	25mm Filter	01-JUN-22 00:00
1205262046	DUP	JE1	PIC5C	DEC-13-22 09:09:26	DONE	25mm Filter	01-JUN-22 00:00
1205262047	LCS	JE1	PIC7A	DEC-13-22 09:09:30	DONE	25mm Filter	01-JUN-22 00:00
601580001	SAMPLE	JE1	PIC1B	DEC-13-22 09:09:35	DONE	25mm Filter	01-JUN-22 00:00
602006001	SAMPLE	JE1	PIC1C	DEC-13-22 09:09:39	DONE	25mm Filter	01-JUN-22 00:00
602006002	SAMPLE	JE1	PIC2A	DEC-13-22 09:09:46	DONE	25mm Filter	01-JUN-22 00:00
602141001	SAMPLE	JE1	PIC2B	DEC-13-22 09:09:49	DONE	25mm Filter	01-JUN-22 00:00
602141002	SAMPLE	JE1	PIC2D	DEC-13-22 09:09:53	DONE	25mm Filter	01-JUN-22 00:00
602141003	SAMPLE	JE1	PIC3B	DEC-13-22 09:09:56	DONE	25mm Filter	01-JUN-22 00:00

# Lucas Cell Raw Data

# Batch 2351334 Check-list

This check-list was completed on 13-DEC-22 by Lyndsey Pace

This batch was reviewed by Lyndsey Pace on 13-DEC-22 and Elizabeth Krouse on 14-DEC-22.

**Batch ID:**  
2351334

**Product:**  
LUC26RAL

**Description:** Lucas Cell Radium 226  
GL-RAD-A-008

#	Criteria	Yes	No	Comments
<b>Preparation Information</b>				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
<b>Internal Checklist Information</b>				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
<b>Technical Information</b>				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
<b>Quality Control (QC) Information</b>				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?		No	
12	Has the method required detection limit been met?	Yes		
<b>Miscellaneous Information</b>				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

# Prep Logbook

## Radium-226 in Liquid

**Batch ID:** 2351334  
**Analyst:** Lyndsey Pace (LXP1)  
**Method:** EPA 903.1 Modified  
**Lab SOP:** GL-RAD-A-008 REV# 15  
**Instrument:** LUCAS-C202389980

Due Dates for Lab: 17-DEC-2022			Package: 19-DEC-2022		SDG: 19-DEC-2022	
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205262032	Radium-226 SPIKE	1715-G	.1	mL	
MS	1205262031	Radium-226 SPIKE	1715-G	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	601580001	07-DEC-2022	1	502.55	502.55	12/09/22 08:35	107	12/13/22 06:13	12/13/22 10:06	7	15
2	601779001	07-DEC-2022	5	303.65	303.65	12/09/22 08:35	206	12/13/22 06:13	12/13/22 10:06	2	62
3	601779002	07-DEC-2022	5	300.14	300.14	12/09/22 08:35	308	12/13/22 06:13	12/13/22 10:06	8	44
4	601779003	07-DEC-2022	5	302.33	302.33	12/09/22 08:35	401	12/13/22 06:13	12/13/22 10:06	1	48
5	601779004	07-DEC-2022	5	303.86	303.86	12/09/22 08:35	506	12/13/22 06:13	12/13/22 10:06	2	42
6	601779005	07-DEC-2022	5	304.68	304.68	12/09/22 08:35	608	12/13/22 06:13	12/13/22 10:06	1	24
7	602006001	07-DEC-2022	1	300.01	300.01	12/09/22 08:35	704	12/13/22 06:13	12/13/22 10:06	4	27
8	602006002	07-DEC-2022	1	302.3	302.3	12/09/22 08:35	805	12/13/22 06:13	12/13/22 10:06	4	51
9	602141001	07-DEC-2022	1	305.59	305.59	12/09/22 08:35	103	12/13/22 06:41	12/13/22 10:38	2	16
10	602141002	07-DEC-2022	1	305.18	305.18	12/09/22 08:35	208	12/13/22 06:41	12/13/22 10:38	3	22
11	602141003	07-DEC-2022	1	303.29	303.29	12/09/22 08:35	303	12/13/22 06:41	12/13/22 10:38	7	13
12	1205262029 MB	07-DEC-2022	1		502.55	12/09/22 08:35	406	12/13/22 06:41	12/13/22 10:38	6	12
13	1205262030 DUP (601779001)	07-DEC-2022	5	301.58	301.58	12/09/22 08:35	502	12/13/22 06:41	12/13/22 10:38	1	45
14	1205262031 MS (601779001)	07-DEC-2022	5	102.03	102.03	12/09/22 08:35	607	12/13/22 06:41	12/13/22 10:38	3	668
15	1205262032 LCS	07-DEC-2022	1		502.55	12/09/22 08:35	708	12/13/22 06:41	12/13/22 10:38	1	657

Reagent/Solvent Lot ID	Description	Amount	Comments:
			Data Entry Date2: 07-DEC-2022 00:00

### Radium-226 Liquid

Filename : RA226.XLS  
 File type : Excel  
 Version # : 1.3.2

Procedure Code : LUC26RAL  
 Parmname : Radium-226  
 Required MDA : 1 pCi/L  
 Halflife of Ra-226 : 1600 years  
 Ra-226 Abundance : 1.00  
 Halflife of Rn-222 : 3.8235 days

Batch : 2351334  
 Analyst : LIN01615  
 Prep Date : 12/7/2022  
 Ra-226 Method Uncertainty : 0.073648

Batch counted on : LUCAS CELL DETECTOR  
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Count Time (min.)	Cell Efficiency (cpm/dpm)
1	601580001.1	0.5026	2.0266E-05	11/14/2022 9:00	107	30	15	0.500	7	0.233	30	1.6990
2	601779001.1	0.3037	1.8520E-05	11/21/2022 8:53	206	30	62	2.067	2	0.067	30	1.8770
3	601779002.1	0.3001	1.8461E-05	11/21/2022 9:41	308	30	44	1.467	8	0.267	30	1.5970
4	601779003.1	0.3023	1.8498E-05	11/21/2022 10:30	401	30	48	1.600	1	0.033	30	1.6120
5	601779004.1	0.3039	1.8524E-05	11/21/2022 11:08	506	30	42	1.400	2	0.067	30	1.7710
6	601779005.1	0.3047	1.8537E-05	11/21/2022 11:08	608	30	24	0.800	1	0.033	30	1.7970
7	602006001.1	0.3000	1.8459E-05	11/22/2022 15:30	704	30	27	0.900	4	0.133	30	1.5870
8	602006002.1	0.3023	1.8498E-05	11/22/2022 15:03	805	30	51	1.700	4	0.133	30	1.9080
9	602141001.1	0.3056	1.8552E-05	11/22/2022 10:52	103	30	16	0.533	2	0.067	30	1.5190
10	602141002.1	0.3052	1.8546E-05	11/22/2022 10:52	208	30	22	0.733	3	0.100	30	1.7740
11	602141003.1	0.3033	1.8514E-05	11/22/2022 9:50	303	30	13	0.433	7	0.233	30	1.7210
12	1205262029.1	0.5026	2.0266E-05	12/7/2022 0:00	406	30	12	0.400	6	0.200	30	1.5760
13	1205262030.1	0.3016	1.8486E-05	11/21/2022 8:53	502	30	45	1.500	1	0.033	30	1.8630
14	1205262031.1	0.1020	1.1494E-05	11/21/2022 8:53	607	30	668	22.267	3	0.100	30	1.8040
15	1205262032.1	0.5026	2.0266E-05	12/7/2022 0:00	708	30	657	21.900	1	0.033	30	1.6020



Pipet, 0.1 ml Stdev : +/- 0.000200 ml  
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml  
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008  
 Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrowth End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
3.900%	4/28/2022	4/30/2023	12/9/2022 8:35	12/13/2022 6:13	12/13/2022 10:06	0.507	0.971	1.002	1.000
2.800%	8/1/2022	7/31/2023	12/9/2022 8:35	12/13/2022 6:13	12/13/2022 10:06	0.507	0.971	1.002	1.000
9.600%	10/25/2022	10/31/2023	12/9/2022 8:35	12/13/2022 6:13	12/13/2022 10:06	0.507	0.971	1.002	1.000
8.100%	2/1/2022	1/31/2023	12/9/2022 8:35	12/13/2022 6:13	12/13/2022 10:06	0.507	0.971	1.002	1.000
5.300%	6/1/2022	5/31/2023	12/9/2022 8:35	12/13/2022 6:13	12/13/2022 10:06	0.507	0.971	1.002	1.000
6.300%	7/1/2022	6/30/2023	12/9/2022 8:35	12/13/2022 6:13	12/13/2022 10:06	0.507	0.971	1.002	1.000
4.200%	11/1/2022	10/31/2023	12/9/2022 8:35	12/13/2022 6:13	12/13/2022 10:06	0.507	0.971	1.002	1.000
7.400%	4/1/2022	3/31/2023	12/9/2022 8:35	12/13/2022 6:13	12/13/2022 10:06	0.507	0.971	1.002	1.000
5.600%	4/28/2022	4/30/2023	12/9/2022 8:35	12/13/2022 6:41	12/13/2022 10:38	0.509	0.971	1.002	1.000
5.500%	8/1/2022	7/31/2023	12/9/2022 8:35	12/13/2022 6:41	12/13/2022 10:38	0.509	0.971	1.002	1.000
7.400%	10/25/2022	10/31/2023	12/9/2022 8:35	12/13/2022 6:41	12/13/2022 10:38	0.509	0.971	1.002	1.000
2.800%	2/1/2022	1/31/2023	12/9/2022 8:35	12/13/2022 6:41	12/13/2022 10:38	0.509	0.971	1.002	1.000
6.700%	6/1/2022	5/31/2023	12/9/2022 8:35	12/13/2022 6:41	12/13/2022 10:38	0.509	0.971	1.002	1.000
3.400%	7/1/2022	6/30/2023	12/9/2022 8:35	12/13/2022 6:41	12/13/2022 10:38	0.509	0.971	1.002	1.000
7.700%	11/1/2022	10/31/2023	12/9/2022 8:35	12/13/2022 6:41	12/13/2022 10:38	0.509	0.971	1.002	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

**Spike S/N :** 1715-G  
**Spike Exp Date :** 9/8/2023  
**Spike Activity (dpm/ml):** 297.46  
**Spike Volume Added:** 0.10

**LCS S/N :** 1715-G  
**LCS Exp Date :** 9/8/2023  
**LCS Activity (dpm/ml):** 297.46  
**LCS Volume Added:** 0.10

<b>Results</b>																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.3120	0.2203	1	0.5479	<b>0.2863</b>	58.76%	0.2667	0.1563	0.3290	0.3323		SAMPLE				
2	0.2498	0.1764	5	0.5136	<b>3.2166</b>	13.62%	2.0000	0.2667	0.8406	0.9764		SAMPLE				
3	0.5941	0.4194	5	1.0301	<b>2.2948</b>	22.21%	1.2000	0.2404	0.9010	1.0526		SAMPLE				
4	0.2066	0.1459	5	0.4798	<b>2.9467</b>	16.95%	1.5667	0.2333	0.8602	1.0676		SAMPLE				
5	0.2646	0.1868	5	0.5439	<b>2.2711</b>	17.41%	1.3333	0.2211	0.7382	0.8415		SAMPLE				
6	0.1839	0.1298	5	0.4271	<b>1.2836</b>	22.63%	0.7667	0.1667	0.5469	0.5988		SAMPLE				
7	0.4229	0.2986	1	0.7897	<b>1.4760</b>	24.57%	0.7667	0.1856	0.7003	0.7420		SAMPLE				
8	0.3491	0.2465	1	0.6519	<b>2.4898</b>	17.43%	1.5667	0.2472	0.7700	0.9233		SAMPLE				
9	0.3058	0.2159	1	0.6288	<b>0.9188</b>	30.82%	0.4667	0.1414	0.5458	0.5706		SAMPLE				
10	0.3212	0.2267	1	0.6223	<b>1.0692</b>	26.88%	0.6333	0.1667	0.5515	0.5842		SAMPLE				
11	0.5089	0.3593	1	0.8936	<b>0.3502</b>	74.90%	0.2000	0.1491	0.5116	0.5166		SAMPLE				
12	0.3105	0.2192	1	0.5538	<b>0.2308</b>	70.77%	0.2000	0.1414	0.3199	0.3218		MB				
13	0.1787	0.1261	5	0.4150	<b>2.3859</b>	16.81%	1.4667	0.2261	0.7208	0.8581	601779001.1	DUP	29.7%	1.2525		
14	0.9447	0.6669	5	1.8304	<b>110.0702</b>	5.17%	22.1667	0.8635	8.4036	19.4132	601779001.1	MS			131.3288	81.4%
15	0.1247	0.0880	1	0.2896	<b>24.8237</b>	8.64%	21.8667	0.8551	1.9025	5.5222		LCS			26.6625	93.1%

# **Continuing Calibration Data**



# Ludlum Alpha Scintillation Counter Checks for 13-DEC-2022

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	07:51	1	1.23E+05	122854	0.57		
LUCAS2	EFF	07:50	1	1.34E+05	134281	0.45		
LUCAS3	EFF	07:48	1	1.12E+05	112044	-1.58		
LUCAS4	EFF	07:44	1	1.28E+05	127684	-0.33		
LUCAS5	EFF	07:41	1	1.33E+05	133259	-0.04		
LUCAS6	EFF	07:40	1	1.30E+05	130416	-0.96		
LUCAS7	EFF	07:39	1	1.31E+05	131055	0.16		
LUCAS8	EFF	07:37	1	1.32E+05	131881	0.48		

**Reviewed by:**

Lyndsey Pace

**Date:** 13-DEC-22

GEL Laboratories LLC

# Runlogs

# Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2351334

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
601580001	SAMPLE	LXP1	LUCAS1	DEC-13-22 10:06:00	DONE	Lucas Cell	28-APR-22 00:00
601779001	SAMPLE	LXP1	LUCAS2	DEC-13-22 10:06:00	DONE	Lucas Cell	01-AUG-22 00:00
601779002	SAMPLE	LXP1	LUCAS3	DEC-13-22 10:06:00	DONE	Lucas Cell	25-OCT-22 00:00
601779003	SAMPLE	LXP1	LUCAS4	DEC-13-22 10:06:00	DONE	Lucas Cell	01-FEB-22 00:00
601779004	SAMPLE	LXP1	LUCAS5	DEC-13-22 10:06:00	DONE	Lucas Cell	01-JUN-22 00:00
601779005	SAMPLE	LXP1	LUCAS6	DEC-13-22 10:06:00	DONE	Lucas Cell	01-JUL-22 00:00
602006001	SAMPLE	LXP1	LUCAS7	DEC-13-22 10:06:00	DONE	Lucas Cell	01-NOV-22 00:00
602006002	SAMPLE	LXP1	LUCAS8	DEC-13-22 10:06:00	DONE	Lucas Cell	01-APR-22 00:00
602141001	SAMPLE	LXP1	LUCAS1	DEC-13-22 10:38:00	DONE	Lucas Cell	28-APR-22 00:00
602141002	SAMPLE	LXP1	LUCAS2	DEC-13-22 10:38:00	DONE	Lucas Cell	01-AUG-22 00:00
602141003	SAMPLE	LXP1	LUCAS3	DEC-13-22 10:38:00	DONE	Lucas Cell	25-OCT-22 00:00
1205262029	MB	LXP1	LUCAS4	DEC-13-22 10:38:00	DONE	Lucas Cell	01-FEB-22 00:00
1205262030	DUP	LXP1	LUCAS5	DEC-13-22 10:38:00	DONE	Lucas Cell	01-JUN-22 00:00
1205262031	MS	LXP1	LUCAS6	DEC-13-22 10:38:00	DONE	Lucas Cell	01-JUL-22 00:00
1205262032	LCS	LXP1	LUCAS7	DEC-13-22 10:38:00	DONE	Lucas Cell	01-NOV-22 00:00



## Data Verification & Validation Report

### Lansing Board of Water & Light – Erickson Power Station

**Sampling Event (dates and purpose):** New Well MW-11B – Background Round 7 – November 2022

Data Package Number: S42756.01

Lab Report Date: 12/27/2022

Data Validator: Aryka Thomson

Data Validation Completion Date: 01/01/2023

General Overall Assessment:

Data are usable without qualification.

Data are usable with qualification (as noted below).

Some or all data are unusable (as noted below).

Wells planned for sampling:

Well ID	Planned for Sampling
MW-1	
MW-2	
MW-3	
MW-4	
MW-5	
MW-6	
MW-7	
MW-7B	
MW-7C	
MW-8	
MW-9	
MW-10	
MW-11	
MW-11B	X
MW-12	
MW-12B	
MW-13	

### Data Summary

Sample ID	Matrix	Lab ID	Date Collected	App III Metals	App IV Metals	Part 115 Metals	Anions	TDS TSS	Rad-226 Rad-228	Diss. Metals
MW-11B	GW	S42756.01	11/22/2022	X	X	X	X	X	X	
MW-11B Dup	QC	S42756.02	11/22/2022	X	X	X	X	X	X	

Other analytes requested for analysis: Na, Mg, K, HCO<sub>3</sub>, CO<sub>3</sub>, hardness

Any planned sampling or analysis NOT completed? If yes, explain: \_\_\_\_\_

### Data Verification & Validation Checklist

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
<b><i>Field Data</i></b>							
Sample Collection Field Forms	X		Purging performed as required in the Groundwater Monitoring Plan	X			
Field Calibration Records	X		Field instruments calibrated daily according to manufacturer specifications	X			
Chain of Custody	X		Accurately reflect samples, collection dates/times, analyses, bottles, etc.	X			
Field decontamination documentation	N/A		Record of decontamination for non-dedicated sampling equipment			X	
Drilling logs	X		N/A	-	-	-	
Well construction logs	X		N/A	-	-	-	
Well development field forms	X		N/A	-	-	-	
<b><i>Analytical Data Package</i></b>							
Cover Sheet	X		N/A	-	-	-	
Case Narrative	X		Summarizes sample receipt and any exceptions to QC acceptance criteria	X			
Internal Laboratory Chain of Custody forms	X		Analyses as requested; accurate transcription of field COC	X			
Sample Chronology and Consistency	X		Accurate representation of dates, times of receipt, preparation, and analysis	X			
Communication Records with Lab	X		N/A	-	-	-	
EDD Format Consistency	X		EDD format and content as requested	X			
Sample Identification, Results Nomenclature, and Data Qualifier Consistency	X		All included in final report	X			
Method Detection Limit Consistency	X		MDLs consistent between samples	X			
Instrument Calibration Records	X		Present and no nonconformance noted	X			
Laboratory Report Complete	X		Includes QC component	X			
Holding Times	X		Analyses performed within allowed holding time	X			



Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Method	X		Method as requested	X			
Reporting Limits	X		RLs as requested	X			RLs for TDS were not met
			MDLs<RLs		X		RL=MDL for carbonate
			MDLs<GPS			X	
<b>QC Validation</b>							
<b>Evaluate Accuracy</b>							
Matrix Spike (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Laboratory Control Sample (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
<b>Evaluate Precision</b>							
Matrix Spike Duplicate (RPD)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Field Duplicate (RPD)	X		RPD ≤ 20%		X		Radium-226+228 RPD is 45%
<b>Evaluate Representativeness</b>							
Equipment Blanks (if applicable)	N/A		Non-detect (<RL)			X	
<b>QC Verification</b>							
<b>Verify Instrument Calibration &amp; Analytical Process</b>							
Initial Calibration Verification	X		Laboratory-determined	-	-	-	
Continuing Calibration Verification	X		Laboratory-determined	-	-	-	
Initial Calibration Blank	X		Laboratory-determined	-	-	-	
Continuing Calibration Blank	X		Laboratory-determined	-	-	-	
Serial Dilutions	X		Laboratory-determined	-	-	-	High recovery for As
Post-Digestion Spikes	X		Laboratory-determined	-	-	-	
Internal Standards	X		Laboratory-determined	-	-	-	
Laboratory Duplicate (RPD)	X		Laboratory-determined	-	-	-	
Method Blanks	X		Laboratory-determined	-	-	-	
<b>Evaluate Completeness (# usable measurements/ # unusable measurements)</b>							
Completeness	X		100%	X			

Other instances of nonconformance to QC control limits noted on case narrative:

The sample and the laboratory-generated duplicate of Rad-226 did not meet the RPD requirement at 29.7%; however, they do meet the relative error ratio requirement. No corrective action or qualification was necessary.

Comments:

Combined Radium-226+228 field duplicate RPD is 45%. Rad-228 and combined radium required qualification as estimated with high bias (J+) in the parent sample MW-11B and as estimated with low bias (J-) in the field duplicate MW-11B-Dup.



Chloride and sulfate for MW-11B were reported at values between the MDL and RL. These results have been qualified as not detected above the RL (U).

Chloride, fluoride, and sulfate for MW-11B-Dup were reported at values between the MDL and RL. These results have been qualified as not detected above the RL (U).

# **Appendix D**

## **Statistical Output Report**



**Table 1: Summary Statistics, Non-Detects Included**

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Date Range	Distributions Fit <sup>a</sup>	Recommended Distribution	Mean	Median	Minimum	Maximum	SD	CV	MAD/0.675	Skewness	Kurtosis
1_01_02	MW-2	Appendix III	Boron	mg/L	14	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	5.12	5.26	3.38	6.17	0.939	0.183	1.03	-0.731	-0.681
1_01_03	MW-3	Appendix III	Boron	mg/L	4	0	0%	2021-05-04 to 2022-08-02		Nonparametric	5.77	5.75	5.41	6.16	0.326	0.0565	0.356	0.212	-1.49
1_01_05	MW-5	Appendix III	Boron	mg/L	14	0	0%	2020-04-28 to 2022-08-02		Nonparametric	4.46	4.71	0.370	5.75	1.27	0.285	0.422	-2.86	9.39
1_01_06	MW-6	Appendix III	Boron	mg/L	14	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	0.800	0.780	0.490	1.09	0.186	0.232	0.200	0.00464	-1.03
1_01_07	MW-7	Appendix III	Boron	mg/L	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	2.0	1.89	1.43	2.75	0.365	0.183	0.341	0.761	1.87
1_01_08	MW-8	Appendix III	Boron	mg/L	9	1	11%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	0.0878	0.0800	0.0400	0.210	0.0521	0.594	0.0444	1.77	3.97
1_01_09	MW-9	Appendix III	Boron	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.0400	0.0400	0.0400	0.0400	0	0	0	NA	NA
1_01_10	MW-10	Appendix III	Boron	mg/L	9	0	0%	2021-06-15 to 2022-08-02		Nonparametric	0.0544	0.0500	0.0500	0.0700	0.00726	0.133	0	1.50	1.47
1_01_13	MW-13	Appendix III	Boron	mg/L	6	0	0%	2022-02-23 to 2022-08-17	Gamma; Lognormal; Normal	Nonparametric	0.162	0.165	0.140	0.180	0.0183	0.113	0.0222	-0.362	-2.10
1_01_7B	MW-7B	Appendix III	Boron	mg/L	5	0	0%	2022-03-09 to 2022-07-28	Gamma; Lognormal; Normal	Nonparametric	3.00	3.02	2.90	3.07	0.0657	0.0219	0.0593	-1.02	0.845
1_02_02	MW-2	Appendix III	Calcium	mg/L	14	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	255	262	204	272	20.2	0.0791	11.9	-1.58	2.12
1_02_03	MW-3	Appendix III	Calcium	mg/L	4	0	0%	2021-05-04 to 2022-08-02		Nonparametric	240	242	223	255	13.2	0.0549	10.4	-0.665	1.64
1_02_05	MW-5	Appendix III	Calcium	mg/L	14	0	0%	2020-04-28 to 2022-08-02		Normal	257	258	70.1	372	68.7	0.267	44.4	-1.27	4.02
1_02_06	MW-6	Appendix III	Calcium	mg/L	14	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	165	165	142	192	17.5	0.106	20.0	0.236	-1.17
1_02_07	MW-7	Appendix III	Calcium	mg/L	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	118	112	104	149	13.7	0.116	11.9	1.58	2.89
1_02_08	MW-8	Appendix III	Calcium	mg/L	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	94.2	94.6	86.5	100	4.50	0.0478	5.78	-0.341	-0.782
1_02_09	MW-9	Appendix III	Calcium	mg/L	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	71.1	71.0	61.8	78.0	6.59	0.0928	8.74	-0.359	-1.66
1_02_10	MW-10	Appendix III	Calcium	mg/L	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	130	129	113	142	9.90	0.0763	11.9	-0.486	-0.514
1_02_13	MW-13	Appendix III	Calcium	mg/L	6	0	0%	2022-02-23 to 2022-08-17	Gamma; Lognormal; Normal	Nonparametric	110	102	94.1	138	18.8	0.171	9.78	0.863	-1.34
1_02_7B	MW-7B	Appendix III	Calcium	mg/L	5	0	0%	2022-03-09 to 2022-07-28	Gamma; Lognormal; Normal	Nonparametric	9.30	9.25	8.24	10.2	0.712	0.0765	0.504	-0.506	1.38
1_03_02	MW-2	Appendix III	Chloride	mg/L	14	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	82.0	84.5	67.0	94.0	7.94	0.0969	5.19	-0.708	-0.208
1_03_03	MW-3	Appendix III	Chloride	mg/L	4	0	0%	2021-05-04 to 2022-08-02		Nonparametric	94.0	93.0	89.0	101	5.10	0.0542	3.70	1.06	1.50
1_03_05	MW-5	Appendix III	Chloride	mg/L	14	0	0%	2020-04-28 to 2022-08-02	Gamma; Normal	Gamma	72.4	75.5	43.0	83.0	10.4	0.144	8.89	-1.81	4.28
1_03_06	MW-6	Appendix III	Chloride	mg/L	14	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	33.4	34.0	24.0	43.0	6.66	0.199	10.4	0.0383	-1.66
1_03_07	MW-7	Appendix III	Chloride	mg/L	9	0	0%	2021-06-15 to 2022-08-02	Nonparametric	Nonparametric	76.9	74.0	72.2	98.0	8.09	0.105	1.48	2.76	7.90
1_03_08	MW-8	Appendix III	Chloride	mg/L	9	2	22%	2021-06-15 to 2022-08-02	Gamma; Lognormal	Gamma	14.9	10.0	4.45	59.0	17.1	1.15	7.41	2.63	7.32
1_03_09	MW-9	Appendix III	Chloride	mg/L	9	8	89%	2021-06-15 to 2022-08-02		Nonparametric	4.57	5.00	1.11	5.00	1.30	0.284	0	-3.00	9.00
1_03_10	MW-10	Appendix III	Chloride	mg/L	9	8	89%	2021-06-15 to 2022-08-02		Nonparametric	4.56	5.00	1.03	5.00	1.32	0.290	0	-3.00	9.00
1_03_13	MW-13	Appendix III	Chloride	mg/L	6	2	33%	2022-02-23 to 2022-08-17		Nonparametric	10.7	11.0	5.00	16.0	5.09	0.477	7.41	-0.120	-2.36
1_03_7B	MW-7B	Appendix III	Chloride	mg/L	5	5	100%	2022-03-09 to 2022-07-28		Nonparametric	5.00	5.00	5.00	5.00	0	0	0	NA	NA
1_04_02	MW-2	Appendix III	Fluoride	mg/L	14	14	100%	2020-04-28 to 2022-08-02		Nonparametric	1.00	1.00	1.00	1.00	0	0	0	NA	NA
1_04_03	MW-3	Appendix III	Fluoride	mg/L	4	4	100%	2021-05-04 to 2022-08-02		Nonparametric	1.00	1.00	1.00	1.00	0	0	0	NA	NA
1_04_05	MW-5	Appendix III	Fluoride	mg/L	14	14	100%	2020-04-28 to 2022-08-02		Nonparametric	1.00	1.00	1.00	1.00	0	0	0	NA	NA
1_04_06	MW-6	Appendix III	Fluoride	mg/L	14	14	100%	2020-04-28 to 2022-08-02		Nonparametric	1.00	1.00	1.00	1.00	0	0	0	NA	NA
1_04_07	MW-7	Appendix III	Fluoride	mg/L	9	8	89%	2021-06-15 to 2022-08-02		Nonparametric	0.926	1.00	0.338	1.00	0.221	0.238	0	-3.00	9.00
1_04_08	MW-8	Appendix III	Fluoride	mg/L	9	8	89%	2021-06-15 to 2022-08-02		Nonparametric	0.895	1.00	0.0587	1.00	0.314	0.350	0	-3.00	9.00
1_04_09	MW-9	Appendix III	Fluoride	mg/L	9	8	89%	2021-06-15 to 2022-08-02		Nonparametric	0.893	1.00	0.0330	1.00	0.322	0.361	0	-3.00	9.00
1_04_10	MW-10	Appendix III	Fluoride	mg/L	9	8	89%	2021-06-15 to 2022-08-02		Nonparametric	0.896	1.00	0.0660	1.00	0.311	0.347	0	-3.00	9.00
1_04_13	MW-13	Appendix III	Fluoride	mg/L	6	6	100%	2022-02-23 to 2022-08-17		Nonparametric	1.00	1.00	1.00	1.00	0	0	0	NA	NA
1_04_7B	MW-7B	Appendix III	Fluoride	mg/L	5	5	100%	2022-03-09 to 2022-07-28		Nonparametric	1.00	1.00	1.00	1.00	0	0	0	NA	NA
1_05_02	MW-2	Appendix III	Sulfate	mg/L	14	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	492	506	330	586	84.0	0.171	80.7	-0.746	-0.798
1_05_03	MW-3	Appendix III	Sulfate	mg/L	4	0	0%	2021-05-04 to 2022-08-02		Nonparametric	703	701	682	727	18.6	0.0265	16.3	0.537	1.17

(Table continues on next page)

<sup>a</sup> Non-detects are excluded from goodness-of-fit tests.

**Table 1: Summary Statistics, Non-Detects Included (continued)**

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Date Range	Distributions Fit <sup>a</sup>	Recommended Distribution	Mean	Median	Minimum	Maximum	SD	CV	MAD/0.675	Skewness	Kurtosis
1_05_05	MW-5	Appendix III	Sulfate	mg/L	14	0	0%	2020-04-28 to 2022-08-02	Gamma; Normal	Gamma	757	752	186	1170	250	0.330	247	-0.510	0.935
1_05_06	MW-6	Appendix III	Sulfate	mg/L	14	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	184	178	123	264	50.5	0.275	64.4	0.390	-1.32
1_05_07	MW-7	Appendix III	Sulfate	mg/L	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	201	191	175	260	25.9	0.129	17.8	1.62	3.05
1_05_08	MW-8	Appendix III	Sulfate	mg/L	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal	Gamma	21.3	16.0	11.0	48.0	12.6	0.591	7.41	1.49	1.51
1_05_09	MW-9	Appendix III	Sulfate	mg/L	9	7	78%	2021-06-15 to 2022-08-02		Nonparametric	4.84	5.00	3.58	5.00	0.473	0.0978	0	-3.00	9.00
1_05_10	MW-10	Appendix III	Sulfate	mg/L	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	13.9	14.5	9.00	18.0	3.07	0.220	3.70	-0.470	-0.842
1_05_13	MW-13	Appendix III	Sulfate	mg/L	6	0	0%	2022-02-23 to 2022-08-17	Gamma; Lognormal; Normal	Nonparametric	33.0	32.5	16.0	55.0	15.3	0.464	20.7	0.281	-1.12
1_05_7B	MW-7B	Appendix III	Sulfate	mg/L	5	5	100%	2022-03-09 to 2022-07-28		Nonparametric	5.00	5.00	5.00	5.00	0	0	0	NA	NA
1_06_02	MW-2	Appendix III	Total Dissolved Solids	mg/L	14	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	1295	1310	1020	1430	121	0.0934	119	-0.913	0.280
1_06_03	MW-3	Appendix III	Total Dissolved Solids	mg/L	4	0	0%	2021-05-04 to 2022-08-02		Nonparametric	1478	1485	1440	1500	26.3	0.0178	14.8	-1.44	2.23
1_06_05	MW-5	Appendix III	Total Dissolved Solids	mg/L	14	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	1482	1530	592	2020	369	0.249	363	-0.820	1.41
1_06_06	MW-6	Appendix III	Total Dissolved Solids	mg/L	14	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	753	733	598	898	95.3	0.127	120	0.0951	-1.21
1_06_07	MW-7	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal	Gamma	619	592	574	758	56.2	0.0908	26.7	2.28	5.78
1_06_08	MW-8	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	381	382	362	414	15.6	0.0410	14.8	1.19	1.80
1_06_09	MW-9	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	249	244	232	280	14.4	0.0578	2.96	1.36	1.81
1_06_10	MW-10	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	431	432	376	482	34.0	0.0789	32.6	-0.0212	-0.423
1_06_13	MW-13	Appendix III	Total Dissolved Solids	mg/L	6	0	0%	2022-02-23 to 2022-08-17	Gamma; Lognormal; Normal	Nonparametric	396	388	336	478	52	0.131	56.3	0.663	-0.191
1_06_7B	MW-7B	Appendix III	Total Dissolved Solids	mg/L	5	0	0%	2022-03-09 to 2022-07-28		Nonparametric	366	366	362	376	5.73	0.0156	5.93	1.58	2.74
1_35_02	MW-2	Appendix III	pH	su	15	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	6.76	6.75	6.54	7.08	0.119	0.0176	0.0741	1.03	3.36
1_35_03	MW-3	Appendix III	pH	su	4	0	0%	2021-05-04 to 2022-08-02		Nonparametric	7.21	7.21	7.15	7.27	0.0506	0.00701	0.0519	-0.261	-0.101
1_35_05	MW-5	Appendix III	pH	su	15	0	0%	2020-04-28 to 2022-08-02	Nonparametric	Nonparametric	7.19	7.27	6.40	7.45	0.277	0.0385	0.119	-2.17	4.62
1_35_06	MW-6	Appendix III	pH	su	15	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	6.74	6.72	6.35	7.11	0.179	0.0266	0.104	0.00743	1.54
1_35_07	MW-7	Appendix III	pH	su	9	0	0%	2021-06-15 to 2022-08-02	Nonparametric	Nonparametric	7.52	7.47	7.24	8.18	0.268	0.0357	0.133	2.17	5.68
1_35_08	MW-8	Appendix III	pH	su	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	7.18	7.12	6.99	7.78	0.250	0.0349	0.178	2.04	4.76
1_35_09	MW-9	Appendix III	pH	su	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	7.31	7.27	7.14	7.74	0.187	0.0256	0.119	1.75	3.35
1_35_10	MW-10	Appendix III	pH	su	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	6.75	6.69	6.49	7.30	0.241	0.0357	0.178	1.60	3.09
1_35_13	MW-13	Appendix III	pH	su	6	0	0%	2022-02-23 to 2022-08-17	Gamma; Lognormal; Normal	Nonparametric	7.00	7.04	6.75	7.22	0.160	0.0228	0.119	-0.473	0.667
1_35_7B	MW-7B	Appendix III	pH	su	5	0	0%	2022-03-09 to 2022-07-28	Gamma; Lognormal; Normal	Nonparametric	7.96	8.04	7.73	8.14	0.178	0.0223	0.148	-0.528	-2.38
2_04_02	MW-2	Appendix IV	Fluoride	mg/L	15	15	100%	2020-04-28 to 2022-08-02		Nonparametric	1.00	1.00	1.00	1.00	0	0	0	NA	NA
2_04_03	MW-3	Appendix IV	Fluoride	mg/L	4	4	100%	2021-05-04 to 2022-08-02		Nonparametric	1.00	1.00	1.00	1.00	0	0	0	NA	NA
2_04_05	MW-5	Appendix IV	Fluoride	mg/L	15	15	100%	2020-04-28 to 2022-08-02		Nonparametric	1.00	1.00	1.00	1.00	0	0	0	NA	NA
2_04_06	MW-6	Appendix IV	Fluoride	mg/L	15	15	100%	2020-04-28 to 2022-08-02		Nonparametric	1.00	1.00	1.00	1.00	0	0	0	NA	NA
2_04_07	MW-7	Appendix IV	Fluoride	mg/L	9	8	89%	2021-06-15 to 2022-08-02		Nonparametric	0.926	1.00	0.338	1.00	0.221	0.238	0	-3.00	9.00
2_04_08	MW-8	Appendix IV	Fluoride	mg/L	9	8	89%	2021-06-15 to 2022-08-02		Nonparametric	0.895	1.00	0.0587	1.00	0.314	0.350	0	-3.00	9.00
2_04_09	MW-9	Appendix IV	Fluoride	mg/L	9	8	89%	2021-06-15 to 2022-08-02		Nonparametric	0.893	1.00	0.0330	1.00	0.322	0.361	0	-3.00	9.00
2_04_10	MW-10	Appendix IV	Fluoride	mg/L	9	8	89%	2021-06-15 to 2022-08-02		Nonparametric	0.896	1.00	0.0660	1.00	0.311	0.347	0	-3.00	9.00
2_04_13	MW-13	Appendix IV	Fluoride	mg/L	6	6	100%	2022-02-23 to 2022-08-17		Nonparametric	1.00	1.00	1.00	1.00	0	0	0	NA	NA
2_04_7B	MW-7B	Appendix IV	Fluoride	mg/L	5	5	100%	2022-03-09 to 2022-07-28		Nonparametric	1.00	1.00	1.00	1.00	0	0	0	NA	NA
2_07_02	MW-2	Appendix IV	Antimony	mg/L	15	15	100%	2020-04-28 to 2022-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
2_07_03	MW-3	Appendix IV	Antimony	mg/L	4	4	100%	2021-05-04 to 2022-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
2_07_05	MW-5	Appendix IV	Antimony	mg/L	15	15	100%	2020-04-28 to 2022-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
2_07_06	MW-6	Appendix IV	Antimony	mg/L	15	15	100%	2020-04-28 to 2022-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA

(Table continues on next page)

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**Table 1: Summary Statistics, Non-Detects Included (continued)**

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Date Range	Distributions Fit <sup>a</sup>	Recommended Distribution	Mean	Median	Minimum	Maximum	SD	CV	MAD/0.675	Skewness	Kurtosis
2_07_07	MW-7	Appendix IV	Antimony	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
2_07_08	MW-8	Appendix IV	Antimony	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
2_07_09	MW-9	Appendix IV	Antimony	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
2_07_10	MW-10	Appendix IV	Antimony	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
2_07_13	MW-13	Appendix IV	Antimony	mg/L	6	6	100%	2022-02-23 to 2022-08-17		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
2_07_7B	MW-7B	Appendix IV	Antimony	mg/L	5	5	100%	2022-03-09 to 2022-07-28		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
2_08_02	MW-2	Appendix IV	Arsenic	mg/L	15	13	87%	2020-04-28 to 2022-08-02		Nonparametric	0.00213	0.00200	0.00200	0.00400	0.000516	0.242	0	3.87	15.0
2_08_03	MW-3	Appendix IV	Arsenic	mg/L	4	0	0%	2021-05-04 to 2022-08-02		Nonparametric	0.00300	0.00300	0.00300	0.00300	0	0	0	NA	NA
2_08_05	MW-5	Appendix IV	Arsenic	mg/L	15	10	67%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Nonparametric	0.00260	0.00200	0.00200	0.00700	0.00145	0.559	0	2.59	6.30
2_08_06	MW-6	Appendix IV	Arsenic	mg/L	15	15	100%	2020-04-28 to 2022-08-02		Nonparametric	0.00200	0.00200	0.00200	0.00200	0	0	0	NA	NA
2_08_07	MW-7	Appendix IV	Arsenic	mg/L	9	0	0%	2021-06-15 to 2022-08-02	Lognormal; Normal	Lognormal	0.00567	0.00600	0.00400	0.00700	0.000866	0.153	0	-0.660	0.825
2_08_08	MW-8	Appendix IV	Arsenic	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.00200	0.00200	0.00200	0.00200	0	0	0	NA	NA
2_08_09	MW-9	Appendix IV	Arsenic	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.00200	0.00200	0.00200	0.00200	0	0	0	NA	NA
2_08_10	MW-10	Appendix IV	Arsenic	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.00200	0.00200	0.00200	0.00200	0	0	0	NA	NA
2_08_13	MW-13	Appendix IV	Arsenic	mg/L	6	6	100%	2022-02-23 to 2022-08-17		Nonparametric	0.00200	0.00200	0.00200	0.00200	0	0	0	NA	NA
2_08_7B	MW-7B	Appendix IV	Arsenic	mg/L	5	4	80%	2022-03-09 to 2022-07-28		Nonparametric	0.00220	0.00200	0.00200	0.00300	0.000447	0.203	0	2.24	5.0
2_09_02	MW-2	Appendix IV	Barium	mg/L	15	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	0.0416	0.0410	0.0360	0.0480	0.00295	0.0708	0.00296	0.376	0.708
2_09_03	MW-3	Appendix IV	Barium	mg/L	4	0	0%	2021-05-04 to 2022-08-02		Nonparametric	0.0203	0.0205	0.0190	0.0210	0.000957	0.0473	0.000741	-0.855	-1.29
2_09_05	MW-5	Appendix IV	Barium	mg/L	15	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	0.0461	0.0430	0.0330	0.0640	0.00845	0.183	0.00741	0.667	-0.149
2_09_06	MW-6	Appendix IV	Barium	mg/L	15	0	0%	2020-04-28 to 2022-08-02	Lognormal; Normal	Lognormal	0.0483	0.0500	0.0380	0.0570	0.00602	0.125	0.00889	-0.147	-1.52
2_09_07	MW-7	Appendix IV	Barium	mg/L	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	0.0548	0.0550	0.0470	0.0620	0.00455	0.0830	0.00444	-0.0402	0.0519
2_09_08	MW-8	Appendix IV	Barium	mg/L	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	0.0214	0.0210	0.0170	0.0280	0.00357	0.167	0.00296	0.820	0.0950
2_09_09	MW-9	Appendix IV	Barium	mg/L	9	0	0%	2021-06-15 to 2022-08-02		Nonparametric	0.0139	0.0140	0.0130	0.0150	0.000928	0.0668	0.00148	0.263	-2.02
2_09_10	MW-10	Appendix IV	Barium	mg/L	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	0.0417	0.0410	0.0370	0.0470	0.00316	0.0759	0.00444	0.119	-0.461
2_09_13	MW-13	Appendix IV	Barium	mg/L	6	0	0%	2022-02-23 to 2022-08-17	Gamma; Lognormal; Normal	Nonparametric	0.0258	0.0265	0.0200	0.0300	0.00376	0.146	0.00444	-0.650	-0.578
2_09_7B	MW-7B	Appendix IV	Barium	mg/L	5	0	0%	2022-03-09 to 2022-07-28		Nonparametric	0.00980	0.0100	0.00900	0.0110	0.000837	0.0854	0.00148	0.512	-0.612
2_10_02	MW-2	Appendix IV	Beryllium	mg/L	15	15	100%	2020-04-28 to 2022-08-02		Nonparametric	0.00100	0.00100	0.00100	0.00100	0	0	0	NA	NA
2_10_03	MW-3	Appendix IV	Beryllium	mg/L	4	4	100%	2021-05-04 to 2022-08-02		Nonparametric	0.00100	0.00100	0.00100	0.00100	0	0	0	NA	NA
2_10_05	MW-5	Appendix IV	Beryllium	mg/L	15	15	100%	2020-04-28 to 2022-08-02		Nonparametric	0.00100	0.00100	0.00100	0.00100	0	0	0	NA	NA
2_10_06	MW-6	Appendix IV	Beryllium	mg/L	15	15	100%	2020-04-28 to 2022-08-02		Nonparametric	0.00100	0.00100	0.00100	0.00100	0	0	0	NA	NA
2_10_07	MW-7	Appendix IV	Beryllium	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.00100	0.00100	0.00100	0.00100	0	0	0	NA	NA
2_10_08	MW-8	Appendix IV	Beryllium	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.00100	0.00100	0.00100	0.00100	0	0	0	NA	NA
2_10_09	MW-9	Appendix IV	Beryllium	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.00100	0.00100	0.00100	0.00100	0	0	0	NA	NA
2_10_10	MW-10	Appendix IV	Beryllium	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.00100	0.00100	0.00100	0.00100	0	0	0	NA	NA
2_10_13	MW-13	Appendix IV	Beryllium	mg/L	6	6	100%	2022-02-23 to 2022-08-17		Nonparametric	0.00100	0.00100	0.00100	0.00100	0	0	0	NA	NA
2_10_7B	MW-7B	Appendix IV	Beryllium	mg/L	5	5	100%	2022-03-09 to 2022-07-28		Nonparametric	0.00100	0.00100	0.00100	0.00100	0	0	0	NA	NA
2_12_02	MW-2	Appendix IV	Cadmium	mg/L	15	15	100%	2020-04-28 to 2022-08-02		Nonparametric	0.000500	0.000500	0.000500	0.000500	0	0	0	NA	NA
2_12_03	MW-3	Appendix IV	Cadmium	mg/L	4	4	100%	2021-05-04 to 2022-08-02		Nonparametric	0.000500	0.000500	0.000500	0.000500	0	0	0	NA	NA
2_12_05	MW-5	Appendix IV	Cadmium	mg/L	15	15	100%	2020-04-28 to 2022-08-02		Nonparametric	0.000500	0.000500	0.000500	0.000500	0	0	0	NA	NA
2_12_06	MW-6	Appendix IV	Cadmium	mg/L	15	15	100%	2020-04-28 to 2022-08-02		Nonparametric	0.000500	0.000500	0.000500	0.000500	0	0	0	NA	NA
2_12_07	MW-7	Appendix IV	Cadmium	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.000500	0.000500	0.000500	0.000500	0	0	0	NA	NA
2_12_08	MW-8	Appendix IV	Cadmium	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.000500	0.000500	0.000500	0.000500	0	0	0	NA	NA

(Table continues on next page)

<sup>a</sup> Non-detects are excluded from goodness-of-fit tests.

**Table 1: Summary Statistics, Non-Detects Included (continued)**

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Date Range	Distributions Fit <sup>a</sup>	Recommended Distribution	Mean	Median	Minimum	Maximum	SD	CV	MAD/0.675	Skewness	Kurtosis
2_12_09	MW-9	Appendix IV	Cadmium	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.000500	0.000500	0.000500	0.000500	0	0	0	NA	NA
2_12_10	MW-10	Appendix IV	Cadmium	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.000500	0.000500	0.000500	0.000500	0	0	0	NA	NA
2_12_13	MW-13	Appendix IV	Cadmium	mg/L	6	6	100%	2022-02-23 to 2022-08-17		Nonparametric	0.000500	0.000500	0.000500	0.000500	0	0	0	NA	NA
2_12_7B	MW-7B	Appendix IV	Cadmium	mg/L	5	5	100%	2022-03-09 to 2022-07-28		Nonparametric	0.000500	0.000500	0.000500	0.000500	0	0	0	NA	NA
2_14_02	MW-2	Appendix IV	Chromium	mg/L	15	15	100%	2020-04-28 to 2022-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
2_14_03	MW-3	Appendix IV	Chromium	mg/L	4	4	100%	2021-05-04 to 2022-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
2_14_05	MW-5	Appendix IV	Chromium	mg/L	15	13	87%	2020-04-28 to 2022-08-02		Nonparametric	0.00547	0.00500	0.00500	0.0100	0.00136	0.248	0	3.16	10.2
2_14_06	MW-6	Appendix IV	Chromium	mg/L	15	15	100%	2020-04-28 to 2022-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
2_14_07	MW-7	Appendix IV	Chromium	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
2_14_08	MW-8	Appendix IV	Chromium	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
2_14_09	MW-9	Appendix IV	Chromium	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
2_14_10	MW-10	Appendix IV	Chromium	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
2_14_13	MW-13	Appendix IV	Chromium	mg/L	6	6	100%	2022-02-23 to 2022-08-17		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
2_14_7B	MW-7B	Appendix IV	Chromium	mg/L	5	5	100%	2022-03-09 to 2022-07-28		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
2_15_02	MW-2	Appendix IV	Cobalt	mg/L	15	15	100%	2020-04-28 to 2022-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
2_15_03	MW-3	Appendix IV	Cobalt	mg/L	4	4	100%	2021-05-04 to 2022-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
2_15_05	MW-5	Appendix IV	Cobalt	mg/L	15	14	93%	2020-04-28 to 2022-08-02		Nonparametric	0.00507	0.00500	0.00500	0.00600	0.000258	0.0510	0	3.87	15.0
2_15_06	MW-6	Appendix IV	Cobalt	mg/L	15	15	100%	2020-04-28 to 2022-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
2_15_07	MW-7	Appendix IV	Cobalt	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
2_15_08	MW-8	Appendix IV	Cobalt	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
2_15_09	MW-9	Appendix IV	Cobalt	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
2_15_10	MW-10	Appendix IV	Cobalt	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
2_15_13	MW-13	Appendix IV	Cobalt	mg/L	6	6	100%	2022-02-23 to 2022-08-17		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
2_15_7B	MW-7B	Appendix IV	Cobalt	mg/L	5	5	100%	2022-03-09 to 2022-07-28		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
2_17_02	MW-2	Appendix IV	Lead	mg/L	15	15	100%	2020-04-28 to 2022-08-02		Nonparametric	0.00300	0.00300	0.00300	0.00300	0	0	0	NA	NA
2_17_03	MW-3	Appendix IV	Lead	mg/L	4	4	100%	2021-05-04 to 2022-08-02		Nonparametric	0.00300	0.00300	0.00300	0.00300	0	0	0	NA	NA
2_17_05	MW-5	Appendix IV	Lead	mg/L	15	12	80%	2020-04-28 to 2022-08-02		Nonparametric	0.00387	0.00300	0.00300	0.0140	0.00285	0.737	0	3.68	13.8
2_17_06	MW-6	Appendix IV	Lead	mg/L	15	15	100%	2020-04-28 to 2022-08-02		Nonparametric	0.00300	0.00300	0.00300	0.00300	0	0	0	NA	NA
2_17_07	MW-7	Appendix IV	Lead	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.00300	0.00300	0.00300	0.00300	0	0	0	NA	NA
2_17_08	MW-8	Appendix IV	Lead	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.00300	0.00300	0.00300	0.00300	0	0	0	NA	NA
2_17_09	MW-9	Appendix IV	Lead	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.00300	0.00300	0.00300	0.00300	0	0	0	NA	NA
2_17_10	MW-10	Appendix IV	Lead	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.00300	0.00300	0.00300	0.00300	0	0	0	NA	NA
2_17_13	MW-13	Appendix IV	Lead	mg/L	6	6	100%	2022-02-23 to 2022-08-17		Nonparametric	0.00300	0.00300	0.00300	0.00300	0	0	0	NA	NA
2_17_7B	MW-7B	Appendix IV	Lead	mg/L	5	4	80%	2022-03-09 to 2022-07-28		Nonparametric	0.00480	0.00300	0.00300	0.0120	0.00402	0.839	0	2.24	5.00
2_18_02	MW-2	Appendix IV	Lithium	mg/L	15	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	0.0595	0.0580	0.0470	0.0700	0.00664	0.112	0.00741	-0.181	-0.825
2_18_03	MW-3	Appendix IV	Lithium	mg/L	4	0	0%	2021-05-04 to 2022-08-02		Nonparametric	0.0850	0.0860	0.0770	0.0910	0.00583	0.0686	0.00370	-0.989	2.05
2_18_05	MW-5	Appendix IV	Lithium	mg/L	15	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	0.0669	0.0730	0.0160	0.0910	0.0199	0.298	0.0178	-1.14	1.72
2_18_06	MW-6	Appendix IV	Lithium	mg/L	15	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	0.0471	0.0470	0.0370	0.0590	0.00721	0.153	0.00889	0.137	-0.963
2_18_07	MW-7	Appendix IV	Lithium	mg/L	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	0.0970	0.0970	0.0860	0.112	0.00753	0.0777	0.00444	0.582	1.24
2_18_08	MW-8	Appendix IV	Lithium	mg/L	9	5	56%	2021-06-15 to 2022-08-02		Nonparametric	0.00700	0.00500	0.00500	0.0130	0.00296	0.423	0	1.30	0.585
2_18_09	MW-9	Appendix IV	Lithium	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.00556	0.00500	0.00500	0.0100	0.00167	0.300	0	3.00	9.00
2_18_10	MW-10	Appendix IV	Lithium	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.00556	0.00500	0.00500	0.0100	0.00167	0.300	0	3.00	9.00

(Table continues on next page)

<sup>a</sup> Non-detects are excluded from goodness-of-fit tests.





**Table 1: Summary Statistics, Non-Detects Included (continued)**

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Date Range	Distributions Fit <sup>a</sup>	Recommended Distribution	Mean	Median	Minimum	Maximum	SD	CV	MAD/0.675	Skewness	Kurtosis
2_18_13	MW-13	Appendix IV	Lithium	mg/L	6	6	100%	2022-02-23 to 2022-08-17		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
2_18_7B	MW-7B	Appendix IV	Lithium	mg/L	5	0	0%	2022-03-09 to 2022-07-28	Gamma; Lognormal; Normal	Nonparametric	0.0312	0.0310	0.0280	0.0340	0.00217	0.0695	0.00148	-0.422	1.44
2_20_02	MW-2	Appendix IV	Mercury	mg/L	15	15	100%	2020-04-28 to 2022-08-02		Nonparametric	0.000200	0.000200	0.000200	0.000200	0	0	0	NA	NA
2_20_03	MW-3	Appendix IV	Mercury	mg/L	4	4	100%	2021-05-04 to 2022-08-02		Nonparametric	0.000200	0.000200	0.000200	0.000200	0	0	0	NA	NA
2_20_05	MW-5	Appendix IV	Mercury	mg/L	15	15	100%	2020-04-28 to 2022-08-02		Nonparametric	0.000200	0.000200	0.000200	0.000200	0	0	0	NA	NA
2_20_06	MW-6	Appendix IV	Mercury	mg/L	15	15	100%	2020-04-28 to 2022-08-02		Nonparametric	0.000200	0.000200	0.000200	0.000200	0	0	0	NA	NA
2_20_07	MW-7	Appendix IV	Mercury	mg/L	9	8	89%	2021-06-15 to 2022-08-02		Nonparametric	0.000200	0.000200	0.000200	0.000200	0	0	0	NA	NA
2_20_08	MW-8	Appendix IV	Mercury	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.000200	0.000200	0.000200	0.000200	0	0	0	NA	NA
2_20_09	MW-9	Appendix IV	Mercury	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.000200	0.000200	0.000200	0.000200	0	0	0	NA	NA
2_20_10	MW-10	Appendix IV	Mercury	mg/L	9	8	89%	2021-06-15 to 2022-08-02		Nonparametric	0.000200	0.000200	0.000200	0.000200	0	0	0	NA	NA
2_20_13	MW-13	Appendix IV	Mercury	mg/L	6	6	100%	2022-02-23 to 2022-08-17		Nonparametric	0.000200	0.000200	0.000200	0.000200	0	0	0	NA	NA
2_20_7B	MW-7B	Appendix IV	Mercury	mg/L	5	5	100%	2022-03-09 to 2022-07-28		Nonparametric	0.000200	0.000200	0.000200	0.000200	0	0	0	NA	NA
2_21_02	MW-2	Appendix IV	Molybdenum	mg/L	15	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	0.0107	0.0110	0.00700	0.0130	0.00168	0.157	0.00148	-0.860	0.200
2_21_03	MW-3	Appendix IV	Molybdenum	mg/L	4	0	0%	2021-05-04 to 2022-08-02		Nonparametric	0.160	0.162	0.153	0.164	0.00492	0.0307	0.00148	-1.77	3.39
2_21_05	MW-5	Appendix IV	Molybdenum	mg/L	15	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	0.0489	0.0500	0.0100	0.0960	0.0190	0.388	0.0163	0.534	2.59
2_21_06	MW-6	Appendix IV	Molybdenum	mg/L	15	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	0.0268	0.0280	0.0160	0.0360	0.00521	0.195	0.00444	-0.242	0.148
2_21_07	MW-7	Appendix IV	Molybdenum	mg/L	9	0	0%	2021-06-15 to 2022-08-02	Nonparametric	Nonparametric	0.265	0.276	0.146	0.296	0.0465	0.176	0.0237	-2.54	6.92
2_21_08	MW-8	Appendix IV	Molybdenum	mg/L	9	7	78%	2021-06-15 to 2022-08-02		Nonparametric	0.00667	0.00500	0.00500	0.0130	0.00308	0.462	0	1.69	1.39
2_21_09	MW-9	Appendix IV	Molybdenum	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
2_21_10	MW-10	Appendix IV	Molybdenum	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
2_21_13	MW-13	Appendix IV	Molybdenum	mg/L	6	6	100%	2022-02-23 to 2022-08-17		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
2_21_7B	MW-7B	Appendix IV	Molybdenum	mg/L	5	5	100%	2022-03-09 to 2022-07-28		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
2_23_02	MW-2	Appendix IV	Radium-226	pCi/L	15	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	0.361	0.296	0.0551	0.813	0.228	0.631	0.185	0.831	-0.248
2_23_03	MW-3	Appendix IV	Radium-226	pCi/L	4	0	0%	2021-05-04 to 2022-08-02		Nonparametric	0.374	0.396	0.152	0.554	0.169	0.452	0.147	-0.686	0.710
2_23_05	MW-5	Appendix IV	Radium-226	pCi/L	15	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal	Gamma	0.796	0.709	0.223	3.30	0.747	0.938	0.496	2.98	10.2
2_23_06	MW-6	Appendix IV	Radium-226	pCi/L	15	0	0%	2020-04-28 to 2022-08-02	Normal	Normal	0.307	0.343	-0.0445	0.571	0.204	0.666	0.194	-0.526	-0.883
2_23_07	MW-7	Appendix IV	Radium-226	pCi/L	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal	Gamma	0.957	0.766	0.253	2.64	0.699	0.730	0.148	2.06	4.77
2_23_08	MW-8	Appendix IV	Radium-226	pCi/L	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal	Gamma	0.676	0.389	0.201	1.77	0.632	0.934	0.239	1.28	-0.0296
2_23_09	MW-9	Appendix IV	Radium-226	pCi/L	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	0.572	0.533	0.0527	1.67	0.500	0.874	0.452	1.38	2.25
2_23_10	MW-10	Appendix IV	Radium-226	pCi/L	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	0.690	0.548	0.183	1.59	0.530	0.767	0.513	0.896	-0.570
2_23_13	MW-13	Appendix IV	Radium-226	pCi/L	6	0	0%	2022-02-23 to 2022-08-17	Gamma; Lognormal; Normal	Nonparametric	0.455	0.362	0.291	0.755	0.201	0.442	0.0985	0.919	-1.36
2_23_7B	MW-7B	Appendix IV	Radium-226	pCi/L	5	0	0%	2022-03-09 to 2022-07-28	Gamma; Lognormal; Normal	Nonparametric	0.419	0.439	0.278	0.547	0.0992	0.237	0.0904	-0.293	0.601
2_24_02	MW-2	Appendix IV	Radium-226/228	pCi/L	15	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	0.856	0.745	0.138	2.12	0.626	0.731	0.659	0.749	-0.520
2_24_03	MW-3	Appendix IV	Radium-226/228	pCi/L	4	0	0%	2021-05-04 to 2022-08-02		Nonparametric	1.92	1.82	1.11	2.92	0.905	0.471	0.993	0.220	-4.65
2_24_05	MW-5	Appendix IV	Radium-226/228	pCi/L	15	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	1.57	1.29	0.524	4.22	1.17	0.744	0.957	1.47	1.48
2_24_06	MW-6	Appendix IV	Radium-226/228	pCi/L	15	0	0%	2020-04-28 to 2022-08-02	Normal	Normal	0.991	0.637	0	2.61	0.734	0.741	0.382	0.820	-0.108
2_24_07	MW-7	Appendix IV	Radium-226/228	pCi/L	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	2.22	2.11	0.676	4.82	1.31	0.591	1.20	0.819	0.642
2_24_08	MW-8	Appendix IV	Radium-226/228	pCi/L	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	2.09	1.93	0.389	6.21	1.87	0.896	1.85	1.41	2.19
2_24_09	MW-9	Appendix IV	Radium-226/228	pCi/L	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	1.14	0.844	0.177	2.37	0.876	0.770	0.856	0.498	-1.60
2_24_10	MW-10	Appendix IV	Radium-226/228	pCi/L	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal	Gamma	0.913	0.671	0.262	2.39	0.695	0.761	0.330	1.55	1.73
2_24_13	MW-13	Appendix IV	Radium-226/228	pCi/L	6	0	0%	2022-02-23 to 2022-08-17	Gamma; Lognormal; Normal	Nonparametric	1.19	1.02	0.300	2.31	0.929	0.783	1.02	0.200	-2.78
2_24_7B	MW-7B	Appendix IV	Radium-226/228	pCi/L	5	0	0%	2022-03-09 to 2022-07-28	Gamma; Lognormal; Normal	Nonparametric	1.25	1.31	0.378	2.43	0.877	0.701	1.33	0.306	-1.55

(Table continues on next page)

<sup>a</sup> Non-detects are excluded from goodness-of-fit tests.





**Table 1: Summary Statistics, Non-Detects Included (continued)**

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Date Range	Distributions Fit <sup>a</sup>	Recommended Distribution	Mean	Median	Minimum	Maximum	SD	CV	MAD/0.675	Skewness	Kurtosis
2_25_02	MW-2	Appendix IV	Radium-228	pCi/L	15	0	0%	2020-04-28 to 2022-08-02	Normal	Normal	0.463	0.150	-0.338	1.49	0.574	1.24	0.627	0.439	-1.18
2_25_03	MW-3	Appendix IV	Radium-228	pCi/L	4	0	0%	2021-05-04 to 2022-08-02		Nonparametric	1.55	1.43	0.760	2.56	0.839	0.543	0.844	0.457	-2.93
2_25_05	MW-5	Appendix IV	Radium-228	pCi/L	15	0	0%	2020-04-28 to 2022-08-02	Normal	Normal	0.712	0.330	-0.641	3.20	0.922	1.30	0.587	1.34	2.89
2_25_06	MW-6	Appendix IV	Radium-228	pCi/L	15	0	0%	2020-04-28 to 2022-08-02	Normal	Normal	0.569	0.384	-0.866	2.04	0.838	1.47	1.01	0.115	-0.770
2_25_07	MW-7	Appendix IV	Radium-228	pCi/L	9	0	0%	2021-06-15 to 2022-08-02	Normal	Normal	1.19	1.27	-0.650	3.42	1.28	1.08	1.62	0.363	-0.459
2_25_08	MW-8	Appendix IV	Radium-228	pCi/L	9	0	0%	2021-06-15 to 2022-08-02	Normal	Normal	1.41	0.583	-0.103	4.44	1.53	1.09	1.02	1.09	0.368
2_25_09	MW-9	Appendix IV	Radium-228	pCi/L	9	0	0%	2021-06-15 to 2022-08-02	Normal	Normal	0.514	0.286	-0.359	1.88	0.743	1.45	0.559	1.01	0.110
2_25_10	MW-10	Appendix IV	Radium-228	pCi/L	9	0	0%	2021-06-15 to 2022-08-02	Normal	Normal	0.00244	0.142	-0.994	0.929	0.610	250	0.323	-0.625	0.191
2_25_13	MW-13	Appendix IV	Radium-228	pCi/L	6	0	0%	2022-02-23 to 2022-08-17	Normal	Nonparametric	0.592	0.687	-0.842	1.66	0.993	1.68	0.995	-0.385	-1.69
2_25_7B	MW-7B	Appendix IV	Radium-228	pCi/L	5	0	0%	2022-03-09 to 2022-07-28	Normal	Nonparametric	0.807	0.872	-0.123	1.88	0.819	1.02	1.09	0.173	-1.56
2_26_02	MW-2	Appendix IV	Selenium	mg/L	15	15	100%	2020-04-28 to 2022-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
2_26_03	MW-3	Appendix IV	Selenium	mg/L	4	4	100%	2021-05-04 to 2022-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
2_26_05	MW-5	Appendix IV	Selenium	mg/L	15	15	100%	2020-04-28 to 2022-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
2_26_06	MW-6	Appendix IV	Selenium	mg/L	15	15	100%	2020-04-28 to 2022-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
2_26_07	MW-7	Appendix IV	Selenium	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
2_26_08	MW-8	Appendix IV	Selenium	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
2_26_09	MW-9	Appendix IV	Selenium	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
2_26_10	MW-10	Appendix IV	Selenium	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
2_26_13	MW-13	Appendix IV	Selenium	mg/L	6	6	100%	2022-02-23 to 2022-08-17		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
2_26_7B	MW-7B	Appendix IV	Selenium	mg/L	5	5	100%	2022-03-09 to 2022-07-28		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
2_28_02	MW-2	Appendix IV	Thallium	mg/L	15	15	100%	2020-04-28 to 2022-08-02		Nonparametric	0.00200	0.00200	0.00200	0.00200	0	0	0	NA	NA
2_28_03	MW-3	Appendix IV	Thallium	mg/L	4	4	100%	2021-05-04 to 2022-08-02		Nonparametric	0.00200	0.00200	0.00200	0.00200	0	0	0	NA	NA
2_28_05	MW-5	Appendix IV	Thallium	mg/L	15	15	100%	2020-04-28 to 2022-08-02		Nonparametric	0.00200	0.00200	0.00200	0.00200	0	0	0	NA	NA
2_28_06	MW-6	Appendix IV	Thallium	mg/L	15	15	100%	2020-04-28 to 2022-08-02		Nonparametric	0.00200	0.00200	0.00200	0.00200	0	0	0	NA	NA
2_28_07	MW-7	Appendix IV	Thallium	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.00200	0.00200	0.00200	0.00200	0	0	0	NA	NA
2_28_08	MW-8	Appendix IV	Thallium	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.00200	0.00200	0.00200	0.00200	0	0	0	NA	NA
2_28_09	MW-9	Appendix IV	Thallium	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.00200	0.00200	0.00200	0.00200	0	0	0	NA	NA
2_28_10	MW-10	Appendix IV	Thallium	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.00200	0.00200	0.00200	0.00200	0	0	0	NA	NA
2_28_13	MW-13	Appendix IV	Thallium	mg/L	6	6	100%	2022-02-23 to 2022-08-17		Nonparametric	0.00200	0.00200	0.00200	0.00200	0	0	0	NA	NA
2_28_7B	MW-7B	Appendix IV	Thallium	mg/L	5	5	100%	2022-03-09 to 2022-07-28		Nonparametric	0.00200	0.00200	0.00200	0.00200	0	0	0	NA	NA
3_11_02	MW-2	Other	Bicarbonate	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	410	410	410	410	NA	NA	0	NA	NA
3_11_03	MW-3	Other	Bicarbonate	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	210	210	210	210	NA	NA	0	NA	NA
3_11_05	MW-5	Other	Bicarbonate	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	280	280	280	280	NA	NA	0	NA	NA
3_11_06	MW-6	Other	Bicarbonate	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	480	480	480	480	NA	NA	0	NA	NA
3_11_07	MW-7	Other	Bicarbonate	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	180	180	180	180	NA	NA	0	NA	NA
3_11_08	MW-8	Other	Bicarbonate	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	410	410	410	410	NA	NA	0	NA	NA
3_11_09	MW-9	Other	Bicarbonate	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	260	260	260	260	NA	NA	0	NA	NA
3_11_10	MW-10	Other	Bicarbonate	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	440	440	440	440	NA	NA	0	NA	NA
3_11_13	MW-13	Other	Bicarbonate	mg/L	4	0	0%	2022-05-04 to 2022-08-17		Nonparametric	335	335	320	349	12.5	0.0374	14.1	-0.0942	-1.34
3_11_7B	MW-7B	Other	Bicarbonate	mg/L	5	0	0%	2022-03-09 to 2022-07-28		Nonparametric	390	390	380	400	7.07	0.0181	0	0	2.00
3_13_02	MW-2	Other	Carbonate	mg/L	1	1	100%	2022-08-02 to 2022-08-02		Nonparametric	10.0	10.0	10.0	10.0	NA	NA	0	NA	NA
3_13_03	MW-3	Other	Carbonate	mg/L	1	1	100%	2022-08-02 to 2022-08-02		Nonparametric	10.0	10.0	10.0	10.0	NA	NA	0	NA	NA

(Table continues on next page)

<sup>a</sup> Non-detects are excluded from goodness-of-fit tests.



**Table 1: Summary Statistics, Non-Detects Included (continued)**

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Date Range	Distributions Fit <sup>a</sup>	Recommended Distribution	Mean	Median	Minimum	Maximum	SD	CV	MAD/0.675	Skewness	Kurtosis
3_13_05	MW-5	Other	Carbonate	mg/L	1	1	100%	2022-08-02 to 2022-08-02		Nonparametric	10.0	10.0	10.0	10.0	NA	NA	0	NA	NA
3_13_06	MW-6	Other	Carbonate	mg/L	1	1	100%	2022-08-02 to 2022-08-02		Nonparametric	10.0	10.0	10.0	10.0	NA	NA	0	NA	NA
3_13_07	MW-7	Other	Carbonate	mg/L	1	1	100%	2022-08-02 to 2022-08-02		Nonparametric	10.0	10.0	10.0	10.0	NA	NA	0	NA	NA
3_13_08	MW-8	Other	Carbonate	mg/L	1	1	100%	2022-08-02 to 2022-08-02		Nonparametric	10.0	10.0	10.0	10.0	NA	NA	0	NA	NA
3_13_09	MW-9	Other	Carbonate	mg/L	1	1	100%	2022-08-02 to 2022-08-02		Nonparametric	10.0	10.0	10.0	10.0	NA	NA	0	NA	NA
3_13_10	MW-10	Other	Carbonate	mg/L	1	1	100%	2022-08-02 to 2022-08-02		Nonparametric	10.0	10.0	10.0	10.0	NA	NA	0	NA	NA
3_13_13	MW-13	Other	Carbonate	mg/L	4	4	100%	2022-05-04 to 2022-08-17		Nonparametric	10.0	10.0	10.0	10.0	0	0	0	NA	NA
3_13_7B	MW-7B	Other	Carbonate	mg/L	5	5	100%	2022-03-09 to 2022-07-28		Nonparametric	10.0	10.0	10.0	10.0	0	0	0	NA	NA
3_16_02	MW-2	Other	Hardness	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	654	654	654	654	NA	NA	0	NA	NA
3_16_03	MW-3	Other	Hardness	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	784	784	784	784	NA	NA	0	NA	NA
3_16_05	MW-5	Other	Hardness	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	748	748	748	748	NA	NA	0	NA	NA
3_16_06	MW-6	Other	Hardness	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	532	532	532	532	NA	NA	0	NA	NA
3_16_07	MW-7	Other	Hardness	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	305	305	305	305	NA	NA	0	NA	NA
3_16_08	MW-8	Other	Hardness	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	347	347	347	347	NA	NA	0	NA	NA
3_16_09	MW-9	Other	Hardness	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	218	218	218	218	NA	NA	0	NA	NA
3_16_10	MW-10	Other	Hardness	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	382	382	382	382	NA	NA	0	NA	NA
3_16_13	MW-13	Other	Hardness	mg/L	4	0	0%	2022-05-04 to 2022-08-17		Nonparametric	321	311	309	353	21.4	0.0666	2.22	1.98	3.93
3_16_7B	MW-7B	Other	Hardness	mg/L	5	0	0%	2022-03-09 to 2022-07-28	Gamma; Lognormal; Normal	Nonparametric	33.0	31.0	29.0	38.0	4.18	0.127	2.96	0.512	-2.96
3_19_02	MW-2	Other	Magnesium	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	50.5	50.5	50.5	50.5	NA	NA	0	NA	NA
3_19_03	MW-3	Other	Magnesium	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	45.9	45.9	45.9	45.9	NA	NA	0	NA	NA
3_19_05	MW-5	Other	Magnesium	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	54.5	54.5	54.5	54.5	NA	NA	0	NA	NA
3_19_06	MW-6	Other	Magnesium	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	32.9	32.9	32.9	32.9	NA	NA	0	NA	NA
3_19_07	MW-7	Other	Magnesium	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	12.3	12.3	12.3	12.3	NA	NA	0	NA	NA
3_19_08	MW-8	Other	Magnesium	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	28.9	28.9	28.9	28.9	NA	NA	0	NA	NA
3_19_09	MW-9	Other	Magnesium	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	15.2	15.2	15.2	15.2	NA	NA	0	NA	NA
3_19_10	MW-10	Other	Magnesium	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	23.6	23.6	23.6	23.6	NA	NA	0	NA	NA
3_19_13	MW-13	Other	Magnesium	mg/L	5	0	0%	2022-03-30 to 2022-08-17	Gamma; Lognormal; Normal	Nonparametric	22.1	20.7	19.7	26.3	2.67	0.121	1.48	1.24	0.766
3_19_7B	MW-7B	Other	Magnesium	mg/L	5	0	0%	2022-03-09 to 2022-07-28	Gamma; Lognormal; Normal	Nonparametric	2.78	2.79	2.43	2.99	0.218	0.0785	0.207	-1.17	1.53
3_22_02	MW-2	Other	Potassium	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	2.70	2.70	2.70	2.70	NA	NA	0	NA	NA
3_22_03	MW-3	Other	Potassium	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	1.67	1.67	1.67	1.67	NA	NA	0	NA	NA
3_22_05	MW-5	Other	Potassium	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	3.77	3.77	3.77	3.77	NA	NA	0	NA	NA
3_22_06	MW-6	Other	Potassium	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	6.40	6.40	6.40	6.40	NA	NA	0	NA	NA
3_22_07	MW-7	Other	Potassium	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	9.53	9.53	9.53	9.53	NA	NA	0	NA	NA
3_22_08	MW-8	Other	Potassium	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	0.570	0.570	0.570	0.570	NA	NA	0	NA	NA
3_22_09	MW-9	Other	Potassium	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	1.09	1.09	1.09	1.09	NA	NA	0	NA	NA
3_22_10	MW-10	Other	Potassium	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	0.730	0.730	0.730	0.730	NA	NA	0	NA	NA
3_22_13	MW-13	Other	Potassium	mg/L	5	0	0%	2022-03-30 to 2022-08-17	Gamma; Lognormal; Normal	Nonparametric	0.766	0.779	0.690	0.830	0.0512	0.0669	0.0430	-0.526	1.11
3_22_7B	MW-7B	Other	Potassium	mg/L	5	0	0%	2022-03-09 to 2022-07-28	Gamma; Normal	Nonparametric	5.44	5.57	4.80	5.72	0.370	0.0679	0.133	-1.92	3.90
3_27_02	MW-2	Other	Sodium	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	61.6	61.6	61.6	61.6	NA	NA	0	NA	NA
3_27_03	MW-3	Other	Sodium	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	111	111	111	111	NA	NA	0	NA	NA
3_27_05	MW-5	Other	Sodium	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	69.5	69.5	69.5	69.5	NA	NA	0	NA	NA
3_27_06	MW-6	Other	Sodium	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	38.8	38.8	38.8	38.8	NA	NA	0	NA	NA

(Table continues on next page)

<sup>a</sup> Non-detects are excluded from goodness-of-fit tests.

Table 1: Summary Statistics, Non-Detects Included (continued)

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Date Range	Distributions Fit <sup>a</sup>	Recommended Distribution	Mean	Median	Minimum	Maximum	SD	CV	MAD/0.675	Skewness	Kurtosis
3_27_07	MW-7	Other	Sodium	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	71.1	71.1	71.1	71.1	NA	NA	0	NA	NA
3_27_08	MW-8	Other	Sodium	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	12.7	12.7	12.7	12.7	NA	NA	0	NA	NA
3_27_09	MW-9	Other	Sodium	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	2.41	2.41	2.41	2.41	NA	NA	0	NA	NA
3_27_10	MW-10	Other	Sodium	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	2.24	2.24	2.24	2.24	NA	NA	0	NA	NA
3_27_13	MW-13	Other	Sodium	mg/L	5	0	0%	2022-03-30 to 2022-08-17	Gamma; Lognormal; Normal	Nonparametric	3.66	3.05	2.45	5.59	1.38	0.377	0.889	0.779	-1.64
3_27_7B	MW-7B	Other	Sodium	mg/L	5	0	0%	2022-03-09 to 2022-07-28	Gamma; Lognormal; Normal	Nonparametric	131	135	116	138	8.88	0.0676	4.44	-1.92	3.83
3_29_02	MW-2	Other	Total Suspended Solids	mg/L	15	4	27%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	7.40	6.00	1.00	19.0	5.41	0.731	5.93	0.650	-0.503
3_29_03	MW-3	Other	Total Suspended Solids	mg/L	4	0	0%	2021-05-04 to 2022-08-02		Nonparametric	2.50	2.50	1.00	4.00	1.29	0.516	1.48	0	-1.20
3_29_05	MW-5	Other	Total Suspended Solids	mg/L	15	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal	Gamma	30.2	17.0	4.00	161	40.9	1.35	14.8	2.67	7.93
3_29_06	MW-6	Other	Total Suspended Solids	mg/L	15	11	73%	2020-04-28 to 2022-08-02		Nonparametric	4.93	3.00	1.00	32.0	7.55	1.53	0	3.76	14.4
3_29_07	MW-7	Other	Total Suspended Solids	mg/L	9	8	89%	2021-06-15 to 2022-08-02		Nonparametric	2.78	3.00	1.00	3.00	0.667	0.240	0	-3.00	9.00
3_29_08	MW-8	Other	Total Suspended Solids	mg/L	9	8	89%	2021-06-15 to 2022-08-02		Nonparametric	2.89	3.00	2.00	3.00	0.333	0.115	0	-3.00	9.00
3_29_09	MW-9	Other	Total Suspended Solids	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	3.00	3.00	3.00	3.00	0	0	0	NA	NA
3_29_10	MW-10	Other	Total Suspended Solids	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	3.00	3.00	3.00	3.00	0	0	0	NA	NA
3_29_13	MW-13	Other	Total Suspended Solids	mg/L	6	6	100%	2022-02-23 to 2022-08-17		Nonparametric	3.00	3.00	3.00	3.00	0	0	0	NA	NA
3_29_7B	MW-7B	Other	Total Suspended Solids	mg/L	5	5	100%	2022-03-09 to 2022-07-28		Nonparametric	3.00	3.00	3.00	3.00	0	0	0	NA	NA
4_30_02	MW-2	Field Parameters	Conductivity	mS/cm	15	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	1.69	1.73	1.40	1.80	0.111	0.0657	0.0859	-1.50	2.39
4_30_03	MW-3	Field Parameters	Conductivity	mS/cm	4	0	0%	2021-05-04 to 2022-08-02		Nonparametric	1.81	1.81	1.80	1.83	0.0151	0.00833	0.0141	0.630	-1.93
4_30_05	MW-5	Field Parameters	Conductivity	mS/cm	15	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	1.77	1.77	1.24	2.49	0.333	0.188	0.256	0.381	0.396
4_30_06	MW-6	Field Parameters	Conductivity	mS/cm	15	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	1.10	1.09	0.902	1.27	0.108	0.0979	0.116	-0.0977	-0.662
4_30_07	MW-7	Field Parameters	Conductivity	mS/cm	9	0	0%	2021-06-15 to 2022-08-02	Nonparametric	Nonparametric	0.901	0.925	0.462	1.13	0.180	0.200	0.0593	-1.99	5.64
4_30_08	MW-8	Field Parameters	Conductivity	mS/cm	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	0.650	0.640	0.620	0.721	0.0307	0.0472	0.0237	1.69	3.65
4_30_09	MW-9	Field Parameters	Conductivity	mS/cm	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	0.441	0.444	0.393	0.471	0.0263	0.0595	0.0356	-0.656	-0.295
4_30_10	MW-10	Field Parameters	Conductivity	mS/cm	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	0.739	0.741	0.664	0.807	0.0468	0.0632	0.0578	-0.166	-0.863
4_30_13	MW-13	Field Parameters	Conductivity	mS/cm	6	0	0%	2022-02-23 to 2022-08-17	Gamma; Lognormal; Normal	Nonparametric	0.651	0.628	0.549	0.782	0.0915	0.141	0.0904	0.508	-1.48
4_30_7B	MW-7B	Field Parameters	Conductivity	mS/cm	5	0	0%	2022-03-09 to 2022-07-28	Nonparametric	Nonparametric	0.616	0.588	0.586	0.730	0.0636	0.103	0.00148	2.23	4.99
4_31_02	MW-2	Field Parameters	Dissolved Oxygen	mg/L	15	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal	Gamma	0.179	0.120	0.0200	1.01	0.248	1.39	0.133	3.0	10.1
4_31_03	MW-3	Field Parameters	Dissolved Oxygen	mg/L	4	0	0%	2021-05-04 to 2022-08-02		Nonparametric	0.115	0.130	0.0300	0.170	0.0645	0.561	0.0519	-0.892	-0.924
4_31_05	MW-5	Field Parameters	Dissolved Oxygen	mg/L	15	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	2.45	2.45	0.550	5.42	1.45	0.591	1.75	0.366	-0.398
4_31_06	MW-6	Field Parameters	Dissolved Oxygen	mg/L	15	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal	Gamma	0.108	0.0800	0.0100	0.440	0.110	1.02	0.0593	2.27	5.78
4_31_07	MW-7	Field Parameters	Dissolved Oxygen	mg/L	9	1	11%	2021-06-15 to 2022-08-02	Nonparametric	Nonparametric	0.0933	0.0200	0	0.490	0.158	1.69	0.0148	2.44	6.24
4_31_08	MW-8	Field Parameters	Dissolved Oxygen	mg/L	9	0	0%	2021-06-15 to 2022-08-02	Gamma	Gamma	2.15	1.66	0.0400	7.83	2.25	1.04	0.933	2.42	6.66
4_31_09	MW-9	Field Parameters	Dissolved Oxygen	mg/L	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	5.16	5.35	3.96	6.17	0.752	0.146	1.16	-0.101	-0.908
4_31_10	MW-10	Field Parameters	Dissolved Oxygen	mg/L	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	3.01	2.89	2.05	3.92	0.575	0.191	0.607	-0.0490	-0.205
4_31_13	MW-13	Field Parameters	Dissolved Oxygen	mg/L	6	0	0%	2022-02-23 to 2022-08-17	Gamma; Lognormal; Normal	Nonparametric	4.45	5.18	1.31	6.23	2.03	0.457	1.54	-0.901	-0.954
4_31_7B	MW-7B	Field Parameters	Dissolved Oxygen	mg/L	5	0	0%	2022-03-09 to 2022-07-28	Gamma; Lognormal; Normal	Nonparametric	0.282	0.110	0.0900	0.850	0.325	1.15	0.0296	2.00	4.02
4_32_02	MW-2	Field Parameters	Oxidation Reduction Potential	mV	15	0	0%	2020-04-28 to 2022-08-02	Normal	Normal	28.8	35.3	-75.8	182	62.1	2.15	30.5	0.647	1.76
4_32_03	MW-3	Field Parameters	Oxidation Reduction Potential	mV	4	0	0%	2021-05-04 to 2022-08-02		Nonparametric	-58.8	-52.8	-92.1	-37.5	25.5	-0.433	20.5	-0.861	-1.17
4_32_05	MW-5	Field Parameters	Oxidation Reduction Potential	mV	15	0	0%	2020-04-28 to 2022-08-02	Normal	Normal	68.0	58.4	-34.8	248	90	1.32	110	0.623	-0.624
4_32_06	MW-6	Field Parameters	Oxidation Reduction Potential	mV	15	0	0%	2020-04-28 to 2022-08-02	Normal	Normal	59.6	70.8	-66.5	168	68.5	1.15	77.2	-0.458	-0.546
4_32_07	MW-7	Field Parameters	Oxidation Reduction Potential	mV	9	0	0%	2021-06-15 to 2022-08-02	Normal	Normal	-123	-129	-157	-36.9	35.3	-0.286	19.4	2.13	5.33
4_32_08	MW-8	Field Parameters	Oxidation Reduction Potential	mV	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	205	228	72.1	365	107	0.522	158	0.210	-1.58

(Table continues on next page)

<sup>a</sup> Non-detects are excluded from goodness-of-fit tests.



**Table 1: Summary Statistics, Non-Detects Included (continued)**

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Date Range	Distributions Fit <sup>a</sup>	Recommended Distribution	Mean	Median	Minimum	Maximum	SD	CV	MAD/0.675	Skewness	Kurtosis
4_32_09	MW-9	Field Parameters	Oxidation Reduction Potential	mV	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	232	238	99.2	381	96.0	0.413	110	0.167	-1.26
4_32_10	MW-10	Field Parameters	Oxidation Reduction Potential	mV	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	223	231	98.9	392	99.3	0.445	123	0.433	-0.864
4_32_13	MW-13	Field Parameters	Oxidation Reduction Potential	mV	6	0	0%	2022-02-23 to 2022-08-17	Gamma; Lognormal; Normal	Nonparametric	111	99.0	66.9	163	37.7	0.338	31.1	0.552	-1.40
4_32_7B	MW-7B	Field Parameters	Oxidation Reduction Potential	mV	5	0	0%	2022-03-09 to 2022-07-28	Normal	Nonparametric	-71.9	-95.1	-136	19.2	62.0	-0.863	60.3	0.816	-0.491
4_33_02	MW-2	Field Parameters	Temperature	°C	15	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	13.2	13.7	9.10	15.4	1.65	0.125	1.48	-0.974	1.15
4_33_03	MW-3	Field Parameters	Temperature	°C	4	0	0%	2021-05-04 to 2022-08-02		Nonparametric	12.7	13.1	10.6	14.2	1.74	0.137	1.63	-0.525	-3.02
4_33_05	MW-5	Field Parameters	Temperature	°C	15	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	13.0	12.7	8.60	17.5	2.24	0.172	1.63	0.0455	0.387
4_33_06	MW-6	Field Parameters	Temperature	°C	15	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	13.0	13.2	10.5	15.2	1.30	0.100	1.48	-0.396	-0.262
4_33_07	MW-7	Field Parameters	Temperature	°C	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	12.5	13.0	6.20	17.0	3.24	0.260	2.37	-0.811	0.593
4_33_08	MW-8	Field Parameters	Temperature	°C	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	12.2	14.0	5.90	16.4	3.27	0.267	3.56	-0.851	0.285
4_33_09	MW-9	Field Parameters	Temperature	°C	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	13.4	13.8	4.70	19.2	5.29	0.396	6.37	-0.523	-1.14
4_33_10	MW-10	Field Parameters	Temperature	°C	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	12.9	14.0	8.60	15.5	2.54	0.197	2.22	-0.663	-0.986
4_33_13	MW-13	Field Parameters	Temperature	°C	6	0	0%	2022-02-23 to 2022-08-17	Gamma; Lognormal; Normal	Nonparametric	10.9	10.3	5.80	17.5	4.60	0.422	5.63	0.387	-1.52
4_33_7B	MW-7B	Field Parameters	Temperature	°C	5	0	0%	2022-03-09 to 2022-07-28	Gamma; Lognormal; Normal	Nonparametric	12.6	13.1	11.0	14.1	1.26	0.0997	1.48	-0.363	-1.66
4_34_02	MW-2	Field Parameters	Turbidity	NTU	15	0	0%	2020-04-28 to 2022-08-02	Nonparametric	Nonparametric	12.8	9.42	4.15	72.3	16.6	1.29	1.08	3.78	14.5
4_34_03	MW-3	Field Parameters	Turbidity	NTU	4	0	0%	2021-05-04 to 2022-08-02		Nonparametric	5.03	5.01	2.10	8.01	2.42	0.480	2.29	0.0554	1.39
4_34_05	MW-5	Field Parameters	Turbidity	NTU	15	0	0%	2020-04-28 to 2022-08-02	Nonparametric	Nonparametric	30.5	17.9	9.52	180	43.6	1.43	4.16	3.30	11.3
4_34_06	MW-6	Field Parameters	Turbidity	NTU	15	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal	Gamma	9.84	8.35	1.19	33.6	7.92	0.804	2.58	2.14	5.58
4_34_07	MW-7	Field Parameters	Turbidity	NTU	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal	Gamma	4.76	2.65	1.71	16.0	4.46	0.937	1.39	2.43	6.43
4_34_08	MW-8	Field Parameters	Turbidity	NTU	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	4.77	5.25	2.00	7.18	2.00	0.421	2.59	-0.244	-1.60
4_34_09	MW-9	Field Parameters	Turbidity	NTU	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	3.94	3.44	1.60	6.70	2.01	0.510	2.73	0.134	-1.90
4_34_10	MW-10	Field Parameters	Turbidity	NTU	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	2.86	2.30	1.29	5.99	1.43	0.502	1.01	1.38	2.10
4_34_13	MW-13	Field Parameters	Turbidity	NTU	6	0	0%	2022-02-23 to 2022-08-17	Gamma; Lognormal; Normal	Nonparametric	5.17	5.33	1.79	7.90	2.37	0.459	2.64	-0.308	-1.56
4_34_7B	MW-7B	Field Parameters	Turbidity	NTU	5	0	0%	2022-03-09 to 2022-07-28	Normal	Nonparametric	4.67	6.01	0.0200	7.01	2.82	0.604	1.48	-1.52	2.03
5_36_02	MW-2	Part 115	Copper	mg/L	15	15	100%	2020-04-28 to 2022-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
5_36_03	MW-3	Part 115	Copper	mg/L	4	4	100%	2021-05-04 to 2022-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
5_36_05	MW-5	Part 115	Copper	mg/L	15	10	67%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Nonparametric	0.00800	0.00500	0.00500	0.0260	0.00629	0.786	0	2.28	4.69
5_36_06	MW-6	Part 115	Copper	mg/L	15	15	100%	2020-04-28 to 2022-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
5_36_07	MW-7	Part 115	Copper	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
5_36_08	MW-8	Part 115	Copper	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
5_36_09	MW-9	Part 115	Copper	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
5_36_10	MW-10	Part 115	Copper	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
5_36_13	MW-13	Part 115	Copper	mg/L	6	6	100%	2022-02-23 to 2022-08-17		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
5_36_7B	MW-7B	Part 115	Copper	mg/L	5	5	100%	2022-03-09 to 2022-07-28		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
5_37_02	MW-2	Part 115	Iron	mg/L	15	0	0%	2020-04-28 to 2022-08-02	Nonparametric	Nonparametric	0.703	0.620	0.440	1.93	0.369	0.525	0.163	2.97	9.81
5_37_03	MW-3	Part 115	Iron	mg/L	4	0	0%	2021-05-04 to 2022-08-02		Nonparametric	1.95	1.98	1.80	2.05	0.110	0.0563	0.0815	-1.09	0.676
5_37_05	MW-5	Part 115	Iron	mg/L	15	1	7%	2020-04-28 to 2022-08-02	Gamma; Lognormal	Gamma	1.56	0.750	0.0200	8.00	2.16	1.38	0.844	2.29	5.46
5_37_06	MW-6	Part 115	Iron	mg/L	15	7	47%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	0.0433	0.0200	0.0200	0.200	0.0476	1.10	0	2.90	9.22
5_37_07	MW-7	Part 115	Iron	mg/L	9	0	0%	2021-06-15 to 2022-08-02	Nonparametric	Nonparametric	1.53	1.37	1.19	2.81	0.493	0.322	0.178	2.69	7.66
5_37_08	MW-8	Part 115	Iron	mg/L	9	8	89%	2021-06-15 to 2022-08-02		Nonparametric	0.0200	0.0200	0.0200	0.0200	0	0	0	NA	NA
5_37_09	MW-9	Part 115	Iron	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.0200	0.0200	0.0200	0.0200	0	0	0	NA	NA
5_37_10	MW-10	Part 115	Iron	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.0200	0.0200	0.0200	0.0200	0	0	0	NA	NA

(Table continues on next page)

<sup>a</sup> Non-detects are excluded from goodness-of-fit tests.



**Table 1: Summary Statistics, Non-Detects Included (continued)**

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Date Range	Distributions Fit <sup>a</sup>	Recommended Distribution	Mean	Median	Minimum	Maximum	SD	CV	MAD/0.675	Skewness	Kurtosis
5_37_13	MW-13	Part 115	Iron	mg/L	6	1	17%	2022-02-23 to 2022-08-17	Gamma; Lognormal; Normal	Nonparametric	0.0350	0.0250	0.0200	0.0800	0.0235	0.670	0.00741	1.88	3.59
5_37_7B	MW-7B	Part 115	Iron	mg/L	5	0	0%	2022-03-09 to 2022-07-28	Gamma; Lognormal; Normal	Nonparametric	0.0420	0.0400	0.0300	0.0600	0.0130	0.310	0.0148	0.541	-1.49
5_38_02	MW-2	Part 115	Nickel	mg/L	15	0	0%	2020-04-28 to 2022-08-02	Nonparametric	Nonparametric	0.0243	0.0260	0.0180	0.0280	0.00344	0.141	0.00148	-1.08	-0.253
5_38_03	MW-3	Part 115	Nickel	mg/L	4	4	100%	2021-05-04 to 2022-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
5_38_05	MW-5	Part 115	Nickel	mg/L	15	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	0.0125	0.0110	0.00700	0.0190	0.00354	0.284	0.00296	0.433	-0.636
5_38_06	MW-6	Part 115	Nickel	mg/L	15	2	13%	2020-04-28 to 2022-08-02	Nonparametric	Nonparametric	0.00660	0.00700	0.00500	0.00800	0.000986	0.149	0	-0.578	-0.531
5_38_07	MW-7	Part 115	Nickel	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
5_38_08	MW-8	Part 115	Nickel	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
5_38_09	MW-9	Part 115	Nickel	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
5_38_10	MW-10	Part 115	Nickel	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
5_38_13	MW-13	Part 115	Nickel	mg/L	6	6	100%	2022-02-23 to 2022-08-17		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
5_38_7B	MW-7B	Part 115	Nickel	mg/L	5	5	100%	2022-03-09 to 2022-07-28		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
5_39_02	MW-2	Part 115	Silver	mg/L	15	15	100%	2020-04-28 to 2022-08-02		Nonparametric	0.000500	0.000500	0.000500	0.000500	0	0	0	NA	NA
5_39_03	MW-3	Part 115	Silver	mg/L	4	4	100%	2021-05-04 to 2022-08-02		Nonparametric	0.000500	0.000500	0.000500	0.000500	0	0	0	NA	NA
5_39_05	MW-5	Part 115	Silver	mg/L	15	15	100%	2020-04-28 to 2022-08-02		Nonparametric	0.000500	0.000500	0.000500	0.000500	0	0	0	NA	NA
5_39_06	MW-6	Part 115	Silver	mg/L	15	15	100%	2020-04-28 to 2022-08-02		Nonparametric	0.000500	0.000500	0.000500	0.000500	0	0	0	NA	NA
5_39_07	MW-7	Part 115	Silver	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.000500	0.000500	0.000500	0.000500	0	0	0	NA	NA
5_39_08	MW-8	Part 115	Silver	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.000500	0.000500	0.000500	0.000500	0	0	0	NA	NA
5_39_09	MW-9	Part 115	Silver	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.000500	0.000500	0.000500	0.000500	0	0	0	NA	NA
5_39_10	MW-10	Part 115	Silver	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.000500	0.000500	0.000500	0.000500	0	0	0	NA	NA
5_39_13	MW-13	Part 115	Silver	mg/L	6	6	100%	2022-02-23 to 2022-08-17		Nonparametric	0.000500	0.000500	0.000500	0.000500	0	0	0	NA	NA
5_39_7B	MW-7B	Part 115	Silver	mg/L	5	5	100%	2022-03-09 to 2022-07-28		Nonparametric	0.000500	0.000500	0.000500	0.000500	0	0	0	NA	NA
5_40_02	MW-2	Part 115	Vanadium	mg/L	15	15	100%	2020-04-28 to 2022-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
5_40_03	MW-3	Part 115	Vanadium	mg/L	4	4	100%	2021-05-04 to 2022-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
5_40_05	MW-5	Part 115	Vanadium	mg/L	15	13	87%	2020-04-28 to 2022-08-02		Nonparametric	0.00573	0.00500	0.00500	0.0120	0.00202	0.352	0	2.77	7.26
5_40_06	MW-6	Part 115	Vanadium	mg/L	15	15	100%	2020-04-28 to 2022-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
5_40_07	MW-7	Part 115	Vanadium	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
5_40_08	MW-8	Part 115	Vanadium	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
5_40_09	MW-9	Part 115	Vanadium	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
5_40_10	MW-10	Part 115	Vanadium	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
5_40_13	MW-13	Part 115	Vanadium	mg/L	6	6	100%	2022-02-23 to 2022-08-17		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
5_40_7B	MW-7B	Part 115	Vanadium	mg/L	5	5	100%	2022-03-09 to 2022-07-28		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
5_41_02	MW-2	Part 115	Zinc	mg/L	15	12	80%	2020-04-28 to 2022-08-02		Nonparametric	0.00767	0.00500	0.00500	0.0410	0.00925	1.21	0	3.84	14.8
5_41_03	MW-3	Part 115	Zinc	mg/L	4	4	100%	2021-05-04 to 2022-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
5_41_05	MW-5	Part 115	Zinc	mg/L	15	4	27%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	0.0200	0.00900	0.00500	0.0980	0.0251	1.25	0.00593	2.48	6.78
5_41_06	MW-6	Part 115	Zinc	mg/L	15	14	93%	2020-04-28 to 2022-08-02		Nonparametric	0.00693	0.00500	0.00500	0.0340	0.00749	1.08	0	3.87	15.0
5_41_07	MW-7	Part 115	Zinc	mg/L	9	6	67%	2021-06-15 to 2022-08-02		Nonparametric	0.00644	0.00500	0.00500	0.0140	0.00296	0.460	0	2.56	6.85
5_41_08	MW-8	Part 115	Zinc	mg/L	9	9	100%	2021-06-15 to 2022-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
5_41_09	MW-9	Part 115	Zinc	mg/L	9	8	89%	2021-06-15 to 2022-08-02		Nonparametric	0.00544	0.00500	0.00500	0.00900	0.00133	0.245	0	3.00	9.00
5_41_10	MW-10	Part 115	Zinc	mg/L	9	7	78%	2021-06-15 to 2022-08-02		Nonparametric	0.00711	0.00500	0.00500	0.0200	0.00501	0.705	0	2.66	7.22
5_41_13	MW-13	Part 115	Zinc	mg/L	6	5	83%	2022-02-23 to 2022-08-17		Nonparametric	0.00583	0.00500	0.00500	0.0100	0.00204	0.350	0	2.45	6.00
5_41_7B	MW-7B	Part 115	Zinc	mg/L	5	5	100%	2022-03-09 to 2022-07-28		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA

<sup>a</sup> Non-detects are excluded from goodness-of-fit tests.





**Table 2: Summary Statistics, Non-Detects Excluded (continued)**

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Date Range	Distributions Fit	Recommended Distribution	Mean	Median	Minimum	Maximum	SD	CV	MAD/0.675	Skewness	Kurtosis
1_06_05	MW-5	Appendix III	Total Dissolved Solids	mg/L	14	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	1482	1530	592	2020	369	0.249	363	-0.820	1.41
1_06_06	MW-6	Appendix III	Total Dissolved Solids	mg/L	14	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	753	733	598	898	95.3	0.127	120	0.0951	-1.21
1_06_07	MW-7	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal	Gamma	619	592	574	758	56.2	0.0908	26.7	2.28	5.78
1_06_08	MW-8	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	381	382	362	414	15.6	0.0410	14.8	1.19	1.80
1_06_09	MW-9	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	249	244	232	280	14.4	0.0578	2.96	1.36	1.81
1_06_10	MW-10	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	431	432	376	482	34.0	0.0789	32.6	-0.0212	-0.423
1_06_13	MW-13	Appendix III	Total Dissolved Solids	mg/L	6	0	0%	2022-02-23 to 2022-08-17	Gamma; Lognormal; Normal	Nonparametric	396	388	336	478	52	0.131	56.3	0.663	-0.191
1_06_7B	MW-7B	Appendix III	Total Dissolved Solids	mg/L	5	0	0%	2022-03-09 to 2022-07-28		Nonparametric	366	366	362	376	5.73	0.0156	5.93	1.58	2.74
1_35_02	MW-2	Appendix III	pH	su	15	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	6.76	6.75	6.54	7.08	0.119	0.0176	0.0741	1.03	3.36
1_35_03	MW-3	Appendix III	pH	su	4	0	0%	2021-05-04 to 2022-08-02		Nonparametric	7.21	7.21	7.15	7.27	0.0506	0.00701	0.0519	-0.261	-0.101
1_35_05	MW-5	Appendix III	pH	su	15	0	0%	2020-04-28 to 2022-08-02	Nonparametric	Nonparametric	7.19	7.27	6.40	7.45	0.277	0.0385	0.119	-2.17	4.62
1_35_06	MW-6	Appendix III	pH	su	15	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	6.74	6.72	6.35	7.11	0.179	0.0266	0.104	0.00743	1.54
1_35_07	MW-7	Appendix III	pH	su	9	0	0%	2021-06-15 to 2022-08-02	Nonparametric	Nonparametric	7.52	7.47	7.24	8.18	0.268	0.0357	0.133	2.17	5.68
1_35_08	MW-8	Appendix III	pH	su	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	7.18	7.12	6.99	7.78	0.250	0.0349	0.178	2.04	4.76
1_35_09	MW-9	Appendix III	pH	su	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	7.31	7.27	7.14	7.74	0.187	0.0256	0.119	1.75	3.35
1_35_10	MW-10	Appendix III	pH	su	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	6.75	6.69	6.49	7.30	0.241	0.0357	0.178	1.60	3.09
1_35_13	MW-13	Appendix III	pH	su	6	0	0%	2022-02-23 to 2022-08-17	Gamma; Lognormal; Normal	Nonparametric	7.00	7.04	6.75	7.22	0.160	0.0228	0.119	-0.473	0.667
1_35_7B	MW-7B	Appendix III	pH	su	5	0	0%	2022-03-09 to 2022-07-28	Gamma; Lognormal; Normal	Nonparametric	7.96	8.04	7.73	8.14	0.178	0.0223	0.148	-0.528	-2.38
2_04_07	MW-7	Appendix IV	Fluoride	mg/L	9	8	89%	2021-06-15 to 2022-08-02		Nonparametric	0.338	0.338	0.338	0.338	NA	NA	0	NA	NA
2_04_08	MW-8	Appendix IV	Fluoride	mg/L	9	8	89%	2021-06-15 to 2022-08-02		Nonparametric	0.0587	0.0587	0.0587	0.0587	NA	NA	0	NA	NA
2_04_09	MW-9	Appendix IV	Fluoride	mg/L	9	8	89%	2021-06-15 to 2022-08-02		Nonparametric	0.0330	0.0330	0.0330	0.0330	NA	NA	0	NA	NA
2_04_10	MW-10	Appendix IV	Fluoride	mg/L	9	8	89%	2021-06-15 to 2022-08-02		Nonparametric	0.0660	0.0660	0.0660	0.0660	NA	NA	0	NA	NA
2_08_02	MW-2	Appendix IV	Arsenic	mg/L	15	13	87%	2020-04-28 to 2022-08-02		Nonparametric	0.00300	0.00300	0.00200	0.00400	0.00141	0.471	0.00148	NA	NA
2_08_03	MW-3	Appendix IV	Arsenic	mg/L	4	0	0%	2021-05-04 to 2022-08-02		Nonparametric	0.00300	0.00300	0.00300	0.00300	0	0	0	NA	NA
2_08_05	MW-5	Appendix IV	Arsenic	mg/L	15	10	67%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Nonparametric	0.00380	0.00300	0.00200	0.00700	0.00217	0.571	0.00148	0.913	-0.738
2_08_07	MW-7	Appendix IV	Arsenic	mg/L	9	0	0%	2021-06-15 to 2022-08-02	Lognormal; Normal	Lognormal	0.00567	0.00600	0.00400	0.00700	0.000866	0.153	0	-0.660	0.825
2_08_7B	MW-7B	Appendix IV	Arsenic	mg/L	5	4	80%	2022-03-09 to 2022-07-28		Nonparametric	0.00300	0.00300	0.00300	0.00300	NA	NA	0	NA	NA
2_09_02	MW-2	Appendix IV	Barium	mg/L	15	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	0.0416	0.0410	0.0360	0.0480	0.00295	0.0708	0.00296	0.376	0.708
2_09_03	MW-3	Appendix IV	Barium	mg/L	4	0	0%	2021-05-04 to 2022-08-02		Nonparametric	0.0203	0.0205	0.0190	0.0210	0.000957	0.0473	0.000741	-0.855	-1.29
2_09_05	MW-5	Appendix IV	Barium	mg/L	15	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	0.0461	0.0430	0.0330	0.0640	0.00845	0.183	0.00741	0.667	-0.149
2_09_06	MW-6	Appendix IV	Barium	mg/L	15	0	0%	2020-04-28 to 2022-08-02	Lognormal; Normal	Lognormal	0.0483	0.0500	0.0380	0.0570	0.00602	0.125	0.00889	-0.147	-1.52
2_09_07	MW-7	Appendix IV	Barium	mg/L	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	0.0548	0.0550	0.0470	0.0620	0.00455	0.0830	0.00444	-0.0402	0.0519
2_09_08	MW-8	Appendix IV	Barium	mg/L	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	0.0214	0.0210	0.0170	0.0280	0.00357	0.167	0.00296	0.820	0.0950
2_09_09	MW-9	Appendix IV	Barium	mg/L	9	0	0%	2021-06-15 to 2022-08-02		Nonparametric	0.0139	0.0140	0.0130	0.0150	0.000928	0.0668	0.00148	0.263	-2.02
2_09_10	MW-10	Appendix IV	Barium	mg/L	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	0.0417	0.0410	0.0370	0.0470	0.00316	0.0759	0.00444	0.119	-0.461
2_09_13	MW-13	Appendix IV	Barium	mg/L	6	0	0%	2022-02-23 to 2022-08-17	Gamma; Lognormal; Normal	Nonparametric	0.0258	0.0265	0.0200	0.0300	0.00376	0.146	0.00444	-0.650	-0.578
2_09_7B	MW-7B	Appendix IV	Barium	mg/L	5	0	0%	2022-03-09 to 2022-07-28		Nonparametric	0.00980	0.0100	0.00900	0.0110	0.000837	0.0854	0.00148	0.512	-0.612
2_14_05	MW-5	Appendix IV	Chromium	mg/L	15	13	87%	2020-04-28 to 2022-08-02		Nonparametric	0.00850	0.00850	0.00700	0.0100	0.00212	0.250	0.00222	NA	NA
2_15_05	MW-5	Appendix IV	Cobalt	mg/L	15	14	93%	2020-04-28 to 2022-08-02		Nonparametric	0.00600	0.00600	0.00600	0.00600	NA	NA	0	NA	NA
2_17_05	MW-5	Appendix IV	Lead	mg/L	15	12	80%	2020-04-28 to 2022-08-02		Nonparametric	0.00733	0.00500	0.00300	0.0140	0.00586	0.799	0.00296	1.51	NA
2_17_7B	MW-7B	Appendix IV	Lead	mg/L	5	4	80%	2022-03-09 to 2022-07-28		Nonparametric	0.0120	0.0120	0.0120	0.0120	NA	NA	0	NA	NA
2_18_02	MW-2	Appendix IV	Lithium	mg/L	15	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	0.0595	0.0580	0.0470	0.0700	0.00664	0.112	0.00741	-0.181	-0.825
2_18_03	MW-3	Appendix IV	Lithium	mg/L	4	0	0%	2021-05-04 to 2022-08-02		Nonparametric	0.0850	0.0860	0.0770	0.0910	0.00583	0.0686	0.00370	-0.989	2.05

(Table continues on next page)



Table 2: Summary Statistics, Non-Detects Excluded (continued)

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Date Range	Distributions Fit	Recommended Distribution	Mean	Median	Minimum	Maximum	SD	CV	MAD/0.675	Skewness	Kurtosis
2_18_05	MW-5	Appendix IV	Lithium	mg/L	15	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	0.0669	0.0730	0.0160	0.0910	0.0199	0.298	0.0178	-1.14	1.72
2_18_06	MW-6	Appendix IV	Lithium	mg/L	15	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	0.0471	0.0470	0.0370	0.0590	0.00721	0.153	0.00889	0.137	-0.963
2_18_07	MW-7	Appendix IV	Lithium	mg/L	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	0.0970	0.0970	0.0860	0.112	0.00753	0.0777	0.00444	0.582	1.24
2_18_08	MW-8	Appendix IV	Lithium	mg/L	9	5	56%	2021-06-15 to 2022-08-02		Nonparametric	0.00825	0.00750	0.00500	0.0130	0.00359	0.436	0.00296	0.889	-0.582
2_18_7B	MW-7B	Appendix IV	Lithium	mg/L	5	0	0%	2022-03-09 to 2022-07-28	Gamma; Lognormal; Normal	Nonparametric	0.0312	0.0310	0.0280	0.0340	0.00217	0.0695	0.00148	-0.422	1.44
2_20_07	MW-7	Appendix IV	Mercury	mg/L	9	8	89%	2021-06-15 to 2022-08-02		Nonparametric	0.000200	0.000200	0.000200	0.000200	NA	NA	0	NA	NA
2_20_10	MW-10	Appendix IV	Mercury	mg/L	9	8	89%	2021-06-15 to 2022-08-02		Nonparametric	0.000200	0.000200	0.000200	0.000200	NA	NA	0	NA	NA
2_21_02	MW-2	Appendix IV	Molybdenum	mg/L	15	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	0.0107	0.0110	0.00700	0.0130	0.00168	0.157	0.00148	-0.860	0.200
2_21_03	MW-3	Appendix IV	Molybdenum	mg/L	4	0	0%	2021-05-04 to 2022-08-02		Nonparametric	0.160	0.162	0.153	0.164	0.00492	0.0307	0.00148	-1.77	3.39
2_21_05	MW-5	Appendix IV	Molybdenum	mg/L	15	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	0.0489	0.0500	0.0100	0.0960	0.0190	0.388	0.0163	0.534	2.59
2_21_06	MW-6	Appendix IV	Molybdenum	mg/L	15	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	0.0268	0.0280	0.0160	0.0360	0.00521	0.195	0.00444	-0.242	0.148
2_21_07	MW-7	Appendix IV	Molybdenum	mg/L	9	0	0%	2021-06-15 to 2022-08-02	Nonparametric	Nonparametric	0.265	0.276	0.146	0.296	0.0465	0.176	0.0237	-2.54	6.92
2_21_08	MW-8	Appendix IV	Molybdenum	mg/L	9	7	78%	2021-06-15 to 2022-08-02		Nonparametric	0.00950	0.00950	0.00600	0.0130	0.00495	0.521	0.00519	NA	NA
2_23_02	MW-2	Appendix IV	Radium-226	pCi/L	15	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	0.361	0.296	0.0551	0.813	0.228	0.631	0.185	0.831	-0.248
2_23_03	MW-3	Appendix IV	Radium-226	pCi/L	4	0	0%	2021-05-04 to 2022-08-02		Nonparametric	0.374	0.396	0.152	0.554	0.169	0.452	0.147	-0.686	0.710
2_23_05	MW-5	Appendix IV	Radium-226	pCi/L	15	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal	Gamma	0.796	0.709	0.223	3.30	0.747	0.938	0.496	2.98	10.2
2_23_06	MW-6	Appendix IV	Radium-226	pCi/L	15	0	0%	2020-04-28 to 2022-08-02	Normal	Normal	0.307	0.343	-0.0445	0.571	0.204	0.666	0.194	-0.526	-0.883
2_23_07	MW-7	Appendix IV	Radium-226	pCi/L	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal	Gamma	0.957	0.766	0.253	2.64	0.699	0.730	0.148	2.06	4.77
2_23_08	MW-8	Appendix IV	Radium-226	pCi/L	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal	Gamma	0.676	0.389	0.201	1.77	0.632	0.934	0.239	1.28	-0.0296
2_23_09	MW-9	Appendix IV	Radium-226	pCi/L	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	0.572	0.533	0.0527	1.67	0.500	0.874	0.452	1.38	2.25
2_23_10	MW-10	Appendix IV	Radium-226	pCi/L	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	0.690	0.548	0.183	1.59	0.530	0.767	0.513	0.896	-0.570
2_23_13	MW-13	Appendix IV	Radium-226	pCi/L	6	0	0%	2022-02-23 to 2022-08-17	Gamma; Lognormal; Normal	Nonparametric	0.455	0.362	0.291	0.755	0.201	0.442	0.0985	0.919	-1.36
2_23_7B	MW-7B	Appendix IV	Radium-226	pCi/L	5	0	0%	2022-03-09 to 2022-07-28	Gamma; Lognormal; Normal	Nonparametric	0.419	0.439	0.278	0.547	0.0992	0.237	0.0904	-0.293	0.601
2_24_02	MW-2	Appendix IV	Radium-226/228	pCi/L	15	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	0.856	0.745	0.138	2.12	0.626	0.731	0.659	0.749	-0.520
2_24_03	MW-3	Appendix IV	Radium-226/228	pCi/L	4	0	0%	2021-05-04 to 2022-08-02		Nonparametric	1.92	1.82	1.11	2.92	0.905	0.471	0.993	0.220	-4.65
2_24_05	MW-5	Appendix IV	Radium-226/228	pCi/L	15	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	1.57	1.29	0.524	4.22	1.17	0.744	0.957	1.47	1.48
2_24_06	MW-6	Appendix IV	Radium-226/228	pCi/L	15	0	0%	2020-04-28 to 2022-08-02	Normal	Normal	0.991	0.637	0	2.61	0.734	0.741	0.382	0.820	-0.108
2_24_07	MW-7	Appendix IV	Radium-226/228	pCi/L	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	2.22	2.11	0.676	4.82	1.31	0.591	1.20	0.819	0.642
2_24_08	MW-8	Appendix IV	Radium-226/228	pCi/L	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	2.09	1.93	0.389	6.21	1.87	0.896	1.85	1.41	2.19
2_24_09	MW-9	Appendix IV	Radium-226/228	pCi/L	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	1.14	0.844	0.177	2.37	0.876	0.770	0.856	0.498	-1.60
2_24_10	MW-10	Appendix IV	Radium-226/228	pCi/L	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal	Gamma	0.913	0.671	0.262	2.39	0.695	0.761	0.330	1.55	1.73
2_24_13	MW-13	Appendix IV	Radium-226/228	pCi/L	6	0	0%	2022-02-23 to 2022-08-17	Gamma; Lognormal; Normal	Nonparametric	1.19	1.02	0.300	2.31	0.929	0.783	1.02	0.200	-2.78
2_24_7B	MW-7B	Appendix IV	Radium-226/228	pCi/L	5	0	0%	2022-03-09 to 2022-07-28	Gamma; Lognormal; Normal	Nonparametric	1.25	1.31	0.378	2.43	0.877	0.701	1.33	0.306	-1.55
2_25_02	MW-2	Appendix IV	Radium-228	pCi/L	15	0	0%	2020-04-28 to 2022-08-02	Normal	Normal	0.463	0.150	-0.338	1.49	0.574	1.24	0.627	0.439	-1.18
2_25_03	MW-3	Appendix IV	Radium-228	pCi/L	4	0	0%	2021-05-04 to 2022-08-02		Nonparametric	1.55	1.43	0.760	2.56	0.839	0.543	0.844	0.457	-2.93
2_25_05	MW-5	Appendix IV	Radium-228	pCi/L	15	0	0%	2020-04-28 to 2022-08-02	Normal	Normal	0.712	0.330	-0.641	3.20	0.922	1.30	0.587	1.34	2.89
2_25_06	MW-6	Appendix IV	Radium-228	pCi/L	15	0	0%	2020-04-28 to 2022-08-02	Normal	Normal	0.569	0.384	-0.866	2.04	0.838	1.47	1.01	0.115	-0.770
2_25_07	MW-7	Appendix IV	Radium-228	pCi/L	9	0	0%	2021-06-15 to 2022-08-02	Normal	Normal	1.19	1.27	-0.650	3.42	1.28	1.08	1.62	0.363	-0.459
2_25_08	MW-8	Appendix IV	Radium-228	pCi/L	9	0	0%	2021-06-15 to 2022-08-02	Normal	Normal	1.41	0.583	-0.103	4.44	1.53	1.09	1.02	1.09	0.368
2_25_09	MW-9	Appendix IV	Radium-228	pCi/L	9	0	0%	2021-06-15 to 2022-08-02	Normal	Normal	0.514	0.286	-0.359	1.88	0.743	1.45	0.559	1.01	0.110
2_25_10	MW-10	Appendix IV	Radium-228	pCi/L	9	0	0%	2021-06-15 to 2022-08-02	Normal	Normal	0.00244	0.142	-0.994	0.929	0.610	250	0.323	-0.625	0.191
2_25_13	MW-13	Appendix IV	Radium-228	pCi/L	6	0	0%	2022-02-23 to 2022-08-17	Normal	Nonparametric	0.592	0.687	-0.842	1.66	0.993	1.68	0.995	-0.385	-1.69
2_25_7B	MW-7B	Appendix IV	Radium-228	pCi/L	5	0	0%	2022-03-09 to 2022-07-28	Normal	Nonparametric	0.807	0.872	-0.123	1.88	0.819	1.02	1.09	0.173	-1.56

(Table continues on next page)





Table 2: Summary Statistics, Non-Detects Excluded (continued)

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Date Range	Distributions Fit	Recommended Distribution	Mean	Median	Minimum	Maximum	SD	CV	MAD/0.675	Skewness	Kurtosis
3_11_02	MW-2	Other	Bicarbonate	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	410	410	410	410	NA	NA	0	NA	NA
3_11_03	MW-3	Other	Bicarbonate	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	210	210	210	210	NA	NA	0	NA	NA
3_11_05	MW-5	Other	Bicarbonate	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	280	280	280	280	NA	NA	0	NA	NA
3_11_06	MW-6	Other	Bicarbonate	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	480	480	480	480	NA	NA	0	NA	NA
3_11_07	MW-7	Other	Bicarbonate	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	180	180	180	180	NA	NA	0	NA	NA
3_11_08	MW-8	Other	Bicarbonate	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	410	410	410	410	NA	NA	0	NA	NA
3_11_09	MW-9	Other	Bicarbonate	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	260	260	260	260	NA	NA	0	NA	NA
3_11_10	MW-10	Other	Bicarbonate	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	440	440	440	440	NA	NA	0	NA	NA
3_11_13	MW-13	Other	Bicarbonate	mg/L	4	0	0%	2022-05-04 to 2022-08-17		Nonparametric	335	335	320	349	12.5	0.0374	14.1	-0.0942	-1.34
3_11_7B	MW-7B	Other	Bicarbonate	mg/L	5	0	0%	2022-03-09 to 2022-07-28		Nonparametric	390	390	380	400	7.07	0.0181	0	0	2.00
3_16_02	MW-2	Other	Hardness	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	654	654	654	654	NA	NA	0	NA	NA
3_16_03	MW-3	Other	Hardness	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	784	784	784	784	NA	NA	0	NA	NA
3_16_05	MW-5	Other	Hardness	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	748	748	748	748	NA	NA	0	NA	NA
3_16_06	MW-6	Other	Hardness	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	532	532	532	532	NA	NA	0	NA	NA
3_16_07	MW-7	Other	Hardness	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	305	305	305	305	NA	NA	0	NA	NA
3_16_08	MW-8	Other	Hardness	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	347	347	347	347	NA	NA	0	NA	NA
3_16_09	MW-9	Other	Hardness	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	218	218	218	218	NA	NA	0	NA	NA
3_16_10	MW-10	Other	Hardness	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	382	382	382	382	NA	NA	0	NA	NA
3_16_13	MW-13	Other	Hardness	mg/L	4	0	0%	2022-05-04 to 2022-08-17		Nonparametric	321	311	309	353	21.4	0.0666	2.22	1.98	3.93
3_16_7B	MW-7B	Other	Hardness	mg/L	5	0	0%	2022-03-09 to 2022-07-28	Gamma; Lognormal; Normal	Nonparametric	33.0	31.0	29.0	38.0	4.18	0.127	2.96	0.512	-2.96
3_19_02	MW-2	Other	Magnesium	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	50.5	50.5	50.5	50.5	NA	NA	0	NA	NA
3_19_03	MW-3	Other	Magnesium	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	45.9	45.9	45.9	45.9	NA	NA	0	NA	NA
3_19_05	MW-5	Other	Magnesium	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	54.5	54.5	54.5	54.5	NA	NA	0	NA	NA
3_19_06	MW-6	Other	Magnesium	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	32.9	32.9	32.9	32.9	NA	NA	0	NA	NA
3_19_07	MW-7	Other	Magnesium	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	12.3	12.3	12.3	12.3	NA	NA	0	NA	NA
3_19_08	MW-8	Other	Magnesium	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	28.9	28.9	28.9	28.9	NA	NA	0	NA	NA
3_19_09	MW-9	Other	Magnesium	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	15.2	15.2	15.2	15.2	NA	NA	0	NA	NA
3_19_10	MW-10	Other	Magnesium	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	23.6	23.6	23.6	23.6	NA	NA	0	NA	NA
3_19_13	MW-13	Other	Magnesium	mg/L	5	0	0%	2022-03-30 to 2022-08-17	Gamma; Lognormal; Normal	Nonparametric	22.1	20.7	19.7	26.3	2.67	0.121	1.48	1.24	0.766
3_19_7B	MW-7B	Other	Magnesium	mg/L	5	0	0%	2022-03-09 to 2022-07-28	Gamma; Lognormal; Normal	Nonparametric	2.78	2.79	2.43	2.99	0.218	0.0785	0.207	-1.17	1.53
3_22_02	MW-2	Other	Potassium	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	2.70	2.70	2.70	2.70	NA	NA	0	NA	NA
3_22_03	MW-3	Other	Potassium	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	1.67	1.67	1.67	1.67	NA	NA	0	NA	NA
3_22_05	MW-5	Other	Potassium	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	3.77	3.77	3.77	3.77	NA	NA	0	NA	NA
3_22_06	MW-6	Other	Potassium	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	6.40	6.40	6.40	6.40	NA	NA	0	NA	NA
3_22_07	MW-7	Other	Potassium	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	9.53	9.53	9.53	9.53	NA	NA	0	NA	NA
3_22_08	MW-8	Other	Potassium	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	0.570	0.570	0.570	0.570	NA	NA	0	NA	NA
3_22_09	MW-9	Other	Potassium	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	1.09	1.09	1.09	1.09	NA	NA	0	NA	NA
3_22_10	MW-10	Other	Potassium	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	0.730	0.730	0.730	0.730	NA	NA	0	NA	NA
3_22_13	MW-13	Other	Potassium	mg/L	5	0	0%	2022-03-30 to 2022-08-17	Gamma; Lognormal; Normal	Nonparametric	0.766	0.779	0.690	0.830	0.0512	0.0669	0.0430	-0.526	1.11
3_22_7B	MW-7B	Other	Potassium	mg/L	5	0	0%	2022-03-09 to 2022-07-28	Gamma; Normal	Nonparametric	5.44	5.57	4.80	5.72	0.370	0.0679	0.133	-1.92	3.90
3_27_02	MW-2	Other	Sodium	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	61.6	61.6	61.6	61.6	NA	NA	0	NA	NA
3_27_03	MW-3	Other	Sodium	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	111	111	111	111	NA	NA	0	NA	NA
3_27_05	MW-5	Other	Sodium	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	69.5	69.5	69.5	69.5	NA	NA	0	NA	NA

(Table continues on next page)



**Table 2: Summary Statistics, Non-Detects Excluded (continued)**

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Date Range	Distributions Fit	Recommended Distribution	Mean	Median	Minimum	Maximum	SD	CV	MAD/0.675	Skewness	Kurtosis
3_27_06	MW-6	Other	Sodium	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	38.8	38.8	38.8	38.8	NA	NA	0	NA	NA
3_27_07	MW-7	Other	Sodium	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	71.1	71.1	71.1	71.1	NA	NA	0	NA	NA
3_27_08	MW-8	Other	Sodium	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	12.7	12.7	12.7	12.7	NA	NA	0	NA	NA
3_27_09	MW-9	Other	Sodium	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	2.41	2.41	2.41	2.41	NA	NA	0	NA	NA
3_27_10	MW-10	Other	Sodium	mg/L	1	0	0%	2022-08-02 to 2022-08-02		Nonparametric	2.24	2.24	2.24	2.24	NA	NA	0	NA	NA
3_27_13	MW-13	Other	Sodium	mg/L	5	0	0%	2022-03-30 to 2022-08-17	Gamma; Lognormal; Normal	Nonparametric	3.66	3.05	2.45	5.59	1.38	0.377	0.889	0.779	-1.64
3_27_7B	MW-7B	Other	Sodium	mg/L	5	0	0%	2022-03-09 to 2022-07-28	Gamma; Lognormal; Normal	Nonparametric	131	135	116	138	8.88	0.0676	4.44	-1.92	3.83
3_29_02	MW-2	Other	Total Suspended Solids	mg/L	15	4	27%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	9.00	10.0	1.00	19.0	5.51	0.613	5.93	0.0613	-0.464
3_29_03	MW-3	Other	Total Suspended Solids	mg/L	4	0	0%	2021-05-04 to 2022-08-02		Nonparametric	2.50	2.50	1.00	4.00	1.29	0.516	1.48	0	-1.20
3_29_05	MW-5	Other	Total Suspended Solids	mg/L	15	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal	Gamma	30.2	17.0	4.00	161	40.9	1.35	14.8	2.67	7.93
3_29_06	MW-6	Other	Total Suspended Solids	mg/L	15	11	73%	2020-04-28 to 2022-08-02		Nonparametric	10.2	4.00	1.00	32.0	14.7	1.43	3.70	1.87	3.54
3_29_07	MW-7	Other	Total Suspended Solids	mg/L	9	8	89%	2021-06-15 to 2022-08-02		Nonparametric	1.00	1.00	1.00	1.00	NA	NA	0	NA	NA
3_29_08	MW-8	Other	Total Suspended Solids	mg/L	9	8	89%	2021-06-15 to 2022-08-02		Nonparametric	2.00	2.00	2.00	2.00	NA	NA	0	NA	NA
4_30_02	MW-2	Field Parameters	Conductivity	mS/cm	15	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	1.69	1.73	1.40	1.80	0.111	0.0657	0.0859	-1.50	2.39
4_30_03	MW-3	Field Parameters	Conductivity	mS/cm	4	0	0%	2021-05-04 to 2022-08-02		Nonparametric	1.81	1.81	1.80	1.83	0.0151	0.00833	0.0141	0.630	-1.93
4_30_05	MW-5	Field Parameters	Conductivity	mS/cm	15	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	1.77	1.77	1.24	2.49	0.333	0.188	0.256	0.381	0.396
4_30_06	MW-6	Field Parameters	Conductivity	mS/cm	15	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	1.10	1.09	0.902	1.27	0.108	0.0979	0.116	-0.0977	-0.662
4_30_07	MW-7	Field Parameters	Conductivity	mS/cm	9	0	0%	2021-06-15 to 2022-08-02	Nonparametric	Nonparametric	0.901	0.925	0.462	1.13	0.180	0.200	0.0593	-1.99	5.64
4_30_08	MW-8	Field Parameters	Conductivity	mS/cm	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	0.650	0.640	0.620	0.721	0.0307	0.0472	0.0237	1.69	3.65
4_30_09	MW-9	Field Parameters	Conductivity	mS/cm	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	0.441	0.444	0.393	0.471	0.0263	0.0595	0.0356	-0.656	-0.295
4_30_10	MW-10	Field Parameters	Conductivity	mS/cm	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	0.739	0.741	0.664	0.807	0.0468	0.0632	0.0578	-0.166	-0.863
4_30_13	MW-13	Field Parameters	Conductivity	mS/cm	6	0	0%	2022-02-23 to 2022-08-17	Gamma; Lognormal; Normal	Nonparametric	0.651	0.628	0.549	0.782	0.0915	0.141	0.0904	0.508	-1.48
4_30_7B	MW-7B	Field Parameters	Conductivity	mS/cm	5	0	0%	2022-03-09 to 2022-07-28	Nonparametric	Nonparametric	0.616	0.588	0.586	0.730	0.0636	0.103	0.00148	2.23	4.99
4_31_02	MW-2	Field Parameters	Dissolved Oxygen	mg/L	15	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal	Gamma	0.179	0.120	0.0200	1.01	0.248	1.39	0.133	3.0	10.1
4_31_03	MW-3	Field Parameters	Dissolved Oxygen	mg/L	4	0	0%	2021-05-04 to 2022-08-02		Nonparametric	0.115	0.130	0.0300	0.170	0.0645	0.561	0.0519	-0.892	-0.924
4_31_05	MW-5	Field Parameters	Dissolved Oxygen	mg/L	15	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	2.45	2.45	0.550	5.42	1.45	0.591	1.75	0.366	-0.398
4_31_06	MW-6	Field Parameters	Dissolved Oxygen	mg/L	15	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal	Gamma	0.108	0.0800	0.0100	0.440	0.110	1.02	0.0593	2.27	5.78
4_31_07	MW-7	Field Parameters	Dissolved Oxygen	mg/L	9	1	11%	2021-06-15 to 2022-08-02	Nonparametric	Nonparametric	0.0925	0.0200	0	0.490	0.169	1.82	0.0148	2.39	5.78
4_31_08	MW-8	Field Parameters	Dissolved Oxygen	mg/L	9	0	0%	2021-06-15 to 2022-08-02	Gamma	Gamma	2.15	1.66	0.0400	7.83	2.25	1.04	0.933	2.42	6.66
4_31_09	MW-9	Field Parameters	Dissolved Oxygen	mg/L	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	5.16	5.35	3.96	6.17	0.752	0.146	1.16	-0.101	-0.908
4_31_10	MW-10	Field Parameters	Dissolved Oxygen	mg/L	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	3.01	2.89	2.05	3.92	0.575	0.191	0.607	-0.0490	-0.205
4_31_13	MW-13	Field Parameters	Dissolved Oxygen	mg/L	6	0	0%	2022-02-23 to 2022-08-17	Gamma; Lognormal; Normal	Nonparametric	4.45	5.18	1.31	6.23	2.03	0.457	1.54	-0.901	-0.954
4_31_7B	MW-7B	Field Parameters	Dissolved Oxygen	mg/L	5	0	0%	2022-03-09 to 2022-07-28	Gamma; Lognormal; Normal	Nonparametric	0.282	0.110	0.0900	0.850	0.325	1.15	0.0296	2.00	4.02
4_32_02	MW-2	Field Parameters	Oxidation Reduction Potential	mV	15	0	0%	2020-04-28 to 2022-08-02	Normal	Normal	28.8	35.3	-75.8	182	62.1	2.15	30.5	0.647	1.76
4_32_03	MW-3	Field Parameters	Oxidation Reduction Potential	mV	4	0	0%	2021-05-04 to 2022-08-02		Nonparametric	-58.8	-52.8	-92.1	-37.5	25.5	-0.433	20.5	-0.861	-1.17
4_32_05	MW-5	Field Parameters	Oxidation Reduction Potential	mV	15	0	0%	2020-04-28 to 2022-08-02	Normal	Normal	68.0	58.4	-34.8	248	90	1.32	110	0.623	-0.624
4_32_06	MW-6	Field Parameters	Oxidation Reduction Potential	mV	15	0	0%	2020-04-28 to 2022-08-02	Normal	Normal	59.6	70.8	-66.5	168	68.5	1.15	77.2	-0.458	-0.546
4_32_07	MW-7	Field Parameters	Oxidation Reduction Potential	mV	9	0	0%	2021-06-15 to 2022-08-02	Normal	Normal	-123	-129	-157	-36.9	35.3	-0.286	19.4	2.13	5.33
4_32_08	MW-8	Field Parameters	Oxidation Reduction Potential	mV	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	205	228	72.1	365	107	0.522	158	0.210	-1.58
4_32_09	MW-9	Field Parameters	Oxidation Reduction Potential	mV	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	232	238	99.2	381	96.0	0.413	110	0.167	-1.26
4_32_10	MW-10	Field Parameters	Oxidation Reduction Potential	mV	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	223	231	98.9	392	99.3	0.445	123	0.433	-0.864
4_32_13	MW-13	Field Parameters	Oxidation Reduction Potential	mV	6	0	0%	2022-02-23 to 2022-08-17	Gamma; Lognormal; Normal	Nonparametric	111	99.0	66.9	163	37.7	0.338	31.1	0.552	-1.40
4_32_7B	MW-7B	Field Parameters	Oxidation Reduction Potential	mV	5	0	0%	2022-03-09 to 2022-07-28	Normal	Nonparametric	-71.9	-95.1	-136	19.2	62.0	-0.863	60.3	0.816	-0.491

(Table continues on next page)



Table 2: Summary Statistics, Non-Detects Excluded (continued)

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Date Range	Distributions Fit	Recommended Distribution	Mean	Median	Minimum	Maximum	SD	CV	MAD/0.675	Skewness	Kurtosis
4_33_02	MW-2	Field Parameters	Temperature	°C	15	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	13.2	13.7	9.10	15.4	1.65	0.125	1.48	-0.974	1.15
4_33_03	MW-3	Field Parameters	Temperature	°C	4	0	0%	2021-05-04 to 2022-08-02		Nonparametric	12.7	13.1	10.6	14.2	1.74	0.137	1.63	-0.525	-3.02
4_33_05	MW-5	Field Parameters	Temperature	°C	15	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	13.0	12.7	8.60	17.5	2.24	0.172	1.63	0.0455	0.387
4_33_06	MW-6	Field Parameters	Temperature	°C	15	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	13.0	13.2	10.5	15.2	1.30	0.100	1.48	-0.396	-0.262
4_33_07	MW-7	Field Parameters	Temperature	°C	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	12.5	13.0	6.20	17.0	3.24	0.260	2.37	-0.811	0.593
4_33_08	MW-8	Field Parameters	Temperature	°C	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	12.2	14.0	5.90	16.4	3.27	0.267	3.56	-0.851	0.285
4_33_09	MW-9	Field Parameters	Temperature	°C	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	13.4	13.8	4.70	19.2	5.29	0.396	6.37	-0.523	-1.14
4_33_10	MW-10	Field Parameters	Temperature	°C	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	12.9	14.0	8.60	15.5	2.54	0.197	2.22	-0.663	-0.986
4_33_13	MW-13	Field Parameters	Temperature	°C	6	0	0%	2022-02-23 to 2022-08-17	Gamma; Lognormal; Normal	Nonparametric	10.9	10.3	5.80	17.5	4.60	0.422	5.63	0.387	-1.52
4_33_7B	MW-7B	Field Parameters	Temperature	°C	5	0	0%	2022-03-09 to 2022-07-28	Gamma; Lognormal; Normal	Nonparametric	12.6	13.1	11.0	14.1	1.26	0.0997	1.48	-0.363	-1.66
4_34_02	MW-2	Field Parameters	Turbidity	NTU	15	0	0%	2020-04-28 to 2022-08-02	Nonparametric	Nonparametric	12.8	9.42	4.15	72.3	16.6	1.29	1.08	3.78	14.5
4_34_03	MW-3	Field Parameters	Turbidity	NTU	4	0	0%	2021-05-04 to 2022-08-02		Nonparametric	5.03	5.01	2.10	8.01	2.42	0.480	2.29	0.0554	1.39
4_34_05	MW-5	Field Parameters	Turbidity	NTU	15	0	0%	2020-04-28 to 2022-08-02	Nonparametric	Nonparametric	30.5	17.9	9.52	180	43.6	1.43	4.16	3.30	11.3
4_34_06	MW-6	Field Parameters	Turbidity	NTU	15	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal	Gamma	9.84	8.35	1.19	33.6	7.92	0.804	2.58	2.14	5.58
4_34_07	MW-7	Field Parameters	Turbidity	NTU	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal	Gamma	4.76	2.65	1.71	16.0	4.46	0.937	1.39	2.43	6.43
4_34_08	MW-8	Field Parameters	Turbidity	NTU	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	4.77	5.25	2.00	7.18	2.00	0.421	2.59	-0.244	-1.60
4_34_09	MW-9	Field Parameters	Turbidity	NTU	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	3.94	3.44	1.60	6.70	2.01	0.510	2.73	0.134	-1.90
4_34_10	MW-10	Field Parameters	Turbidity	NTU	9	0	0%	2021-06-15 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	2.86	2.30	1.29	5.99	1.43	0.502	1.01	1.38	2.10
4_34_13	MW-13	Field Parameters	Turbidity	NTU	6	0	0%	2022-02-23 to 2022-08-17	Gamma; Lognormal; Normal	Nonparametric	5.17	5.33	1.79	7.90	2.37	0.459	2.64	-0.308	-1.56
4_34_7B	MW-7B	Field Parameters	Turbidity	NTU	5	0	0%	2022-03-09 to 2022-07-28	Normal	Nonparametric	4.67	6.01	0.0200	7.01	2.82	0.604	1.48	-1.52	2.03
5_36_05	MW-5	Part 115	Copper	mg/L	15	10	67%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Nonparametric	0.0140	0.0110	0.00500	0.0260	0.00843	0.602	0.00889	0.677	-0.901
5_37_02	MW-2	Part 115	Iron	mg/L	15	0	0%	2020-04-28 to 2022-08-02	Nonparametric	Nonparametric	0.703	0.620	0.440	1.93	0.369	0.525	0.163	2.97	9.81
5_37_03	MW-3	Part 115	Iron	mg/L	4	0	0%	2021-05-04 to 2022-08-02		Nonparametric	1.95	1.98	1.80	2.05	0.110	0.0563	0.0815	-1.09	0.676
5_37_05	MW-5	Part 115	Iron	mg/L	15	1	7%	2020-04-28 to 2022-08-02	Gamma; Lognormal	Gamma	1.67	0.825	0.180	8.00	2.20	1.31	0.933	2.23	5.10
5_37_06	MW-6	Part 115	Iron	mg/L	15	7	47%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	0.0638	0.0450	0.0200	0.200	0.0593	0.930	0.0370	2.12	4.93
5_37_07	MW-7	Part 115	Iron	mg/L	9	0	0%	2021-06-15 to 2022-08-02	Nonparametric	Nonparametric	1.53	1.37	1.19	2.81	0.493	0.322	0.178	2.69	7.66
5_37_08	MW-8	Part 115	Iron	mg/L	9	8	89%	2021-06-15 to 2022-08-02		Nonparametric	0.0200	0.0200	0.0200	0.0200	NA	NA	0	NA	NA
5_37_13	MW-13	Part 115	Iron	mg/L	6	1	17%	2022-02-23 to 2022-08-17	Gamma; Lognormal; Normal	Nonparametric	0.0380	0.0300	0.0200	0.0800	0.0249	0.655	0.0148	1.67	2.81
5_37_7B	MW-7B	Part 115	Iron	mg/L	5	0	0%	2022-03-09 to 2022-07-28	Gamma; Lognormal; Normal	Nonparametric	0.0420	0.0400	0.0300	0.0600	0.0130	0.310	0.0148	0.541	-1.49
5_38_02	MW-2	Part 115	Nickel	mg/L	15	0	0%	2020-04-28 to 2022-08-02	Nonparametric	Nonparametric	0.0243	0.0260	0.0180	0.0280	0.00344	0.141	0.00148	-1.08	-0.253
5_38_05	MW-5	Part 115	Nickel	mg/L	15	0	0%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	0.0125	0.0110	0.00700	0.0190	0.00354	0.284	0.00296	0.433	-0.636
5_38_06	MW-6	Part 115	Nickel	mg/L	15	2	13%	2020-04-28 to 2022-08-02	Nonparametric	Nonparametric	0.00685	0.00700	0.00500	0.00800	0.000801	0.117	0	-0.845	1.51
5_40_05	MW-5	Part 115	Vanadium	mg/L	15	13	87%	2020-04-28 to 2022-08-02		Nonparametric	0.0105	0.0105	0.00900	0.0120	0.00212	0.202	0.00222	NA	NA
5_41_02	MW-2	Part 115	Zinc	mg/L	15	12	80%	2020-04-28 to 2022-08-02		Nonparametric	0.0183	0.00700	0.00700	0.0410	0.0196	1.07	0	1.73	NA
5_41_05	MW-5	Part 115	Zinc	mg/L	15	4	27%	2020-04-28 to 2022-08-02	Gamma; Lognormal; Normal	Gamma	0.0255	0.0140	0.00500	0.0980	0.0275	1.08	0.0133	2.12	4.93
5_41_06	MW-6	Part 115	Zinc	mg/L	15	14	93%	2020-04-28 to 2022-08-02		Nonparametric	0.0340	0.0340	0.0340	0.0340	NA	NA	0	NA	NA
5_41_07	MW-7	Part 115	Zinc	mg/L	9	6	67%	2021-06-15 to 2022-08-02		Nonparametric	0.00933	0.00700	0.00700	0.0140	0.00404	0.433	0	1.73	NA
5_41_09	MW-9	Part 115	Zinc	mg/L	9	8	89%	2021-06-15 to 2022-08-02		Nonparametric	0.00900	0.00900	0.00900	0.00900	NA	NA	0	NA	NA
5_41_10	MW-10	Part 115	Zinc	mg/L	9	7	78%	2021-06-15 to 2022-08-02		Nonparametric	0.0145	0.0145	0.00900	0.0200	0.00778	0.536	0.00815	NA	NA
5_41_13	MW-13	Part 115	Zinc	mg/L	6	5	83%	2022-02-23 to 2022-08-17		Nonparametric	0.0100	0.0100	0.0100	0.0100	NA	NA	0	NA	NA



**Table 3: Goodness-of-Fit Tests, Non-Detects Excluded**

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Normal		Lognormal		Gamma				Log-SD (NDs excl.)	ProUCL Distributions Fit	Recommended Distribution				
								S-W		Lilliefors		S-W		Lilliefors					K-S		A-D	
								Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value				Stat.	p-Value	Stat.	p-Value
1_01_02	MW-2	Appendix III	Boron	mg/L	14	0	0%	0.887	0.072	0.193	0.170	0.863	0.033	0.189	0.190	0.199	>= 0.10	0.721	0.05 <= p < 0.10	0.199	Gamma; Lognormal; Normal	Gamma
1_01_03	MW-3	Appendix III	Boron	mg/L	4	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
1_01_05	MW-5	Appendix III	Boron	mg/L	14	0	0%	0.654	0.000	0.305	0.001	0.433	0.000	0.404	0.000	0.390	< 0.01	3.013	< 0.01	0.690	Nonparametric	Nonparametric
1_01_06	MW-6	Appendix III	Boron	mg/L	14	0	0%	0.970	0.876	0.106	0.940	0.965	0.801	0.103	0.952	0.114	>= 0.10	0.194	>= 0.10	0.241	Gamma; Lognormal; Normal	Gamma
1_01_07	MW-7	Appendix III	Boron	mg/L	9	0	0%	0.933	0.506	0.189	0.463	0.954	0.733	0.175	0.591	0.162	>= 0.10	0.326	>= 0.10	0.180	Gamma; Lognormal; Normal	Gamma
1_01_08	MW-8	Appendix III	Boron	mg/L	9	1	11%	0.819	0.045	0.253	0.137	0.943	0.643	0.216	0.332	0.191	>= 0.10	0.404	>= 0.10	0.503	Gamma; Lognormal; Normal	Gamma
1_01_09	MW-9	Appendix III	Boron	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
1_01_10	MW-10	Appendix III	Boron	mg/L	9	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.125	NA	Nonparametric
1_01_13	MW-13	Appendix III	Boron	mg/L	6	0	0%	0.850	0.158	0.215	0.523	0.843	0.137	0.217	0.501	0.240	>= 0.10	0.514	>= 0.10	0.116	Gamma; Lognormal; Normal	Nonparametric
1_01_7B	MW-7B	Appendix III	Boron	mg/L	5	0	0%	0.940	0.668	0.208	0.679	0.936	0.641	0.210	0.662	0.223	>= 0.10	0.287	>= 0.10	0.022	Gamma; Lognormal; Normal	Nonparametric
1_02_02	MW-2	Appendix III	Calcium	mg/L	14	0	0%	0.801	0.005	0.204	0.119	0.780	0.003	0.221	0.063	0.208	>= 0.10	1.176	< 0.01	0.084	Gamma; Lognormal; Normal	Gamma
1_02_03	MW-3	Appendix III	Calcium	mg/L	4	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
1_02_05	MW-5	Appendix III	Calcium	mg/L	14	0	0%	0.880	0.057	0.228	0.046	0.677	0.000	0.329	0.000	0.293	< 0.01	1.220	< 0.01	0.389	Normal	Normal
1_02_06	MW-6	Appendix III	Calcium	mg/L	14	0	0%	0.927	0.276	0.127	0.785	0.931	0.320	0.121	0.837	0.130	>= 0.10	0.340	>= 0.10	0.105	Gamma; Lognormal; Normal	Gamma
1_02_07	MW-7	Appendix III	Calcium	mg/L	9	0	0%	0.850	0.075	0.228	0.194	0.883	0.170	0.224	0.215	0.228	>= 0.10	0.504	>= 0.10	0.109	Gamma; Lognormal; Normal	Gamma
1_02_08	MW-8	Appendix III	Calcium	mg/L	9	0	0%	0.960	0.794	0.166	0.678	0.957	0.769	0.164	0.695	0.180	>= 0.10	0.230	>= 0.10	0.048	Gamma; Lognormal; Normal	Gamma
1_02_09	MW-9	Appendix III	Calcium	mg/L	9	0	0%	0.867	0.114	0.244	0.126	0.865	0.108	0.243	0.130	0.260	0.05 <= p < 0.10	0.569	>= 0.10	0.094	Gamma; Lognormal; Normal	Gamma
1_02_10	MW-10	Appendix III	Calcium	mg/L	9	0	0%	0.931	0.492	0.211	0.296	0.923	0.416	0.225	0.209	0.216	>= 0.10	0.359	>= 0.10	0.078	Gamma; Lognormal; Normal	Gamma
1_02_13	MW-13	Appendix III	Calcium	mg/L	6	0	0%	0.828	0.104	0.268	0.195	0.836	0.121	0.270	0.184	0.290	>= 0.10	0.582	>= 0.10	0.165	Gamma; Lognormal; Normal	Nonparametric
1_02_7B	MW-7B	Appendix III	Calcium	mg/L	5	0	0%	0.956	0.781	0.255	0.351	0.946	0.711	0.268	0.279	0.259	>= 0.10	0.300	>= 0.10	0.078	Gamma; Lognormal; Normal	Nonparametric
1_03_02	MW-2	Appendix III	Chloride	mg/L	14	0	0%	0.919	0.210	0.171	0.326	0.901	0.115	0.184	0.226	0.186	>= 0.10	0.622	0.05 <= p < 0.10	0.101	Gamma; Lognormal; Normal	Gamma
1_03_03	MW-3	Appendix III	Chloride	mg/L	4	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
1_03_05	MW-5	Appendix III	Chloride	mg/L	14	0	0%	0.820	0.009	0.197	0.146	0.743	0.001	0.244	0.024	0.222	0.05 <= p < 0.10	1.011	< 0.01	0.168	Gamma; Normal	Gamma
1_03_06	MW-6	Appendix III	Chloride	mg/L	14	0	0%	0.907	0.143	0.190	0.187	0.905	0.134	0.189	0.194	0.200	>= 0.10	0.615	>= 0.10	0.203	Gamma; Lognormal; Normal	Gamma
1_03_07	MW-7	Appendix III	Chloride	mg/L	9	0	0%	0.572	0.000	0.371	0.001	0.597	0.000	0.365	0.001	0.365	< 0.01	1.643	< 0.01	0.095	Nonparametric	Nonparametric
1_03_08	MW-8	Appendix III	Chloride	mg/L	9	2	22%	0.671	0.002	0.374	0.004	0.931	0.560	0.222	0.372	0.277	>= 0.10	0.566	>= 0.10	0.802	Gamma; Lognormal	Gamma
1_03_09	MW-9	Appendix III	Chloride	mg/L	9	8	89%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
1_03_10	MW-10	Appendix III	Chloride	mg/L	9	8	89%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
1_03_13	MW-13	Appendix III	Chloride	mg/L	6	2	33%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.271	NA	NA	Nonparametric
1_03_7B	MW-7B	Appendix III	Chloride	mg/L	5	5	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
1_04_02	MW-2	Appendix III	Fluoride	mg/L	14	14	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
1_04_03	MW-3	Appendix III	Fluoride	mg/L	4	4	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
1_04_05	MW-5	Appendix III	Fluoride	mg/L	14	14	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
1_04_06	MW-6	Appendix III	Fluoride	mg/L	14	14	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
1_04_07	MW-7	Appendix III	Fluoride	mg/L	9	8	89%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
1_04_08	MW-8	Appendix III	Fluoride	mg/L	9	8	89%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
1_04_09	MW-9	Appendix III	Fluoride	mg/L	9	8	89%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
1_04_10	MW-10	Appendix III	Fluoride	mg/L	9	8	89%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
1_04_13	MW-13	Appendix III	Fluoride	mg/L	6	6	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric

(Table continues on next page)

Note: p-values above 0.05 suggest a fit to the tested distribution; a distribution passes its GOF test when at least one of the two p-values is above 0.05.



**Table 3: Goodness-of-Fit Tests, Non-Detects Excluded (continued)**

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Normal		Lognormal		Gamma				Log-SD (NDs excl.)	ProUCL Distributions Fit	Recommended Distribution				
								S-W		Lilliefors		S-W		Lilliefors					K-S		A-D	
								Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value				Stat.	p-Value	Stat.	p-Value
1_04_7B	MW-7B	Appendix III	Fluoride	mg/L	5	5	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Gamma	Nonparametric		
1_05_02	MW-2	Appendix III	Sulfate	mg/L	14	0	0%	0.875	0.050	0.198	0.145	0.854	0.025	0.225	0.053	0.219	0.05 <= p < 0.10	0.885	0.01 <= p < 0.05	0.184	Gamma; Lognormal; Normal	Gamma
1_05_03	MW-3	Appendix III	Sulfate	mg/L	4	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
1_05_05	MW-5	Appendix III	Sulfate	mg/L	14	0	0%	0.954	0.618	0.165	0.378	0.791	0.004	0.259	0.012	0.218	0.05 <= p < 0.10	0.631	0.05 <= p < 0.10	0.448	Gamma; Normal	Gamma
1_05_06	MW-6	Appendix III	Sulfate	mg/L	14	0	0%	0.904	0.128	0.170	0.337	0.914	0.178	0.171	0.320	0.180	>= 0.10	0.482	>= 0.10	0.273	Gamma; Lognormal; Normal	Gamma
1_05_07	MW-7	Appendix III	Sulfate	mg/L	9	0	0%	0.849	0.073	0.206	0.333	0.887	0.185	0.198	0.389	0.202	>= 0.10	0.470	>= 0.10	0.121	Gamma; Lognormal; Normal	Gamma
1_05_08	MW-8	Appendix III	Sulfate	mg/L	9	0	0%	0.806	0.024	0.301	0.019	0.895	0.226	0.242	0.133	0.273	0.05 <= p < 0.10	0.573	>= 0.10	0.513	Gamma; Lognormal	Gamma
1_05_09	MW-9	Appendix III	Sulfate	mg/L	9	7	78%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.236	Nonparametric	
1_05_10	MW-10	Appendix III	Sulfate	mg/L	9	0	0%	0.951	0.696	0.174	0.602	0.921	0.399	0.213	0.281	0.203	>= 0.10	0.335	>= 0.10	0.237	Gamma; Lognormal; Normal	Gamma
1_05_13	MW-13	Appendix III	Sulfate	mg/L	6	0	0%	0.929	0.572	0.185	0.749	0.907	0.414	0.221	0.474	0.220	>= 0.10	0.337	>= 0.10	0.503	Gamma; Lognormal; Normal	Nonparametric
1_05_7B	MW-7B	Appendix III	Sulfate	mg/L	5	5	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
1_06_02	MW-2	Appendix III	Total Dissolved Solids	mg/L	14	0	0%	0.892	0.087	0.212	0.087	0.875	0.050	0.207	0.106	0.224	0.05 <= p < 0.10	0.689	0.05 <= p < 0.10	0.098	Gamma; Lognormal; Normal	Gamma
1_06_03	MW-3	Appendix III	Total Dissolved Solids	mg/L	4	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
1_06_05	MW-5	Appendix III	Total Dissolved Solids	mg/L	14	0	0%	0.939	0.408	0.159	0.443	0.825	0.010	0.222	0.059	0.192	>= 0.10	0.563	>= 0.10	0.306	Gamma; Lognormal; Normal	Gamma
1_06_06	MW-6	Appendix III	Total Dissolved Solids	mg/L	14	0	0%	0.951	0.582	0.132	0.729	0.955	0.646	0.127	0.784	0.132	>= 0.10	0.305	>= 0.10	0.127	Gamma; Lognormal; Normal	Gamma
1_06_07	MW-7	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	0.712	0.002	0.281	0.039	0.742	0.004	0.260	0.080	0.265	0.05 <= p < 0.10	1.005	< 0.01	0.085	Gamma; Lognormal	Gamma
1_06_08	MW-8	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	0.909	0.308	0.193	0.430	0.919	0.387	0.185	0.501	0.183	>= 0.10	0.369	>= 0.10	0.040	Gamma; Lognormal; Normal	Gamma
1_06_09	MW-9	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	0.857	0.088	0.258	0.086	0.871	0.125	0.251	0.104	0.257	>= 0.10	0.651	0.05 <= p < 0.10	0.056	Gamma; Lognormal; Normal	Gamma
1_06_10	MW-10	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	0.973	0.919	0.128	0.942	0.973	0.917	0.142	0.868	0.135	>= 0.10	0.189	>= 0.10	0.079	Gamma; Lognormal; Normal	Gamma
1_06_13	MW-13	Appendix III	Total Dissolved Solids	mg/L	6	0	0%	0.964	0.846	0.164	0.880	0.977	0.934	0.142	0.965	0.148	>= 0.10	0.184	>= 0.10	0.129	Gamma; Lognormal; Normal	Nonparametric
1_06_7B	MW-7B	Appendix III	Total Dissolved Solids	mg/L	5	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.016	Nonparametric	
1_35_02	MW-2	Appendix III	pH	su	15	0	0%	0.912	0.145	0.147	0.515	0.918	0.178	0.144	0.551	0.139	>= 0.10	0.500	>= 0.10	0.018	Gamma; Lognormal; Normal	Gamma
1_35_03	MW-3	Appendix III	pH	su	4	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
1_35_05	MW-5	Appendix III	pH	su	15	0	0%	0.722	0.000	0.325	0.000	0.707	0.000	0.333	0.000	0.328	< 0.01	1.772	< 0.01	0.040	Nonparametric	Nonparametric
1_35_06	MW-6	Appendix III	pH	su	15	0	0%	0.943	0.424	0.174	0.253	0.943	0.417	0.179	0.222	0.173	>= 0.10	0.500	>= 0.10	0.027	Gamma; Lognormal; Normal	Gamma
1_35_07	MW-7	Appendix III	pH	su	9	0	0%	0.756	0.006	0.299	0.020	0.771	0.009	0.290	0.027	0.289	0.01 <= p < 0.05	0.926	0.01 <= p < 0.05	0.035	Nonparametric	Nonparametric
1_35_08	MW-8	Appendix III	pH	su	9	0	0%	0.754	0.006	0.258	0.085	0.765	0.008	0.250	0.108	0.247	>= 0.10	0.837	0.01 <= p < 0.05	0.034	Gamma; Lognormal; Normal	Gamma
1_35_09	MW-9	Appendix III	pH	su	9	0	0%	0.826	0.040	0.230	0.183	0.834	0.050	0.227	0.199	0.231	>= 0.10	0.626	0.05 <= p < 0.10	0.025	Gamma; Lognormal; Normal	Gamma
1_35_10	MW-10	Appendix III	pH	su	9	0	0%	0.858	0.091	0.252	0.101	0.870	0.123	0.248	0.113	0.253	>= 0.10	0.536	>= 0.10	0.035	Gamma; Lognormal; Normal	Gamma
1_35_13	MW-13	Appendix III	pH	su	6	0	0%	0.969	0.885	0.183	0.762	0.967	0.868	0.187	0.735	0.188	>= 0.10	0.244	>= 0.10	0.023	Gamma; Lognormal; Normal	Nonparametric
1_35_7B	MW-7B	Appendix III	pH	su	5	0	0%	0.890	0.357	0.278	0.231	0.889	0.351	0.280	0.223	0.299	>= 0.10	0.428	>= 0.10	0.022	Gamma; Lognormal; Normal	Nonparametric
2_04_02	MW-2	Appendix IV	Fluoride	mg/L	15	15	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
2_04_03	MW-3	Appendix IV	Fluoride	mg/L	4	4	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
2_04_05	MW-5	Appendix IV	Fluoride	mg/L	15	15	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
2_04_06	MW-6	Appendix IV	Fluoride	mg/L	15	15	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
2_04_07	MW-7	Appendix IV	Fluoride	mg/L	9	8	89%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
2_04_08	MW-8	Appendix IV	Fluoride	mg/L	9	8	89%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
2_04_09	MW-9	Appendix IV	Fluoride	mg/L	9	8	89%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
2_04_10	MW-10	Appendix IV	Fluoride	mg/L	9	8	89%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	

(Table continues on next page)

Note: p-values above 0.05 suggest a fit to the tested distribution; a distribution passes its GOF test when at least one of the two p-values is above 0.05.





**Table 3: Goodness-of-Fit Tests, Non-Detects Excluded (continued)**

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Normal		Lognormal		Gamma				Log-SD (NDs excl.)	ProUCL Distributions Fit	Recommended Distribution				
								S-W		Lilliefors		S-W		Lilliefors					K-S		A-D	
								Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value				Stat.	p-Value	Stat.	p-Value
2_04_13	MW-13	Appendix IV	Fluoride	mg/L	6	6	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
2_04_7B	MW-7B	Appendix IV	Fluoride	mg/L	5	5	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
2_07_02	MW-2	Appendix IV	Antimony	mg/L	15	15	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
2_07_03	MW-3	Appendix IV	Antimony	mg/L	4	4	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
2_07_05	MW-5	Appendix IV	Antimony	mg/L	15	15	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
2_07_06	MW-6	Appendix IV	Antimony	mg/L	15	15	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
2_07_07	MW-7	Appendix IV	Antimony	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
2_07_08	MW-8	Appendix IV	Antimony	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
2_07_09	MW-9	Appendix IV	Antimony	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
2_07_10	MW-10	Appendix IV	Antimony	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
2_07_13	MW-13	Appendix IV	Antimony	mg/L	6	6	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
2_07_7B	MW-7B	Appendix IV	Antimony	mg/L	5	5	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
2_08_02	MW-2	Appendix IV	Arsenic	mg/L	15	13	87%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.490	Nonparametric			
2_08_03	MW-3	Appendix IV	Arsenic	mg/L	4	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
2_08_05	MW-5	Appendix IV	Arsenic	mg/L	15	10	67%	0.871	0.272	0.244	0.423	0.890	0.357	0.222	0.578	0.242	>= 0.10	0.386	>= 0.10	0.559	Gamma; Lognormal; Normal	Nonparametric
2_08_06	MW-6	Appendix IV	Arsenic	mg/L	15	15	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
2_08_07	MW-7	Appendix IV	Arsenic	mg/L	9	0	0%	0.873	0.132	0.317	0.010	0.849	0.072	0.329	0.006	0.340	< 0.01	0.826	0.01 <= p < 0.05	0.163	Lognormal; Normal	Lognormal
2_08_08	MW-8	Appendix IV	Arsenic	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
2_08_09	MW-9	Appendix IV	Arsenic	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
2_08_10	MW-10	Appendix IV	Arsenic	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
2_08_13	MW-13	Appendix IV	Arsenic	mg/L	6	6	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
2_08_7B	MW-7B	Appendix IV	Arsenic	mg/L	5	4	80%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
2_09_02	MW-2	Appendix IV	Barium	mg/L	15	0	0%	0.954	0.586	0.181	0.208	0.958	0.665	0.169	0.299	0.175	>= 0.10	0.402	>= 0.10	0.070	Gamma; Lognormal; Normal	Gamma
2_09_03	MW-3	Appendix IV	Barium	mg/L	4	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
2_09_05	MW-5	Appendix IV	Barium	mg/L	15	0	0%	0.939	0.370	0.197	0.123	0.962	0.731	0.168	0.303	0.181	>= 0.10	0.393	>= 0.10	0.179	Gamma; Lognormal; Normal	Gamma
2_09_06	MW-6	Appendix IV	Barium	mg/L	15	0	0%	0.904	0.111	0.228	0.035	0.902	0.102	0.216	0.059	0.230	0.01 <= p < 0.05	0.792	0.01 <= p < 0.05	0.127	Lognormal; Normal	Lognormal
2_09_07	MW-7	Appendix IV	Barium	mg/L	9	0	0%	0.979	0.959	0.172	0.621	0.977	0.946	0.160	0.731	0.156	>= 0.10	0.191	>= 0.10	0.084	Gamma; Lognormal; Normal	Gamma
2_09_08	MW-8	Appendix IV	Barium	mg/L	9	0	0%	0.914	0.342	0.216	0.261	0.938	0.565	0.189	0.465	0.199	>= 0.10	0.362	>= 0.10	0.161	Gamma; Lognormal; Normal	Gamma
2_09_09	MW-9	Appendix IV	Barium	mg/L	9	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.066	Nonparametric	
2_09_10	MW-10	Appendix IV	Barium	mg/L	9	0	0%	0.971	0.906	0.139	0.884	0.972	0.909	0.126	0.947	0.135	>= 0.10	0.210	>= 0.10	0.076	Gamma; Lognormal; Normal	Gamma
2_09_13	MW-13	Appendix IV	Barium	mg/L	6	0	0%	0.950	0.739	0.184	0.754	0.932	0.597	0.208	0.573	0.204	>= 0.10	0.293	>= 0.10	0.152	Gamma; Lognormal; Normal	Nonparametric
2_09_7B	MW-7B	Appendix IV	Barium	mg/L	5	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.085	Nonparametric		
2_10_02	MW-2	Appendix IV	Beryllium	mg/L	15	15	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
2_10_03	MW-3	Appendix IV	Beryllium	mg/L	4	4	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
2_10_05	MW-5	Appendix IV	Beryllium	mg/L	15	15	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
2_10_06	MW-6	Appendix IV	Beryllium	mg/L	15	15	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
2_10_07	MW-7	Appendix IV	Beryllium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
2_10_08	MW-8	Appendix IV	Beryllium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
2_10_09	MW-9	Appendix IV	Beryllium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	

(Table continues on next page)

Note: p-values above 0.05 suggest a fit to the tested distribution; a distribution passes its GOF test when at least one of the two p-values is above 0.05.



**Table 3: Goodness-of-Fit Tests, Non-Detects Excluded (continued)**

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Normal		Lognormal		Gamma				Log-SD (NDs excl.)	ProUCL Distributions Fit	Recommended Distribution				
								S-W		Lilliefors		S-W		Lilliefors					K-S		A-D	
								Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value				Stat.	p-Value	Stat.	p-Value
2_10_10	MW-10	Appendix IV	Beryllium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric				
2_10_13	MW-13	Appendix IV	Beryllium	mg/L	6	6	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric				
2_10_7B	MW-7B	Appendix IV	Beryllium	mg/L	5	5	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric				
2_12_02	MW-2	Appendix IV	Cadmium	mg/L	15	15	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric				
2_12_03	MW-3	Appendix IV	Cadmium	mg/L	4	4	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric				
2_12_05	MW-5	Appendix IV	Cadmium	mg/L	15	15	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric				
2_12_06	MW-6	Appendix IV	Cadmium	mg/L	15	15	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric				
2_12_07	MW-7	Appendix IV	Cadmium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric				
2_12_08	MW-8	Appendix IV	Cadmium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric				
2_12_09	MW-9	Appendix IV	Cadmium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric				
2_12_10	MW-10	Appendix IV	Cadmium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric				
2_12_13	MW-13	Appendix IV	Cadmium	mg/L	6	6	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric				
2_12_7B	MW-7B	Appendix IV	Cadmium	mg/L	5	5	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric				
2_14_02	MW-2	Appendix IV	Chromium	mg/L	15	15	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric				
2_14_03	MW-3	Appendix IV	Chromium	mg/L	4	4	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric				
2_14_05	MW-5	Appendix IV	Chromium	mg/L	15	13	87%	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.252	Nonparametric				
2_14_06	MW-6	Appendix IV	Chromium	mg/L	15	15	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric				
2_14_07	MW-7	Appendix IV	Chromium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric				
2_14_08	MW-8	Appendix IV	Chromium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric				
2_14_09	MW-9	Appendix IV	Chromium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric				
2_14_10	MW-10	Appendix IV	Chromium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric				
2_14_13	MW-13	Appendix IV	Chromium	mg/L	6	6	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric				
2_14_7B	MW-7B	Appendix IV	Chromium	mg/L	5	5	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric				
2_15_02	MW-2	Appendix IV	Cobalt	mg/L	15	15	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric				
2_15_03	MW-3	Appendix IV	Cobalt	mg/L	4	4	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric				
2_15_05	MW-5	Appendix IV	Cobalt	mg/L	15	14	93%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric				
2_15_06	MW-6	Appendix IV	Cobalt	mg/L	15	15	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric				
2_15_07	MW-7	Appendix IV	Cobalt	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric				
2_15_08	MW-8	Appendix IV	Cobalt	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric				
2_15_09	MW-9	Appendix IV	Cobalt	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric				
2_15_10	MW-10	Appendix IV	Cobalt	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric				
2_15_13	MW-13	Appendix IV	Cobalt	mg/L	6	6	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric				
2_15_7B	MW-7B	Appendix IV	Cobalt	mg/L	5	5	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric				
2_17_02	MW-2	Appendix IV	Lead	mg/L	15	15	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric				
2_17_03	MW-3	Appendix IV	Lead	mg/L	4	4	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric				
2_17_05	MW-5	Appendix IV	Lead	mg/L	15	12	80%	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.785	Nonparametric				
2_17_06	MW-6	Appendix IV	Lead	mg/L	15	15	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric				
2_17_07	MW-7	Appendix IV	Lead	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric				
2_17_08	MW-8	Appendix IV	Lead	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric				

(Table continues on next page)

Note: p-values above 0.05 suggest a fit to the tested distribution; a distribution passes its GOF test when at least one of the two p-values is above 0.05.



**Table 3: Goodness-of-Fit Tests, Non-Detects Excluded (continued)**

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Normal		Lognormal		Gamma				Log-SD (NDs excl.)	ProUCL Distributions Fit	Recommended Distribution				
								S-W		Lilliefors		S-W		Lilliefors					K-S		A-D	
								Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value				Stat.	p-Value	Stat.	p-Value
2_17_09	MW-9	Appendix IV	Lead	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
2_17_10	MW-10	Appendix IV	Lead	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
2_17_13	MW-13	Appendix IV	Lead	mg/L	6	6	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
2_17_7B	MW-7B	Appendix IV	Lead	mg/L	5	4	80%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
2_18_02	MW-2	Appendix IV	Lithium	mg/L	15	0	0%	0.968	0.831	0.131	0.699	0.963	0.749	0.131	0.695	0.142	>= 0.10	0.273	>= 0.10	0.114	Gamma; Lognormal; Normal	Gamma
2_18_03	MW-3	Appendix IV	Lithium	mg/L	4	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
2_18_05	MW-5	Appendix IV	Lithium	mg/L	15	0	0%	0.915	0.159	0.163	0.355	0.735	0.001	0.202	0.102	0.198	>= 0.10	0.893	0.01 <= p < 0.05	0.432	Gamma; Lognormal; Normal	Gamma
2_18_06	MW-6	Appendix IV	Lithium	mg/L	15	0	0%	0.950	0.519	0.119	0.823	0.948	0.491	0.108	0.912	0.113	>= 0.10	0.263	>= 0.10	0.154	Gamma; Lognormal; Normal	Gamma
2_18_07	MW-7	Appendix IV	Lithium	mg/L	9	0	0%	0.938	0.565	0.234	0.166	0.949	0.676	0.222	0.226	0.218	>= 0.10	0.317	>= 0.10	0.077	Gamma; Lognormal; Normal	Gamma
2_18_08	MW-8	Appendix IV	Lithium	mg/L	9	5	56%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.427	NA	Nonparametric	
2_18_09	MW-9	Appendix IV	Lithium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
2_18_10	MW-10	Appendix IV	Lithium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
2_18_13	MW-13	Appendix IV	Lithium	mg/L	6	6	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
2_18_7B	MW-7B	Appendix IV	Lithium	mg/L	5	0	0%	0.951	0.747	0.263	0.305	0.944	0.693	0.275	0.246	0.267	>= 0.10	0.314	>= 0.10	0.070	Gamma; Lognormal; Normal	Nonparametric
2_20_02	MW-2	Appendix IV	Mercury	mg/L	15	15	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
2_20_03	MW-3	Appendix IV	Mercury	mg/L	4	4	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
2_20_05	MW-5	Appendix IV	Mercury	mg/L	15	15	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
2_20_06	MW-6	Appendix IV	Mercury	mg/L	15	15	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
2_20_07	MW-7	Appendix IV	Mercury	mg/L	9	8	89%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
2_20_08	MW-8	Appendix IV	Mercury	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
2_20_09	MW-9	Appendix IV	Mercury	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
2_20_10	MW-10	Appendix IV	Mercury	mg/L	9	8	89%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
2_20_13	MW-13	Appendix IV	Mercury	mg/L	6	6	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
2_20_7B	MW-7B	Appendix IV	Mercury	mg/L	5	5	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
2_21_02	MW-2	Appendix IV	Molybdenum	mg/L	15	0	0%	0.910	0.136	0.187	0.171	0.876	0.042	0.201	0.107	0.197	>= 0.10	0.721	0.05 <= p < 0.10	0.171	Gamma; Lognormal; Normal	Gamma
2_21_03	MW-3	Appendix IV	Molybdenum	mg/L	4	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
2_21_05	MW-5	Appendix IV	Molybdenum	mg/L	15	0	0%	0.931	0.286	0.195	0.131	0.816	0.006	0.190	0.154	0.176	>= 0.10	0.686	0.05 <= p < 0.10	0.497	Gamma; Lognormal; Normal	Gamma
2_21_06	MW-6	Appendix IV	Molybdenum	mg/L	15	0	0%	0.983	0.985	0.124	0.770	0.952	0.552	0.152	0.457	0.148	>= 0.10	0.246	>= 0.10	0.208	Gamma; Lognormal; Normal	Gamma
2_21_07	MW-7	Appendix IV	Molybdenum	mg/L	9	0	0%	0.655	0.000	0.340	0.003	0.591	0.000	0.384	0.000	0.370	< 0.01	1.537	< 0.01	0.222	Nonparametric	Nonparametric
2_21_08	MW-8	Appendix IV	Molybdenum	mg/L	9	7	78%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.547	NA	Nonparametric	
2_21_09	MW-9	Appendix IV	Molybdenum	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
2_21_10	MW-10	Appendix IV	Molybdenum	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
2_21_13	MW-13	Appendix IV	Molybdenum	mg/L	6	6	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
2_21_7B	MW-7B	Appendix IV	Molybdenum	mg/L	5	5	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
2_23_02	MW-2	Appendix IV	Radium-226	pCi/L	15	0	0%	0.913	0.149	0.158	0.400	0.952	0.560	0.109	0.900	0.109	>= 0.10	0.229	>= 0.10	0.713	Gamma; Lognormal; Normal	Gamma
2_23_03	MW-3	Appendix IV	Radium-226	pCi/L	4	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
2_23_05	MW-5	Appendix IV	Radium-226	pCi/L	15	0	0%	0.637	0.000	0.292	0.001	0.936	0.333	0.146	0.525	0.198	>= 0.10	0.638	0.05 <= p < 0.10	0.690	Gamma; Lognormal	Gamma
2_23_06	MW-6	Appendix IV	Radium-226	pCi/L	15	0	0%	0.928	0.253	0.126	0.751	NA	NA	NA	NA	NA	NA	NA	NA	NA	Normal	Normal
2_23_07	MW-7	Appendix IV	Radium-226	pCi/L	9	0	0%	0.757	0.007	0.351	0.002	0.927	0.452	0.250	0.107	0.291	0.01 <= p < 0.05	0.576	>= 0.10	0.637	Gamma; Lognormal	Gamma

(Table continues on next page)

Note: p-values above 0.05 suggest a fit to the tested distribution; a distribution passes its GOF test when at least one of the two p-values is above 0.05.





**Table 3: Goodness-of-Fit Tests, Non-Detects Excluded (continued)**

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Normal		Lognormal		Gamma				Log-SD (NDs excl.)	ProUCL Distributions Fit	Recommended Distribution				
								S-W		Lilliefors		S-W		Lilliefors					K-S		A-D	
								Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value				Stat.	p-Value	Stat.	p-Value
2_23_08	MW-8	Appendix IV	Radium-226	pCi/L	9	0	0%	0.740	0.004	0.314	0.011	0.858	0.091	0.208	0.315	0.260	>= 0.10	0.750	0.01 <= p < 0.05	0.852	Gamma; Lognormal	Gamma
2_23_09	MW-9	Appendix IV	Radium-226	pCi/L	9	0	0%	0.874	0.135	0.186	0.492	0.956	0.754	0.180	0.549	0.137	>= 0.10	0.214	>= 0.10	1.051	Gamma; Lognormal; Normal	Gamma
2_23_10	MW-10	Appendix IV	Radium-226	pCi/L	9	0	0%	0.866	0.110	0.169	0.646	0.932	0.501	0.134	0.913	0.150	>= 0.10	0.304	>= 0.10	0.815	Gamma; Lognormal; Normal	Gamma
2_23_13	MW-13	Appendix IV	Radium-226	pCi/L	6	0	0%	0.814	0.078	0.270	0.187	0.841	0.133	0.241	0.335	0.263	>= 0.10	0.581	>= 0.10	0.416	Gamma; Lognormal; Normal	Nonparametric
2_23_7B	MW-7B	Appendix IV	Radium-226	pCi/L	5	0	0%	0.980	0.934	0.181	0.849	0.953	0.762	0.212	0.647	0.215	>= 0.10	0.250	>= 0.10	0.252	Gamma; Lognormal; Normal	Nonparametric
2_24_02	MW-2	Appendix IV	Radium-226/228	pCi/L	15	0	0%	0.912	0.144	0.174	0.257	0.960	0.693	0.107	0.917	0.115	>= 0.10	0.229	>= 0.10	0.844	Gamma; Lognormal; Normal	Gamma
2_24_03	MW-3	Appendix IV	Radium-226/228	pCi/L	4	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA	Nonparametric	
2_24_05	MW-5	Appendix IV	Radium-226/228	pCi/L	15	0	0%	0.809	0.005	0.185	0.179	0.939	0.368	0.115	0.859	0.135	>= 0.10	0.454	>= 0.10	0.676	Gamma; Lognormal; Normal	Gamma
2_24_06	MW-6	Appendix IV	Radium-226/228	pCi/L	15	0	0%	0.901	0.100	0.225	0.040	NA	NA	NA	NA	NA		NA		NA	Normal	Normal
2_24_07	MW-7	Appendix IV	Radium-226/228	pCi/L	9	0	0%	0.945	0.632	0.134	0.913	0.958	0.777	0.157	0.757	0.134	>= 0.10	0.177	>= 0.10	0.651	Gamma; Lognormal; Normal	Gamma
2_24_08	MW-8	Appendix IV	Radium-226/228	pCi/L	9	0	0%	0.846	0.068	0.216	0.263	0.930	0.482	0.220	0.239	0.242	>= 0.10	0.380	>= 0.10	0.953	Gamma; Lognormal; Normal	Gamma
2_24_09	MW-9	Appendix IV	Radium-226/228	pCi/L	9	0	0%	0.874	0.137	0.187	0.487	0.930	0.481	0.156	0.764	0.174	>= 0.10	0.307	>= 0.10	0.948	Gamma; Lognormal; Normal	Gamma
2_24_10	MW-10	Appendix IV	Radium-226/228	pCi/L	9	0	0%	0.803	0.022	0.289	0.029	0.949	0.674	0.192	0.437	0.236	>= 0.10	0.468	>= 0.10	0.688	Gamma; Lognormal	Gamma
2_24_13	MW-13	Appendix IV	Radium-226/228	pCi/L	6	0	0%	0.819	0.087	0.298	0.096	0.812	0.076	0.277	0.159	0.308	>= 0.10	0.660	0.05 <= p < 0.10	0.950	Gamma; Lognormal; Normal	Nonparametric
2_24_7B	MW-7B	Appendix IV	Radium-226/228	pCi/L	5	0	0%	0.916	0.507	0.230	0.519	0.869	0.262	0.242	0.434	0.267	>= 0.10	0.399	>= 0.10	0.848	Gamma; Lognormal; Normal	Nonparametric
2_25_02	MW-2	Appendix IV	Radium-228	pCi/L	15	0	0%	0.915	0.162	0.240	0.020	NA	NA	NA	NA	NA		NA		NA	Normal	Normal
2_25_03	MW-3	Appendix IV	Radium-228	pCi/L	4	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA	Nonparametric	
2_25_05	MW-5	Appendix IV	Radium-228	pCi/L	15	0	0%	0.888	0.063	0.194	0.134	NA	NA	NA	NA	NA		NA		NA	Normal	Normal
2_25_06	MW-6	Appendix IV	Radium-228	pCi/L	15	0	0%	0.973	0.896	0.152	0.467	NA	NA	NA	NA	NA		NA		NA	Normal	Normal
2_25_07	MW-7	Appendix IV	Radium-228	pCi/L	9	0	0%	0.976	0.943	0.140	0.881	NA	NA	NA	NA	NA		NA		NA	Normal	Normal
2_25_08	MW-8	Appendix IV	Radium-228	pCi/L	9	0	0%	0.874	0.137	0.260	0.082	NA	NA	NA	NA	NA		NA		NA	Normal	Normal
2_25_09	MW-9	Appendix IV	Radium-228	pCi/L	9	0	0%	0.897	0.233	0.199	0.381	NA	NA	NA	NA	NA		NA		NA	Normal	Normal
2_25_10	MW-10	Appendix IV	Radium-228	pCi/L	9	0	0%	0.887	0.185	0.245	0.124	NA	NA	NA	NA	NA		NA		NA	Normal	Normal
2_25_13	MW-13	Appendix IV	Radium-228	pCi/L	6	0	0%	0.892	0.328	0.268	0.192	NA	NA	NA	NA	NA		NA		NA	Normal	Nonparametric
2_25_7B	MW-7B	Appendix IV	Radium-228	pCi/L	5	0	0%	0.959	0.804	0.194	0.778	NA	NA	NA	NA	NA		NA		NA	Normal	Nonparametric
2_26_02	MW-2	Appendix IV	Selenium	mg/L	15	15	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA	Nonparametric	
2_26_03	MW-3	Appendix IV	Selenium	mg/L	4	4	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA	Nonparametric	
2_26_05	MW-5	Appendix IV	Selenium	mg/L	15	15	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA	Nonparametric	
2_26_06	MW-6	Appendix IV	Selenium	mg/L	15	15	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA	Nonparametric	
2_26_07	MW-7	Appendix IV	Selenium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA	Nonparametric	
2_26_08	MW-8	Appendix IV	Selenium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA	Nonparametric	
2_26_09	MW-9	Appendix IV	Selenium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA	Nonparametric	
2_26_10	MW-10	Appendix IV	Selenium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA	Nonparametric	
2_26_13	MW-13	Appendix IV	Selenium	mg/L	6	6	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA	Nonparametric	
2_26_7B	MW-7B	Appendix IV	Selenium	mg/L	5	5	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA	Nonparametric	
2_28_02	MW-2	Appendix IV	Thallium	mg/L	15	15	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA	Nonparametric	
2_28_03	MW-3	Appendix IV	Thallium	mg/L	4	4	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA	Nonparametric	
2_28_05	MW-5	Appendix IV	Thallium	mg/L	15	15	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA	Nonparametric	
2_28_06	MW-6	Appendix IV	Thallium	mg/L	15	15	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA	Nonparametric	

(Table continues on next page)

Note: p-values above 0.05 suggest a fit to the tested distribution; a distribution passes its GOF test when at least one of the two p-values is above 0.05.



**Table 3: Goodness-of-Fit Tests, Non-Detects Excluded (continued)**

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Normal		Lognormal		Gamma				Log-SD (NDs excl.)	ProUCL Distributions Fit	Recommended Distribution				
								S-W		Lilliefors		S-W		Lilliefors					K-S		A-D	
								Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value				Stat.	p-Value	Stat.	p-Value
2_28_07	MW-7	Appendix IV	Thallium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
2_28_08	MW-8	Appendix IV	Thallium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
2_28_09	MW-9	Appendix IV	Thallium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
2_28_10	MW-10	Appendix IV	Thallium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
2_28_13	MW-13	Appendix IV	Thallium	mg/L	6	6	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
2_28_7B	MW-7B	Appendix IV	Thallium	mg/L	5	5	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
3_11_02	MW-2	Other	Bicarbonate	mg/L	1	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
3_11_03	MW-3	Other	Bicarbonate	mg/L	1	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
3_11_05	MW-5	Other	Bicarbonate	mg/L	1	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
3_11_06	MW-6	Other	Bicarbonate	mg/L	1	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
3_11_07	MW-7	Other	Bicarbonate	mg/L	1	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
3_11_08	MW-8	Other	Bicarbonate	mg/L	1	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
3_11_09	MW-9	Other	Bicarbonate	mg/L	1	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
3_11_10	MW-10	Other	Bicarbonate	mg/L	1	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
3_11_13	MW-13	Other	Bicarbonate	mg/L	4	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
3_11_7B	MW-7B	Other	Bicarbonate	mg/L	5	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.018	Nonparametric			
3_13_02	MW-2	Other	Carbonate	mg/L	1	1	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
3_13_03	MW-3	Other	Carbonate	mg/L	1	1	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
3_13_05	MW-5	Other	Carbonate	mg/L	1	1	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
3_13_06	MW-6	Other	Carbonate	mg/L	1	1	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
3_13_07	MW-7	Other	Carbonate	mg/L	1	1	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
3_13_08	MW-8	Other	Carbonate	mg/L	1	1	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
3_13_09	MW-9	Other	Carbonate	mg/L	1	1	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
3_13_10	MW-10	Other	Carbonate	mg/L	1	1	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
3_13_13	MW-13	Other	Carbonate	mg/L	4	4	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
3_13_7B	MW-7B	Other	Carbonate	mg/L	5	5	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
3_16_02	MW-2	Other	Hardness	mg/L	1	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
3_16_03	MW-3	Other	Hardness	mg/L	1	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
3_16_05	MW-5	Other	Hardness	mg/L	1	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
3_16_06	MW-6	Other	Hardness	mg/L	1	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
3_16_07	MW-7	Other	Hardness	mg/L	1	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
3_16_08	MW-8	Other	Hardness	mg/L	1	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
3_16_09	MW-9	Other	Hardness	mg/L	1	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
3_16_10	MW-10	Other	Hardness	mg/L	1	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
3_16_13	MW-13	Other	Hardness	mg/L	4	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
3_16_7B	MW-7B	Other	Hardness	mg/L	5	0	0%	0.841	0.167	0.284	0.205	0.849	0.190	0.274	0.251	0.294	>= 0.10	0.509	>= 0.10	0.125	Gamma; Lognormal; Normal	Nonparametric
3_19_02	MW-2	Other	Magnesium	mg/L	1	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
3_19_03	MW-3	Other	Magnesium	mg/L	1	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
3_19_05	MW-5	Other	Magnesium	mg/L	1	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	

(Table continues on next page)

Note: p-values above 0.05 suggest a fit to the tested distribution; a distribution passes its GOF test when at least one of the two p-values is above 0.05.



**Table 3: Goodness-of-Fit Tests, Non-Detects Excluded (continued)**

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Normal		Lognormal		Gamma				Log-SD (NDs excl.)	ProUCL Distributions Fit	Recommended Distribution				
								S-W		Lilliefors		S-W		Lilliefors					K-S		A-D	
								Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value				Stat.	p-Value	Stat.	p-Value
3_19_06	MW-6	Other	Magnesium	mg/L	1	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
3_19_07	MW-7	Other	Magnesium	mg/L	1	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
3_19_08	MW-8	Other	Magnesium	mg/L	1	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
3_19_09	MW-9	Other	Magnesium	mg/L	1	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
3_19_10	MW-10	Other	Magnesium	mg/L	1	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
3_19_13	MW-13	Other	Magnesium	mg/L	5	0	0%	0.870	0.268	0.297	0.155	0.886	0.339	0.293	0.168	0.310	>= 0.10	0.413	>= 0.10	0.117	Gamma; Lognormal; Normal	Nonparametric
3_19_7B	MW-7B	Other	Magnesium	mg/L	5	0	0%	0.909	0.461	0.249	0.390	0.893	0.375	0.263	0.307	0.252	>= 0.10	0.378	>= 0.10	0.081	Gamma; Lognormal; Normal	Nonparametric
3_22_02	MW-2	Other	Potassium	mg/L	1	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
3_22_03	MW-3	Other	Potassium	mg/L	1	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
3_22_05	MW-5	Other	Potassium	mg/L	1	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
3_22_06	MW-6	Other	Potassium	mg/L	1	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
3_22_07	MW-7	Other	Potassium	mg/L	1	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
3_22_08	MW-8	Other	Potassium	mg/L	1	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
3_22_09	MW-9	Other	Potassium	mg/L	1	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
3_22_10	MW-10	Other	Potassium	mg/L	1	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
3_22_13	MW-13	Other	Potassium	mg/L	5	0	0%	0.959	0.798	0.202	0.723	0.951	0.744	0.210	0.665	0.220	>= 0.10	0.291	>= 0.10	0.068	Gamma; Lognormal; Normal	Nonparametric
3_22_7B	MW-7B	Other	Potassium	mg/L	5	0	0%	0.773	0.048	0.341	0.058	0.759	0.036	0.350	0.045	0.354	0.05 <= p < 0.10	0.721	0.01 <= p < 0.05	0.071	Gamma; Normal	Nonparametric
3_27_02	MW-2	Other	Sodium	mg/L	1	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
3_27_03	MW-3	Other	Sodium	mg/L	1	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
3_27_05	MW-5	Other	Sodium	mg/L	1	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
3_27_06	MW-6	Other	Sodium	mg/L	1	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
3_27_07	MW-7	Other	Sodium	mg/L	1	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
3_27_08	MW-8	Other	Sodium	mg/L	1	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
3_27_09	MW-9	Other	Sodium	mg/L	1	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
3_27_10	MW-10	Other	Sodium	mg/L	1	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
3_27_13	MW-13	Other	Sodium	mg/L	5	0	0%	0.872	0.273	0.270	0.269	0.890	0.357	0.236	0.475	0.265	>= 0.10	0.411	>= 0.10	0.364	Gamma; Lognormal; Normal	Nonparametric
3_27_7B	MW-7B	Other	Sodium	mg/L	5	0	0%	0.771	0.046	0.327	0.086	0.757	0.035	0.337	0.066	0.338	0.05 <= p < 0.10	0.727	0.01 <= p < 0.05	0.070	Gamma; Lognormal; Normal	Nonparametric
3_29_02	MW-2	Other	Total Suspended Solids	mg/L	15	4	27%	0.945	0.585	0.208	0.201	0.859	0.056	0.300	0.007	0.288	0.01 <= p < 0.05	0.599	>= 0.10	0.923	Gamma; Lognormal; Normal	Gamma
3_29_03	MW-3	Other	Total Suspended Solids	mg/L	4	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
3_29_05	MW-5	Other	Total Suspended Solids	mg/L	15	0	0%	0.650	0.000	0.303	0.001	0.947	0.483	0.148	0.501	0.196	>= 0.10	0.633	>= 0.10	1.089	Gamma; Lognormal	Gamma
3_29_06	MW-6	Other	Total Suspended Solids	mg/L	15	11	73%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
3_29_07	MW-7	Other	Total Suspended Solids	mg/L	9	8	89%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
3_29_08	MW-8	Other	Total Suspended Solids	mg/L	9	8	89%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
3_29_09	MW-9	Other	Total Suspended Solids	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
3_29_10	MW-10	Other	Total Suspended Solids	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
3_29_13	MW-13	Other	Total Suspended Solids	mg/L	6	6	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
3_29_7B	MW-7B	Other	Total Suspended Solids	mg/L	5	5	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
4_30_02	MW-2	Field Parameters	Conductivity	mS/cm	15	0	0%	0.849	0.017	0.195	0.131	0.827	0.008	0.206	0.088	0.204	0.05 <= p < 0.10	0.851	0.01 <= p < 0.05	0.069	Gamma; Lognormal; Normal	Gamma
4_30_03	MW-3	Field Parameters	Conductivity	mS/cm	4	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	

(Table continues on next page)

Note: p-values above 0.05 suggest a fit to the tested distribution; a distribution passes its GOF test when at least one of the two p-values is above 0.05.



**Table 3: Goodness-of-Fit Tests, Non-Detects Excluded (continued)**

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Normal		Lognormal		Gamma				Log-SD (NDs excl.)	ProUCL Distributions Fit	Recommended Distribution				
								S-W		Lilliefors		S-W		Lilliefors					K-S		A-D	
								Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value				Stat.	p-Value	Stat.	p-Value
4_30_05	MW-5	Field Parameters	Conductivity	mS/cm	15	0	0%	0.969	0.837	0.143	0.558	0.974	0.908	0.126	0.756	0.124	>= 0.10	0.222	>= 0.10	0.189	Gamma; Lognormal; Normal	Gamma
4_30_06	MW-6	Field Parameters	Conductivity	mS/cm	15	0	0%	0.983	0.987	0.093	0.978	0.980	0.968	0.094	0.977	0.093	>= 0.10	0.143	>= 0.10	0.099	Gamma; Lognormal; Normal	Gamma
4_30_07	MW-7	Field Parameters	Conductivity	mS/cm	9	0	0%	0.748	0.005	0.340	0.004	0.655	0.000	0.387	0.000	0.372	< 0.01	1.349	< 0.01	0.252	Nonparametric	Nonparametric
4_30_08	MW-8	Field Parameters	Conductivity	mS/cm	9	0	0%	0.835	0.050	0.201	0.366	0.850	0.075	0.191	0.449	0.190	>= 0.10	0.570	>= 0.10	0.046	Gamma; Lognormal; Normal	Gamma
4_30_09	MW-9	Field Parameters	Conductivity	mS/cm	9	0	0%	0.930	0.481	0.145	0.848	0.923	0.417	0.156	0.765	0.157	>= 0.10	0.335	>= 0.10	0.061	Gamma; Lognormal; Normal	Gamma
4_30_10	MW-10	Field Parameters	Conductivity	mS/cm	9	0	0%	0.979	0.959	0.140	0.876	0.977	0.946	0.140	0.877	0.155	>= 0.10	0.166	>= 0.10	0.064	Gamma; Lognormal; Normal	Gamma
4_30_13	MW-13	Field Parameters	Conductivity	mS/cm	6	0	0%	0.928	0.568	0.229	0.416	0.937	0.637	0.222	0.467	0.241	>= 0.10	0.299	>= 0.10	0.139	Gamma; Lognormal; Normal	Nonparametric
4_30_7B	MW-7B	Field Parameters	Conductivity	mS/cm	5	0	0%	0.569	0.000	0.465	0.001	0.570	0.000	0.465	0.001	0.475	< 0.01	1.223	< 0.01	0.097	Nonparametric	Nonparametric
4_31_02	MW-2	Field Parameters	Dissolved Oxygen	mg/L	15	0	0%	0.617	0.000	0.316	0.000	0.924	0.222	0.165	0.332	0.172	>= 0.10	0.557	>= 0.10	1.186	Gamma; Lognormal	Gamma
4_31_03	MW-3	Field Parameters	Dissolved Oxygen	mg/L	4	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
4_31_05	MW-5	Field Parameters	Dissolved Oxygen	mg/L	15	0	0%	0.942	0.408	0.137	0.627	0.895	0.080	0.258	0.008	0.224	0.05 <= p < 0.10	0.537	>= 0.10	0.739	Gamma; Lognormal; Normal	Gamma
4_31_06	MW-6	Field Parameters	Dissolved Oxygen	mg/L	15	0	0%	0.746	0.001	0.262	0.007	0.982	0.980	0.131	0.699	0.156	>= 0.10	0.323	>= 0.10	0.946	Gamma; Lognormal	Gamma
4_31_07	MW-7	Field Parameters	Dissolved Oxygen	mg/L	9	1	11%	0.606	0.000	0.395	0.001	NA	NA	NA	NA	NA		NA		NA	Nonparametric	Nonparametric
4_31_08	MW-8	Field Parameters	Dissolved Oxygen	mg/L	9	0	0%	0.697	0.001	0.364	0.001	0.784	0.014	0.295	0.023	0.235	>= 0.10	0.624	>= 0.10	1.430	Gamma	Gamma
4_31_09	MW-9	Field Parameters	Dissolved Oxygen	mg/L	9	0	0%	0.947	0.658	0.156	0.759	0.945	0.633	0.178	0.568	0.179	>= 0.10	0.292	>= 0.10	0.149	Gamma; Lognormal; Normal	Gamma
4_31_10	MW-10	Field Parameters	Dissolved Oxygen	mg/L	9	0	0%	0.983	0.978	0.151	0.799	0.970	0.896	0.185	0.504	0.164	>= 0.10	0.199	>= 0.10	0.198	Gamma; Lognormal; Normal	Gamma
4_31_13	MW-13	Field Parameters	Dissolved Oxygen	mg/L	6	0	0%	0.859	0.186	0.261	0.224	0.806	0.066	0.313	0.066	0.314	0.05 <= p < 0.10	0.589	>= 0.10	0.625	Gamma; Lognormal; Normal	Nonparametric
4_31_7B	MW-7B	Field Parameters	Dissolved Oxygen	mg/L	5	0	0%	0.699	0.009	0.327	0.086	0.823	0.122	0.309	0.121	0.336	>= 0.10	0.641	0.05 <= p < 0.10	0.950	Gamma; Lognormal; Normal	Nonparametric
4_32_02	MW-2	Field Parameters	Oxidation Reduction Potential	mV	15	0	0%	0.921	0.202	0.197	0.122	NA	NA	NA	NA	NA		NA		NA	Normal	Normal
4_32_03	MW-3	Field Parameters	Oxidation Reduction Potential	mV	4	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
4_32_05	MW-5	Field Parameters	Oxidation Reduction Potential	mV	15	0	0%	0.917	0.172	0.160	0.378	NA	NA	NA	NA	NA		NA		NA	Normal	Normal
4_32_06	MW-6	Field Parameters	Oxidation Reduction Potential	mV	15	0	0%	0.954	0.588	0.166	0.324	NA	NA	NA	NA	NA		NA		NA	Normal	Normal
4_32_07	MW-7	Field Parameters	Oxidation Reduction Potential	mV	9	0	0%	0.772	0.010	0.270	0.057	NA	NA	NA	NA	NA		NA		NA	Normal	Normal
4_32_08	MW-8	Field Parameters	Oxidation Reduction Potential	mV	9	0	0%	0.918	0.373	0.225	0.211	0.916	0.362	0.222	0.228	0.214	>= 0.10	0.415	>= 0.10	0.583	Gamma; Lognormal; Normal	Gamma
4_32_09	MW-9	Field Parameters	Oxidation Reduction Potential	mV	9	0	0%	0.959	0.790	0.180	0.548	0.955	0.747	0.152	0.796	0.159	>= 0.10	0.235	>= 0.10	0.450	Gamma; Lognormal; Normal	Gamma
4_32_10	MW-10	Field Parameters	Oxidation Reduction Potential	mV	9	0	0%	0.954	0.733	0.168	0.652	0.964	0.843	0.163	0.700	0.150	>= 0.10	0.207	>= 0.10	0.468	Gamma; Lognormal; Normal	Gamma
4_32_13	MW-13	Field Parameters	Oxidation Reduction Potential	mV	6	0	0%	0.899	0.367	0.270	0.185	0.932	0.594	0.220	0.479	0.245	>= 0.10	0.360	>= 0.10	0.337	Gamma; Lognormal; Normal	Nonparametric
4_32_7B	MW-7B	Field Parameters	Oxidation Reduction Potential	mV	5	0	0%	0.935	0.631	0.246	0.409	NA	NA	NA	NA	NA		NA		NA	Normal	Nonparametric
4_33_02	MW-2	Field Parameters	Temperature	°C	15	0	0%	0.927	0.246	0.159	0.394	0.887	0.060	0.170	0.287	0.176	>= 0.10	0.507	>= 0.10	0.135	Gamma; Lognormal; Normal	Gamma
4_33_03	MW-3	Field Parameters	Temperature	°C	4	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
4_33_05	MW-5	Field Parameters	Temperature	°C	15	0	0%	0.975	0.922	0.127	0.743	0.962	0.731	0.148	0.506	0.133	>= 0.10	0.279	>= 0.10	0.177	Gamma; Lognormal; Normal	Gamma
4_33_06	MW-6	Field Parameters	Temperature	°C	15	0	0%	0.974	0.906	0.107	0.916	0.960	0.694	0.126	0.750	0.114	>= 0.10	0.272	>= 0.10	0.103	Gamma; Lognormal; Normal	Gamma
4_33_07	MW-7	Field Parameters	Temperature	°C	9	0	0%	0.942	0.608	0.221	0.231	0.873	0.131	0.260	0.080	0.254	>= 0.10	0.485	>= 0.10	0.305	Gamma; Lognormal; Normal	Gamma
4_33_08	MW-8	Field Parameters	Temperature	°C	9	0	0%	0.918	0.372	0.261	0.077	0.855	0.084	0.265	0.068	0.277	0.05 <= p < 0.10	0.552	>= 0.10	0.316	Gamma; Lognormal; Normal	Gamma
4_33_09	MW-9	Field Parameters	Temperature	°C	9	0	0%	0.916	0.362	0.199	0.384	0.871	0.126	0.213	0.280	0.213	>= 0.10	0.467	>= 0.10	0.491	Gamma; Lognormal; Normal	Gamma
4_33_10	MW-10	Field Parameters	Temperature	°C	9	0	0%	0.895	0.226	0.225	0.211	0.877	0.145	0.239	0.144	0.245	>= 0.10	0.498	>= 0.10	0.213	Gamma; Lognormal; Normal	Gamma
4_33_13	MW-13	Field Parameters	Temperature	°C	6	0	0%	0.940	0.662	0.199	0.644	0.950	0.738	0.169	0.856	0.185	>= 0.10	0.257	>= 0.10	0.436	Gamma; Lognormal; Normal	Nonparametric
4_33_7B	MW-7B	Field Parameters	Temperature	°C	5	0	0%	0.942	0.682	0.242	0.432	0.936	0.638	0.253	0.366	0.267	>= 0.10	0.318	>= 0.10	0.101	Gamma; Lognormal; Normal	Nonparametric
4_34_02	MW-2	Field Parameters	Turbidity	NTU	15	0	0%	0.389	0.000	0.470	0.000	0.676	0.000	0.330	0.000	0.402	< 0.01	2.728	< 0.01	0.618	Nonparametric	Nonparametric

(Table continues on next page)

Note: p-values above 0.05 suggest a fit to the tested distribution; a distribution passes its GOF test when at least one of the two p-values is above 0.05.



**Table 3: Goodness-of-Fit Tests, Non-Detects Excluded (continued)**

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Normal		Lognormal		Gamma				Log-SD (NDs excl.)	ProUCL Distributions Fit	Recommended Distribution					
								S-W		Lilliefors		S-W		Lilliefors					K-S		A-D		
								Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value				Stat.	p-Value	Stat.	p-Value	
4_34_03	MW-3	Field Parameters	Turbidity	NTU	4	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric				
4_34_05	MW-5	Field Parameters	Turbidity	NTU	15	0	0%	0.470	0.000	0.453	0.000	0.736	0.001	0.347	0.000	0.412	< 0.01	2.385	< 0.01	0.758	Nonparametric	Nonparametric	
4_34_06	MW-6	Field Parameters	Turbidity	NTU	15	0	0%	0.773	0.002	0.308	0.000	0.939	0.375	0.176	0.238	0.216	0.05 <= p < 0.10	0.514	>= 0.10	0.786	Gamma; Lognormal	Gamma	
4_34_07	MW-7	Field Parameters	Turbidity	NTU	9	0	0%	0.663	0.001	0.334	0.004	0.872	0.129	0.236	0.158	0.257	>= 0.10	0.758	0.01 <= p < 0.05	0.697	Gamma; Lognormal	Gamma	
4_34_08	MW-8	Field Parameters	Turbidity	NTU	9	0	0%	0.910	0.317	0.151	0.802	0.881	0.161	0.209	0.311	0.200	>= 0.10	0.451	>= 0.10	0.490	Gamma; Lognormal; Normal	Gamma	
4_34_09	MW-9	Field Parameters	Turbidity	NTU	9	0	0%	0.895	0.223	0.187	0.481	0.891	0.202	0.215	0.271	0.221	>= 0.10	0.441	>= 0.10	0.570	Gamma; Lognormal; Normal	Gamma	
4_34_10	MW-10	Field Parameters	Turbidity	NTU	9	0	0%	0.882	0.165	0.207	0.324	0.975	0.937	0.155	0.767	0.184	>= 0.10	0.267	>= 0.10	0.465	Gamma; Lognormal; Normal	Gamma	
4_34_13	MW-13	Field Parameters	Turbidity	NTU	6	0	0%	0.939	0.654	0.213	0.533	0.901	0.378	0.230	0.411	0.247	>= 0.10	0.329	>= 0.10	0.560	Gamma; Lognormal; Normal	Nonparametric	
4_34_7B	MW-7B	Field Parameters	Turbidity	NTU	5	0	0%	0.843	0.175	0.283	0.208	0.621	0.001	0.422	0.004	0.421	0.01 <= p < 0.05	1.056	< 0.01	2.537	Normal	Nonparametric	
5_36_02	MW-2	Part 115	Copper	mg/L	15	15	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	Nonparametric	
5_36_03	MW-3	Part 115	Copper	mg/L	4	4	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	Nonparametric
5_36_05	MW-5	Part 115	Copper	mg/L	15	10	67%	0.944	0.692	0.239	0.455	0.978	0.922	0.163	0.931	0.193	>= 0.10	0.212	>= 0.10	0.645	Gamma; Lognormal; Normal	Nonparametric	
5_36_06	MW-6	Part 115	Copper	mg/L	15	15	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	Nonparametric
5_36_07	MW-7	Part 115	Copper	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	Nonparametric
5_36_08	MW-8	Part 115	Copper	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	Nonparametric
5_36_09	MW-9	Part 115	Copper	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	Nonparametric
5_36_10	MW-10	Part 115	Copper	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	Nonparametric
5_36_13	MW-13	Part 115	Copper	mg/L	6	6	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	Nonparametric
5_36_7B	MW-7B	Part 115	Copper	mg/L	5	5	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	Nonparametric
5_37_02	MW-2	Part 115	Iron	mg/L	15	0	0%	0.620	0.000	0.335	0.000	0.803	0.004	0.265	0.006	0.295	< 0.01	1.320	< 0.01	0.372	Nonparametric	Nonparametric	
5_37_03	MW-3	Part 115	Iron	mg/L	4	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	Nonparametric
5_37_05	MW-5	Part 115	Iron	mg/L	15	1	7%	0.705	0.000	0.248	0.019	0.951	0.570	0.114	0.892	0.135	>= 0.10	0.441	>= 0.10	1.213	Gamma; Lognormal	Gamma	
5_37_06	MW-6	Part 115	Iron	mg/L	15	7	47%	0.746	0.007	0.267	0.097	0.939	0.602	0.132	0.951	0.161	>= 0.10	0.381	>= 0.10	0.777	Gamma; Lognormal; Normal	Gamma	
5_37_07	MW-7	Part 115	Iron	mg/L	9	0	0%	0.614	0.000	0.398	0.000	0.708	0.002	0.348	0.002	0.366	< 0.01	1.267	< 0.01	0.255	Nonparametric	Nonparametric	
5_37_08	MW-8	Part 115	Iron	mg/L	9	8	89%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	Nonparametric
5_37_09	MW-9	Part 115	Iron	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	Nonparametric
5_37_10	MW-10	Part 115	Iron	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	Nonparametric
5_37_13	MW-13	Part 115	Iron	mg/L	6	1	17%	0.806	0.090	0.268	0.279	0.890	0.357	0.205	0.696	0.221	>= 0.10	0.417	>= 0.10	0.577	Gamma; Lognormal; Normal	Nonparametric	
5_37_7B	MW-7B	Part 115	Iron	mg/L	5	0	0%	0.902	0.421	0.221	0.581	0.899	0.407	0.234	0.492	0.257	>= 0.10	0.351	>= 0.10	0.308	Gamma; Lognormal; Normal	Nonparametric	
5_38_02	MW-2	Part 115	Nickel	mg/L	15	0	0%	0.813	0.006	0.244	0.017	0.786	0.002	0.263	0.006	0.263	< 0.01	1.455	< 0.01	0.153	Nonparametric	Nonparametric	
5_38_03	MW-3	Part 115	Nickel	mg/L	4	4	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	Nonparametric
5_38_05	MW-5	Part 115	Nickel	mg/L	15	0	0%	0.949	0.511	0.194	0.135	0.964	0.770	0.153	0.456	0.172	>= 0.10	0.297	>= 0.10	0.287	Gamma; Lognormal; Normal	Gamma	
5_38_06	MW-6	Part 115	Nickel	mg/L	15	2	13%	0.821	0.012	0.345	0.000	0.798	0.006	0.362	0.000	0.362	< 0.01	1.377	< 0.01	0.124	Nonparametric	Nonparametric	
5_38_07	MW-7	Part 115	Nickel	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	Nonparametric
5_38_08	MW-8	Part 115	Nickel	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	Nonparametric
5_38_09	MW-9	Part 115	Nickel	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	Nonparametric
5_38_10	MW-10	Part 115	Nickel	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	Nonparametric
5_38_13	MW-13	Part 115	Nickel	mg/L	6	6	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	Nonparametric
5_38_7B	MW-7B	Part 115	Nickel	mg/L	5	5	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	Nonparametric

(Table continues on next page)

Note: p-values above 0.05 suggest a fit to the tested distribution; a distribution passes its GOF test when at least one of the two p-values is above 0.05.



**Table 3: Goodness-of-Fit Tests, Non-Detects Excluded (continued)**

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Normal		Lognormal		Gamma				Log-SD (NDs excl.)	ProUCL Distributions Fit	Recommended Distribution				
								S-W		Lilliefors		S-W		Lilliefors					K-S		A-D	
								Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value				Stat.	p-Value	Stat.	p-Value
5_39_02	MW-2	Part 115	Silver	mg/L	15	15	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
5_39_03	MW-3	Part 115	Silver	mg/L	4	4	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
5_39_05	MW-5	Part 115	Silver	mg/L	15	15	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
5_39_06	MW-6	Part 115	Silver	mg/L	15	15	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
5_39_07	MW-7	Part 115	Silver	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
5_39_08	MW-8	Part 115	Silver	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
5_39_09	MW-9	Part 115	Silver	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
5_39_10	MW-10	Part 115	Silver	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
5_39_13	MW-13	Part 115	Silver	mg/L	6	6	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
5_39_7B	MW-7B	Part 115	Silver	mg/L	5	5	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
5_40_02	MW-2	Part 115	Vanadium	mg/L	15	15	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
5_40_03	MW-3	Part 115	Vanadium	mg/L	4	4	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
5_40_05	MW-5	Part 115	Vanadium	mg/L	15	13	87%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.203	Nonparametric			
5_40_06	MW-6	Part 115	Vanadium	mg/L	15	15	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
5_40_07	MW-7	Part 115	Vanadium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
5_40_08	MW-8	Part 115	Vanadium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
5_40_09	MW-9	Part 115	Vanadium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
5_40_10	MW-10	Part 115	Vanadium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
5_40_13	MW-13	Part 115	Vanadium	mg/L	6	6	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
5_40_7B	MW-7B	Part 115	Vanadium	mg/L	5	5	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
5_41_02	MW-2	Part 115	Zinc	mg/L	15	12	80%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.021	Nonparametric			
5_41_03	MW-3	Part 115	Zinc	mg/L	4	4	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
5_41_05	MW-5	Part 115	Zinc	mg/L	15	4	27%	0.745	0.002	0.229	0.111	0.956	0.723	0.124	0.905	0.171	>= 0.10	0.393	>= 0.10	0.941	Gamma; Lognormal; Normal	Gamma
5_41_06	MW-6	Part 115	Zinc	mg/L	15	14	93%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
5_41_07	MW-7	Part 115	Zinc	mg/L	9	6	67%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.400	NA	Nonparametric	
5_41_08	MW-8	Part 115	Zinc	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
5_41_09	MW-9	Part 115	Zinc	mg/L	9	8	89%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
5_41_10	MW-10	Part 115	Zinc	mg/L	9	7	78%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.565	NA	Nonparametric	
5_41_13	MW-13	Part 115	Zinc	mg/L	6	5	83%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
5_41_7B	MW-7B	Part 115	Zinc	mg/L	5	5	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	

Note: p-values above 0.05 suggest a fit to the tested distribution; a distribution passes its GOF test when at least one of the two p-values is above 0.05.





**Table 4: Autocorrelation Tests, Non-Detects Excluded**

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Autocorrelation	Box-Ljung p-value	Sig.
1_01_02	MW-2	Appendix III	Boron	mg/L	14	0	0%	0.684	0.005	**
1_01_03	MW-3	Appendix III	Boron	mg/L	4	0	0%	-0.681	0.054	
1_01_05	MW-5	Appendix III	Boron	mg/L	14	0	0%	0.042	0.860	
1_01_06	MW-6	Appendix III	Boron	mg/L	14	0	0%	0.661	0.006	**
1_01_07	MW-7	Appendix III	Boron	mg/L	9	0	0%	-0.209	0.462	
1_01_08	MW-8	Appendix III	Boron	mg/L	9	1	11%	0.027	0.928	
1_01_10	MW-10	Appendix III	Boron	mg/L	9	0	0%	-0.468	0.100	
1_01_13	MW-13	Appendix III	Boron	mg/L	6	0	0%	0.355	0.272	
1_01_7B	MW-7B	Appendix III	Boron	mg/L	5	0	0%	-0.516	0.127	
1_02_02	MW-2	Appendix III	Calcium	mg/L	14	0	0%	0.527	0.029	*
1_02_03	MW-3	Appendix III	Calcium	mg/L	4	0	0%	-0.555	0.116	
1_02_05	MW-5	Appendix III	Calcium	mg/L	14	0	0%	0.387	0.109	
1_02_06	MW-6	Appendix III	Calcium	mg/L	14	0	0%	0.446	0.064	
1_02_07	MW-7	Appendix III	Calcium	mg/L	9	0	0%	-0.113	0.690	
1_02_08	MW-8	Appendix III	Calcium	mg/L	9	0	0%	0.530	0.062	
1_02_09	MW-9	Appendix III	Calcium	mg/L	9	0	0%	0.287	0.313	
1_02_10	MW-10	Appendix III	Calcium	mg/L	9	0	0%	-0.206	0.469	
1_02_13	MW-13	Appendix III	Calcium	mg/L	6	0	0%	0.302	0.349	
1_02_7B	MW-7B	Appendix III	Calcium	mg/L	5	0	0%	0.021	0.951	
1_03_02	MW-2	Appendix III	Chloride	mg/L	14	0	0%	0.521	0.031	*
1_03_03	MW-3	Appendix III	Chloride	mg/L	4	0	0%	0.128	0.717	
1_03_05	MW-5	Appendix III	Chloride	mg/L	14	0	0%	0.362	0.133	
1_03_06	MW-6	Appendix III	Chloride	mg/L	14	0	0%	0.674	0.005	**
1_03_07	MW-7	Appendix III	Chloride	mg/L	9	0	0%	0.007	0.980	
1_03_08	MW-8	Appendix III	Chloride	mg/L	9	2	22%	-0.261	0.397	
1_03_09	MW-9	Appendix III	Chloride	mg/L	9	8	89%	NA	NA	
1_03_10	MW-10	Appendix III	Chloride	mg/L	9	8	89%	NA	NA	
1_03_13	MW-13	Appendix III	Chloride	mg/L	6	2	33%	0.220	0.534	
1_04_07	MW-7	Appendix III	Fluoride	mg/L	9	8	89%	NA	NA	
1_04_08	MW-8	Appendix III	Fluoride	mg/L	9	8	89%	NA	NA	
1_04_09	MW-9	Appendix III	Fluoride	mg/L	9	8	89%	NA	NA	
1_04_10	MW-10	Appendix III	Fluoride	mg/L	9	8	89%	NA	NA	
1_05_02	MW-2	Appendix III	Sulfate	mg/L	14	0	0%	0.602	0.012	*
1_05_03	MW-3	Appendix III	Sulfate	mg/L	4	0	0%	-0.618	0.081	
1_05_05	MW-5	Appendix III	Sulfate	mg/L	14	0	0%	0.347	0.150	
1_05_06	MW-6	Appendix III	Sulfate	mg/L	14	0	0%	0.673	0.005	**
1_05_07	MW-7	Appendix III	Sulfate	mg/L	9	0	0%	-0.015	0.959	
1_05_08	MW-8	Appendix III	Sulfate	mg/L	9	0	0%	0.018	0.948	
1_05_09	MW-9	Appendix III	Sulfate	mg/L	9	7	78%	-0.500	0.157	
1_05_10	MW-10	Appendix III	Sulfate	mg/L	9	0	0%	-0.175	0.537	
1_05_13	MW-13	Appendix III	Sulfate	mg/L	6	0	0%	-0.252	0.435	
1_06_02	MW-2	Appendix III	Total Dissolved Solids	mg/L	14	0	0%	0.550	0.022	*

(Table continues on next page)

\*\*\* p < 0.001, \*\* p < 0.01, \* p < 0.05

**Table 4:** Autocorrelation Tests, Non-Detects Excluded (*continued*)

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Autocorrelation	Box-Ljung p-value	Sig.
1_06_03	MW-3	Appendix III	Total Dissolved Solids	mg/L	4	0	0%	0.117	0.740	
1_06_05	MW-5	Appendix III	Total Dissolved Solids	mg/L	14	0	0%	0.385	0.110	
1_06_06	MW-6	Appendix III	Total Dissolved Solids	mg/L	14	0	0%	0.676	0.005	**
1_06_07	MW-7	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	0.010	0.972	
1_06_08	MW-8	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	-0.436	0.125	
1_06_09	MW-9	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	0.198	0.487	
1_06_10	MW-10	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	-0.033	0.907	
1_06_13	MW-13	Appendix III	Total Dissolved Solids	mg/L	6	0	0%	0.240	0.456	
1_06_7B	MW-7B	Appendix III	Total Dissolved Solids	mg/L	5	0	0%	-0.282	0.405	
1_35_02	MW-2	Appendix III	pH	su	15	0	0%	0.156	0.505	
1_35_03	MW-3	Appendix III	pH	su	4	0	0%	0.090	0.798	
1_35_05	MW-5	Appendix III	pH	su	15	0	0%	-0.136	0.561	
1_35_06	MW-6	Appendix III	pH	su	15	0	0%	0.011	0.963	
1_35_07	MW-7	Appendix III	pH	su	9	0	0%	-0.130	0.648	
1_35_08	MW-8	Appendix III	pH	su	9	0	0%	-0.214	0.451	
1_35_09	MW-9	Appendix III	pH	su	9	0	0%	-0.174	0.541	
1_35_10	MW-10	Appendix III	pH	su	9	0	0%	-0.212	0.456	
1_35_13	MW-13	Appendix III	pH	su	6	0	0%	0.302	0.350	
1_35_7B	MW-7B	Appendix III	pH	su	5	0	0%	0.256	0.449	
2_04_07	MW-7	Appendix IV	Fluoride	mg/L	9	8	89%	NA	NA	
2_04_08	MW-8	Appendix IV	Fluoride	mg/L	9	8	89%	NA	NA	
2_04_09	MW-9	Appendix IV	Fluoride	mg/L	9	8	89%	NA	NA	
2_04_10	MW-10	Appendix IV	Fluoride	mg/L	9	8	89%	NA	NA	
2_08_02	MW-2	Appendix IV	Arsenic	mg/L	15	13	87%	-0.500	0.157	
2_08_03	MW-3	Appendix IV	Arsenic	mg/L	4	0	0%	NA	NA	
2_08_05	MW-5	Appendix IV	Arsenic	mg/L	15	10	67%	-0.268	0.428	
2_08_07	MW-7	Appendix IV	Arsenic	mg/L	9	0	0%	0.259	0.362	
2_08_7B	MW-7B	Appendix IV	Arsenic	mg/L	5	4	80%	NA	NA	
2_09_02	MW-2	Appendix IV	Barium	mg/L	15	0	0%	-0.409	0.081	
2_09_03	MW-3	Appendix IV	Barium	mg/L	4	0	0%	0.250	0.480	
2_09_05	MW-5	Appendix IV	Barium	mg/L	15	0	0%	0.286	0.222	
2_09_06	MW-6	Appendix IV	Barium	mg/L	15	0	0%	0.510	0.029	*
2_09_07	MW-7	Appendix IV	Barium	mg/L	9	0	0%	-0.302	0.289	
2_09_08	MW-8	Appendix IV	Barium	mg/L	9	0	0%	0.247	0.385	
2_09_09	MW-9	Appendix IV	Barium	mg/L	9	0	0%	-0.018	0.950	
2_09_10	MW-10	Appendix IV	Barium	mg/L	9	0	0%	0.174	0.541	
2_09_13	MW-13	Appendix IV	Barium	mg/L	6	0	0%	0.235	0.467	
2_09_7B	MW-7B	Appendix IV	Barium	mg/L	5	0	0%	0.343	0.310	
2_14_05	MW-5	Appendix IV	Chromium	mg/L	15	13	87%	-0.500	0.157	
2_15_05	MW-5	Appendix IV	Cobalt	mg/L	15	14	93%	NA	NA	
2_17_05	MW-5	Appendix IV	Lead	mg/L	15	12	80%	-0.273	0.454	
2_17_7B	MW-7B	Appendix IV	Lead	mg/L	5	4	80%	NA	NA	

(Table continues on next page)

\*\*\* p &lt; 0.001, \*\* p &lt; 0.01, \* p &lt; 0.05





**Table 4:** Autocorrelation Tests, Non-Detects Excluded (*continued*)

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Autocorrelation	Box-Ljung p-value	Sig.
2_18_02	MW-2	Appendix IV	Lithium	mg/L	15	0	0%	0.591	0.012	*
2_18_03	MW-3	Appendix IV	Lithium	mg/L	4	0	0%	-0.010	0.978	
2_18_05	MW-5	Appendix IV	Lithium	mg/L	15	0	0%	-0.048	0.837	
2_18_06	MW-6	Appendix IV	Lithium	mg/L	15	0	0%	0.711	0.002	**
2_18_07	MW-7	Appendix IV	Lithium	mg/L	9	0	0%	-0.198	0.486	
2_18_08	MW-8	Appendix IV	Lithium	mg/L	9	5	56%	0.237	0.502	
2_18_7B	MW-7B	Appendix IV	Lithium	mg/L	5	0	0%	-0.449	0.184	
2_20_07	MW-7	Appendix IV	Mercury	mg/L	9	8	89%	NA	NA	
2_20_10	MW-10	Appendix IV	Mercury	mg/L	9	8	89%	NA	NA	
2_21_02	MW-2	Appendix IV	Molybdenum	mg/L	15	0	0%	0.251	0.283	
2_21_03	MW-3	Appendix IV	Molybdenum	mg/L	4	0	0%	-0.458	0.195	
2_21_05	MW-5	Appendix IV	Molybdenum	mg/L	15	0	0%	0.080	0.733	
2_21_06	MW-6	Appendix IV	Molybdenum	mg/L	15	0	0%	-0.003	0.989	
2_21_07	MW-7	Appendix IV	Molybdenum	mg/L	9	0	0%	-0.008	0.977	
2_21_08	MW-8	Appendix IV	Molybdenum	mg/L	9	7	78%	-0.500	0.157	
2_23_02	MW-2	Appendix IV	Radium-226	pCi/L	15	0	0%	-0.382	0.103	
2_23_03	MW-3	Appendix IV	Radium-226	pCi/L	4	0	0%	-0.667	0.059	
2_23_05	MW-5	Appendix IV	Radium-226	pCi/L	15	0	0%	0.000	0.998	
2_23_06	MW-6	Appendix IV	Radium-226	pCi/L	15	0	0%	-0.072	0.760	
2_23_07	MW-7	Appendix IV	Radium-226	pCi/L	9	0	0%	-0.308	0.279	
2_23_08	MW-8	Appendix IV	Radium-226	pCi/L	9	0	0%	0.393	0.167	
2_23_09	MW-9	Appendix IV	Radium-226	pCi/L	9	0	0%	-0.096	0.734	
2_23_10	MW-10	Appendix IV	Radium-226	pCi/L	9	0	0%	0.359	0.207	
2_23_13	MW-13	Appendix IV	Radium-226	pCi/L	6	0	0%	-0.680	0.035	*
2_23_7B	MW-7B	Appendix IV	Radium-226	pCi/L	5	0	0%	-0.595	0.078	
2_24_02	MW-2	Appendix IV	Radium-226/228	pCi/L	15	0	0%	-0.221	0.345	
2_24_03	MW-3	Appendix IV	Radium-226/228	pCi/L	4	0	0%	0.279	0.431	
2_24_05	MW-5	Appendix IV	Radium-226/228	pCi/L	15	0	0%	0.170	0.469	
2_24_06	MW-6	Appendix IV	Radium-226/228	pCi/L	15	0	0%	0.257	0.273	
2_24_07	MW-7	Appendix IV	Radium-226/228	pCi/L	9	0	0%	-0.527	0.064	
2_24_08	MW-8	Appendix IV	Radium-226/228	pCi/L	9	0	0%	0.430	0.130	
2_24_09	MW-9	Appendix IV	Radium-226/228	pCi/L	9	0	0%	-0.041	0.886	
2_24_10	MW-10	Appendix IV	Radium-226/228	pCi/L	9	0	0%	0.371	0.192	
2_24_13	MW-13	Appendix IV	Radium-226/228	pCi/L	6	0	0%	-0.526	0.103	
2_24_7B	MW-7B	Appendix IV	Radium-226/228	pCi/L	5	0	0%	-0.663	0.050	*
2_25_02	MW-2	Appendix IV	Radium-228	pCi/L	15	0	0%	-0.183	0.434	
2_25_03	MW-3	Appendix IV	Radium-228	pCi/L	4	0	0%	0.289	0.413	
2_25_05	MW-5	Appendix IV	Radium-228	pCi/L	15	0	0%	-0.041	0.861	
2_25_06	MW-6	Appendix IV	Radium-228	pCi/L	15	0	0%	0.337	0.151	
2_25_07	MW-7	Appendix IV	Radium-228	pCi/L	9	0	0%	0.011	0.969	
2_25_08	MW-8	Appendix IV	Radium-228	pCi/L	9	0	0%	0.235	0.409	
2_25_09	MW-9	Appendix IV	Radium-228	pCi/L	9	0	0%	-0.159	0.577	

(Table continues on next page)

\*\*\* p < 0.001, \*\* p < 0.01, \* p < 0.05

**Table 4:** Autocorrelation Tests, Non-Detects Excluded (*continued*)

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Autocorrelation	Box-Ljung p-value	Sig.
2_25_10	MW-10	Appendix IV	Radium-228	pCi/L	9	0	0%	-0.166	0.558	
2_25_13	MW-13	Appendix IV	Radium-228	pCi/L	6	0	0%	-0.333	0.302	
2_25_7B	MW-7B	Appendix IV	Radium-228	pCi/L	5	0	0%	-0.651	0.054	
3_11_02	MW-2	Other	Bicarbonate	mg/L	1	0	0%	NA	NA	
3_11_03	MW-3	Other	Bicarbonate	mg/L	1	0	0%	NA	NA	
3_11_05	MW-5	Other	Bicarbonate	mg/L	1	0	0%	NA	NA	
3_11_06	MW-6	Other	Bicarbonate	mg/L	1	0	0%	NA	NA	
3_11_07	MW-7	Other	Bicarbonate	mg/L	1	0	0%	NA	NA	
3_11_08	MW-8	Other	Bicarbonate	mg/L	1	0	0%	NA	NA	
3_11_09	MW-9	Other	Bicarbonate	mg/L	1	0	0%	NA	NA	
3_11_10	MW-10	Other	Bicarbonate	mg/L	1	0	0%	NA	NA	
3_11_13	MW-13	Other	Bicarbonate	mg/L	4	0	0%	0.164	0.643	
3_11_7B	MW-7B	Other	Bicarbonate	mg/L	5	0	0%	-0.500	0.139	
3_16_02	MW-2	Other	Hardness	mg/L	1	0	0%	NA	NA	
3_16_03	MW-3	Other	Hardness	mg/L	1	0	0%	NA	NA	
3_16_05	MW-5	Other	Hardness	mg/L	1	0	0%	NA	NA	
3_16_06	MW-6	Other	Hardness	mg/L	1	0	0%	NA	NA	
3_16_07	MW-7	Other	Hardness	mg/L	1	0	0%	NA	NA	
3_16_08	MW-8	Other	Hardness	mg/L	1	0	0%	NA	NA	
3_16_09	MW-9	Other	Hardness	mg/L	1	0	0%	NA	NA	
3_16_10	MW-10	Other	Hardness	mg/L	1	0	0%	NA	NA	
3_16_13	MW-13	Other	Hardness	mg/L	4	0	0%	-0.371	0.294	
3_16_7B	MW-7B	Other	Hardness	mg/L	5	0	0%	0.257	0.447	
3_19_02	MW-2	Other	Magnesium	mg/L	1	0	0%	NA	NA	
3_19_03	MW-3	Other	Magnesium	mg/L	1	0	0%	NA	NA	
3_19_05	MW-5	Other	Magnesium	mg/L	1	0	0%	NA	NA	
3_19_06	MW-6	Other	Magnesium	mg/L	1	0	0%	NA	NA	
3_19_07	MW-7	Other	Magnesium	mg/L	1	0	0%	NA	NA	
3_19_08	MW-8	Other	Magnesium	mg/L	1	0	0%	NA	NA	
3_19_09	MW-9	Other	Magnesium	mg/L	1	0	0%	NA	NA	
3_19_10	MW-10	Other	Magnesium	mg/L	1	0	0%	NA	NA	
3_19_13	MW-13	Other	Magnesium	mg/L	5	0	0%	-0.338	0.317	
3_19_7B	MW-7B	Other	Magnesium	mg/L	5	0	0%	-0.169	0.617	
3_22_02	MW-2	Other	Potassium	mg/L	1	0	0%	NA	NA	
3_22_03	MW-3	Other	Potassium	mg/L	1	0	0%	NA	NA	
3_22_05	MW-5	Other	Potassium	mg/L	1	0	0%	NA	NA	
3_22_06	MW-6	Other	Potassium	mg/L	1	0	0%	NA	NA	
3_22_07	MW-7	Other	Potassium	mg/L	1	0	0%	NA	NA	
3_22_08	MW-8	Other	Potassium	mg/L	1	0	0%	NA	NA	
3_22_09	MW-9	Other	Potassium	mg/L	1	0	0%	NA	NA	
3_22_10	MW-10	Other	Potassium	mg/L	1	0	0%	NA	NA	
3_22_13	MW-13	Other	Potassium	mg/L	5	0	0%	-0.251	0.458	

(Table continues on next page)

\*\*\* p &lt; 0.001, \*\* p &lt; 0.01, \* p &lt; 0.05

**Table 4:** Autocorrelation Tests, Non-Detects Excluded (*continued*)

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Autocorrelation	Box-Ljung p-value	Sig.
3_22_7B	MW-7B	Other	Potassium	mg/L	5	0	0%	-0.304	0.368	
3_27_02	MW-2	Other	Sodium	mg/L	1	0	0%	NA	NA	
3_27_03	MW-3	Other	Sodium	mg/L	1	0	0%	NA	NA	
3_27_05	MW-5	Other	Sodium	mg/L	1	0	0%	NA	NA	
3_27_06	MW-6	Other	Sodium	mg/L	1	0	0%	NA	NA	
3_27_07	MW-7	Other	Sodium	mg/L	1	0	0%	NA	NA	
3_27_08	MW-8	Other	Sodium	mg/L	1	0	0%	NA	NA	
3_27_09	MW-9	Other	Sodium	mg/L	1	0	0%	NA	NA	
3_27_10	MW-10	Other	Sodium	mg/L	1	0	0%	NA	NA	
3_27_13	MW-13	Other	Sodium	mg/L	5	0	0%	0.235	0.488	
3_27_7B	MW-7B	Other	Sodium	mg/L	5	0	0%	-0.316	0.349	
3_29_02	MW-2	Other	Total Suspended Solids	mg/L	15	4	27%	-0.007	0.980	
3_29_03	MW-3	Other	Total Suspended Solids	mg/L	4	0	0%	-0.150	0.671	
3_29_05	MW-5	Other	Total Suspended Solids	mg/L	15	0	0%	-0.023	0.923	
3_29_06	MW-6	Other	Total Suspended Solids	mg/L	15	11	73%	-0.099	0.780	
3_29_07	MW-7	Other	Total Suspended Solids	mg/L	9	8	89%	NA	NA	
3_29_08	MW-8	Other	Total Suspended Solids	mg/L	9	8	89%	NA	NA	
4_30_02	MW-2	Field Parameters	Conductivity	mS/cm	15	0	0%	0.479	0.041	*
4_30_03	MW-3	Field Parameters	Conductivity	mS/cm	4	0	0%	0.242	0.494	
4_30_05	MW-5	Field Parameters	Conductivity	mS/cm	15	0	0%	-0.205	0.381	
4_30_06	MW-6	Field Parameters	Conductivity	mS/cm	15	0	0%	0.607	0.010	**
4_30_07	MW-7	Field Parameters	Conductivity	mS/cm	9	0	0%	-0.030	0.915	
4_30_08	MW-8	Field Parameters	Conductivity	mS/cm	9	0	0%	-0.153	0.591	
4_30_09	MW-9	Field Parameters	Conductivity	mS/cm	9	0	0%	0.302	0.288	
4_30_10	MW-10	Field Parameters	Conductivity	mS/cm	9	0	0%	-0.027	0.923	
4_30_13	MW-13	Field Parameters	Conductivity	mS/cm	6	0	0%	0.188	0.560	
4_30_7B	MW-7B	Field Parameters	Conductivity	mS/cm	5	0	0%	-0.047	0.888	
4_31_02	MW-2	Field Parameters	Dissolved Oxygen	mg/L	15	0	0%	0.008	0.973	
4_31_03	MW-3	Field Parameters	Dissolved Oxygen	mg/L	4	0	0%	-0.006	0.986	
4_31_05	MW-5	Field Parameters	Dissolved Oxygen	mg/L	15	0	0%	0.203	0.386	
4_31_06	MW-6	Field Parameters	Dissolved Oxygen	mg/L	15	0	0%	-0.082	0.726	
4_31_07	MW-7	Field Parameters	Dissolved Oxygen	mg/L	9	1	11%	-0.214	0.469	
4_31_08	MW-8	Field Parameters	Dissolved Oxygen	mg/L	9	0	0%	-0.302	0.287	
4_31_09	MW-9	Field Parameters	Dissolved Oxygen	mg/L	9	0	0%	0.109	0.702	
4_31_10	MW-10	Field Parameters	Dissolved Oxygen	mg/L	9	0	0%	0.045	0.873	
4_31_13	MW-13	Field Parameters	Dissolved Oxygen	mg/L	6	0	0%	0.328	0.309	
4_31_7B	MW-7B	Field Parameters	Dissolved Oxygen	mg/L	5	0	0%	0.141	0.677	
4_32_02	MW-2	Field Parameters	Oxidation Reduction Potential	mV	15	0	0%	0.169	0.471	
4_32_03	MW-3	Field Parameters	Oxidation Reduction Potential	mV	4	0	0%	-0.448	0.205	
4_32_05	MW-5	Field Parameters	Oxidation Reduction Potential	mV	15	0	0%	0.048	0.838	
4_32_06	MW-6	Field Parameters	Oxidation Reduction Potential	mV	15	0	0%	-0.292	0.213	
4_32_07	MW-7	Field Parameters	Oxidation Reduction Potential	mV	9	0	0%	0.084	0.768	

(Table continues on next page)

\*\*\* p &lt; 0.001, \*\* p &lt; 0.01, \* p &lt; 0.05

**Table 4:** Autocorrelation Tests, Non-Detects Excluded (*continued*)

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Autocorrelation	Box-Ljung p-value	Sig.
4_32_08	MW-8	Field Parameters	Oxidation Reduction Potential	mV	9	0	0%	-0.334	0.239	
4_32_09	MW-9	Field Parameters	Oxidation Reduction Potential	mV	9	0	0%	-0.310	0.276	
4_32_10	MW-10	Field Parameters	Oxidation Reduction Potential	mV	9	0	0%	-0.287	0.313	
4_32_13	MW-13	Field Parameters	Oxidation Reduction Potential	mV	6	0	0%	0.431	0.182	
4_32_7B	MW-7B	Field Parameters	Oxidation Reduction Potential	mV	5	0	0%	-0.258	0.445	
4_33_02	MW-2	Field Parameters	Temperature	°C	15	0	0%	-0.256	0.274	
4_33_03	MW-3	Field Parameters	Temperature	°C	4	0	0%	-0.774	0.028	*
4_33_05	MW-5	Field Parameters	Temperature	°C	15	0	0%	0.006	0.978	
4_33_06	MW-6	Field Parameters	Temperature	°C	15	0	0%	-0.359	0.126	
4_33_07	MW-7	Field Parameters	Temperature	°C	9	0	0%	0.342	0.229	
4_33_08	MW-8	Field Parameters	Temperature	°C	9	0	0%	0.278	0.328	
4_33_09	MW-9	Field Parameters	Temperature	°C	9	0	0%	0.308	0.279	
4_33_10	MW-10	Field Parameters	Temperature	°C	9	0	0%	0.301	0.290	
4_33_13	MW-13	Field Parameters	Temperature	°C	6	0	0%	0.522	0.106	
4_33_7B	MW-7B	Field Parameters	Temperature	°C	5	0	0%	0.323	0.339	
4_34_02	MW-2	Field Parameters	Turbidity	NTU	15	0	0%	-0.005	0.984	
4_34_03	MW-3	Field Parameters	Turbidity	NTU	4	0	0%	-0.534	0.131	
4_34_05	MW-5	Field Parameters	Turbidity	NTU	15	0	0%	0.297	0.204	
4_34_06	MW-6	Field Parameters	Turbidity	NTU	15	0	0%	0.293	0.212	
4_34_07	MW-7	Field Parameters	Turbidity	NTU	9	0	0%	0.169	0.552	
4_34_08	MW-8	Field Parameters	Turbidity	NTU	9	0	0%	0.069	0.809	
4_34_09	MW-9	Field Parameters	Turbidity	NTU	9	0	0%	0.225	0.428	
4_34_10	MW-10	Field Parameters	Turbidity	NTU	9	0	0%	-0.291	0.306	
4_34_13	MW-13	Field Parameters	Turbidity	NTU	6	0	0%	0.076	0.814	
4_34_7B	MW-7B	Field Parameters	Turbidity	NTU	5	0	0%	-0.185	0.584	
5_36_05	MW-5	Part 115	Copper	mg/L	15	10	67%	-0.549	0.104	
5_37_02	MW-2	Part 115	Iron	mg/L	15	0	0%	0.239	0.309	
5_37_03	MW-3	Part 115	Iron	mg/L	4	0	0%	0.180	0.612	
5_37_05	MW-5	Part 115	Iron	mg/L	15	1	7%	0.019	0.937	
5_37_06	MW-6	Part 115	Iron	mg/L	15	7	47%	0.285	0.336	
5_37_07	MW-7	Part 115	Iron	mg/L	9	0	0%	-0.149	0.599	
5_37_08	MW-8	Part 115	Iron	mg/L	9	8	89%	NA	NA	
5_37_13	MW-13	Part 115	Iron	mg/L	6	1	17%	-0.397	0.241	
5_37_7B	MW-7B	Part 115	Iron	mg/L	5	0	0%	-0.271	0.423	
5_38_02	MW-2	Part 115	Nickel	mg/L	15	0	0%	0.491	0.036	*
5_38_05	MW-5	Part 115	Nickel	mg/L	15	0	0%	0.457	0.051	
5_38_06	MW-6	Part 115	Nickel	mg/L	15	2	13%	0.127	0.609	
5_40_05	MW-5	Part 115	Vanadium	mg/L	15	13	87%	-0.500	0.157	
5_41_02	MW-2	Part 115	Zinc	mg/L	15	12	80%	-0.167	0.648	
5_41_05	MW-5	Part 115	Zinc	mg/L	15	4	27%	-0.317	0.231	
5_41_06	MW-6	Part 115	Zinc	mg/L	15	14	93%	NA	NA	
5_41_07	MW-7	Part 115	Zinc	mg/L	9	6	67%	-0.667	0.068	

(Table continues on next page)

\*\*\* p &lt; 0.001, \*\* p &lt; 0.01, \* p &lt; 0.05



**Table 4:** Autocorrelation Tests, Non-Detects Excluded (*continued*)

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Autocorrelation	Box-Ljung p-value	Sig.
5_41_09	MW-9	Part 115	Zinc	mg/L	9	8	89%	NA	NA	
5_41_10	MW-10	Part 115	Zinc	mg/L	9	7	78%	-0.500	0.157	
5_41_13	MW-13	Part 115	Zinc	mg/L	6	5	83%	NA	NA	

\*\*\* p < 0.001, \*\* p < 0.01, \* p < 0.05



**Table 5: Outlier Counts by Date**

Date	Count
2020-04-28	4
2020-05-26	1
2020-10-19	1
2020-11-06	1
2021-01-27	1
2021-05-04	1
2021-06-15	2
2021-08-24	1
2021-09-28	2
2021-11-02	2
2022-01-11	1
2022-02-01	2
2022-02-17	3
2022-03-09	1
2022-07-13	1
2022-08-02	4

**Table 6: Outliers Identified at the 1% Significance Level, Non-Detects Excluded**

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	No. Detects	Date	Value
1_01_05	MW-5	Appendix III	Boron	mg/L	14	0	0%	14	2022-02-01	0.370
1_03_07	MW-7	Appendix III	Chloride	mg/L	9	0	0%	9	2022-08-02	98.0
1_03_08	MW-8	Appendix III	Chloride	mg/L	9	2	22%	7	2021-09-28	59.0
1_06_07	MW-7	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	9	2022-02-17	758
1_35_02	MW-2	Appendix III	pH	su	15	0	0%	15	2020-10-19	7.08
1_35_05	MW-5	Appendix III	pH	su	15	0	0%	15	2021-05-04	6.40
1_35_07	MW-7	Appendix III	pH	su	9	0	0%	9	2021-06-15	8.18
1_35_08	MW-8	Appendix III	pH	su	9	0	0%	9	2021-06-15	7.78
2_21_07	MW-7	Appendix IV	Molybdenum	mg/L	9	0	0%	9	2022-08-02	0.146
2_23_05	MW-5	Appendix IV	Radium-226	pCi/L	15	0	0%	15	2020-11-06	3.30
3_16_13	MW-13	Other	Hardness	mg/L	4	0	0%	4	2022-07-13	353
3_29_05	MW-5	Other	Total Suspended Solids	mg/L	15	0	0%	15	2020-04-28	161
4_30_07	MW-7	Field Parameters	Conductivity	mS/cm	9	0	0%	9	2021-11-02	0.462
4_30_7B	MW-7B	Field Parameters	Conductivity	mS/cm	5	0	0%	5	2022-03-09	0.730
4_31_02	MW-2	Field Parameters	Dissolved Oxygen	mg/L	15	0	0%	15	2022-08-02	1.01
4_31_06	MW-6	Field Parameters	Dissolved Oxygen	mg/L	15	0	0%	15	2022-08-02	0.440
4_31_07	MW-7	Field Parameters	Dissolved Oxygen	mg/L	9	1	11%	8	2022-01-11	0.490
4_31_08	MW-8	Field Parameters	Dissolved Oxygen	mg/L	9	0	0%	9	2021-11-02	7.83
4_32_07	MW-7	Field Parameters	Oxidation Reduction Potential	mV	9	0	0%	9	2022-02-17	-36.9
4_34_02	MW-2	Field Parameters	Turbidity	NTU	15	0	0%	15	2020-04-28	72.3
4_34_05	MW-5	Field Parameters	Turbidity	NTU	15	0	0%	15	2020-04-28	180

(Table continues on next page)



**Table 6:** Outliers Identified at the 1% Significance Level, Non-Detects Excluded (*continued*)

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	No. Detects	Date	Value
4_34_07	MW-7	Field Parameters	Turbidity	NTU	9	0	0%	9	2021-09-28	16.0
5_37_02	MW-2	Part 115	Iron	mg/L	15	0	0%	15	2022-02-01	1.93
5_37_05	MW-5	Part 115	Iron	mg/L	15	1	7%	14	2020-04-28	8.00
5_37_07	MW-7	Part 115	Iron	mg/L	9	0	0%	9	2022-02-17	2.81
5_41_02	MW-2	Part 115	Zinc	mg/L	15	12	80%	3	2020-05-26	0.0410
5_41_05	MW-5	Part 115	Zinc	mg/L	15	4	27%	11	2021-01-27	0.0980
5_41_07	MW-7	Part 115	Zinc	mg/L	9	6	67%	3	2021-08-24	0.0140



**Table 7: Seasonality Tests**

ID	Well	Constituent Type	Constituent	Unit	% NDs	Full										Without Non-Detects									
						Sample Size					p-Value					Sample Size					p-Value				
						Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA				
1_01_02	MW-2	Appendix III	Boron	mg/L	0%	2	3	5	4	14	0.057	0.016 *	0.017 *	2	3	5	4	14	0.057	0.016 *	0.017 *				
1_01_03	MW-3	Appendix III	Boron	mg/L	0%	1	1	2	0	4	0.259	0.338	0.324	1	1	2	0	4	0.259	0.338	0.324				
1_01_05	MW-5	Appendix III	Boron	mg/L	0%	2	3	5	4	14	0.069	0.077	0.084	2	3	5	4	14	0.069	0.077	0.084				
1_01_06	MW-6	Appendix III	Boron	mg/L	0%	2	3	5	4	14	0.012 *	0.000 ***	0.000 ***	2	3	5	4	14	0.012 *	0.000 ***	0.000 ***				
1_01_07	MW-7	Appendix III	Boron	mg/L	0%	3	0	4	2	9	0.055	0.060	0.063	3	0	4	2	9	0.055	0.060	0.063				
1_01_08	MW-8	Appendix III	Boron	mg/L	11%	3	0	4	2	9	0.057	0.075	0.017 *	2	0	4	2	8	0.115	0.158	0.059				
1_01_09	MW-9	Appendix III	Boron	mg/L	100%	3	0	4	2	9	NA	NA	0.601	NA	NA	NA	NA	NA	NA	NA	NA				
1_01_10	MW-10	Appendix III	Boron	mg/L	0%	3	0	4	2	9	0.670	0.530	0.570	3	0	4	2	9	0.670	0.530	0.570				
1_01_13	MW-13	Appendix III	Boron	mg/L	0%	1	2	3	0	6	0.103	0.008 **	0.006 **	1	2	3	0	6	0.103	0.008 **	0.006 **				
1_01_7B	MW-7B	Appendix III	Boron	mg/L	0%	0	3	2	0	5	1.000	0.859	0.852	0	3	2	0	5	1.000	0.859	0.852				
1_02_02	MW-2	Appendix III	Calcium	mg/L	0%	2	3	5	4	14	0.312	0.498	0.511	2	3	5	4	14	0.312	0.498	0.511				
1_02_03	MW-3	Appendix III	Calcium	mg/L	0%	1	1	2	0	4	0.259	0.557	0.571	1	1	2	0	4	0.259	0.557	0.571				
1_02_05	MW-5	Appendix III	Calcium	mg/L	0%	2	3	5	4	14	0.148	0.059	0.060	2	3	5	4	14	0.148	0.059	0.060				
1_02_06	MW-6	Appendix III	Calcium	mg/L	0%	2	3	5	4	14	0.023 *	0.006 **	0.005 **	2	3	5	4	14	0.023 *	0.006 **	0.005 **				
1_02_07	MW-7	Appendix III	Calcium	mg/L	0%	3	0	4	2	9	0.103	0.059	0.050 *	3	0	4	2	9	0.103	0.059	0.050 *				
1_02_08	MW-8	Appendix III	Calcium	mg/L	0%	3	0	4	2	9	0.055	0.019 *	0.022 *	3	0	4	2	9	0.055	0.019 *	0.022 *				
1_02_09	MW-9	Appendix III	Calcium	mg/L	0%	3	0	4	2	9	0.050 *	0.006 **	0.007 **	3	0	4	2	9	0.050 *	0.006 **	0.007 **				
1_02_10	MW-10	Appendix III	Calcium	mg/L	0%	3	0	4	2	9	0.361	0.325	0.337	3	0	4	2	9	0.361	0.325	0.337				
1_02_13	MW-13	Appendix III	Calcium	mg/L	0%	1	2	3	0	6	0.304	0.206	0.233	1	2	3	0	6	0.304	0.206	0.233				
1_02_7B	MW-7B	Appendix III	Calcium	mg/L	0%	0	3	2	0	5	0.564	0.894	0.931	0	3	2	0	5	0.564	0.894	0.931				
1_03_02	MW-2	Appendix III	Chloride	mg/L	0%	2	3	5	4	14	0.023 *	0.002 **	0.002 **	2	3	5	4	14	0.023 *	0.002 **	0.002 **				
1_03_03	MW-3	Appendix III	Chloride	mg/L	0%	1	1	2	0	4	0.407	0.721	0.711	1	1	2	0	4	0.407	0.721	0.711				
1_03_05	MW-5	Appendix III	Chloride	mg/L	0%	2	3	5	4	14	0.068	0.019 *	0.020 *	2	3	5	4	14	0.068	0.019 *	0.020 *				
1_03_06	MW-6	Appendix III	Chloride	mg/L	0%	2	3	5	4	14	0.014 *	0.002 **	0.003 **	2	3	5	4	14	0.014 *	0.002 **	0.003 **				
1_03_07	MW-7	Appendix III	Chloride	mg/L	0%	3	0	4	2	9	0.957	0.697	0.709	3	0	4	2	9	0.957	0.697	0.709				
1_03_08	MW-8	Appendix III	Chloride	mg/L	22%	3	0	4	2	9	0.066	0.185	0.073	1	0	4	2	7	0.325	0.408	0.320				
1_03_09	MW-9	Appendix III	Chloride	mg/L	89%	3	0	4	2	9	0.368	0.422	0.422	1	0	0	0	1	NA	NA	NA				
1_03_10	MW-10	Appendix III	Chloride	mg/L	89%	3	0	4	2	9	0.368	0.422	0.422	1	0	0	0	1	NA	NA	NA				
1_03_13	MW-13	Appendix III	Chloride	mg/L	33%	1	2	3	0	6	0.122	0.036 *	0.051	0	1	3	0	4	0.157	0.095	0.067				
1_03_7B	MW-7B	Appendix III	Chloride	mg/L	100%	0	3	2	0	5	NA	NA	0.495	NA	NA	NA	NA	NA	NA	NA	NA				
1_04_02	MW-2	Appendix III	Fluoride	mg/L	100%	2	3	5	4	14	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA				
1_04_03	MW-3	Appendix III	Fluoride	mg/L	100%	1	1	2	0	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA				
1_04_05	MW-5	Appendix III	Fluoride	mg/L	100%	2	3	5	4	14	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA				
1_04_06	MW-6	Appendix III	Fluoride	mg/L	100%	2	3	5	4	14	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA				
1_04_07	MW-7	Appendix III	Fluoride	mg/L	89%	3	0	4	2	9	0.368	0.422	0.422	1	0	0	0	1	NA	NA	NA				
1_04_08	MW-8	Appendix III	Fluoride	mg/L	89%	3	0	4	2	9	0.368	0.422	0.422	1	0	0	0	1	NA	NA	NA				
1_04_09	MW-9	Appendix III	Fluoride	mg/L	89%	3	0	4	2	9	0.368	0.422	0.422	1	0	0	0	1	NA	NA	NA				
1_04_10	MW-10	Appendix III	Fluoride	mg/L	89%	3	0	4	2	9	0.368	0.422	0.422	1	0	0	0	1	NA	NA	NA				
1_04_13	MW-13	Appendix III	Fluoride	mg/L	100%	1	2	3	0	6	NA	0.000 ***	NA	NA	NA	NA	NA	NA	NA	NA	NA				

(Table continues on next page)

\*\*\* p < 0.001, \*\* p < 0.01, \* p < 0.05





**Table 7: Seasonality Tests (continued)**

ID	Well	Constituent Type	Constituent	Unit	% NDs	Full							Without Non-Detects								
						Sample Size					p-Value		Sample Size					p-Value			
						Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA
1_04_7B	MW-7B	Appendix III	Fluoride	mg/L	100%	0	3	2	0	5	NA	0.495	NA	NA	NA	NA	NA	NA	NA	NA	NA
1_05_02	MW-2	Appendix III	Sulfate	mg/L	0%	2	3	5	4	14	0.082	0.127	0.176	2	3	5	4	14	0.082	0.127	0.176
1_05_03	MW-3	Appendix III	Sulfate	mg/L	0%	1	1	2	0	4	0.259	0.504	0.496	1	1	2	0	4	0.259	0.504	0.496
1_05_05	MW-5	Appendix III	Sulfate	mg/L	0%	2	3	5	4	14	0.061	0.022 *	0.020 *	2	3	5	4	14	0.061	0.022 *	0.020 *
1_05_06	MW-6	Appendix III	Sulfate	mg/L	0%	2	3	5	4	14	0.022 *	0.002 **	0.002 **	2	3	5	4	14	0.022 *	0.002 **	0.002 **
1_05_07	MW-7	Appendix III	Sulfate	mg/L	0%	3	0	4	2	9	0.040 *	0.064	0.048 *	3	0	4	2	9	0.040 *	0.064	0.048 *
1_05_08	MW-8	Appendix III	Sulfate	mg/L	0%	3	0	4	2	9	0.062	0.219	0.136	3	0	4	2	9	0.062	0.219	0.136
1_05_09	MW-9	Appendix III	Sulfate	mg/L	78%	3	0	4	2	9	0.368	0.422	0.422	1	0	1	0	2	0.317	NA	NA
1_05_10	MW-10	Appendix III	Sulfate	mg/L	0%	3	0	4	2	9	0.287	0.348	0.370	3	0	4	2	9	0.287	0.348	0.370
1_05_13	MW-13	Appendix III	Sulfate	mg/L	0%	1	2	3	0	6	0.807	0.968	0.959	1	2	3	0	6	0.807	0.968	0.959
1_05_7B	MW-7B	Appendix III	Sulfate	mg/L	100%	0	3	2	0	5	NA	NA	0.495	NA	NA	NA	NA	NA	NA	NA	NA
1_06_02	MW-2	Appendix III	Total Dissolved Solids	mg/L	0%	2	3	5	4	14	0.099	0.165	0.206	2	3	5	4	14	0.099	0.165	0.206
1_06_03	MW-3	Appendix III	Total Dissolved Solids	mg/L	0%	1	1	2	0	4	0.861	0.931	0.930	1	1	2	0	4	0.861	0.931	0.930
1_06_05	MW-5	Appendix III	Total Dissolved Solids	mg/L	0%	2	3	5	4	14	0.079	0.022 *	0.019 *	2	3	5	4	14	0.079	0.022 *	0.019 *
1_06_06	MW-6	Appendix III	Total Dissolved Solids	mg/L	0%	2	3	5	4	14	0.012 *	0.000 ***	0.000 ***	2	3	5	4	14	0.012 *	0.000 ***	0.000 ***
1_06_07	MW-7	Appendix III	Total Dissolved Solids	mg/L	0%	3	0	4	2	9	0.055	0.105	0.089	3	0	4	2	9	0.055	0.105	0.089
1_06_08	MW-8	Appendix III	Total Dissolved Solids	mg/L	0%	3	0	4	2	9	0.809	0.581	0.600	3	0	4	2	9	0.809	0.581	0.600
1_06_09	MW-9	Appendix III	Total Dissolved Solids	mg/L	0%	3	0	4	2	9	0.042 *	0.089	0.086	3	0	4	2	9	0.042 *	0.089	0.086
1_06_10	MW-10	Appendix III	Total Dissolved Solids	mg/L	0%	3	0	4	2	9	0.287	0.147	0.156	3	0	4	2	9	0.287	0.147	0.156
1_06_13	MW-13	Appendix III	Total Dissolved Solids	mg/L	0%	1	2	3	0	6	0.343	0.247	0.295	1	2	3	0	6	0.343	0.247	0.295
1_06_7B	MW-7B	Appendix III	Total Dissolved Solids	mg/L	0%	0	3	2	0	5	0.761	0.488	0.492	0	3	2	0	5	0.761	0.488	0.492
1_35_02	MW-2	Appendix III	pH	su	0%	2	3	5	5	15	0.502	0.333	0.330	2	3	5	5	15	0.502	0.333	0.330
1_35_03	MW-3	Appendix III	pH	su	0%	1	1	2	0	4	0.861	0.969	0.968	1	1	2	0	4	0.861	0.969	0.968
1_35_05	MW-5	Appendix III	pH	su	0%	2	3	5	5	15	0.480	0.416	0.413	2	3	5	5	15	0.480	0.416	0.413
1_35_06	MW-6	Appendix III	pH	su	0%	2	3	5	5	15	0.618	0.646	0.640	2	3	5	5	15	0.618	0.646	0.640
1_35_07	MW-7	Appendix III	pH	su	0%	3	0	4	2	9	0.586	0.544	0.544	3	0	4	2	9	0.586	0.544	0.544
1_35_08	MW-8	Appendix III	pH	su	0%	3	0	4	2	9	0.958	0.848	0.857	3	0	4	2	9	0.958	0.848	0.857
1_35_09	MW-9	Appendix III	pH	su	0%	3	0	4	2	9	0.555	0.497	0.497	3	0	4	2	9	0.555	0.497	0.497
1_35_10	MW-10	Appendix III	pH	su	0%	3	0	4	2	9	0.378	0.476	0.473	3	0	4	2	9	0.378	0.476	0.473
1_35_13	MW-13	Appendix III	pH	su	0%	1	2	3	0	6	0.145	0.245	0.246	1	2	3	0	6	0.145	0.245	0.246
1_35_7B	MW-7B	Appendix III	pH	su	0%	0	3	2	0	5	0.083	0.008 **	0.007 **	0	3	2	0	5	0.083	0.008 **	0.007 **
2_04_02	MW-2	Appendix IV	Fluoride	mg/L	100%	2	3	5	5	15	NA	0.277	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_04_03	MW-3	Appendix IV	Fluoride	mg/L	100%	1	1	2	0	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_04_05	MW-5	Appendix IV	Fluoride	mg/L	100%	2	3	5	5	15	NA	0.277	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_04_06	MW-6	Appendix IV	Fluoride	mg/L	100%	2	3	5	5	15	NA	0.277	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_04_07	MW-7	Appendix IV	Fluoride	mg/L	89%	3	0	4	2	9	0.368	0.422	0.422	1	0	0	0	1	NA	NA	NA
2_04_08	MW-8	Appendix IV	Fluoride	mg/L	89%	3	0	4	2	9	0.368	0.422	0.422	1	0	0	0	1	NA	NA	NA
2_04_09	MW-9	Appendix IV	Fluoride	mg/L	89%	3	0	4	2	9	0.368	0.422	0.422	1	0	0	0	1	NA	NA	NA
2_04_10	MW-10	Appendix IV	Fluoride	mg/L	89%	3	0	4	2	9	0.368	0.422	0.422	1	0	0	0	1	NA	NA	NA

(Table continues on next page)

\*\*\* p < 0.001, \*\* p < 0.01, \* p < 0.05



Table 7: Seasonality Tests (continued)

ID	Well	Constituent Type	Constituent	Unit	% NDs	Full							Without Non-Detects														
						Sample Size					p-Value		Sample Size					p-Value									
						Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA						
2_04_13	MW-13	Appendix IV	Fluoride	mg/L	100%	1	2	3	0	6	NA	0.000	***	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
2_04_7B	MW-7B	Appendix IV	Fluoride	mg/L	100%	0	3	2	0	5	NA	0.495		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
2_07_02	MW-2	Appendix IV	Antimony	mg/L	100%	2	3	5	5	15	NA	0.277		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
2_07_03	MW-3	Appendix IV	Antimony	mg/L	100%	1	1	2	0	4	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
2_07_05	MW-5	Appendix IV	Antimony	mg/L	100%	2	3	5	5	15	NA	0.277		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
2_07_06	MW-6	Appendix IV	Antimony	mg/L	100%	2	3	5	5	15	NA	0.277		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
2_07_07	MW-7	Appendix IV	Antimony	mg/L	100%	3	0	4	2	9	NA	NA	0.601		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
2_07_08	MW-8	Appendix IV	Antimony	mg/L	100%	3	0	4	2	9	NA	NA	0.601		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
2_07_09	MW-9	Appendix IV	Antimony	mg/L	100%	3	0	4	2	9	NA	NA	0.601		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
2_07_10	MW-10	Appendix IV	Antimony	mg/L	100%	3	0	4	2	9	NA	NA	0.601		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
2_07_13	MW-13	Appendix IV	Antimony	mg/L	100%	1	2	3	0	6	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
2_07_7B	MW-7B	Appendix IV	Antimony	mg/L	100%	0	3	2	0	5	NA	0.495		0.495	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
2_08_02	MW-2	Appendix IV	Arsenic	mg/L	87%	2	3	5	5	15	0.090	0.067		0.067	1	0	0	1	2	0.317	NA	NA	NA	NA			
2_08_03	MW-3	Appendix IV	Arsenic	mg/L	0%	1	1	2	0	4	NA	0.000	***	0.000	***	1	1	2	0	4	NA	0.000	***	0.000	***		
2_08_05	MW-5	Appendix IV	Arsenic	mg/L	67%	2	3	5	5	15	0.388	0.179		0.239	1	3	1	0	5	0.325	0.319		0.449				
2_08_06	MW-6	Appendix IV	Arsenic	mg/L	100%	2	3	5	5	15	NA	0.277		0.277	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
2_08_07	MW-7	Appendix IV	Arsenic	mg/L	0%	3	0	4	2	9	0.837	0.959		0.981	3	0	4	2	9	0.837	0.959		0.981				
2_08_08	MW-8	Appendix IV	Arsenic	mg/L	100%	3	0	4	2	9	NA	0.601		0.601	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
2_08_09	MW-9	Appendix IV	Arsenic	mg/L	100%	3	0	4	2	9	NA	0.601		0.601	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
2_08_10	MW-10	Appendix IV	Arsenic	mg/L	100%	3	0	4	2	9	NA	0.601		0.601	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
2_08_13	MW-13	Appendix IV	Arsenic	mg/L	100%	1	2	3	0	6	NA	NA		0.000	***	NA	NA	NA	NA	NA	NA	NA	NA	NA			
2_08_7B	MW-7B	Appendix IV	Arsenic	mg/L	80%	0	3	2	0	5	0.414	0.495		0.495	0	1	0	0	1	NA	NA	NA	NA	NA			
2_09_02	MW-2	Appendix IV	Barium	mg/L	0%	2	3	5	5	15	0.683	0.535		0.581	2	3	5	5	15	0.683	0.535		0.581				
2_09_03	MW-3	Appendix IV	Barium	mg/L	0%	1	1	2	0	4	0.632	0.853		0.855	1	1	2	0	4	0.632	0.853		0.855				
2_09_05	MW-5	Appendix IV	Barium	mg/L	0%	2	3	5	5	15	0.697	0.407		0.471	2	3	5	5	15	0.697	0.407		0.471				
2_09_06	MW-6	Appendix IV	Barium	mg/L	0%	2	3	5	5	15	0.030	*	0.015	*	0.018	*	2	3	5	5	15	0.030	*	0.015	*	0.018	*
2_09_07	MW-7	Appendix IV	Barium	mg/L	0%	3	0	4	2	9	0.286	0.440		0.446	3	0	4	2	9	0.286	0.440		0.446				
2_09_08	MW-8	Appendix IV	Barium	mg/L	0%	3	0	4	2	9	0.180	0.271		0.232	3	0	4	2	9	0.180	0.271		0.232				
2_09_09	MW-9	Appendix IV	Barium	mg/L	0%	3	0	4	2	9	0.368	0.422		0.422	3	0	4	2	9	0.368	0.422		0.422				
2_09_10	MW-10	Appendix IV	Barium	mg/L	0%	3	0	4	2	9	0.568	0.726		0.735	3	0	4	2	9	0.568	0.726		0.735				
2_09_13	MW-13	Appendix IV	Barium	mg/L	0%	1	2	3	0	6	0.213	0.372		0.395	1	2	3	0	6	0.213	0.372		0.395				
2_09_7B	MW-7B	Appendix IV	Barium	mg/L	0%	0	3	2	0	5	0.068	0.053		0.044	*	0	3	2	0	5	0.068	0.053		0.044	*		
2_10_02	MW-2	Appendix IV	Beryllium	mg/L	100%	2	3	5	5	15	NA	0.277		0.277	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
2_10_03	MW-3	Appendix IV	Beryllium	mg/L	100%	1	1	2	0	4	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
2_10_05	MW-5	Appendix IV	Beryllium	mg/L	100%	2	3	5	5	15	NA	0.277		0.277	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
2_10_06	MW-6	Appendix IV	Beryllium	mg/L	100%	2	3	5	5	15	NA	0.277		0.277	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
2_10_07	MW-7	Appendix IV	Beryllium	mg/L	100%	3	0	4	2	9	NA	0.601		0.601	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
2_10_08	MW-8	Appendix IV	Beryllium	mg/L	100%	3	0	4	2	9	NA	0.601		0.601	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
2_10_09	MW-9	Appendix IV	Beryllium	mg/L	100%	3	0	4	2	9	NA	0.601		0.601	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			

(Table continues on next page)

\*\*\* p < 0.001, \*\* p < 0.01, \* p < 0.05

Table 7: Seasonality Tests (continued)

ID	Well	Constituent Type	Constituent	Unit	% NDs	Full							Without Non-Detects											
						Sample Size					p-Value		Sample Size					p-Value						
						Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA			
2_10_10	MW-10	Appendix IV	Beryllium	mg/L	100%	3	0	4	2	9	NA	0.601	0.601	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
2_10_13	MW-13	Appendix IV	Beryllium	mg/L	100%	1	2	3	0	6	NA	NA	0.000 ***	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_10_7B	MW-7B	Appendix IV	Beryllium	mg/L	100%	0	3	2	0	5	NA	NA	0.495	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_12_02	MW-2	Appendix IV	Cadmium	mg/L	100%	2	3	5	5	15	NA	0.277	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_12_03	MW-3	Appendix IV	Cadmium	mg/L	100%	1	1	2	0	4	NA	NA	0.000 ***	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_12_05	MW-5	Appendix IV	Cadmium	mg/L	100%	2	3	5	5	15	NA	0.277	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_12_06	MW-6	Appendix IV	Cadmium	mg/L	100%	2	3	5	5	15	NA	0.277	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_12_07	MW-7	Appendix IV	Cadmium	mg/L	100%	3	0	4	2	9	NA	0.601	0.601	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_12_08	MW-8	Appendix IV	Cadmium	mg/L	100%	3	0	4	2	9	NA	0.601	0.601	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_12_09	MW-9	Appendix IV	Cadmium	mg/L	100%	3	0	4	2	9	NA	0.601	0.601	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_12_10	MW-10	Appendix IV	Cadmium	mg/L	100%	3	0	4	2	9	NA	0.601	0.601	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_12_13	MW-13	Appendix IV	Cadmium	mg/L	100%	1	2	3	0	6	NA	NA	0.000 ***	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_12_7B	MW-7B	Appendix IV	Cadmium	mg/L	100%	0	3	2	0	5	NA	NA	0.495	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_14_02	MW-2	Appendix IV	Chromium	mg/L	100%	2	3	5	5	15	NA	0.277	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_14_03	MW-3	Appendix IV	Chromium	mg/L	100%	1	1	2	0	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_14_05	MW-5	Appendix IV	Chromium	mg/L	87%	2	3	5	5	15	0.221	0.298	0.289	1	1	0	0	2	0.317	NA	NA	NA	NA	NA
2_14_06	MW-6	Appendix IV	Chromium	mg/L	100%	2	3	5	5	15	NA	0.277	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_14_07	MW-7	Appendix IV	Chromium	mg/L	100%	3	0	4	2	9	NA	NA	0.601	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_14_08	MW-8	Appendix IV	Chromium	mg/L	100%	3	0	4	2	9	NA	NA	0.601	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_14_09	MW-9	Appendix IV	Chromium	mg/L	100%	3	0	4	2	9	NA	NA	0.601	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_14_10	MW-10	Appendix IV	Chromium	mg/L	100%	3	0	4	2	9	NA	NA	0.601	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_14_13	MW-13	Appendix IV	Chromium	mg/L	100%	1	2	3	0	6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_14_7B	MW-7B	Appendix IV	Chromium	mg/L	100%	0	3	2	0	5	NA	0.495	0.495	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_15_02	MW-2	Appendix IV	Cobalt	mg/L	100%	2	3	5	5	15	NA	0.277	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_15_03	MW-3	Appendix IV	Cobalt	mg/L	100%	1	1	2	0	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_15_05	MW-5	Appendix IV	Cobalt	mg/L	93%	2	3	5	5	15	0.261	0.277	0.277	0	1	0	0	1	NA	NA	NA	NA	NA	NA
2_15_06	MW-6	Appendix IV	Cobalt	mg/L	100%	2	3	5	5	15	NA	0.277	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_15_07	MW-7	Appendix IV	Cobalt	mg/L	100%	3	0	4	2	9	NA	NA	0.601	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_15_08	MW-8	Appendix IV	Cobalt	mg/L	100%	3	0	4	2	9	NA	NA	0.601	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_15_09	MW-9	Appendix IV	Cobalt	mg/L	100%	3	0	4	2	9	NA	NA	0.601	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_15_10	MW-10	Appendix IV	Cobalt	mg/L	100%	3	0	4	2	9	NA	NA	0.601	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_15_13	MW-13	Appendix IV	Cobalt	mg/L	100%	1	2	3	0	6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_15_7B	MW-7B	Appendix IV	Cobalt	mg/L	100%	0	3	2	0	5	NA	0.495	0.495	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_17_02	MW-2	Appendix IV	Lead	mg/L	100%	2	3	5	5	15	NA	0.277	0.277	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_17_03	MW-3	Appendix IV	Lead	mg/L	100%	1	1	2	0	4	NA	0.000 ***	0.000 ***	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_17_05	MW-5	Appendix IV	Lead	mg/L	80%	2	3	5	5	15	0.190	0.081	0.099	1	1	1	0	3	0.368	NA	NA	NA	NA	NA
2_17_06	MW-6	Appendix IV	Lead	mg/L	100%	2	3	5	5	15	NA	0.277	0.277	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_17_07	MW-7	Appendix IV	Lead	mg/L	100%	3	0	4	2	9	NA	0.601	0.601	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_17_08	MW-8	Appendix IV	Lead	mg/L	100%	3	0	4	2	9	NA	0.601	0.601	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

(Table continues on next page)

\*\*\* p &lt; 0.001, \*\* p &lt; 0.01, \* p &lt; 0.05



**Table 7: Seasonality Tests (continued)**

ID	Well	Constituent Type	Constituent	Unit	% NDs	Full							Without Non-Detects										
						Sample Size					p-Value		Sample Size					p-Value					
						Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA		
2_17_09	MW-9	Appendix IV	Lead	mg/L	100%	3	0	4	2	9	NA	0.601	0.601	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_17_10	MW-10	Appendix IV	Lead	mg/L	100%	3	0	4	2	9	NA	0.601	0.601	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_17_13	MW-13	Appendix IV	Lead	mg/L	100%	1	2	3	0	6	NA	NA	0.000 ***	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_17_7B	MW-7B	Appendix IV	Lead	mg/L	80%	0	3	2	0	5	0.221	0.272	0.272	0	0	1	0	1	NA	NA	NA	NA	NA
2_18_02	MW-2	Appendix IV	Lithium	mg/L	0%	2	3	5	5	15	0.022 *	0.005 **	0.006 **	2	3	5	5	15	0.022 *	0.005 **	0.006 **	0.006 **	0.006 **
2_18_03	MW-3	Appendix IV	Lithium	mg/L	0%	1	1	2	0	4	0.325	0.350	0.330	1	1	2	0	4	0.325	0.350	0.330	0.330	0.330
2_18_05	MW-5	Appendix IV	Lithium	mg/L	0%	2	3	5	5	15	0.651	0.446	0.235	2	3	5	5	15	0.651	0.446	0.235	0.235	0.235
2_18_06	MW-6	Appendix IV	Lithium	mg/L	0%	2	3	5	5	15	0.019 *	0.001 **	0.002 **	2	3	5	5	15	0.019 *	0.001 **	0.002 **	0.002 **	0.002 **
2_18_07	MW-7	Appendix IV	Lithium	mg/L	0%	3	0	4	2	9	0.036 *	0.043 *	0.039 *	3	0	4	2	9	0.036 *	0.043 *	0.039 *	0.039 *	0.039 *
2_18_08	MW-8	Appendix IV	Lithium	mg/L	56%	3	0	4	2	9	0.156	0.060	0.065	1	0	1	2	4	0.259	0.454	0.351	0.351	0.351
2_18_09	MW-9	Appendix IV	Lithium	mg/L	100%	3	0	4	2	9	0.535	0.601	0.601	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_18_10	MW-10	Appendix IV	Lithium	mg/L	100%	3	0	4	2	9	0.535	0.601	0.601	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_18_13	MW-13	Appendix IV	Lithium	mg/L	100%	1	2	3	0	6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_18_7B	MW-7B	Appendix IV	Lithium	mg/L	0%	0	3	2	0	5	0.767	0.840	0.812	0	3	2	0	5	0.767	0.840	0.812	0.812	0.812
2_20_02	MW-2	Appendix IV	Mercury	mg/L	100%	2	3	5	5	15	NA	0.277	0.277	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_20_03	MW-3	Appendix IV	Mercury	mg/L	100%	1	1	2	0	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_20_05	MW-5	Appendix IV	Mercury	mg/L	100%	2	3	5	5	15	NA	0.277	0.277	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_20_06	MW-6	Appendix IV	Mercury	mg/L	100%	2	3	5	5	15	NA	0.277	0.277	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_20_07	MW-7	Appendix IV	Mercury	mg/L	89%	3	0	4	2	9	NA	0.601	NA	0	0	1	0	1	NA	NA	NA	NA	NA
2_20_08	MW-8	Appendix IV	Mercury	mg/L	100%	3	0	4	2	9	NA	0.601	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_20_09	MW-9	Appendix IV	Mercury	mg/L	100%	3	0	4	2	9	NA	0.601	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_20_10	MW-10	Appendix IV	Mercury	mg/L	89%	3	0	4	2	9	NA	0.601	NA	0	0	1	0	1	NA	NA	NA	NA	NA
2_20_13	MW-13	Appendix IV	Mercury	mg/L	100%	1	2	3	0	6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_20_7B	MW-7B	Appendix IV	Mercury	mg/L	100%	0	3	2	0	5	NA	NA	0.495	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_21_02	MW-2	Appendix IV	Molybdenum	mg/L	0%	2	3	5	5	15	0.094	0.143	0.178	2	3	5	5	15	0.094	0.143	0.178	0.178	0.178
2_21_03	MW-3	Appendix IV	Molybdenum	mg/L	0%	1	1	2	0	4	0.325	0.746	0.749	1	1	2	0	4	0.325	0.746	0.749	0.749	0.749
2_21_05	MW-5	Appendix IV	Molybdenum	mg/L	0%	2	3	5	5	15	0.258	0.139	0.109	2	3	5	5	15	0.258	0.139	0.109	0.109	0.109
2_21_06	MW-6	Appendix IV	Molybdenum	mg/L	0%	2	3	5	5	15	0.108	0.115	0.144	2	3	5	5	15	0.108	0.115	0.144	0.144	0.144
2_21_07	MW-7	Appendix IV	Molybdenum	mg/L	0%	3	0	4	2	9	0.101	0.366	0.418	3	0	4	2	9	0.101	0.366	0.418	0.418	0.418
2_21_08	MW-8	Appendix IV	Molybdenum	mg/L	78%	3	0	4	2	9	0.359	0.416	0.435	0	0	1	1	2	0.317	NA	NA	NA	NA
2_21_09	MW-9	Appendix IV	Molybdenum	mg/L	100%	3	0	4	2	9	NA	NA	0.601	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_21_10	MW-10	Appendix IV	Molybdenum	mg/L	100%	3	0	4	2	9	NA	NA	0.601	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_21_13	MW-13	Appendix IV	Molybdenum	mg/L	100%	1	2	3	0	6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_21_7B	MW-7B	Appendix IV	Molybdenum	mg/L	100%	0	3	2	0	5	NA	0.495	0.495	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_23_02	MW-2	Appendix IV	Radium-226	pCi/L	0%	2	3	5	5	15	0.815	0.869	0.889	2	3	5	5	15	0.815	0.869	0.889	0.889	0.889
2_23_03	MW-3	Appendix IV	Radium-226	pCi/L	0%	1	1	2	0	4	0.259	0.489	0.615	1	1	2	0	4	0.259	0.489	0.615	0.615	0.615
2_23_05	MW-5	Appendix IV	Radium-226	pCi/L	0%	2	3	5	5	15	0.315	0.420	0.202	2	3	5	5	15	0.315	0.420	0.202	0.202	0.202
2_23_06	MW-6	Appendix IV	Radium-226	pCi/L	0%	2	3	5	5	15	0.065	0.055	NA	2	3	5	5	15	0.065	0.055	NA	NA	NA
2_23_07	MW-7	Appendix IV	Radium-226	pCi/L	0%	3	0	4	2	9	0.537	0.505	0.532	3	0	4	2	9	0.537	0.505	0.532	0.532	0.532

(Table continues on next page)

\*\*\* p < 0.001, \*\* p < 0.01, \* p < 0.05



**Table 7: Seasonality Tests (continued)**

ID	Well	Constituent Type	Constituent	Unit	% NDs	Full										Without Non-Detects											
						Sample Size					p-Value					Sample Size					p-Value						
						Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA						
2_23_08	MW-8	Appendix IV	Radium-226	pCi/L	0%	3	0	4	2	9	0.054	0.006	**	0.002	**	3	0	4	2	9	0.054	0.006	**	0.002	**		
2_23_09	MW-9	Appendix IV	Radium-226	pCi/L	0%	3	0	4	2	9	0.179	0.151		0.177		3	0	4	2	9	0.179	0.151		0.177			
2_23_10	MW-10	Appendix IV	Radium-226	pCi/L	0%	3	0	4	2	9	0.043	*	0.006	**	0.010	**	3	0	4	2	9	0.043	*	0.006	**	0.010	**
2_23_13	MW-13	Appendix IV	Radium-226	pCi/L	0%	1	2	3	0	6	0.538	0.732		0.728		1	2	3	0	6	0.538	0.732		0.728			
2_23_7B	MW-7B	Appendix IV	Radium-226	pCi/L	0%	0	3	2	0	5	1.000	0.929		0.786		0	3	2	0	5	1.000	0.929		0.786			
2_24_02	MW-2	Appendix IV	Radium-226/228	pCi/L	0%	2	3	5	5	15	0.505	0.411		0.562		2	3	5	5	15	0.505	0.411		0.562			
2_24_03	MW-3	Appendix IV	Radium-226/228	pCi/L	0%	1	1	2	0	4	0.861	0.817		0.803		1	1	2	0	4	0.861	0.817		0.803			
2_24_05	MW-5	Appendix IV	Radium-226/228	pCi/L	0%	2	3	5	5	15	0.135	0.128		0.103		2	3	5	5	15	0.135	0.128		0.103			
2_24_06	MW-6	Appendix IV	Radium-226/228	pCi/L	0%	2	3	5	5	15	0.152	0.036	*	NA		2	3	5	5	15	0.152	0.036	*	NA			
2_24_07	MW-7	Appendix IV	Radium-226/228	pCi/L	0%	3	0	4	2	9	0.962	0.867		0.823		3	0	4	2	9	0.962	0.867		0.823			
2_24_08	MW-8	Appendix IV	Radium-226/228	pCi/L	0%	3	0	4	2	9	0.179	0.162		0.133		3	0	4	2	9	0.179	0.162		0.133			
2_24_09	MW-9	Appendix IV	Radium-226/228	pCi/L	0%	3	0	4	2	9	0.287	0.355		0.422		3	0	4	2	9	0.287	0.355		0.422			
2_24_10	MW-10	Appendix IV	Radium-226/228	pCi/L	0%	3	0	4	2	9	0.043	*	0.033	*	0.023	*	3	0	4	2	9	0.043	*	0.033	*	0.023	*
2_24_13	MW-13	Appendix IV	Radium-226/228	pCi/L	0%	1	2	3	0	6	0.304	0.672		0.580		1	2	3	0	6	0.304	0.672		0.580			
2_24_7B	MW-7B	Appendix IV	Radium-226/228	pCi/L	0%	0	3	2	0	5	0.564	0.774		0.954		0	3	2	0	5	0.564	0.774		0.954			
2_25_02	MW-2	Appendix IV	Radium-228	pCi/L	0%	2	3	5	5	15	0.306	0.377		NA		2	3	5	5	15	0.306	0.377		NA			
2_25_03	MW-3	Appendix IV	Radium-228	pCi/L	0%	1	1	2	0	4	0.407	0.777		0.702		1	1	2	0	4	0.407	0.777		0.702			
2_25_05	MW-5	Appendix IV	Radium-228	pCi/L	0%	2	3	5	5	15	0.162	0.030	*	NA		2	3	5	5	15	0.162	0.030	*	NA			
2_25_06	MW-6	Appendix IV	Radium-228	pCi/L	0%	2	3	5	5	15	0.133	0.082		NA		2	3	5	5	15	0.133	0.082		NA			
2_25_07	MW-7	Appendix IV	Radium-228	pCi/L	0%	3	0	4	2	9	0.378	0.397		NA		3	0	4	2	9	0.378	0.397		NA			
2_25_08	MW-8	Appendix IV	Radium-228	pCi/L	0%	3	0	4	2	9	0.247	0.488		NA		3	0	4	2	9	0.247	0.488		NA			
2_25_09	MW-9	Appendix IV	Radium-228	pCi/L	0%	3	0	4	2	9	0.705	0.761		NA		3	0	4	2	9	0.705	0.761		NA			
2_25_10	MW-10	Appendix IV	Radium-228	pCi/L	0%	3	0	4	2	9	0.962	0.961		NA		3	0	4	2	9	0.962	0.961		NA			
2_25_13	MW-13	Appendix IV	Radium-228	pCi/L	0%	1	2	3	0	6	0.304	0.328		NA		1	2	3	0	6	0.304	0.328		NA			
2_25_7B	MW-7B	Appendix IV	Radium-228	pCi/L	0%	0	3	2	0	5	0.564	0.717		NA		0	3	2	0	5	0.564	0.717		NA			
2_26_02	MW-2	Appendix IV	Selenium	mg/L	100%	2	3	5	5	15	NA	0.277		NA		NA	NA	NA	NA	NA	NA	NA		NA			
2_26_03	MW-3	Appendix IV	Selenium	mg/L	100%	1	1	2	0	4	NA	NA		NA		NA	NA	NA	NA	NA	NA	NA		NA			
2_26_05	MW-5	Appendix IV	Selenium	mg/L	100%	2	3	5	5	15	NA	0.277		NA		NA	NA	NA	NA	NA	NA	NA		NA			
2_26_06	MW-6	Appendix IV	Selenium	mg/L	100%	2	3	5	5	15	NA	0.277		NA		NA	NA	NA	NA	NA	NA	NA		NA			
2_26_07	MW-7	Appendix IV	Selenium	mg/L	100%	3	0	4	2	9	NA	NA		0.601		NA	NA	NA	NA	NA	NA	NA		NA			
2_26_08	MW-8	Appendix IV	Selenium	mg/L	100%	3	0	4	2	9	NA	NA		0.601		NA	NA	NA	NA	NA	NA	NA		NA			
2_26_09	MW-9	Appendix IV	Selenium	mg/L	100%	3	0	4	2	9	NA	NA		0.601		NA	NA	NA	NA	NA	NA	NA		NA			
2_26_10	MW-10	Appendix IV	Selenium	mg/L	100%	3	0	4	2	9	NA	NA		0.601		NA	NA	NA	NA	NA	NA	NA		NA			
2_26_13	MW-13	Appendix IV	Selenium	mg/L	100%	1	2	3	0	6	NA	NA		NA		NA	NA	NA	NA	NA	NA	NA		NA			
2_26_7B	MW-7B	Appendix IV	Selenium	mg/L	100%	0	3	2	0	5	NA	0.495		0.495		NA	NA	NA	NA	NA	NA	NA		NA			
2_28_02	MW-2	Appendix IV	Thallium	mg/L	100%	2	3	5	5	15	NA	0.277		0.277		NA	NA	NA	NA	NA	NA	NA		NA			
2_28_03	MW-3	Appendix IV	Thallium	mg/L	100%	1	1	2	0	4	NA	NA		0.000	***	NA	NA	NA	NA	NA	NA	NA		NA			
2_28_05	MW-5	Appendix IV	Thallium	mg/L	100%	2	3	5	5	15	NA	0.277		0.277		NA	NA	NA	NA	NA	NA	NA		NA			
2_28_06	MW-6	Appendix IV	Thallium	mg/L	100%	2	3	5	5	15	NA	0.277		0.277		NA	NA	NA	NA	NA	NA	NA		NA			

(Table continues on next page)

\*\*\* p < 0.001, \*\* p < 0.01, \* p < 0.05



**Table 7: Seasonality Tests (continued)**

ID	Well	Constituent Type	Constituent	Unit	% NDs	Full							Without Non-Detects										
						Sample Size					p-Value			Sample Size					p-Value				
						Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA		
2_28_07	MW-7	Appendix IV	Thallium	mg/L	100%	3	0	4	2	9	NA	0.601	0.601	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_28_08	MW-8	Appendix IV	Thallium	mg/L	100%	3	0	4	2	9	NA	0.601	0.601	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_28_09	MW-9	Appendix IV	Thallium	mg/L	100%	3	0	4	2	9	NA	0.601	0.601	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_28_10	MW-10	Appendix IV	Thallium	mg/L	100%	3	0	4	2	9	NA	0.601	0.601	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_28_13	MW-13	Appendix IV	Thallium	mg/L	100%	1	2	3	0	6	NA	NA	0.000 ***	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_28_7B	MW-7B	Appendix IV	Thallium	mg/L	100%	0	3	2	0	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3_11_02	MW-2	Other	Bicarbonate	mg/L	0%	0	0	1	0	1	NA	NA	NA	0	0	1	0	1	NA	NA	NA	NA	NA
3_11_03	MW-3	Other	Bicarbonate	mg/L	0%	0	0	1	0	1	NA	NA	NA	0	0	1	0	1	NA	NA	NA	NA	NA
3_11_05	MW-5	Other	Bicarbonate	mg/L	0%	0	0	1	0	1	NA	NA	NA	0	0	1	0	1	NA	NA	NA	NA	NA
3_11_06	MW-6	Other	Bicarbonate	mg/L	0%	0	0	1	0	1	NA	NA	NA	0	0	1	0	1	NA	NA	NA	NA	NA
3_11_07	MW-7	Other	Bicarbonate	mg/L	0%	0	0	1	0	1	NA	NA	NA	0	0	1	0	1	NA	NA	NA	NA	NA
3_11_08	MW-8	Other	Bicarbonate	mg/L	0%	0	0	1	0	1	NA	NA	NA	0	0	1	0	1	NA	NA	NA	NA	NA
3_11_09	MW-9	Other	Bicarbonate	mg/L	0%	0	0	1	0	1	NA	NA	NA	0	0	1	0	1	NA	NA	NA	NA	NA
3_11_10	MW-10	Other	Bicarbonate	mg/L	0%	0	0	1	0	1	NA	NA	NA	0	0	1	0	1	NA	NA	NA	NA	NA
3_11_13	MW-13	Other	Bicarbonate	mg/L	0%	0	1	3	0	4	0.655	0.721	0.714	0	1	3	0	4	0.655	0.721	0.714	0.714	0.714
3_11_7B	MW-7B	Other	Bicarbonate	mg/L	0%	0	3	2	0	5	0.197	0.239	0.238	0	3	2	0	5	0.197	0.239	0.238	0.238	0.238
3_13_02	MW-2	Other	Carbonate	mg/L	100%	0	0	1	0	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3_13_03	MW-3	Other	Carbonate	mg/L	100%	0	0	1	0	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3_13_05	MW-5	Other	Carbonate	mg/L	100%	0	0	1	0	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3_13_06	MW-6	Other	Carbonate	mg/L	100%	0	0	1	0	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3_13_07	MW-7	Other	Carbonate	mg/L	100%	0	0	1	0	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3_13_08	MW-8	Other	Carbonate	mg/L	100%	0	0	1	0	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3_13_09	MW-9	Other	Carbonate	mg/L	100%	0	0	1	0	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3_13_10	MW-10	Other	Carbonate	mg/L	100%	0	0	1	0	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3_13_13	MW-13	Other	Carbonate	mg/L	100%	0	1	3	0	4	NA	NA	0.000 ***	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3_13_7B	MW-7B	Other	Carbonate	mg/L	100%	0	3	2	0	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3_16_02	MW-2	Other	Hardness	mg/L	0%	0	0	1	0	1	NA	NA	NA	0	0	1	0	1	NA	NA	NA	NA	NA
3_16_03	MW-3	Other	Hardness	mg/L	0%	0	0	1	0	1	NA	NA	NA	0	0	1	0	1	NA	NA	NA	NA	NA
3_16_05	MW-5	Other	Hardness	mg/L	0%	0	0	1	0	1	NA	NA	NA	0	0	1	0	1	NA	NA	NA	NA	NA
3_16_06	MW-6	Other	Hardness	mg/L	0%	0	0	1	0	1	NA	NA	NA	0	0	1	0	1	NA	NA	NA	NA	NA
3_16_07	MW-7	Other	Hardness	mg/L	0%	0	0	1	0	1	NA	NA	NA	0	0	1	0	1	NA	NA	NA	NA	NA
3_16_08	MW-8	Other	Hardness	mg/L	0%	0	0	1	0	1	NA	NA	NA	0	0	1	0	1	NA	NA	NA	NA	NA
3_16_09	MW-9	Other	Hardness	mg/L	0%	0	0	1	0	1	NA	NA	NA	0	0	1	0	1	NA	NA	NA	NA	NA
3_16_10	MW-10	Other	Hardness	mg/L	0%	0	0	1	0	1	NA	NA	NA	0	0	1	0	1	NA	NA	NA	NA	NA
3_16_13	MW-13	Other	Hardness	mg/L	0%	0	1	3	0	4	0.180	0.626	0.623	0	1	3	0	4	0.180	0.626	0.623	0.623	0.623
3_16_7B	MW-7B	Other	Hardness	mg/L	0%	0	3	2	0	5	0.564	0.342	0.358	0	3	2	0	5	0.564	0.342	0.358	0.358	0.358
3_19_02	MW-2	Other	Magnesium	mg/L	0%	0	0	1	0	1	NA	NA	NA	0	0	1	0	1	NA	NA	NA	NA	NA
3_19_03	MW-3	Other	Magnesium	mg/L	0%	0	0	1	0	1	NA	NA	NA	0	0	1	0	1	NA	NA	NA	NA	NA
3_19_05	MW-5	Other	Magnesium	mg/L	0%	0	0	1	0	1	NA	NA	NA	0	0	1	0	1	NA	NA	NA	NA	NA

(Table continues on next page)

\*\*\* p < 0.001, \*\* p < 0.01, \* p < 0.05





**Table 7: Seasonality Tests (continued)**

ID	Well	Constituent Type	Constituent	Unit	% NDs	Full							Without Non-Detects										
						Sample Size					p-Value			Sample Size					p-Value				
						Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA		
3_19_06	MW-6	Other	Magnesium	mg/L	0%	0	0	1	0	1	NA	NA	NA	0	0	1	0	1	NA	NA	NA		
3_19_07	MW-7	Other	Magnesium	mg/L	0%	0	0	1	0	1	NA	NA	NA	0	0	1	0	1	NA	NA	NA		
3_19_08	MW-8	Other	Magnesium	mg/L	0%	0	0	1	0	1	NA	NA	NA	0	0	1	0	1	NA	NA	NA		
3_19_09	MW-9	Other	Magnesium	mg/L	0%	0	0	1	0	1	NA	NA	NA	0	0	1	0	1	NA	NA	NA		
3_19_10	MW-10	Other	Magnesium	mg/L	0%	0	0	1	0	1	NA	NA	NA	0	0	1	0	1	NA	NA	NA		
3_19_13	MW-13	Other	Magnesium	mg/L	0%	0	2	3	0	5	1.000	0.607	0.646	0	2	3	0	5	1.000	0.607	0.646		
3_19_7B	MW-7B	Other	Magnesium	mg/L	0%	0	3	2	0	5	0.564	0.957	0.995	0	3	2	0	5	0.564	0.957	0.995		
3_22_02	MW-2	Other	Potassium	mg/L	0%	0	0	1	0	1	NA	NA	NA	0	0	1	0	1	NA	NA	NA		
3_22_03	MW-3	Other	Potassium	mg/L	0%	0	0	1	0	1	NA	NA	NA	0	0	1	0	1	NA	NA	NA		
3_22_05	MW-5	Other	Potassium	mg/L	0%	0	0	1	0	1	NA	NA	NA	0	0	1	0	1	NA	NA	NA		
3_22_06	MW-6	Other	Potassium	mg/L	0%	0	0	1	0	1	NA	NA	NA	0	0	1	0	1	NA	NA	NA		
3_22_07	MW-7	Other	Potassium	mg/L	0%	0	0	1	0	1	NA	NA	NA	0	0	1	0	1	NA	NA	NA		
3_22_08	MW-8	Other	Potassium	mg/L	0%	0	0	1	0	1	NA	NA	NA	0	0	1	0	1	NA	NA	NA		
3_22_09	MW-9	Other	Potassium	mg/L	0%	0	0	1	0	1	NA	NA	NA	0	0	1	0	1	NA	NA	NA		
3_22_10	MW-10	Other	Potassium	mg/L	0%	0	0	1	0	1	NA	NA	NA	0	0	1	0	1	NA	NA	NA		
3_22_13	MW-13	Other	Potassium	mg/L	0%	0	2	3	0	5	0.083	0.092	0.091	0	2	3	0	5	0.083	0.092	0.091		
3_22_7B	MW-7B	Other	Potassium	mg/L	0%	0	3	2	0	5	0.248	0.390	0.396	0	3	2	0	5	0.248	0.390	0.396		
3_27_02	MW-2	Other	Sodium	mg/L	0%	0	0	1	0	1	NA	NA	NA	0	0	1	0	1	NA	NA	NA		
3_27_03	MW-3	Other	Sodium	mg/L	0%	0	0	1	0	1	NA	NA	NA	0	0	1	0	1	NA	NA	NA		
3_27_05	MW-5	Other	Sodium	mg/L	0%	0	0	1	0	1	NA	NA	NA	0	0	1	0	1	NA	NA	NA		
3_27_06	MW-6	Other	Sodium	mg/L	0%	0	0	1	0	1	NA	NA	NA	0	0	1	0	1	NA	NA	NA		
3_27_07	MW-7	Other	Sodium	mg/L	0%	0	0	1	0	1	NA	NA	NA	0	0	1	0	1	NA	NA	NA		
3_27_08	MW-8	Other	Sodium	mg/L	0%	0	0	1	0	1	NA	NA	NA	0	0	1	0	1	NA	NA	NA		
3_27_09	MW-9	Other	Sodium	mg/L	0%	0	0	1	0	1	NA	NA	NA	0	0	1	0	1	NA	NA	NA		
3_27_10	MW-10	Other	Sodium	mg/L	0%	0	0	1	0	1	NA	NA	NA	0	0	1	0	1	NA	NA	NA		
3_27_13	MW-13	Other	Sodium	mg/L	0%	0	2	3	0	5	0.248	0.284	0.292	0	2	3	0	5	0.248	0.284	0.292		
3_27_7B	MW-7B	Other	Sodium	mg/L	0%	0	3	2	0	5	0.248	0.364	0.372	0	3	2	0	5	0.248	0.364	0.372		
3_29_02	MW-2	Other	Total Suspended Solids	mg/L	27%	2	3	5	5	15	0.317	0.353	0.333	2	2	3	4	11	0.174	0.129	0.240		
3_29_03	MW-3	Other	Total Suspended Solids	mg/L	0%	1	1	2	0	4	0.861	0.949	0.941	1	1	2	0	4	0.861	0.949	0.941		
3_29_05	MW-5	Other	Total Suspended Solids	mg/L	0%	2	3	5	5	15	0.529	0.480	0.669	2	3	5	5	15	0.529	0.480	0.669		
3_29_06	MW-6	Other	Total Suspended Solids	mg/L	73%	2	3	5	5	15	0.221	0.069	0.099	1	1	1	1	4	0.392	NA	NA		
3_29_07	MW-7	Other	Total Suspended Solids	mg/L	89%	3	0	4	2	9	0.368	0.422	0.422	1	0	0	0	1	NA	NA	NA		
3_29_08	MW-8	Other	Total Suspended Solids	mg/L	89%	3	0	4	2	9	0.368	0.422	0.422	1	0	0	0	1	NA	NA	NA		
3_29_09	MW-9	Other	Total Suspended Solids	mg/L	100%	3	0	4	2	9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		
3_29_10	MW-10	Other	Total Suspended Solids	mg/L	100%	3	0	4	2	9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		
3_29_13	MW-13	Other	Total Suspended Solids	mg/L	100%	1	2	3	0	6	NA	0.000	***	NA	NA	NA	NA	NA	NA	NA	NA	NA	
3_29_7B	MW-7B	Other	Total Suspended Solids	mg/L	100%	0	3	2	0	5	NA	0.495	0.495	NA	NA	NA	NA	NA	NA	NA	NA	NA	
4_30_02	MW-2	Field Parameters	Conductivity	mS/cm	0%	2	3	5	5	15	0.031	*	0.146	0.178	2	3	5	5	15	0.031	*	0.146	0.178
4_30_03	MW-3	Field Parameters	Conductivity	mS/cm	0%	1	1	2	0	4	0.861	0.894	0.893	1	1	2	0	4	0.861	0.894	0.893		

(Table continues on next page)

\*\*\* p < 0.001, \*\* p < 0.01, \* p < 0.05



**Table 7: Seasonality Tests (continued)**

ID	Well	Constituent Type	Constituent	Unit	% NDs	Full										Without Non-Detects									
						Sample Size					p-Value					Sample Size					p-Value				
						Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA				
4_30_05	MW-5	Field Parameters	Conductivity	mS/cm	0%	2	3	5	5	15	0.072	0.043 *	0.022 *	2	3	5	5	15	0.072	0.043 *	0.022 *				
4_30_06	MW-6	Field Parameters	Conductivity	mS/cm	0%	2	3	5	5	15	0.010 *	0.000 ***	0.000 ***	2	3	5	5	15	0.010 *	0.000 ***	0.000 ***				
4_30_07	MW-7	Field Parameters	Conductivity	mS/cm	0%	3	0	4	2	9	0.108	0.122	0.136	3	0	4	2	9	0.108	0.122	0.136				
4_30_08	MW-8	Field Parameters	Conductivity	mS/cm	0%	3	0	4	2	9	0.208	0.113	0.115	3	0	4	2	9	0.208	0.113	0.115				
4_30_09	MW-9	Field Parameters	Conductivity	mS/cm	0%	3	0	4	2	9	0.047 *	0.025 *	0.028 *	3	0	4	2	9	0.047 *	0.025 *	0.028 *				
4_30_10	MW-10	Field Parameters	Conductivity	mS/cm	0%	3	0	4	2	9	0.116	0.163	0.172	3	0	4	2	9	0.116	0.163	0.172				
4_30_13	MW-13	Field Parameters	Conductivity	mS/cm	0%	1	2	3	0	6	0.343	0.338	0.382	1	2	3	0	6	0.343	0.338	0.382				
4_30_7B	MW-7B	Field Parameters	Conductivity	mS/cm	0%	0	3	2	0	5	0.139	0.483	0.481	0	3	2	0	5	0.139	0.483	0.481				
4_31_02	MW-2	Field Parameters	Dissolved Oxygen	mg/L	0%	2	3	5	5	15	0.768	0.714	0.668	2	3	5	5	15	0.768	0.714	0.668				
4_31_03	MW-3	Field Parameters	Dissolved Oxygen	mg/L	0%	1	1	2	0	4	0.861	0.885	0.880	1	1	2	0	4	0.861	0.885	0.880				
4_31_05	MW-5	Field Parameters	Dissolved Oxygen	mg/L	0%	2	3	5	5	15	0.185	0.214	0.112	2	3	5	5	15	0.185	0.214	0.112				
4_31_06	MW-6	Field Parameters	Dissolved Oxygen	mg/L	0%	2	3	5	5	15	0.638	0.746	0.518	2	3	5	5	15	0.638	0.746	0.518				
4_31_07	MW-7	Field Parameters	Dissolved Oxygen	mg/L	11%	3	0	4	2	9	0.400	0.566	NA	3	0	3	2	8	0.496	0.615	NA				
4_31_08	MW-8	Field Parameters	Dissolved Oxygen	mg/L	0%	3	0	4	2	9	0.856	0.491	0.706	3	0	4	2	9	0.856	0.491	0.706				
4_31_09	MW-9	Field Parameters	Dissolved Oxygen	mg/L	0%	3	0	4	2	9	0.108	0.084	0.107	3	0	4	2	9	0.108	0.084	0.107				
4_31_10	MW-10	Field Parameters	Dissolved Oxygen	mg/L	0%	3	0	4	2	9	0.170	0.222	0.269	3	0	4	2	9	0.170	0.222	0.269				
4_31_13	MW-13	Field Parameters	Dissolved Oxygen	mg/L	0%	1	2	3	0	6	0.343	0.213	0.095	1	2	3	0	6	0.343	0.213	0.095				
4_31_7B	MW-7B	Field Parameters	Dissolved Oxygen	mg/L	0%	0	3	2	0	5	0.248	0.379	0.287	0	3	2	0	5	0.248	0.379	0.287				
4_32_02	MW-2	Field Parameters	Oxidation Reduction Potential	mV	0%	2	3	5	5	15	0.585	0.644	NA	2	3	5	5	15	0.585	0.644	NA				
4_32_03	MW-3	Field Parameters	Oxidation Reduction Potential	mV	0%	1	1	2	0	4	0.259	0.431	NA	1	1	2	0	4	0.259	0.431	NA				
4_32_05	MW-5	Field Parameters	Oxidation Reduction Potential	mV	0%	2	3	5	5	15	0.688	0.801	NA	2	3	5	5	15	0.688	0.801	NA				
4_32_06	MW-6	Field Parameters	Oxidation Reduction Potential	mV	0%	2	3	5	5	15	0.662	0.749	NA	2	3	5	5	15	0.662	0.749	NA				
4_32_07	MW-7	Field Parameters	Oxidation Reduction Potential	mV	0%	3	0	4	2	9	0.705	0.505	NA	3	0	4	2	9	0.705	0.505	NA				
4_32_08	MW-8	Field Parameters	Oxidation Reduction Potential	mV	0%	3	0	4	2	9	0.574	0.799	0.803	3	0	4	2	9	0.574	0.799	0.803				
4_32_09	MW-9	Field Parameters	Oxidation Reduction Potential	mV	0%	3	0	4	2	9	0.870	0.853	0.905	3	0	4	2	9	0.870	0.853	0.905				
4_32_10	MW-10	Field Parameters	Oxidation Reduction Potential	mV	0%	3	0	4	2	9	0.583	0.615	0.644	3	0	4	2	9	0.583	0.615	0.644				
4_32_13	MW-13	Field Parameters	Oxidation Reduction Potential	mV	0%	1	2	3	0	6	0.213	0.167	0.201	1	2	3	0	6	0.213	0.167	0.201				
4_32_7B	MW-7B	Field Parameters	Oxidation Reduction Potential	mV	0%	0	3	2	0	5	1.000	0.963	NA	0	3	2	0	5	1.000	0.963	NA				
4_33_02	MW-2	Field Parameters	Temperature	°C	0%	2	3	5	5	15	0.057	0.013 *	0.010 *	2	3	5	5	15	0.057	0.013 *	0.010 *				
4_33_03	MW-3	Field Parameters	Temperature	°C	0%	1	1	2	0	4	0.259	0.023 *	0.021 *	1	1	2	0	4	0.259	0.023 *	0.021 *				
4_33_05	MW-5	Field Parameters	Temperature	°C	0%	2	3	5	5	15	0.053	0.013 *	0.005 **	2	3	5	5	15	0.053	0.013 *	0.005 **				
4_33_06	MW-6	Field Parameters	Temperature	°C	0%	2	3	5	5	15	0.503	0.381	0.361	2	3	5	5	15	0.503	0.381	0.361				
4_33_07	MW-7	Field Parameters	Temperature	°C	0%	3	0	4	2	9	0.064	0.017 *	0.024 *	3	0	4	2	9	0.064	0.017 *	0.024 *				
4_33_08	MW-8	Field Parameters	Temperature	°C	0%	3	0	4	2	9	0.116	0.049 *	0.060	3	0	4	2	9	0.116	0.049 *	0.060				
4_33_09	MW-9	Field Parameters	Temperature	°C	0%	3	0	4	2	9	0.064	0.007 **	0.007 **	3	0	4	2	9	0.064	0.007 **	0.007 **				
4_33_10	MW-10	Field Parameters	Temperature	°C	0%	3	0	4	2	9	0.067	0.016 *	0.015 *	3	0	4	2	9	0.067	0.016 *	0.015 *				
4_33_13	MW-13	Field Parameters	Temperature	°C	0%	1	2	3	0	6	0.117	0.055	0.028 *	1	2	3	0	6	0.117	0.055	0.028 *				
4_33_7B	MW-7B	Field Parameters	Temperature	°C	0%	0	3	2	0	5	0.083	0.129	0.137	0	3	2	0	5	0.083	0.129	0.137				
4_34_02	MW-2	Field Parameters	Turbidity	NTU	0%	2	3	5	5	15	0.265	0.257	0.223	2	3	5	5	15	0.265	0.257	0.223				

(Table continues on next page)

\*\*\* p < 0.001, \*\* p < 0.01, \* p < 0.05





**Table 7: Seasonality Tests (continued)**

ID	Well	Constituent Type	Constituent	Unit	% NDs	Full							Without Non-Detects								
						Sample Size					p-Value		Sample Size					p-Value			
						Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA
4_34_03	MW-3	Field Parameters	Turbidity	NTU	0%	1	1	2	0	4	0.259	0.476	0.317	1	1	2	0	4	0.259	0.476	0.317
4_34_05	MW-5	Field Parameters	Turbidity	NTU	0%	2	3	5	5	15	0.066	0.048 *	0.011 *	2	3	5	5	15	0.066	0.048 *	0.011 *
4_34_06	MW-6	Field Parameters	Turbidity	NTU	0%	2	3	5	5	15	0.147	0.394	0.081	2	3	5	5	15	0.147	0.394	0.081
4_34_07	MW-7	Field Parameters	Turbidity	NTU	0%	3	0	4	2	9	0.135	0.079	0.062	3	0	4	2	9	0.135	0.079	0.062
4_34_08	MW-8	Field Parameters	Turbidity	NTU	0%	3	0	4	2	9	0.432	0.406	0.408	3	0	4	2	9	0.432	0.406	0.408
4_34_09	MW-9	Field Parameters	Turbidity	NTU	0%	3	0	4	2	9	0.233	0.173	0.188	3	0	4	2	9	0.233	0.173	0.188
4_34_10	MW-10	Field Parameters	Turbidity	NTU	0%	3	0	4	2	9	0.705	0.668	0.851	3	0	4	2	9	0.705	0.668	0.851
4_34_13	MW-13	Field Parameters	Turbidity	NTU	0%	1	2	3	0	6	0.304	0.529	0.539	1	2	3	0	6	0.304	0.529	0.539
4_34_7B	MW-7B	Field Parameters	Turbidity	NTU	0%	0	3	2	0	5	0.564	0.851	0.559	0	3	2	0	5	0.564	0.851	0.559
5_36_02	MW-2	Part 115	Copper	mg/L	100%	2	3	5	5	15	NA	0.277	NA	NA	NA	NA	NA	NA	NA	NA	NA
5_36_03	MW-3	Part 115	Copper	mg/L	100%	1	1	2	0	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5_36_05	MW-5	Part 115	Copper	mg/L	67%	2	3	5	5	15	0.844	0.705	0.760	1	1	2	1	5	0.849	0.952	0.964
5_36_06	MW-6	Part 115	Copper	mg/L	100%	2	3	5	5	15	NA	0.277	NA	NA	NA	NA	NA	NA	NA	NA	NA
5_36_07	MW-7	Part 115	Copper	mg/L	100%	3	0	4	2	9	NA	NA	0.601	NA	NA	NA	NA	NA	NA	NA	NA
5_36_08	MW-8	Part 115	Copper	mg/L	100%	3	0	4	2	9	NA	NA	0.601	NA	NA	NA	NA	NA	NA	NA	NA
5_36_09	MW-9	Part 115	Copper	mg/L	100%	3	0	4	2	9	NA	NA	0.601	NA	NA	NA	NA	NA	NA	NA	NA
5_36_10	MW-10	Part 115	Copper	mg/L	100%	3	0	4	2	9	NA	NA	0.601	NA	NA	NA	NA	NA	NA	NA	NA
5_36_13	MW-13	Part 115	Copper	mg/L	100%	1	2	3	0	6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5_36_7B	MW-7B	Part 115	Copper	mg/L	100%	0	3	2	0	5	NA	0.495	0.495	NA	NA	NA	NA	NA	NA	NA	NA
5_37_02	MW-2	Part 115	Iron	mg/L	0%	2	3	5	5	15	0.683	0.203	0.380	2	3	5	5	15	0.683	0.203	0.380
5_37_03	MW-3	Part 115	Iron	mg/L	0%	1	1	2	0	4	0.861	0.929	0.927	1	1	2	0	4	0.861	0.929	0.927
5_37_05	MW-5	Part 115	Iron	mg/L	7%	2	3	5	5	15	0.083	0.182	0.071	2	3	5	4	14	0.147	0.253	0.133
5_37_06	MW-6	Part 115	Iron	mg/L	47%	2	3	5	5	15	0.151	0.114	0.111	1	2	5	0	8	0.129	0.083	0.098
5_37_07	MW-7	Part 115	Iron	mg/L	0%	3	0	4	2	9	0.030 *	0.205	0.140	3	0	4	2	9	0.030 *	0.205	0.140
5_37_08	MW-8	Part 115	Iron	mg/L	89%	3	0	4	2	9	NA	NA	0.601	1	0	0	0	1	NA	NA	NA
5_37_09	MW-9	Part 115	Iron	mg/L	100%	3	0	4	2	9	NA	NA	0.601	NA	NA	NA	NA	NA	NA	NA	NA
5_37_10	MW-10	Part 115	Iron	mg/L	100%	3	0	4	2	9	NA	NA	0.601	NA	NA	NA	NA	NA	NA	NA	NA
5_37_13	MW-13	Part 115	Iron	mg/L	17%	1	2	3	0	6	0.298	0.651	0.537	1	1	3	0	5	0.496	0.833	0.763
5_37_7B	MW-7B	Part 115	Iron	mg/L	0%	0	3	2	0	5	0.554	0.735	0.625	0	3	2	0	5	0.554	0.735	0.625
5_38_02	MW-2	Part 115	Nickel	mg/L	0%	2	3	5	5	15	0.010 **	0.019 *	0.028 *	2	3	5	5	15	0.010 **	0.019 *	0.028 *
5_38_03	MW-3	Part 115	Nickel	mg/L	100%	1	1	2	0	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5_38_05	MW-5	Part 115	Nickel	mg/L	0%	2	3	5	5	15	0.273	0.282	0.333	2	3	5	5	15	0.273	0.282	0.333
5_38_06	MW-6	Part 115	Nickel	mg/L	13%	2	3	5	5	15	0.070	0.046 *	0.043 *	2	2	4	5	13	0.058	0.015 *	0.010 *
5_38_07	MW-7	Part 115	Nickel	mg/L	100%	3	0	4	2	9	NA	NA	0.601	NA	NA	NA	NA	NA	NA	NA	NA
5_38_08	MW-8	Part 115	Nickel	mg/L	100%	3	0	4	2	9	NA	NA	0.601	NA	NA	NA	NA	NA	NA	NA	NA
5_38_09	MW-9	Part 115	Nickel	mg/L	100%	3	0	4	2	9	NA	NA	0.601	NA	NA	NA	NA	NA	NA	NA	NA
5_38_10	MW-10	Part 115	Nickel	mg/L	100%	3	0	4	2	9	NA	NA	0.601	NA	NA	NA	NA	NA	NA	NA	NA
5_38_13	MW-13	Part 115	Nickel	mg/L	100%	1	2	3	0	6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5_38_7B	MW-7B	Part 115	Nickel	mg/L	100%	0	3	2	0	5	NA	0.495	0.495	NA	NA	NA	NA	NA	NA	NA	NA

(Table continues on next page)

\*\*\* p < 0.001, \*\* p < 0.01, \* p < 0.05



**Table 7: Seasonality Tests (continued)**

ID	Well	Constituent Type	Constituent	Unit	% NDs	Full							Without Non-Detects											
						Sample Size					p-Value		Sample Size					p-Value						
						Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA			
5_39_02	MW-2	Part 115	Silver	mg/L	100%	2	3	5	5	15	NA	0.277	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
5_39_03	MW-3	Part 115	Silver	mg/L	100%	1	1	2	0	4	NA	NA	0.000 ***	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5_39_05	MW-5	Part 115	Silver	mg/L	100%	2	3	5	5	15	NA	0.277	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5_39_06	MW-6	Part 115	Silver	mg/L	100%	2	3	5	5	15	NA	0.277	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5_39_07	MW-7	Part 115	Silver	mg/L	100%	3	0	4	2	9	NA	0.601	0.601	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5_39_08	MW-8	Part 115	Silver	mg/L	100%	3	0	4	2	9	NA	0.601	0.601	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5_39_09	MW-9	Part 115	Silver	mg/L	100%	3	0	4	2	9	NA	0.601	0.601	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5_39_10	MW-10	Part 115	Silver	mg/L	100%	3	0	4	2	9	NA	0.601	0.601	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5_39_13	MW-13	Part 115	Silver	mg/L	100%	1	2	3	0	6	NA	NA	0.000 ***	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5_39_7B	MW-7B	Part 115	Silver	mg/L	100%	0	3	2	0	5	NA	NA	0.495	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5_40_02	MW-2	Part 115	Vanadium	mg/L	100%	2	3	5	5	15	NA	0.277	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5_40_03	MW-3	Part 115	Vanadium	mg/L	100%	1	1	2	0	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5_40_05	MW-5	Part 115	Vanadium	mg/L	87%	2	3	5	5	15	0.221	0.277	0.261	1	1	0	0	2	0.317	NA	NA	NA	NA	NA
5_40_06	MW-6	Part 115	Vanadium	mg/L	100%	2	3	5	5	15	NA	0.277	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5_40_07	MW-7	Part 115	Vanadium	mg/L	100%	3	0	4	2	9	NA	NA	0.601	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5_40_08	MW-8	Part 115	Vanadium	mg/L	100%	3	0	4	2	9	NA	NA	0.601	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5_40_09	MW-9	Part 115	Vanadium	mg/L	100%	3	0	4	2	9	NA	NA	0.601	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5_40_10	MW-10	Part 115	Vanadium	mg/L	100%	3	0	4	2	9	NA	NA	0.601	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5_40_13	MW-13	Part 115	Vanadium	mg/L	100%	1	2	3	0	6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5_40_7B	MW-7B	Part 115	Vanadium	mg/L	100%	0	3	2	0	5	NA	0.495	0.495	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5_41_02	MW-2	Part 115	Zinc	mg/L	80%	2	3	5	5	15	0.471	0.299	0.345	1	1	1	0	3	0.368	NA	NA	NA	NA	NA
5_41_03	MW-3	Part 115	Zinc	mg/L	100%	1	1	2	0	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5_41_05	MW-5	Part 115	Zinc	mg/L	27%	2	3	5	5	15	0.076	0.001 ***	0.007 **	2	2	5	2	11	0.085	0.009 **	0.016 *			
5_41_06	MW-6	Part 115	Zinc	mg/L	93%	2	3	5	5	15	0.261	0.277	0.277	0	1	0	0	1	NA	NA	NA	NA	NA	NA
5_41_07	MW-7	Part 115	Zinc	mg/L	67%	3	0	4	2	9	0.090	0.295	0.198	0	0	3	0	3	NA	NA	NA	NA	NA	NA
5_41_08	MW-8	Part 115	Zinc	mg/L	100%	3	0	4	2	9	NA	NA	0.601	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5_41_09	MW-9	Part 115	Zinc	mg/L	89%	3	0	4	2	9	0.368	0.422	0.422	1	0	0	0	1	NA	NA	NA	NA	NA	NA
5_41_10	MW-10	Part 115	Zinc	mg/L	78%	3	0	4	2	9	0.659	0.524	0.592	1	0	1	0	2	0.317	NA	NA	NA	NA	NA
5_41_13	MW-13	Part 115	Zinc	mg/L	83%	1	2	3	0	6	0.607	0.716	0.716	0	0	1	0	1	NA	NA	NA	NA	NA	NA
5_41_7B	MW-7B	Part 115	Zinc	mg/L	100%	0	3	2	0	5	NA	0.495	0.495	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

\*\*\* p < 0.001, \*\* p < 0.01, \* p < 0.05

**Table 8:** Trend Tests: Lognormal MLE and MK

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Type	Method	Slope	p-value	Trend
1_01_02	MW-2	Appendix III	Boron	mg/L	14	0	0%	Parametric	Lognormal MLE	0.000261	0.207	↔
1_01_05	MW-5	Appendix III	Boron	mg/L	14	0	0%	Nonparametric	MK	-0.00103	0.170	↔
1_01_06	MW-6	Appendix III	Boron	mg/L	14	0	0%	Parametric	Lognormal MLE	0.0000645	0.806	↔
1_01_07	MW-7	Appendix III	Boron	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.000152	0.749	↔
1_01_08	MW-8	Appendix III	Boron	mg/L	9	1	11%	Parametric	Lognormal MLE	-0.00205	0.141	↔
1_01_10	MW-10	Appendix III	Boron	mg/L	9	0	0%	Nonparametric	MK	0	1.000	↔
1_02_02	MW-2	Appendix III	Calcium	mg/L	14	0	0%	Parametric	Lognormal MLE	-0.000293	0.000	↓
1_02_05	MW-5	Appendix III	Calcium	mg/L	14	0	0%	Parametric	Lognormal MLE	-0.000976	0.004	↓
1_02_06	MW-6	Appendix III	Calcium	mg/L	14	0	0%	Parametric	Lognormal MLE	0.0000158	0.891	↔
1_02_07	MW-7	Appendix III	Calcium	mg/L	9	0	0%	Parametric	Lognormal MLE	0.000143	0.616	↔
1_02_08	MW-8	Appendix III	Calcium	mg/L	9	0	0%	Parametric	Lognormal MLE	0.000197	0.072	↔
1_02_09	MW-9	Appendix III	Calcium	mg/L	9	0	0%	Parametric	Lognormal MLE	0.0000633	0.799	↔
1_02_10	MW-10	Appendix III	Calcium	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.0000673	0.742	↔
1_03_02	MW-2	Appendix III	Chloride	mg/L	14	0	0%	Parametric	Lognormal MLE	0.000168	0.095	↔
1_03_05	MW-5	Appendix III	Chloride	mg/L	14	0	0%	Parametric	Lognormal MLE	-0.000457	0.001	↓
1_03_06	MW-6	Appendix III	Chloride	mg/L	14	0	0%	Parametric	Lognormal MLE	-0.0000653	0.768	↔
1_03_07	MW-7	Appendix III	Chloride	mg/L	9	0	0%	Nonparametric	MK	0.0189	0.138	↔
1_03_08	MW-8	Appendix III	Chloride	mg/L	9	2	22%	Parametric	Lognormal MLE	-0.00207	0.423	↔
1_05_02	MW-2	Appendix III	Sulfate	mg/L	14	0	0%	Parametric	Lognormal MLE	-0.000360	0.042	↔
1_05_05	MW-5	Appendix III	Sulfate	mg/L	14	0	0%	Parametric	Lognormal MLE	-0.00111	0.004	↓
1_05_06	MW-6	Appendix III	Sulfate	mg/L	14	0	0%	Parametric	Lognormal MLE	-0.000255	0.382	↔
1_05_07	MW-7	Appendix III	Sulfate	mg/L	9	0	0%	Parametric	Lognormal MLE	0.000181	0.565	↔
1_05_08	MW-8	Appendix III	Sulfate	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00235	0.034	↔
1_05_10	MW-10	Appendix III	Sulfate	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.000199	0.750	↔
1_06_02	MW-2	Appendix III	Total Dissolved Solids	mg/L	14	0	0%	Parametric	Lognormal MLE	-0.000238	0.005	↓
1_06_05	MW-5	Appendix III	Total Dissolved Solids	mg/L	14	0	0%	Parametric	Lognormal MLE	-0.000815	0.001	↓
1_06_06	MW-6	Appendix III	Total Dissolved Solids	mg/L	14	0	0%	Parametric	Lognormal MLE	-0.0000561	0.685	↔
1_06_07	MW-7	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	Parametric	Lognormal MLE	0.000245	0.241	↔
1_06_08	MW-8	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.0000443	0.675	↔
1_06_09	MW-9	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	Parametric	Lognormal MLE	0.000185	0.172	↔
1_06_10	MW-10	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	Parametric	Lognormal MLE	0.0000156	0.941	↔
1_35_02	MW-2	Appendix III	pH	su	15	0	0%	Parametric	Lognormal MLE	0.00000856	0.653	↔
1_35_05	MW-5	Appendix III	pH	su	15	0	0%	Nonparametric	MK	0	1.000	↔
1_35_06	MW-6	Appendix III	pH	su	15	0	0%	Parametric	Lognormal MLE	0.0000134	0.641	↔
1_35_07	MW-7	Appendix III	pH	su	9	0	0%	Nonparametric	MK	0	1.000	↔
1_35_08	MW-8	Appendix III	pH	su	9	0	0%	Parametric	Lognormal MLE	-0.0000728	0.400	↔
1_35_09	MW-9	Appendix III	pH	su	9	0	0%	Parametric	Lognormal MLE	-0.0000196	0.768	↔
1_35_10	MW-10	Appendix III	pH	su	9	0	0%	Parametric	Lognormal MLE	-0.0000789	0.374	↔
2_08_07	MW-7	Appendix IV	Arsenic	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00104	0.000	↓
2_09_02	MW-2	Appendix IV	Barium	mg/L	15	0	0%	Parametric	Lognormal MLE	0.0000980	0.178	↔
2_09_05	MW-5	Appendix IV	Barium	mg/L	15	0	0%	Parametric	Lognormal MLE	-0.000157	0.411	↔
2_09_06	MW-6	Appendix IV	Barium	mg/L	15	0	0%	Parametric	Lognormal MLE	-0.000261	0.031	↔
2_09_07	MW-7	Appendix IV	Barium	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.000265	0.192	↔

(Table continues on next page)

**Table 8:** Trend Tests: Lognormal MLE and MK (*continued*)

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Type	Method	Slope	p-value	Trend
2_09_08	MW-8	Appendix IV	Barium	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.000891	0.004	↓
2_09_09	MW-9	Appendix IV	Barium	mg/L	9	0	0%	Nonparametric	MK	-0.0000528	0.091	↔
2_09_10	MW-10	Appendix IV	Barium	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.000453	0.001	↓
2_18_02	MW-2	Appendix IV	Lithium	mg/L	15	0	0%	Parametric	Lognormal MLE	-0.0000396	0.750	↔
2_18_05	MW-5	Appendix IV	Lithium	mg/L	15	0	0%	Parametric	Lognormal MLE	-0.000613	0.168	↔
2_18_06	MW-6	Appendix IV	Lithium	mg/L	15	0	0%	Parametric	Lognormal MLE	0.000106	0.525	↔
2_18_07	MW-7	Appendix IV	Lithium	mg/L	9	0	0%	Parametric	Lognormal MLE	0.0000171	0.933	↔
2_21_02	MW-2	Appendix IV	Molybdenum	mg/L	15	0	0%	Parametric	Lognormal MLE	0.000315	0.062	↔
2_21_05	MW-5	Appendix IV	Molybdenum	mg/L	15	0	0%	Parametric	Lognormal MLE	-0.000887	0.072	↔
2_21_06	MW-6	Appendix IV	Molybdenum	mg/L	15	0	0%	Parametric	Lognormal MLE	-0.000143	0.522	↔
2_21_07	MW-7	Appendix IV	Molybdenum	mg/L	9	0	0%	Nonparametric	MK	0.0000656	0.402	↔
2_23_02	MW-2	Appendix IV	Radium-226	pCi/L	15	0	0%	Parametric	Lognormal MLE	0.000323	0.677	↔
2_23_05	MW-5	Appendix IV	Radium-226	pCi/L	15	0	0%	Parametric	Lognormal MLE	-0.00100	0.156	↔
2_23_07	MW-7	Appendix IV	Radium-226	pCi/L	9	0	0%	Parametric	Lognormal MLE	0.000349	0.836	↔
2_23_08	MW-8	Appendix IV	Radium-226	pCi/L	9	0	0%	Parametric	Lognormal MLE	0.000675	0.764	↔
2_23_09	MW-9	Appendix IV	Radium-226	pCi/L	9	0	0%	Parametric	Lognormal MLE	-0.00311	0.229	↔
2_23_10	MW-10	Appendix IV	Radium-226	pCi/L	9	0	0%	Parametric	Lognormal MLE	0.000249	0.908	↔
2_24_02	MW-2	Appendix IV	Radium-226/228	pCi/L	15	0	0%	Parametric	Lognormal MLE	0.000458	0.617	↔
2_24_05	MW-5	Appendix IV	Radium-226/228	pCi/L	15	0	0%	Parametric	Lognormal MLE	-0.0000601	0.935	↔
2_24_07	MW-7	Appendix IV	Radium-226/228	pCi/L	9	0	0%	Parametric	Lognormal MLE	-0.00117	0.485	↔
2_24_08	MW-8	Appendix IV	Radium-226/228	pCi/L	9	0	0%	Parametric	Lognormal MLE	0.00589	0.000	↑
2_24_09	MW-9	Appendix IV	Radium-226/228	pCi/L	9	0	0%	Parametric	Lognormal MLE	0.00337	0.133	↔
2_24_10	MW-10	Appendix IV	Radium-226/228	pCi/L	9	0	0%	Parametric	Lognormal MLE	0.00186	0.276	↔
3_29_02	MW-2	Other	Total Suspended Solids	mg/L	15	4	27%	Parametric	Lognormal MLE	0.00319	0.000	↑
3_29_05	MW-5	Other	Total Suspended Solids	mg/L	15	0	0%	Parametric	Lognormal MLE	-0.000764	0.516	↔
4_30_02	MW-2	Field Parameters	Conductivity	mS/cm	15	0	0%	Parametric	Lognormal MLE	-0.000172	0.005	↓
4_30_05	MW-5	Field Parameters	Conductivity	mS/cm	15	0	0%	Parametric	Lognormal MLE	-0.000332	0.078	↔
4_30_06	MW-6	Field Parameters	Conductivity	mS/cm	15	0	0%	Parametric	Lognormal MLE	-0.0000200	0.985	↔
4_30_07	MW-7	Field Parameters	Conductivity	mS/cm	9	0	0%	Nonparametric	MK	0.000421	0.029	↔
4_30_08	MW-8	Field Parameters	Conductivity	mS/cm	9	0	0%	Parametric	Lognormal MLE	0.0000870	0.461	↔
4_30_09	MW-9	Field Parameters	Conductivity	mS/cm	9	0	0%	Parametric	Lognormal MLE	0.000146	0.338	↔
4_30_10	MW-10	Field Parameters	Conductivity	mS/cm	9	0	0%	Parametric	Lognormal MLE	0.0000426	0.800	↔
4_31_02	MW-2	Field Parameters	Dissolved Oxygen	mg/L	15	0	0%	Parametric	Lognormal MLE	0.00264	0.017	↔
4_31_05	MW-5	Field Parameters	Dissolved Oxygen	mg/L	15	0	0%	Parametric	Lognormal MLE	0.00169	0.013	↔
4_31_06	MW-6	Field Parameters	Dissolved Oxygen	mg/L	15	0	0%	Parametric	Lognormal MLE	0.00219	0.011	↔
4_31_07	MW-7	Field Parameters	Dissolved Oxygen	mg/L	9	1	11%	Nonparametric	MK	0.0000467	0.916	↔
4_31_08	MW-8	Field Parameters	Dissolved Oxygen	mg/L	9	0	0%	Parametric	Lognormal MLE	0.000211	0.956	↔
4_31_09	MW-9	Field Parameters	Dissolved Oxygen	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.000285	0.456	↔
4_31_10	MW-10	Field Parameters	Dissolved Oxygen	mg/L	9	0	0%	Parametric	Lognormal MLE	0.000540	0.273	↔
4_32_08	MW-8	Field Parameters	Oxidation Reduction Potential	mV	9	0	0%	Parametric	Lognormal MLE	-0.000162	0.917	↔
4_32_09	MW-9	Field Parameters	Oxidation Reduction Potential	mV	9	0	0%	Parametric	Lognormal MLE	-0.00138	0.211	↔
4_32_10	MW-10	Field Parameters	Oxidation Reduction Potential	mV	9	0	0%	Parametric	Lognormal MLE	-0.000677	0.579	↔
4_33_02	MW-2	Field Parameters	Temperature	°C	15	0	0%	Parametric	Lognormal MLE	0.0000280	0.849	↔

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**Table 8:** Trend Tests: Lognormal MLE and MK (continued)

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Type	Method	Slope	p-value	Trend
4_33_05	MW-5	Field Parameters	Temperature	°C	15	0	0%	Parametric	Lognormal MLE	-0.0000872	0.651	↔
4_33_06	MW-6	Field Parameters	Temperature	°C	15	0	0%	Parametric	Lognormal MLE	0.000117	0.278	↔
4_33_07	MW-7	Field Parameters	Temperature	°C	9	0	0%	Parametric	Lognormal MLE	-0.000760	0.322	↔
4_33_08	MW-8	Field Parameters	Temperature	°C	9	0	0%	Parametric	Lognormal MLE	-0.000573	0.482	↔
4_33_09	MW-9	Field Parameters	Temperature	°C	9	0	0%	Parametric	Lognormal MLE	-0.000876	0.489	↔
4_33_10	MW-10	Field Parameters	Temperature	°C	9	0	0%	Parametric	Lognormal MLE	-0.000257	0.644	↔
4_34_02	MW-2	Field Parameters	Turbidity	NTU	15	0	0%	Nonparametric	MK	0.00169	0.488	↔
4_34_05	MW-5	Field Parameters	Turbidity	NTU	15	0	0%	Nonparametric	MK	-0.0220	0.092	↔
4_34_06	MW-6	Field Parameters	Turbidity	NTU	15	0	0%	Parametric	Lognormal MLE	-0.00190	0.007	↓
4_34_07	MW-7	Field Parameters	Turbidity	NTU	9	0	0%	Parametric	Lognormal MLE	-0.00152	0.393	↔
4_34_08	MW-8	Field Parameters	Turbidity	NTU	9	0	0%	Parametric	Lognormal MLE	-0.000705	0.581	↔
4_34_09	MW-9	Field Parameters	Turbidity	NTU	9	0	0%	Parametric	Lognormal MLE	-0.00101	0.492	↔
4_34_10	MW-10	Field Parameters	Turbidity	NTU	9	0	0%	Parametric	Lognormal MLE	0.00146	0.198	↔
5_37_02	MW-2	Part 115	Iron	mg/L	15	0	0%	Nonparametric	MK	0.000309	0.275	↔
5_37_05	MW-5	Part 115	Iron	mg/L	15	1	7%	Parametric	Lognormal MLE	0.000903	0.606	↔
5_37_06	MW-6	Part 115	Iron	mg/L	15	7	47%	Parametric	Lognormal MLE	-0.00106	0.370	↔
5_37_07	MW-7	Part 115	Iron	mg/L	9	0	0%	Nonparametric	MK	0.00146	0.118	↔
5_38_02	MW-2	Part 115	Nickel	mg/L	15	0	0%	Nonparametric	MK	0.00000357	0.450	↔
5_38_05	MW-5	Part 115	Nickel	mg/L	15	0	0%	Parametric	Lognormal MLE	-0.000638	0.017	↔
5_38_06	MW-6	Part 115	Nickel	mg/L	15	2	13%	Nonparametric	MK	0	0.785	↔
5_41_05	MW-5	Part 115	Zinc	mg/L	15	4	27%	Parametric	Lognormal MLE	0.0000652	0.962	↔

**Table 9:** Trend Tests: Piecewise Linear-Linear

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Line 1			Line 2			Break 1	R-Squared	Overall Trend
								Slope	p-Value	Trend	Slope	p-Value	Trend			
1_01_02	MW-2	Appendix III	Boron	mg/L	14	0	0%	0.0182	0.000	↑	-0.00155	0.022	↔	2020-09-28	0.896	↔
1_01_05	MW-5	Appendix III	Boron	mg/L	14	0	0%	0.000707	0.924	↔	-0.00373	0.113	↔	2020-10-18	0.358	↔
1_01_06	MW-6	Appendix III	Boron	mg/L	14	0	0%	0.00356	0.003	↑	-0.000455	0.022	↔	2020-09-15	0.733	↔
1_01_10	MW-10	Appendix III	Boron	mg/L	9	0	0%	0.0000717	0.352	↔	-0.0000426	0.361	↔	2021-11-02	0.292	↔
1_02_02	MW-2	Appendix III	Calcium	mg/L	14	0	0%	0.257	0.040	↔	-0.0904	0.000	↓	2020-07-29	0.912	↔
1_02_06	MW-6	Appendix III	Calcium	mg/L	14	0	0%	0.292	0.081	↔	-0.0361	0.091	↔	2020-09-14	0.552	↔
1_02_09	MW-9	Appendix III	Calcium	mg/L	9	0	0%	0.0893	0.001	↑	-0.0807	0.002	↓	2021-12-24	0.944	↔
1_02_13	MW-13	Appendix III	Calcium	mg/L	6	0	0%	-0.596	0.089	↔	-0.0144	0.946	↔	2022-05-04	0.900	↔
1_02_7B	MW-7B	Appendix III	Calcium	mg/L	5	0	0%	-0.0256	0.215	↔	0.0131	0.604	↔	2022-05-19	0.900	↔
1_03_02	MW-2	Appendix III	Chloride	mg/L	14	0	0%	0.175	0.007	↑	-0.00322	0.641	↔	2020-08-26	0.737	↔
1_03_06	MW-6	Appendix III	Chloride	mg/L	14	0	0%	0.112	0.065	↔	-0.0176	0.029	↔	2020-09-14	0.603	↔
1_03_09	MW-9	Appendix III	Chloride	mg/L	9	8	89%	-0.0100	0.470	↔	0.00704	0.408	↔	2021-12-06	0.247	↔
1_03_10	MW-10	Appendix III	Chloride	mg/L	9	8	89%	-0.0102	0.470	↔	0.00719	0.408	↔	2021-12-06	0.247	↔
1_04_07	MW-7	Appendix III	Fluoride	mg/L	9	8	89%	-0.00171	0.470	↔	0.00120	0.408	↔	2021-12-06	0.247	↔
1_04_08	MW-8	Appendix III	Fluoride	mg/L	9	8	89%	-0.00243	0.470	↔	0.00170	0.408	↔	2021-12-06	0.247	↔

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**Table 9: Trend Tests: Piecewise Linear-Linear (continued)**

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Line 1			Line 2			Break 1	R-Squared	Overall Trend
								Slope	p-Value	Trend	Slope	p-Value	Trend			
1_04_09	MW-9	Appendix III	Fluoride	mg/L	9	8	89%	-0.00249	0.470	↔	0.00175	0.408	↔	2021-12-06	0.247	↔
1_04_10	MW-10	Appendix III	Fluoride	mg/L	9	8	89%	-0.00241	0.470	↔	0.00169	0.408	↔	2021-12-06	0.247	↔
1_05_02	MW-2	Appendix III	Sulfate	mg/L	14	0	0%	2.10	0.000	↑	-0.337	0.000	↓	2020-08-11	0.949	↔
1_05_05	MW-5	Appendix III	Sulfate	mg/L	14	0	0%	12.1	0.261	↔	-0.733	0.015	↔	2020-05-27	0.500	↔
1_05_06	MW-6	Appendix III	Sulfate	mg/L	14	0	0%	0.836	0.061	↔	-0.160	0.010	↔	2020-09-11	0.630	↔
1_05_09	MW-9	Appendix III	Sulfate	mg/L	9	7	78%	-0.00366	0.470	↔	0.00257	0.408	↔	2021-12-06	0.247	↔
1_05_10	MW-10	Appendix III	Sulfate	mg/L	9	0	0%	0.0204	0.242	↔	-0.0361	0.197	↔	2022-01-28	0.460	↔
1_05_13	MW-13	Appendix III	Sulfate	mg/L	6	0	0%	-0.229	0.646	↔	0.229	0.646	↔	2022-05-12	0.239	↔
1_06_02	MW-2	Appendix III	Total Dissolved Solids	mg/L	14	0	0%	2.79	0.000	↑	-0.517	0.000	↓	2020-08-08	0.943	↔
1_06_06	MW-6	Appendix III	Total Dissolved Solids	mg/L	14	0	0%	1.77	0.026	↔	-0.275	0.010	↔	2020-09-10	0.693	↔
1_06_08	MW-8	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	-0.0847	0.536	↔	0.0364	0.778	↔	2021-12-07	0.105	↔
1_06_13	MW-13	Appendix III	Total Dissolved Solids	mg/L	6	0	0%	-2.0	0.149	↔	0.435	0.255	↔	2022-05-03	0.931	↔
1_35_02	MW-2	Appendix III	pH	su	15	0	0%	0.000868	0.236	↔	-0.0000990	0.679	↔	2020-10-19	0.156	↔
1_35_05	MW-5	Appendix III	pH	su	15	0	0%	-0.00131	0.118	↔	0.00118	0.278	↔	2021-05-04	0.277	↔
1_35_06	MW-6	Appendix III	pH	su	15	0	0%	0.00261	0.203	↔	-0.000162	0.514	↔	2020-08-28	0.288	↔
1_35_07	MW-7	Appendix III	pH	su	9	0	0%	-0.0223	0.006	↓	0.000354	0.450	↔	2021-07-20	0.874	↔
1_35_09	MW-9	Appendix III	pH	su	9	0	0%	-0.0154	0.008	↓	0.000596	0.123	↔	2021-07-21	0.856	↔
2_04_07	MW-7	Appendix IV	Fluoride	mg/L	9	8	89%	-0.00171	0.470	↔	0.00120	0.408	↔	2021-12-06	0.247	↔
2_04_08	MW-8	Appendix IV	Fluoride	mg/L	9	8	89%	-0.00243	0.470	↔	0.00170	0.408	↔	2021-12-06	0.247	↔
2_04_09	MW-9	Appendix IV	Fluoride	mg/L	9	8	89%	-0.00249	0.470	↔	0.00175	0.408	↔	2021-12-06	0.247	↔
2_04_10	MW-10	Appendix IV	Fluoride	mg/L	9	8	89%	-0.00241	0.470	↔	0.00169	0.408	↔	2021-12-06	0.247	↔
2_08_02	MW-2	Appendix IV	Arsenic	mg/L	15	13	87%	-0.0000000000139	1.000	↔	0.00000132	0.278	↔	2020-11-26	0.234	↔
2_08_05	MW-5	Appendix IV	Arsenic	mg/L	15	10	67%	-0.000107	0.136	↔	0.00000251	0.152	↔	2020-05-27	0.354	↔
2_08_07	MW-7	Appendix IV	Arsenic	mg/L	9	0	0%	0.00000752	0.763	↔	-0.00000708	0.020	↔	2021-08-23	0.715	↔
2_08_7B	MW-7B	Appendix IV	Arsenic	mg/L	5	4	80%	-0.000000929	0.964	↔	-0.00000482	0.909	↔	2022-05-19	0.144	↔
2_09_02	MW-2	Appendix IV	Barium	mg/L	15	0	0%	-0.000000605	0.947	↔	0.0000110	0.374	↔	2021-07-03	0.159	↔
2_09_05	MW-5	Appendix IV	Barium	mg/L	15	0	0%	-0.000108	0.005	↓	0.0000190	0.196	↔	2020-11-18	0.592	↔
2_09_06	MW-6	Appendix IV	Barium	mg/L	15	0	0%	0.0000766	0.010	↔	-0.0000251	0.001	↓	2020-09-28	0.738	↔
2_09_09	MW-9	Appendix IV	Barium	mg/L	9	0	0%	-0.00000173	0.892	↔	-0.00000551	0.270	↔	2021-11-01	0.353	↔
2_09_10	MW-10	Appendix IV	Barium	mg/L	9	0	0%	0.0000206	0.845	↔	-0.0000237	0.044	↔	2021-08-23	0.618	↔
2_09_13	MW-13	Appendix IV	Barium	mg/L	6	0	0%	-0.000143	0.013	↔	0.0000857	0.035	↔	2022-05-04	0.981	↔
2_09_7B	MW-7B	Appendix IV	Barium	mg/L	5	0	0%	-0.00000335	0.892	↔	-0.0000195	0.710	↔	2022-05-19	0.654	↔
2_14_05	MW-5	Appendix IV	Chromium	mg/L	15	13	87%	-0.000179	0.000	↓	0.00000111	0.108	↔	2020-05-26	0.888	↔
2_15_05	MW-5	Appendix IV	Cobalt	mg/L	15	14	93%	-0.0000193	0.005	↓	0.000000704	0.612	↔	2020-06-13	0.859	↔
2_18_02	MW-2	Appendix IV	Lithium	mg/L	15	0	0%	0.000102	0.000	↑	-0.0000227	0.006	↓	2020-10-19	0.772	↔
2_18_06	MW-6	Appendix IV	Lithium	mg/L	15	0	0%	0.000118	0.000	↑	-0.0000184	0.013	↔	2020-10-18	0.794	↔
2_18_08	MW-8	Appendix IV	Lithium	mg/L	9	5	56%	0.0000105	0.813	↔	-0.0000152	0.373	↔	2021-09-28	0.225	↔
2_18_09	MW-9	Appendix IV	Lithium	mg/L	9	9	100%	-0.000143	0.000	↓	0.000000000000000232	0.340	↔	2021-07-20	1.000	↔
2_18_10	MW-10	Appendix IV	Lithium	mg/L	9	9	100%	-0.000143	0.000	↓	0.000000000000000232	0.340	↔	2021-07-20	1.000	↔
2_21_02	MW-2	Appendix IV	Molybdenum	mg/L	15	0	0%	0.0000169	0.141	↔	0.00000114	0.637	↔	2020-09-30	0.375	↔
2_21_05	MW-5	Appendix IV	Molybdenum	mg/L	15	0	0%	-0.00161	0.060	↔	-0.0000119	0.540	↔	2020-05-27	0.496	↔
2_21_06	MW-6	Appendix IV	Molybdenum	mg/L	15	0	0%	0.0000786	0.171	↔	-0.00000975	0.173	↔	2020-08-30	0.348	↔

(Table continues on next page)





**Table 9: Trend Tests: Piecewise Linear-Linear (continued)**

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Line 1			Line 2			Break 1	R-Squared	Overall Trend
								Slope	p-Value	Trend	Slope	p-Value	Trend			
2_21_07	MW-7	Appendix IV	Molybdenum	mg/L	9	0	0%	0.000164	0.029	↔	-0.000831	0.000	↓	2022-01-29	0.971	↔
2_23_02	MW-2	Appendix IV	Radium-226	pCi/L	15	0	0%	-0.00300	0.433	↔	0.000208	0.518	↔	2020-08-17	0.194	↔
2_23_05	MW-5	Appendix IV	Radium-226	pCi/L	15	0	0%	0.00251	0.581	↔	-0.00153	0.324	↔	2020-11-05	0.126	↔
2_23_06	MW-6	Appendix IV	Radium-226	pCi/L	15	0	0%	0.00238	0.167	↔	-0.000367	0.214	↔	2020-09-27	0.330	↔
2_23_07	MW-7	Appendix IV	Radium-226	pCi/L	9	0	0%	0.00510	0.373	↔	-0.00432	0.426	↔	2021-12-07	0.255	↔
2_23_08	MW-8	Appendix IV	Radium-226	pCi/L	9	0	0%	0.00629	0.075	↔	-0.00590	0.240	↔	2022-01-11	0.576	↔
2_23_09	MW-9	Appendix IV	Radium-226	pCi/L	9	0	0%	0.00426	0.381	↔	-0.00407	0.191	↔	2021-12-06	0.397	↔
2_23_10	MW-10	Appendix IV	Radium-226	pCi/L	9	0	0%	0.00539	0.057	↔	-0.00549	0.173	↔	2022-01-11	0.634	↔
2_24_05	MW-5	Appendix IV	Radium-226/228	pCi/L	15	0	0%	0.00747	0.225	↔	-0.00337	0.222	↔	2021-01-03	0.235	↔
2_24_07	MW-7	Appendix IV	Radium-226/228	pCi/L	9	0	0%	-0.00729	0.513	↔	0.00192	0.854	↔	2022-01-10	0.168	↔
2_24_09	MW-9	Appendix IV	Radium-226/228	pCi/L	9	0	0%	0.00618	0.370	↔	0.00104	0.870	↔	2021-12-21	0.314	↔
2_24_10	MW-10	Appendix IV	Radium-226/228	pCi/L	9	0	0%	0.00813	0.110	↔	-0.00442	0.320	↔	2021-12-10	0.514	↔
2_24_13	MW-13	Appendix IV	Radium-226/228	pCi/L	6	0	0%	0.0124	0.481	↔	-0.0351	0.521	↔	2022-06-28	0.410	↔
2_25_05	MW-5	Appendix IV	Radium-228	pCi/L	15	0	0%	0.00603	0.210	↔	-0.00200	0.346	↔	2021-01-26	0.256	↔
2_25_06	MW-6	Appendix IV	Radium-228	pCi/L	15	0	0%	0.00352	0.034	↔	-0.00943	0.096	↔	2022-01-24	0.504	↔
2_25_07	MW-7	Appendix IV	Radium-228	pCi/L	9	0	0%	-0.0133	0.172	↔	0.00613	0.478	↔	2021-12-20	0.433	↔
2_25_08	MW-8	Appendix IV	Radium-228	pCi/L	9	0	0%	0.0140	0.153	↔	0.00221	0.793	↔	2022-01-10	0.607	↔
2_25_09	MW-9	Appendix IV	Radium-228	pCi/L	9	0	0%	-0.00544	0.834	↔	0.00545	0.055	↔	2021-08-23	0.581	↔
2_25_10	MW-10	Appendix IV	Radium-228	pCi/L	9	0	0%	0.00321	0.650	↔	-0.000401	0.925	↔	2021-11-21	0.089	↔
2_25_13	MW-13	Appendix IV	Radium-228	pCi/L	6	0	0%	0.0178	0.303	↔	-0.0384	0.448	↔	2022-06-29	0.582	↔
3_16_7B	MW-7B	Other	Hardness	mg/L	5	0	0%	-0.123	0.281	↔	-0.00110	0.994	↔	2022-05-19	0.879	↔
3_19_7B	MW-7B	Other	Magnesium	mg/L	5	0	0%	-0.00665	0.642	↔	0.00378	0.604	↔	2022-05-18	0.642	↔
3_22_13	MW-13	Other	Potassium	mg/L	5	0	0%	0.00110	0.796	↔	-0.000246	0.906	↔	2022-06-07	0.359	↔
3_22_7B	MW-7B	Other	Potassium	mg/L	5	0	0%	-0.00853	0.719	↔	0.0110	0.437	↔	2022-05-18	0.635	↔
3_27_13	MW-13	Other	Sodium	mg/L	5	0	0%	-0.0171	0.838	↔	0.0287	0.543	↔	2022-05-08	0.650	↔
3_27_7B	MW-7B	Other	Sodium	mg/L	5	0	0%	-0.198	0.530	↔	0.263	0.658	↔	2022-05-19	0.622	↔
3_29_02	MW-2	Other	Total Suspended Solids	mg/L	15	4	27%	0.0382	0.525	↔	0.0165	0.006	↑	2020-08-17	0.643	↔
3_29_05	MW-5	Other	Total Suspended Solids	mg/L	15	0	0%	-0.480	0.033	↔	0.0517	0.451	↔	2020-10-22	0.419	↔
3_29_06	MW-6	Other	Total Suspended Solids	mg/L	15	11	73%	-0.0115	0.790	↔	0.0188	0.212	↔	2020-10-19	0.223	↔
3_29_08	MW-8	Other	Total Suspended Solids	mg/L	9	8	89%	-0.00258	0.470	↔	0.00181	0.408	↔	2021-12-06	0.247	↔
4_30_02	MW-2	Field Parameters	Conductivity	mS/cm	15	0	0%	0.00181	0.002	↑	-0.000503	0.000	↓	2020-09-04	0.899	↔
4_30_05	MW-5	Field Parameters	Conductivity	mS/cm	15	0	0%	0.0109	0.523	↔	-0.000703	0.110	↔	2020-06-01	0.241	↔
4_30_06	MW-6	Field Parameters	Conductivity	mS/cm	15	0	0%	0.00199	0.026	↔	-0.000265	0.019	↔	2020-09-14	0.679	↔
4_30_07	MW-7	Field Parameters	Conductivity	mS/cm	9	0	0%	-0.000704	0.801	↔	0.000938	0.381	↔	2021-11-01	0.172	↔
4_30_08	MW-8	Field Parameters	Conductivity	mS/cm	9	0	0%	0.000482	0.496	↔	-0.0000650	0.646	↔	2021-09-27	0.297	↔
4_30_09	MW-9	Field Parameters	Conductivity	mS/cm	9	0	0%	0.000514	0.003	↑	-0.000177	0.027	↔	2021-11-06	0.902	↔
4_30_10	MW-10	Field Parameters	Conductivity	mS/cm	9	0	0%	0.000379	0.145	↔	-0.000560	0.166	↔	2022-02-06	0.529	↔
4_30_13	MW-13	Field Parameters	Conductivity	mS/cm	6	0	0%	-0.00318	0.307	↔	0.000433	0.618	↔	2022-05-03	0.839	↔
4_31_02	MW-2	Field Parameters	Dissolved Oxygen	mg/L	15	0	0%	0.0000755	0.741	↔	0.00445	0.000	↑	2022-01-20	0.866	↔
4_31_07	MW-7	Field Parameters	Dissolved Oxygen	mg/L	9	1	11%	-0.000123	0.988	↔	0.000473	0.515	↔	2021-08-23	0.109	↔
4_31_08	MW-8	Field Parameters	Dissolved Oxygen	mg/L	9	0	0%	0.0184	0.594	↔	-0.0114	0.383	↔	2021-11-01	0.209	↔
4_31_13	MW-13	Field Parameters	Dissolved Oxygen	mg/L	6	0	0%	0.0703	0.060	↔	-0.00686	0.741	↔	2022-05-06	0.922	↔

(Table continues on next page)



**Table 9: Trend Tests: Piecewise Linear-Linear (continued)**

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Line 1			Line 2			Break 1	R-Squared	Overall Trend
								Slope	p-Value	Trend	Slope	p-Value	Trend			
4_31_7B	MW-7B	Field Parameters	Dissolved Oxygen	mg/L	5	0	0%	-0.0169	0.019	↔	0.000143	0.667	↔	2022-04-23	1.000	↔
4_32_02	MW-2	Field Parameters	Oxidation Reduction Potential	mV	15	0	0%	0.421	0.013	↔	-0.224	0.268	↔	2021-05-04	0.503	↔
4_32_05	MW-5	Field Parameters	Oxidation Reduction Potential	mV	15	0	0%	0.637	0.038	↔	-0.442	0.044	↔	2021-05-03	0.550	↔
4_32_06	MW-6	Field Parameters	Oxidation Reduction Potential	mV	15	0	0%	0.257	0.105	↔	-0.336	0.532	↔	2021-08-03	0.248	↔
4_32_7B	MW-7B	Field Parameters	Oxidation Reduction Potential	mV	5	0	0%	-3.27	0.446	↔	0.384	0.827	↔	2022-04-20	0.698	↔
4_33_02	MW-2	Field Parameters	Temperature	°C	15	0	0%	-0.00775	0.273	↔	0.00466	0.357	↔	2021-01-28	0.174	↔
4_33_06	MW-6	Field Parameters	Temperature	°C	15	0	0%	0.0214	0.541	↔	0.000630	0.723	↔	2020-07-10	0.164	↔
4_33_13	MW-13	Field Parameters	Temperature	°C	6	0	0%	0.0314	0.201	↔	0.0837	0.004	↑	2022-04-19	0.997	↔
4_34_02	MW-2	Field Parameters	Turbidity	NTU	15	0	0%	-2.29	0.000	↓	0.00296	0.261	↔	2020-05-26	0.988	↔
4_34_05	MW-5	Field Parameters	Turbidity	NTU	15	0	0%	-3.92	0.000	↓	0.000660	0.897	↔	2020-06-08	0.993	↔
4_34_06	MW-6	Field Parameters	Turbidity	NTU	15	0	0%	-0.104	0.078	↔	-0.00585	0.542	↔	2020-09-16	0.504	↔
4_34_07	MW-7	Field Parameters	Turbidity	NTU	9	0	0%	0.0575	0.560	↔	-0.0274	0.202	↔	2021-09-27	0.345	↔
4_34_7B	MW-7B	Field Parameters	Turbidity	NTU	5	0	0%	0.200	0.090	↔	-0.0314	0.270	↔	2022-04-15	0.984	↔
5_36_05	MW-5	Part 115	Copper	mg/L	15	10	67%	-0.0000169	0.638	↔	0.00000923	0.567	↔	2021-01-18	0.051	↔
5_37_02	MW-2	Part 115	Iron	mg/L	15	0	0%	-0.000885	0.585	↔	0.00156	0.049	↔	2020-12-24	0.438	↔
5_37_05	MW-5	Part 115	Iron	mg/L	15	1	7%	-0.217	0.005	↓	0.00238	0.145	↔	2020-06-01	0.746	↔
5_37_06	MW-6	Part 115	Iron	mg/L	15	7	47%	-0.000893	0.034	↔	0.0000121	0.798	↔	2020-09-05	0.630	↔
5_37_13	MW-13	Part 115	Iron	mg/L	6	1	17%	0.000316	0.490	↔	-0.000556	0.686	↔	2022-06-08	0.368	↔
5_37_7B	MW-7B	Part 115	Iron	mg/L	5	0	0%	-0.000857	0.333	↔	0.000143	0.667	↔	2022-04-13	0.779	↔
5_38_02	MW-2	Part 115	Nickel	mg/L	15	0	0%	0.0000750	0.001	↑	-0.0000101	0.000	↓	2020-09-09	0.869	↔
5_38_05	MW-5	Part 115	Nickel	mg/L	15	0	0%	-0.000107	0.174	↔	-0.00000536	0.182	↔	2020-06-24	0.467	↔
5_38_06	MW-6	Part 115	Nickel	mg/L	15	2	13%	0.0000286	0.022	↔	-0.00000253	0.017	↔	2020-07-27	0.639	↔
5_40_05	MW-5	Part 115	Vanadium	mg/L	15	13	87%	-0.000250	0.001	↓	0.00000221	0.108	↔	2020-05-26	0.797	↔
5_41_02	MW-2	Part 115	Zinc	mg/L	15	12	80%	-0.000114	0.290	↔	0.00000121	0.927	↔	2020-08-29	0.239	↔
5_41_05	MW-5	Part 115	Zinc	mg/L	15	4	27%	-0.000180	0.692	↔	0.0000169	0.660	↔	2020-07-21	0.037	↔
5_41_06	MW-6	Part 115	Zinc	mg/L	15	14	93%	-0.000104	0.236	↔	0.000000000000286	1.000	↔	2020-08-18	0.250	↔
5_41_07	MW-7	Part 115	Zinc	mg/L	9	6	67%	-0.0000133	0.515	↔	0.0000120	0.704	↔	2022-02-04	0.122	↔
5_41_09	MW-9	Part 115	Zinc	mg/L	9	8	89%	0.0000103	0.470	↔	-0.00000724	0.408	↔	2021-12-06	0.247	↔

**Table 10: Trend Tests: Piecewise Linear-Linear-Linear**

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Line 1			Line 2			Line 3			Break 1	Break 2	R-Squared	Overall Trend
								Slope	p-Value	Trend	Slope	p-Value	Trend	Slope	p-Value	Trend				
1_01_08	MW-8	Appendix III	Boron	mg/L	9	1	11%	0.000702	0.333	↔	-0.00164	0.458	↔	0.000231	0.513	↔	2021-09-28	2021-12-17	0.686	↔
1_02_02	MW-2	Appendix III	Calcium	mg/L	14	0	0%	0.306	0.147	↔	-0.0366	0.756	↔	-0.0928	0.000	↓	2020-07-09	2020-10-18	0.914	↔
1_02_05	MW-5	Appendix III	Calcium	mg/L	14	0	0%	-0.146	0.840	↔	1.34	0.848	↔	-0.267	0.032	↔	2020-09-09	2020-10-11	0.499	↔
1_02_06	MW-6	Appendix III	Calcium	mg/L	14	0	0%	0.343	0.005	↑	-0.117	0.014	↔	0.0596	0.486	↔	2020-09-17	2021-08-03	0.778	↔
1_02_08	MW-8	Appendix III	Calcium	mg/L	9	0	0%	-0.0540	0.185	↔	0.157	0.213	↔	-0.0199	0.305	↔	2021-09-28	2021-12-16	0.887	↔
1_02_10	MW-10	Appendix III	Calcium	mg/L	9	0	0%	-0.119	0.529	↔	0.190	0.173	↔	-0.152	0.122	↔	2021-09-27	2022-02-01	0.735	↔
1_03_02	MW-2	Appendix III	Chloride	mg/L	14	0	0%	0.175	0.007	↑	-0.0274	0.232	↔	0.0220	0.225	↔	2020-09-08	2021-07-20	0.820	↔

(Table continues on next page)





**Table 10: Trend Tests: Piecewise Linear-Linear-Linear (continued)**

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Line 1			Line 2			Line 3			Break 1	Break 2	R-Squared	Overall Trend
								Slope	p-Value	Trend	Slope	p-Value	Trend	Slope	p-Value	Trend				
1_03_06	MW-6	Appendix III	Chloride	mg/L	14	0	0%	0.131	0.000	↑	-0.0506	0.000	↓	0.0440	0.055	↔	2020-09-20	2021-10-13	0.912	↔
1_03_08	MW-8	Appendix III	Chloride	mg/L	9	2	22%	0.329	0.425	↔	-0.523	0.240	↔	0.0745	0.566	↔	2021-09-27	2021-12-15	0.599	↔
1_04_07	MW-7	Appendix III	Fluoride	mg/L	9	8	89%	0.000822	0.897	↔	-0.00442	0.731	↔	0.00154	0.403	↔	2021-09-20	2021-12-06	0.354	↔
1_04_08	MW-8	Appendix III	Fluoride	mg/L	9	8	89%	0.00117	0.897	↔	-0.00628	0.731	↔	0.00219	0.403	↔	2021-09-20	2021-12-06	0.354	↔
1_04_09	MW-9	Appendix III	Fluoride	mg/L	9	8	89%	0.00120	0.897	↔	-0.00645	0.731	↔	0.00225	0.403	↔	2021-09-20	2021-12-06	0.354	↔
1_04_10	MW-10	Appendix III	Fluoride	mg/L	9	8	89%	0.00116	0.897	↔	-0.00623	0.731	↔	0.00217	0.403	↔	2021-09-20	2021-12-06	0.354	↔
1_05_02	MW-2	Appendix III	Sulfate	mg/L	14	0	0%	1.92	0.001	↑	-0.272	0.193	↔	-0.376	0.001	↓	2020-08-16	2021-04-03	0.951	↔
1_05_05	MW-5	Appendix III	Sulfate	mg/L	14	0	0%	1.69	0.296	↔	-5.39	0.903	↔	-0.361	0.473	↔	2020-10-05	2020-12-08	0.558	↔
1_05_06	MW-6	Appendix III	Sulfate	mg/L	14	0	0%	0.970	0.005	↑	-0.381	0.001	↓	0.242	0.195	↔	2020-09-14	2021-10-05	0.883	↔
1_05_09	MW-9	Appendix III	Sulfate	mg/L	9	7	78%	0.00176	0.897	↔	-0.00948	0.731	↔	0.00331	0.403	↔	2021-09-20	2021-12-06	0.354	↔
1_05_10	MW-10	Appendix III	Sulfate	mg/L	9	0	0%	-0.0140	0.840	↔	0.0502	0.301	↔	-0.0417	0.218	↔	2021-09-27	2022-01-20	0.604	↔
1_06_05	MW-5	Appendix III	Total Dissolved Solids	mg/L	14	0	0%	15.3	0.360	↔	-0.325	0.950	↔	-1.23	0.034	↔	2020-05-26	2020-09-19	0.558	↔
1_06_06	MW-6	Appendix III	Total Dissolved Solids	mg/L	14	0	0%	1.93	0.000	↑	-0.904	0.002	↓	0.0989	0.527	↔	2020-09-22	2021-05-07	0.900	↔
1_06_08	MW-8	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	0.0622	0.845	↔	-0.250	0.805	↔	0.0664	0.687	↔	2021-09-28	2021-12-17	0.195	↔
1_06_10	MW-10	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	-0.484	0.204	↔	0.746	0.213	↔	-0.498	0.088	↔	2021-09-28	2022-02-03	0.822	↔
1_35_02	MW-2	Appendix III	pH	su	15	0	0%	0.00120	0.096	↔	-0.000790	0.409	↔	0.000579	0.229	↔	2020-10-19	2021-07-20	0.397	↔
1_35_06	MW-6	Appendix III	pH	su	15	0	0%	0.00202	0.103	↔	-0.000753	0.333	↔	0.000398	0.782	↔	2020-10-18	2021-08-19	0.355	↔
2_04_07	MW-7	Appendix IV	Fluoride	mg/L	9	8	89%	0.000822	0.897	↔	-0.00442	0.731	↔	0.00154	0.403	↔	2021-09-20	2021-12-06	0.354	↔
2_04_08	MW-8	Appendix IV	Fluoride	mg/L	9	8	89%	0.00117	0.897	↔	-0.00628	0.731	↔	0.00219	0.403	↔	2021-09-20	2021-12-06	0.354	↔
2_04_09	MW-9	Appendix IV	Fluoride	mg/L	9	8	89%	0.00120	0.897	↔	-0.00645	0.731	↔	0.00225	0.403	↔	2021-09-20	2021-12-06	0.354	↔
2_04_10	MW-10	Appendix IV	Fluoride	mg/L	9	8	89%	0.00116	0.897	↔	-0.00623	0.731	↔	0.00217	0.403	↔	2021-09-20	2021-12-06	0.354	↔
2_08_02	MW-2	Appendix IV	Arsenic	mg/L	15	13	87%	-0.0000000000120	1.000	↔	0.0000000000706	1.000	↔	0.00000132	0.329	↔	2020-09-11	2020-11-26	0.234	↔
2_08_07	MW-7	Appendix IV	Arsenic	mg/L	9	0	0%	0.00000718	0.670	↔	-0.00000674	0.689	↔	-0.00000726	0.238	↔	2021-08-24	2021-12-25	0.715	↔
2_09_05	MW-5	Appendix IV	Barium	mg/L	15	0	0%	-0.000286	0.397	↔	-0.0000720	0.192	↔	0.0000190	0.220	↔	2020-06-13	2020-12-11	0.636	↔
2_09_06	MW-6	Appendix IV	Barium	mg/L	15	0	0%	0.0000749	0.003	↑	-0.0000534	0.077	↔	-0.0000125	0.366	↔	2020-10-20	2021-05-04	0.796	↔
2_09_09	MW-9	Appendix IV	Barium	mg/L	9	0	0%	0.0000286	0.776	↔	-0.0000286	0.537	↔	0.000000000709	1.000	↔	2021-11-14	2022-01-11	0.550	↔
2_14_05	MW-5	Appendix IV	Chromium	mg/L	15	13	87%	-0.000179	0.000	↓	0.00000000000893	1.000	↔	0.00000132	0.329	↔	2020-05-26	2020-11-26	0.889	↔
2_15_05	MW-5	Appendix IV	Cobalt	mg/L	15	14	93%	-0.0000235	0.002	↓	0.00000393	0.474	↔	-0.000000253	0.861	↔	2020-06-13	2020-08-05	0.896	↔
2_18_08	MW-8	Appendix IV	Lithium	mg/L	9	5	56%	0.0000257	0.631	↔	-0.0000857	0.613	↔	-0.000000000000329	1.000	↔	2021-10-19	2021-12-18	0.390	↔
2_21_07	MW-7	Appendix IV	Molybdenum	mg/L	9	0	0%	0.000339	0.241	↔	0.0000991	0.549	↔	-0.000825	0.004	↓	2021-08-24	2022-02-02	0.977	↔
2_23_02	MW-2	Appendix IV	Radium-226	pCi/L	15	0	0%	-0.00357	0.230	↔	0.00426	0.660	↔	-0.0000437	0.927	↔	2020-09-09	2020-11-05	0.255	↔
2_23_05	MW-5	Appendix IV	Radium-226	pCi/L	15	0	0%	-0.00611	0.504	↔	0.0213	0.492	↔	-0.00247	0.125	↔	2020-09-06	2020-11-05	0.305	↔
2_23_09	MW-9	Appendix IV	Radium-226	pCi/L	9	0	0%	-0.00908	0.706	↔	0.00870	0.485	↔	-0.00479	0.205	↔	2021-08-10	2021-12-06	0.559	↔
2_23_10	MW-10	Appendix IV	Radium-226	pCi/L	9	0	0%	-0.00843	0.625	↔	0.0100	0.135	↔	-0.00606	0.095	↔	2021-08-13	2021-12-30	0.802	↔
2_24_09	MW-9	Appendix IV	Radium-226/228	pCi/L	9	0	0%	-0.00545	0.821	↔	0.0157	0.746	↔	0.0000418	0.995	↔	2021-09-08	2021-12-06	0.417	↔
2_24_10	MW-10	Appendix IV	Radium-226/228	pCi/L	9	0	0%	-0.00392	0.760	↔	0.0203	0.450	↔	-0.00584	0.163	↔	2021-09-17	2021-12-06	0.739	↔
3_29_08	MW-8	Other	Total Suspended Solids	mg/L	9	8	89%	0.00124	0.897	↔	-0.00667	0.731	↔	0.00233	0.403	↔	2021-09-20	2021-12-06	0.354	↔
4_30_06	MW-6	Field Parameters	Conductivity	mS/cm	15	0	0%	0.00185	0.000	↑	-0.00112	0.006	↓	0.000191	0.345	↔	2020-10-18	2021-05-19	0.865	↔
4_30_08	MW-8	Field Parameters	Conductivity	mS/cm	9	0	0%	0.000738	0.343	↔	-0.000508	0.308	↔	0.000162	0.601	↔	2021-09-27	2022-01-13	0.579	↔
4_30_10	MW-10	Field Parameters	Conductivity	mS/cm	9	0	0%	-0.000243	0.781	↔	0.000984	0.146	↔	-0.000583	0.182	↔	2021-09-27	2022-01-12	0.732	↔
4_31_02	MW-2	Field Parameters	Dissolved Oxygen	mg/L	15	0	0%	0.00196	0.248	↔	-0.000182	0.555	↔	0.00445	0.000	↑	2020-07-21	2021-12-31	0.897	↔
4_31_05	MW-5	Field Parameters	Dissolved Oxygen	mg/L	15	0	0%	0.0368	0.265	↔	-0.000593	0.865	↔	0.0121	0.234	↔	2020-06-28	2021-11-11	0.538	↔

(Table continues on next page)



**Table 10: Trend Tests: Piecewise Linear-Linear-Linear (continued)**

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Line 1			Line 2			Line 3			Break 1	Break 2	R-Squared	Overall Trend
								Slope	p-Value	Trend	Slope	p-Value	Trend	Slope	p-Value	Trend				
4_31_07	MW-7	Field Parameters	Dissolved Oxygen	mg/L	9	1	11%	-0.00101	0.735	↔	0.00250	0.790	↔	-0.000518	0.734	↔	2021-09-28	2022-01-10	0.320	↔
4_31_09	MW-9	Field Parameters	Dissolved Oxygen	mg/L	9	0	0%	-0.0137	0.037	↔	0.0155	0.008	↑	-0.0133	0.004	↓	2021-09-18	2022-02-01	0.976	↔
4_32_02	MW-2	Field Parameters	Oxidation Reduction Potential	mV	15	0	0%	0.154	0.550	↔	0.984	0.204	↔	-0.346	0.104	↔	2021-01-06	2021-05-18	0.595	↔
4_33_02	MW-2	Field Parameters	Temperature	°C	15	0	0%	0.0280	0.269	↔	-0.0227	0.363	↔	0.00741	0.056	↔	2020-08-02	2021-01-26	0.476	↔
4_33_05	MW-5	Field Parameters	Temperature	°C	15	0	0%	0.0643	0.244	↔	-0.0330	0.173	↔	0.00712	0.158	↔	2020-07-04	2020-12-31	0.466	↔
4_33_06	MW-6	Field Parameters	Temperature	°C	15	0	0%	0.0221	0.318	↔	-0.0114	0.303	↔	0.00458	0.253	↔	2020-08-15	2021-02-08	0.350	↔
4_33_09	MW-9	Field Parameters	Temperature	°C	9	0	0%	0.0871	0.007	↑	-0.0989	0.001	↓	0.0873	0.001	↑	2021-08-30	2022-02-07	0.994	↔
4_33_10	MW-10	Field Parameters	Temperature	°C	9	0	0%	0.0500	0.013	↔	-0.0529	0.003	↓	0.0410	0.002	↑	2021-09-09	2022-02-09	0.987	↔
4_34_02	MW-2	Field Parameters	Turbidity	NTU	15	0	0%	-2.29	0.000	↓	0.00976	0.427	↔	-0.00170	0.785	↔	2020-05-26	2021-04-11	0.989	↔
4_34_05	MW-5	Field Parameters	Turbidity	NTU	15	0	0%	-3.92	0.000	↓	-0.00881	0.417	↔	0.0329	0.324	↔	2020-06-08	2021-12-07	0.994	↔
4_34_06	MW-6	Field Parameters	Turbidity	NTU	15	0	0%	0.198	0.163	↔	-0.320	0.252	↔	-0.00363	0.631	↔	2020-06-23	2020-08-23	0.725	↔
4_34_07	MW-7	Field Parameters	Turbidity	NTU	9	0	0%	0.113	0.067	↔	-0.148	0.328	↔	0.00657	0.770	↔	2021-09-28	2021-12-13	0.814	↔
4_34_08	MW-8	Field Parameters	Turbidity	NTU	9	0	0%	0.132	0.121	↔	-0.0381	0.145	↔	0.00200	0.854	↔	2021-07-31	2021-12-07	0.783	↔
4_34_10	MW-10	Field Parameters	Turbidity	NTU	9	0	0%	0.0332	0.438	↔	-0.0375	0.649	↔	0.00705	0.535	↔	2021-09-17	2021-11-17	0.383	↔
5_36_05	MW-5	Part 115	Copper	mg/L	15	10	67%	0.000101	0.583	↔	-0.0000806	0.318	↔	0.0000137	0.409	↔	2020-07-20	2020-11-28	0.204	↔
5_38_05	MW-5	Part 115	Nickel	mg/L	15	0	0%	-0.000107	0.502	↔	-0.00000959	0.248	↔	0.0000165	0.502	↔	2020-06-18	2022-01-25	0.529	↔
5_38_06	MW-6	Part 115	Nickel	mg/L	15	2	13%	0.0000295	0.023	↔	-0.0000115	0.312	↔	-0.0000122	0.444	↔	2020-08-11	2020-12-06	0.700	↔
5_40_05	MW-5	Part 115	Vanadium	mg/L	15	13	87%	-0.000250	0.002	↓	0.00000000000114	1.000	↔	0.00000264	0.329	↔	2020-05-26	2020-11-26	0.799	↔
5_41_05	MW-5	Part 115	Zinc	mg/L	15	4	27%	-0.000265	0.385	↔	0.000350	0.602	↔	-0.0000706	0.257	↔	2020-09-05	2021-01-26	0.323	↔
5_41_06	MW-6	Part 115	Zinc	mg/L	15	14	93%	-0.000104	0.443	↔	-0.0000000000107	1.000	↔	0.000000000000629	1.000	↔	2020-08-17	2020-10-02	0.250	↔
5_41_07	MW-7	Part 115	Zinc	mg/L	9	6	67%	0.0000949	0.189	↔	-0.0000788	0.532	↔	0.0000142	0.418	↔	2021-08-24	2021-11-27	0.672	↔
5_41_09	MW-9	Part 115	Zinc	mg/L	9	8	89%	-0.0000497	0.897	↔	0.0000267	0.731	↔	-0.00000931	0.403	↔	2021-09-20	2021-12-06	0.354	↔
5_41_10	MW-10	Part 115	Zinc	mg/L	9	7	78%	-0.0000189	0.834	↔	0.0000807	0.778	↔	-0.0000197	0.674	↔	2021-09-28	2022-01-10	0.371	↔

**Erickson BWL Glacial – 95% Lower Confidence Limits for Assessment Monitoring**

Code	Well	Type	Constituent	Unit	n	% NDs	Range of Sampling Period	Method	LCL
1_01_02	MW-2	Appendix III	Boron	mg/L	14	0%	2020-04-28 to 2022-08-02	Adjusted Gamma LCL	4.6
1_02_02	MW-2	Appendix III	Calcium	mg/L	14	0%	2020-04-28 to 2022-08-02	Adjusted Gamma LCL	250
1_03_02	MW-2	Appendix III	Chloride	mg/L	14	0%	2020-04-28 to 2022-08-02	Adjusted Gamma LCL	78
1_04_02	MW-2	Appendix III	Fluoride	mg/L	14	100%	2020-04-28 to 2022-08-02	Nonparametric LCL around the Median	1.0
1_05_02	MW-2	Appendix III	Sulfate	mg/L	14	0%	2020-04-28 to 2022-08-02	Adjusted Gamma LCL	448
1_06_02	MW-2	Appendix III	Total Dissolved Solids	mg/L	14	0%	2020-04-28 to 2022-08-02	Adjusted Gamma LCL	1,200
2_04_02	MW-2	Appendix IV	Fluoride	mg/L	15	100%	2020-04-28 to 2022-08-02	Nonparametric LCL around the Median	1.0
2_07_02	MW-2	Appendix IV	Antimony	mg/L	15	100%	2020-04-28 to 2022-08-02	Nonparametric LCL around the Median	0.0050
2_08_02	MW-2	Appendix IV	Arsenic	mg/L	15	87%	2020-04-28 to 2022-08-02	Nonparametric LCL around the Median	0.0020
2_09_02	MW-2	Appendix IV	Barium	mg/L	15	0%	2020-04-28 to 2022-08-02	Adjusted Gamma LCL	0.040
2_10_02	MW-2	Appendix IV	Beryllium	mg/L	15	100%	2020-04-28 to 2022-08-02	Nonparametric LCL around the Median	0.0010
2_12_02	MW-2	Appendix IV	Cadmium	mg/L	15	100%	2020-04-28 to 2022-08-02	Nonparametric LCL around the Median	0.00050
2_14_02	MW-2	Appendix IV	Chromium	mg/L	15	100%	2020-04-28 to 2022-08-02	Nonparametric LCL around the Median	0.0050
2_15_02	MW-2	Appendix IV	Cobalt	mg/L	15	100%	2020-04-28 to 2022-08-02	Nonparametric LCL around the Median	0.0050
2_17_02	MW-2	Appendix IV	Lead	mg/L	15	100%	2020-04-28 to 2022-08-02	Nonparametric LCL around the Median	0.0030
2_18_02	MW-2	Appendix IV	Lithium	mg/L	15	0%	2020-04-28 to 2022-08-02	Adjusted Gamma LCL	0.056
2_20_02	MW-2	Appendix IV	Mercury	mg/L	15	100%	2020-04-28 to 2022-08-02	Nonparametric LCL around the Median	0.00020
2_21_02	MW-2	Appendix IV	Molybdenum	mg/L	15	0%	2020-04-28 to 2022-08-02	Adjusted Gamma LCL	0.0098
2_23_02	MW-2	Appendix IV	Radium-226	pCi/L	15	0%	2020-04-28 to 2022-08-02	Adjusted Gamma LCL	0.27
2_24_02	MW-2	Appendix IV	Radium-226/228	pCi/L	15	0%	2020-04-28 to 2022-08-02	Adjusted Gamma LCL	0.60
2_25_02	MW-2	Appendix IV	Radium-228	pCi/L	15	0%	2020-04-28 to 2022-08-02	Normal LCL	0.20
2_26_02	MW-2	Appendix IV	Selenium	mg/L	15	100%	2020-04-28 to 2022-08-02	Nonparametric LCL around the Median	0.0050
2_28_02	MW-2	Appendix IV	Thallium	mg/L	15	100%	2020-04-28 to 2022-08-02	Nonparametric LCL around the Median	0.0020
5_36_02	MW-2	Part 115	Copper	mg/L	15	100%	2020-04-28 to 2022-08-02	Nonparametric LCL around the Median	0.0050
5_37_02	MW-2	Part 115	Iron	mg/L	15	0%	2020-04-28 to 2022-08-02	Nonparametric LCL around the Median	0.51
5_38_02	MW-2	Part 115	Nickel	mg/L	15	0%	2020-04-28 to 2022-08-02	Nonparametric LCL around the Median	0.022
5_39_02	MW-2	Part 115	Silver	mg/L	15	100%	2020-04-28 to 2022-08-02	Nonparametric LCL around the Median	0.00050
5_40_02	MW-2	Part 115	Vanadium	mg/L	15	100%	2020-04-28 to 2022-08-02	Nonparametric LCL around the Median	0.0050
5_41_02	MW-2	Part 115	Zinc	mg/L	15	80%	2020-04-28 to 2022-08-02	Nonparametric LCL around the Median	0.0050
1_01_03	MW-3	Appendix III	Boron	mg/L	4	0%	2021-05-04 to 2022-08-02	Nonparametric LCL around the Median	5.4
1_02_03	MW-3	Appendix III	Calcium	mg/L	4	0%	2021-05-04 to 2022-08-02	Nonparametric LCL around the Median	223
1_03_03	MW-3	Appendix III	Chloride	mg/L	4	0%	2021-05-04 to 2022-08-02	Nonparametric LCL around the Median	89
1_04_03	MW-3	Appendix III	Fluoride	mg/L	4	100%	2021-05-04 to 2022-08-02	Nonparametric LCL around the Median	1.0
1_05_03	MW-3	Appendix III	Sulfate	mg/L	4	0%	2021-05-04 to 2022-08-02	Nonparametric LCL around the Median	682
1_06_03	MW-3	Appendix III	Total Dissolved Solids	mg/L	4	0%	2021-05-04 to 2022-08-02	Nonparametric LCL around the Median	1,400
2_04_03	MW-3	Appendix IV	Fluoride	mg/L	4	100%	2021-05-04 to 2022-08-02	Nonparametric LCL around the Median	1.0
2_07_03	MW-3	Appendix IV	Antimony	mg/L	4	100%	2021-05-04 to 2022-08-02	Nonparametric LCL around the Median	0.0050
2_08_03	MW-3	Appendix IV	Arsenic	mg/L	4	0%	2021-05-04 to 2022-08-02	Nonparametric LCL around the Median	0.0030
2_09_03	MW-3	Appendix IV	Barium	mg/L	4	0%	2021-05-04 to 2022-08-02	Nonparametric LCL around the Median	0.019
2_10_03	MW-3	Appendix IV	Beryllium	mg/L	4	100%	2021-05-04 to 2022-08-02	Nonparametric LCL around the Median	0.0010
2_12_03	MW-3	Appendix IV	Cadmium	mg/L	4	100%	2021-05-04 to 2022-08-02	Nonparametric LCL around the Median	0.00050
2_14_03	MW-3	Appendix IV	Chromium	mg/L	4	100%	2021-05-04 to 2022-08-02	Nonparametric LCL around the Median	0.0050
2_15_03	MW-3	Appendix IV	Cobalt	mg/L	4	100%	2021-05-04 to 2022-08-02	Nonparametric LCL around the Median	0.0050
2_17_03	MW-3	Appendix IV	Lead	mg/L	4	100%	2021-05-04 to 2022-08-02	Nonparametric LCL around the Median	0.0030

2_18_03	MW-3	Appendix IV	Lithium	mg/L	4	0%	2021-05-04 to 2022-08-02	Nonparametric LCL around the Median	0.077
2_20_03	MW-3	Appendix IV	Mercury	mg/L	4	100%	2021-05-04 to 2022-08-02	Nonparametric LCL around the Median	0.00020
2_21_03	MW-3	Appendix IV	Molybdenum	mg/L	4	0%	2021-05-04 to 2022-08-02	Nonparametric LCL around the Median	0.15
2_23_03	MW-3	Appendix IV	Radium-226	pCi/L	4	0%	2021-05-04 to 2022-08-02	Nonparametric LCL around the Median	0.15
2_24_03	MW-3	Appendix IV	Radium-226/228	pCi/L	4	0%	2021-05-04 to 2022-08-02	Nonparametric LCL around the Median	1.1
2_25_03	MW-3	Appendix IV	Radium-228	pCi/L	4	0%	2021-05-04 to 2022-08-02	Nonparametric LCL around the Median	0.76
2_26_03	MW-3	Appendix IV	Selenium	mg/L	4	100%	2021-05-04 to 2022-08-02	Nonparametric LCL around the Median	0.0050
2_28_03	MW-3	Appendix IV	Thallium	mg/L	4	100%	2021-05-04 to 2022-08-02	Nonparametric LCL around the Median	0.0020
5_36_03	MW-3	Part 115	Copper	mg/L	4	100%	2021-05-04 to 2022-08-02	Nonparametric LCL around the Median	0.0050
5_37_03	MW-3	Part 115	Iron	mg/L	4	0%	2021-05-04 to 2022-08-02	Nonparametric LCL around the Median	1.8
5_38_03	MW-3	Part 115	Nickel	mg/L	4	100%	2021-05-04 to 2022-08-02	Nonparametric LCL around the Median	0.0050
5_39_03	MW-3	Part 115	Silver	mg/L	4	100%	2021-05-04 to 2022-08-02	Nonparametric LCL around the Median	0.00050
5_40_03	MW-3	Part 115	Vanadium	mg/L	4	100%	2021-05-04 to 2022-08-02	Nonparametric LCL around the Median	0.0050
5_41_03	MW-3	Part 115	Zinc	mg/L	4	100%	2021-05-04 to 2022-08-02	Nonparametric LCL around the Median	0.0050
1_01_05	MW-5	Appendix III	Boron	mg/L	14	0%	2020-04-28 to 2022-08-02	Nonparametric LCL around the Median	4.5
1_02_05	MW-5	Appendix III	Calcium	mg/L	14	0%	2020-04-28 to 2022-08-02	Normal LCL	225
1_03_05	MW-5	Appendix III	Chloride	mg/L	14	0%	2020-04-28 to 2022-08-02	Adjusted Gamma LCL	67
1_04_05	MW-5	Appendix III	Fluoride	mg/L	14	100%	2020-04-28 to 2022-08-02	Nonparametric LCL around the Median	1.0
1_05_05	MW-5	Appendix III	Sulfate	mg/L	14	0%	2020-04-28 to 2022-08-02	Adjusted Gamma LCL	620
1_06_05	MW-5	Appendix III	Total Dissolved Solids	mg/L	14	0%	2020-04-28 to 2022-08-02	Adjusted Gamma LCL	1,300
2_04_05	MW-5	Appendix IV	Fluoride	mg/L	15	100%	2020-04-28 to 2022-08-02	Nonparametric LCL around the Median	1.0
2_07_05	MW-5	Appendix IV	Antimony	mg/L	15	100%	2020-04-28 to 2022-08-02	Nonparametric LCL around the Median	0.0050
2_08_05	MW-5	Appendix IV	Arsenic	mg/L	15	67%	2020-04-28 to 2022-08-02	Nonparametric LCL around the Median	0.0020
2_09_05	MW-5	Appendix IV	Barium	mg/L	15	0%	2020-04-28 to 2022-08-02	Adjusted Gamma LCL	0.042
2_10_05	MW-5	Appendix IV	Beryllium	mg/L	15	100%	2020-04-28 to 2022-08-02	Nonparametric LCL around the Median	0.0010
2_12_05	MW-5	Appendix IV	Cadmium	mg/L	15	100%	2020-04-28 to 2022-08-02	Nonparametric LCL around the Median	0.00050
2_14_05	MW-5	Appendix IV	Chromium	mg/L	15	87%	2020-04-28 to 2022-08-02	Nonparametric LCL around the Median	0.0050
2_15_05	MW-5	Appendix IV	Cobalt	mg/L	15	93%	2020-04-28 to 2022-08-02	Nonparametric LCL around the Median	0.0050
2_17_05	MW-5	Appendix IV	Lead	mg/L	15	80%	2020-04-28 to 2022-08-02	Nonparametric LCL around the Median	0.0030
2_18_05	MW-5	Appendix IV	Lithium	mg/L	15	0%	2020-04-28 to 2022-08-02	Adjusted Gamma LCL	0.056
2_20_05	MW-5	Appendix IV	Mercury	mg/L	15	100%	2020-04-28 to 2022-08-02	Nonparametric LCL around the Median	0.00020
2_21_05	MW-5	Appendix IV	Molybdenum	mg/L	15	0%	2020-04-28 to 2022-08-02	Adjusted Gamma LCL	0.040
2_23_05	MW-5	Appendix IV	Radium-226	pCi/L	15	0%	2020-04-28 to 2022-08-02	Adjusted Gamma LCL	0.57
2_24_05	MW-5	Appendix IV	Radium-226/228	pCi/L	15	0%	2020-04-28 to 2022-08-02	Adjusted Gamma LCL	1.1
2_25_05	MW-5	Appendix IV	Radium-228	pCi/L	15	0%	2020-04-28 to 2022-08-02	Normal LCL	0.29
2_26_05	MW-5	Appendix IV	Selenium	mg/L	15	100%	2020-04-28 to 2022-08-02	Nonparametric LCL around the Median	0.0050
2_28_05	MW-5	Appendix IV	Thallium	mg/L	15	100%	2020-04-28 to 2022-08-02	Nonparametric LCL around the Median	0.0020
5_36_05	MW-5	Part 115	Copper	mg/L	15	67%	2020-04-28 to 2022-08-02	Nonparametric LCL around the Median	0.0050
5_37_05	MW-5	Part 115	Iron	mg/L	15	7%	2020-04-28 to 2022-08-02	Gamma MLE LCL	1.6
5_38_05	MW-5	Part 115	Nickel	mg/L	15	0%	2020-04-28 to 2022-08-02	Adjusted Gamma LCL	0.011
5_39_05	MW-5	Part 115	Silver	mg/L	15	100%	2020-04-28 to 2022-08-02	Nonparametric LCL around the Median	0.00050
5_40_05	MW-5	Part 115	Vanadium	mg/L	15	87%	2020-04-28 to 2022-08-02	Nonparametric LCL around the Median	0.0050
5_41_05	MW-5	Part 115	Zinc	mg/L	15	27%	2020-04-28 to 2022-08-02	Gamma MLE LCL	0.012
1_01_06	MW-6	Appendix III	Boron	mg/L	14	0%	2020-04-28 to 2022-08-02	Adjusted Gamma LCL	0.71
1_02_06	MW-6	Appendix III	Calcium	mg/L	14	0%	2020-04-28 to 2022-08-02	Adjusted Gamma LCL	160
1_03_06	MW-6	Appendix III	Chloride	mg/L	14	0%	2020-04-28 to 2022-08-02	Adjusted Gamma LCL	30
1_04_06	MW-6	Appendix III	Fluoride	mg/L	14	100%	2020-04-28 to 2022-08-02	Nonparametric LCL around the Median	1.0
1_05_06	MW-6	Appendix III	Sulfate	mg/L	14	0%	2020-04-28 to 2022-08-02	Adjusted Gamma LCL	160

1_06_06	MW-6	Appendix III	Total Dissolved Solids	mg/L	14	0%	2020-04-28 to 2022-08-02	Adjusted Gamma LCL	704
2_04_06	MW-6	Appendix IV	Fluoride	mg/L	15	100%	2020-04-28 to 2022-08-02	Nonparametric LCL around the Median	1.0
2_07_06	MW-6	Appendix IV	Antimony	mg/L	15	100%	2020-04-28 to 2022-08-02	Nonparametric LCL around the Median	0.0050
2_08_06	MW-6	Appendix IV	Arsenic	mg/L	15	100%	2020-04-28 to 2022-08-02	Nonparametric LCL around the Median	0.0020
2_09_06	MW-6	Appendix IV	Barium	mg/L	15	0%	2020-04-28 to 2022-08-02	Lognormal H-LCL	0.046
2_10_06	MW-6	Appendix IV	Beryllium	mg/L	15	100%	2020-04-28 to 2022-08-02	Nonparametric LCL around the Median	0.0010
2_12_06	MW-6	Appendix IV	Cadmium	mg/L	15	100%	2020-04-28 to 2022-08-02	Nonparametric LCL around the Median	0.00050
2_14_06	MW-6	Appendix IV	Chromium	mg/L	15	100%	2020-04-28 to 2022-08-02	Nonparametric LCL around the Median	0.0050
2_15_06	MW-6	Appendix IV	Cobalt	mg/L	15	100%	2020-04-28 to 2022-08-02	Nonparametric LCL around the Median	0.0050
2_17_06	MW-6	Appendix IV	Lead	mg/L	15	100%	2020-04-28 to 2022-08-02	Nonparametric LCL around the Median	0.0030
2_18_06	MW-6	Appendix IV	Lithium	mg/L	15	0%	2020-04-28 to 2022-08-02	Adjusted Gamma LCL	0.044
2_20_06	MW-6	Appendix IV	Mercury	mg/L	15	100%	2020-04-28 to 2022-08-02	Nonparametric LCL around the Median	0.00020
2_21_06	MW-6	Appendix IV	Molybdenum	mg/L	15	0%	2020-04-28 to 2022-08-02	Adjusted Gamma LCL	0.024
2_23_06	MW-6	Appendix IV	Radium-226	pCi/L	15	0%	2020-04-28 to 2022-08-02	Normal LCL	0.21
2_24_06	MW-6	Appendix IV	Radium-226/228	pCi/L	15	0%	2020-04-28 to 2022-08-02	Normal LCL	0.66
2_25_06	MW-6	Appendix IV	Radium-228	pCi/L	15	0%	2020-04-28 to 2022-08-02	Normal LCL	0.19
2_26_06	MW-6	Appendix IV	Selenium	mg/L	15	100%	2020-04-28 to 2022-08-02	Nonparametric LCL around the Median	0.0050
2_28_06	MW-6	Appendix IV	Thallium	mg/L	15	100%	2020-04-28 to 2022-08-02	Nonparametric LCL around the Median	0.0020
5_36_06	MW-6	Part 115	Copper	mg/L	15	100%	2020-04-28 to 2022-08-02	Nonparametric LCL around the Median	0.0050
5_37_06	MW-6	Part 115	Iron	mg/L	15	47%	2020-04-28 to 2022-08-02	Gamma MLE LCL	0.022
5_38_06	MW-6	Part 115	Nickel	mg/L	15	13%	2020-04-28 to 2022-08-02	Nonparametric LCL around the Median	0.0060
5_39_06	MW-6	Part 115	Silver	mg/L	15	100%	2020-04-28 to 2022-08-02	Nonparametric LCL around the Median	0.00050
5_40_06	MW-6	Part 115	Vanadium	mg/L	15	100%	2020-04-28 to 2022-08-02	Nonparametric LCL around the Median	0.0050
5_41_06	MW-6	Part 115	Zinc	mg/L	15	93%	2020-04-28 to 2022-08-02	Nonparametric LCL around the Median	0.0050
1_01_07	MW-7	Appendix III	Boron	mg/L	9	0%	2021-06-15 to 2022-08-02	Adjusted Gamma LCL	1.7
1_02_07	MW-7	Appendix III	Calcium	mg/L	9	0%	2021-06-15 to 2022-08-02	Adjusted Gamma LCL	110
1_03_07	MW-7	Appendix III	Chloride	mg/L	9	0%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	73
1_04_07	MW-7	Appendix III	Fluoride	mg/L	9	89%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	1.0
1_05_07	MW-7	Appendix III	Sulfate	mg/L	9	0%	2021-06-15 to 2022-08-02	Adjusted Gamma LCL	182
1_06_07	MW-7	Appendix III	Total Dissolved Solids	mg/L	9	0%	2021-06-15 to 2022-08-02	Adjusted Gamma LCL	580
2_04_07	MW-7	Appendix IV	Fluoride	mg/L	9	89%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	1.0
2_07_07	MW-7	Appendix IV	Antimony	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.0050
2_08_07	MW-7	Appendix IV	Arsenic	mg/L	9	0%	2021-06-15 to 2022-08-02	Lognormal H-LCL	0.0052
2_09_07	MW-7	Appendix IV	Barium	mg/L	9	0%	2021-06-15 to 2022-08-02	Adjusted Gamma LCL	0.051
2_10_07	MW-7	Appendix IV	Beryllium	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.0010
2_12_07	MW-7	Appendix IV	Cadmium	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.00050
2_14_07	MW-7	Appendix IV	Chromium	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.0050
2_15_07	MW-7	Appendix IV	Cobalt	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.0050
2_17_07	MW-7	Appendix IV	Lead	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.0030
2_18_07	MW-7	Appendix IV	Lithium	mg/L	9	0%	2021-06-15 to 2022-08-02	Adjusted Gamma LCL	0.091
2_20_07	MW-7	Appendix IV	Mercury	mg/L	9	89%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.00020
2_21_07	MW-7	Appendix IV	Molybdenum	mg/L	9	0%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.26
2_23_07	MW-7	Appendix IV	Radium-226	pCi/L	9	0%	2021-06-15 to 2022-08-02	Adjusted Gamma LCL	0.63
2_24_07	MW-7	Appendix IV	Radium-226/228	pCi/L	9	0%	2021-06-15 to 2022-08-02	Adjusted Gamma LCL	1.5
2_25_07	MW-7	Appendix IV	Radium-228	pCi/L	9	0%	2021-06-15 to 2022-08-02	Normal LCL	0.39
2_26_07	MW-7	Appendix IV	Selenium	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.0050
2_28_07	MW-7	Appendix IV	Thallium	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.0020
5_36_07	MW-7	Part 115	Copper	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.0050

5_37_07	MW-7	Part 115	Iron	mg/L	9	0%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	1.3
5_38_07	MW-7	Part 115	Nickel	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.0050
5_39_07	MW-7	Part 115	Silver	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.00050
5_40_07	MW-7	Part 115	Vanadium	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.0050
5_41_07	MW-7	Part 115	Zinc	mg/L	9	67%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.0050
1_01_7B	MW-7B	Appendix III	Boron	mg/L	5	0%	2022-03-09 to 2022-07-28	Nonparametric LCL around the Median	2.9
1_02_7B	MW-7B	Appendix III	Calcium	mg/L	5	0%	2022-03-09 to 2022-07-28	Nonparametric LCL around the Median	8.2
1_03_7B	MW-7B	Appendix III	Chloride	mg/L	5	100%	2022-03-09 to 2022-07-28	Nonparametric LCL around the Median	5.0
1_04_7B	MW-7B	Appendix III	Fluoride	mg/L	5	100%	2022-03-09 to 2022-07-28	Nonparametric LCL around the Median	1.0
1_05_7B	MW-7B	Appendix III	Sulfate	mg/L	5	100%	2022-03-09 to 2022-07-28	Nonparametric LCL around the Median	5.0
1_06_7B	MW-7B	Appendix III	Total Dissolved Solids	mg/L	5	0%	2022-03-09 to 2022-07-28	Nonparametric LCL around the Median	362
2_04_7B	MW-7B	Appendix IV	Fluoride	mg/L	5	100%	2022-03-09 to 2022-07-28	Nonparametric LCL around the Median	1.0
2_07_7B	MW-7B	Appendix IV	Antimony	mg/L	5	100%	2022-03-09 to 2022-07-28	Nonparametric LCL around the Median	0.0050
2_08_7B	MW-7B	Appendix IV	Arsenic	mg/L	5	80%	2022-03-09 to 2022-07-28	Nonparametric LCL around the Median	0.0020
2_09_7B	MW-7B	Appendix IV	Barium	mg/L	5	0%	2022-03-09 to 2022-07-28	Nonparametric LCL around the Median	0.0090
2_10_7B	MW-7B	Appendix IV	Beryllium	mg/L	5	100%	2022-03-09 to 2022-07-28	Nonparametric LCL around the Median	0.0010
2_12_7B	MW-7B	Appendix IV	Cadmium	mg/L	5	100%	2022-03-09 to 2022-07-28	Nonparametric LCL around the Median	0.00050
2_14_7B	MW-7B	Appendix IV	Chromium	mg/L	5	100%	2022-03-09 to 2022-07-28	Nonparametric LCL around the Median	0.0050
2_15_7B	MW-7B	Appendix IV	Cobalt	mg/L	5	100%	2022-03-09 to 2022-07-28	Nonparametric LCL around the Median	0.0050
2_17_7B	MW-7B	Appendix IV	Lead	mg/L	5	80%	2022-03-09 to 2022-07-28	Nonparametric LCL around the Median	0.0030
2_18_7B	MW-7B	Appendix IV	Lithium	mg/L	5	0%	2022-03-09 to 2022-07-28	Nonparametric LCL around the Median	0.028
2_20_7B	MW-7B	Appendix IV	Mercury	mg/L	5	100%	2022-03-09 to 2022-07-28	Nonparametric LCL around the Median	0.00020
2_21_7B	MW-7B	Appendix IV	Molybdenum	mg/L	5	100%	2022-03-09 to 2022-07-28	Nonparametric LCL around the Median	0.0050
2_23_7B	MW-7B	Appendix IV	Radium-226	pCi/L	5	0%	2022-03-09 to 2022-07-28	Nonparametric LCL around the Median	0.28
2_24_7B	MW-7B	Appendix IV	Radium-226/228	pCi/L	5	0%	2022-03-09 to 2022-07-28	Nonparametric LCL around the Median	0.38
2_25_7B	MW-7B	Appendix IV	Radium-228	pCi/L	5	0%	2022-03-09 to 2022-07-28	Nonparametric LCL around the Median	-0.12
2_26_7B	MW-7B	Appendix IV	Selenium	mg/L	5	100%	2022-03-09 to 2022-07-28	Nonparametric LCL around the Median	0.0050
2_28_7B	MW-7B	Appendix IV	Thallium	mg/L	5	100%	2022-03-09 to 2022-07-28	Nonparametric LCL around the Median	0.0020
5_36_7B	MW-7B	Part 115	Copper	mg/L	5	100%	2022-03-09 to 2022-07-28	Nonparametric LCL around the Median	0.0050
5_37_7B	MW-7B	Part 115	Iron	mg/L	5	0%	2022-03-09 to 2022-07-28	Nonparametric LCL around the Median	0.030
5_38_7B	MW-7B	Part 115	Nickel	mg/L	5	100%	2022-03-09 to 2022-07-28	Nonparametric LCL around the Median	0.0050
5_39_7B	MW-7B	Part 115	Silver	mg/L	5	100%	2022-03-09 to 2022-07-28	Nonparametric LCL around the Median	0.00050
5_40_7B	MW-7B	Part 115	Vanadium	mg/L	5	100%	2022-03-09 to 2022-07-28	Nonparametric LCL around the Median	0.0050
5_41_7B	MW-7B	Part 115	Zinc	mg/L	5	100%	2022-03-09 to 2022-07-28	Nonparametric LCL around the Median	0.0050
1_01_08	MW-8	Appendix III	Boron	mg/L	9	11%	2021-06-15 to 2022-08-02	Gamma MLE LCL	0.063
1_02_08	MW-8	Appendix III	Calcium	mg/L	9	0%	2021-06-15 to 2022-08-02	Adjusted Gamma LCL	91
1_03_08	MW-8	Appendix III	Chloride	mg/L	9	22%	2021-06-15 to 2022-08-02	Gamma MLE LCL	8.4
1_04_08	MW-8	Appendix III	Fluoride	mg/L	9	89%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	1.0
1_05_08	MW-8	Appendix III	Sulfate	mg/L	9	0%	2021-06-15 to 2022-08-02	Adjusted Gamma LCL	15
1_06_08	MW-8	Appendix III	Total Dissolved Solids	mg/L	9	0%	2021-06-15 to 2022-08-02	Adjusted Gamma LCL	369
2_04_08	MW-8	Appendix IV	Fluoride	mg/L	9	89%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	1.0
2_07_08	MW-8	Appendix IV	Antimony	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.0050
2_08_08	MW-8	Appendix IV	Arsenic	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.0020
2_09_08	MW-8	Appendix IV	Barium	mg/L	9	0%	2021-06-15 to 2022-08-02	Adjusted Gamma LCL	0.019
2_10_08	MW-8	Appendix IV	Beryllium	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.0010
2_12_08	MW-8	Appendix IV	Cadmium	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.00050
2_14_08	MW-8	Appendix IV	Chromium	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.0050
2_15_08	MW-8	Appendix IV	Cobalt	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.0050

2_17_08	MW-8	Appendix IV	Lead	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.0030
2_18_08	MW-8	Appendix IV	Lithium	mg/L	9	56%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.0050
2_20_08	MW-8	Appendix IV	Mercury	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.00020
2_21_08	MW-8	Appendix IV	Molybdenum	mg/L	9	78%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.0050
2_23_08	MW-8	Appendix IV	Radium-226	pCi/L	9	0%	2021-06-15 to 2022-08-02	Adjusted Gamma LCL	0.39
2_24_08	MW-8	Appendix IV	Radium-226/228	pCi/L	9	0%	2021-06-15 to 2022-08-02	Adjusted Gamma LCL	1.2
2_25_08	MW-8	Appendix IV	Radium-228	pCi/L	9	0%	2021-06-15 to 2022-08-02	Normal LCL	0.45
2_26_08	MW-8	Appendix IV	Selenium	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.0050
2_28_08	MW-8	Appendix IV	Thallium	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.0020
5_36_08	MW-8	Part 115	Copper	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.0050
5_37_08	MW-8	Part 115	Iron	mg/L	9	89%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.020
5_38_08	MW-8	Part 115	Nickel	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.0050
5_39_08	MW-8	Part 115	Silver	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.00050
5_40_08	MW-8	Part 115	Vanadium	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.0050
5_41_08	MW-8	Part 115	Zinc	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.0050
1_01_09	MW-9	Appendix III	Boron	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.040
1_02_09	MW-9	Appendix III	Calcium	mg/L	9	0%	2021-06-15 to 2022-08-02	Adjusted Gamma LCL	66
1_03_09	MW-9	Appendix III	Chloride	mg/L	9	89%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	5.0
1_04_09	MW-9	Appendix III	Fluoride	mg/L	9	89%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	1.0
1_05_09	MW-9	Appendix III	Sulfate	mg/L	9	78%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	5.0
1_06_09	MW-9	Appendix III	Total Dissolved Solids	mg/L	9	0%	2021-06-15 to 2022-08-02	Adjusted Gamma LCL	240
2_04_09	MW-9	Appendix IV	Fluoride	mg/L	9	89%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	1.0
2_07_09	MW-9	Appendix IV	Antimony	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.0050
2_08_09	MW-9	Appendix IV	Arsenic	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.0020
2_09_09	MW-9	Appendix IV	Barium	mg/L	9	0%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.013
2_10_09	MW-9	Appendix IV	Beryllium	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.0010
2_12_09	MW-9	Appendix IV	Cadmium	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.00050
2_14_09	MW-9	Appendix IV	Chromium	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.0050
2_15_09	MW-9	Appendix IV	Cobalt	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.0050
2_17_09	MW-9	Appendix IV	Lead	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.0030
2_18_09	MW-9	Appendix IV	Lithium	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.0050
2_20_09	MW-9	Appendix IV	Mercury	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.00020
2_21_09	MW-9	Appendix IV	Molybdenum	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.0050
2_23_09	MW-9	Appendix IV	Radium-226	pCi/L	9	0%	2021-06-15 to 2022-08-02	Adjusted Gamma LCL	0.32
2_24_09	MW-9	Appendix IV	Radium-226/228	pCi/L	9	0%	2021-06-15 to 2022-08-02	Adjusted Gamma LCL	0.66
2_25_09	MW-9	Appendix IV	Radium-228	pCi/L	9	0%	2021-06-15 to 2022-08-02	Normal LCL	0.054
2_26_09	MW-9	Appendix IV	Selenium	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.0050
2_28_09	MW-9	Appendix IV	Thallium	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.0020
5_36_09	MW-9	Part 115	Copper	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.0050
5_37_09	MW-9	Part 115	Iron	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.020
5_38_09	MW-9	Part 115	Nickel	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.0050
5_39_09	MW-9	Part 115	Silver	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.00050
5_40_09	MW-9	Part 115	Vanadium	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.0050
5_41_09	MW-9	Part 115	Zinc	mg/L	9	89%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.0050
1_01_10	MW-10	Appendix III	Boron	mg/L	9	0%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.050
1_02_10	MW-10	Appendix III	Calcium	mg/L	9	0%	2021-06-15 to 2022-08-02	Adjusted Gamma LCL	122
1_03_10	MW-10	Appendix III	Chloride	mg/L	9	89%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	5.0
1_04_10	MW-10	Appendix III	Fluoride	mg/L	9	89%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	1.0

1_05_10	MW-10	Appendix III	Sulfate	mg/L	9	0%	2021-06-15 to 2022-08-02	Adjusted Gamma LCL	12
1_06_10	MW-10	Appendix III	Total Dissolved Solids	mg/L	9	0%	2021-06-15 to 2022-08-02	Adjusted Gamma LCL	410
2_04_10	MW-10	Appendix IV	Fluoride	mg/L	9	89%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	1.0
2_07_10	MW-10	Appendix IV	Antimony	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.0050
2_08_10	MW-10	Appendix IV	Arsenic	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.0020
2_09_10	MW-10	Appendix IV	Barium	mg/L	9	0%	2021-06-15 to 2022-08-02	Adjusted Gamma LCL	0.039
2_10_10	MW-10	Appendix IV	Beryllium	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.0010
2_12_10	MW-10	Appendix IV	Cadmium	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.00050
2_14_10	MW-10	Appendix IV	Chromium	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.0050
2_15_10	MW-10	Appendix IV	Cobalt	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.0050
2_17_10	MW-10	Appendix IV	Lead	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.0030
2_18_10	MW-10	Appendix IV	Lithium	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.0050
2_20_10	MW-10	Appendix IV	Mercury	mg/L	9	89%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.00020
2_21_10	MW-10	Appendix IV	Molybdenum	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.0050
2_23_10	MW-10	Appendix IV	Radium-226	pCi/L	9	0%	2021-06-15 to 2022-08-02	Adjusted Gamma LCL	0.42
2_24_10	MW-10	Appendix IV	Radium-226/228	pCi/L	9	0%	2021-06-15 to 2022-08-02	Adjusted Gamma LCL	0.58
2_25_10	MW-10	Appendix IV	Radium-228	pCi/L	9	0%	2021-06-15 to 2022-08-02	Normal LCL	-0.38
2_26_10	MW-10	Appendix IV	Selenium	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.0050
2_28_10	MW-10	Appendix IV	Thallium	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.0020
5_36_10	MW-10	Part 115	Copper	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.0050
5_37_10	MW-10	Part 115	Iron	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.020
5_38_10	MW-10	Part 115	Nickel	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.0050
5_39_10	MW-10	Part 115	Silver	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.00050
5_40_10	MW-10	Part 115	Vanadium	mg/L	9	100%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.0050
5_41_10	MW-10	Part 115	Zinc	mg/L	9	78%	2021-06-15 to 2022-08-02	Nonparametric LCL around the Median	0.0050
1_01_13	MW-13	Appendix III	Boron	mg/L	6	0%	2022-02-23 to 2022-08-17	Nonparametric LCL around the Median	0.14
1_02_13	MW-13	Appendix III	Calcium	mg/L	6	0%	2022-02-23 to 2022-08-17	Nonparametric LCL around the Median	94
1_03_13	MW-13	Appendix III	Chloride	mg/L	6	33%	2022-02-23 to 2022-08-17	Nonparametric LCL around the Median	5.0
1_04_13	MW-13	Appendix III	Fluoride	mg/L	6	100%	2022-02-23 to 2022-08-17	Nonparametric LCL around the Median	1.0
1_05_13	MW-13	Appendix III	Sulfate	mg/L	6	0%	2022-02-23 to 2022-08-17	Nonparametric LCL around the Median	16
1_06_13	MW-13	Appendix III	Total Dissolved Solids	mg/L	6	0%	2022-02-23 to 2022-08-17	Nonparametric LCL around the Median	340
2_04_13	MW-13	Appendix IV	Fluoride	mg/L	6	100%	2022-02-23 to 2022-08-17	Nonparametric LCL around the Median	1.0
2_07_13	MW-13	Appendix IV	Antimony	mg/L	6	100%	2022-02-23 to 2022-08-17	Nonparametric LCL around the Median	0.0050
2_08_13	MW-13	Appendix IV	Arsenic	mg/L	6	100%	2022-02-23 to 2022-08-17	Nonparametric LCL around the Median	0.0020
2_09_13	MW-13	Appendix IV	Barium	mg/L	6	0%	2022-02-23 to 2022-08-17	Nonparametric LCL around the Median	0.020
2_10_13	MW-13	Appendix IV	Beryllium	mg/L	6	100%	2022-02-23 to 2022-08-17	Nonparametric LCL around the Median	0.0010
2_12_13	MW-13	Appendix IV	Cadmium	mg/L	6	100%	2022-02-23 to 2022-08-17	Nonparametric LCL around the Median	0.00050
2_14_13	MW-13	Appendix IV	Chromium	mg/L	6	100%	2022-02-23 to 2022-08-17	Nonparametric LCL around the Median	0.0050
2_15_13	MW-13	Appendix IV	Cobalt	mg/L	6	100%	2022-02-23 to 2022-08-17	Nonparametric LCL around the Median	0.0050
2_17_13	MW-13	Appendix IV	Lead	mg/L	6	100%	2022-02-23 to 2022-08-17	Nonparametric LCL around the Median	0.0030
2_18_13	MW-13	Appendix IV	Lithium	mg/L	6	100%	2022-02-23 to 2022-08-17	Nonparametric LCL around the Median	0.0050
2_20_13	MW-13	Appendix IV	Mercury	mg/L	6	100%	2022-02-23 to 2022-08-17	Nonparametric LCL around the Median	0.00020
2_21_13	MW-13	Appendix IV	Molybdenum	mg/L	6	100%	2022-02-23 to 2022-08-17	Nonparametric LCL around the Median	0.0050
2_23_13	MW-13	Appendix IV	Radium-226	pCi/L	6	0%	2022-02-23 to 2022-08-17	Nonparametric LCL around the Median	0.29
2_24_13	MW-13	Appendix IV	Radium-226/228	pCi/L	6	0%	2022-02-23 to 2022-08-17	Nonparametric LCL around the Median	0.30
2_25_13	MW-13	Appendix IV	Radium-228	pCi/L	6	0%	2022-02-23 to 2022-08-17	Nonparametric LCL around the Median	-0.84
2_26_13	MW-13	Appendix IV	Selenium	mg/L	6	100%	2022-02-23 to 2022-08-17	Nonparametric LCL around the Median	0.0050
2_28_13	MW-13	Appendix IV	Thallium	mg/L	6	100%	2022-02-23 to 2022-08-17	Nonparametric LCL around the Median	0.0020

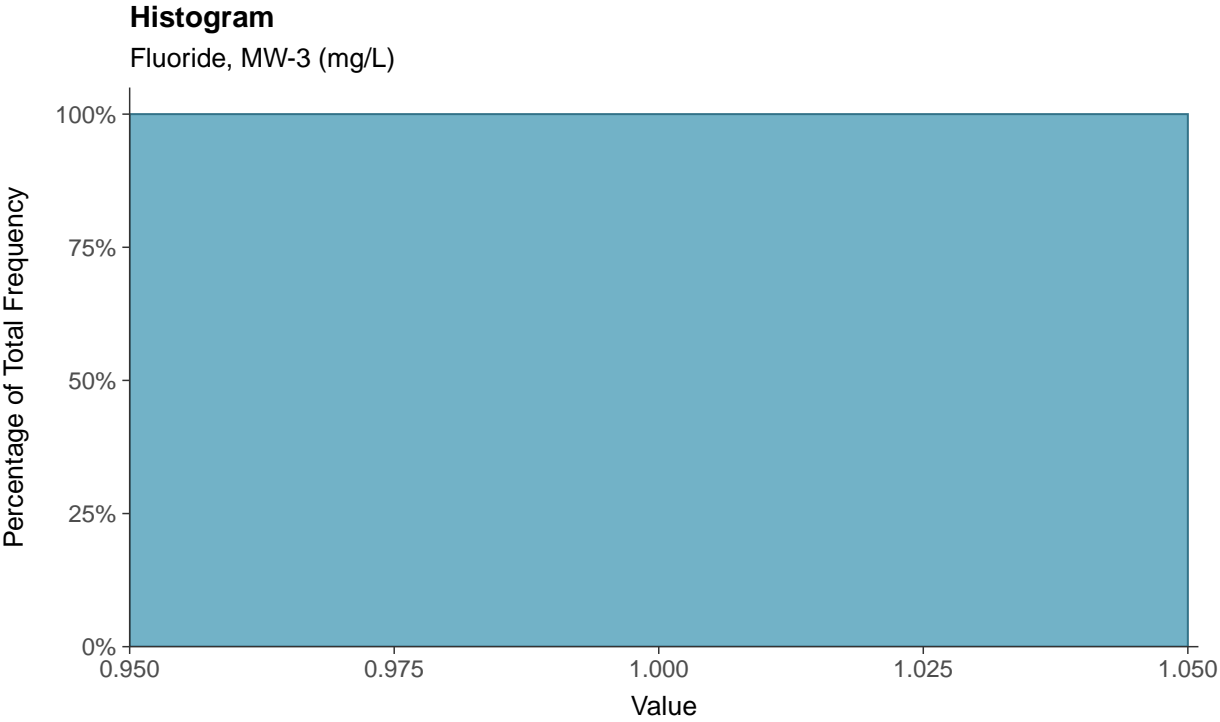
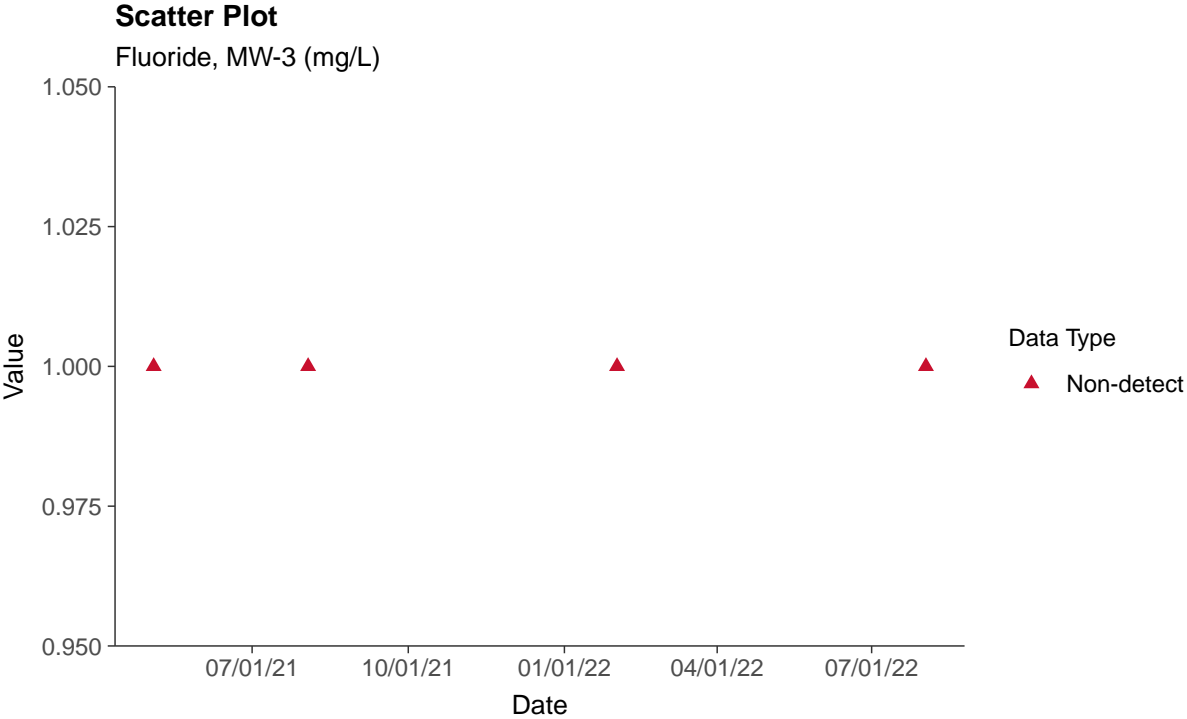


5_36_13	MW-13	Part 115	Copper	mg/L	6	100%	2022-02-23 to 2022-08-17	Nonparametric LCL around the Median	0.0050
5_37_13	MW-13	Part 115	Iron	mg/L	6	17%	2022-02-23 to 2022-08-17	Nonparametric LCL around the Median	0.020
5_38_13	MW-13	Part 115	Nickel	mg/L	6	100%	2022-02-23 to 2022-08-17	Nonparametric LCL around the Median	0.0050
5_39_13	MW-13	Part 115	Silver	mg/L	6	100%	2022-02-23 to 2022-08-17	Nonparametric LCL around the Median	0.00050
5_40_13	MW-13	Part 115	Vanadium	mg/L	6	100%	2022-02-23 to 2022-08-17	Nonparametric LCL around the Median	0.0050
5_41_13	MW-13	Part 115	Zinc	mg/L	6	83%	2022-02-23 to 2022-08-17	Nonparametric LCL around the Median	0.0050



### Appendix IV: Fluoride, MW-3

ID: 2\_04\_03





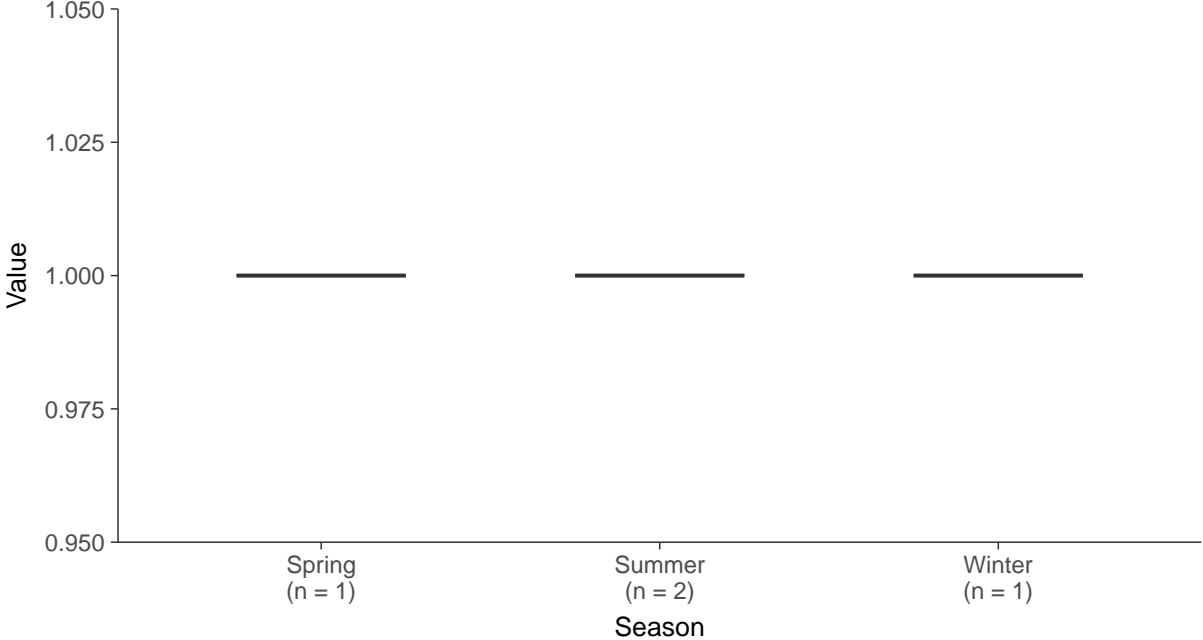
**Boxplot**

Fluoride, MW-3 (mg/L)



**Boxplot by Season**

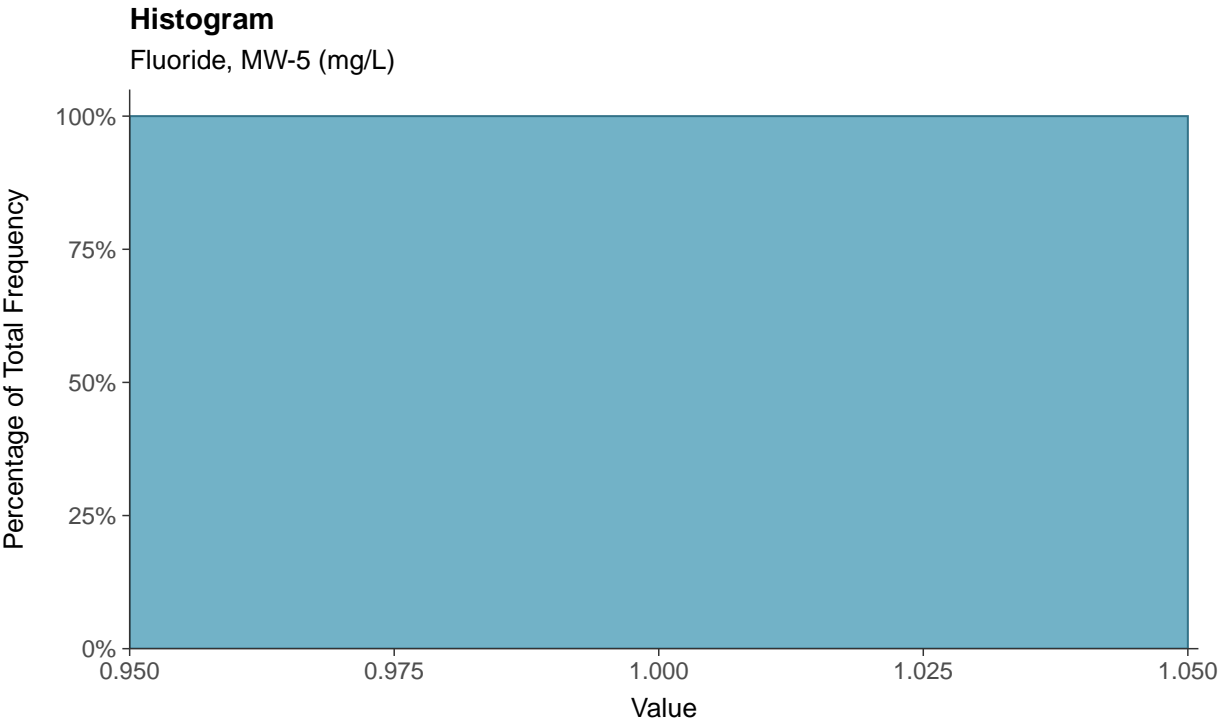
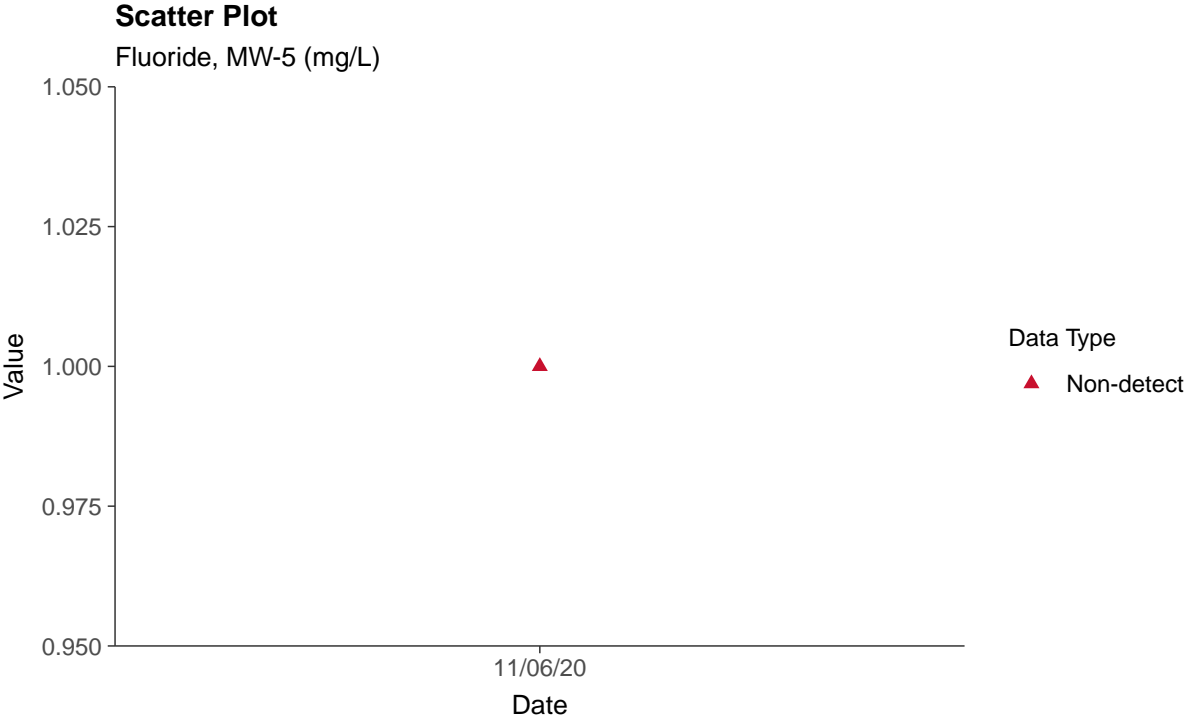
Fluoride, MW-3 (mg/L)





### Appendix IV: Fluoride, MW-5

ID: 2\_04\_05





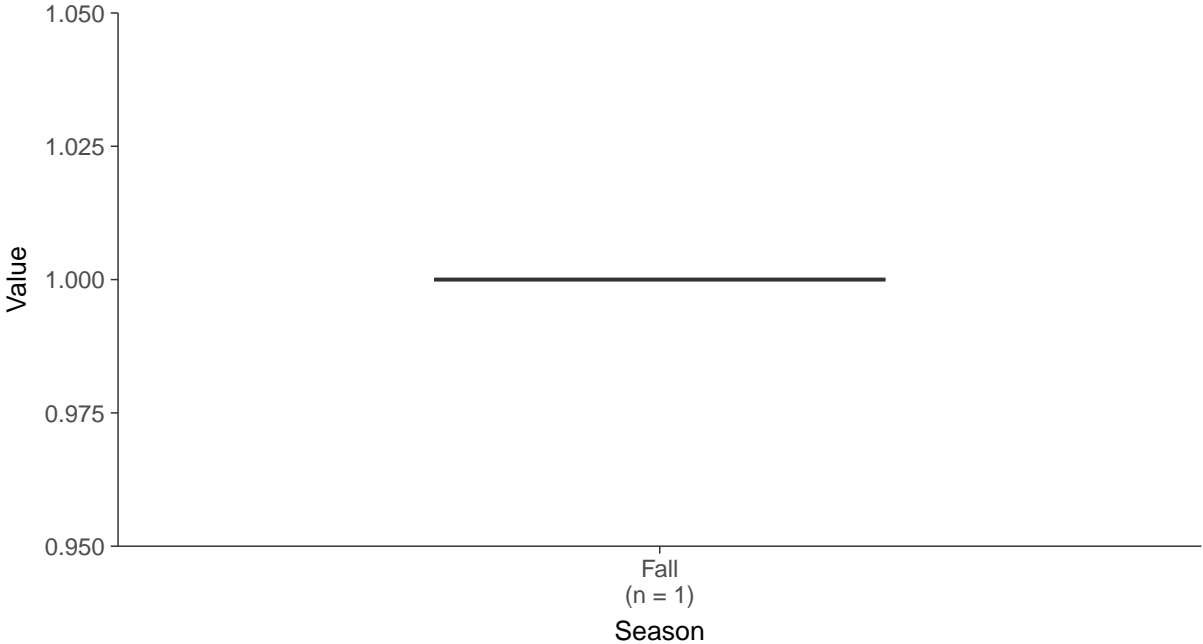
**Boxplot**

Fluoride, MW-5 (mg/L)



**Boxplot by Season**

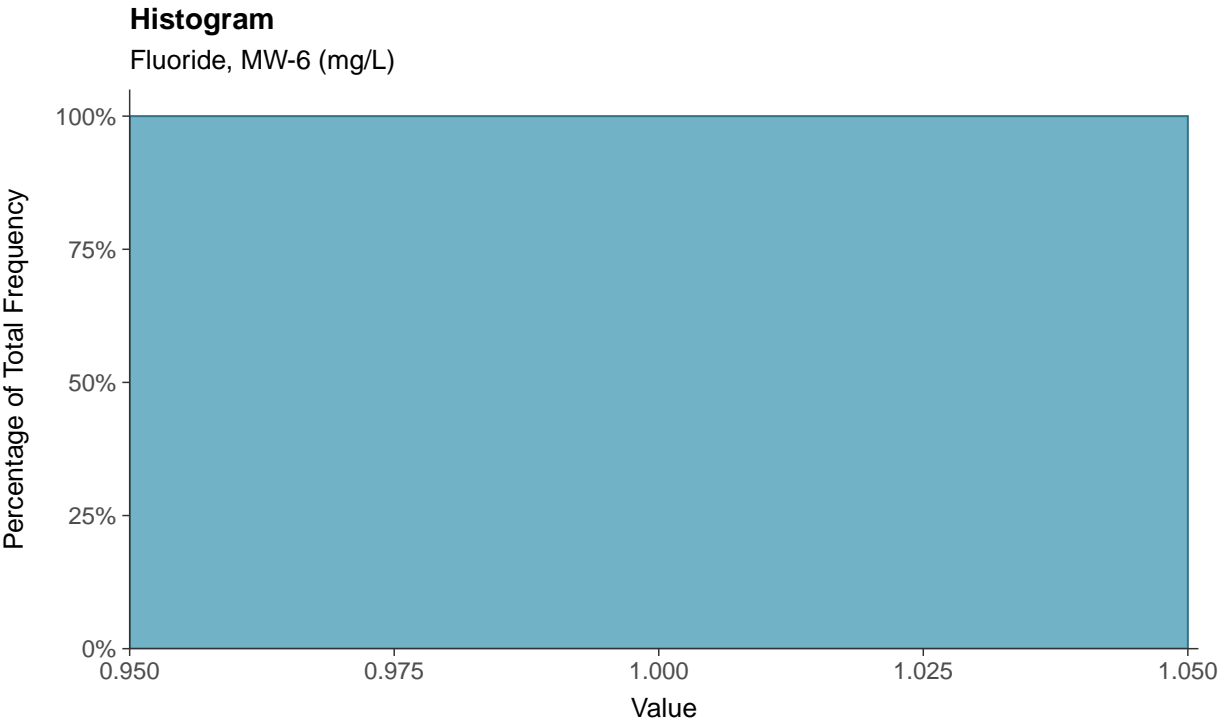
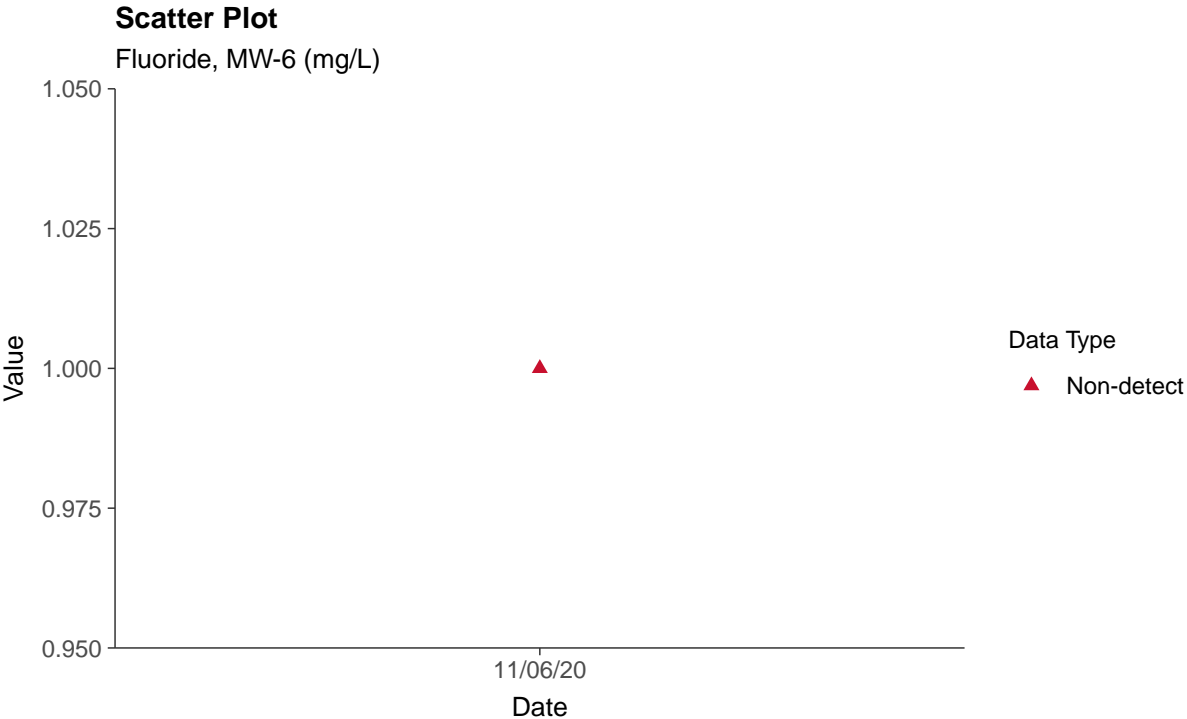
Fluoride, MW-5 (mg/L)





### Appendix IV: Fluoride, MW-6

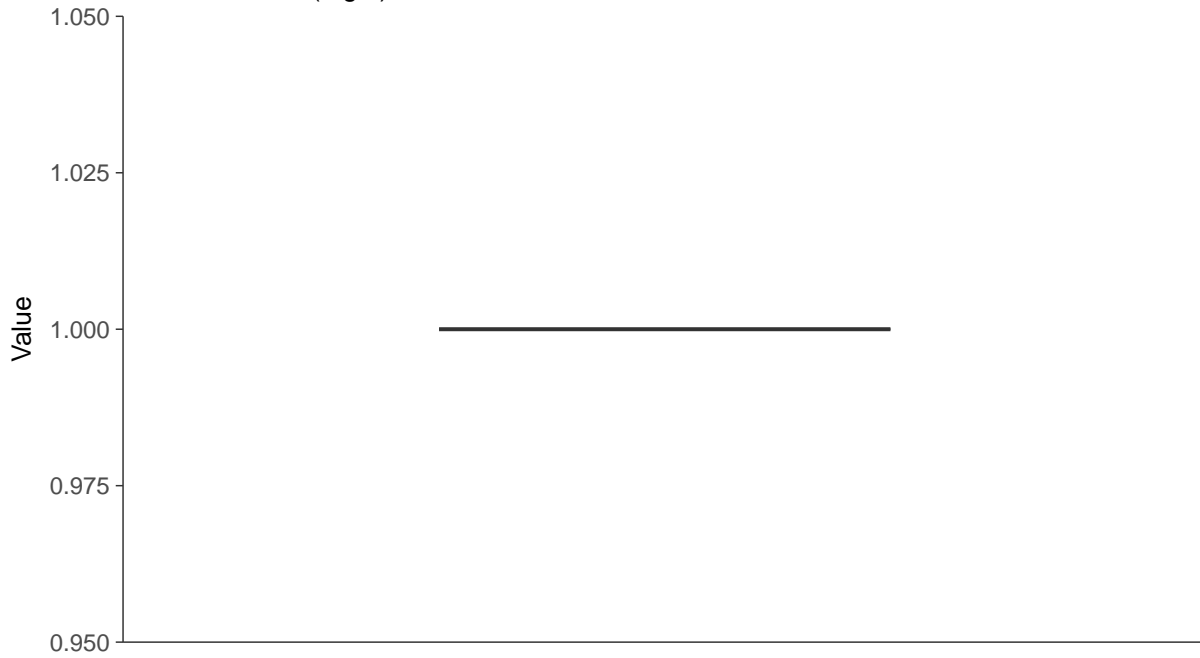
ID: 2\_04\_06





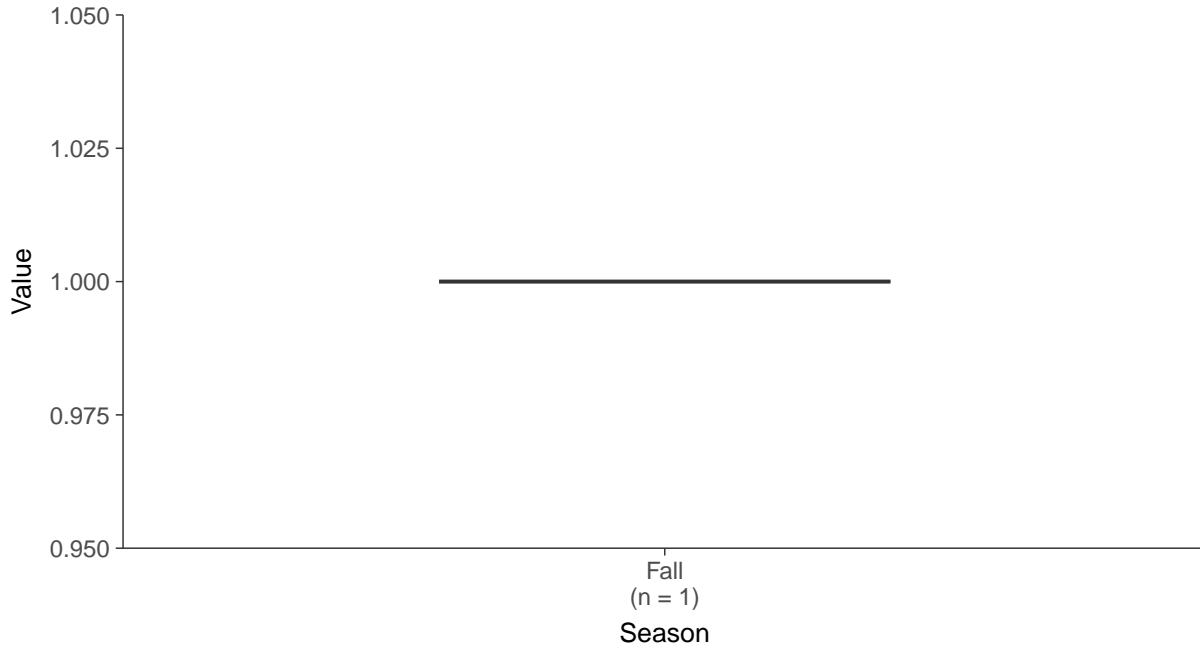
### Boxplot

Fluoride, MW-6 (mg/L)



### Boxplot by Season

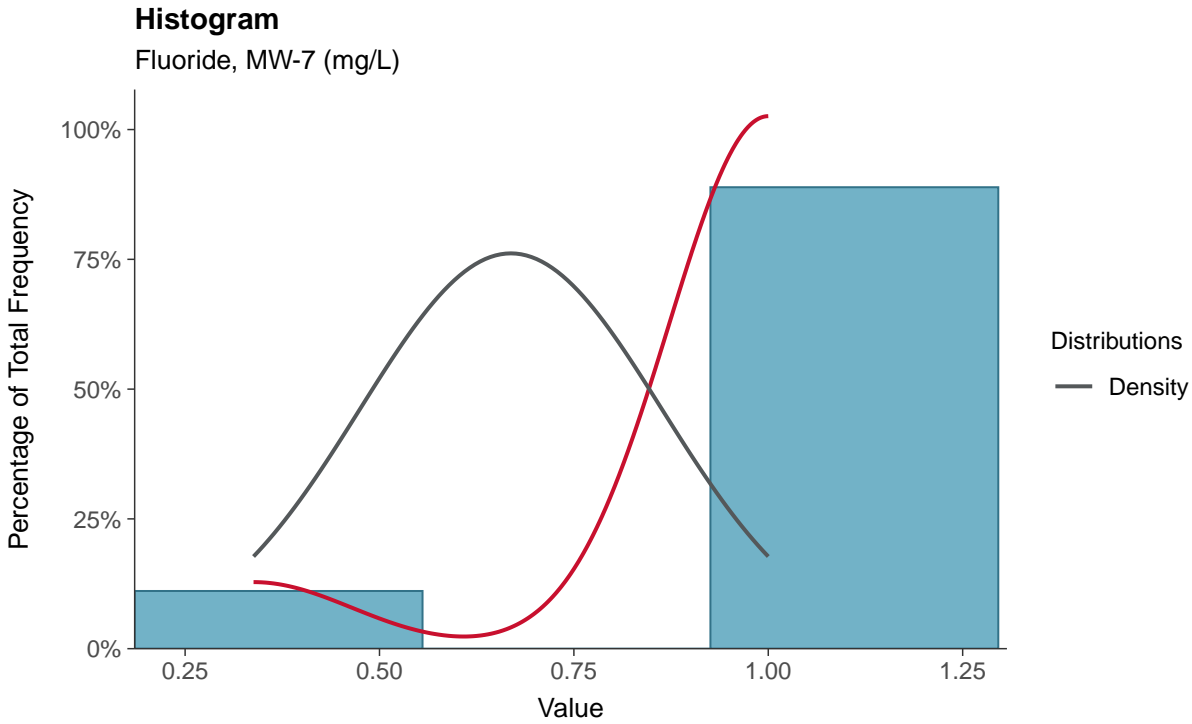
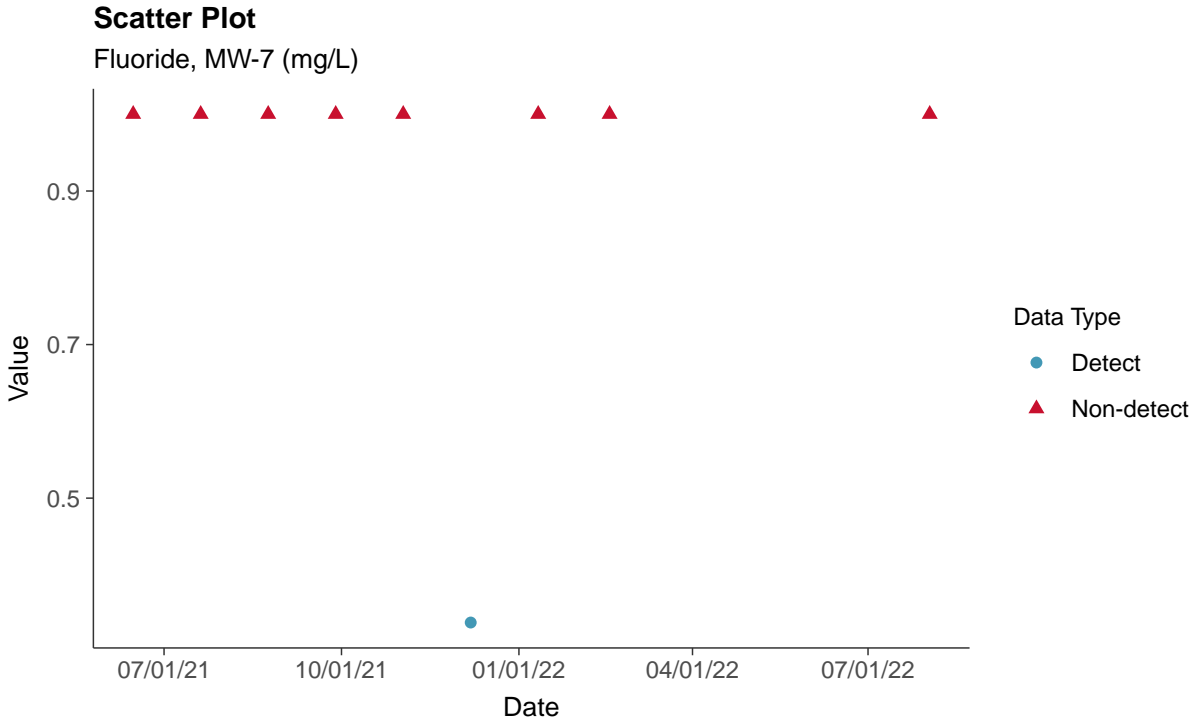
Fluoride, MW-6 (mg/L)





### Appendix IV: Fluoride, MW-7

ID: 2\_04\_07

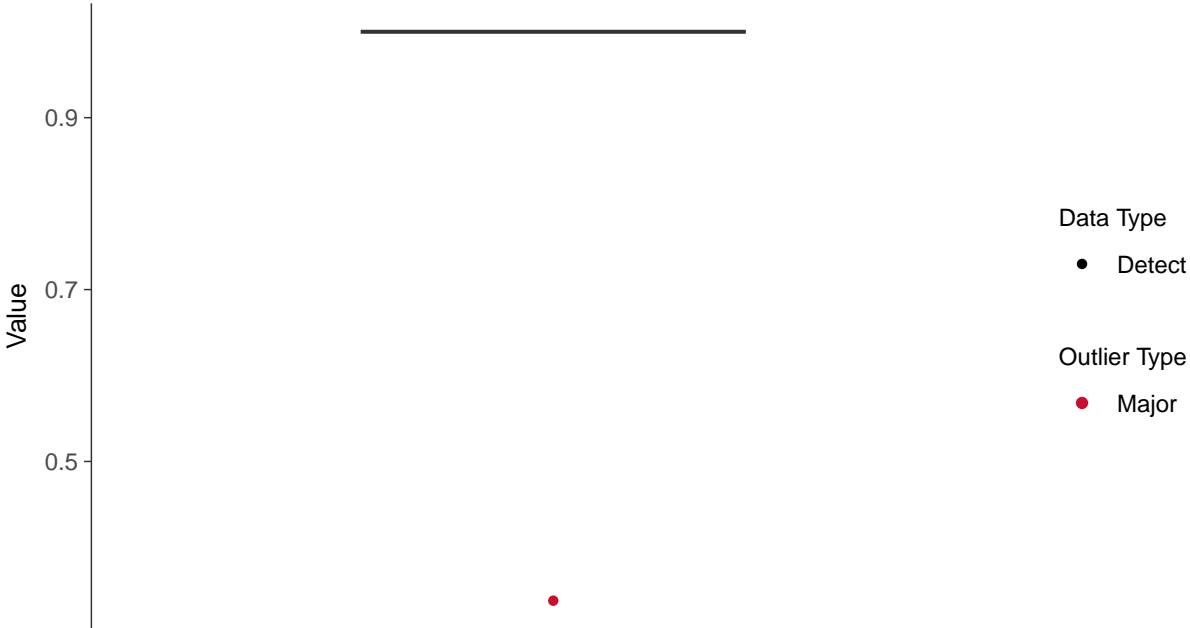






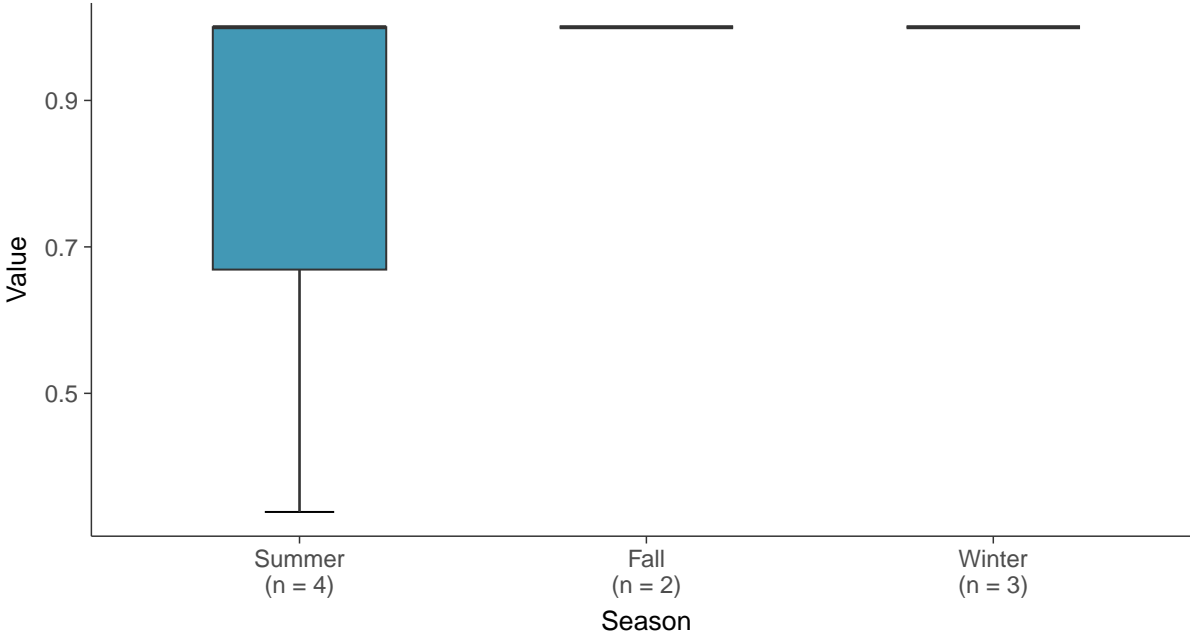
**Boxplot**

Fluoride, MW-7 (mg/L)



**Boxplot by Season**

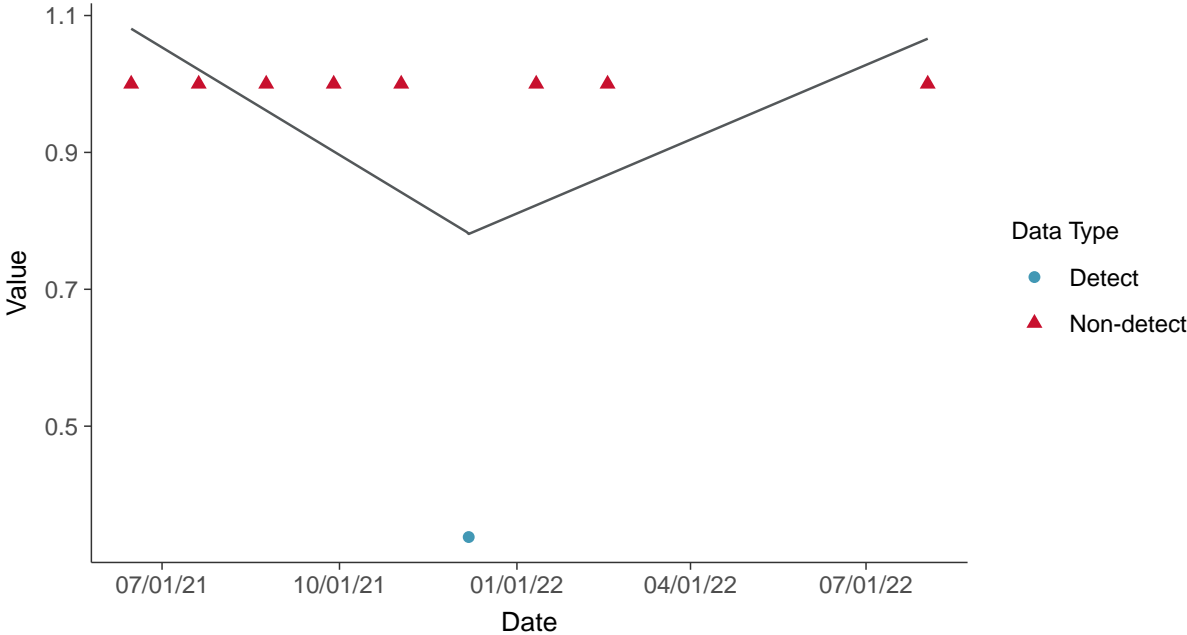
Fluoride, MW-7 (mg/L)





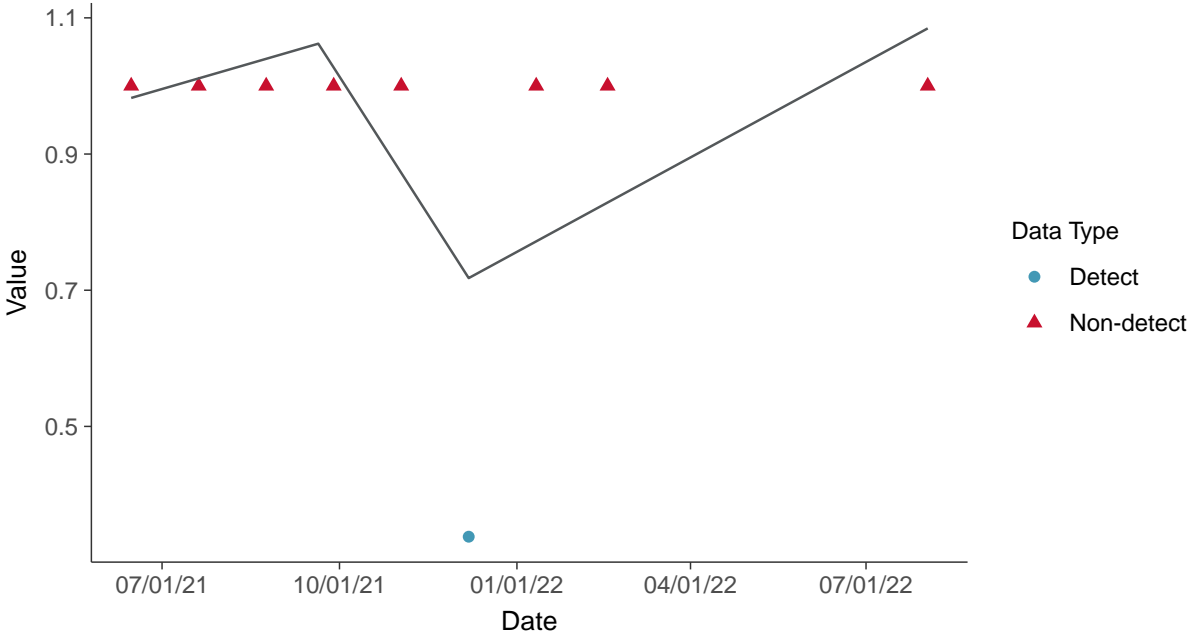
**Trend Regression: Piecewise Linear-Linear**

Fluoride, MW-7 (mg/L)



**Trend Regression: Piecewise Linear-Linear-Linear**

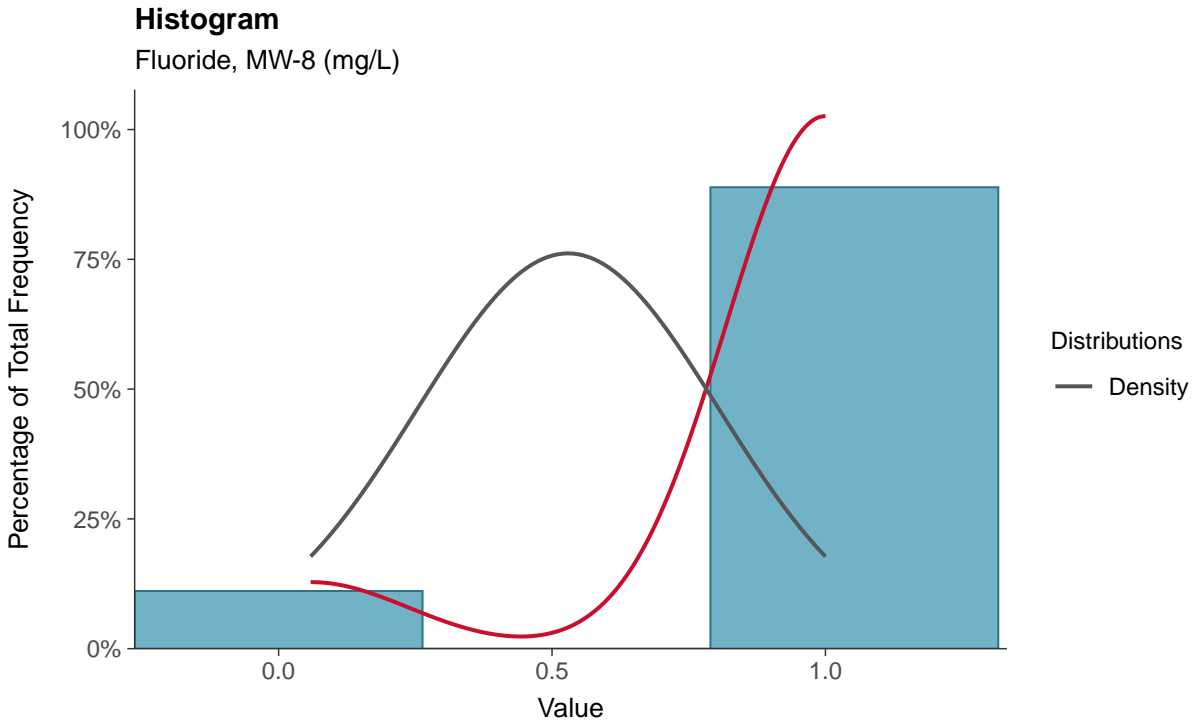
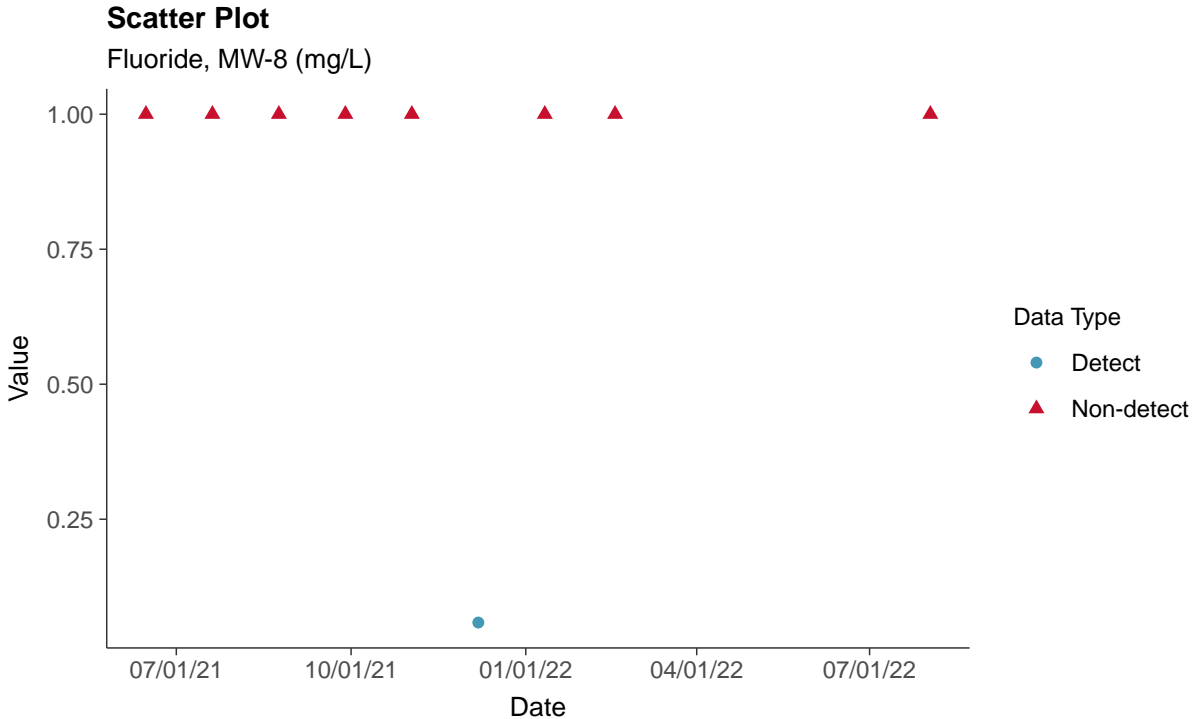
Fluoride, MW-7 (mg/L)





### Appendix IV: Fluoride, MW-8

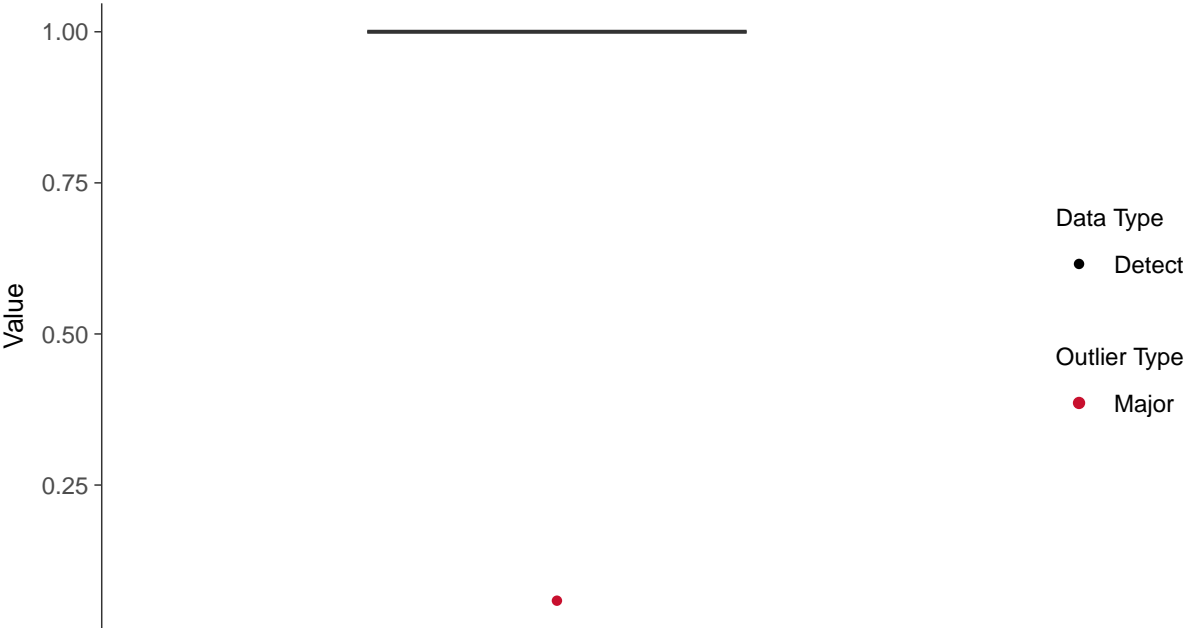
ID: 2\_04\_08





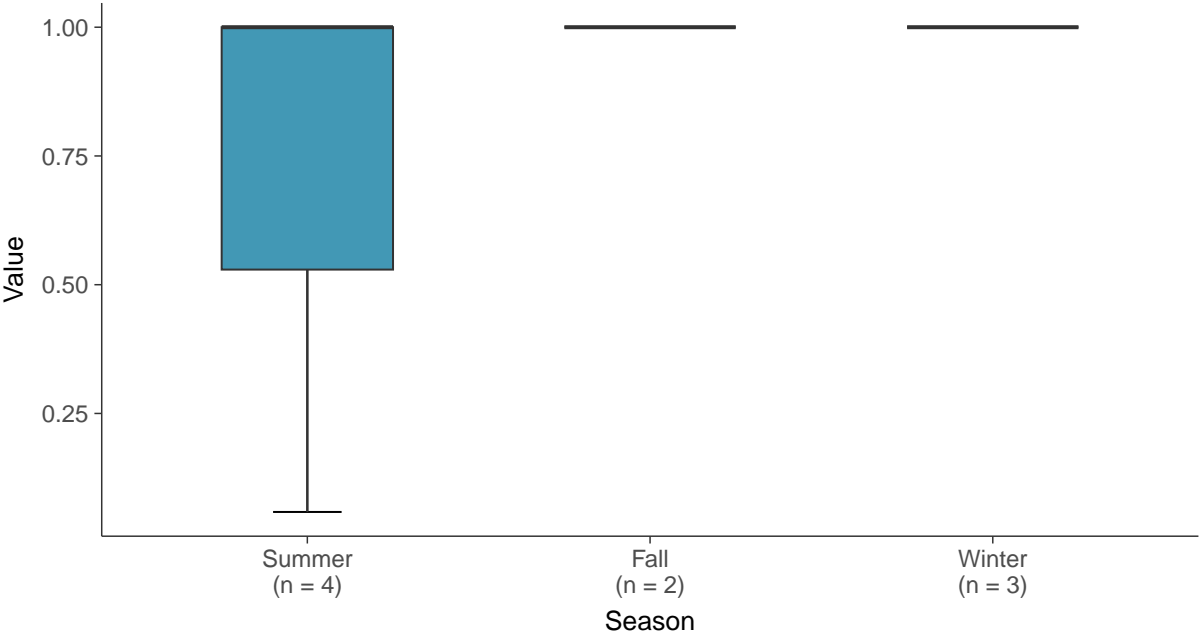
**Boxplot**

Fluoride, MW-8 (mg/L)



**Boxplot by Season**

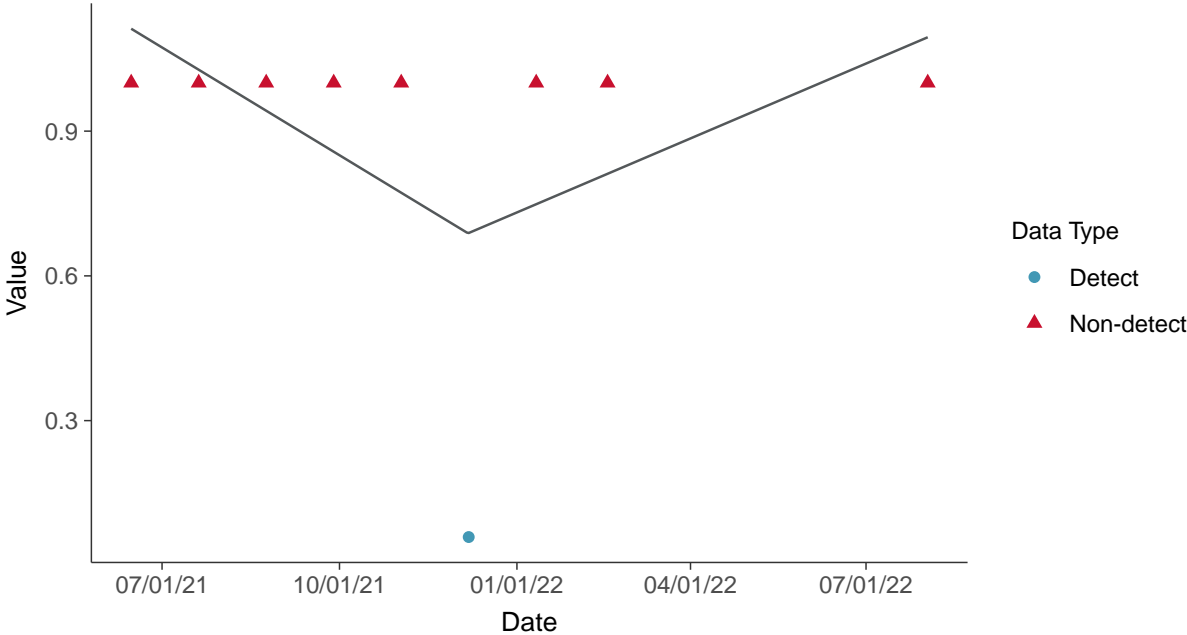
Fluoride, MW-8 (mg/L)





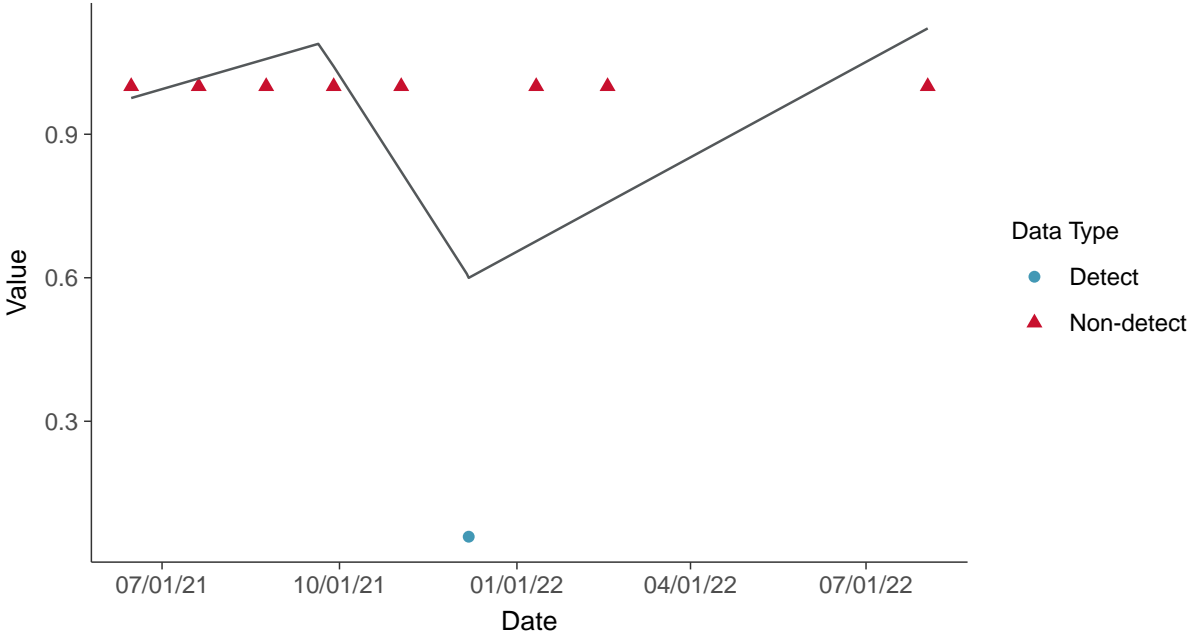
**Trend Regression: Piecewise Linear-Linear**

Fluoride, MW-8 (mg/L)



**Trend Regression: Piecewise Linear-Linear-Linear**

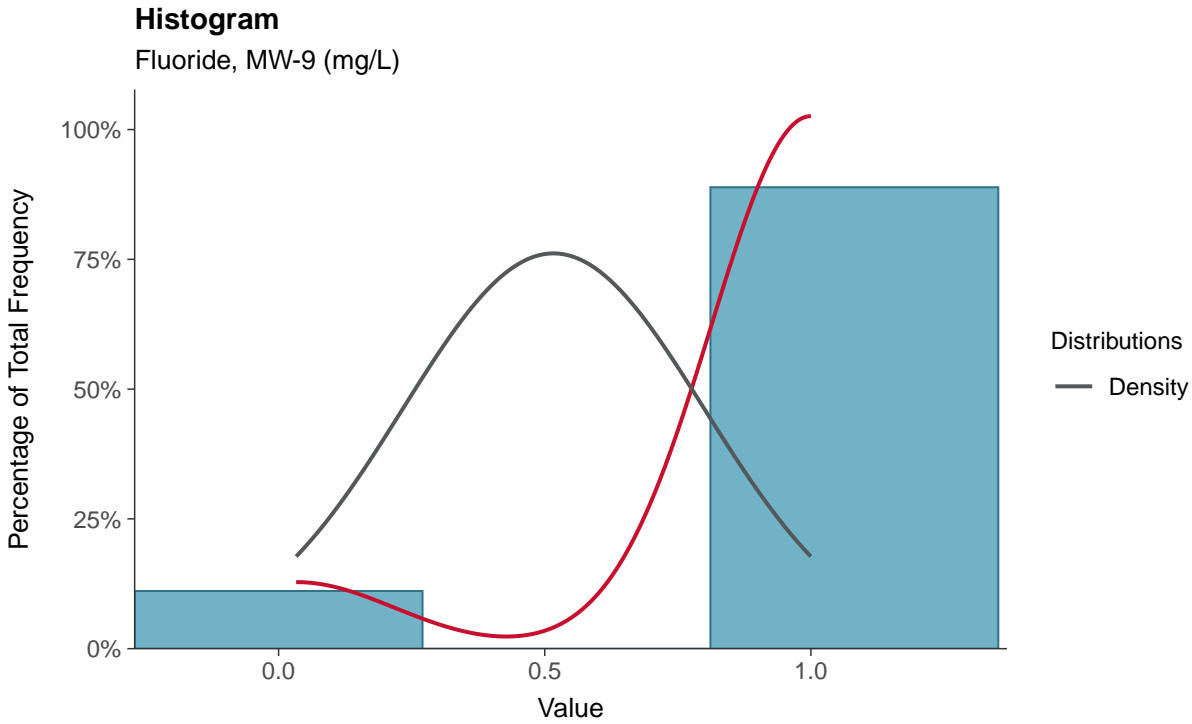
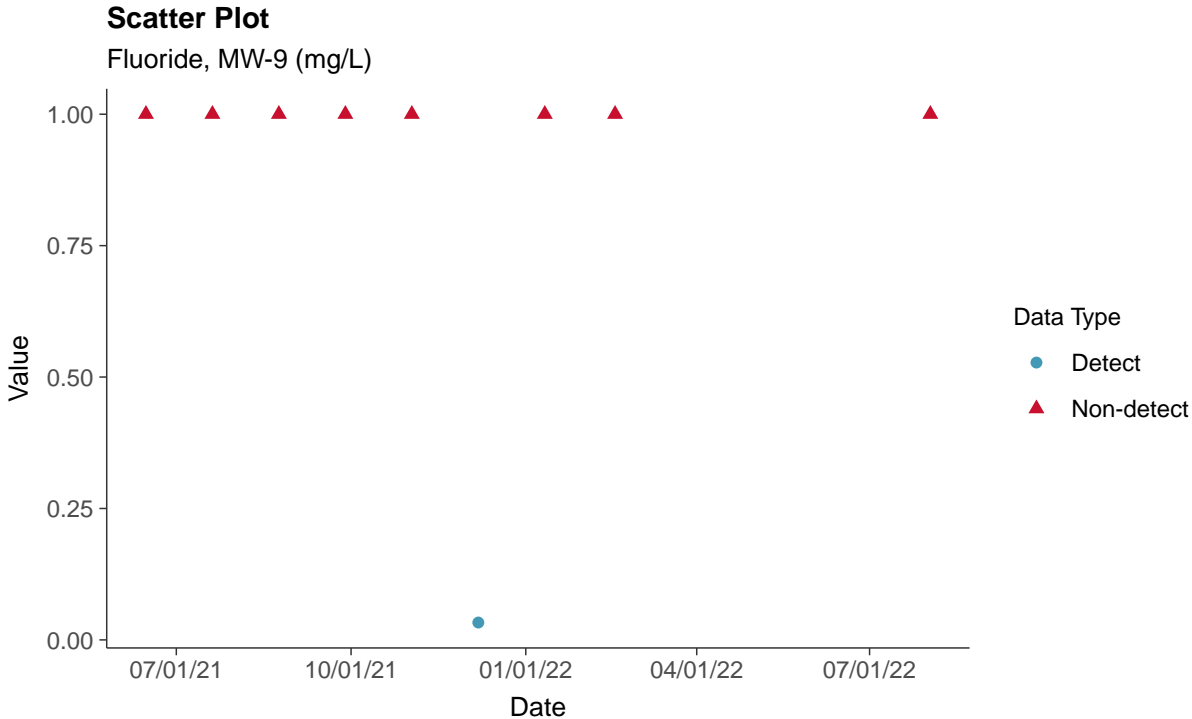
Fluoride, MW-8 (mg/L)





### Appendix IV: Fluoride, MW-9

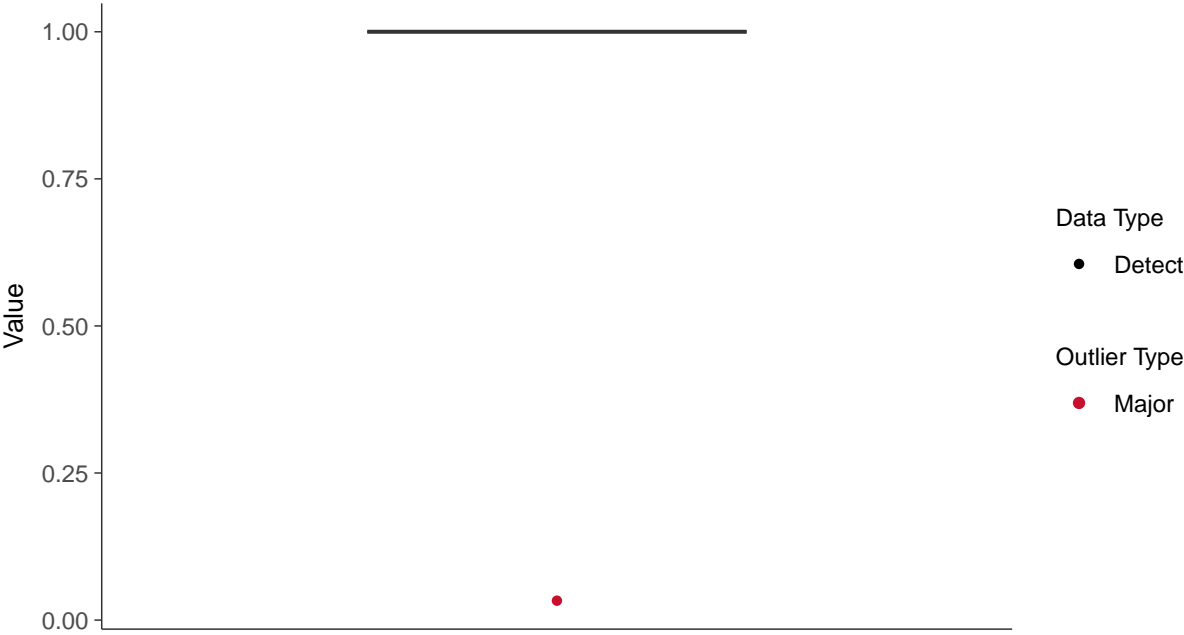
ID: 2\_04\_09





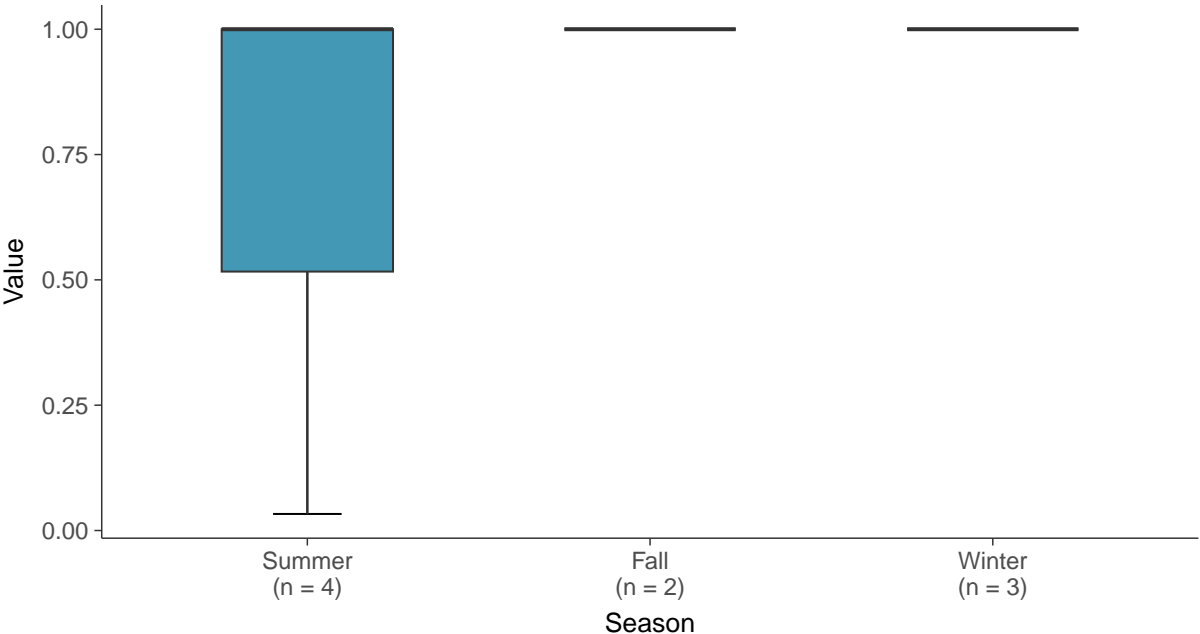
**Boxplot**

Fluoride, MW-9 (mg/L)



**Boxplot by Season**

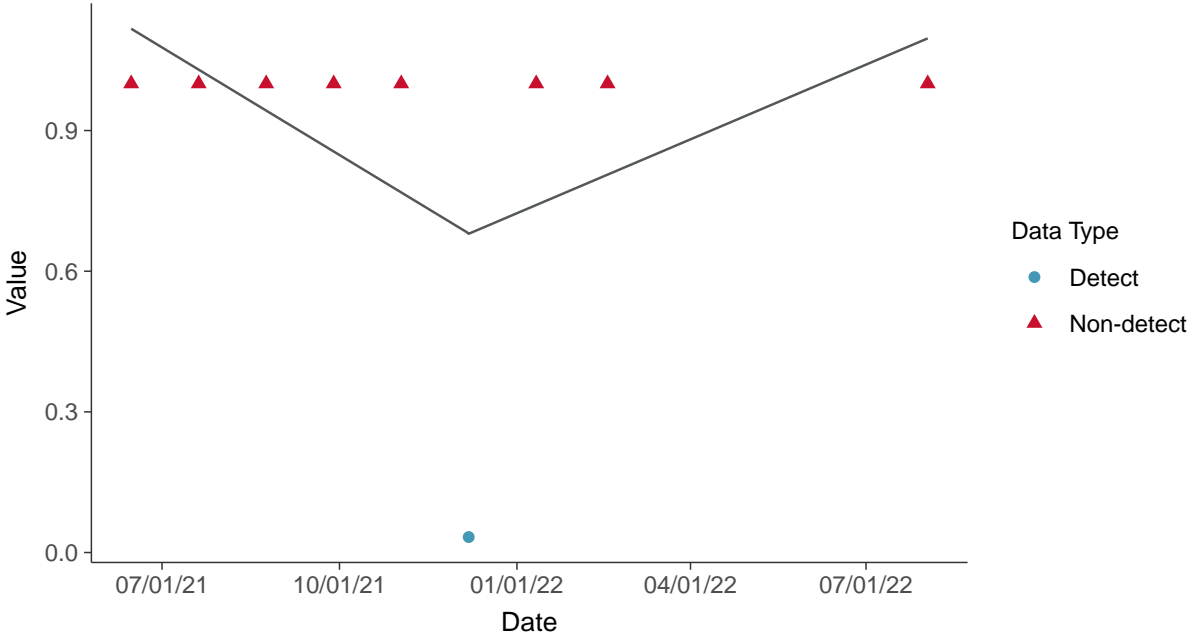
Fluoride, MW-9 (mg/L)





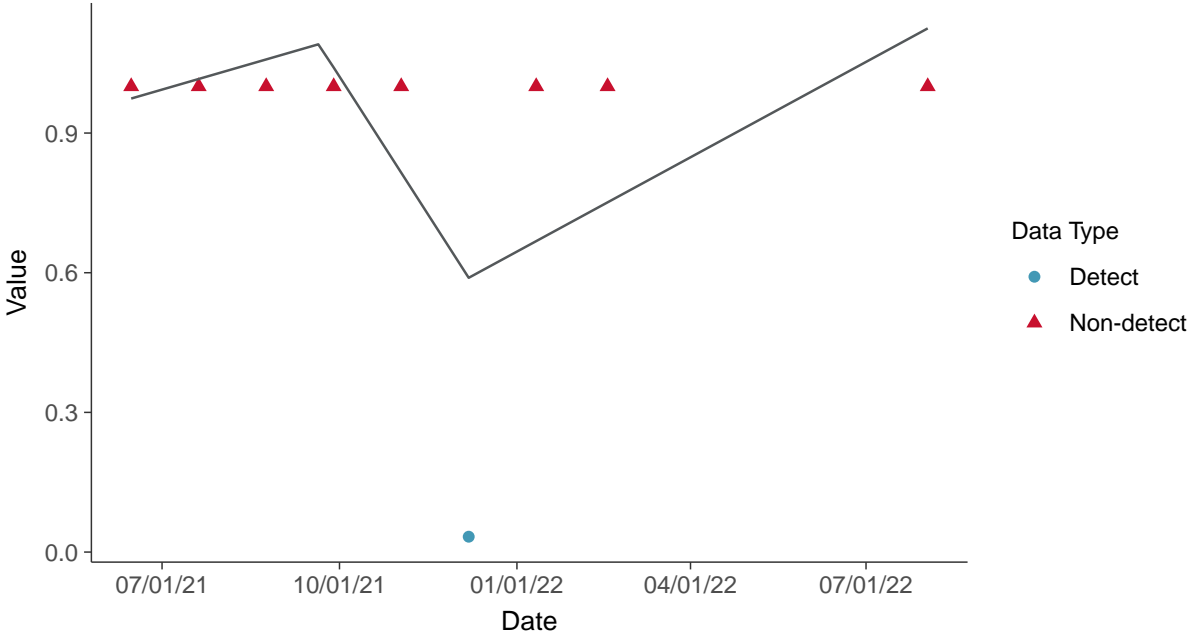
**Trend Regression: Piecewise Linear-Linear**

Fluoride, MW-9 (mg/L)



**Trend Regression: Piecewise Linear-Linear-Linear**

Fluoride, MW-9 (mg/L)

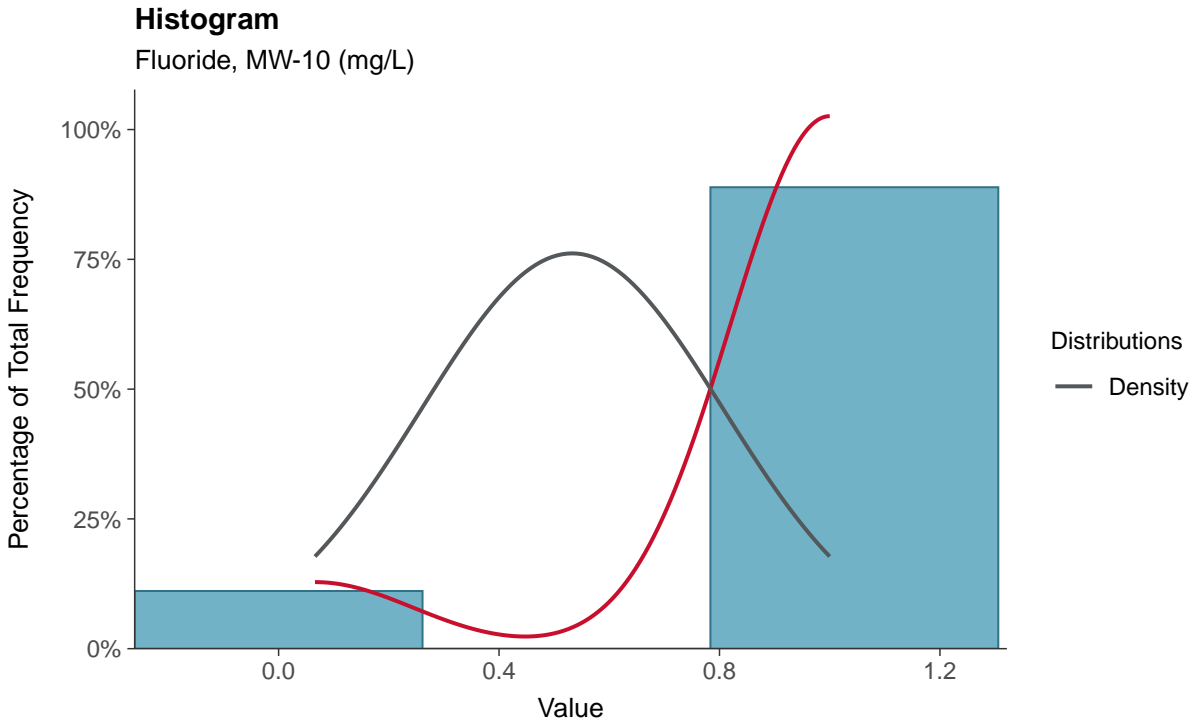
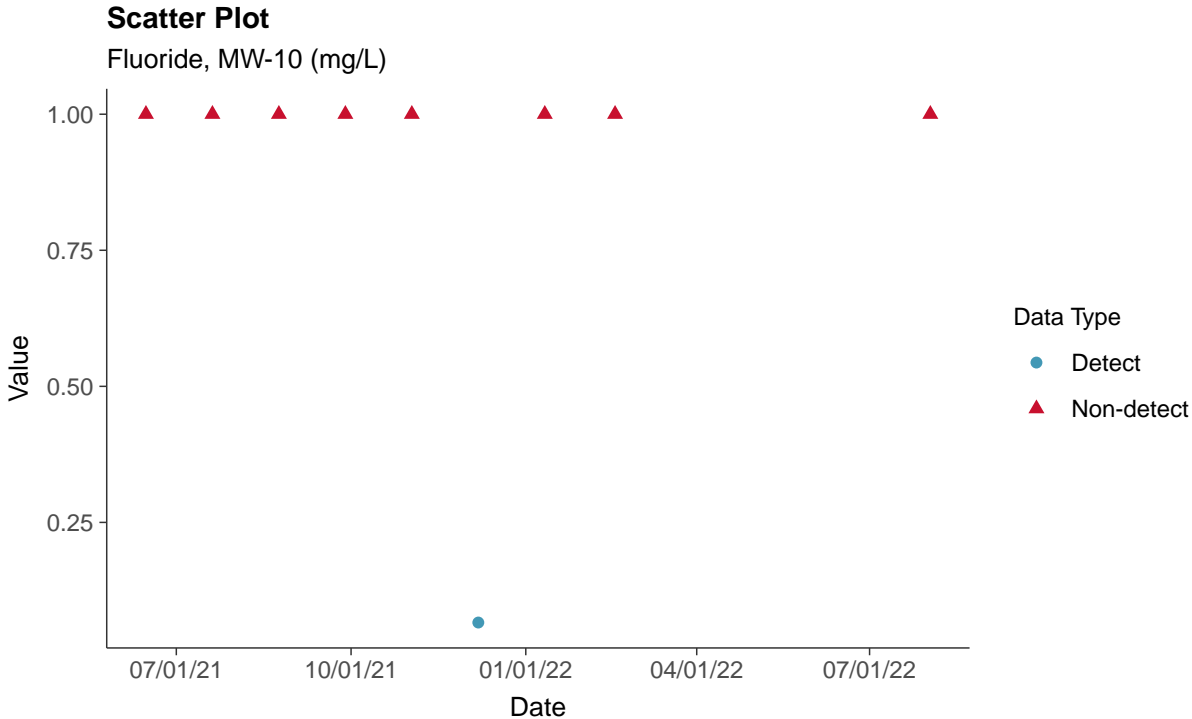






### Appendix IV: Fluoride, MW-10

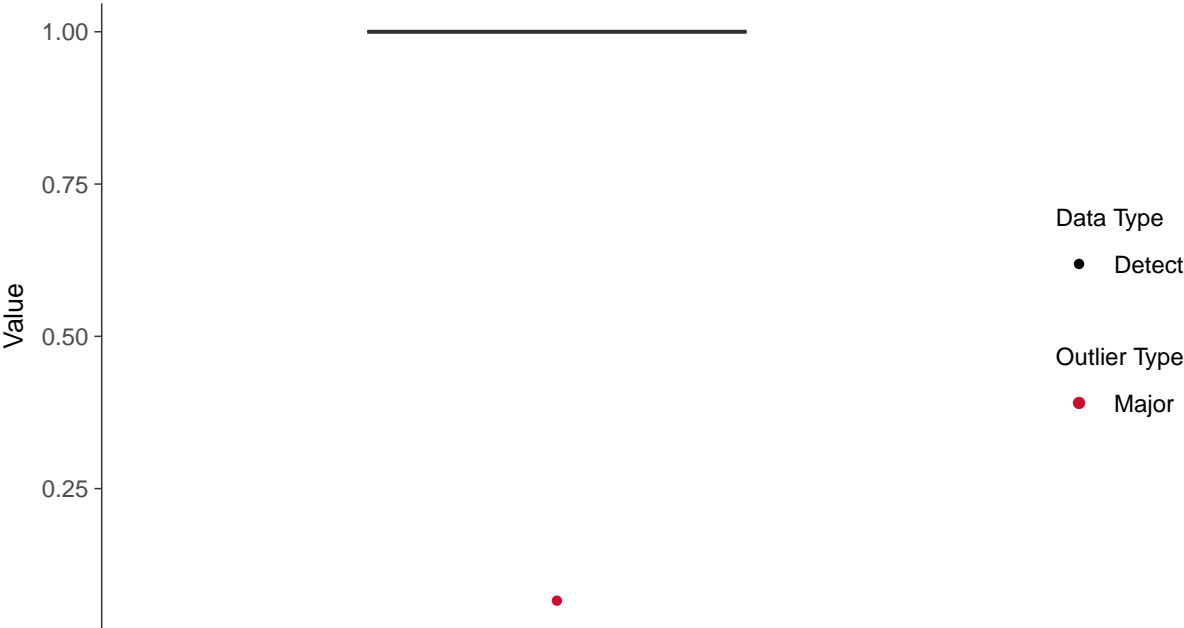
ID: 2\_04\_10





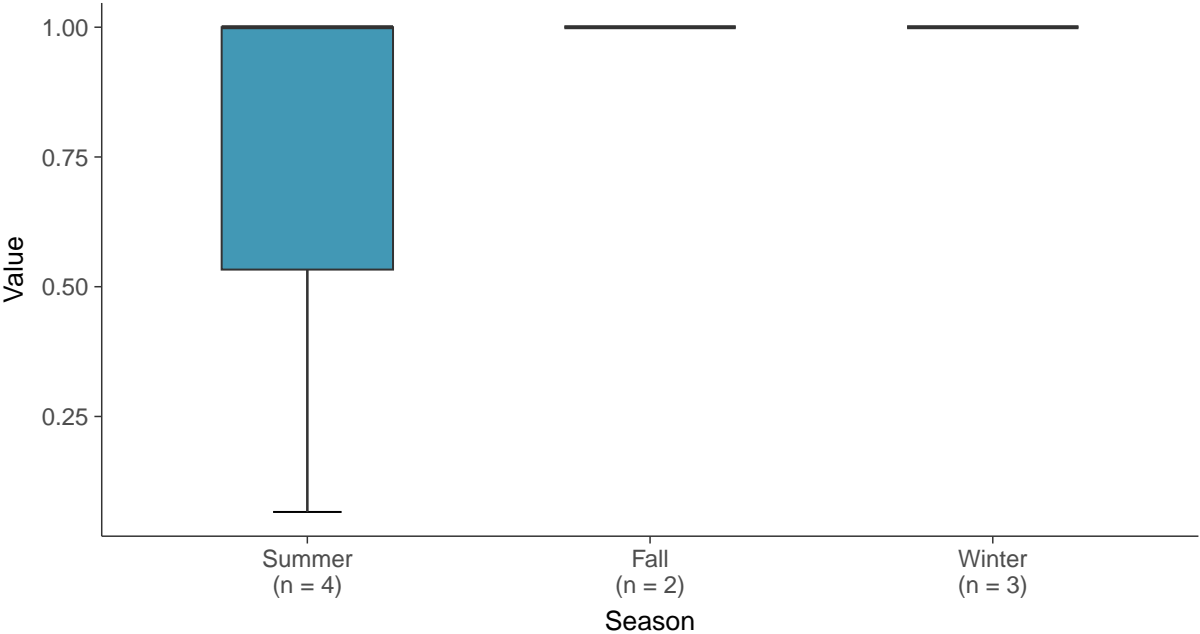
**Boxplot**

Fluoride, MW-10 (mg/L)



**Boxplot by Season**

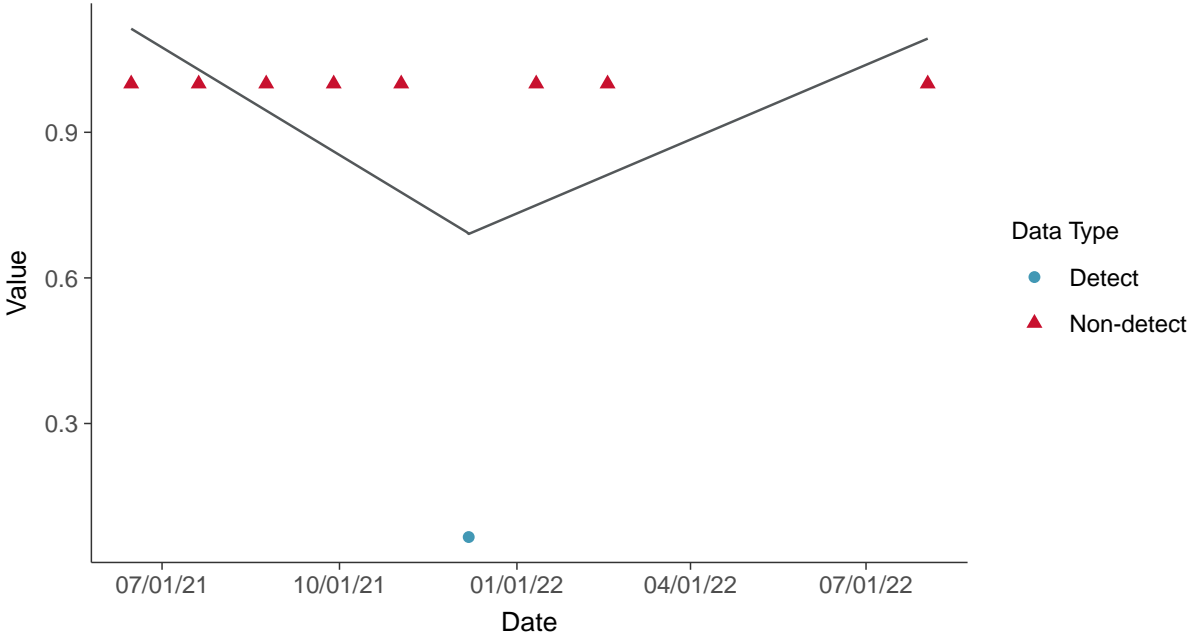
Fluoride, MW-10 (mg/L)





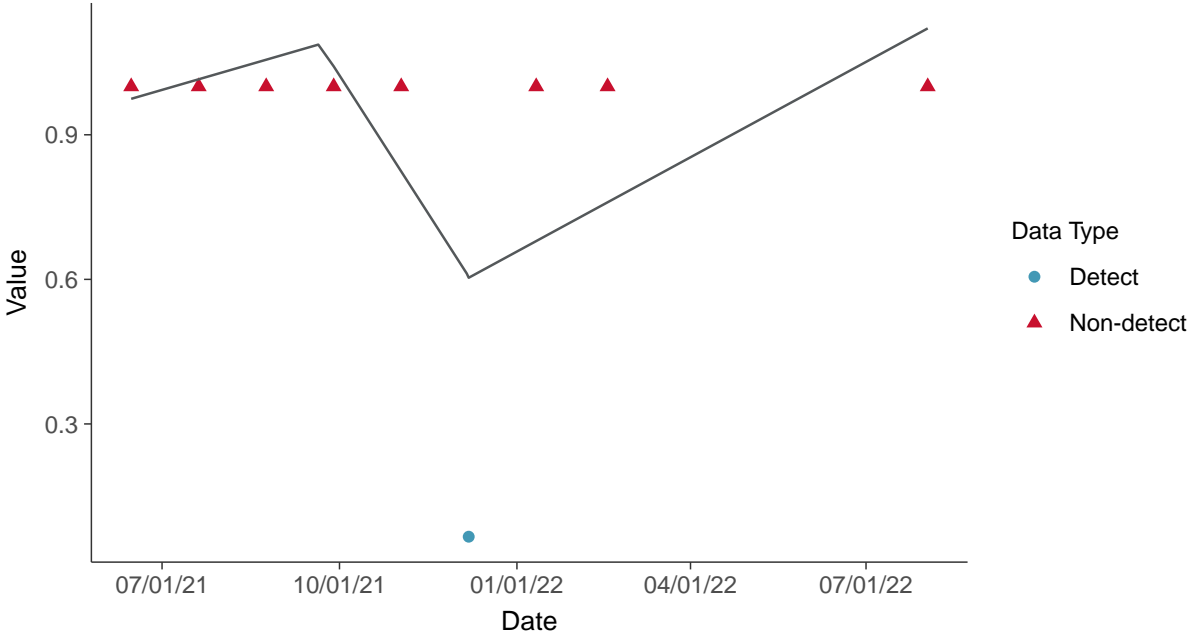
**Trend Regression: Piecewise Linear-Linear**

Fluoride, MW-10 (mg/L)



**Trend Regression: Piecewise Linear-Linear-Linear**

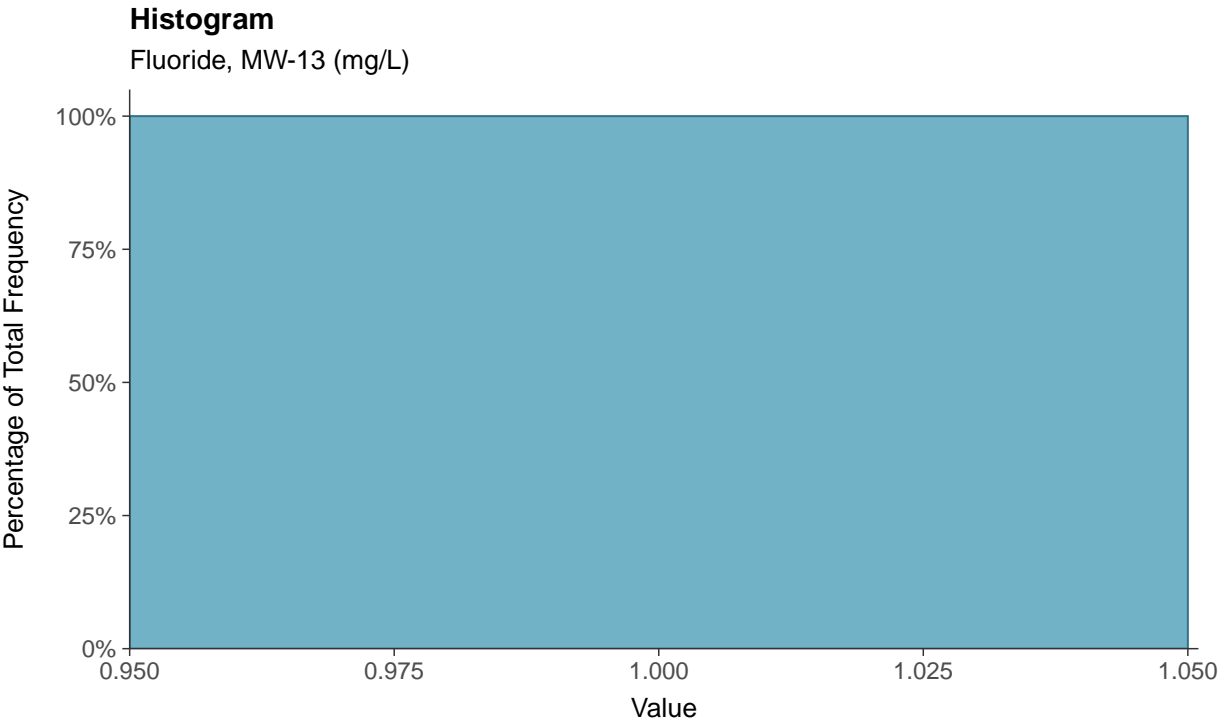
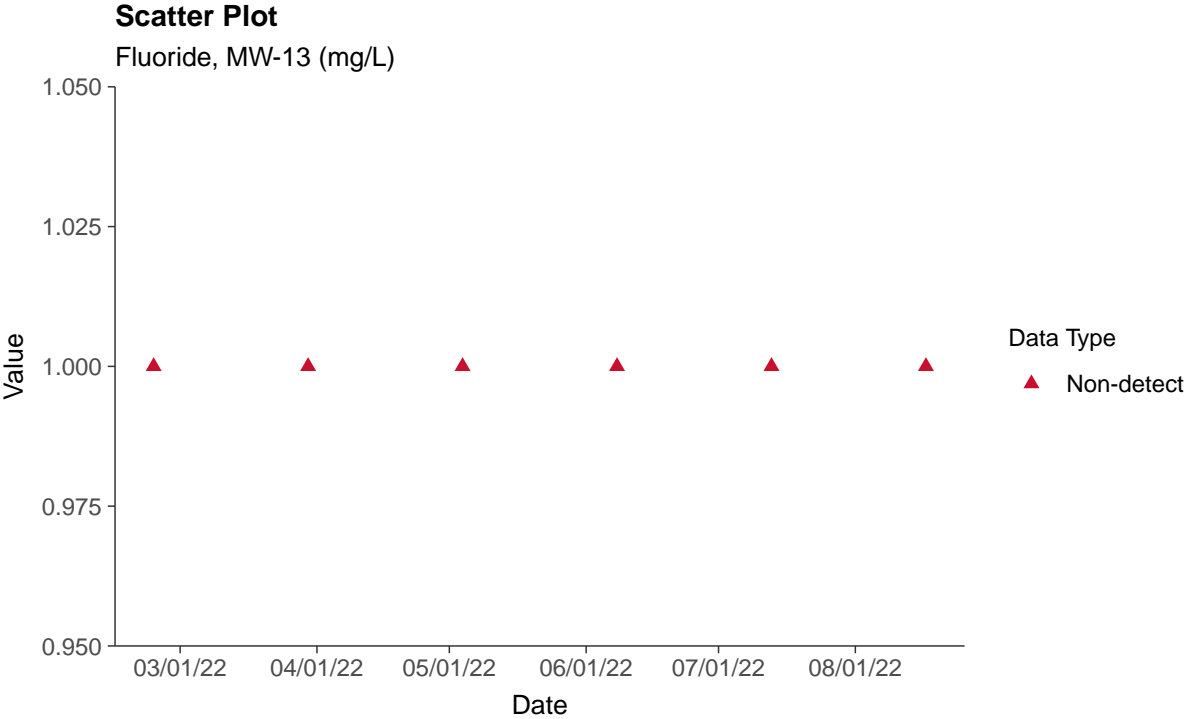
Fluoride, MW-10 (mg/L)





### Appendix IV: Fluoride, MW-13

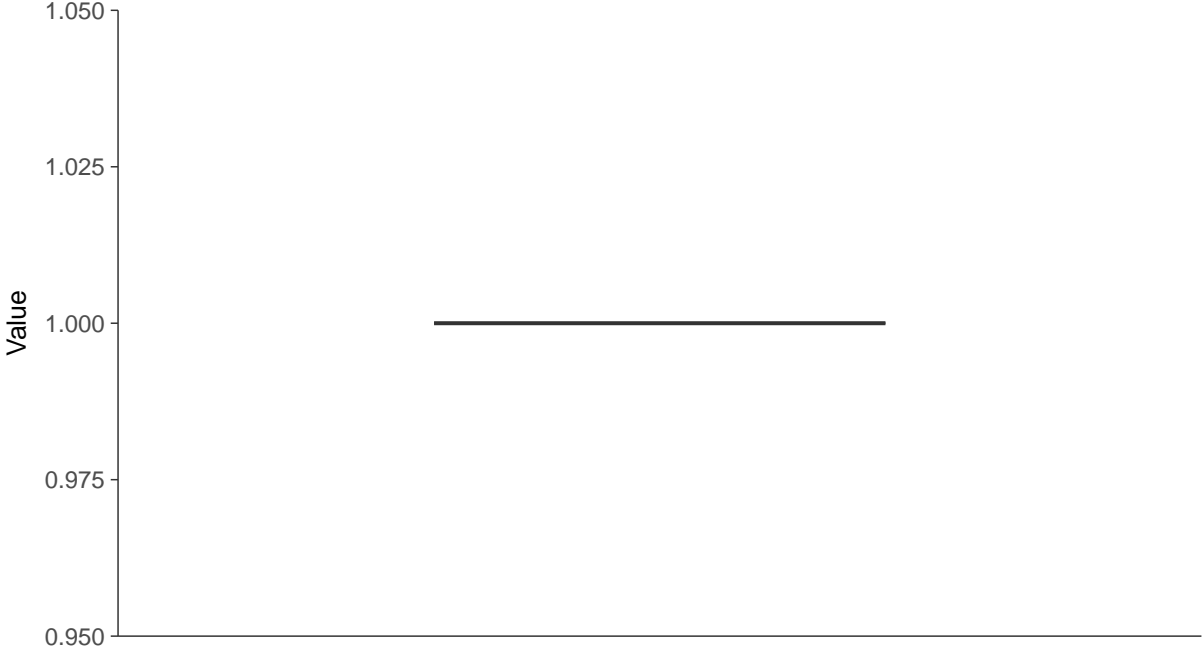
ID: 2\_04\_13





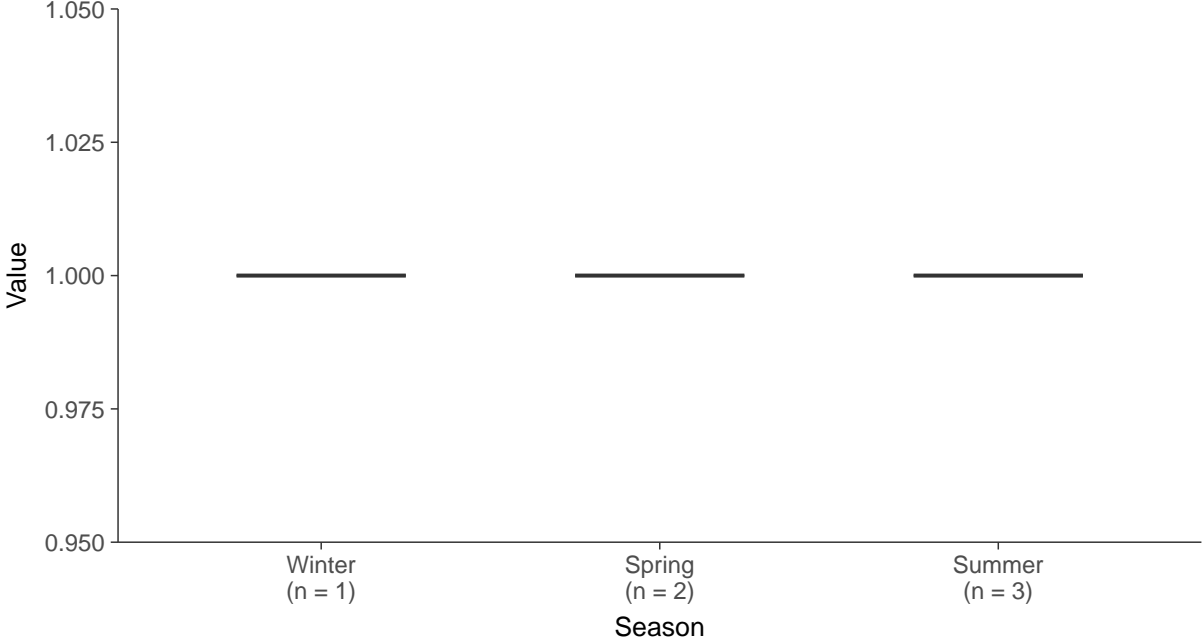
**Boxplot**

Fluoride, MW-13 (mg/L)



**Boxplot by Season**

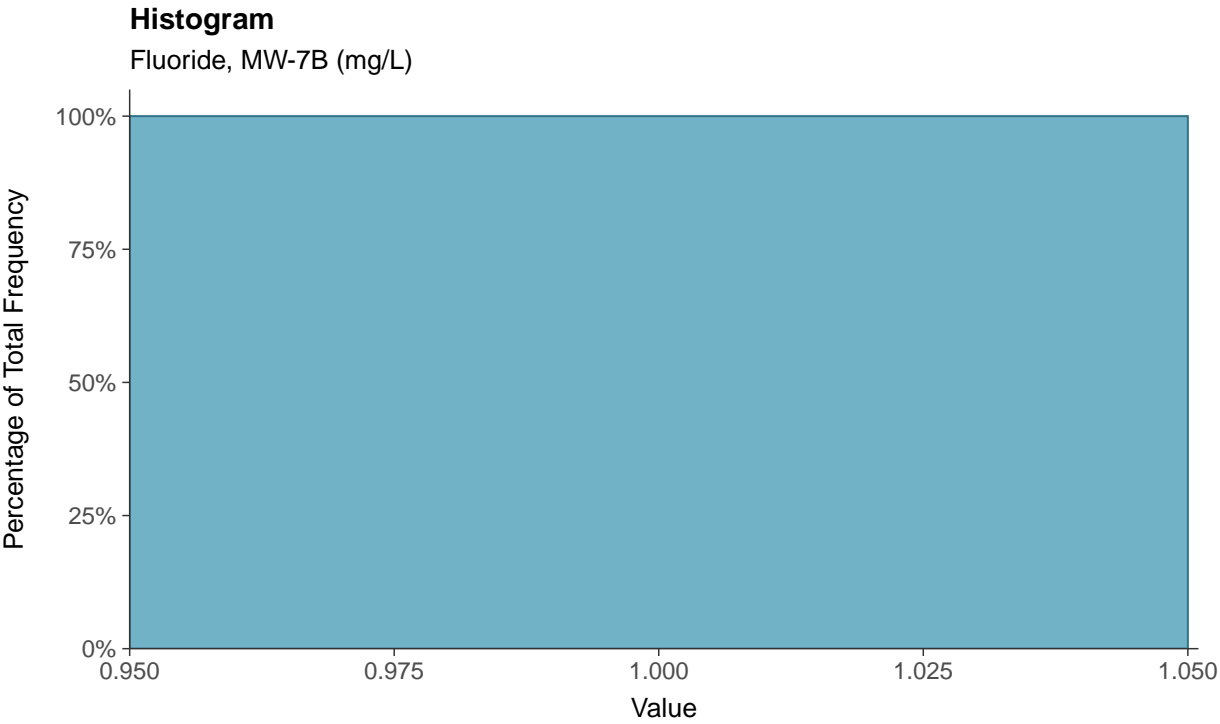
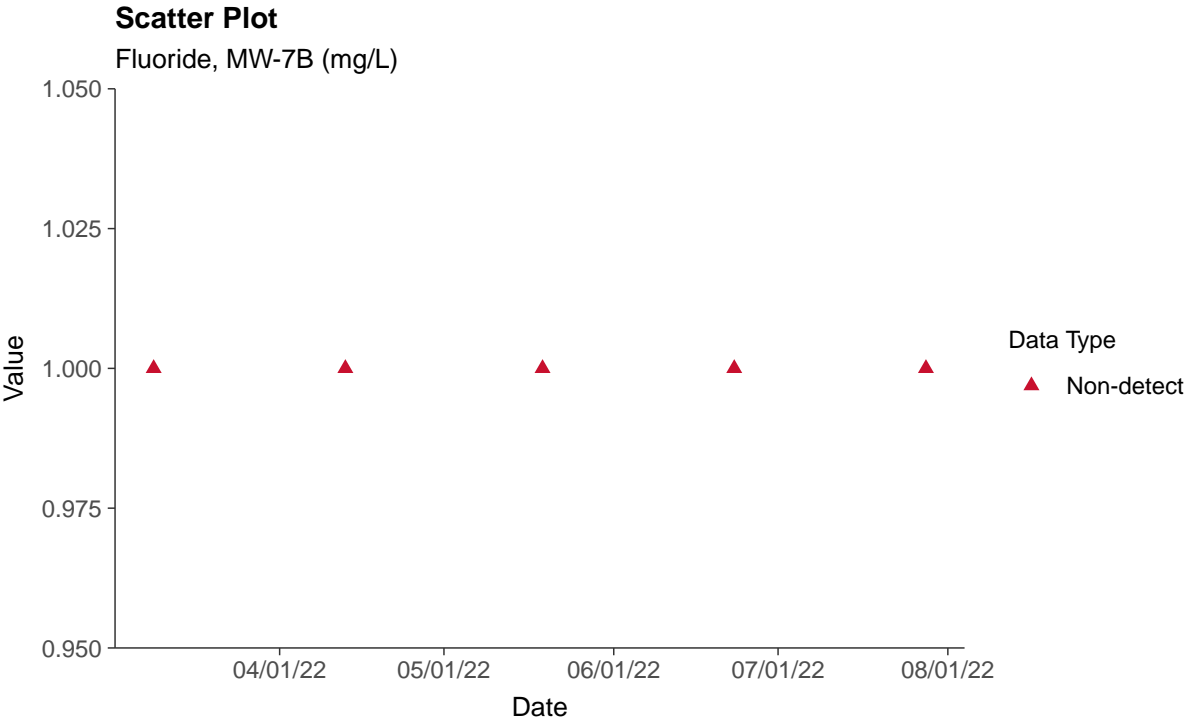
Fluoride, MW-13 (mg/L)





### Appendix IV: Fluoride, MW-7B

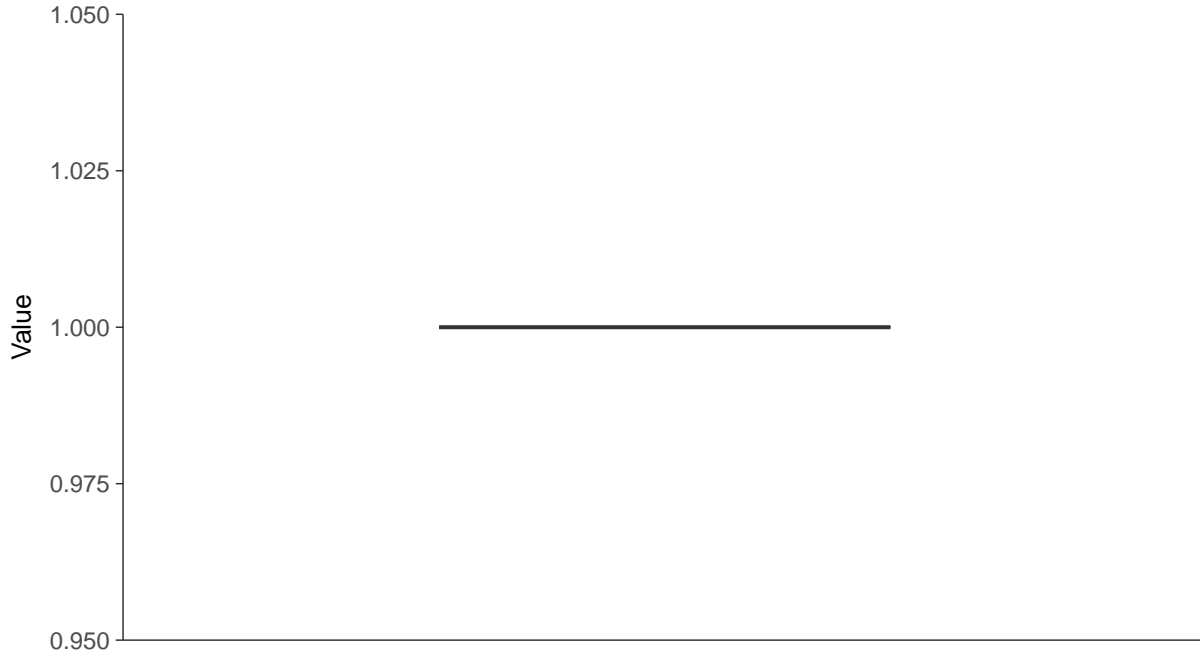
ID: 2\_04\_7B





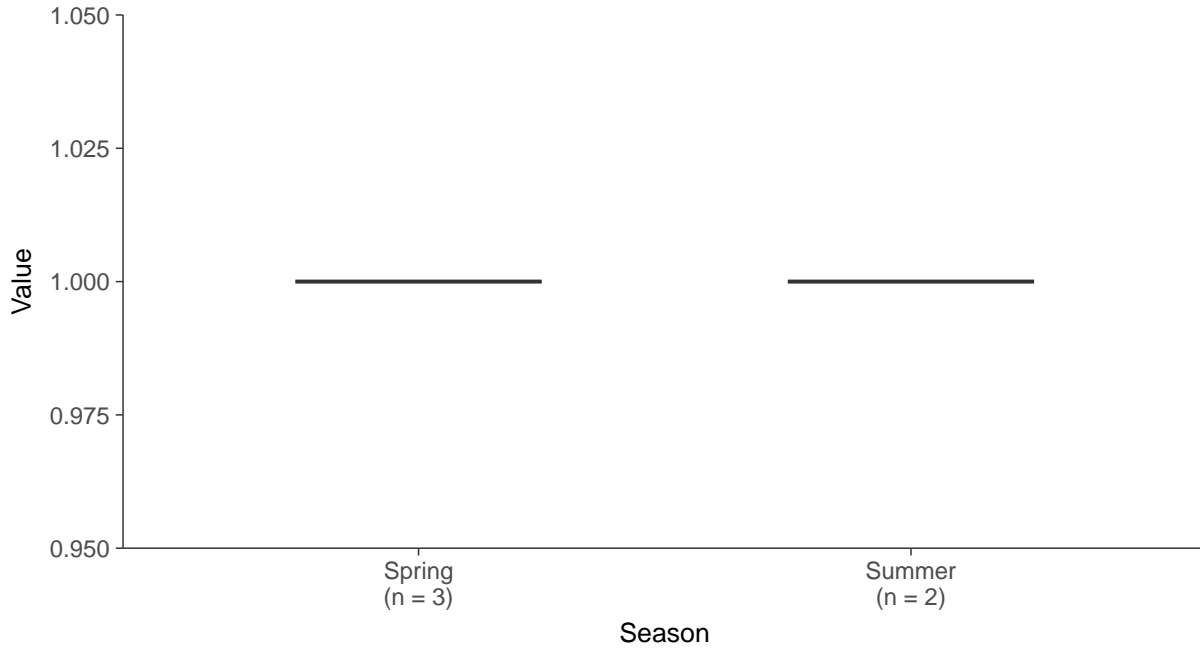
### Boxplot

Fluoride, MW-7B (mg/L)



### Boxplot by Season

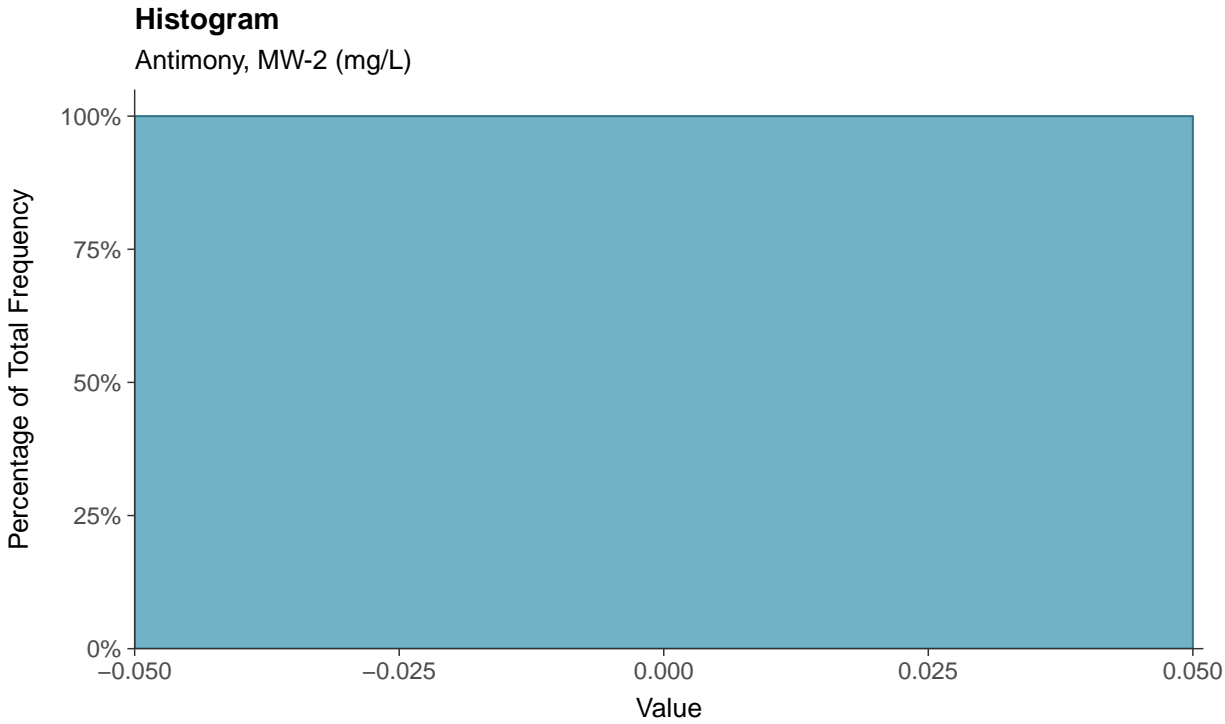
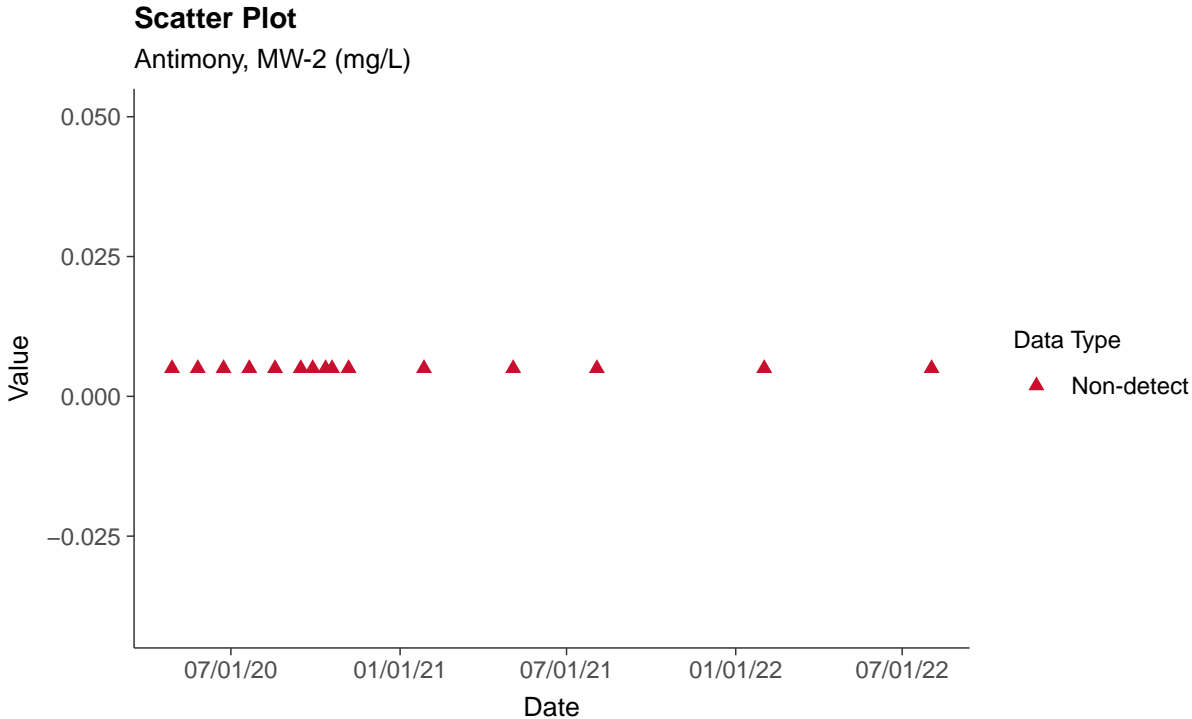
Fluoride, MW-7B (mg/L)





### Appendix IV: Antimony, MW-2

ID: 2\_07\_02







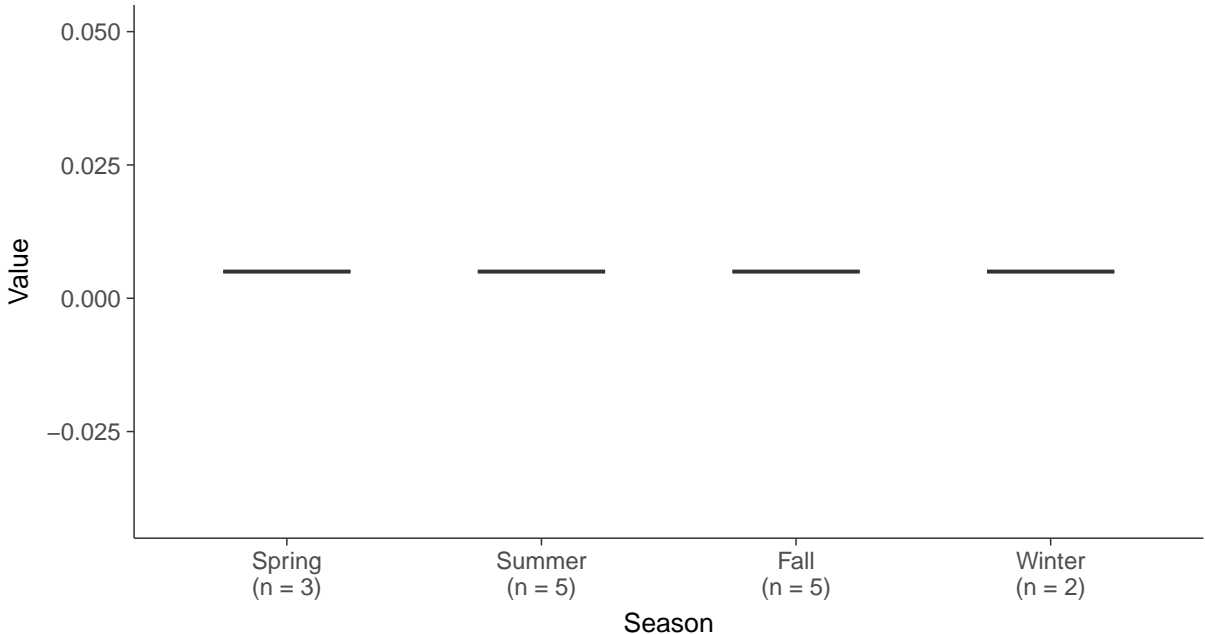
**Boxplot**

Antimony, MW-2 (mg/L)



**Boxplot by Season**

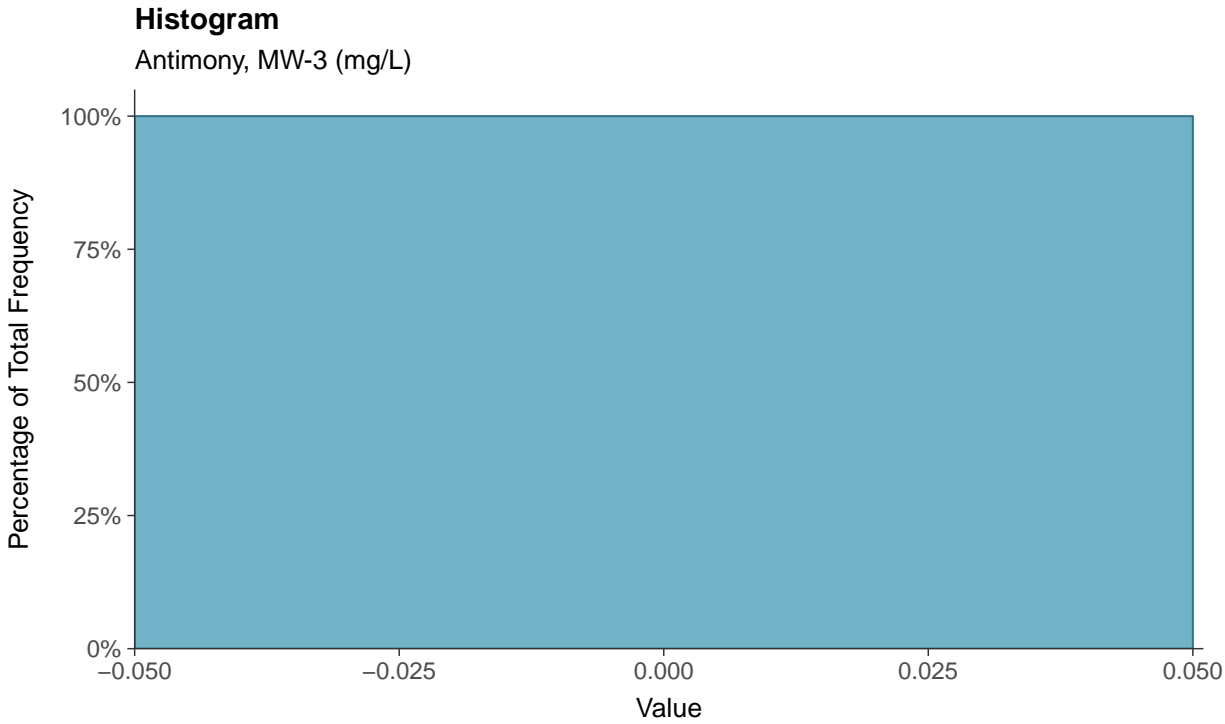
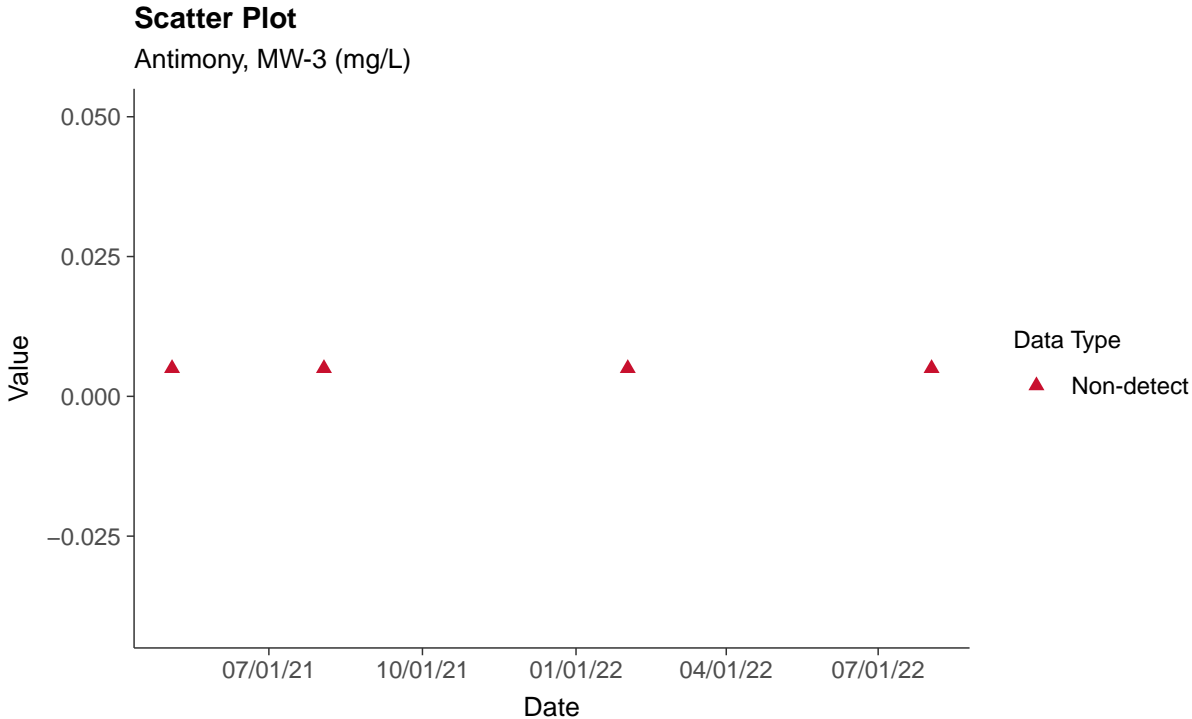
Antimony, MW-2 (mg/L)





### Appendix IV: Antimony, MW-3

ID: 2\_07\_03





**Boxplot**

Antimony, MW-3 (mg/L)



**Boxplot by Season**

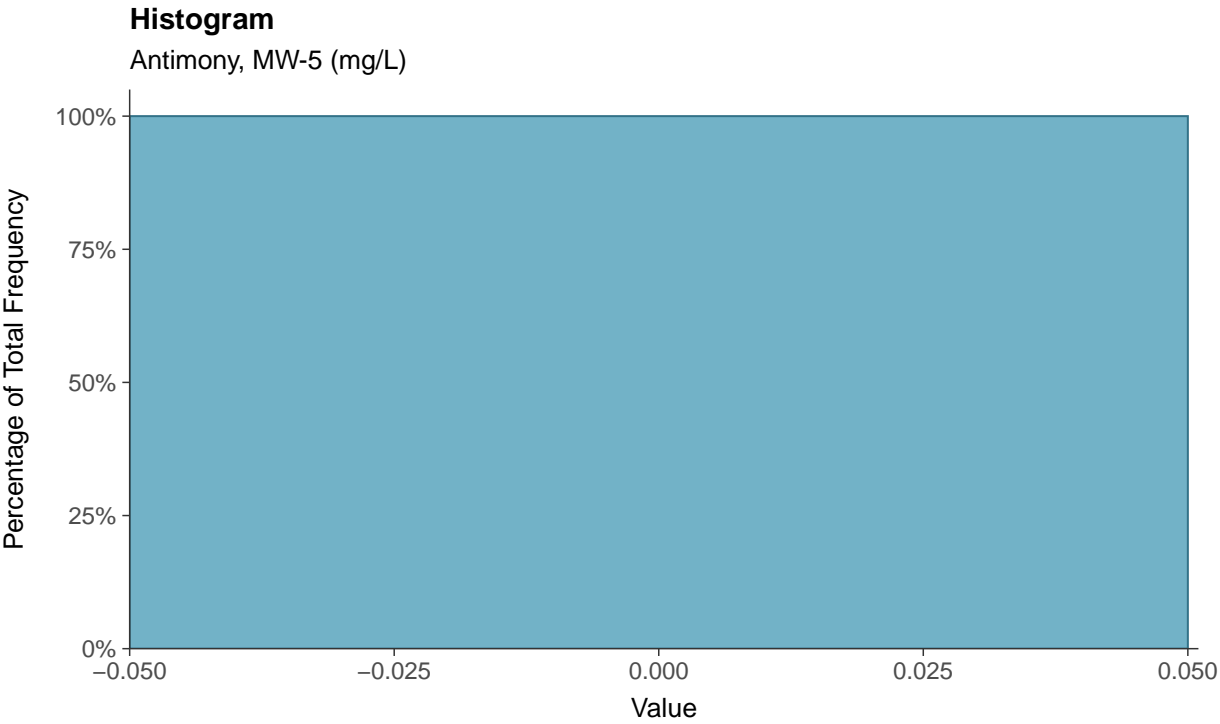
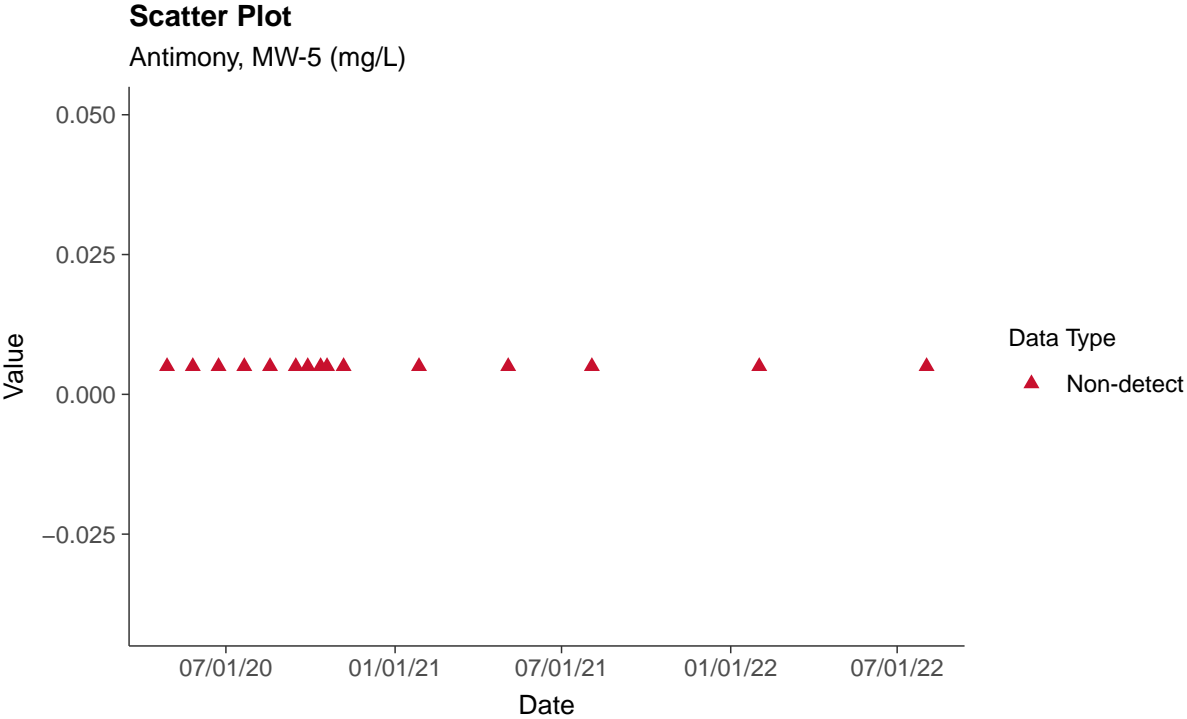
Antimony, MW-3 (mg/L)





### Appendix IV: Antimony, MW-5

ID: 2\_07\_05





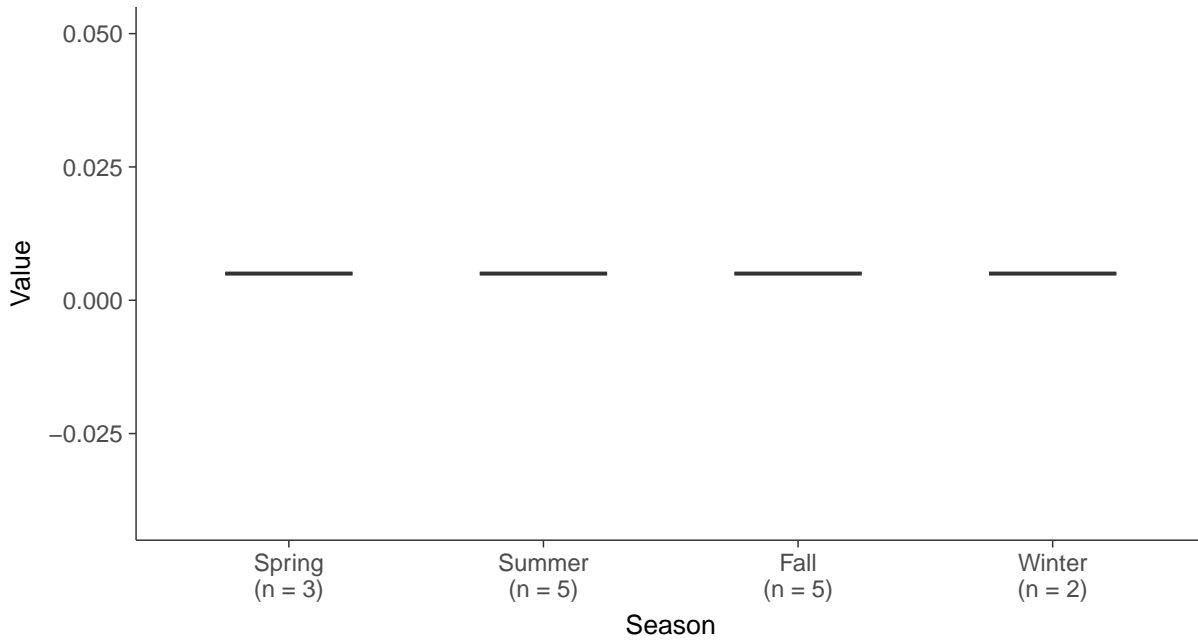
### Boxplot

Antimony, MW-5 (mg/L)



### Boxplot by Season

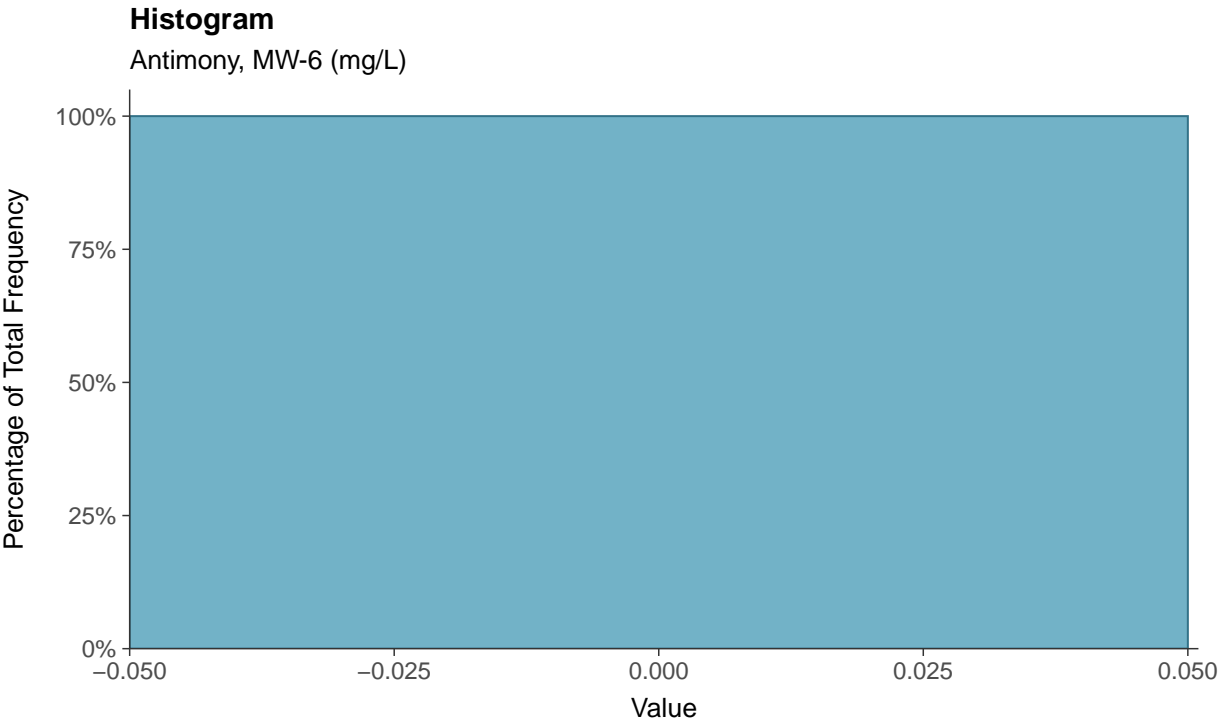
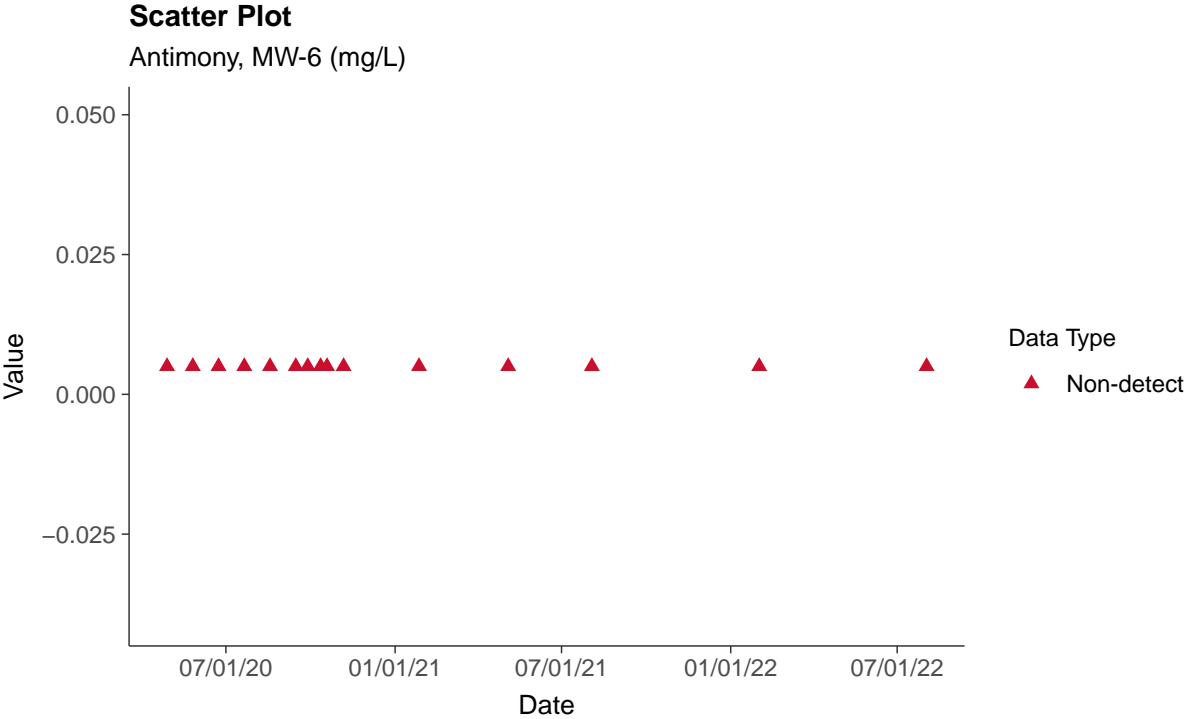
Antimony, MW-5 (mg/L)





### Appendix IV: Antimony, MW-6

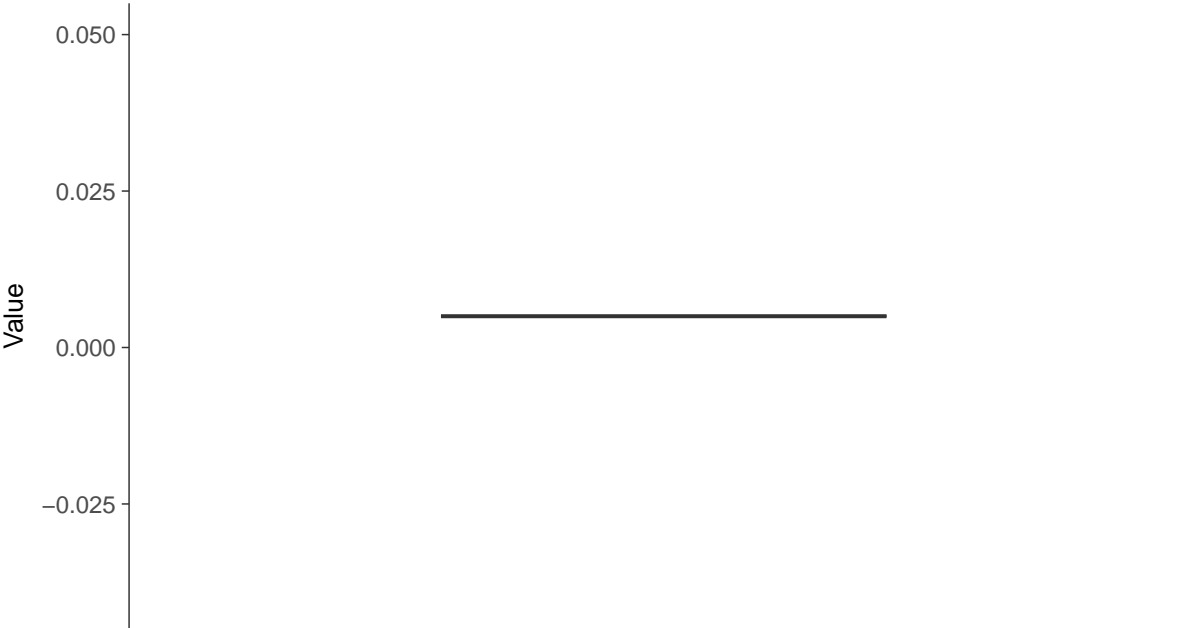
ID: 2\_07\_06





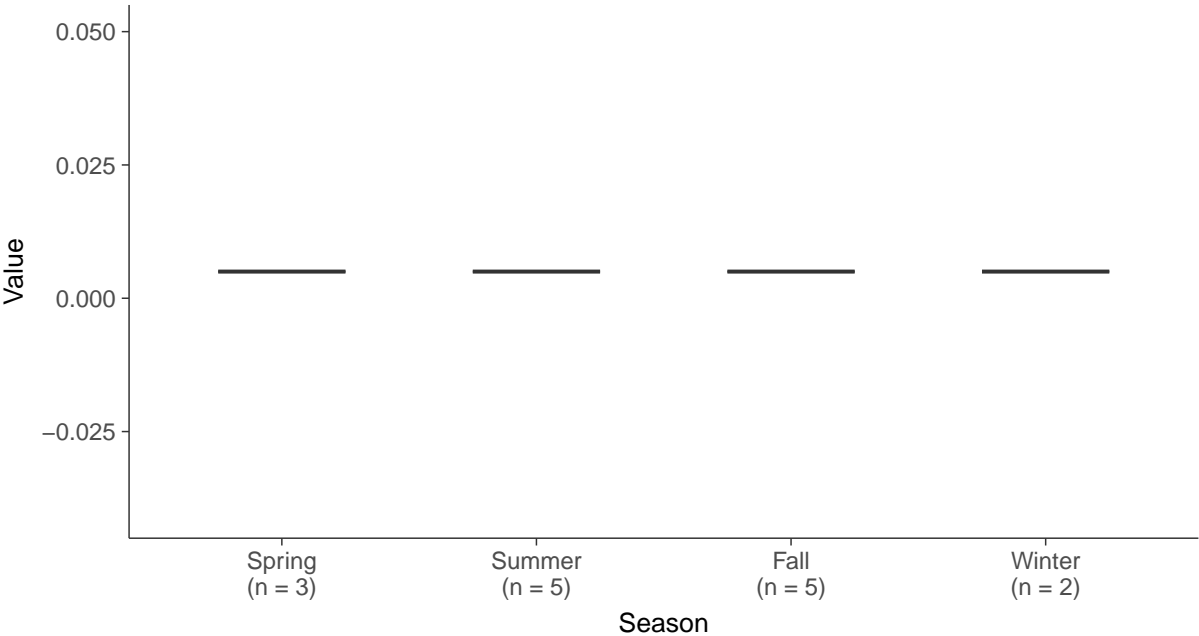
**Boxplot**

Antimony, MW-6 (mg/L)



**Boxplot by Season**

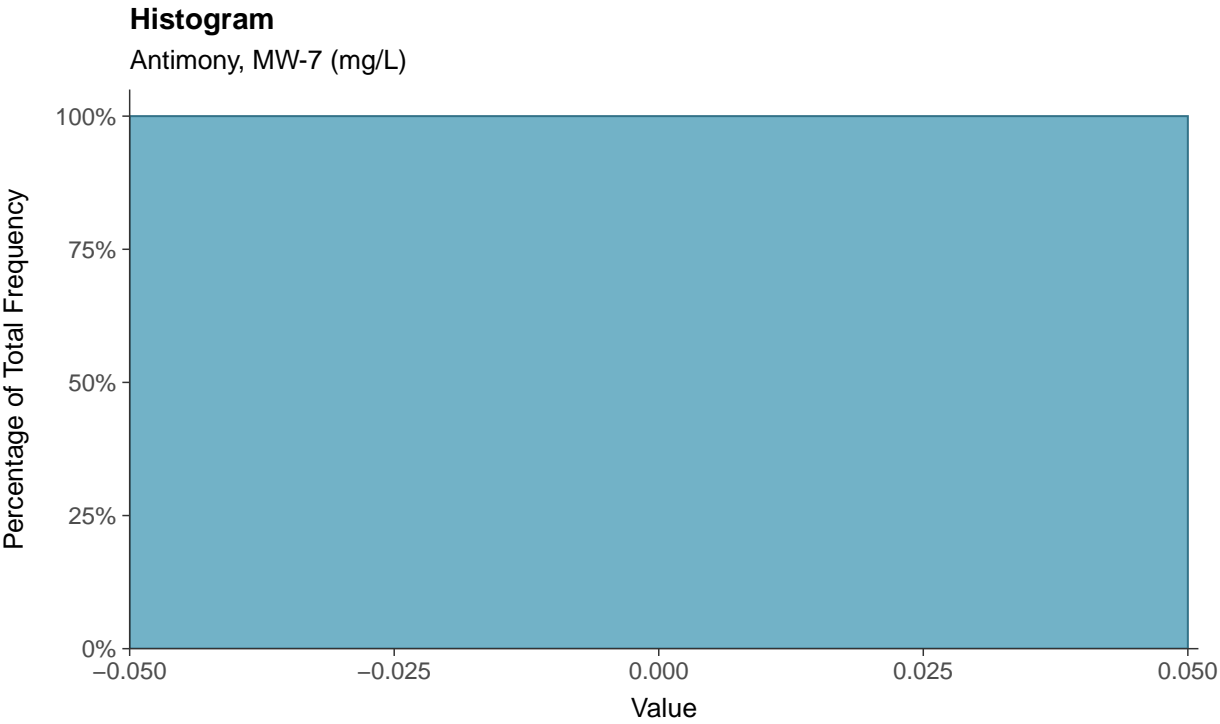
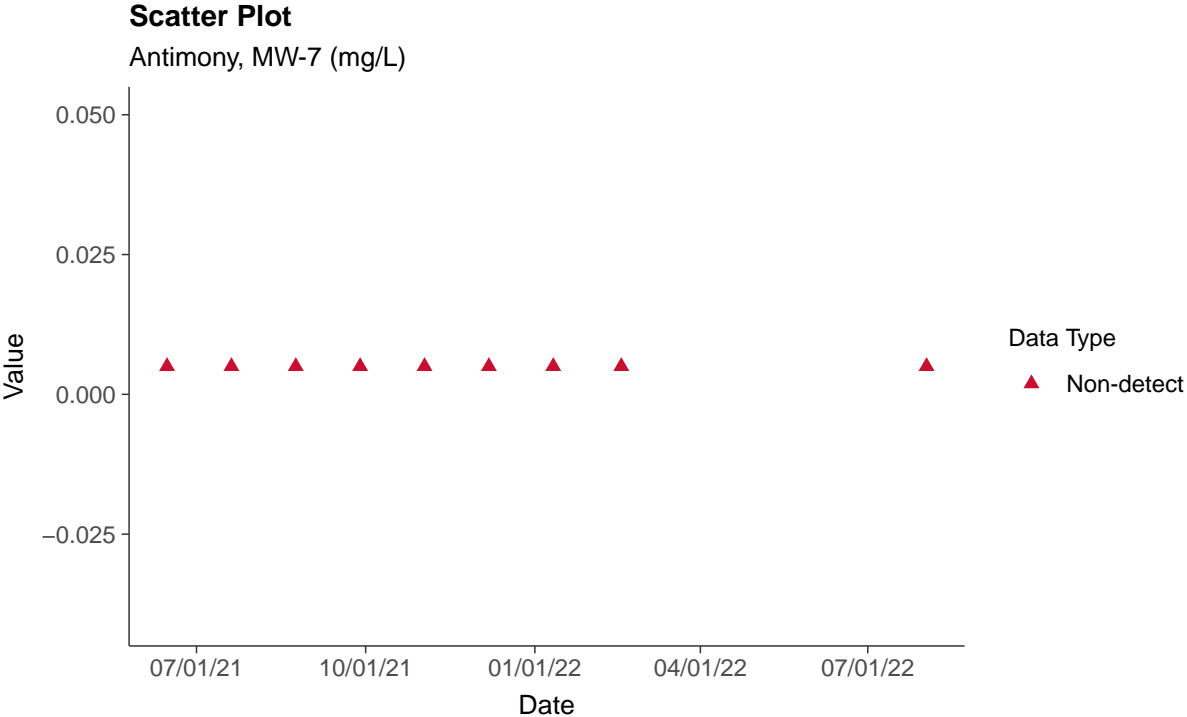
Antimony, MW-6 (mg/L)





**Appendix IV: Antimony, MW-7**

ID: 2\_07\_07







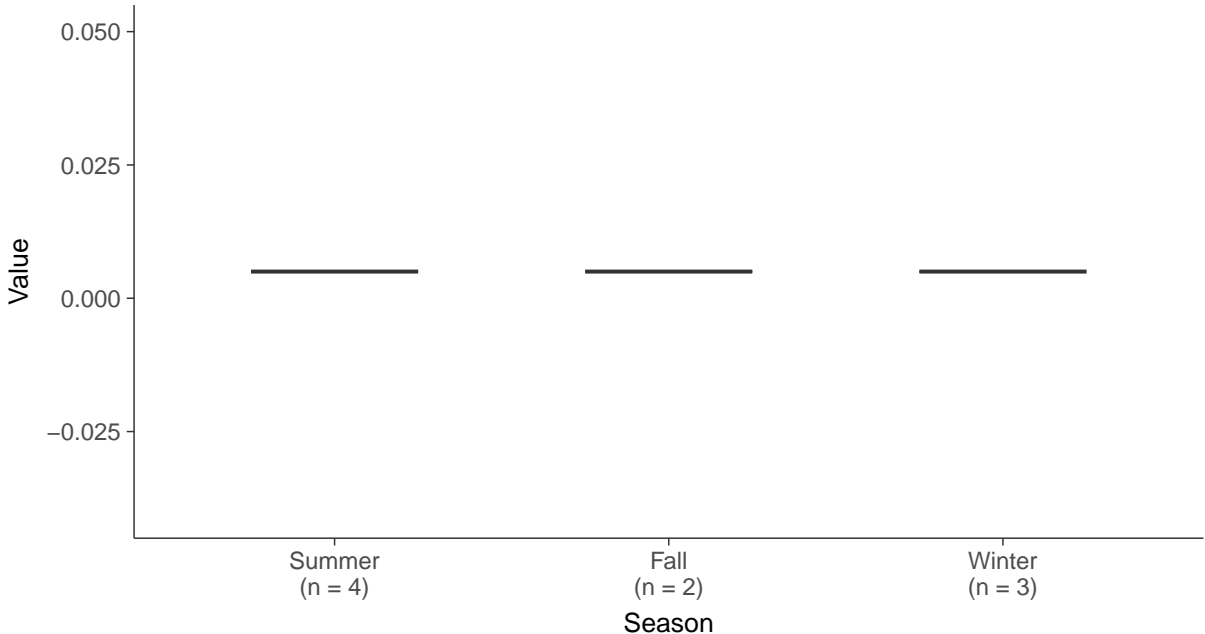
**Boxplot**

Antimony, MW-7 (mg/L)



**Boxplot by Season**

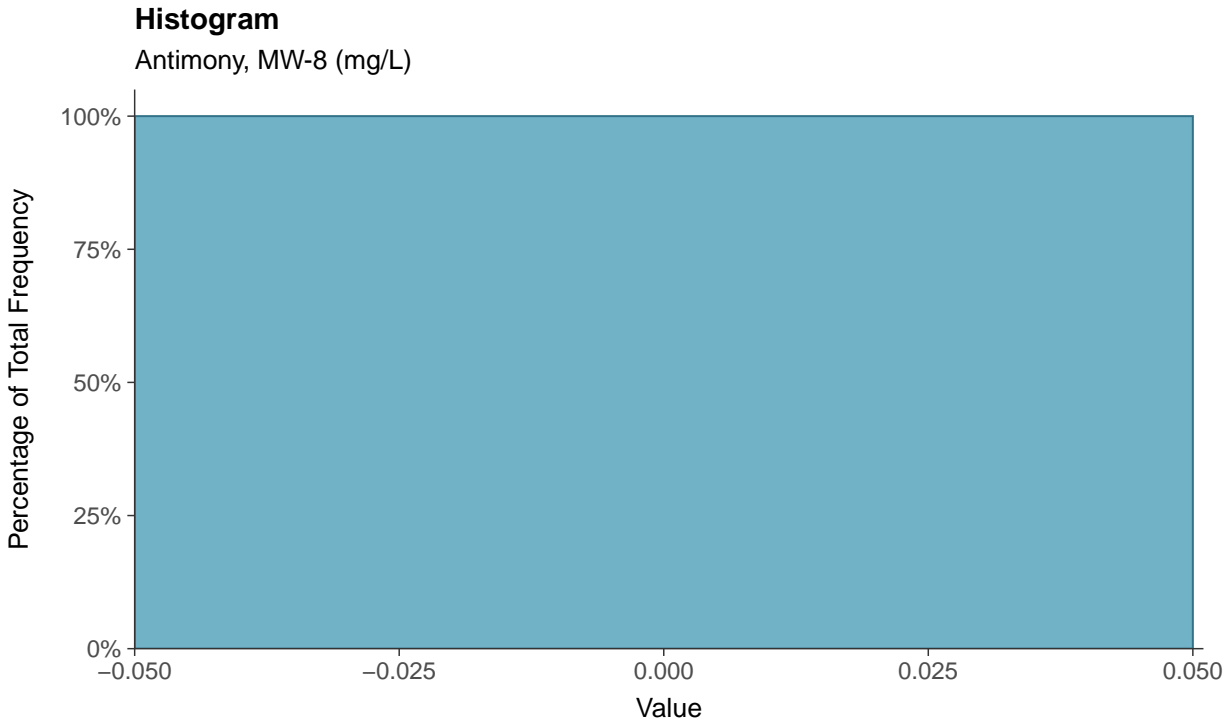
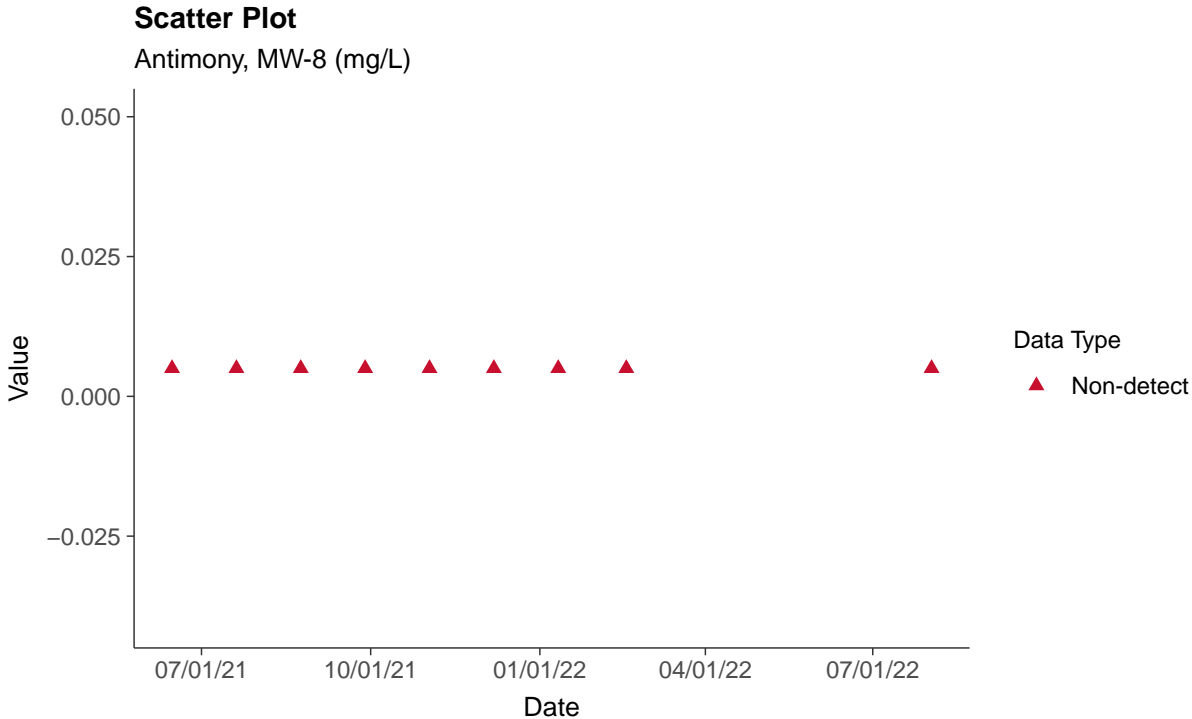
Antimony, MW-7 (mg/L)

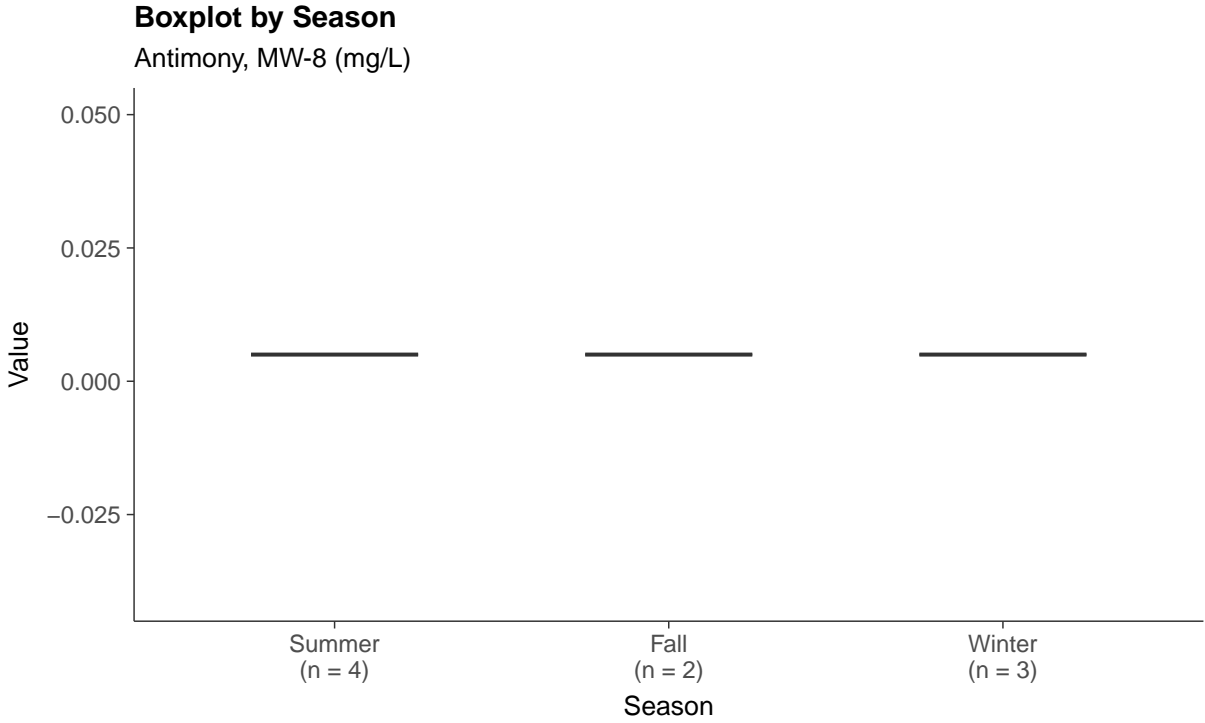
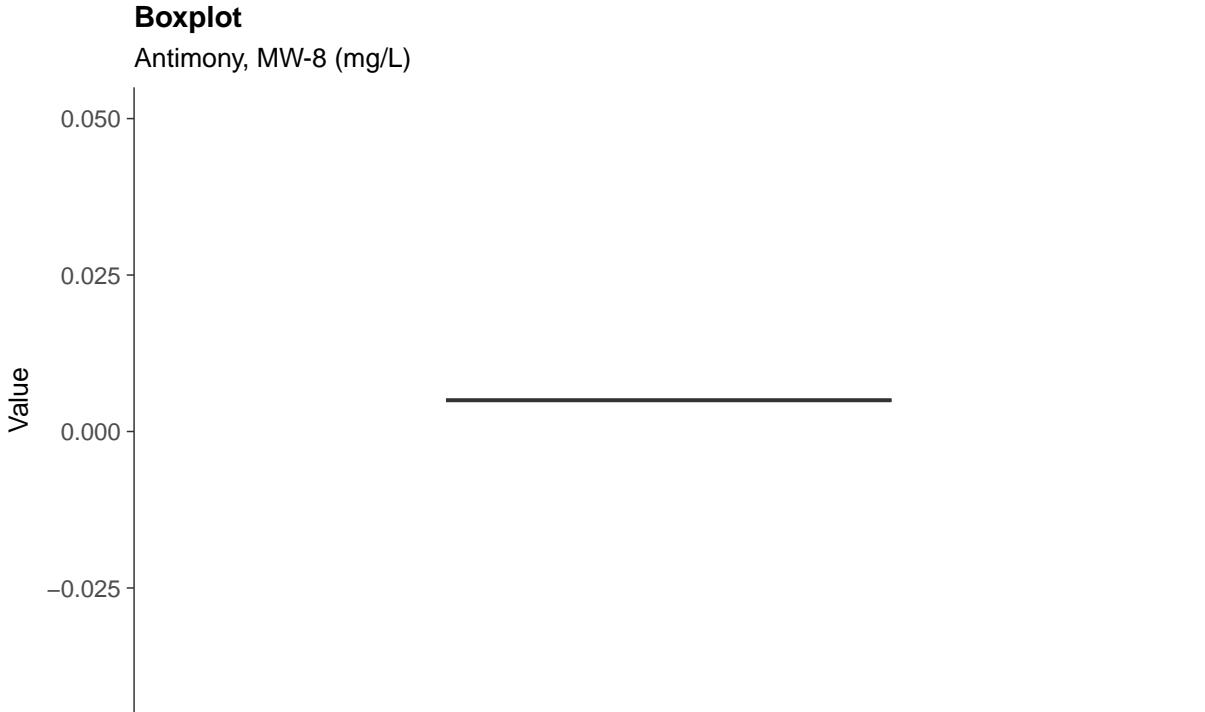




### Appendix IV: Antimony, MW-8

ID: 2\_07\_08





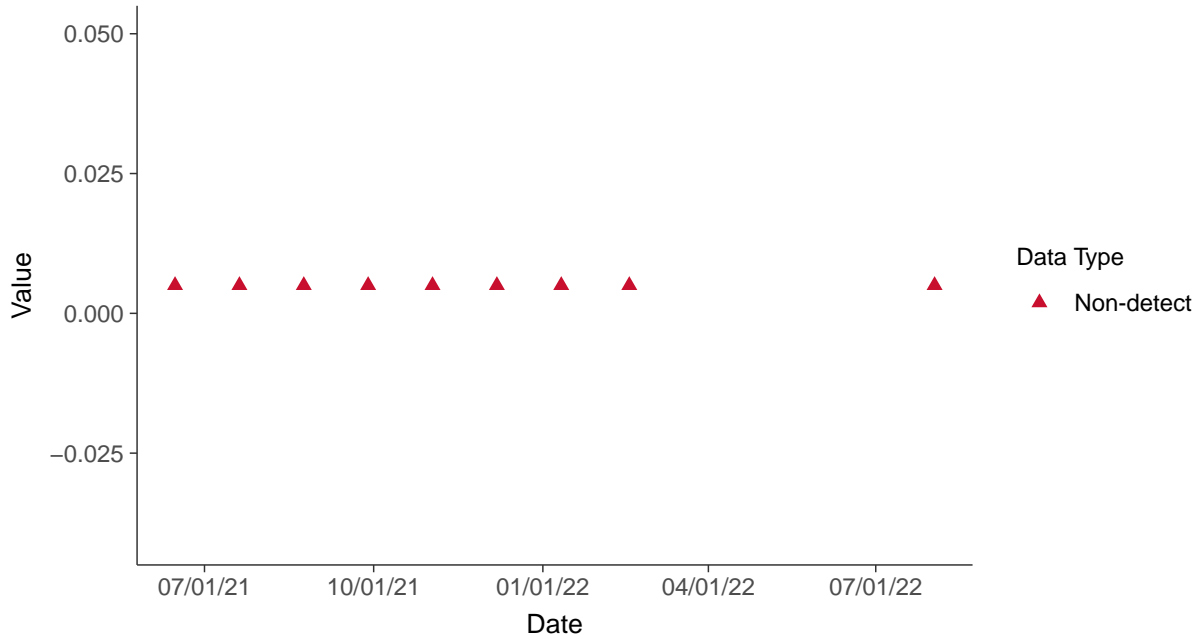


### Appendix IV: Antimony, MW-9

ID: 2\_07\_09

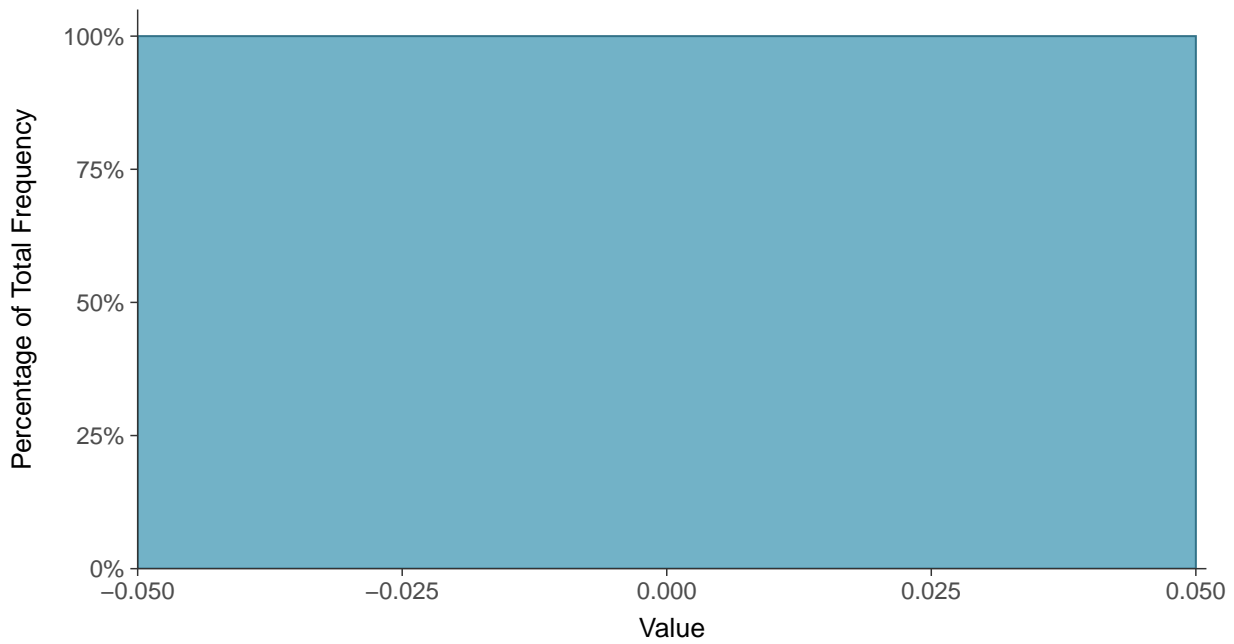
#### Scatter Plot

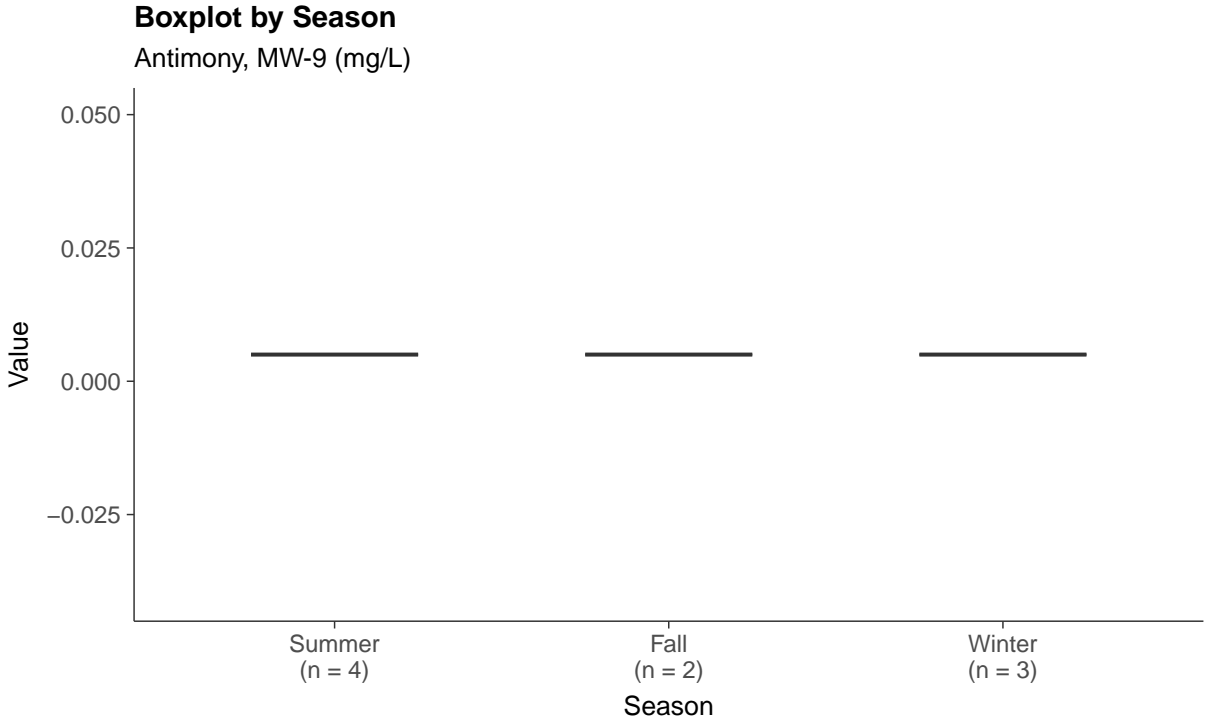
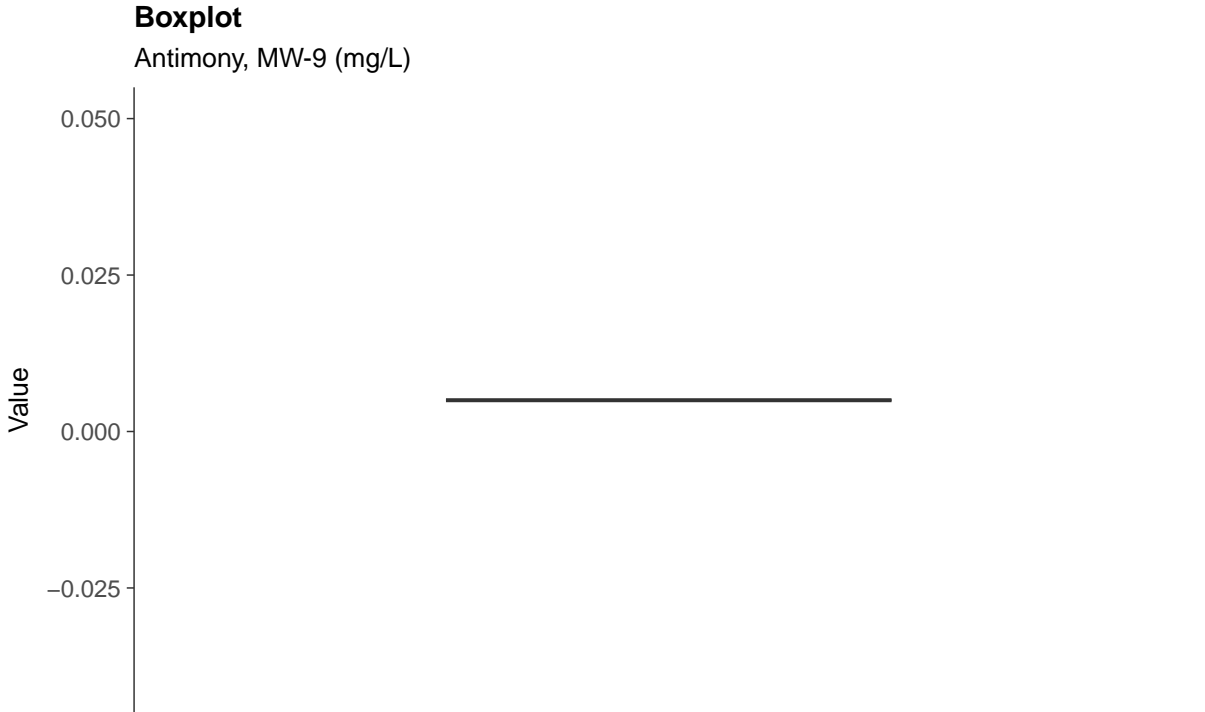
Antimony, MW-9 (mg/L)



#### Histogram

Antimony, MW-9 (mg/L)

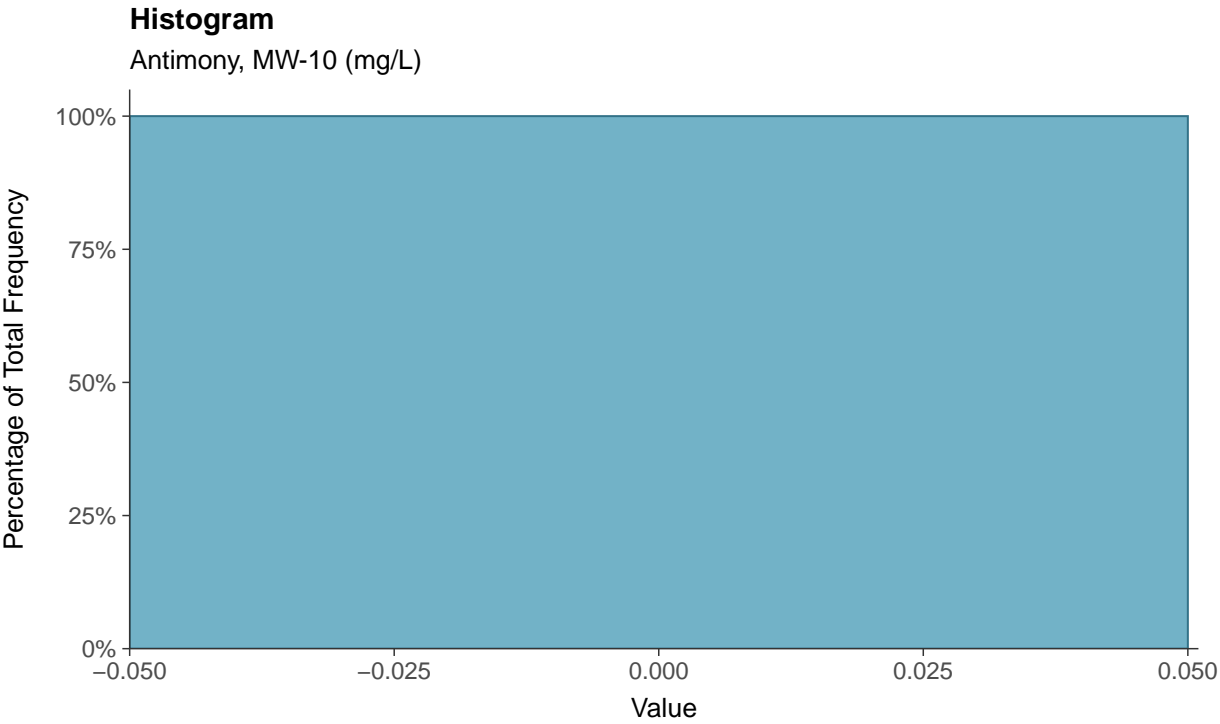
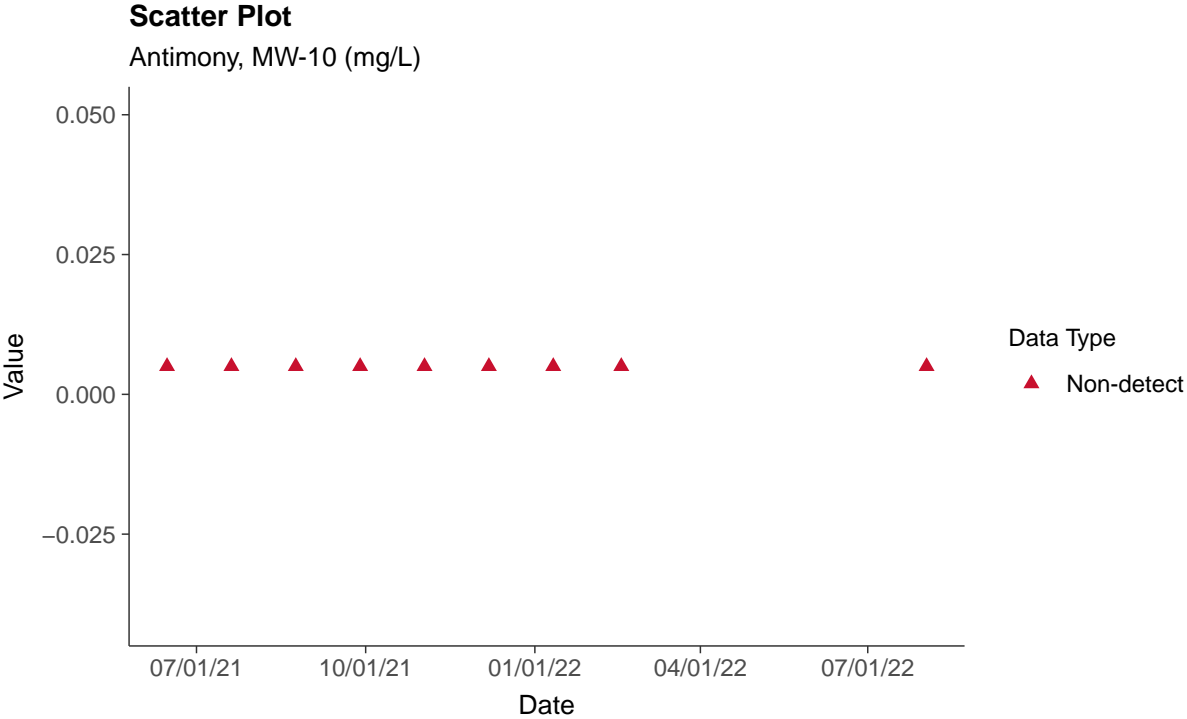






### Appendix IV: Antimony, MW-10

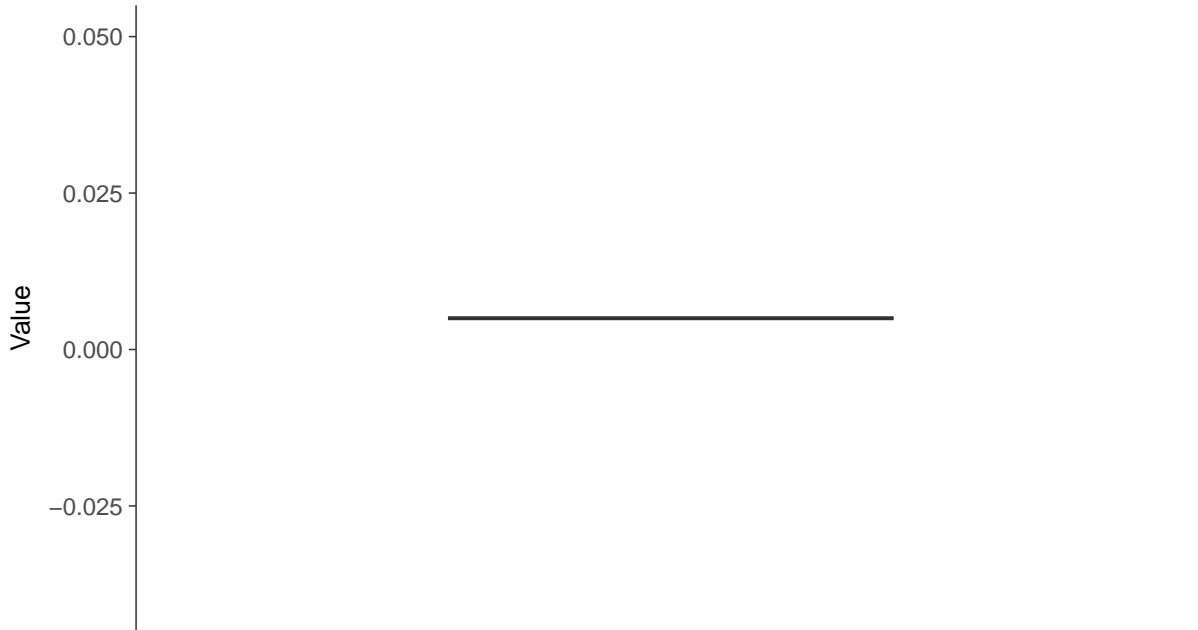
ID: 2\_07\_10





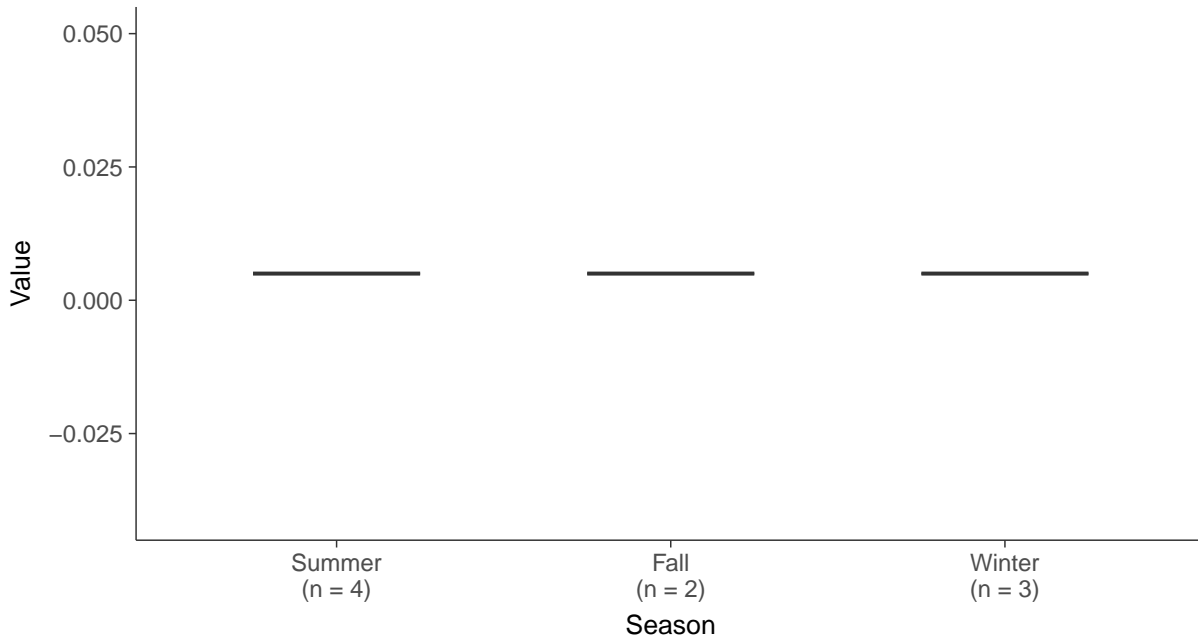
### Boxplot

Antimony, MW-10 (mg/L)



### Boxplot by Season

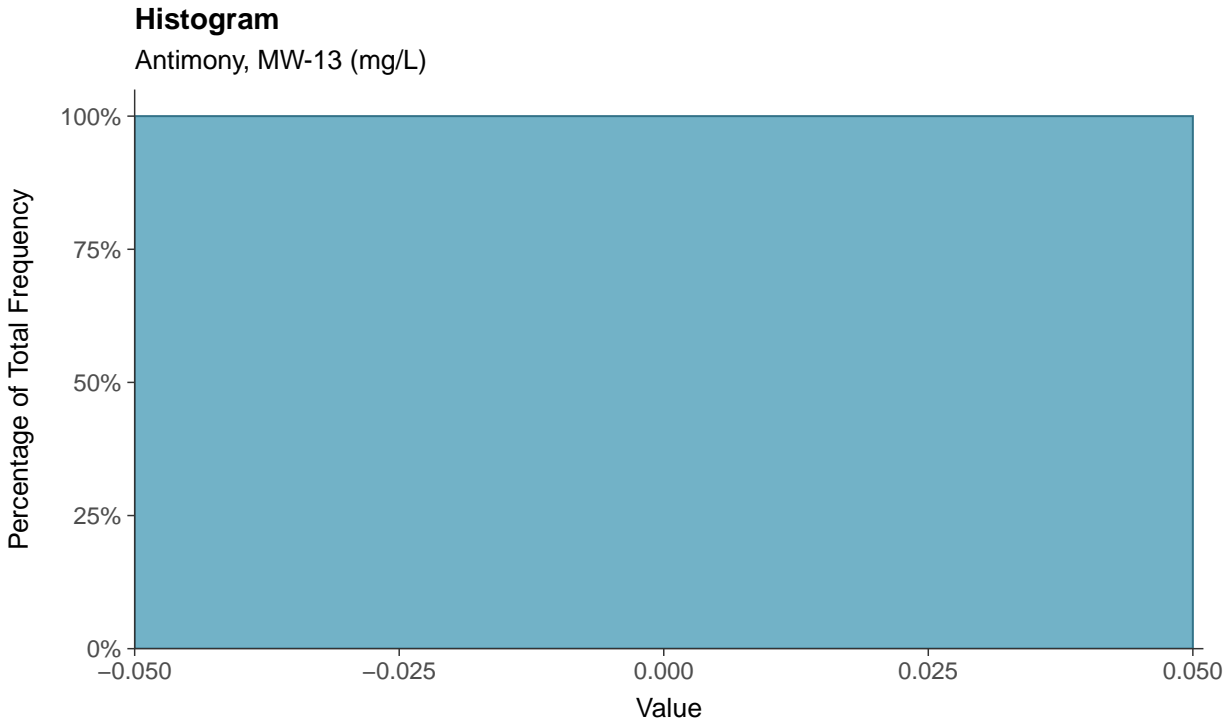
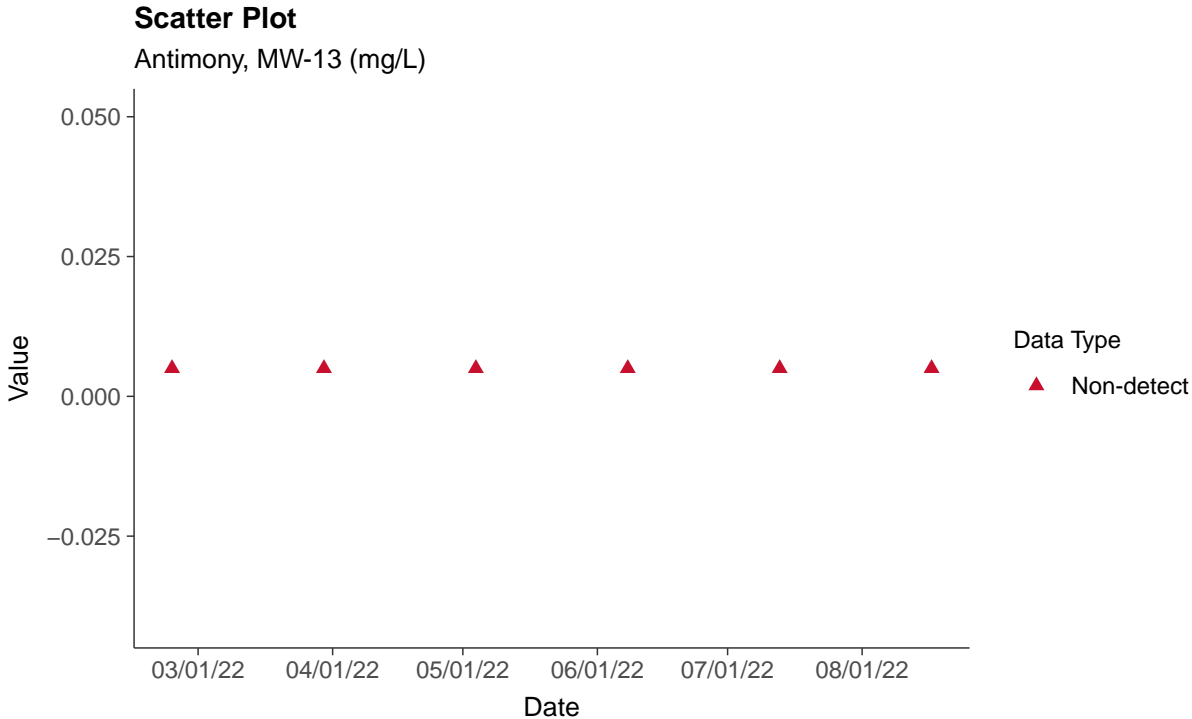
Antimony, MW-10 (mg/L)





### Appendix IV: Antimony, MW-13

ID: 2\_07\_13

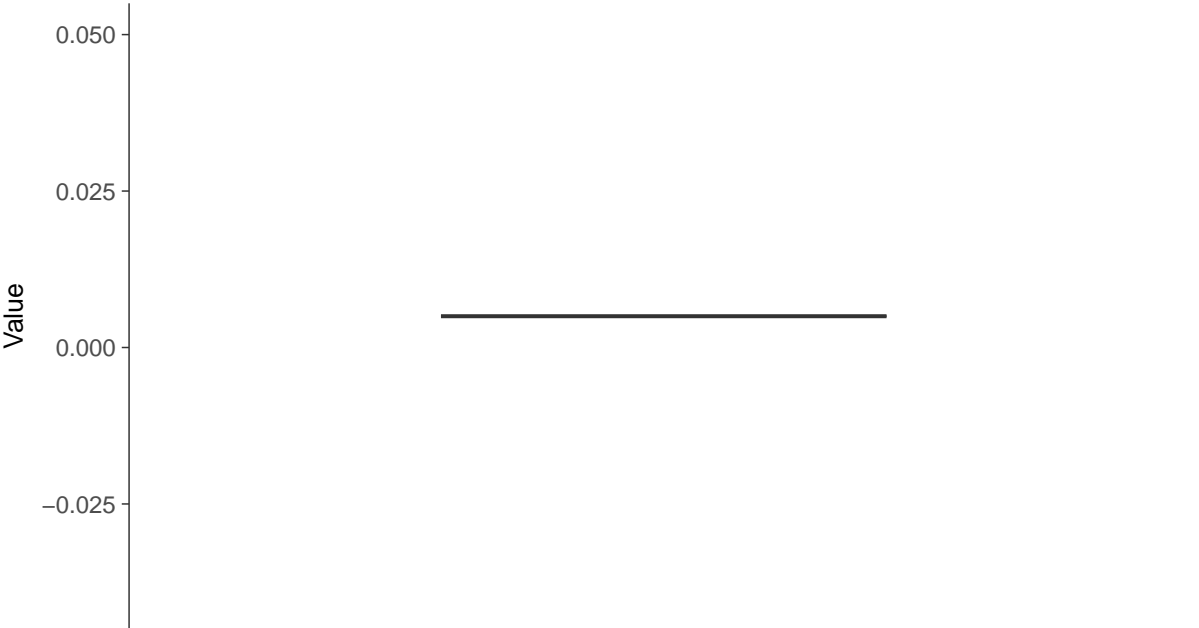






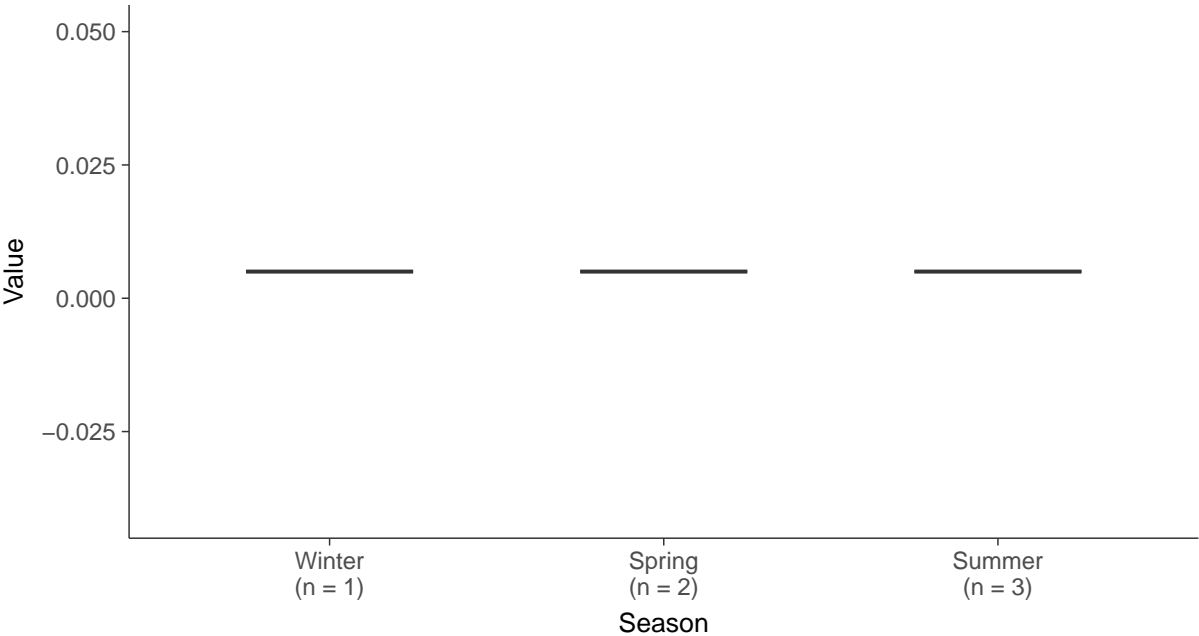
**Boxplot**

Antimony, MW-13 (mg/L)



**Boxplot by Season**

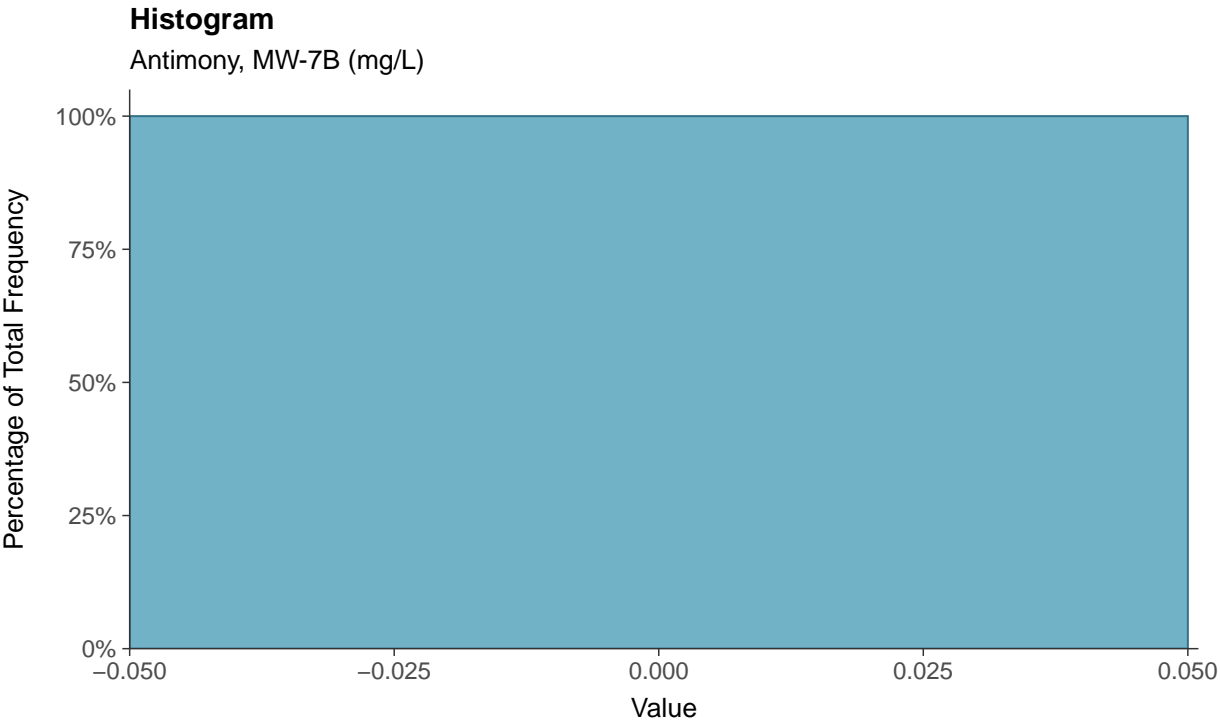
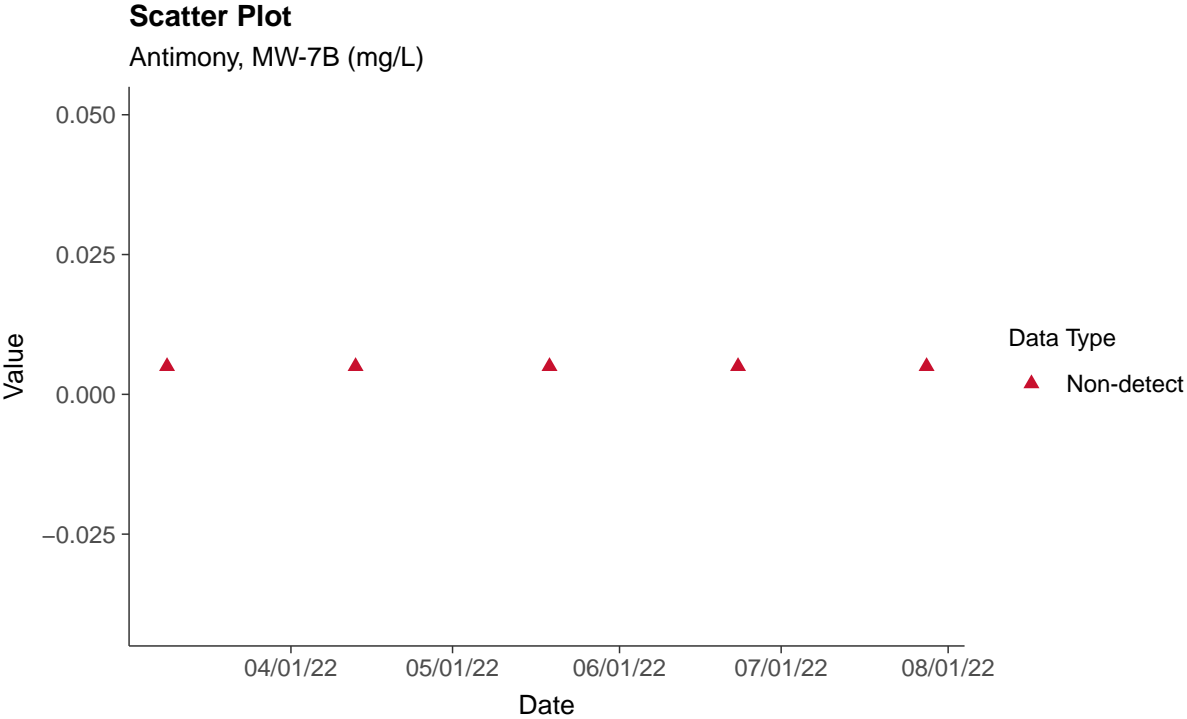
Antimony, MW-13 (mg/L)





### Appendix IV: Antimony, MW-7B

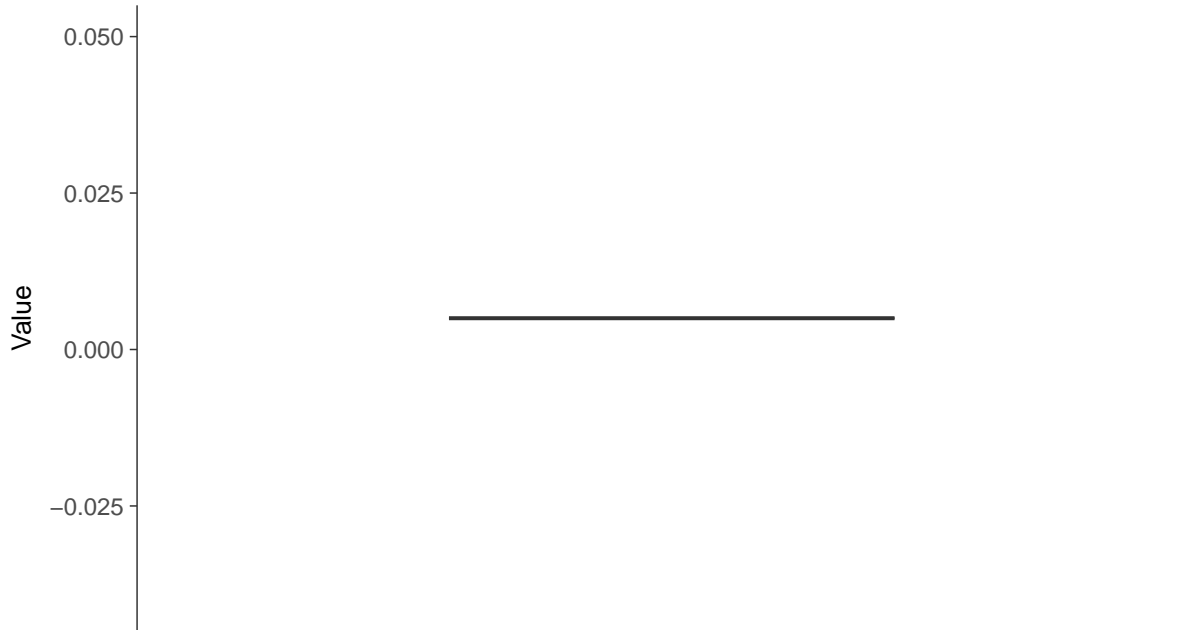
ID: 2\_07\_7B





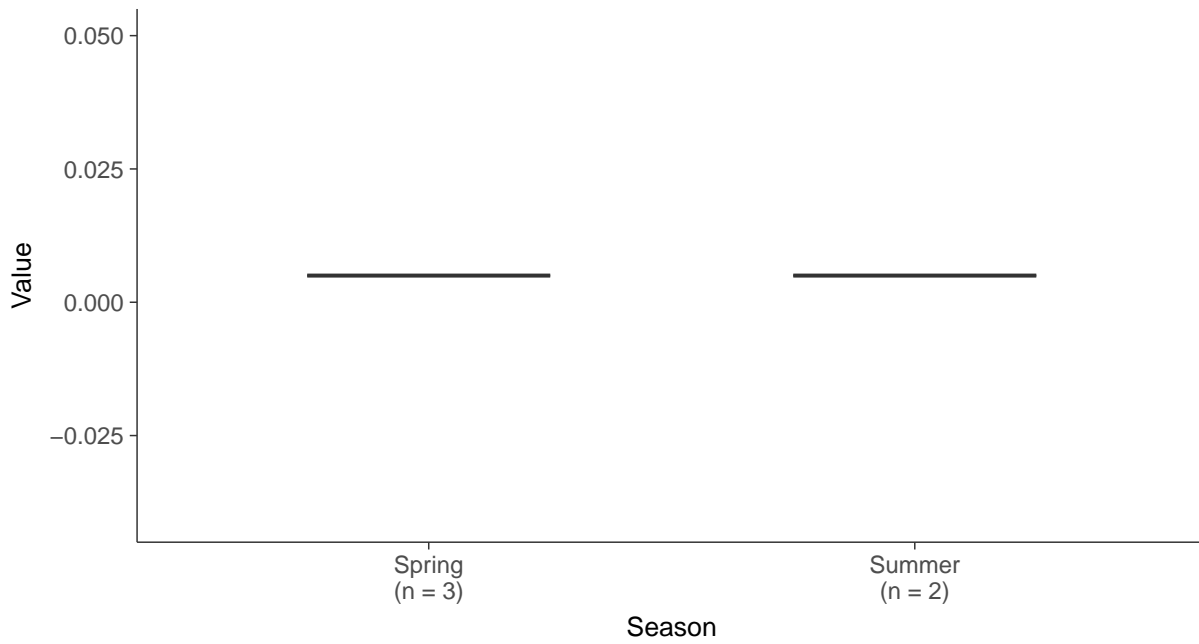
### Boxplot

Antimony, MW-7B (mg/L)



### Boxplot by Season

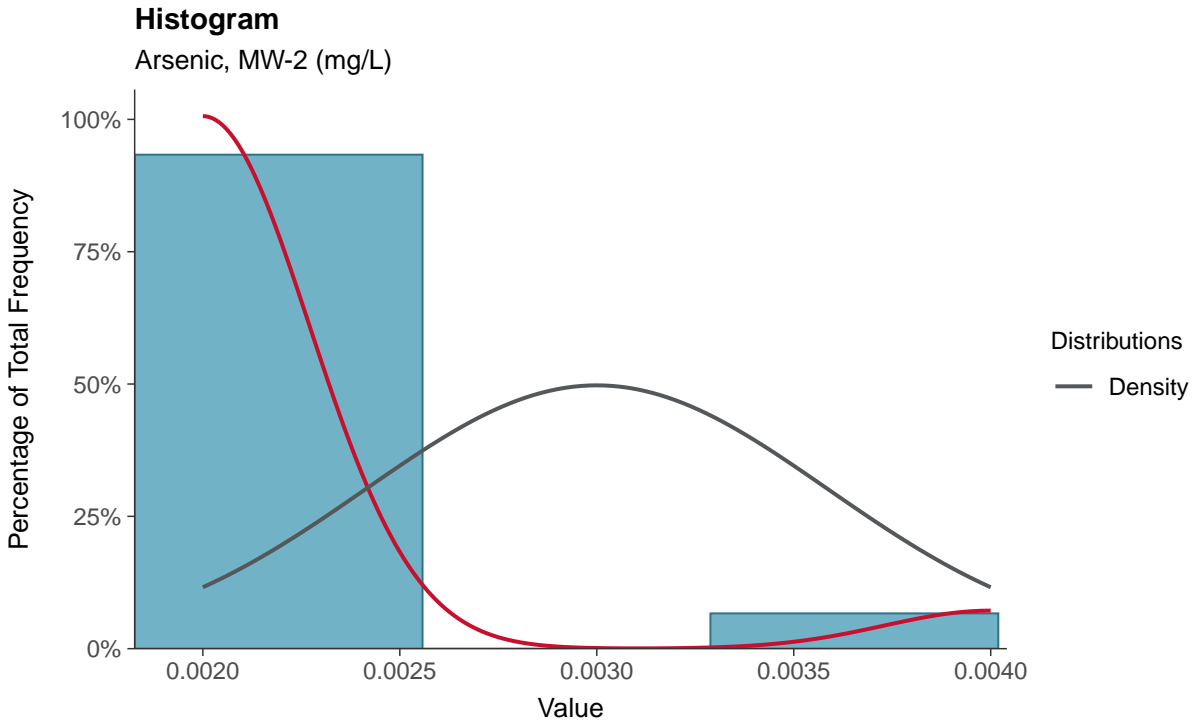
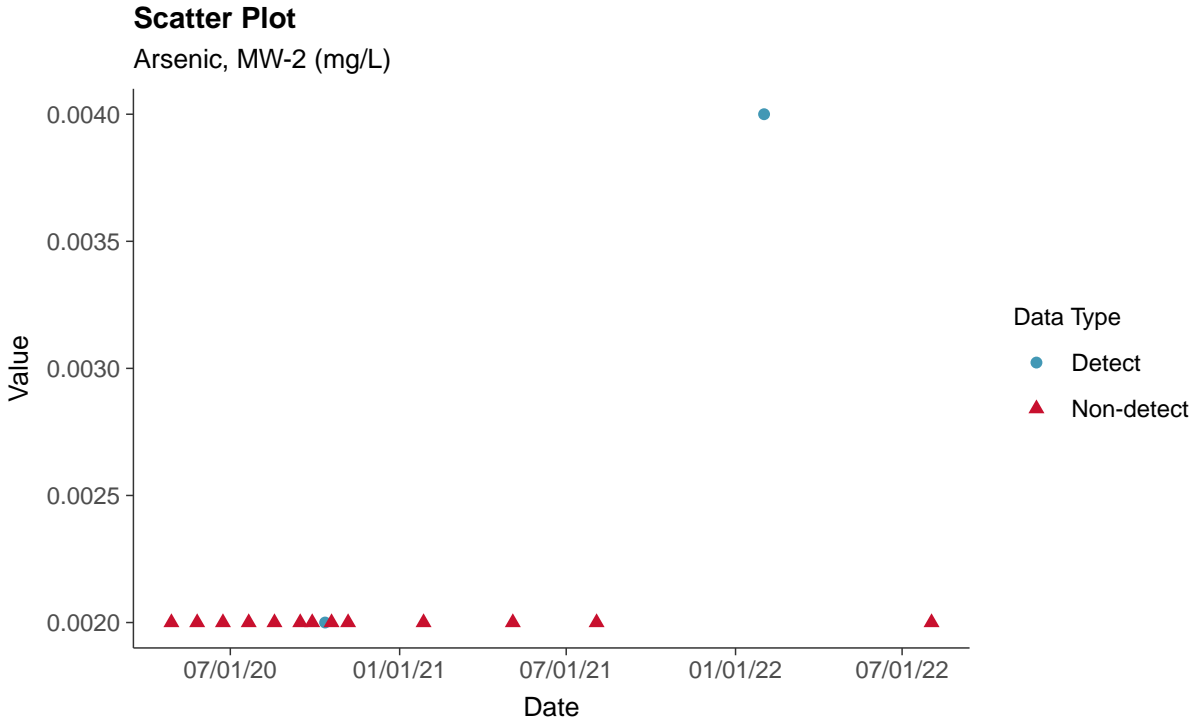
Antimony, MW-7B (mg/L)





### Appendix IV: Arsenic, MW-2

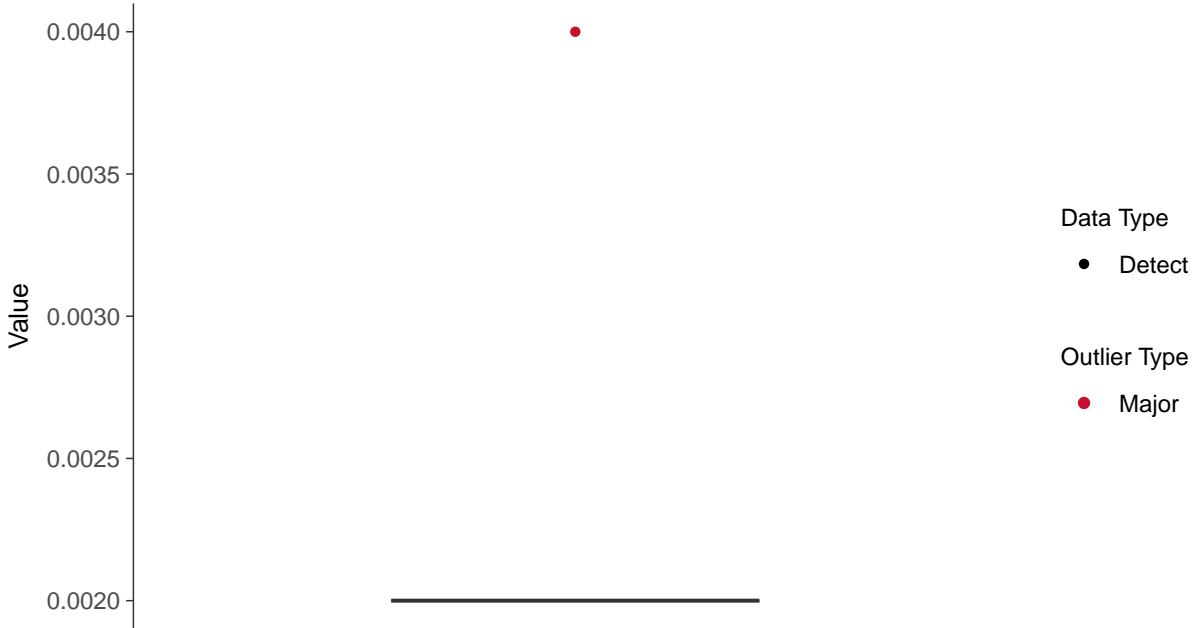
ID: 2\_08\_02





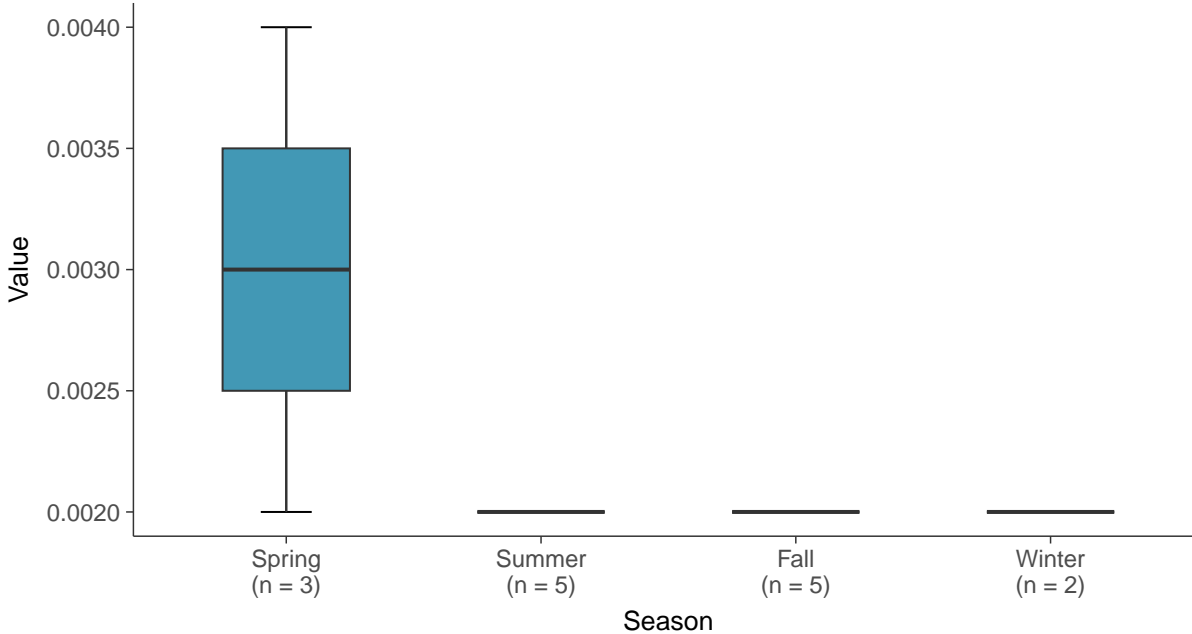
**Boxplot**

Arsenic, MW-2 (mg/L)



**Boxplot by Season**

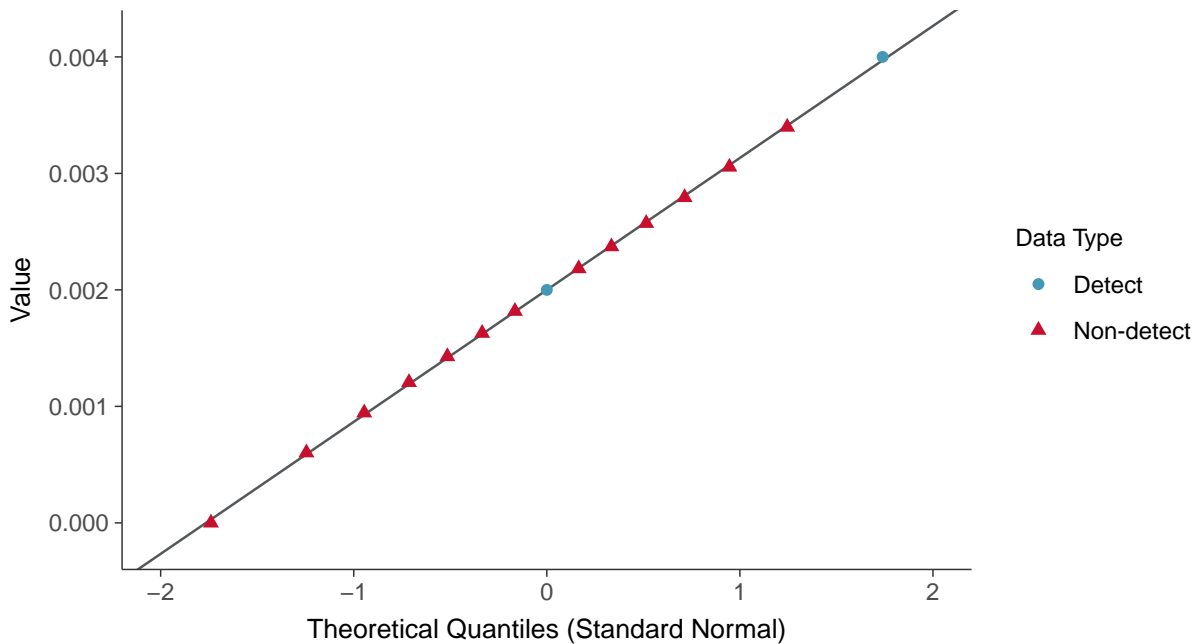
Arsenic, MW-2 (mg/L)





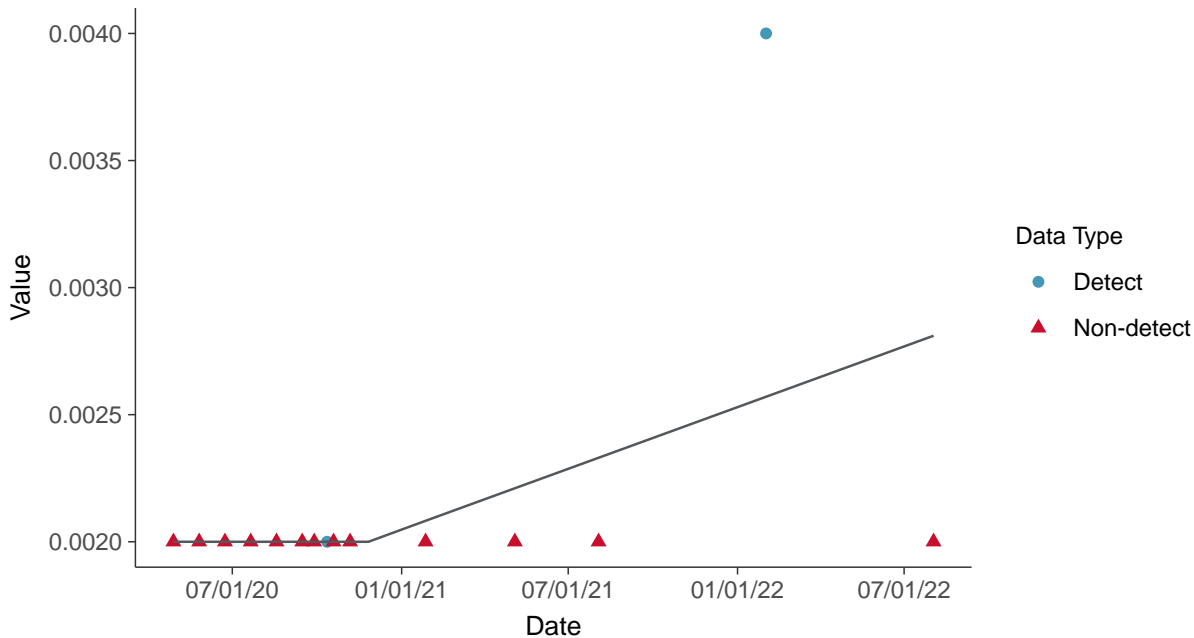
### Normal Q-Q plot using ROS Imputed Estimates

Arsenic, MW-2 (mg/L)



### Trend Regression: Piecewise Linear-Linear

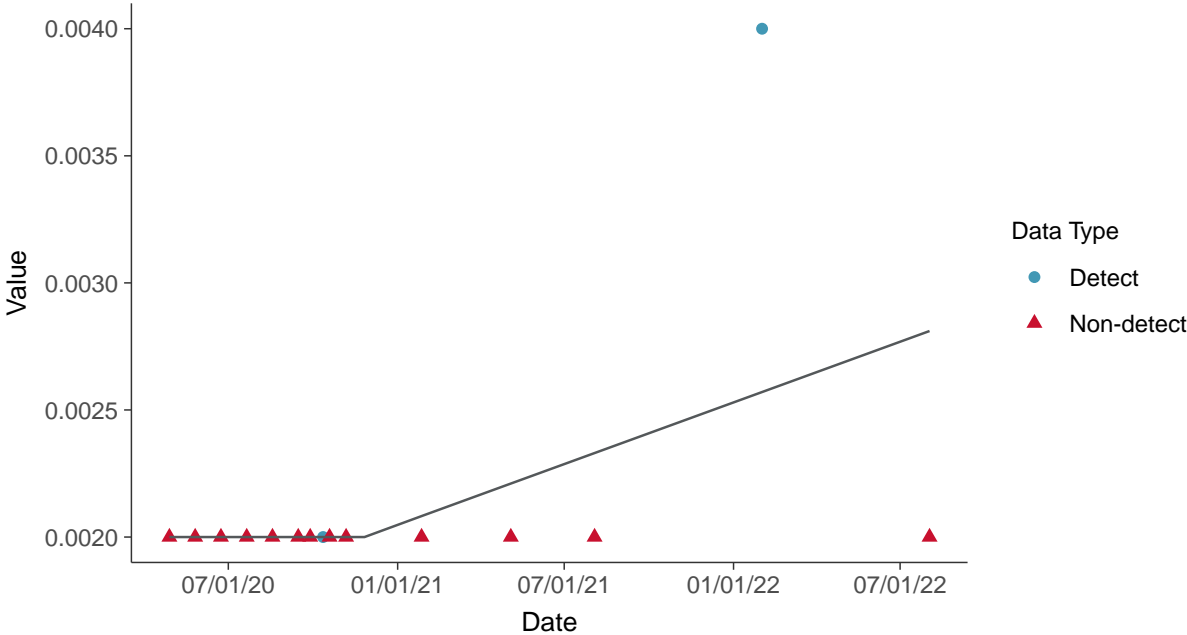
Arsenic, MW-2 (mg/L)





### Trend Regression: Piecewise Linear-Linear-Linear

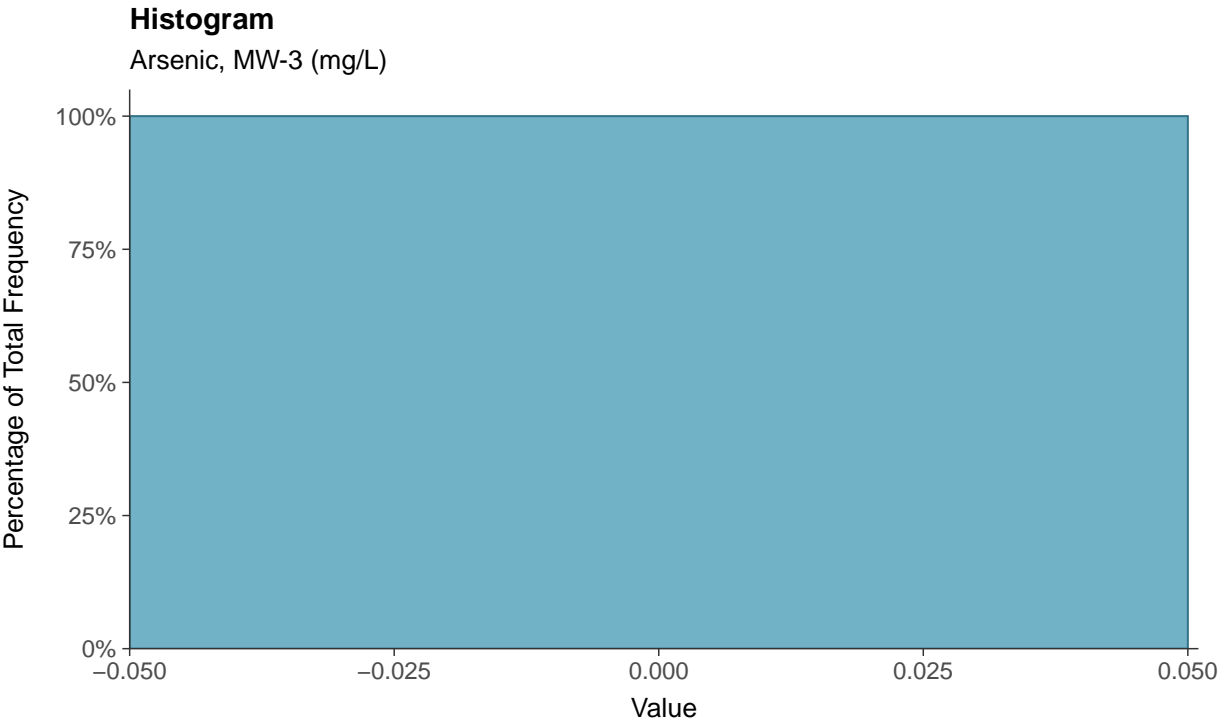
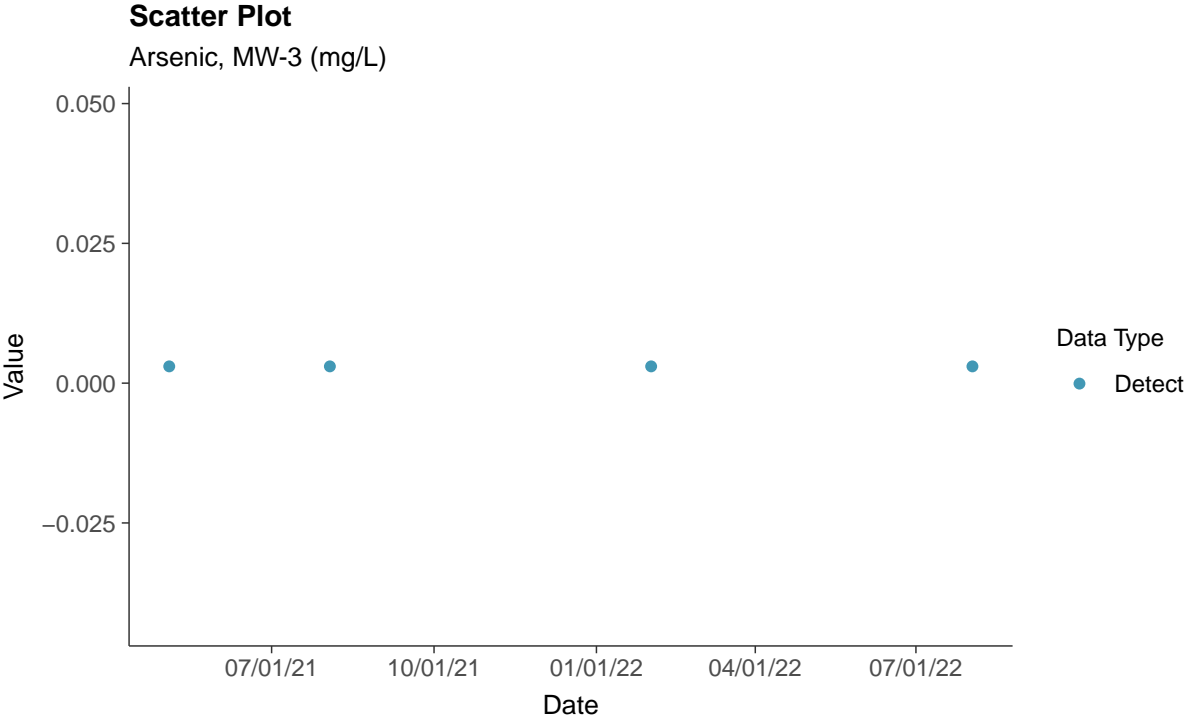
Arsenic, MW-2 (mg/L)





### Appendix IV: Arsenic, MW-3

ID: 2\_08\_03







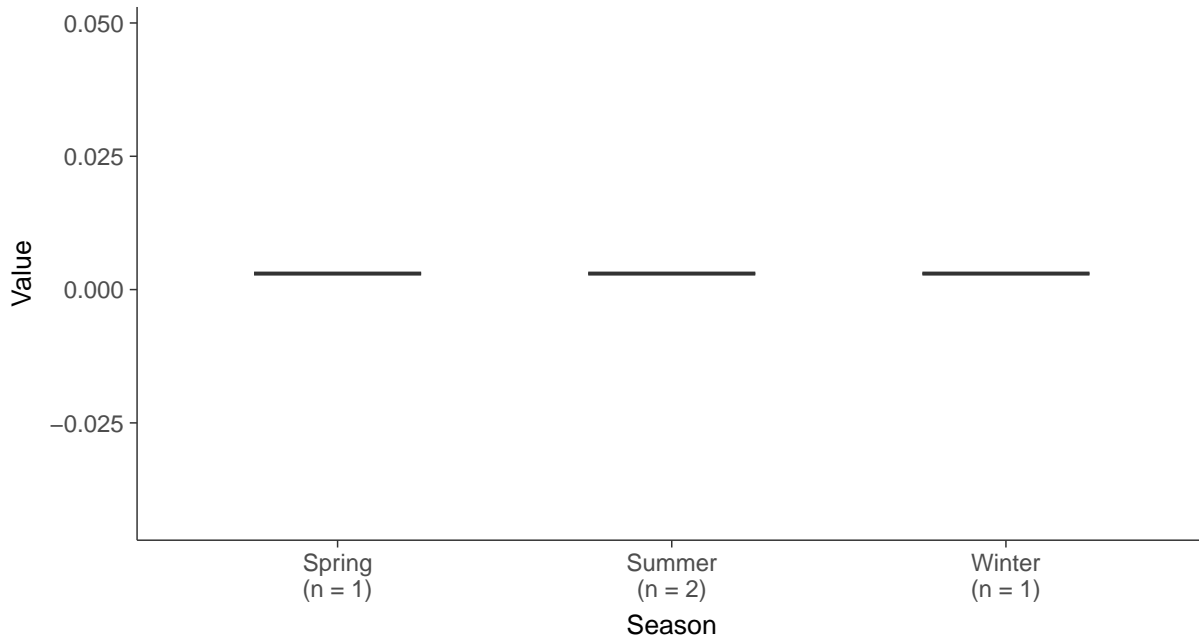
### Boxplot

Arsenic, MW-3 (mg/L)



### Boxplot by Season

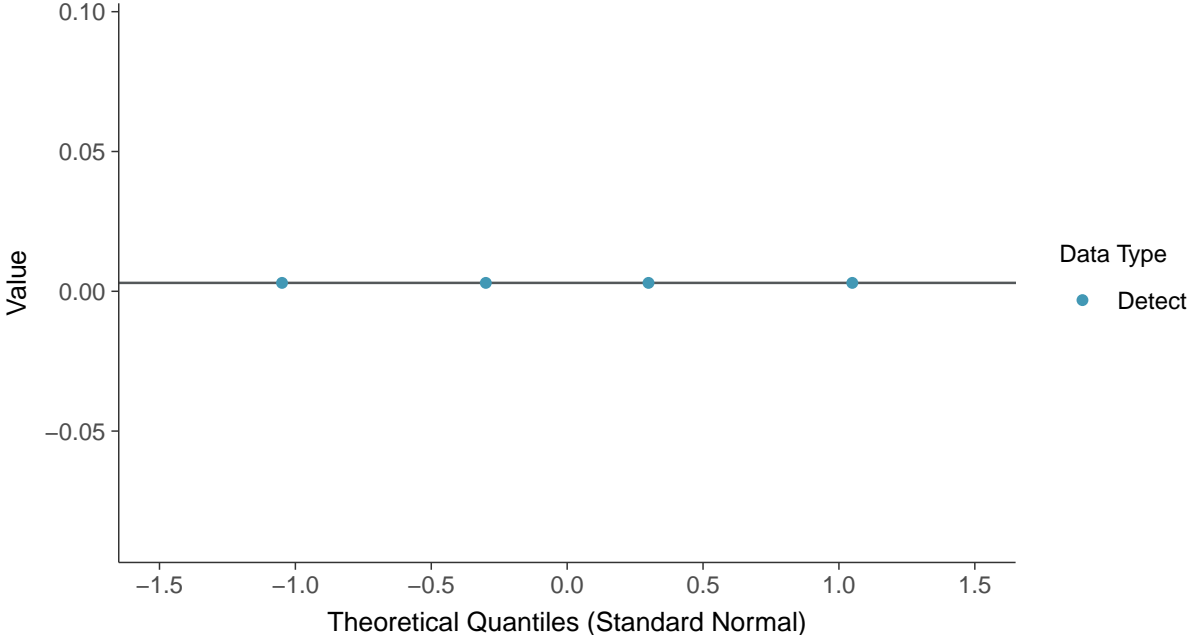
Arsenic, MW-3 (mg/L)





**Normal Q-Q plot**

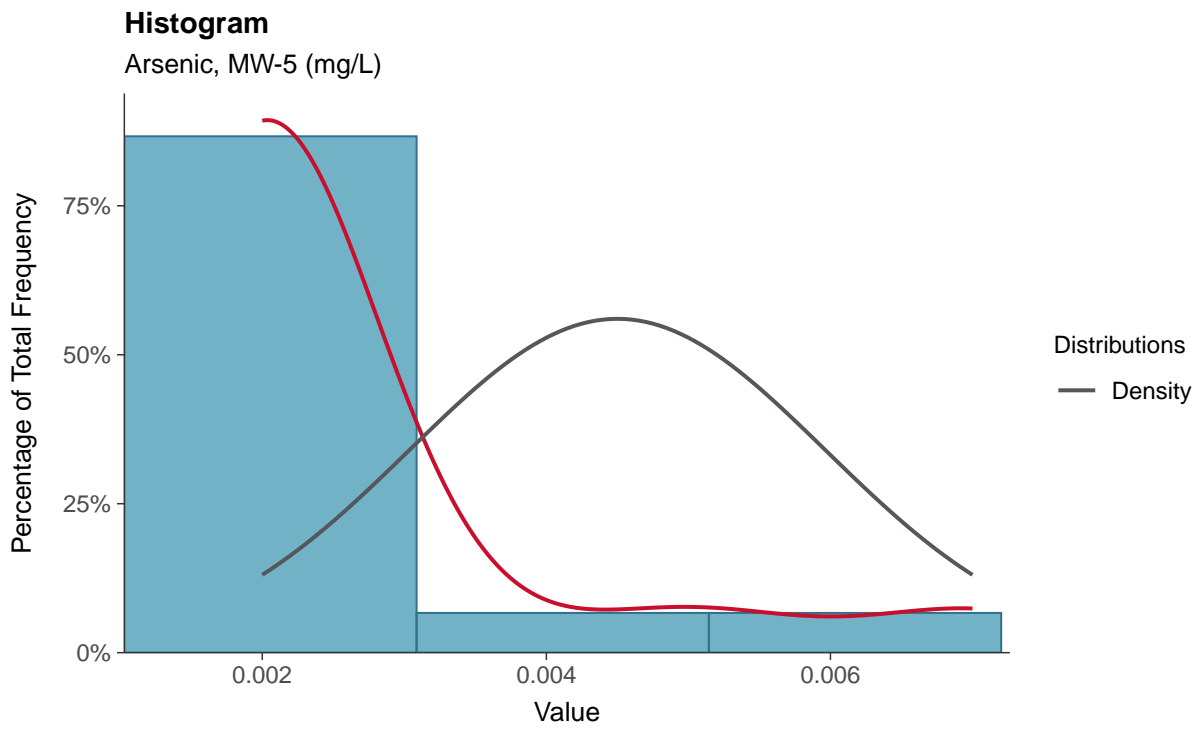
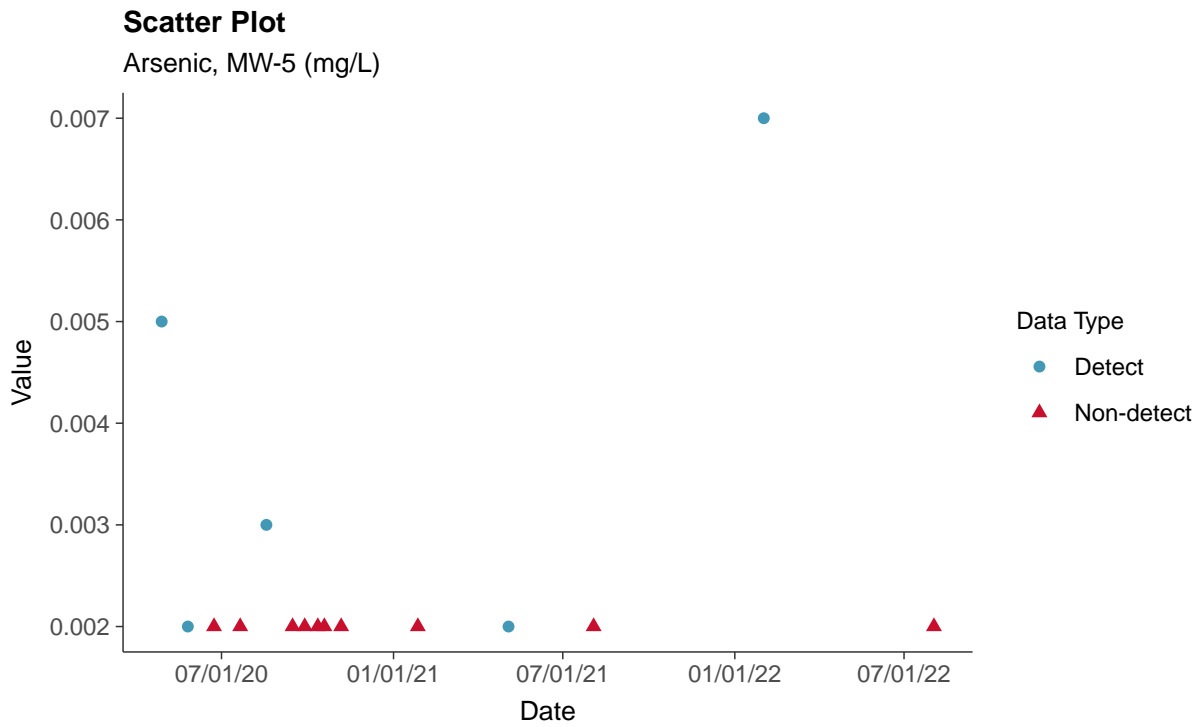
Arsenic, MW-3 (mg/L)





## Appendix IV: Arsenic, MW-5

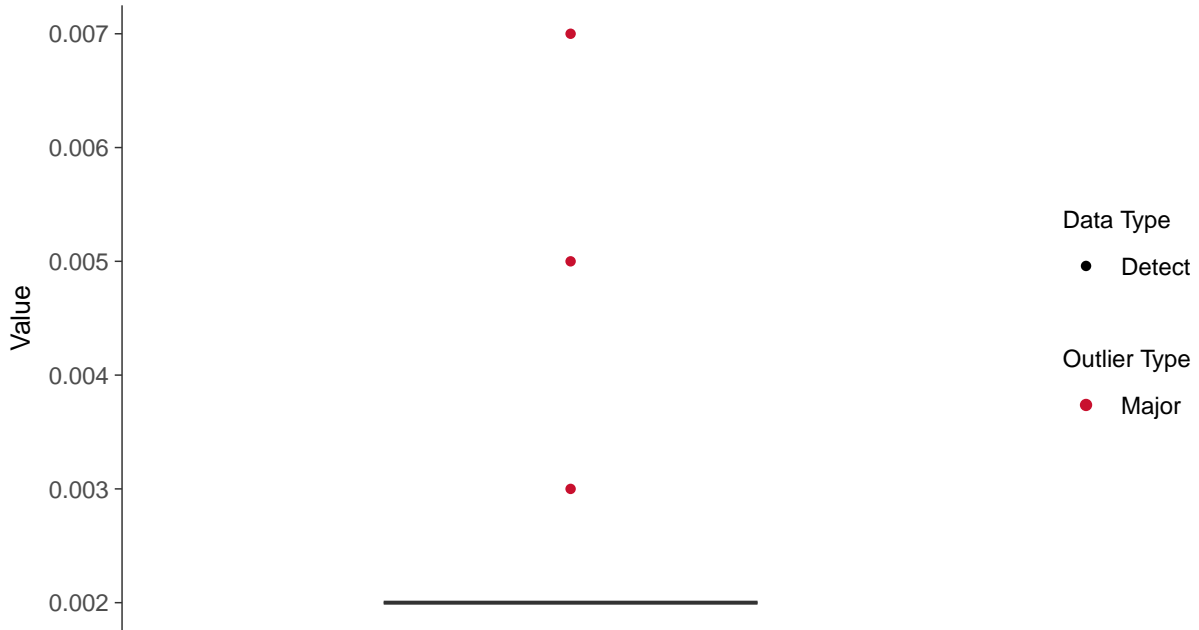
ID: 2\_08\_05





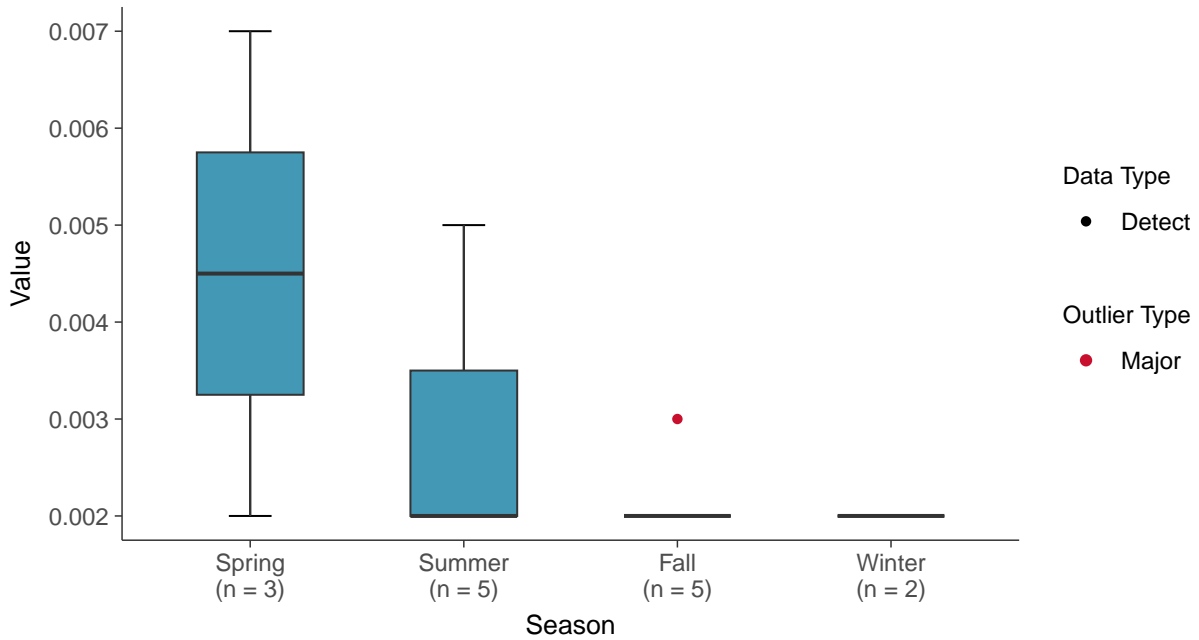
### Boxplot

Arsenic, MW-5 (mg/L)



### Boxplot by Season

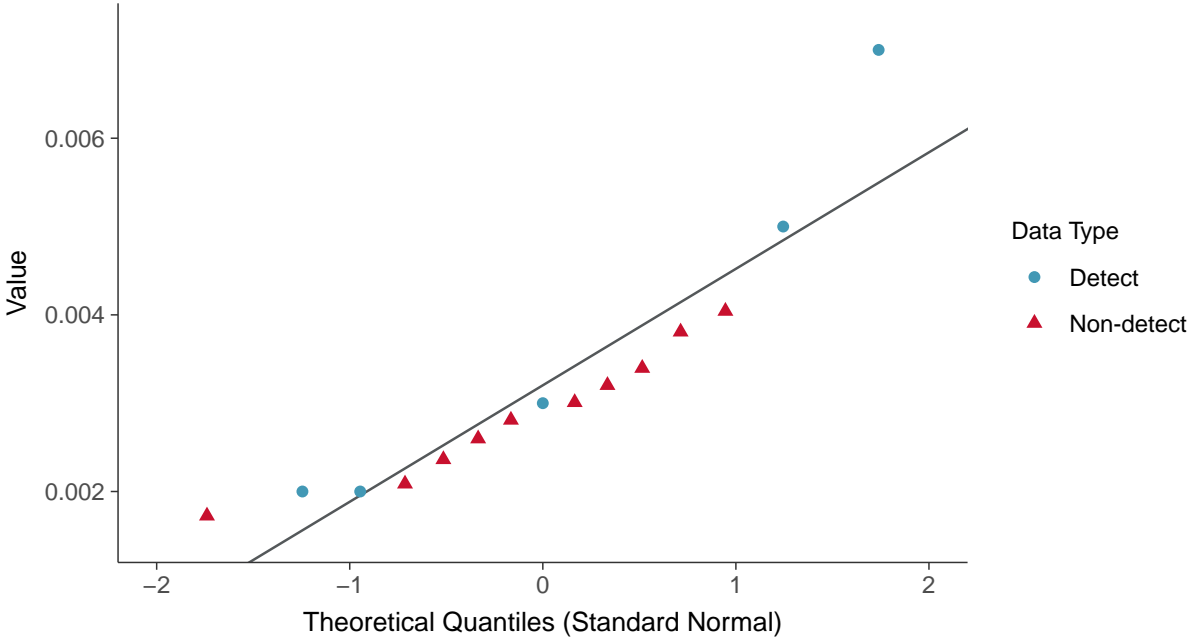
Arsenic, MW-5 (mg/L)





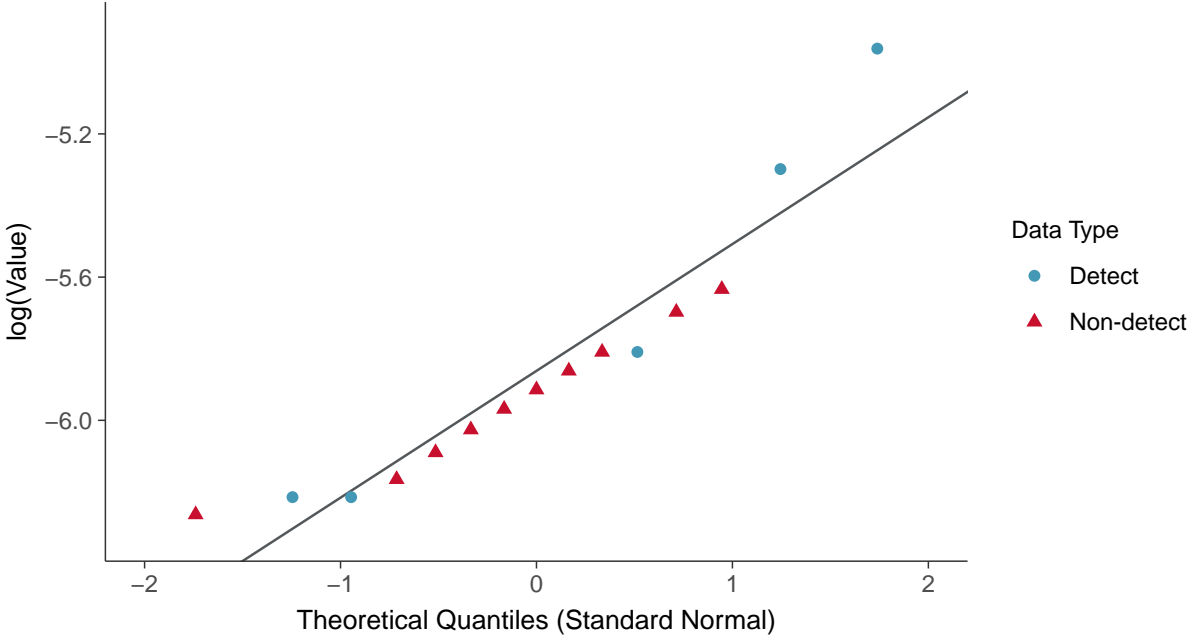
### Normal Q-Q plot using ROS Imputed Estimates

Arsenic, MW-5 (mg/L)



### Lognormal Q-Q plot using ROS Imputed Estimates

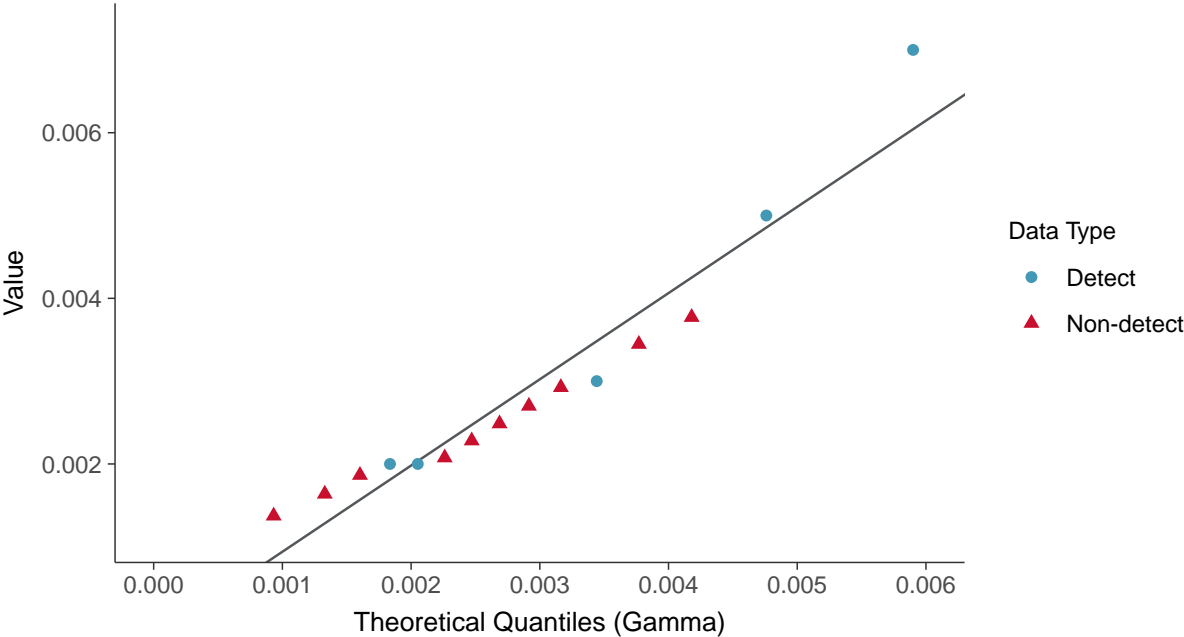
Arsenic, MW-5 (mg/L)





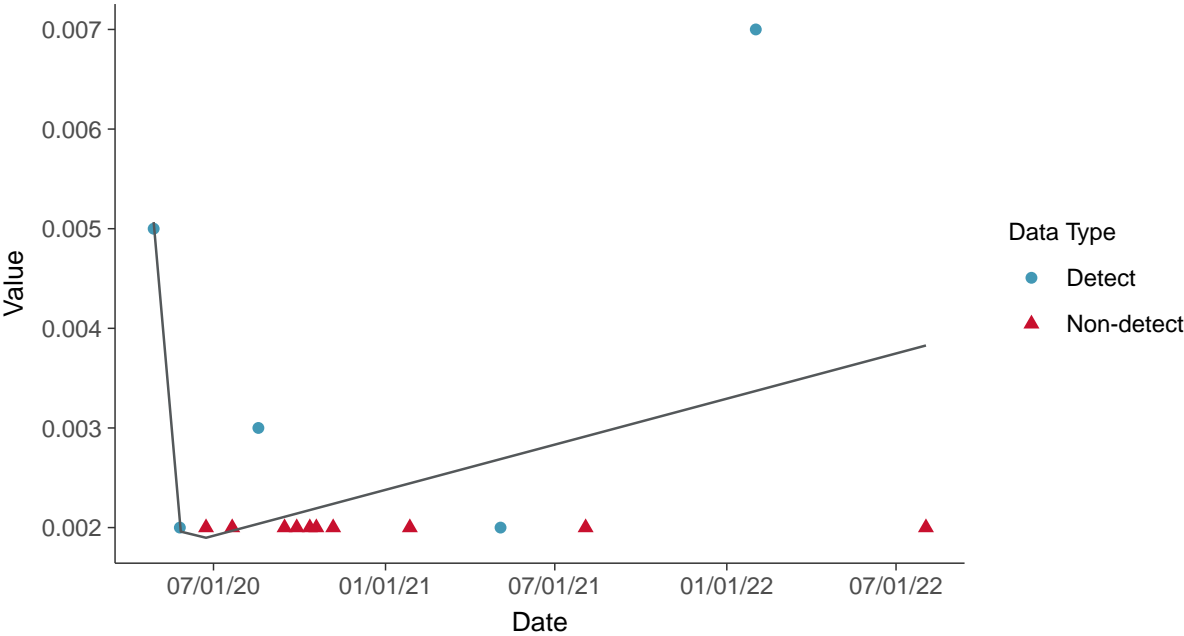
### Gamma Q-Q plot using ROS Imputed Estimates

Arsenic, MW-5 (mg/L)



### Trend Regression: Piecewise Linear-Linear

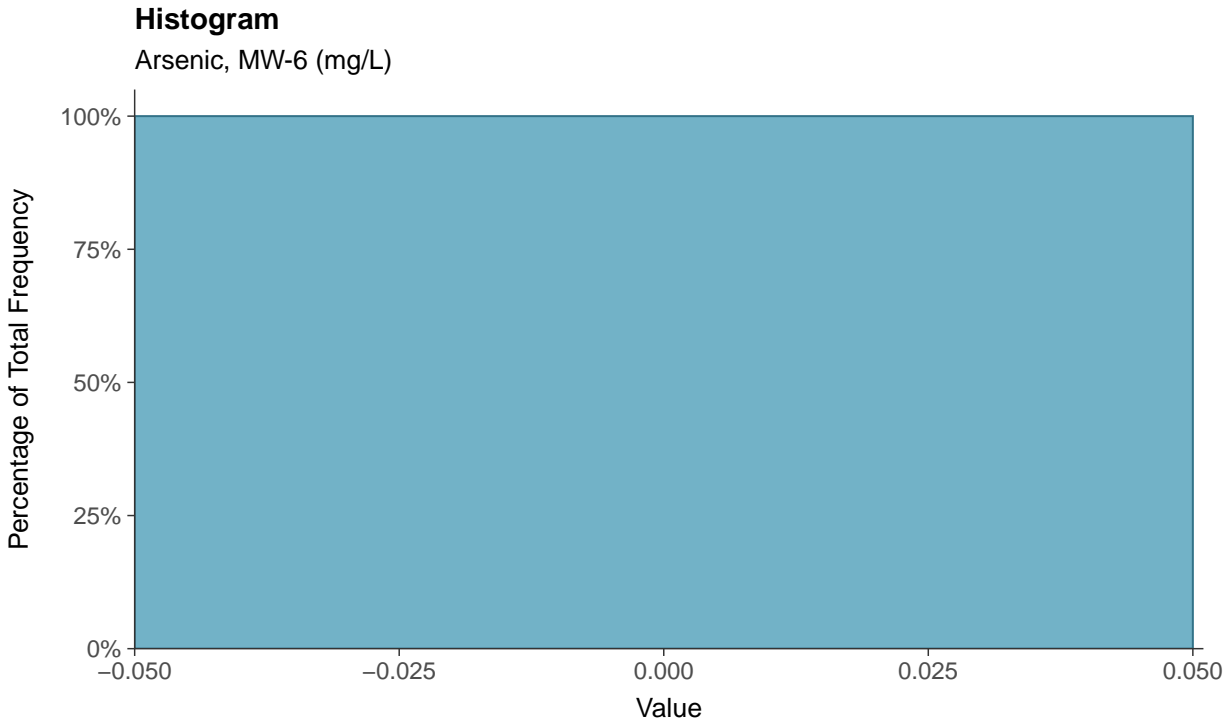
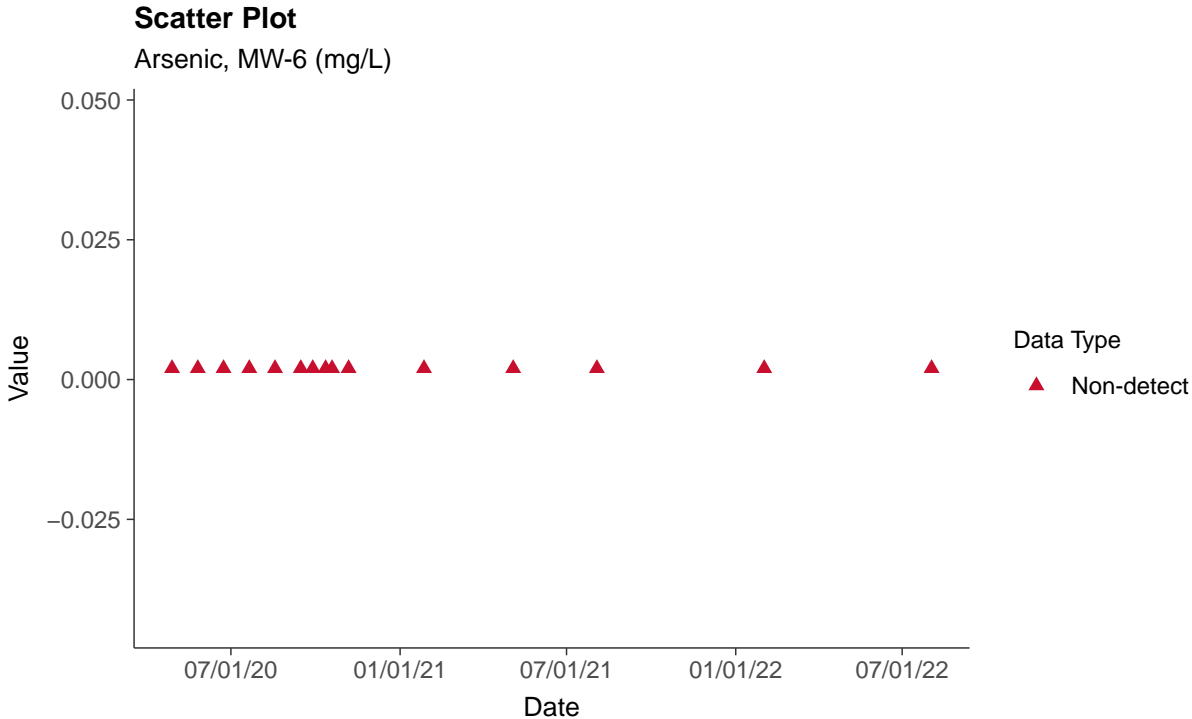
Arsenic, MW-5 (mg/L)





### Appendix IV: Arsenic, MW-6

ID: 2\_08\_06





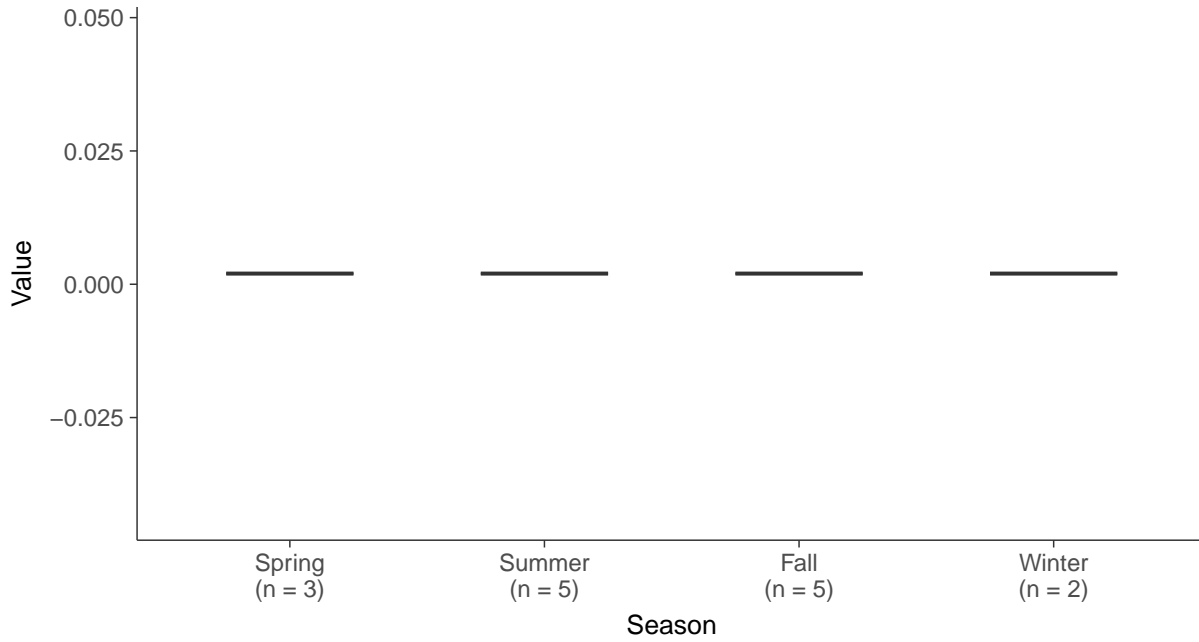
### Boxplot

Arsenic, MW-6 (mg/L)



### Boxplot by Season

Arsenic, MW-6 (mg/L)

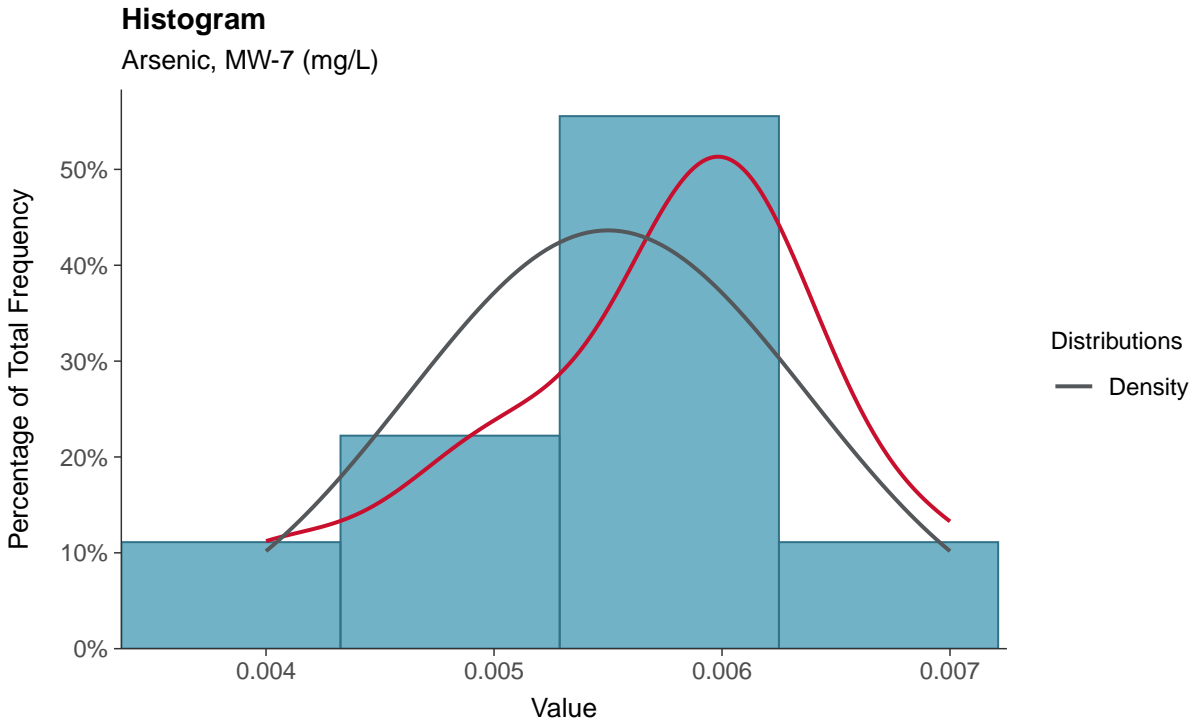
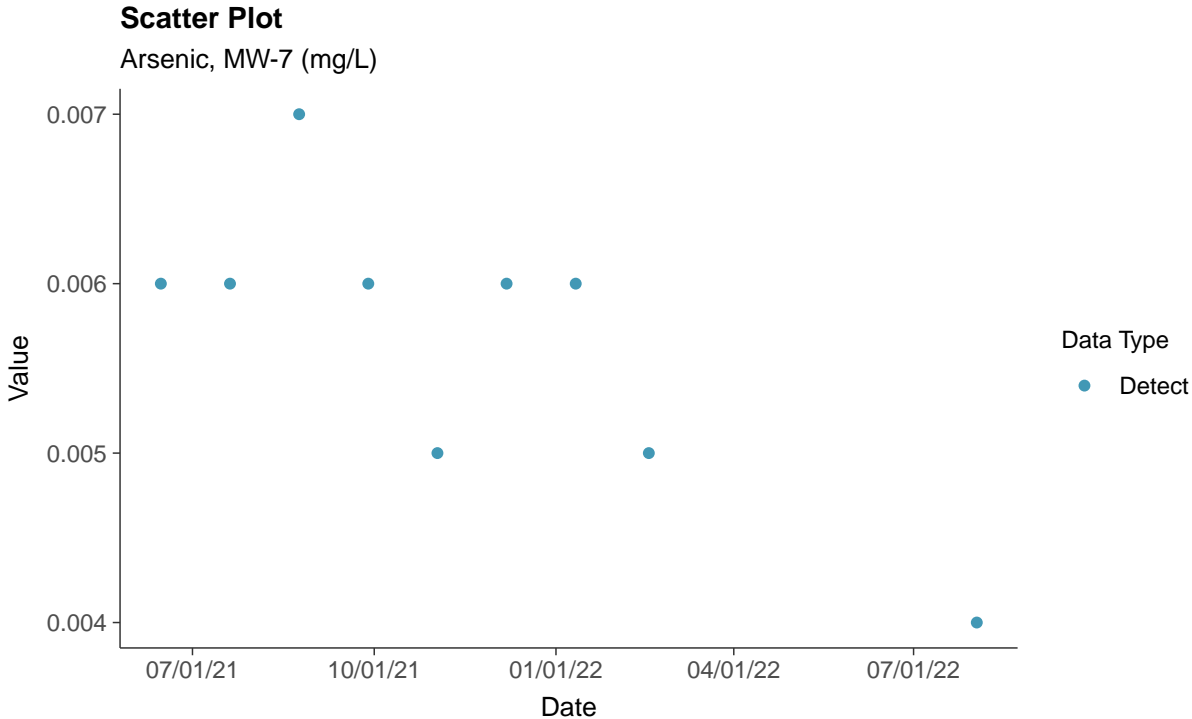






### Appendix IV: Arsenic, MW-7

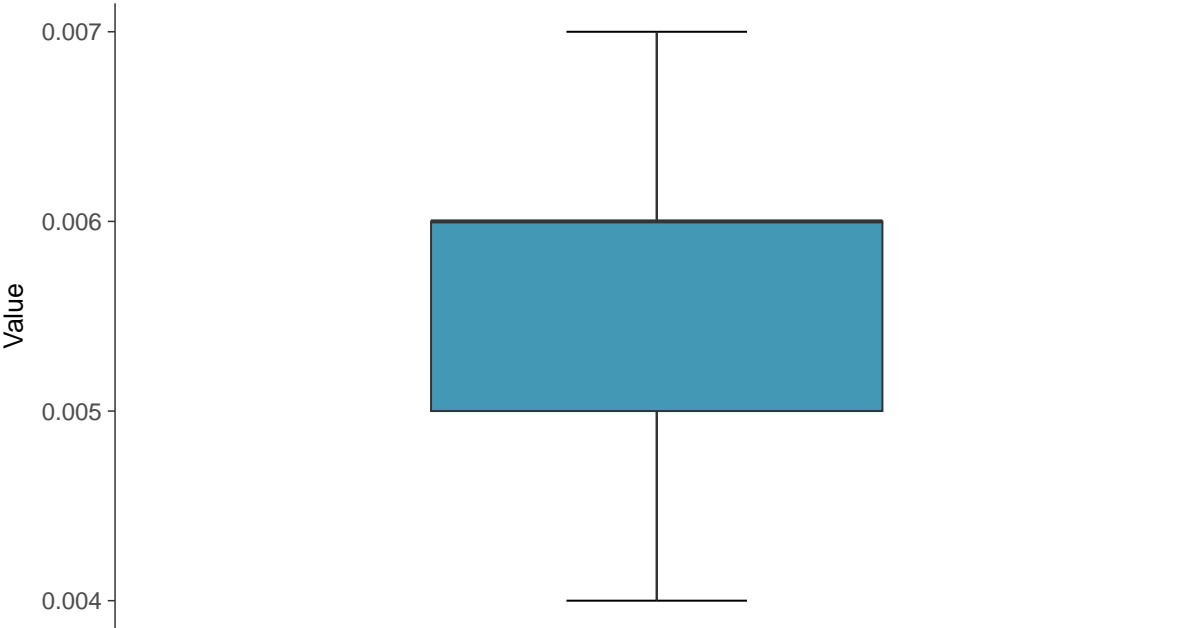
ID: 2\_08\_07





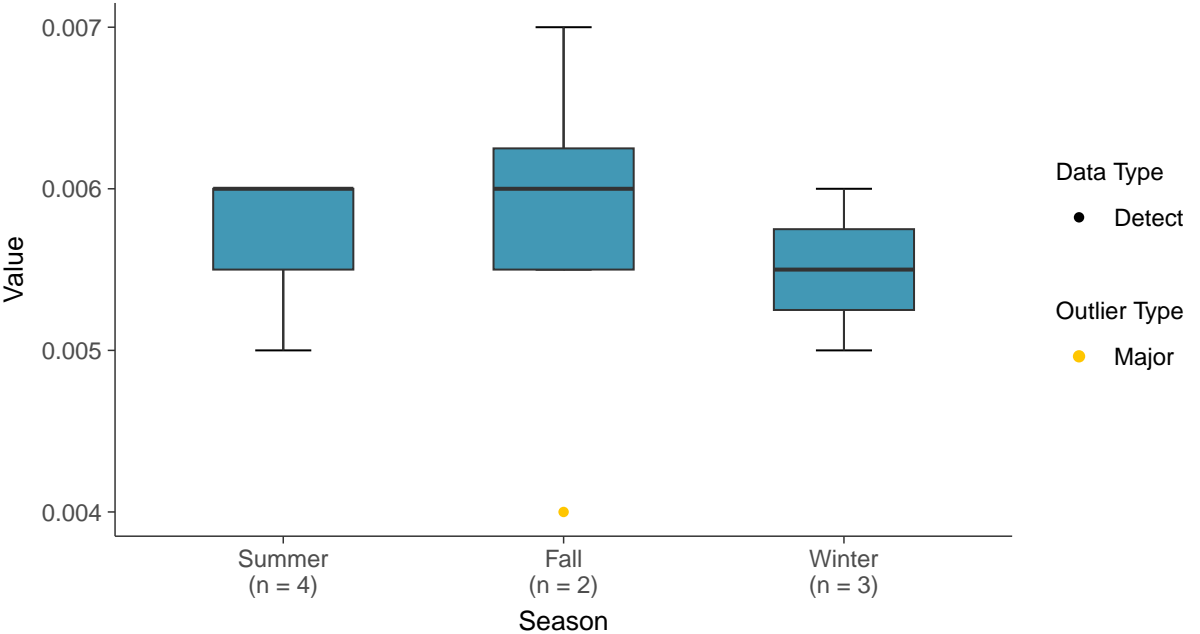
**Boxplot**

Arsenic, MW-7 (mg/L)



**Boxplot by Season**

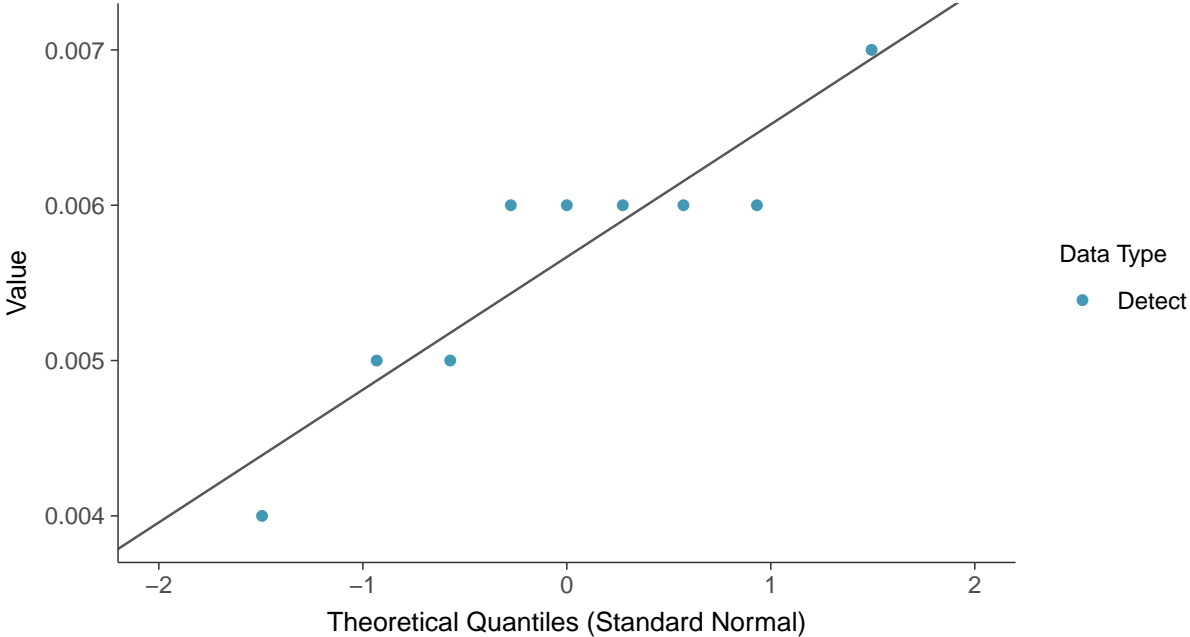
Arsenic, MW-7 (mg/L)





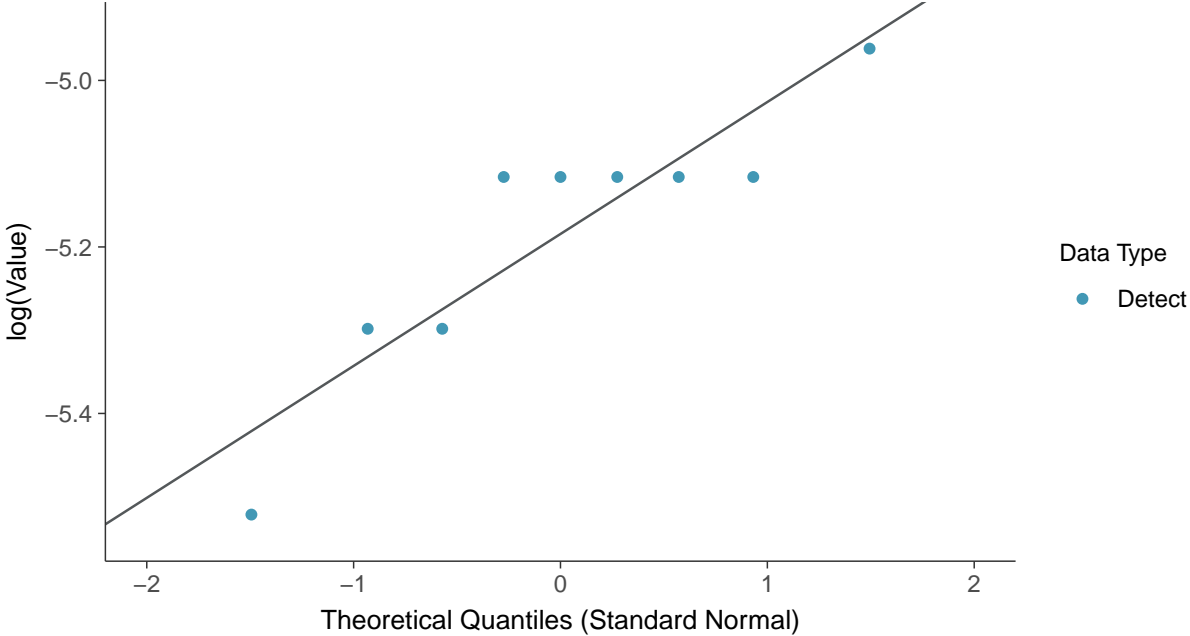
**Normal Q-Q plot**

Arsenic, MW-7 (mg/L)



**Lognormal Q-Q plot**

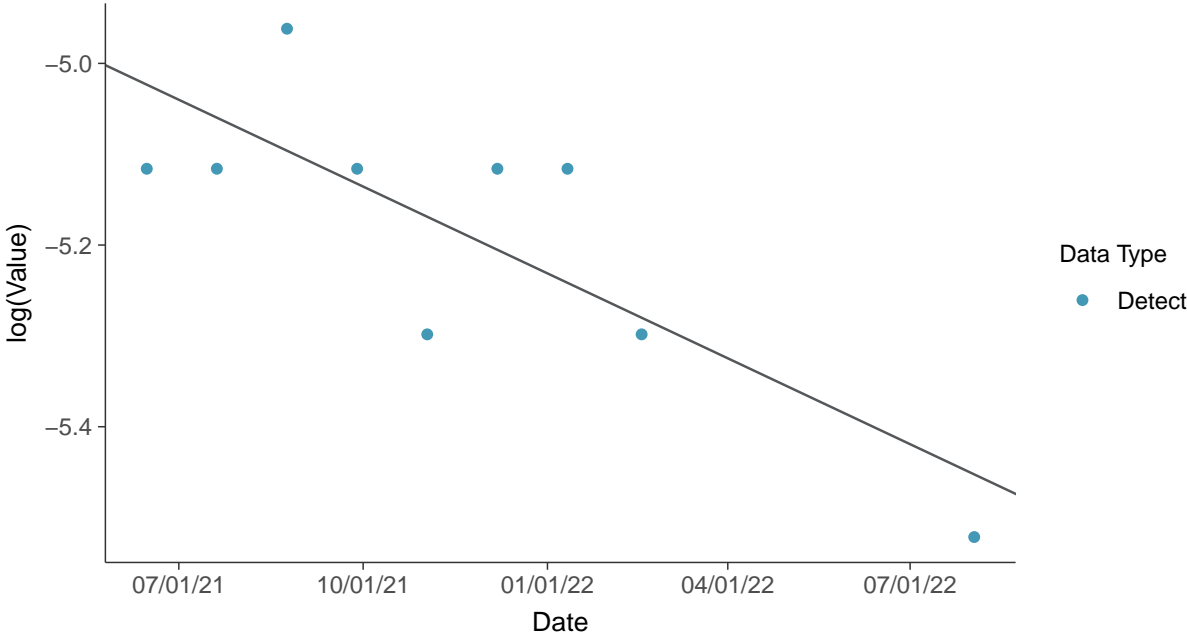
Arsenic, MW-7 (mg/L)





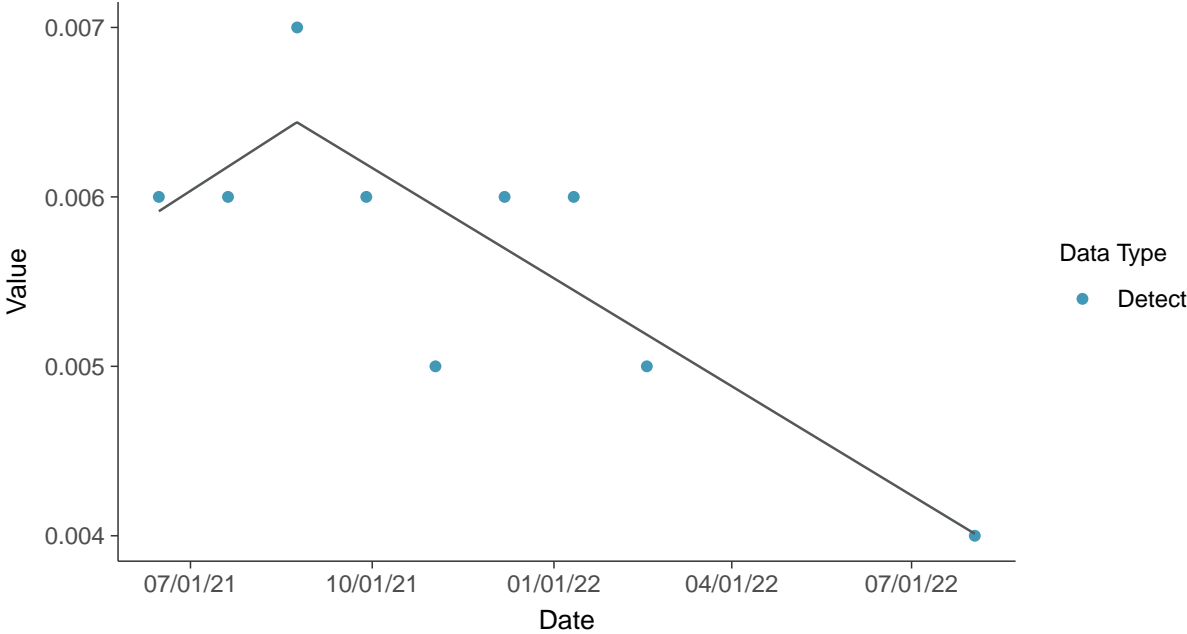
**Trend Regression: Lognormal MLE**

Arsenic, MW-7 (mg/L)



**Trend Regression: Piecewise Linear-Linear**

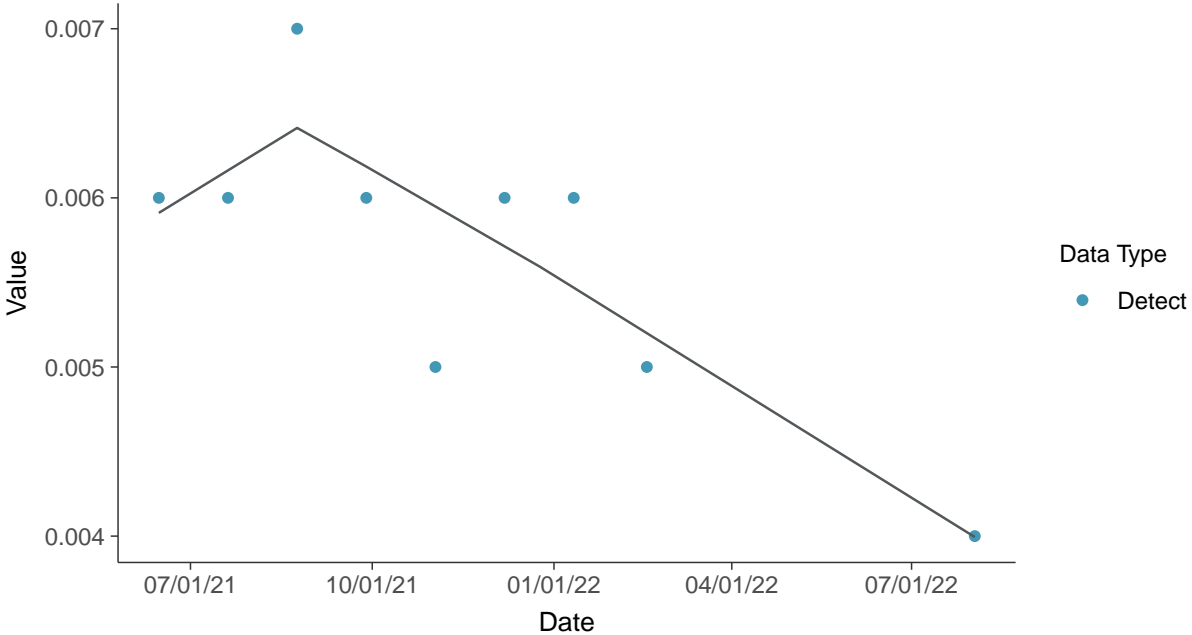
Arsenic, MW-7 (mg/L)





**Trend Regression: Piecewise Linear-Linear-Linear**

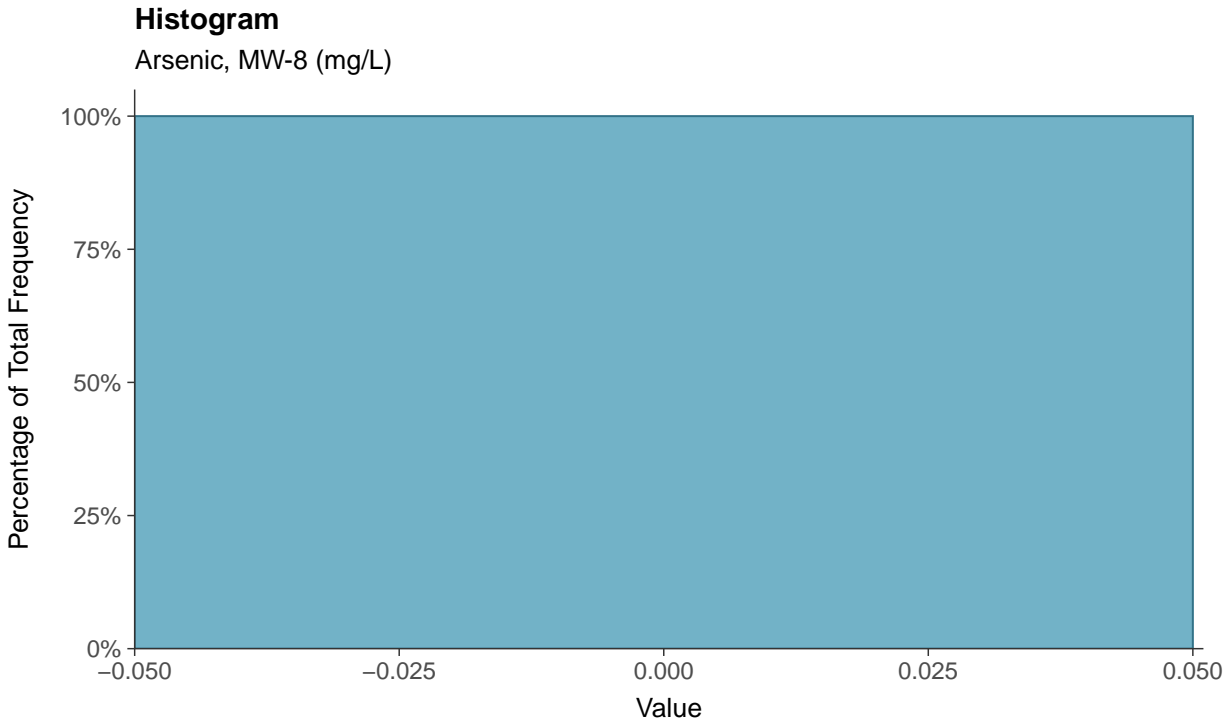
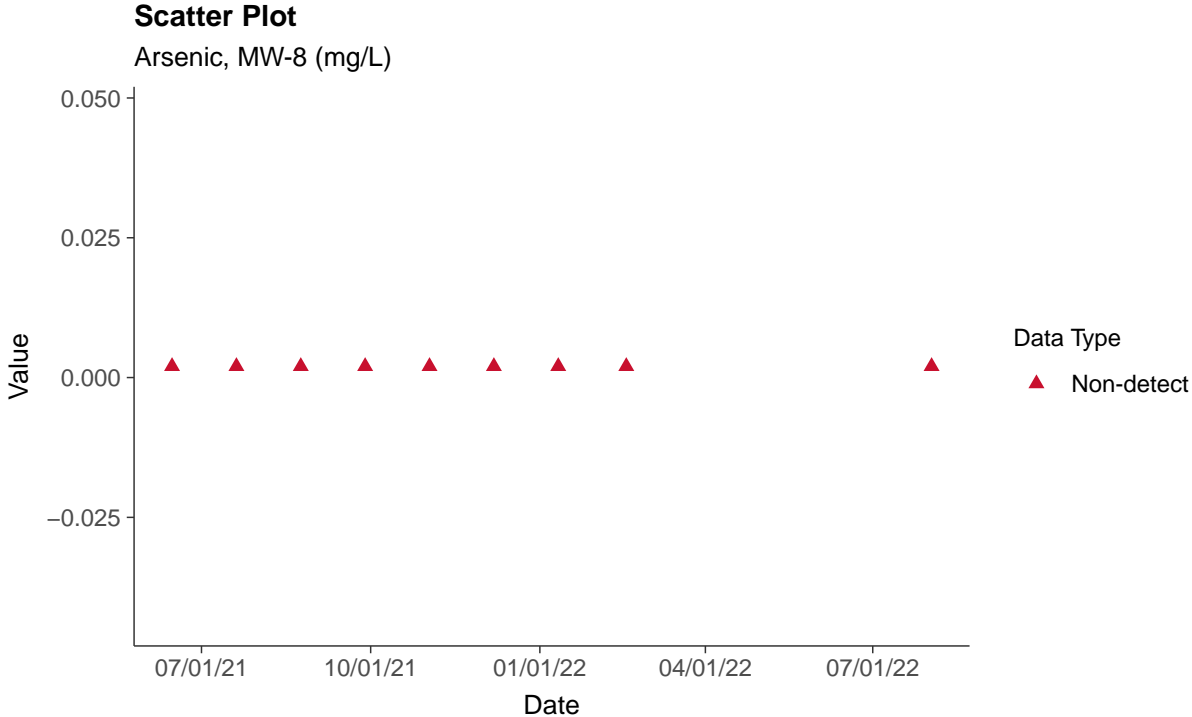
Arsenic, MW-7 (mg/L)





### Appendix IV: Arsenic, MW-8

ID: 2\_08\_08





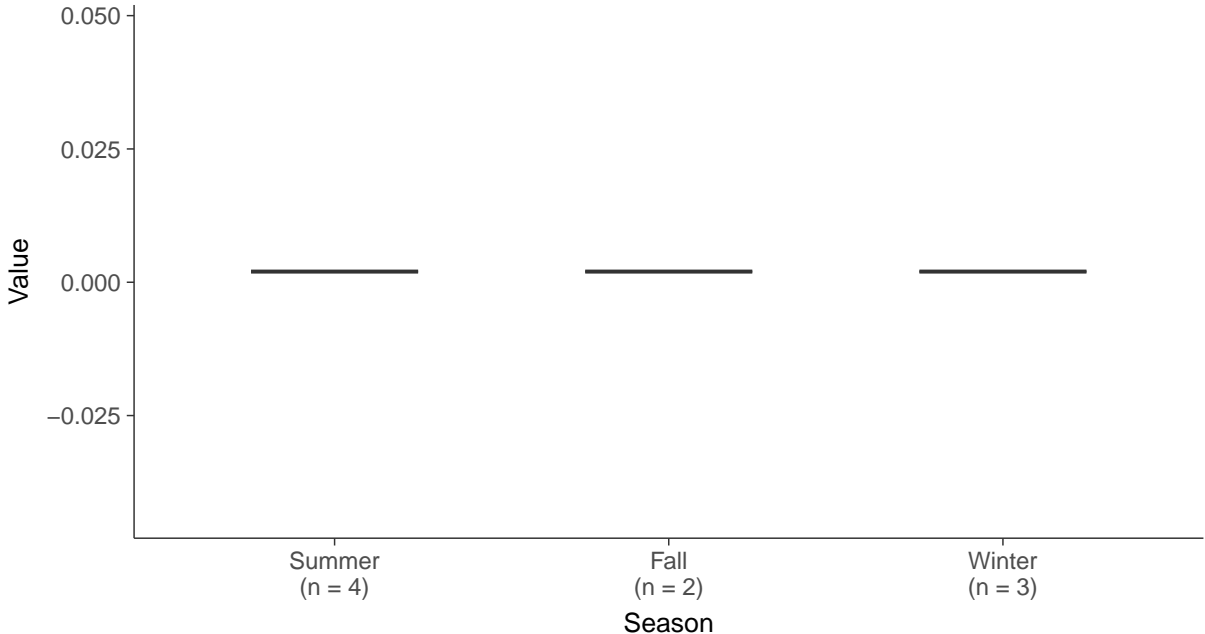
**Boxplot**

Arsenic, MW-8 (mg/L)



**Boxplot by Season**

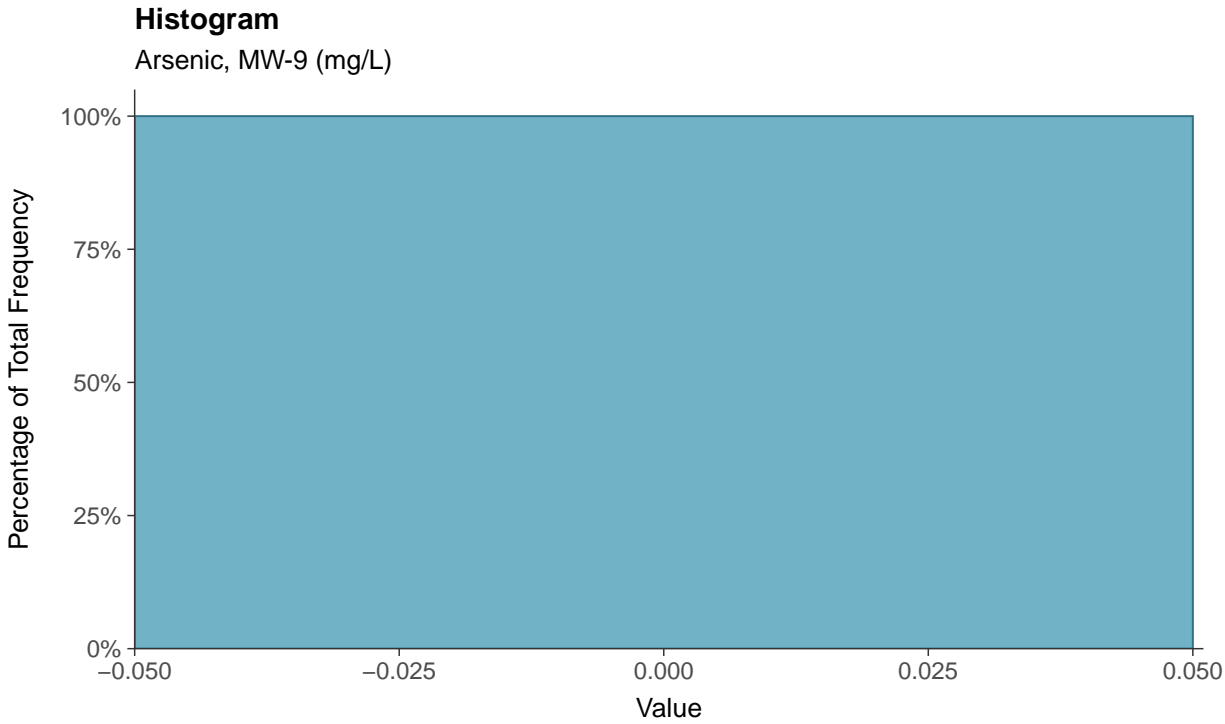
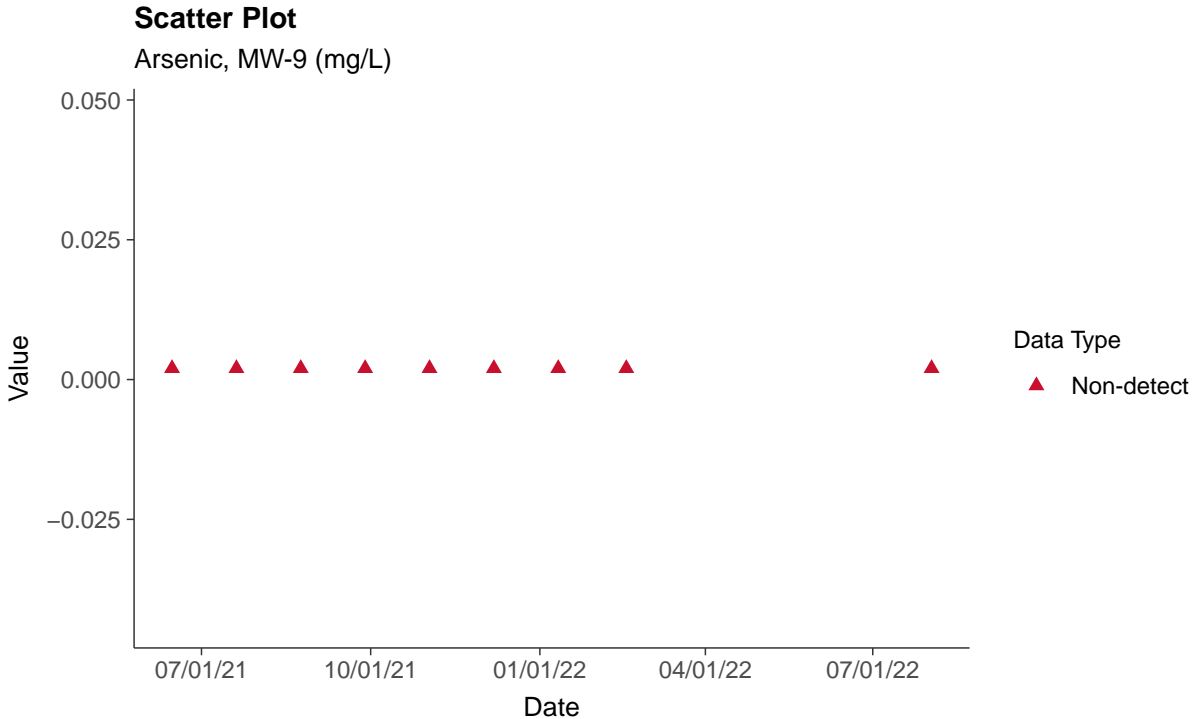
Arsenic, MW-8 (mg/L)





### Appendix IV: Arsenic, MW-9

ID: 2\_08\_09







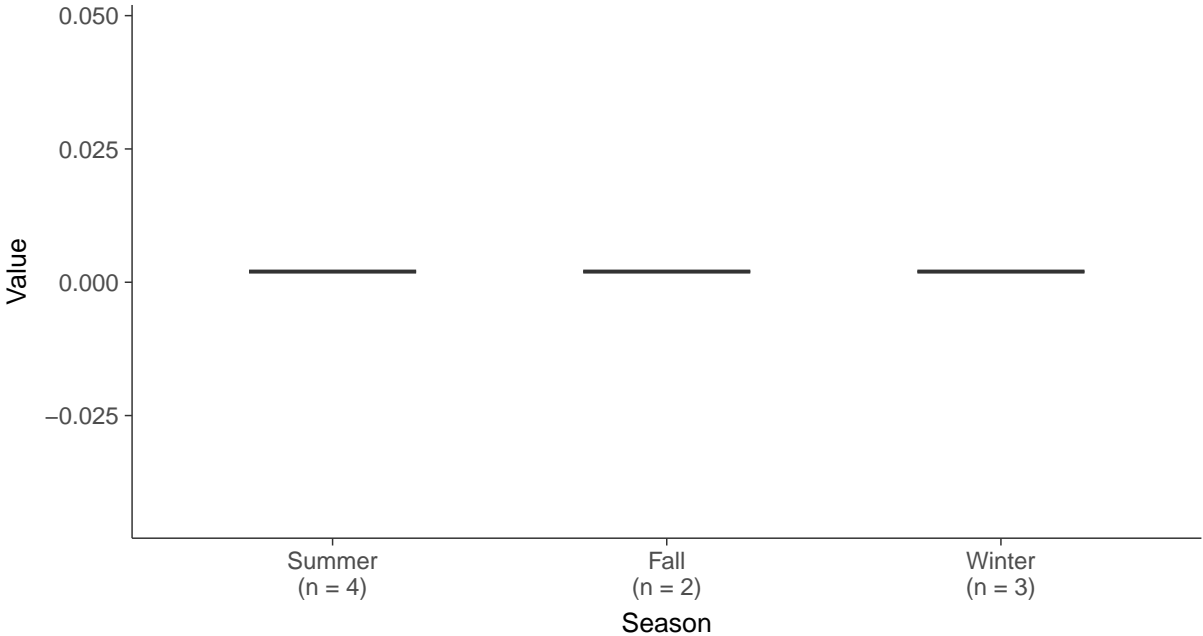
**Boxplot**

Arsenic, MW-9 (mg/L)



**Boxplot by Season**

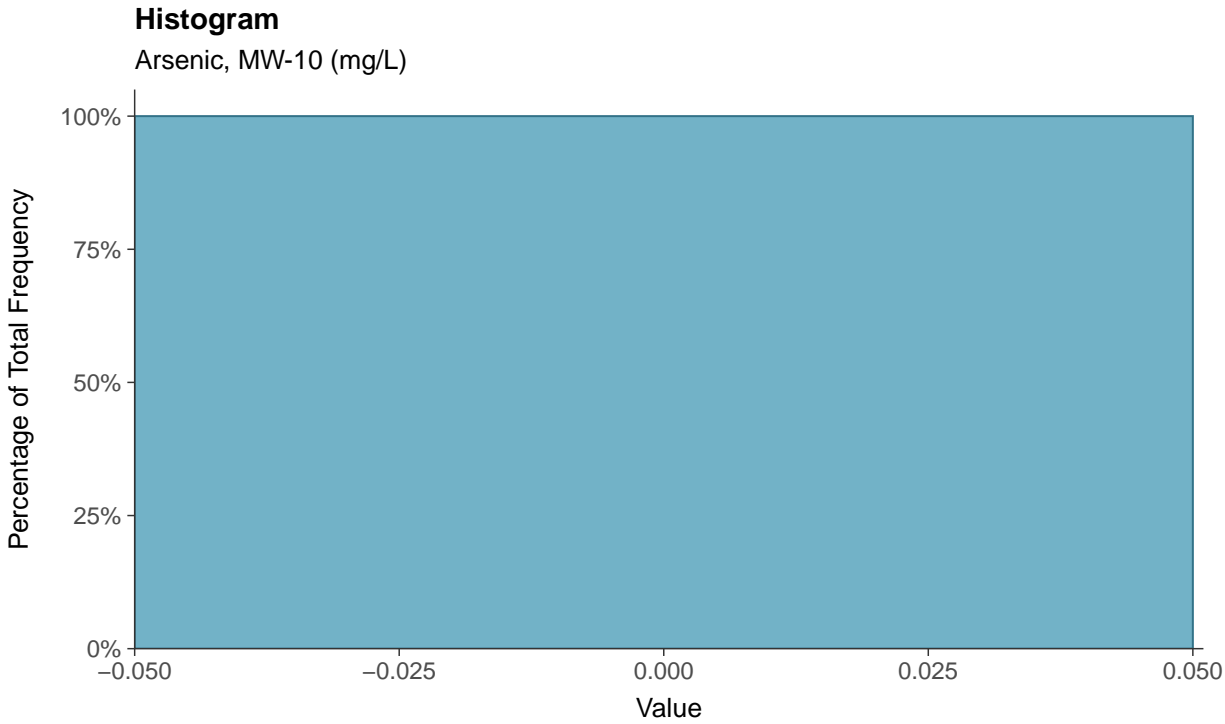
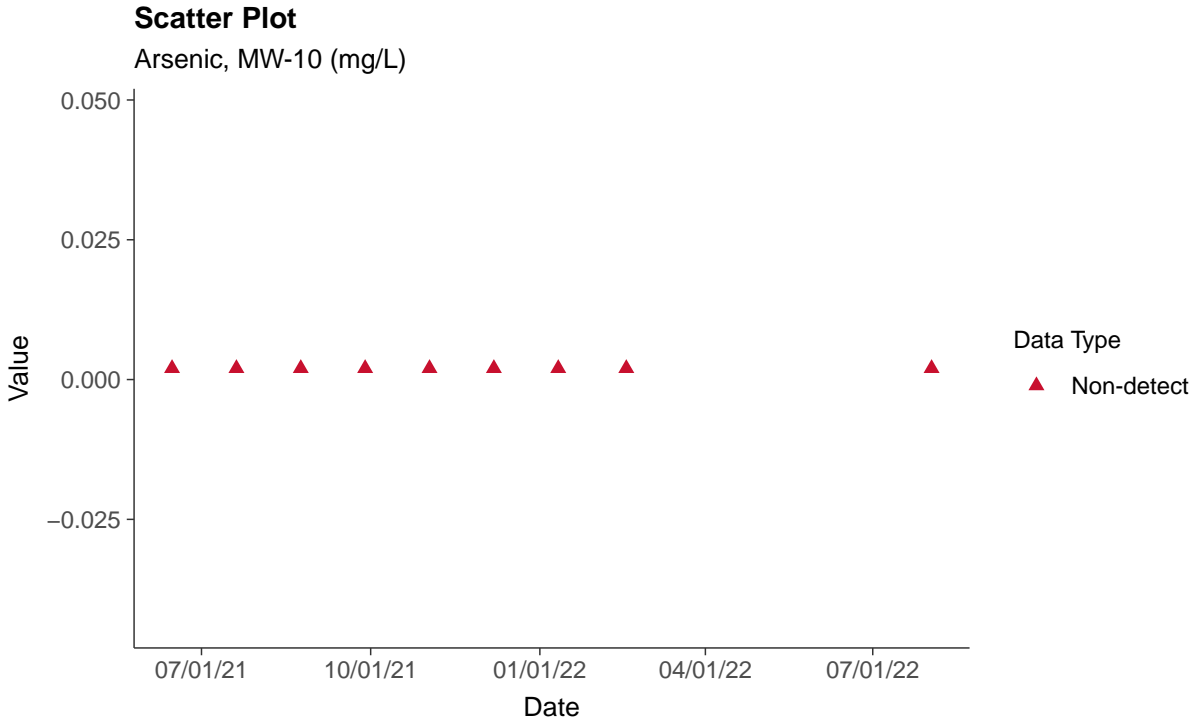
Arsenic, MW-9 (mg/L)





### Appendix IV: Arsenic, MW-10

ID: 2\_08\_10





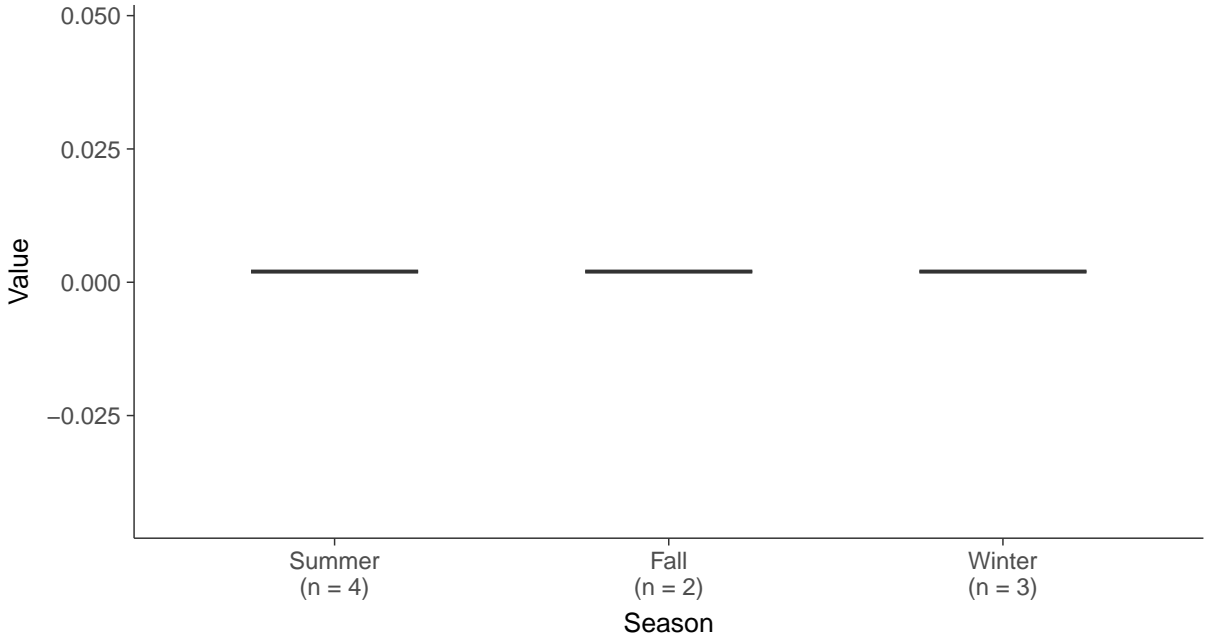
**Boxplot**

Arsenic, MW-10 (mg/L)



**Boxplot by Season**

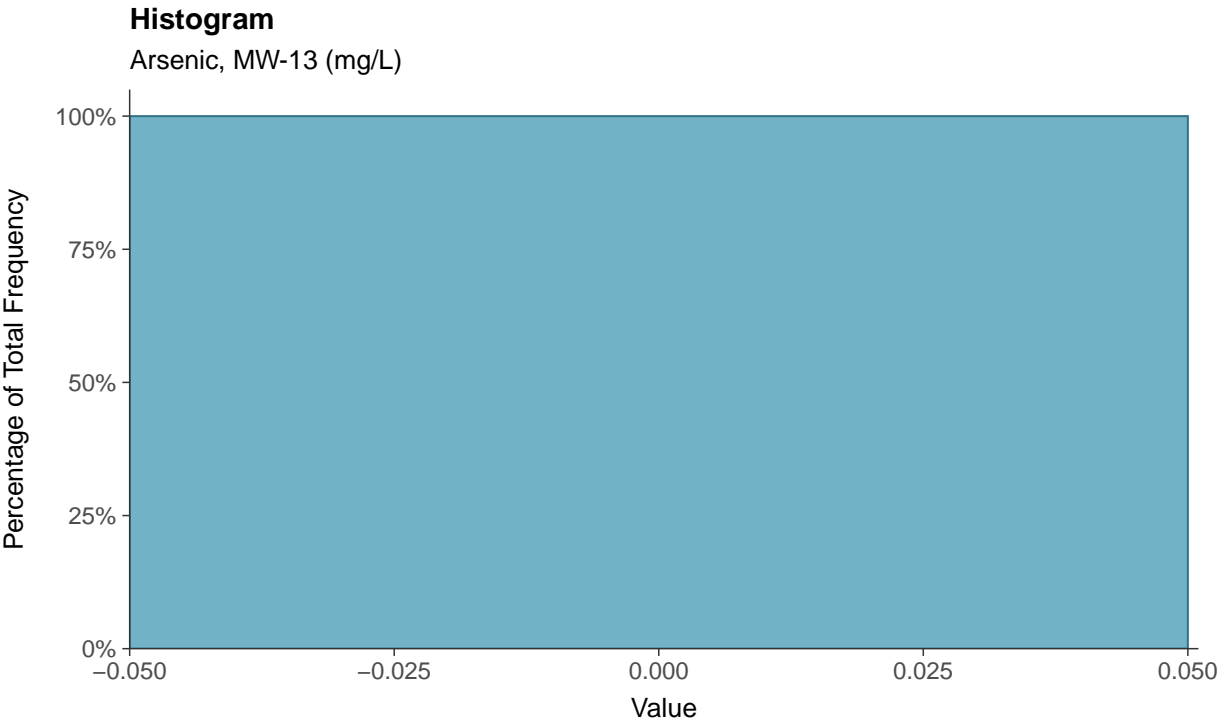
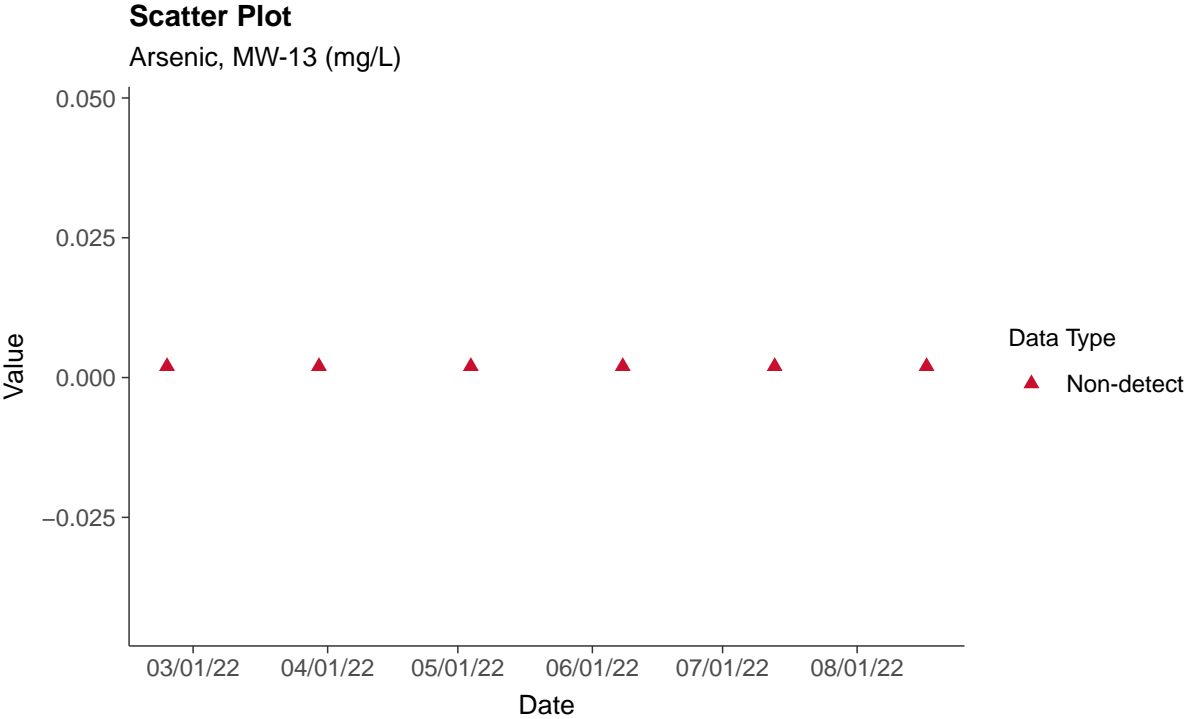
Arsenic, MW-10 (mg/L)





### Appendix IV: Arsenic, MW-13

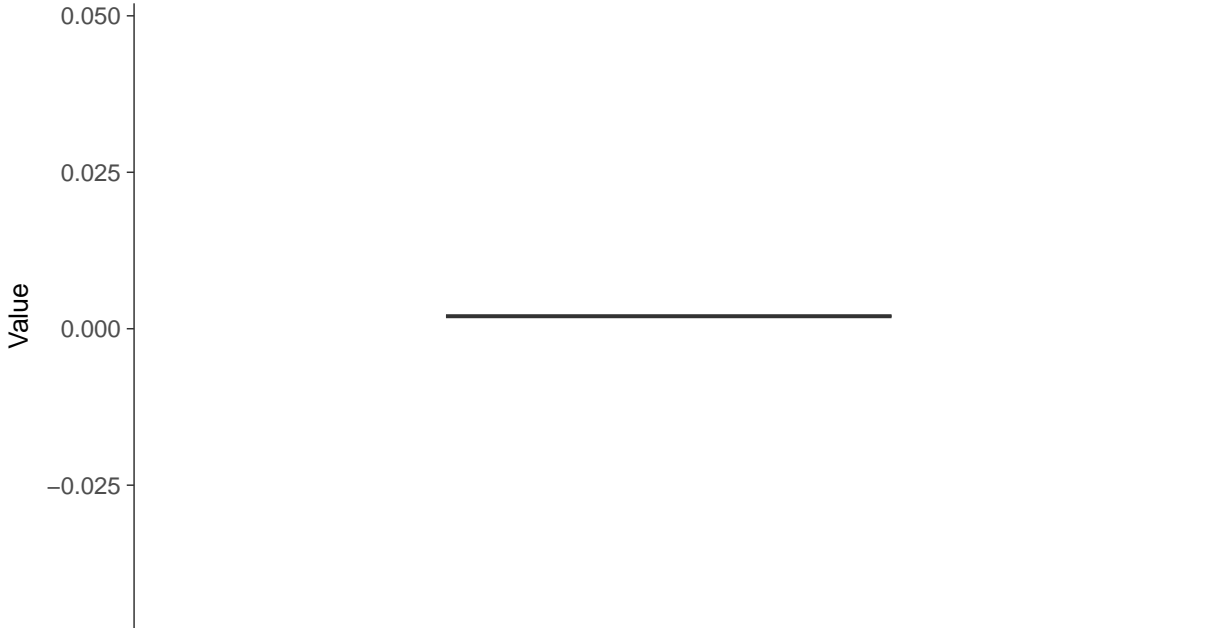
ID: 2\_08\_13





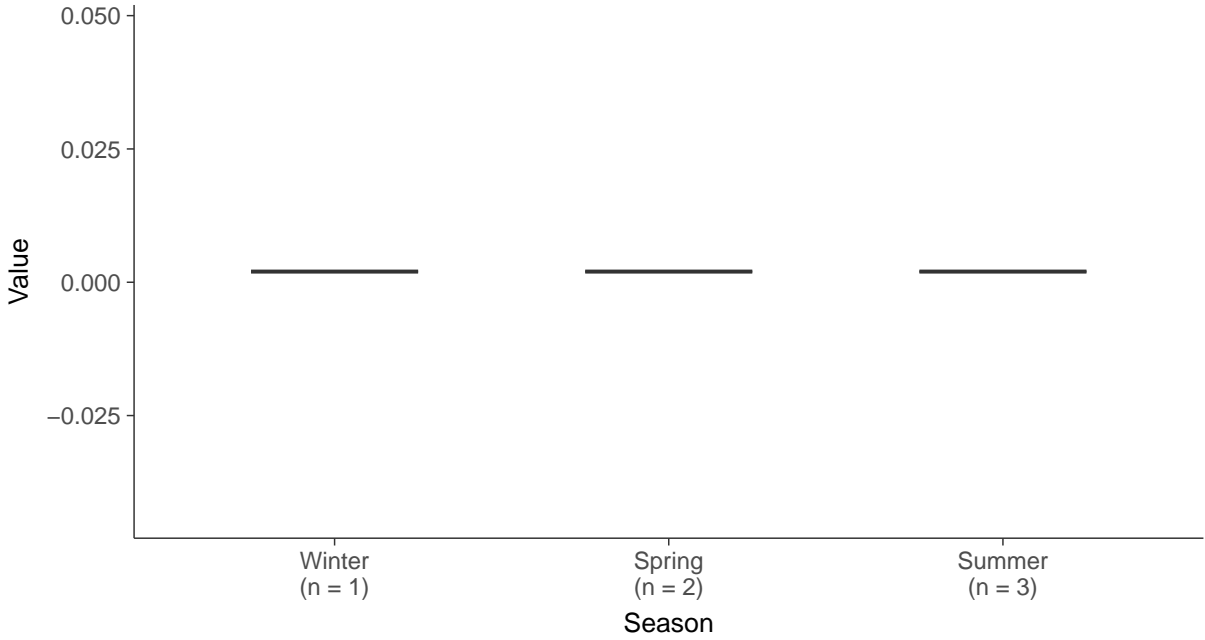
**Boxplot**

Arsenic, MW-13 (mg/L)



**Boxplot by Season**

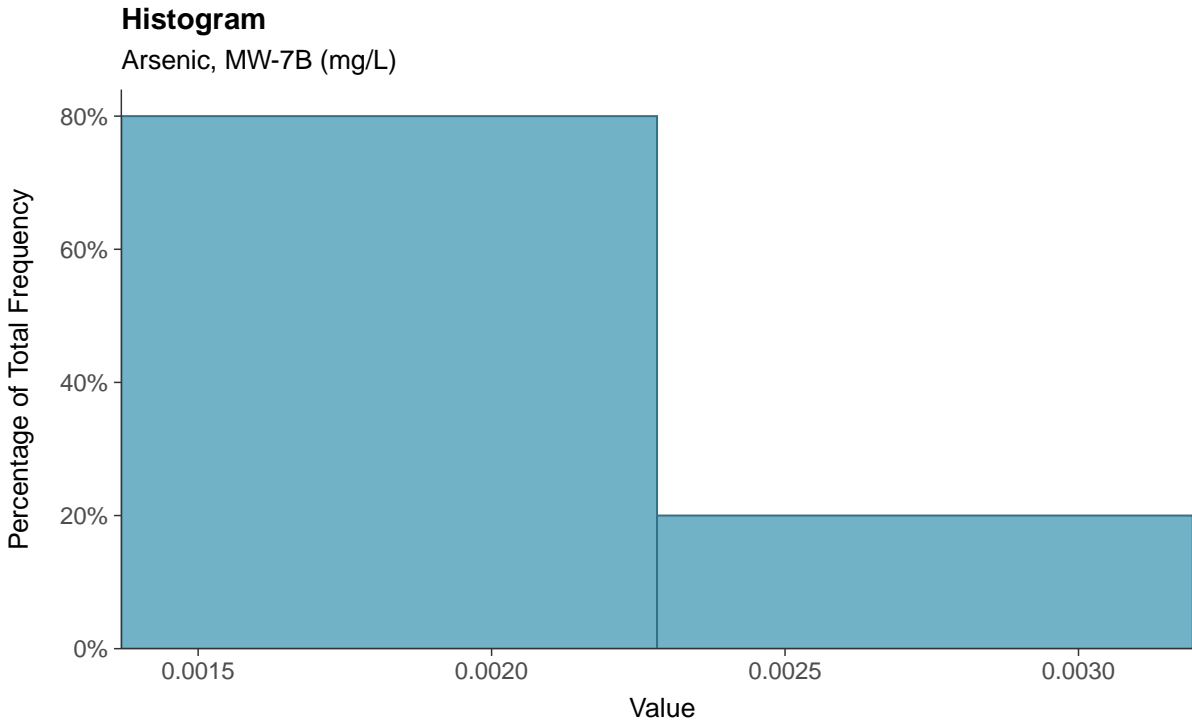
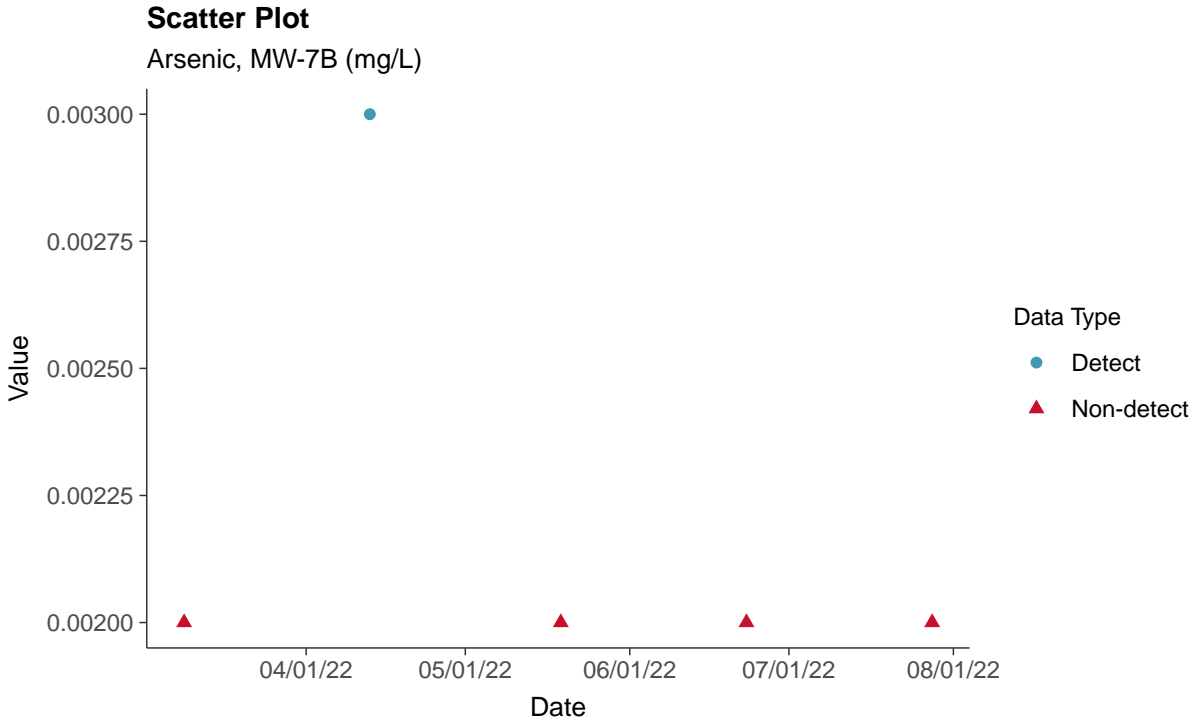
Arsenic, MW-13 (mg/L)





### Appendix IV: Arsenic, MW-7B

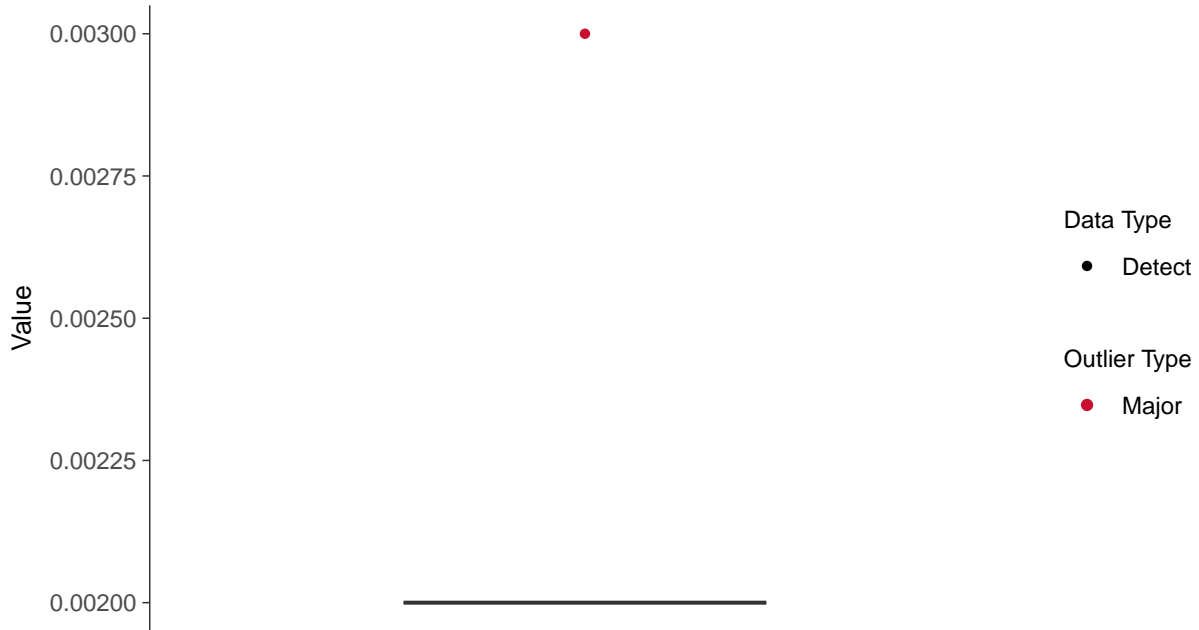
ID: 2\_08\_7B





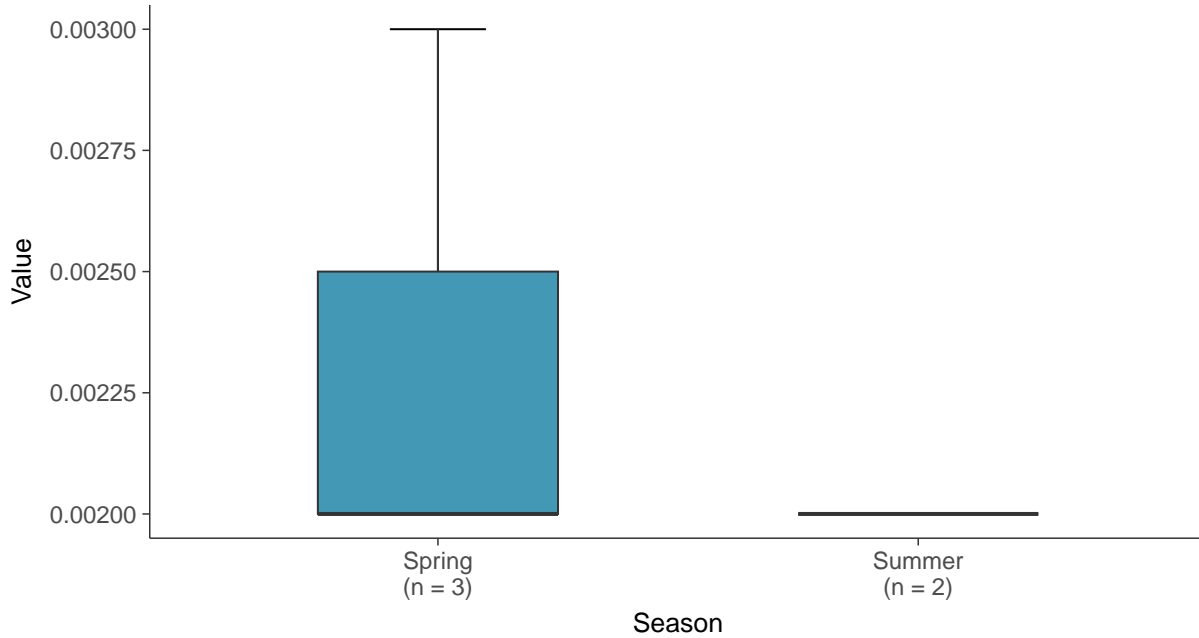
### Boxplot

Arsenic, MW-7B (mg/L)



### Boxplot by Season

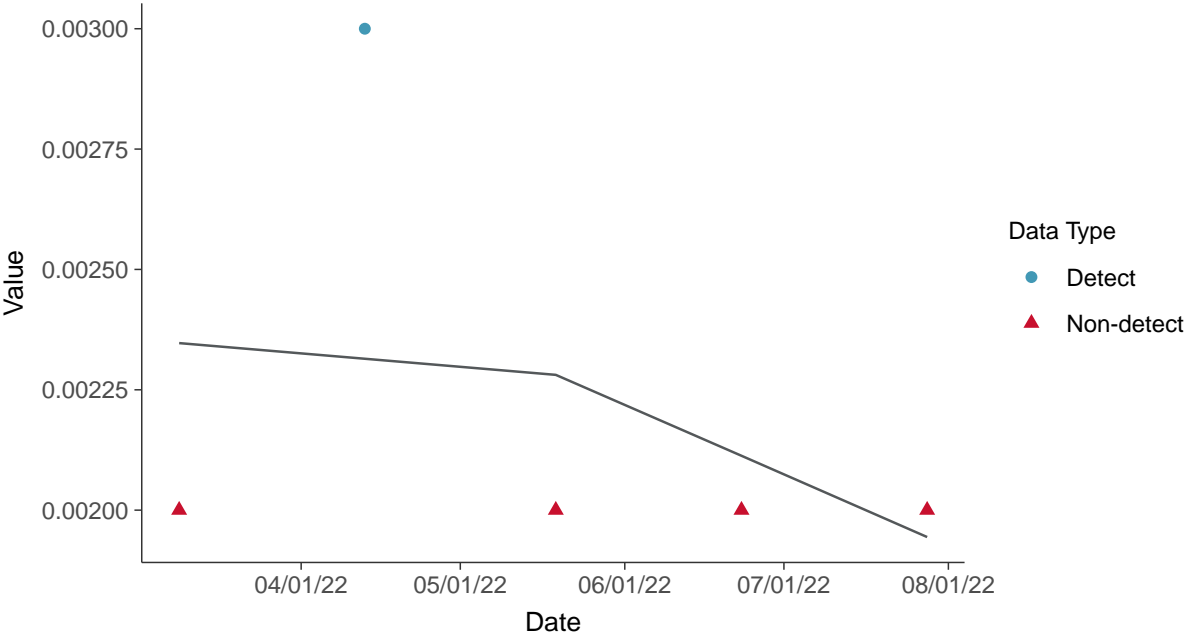
Arsenic, MW-7B (mg/L)





**Trend Regression: Piecewise Linear-Linear**

Arsenic, MW-7B (mg/L)





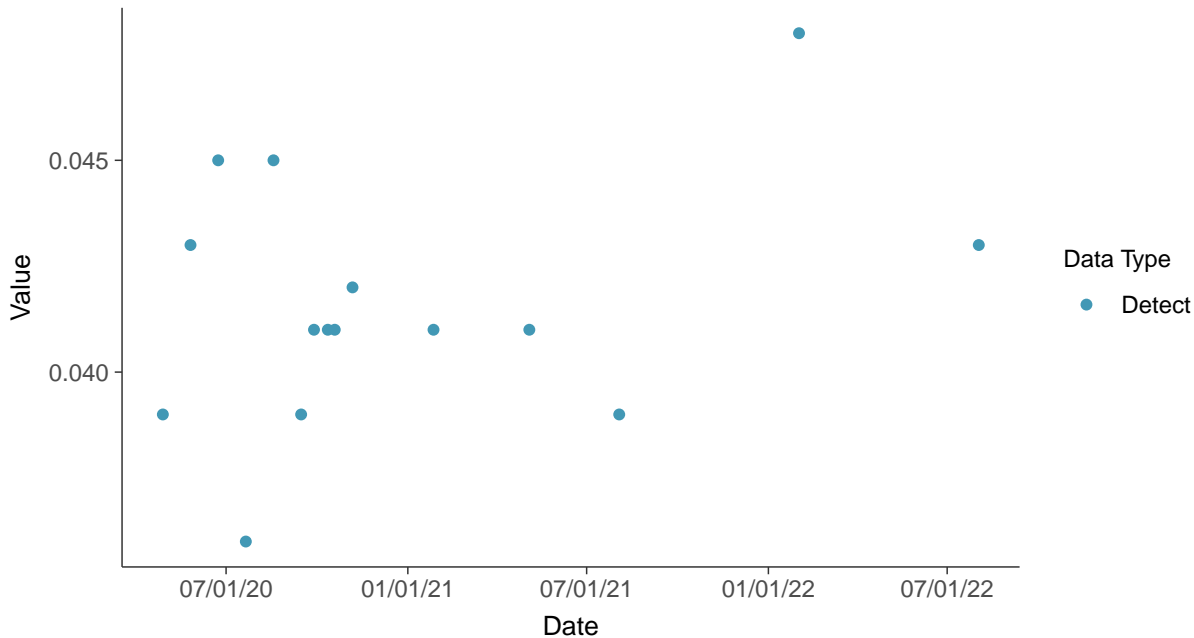


### Appendix IV: Barium, MW-2

ID: 2\_09\_02

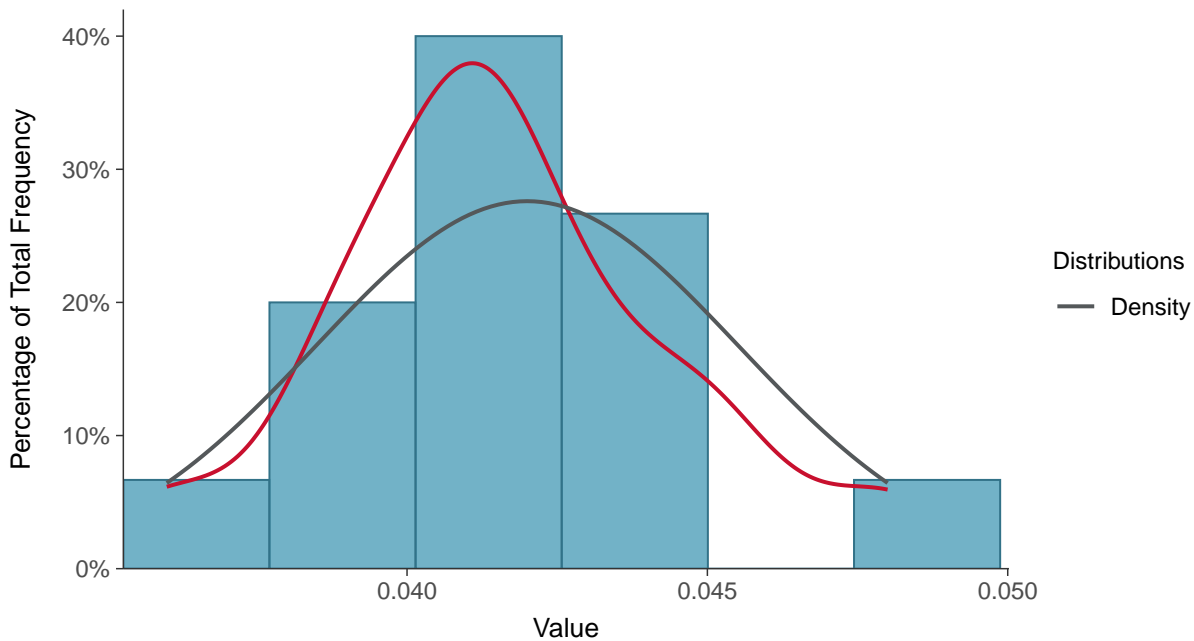
#### Scatter Plot

Barium, MW-2 (mg/L)



#### Histogram

Barium, MW-2 (mg/L)

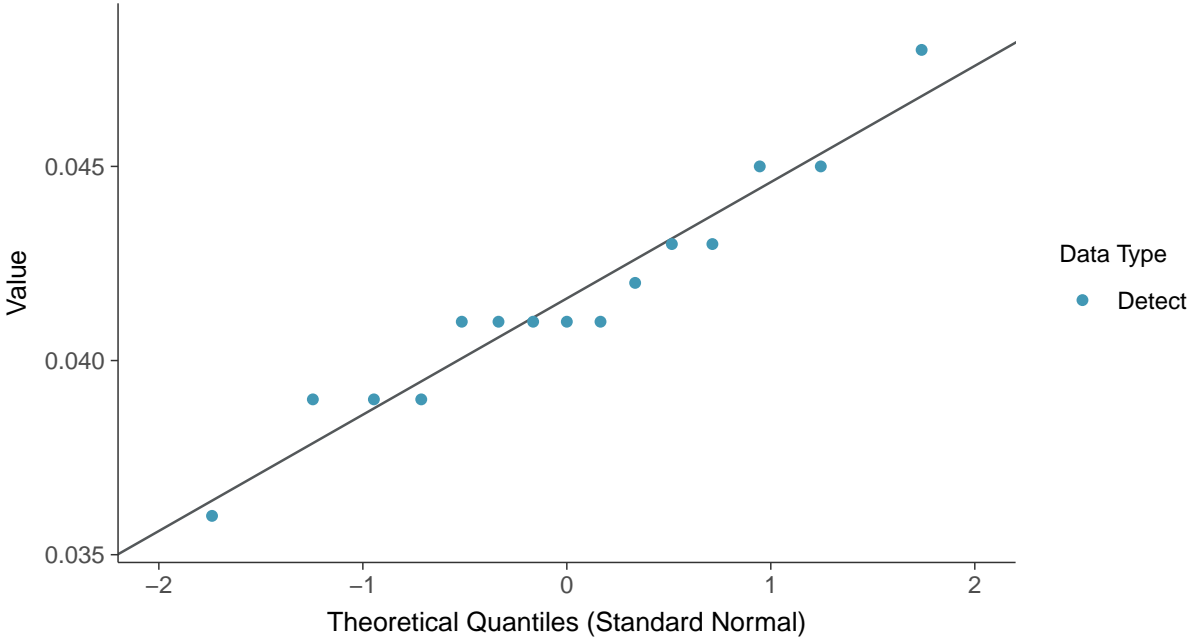






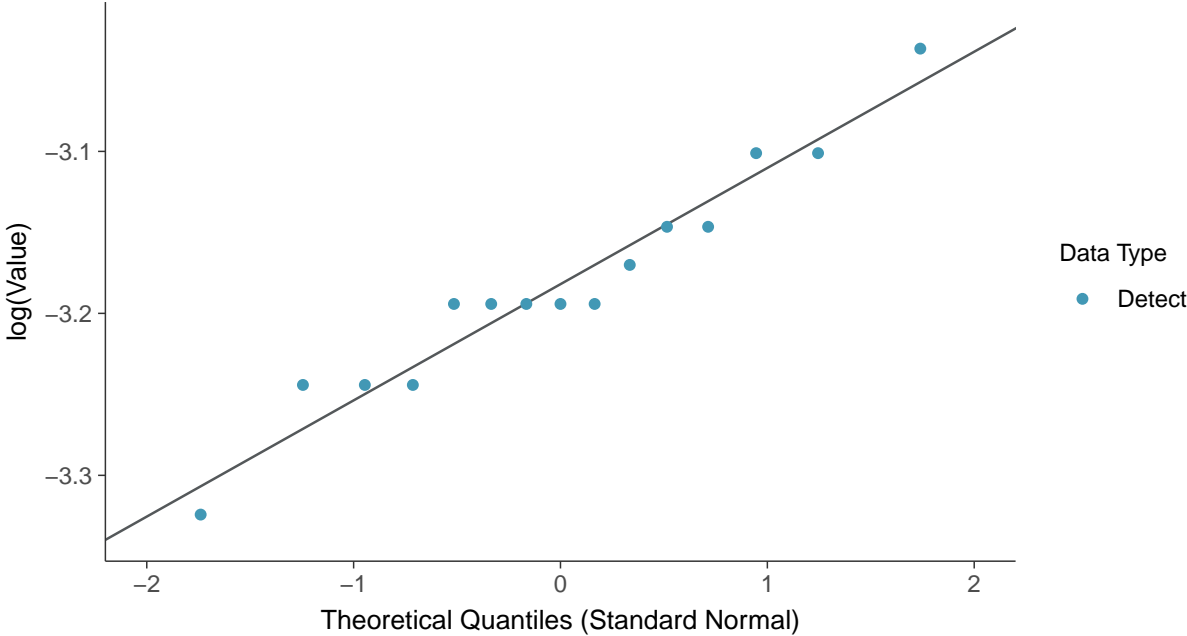
**Normal Q-Q plot**

Barium, MW-2 (mg/L)



**Lognormal Q-Q plot**

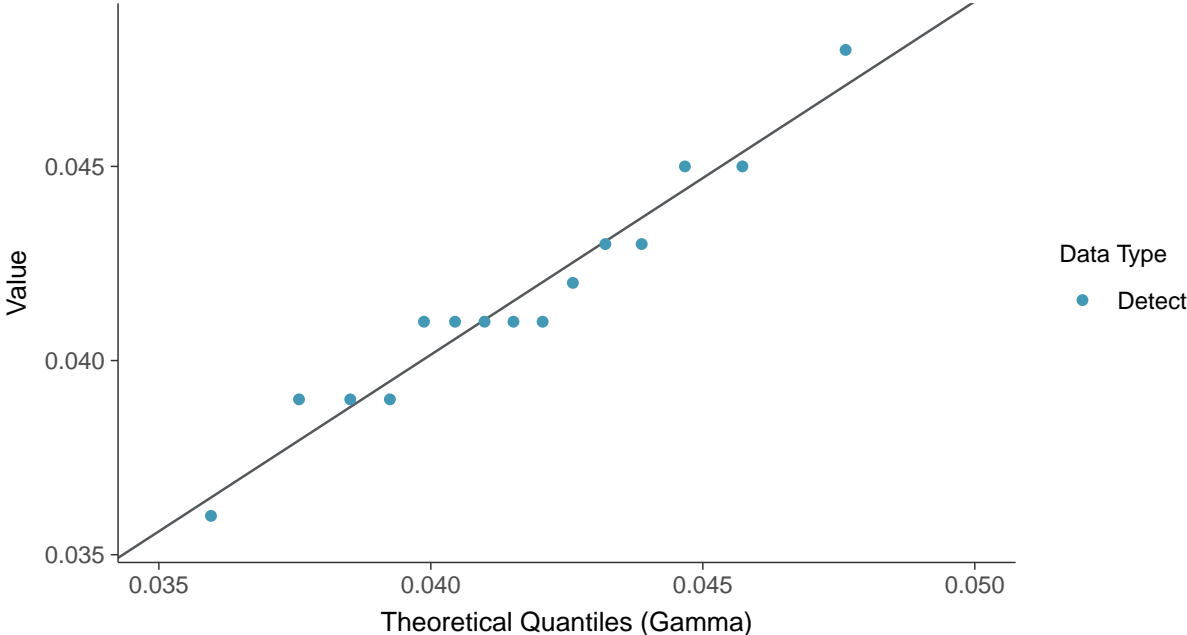
Barium, MW-2 (mg/L)





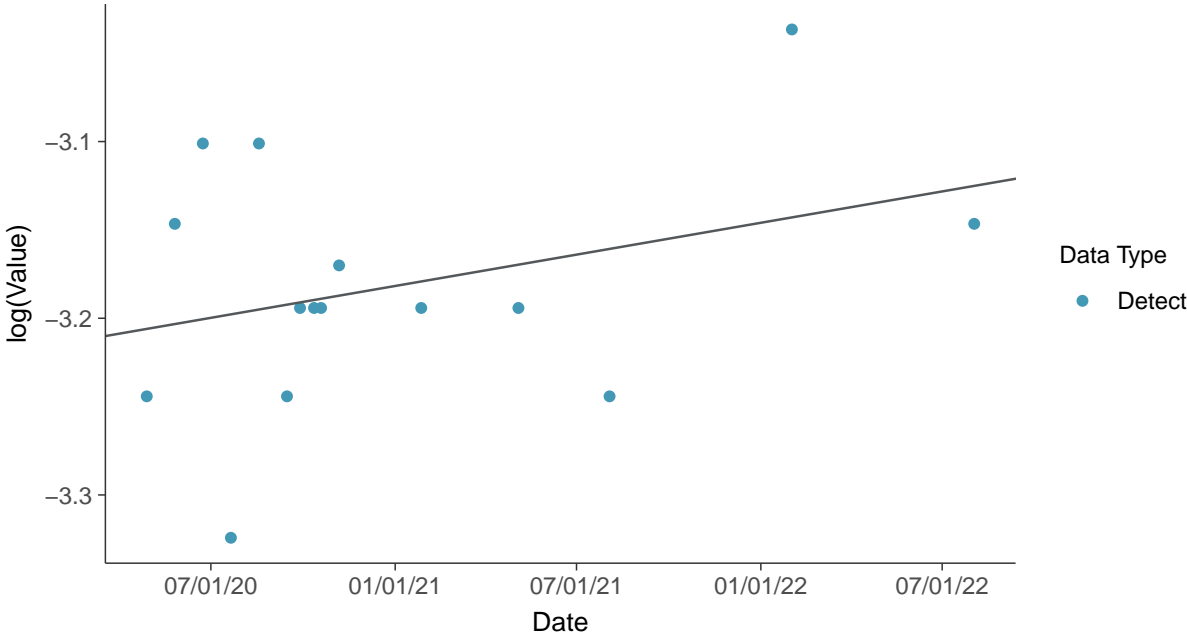
### Gamma Q-Q plot

Barium, MW-2 (mg/L)



### Trend Regression: Lognormal MLE

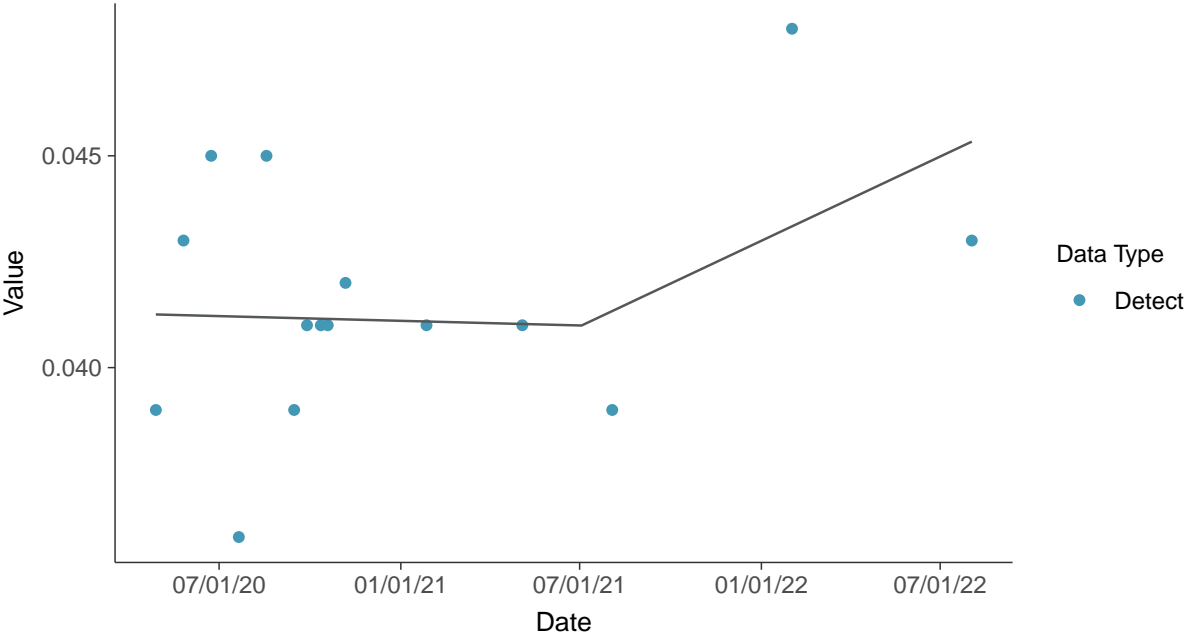
Barium, MW-2 (mg/L)





### Trend Regression: Piecewise Linear-Linear

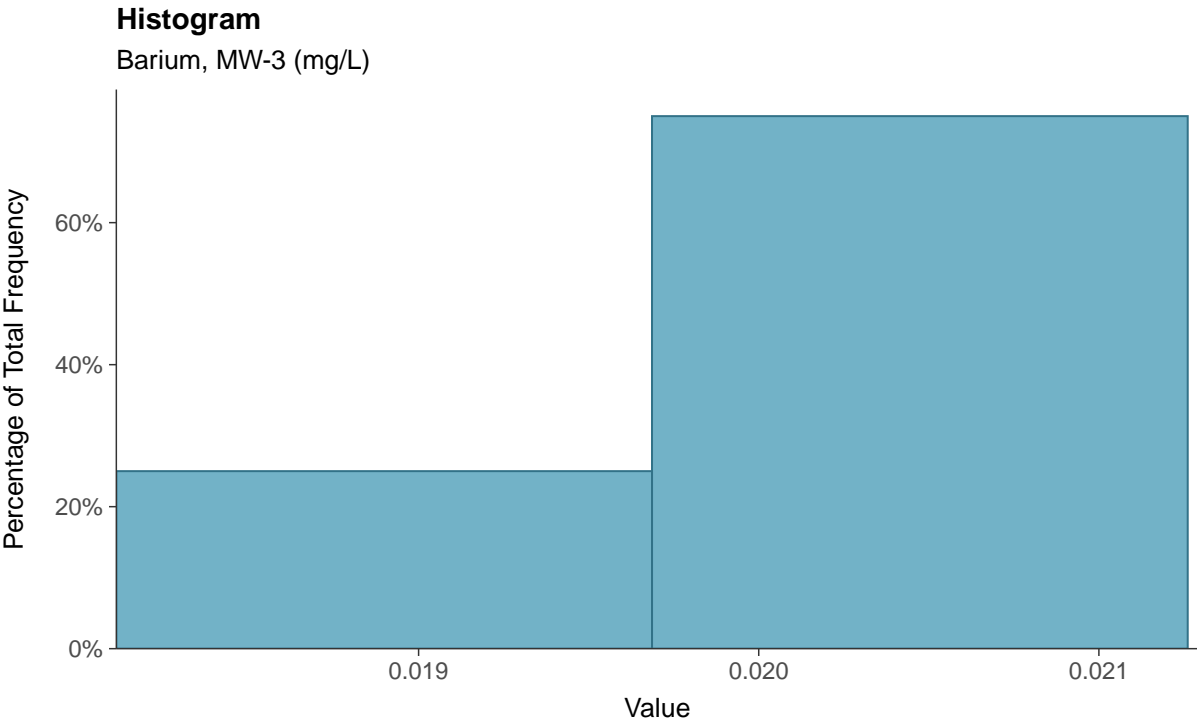
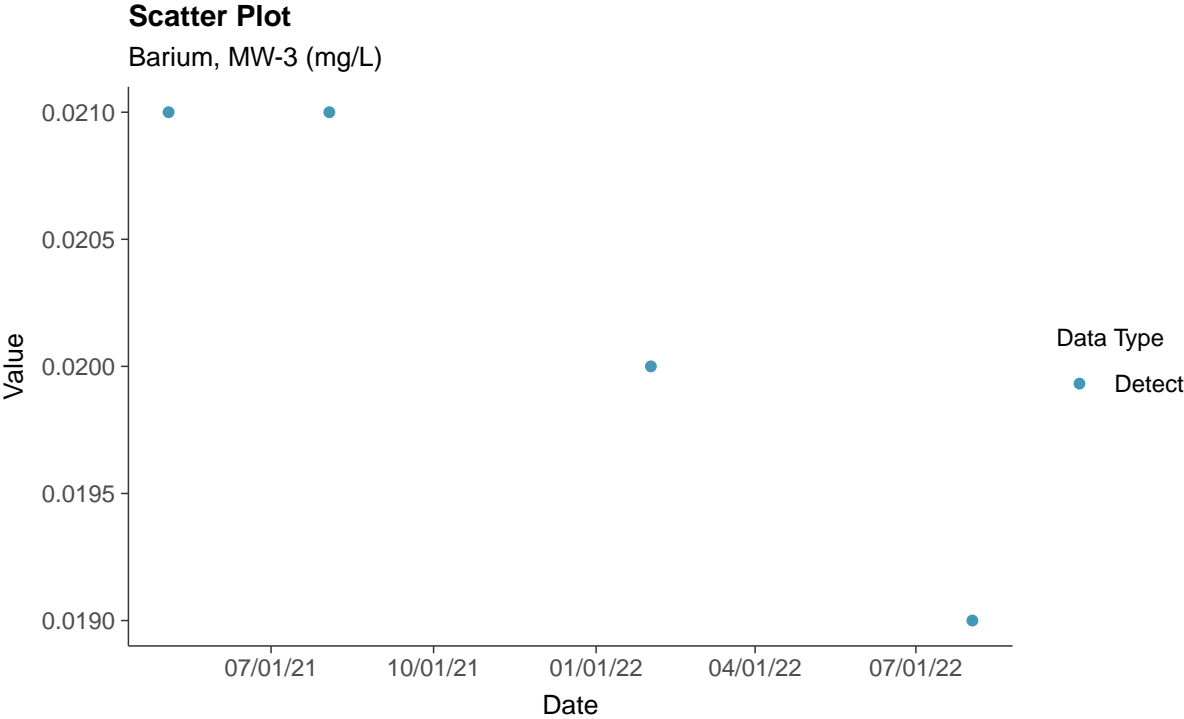
Barium, MW-2 (mg/L)





### Appendix IV: Barium, MW-3

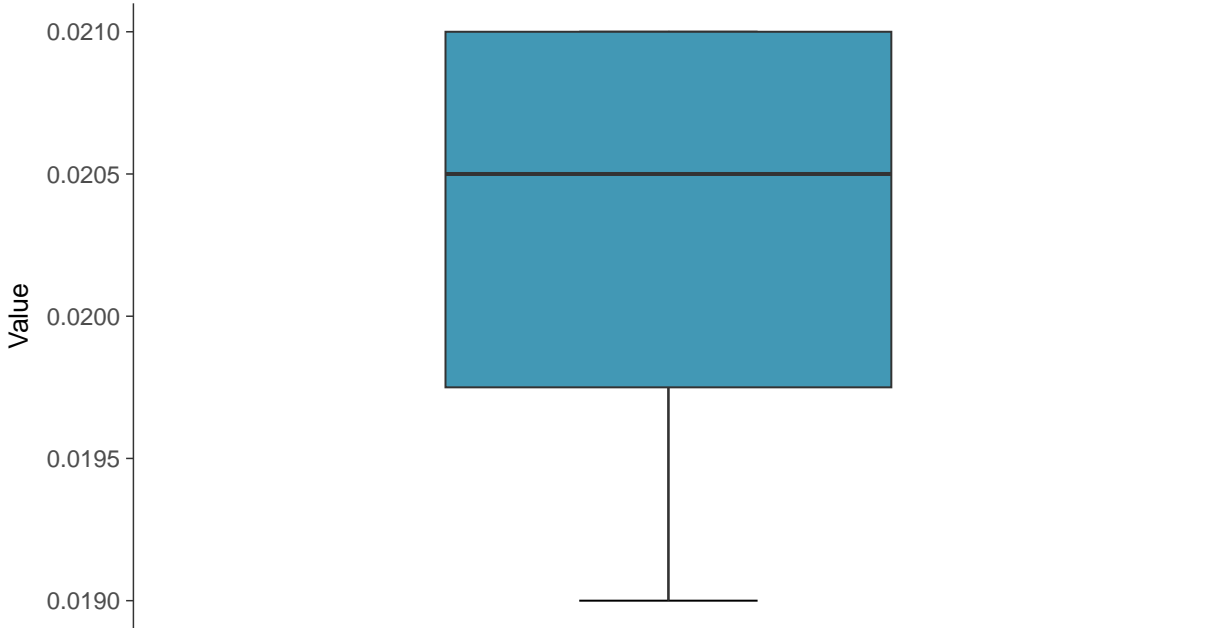
ID: 2\_09\_03





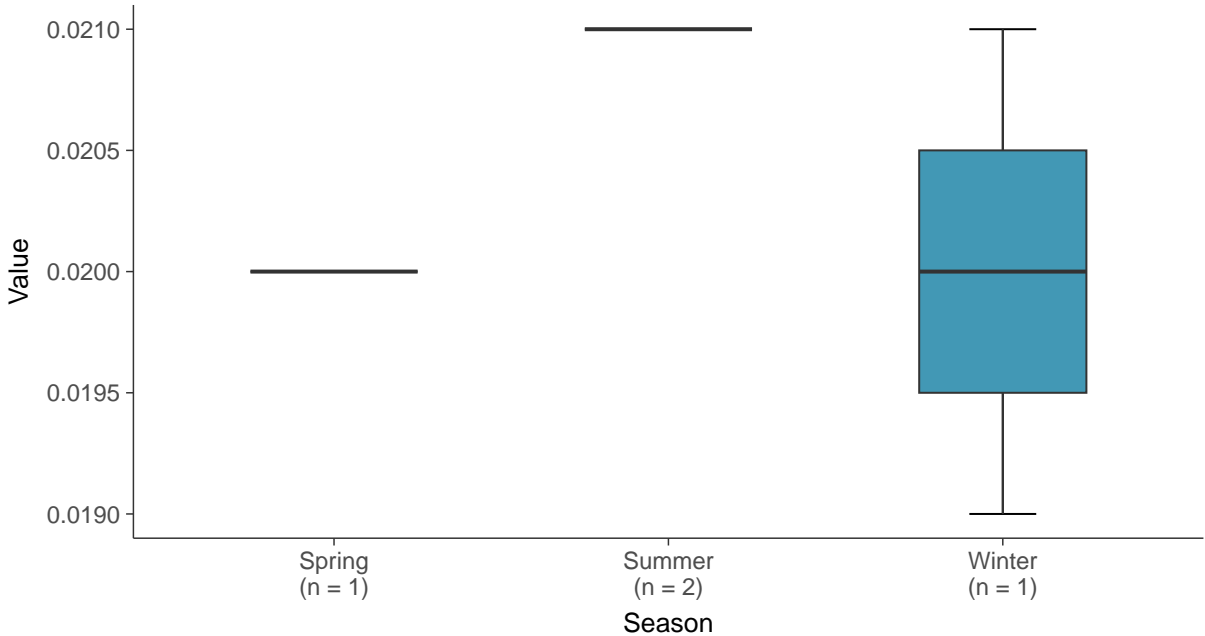
**Boxplot**

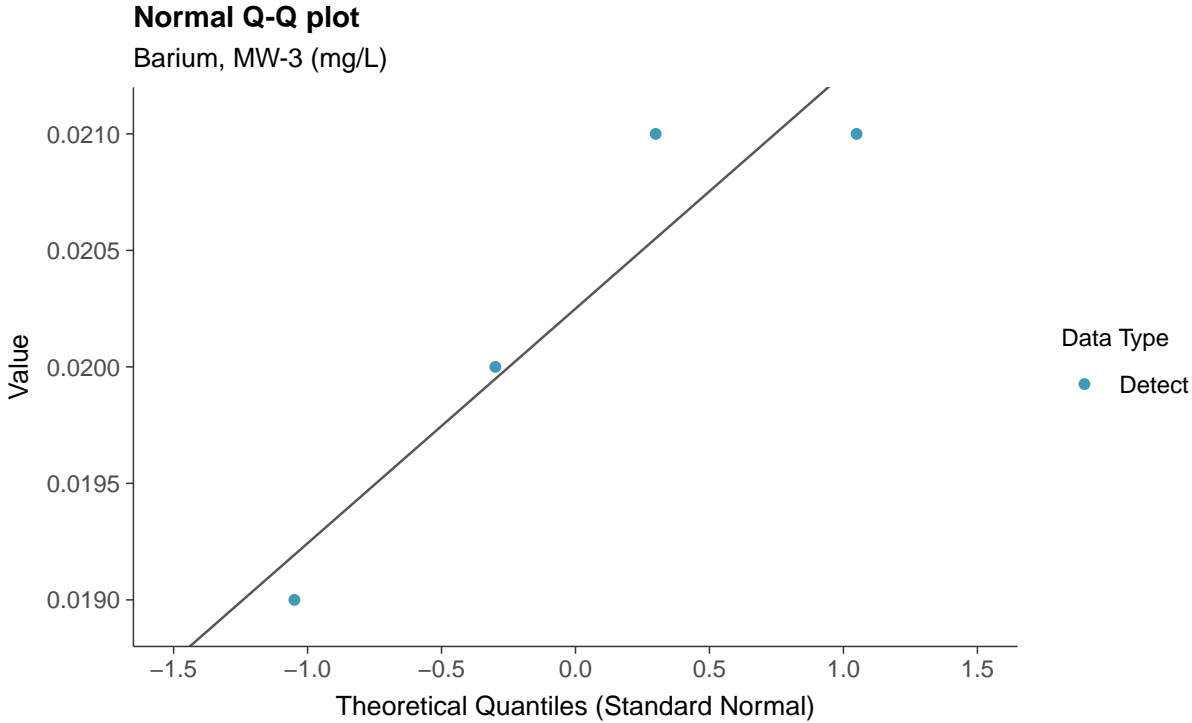
Barium, MW-3 (mg/L)



**Boxplot by Season**

Barium, MW-3 (mg/L)



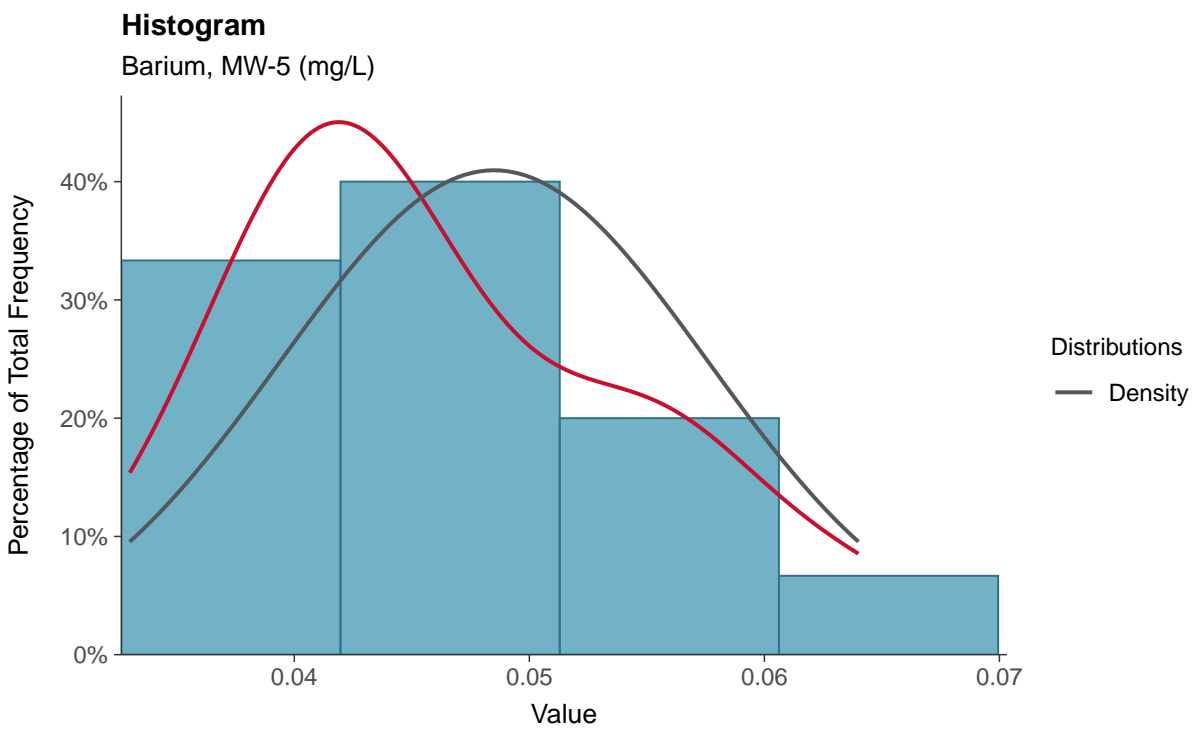
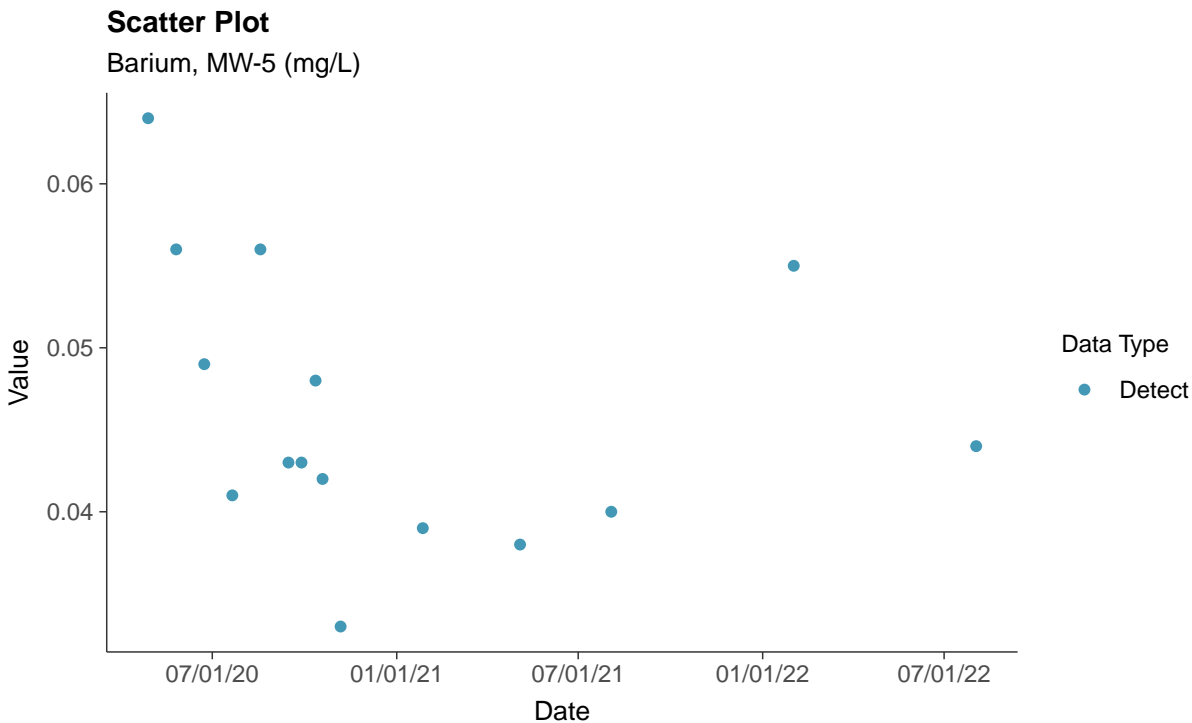






### Appendix IV: Barium, MW-5

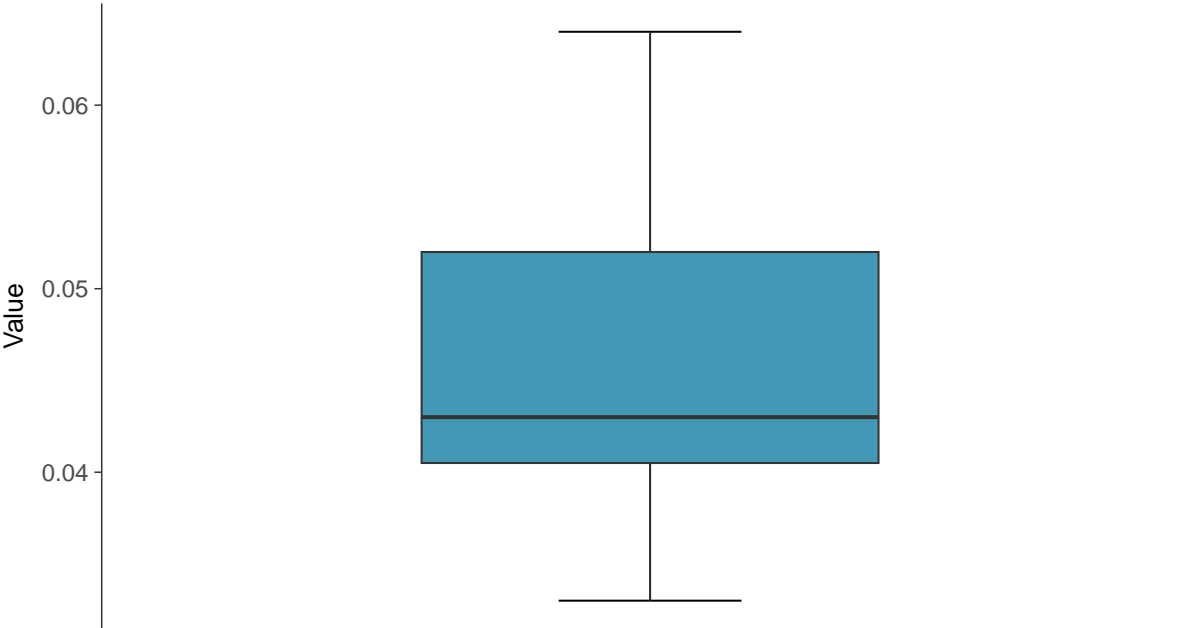
ID: 2\_09\_05





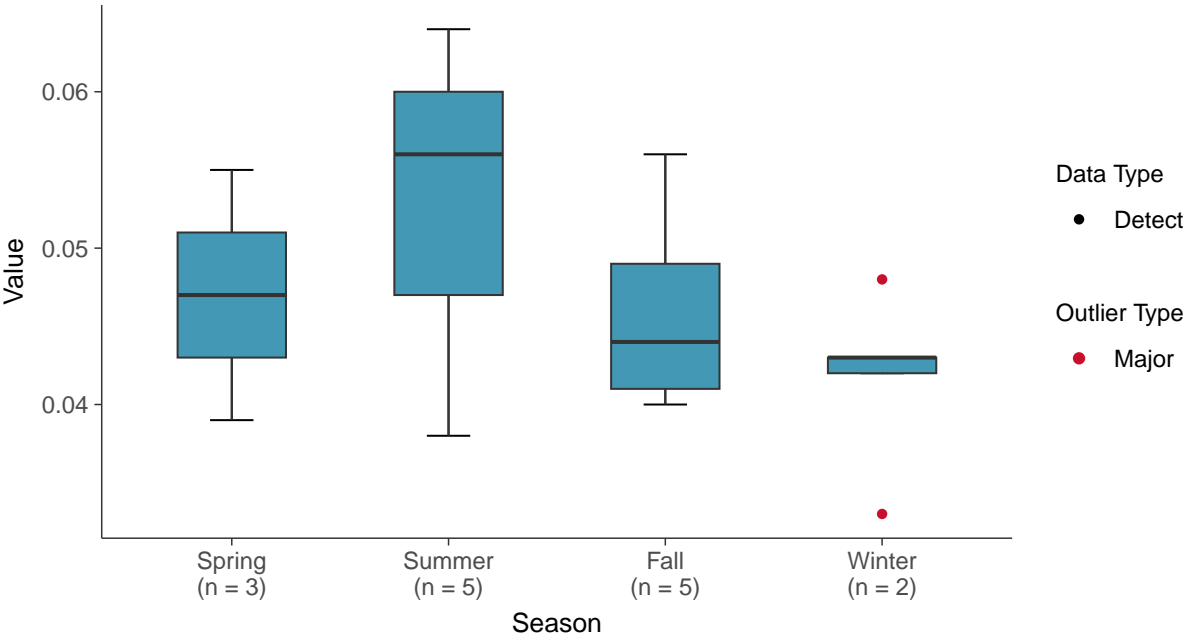
**Boxplot**

Barium, MW-5 (mg/L)



**Boxplot by Season**

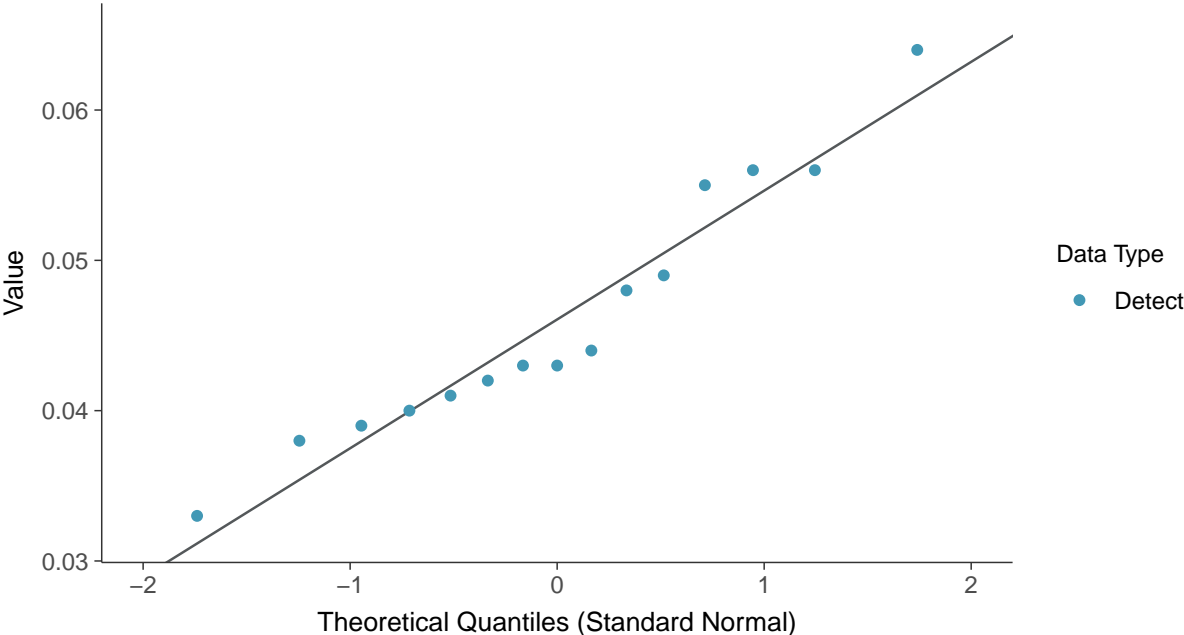
Barium, MW-5 (mg/L)





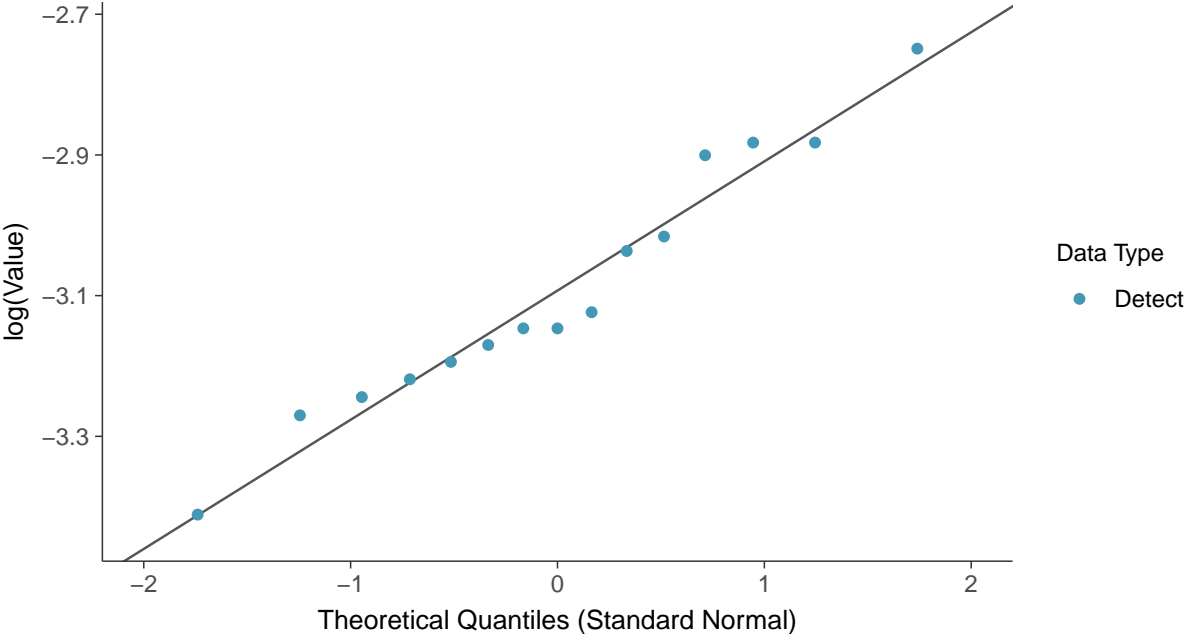
**Normal Q-Q plot**

Barium, MW-5 (mg/L)



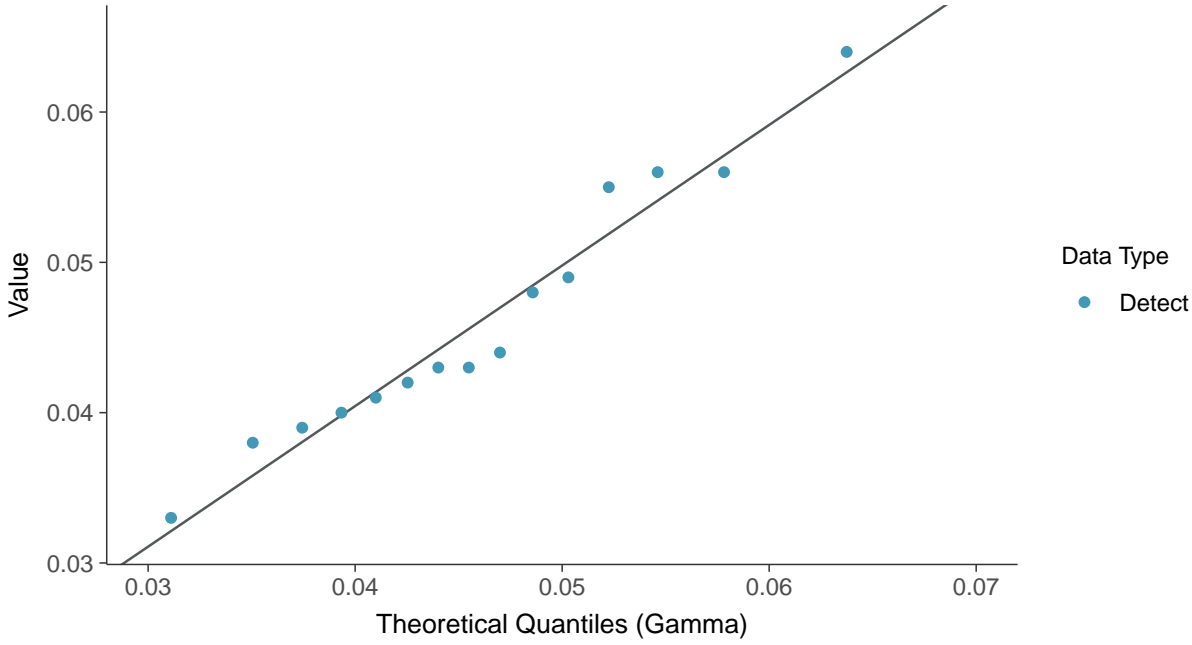
**Lognormal Q-Q plot**

Barium, MW-5 (mg/L)

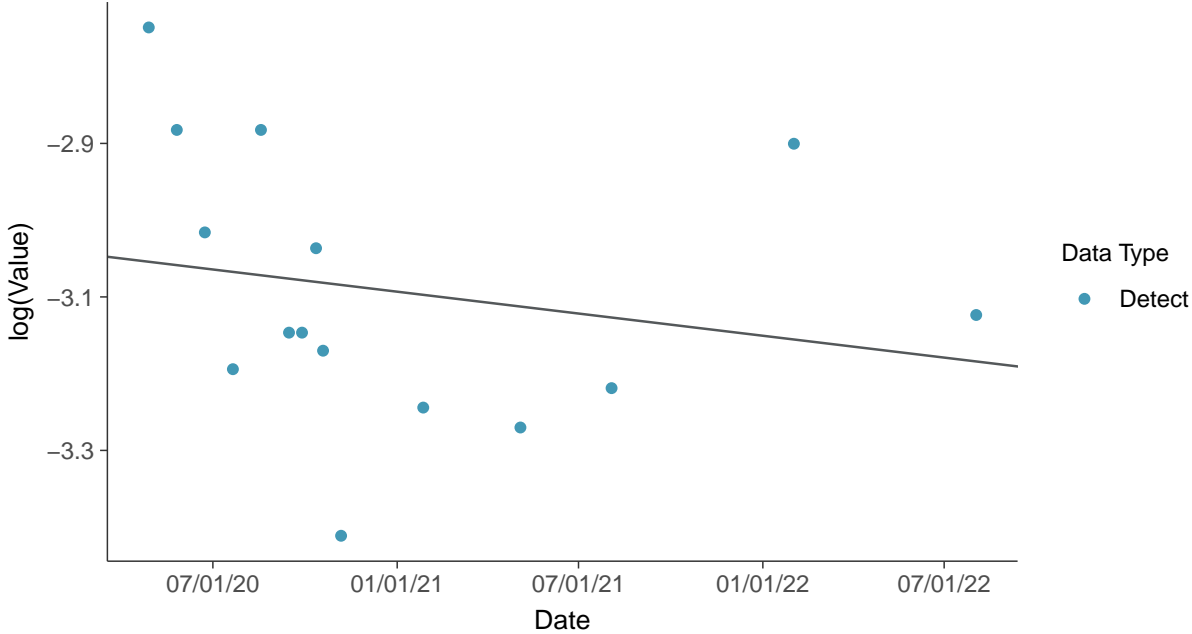




**Gamma Q-Q plot**  
Barium, MW-5 (mg/L)



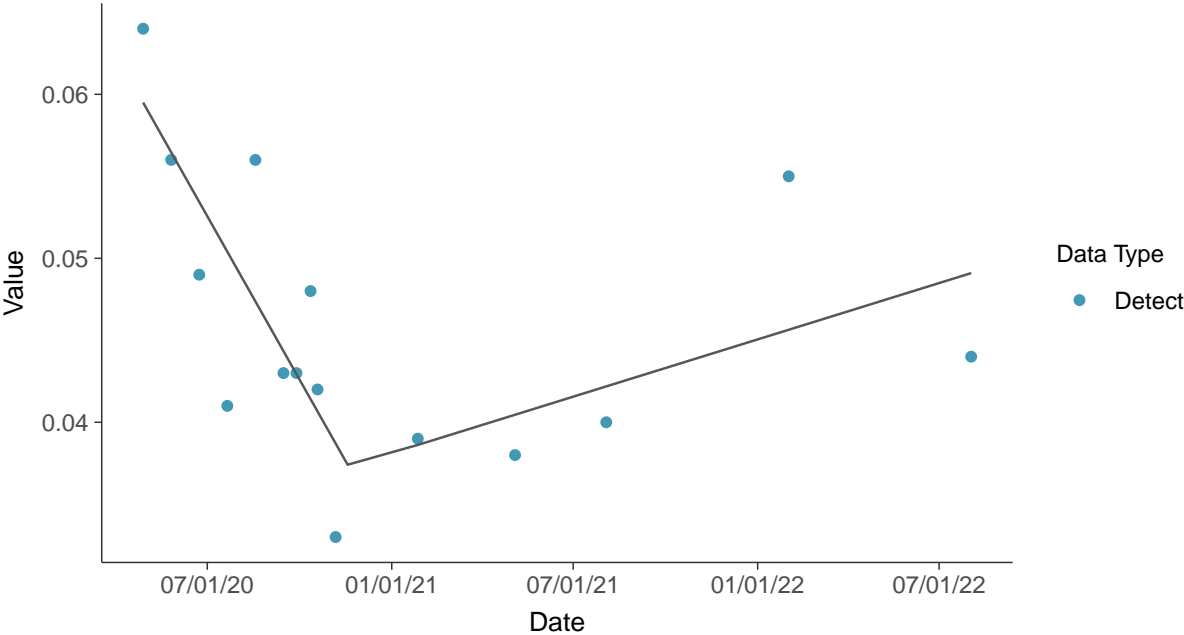
**Trend Regression: Lognormal MLE**  
Barium, MW-5 (mg/L)





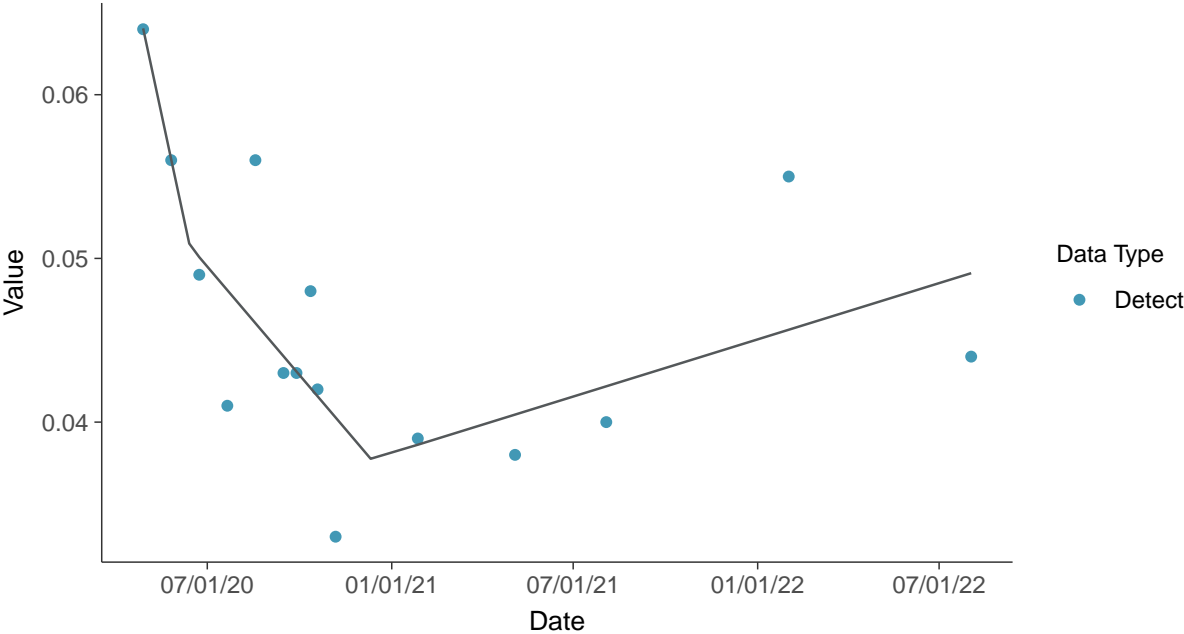
**Trend Regression: Piecewise Linear-Linear**

Barium, MW-5 (mg/L)



**Trend Regression: Piecewise Linear-Linear-Linear**

Barium, MW-5 (mg/L)



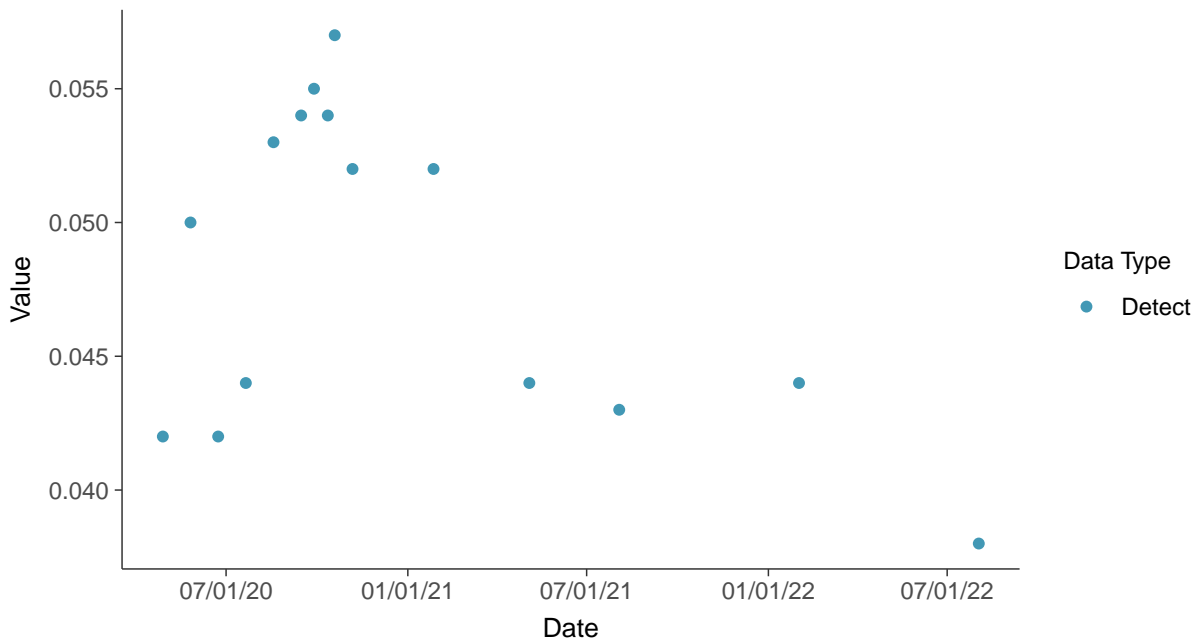


### Appendix IV: Barium, MW-6

ID: 2\_09\_06

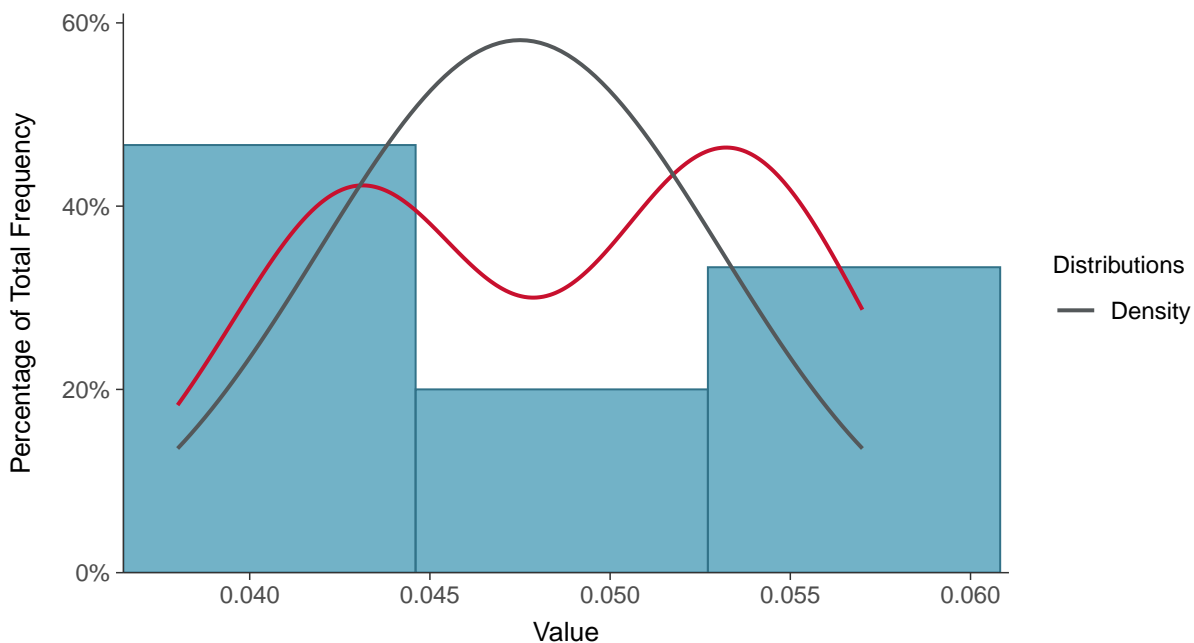
#### Scatter Plot

Barium, MW-6 (mg/L)



#### Histogram

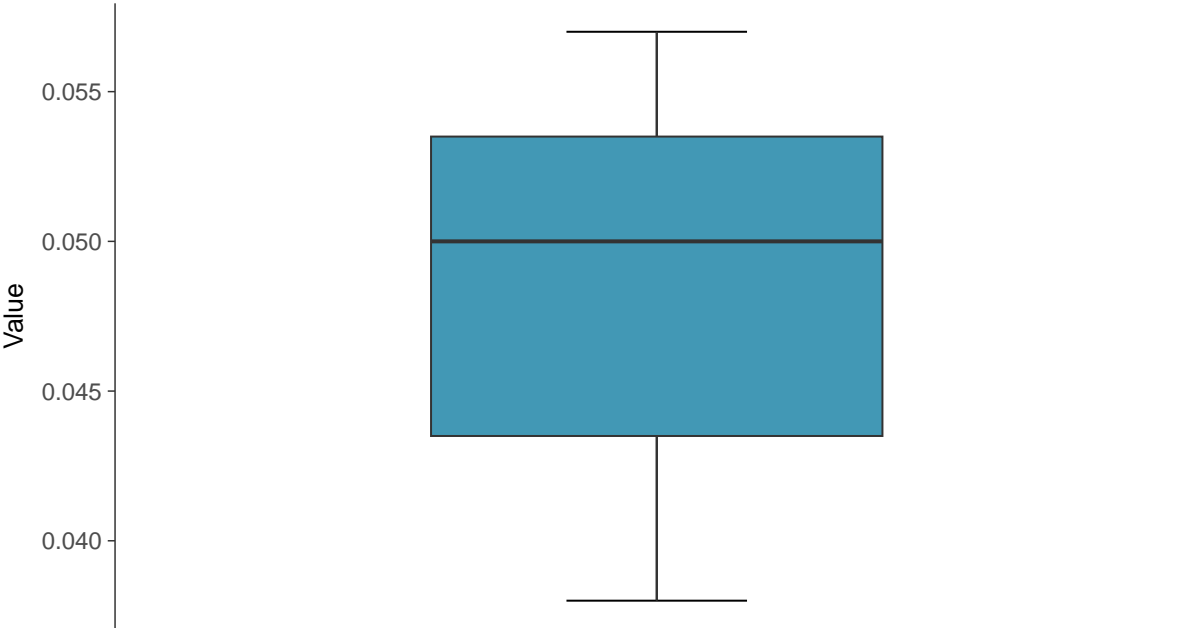
Barium, MW-6 (mg/L)





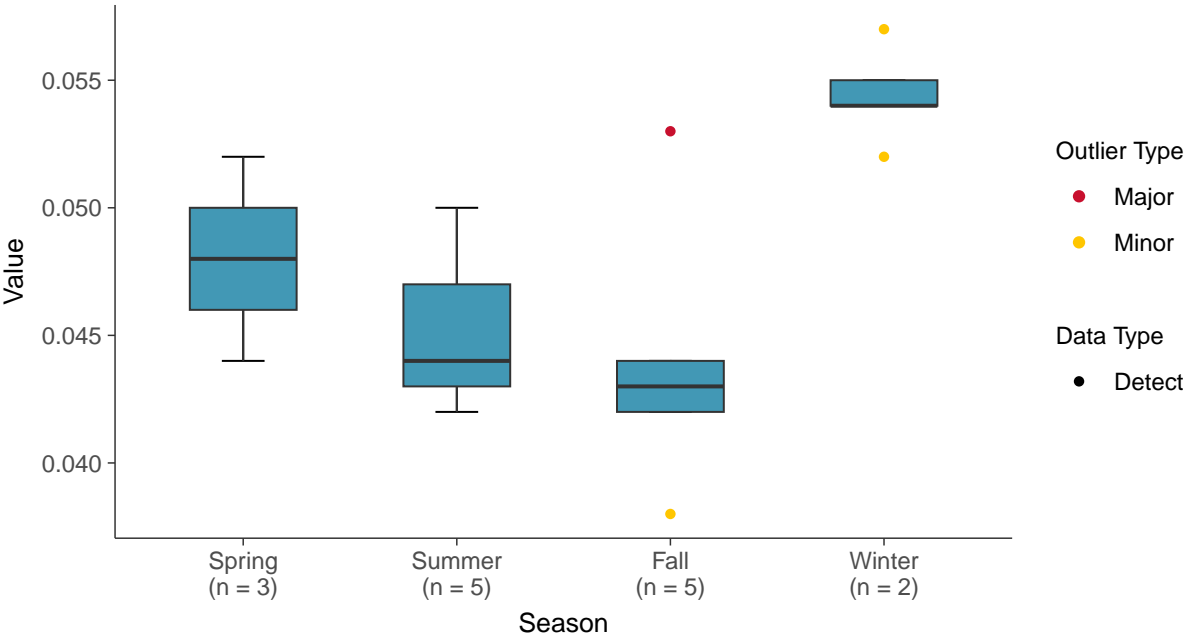
**Boxplot**

Barium, MW-6 (mg/L)



**Boxplot by Season**

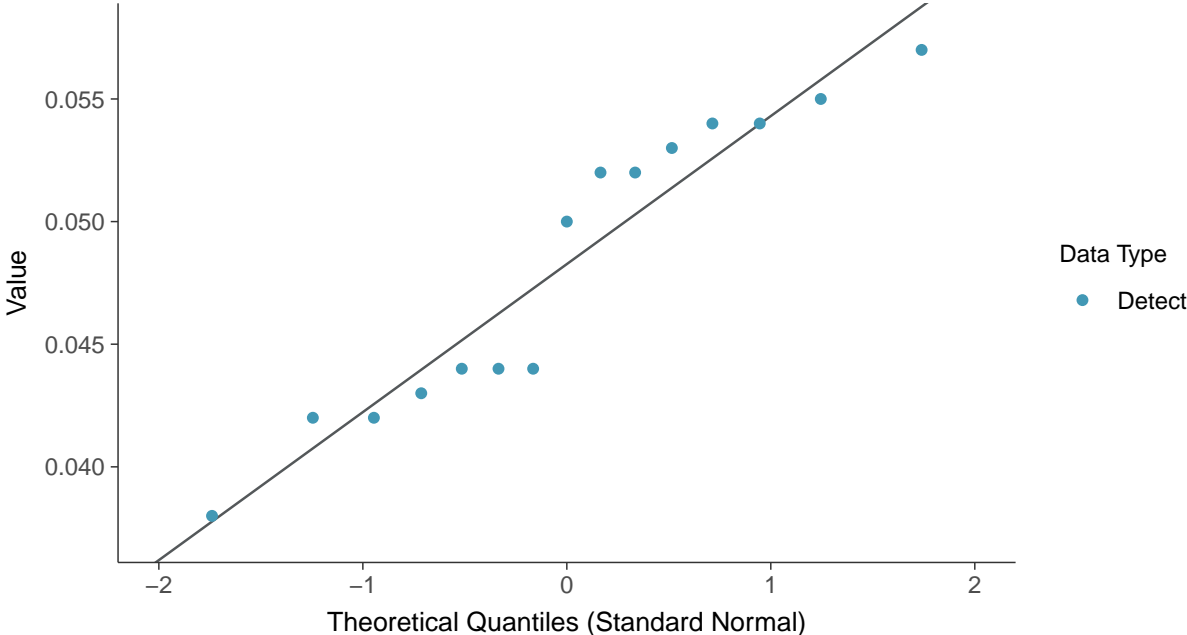
Barium, MW-6 (mg/L)





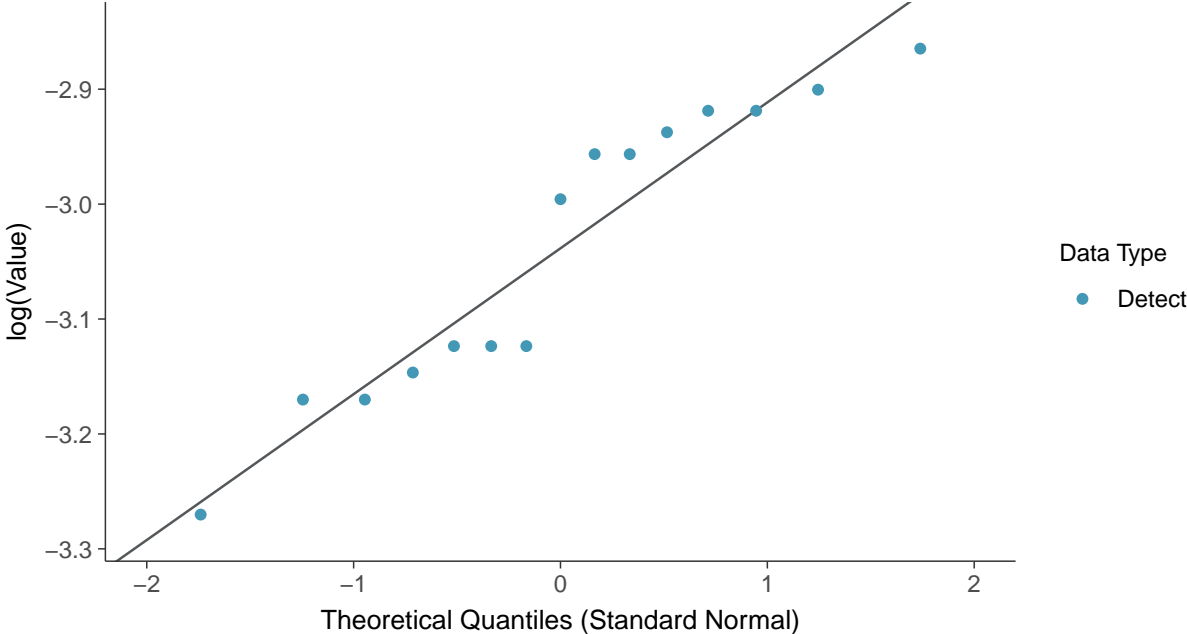
**Normal Q-Q plot**

Barium, MW-6 (mg/L)



**Lognormal Q-Q plot**

Barium, MW-6 (mg/L)

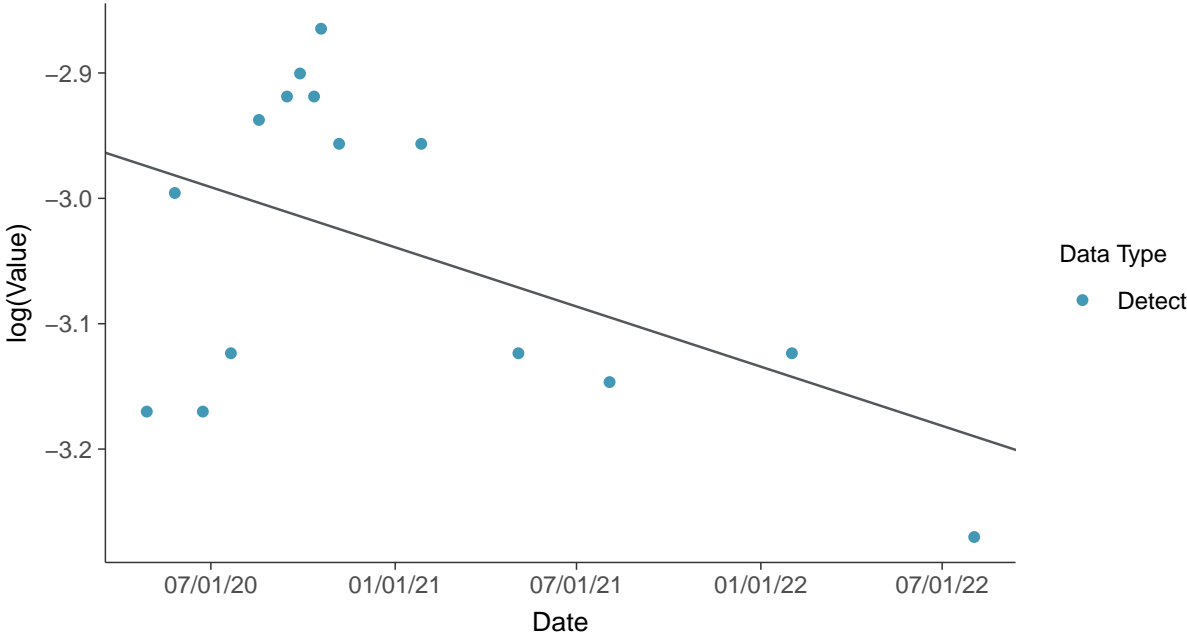






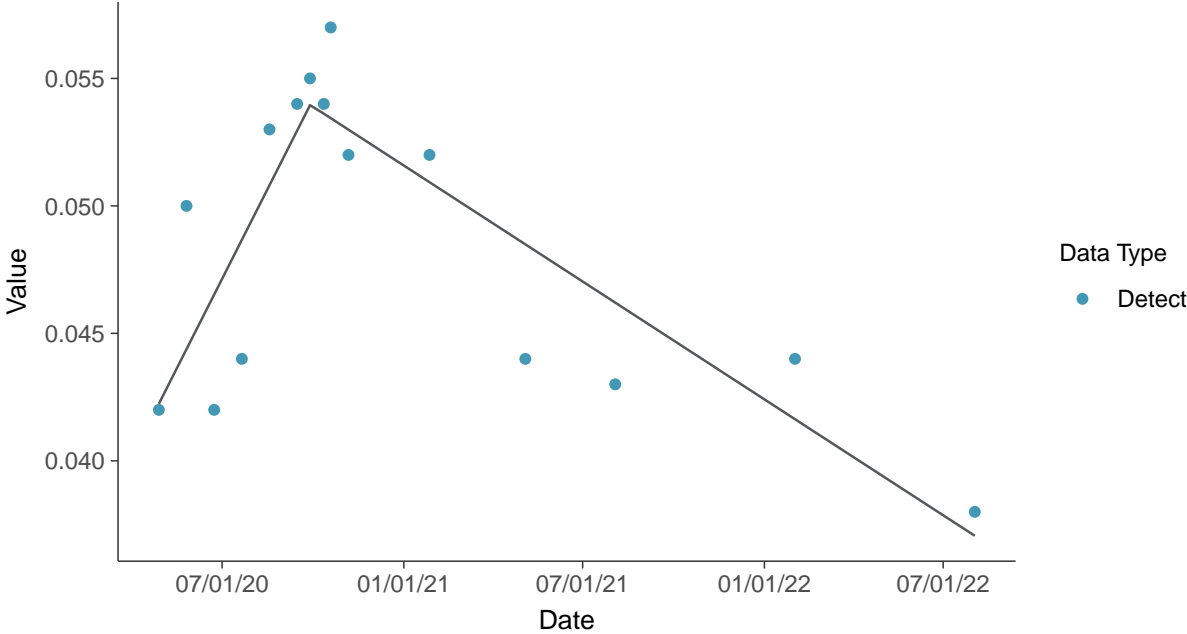
**Trend Regression: Lognormal MLE**

Barium, MW-6 (mg/L)



**Trend Regression: Piecewise Linear-Linear**

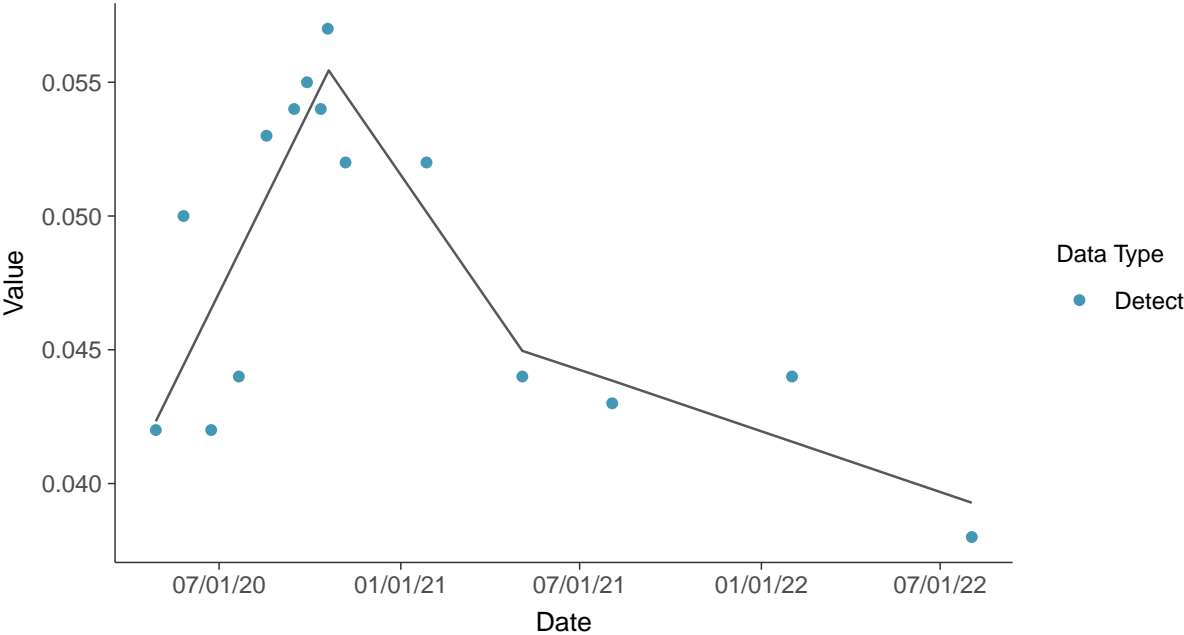
Barium, MW-6 (mg/L)





### Trend Regression: Piecewise Linear-Linear-Linear

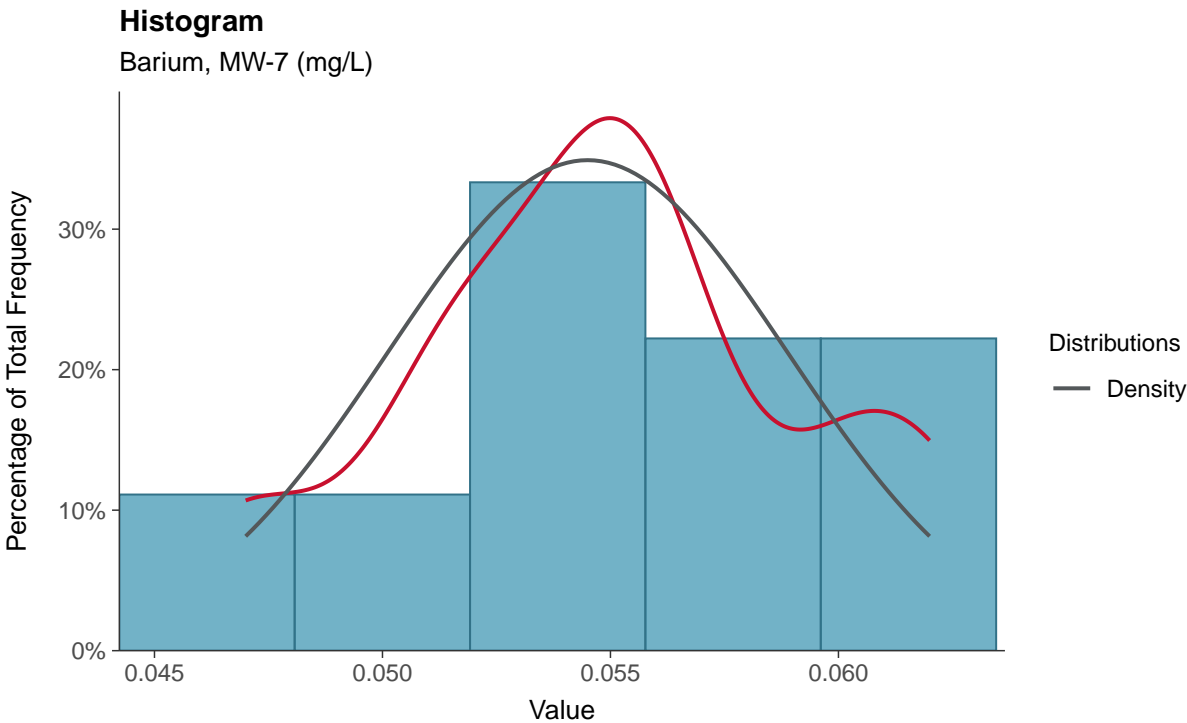
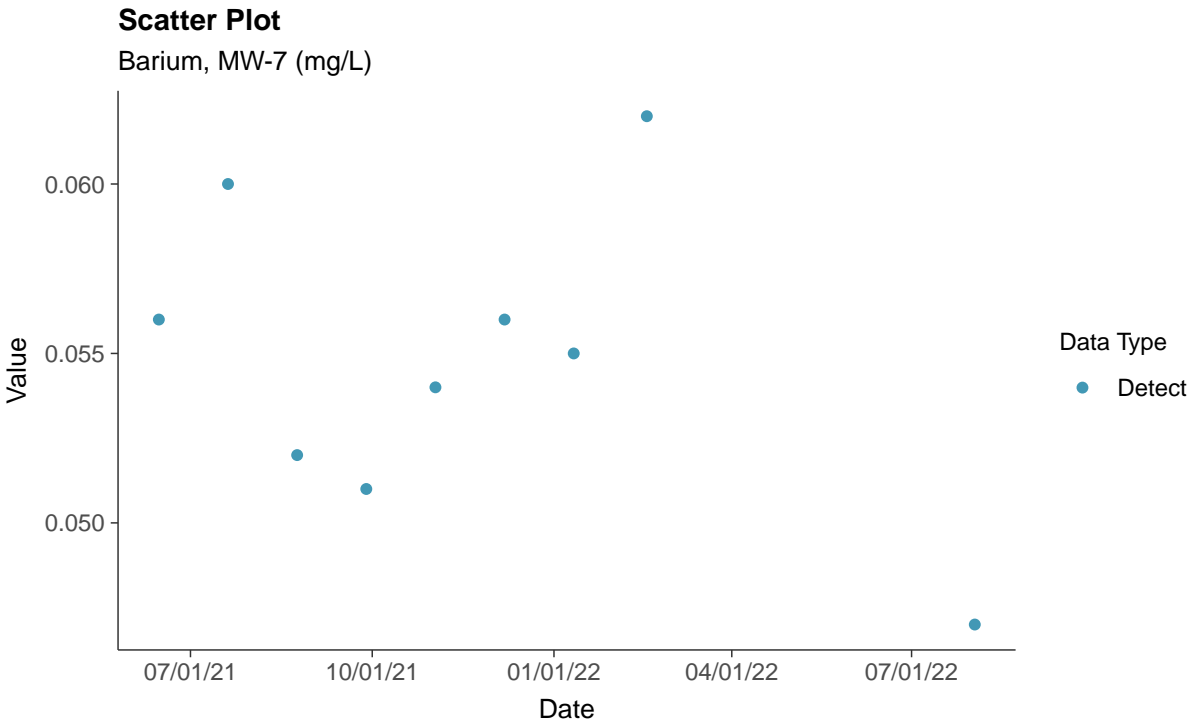
Barium, MW-6 (mg/L)





### Appendix IV: Barium, MW-7

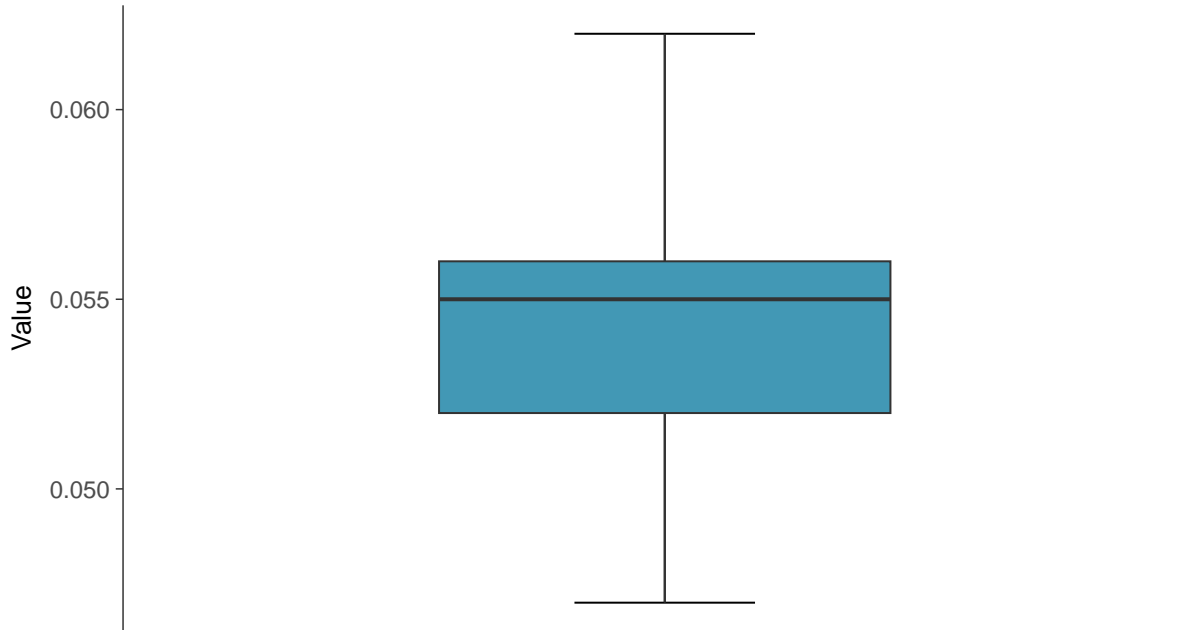
ID: 2\_09\_07





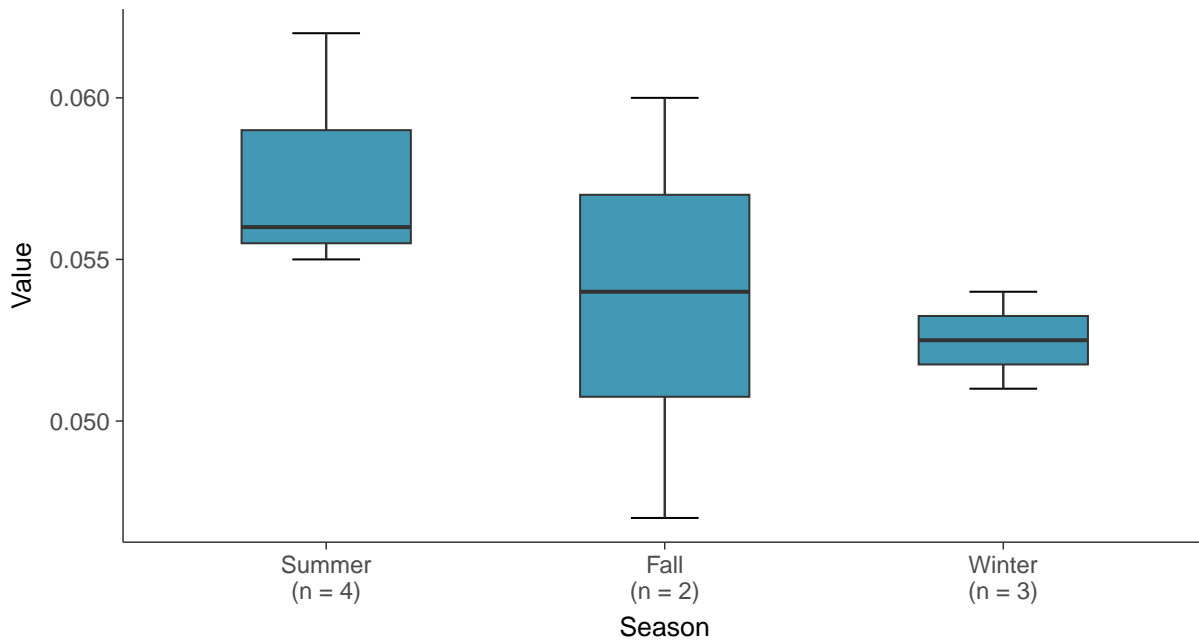
### Boxplot

Barium, MW-7 (mg/L)



### Boxplot by Season

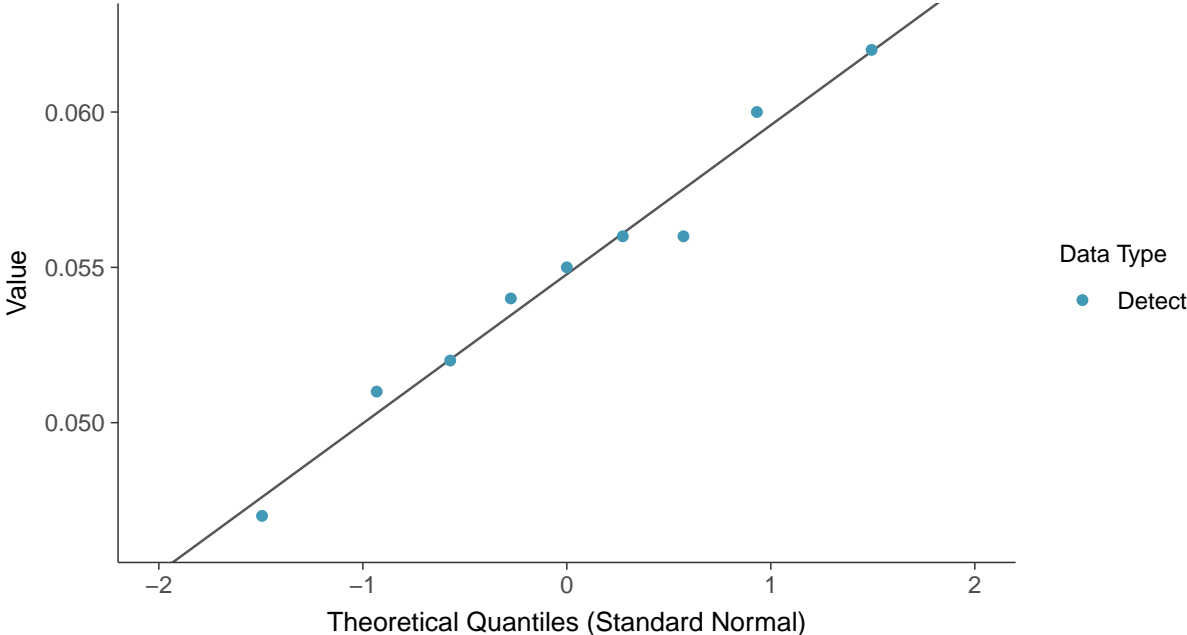
Barium, MW-7 (mg/L)





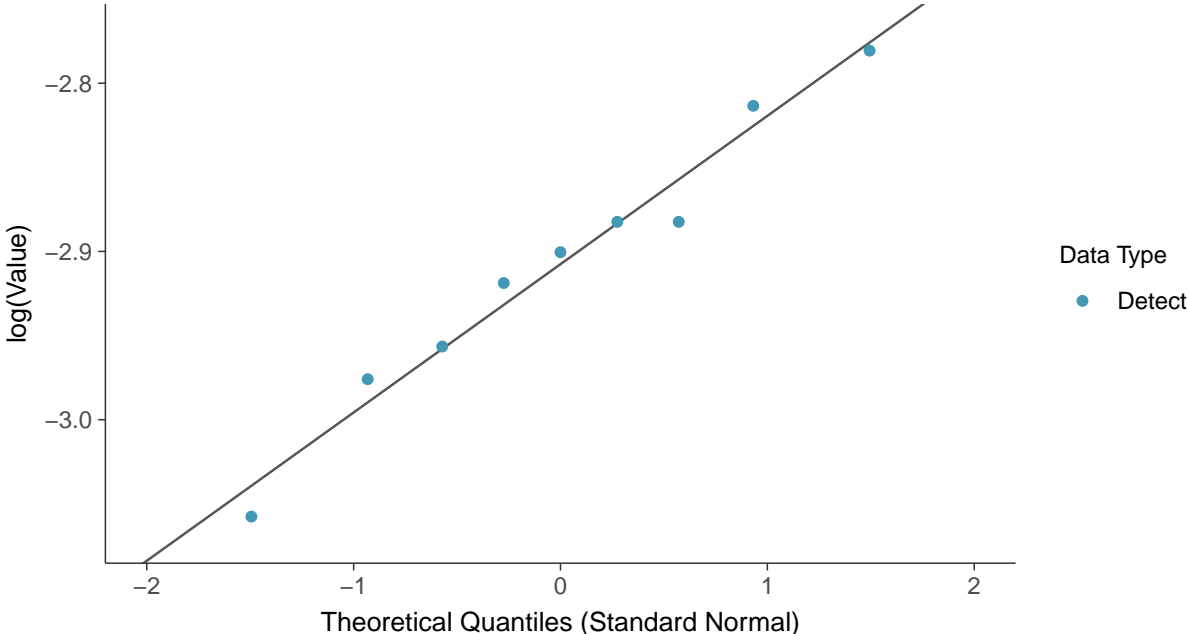
**Normal Q-Q plot**

Barium, MW-7 (mg/L)



**Lognormal Q-Q plot**

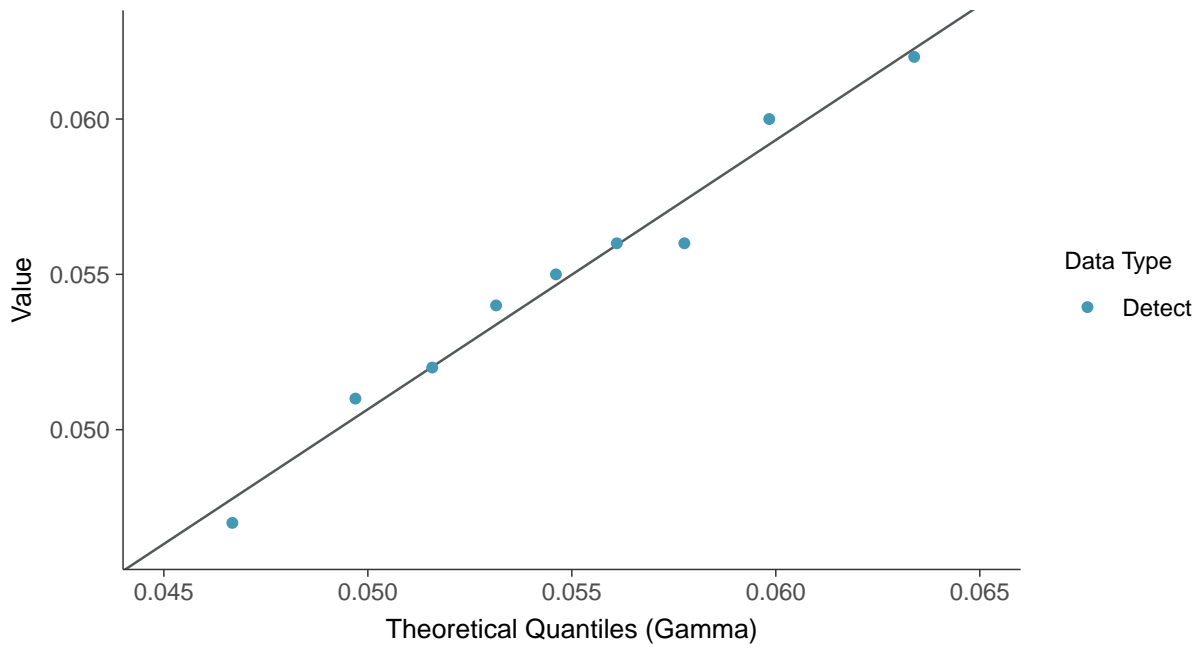
Barium, MW-7 (mg/L)





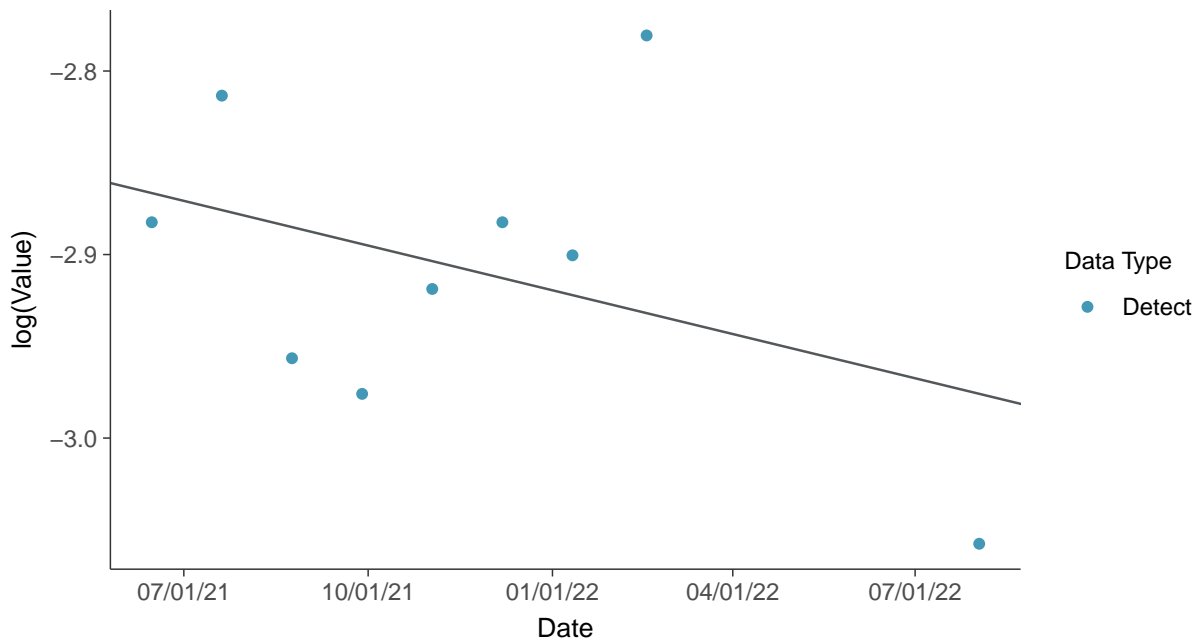
### Gamma Q-Q plot

Barium, MW-7 (mg/L)



### Trend Regression: Lognormal MLE

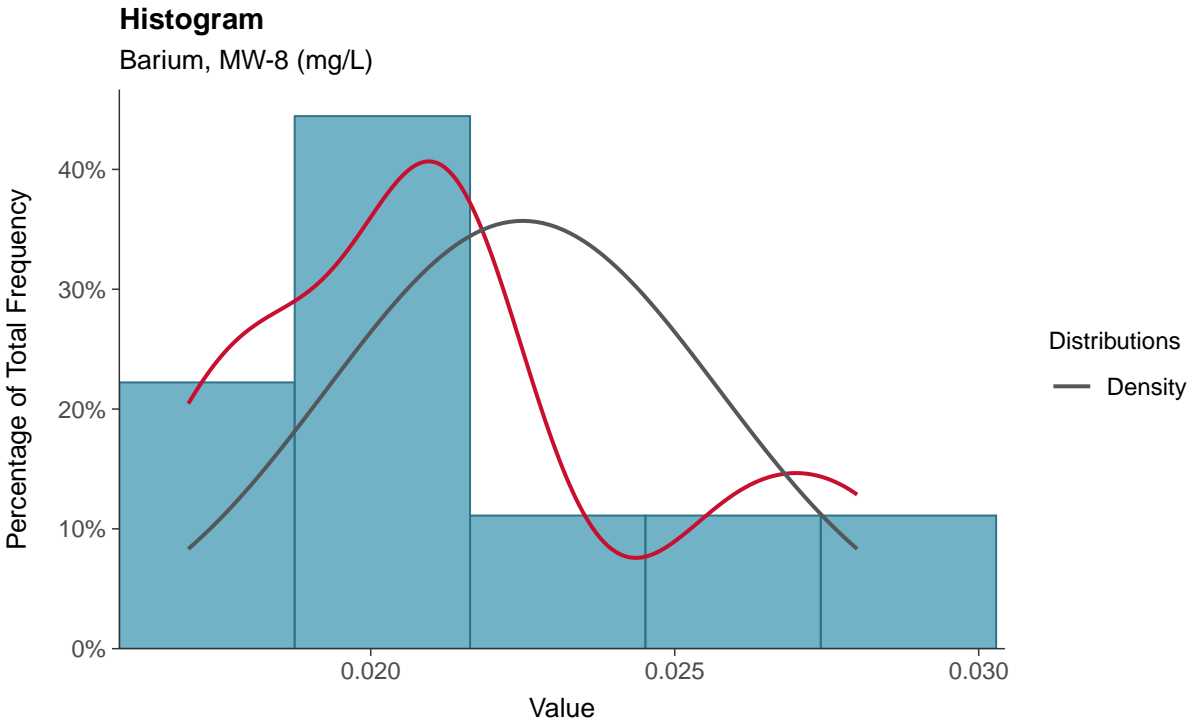
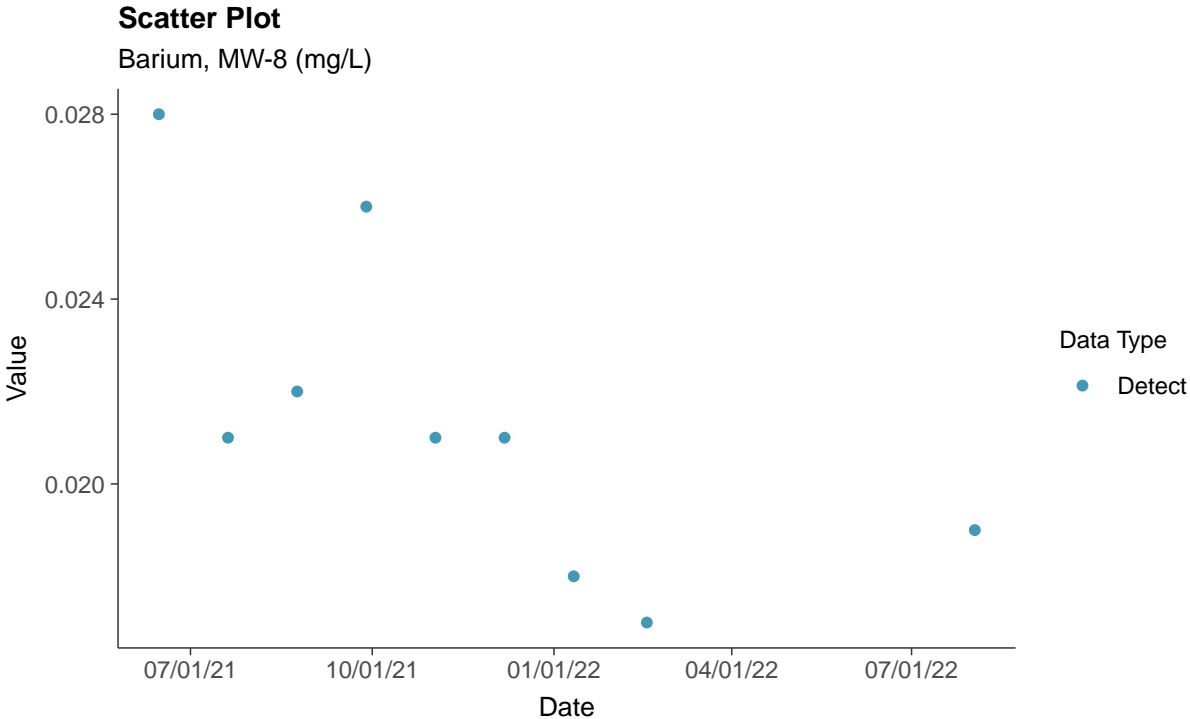
Barium, MW-7 (mg/L)





### Appendix IV: Barium, MW-8

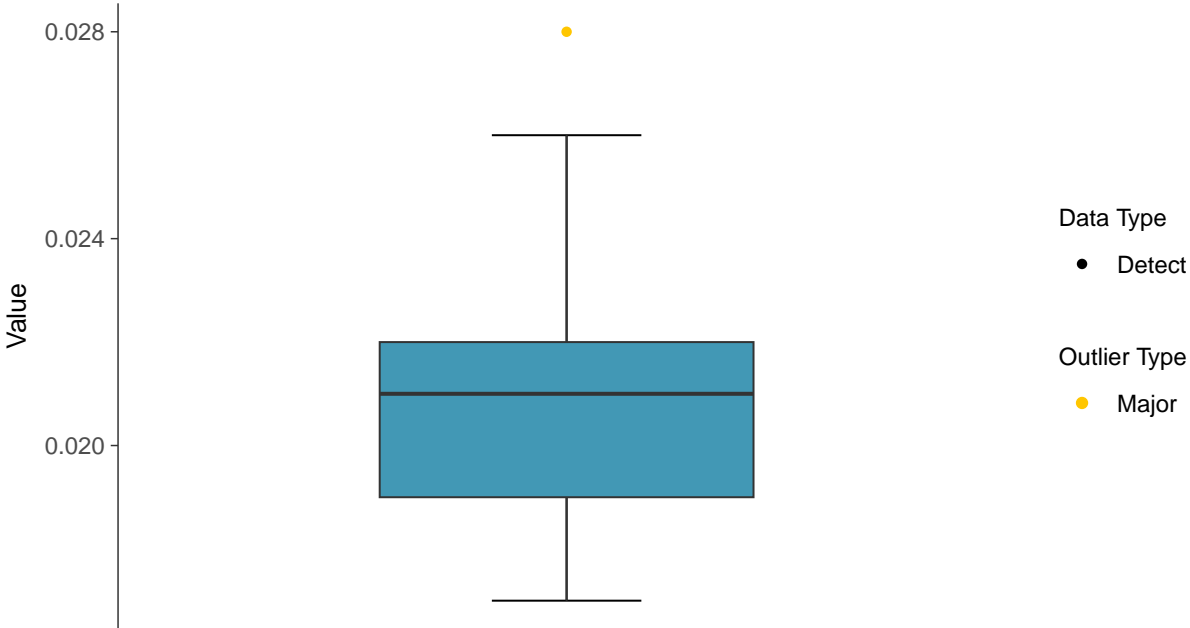
ID: 2\_09\_08





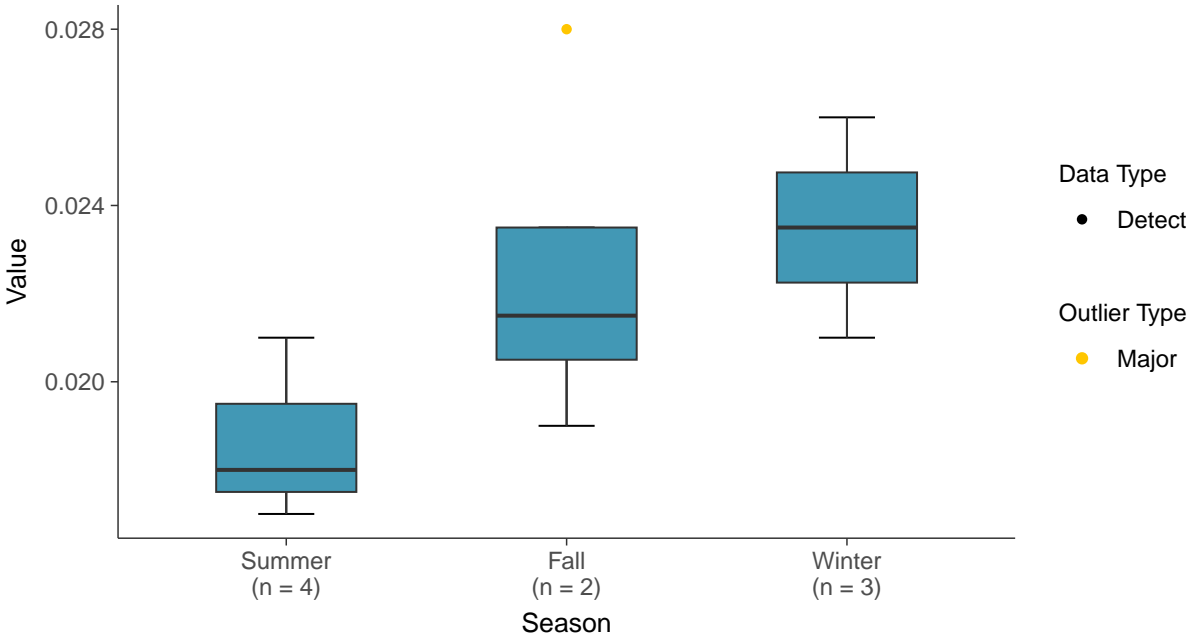
**Boxplot**

Barium, MW-8 (mg/L)



**Boxplot by Season**

Barium, MW-8 (mg/L)

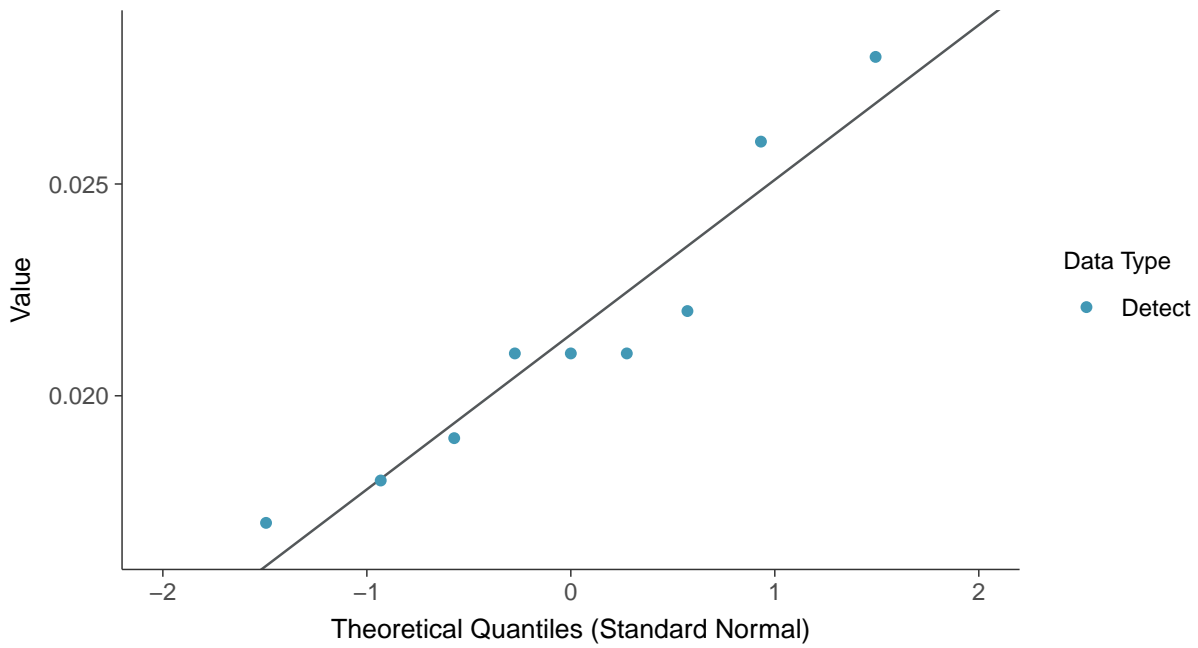






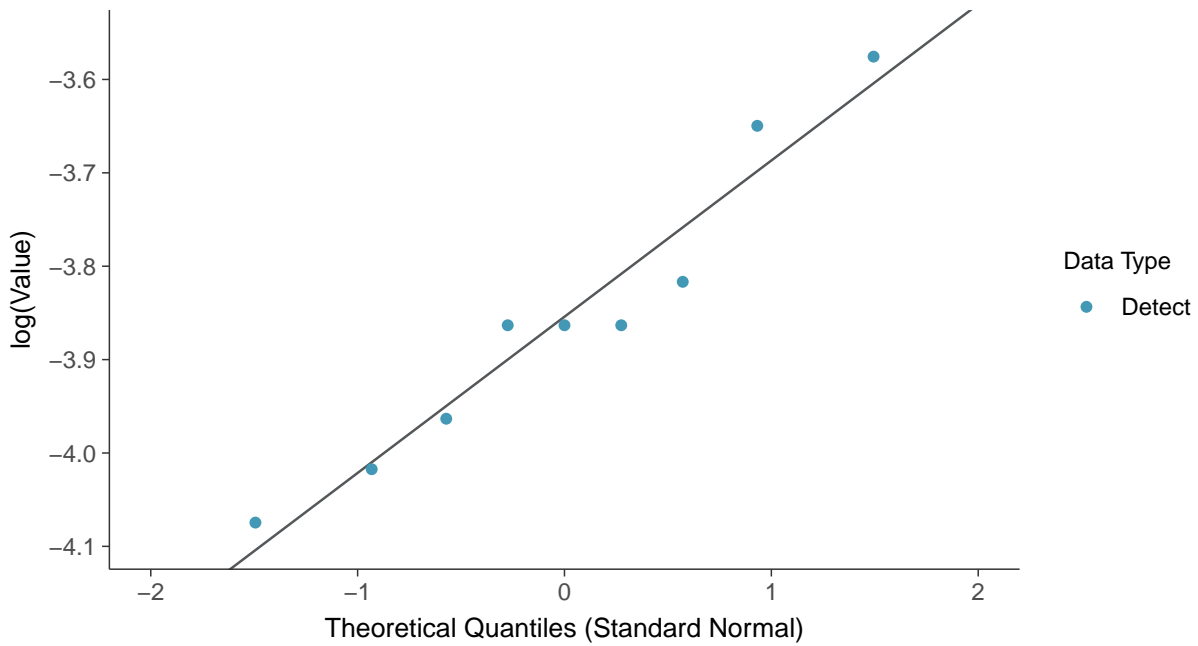
### Normal Q-Q plot

Barium, MW-8 (mg/L)



### Lognormal Q-Q plot

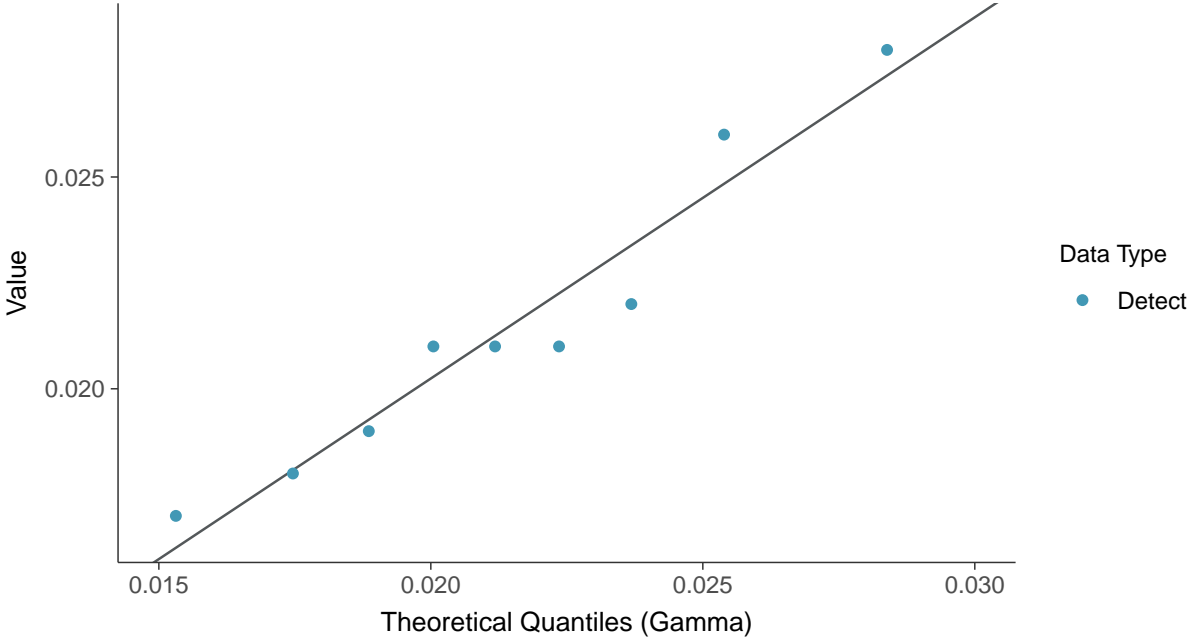
Barium, MW-8 (mg/L)





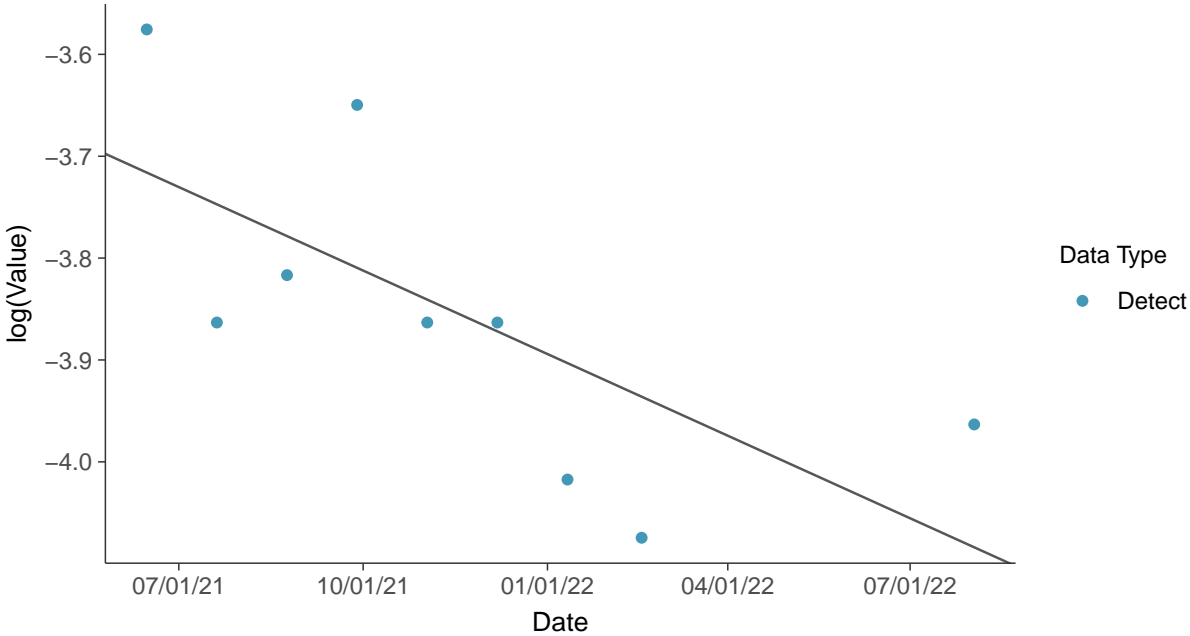
### Gamma Q-Q plot

Barium, MW-8 (mg/L)



### Trend Regression: Lognormal MLE

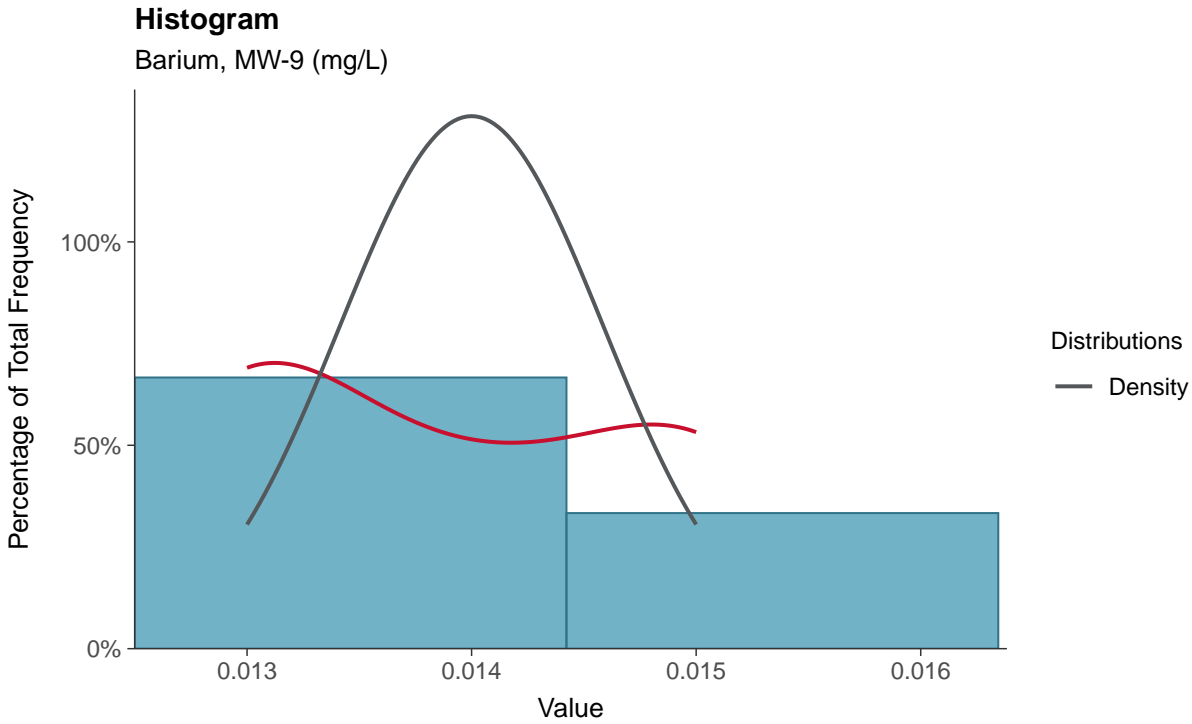
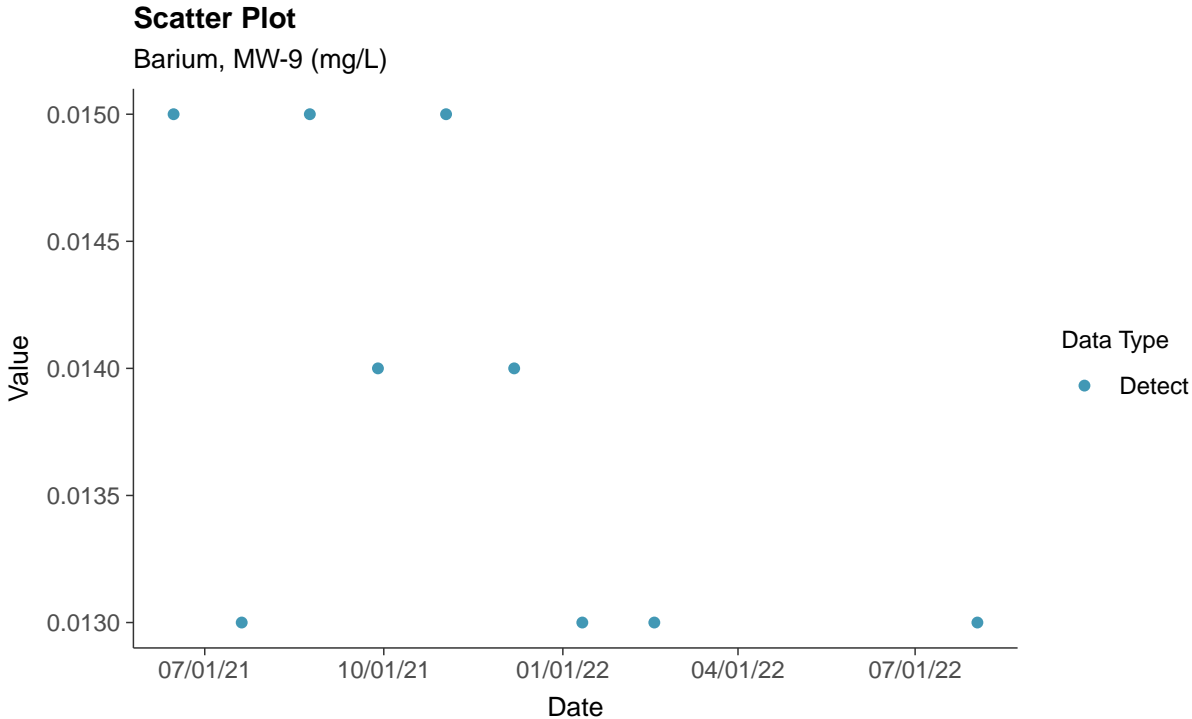
Barium, MW-8 (mg/L)





### Appendix IV: Barium, MW-9

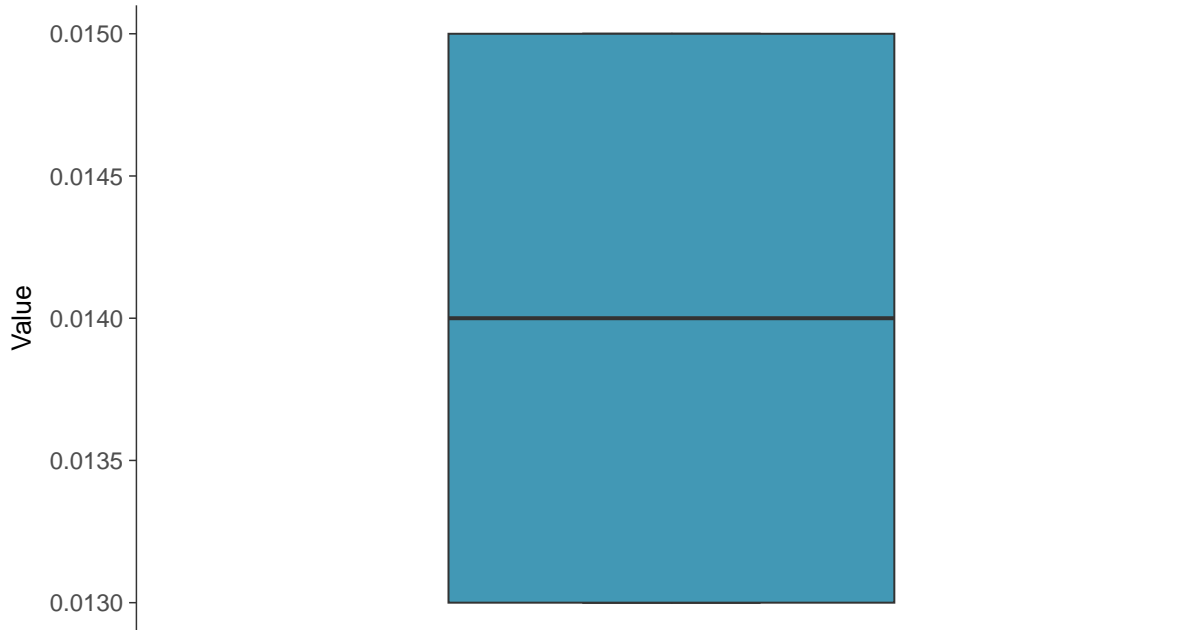
ID: 2\_09\_09





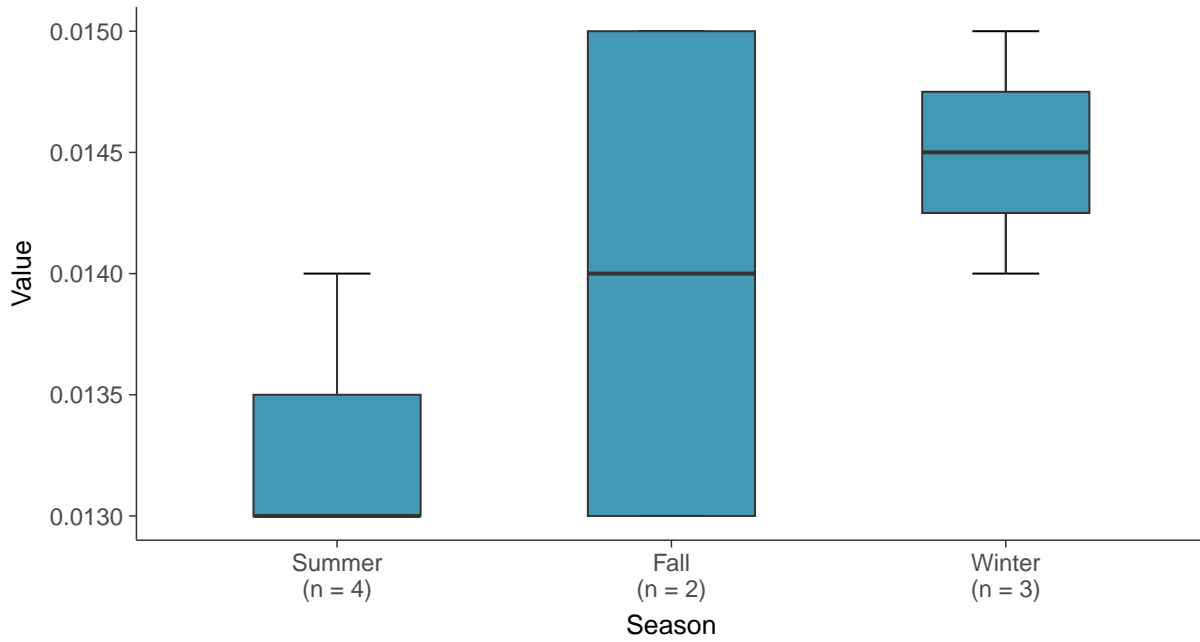
### Boxplot

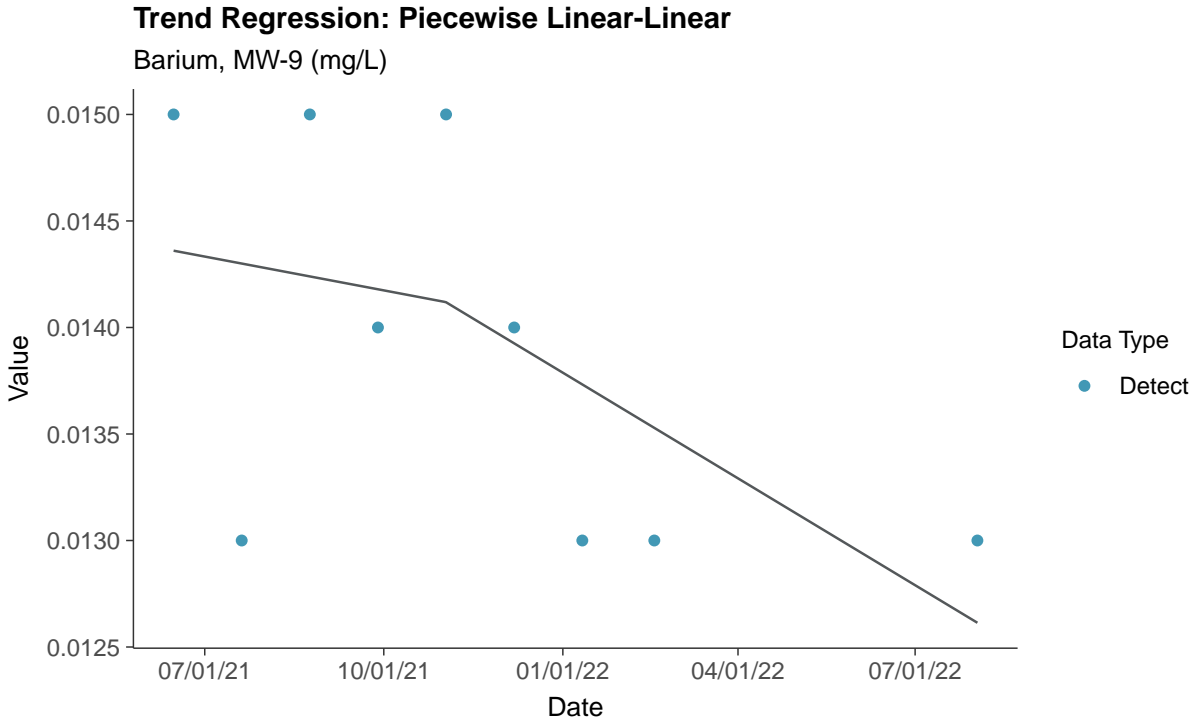
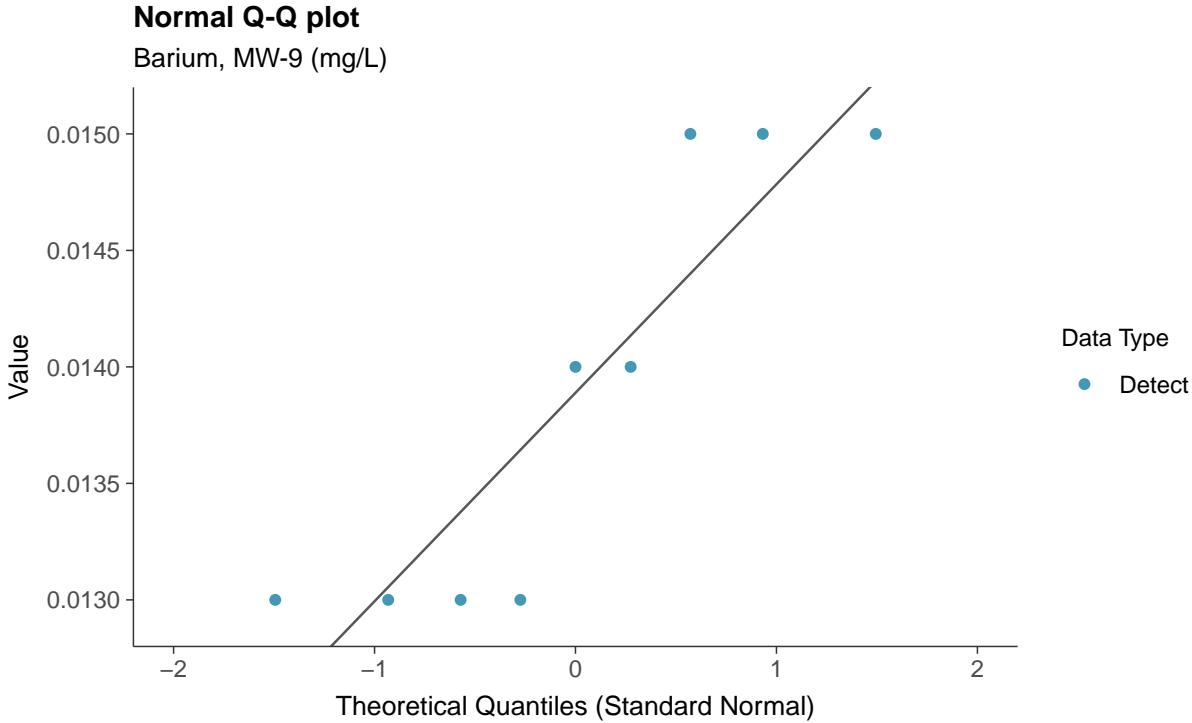
Barium, MW-9 (mg/L)



### Boxplot by Season

Barium, MW-9 (mg/L)

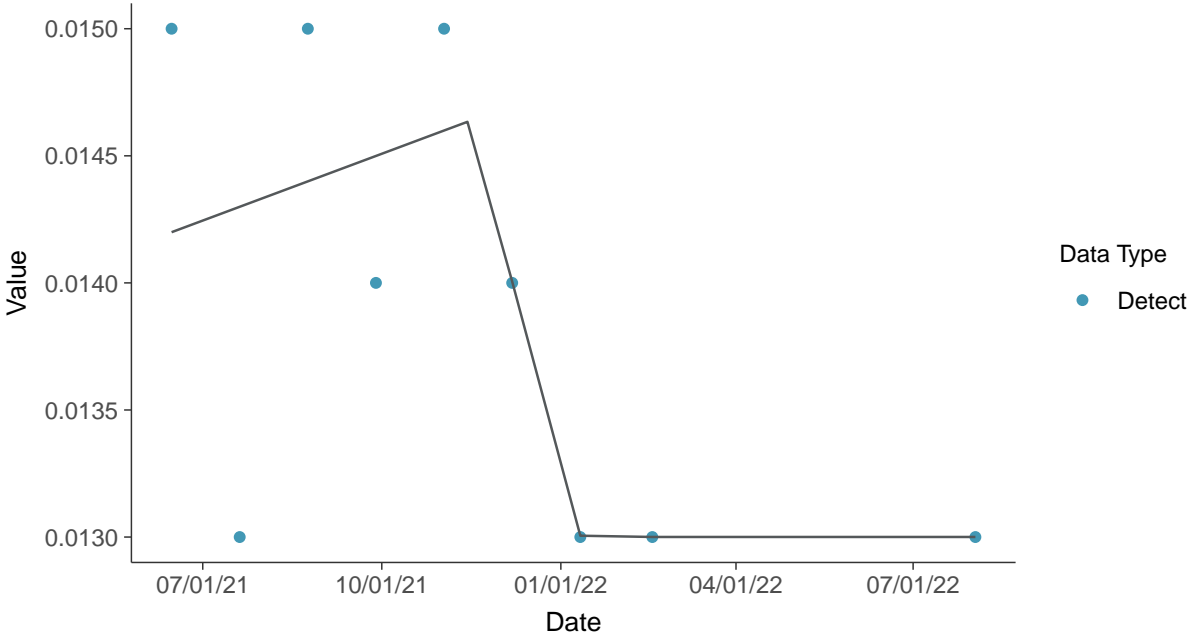






### Trend Regression: Piecewise Linear-Linear-Linear

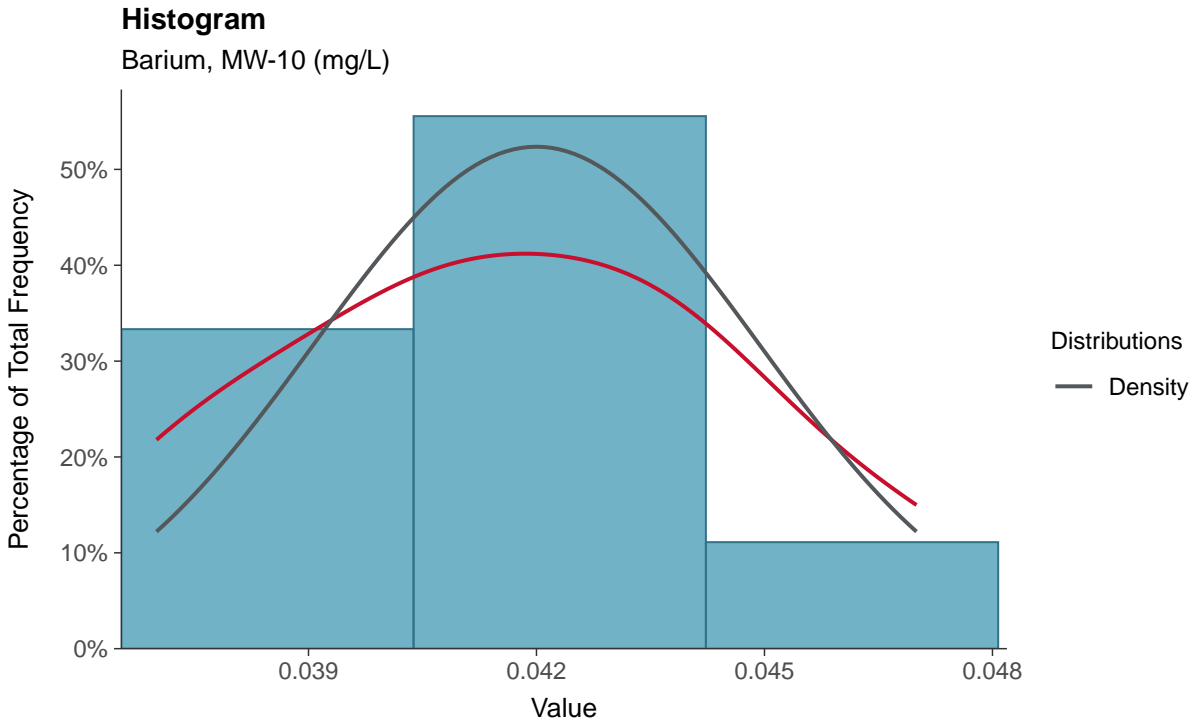
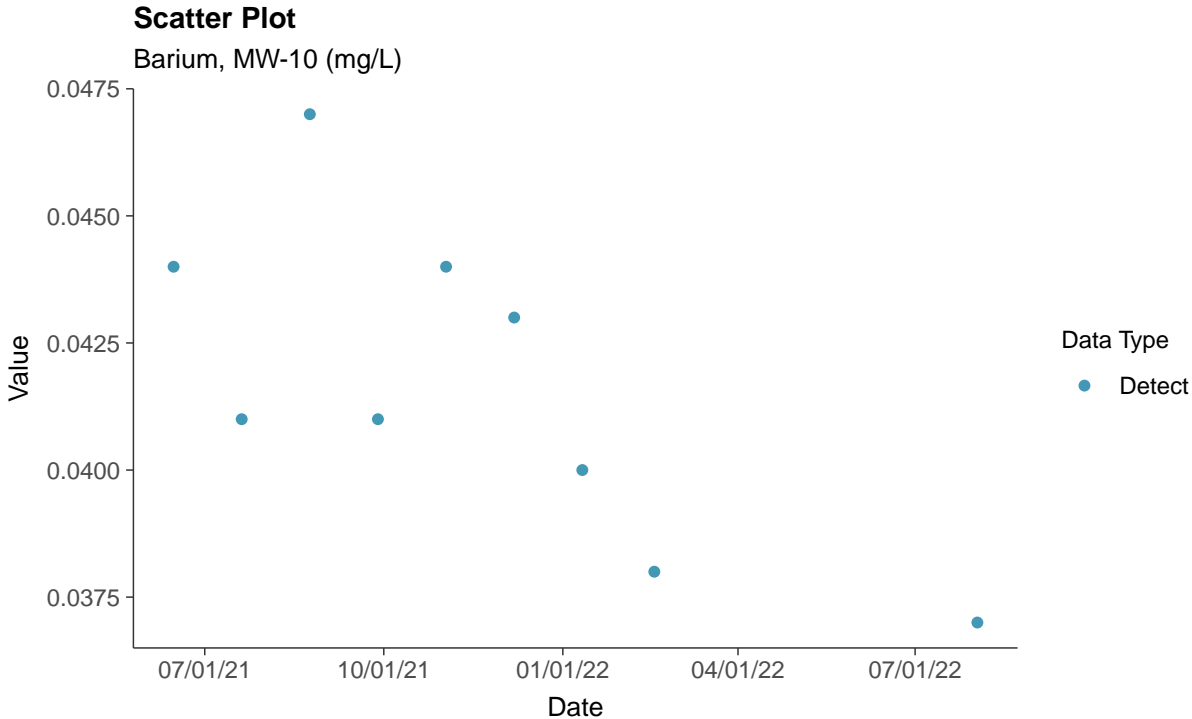
Barium, MW-9 (mg/L)





### Appendix IV: Barium, MW-10

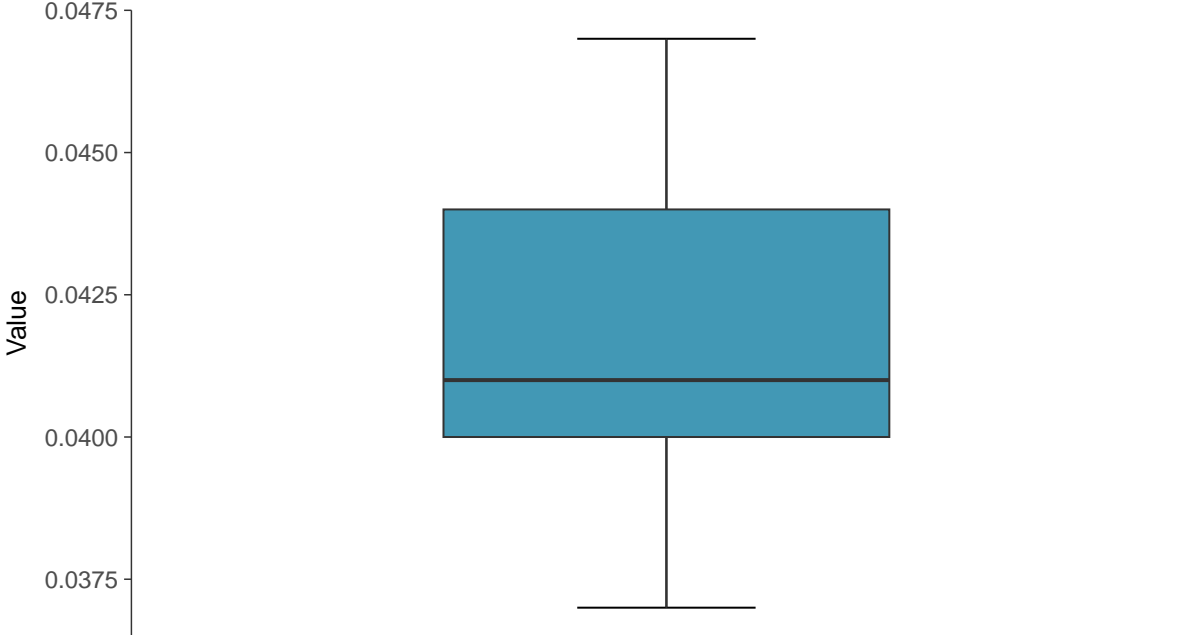
ID: 2\_09\_10





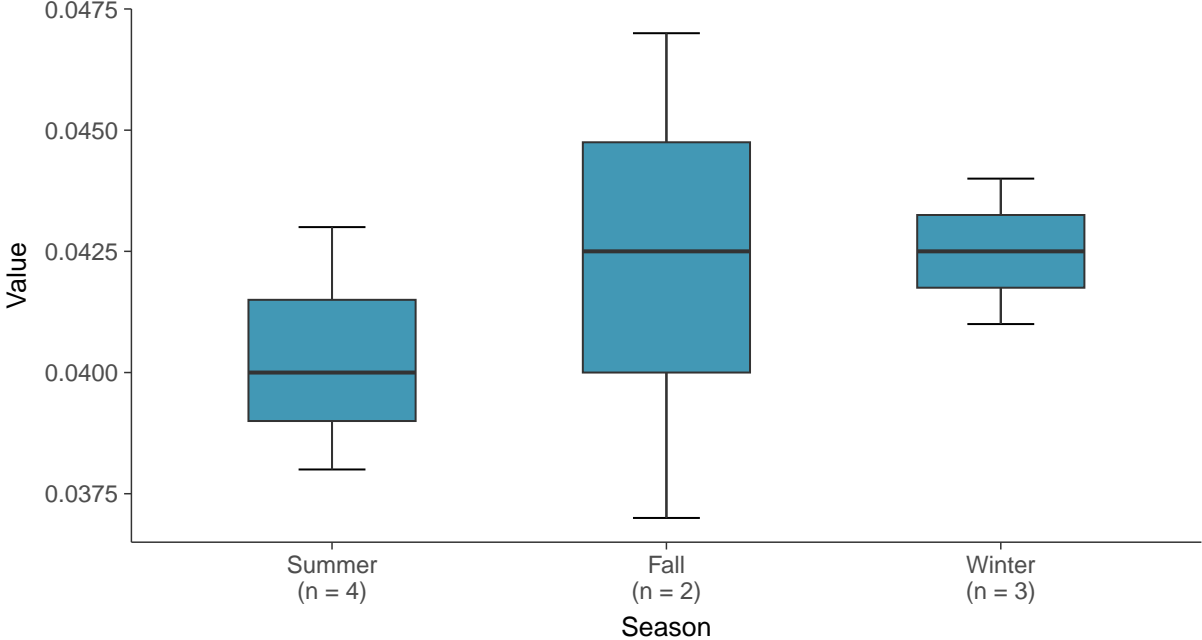
**Boxplot**

Barium, MW-10 (mg/L)



**Boxplot by Season**

Barium, MW-10 (mg/L)

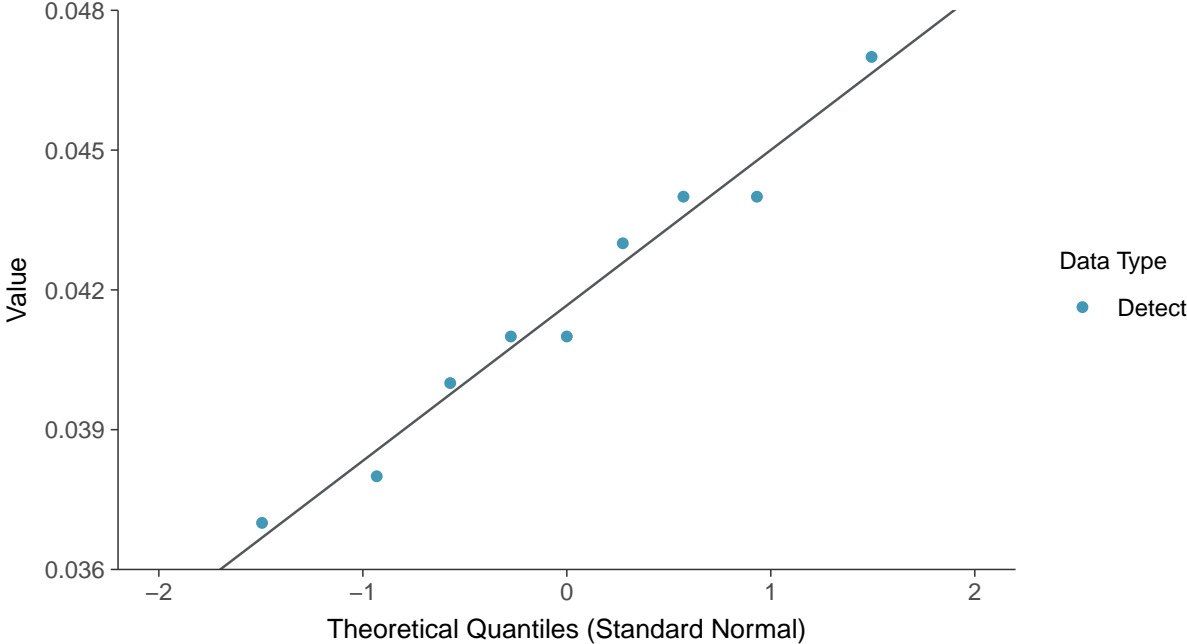






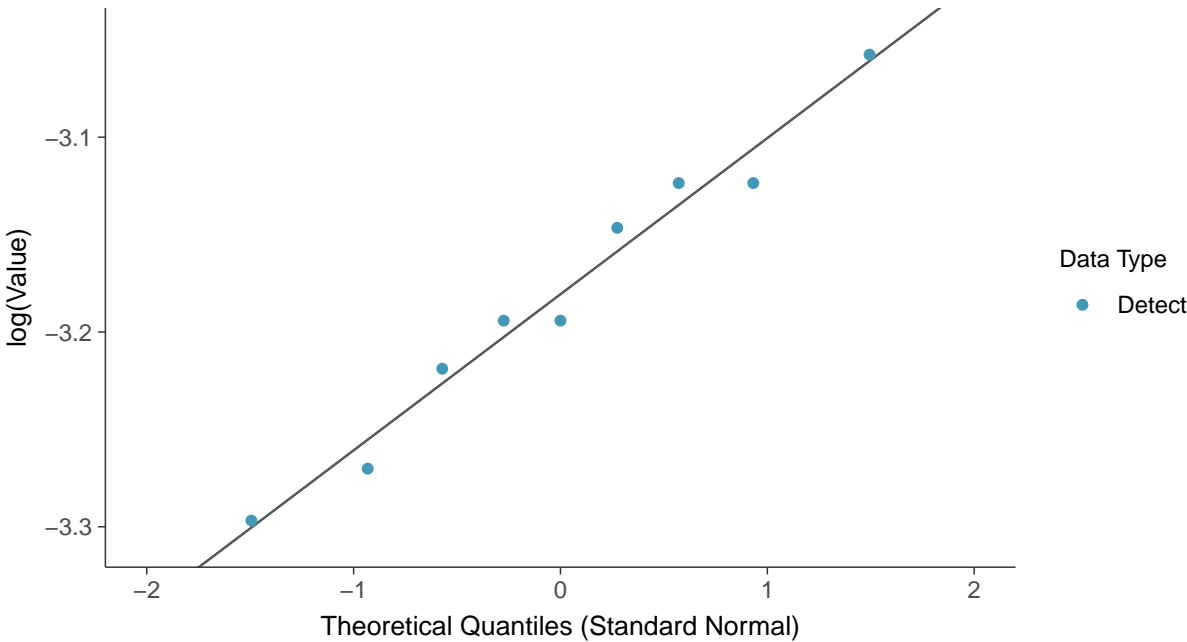
**Normal Q-Q plot**

Barium, MW-10 (mg/L)



**Lognormal Q-Q plot**

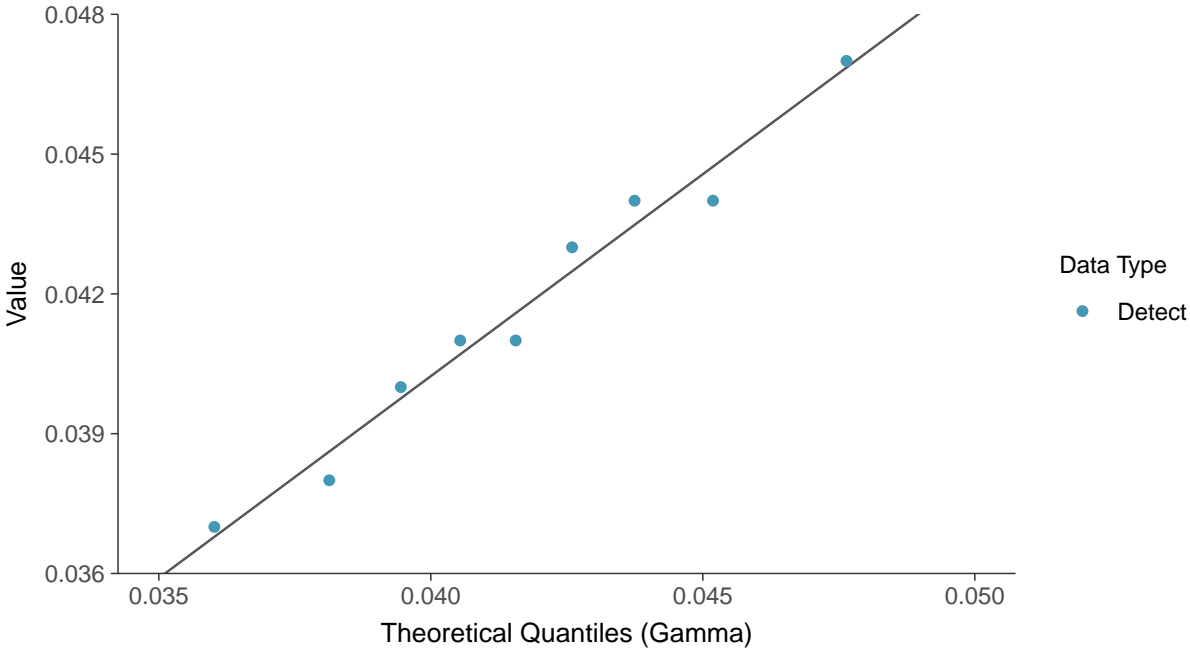
Barium, MW-10 (mg/L)





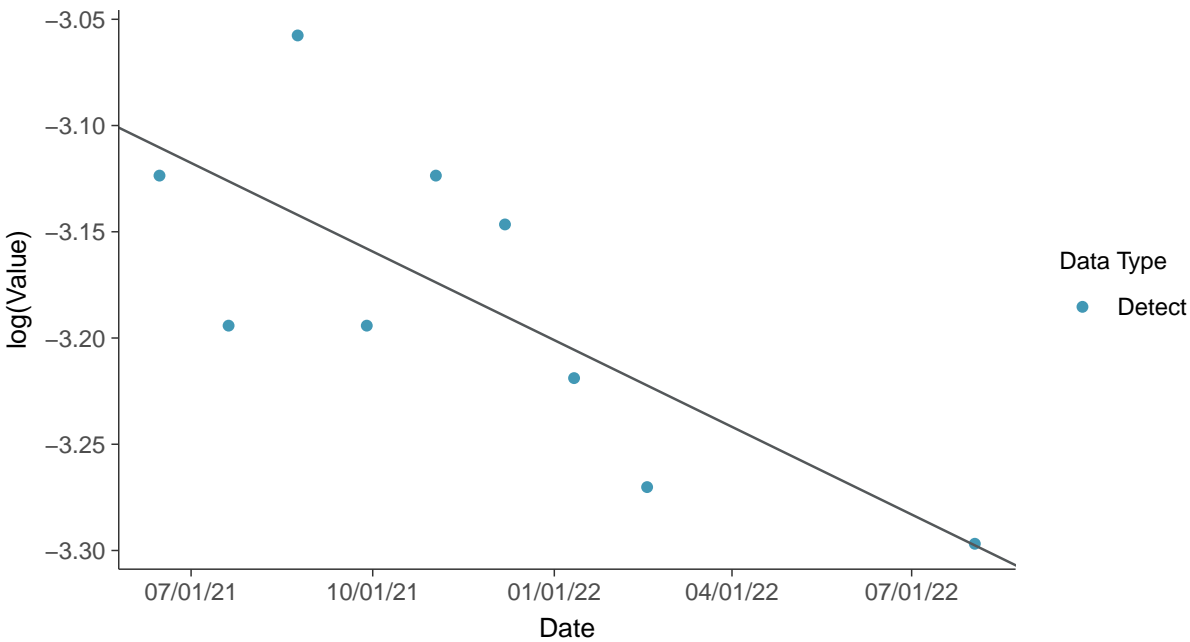
### Gamma Q-Q plot

Barium, MW-10 (mg/L)



### Trend Regression: Lognormal MLE

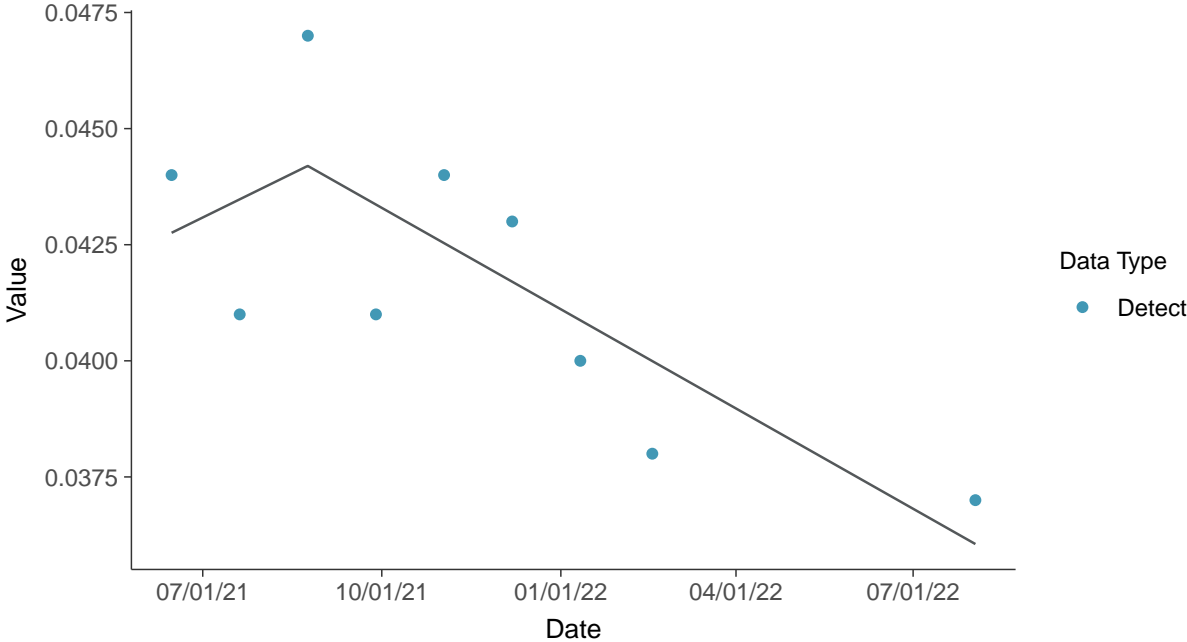
Barium, MW-10 (mg/L)





### Trend Regression: Piecewise Linear-Linear

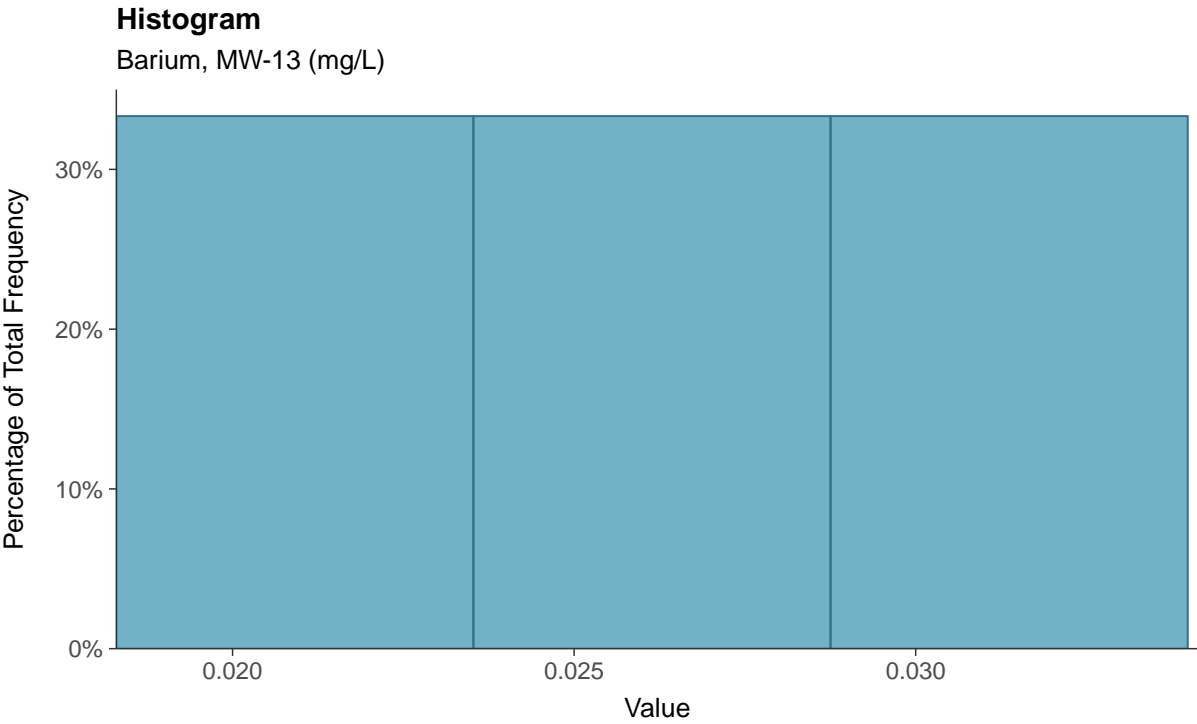
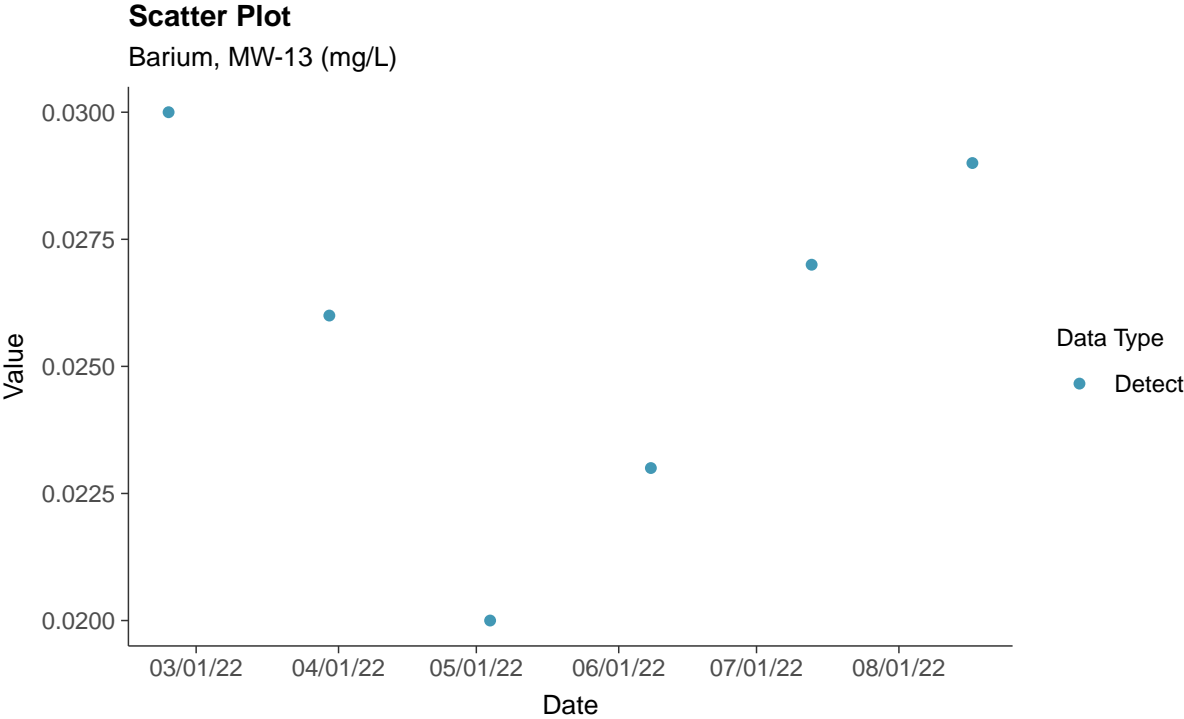
Barium, MW-10 (mg/L)





### Appendix IV: Barium, MW-13

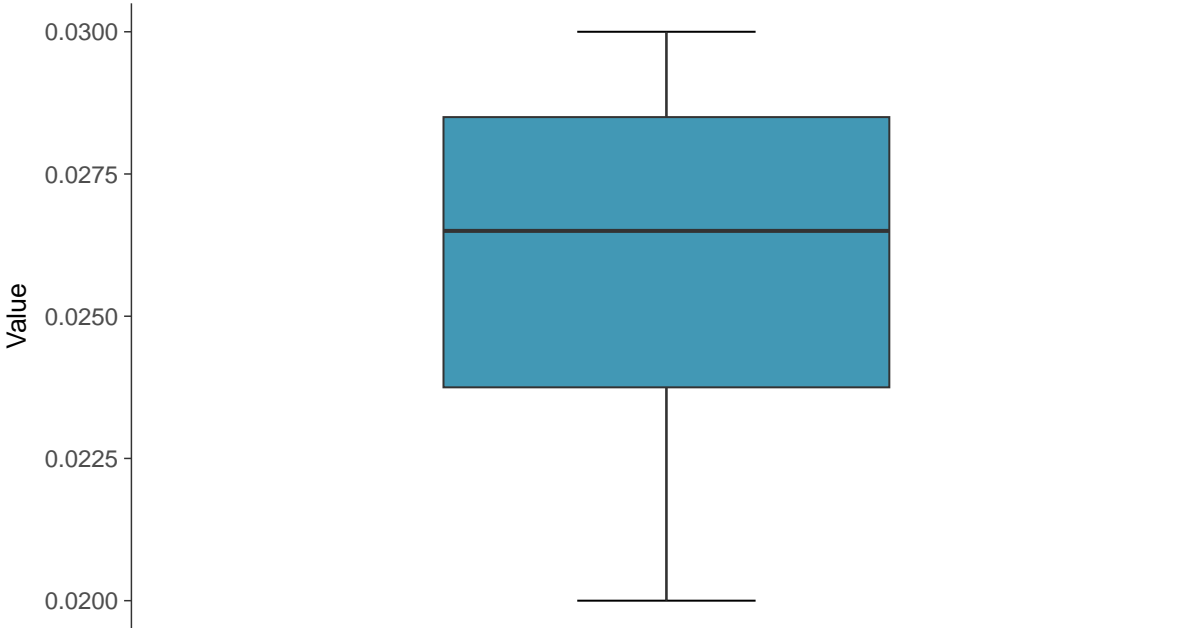
ID: 2\_09\_13





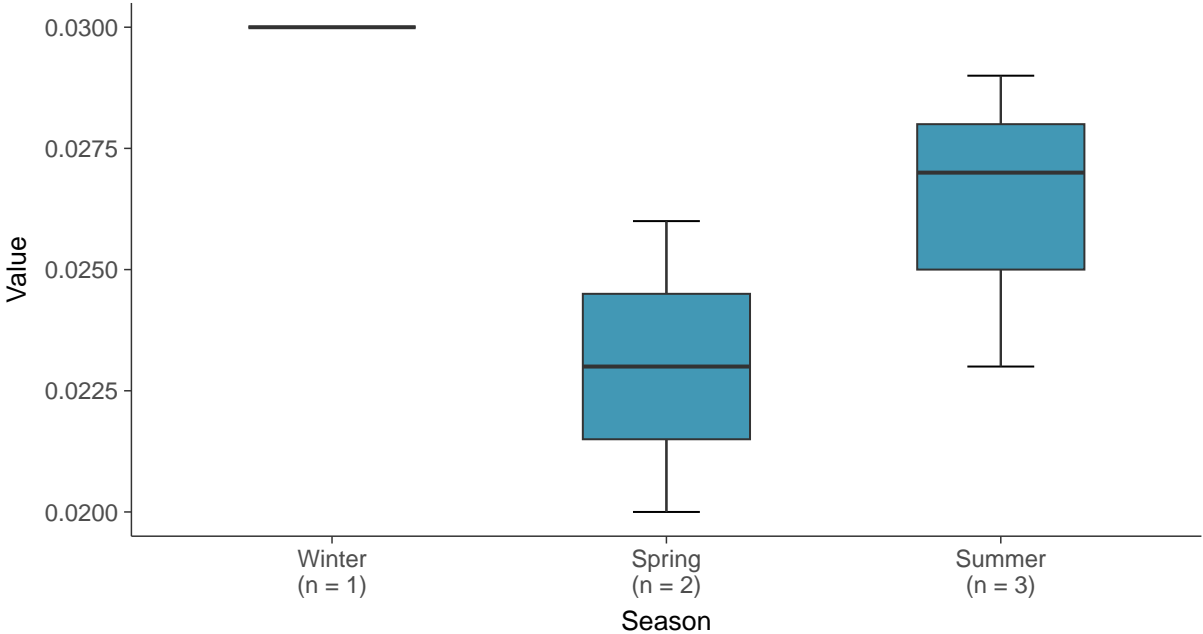
**Boxplot**

Barium, MW-13 (mg/L)



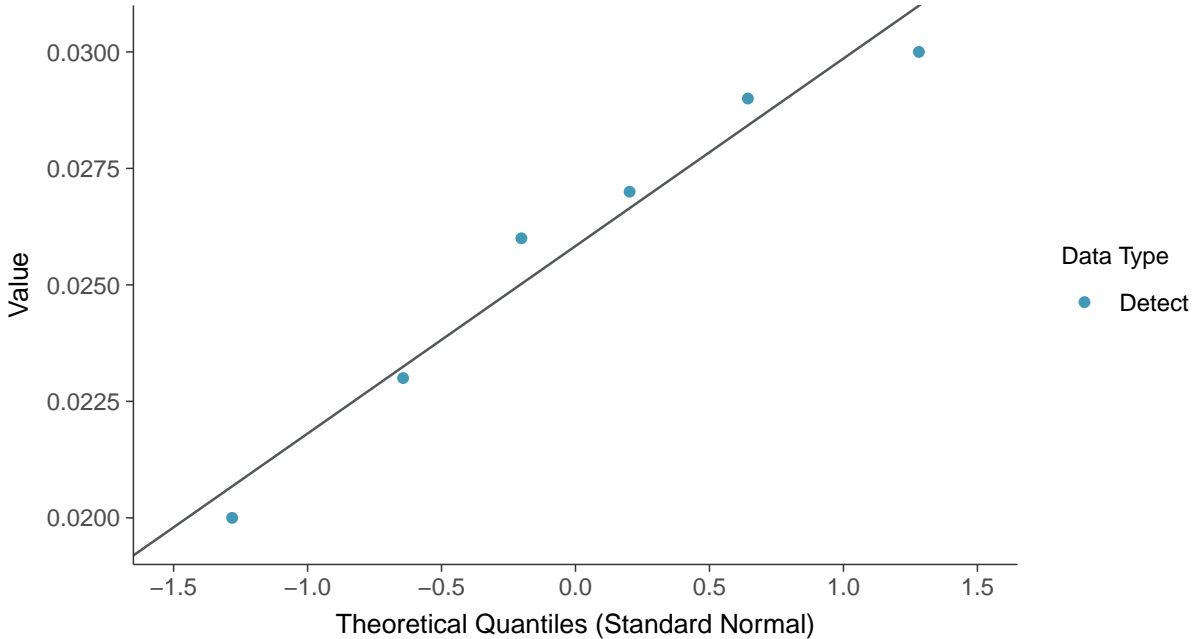
**Boxplot by Season**

Barium, MW-13 (mg/L)

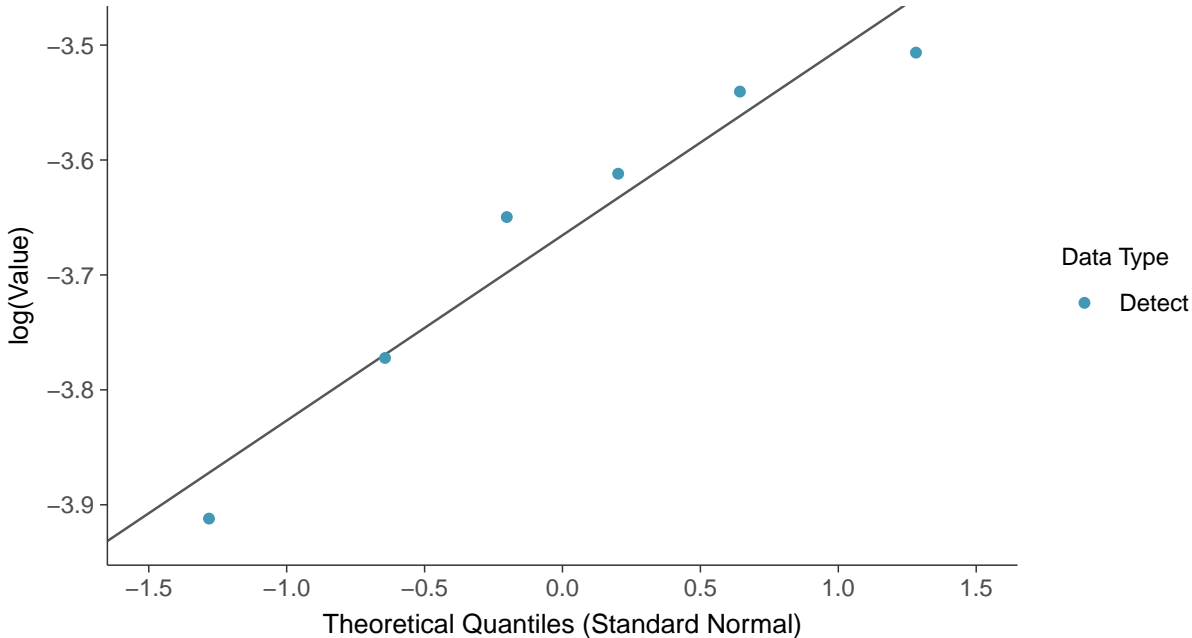




**Normal Q-Q plot**  
Barium, MW-13 (mg/L)

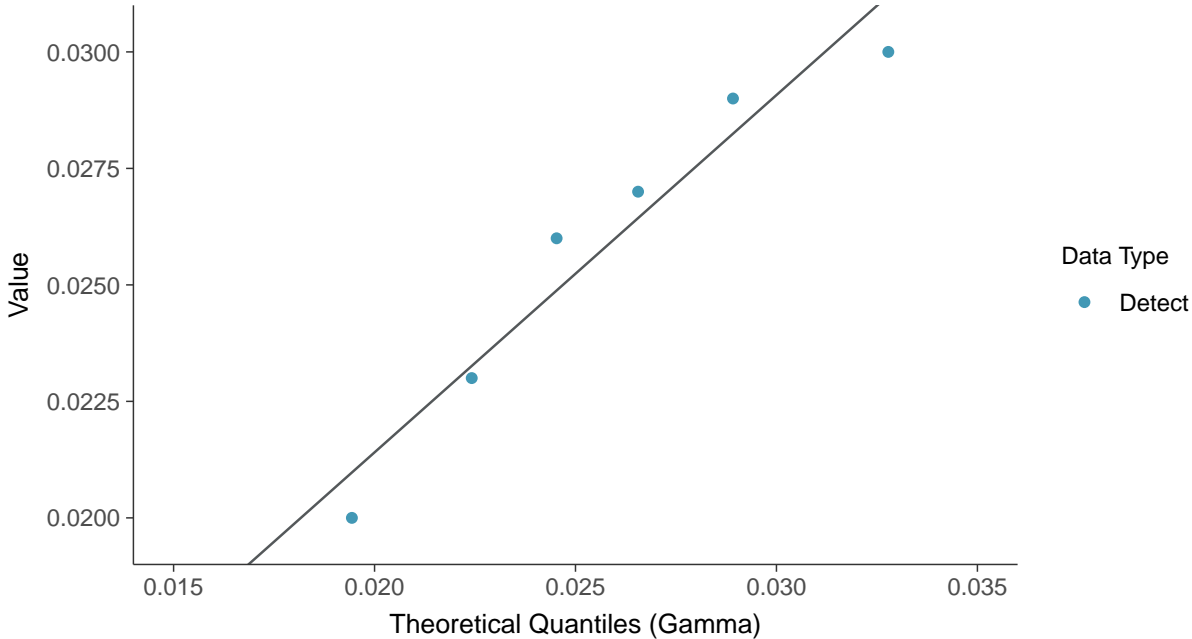


**Lognormal Q-Q plot**  
Barium, MW-13 (mg/L)

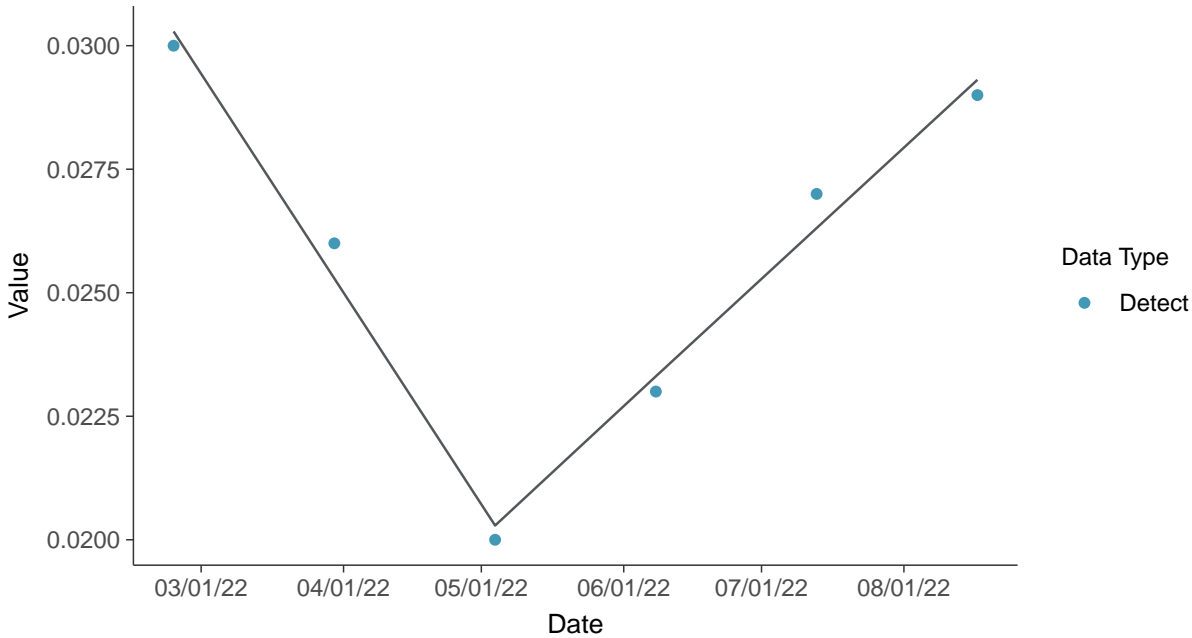




**Gamma Q-Q plot**  
Barium, MW-13 (mg/L)



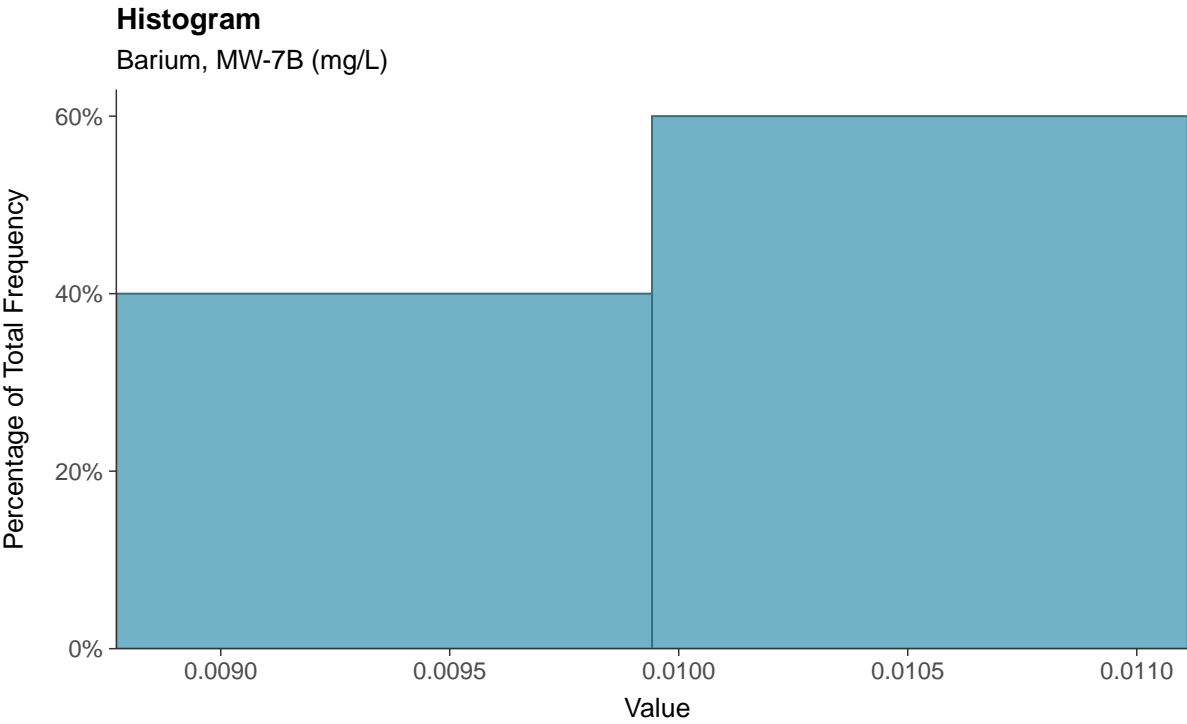
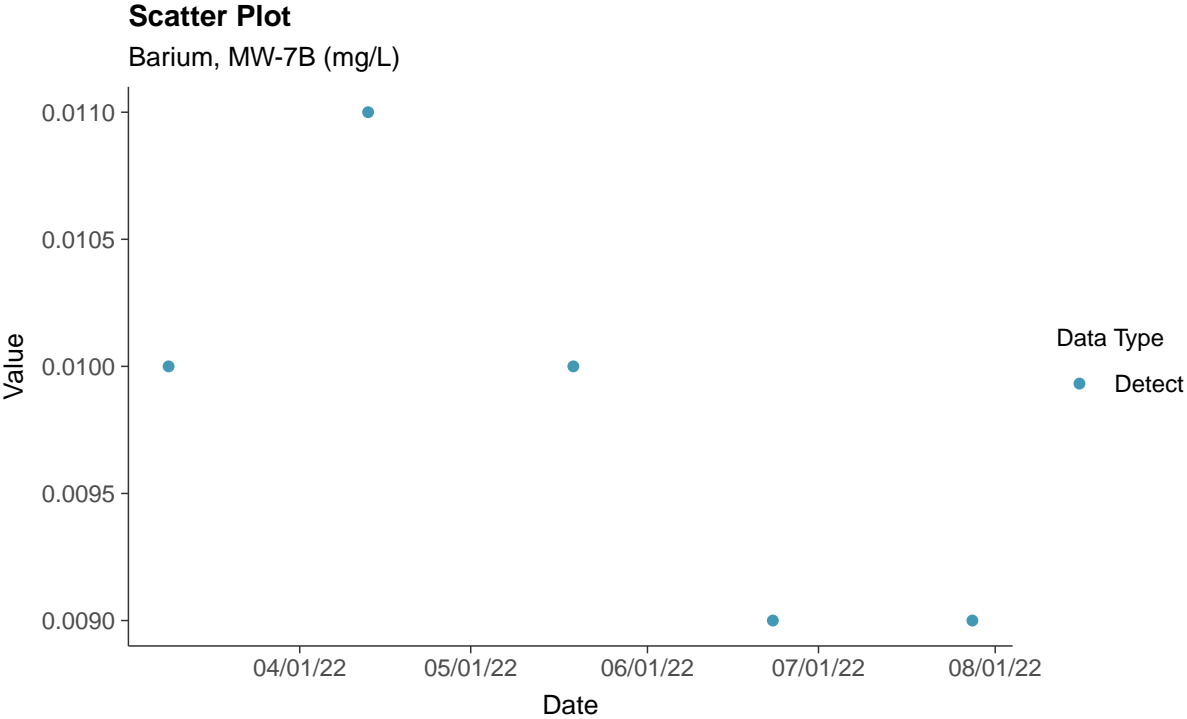
**Trend Regression: Piecewise Linear-Linear**  
Barium, MW-13 (mg/L)





### Appendix IV: Barium, MW-7B

ID: 2\_09\_7B

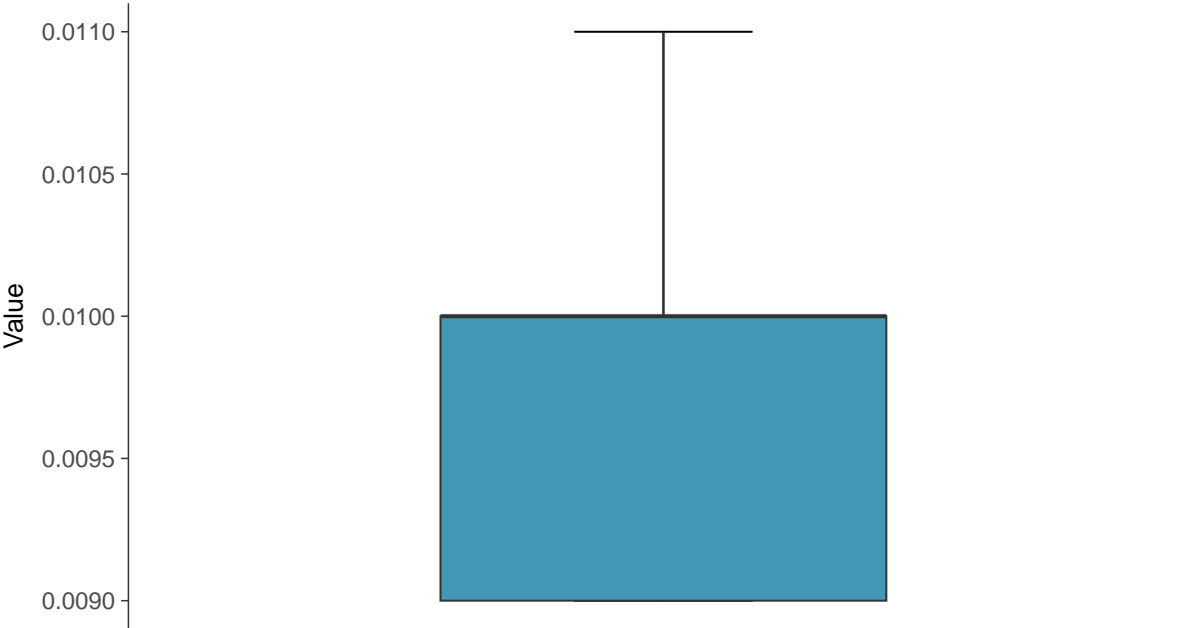






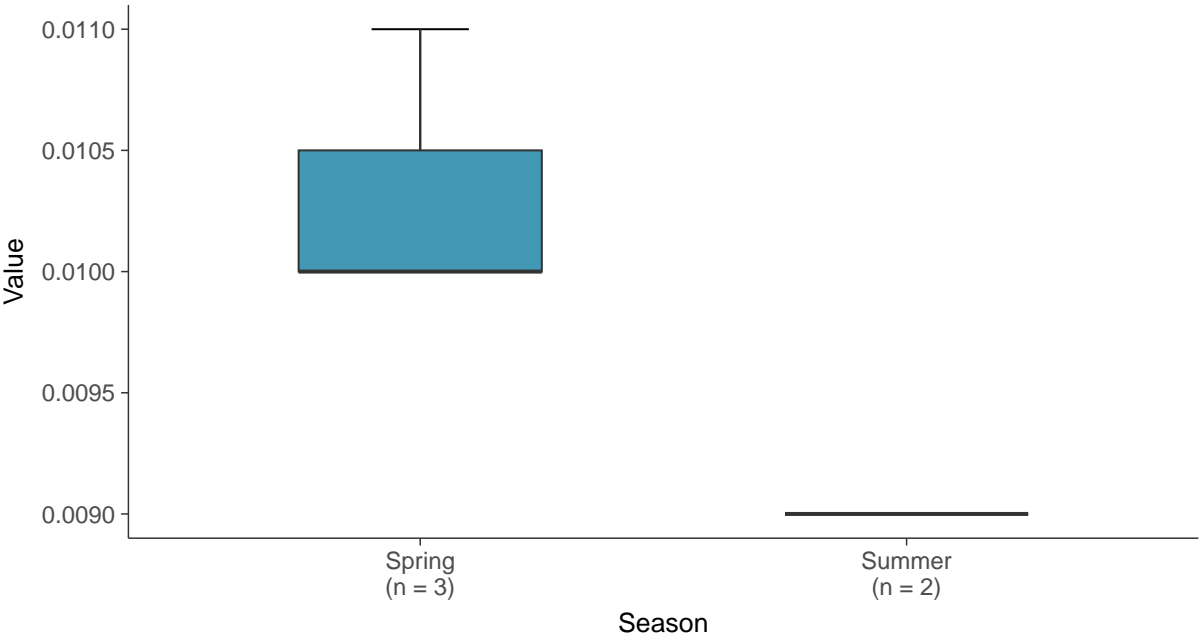
**Boxplot**

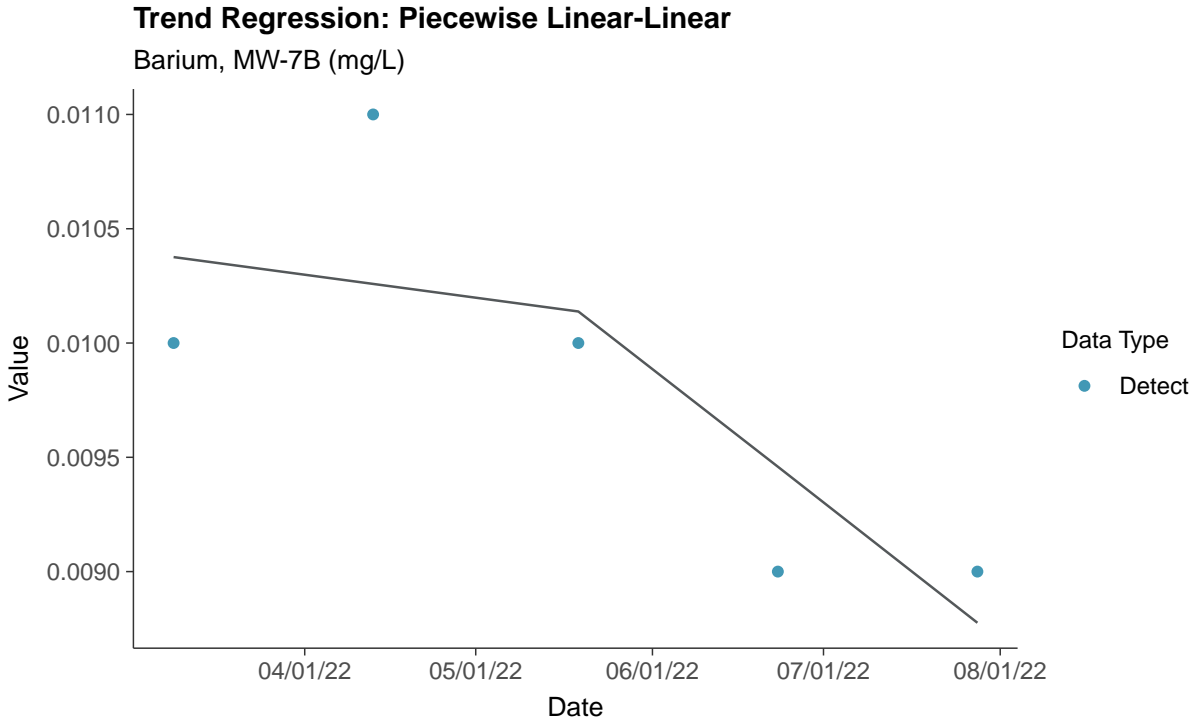
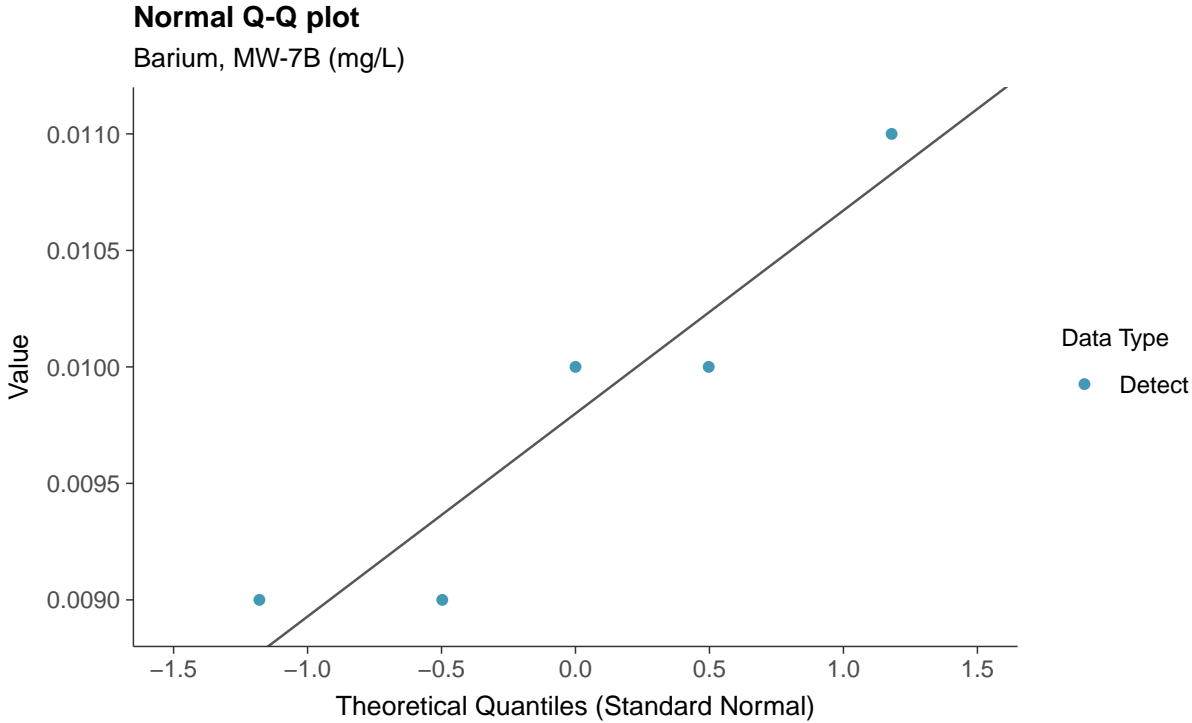
Barium, MW-7B (mg/L)



**Boxplot by Season**

Barium, MW-7B (mg/L)

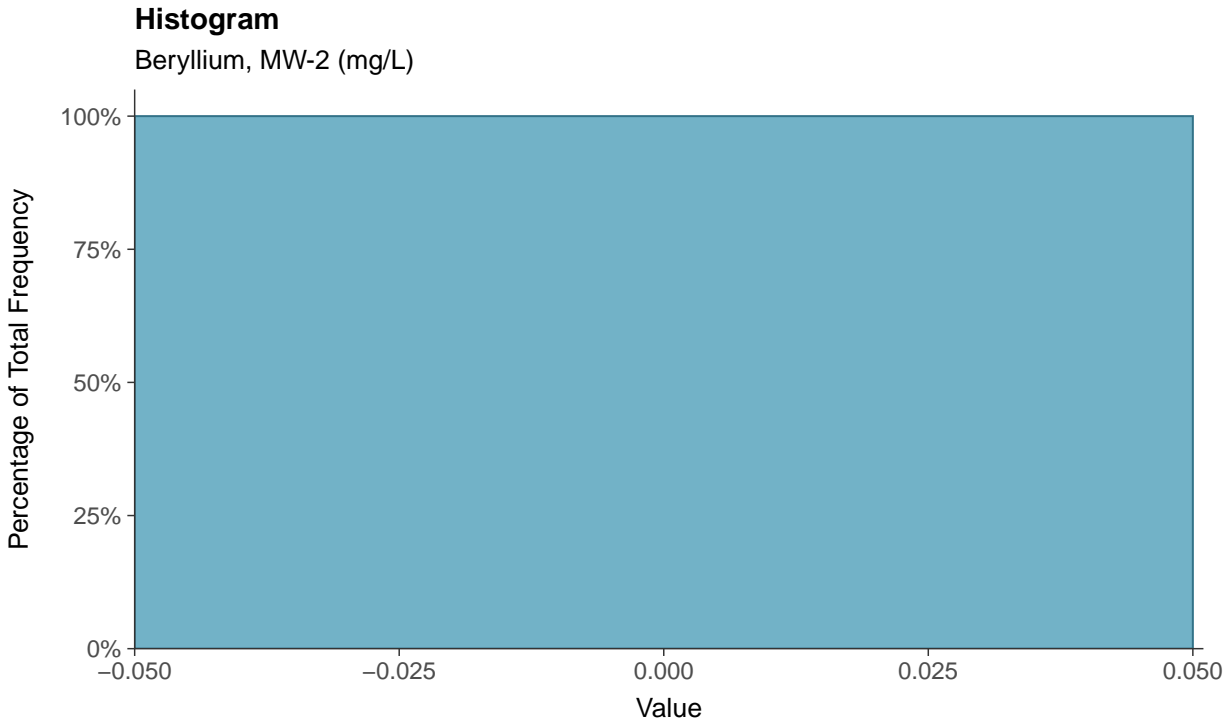
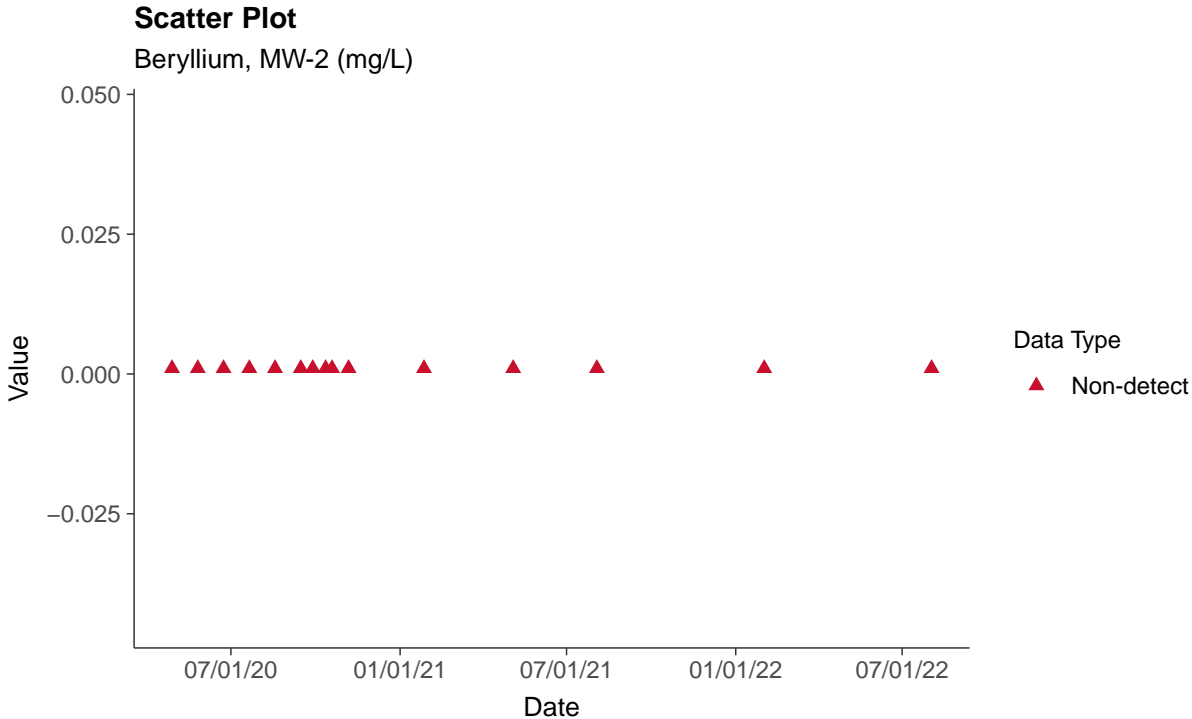






### Appendix IV: Beryllium, MW-2

ID: 2\_10\_02





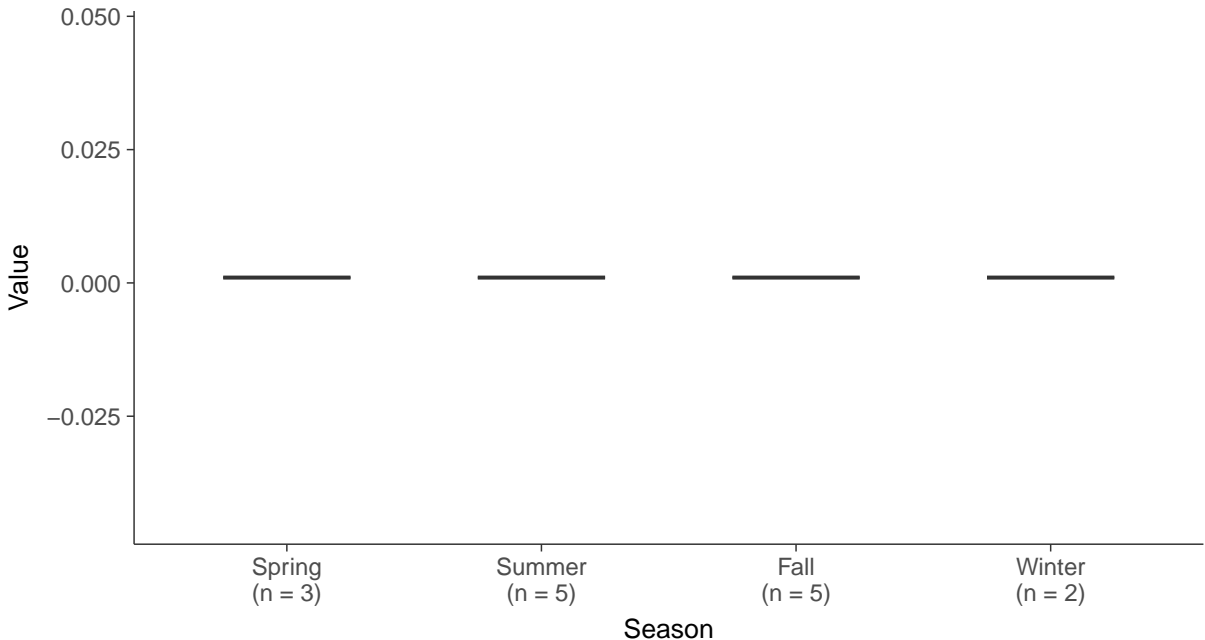
**Boxplot**

Beryllium, MW-2 (mg/L)



**Boxplot by Season**

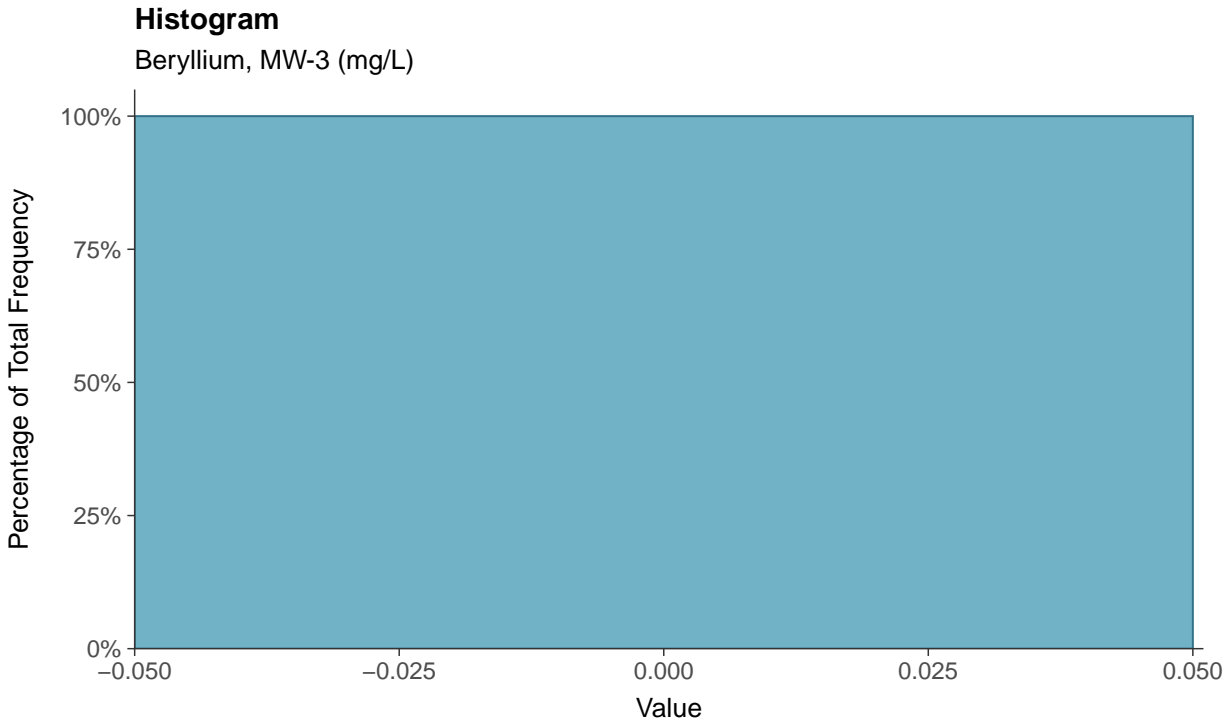
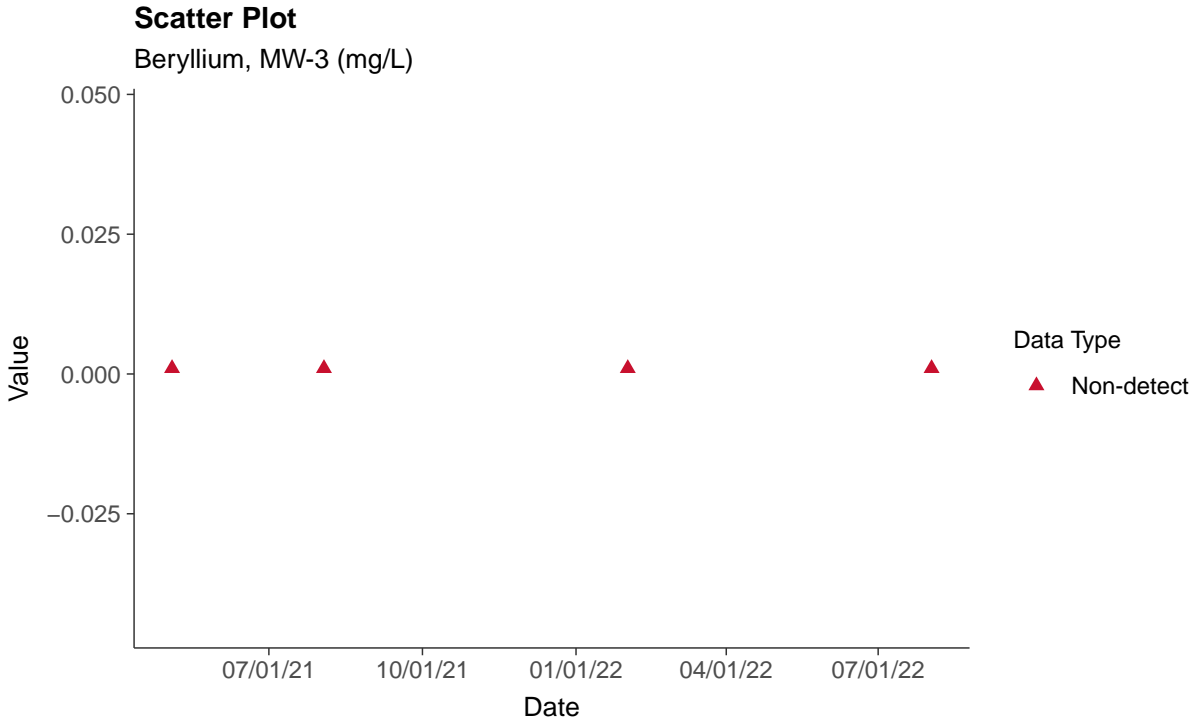
Beryllium, MW-2 (mg/L)

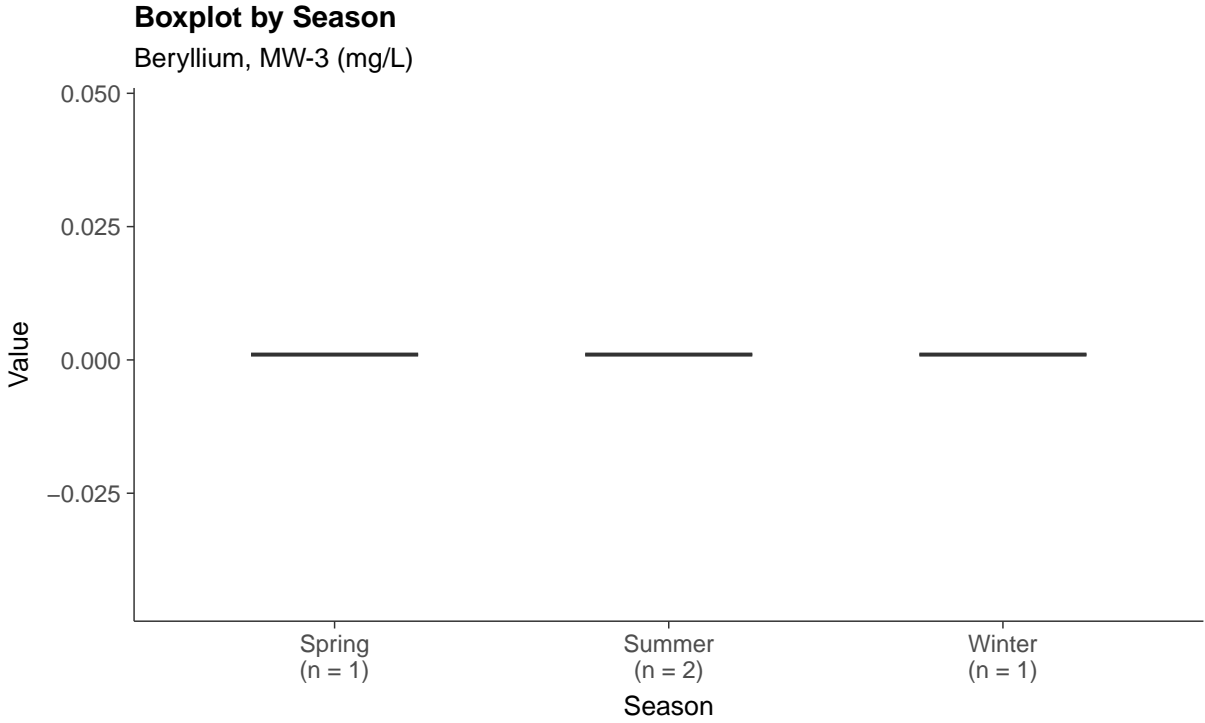
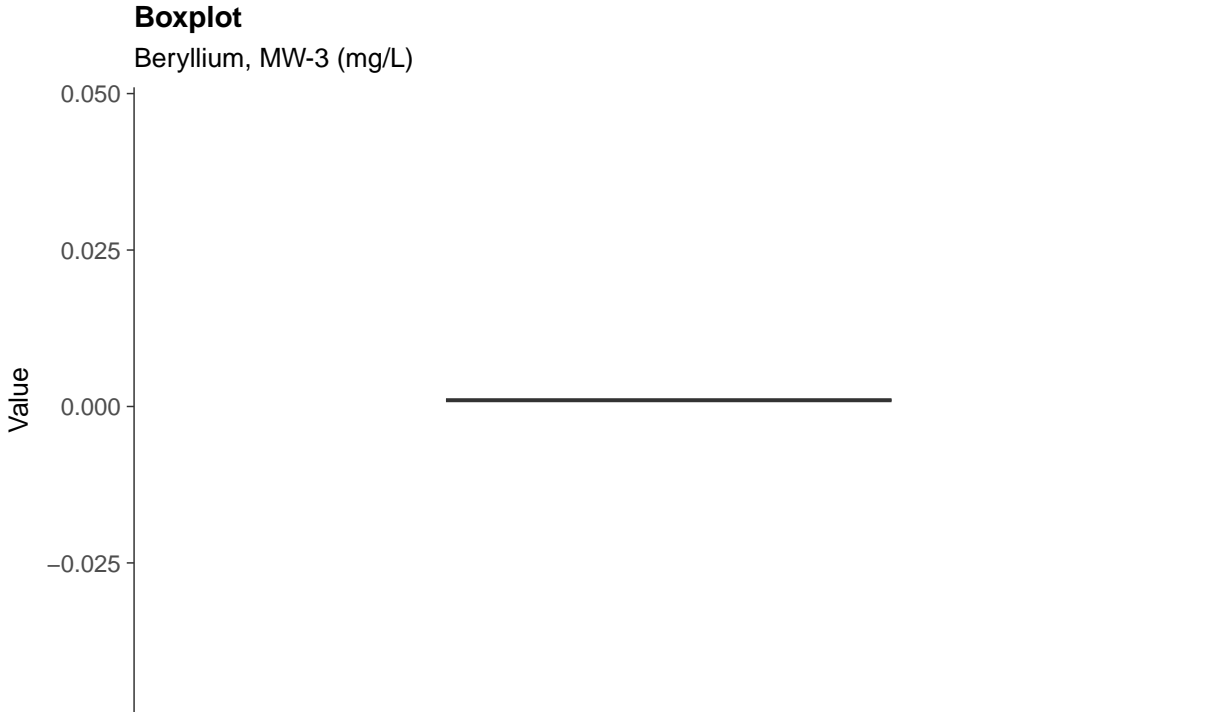




### Appendix IV: Beryllium, MW-3

ID: 2\_10\_03

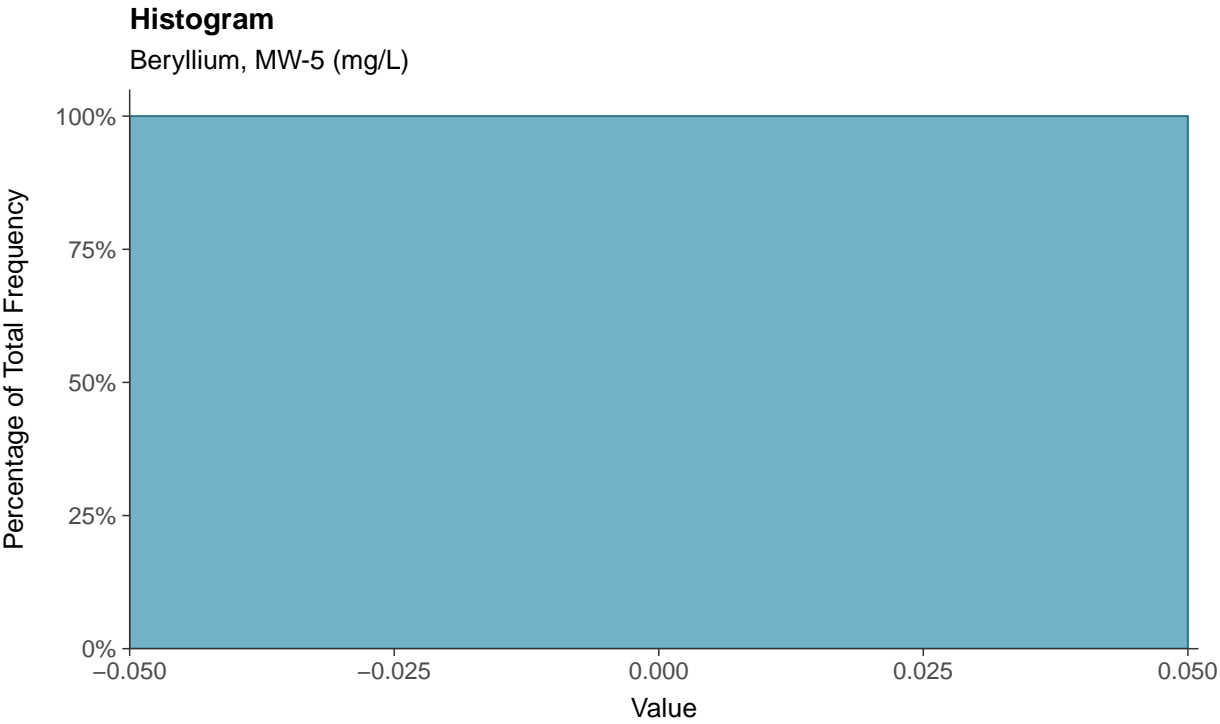
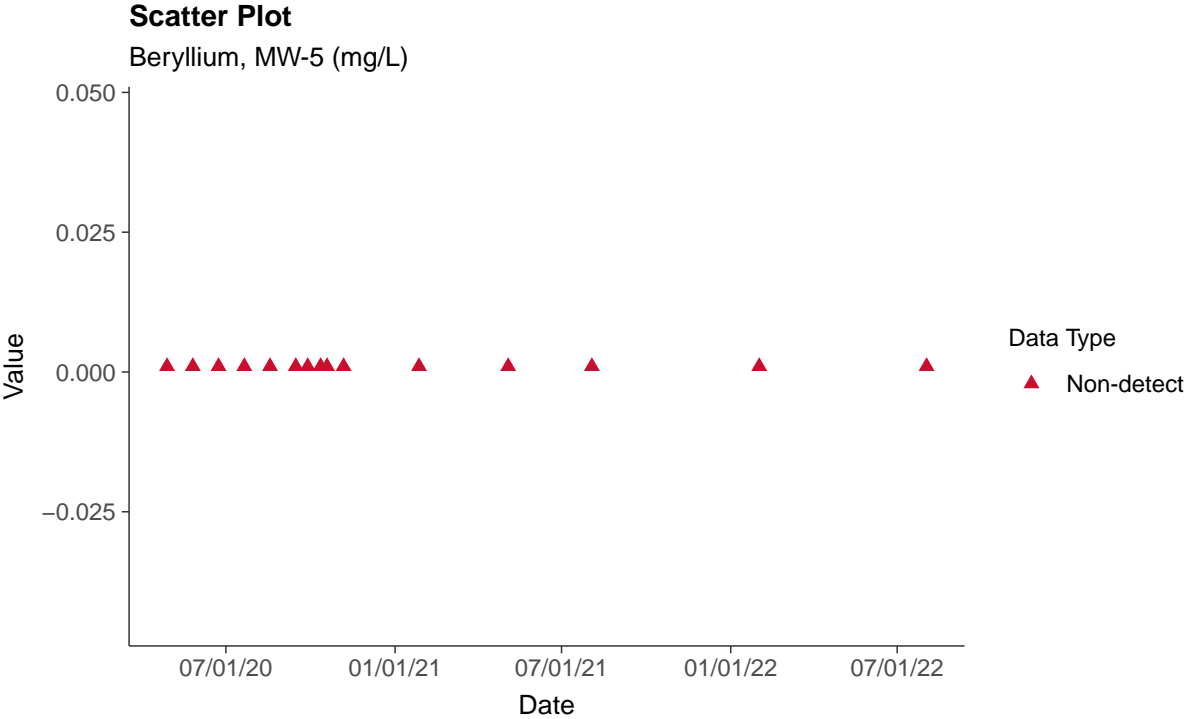


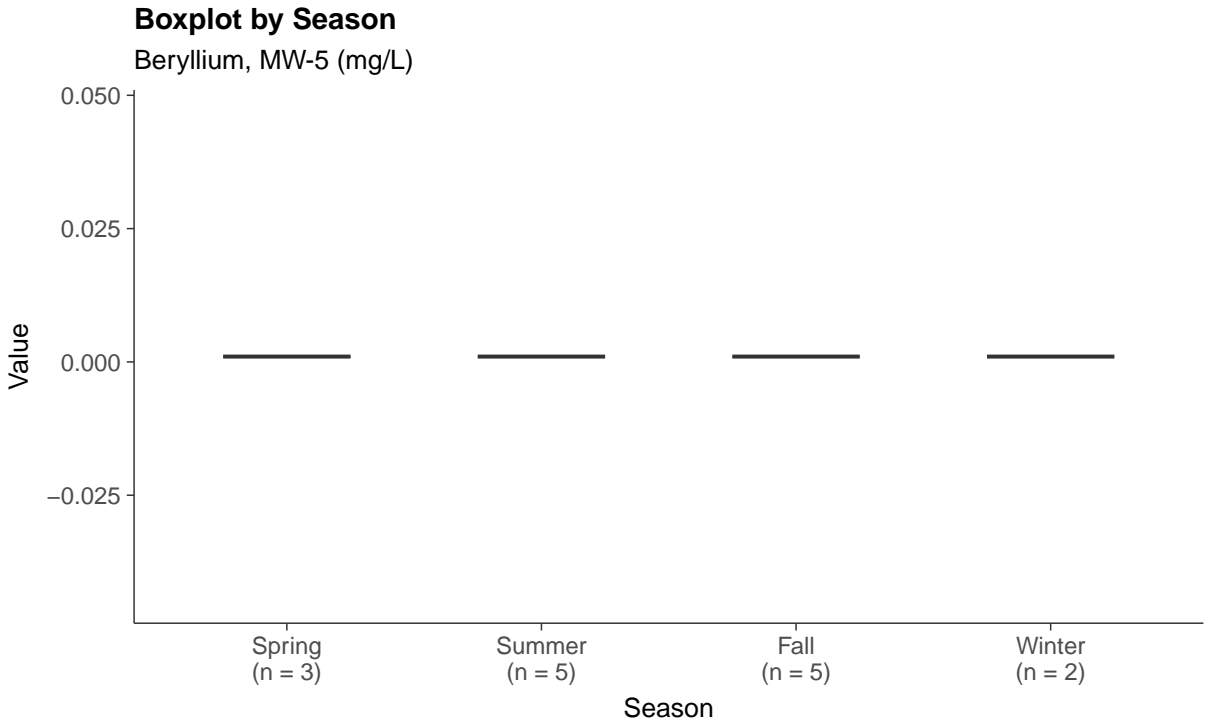
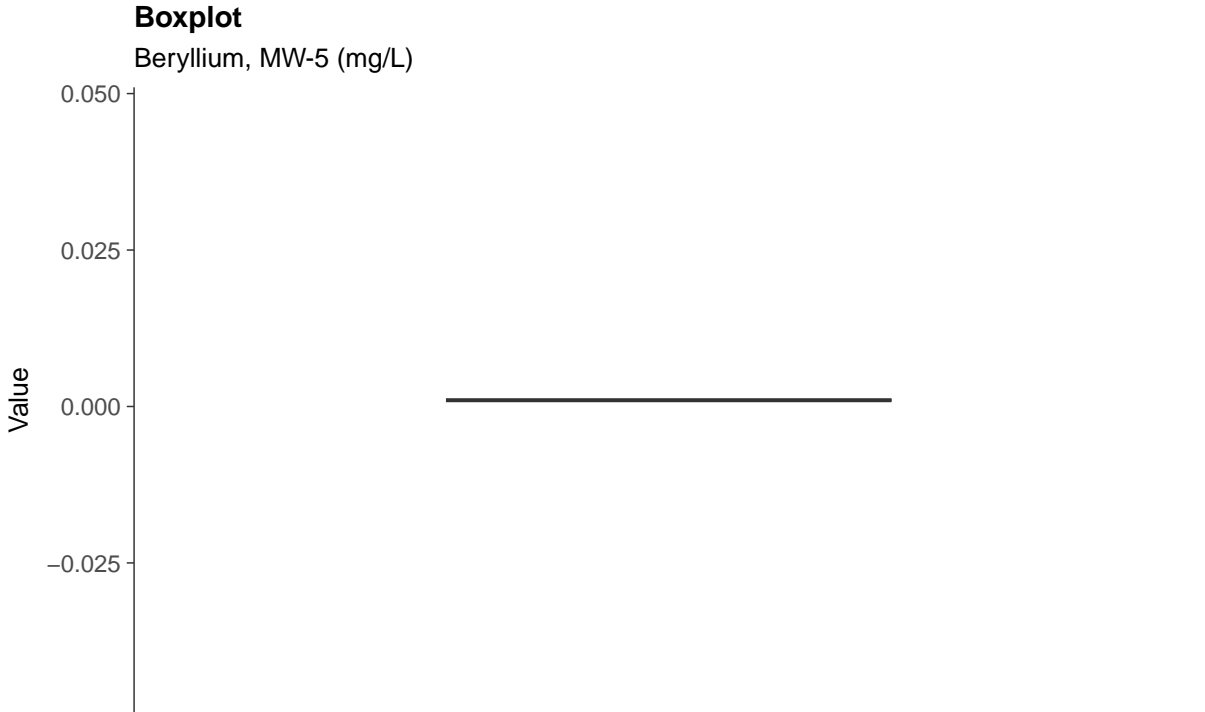




### Appendix IV: Beryllium, MW-5

ID: 2\_10\_05



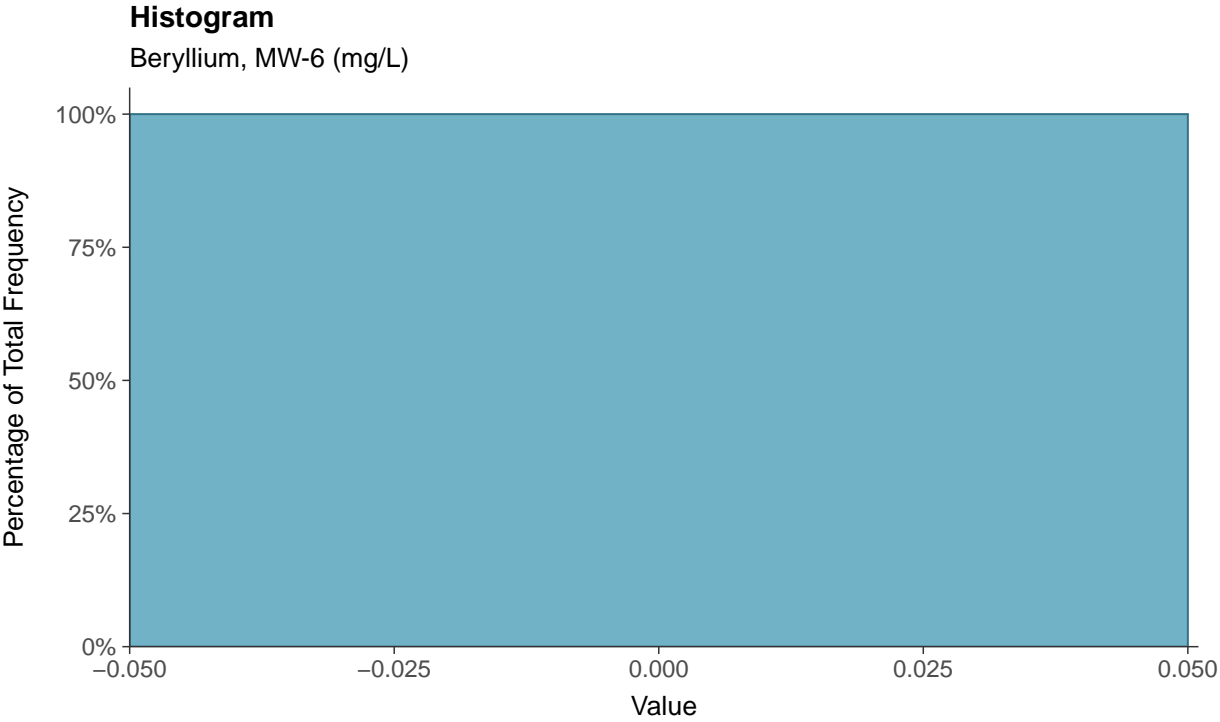
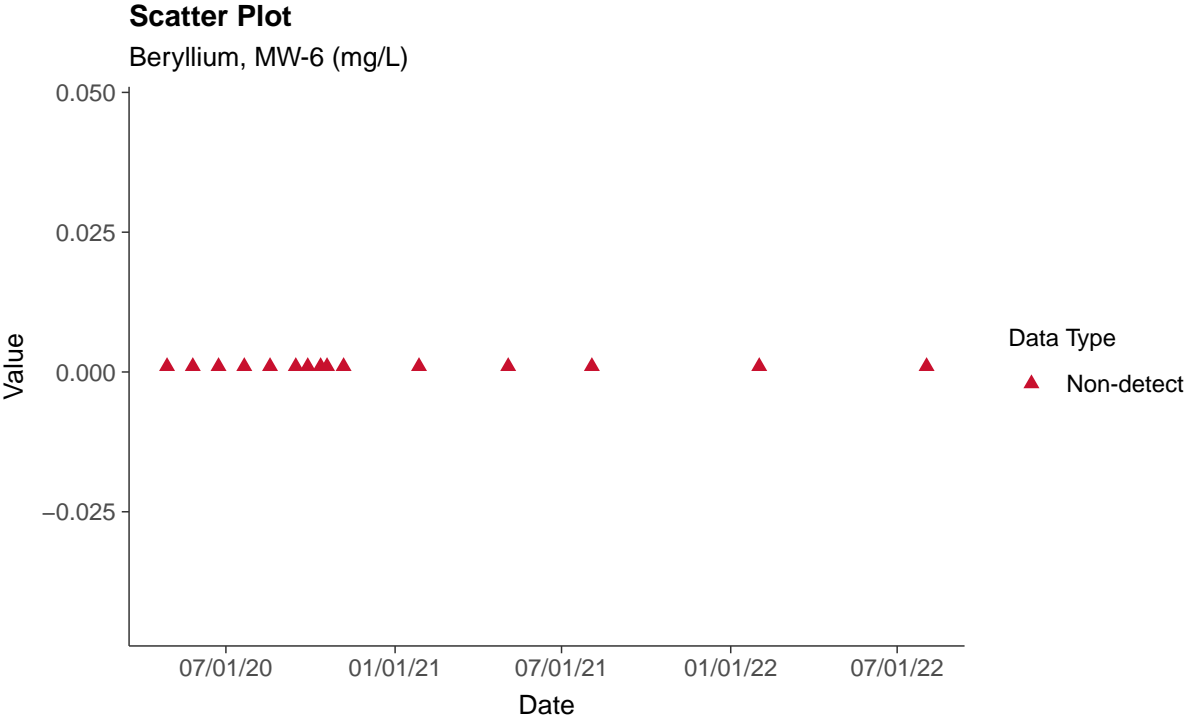


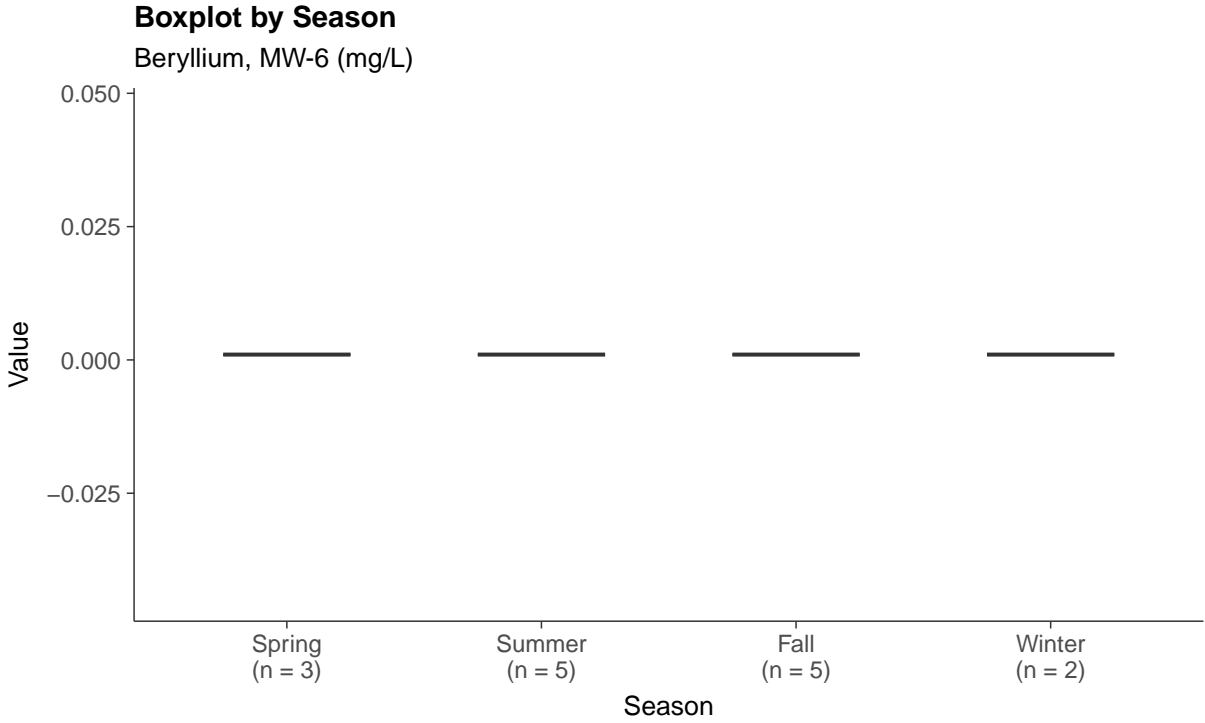
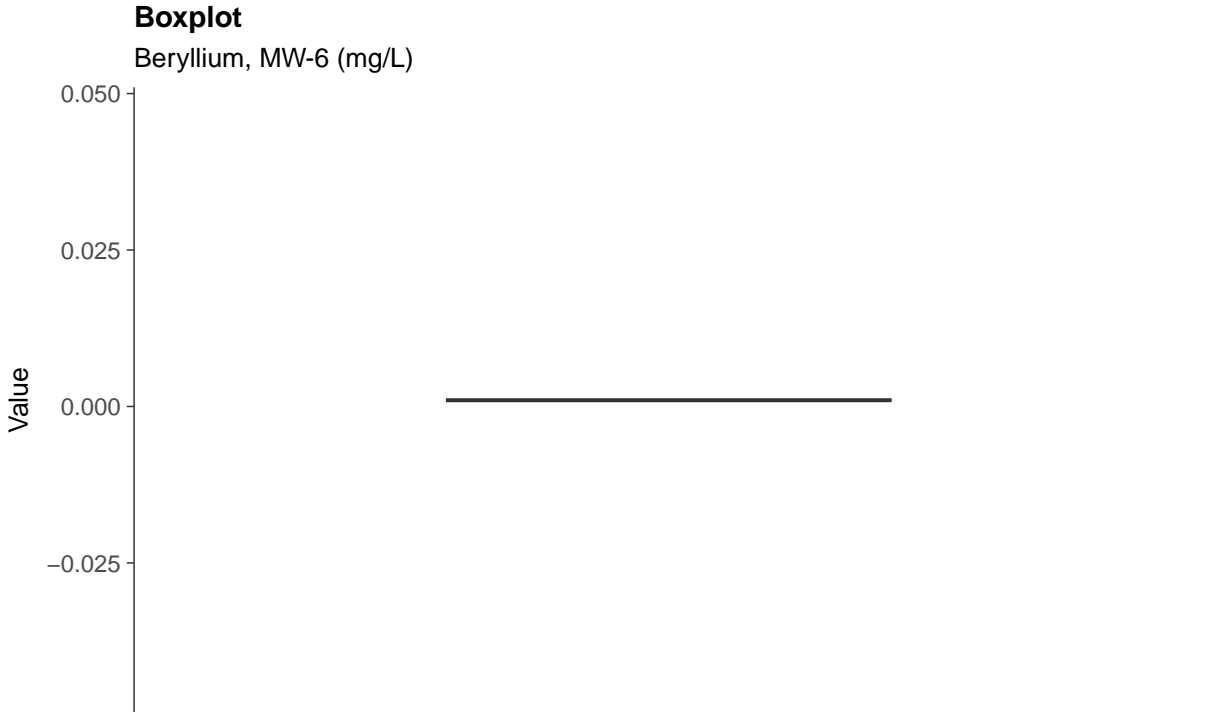




### Appendix IV: Beryllium, MW-6

ID: 2\_10\_06

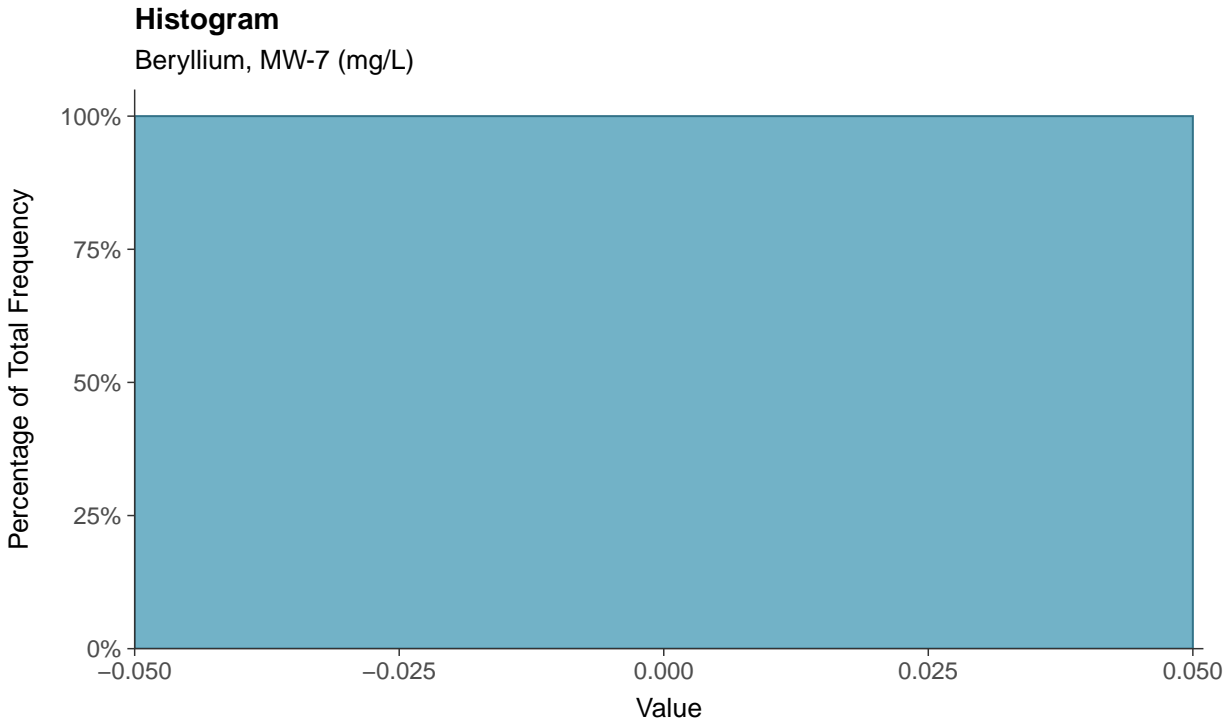
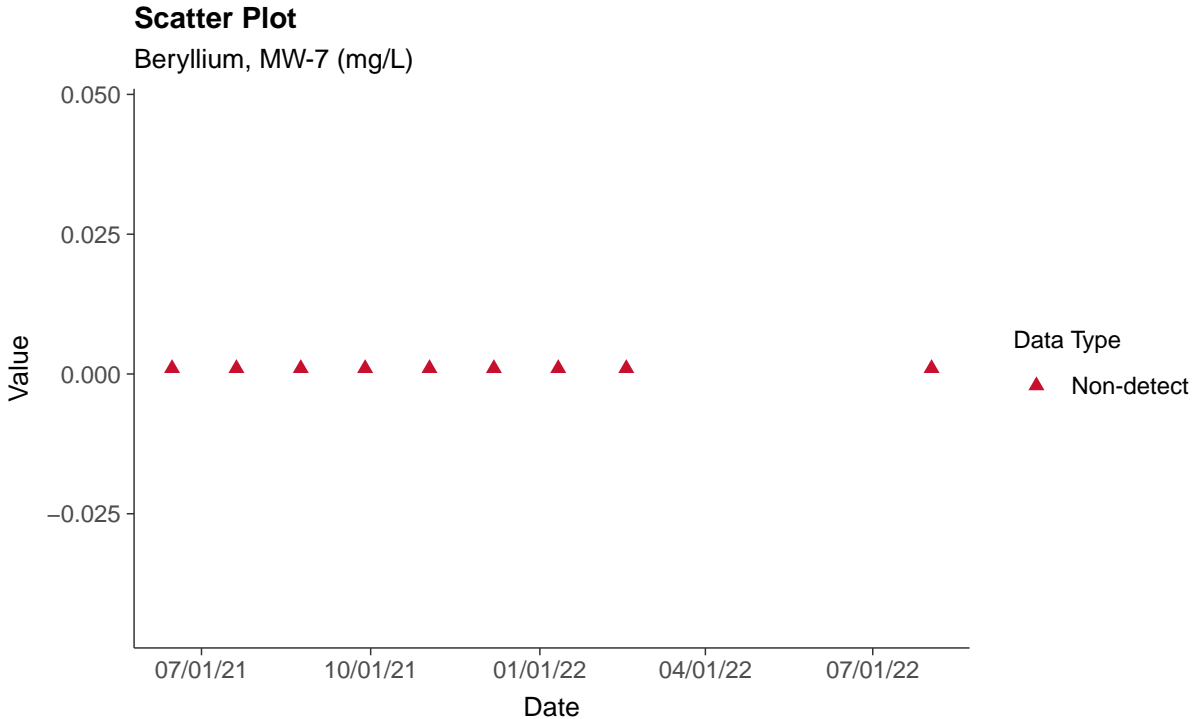


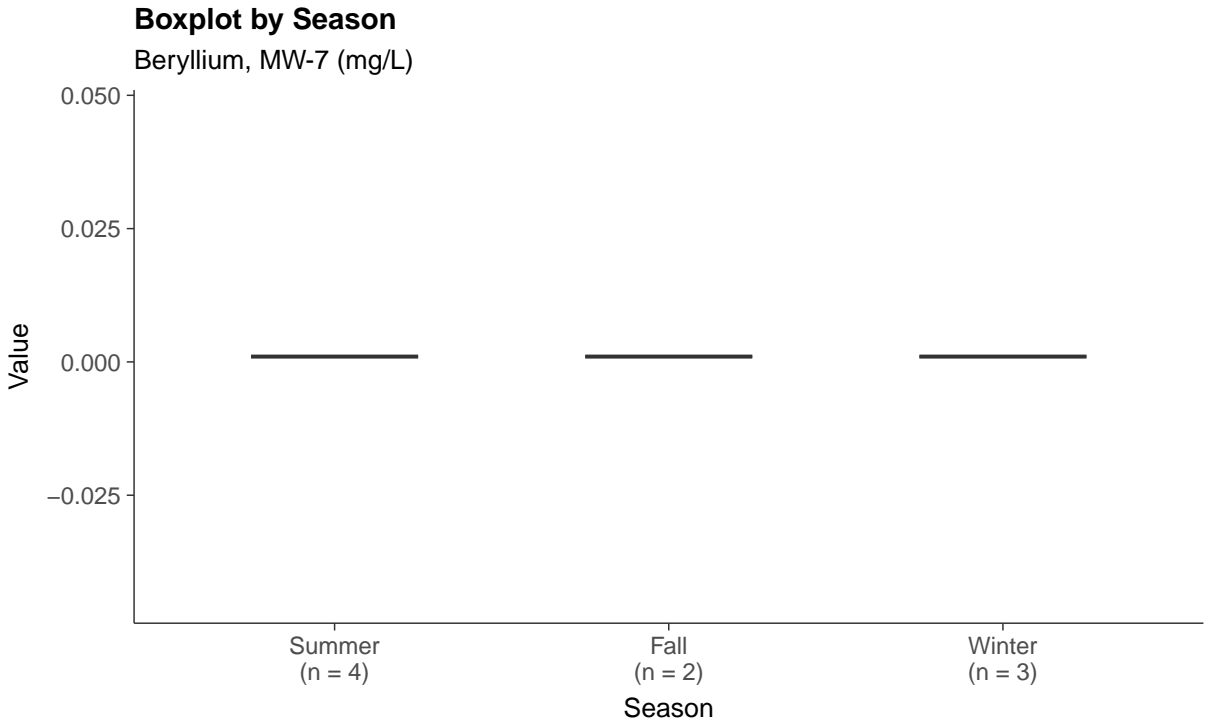
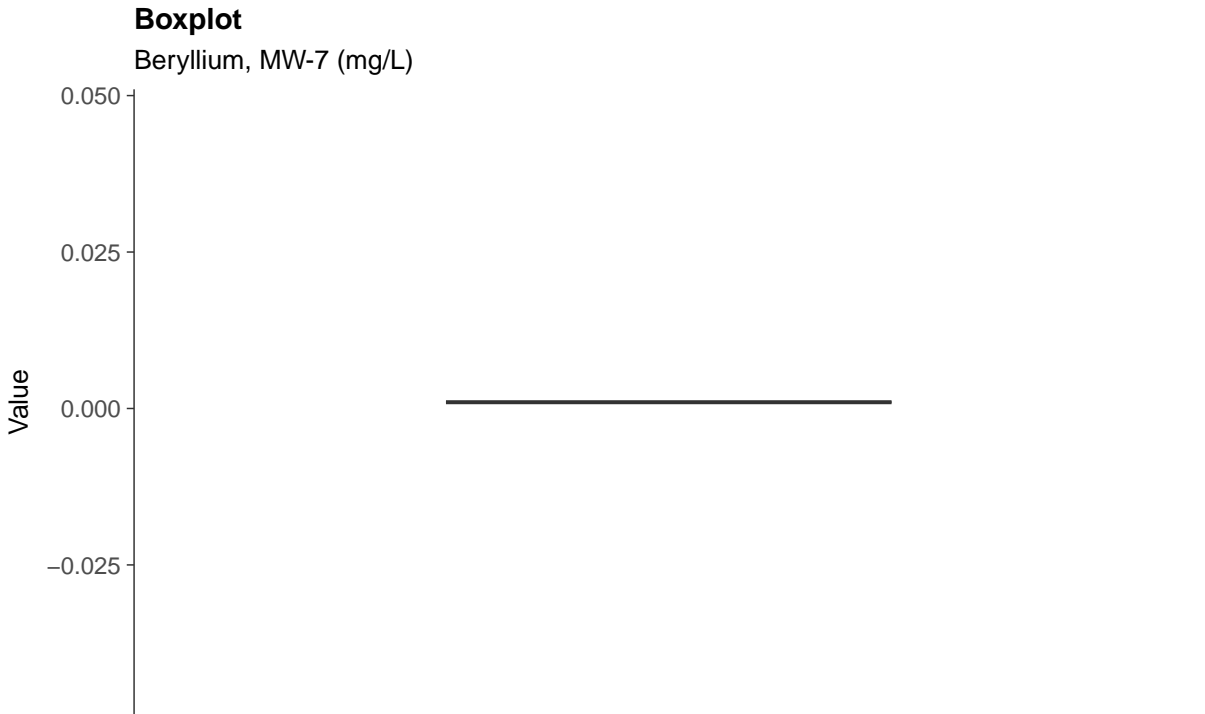




### Appendix IV: Beryllium, MW-7

ID: 2\_10\_07

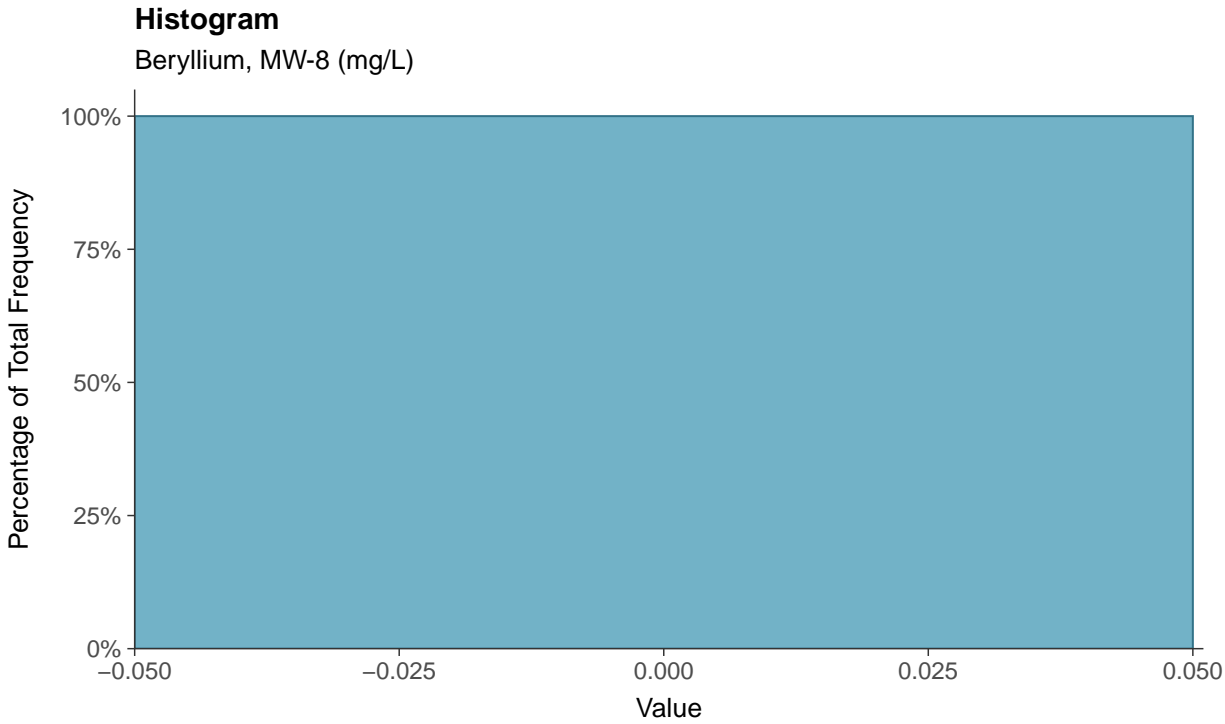
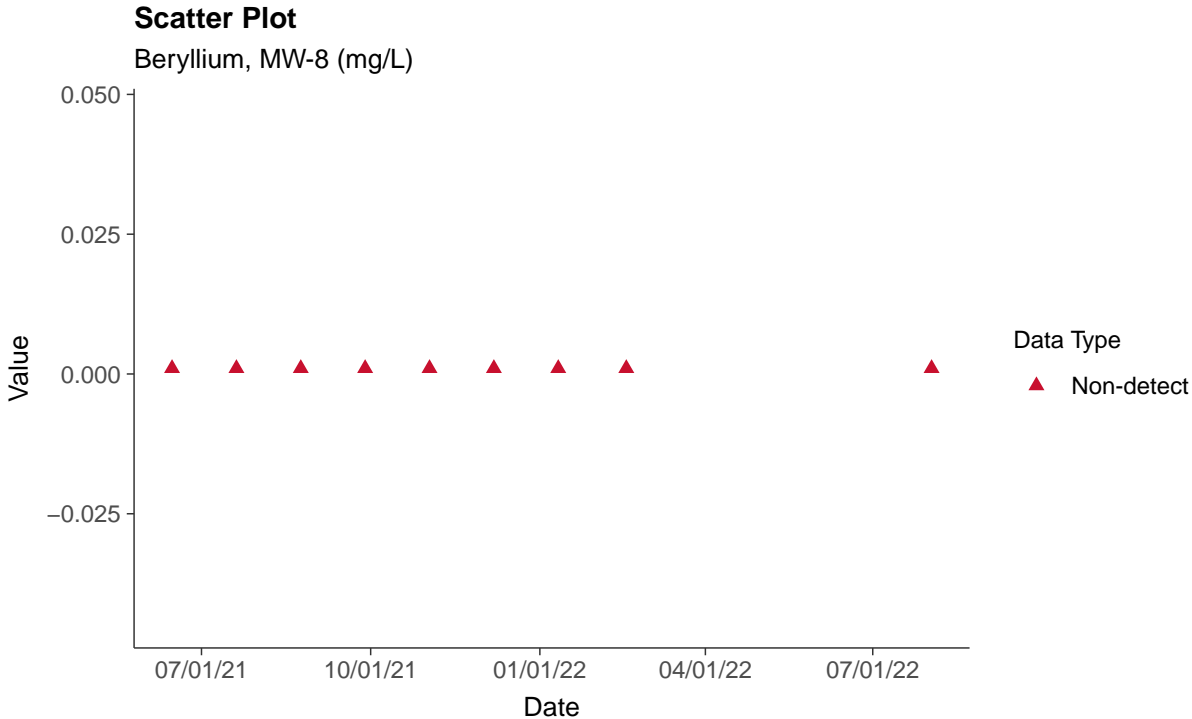


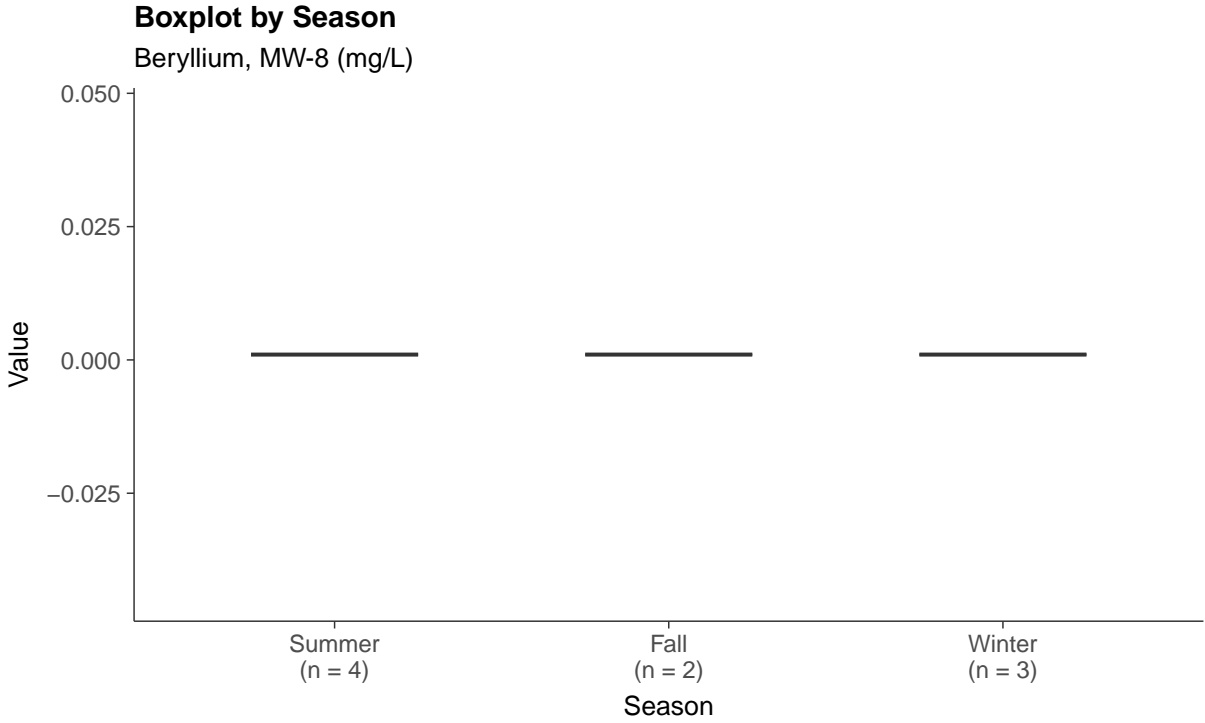
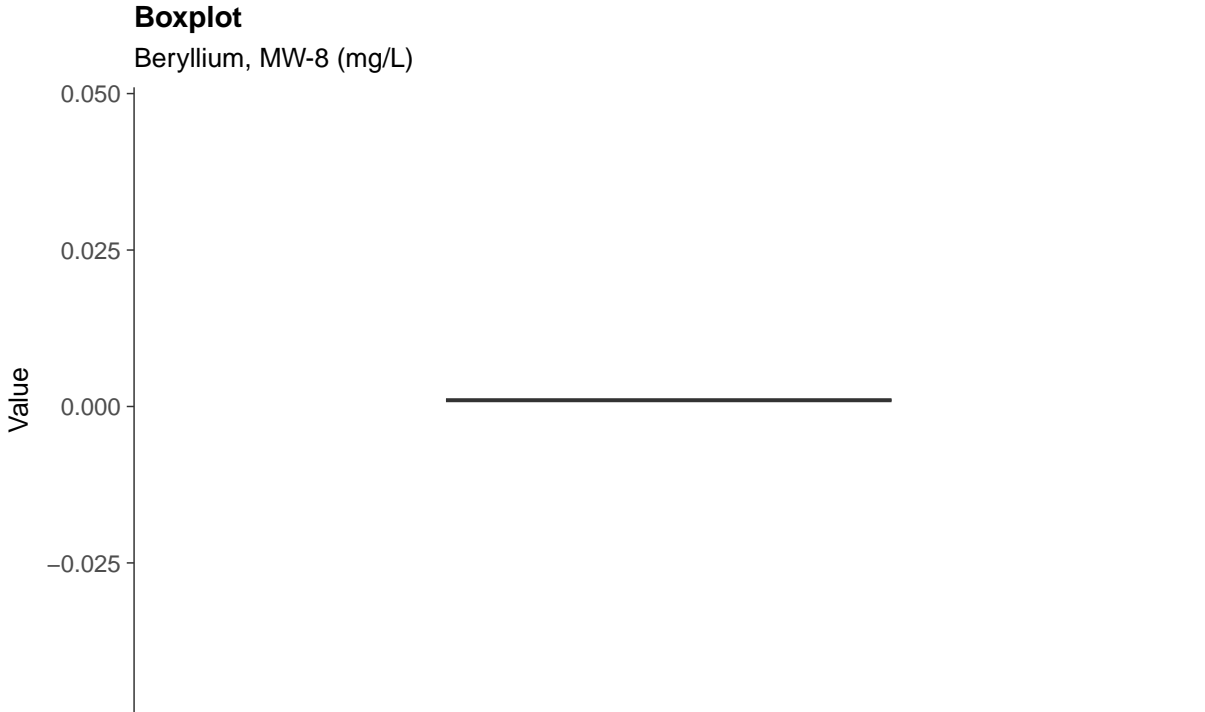




### Appendix IV: Beryllium, MW-8

ID: 2\_10\_08

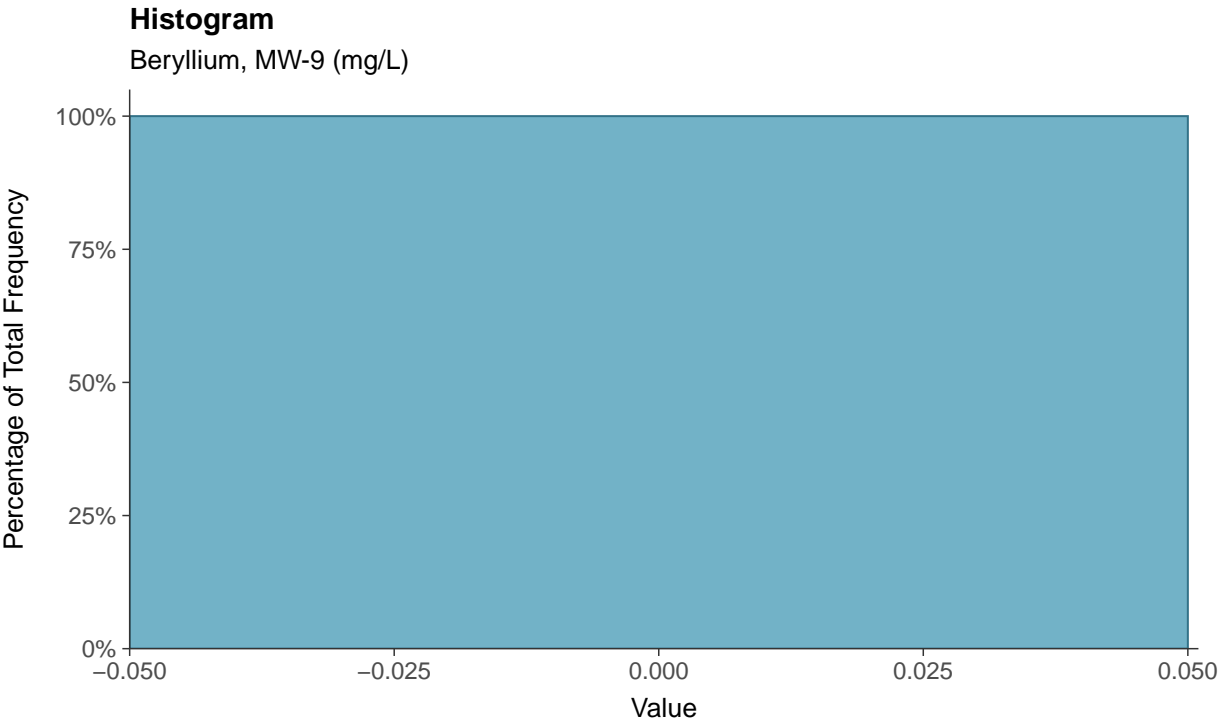
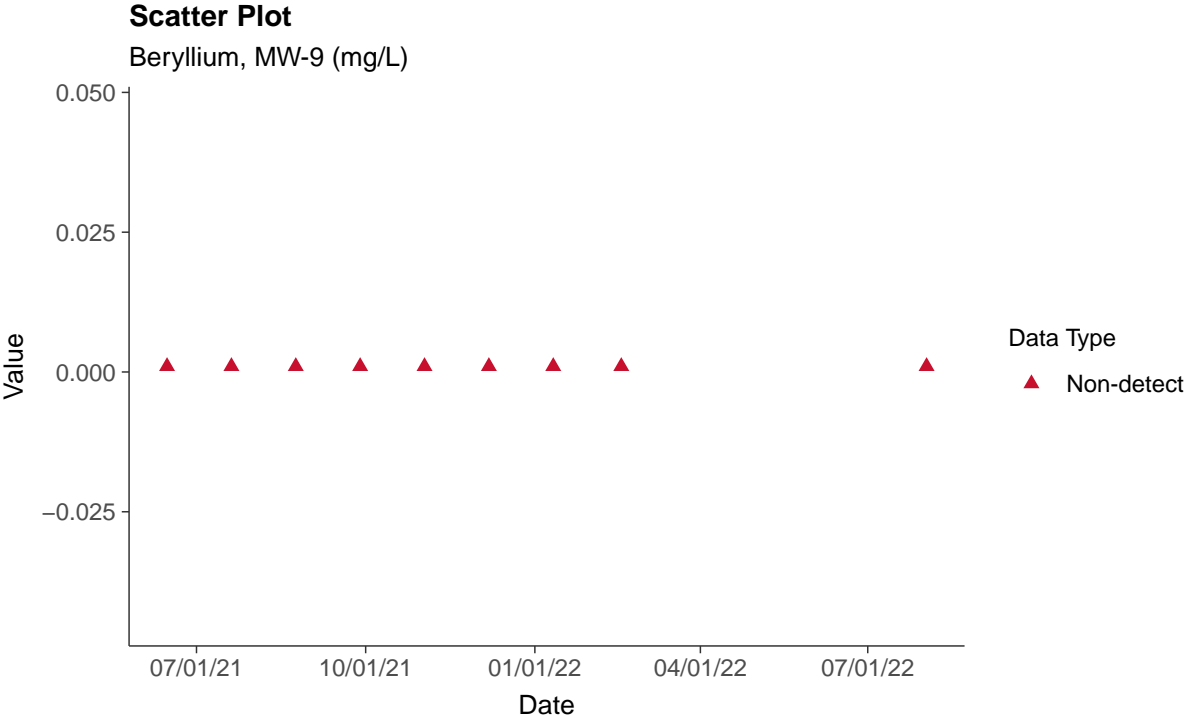


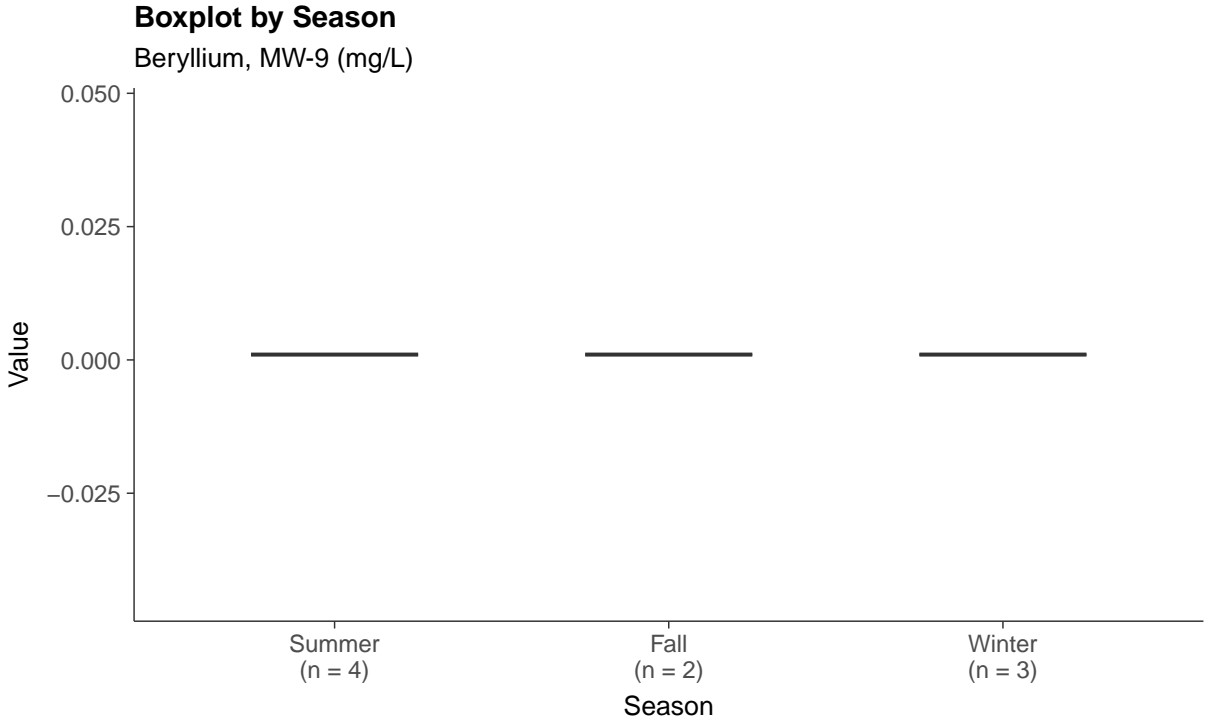
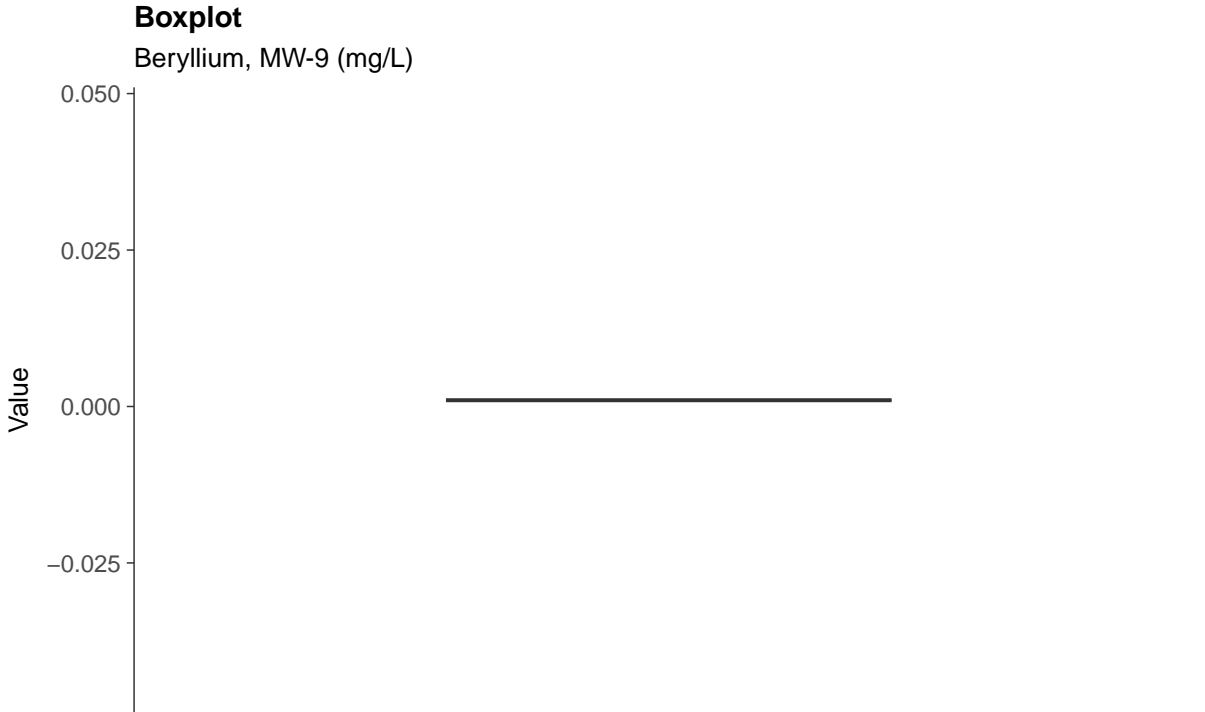




### Appendix IV: Beryllium, MW-9

ID: 2\_10\_09



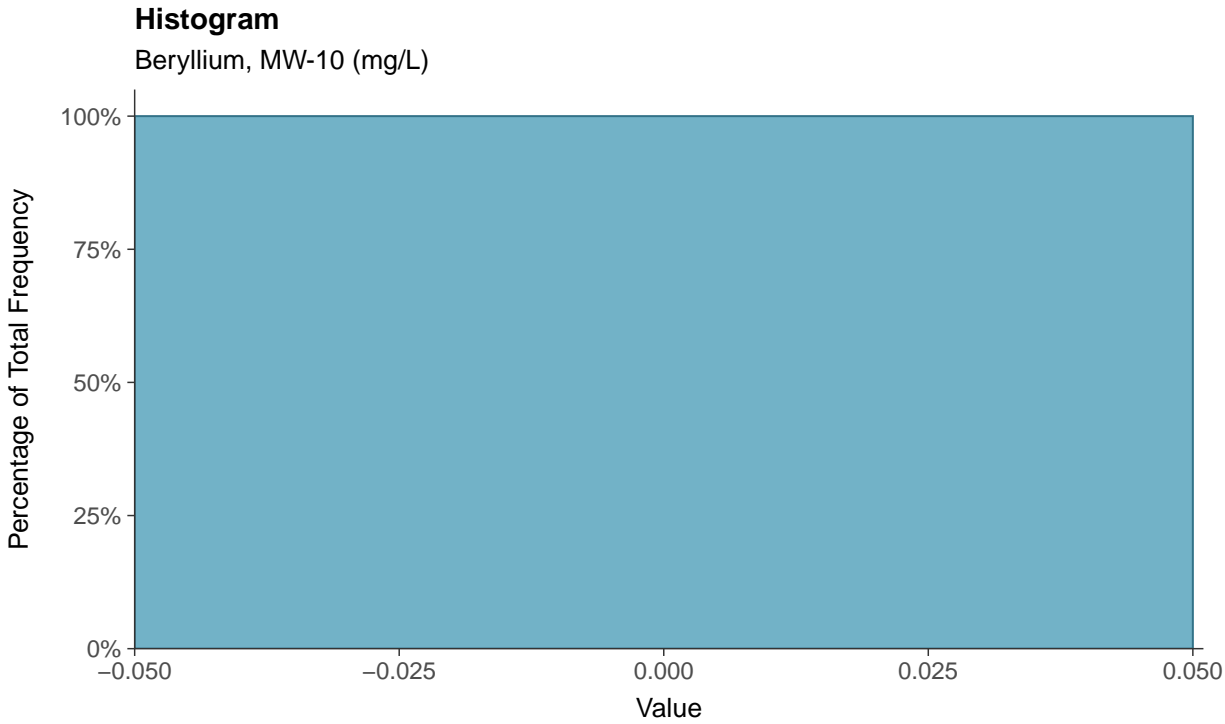
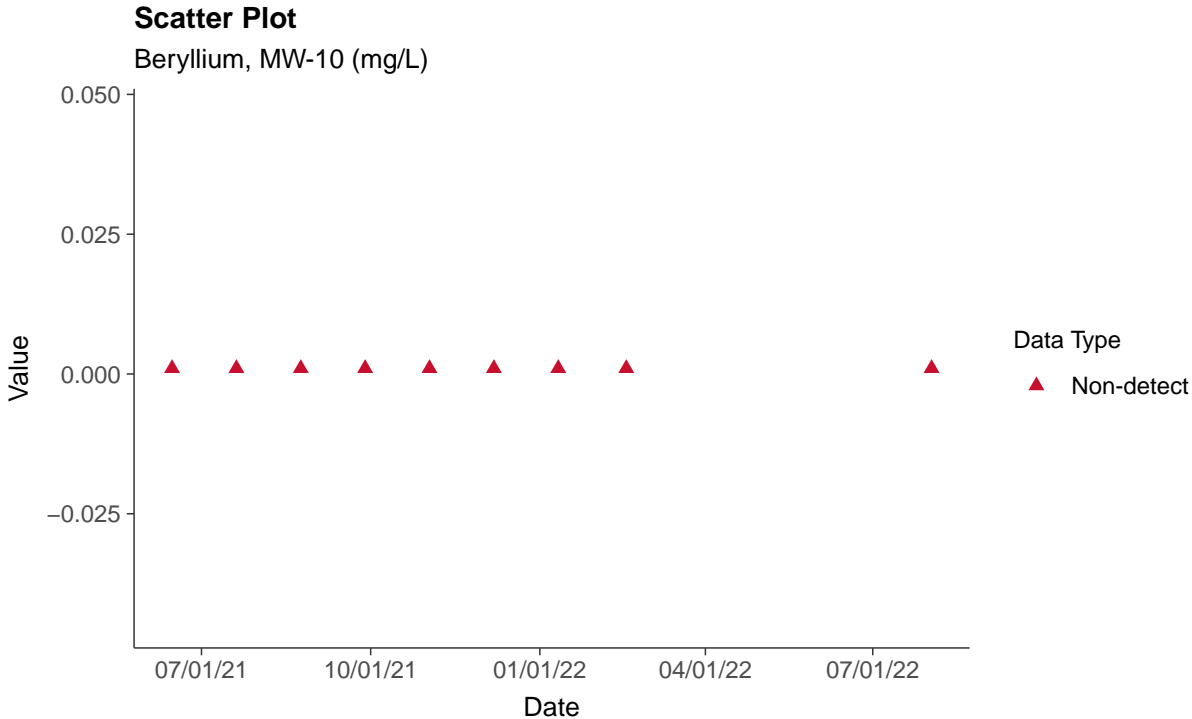


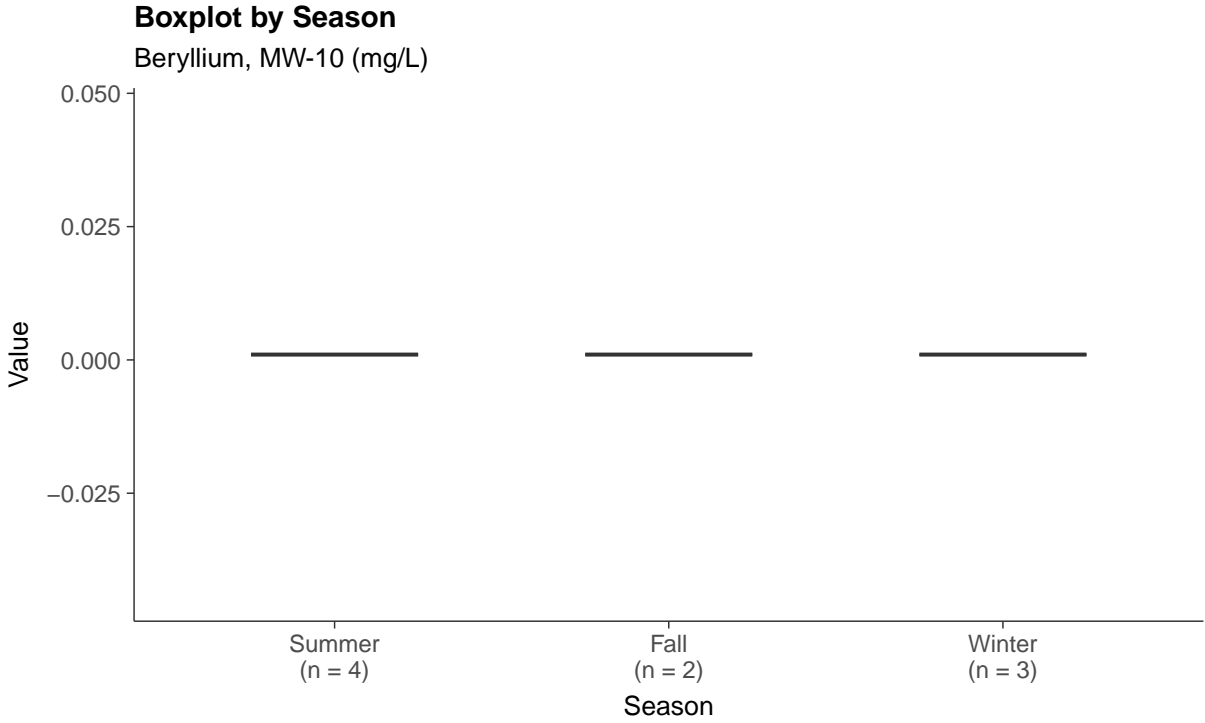
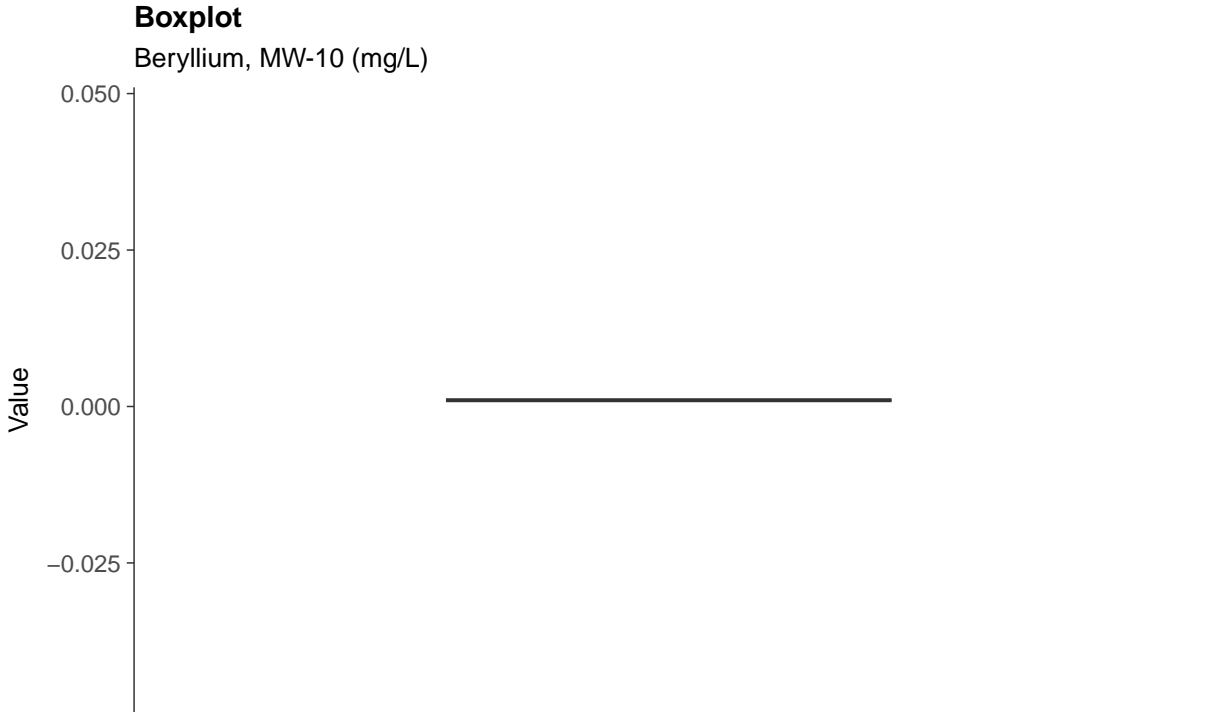




### Appendix IV: Beryllium, MW-10

ID: 2\_10\_10





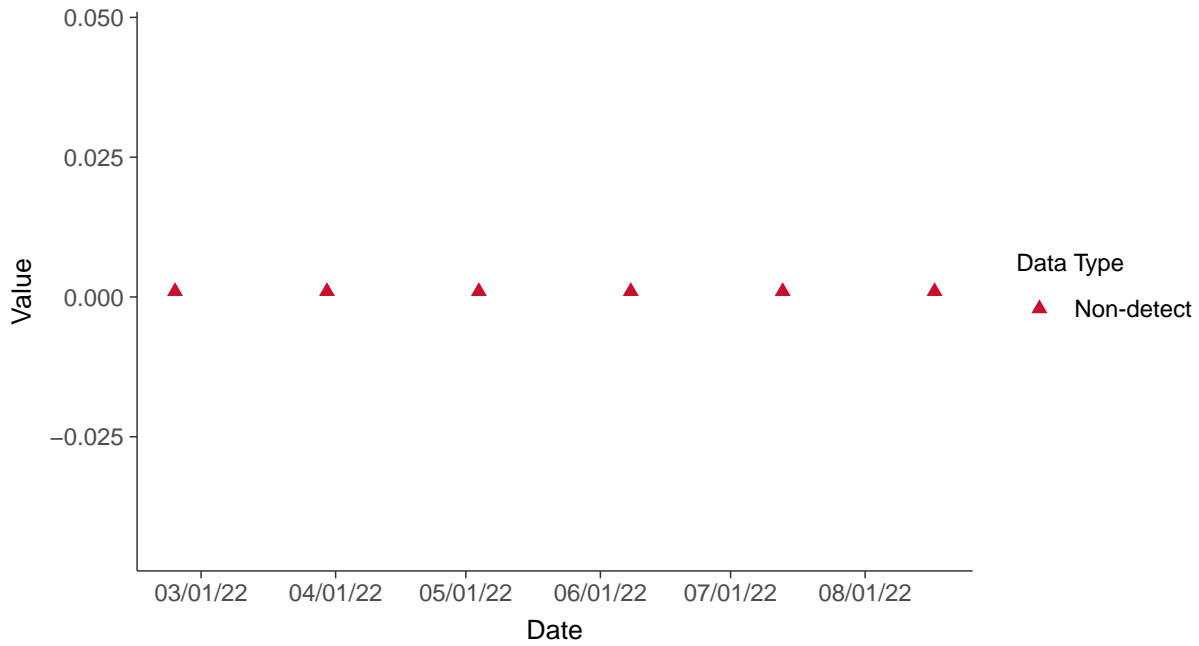


## Appendix IV: Beryllium, MW-13

ID: 2\_10\_13

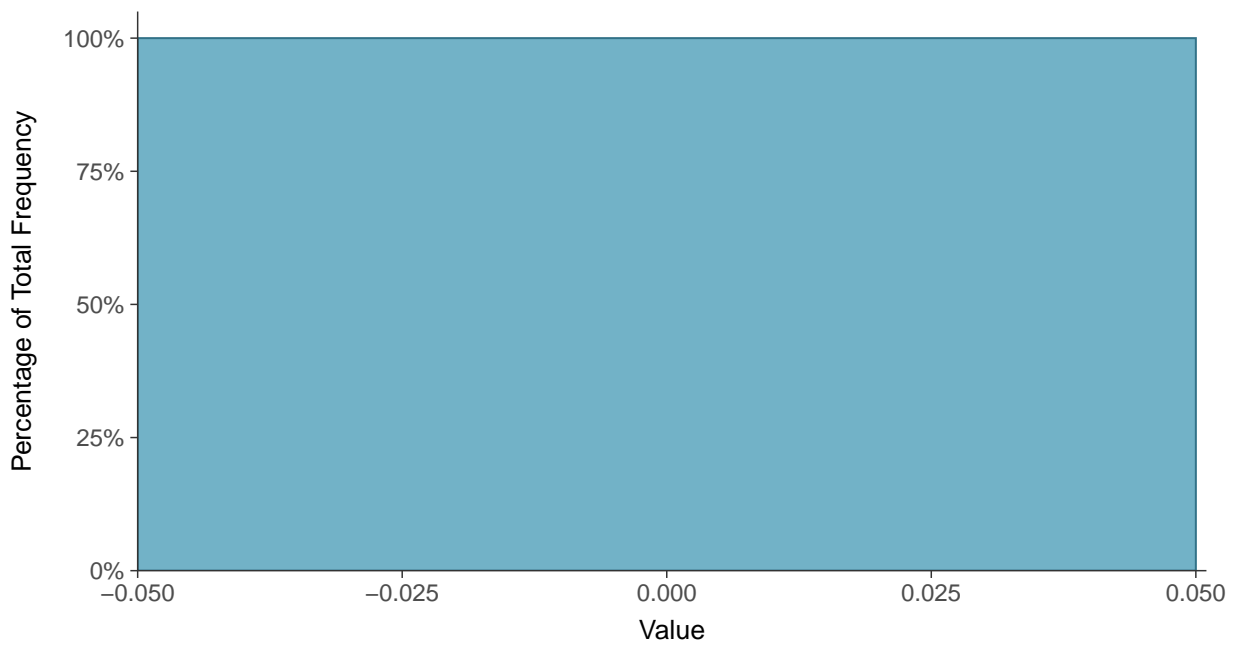
### Scatter Plot

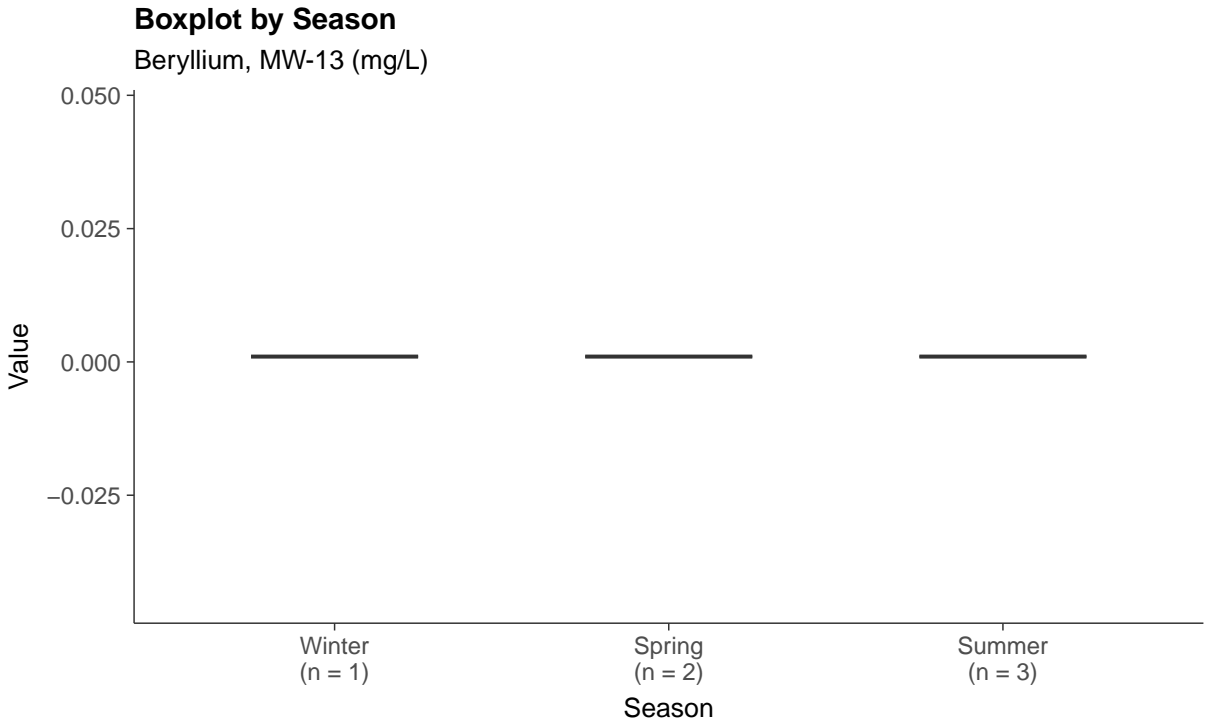
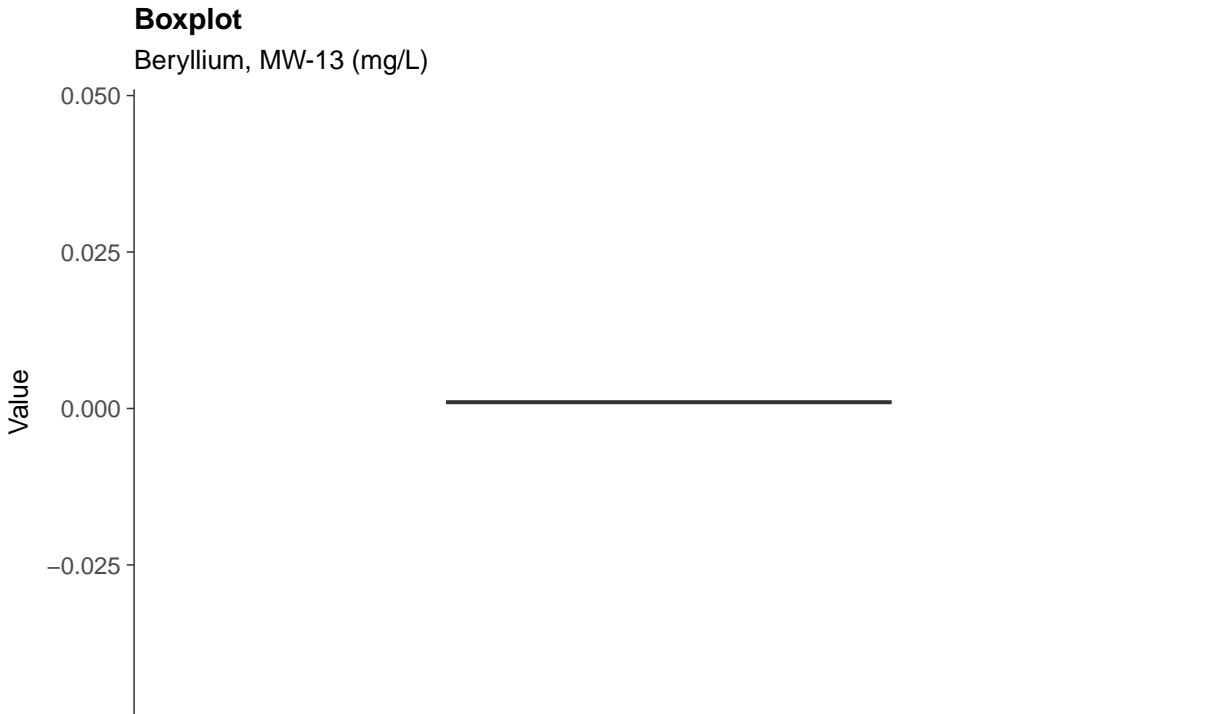
Beryllium, MW-13 (mg/L)



### Histogram

Beryllium, MW-13 (mg/L)

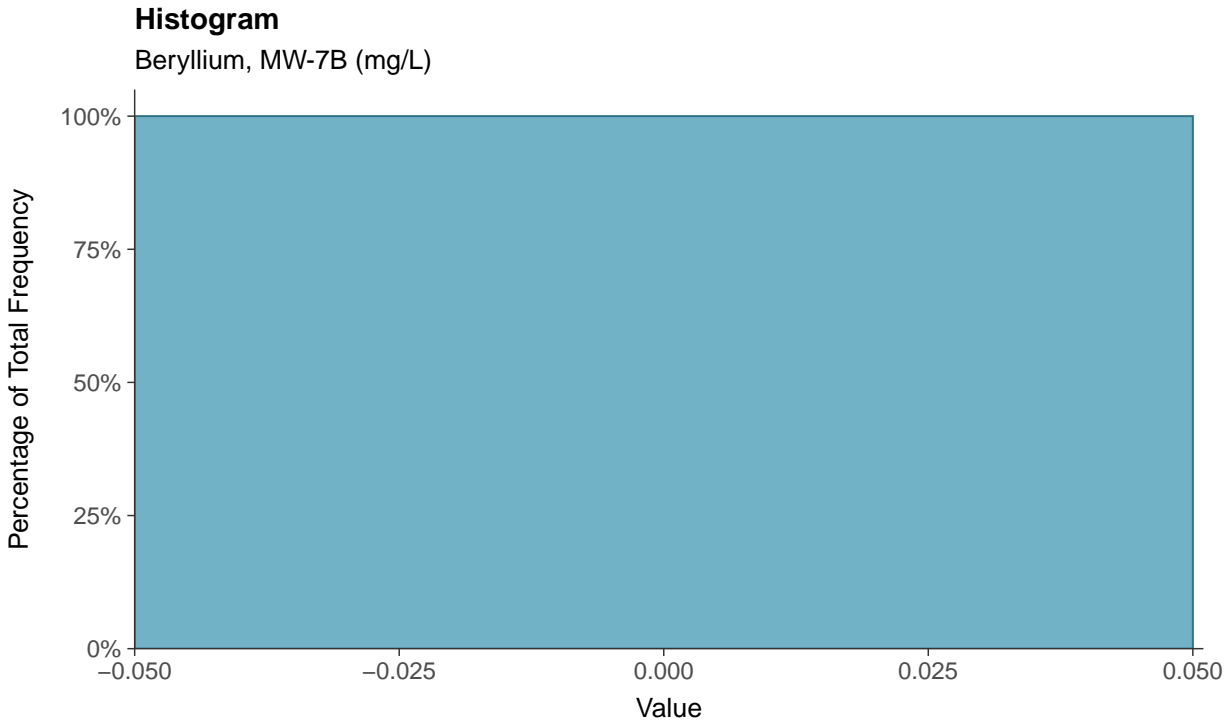
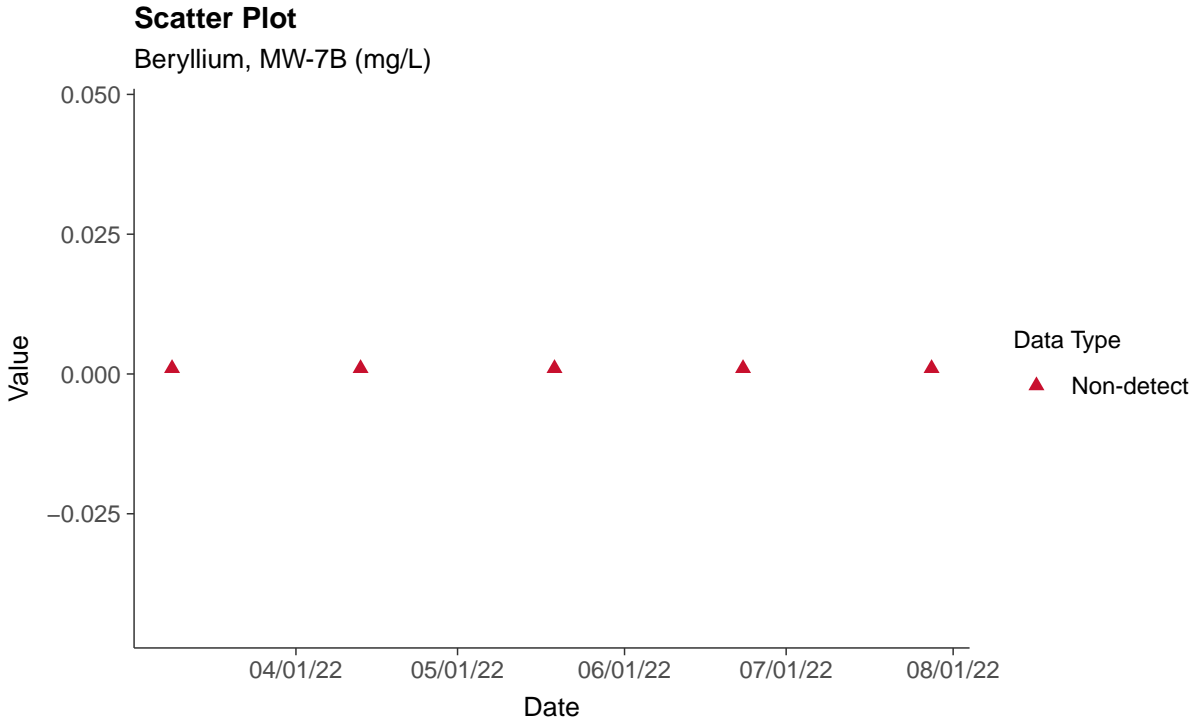






### Appendix IV: Beryllium, MW-7B

ID: 2\_10\_7B





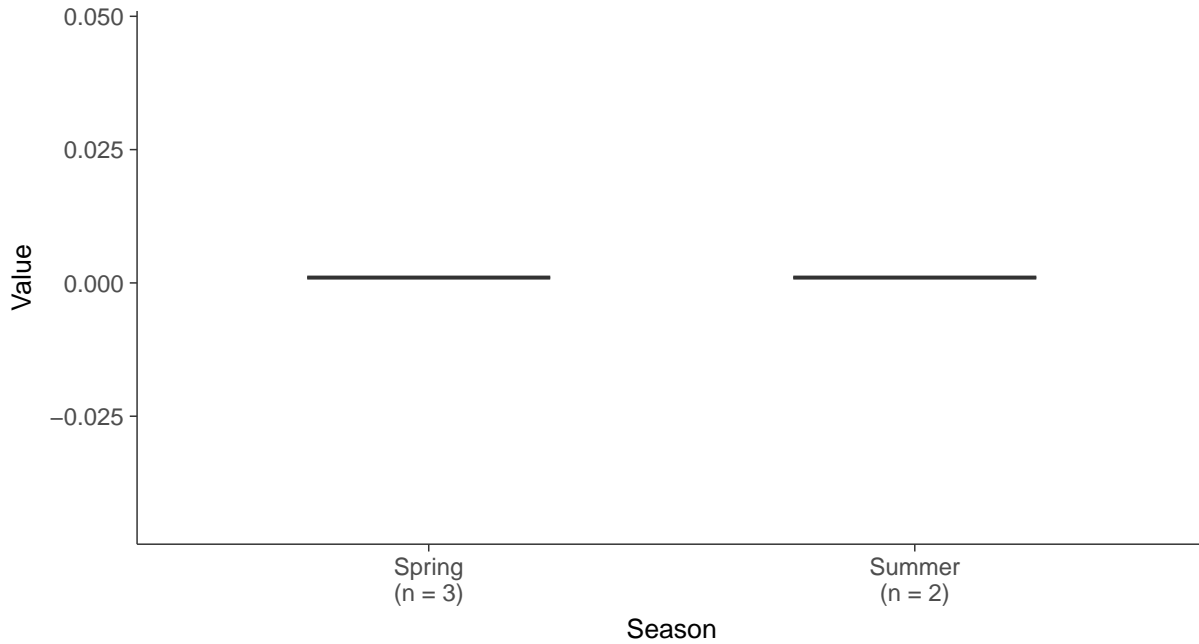
### Boxplot

Beryllium, MW-7B (mg/L)



### Boxplot by Season

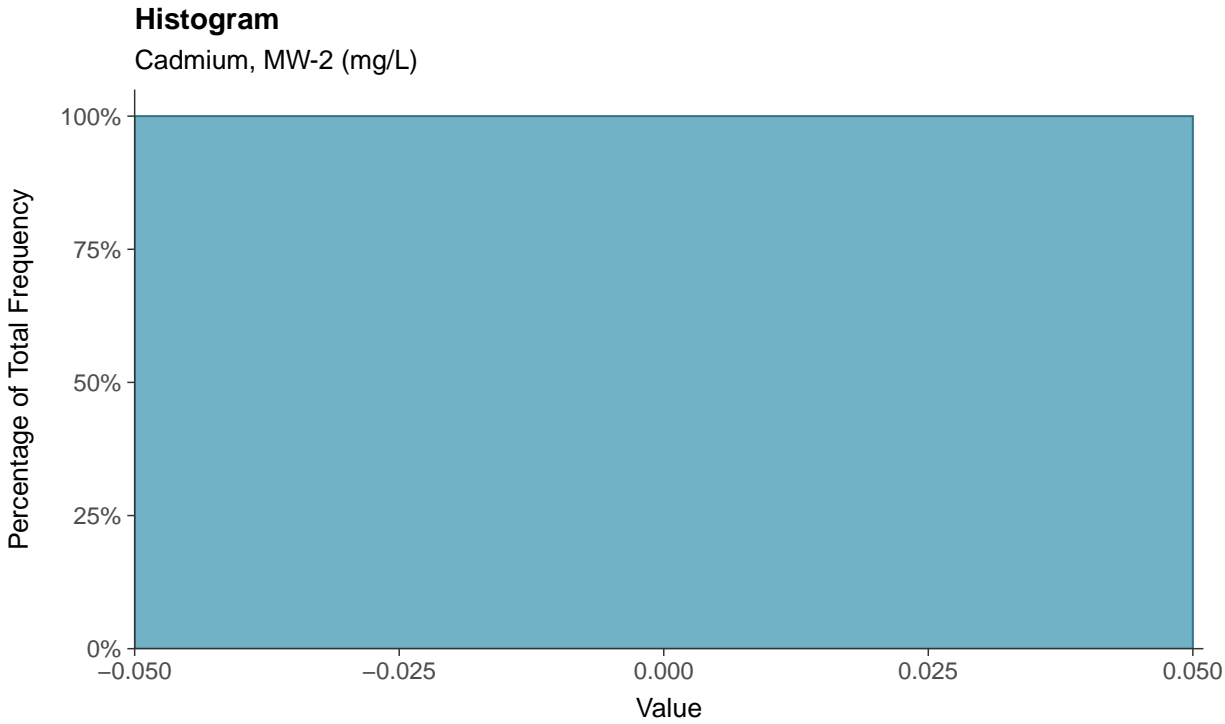
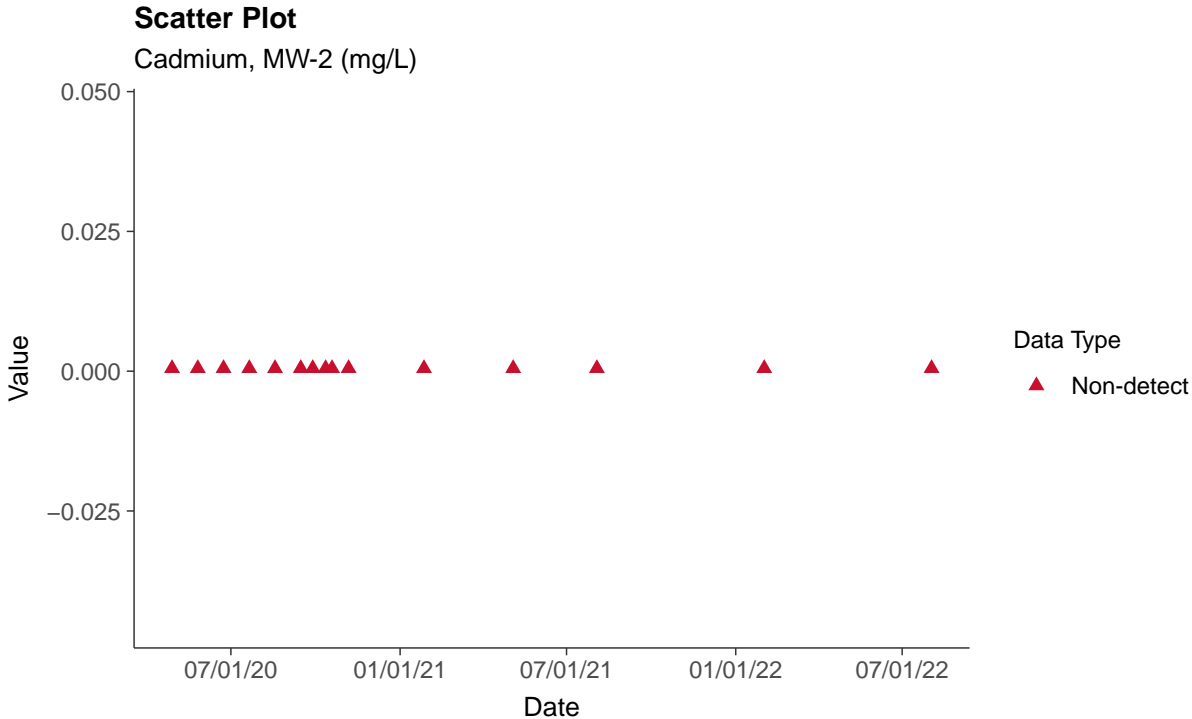
Beryllium, MW-7B (mg/L)

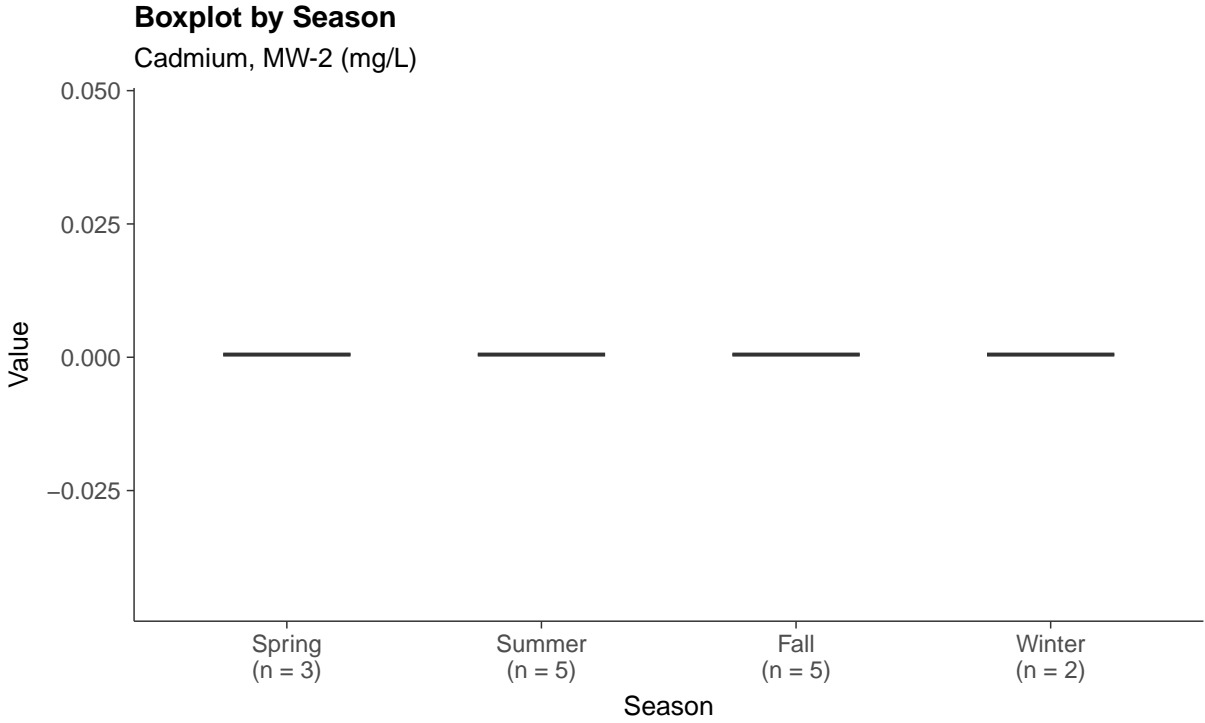
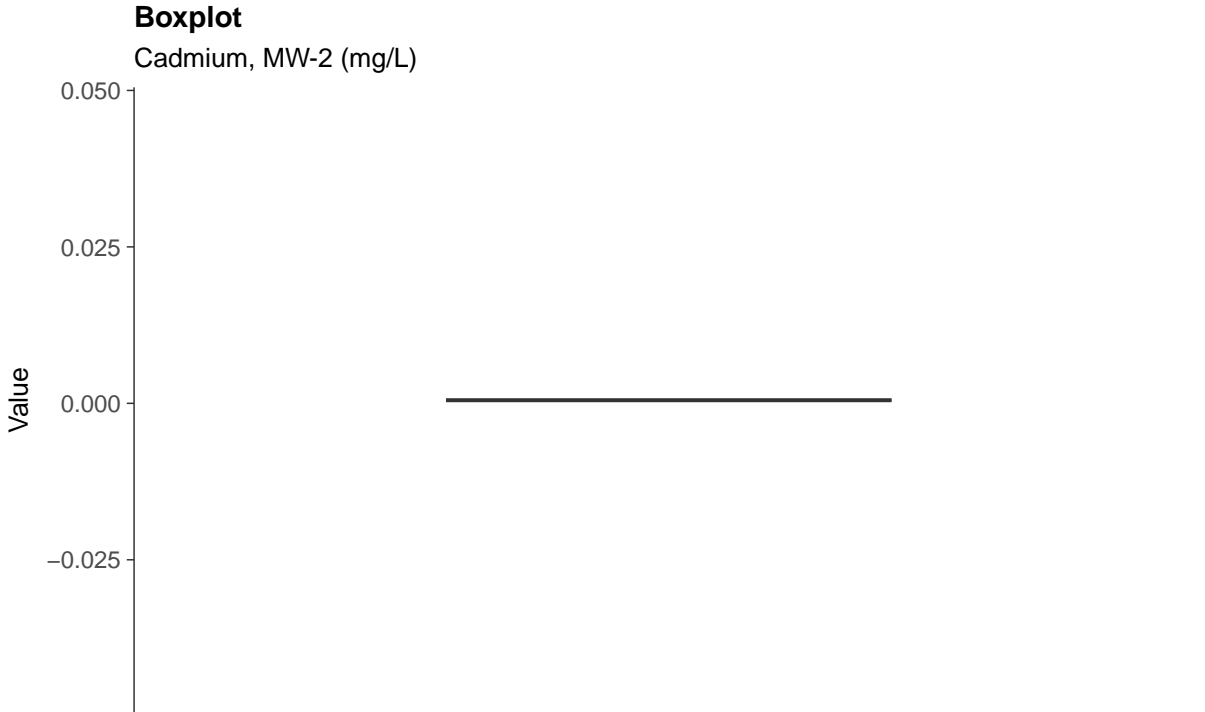




### Appendix IV: Cadmium, MW-2

ID: 2\_12\_02



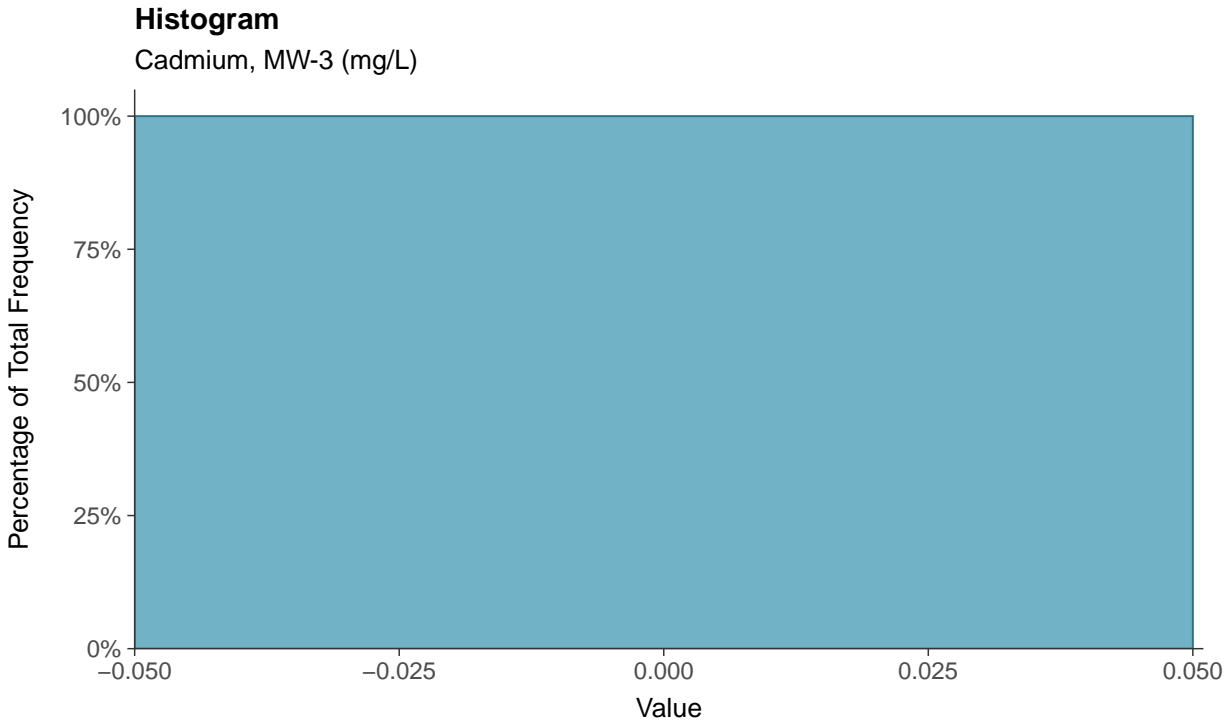
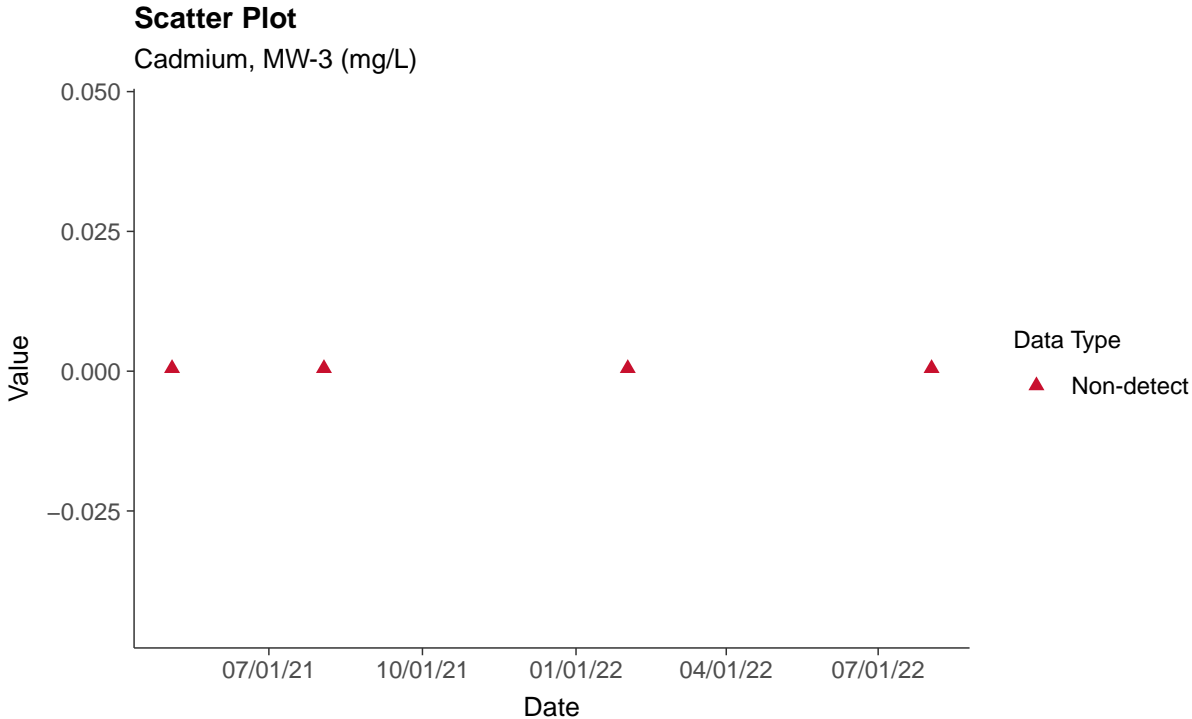


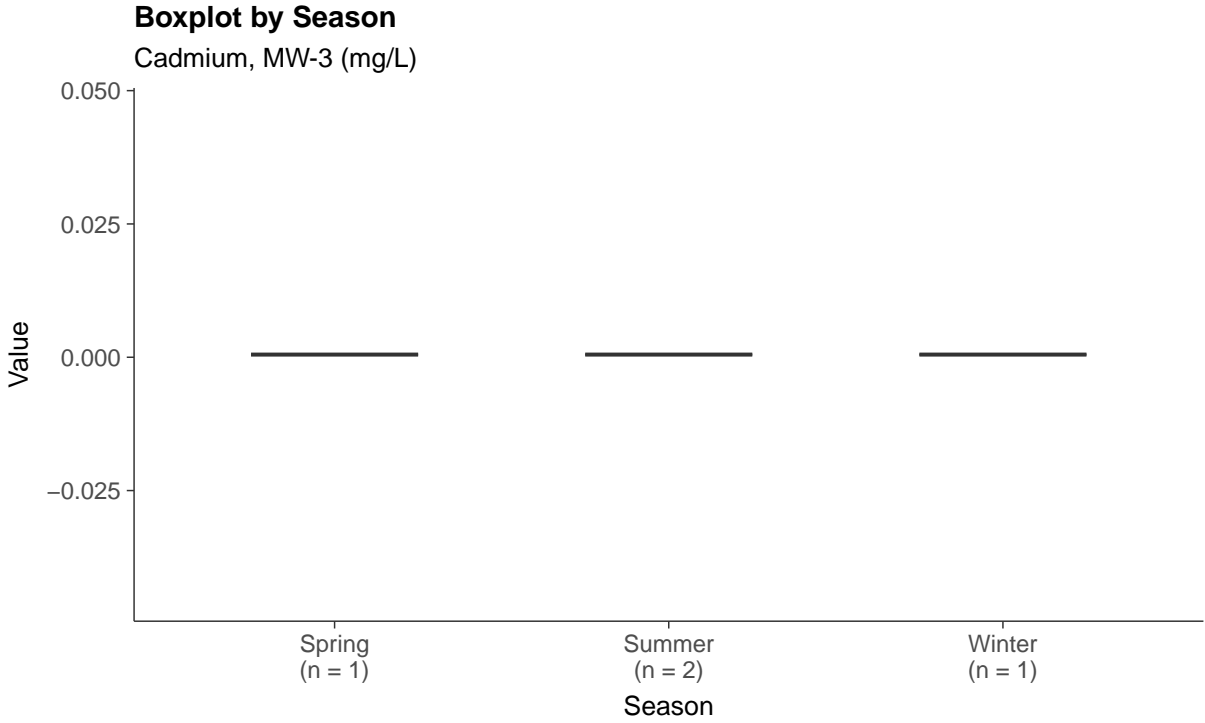
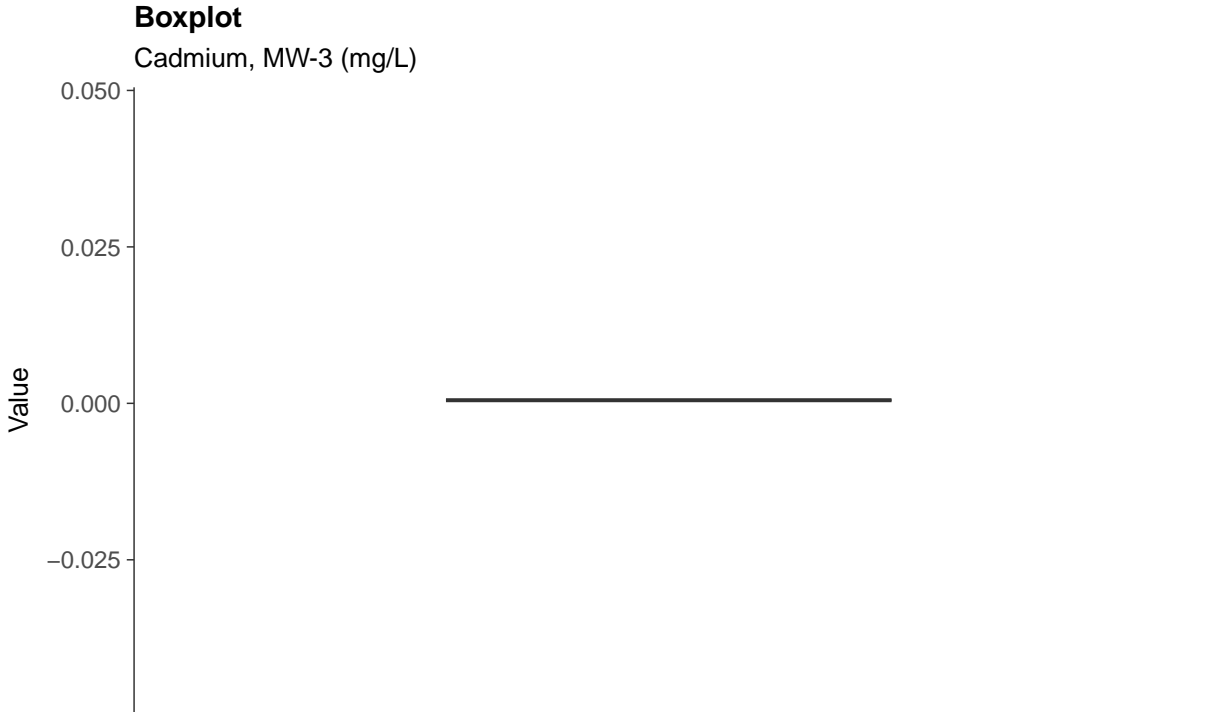




### Appendix IV: Cadmium, MW-3

ID: 2\_12\_03

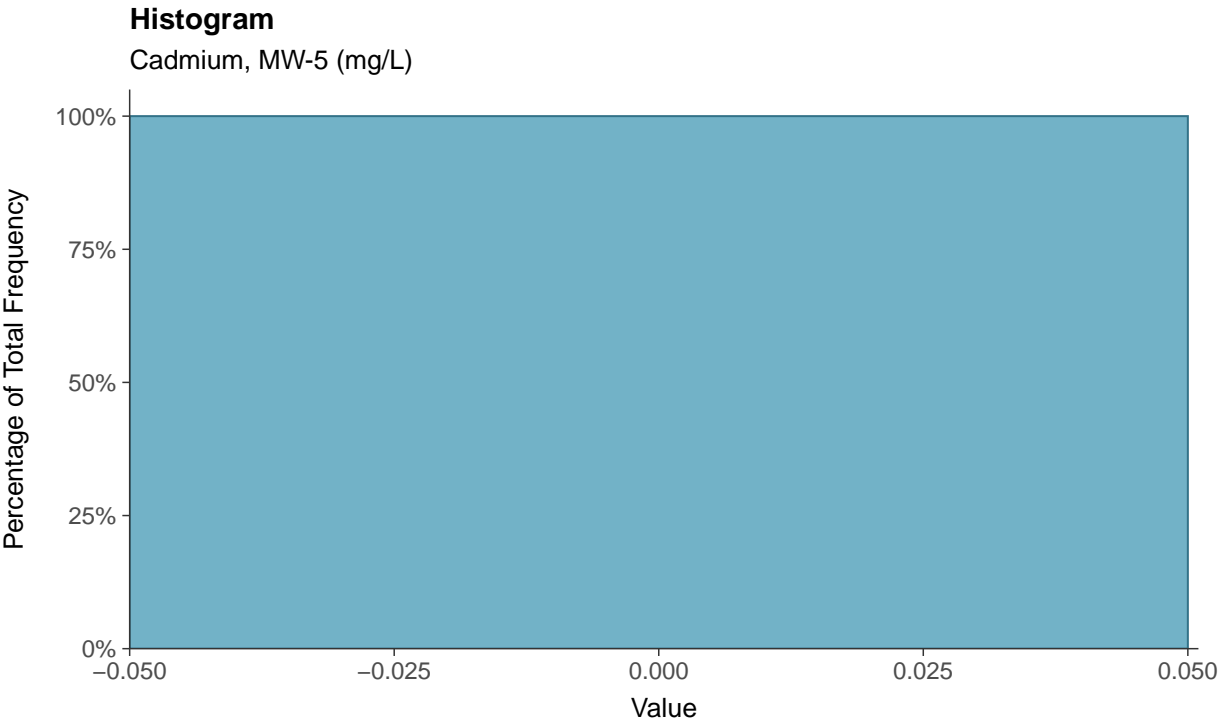
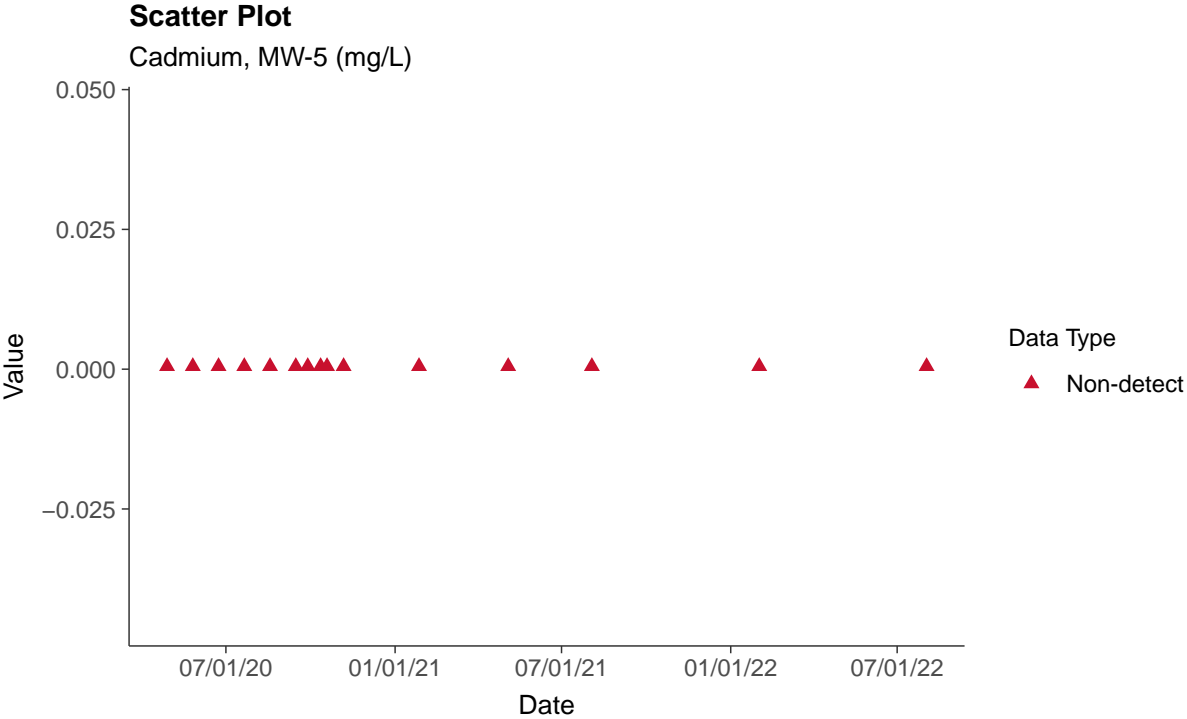


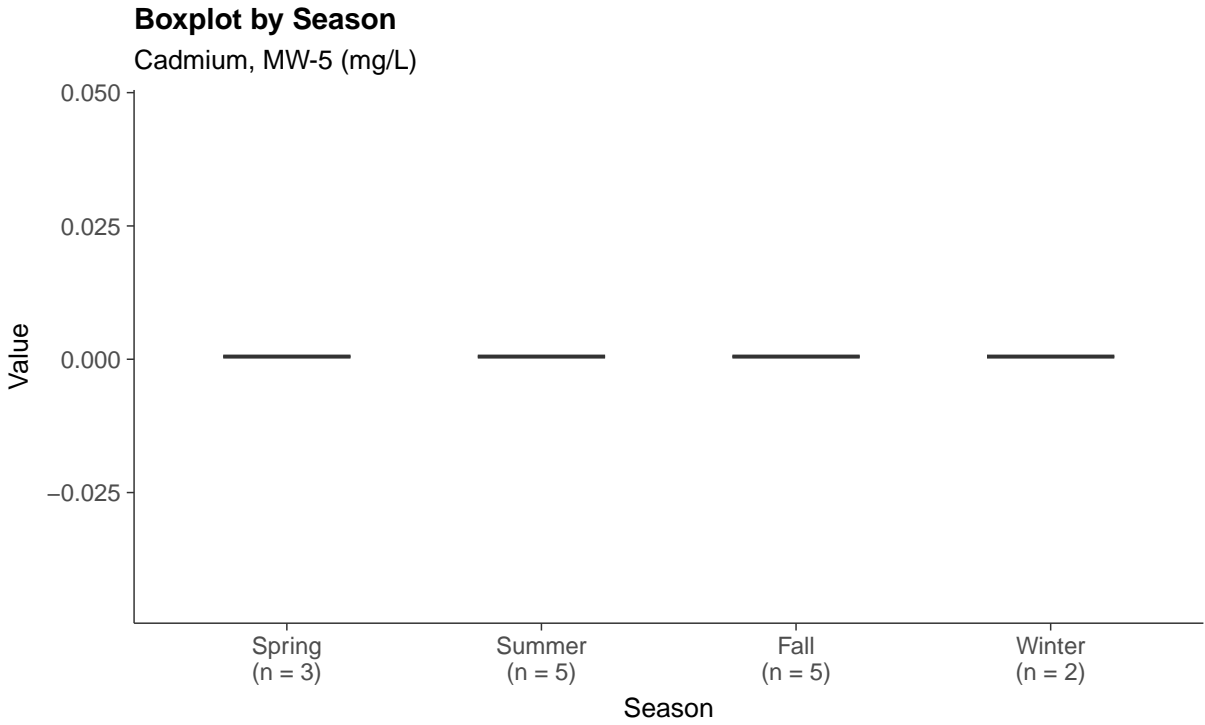
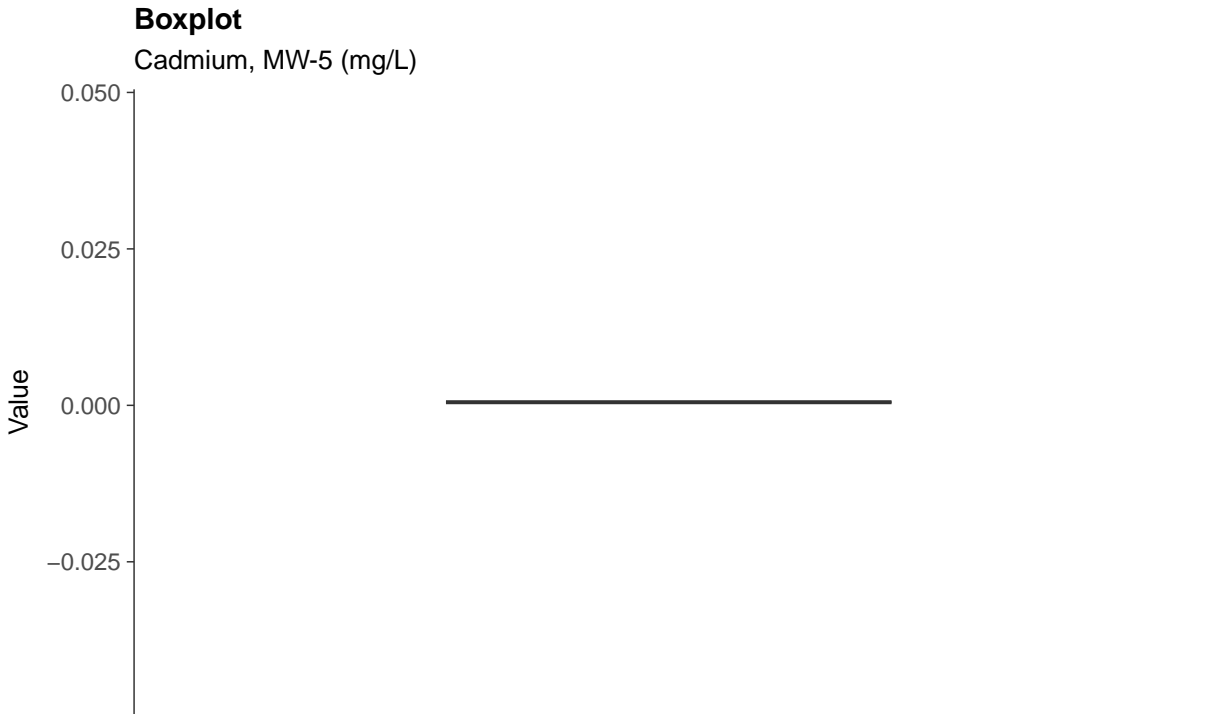




### Appendix IV: Cadmium, MW-5

ID: 2\_12\_05

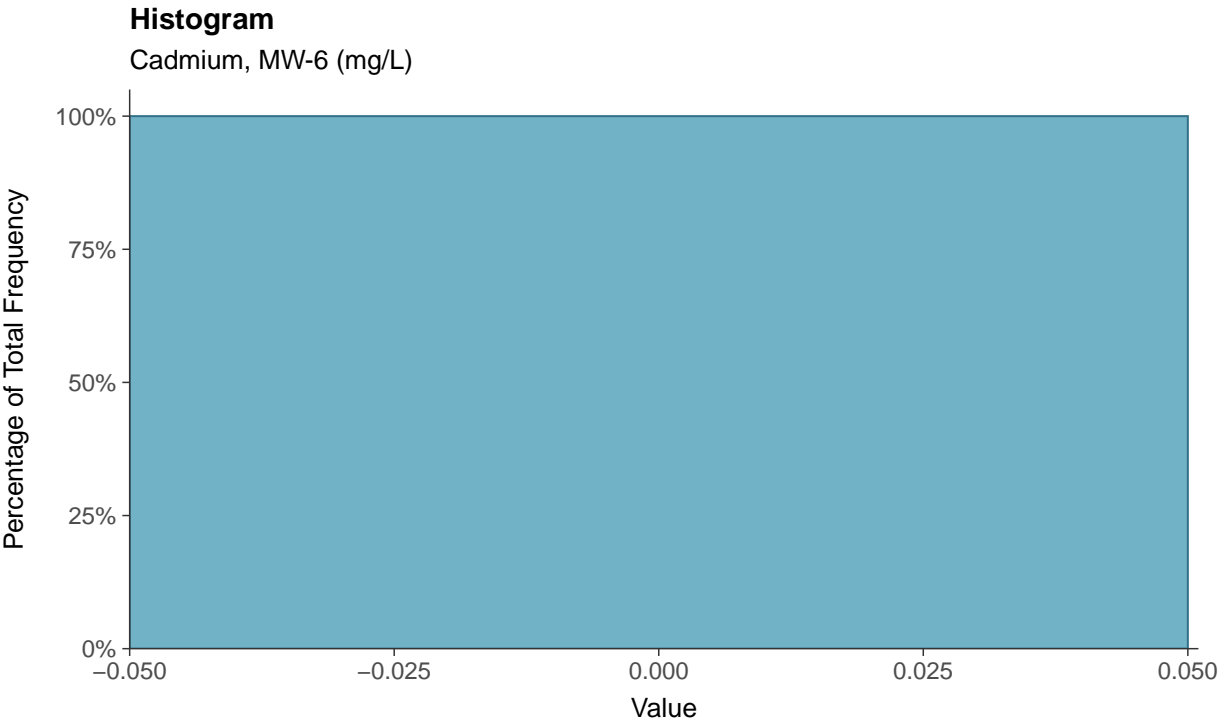
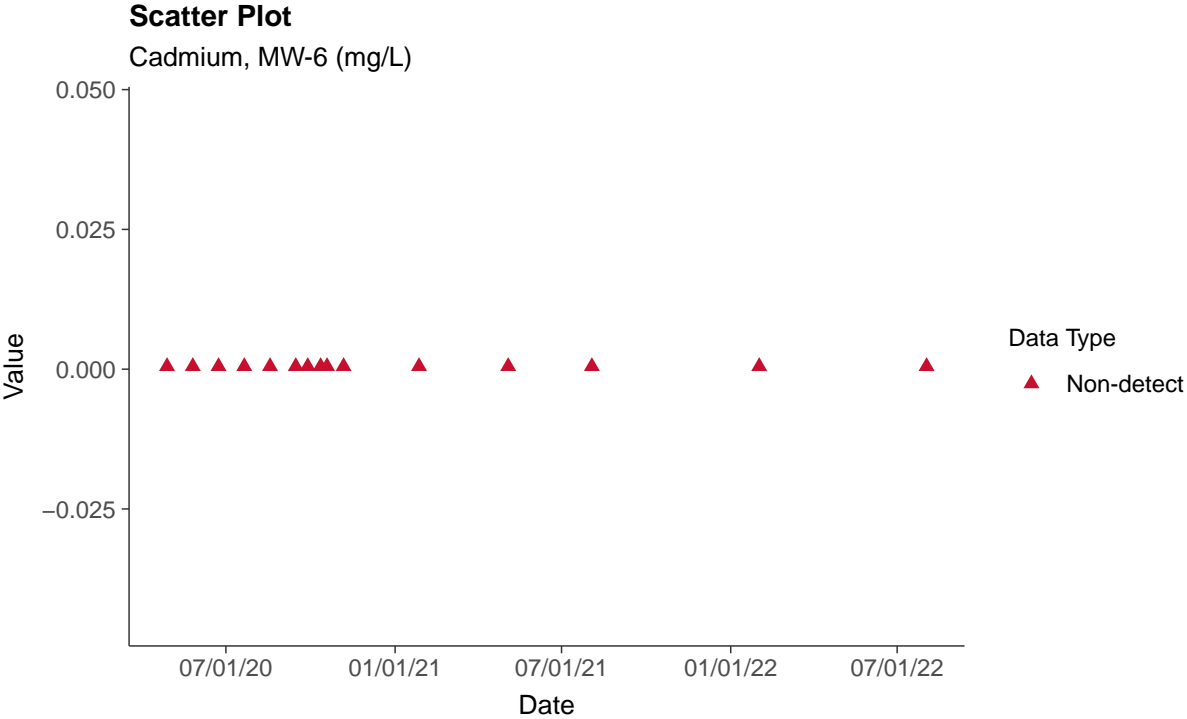


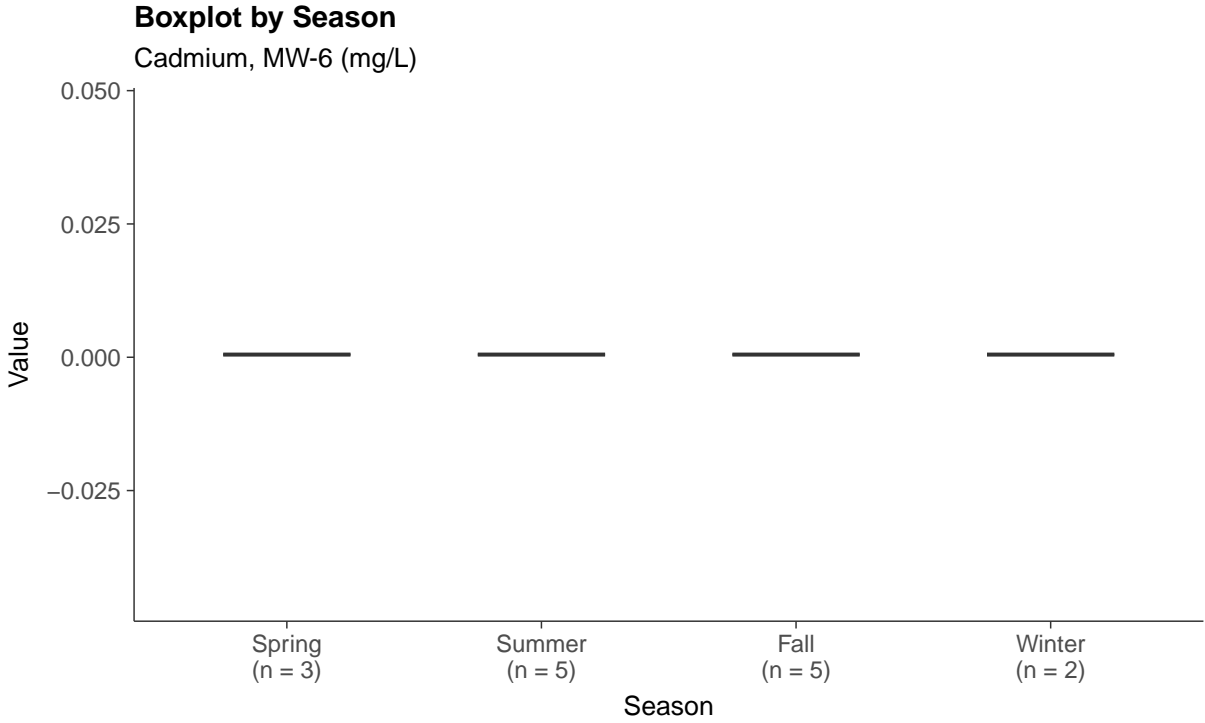
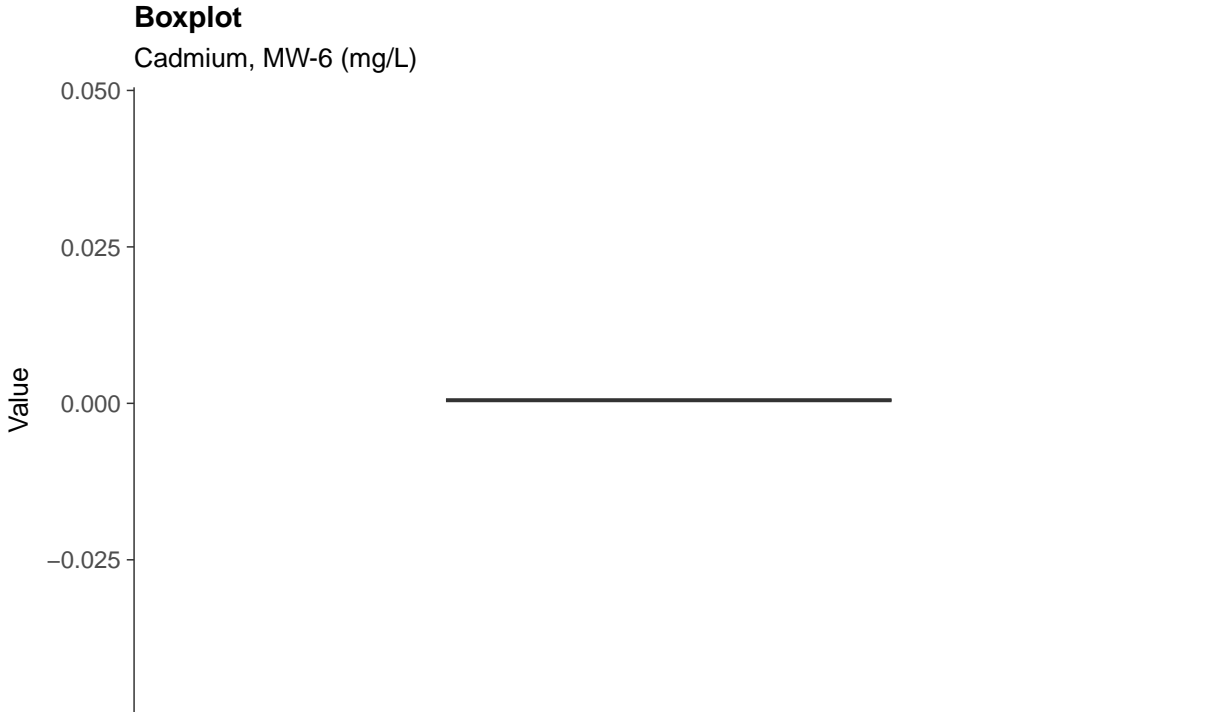




### Appendix IV: Cadmium, MW-6

ID: 2\_12\_06

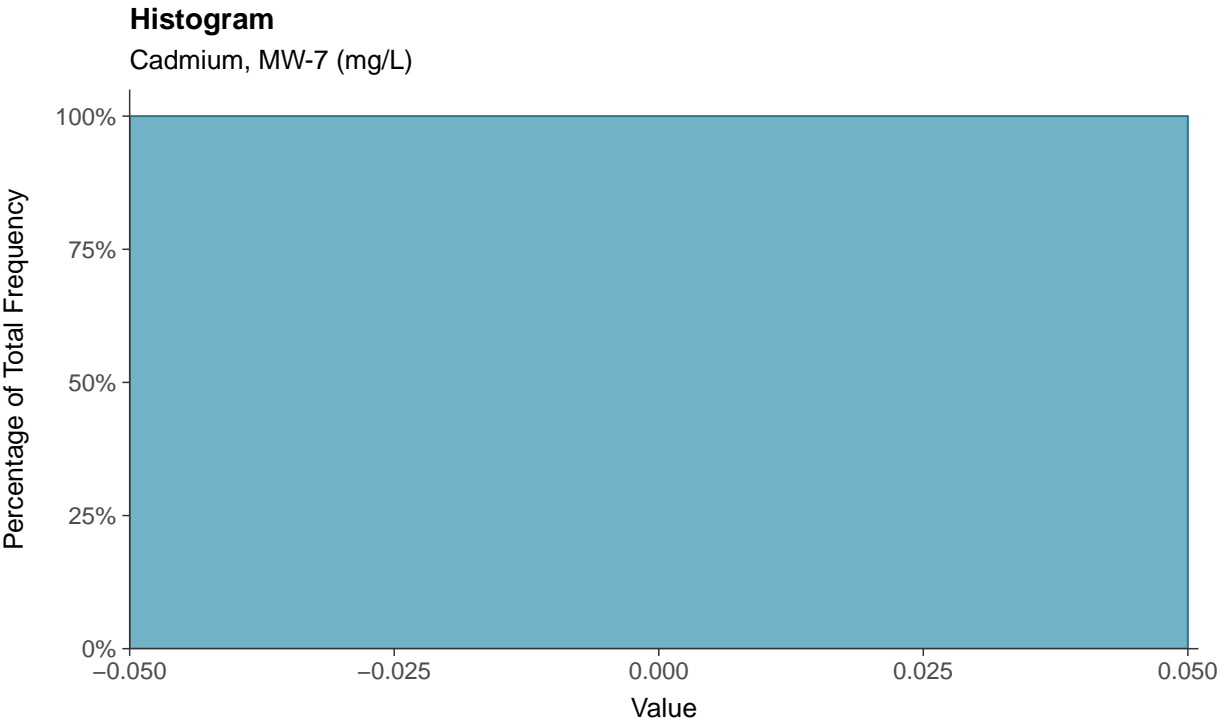
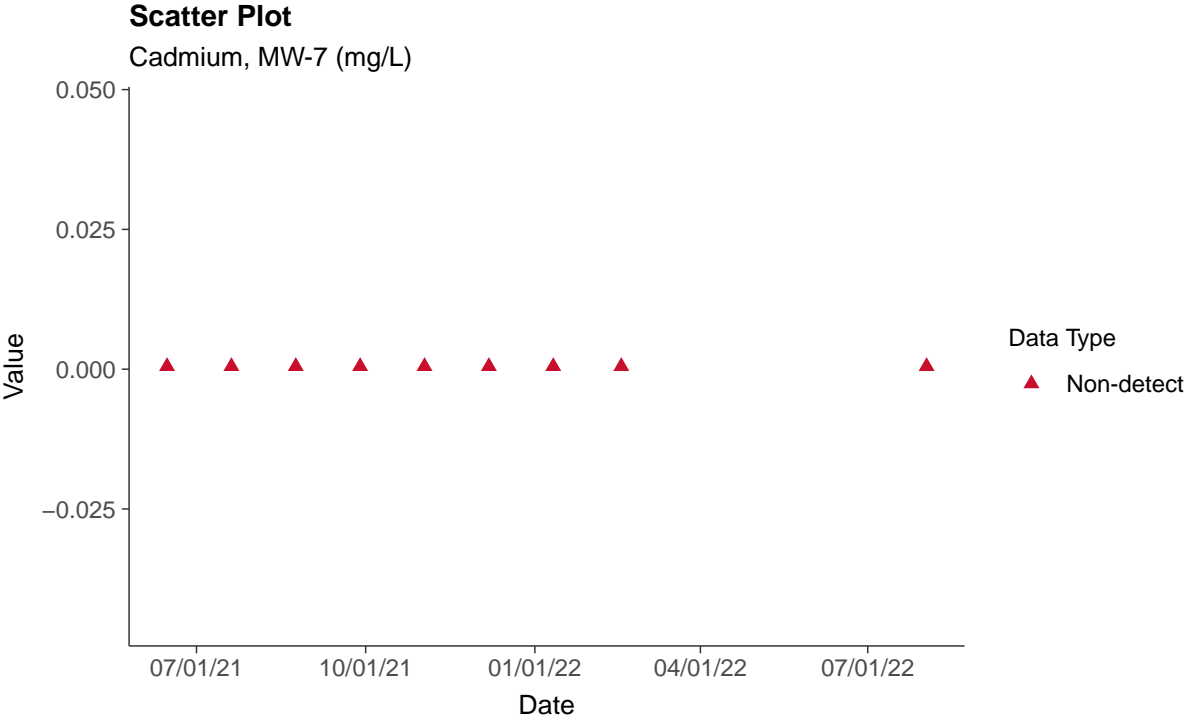


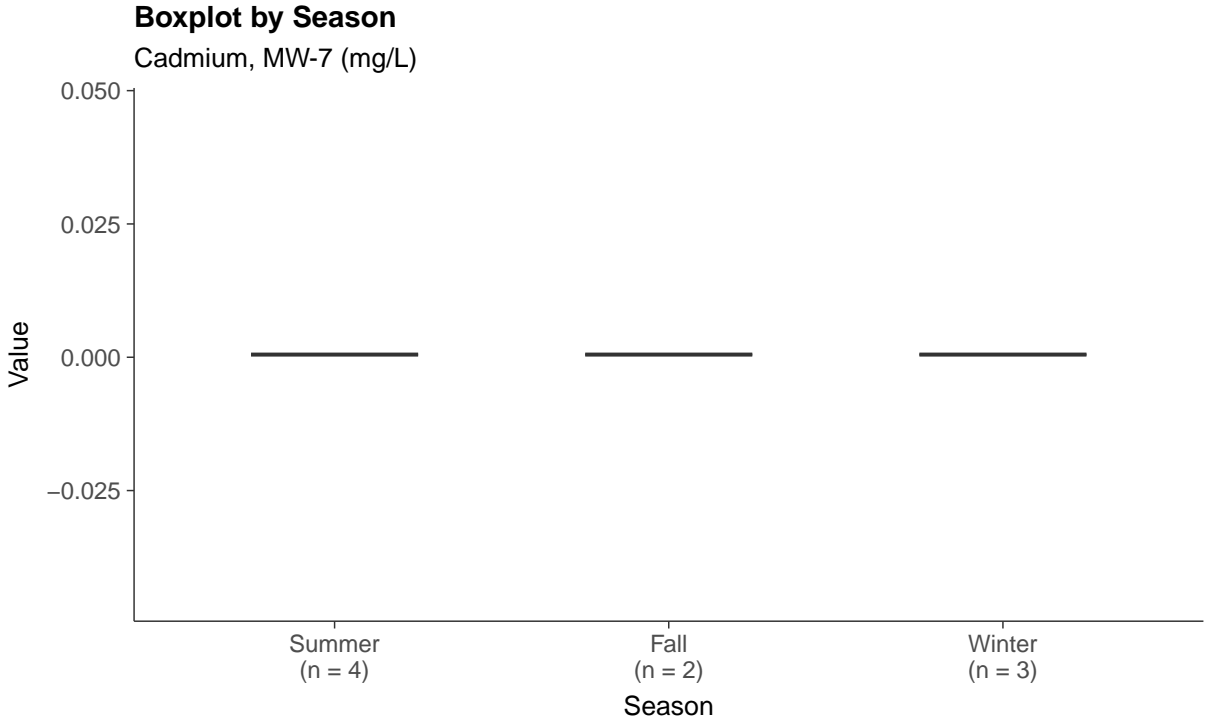
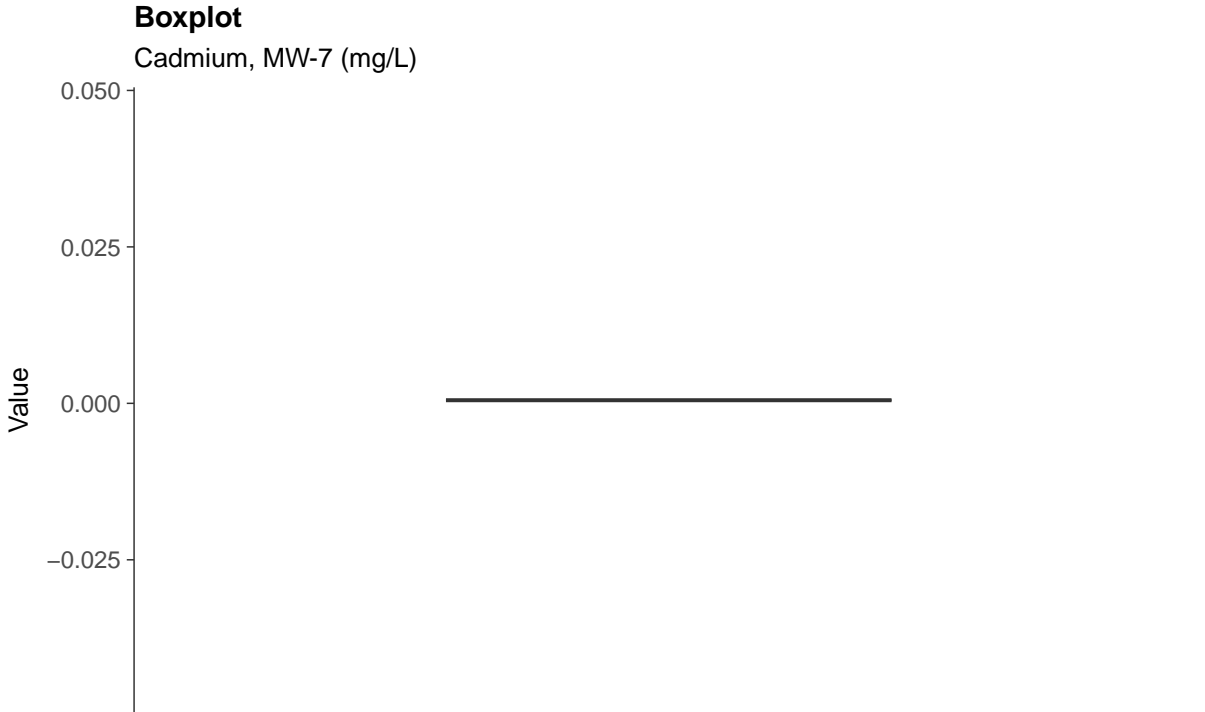




### Appendix IV: Cadmium, MW-7

ID: 2\_12\_07



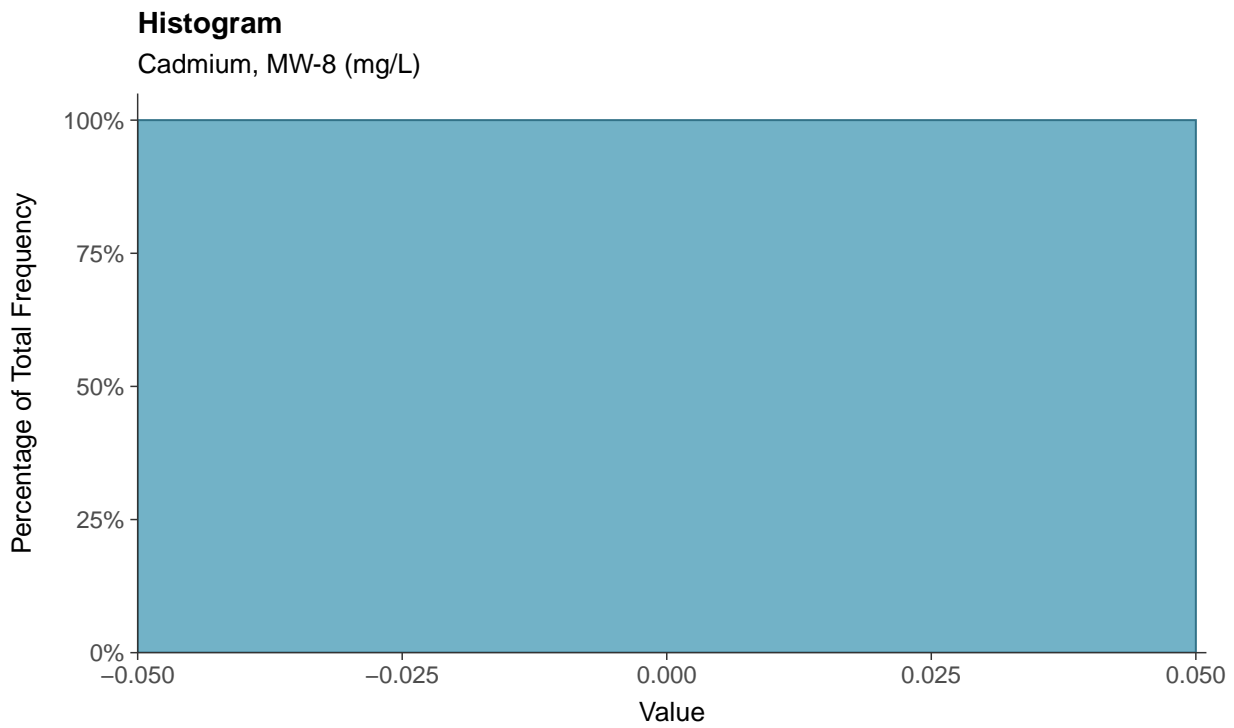
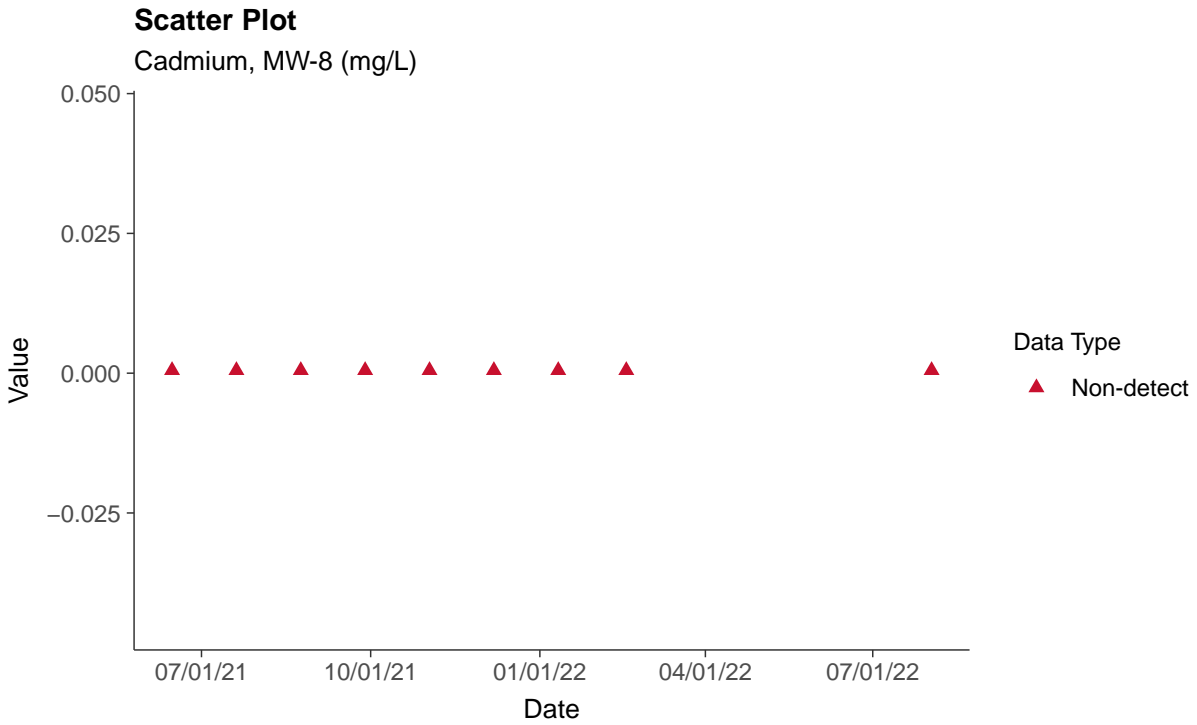


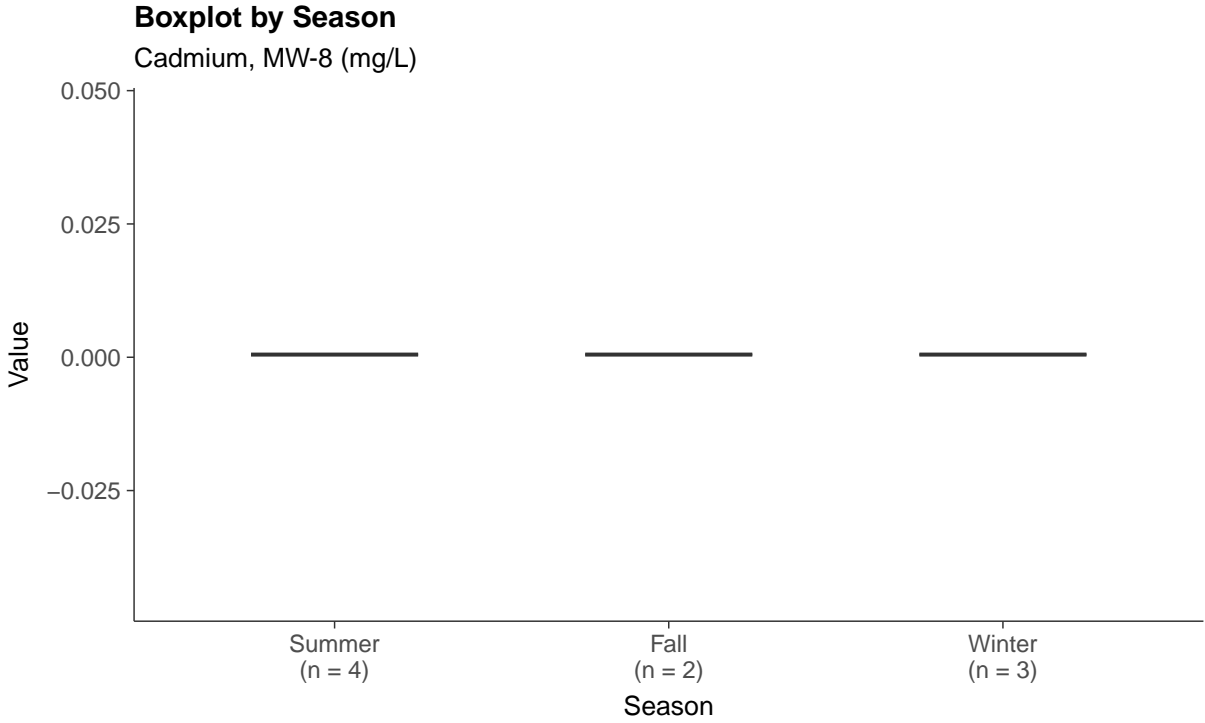
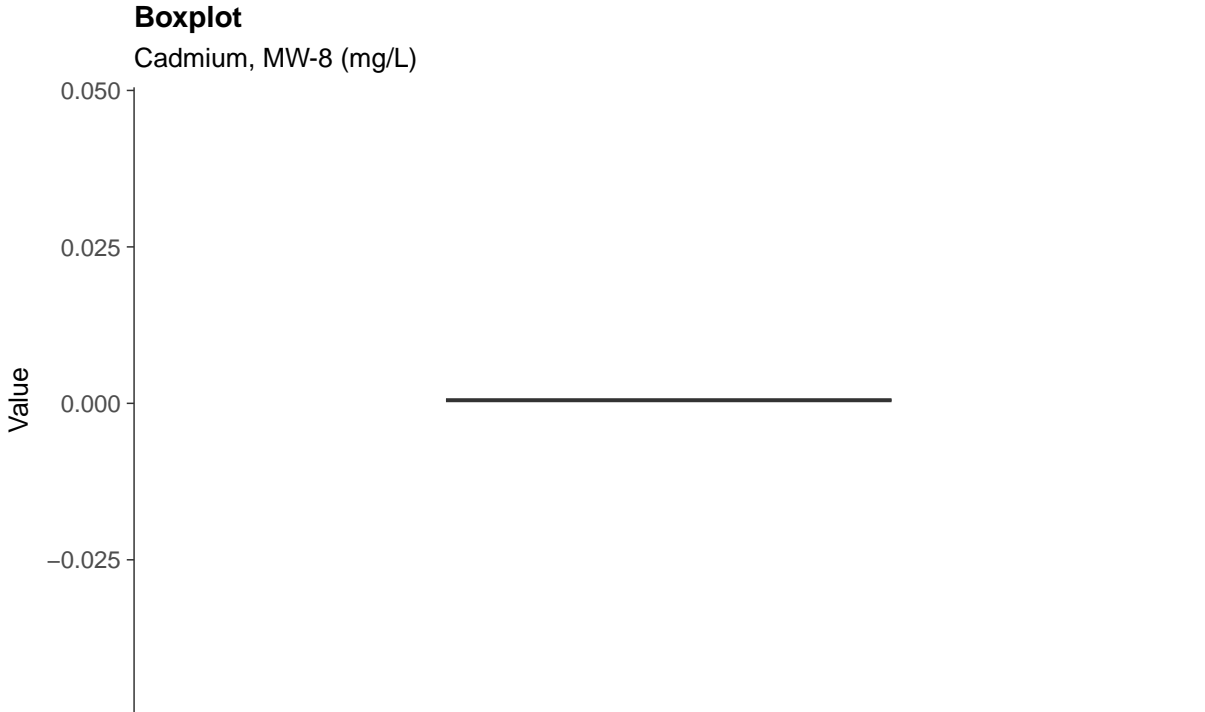




### Appendix IV: Cadmium, MW-8

ID: 2\_12\_08

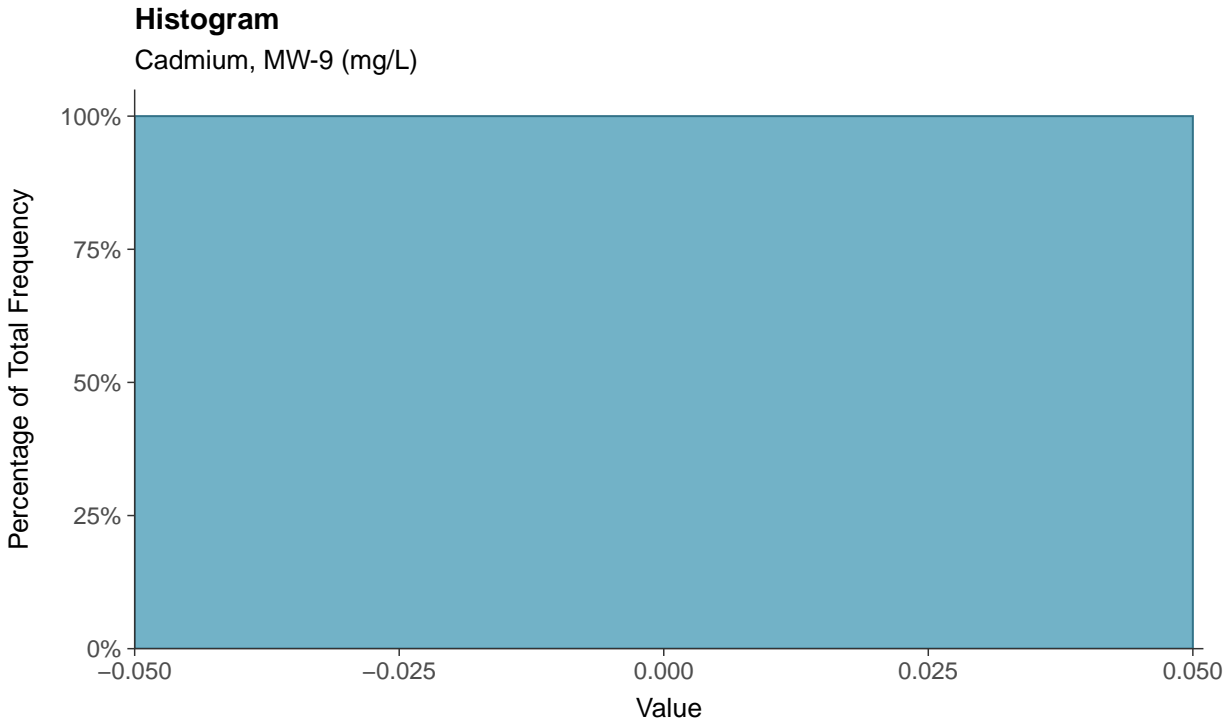
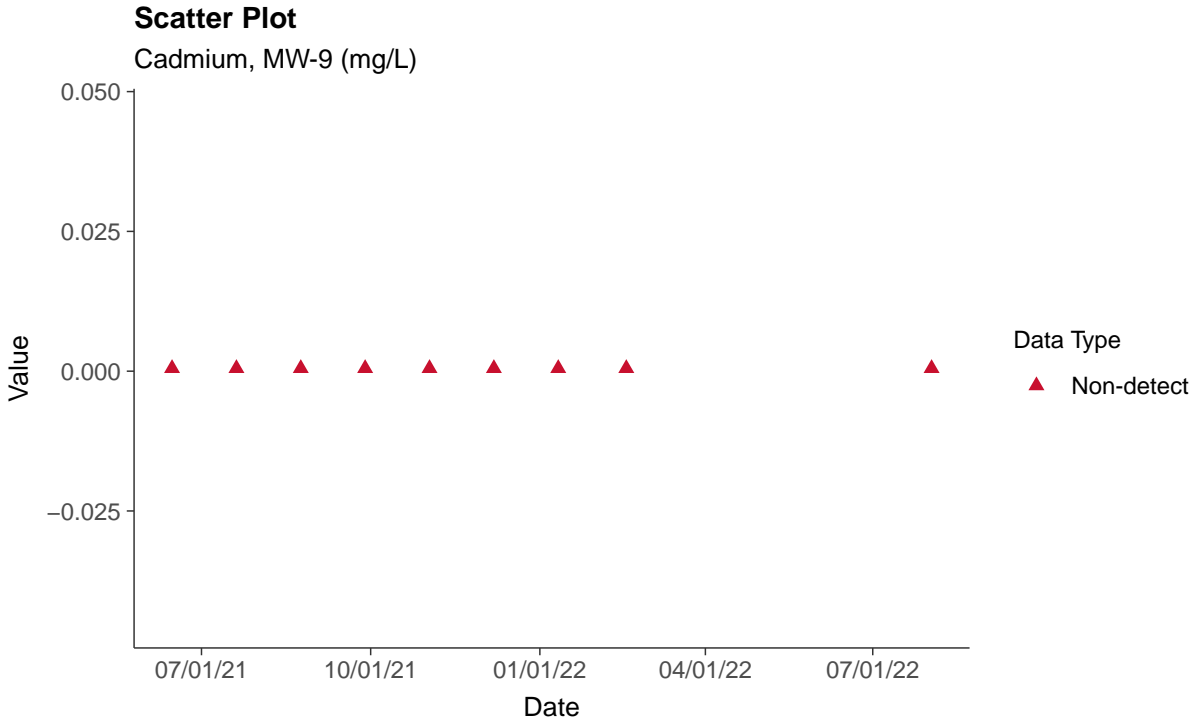


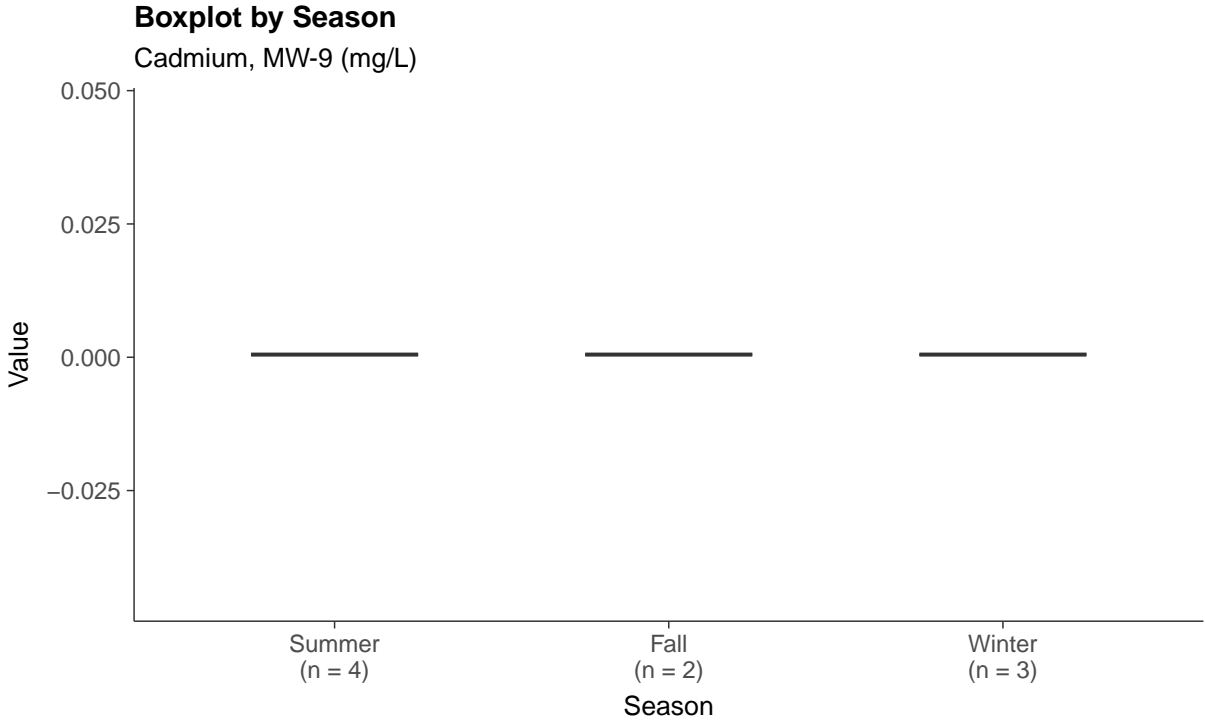
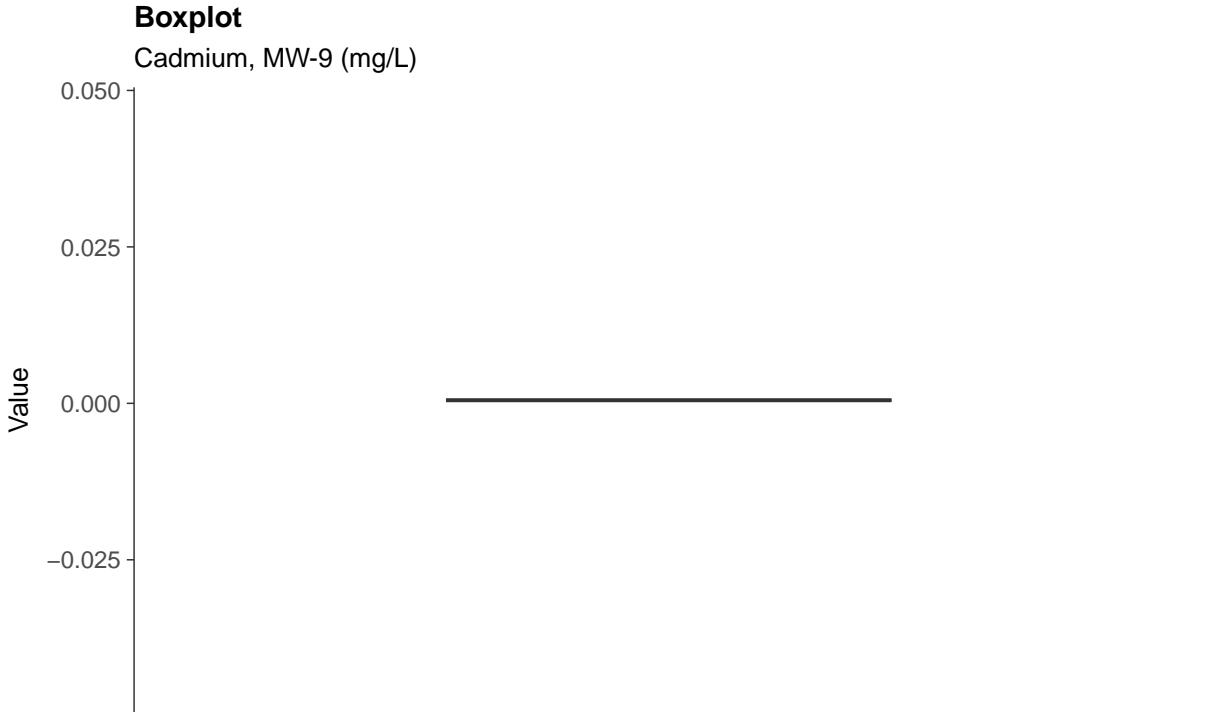




### Appendix IV: Cadmium, MW-9

ID: 2\_12\_09

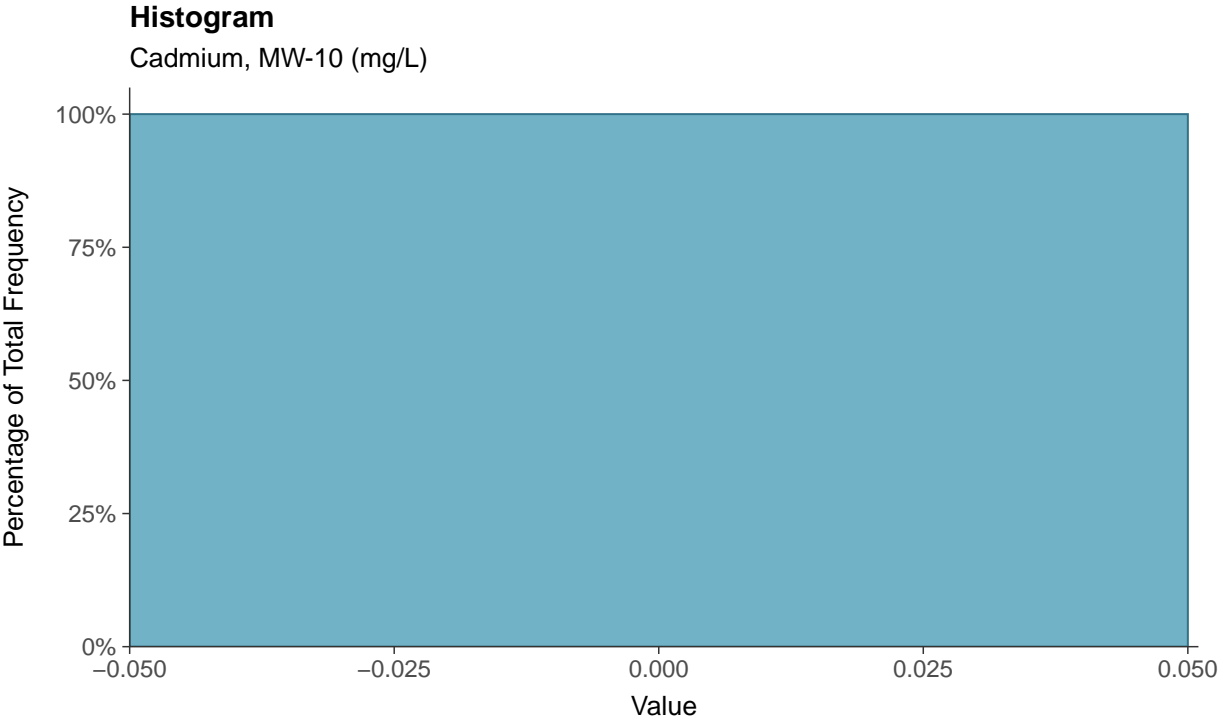
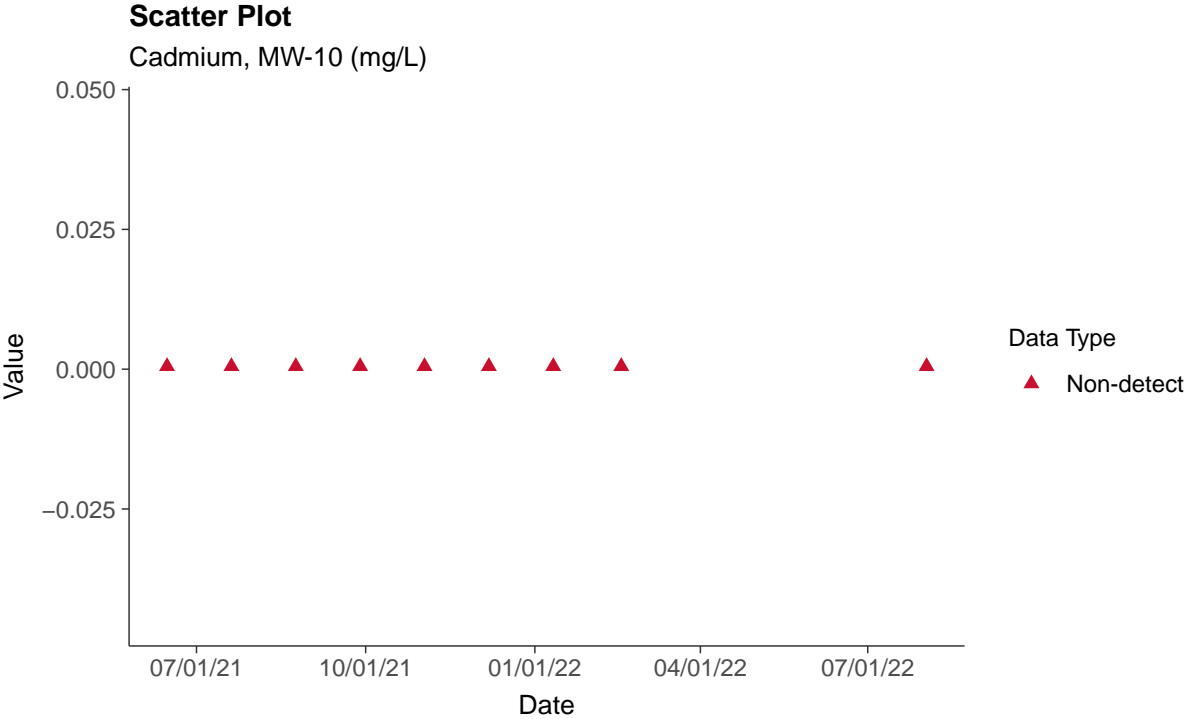






### Appendix IV: Cadmium, MW-10

ID: 2\_12\_10





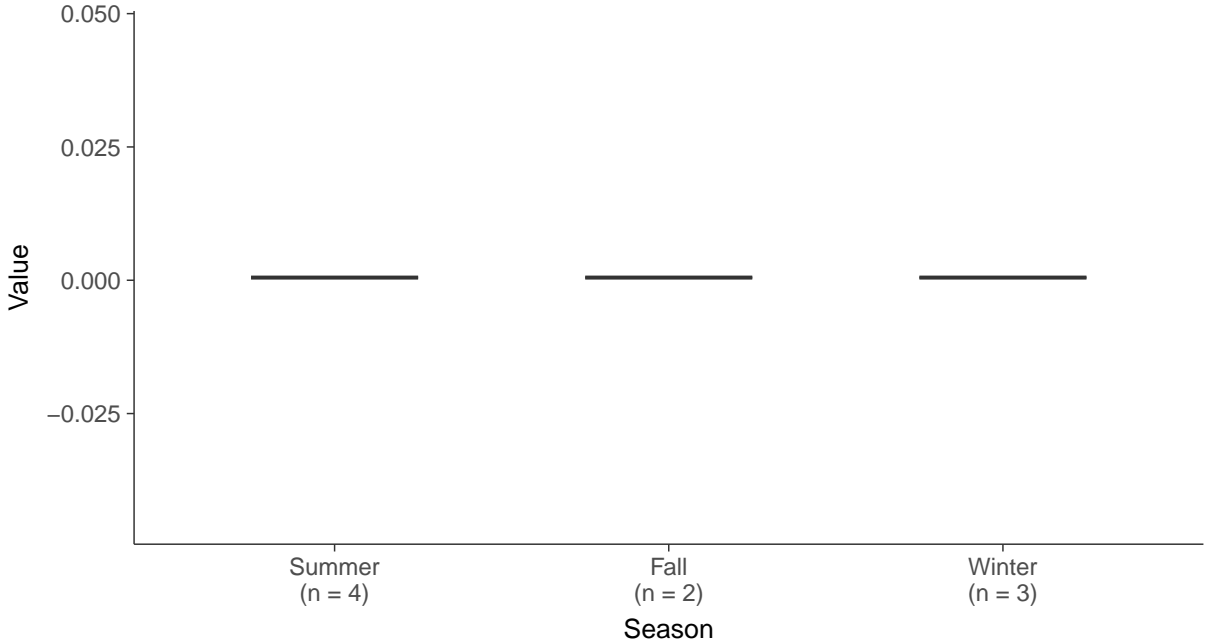
**Boxplot**

Cadmium, MW-10 (mg/L)



**Boxplot by Season**

Cadmium, MW-10 (mg/L)



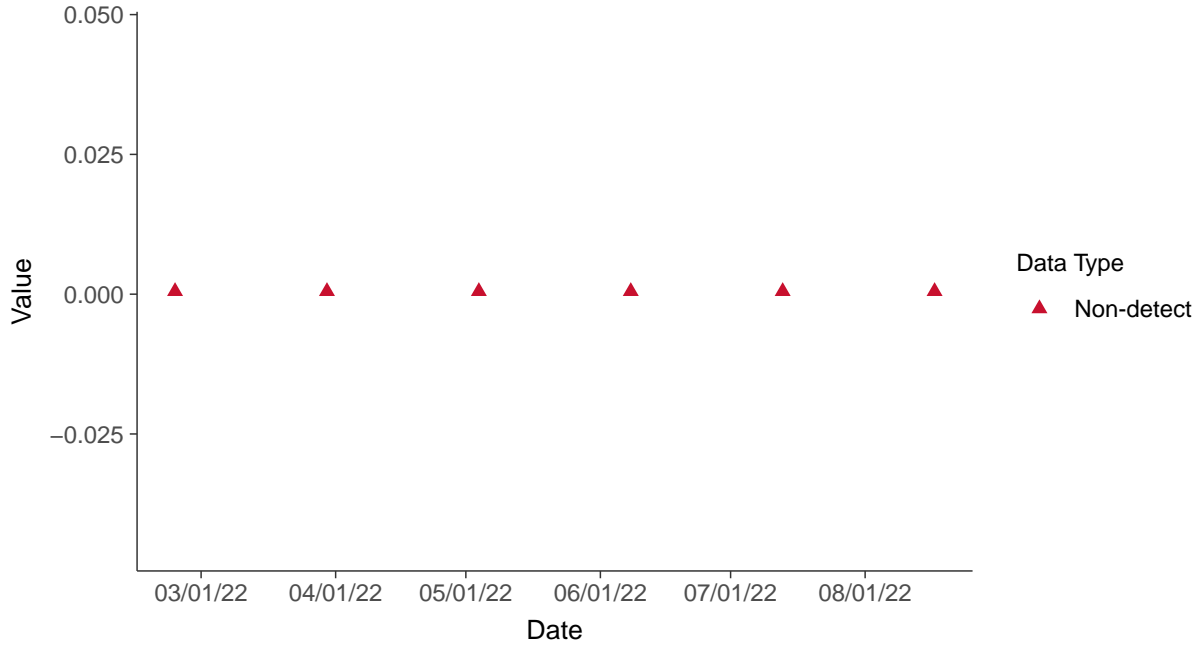


### Appendix IV: Cadmium, MW-13

ID: 2\_12\_13

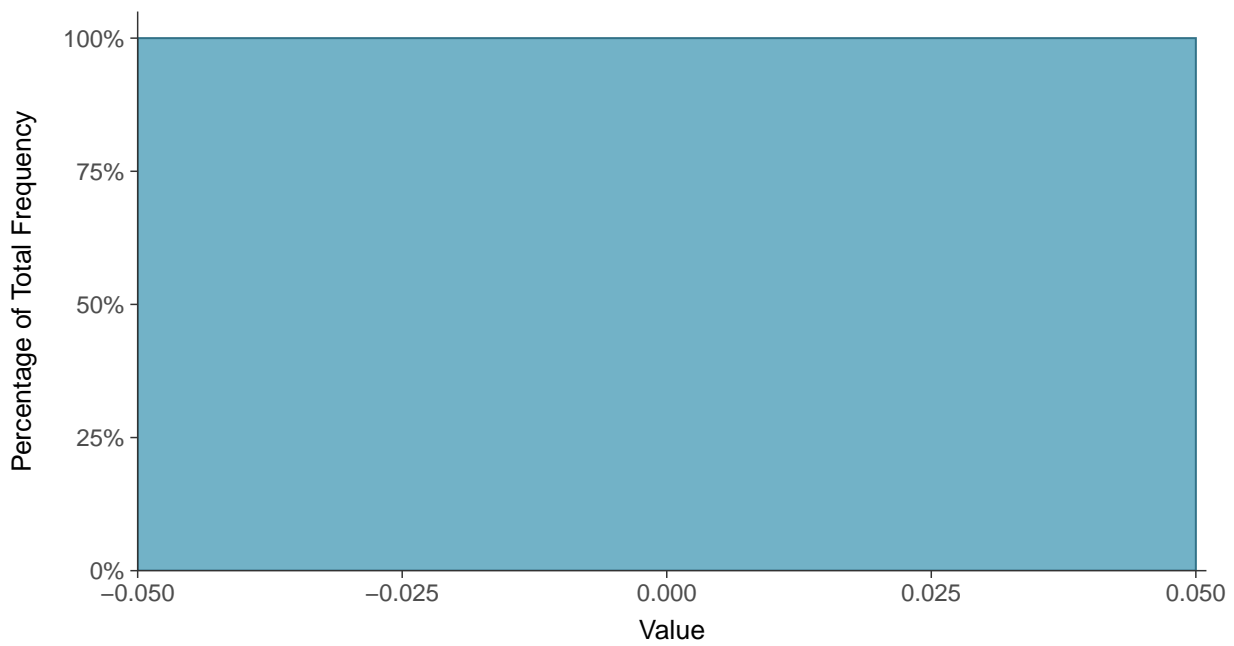
#### Scatter Plot

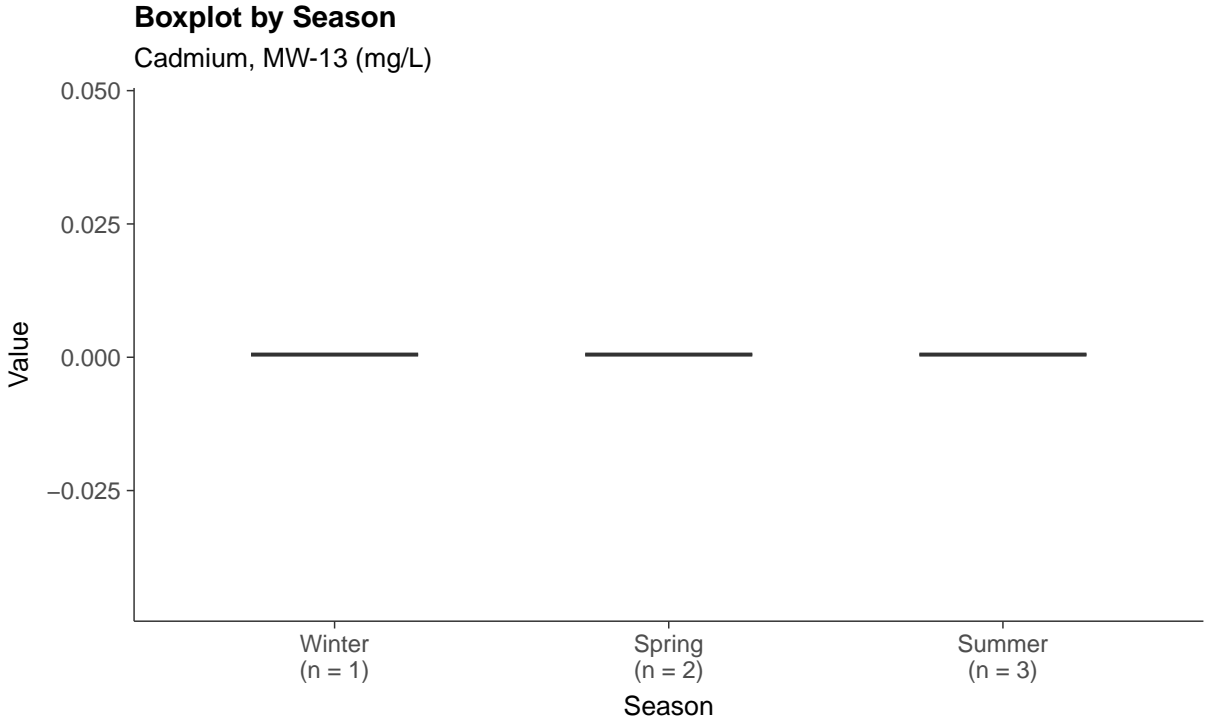
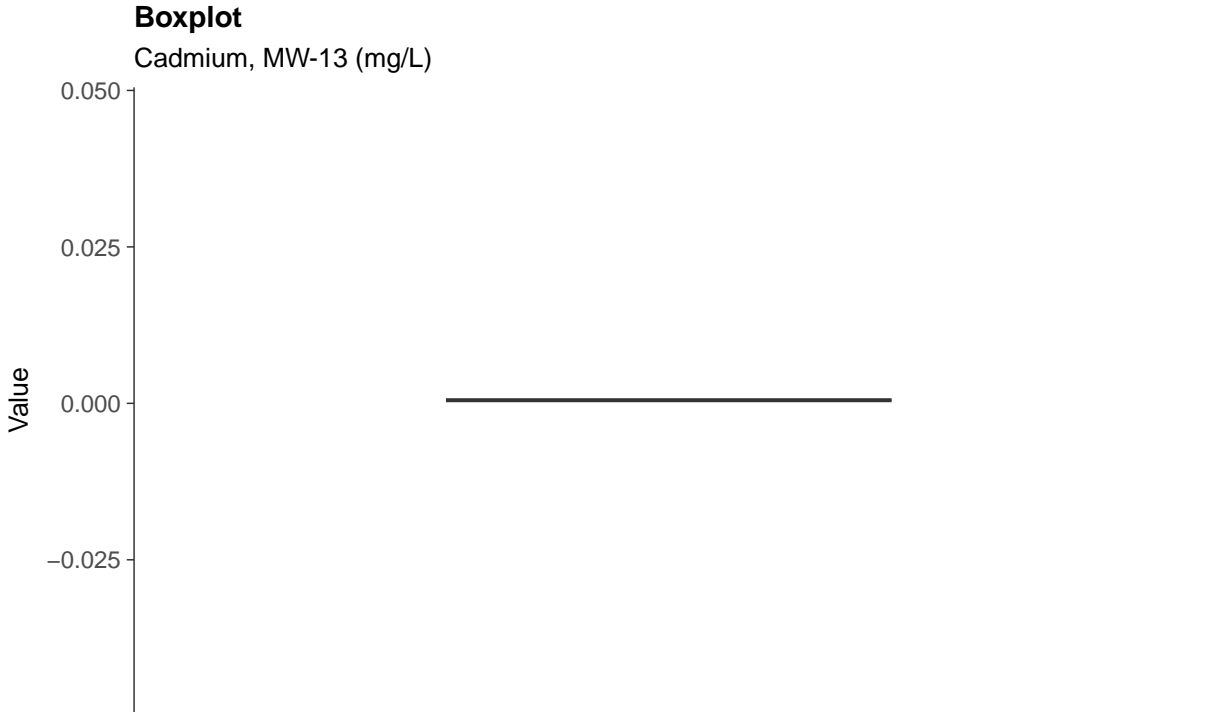
Cadmium, MW-13 (mg/L)



#### Histogram

Cadmium, MW-13 (mg/L)



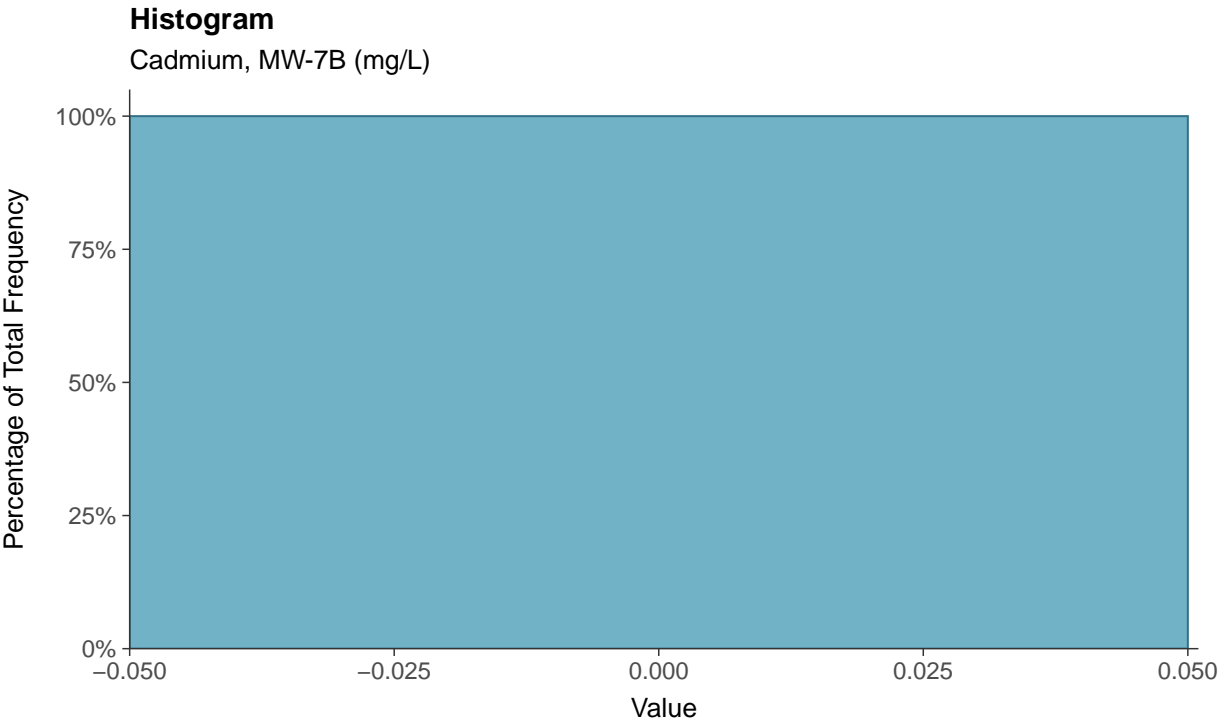
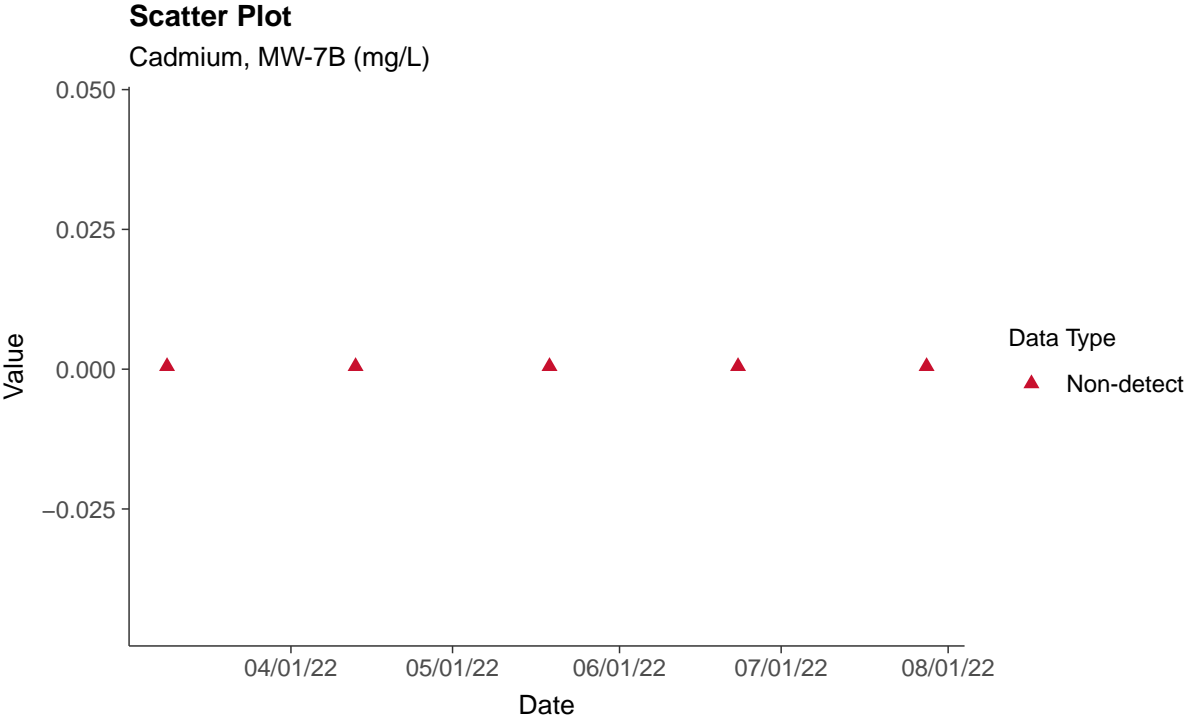






### Appendix IV: Cadmium, MW-7B

ID: 2\_12\_7B





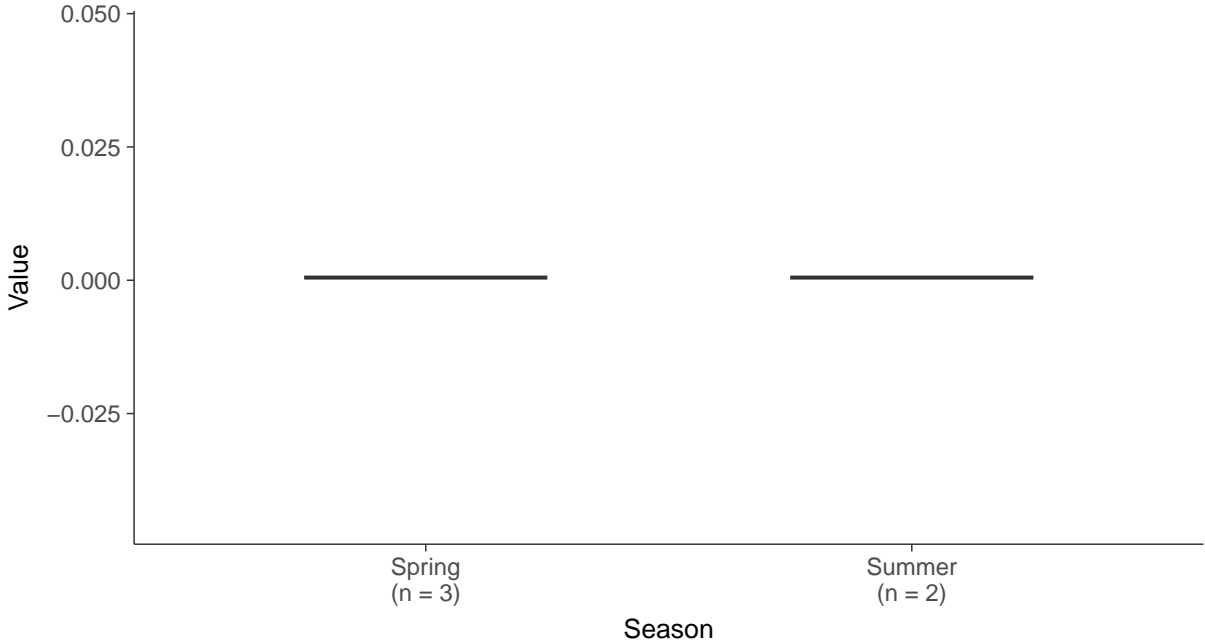
**Boxplot**

Cadmium, MW-7B (mg/L)



**Boxplot by Season**

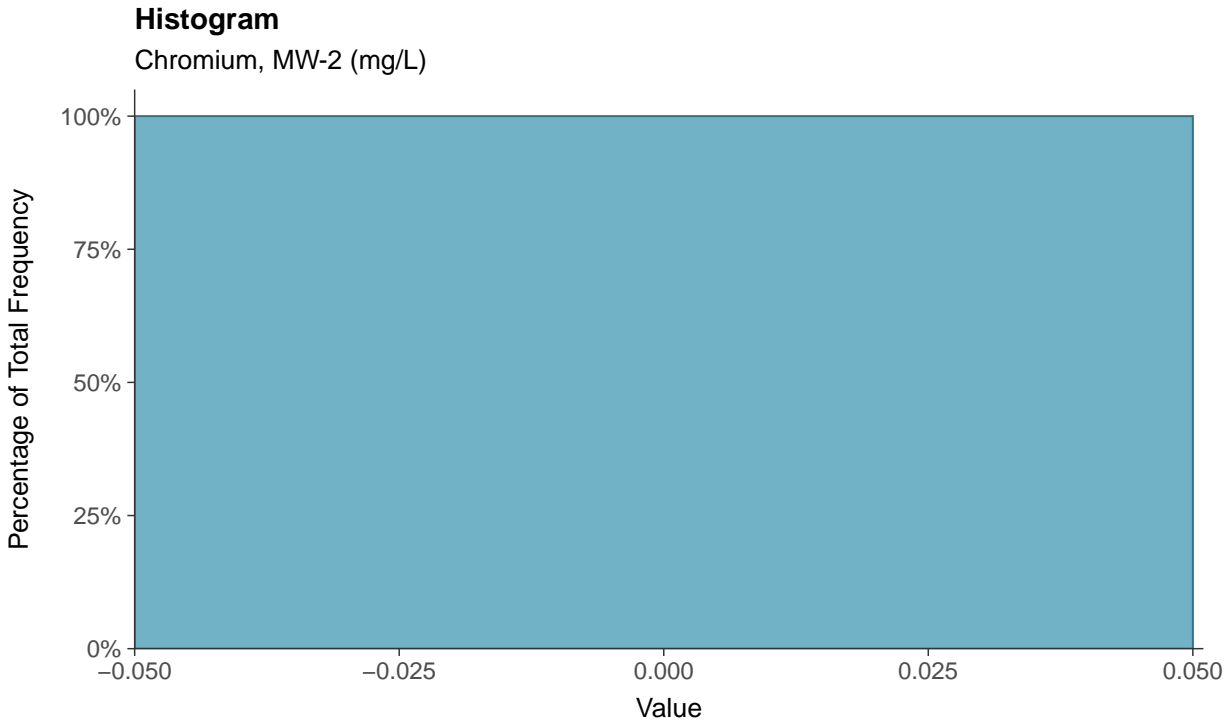
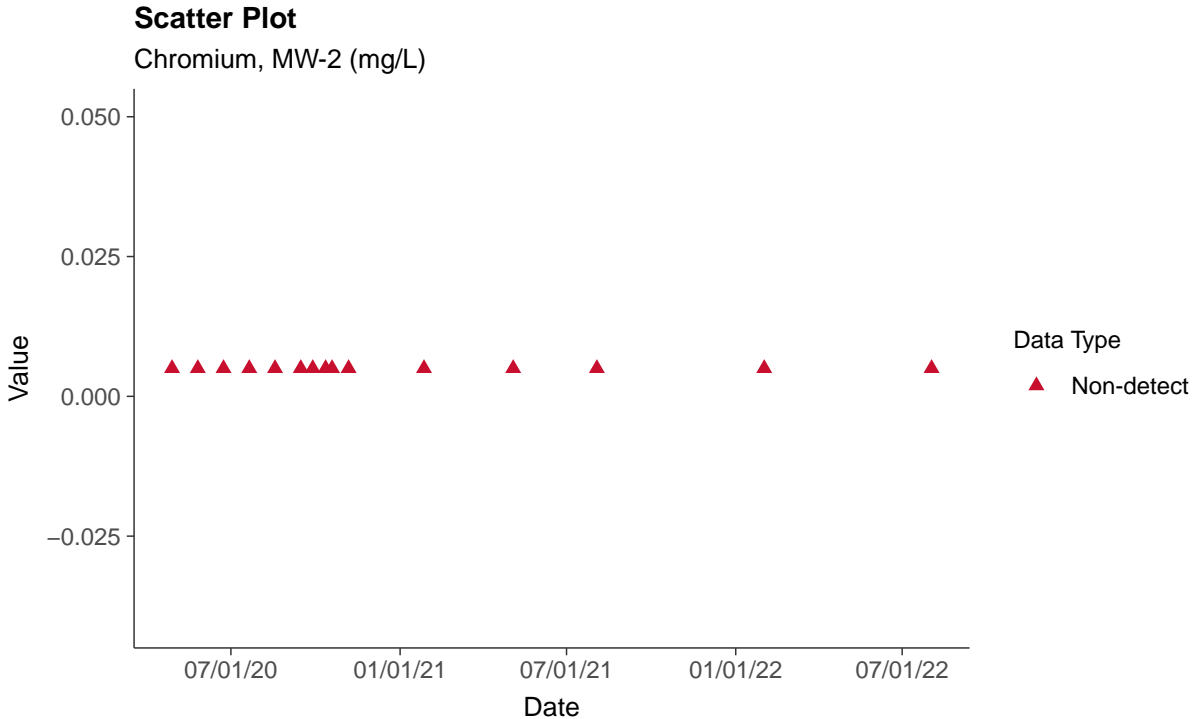
Cadmium, MW-7B (mg/L)





### Appendix IV: Chromium, MW-2

ID: 2\_14\_02





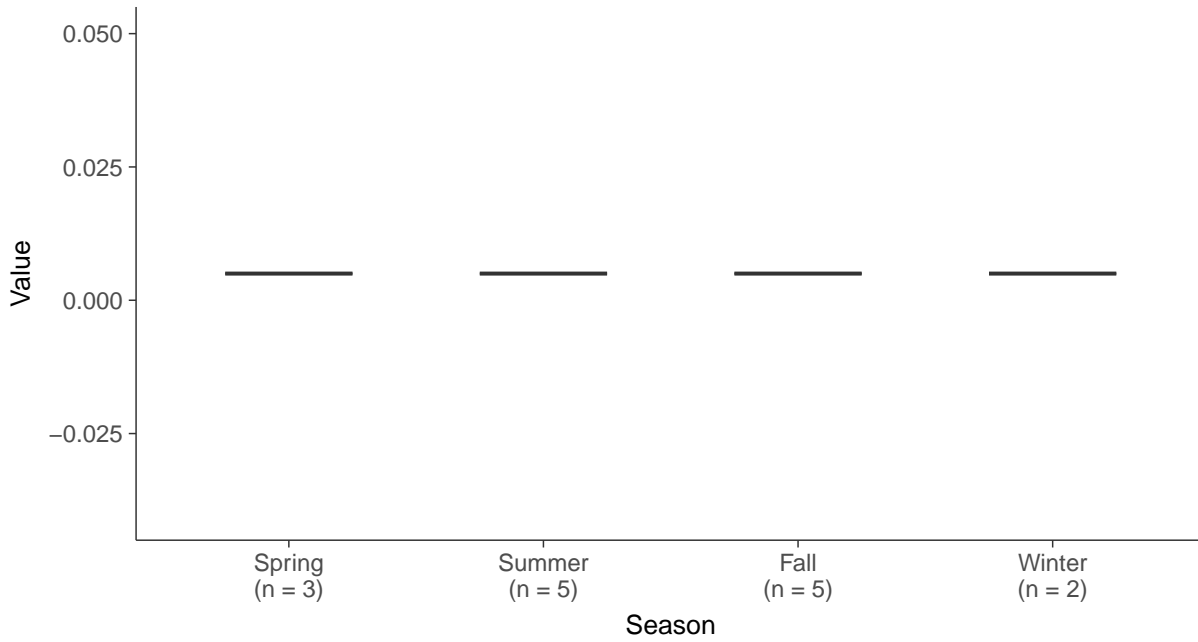
### Boxplot

Chromium, MW-2 (mg/L)



### Boxplot by Season

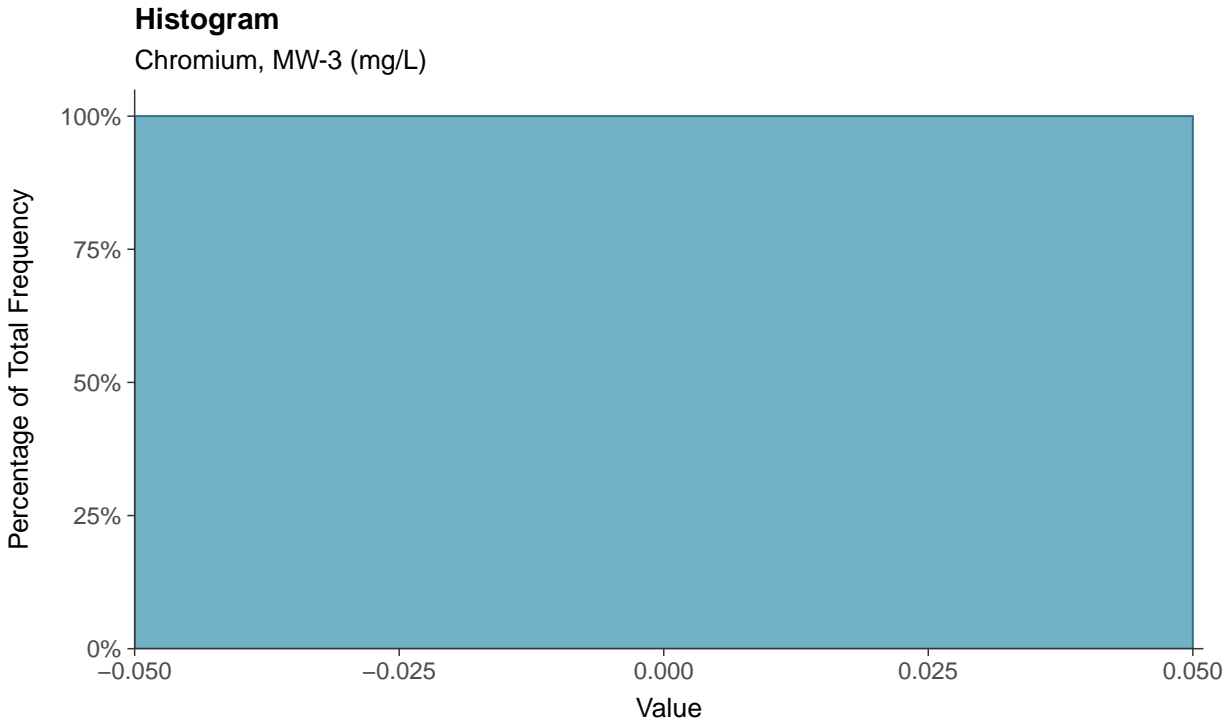
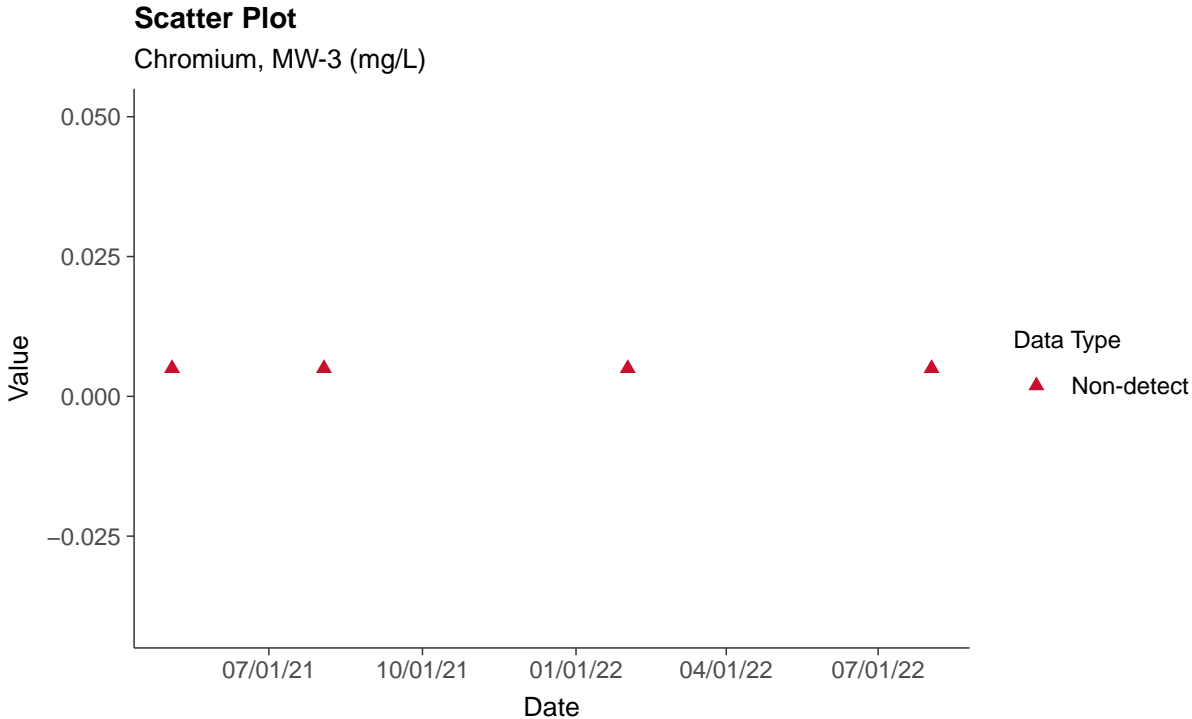
Chromium, MW-2 (mg/L)





### Appendix IV: Chromium, MW-3

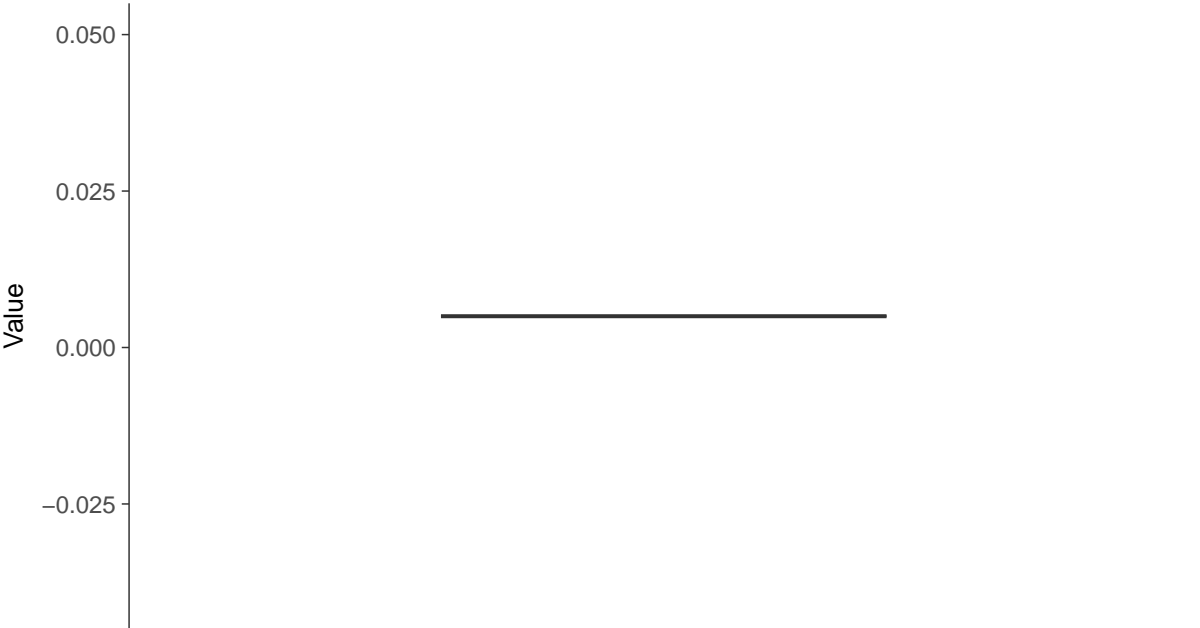
ID: 2\_14\_03





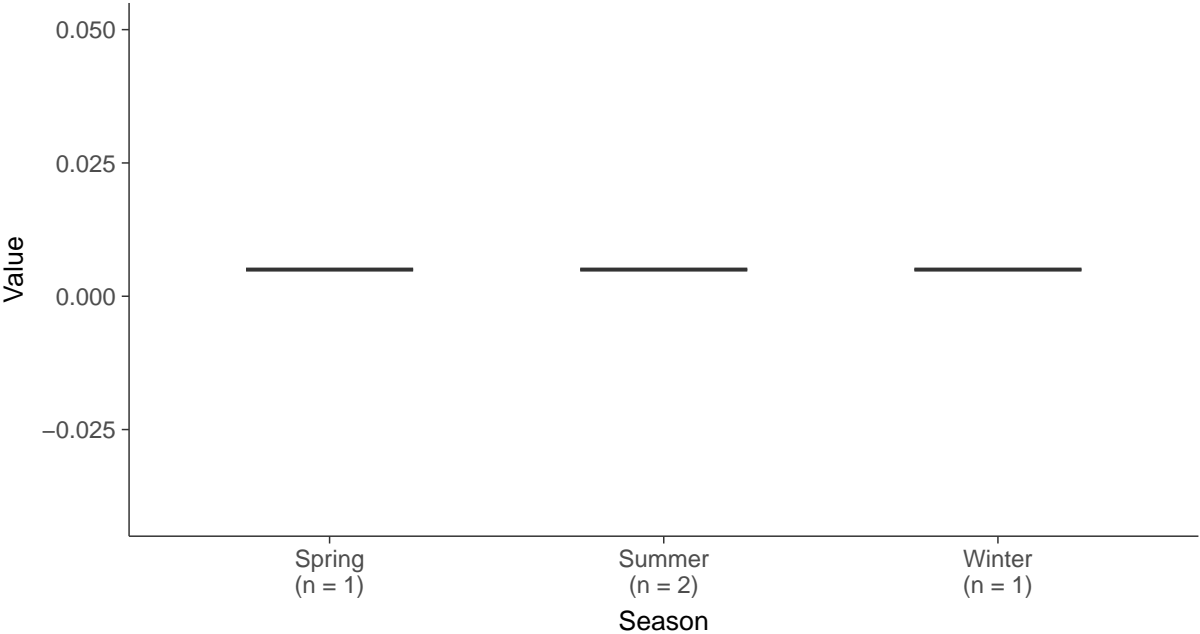
**Boxplot**

Chromium, MW-3 (mg/L)



**Boxplot by Season**

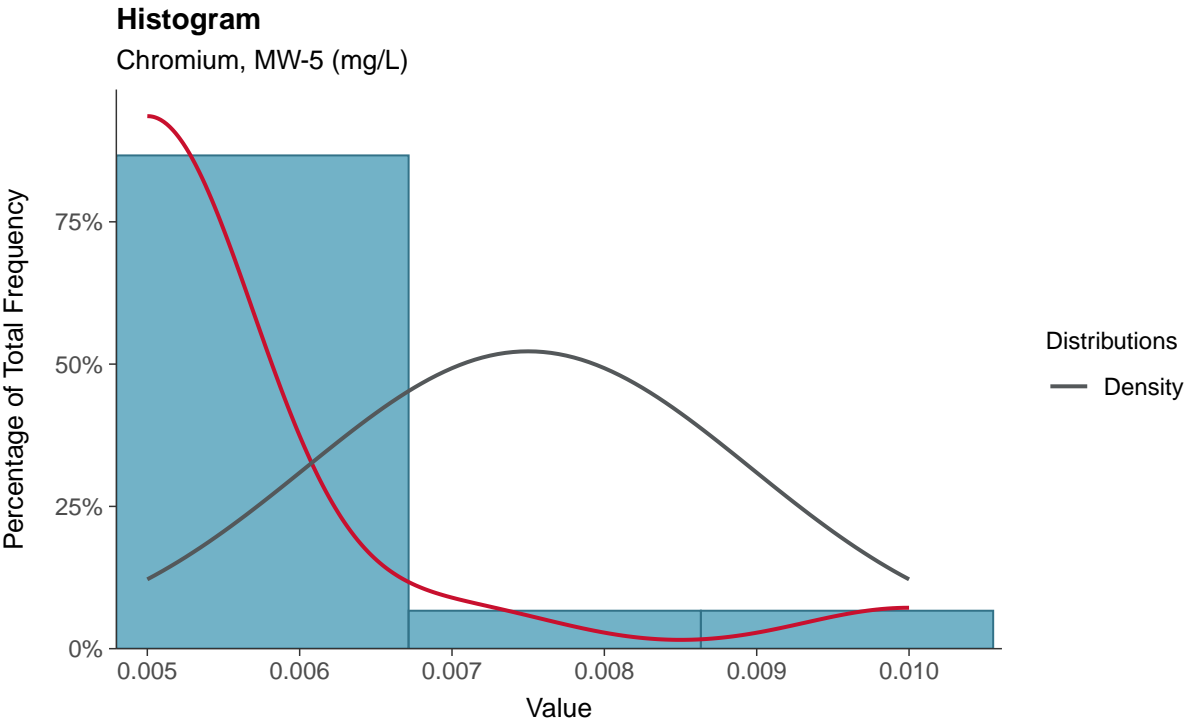
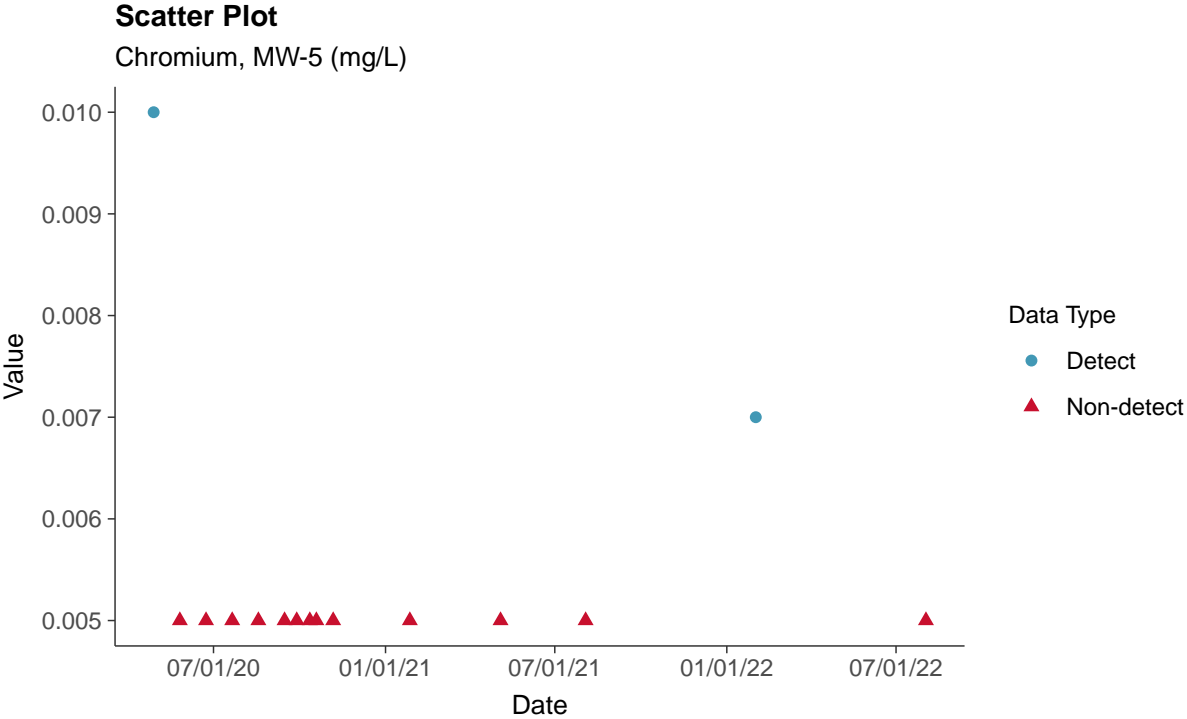
Chromium, MW-3 (mg/L)





### Appendix IV: Chromium, MW-5

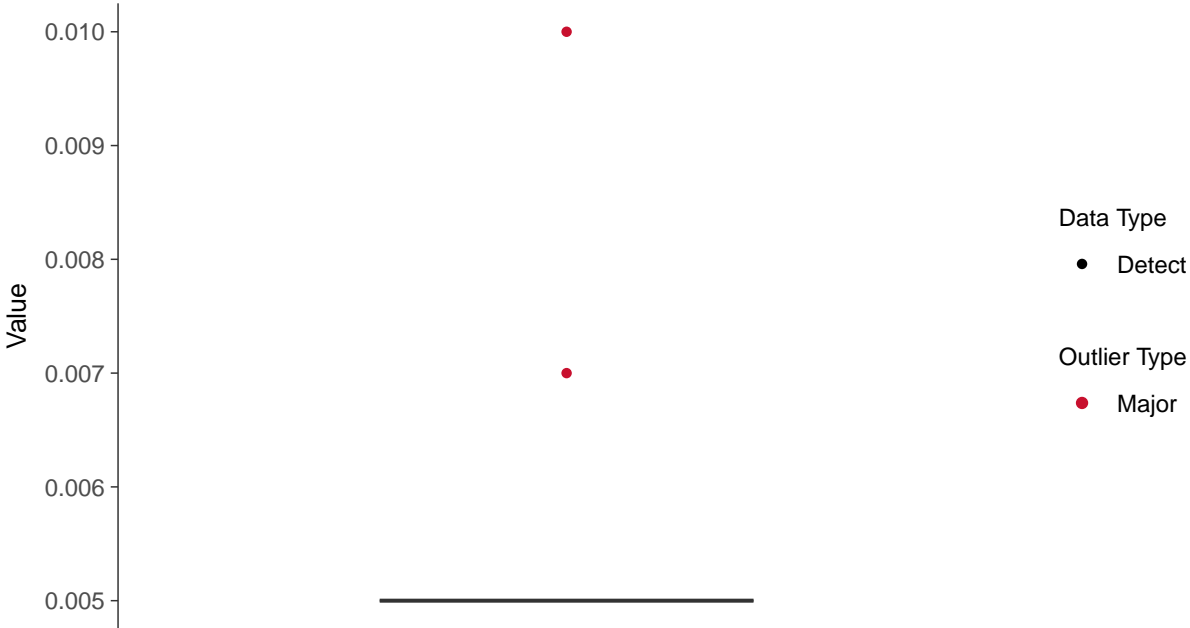
ID: 2\_14\_05





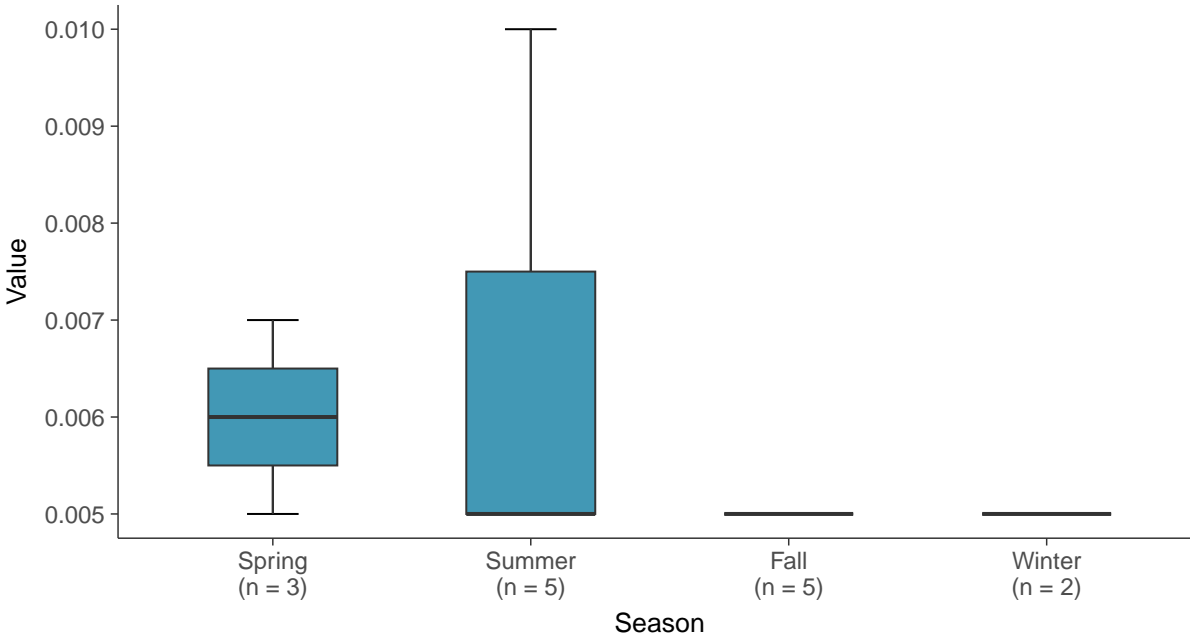
**Boxplot**

Chromium, MW-5 (mg/L)



**Boxplot by Season**

Chromium, MW-5 (mg/L)

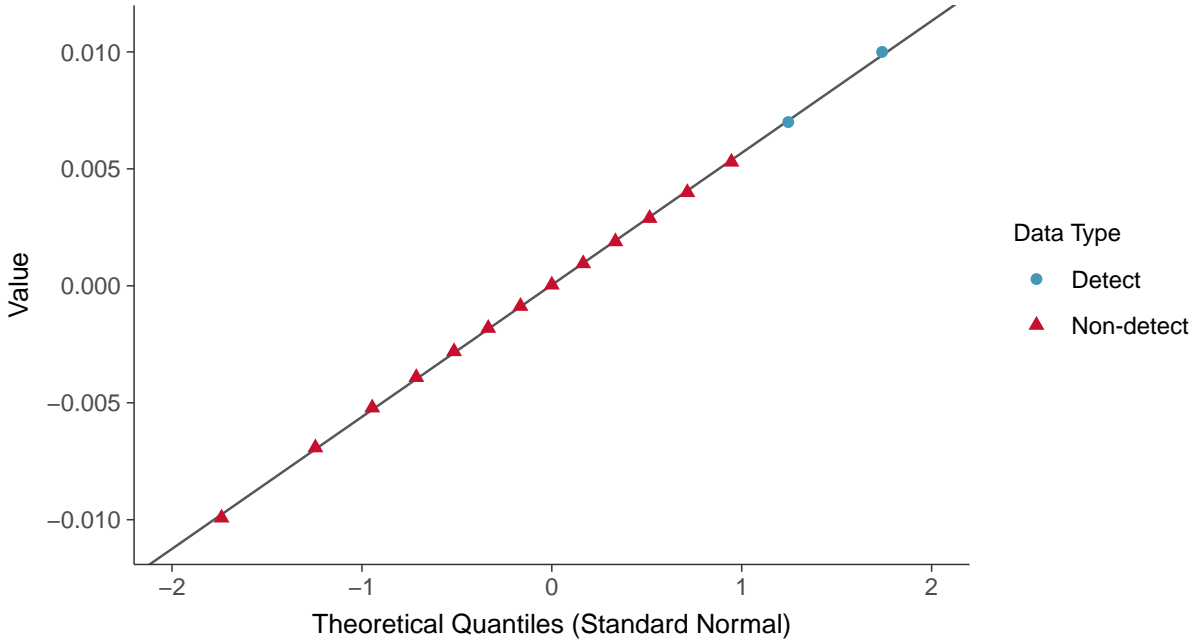






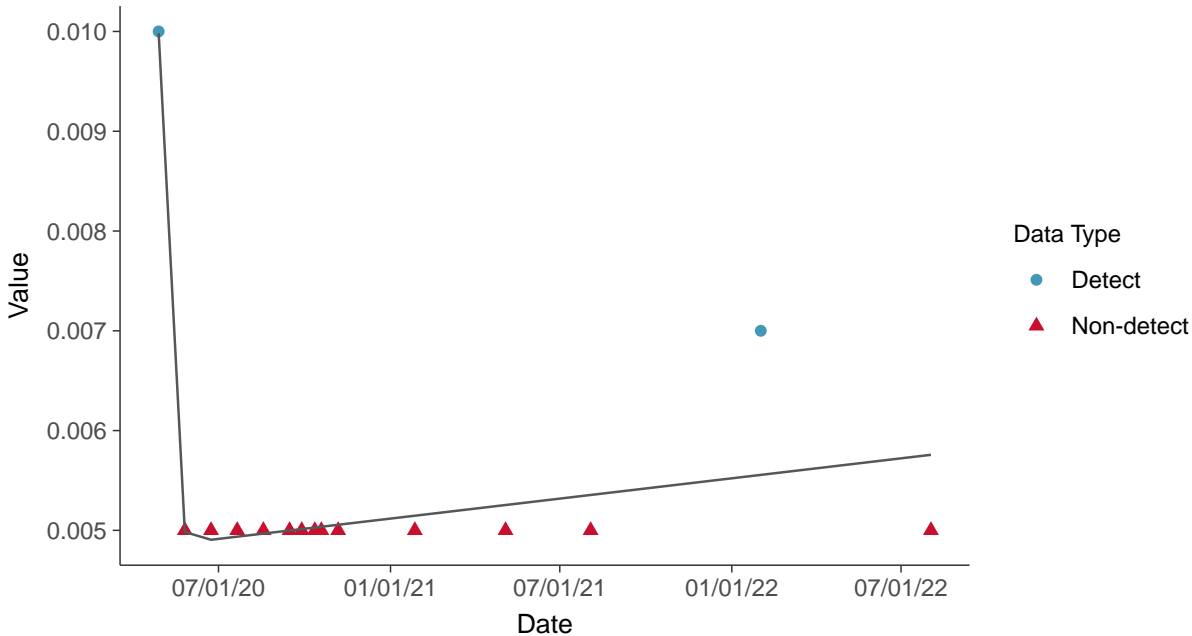
### Normal Q-Q plot using ROS Imputed Estimates

Chromium, MW-5 (mg/L)



### Trend Regression: Piecewise Linear-Linear

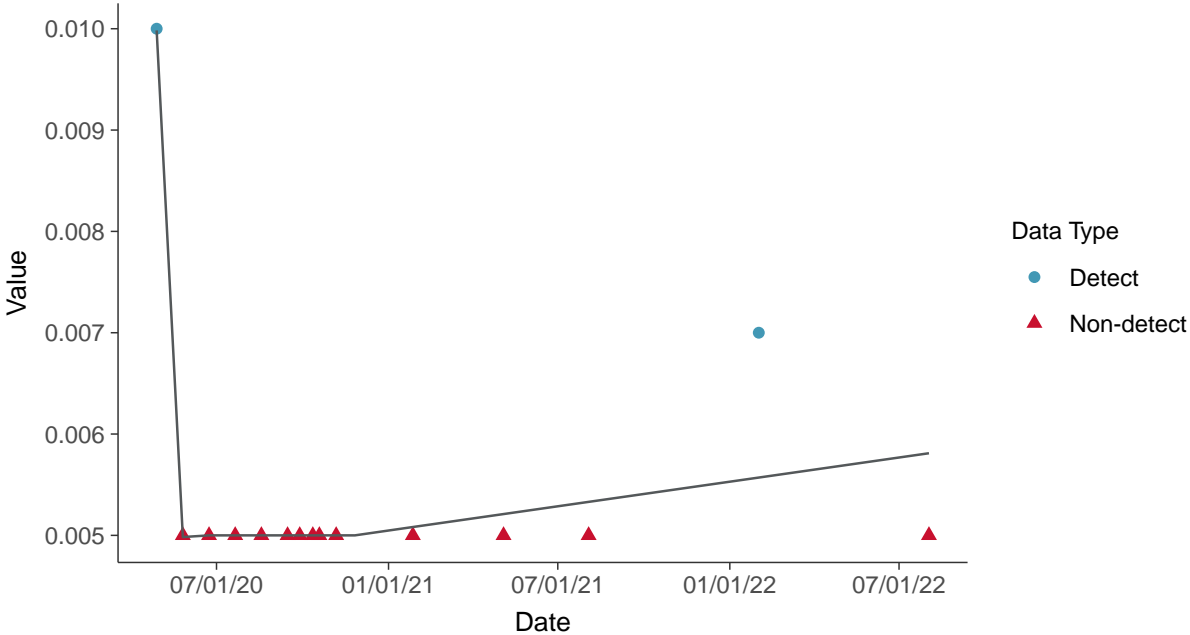
Chromium, MW-5 (mg/L)





### Trend Regression: Piecewise Linear-Linear-Linear

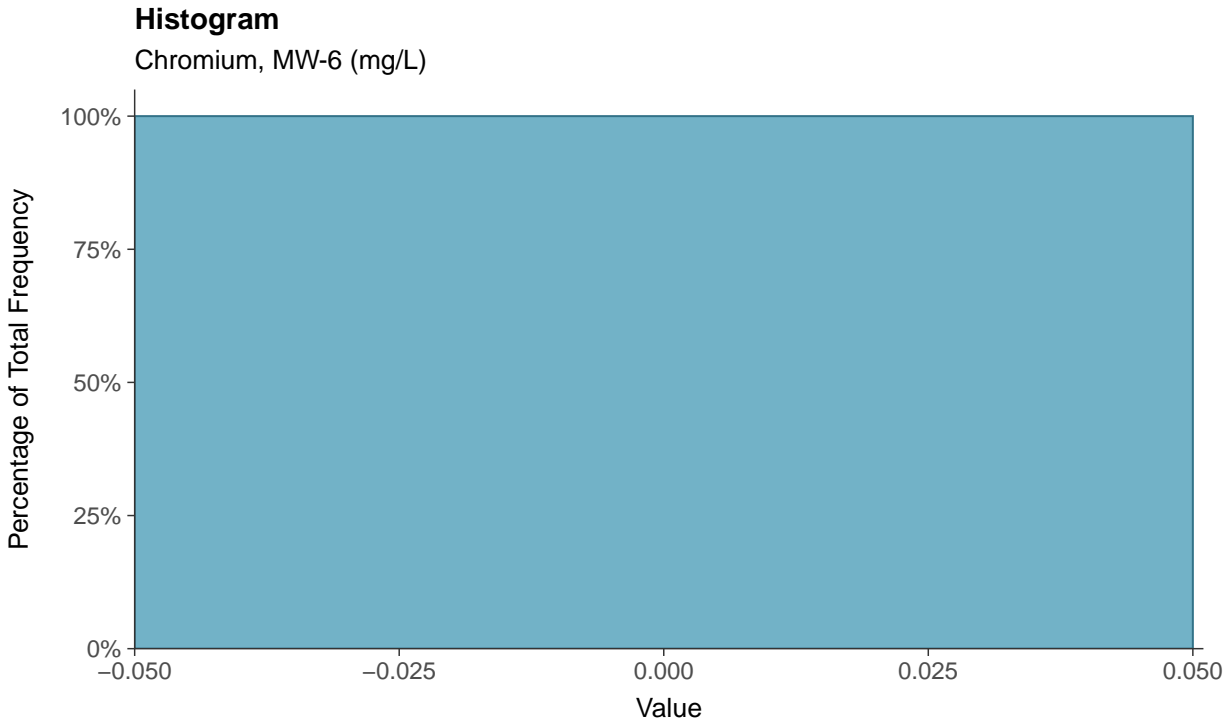
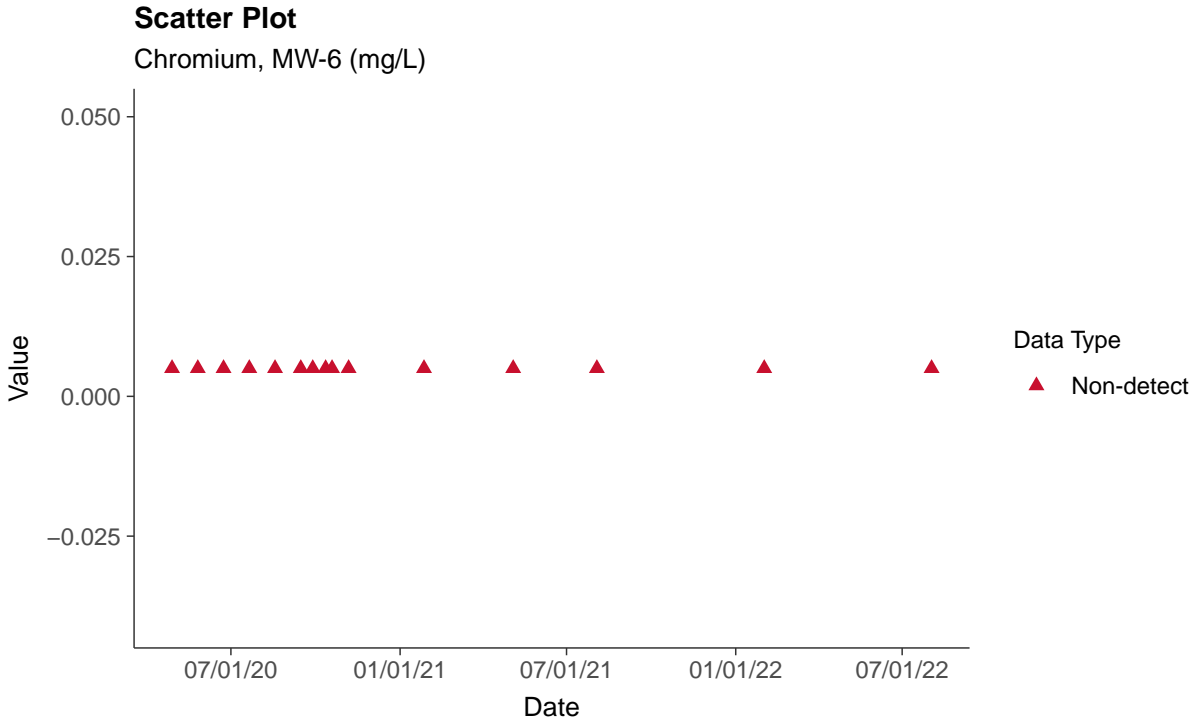
Chromium, MW-5 (mg/L)





### Appendix IV: Chromium, MW-6

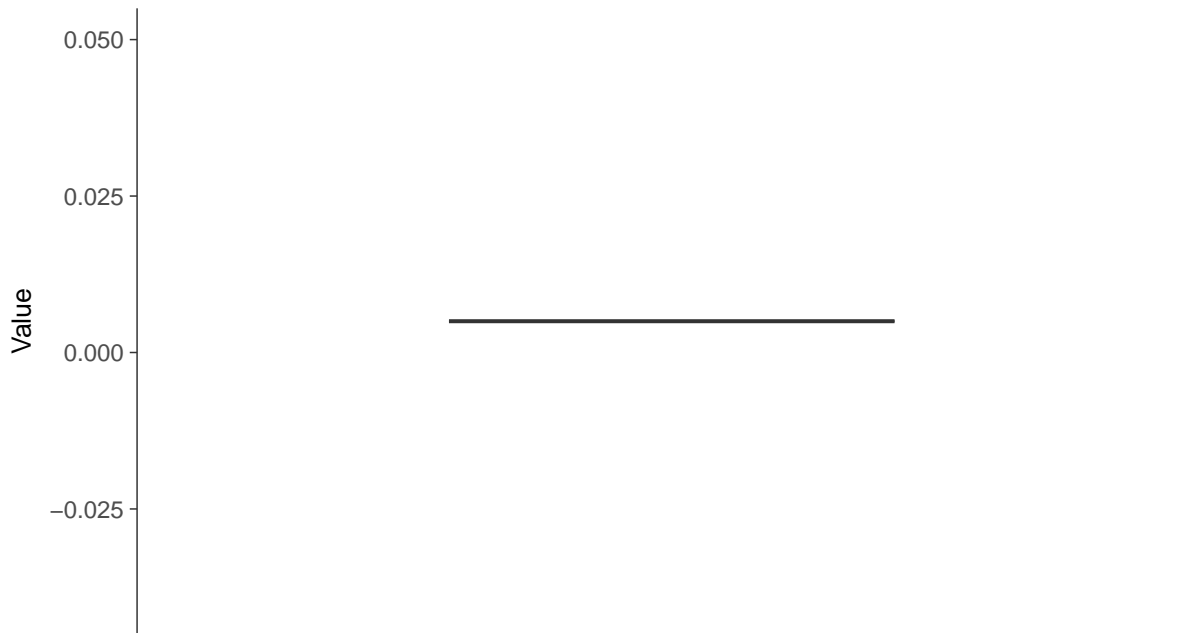
ID: 2\_14\_06





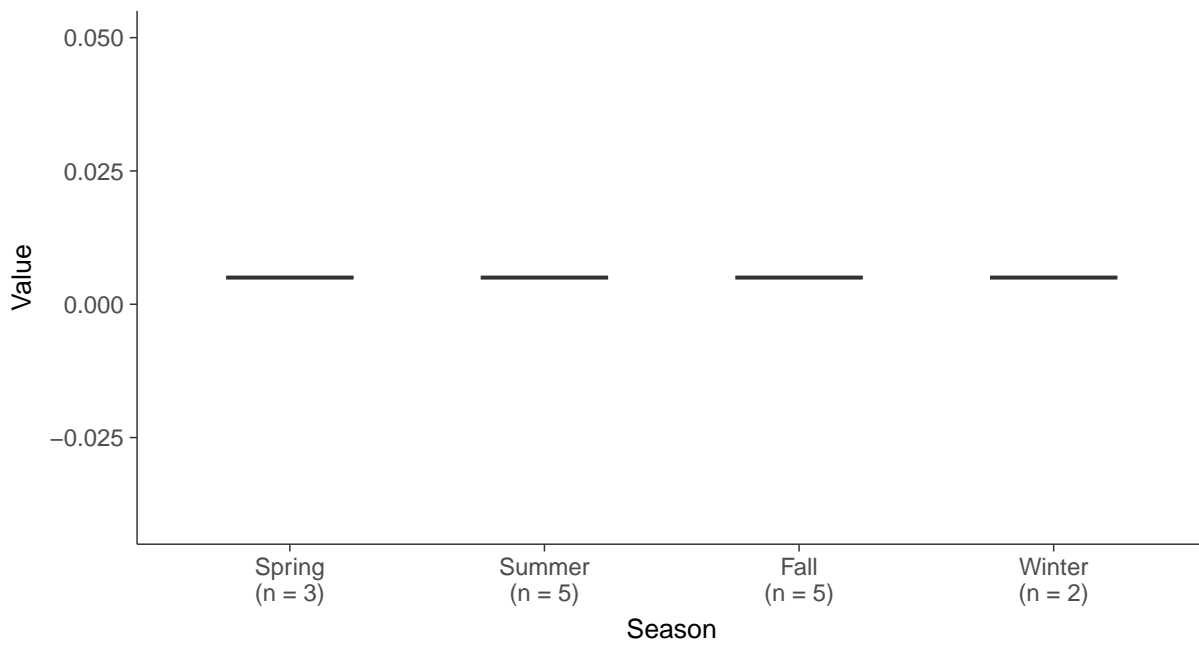
### Boxplot

Chromium, MW-6 (mg/L)



### Boxplot by Season

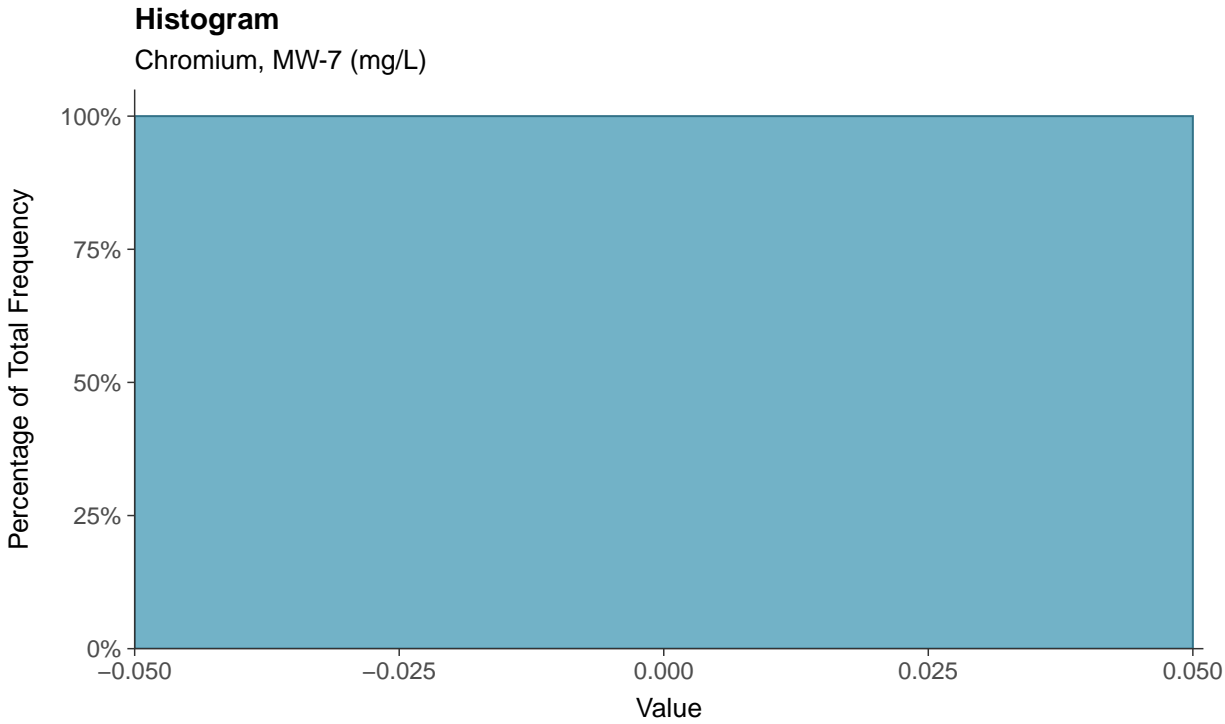
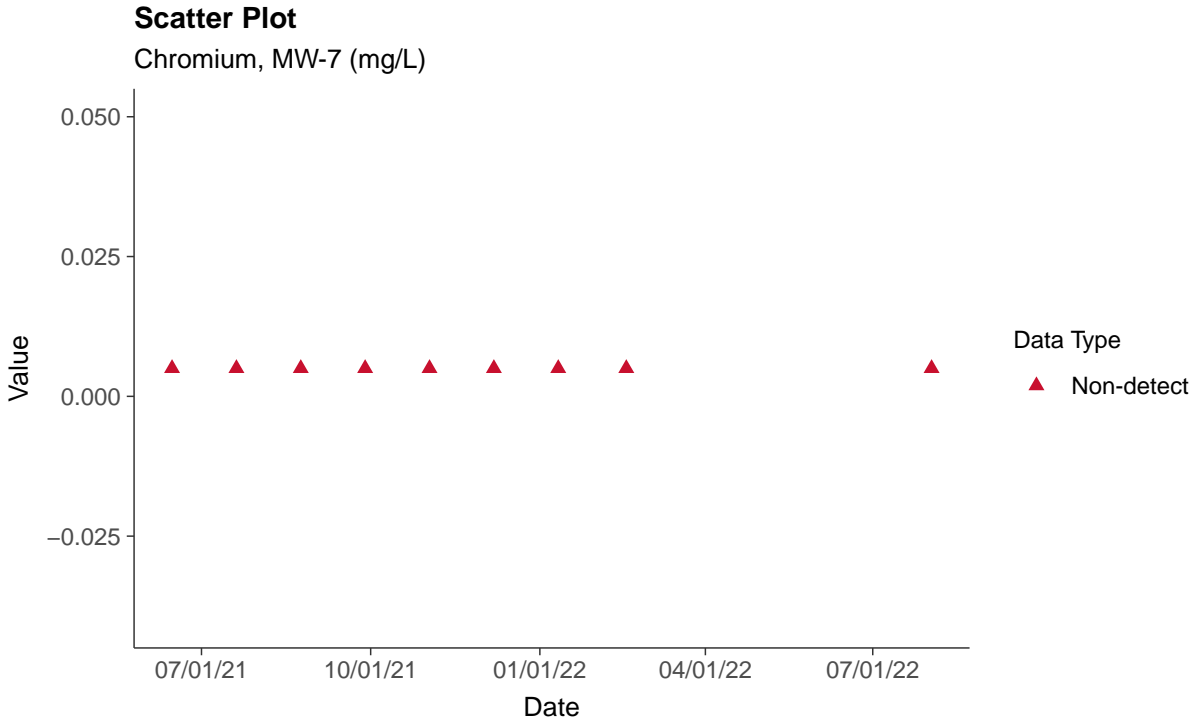
Chromium, MW-6 (mg/L)





### Appendix IV: Chromium, MW-7

ID: 2\_14\_07





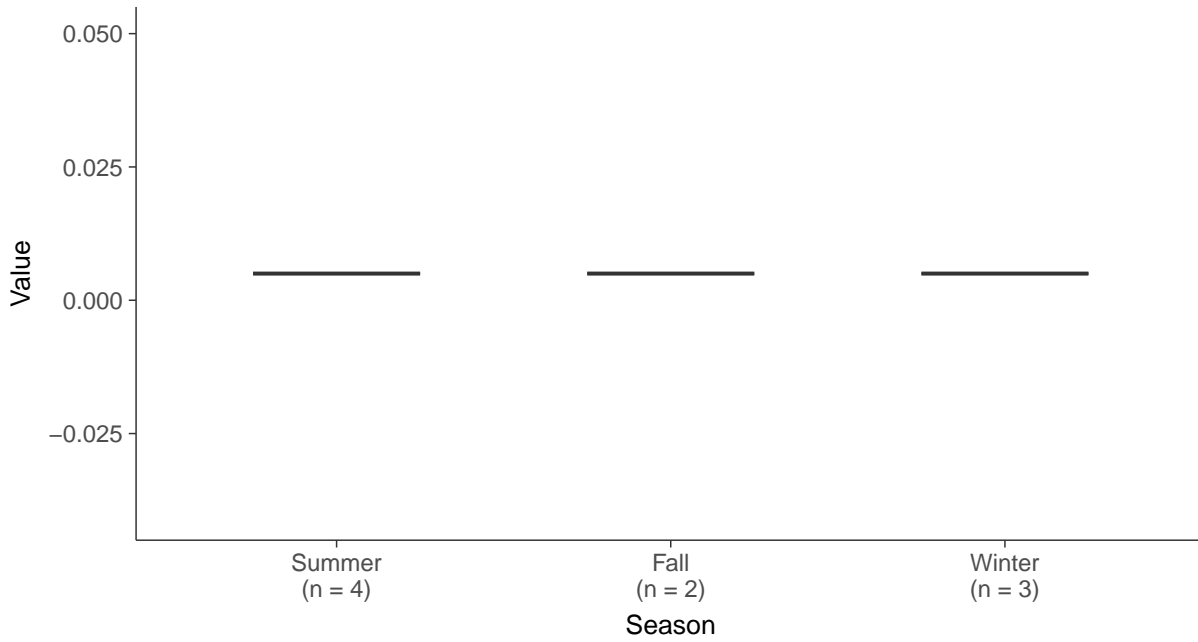
### Boxplot

Chromium, MW-7 (mg/L)



### Boxplot by Season

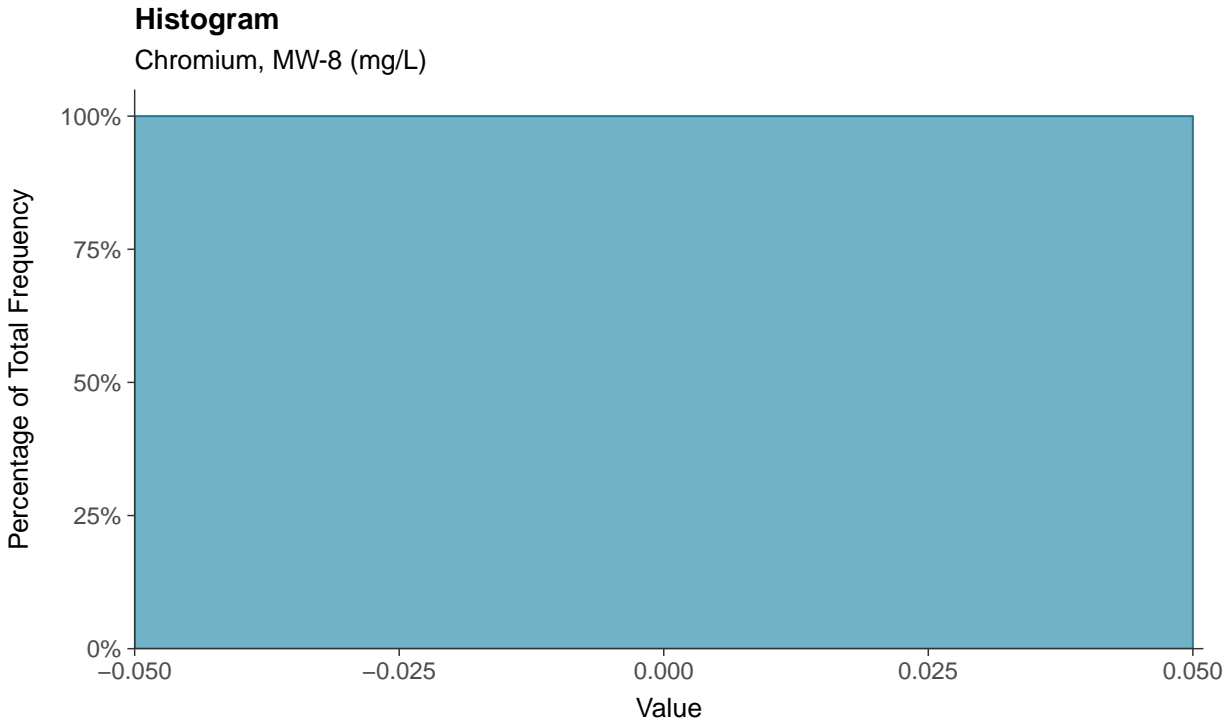
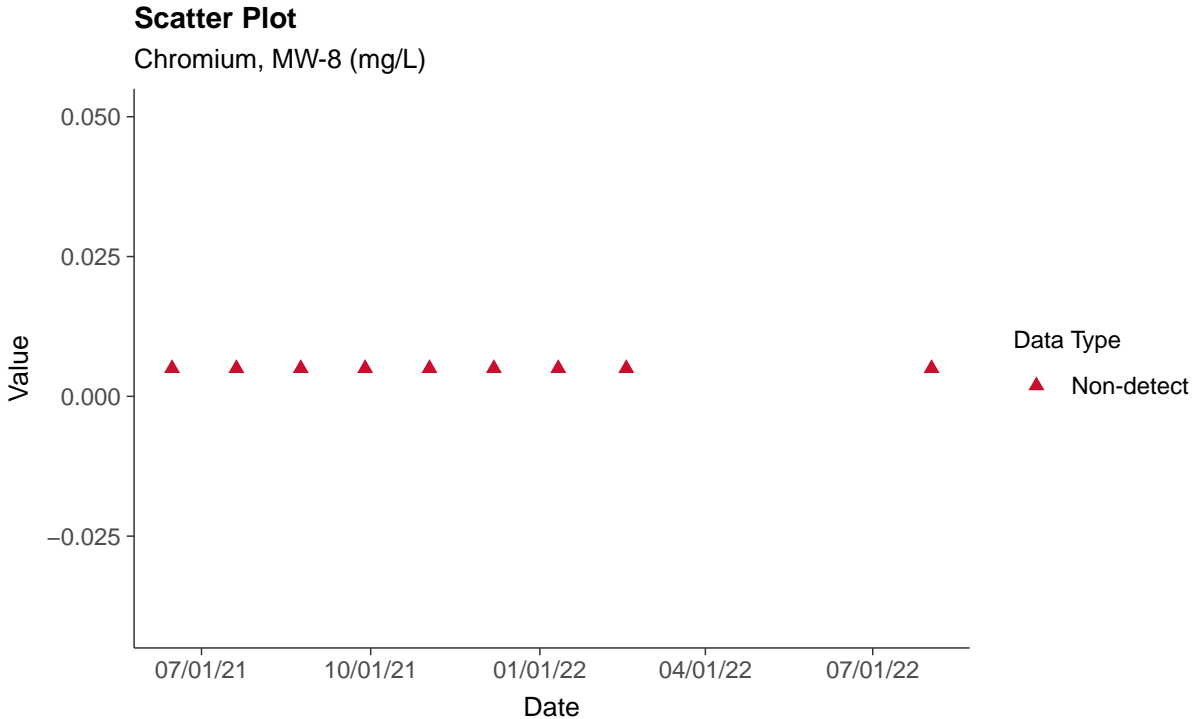
Chromium, MW-7 (mg/L)





### Appendix IV: Chromium, MW-8

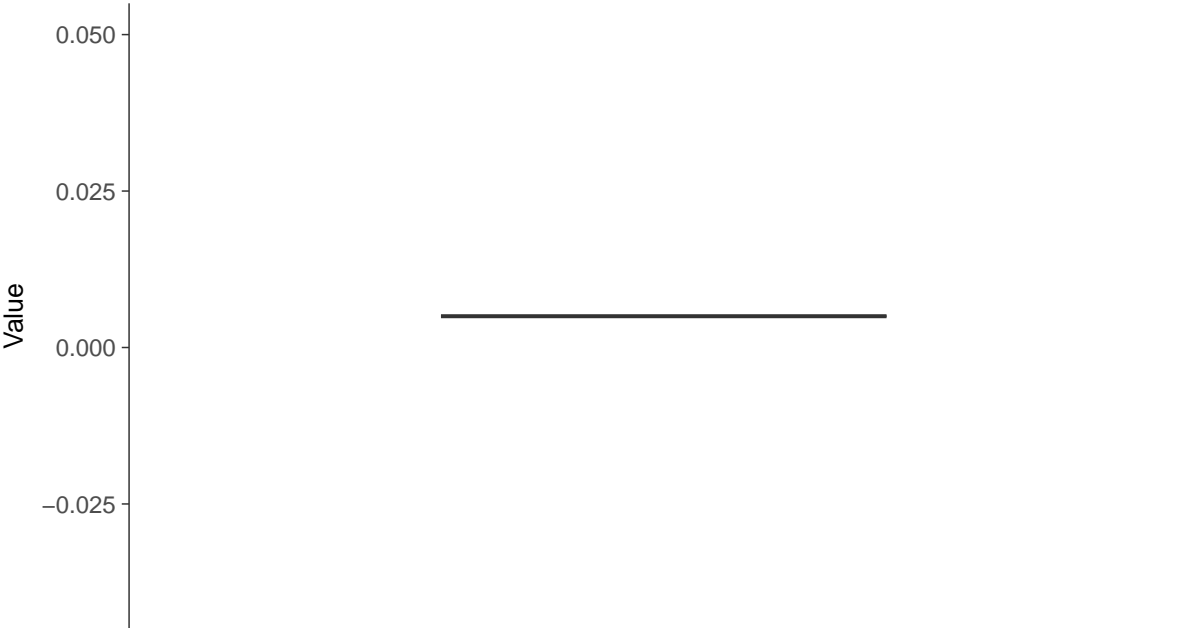
ID: 2\_14\_08





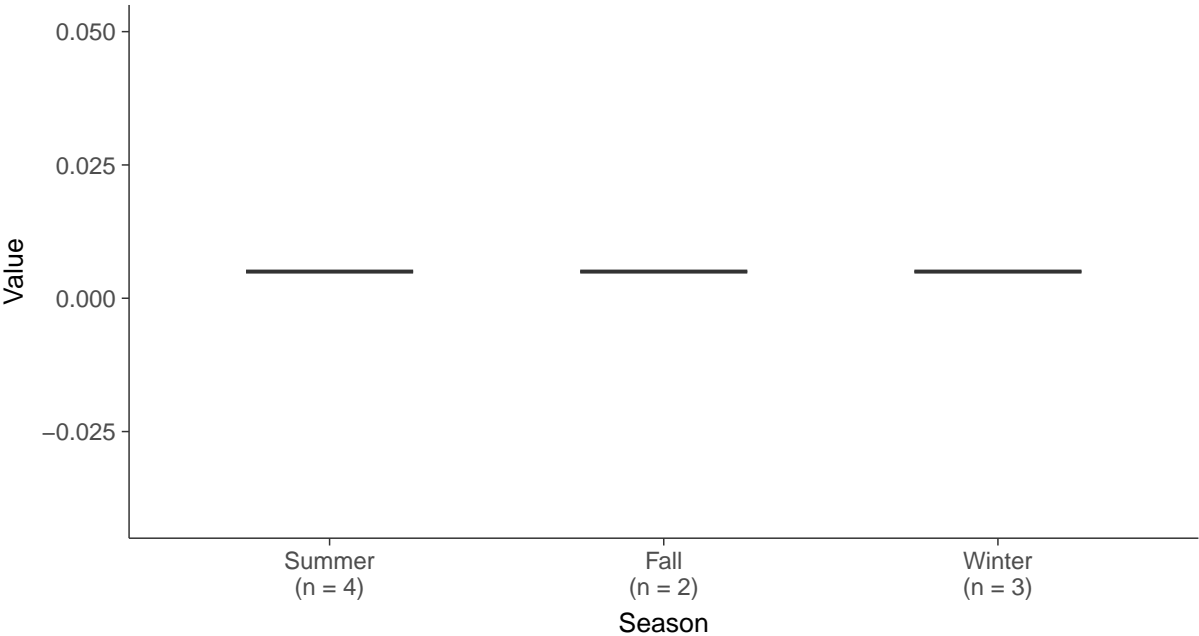
**Boxplot**

Chromium, MW-8 (mg/L)



**Boxplot by Season**

Chromium, MW-8 (mg/L)

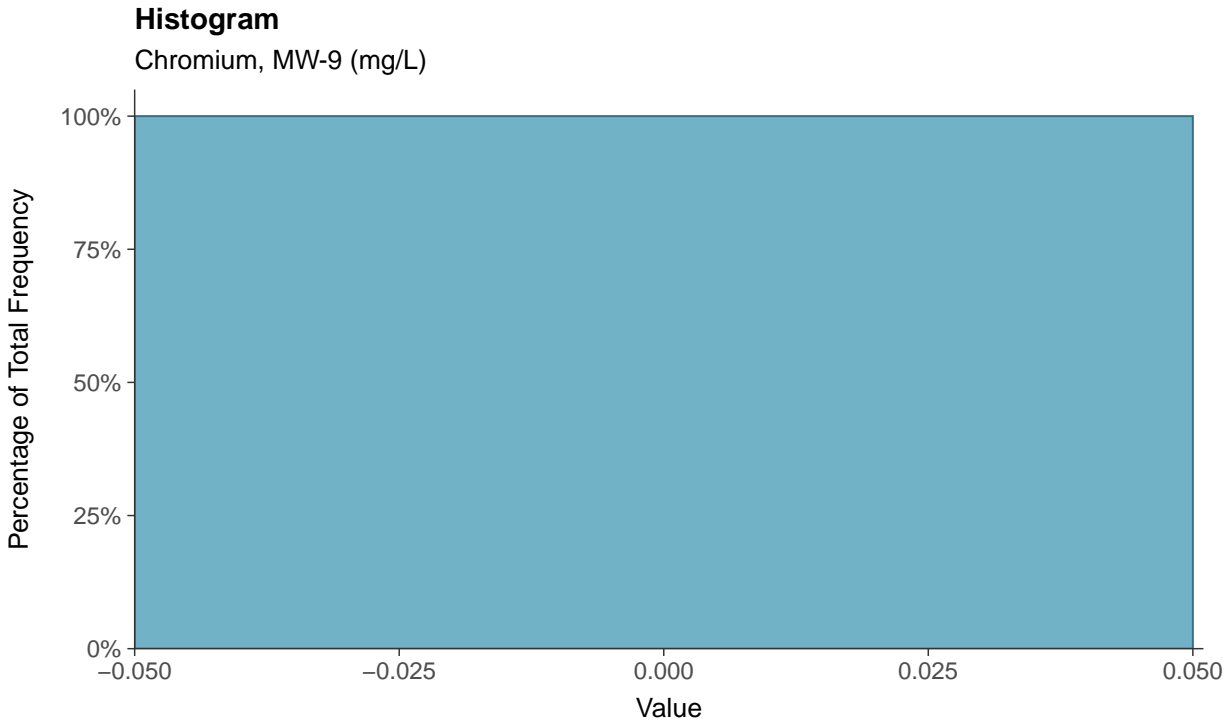
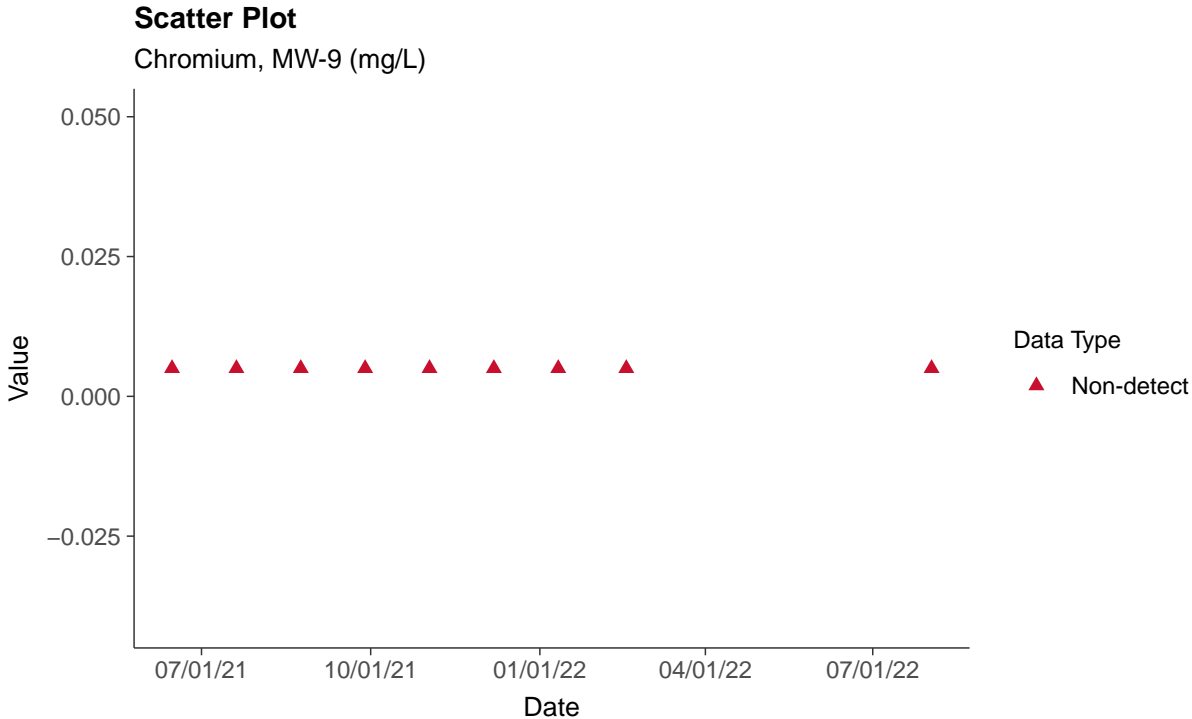






### Appendix IV: Chromium, MW-9

ID: 2\_14\_09





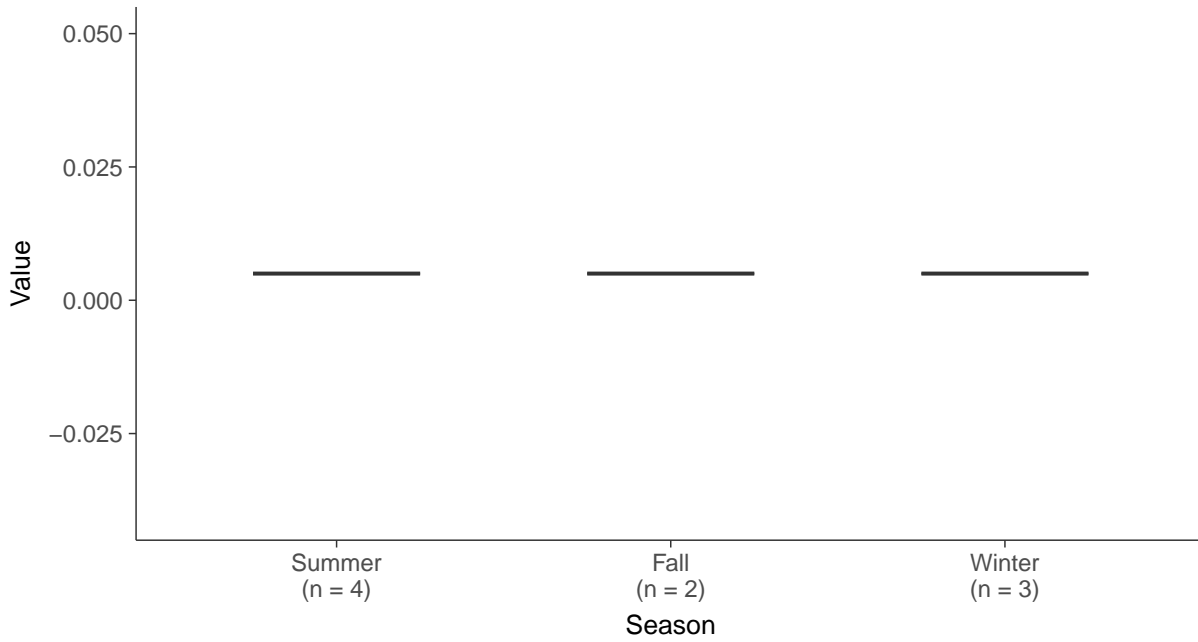
**Boxplot**

Chromium, MW-9 (mg/L)



**Boxplot by Season**

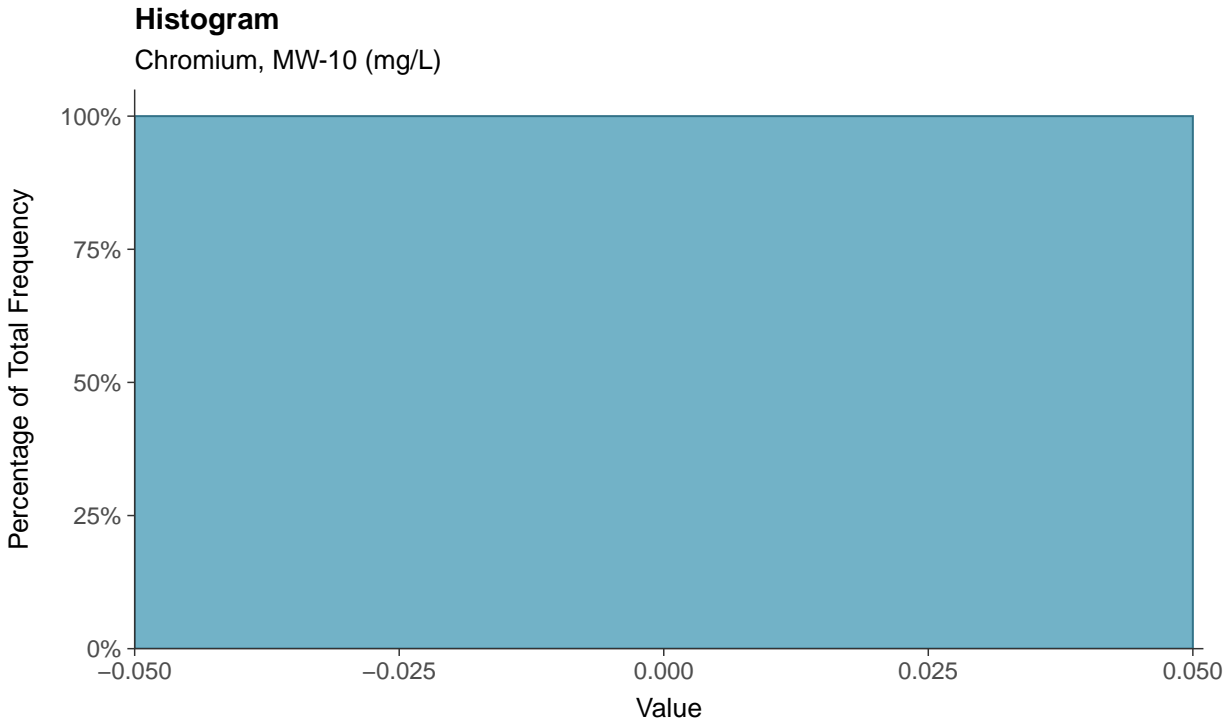
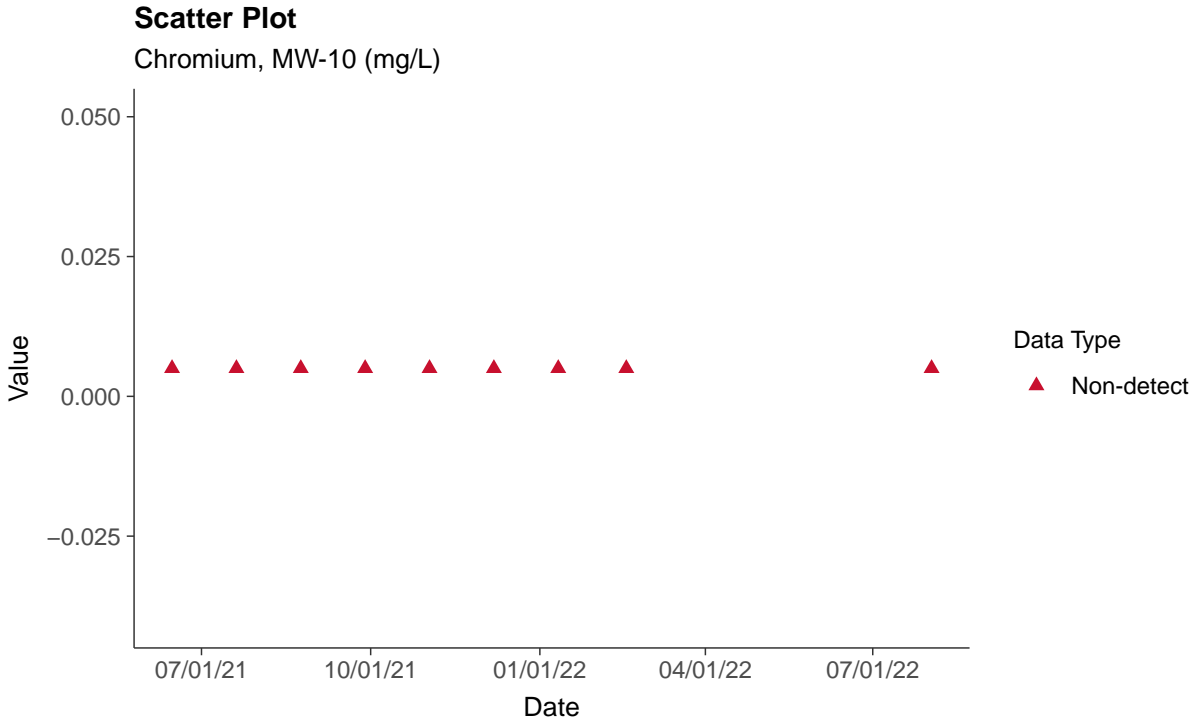
Chromium, MW-9 (mg/L)





### Appendix IV: Chromium, MW-10

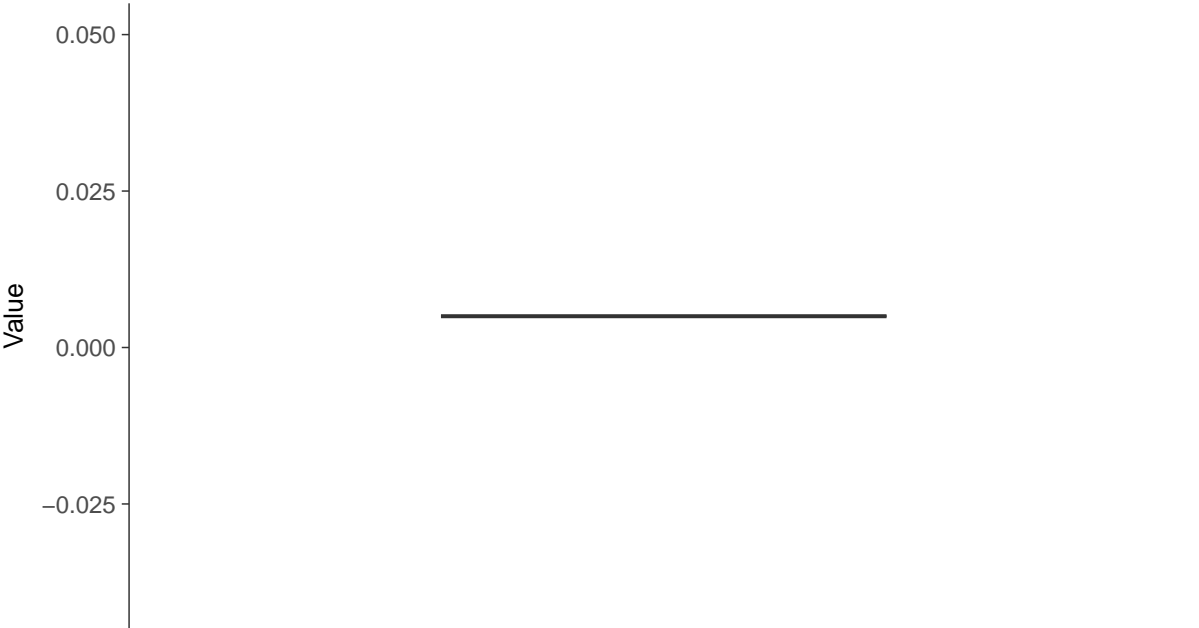
ID: 2\_14\_10





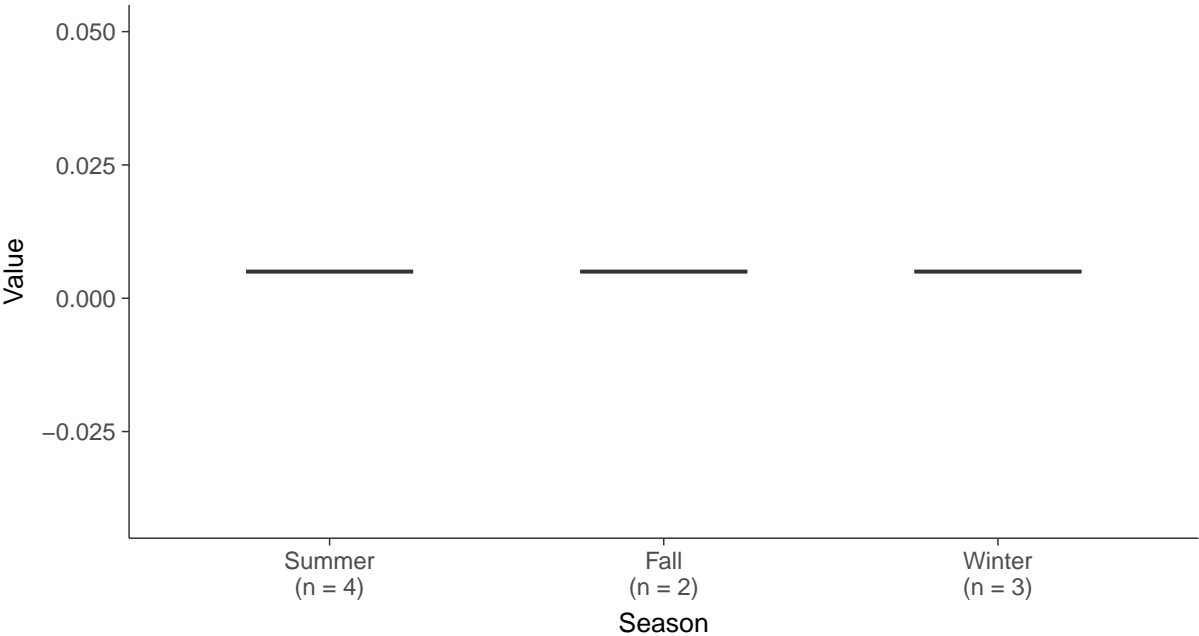
**Boxplot**

Chromium, MW-10 (mg/L)



**Boxplot by Season**

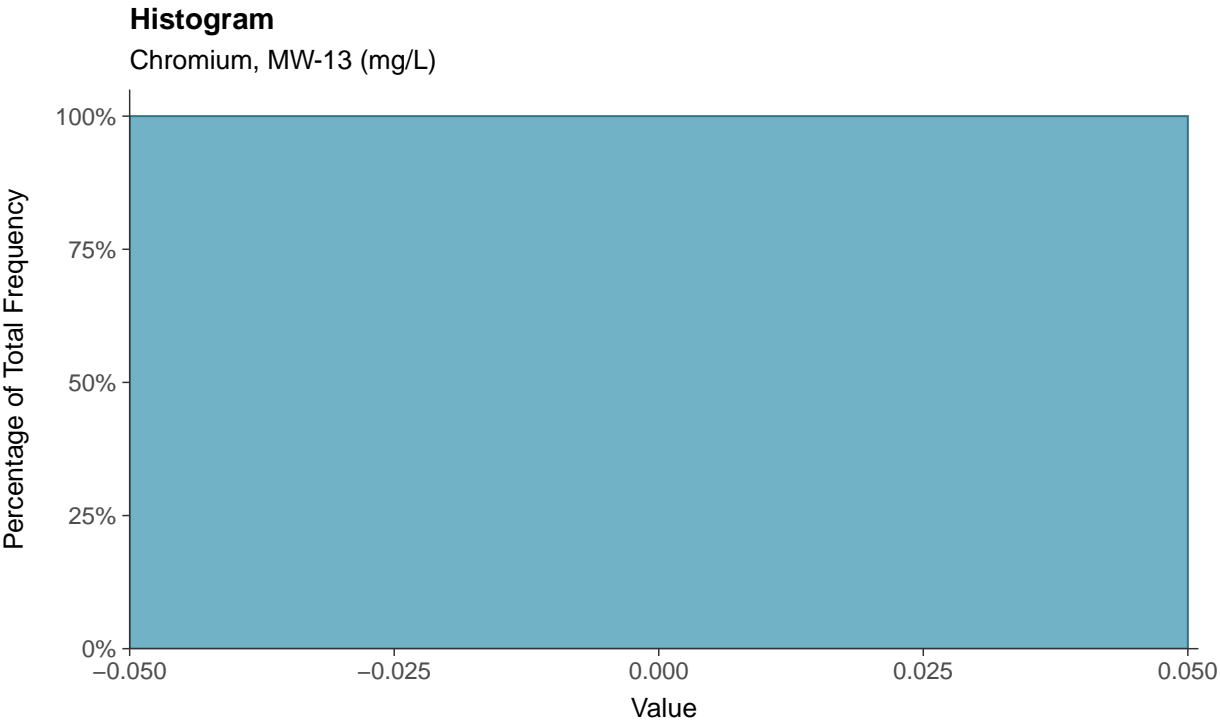
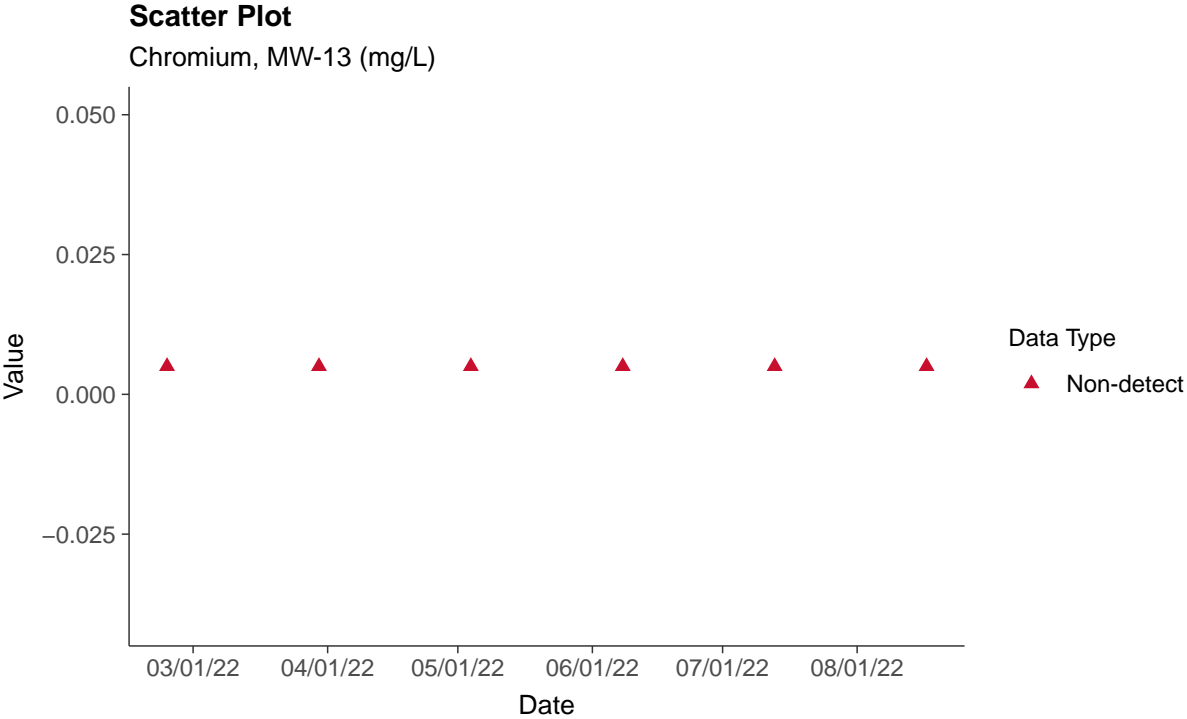
Chromium, MW-10 (mg/L)





### Appendix IV: Chromium, MW-13

ID: 2\_14\_13





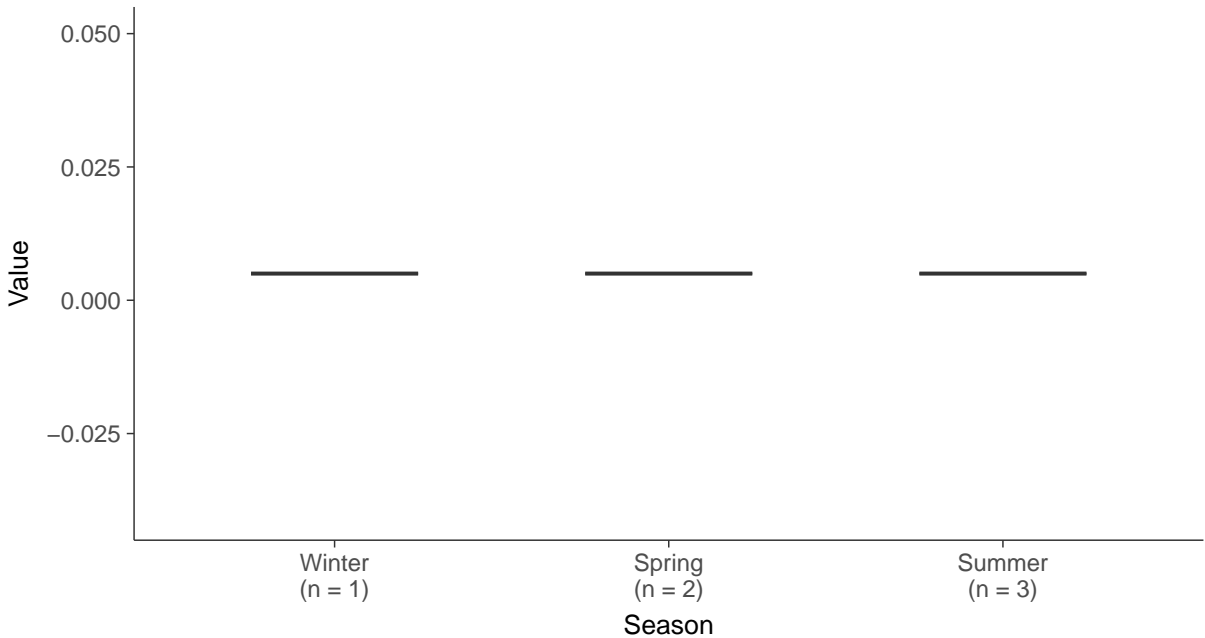
**Boxplot**

Chromium, MW-13 (mg/L)



**Boxplot by Season**

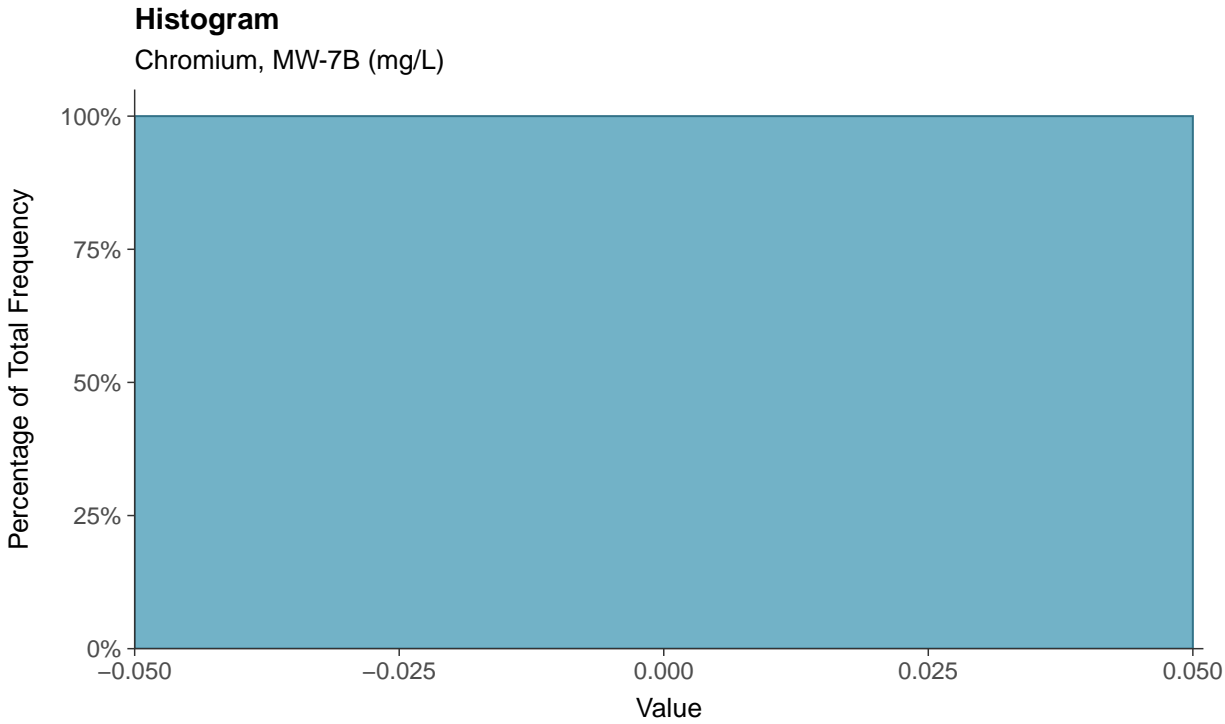
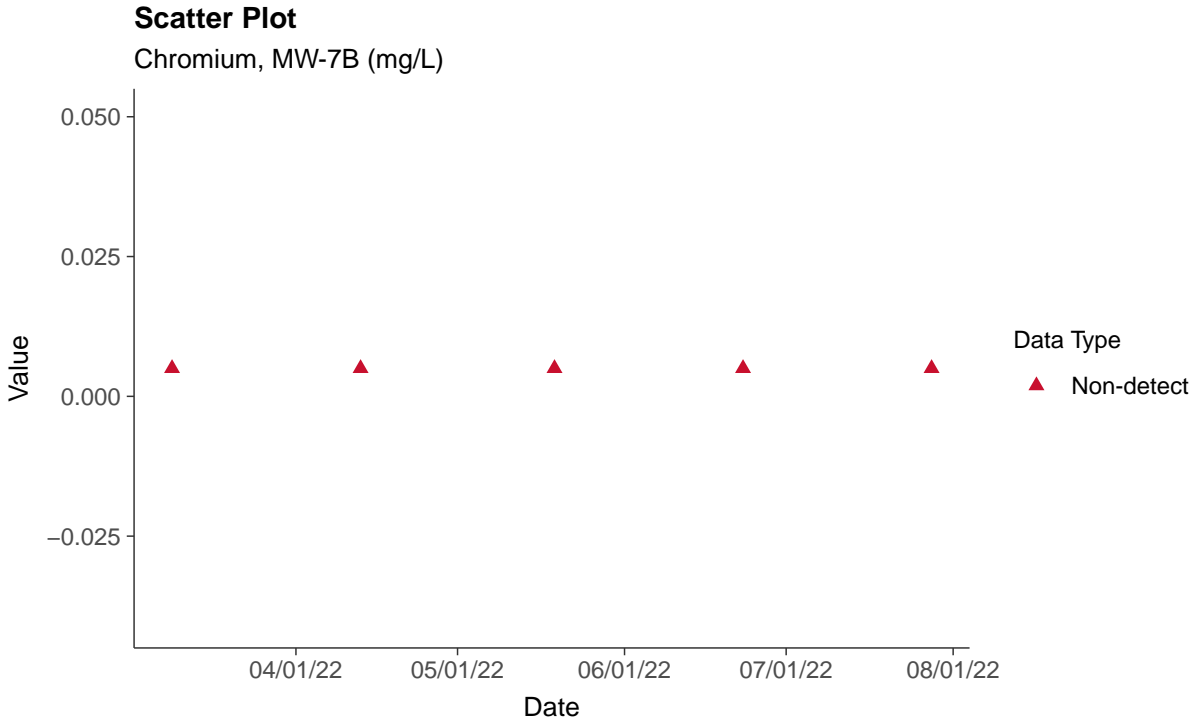
Chromium, MW-13 (mg/L)





### Appendix IV: Chromium, MW-7B

ID: 2\_14\_7B





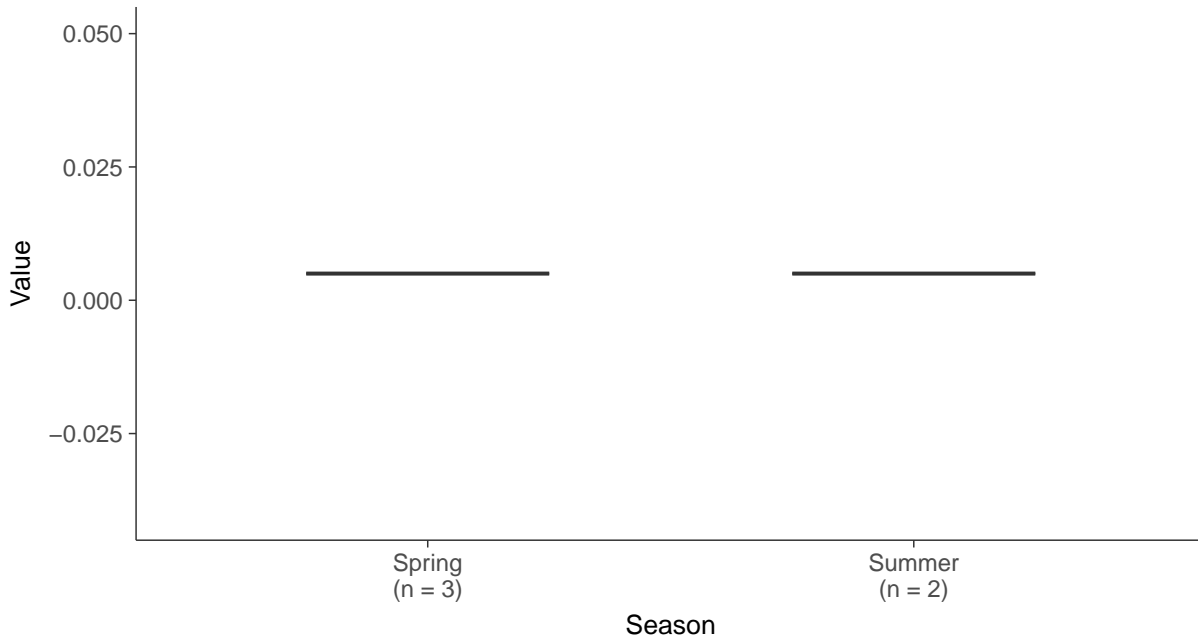
### Boxplot

Chromium, MW-7B (mg/L)



### Boxplot by Season

Chromium, MW-7B (mg/L)

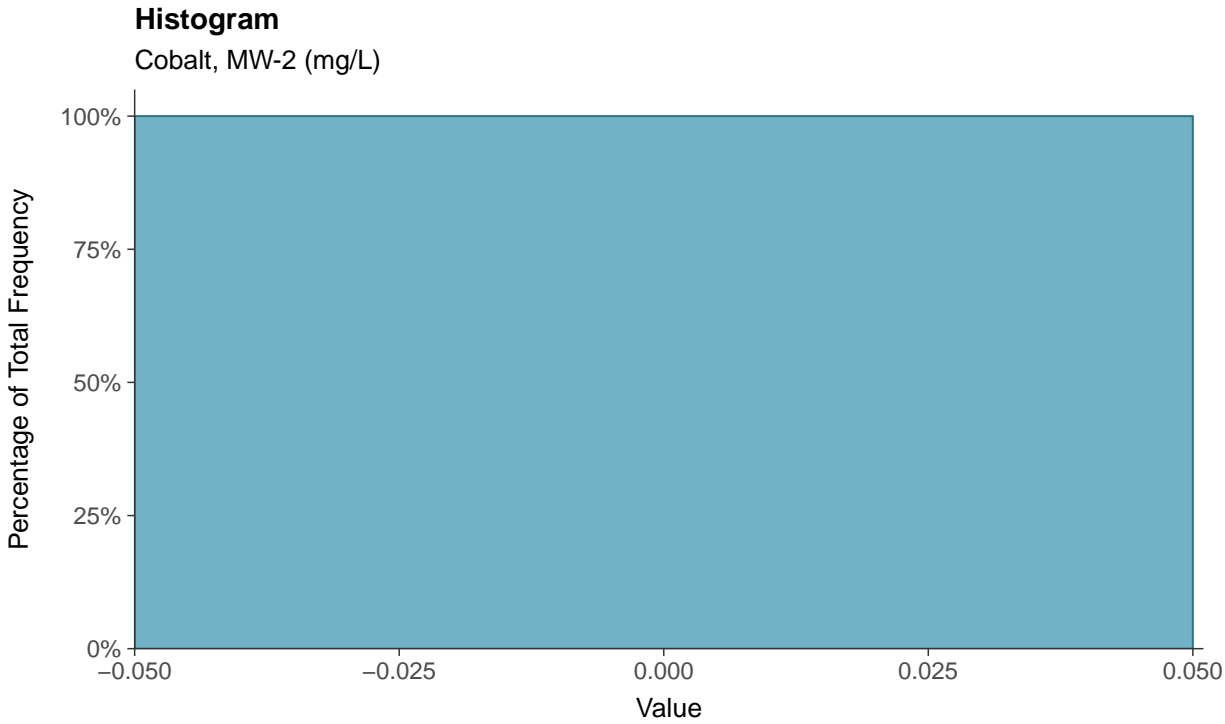
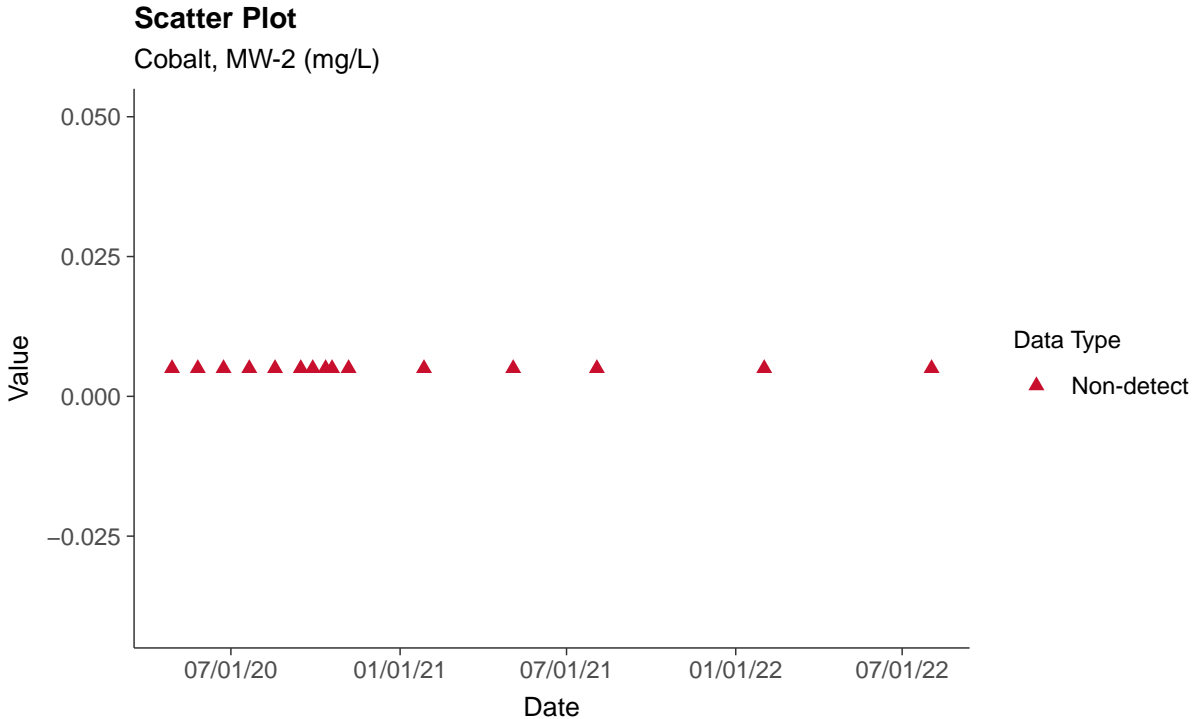






### Appendix IV: Cobalt, MW-2

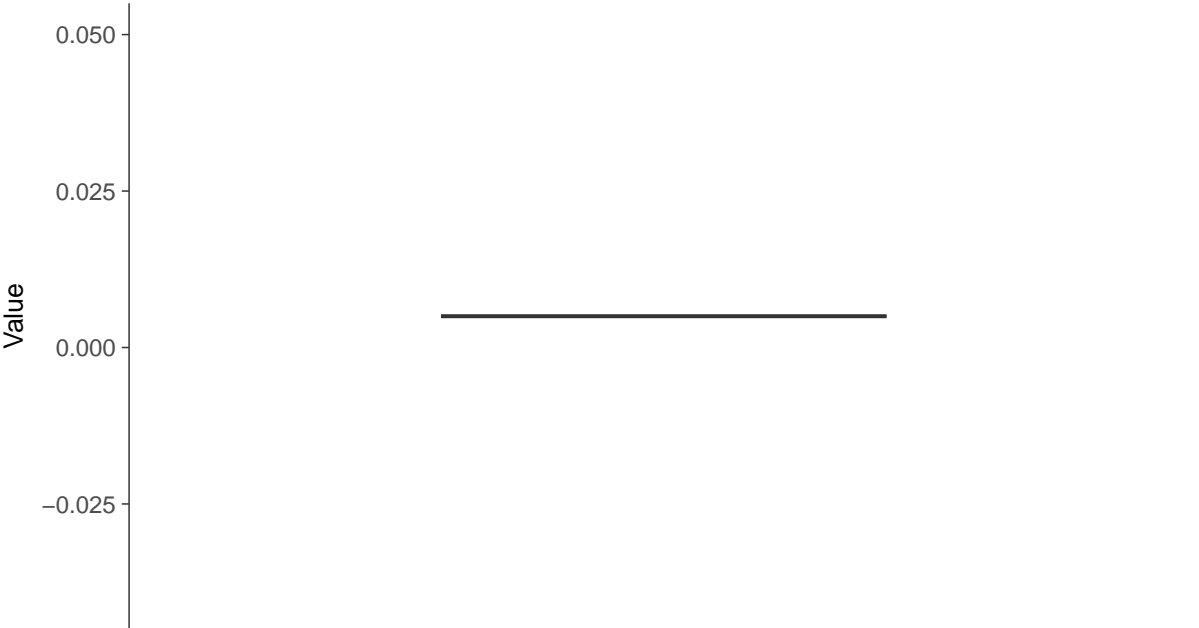
ID: 2\_15\_02





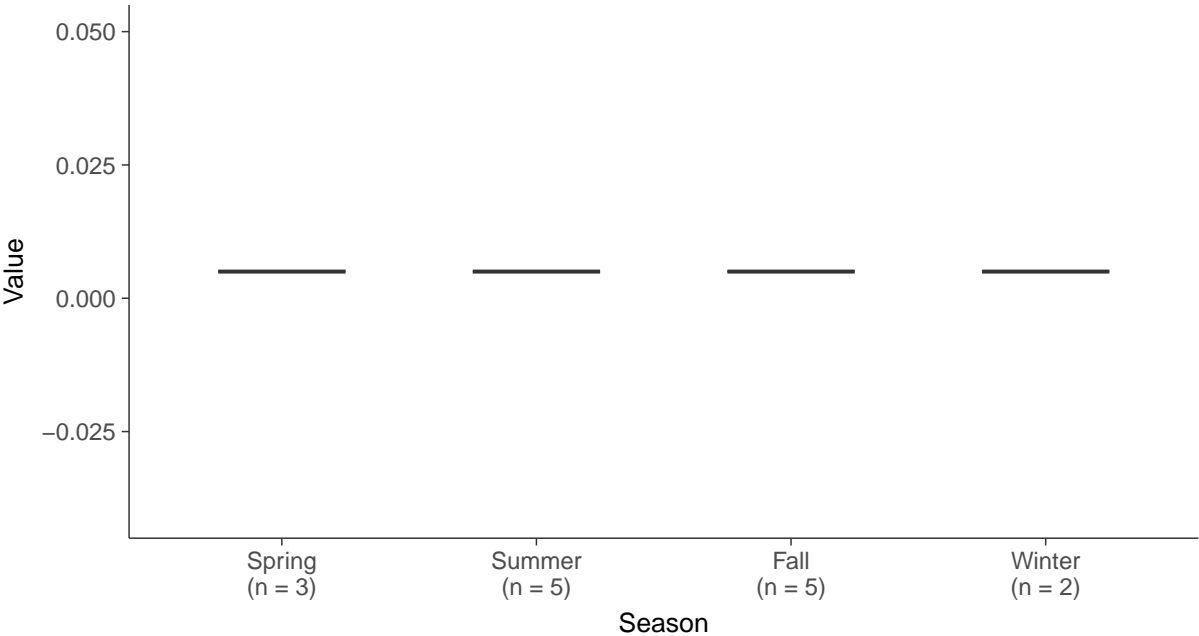
**Boxplot**

Cobalt, MW-2 (mg/L)



**Boxplot by Season**

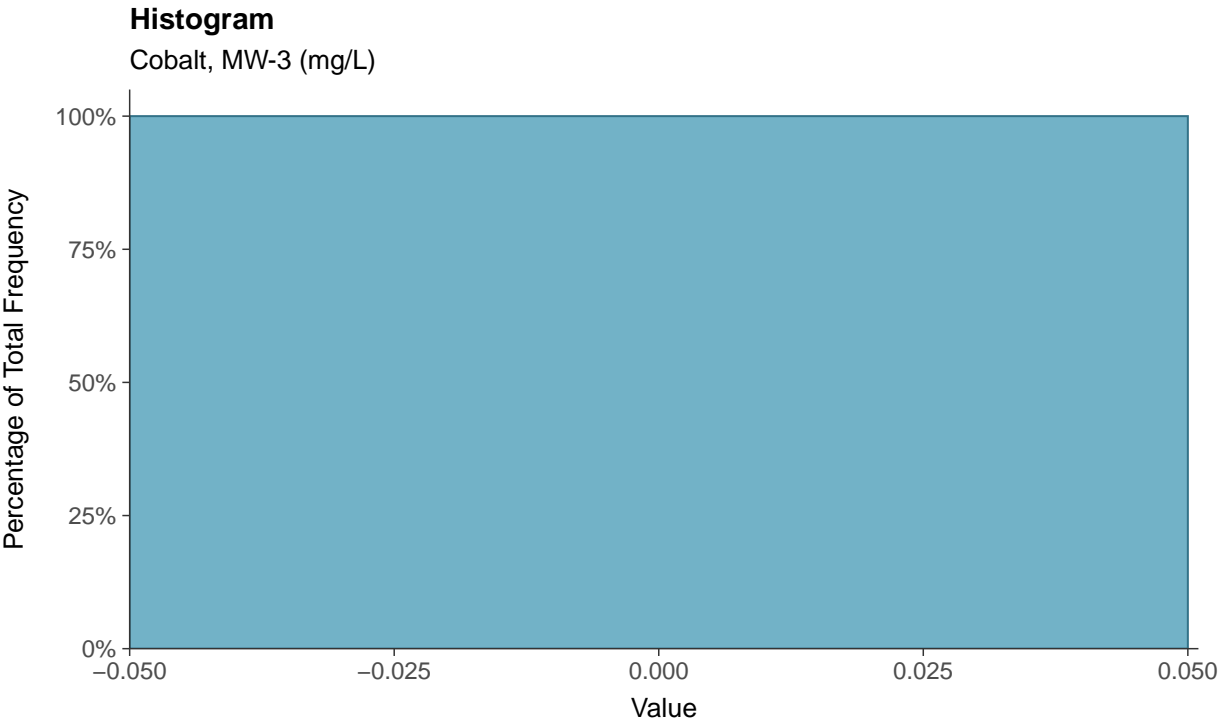
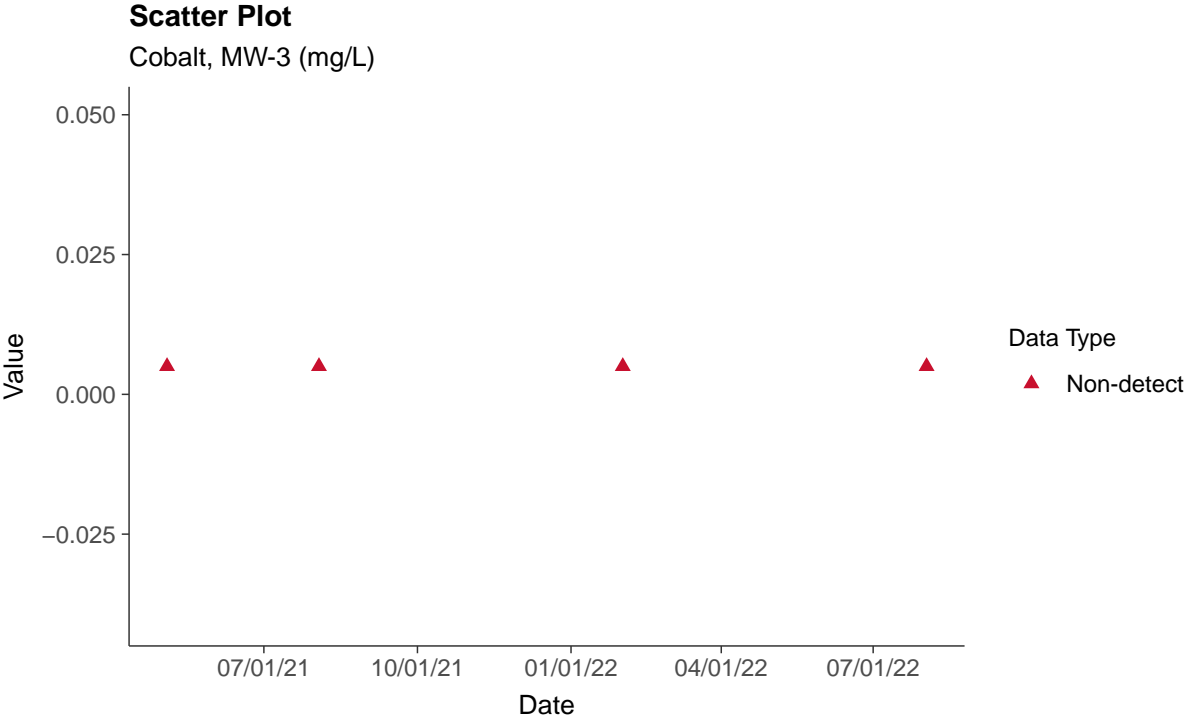
Cobalt, MW-2 (mg/L)





### Appendix IV: Cobalt, MW-3

ID: 2\_15\_03





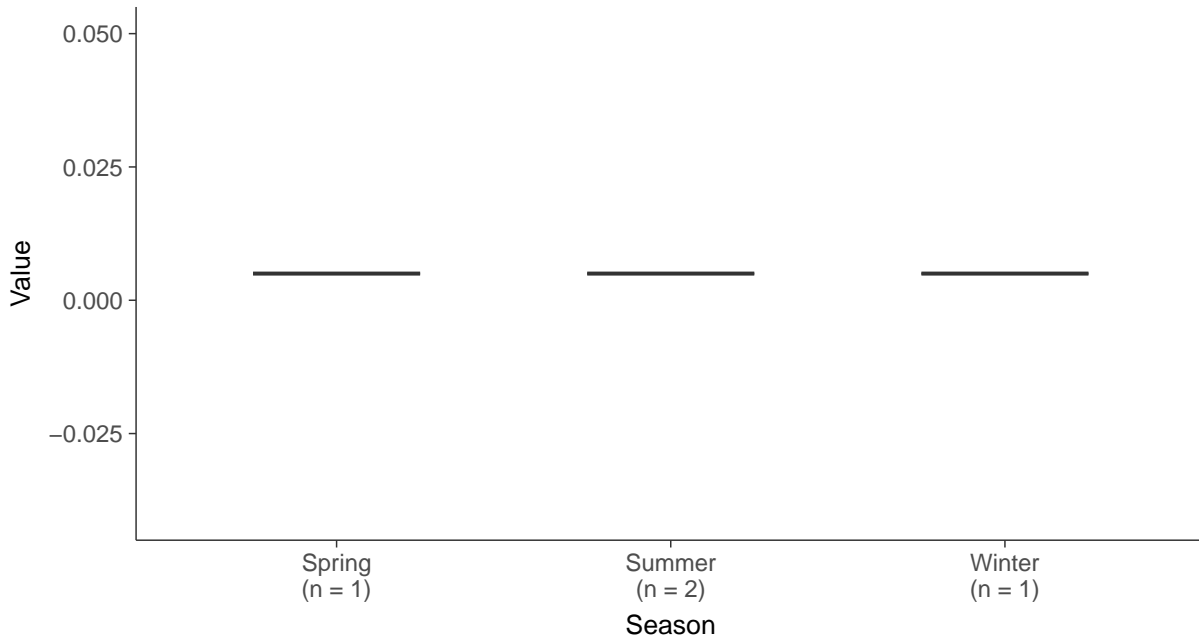
### Boxplot

Cobalt, MW-3 (mg/L)



### Boxplot by Season

Cobalt, MW-3 (mg/L)



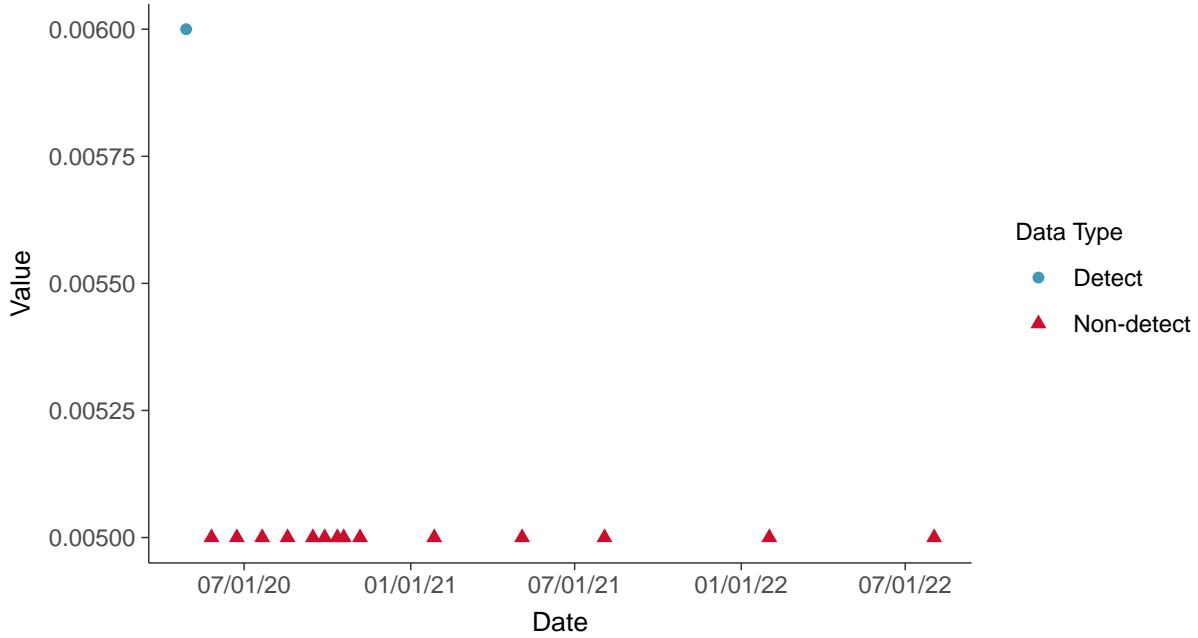


### Appendix IV: Cobalt, MW-5

ID: 2\_15\_05

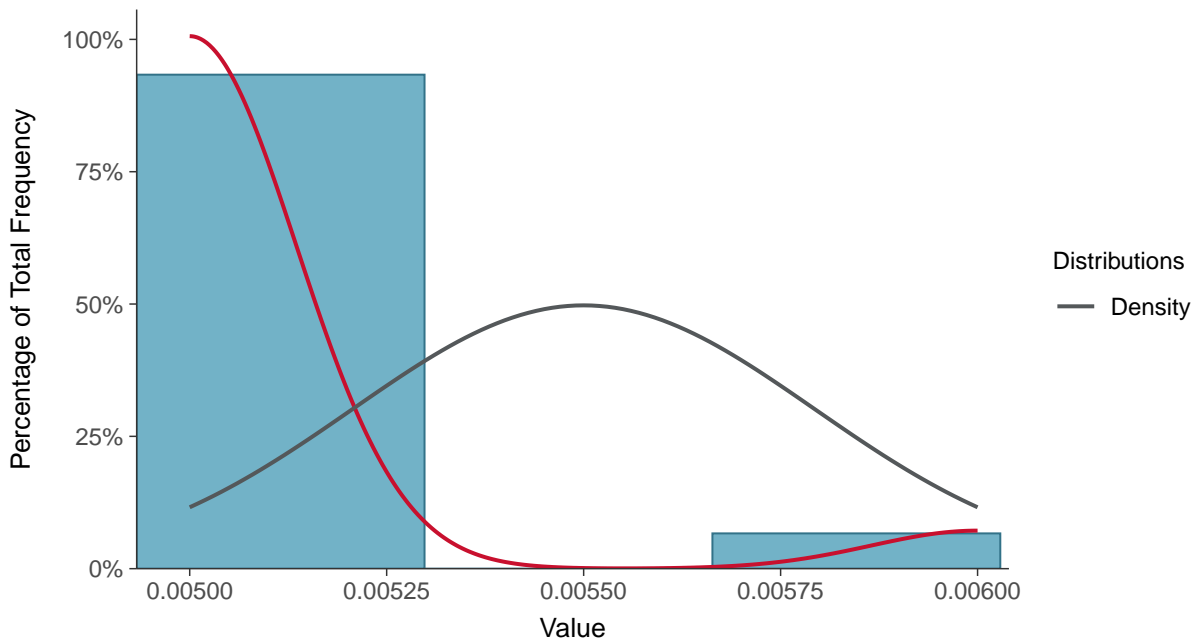
#### Scatter Plot

Cobalt, MW-5 (mg/L)



#### Histogram

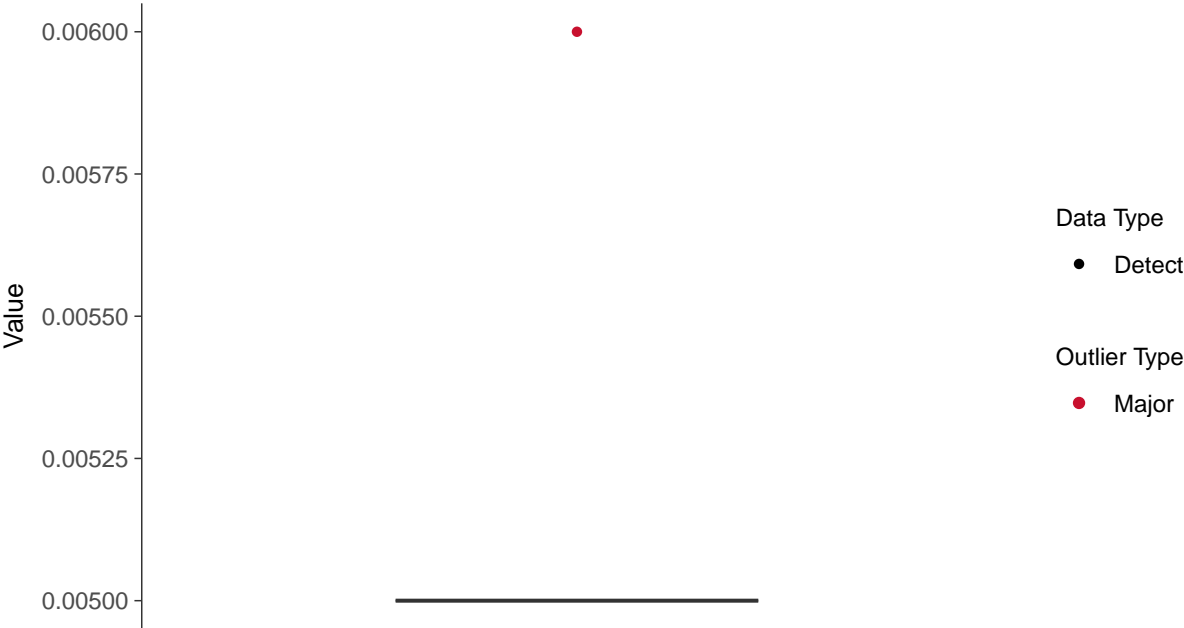
Cobalt, MW-5 (mg/L)





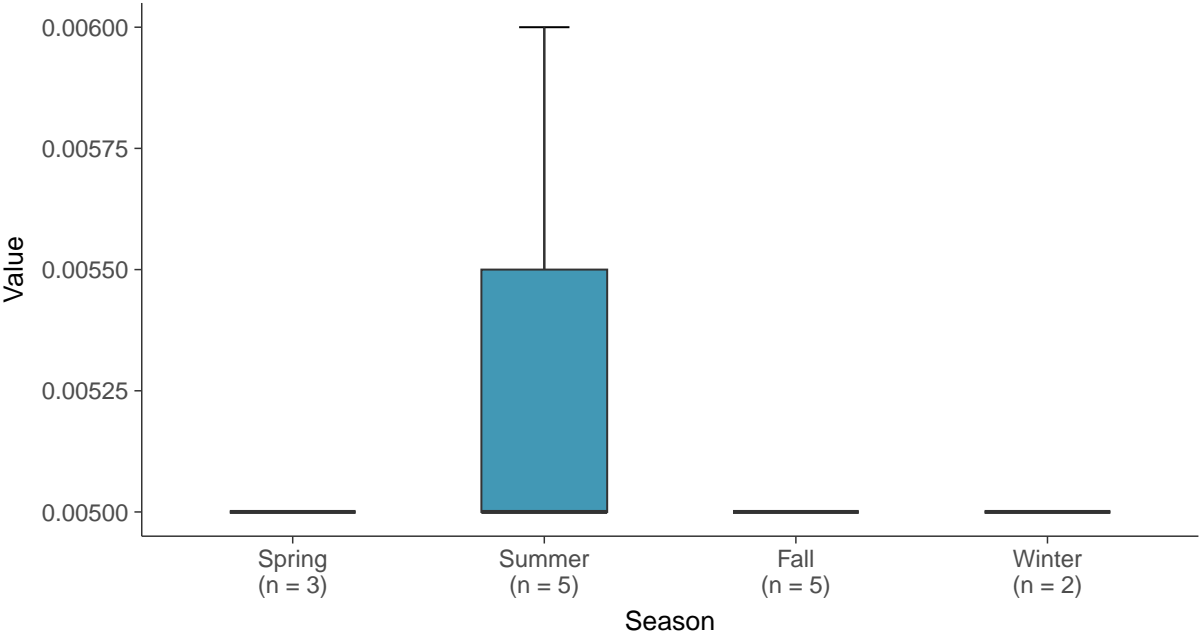
**Boxplot**

Cobalt, MW-5 (mg/L)



**Boxplot by Season**

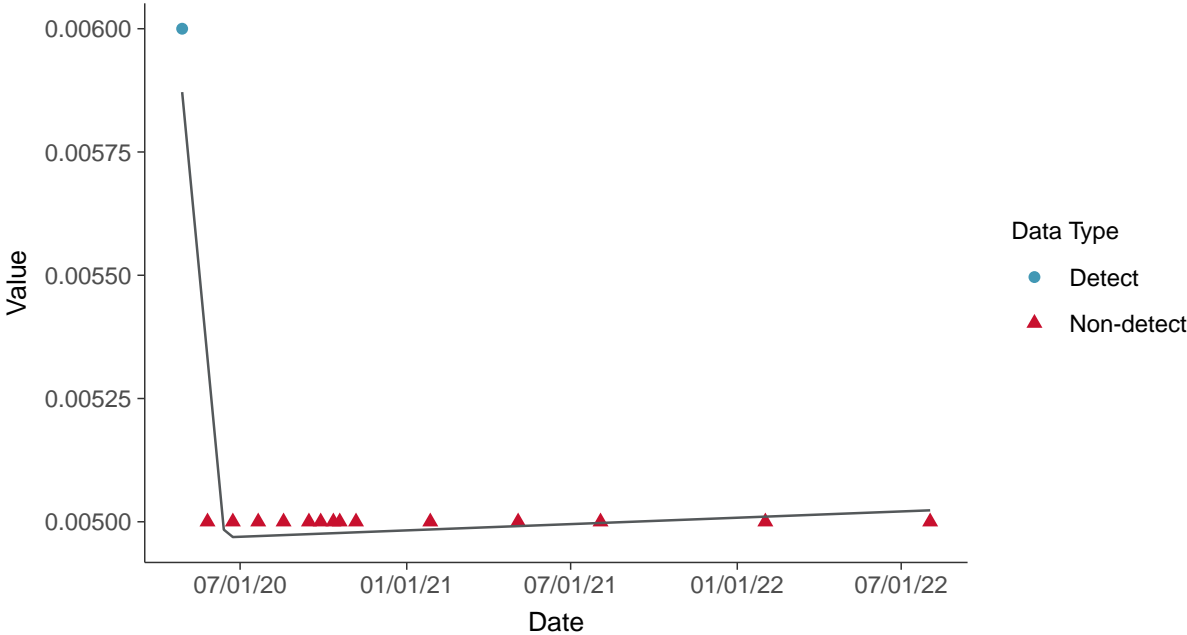
Cobalt, MW-5 (mg/L)





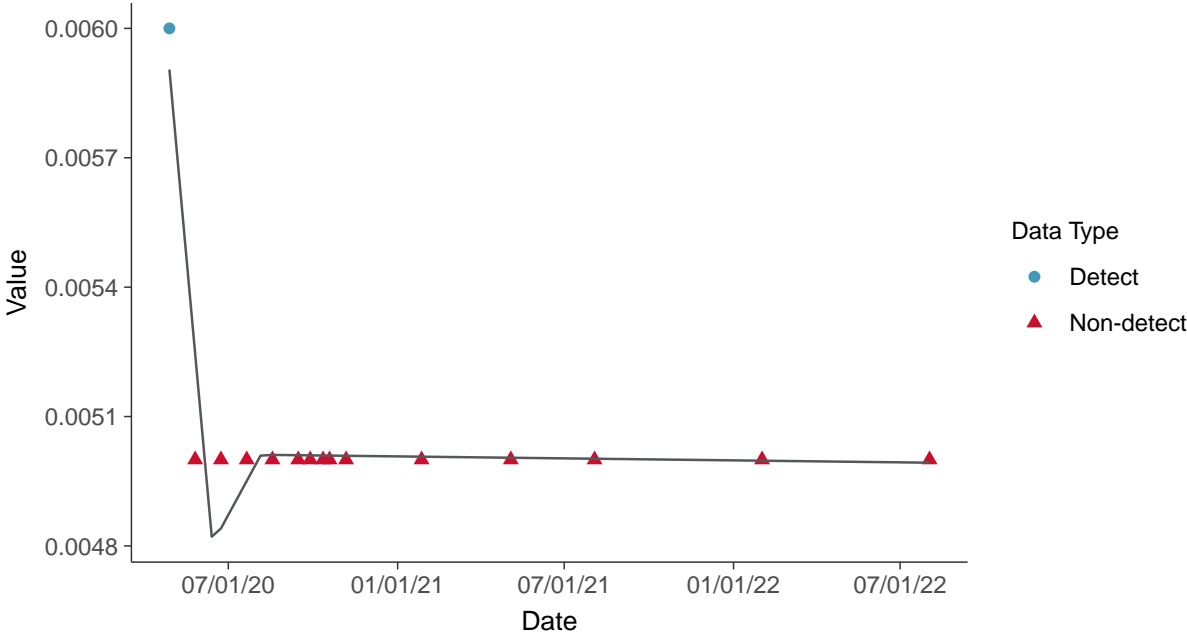
### Trend Regression: Piecewise Linear-Linear

Cobalt, MW-5 (mg/L)



### Trend Regression: Piecewise Linear-Linear-Linear

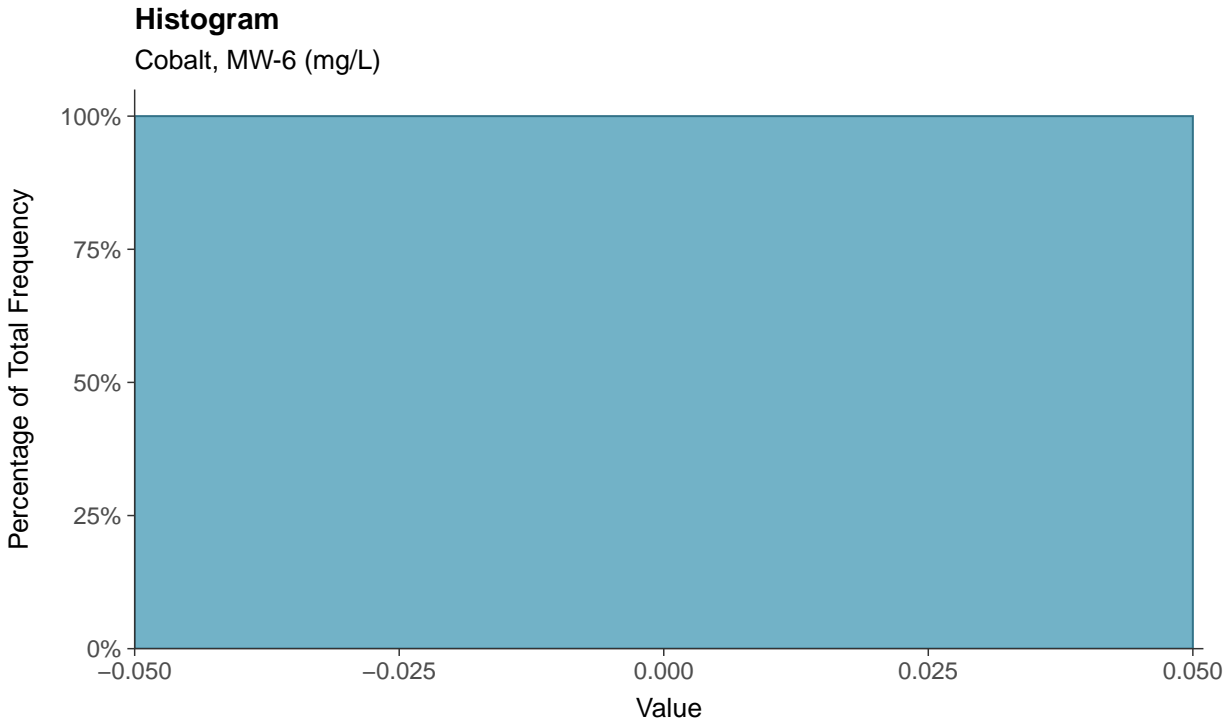
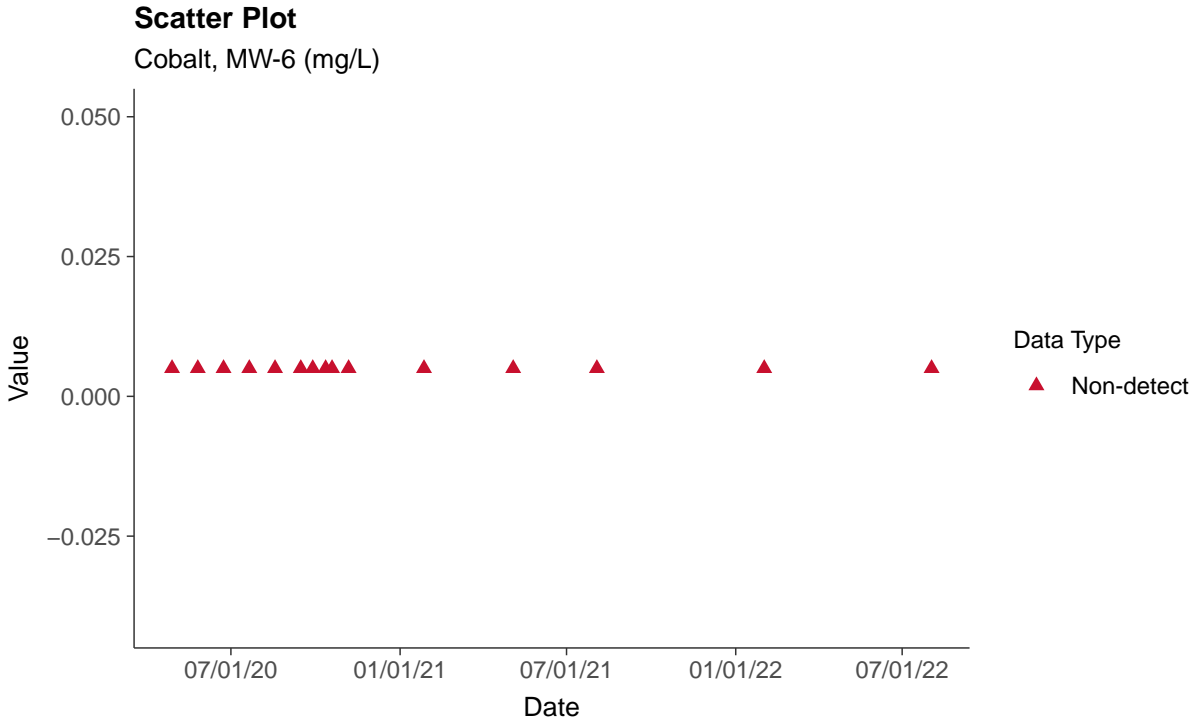
Cobalt, MW-5 (mg/L)





### Appendix IV: Cobalt, MW-6

ID: 2\_15\_06







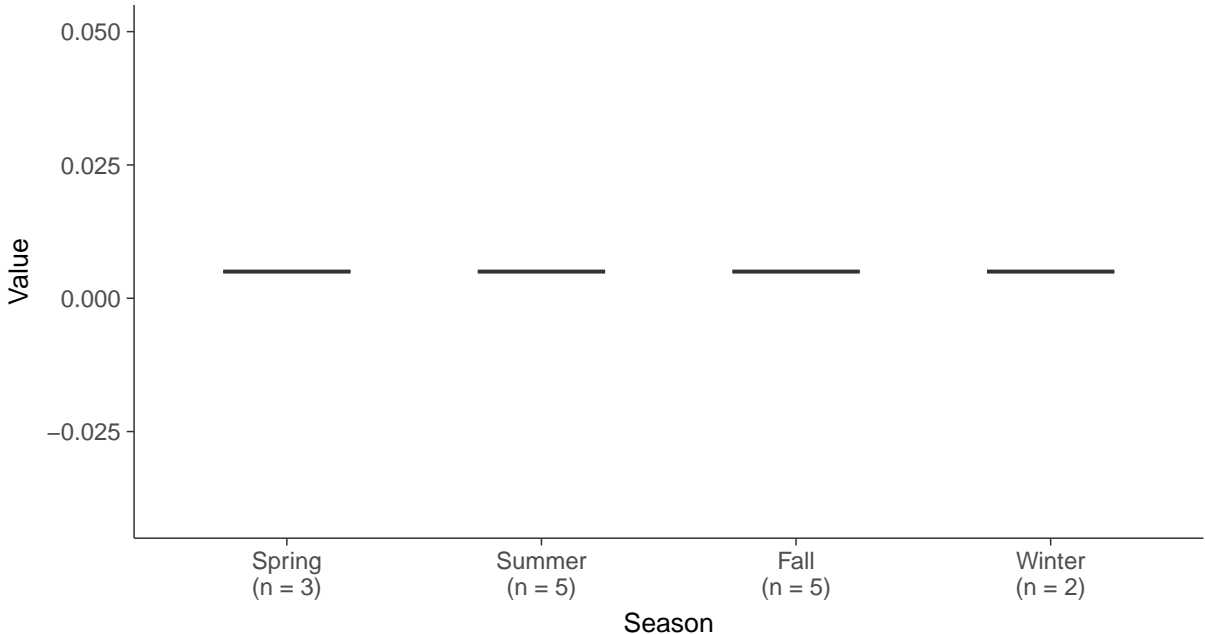
**Boxplot**

Cobalt, MW-6 (mg/L)



**Boxplot by Season**

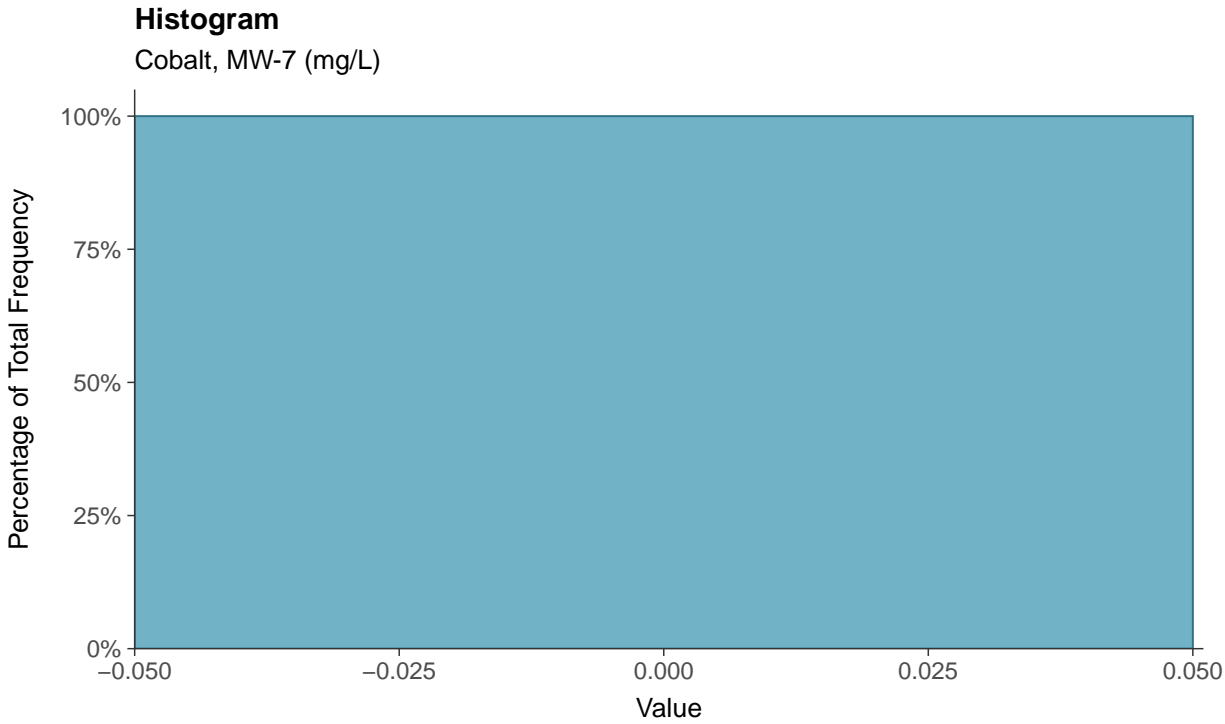
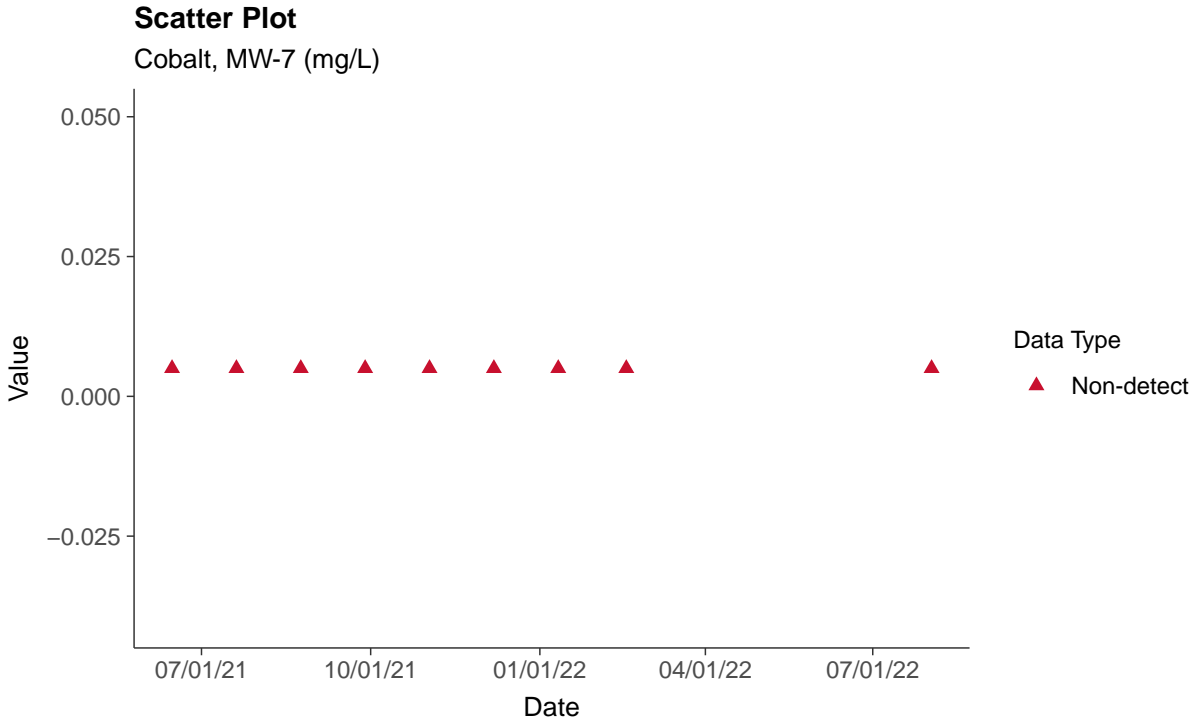
Cobalt, MW-6 (mg/L)





### Appendix IV: Cobalt, MW-7

ID: 2\_15\_07





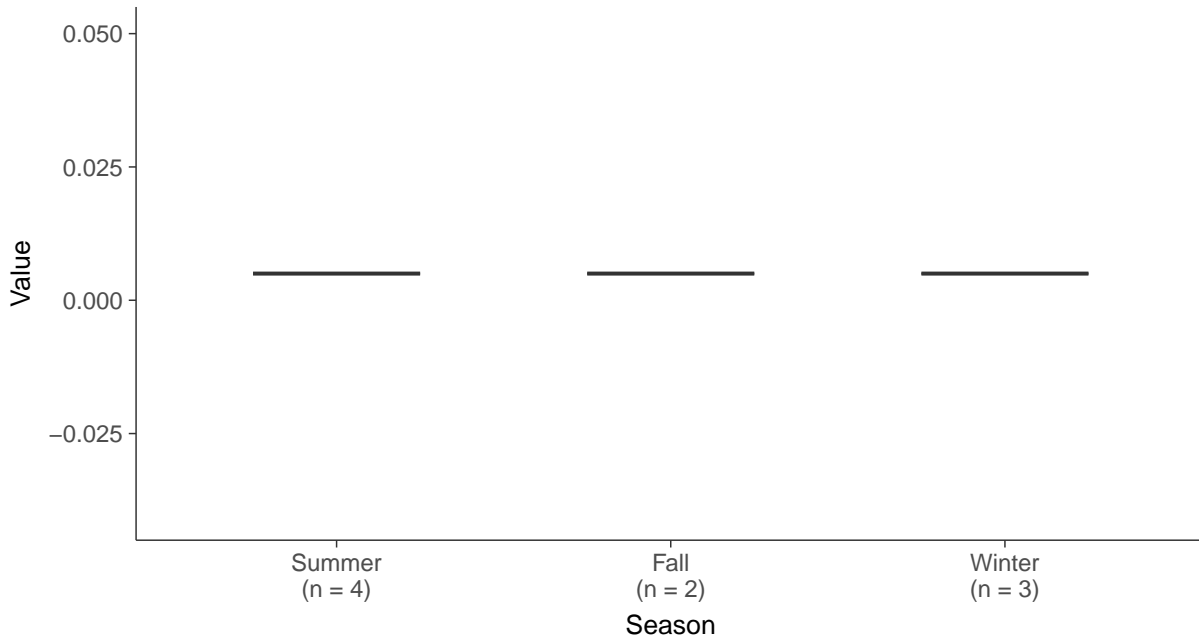
### Boxplot

Cobalt, MW-7 (mg/L)



### Boxplot by Season

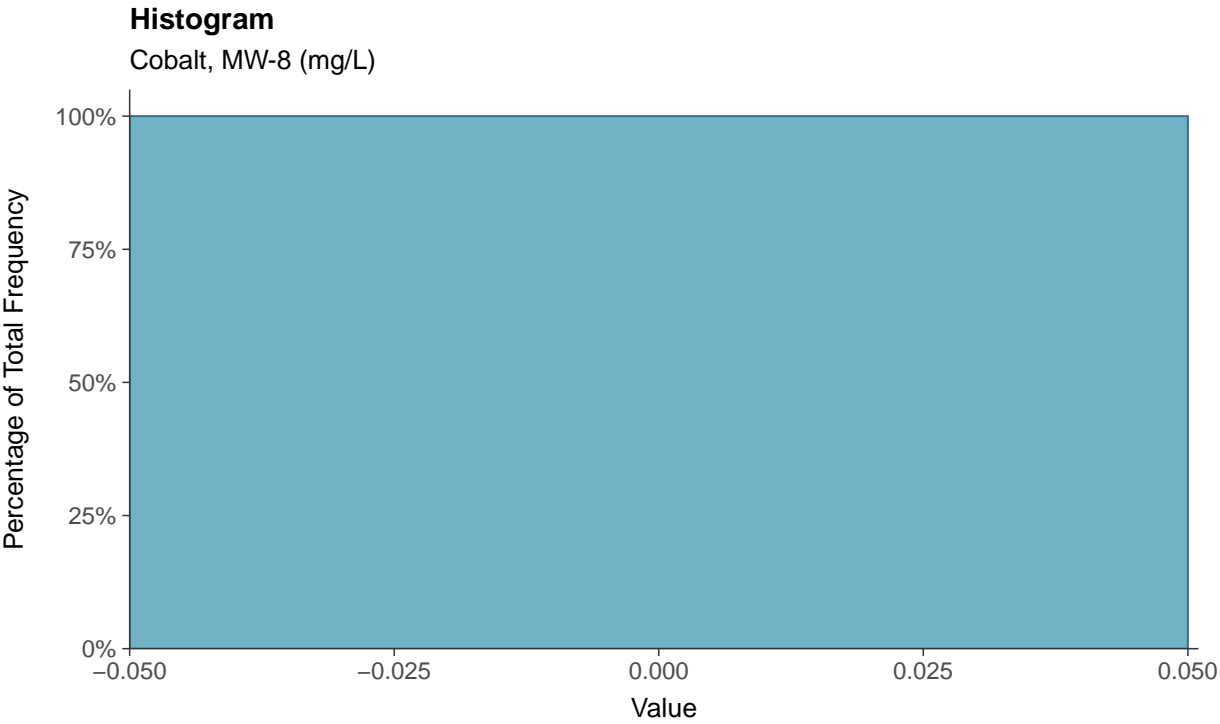
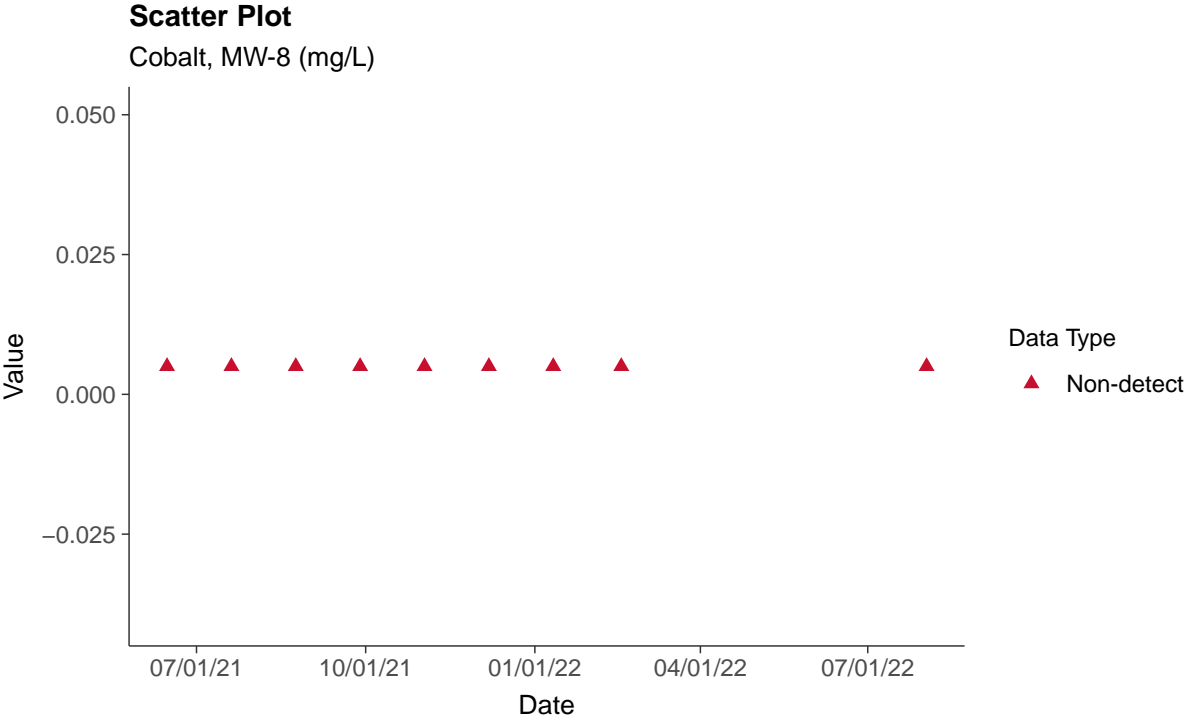
Cobalt, MW-7 (mg/L)





### Appendix IV: Cobalt, MW-8

ID: 2\_15\_08





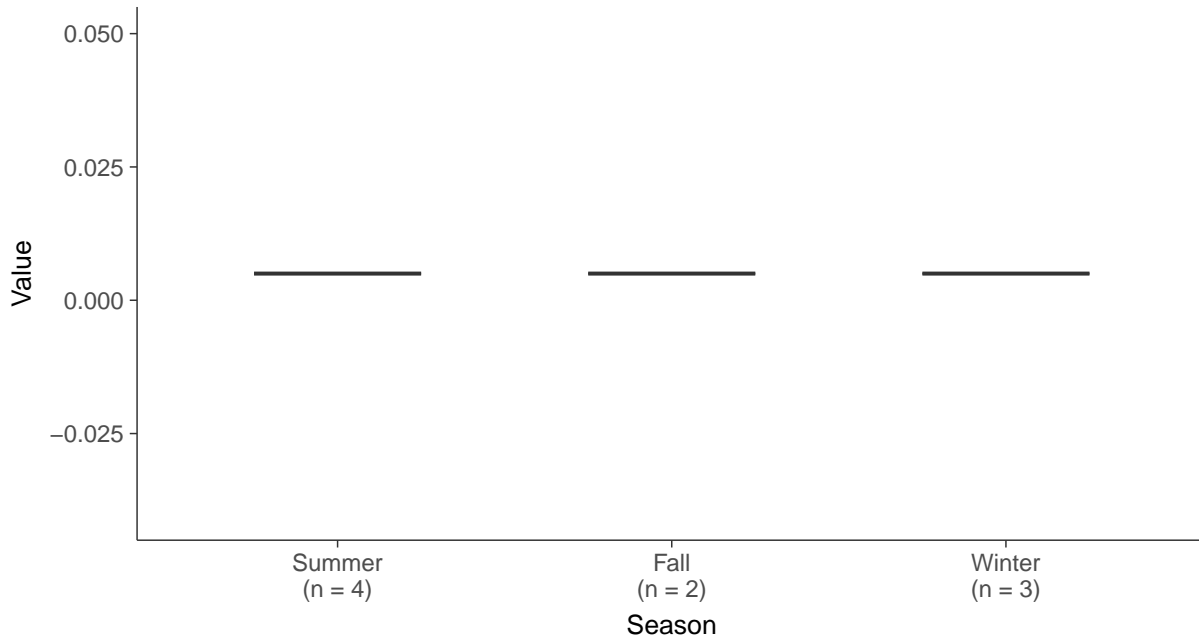
### Boxplot

Cobalt, MW-8 (mg/L)



### Boxplot by Season

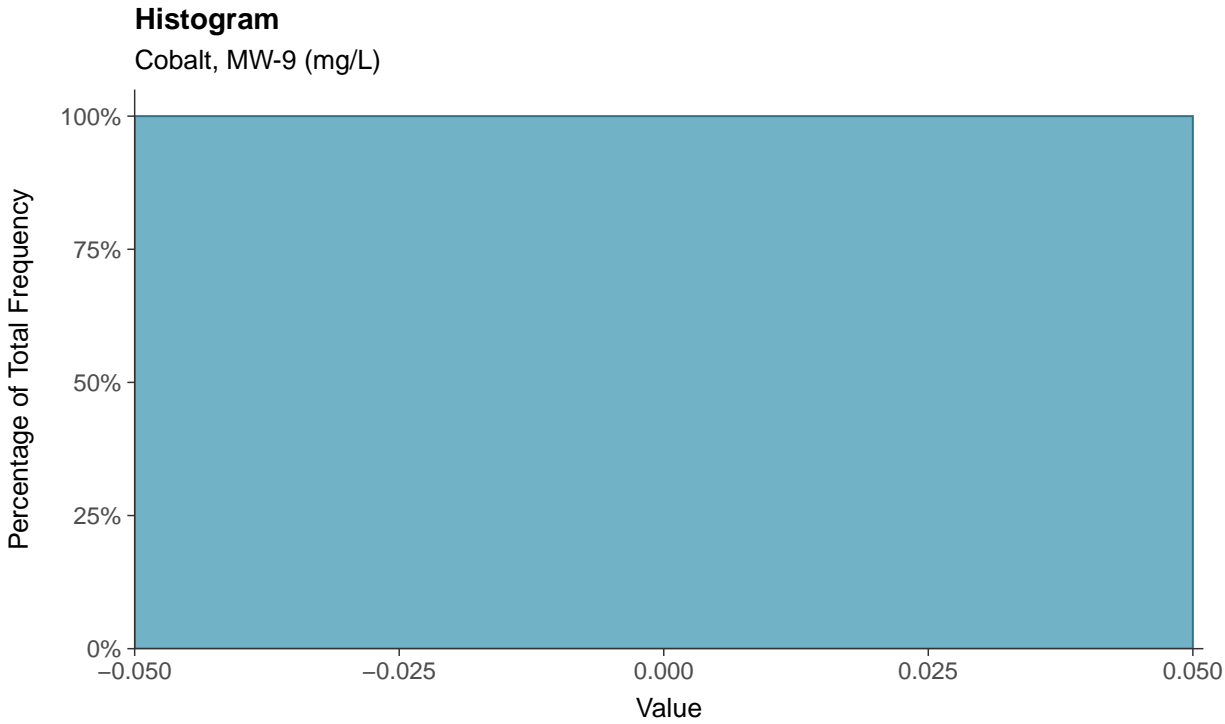
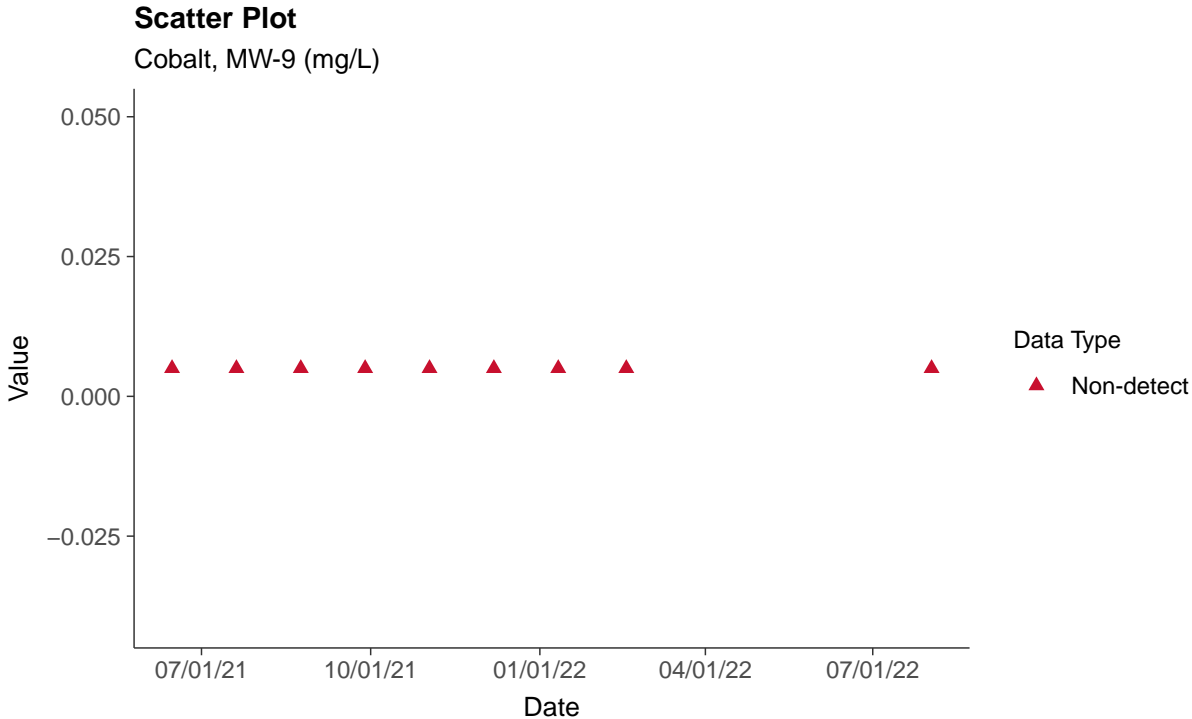
Cobalt, MW-8 (mg/L)





### Appendix IV: Cobalt, MW-9

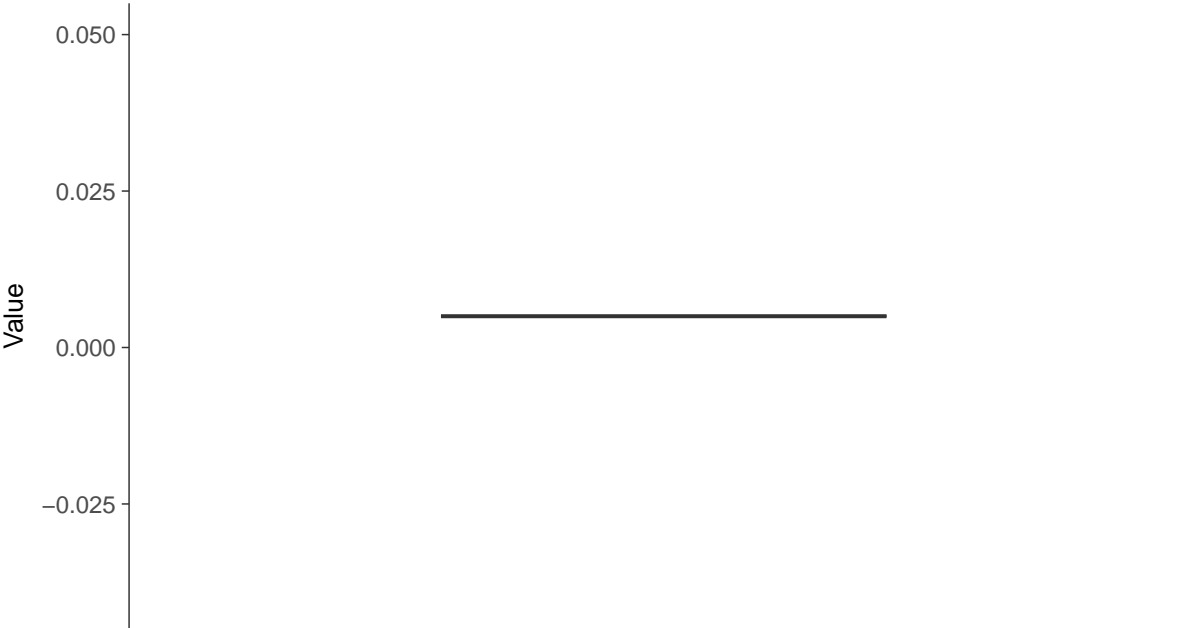
ID: 2\_15\_09





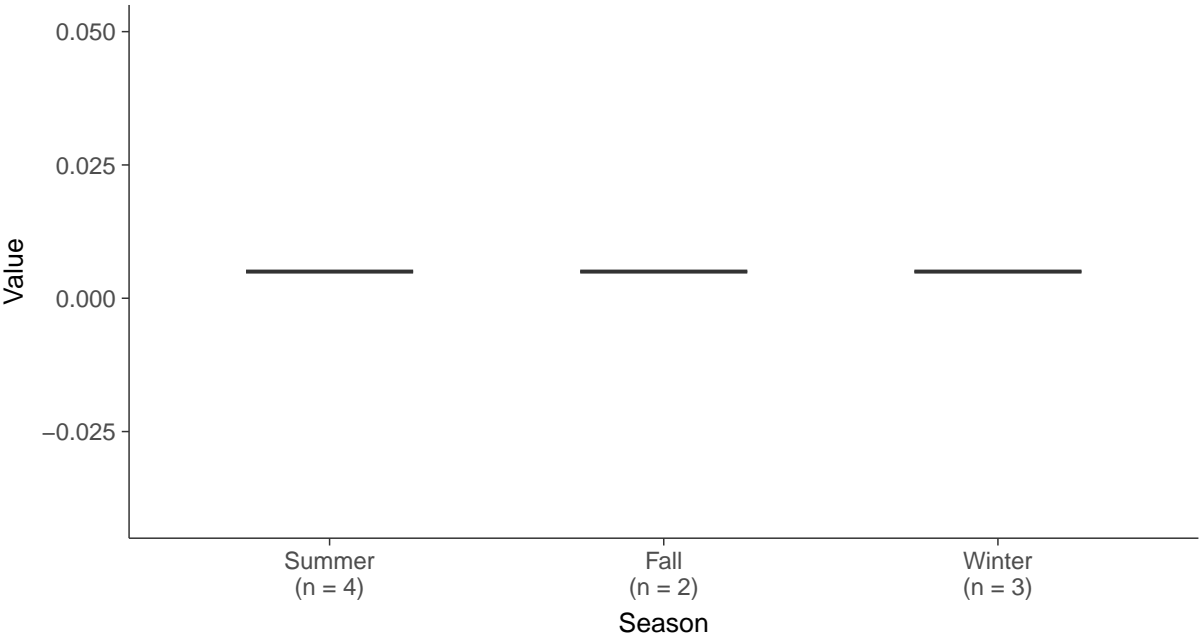
**Boxplot**

Cobalt, MW-9 (mg/L)



**Boxplot by Season**

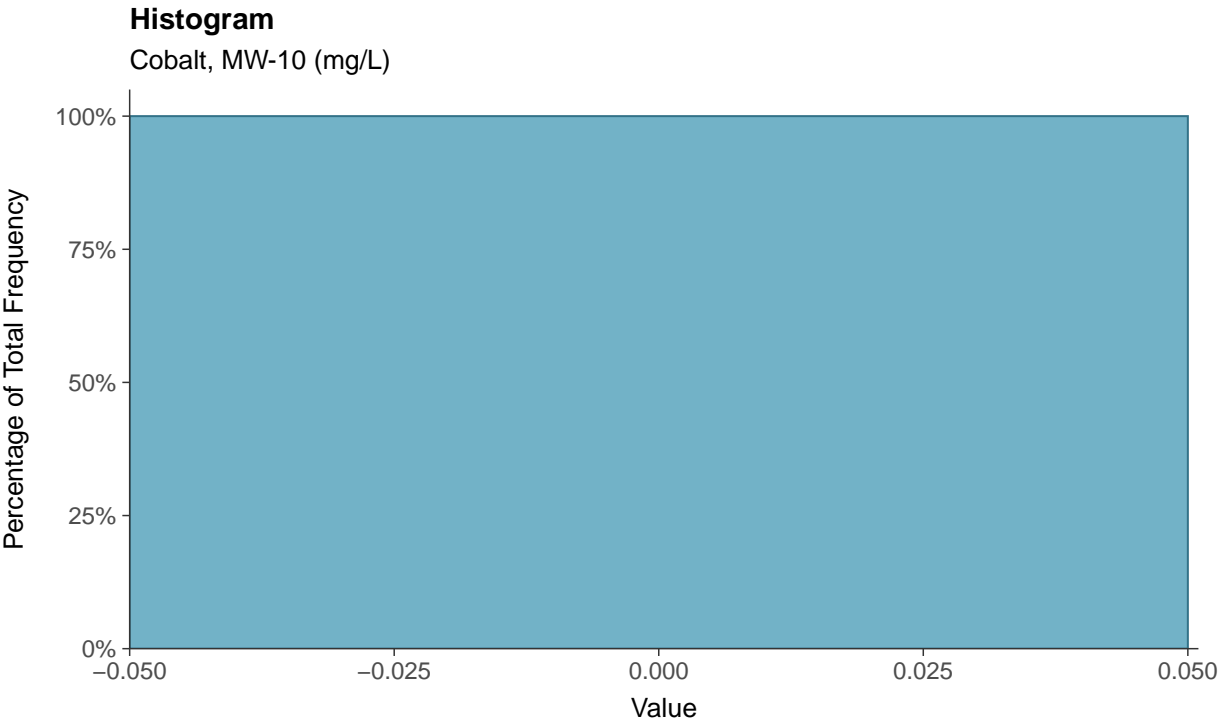
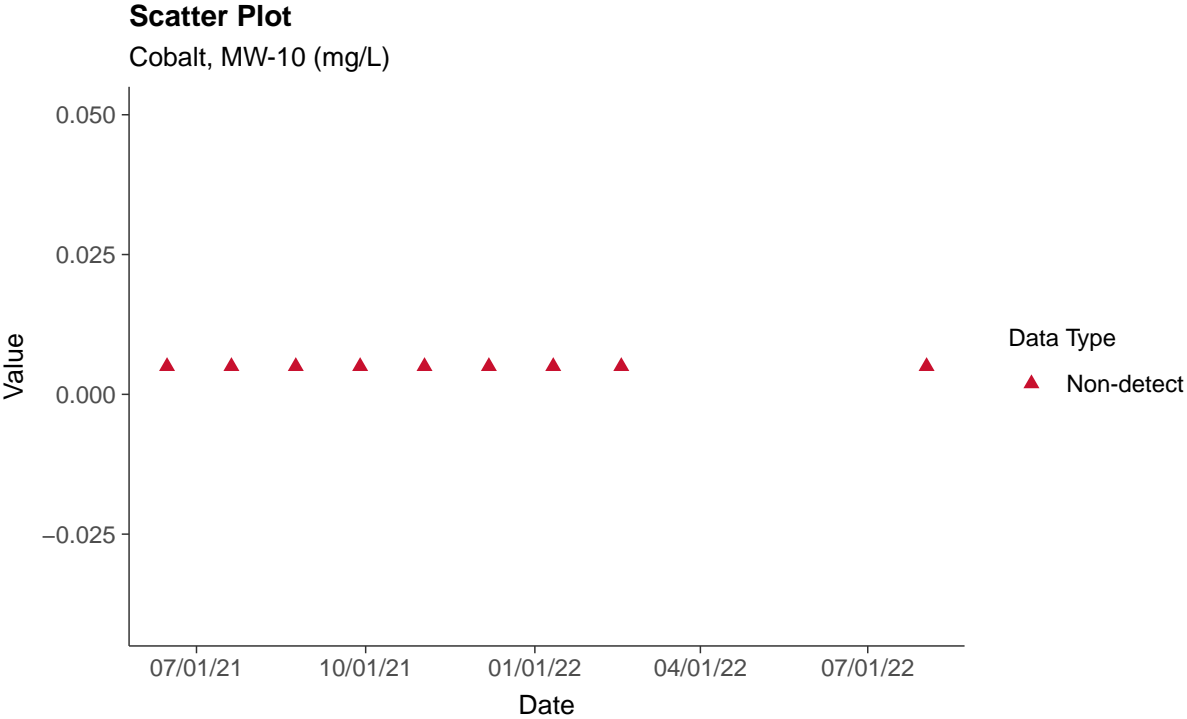
Cobalt, MW-9 (mg/L)





### Appendix IV: Cobalt, MW-10

ID: 2\_15\_10

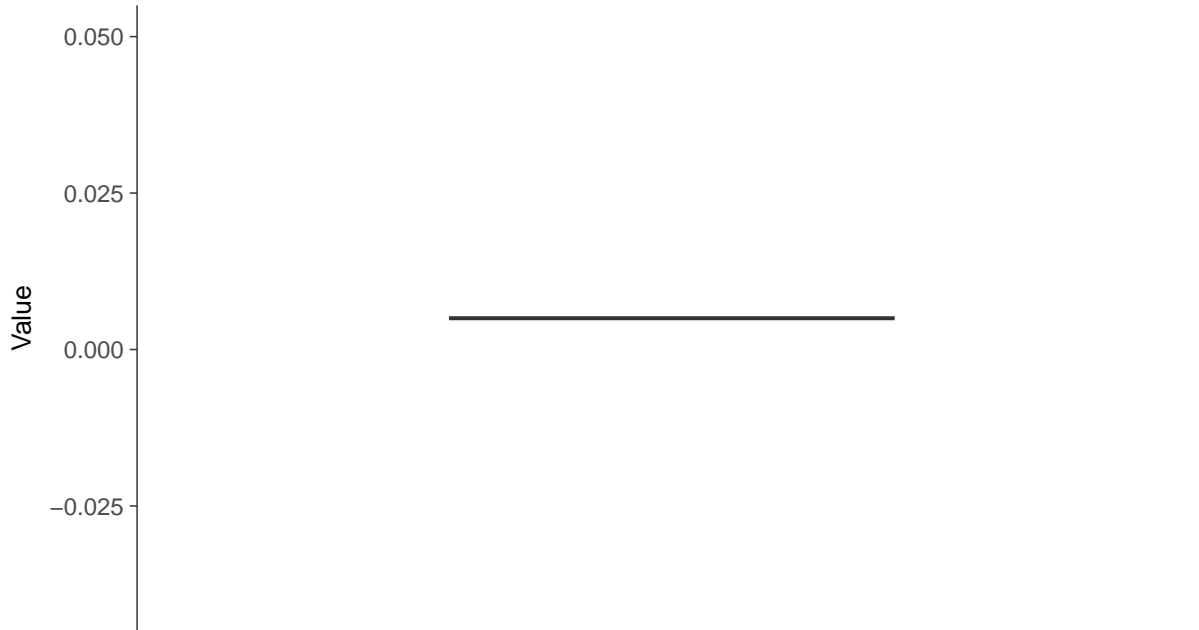






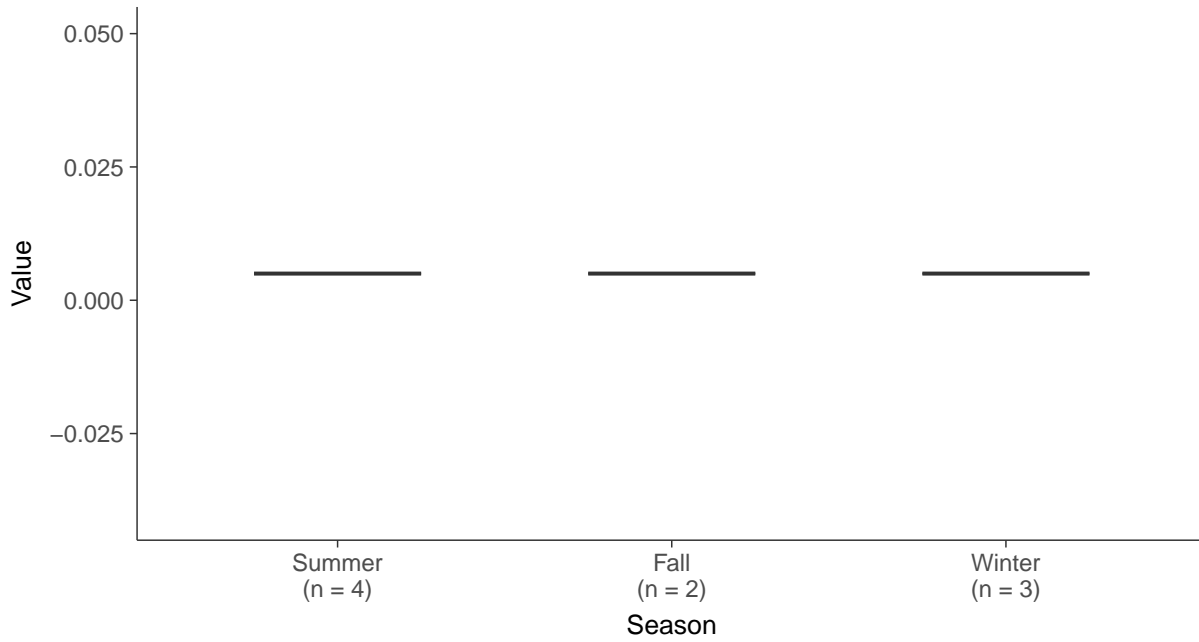
### Boxplot

Cobalt, MW-10 (mg/L)



### Boxplot by Season

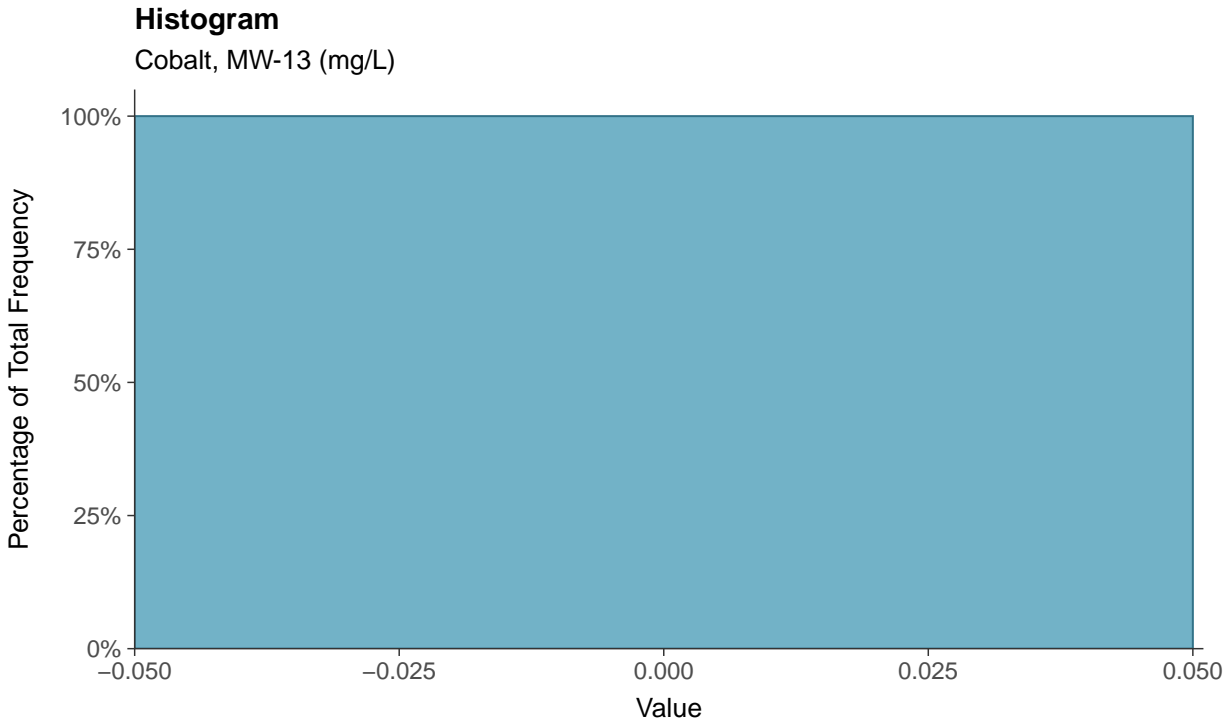
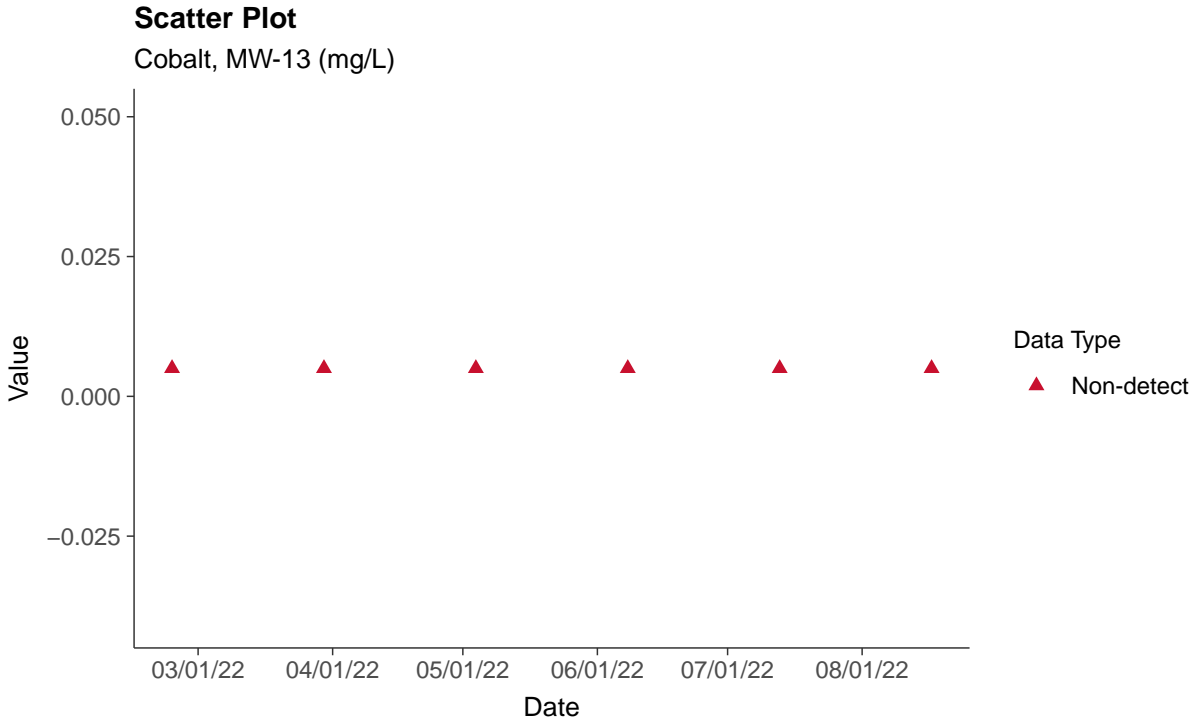
Cobalt, MW-10 (mg/L)





### Appendix IV: Cobalt, MW-13

ID: 2\_15\_13





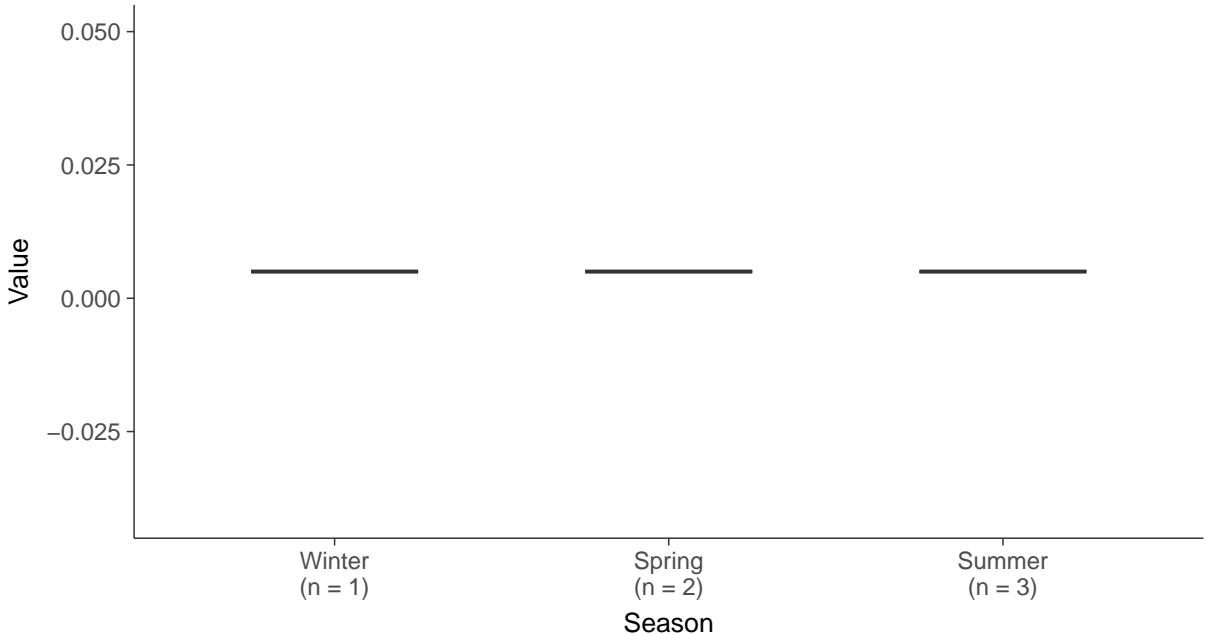
**Boxplot**

Cobalt, MW-13 (mg/L)



**Boxplot by Season**

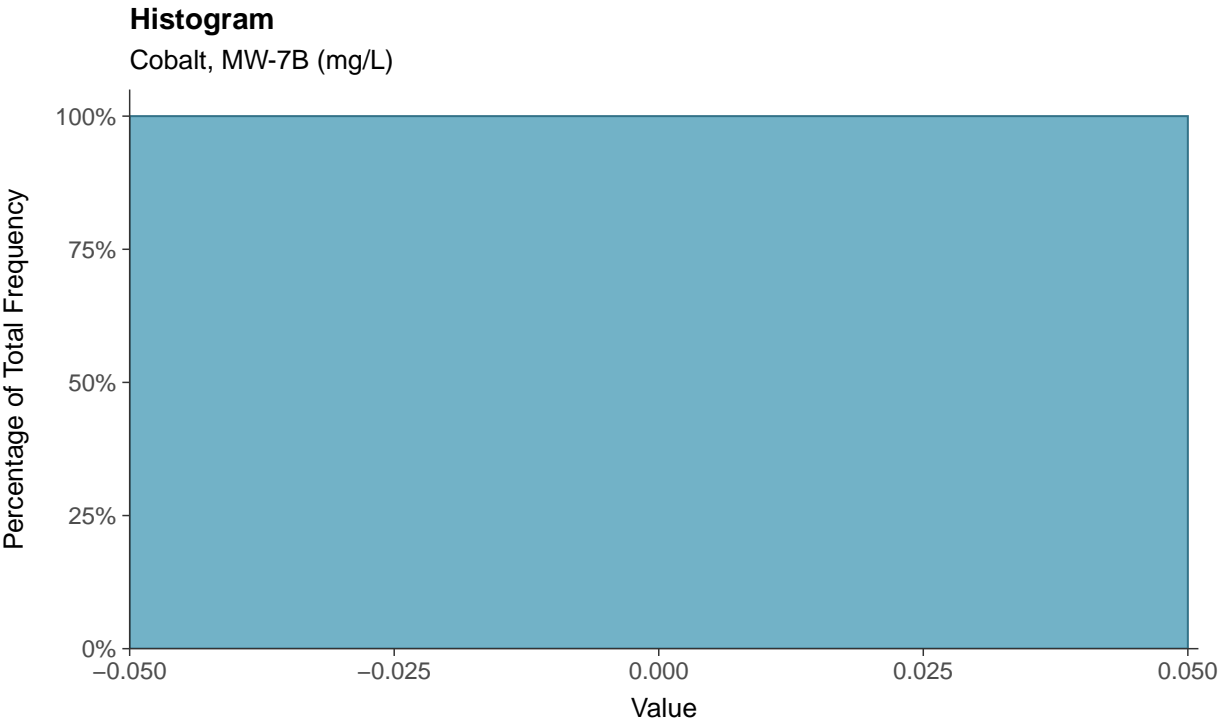
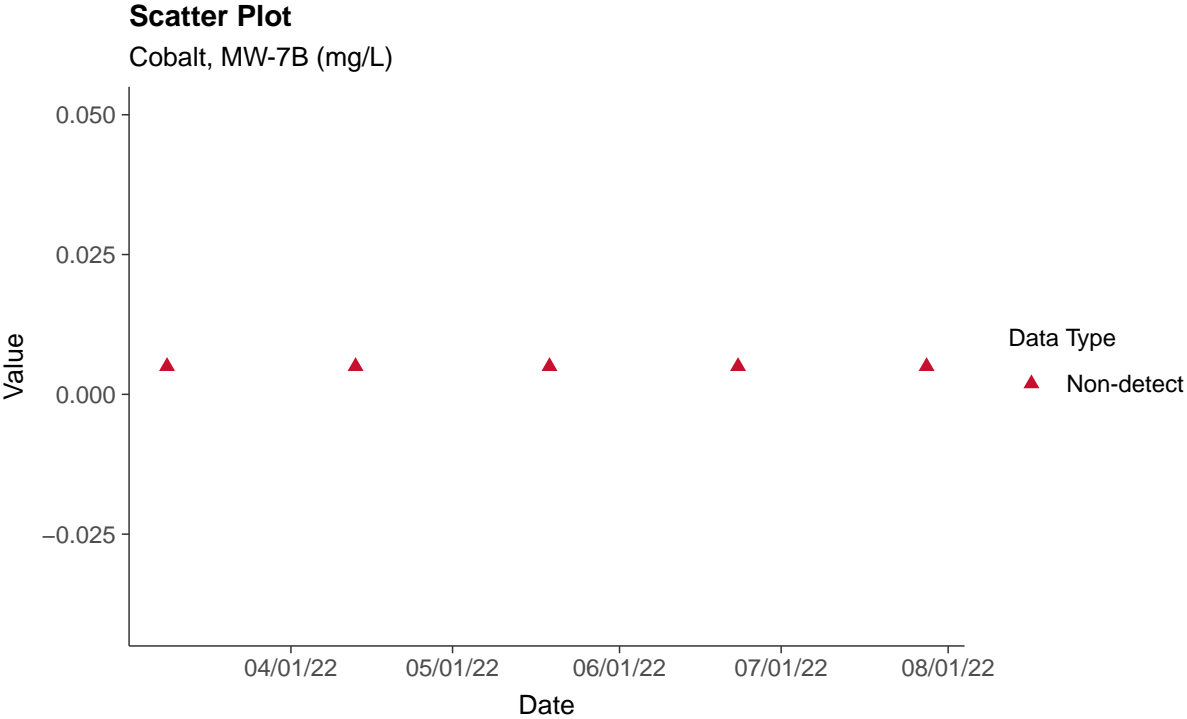
Cobalt, MW-13 (mg/L)





### Appendix IV: Cobalt, MW-7B

ID: 2\_15\_7B





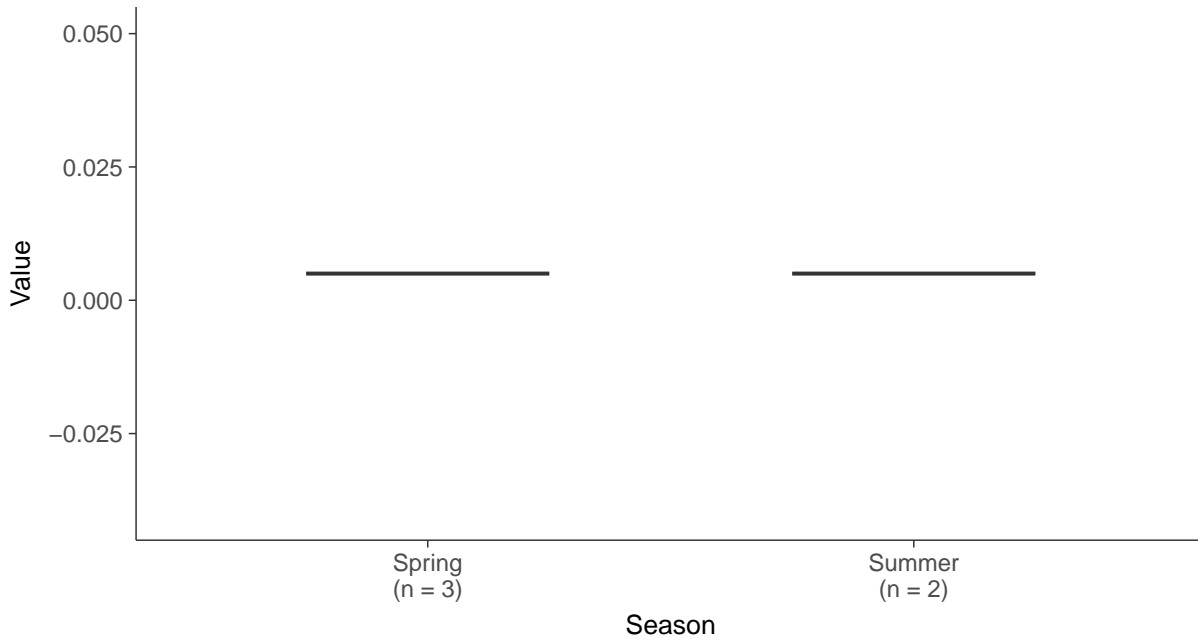
### Boxplot

Cobalt, MW-7B (mg/L)



### Boxplot by Season

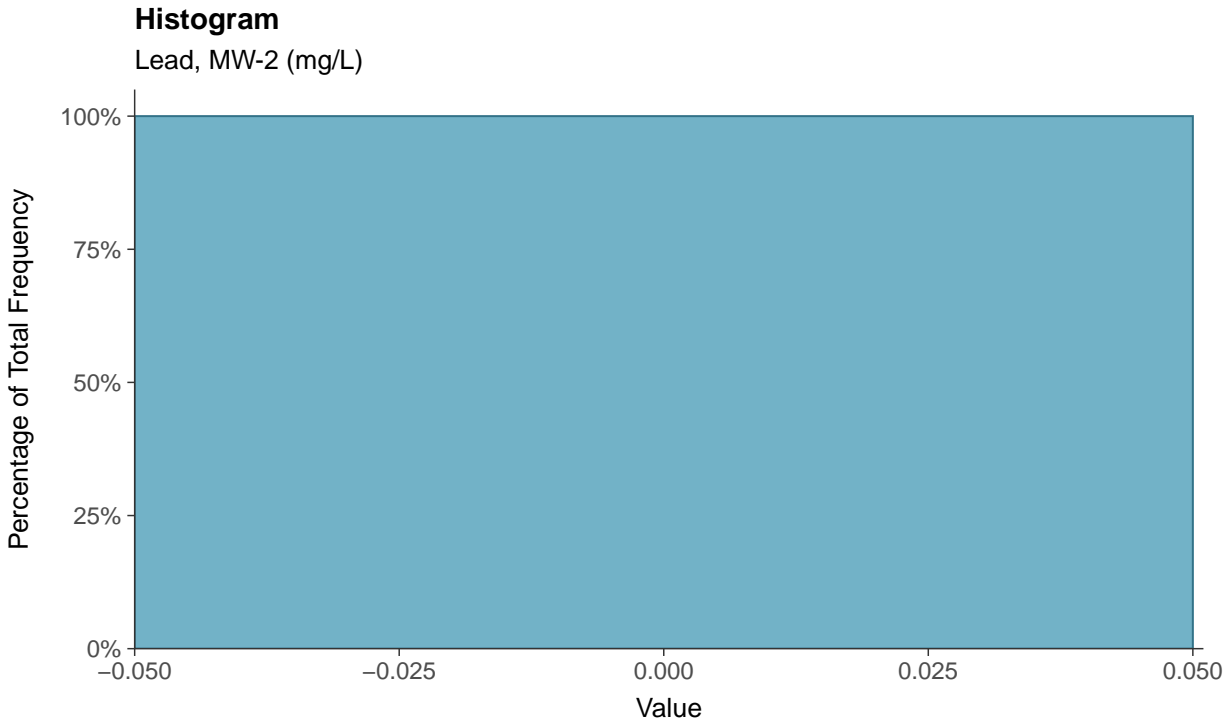
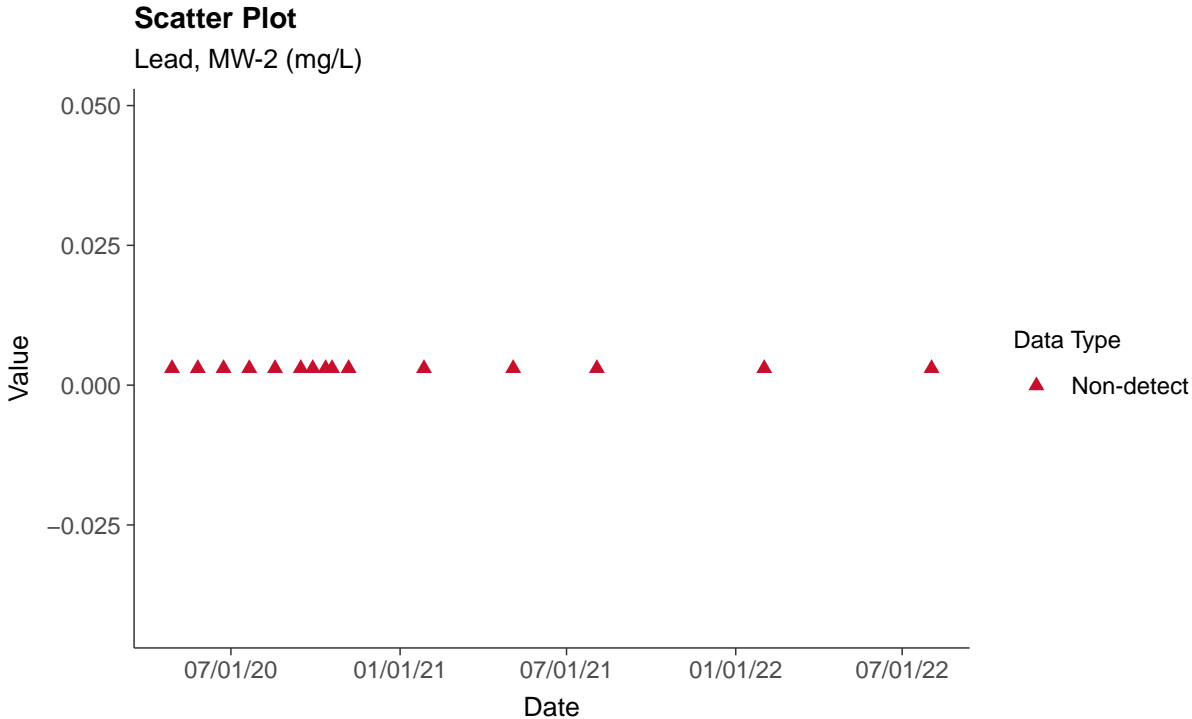
Cobalt, MW-7B (mg/L)





### Appendix IV: Lead, MW-2

ID: 2\_17\_02





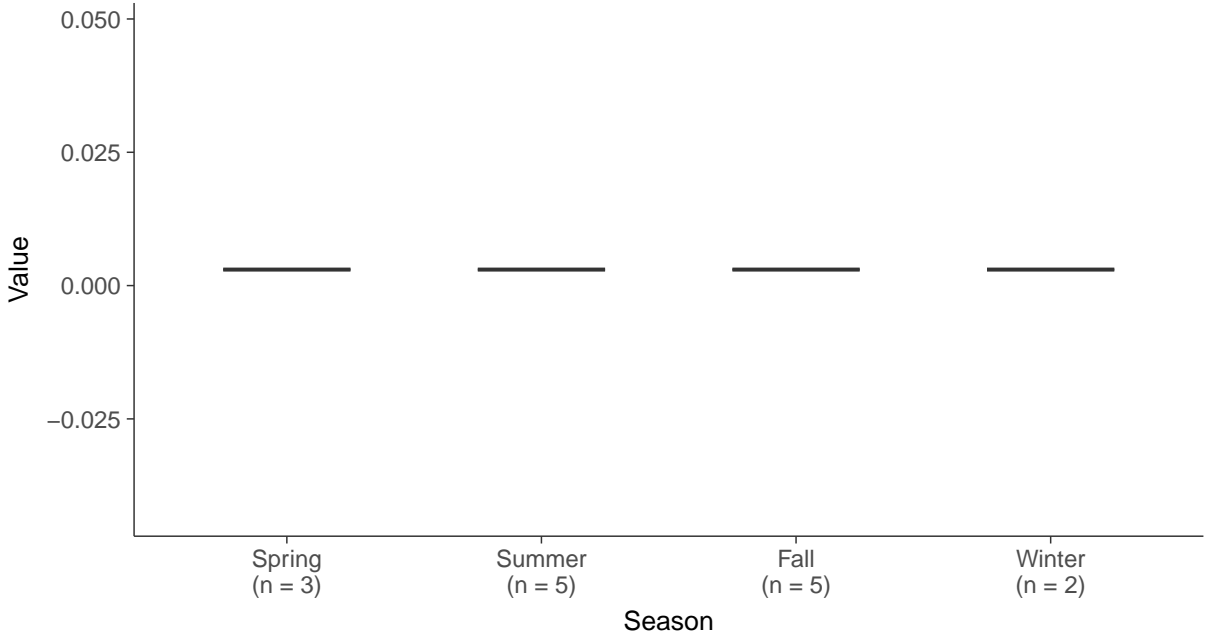
**Boxplot**

Lead, MW-2 (mg/L)



**Boxplot by Season**

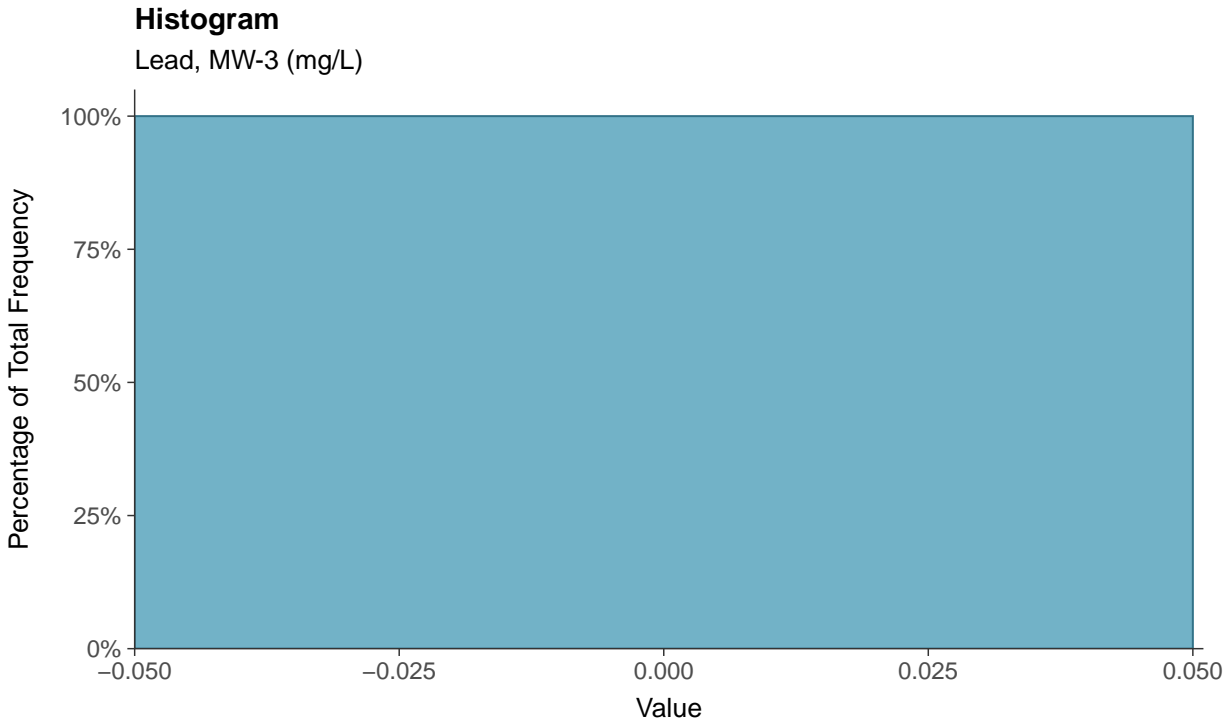
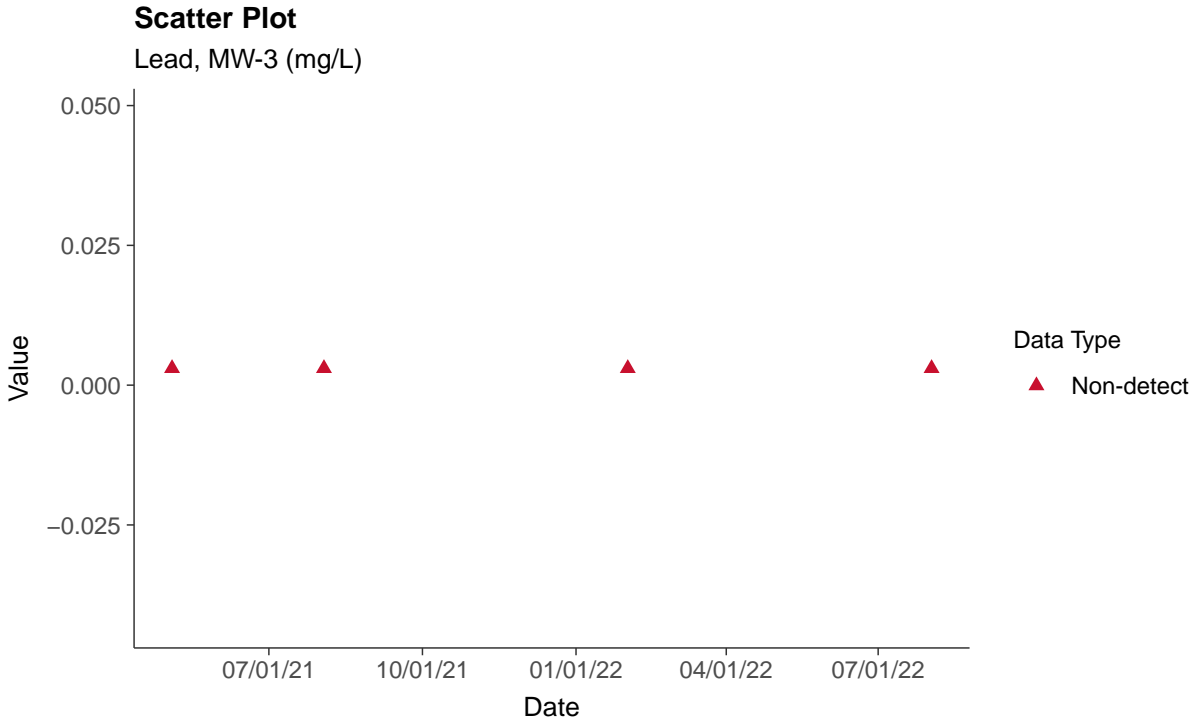
Lead, MW-2 (mg/L)





### Appendix IV: Lead, MW-3

ID: 2\_17\_03







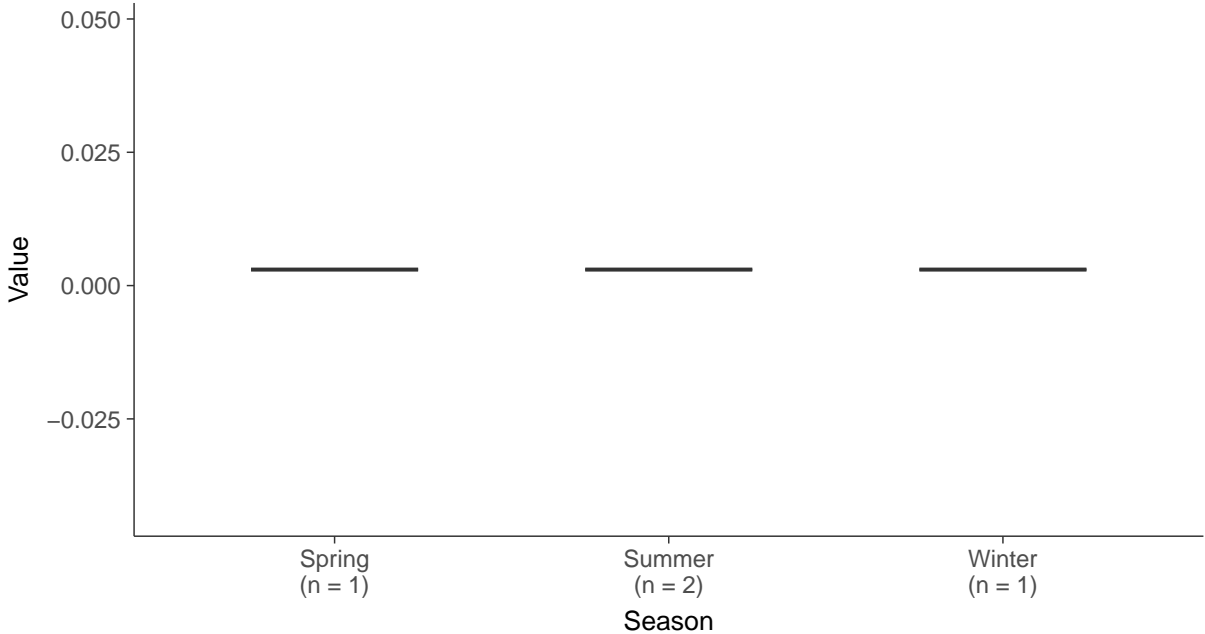
**Boxplot**

Lead, MW-3 (mg/L)



**Boxplot by Season**

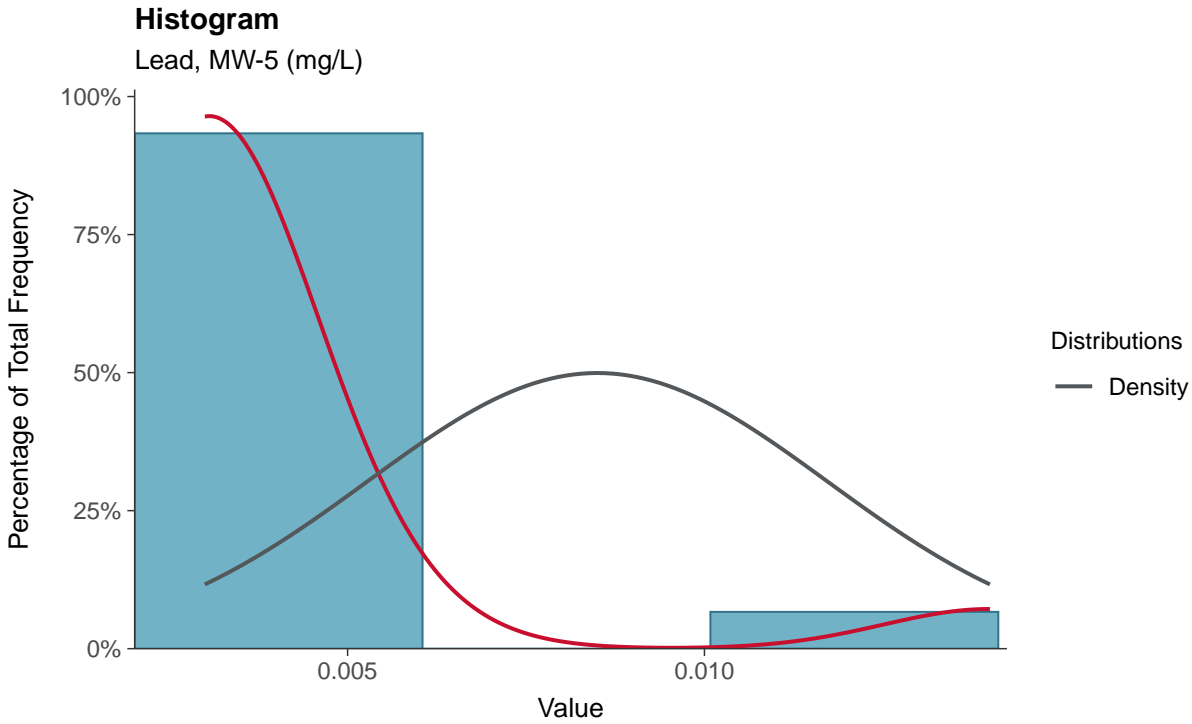
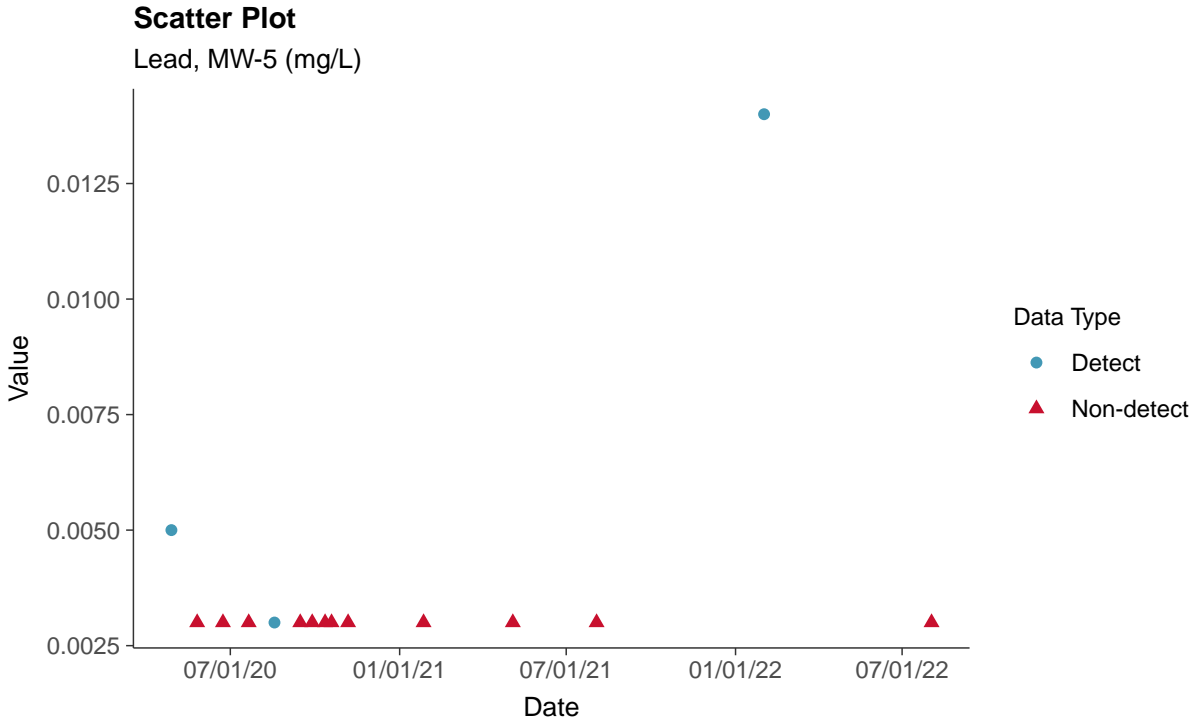
Lead, MW-3 (mg/L)





### Appendix IV: Lead, MW-5

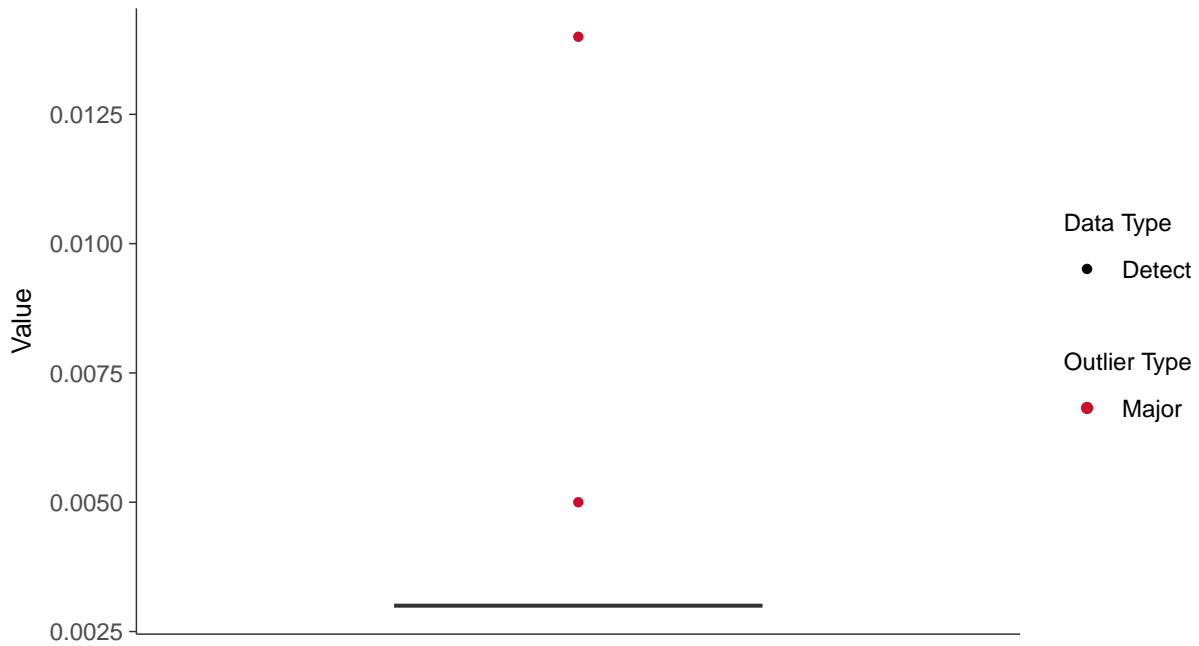
ID: 2\_17\_05





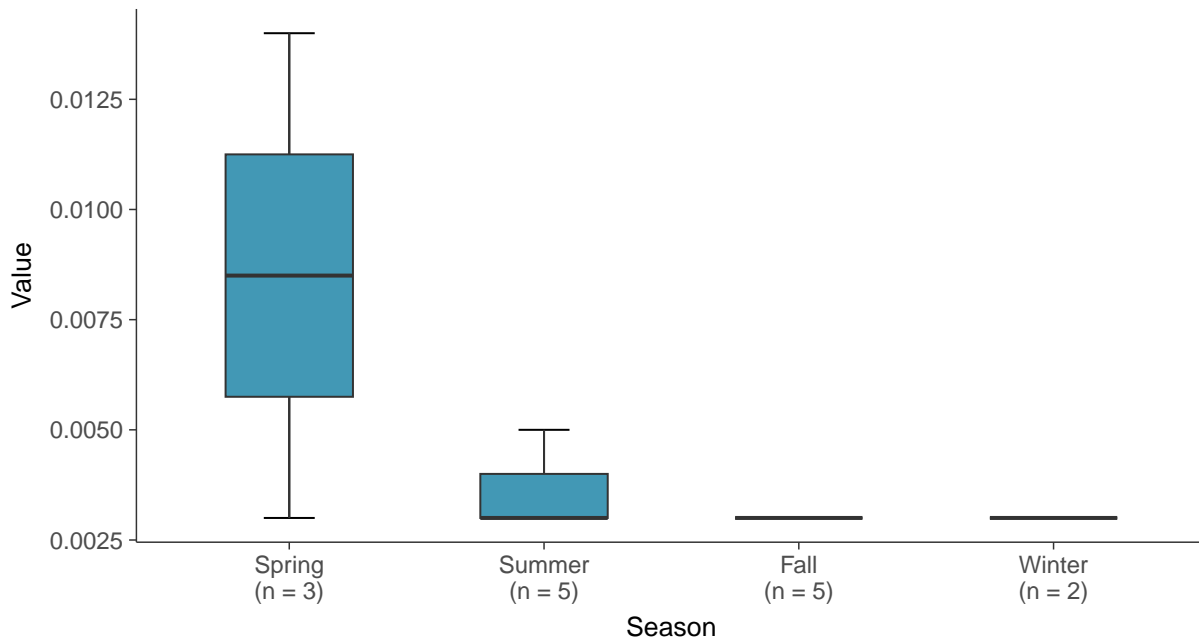
### Boxplot

Lead, MW-5 (mg/L)



### Boxplot by Season

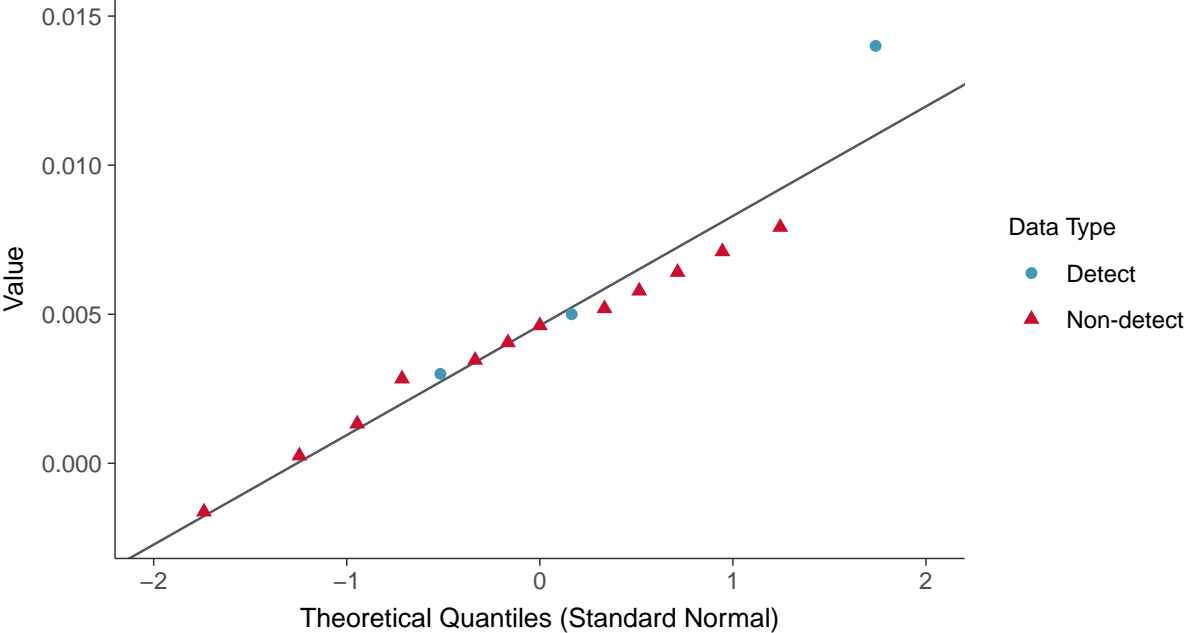
Lead, MW-5 (mg/L)





### Normal Q-Q plot using ROS Imputed Estimates

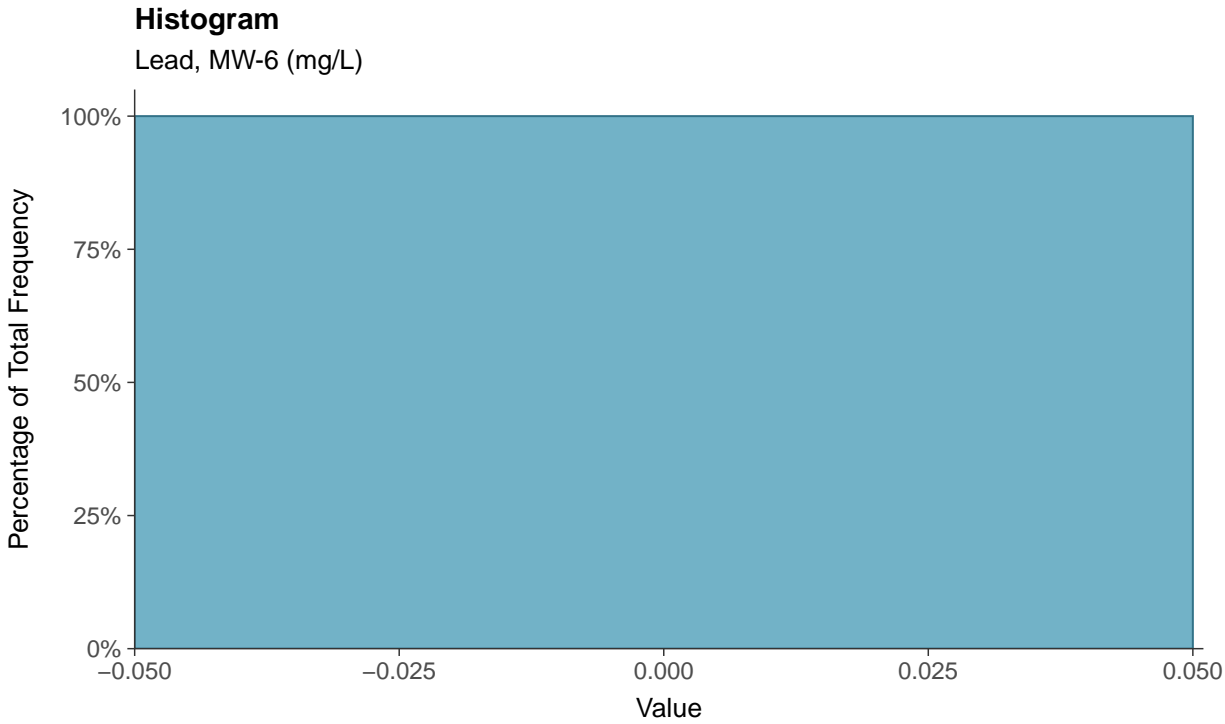
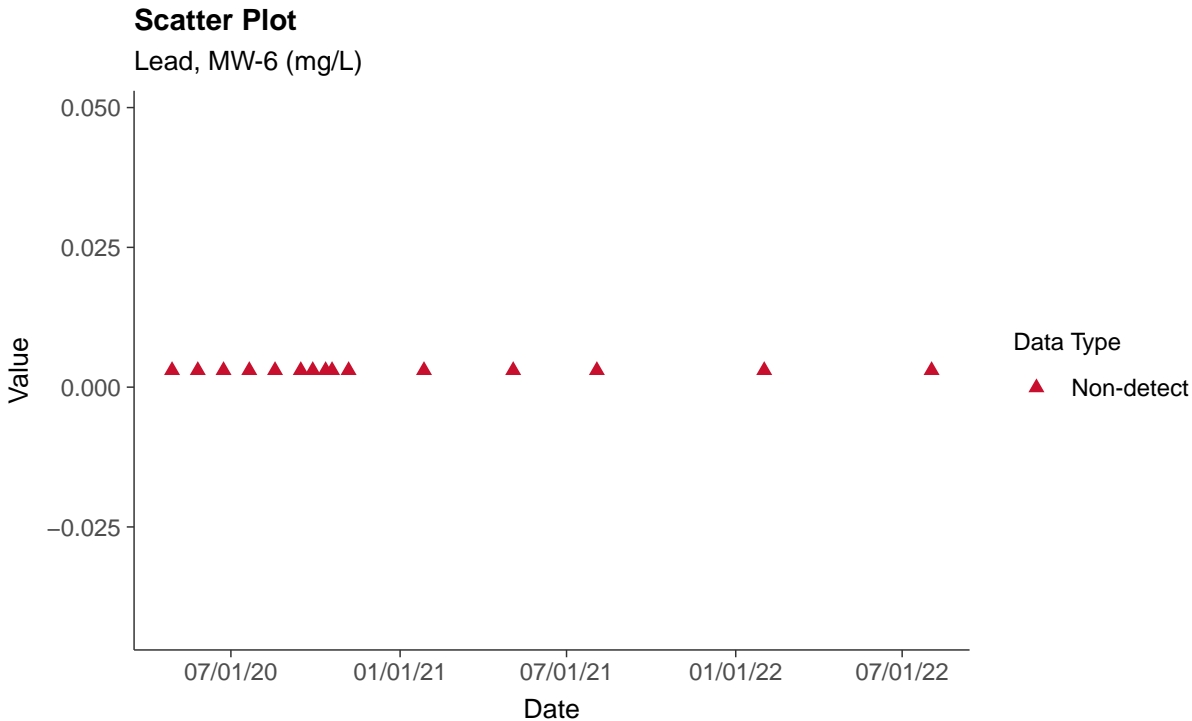
Lead, MW-5 (mg/L)





### Appendix IV: Lead, MW-6

ID: 2\_17\_06





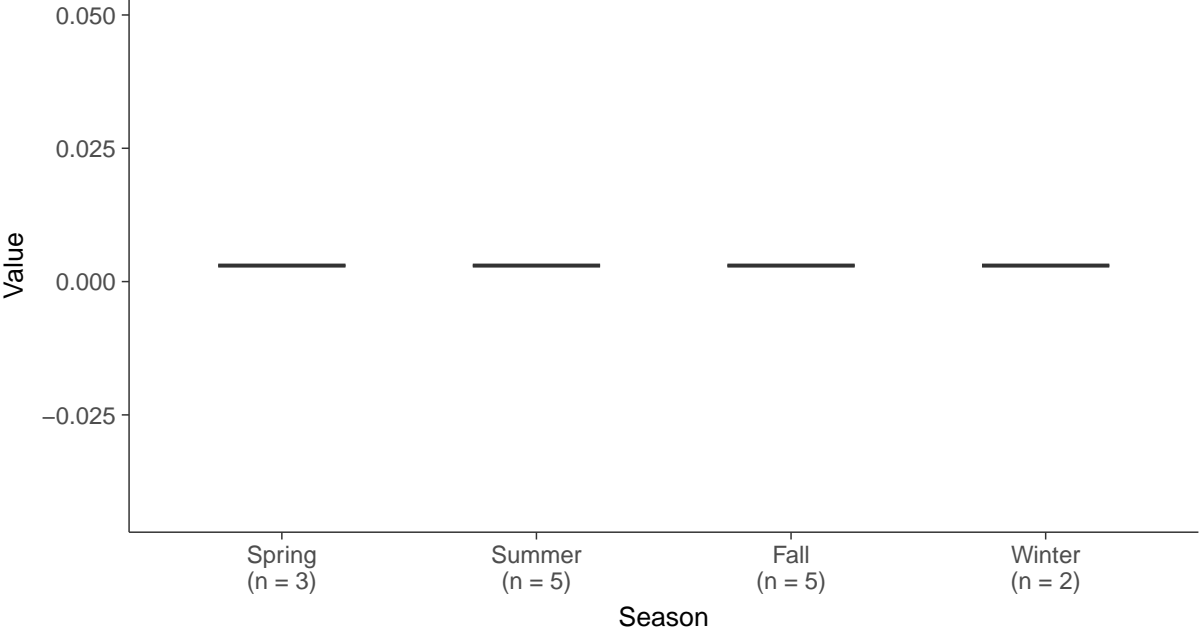
**Boxplot**

Lead, MW-6 (mg/L)



**Boxplot by Season**

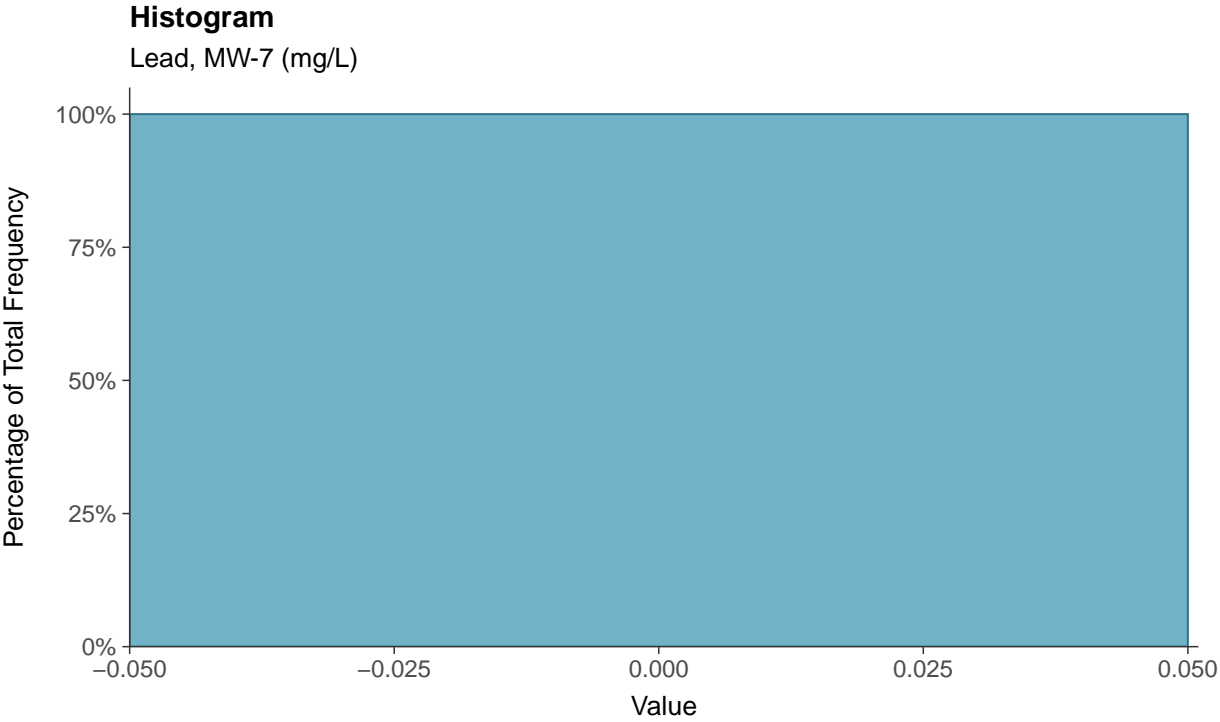
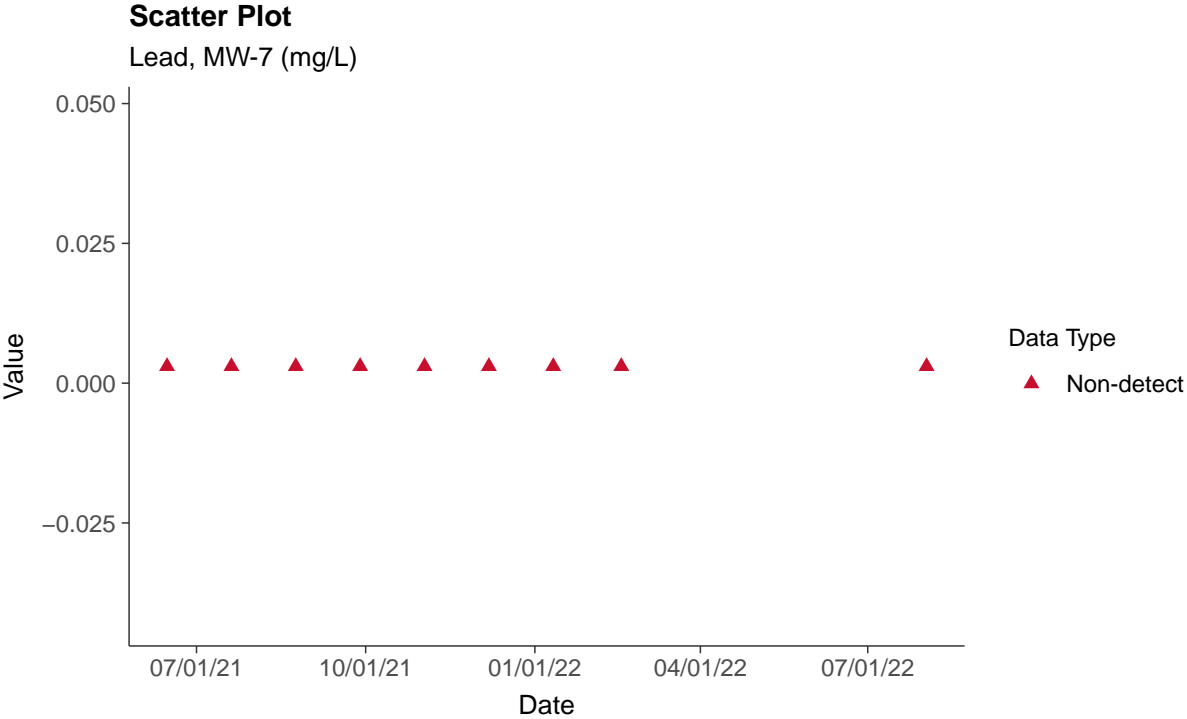
Lead, MW-6 (mg/L)





**Appendix IV: Lead, MW-7**

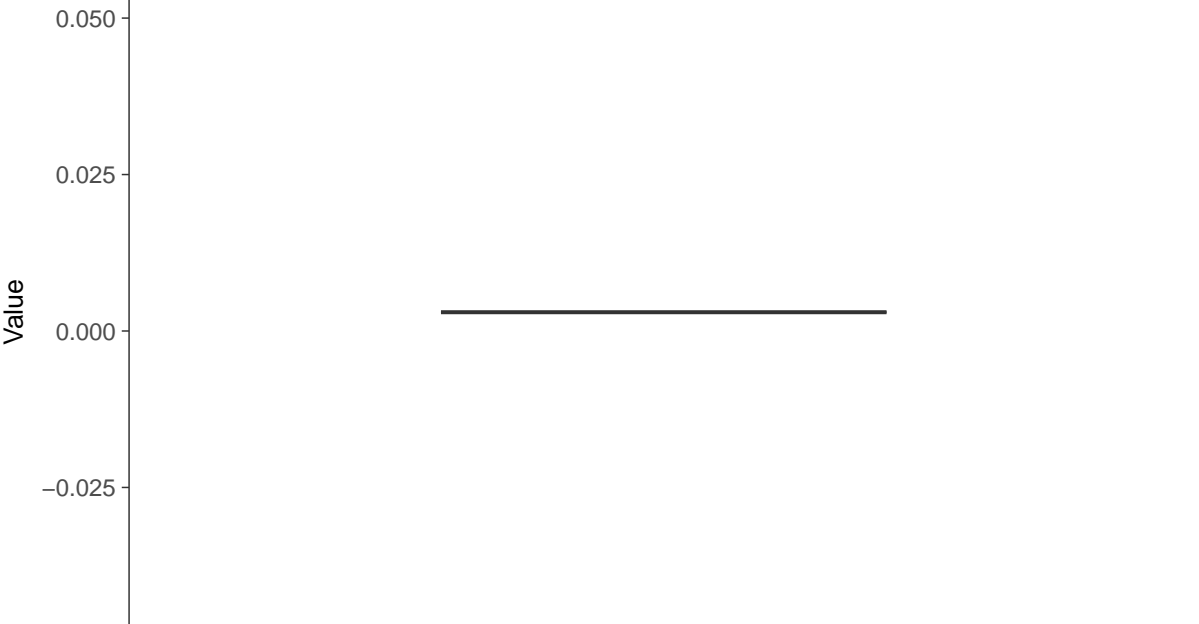
ID: 2\_17\_07





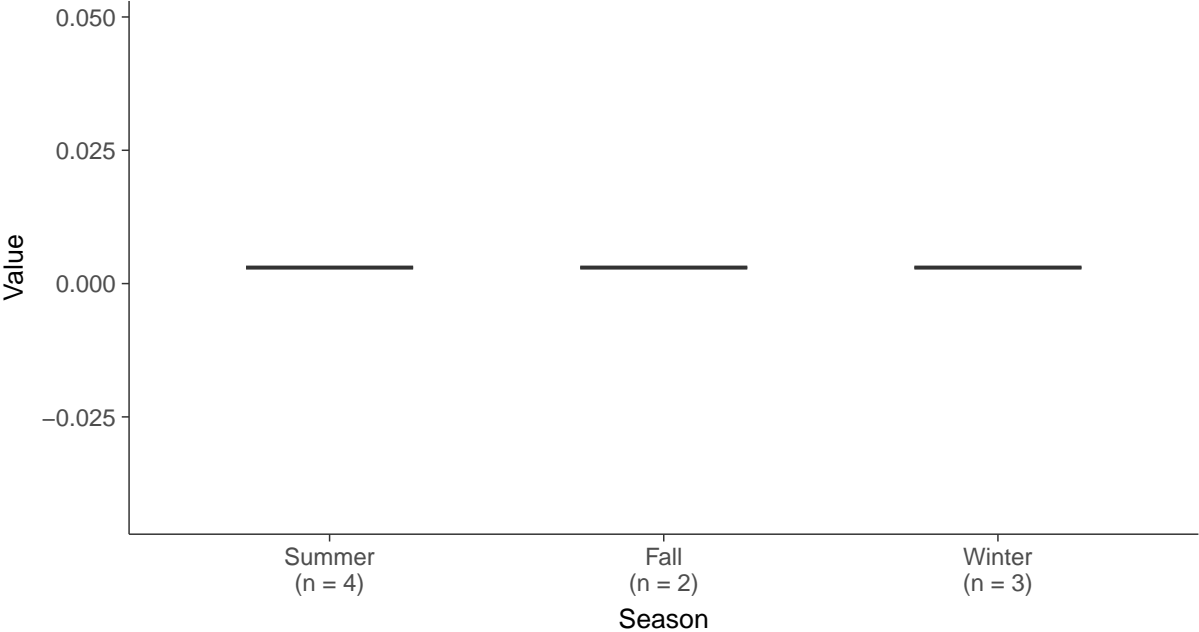
**Boxplot**

Lead, MW-7 (mg/L)



**Boxplot by Season**

Lead, MW-7 (mg/L)

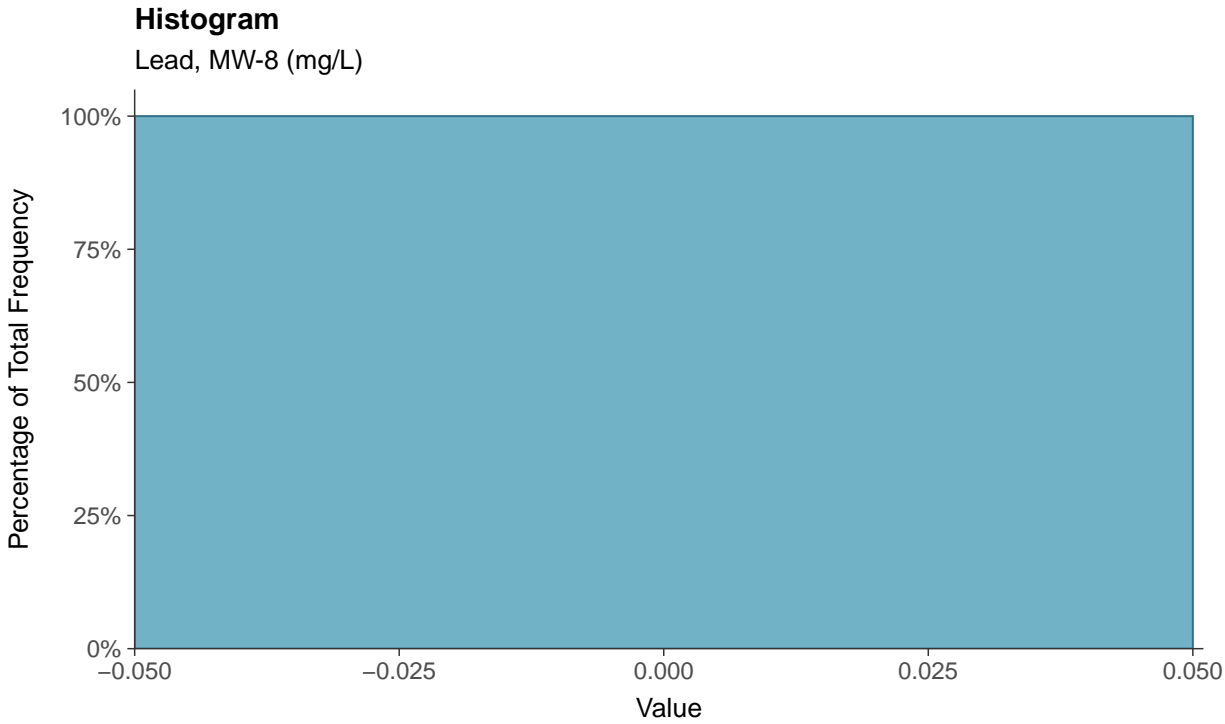
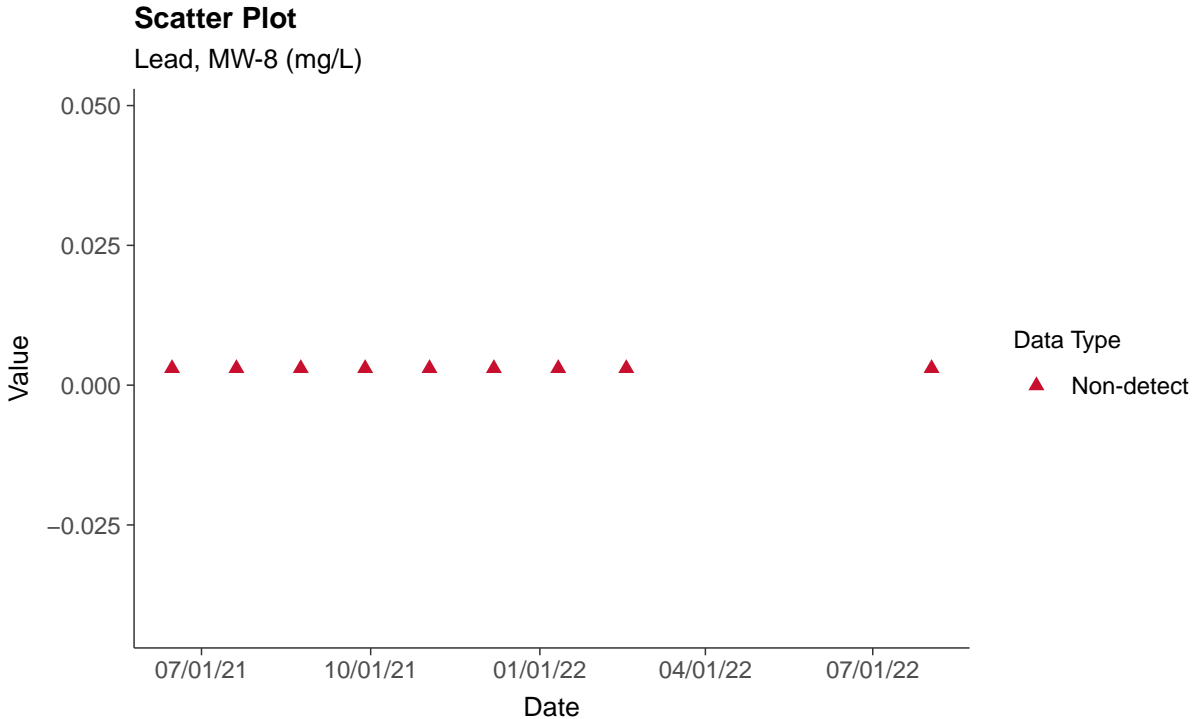






### Appendix IV: Lead, MW-8

ID: 2\_17\_08





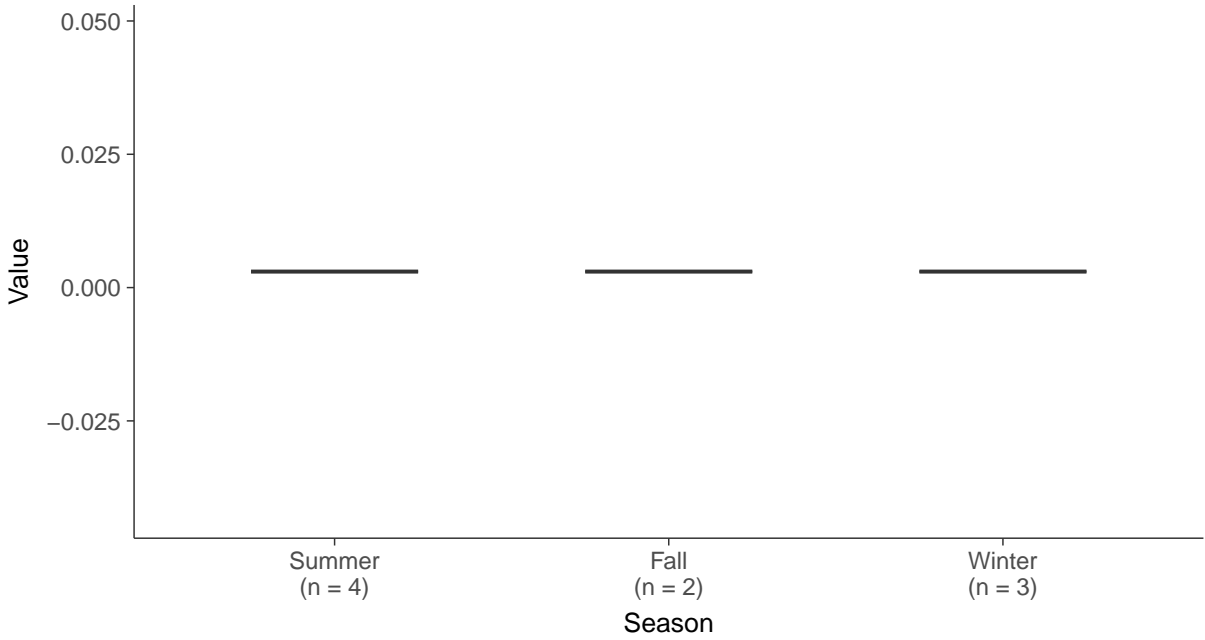
**Boxplot**

Lead, MW-8 (mg/L)



**Boxplot by Season**

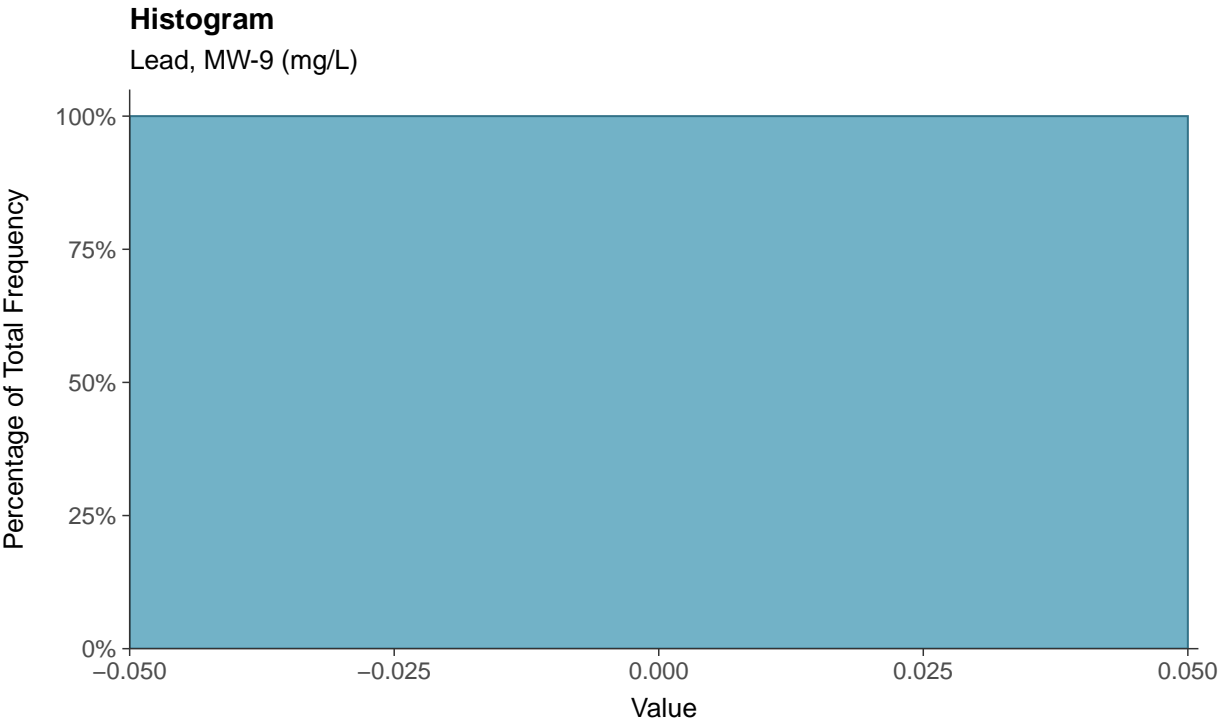
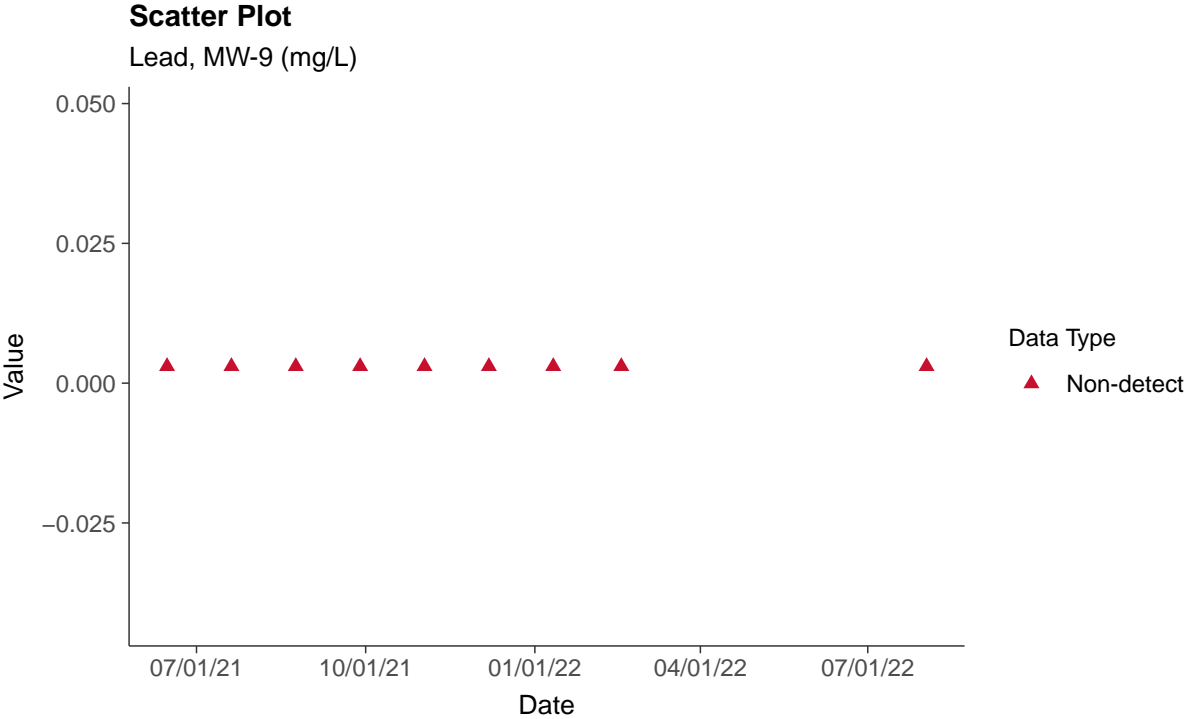
Lead, MW-8 (mg/L)





**Appendix IV: Lead, MW-9**

ID: 2\_17\_09





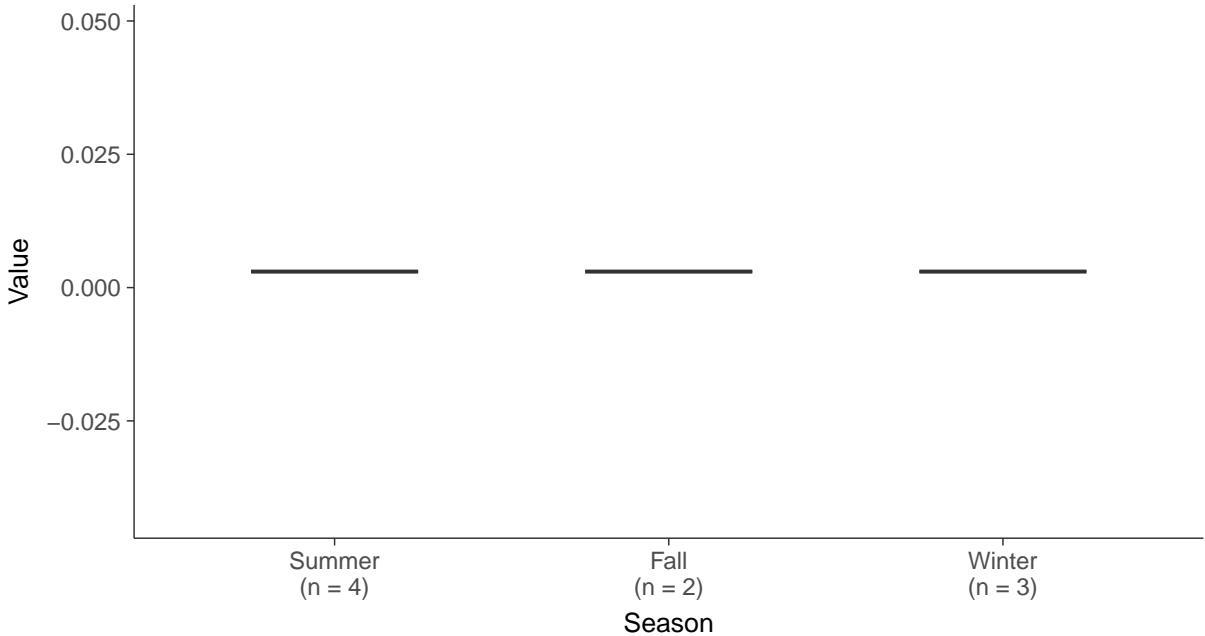
**Boxplot**

Lead, MW-9 (mg/L)



**Boxplot by Season**

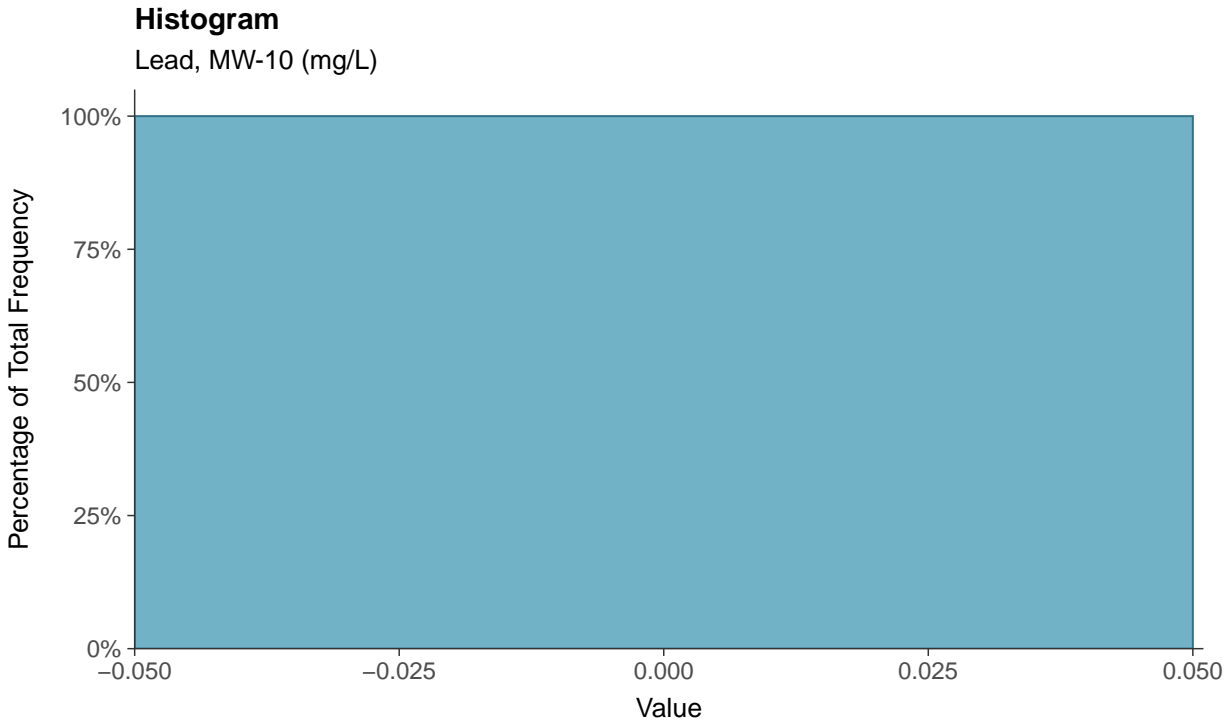
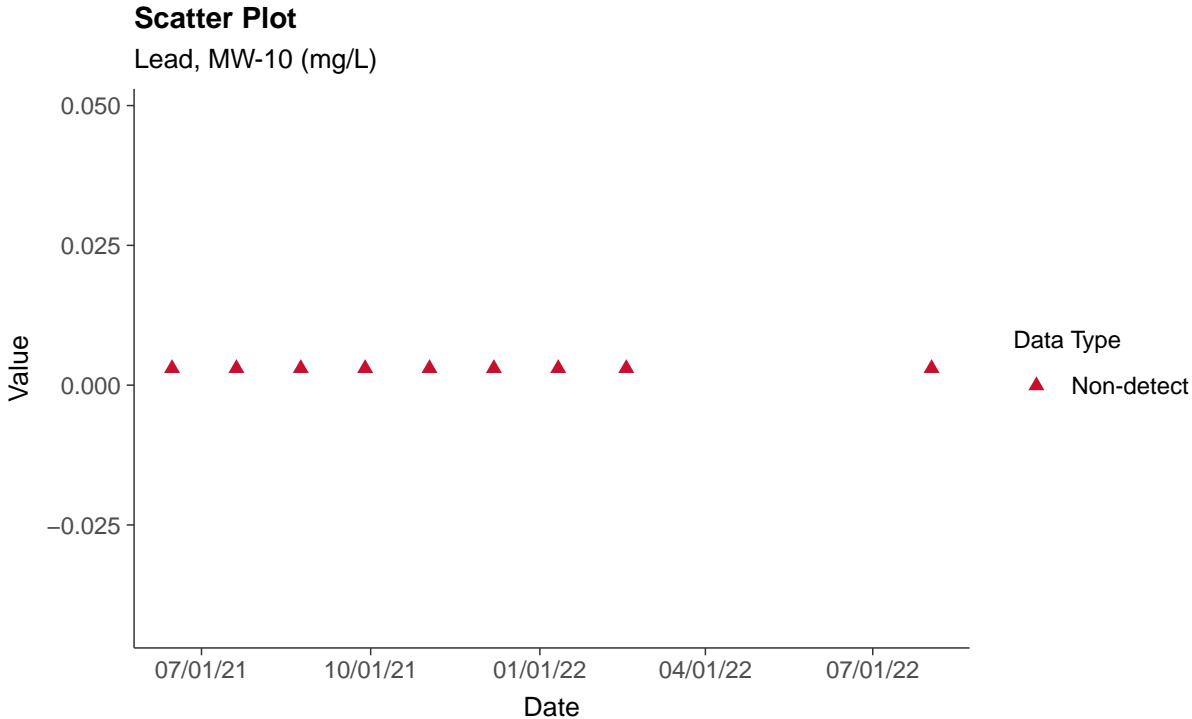
Lead, MW-9 (mg/L)





### Appendix IV: Lead, MW-10

ID: 2\_17\_10





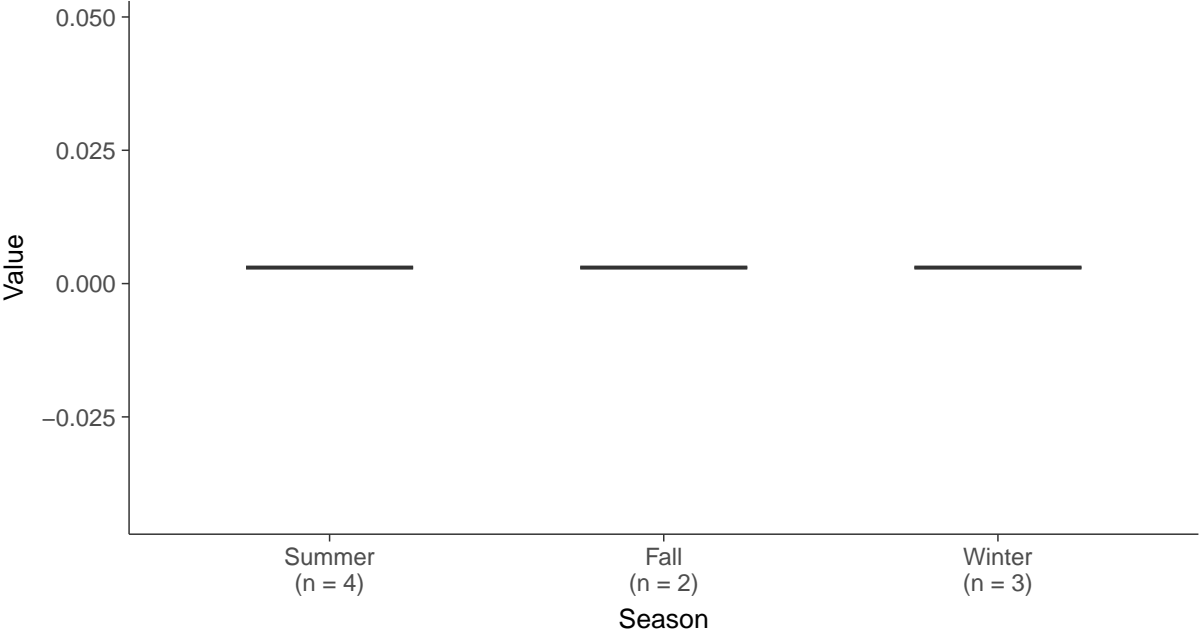
**Boxplot**

Lead, MW-10 (mg/L)



**Boxplot by Season**

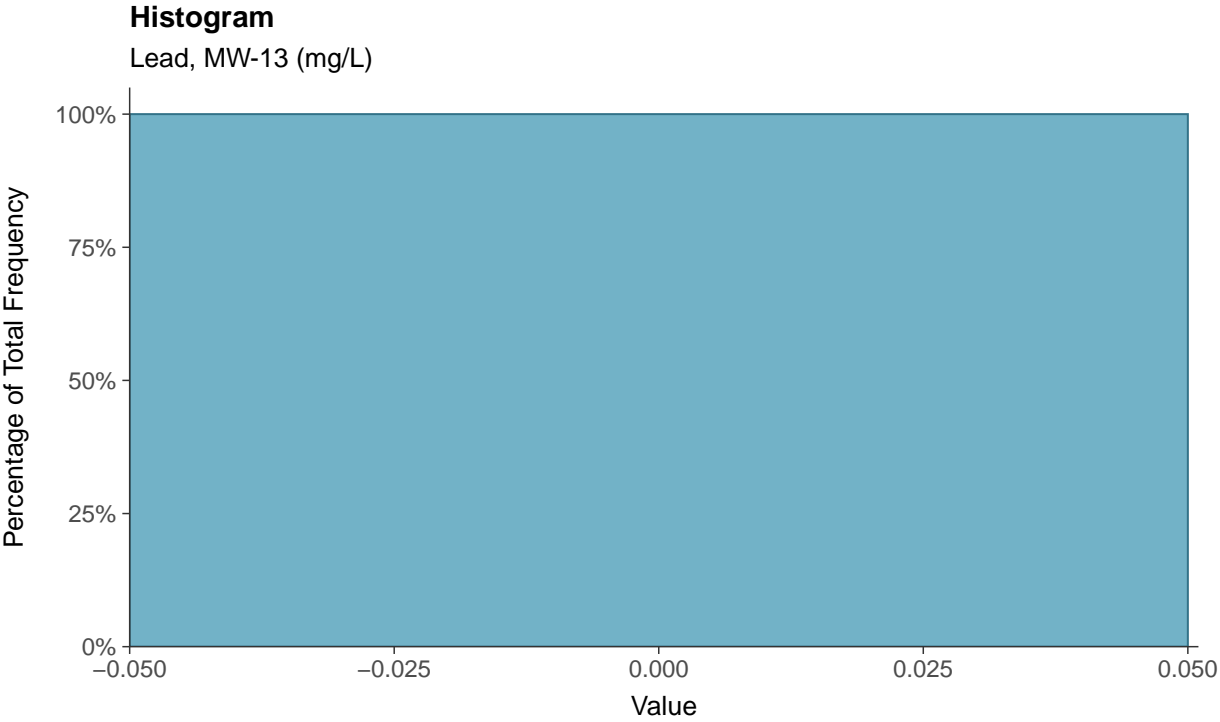
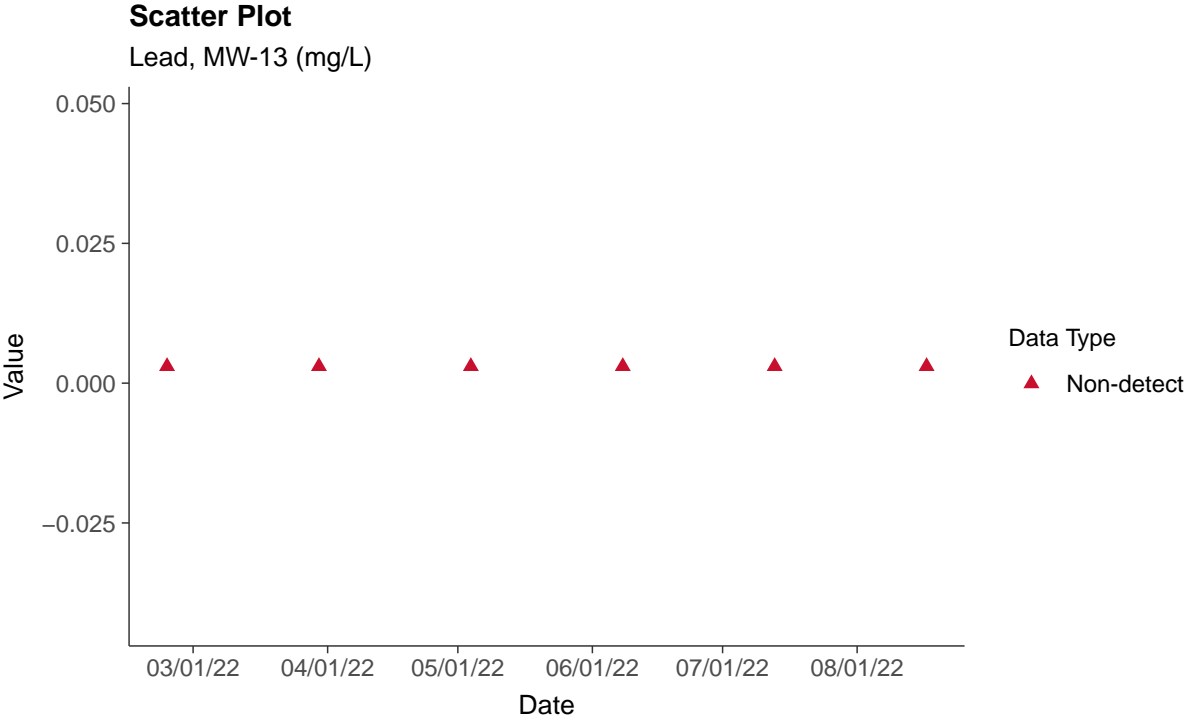
Lead, MW-10 (mg/L)





### Appendix IV: Lead, MW-13

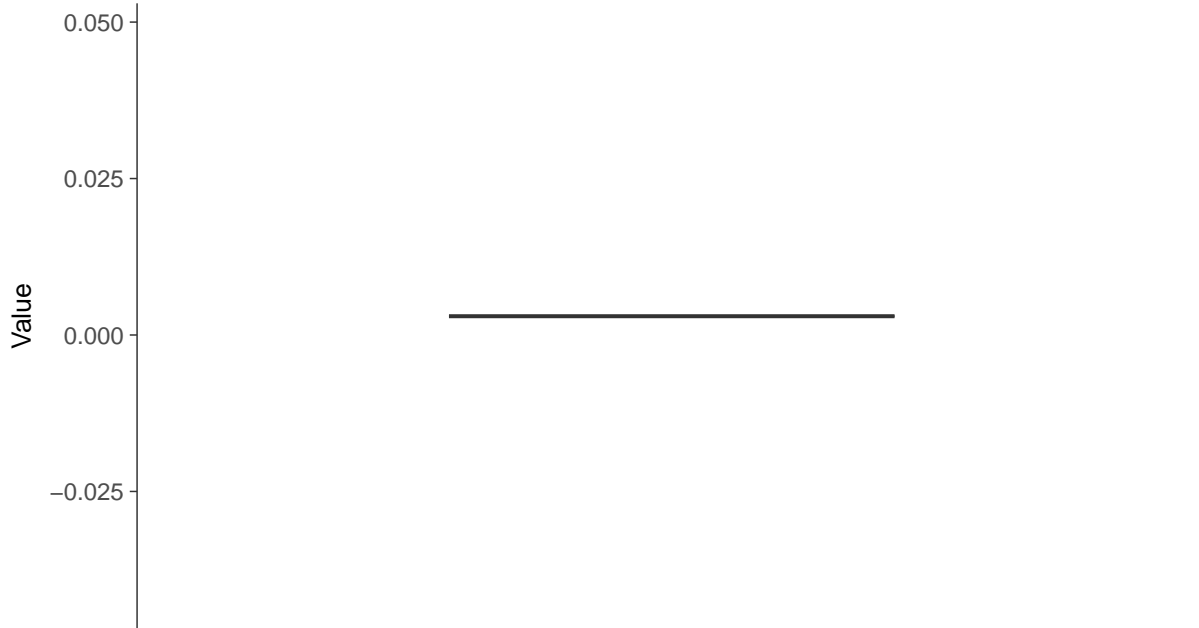
ID: 2\_17\_13





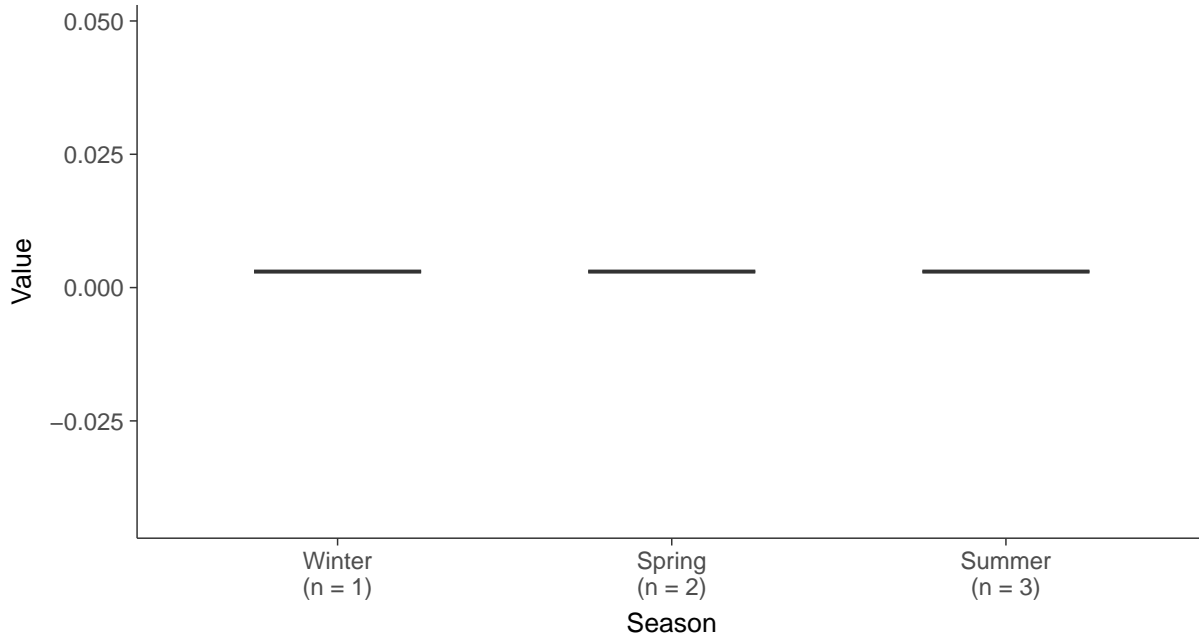
### Boxplot

Lead, MW-13 (mg/L)



### Boxplot by Season

Lead, MW-13 (mg/L)

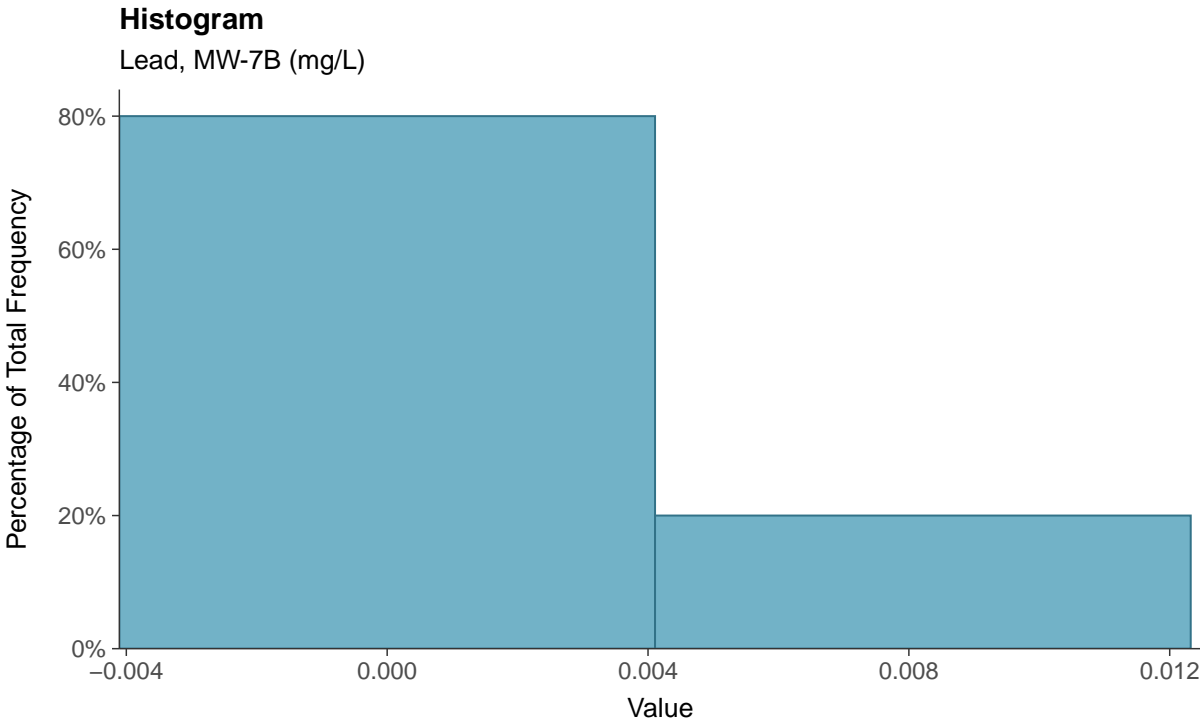
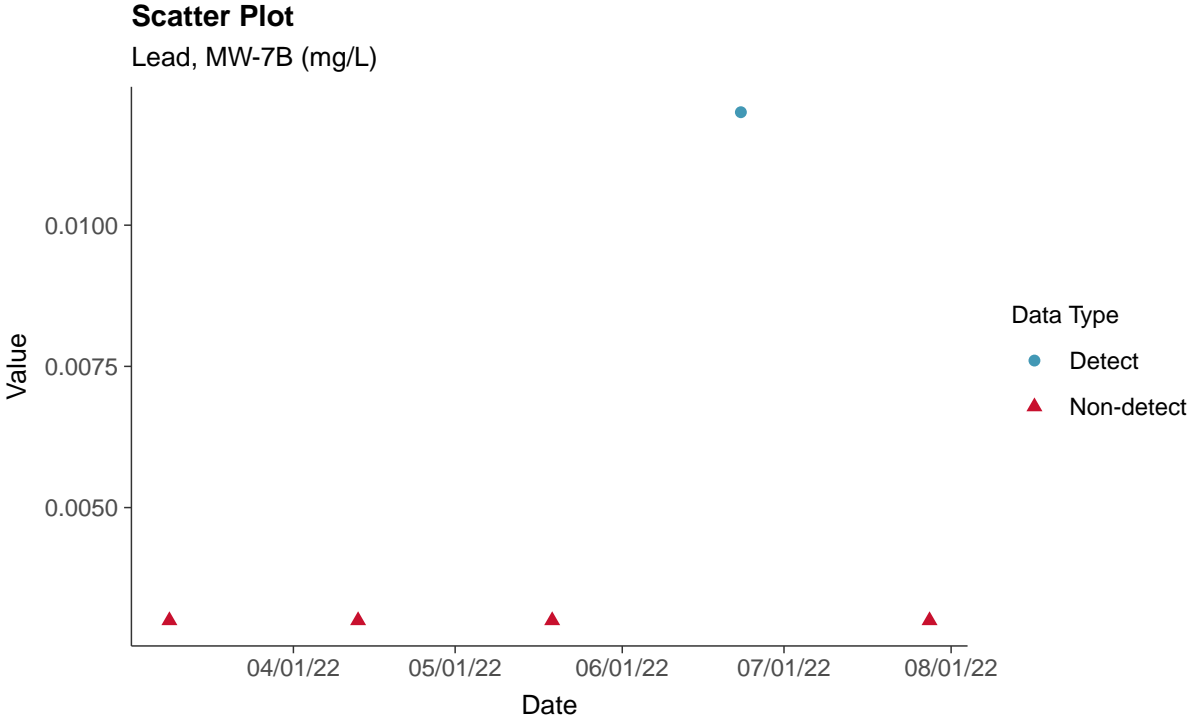






### Appendix IV: Lead, MW-7B

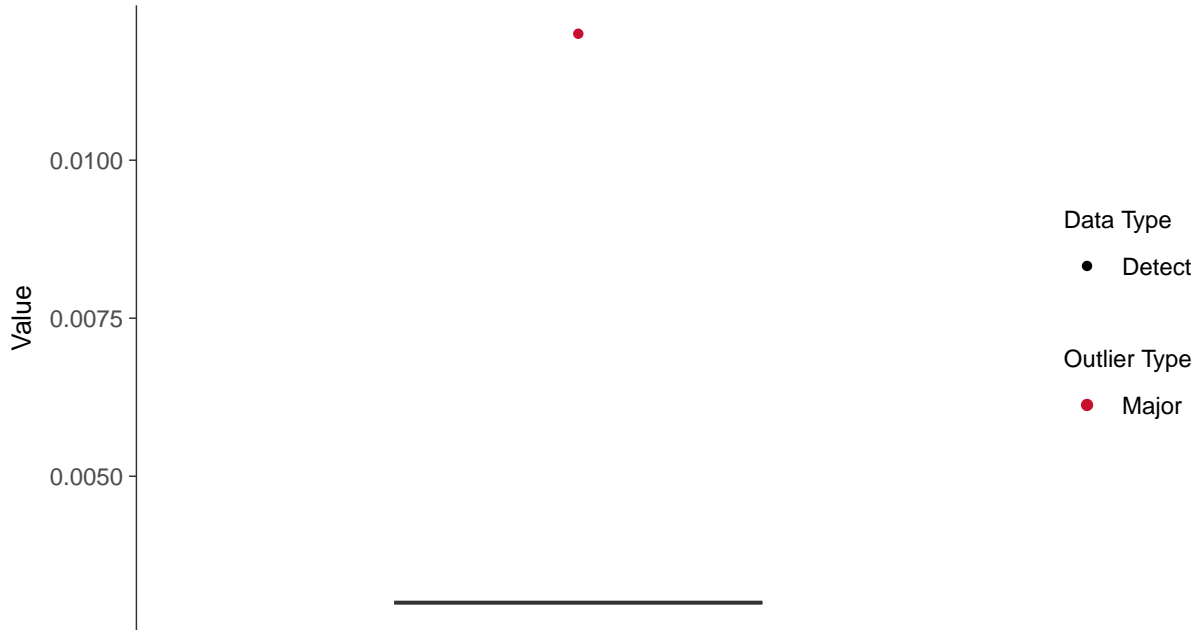
ID: 2\_17\_7B





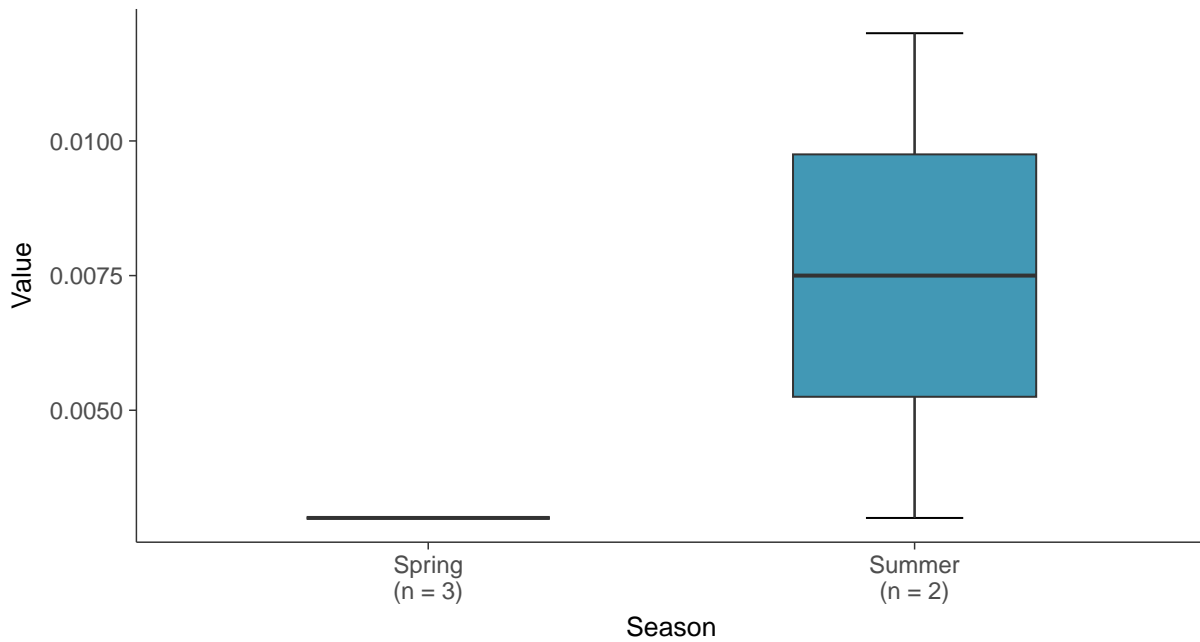
### Boxplot

Lead, MW-7B (mg/L)



### Boxplot by Season

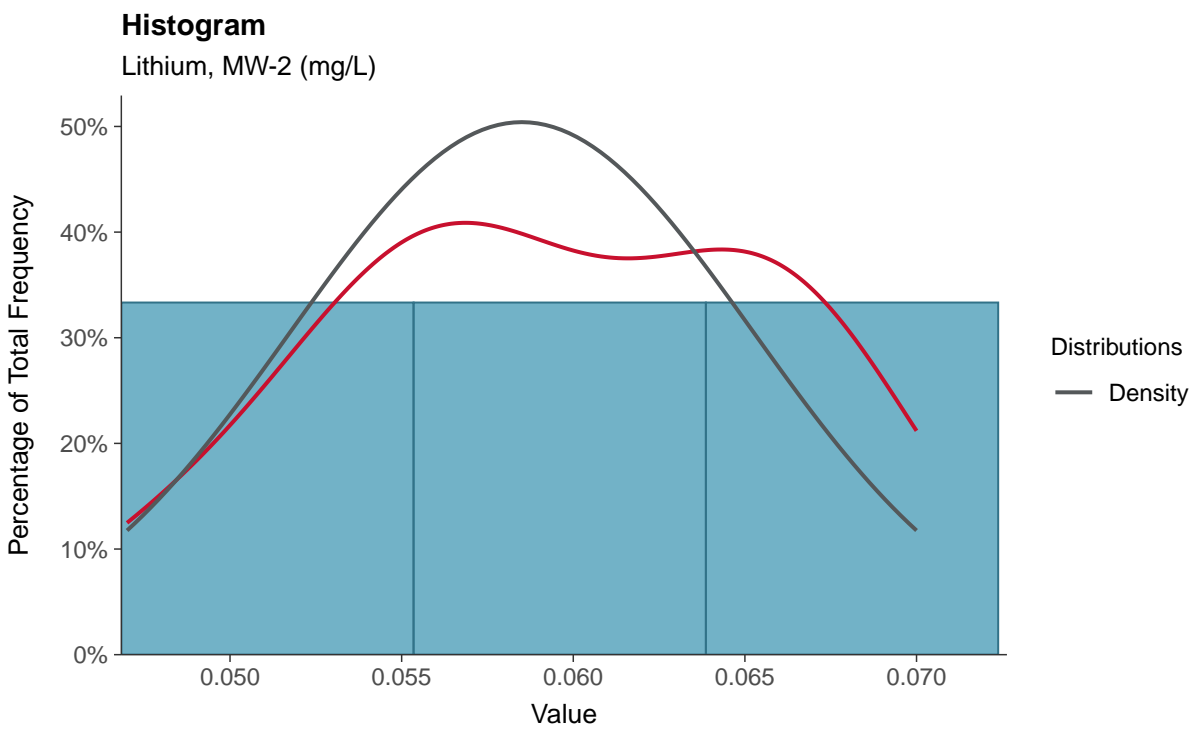
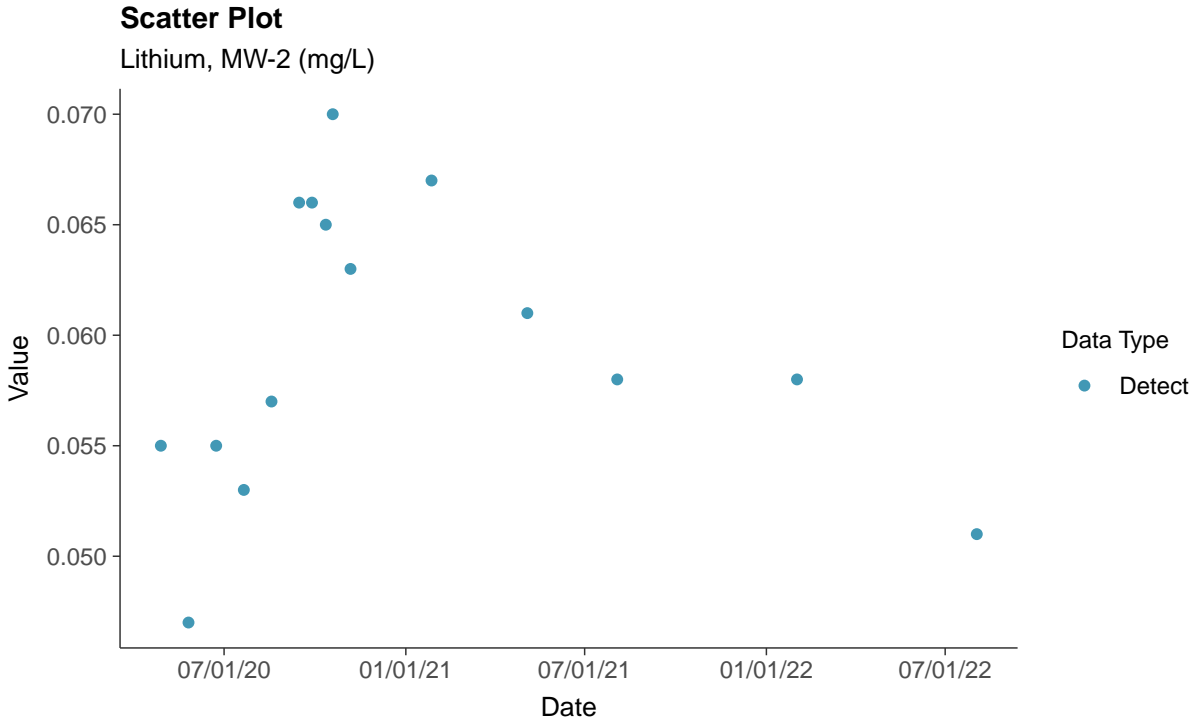
Lead, MW-7B (mg/L)





### Appendix IV: Lithium, MW-2

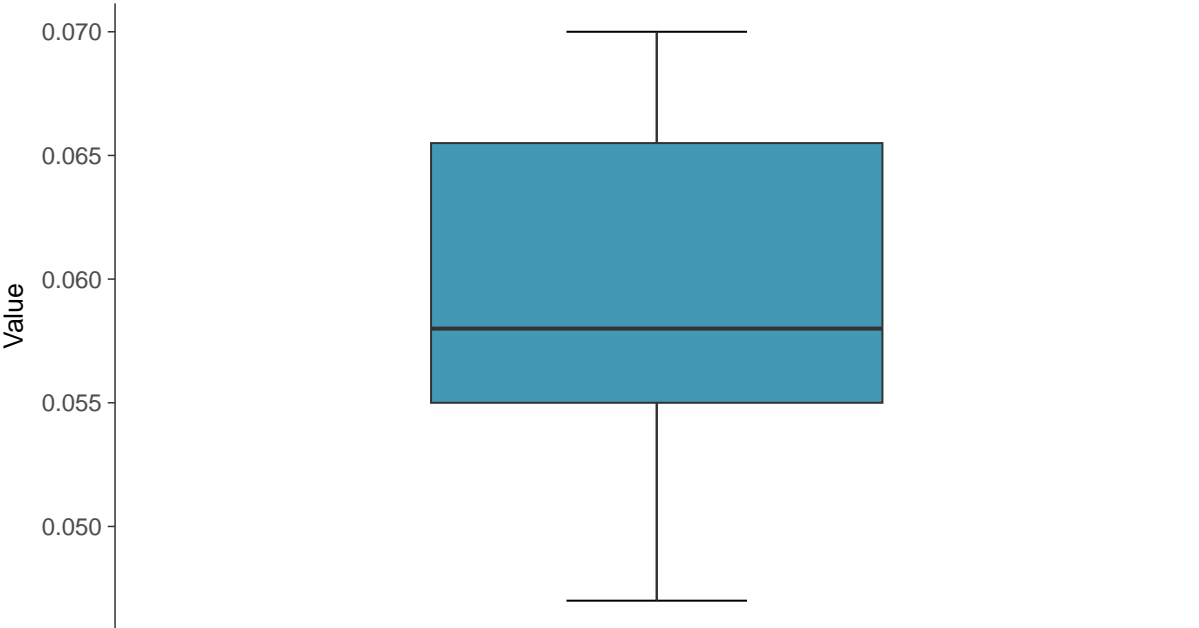
ID: 2\_18\_02





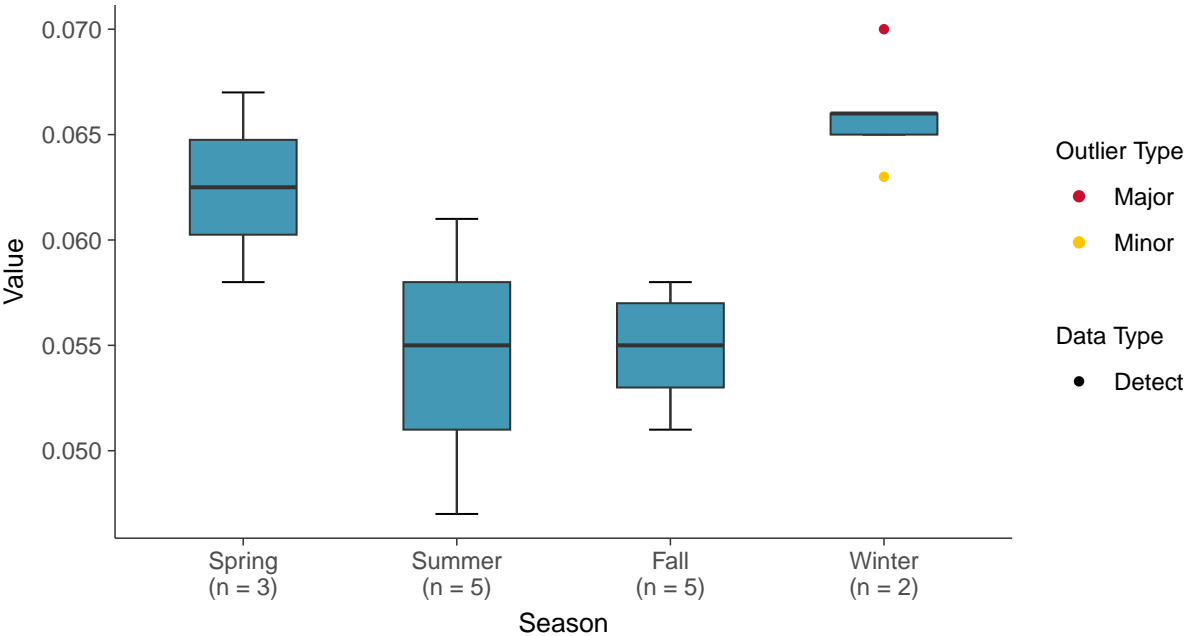
**Boxplot**

Lithium, MW-2 (mg/L)



**Boxplot by Season**

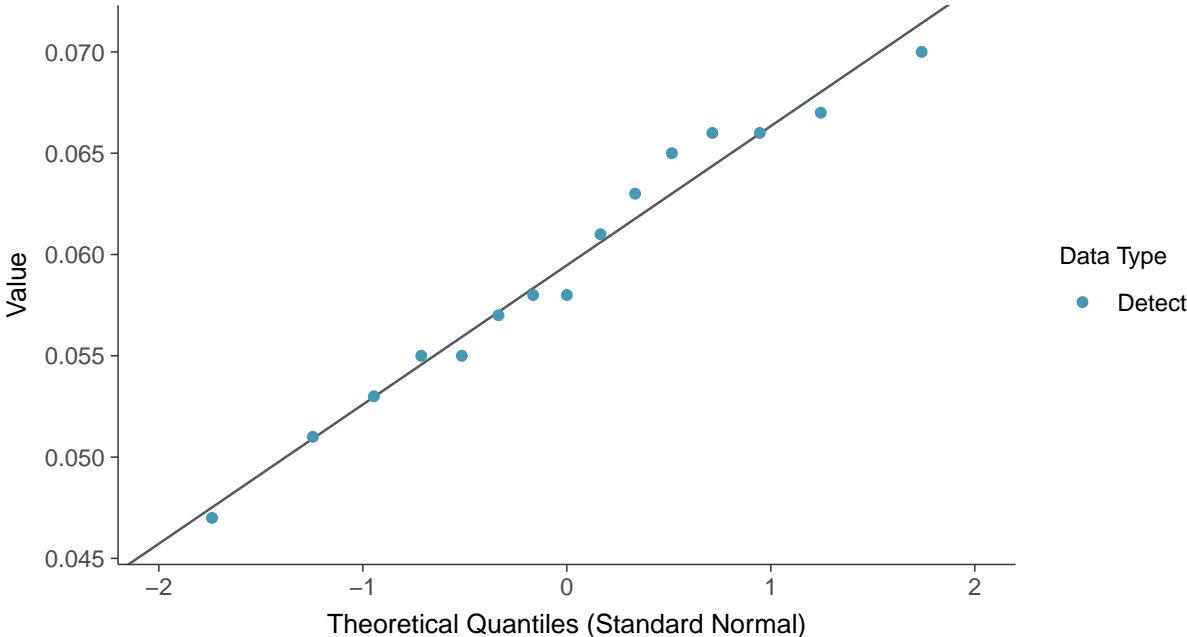
Lithium, MW-2 (mg/L)





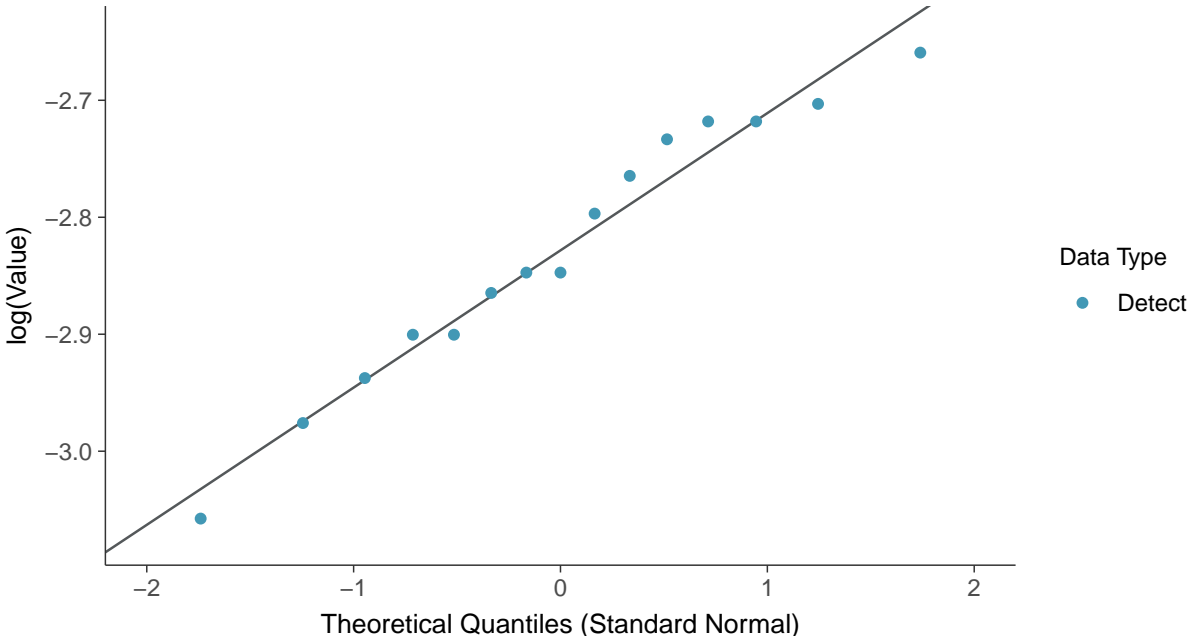
**Normal Q-Q plot**

Lithium, MW-2 (mg/L)



**Lognormal Q-Q plot**

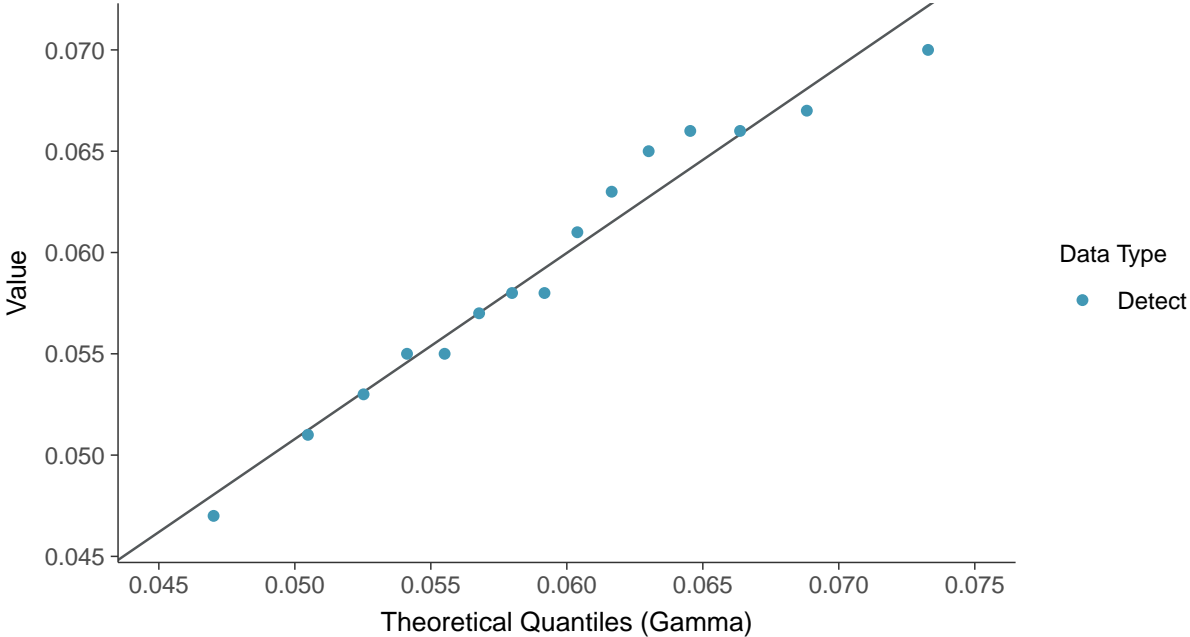
Lithium, MW-2 (mg/L)





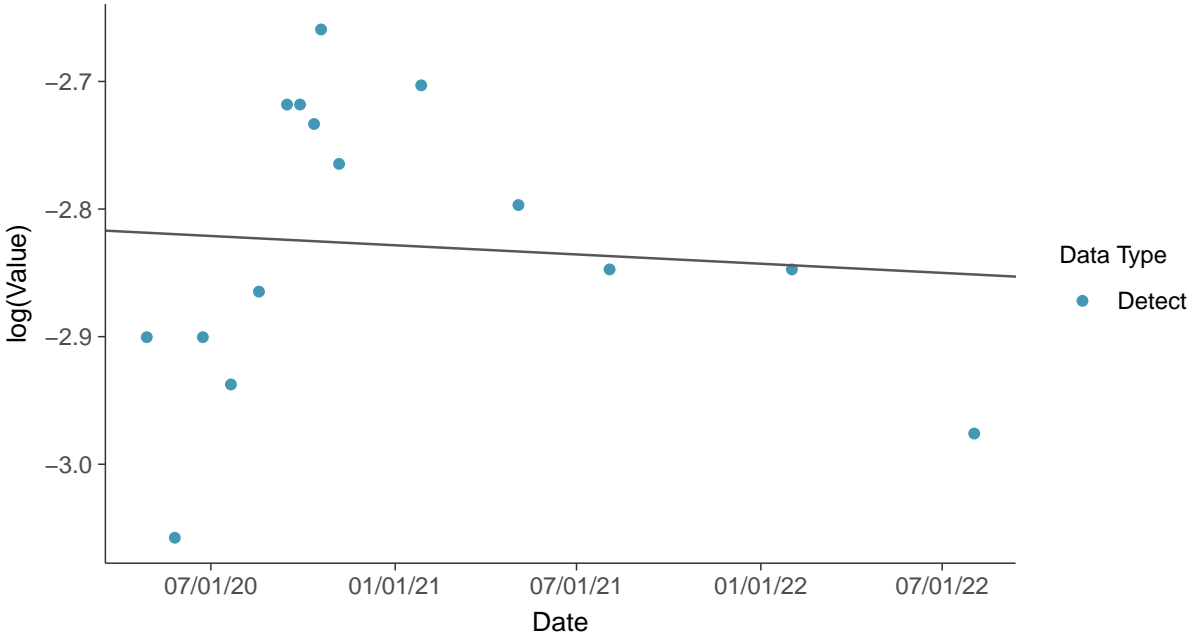
### Gamma Q-Q plot

Lithium, MW-2 (mg/L)



### Trend Regression: Lognormal MLE

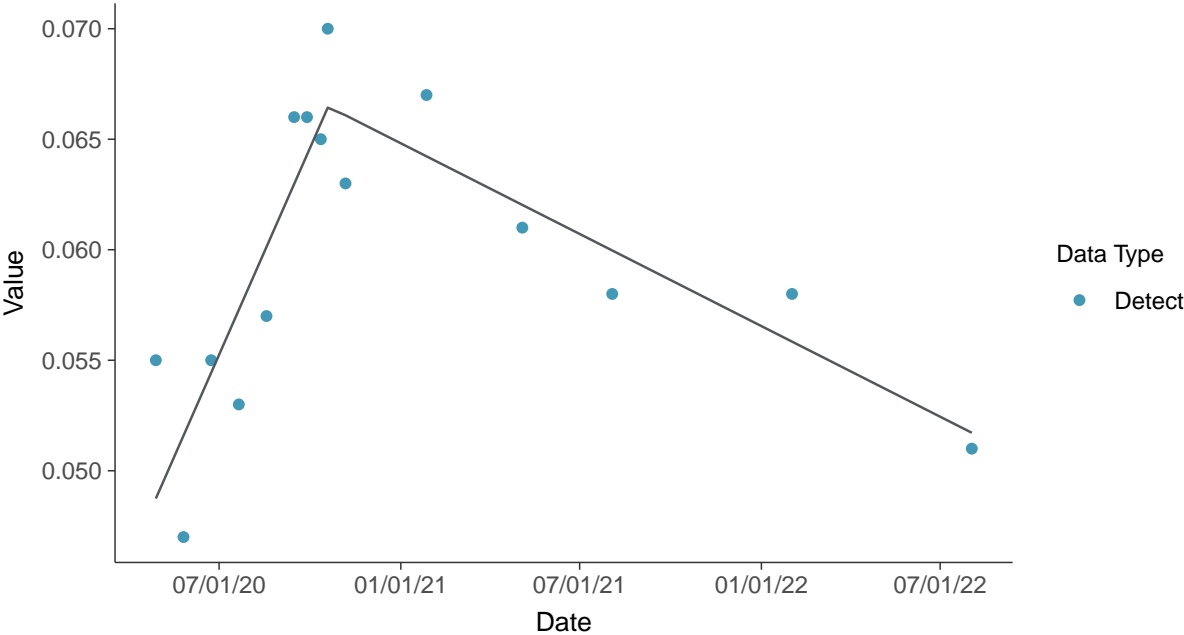
Lithium, MW-2 (mg/L)





**Trend Regression: Piecewise Linear-Linear**

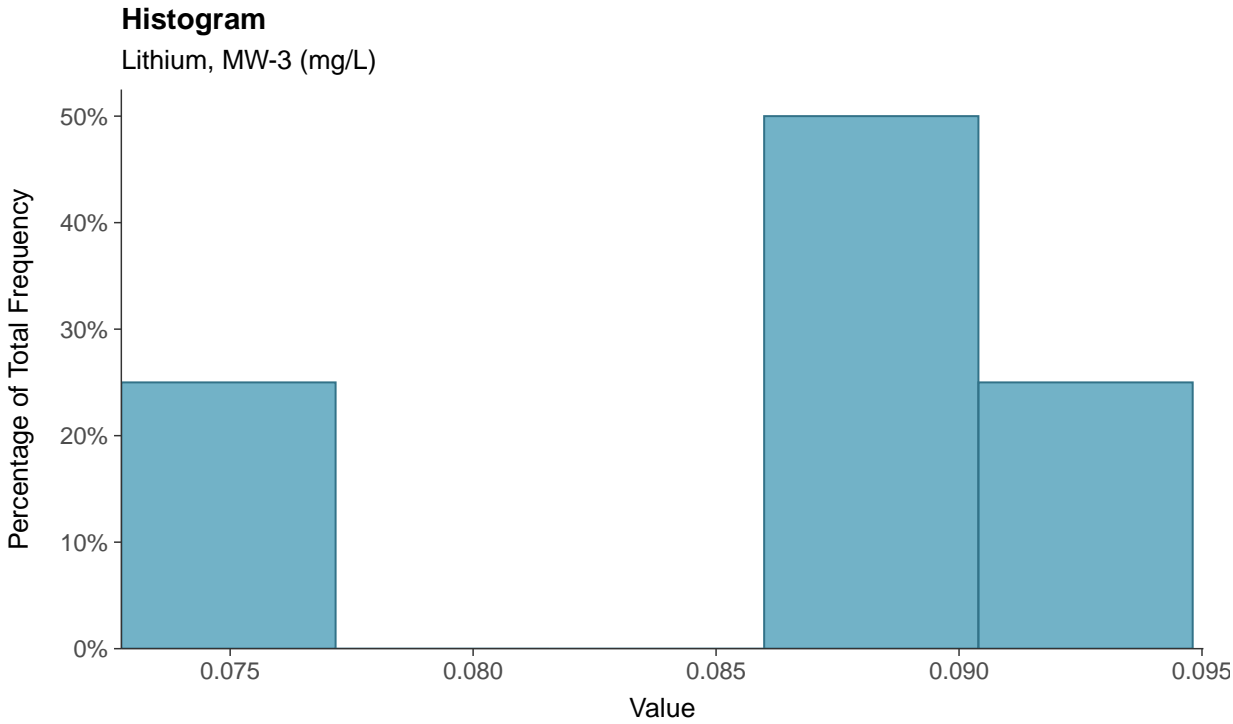
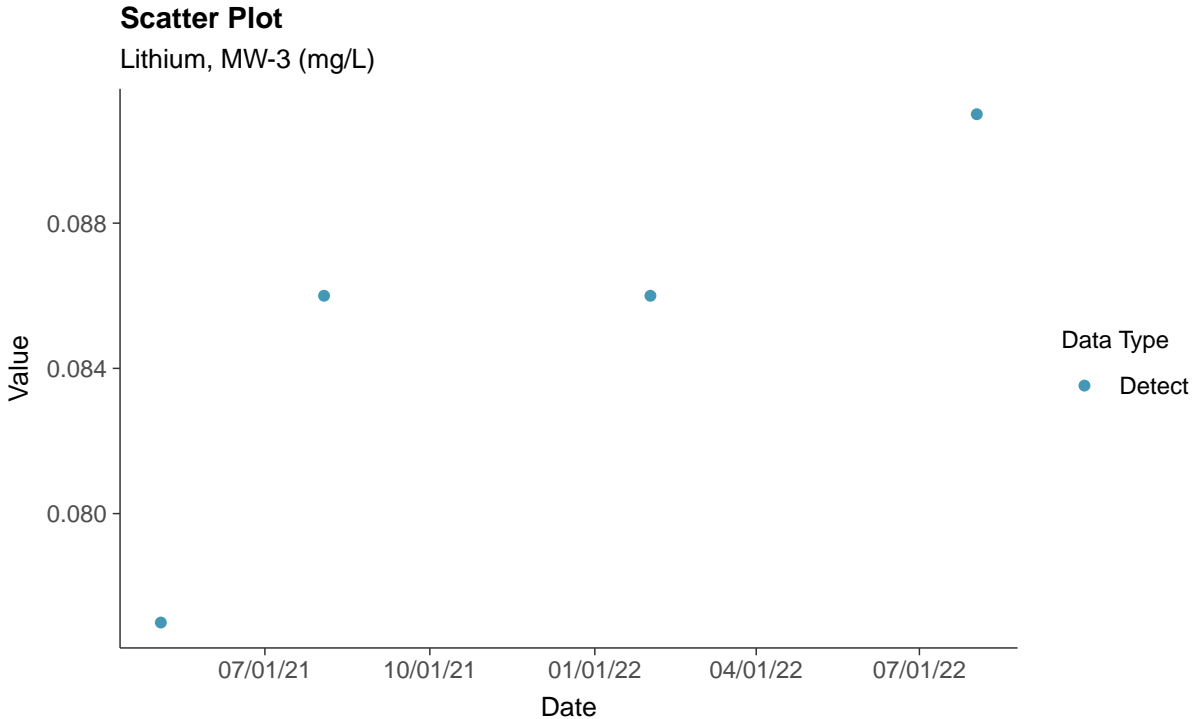
Lithium, MW-2 (mg/L)





### Appendix IV: Lithium, MW-3

ID: 2\_18\_03

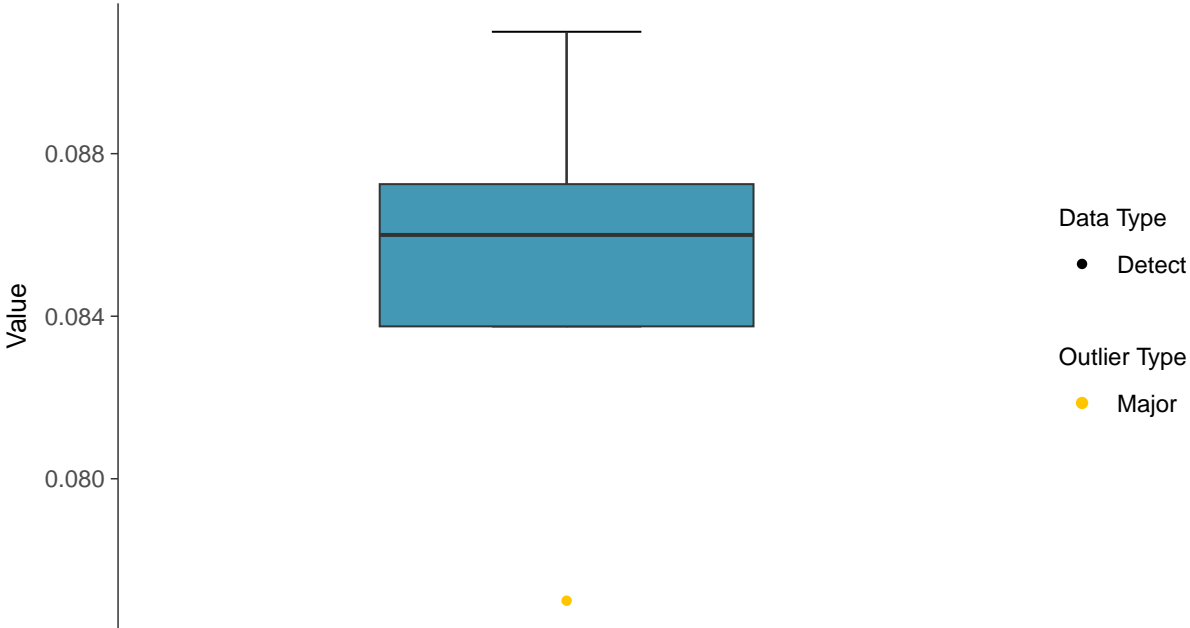






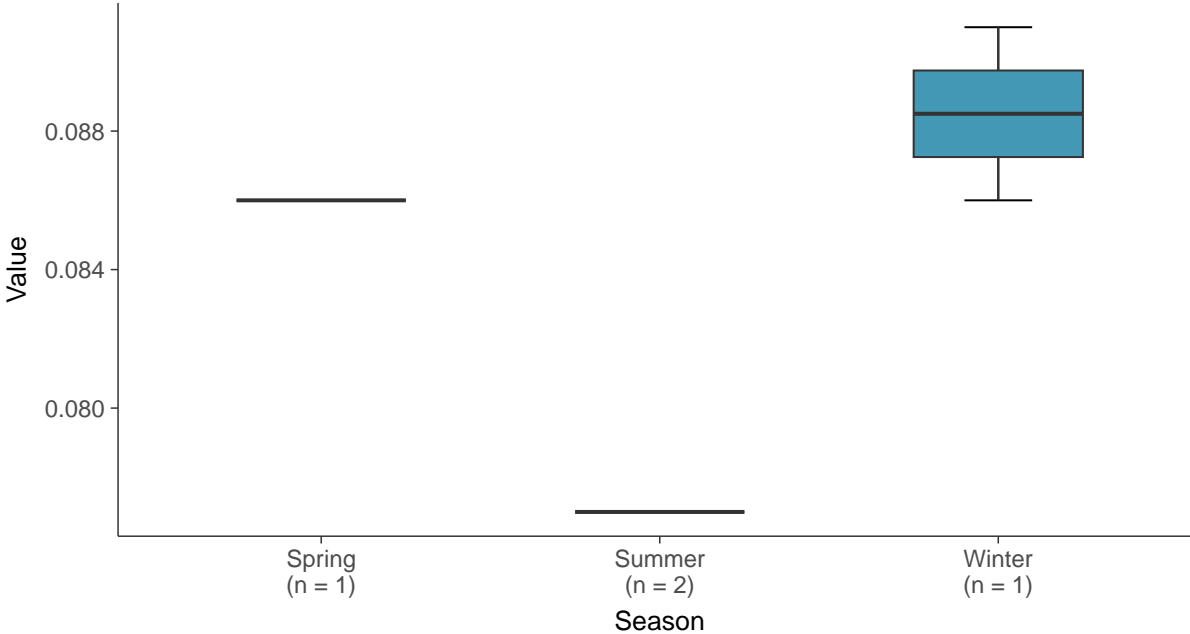
**Boxplot**

Lithium, MW-3 (mg/L)



**Boxplot by Season**

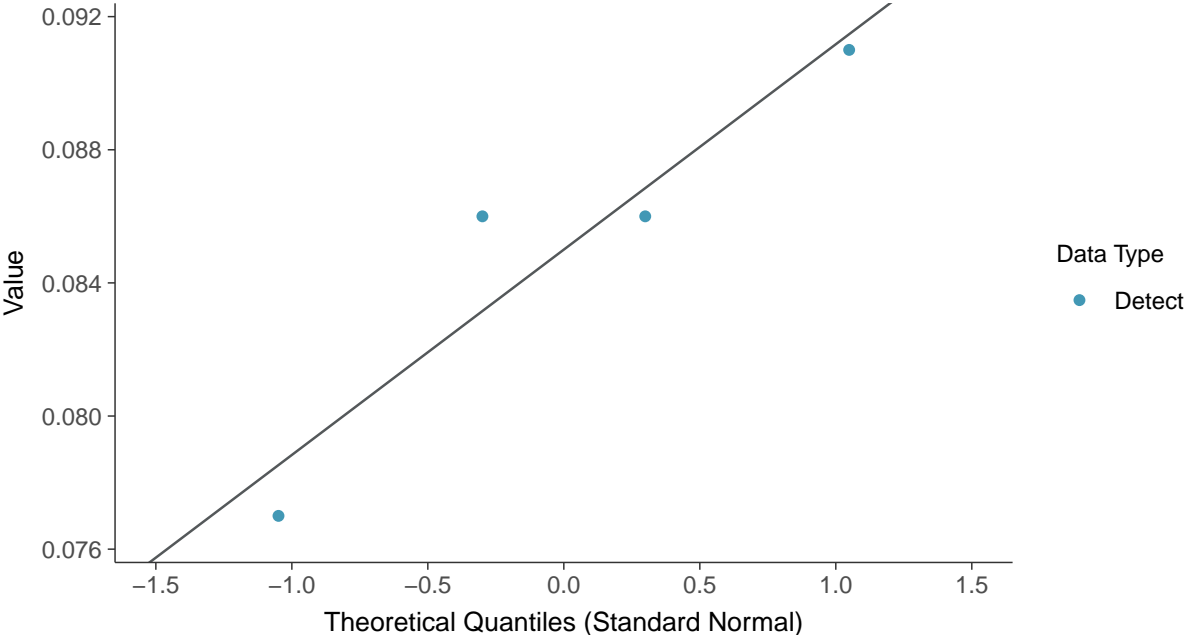
Lithium, MW-3 (mg/L)





**Normal Q-Q plot**

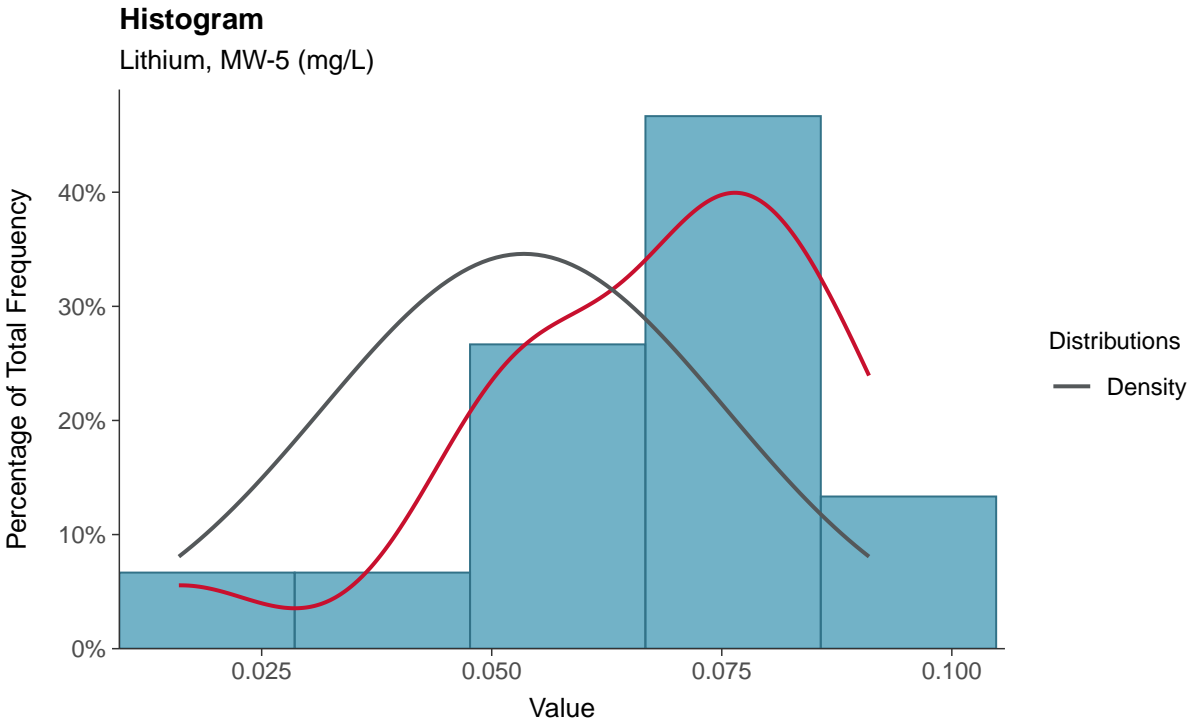
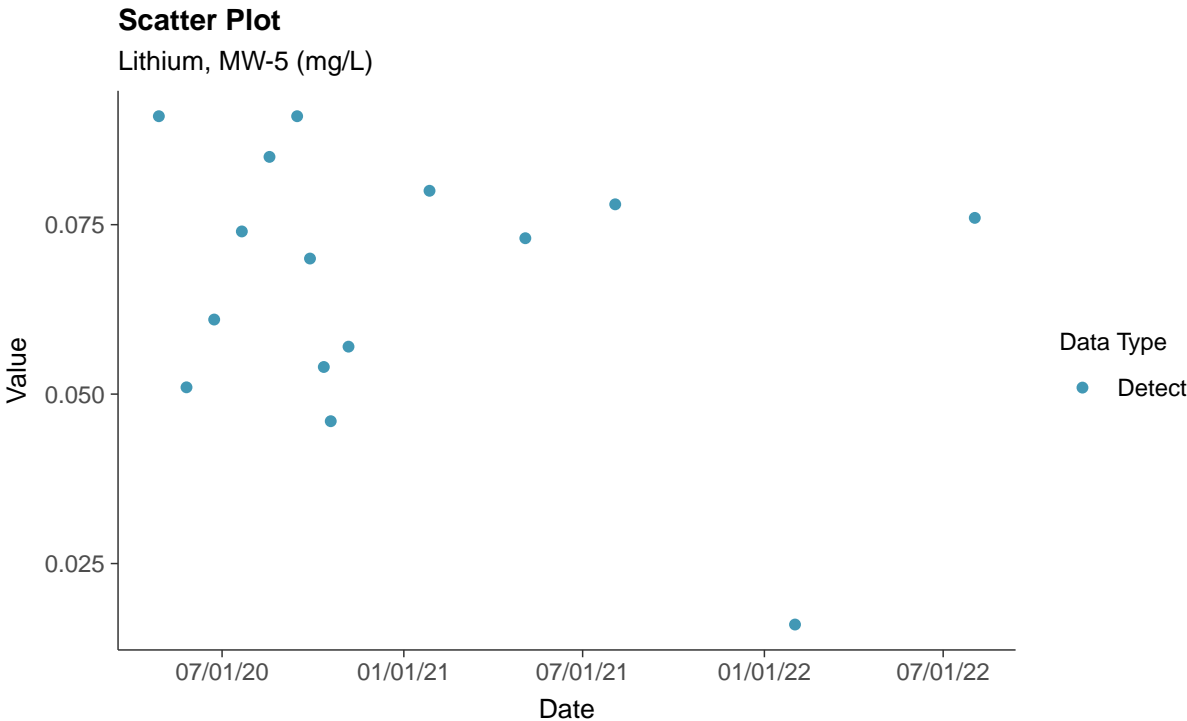
Lithium, MW-3 (mg/L)





### Appendix IV: Lithium, MW-5

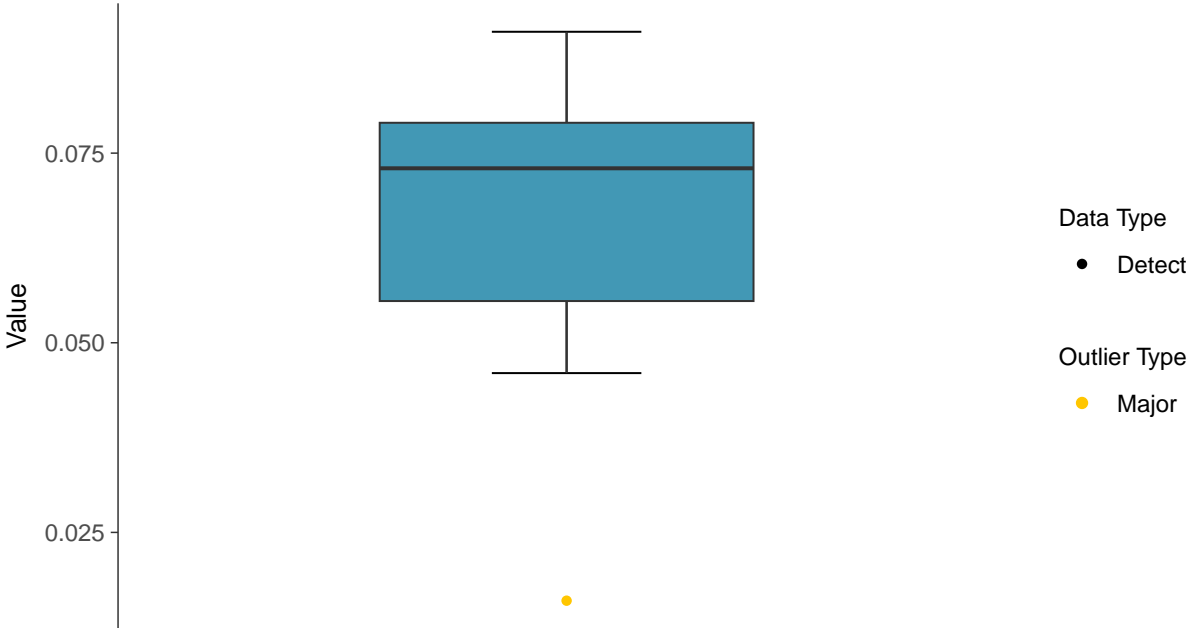
ID: 2\_18\_05





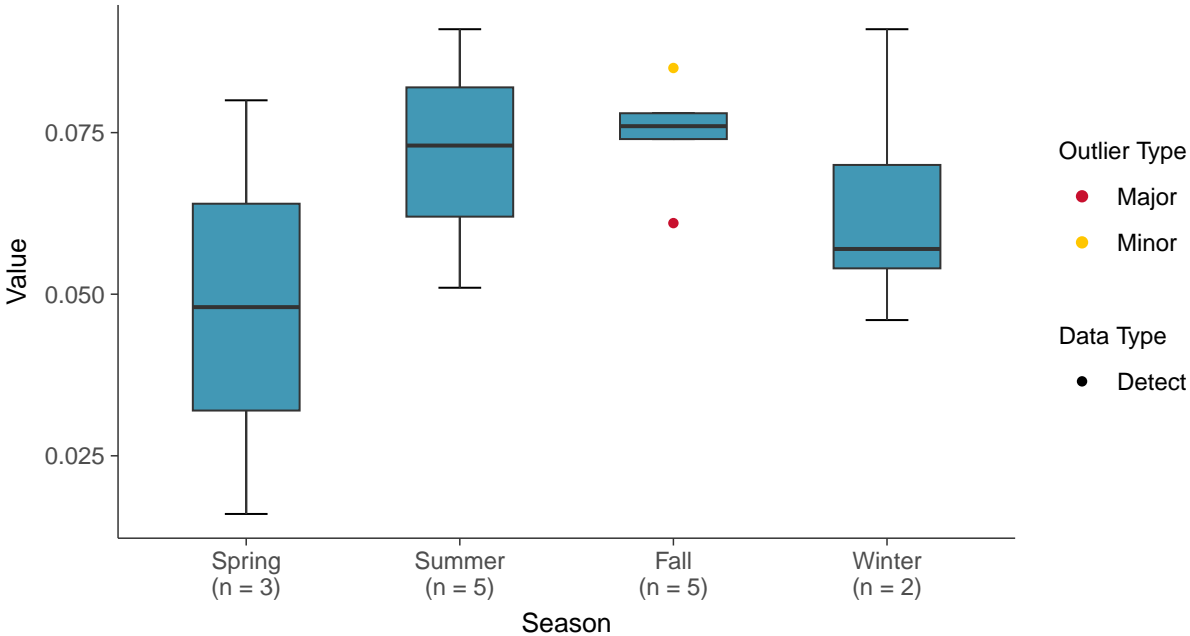
**Boxplot**

Lithium, MW-5 (mg/L)



**Boxplot by Season**

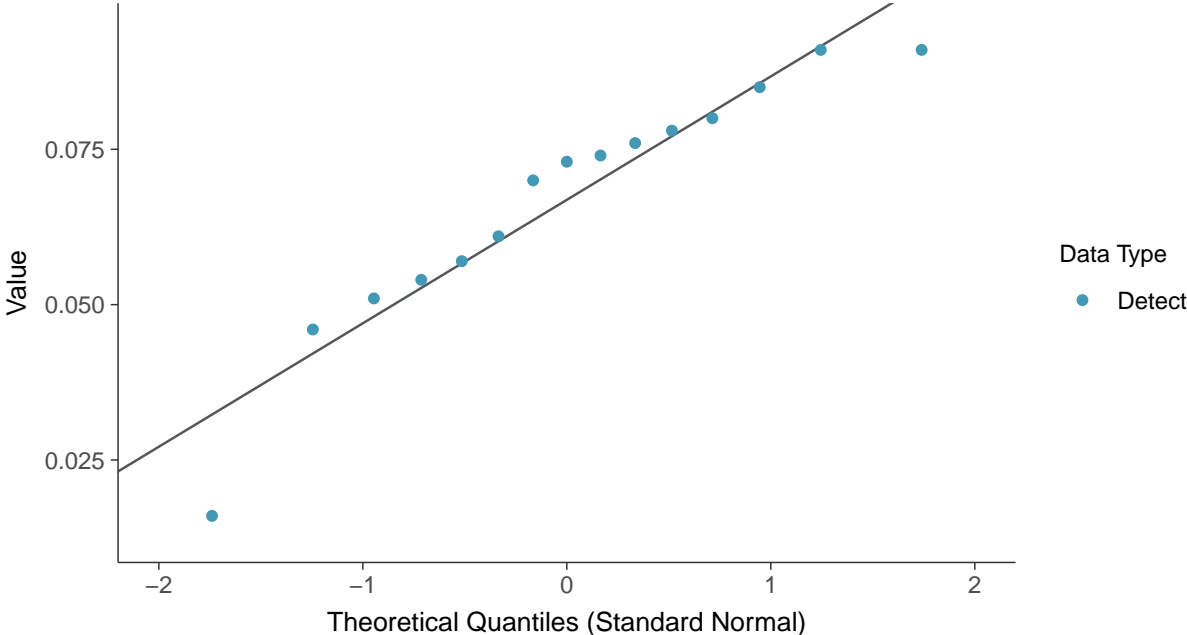
Lithium, MW-5 (mg/L)





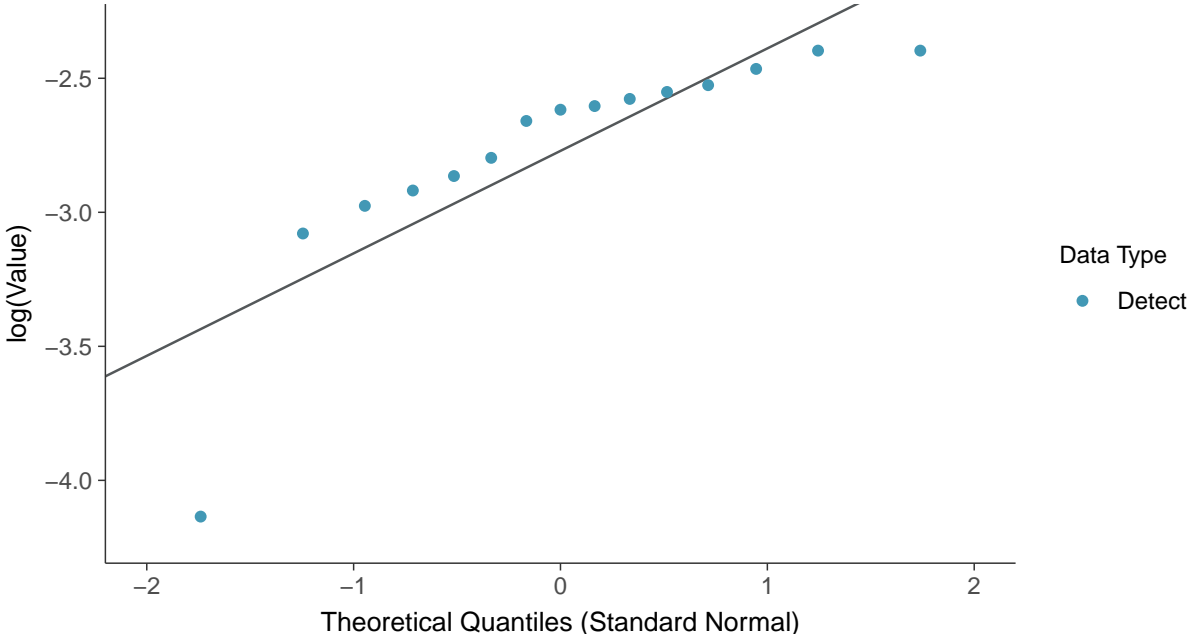
**Normal Q-Q plot**

Lithium, MW-5 (mg/L)



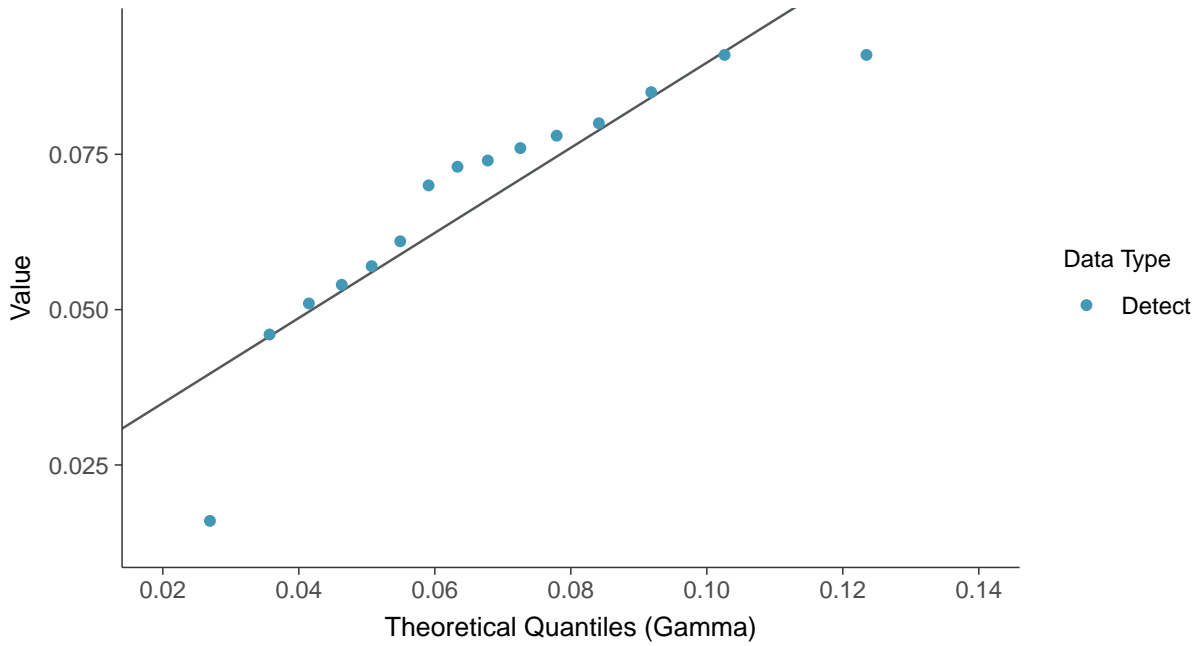
**Lognormal Q-Q plot**

Lithium, MW-5 (mg/L)

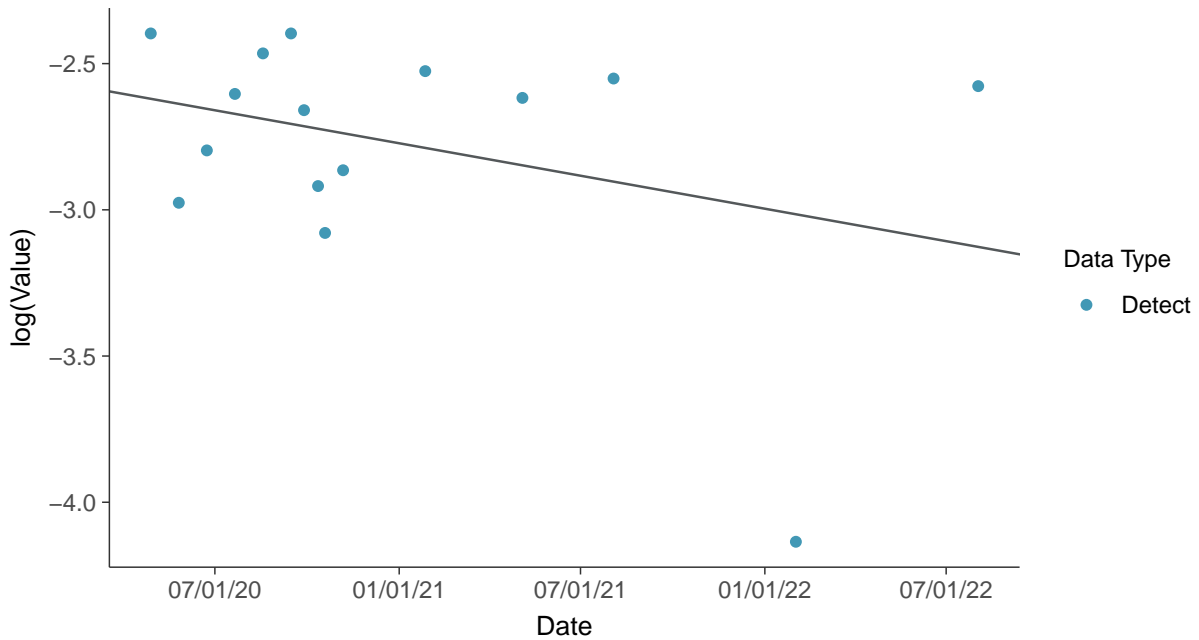




**Gamma Q-Q plot**  
Lithium, MW-5 (mg/L)



**Trend Regression: Lognormal MLE**  
Lithium, MW-5 (mg/L)



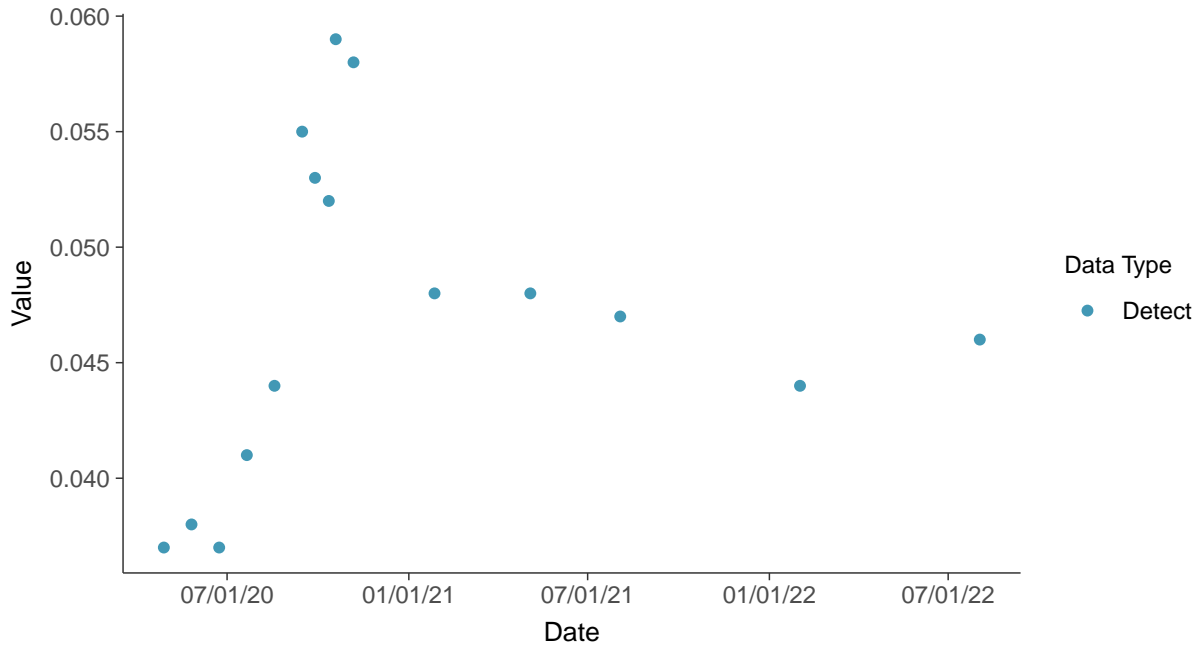


### Appendix IV: Lithium, MW-6

ID: 2\_18\_06

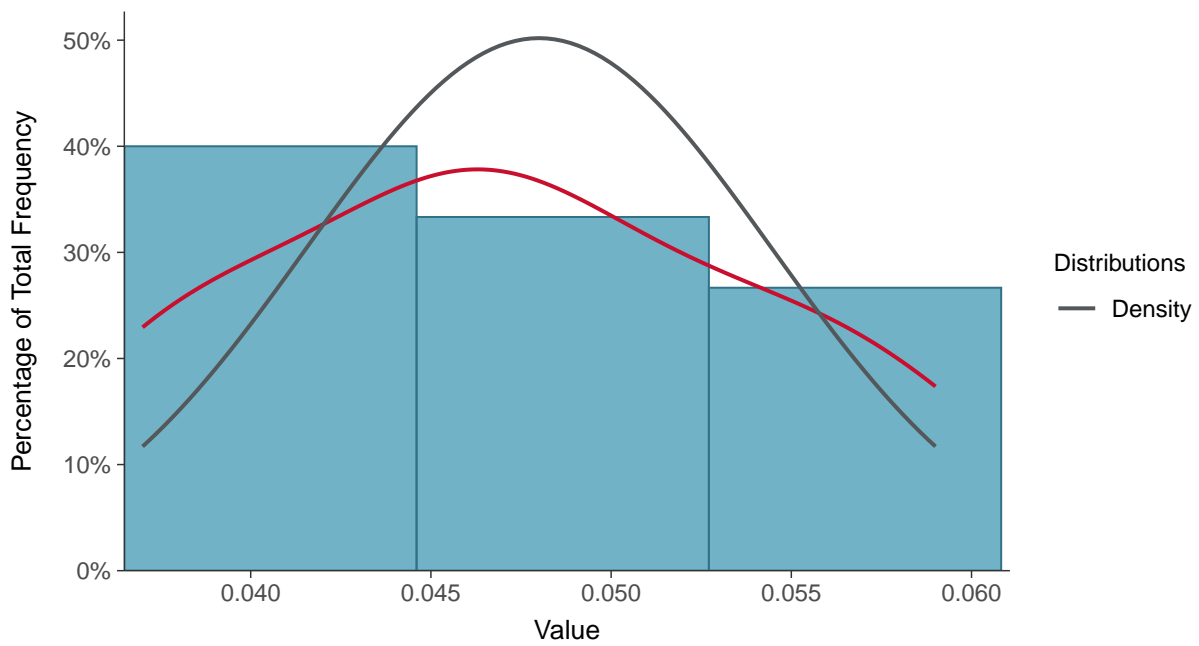
#### Scatter Plot

Lithium, MW-6 (mg/L)



#### Histogram

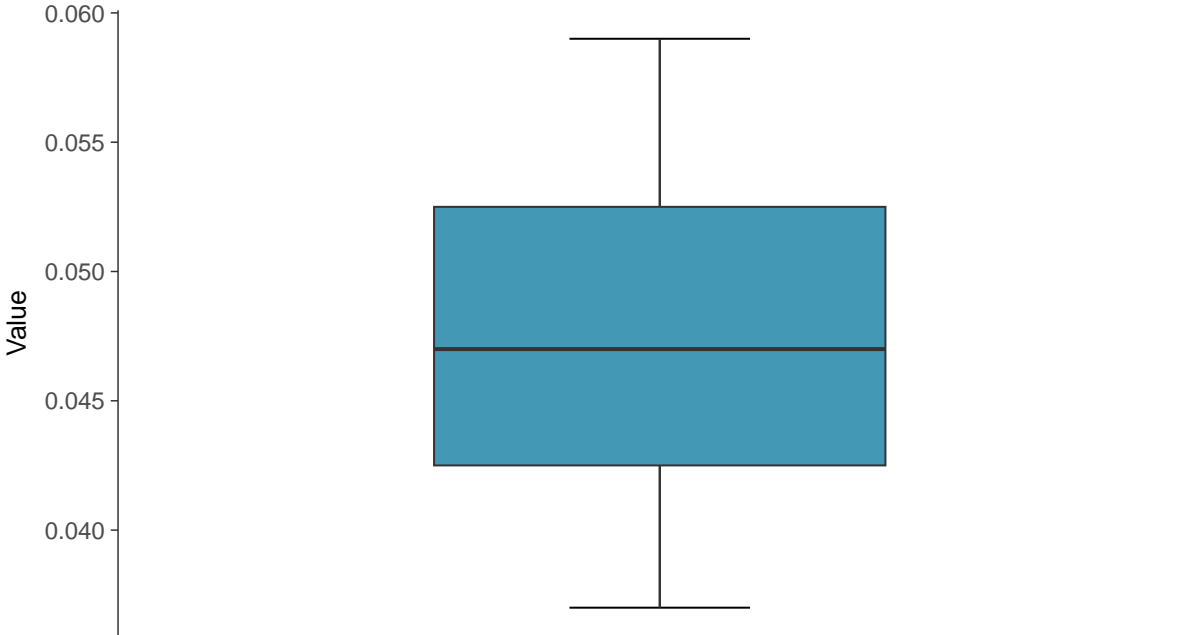
Lithium, MW-6 (mg/L)





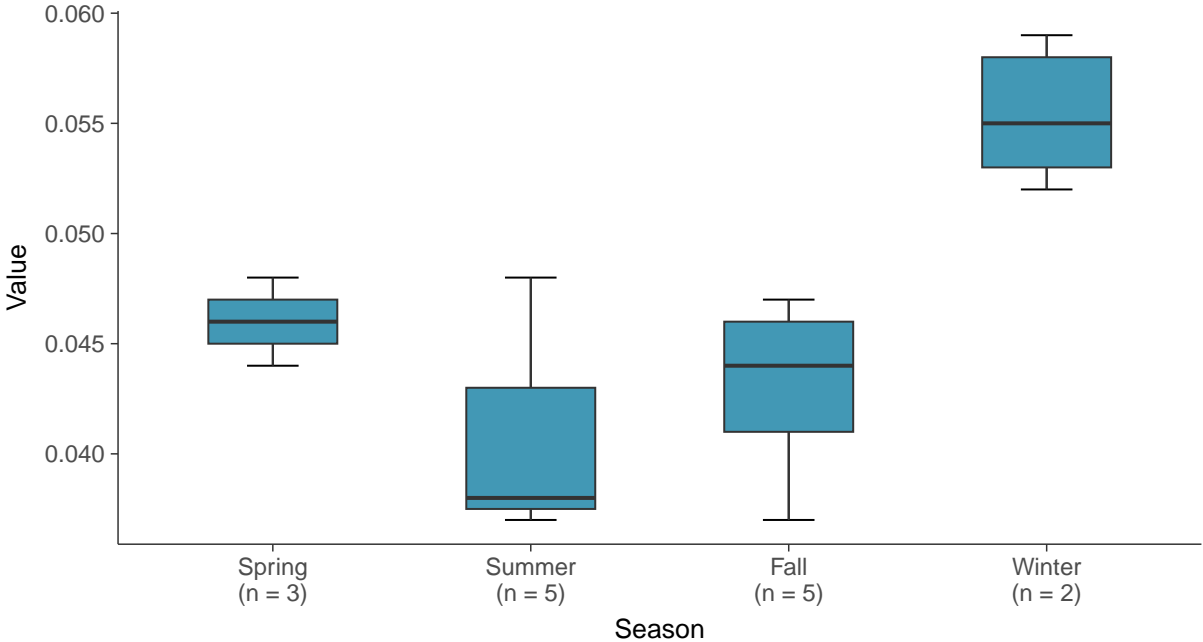
**Boxplot**

Lithium, MW-6 (mg/L)



**Boxplot by Season**

Lithium, MW-6 (mg/L)

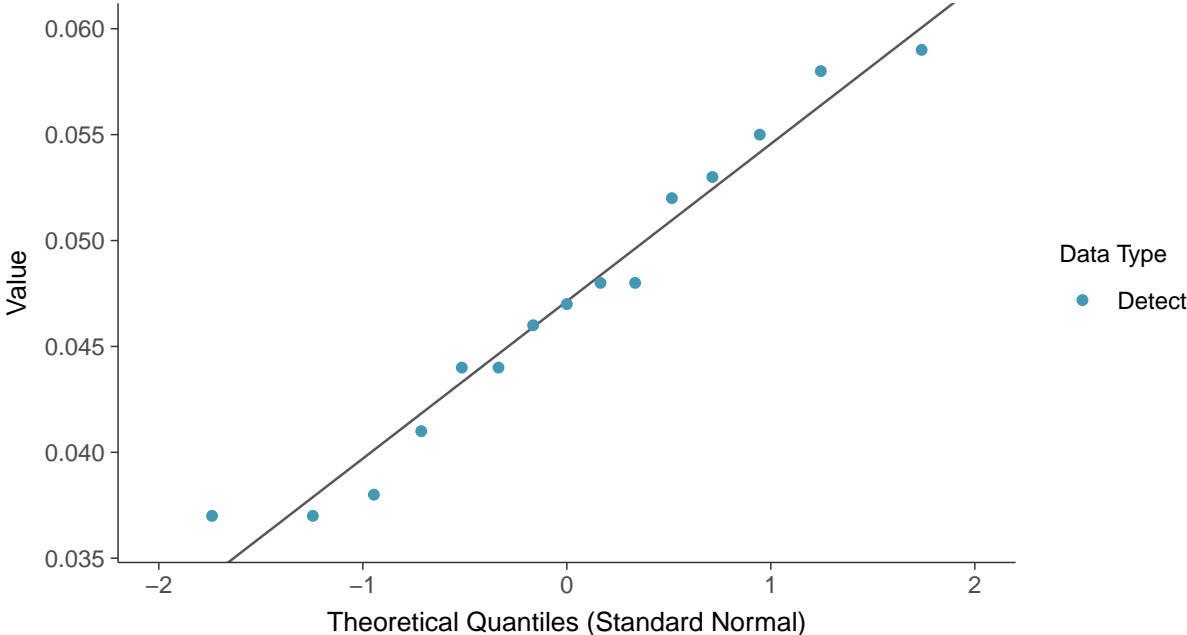






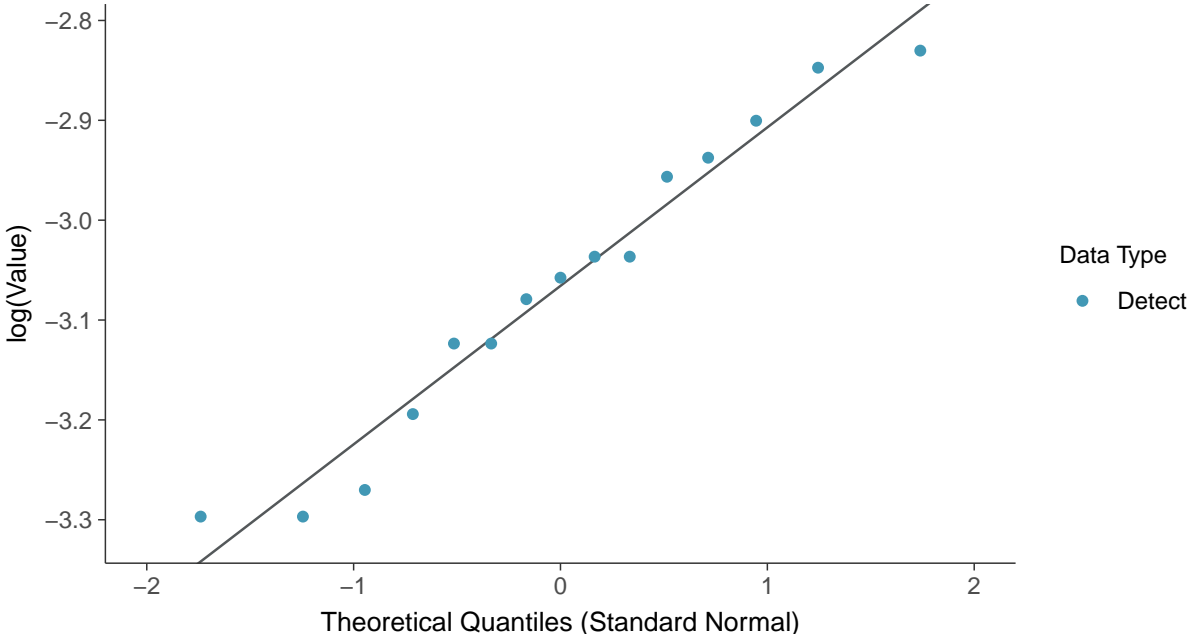
**Normal Q-Q plot**

Lithium, MW-6 (mg/L)



**Lognormal Q-Q plot**

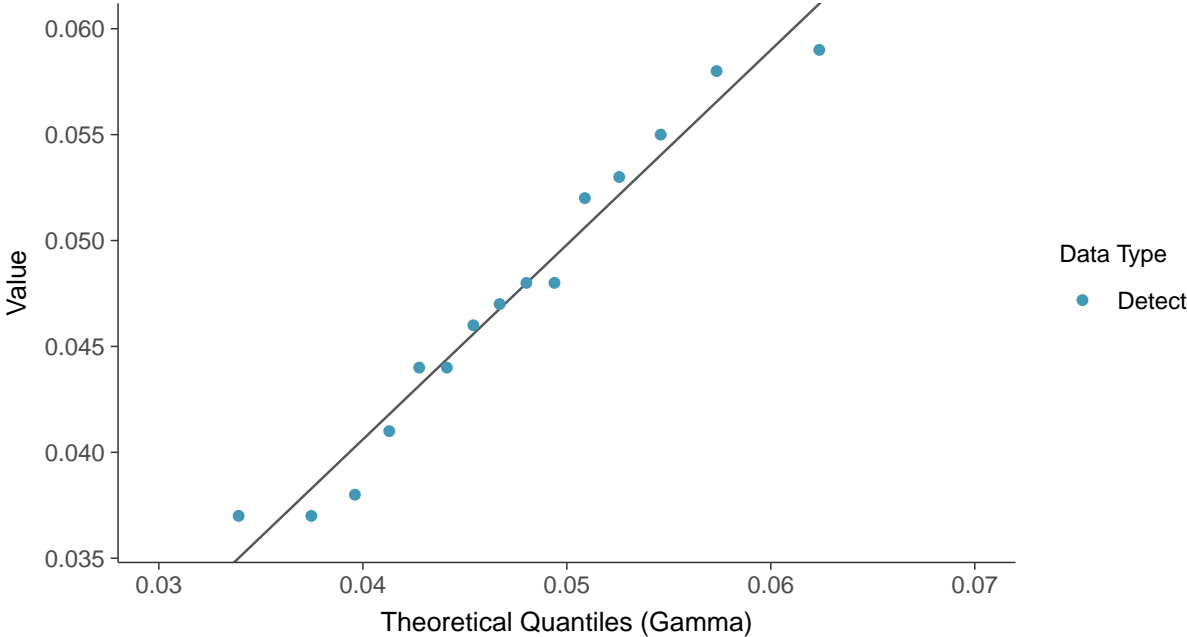
Lithium, MW-6 (mg/L)





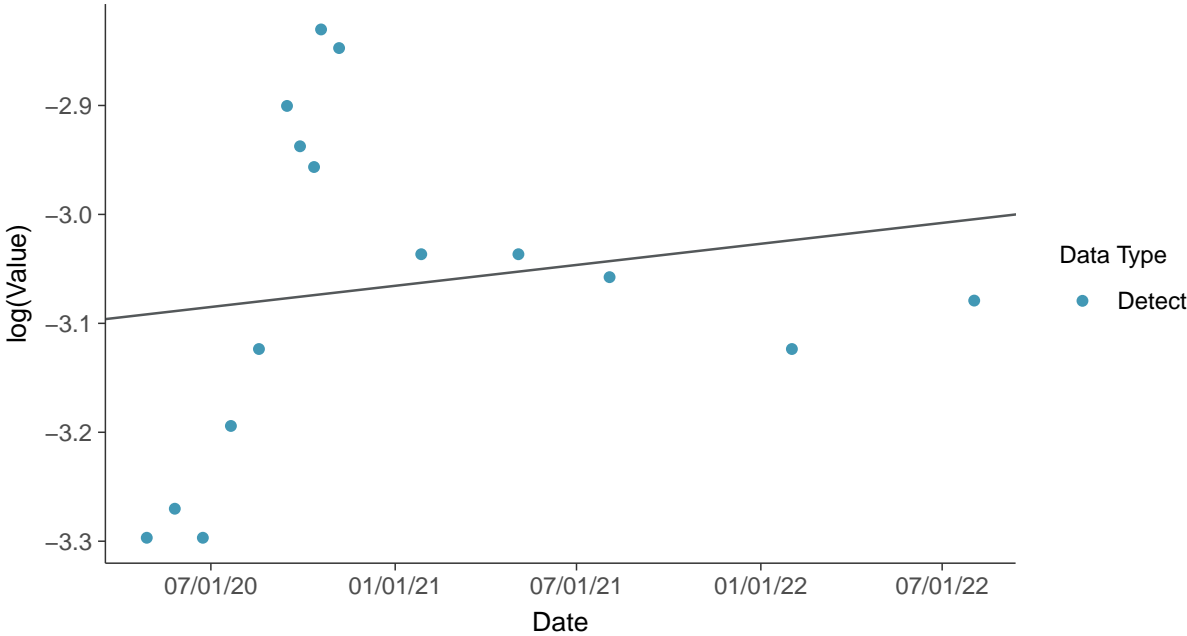
### Gamma Q-Q plot

Lithium, MW-6 (mg/L)



### Trend Regression: Lognormal MLE

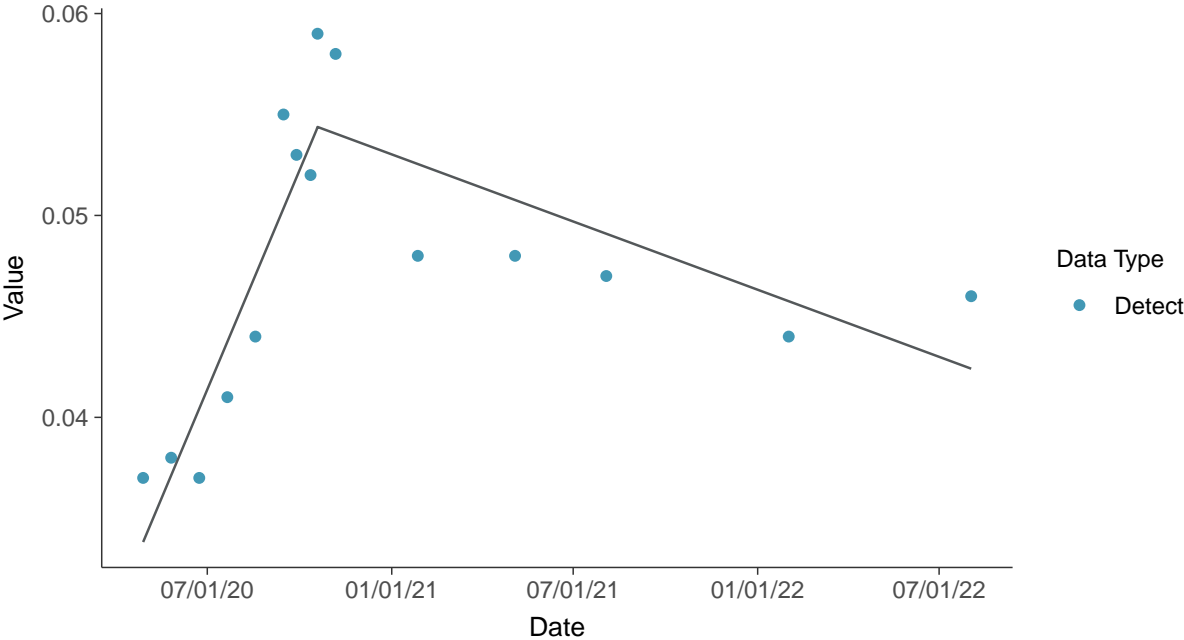
Lithium, MW-6 (mg/L)





### Trend Regression: Piecewise Linear-Linear

Lithium, MW-6 (mg/L)



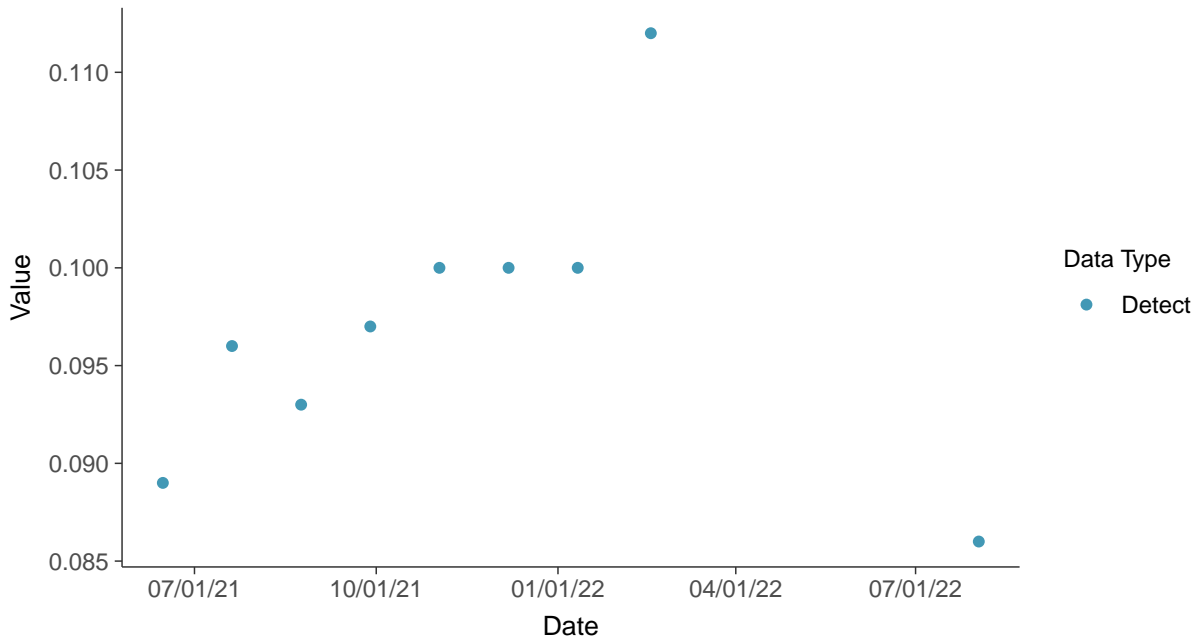


### Appendix IV: Lithium, MW-7

ID: 2\_18\_07

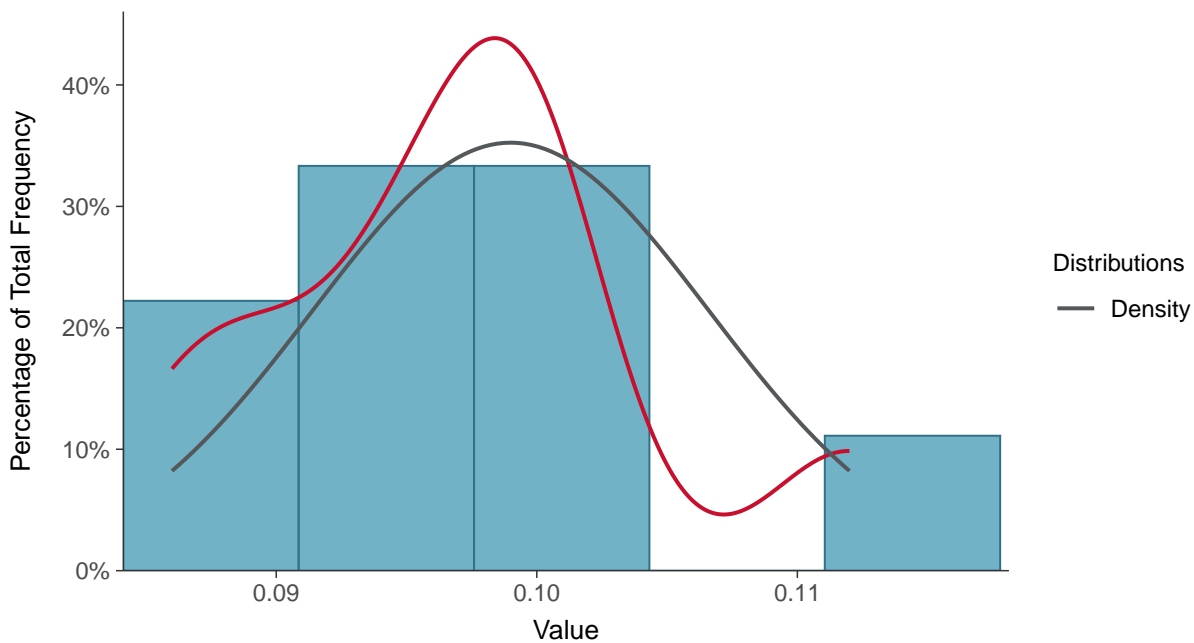
#### Scatter Plot

Lithium, MW-7 (mg/L)



#### Histogram

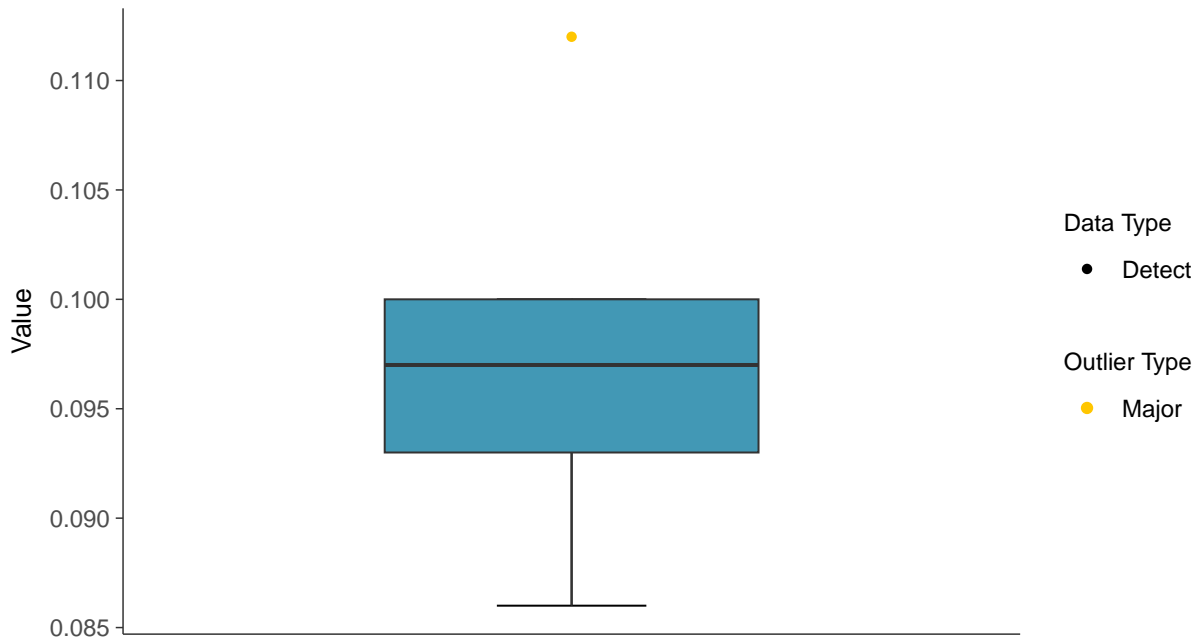
Lithium, MW-7 (mg/L)





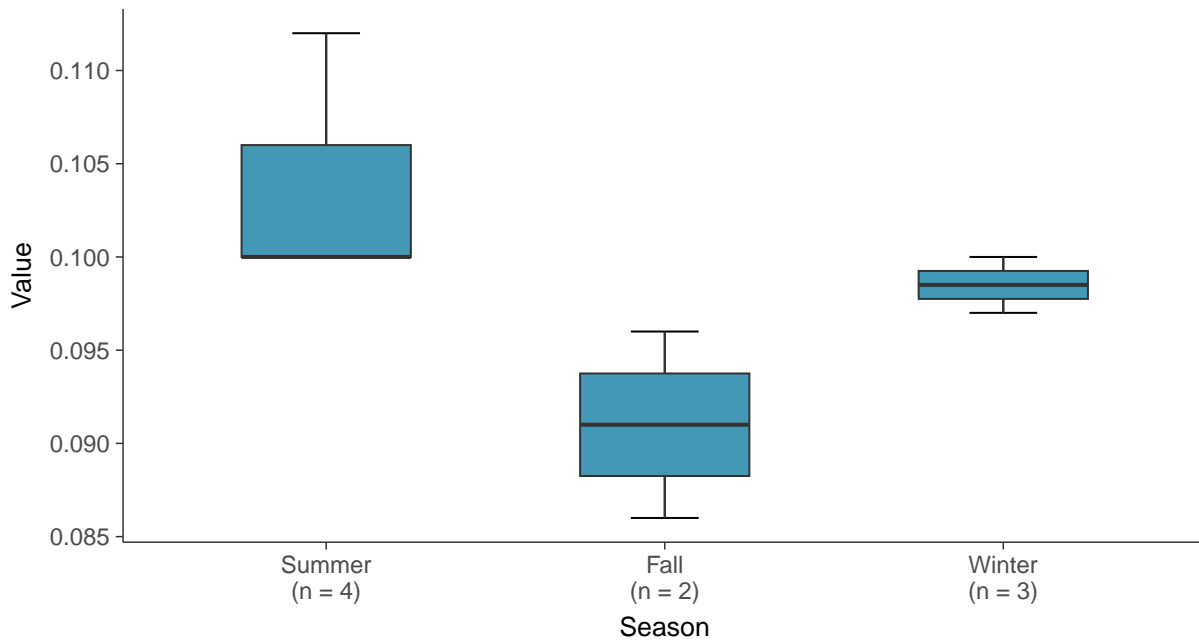
### Boxplot

Lithium, MW-7 (mg/L)



### Boxplot by Season

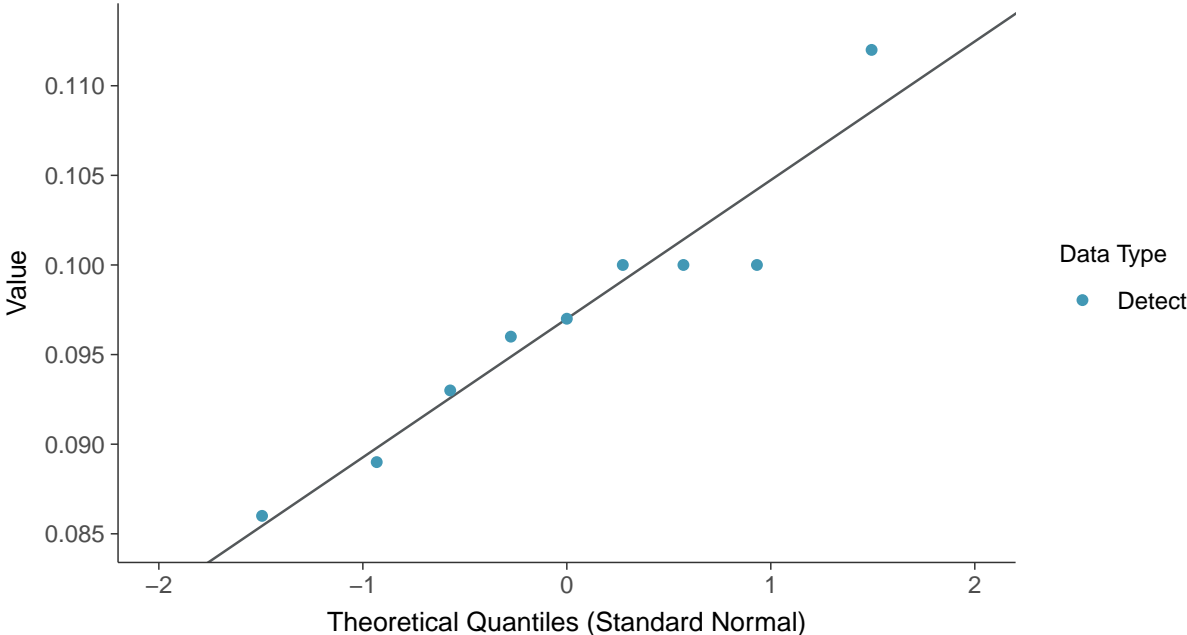
Lithium, MW-7 (mg/L)





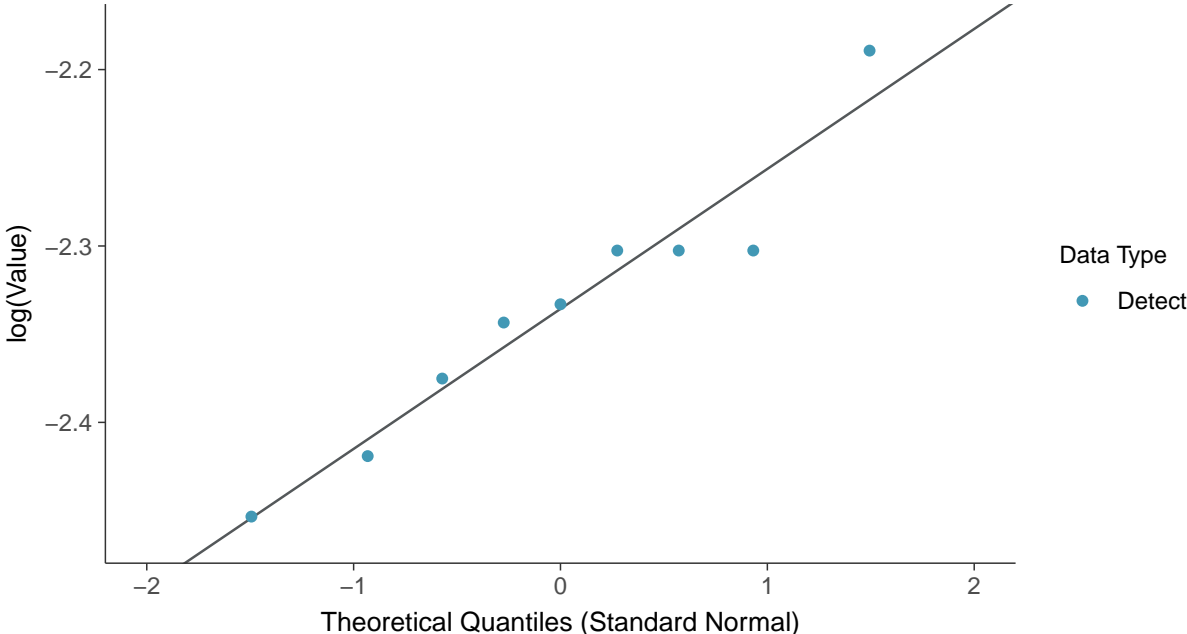
**Normal Q-Q plot**

Lithium, MW-7 (mg/L)



**Lognormal Q-Q plot**

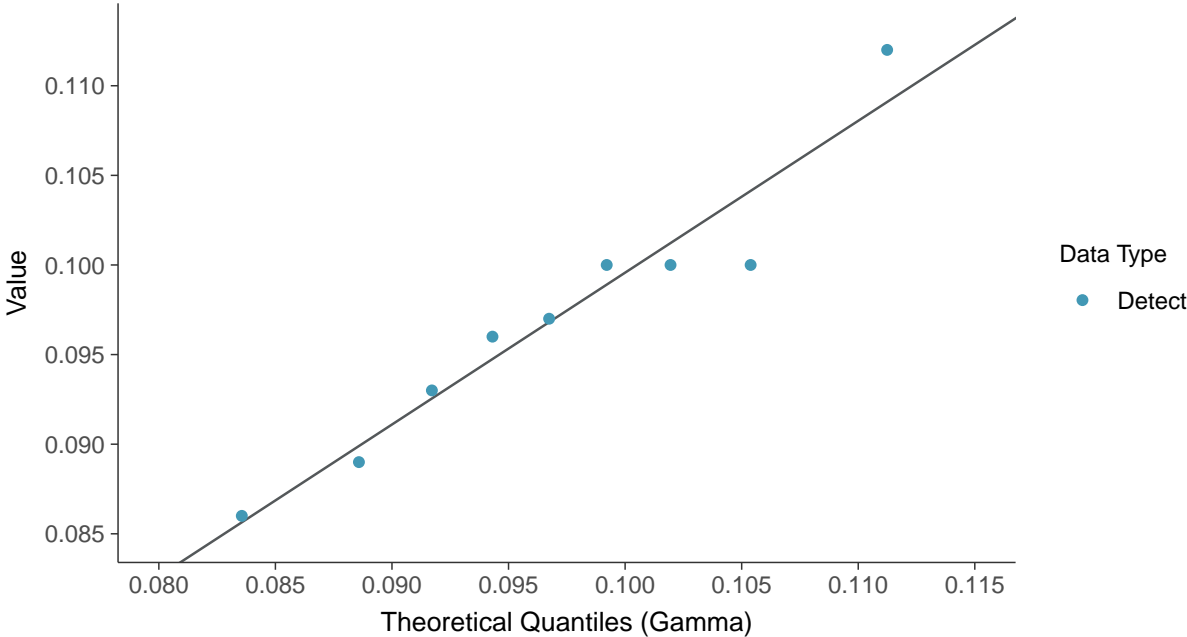
Lithium, MW-7 (mg/L)





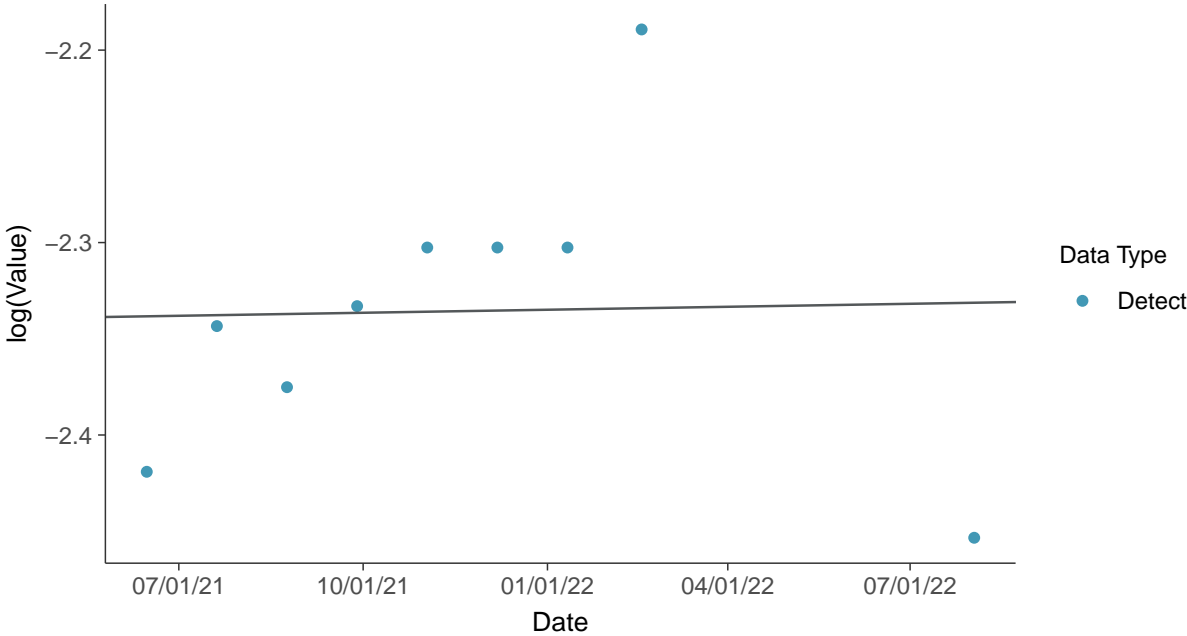
### Gamma Q-Q plot

Lithium, MW-7 (mg/L)



### Trend Regression: Lognormal MLE

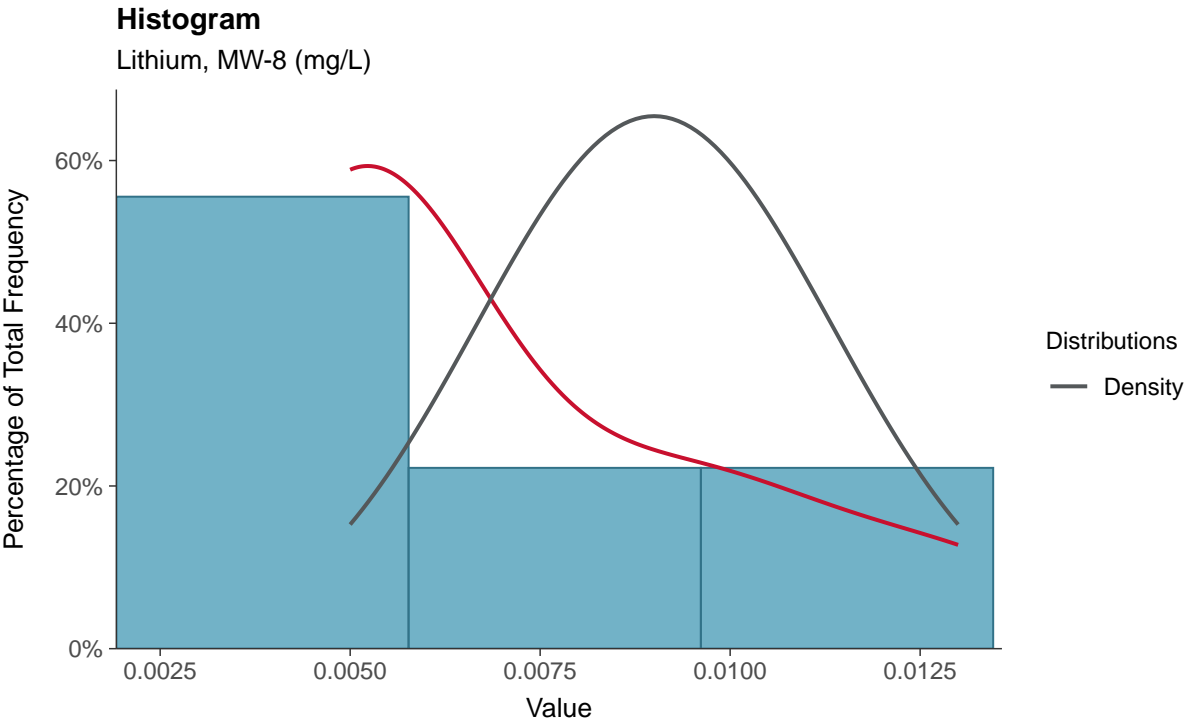
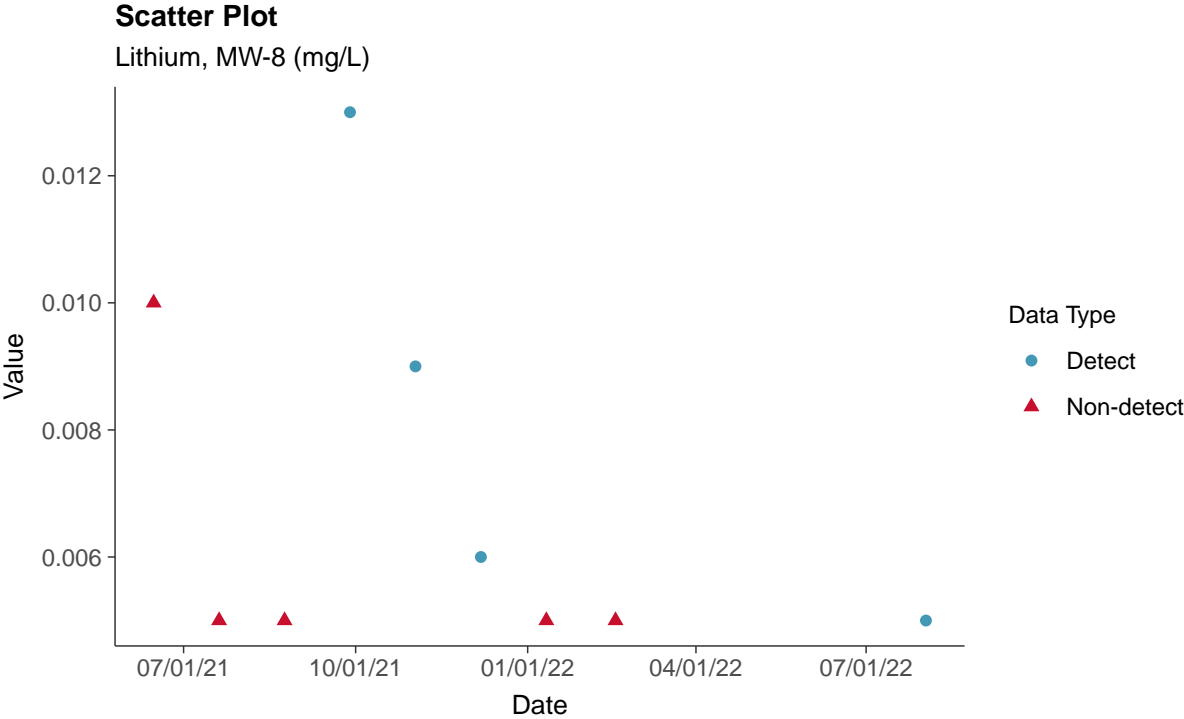
Lithium, MW-7 (mg/L)





### Appendix IV: Lithium, MW-8

ID: 2\_18\_08

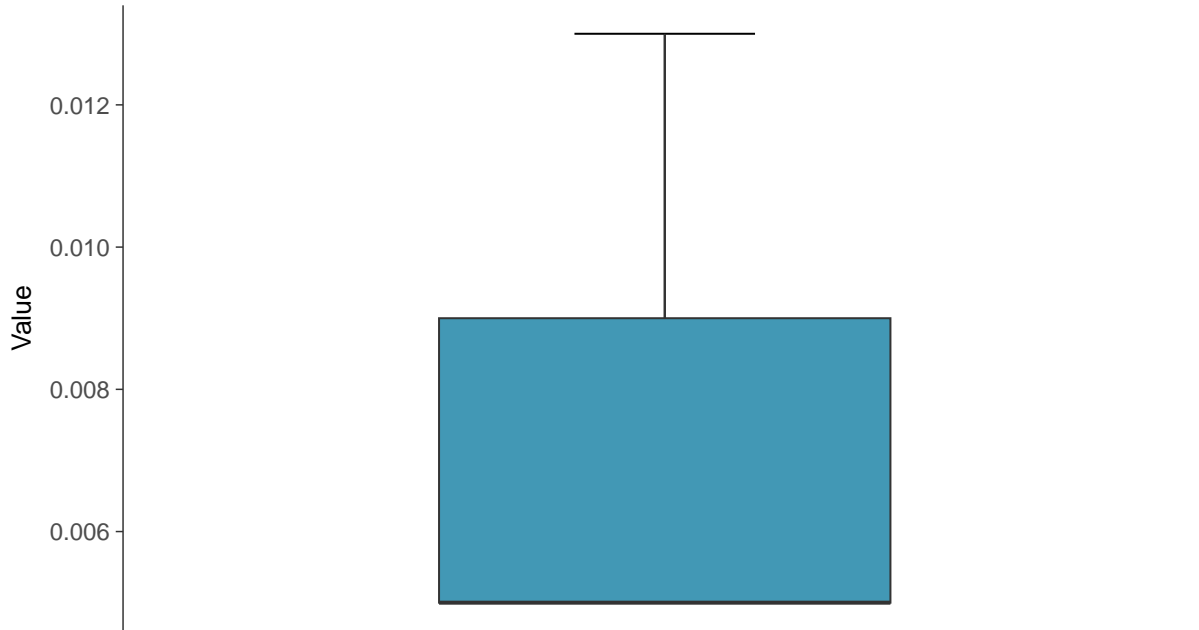






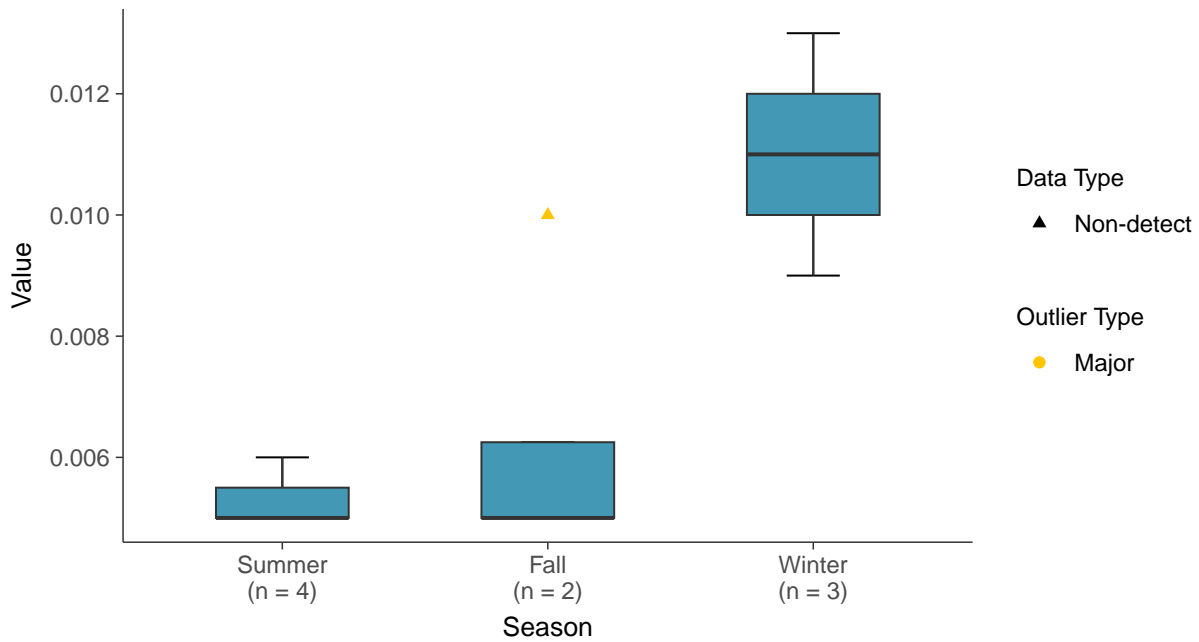
### Boxplot

Lithium, MW-8 (mg/L)



### Boxplot by Season

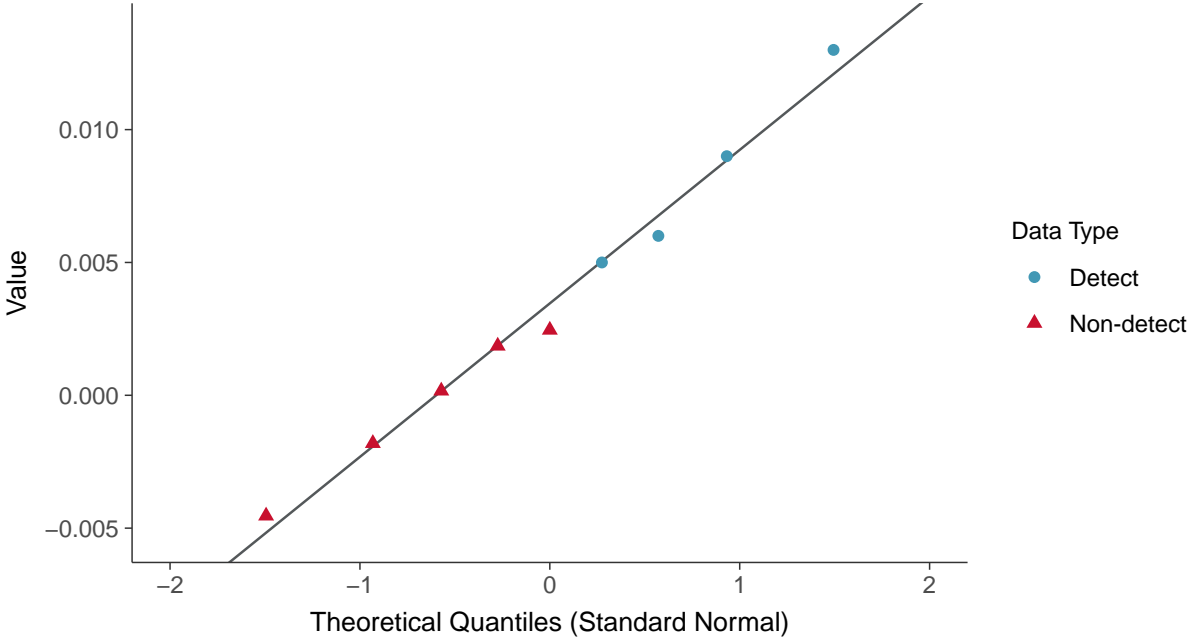
Lithium, MW-8 (mg/L)





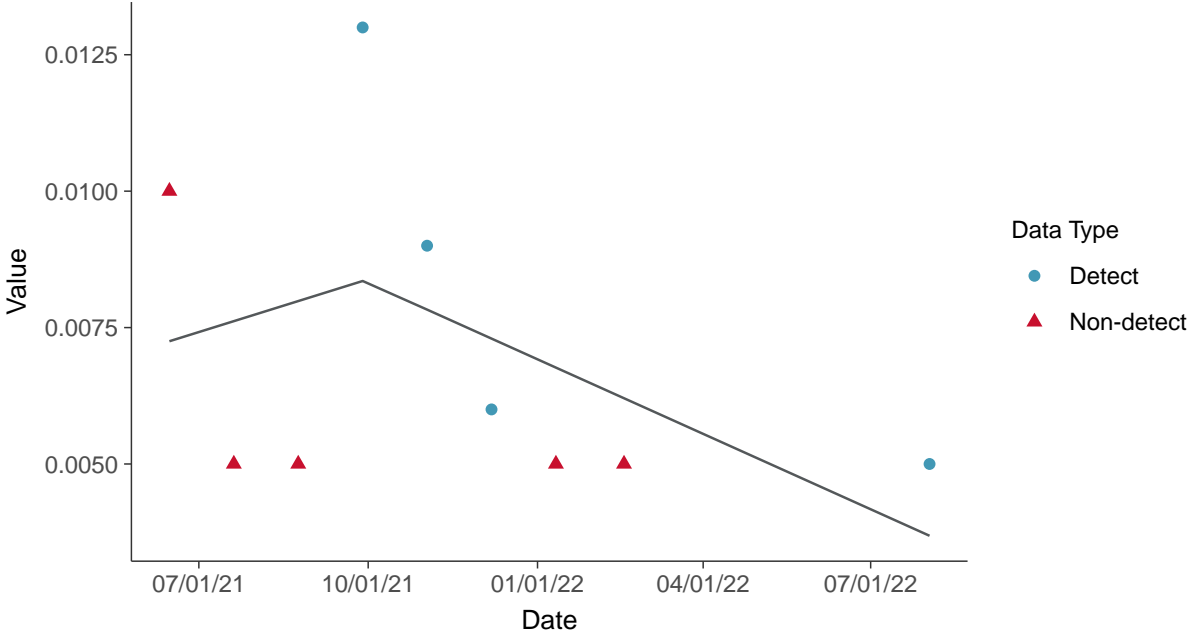
### Normal Q-Q plot using ROS Imputed Estimates

Lithium, MW-8 (mg/L)



### Trend Regression: Piecewise Linear-Linear

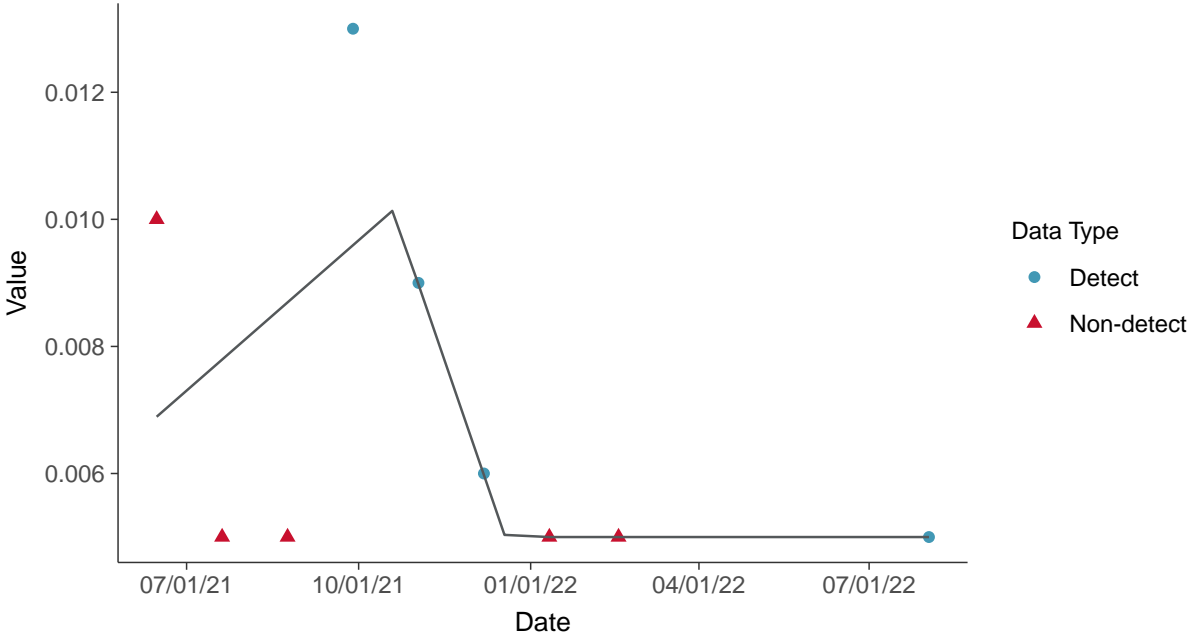
Lithium, MW-8 (mg/L)





### Trend Regression: Piecewise Linear-Linear-Linear

Lithium, MW-8 (mg/L)



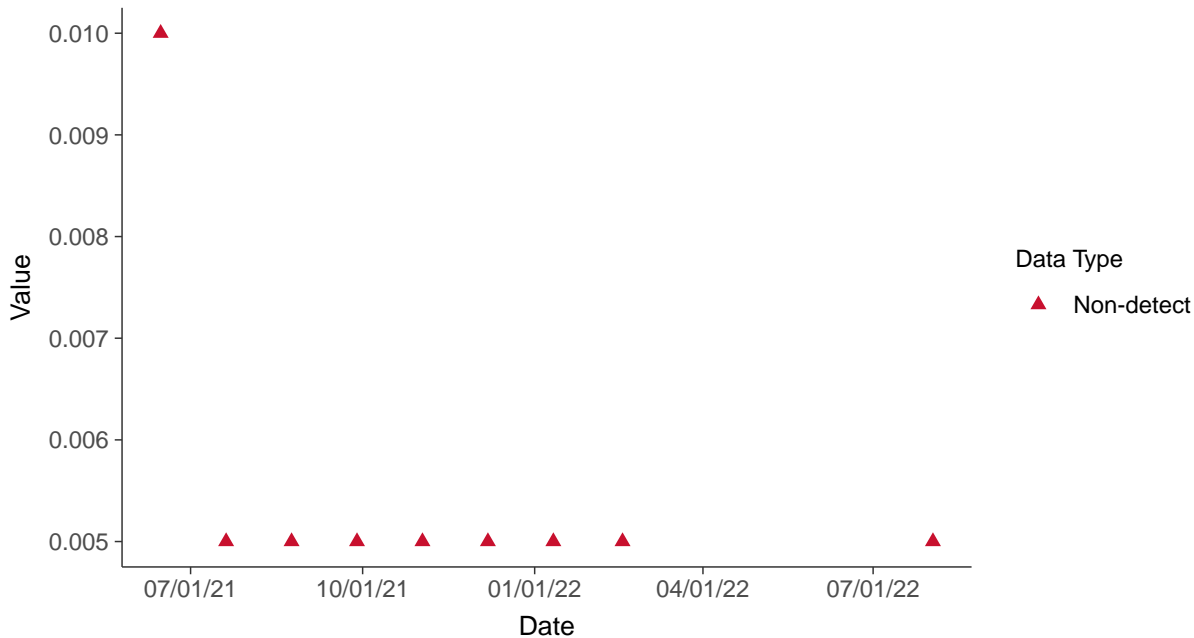


### Appendix IV: Lithium, MW-9

ID: 2\_18\_09

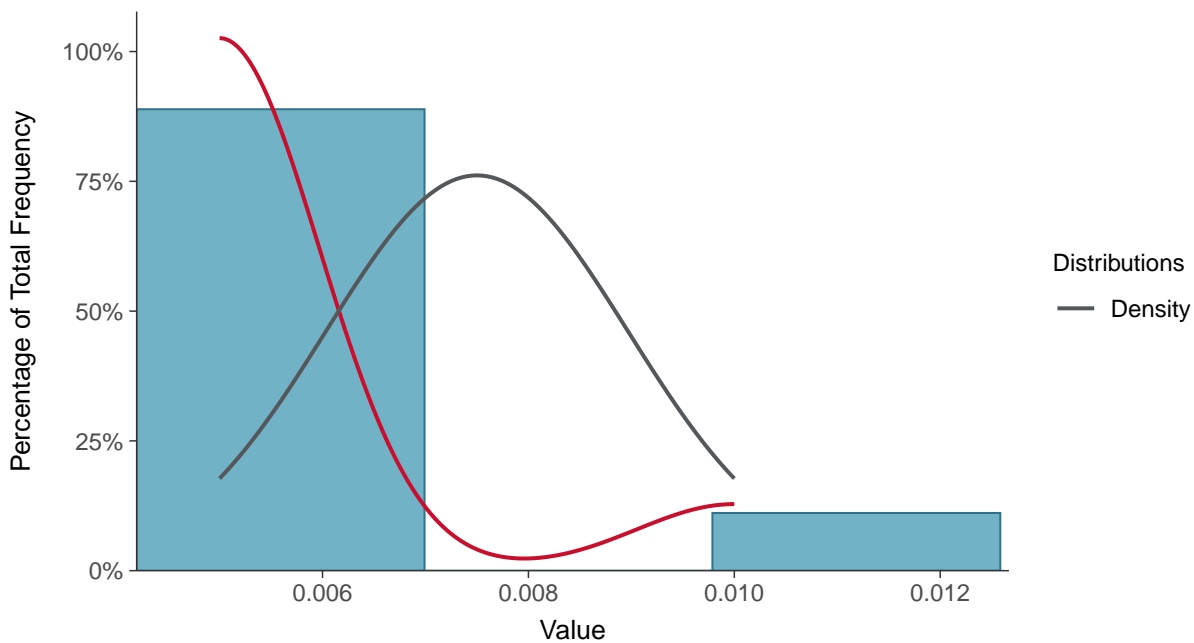
#### Scatter Plot

Lithium, MW-9 (mg/L)



#### Histogram

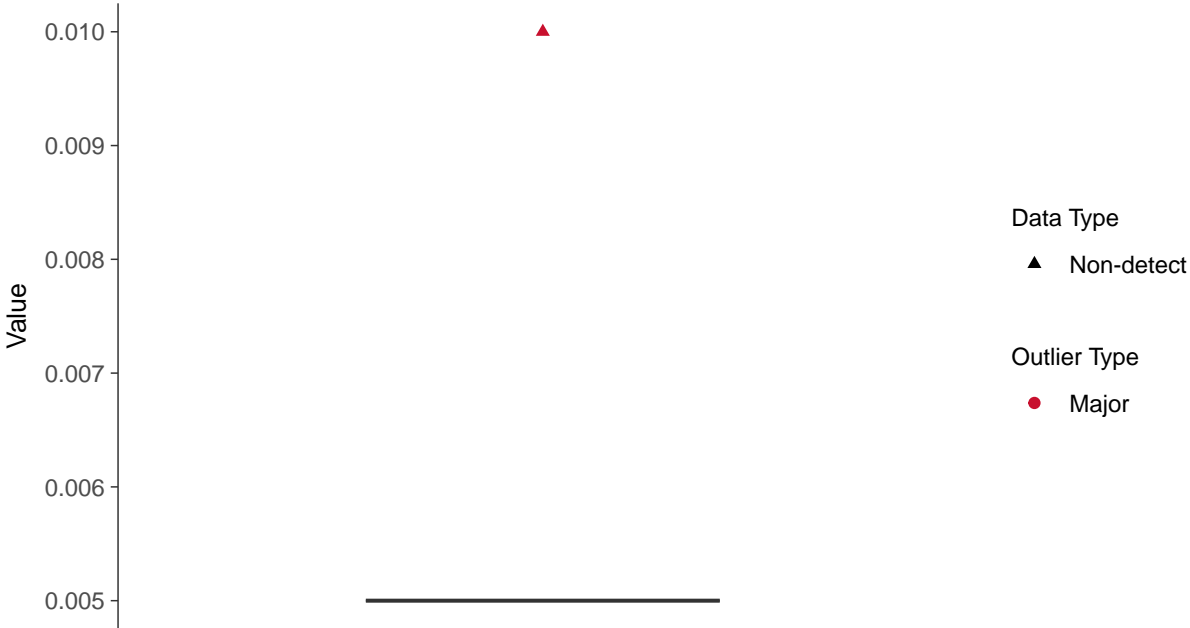
Lithium, MW-9 (mg/L)





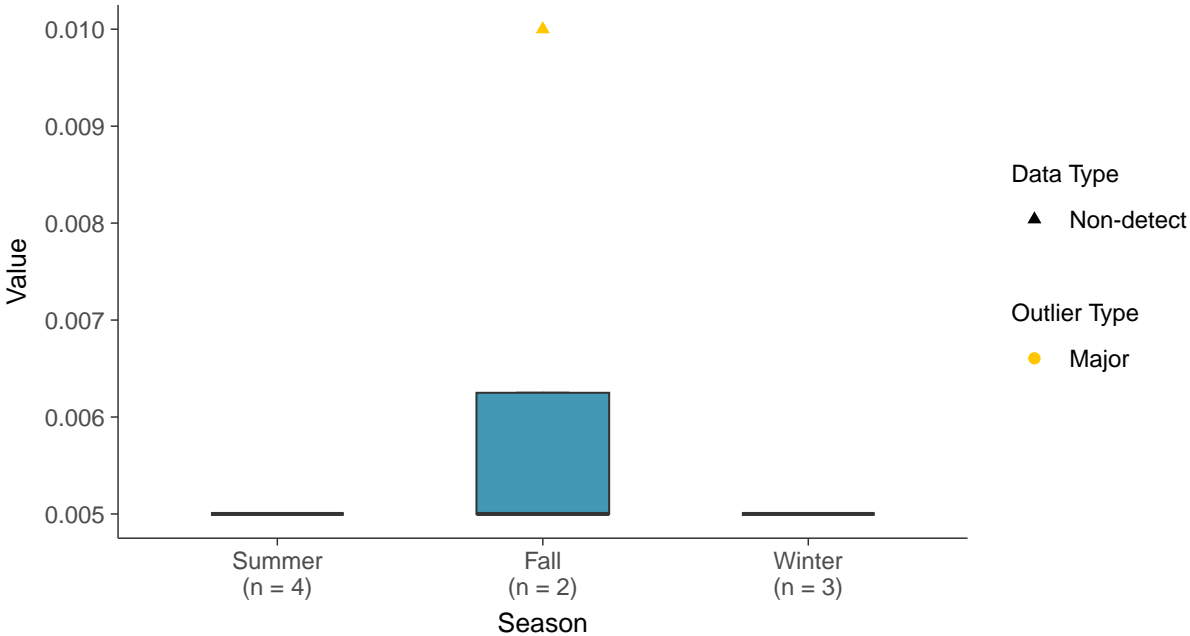
### Boxplot

Lithium, MW-9 (mg/L)



### Boxplot by Season

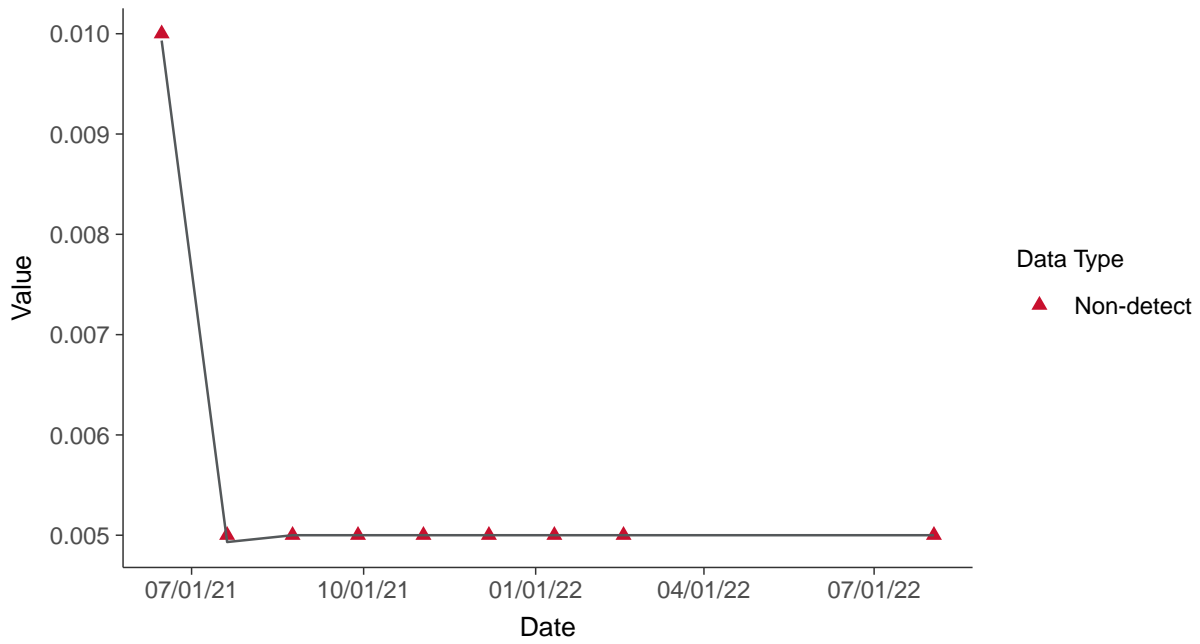
Lithium, MW-9 (mg/L)





### Trend Regression: Piecewise Linear-Linear

Lithium, MW-9 (mg/L)



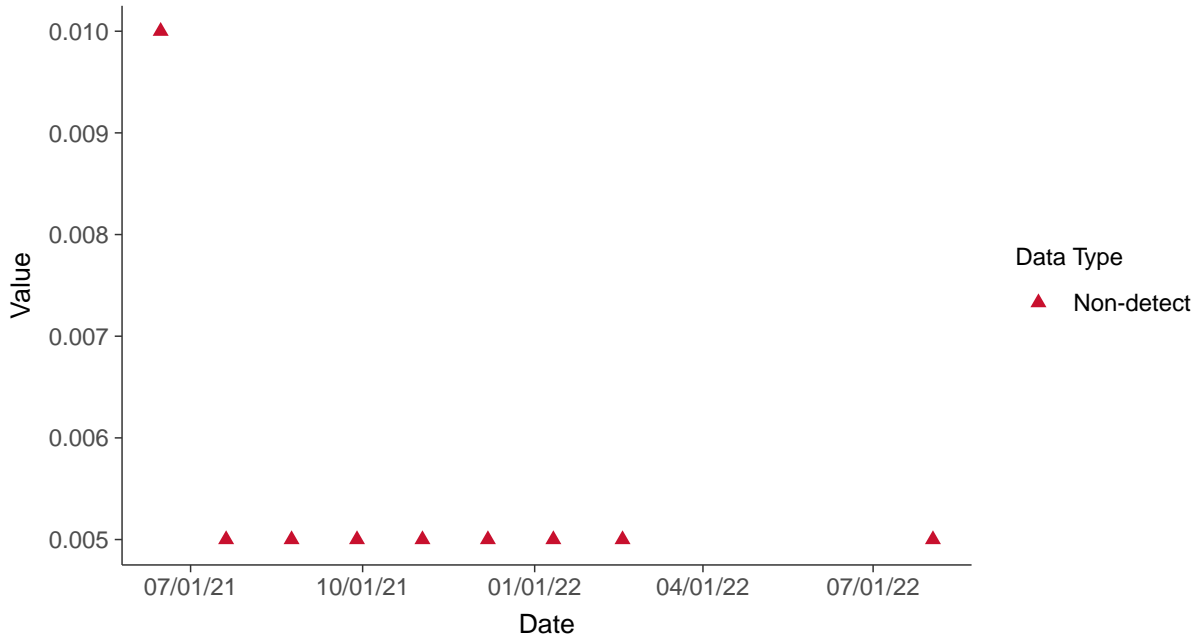


### Appendix IV: Lithium, MW-10

ID: 2\_18\_10

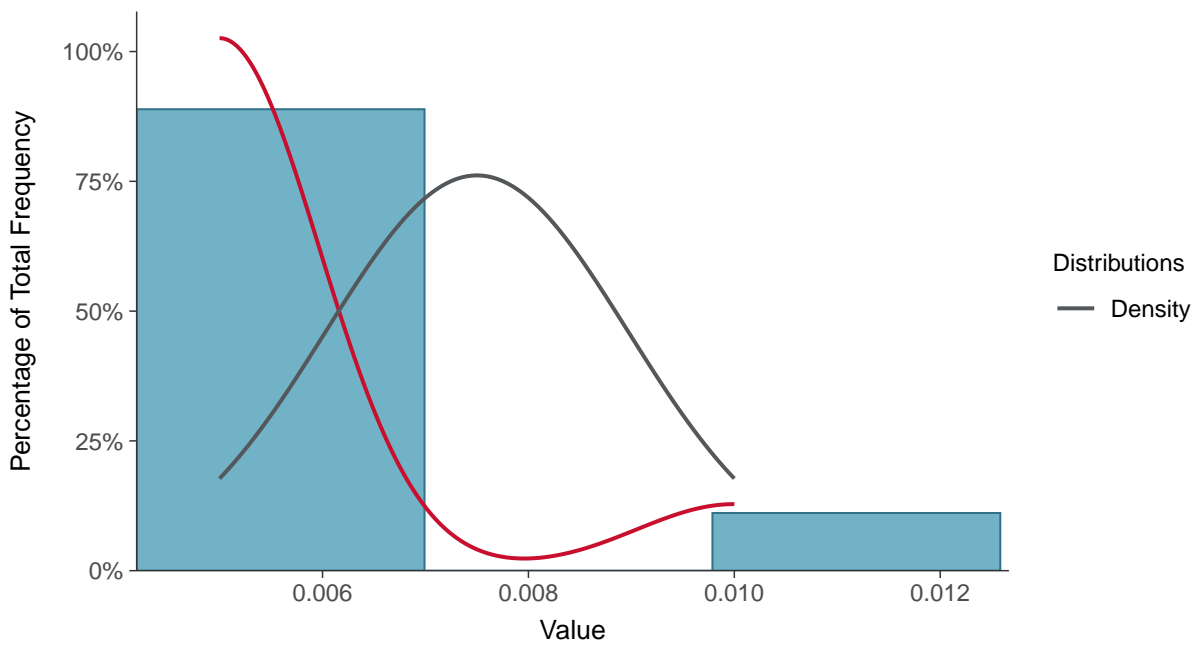
#### Scatter Plot

Lithium, MW-10 (mg/L)



#### Histogram

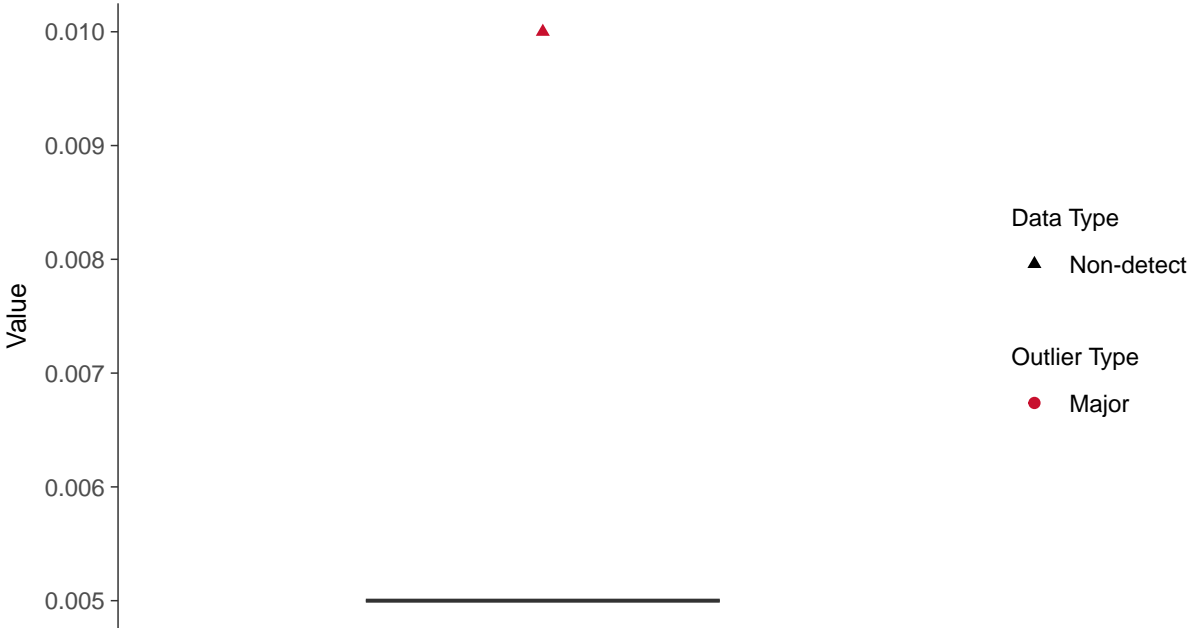
Lithium, MW-10 (mg/L)





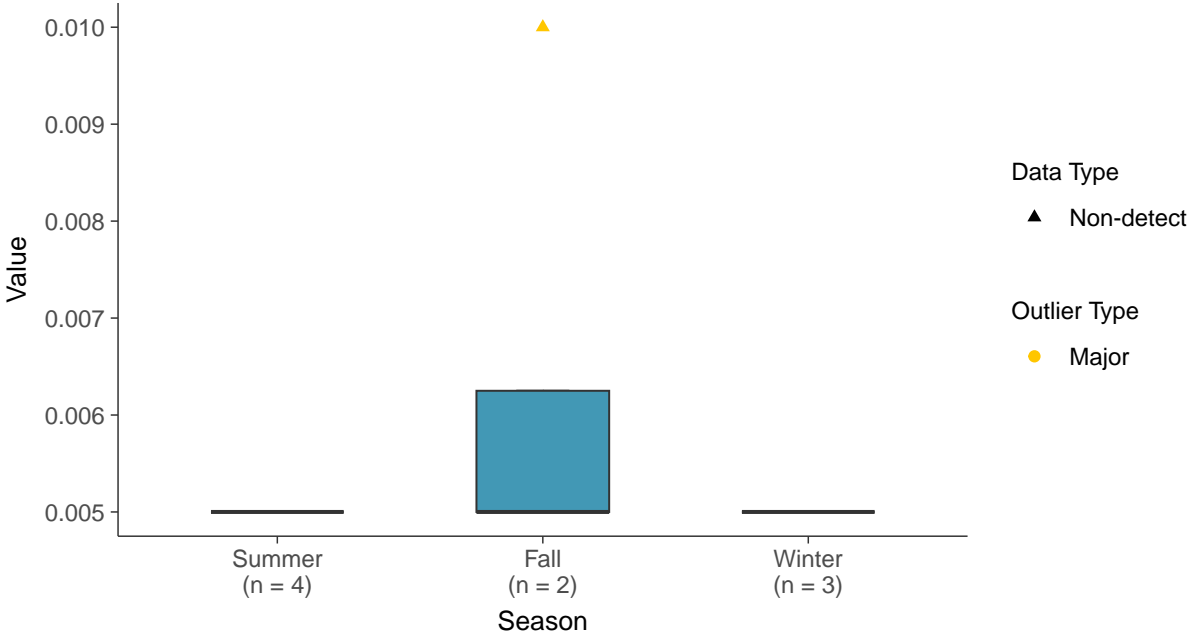
**Boxplot**

Lithium, MW-10 (mg/L)



**Boxplot by Season**

Lithium, MW-10 (mg/L)

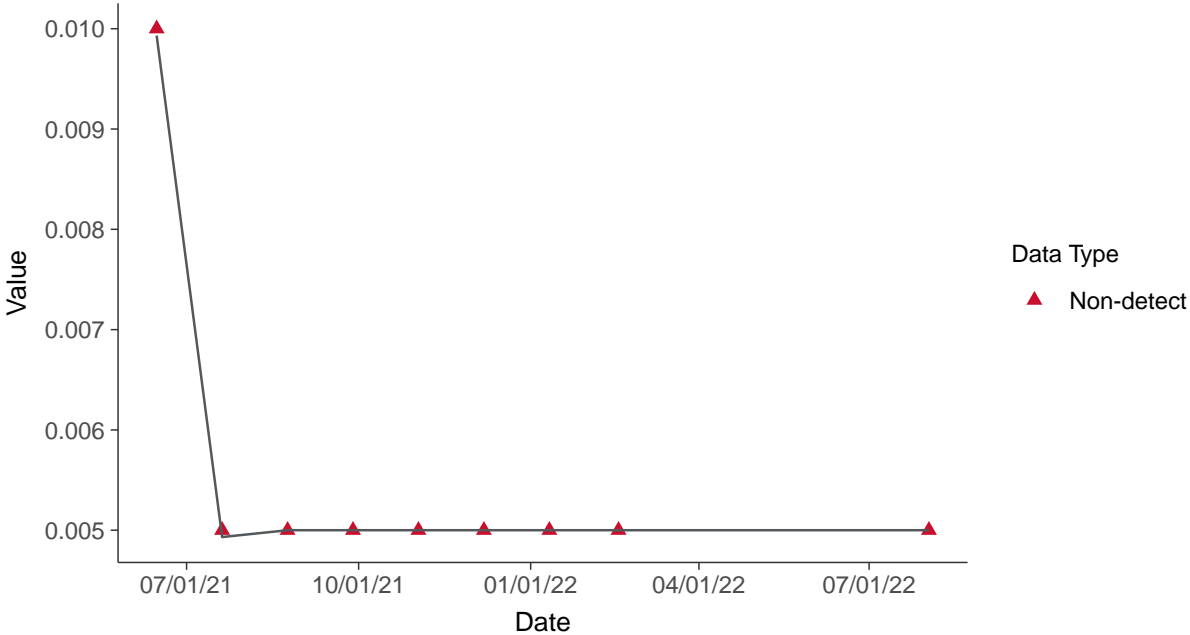






### Trend Regression: Piecewise Linear-Linear

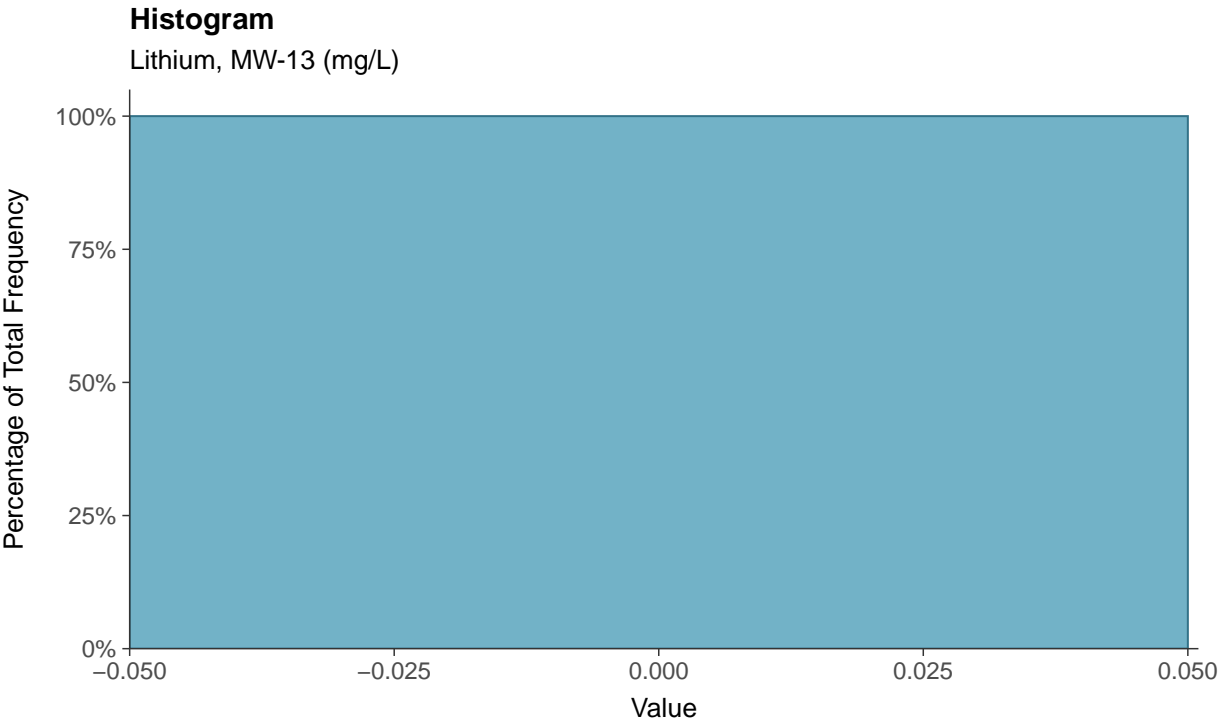
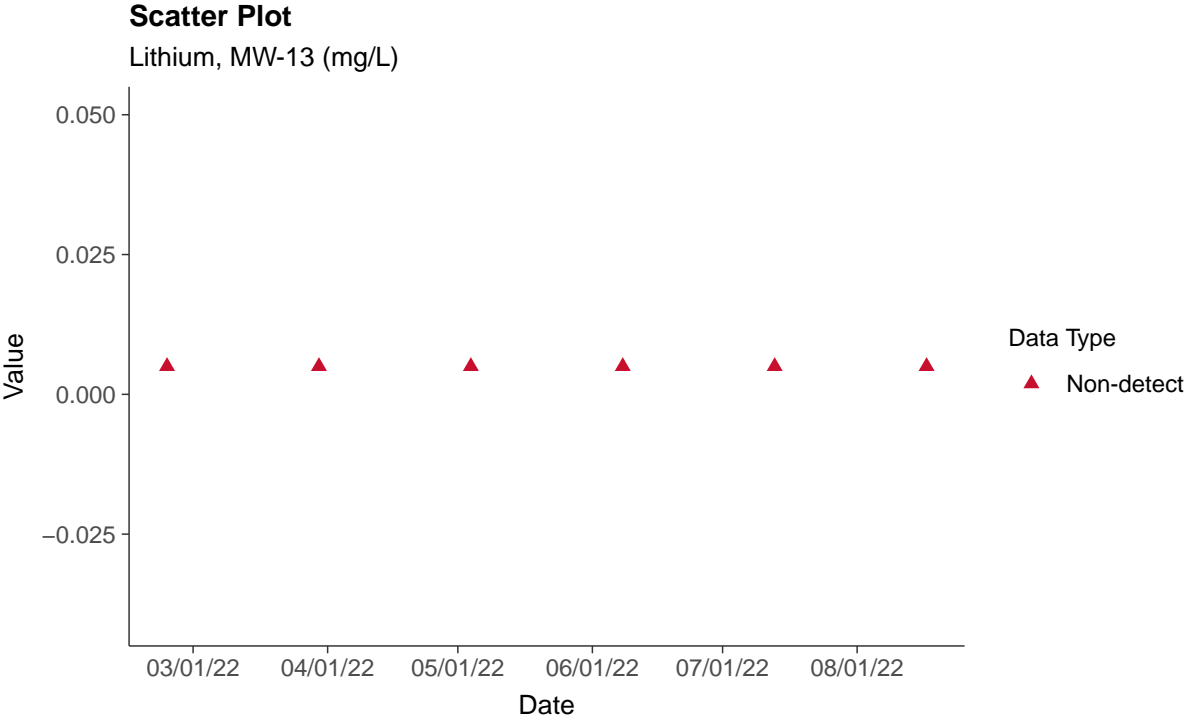
Lithium, MW-10 (mg/L)





### Appendix IV: Lithium, MW-13

ID: 2\_18\_13





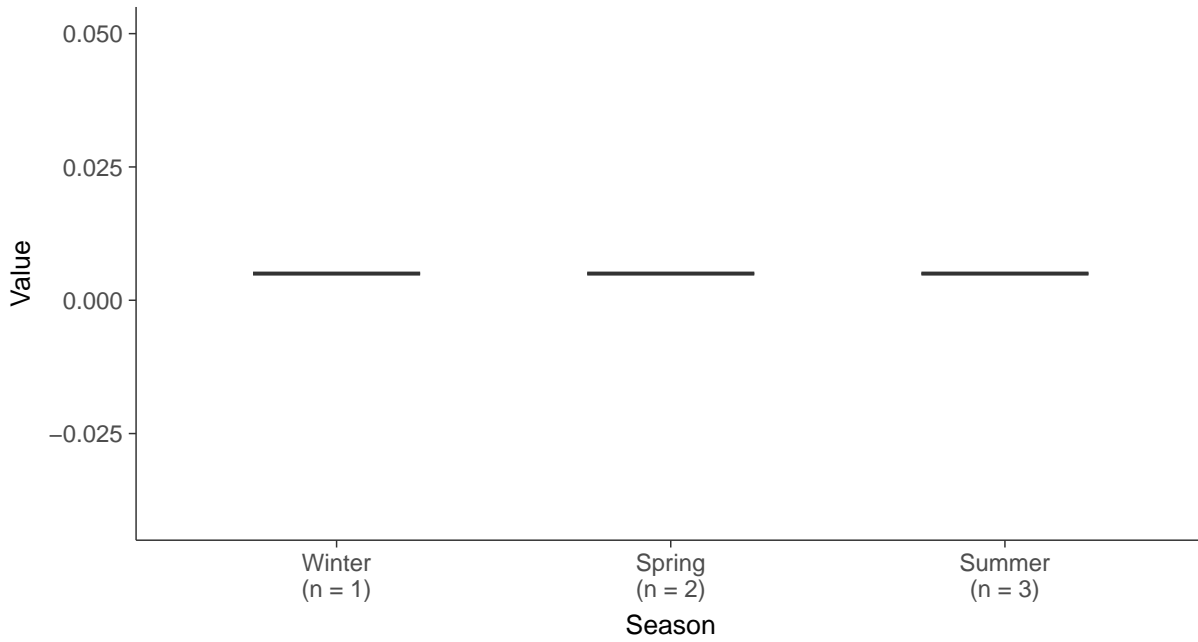
### Boxplot

Lithium, MW-13 (mg/L)



### Boxplot by Season

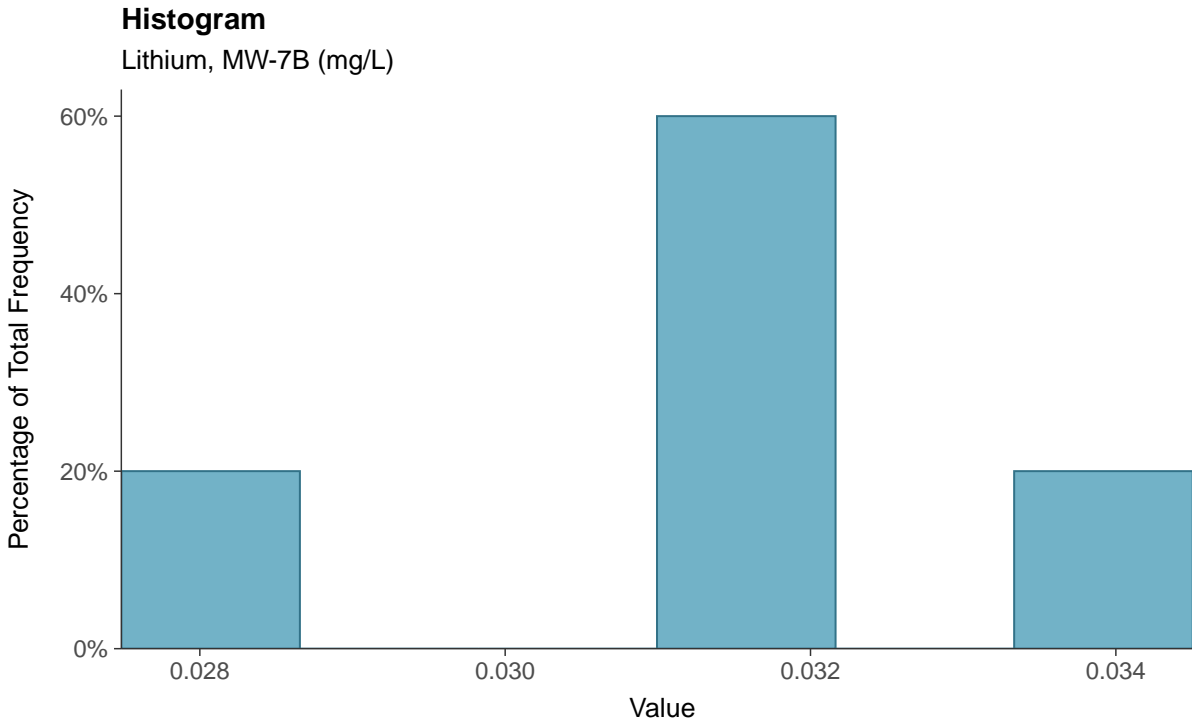
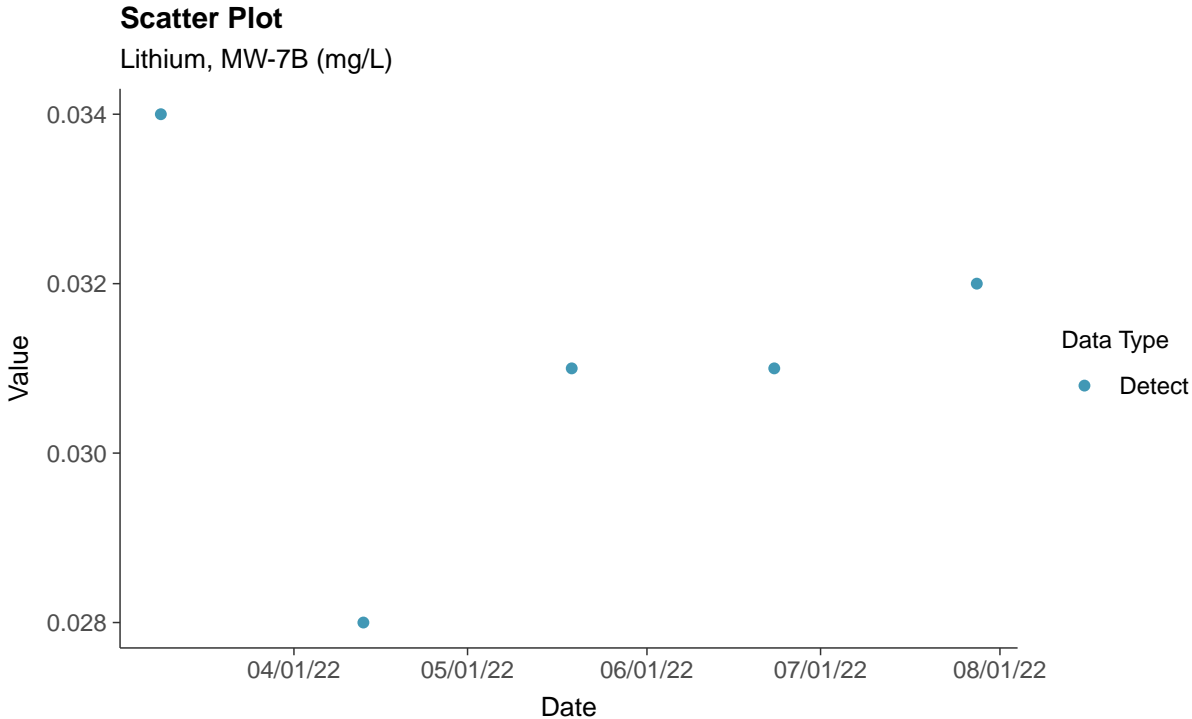
Lithium, MW-13 (mg/L)





### Appendix IV: Lithium, MW-7B

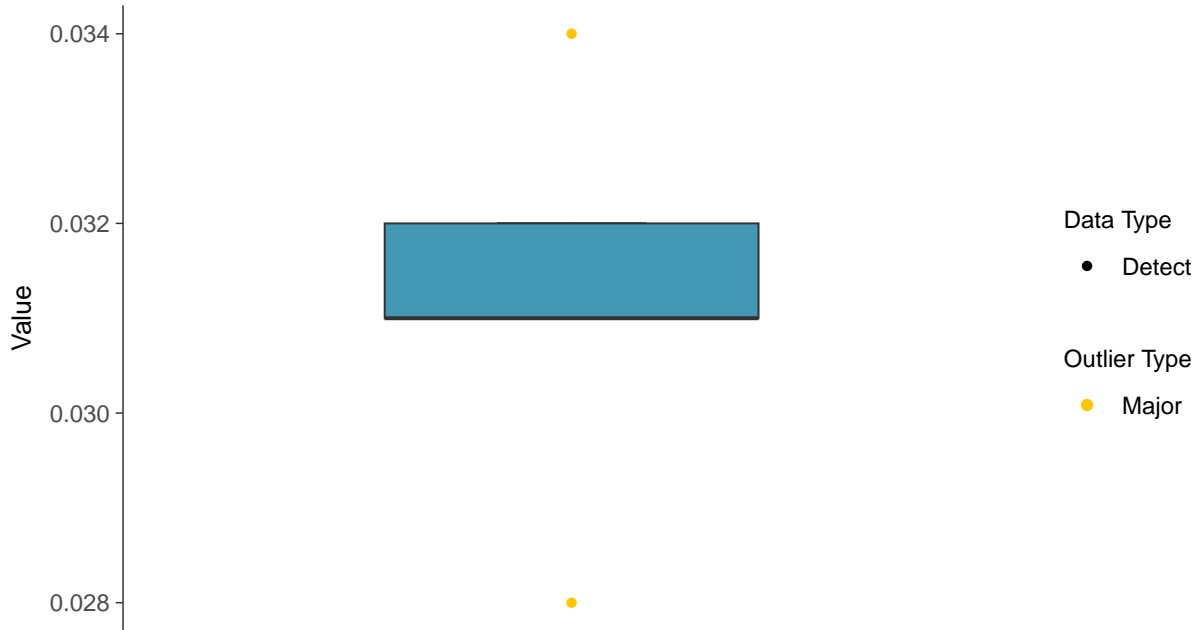
ID: 2\_18\_7B





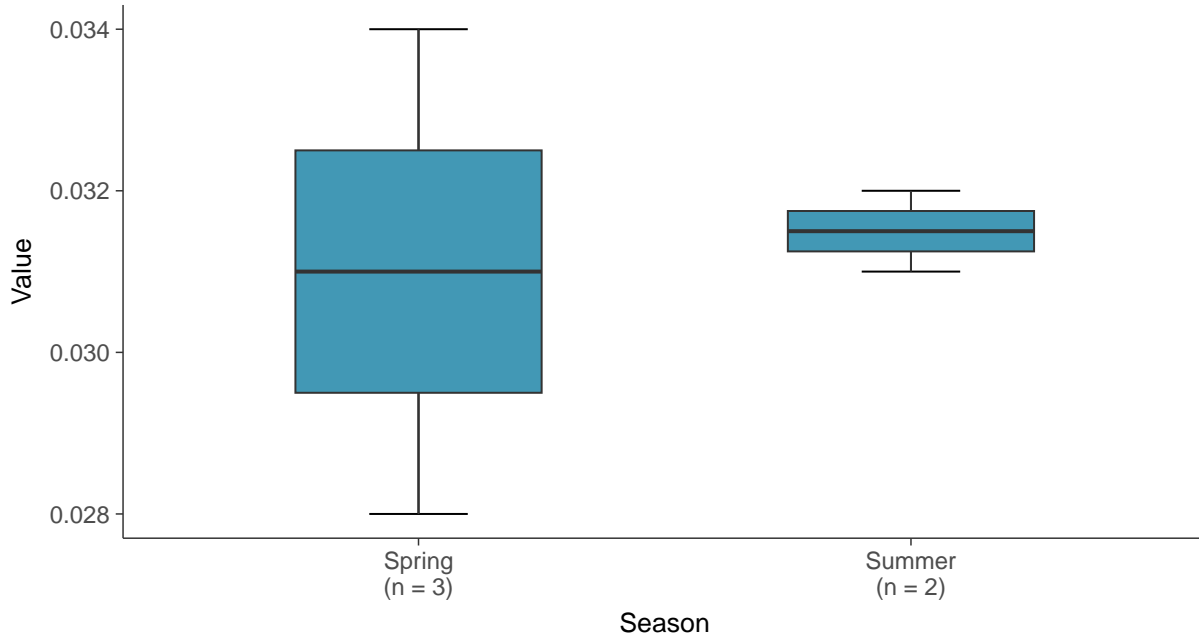
### Boxplot

Lithium, MW-7B (mg/L)



### Boxplot by Season

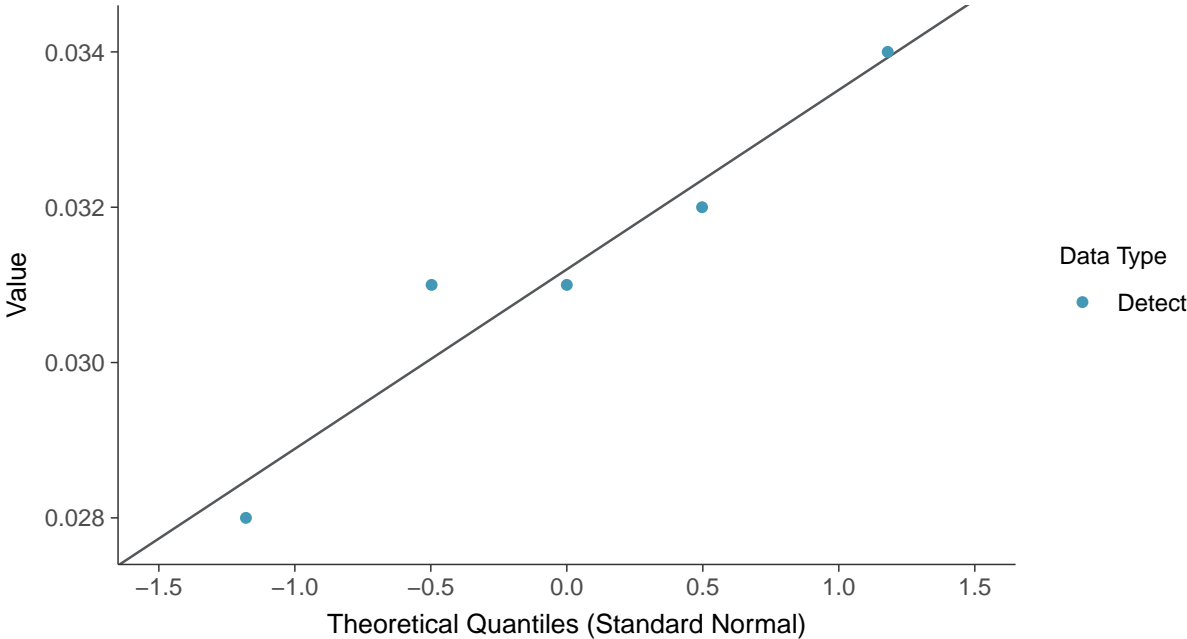
Lithium, MW-7B (mg/L)





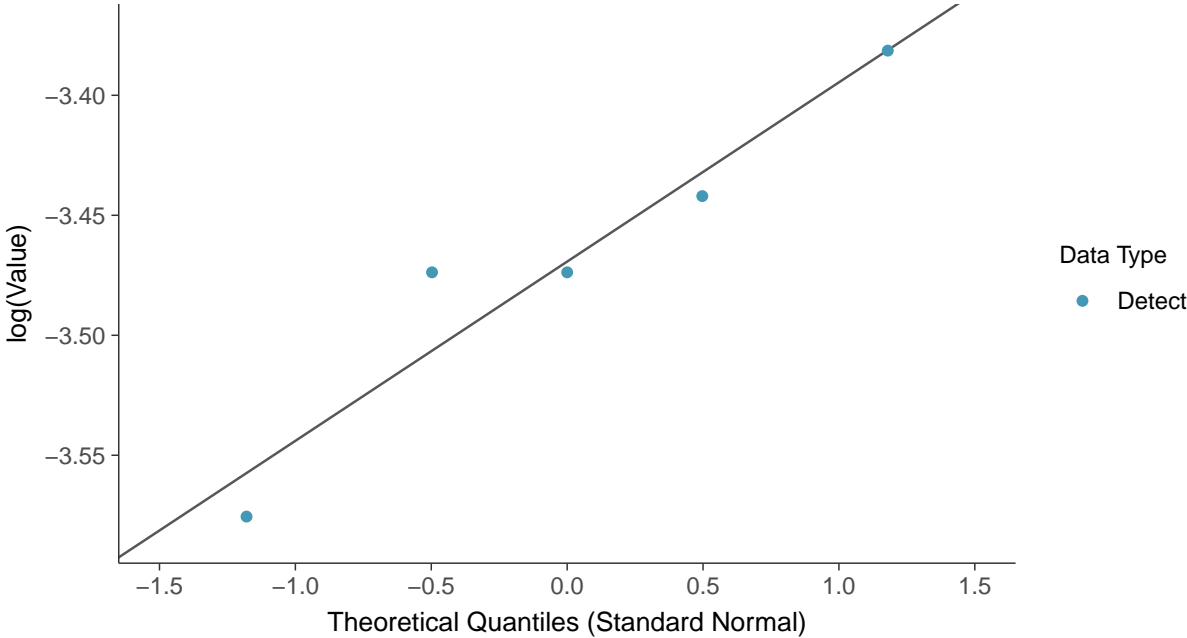
**Normal Q-Q plot**

Lithium, MW-7B (mg/L)



**Lognormal Q-Q plot**

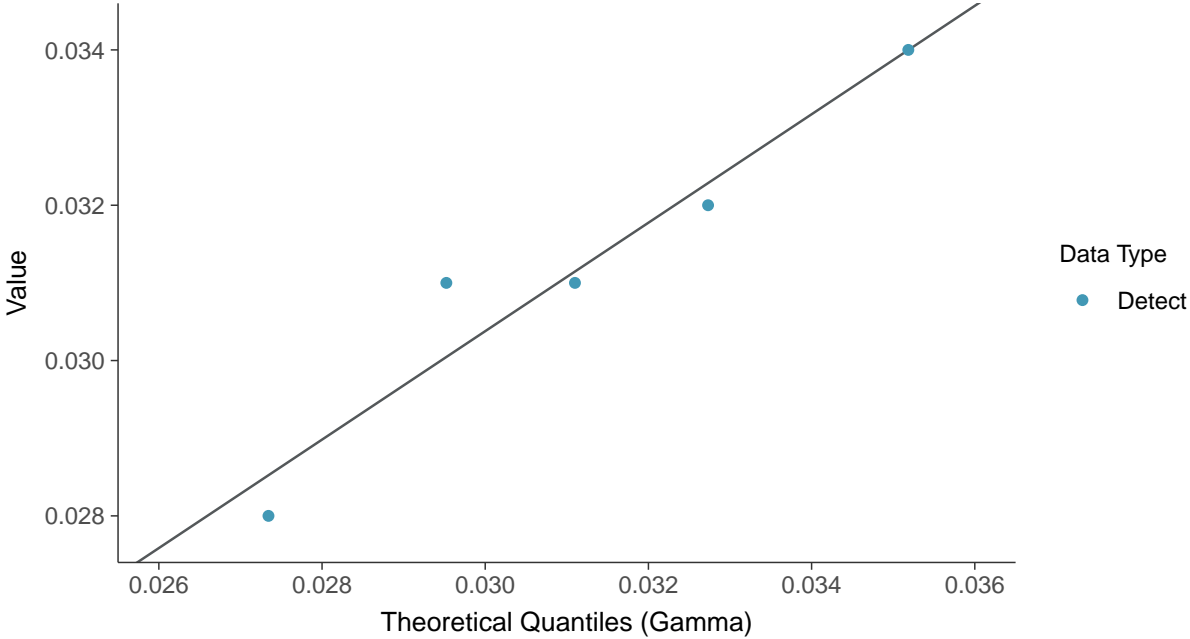
Lithium, MW-7B (mg/L)





**Gamma Q-Q plot**

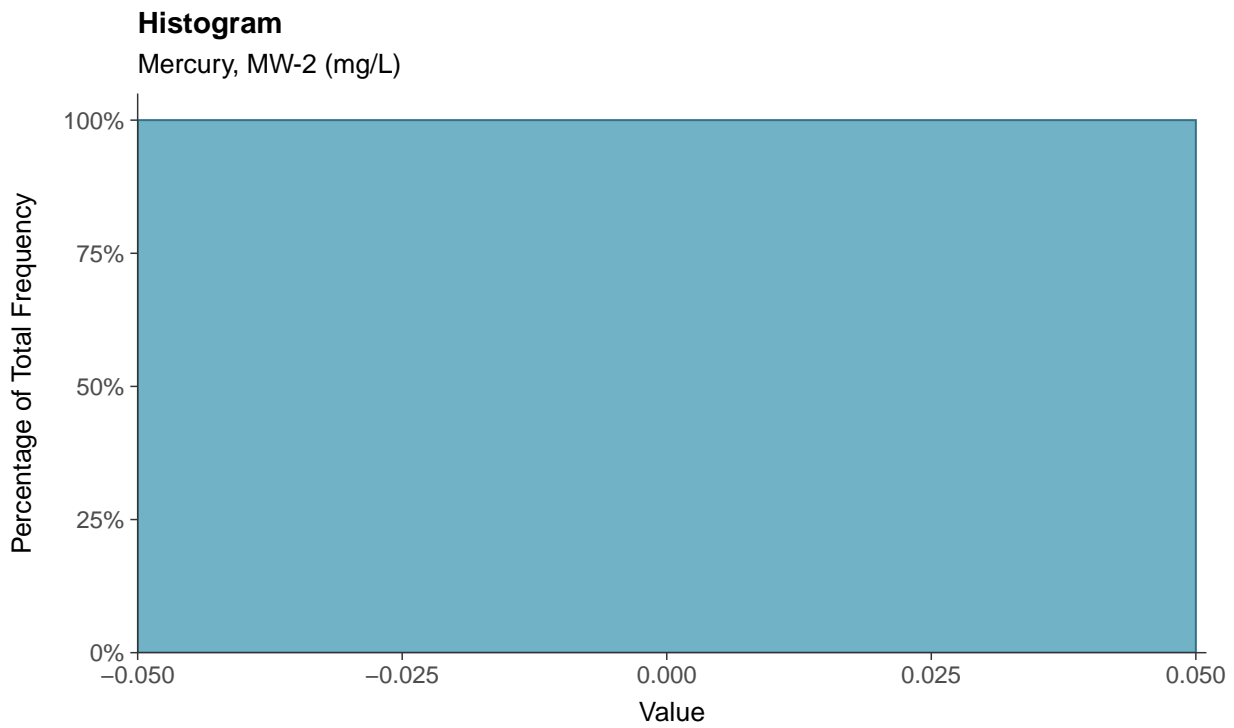
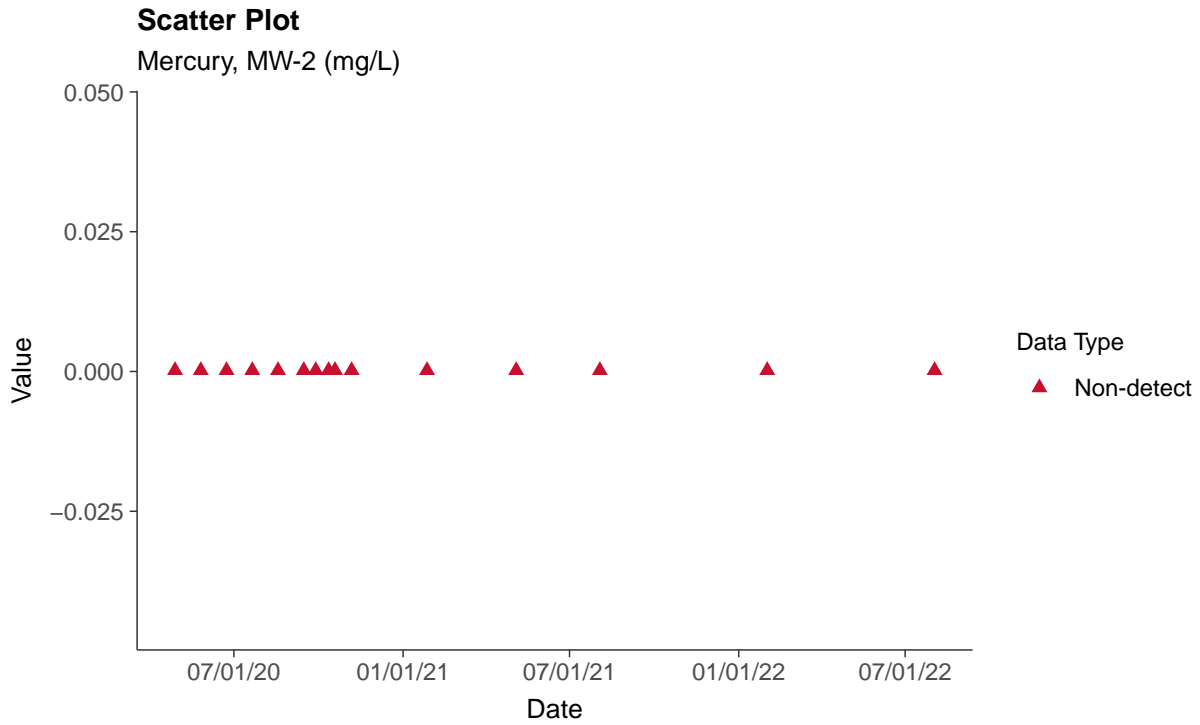
Lithium, MW-7B (mg/L)



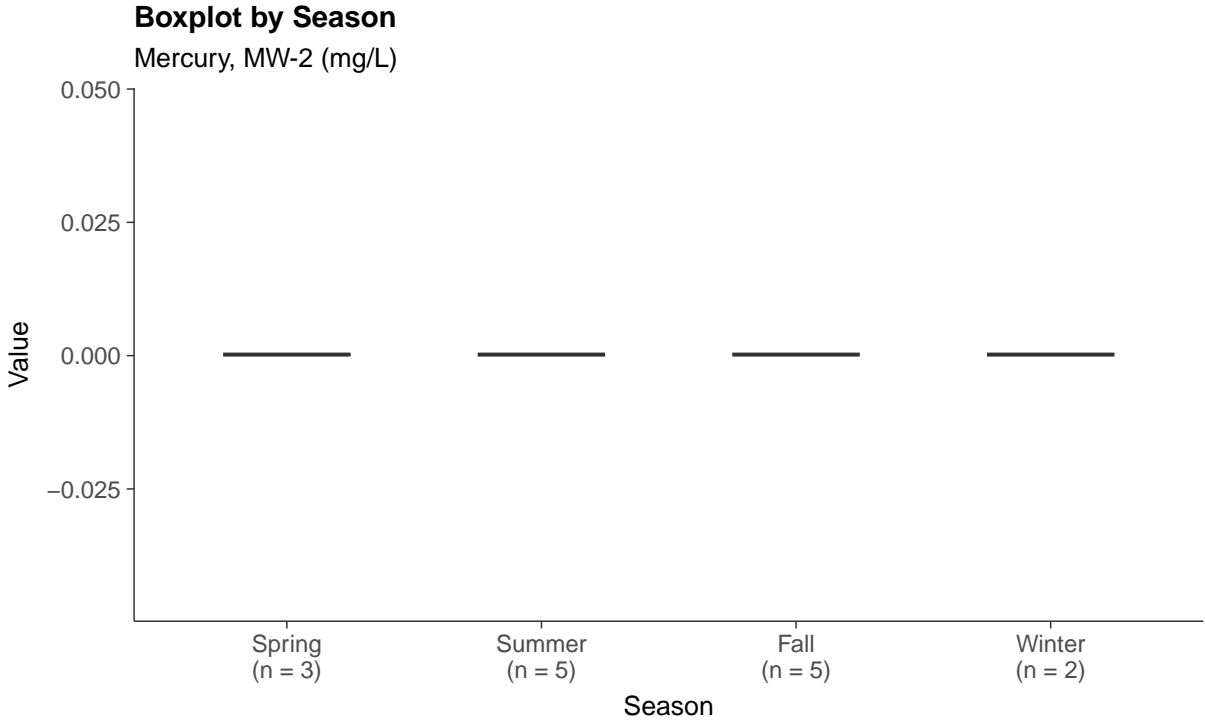
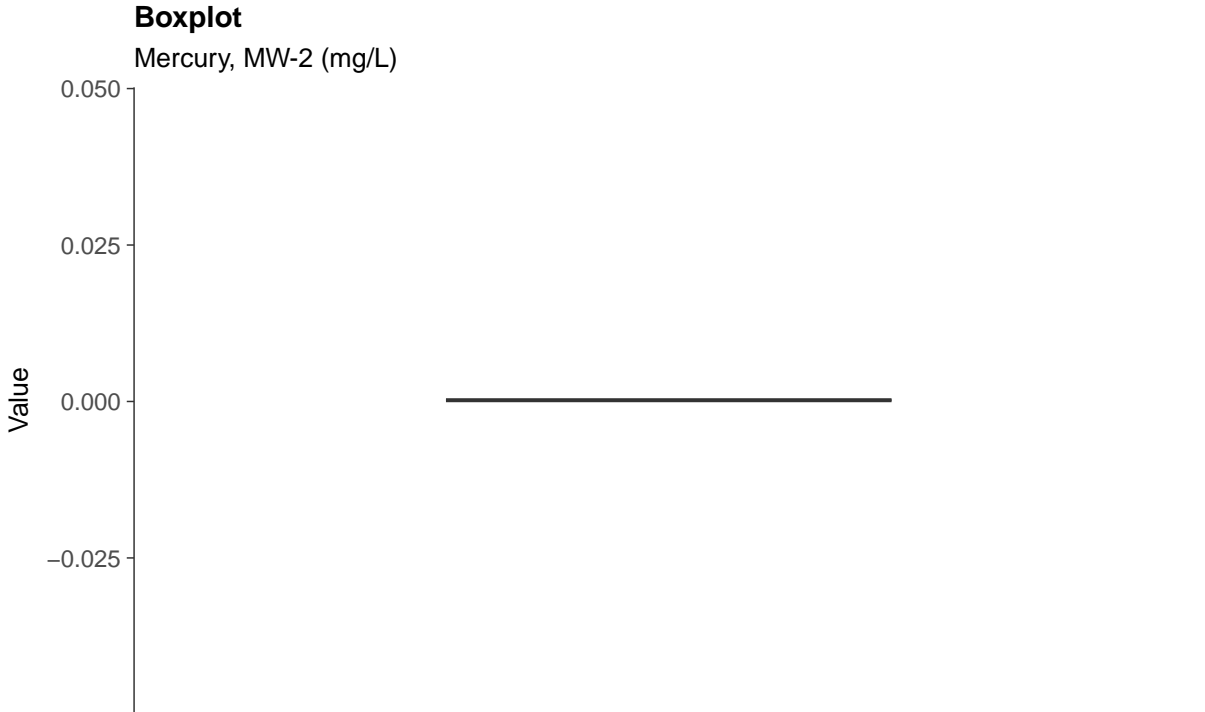


### Appendix IV: Mercury, MW-2

ID: 2\_20\_02



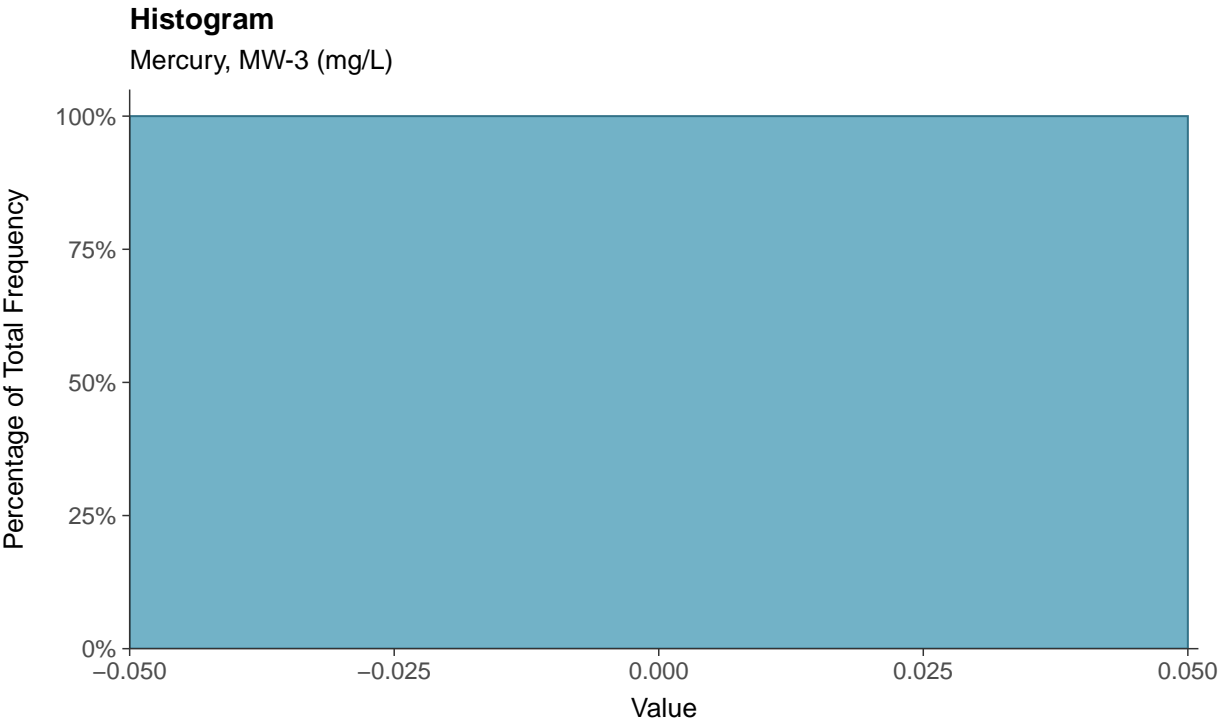
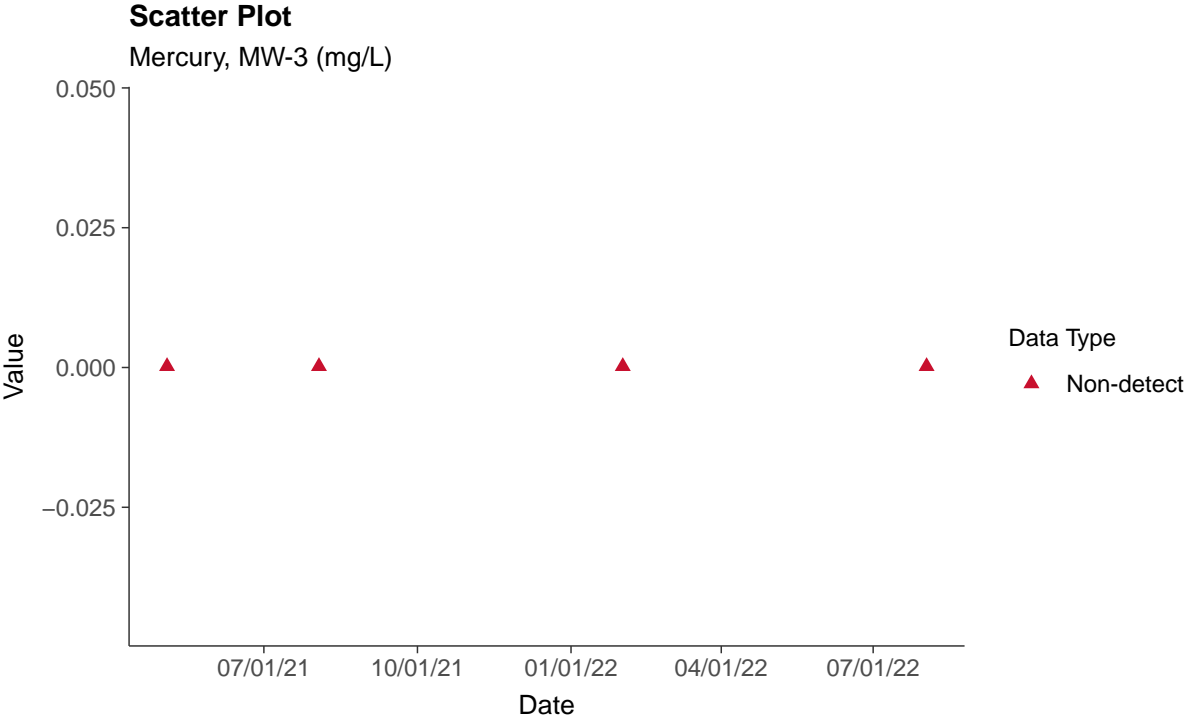


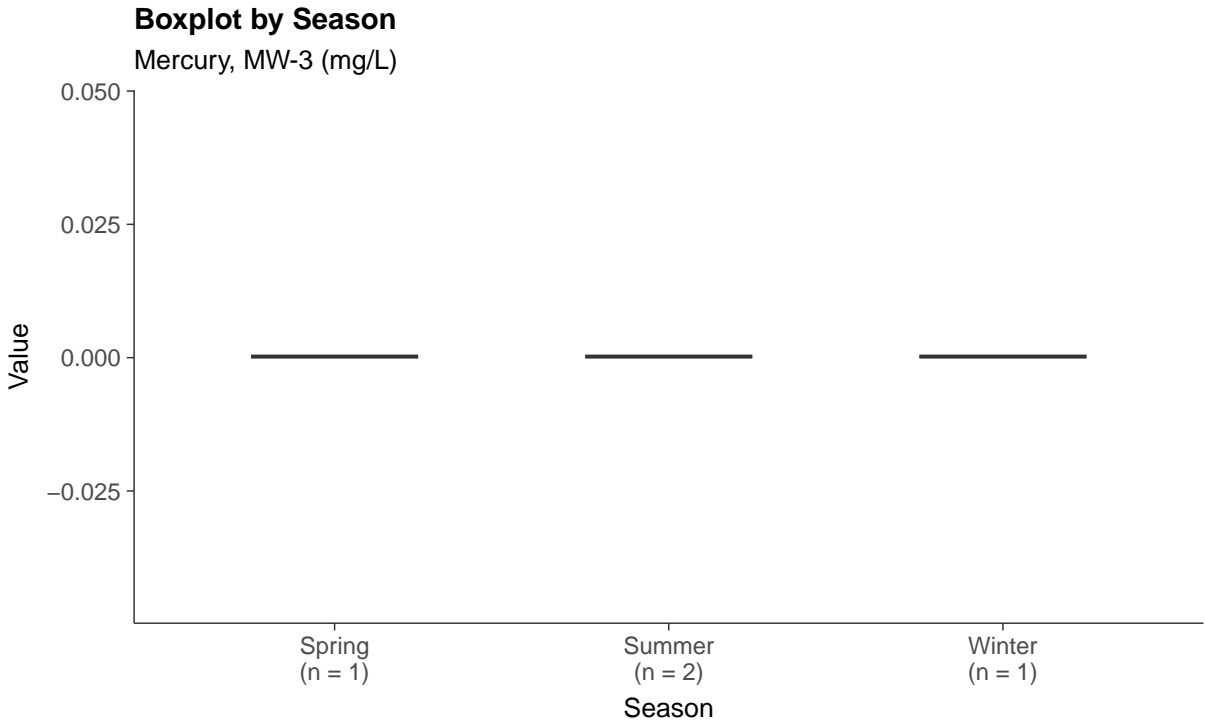
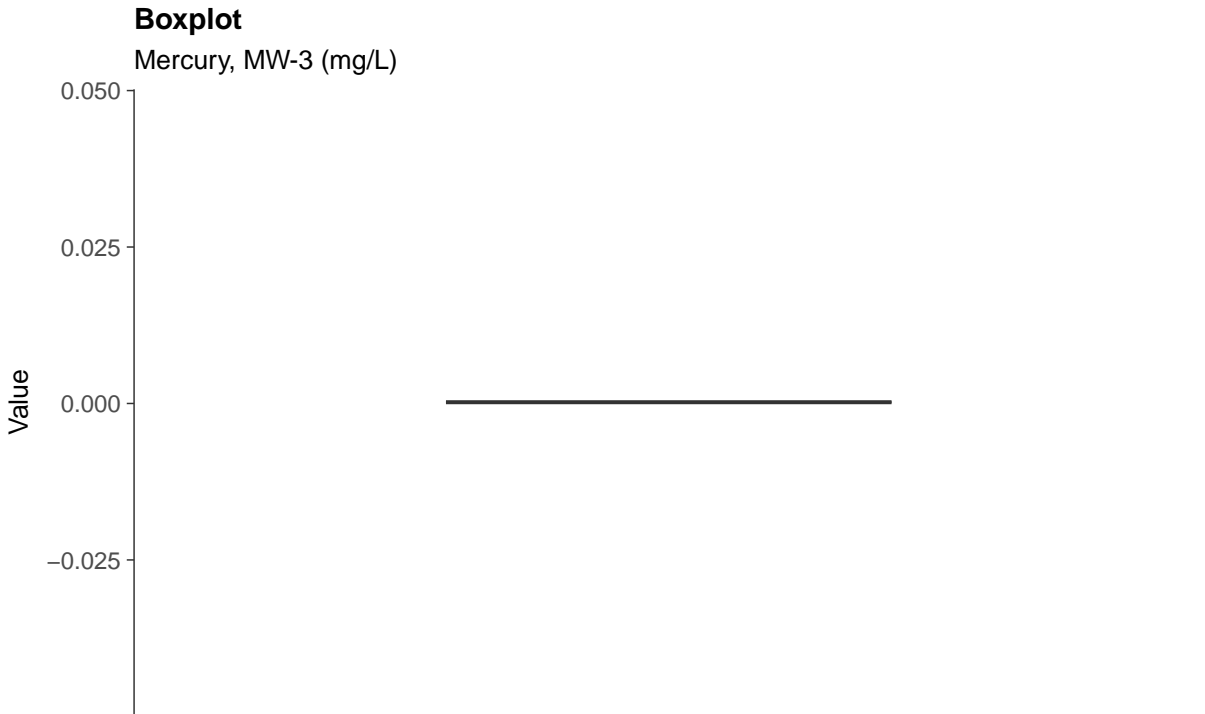




### Appendix IV: Mercury, MW-3

ID: 2\_20\_03

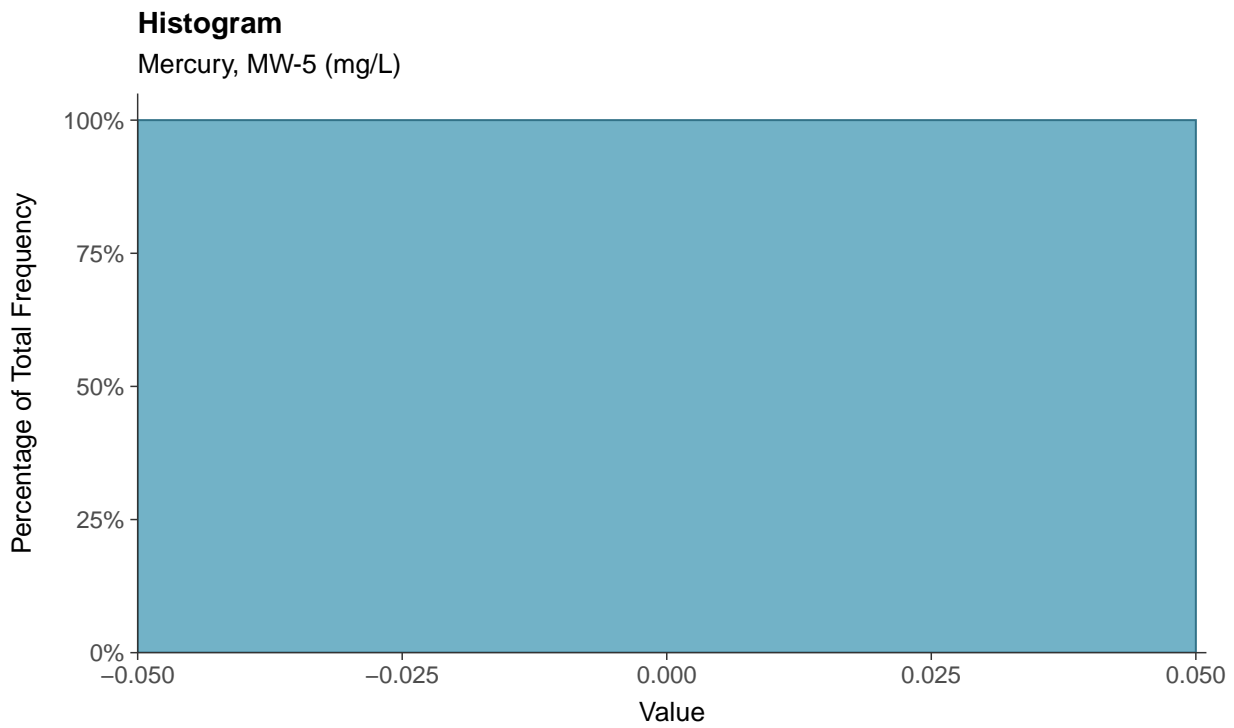
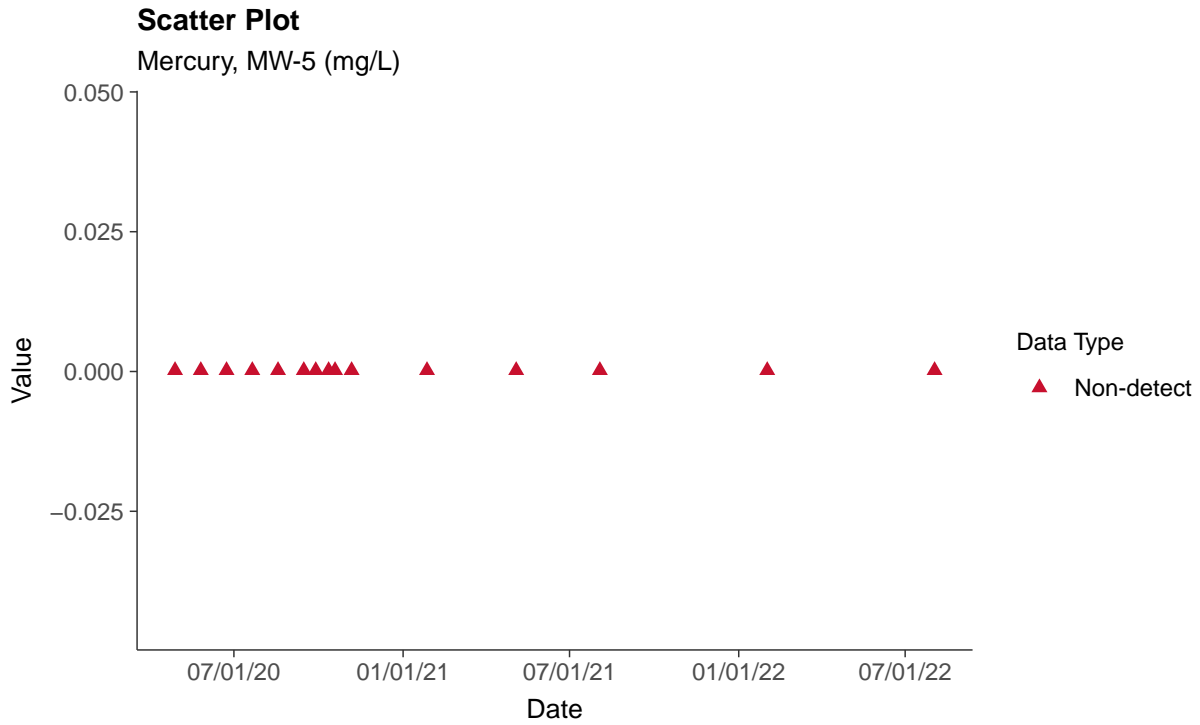






### Appendix IV: Mercury, MW-5

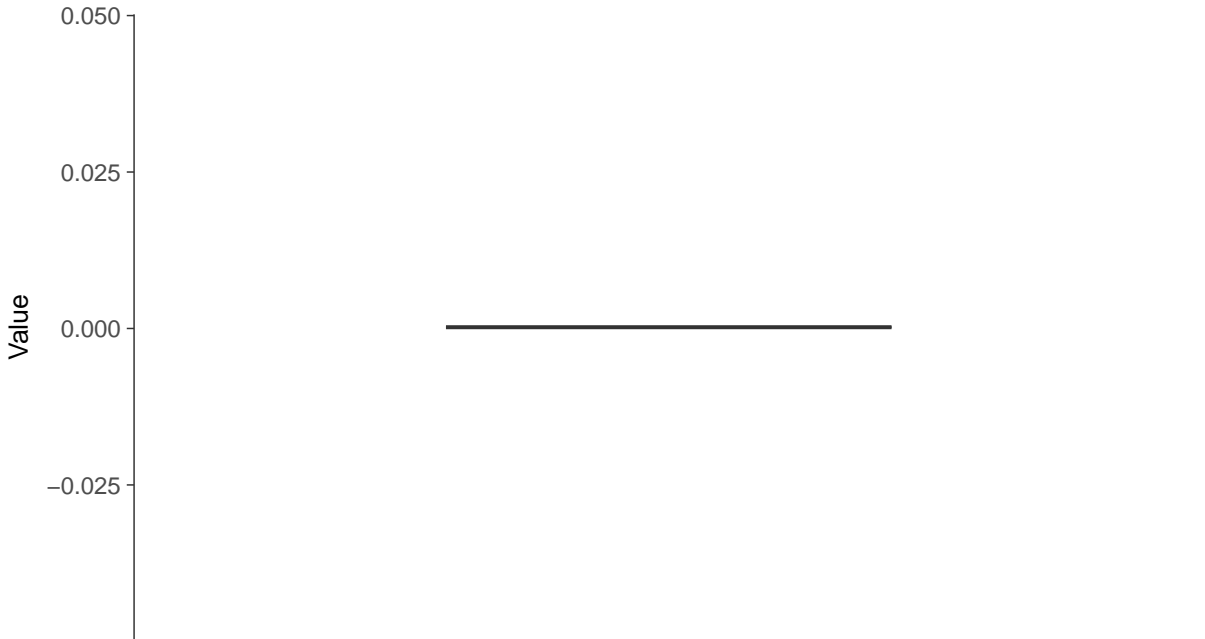
ID: 2\_20\_05





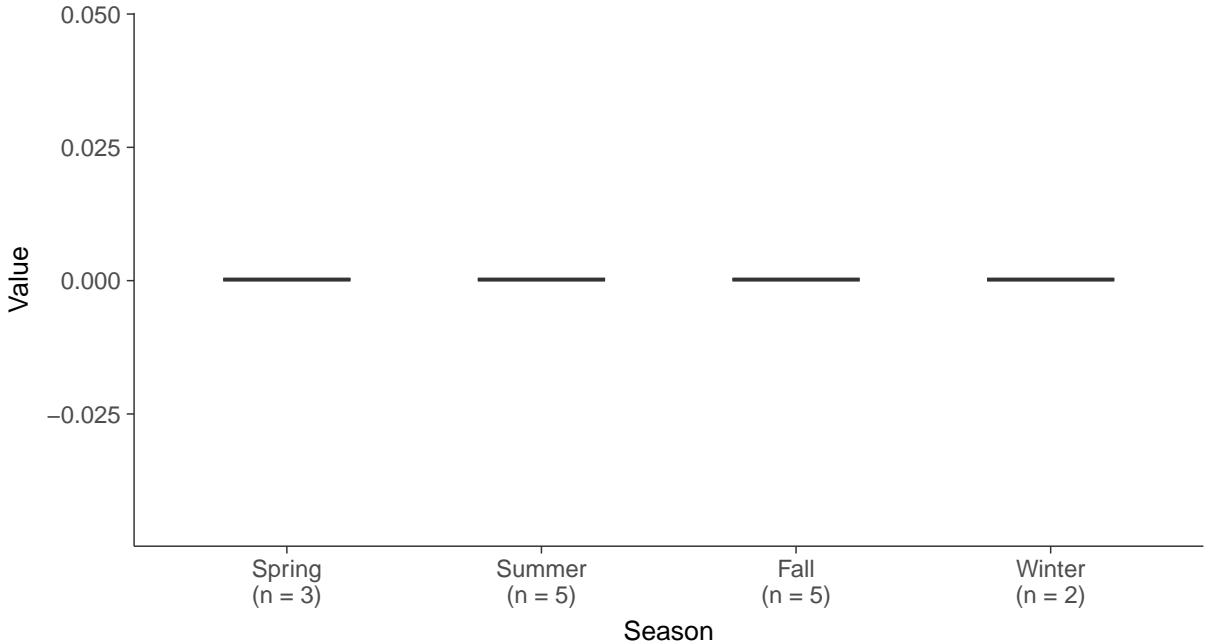
**Boxplot**

Mercury, MW-5 (mg/L)



**Boxplot by Season**

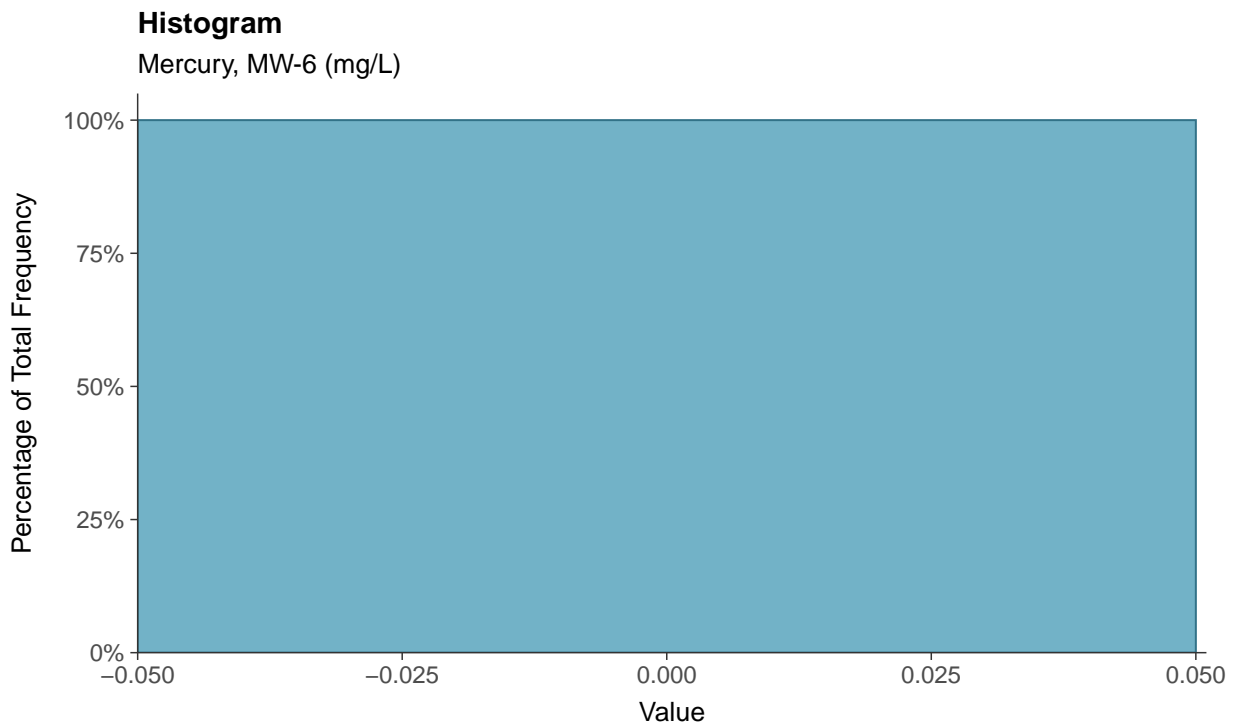
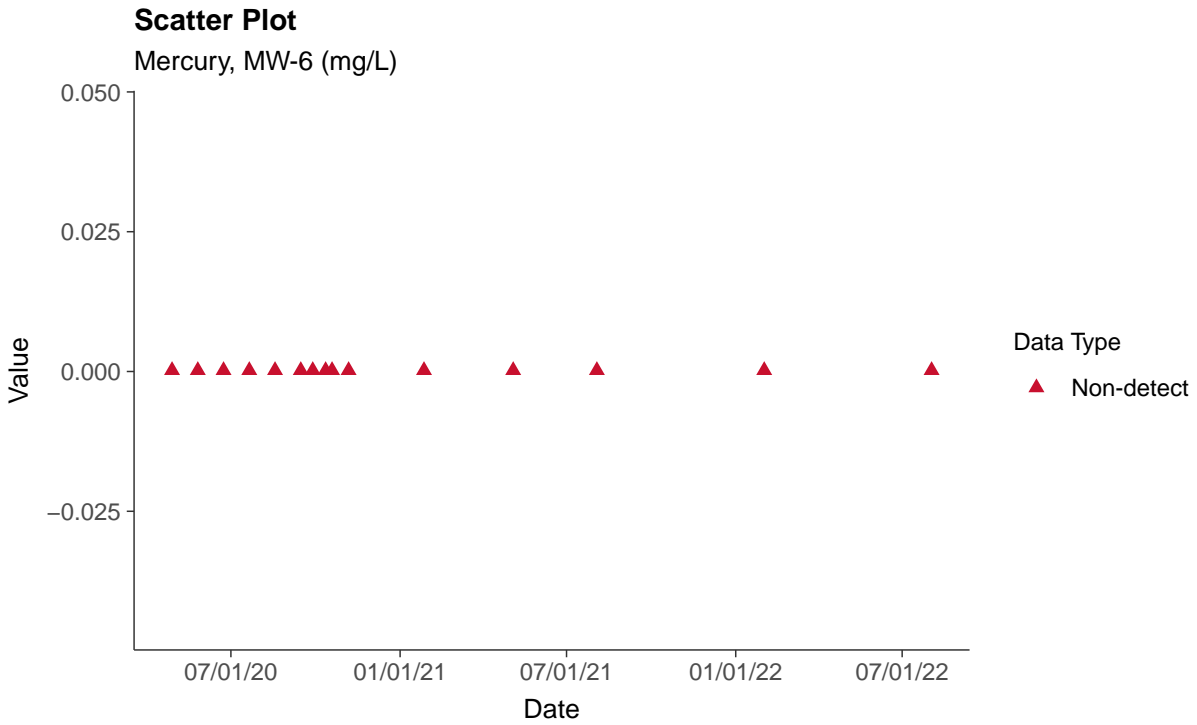
Mercury, MW-5 (mg/L)





### Appendix IV: Mercury, MW-6

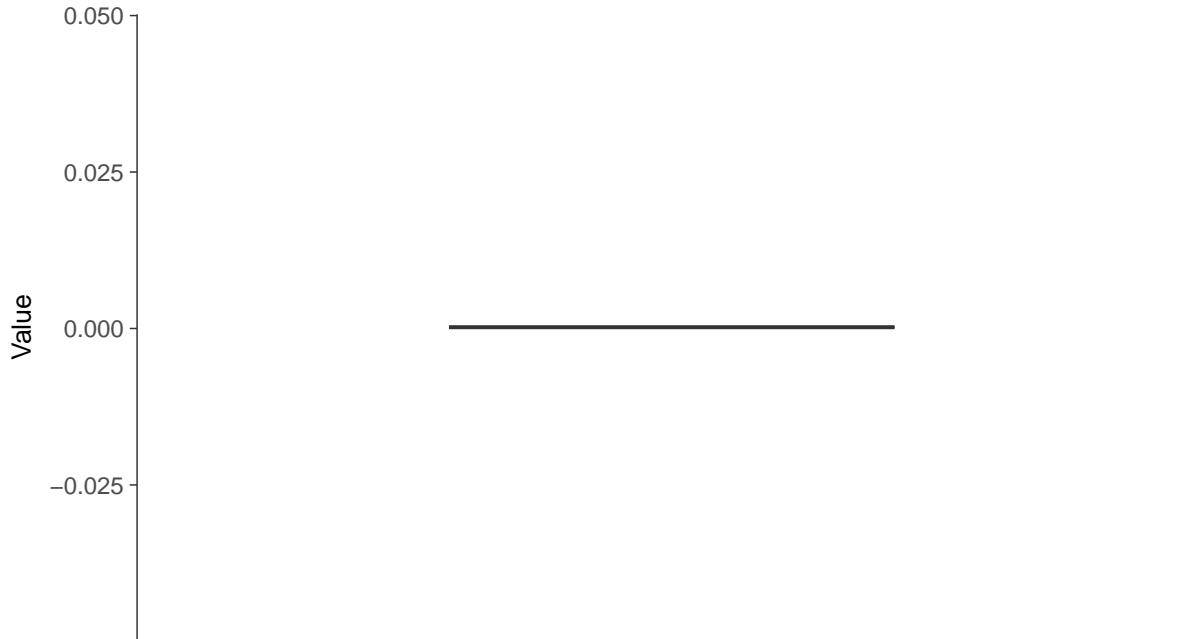
ID: 2\_20\_06





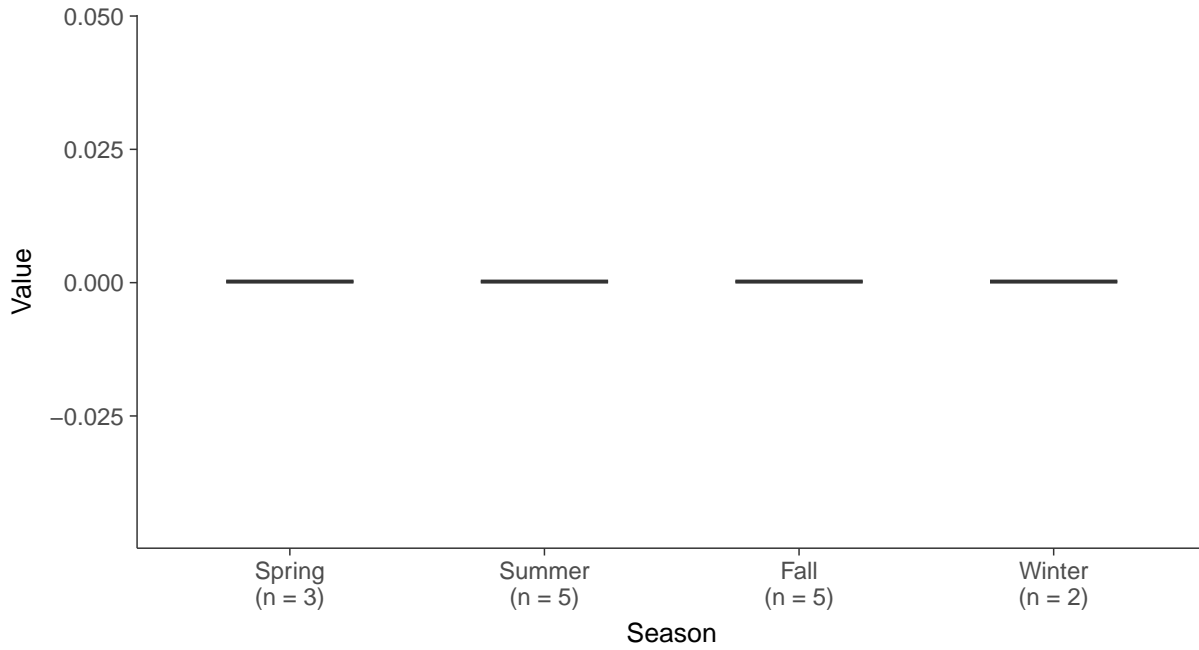
### Boxplot

Mercury, MW-6 (mg/L)



### Boxplot by Season

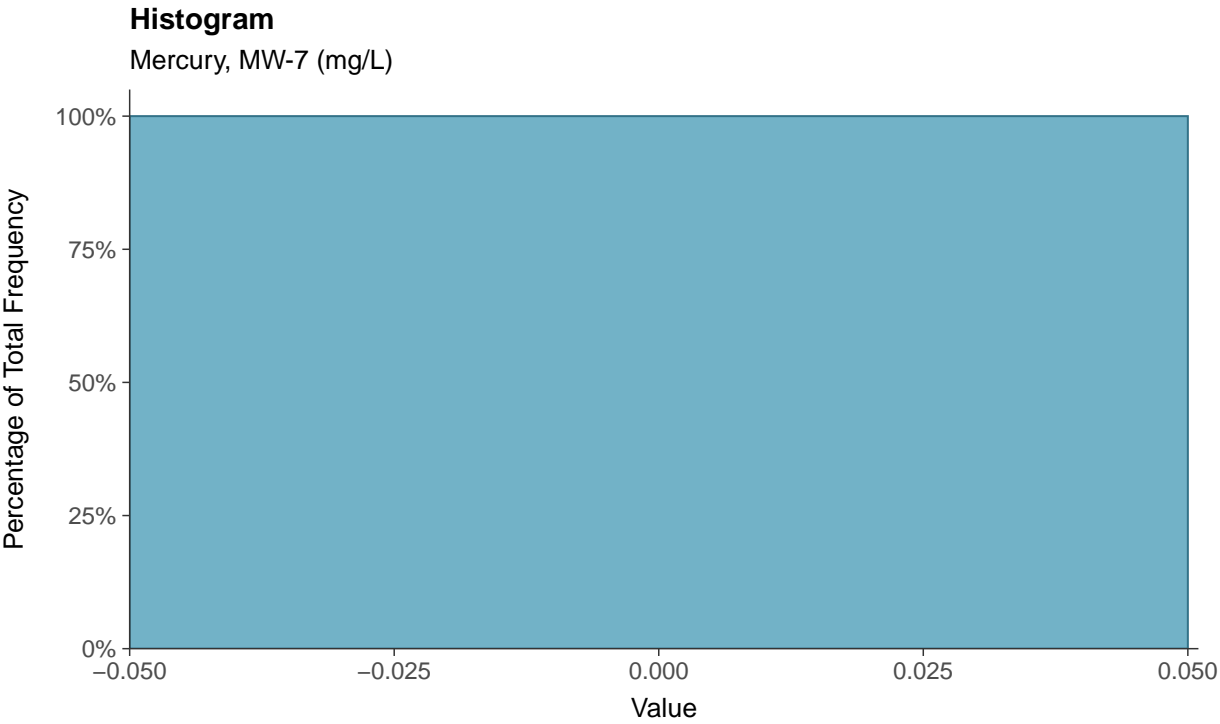
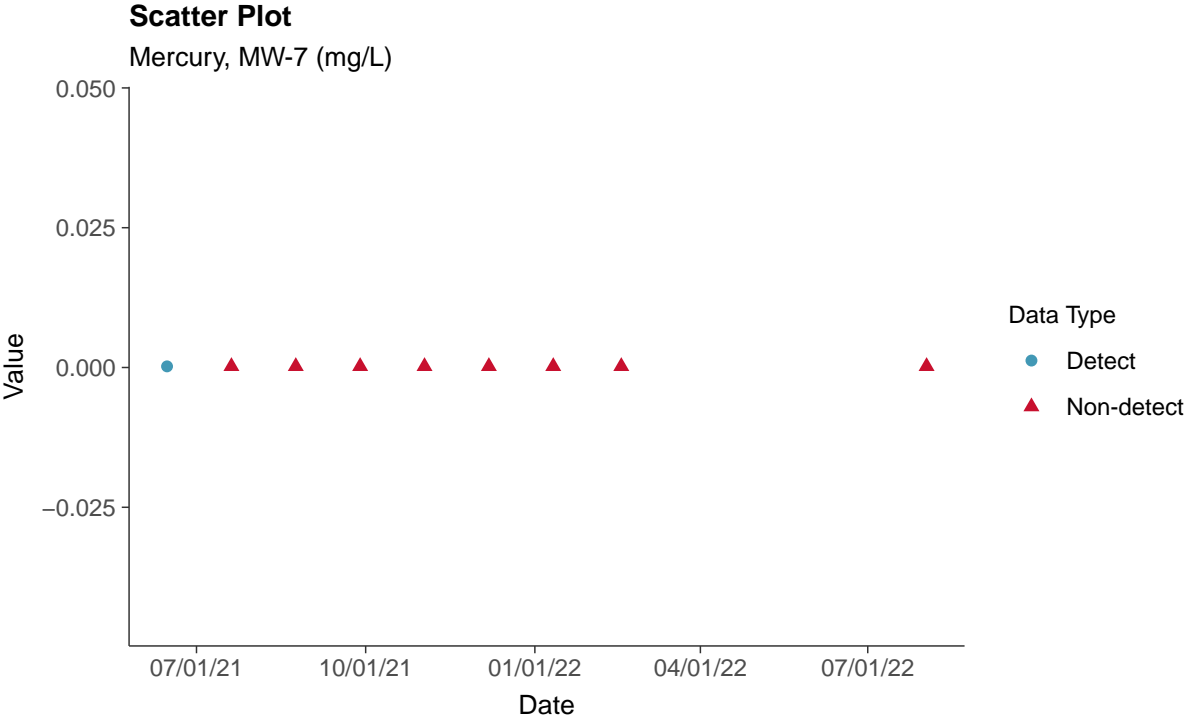
Mercury, MW-6 (mg/L)



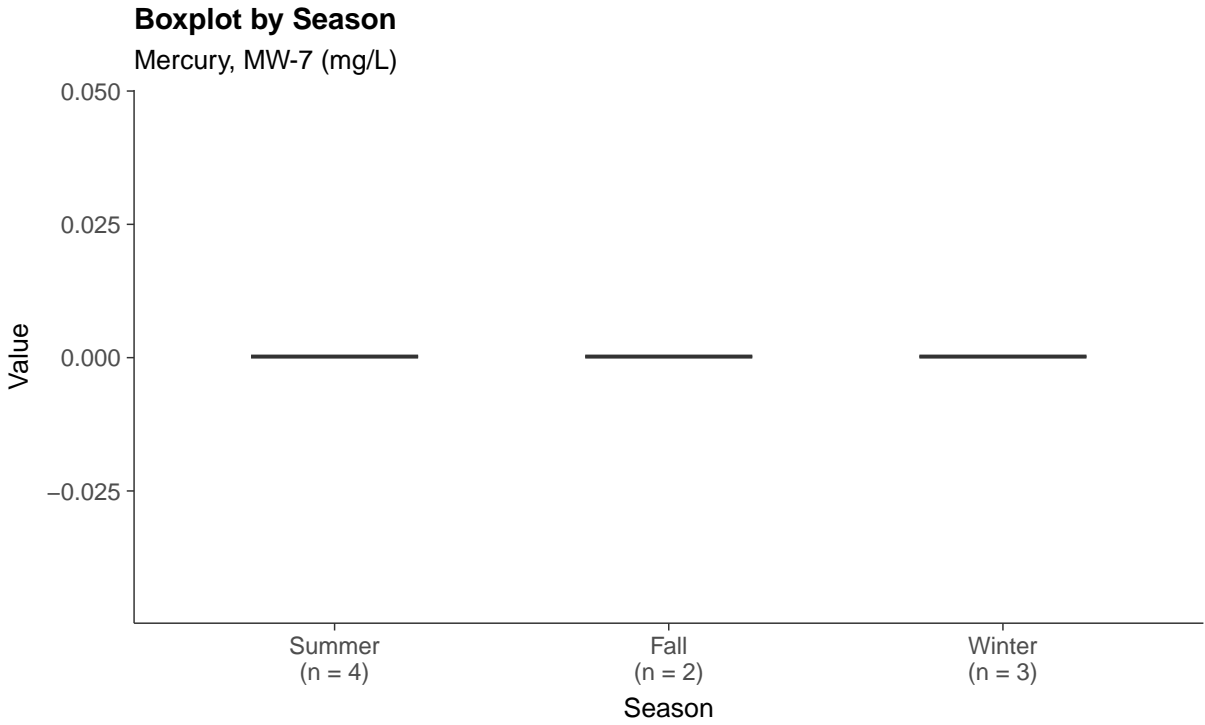
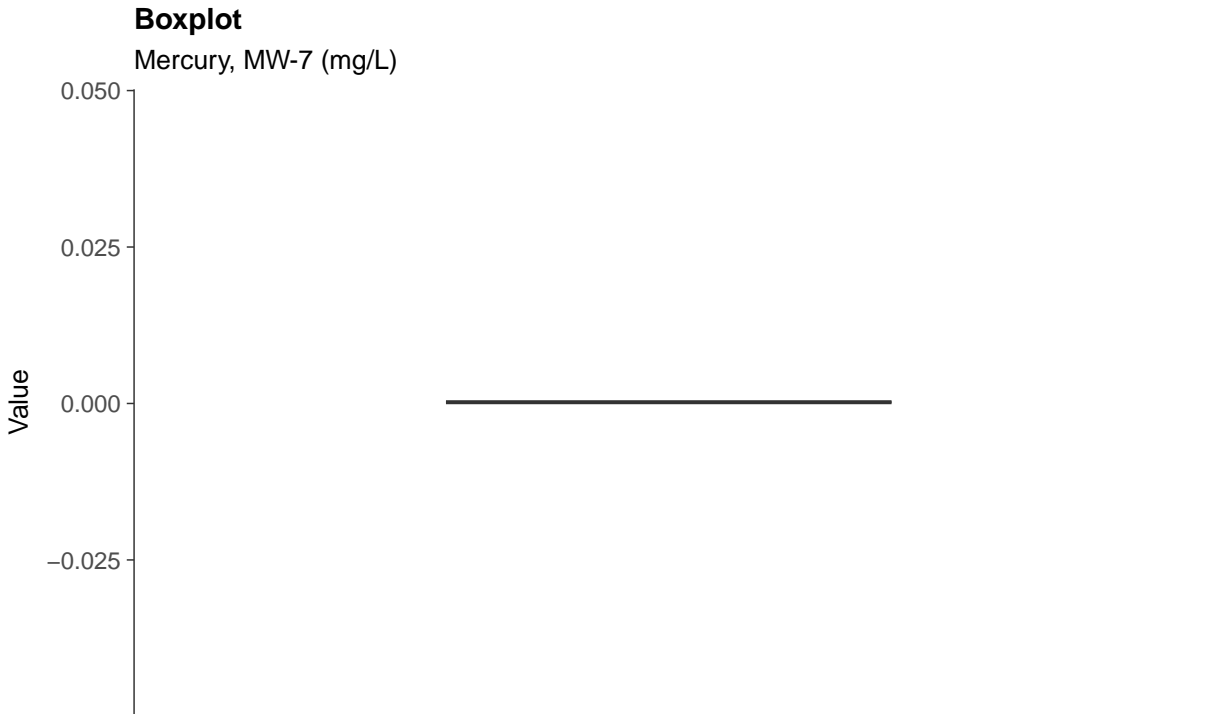


### Appendix IV: Mercury, MW-7

ID: 2\_20\_07



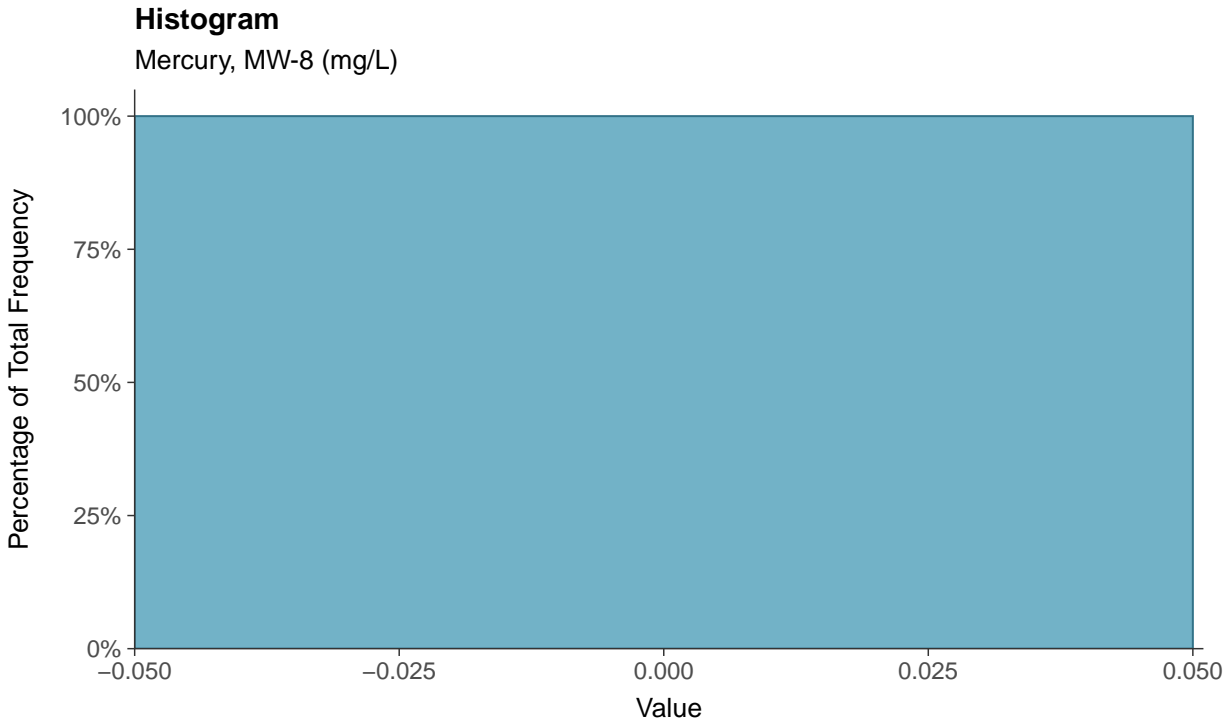
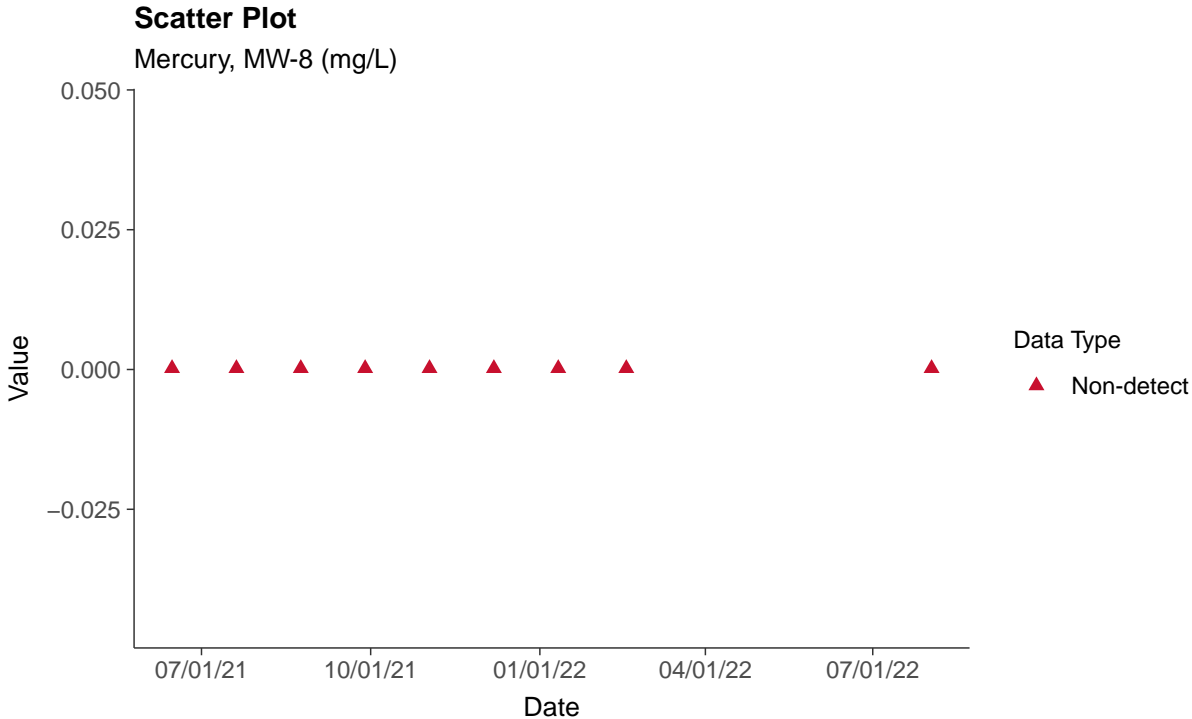


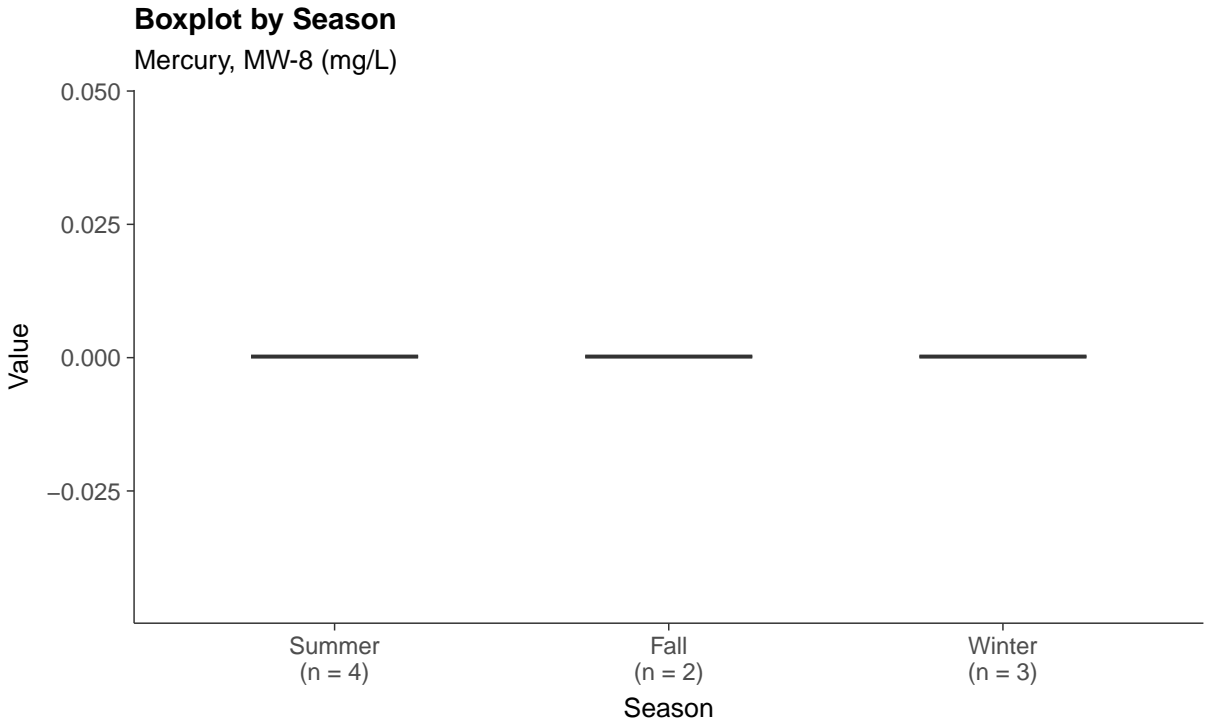
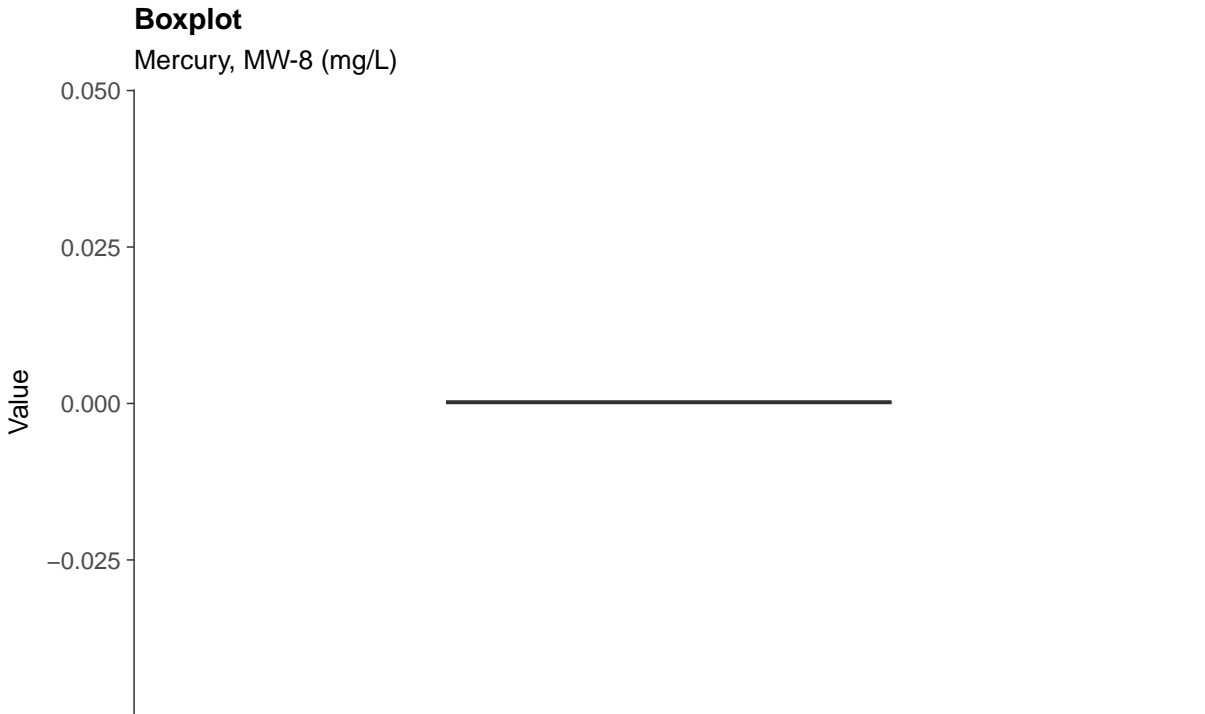




### Appendix IV: Mercury, MW-8

ID: 2\_20\_08

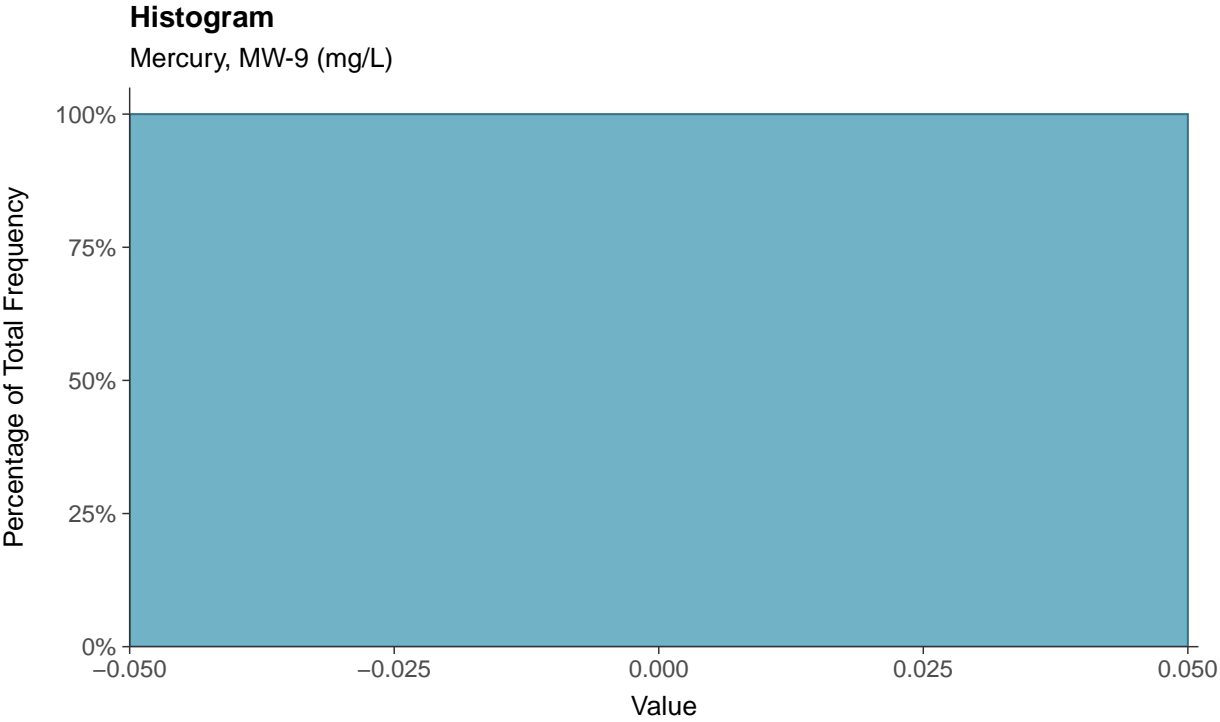
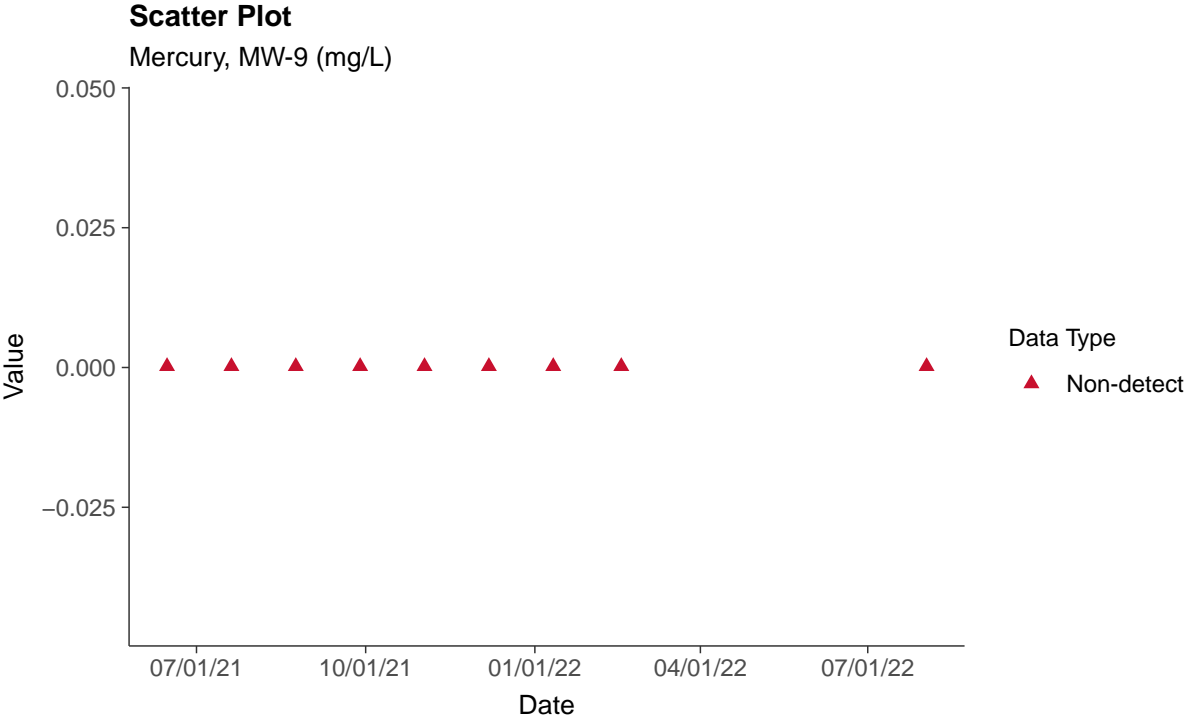


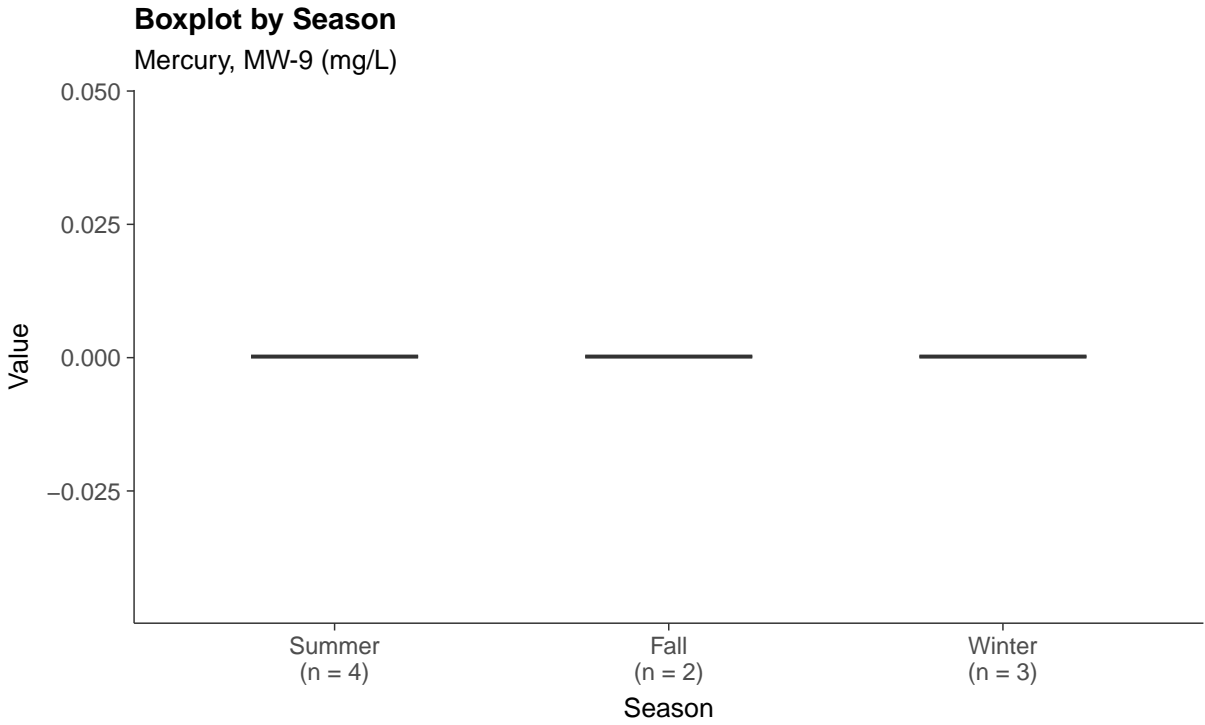
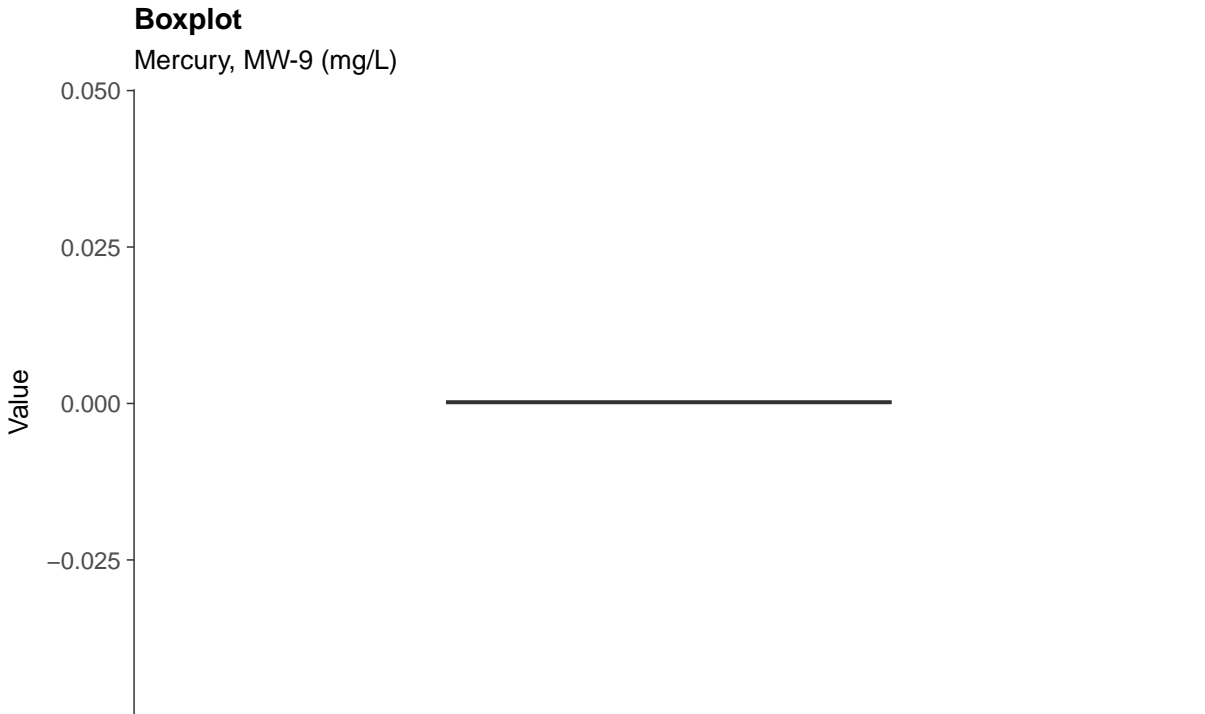




### Appendix IV: Mercury, MW-9

ID: 2\_20\_09

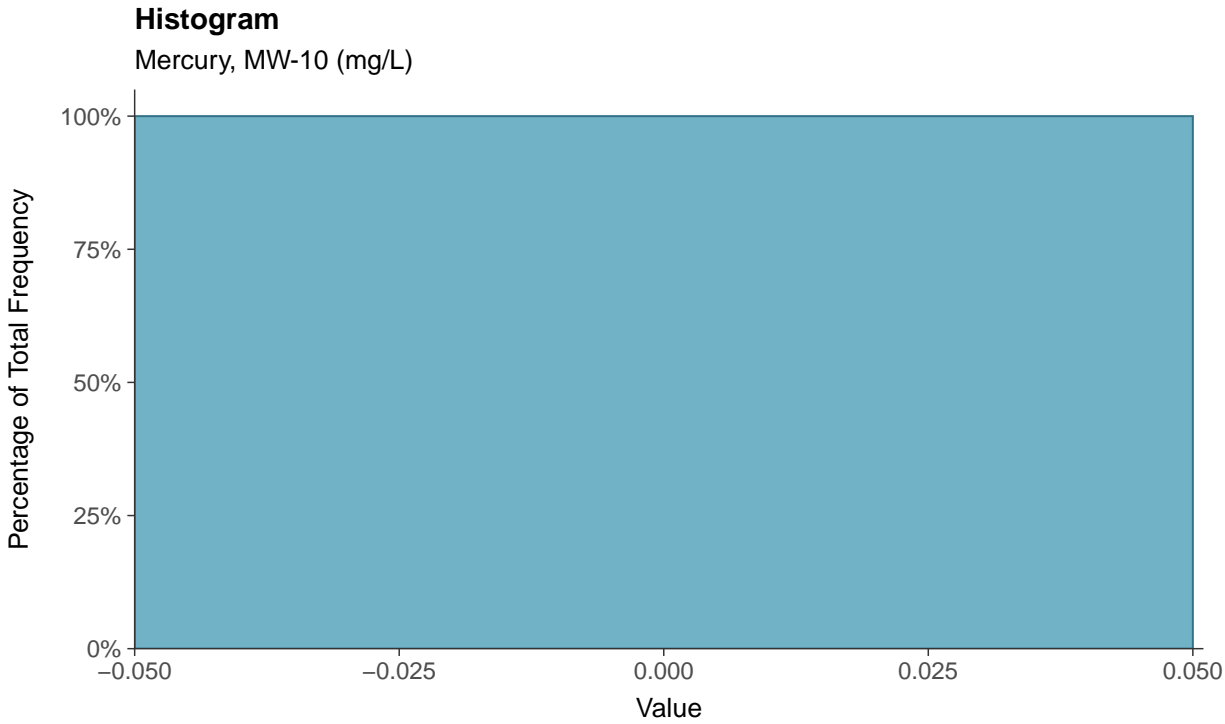
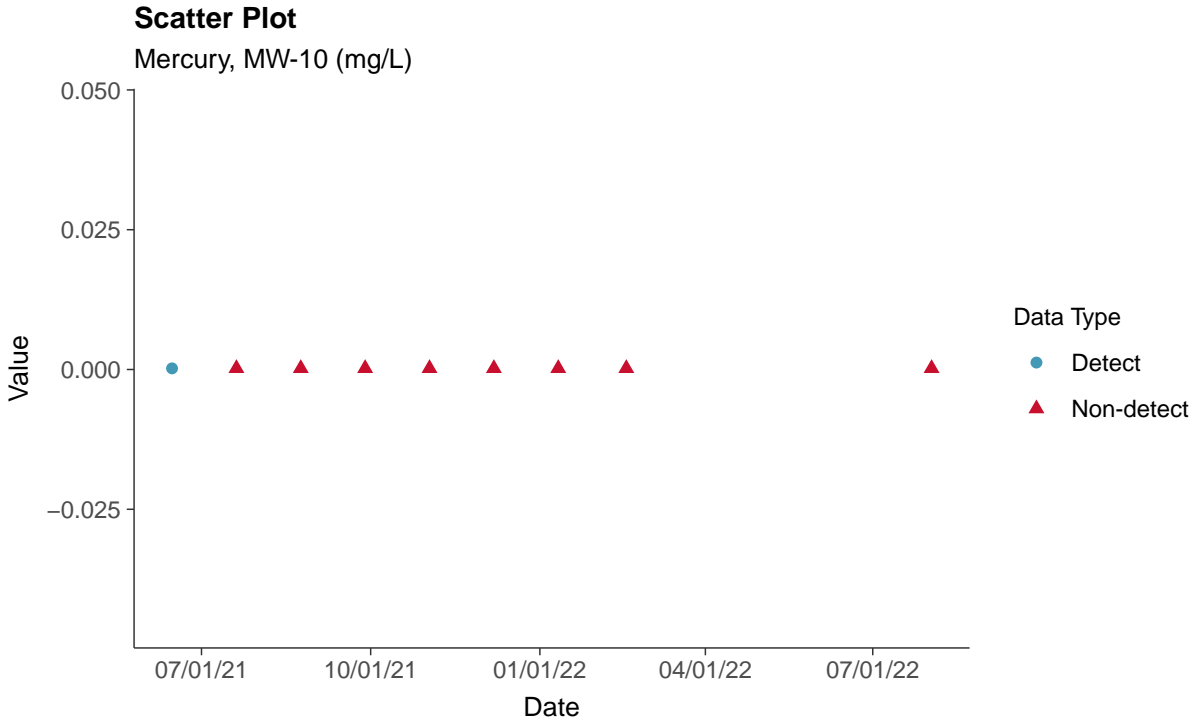


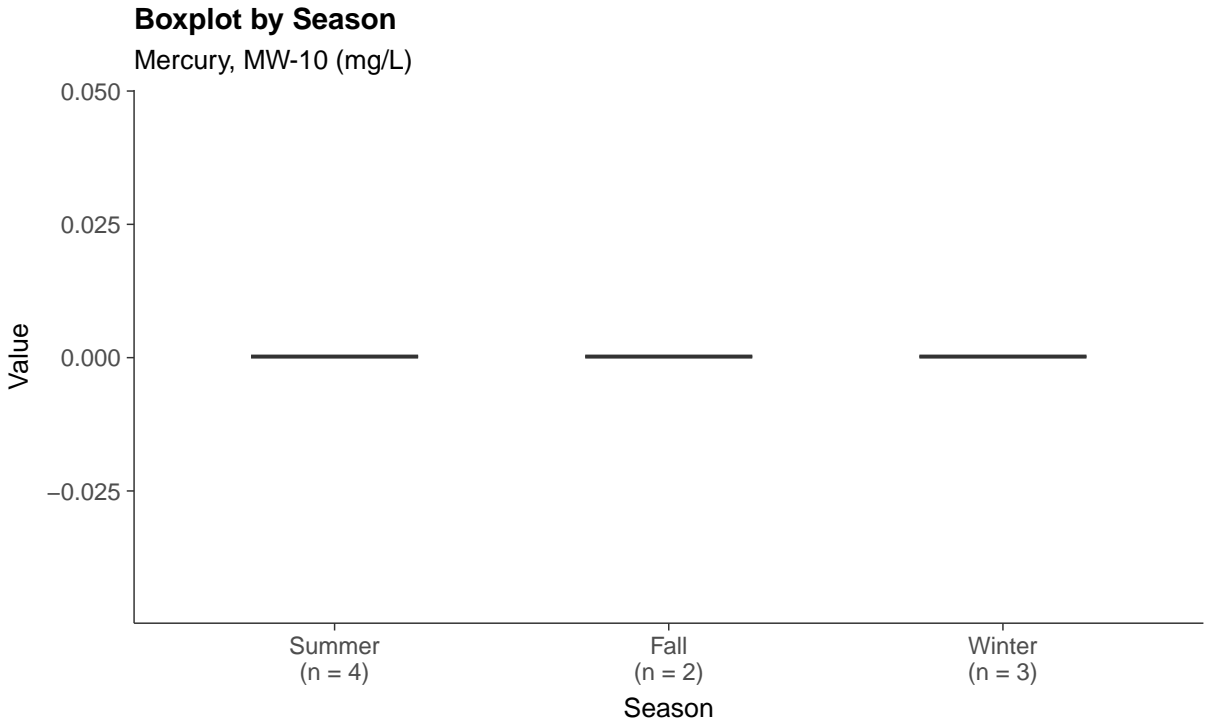
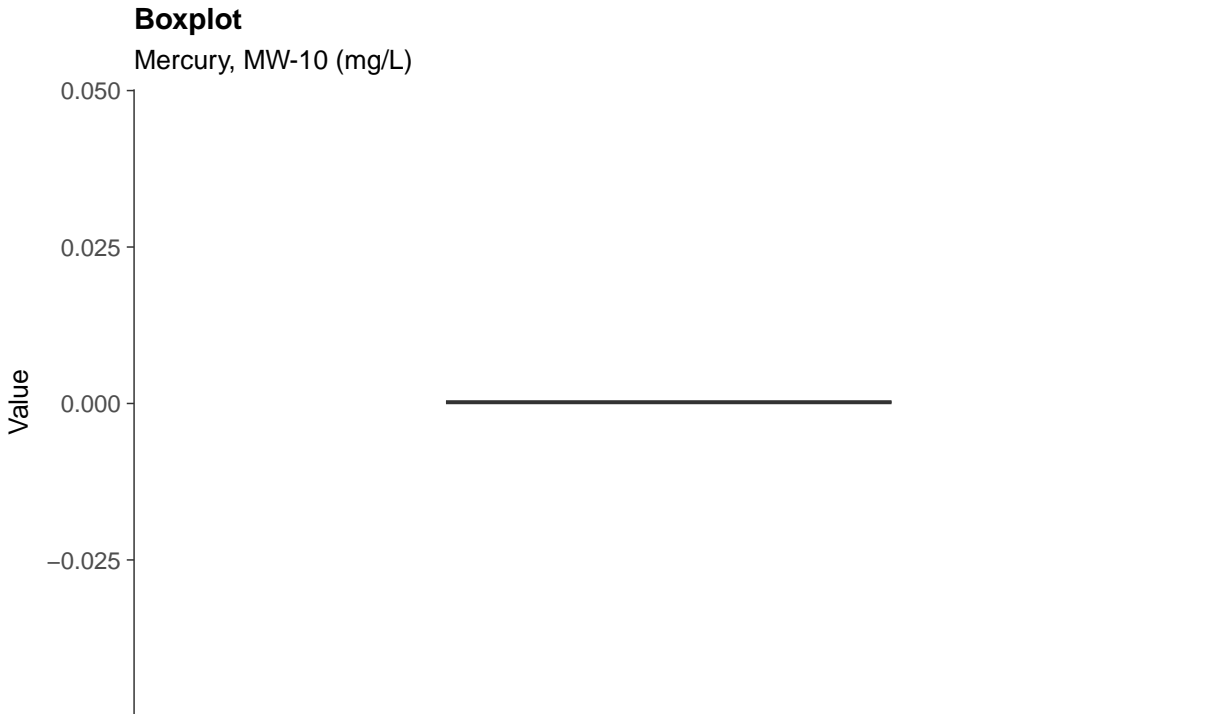




### Appendix IV: Mercury, MW-10

ID: 2\_20\_10

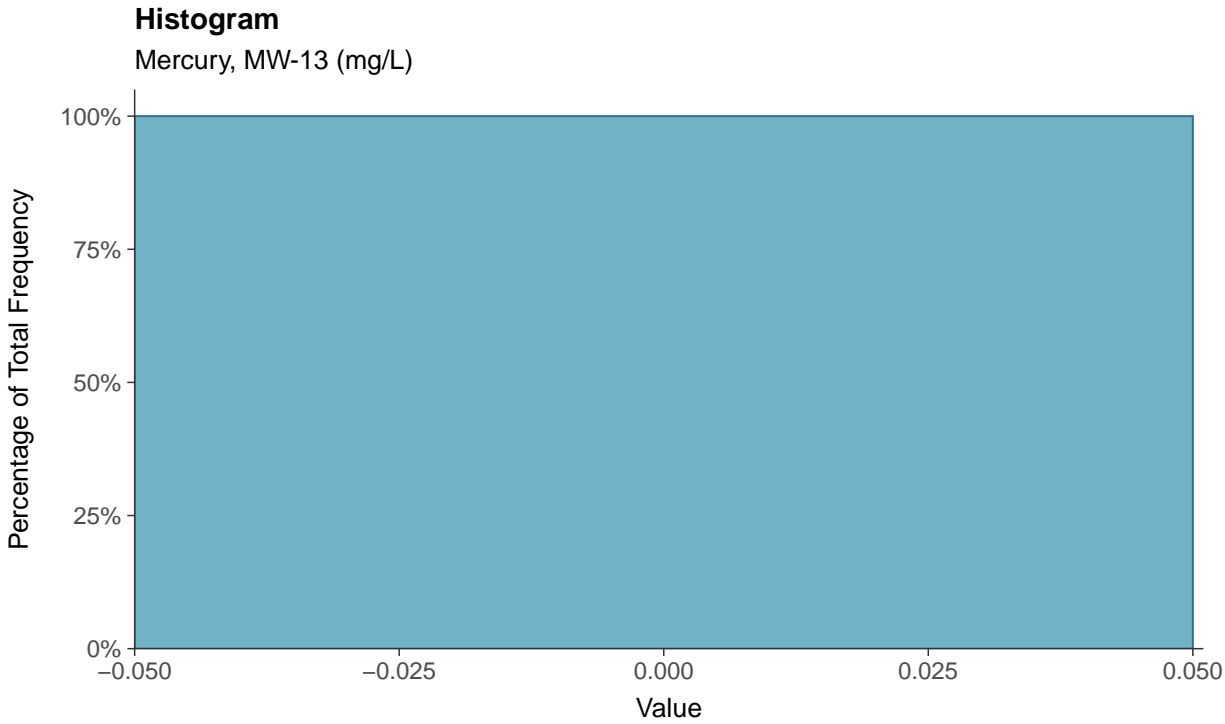
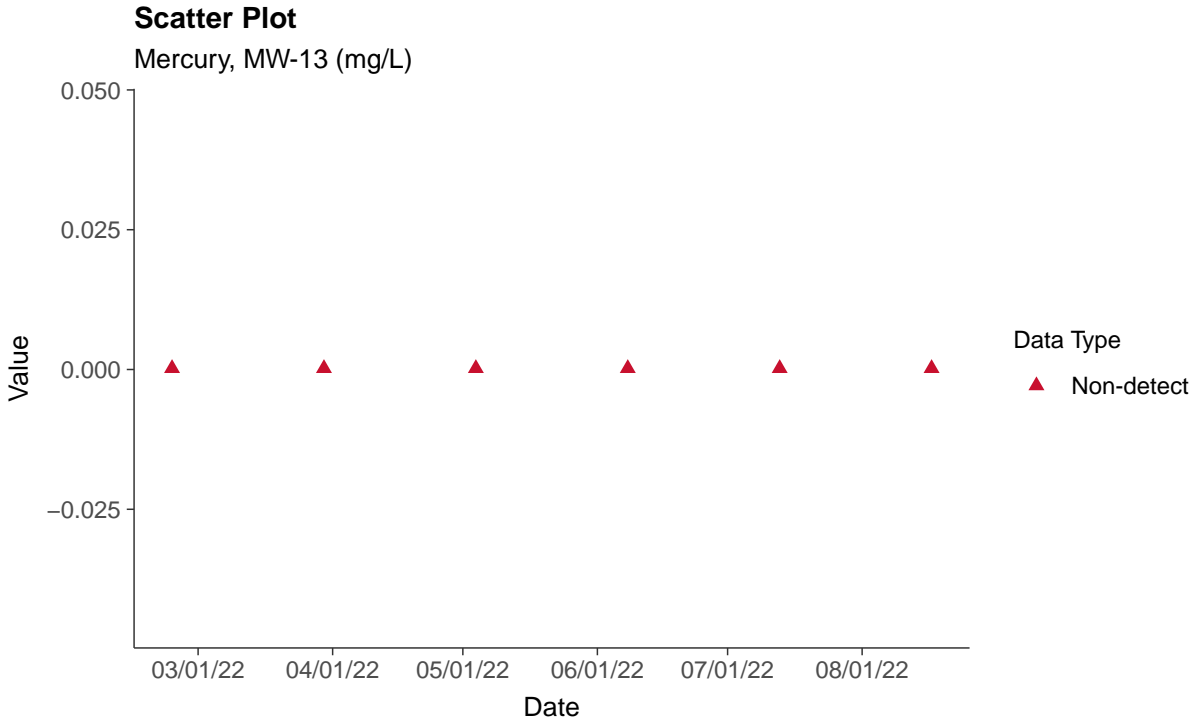




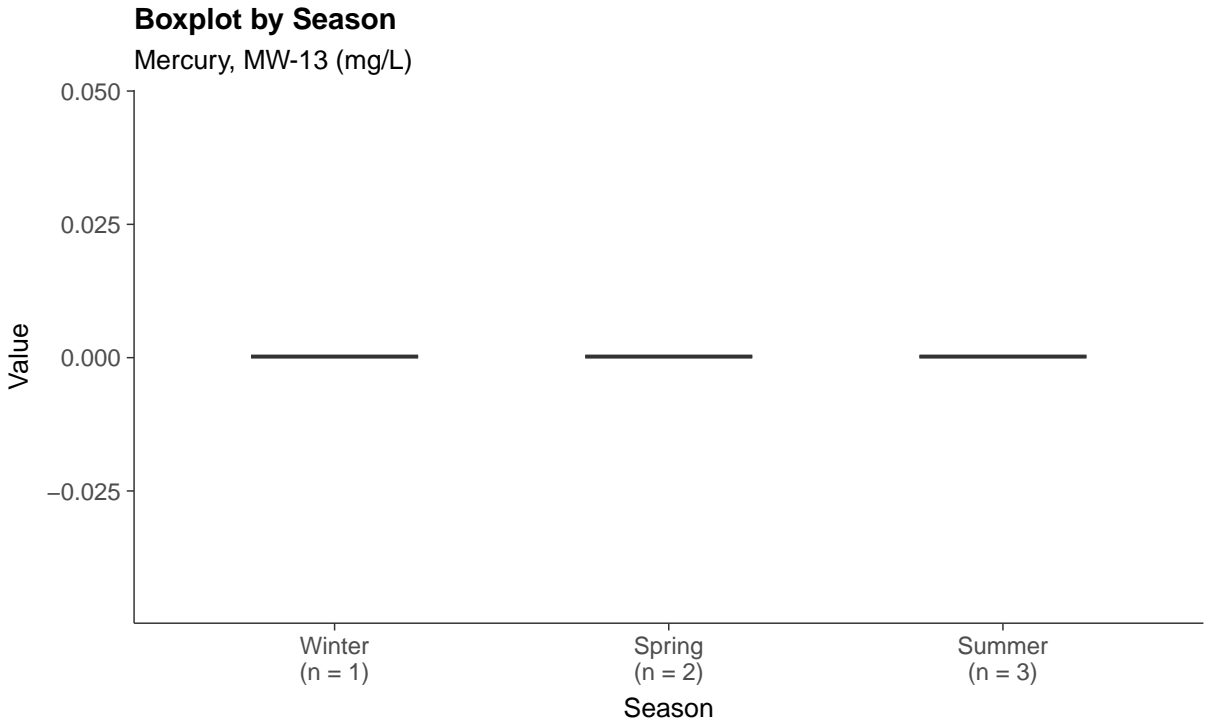
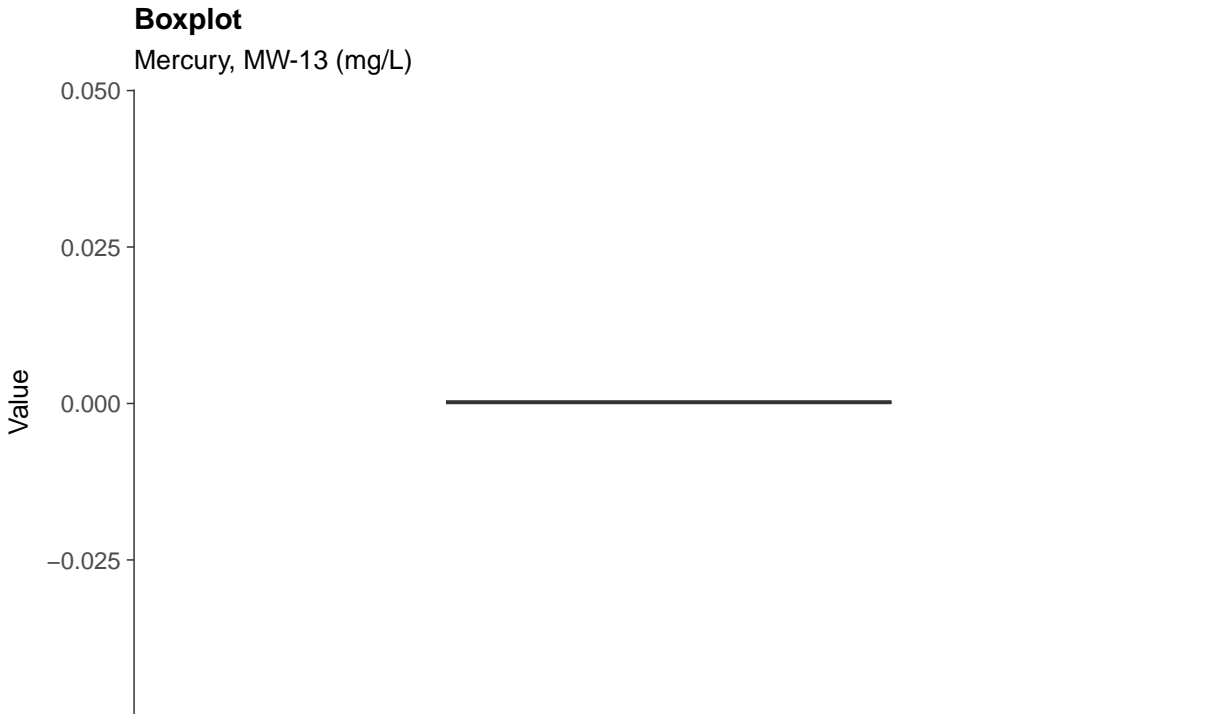


### Appendix IV: Mercury, MW-13

ID: 2\_20\_13



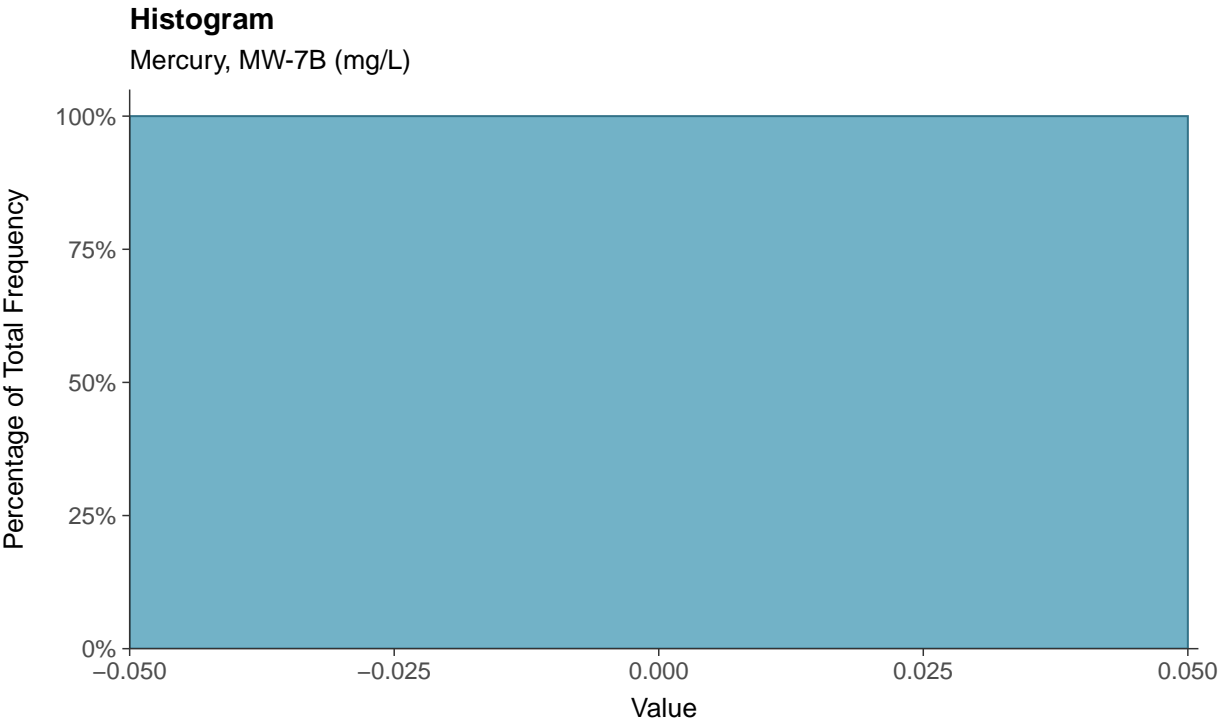
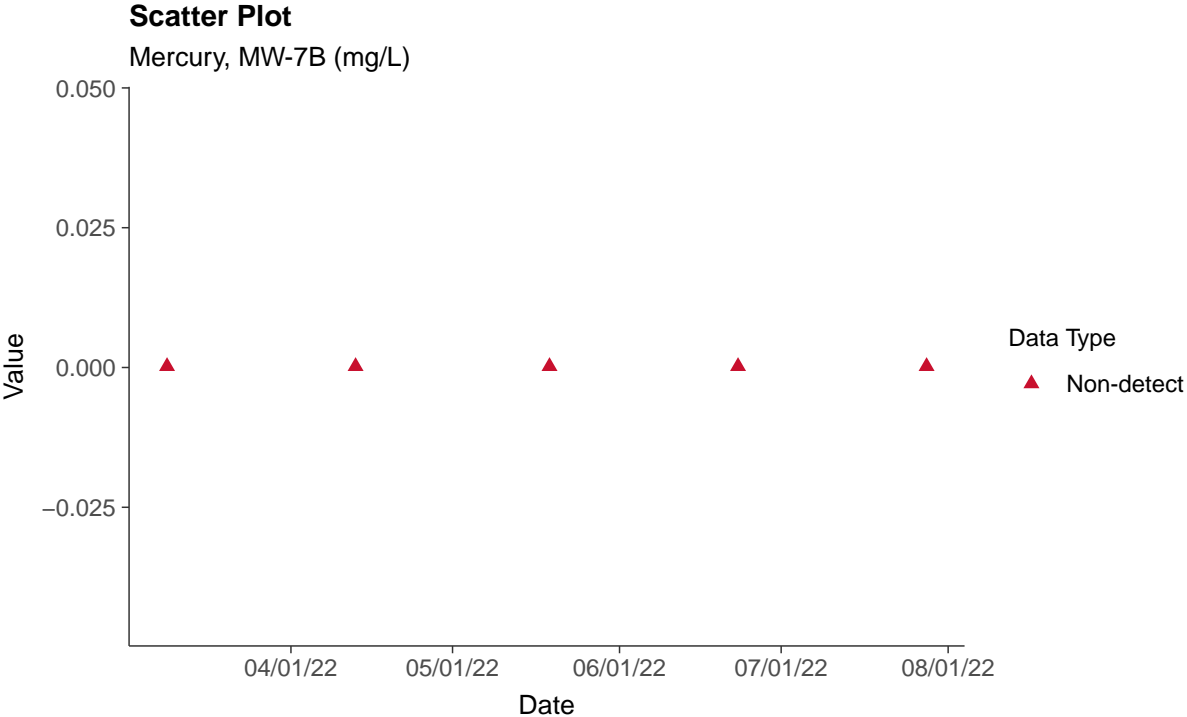






### Appendix IV: Mercury, MW-7B

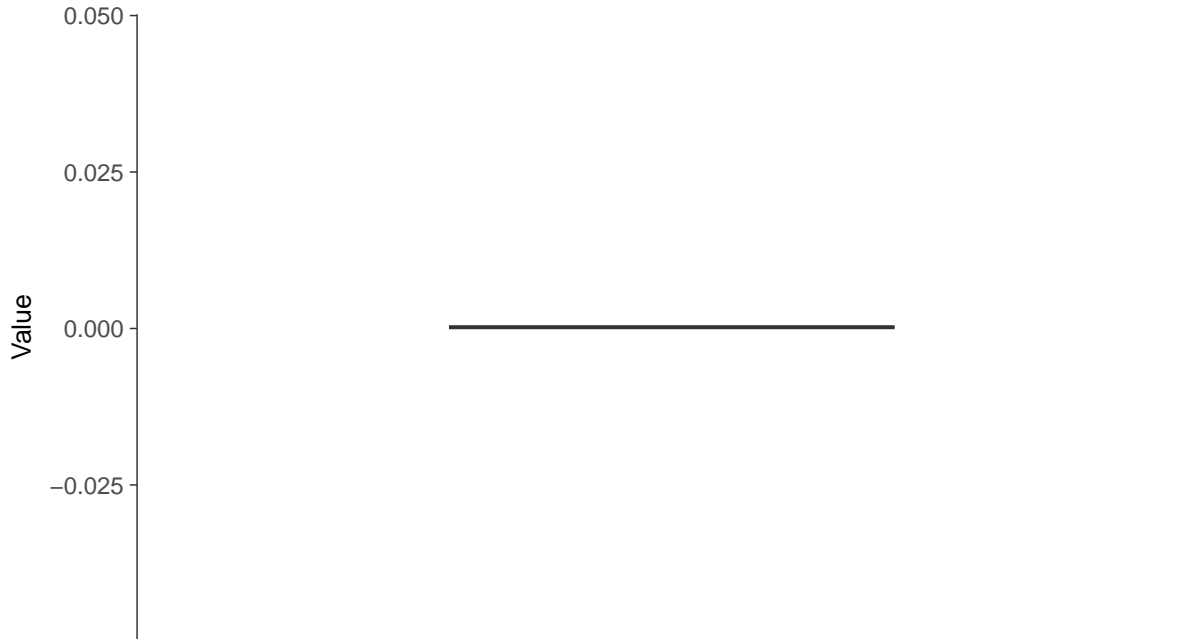
ID: 2\_20\_7B





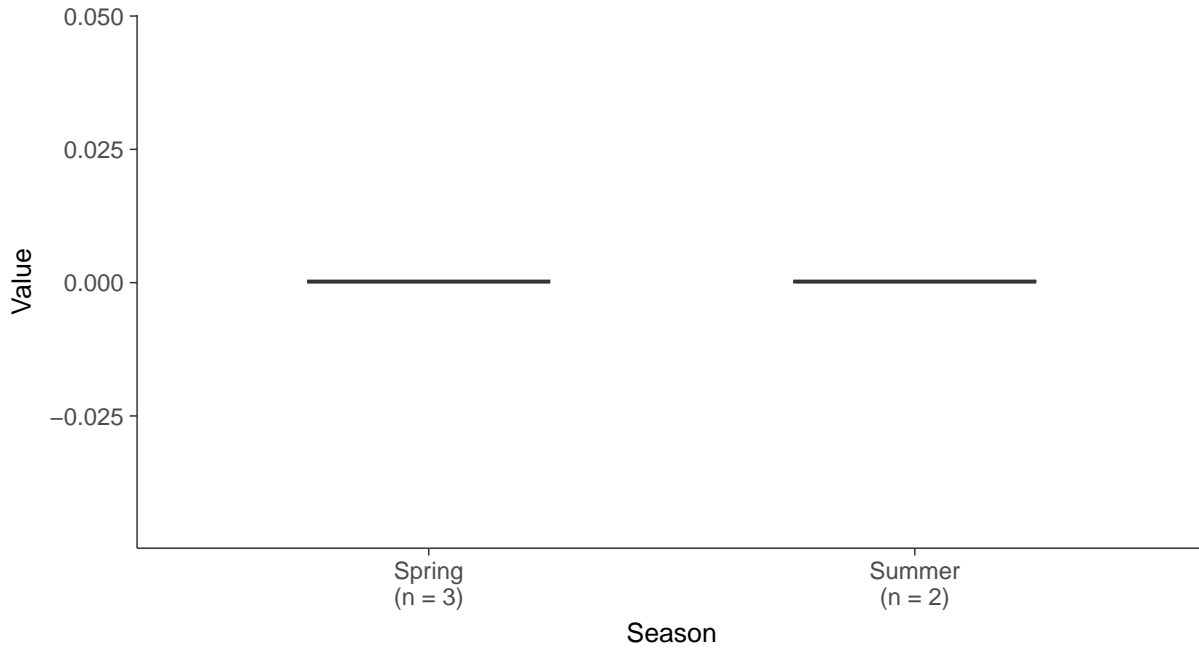
### Boxplot

Mercury, MW-7B (mg/L)



### Boxplot by Season

Mercury, MW-7B (mg/L)



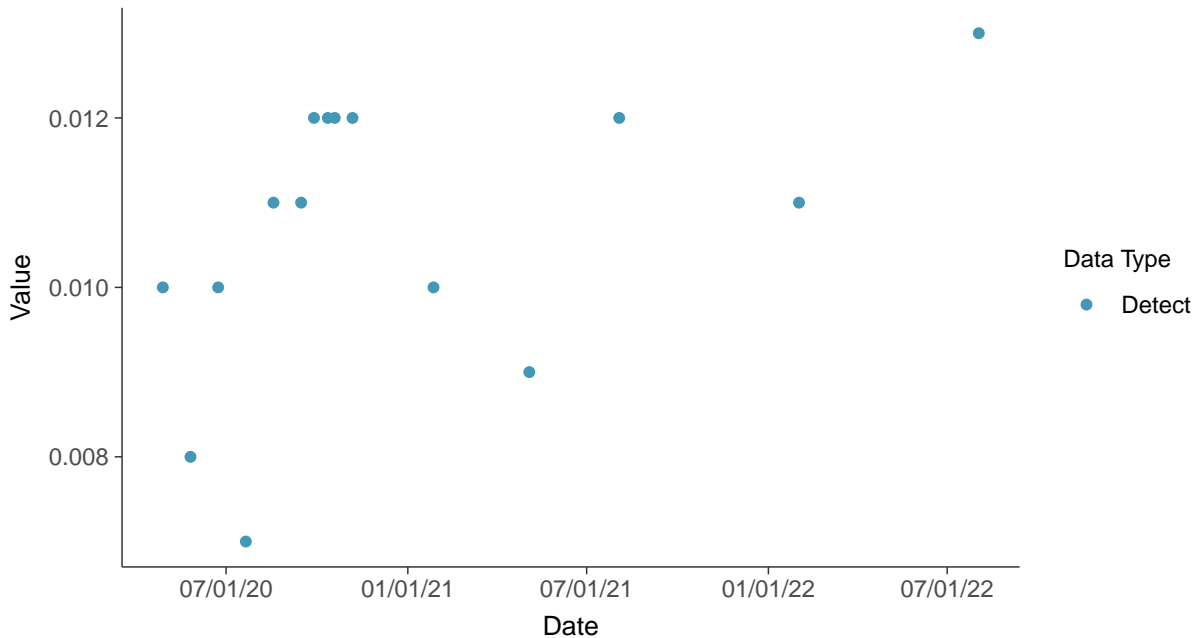


### Appendix IV: Molybdenum, MW-2

ID: 2\_21\_02

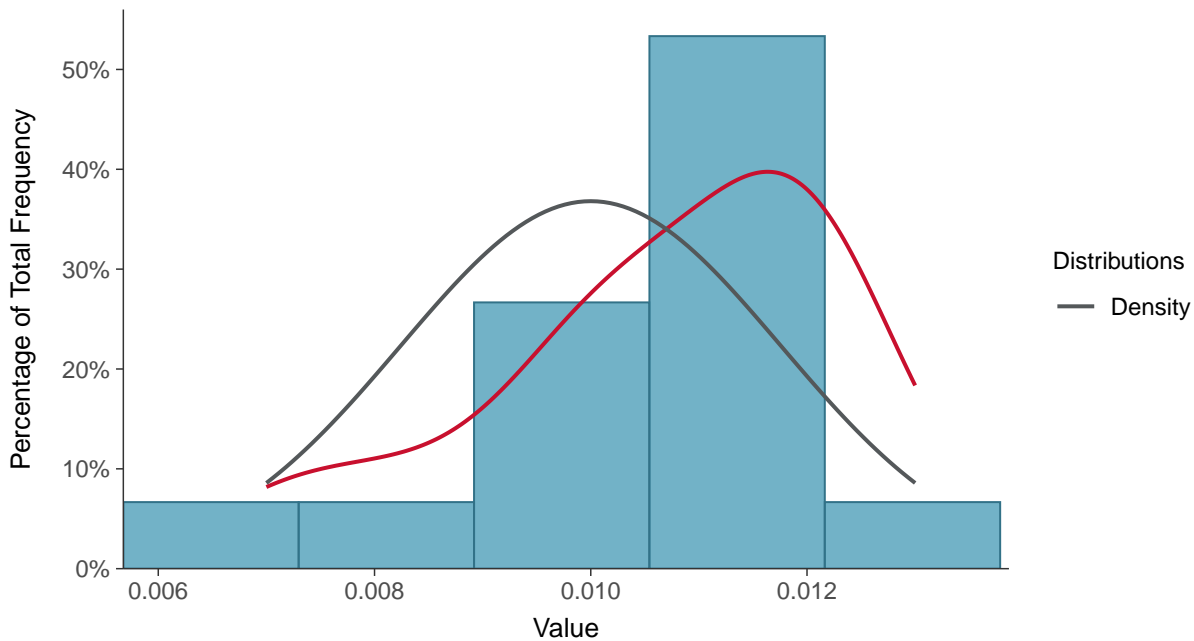
#### Scatter Plot

Molybdenum, MW-2 (mg/L)



#### Histogram

Molybdenum, MW-2 (mg/L)

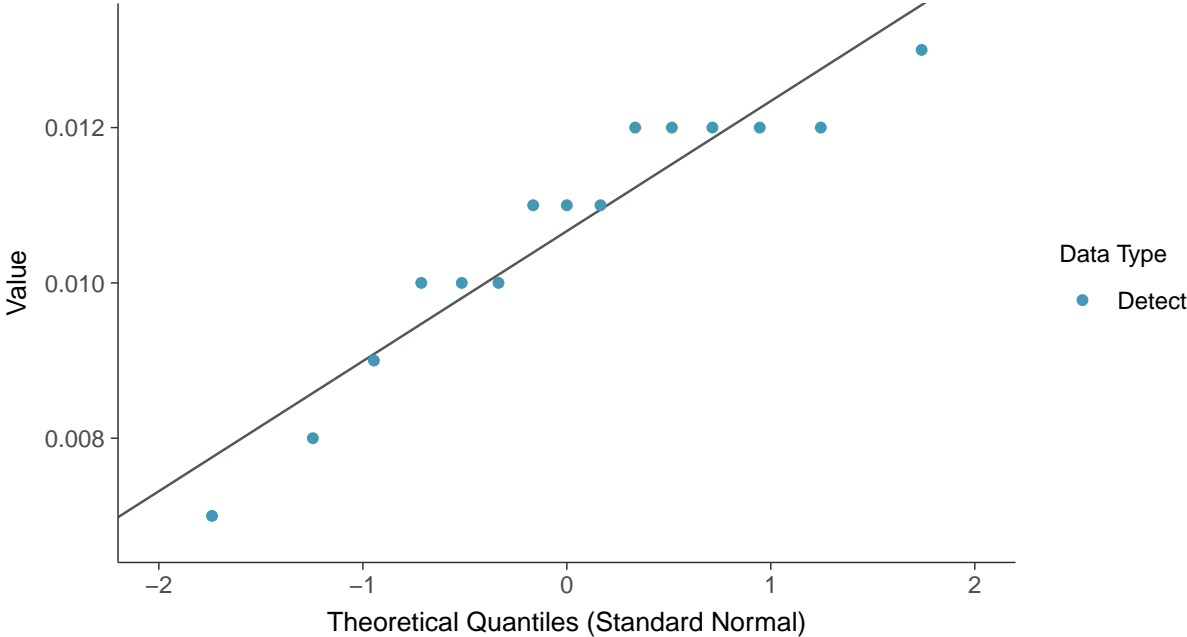






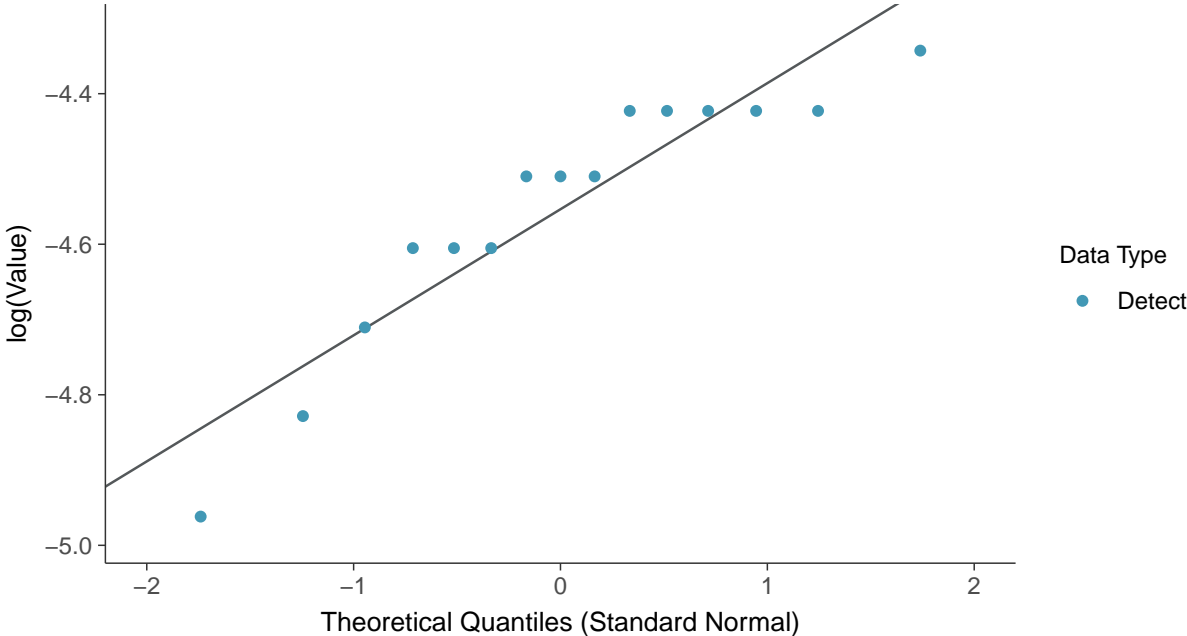
**Normal Q-Q plot**

Molybdenum, MW-2 (mg/L)



**Lognormal Q-Q plot**

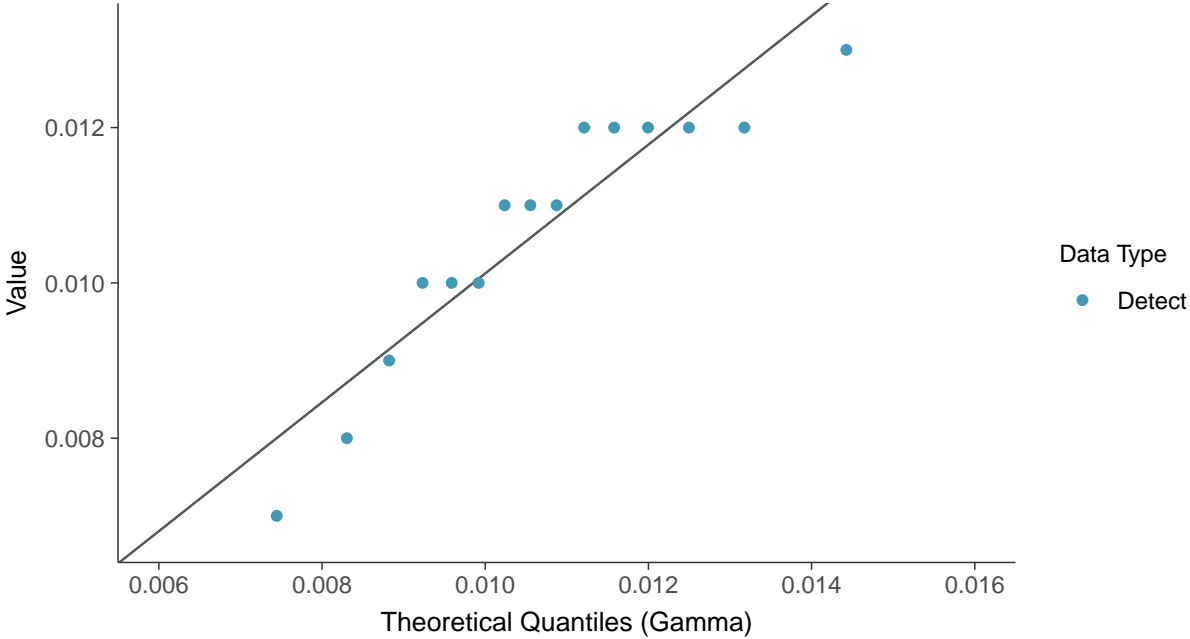
Molybdenum, MW-2 (mg/L)





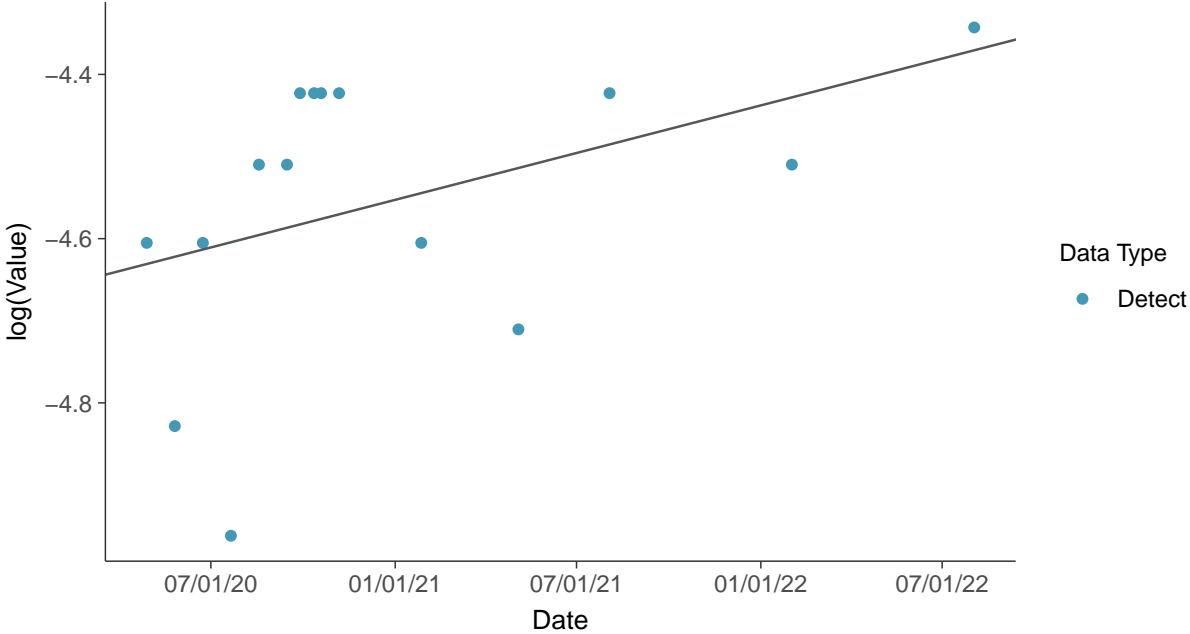
### Gamma Q-Q plot

Molybdenum, MW-2 (mg/L)



### Trend Regression: Lognormal MLE

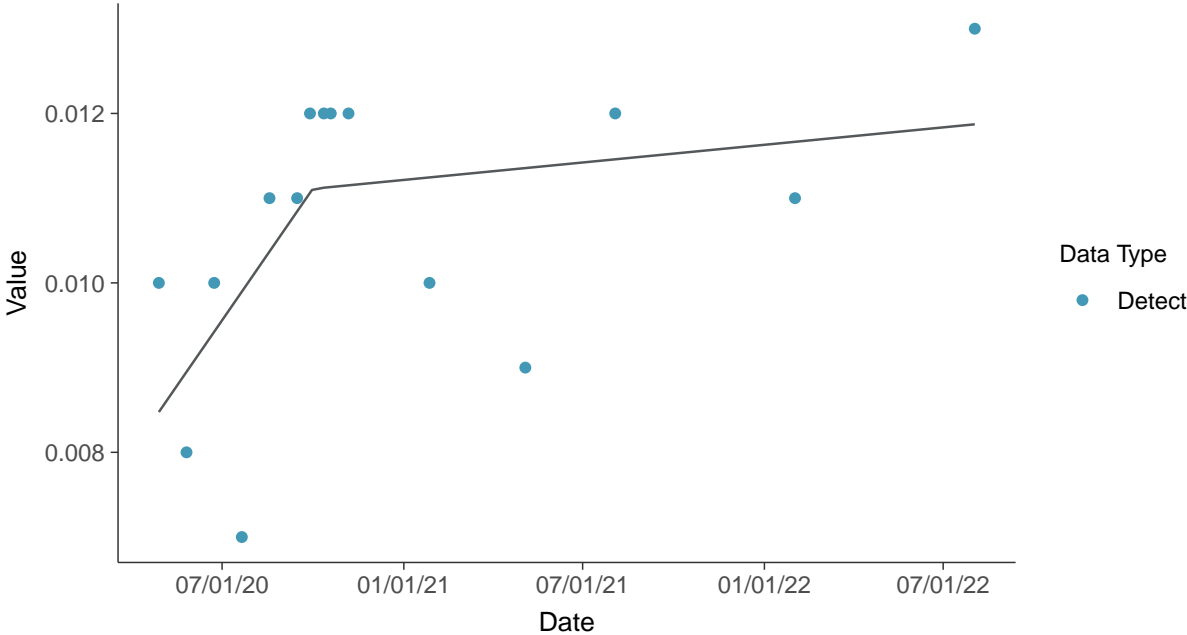
Molybdenum, MW-2 (mg/L)





### Trend Regression: Piecewise Linear-Linear

Molybdenum, MW-2 (mg/L)

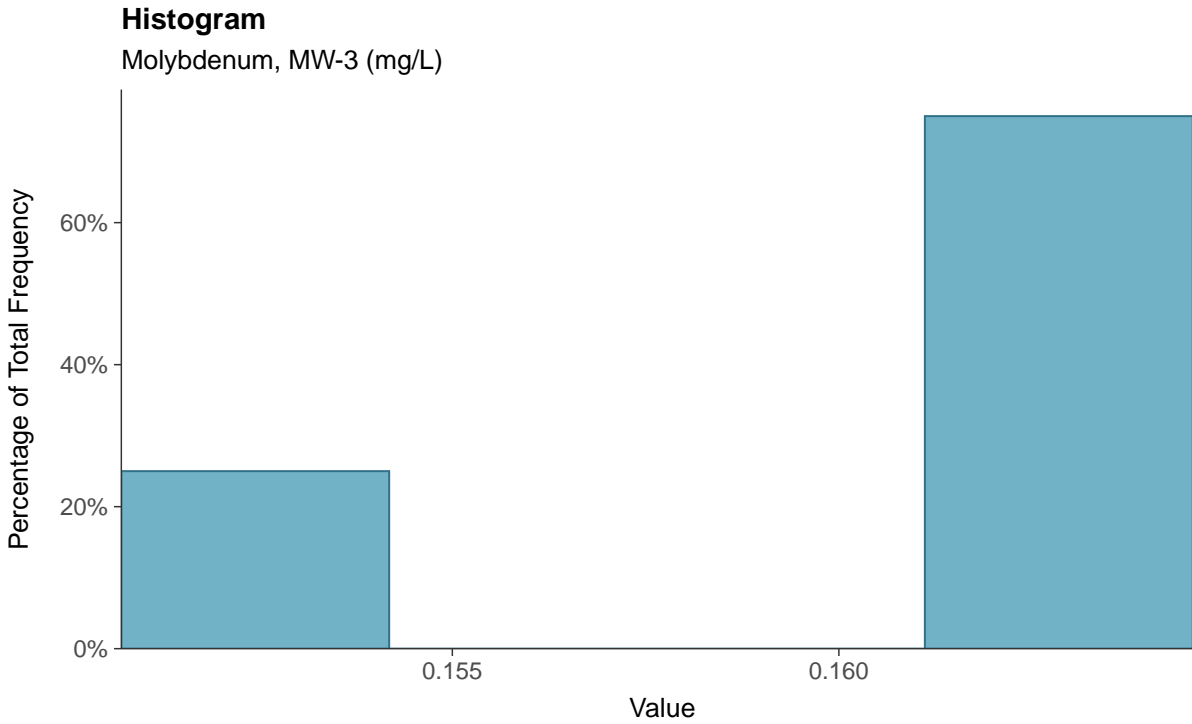
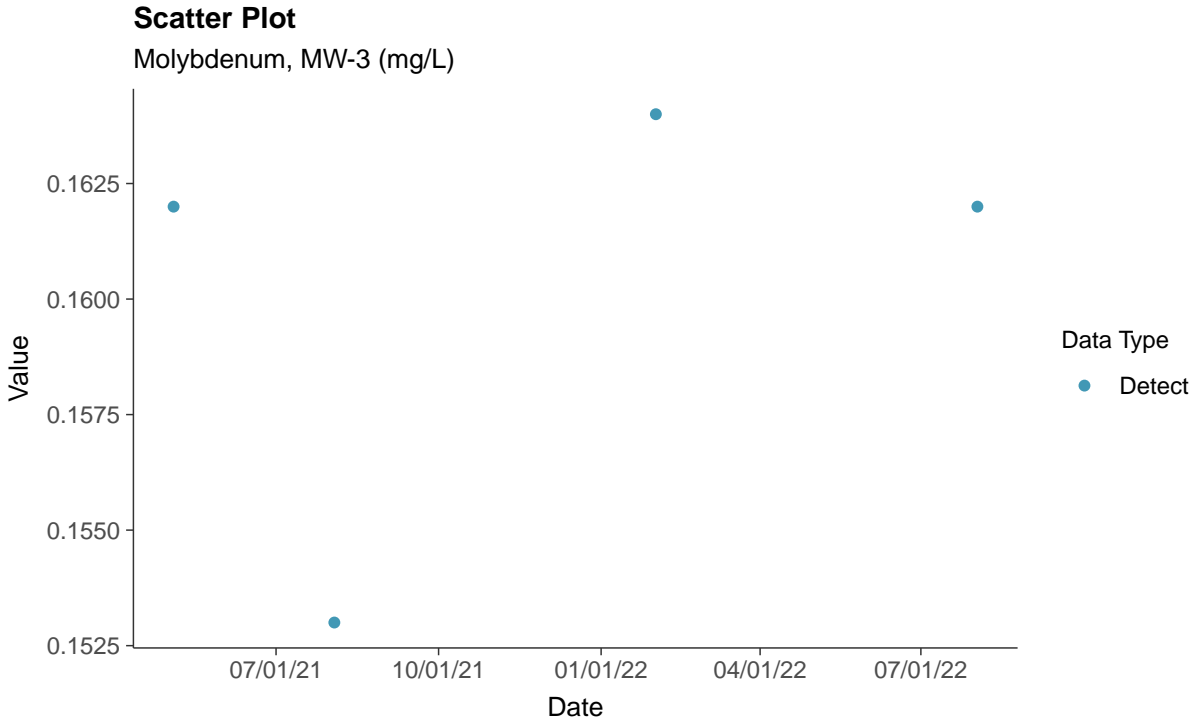






### Appendix IV: Molybdenum, MW-3

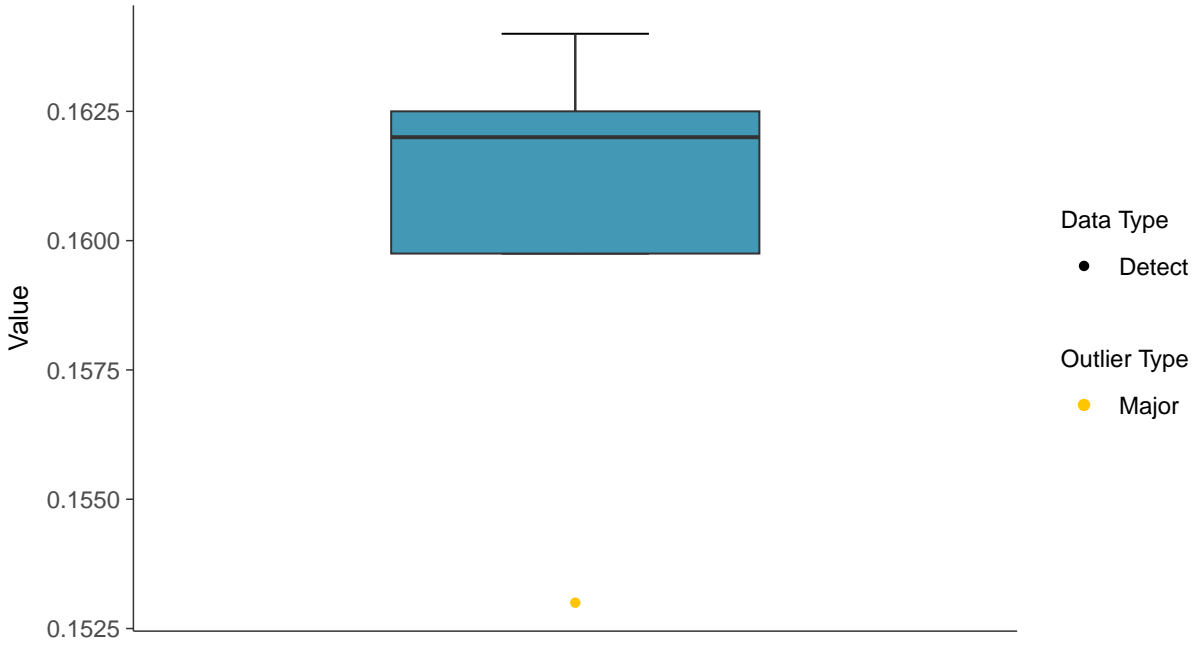
ID: 2\_21\_03





**Boxplot**

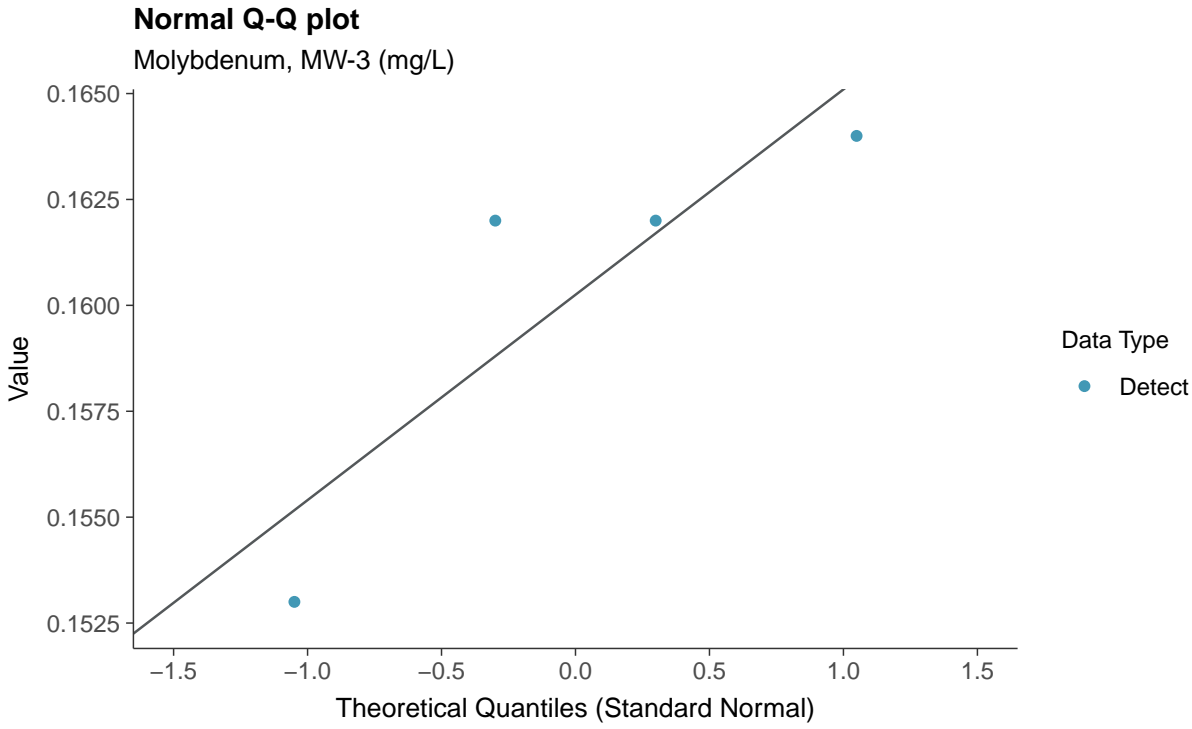
Molybdenum, MW-3 (mg/L)



**Boxplot by Season**

Molybdenum, MW-3 (mg/L)

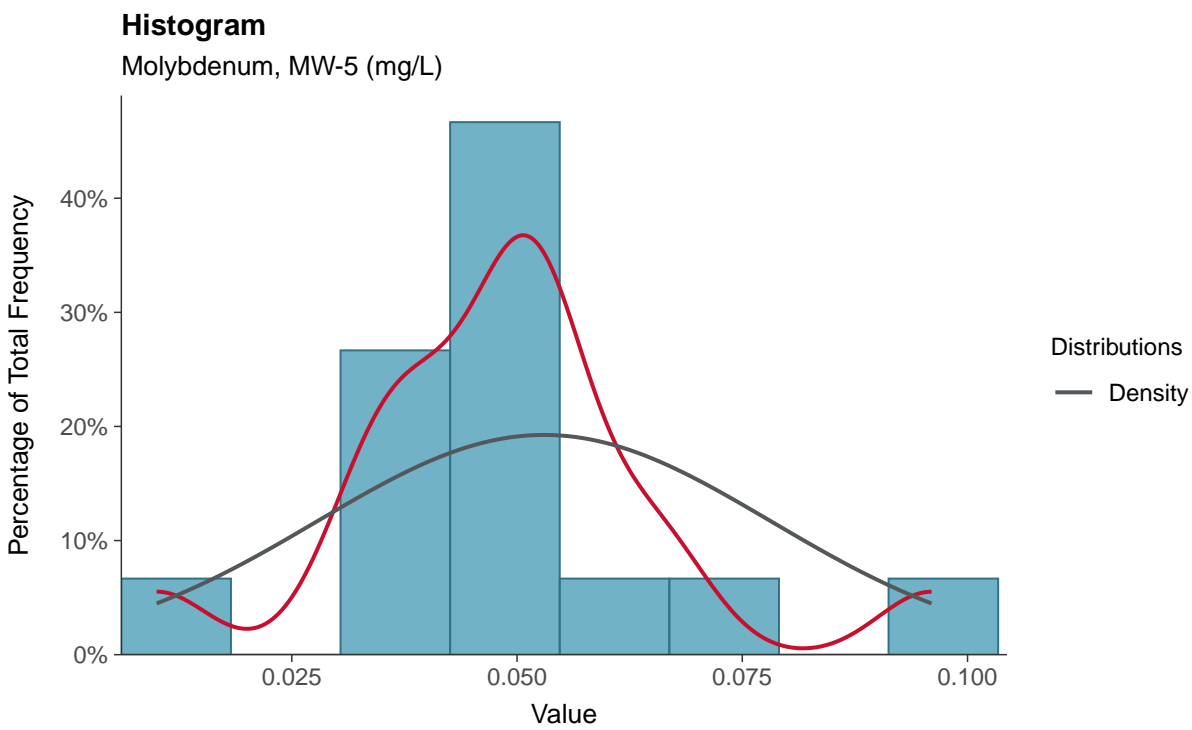
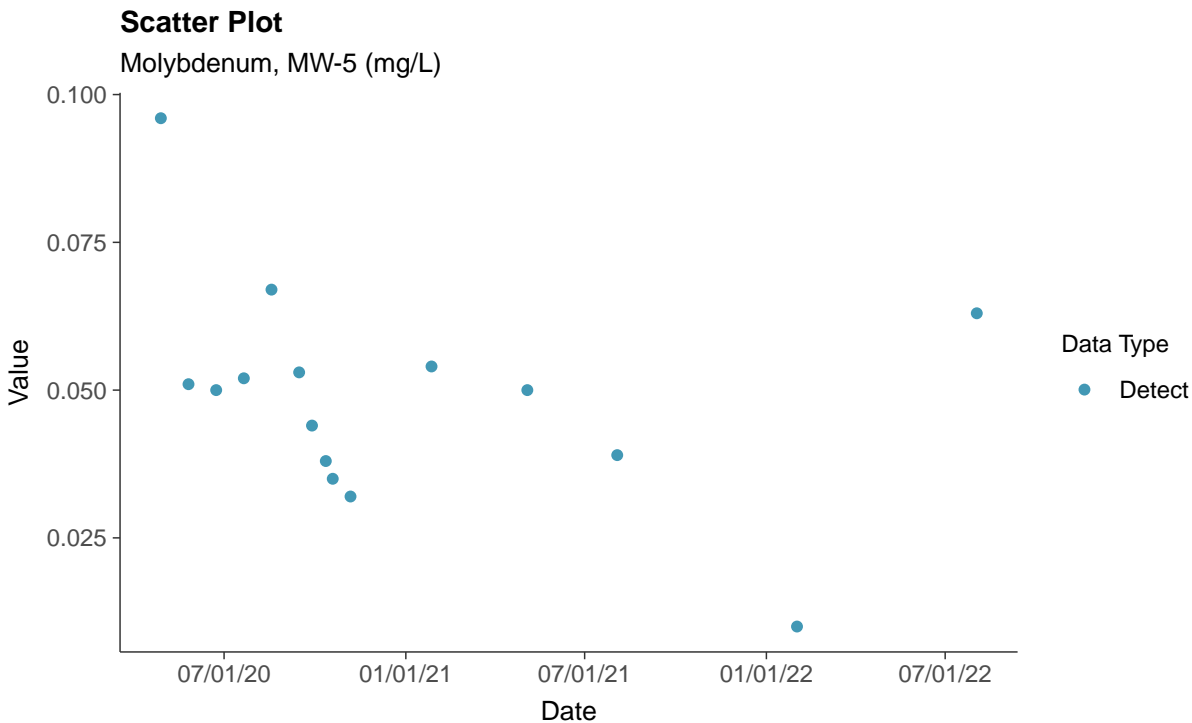






### Appendix IV: Molybdenum, MW-5

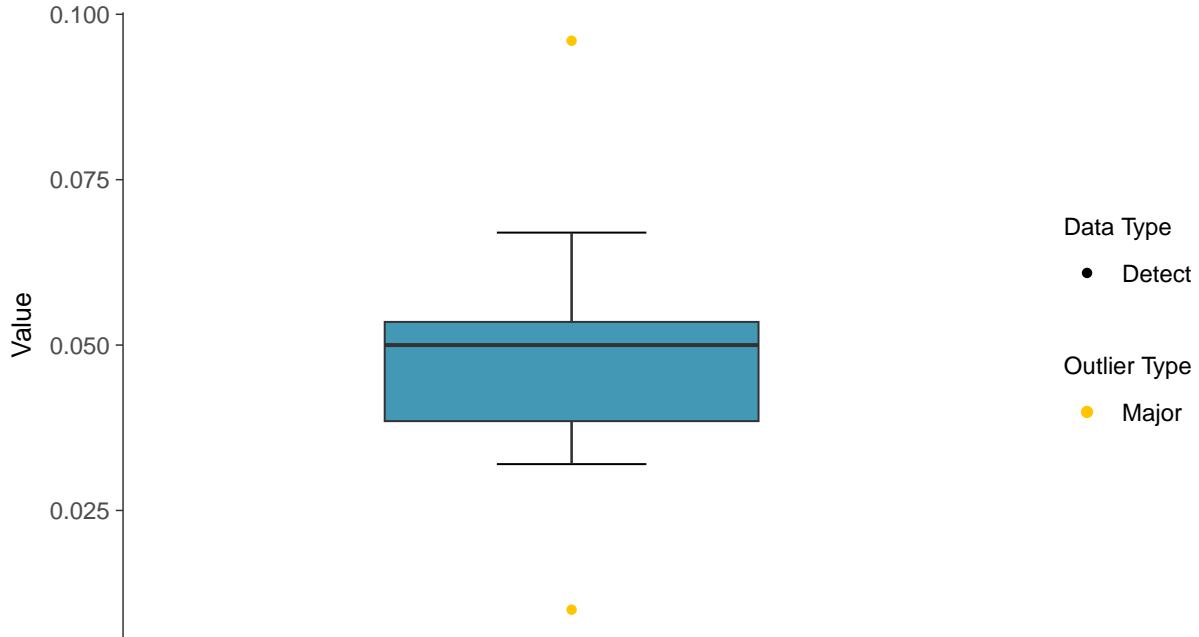
ID: 2\_21\_05





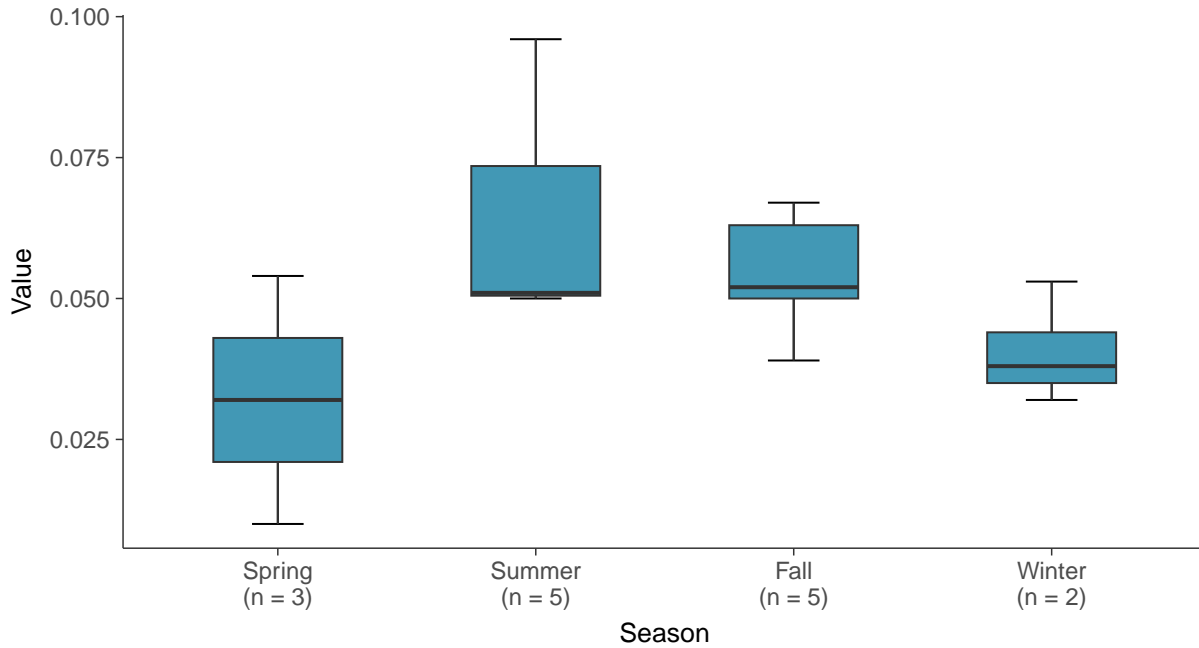
### Boxplot

Molybdenum, MW-5 (mg/L)



### Boxplot by Season

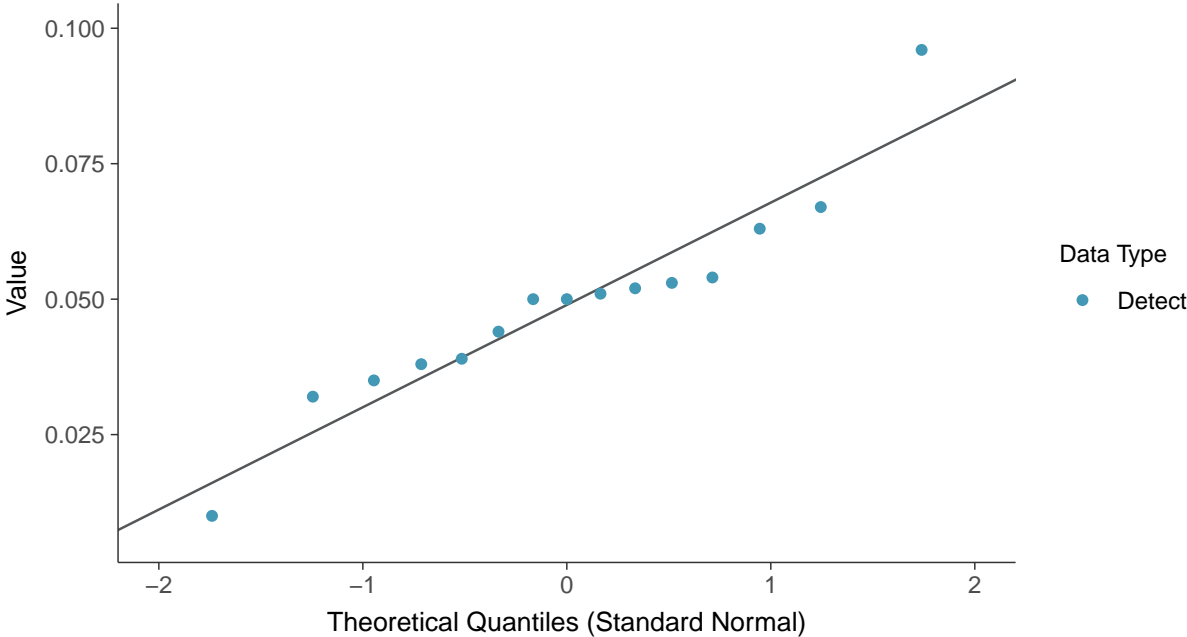
Molybdenum, MW-5 (mg/L)





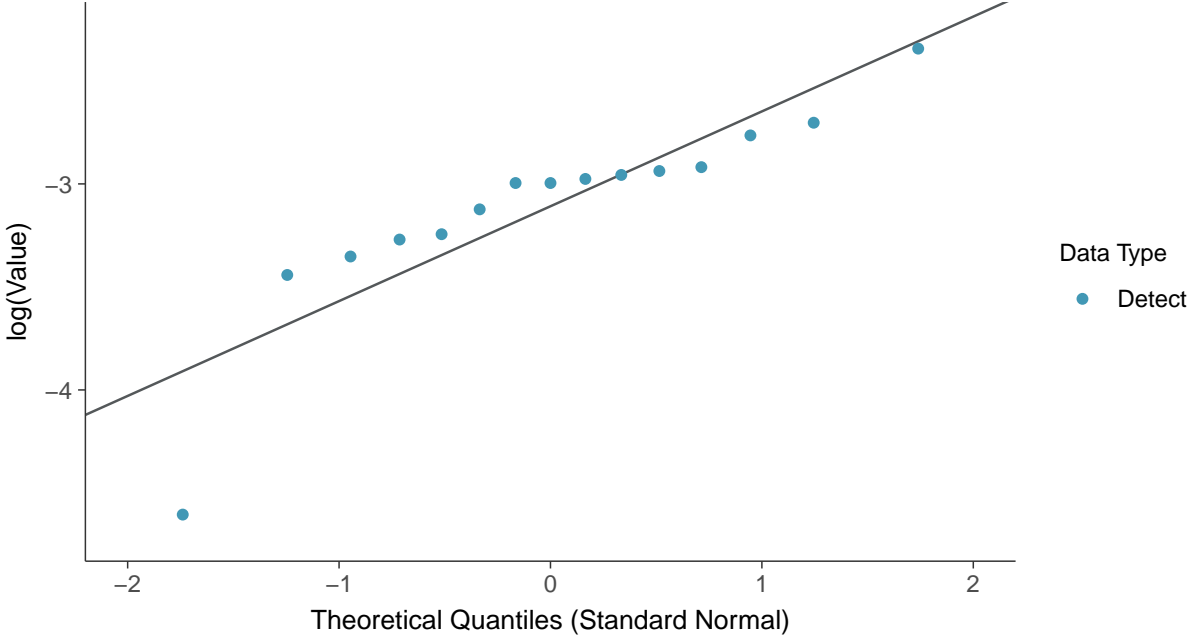
**Normal Q-Q plot**

Molybdenum, MW-5 (mg/L)



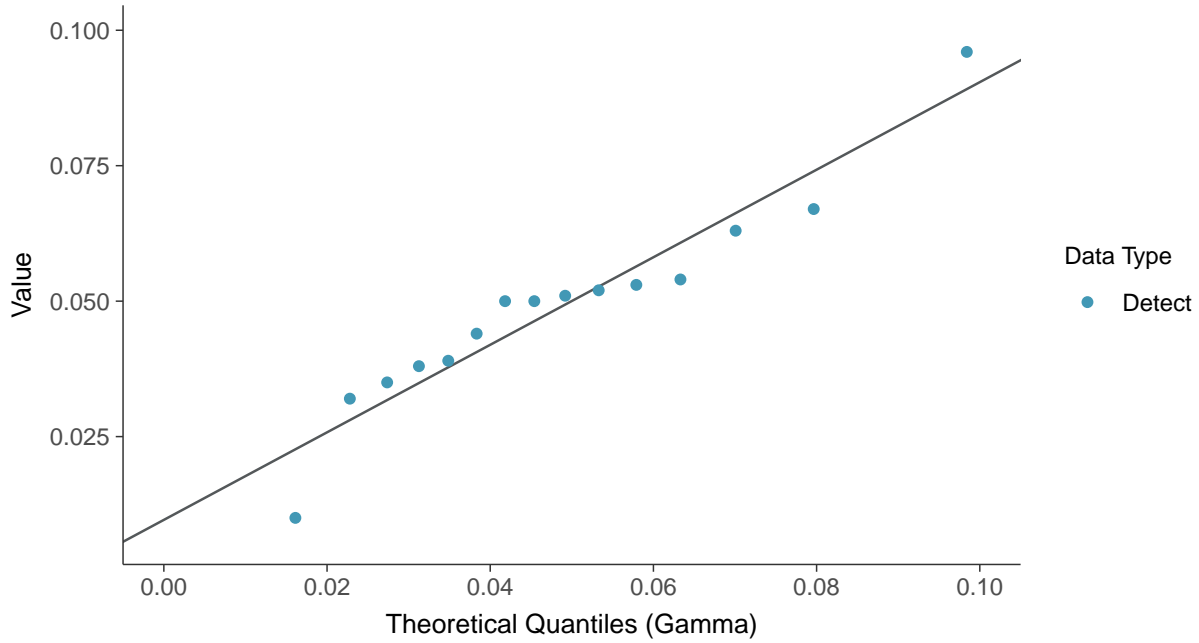
**Lognormal Q-Q plot**

Molybdenum, MW-5 (mg/L)

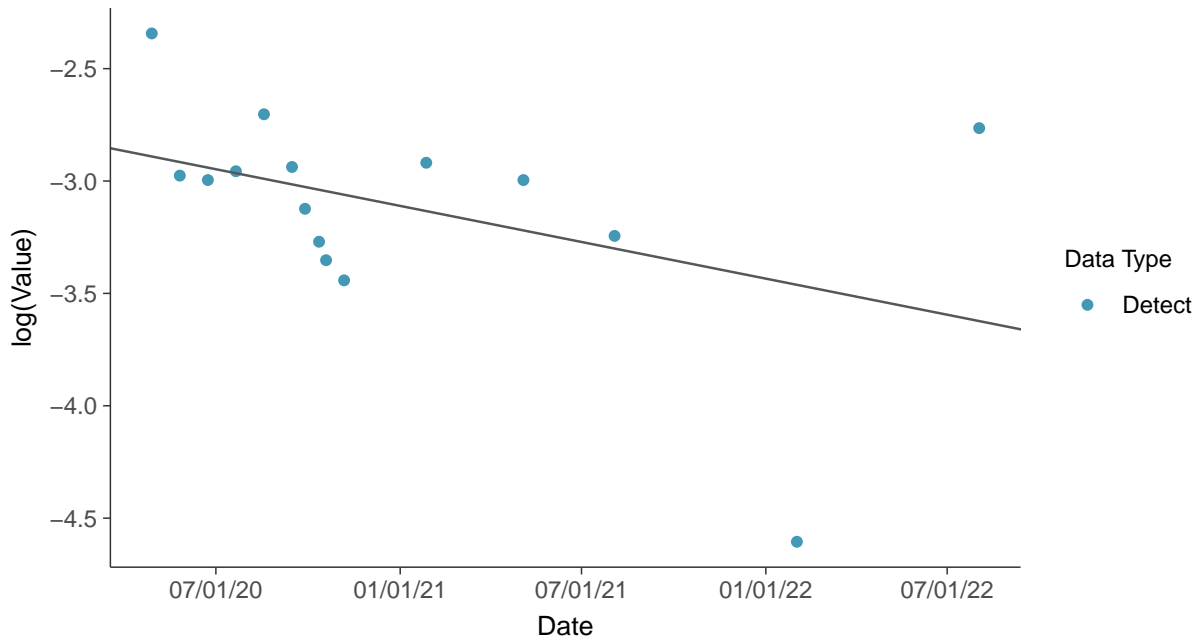




**Gamma Q-Q plot**  
Molybdenum, MW-5 (mg/L)



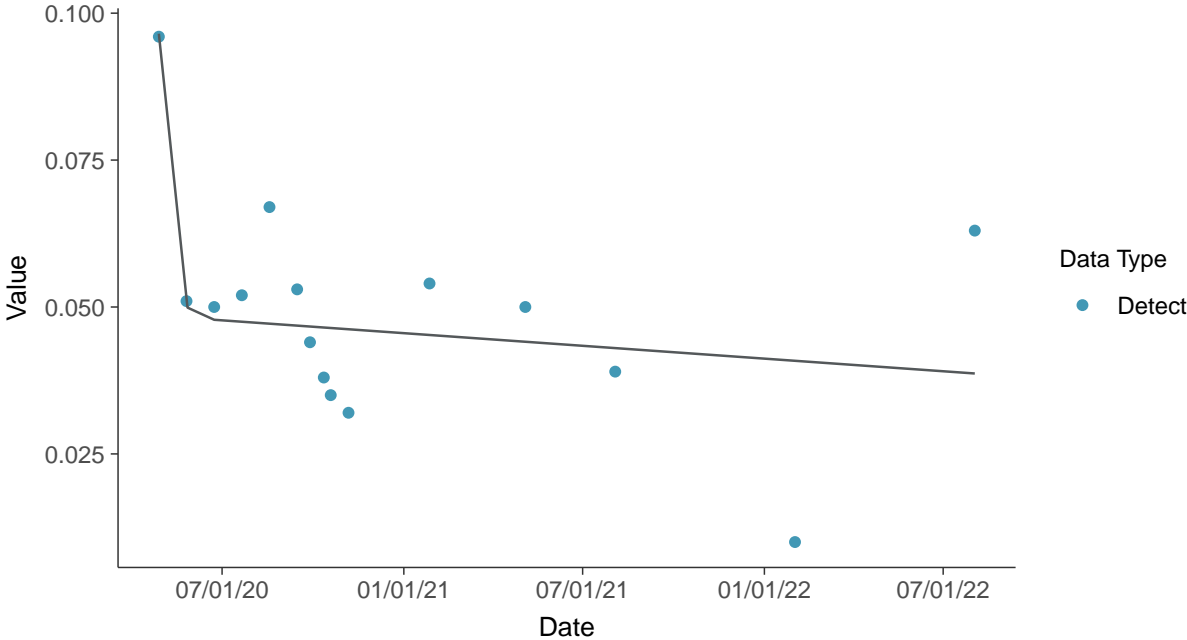
**Trend Regression: Lognormal MLE**  
Molybdenum, MW-5 (mg/L)





### Trend Regression: Piecewise Linear-Linear

Molybdenum, MW-5 (mg/L)

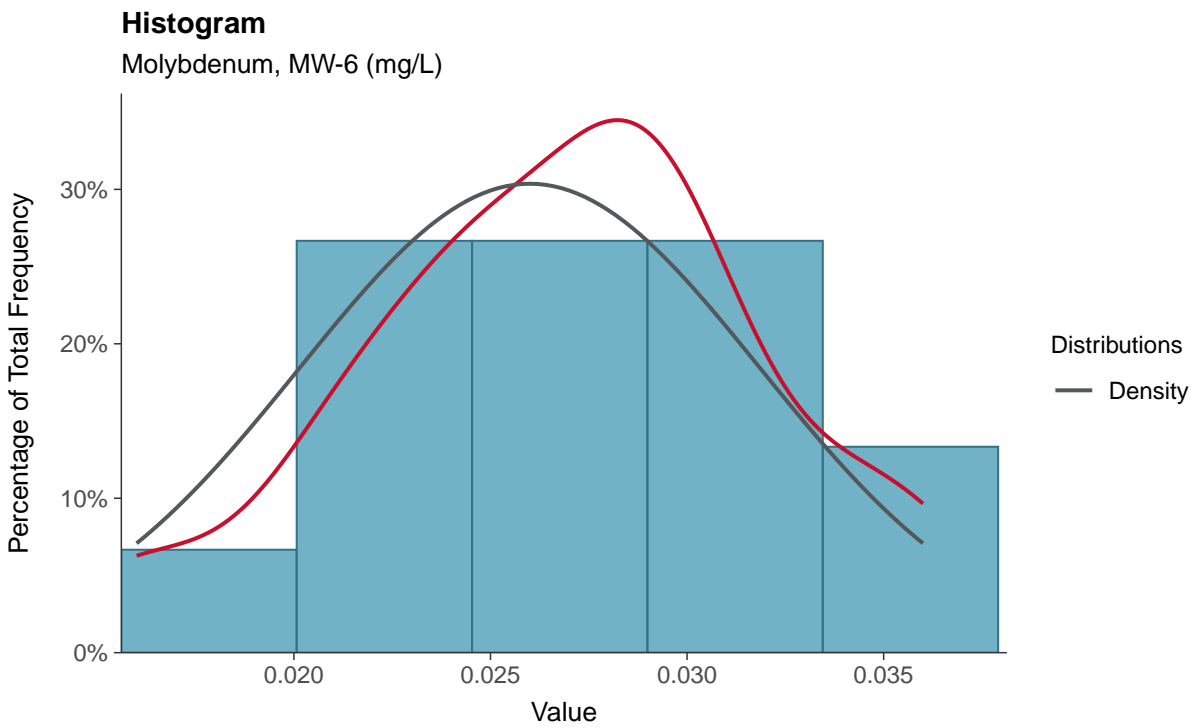
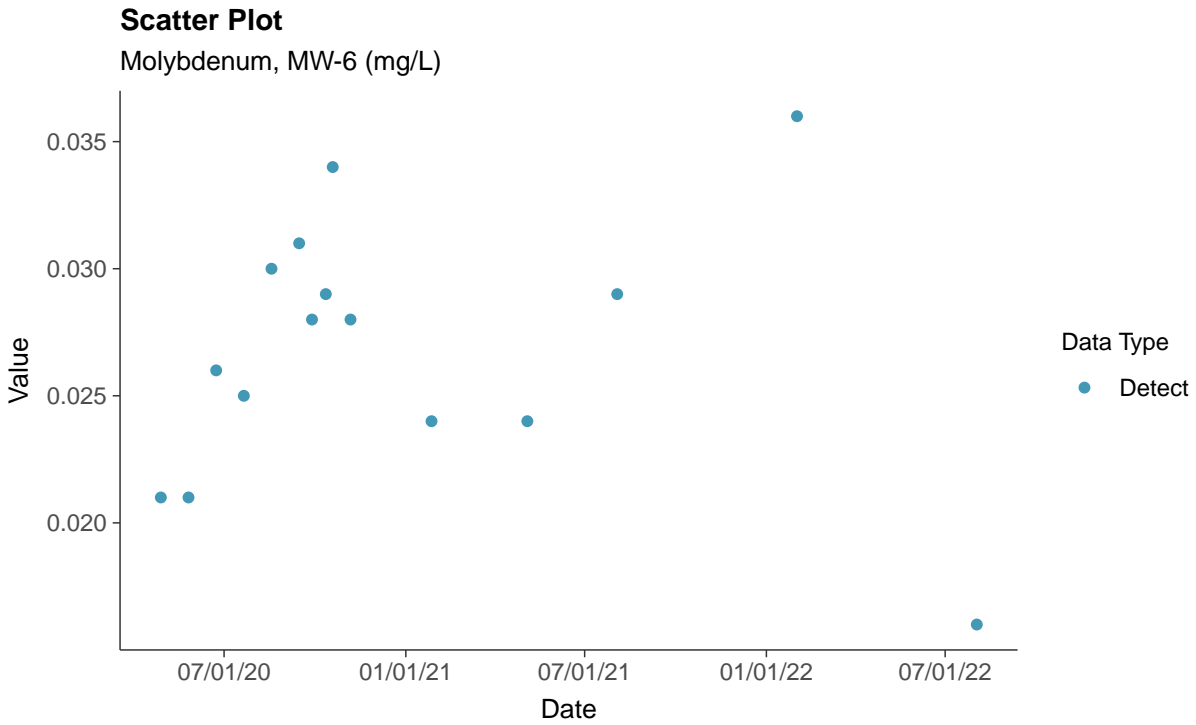






### Appendix IV: Molybdenum, MW-6

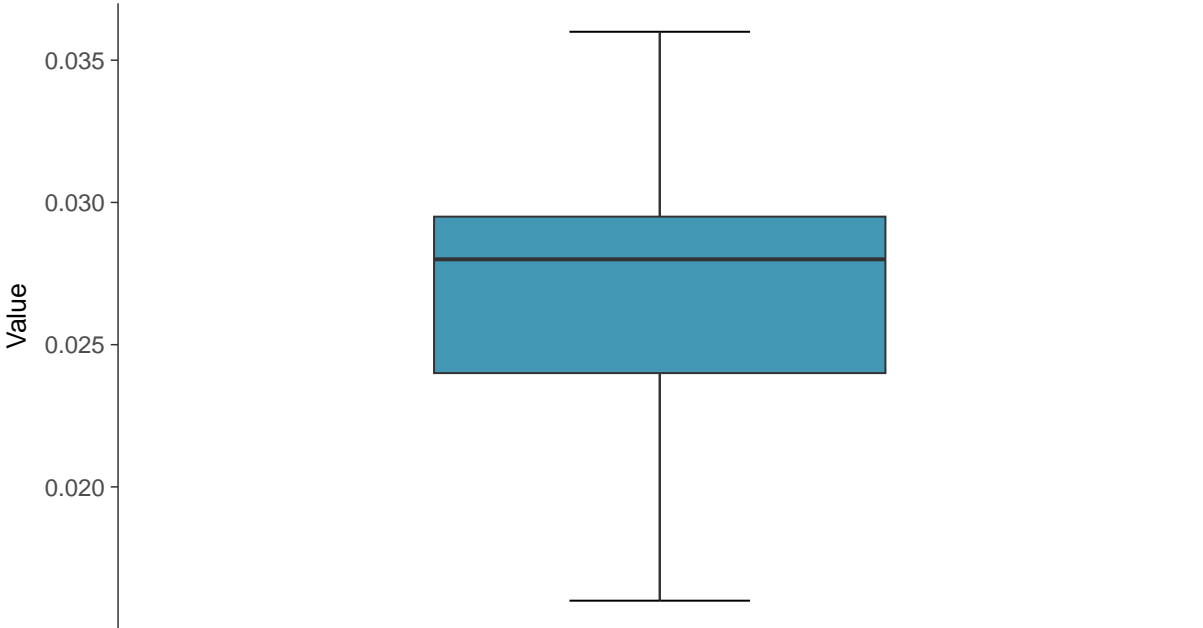
ID: 2\_21\_06





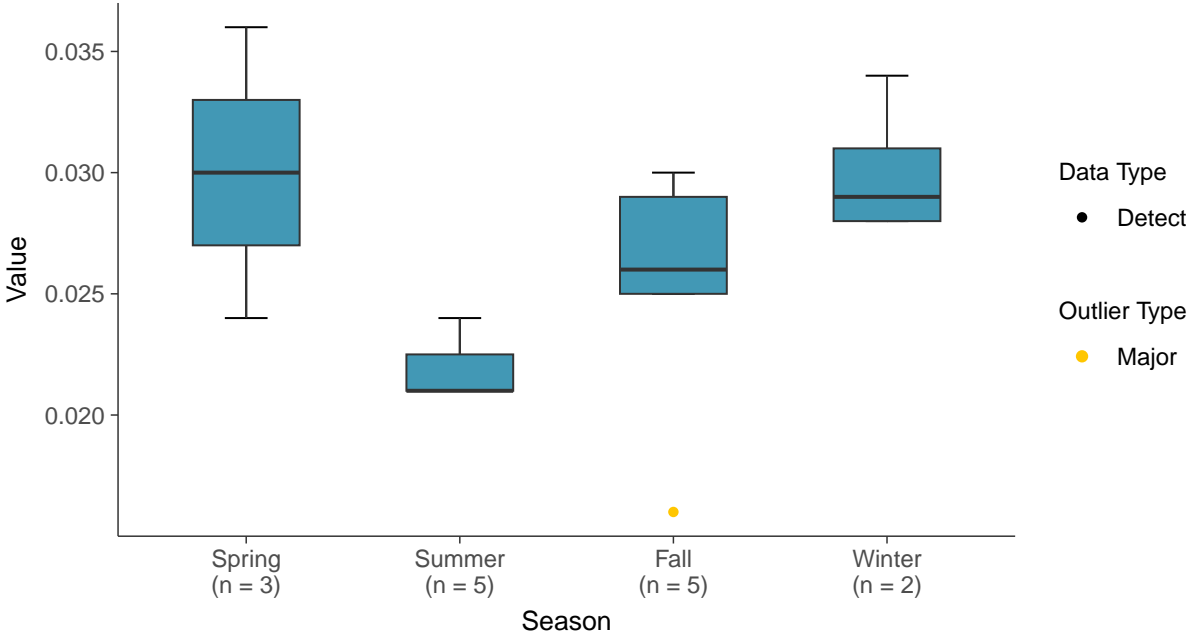
**Boxplot**

Molybdenum, MW-6 (mg/L)



**Boxplot by Season**

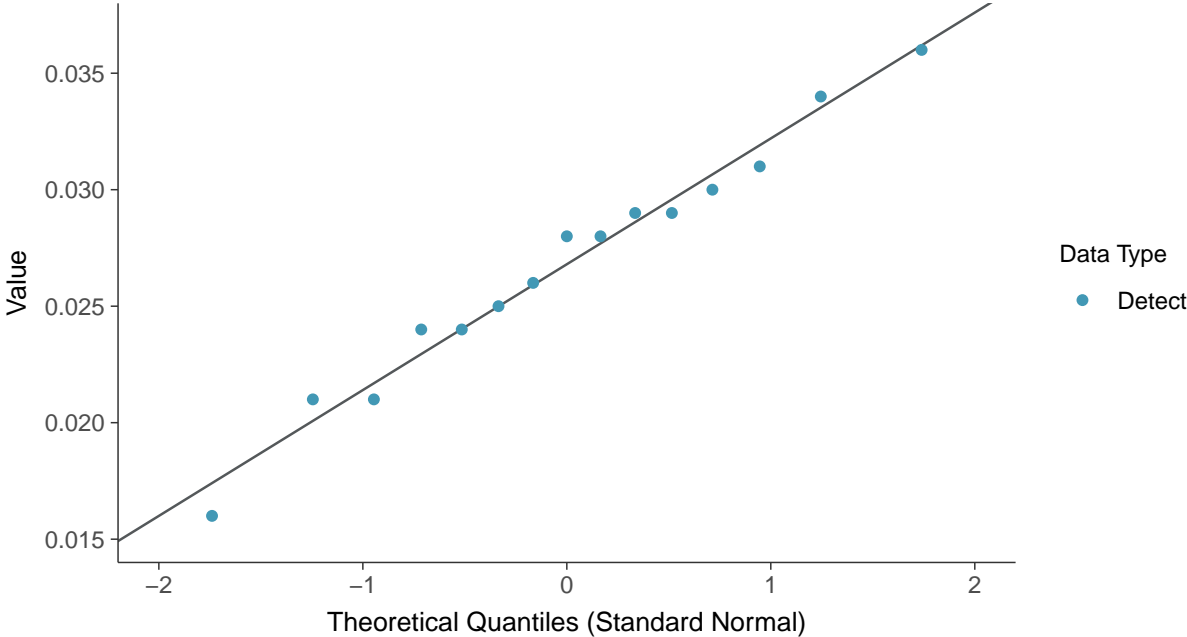
Molybdenum, MW-6 (mg/L)





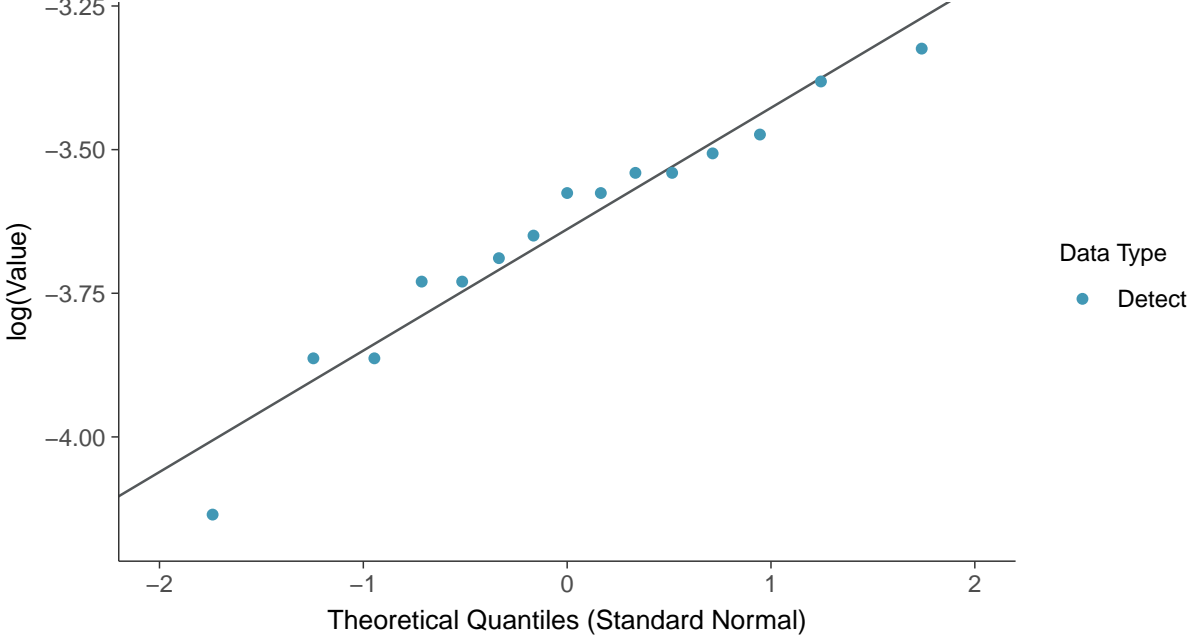
**Normal Q-Q plot**

Molybdenum, MW-6 (mg/L)



**Lognormal Q-Q plot**

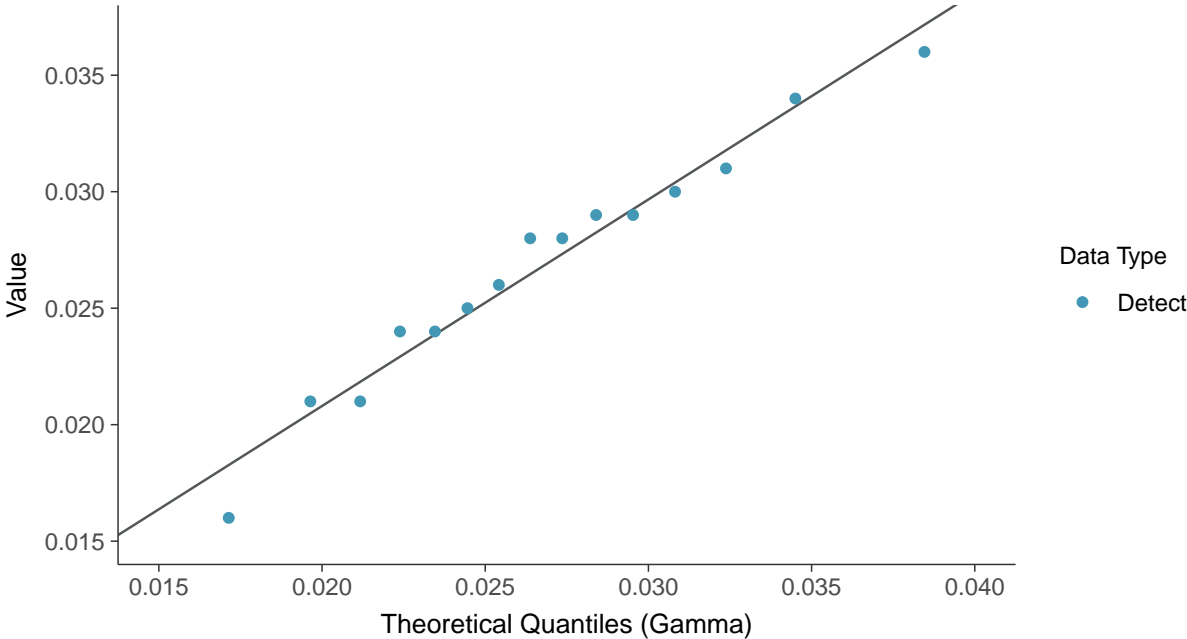
Molybdenum, MW-6 (mg/L)





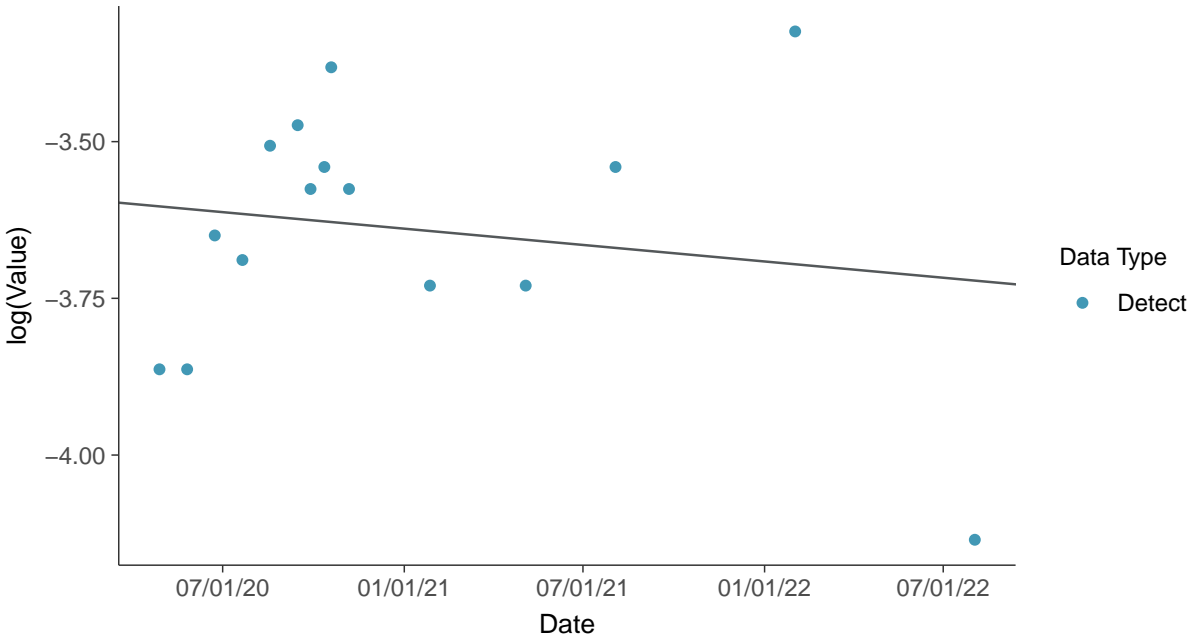
**Gamma Q-Q plot**

Molybdenum, MW-6 (mg/L)



**Trend Regression: Lognormal MLE**

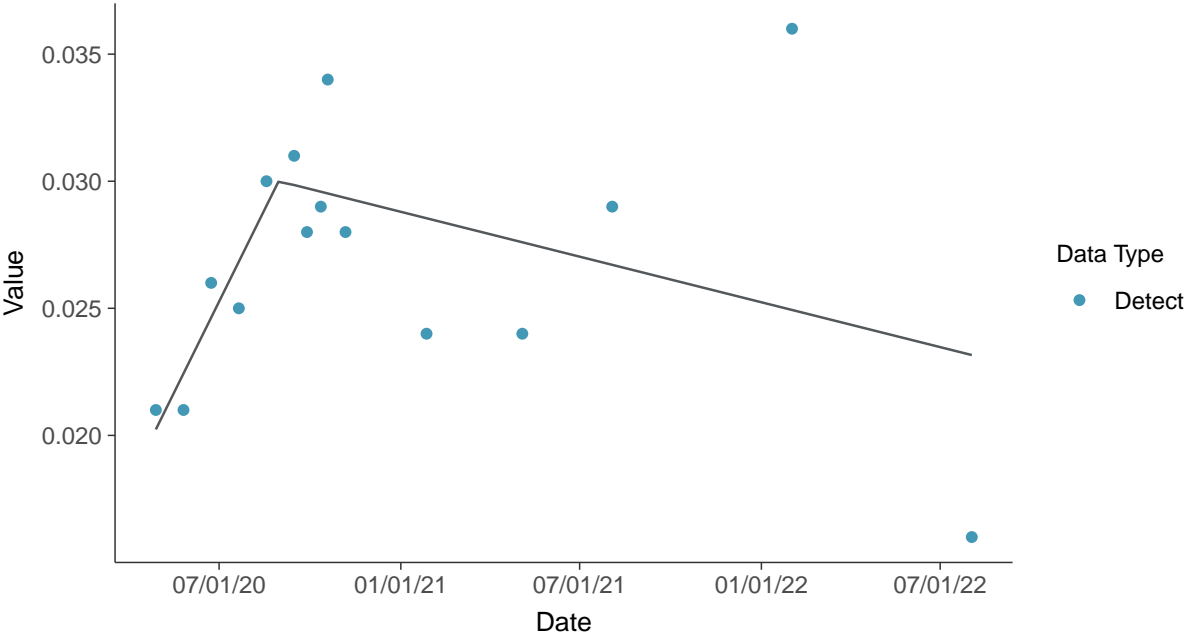
Molybdenum, MW-6 (mg/L)





### Trend Regression: Piecewise Linear-Linear

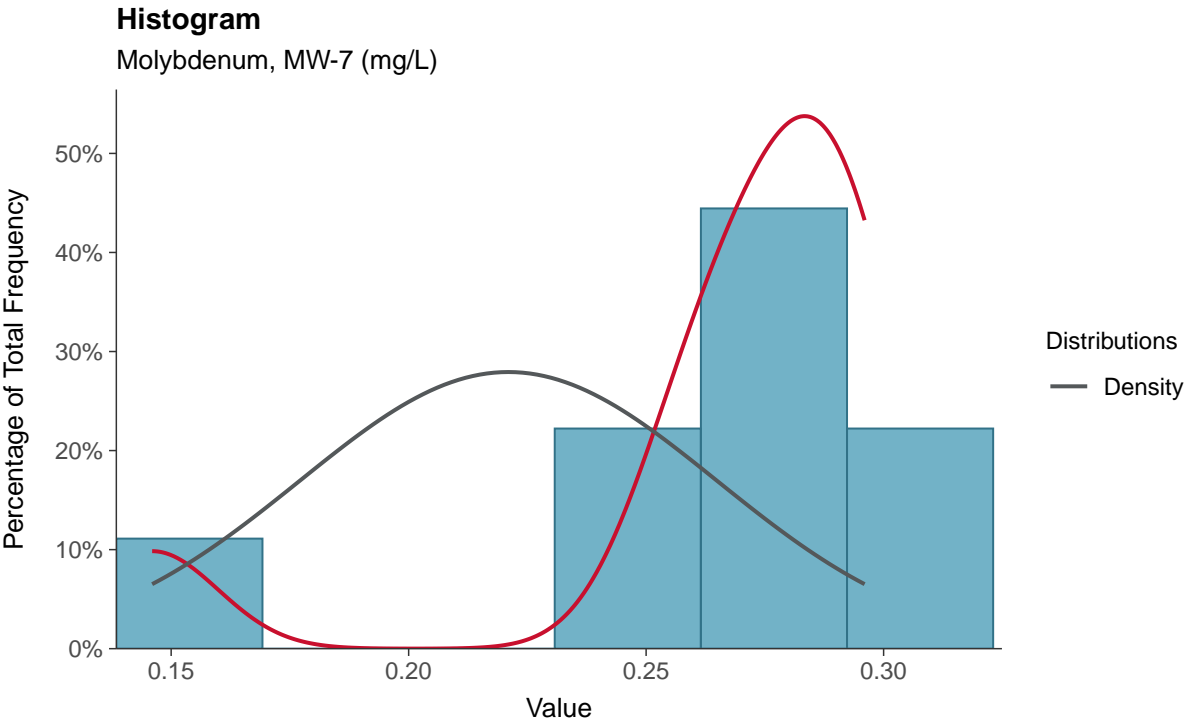
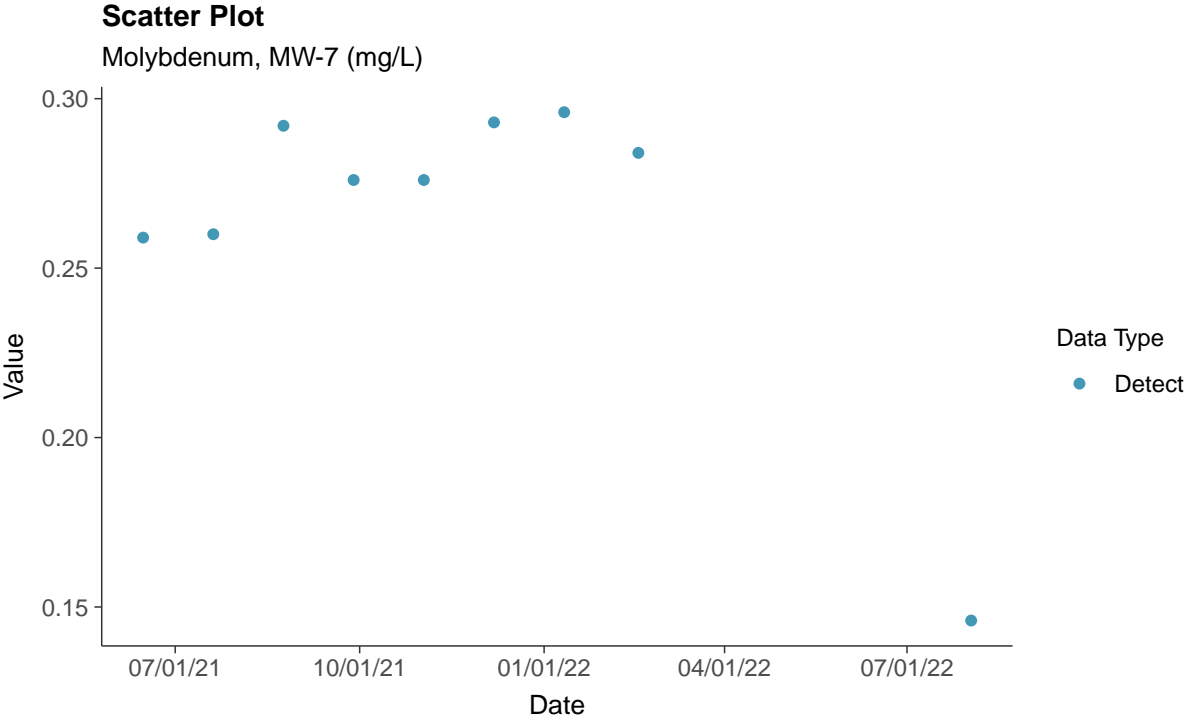
Molybdenum, MW-6 (mg/L)





### Appendix IV: Molybdenum, MW-7

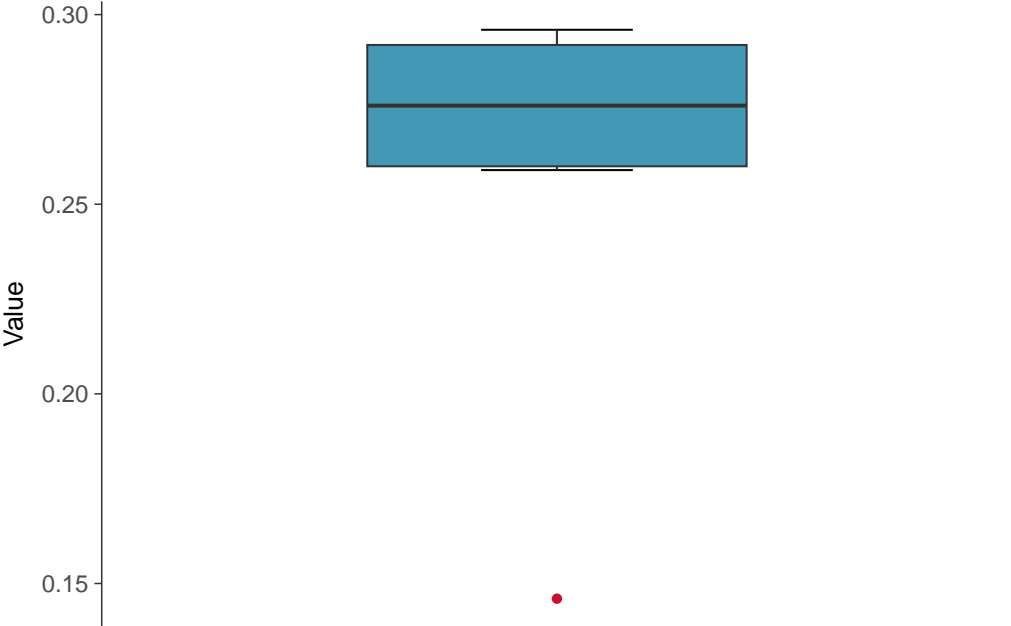
ID: 2\_21\_07





**Boxplot**

Molybdenum, MW-7 (mg/L)



Data Type

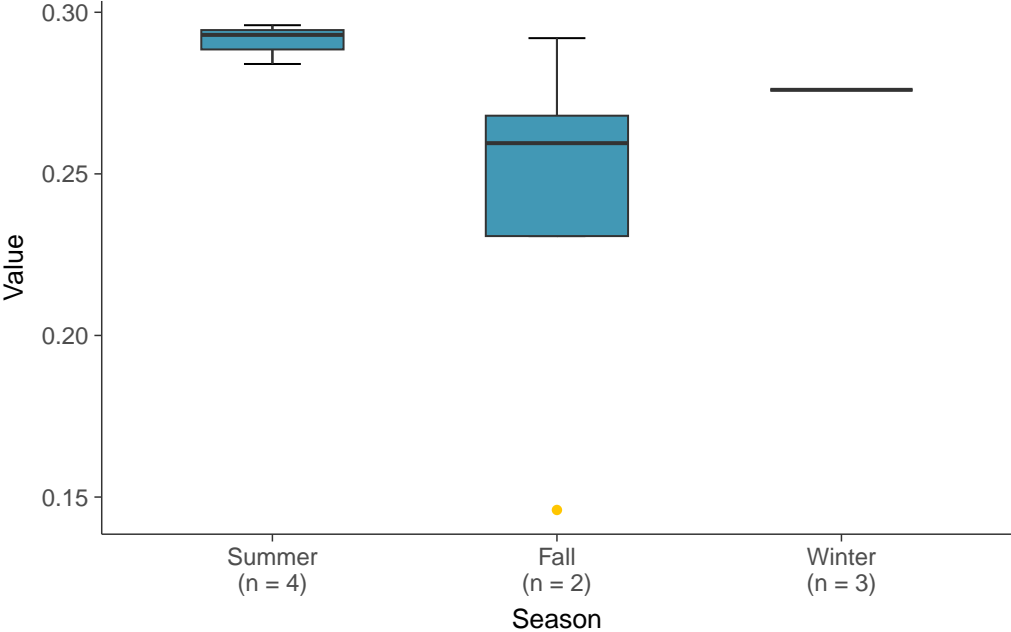
• Detect

Outlier Type

• Major

**Boxplot by Season**

Molybdenum, MW-7 (mg/L)



Data Type

• Detect

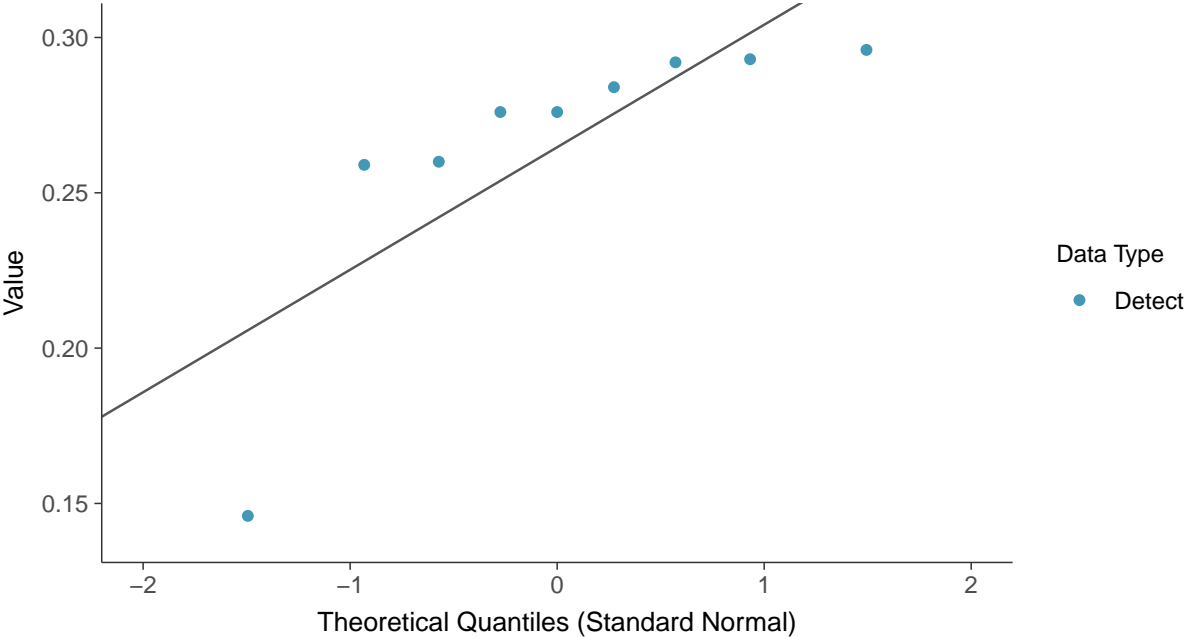
Outlier Type

• Major



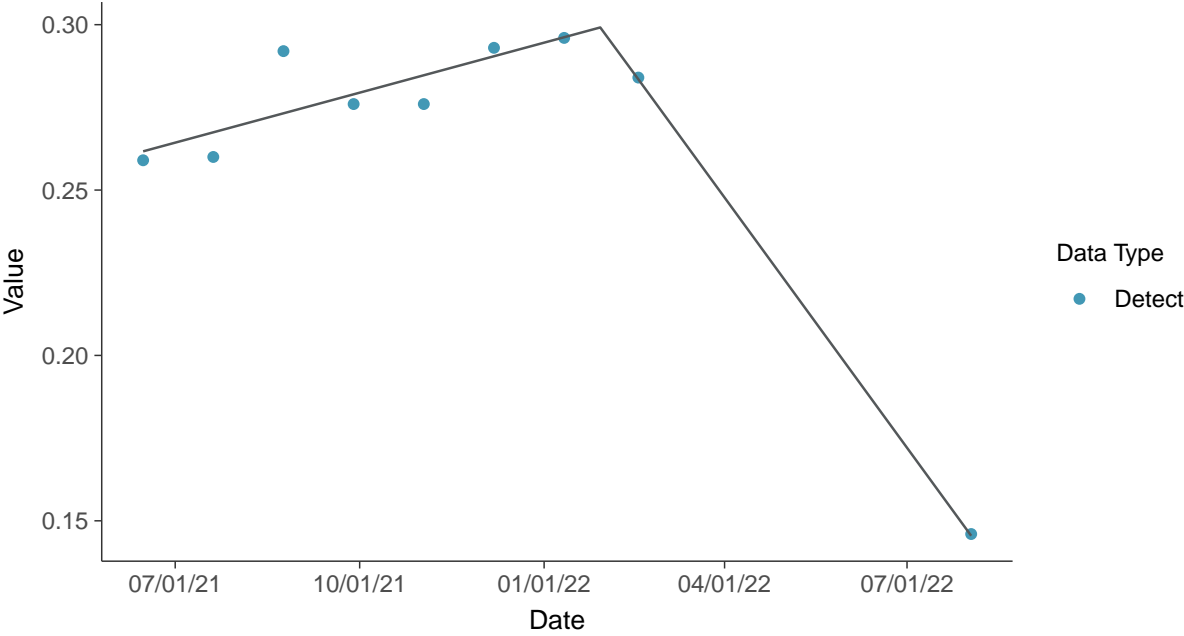
**Normal Q-Q plot**

Molybdenum, MW-7 (mg/L)



**Trend Regression: Piecewise Linear-Linear**

Molybdenum, MW-7 (mg/L)

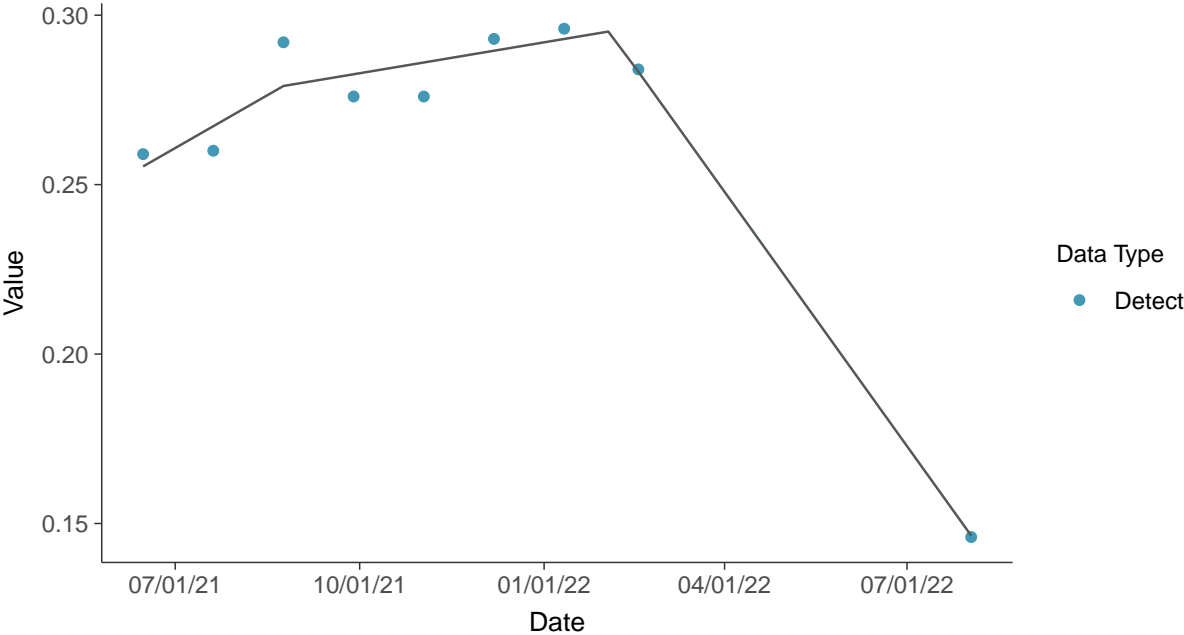






### Trend Regression: Piecewise Linear-Linear-Linear

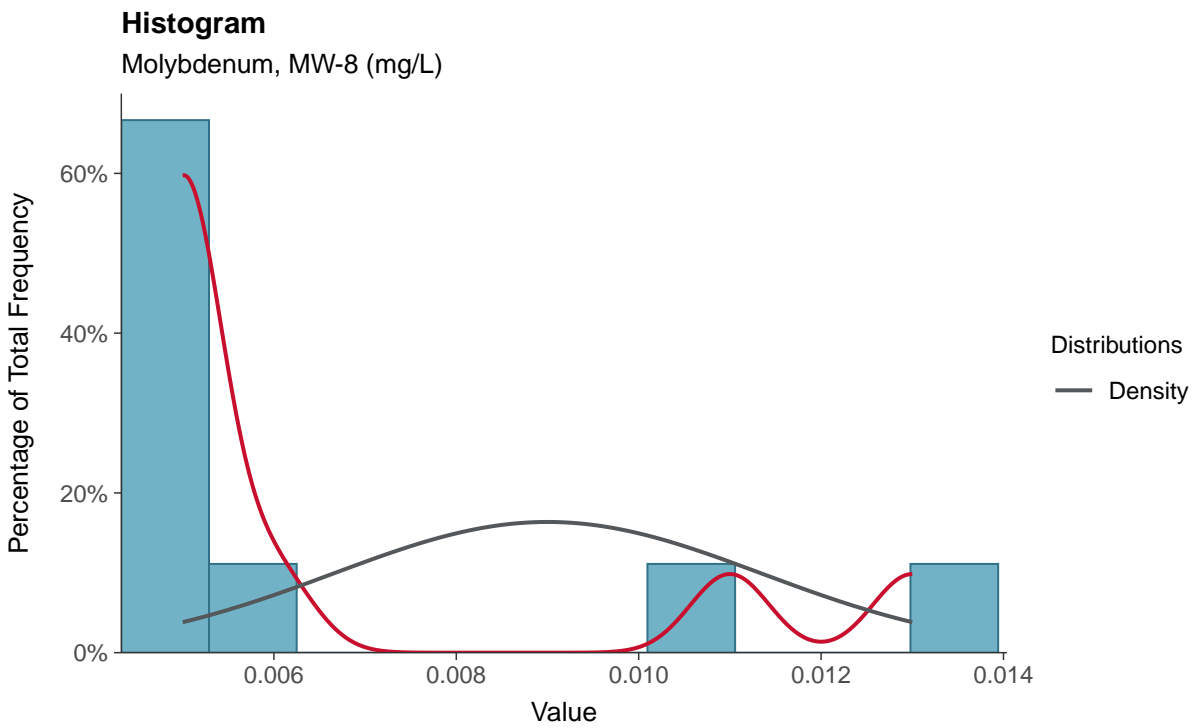
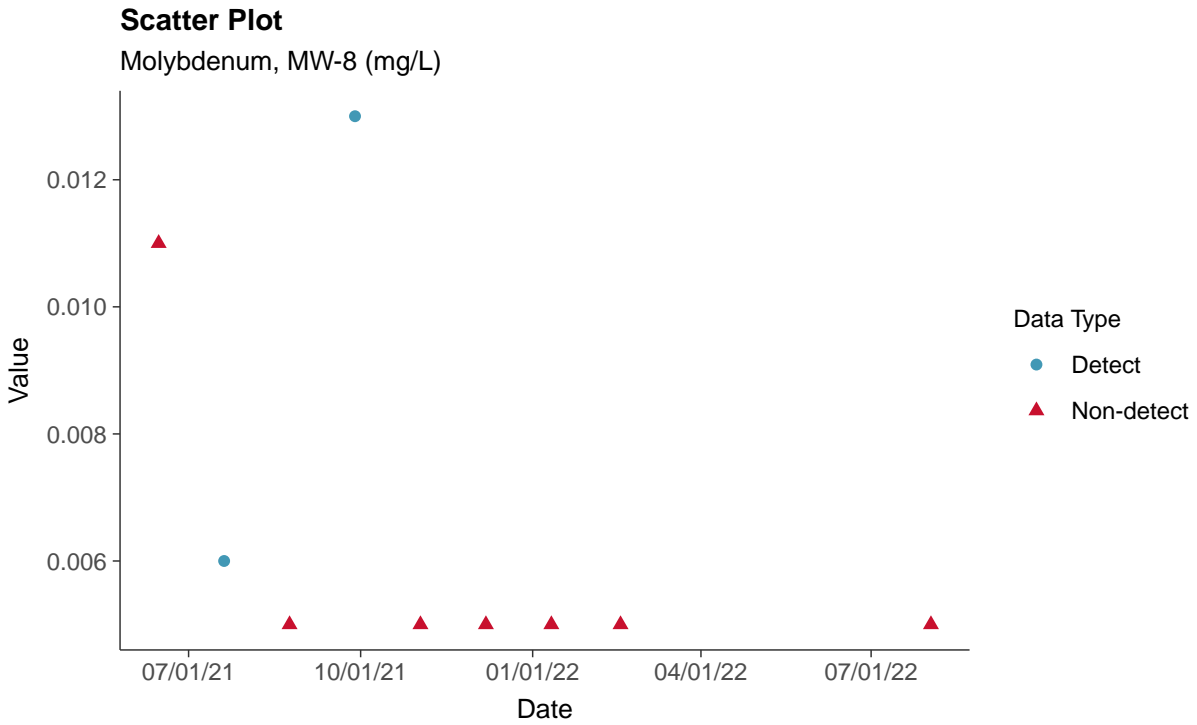
Molybdenum, MW-7 (mg/L)





### Appendix IV: Molybdenum, MW-8

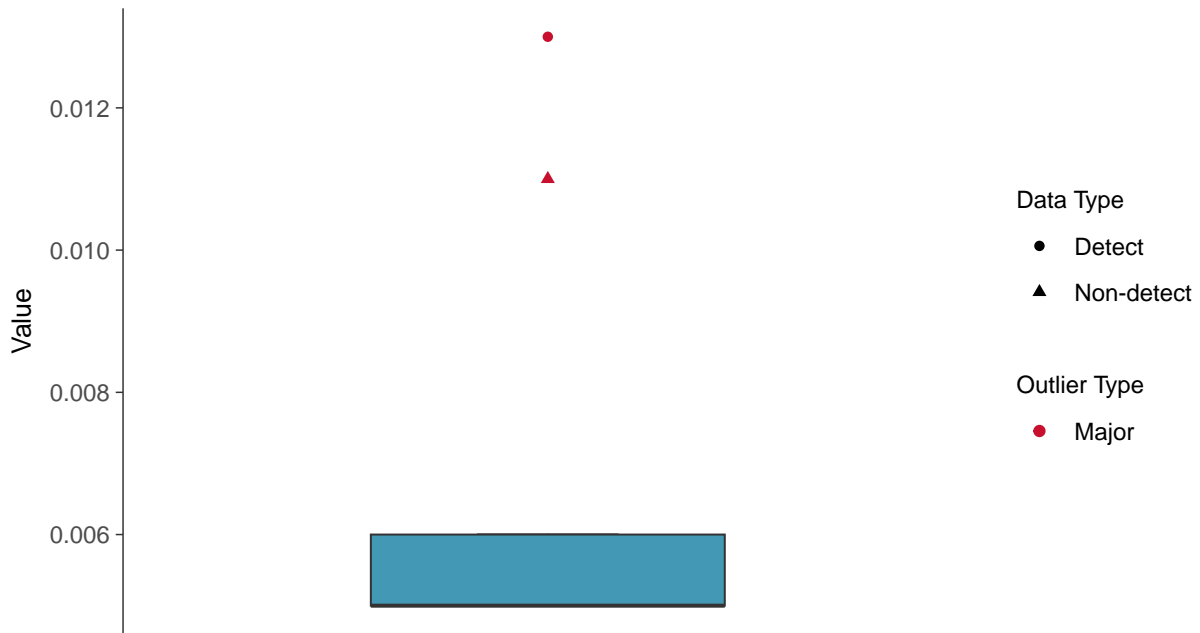
ID: 2\_21\_08





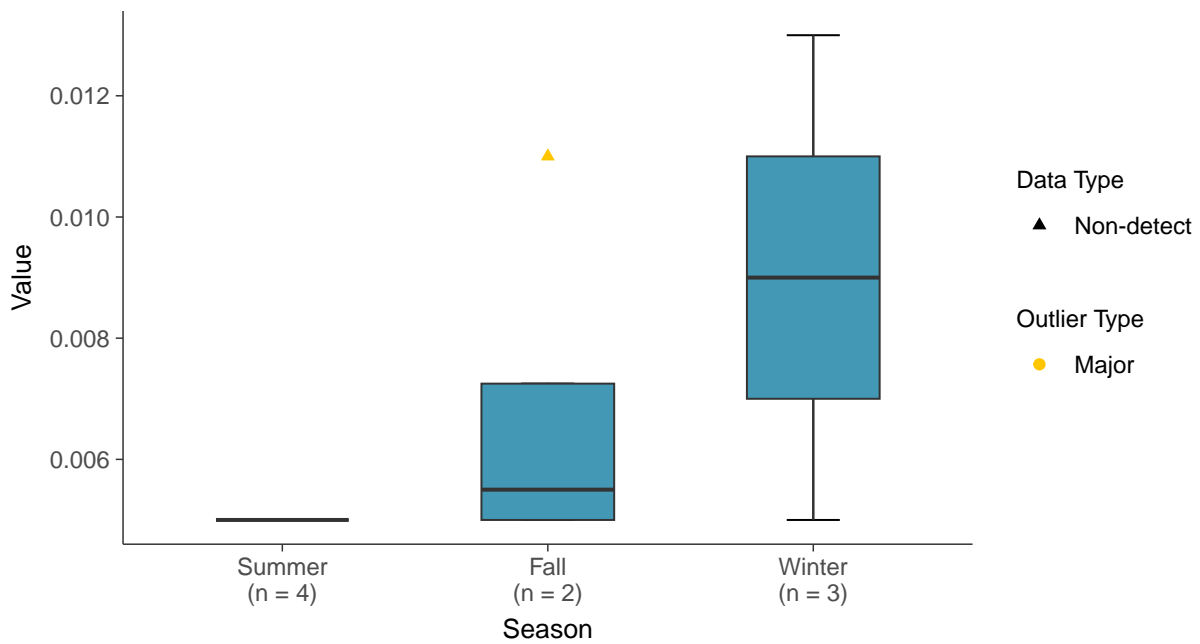
### Boxplot

Molybdenum, MW-8 (mg/L)



### Boxplot by Season

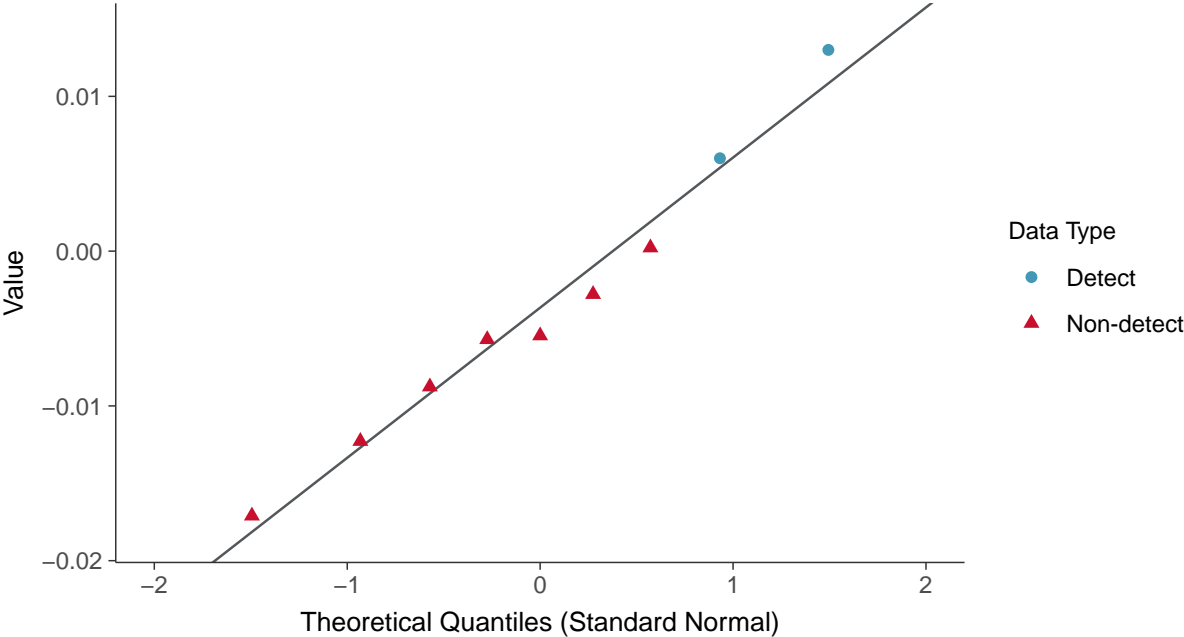
Molybdenum, MW-8 (mg/L)





### Normal Q-Q plot using ROS Imputed Estimates

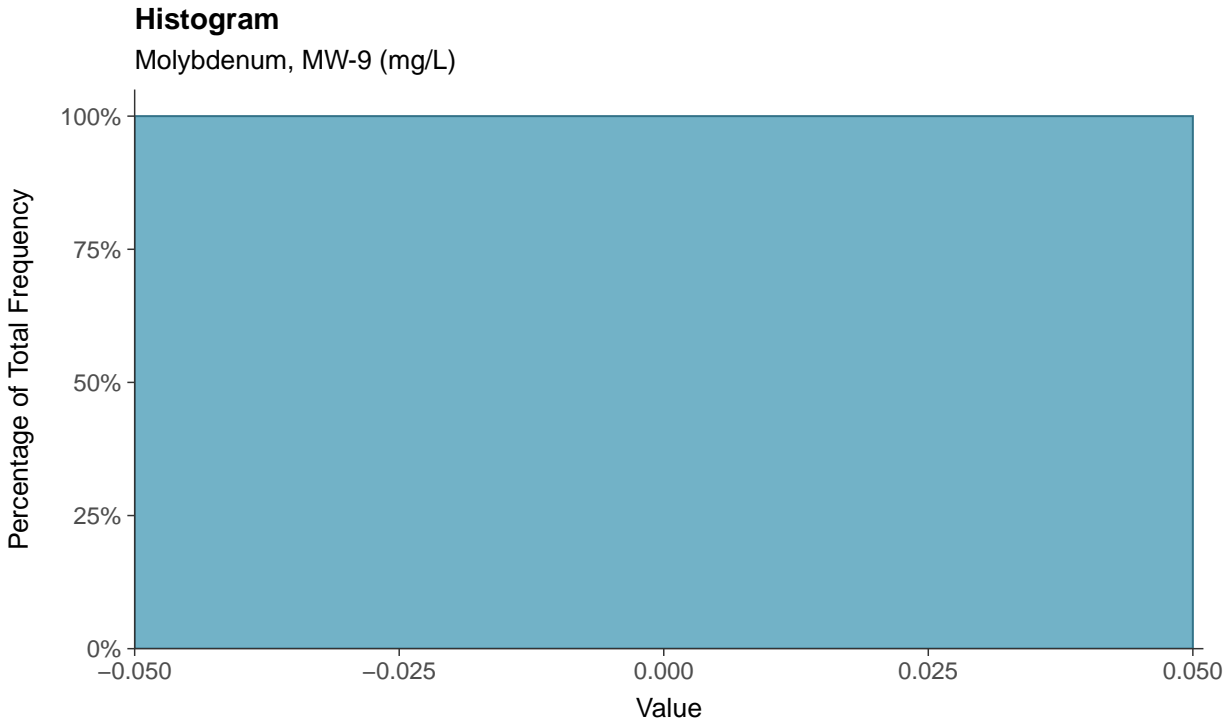
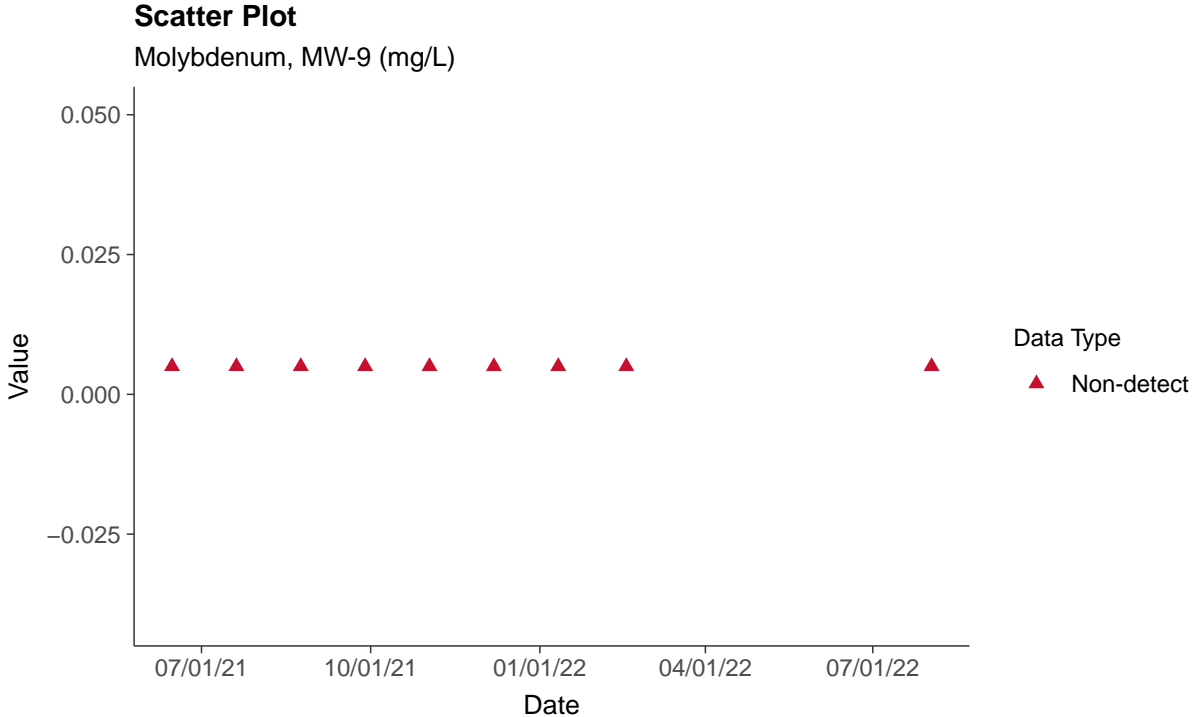
Molybdenum, MW-8 (mg/L)





### Appendix IV: Molybdenum, MW-9

ID: 2\_21\_09





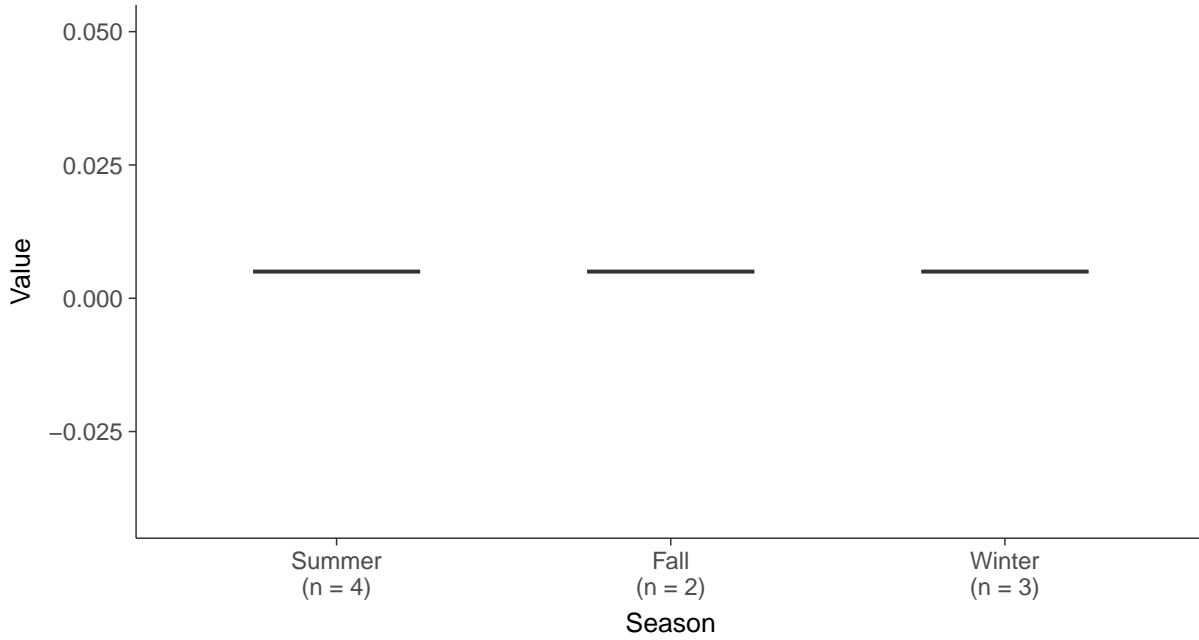
### Boxplot

Molybdenum, MW-9 (mg/L)



### Boxplot by Season

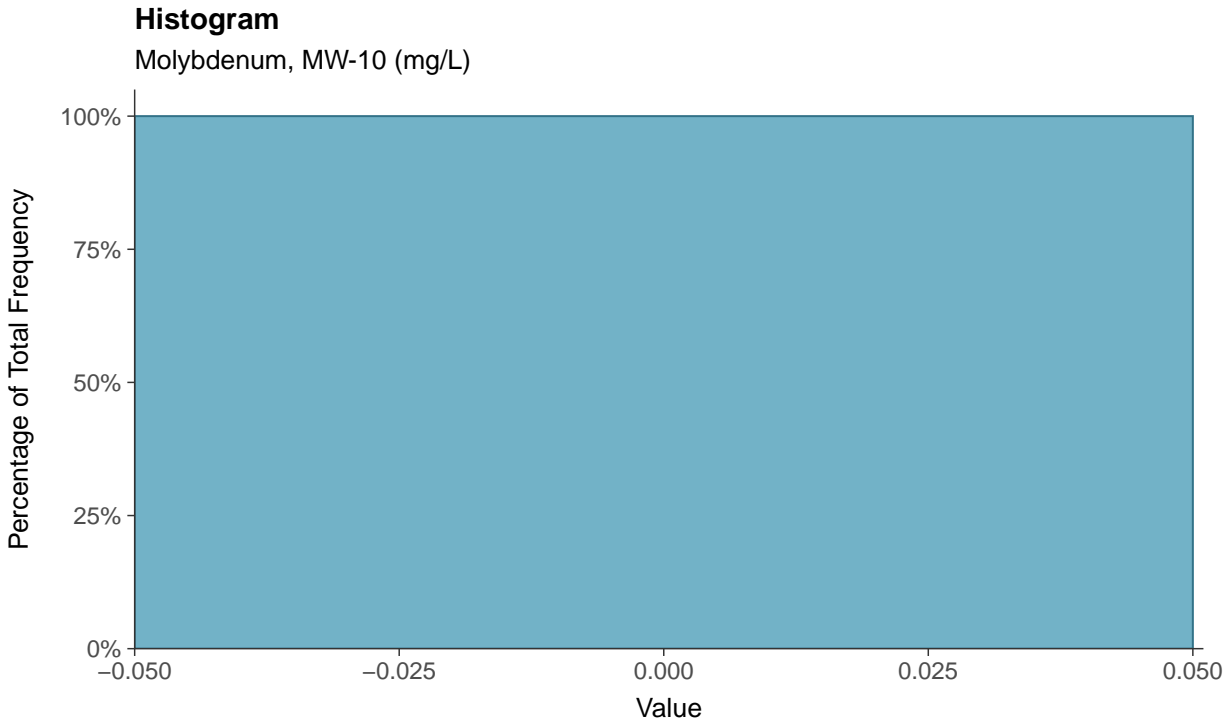
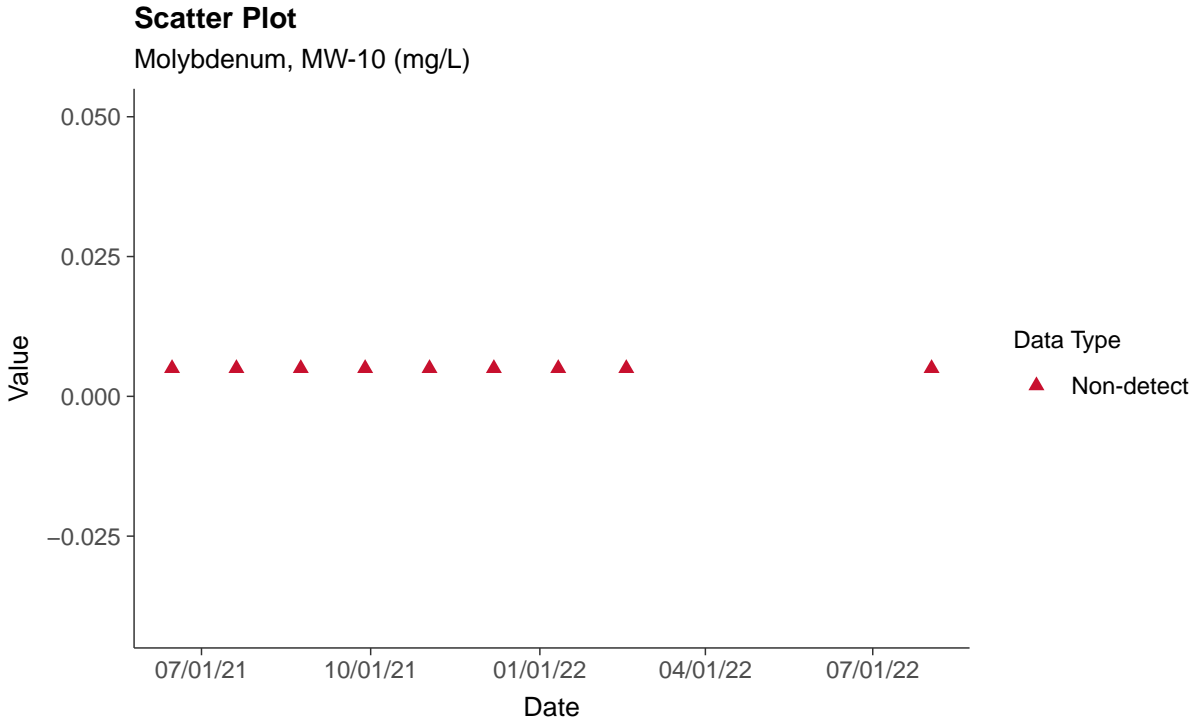
Molybdenum, MW-9 (mg/L)





### Appendix IV: Molybdenum, MW-10

ID: 2\_21\_10





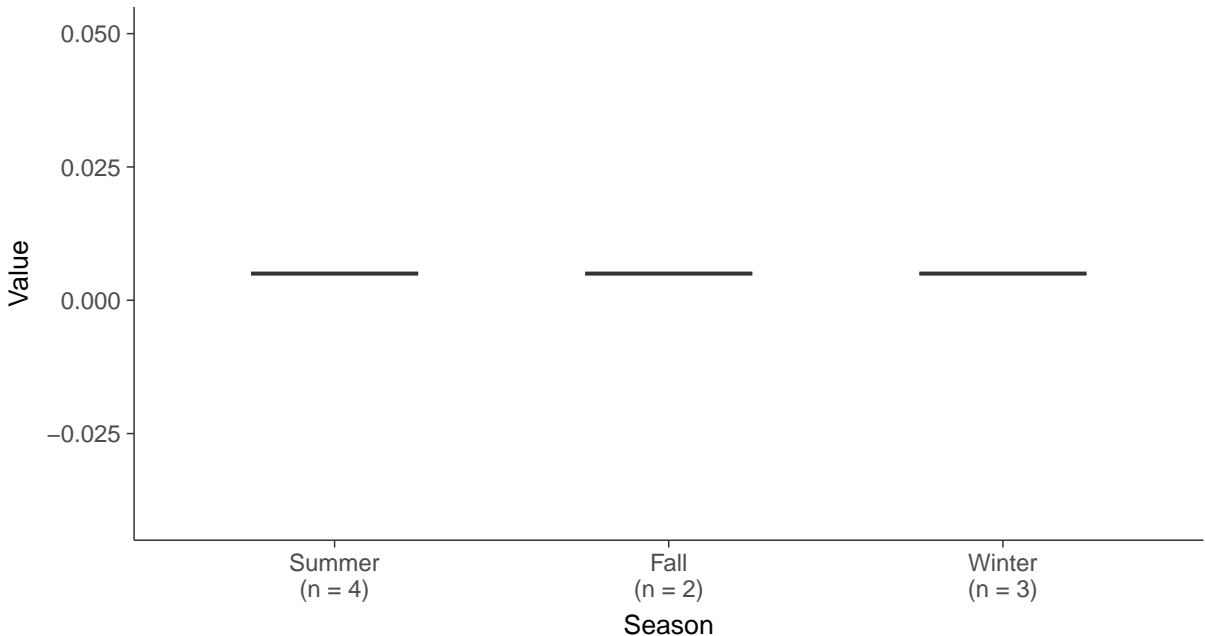
**Boxplot**

Molybdenum, MW-10 (mg/L)



**Boxplot by Season**

Molybdenum, MW-10 (mg/L)

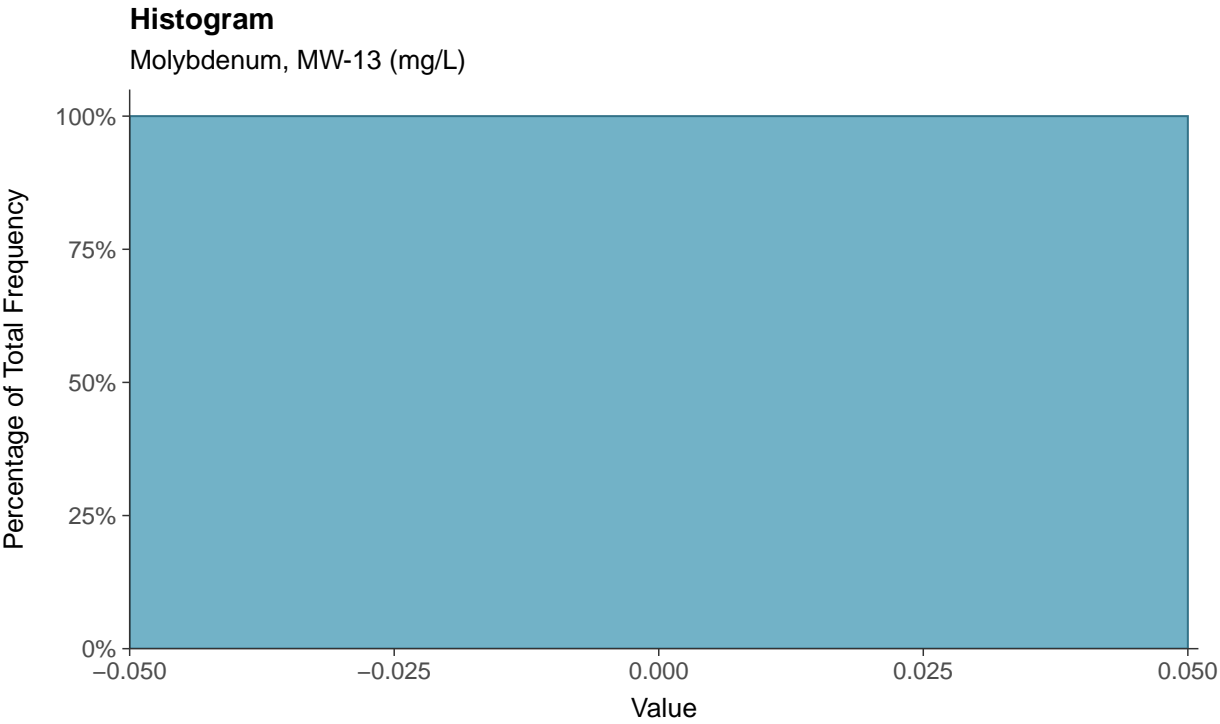
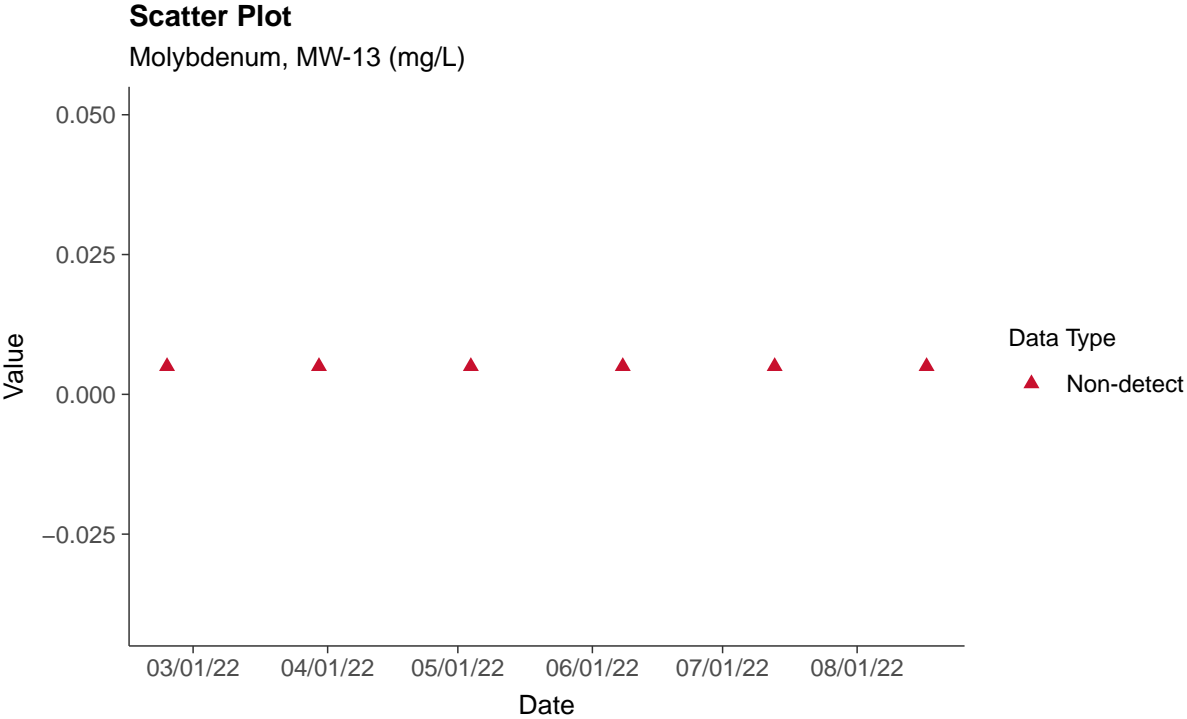






### Appendix IV: Molybdenum, MW-13

ID: 2\_21\_13





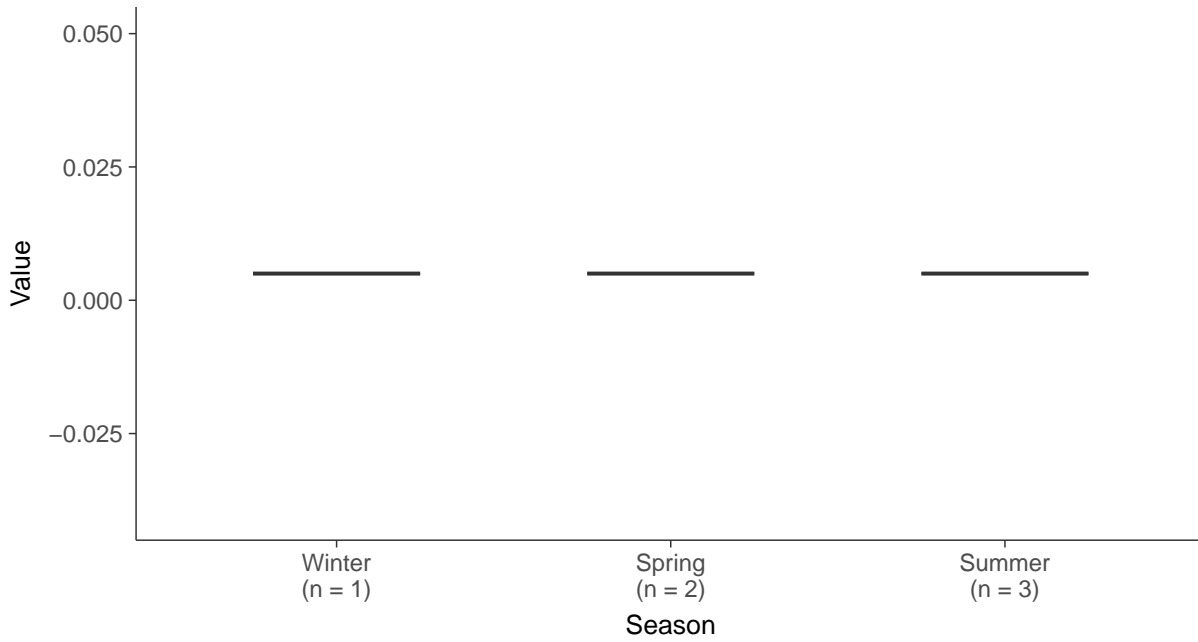
### Boxplot

Molybdenum, MW-13 (mg/L)



### Boxplot by Season

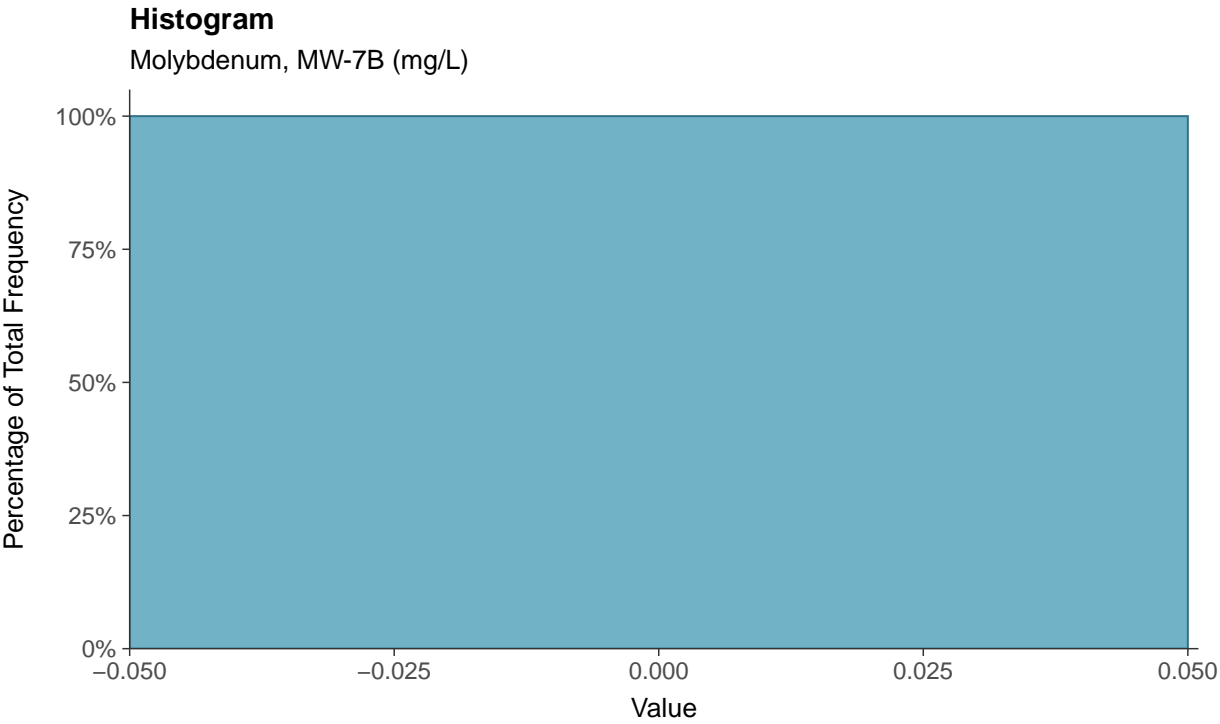
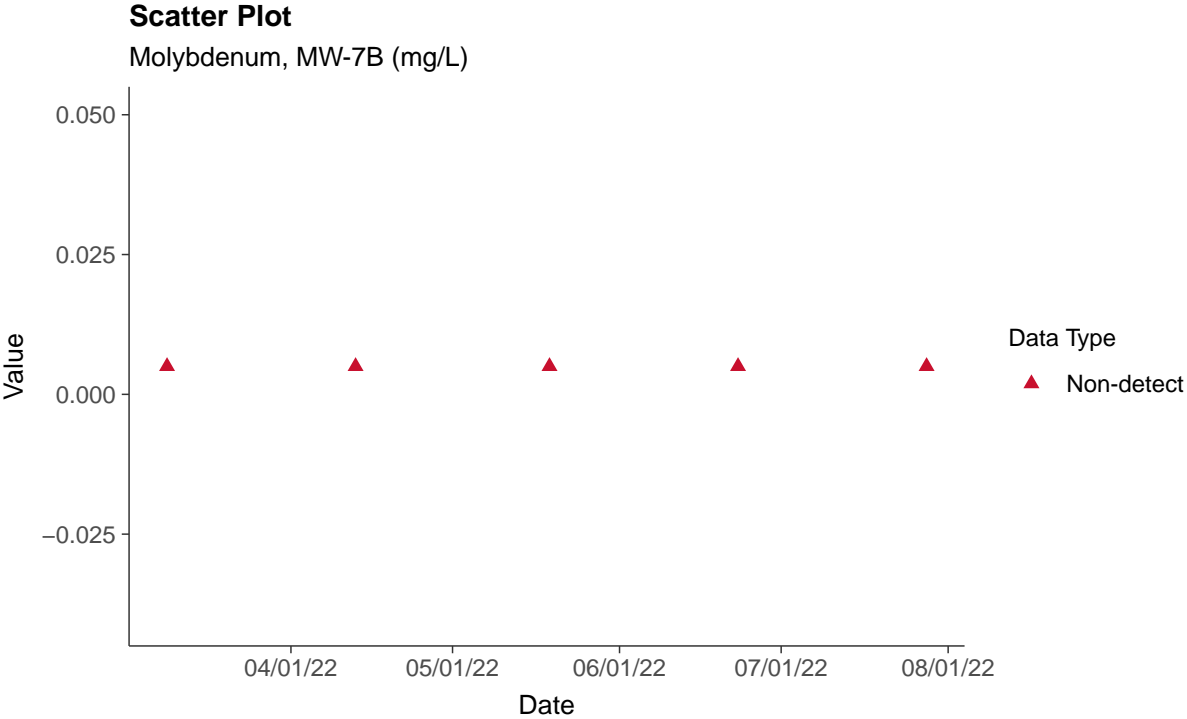
Molybdenum, MW-13 (mg/L)





### Appendix IV: Molybdenum, MW-7B

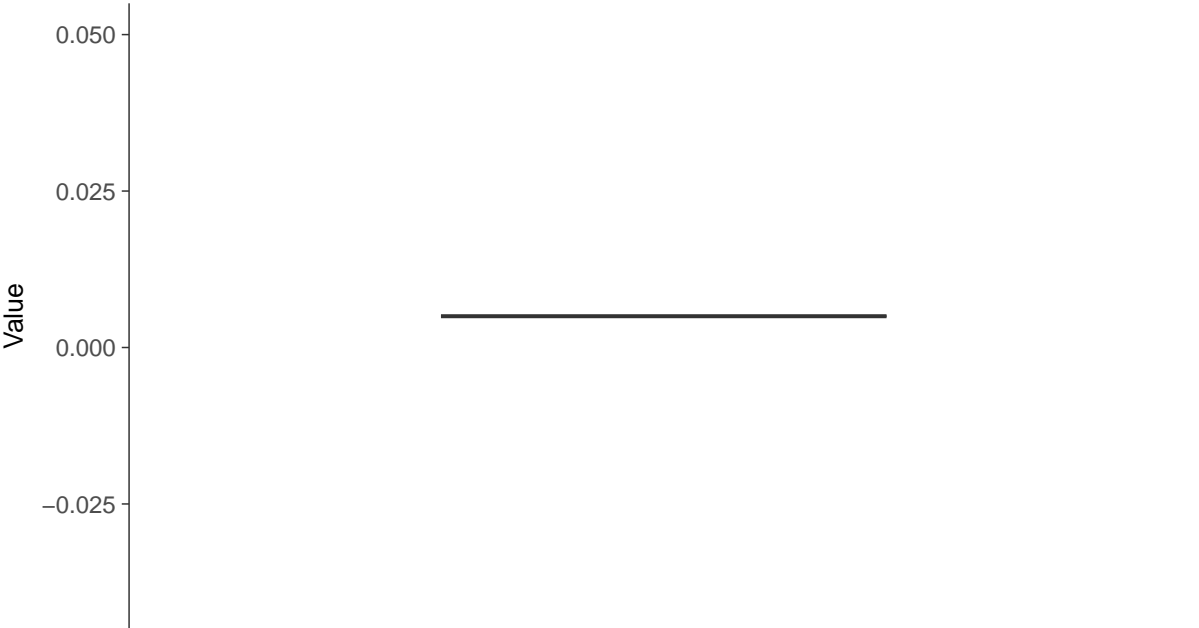
ID: 2\_21\_7B





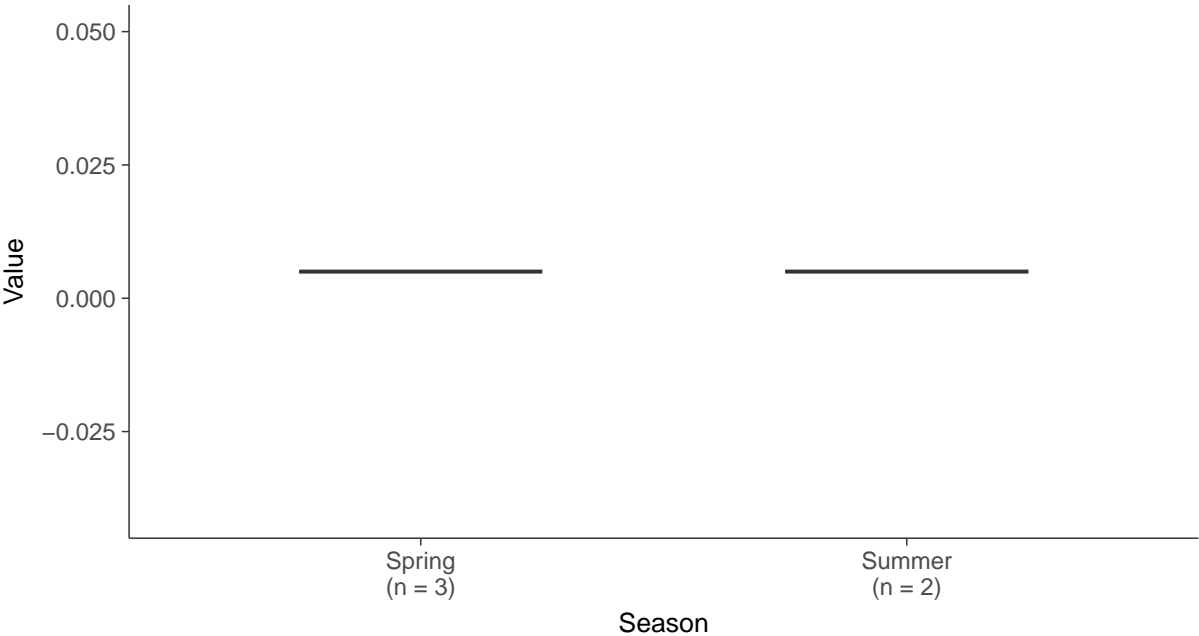
**Boxplot**

Molybdenum, MW-7B (mg/L)



**Boxplot by Season**

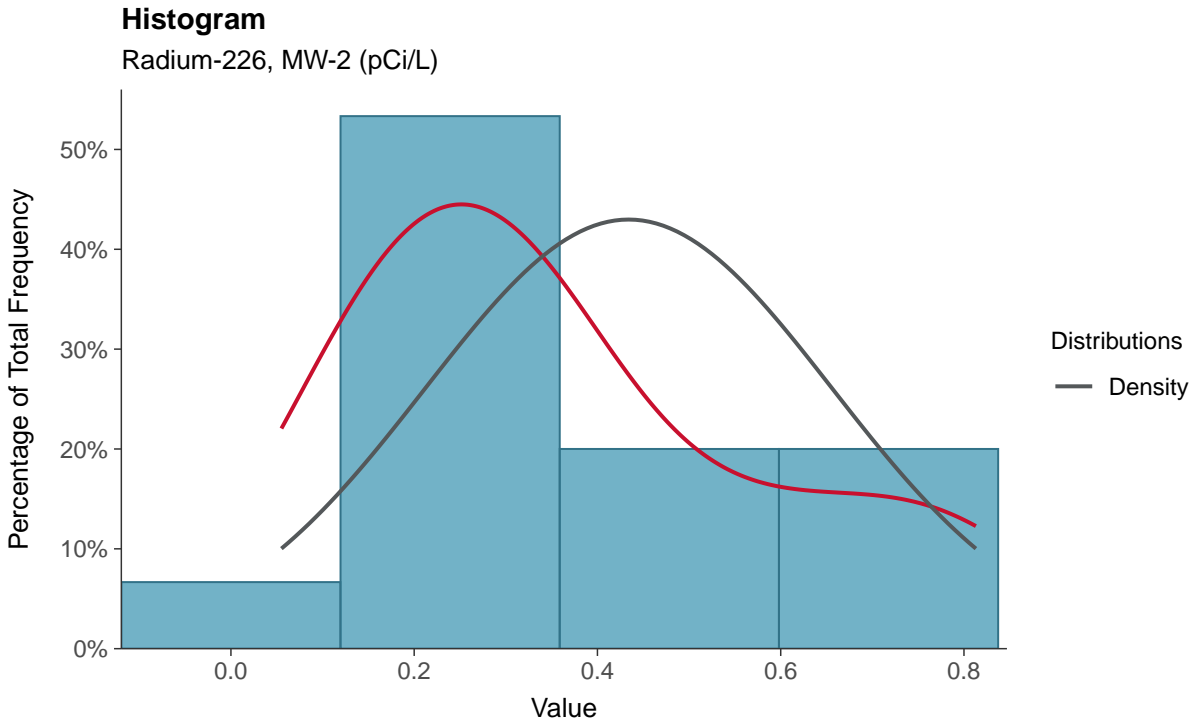
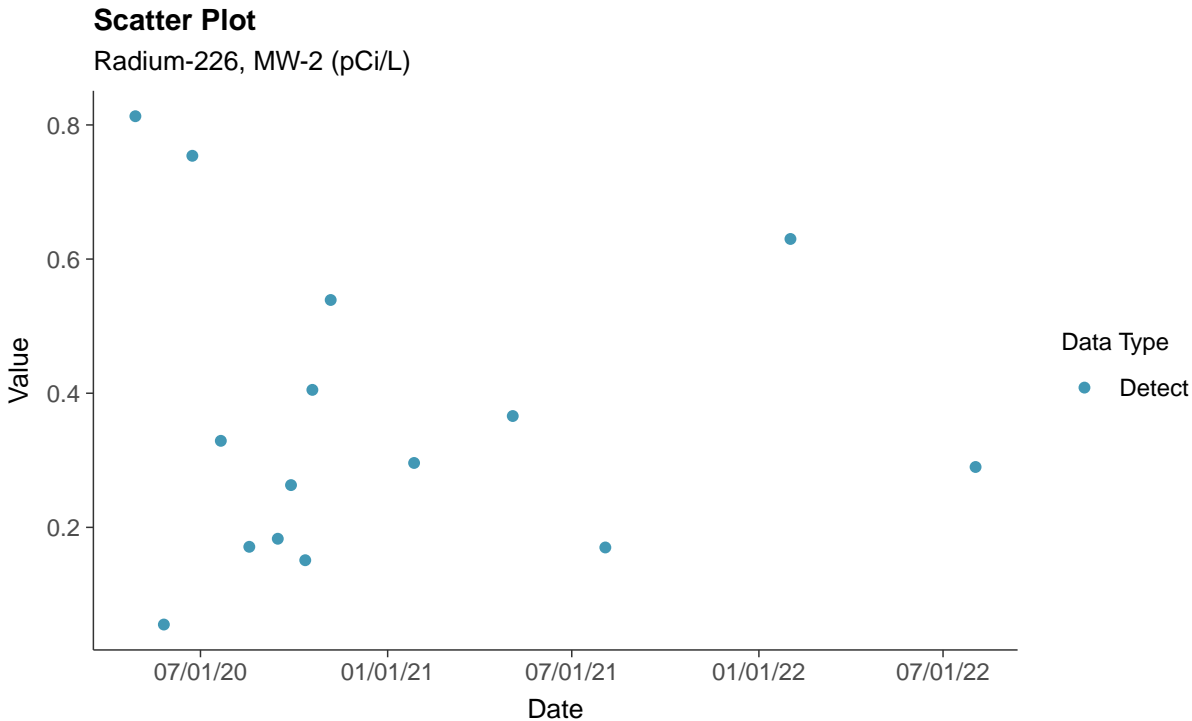
Molybdenum, MW-7B (mg/L)





### Appendix IV: Radium-226, MW-2

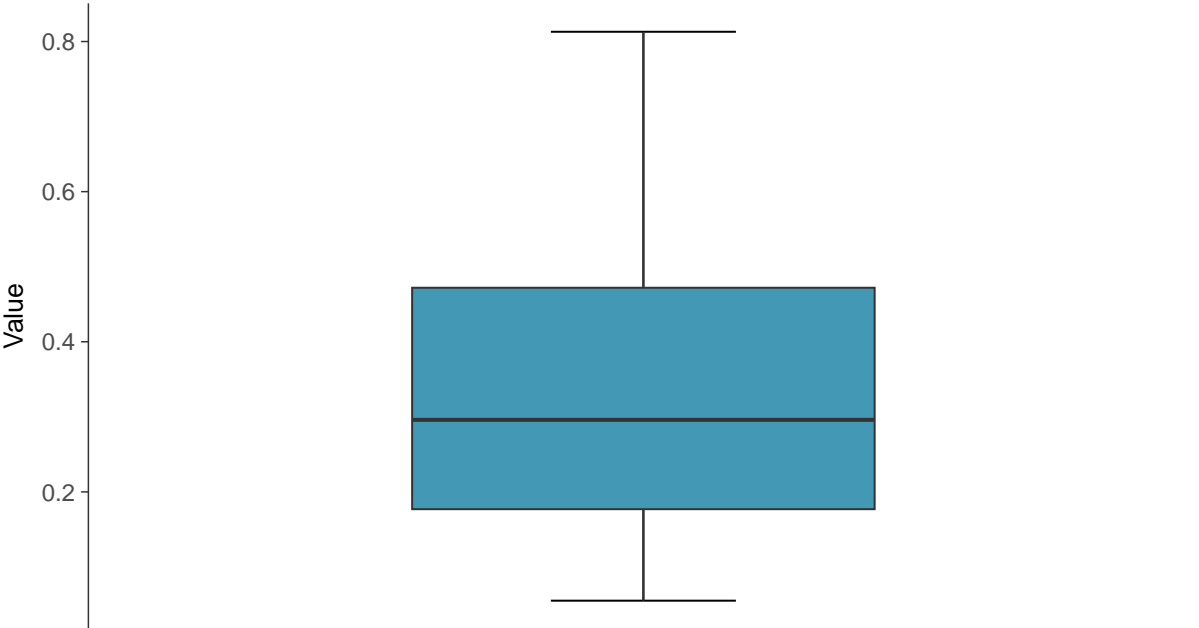
ID: 2\_23\_02





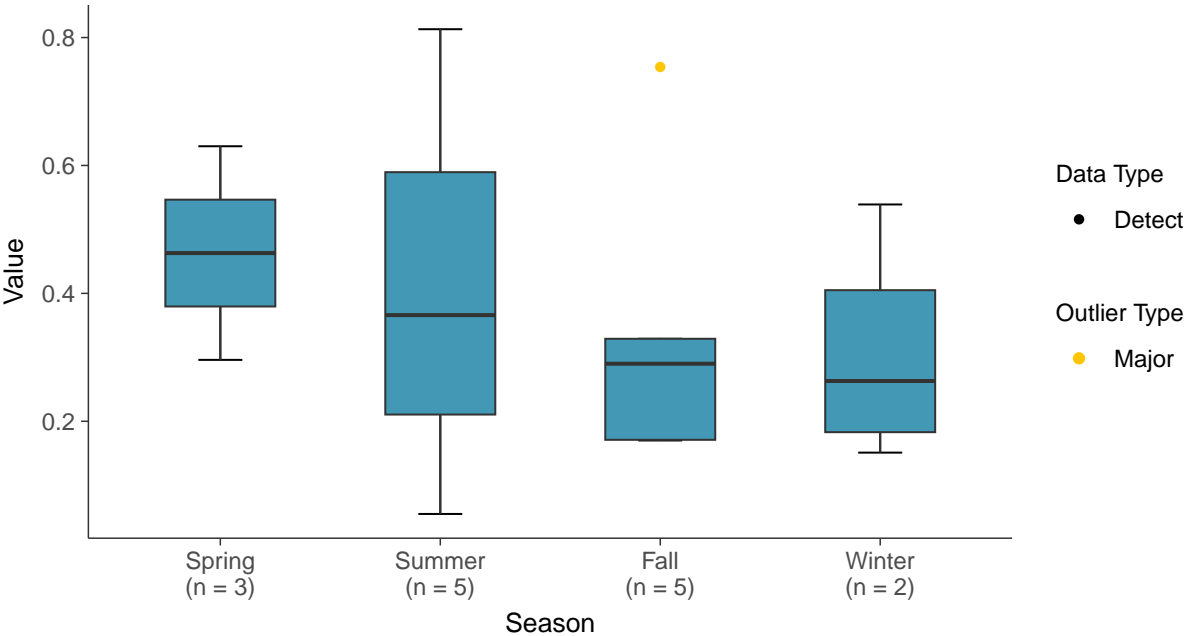
**Boxplot**

Radium-226, MW-2 (pCi/L)



**Boxplot by Season**

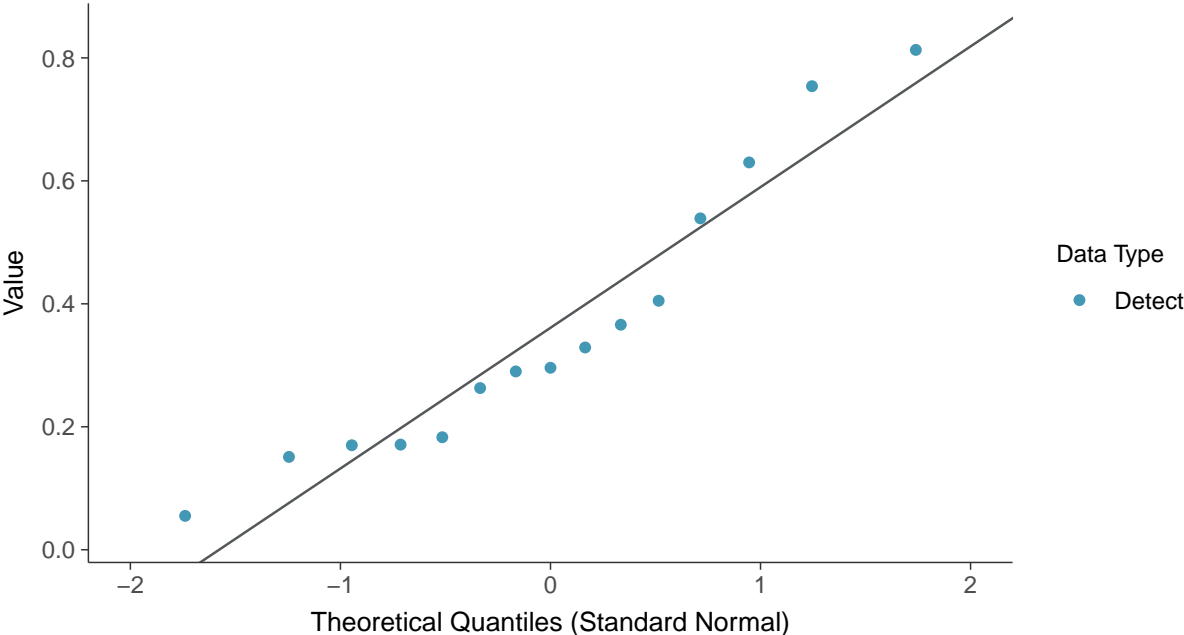
Radium-226, MW-2 (pCi/L)





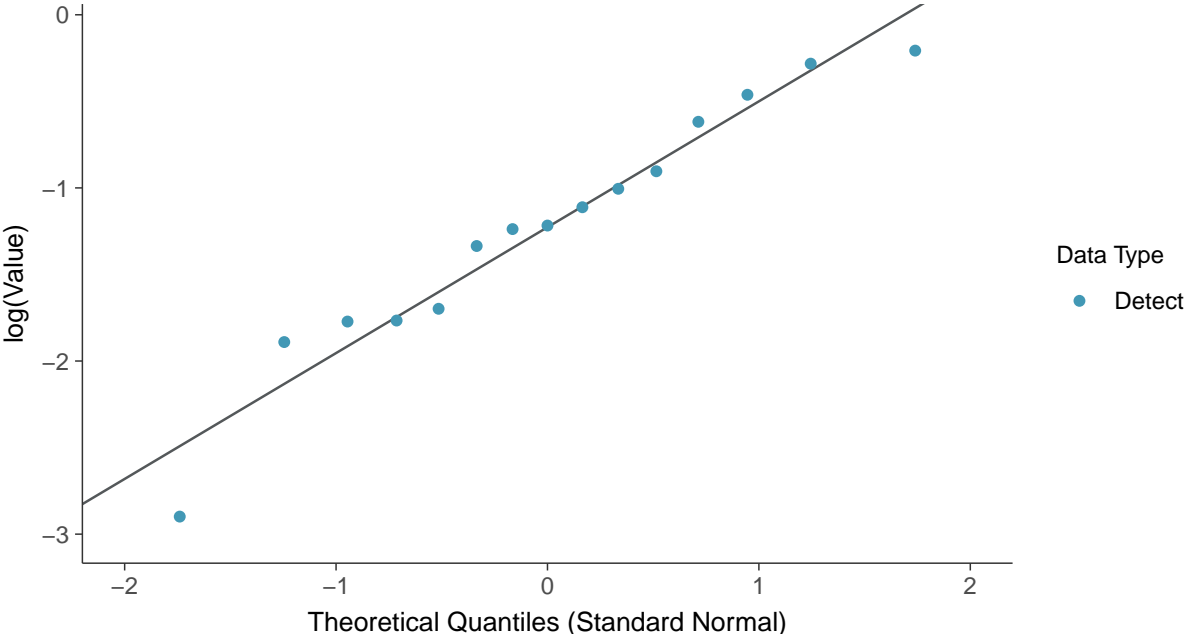
**Normal Q-Q plot**

Radium-226, MW-2 (pCi/L)



**Lognormal Q-Q plot**

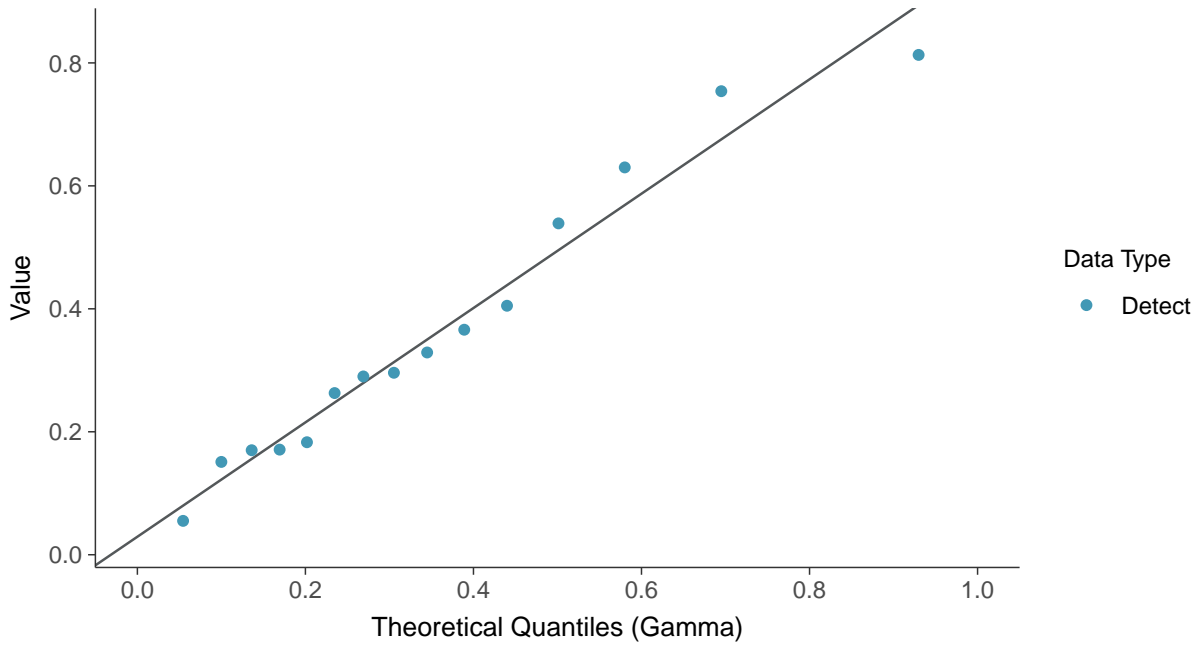
Radium-226, MW-2 (pCi/L)





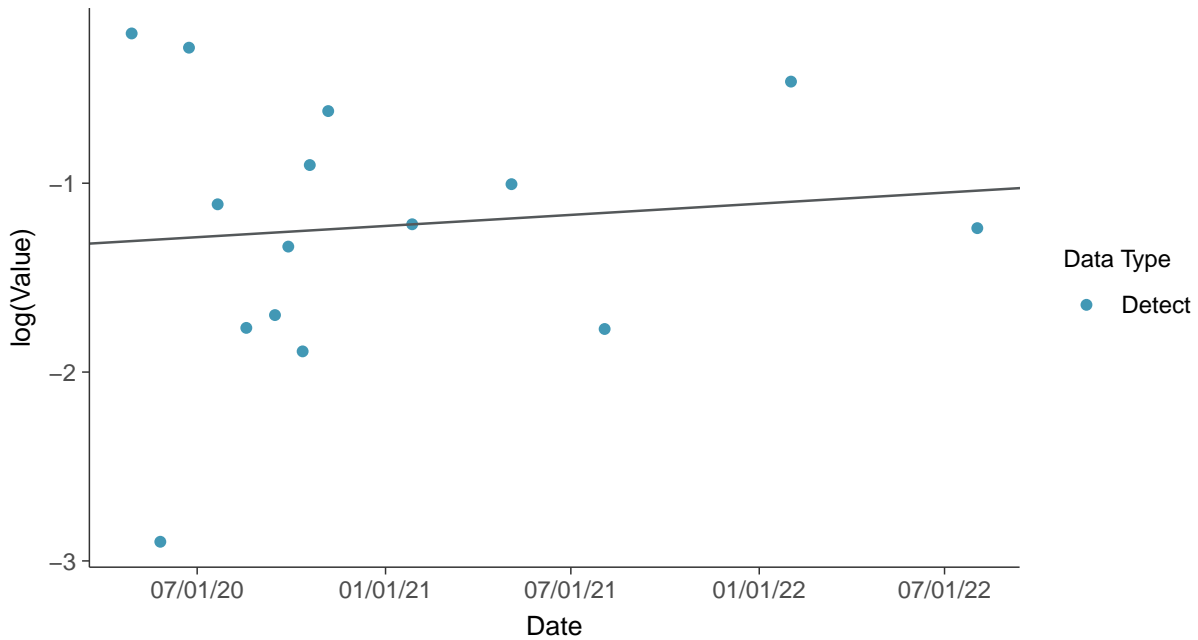
### Gamma Q-Q plot

Radium-226, MW-2 (pCi/L)



### Trend Regression: Lognormal MLE

Radium-226, MW-2 (pCi/L)

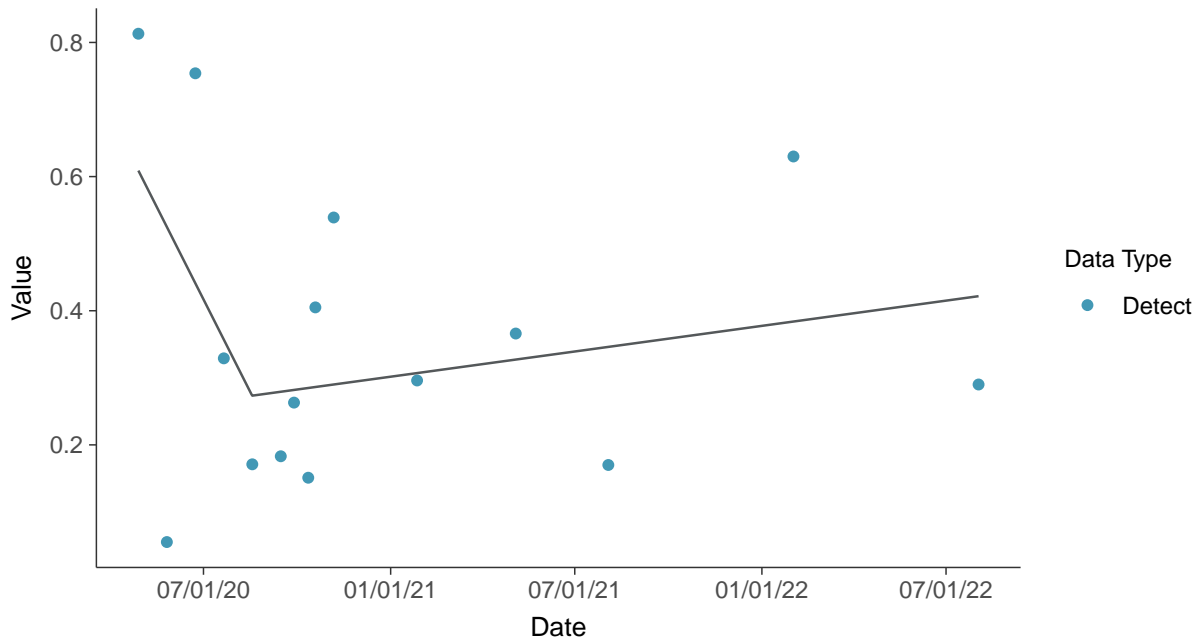






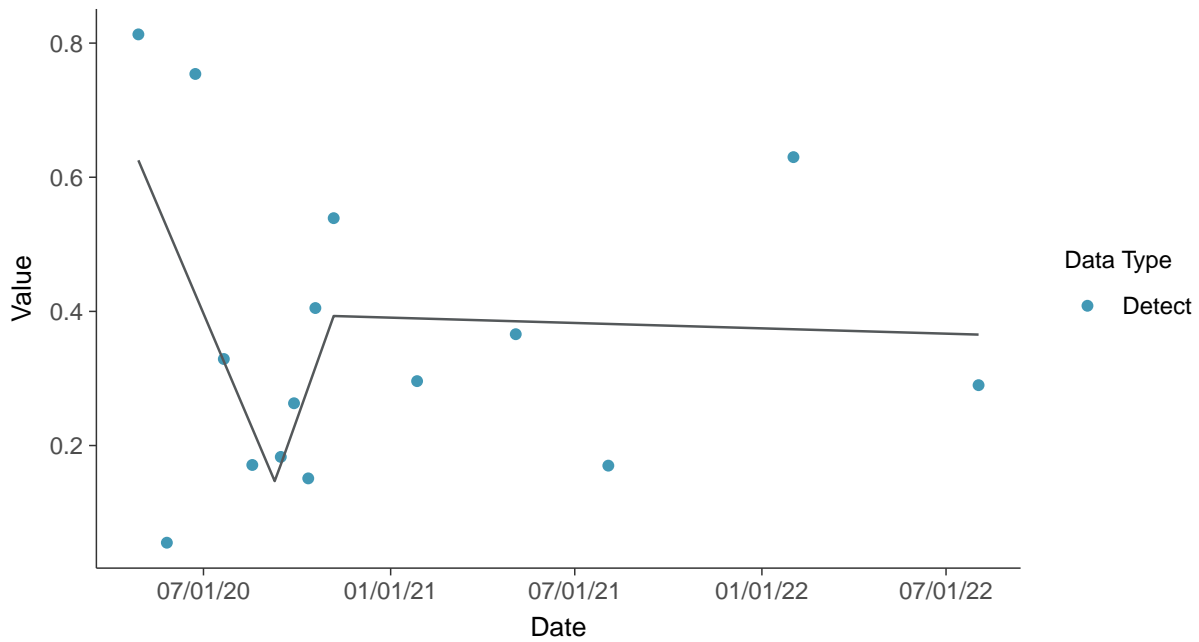
### Trend Regression: Piecewise Linear-Linear

Radium-226, MW-2 (pCi/L)



### Trend Regression: Piecewise Linear-Linear-Linear

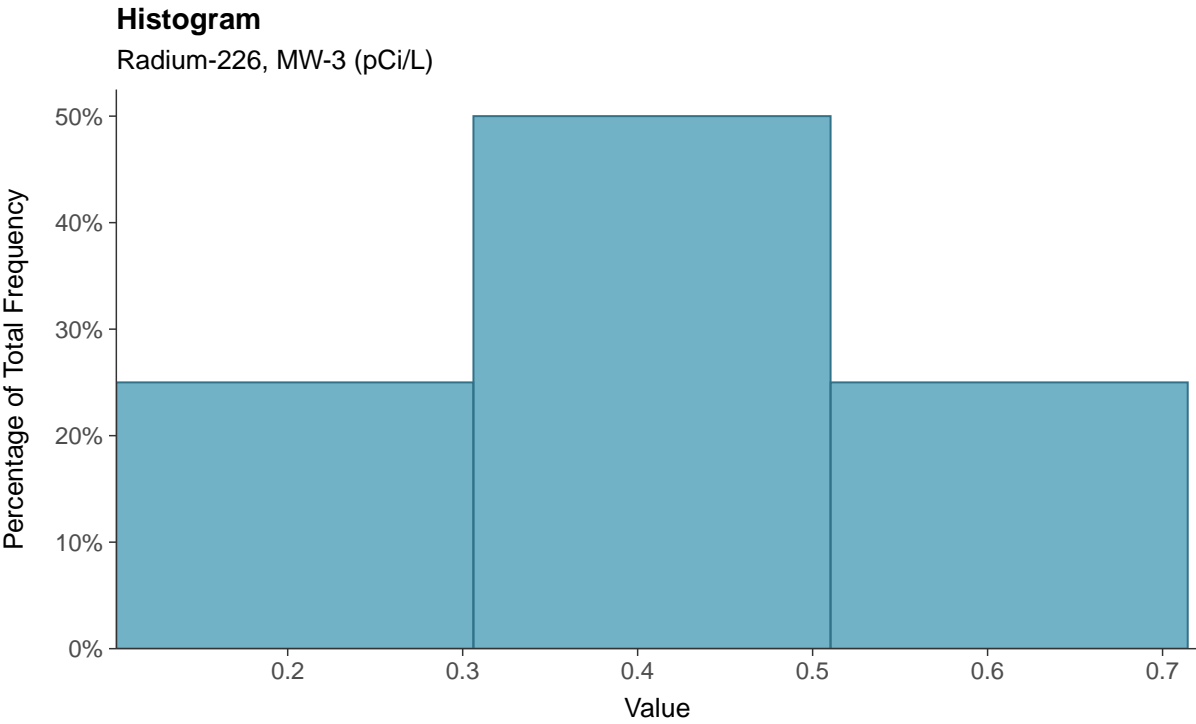
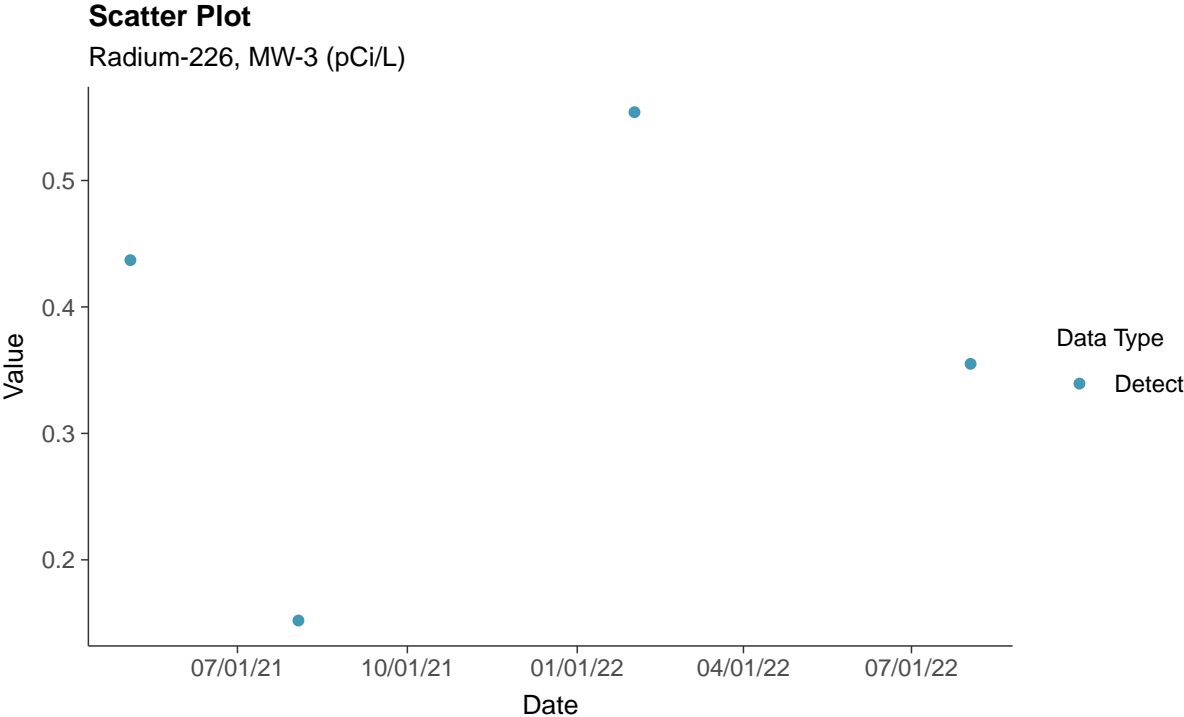
Radium-226, MW-2 (pCi/L)





### Appendix IV: Radium-226, MW-3

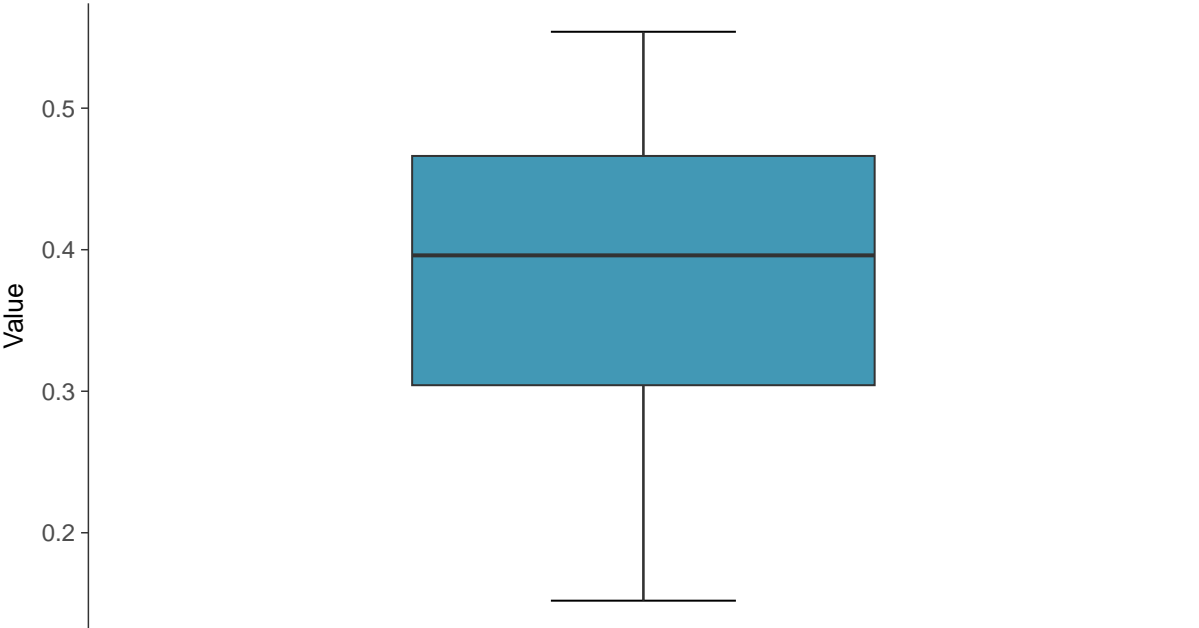
ID: 2\_23\_03





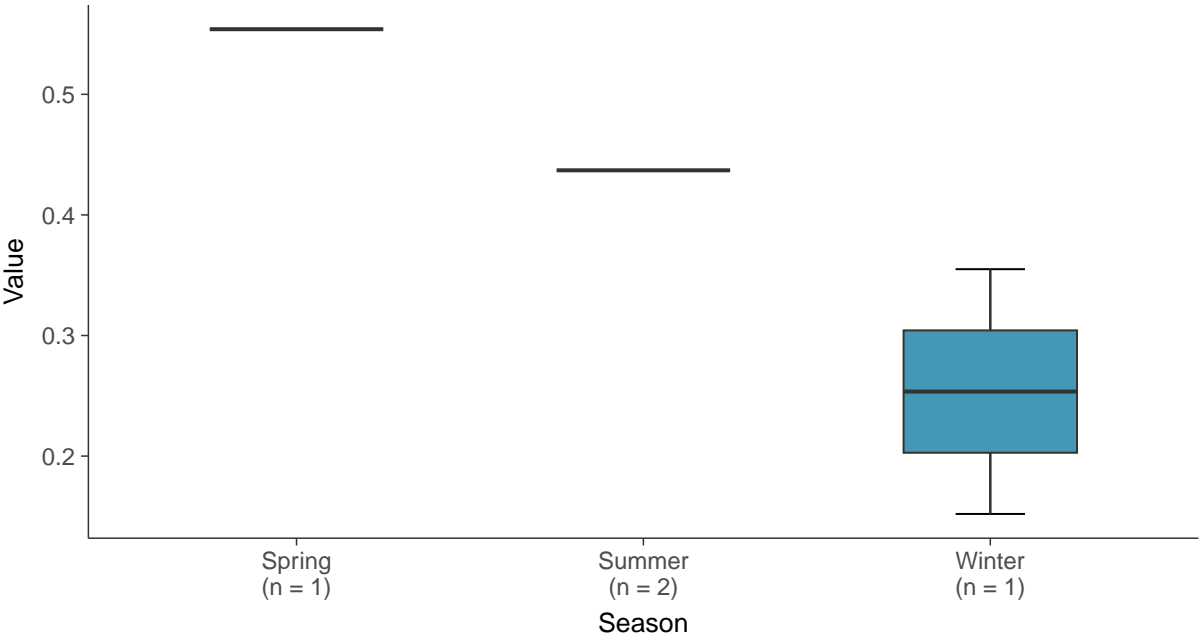
**Boxplot**

Radium-226, MW-3 (pCi/L)



**Boxplot by Season**

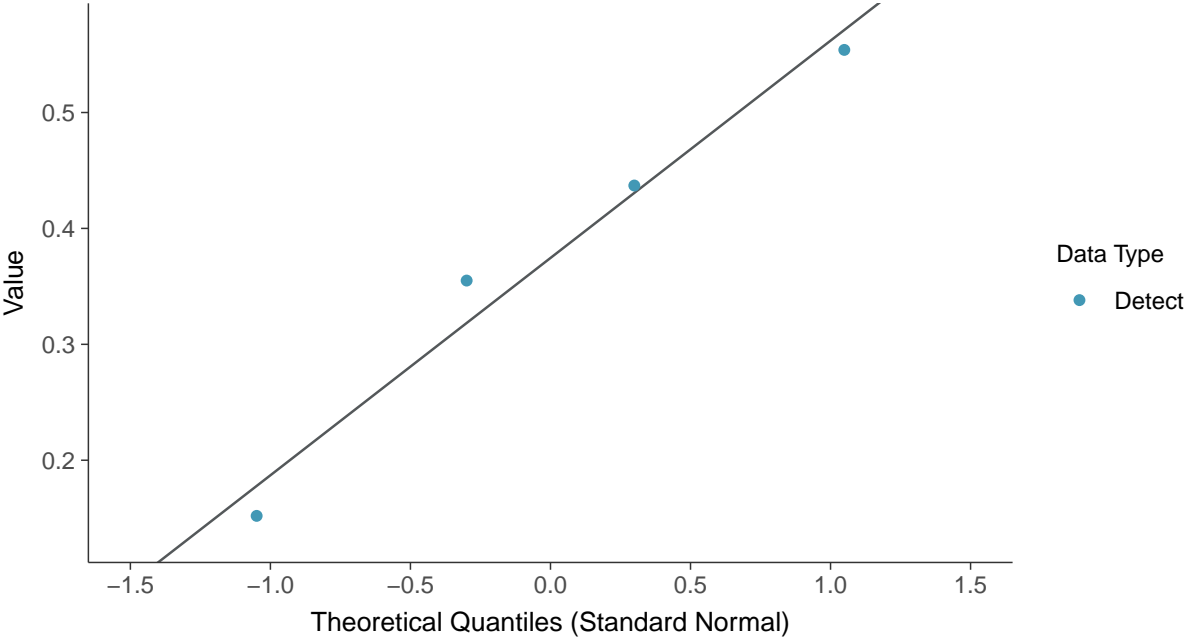
Radium-226, MW-3 (pCi/L)





**Normal Q-Q plot**

Radium-226, MW-3 (pCi/L)



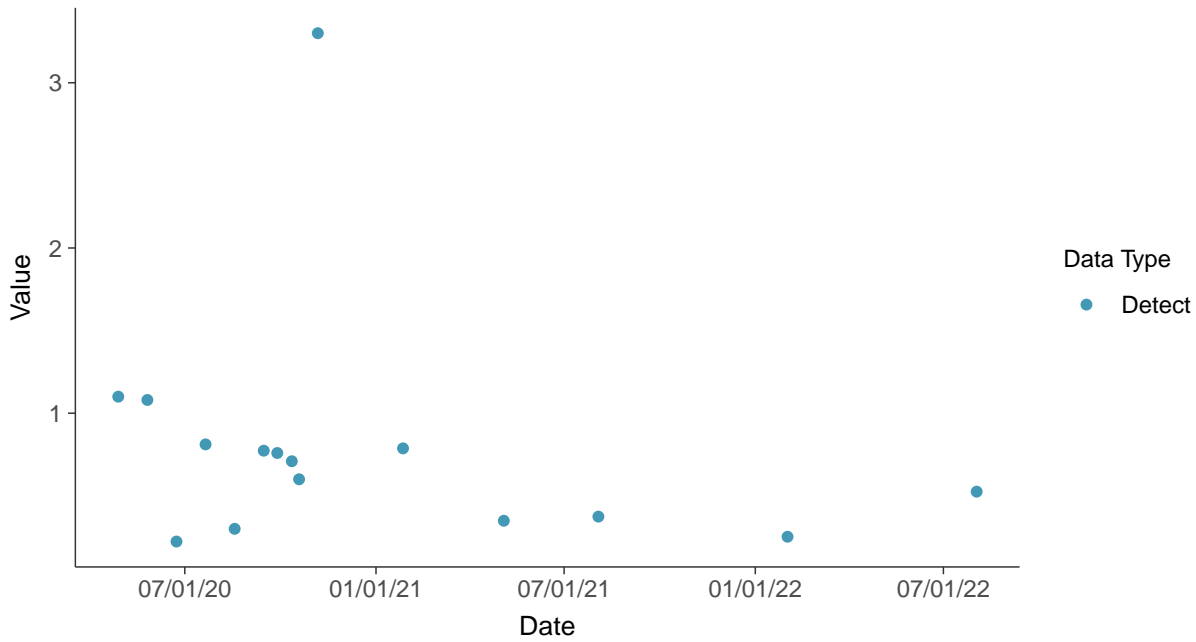


### Appendix IV: Radium-226, MW-5

ID: 2\_23\_05

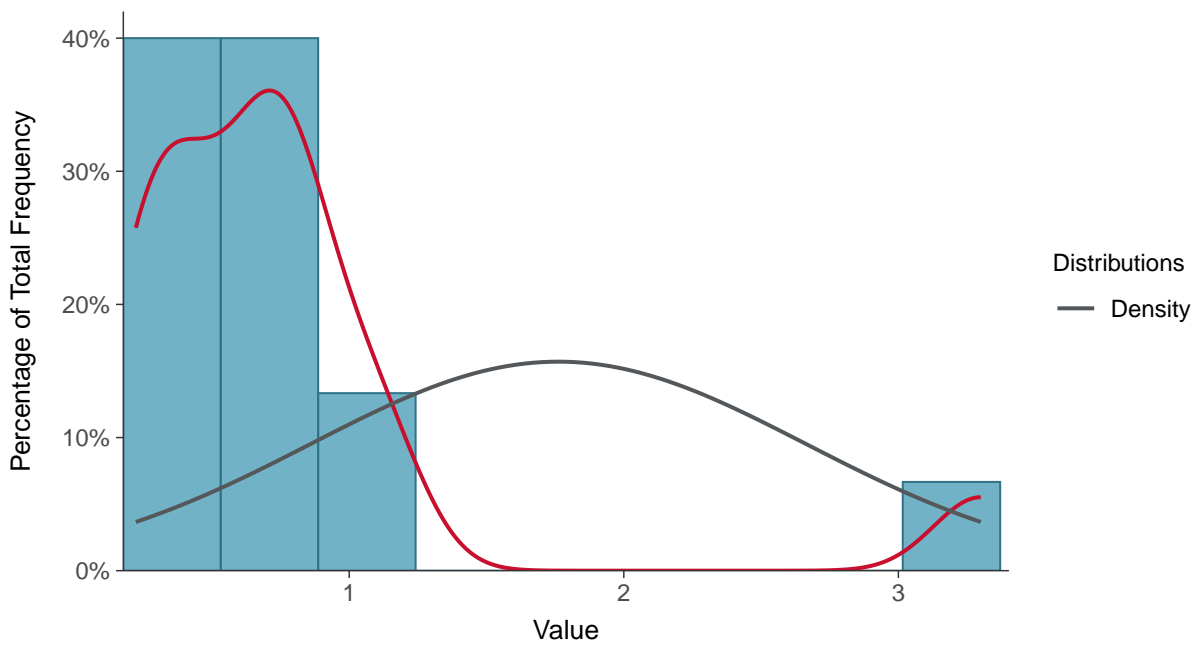
#### Scatter Plot

Radium-226, MW-5 (pCi/L)



#### Histogram

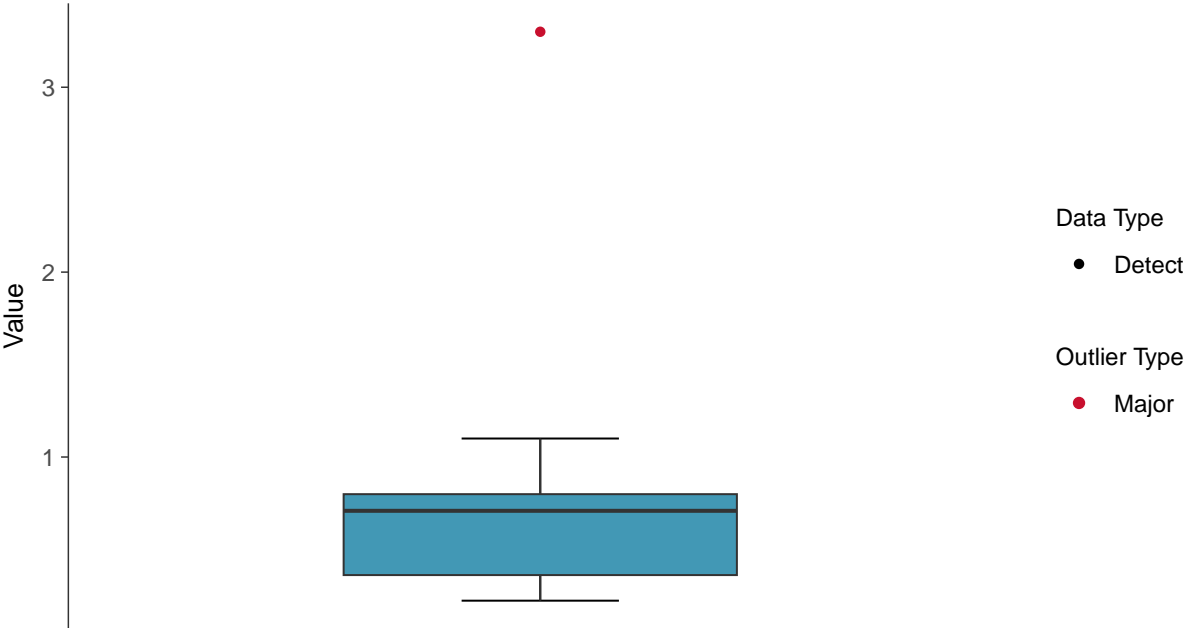
Radium-226, MW-5 (pCi/L)





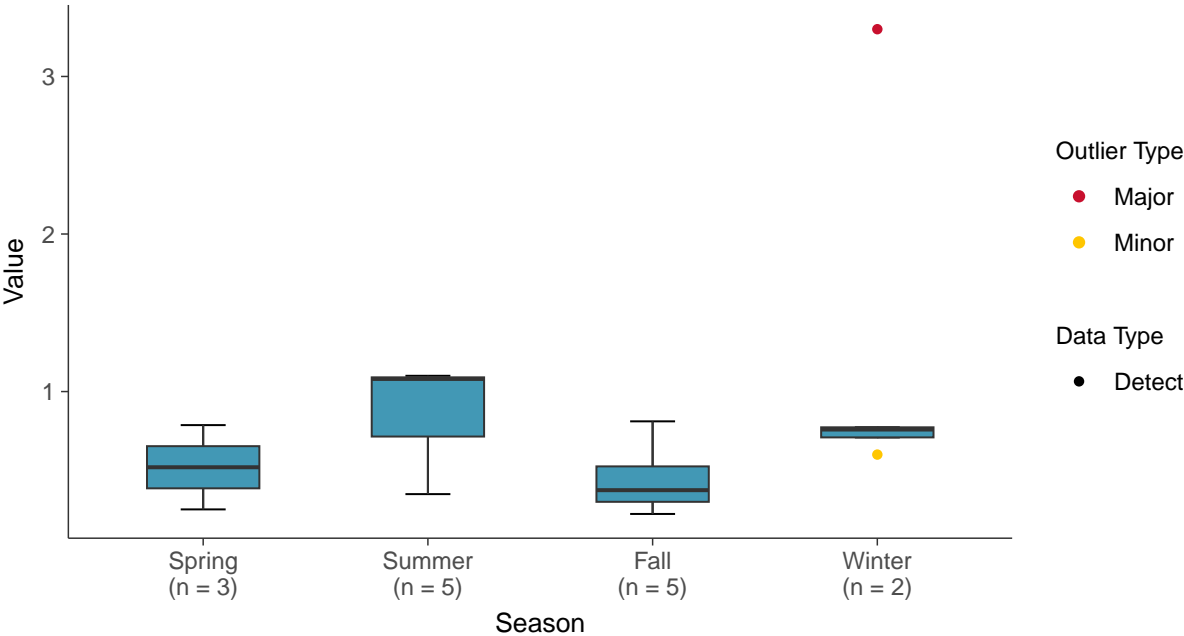
**Boxplot**

Radium-226, MW-5 (pCi/L)



**Boxplot by Season**

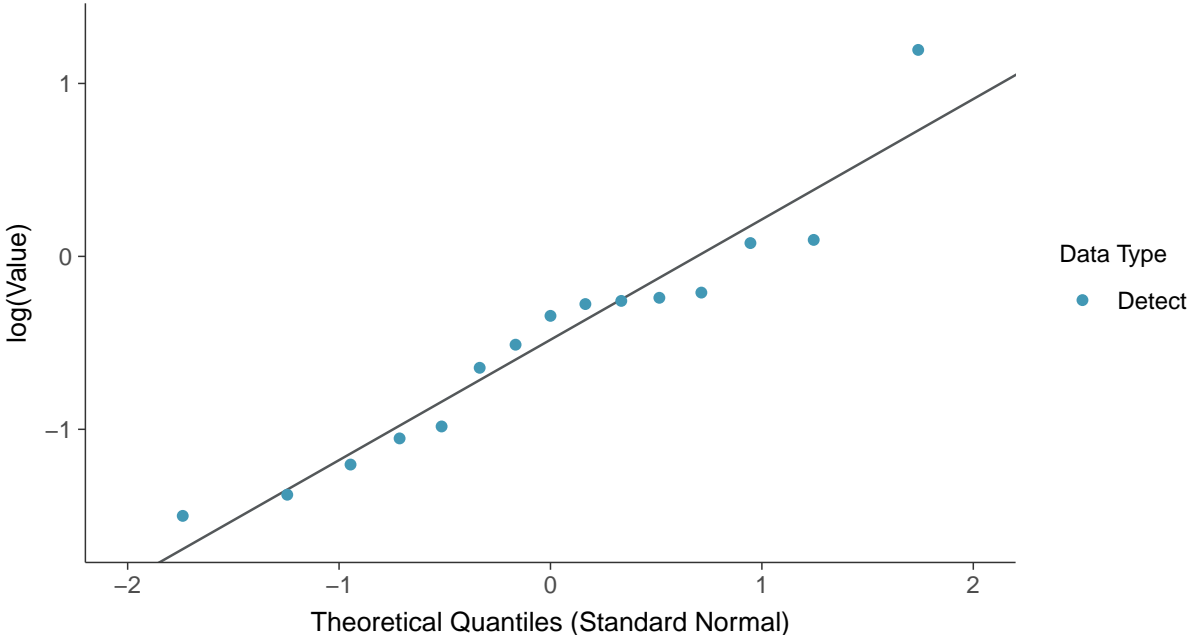
Radium-226, MW-5 (pCi/L)





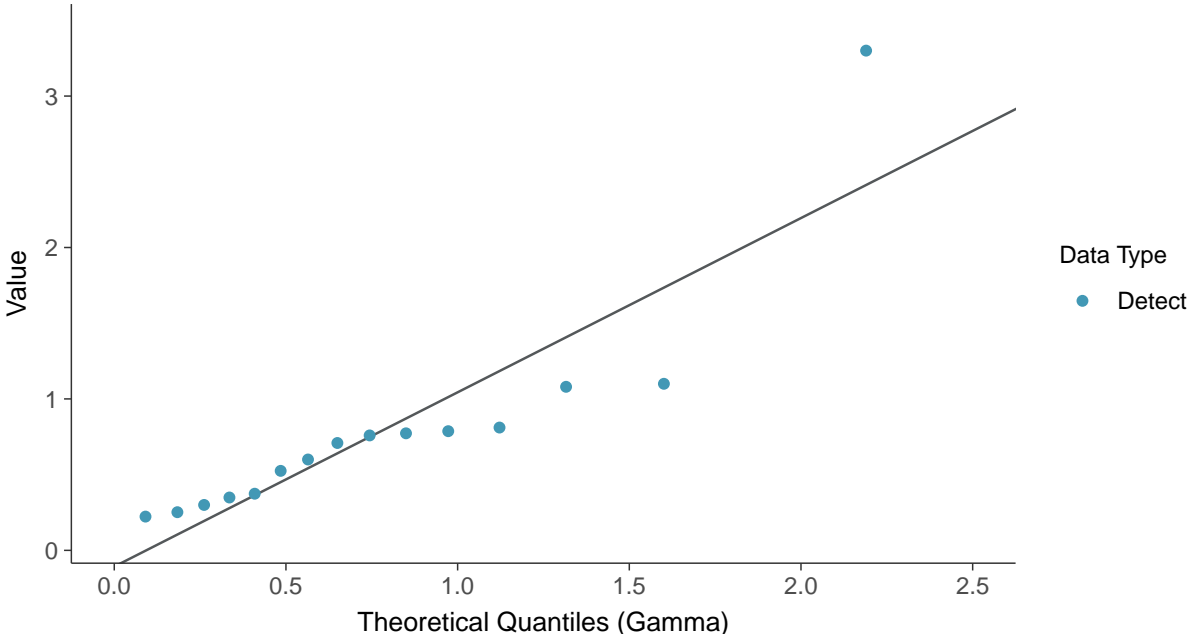
**Lognormal Q-Q plot**

Radium-226, MW-5 (pCi/L)



**Gamma Q-Q plot**

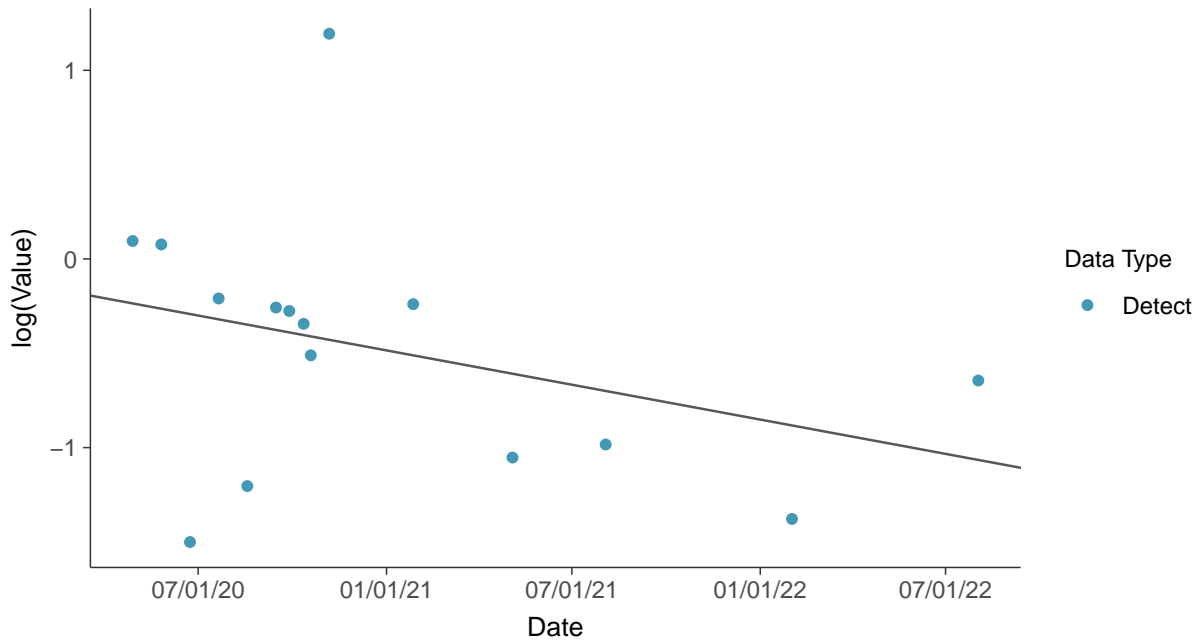
Radium-226, MW-5 (pCi/L)





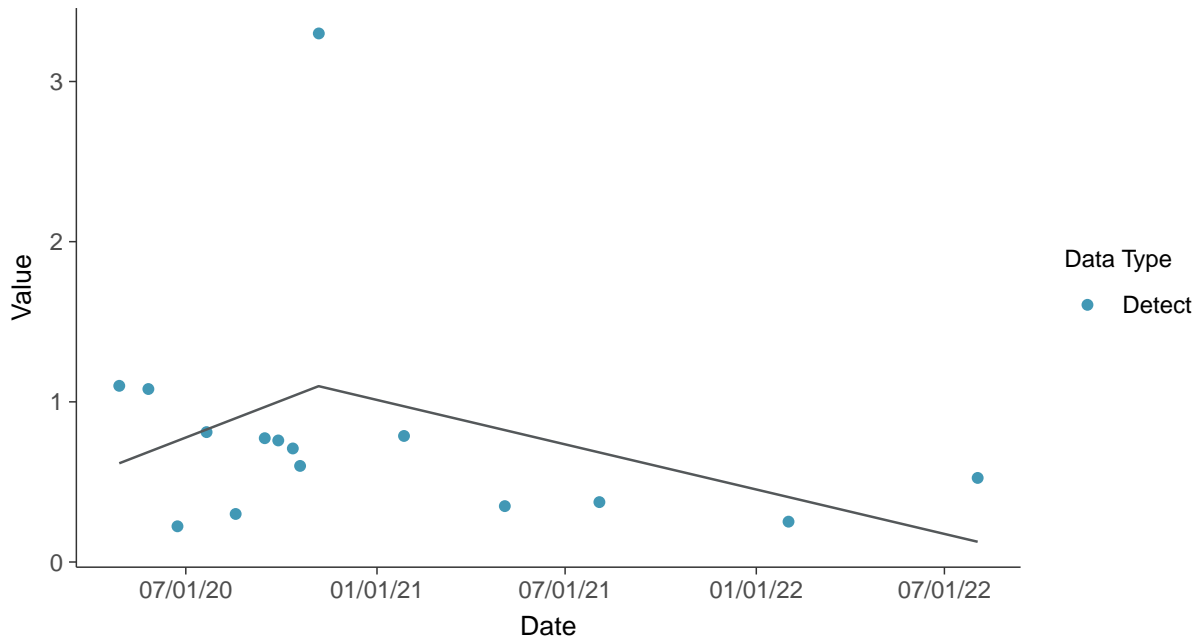
### Trend Regression: Lognormal MLE

Radium-226, MW-5 (pCi/L)



### Trend Regression: Piecewise Linear-Linear

Radium-226, MW-5 (pCi/L)

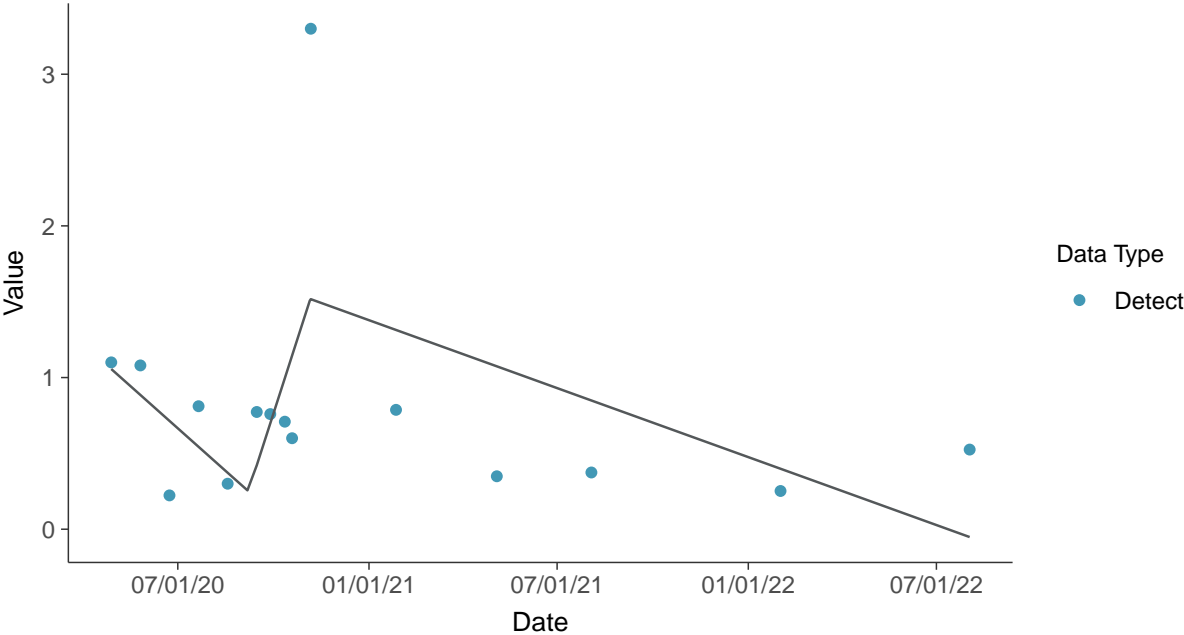






### Trend Regression: Piecewise Linear-Linear-Linear

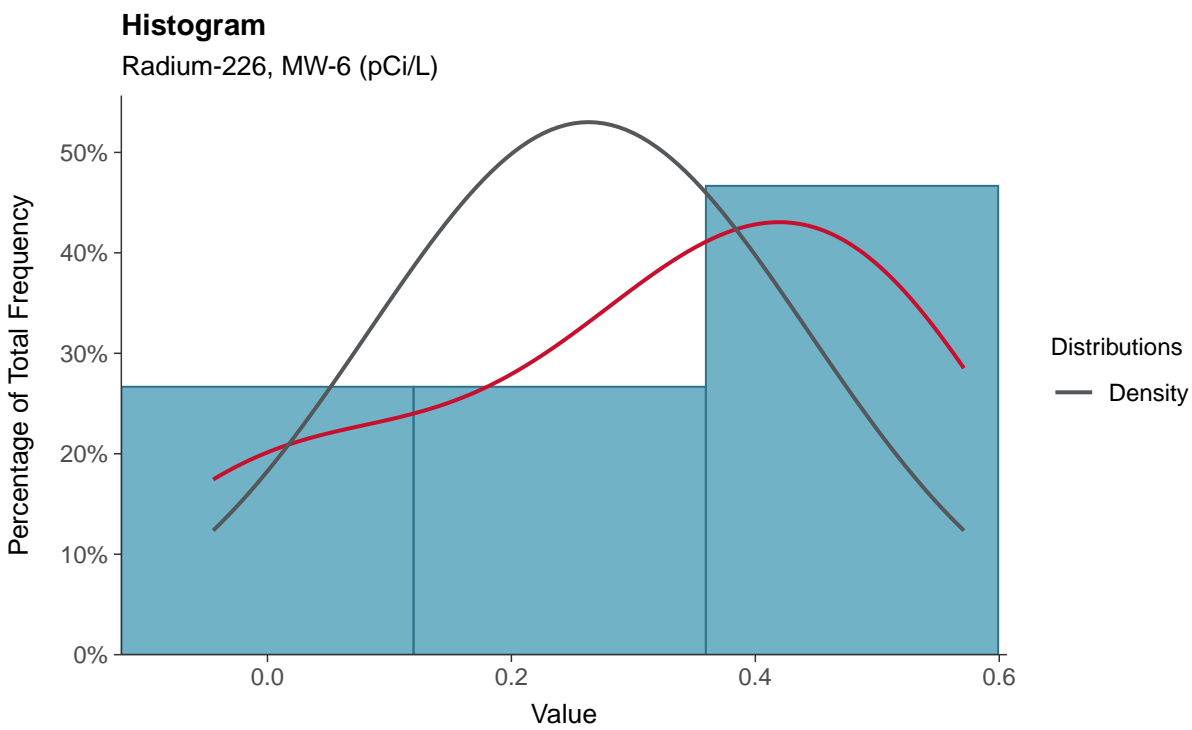
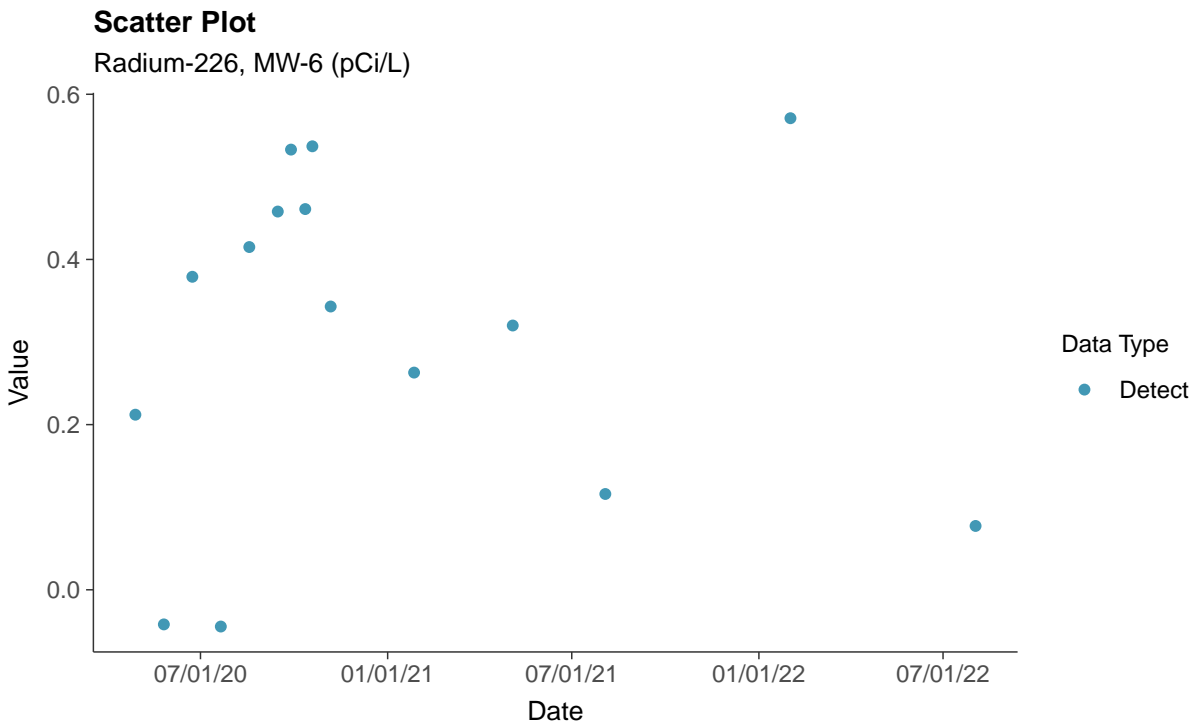
Radium-226, MW-5 (pCi/L)





### Appendix IV: Radium-226, MW-6

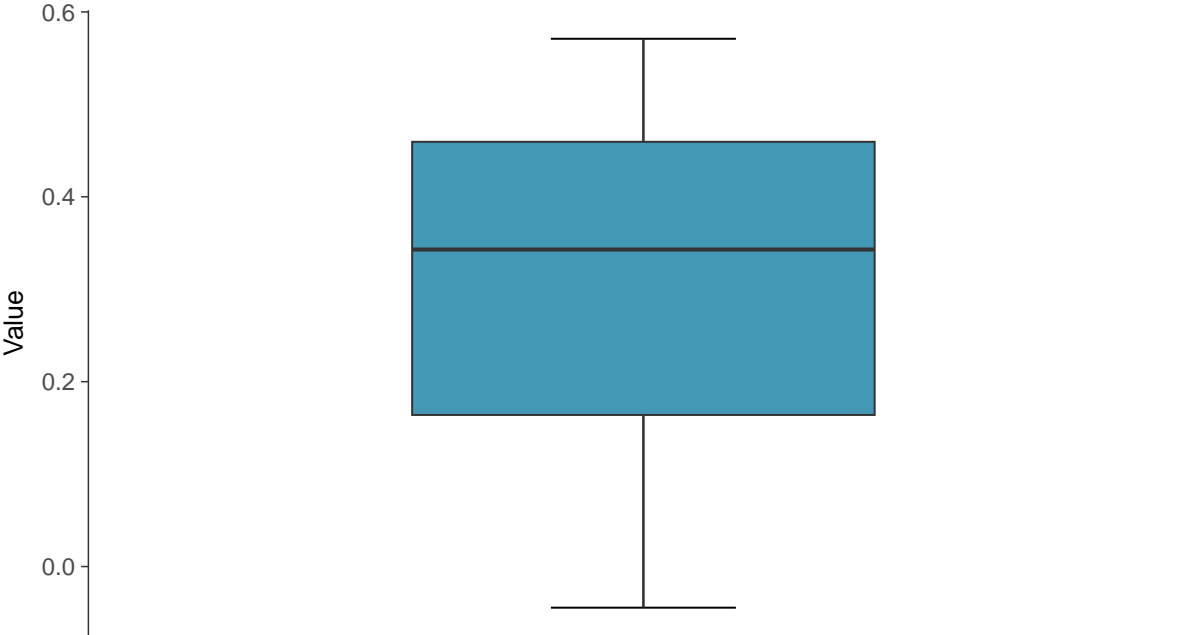
ID: 2\_23\_06





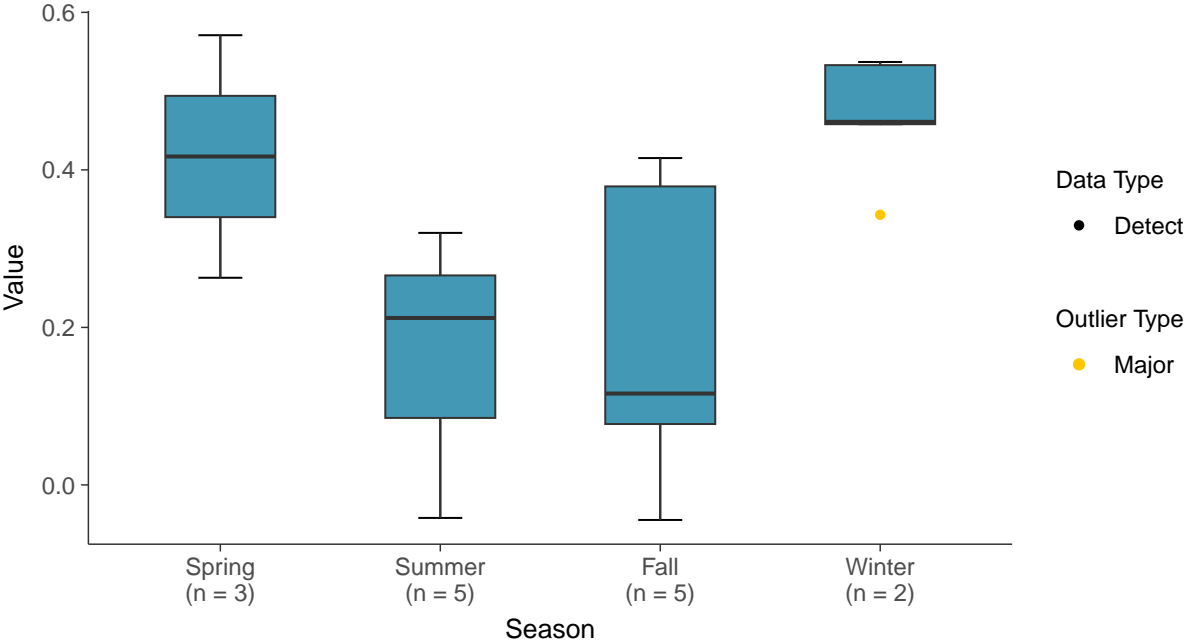
**Boxplot**

Radium-226, MW-6 (pCi/L)



**Boxplot by Season**

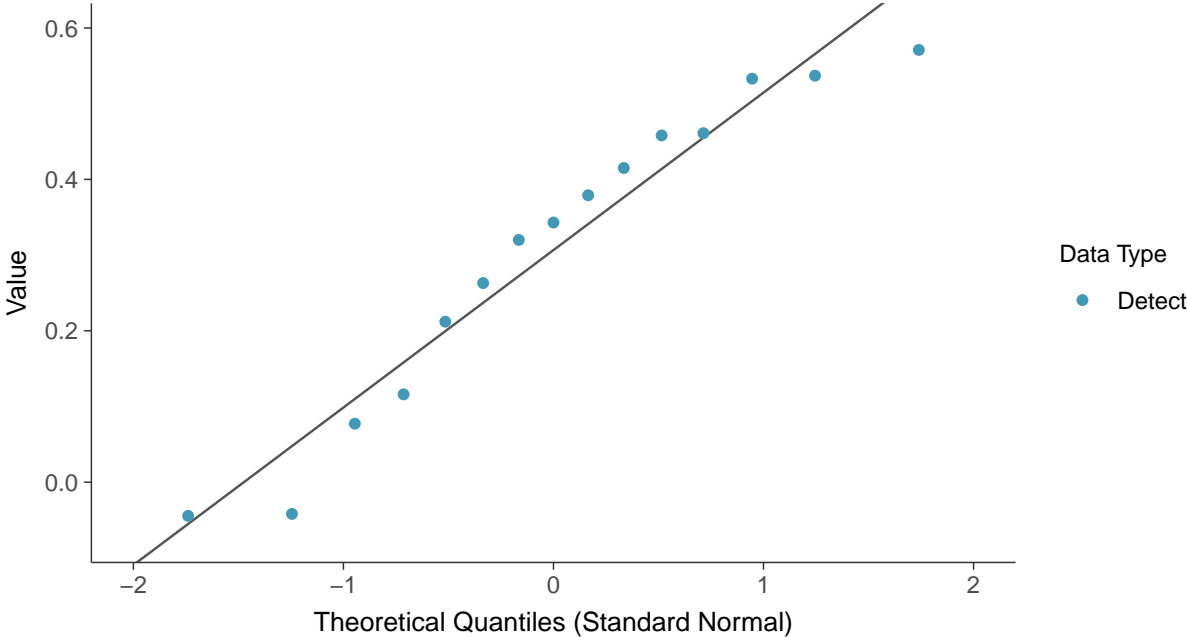
Radium-226, MW-6 (pCi/L)





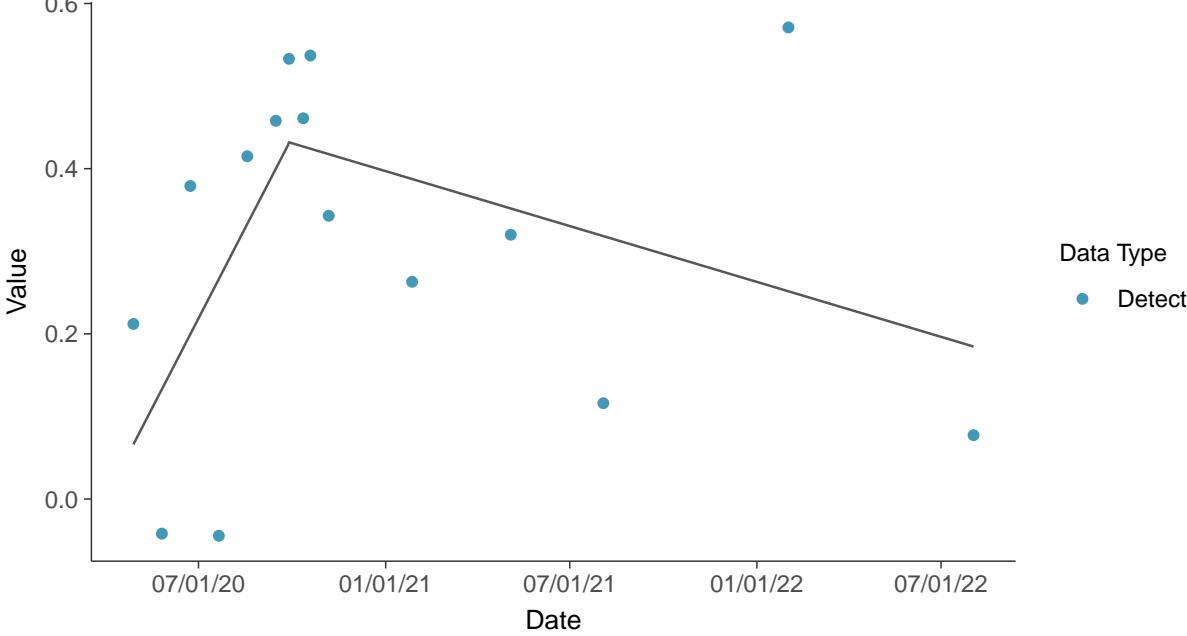
### Normal Q-Q plot

Radium-226, MW-6 (pCi/L)



### Trend Regression: Piecewise Linear-Linear

Radium-226, MW-6 (pCi/L)



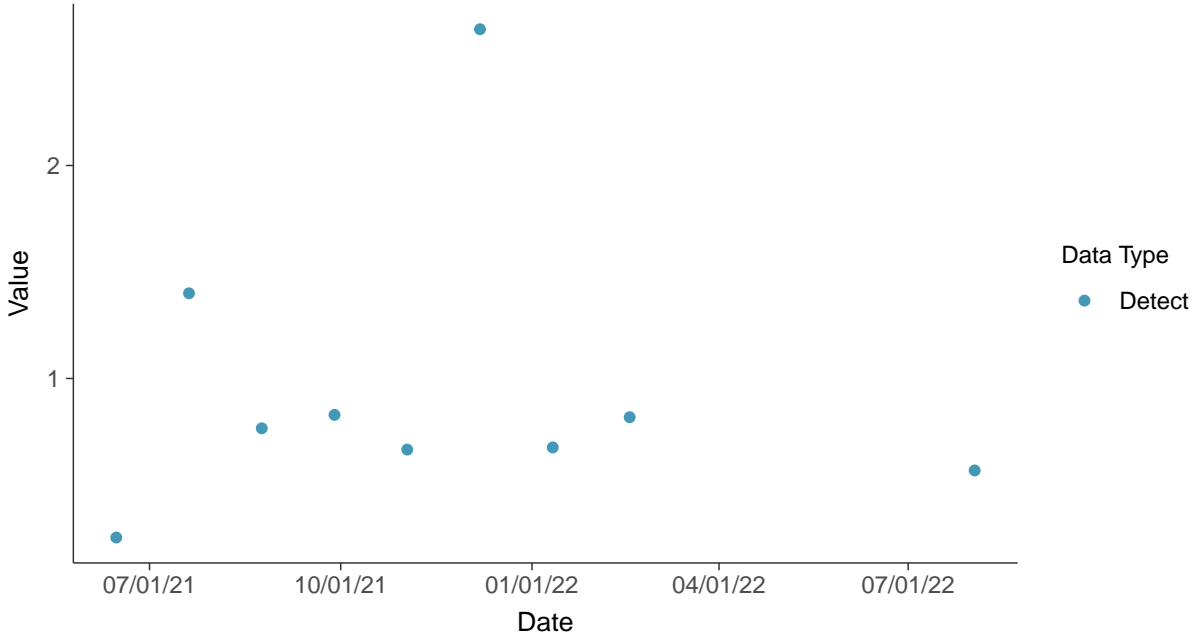


### Appendix IV: Radium-226, MW-7

ID: 2\_23\_07

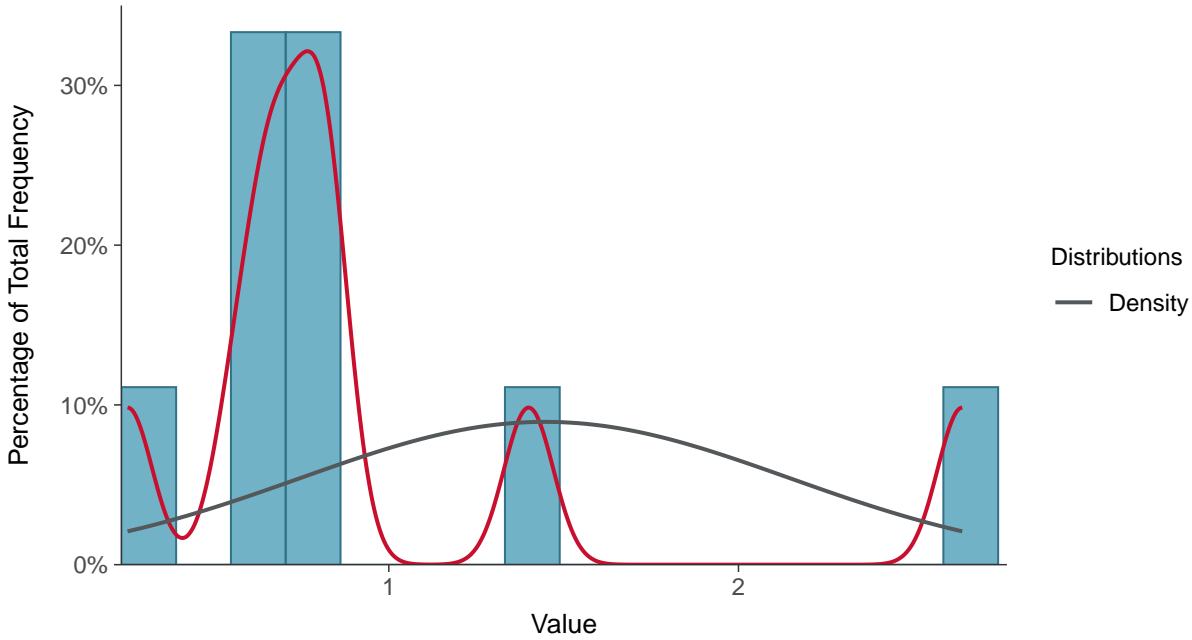
#### Scatter Plot

Radium-226, MW-7 (pCi/L)



#### Histogram

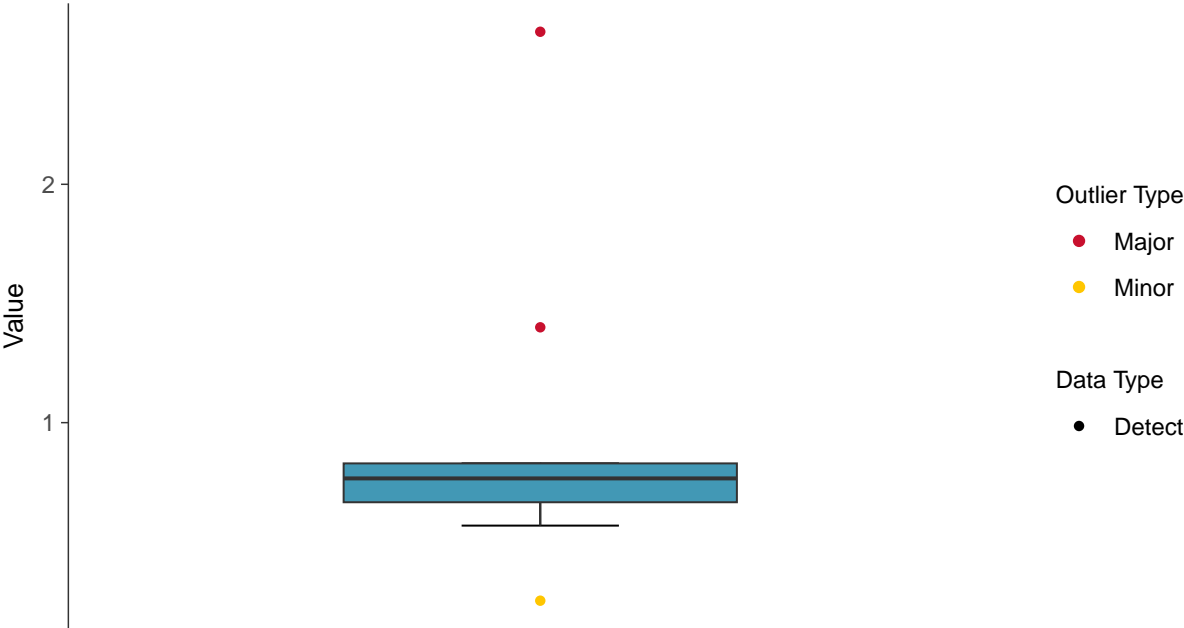
Radium-226, MW-7 (pCi/L)





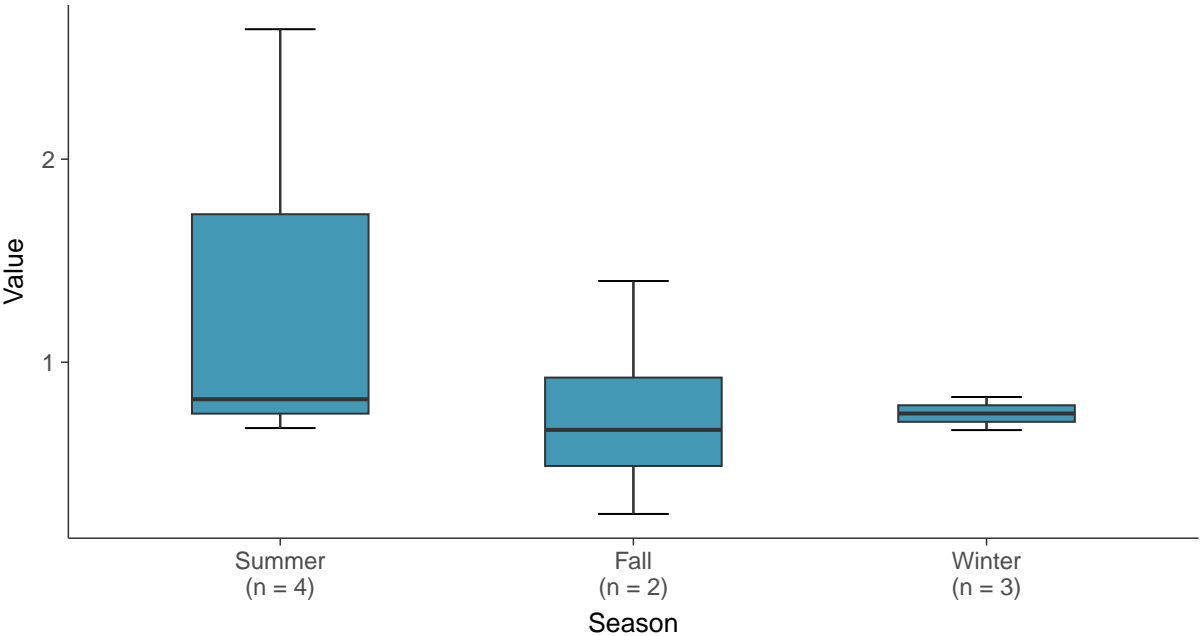
**Boxplot**

Radium-226, MW-7 (pCi/L)



**Boxplot by Season**

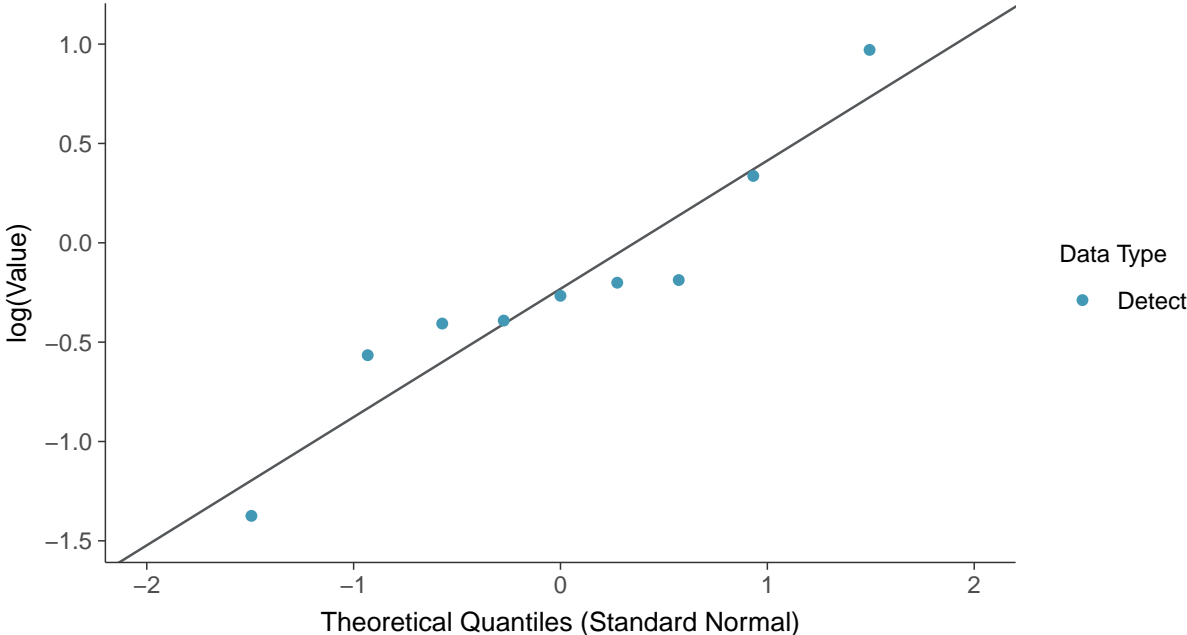
Radium-226, MW-7 (pCi/L)





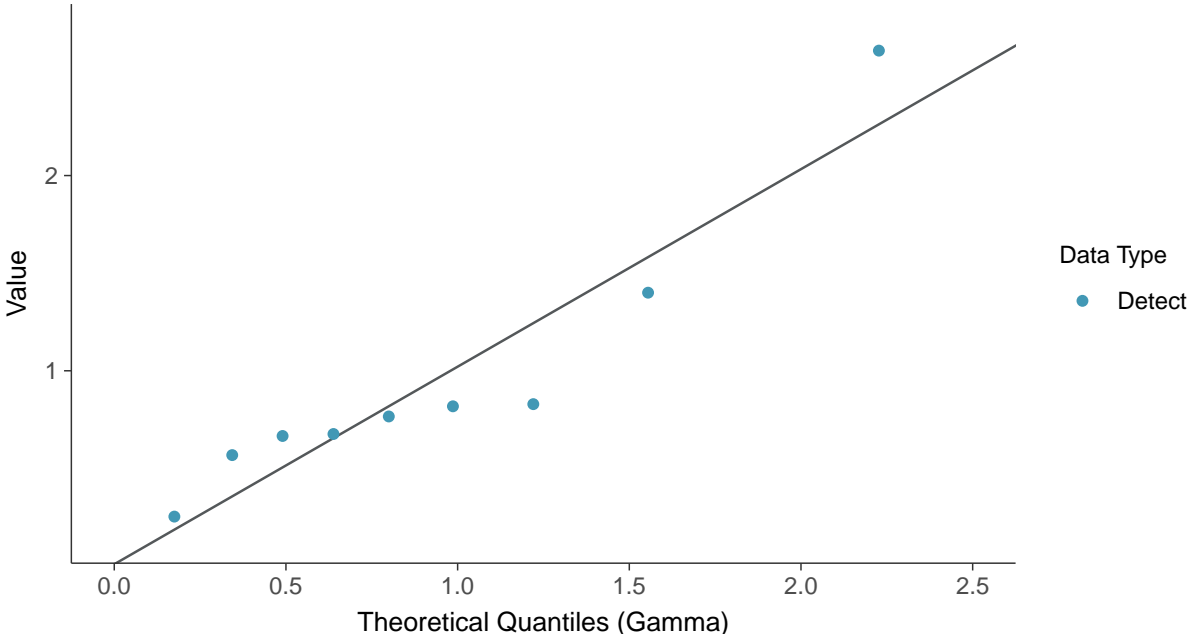
**Lognormal Q-Q plot**

Radium-226, MW-7 (pCi/L)



**Gamma Q-Q plot**

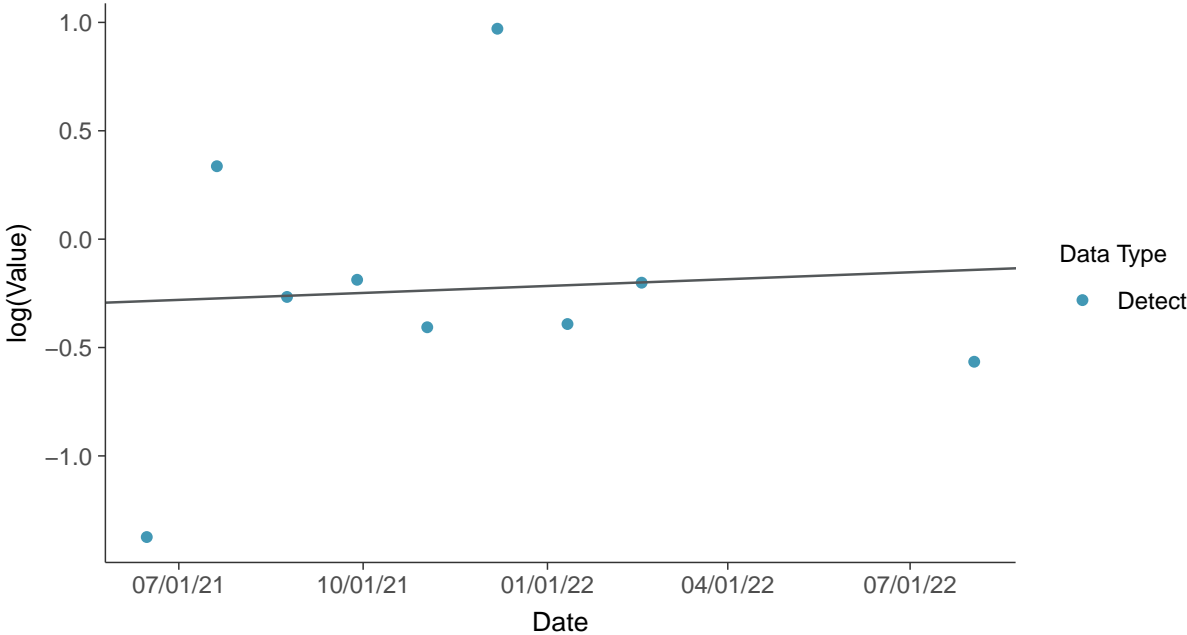
Radium-226, MW-7 (pCi/L)





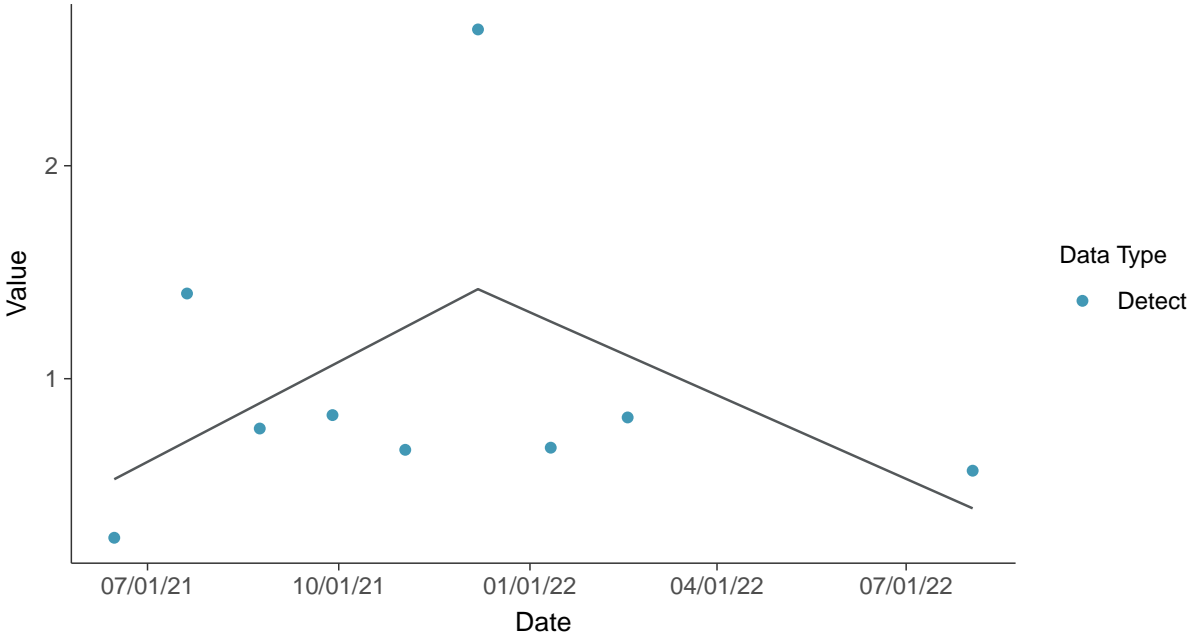
**Trend Regression: Lognormal MLE**

Radium-226, MW-7 (pCi/L)



**Trend Regression: Piecewise Linear-Linear**

Radium-226, MW-7 (pCi/L)

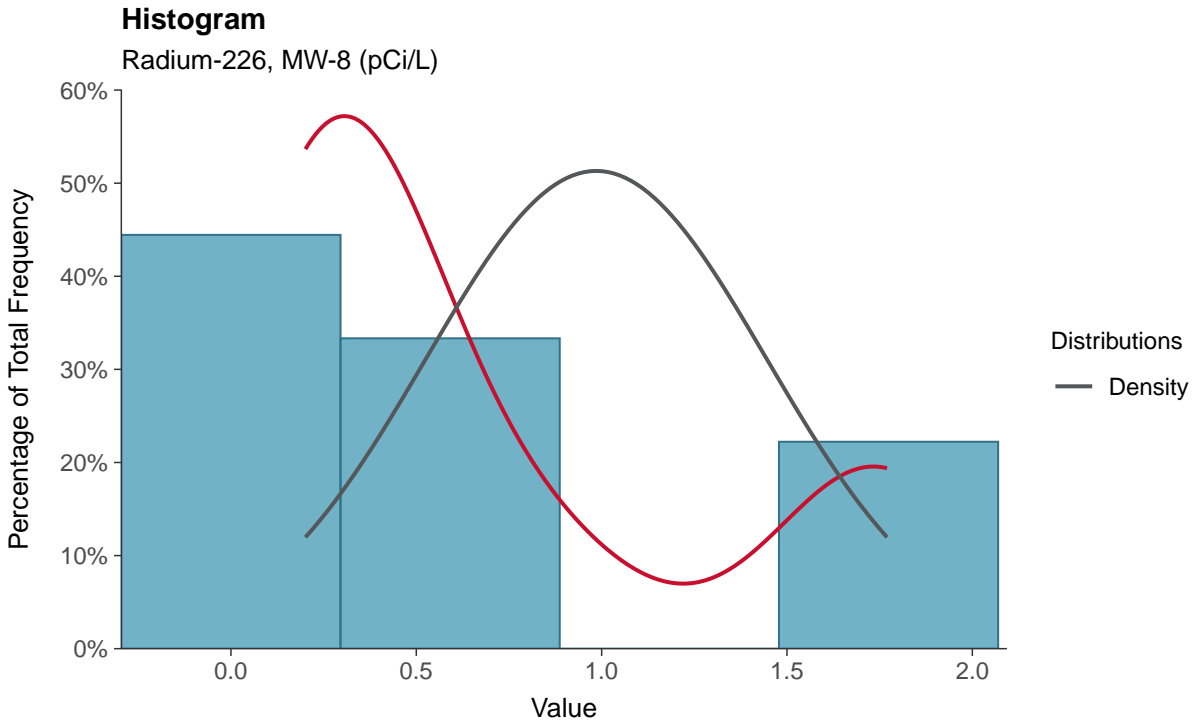
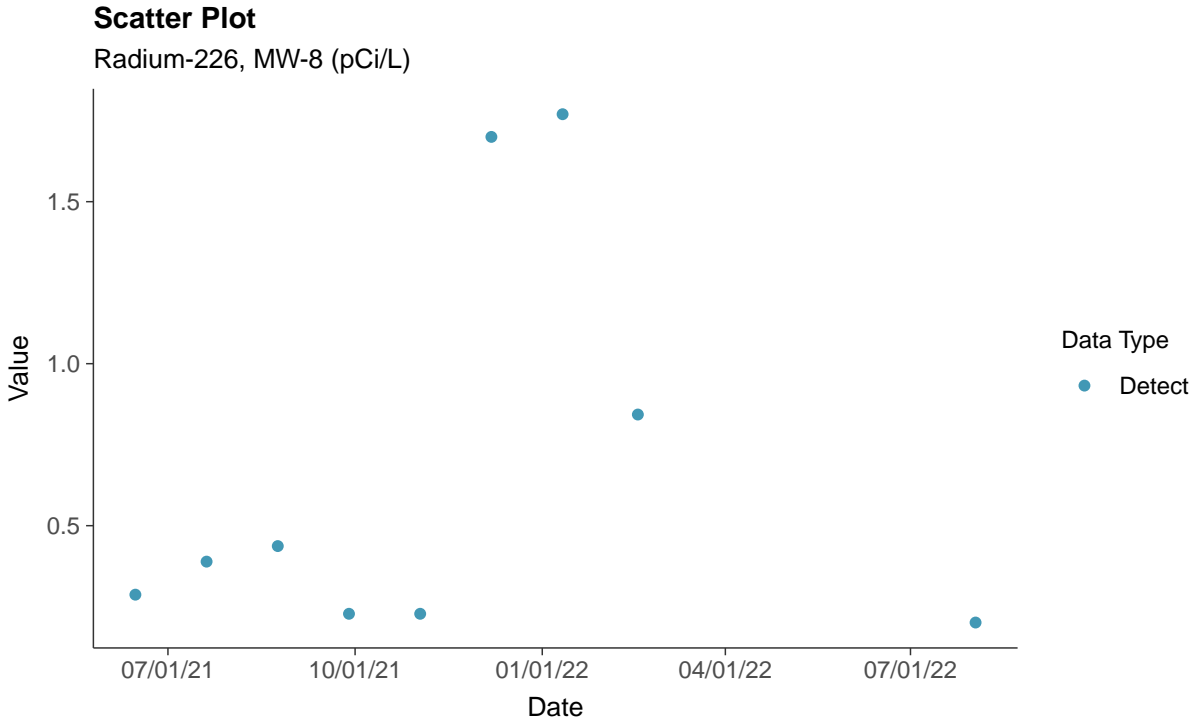






### Appendix IV: Radium-226, MW-8

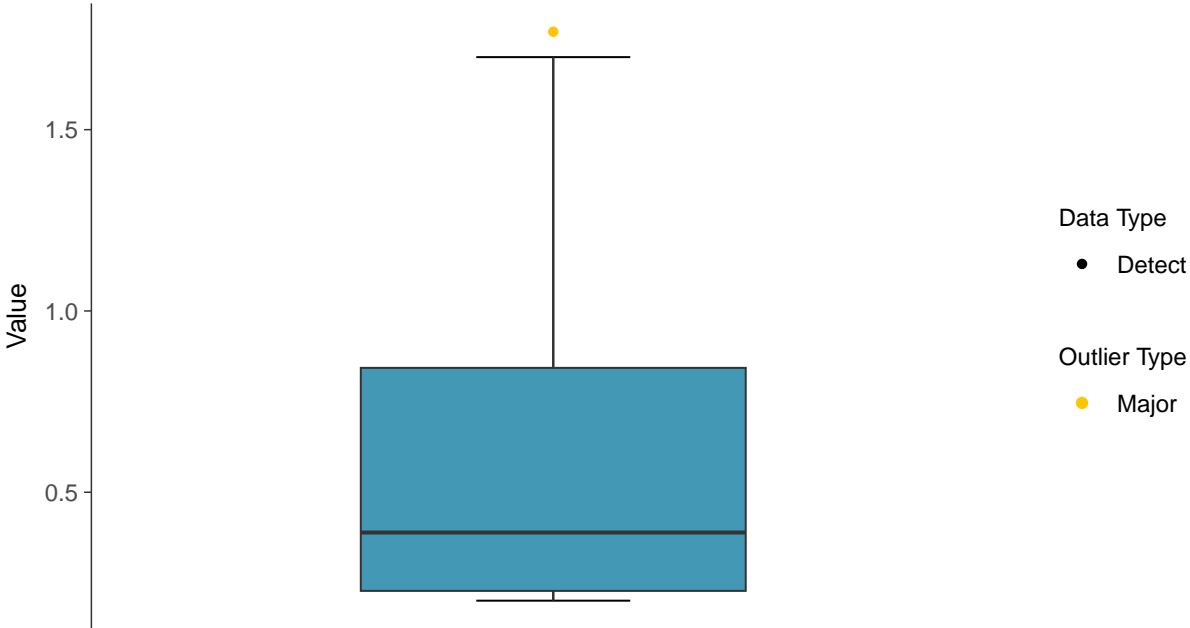
ID: 2\_23\_08





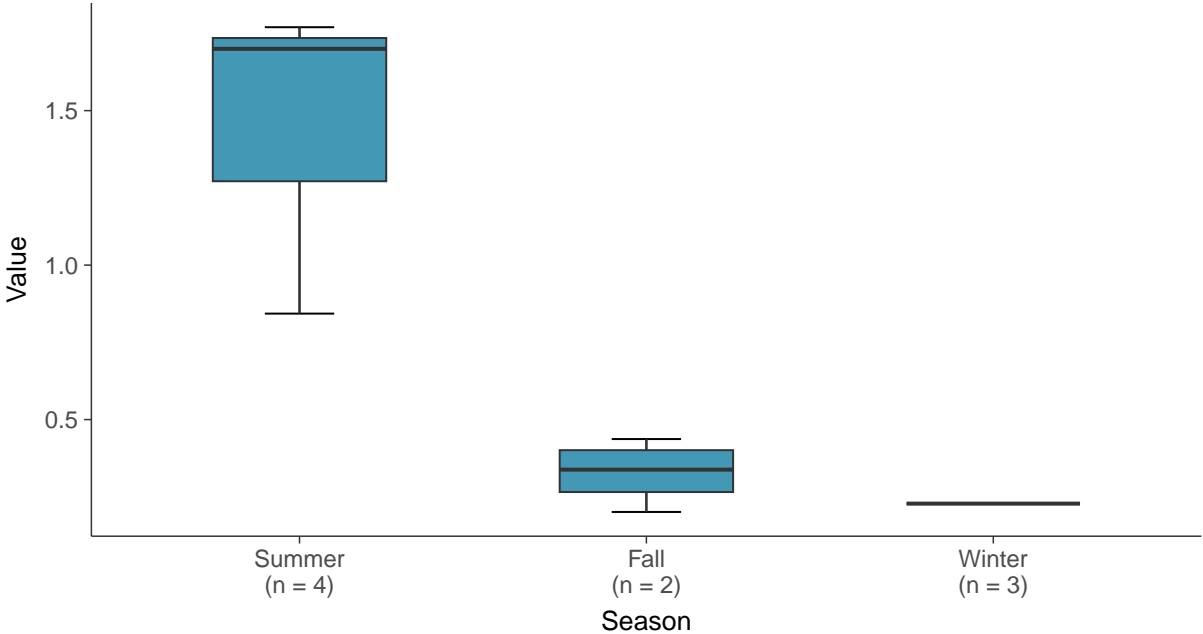
**Boxplot**

Radium-226, MW-8 (pCi/L)



**Boxplot by Season**

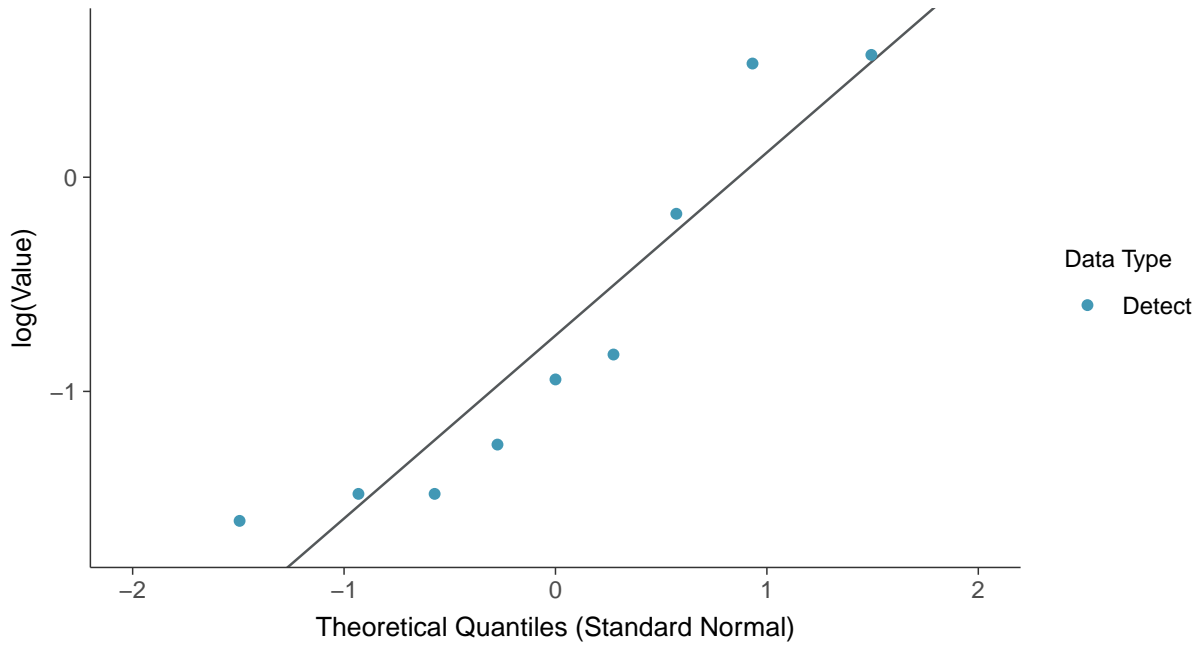
Radium-226, MW-8 (pCi/L)





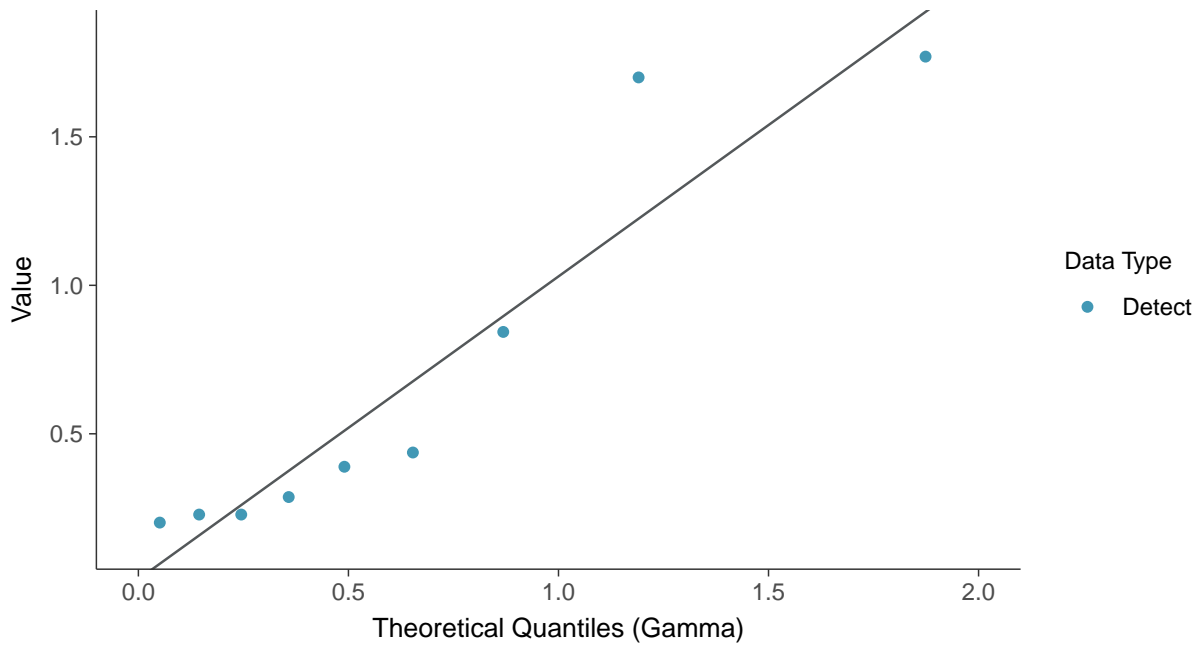
### Lognormal Q-Q plot

Radium-226, MW-8 (pCi/L)



### Gamma Q-Q plot

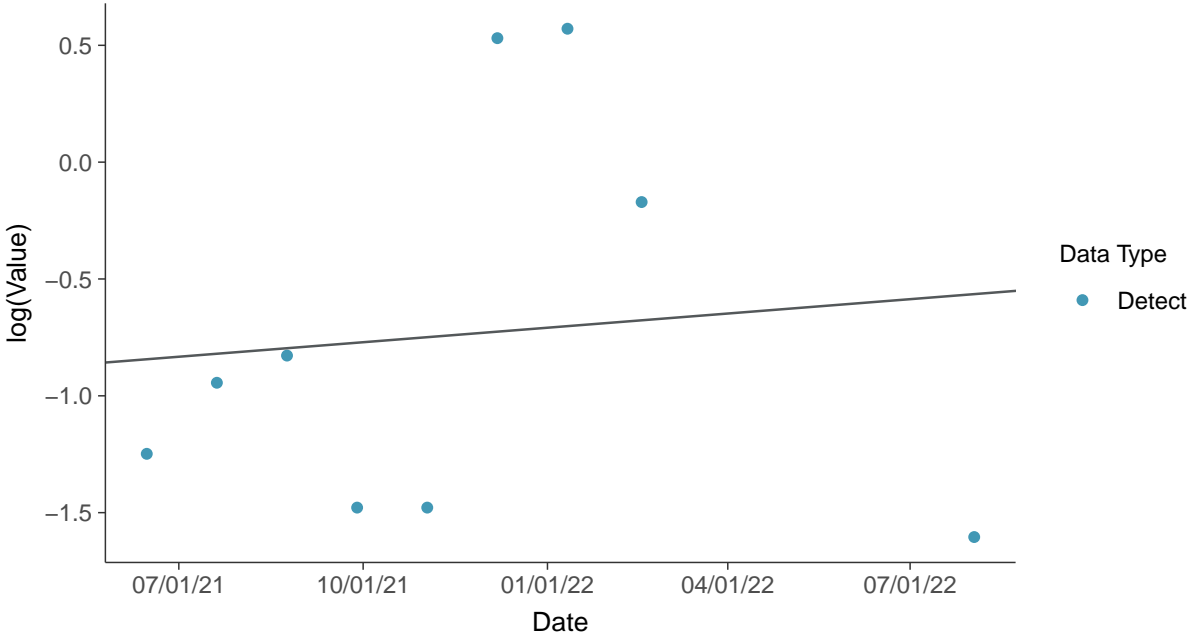
Radium-226, MW-8 (pCi/L)





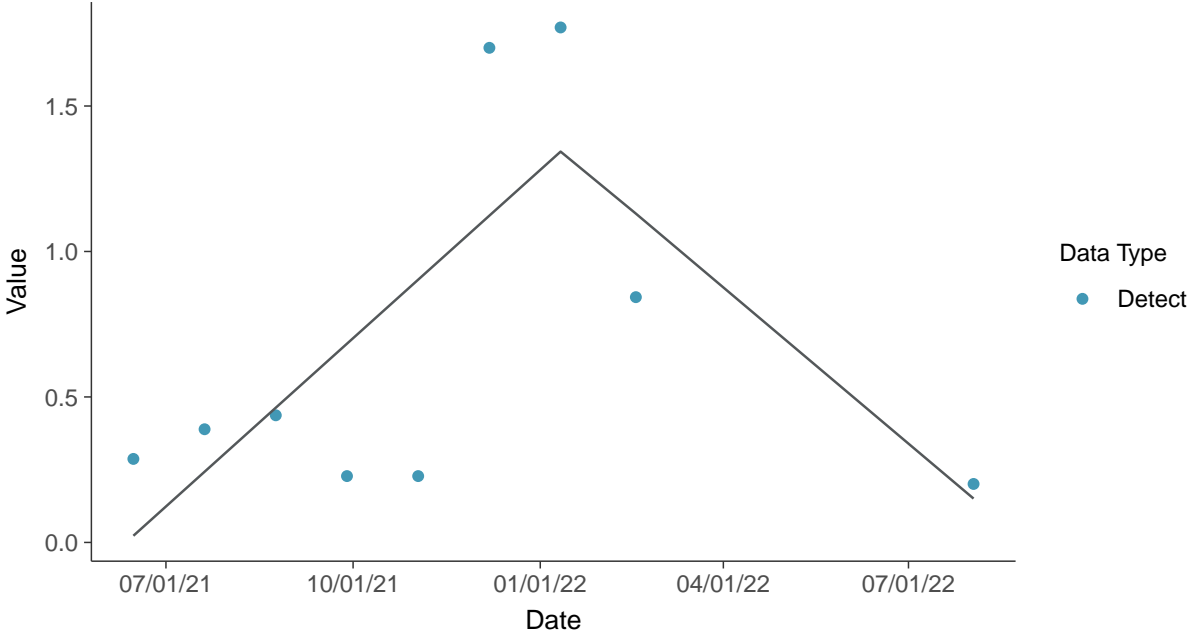
**Trend Regression: Lognormal MLE**

Radium-226, MW-8 (pCi/L)



**Trend Regression: Piecewise Linear-Linear**

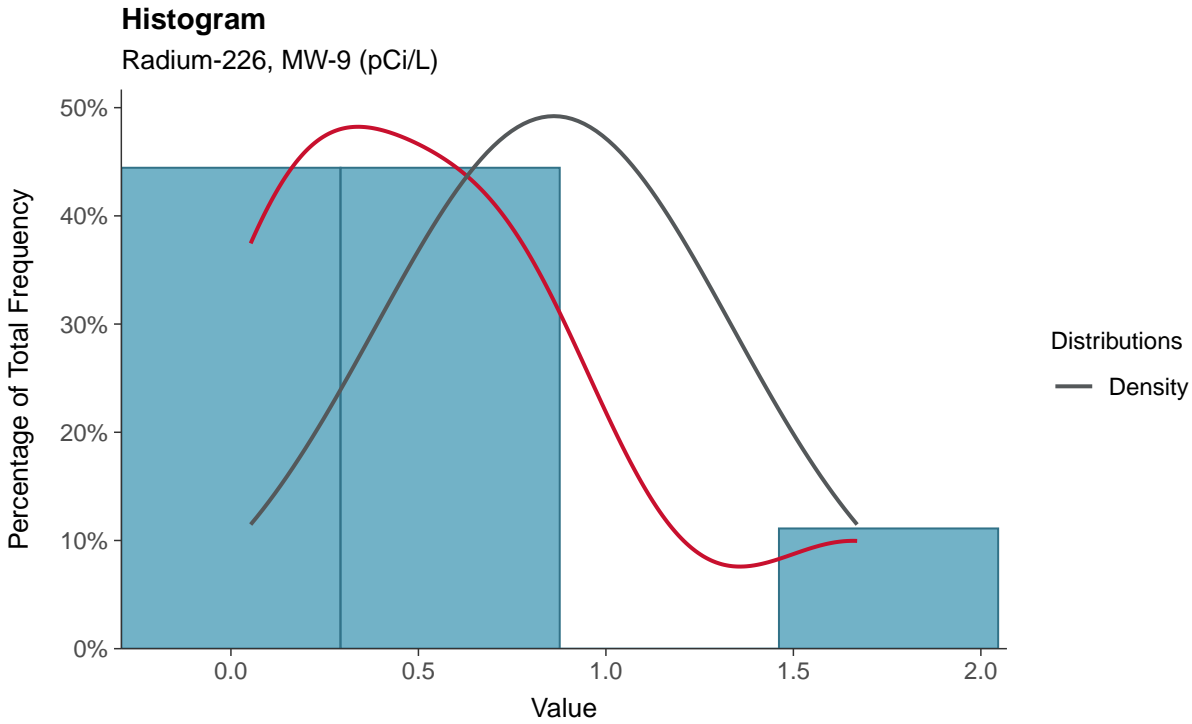
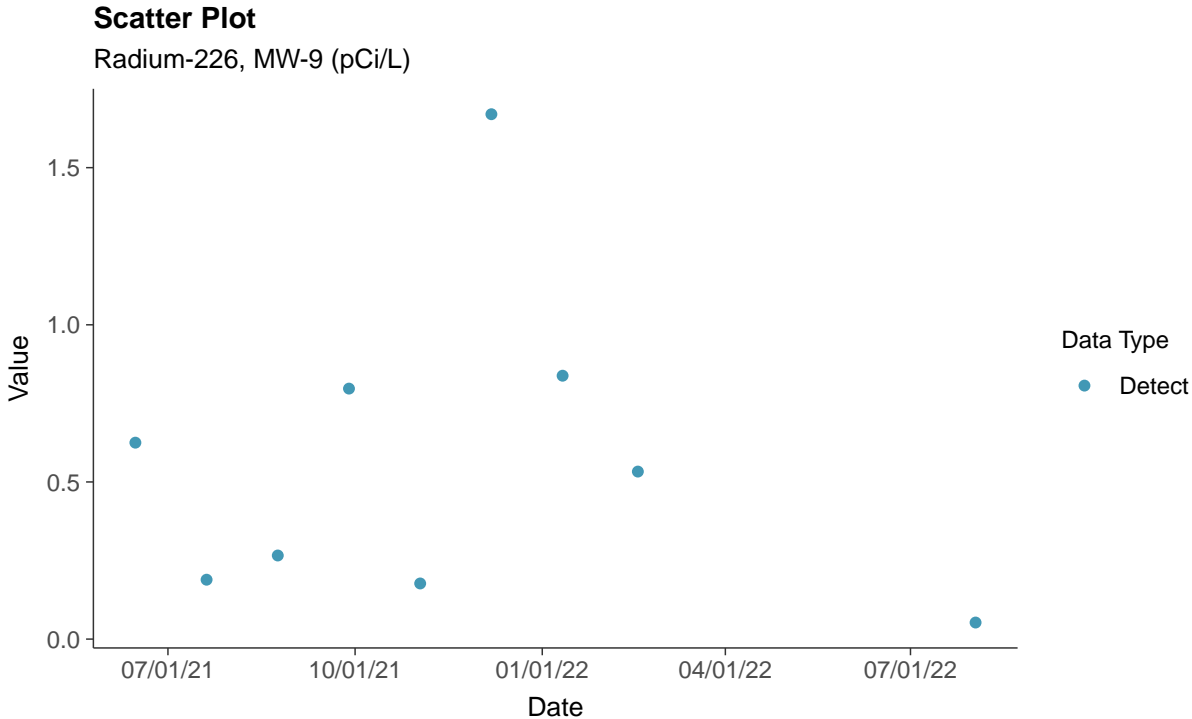
Radium-226, MW-8 (pCi/L)





### Appendix IV: Radium-226, MW-9

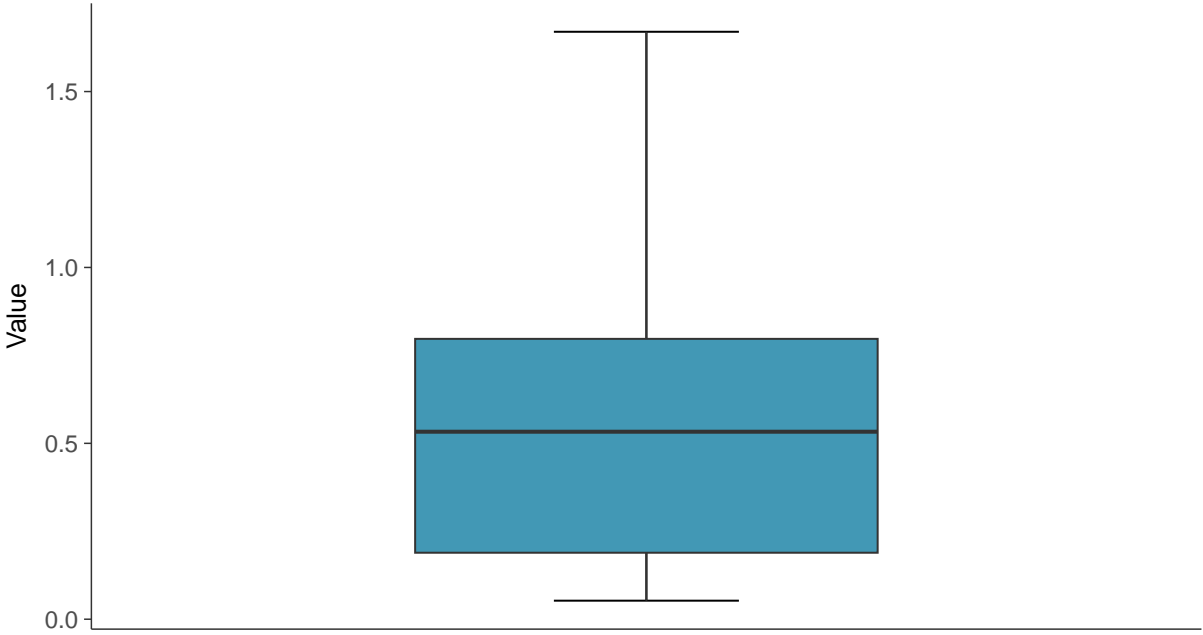
ID: 2\_23\_09





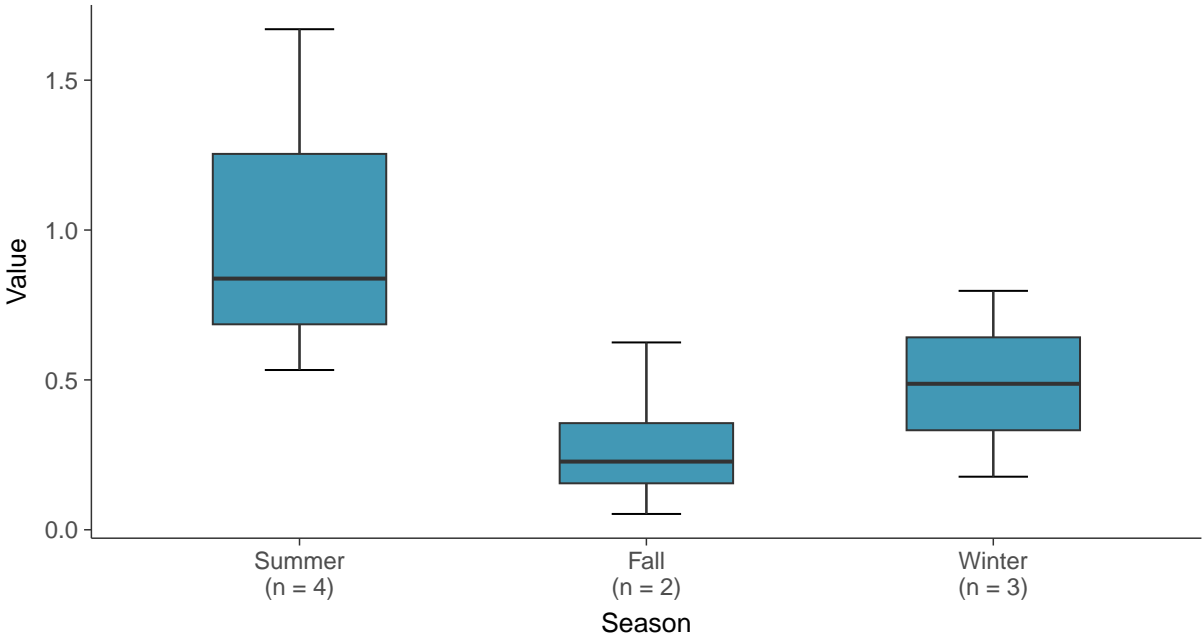
**Boxplot**

Radium-226, MW-9 (pCi/L)



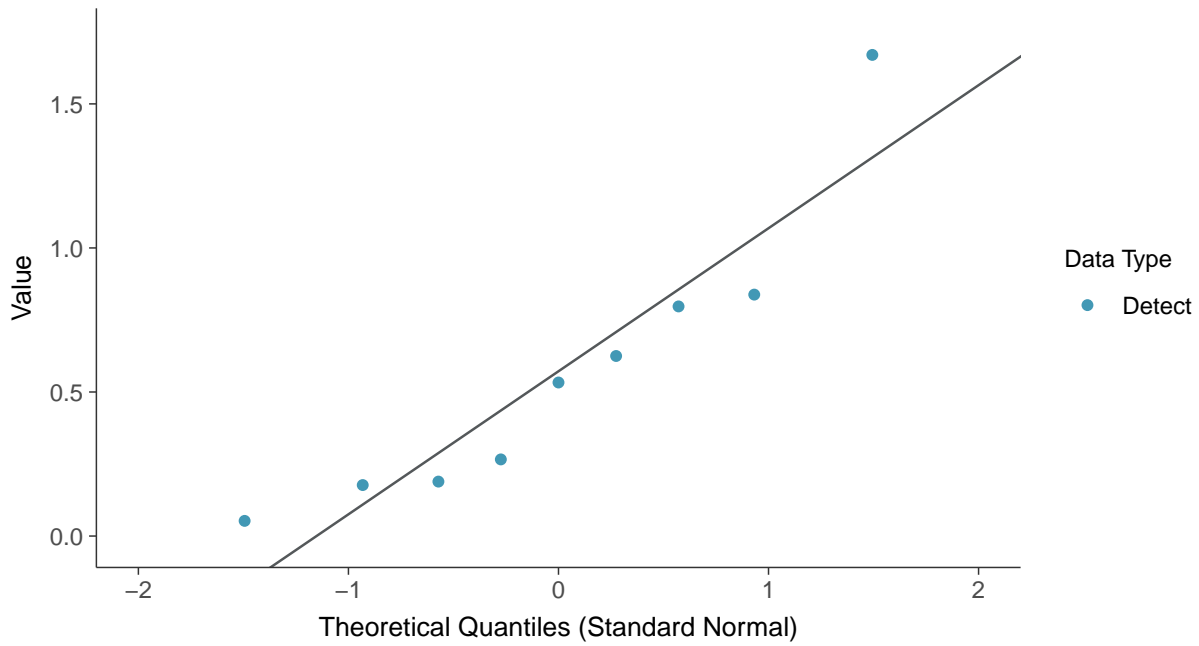
**Boxplot by Season**

Radium-226, MW-9 (pCi/L)

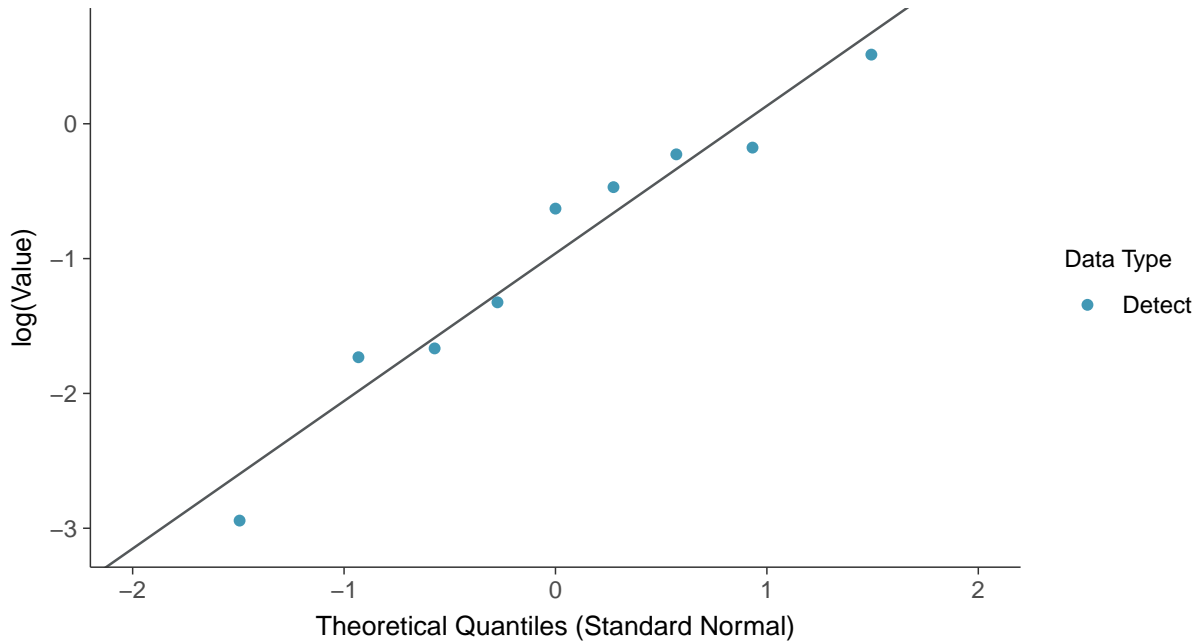




**Normal Q-Q plot**  
Radium-226, MW-9 (pCi/L)



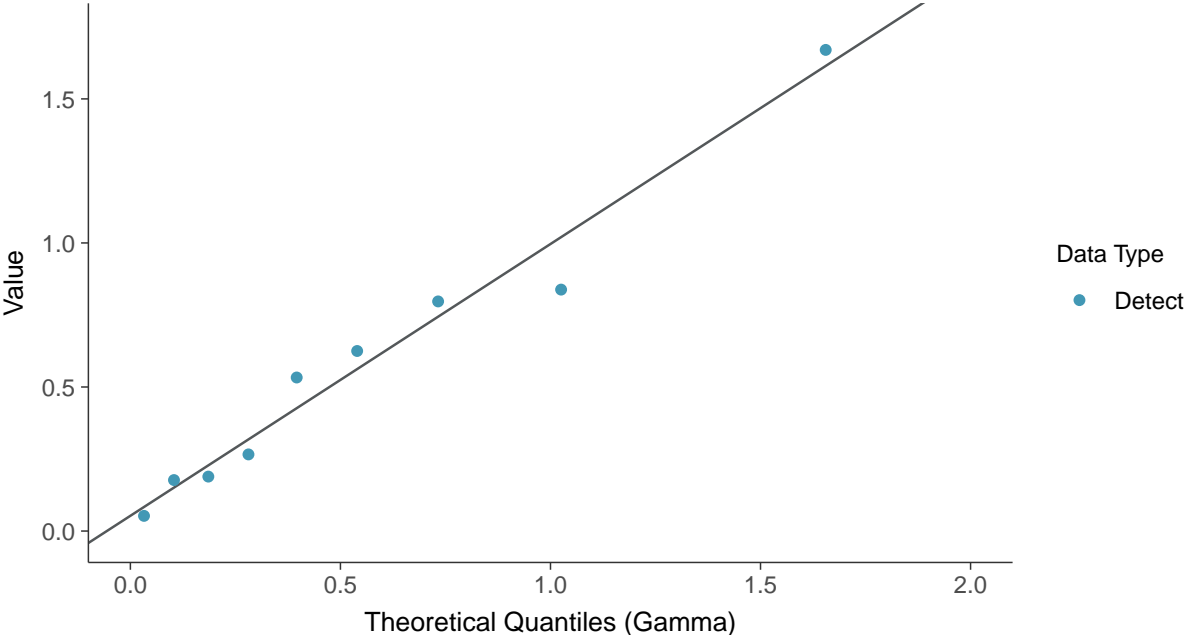
**Lognormal Q-Q plot**  
Radium-226, MW-9 (pCi/L)





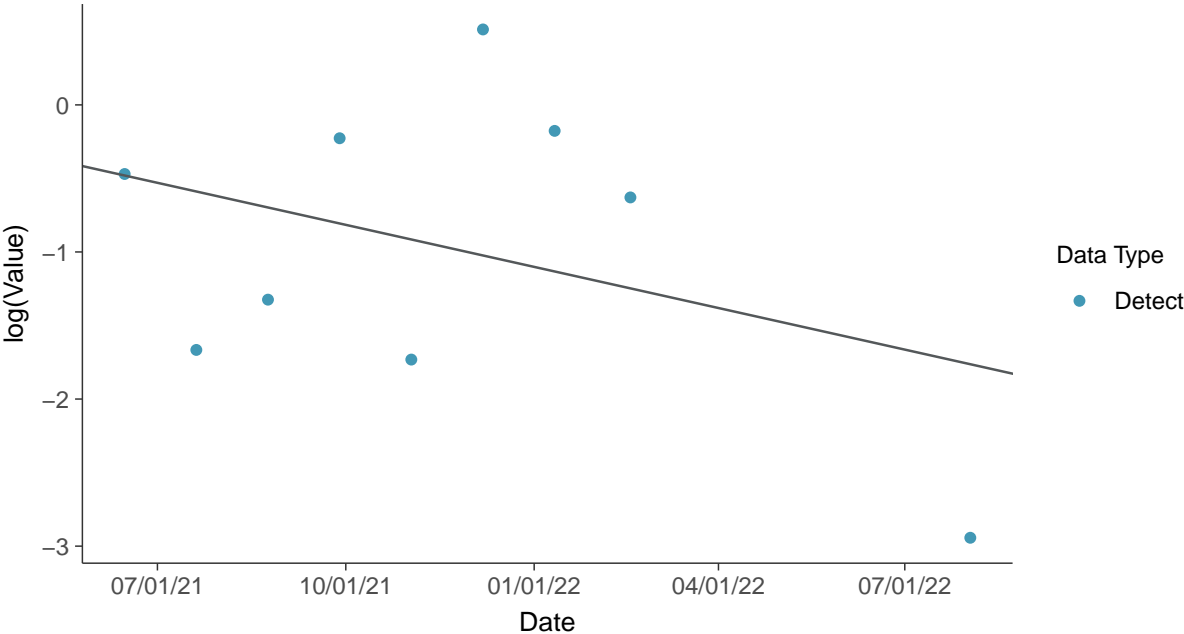
**Gamma Q-Q plot**

Radium-226, MW-9 (pCi/L)



**Trend Regression: Lognormal MLE**

Radium-226, MW-9 (pCi/L)

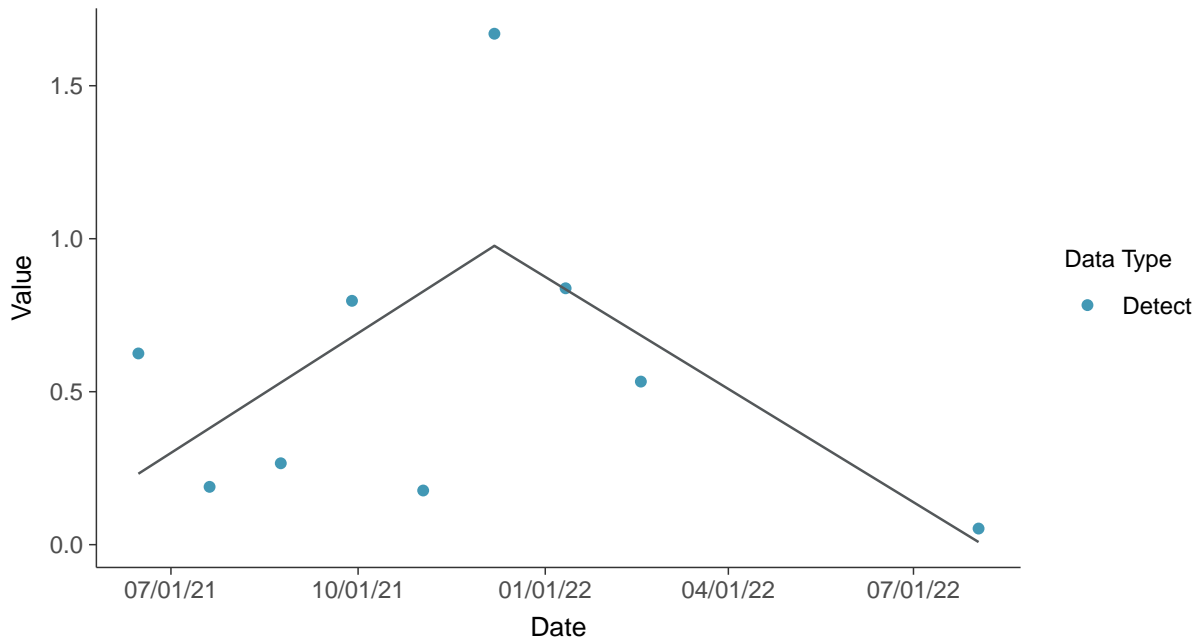






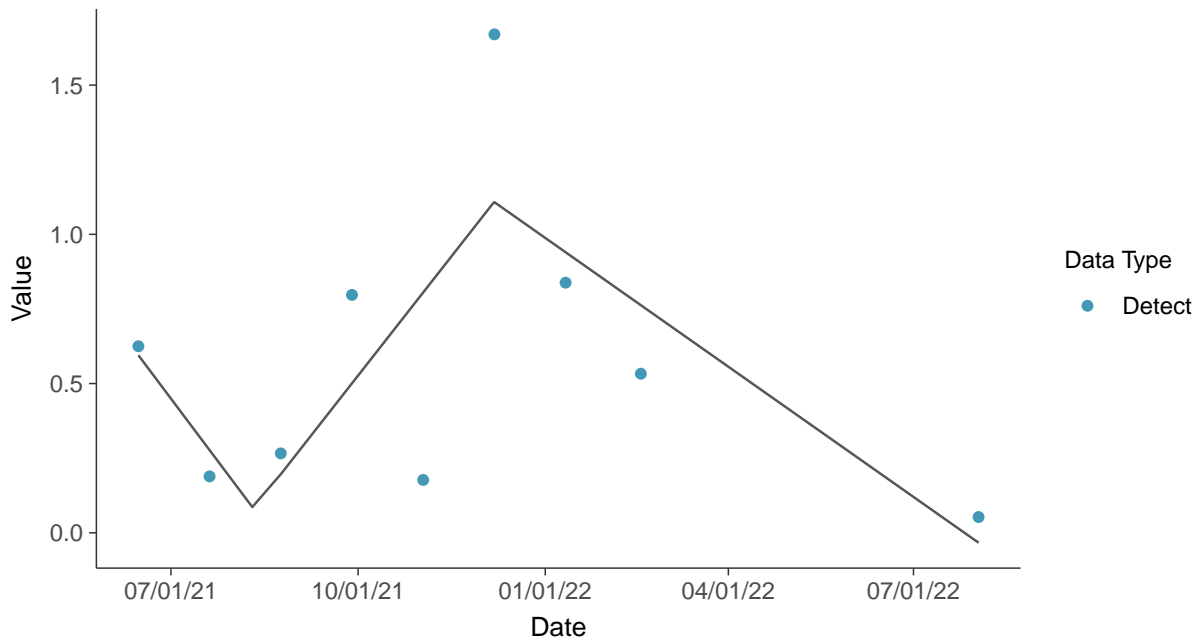
### Trend Regression: Piecewise Linear-Linear

Radium-226, MW-9 (pCi/L)



### Trend Regression: Piecewise Linear-Linear-Linear

Radium-226, MW-9 (pCi/L)



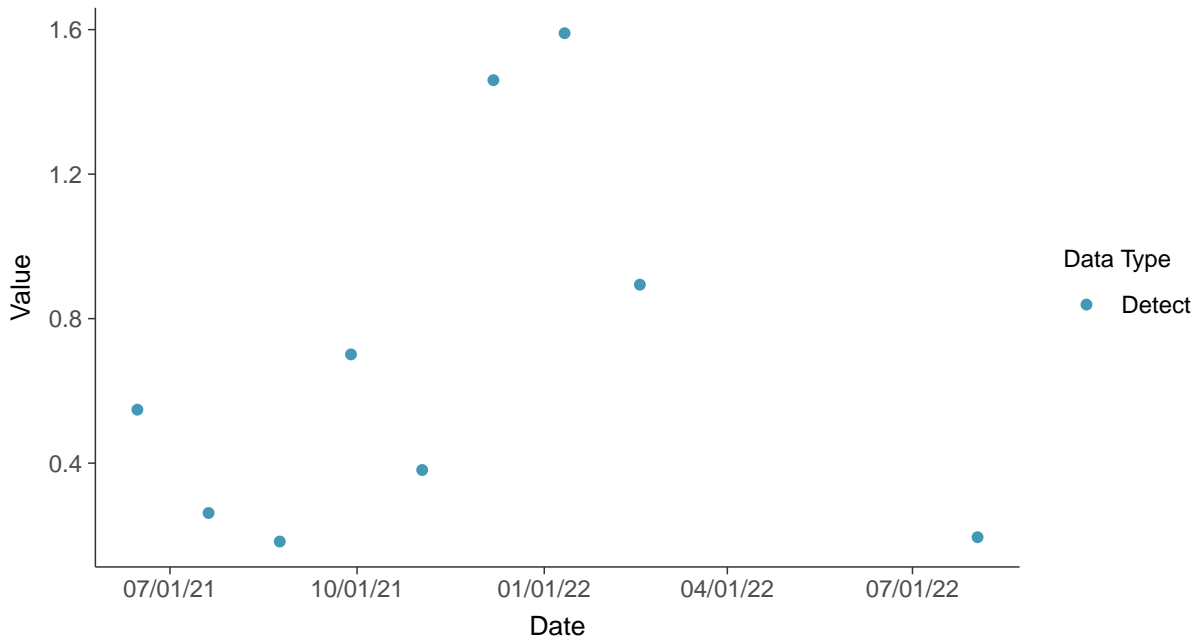


### Appendix IV: Radium-226, MW-10

ID: 2\_23\_10

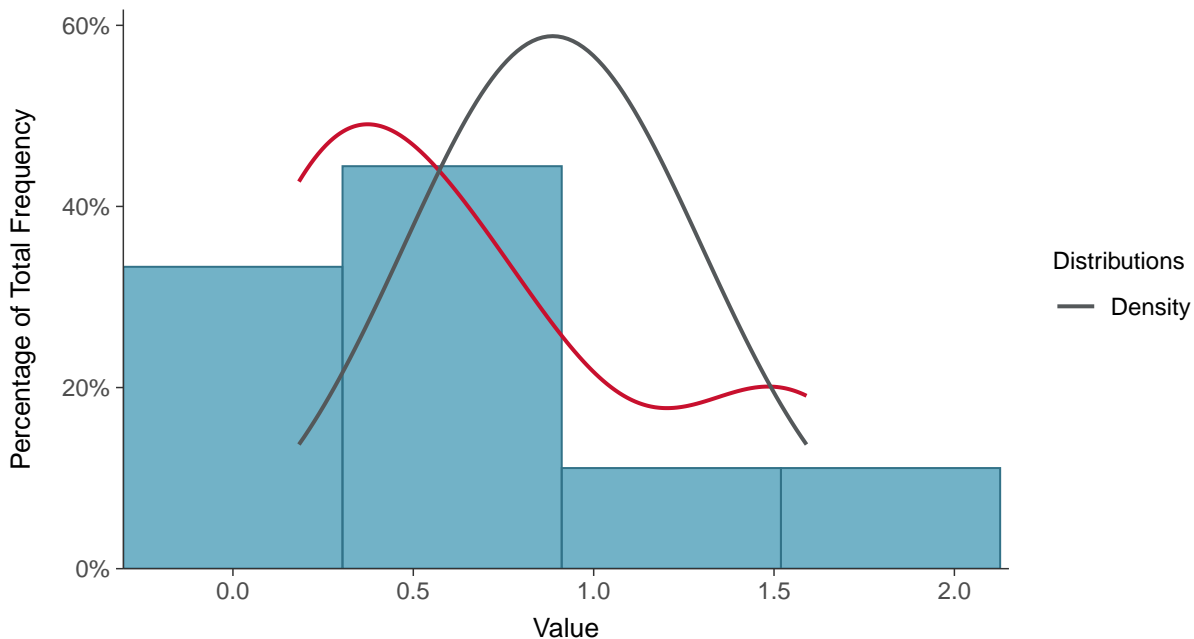
#### Scatter Plot

Radium-226, MW-10 (pCi/L)



#### Histogram

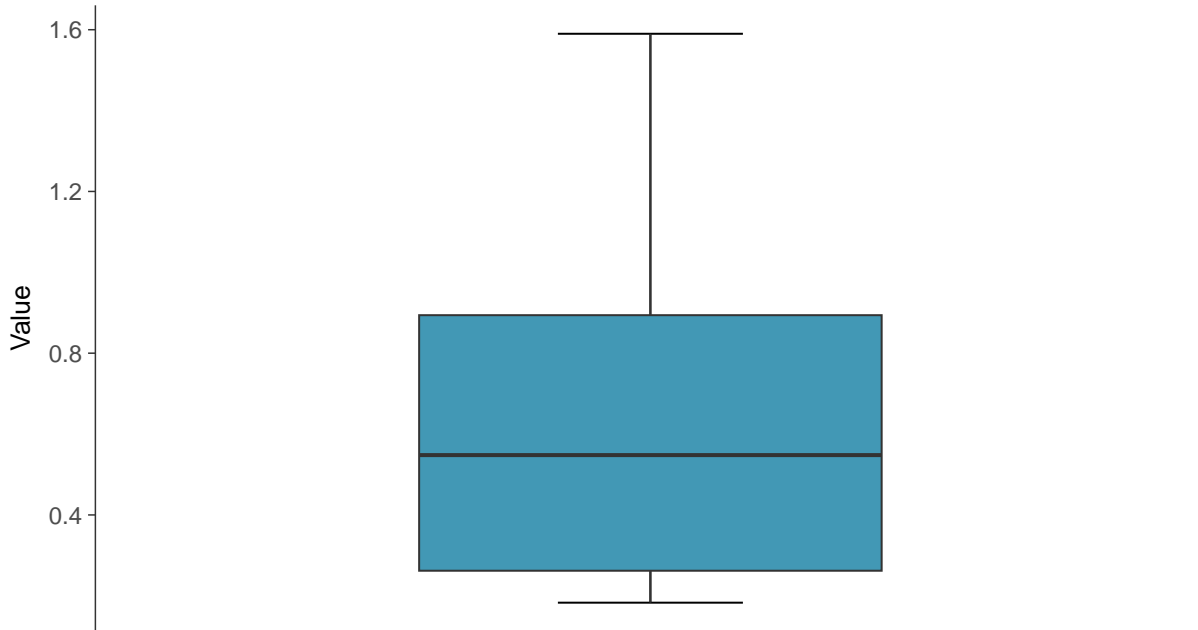
Radium-226, MW-10 (pCi/L)





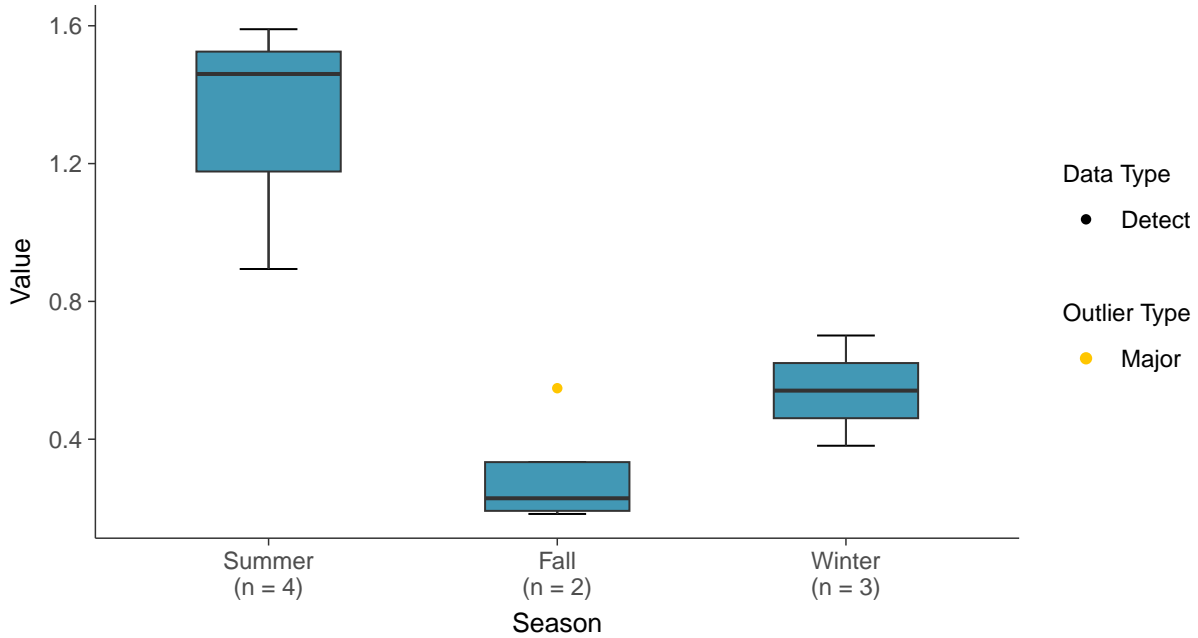
### Boxplot

Radium-226, MW-10 (pCi/L)



### Boxplot by Season

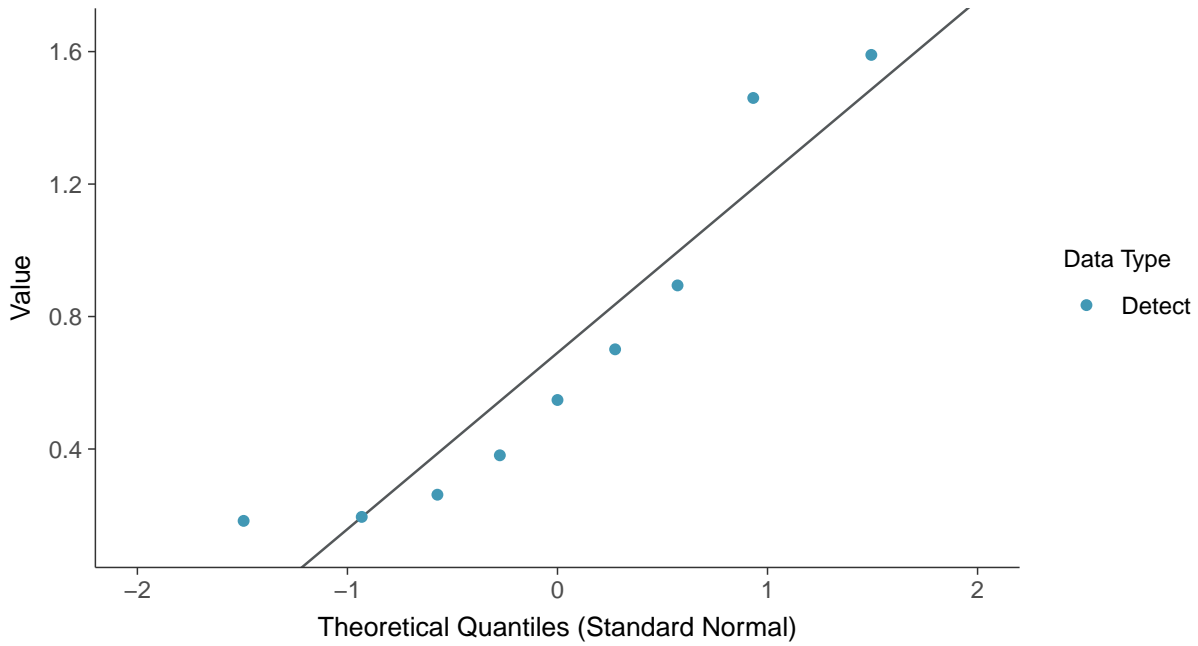
Radium-226, MW-10 (pCi/L)





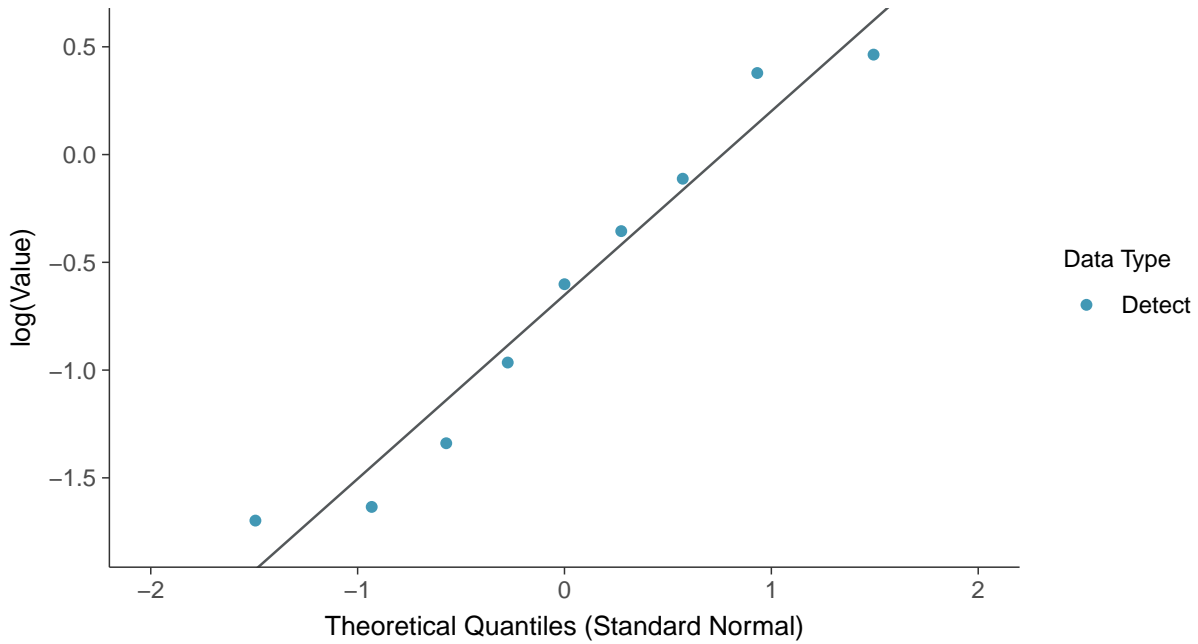
### Normal Q-Q plot

Radium-226, MW-10 (pCi/L)



### Lognormal Q-Q plot

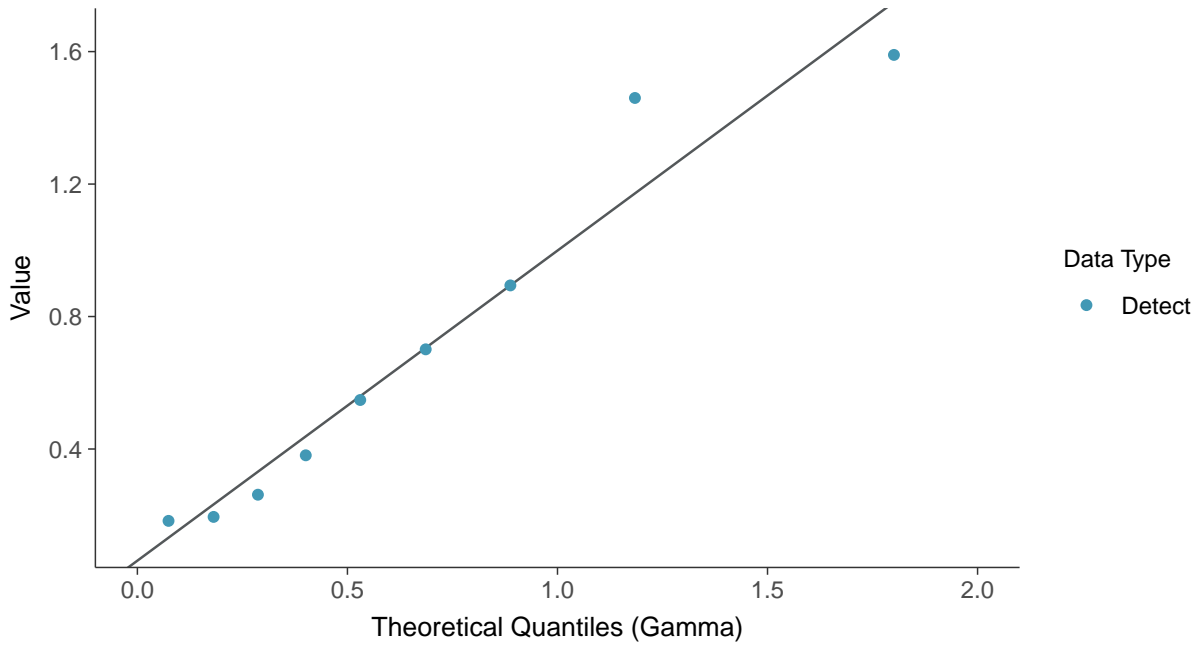
Radium-226, MW-10 (pCi/L)





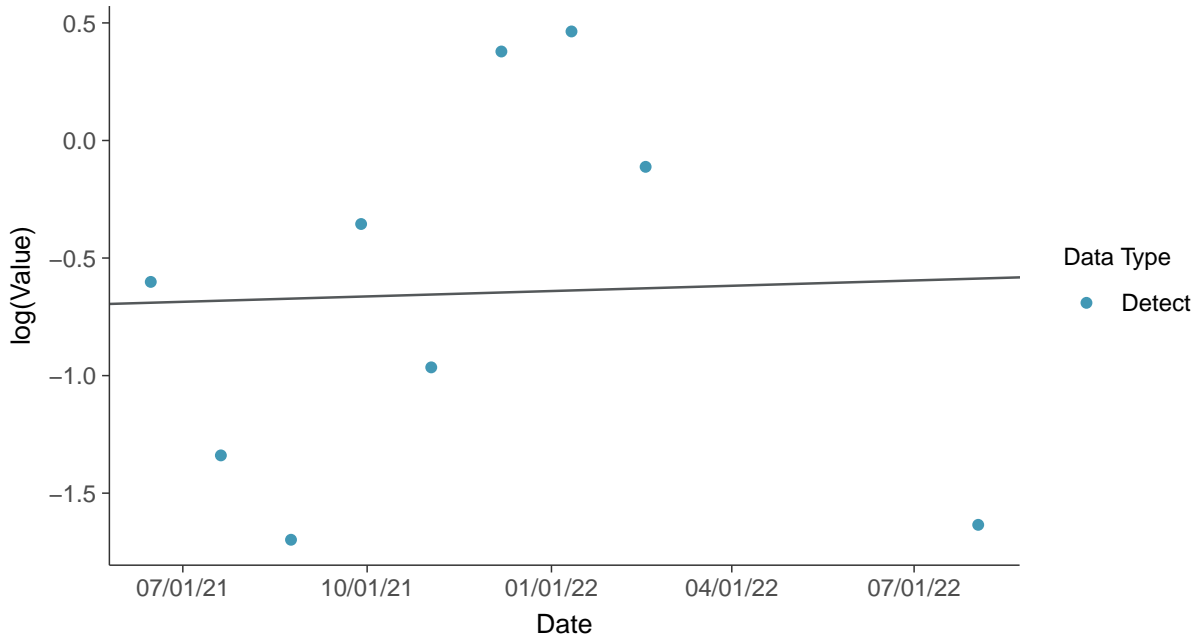
### Gamma Q-Q plot

Radium-226, MW-10 (pCi/L)



### Trend Regression: Lognormal MLE

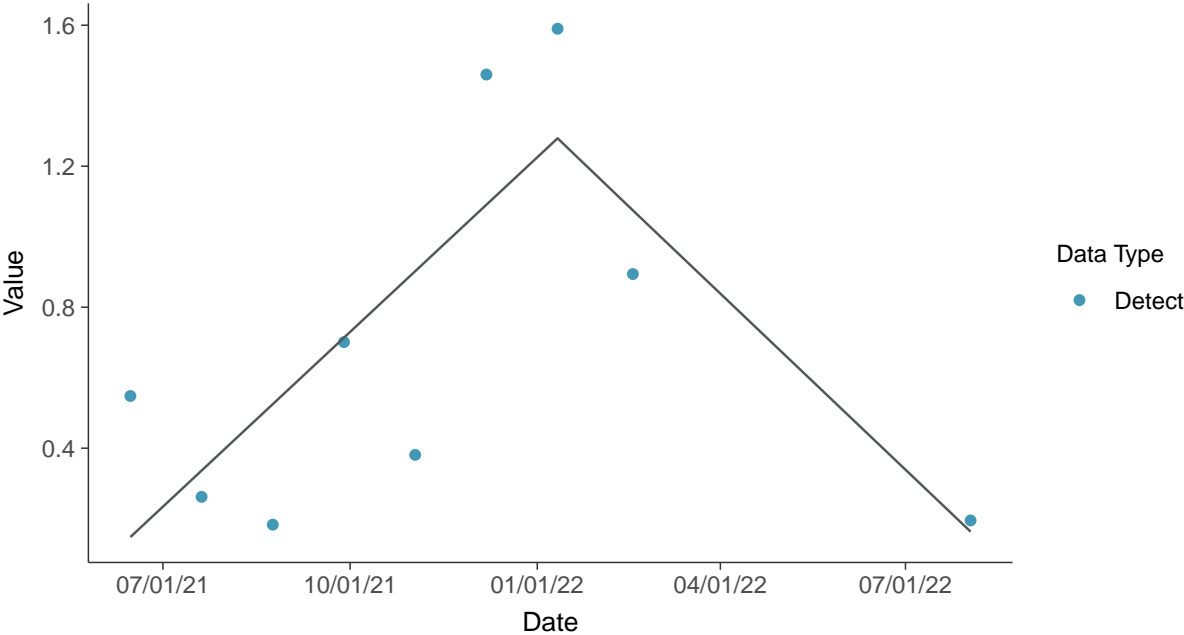
Radium-226, MW-10 (pCi/L)





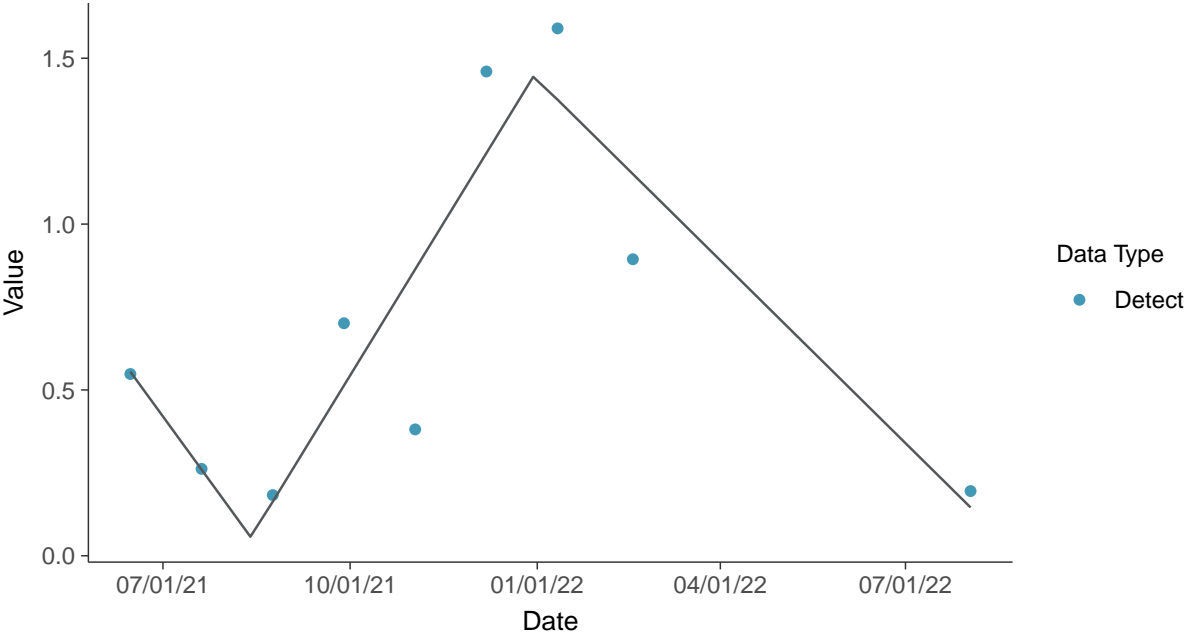
**Trend Regression: Piecewise Linear-Linear**

Radium-226, MW-10 (pCi/L)



**Trend Regression: Piecewise Linear-Linear-Linear**

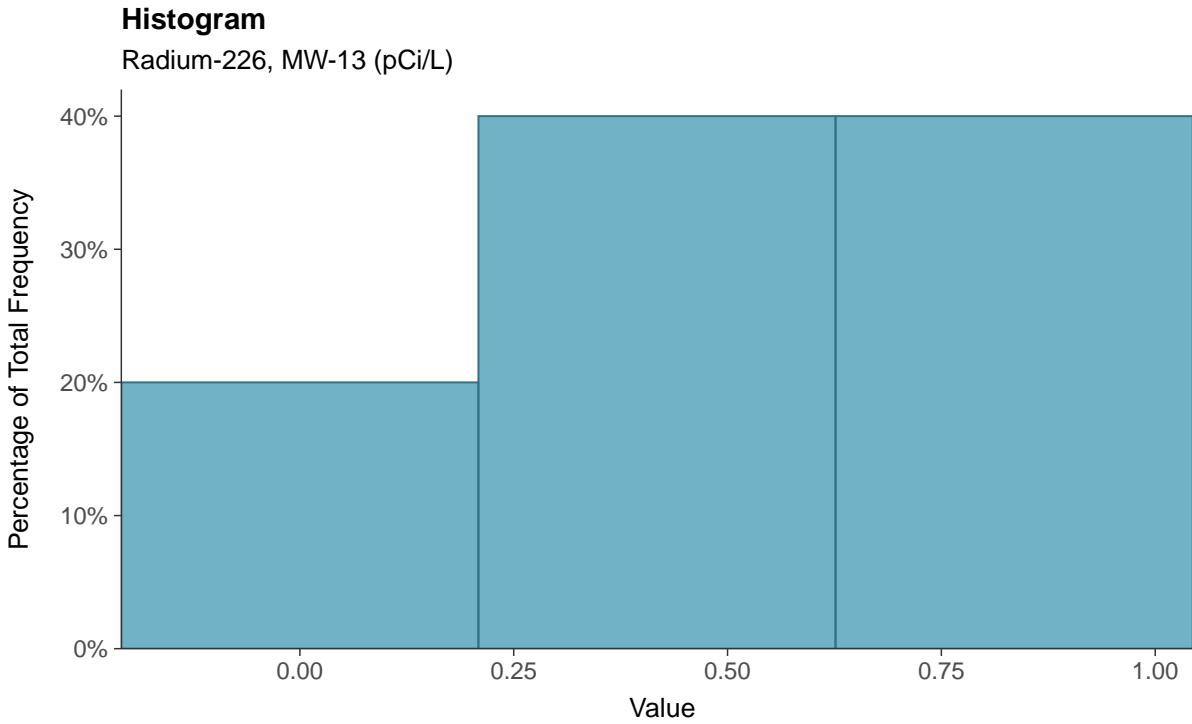
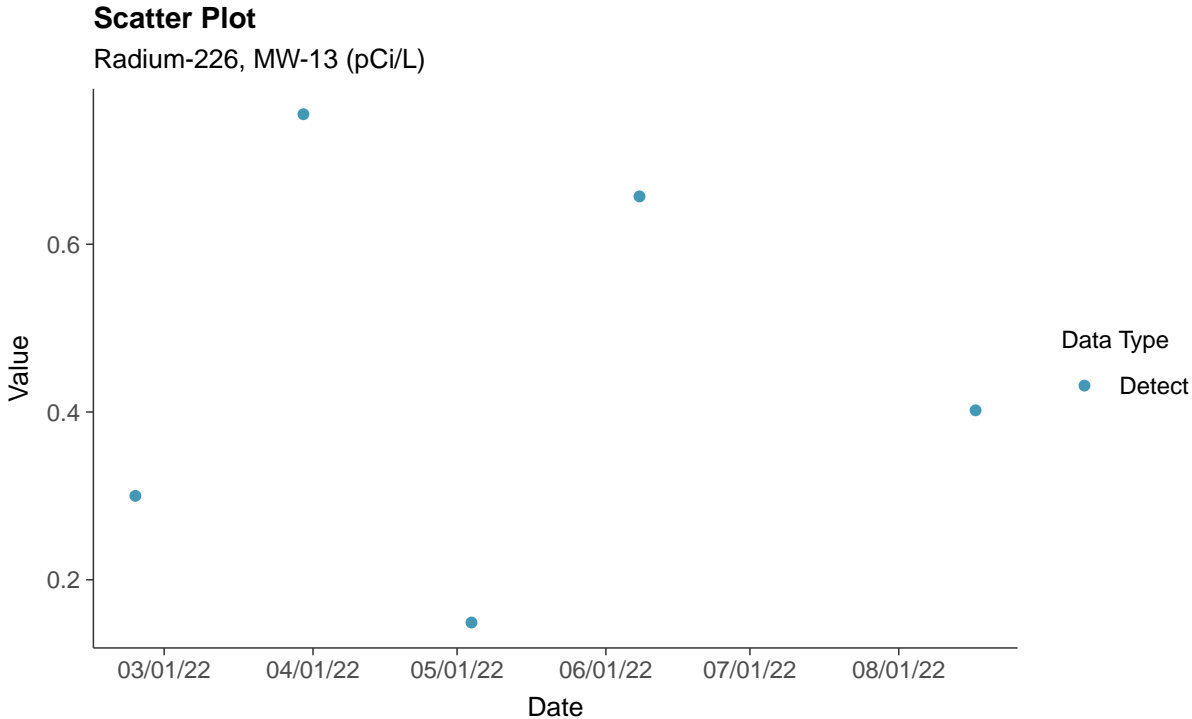
Radium-226, MW-10 (pCi/L)





### Appendix IV: Radium-226, MW-13

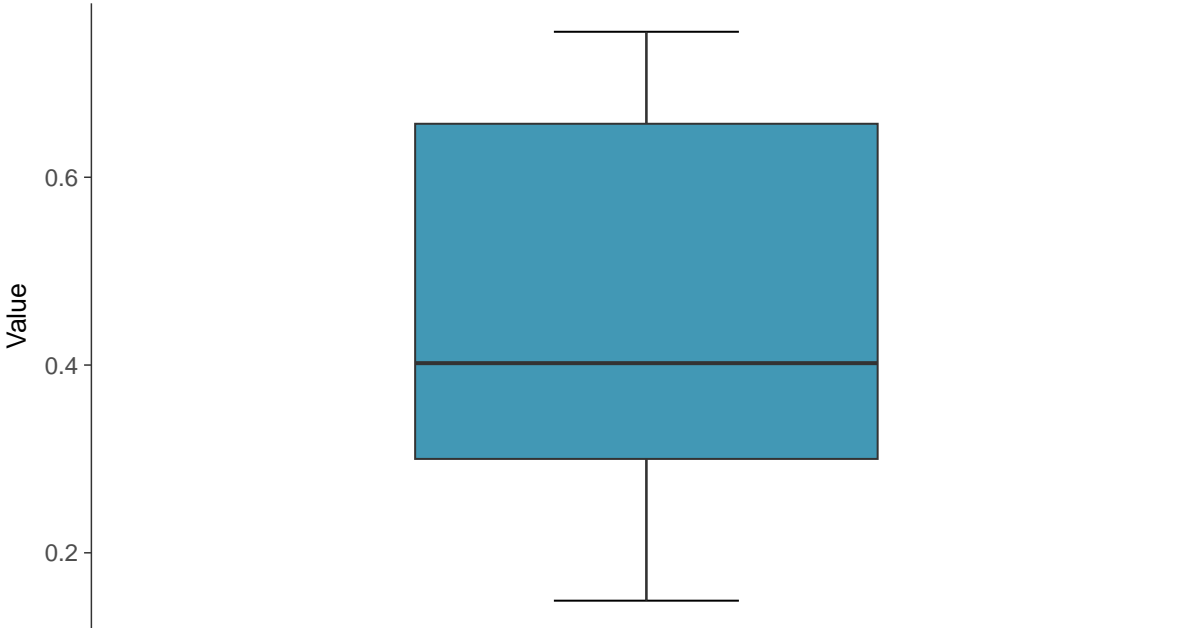
ID: 2\_23\_13





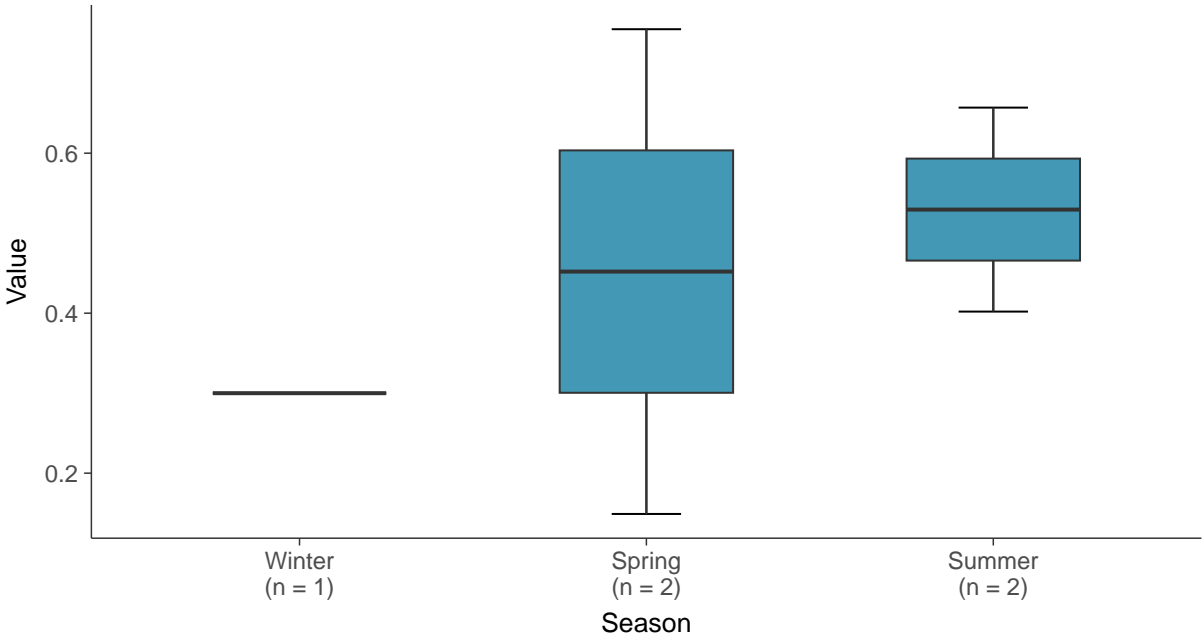
**Boxplot**

Radium-226, MW-13 (pCi/L)



**Boxplot by Season**

Radium-226, MW-13 (pCi/L)

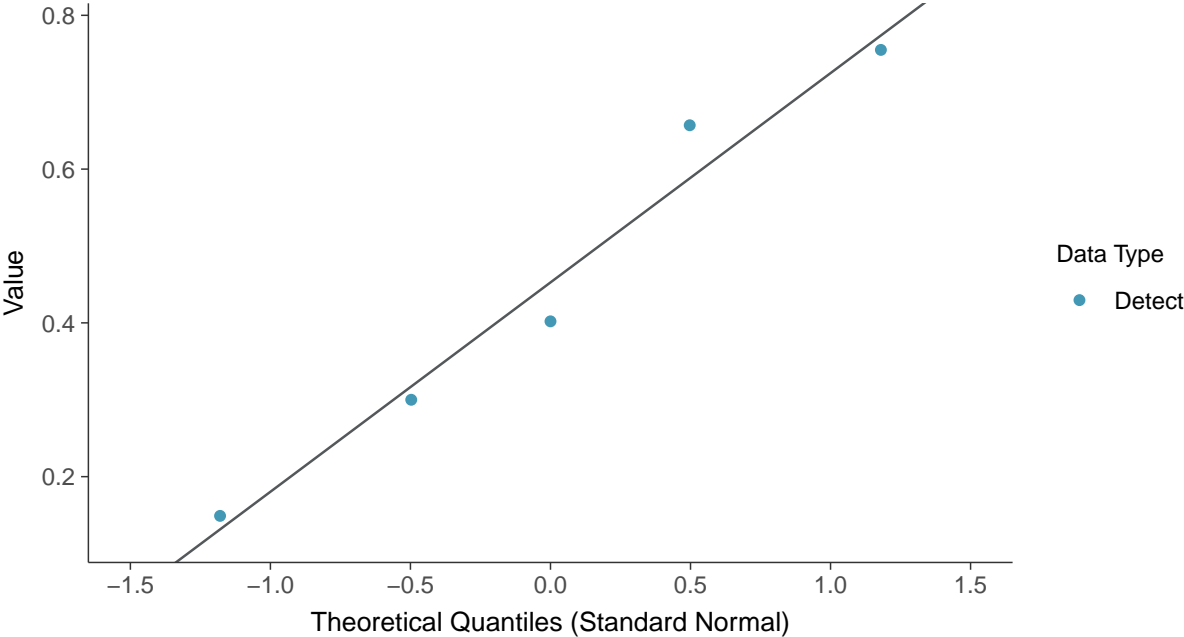






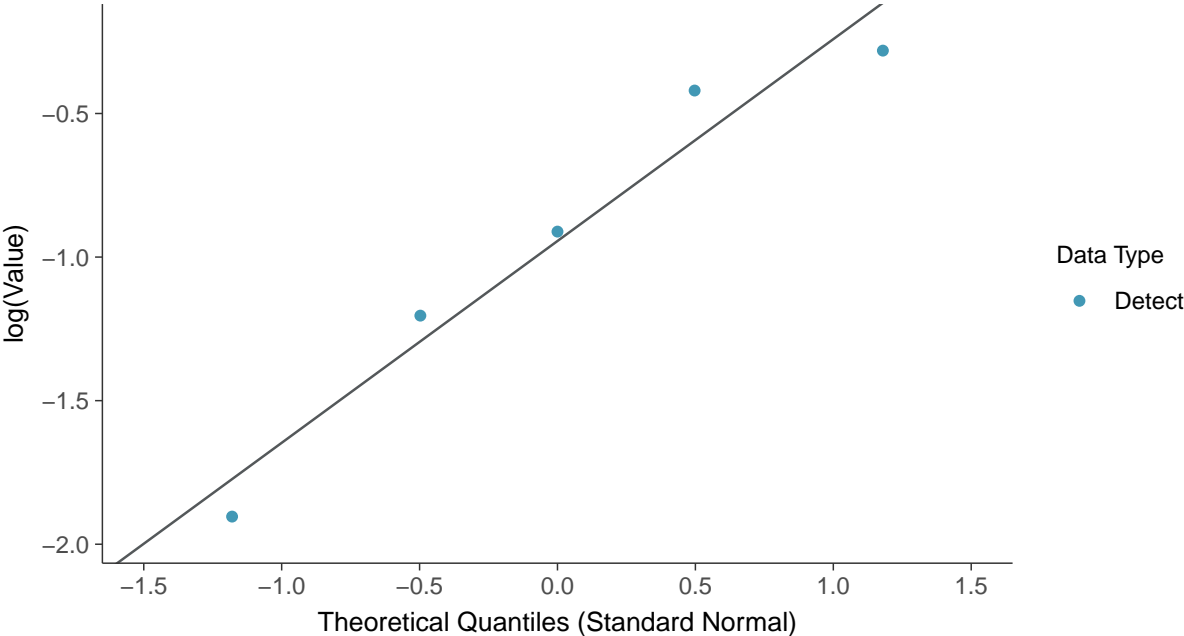
**Normal Q-Q plot**

Radium-226, MW-13 (pCi/L)



**Lognormal Q-Q plot**

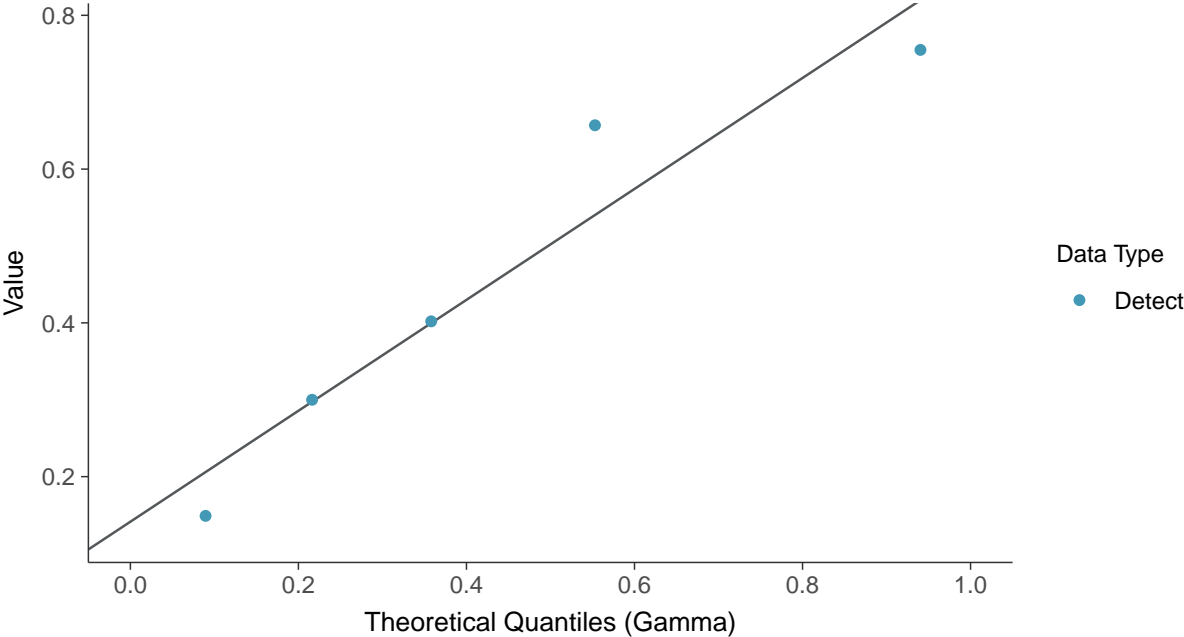
Radium-226, MW-13 (pCi/L)





**Gamma Q-Q plot**

Radium-226, MW-13 (pCi/L)



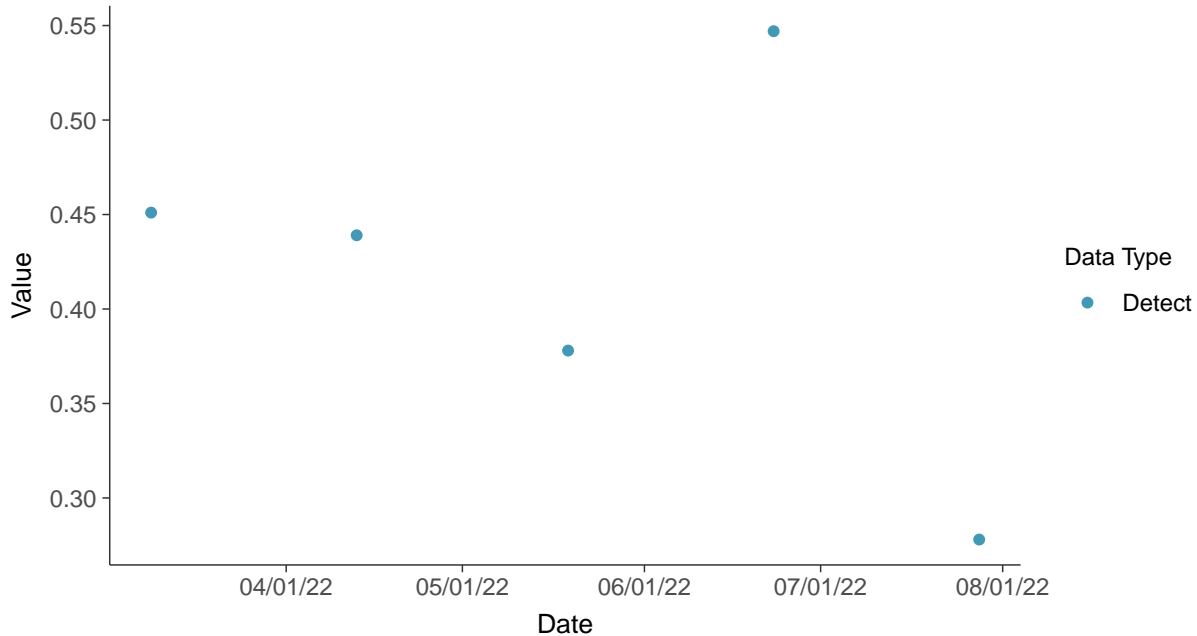


### Appendix IV: Radium-226, MW-7B

ID: 2\_23\_7B

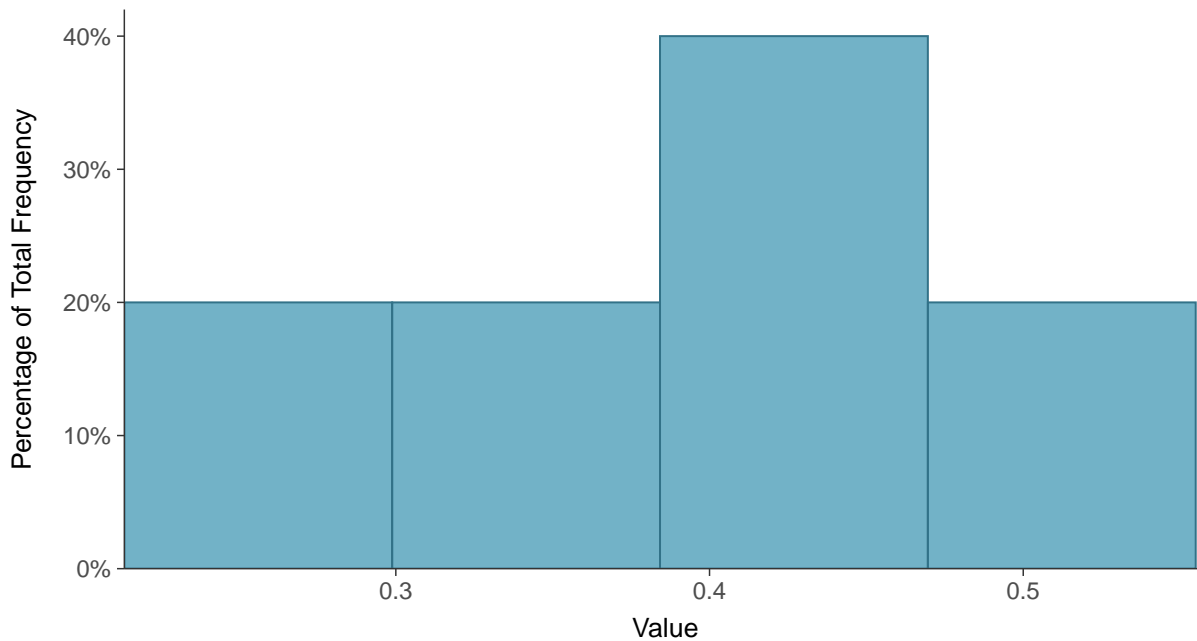
#### Scatter Plot

Radium-226, MW-7B (pCi/L)



#### Histogram

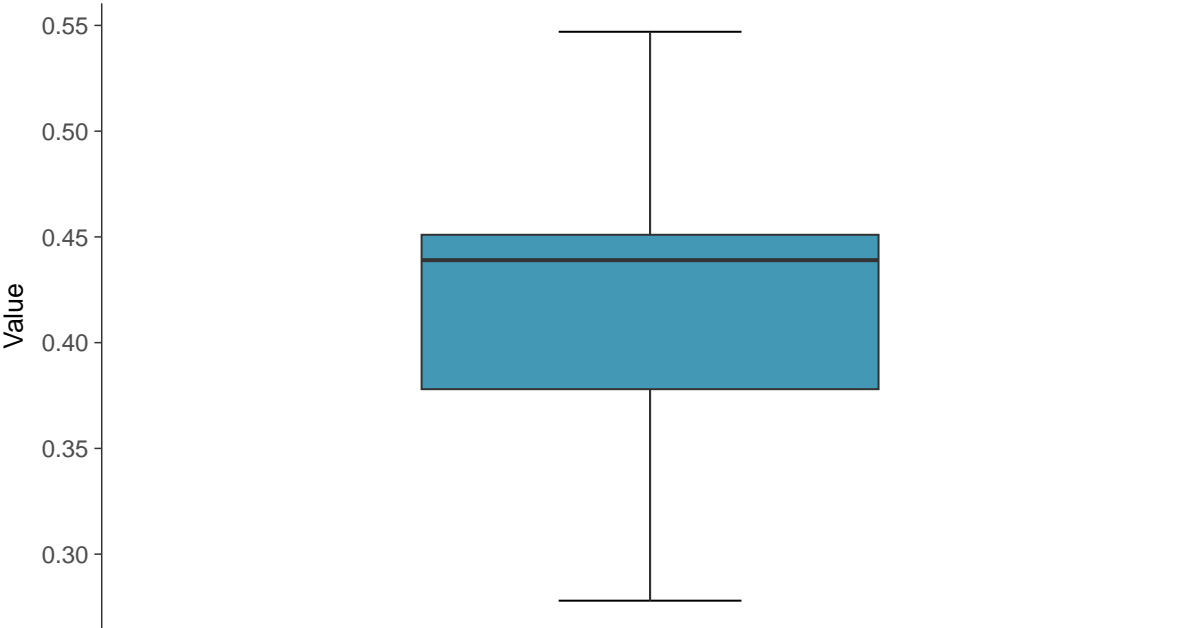
Radium-226, MW-7B (pCi/L)





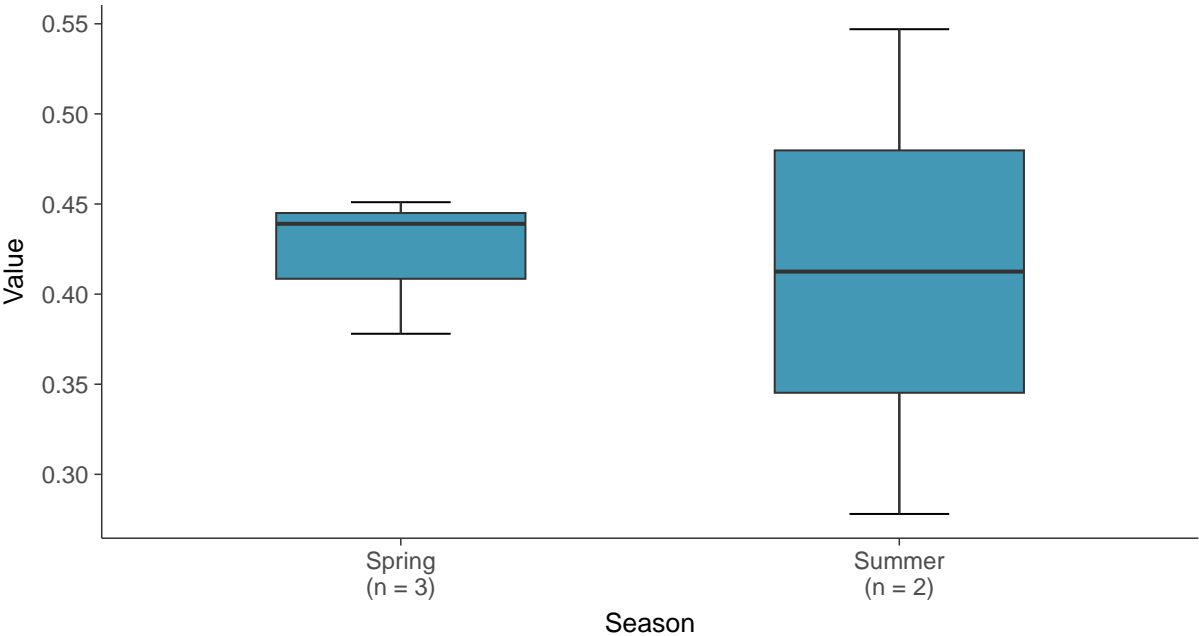
**Boxplot**

Radium-226, MW-7B (pCi/L)



**Boxplot by Season**

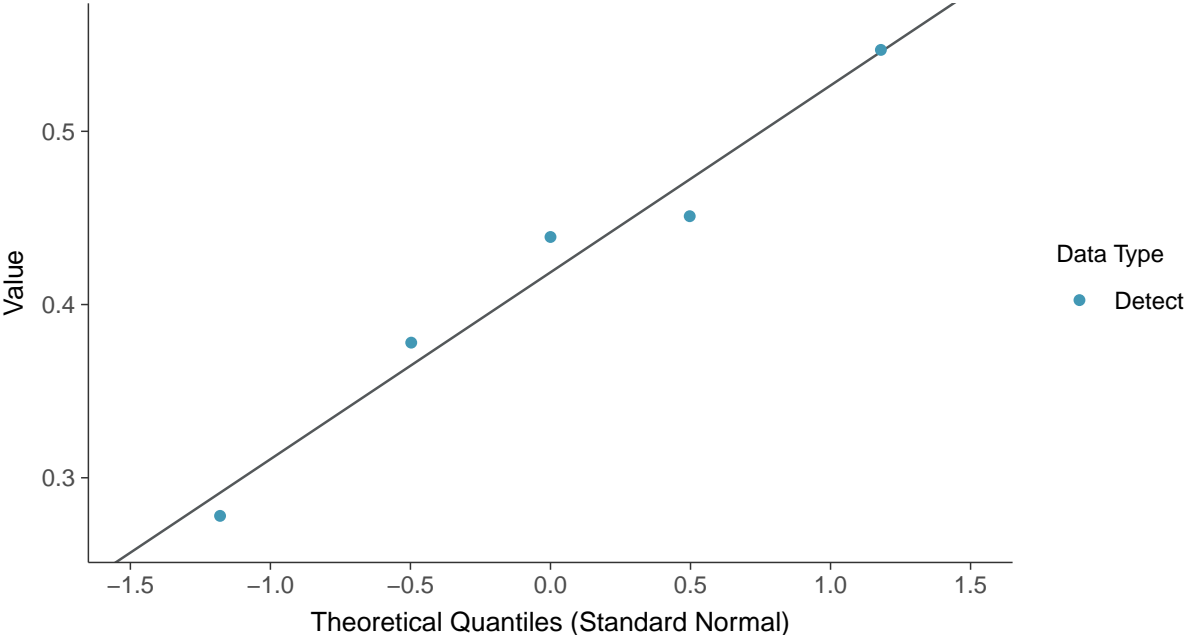
Radium-226, MW-7B (pCi/L)





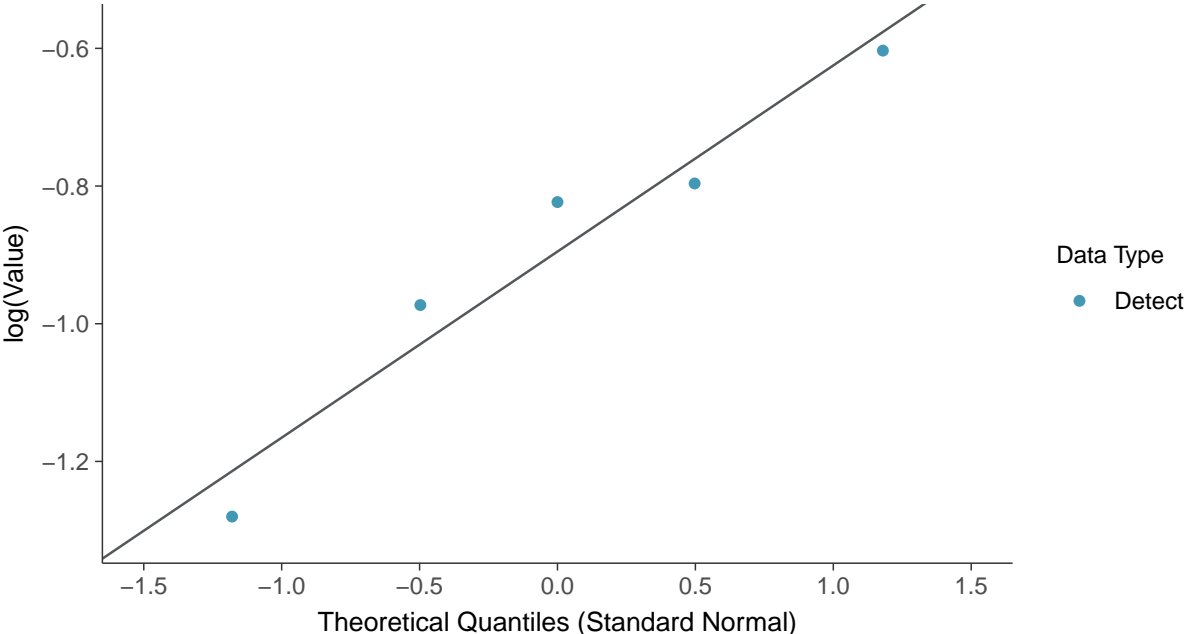
**Normal Q-Q plot**

Radium-226, MW-7B (pCi/L)



**Lognormal Q-Q plot**

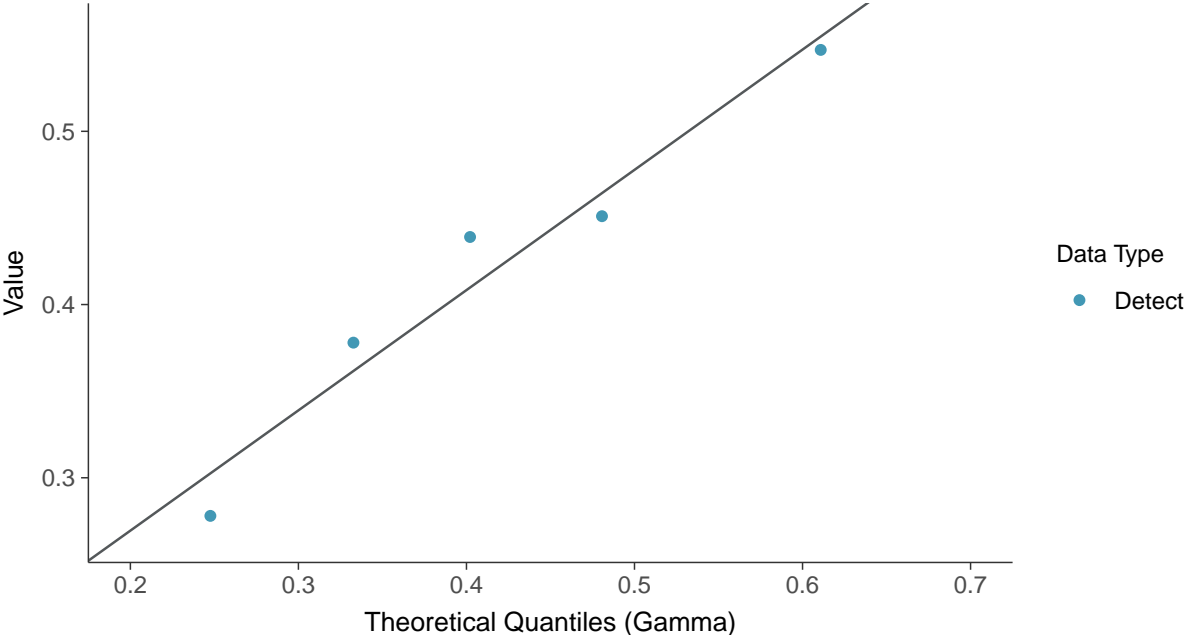
Radium-226, MW-7B (pCi/L)





**Gamma Q-Q plot**

Radium-226, MW-7B (pCi/L)



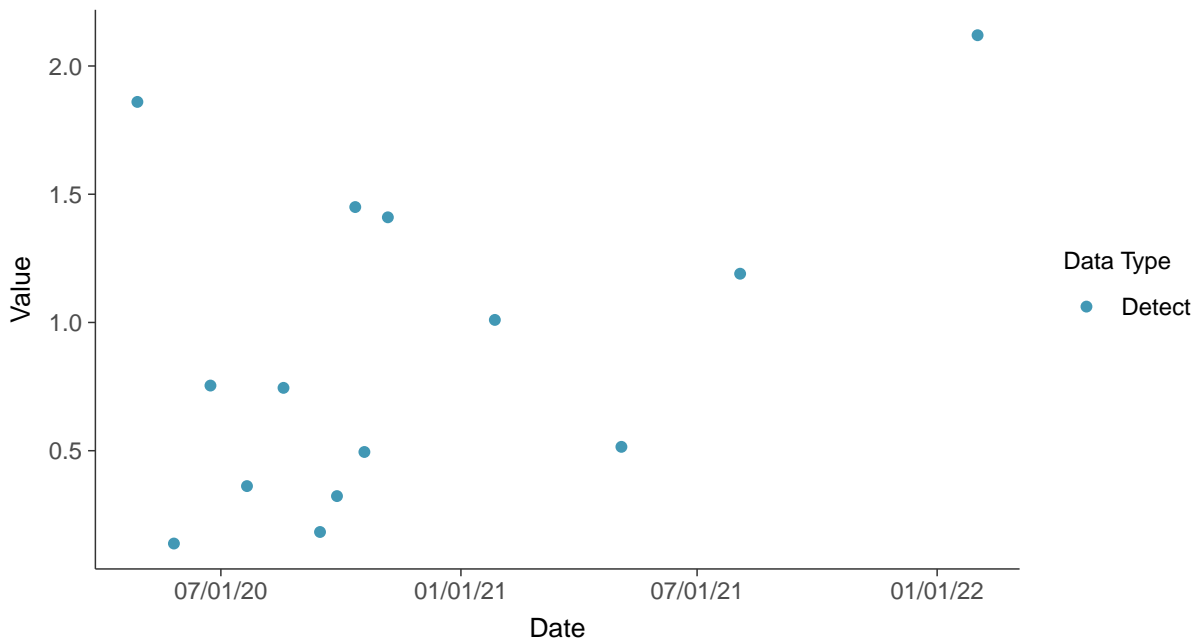


### Appendix IV: Radium-226/228, MW-2

ID: 2\_24\_02

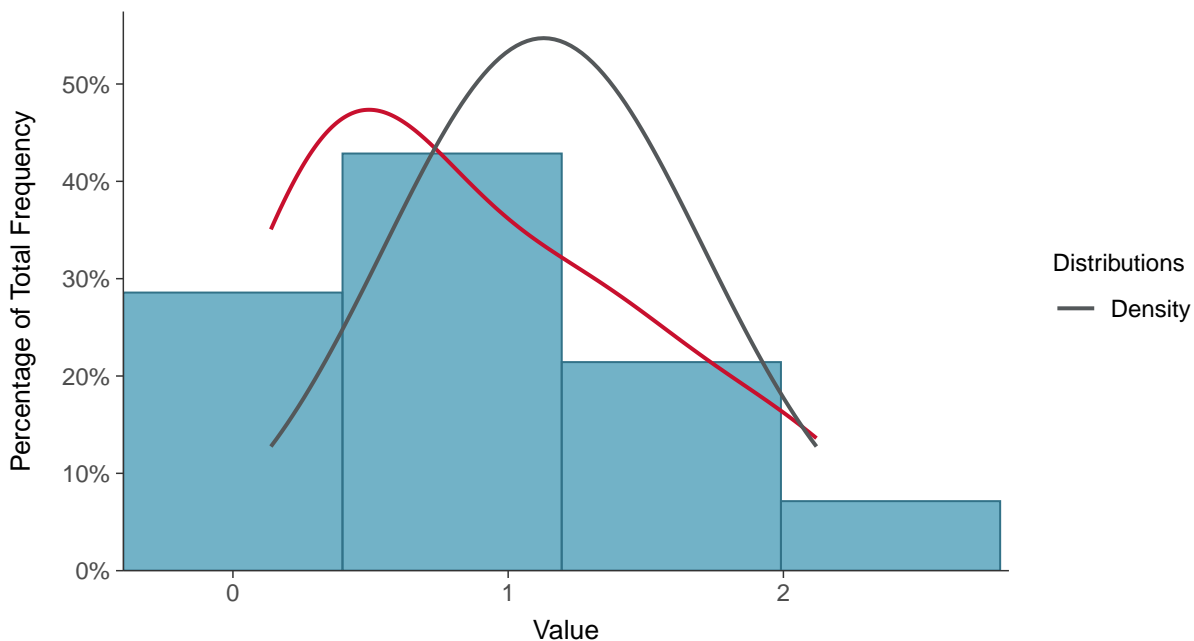
#### Scatter Plot

Radium-226/228, MW-2 (pCi/L)



#### Histogram

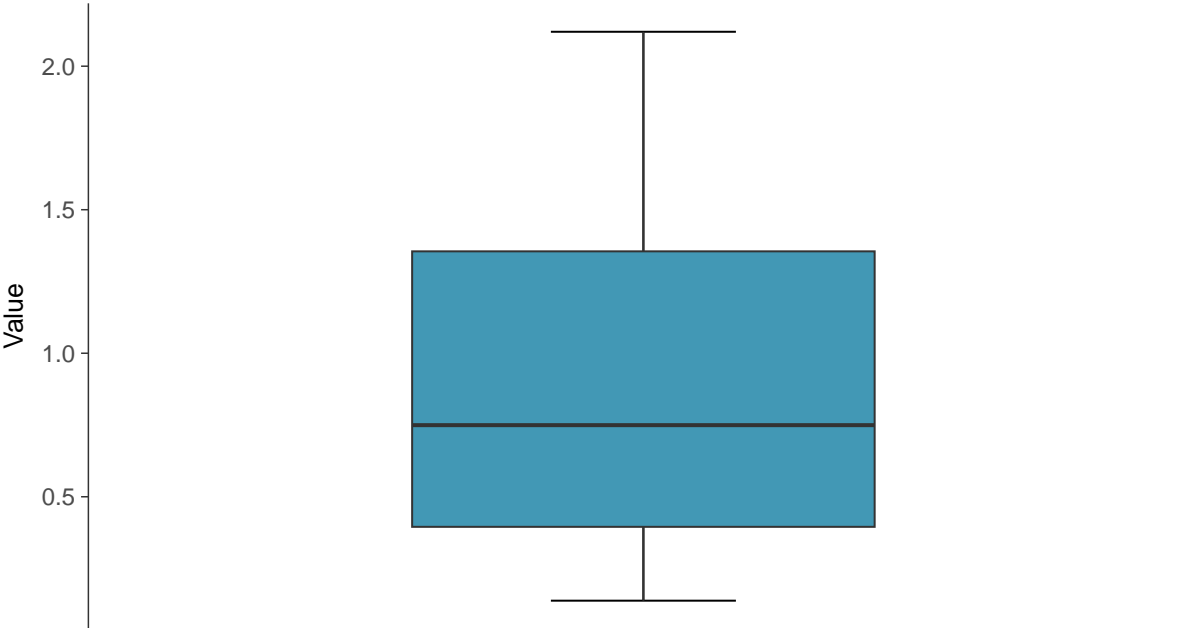
Radium-226/228, MW-2 (pCi/L)





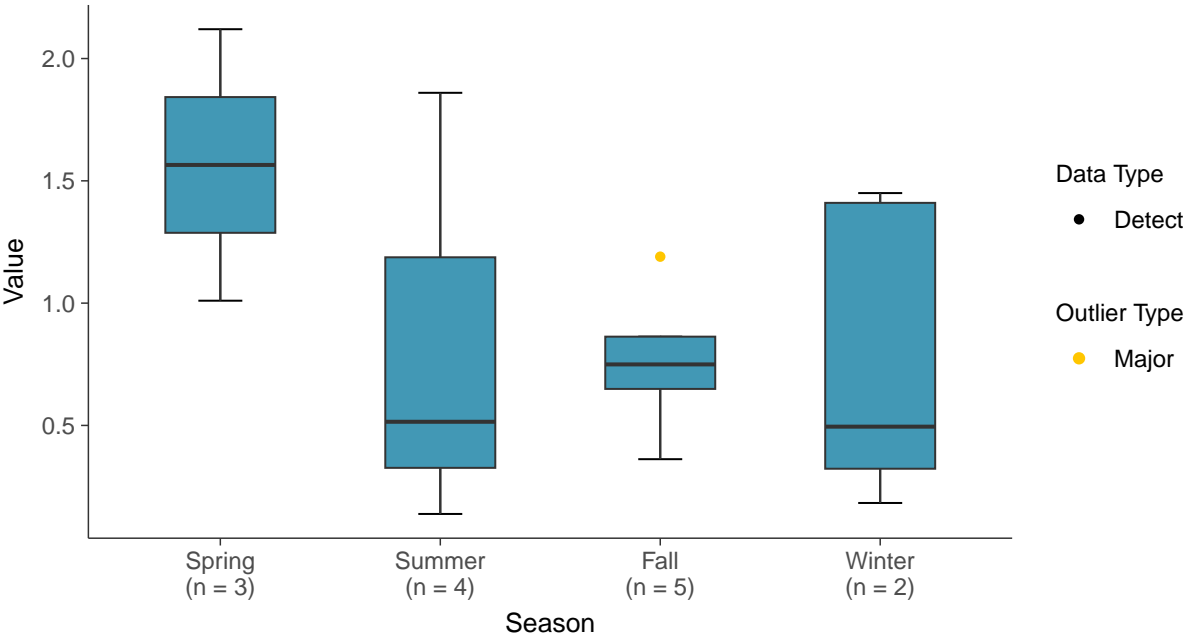
**Boxplot**

Radium-226/228, MW-2 (pCi/L)



**Boxplot by Season**

Radium-226/228, MW-2 (pCi/L)

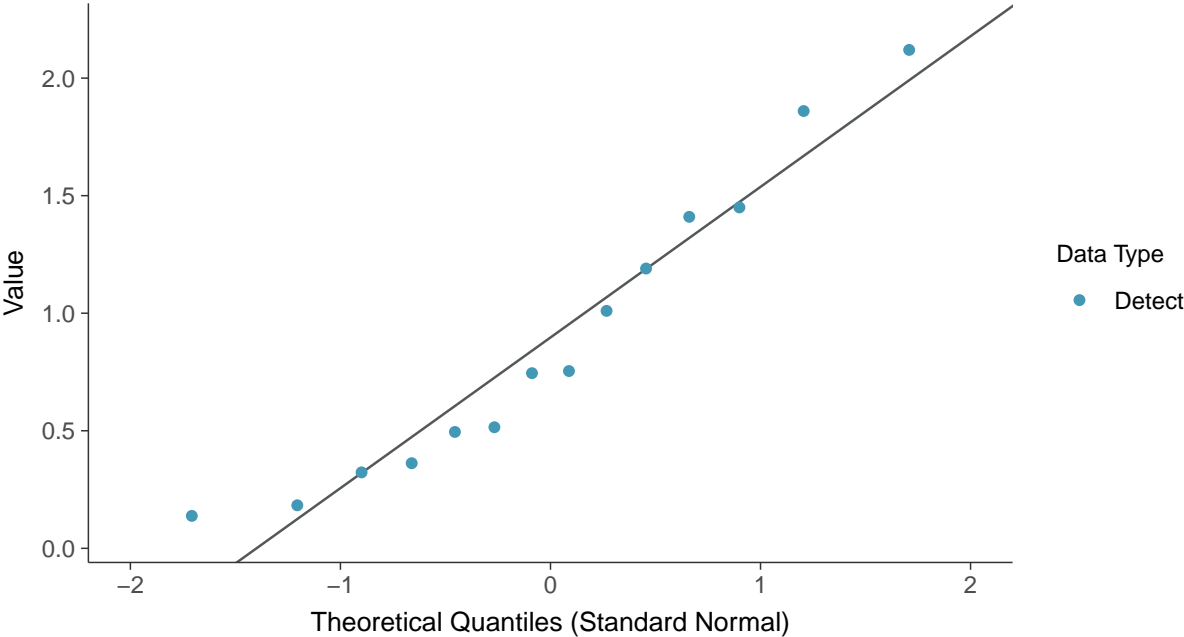






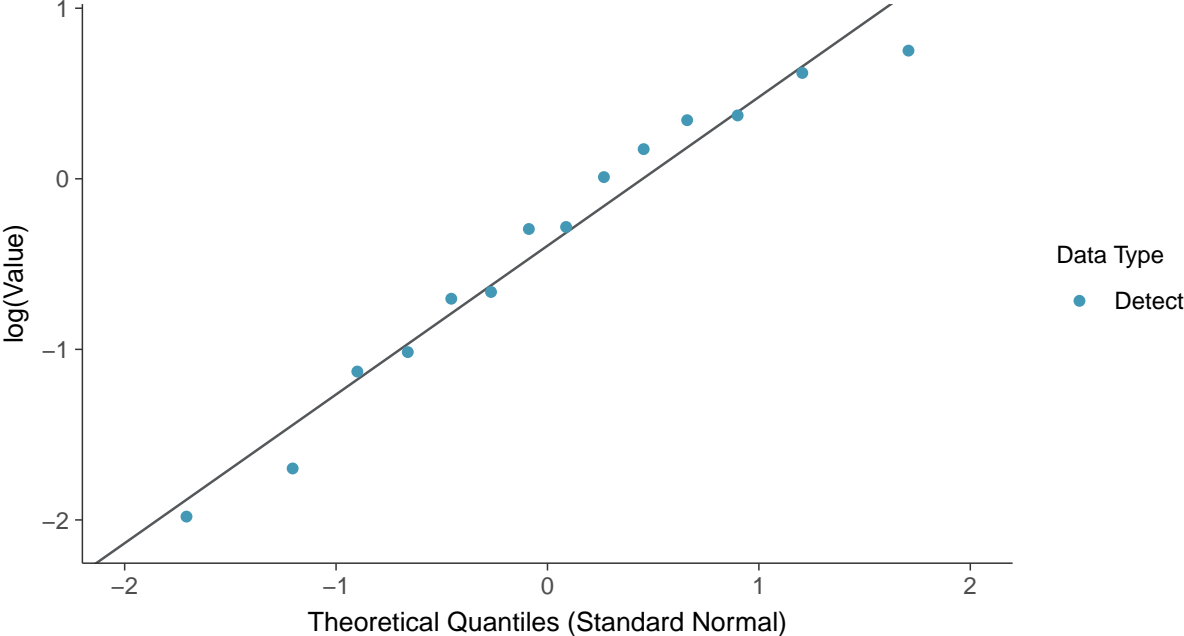
**Normal Q-Q plot**

Radium-226/228, MW-2 (pCi/L)



**Lognormal Q-Q plot**

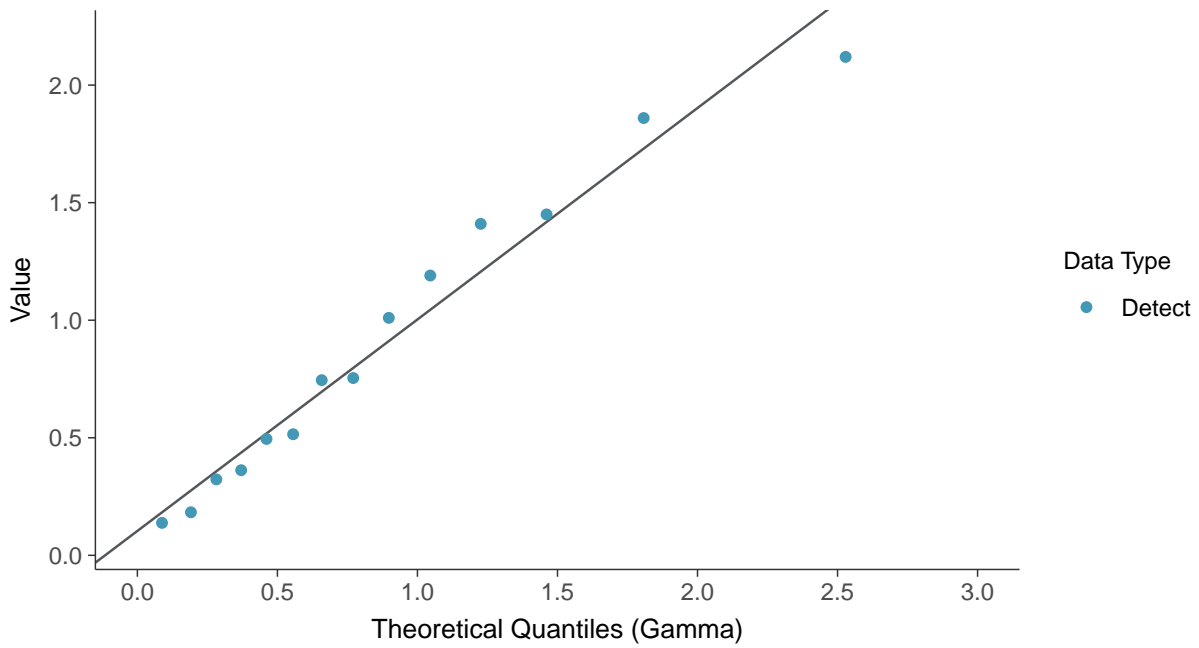
Radium-226/228, MW-2 (pCi/L)





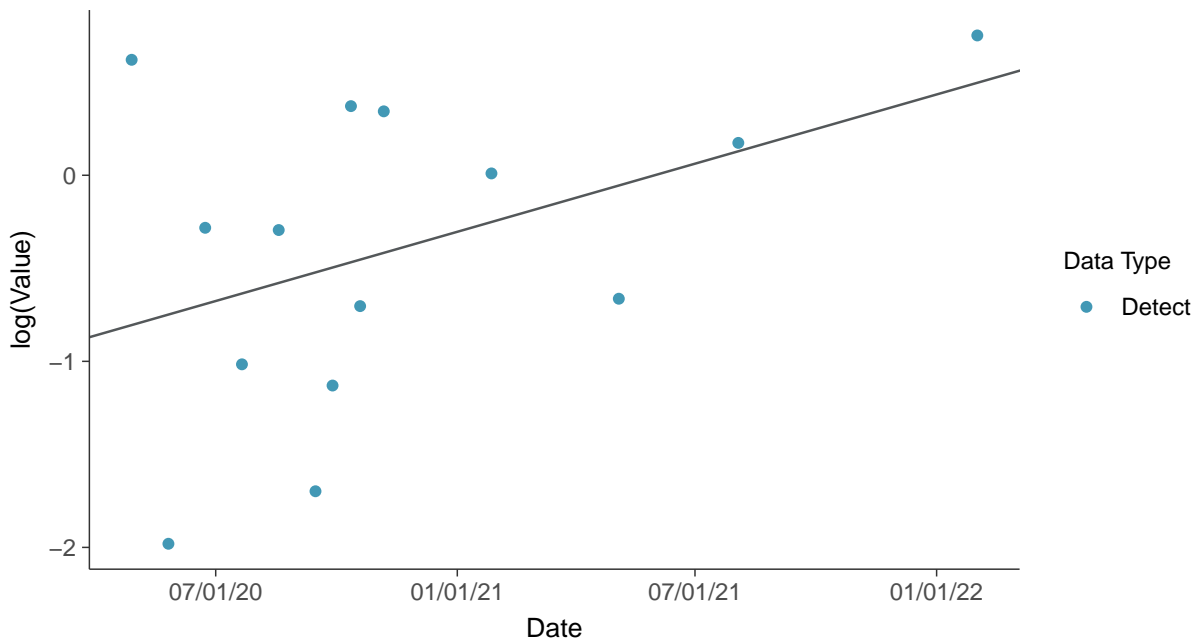
### Gamma Q-Q plot

Radium-226/228, MW-2 (pCi/L)



### Trend Regression: Lognormal MLE

Radium-226/228, MW-2 (pCi/L)



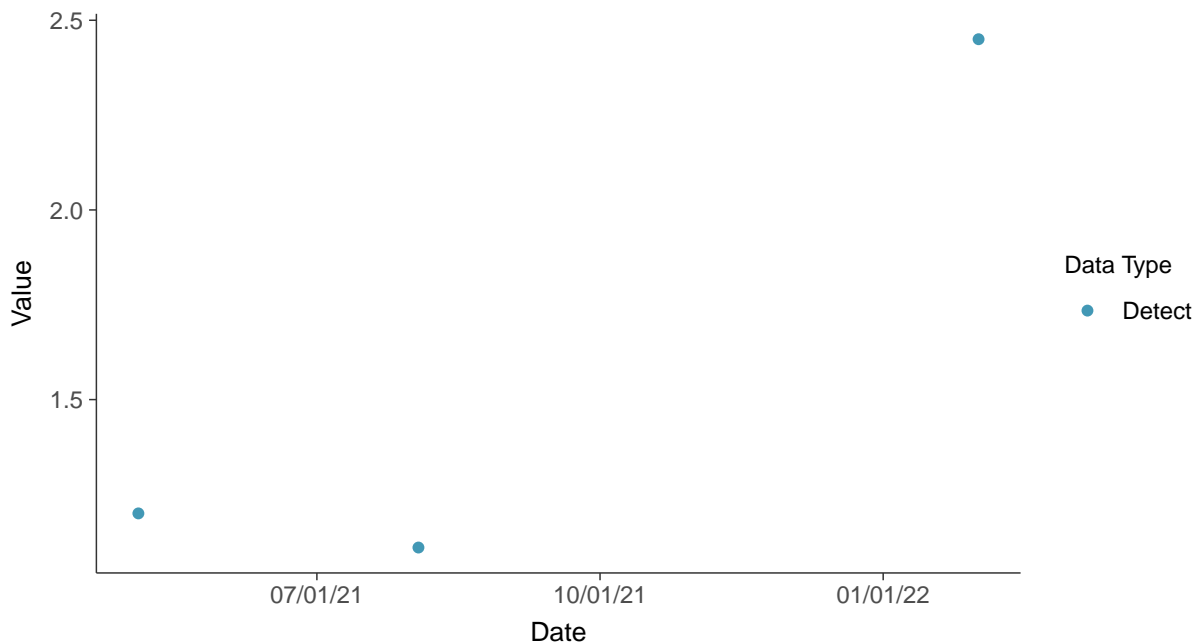


### Appendix IV: Radium-226/228, MW-3

ID: 2\_24\_03

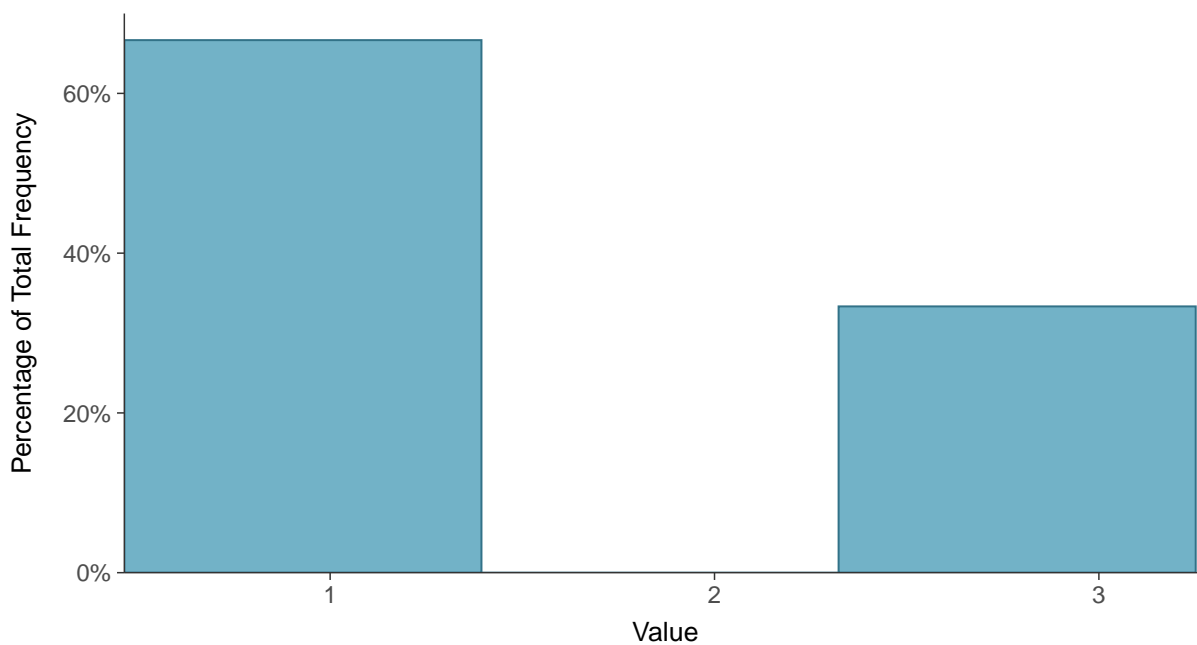
#### Scatter Plot

Radium-226/228, MW-3 (pCi/L)



#### Histogram

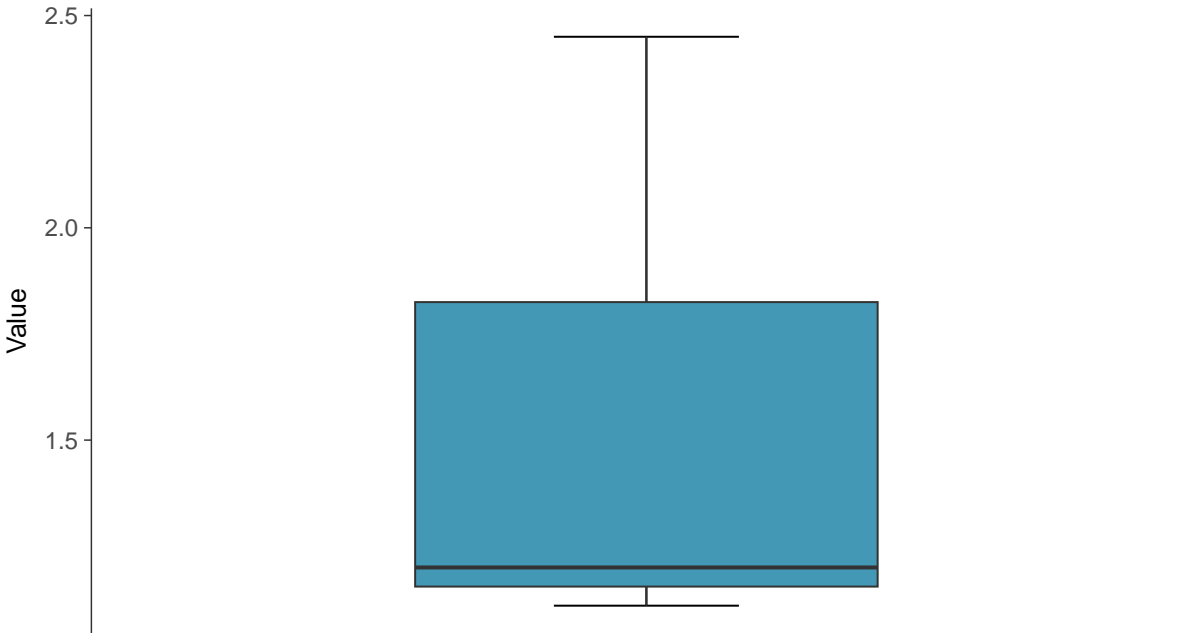
Radium-226/228, MW-3 (pCi/L)





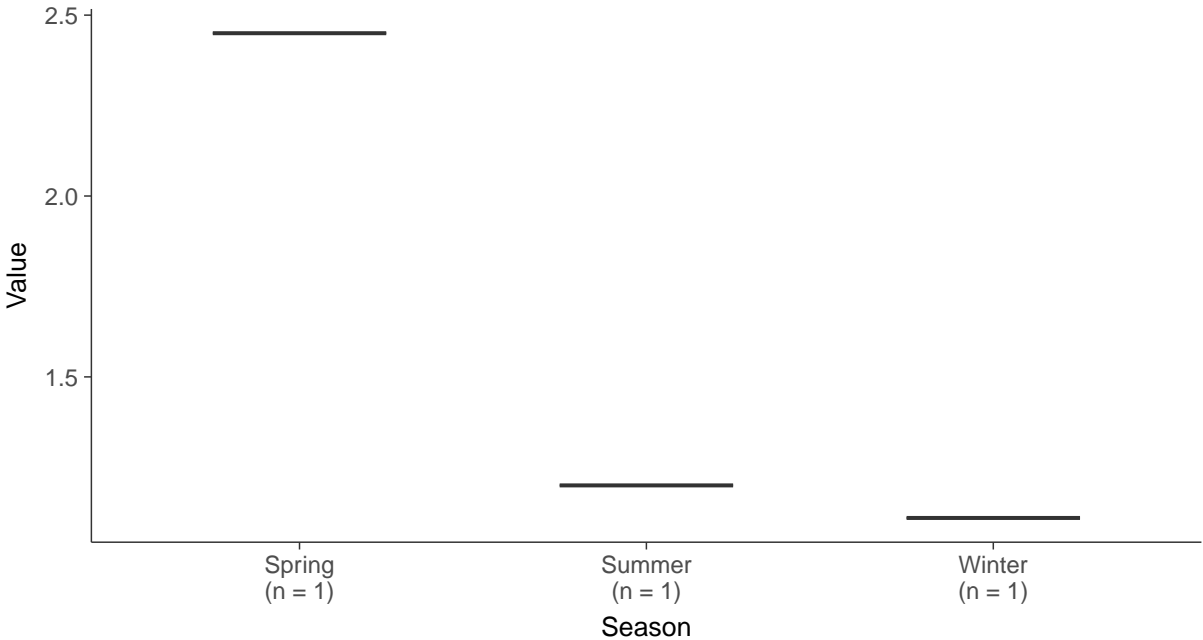
**Boxplot**

Radium-226/228, MW-3 (pCi/L)



**Boxplot by Season**

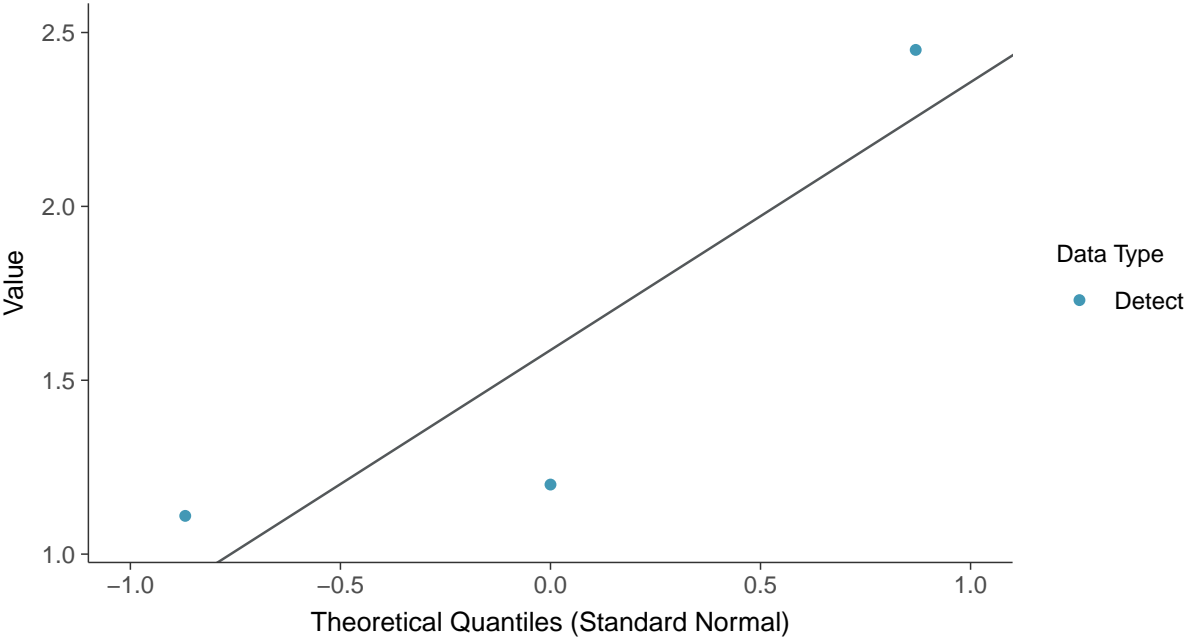
Radium-226/228, MW-3 (pCi/L)





**Normal Q-Q plot**

Radium-226/228, MW-3 (pCi/L)



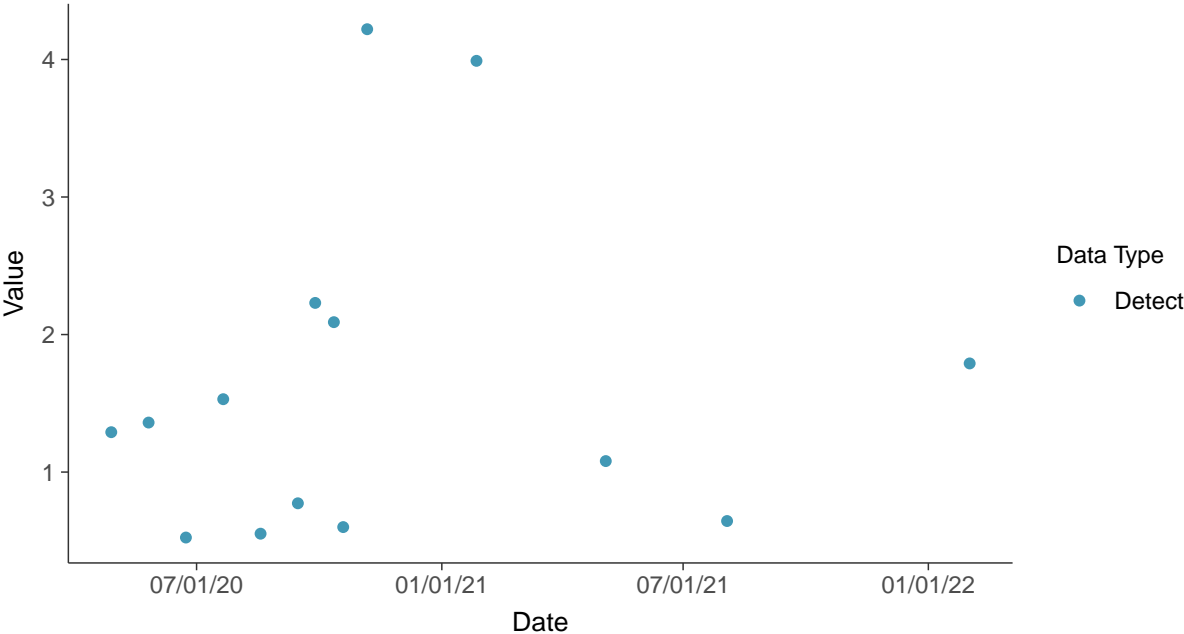


### Appendix IV: Radium-226/228, MW-5

ID: 2\_24\_05

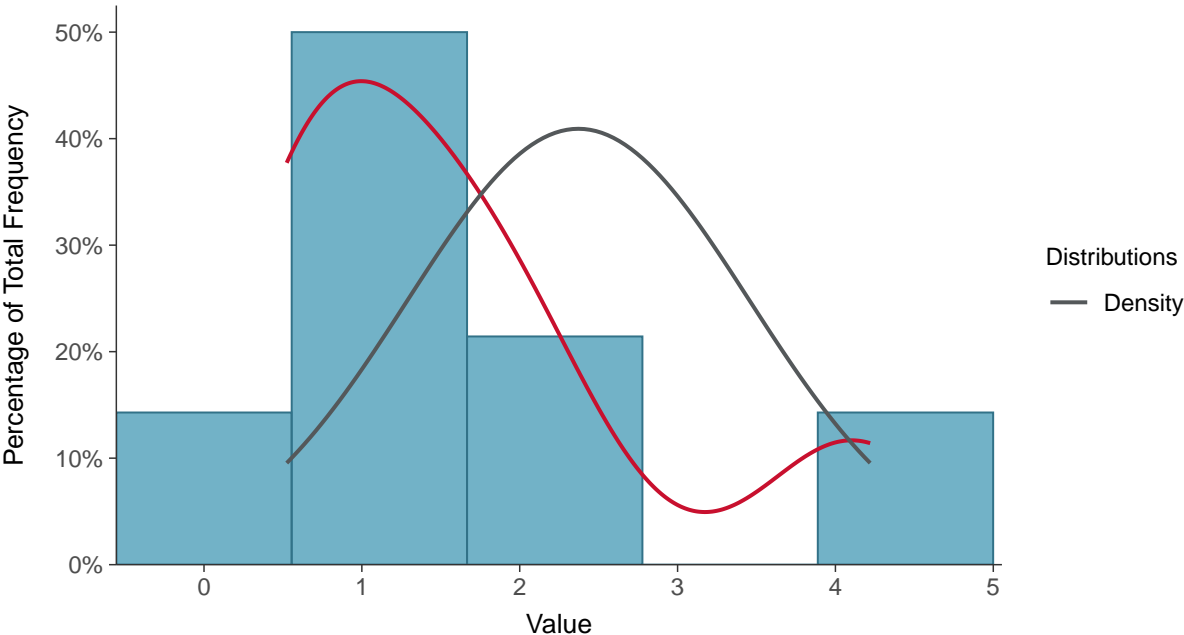
#### Scatter Plot

Radium-226/228, MW-5 (pCi/L)



#### Histogram

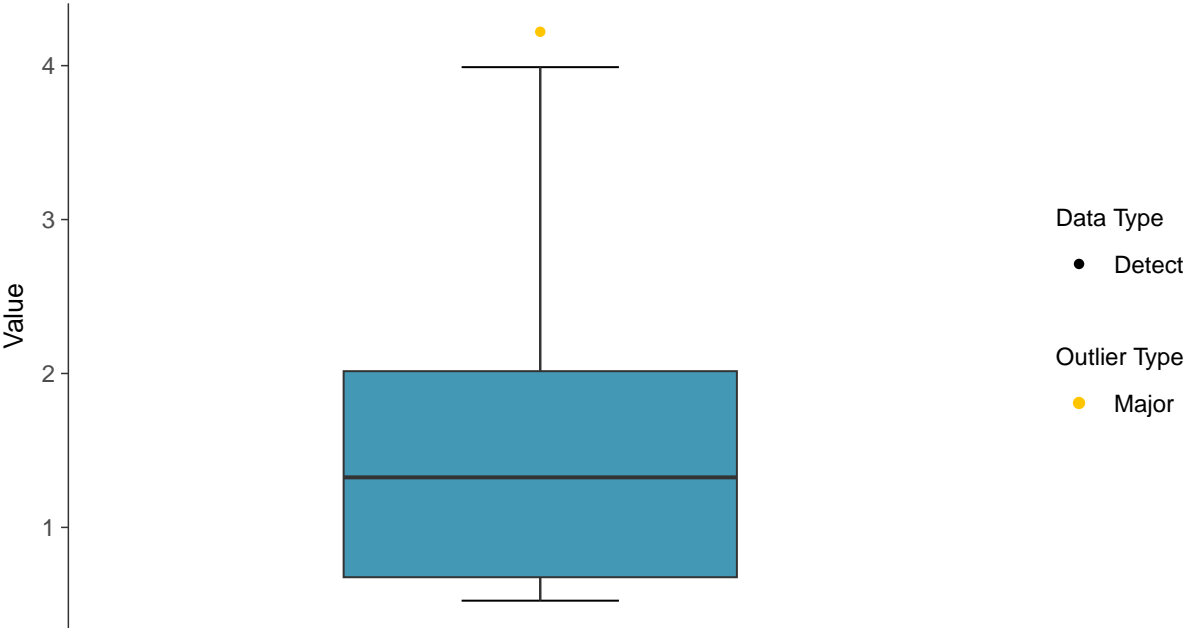
Radium-226/228, MW-5 (pCi/L)





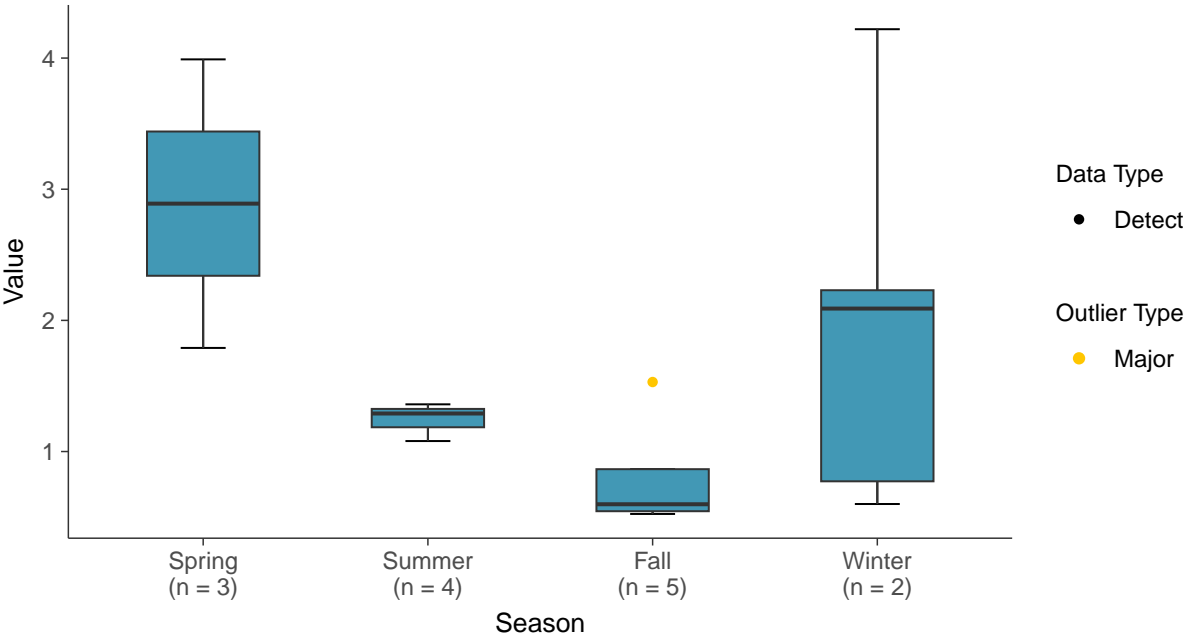
**Boxplot**

Radium-226/228, MW-5 (pCi/L)



**Boxplot by Season**

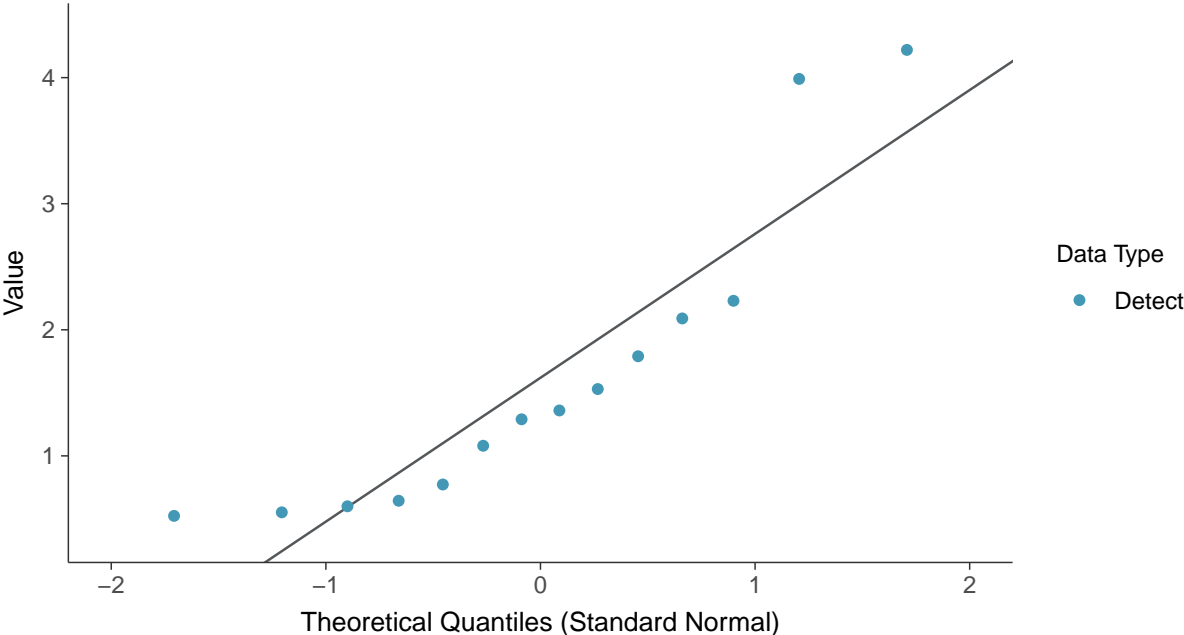
Radium-226/228, MW-5 (pCi/L)





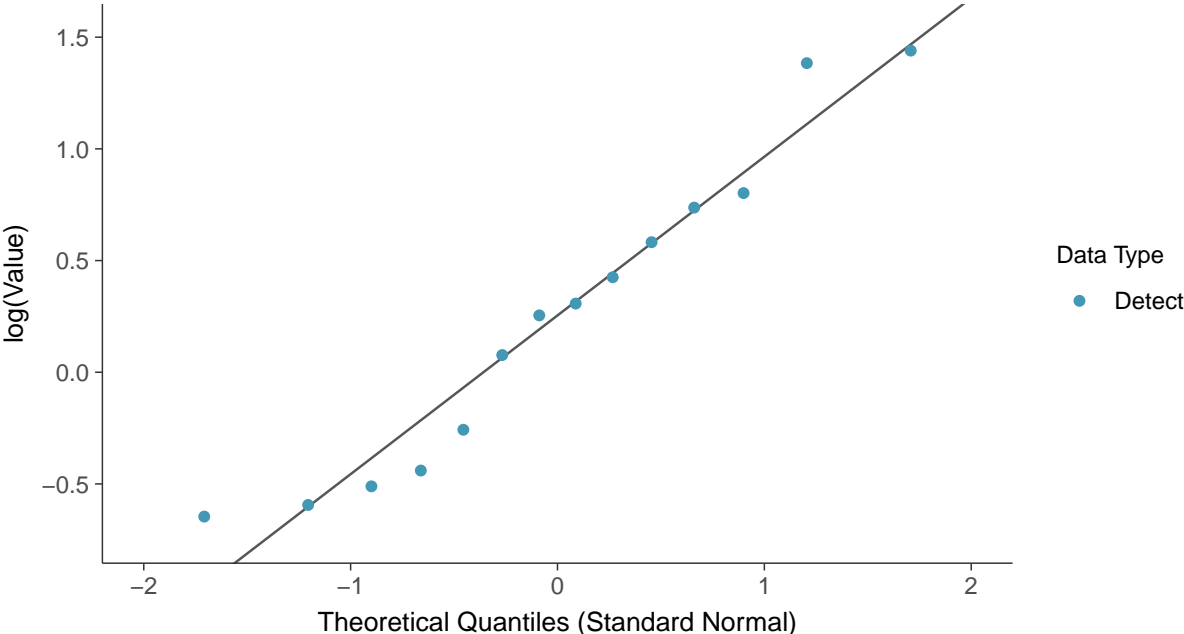
**Normal Q-Q plot**

Radium-226/228, MW-5 (pCi/L)



**Lognormal Q-Q plot**

Radium-226/228, MW-5 (pCi/L)

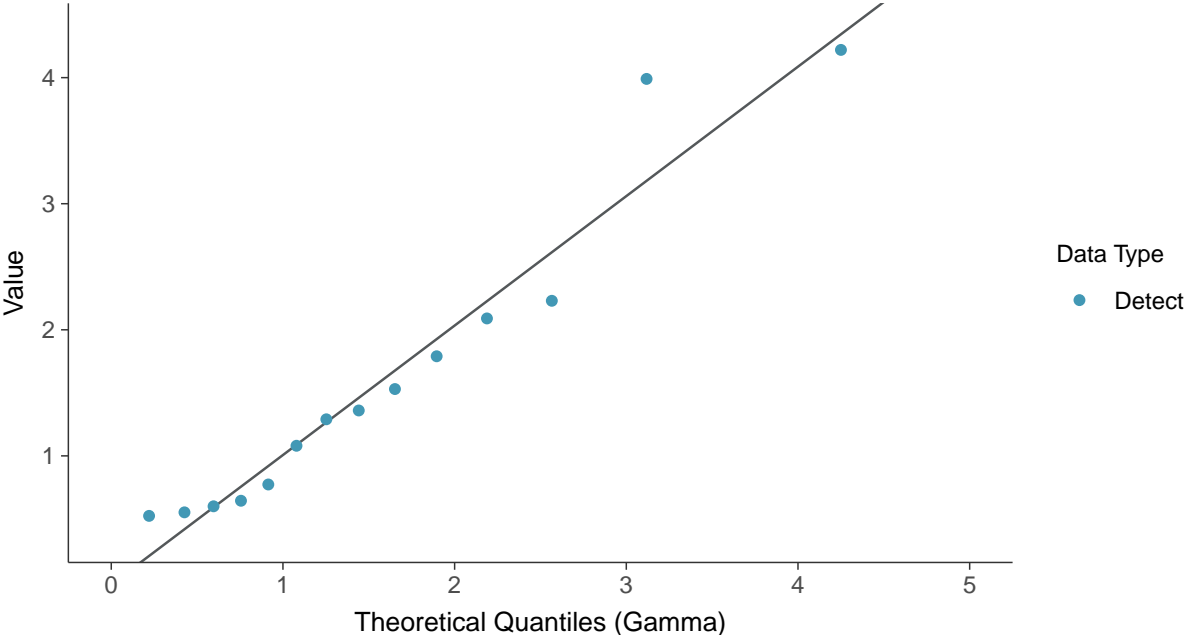






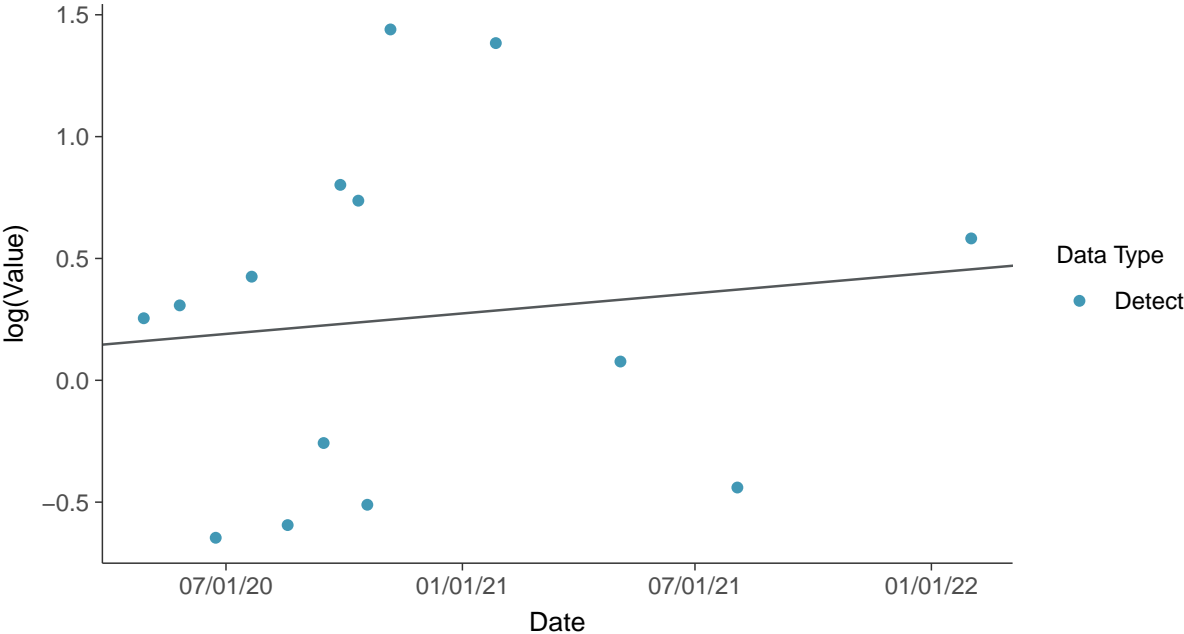
**Gamma Q-Q plot**

Radium-226/228, MW-5 (pCi/L)



**Trend Regression: Lognormal MLE**

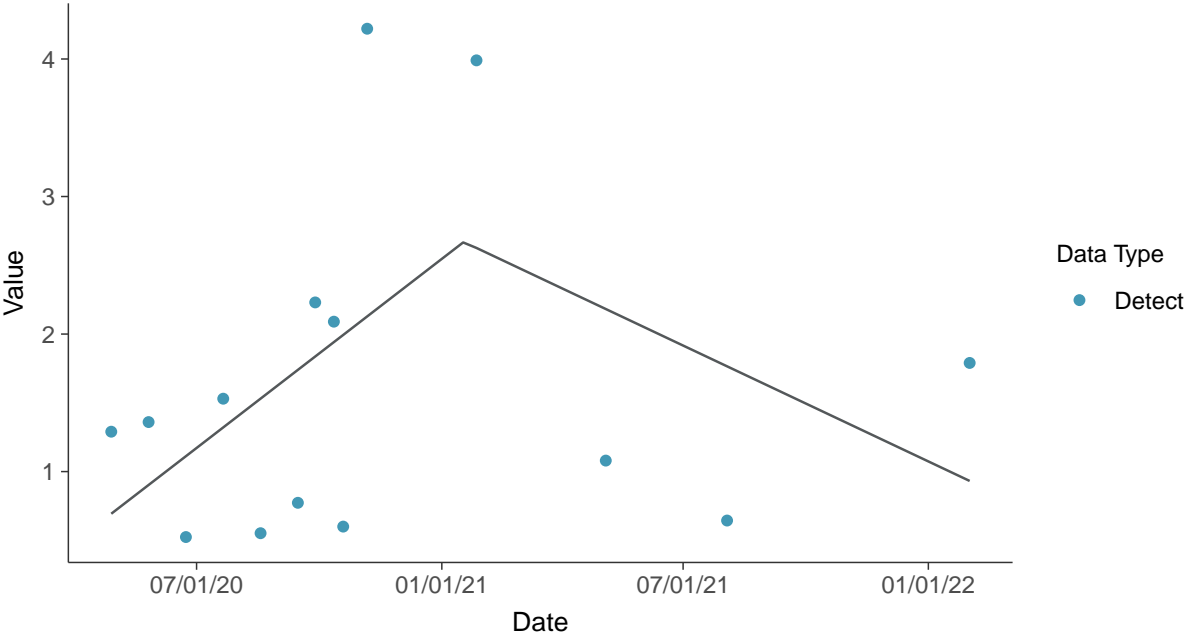
Radium-226/228, MW-5 (pCi/L)





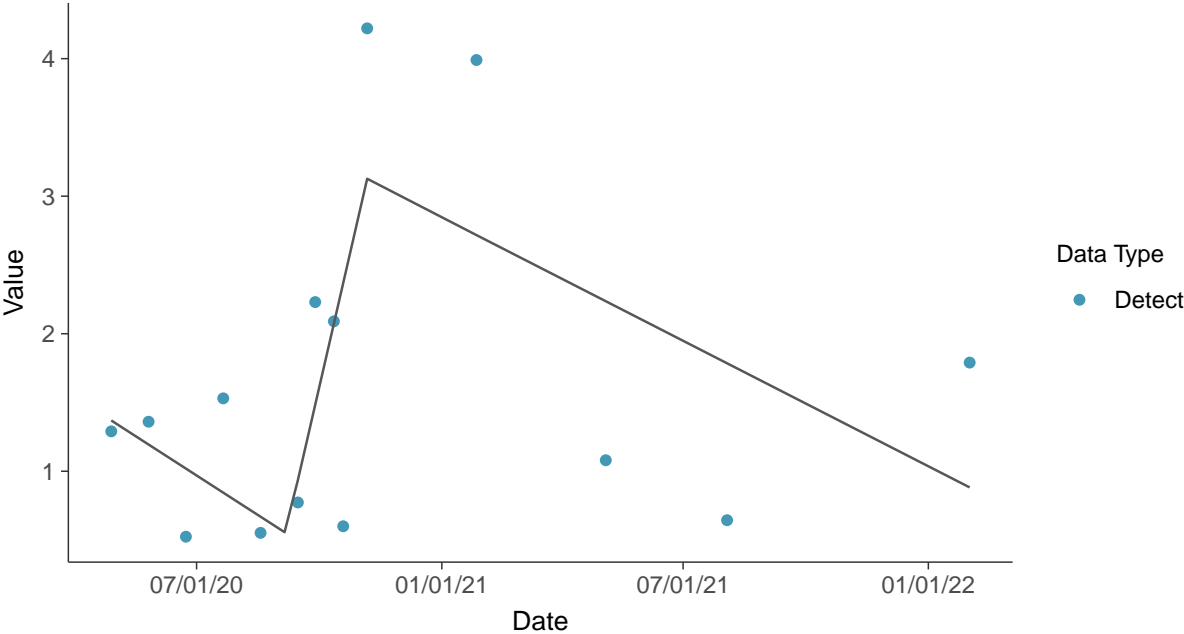
**Trend Regression: Piecewise Linear-Linear**

Radium-226/228, MW-5 (pCi/L)



**Trend Regression: Piecewise Linear-Linear-Linear**

Radium-226/228, MW-5 (pCi/L)



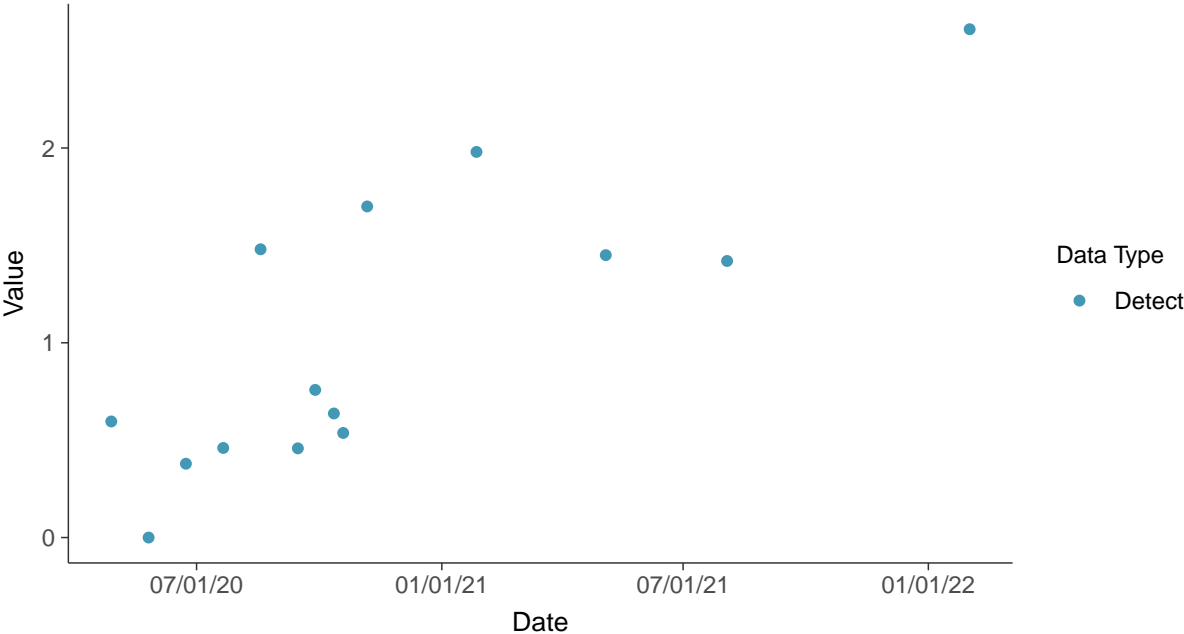


### Appendix IV: Radium-226/228, MW-6

ID: 2\_24\_06

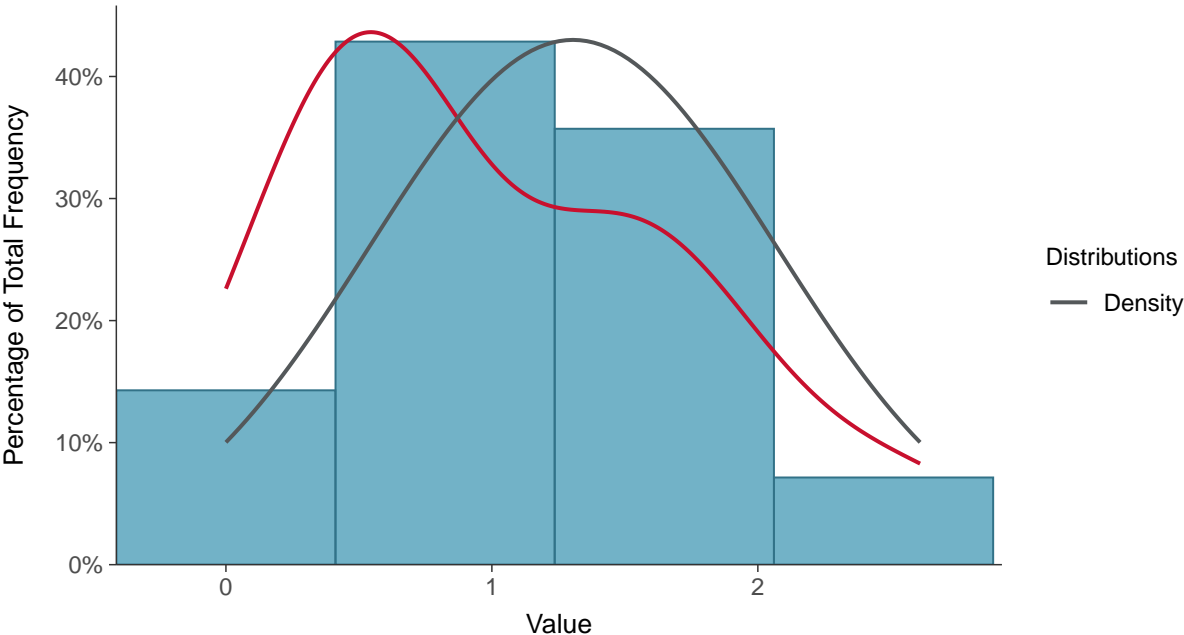
#### Scatter Plot

Radium-226/228, MW-6 (pCi/L)



#### Histogram

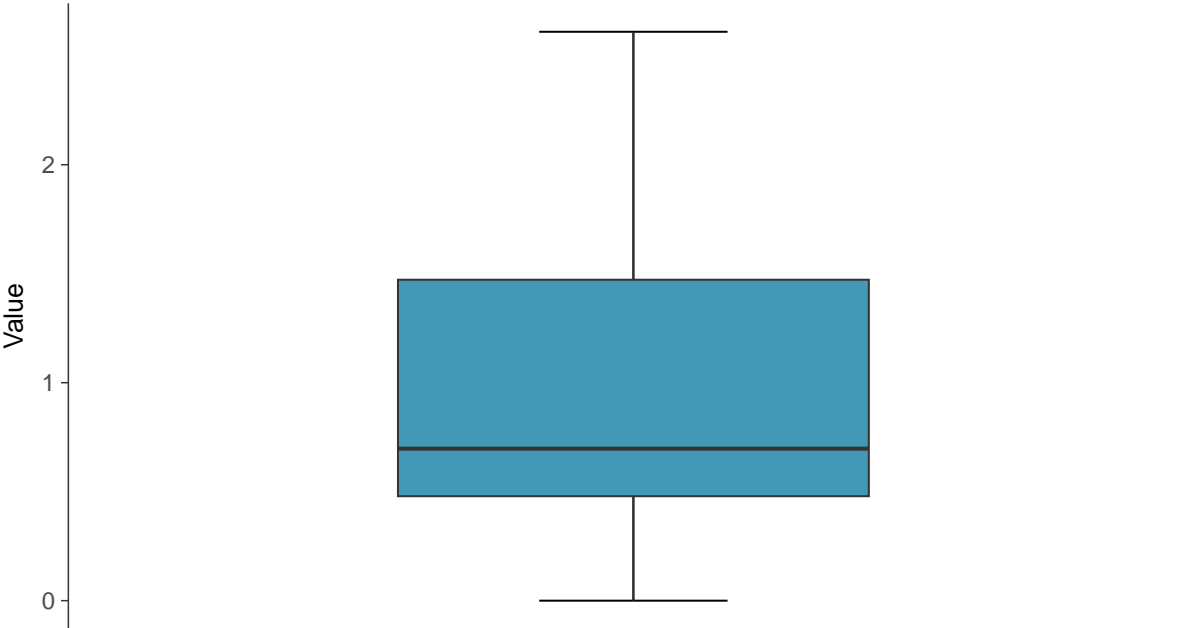
Radium-226/228, MW-6 (pCi/L)





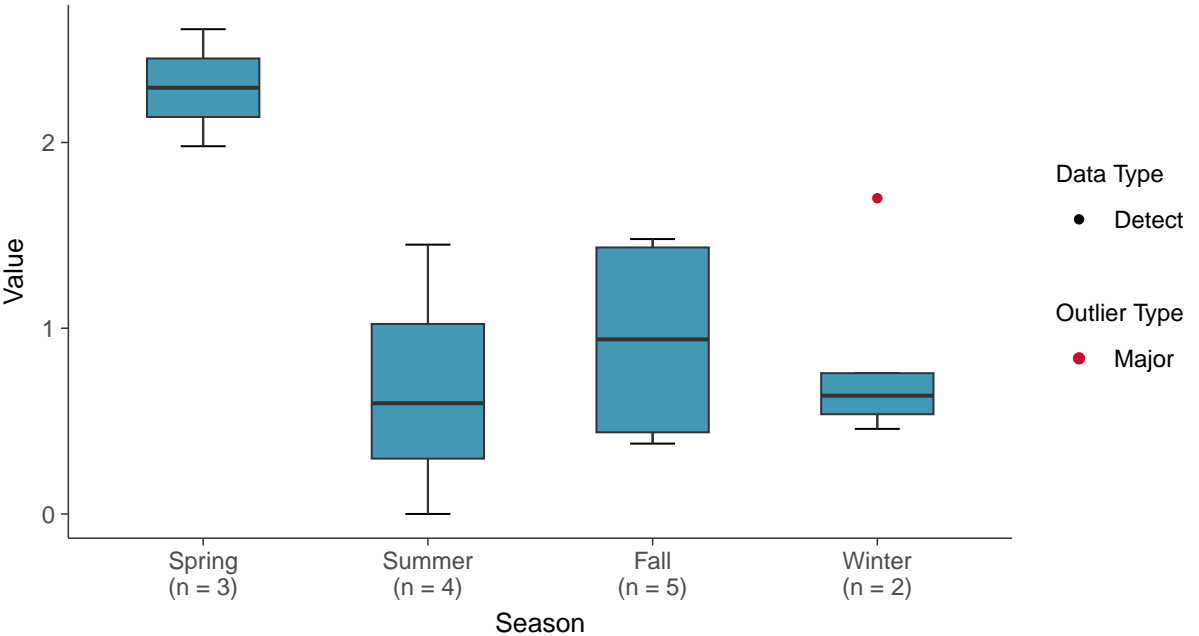
**Boxplot**

Radium-226/228, MW-6 (pCi/L)



**Boxplot by Season**

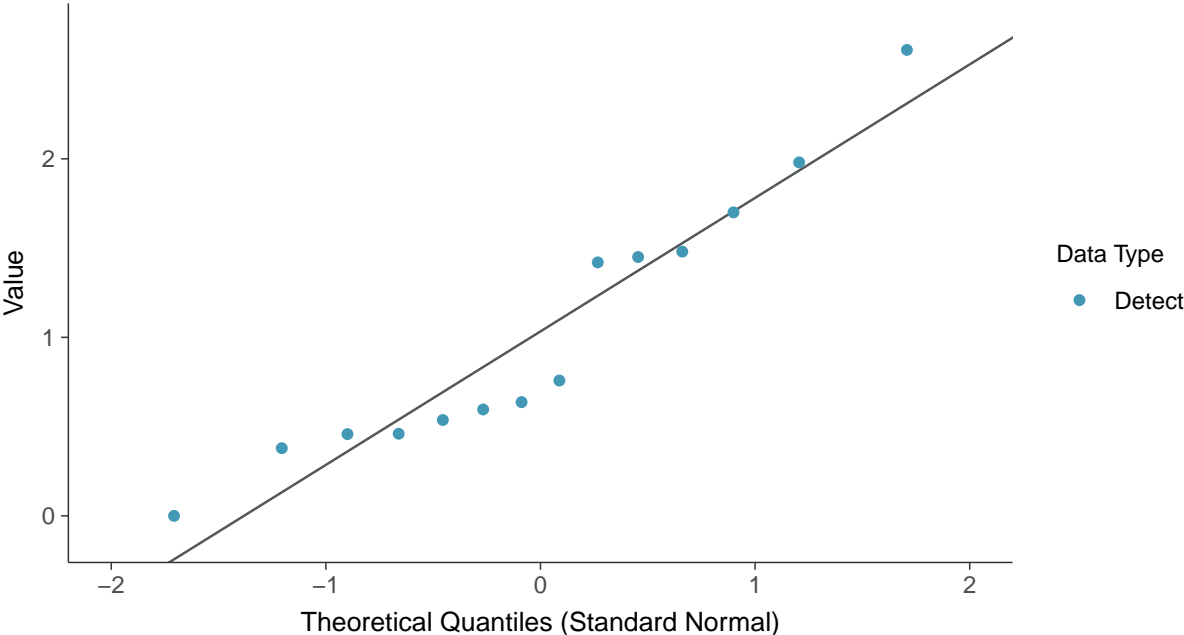
Radium-226/228, MW-6 (pCi/L)





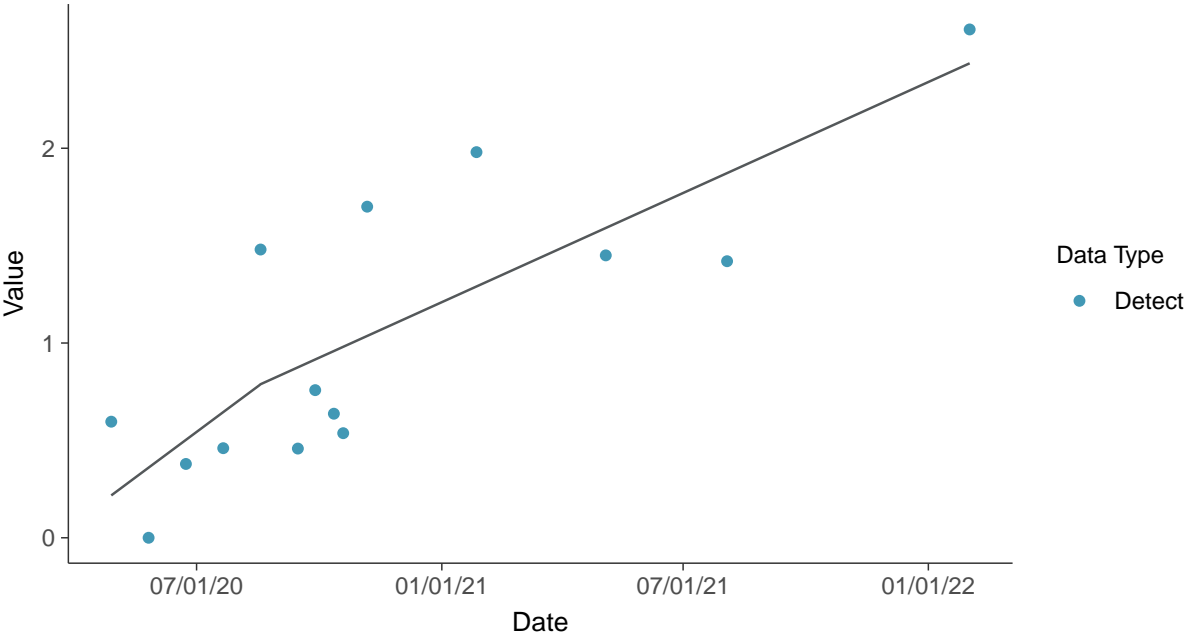
**Normal Q-Q plot**

Radium-226/228, MW-6 (pCi/L)



**Trend Regression: Piecewise Linear-Linear**

Radium-226/228, MW-6 (pCi/L)



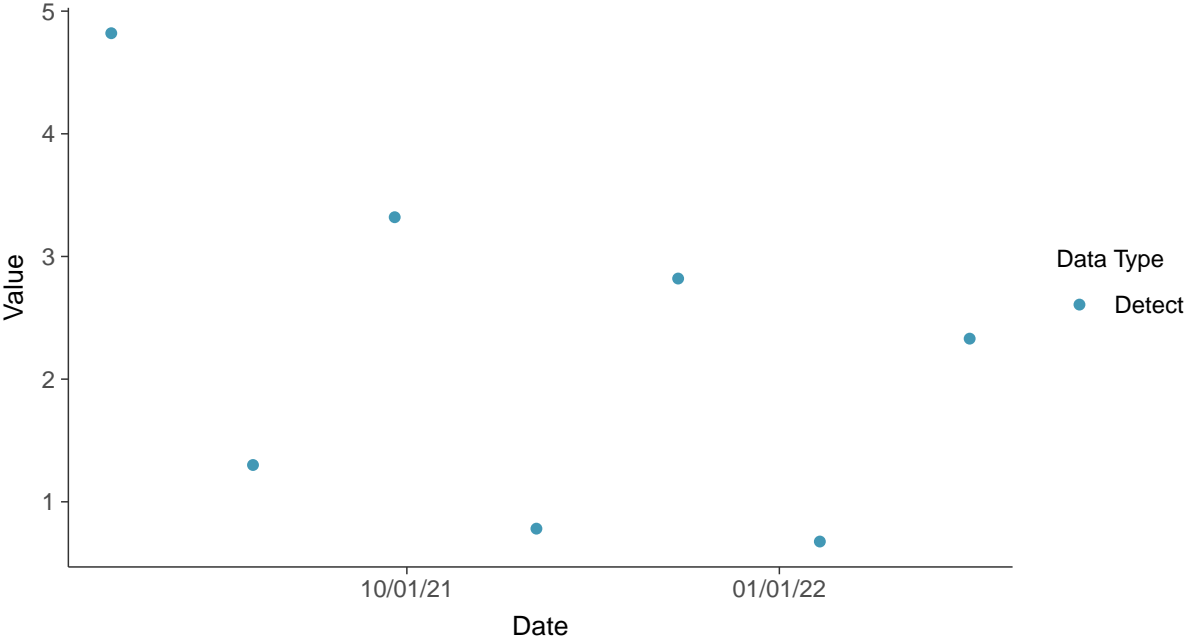


### Appendix IV: Radium-226/228, MW-7

ID: 2\_24\_07

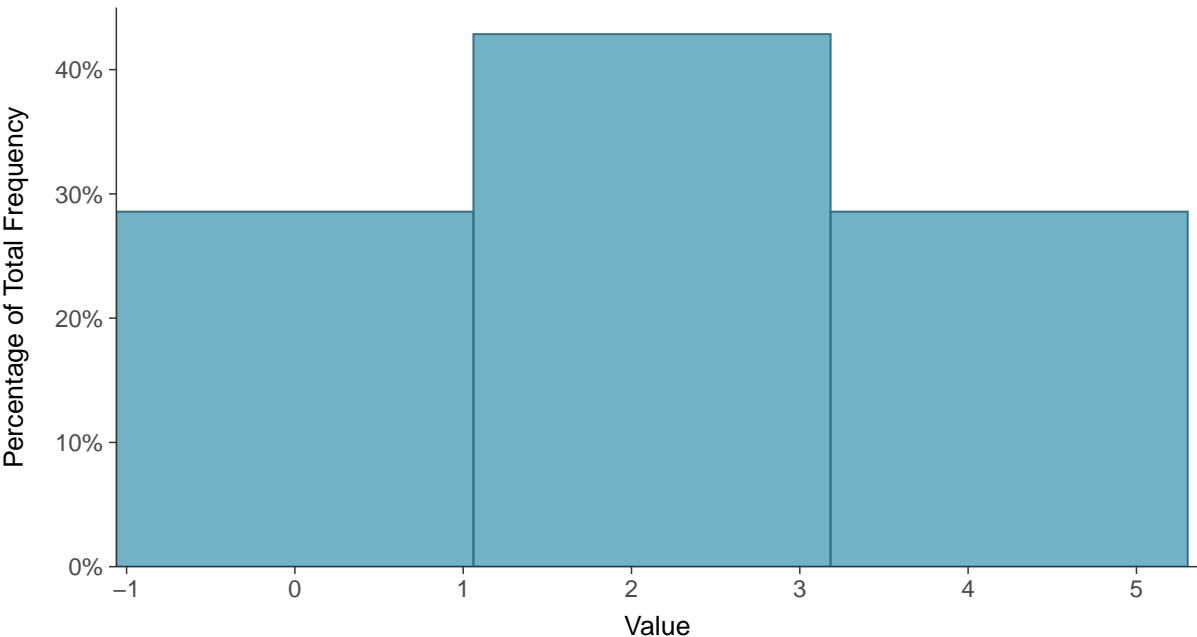
#### Scatter Plot

Radium-226/228, MW-7 (pCi/L)



#### Histogram

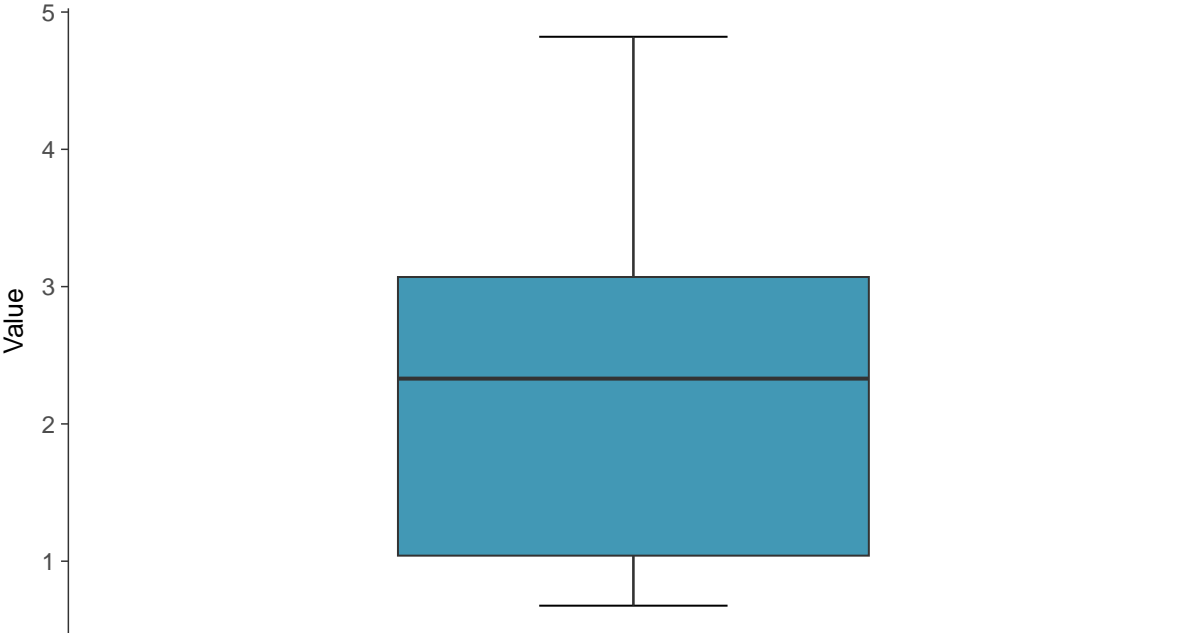
Radium-226/228, MW-7 (pCi/L)





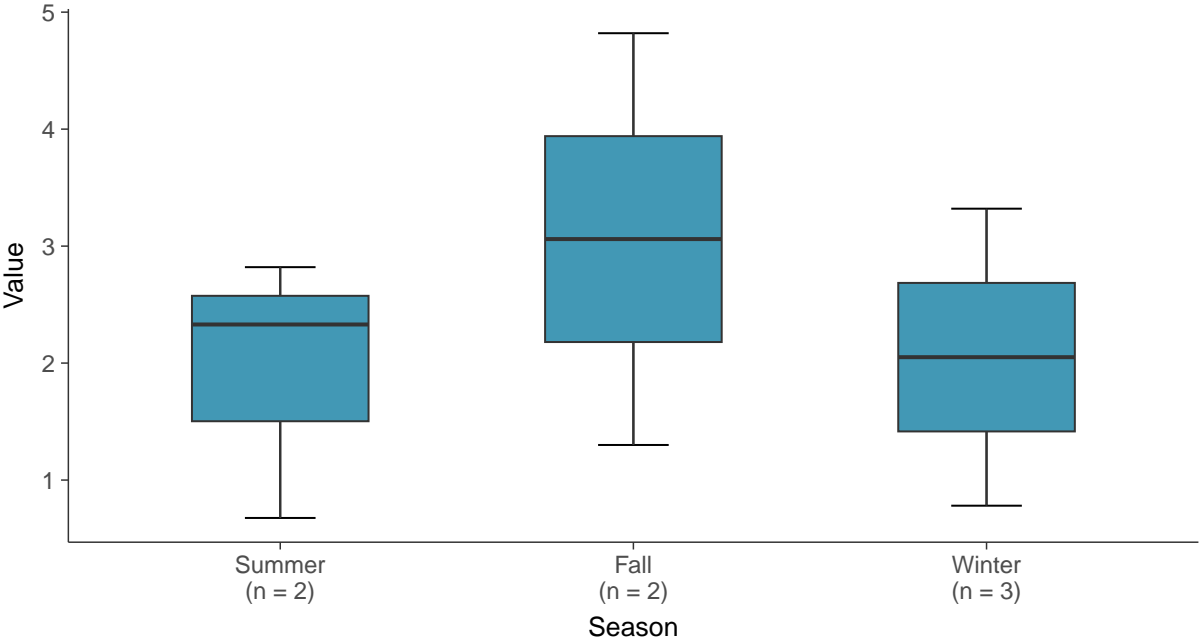
**Boxplot**

Radium-226/228, MW-7 (pCi/L)



**Boxplot by Season**

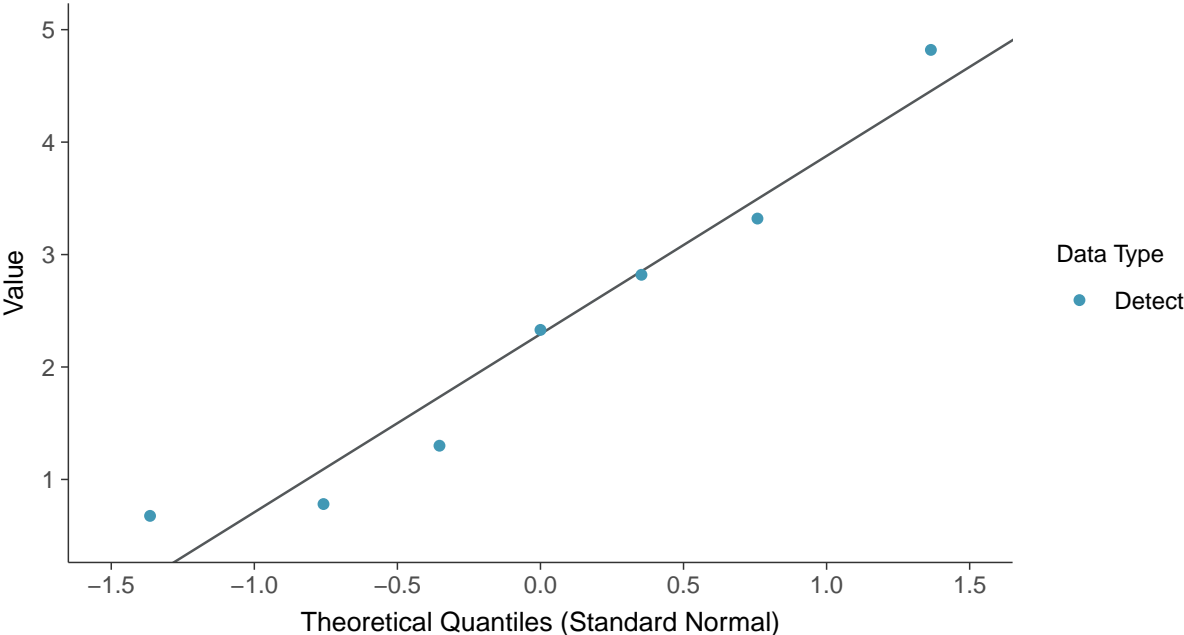
Radium-226/228, MW-7 (pCi/L)





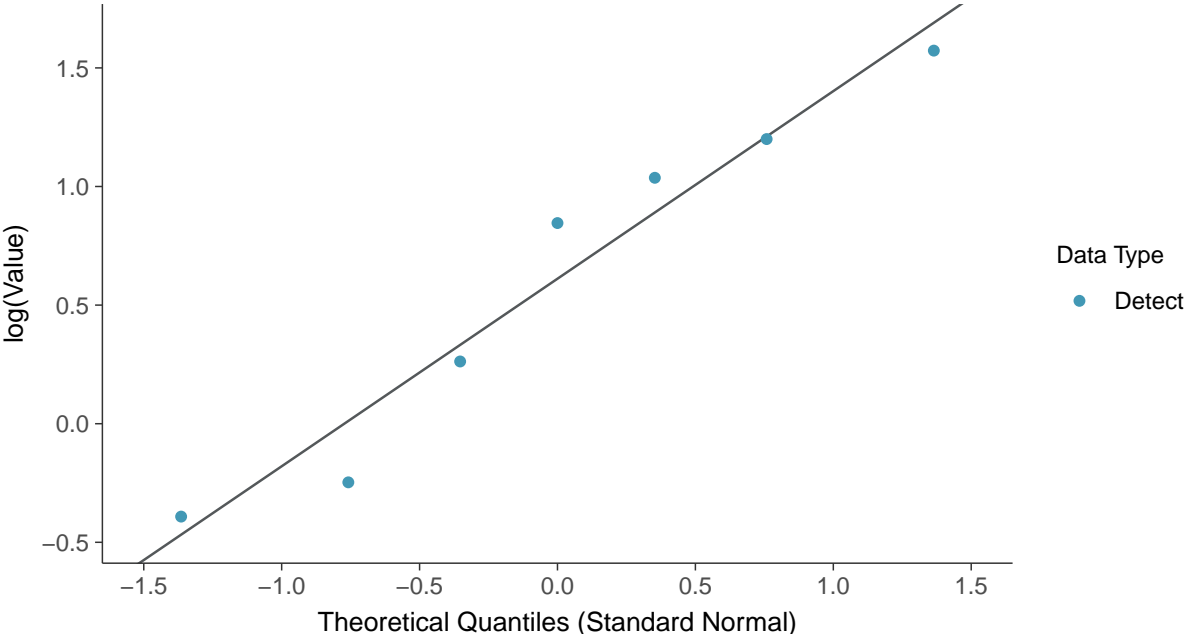
**Normal Q-Q plot**

Radium-226/228, MW-7 (pCi/L)



**Lognormal Q-Q plot**

Radium-226/228, MW-7 (pCi/L)

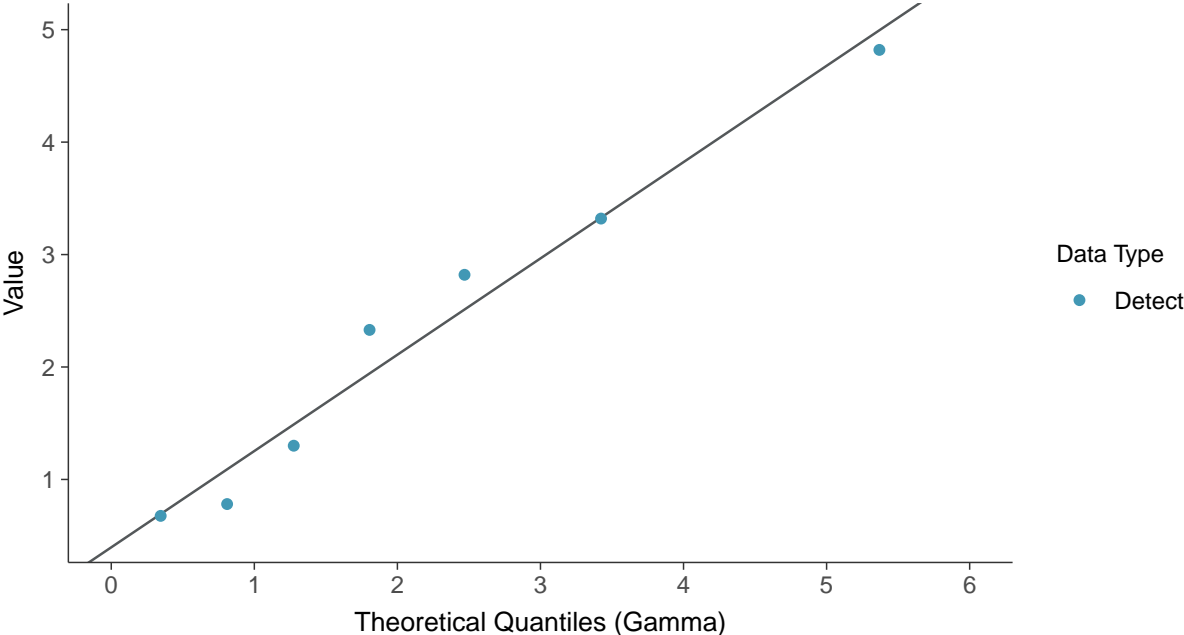






**Gamma Q-Q plot**

Radium-226/228, MW-7 (pCi/L)



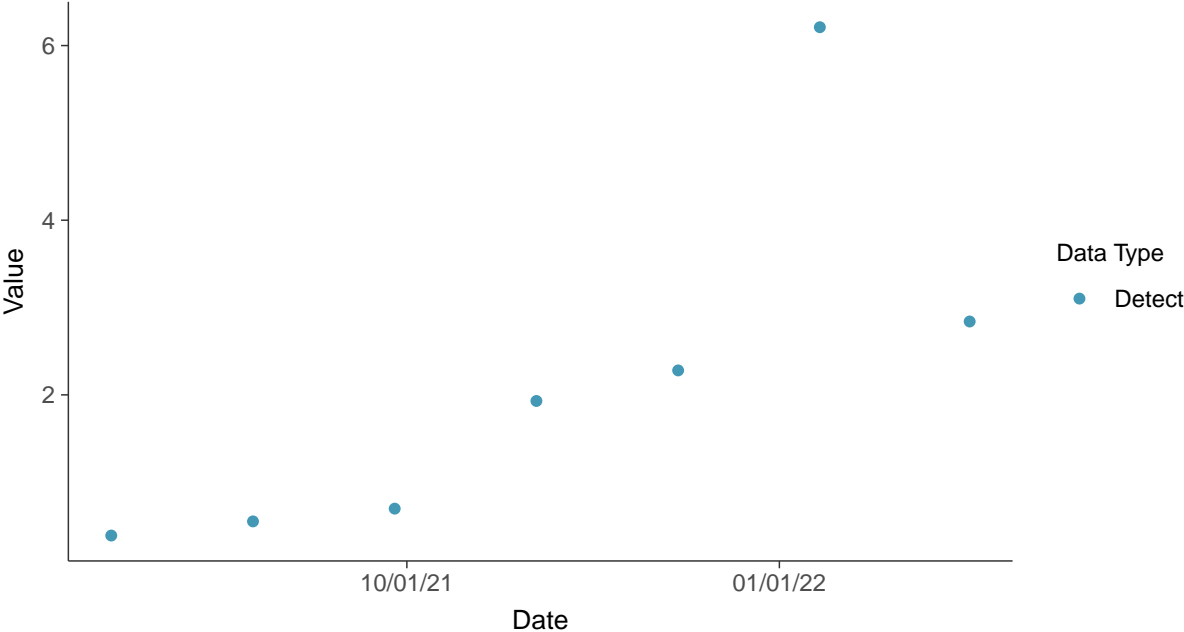


### Appendix IV: Radium-226/228, MW-8

ID: 2\_24\_08

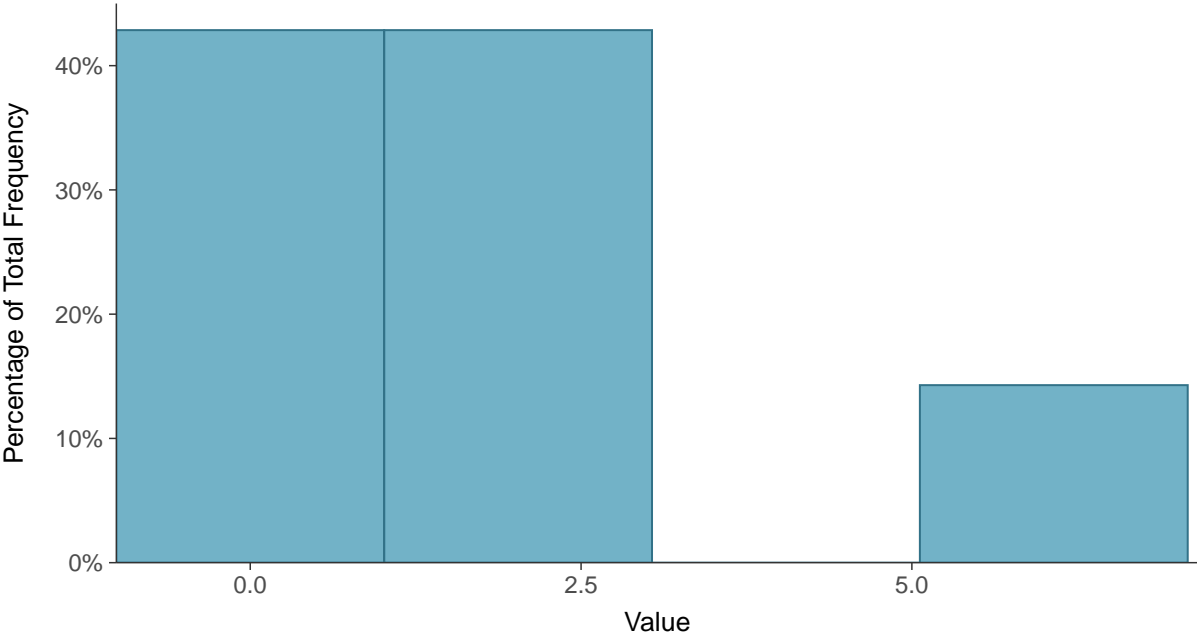
#### Scatter Plot

Radium-226/228, MW-8 (pCi/L)



#### Histogram

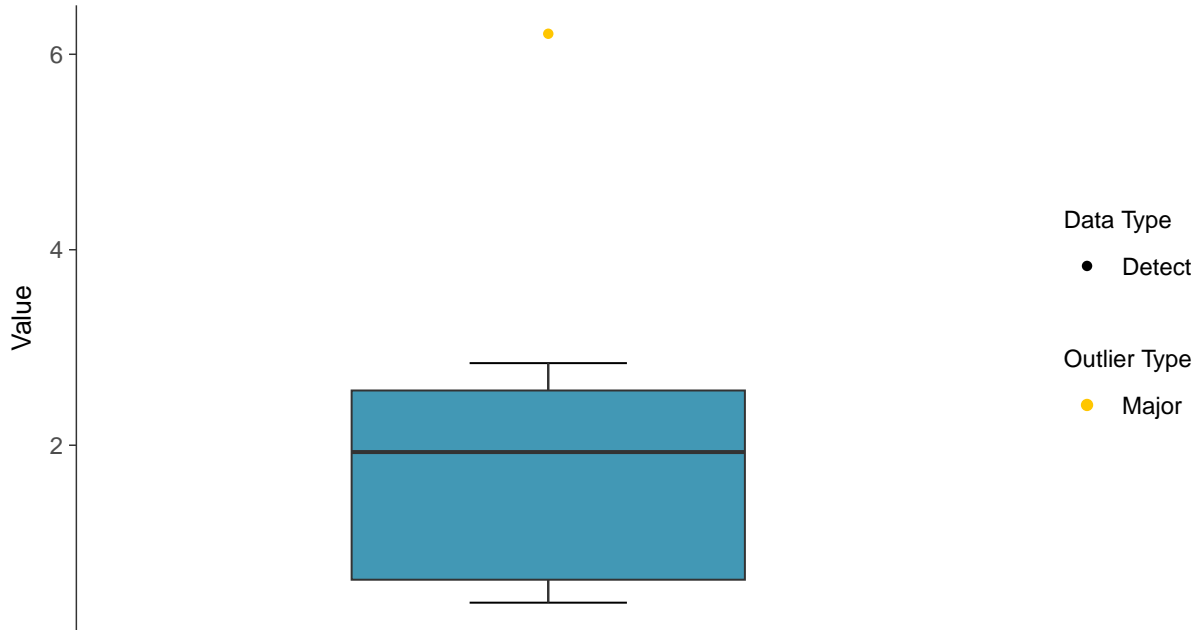
Radium-226/228, MW-8 (pCi/L)





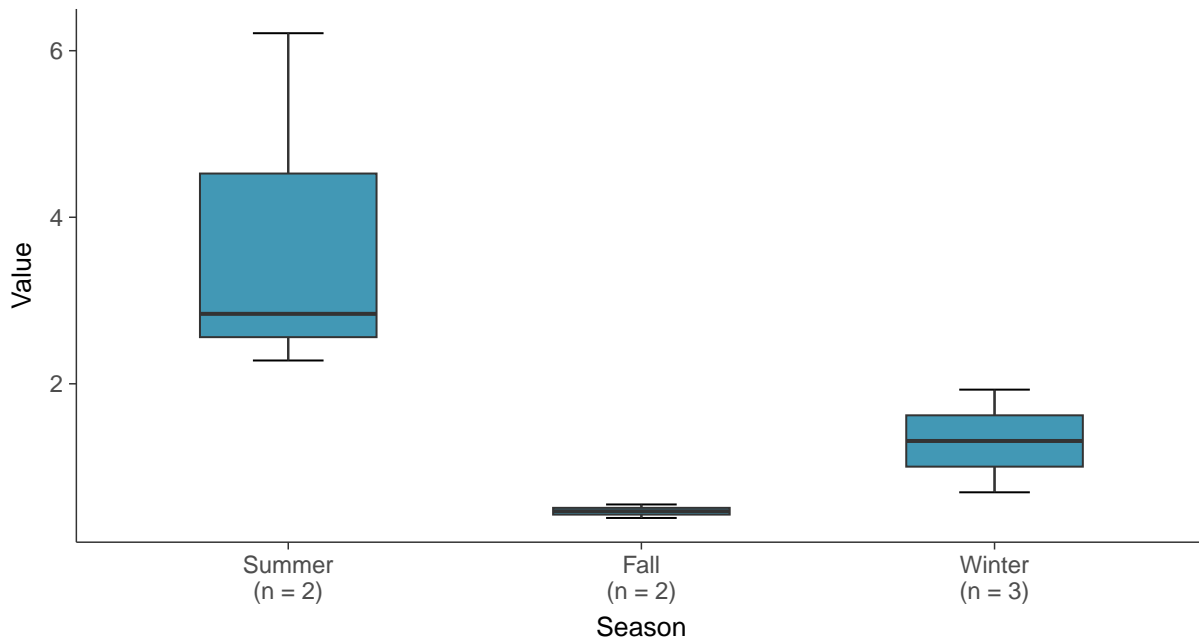
### Boxplot

Radium-226/228, MW-8 (pCi/L)



### Boxplot by Season

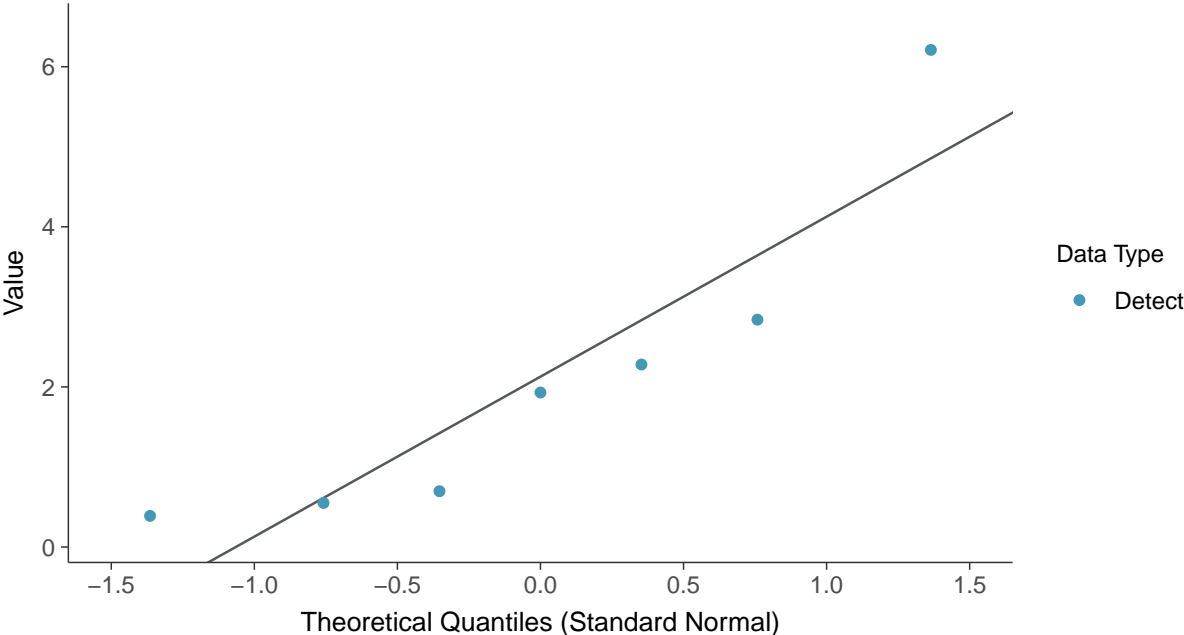
Radium-226/228, MW-8 (pCi/L)





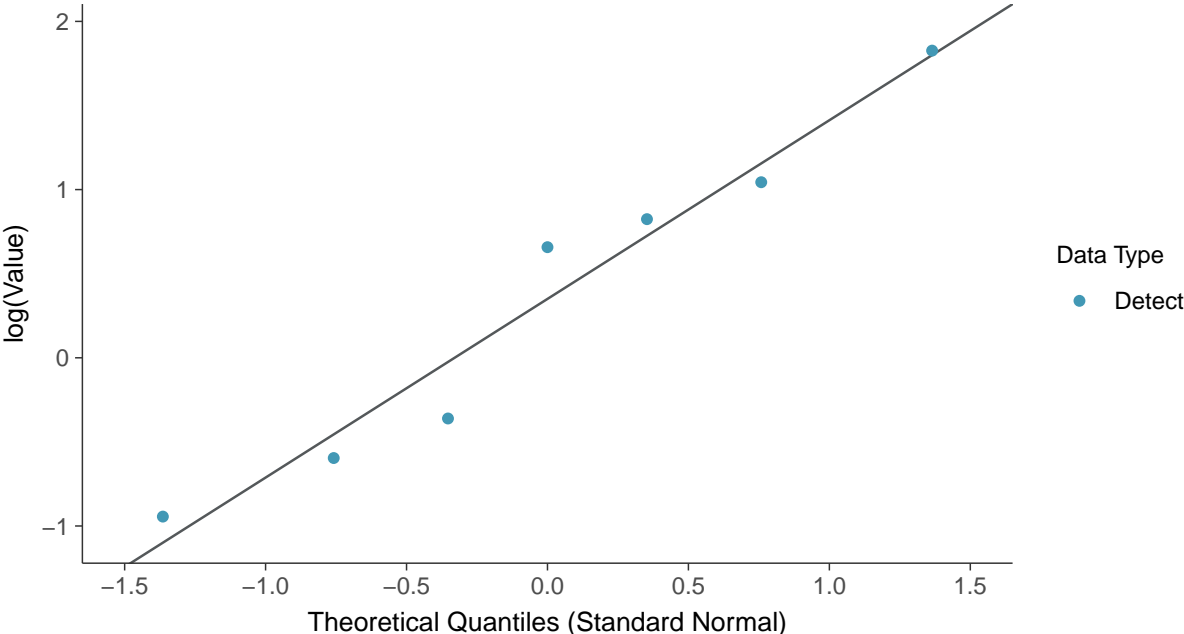
**Normal Q-Q plot**

Radium-226/228, MW-8 (pCi/L)



**Lognormal Q-Q plot**

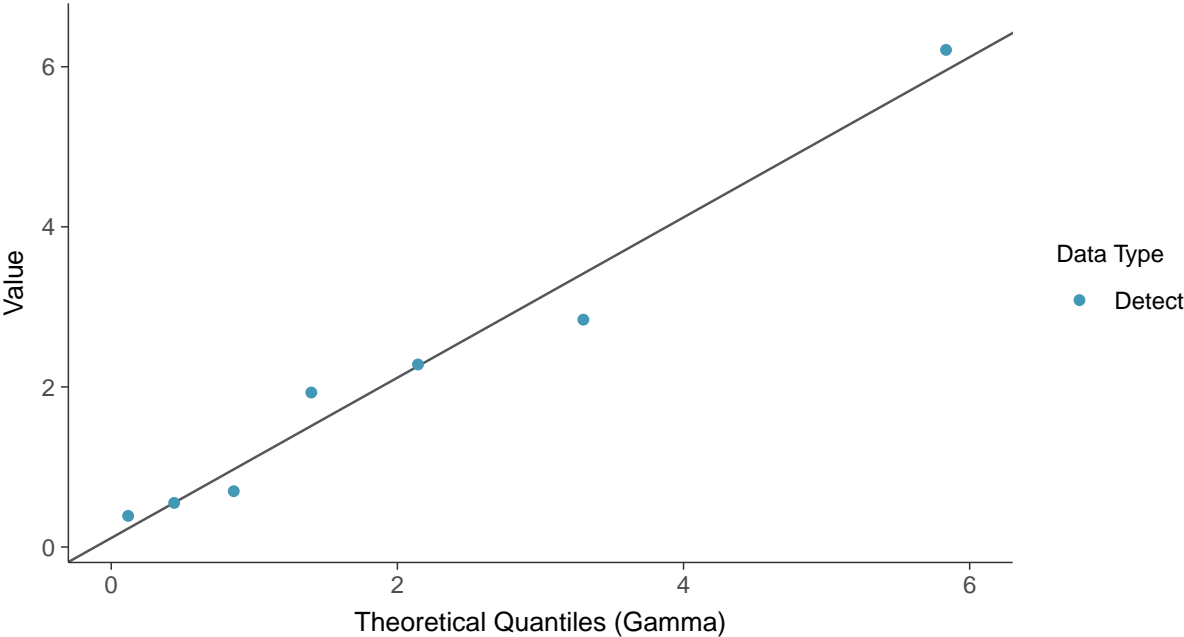
Radium-226/228, MW-8 (pCi/L)





**Gamma Q-Q plot**

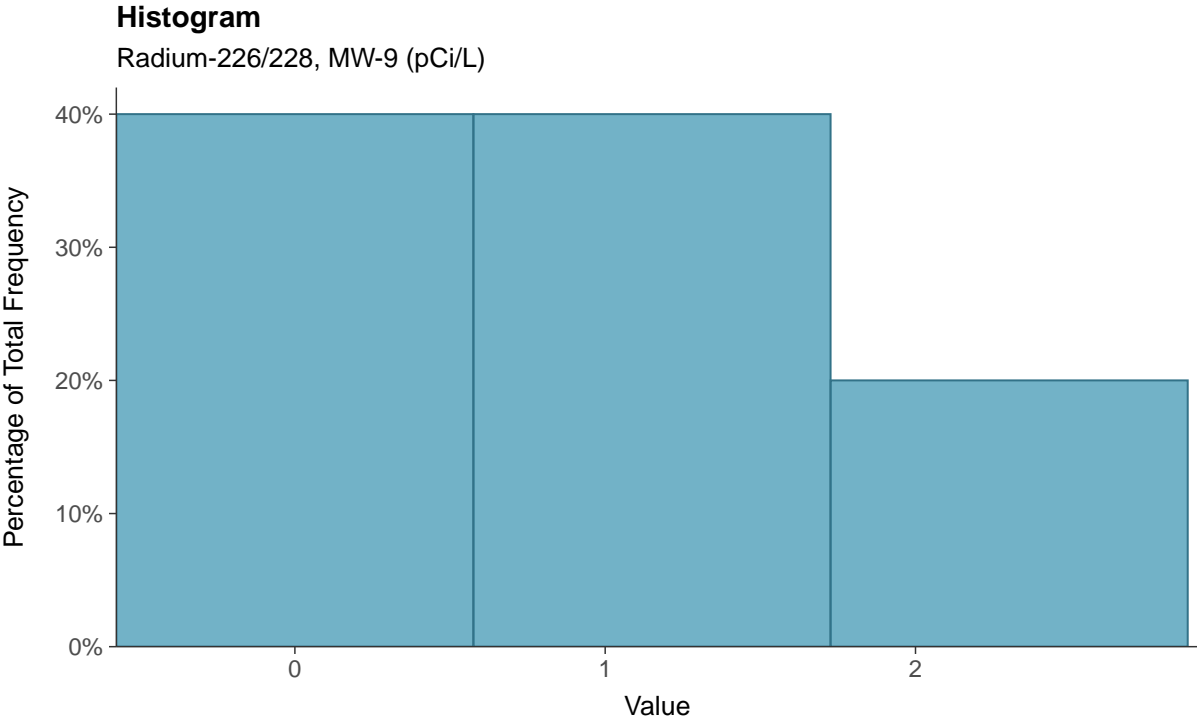
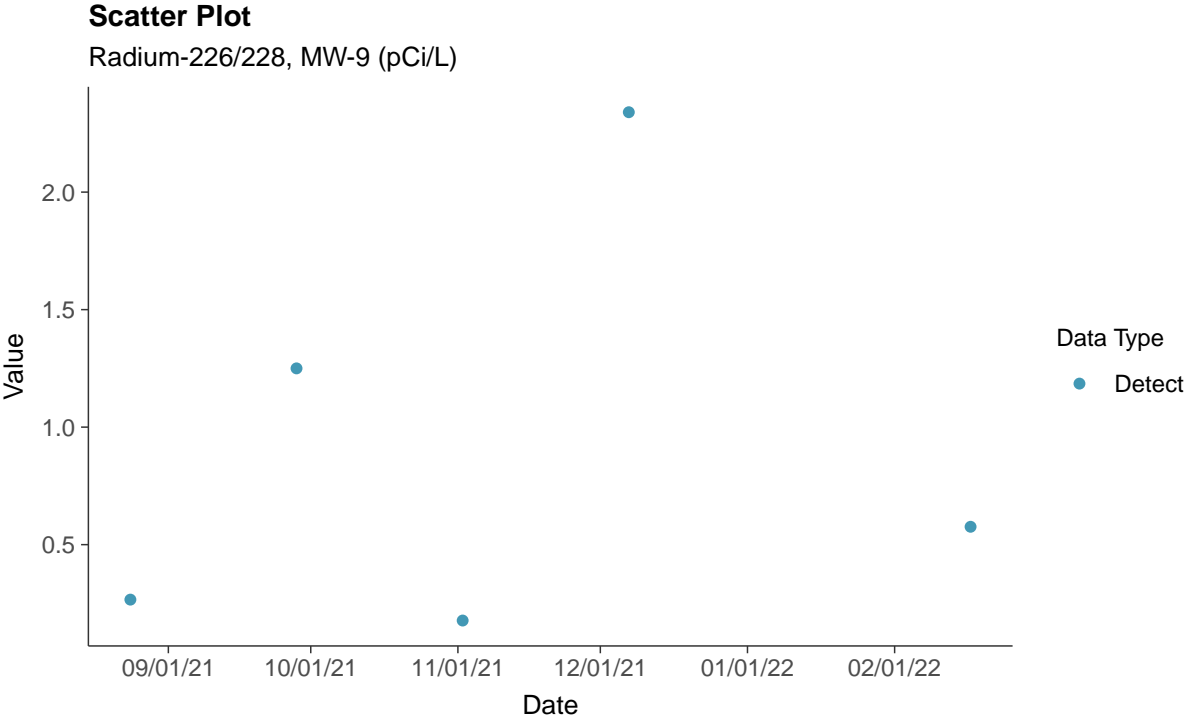
Radium-226/228, MW-8 (pCi/L)





### Appendix IV: Radium-226/228, MW-9

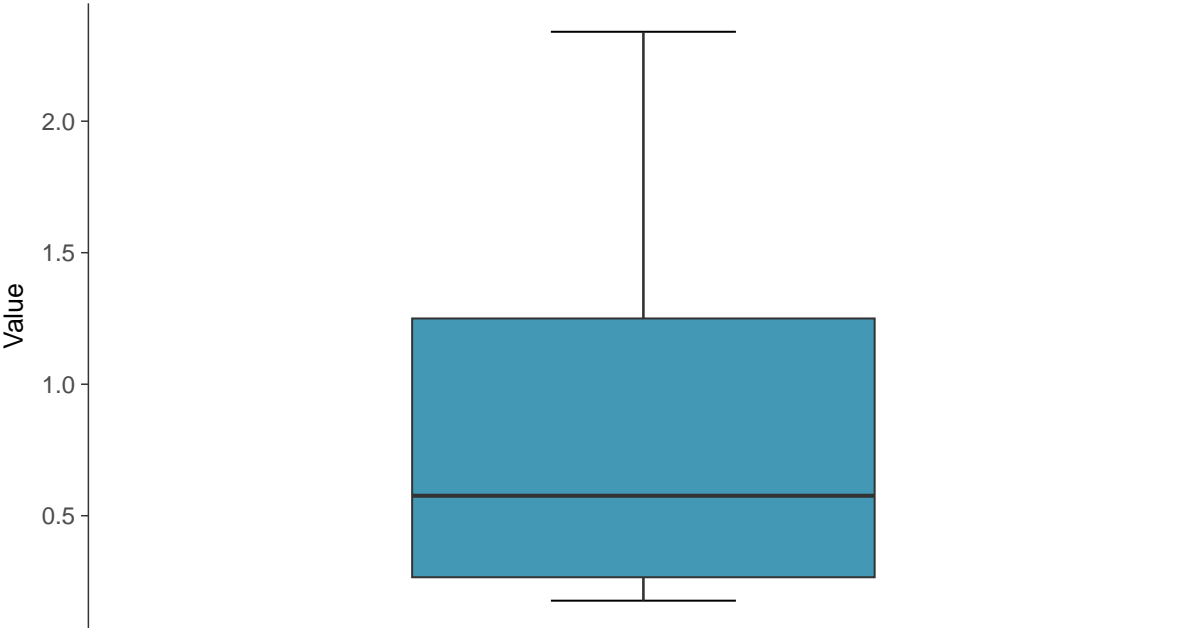
ID: 2\_24\_09





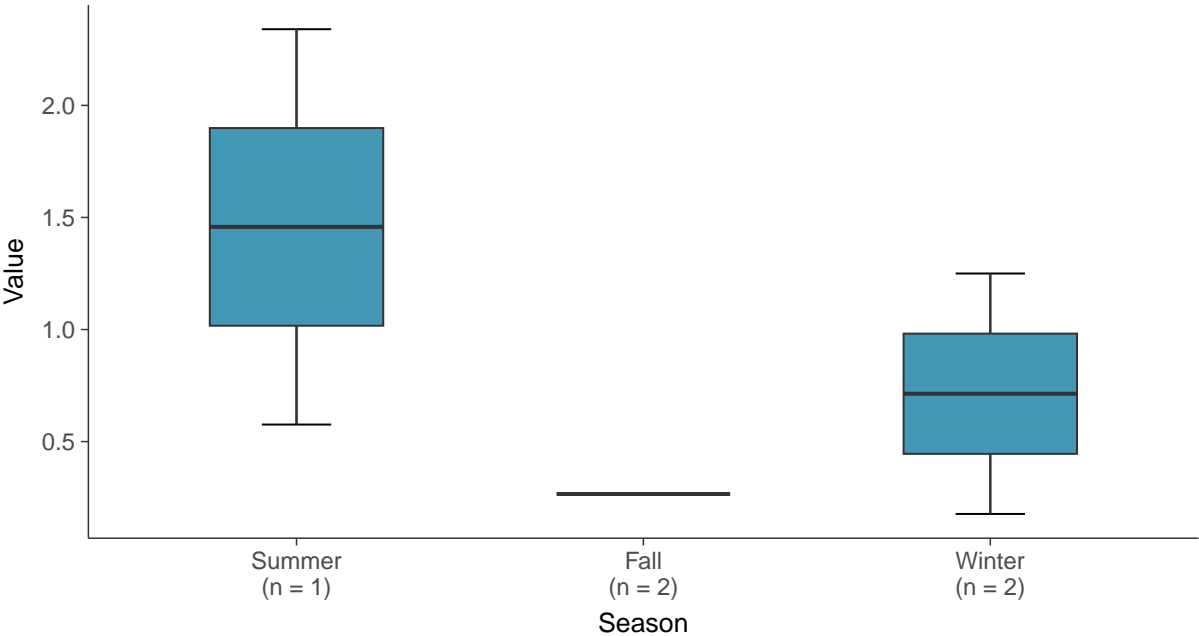
**Boxplot**

Radium-226/228, MW-9 (pCi/L)



**Boxplot by Season**

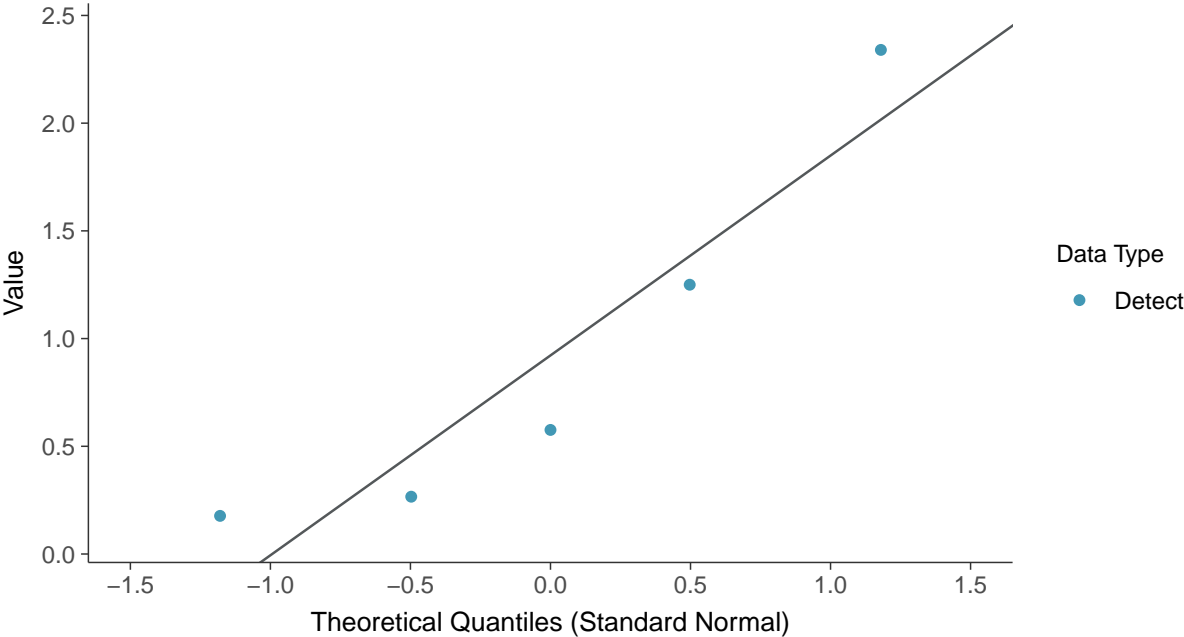
Radium-226/228, MW-9 (pCi/L)





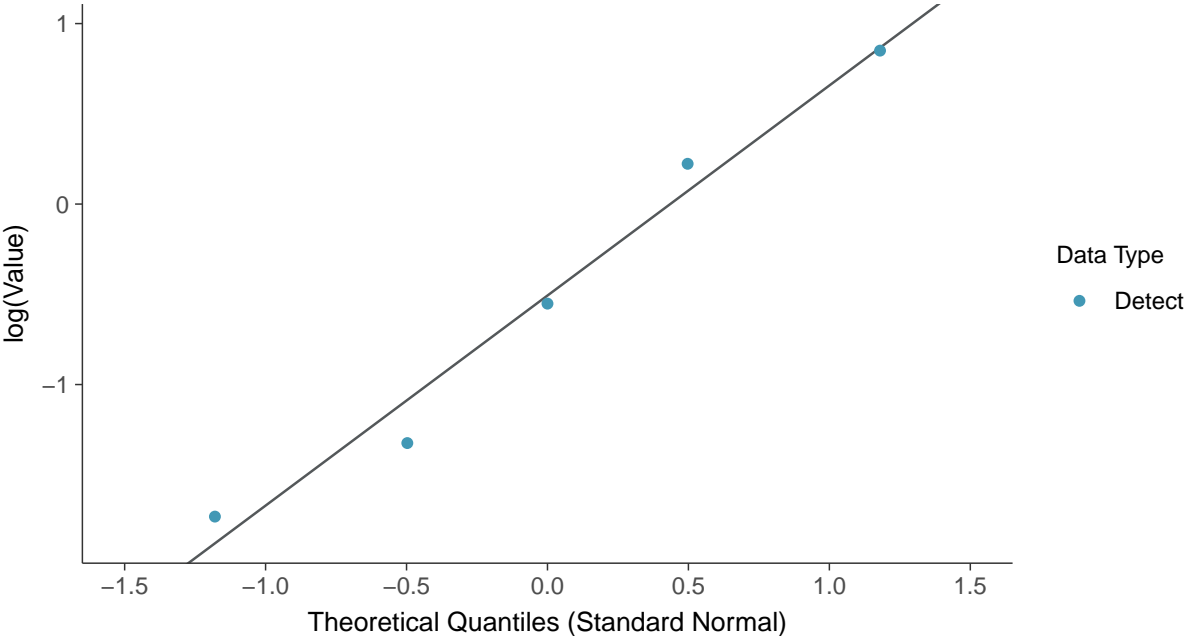
**Normal Q-Q plot**

Radium-226/228, MW-9 (pCi/L)



**Lognormal Q-Q plot**

Radium-226/228, MW-9 (pCi/L)

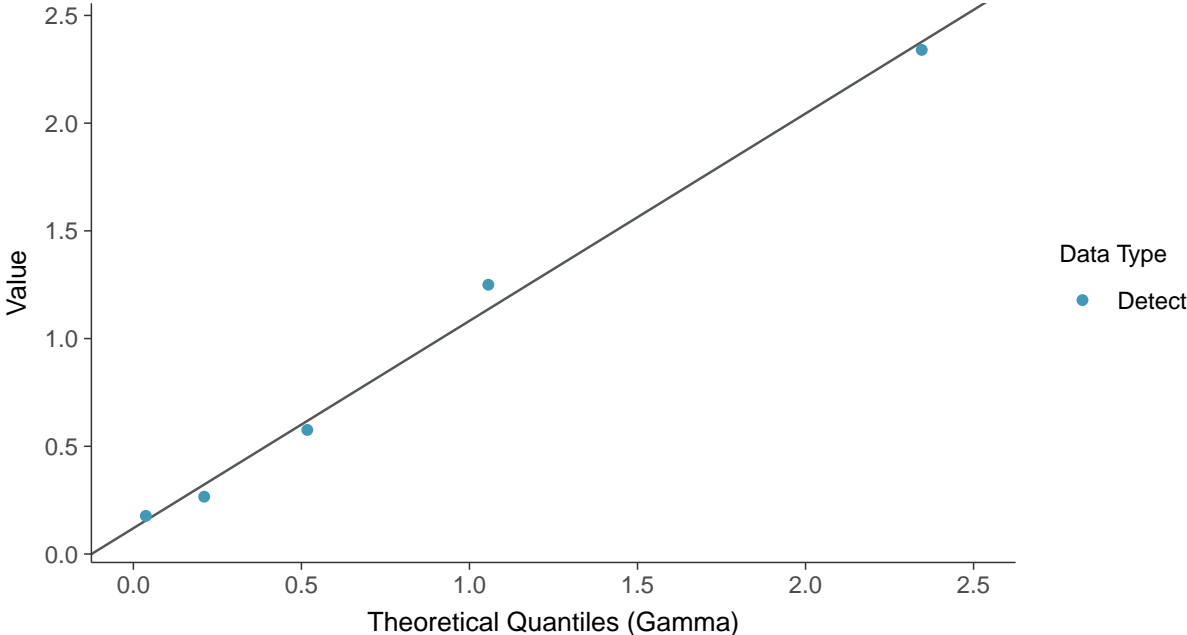






**Gamma Q-Q plot**

Radium-226/228, MW-9 (pCi/L)



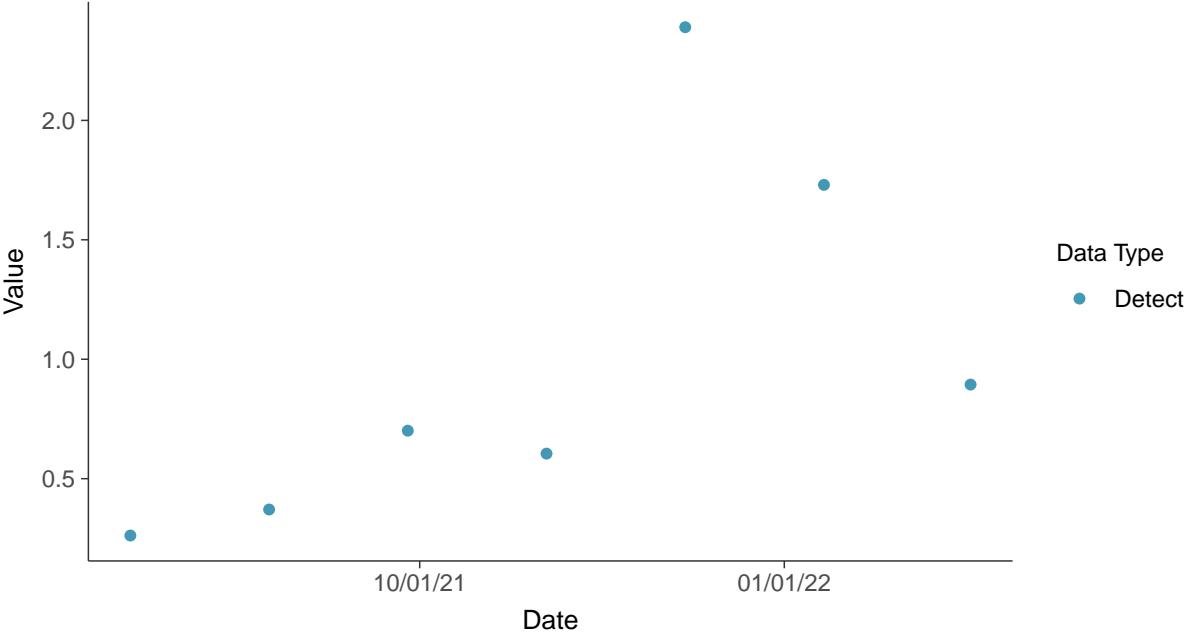


### Appendix IV: Radium-226/228, MW-10

ID: 2\_24\_10

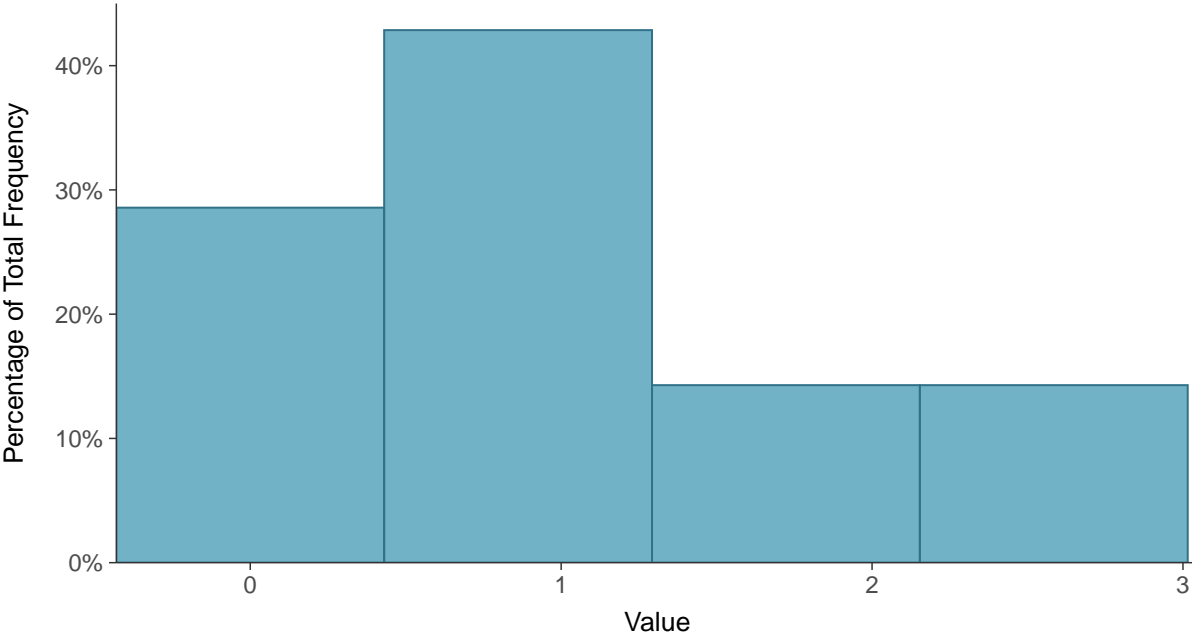
#### Scatter Plot

Radium-226/228, MW-10 (pCi/L)



#### Histogram

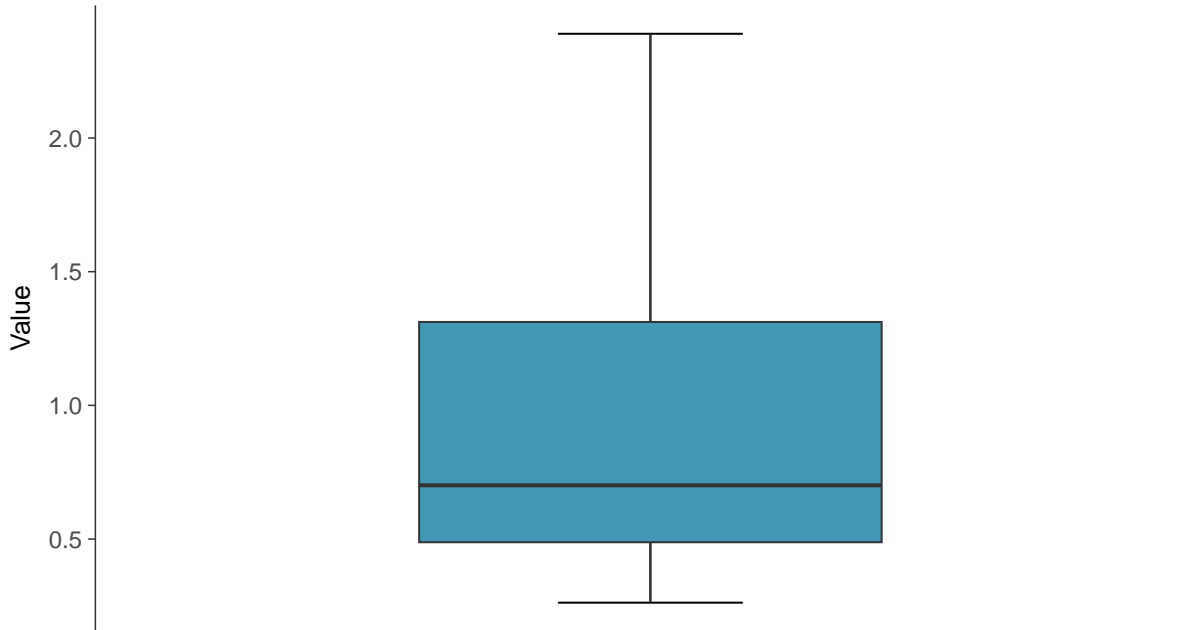
Radium-226/228, MW-10 (pCi/L)





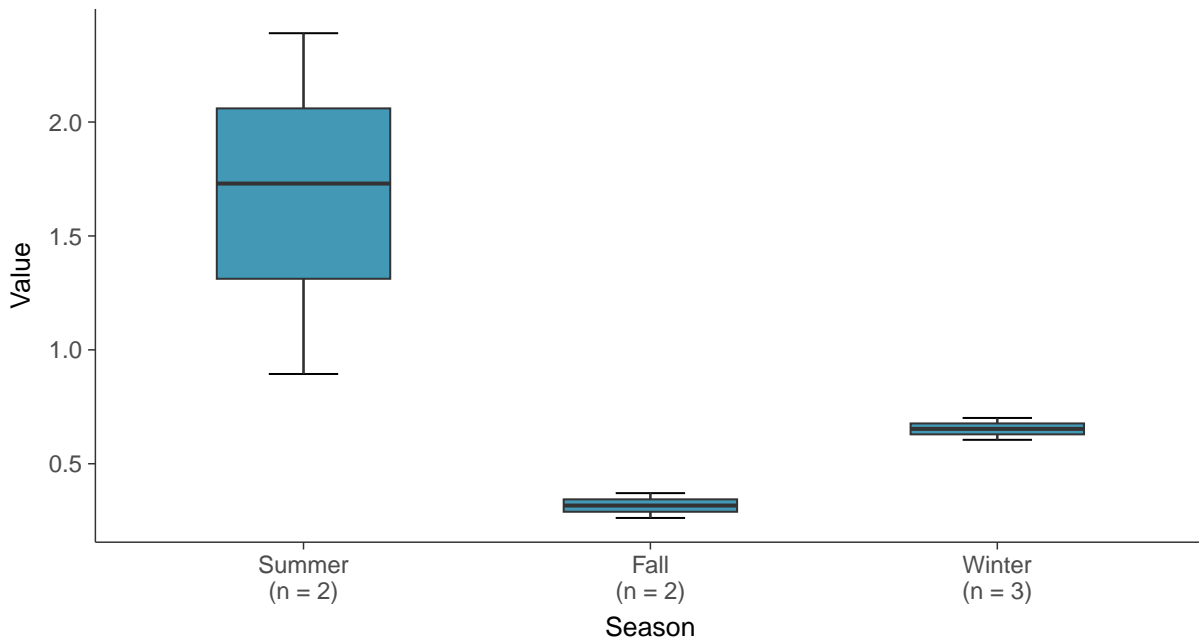
### Boxplot

Radium-226/228, MW-10 (pCi/L)



### Boxplot by Season

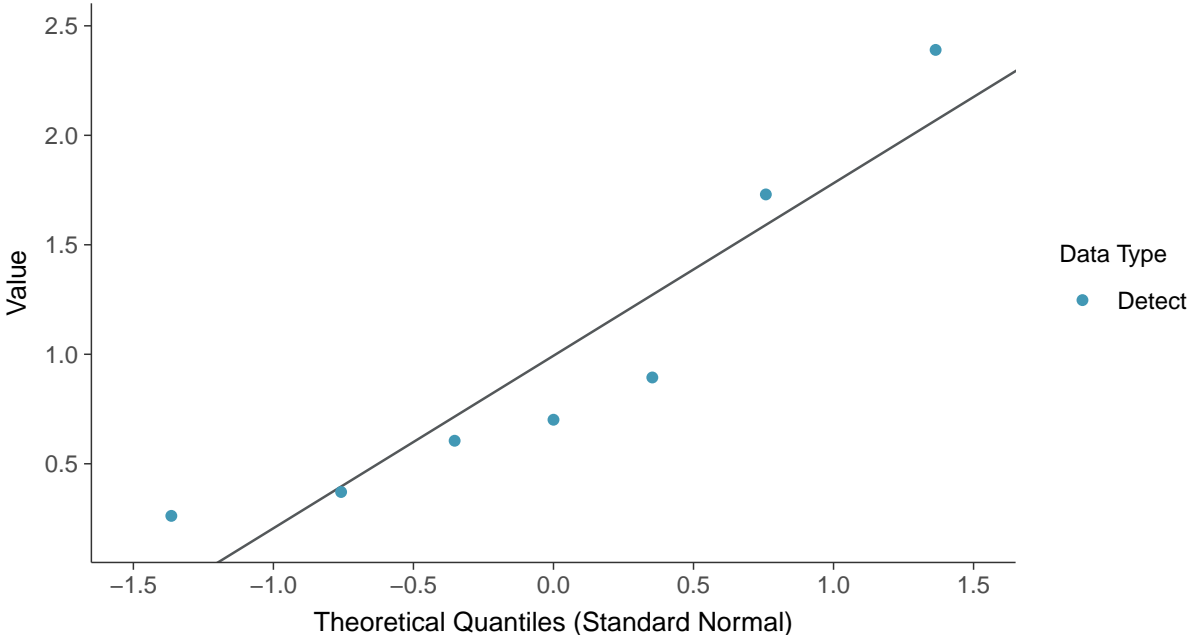
Radium-226/228, MW-10 (pCi/L)





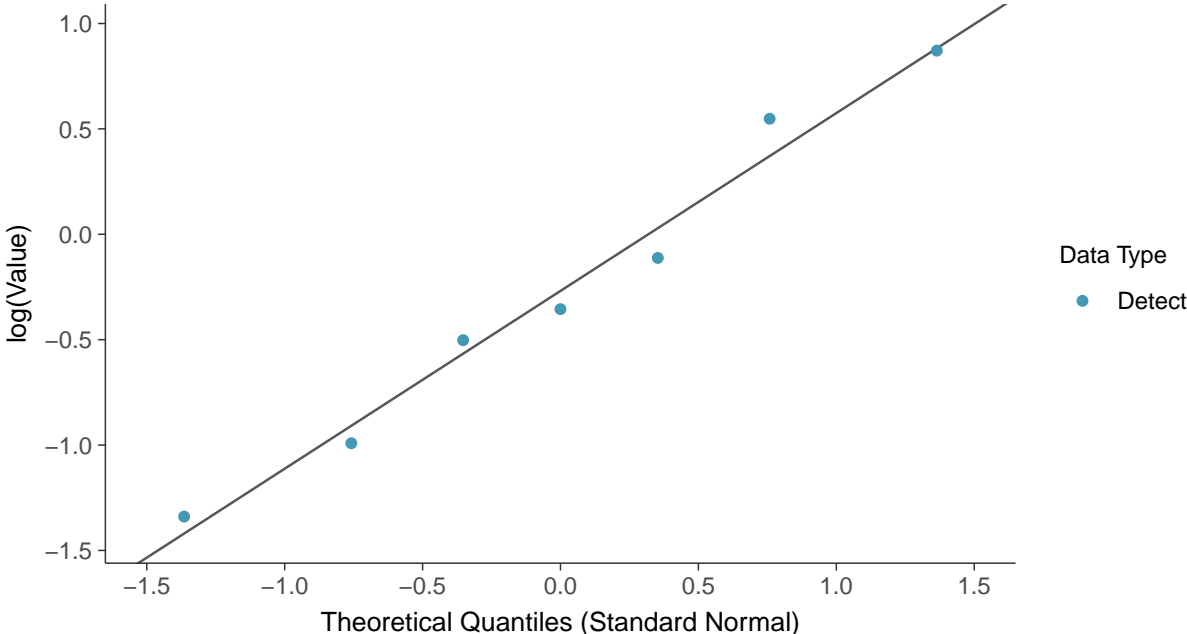
**Normal Q-Q plot**

Radium-226/228, MW-10 (pCi/L)



**Lognormal Q-Q plot**

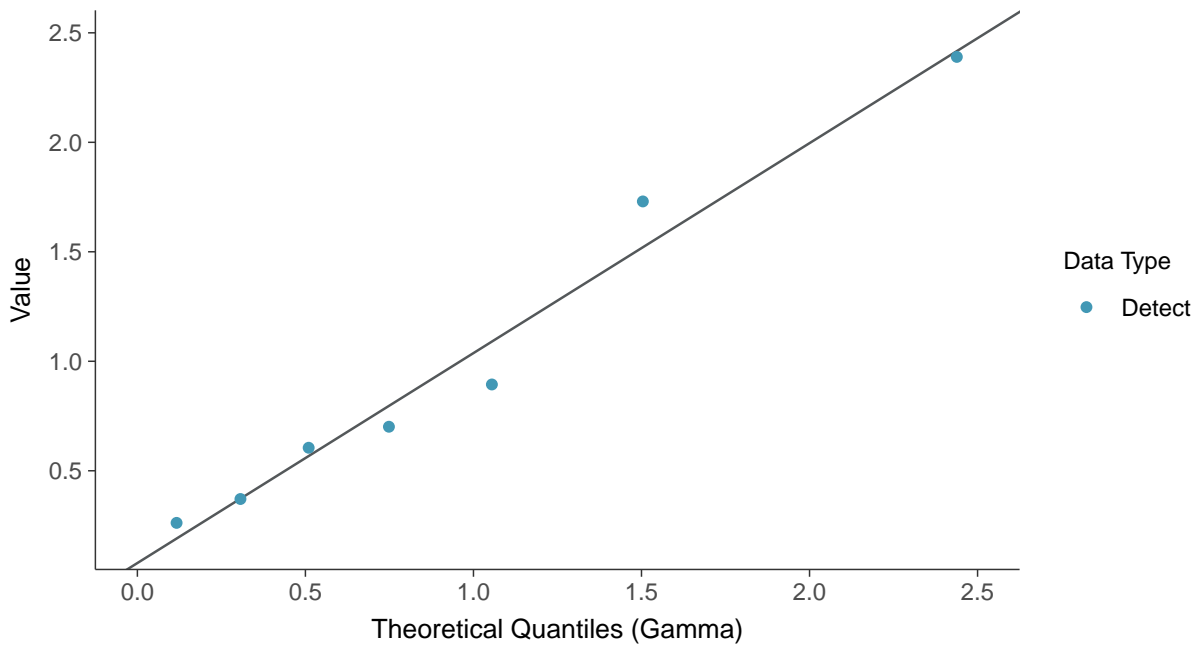
Radium-226/228, MW-10 (pCi/L)





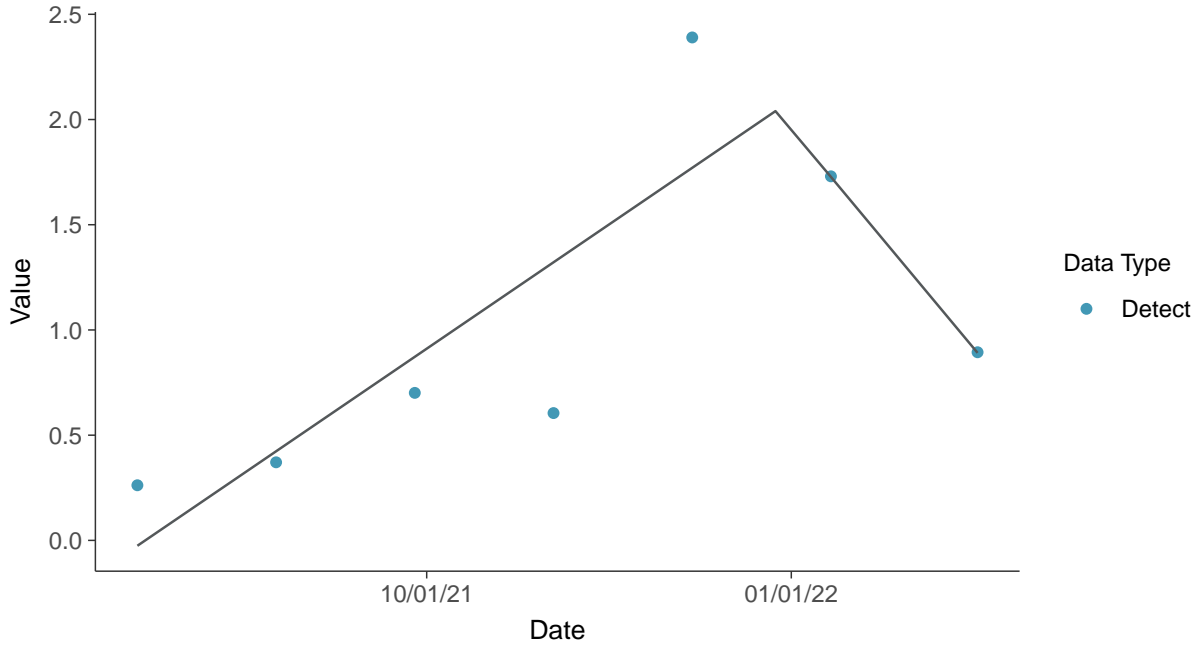
### Gamma Q-Q plot

Radium-226/228, MW-10 (pCi/L)



### Trend Regression: Piecewise Linear-Linear

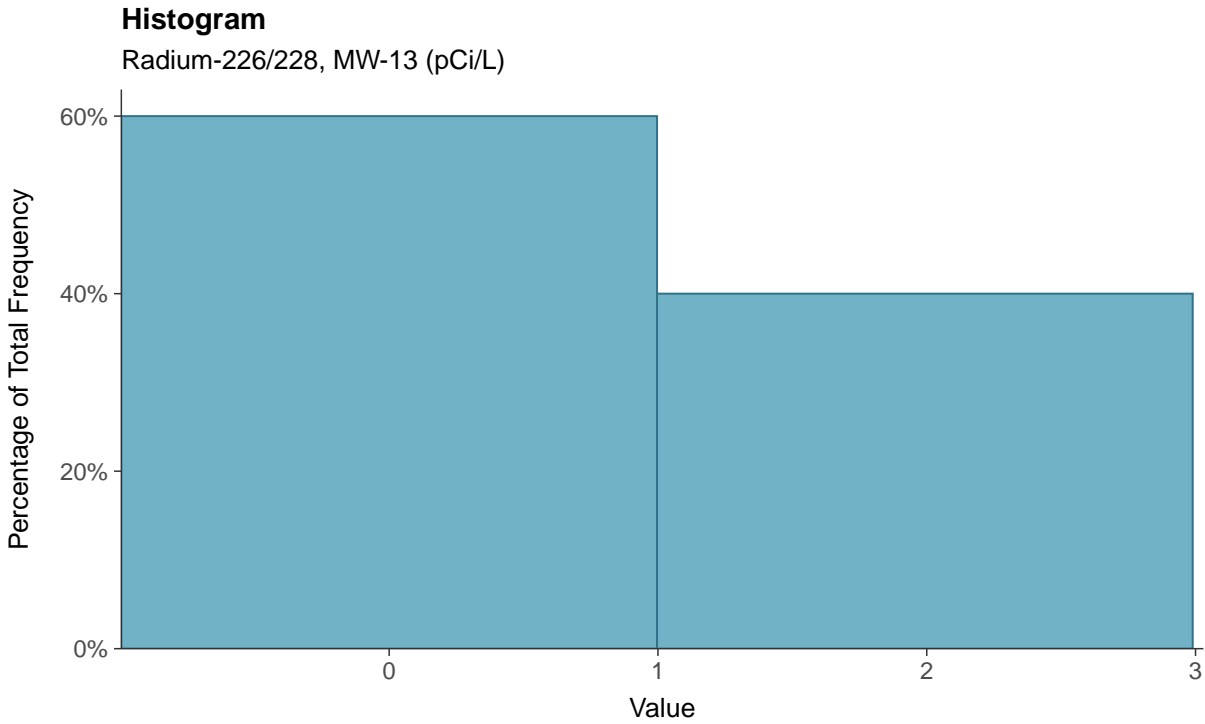
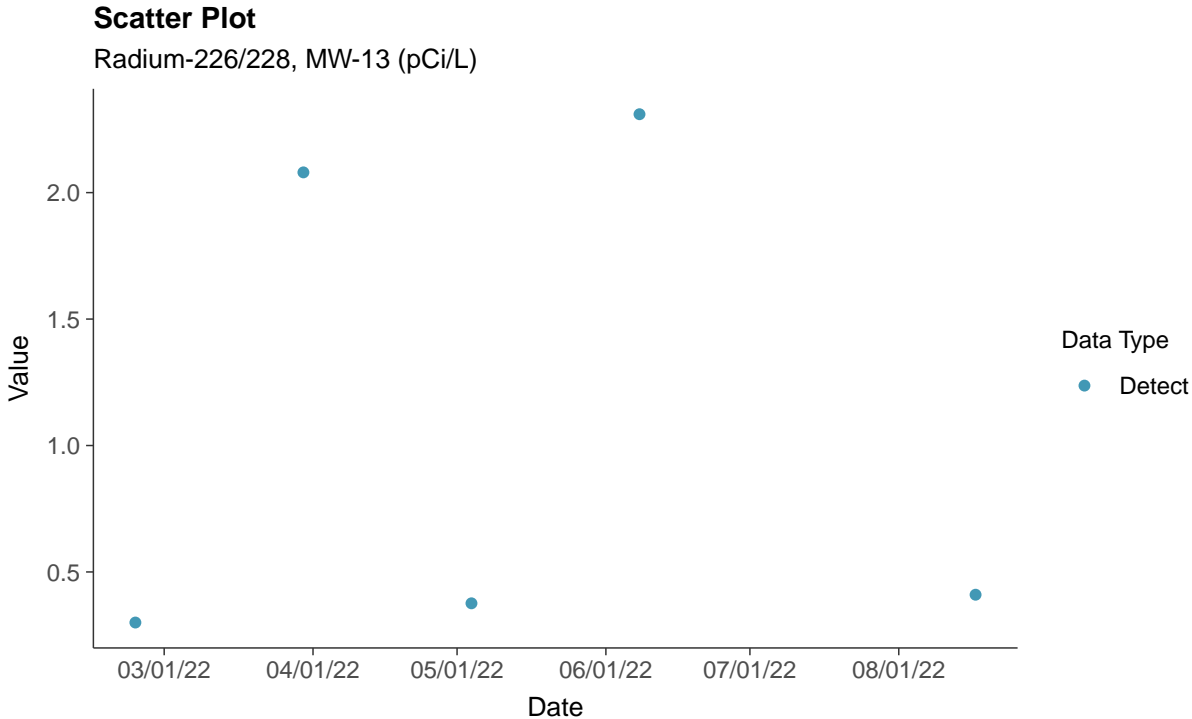
Radium-226/228, MW-10 (pCi/L)





### Appendix IV: Radium-226/228, MW-13

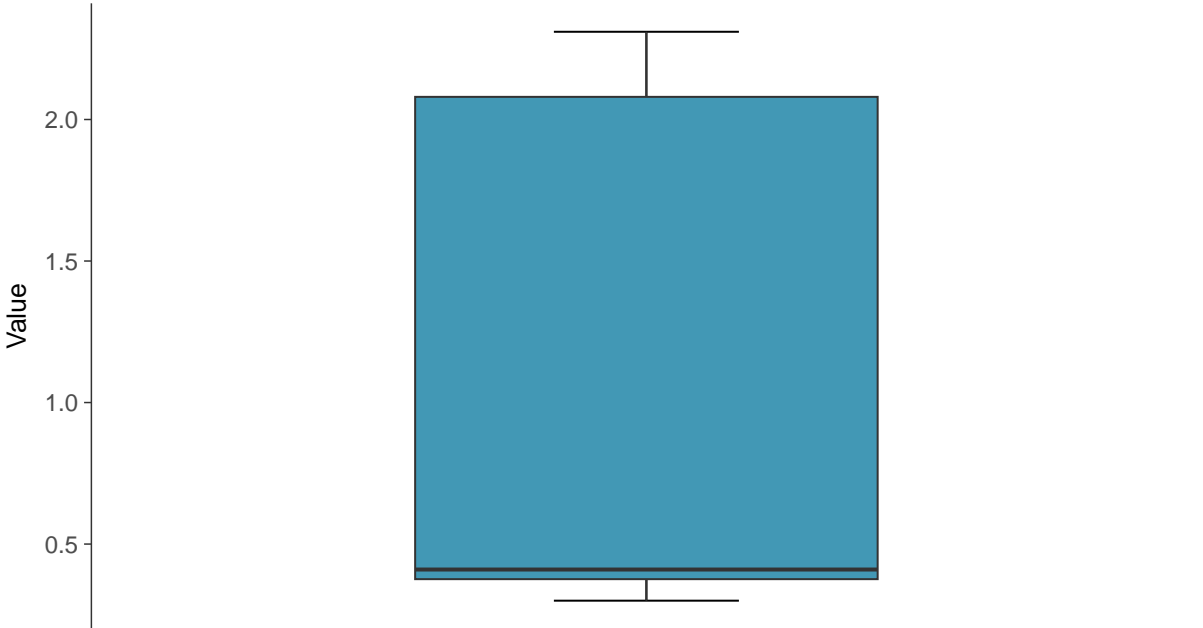
ID: 2\_24\_13





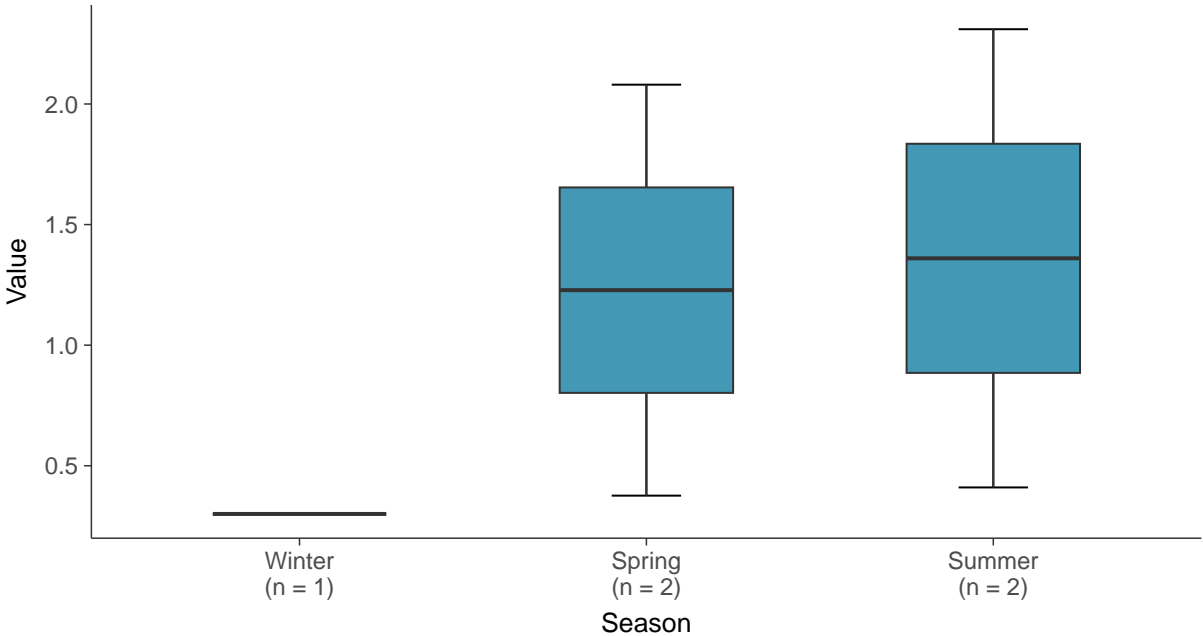
**Boxplot**

Radium-226/228, MW-13 (pCi/L)



**Boxplot by Season**

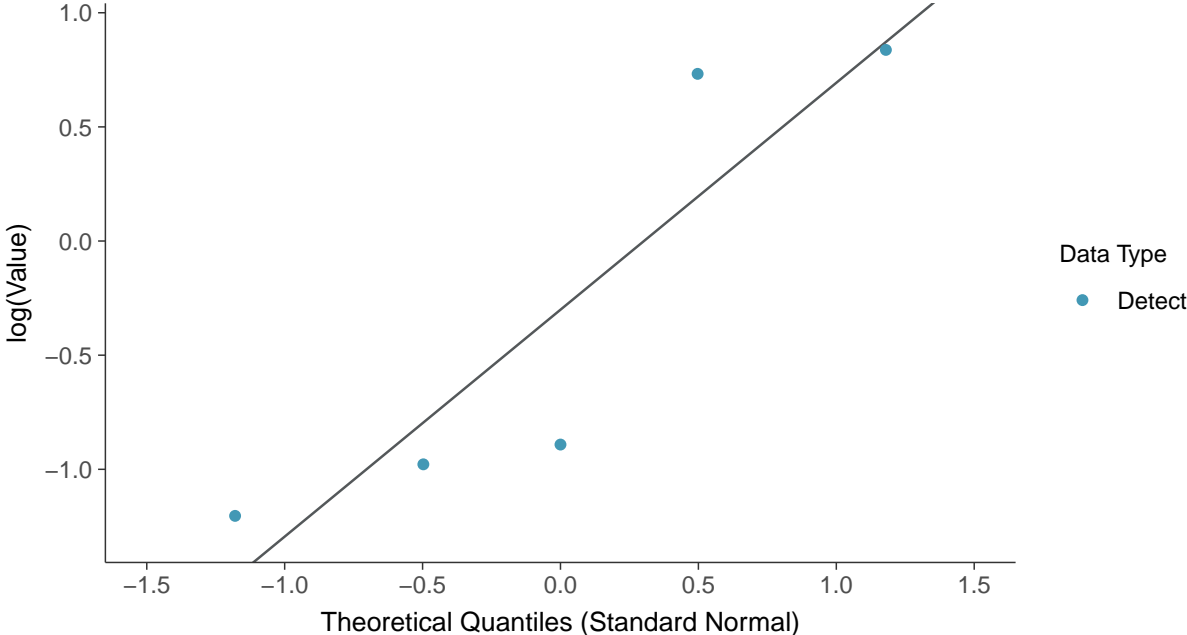
Radium-226/228, MW-13 (pCi/L)





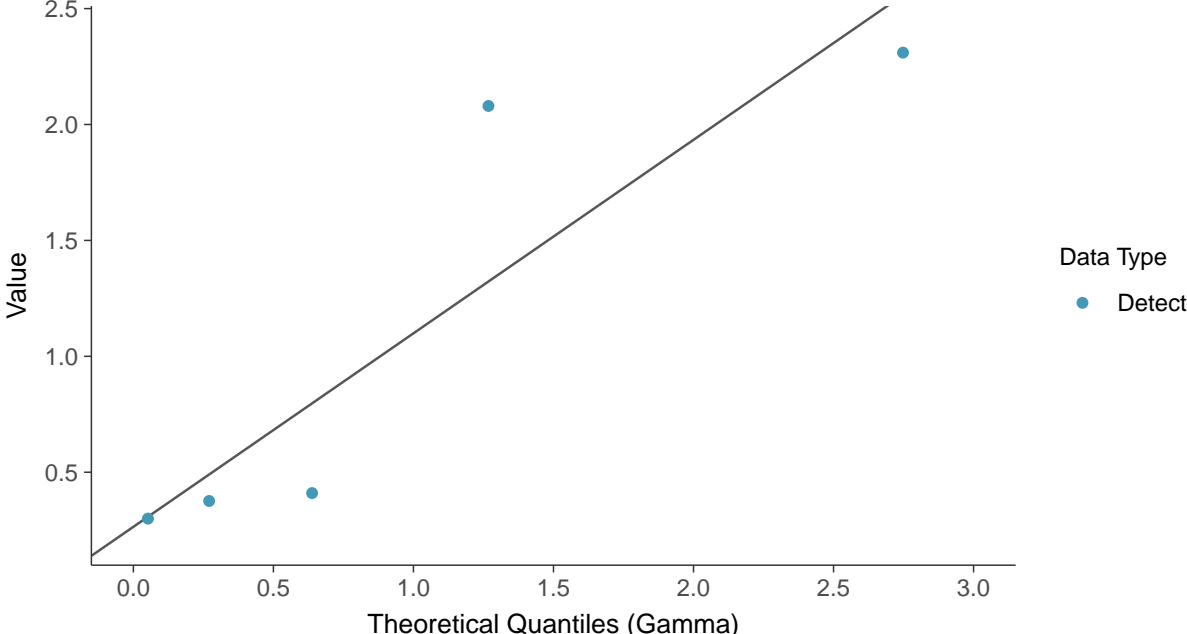
**Lognormal Q-Q plot**

Radium-226/228, MW-13 (pCi/L)



**Gamma Q-Q plot**

Radium-226/228, MW-13 (pCi/L)





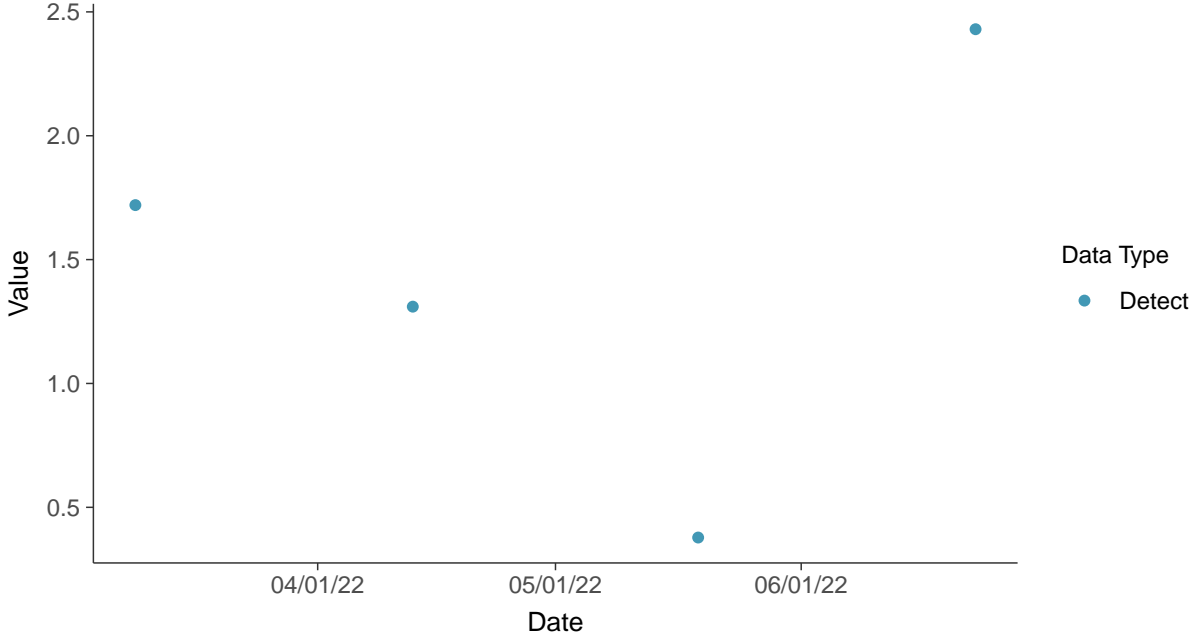


### Appendix IV: Radium-226/228, MW-7B

ID: 2\_24\_7B

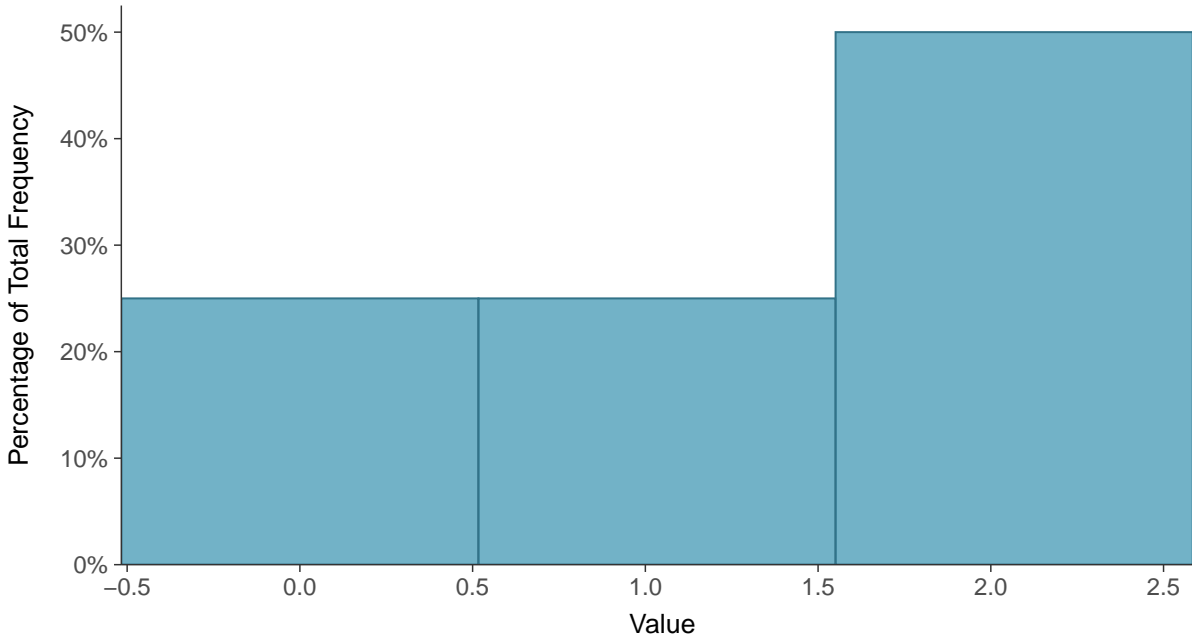
#### Scatter Plot

Radium-226/228, MW-7B (pCi/L)



#### Histogram

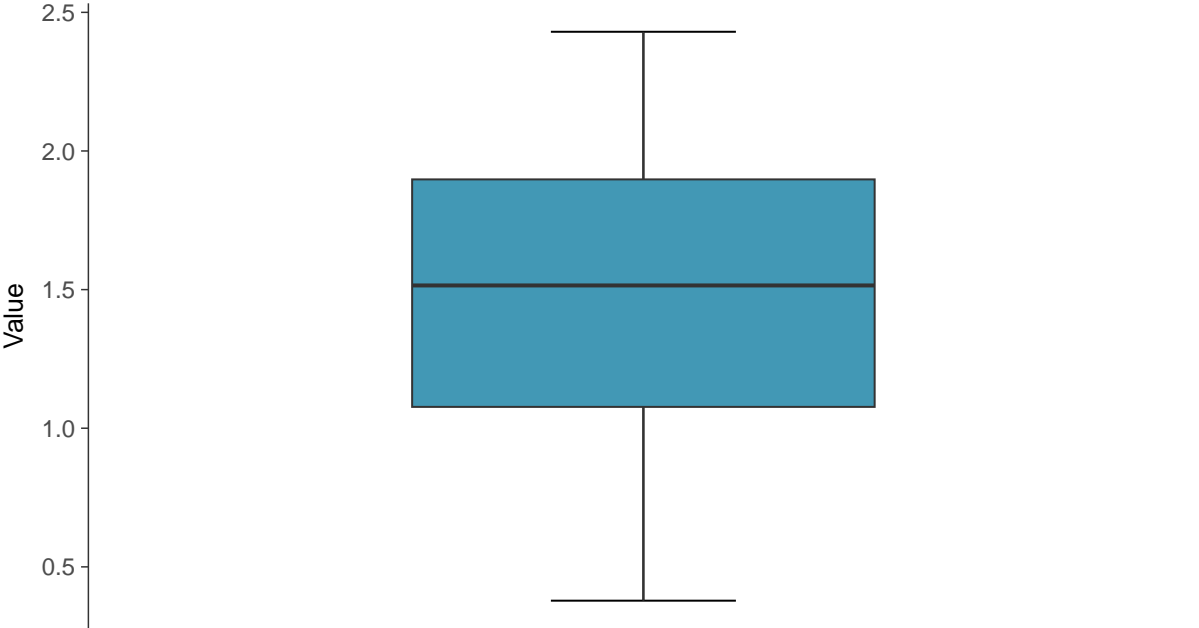
Radium-226/228, MW-7B (pCi/L)





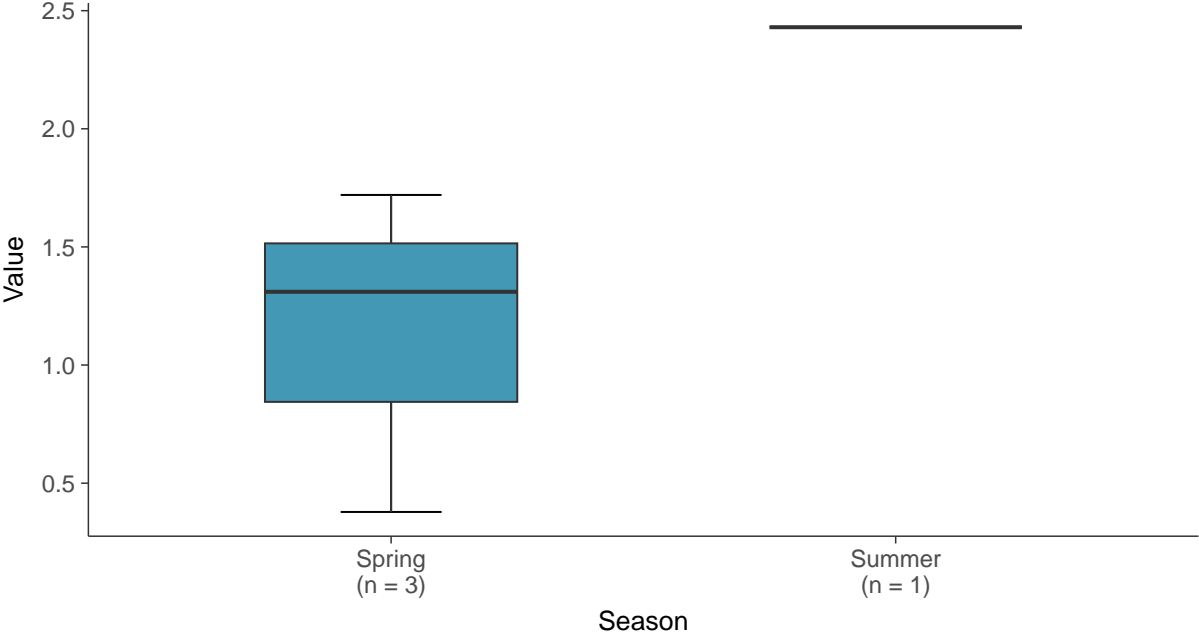
**Boxplot**

Radium-226/228, MW-7B (pCi/L)



**Boxplot by Season**

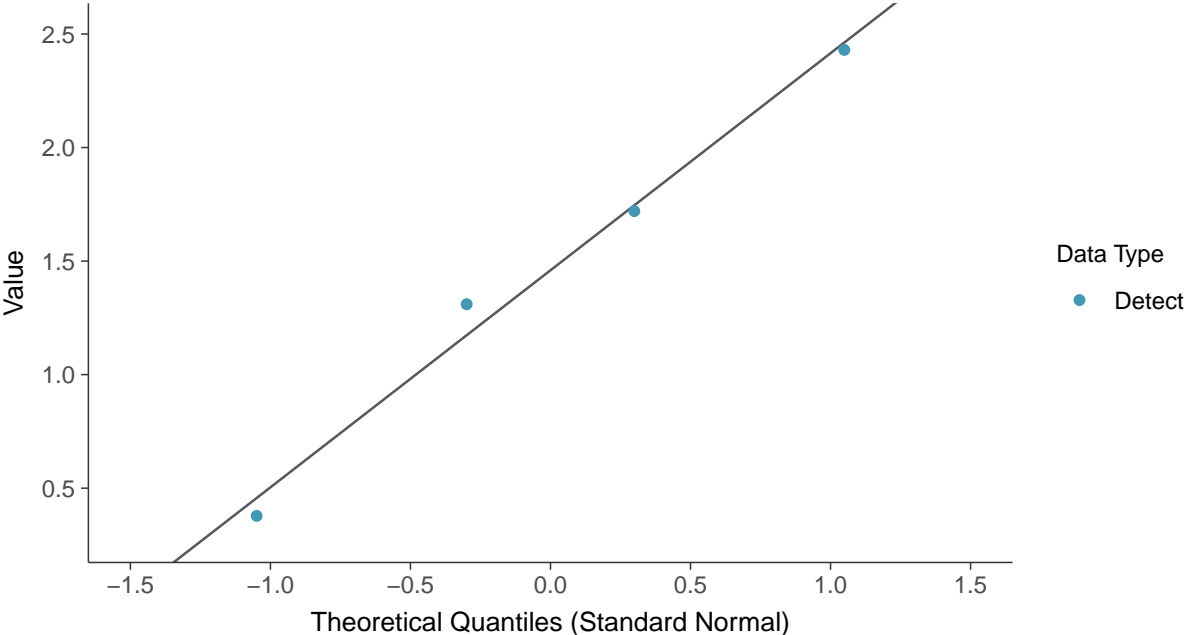
Radium-226/228, MW-7B (pCi/L)





**Normal Q-Q plot**

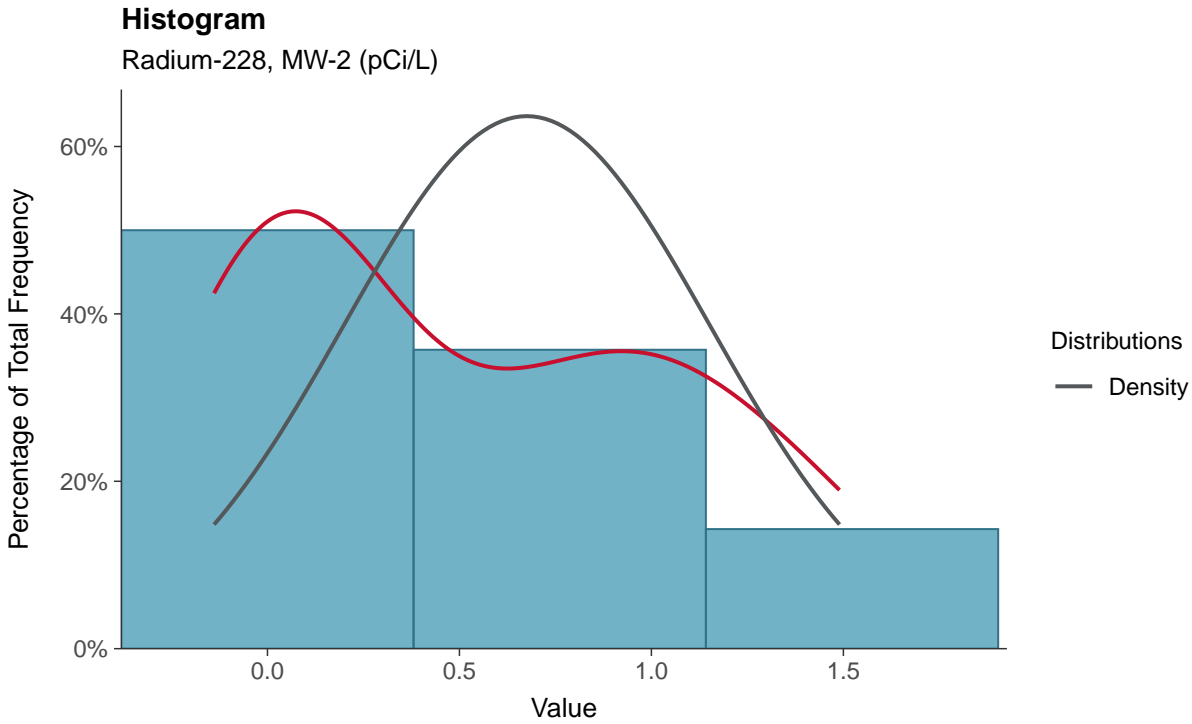
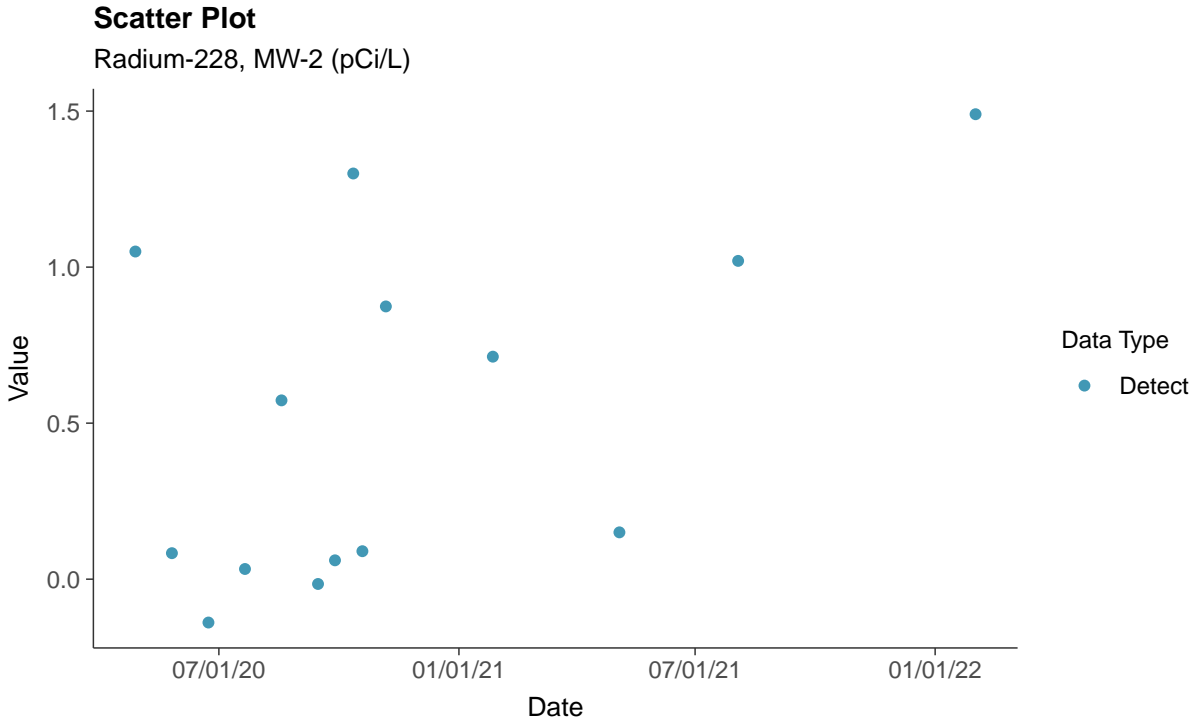
Radium-226/228, MW-7B (pCi/L)





### Appendix IV: Radium-228, MW-2

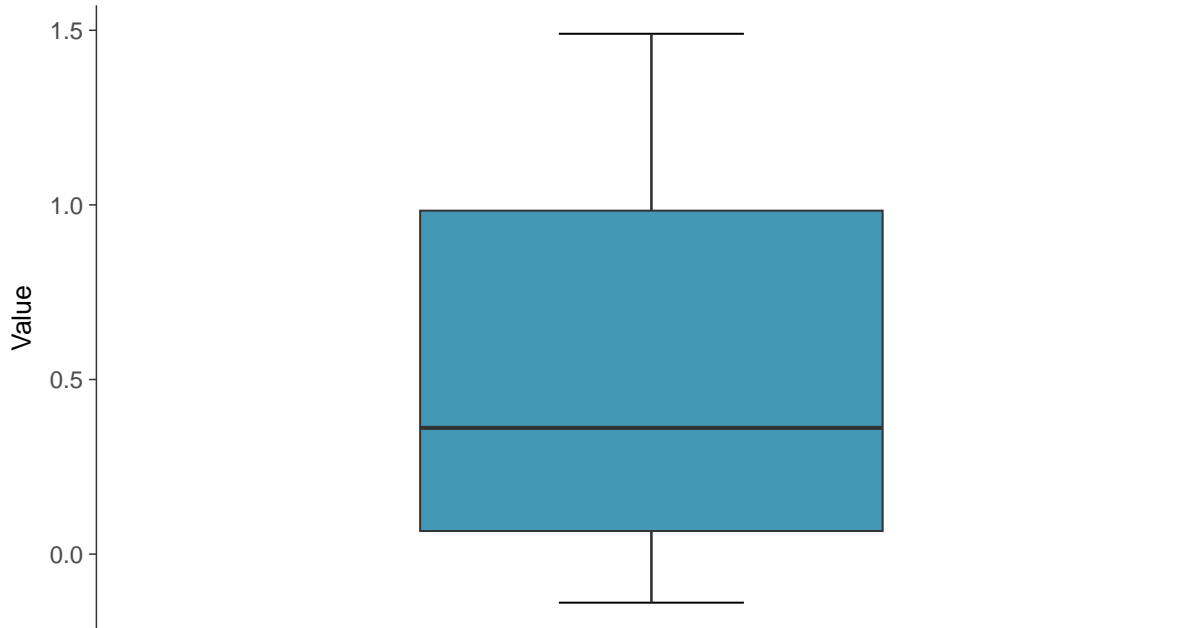
ID: 2\_25\_02





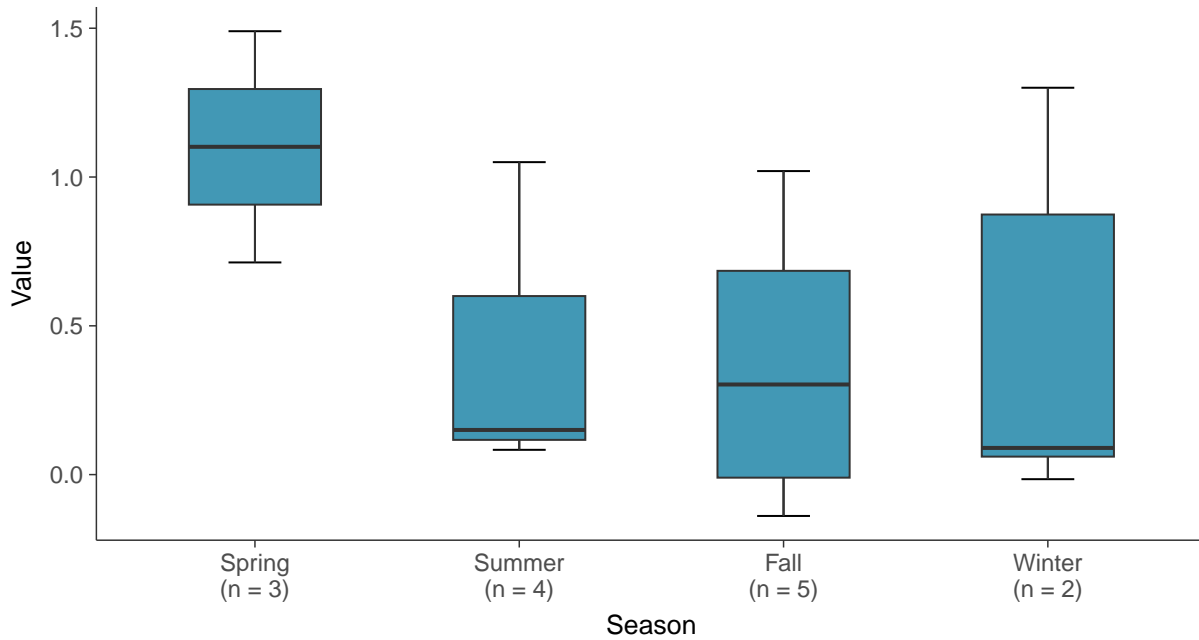
### Boxplot

Radium-228, MW-2 (pCi/L)



### Boxplot by Season

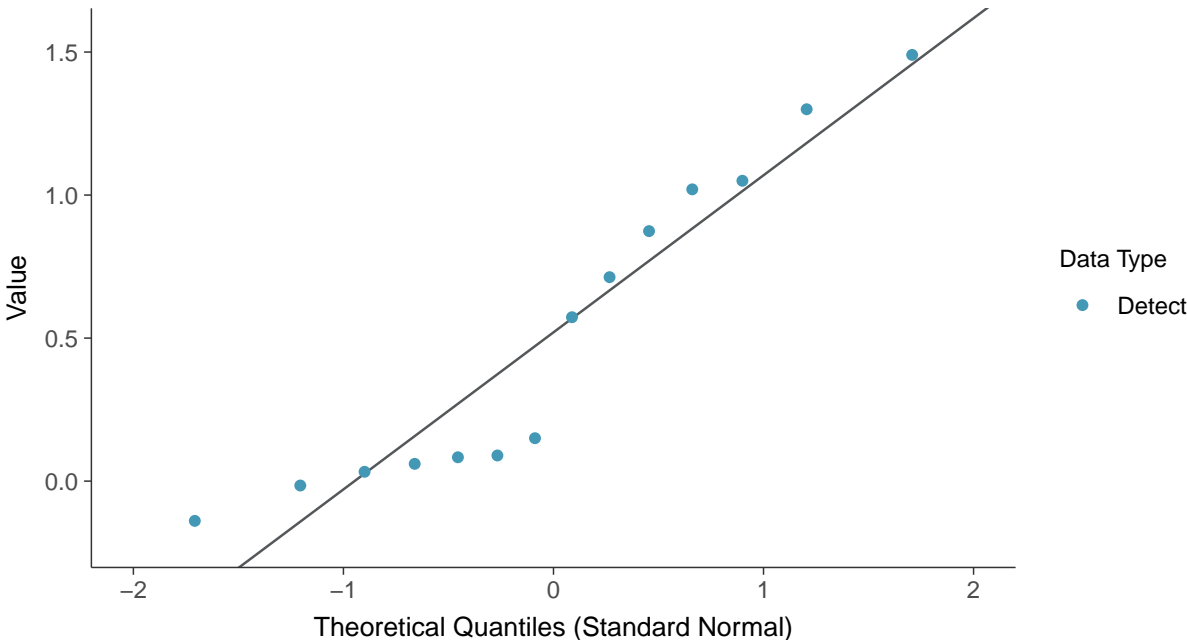
Radium-228, MW-2 (pCi/L)





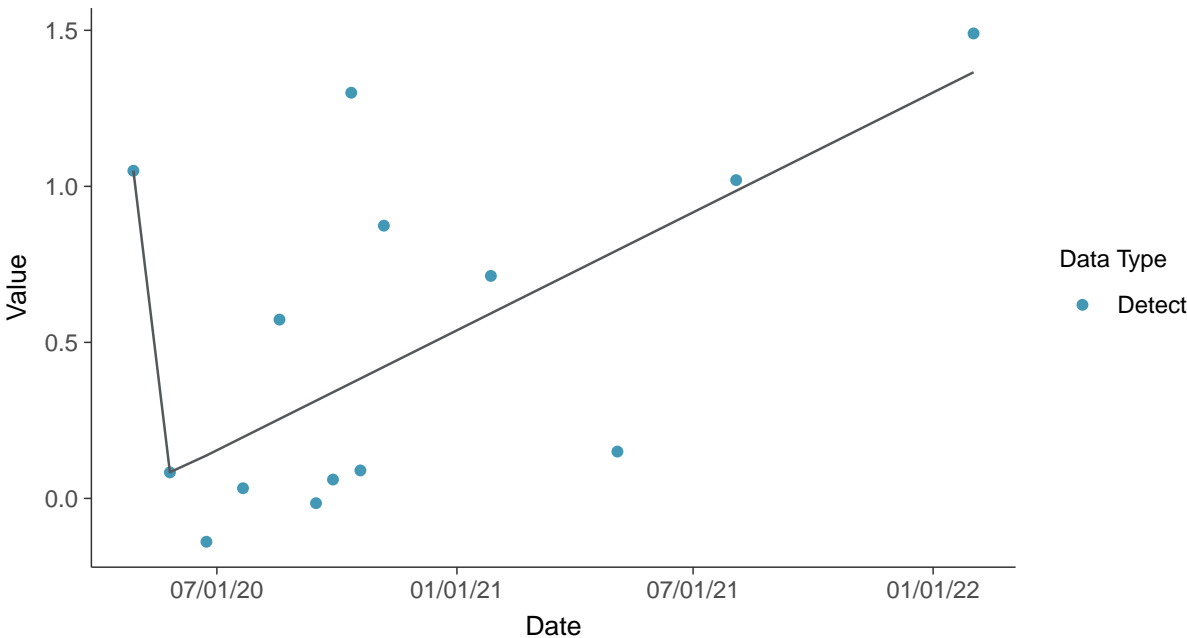
**Normal Q-Q plot**

Radium-228, MW-2 (pCi/L)



**Trend Regression: Piecewise Linear-Linear**

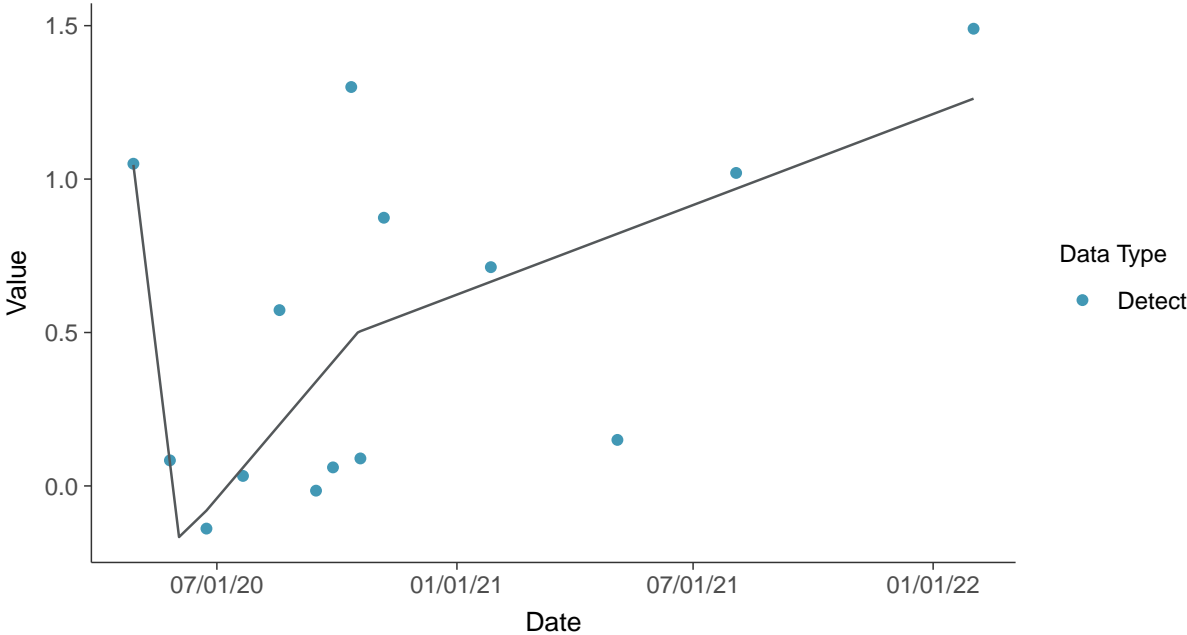
Radium-228, MW-2 (pCi/L)





**Trend Regression: Piecewise Linear-Linear-Linear**

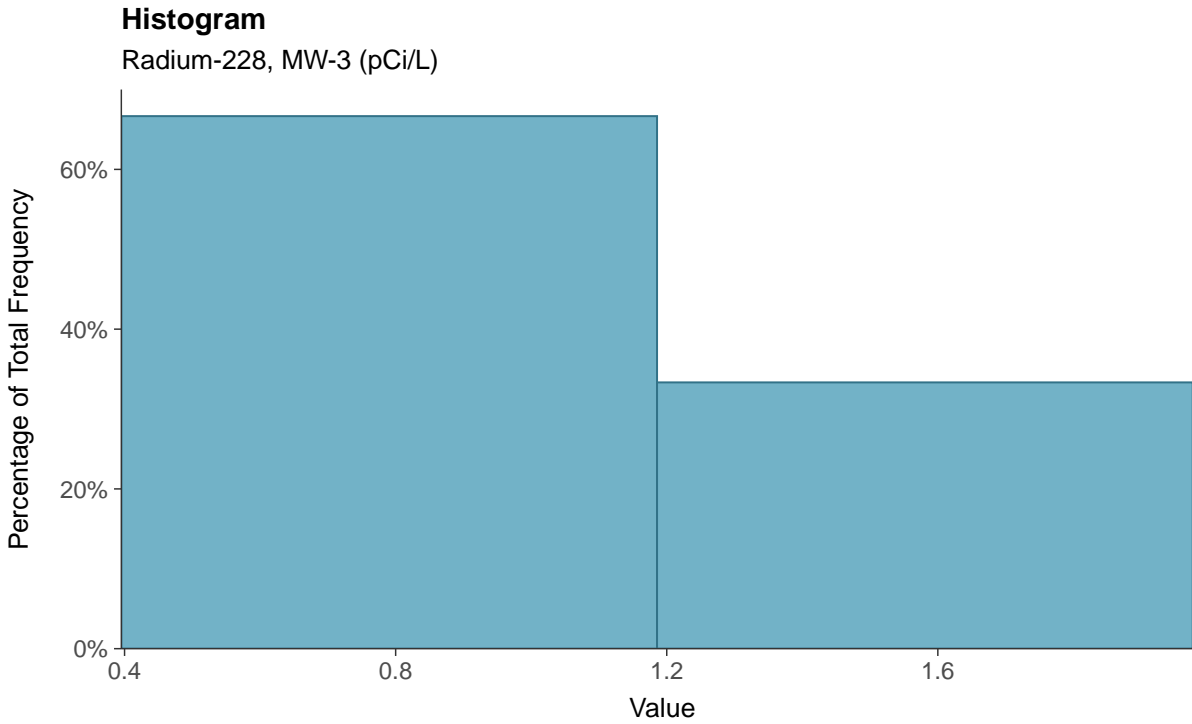
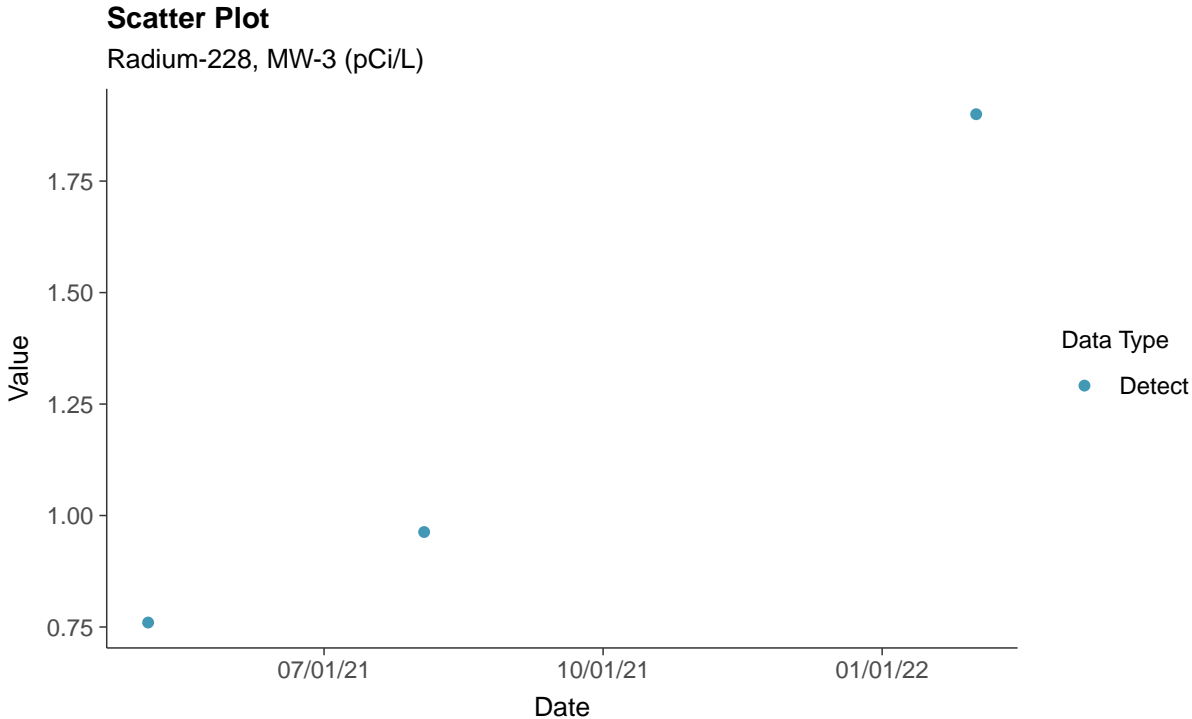
Radium-228, MW-2 (pCi/L)





### Appendix IV: Radium-228, MW-3

ID: 2\_25\_03

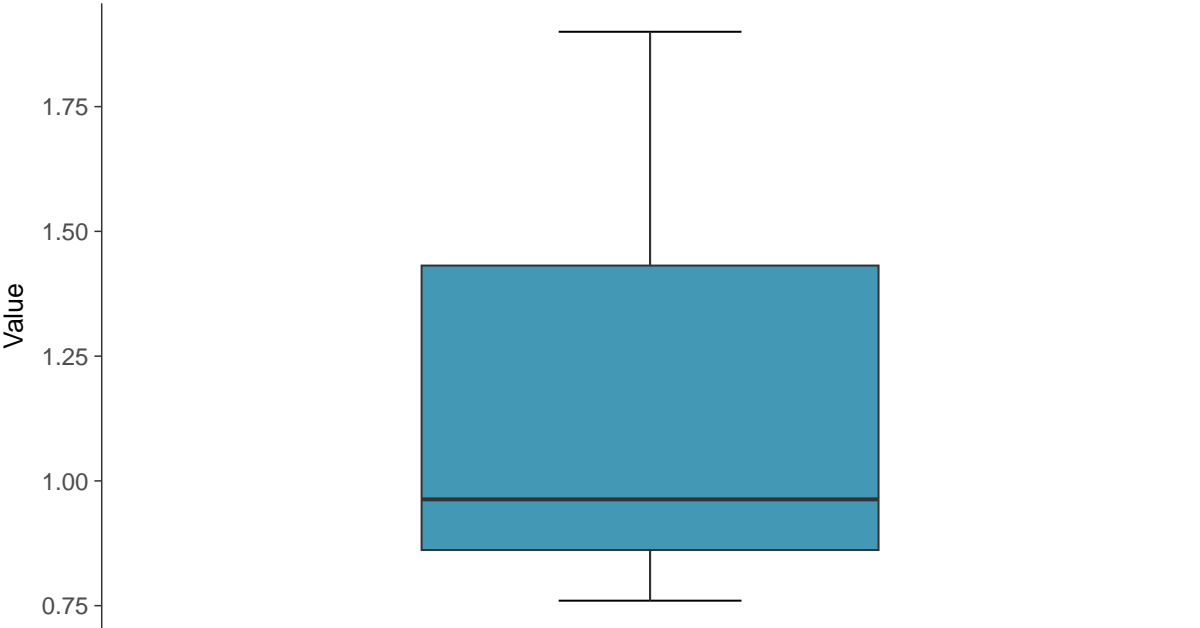






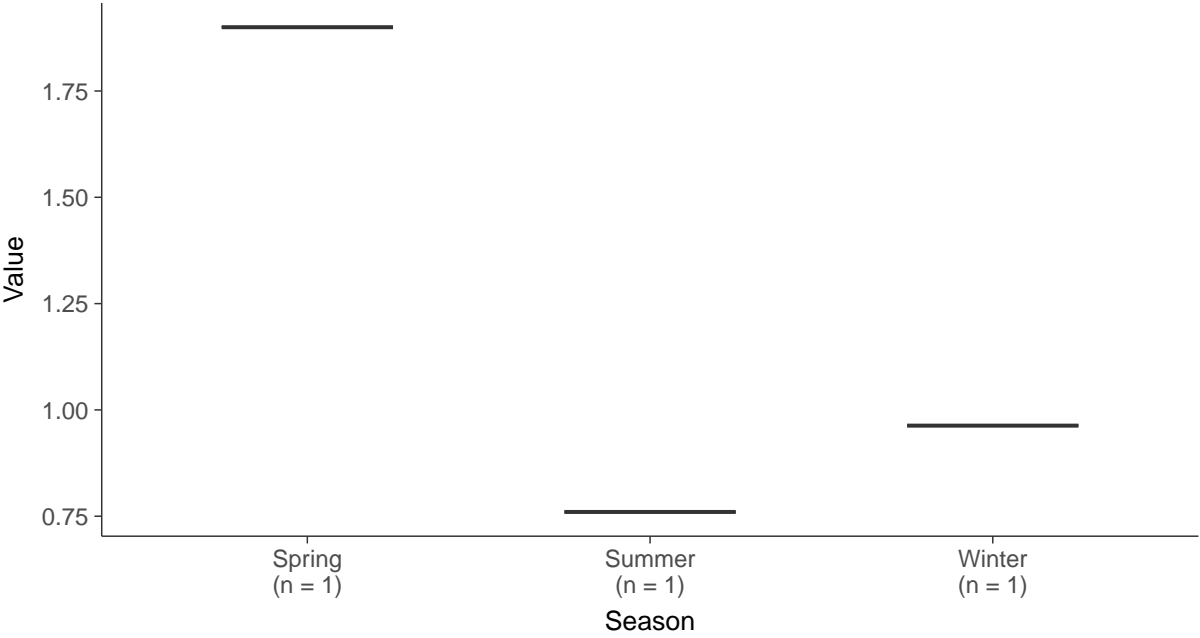
**Boxplot**

Radium-228, MW-3 (pCi/L)



**Boxplot by Season**

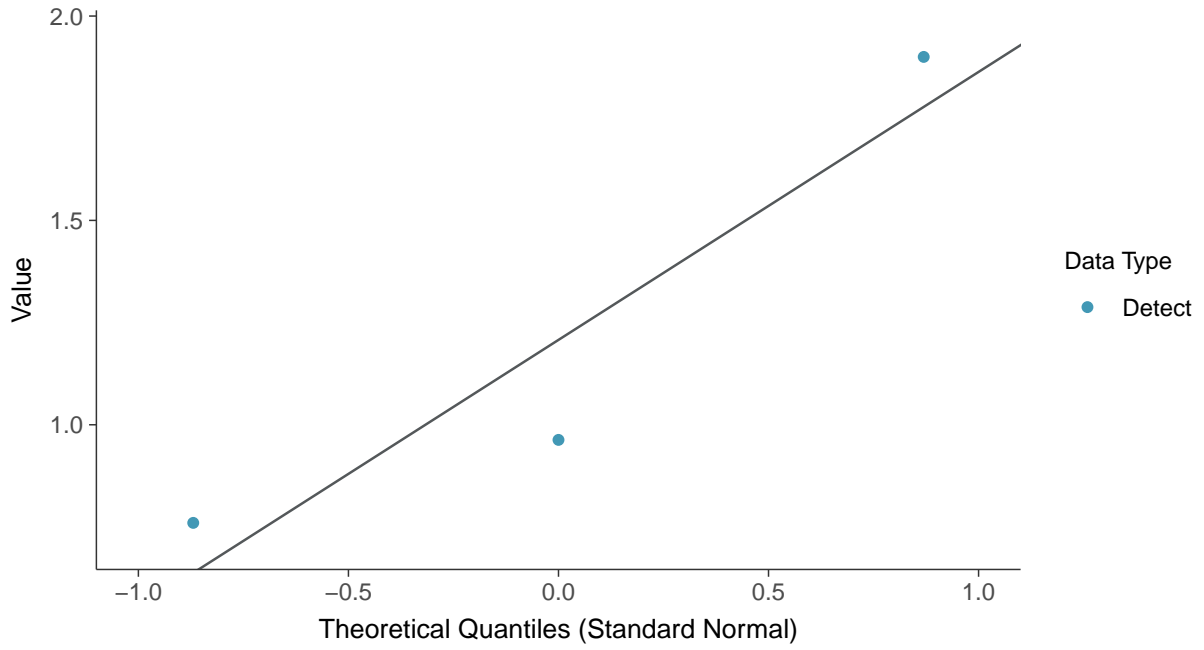
Radium-228, MW-3 (pCi/L)





### Normal Q-Q plot

Radium-228, MW-3 (pCi/L)



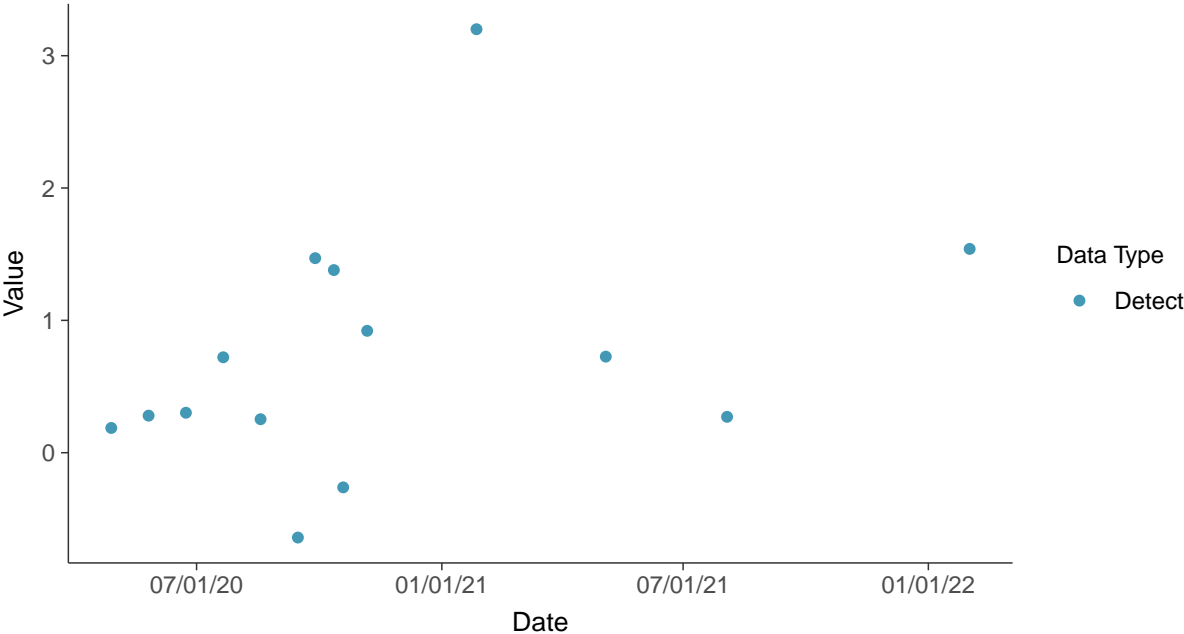


### Appendix IV: Radium-228, MW-5

ID: 2\_25\_05

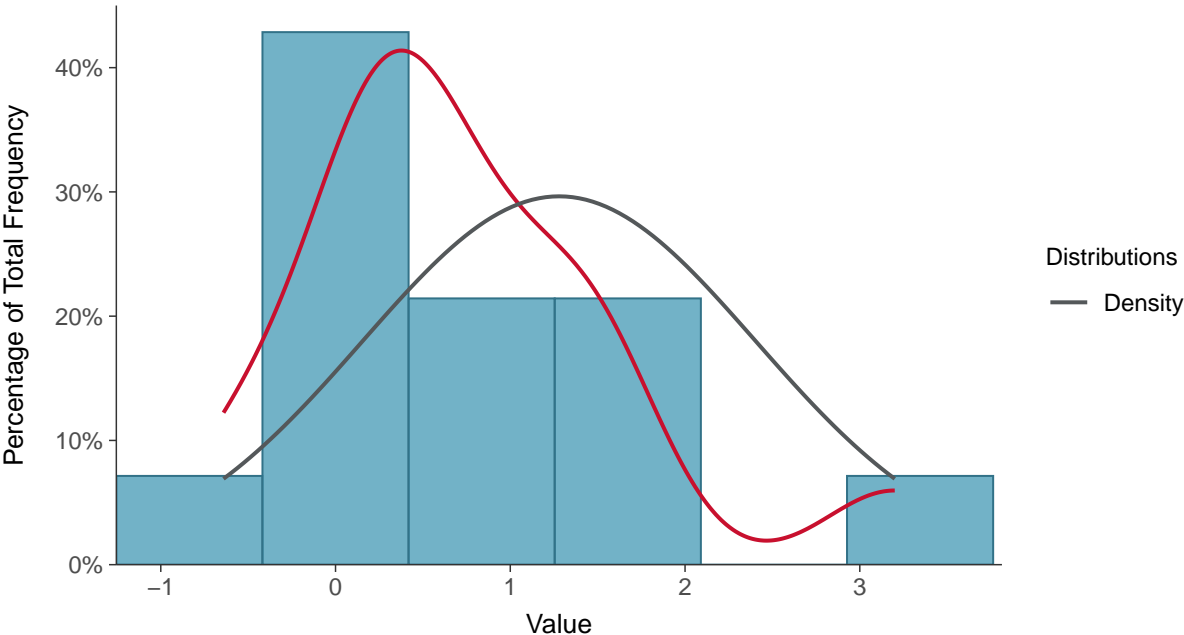
#### Scatter Plot

Radium-228, MW-5 (pCi/L)



#### Histogram

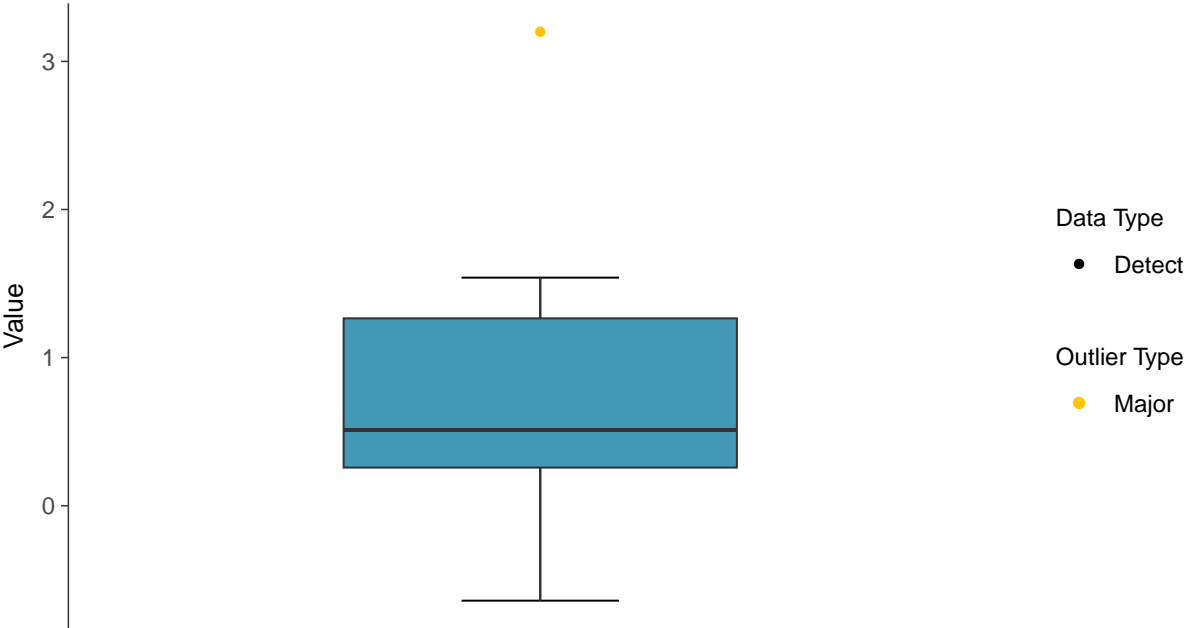
Radium-228, MW-5 (pCi/L)





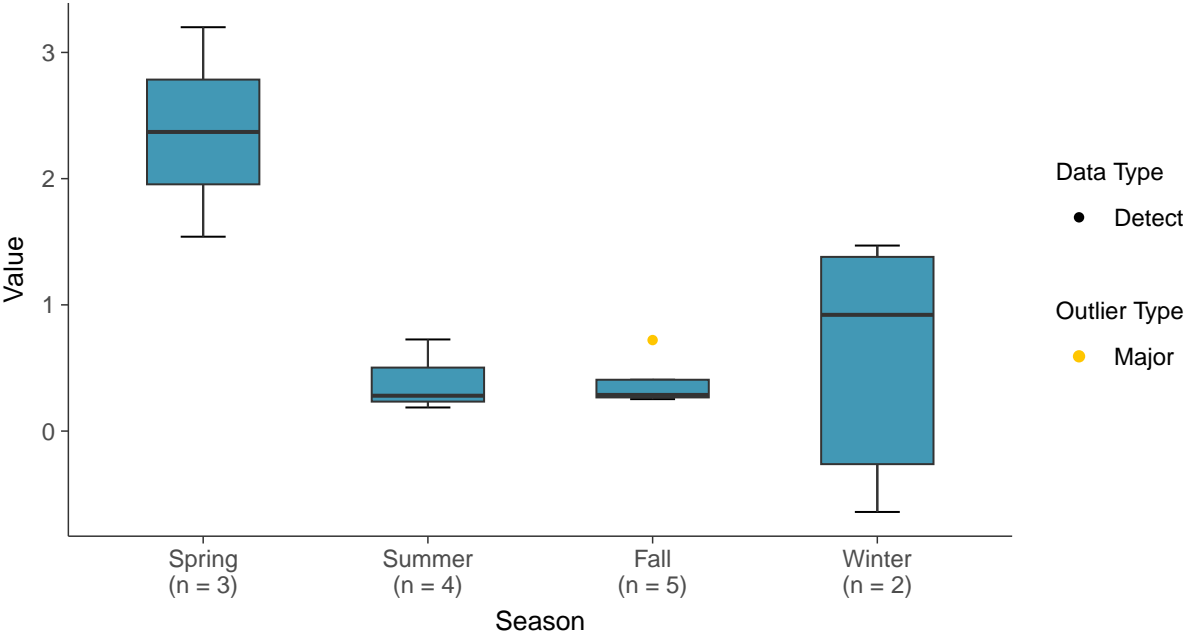
**Boxplot**

Radium-228, MW-5 (pCi/L)



**Boxplot by Season**

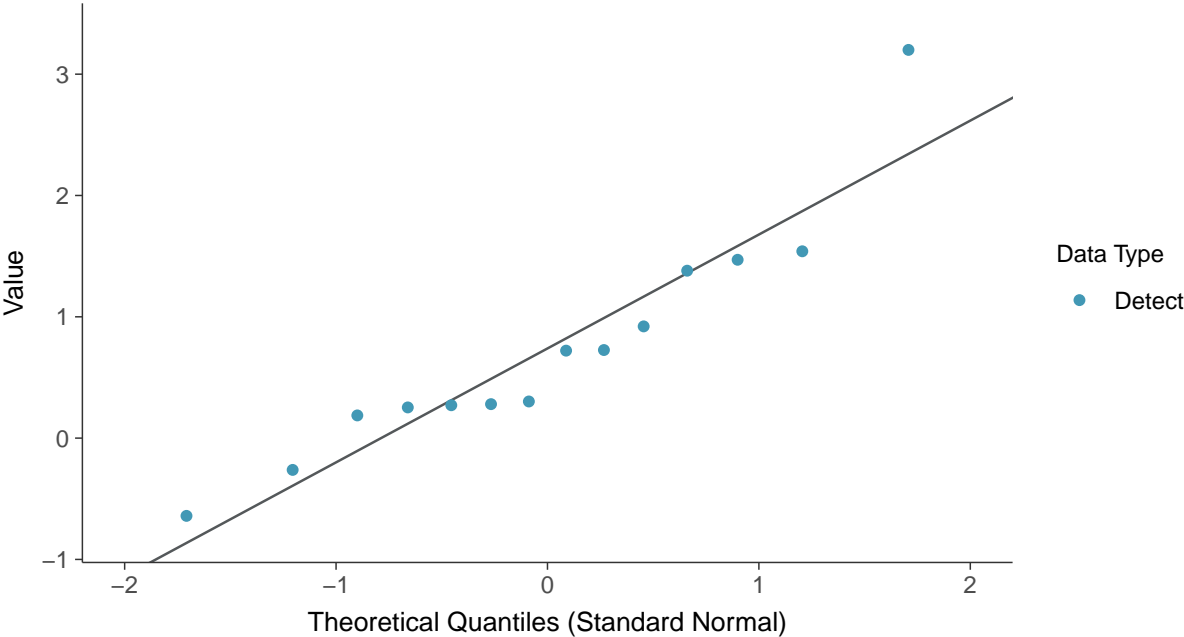
Radium-228, MW-5 (pCi/L)





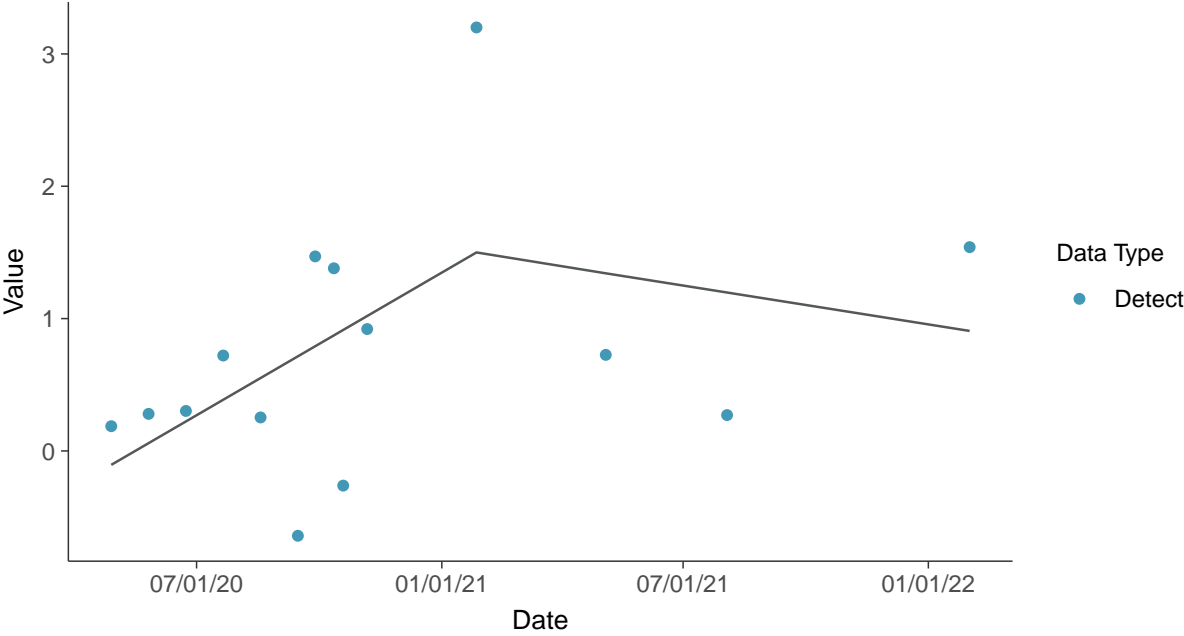
### Normal Q-Q plot

Radium-228, MW-5 (pCi/L)



### Trend Regression: Piecewise Linear-Linear

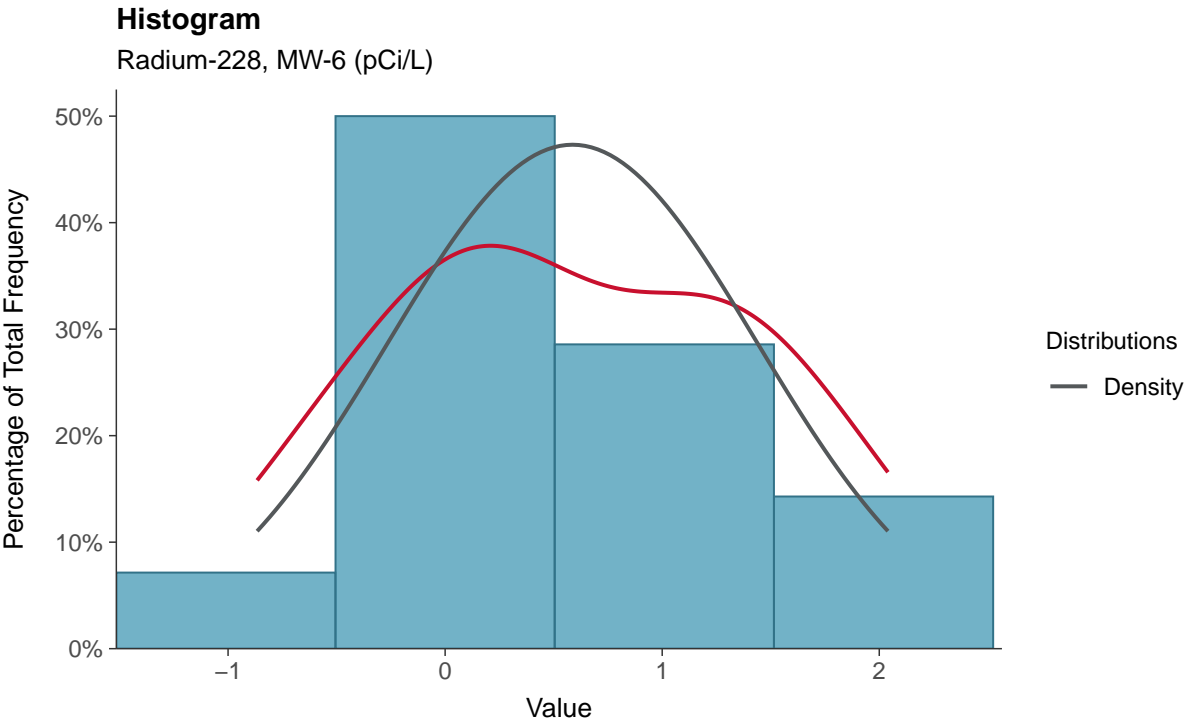
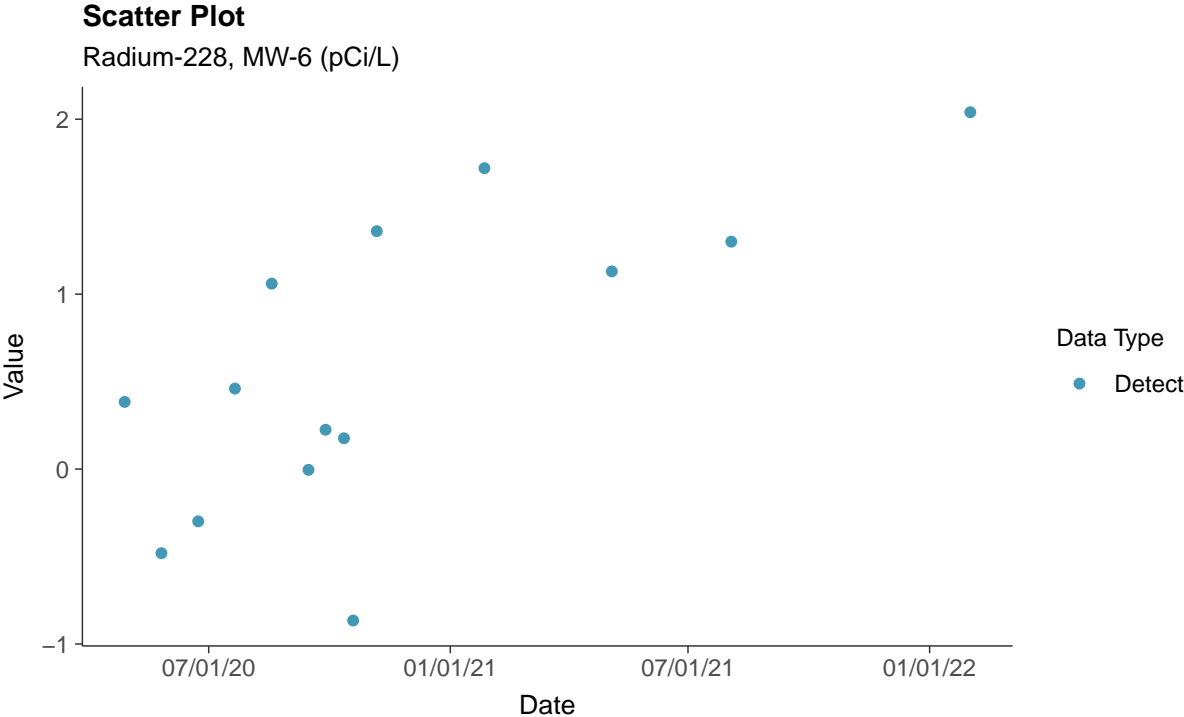
Radium-228, MW-5 (pCi/L)





### Appendix IV: Radium-228, MW-6

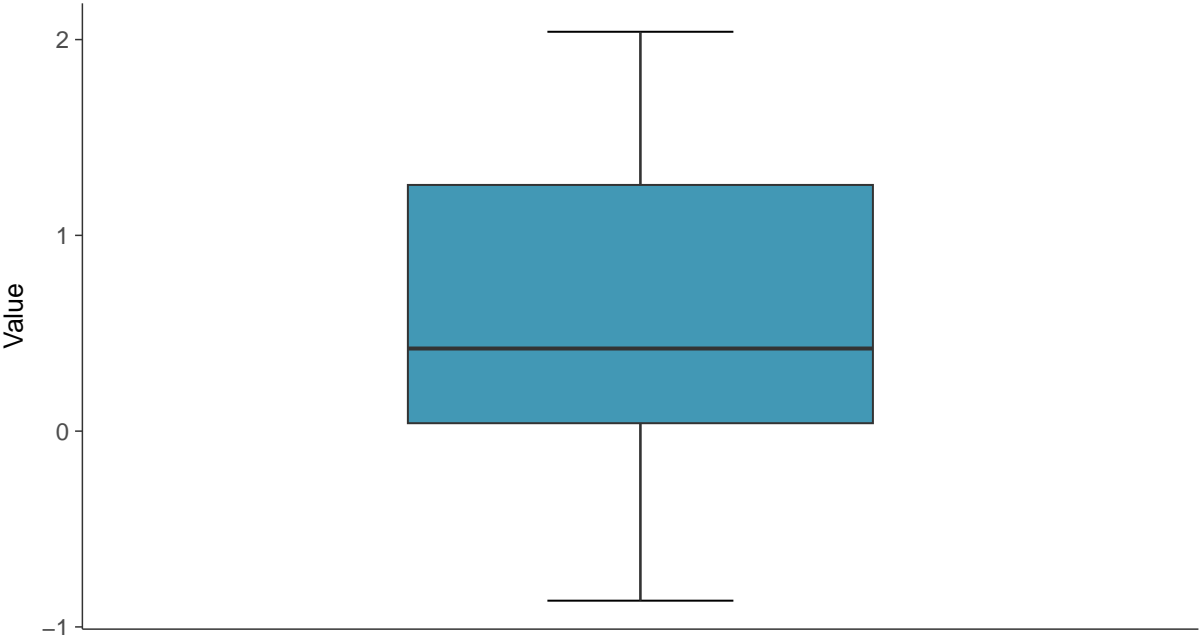
ID: 2\_25\_06





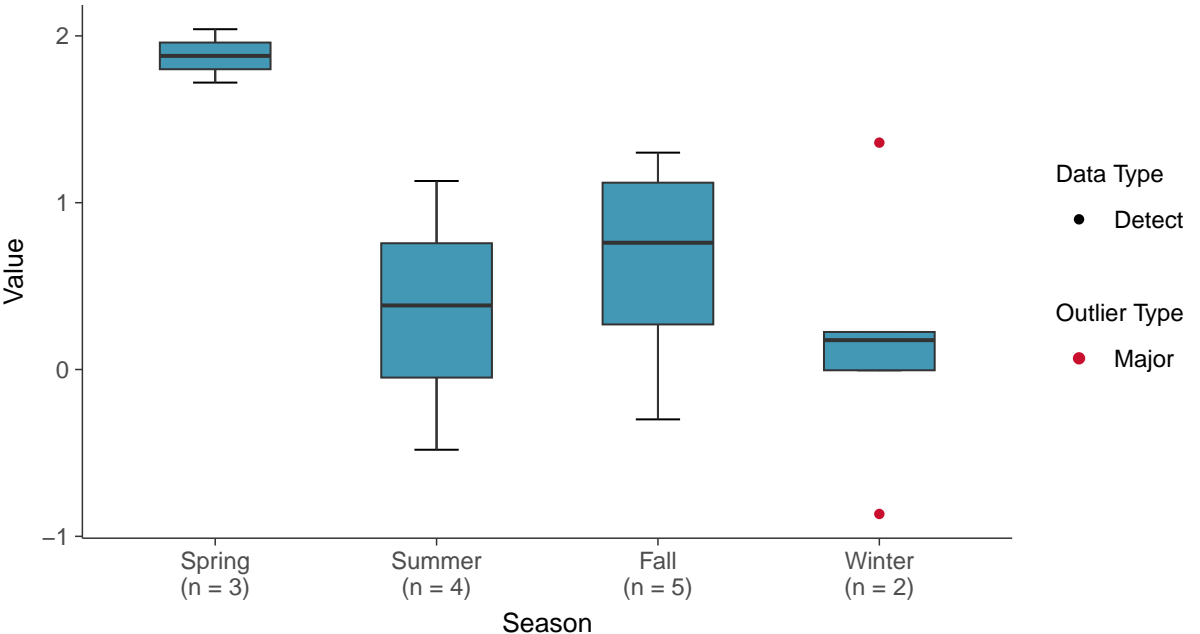
**Boxplot**

Radium-228, MW-6 (pCi/L)



**Boxplot by Season**

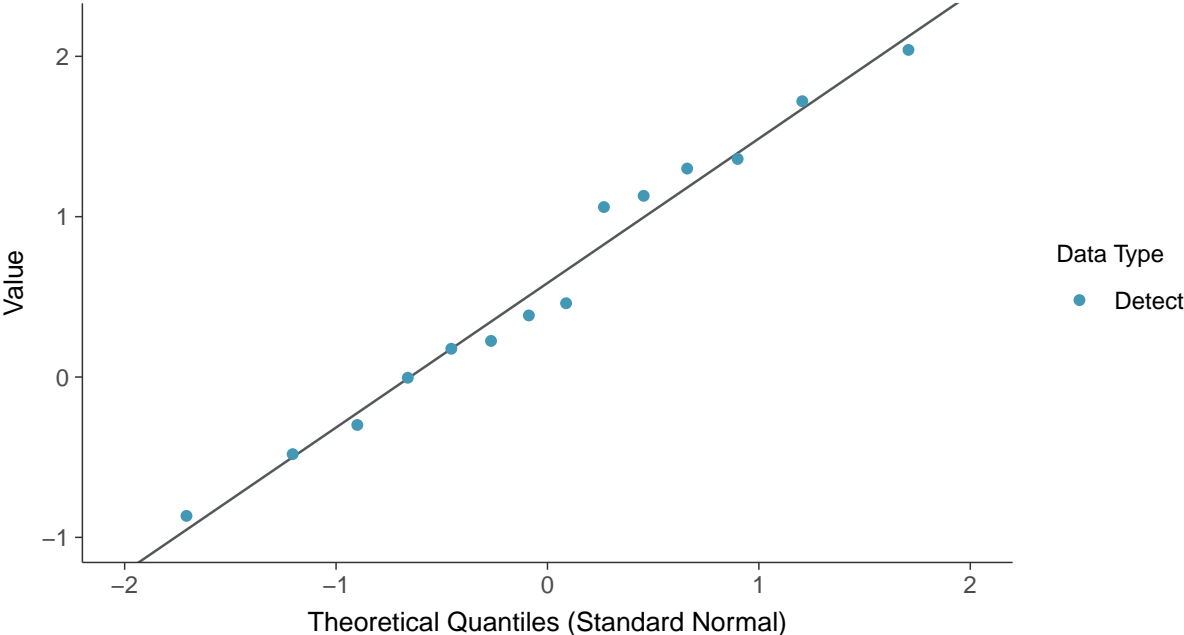
Radium-228, MW-6 (pCi/L)





**Normal Q-Q plot**

Radium-228, MW-6 (pCi/L)





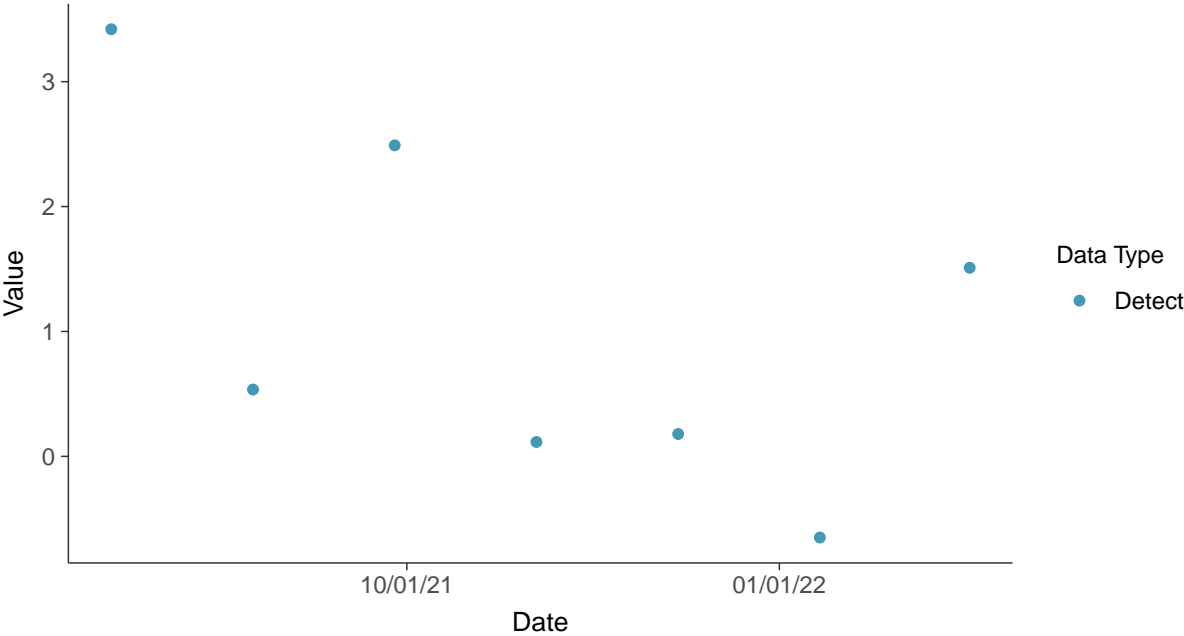


### Appendix IV: Radium-228, MW-7

ID: 2\_25\_07

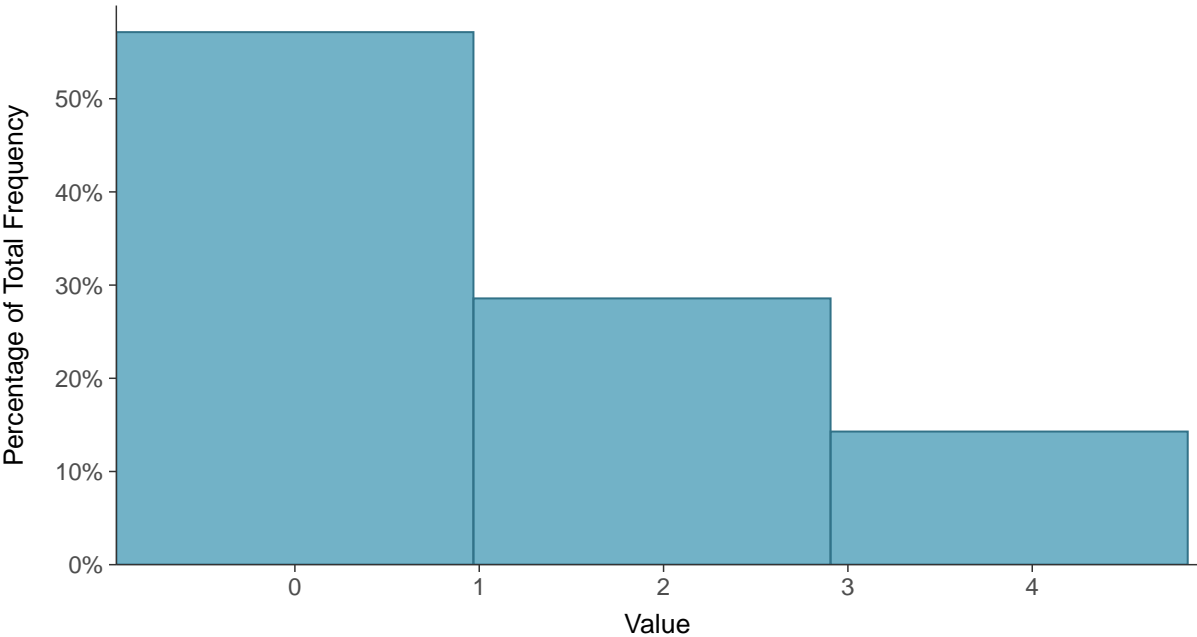
#### Scatter Plot

Radium-228, MW-7 (pCi/L)



#### Histogram

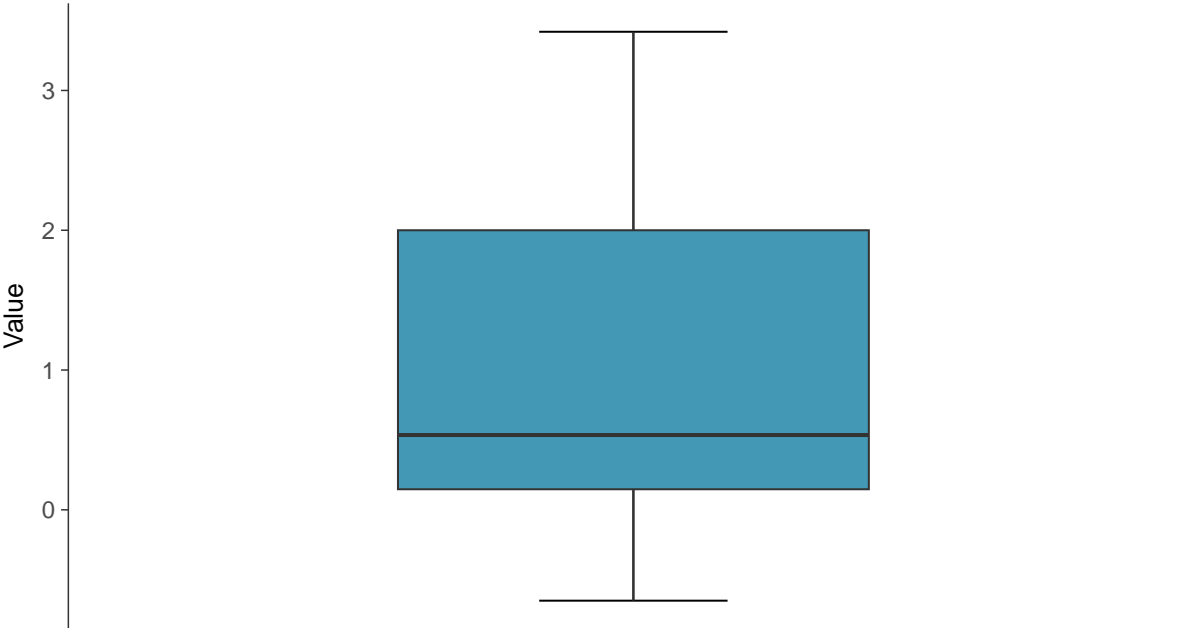
Radium-228, MW-7 (pCi/L)





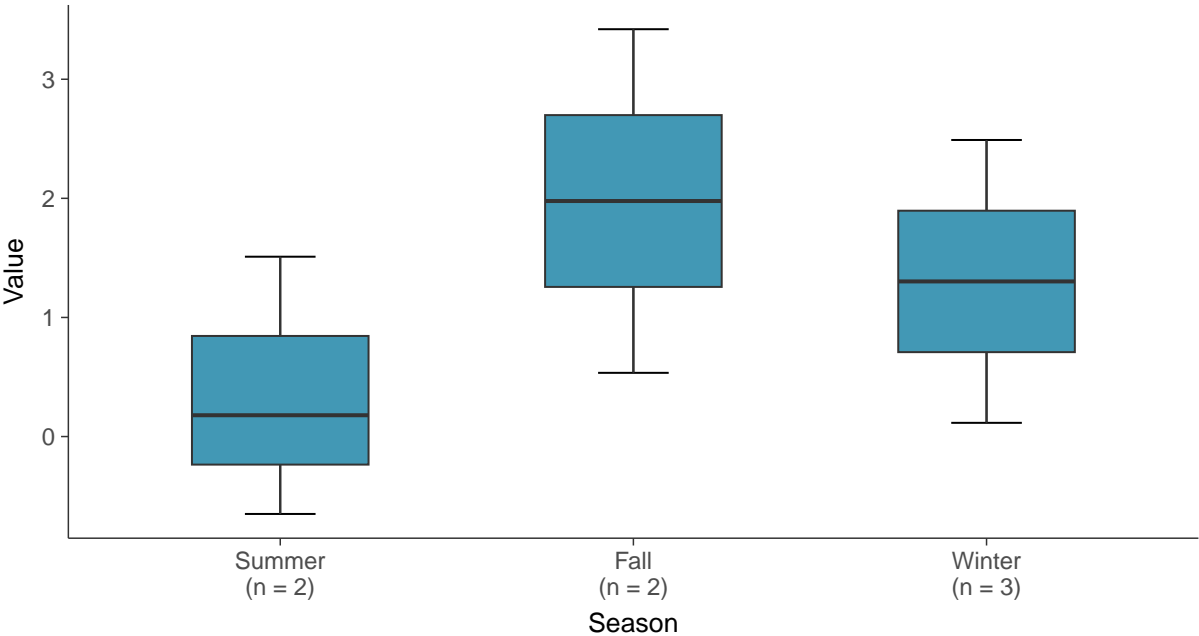
**Boxplot**

Radium-228, MW-7 (pCi/L)



**Boxplot by Season**

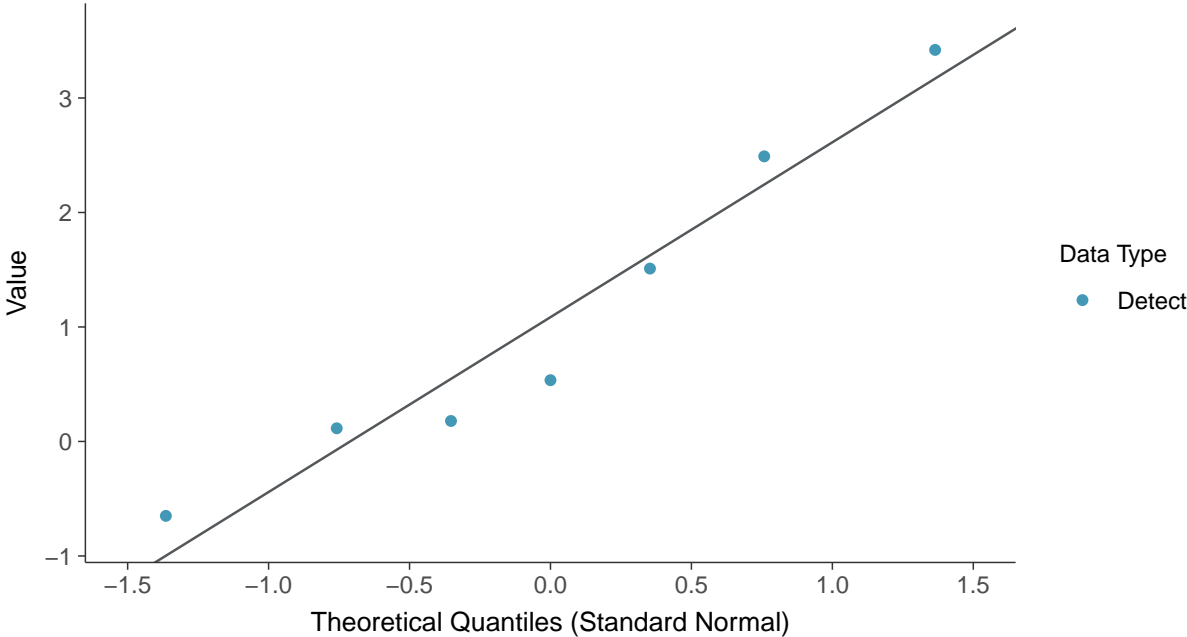
Radium-228, MW-7 (pCi/L)





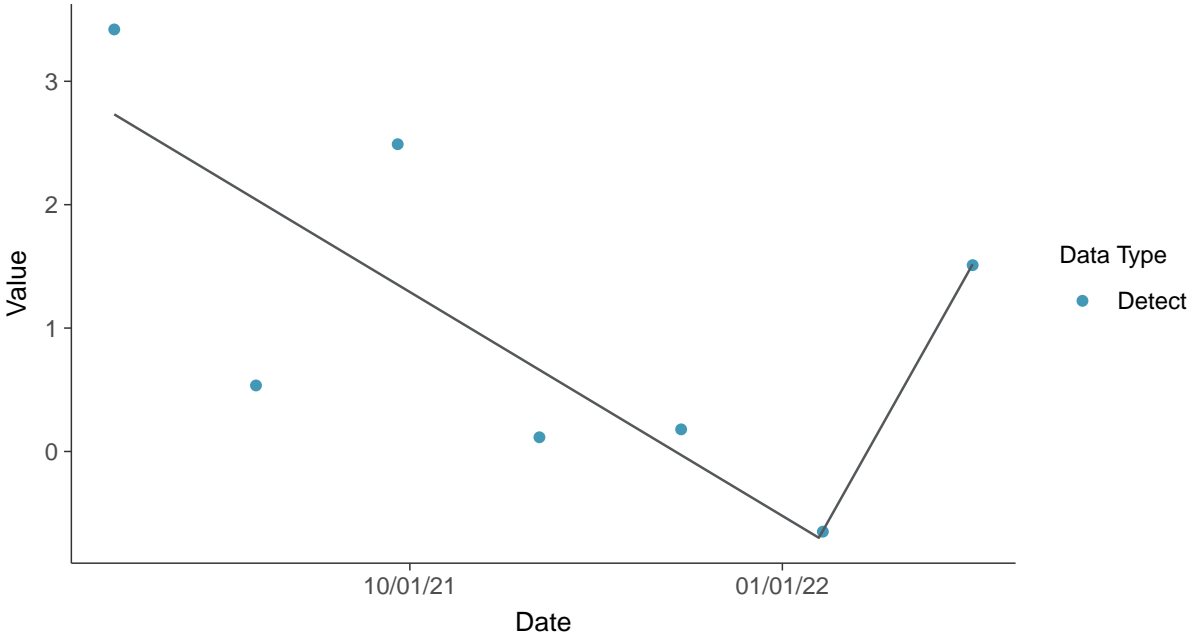
**Normal Q-Q plot**

Radium-228, MW-7 (pCi/L)



**Trend Regression: Piecewise Linear-Linear**

Radium-228, MW-7 (pCi/L)



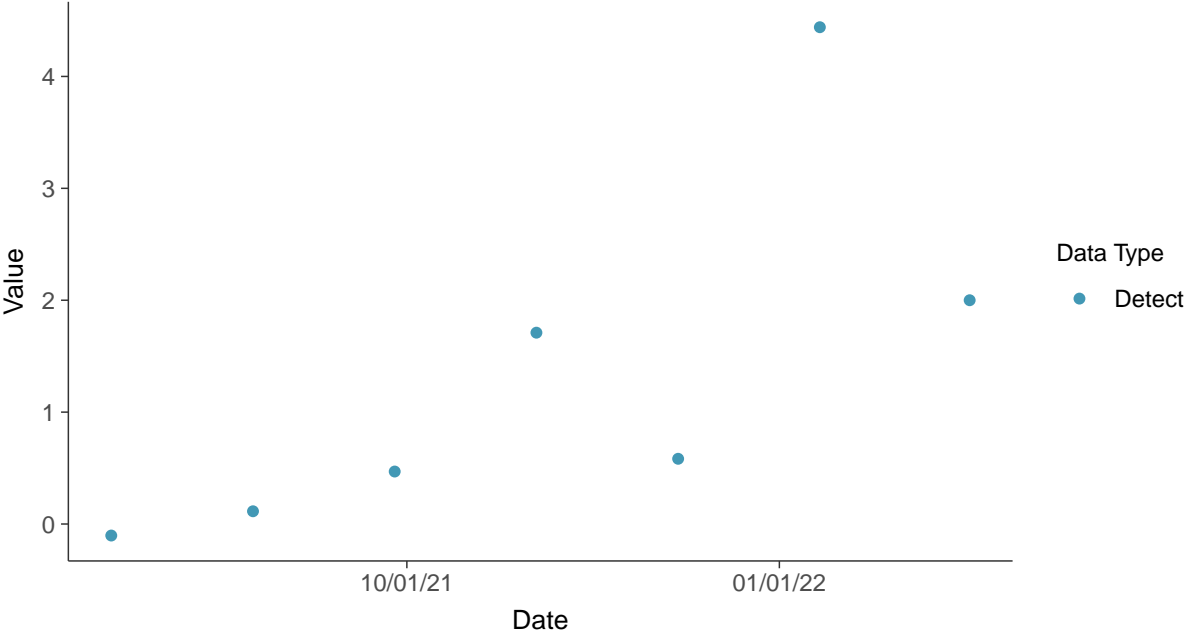


### Appendix IV: Radium-228, MW-8

ID: 2\_25\_08

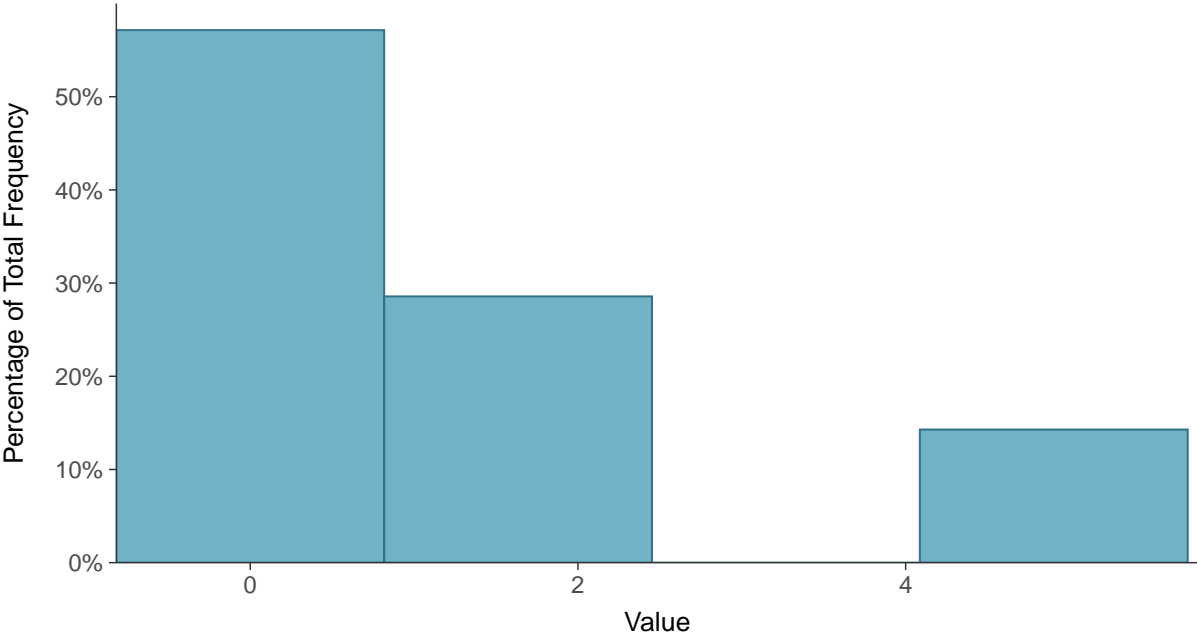
#### Scatter Plot

Radium-228, MW-8 (pCi/L)



#### Histogram

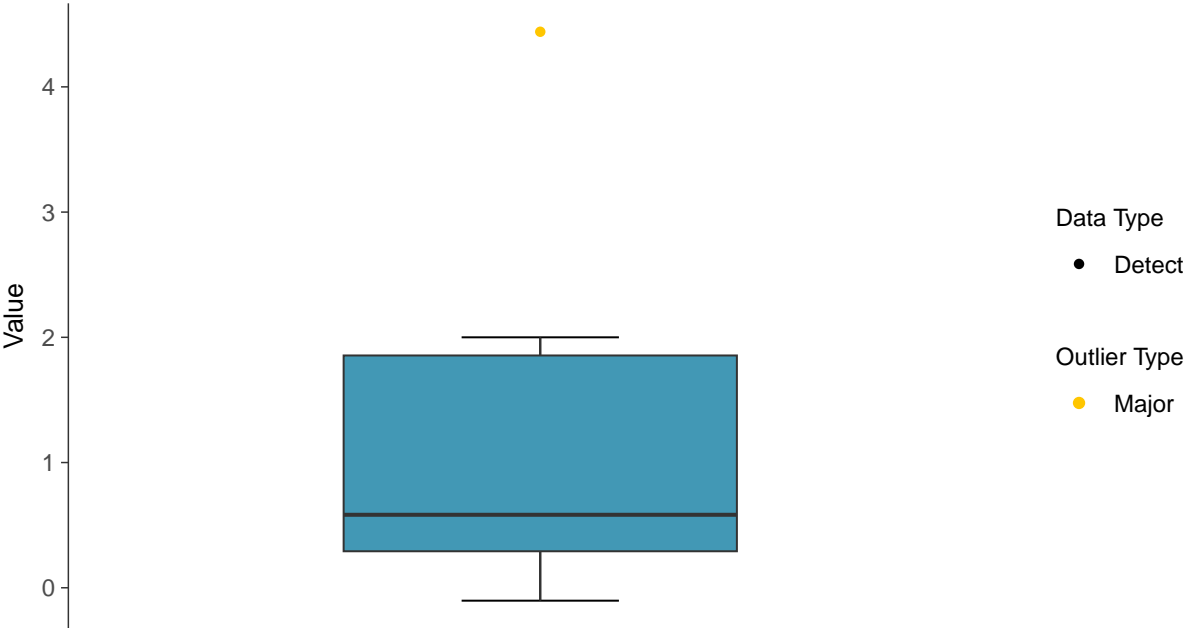
Radium-228, MW-8 (pCi/L)





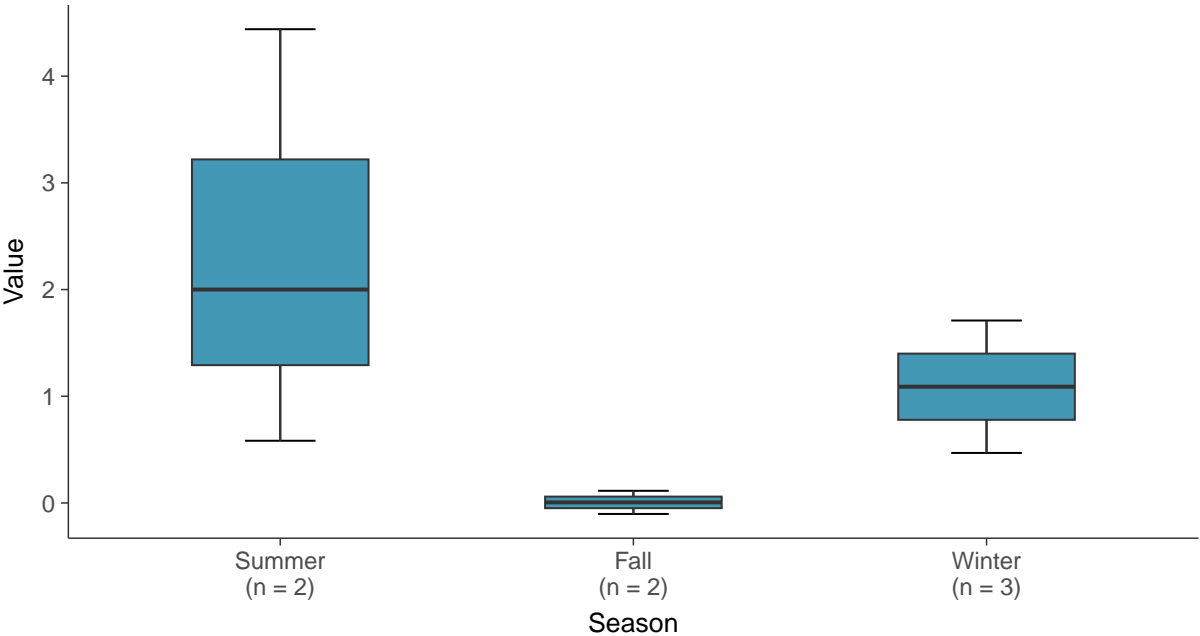
**Boxplot**

Radium-228, MW-8 (pCi/L)



**Boxplot by Season**

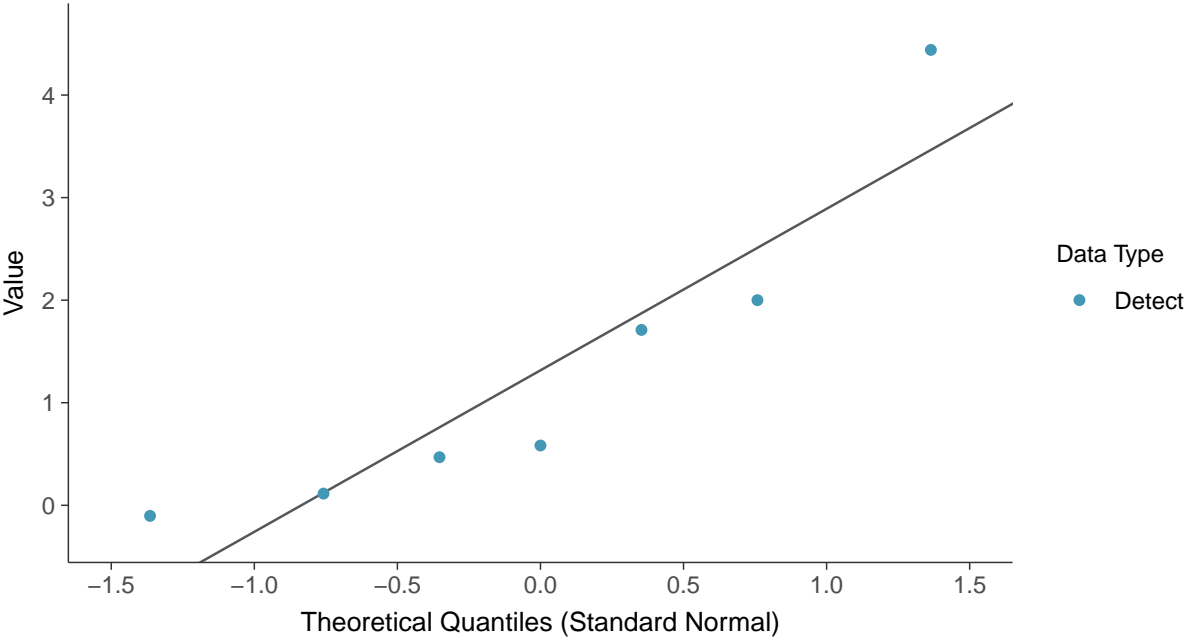
Radium-228, MW-8 (pCi/L)





**Normal Q-Q plot**

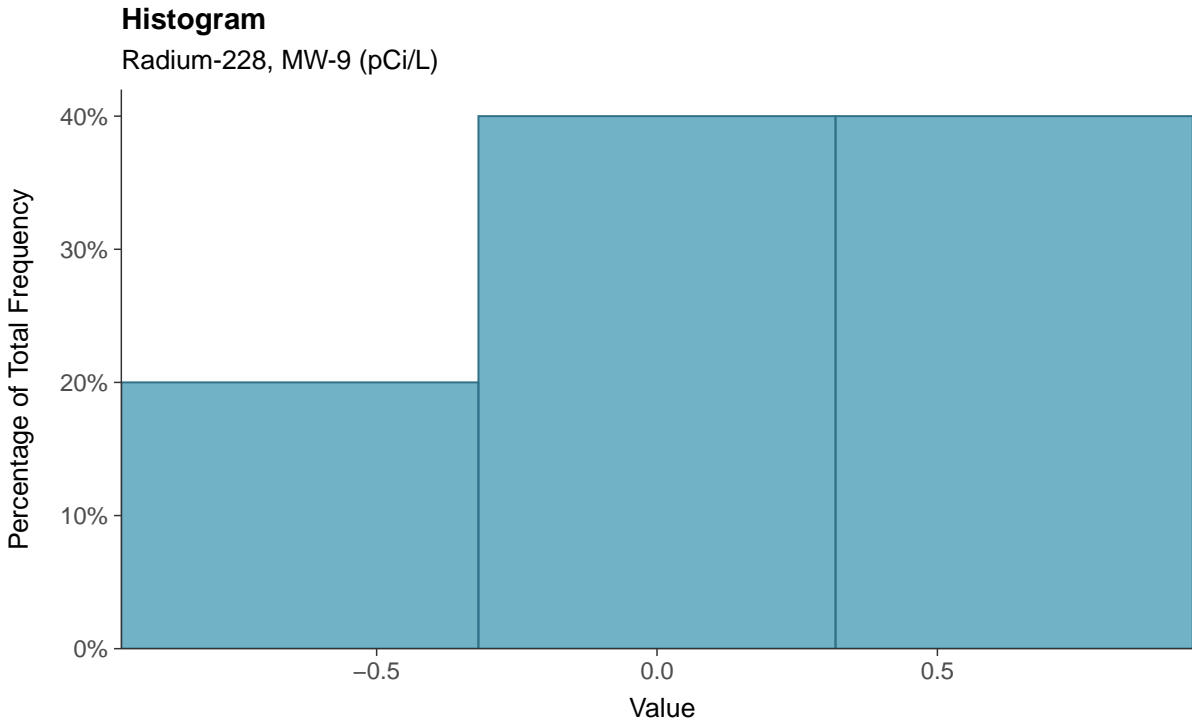
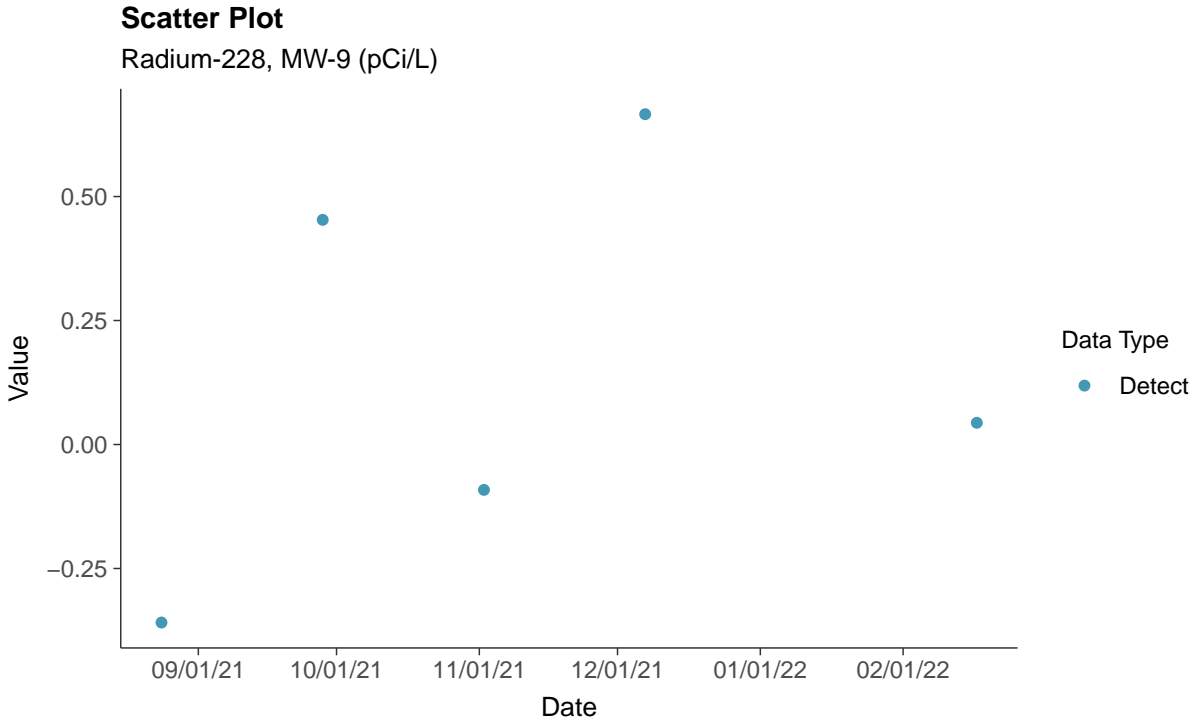
Radium-228, MW-8 (pCi/L)





### Appendix IV: Radium-228, MW-9

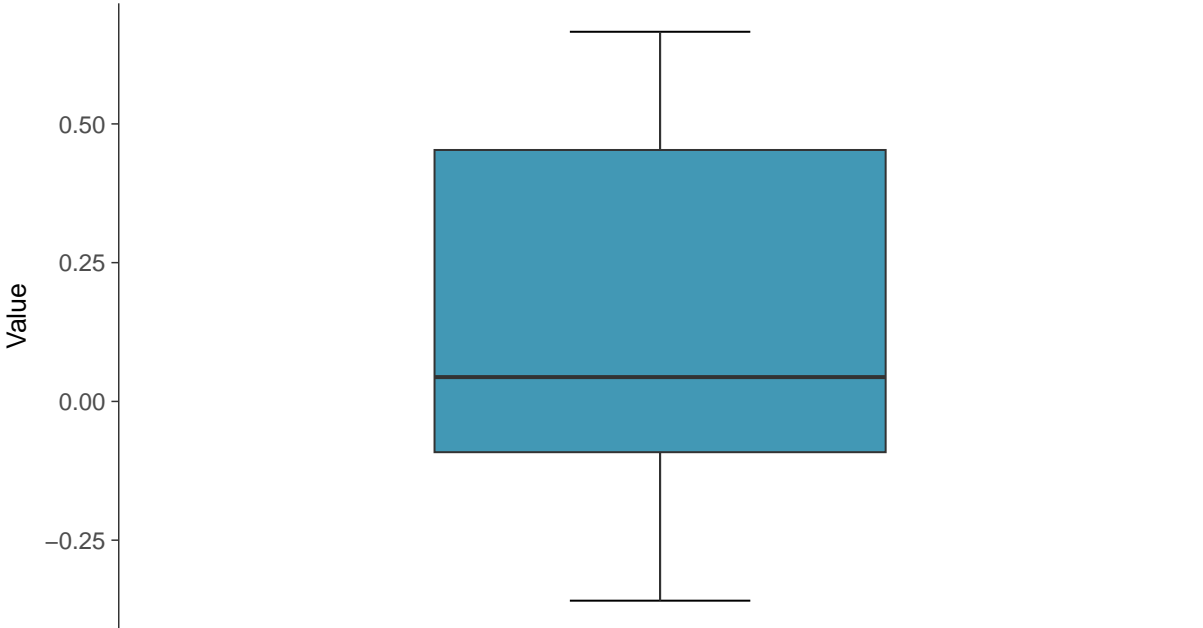
ID: 2\_25\_09





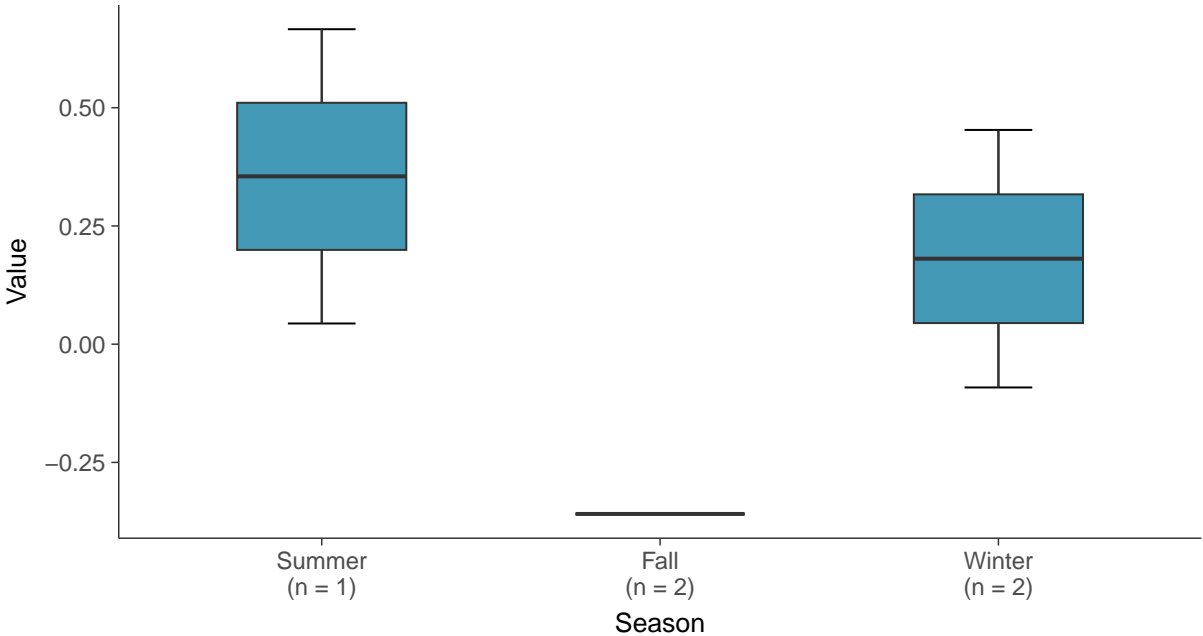
**Boxplot**

Radium-228, MW-9 (pCi/L)



**Boxplot by Season**

Radium-228, MW-9 (pCi/L)

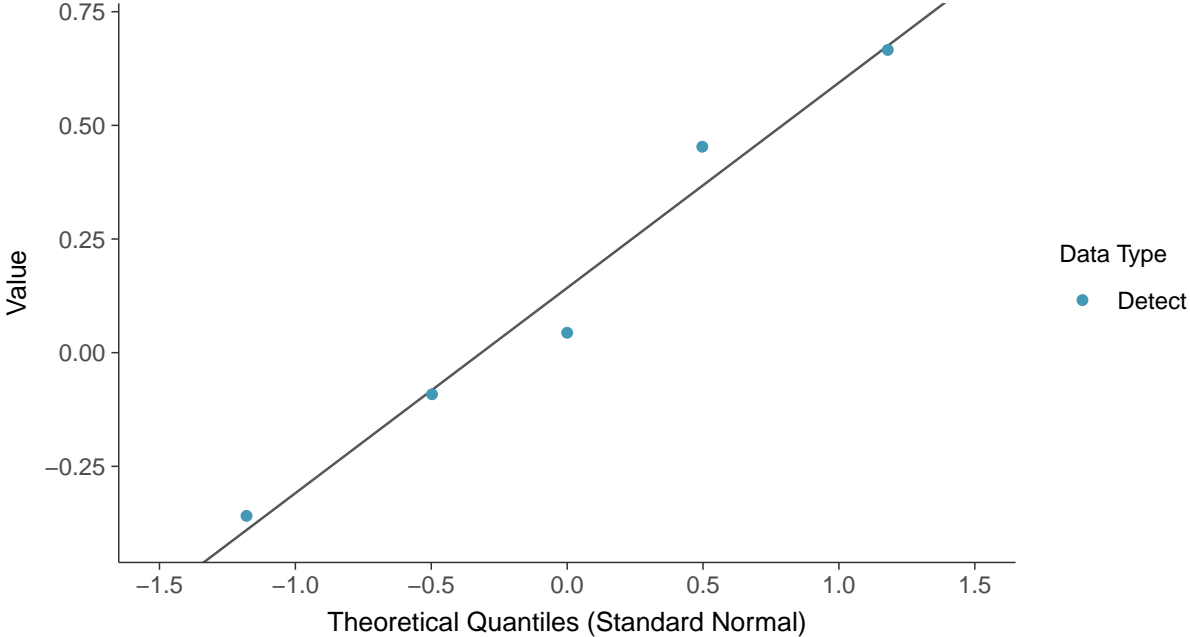






**Normal Q-Q plot**

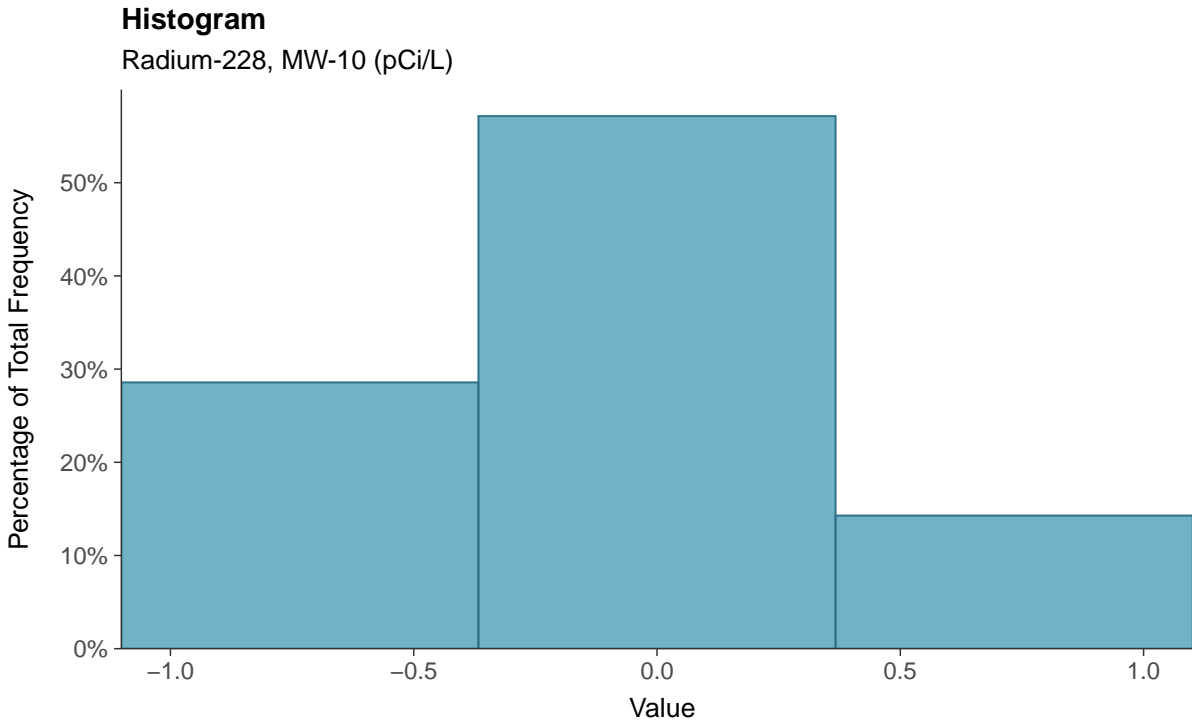
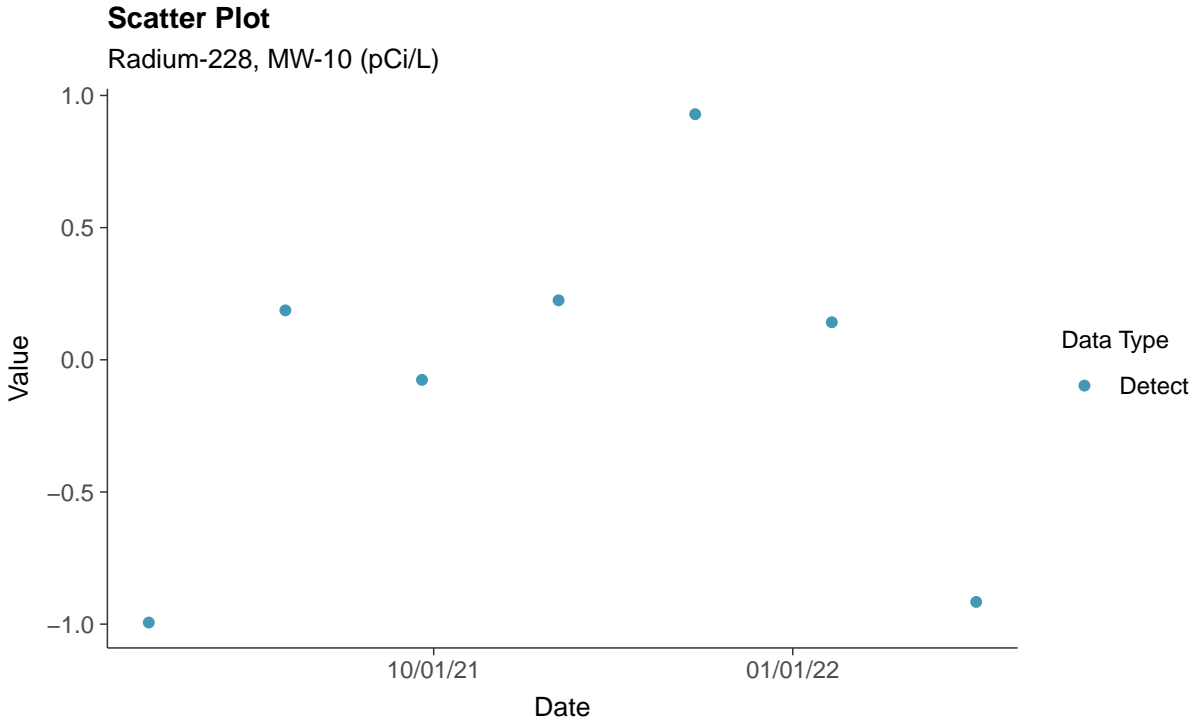
Radium-228, MW-9 (pCi/L)





### Appendix IV: Radium-228, MW-10

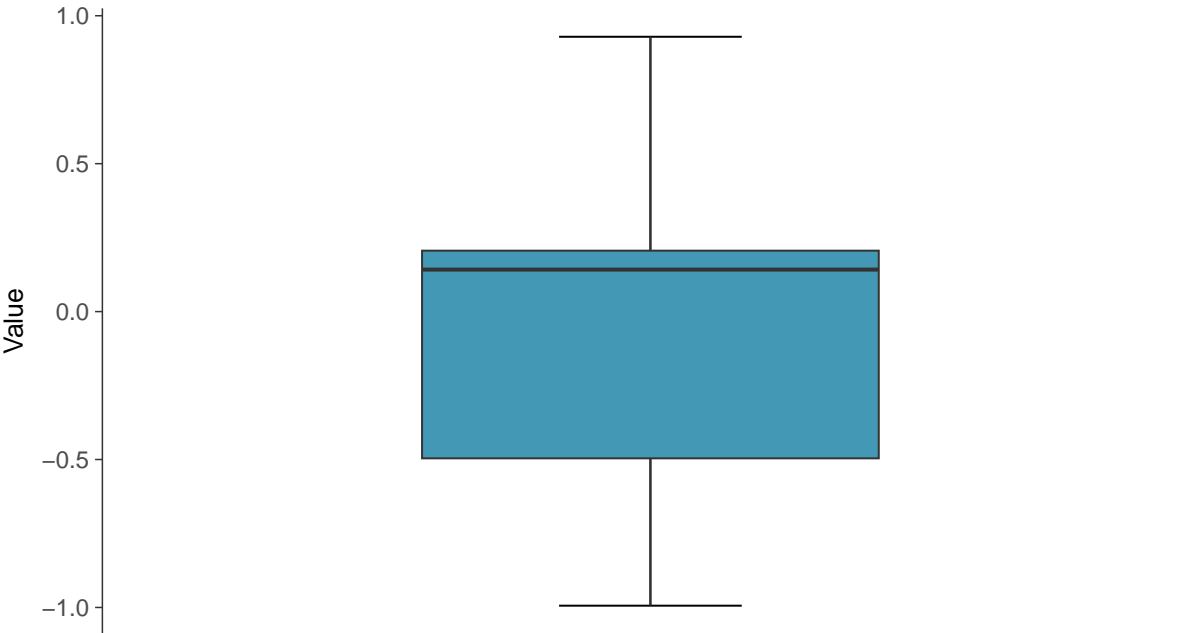
ID: 2\_25\_10





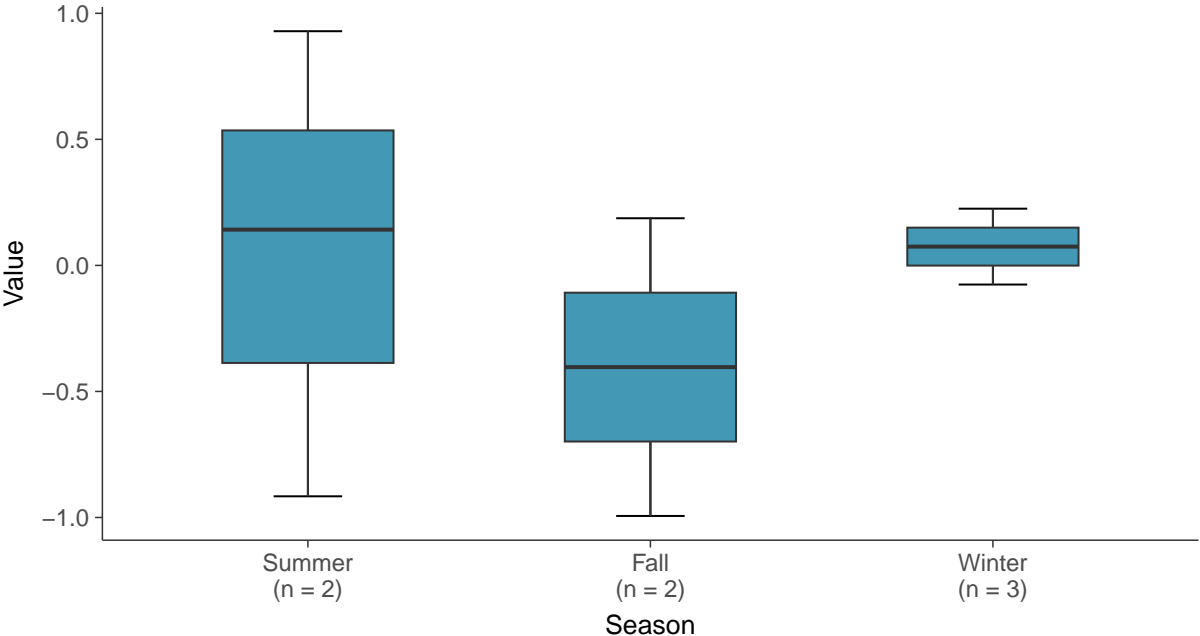
**Boxplot**

Radium-228, MW-10 (pCi/L)



**Boxplot by Season**

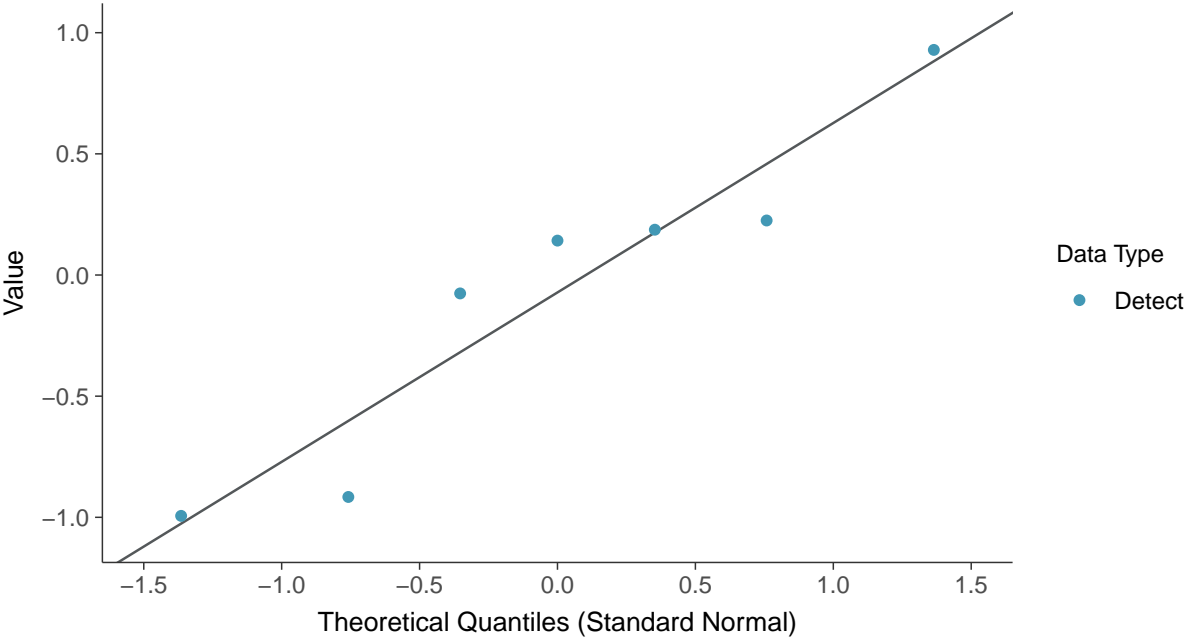
Radium-228, MW-10 (pCi/L)





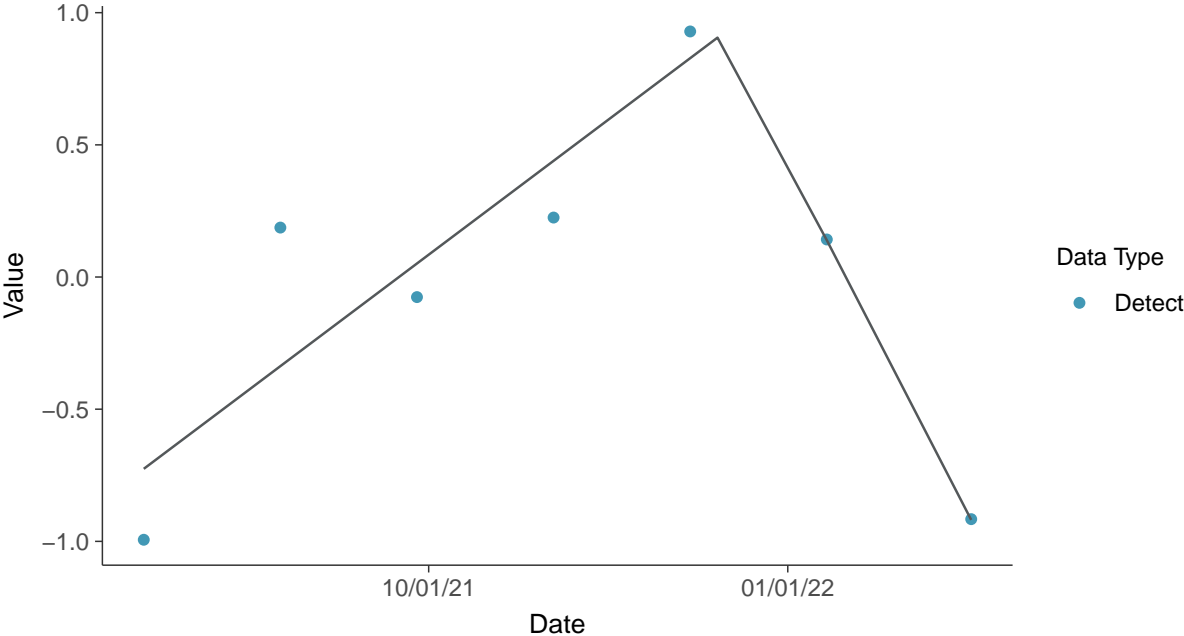
**Normal Q-Q plot**

Radium-228, MW-10 (pCi/L)



**Trend Regression: Piecewise Linear-Linear**

Radium-228, MW-10 (pCi/L)



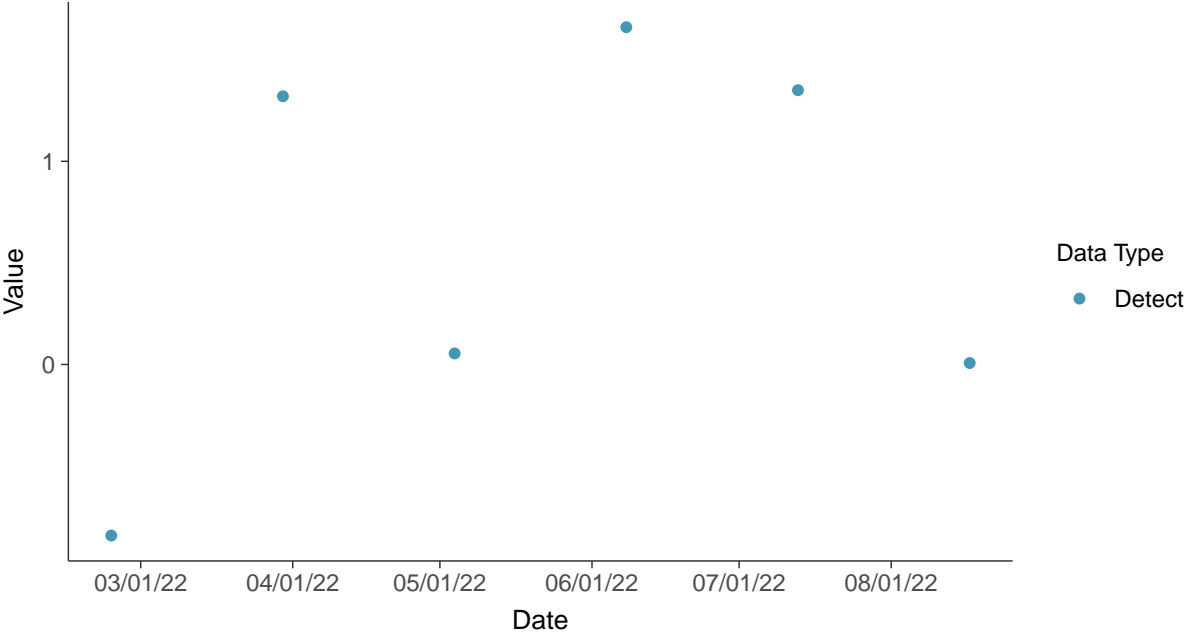


### Appendix IV: Radium-228, MW-13

ID: 2\_25\_13

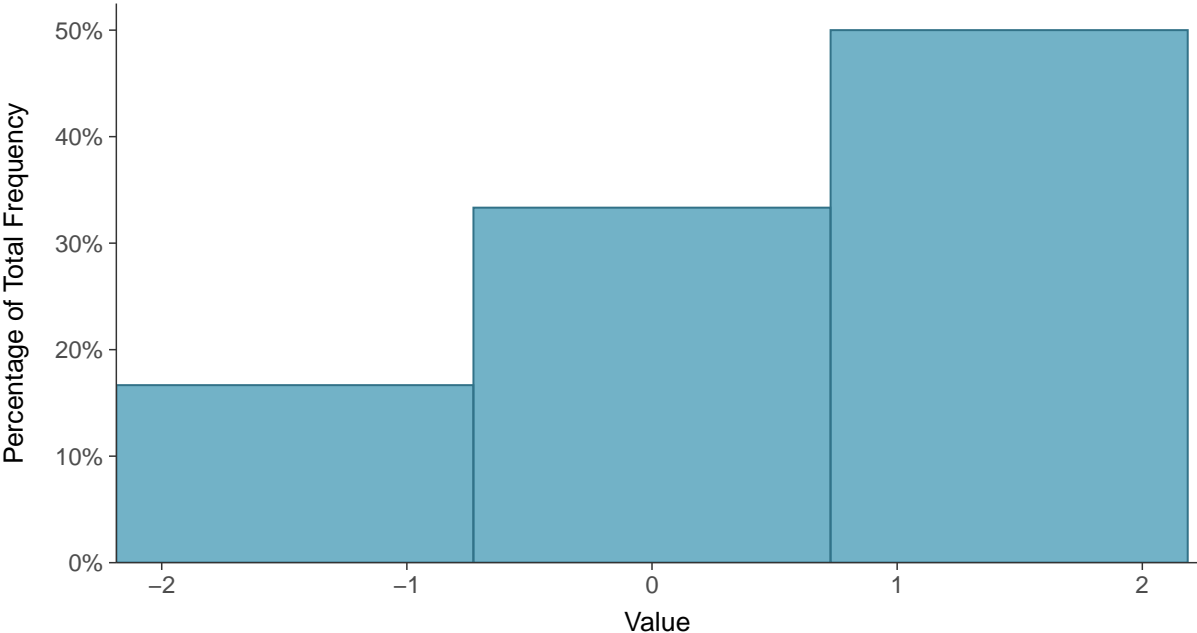
#### Scatter Plot

Radium-228, MW-13 (pCi/L)



#### Histogram

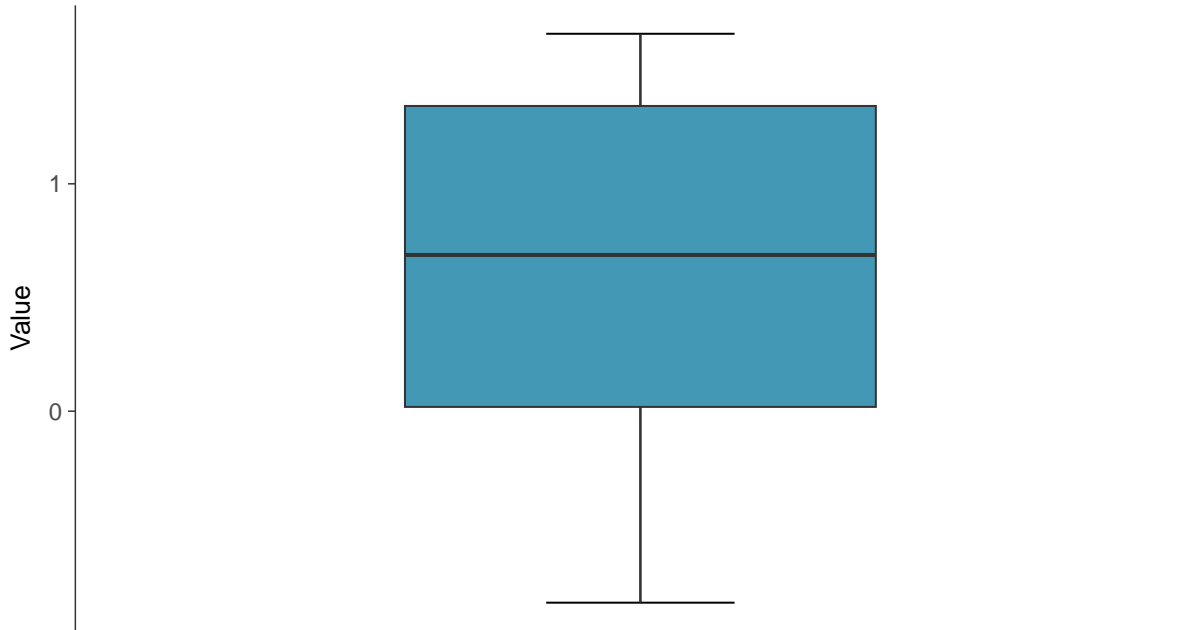
Radium-228, MW-13 (pCi/L)





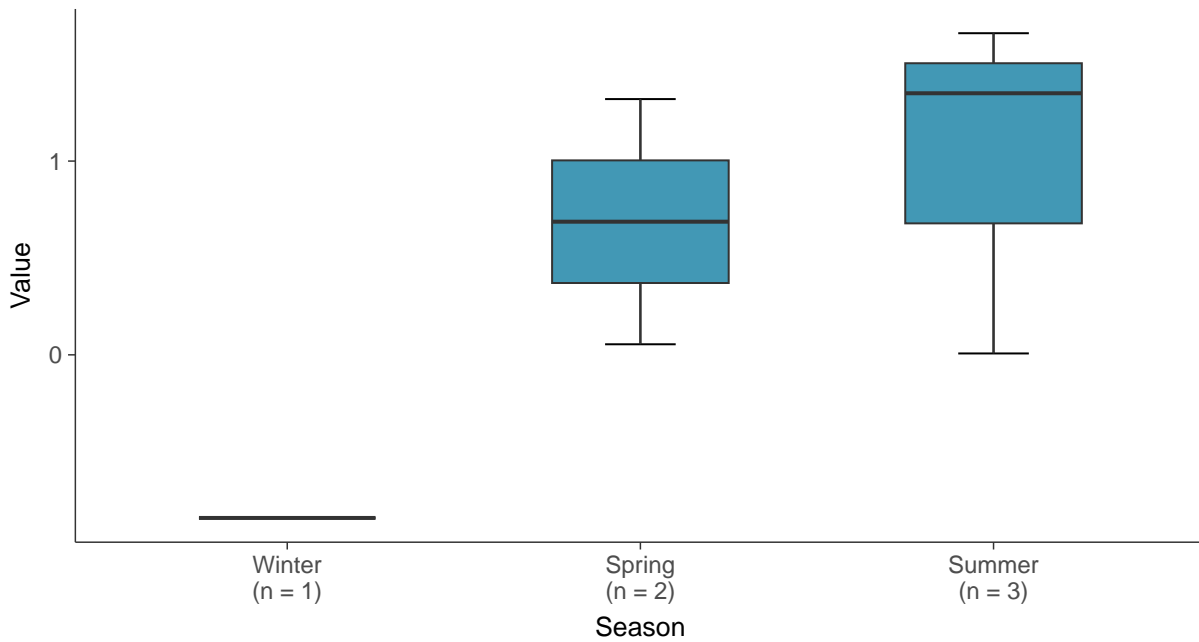
### Boxplot

Radium-228, MW-13 (pCi/L)



### Boxplot by Season

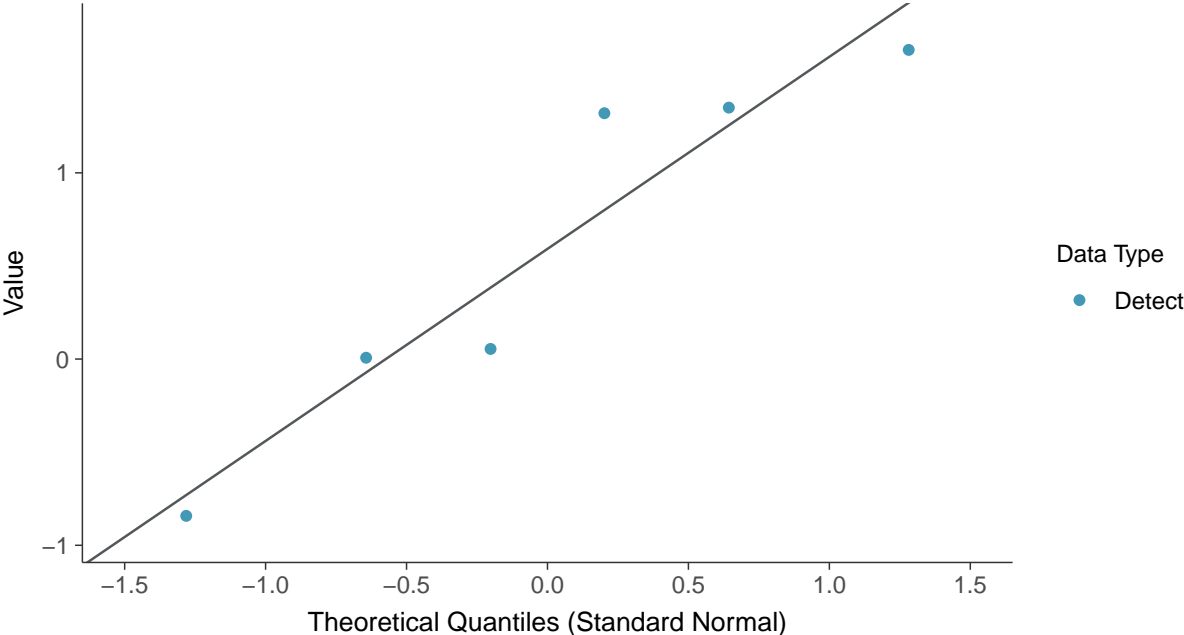
Radium-228, MW-13 (pCi/L)





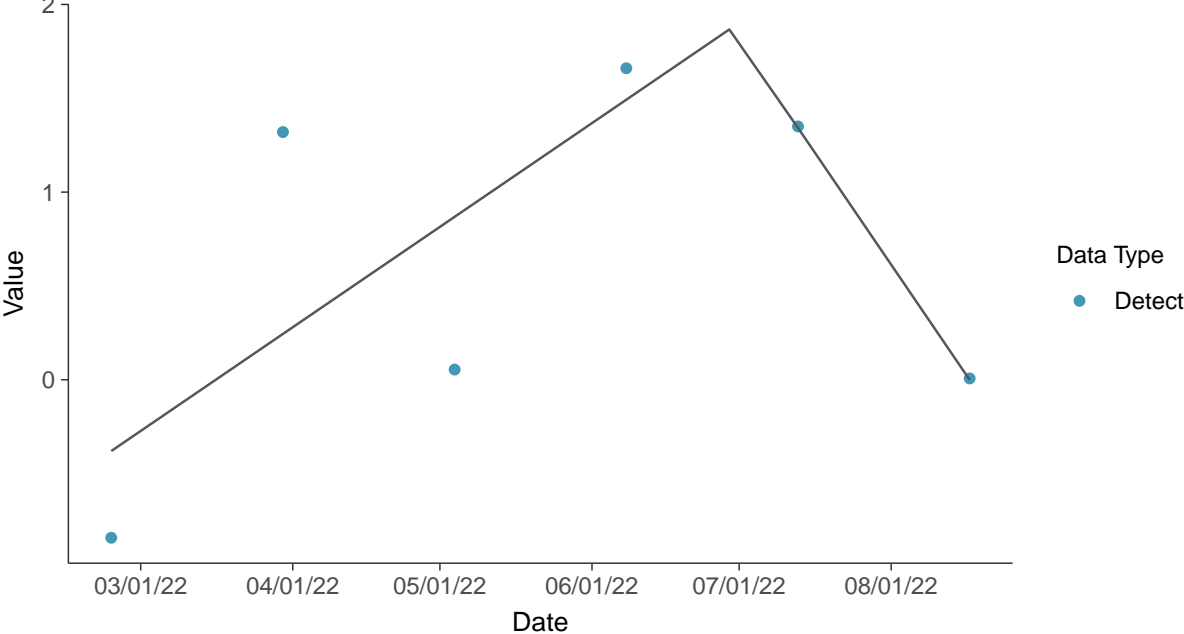
**Normal Q-Q plot**

Radium-228, MW-13 (pCi/L)



**Trend Regression: Piecewise Linear-Linear**

Radium-228, MW-13 (pCi/L)



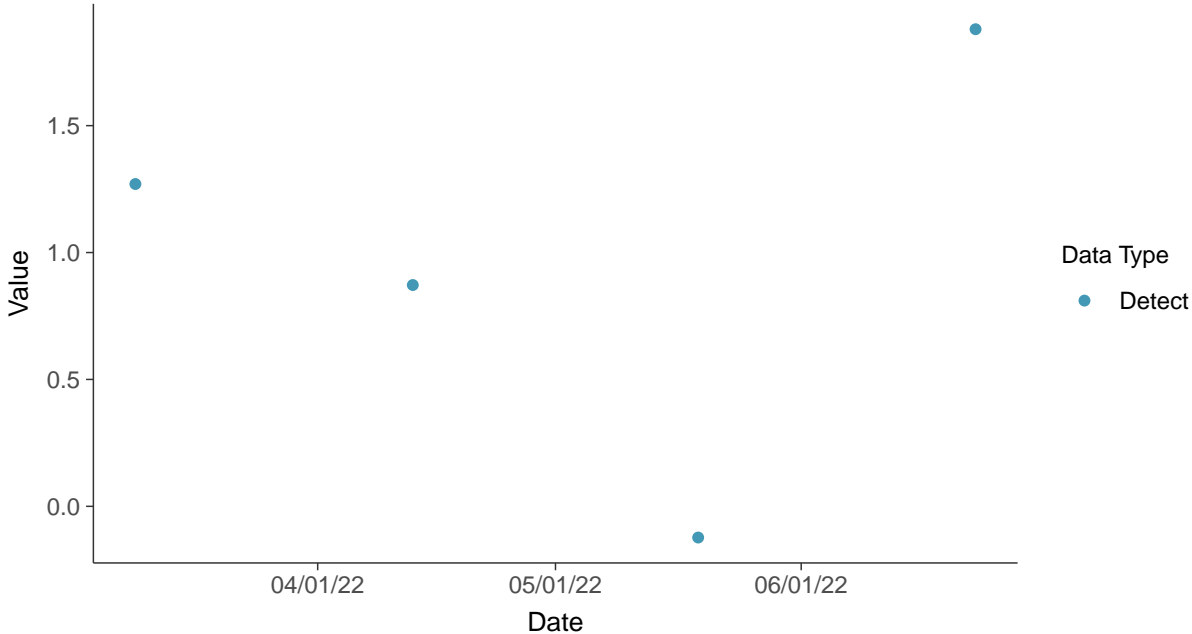


### Appendix IV: Radium-228, MW-7B

ID: 2\_25\_7B

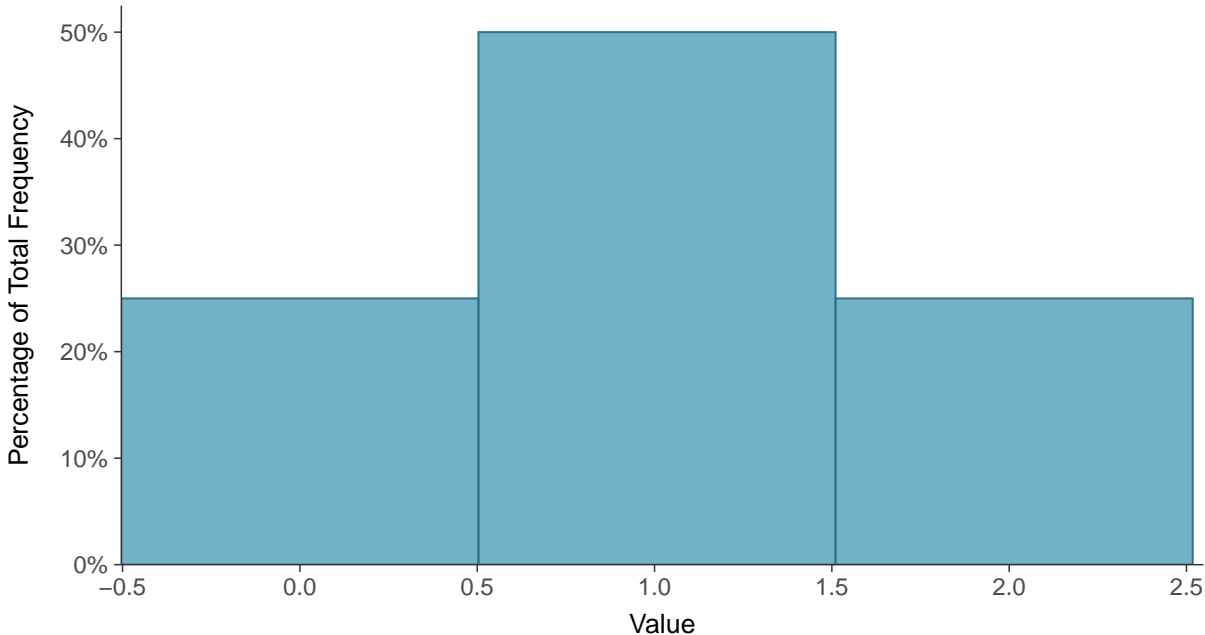
#### Scatter Plot

Radium-228, MW-7B (pCi/L)



#### Histogram

Radium-228, MW-7B (pCi/L)

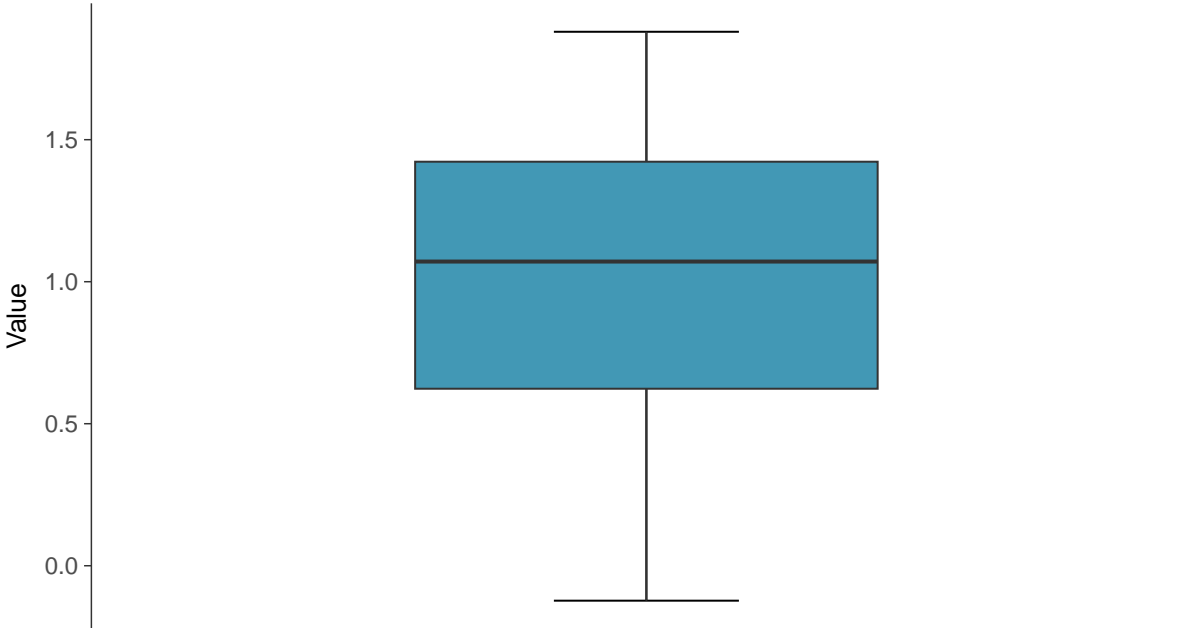






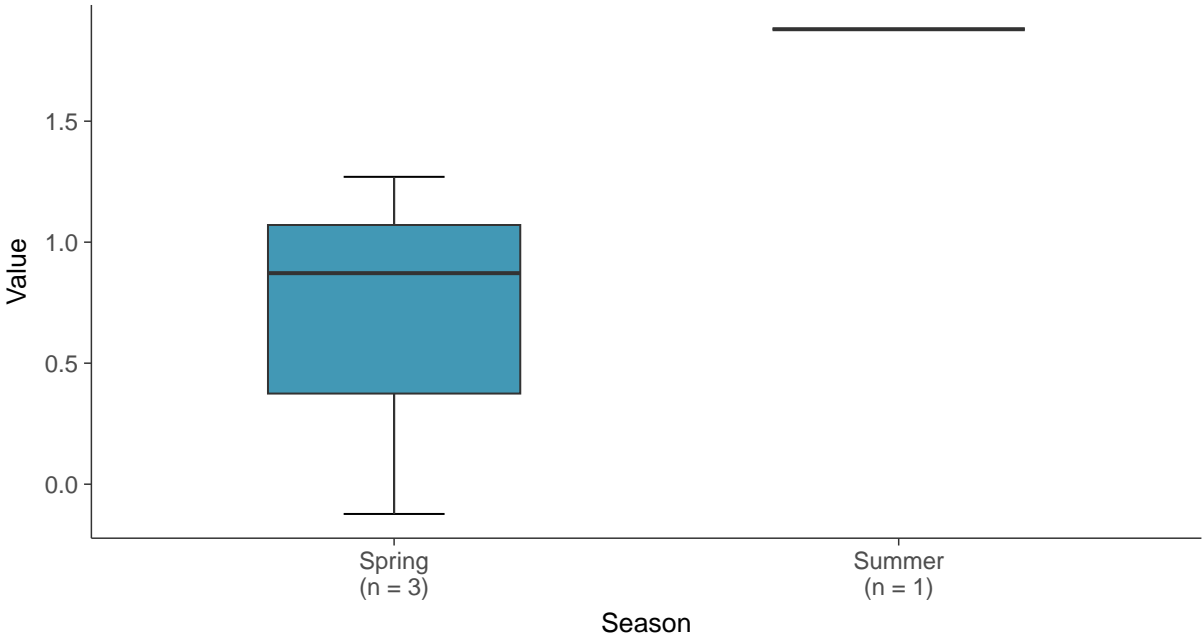
**Boxplot**

Radium-228, MW-7B (pCi/L)



**Boxplot by Season**

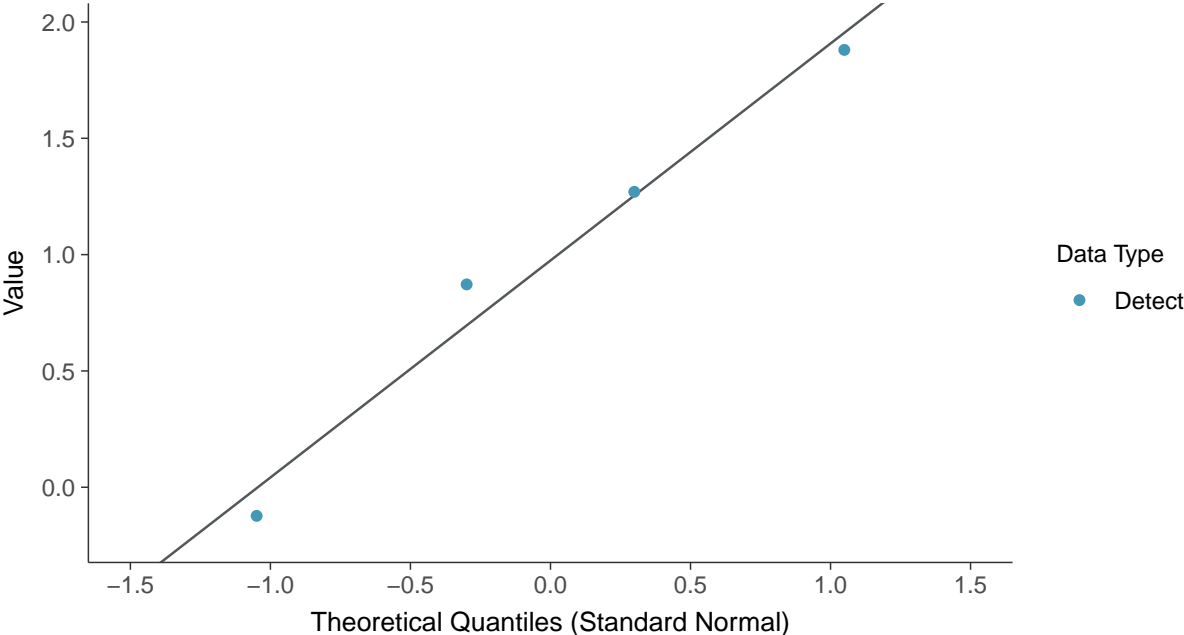
Radium-228, MW-7B (pCi/L)





**Normal Q-Q plot**

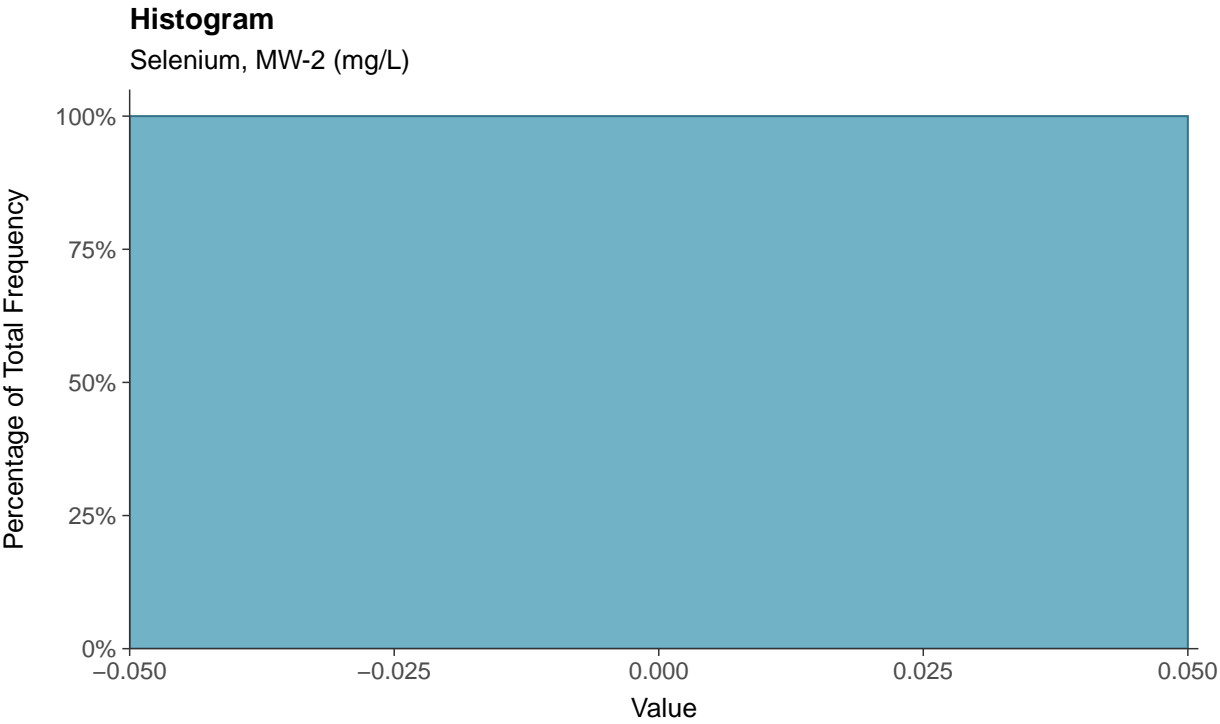
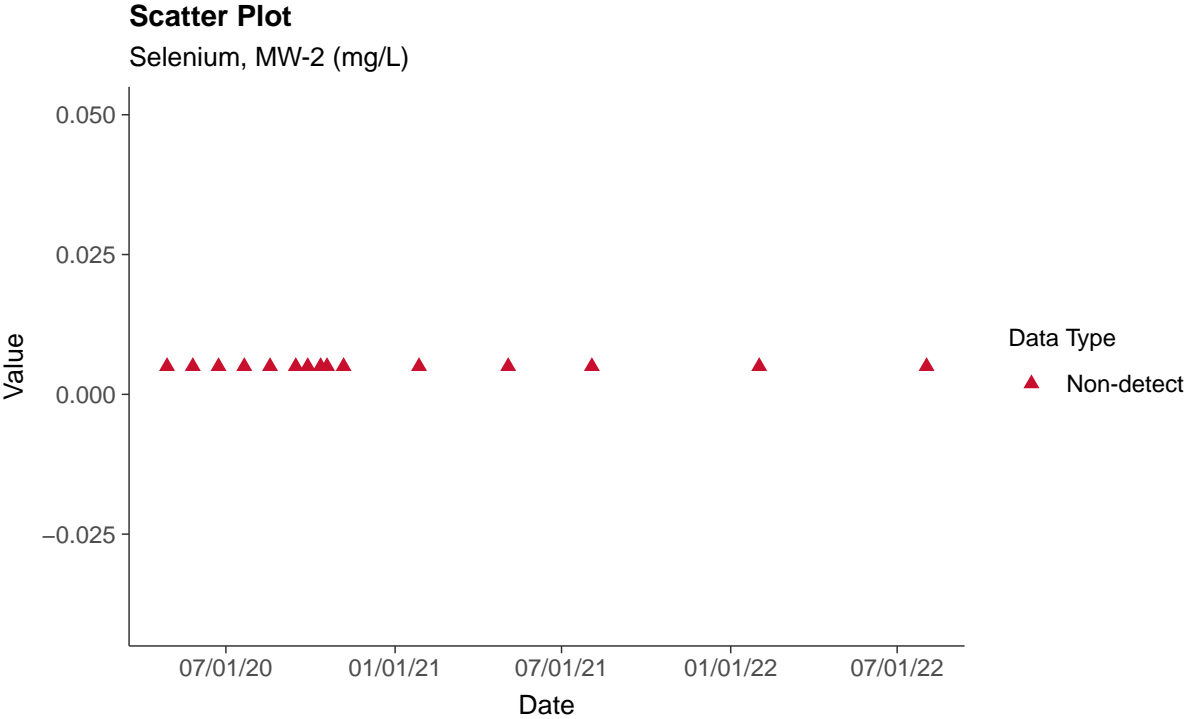
Radium-228, MW-7B (pCi/L)





### Appendix IV: Selenium, MW-2

ID: 2\_26\_02





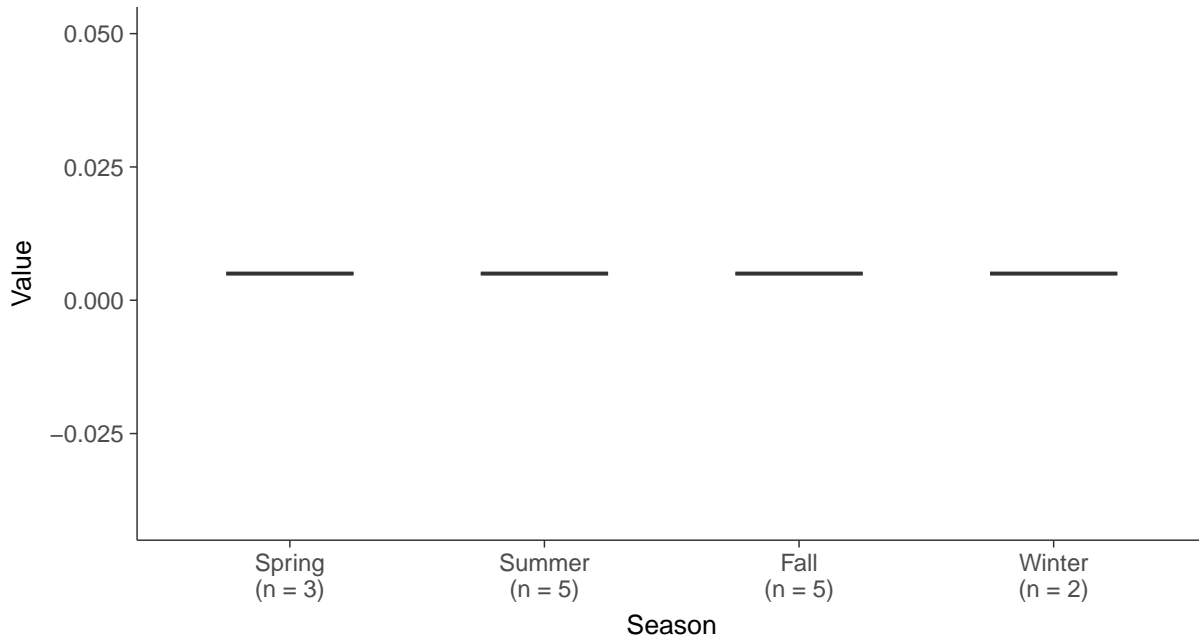
### Boxplot

Selenium, MW-2 (mg/L)



### Boxplot by Season

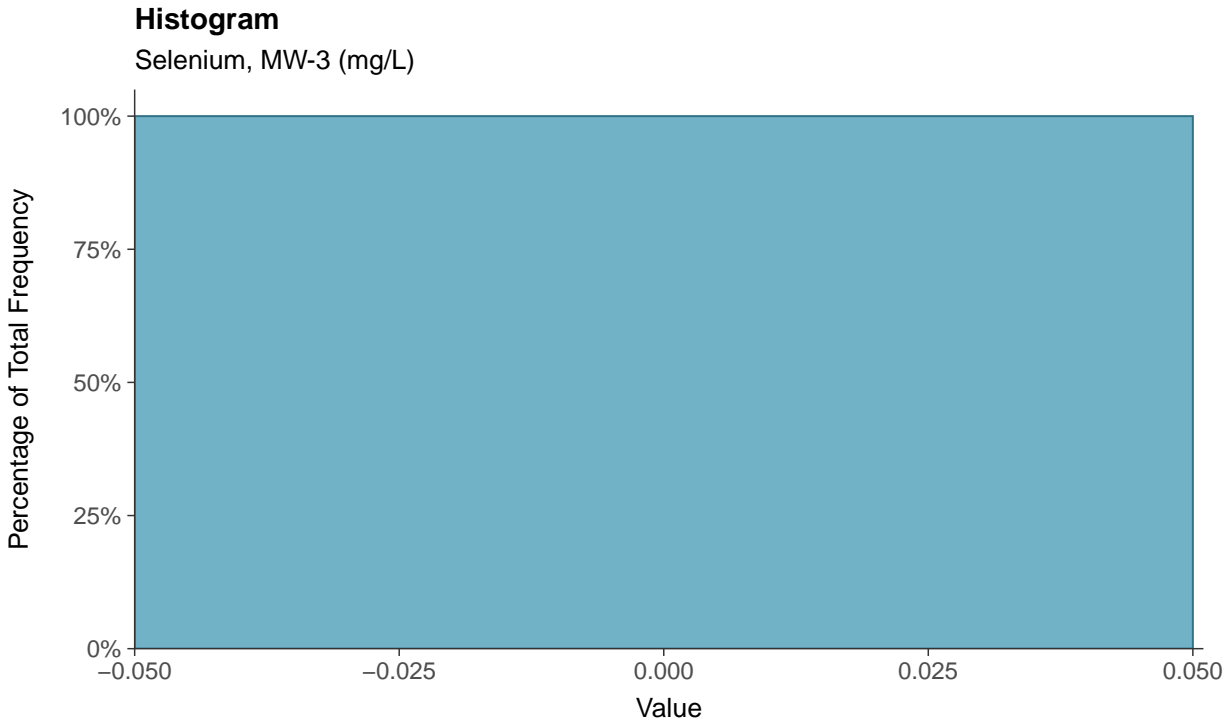
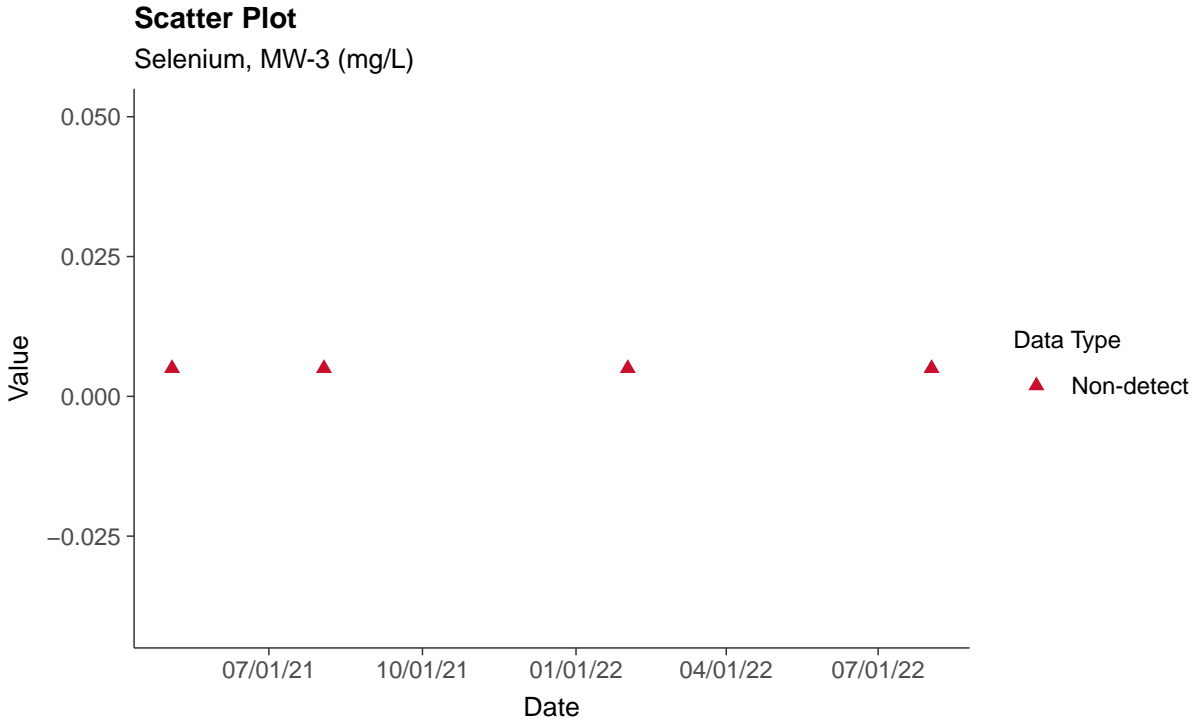
Selenium, MW-2 (mg/L)





### Appendix IV: Selenium, MW-3

ID: 2\_26\_03





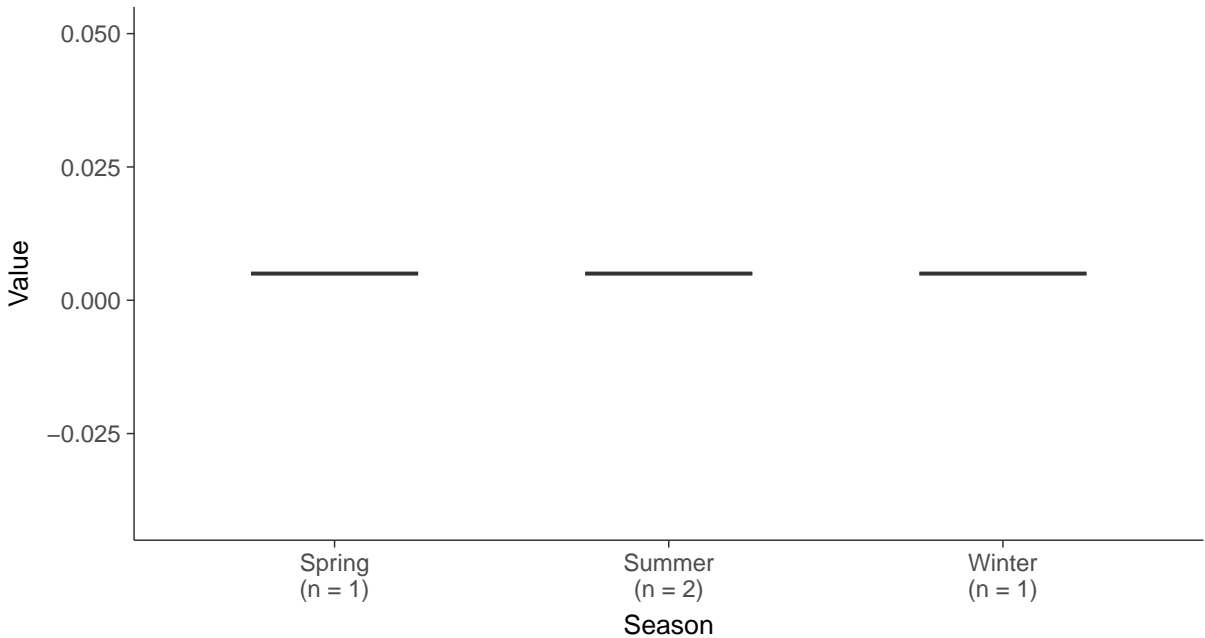
**Boxplot**

Selenium, MW-3 (mg/L)



**Boxplot by Season**

Selenium, MW-3 (mg/L)



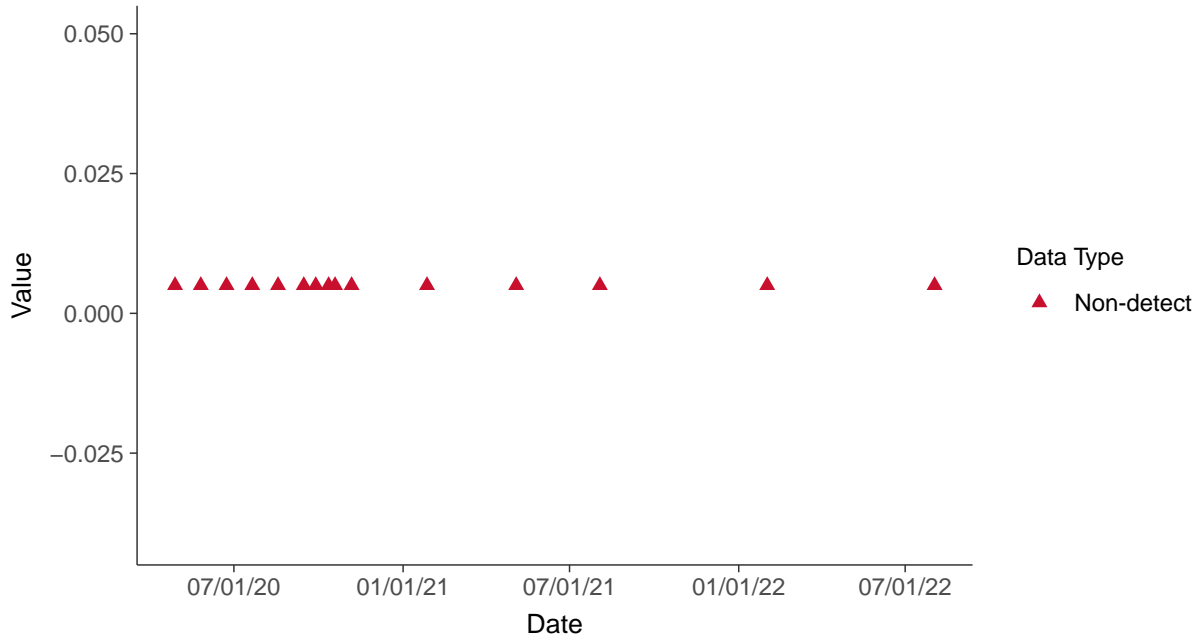


### Appendix IV: Selenium, MW-5

ID: 2\_26\_05

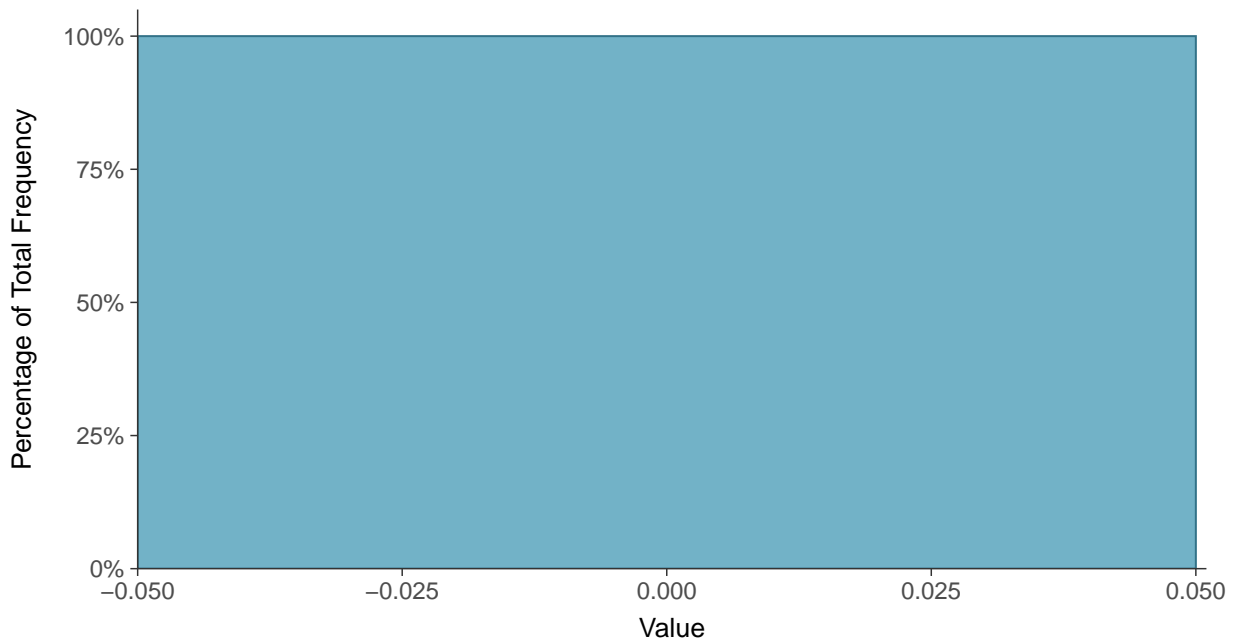
#### Scatter Plot

Selenium, MW-5 (mg/L)



#### Histogram

Selenium, MW-5 (mg/L)





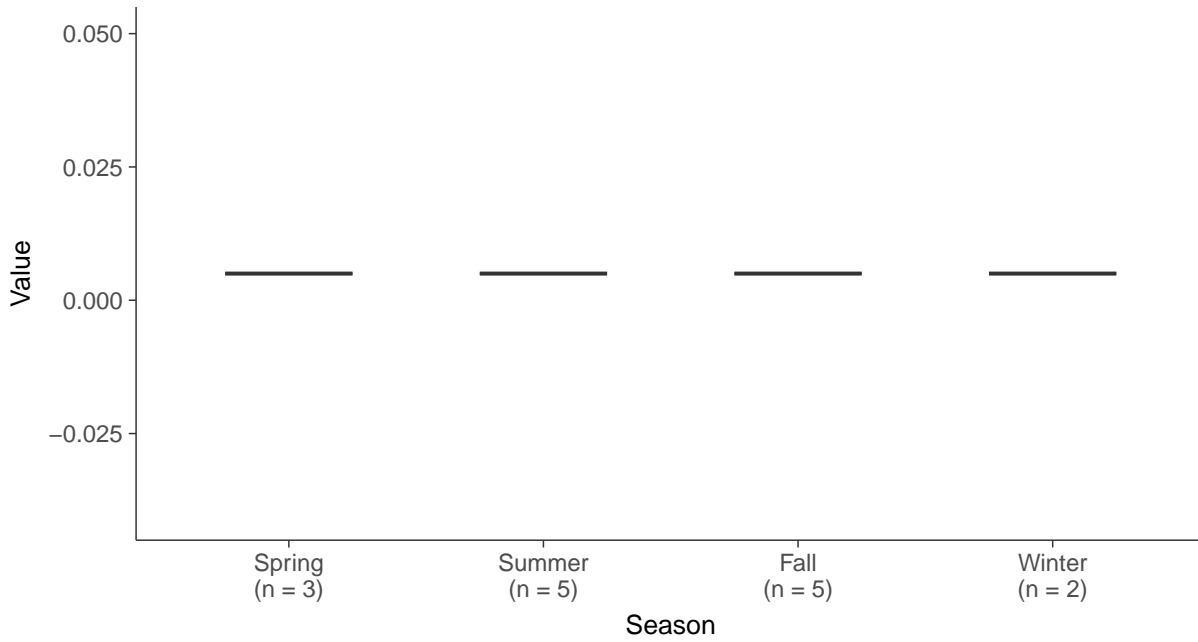
### Boxplot

Selenium, MW-5 (mg/L)



### Boxplot by Season

Selenium, MW-5 (mg/L)

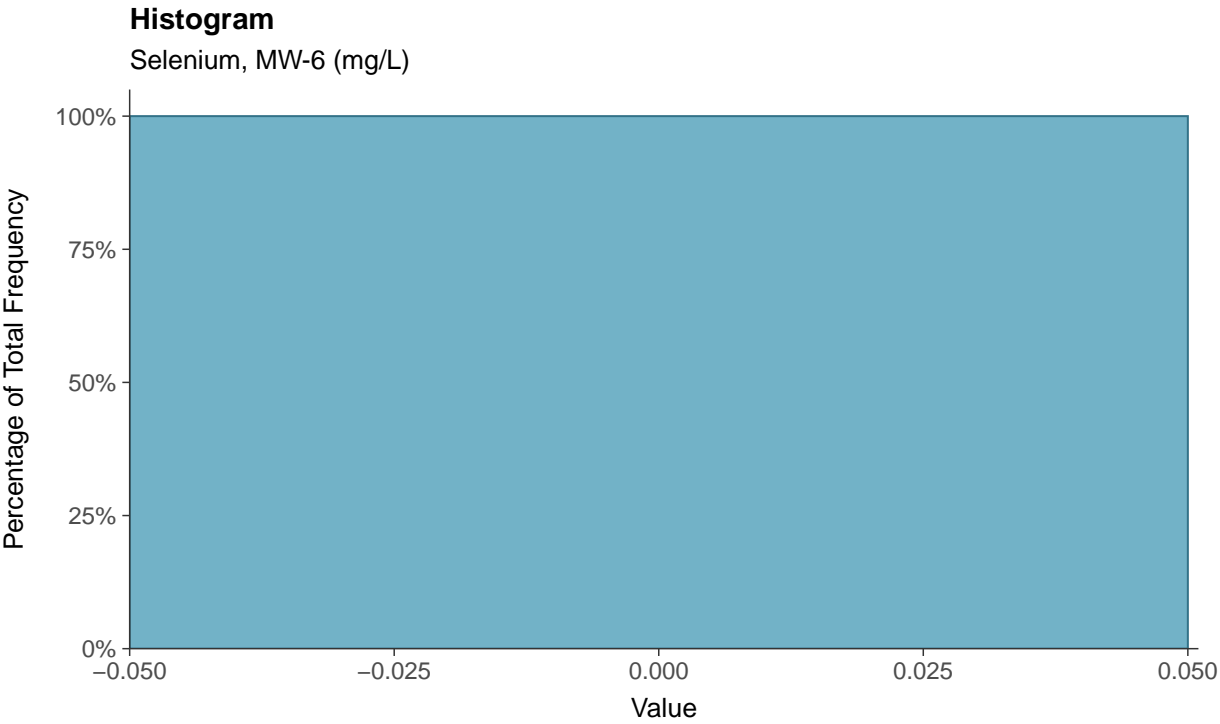
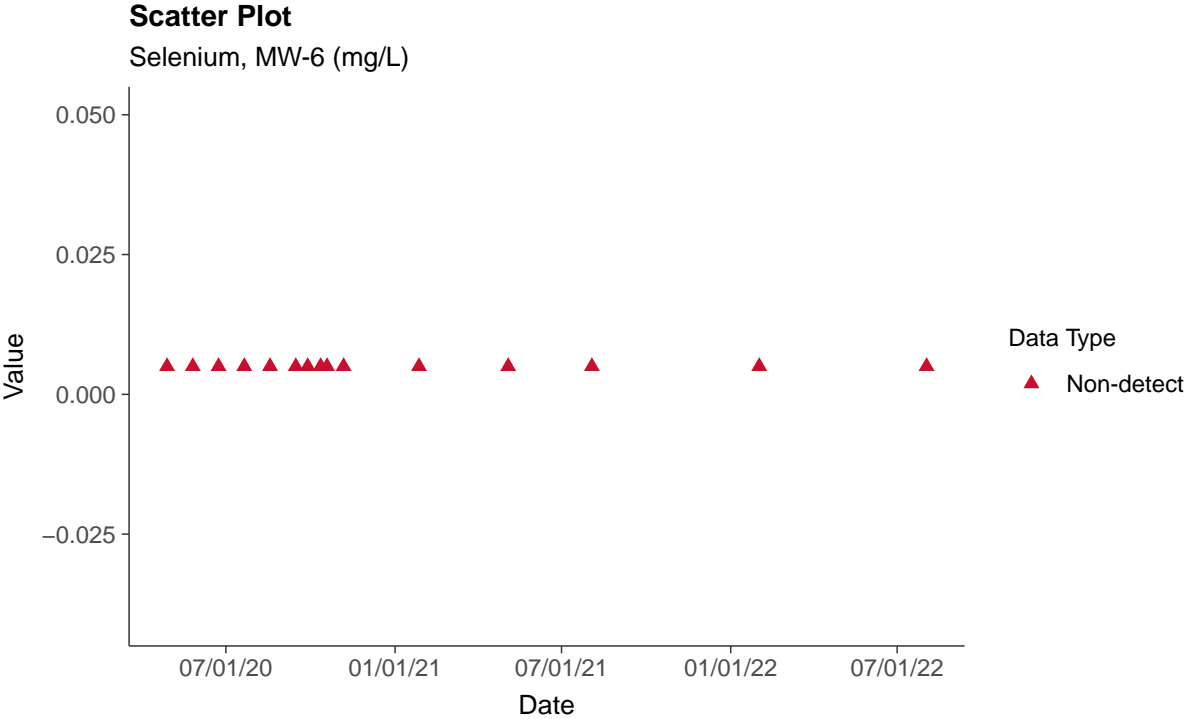






### Appendix IV: Selenium, MW-6

ID: 2\_26\_06





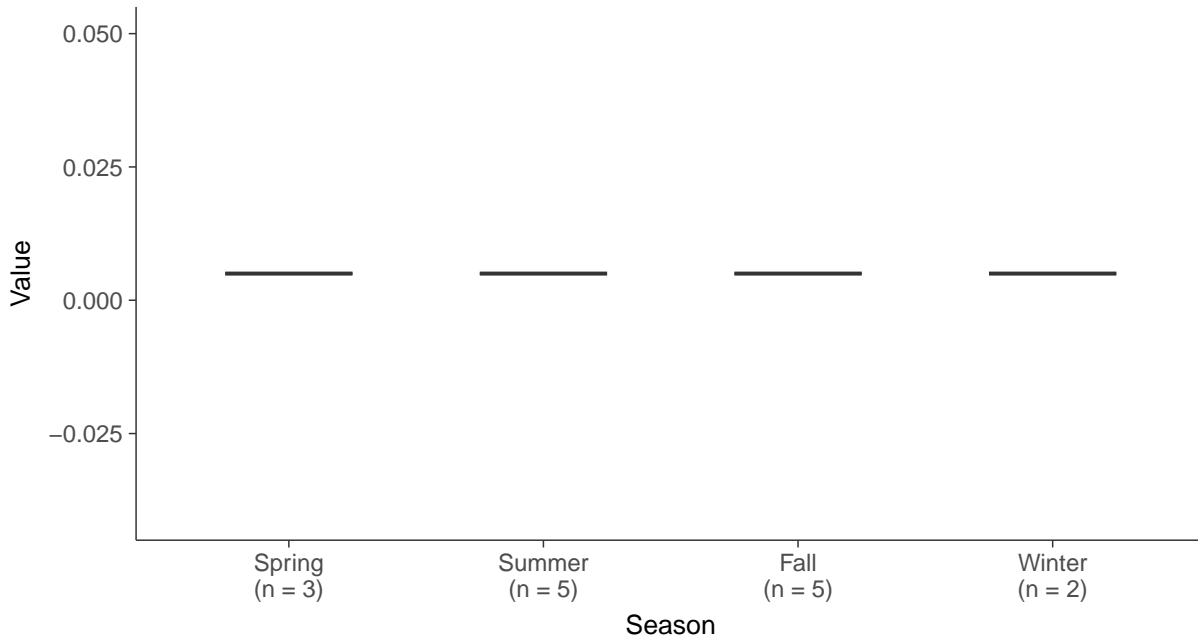
### Boxplot

Selenium, MW-6 (mg/L)



### Boxplot by Season

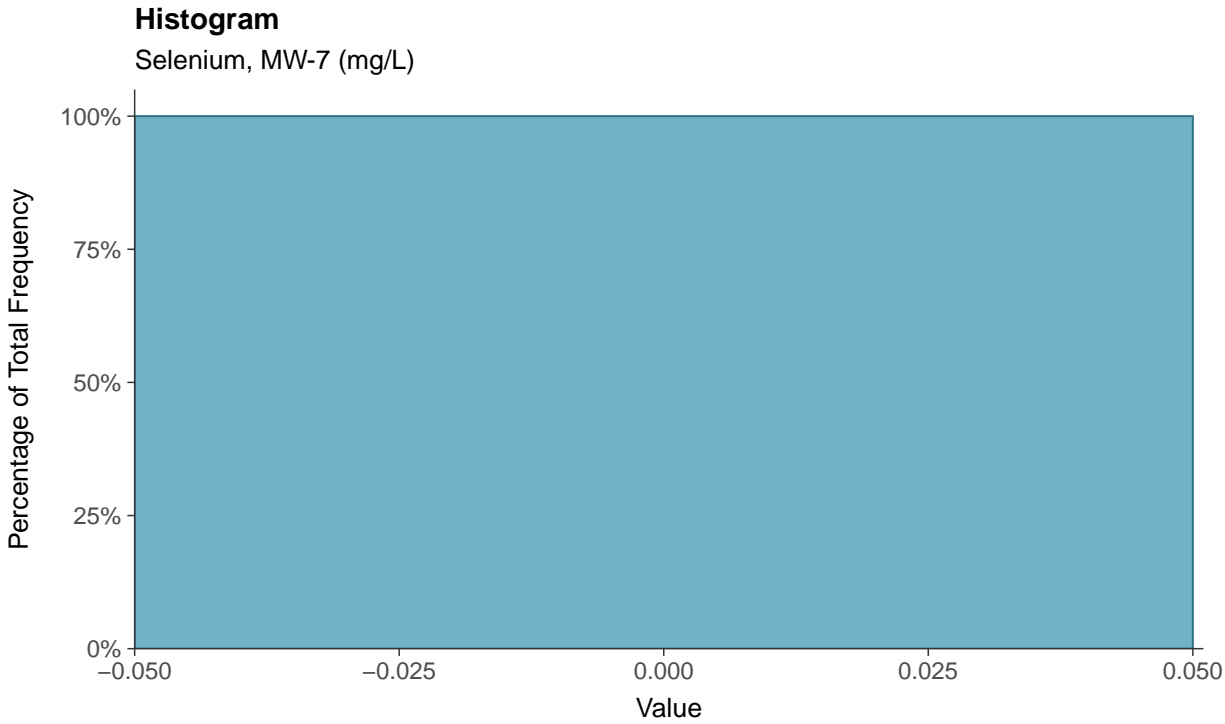
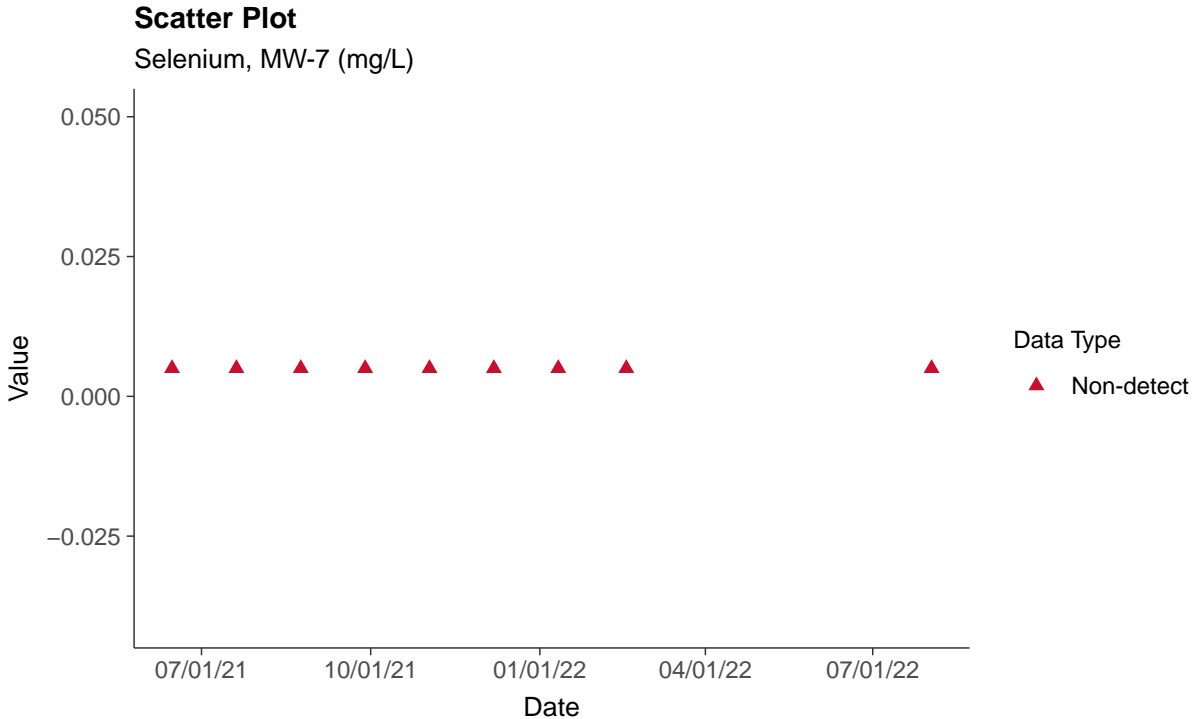
Selenium, MW-6 (mg/L)





### Appendix IV: Selenium, MW-7

ID: 2\_26\_07





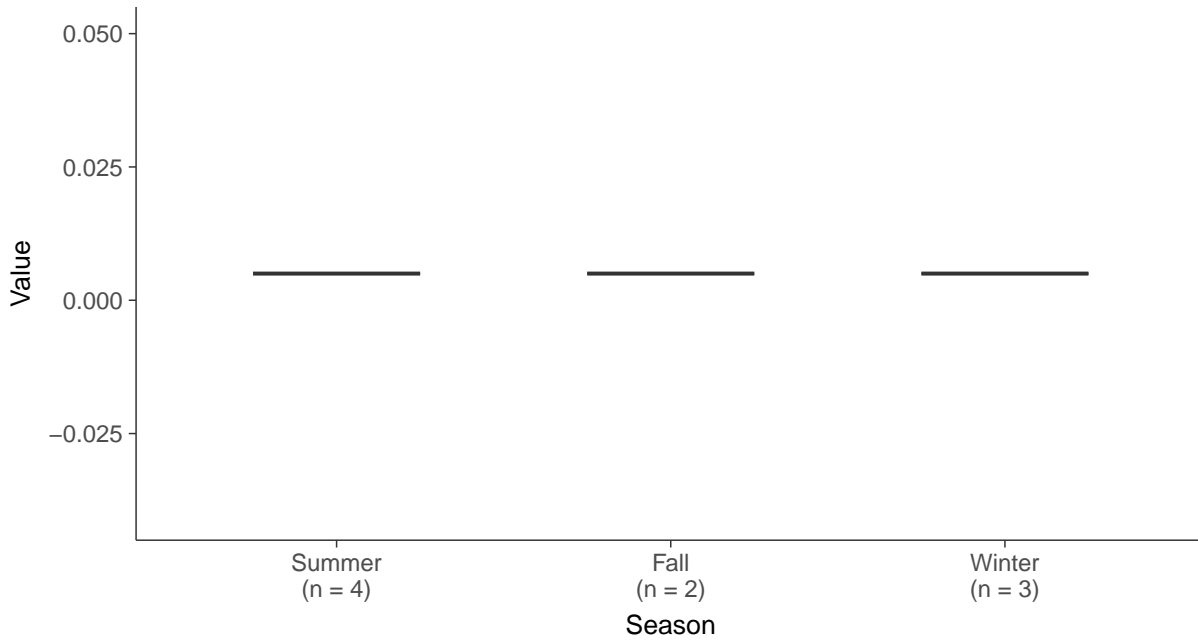
### Boxplot

Selenium, MW-7 (mg/L)



### Boxplot by Season

Selenium, MW-7 (mg/L)



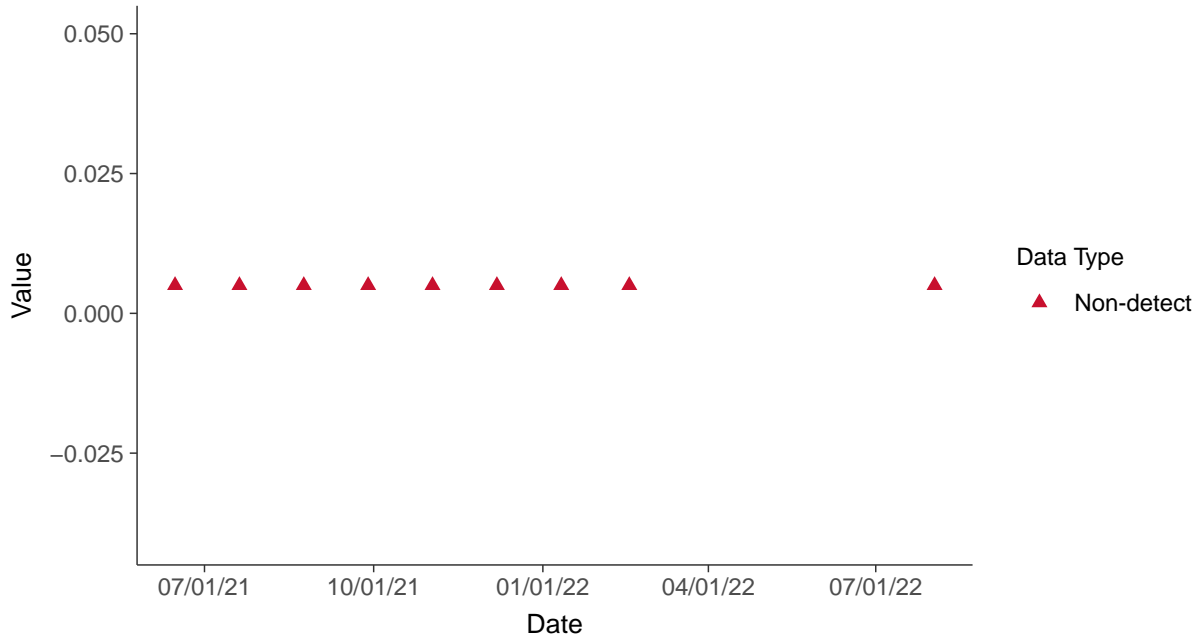


### Appendix IV: Selenium, MW-8

ID: 2\_26\_08

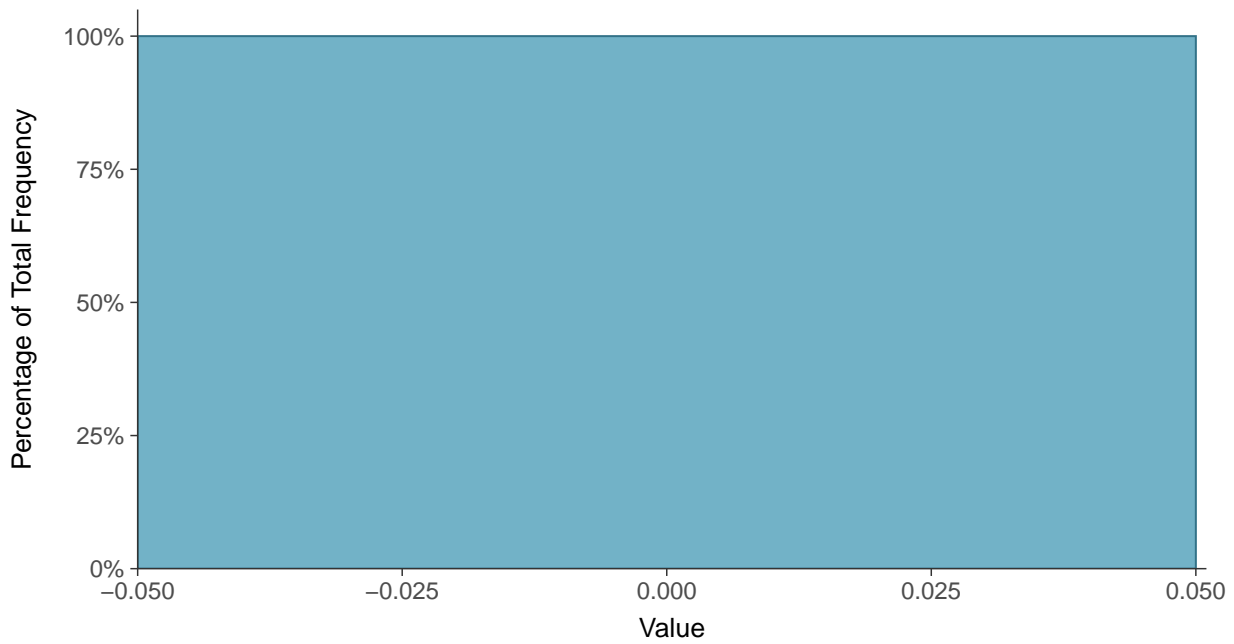
#### Scatter Plot

Selenium, MW-8 (mg/L)



#### Histogram

Selenium, MW-8 (mg/L)





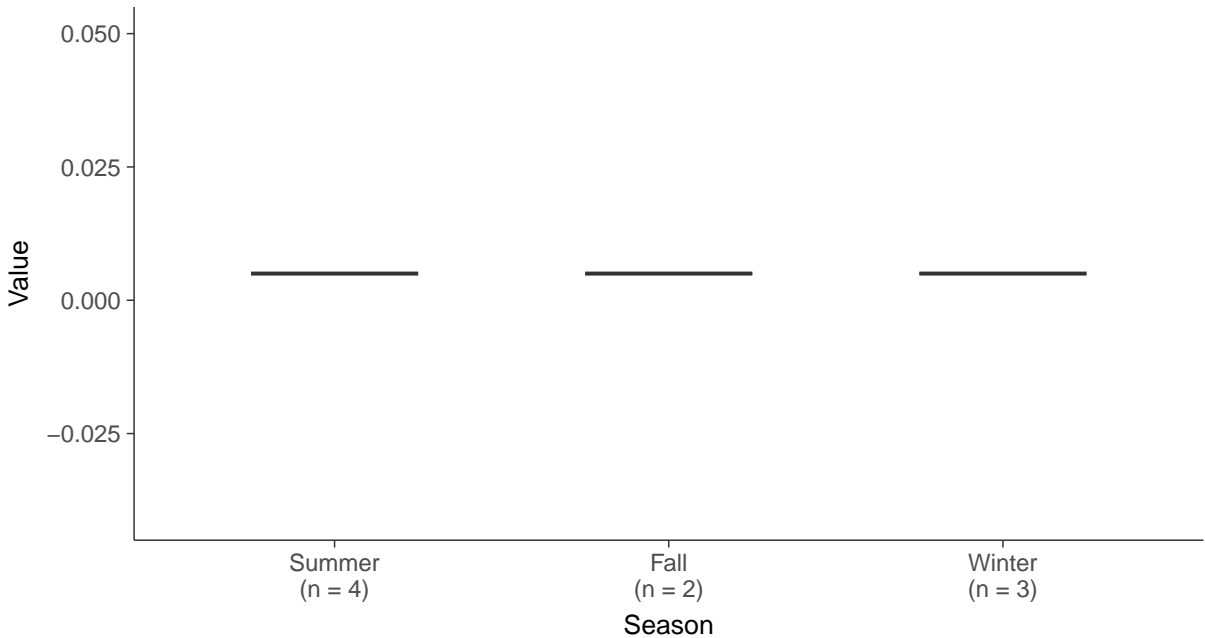
**Boxplot**

Selenium, MW-8 (mg/L)



**Boxplot by Season**

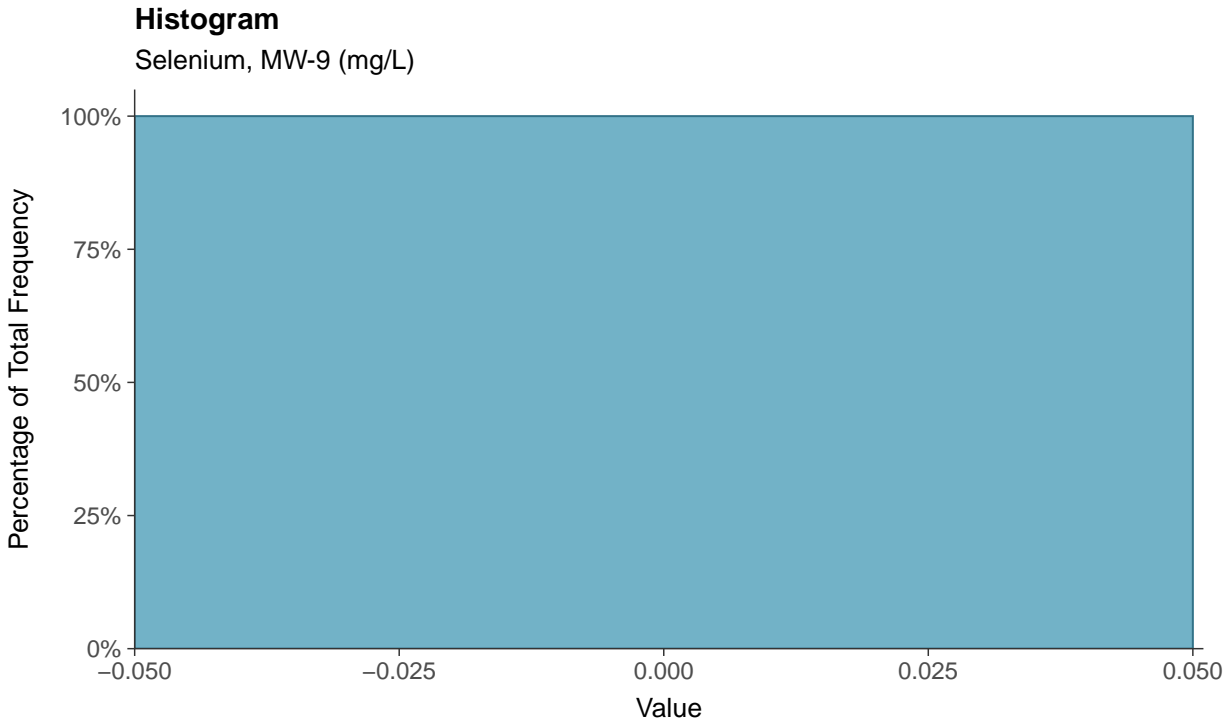
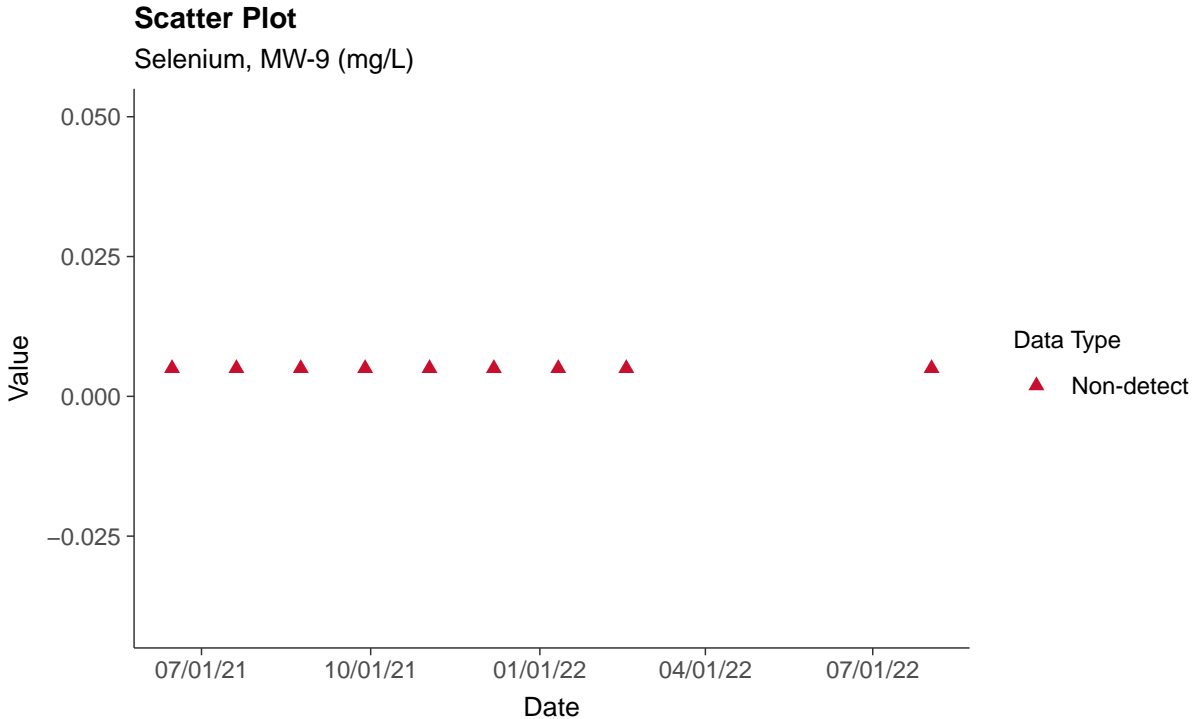
Selenium, MW-8 (mg/L)





### Appendix IV: Selenium, MW-9

ID: 2\_26\_09





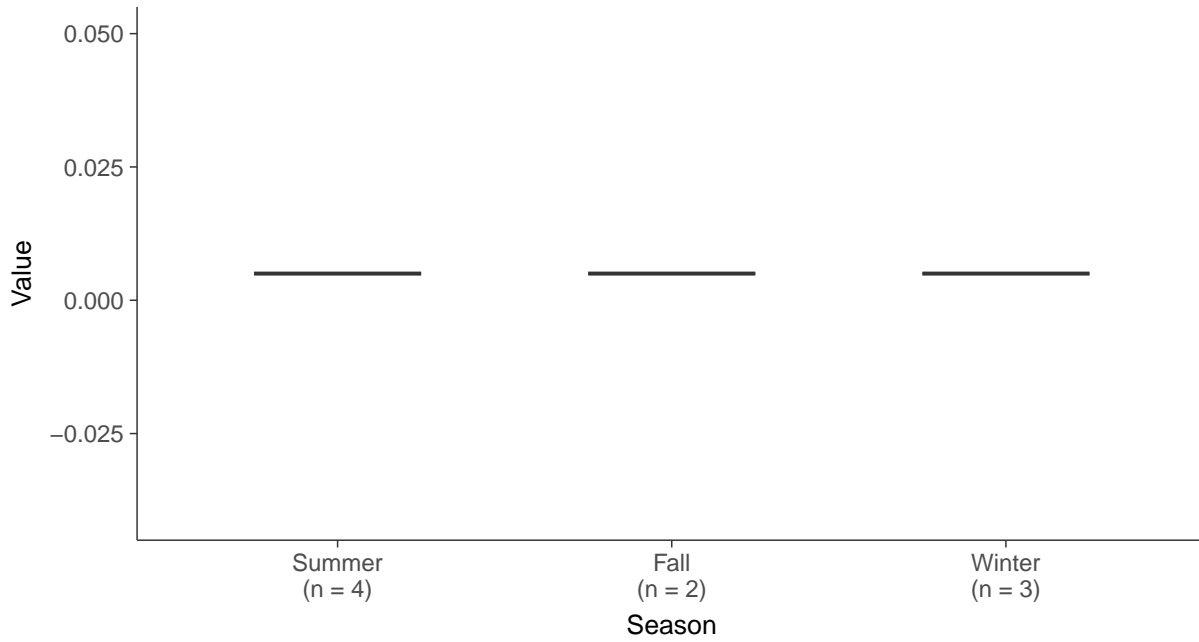
### Boxplot

Selenium, MW-9 (mg/L)



### Boxplot by Season

Selenium, MW-9 (mg/L)

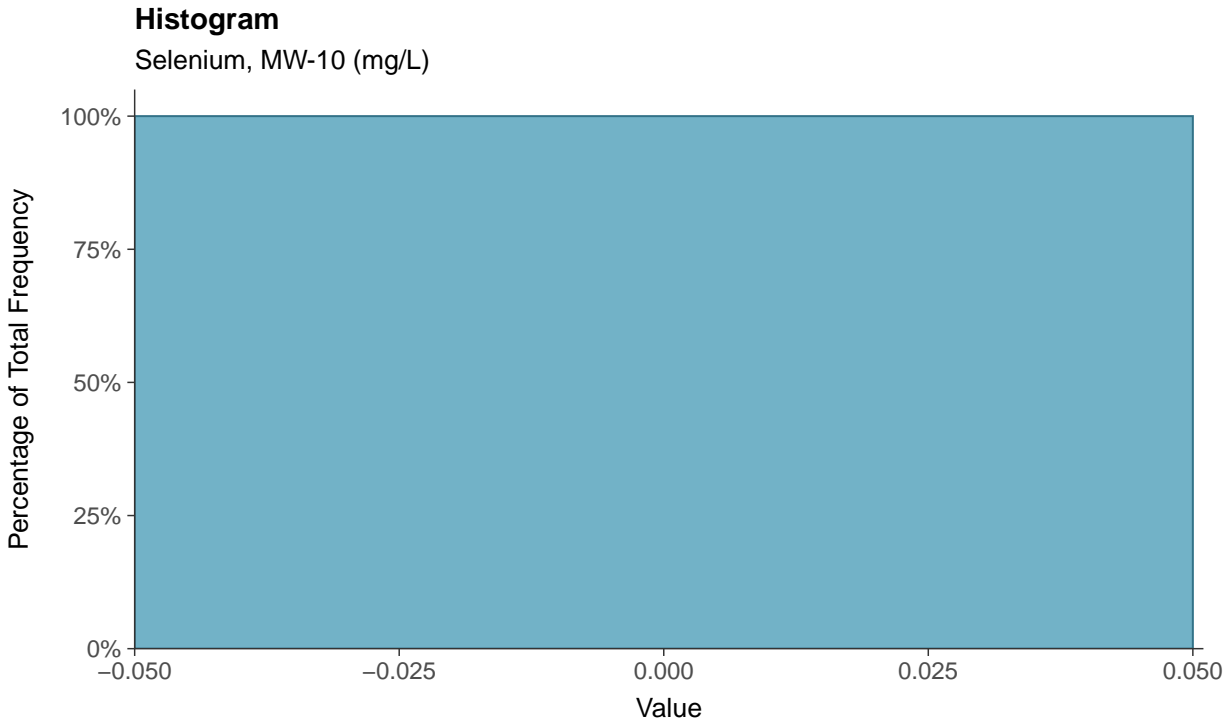
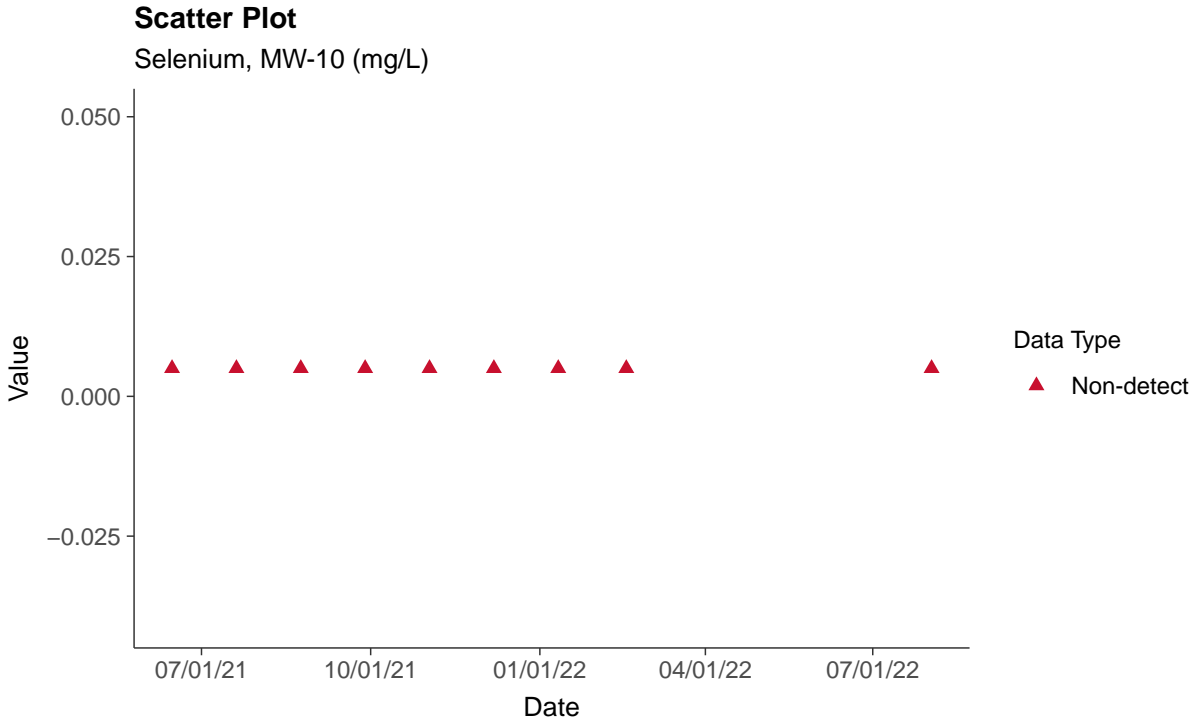






### Appendix IV: Selenium, MW-10

ID: 2\_26\_10





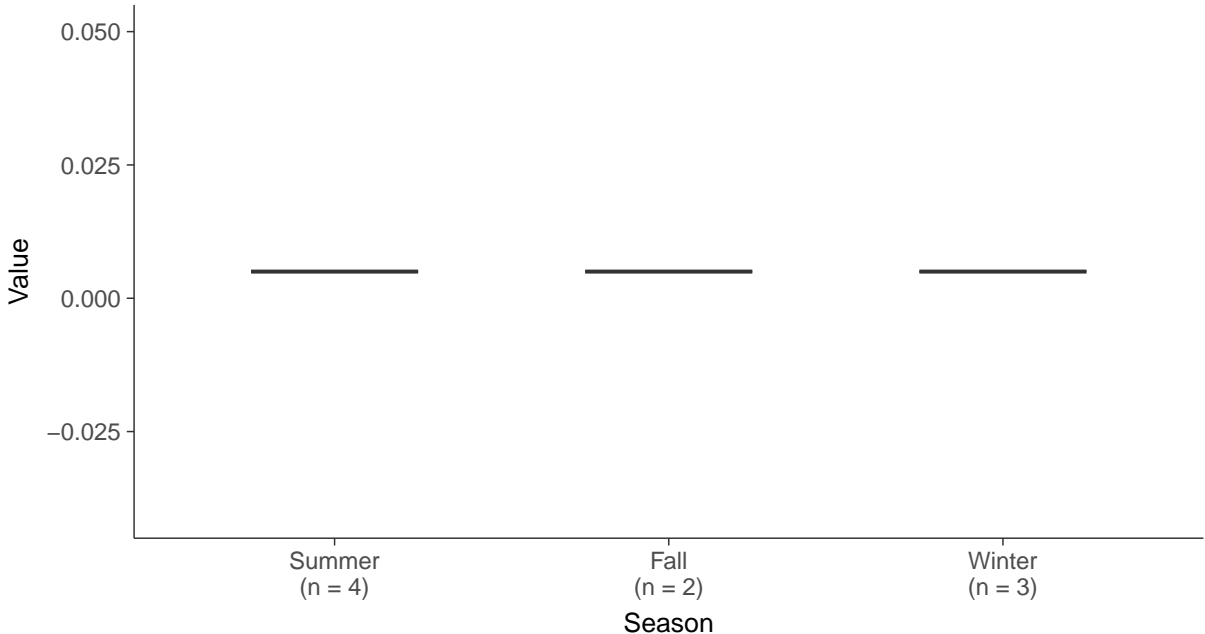
**Boxplot**

Selenium, MW-10 (mg/L)



**Boxplot by Season**

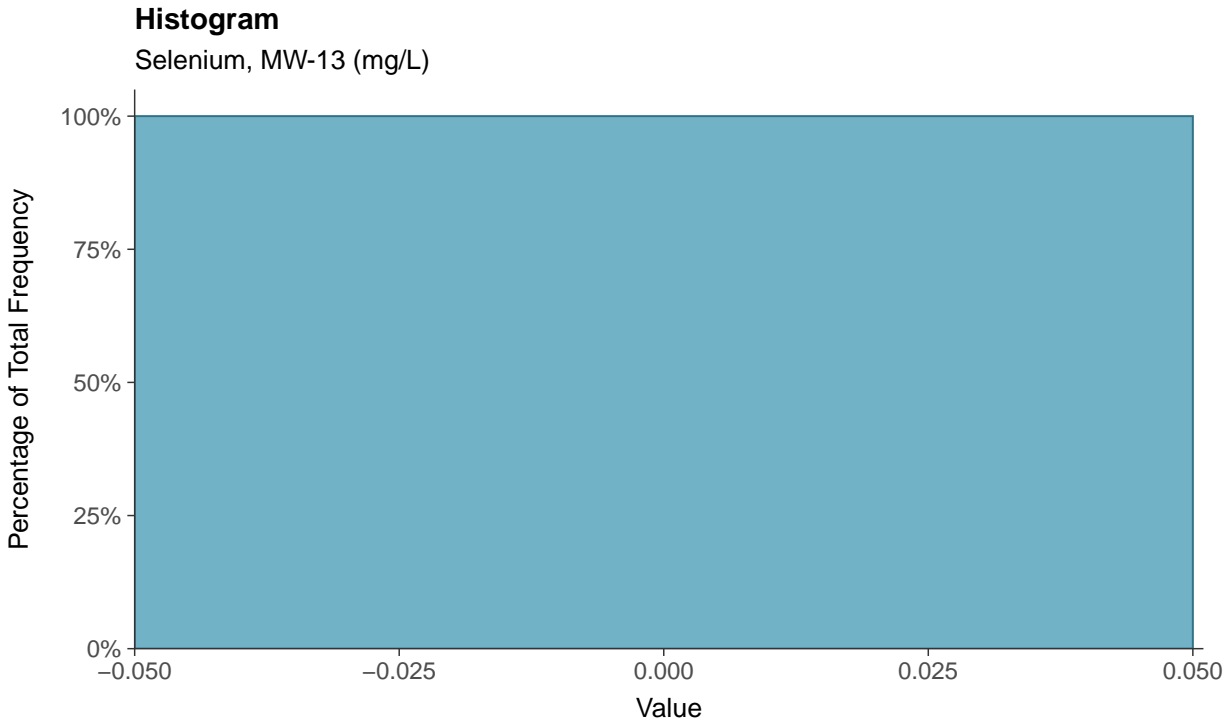
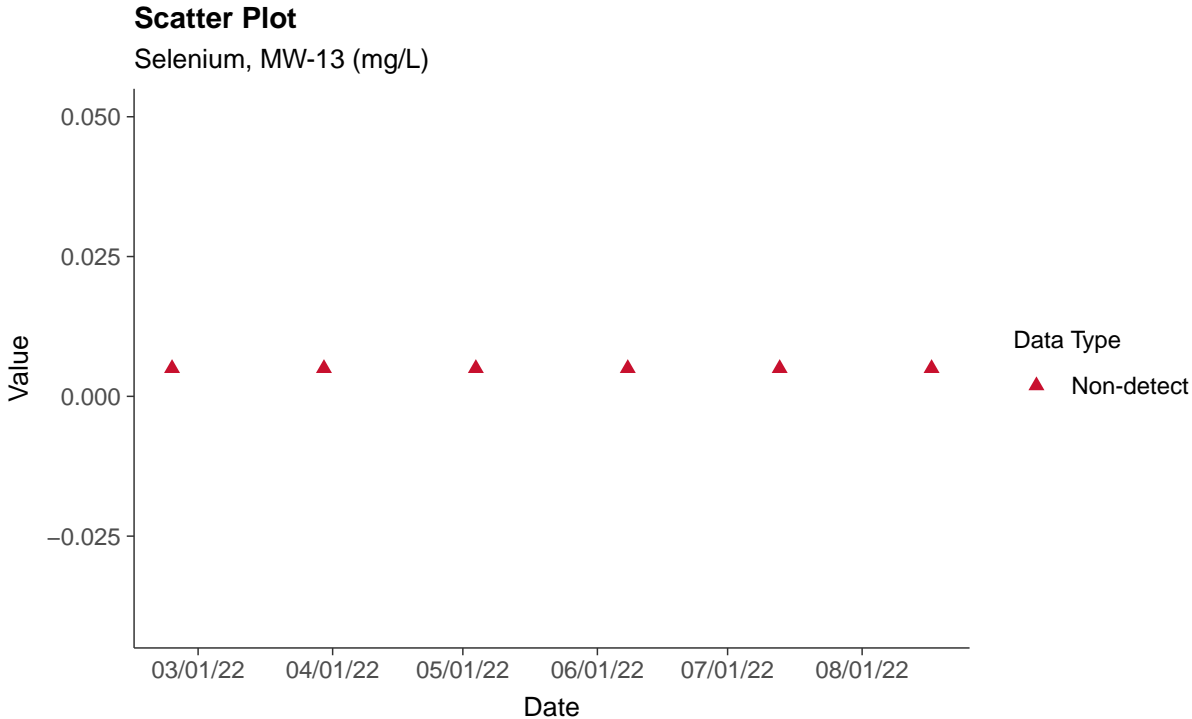
Selenium, MW-10 (mg/L)





### Appendix IV: Selenium, MW-13

ID: 2\_26\_13





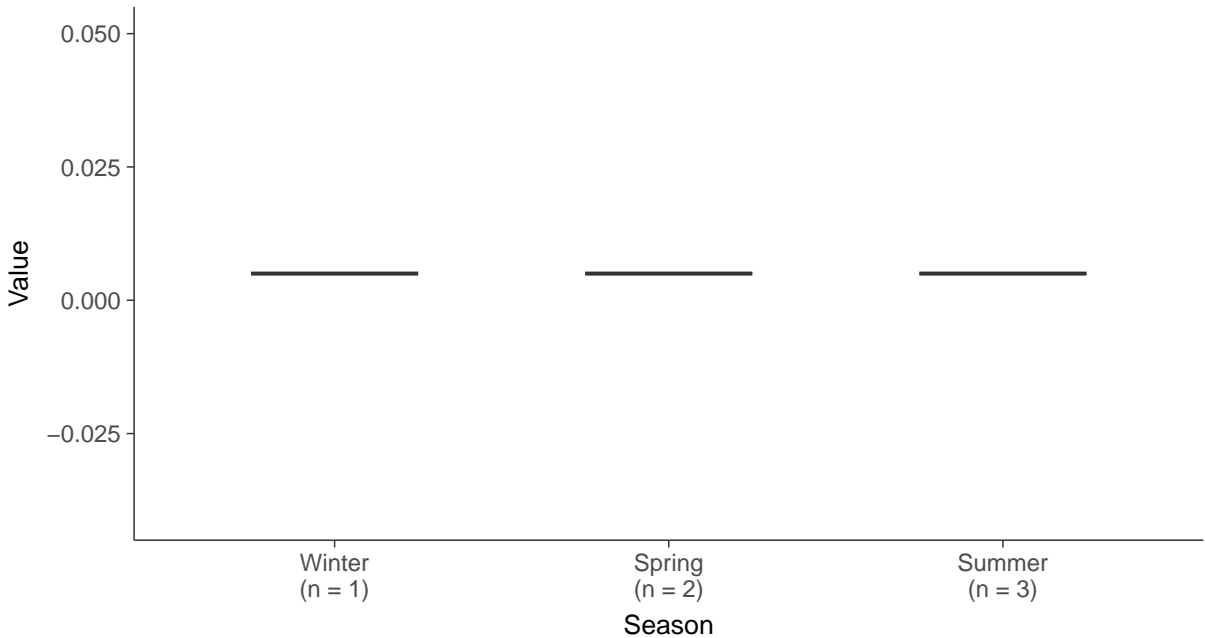
**Boxplot**

Selenium, MW-13 (mg/L)



**Boxplot by Season**

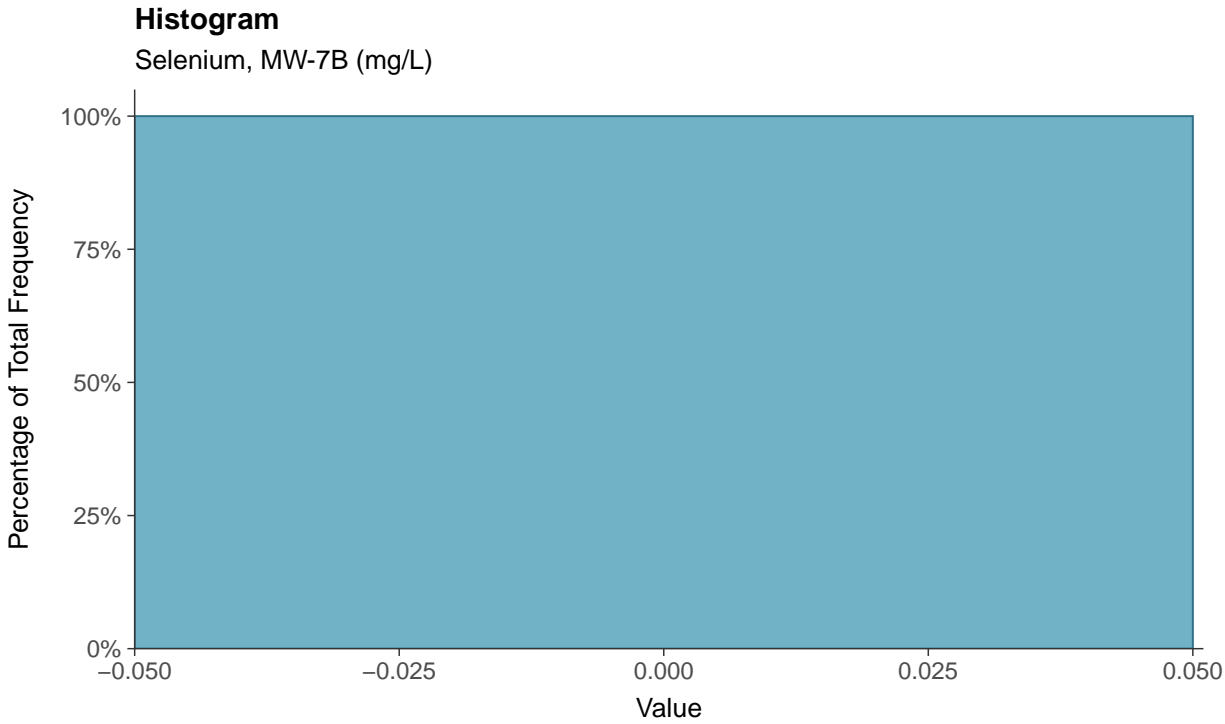
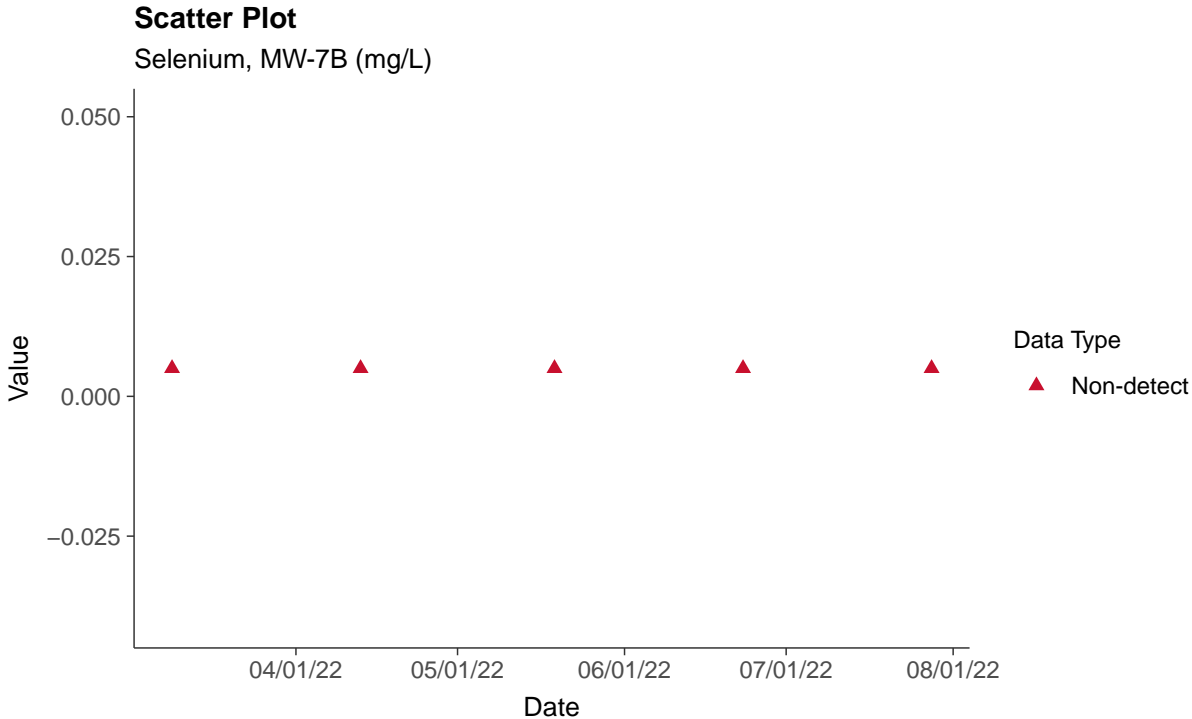
Selenium, MW-13 (mg/L)





### Appendix IV: Selenium, MW-7B

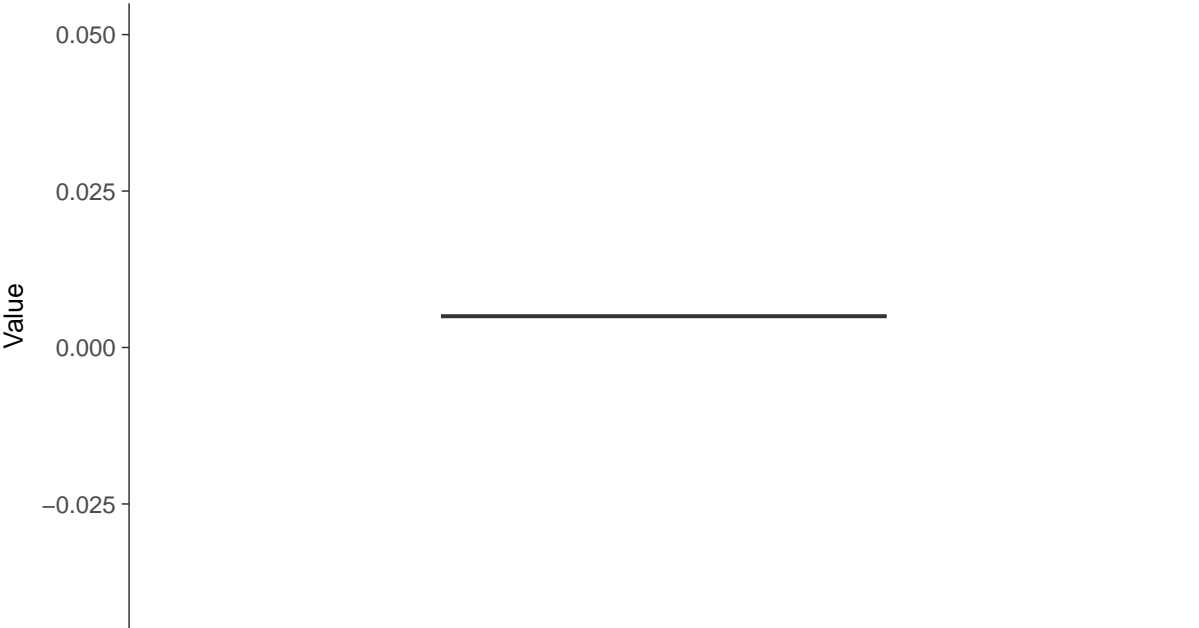
ID: 2\_26\_7B





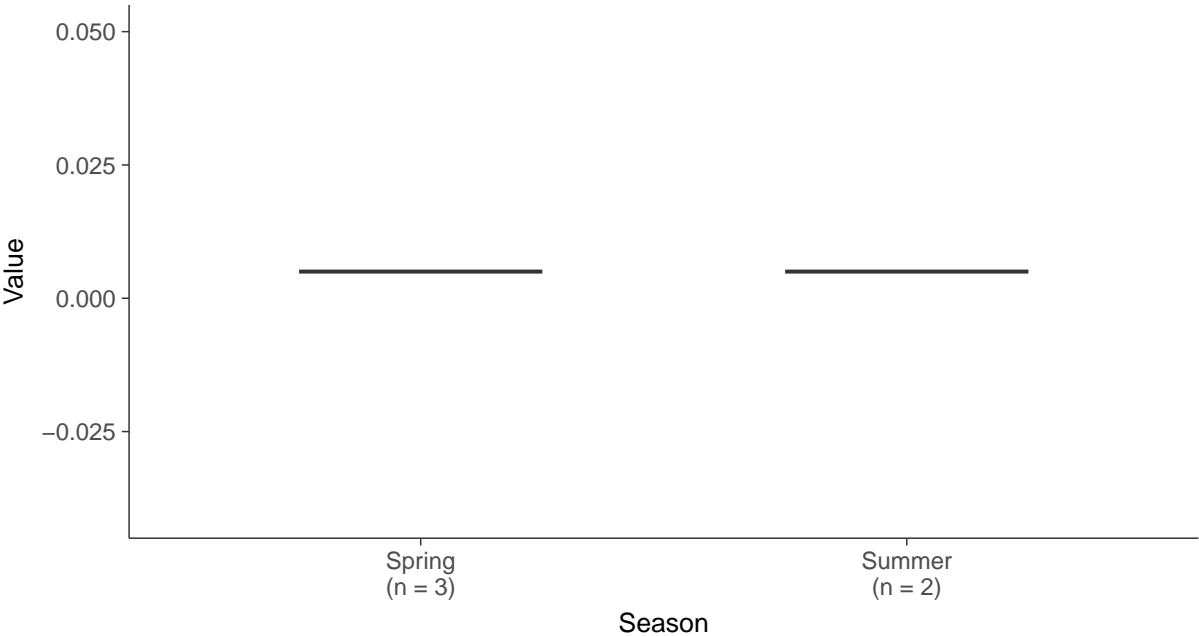
**Boxplot**

Selenium, MW-7B (mg/L)



**Boxplot by Season**

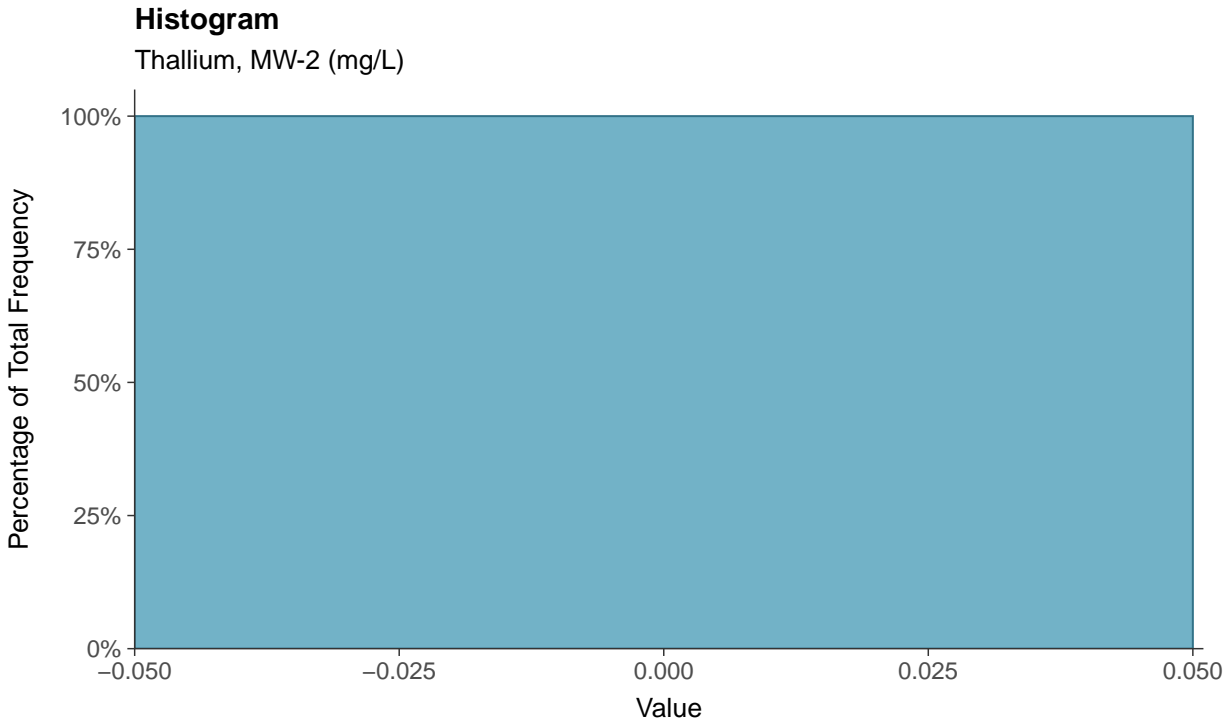
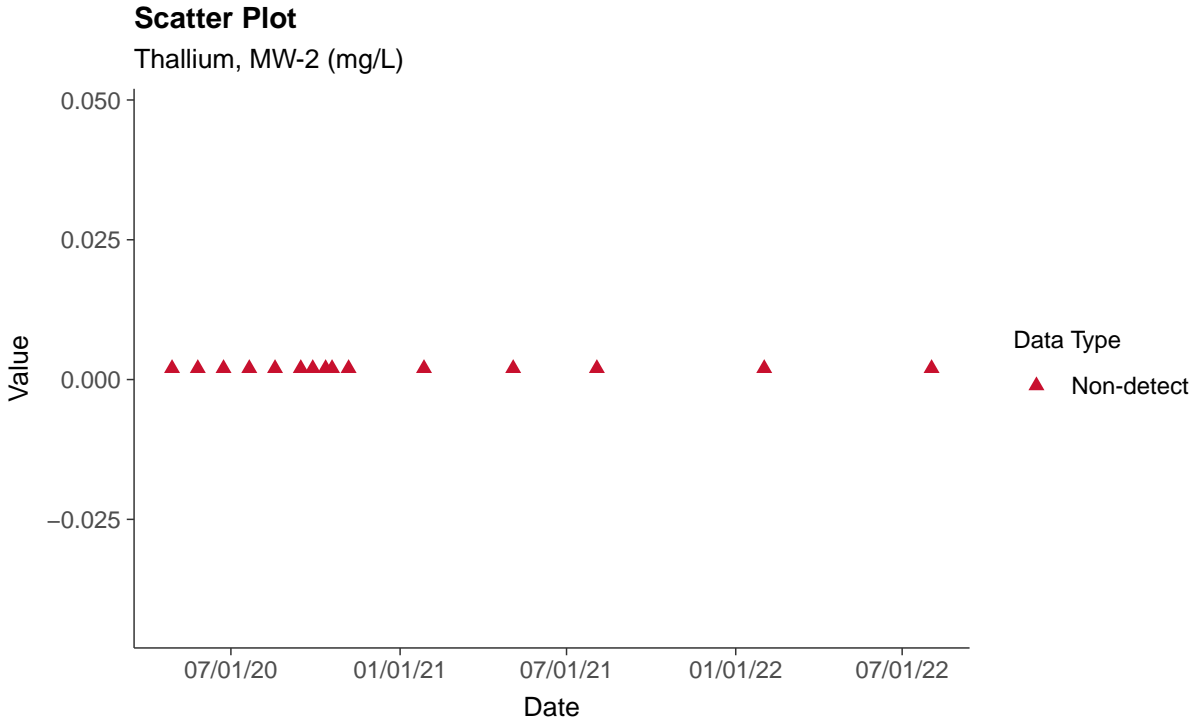
Selenium, MW-7B (mg/L)





### Appendix IV: Thallium, MW-2

ID: 2\_28\_02





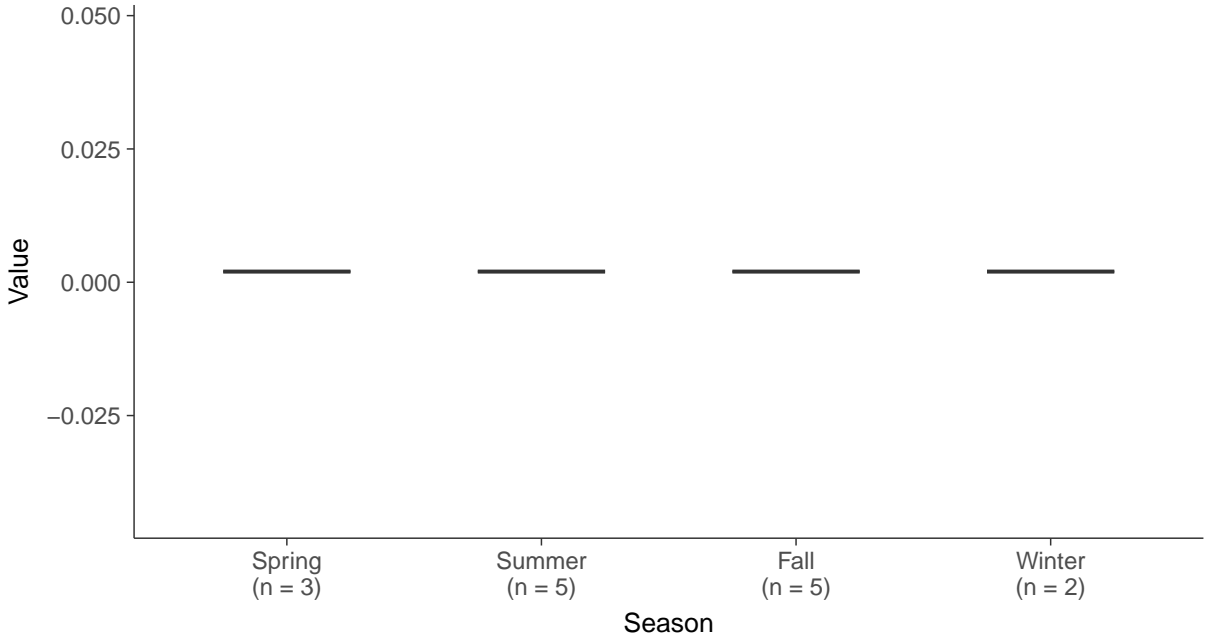
**Boxplot**

Thallium, MW-2 (mg/L)



**Boxplot by Season**

Thallium, MW-2 (mg/L)

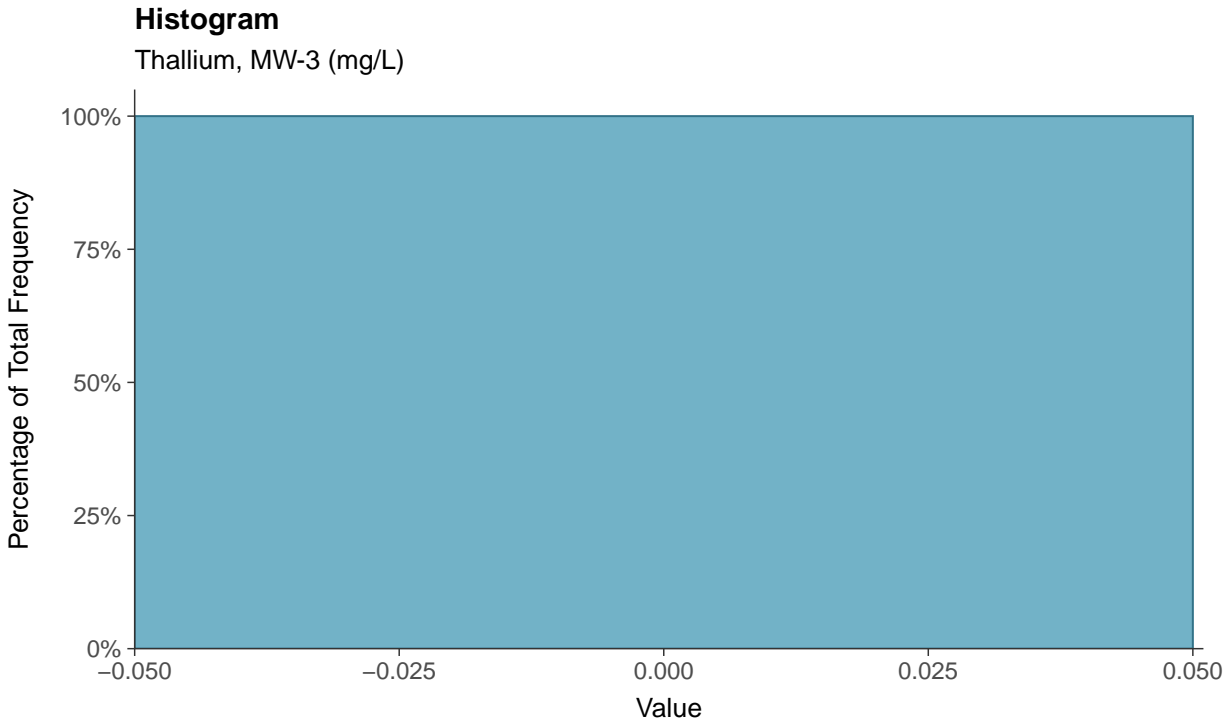
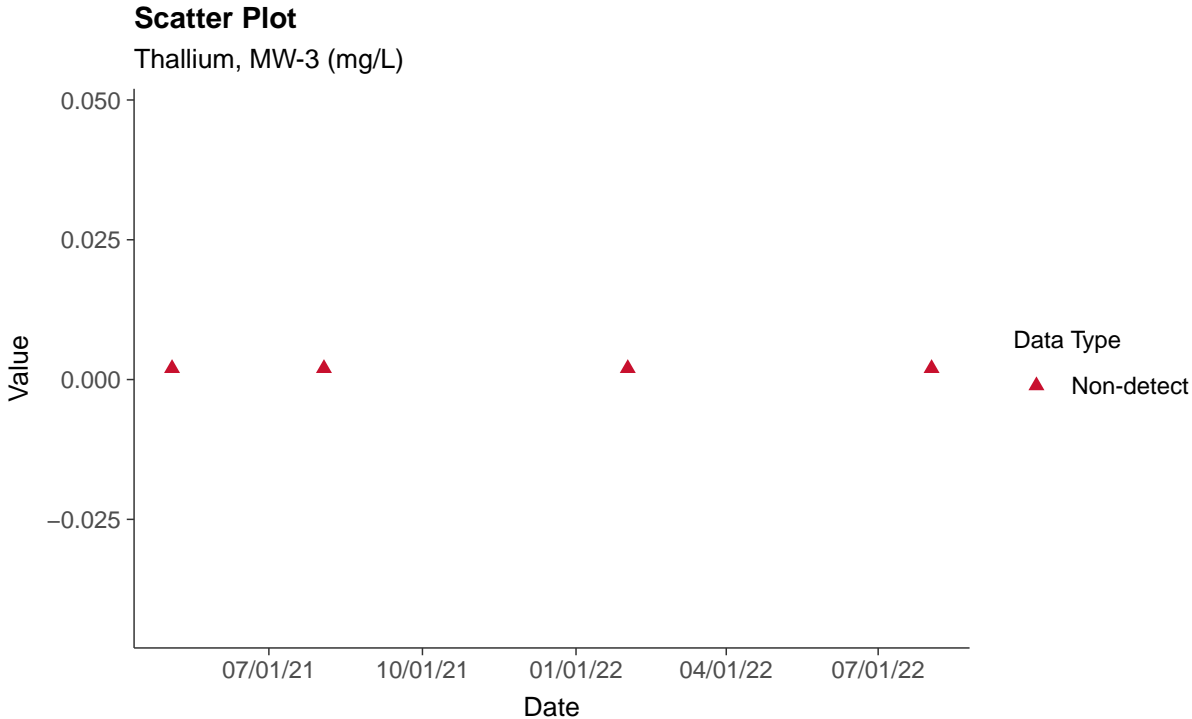






### Appendix IV: Thallium, MW-3

ID: 2\_28\_03





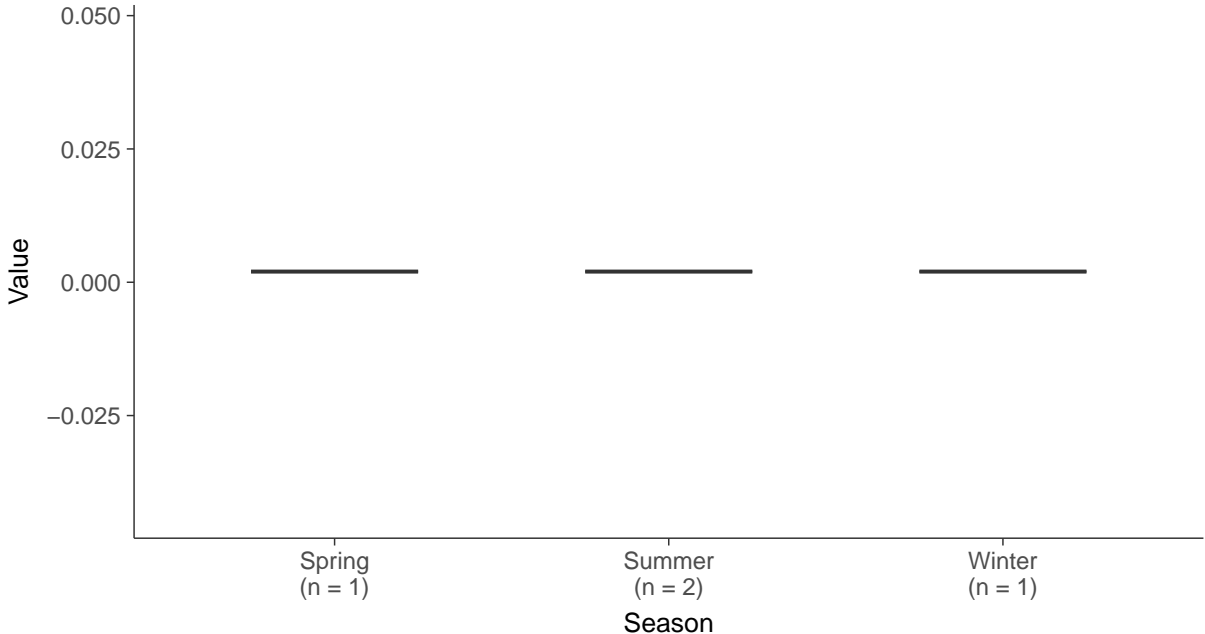
**Boxplot**

Thallium, MW-3 (mg/L)



**Boxplot by Season**

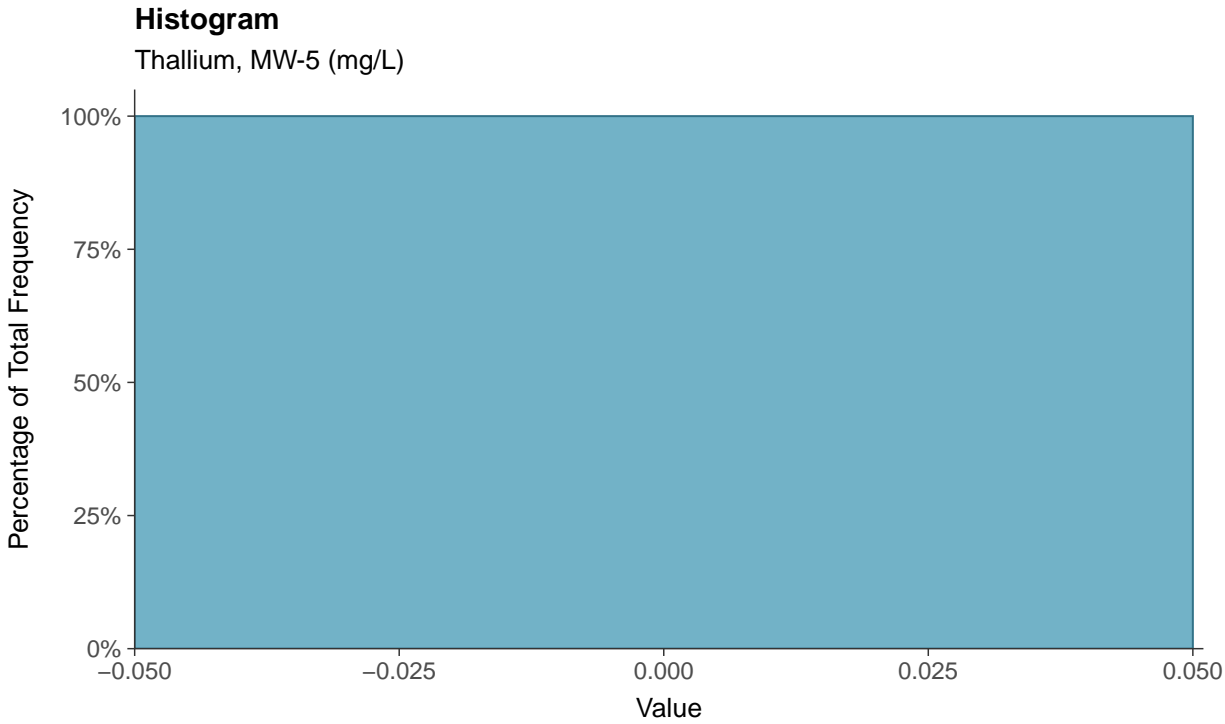
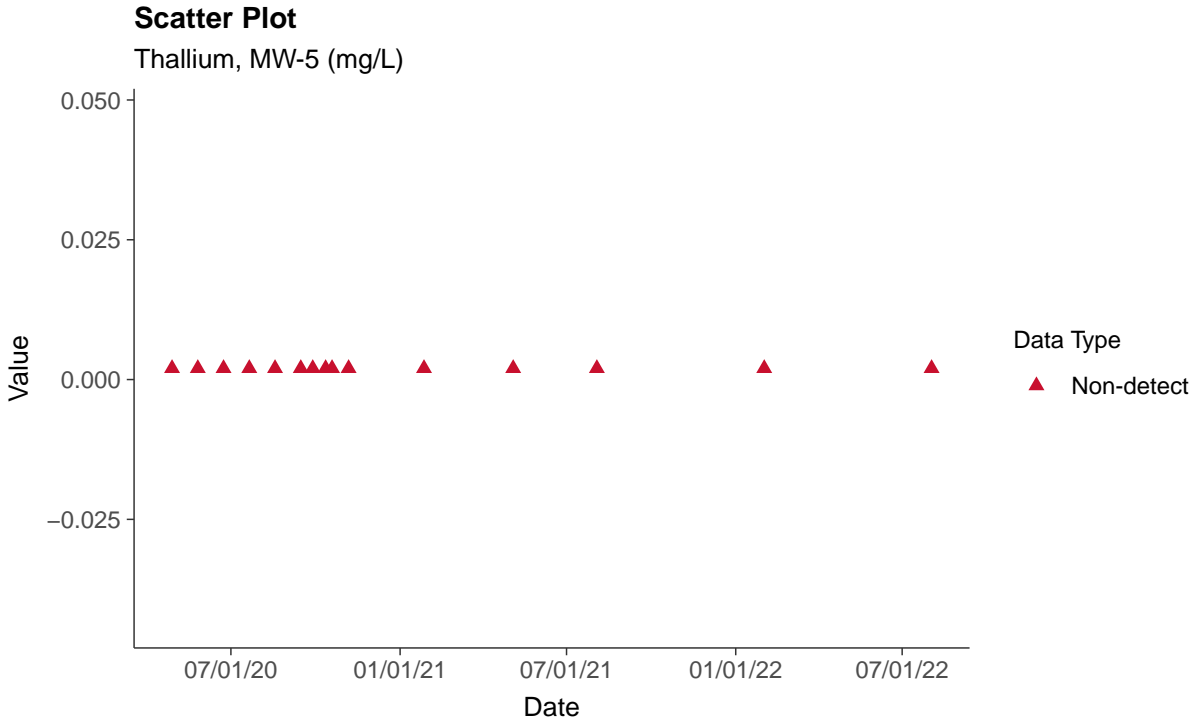
Thallium, MW-3 (mg/L)





### Appendix IV: Thallium, MW-5

ID: 2\_28\_05





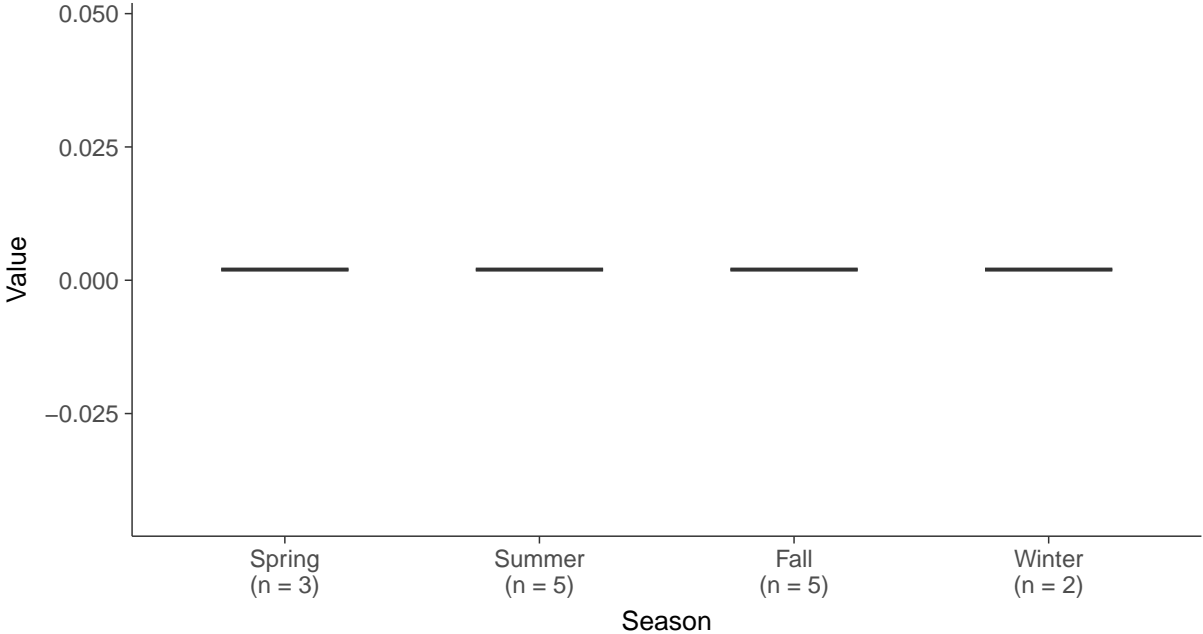
**Boxplot**

Thallium, MW-5 (mg/L)



**Boxplot by Season**

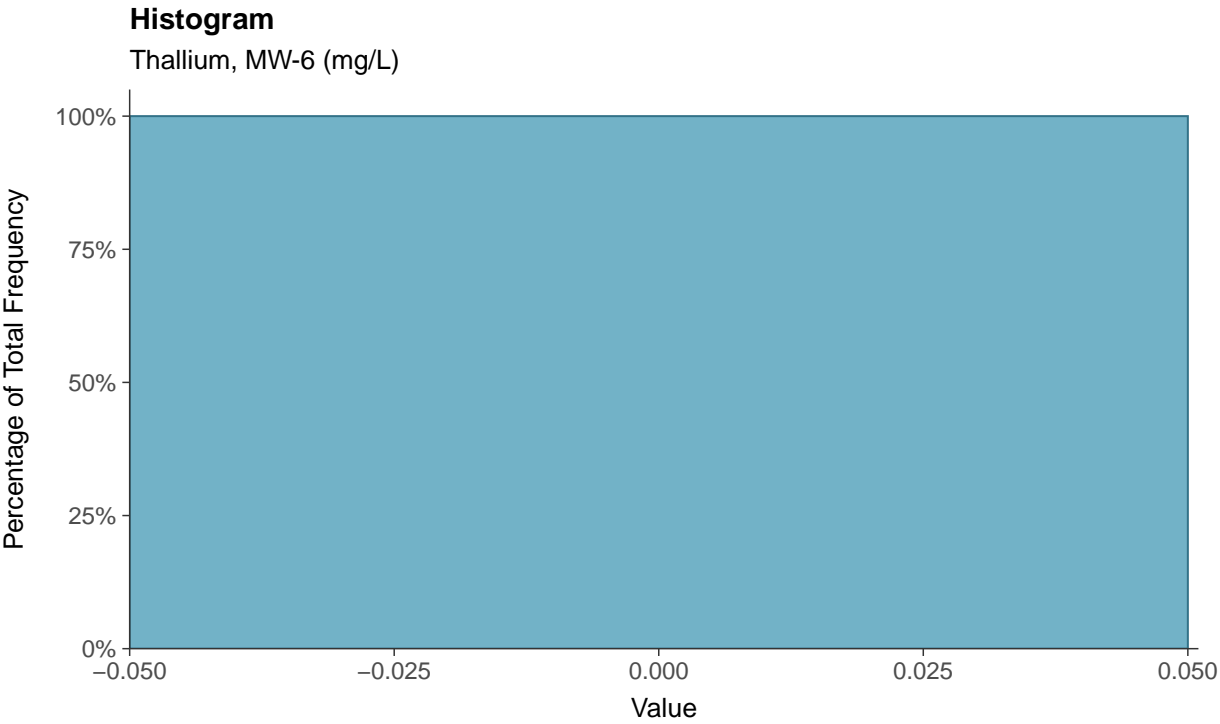
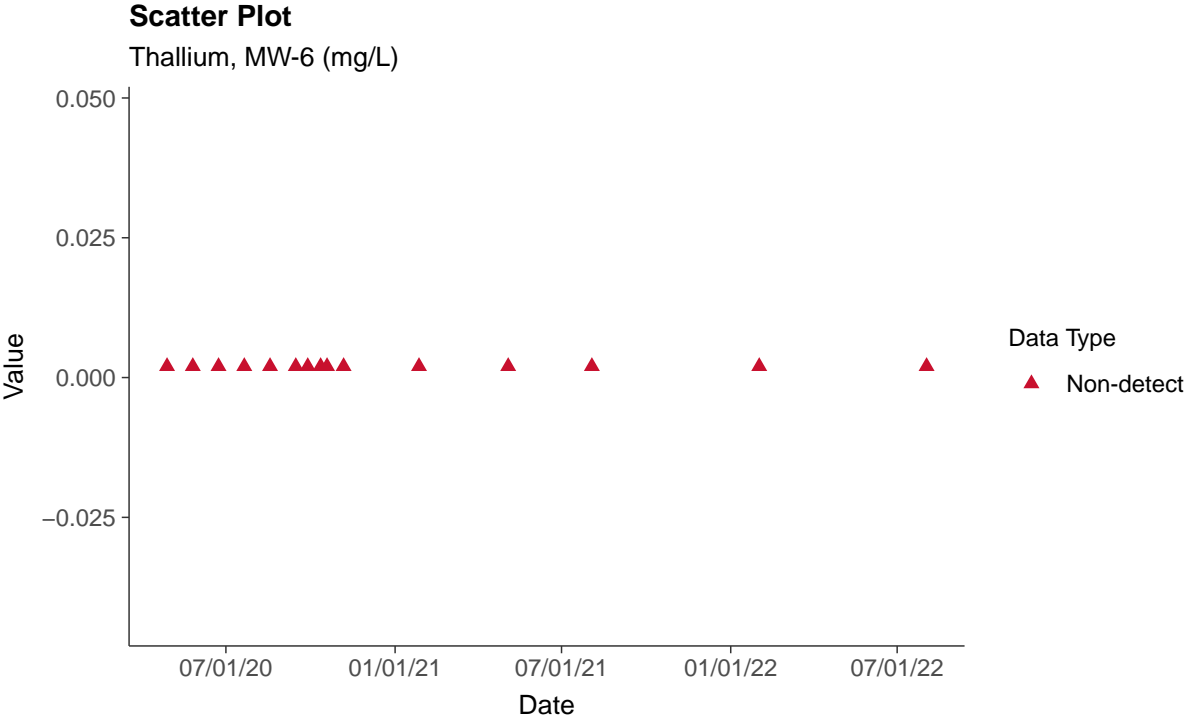
Thallium, MW-5 (mg/L)





### Appendix IV: Thallium, MW-6

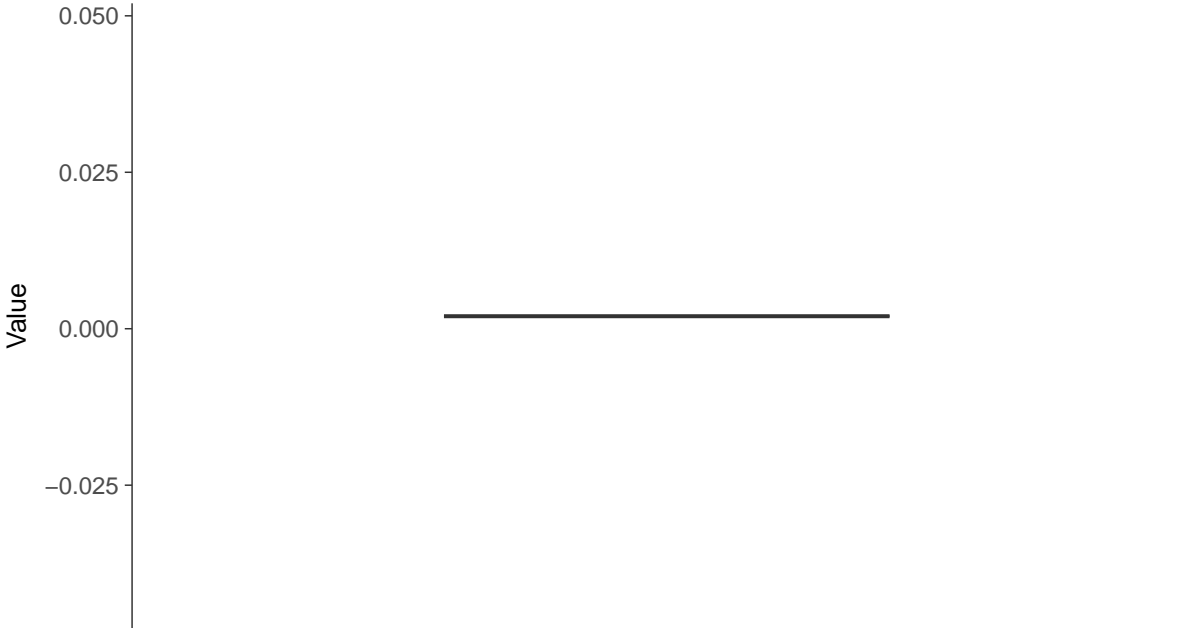
ID: 2\_28\_06





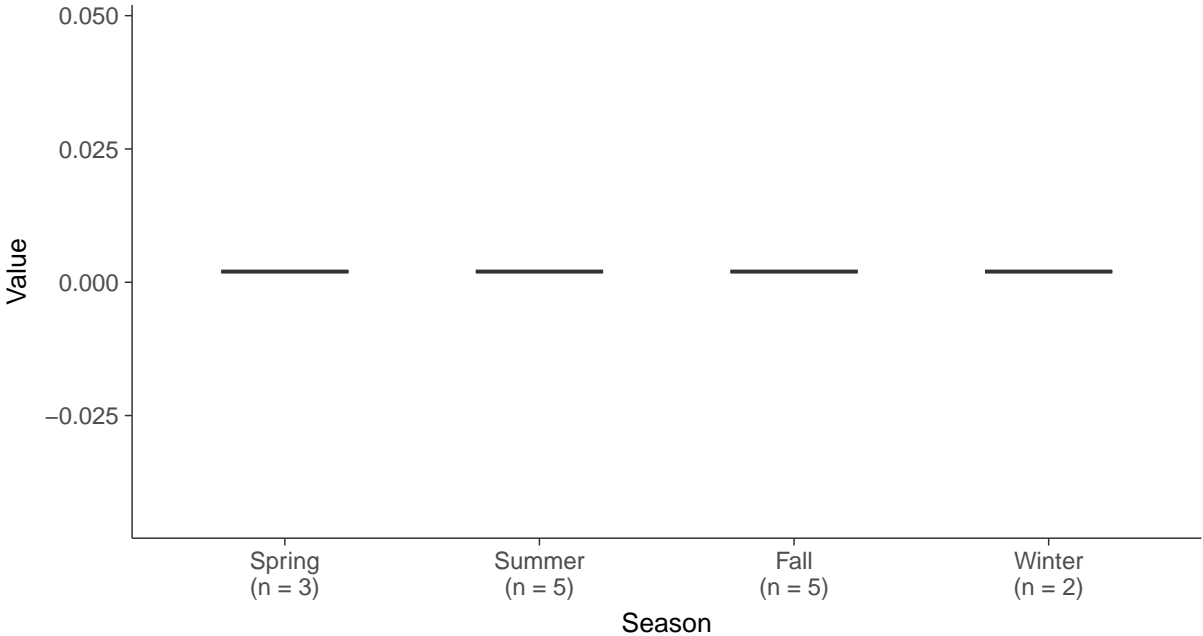
**Boxplot**

Thallium, MW-6 (mg/L)



**Boxplot by Season**

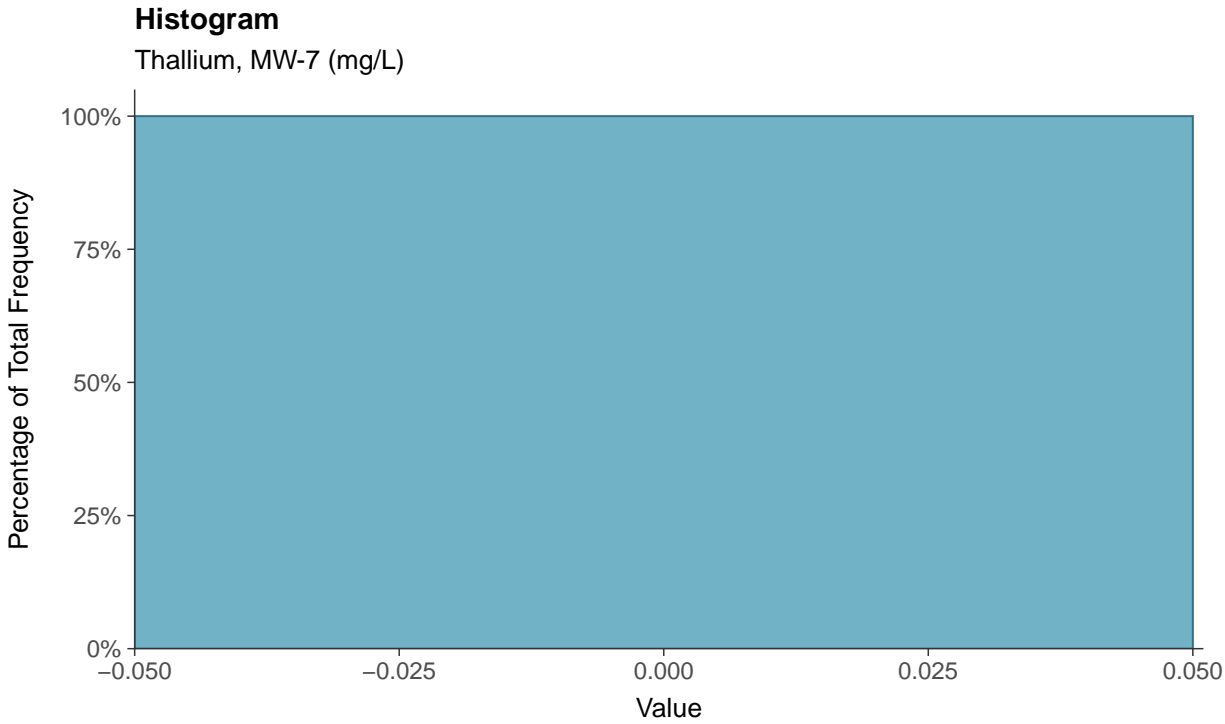
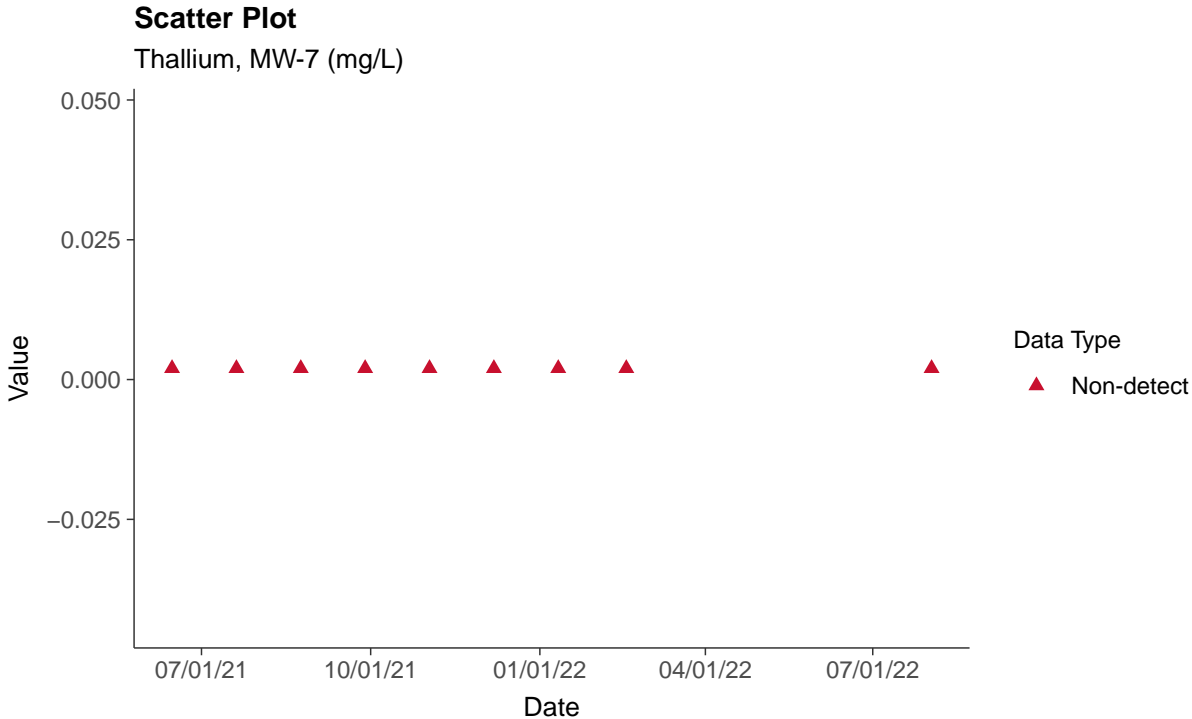
Thallium, MW-6 (mg/L)





### Appendix IV: Thallium, MW-7

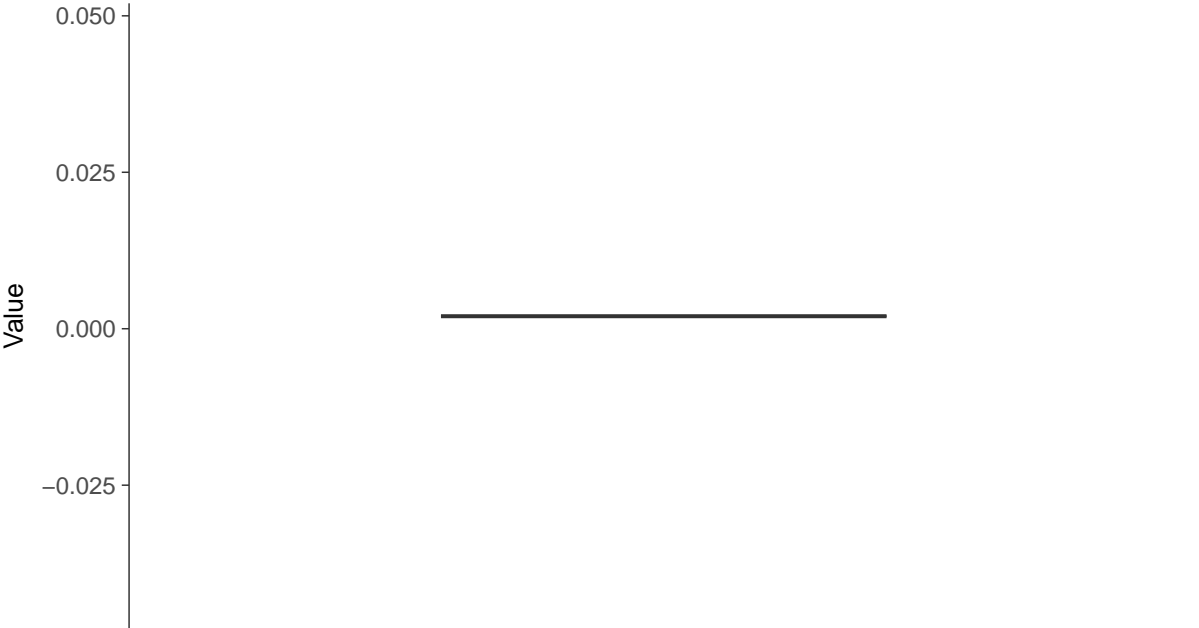
ID: 2\_28\_07





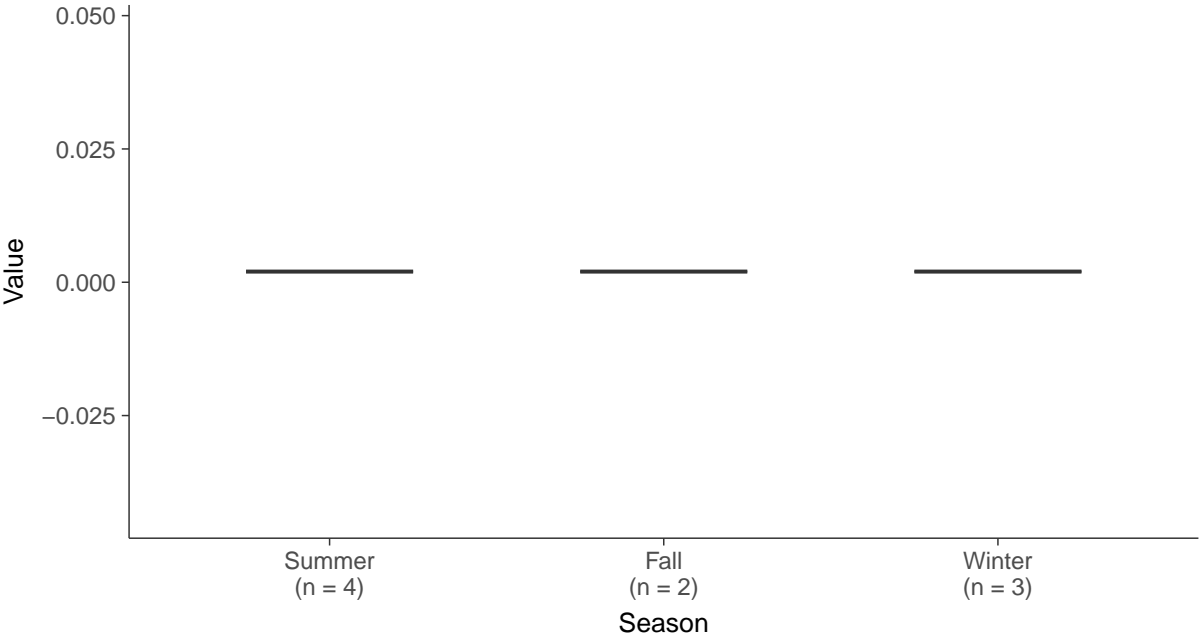
**Boxplot**

Thallium, MW-7 (mg/L)



**Boxplot by Season**

Thallium, MW-7 (mg/L)

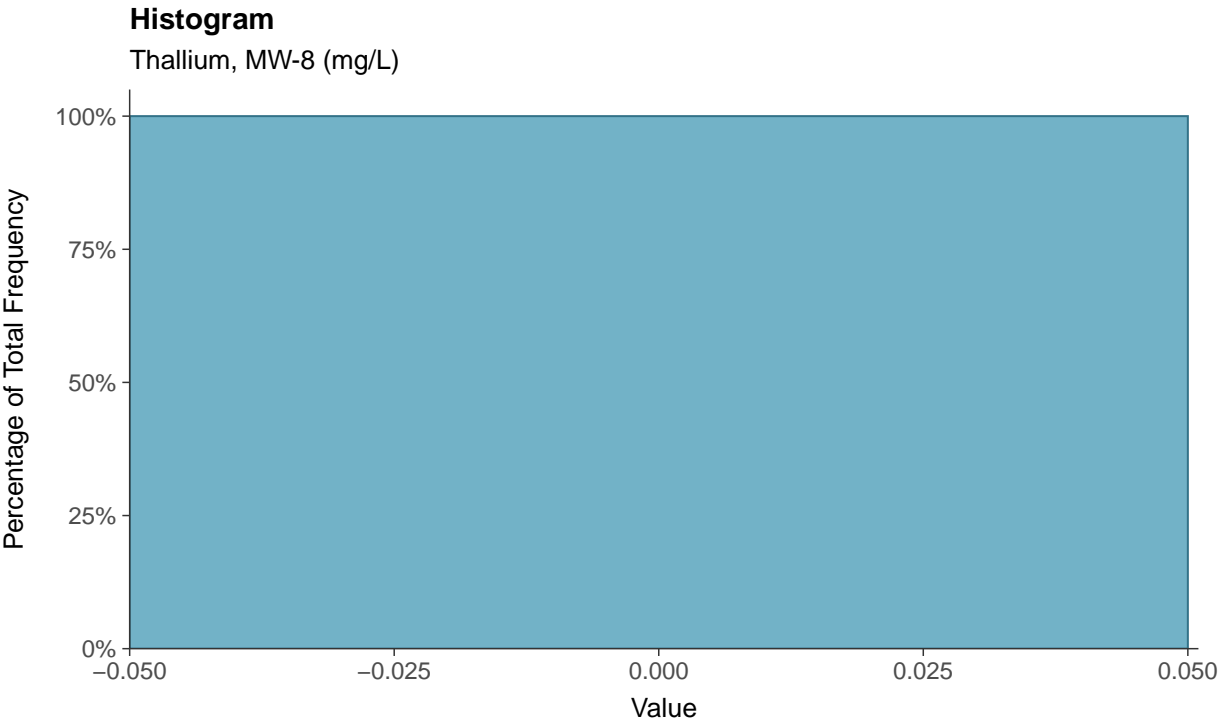
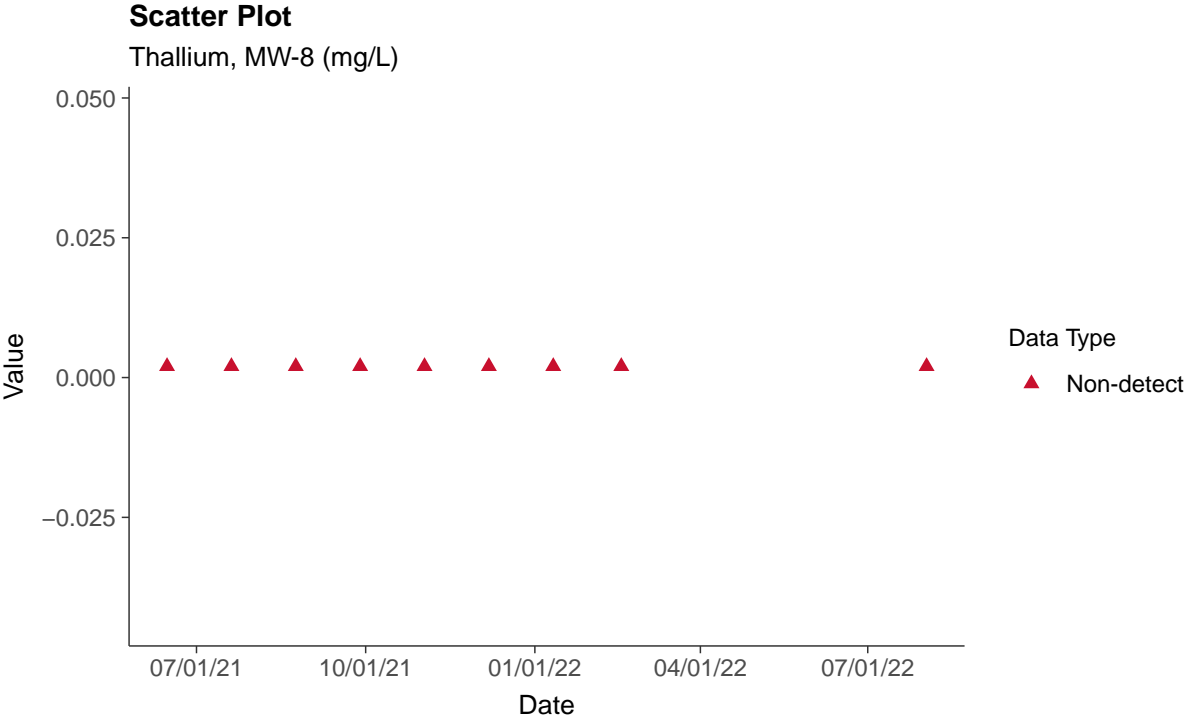






### Appendix IV: Thallium, MW-8

ID: 2\_28\_08





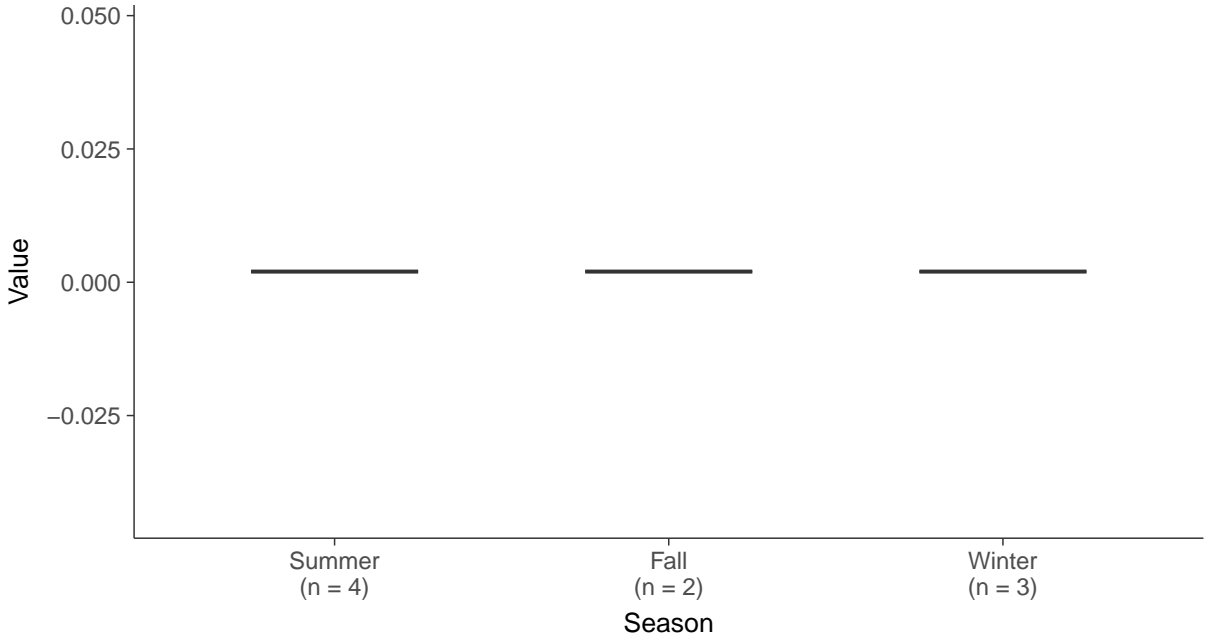
**Boxplot**

Thallium, MW-8 (mg/L)



**Boxplot by Season**

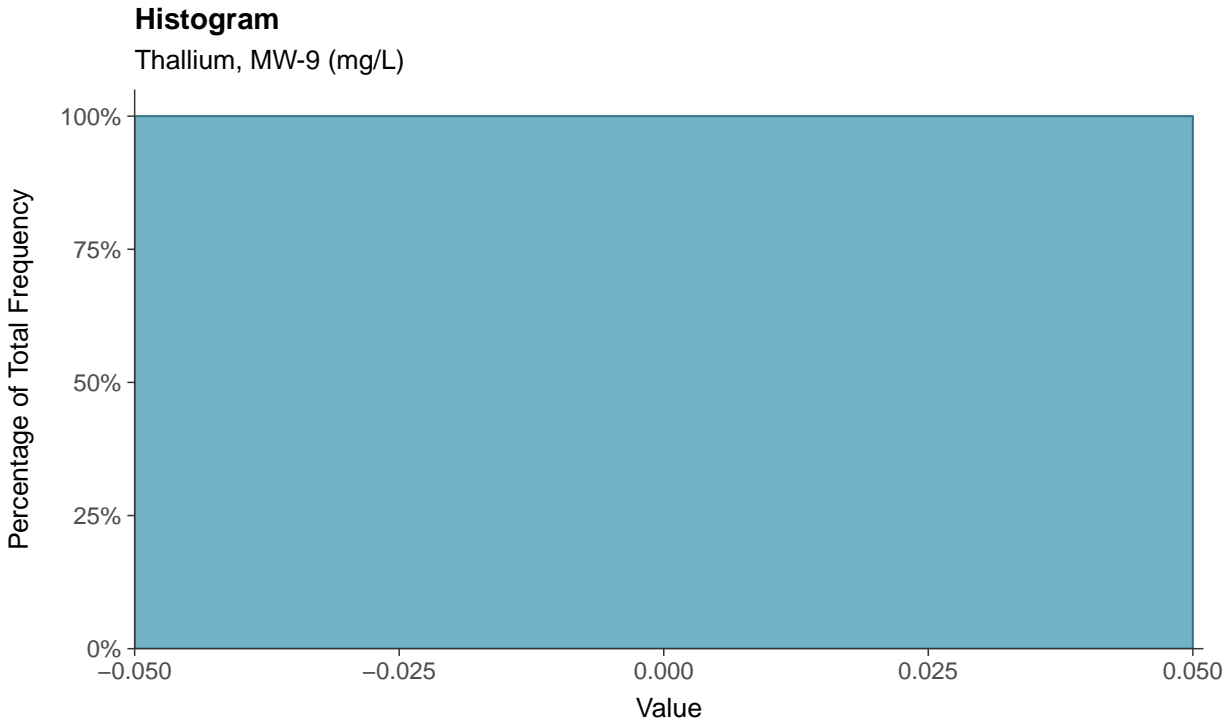
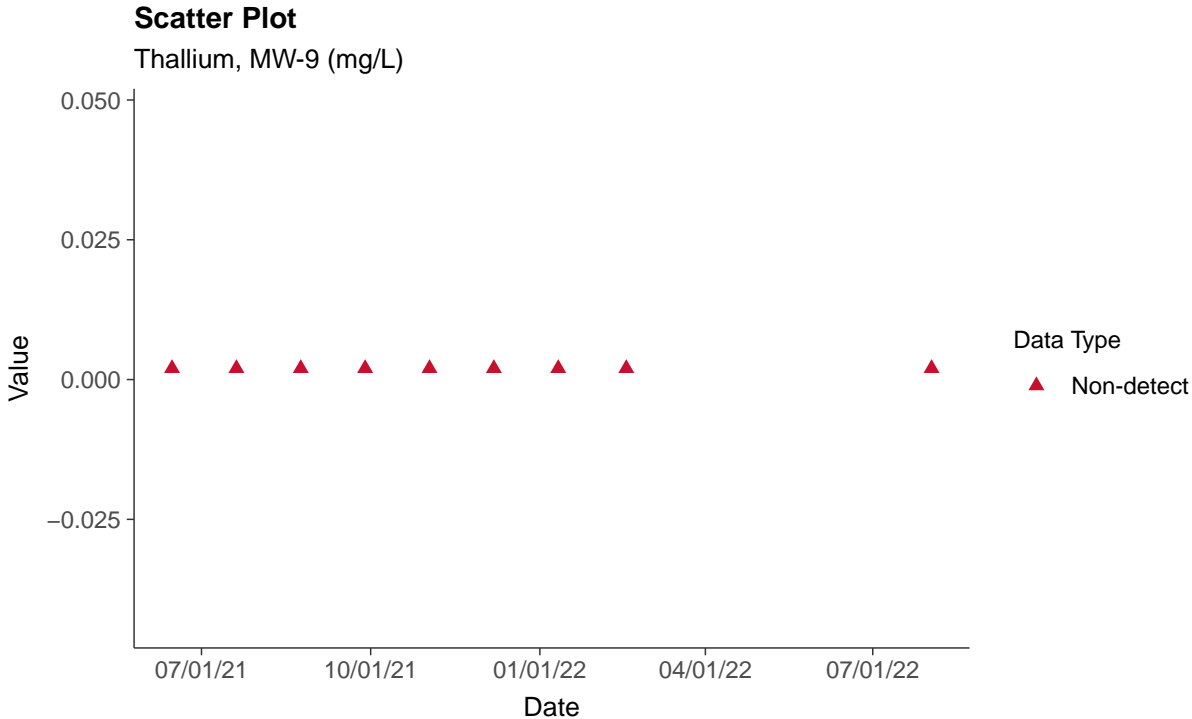
Thallium, MW-8 (mg/L)





### Appendix IV: Thallium, MW-9

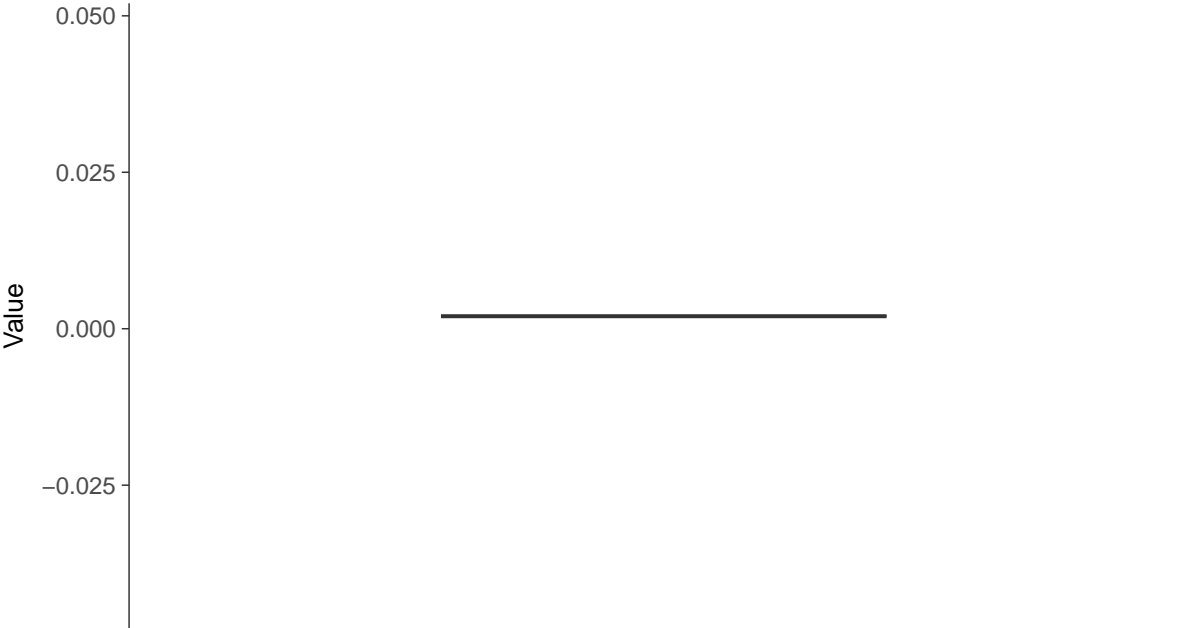
ID: 2\_28\_09





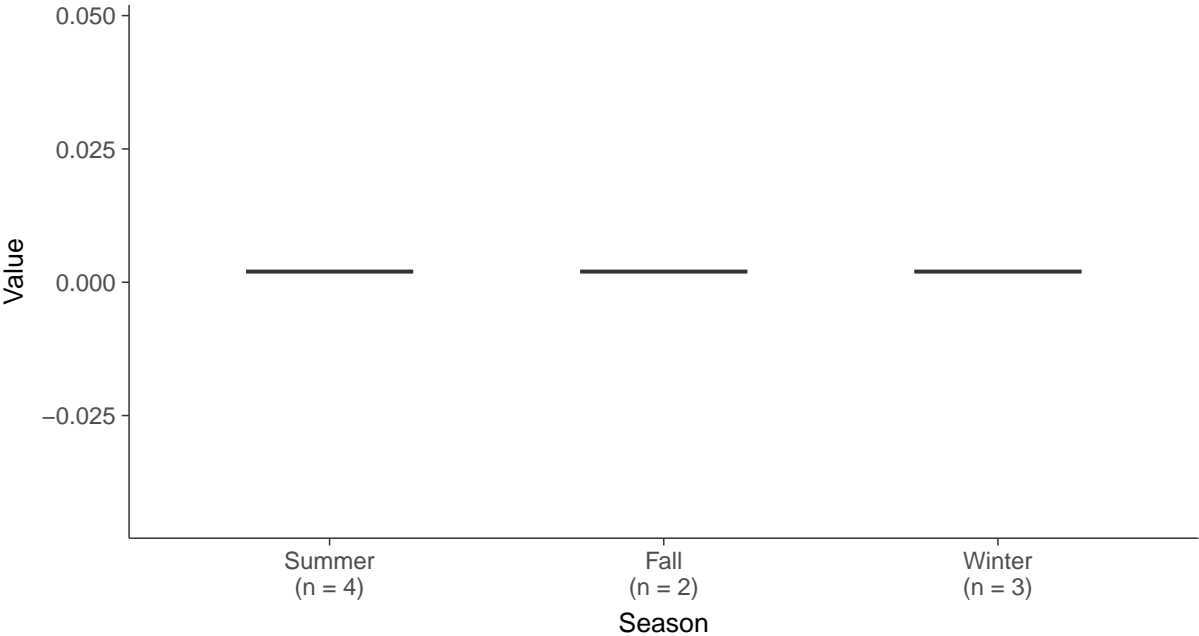
**Boxplot**

Thallium, MW-9 (mg/L)



**Boxplot by Season**

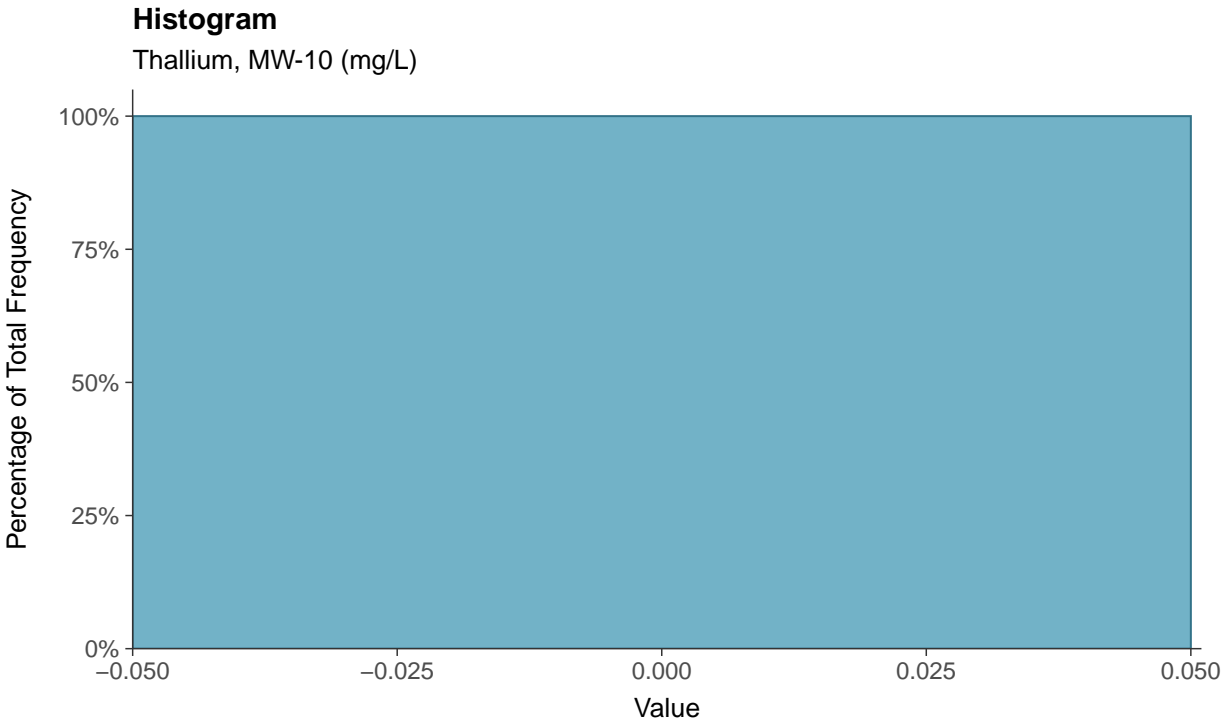
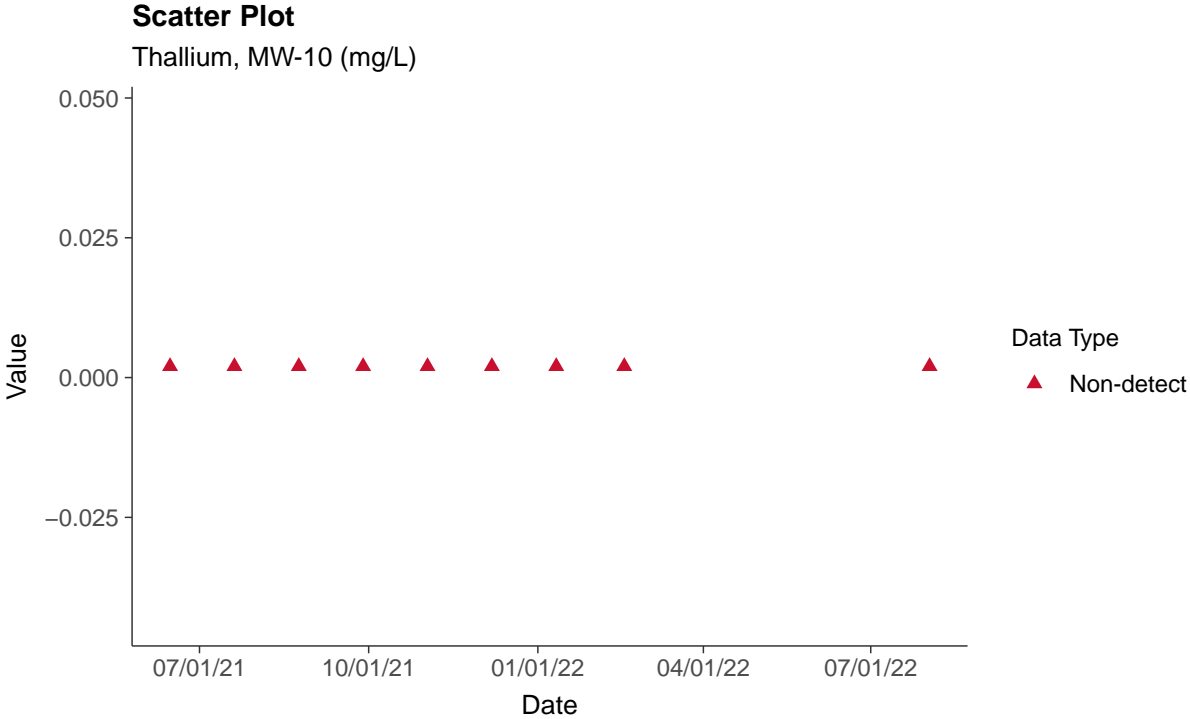
Thallium, MW-9 (mg/L)





### Appendix IV: Thallium, MW-10

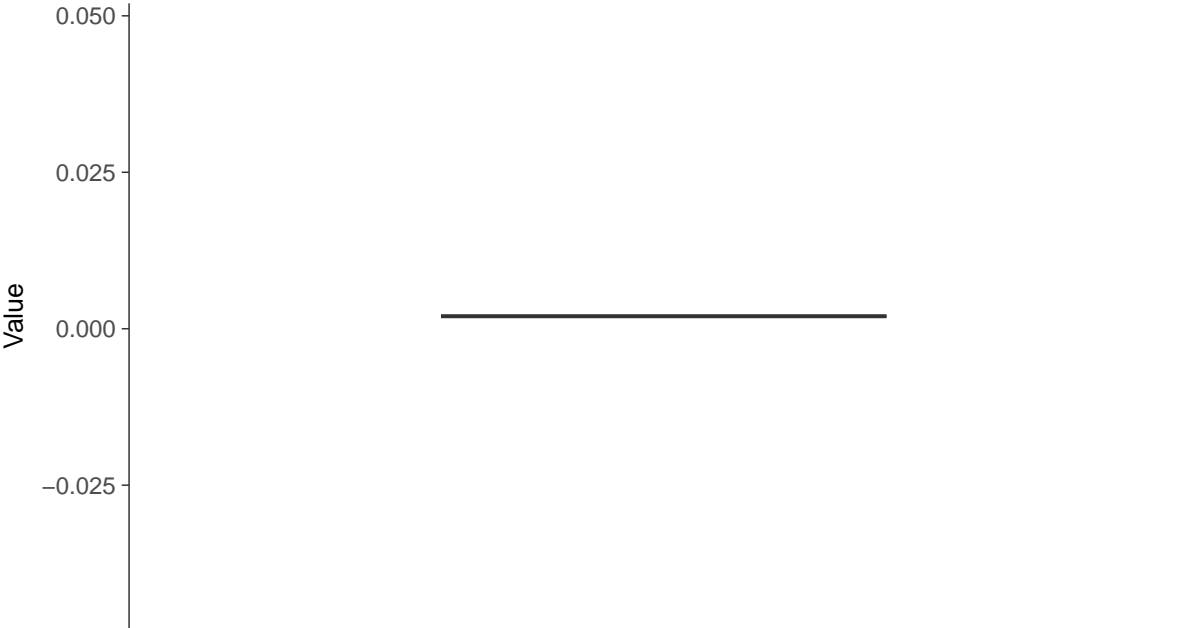
ID: 2\_28\_10





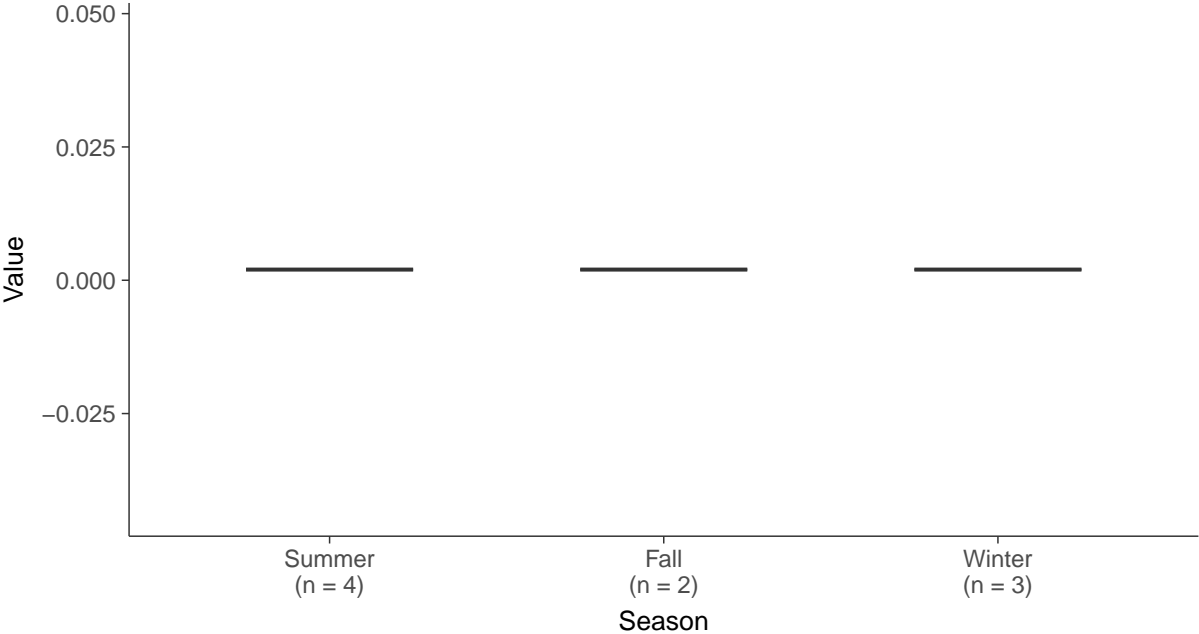
**Boxplot**

Thallium, MW-10 (mg/L)



**Boxplot by Season**

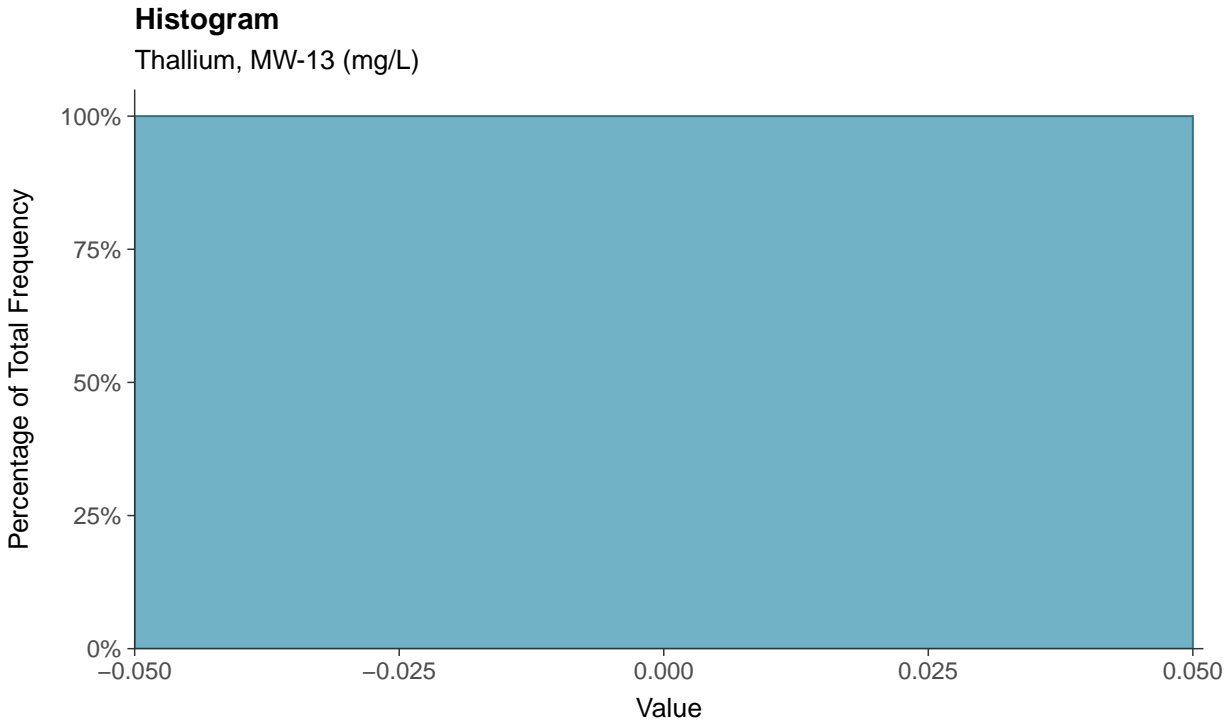
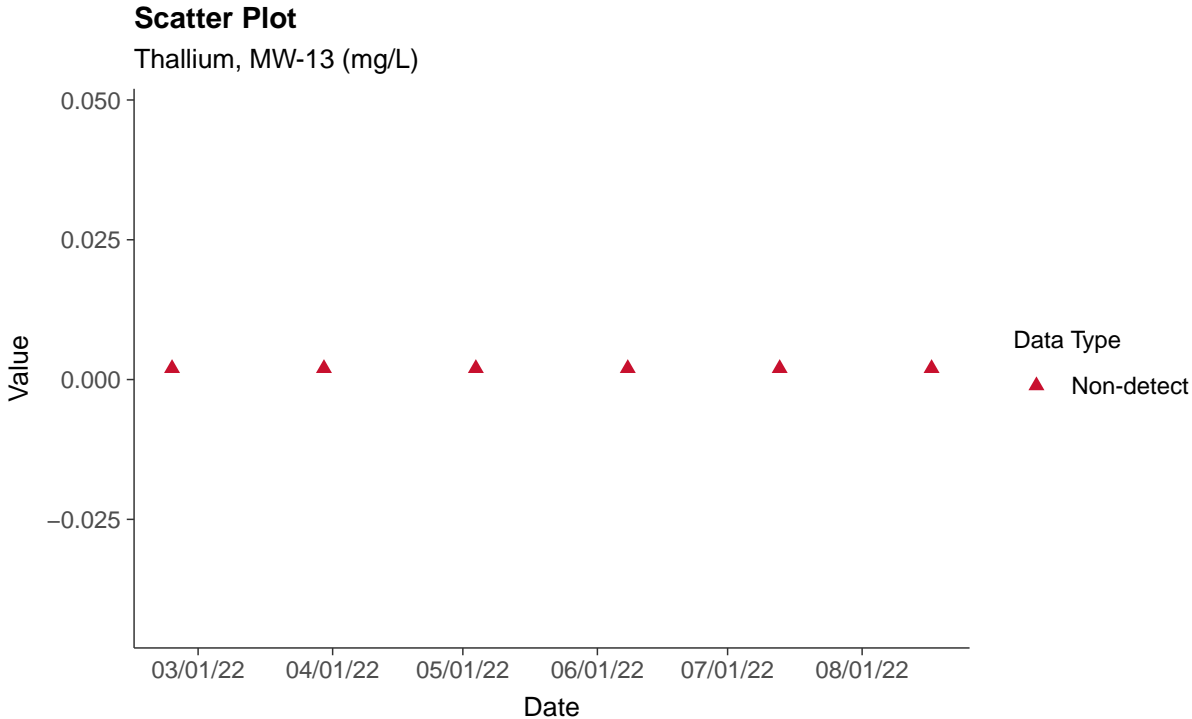
Thallium, MW-10 (mg/L)





### Appendix IV: Thallium, MW-13

ID: 2\_28\_13





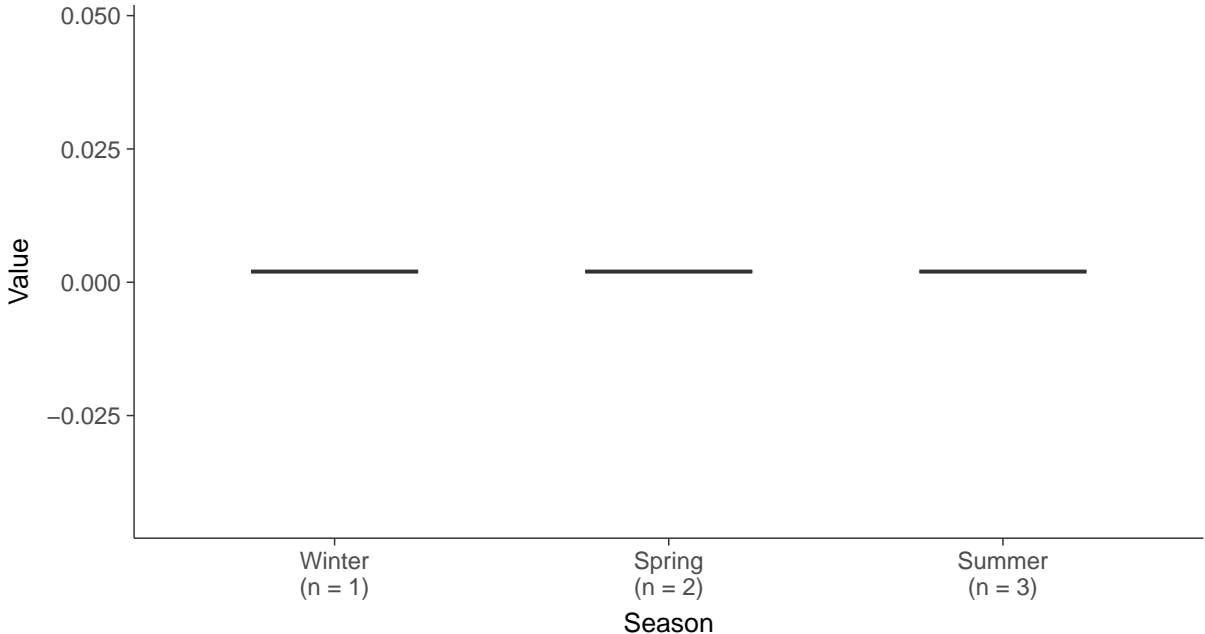
**Boxplot**

Thallium, MW-13 (mg/L)



**Boxplot by Season**

Thallium, MW-13 (mg/L)

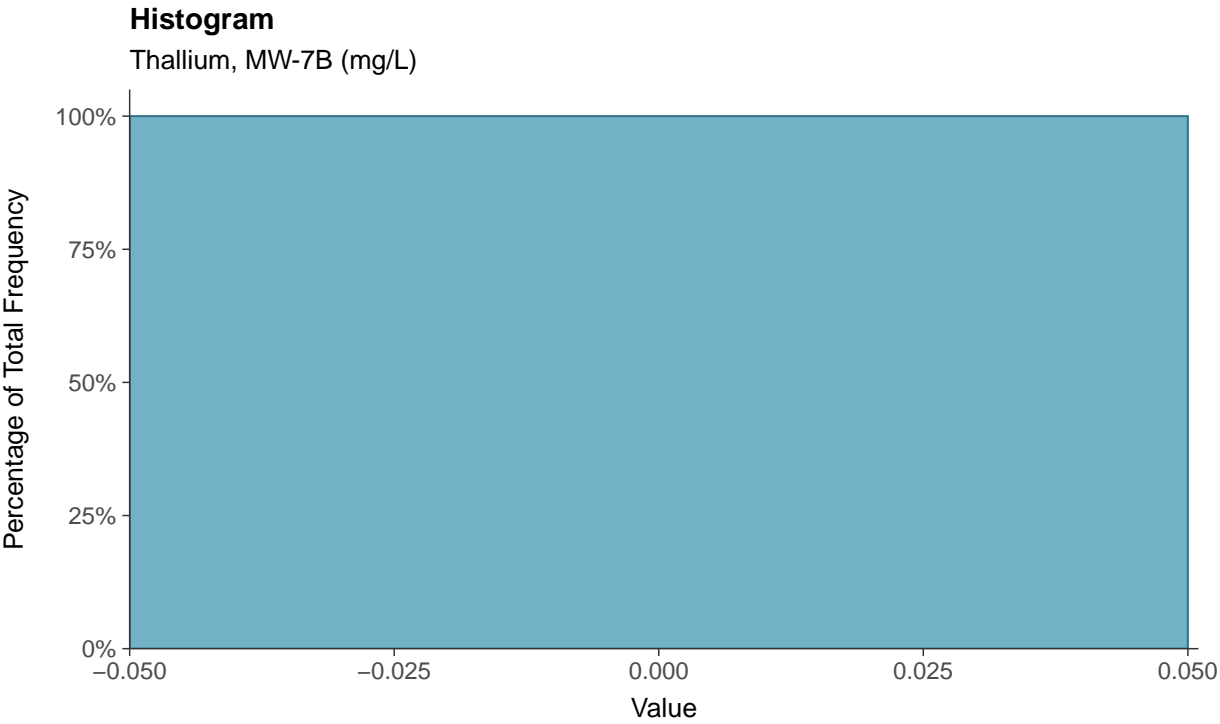
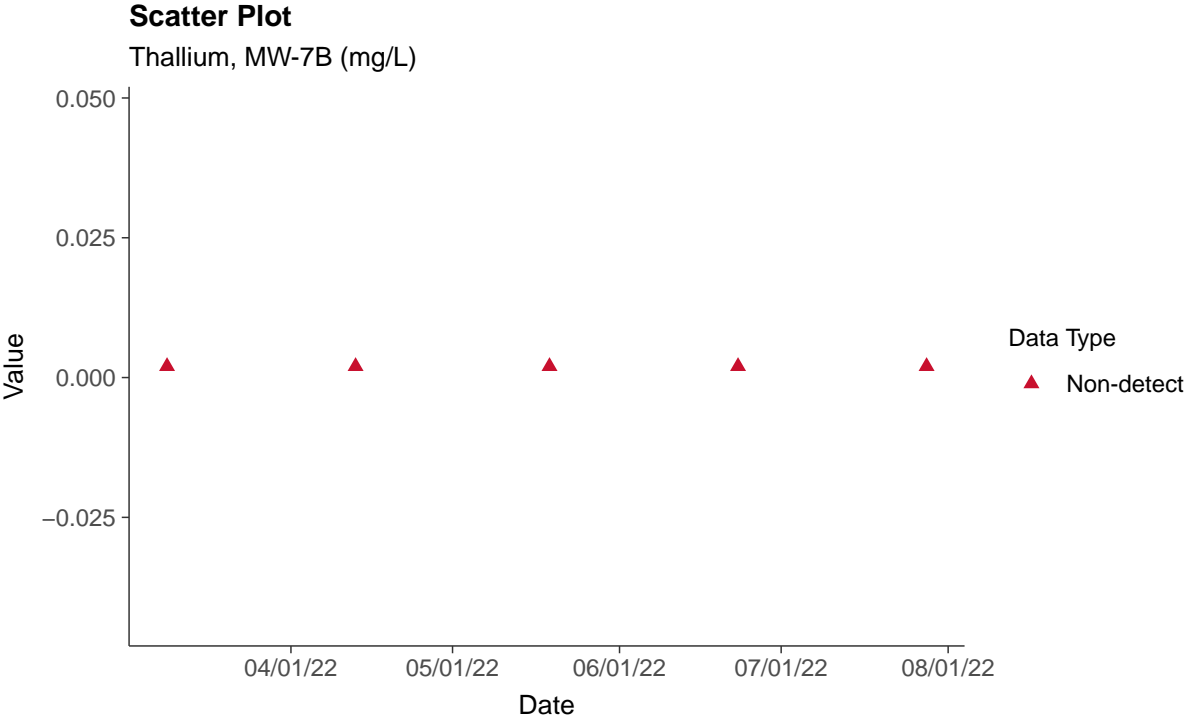






### Appendix IV: Thallium, MW-7B

ID: 2\_28\_7B





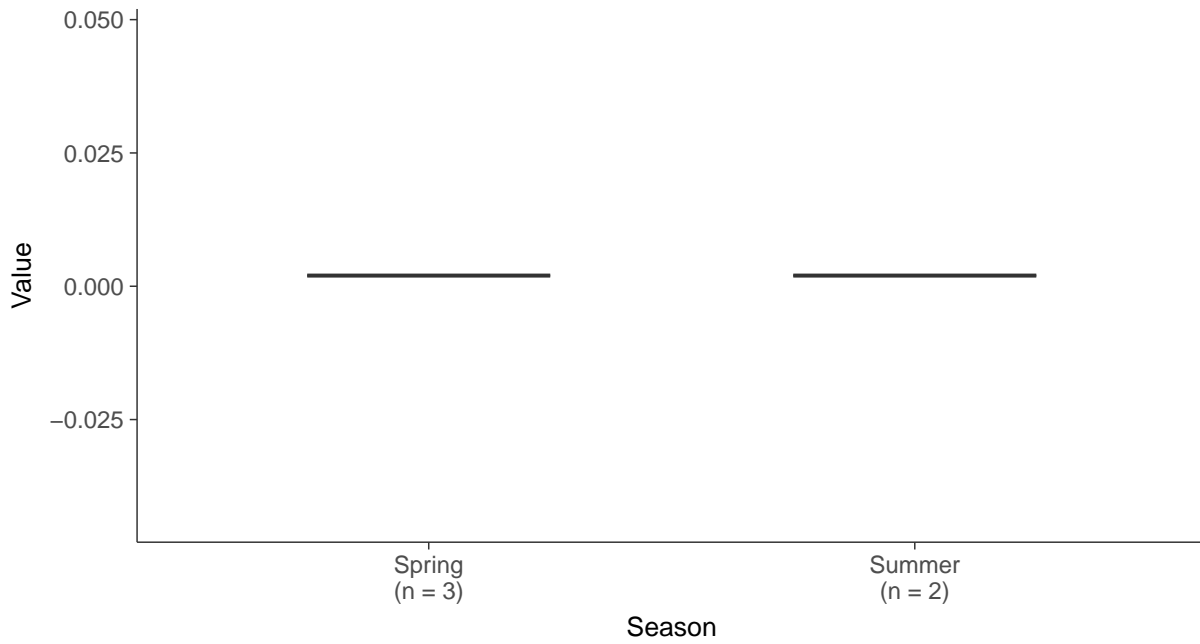
### Boxplot

Thallium, MW-7B (mg/L)



### Boxplot by Season

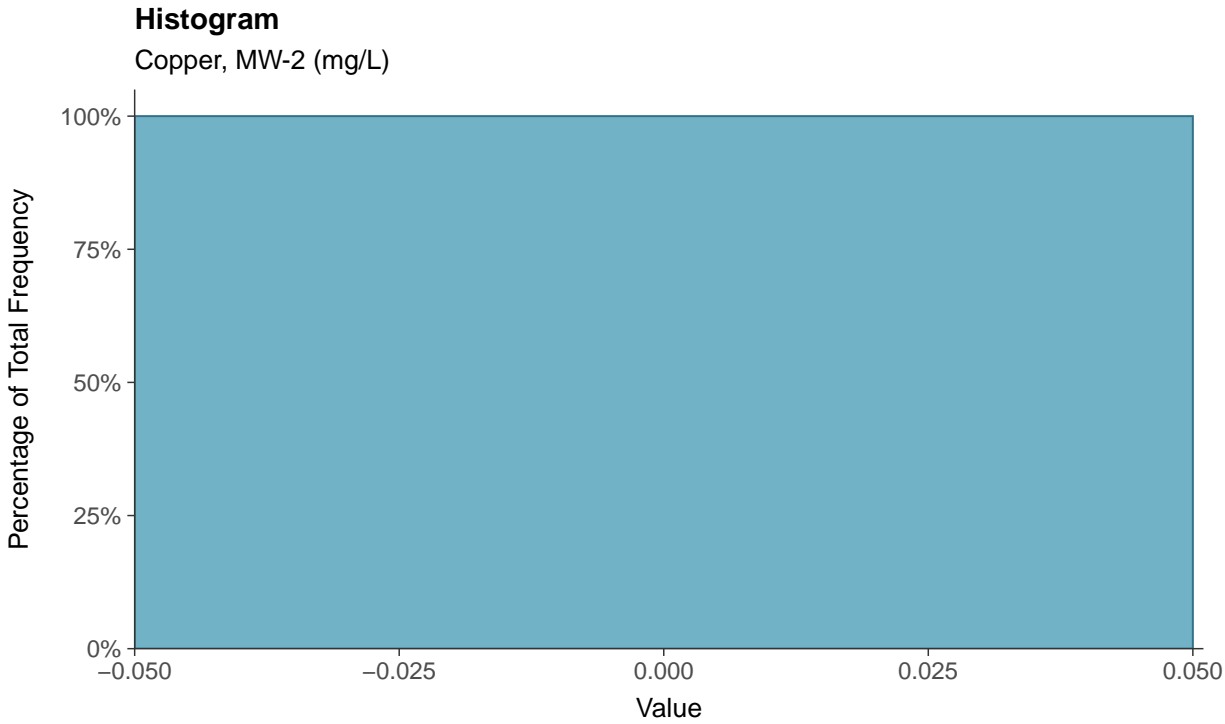
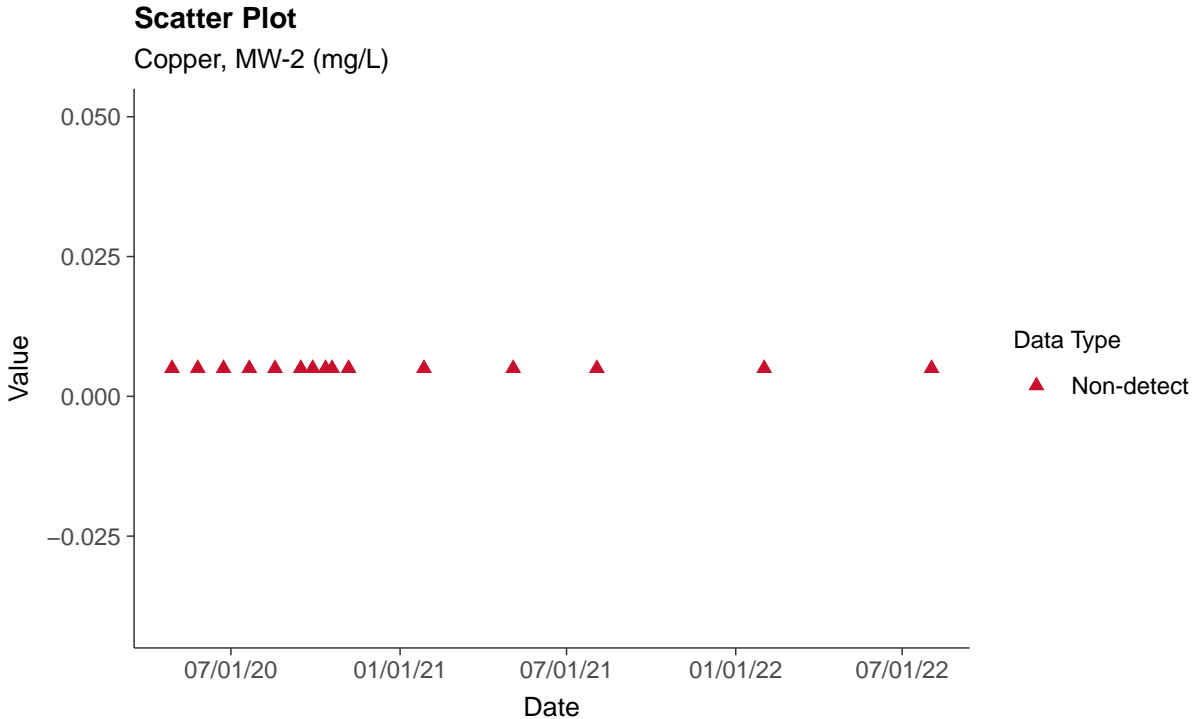
Thallium, MW-7B (mg/L)





**Part 115: Copper, MW-2**

ID: 5\_36\_02





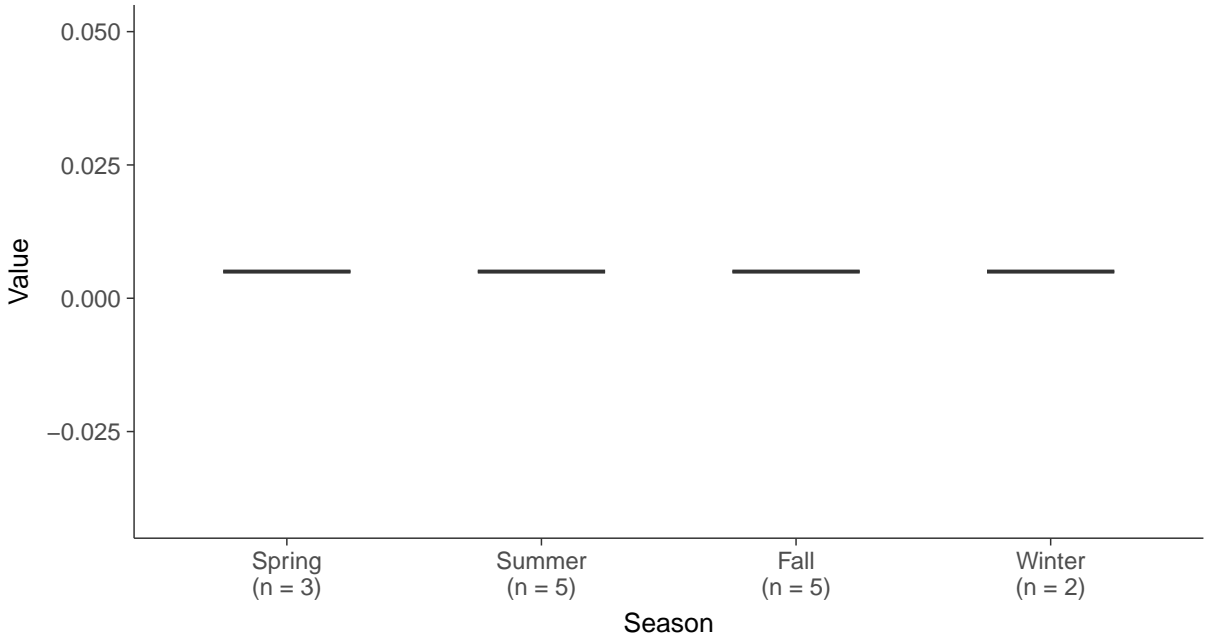
**Boxplot**

Copper, MW-2 (mg/L)



**Boxplot by Season**

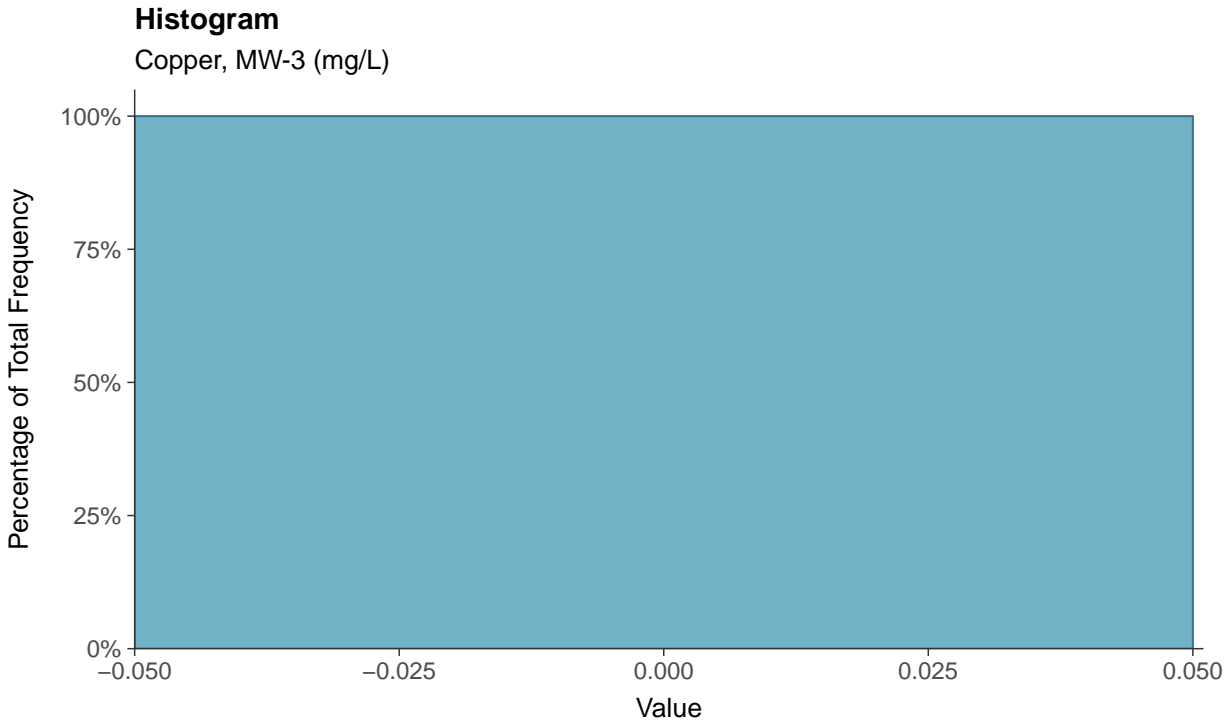
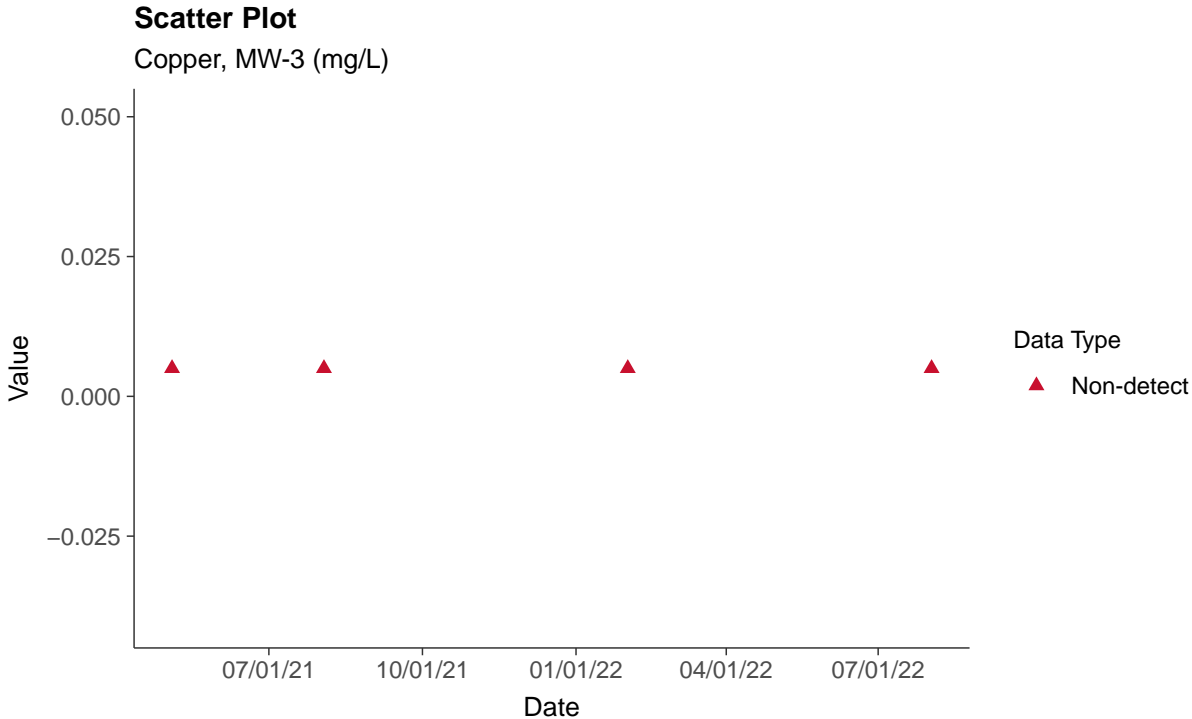
Copper, MW-2 (mg/L)





**Part 115: Copper, MW-3**

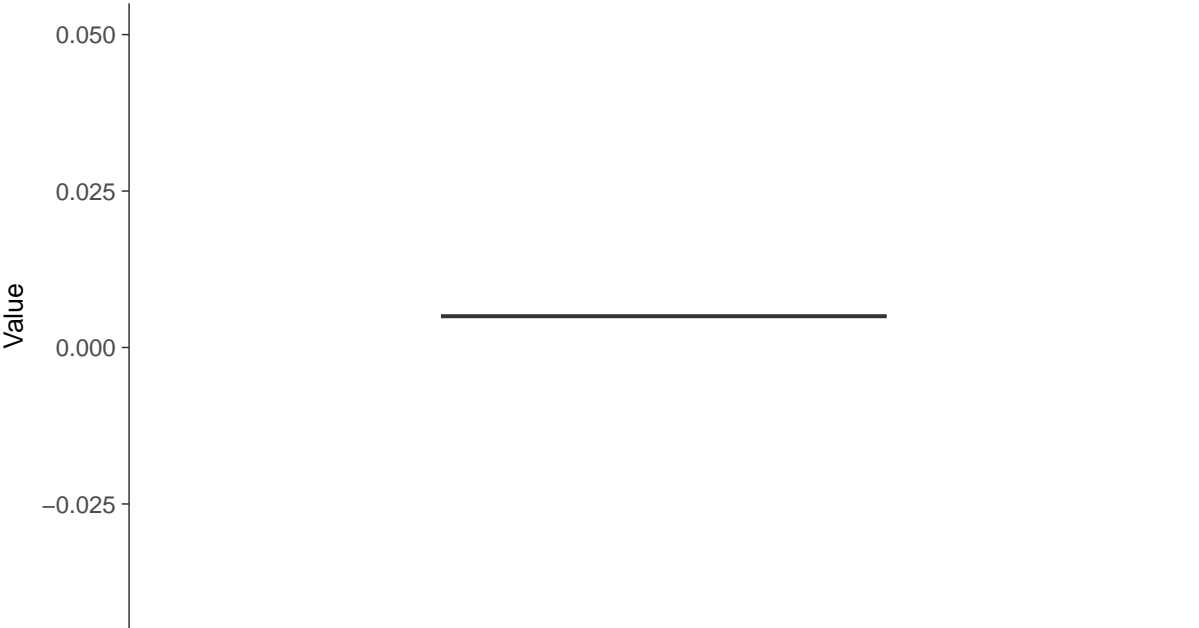
ID: 5\_36\_03





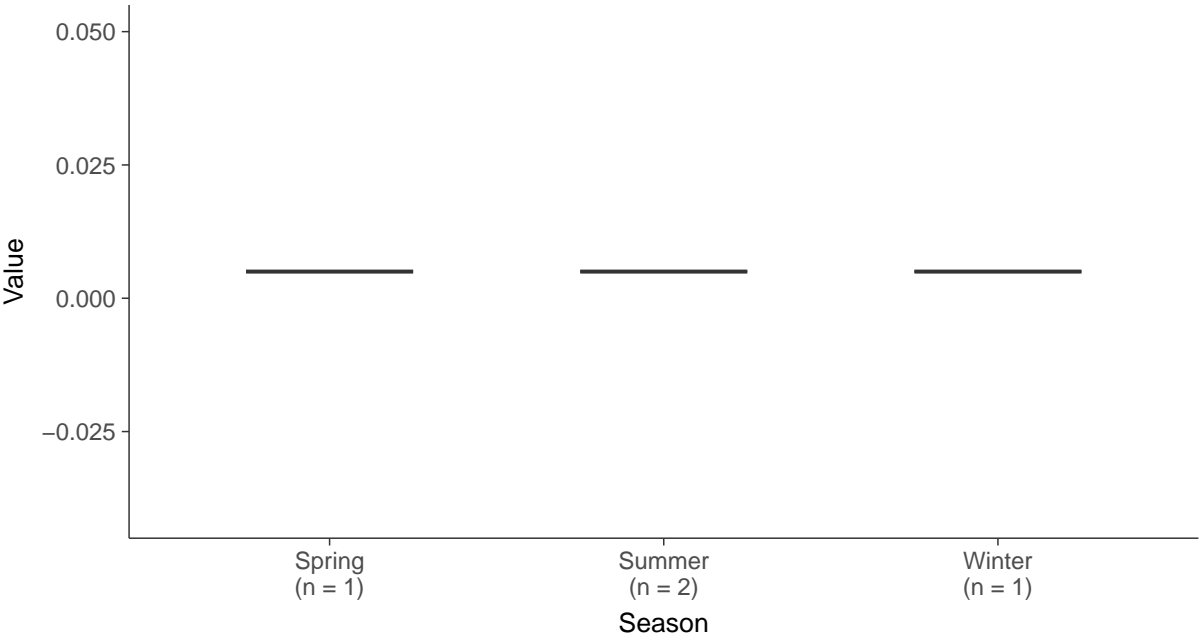
**Boxplot**

Copper, MW-3 (mg/L)



**Boxplot by Season**

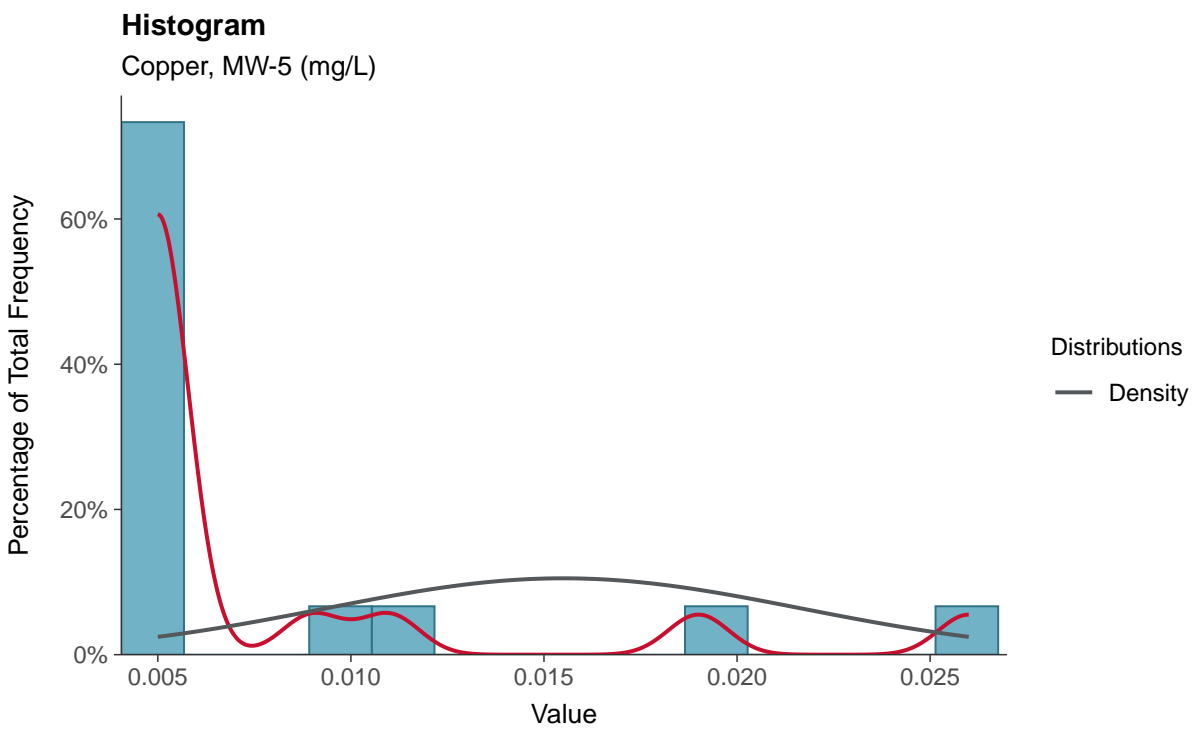
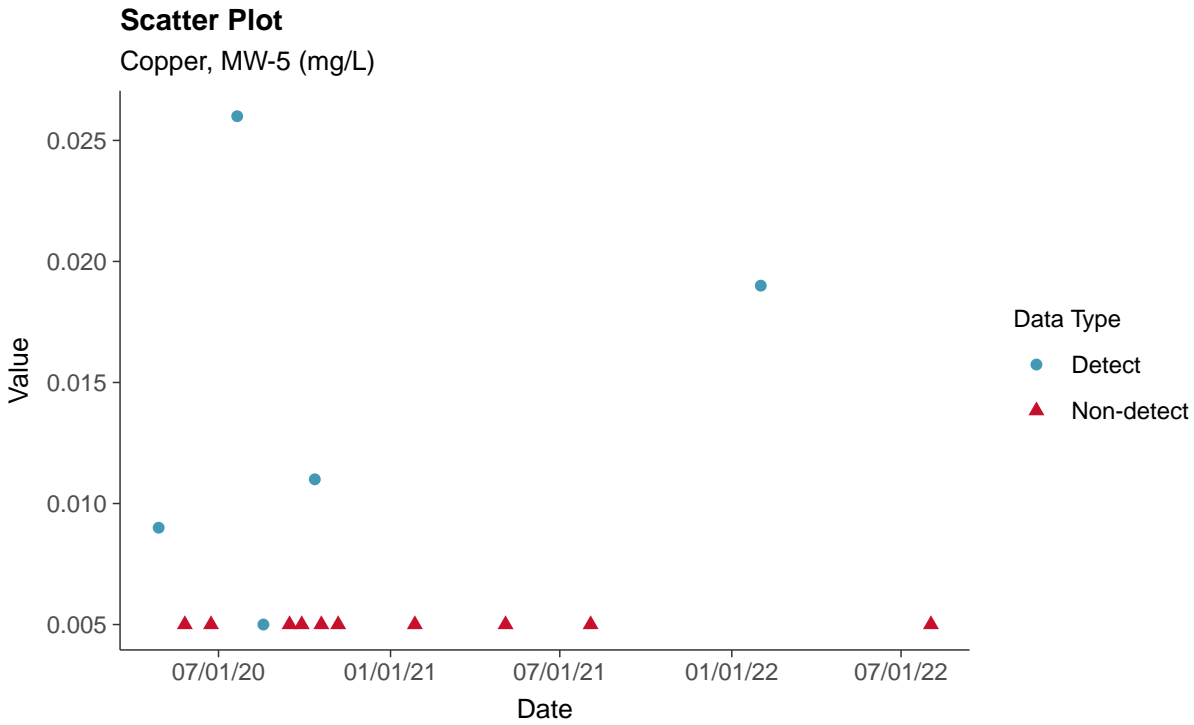
Copper, MW-3 (mg/L)





Part 115: Copper, MW-5

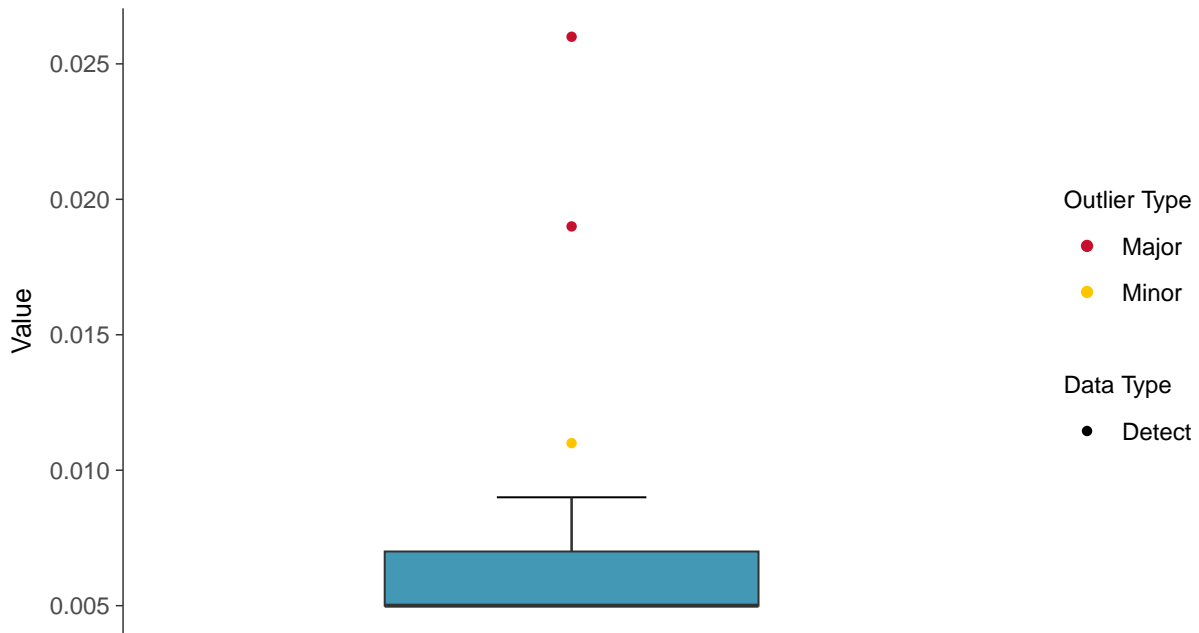
ID: 5\_36\_05





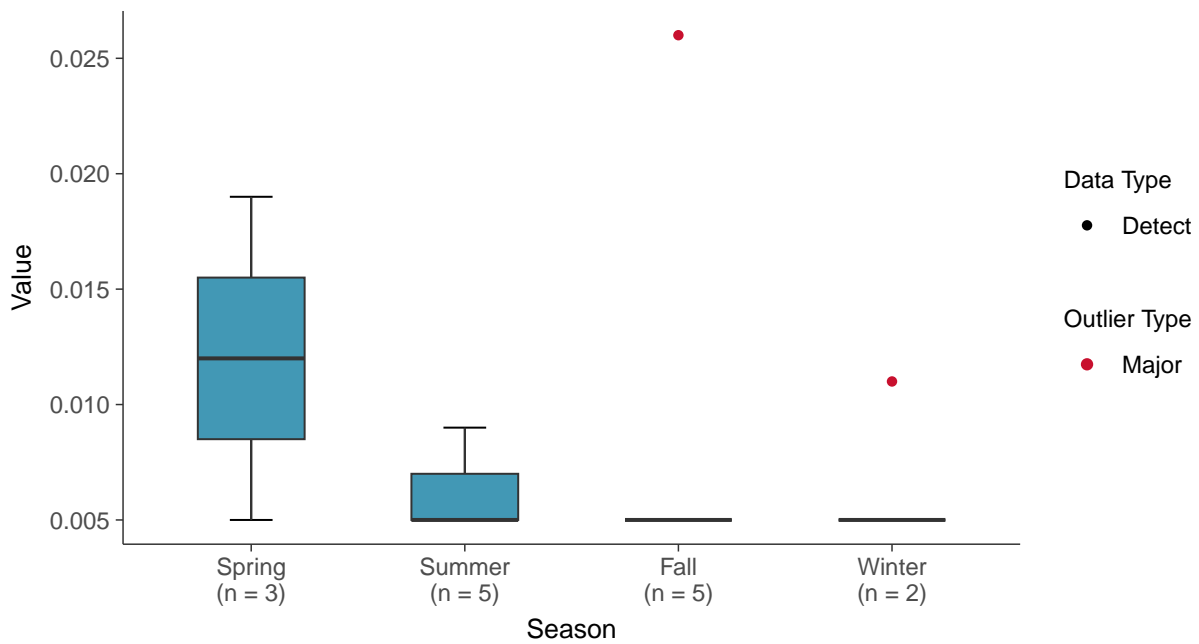
### Boxplot

Copper, MW-5 (mg/L)



### Boxplot by Season

Copper, MW-5 (mg/L)

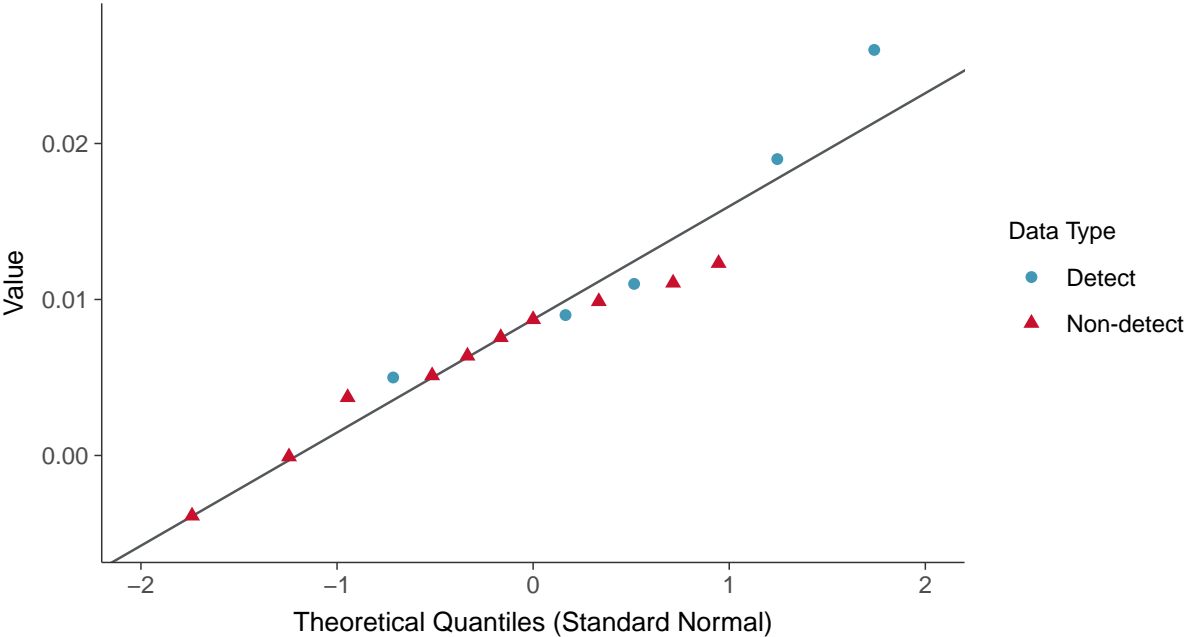






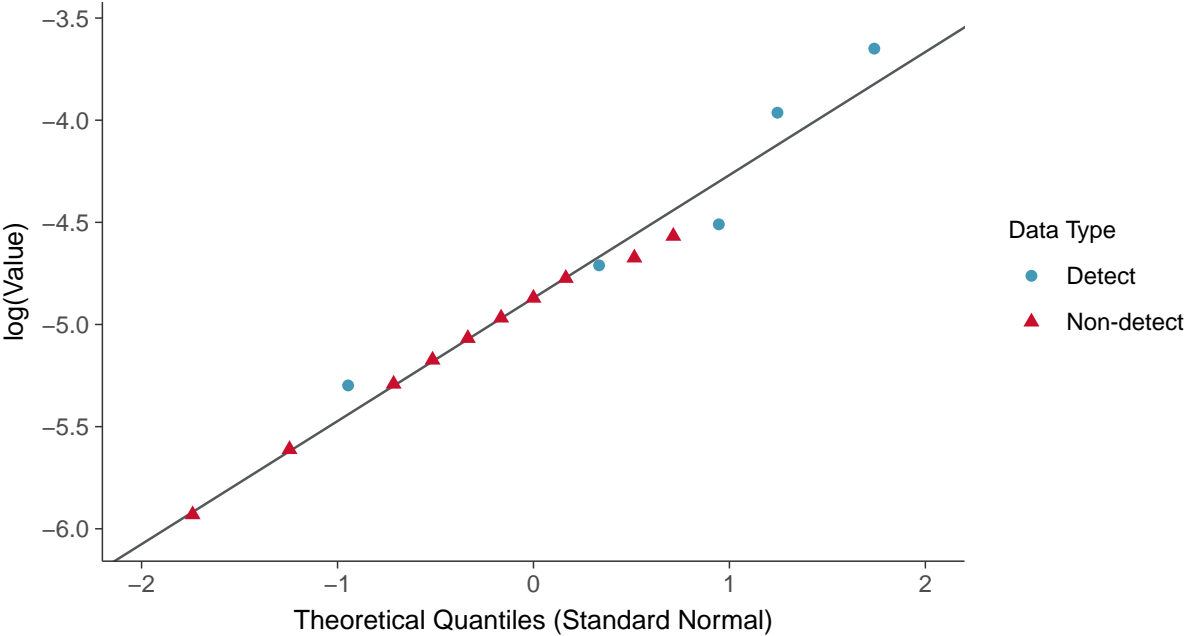
### Normal Q-Q plot using ROS Imputed Estimates

Copper, MW-5 (mg/L)



### Lognormal Q-Q plot using ROS Imputed Estimates

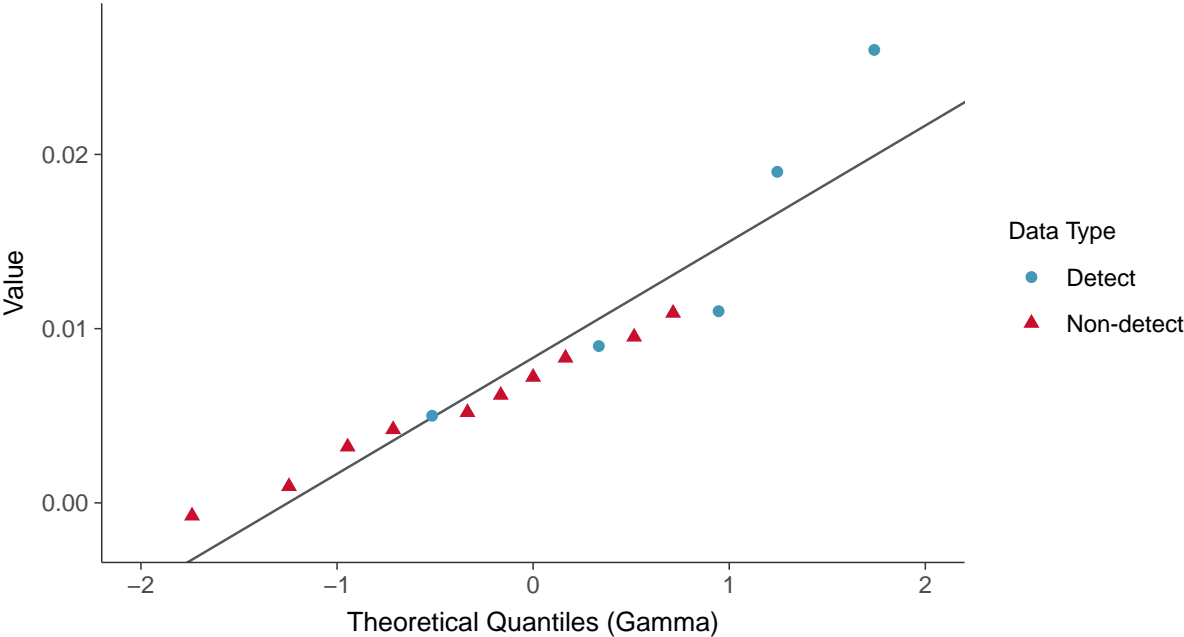
Copper, MW-5 (mg/L)





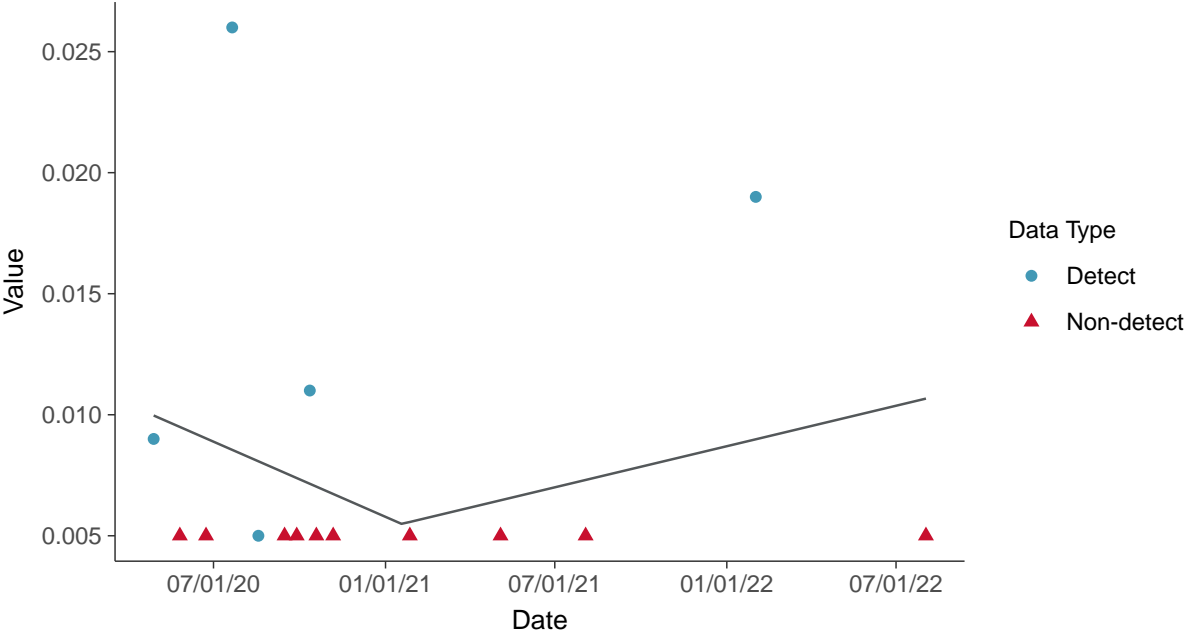
### Gamma Q-Q plot using ROS Imputed Estimates

Copper, MW-5 (mg/L)



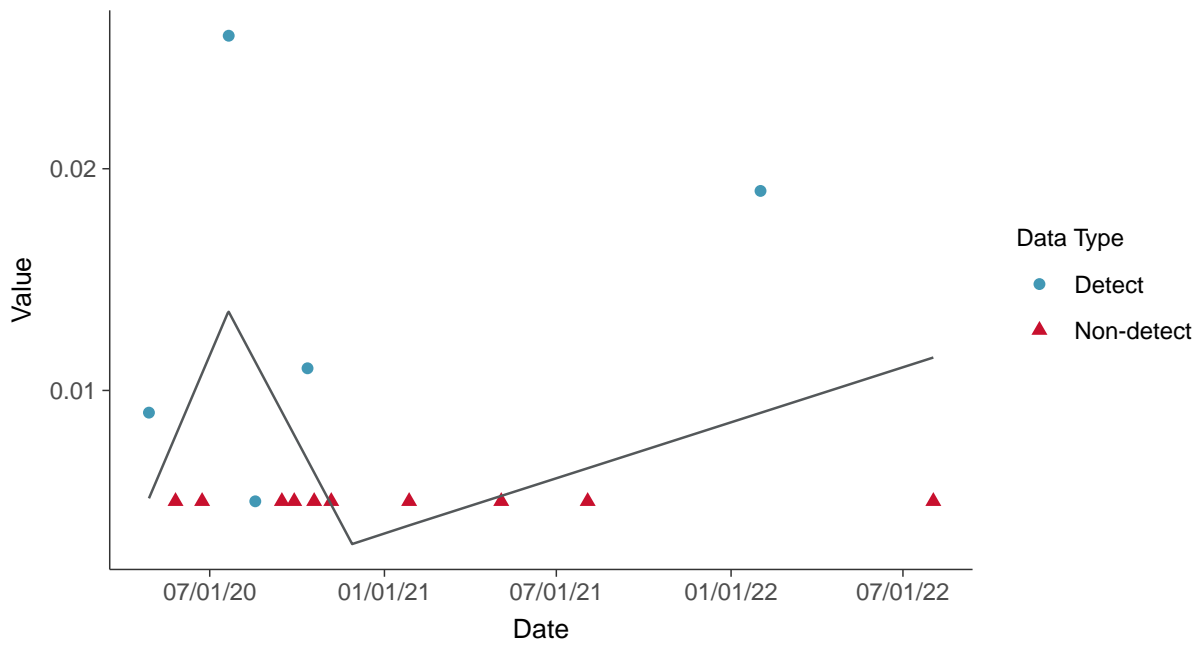
### Trend Regression: Piecewise Linear-Linear

Copper, MW-5 (mg/L)





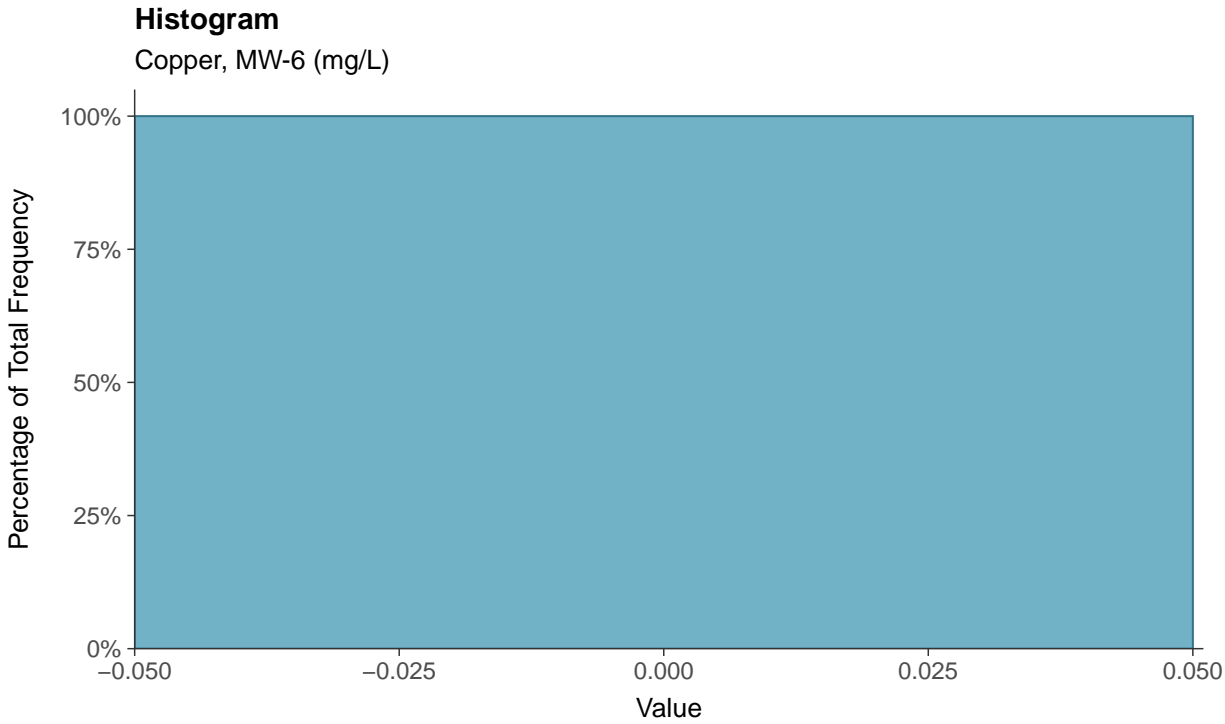
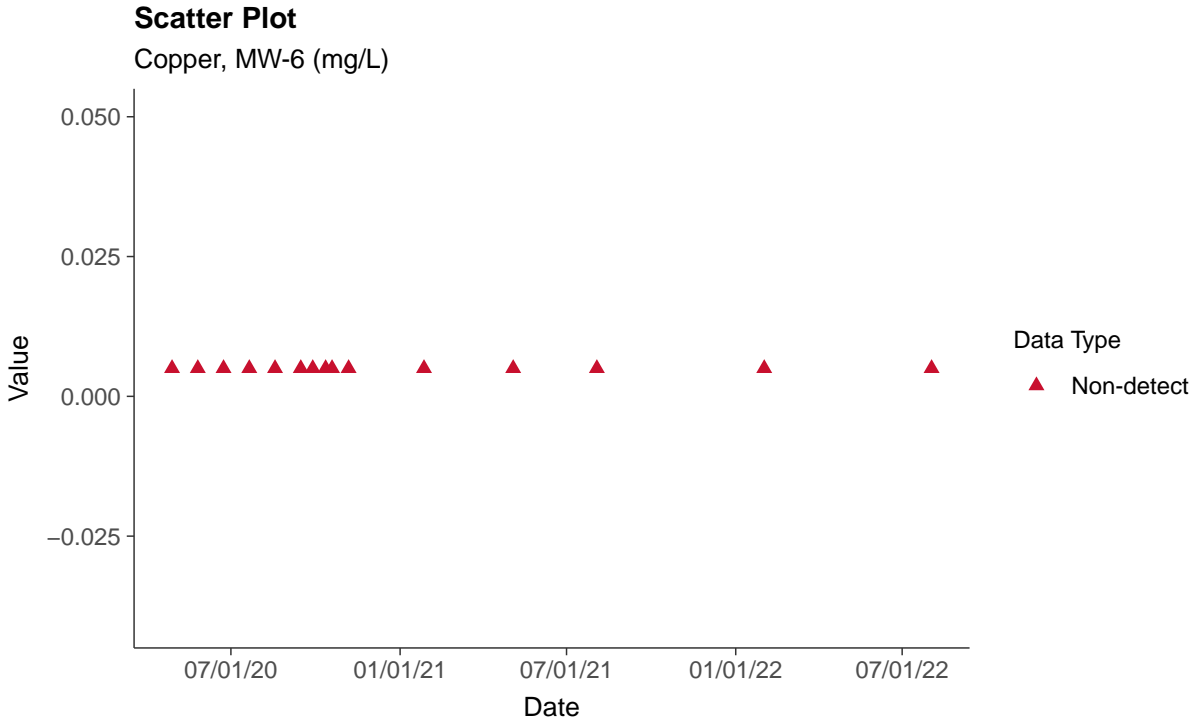
**Trend Regression: Piecewise Linear-Linear-Linear**  
 Copper, MW-5 (mg/L)





**Part 115: Copper, MW-6**

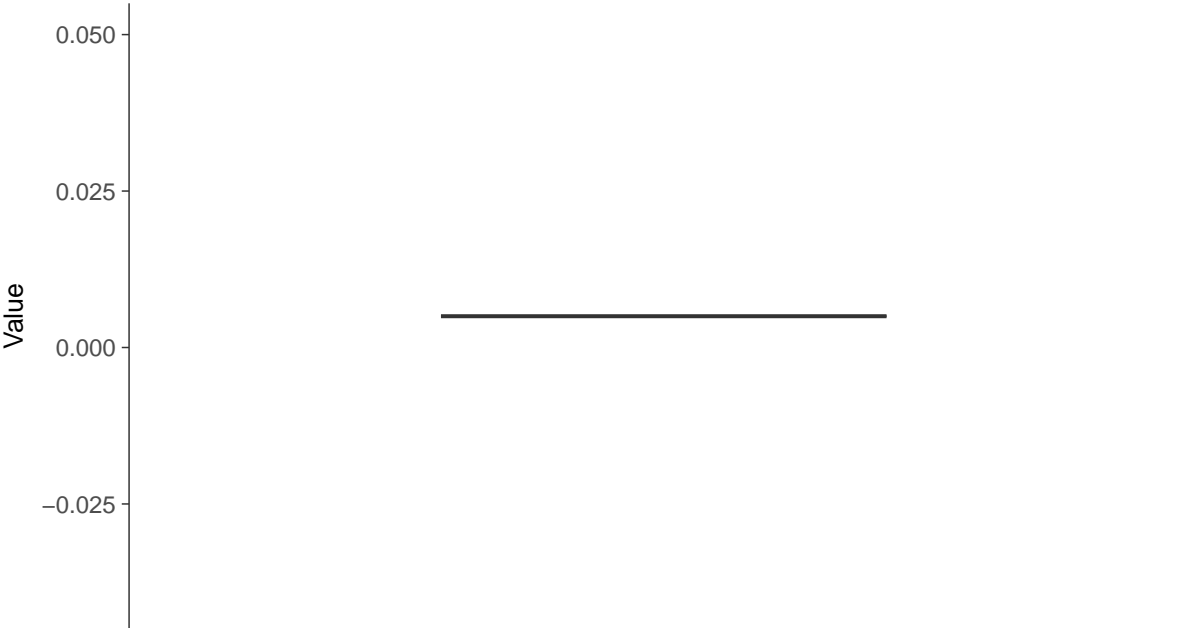
ID: 5\_36\_06





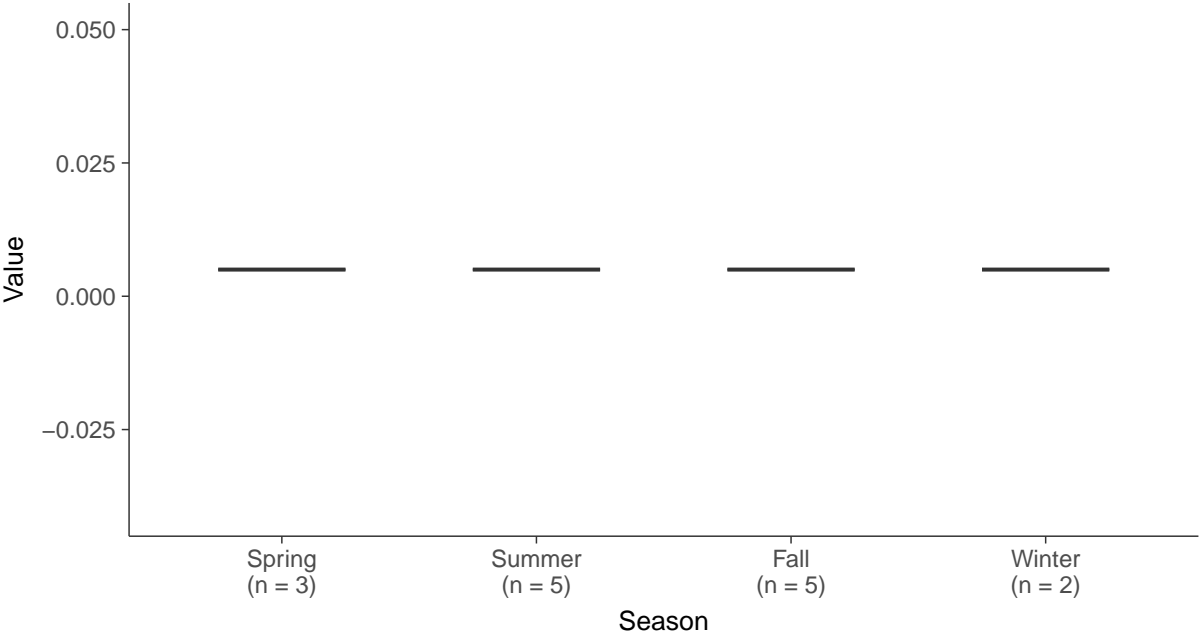
**Boxplot**

Copper, MW-6 (mg/L)



**Boxplot by Season**

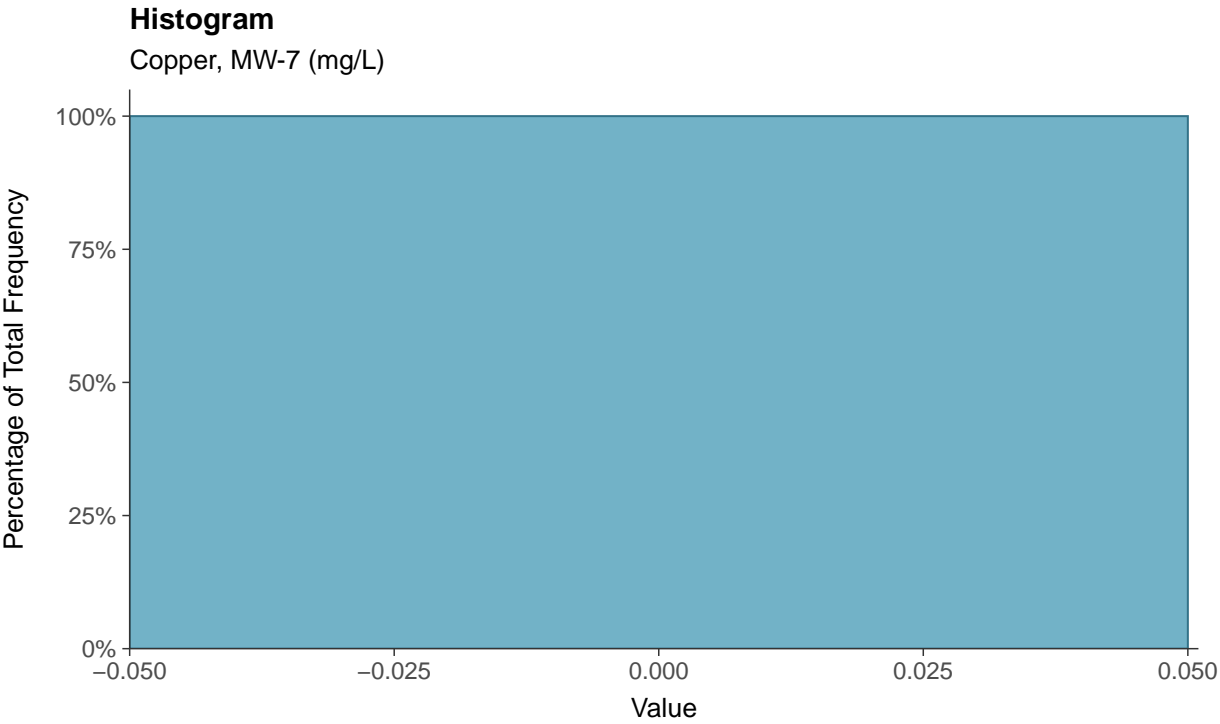
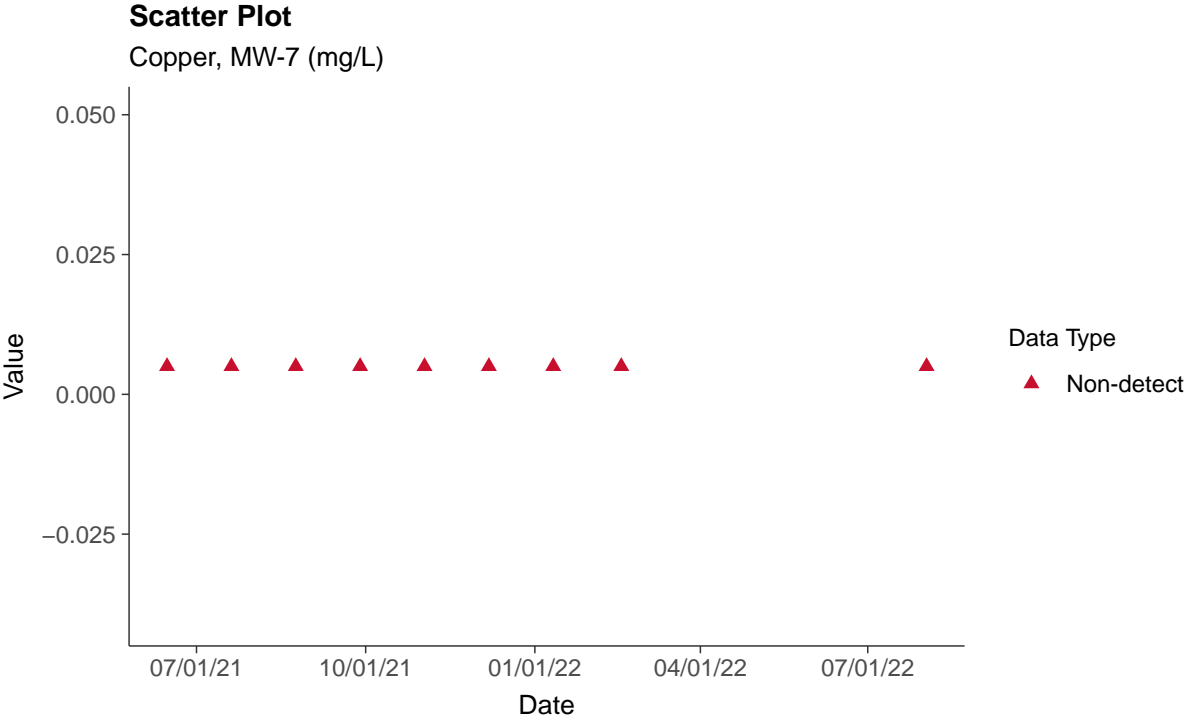
Copper, MW-6 (mg/L)





**Part 115: Copper, MW-7**

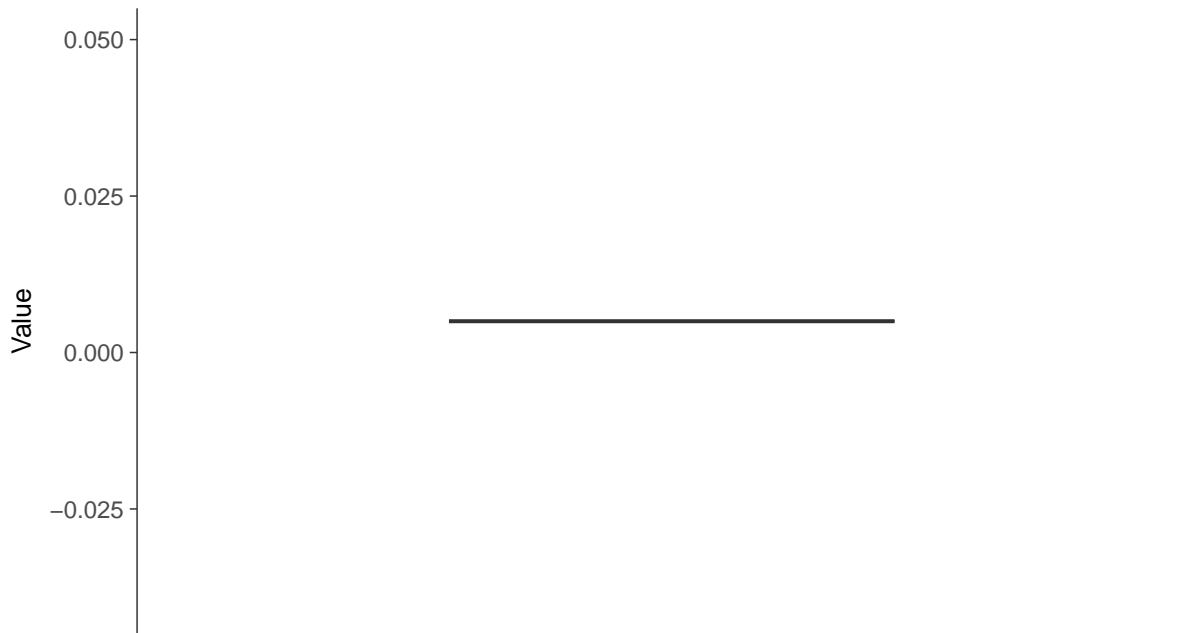
ID: 5\_36\_07





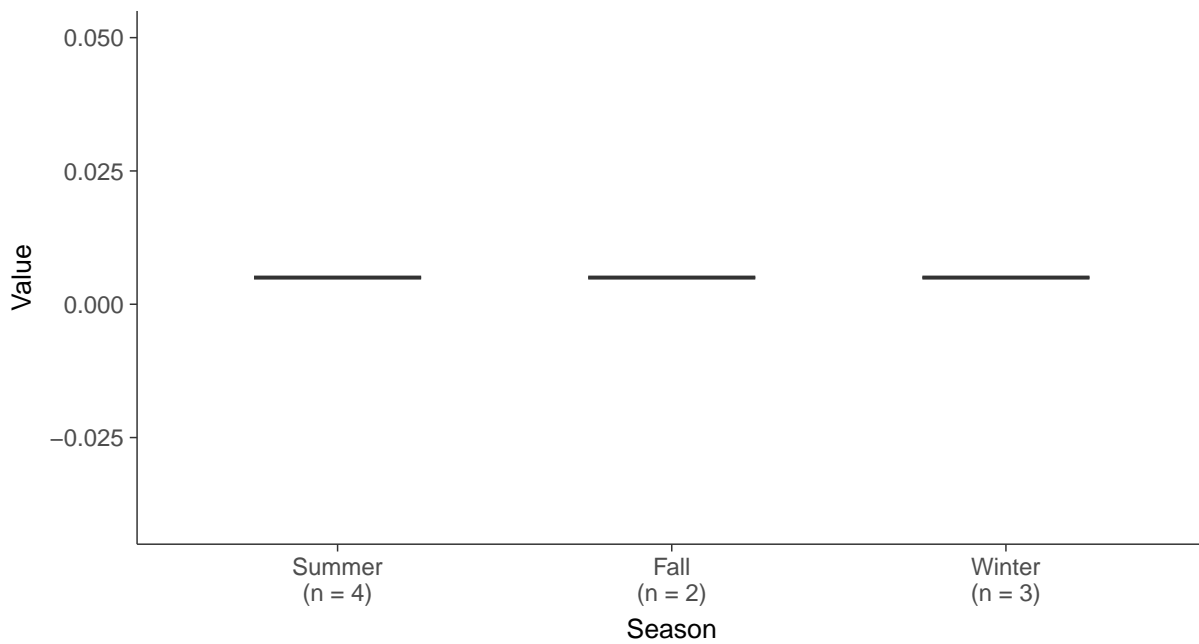
### Boxplot

Copper, MW-7 (mg/L)



### Boxplot by Season

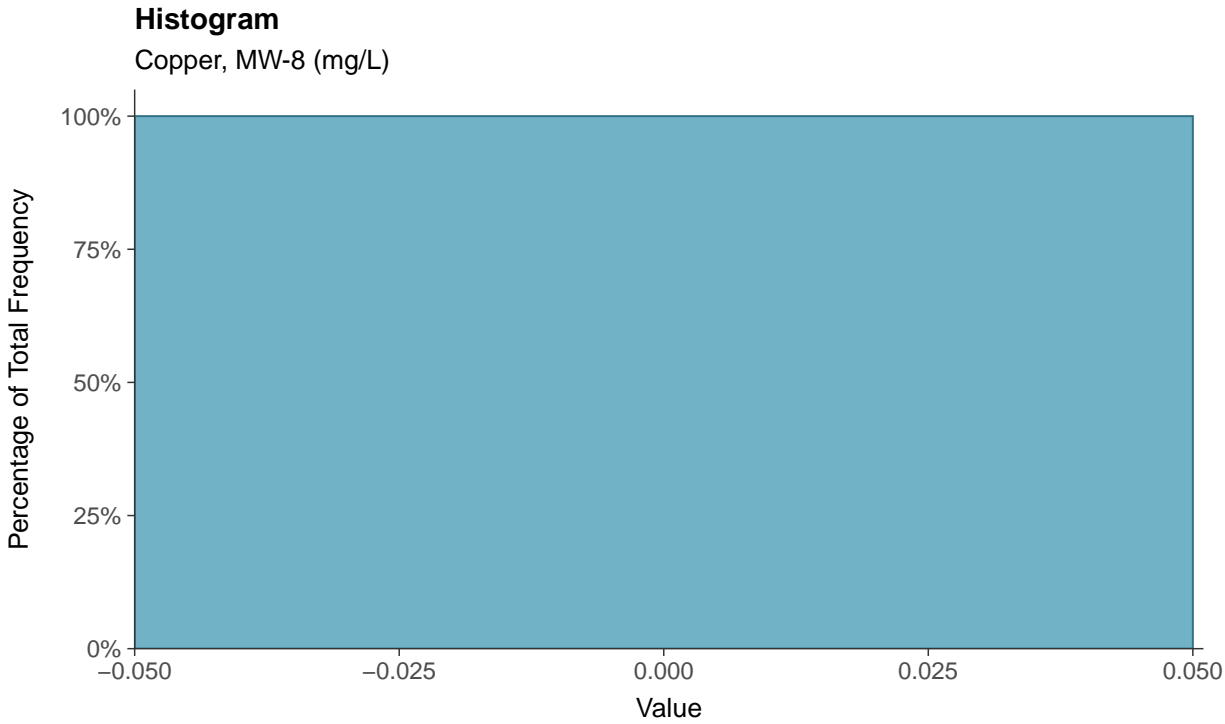
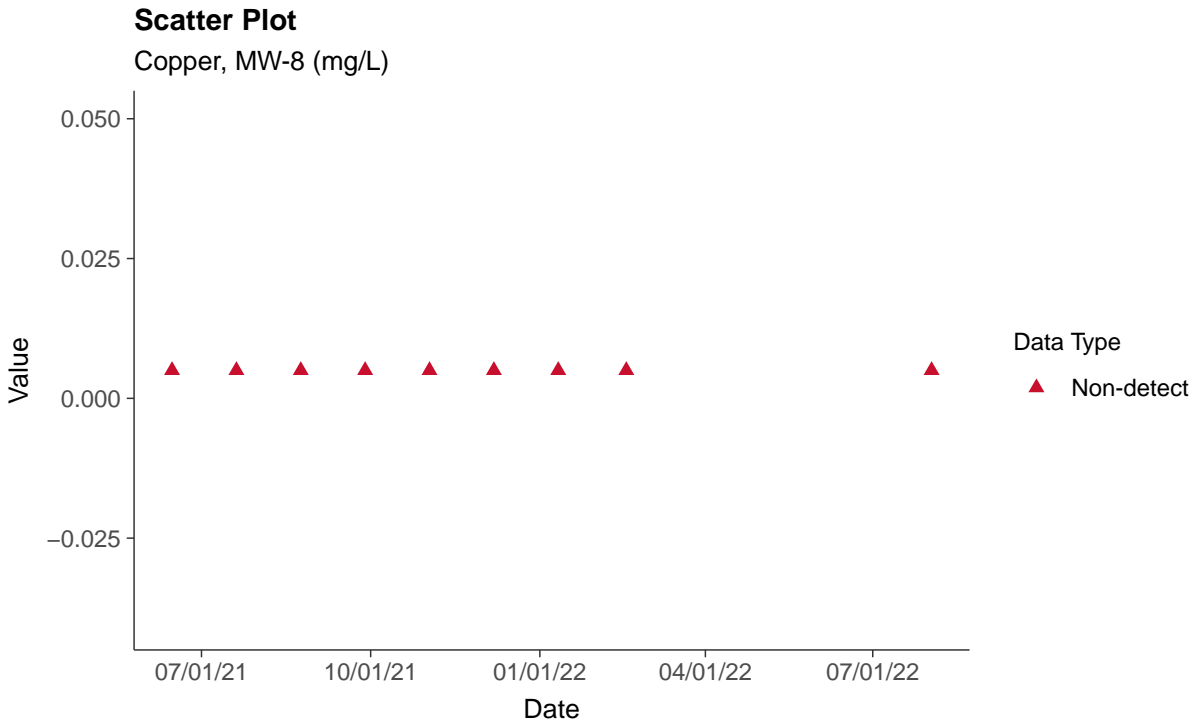
Copper, MW-7 (mg/L)





**Part 115: Copper, MW-8**

ID: 5\_36\_08







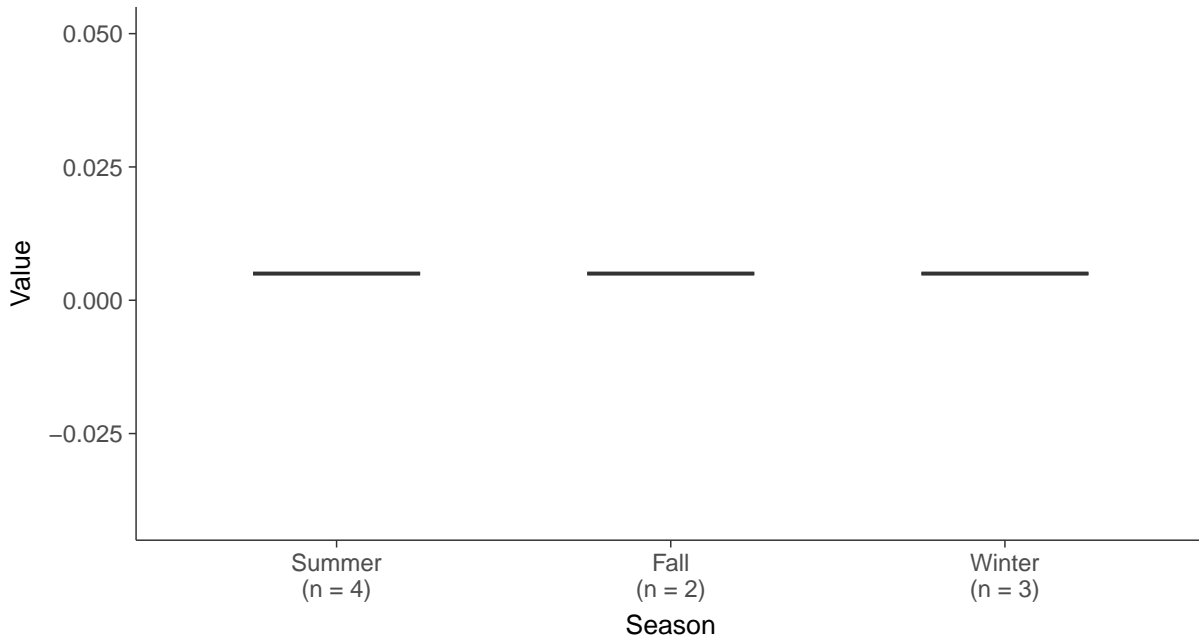
### Boxplot

Copper, MW-8 (mg/L)



### Boxplot by Season

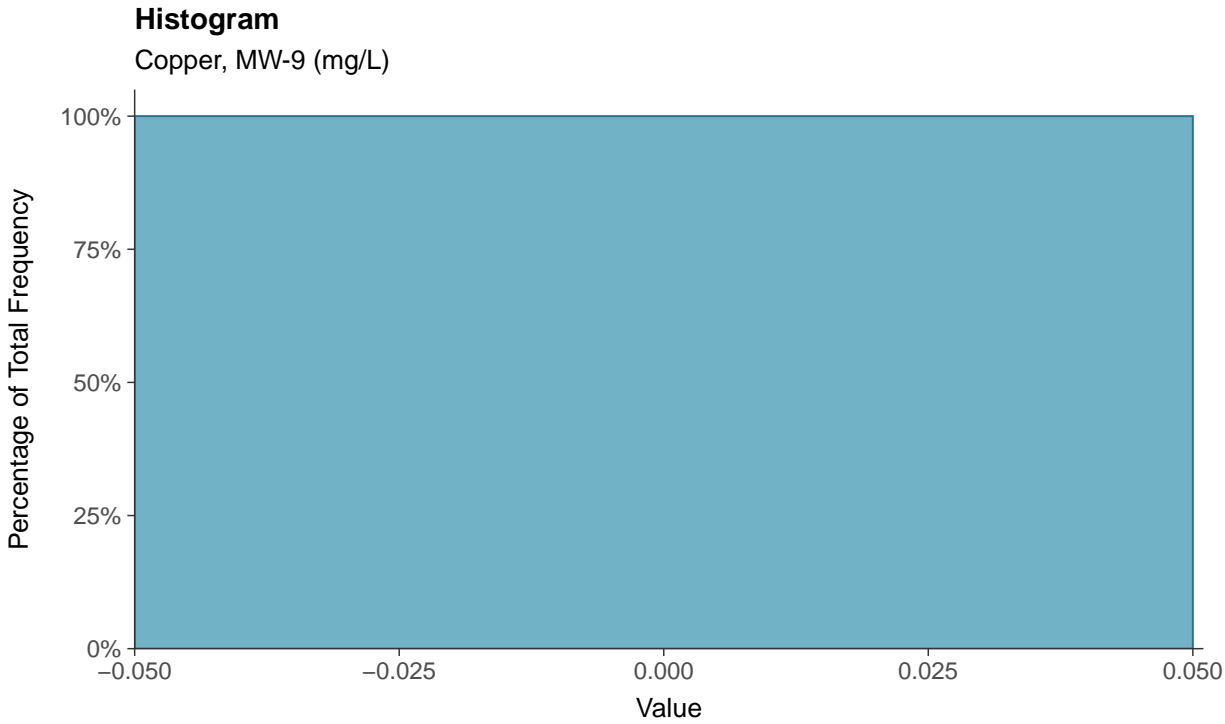
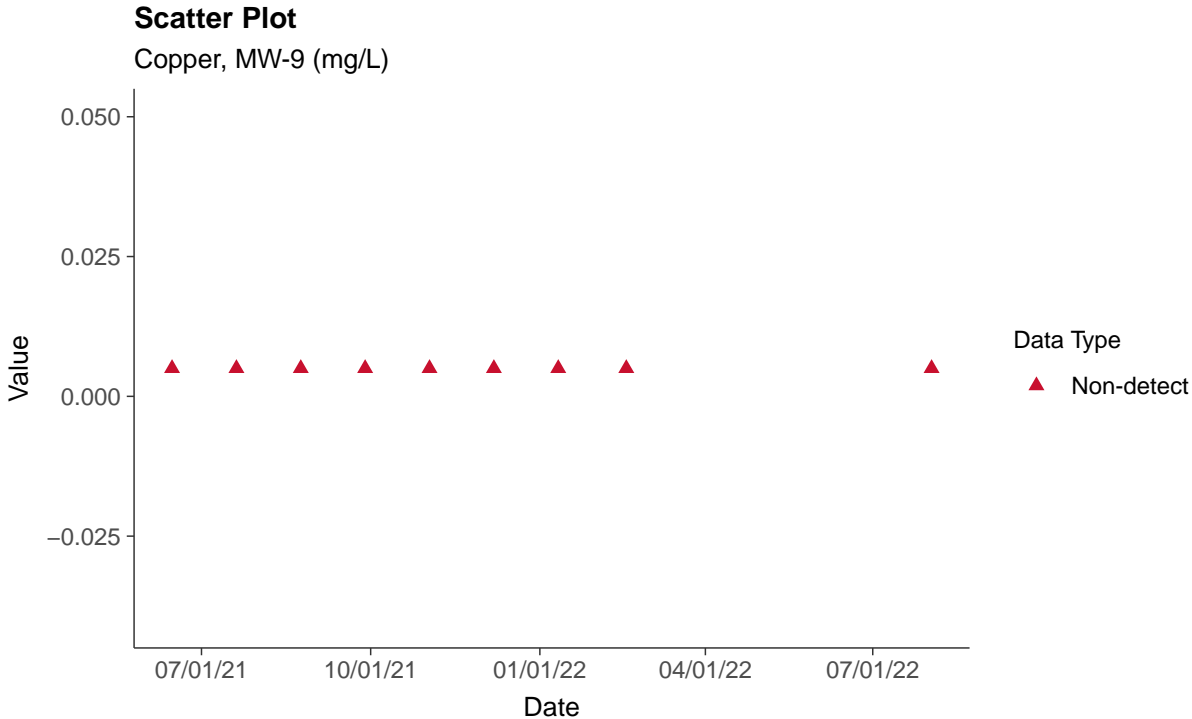
Copper, MW-8 (mg/L)





### Part 115: Copper, MW-9

ID: 5\_36\_09





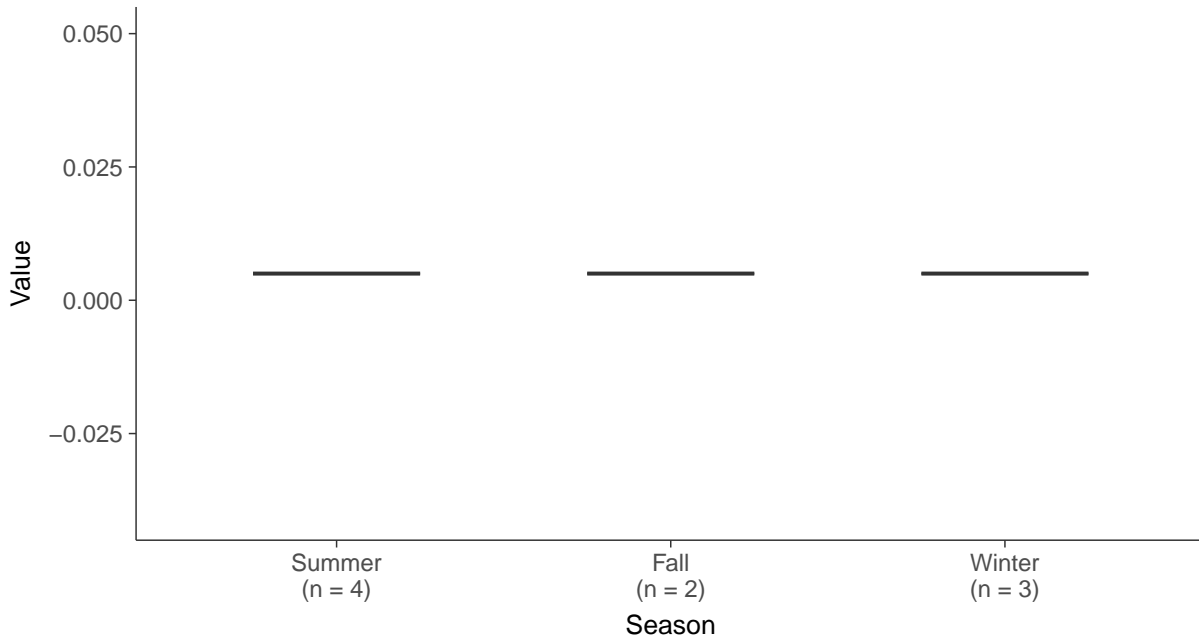
### Boxplot

Copper, MW-9 (mg/L)



### Boxplot by Season

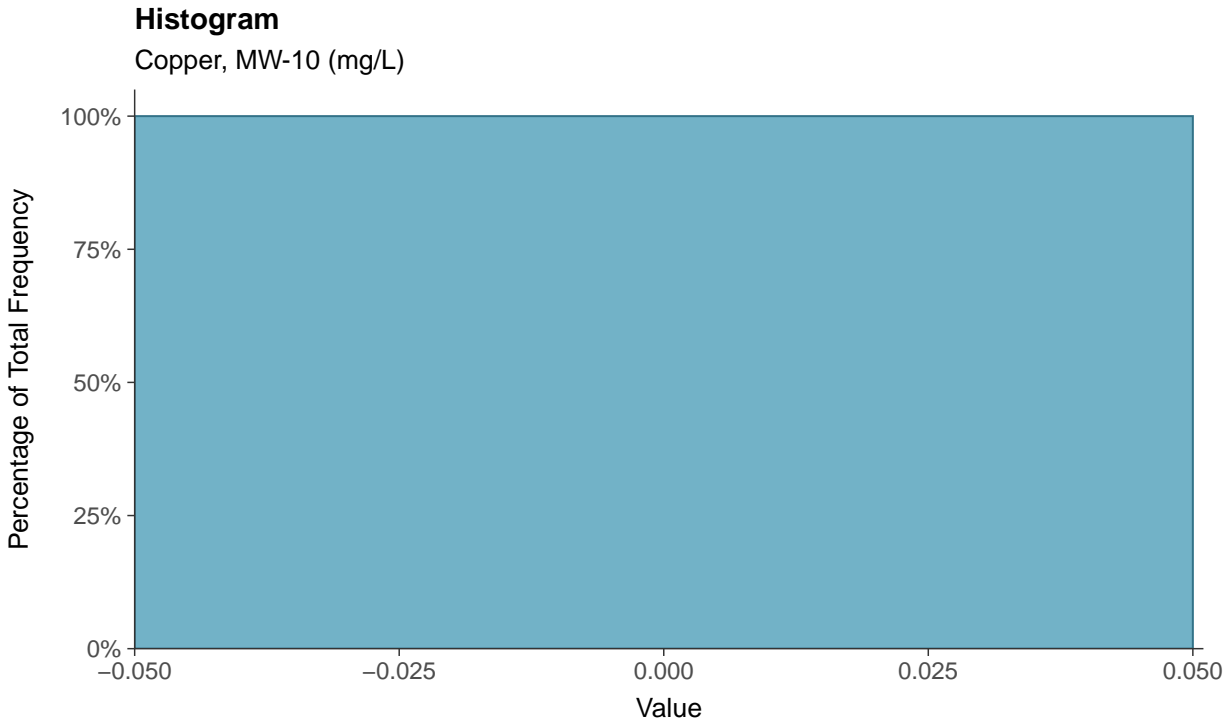
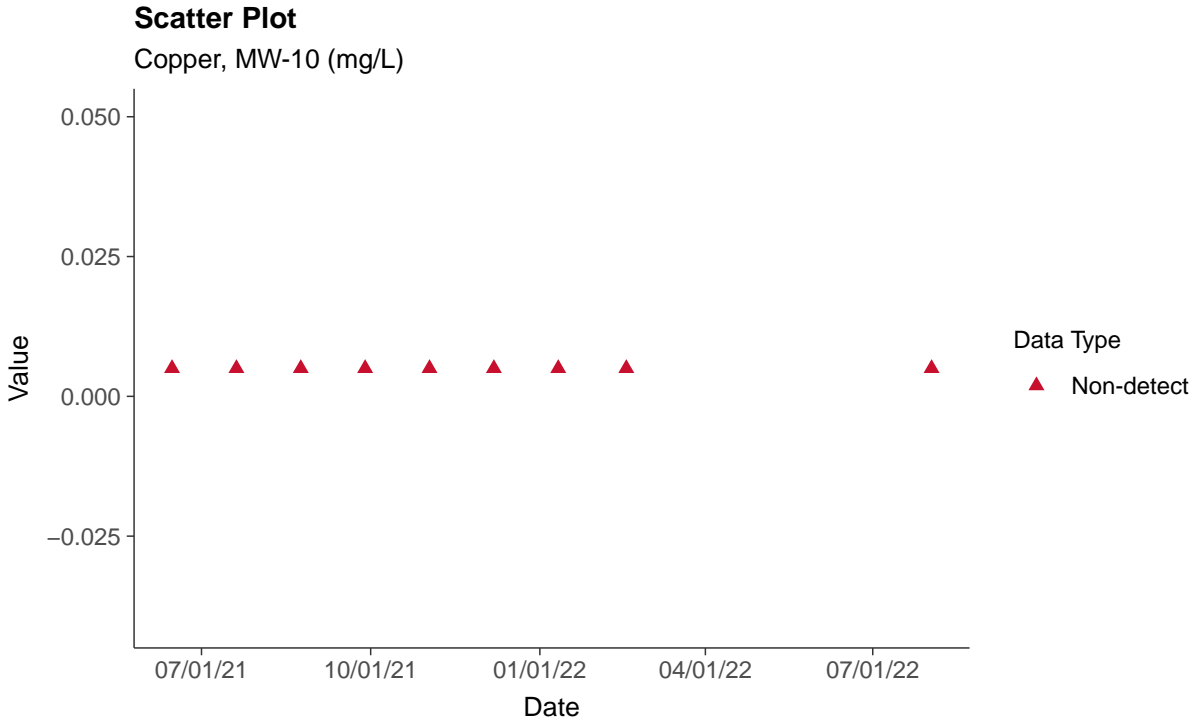
Copper, MW-9 (mg/L)





**Part 115: Copper, MW-10**

ID: 5\_36\_10





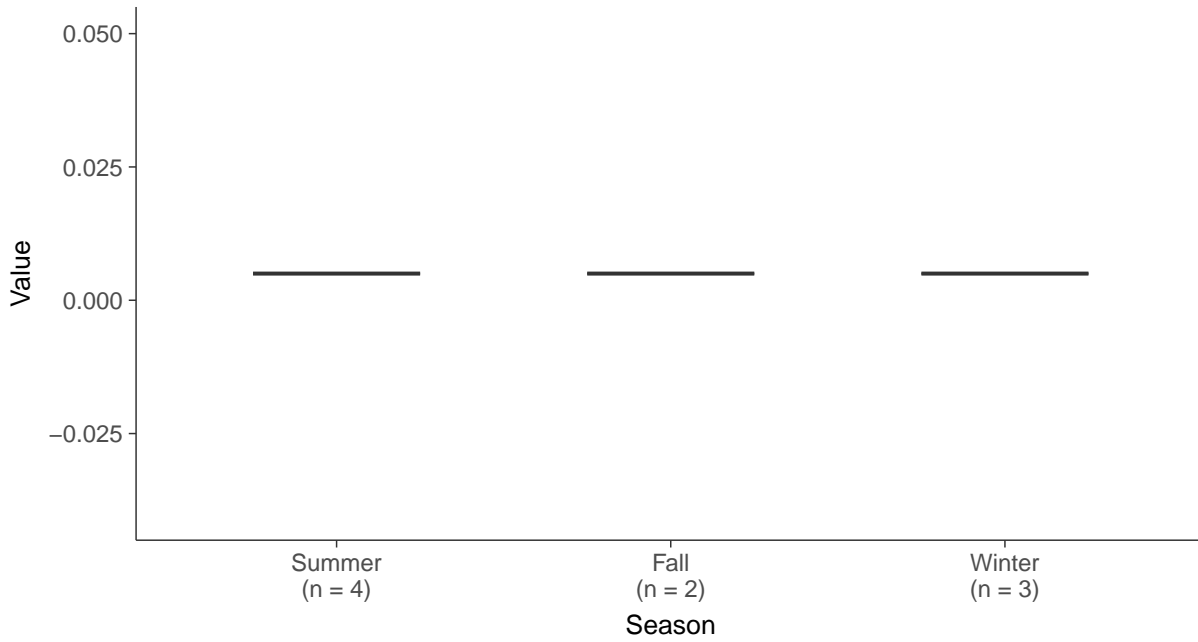
### Boxplot

Copper, MW-10 (mg/L)



### Boxplot by Season

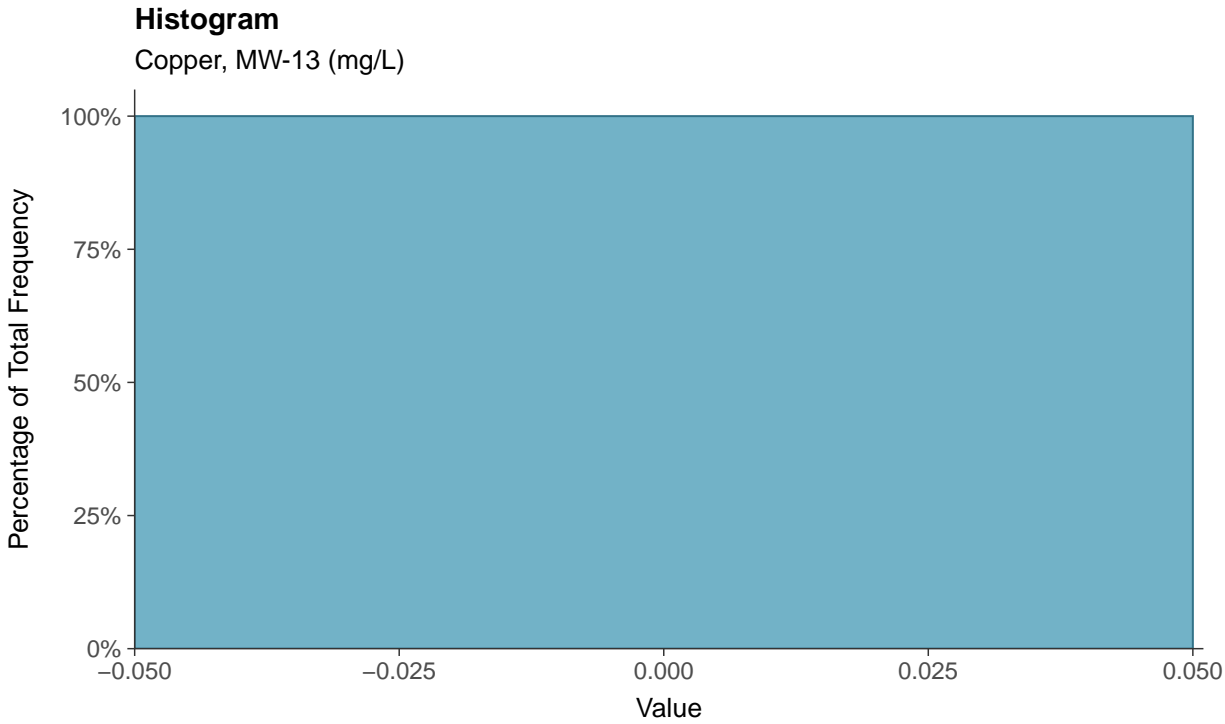
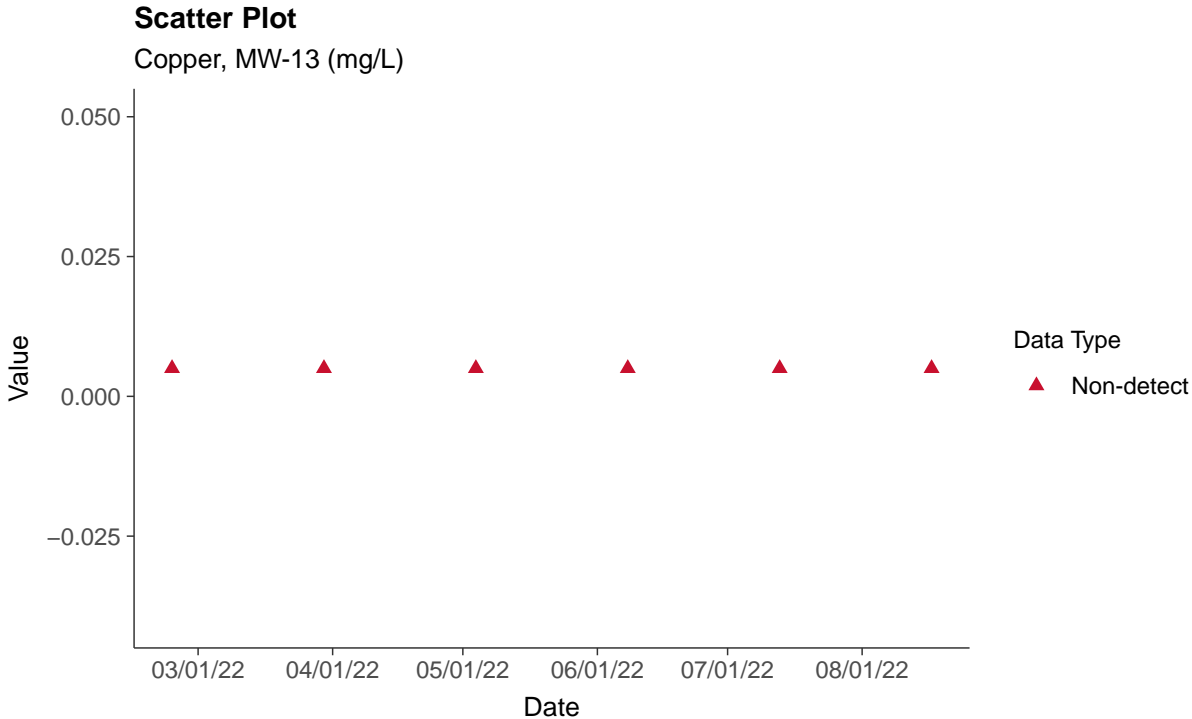
Copper, MW-10 (mg/L)





**Part 115: Copper, MW-13**

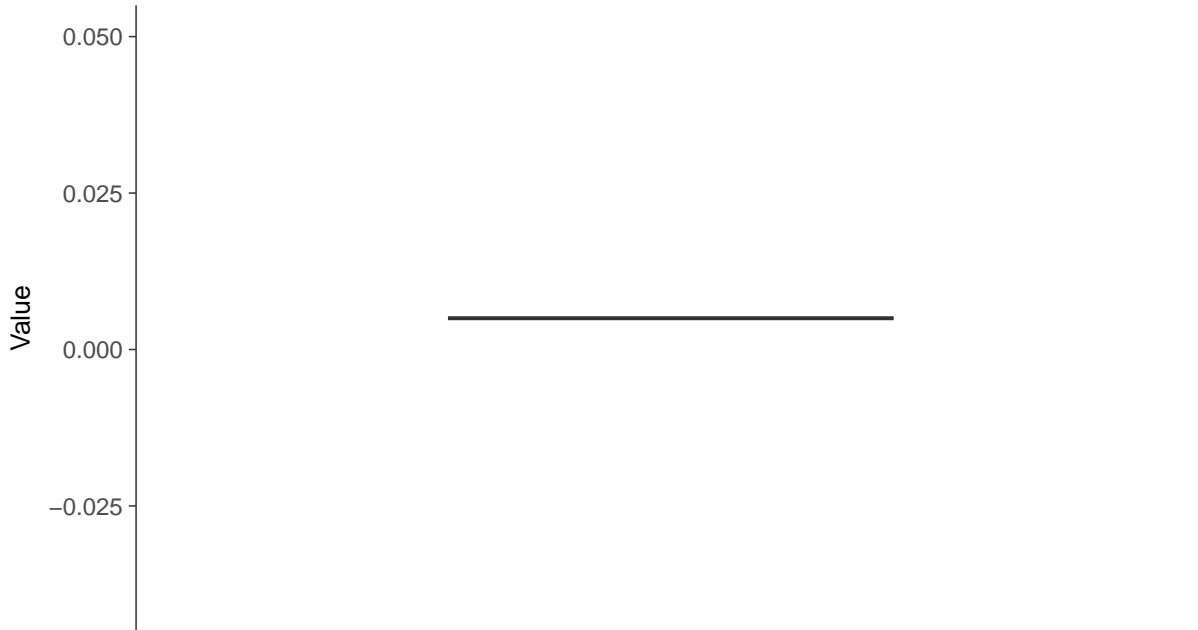
ID: 5\_36\_13





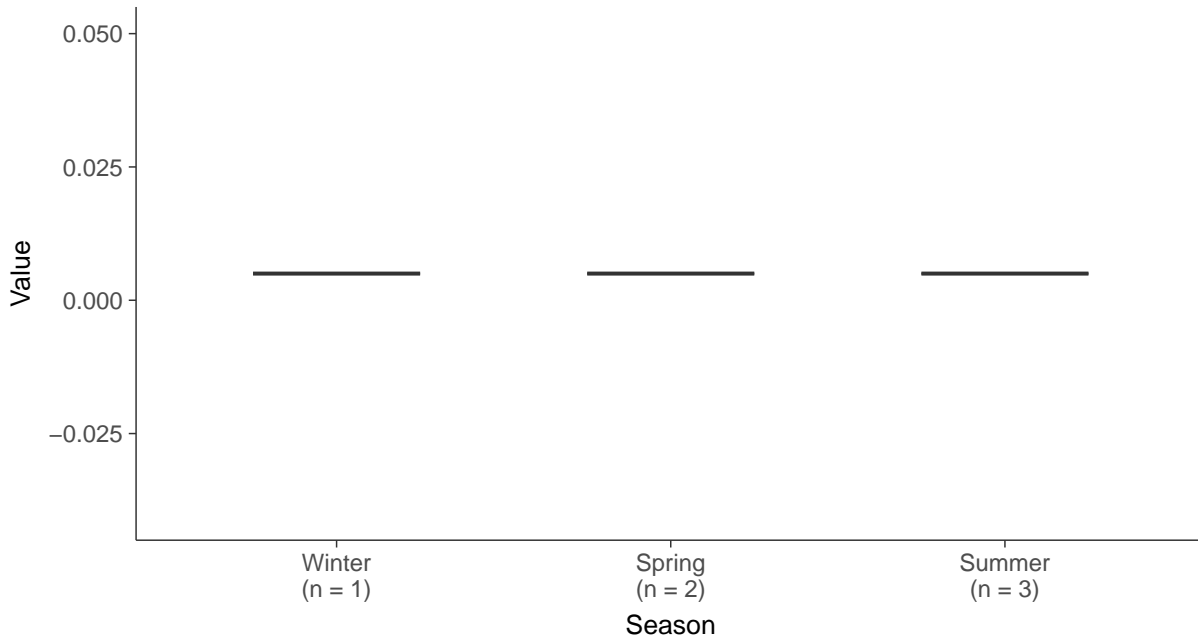
### Boxplot

Copper, MW-13 (mg/L)



### Boxplot by Season

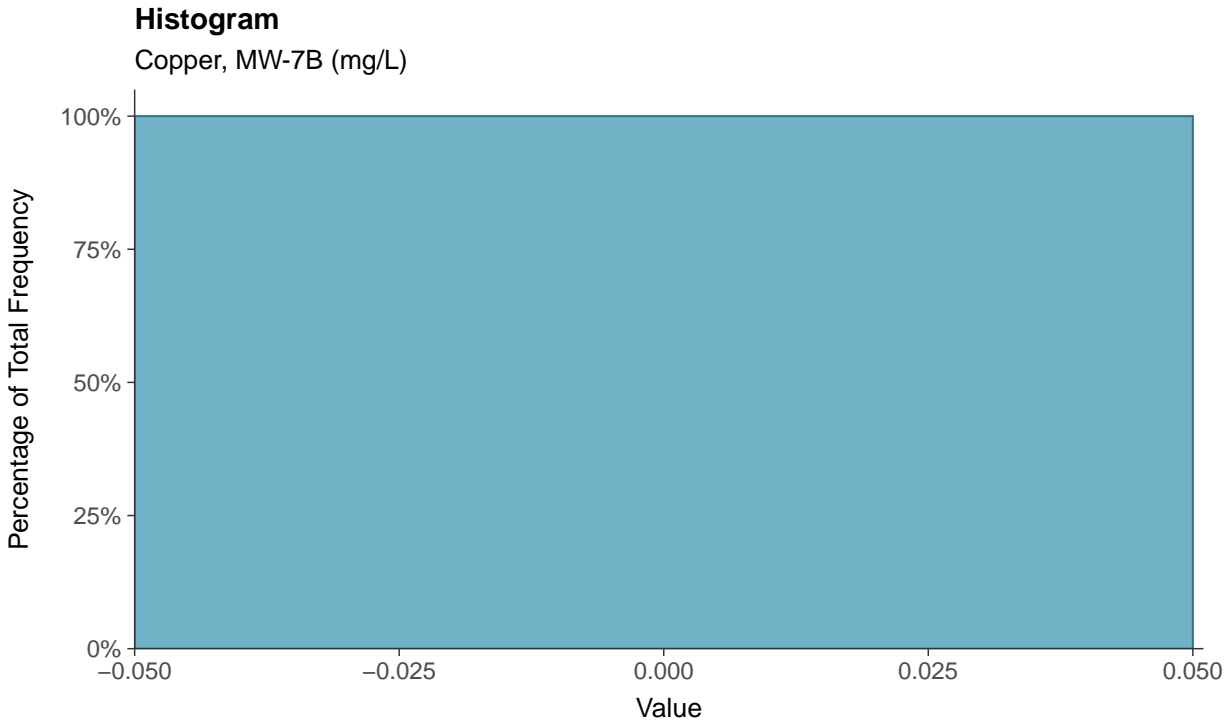
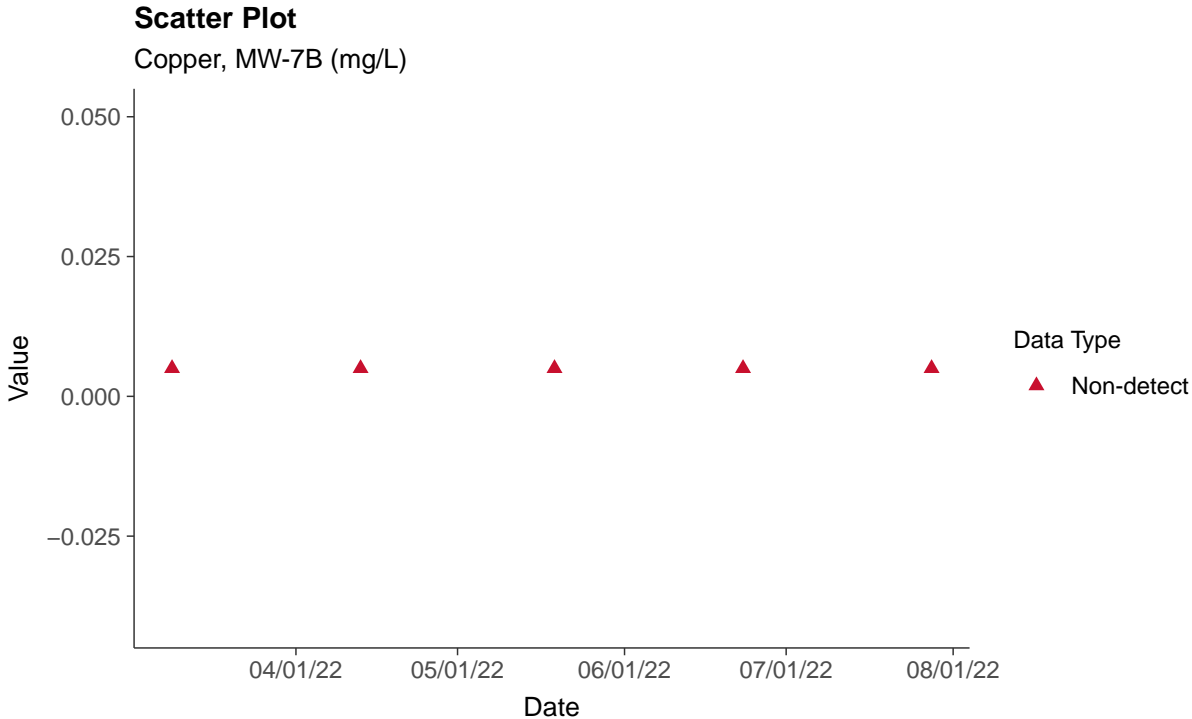
Copper, MW-13 (mg/L)





**Part 115: Copper, MW-7B**

ID: 5\_36\_7B

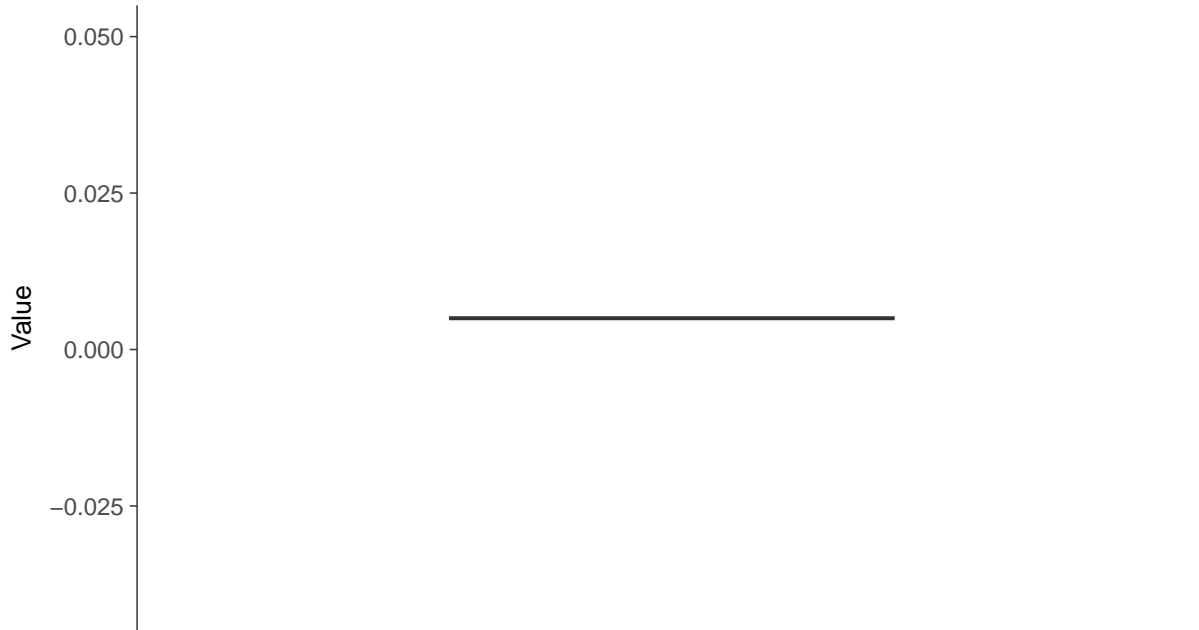






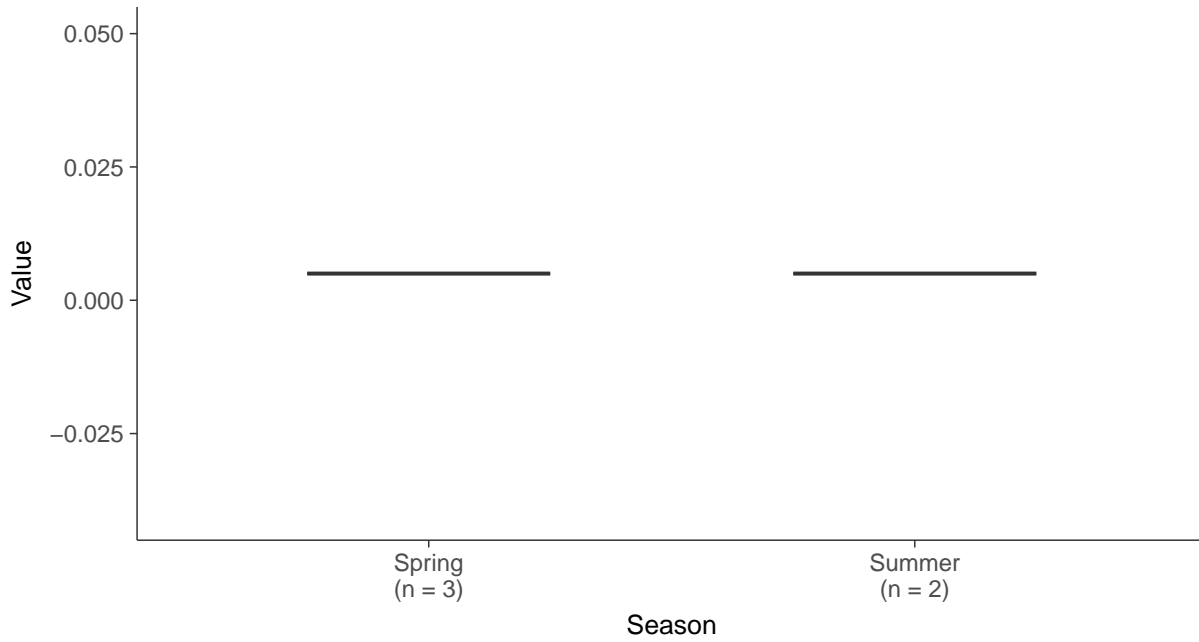
### Boxplot

Copper, MW-7B (mg/L)



### Boxplot by Season

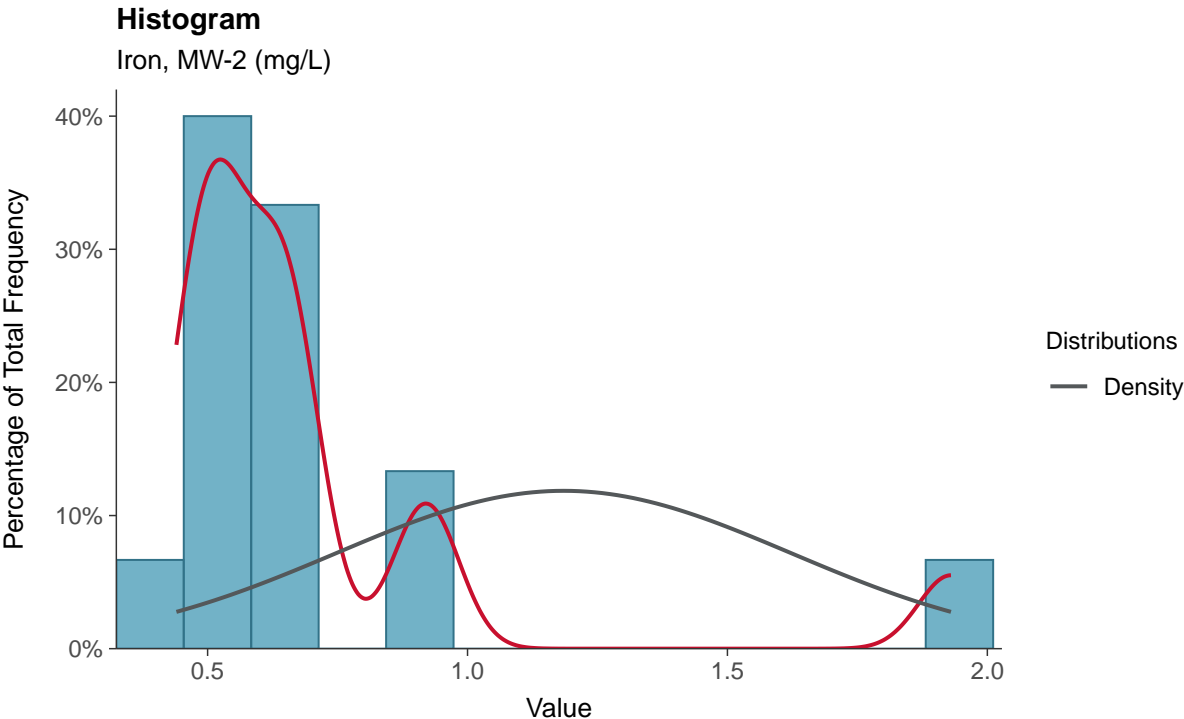
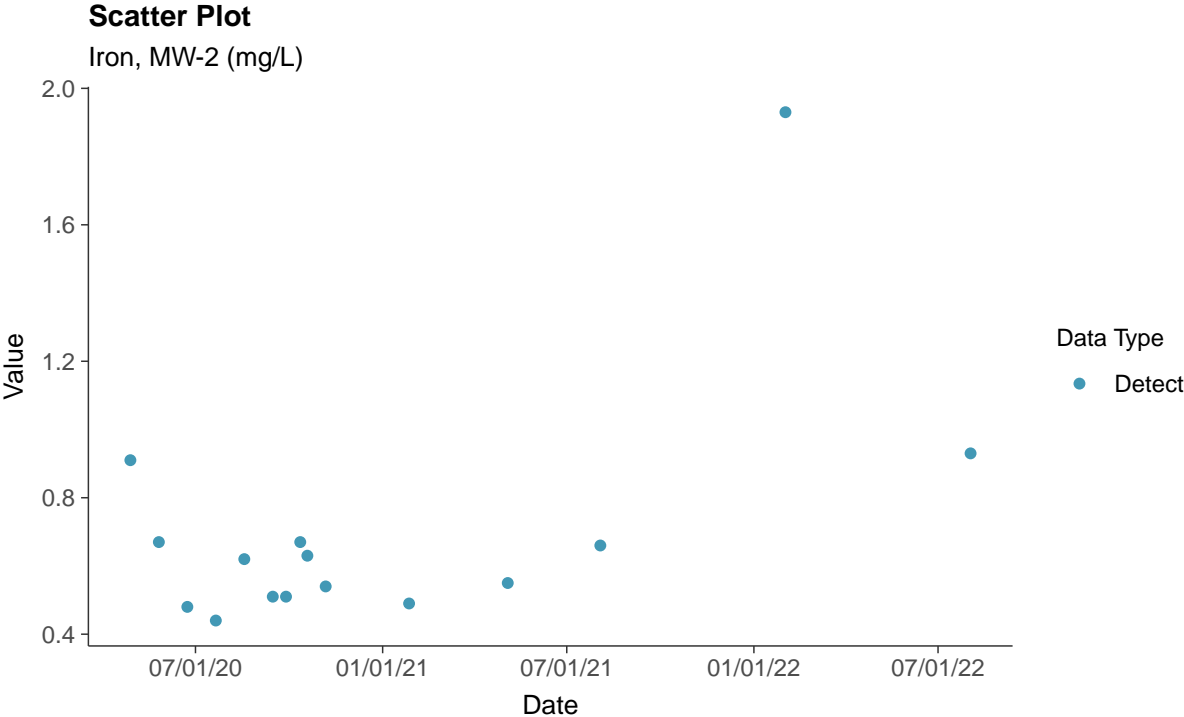
Copper, MW-7B (mg/L)





Part 115: Iron, MW-2

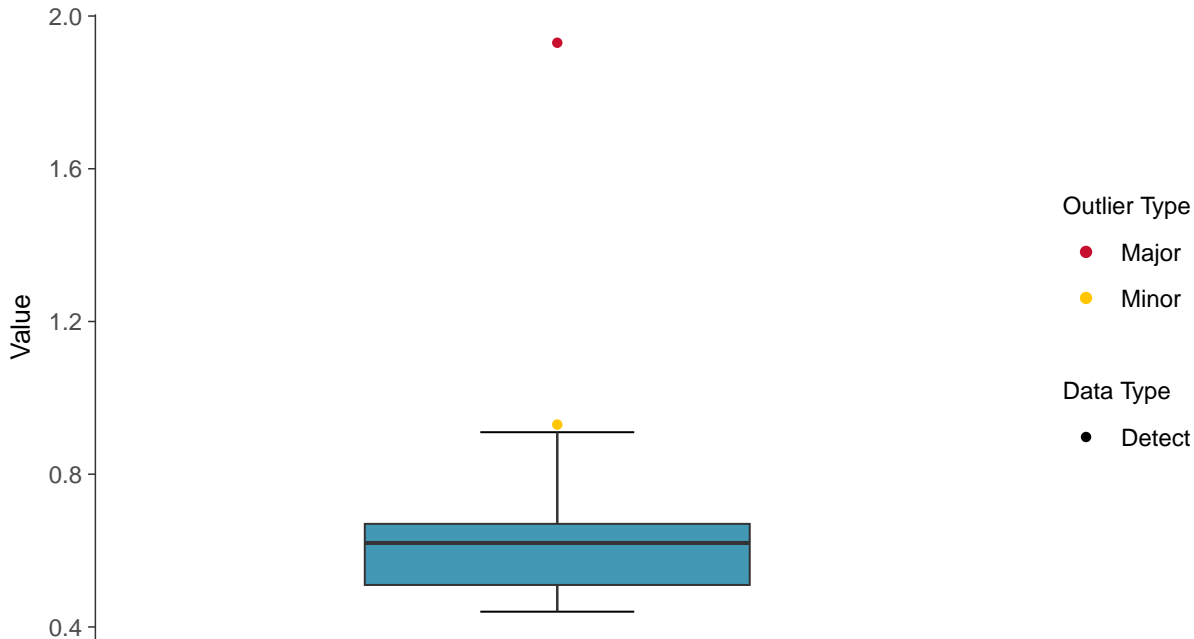
ID: 5\_37\_02





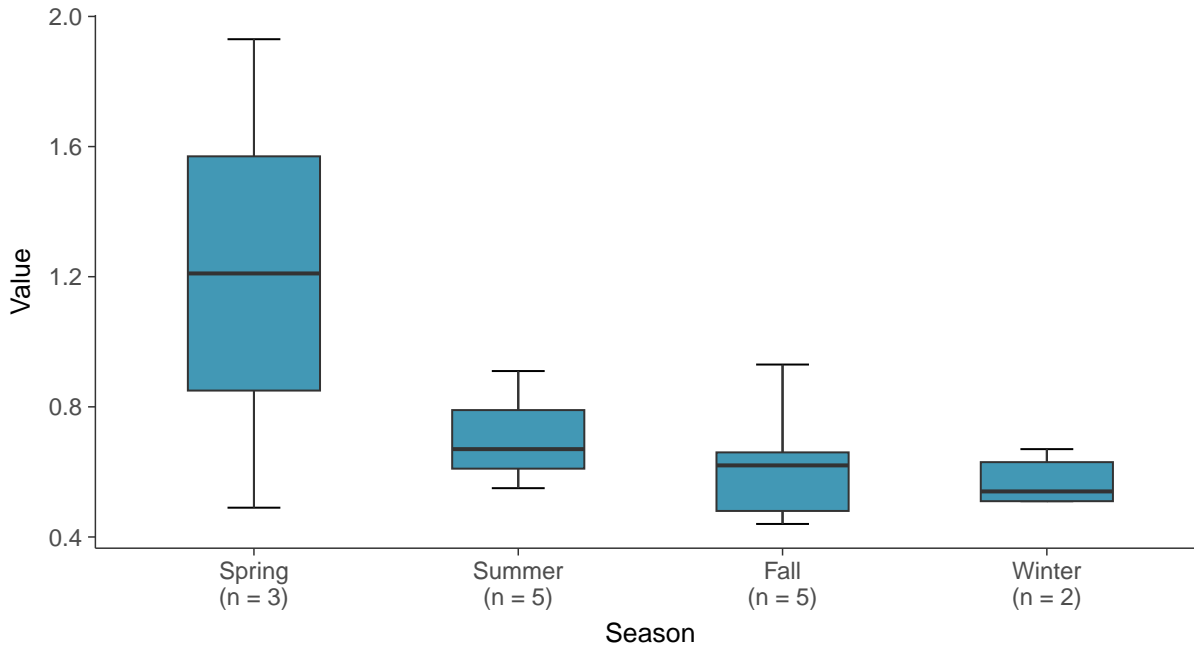
### Boxplot

Iron, MW-2 (mg/L)



### Boxplot by Season

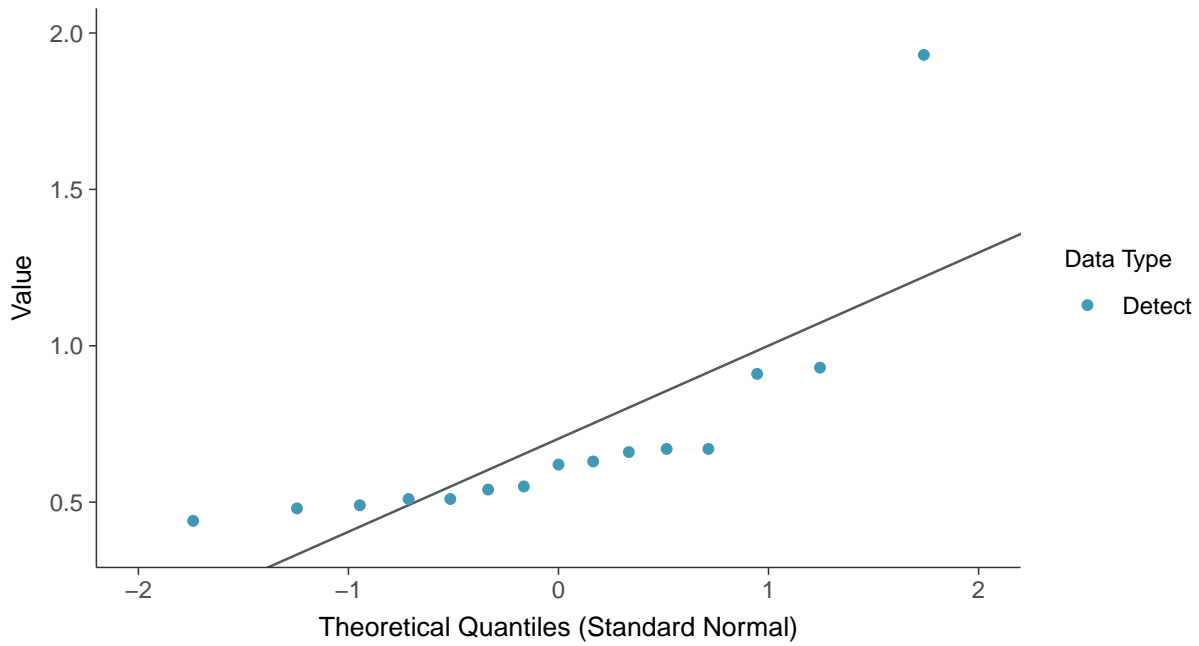
Iron, MW-2 (mg/L)





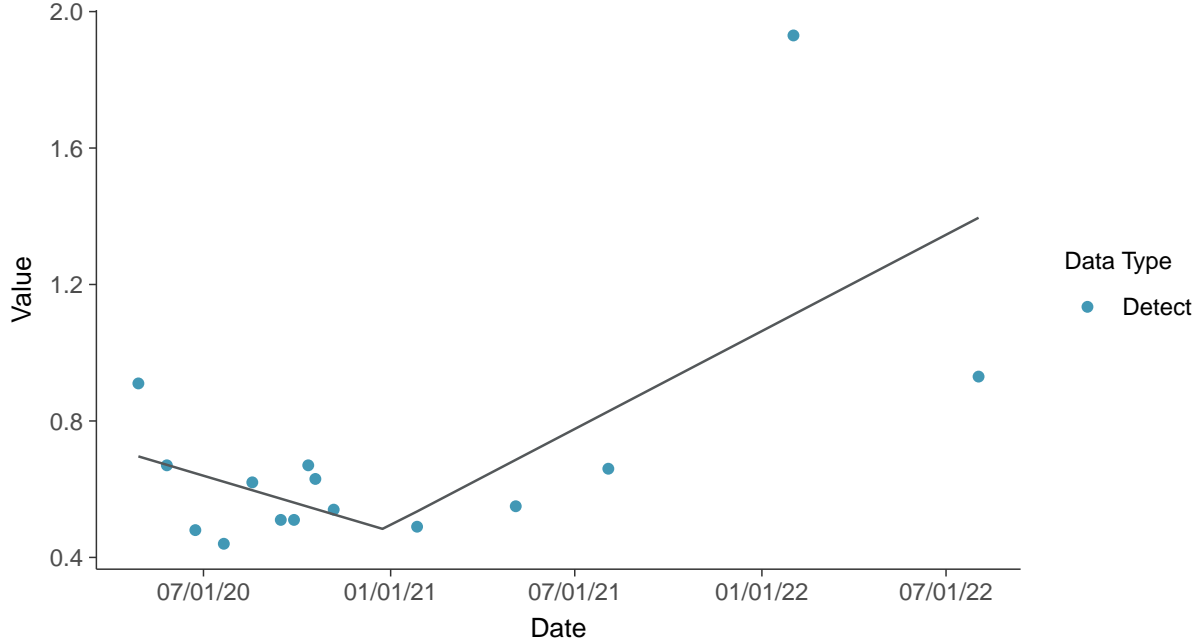
### Normal Q-Q plot

Iron, MW-2 (mg/L)



### Trend Regression: Piecewise Linear-Linear

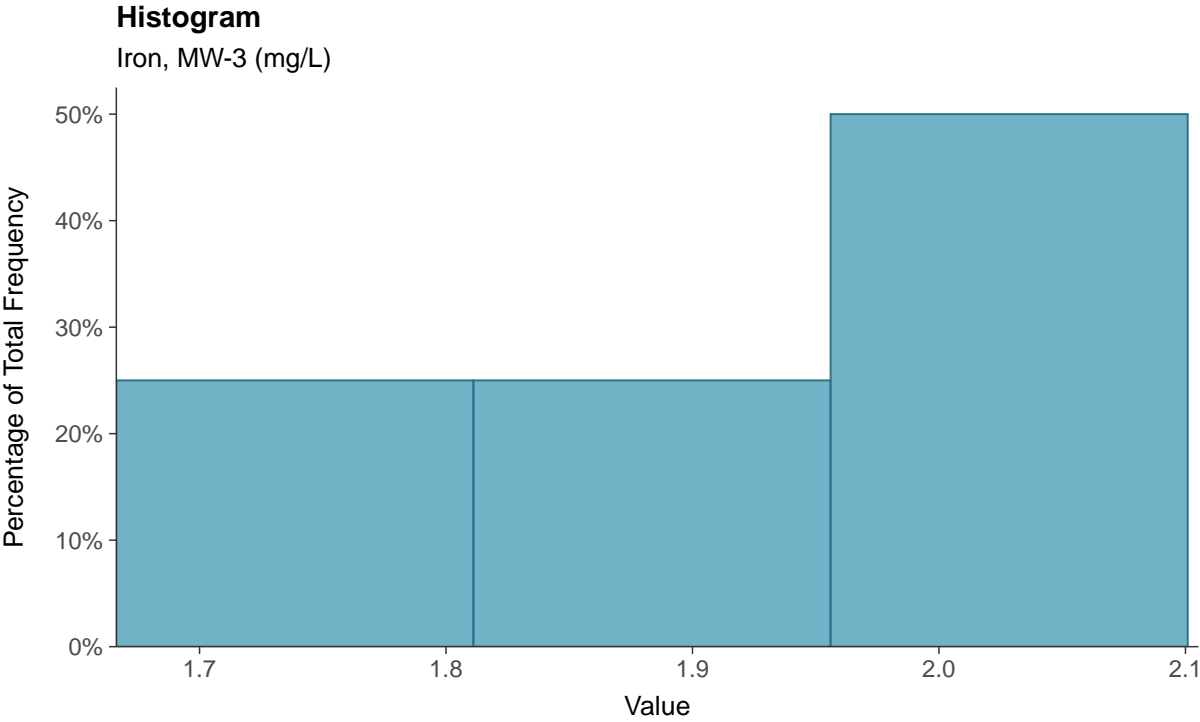
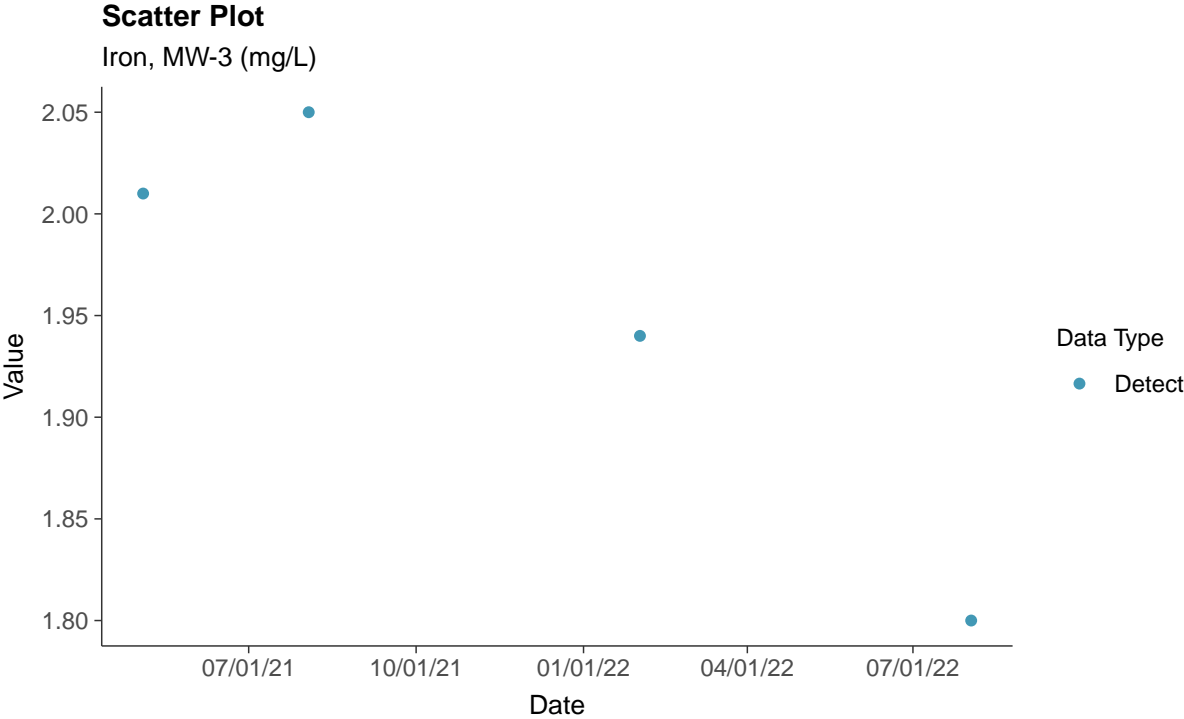
Iron, MW-2 (mg/L)





**Part 115: Iron, MW-3**

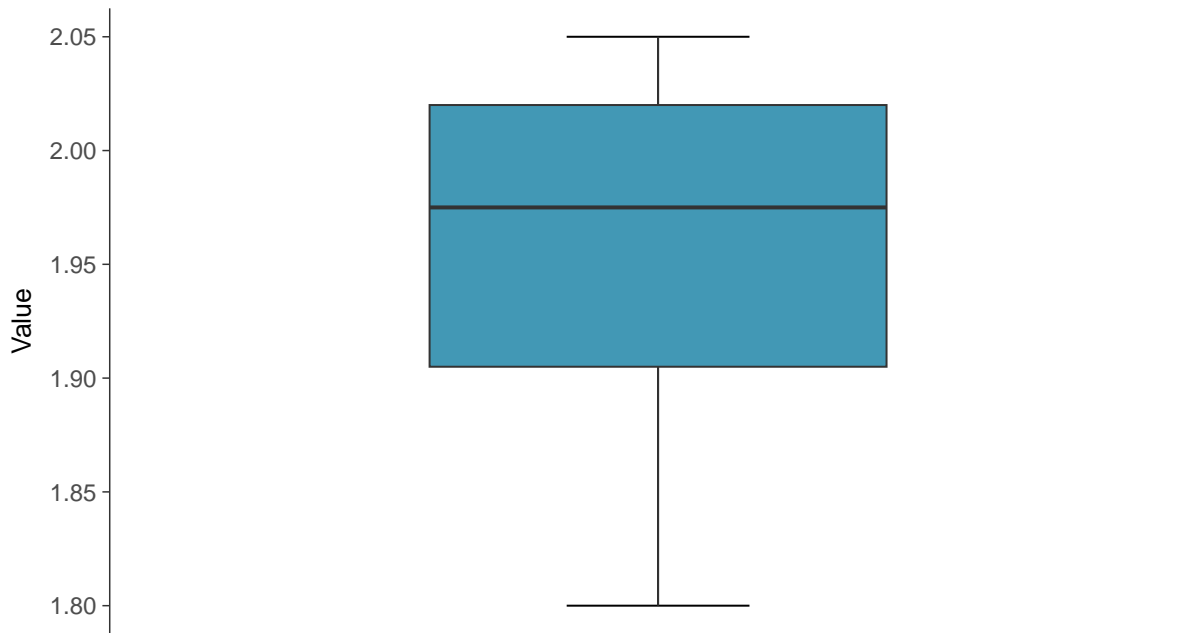
ID: 5\_37\_03





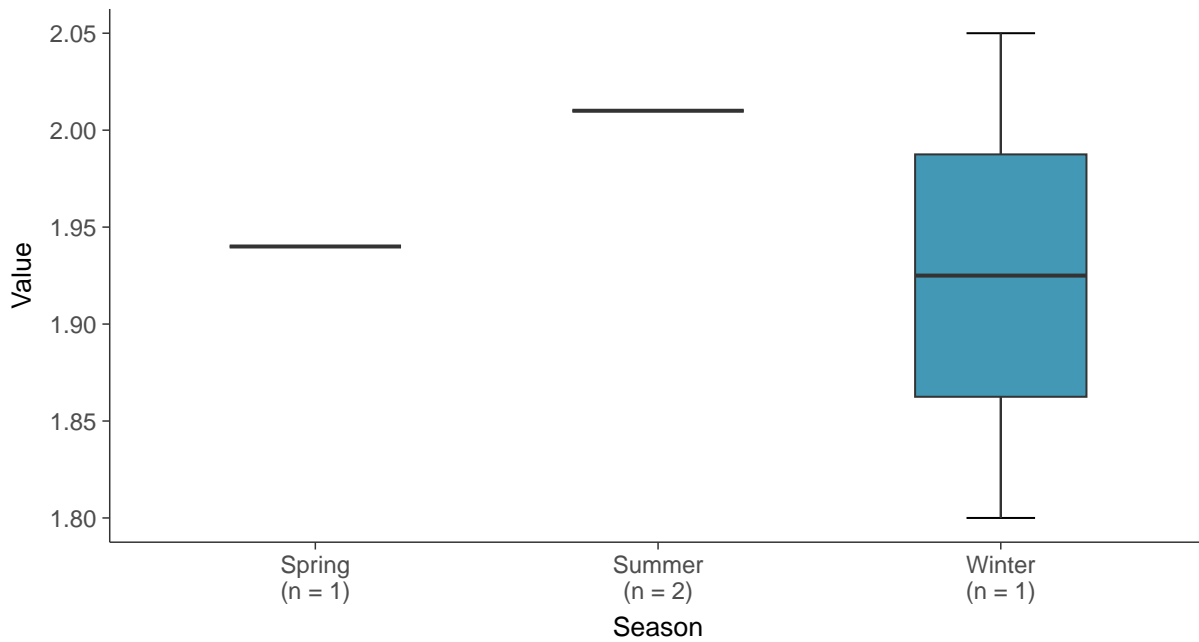
### Boxplot

Iron, MW-3 (mg/L)



### Boxplot by Season

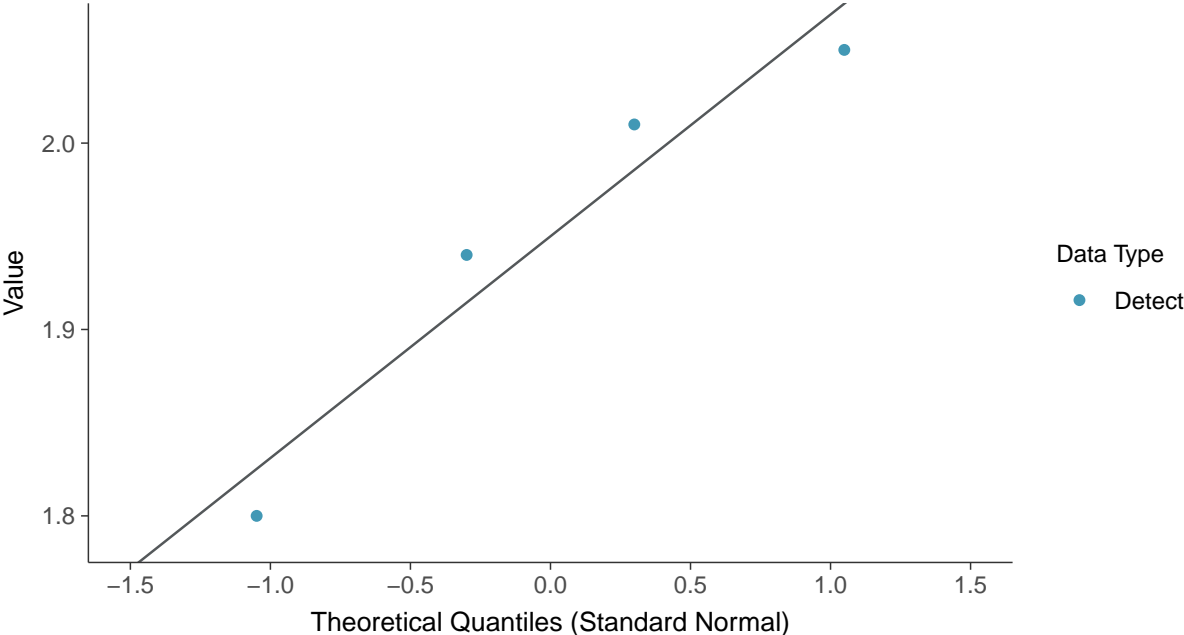
Iron, MW-3 (mg/L)





**Normal Q-Q plot**

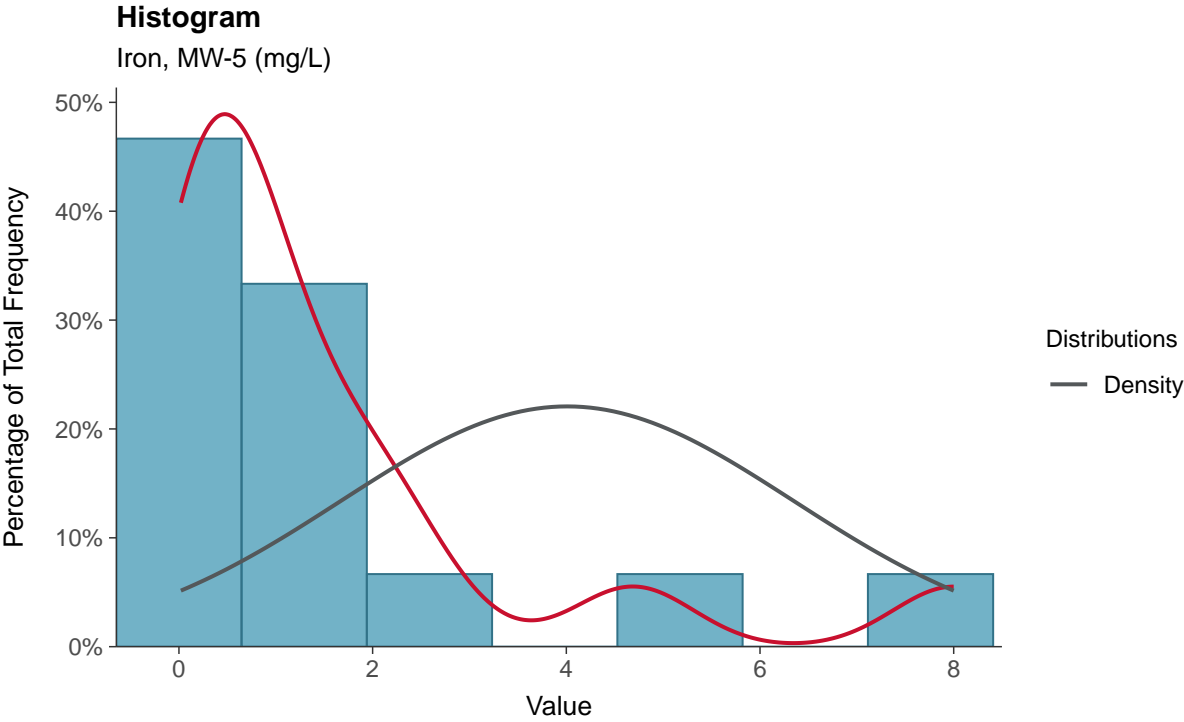
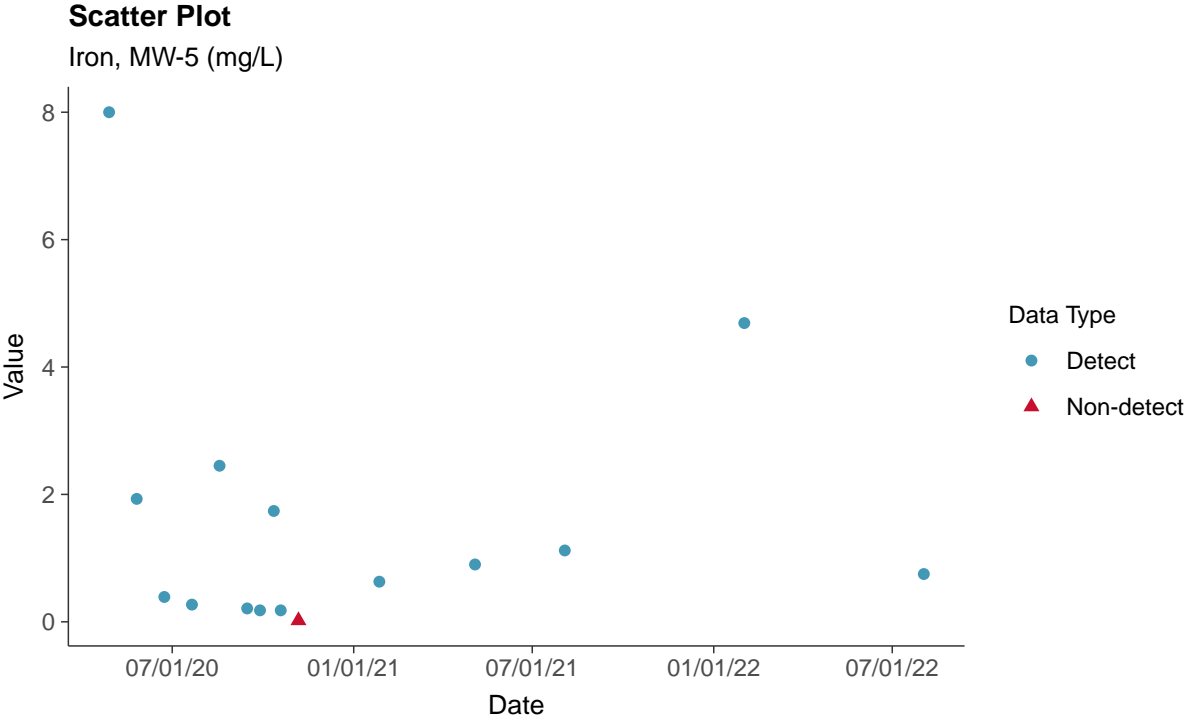
Iron, MW-3 (mg/L)





Part 115: Iron, MW-5

ID: 5\_37\_05

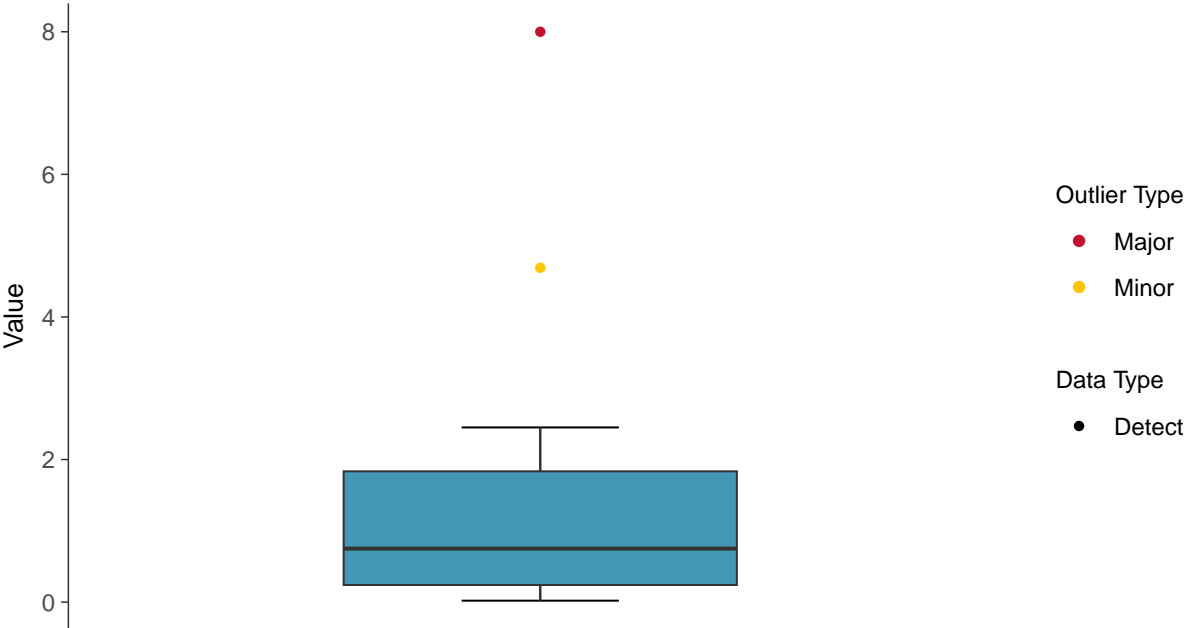






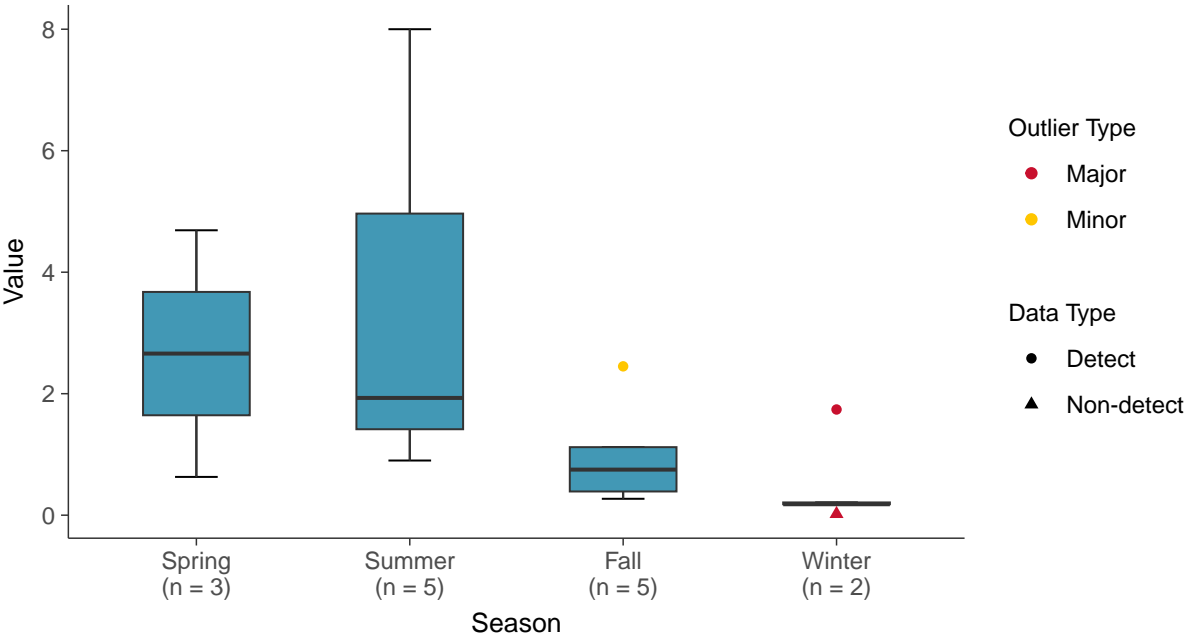
**Boxplot**

Iron, MW-5 (mg/L)



**Boxplot by Season**

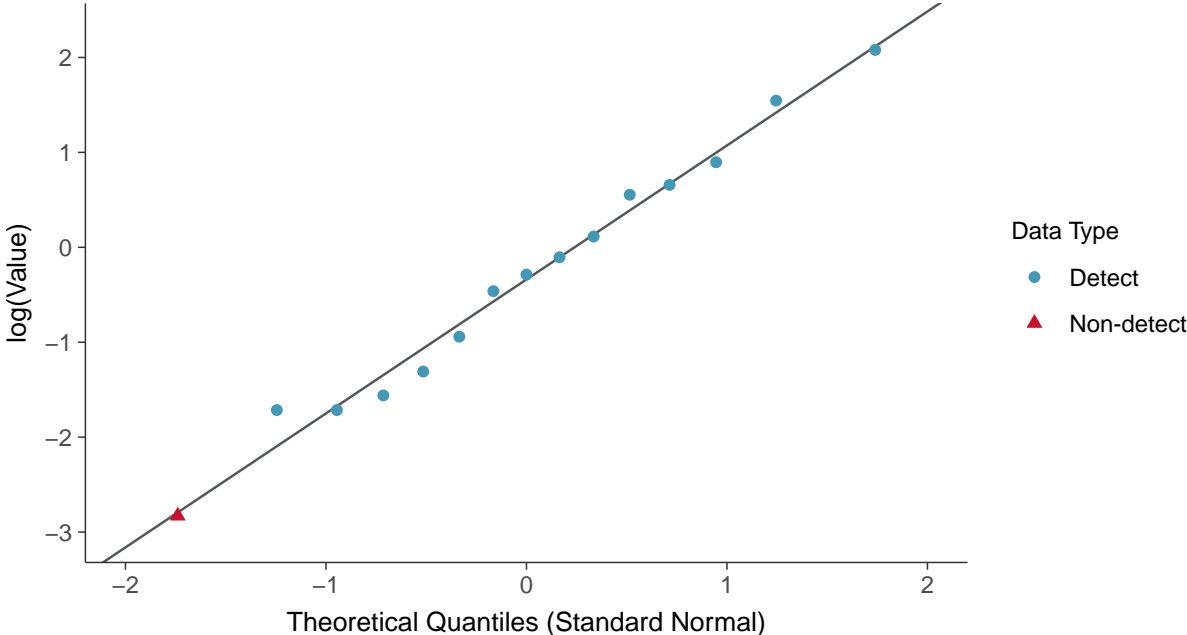
Iron, MW-5 (mg/L)





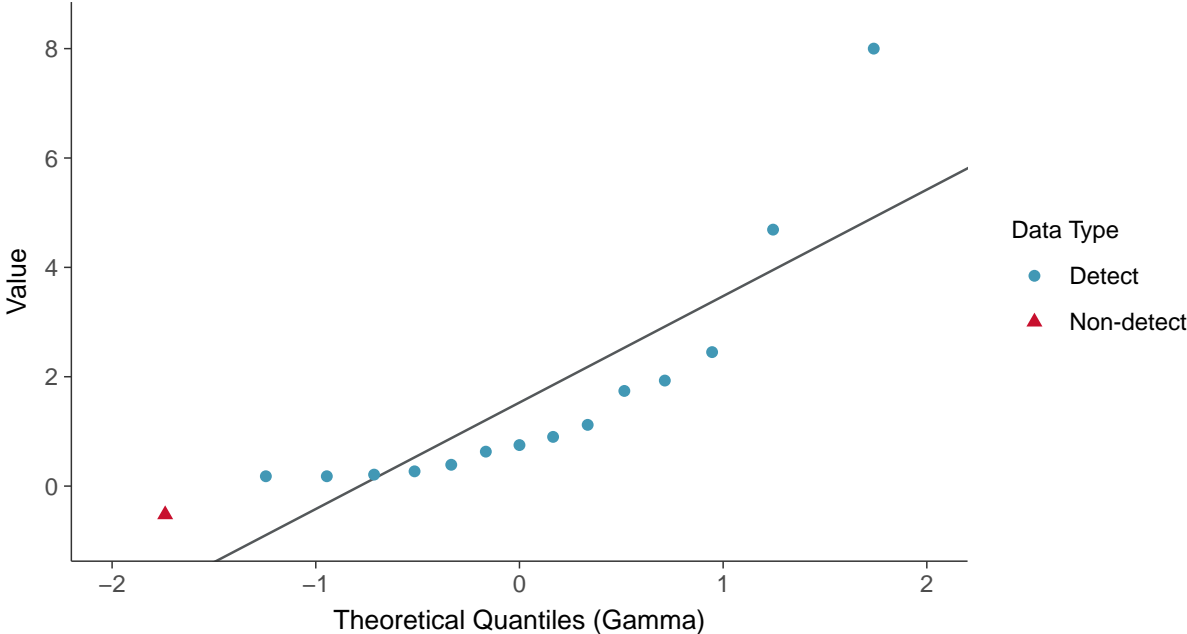
### Lognormal Q-Q plot using ROS Imputed Estimates

Iron, MW-5 (mg/L)



### Gamma Q-Q plot using ROS Imputed Estimates

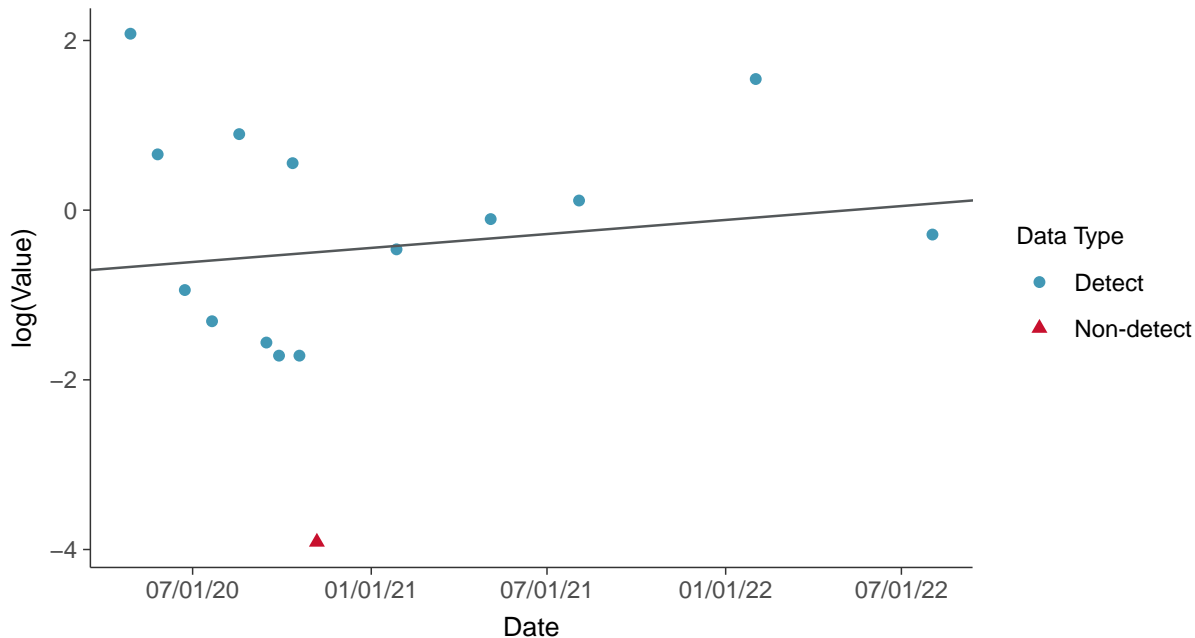
Iron, MW-5 (mg/L)





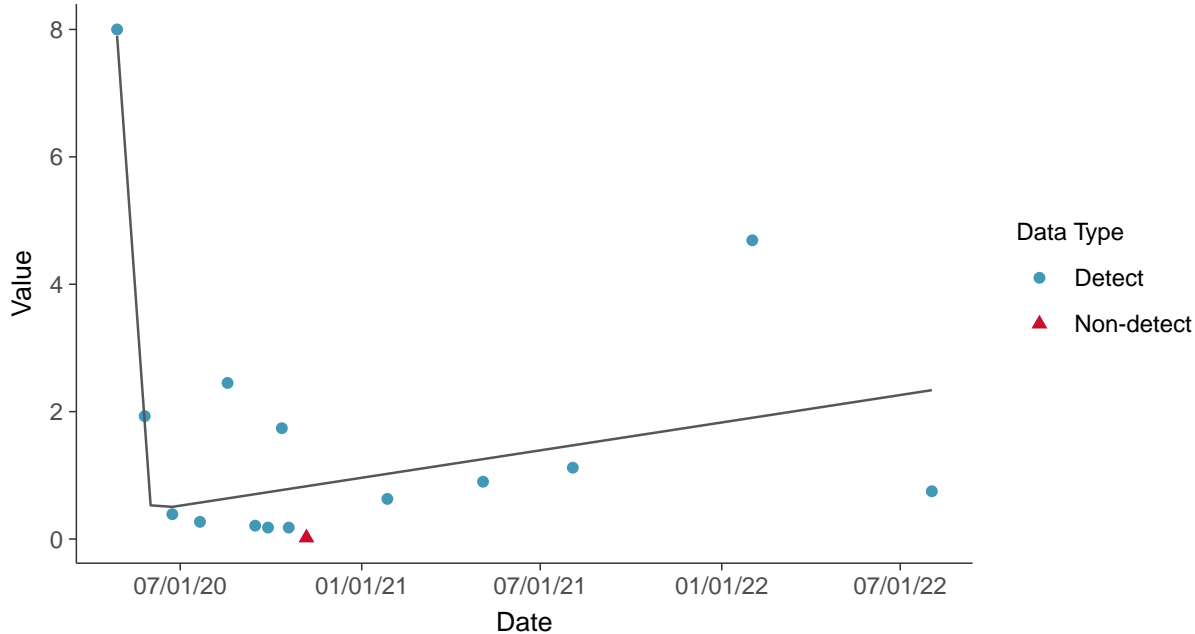
### Trend Regression: Lognormal MLE

Iron, MW-5 (mg/L)



### Trend Regression: Piecewise Linear-Linear

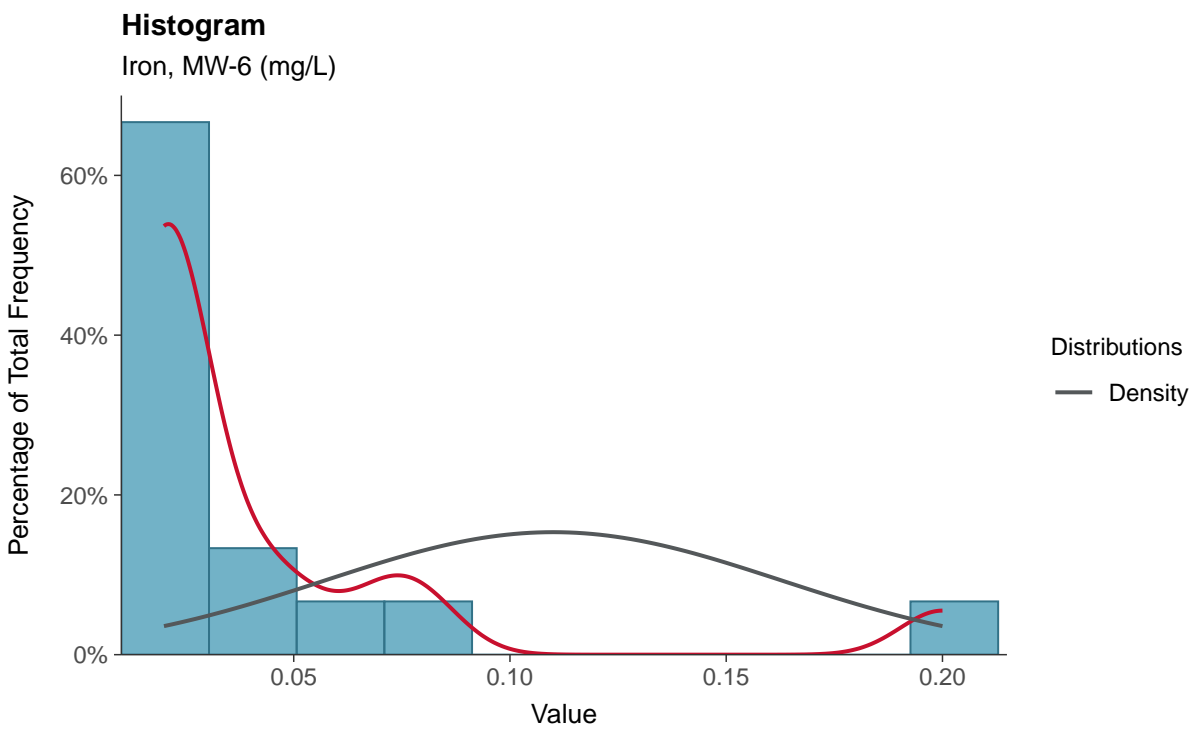
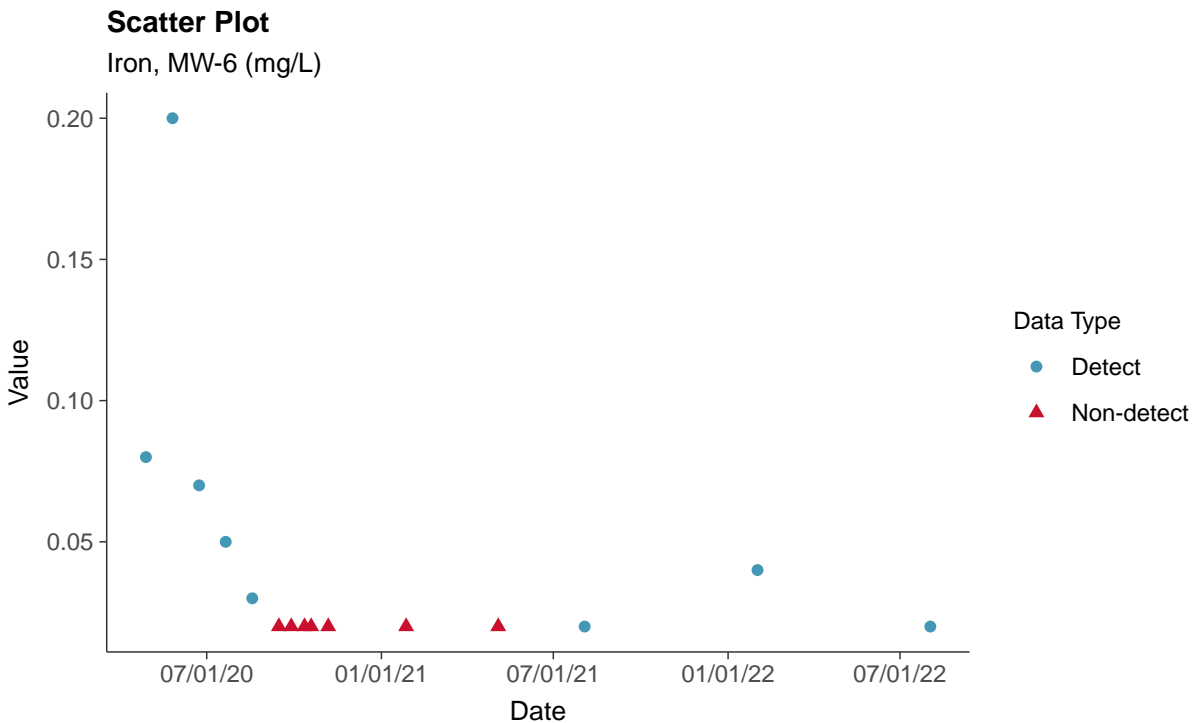
Iron, MW-5 (mg/L)





### Part 115: Iron, MW-6

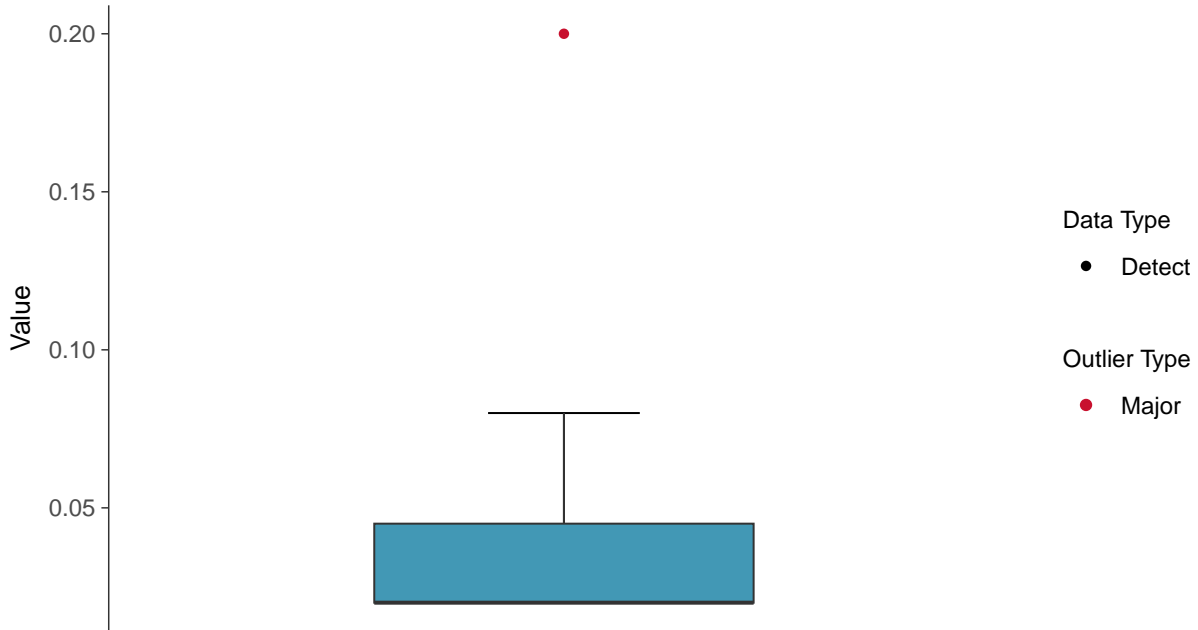
ID: 5\_37\_06





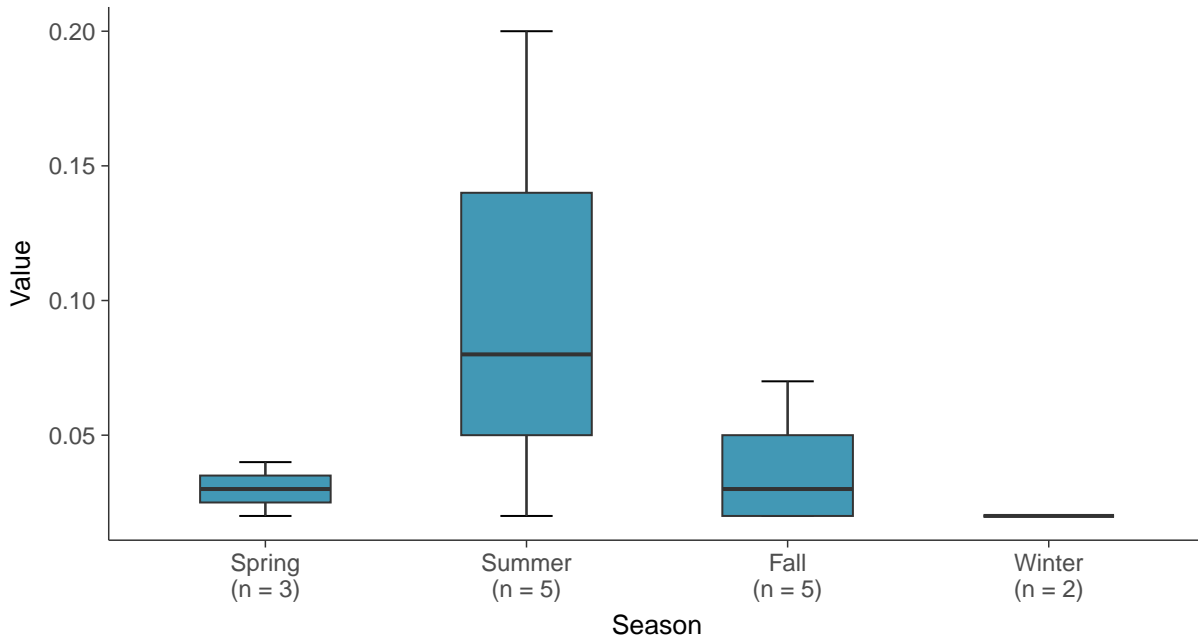
### Boxplot

Iron, MW-6 (mg/L)



### Boxplot by Season

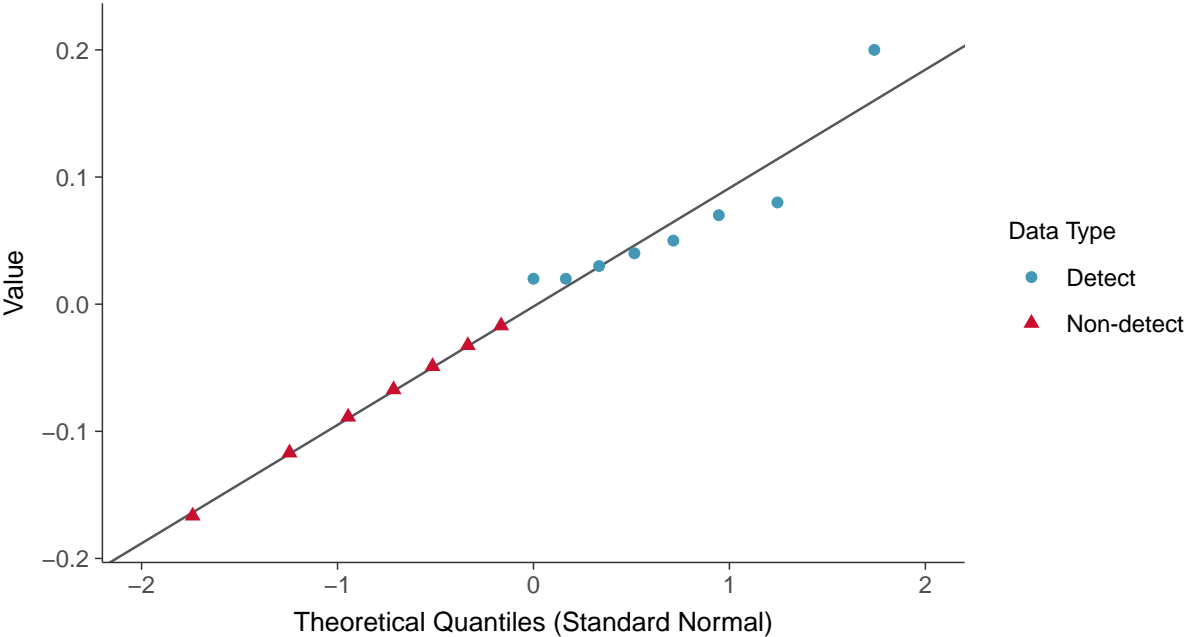
Iron, MW-6 (mg/L)





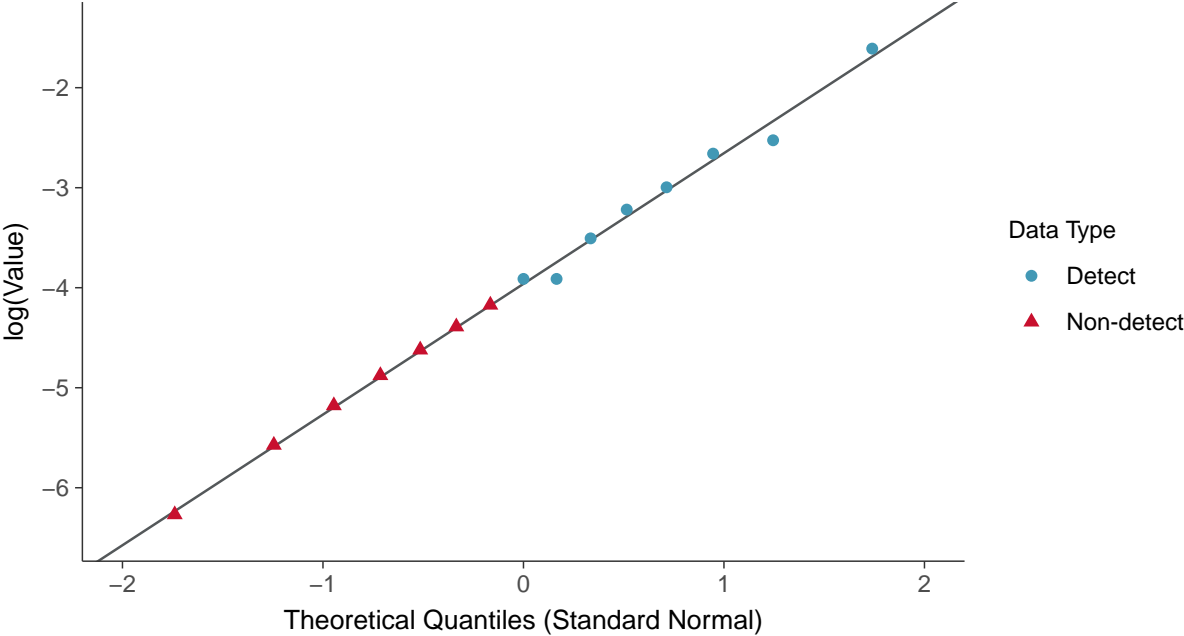
### Normal Q-Q plot using ROS Imputed Estimates

Iron, MW-6 (mg/L)



### Lognormal Q-Q plot using ROS Imputed Estimates

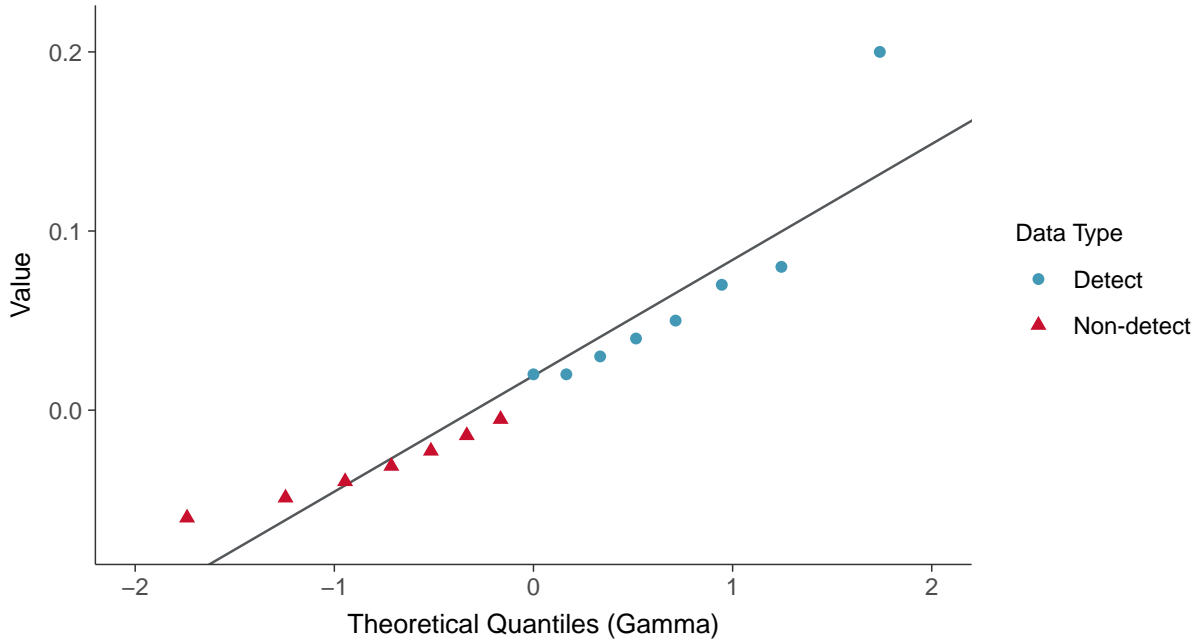
Iron, MW-6 (mg/L)





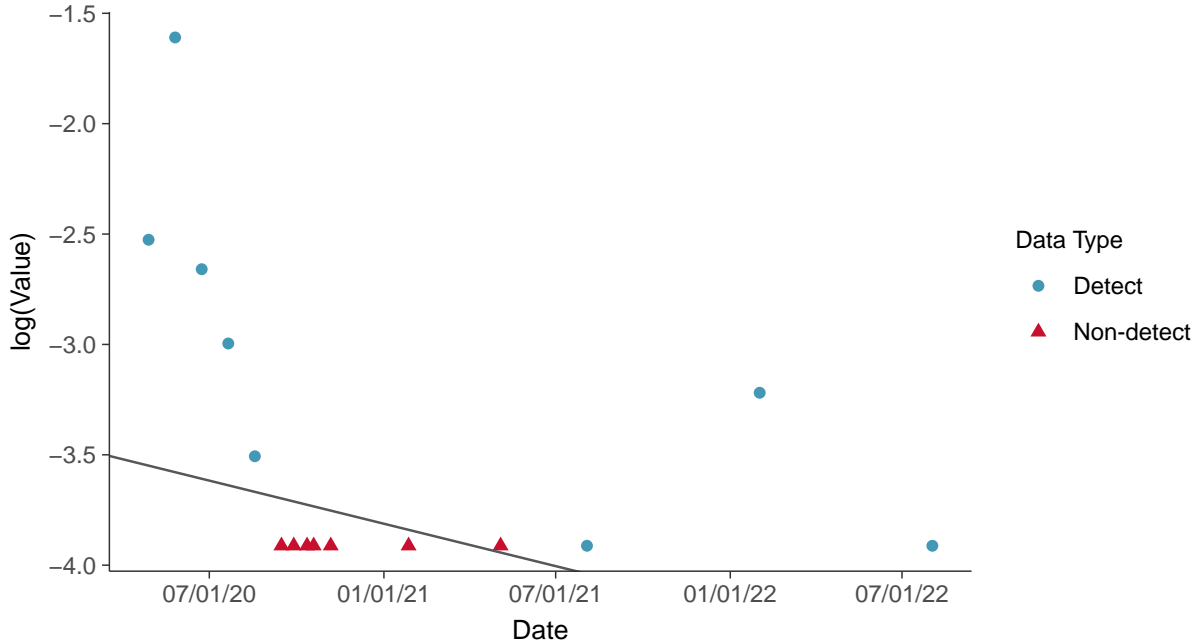
**Gamma Q-Q plot using ROS Imputed Estimates**

Iron, MW-6 (mg/L)



**Trend Regression: Lognormal MLE**

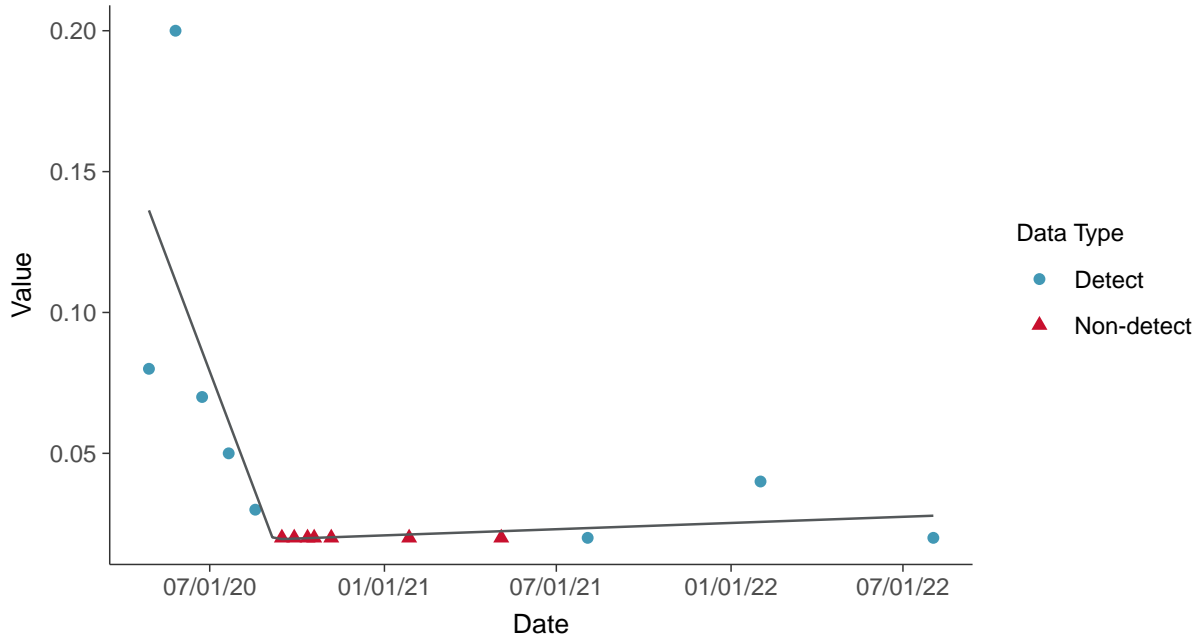
Iron, MW-6 (mg/L)





**Trend Regression: Piecewise Linear-Linear**

Iron, MW-6 (mg/L)





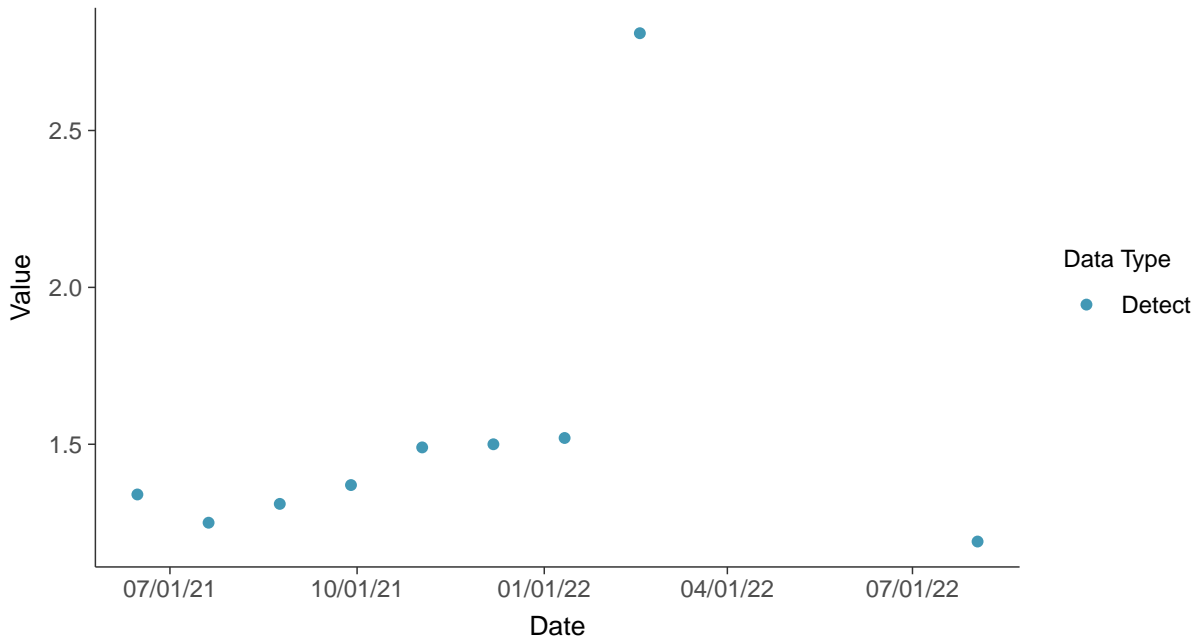


### Part 115: Iron, MW-7

ID: 5\_37\_07

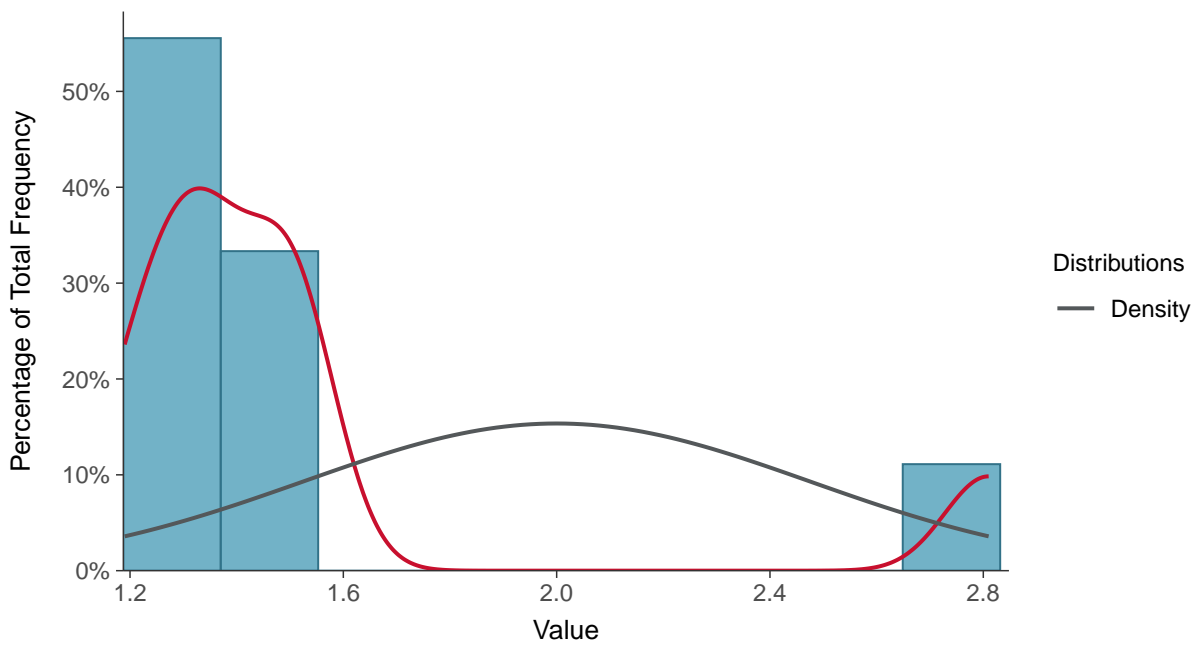
#### Scatter Plot

Iron, MW-7 (mg/L)



#### Histogram

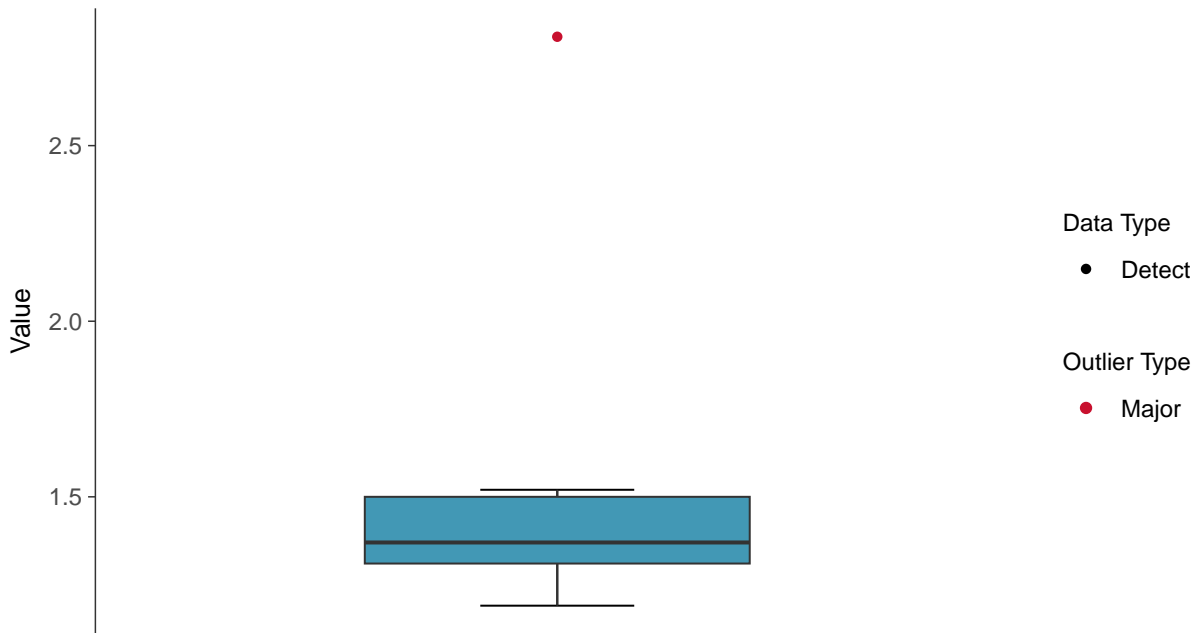
Iron, MW-7 (mg/L)





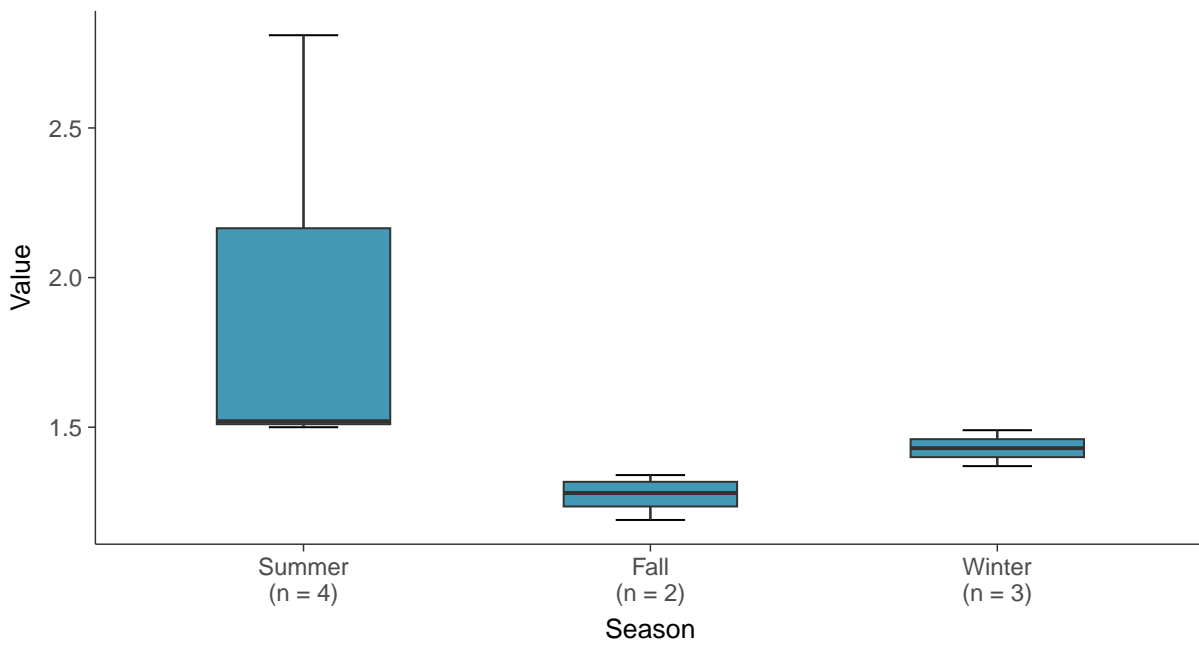
### Boxplot

Iron, MW-7 (mg/L)



### Boxplot by Season

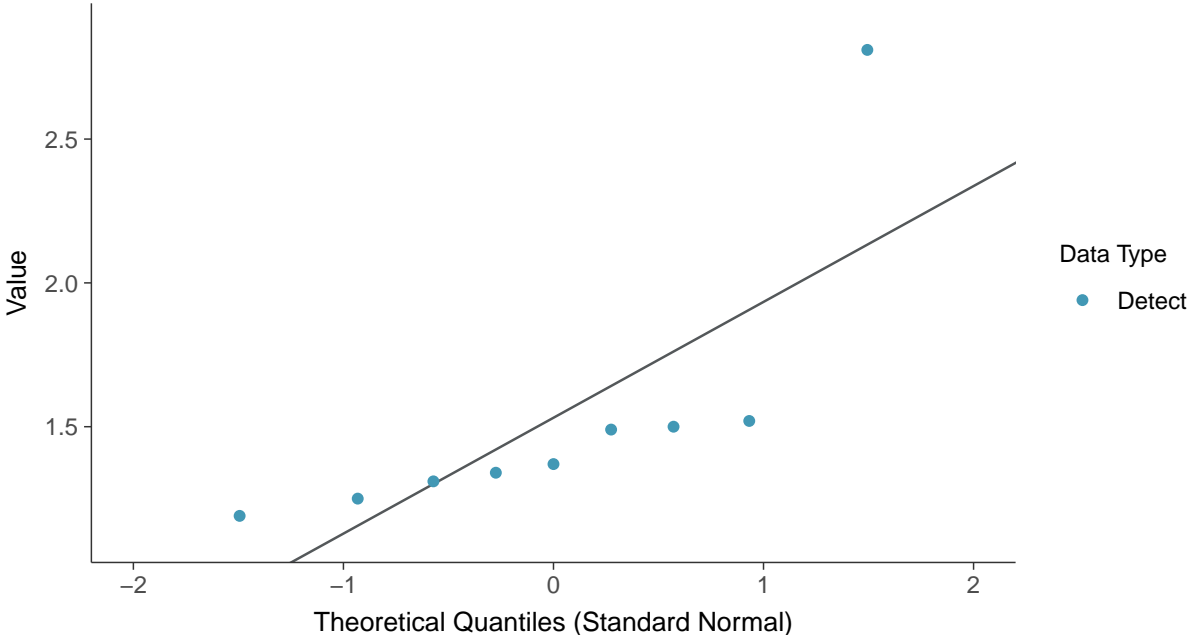
Iron, MW-7 (mg/L)





**Normal Q-Q plot**

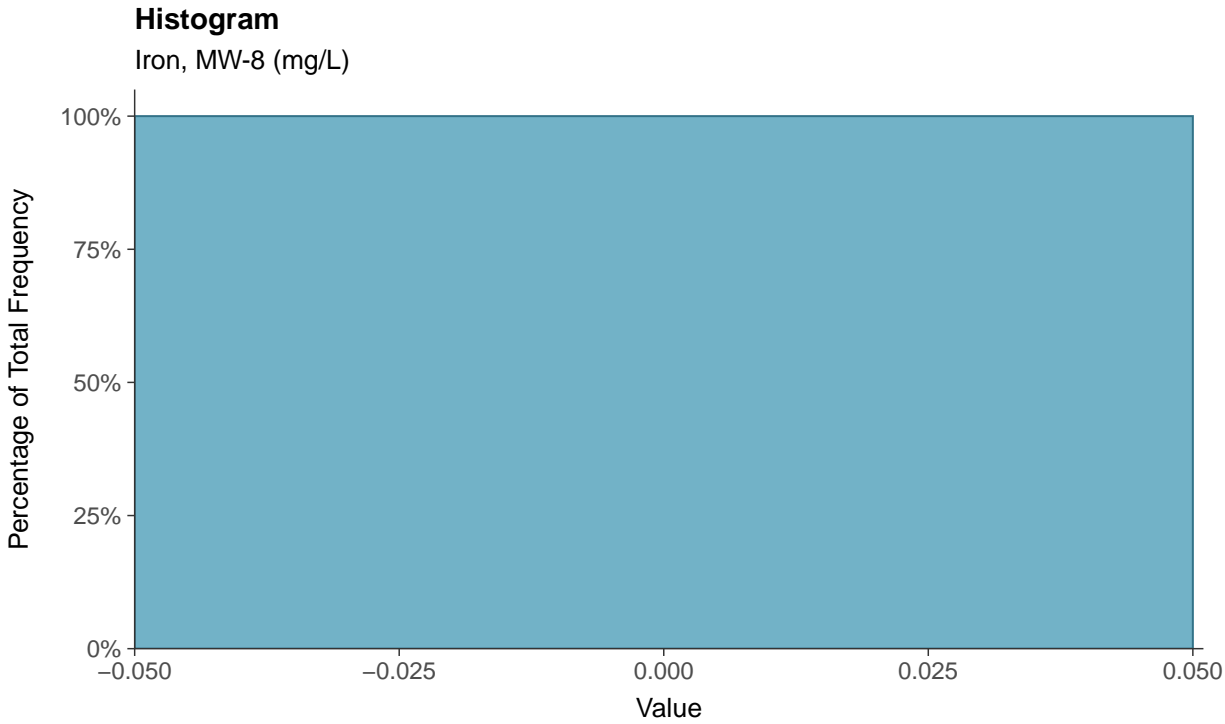
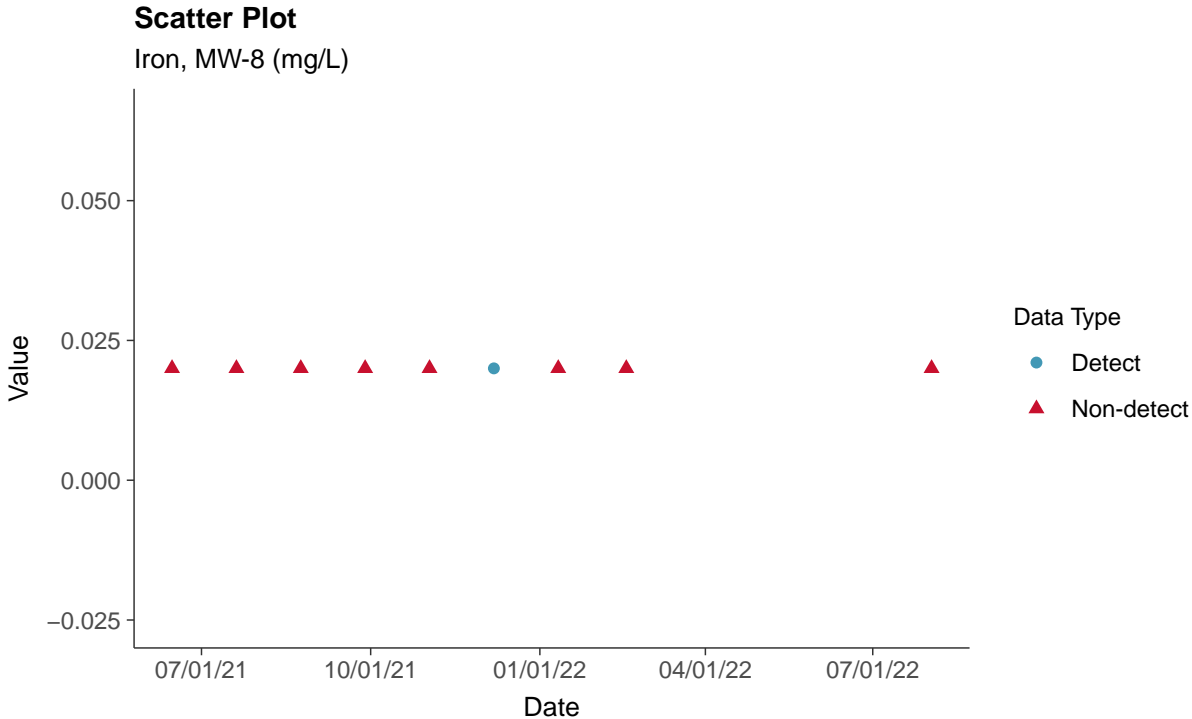
Iron, MW-7 (mg/L)





**Part 115: Iron, MW-8**

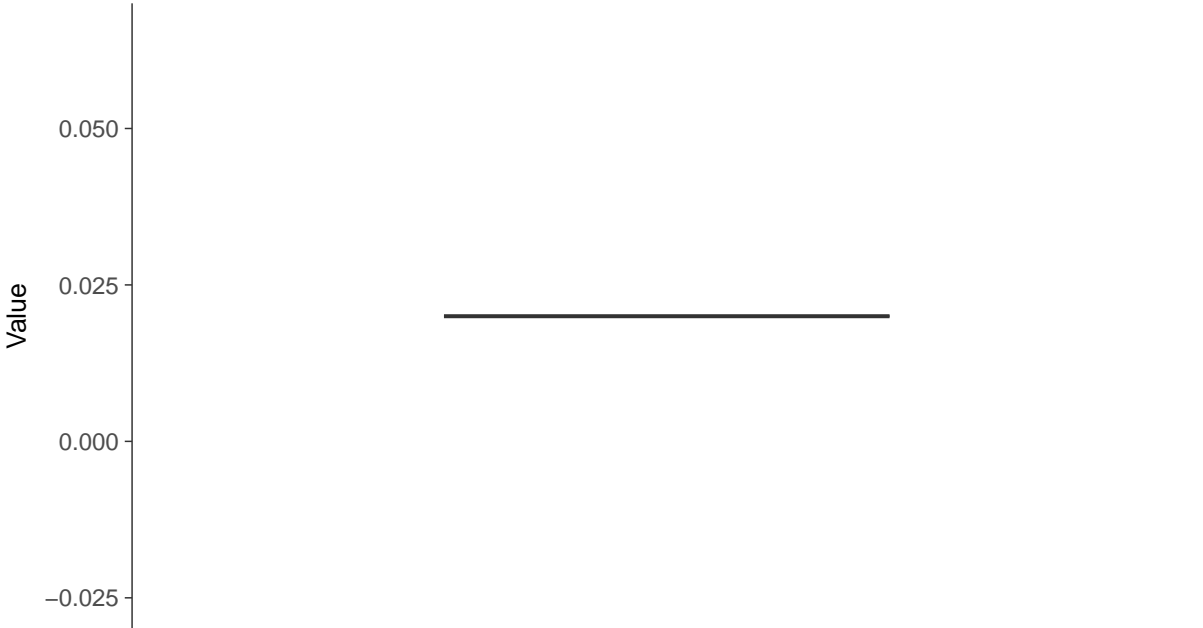
ID: 5\_37\_08





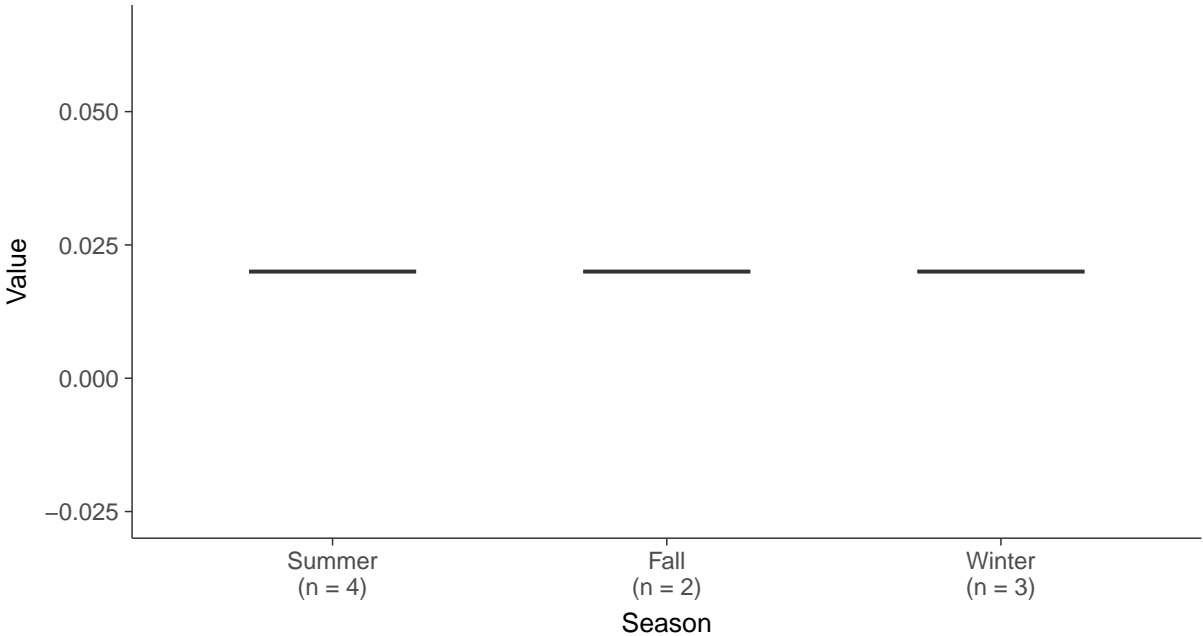
**Boxplot**

Iron, MW-8 (mg/L)



**Boxplot by Season**

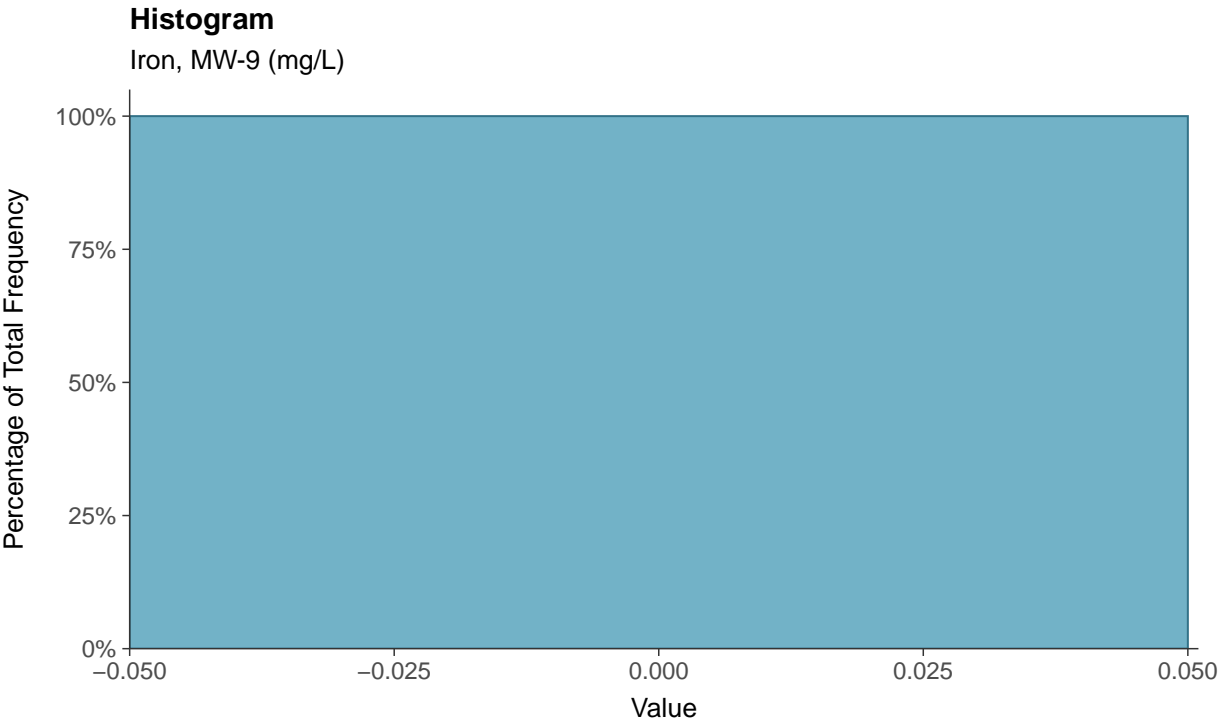
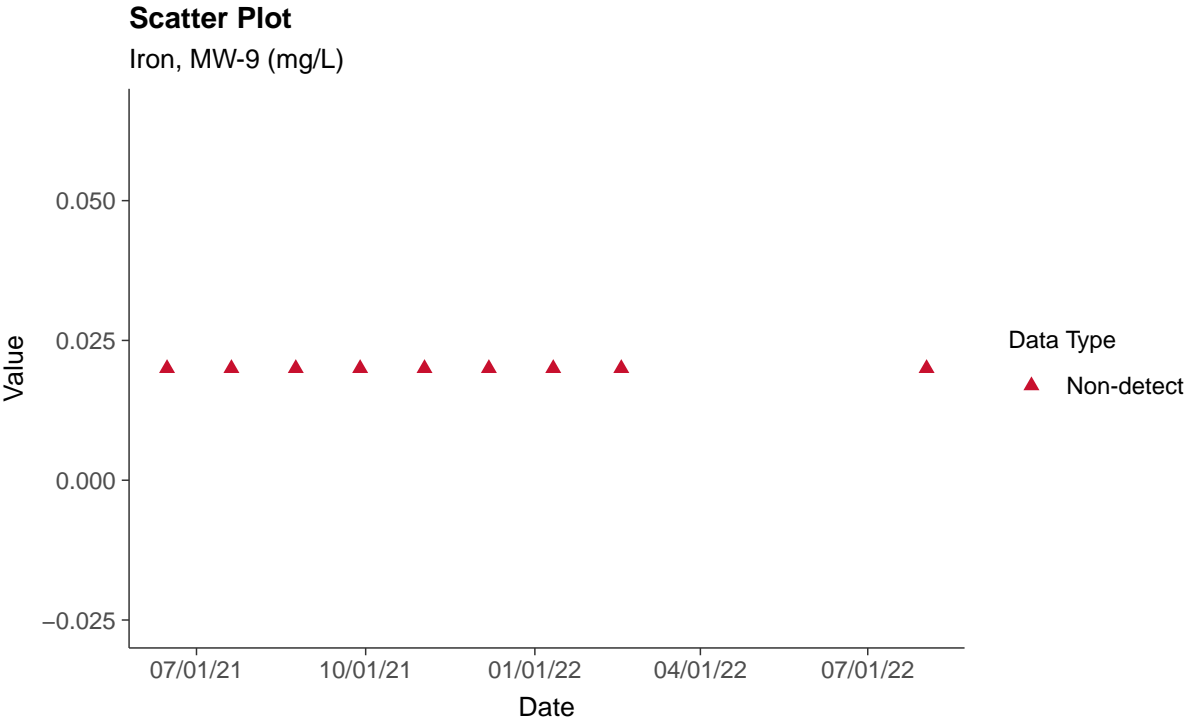
Iron, MW-8 (mg/L)





**Part 115: Iron, MW-9**

ID: 5\_37\_09





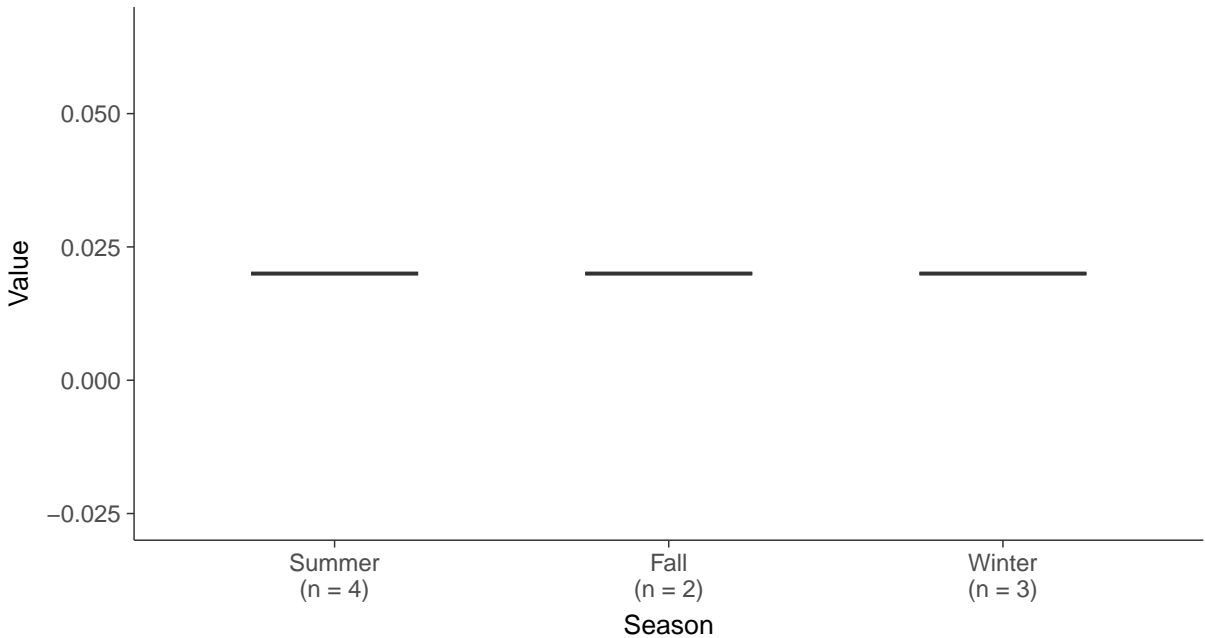
**Boxplot**

Iron, MW-9 (mg/L)



**Boxplot by Season**

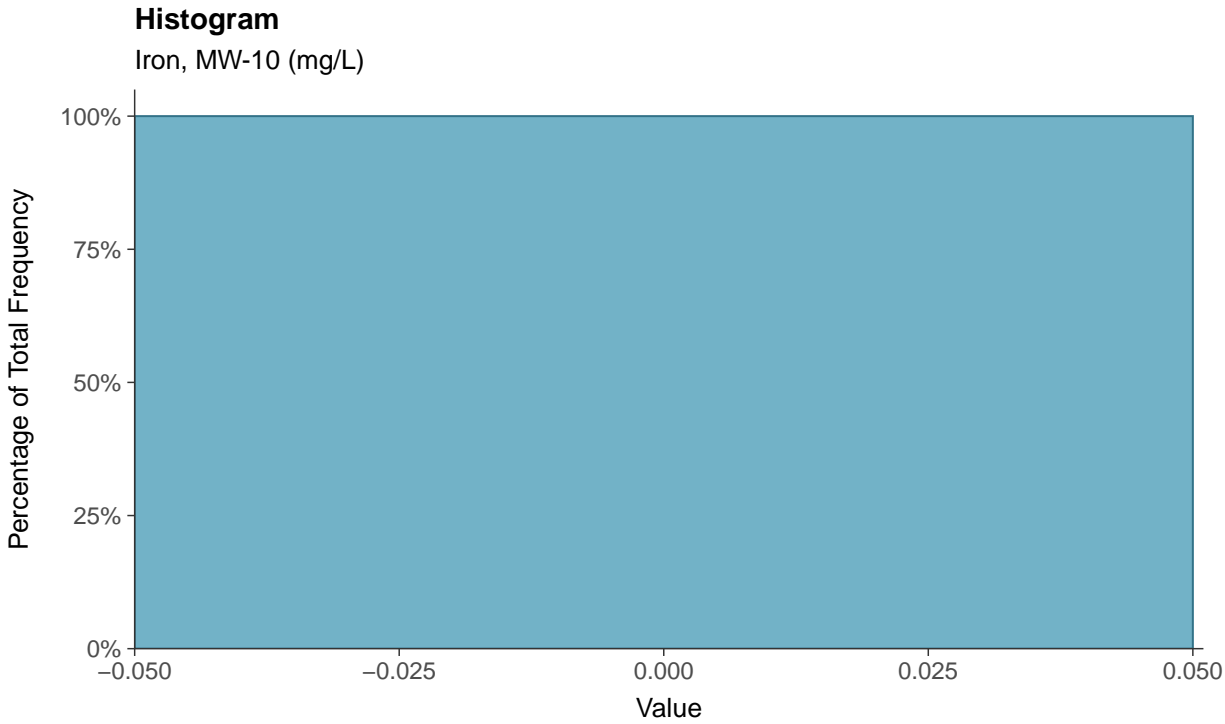
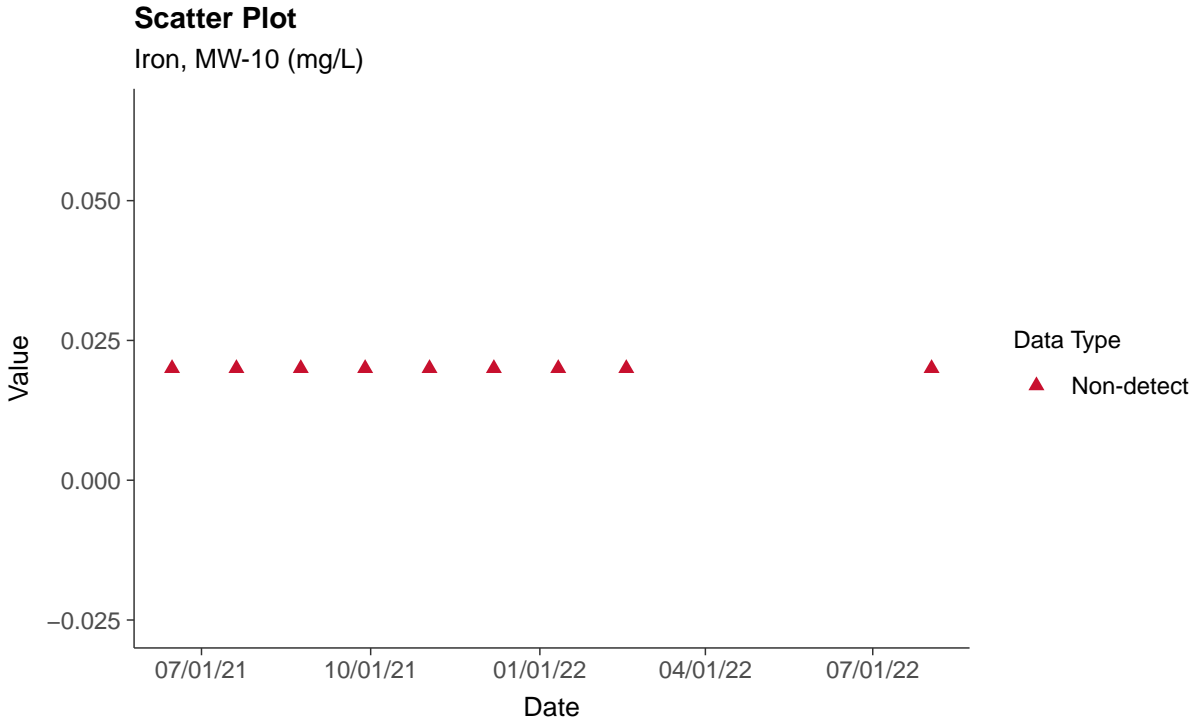
Iron, MW-9 (mg/L)





**Part 115: Iron, MW-10**

ID: 5\_37\_10







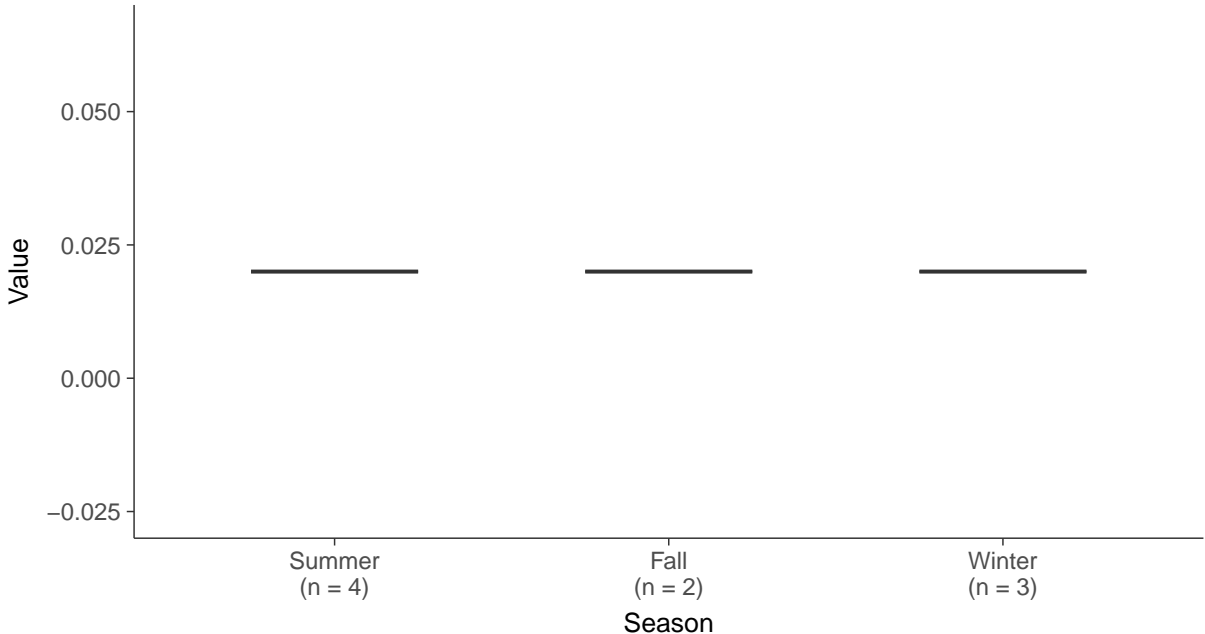
**Boxplot**

Iron, MW-10 (mg/L)



**Boxplot by Season**

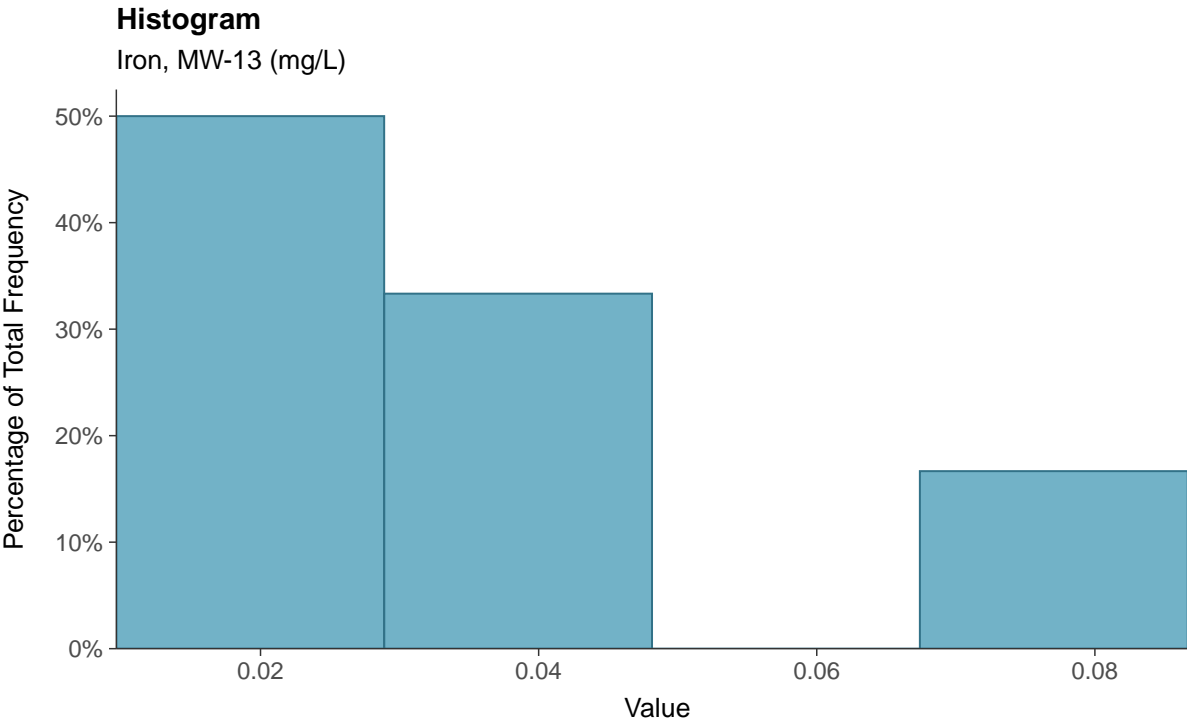
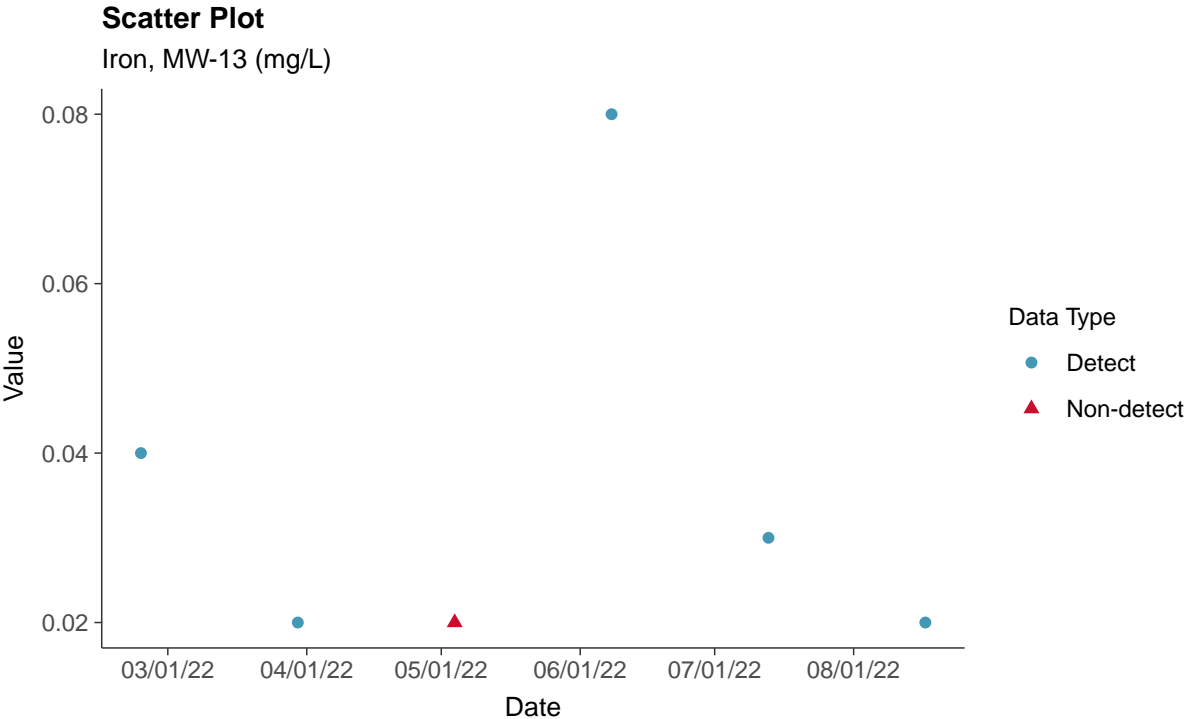
Iron, MW-10 (mg/L)





**Part 115: Iron, MW-13**

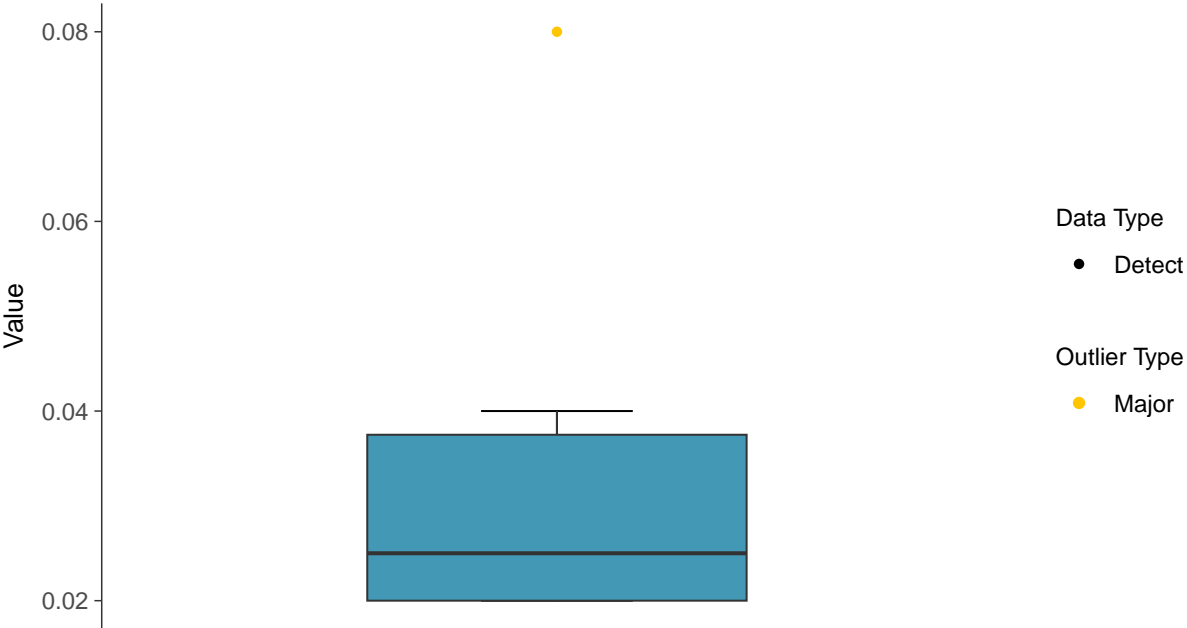
ID: 5\_37\_13





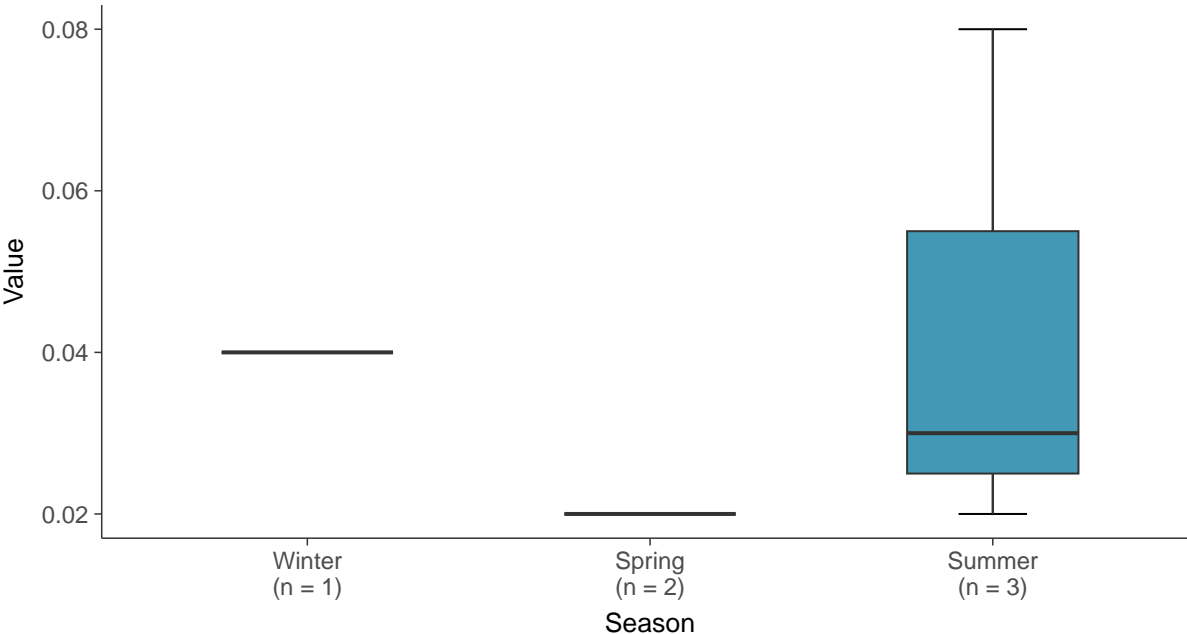
**Boxplot**

Iron, MW-13 (mg/L)



**Boxplot by Season**

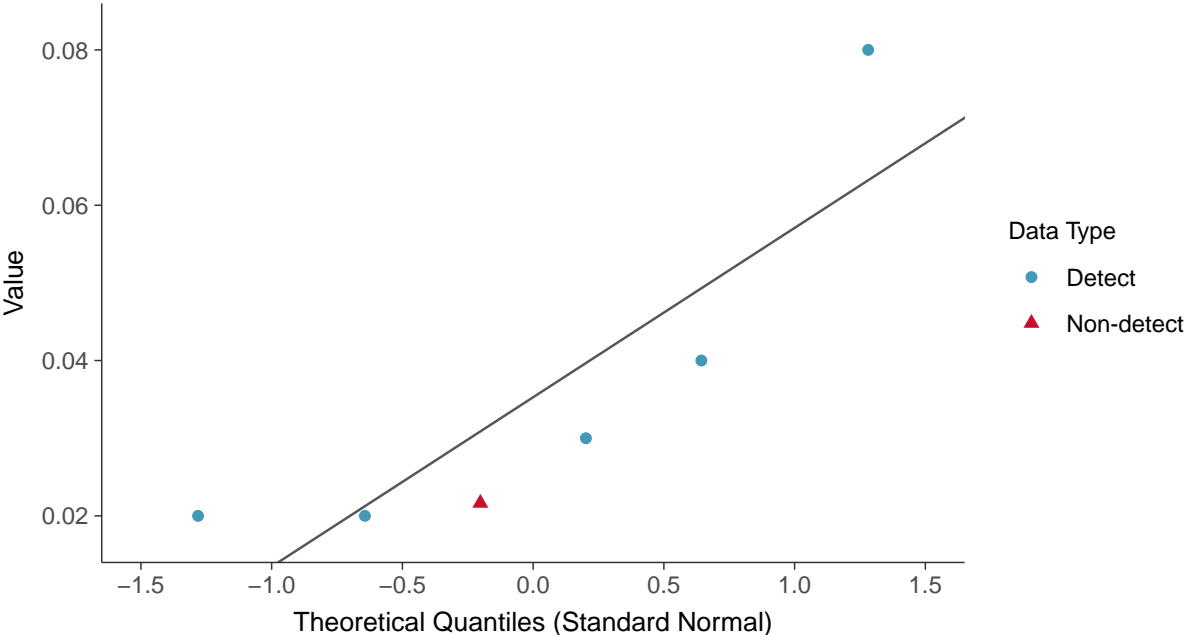
Iron, MW-13 (mg/L)





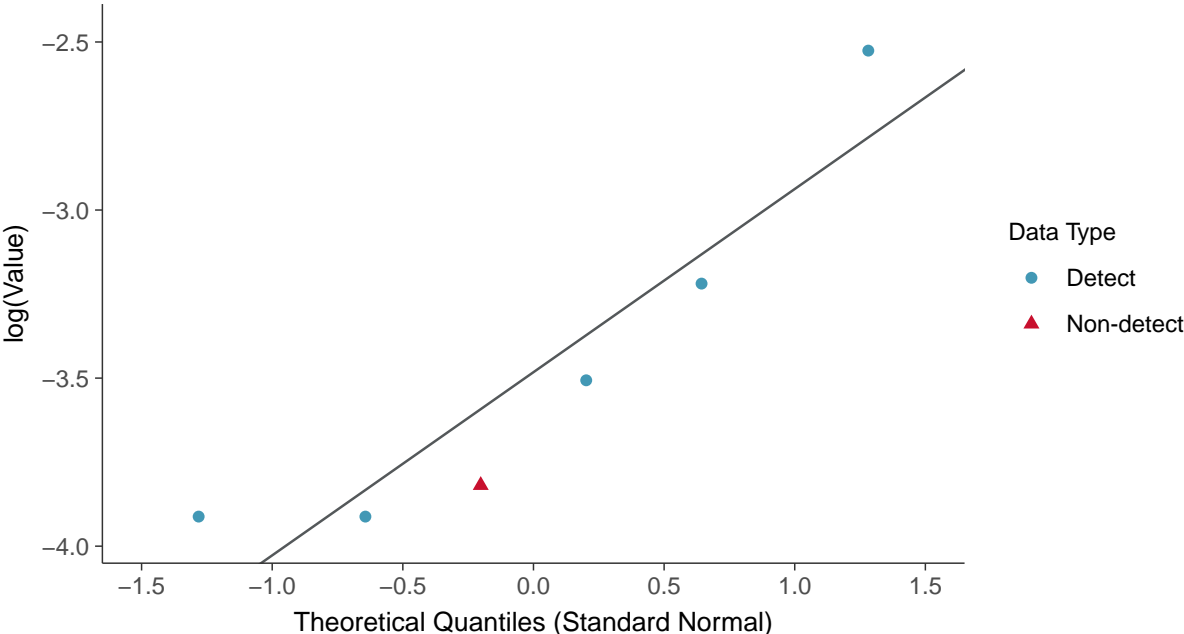
### Normal Q-Q plot using ROS Imputed Estimates

Iron, MW-13 (mg/L)



### Lognormal Q-Q plot using ROS Imputed Estimates

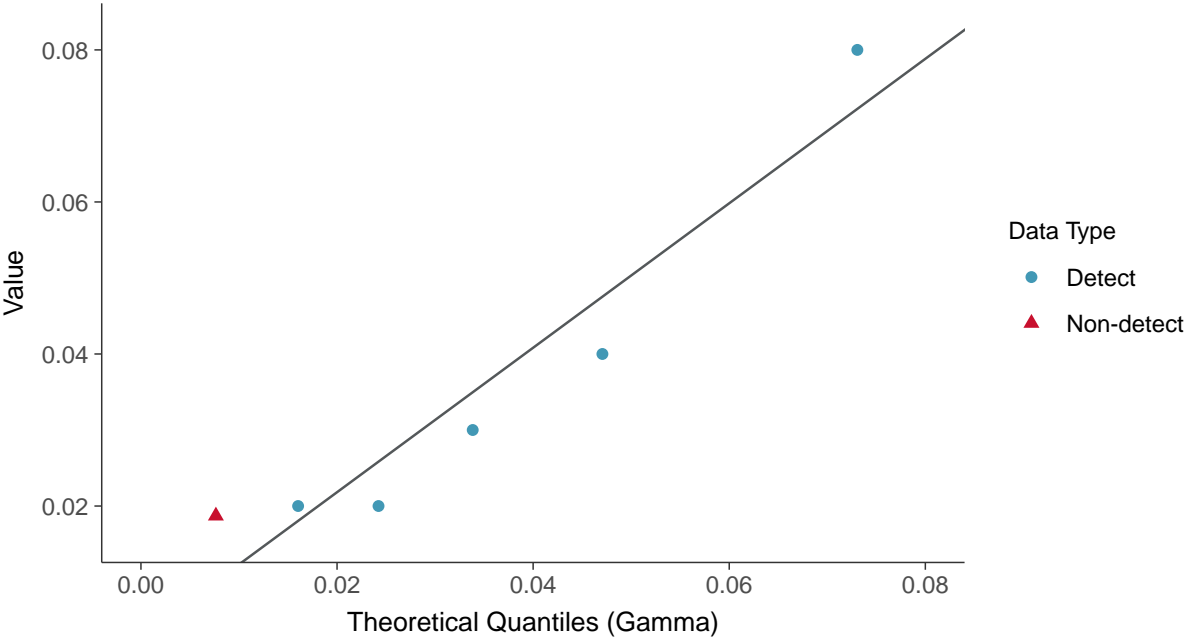
Iron, MW-13 (mg/L)





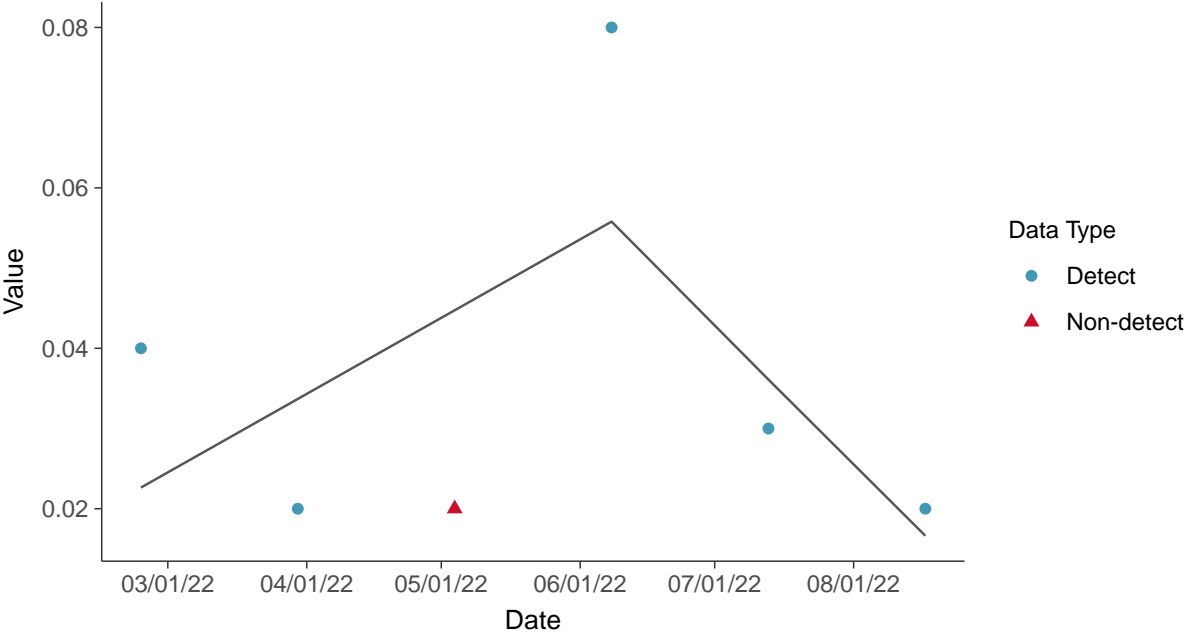
### Gamma Q-Q plot using ROS Imputed Estimates

Iron, MW-13 (mg/L)



### Trend Regression: Piecewise Linear-Linear

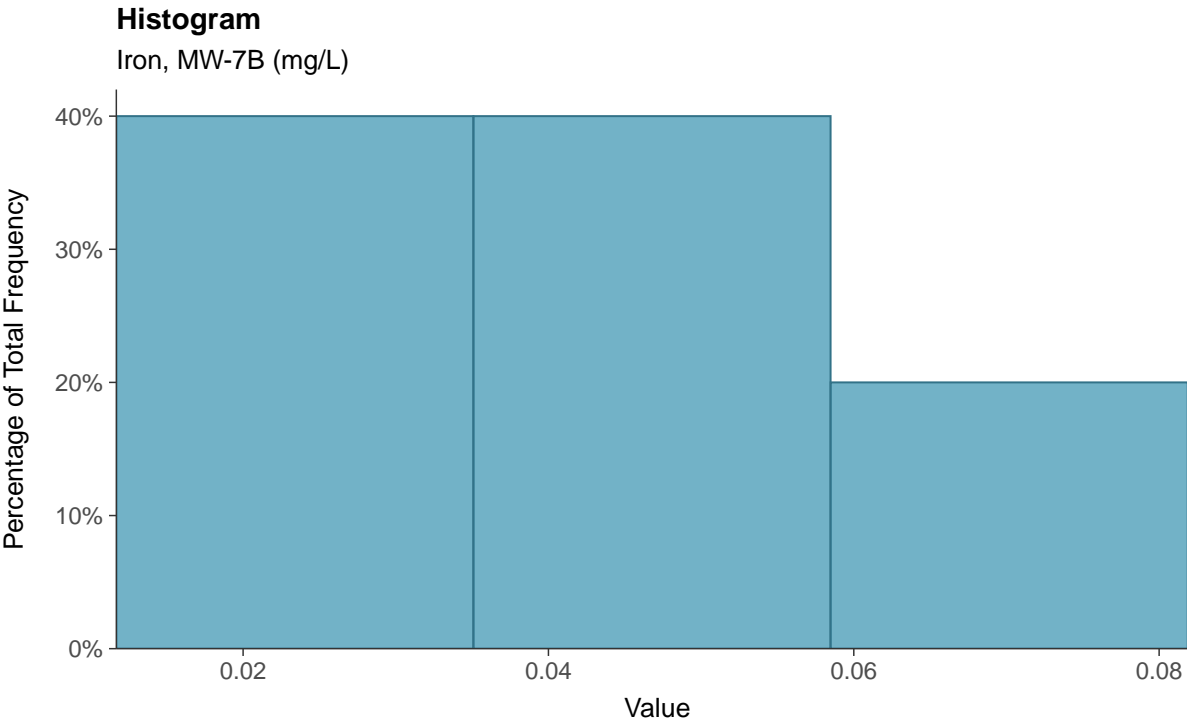
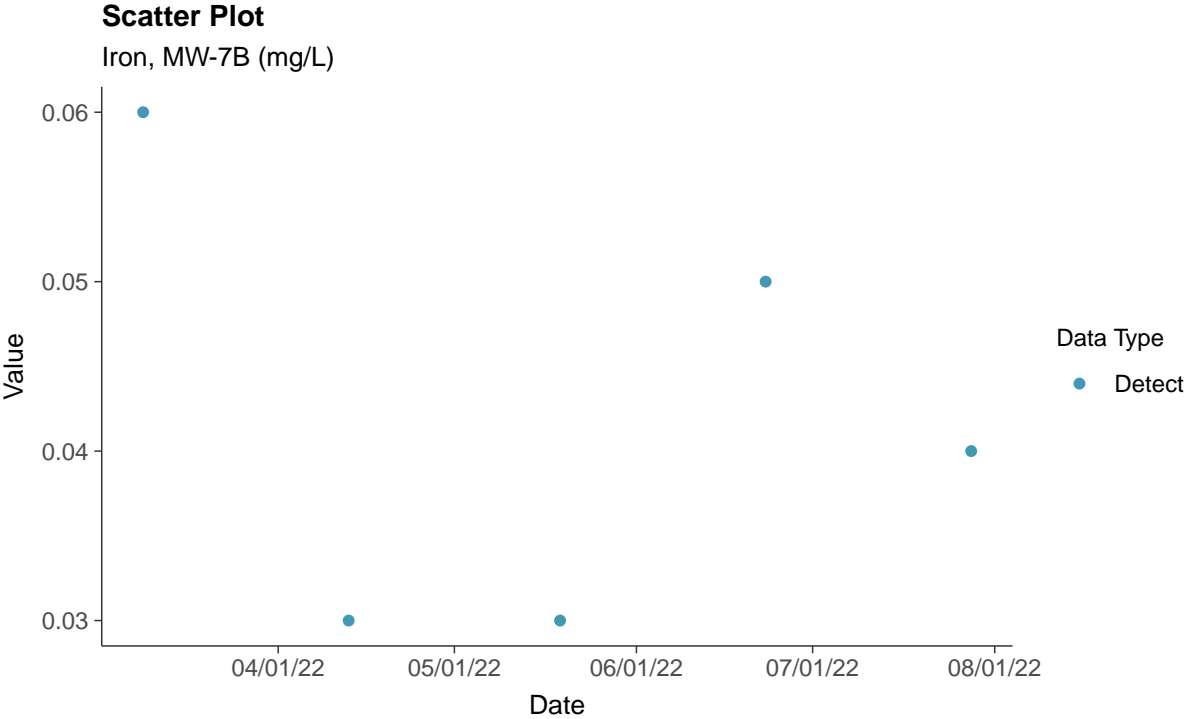
Iron, MW-13 (mg/L)





**Part 115: Iron, MW-7B**

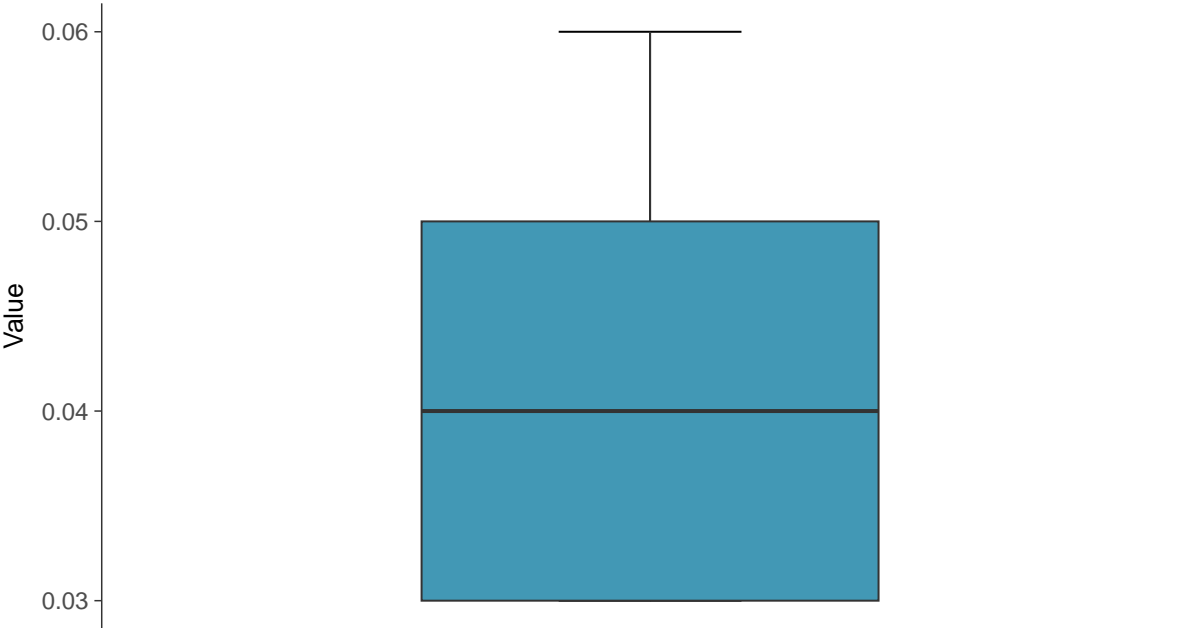
ID: 5\_37\_7B





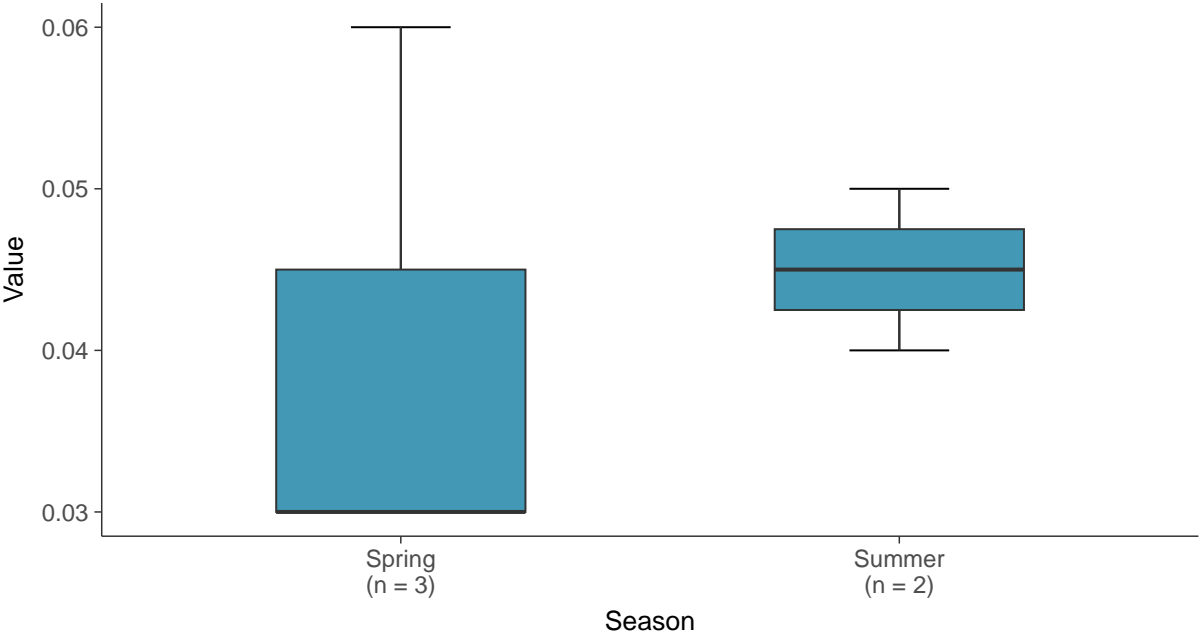
**Boxplot**

Iron, MW-7B (mg/L)



**Boxplot by Season**

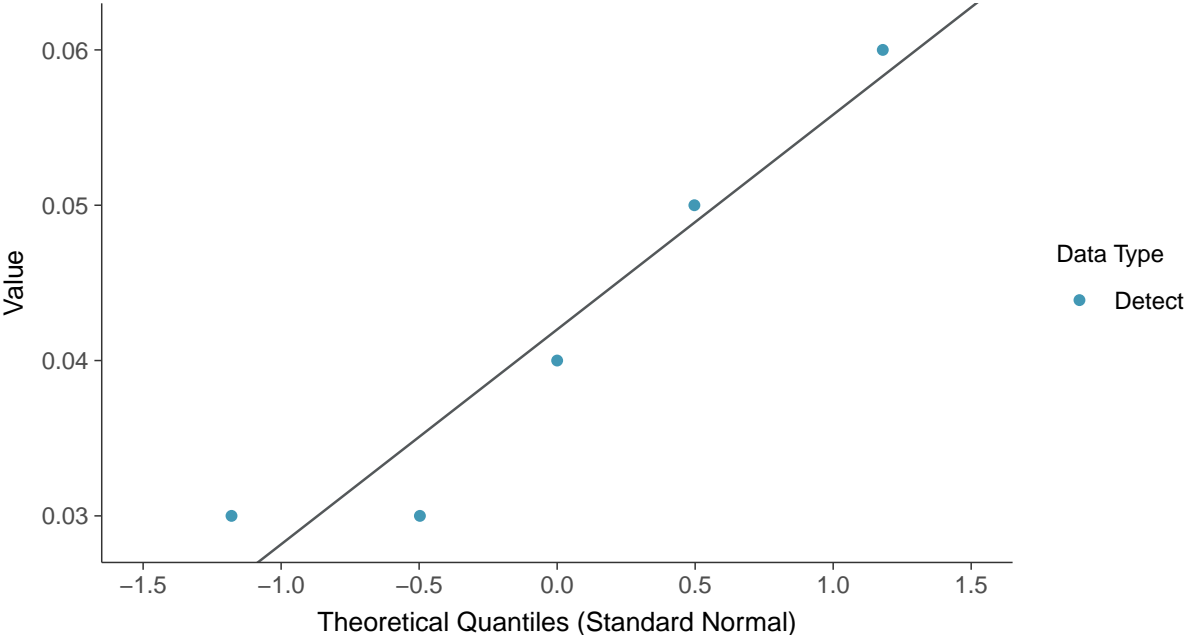
Iron, MW-7B (mg/L)





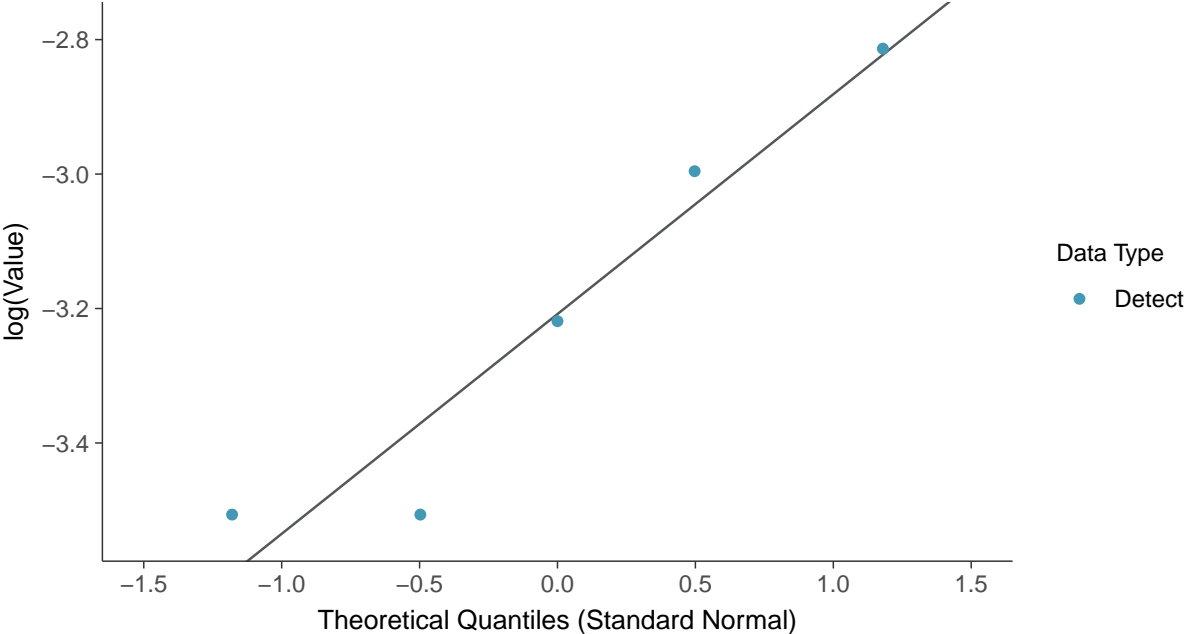
**Normal Q-Q plot**

Iron, MW-7B (mg/L)



**Lognormal Q-Q plot**

Iron, MW-7B (mg/L)

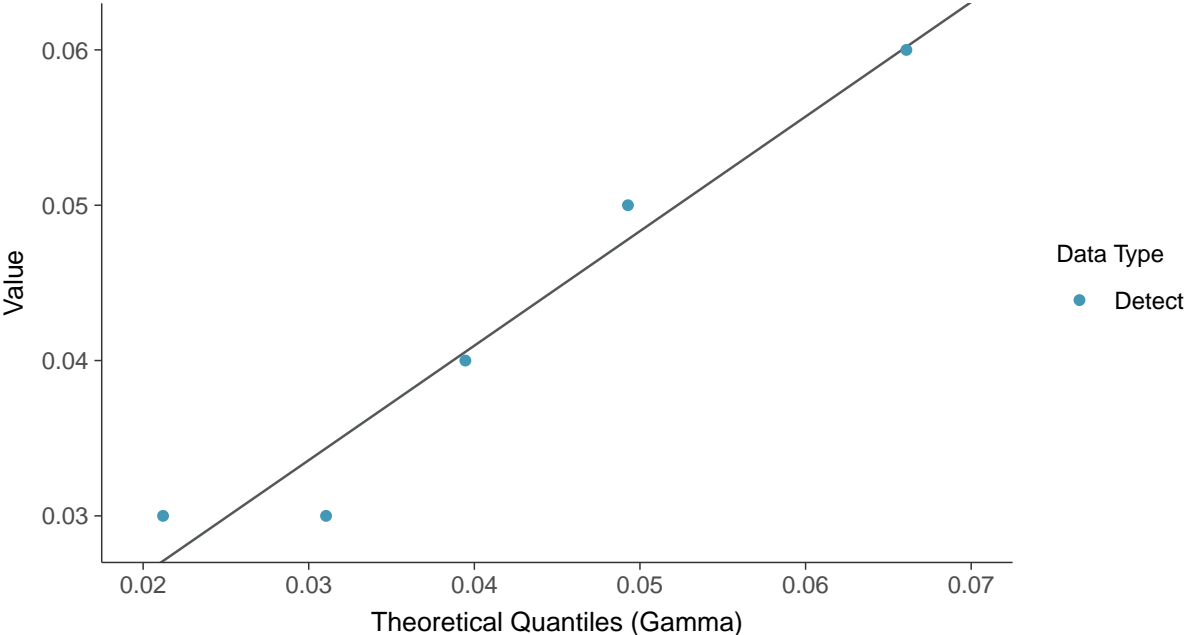






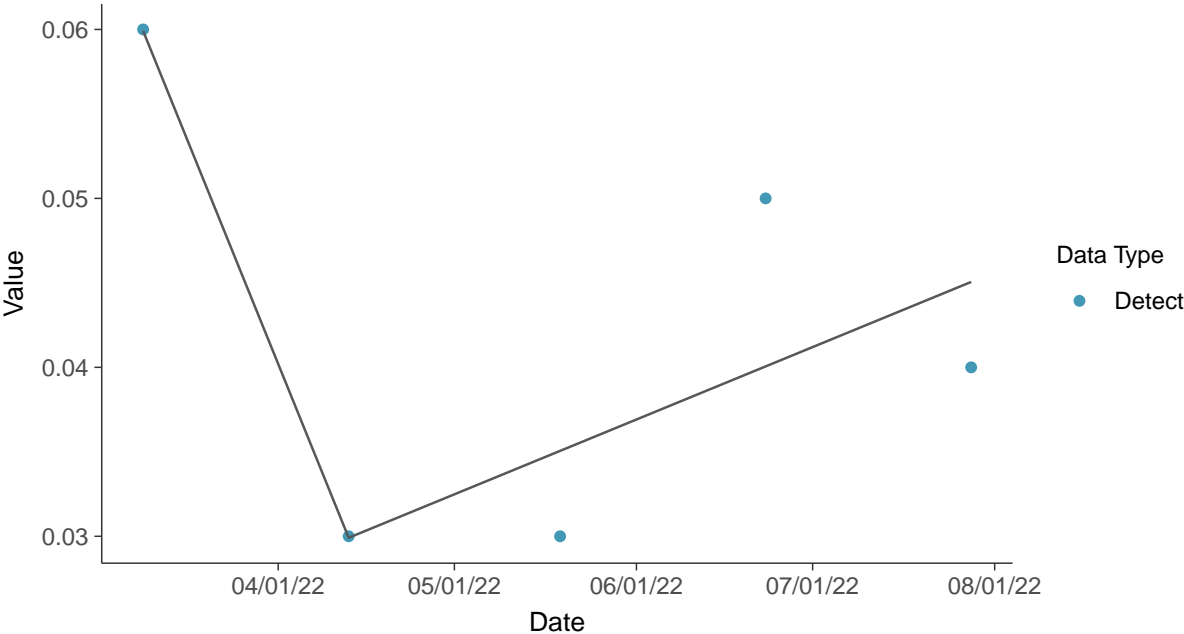
**Gamma Q-Q plot**

Iron, MW-7B (mg/L)



**Trend Regression: Piecewise Linear-Linear**

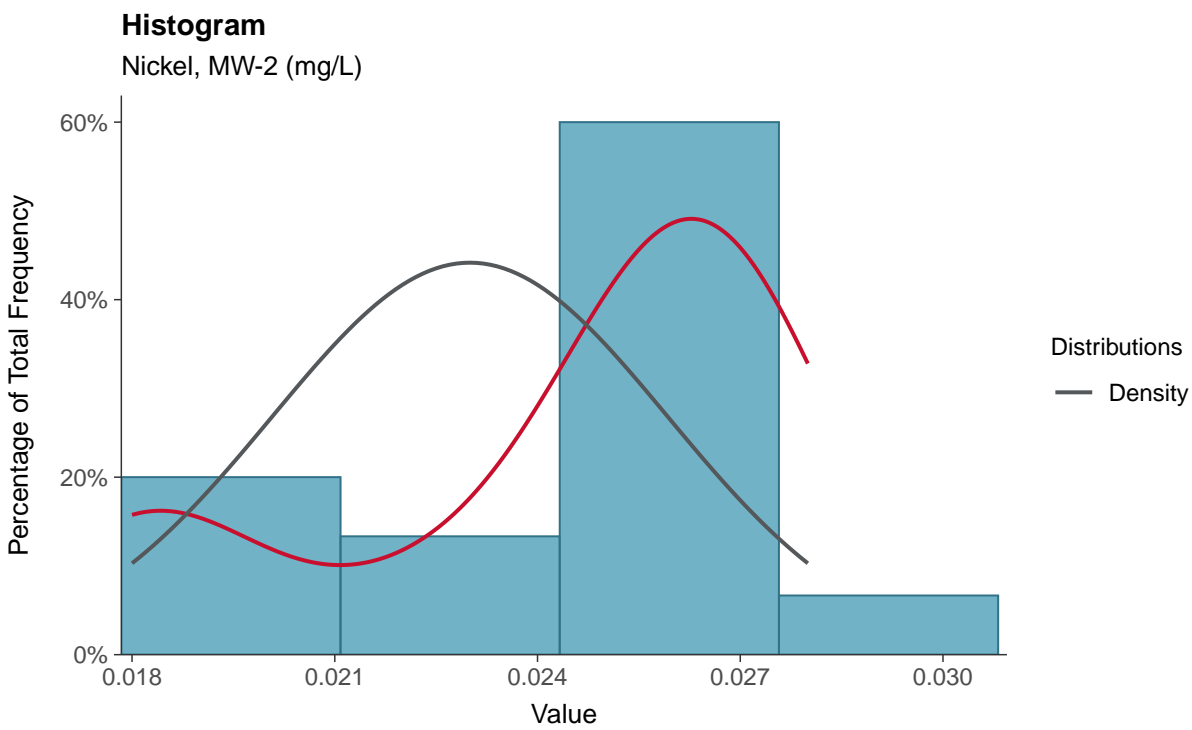
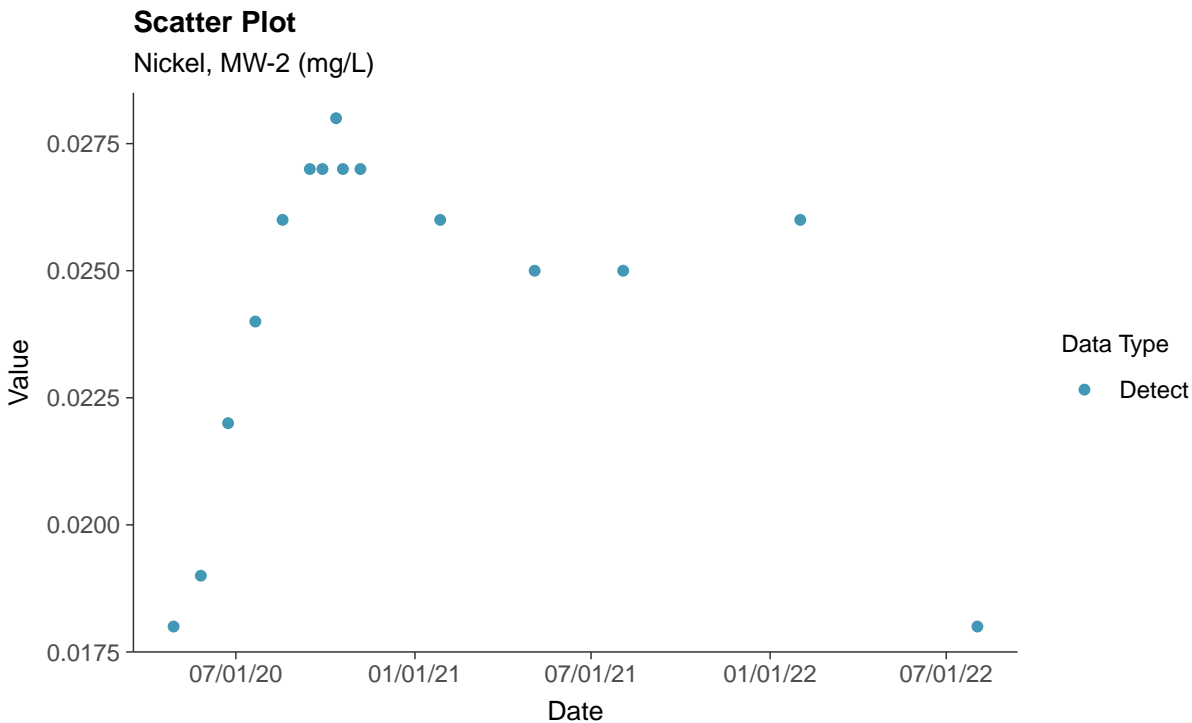
Iron, MW-7B (mg/L)





### Part 115: Nickel, MW-2

ID: 5\_38\_02

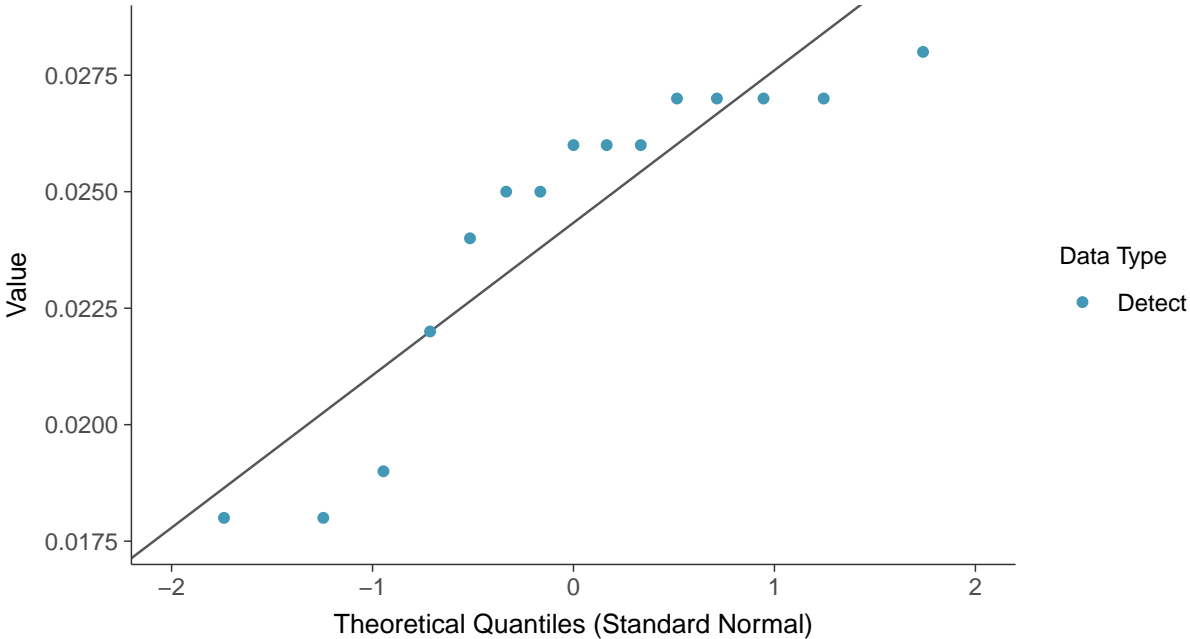






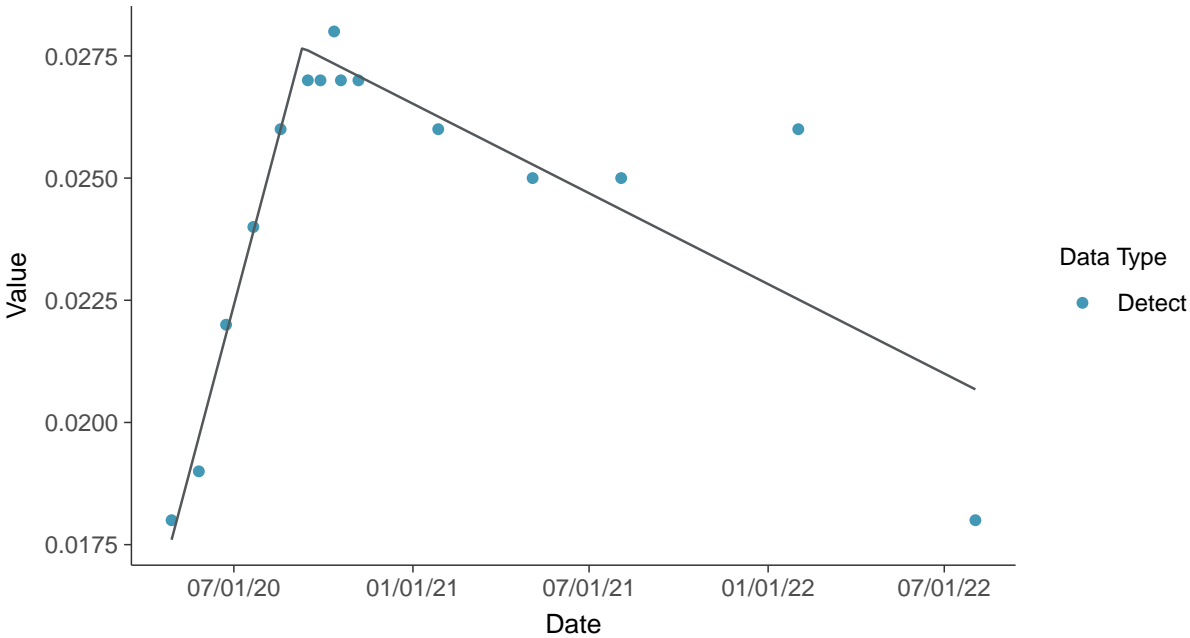
**Normal Q-Q plot**

Nickel, MW-2 (mg/L)



**Trend Regression: Piecewise Linear-Linear**

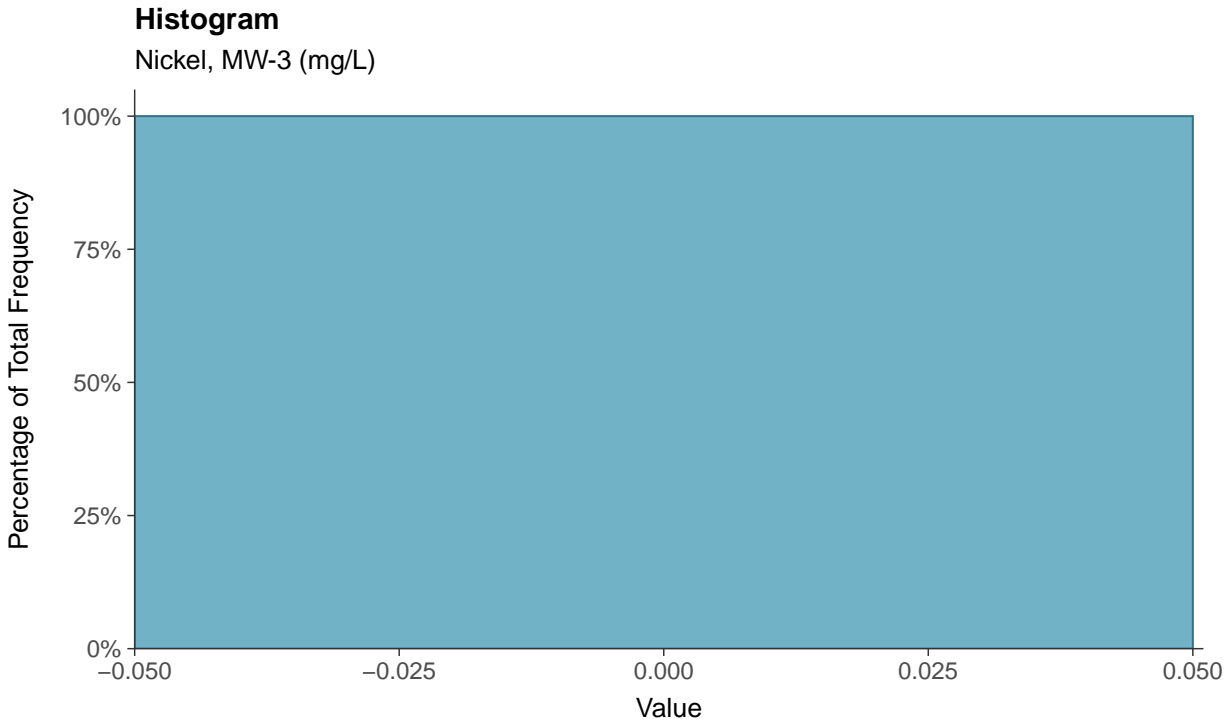
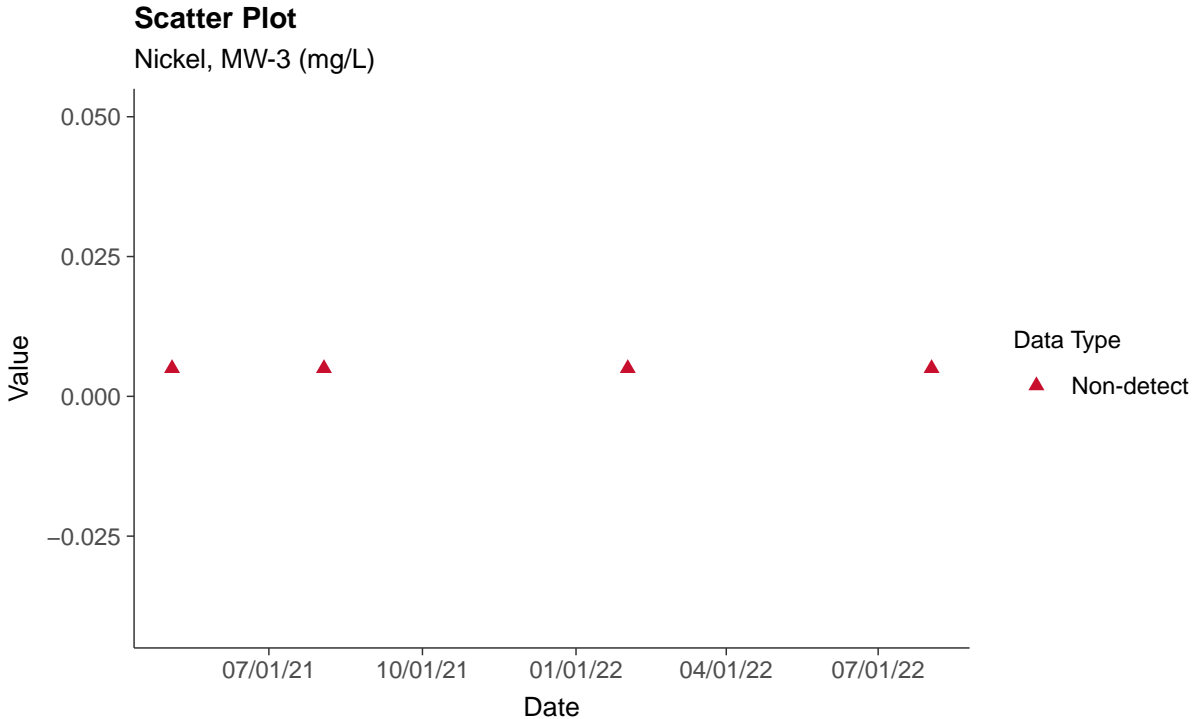
Nickel, MW-2 (mg/L)





**Part 115: Nickel, MW-3**

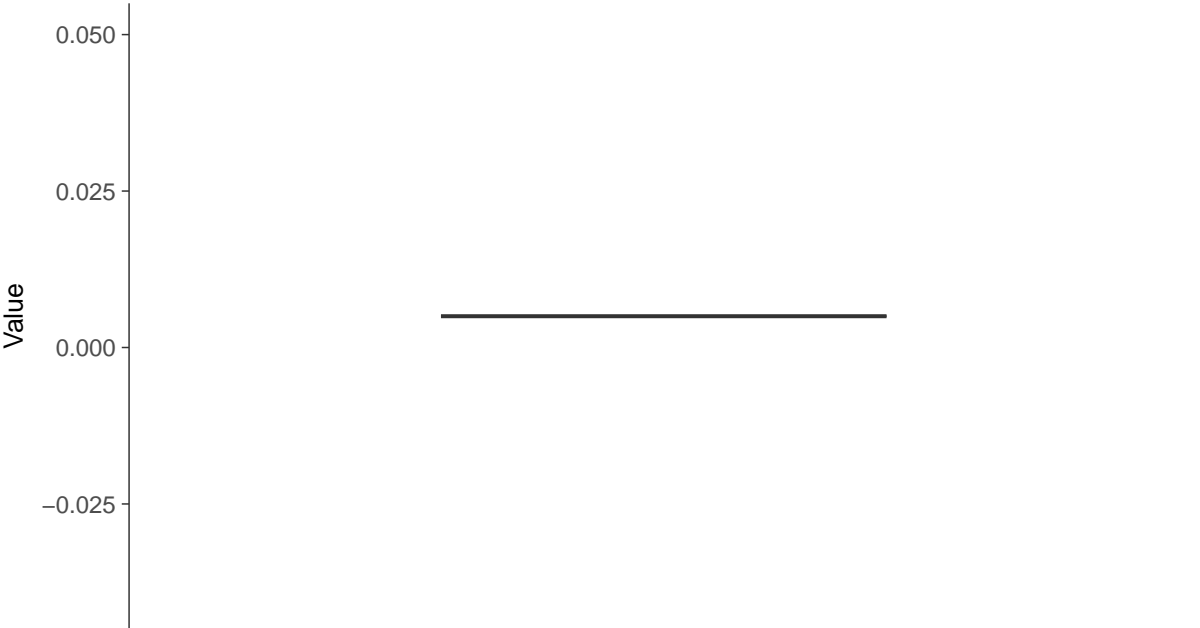
ID: 5\_38\_03





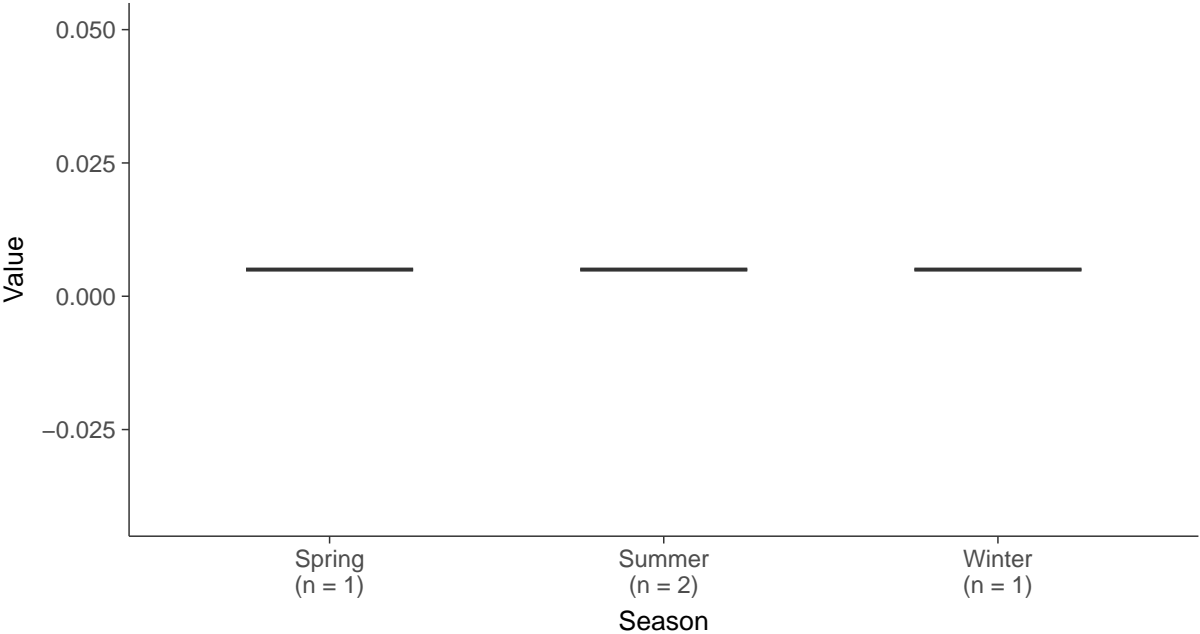
**Boxplot**

Nickel, MW-3 (mg/L)



**Boxplot by Season**

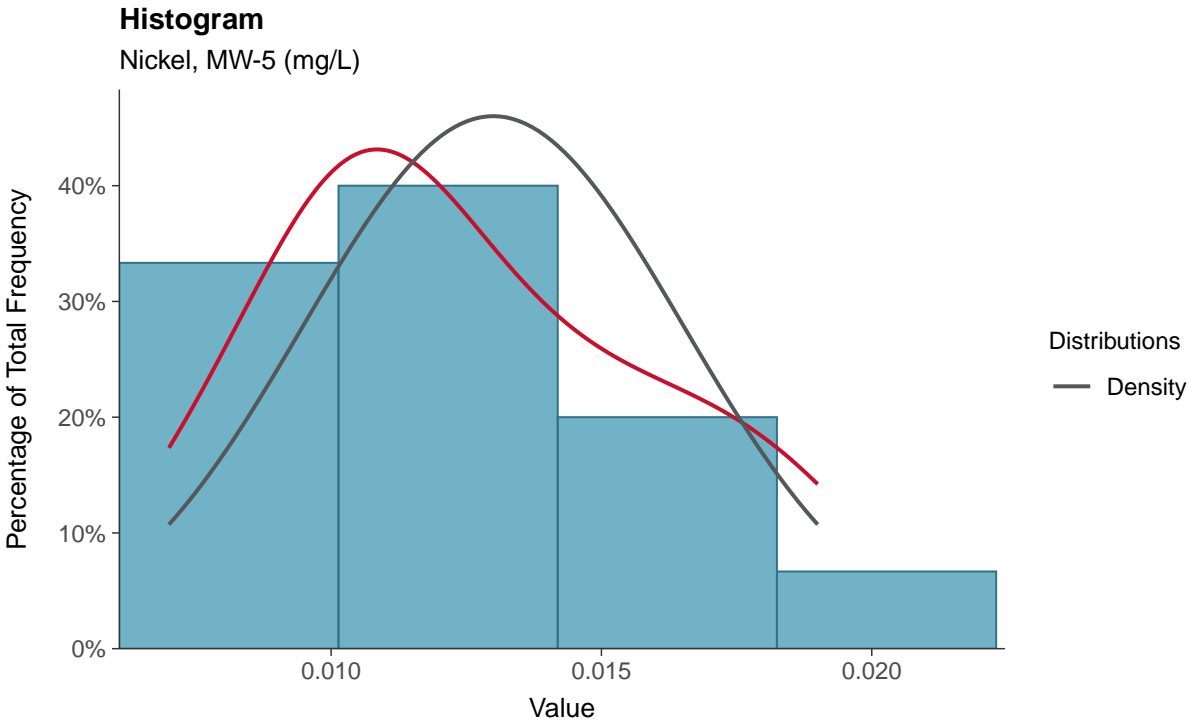
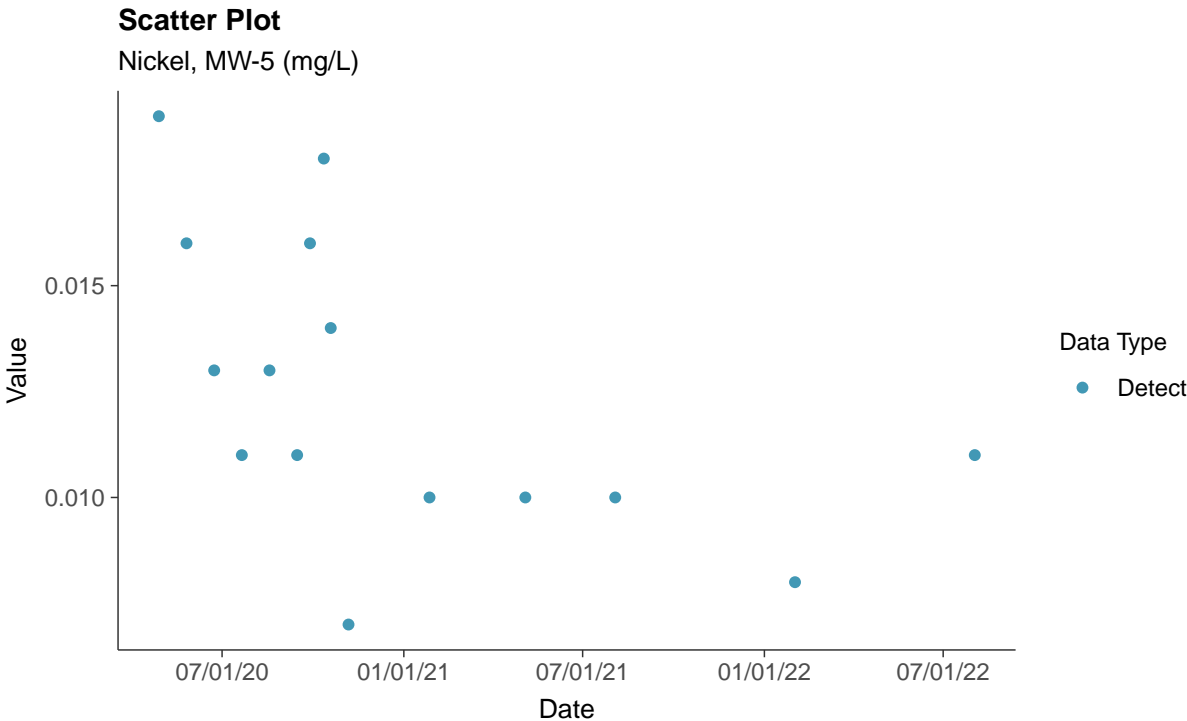
Nickel, MW-3 (mg/L)





**Part 115: Nickel, MW-5**

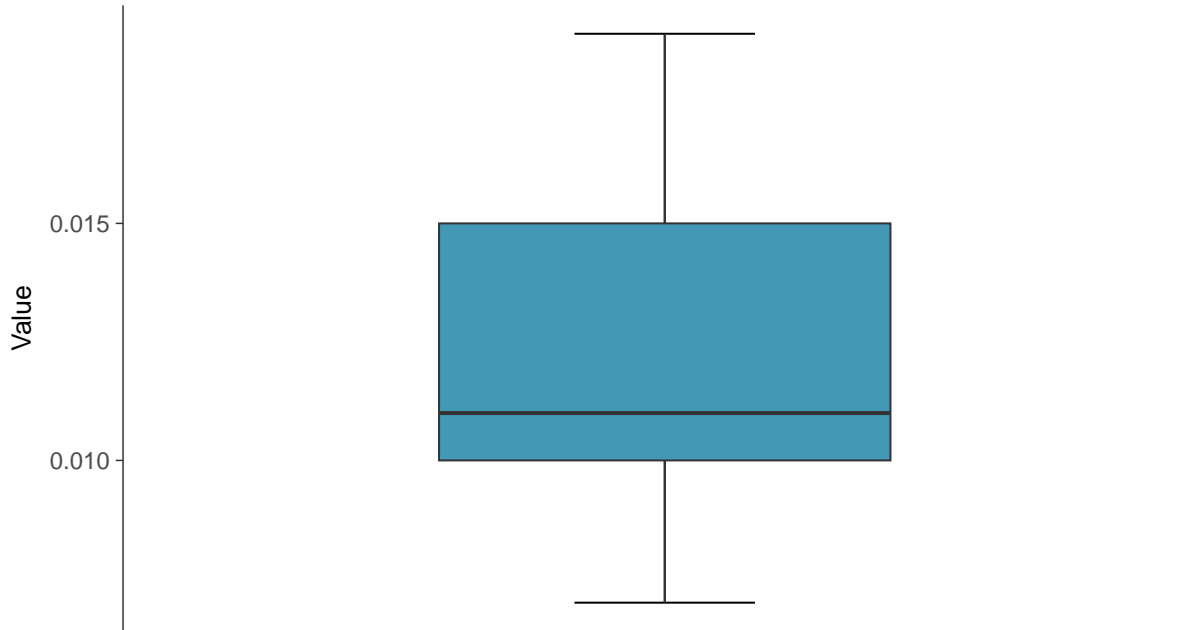
ID: 5\_38\_05





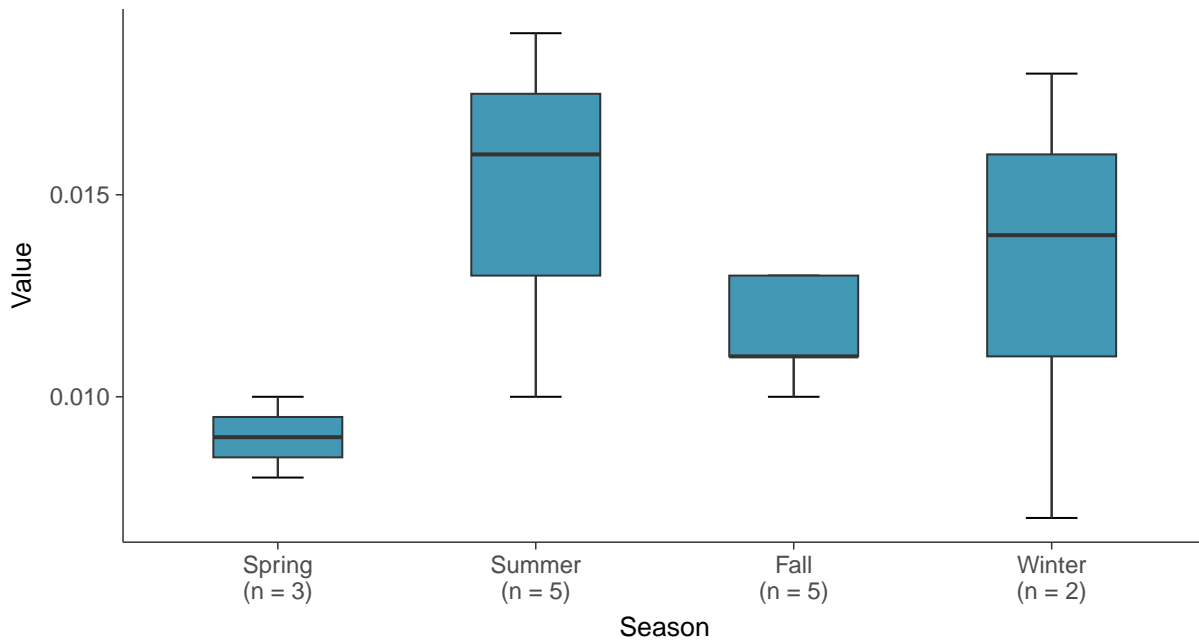
### Boxplot

Nickel, MW-5 (mg/L)

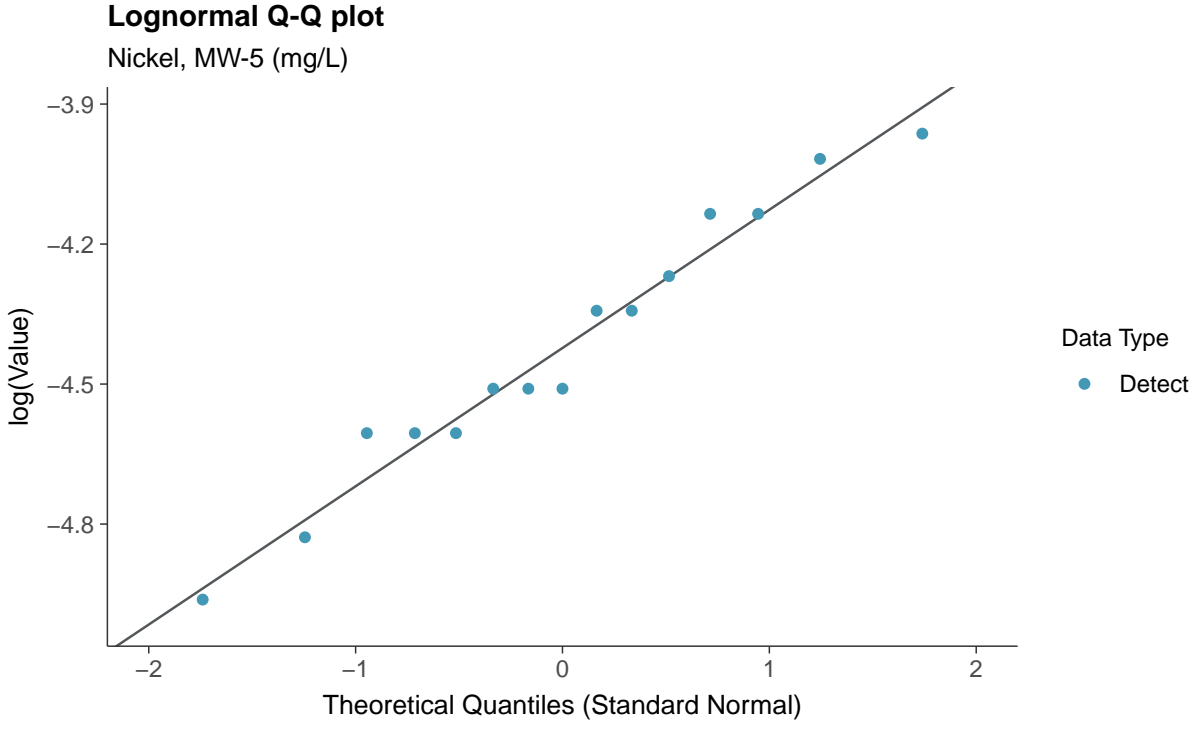
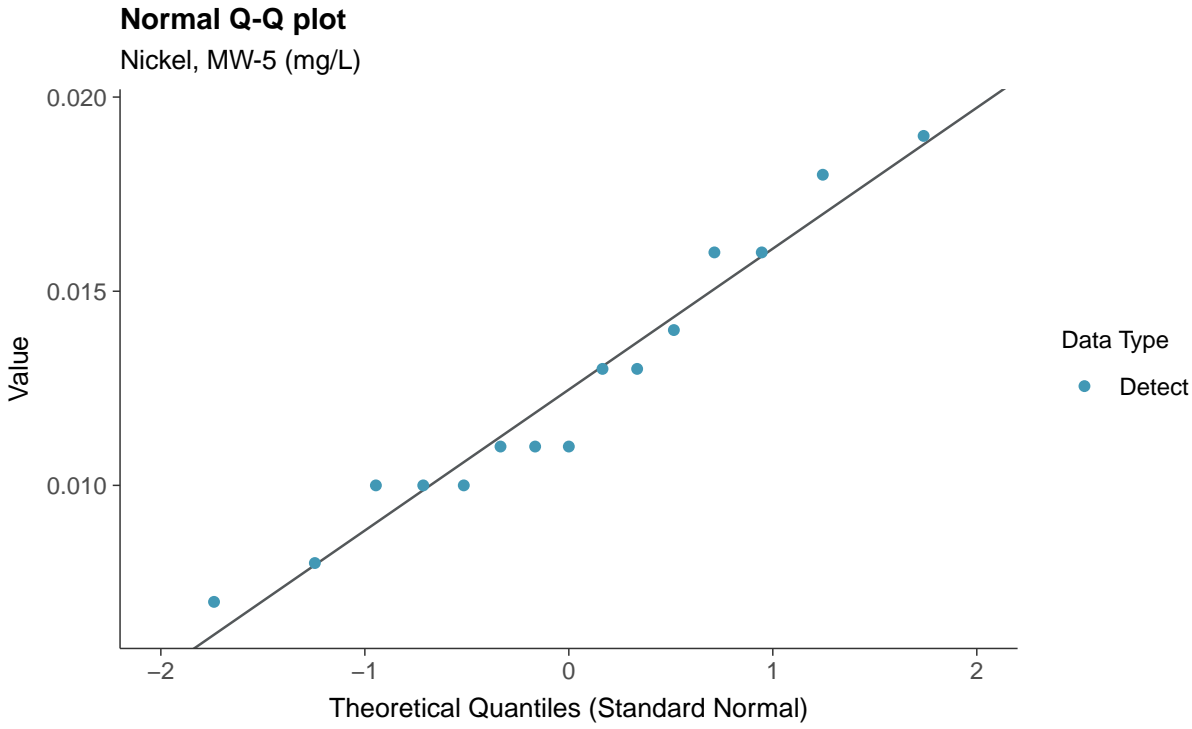


### Boxplot by Season

Nickel, MW-5 (mg/L)

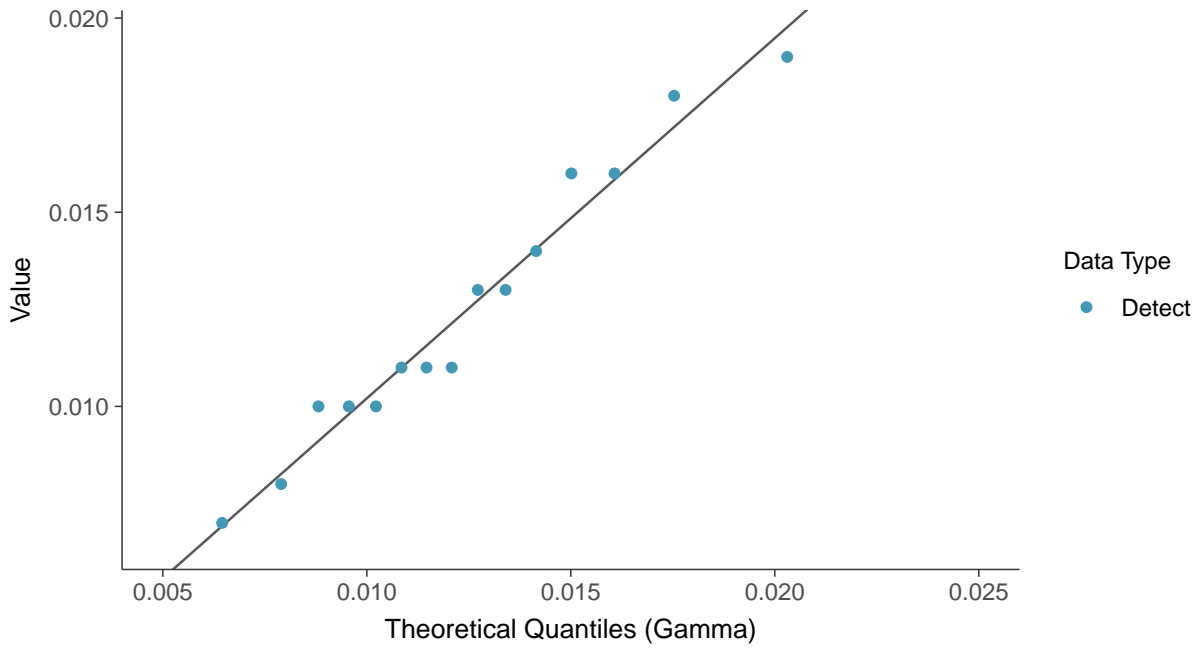




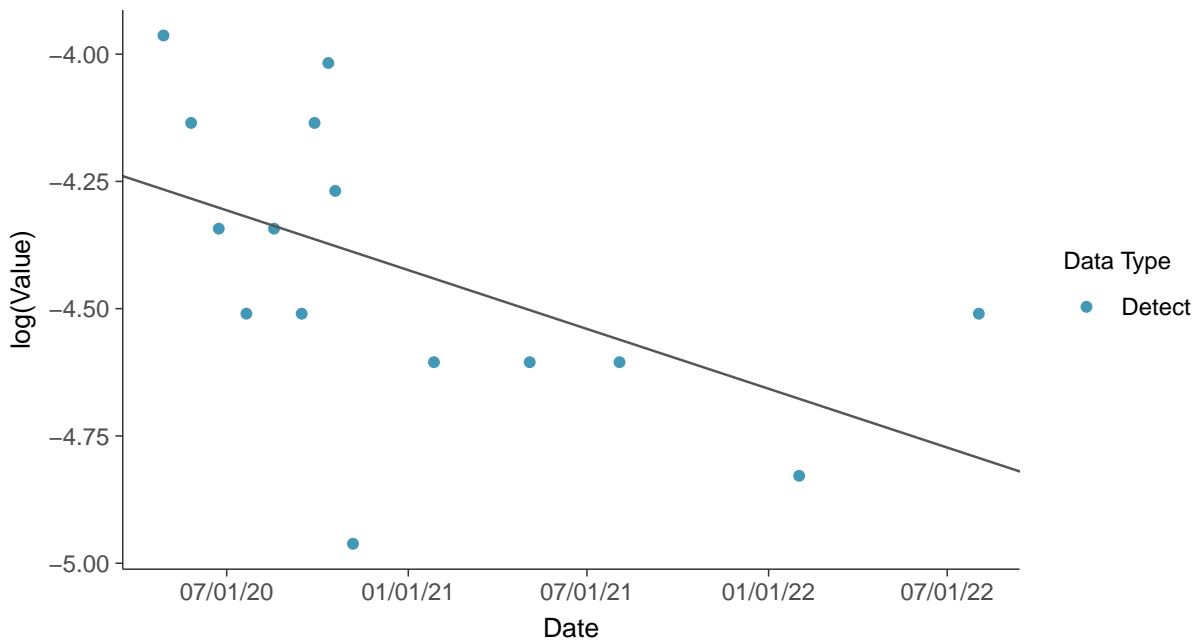




**Gamma Q-Q plot**  
Nickel, MW-5 (mg/L)



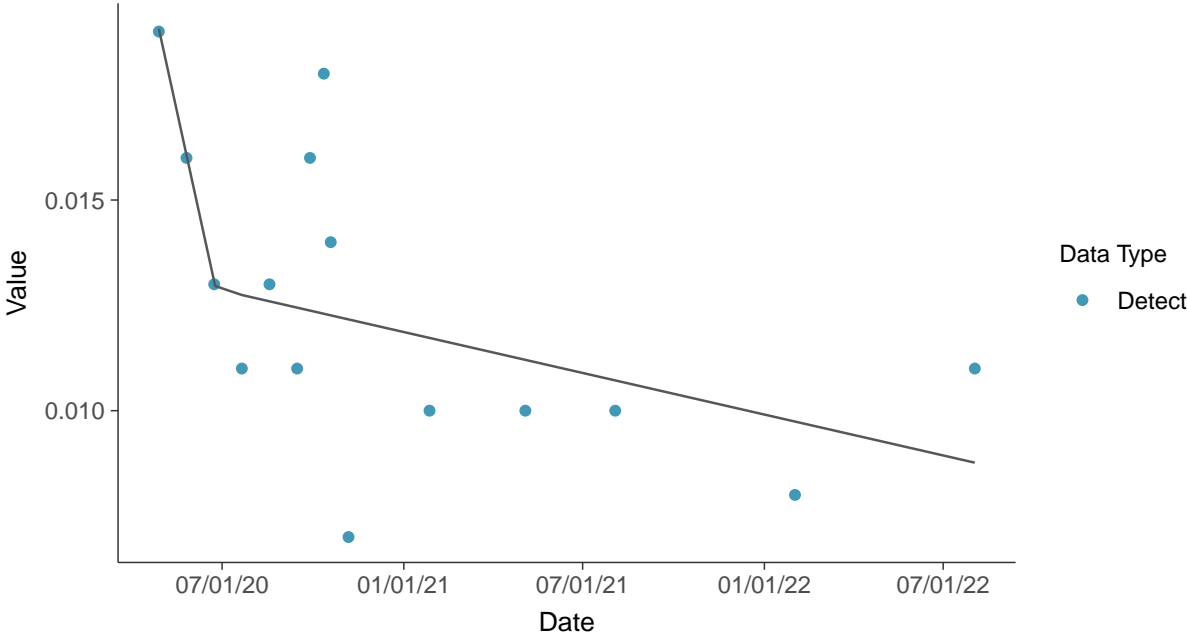
**Trend Regression: Lognormal MLE**  
Nickel, MW-5 (mg/L)





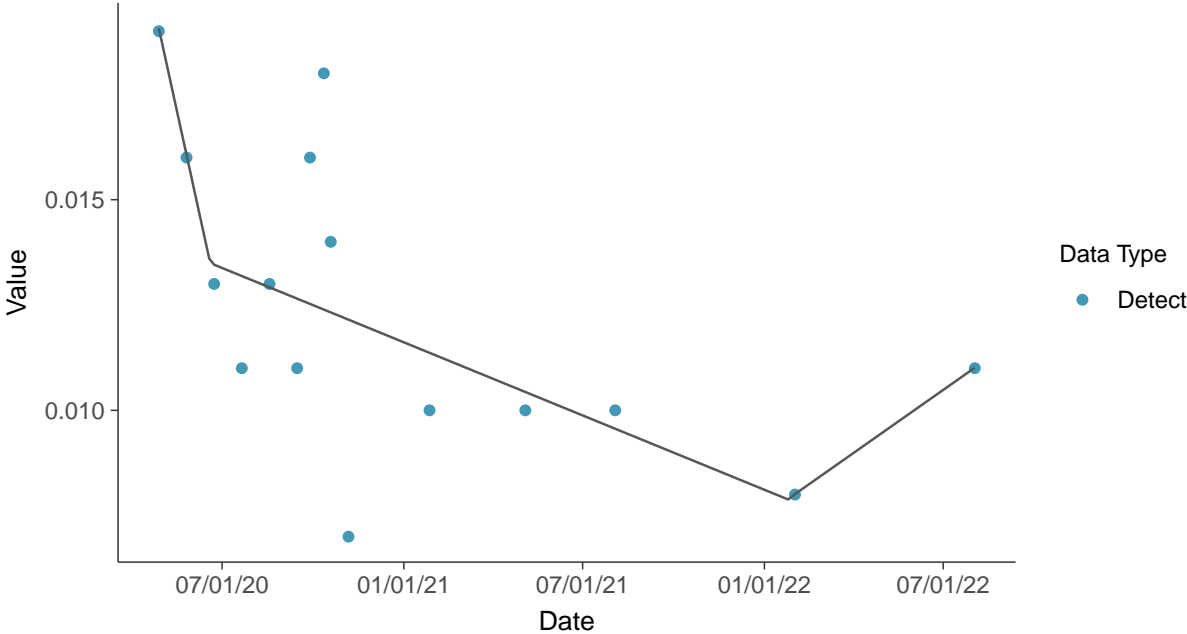
**Trend Regression: Piecewise Linear-Linear**

Nickel, MW-5 (mg/L)



**Trend Regression: Piecewise Linear-Linear-Linear**

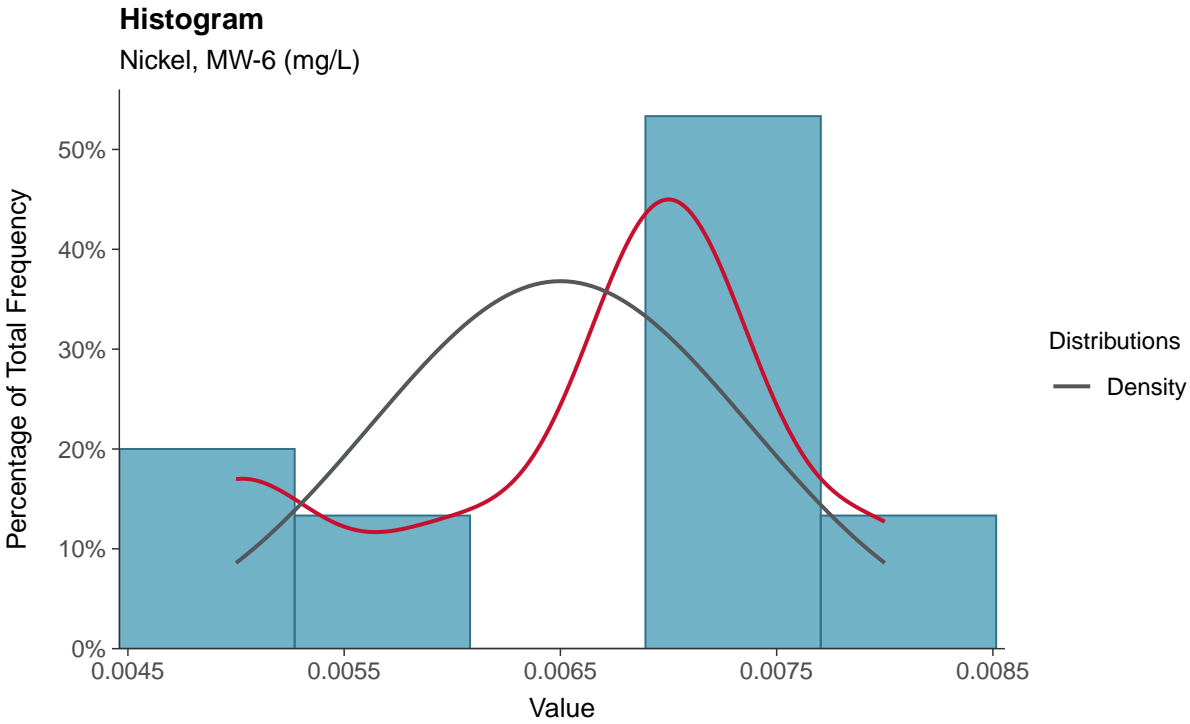
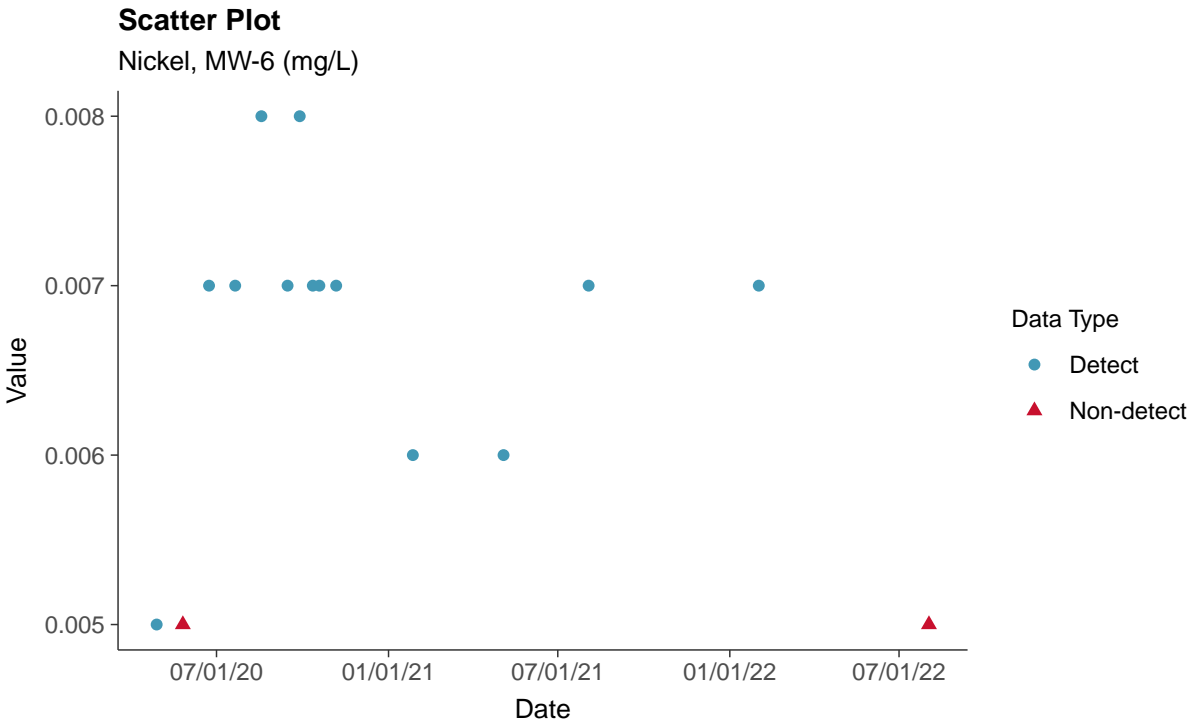
Nickel, MW-5 (mg/L)





**Part 115: Nickel, MW-6**

ID: 5\_38\_06

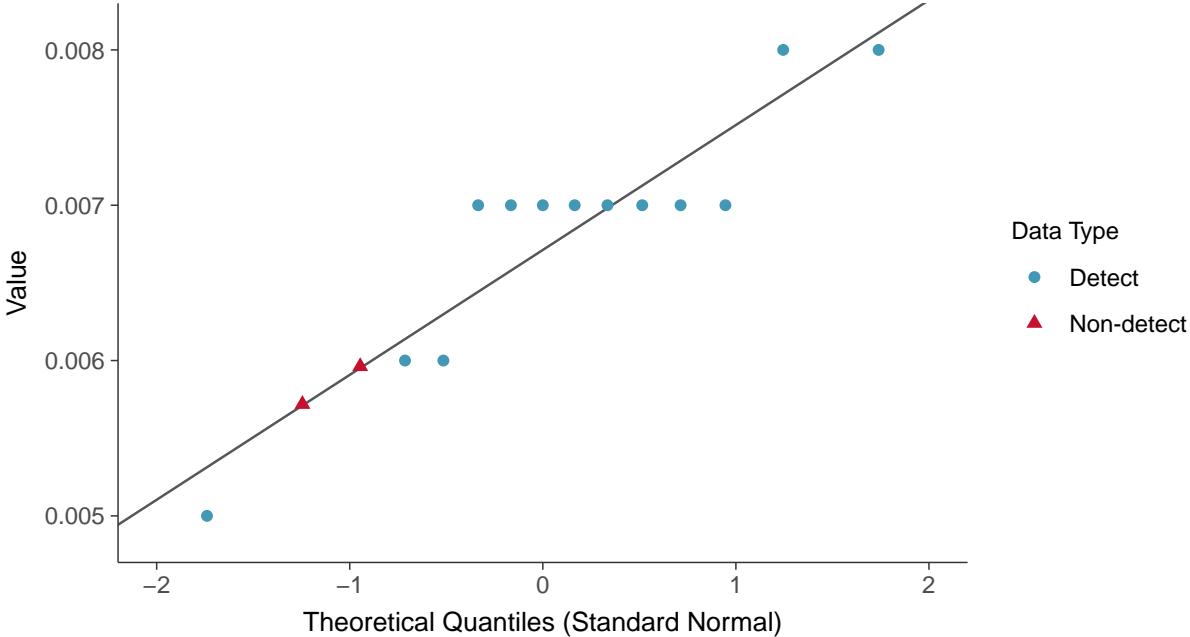






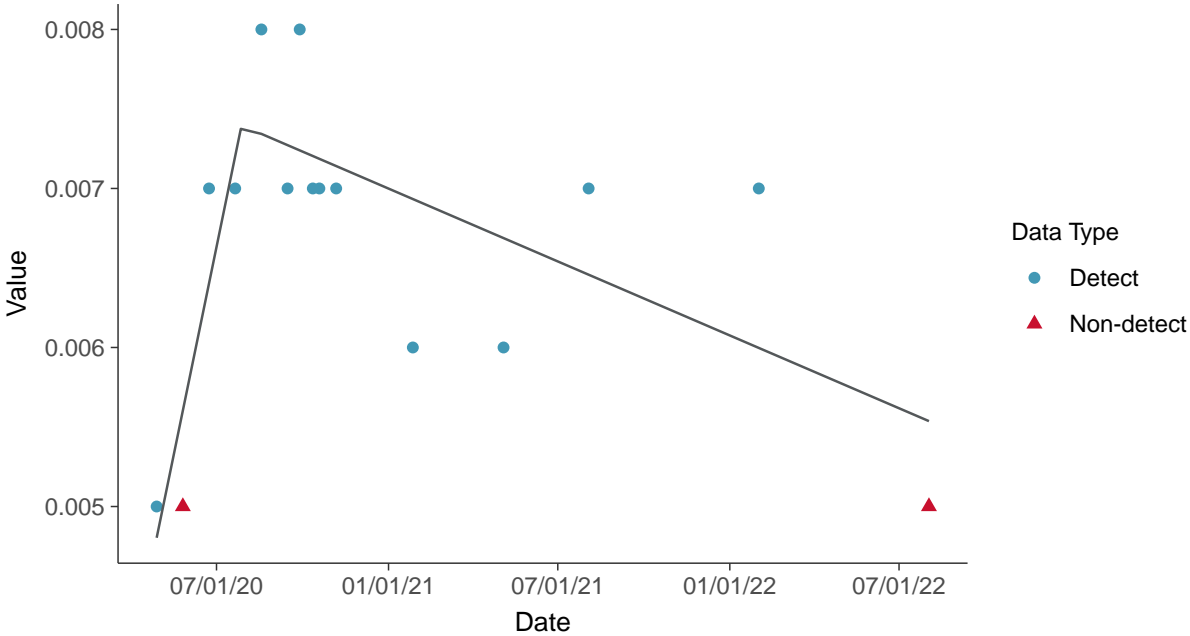
### Normal Q-Q plot using ROS Imputed Estimates

Nickel, MW-6 (mg/L)



### Trend Regression: Piecewise Linear-Linear

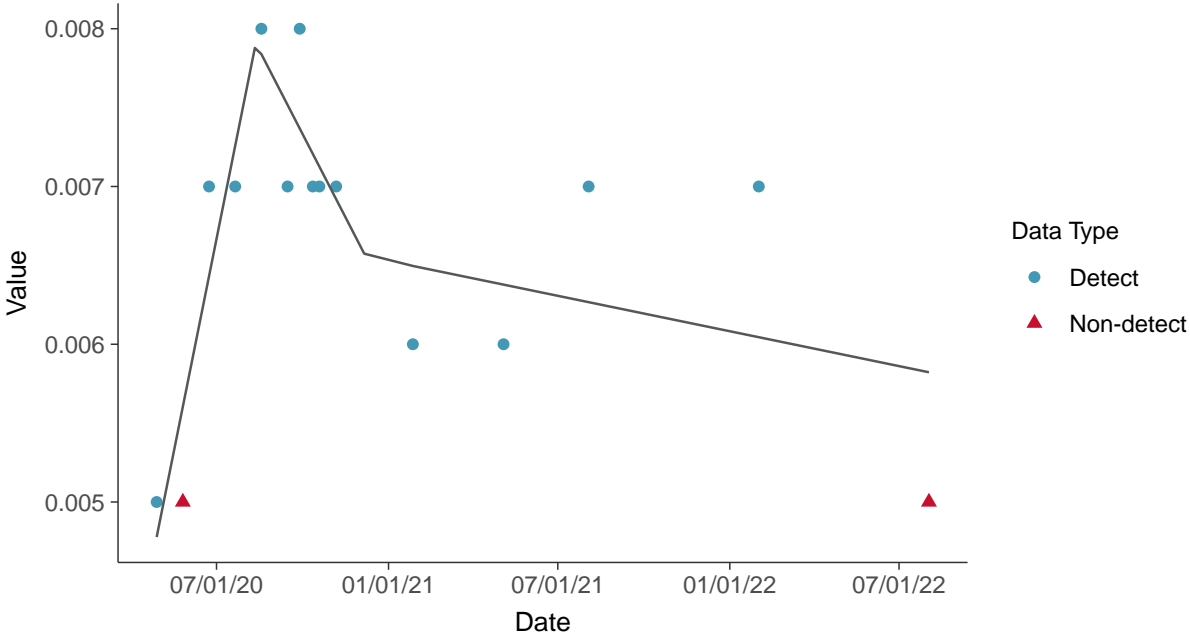
Nickel, MW-6 (mg/L)





### Trend Regression: Piecewise Linear-Linear-Linear

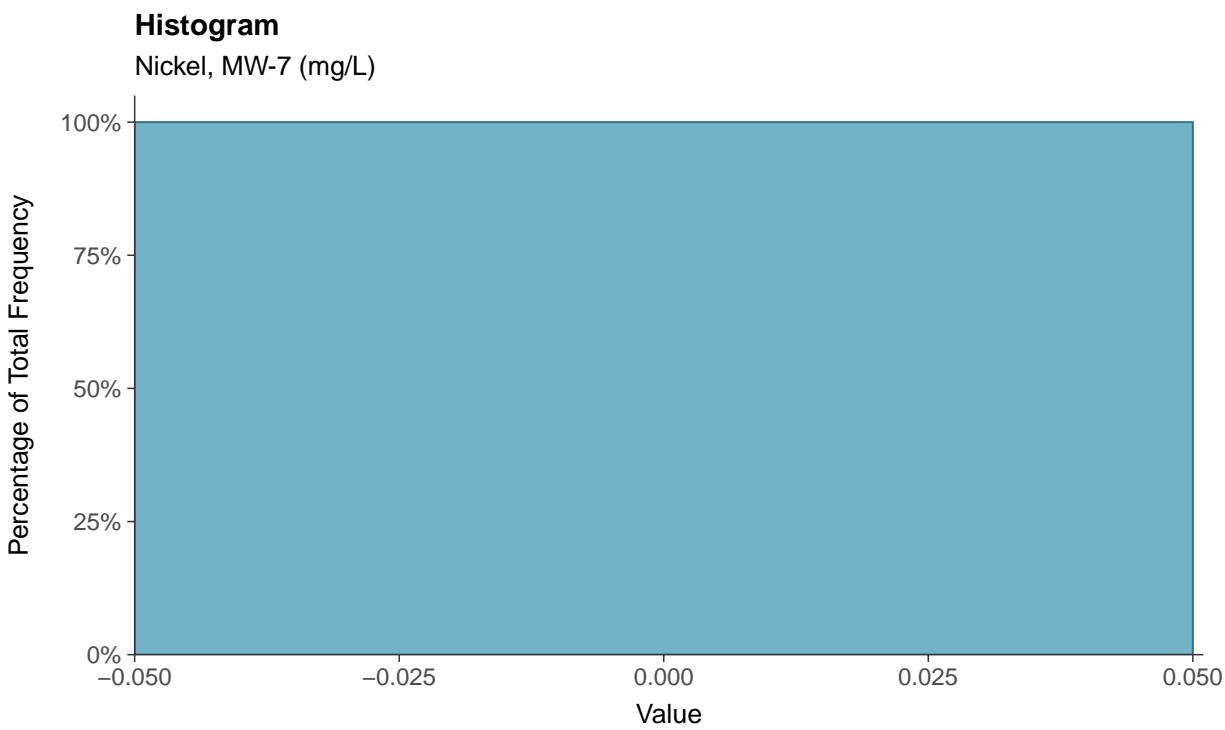
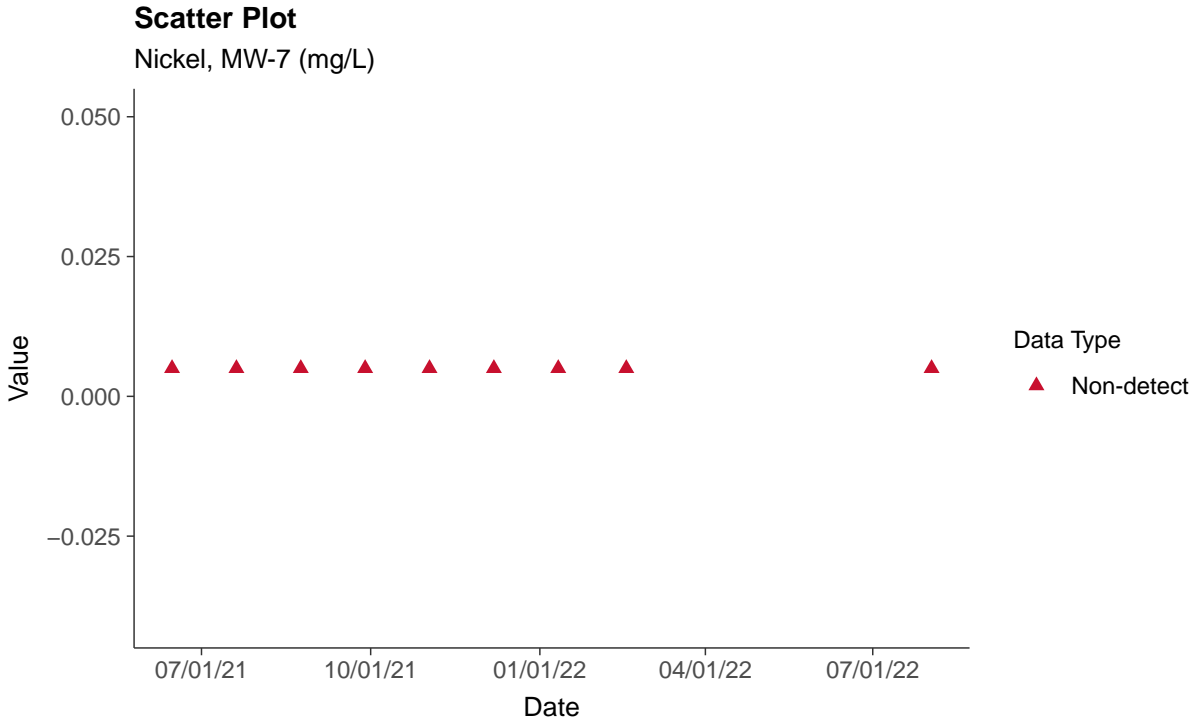
Nickel, MW-6 (mg/L)





**Part 115: Nickel, MW-7**

ID: 5\_38\_07

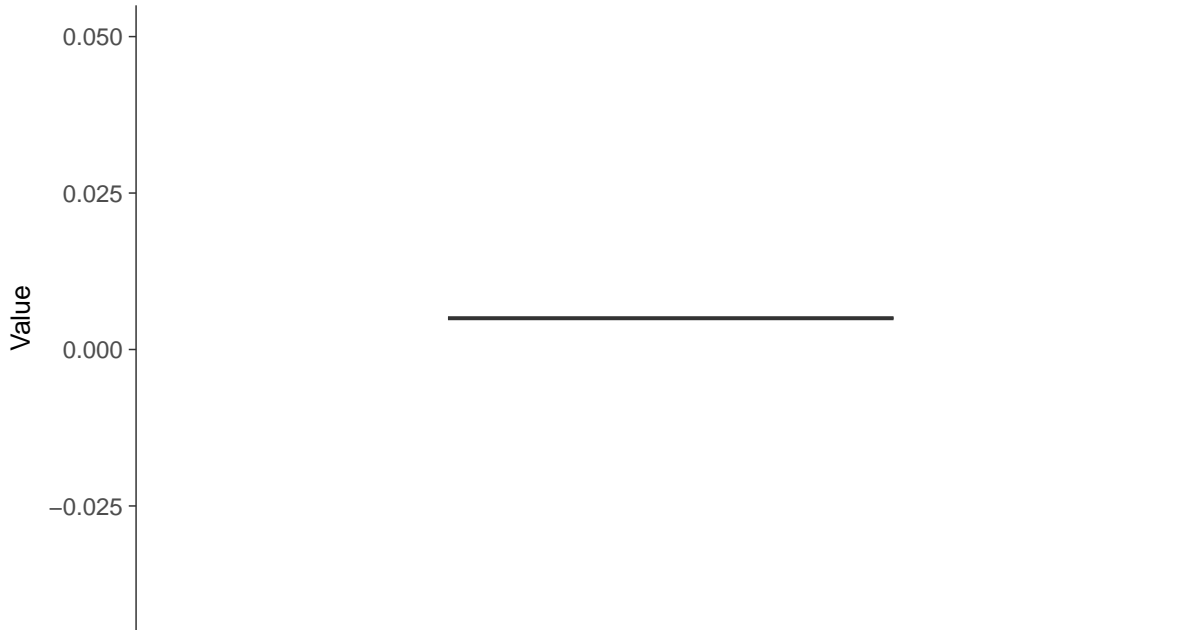






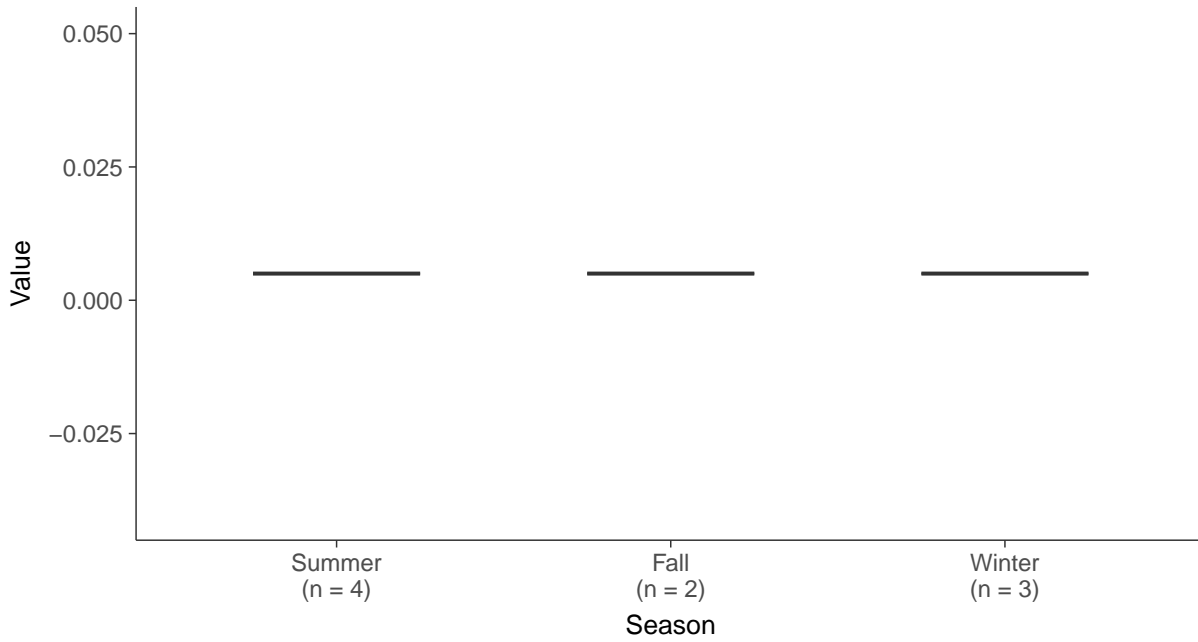
### Boxplot

Nickel, MW-7 (mg/L)



### Boxplot by Season

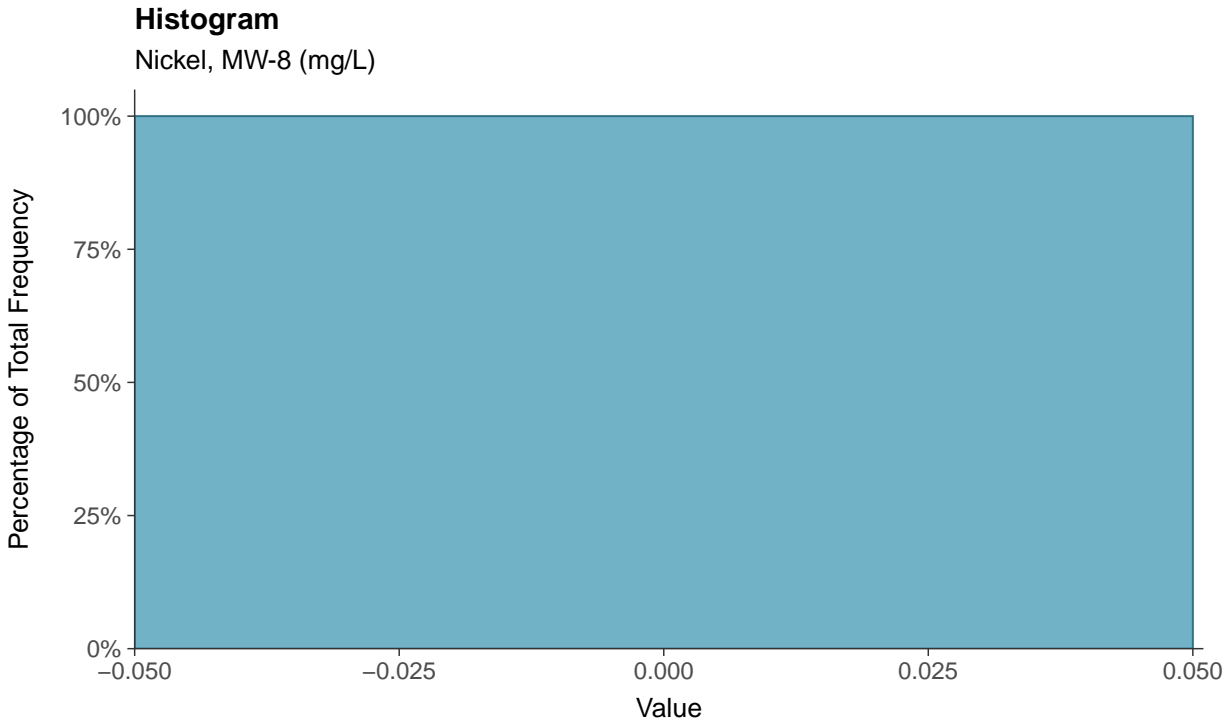
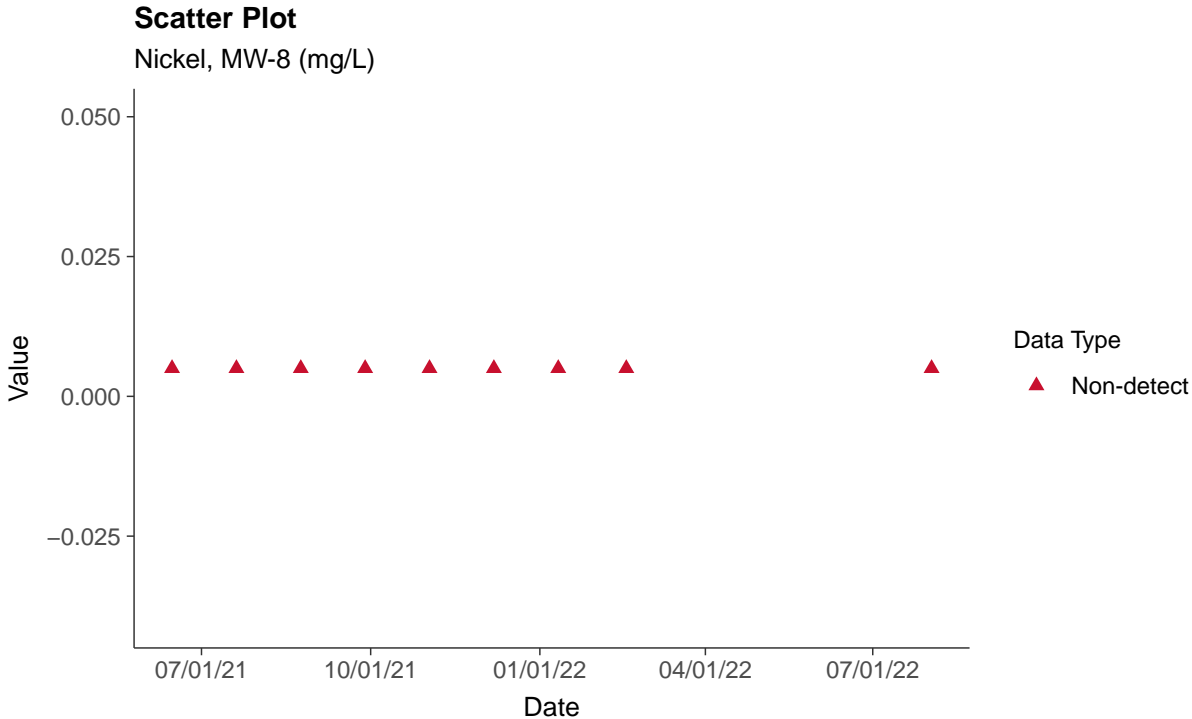
Nickel, MW-7 (mg/L)





**Part 115: Nickel, MW-8**

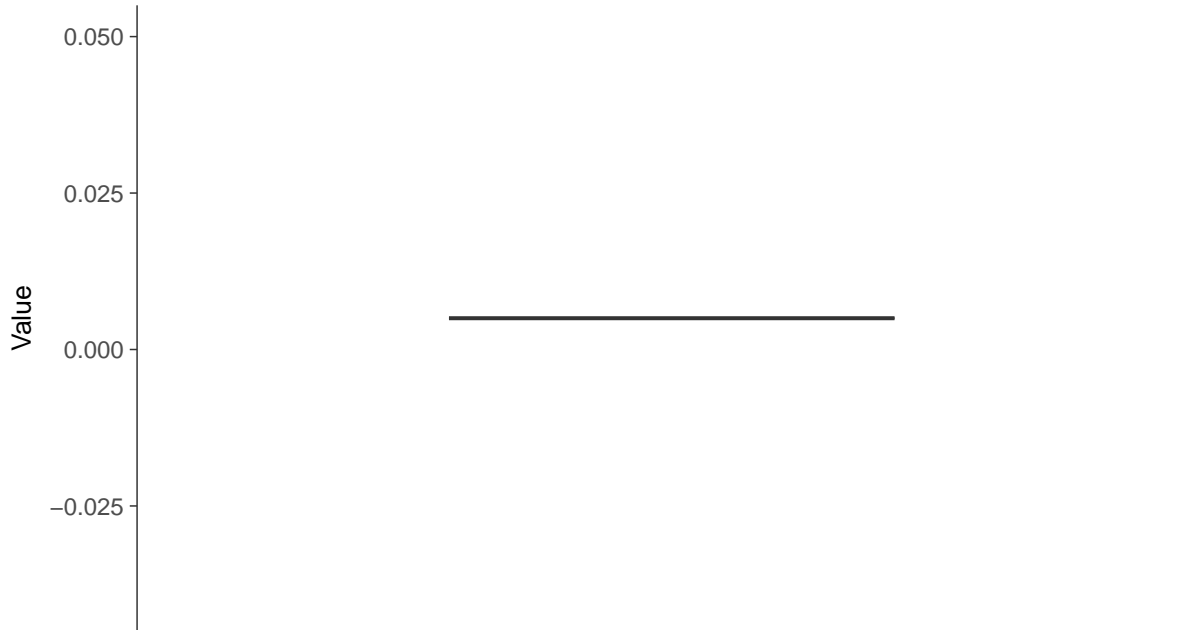
ID: 5\_38\_08





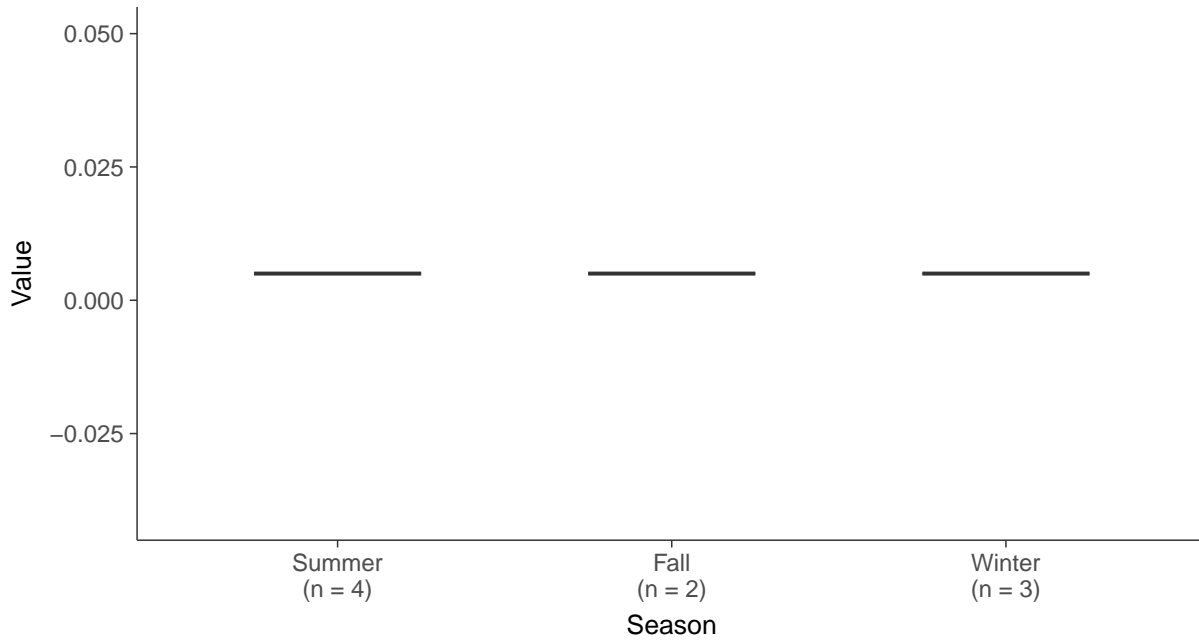
### Boxplot

Nickel, MW-8 (mg/L)



### Boxplot by Season

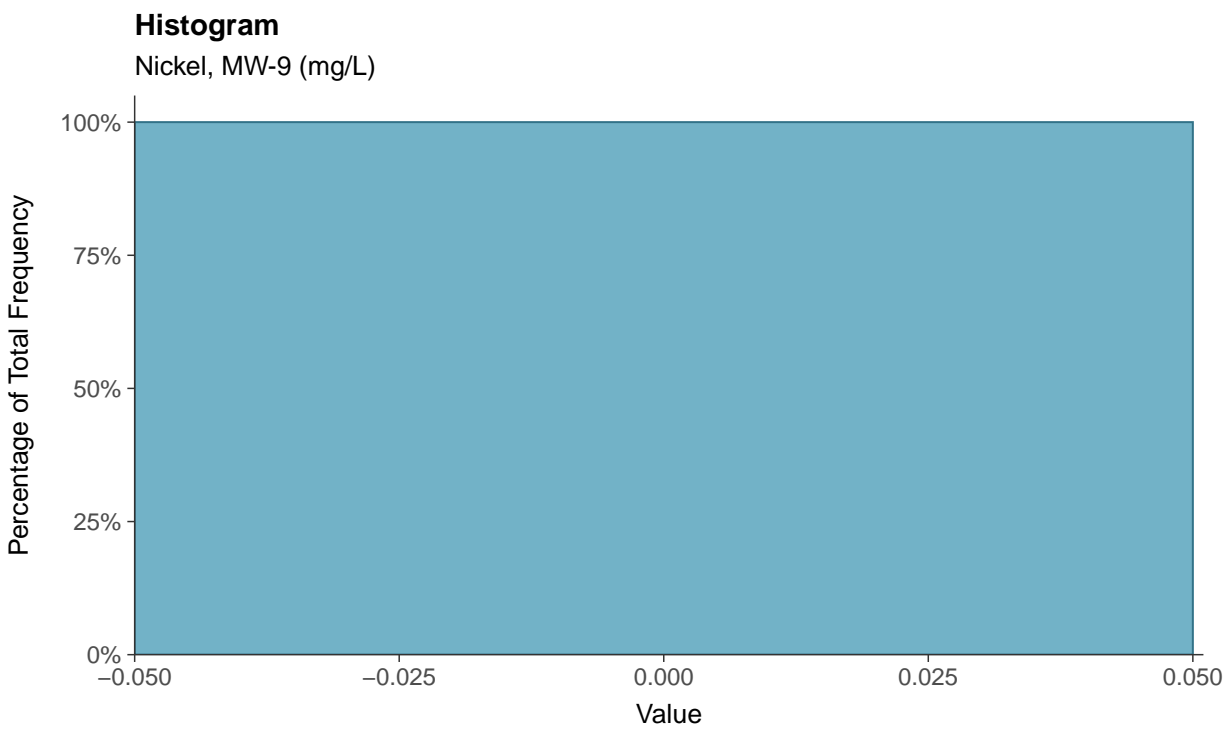
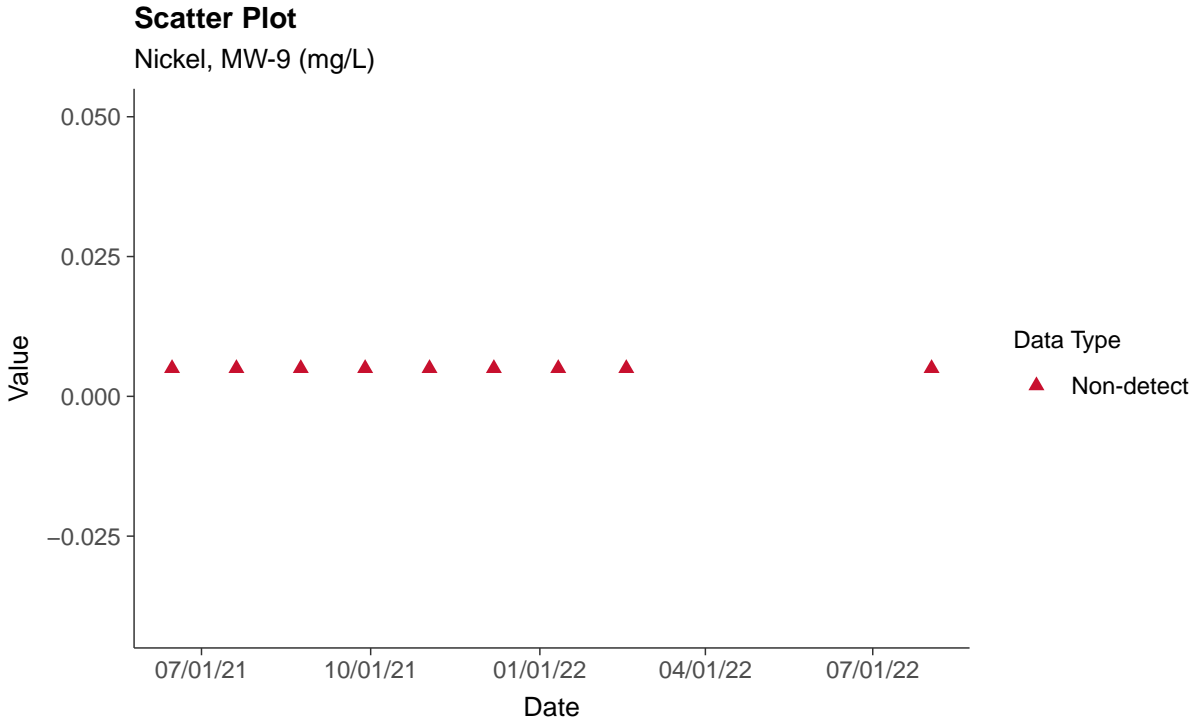
Nickel, MW-8 (mg/L)





**Part 115: Nickel, MW-9**

ID: 5\_38\_09





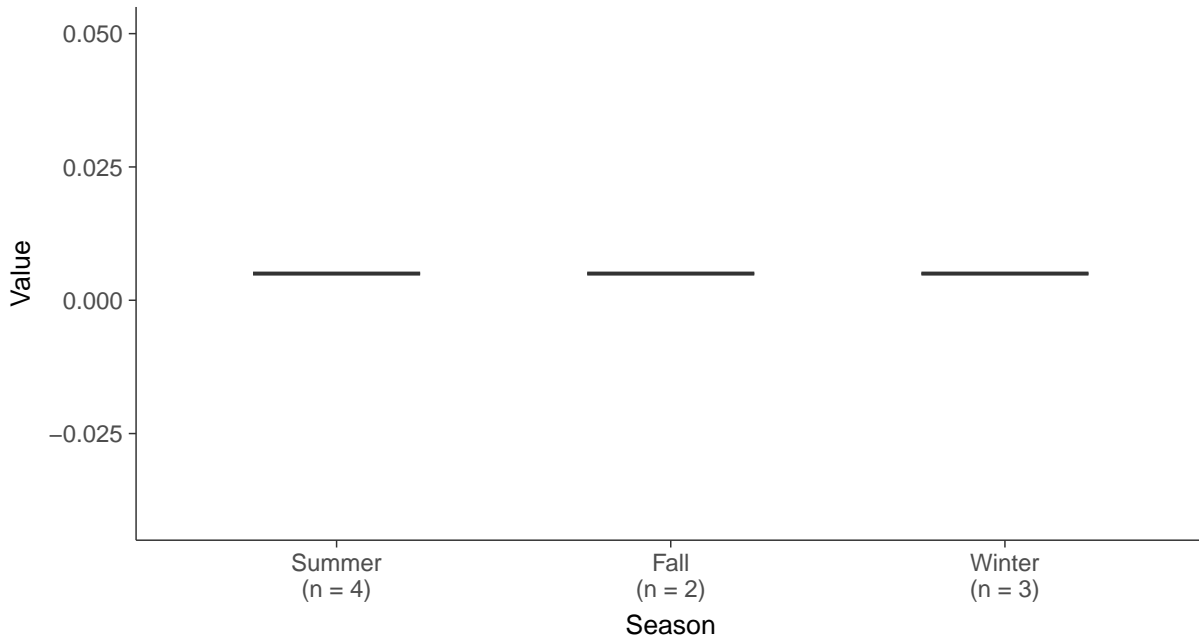
### Boxplot

Nickel, MW-9 (mg/L)



### Boxplot by Season

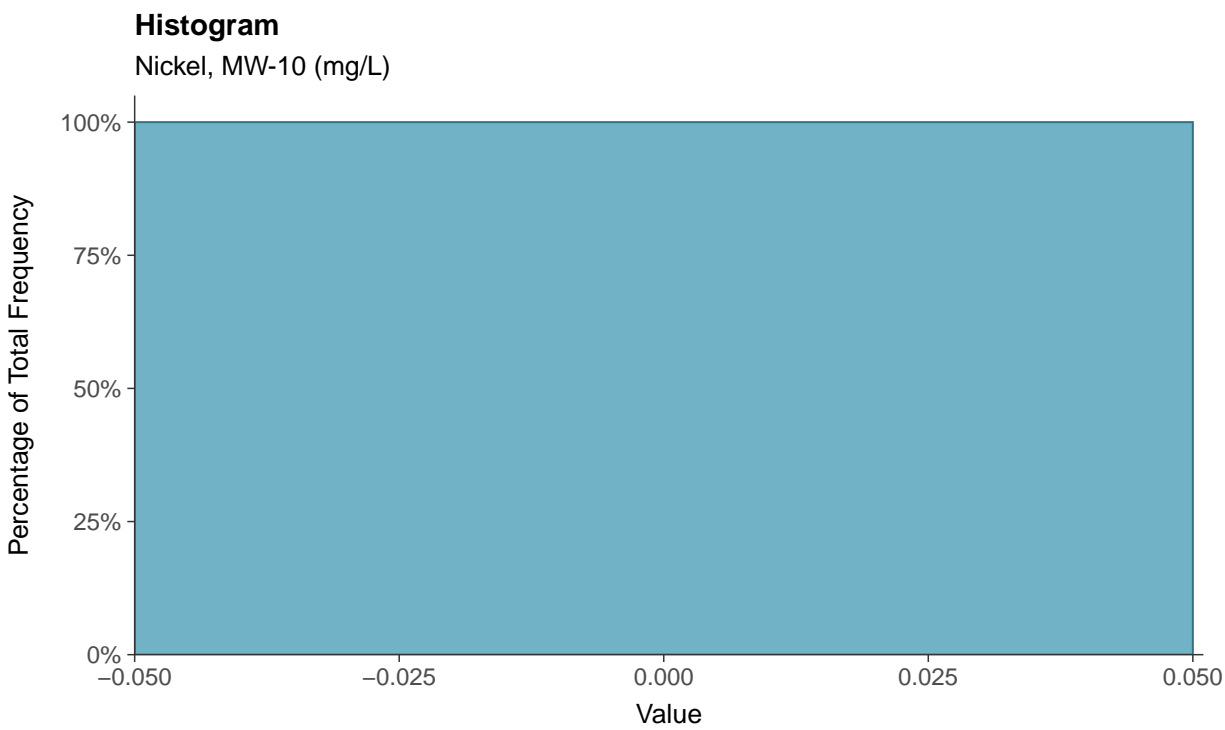
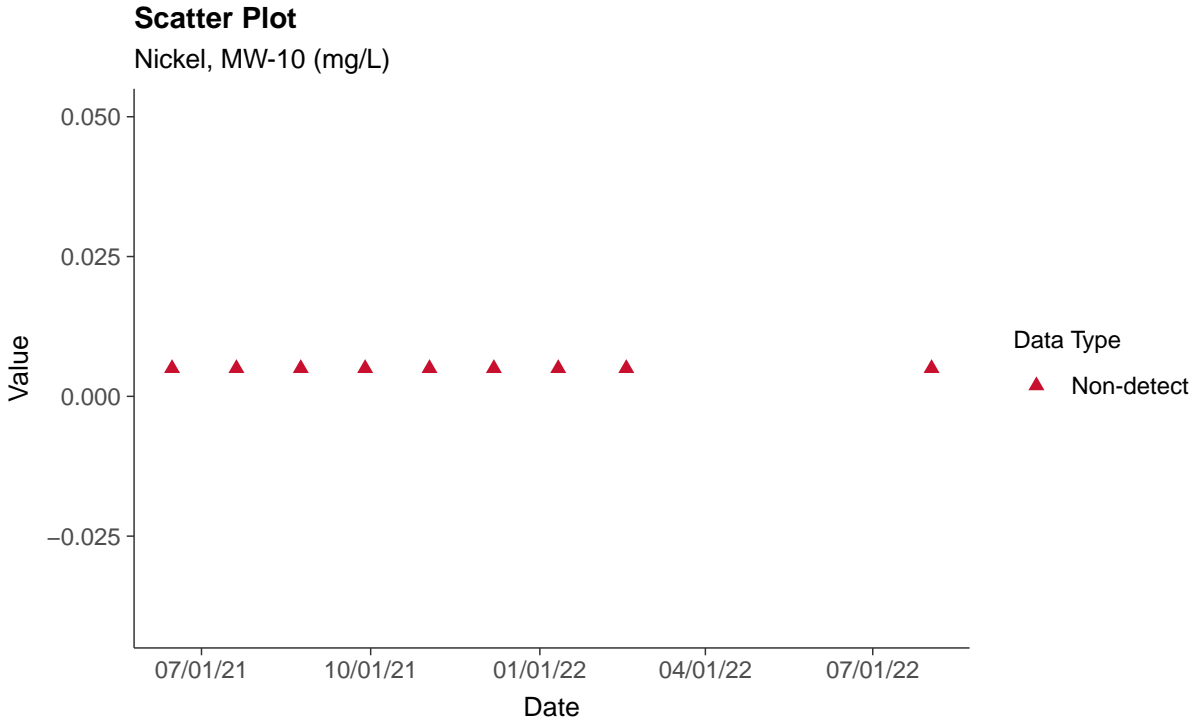
Nickel, MW-9 (mg/L)





**Part 115: Nickel, MW-10**

ID: 5\_38\_10





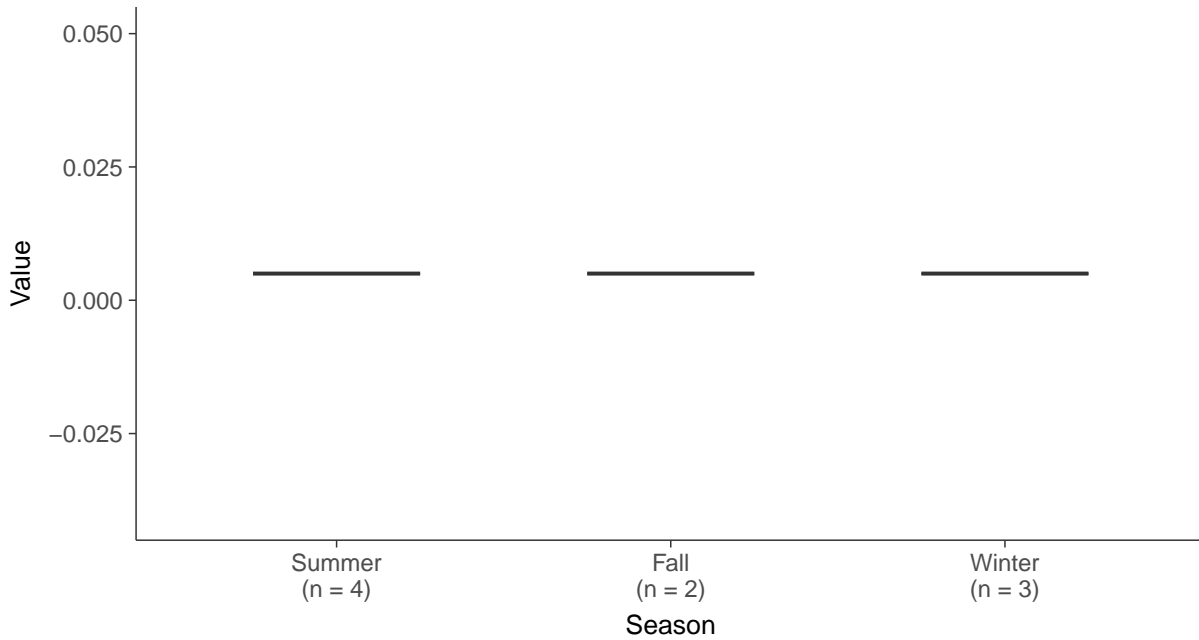
### Boxplot

Nickel, MW-10 (mg/L)



### Boxplot by Season

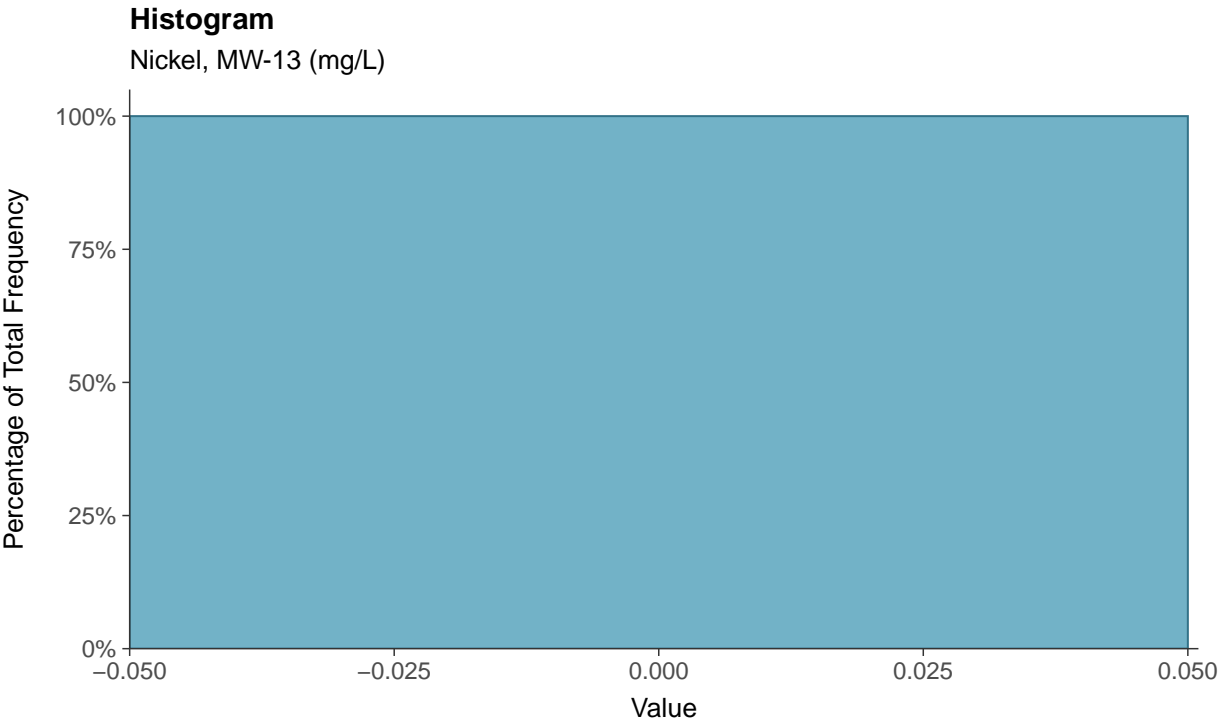
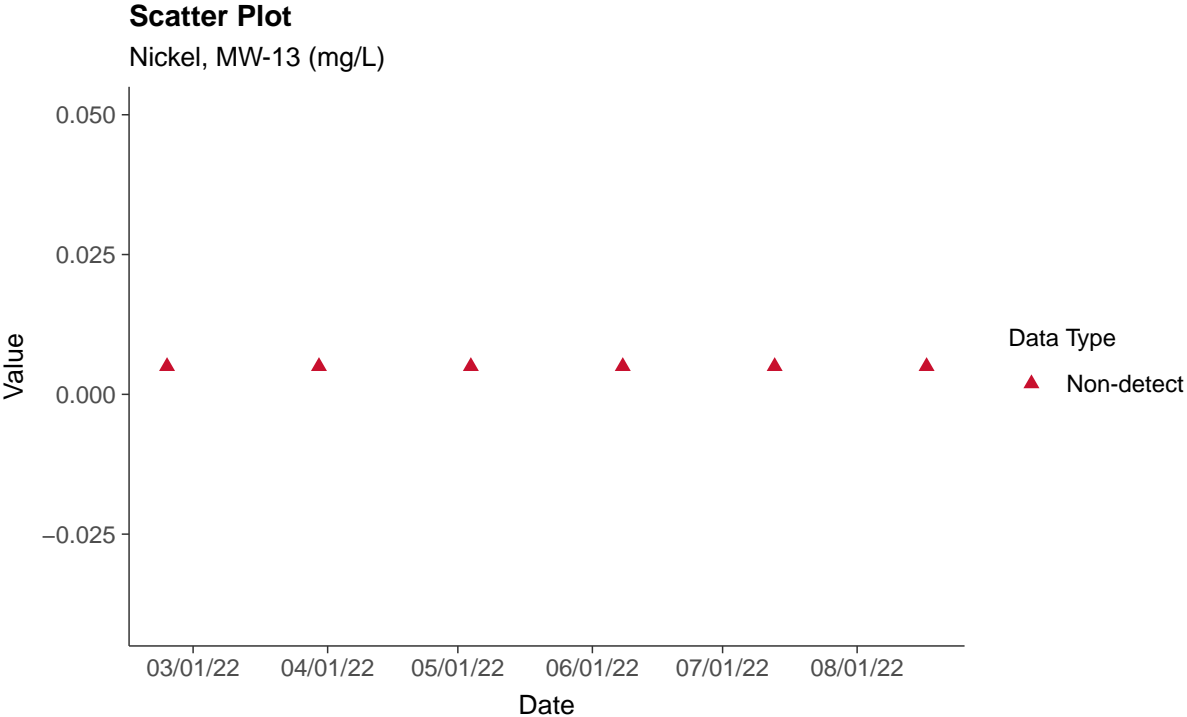
Nickel, MW-10 (mg/L)





**Part 115: Nickel, MW-13**

ID: 5\_38\_13







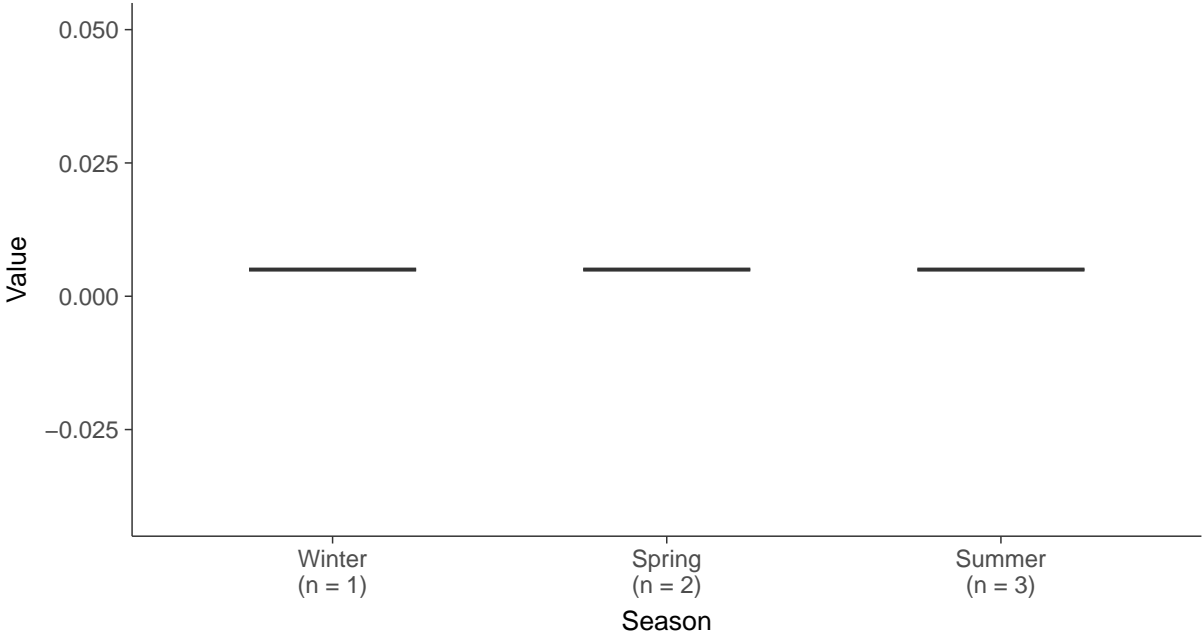
**Boxplot**

Nickel, MW-13 (mg/L)



**Boxplot by Season**

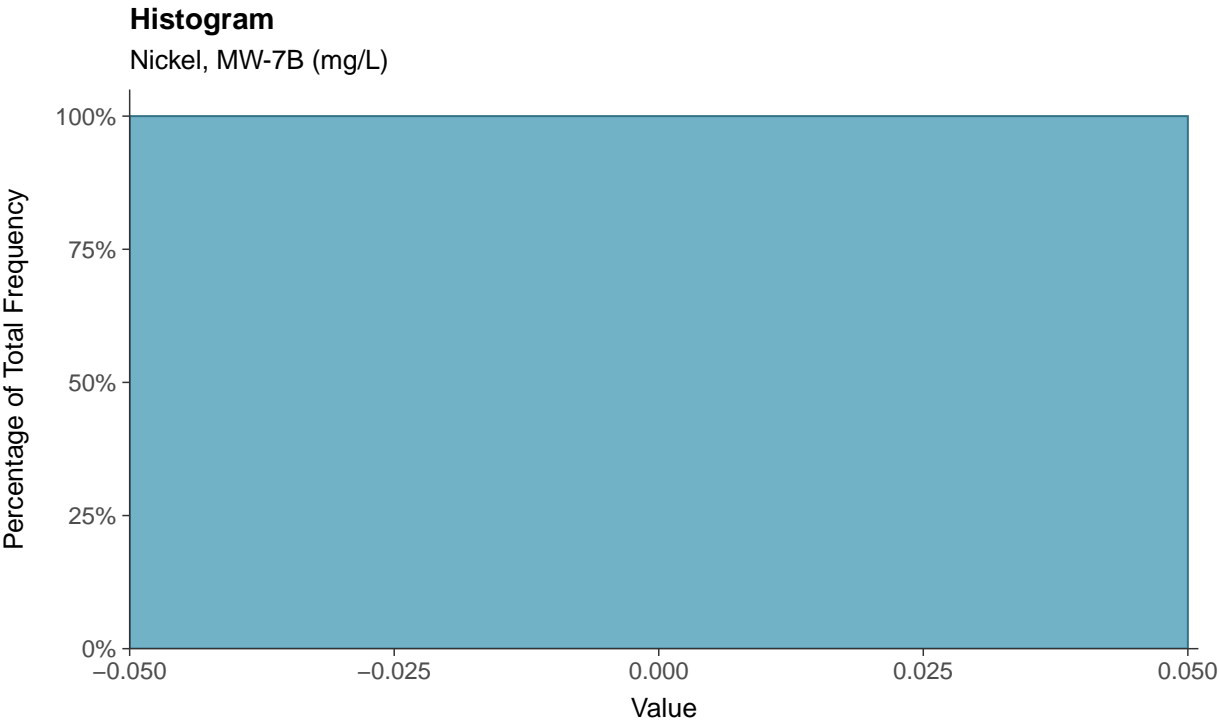
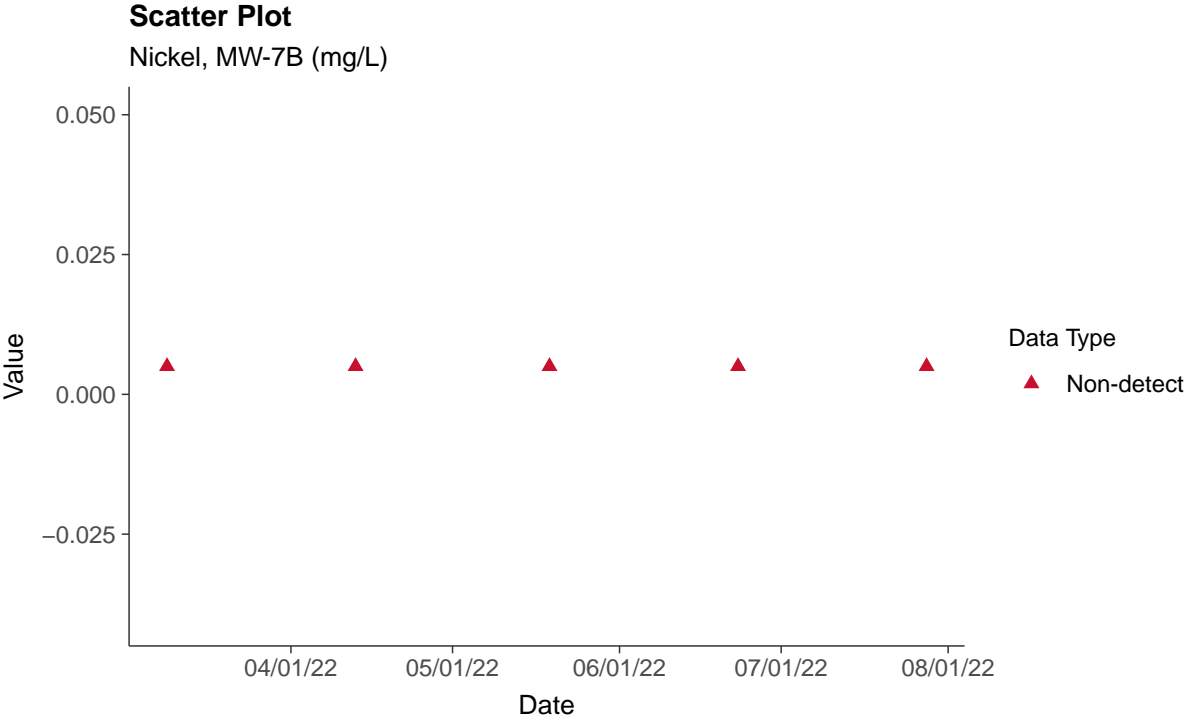
Nickel, MW-13 (mg/L)





**Part 115: Nickel, MW-7B**

ID: 5\_38\_7B





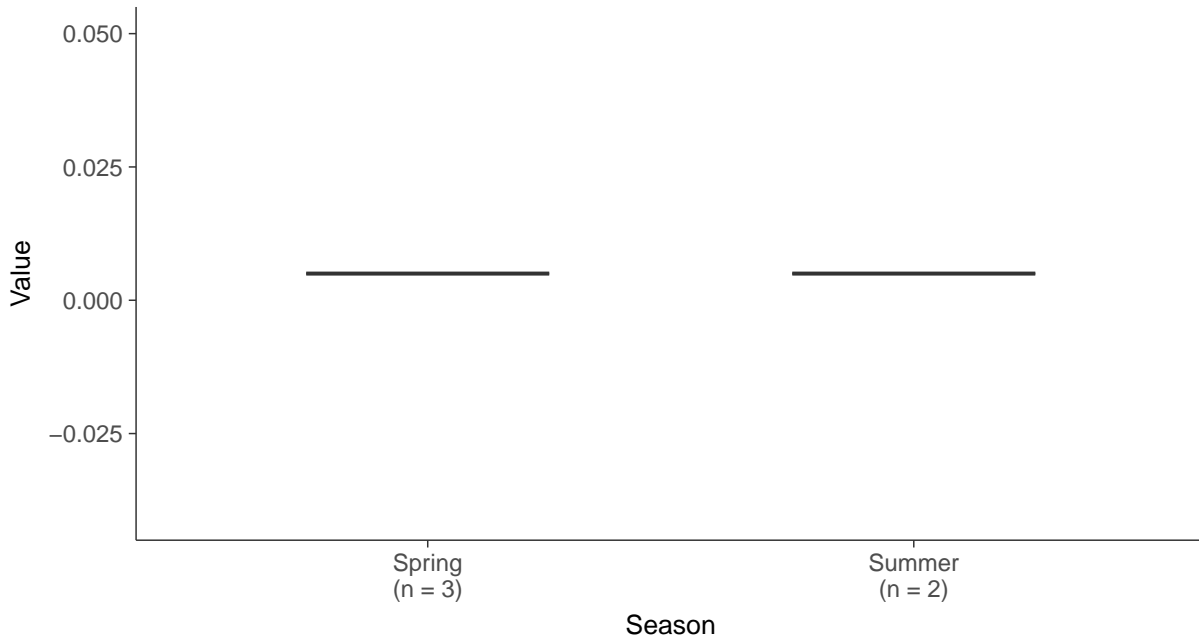
### Boxplot

Nickel, MW-7B (mg/L)



### Boxplot by Season

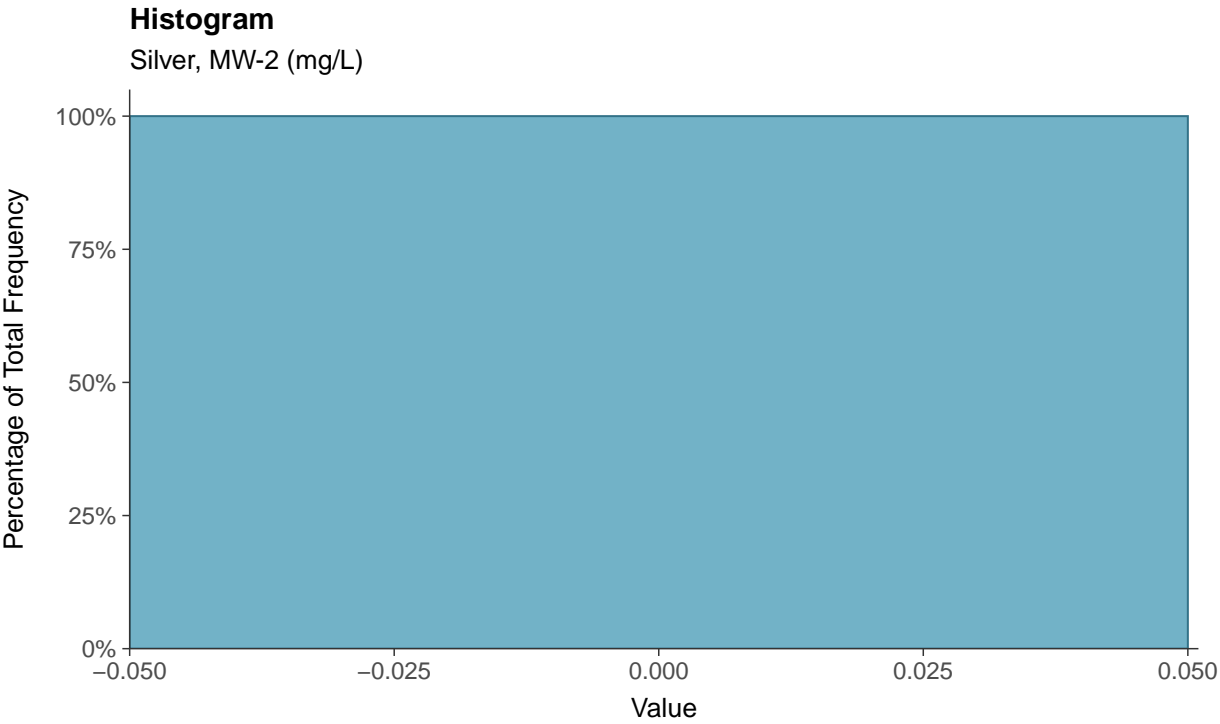
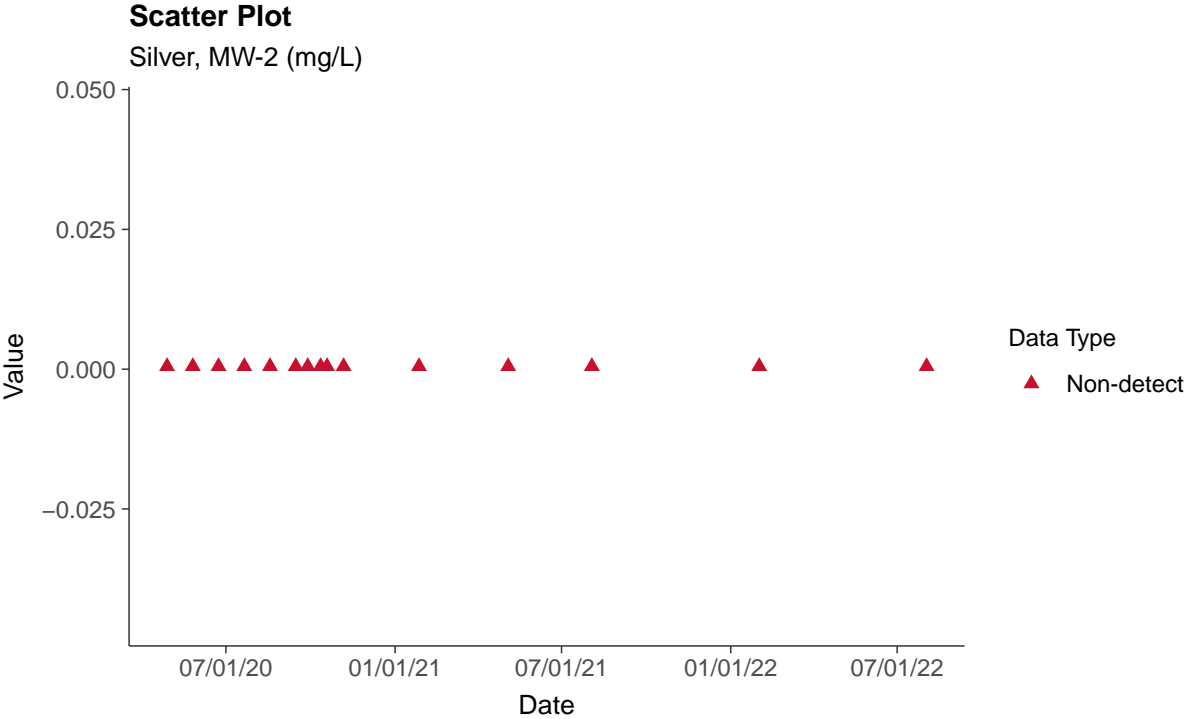
Nickel, MW-7B (mg/L)

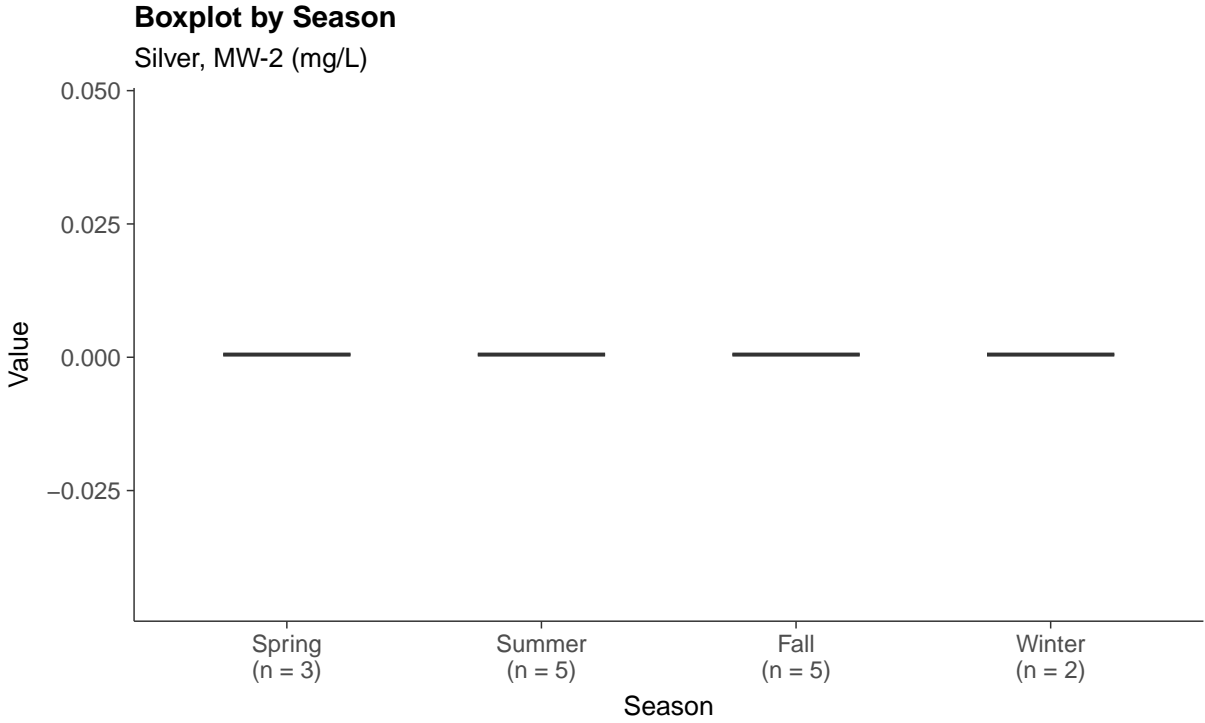
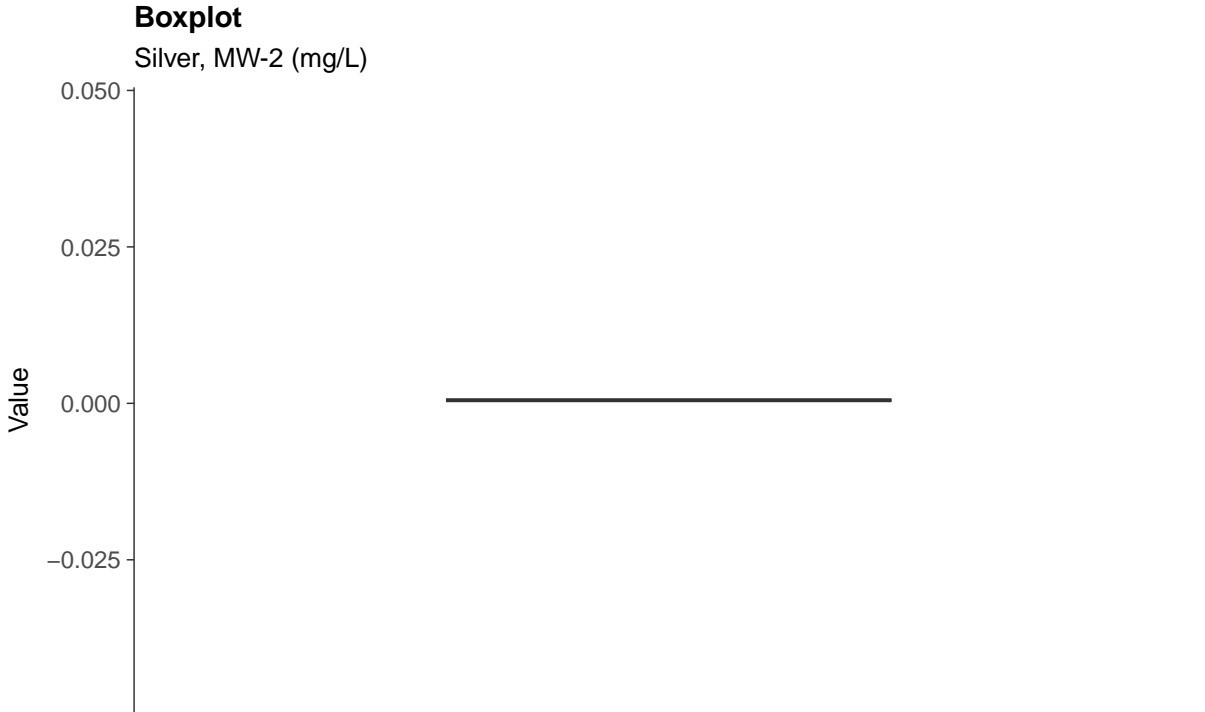




**Part 115: Silver, MW-2**

ID: 5\_39\_02

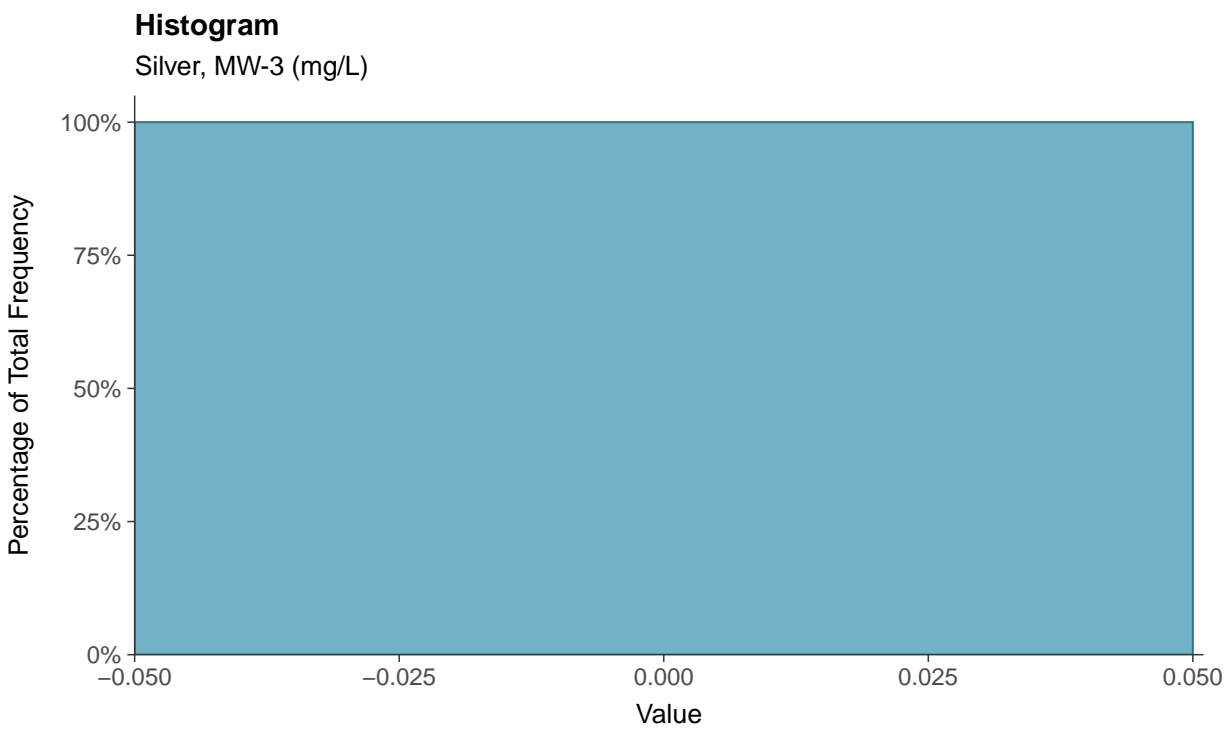
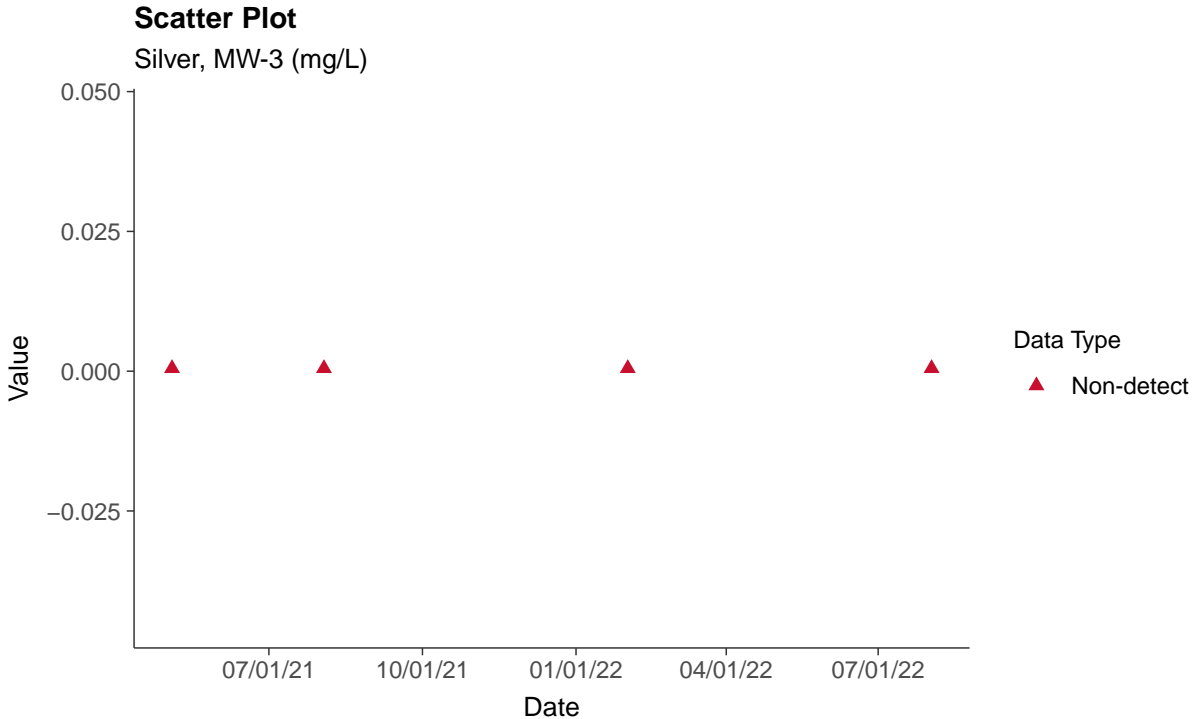


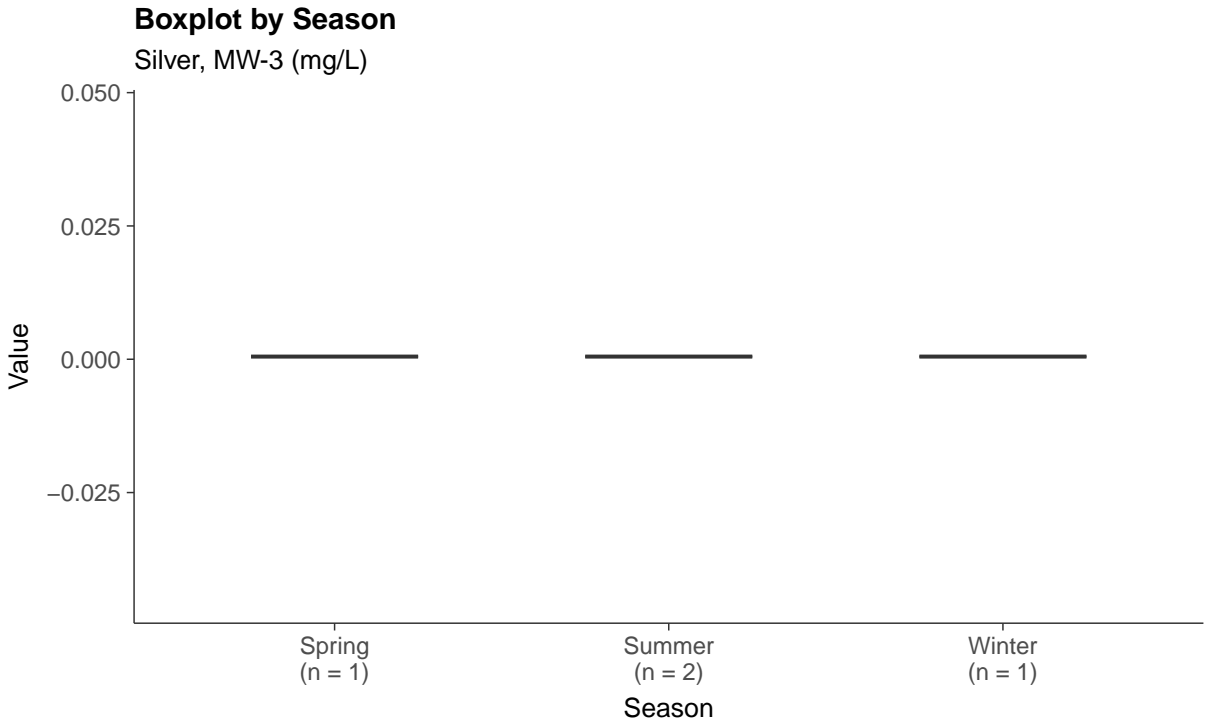
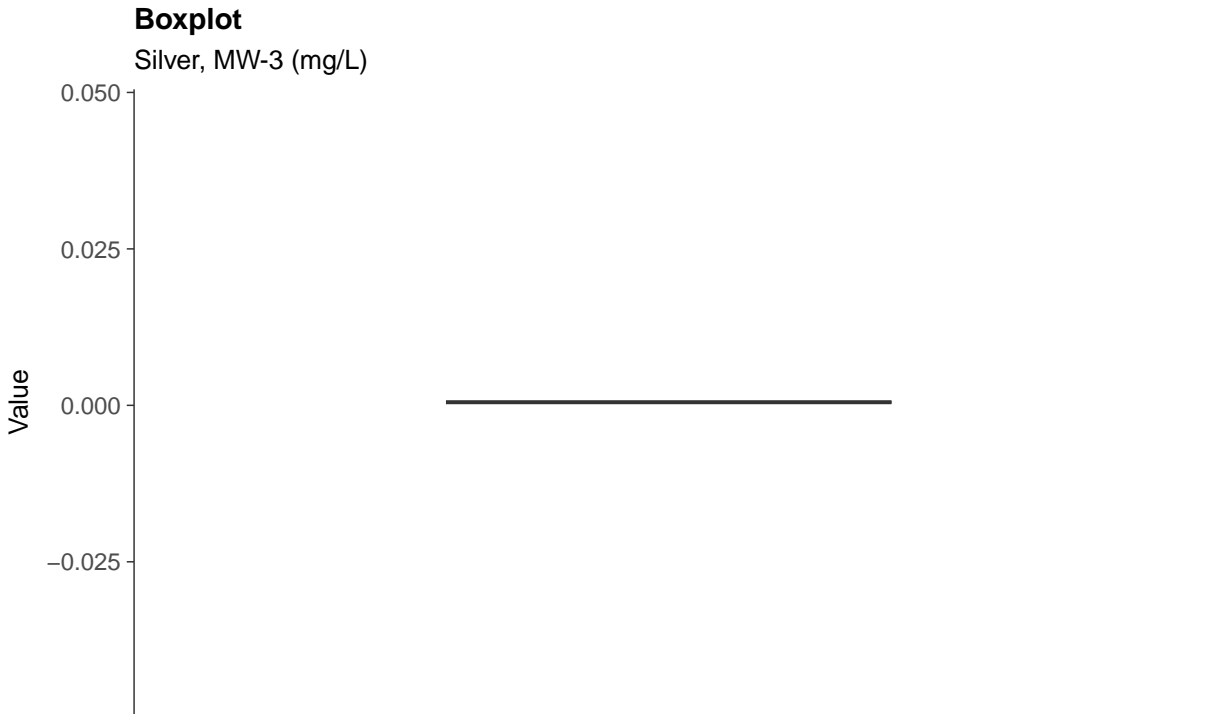




**Part 115: Silver, MW-3**

ID: 5\_39\_03

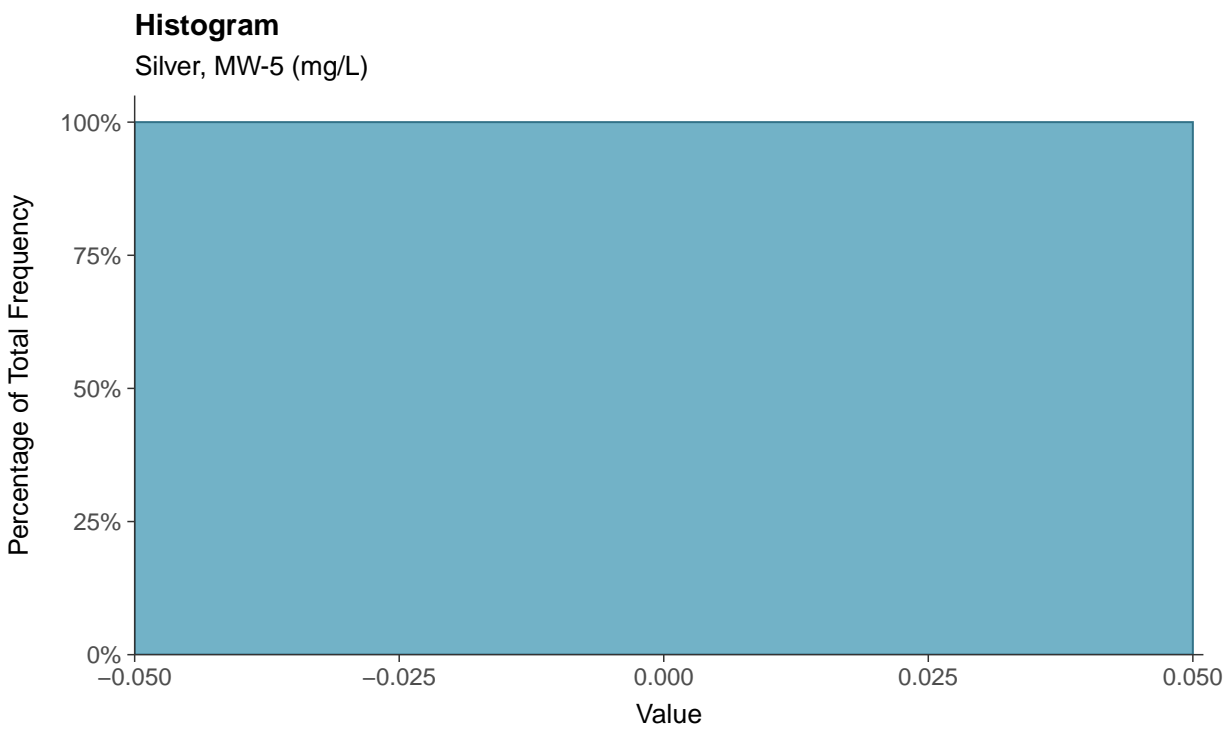
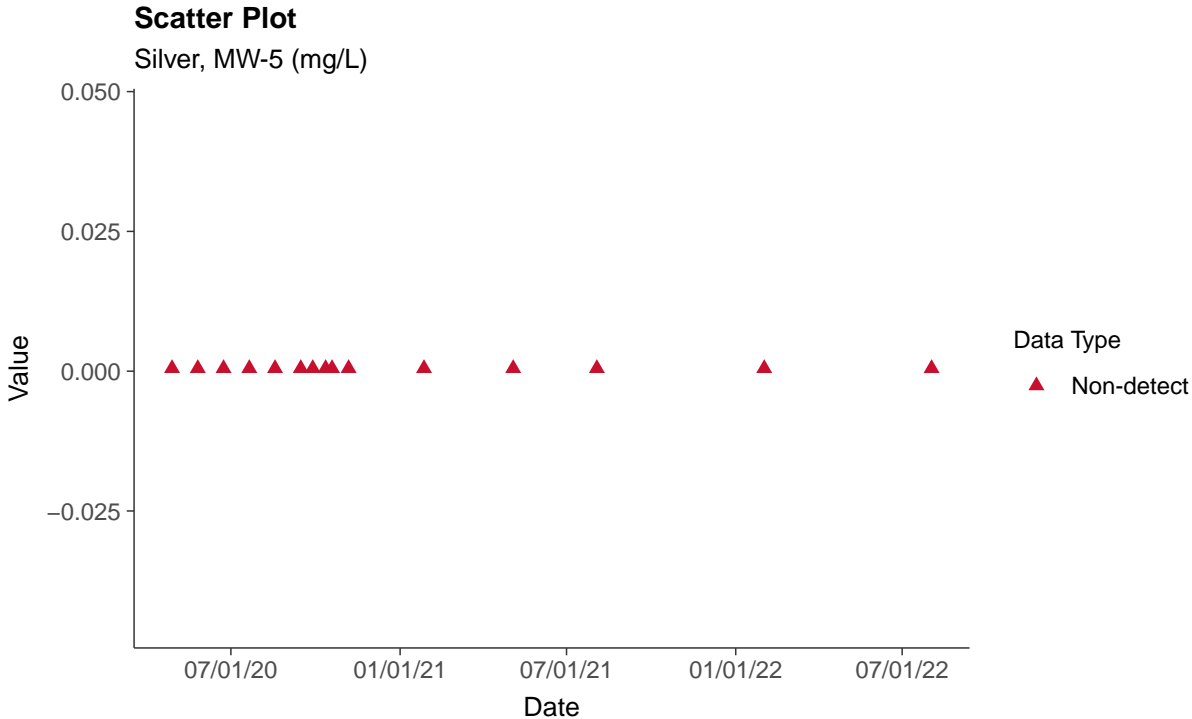




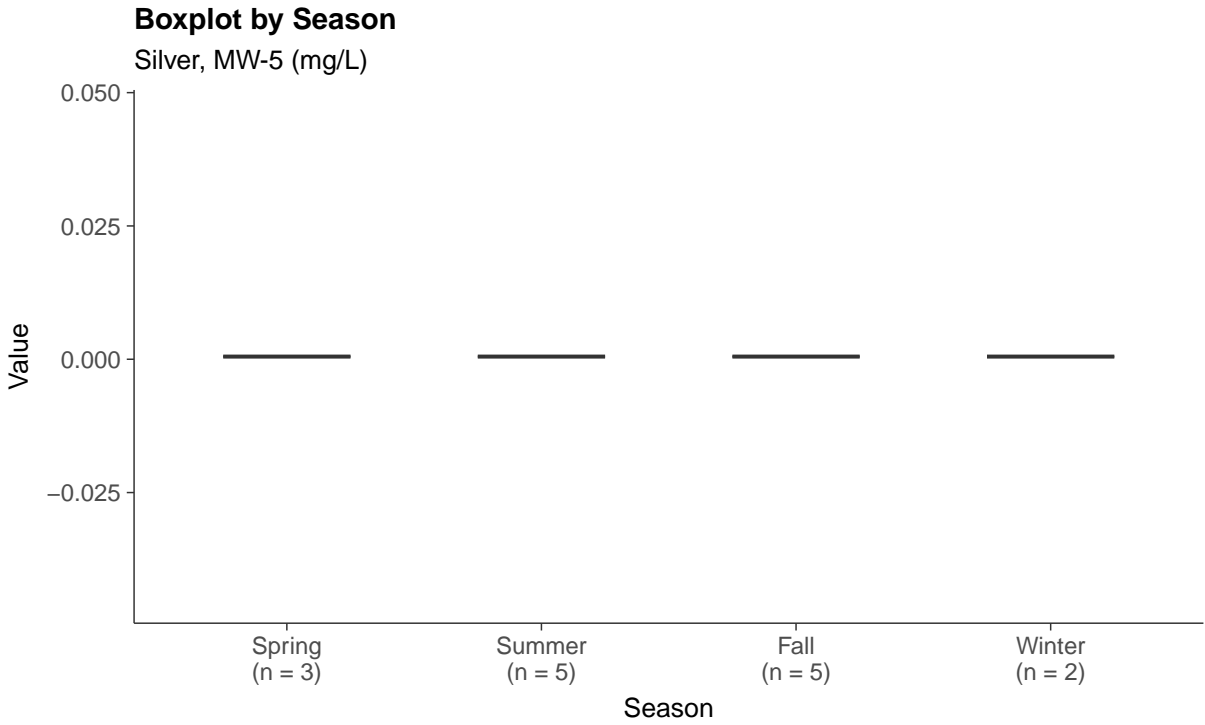
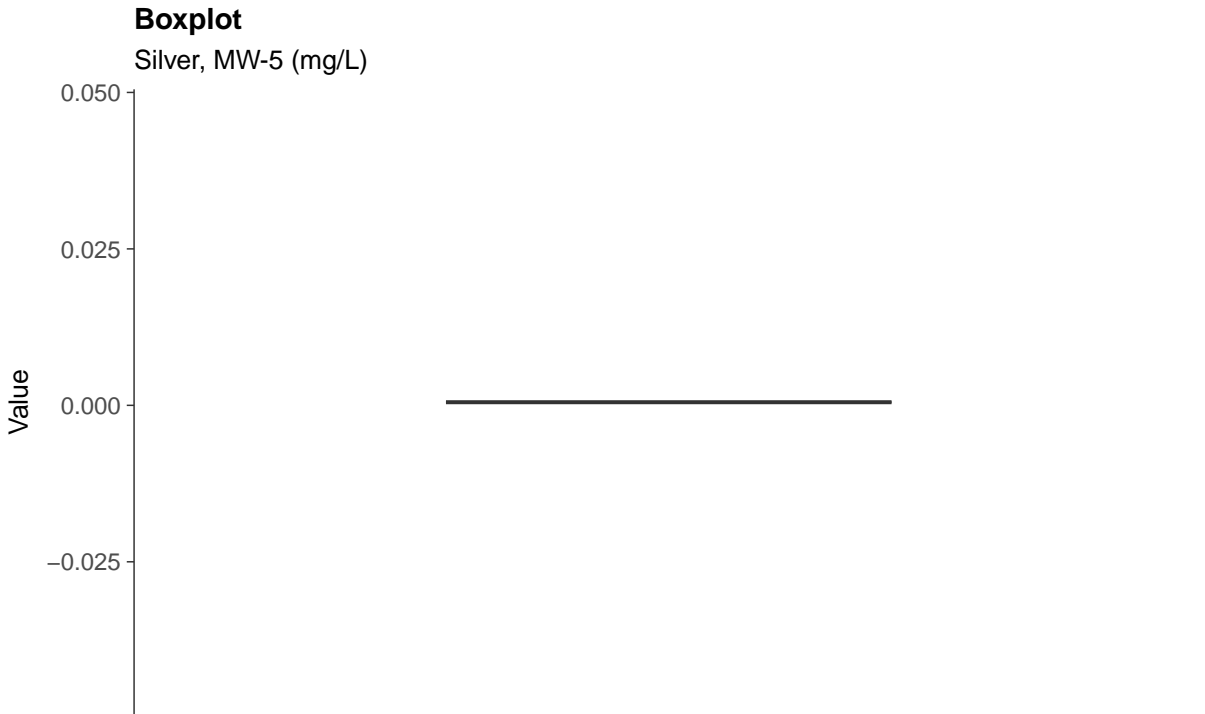


**Part 115: Silver, MW-5**

ID: 5\_39\_05



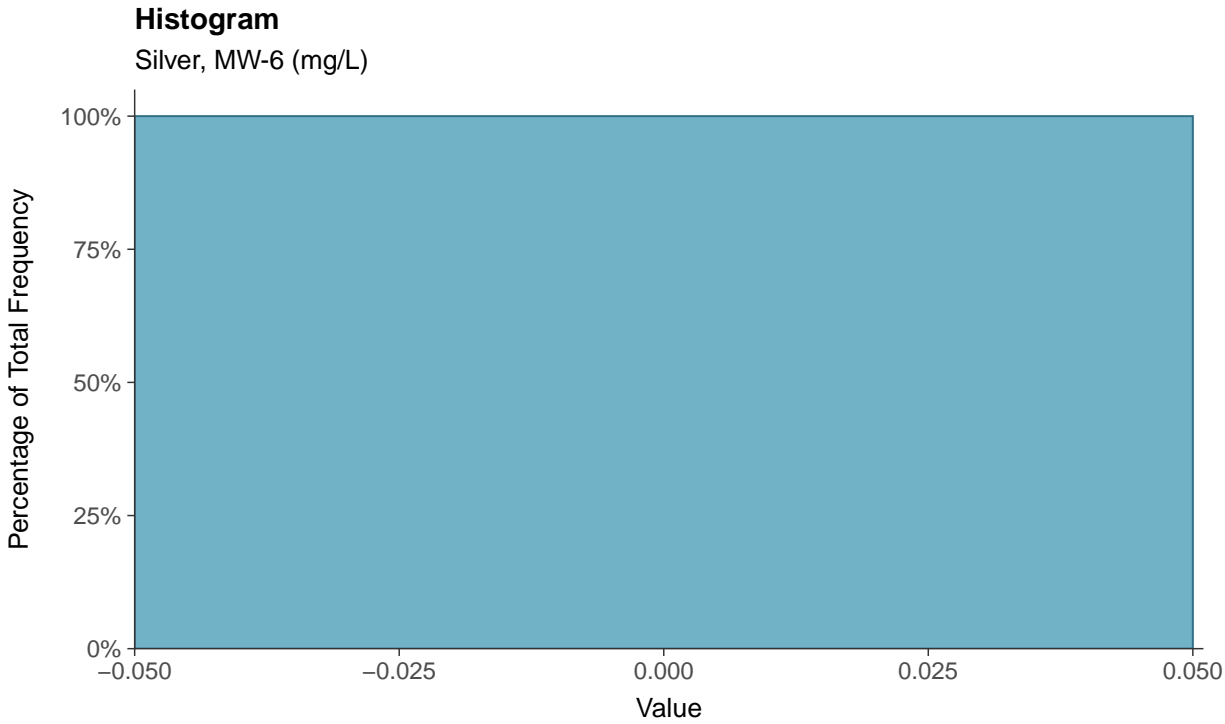
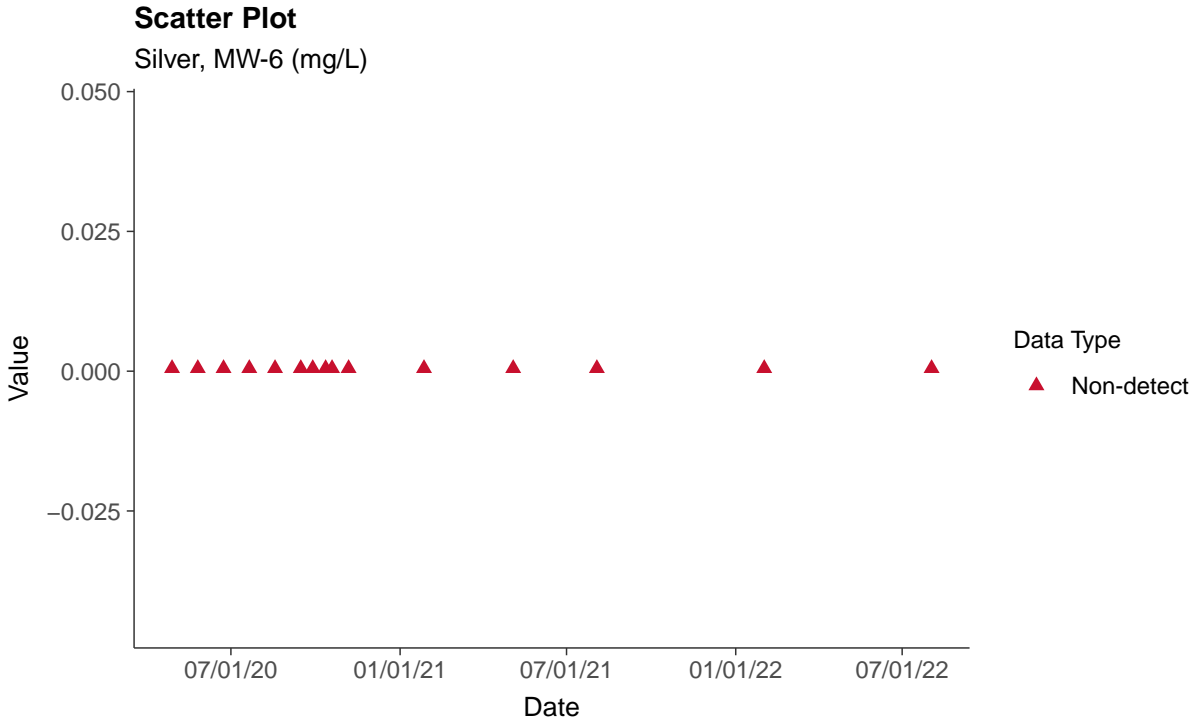


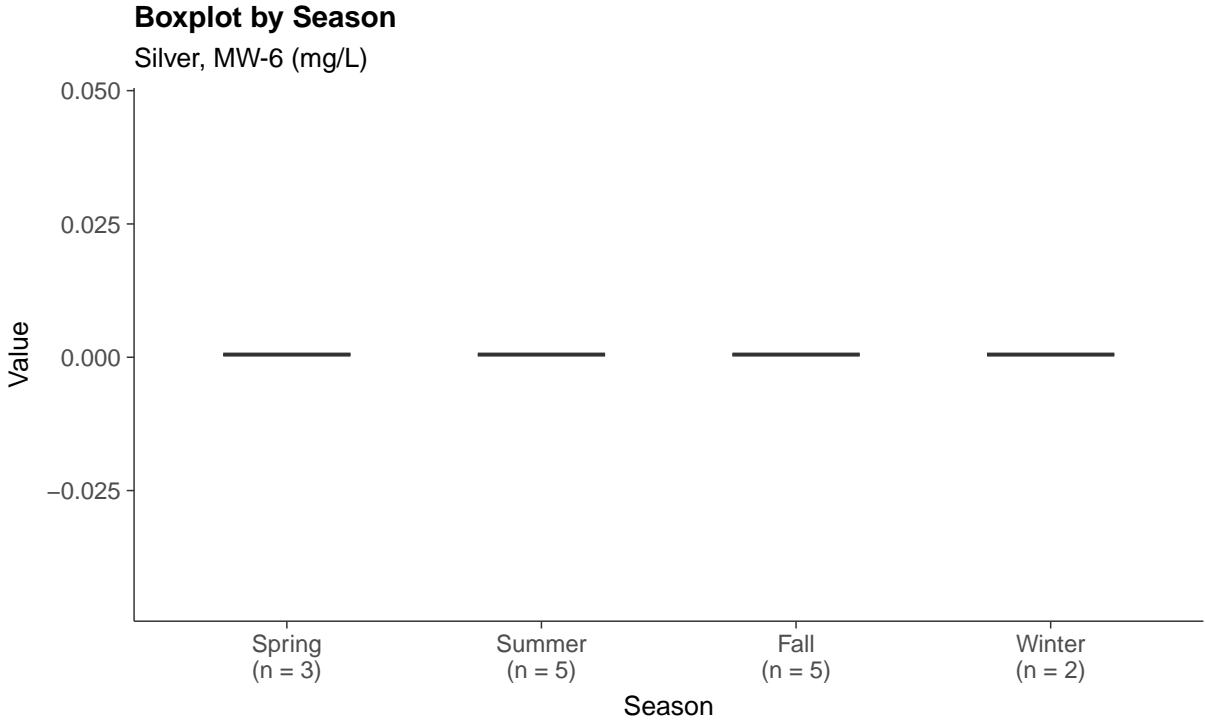
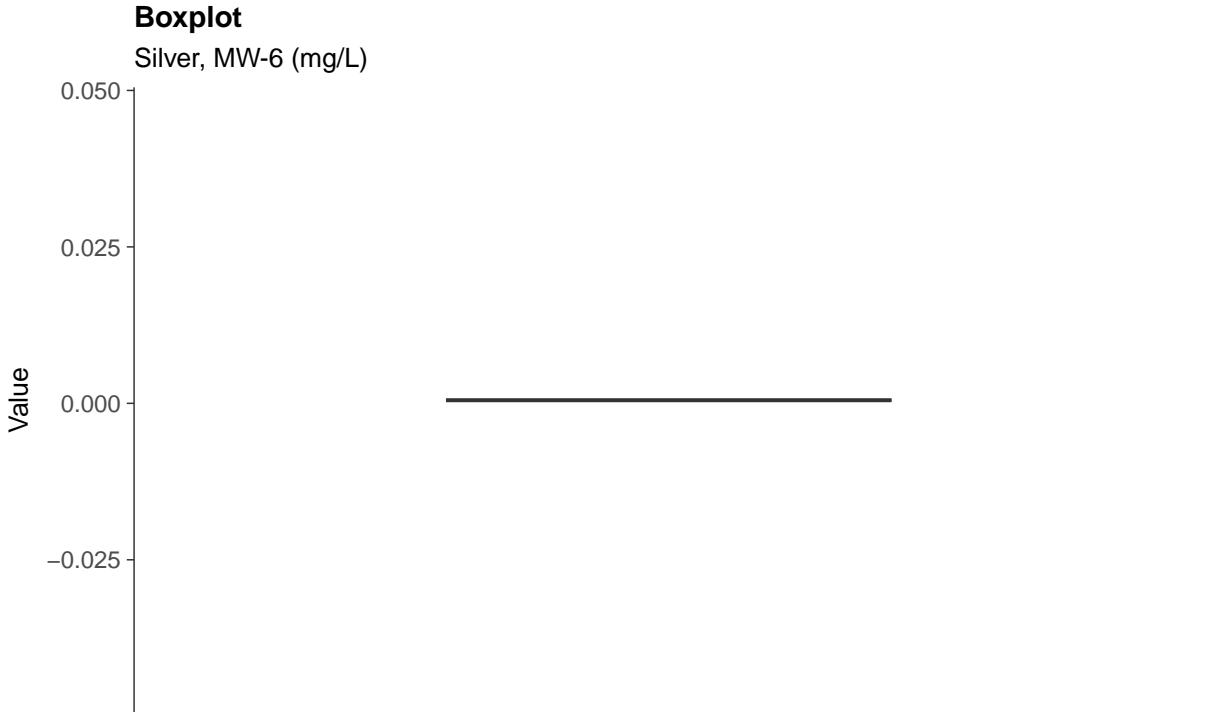




**Part 115: Silver, MW-6**

ID: 5\_39\_06

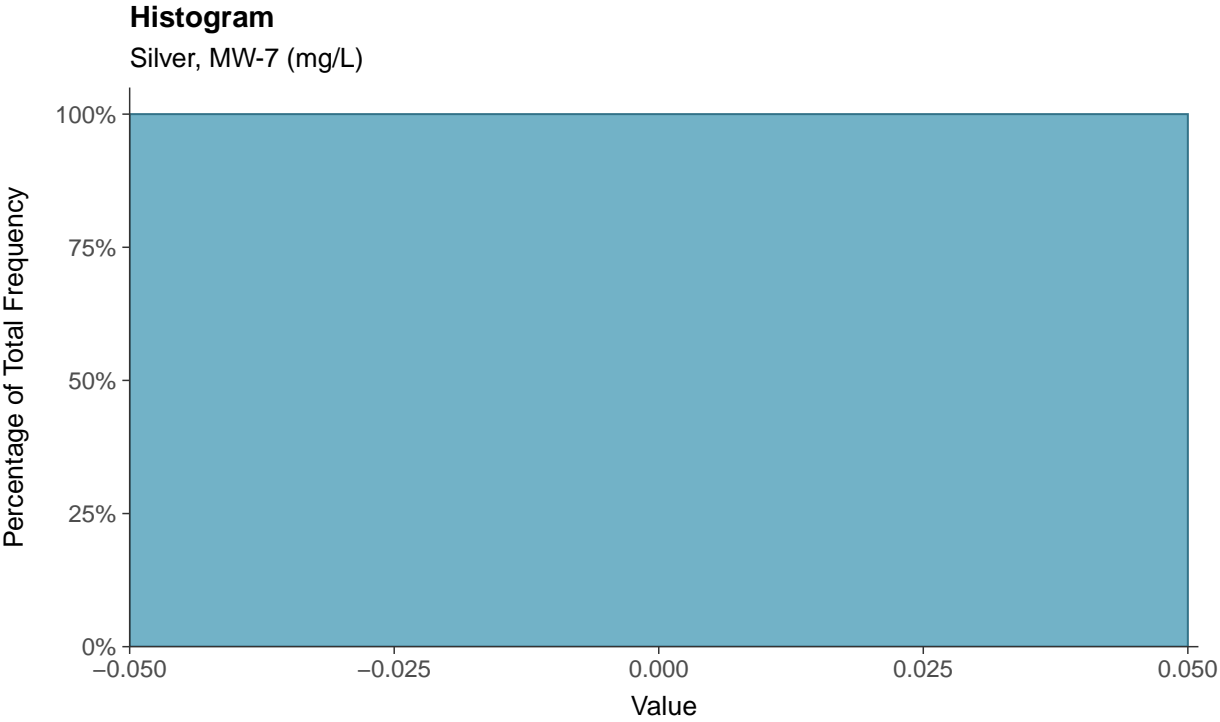
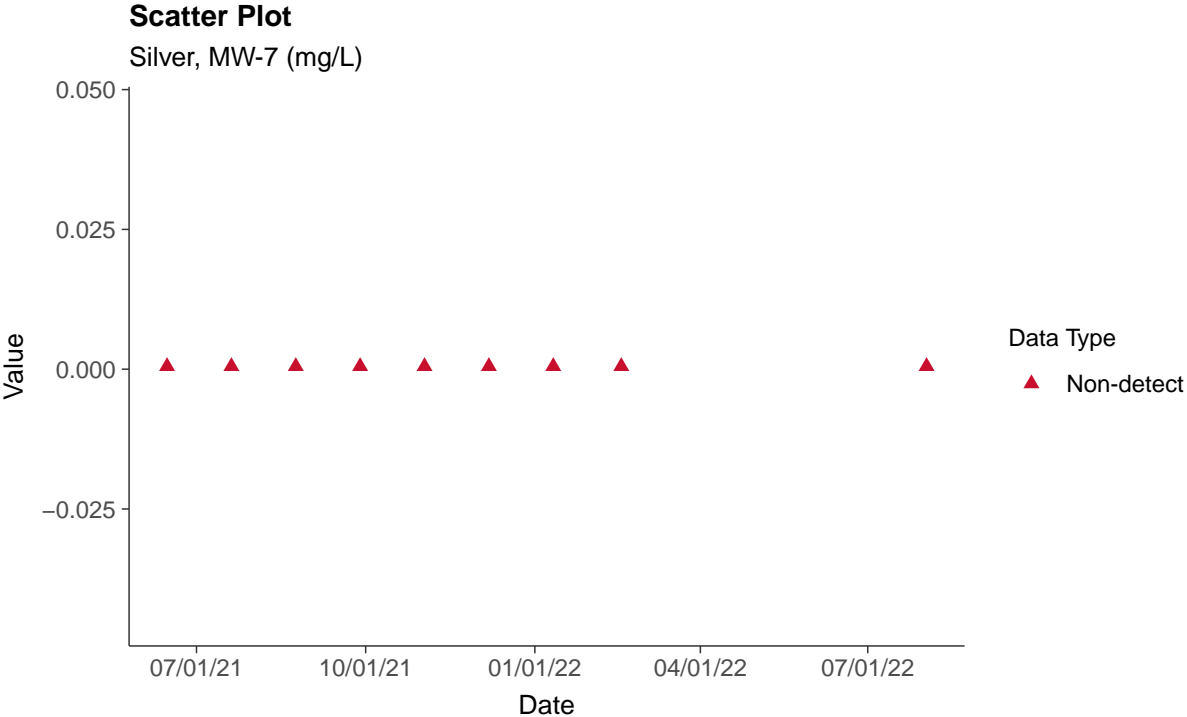






**Part 115: Silver, MW-7**

ID: 5\_39\_07





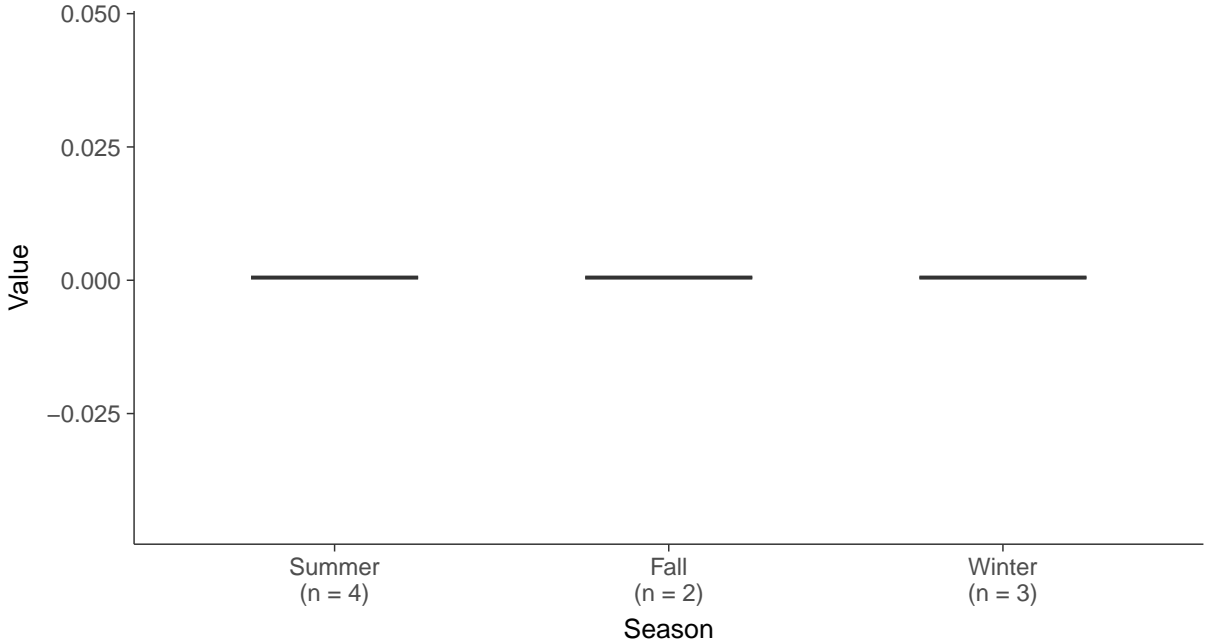
**Boxplot**

Silver, MW-7 (mg/L)



**Boxplot by Season**

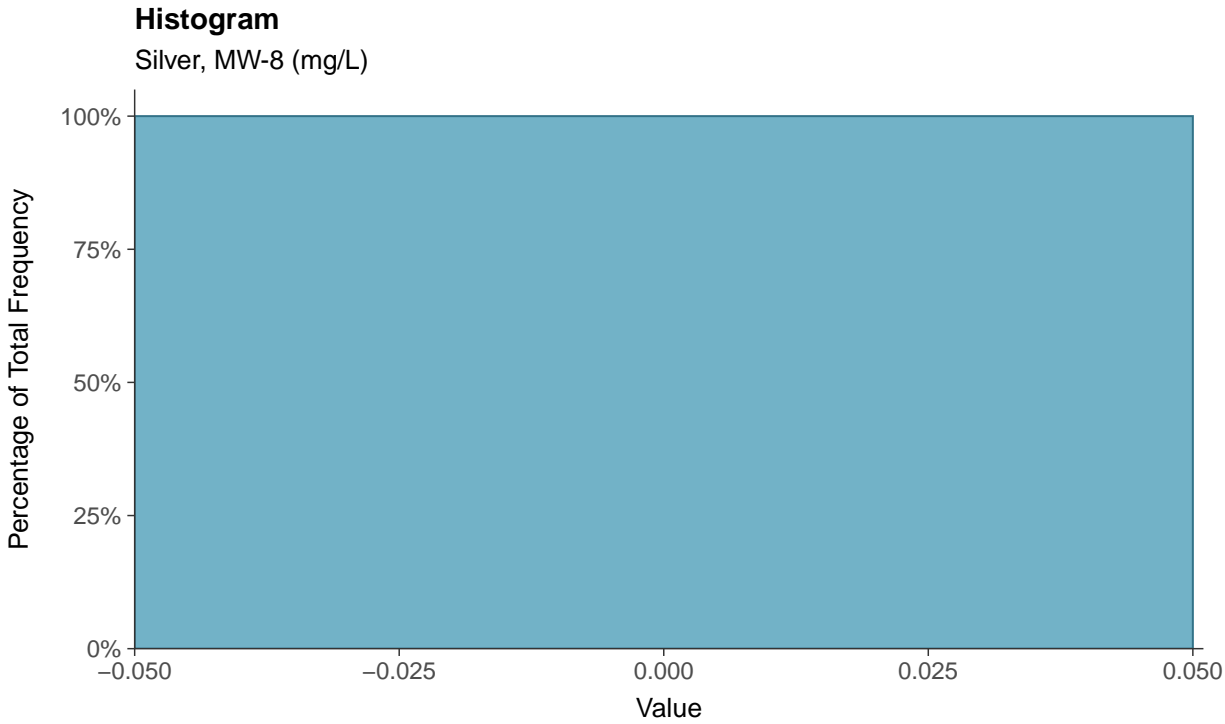
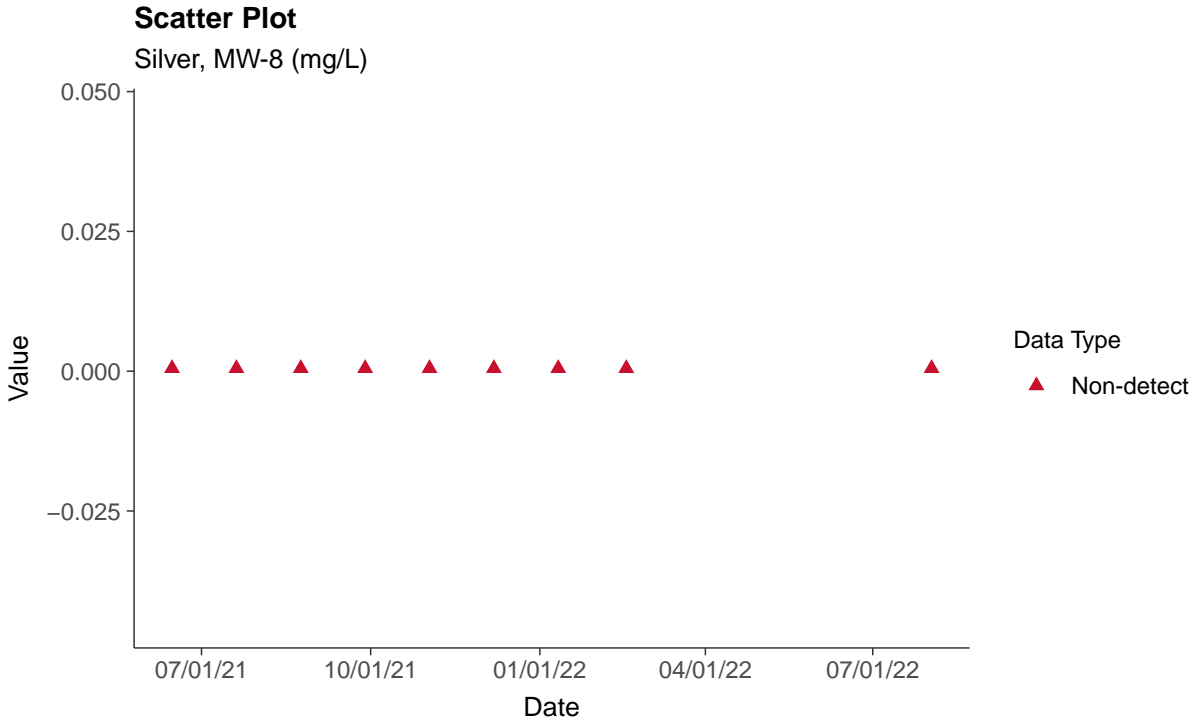
Silver, MW-7 (mg/L)

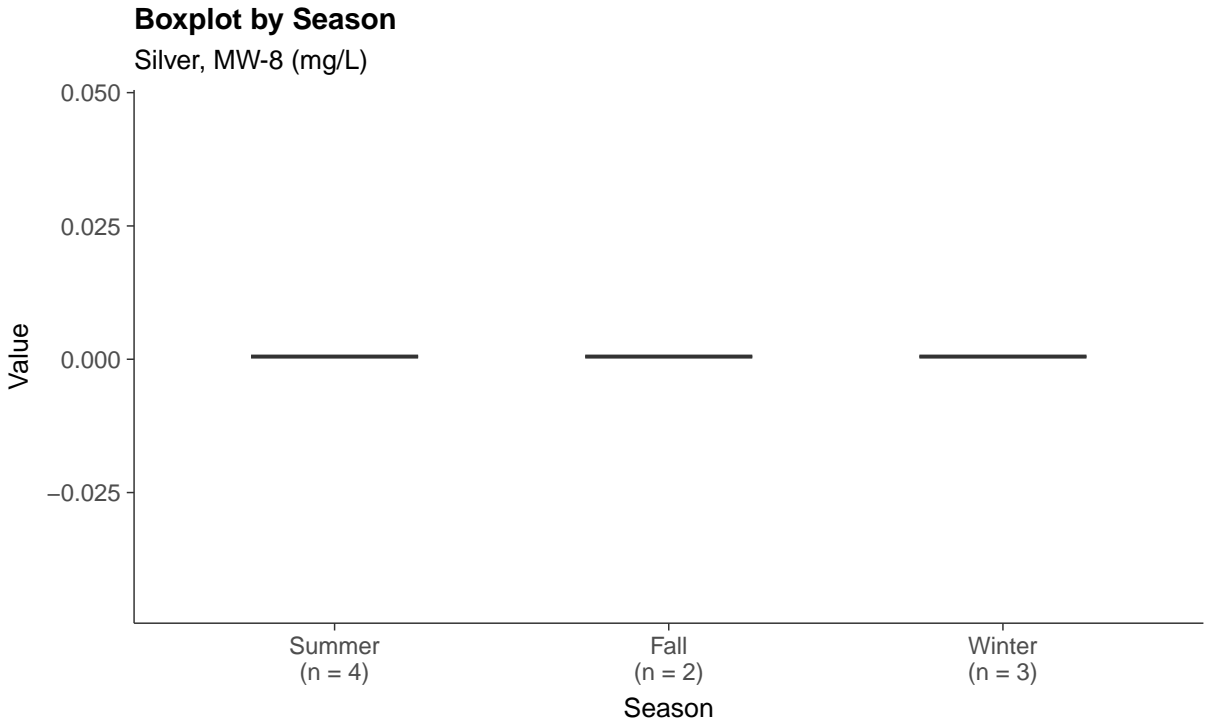
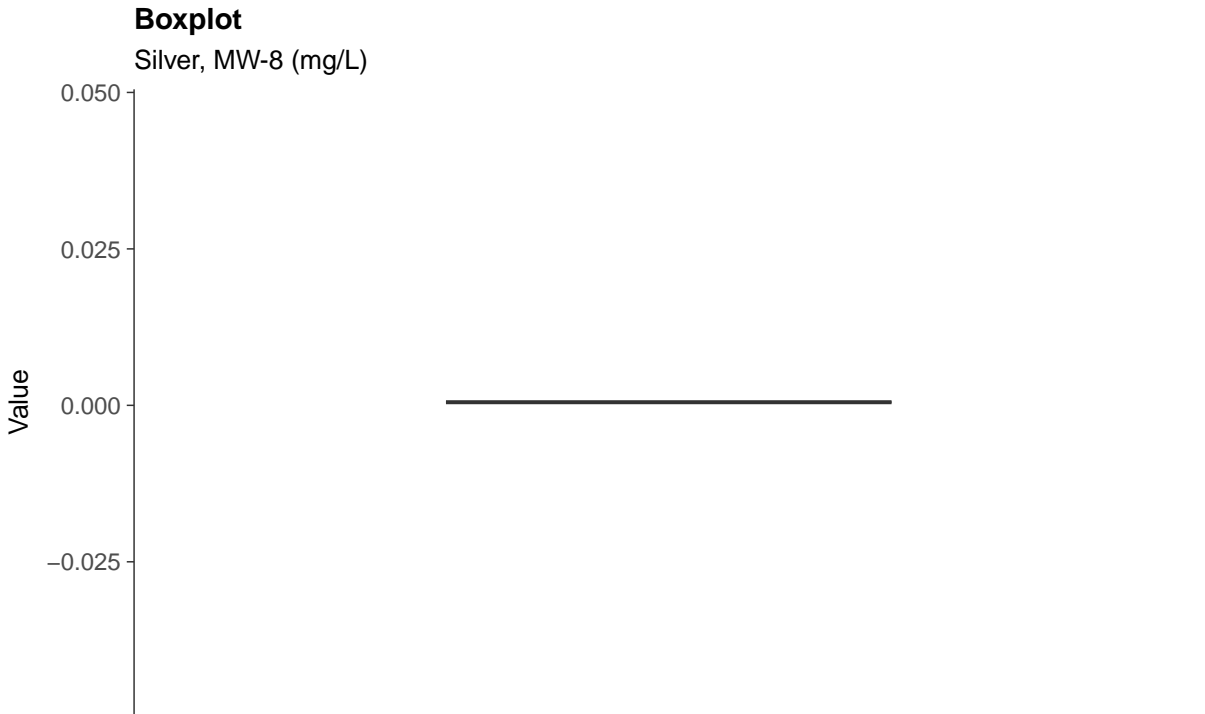




**Part 115: Silver, MW-8**

ID: 5\_39\_08

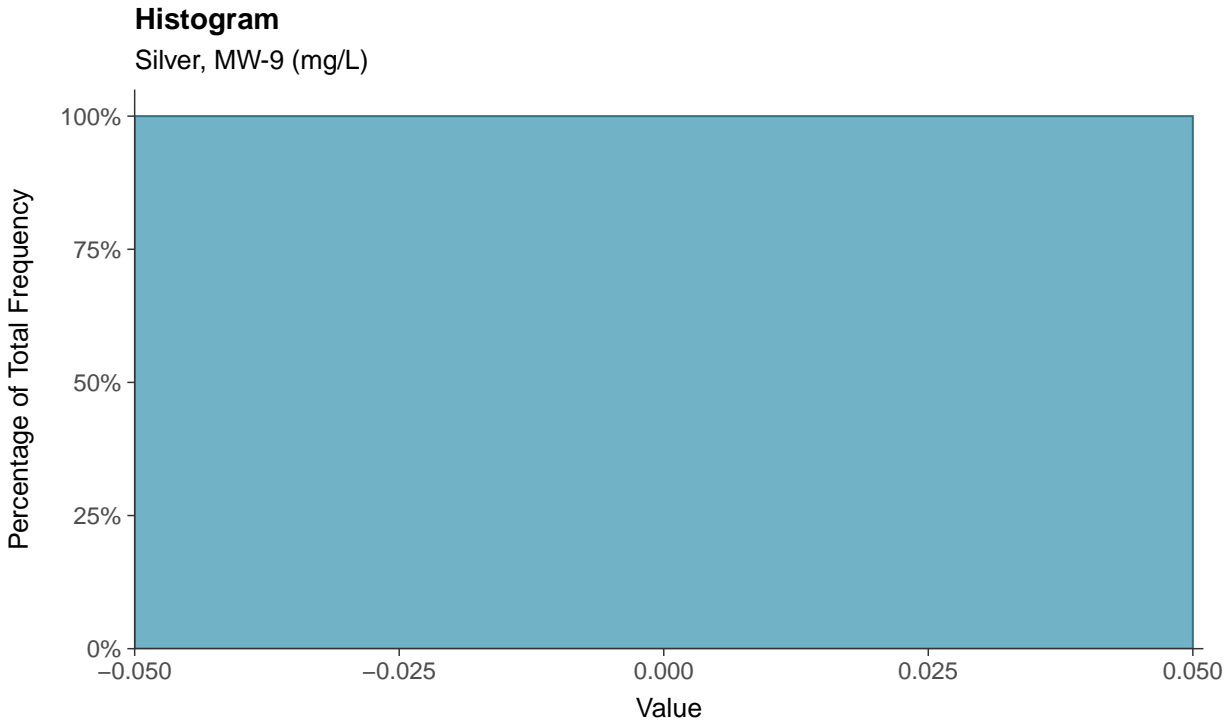
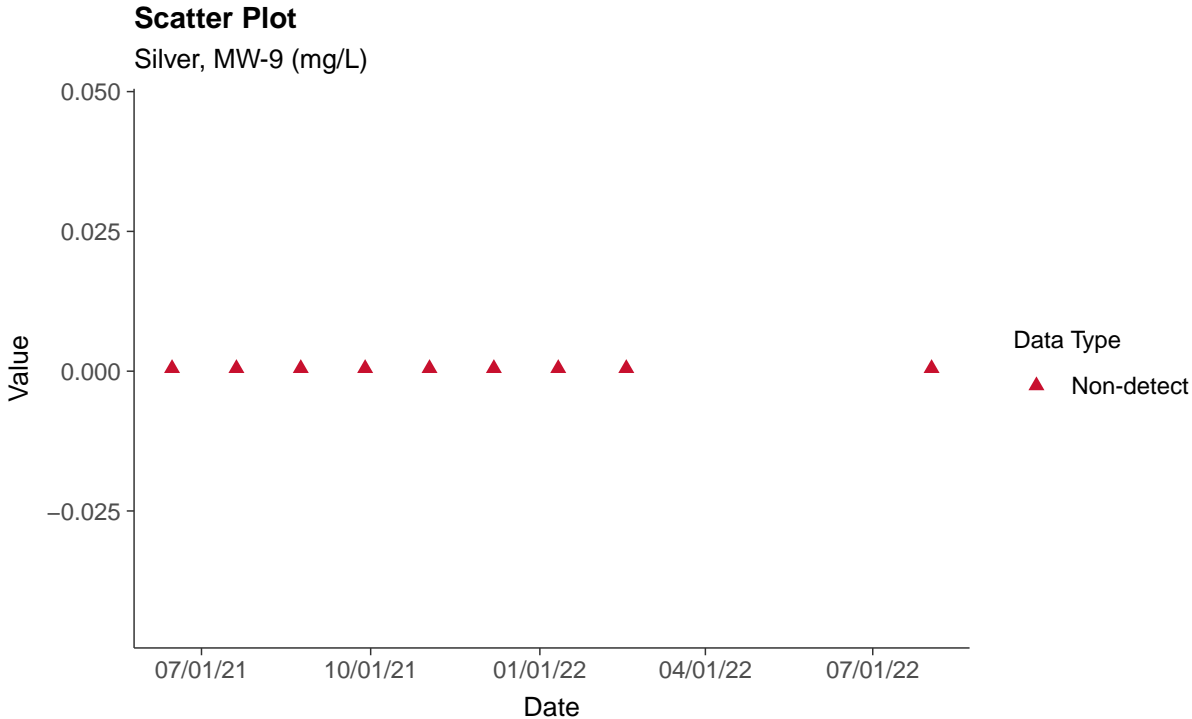




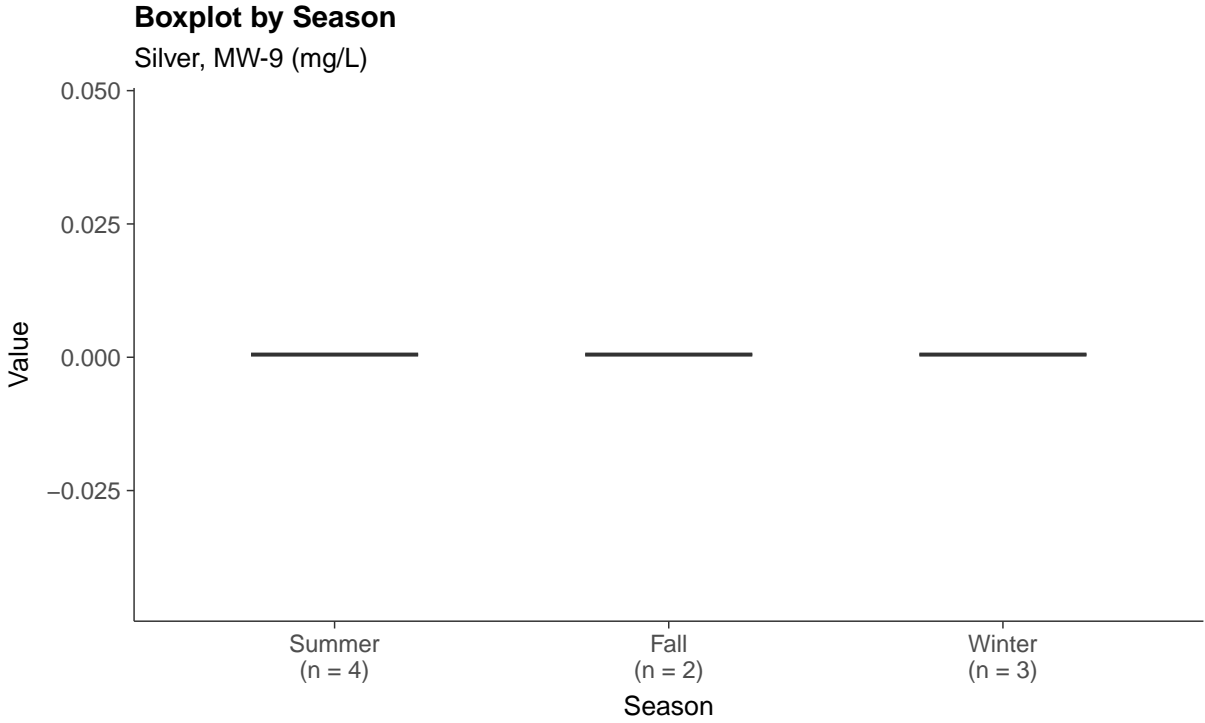
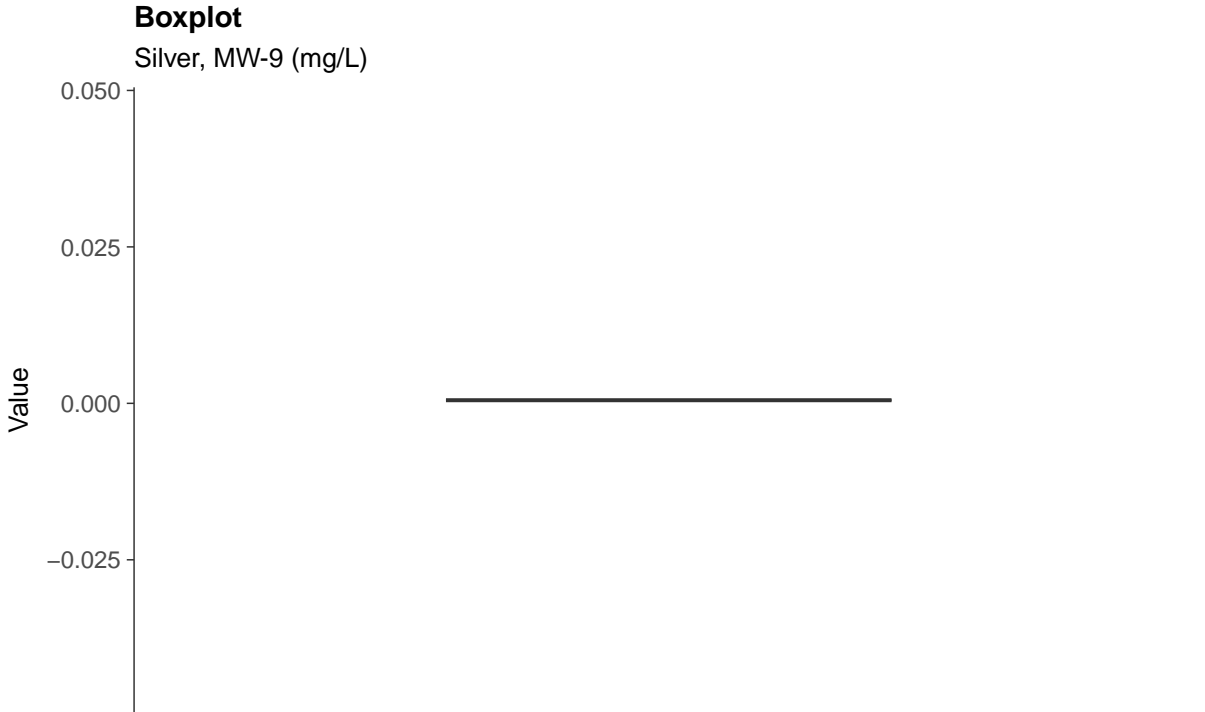


**Part 115: Silver, MW-9**

ID: 5\_39\_09



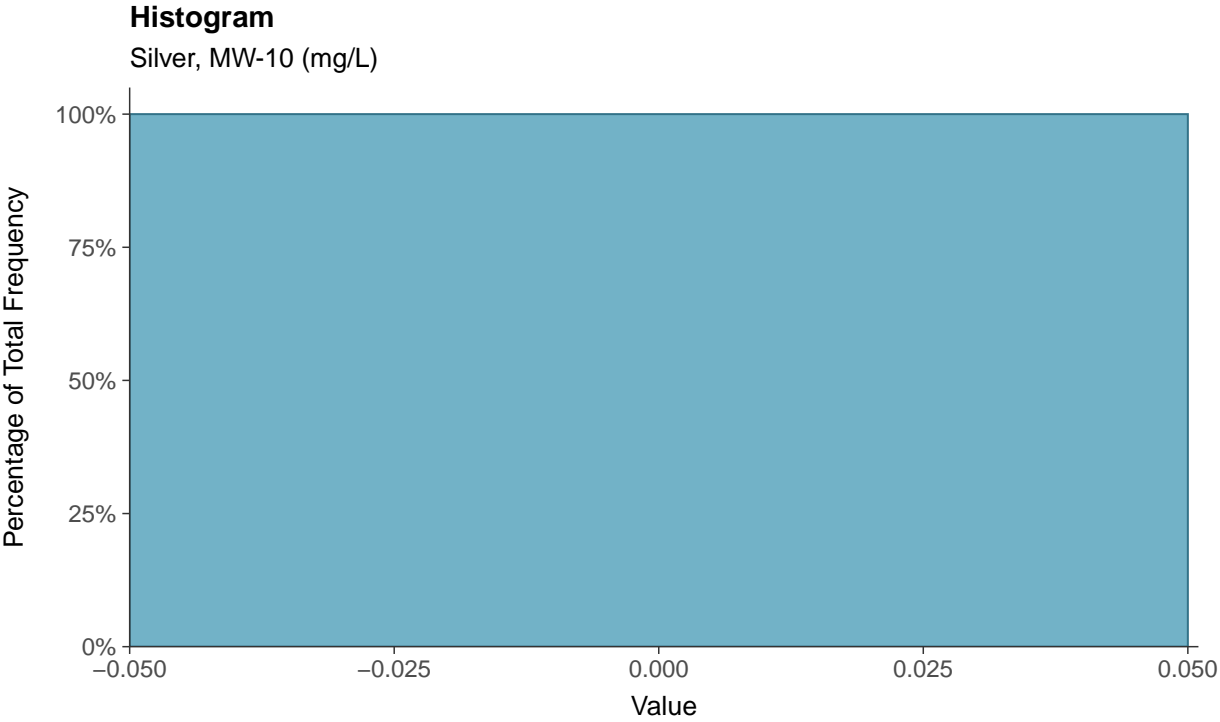
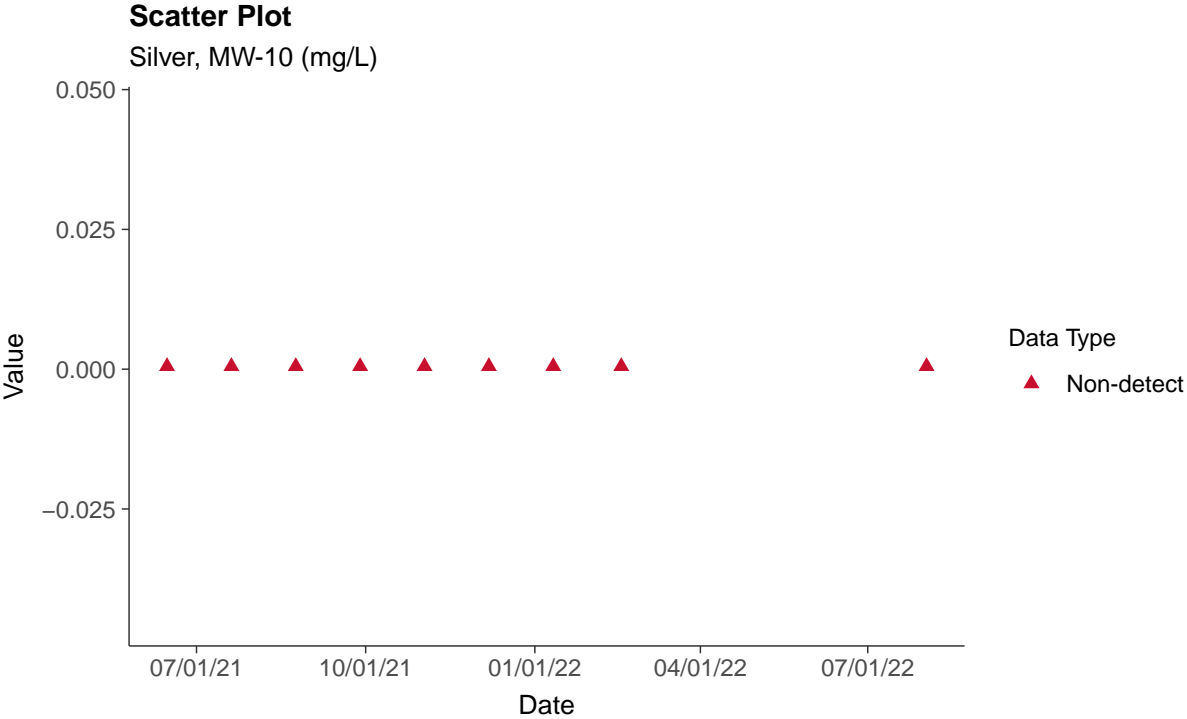


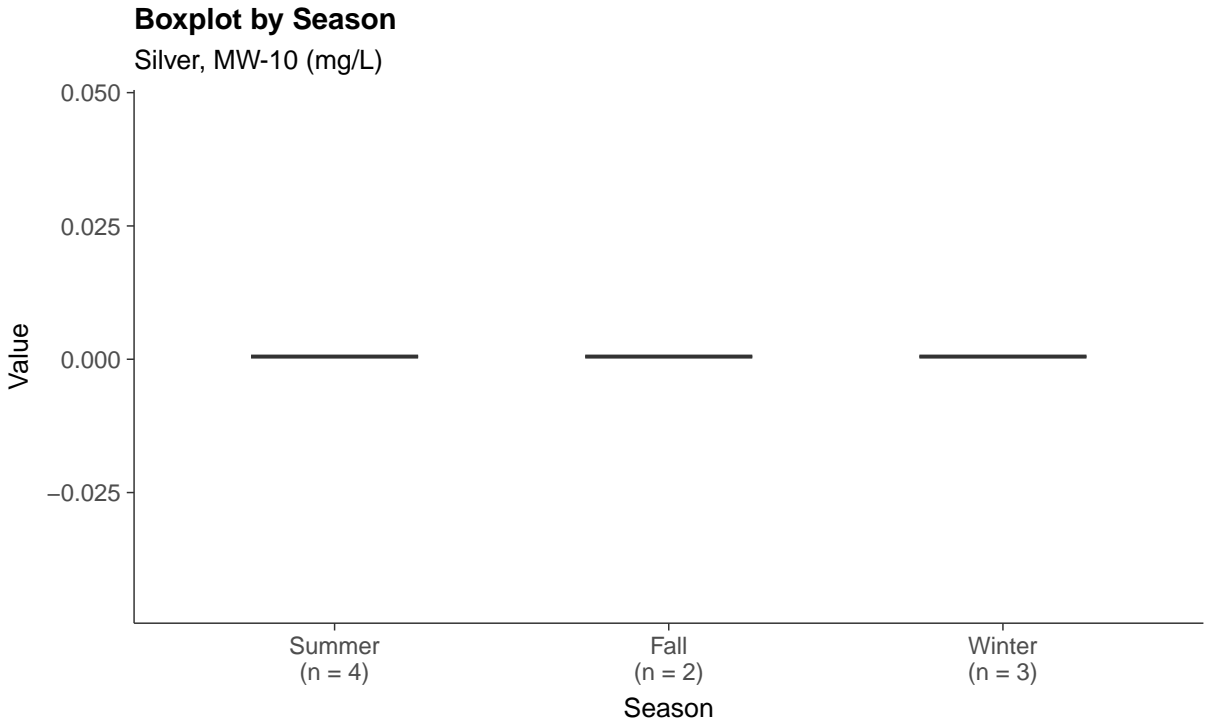
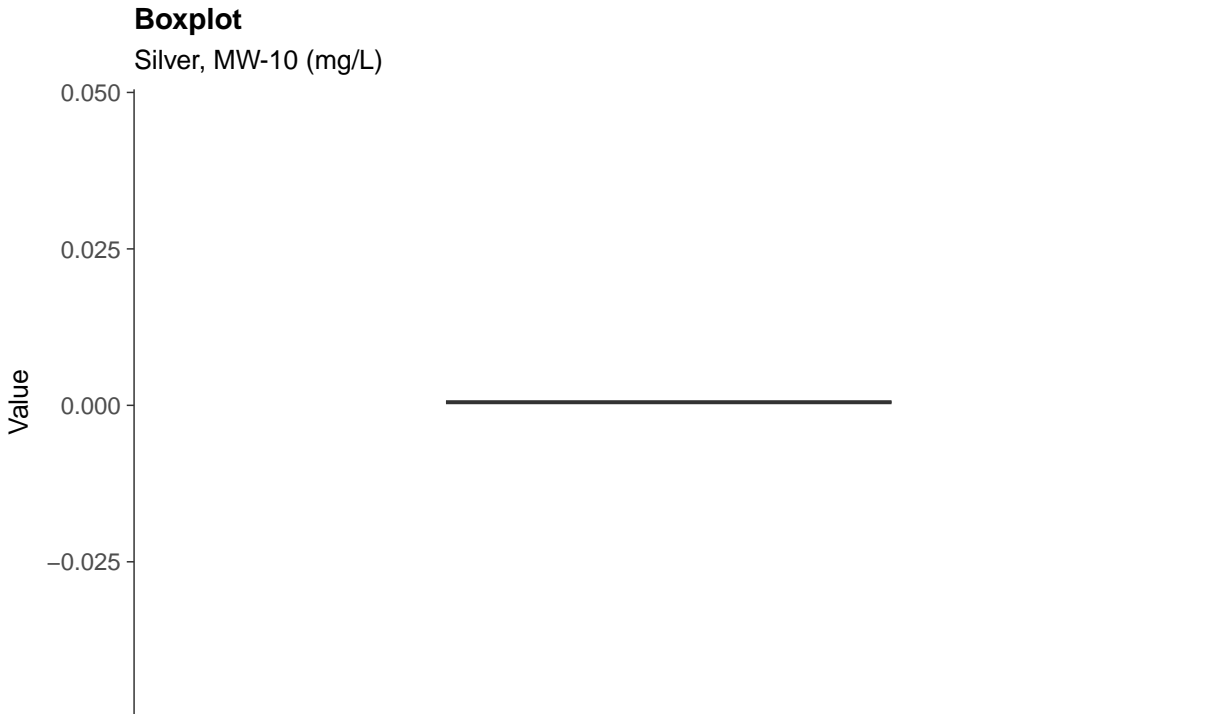




**Part 115: Silver, MW-10**

ID: 5\_39\_10

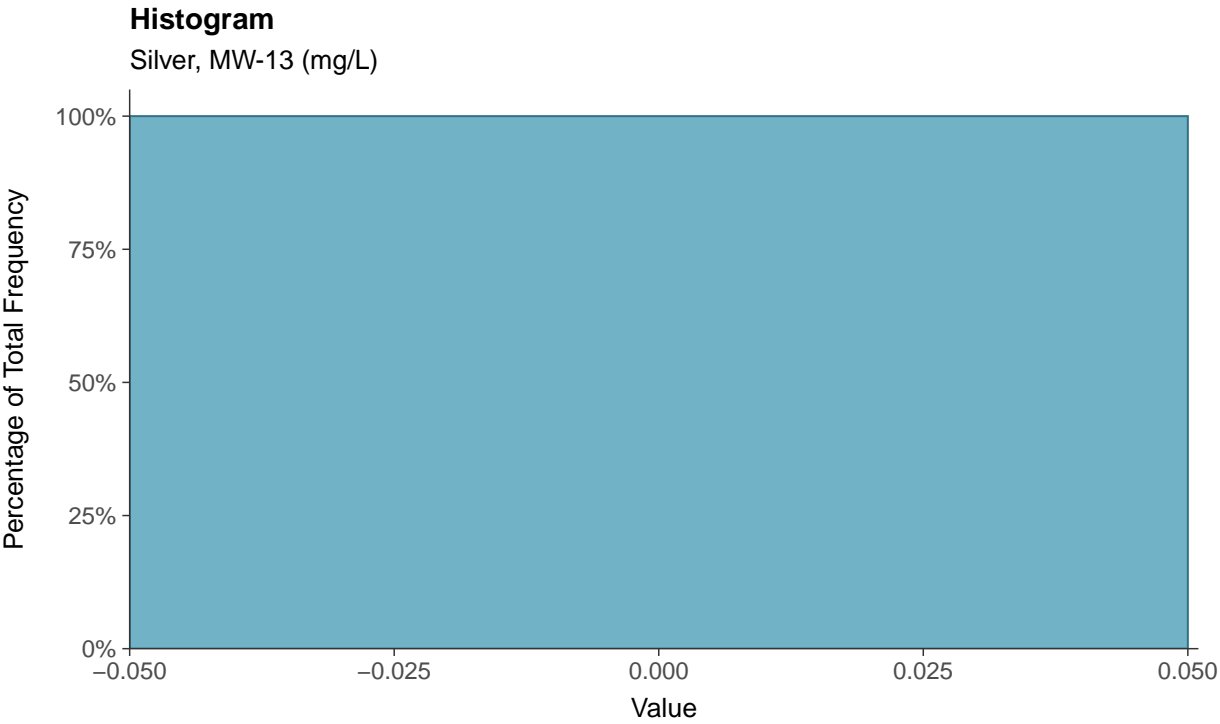
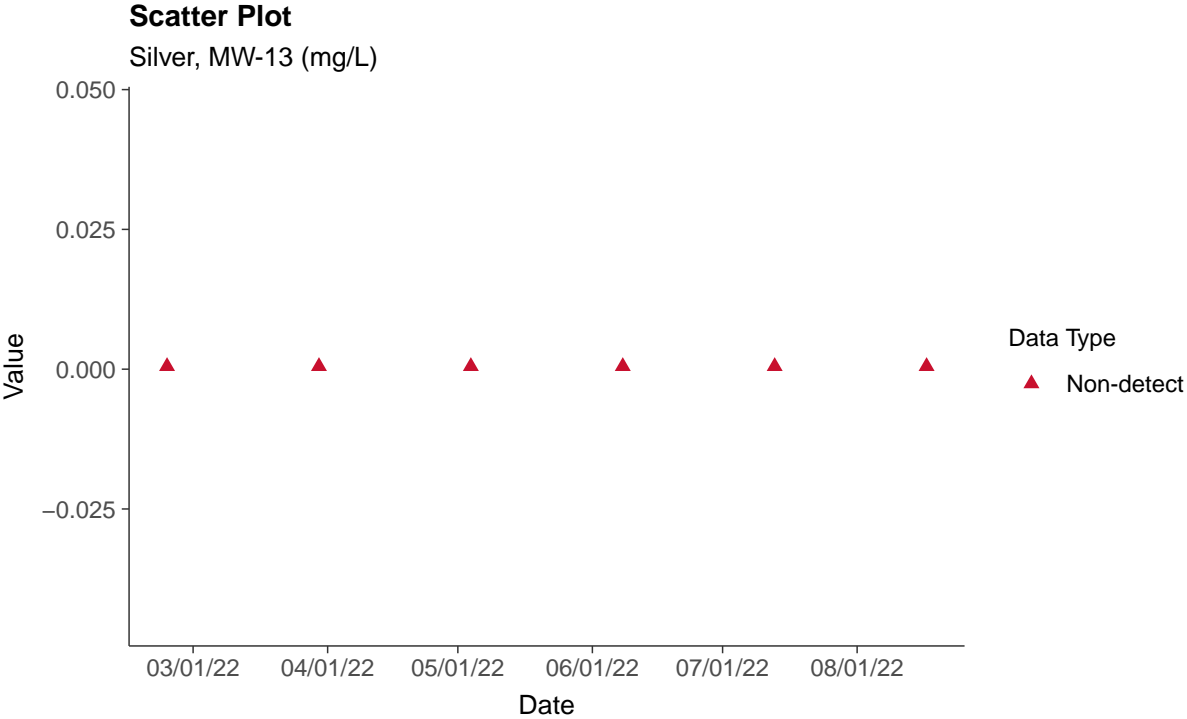






**Part 115: Silver, MW-13**

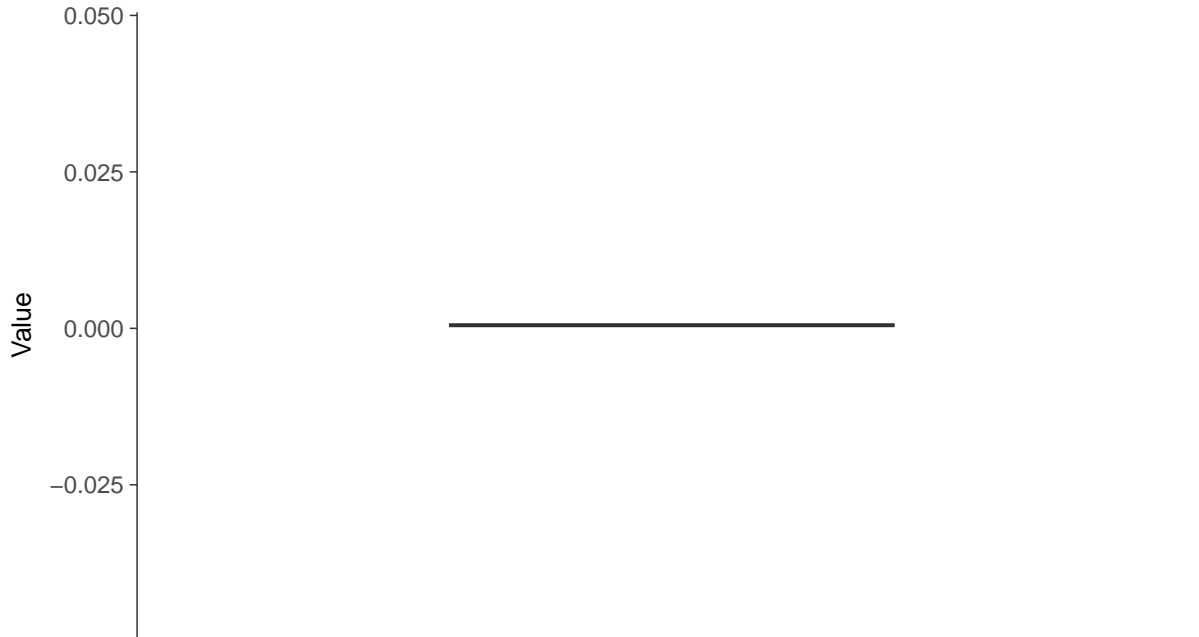
ID: 5\_39\_13





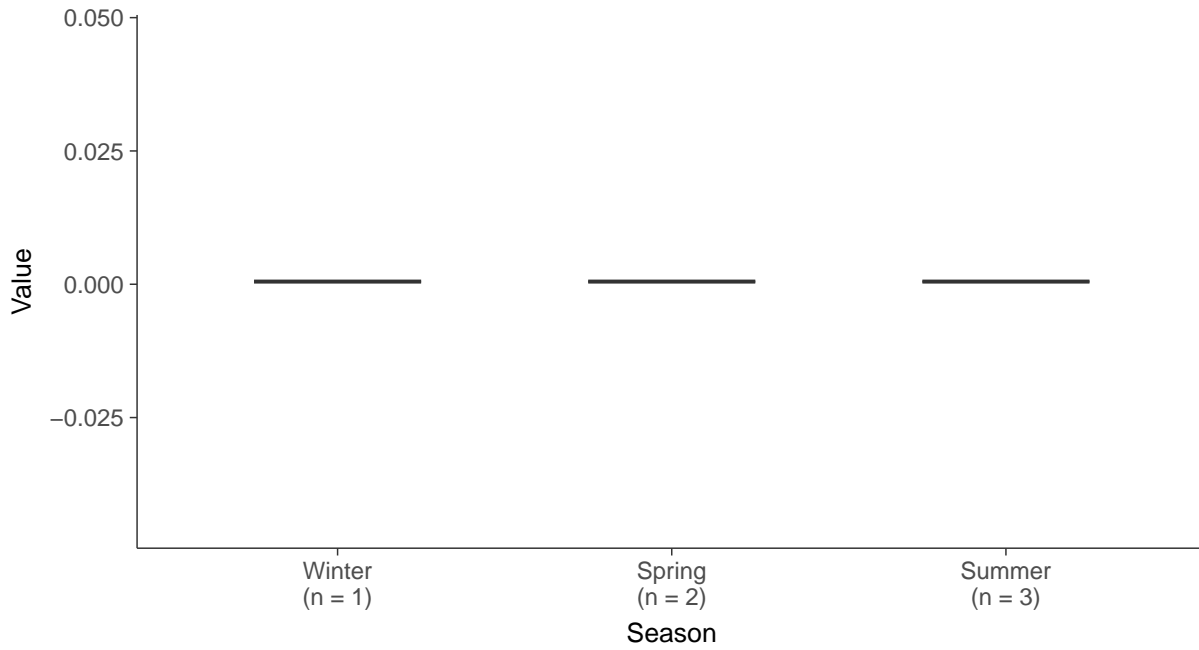
### Boxplot

Silver, MW-13 (mg/L)



### Boxplot by Season

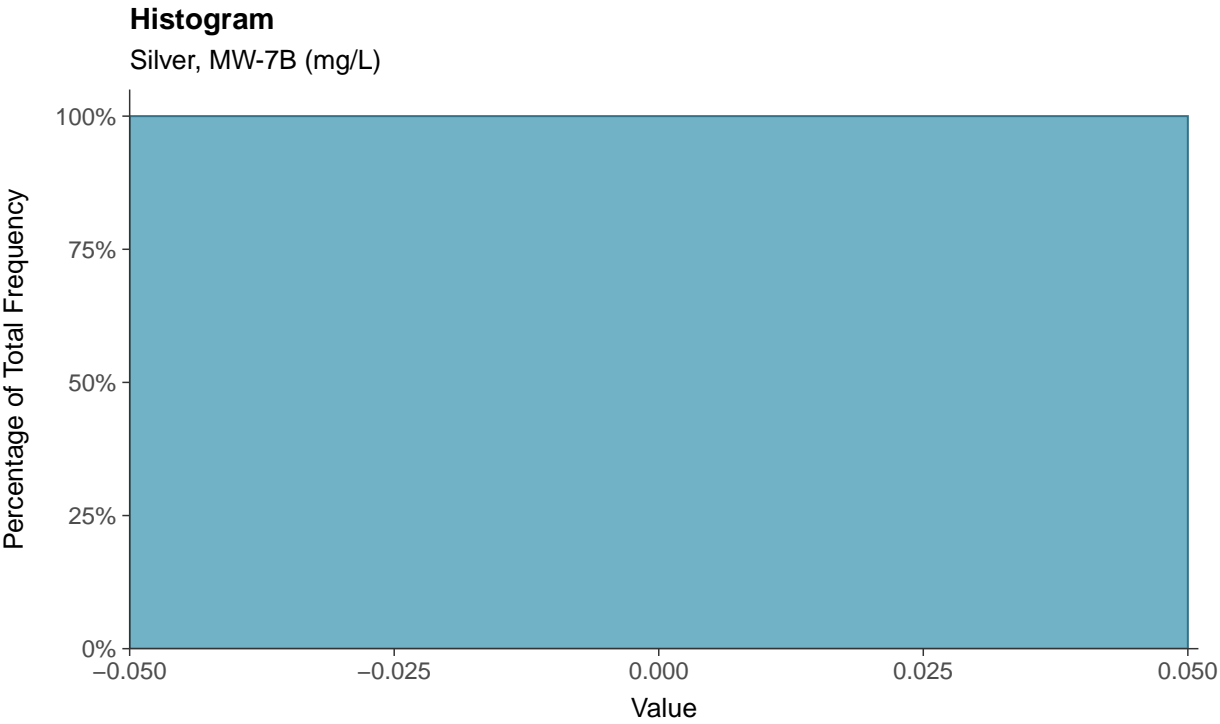
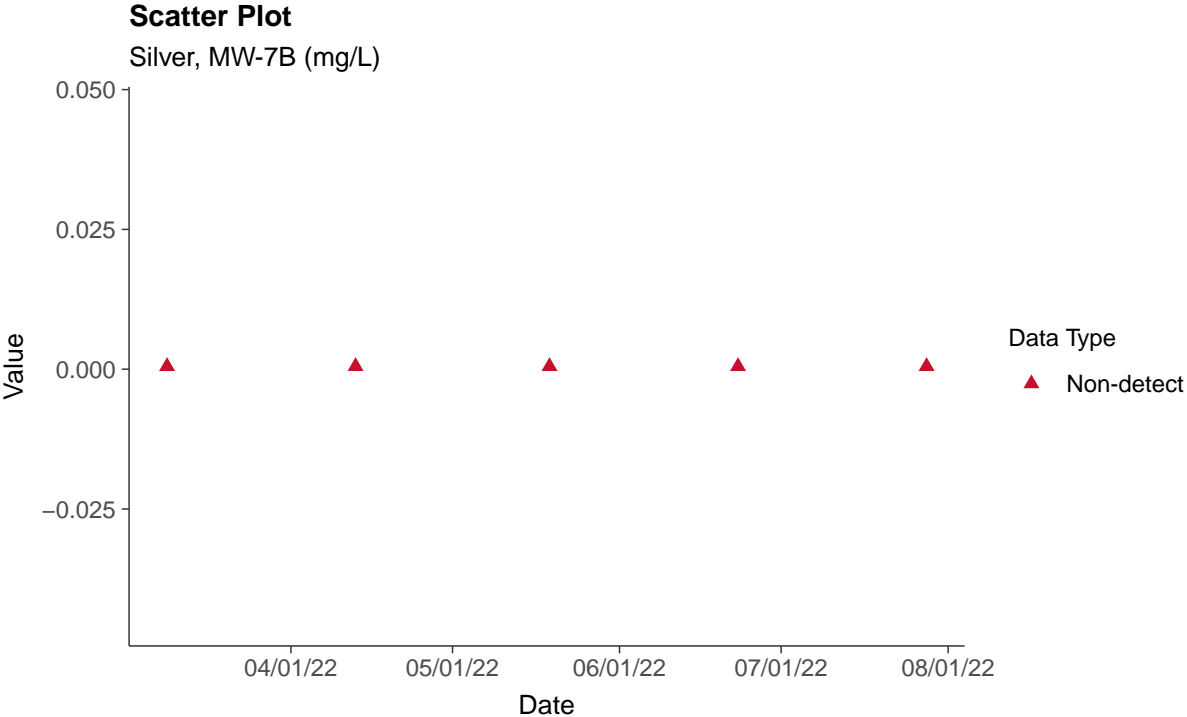
Silver, MW-13 (mg/L)

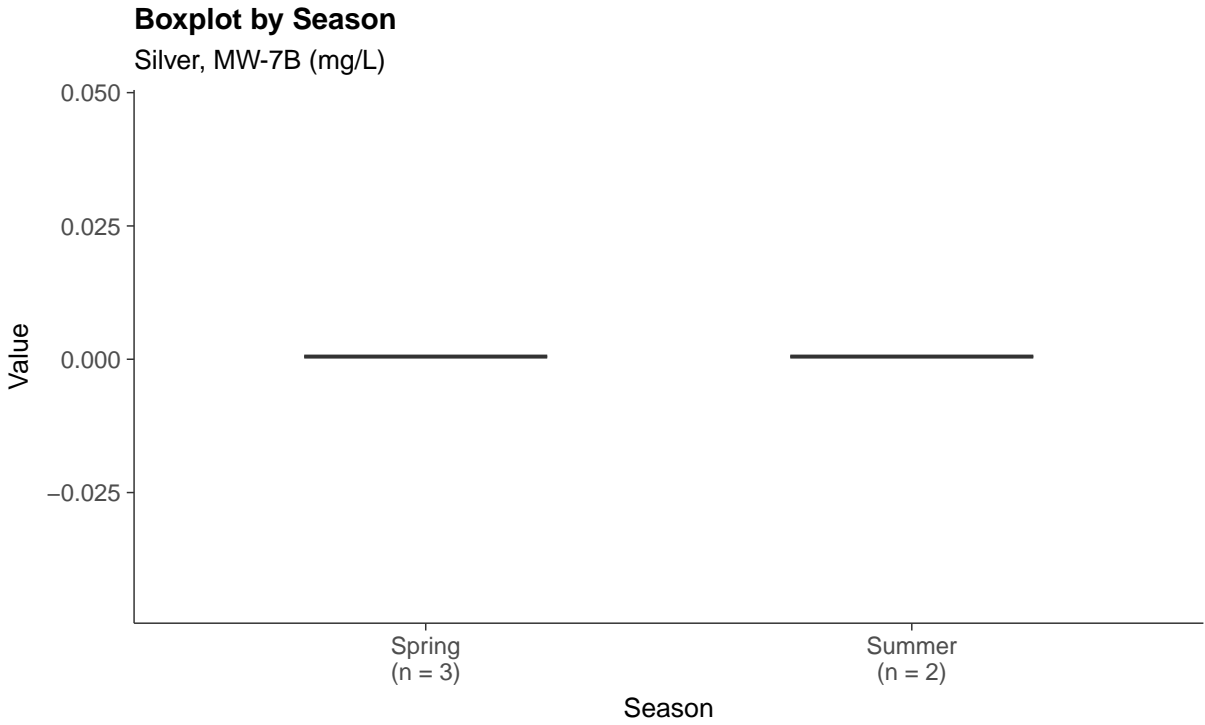
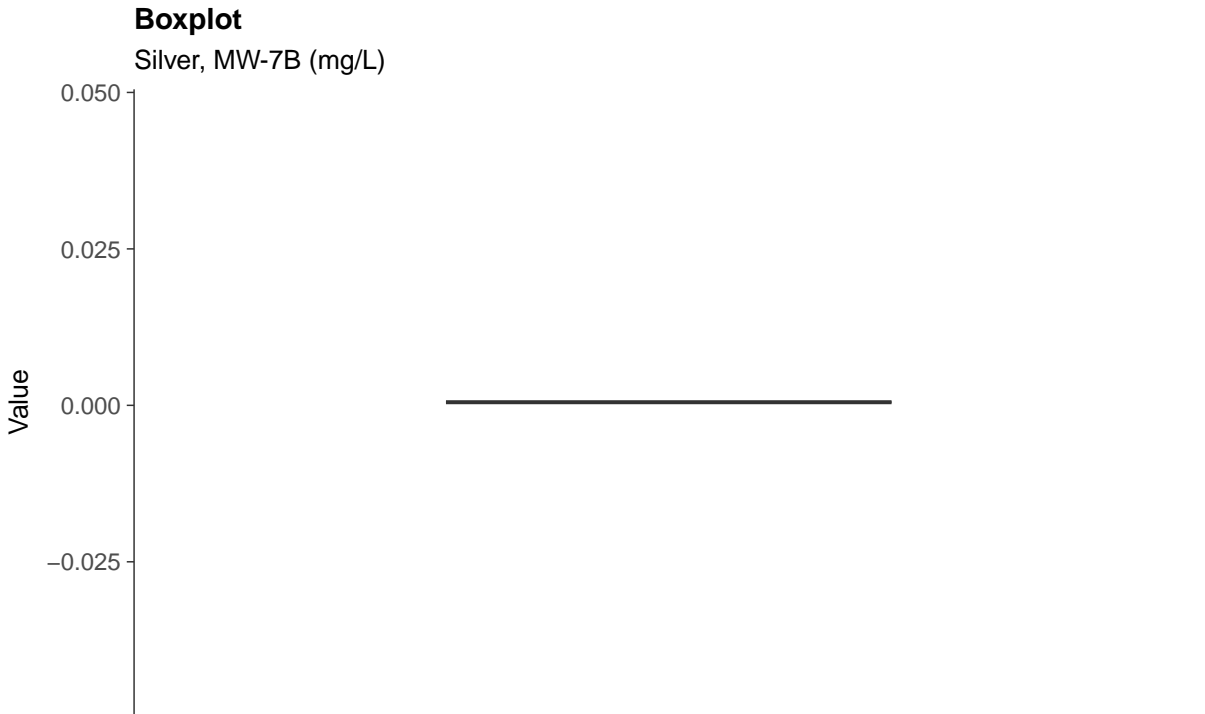




**Part 115: Silver, MW-7B**

ID: 5\_39\_7B

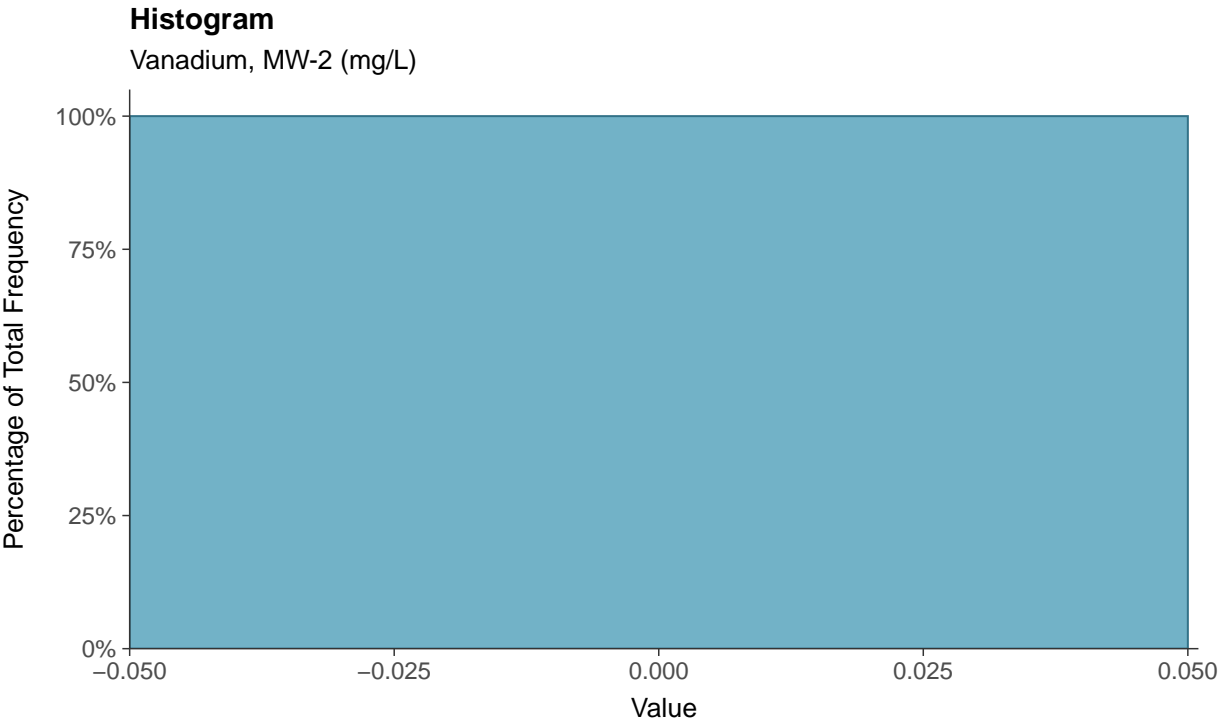
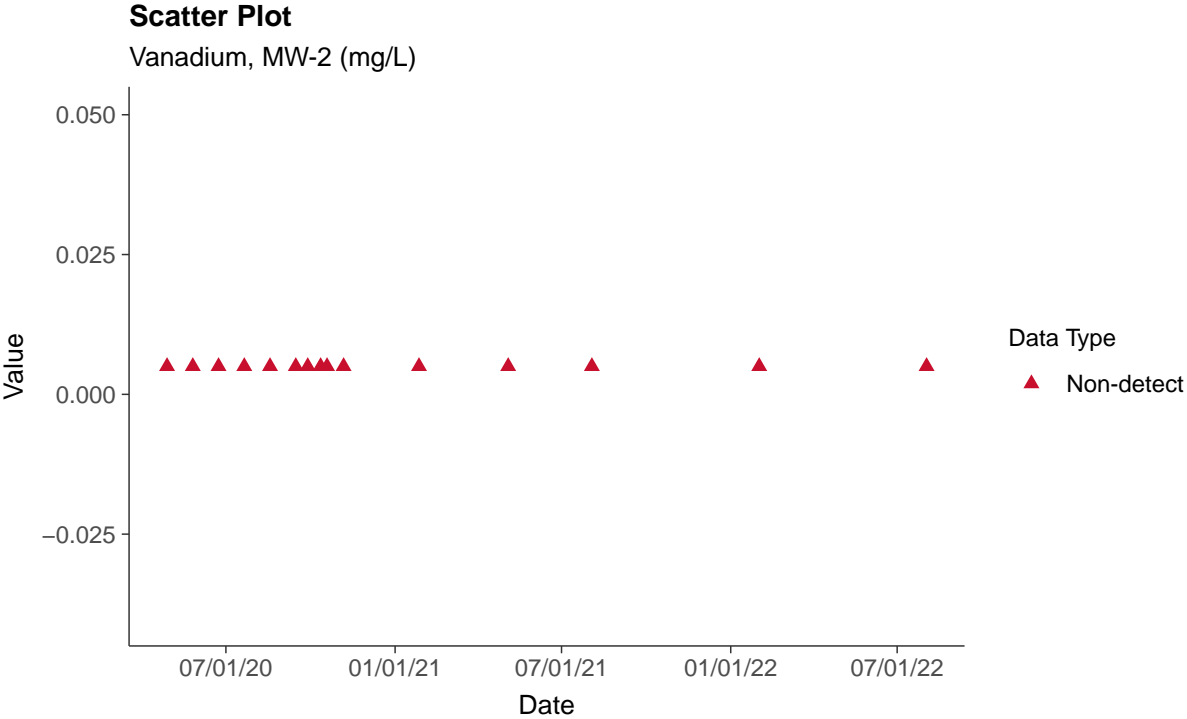






**Part 115: Vanadium, MW-2**

ID: 5\_40\_02

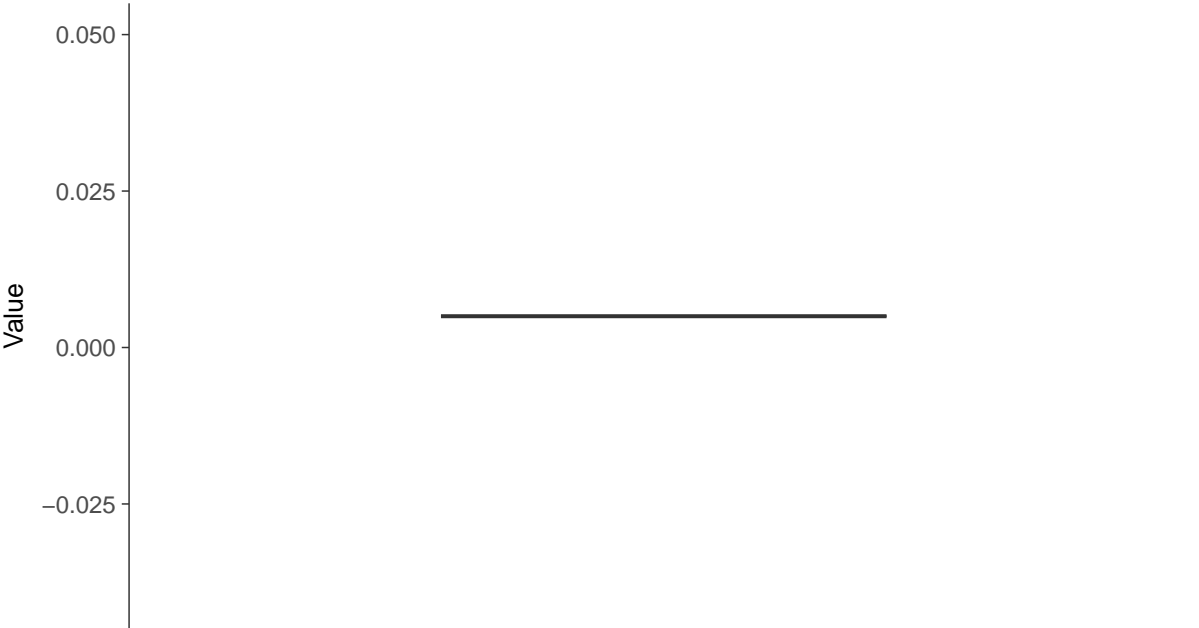






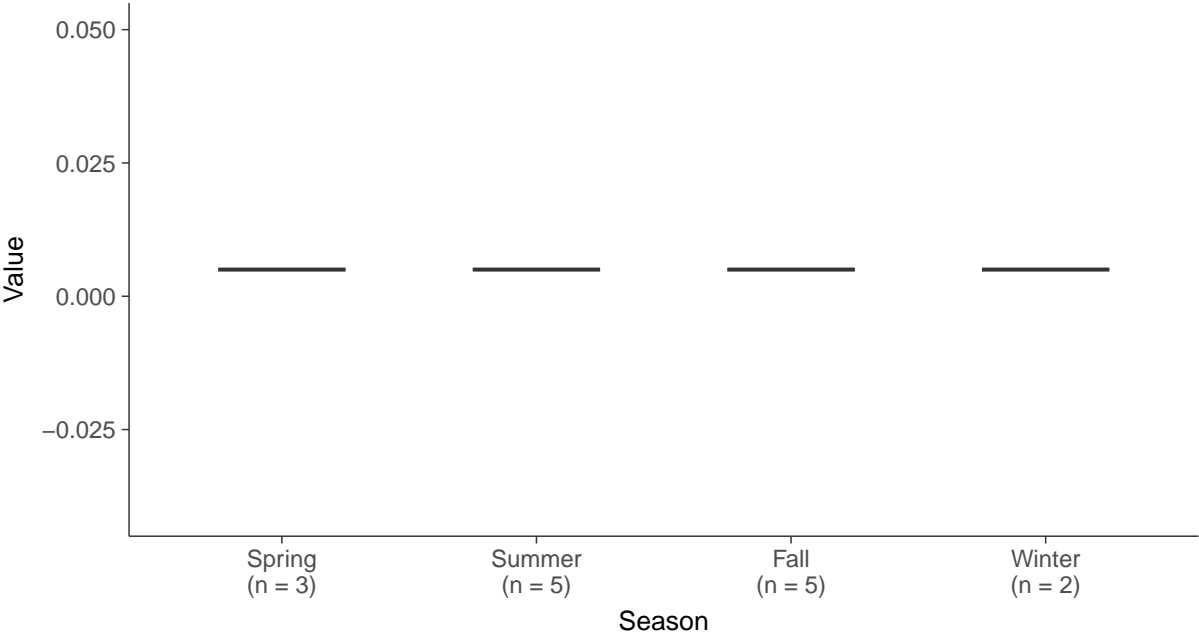
**Boxplot**

Vanadium, MW-2 (mg/L)



**Boxplot by Season**

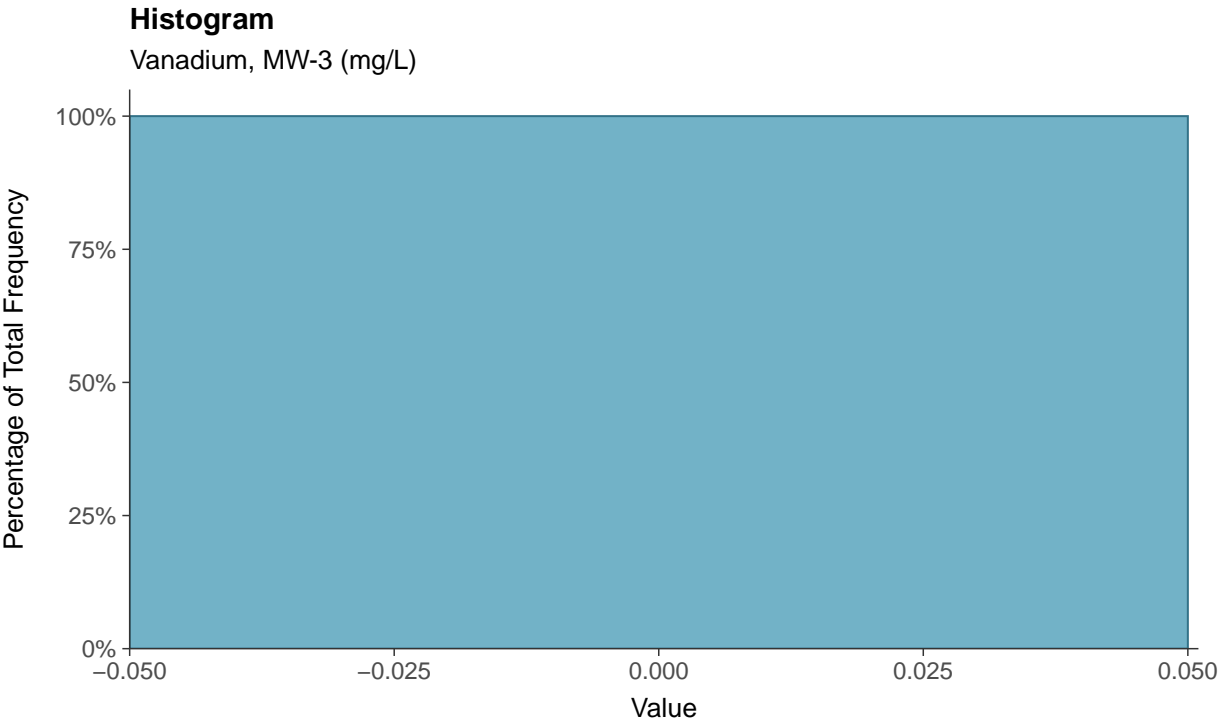
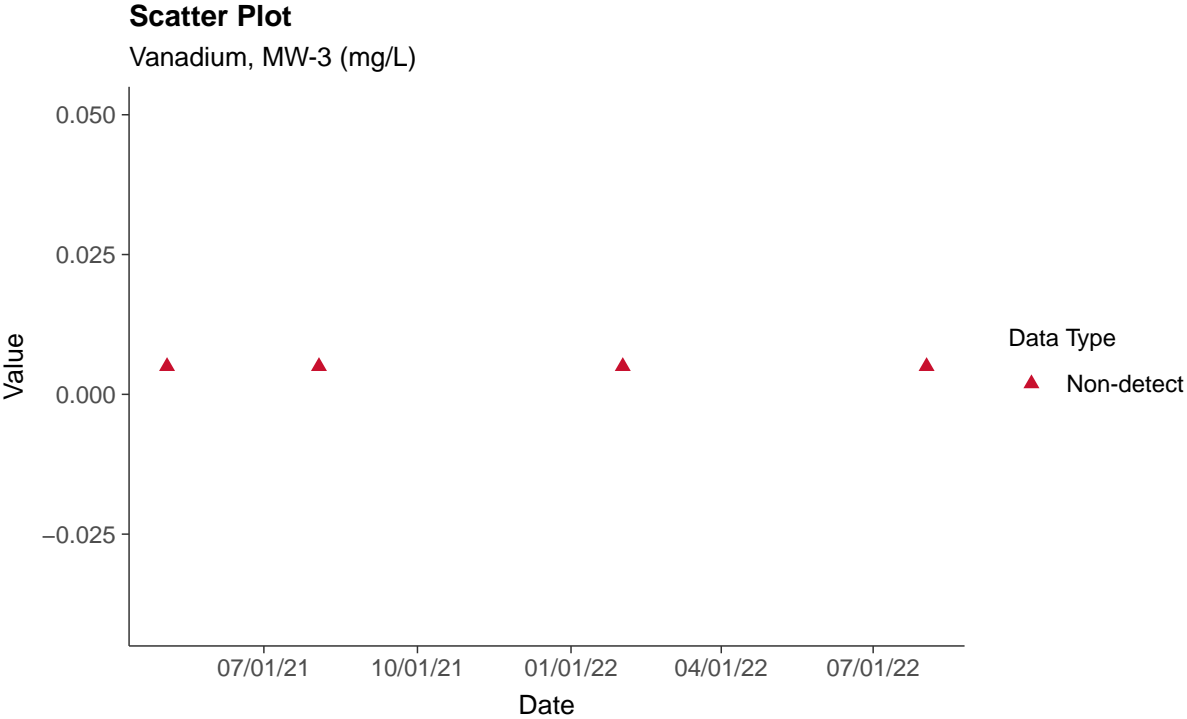
Vanadium, MW-2 (mg/L)





**Part 115: Vanadium, MW-3**

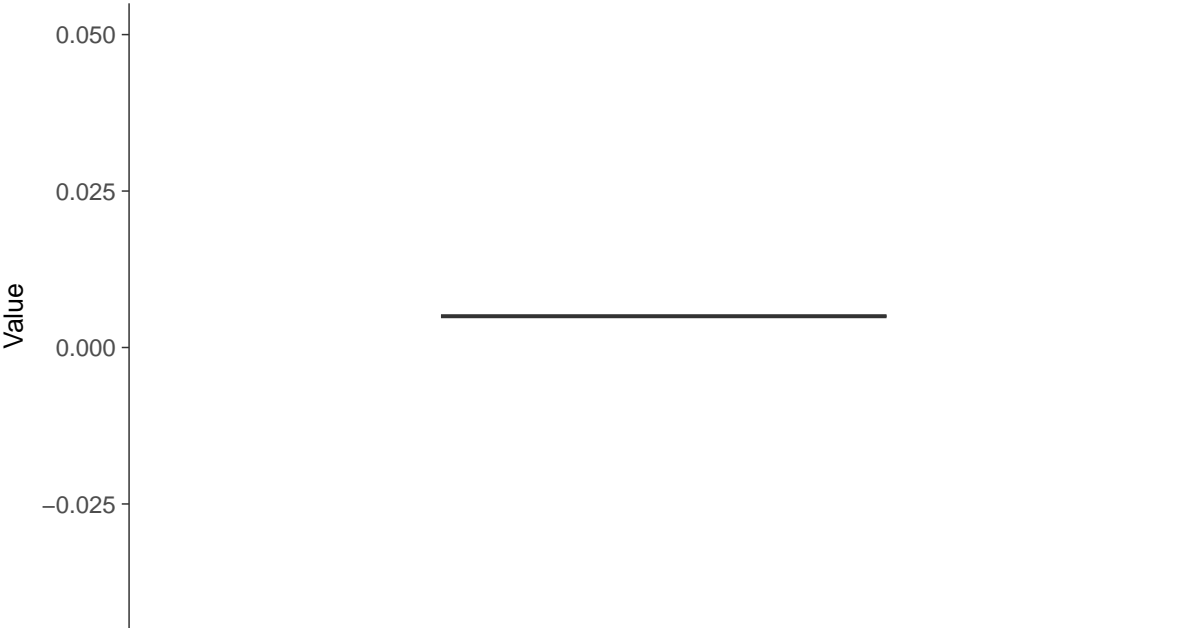
ID: 5\_40\_03





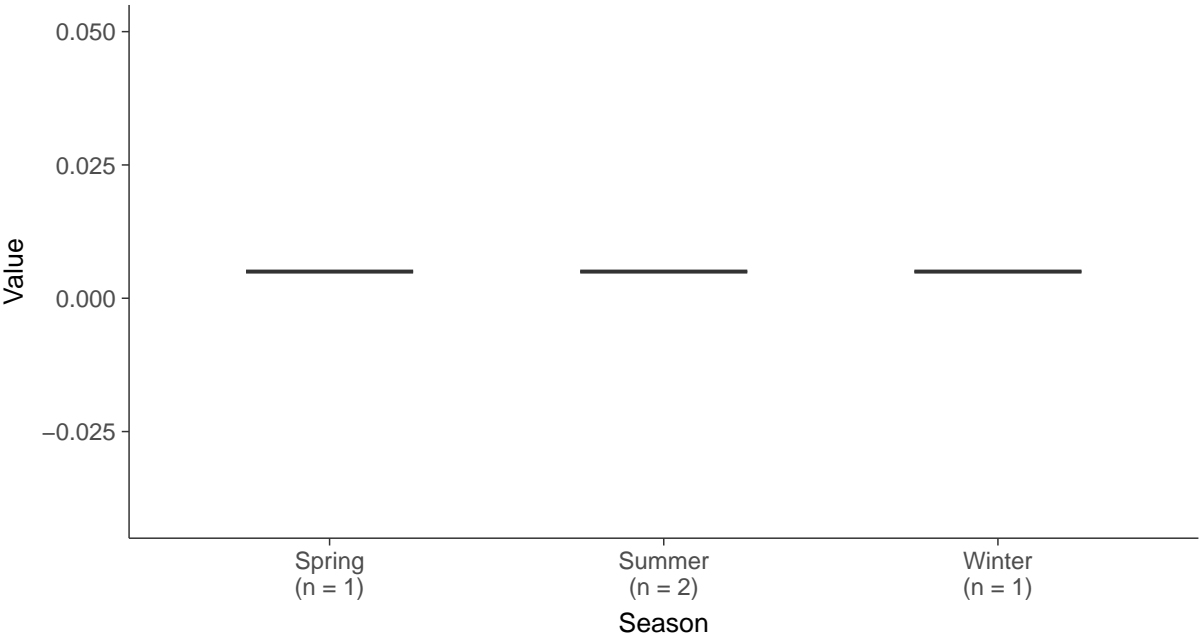
**Boxplot**

Vanadium, MW-3 (mg/L)



**Boxplot by Season**

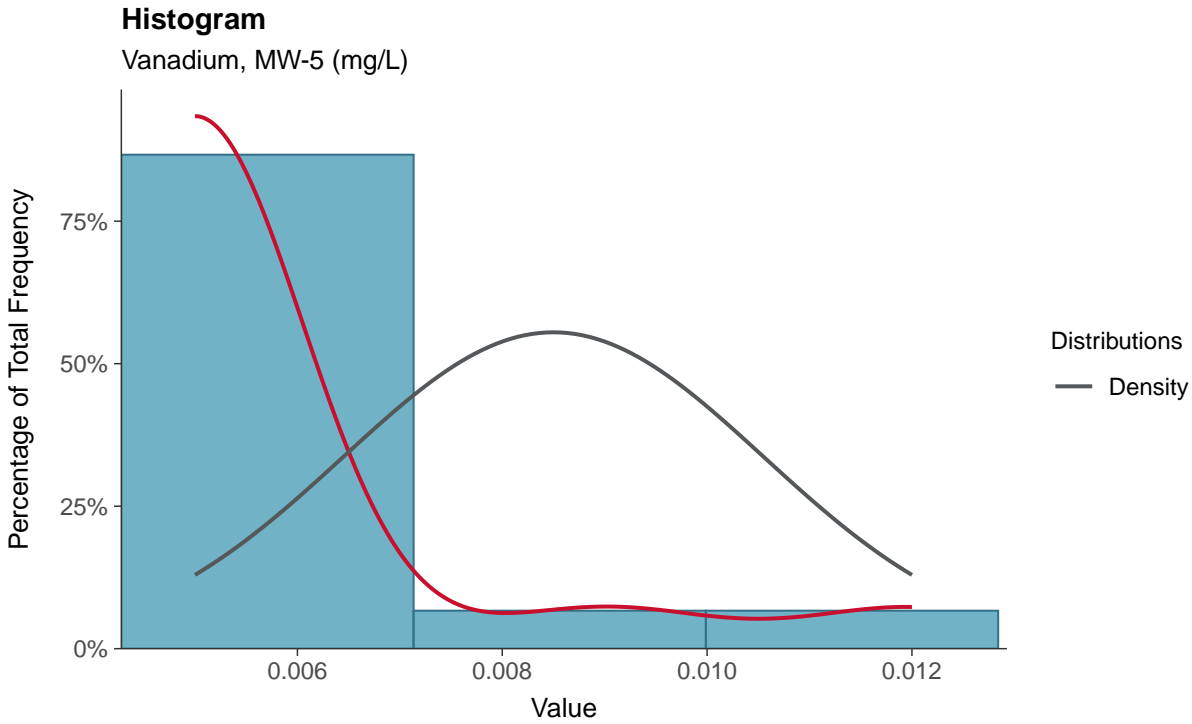
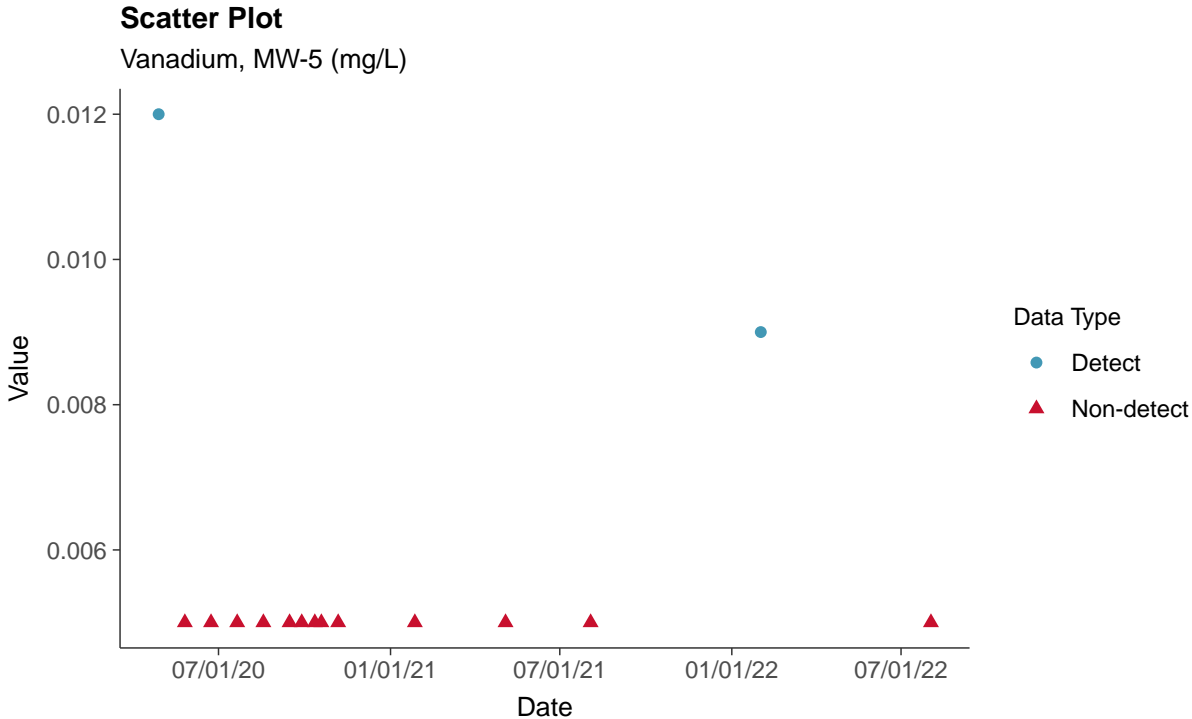
Vanadium, MW-3 (mg/L)





### Part 115: Vanadium, MW-5

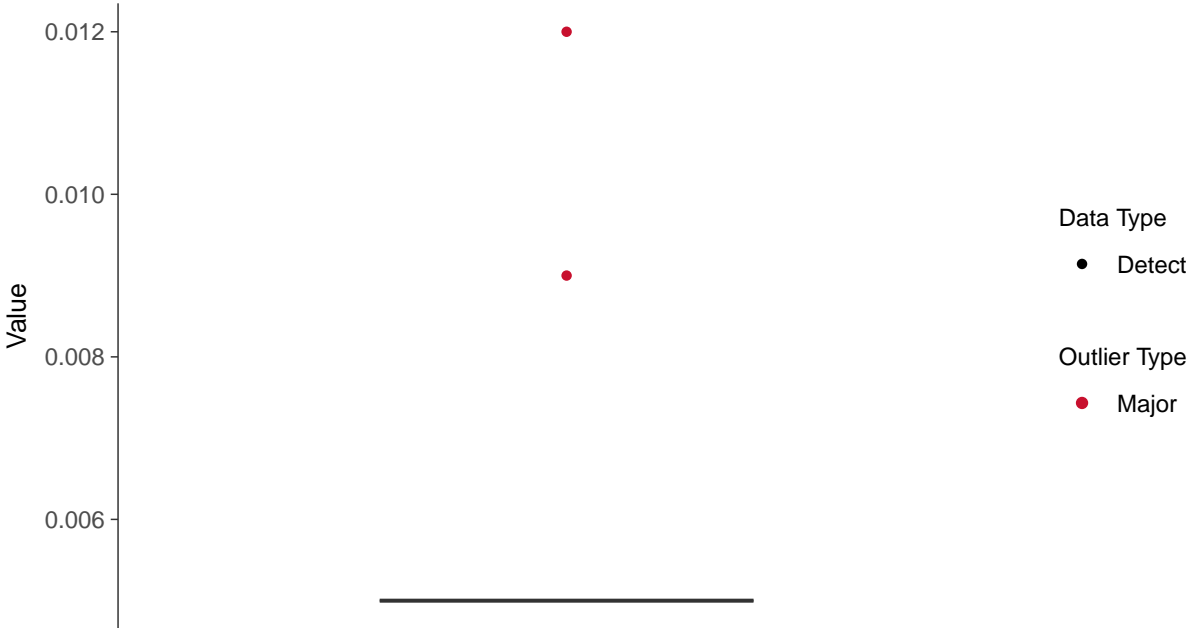
ID: 5\_40\_05





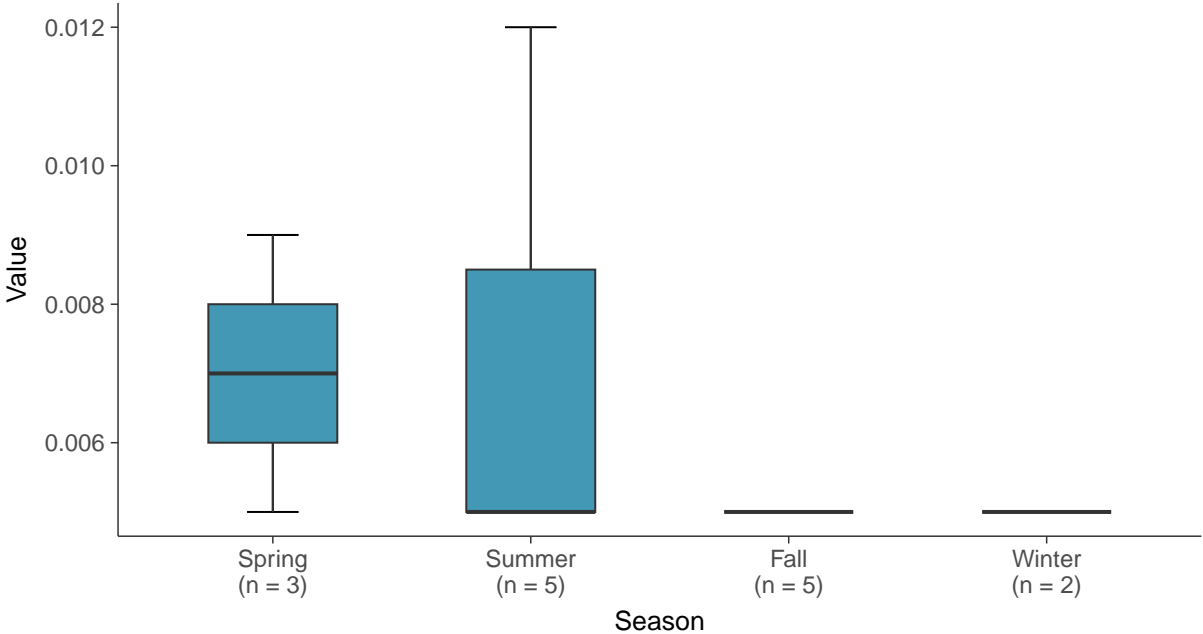
**Boxplot**

Vanadium, MW-5 (mg/L)



**Boxplot by Season**

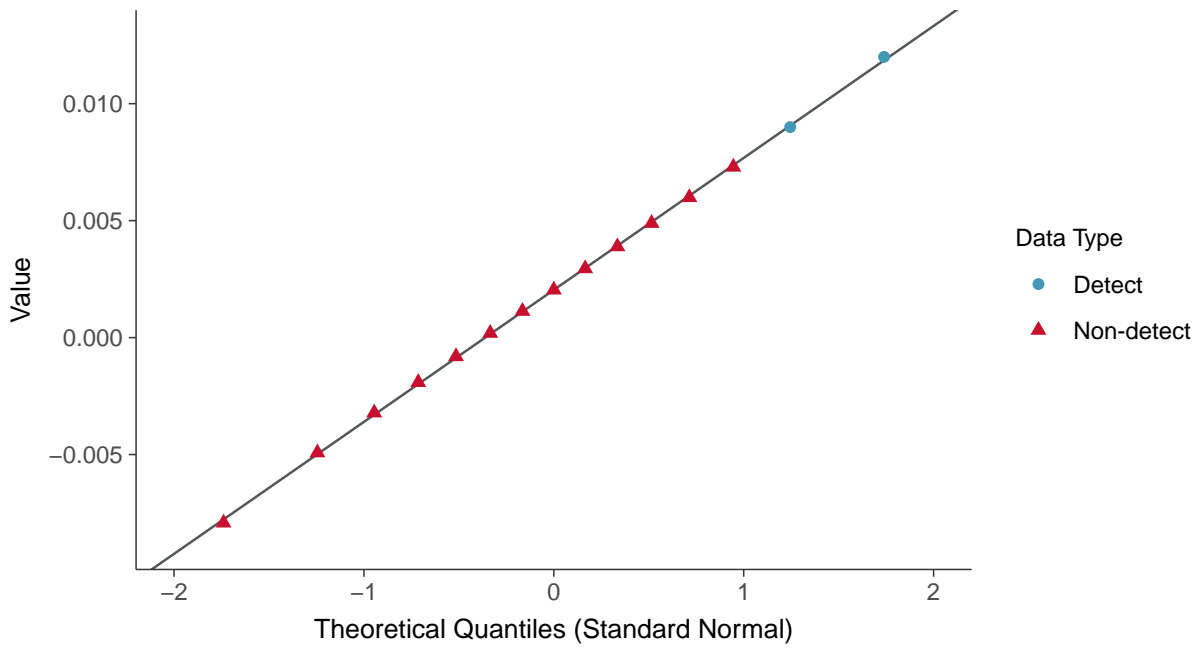
Vanadium, MW-5 (mg/L)





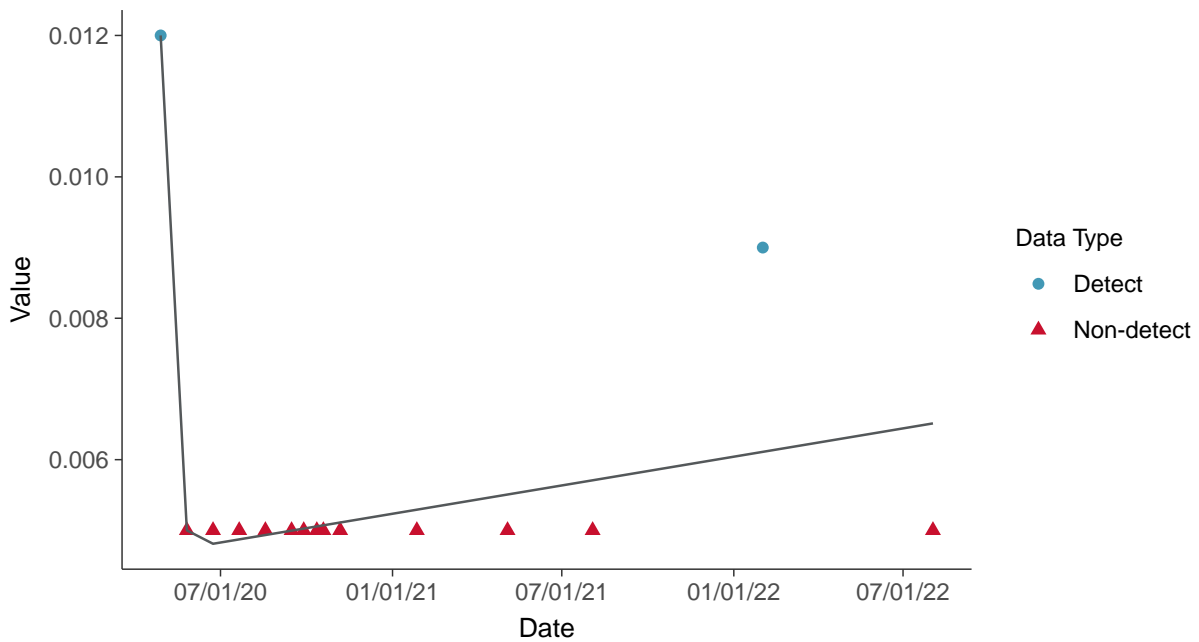
### Normal Q-Q plot using ROS Imputed Estimates

Vanadium, MW-5 (mg/L)



### Trend Regression: Piecewise Linear-Linear

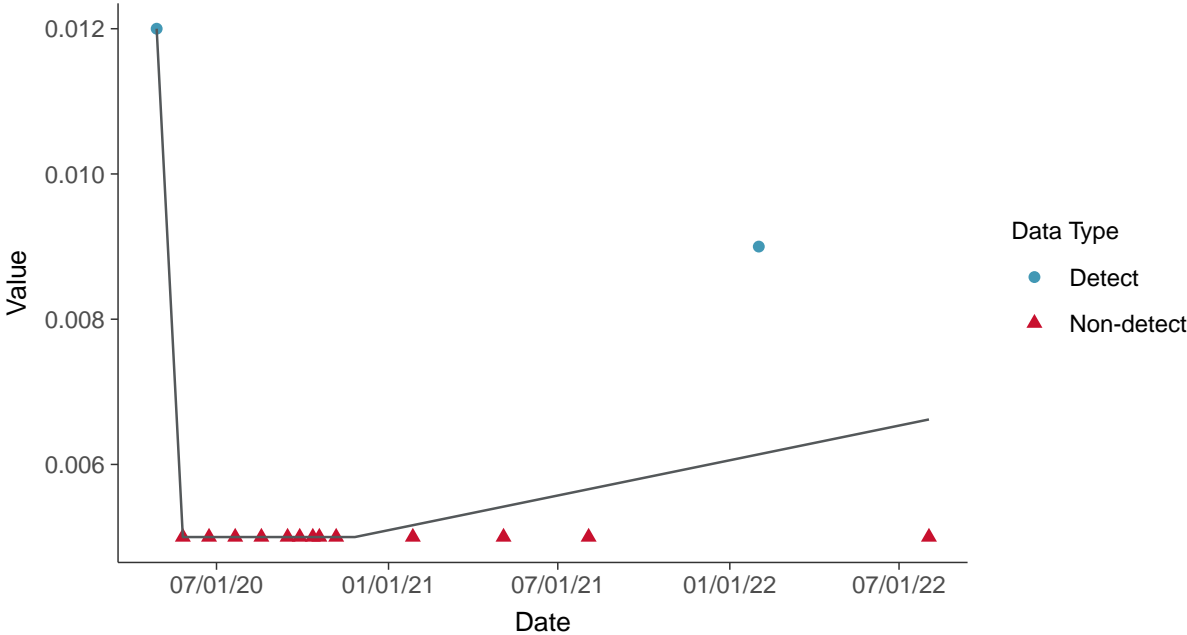
Vanadium, MW-5 (mg/L)





### Trend Regression: Piecewise Linear-Linear-Linear

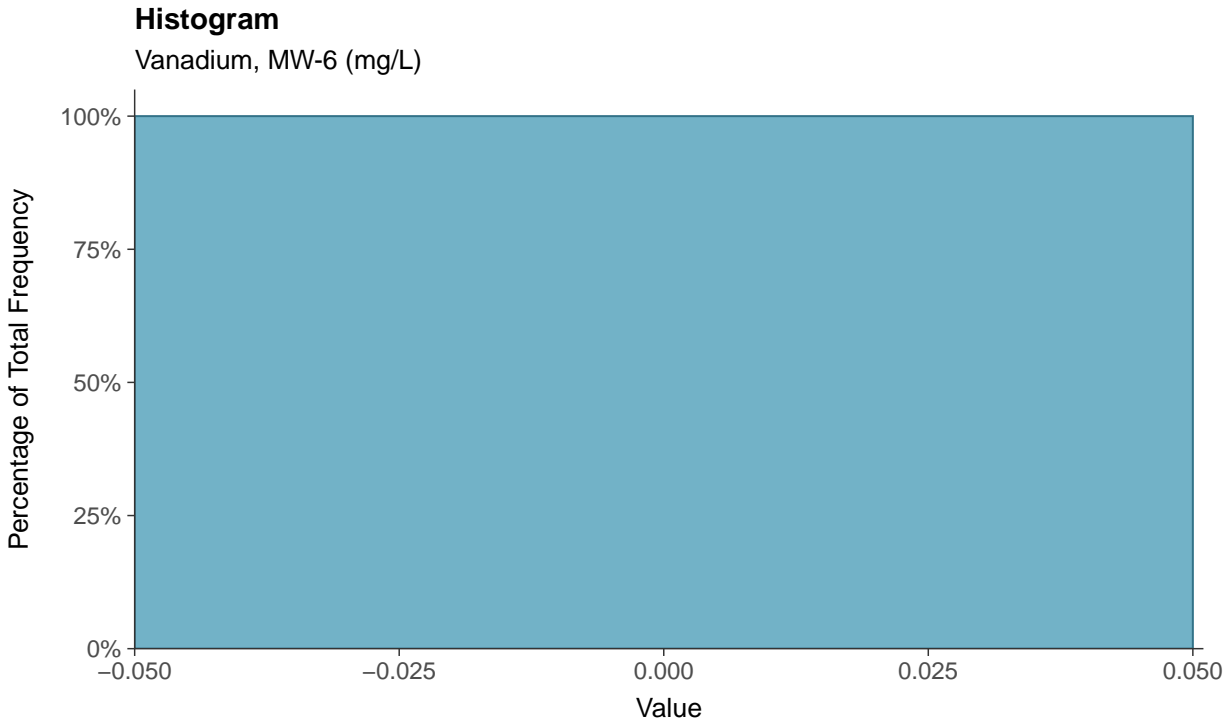
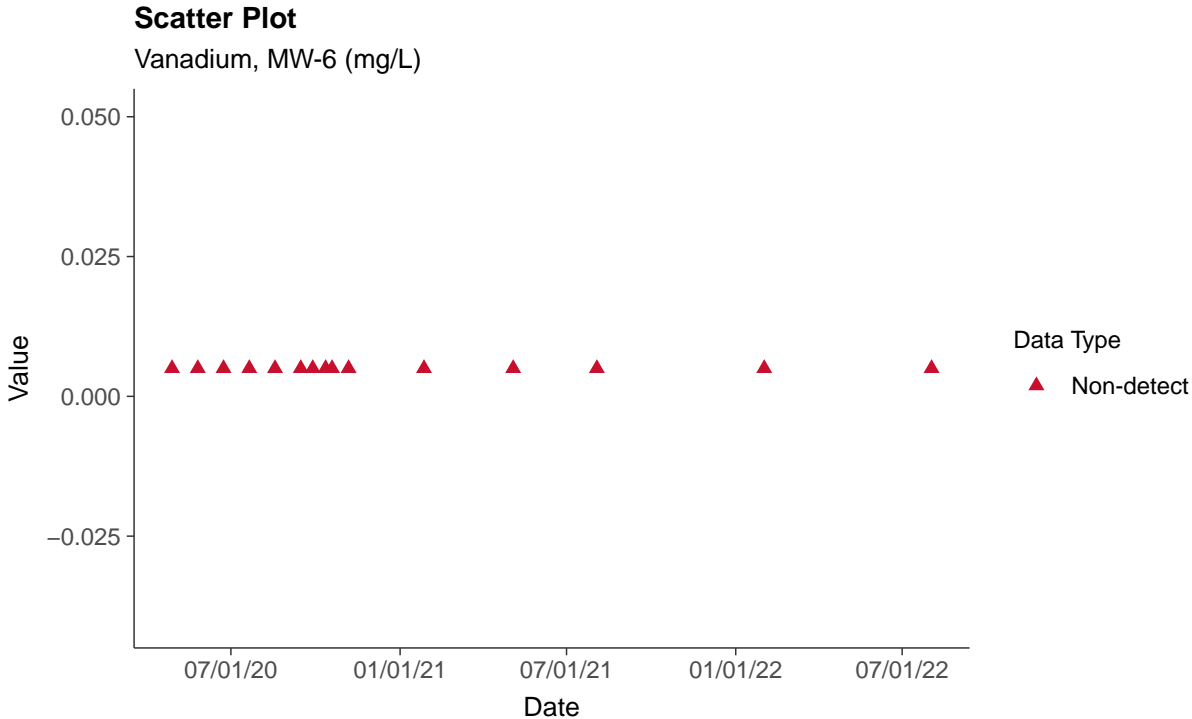
Vanadium, MW-5 (mg/L)





**Part 115: Vanadium, MW-6**

ID: 5\_40\_06

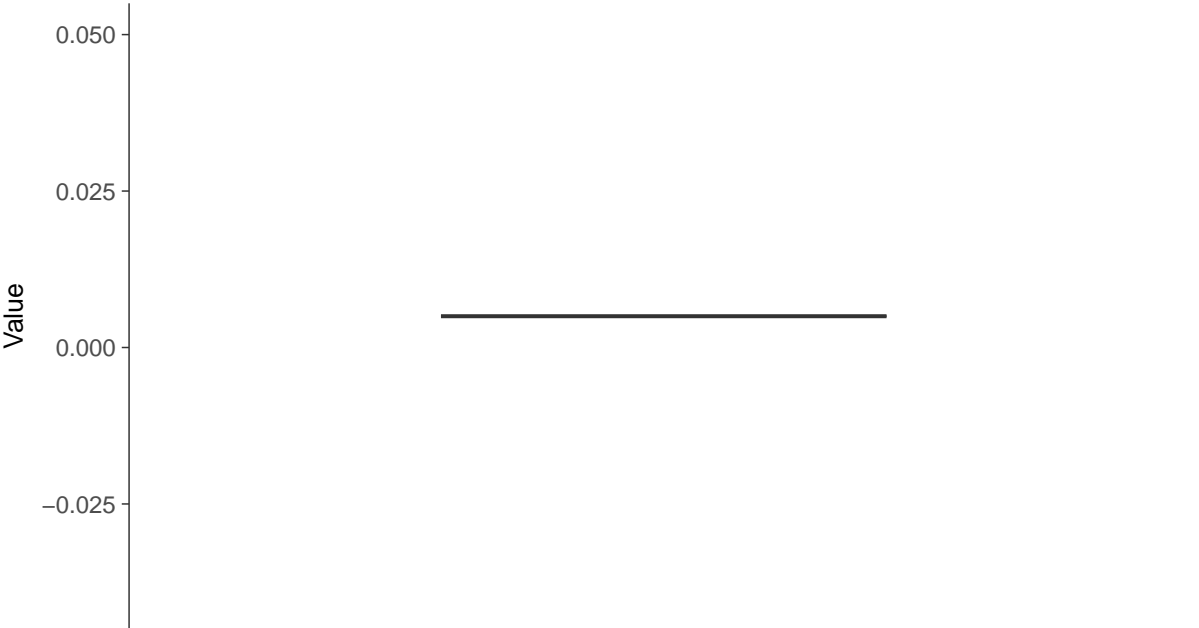






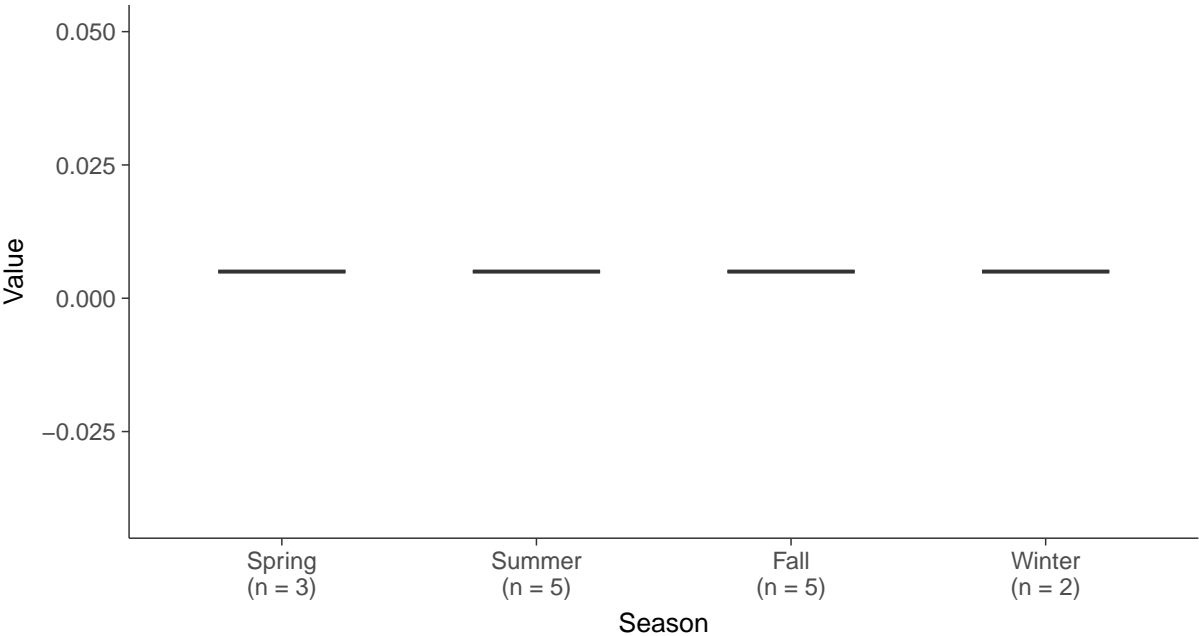
**Boxplot**

Vanadium, MW-6 (mg/L)



**Boxplot by Season**

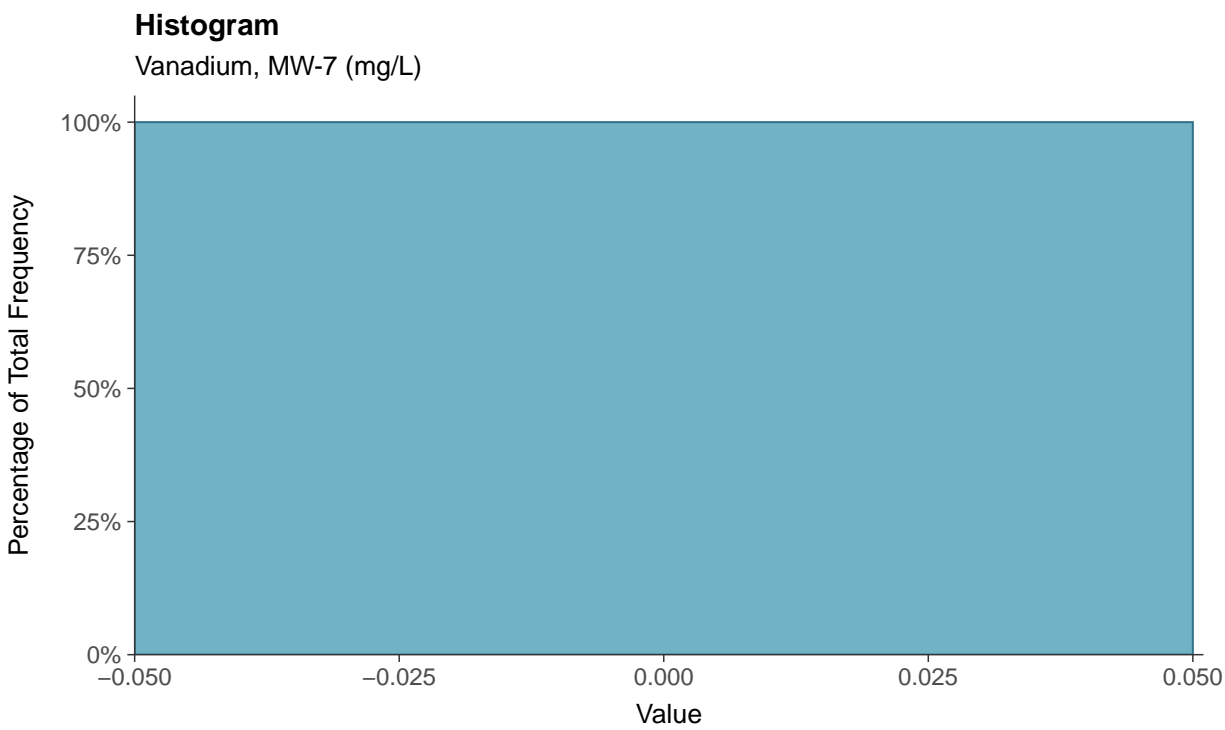
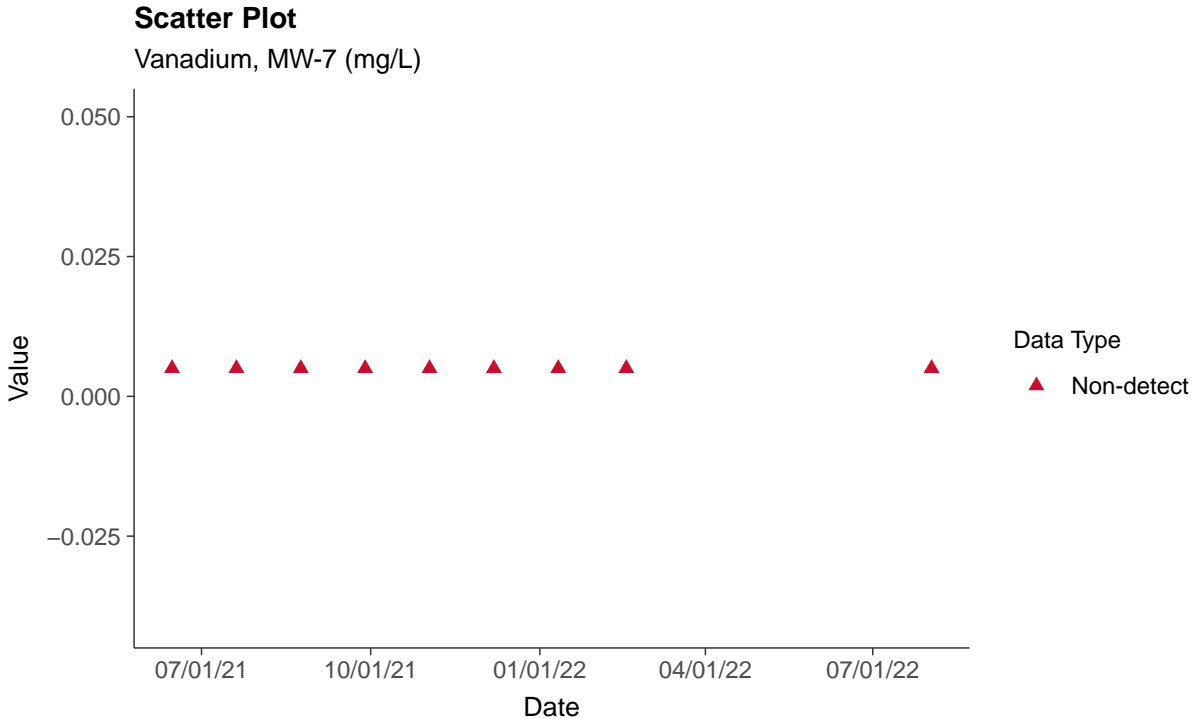
Vanadium, MW-6 (mg/L)





**Part 115: Vanadium, MW-7**

ID: 5\_40\_07





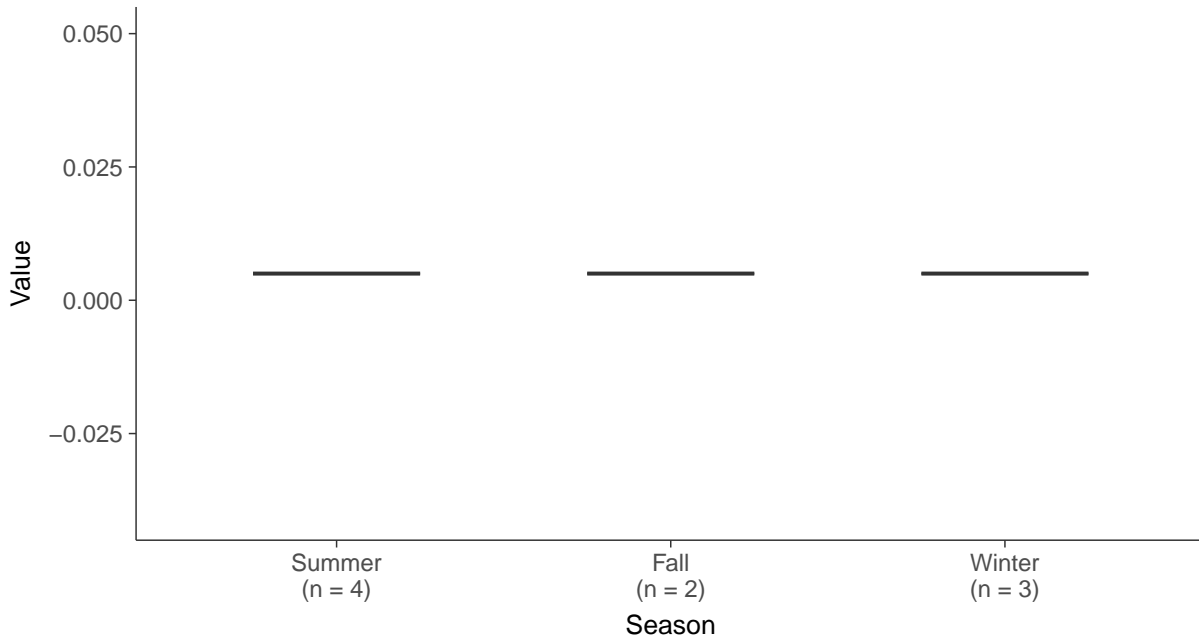
### Boxplot

Vanadium, MW-7 (mg/L)



### Boxplot by Season

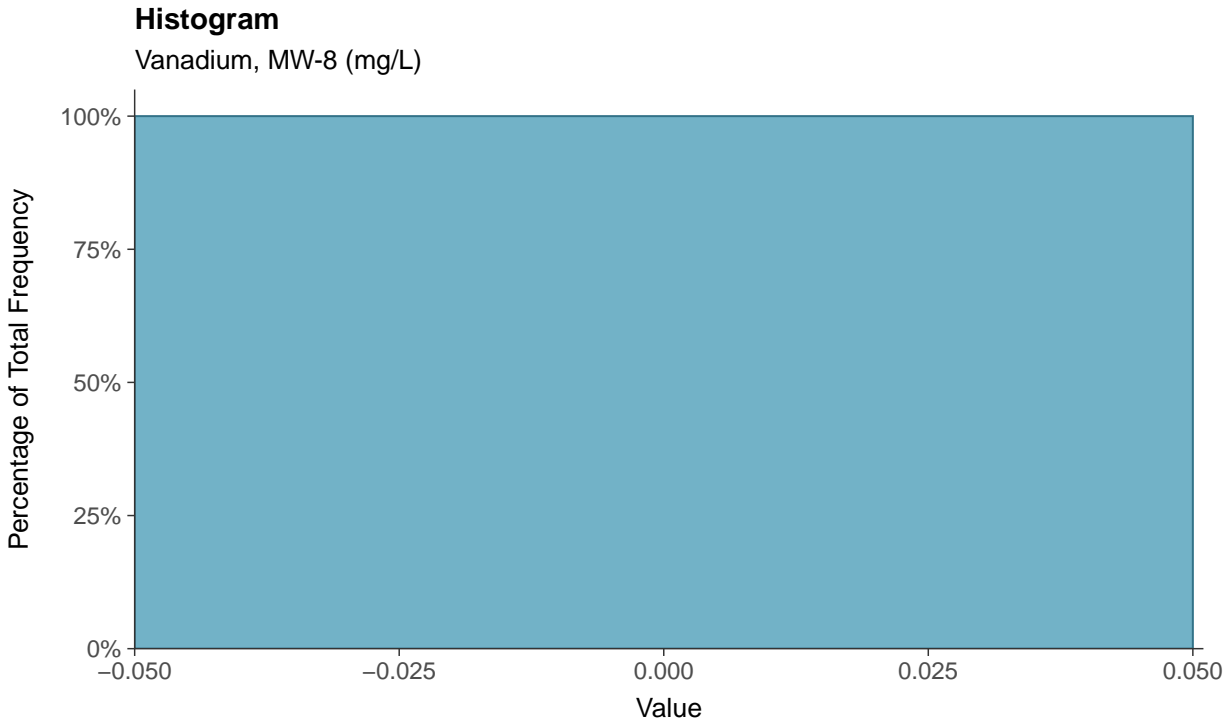
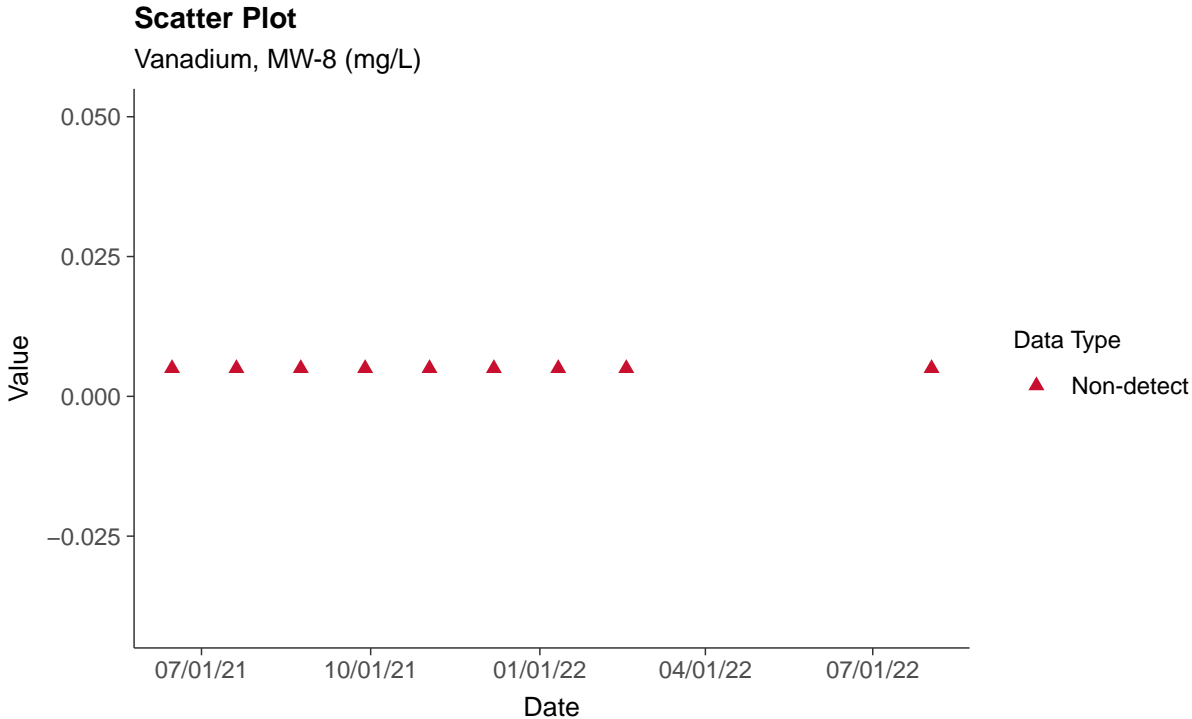
Vanadium, MW-7 (mg/L)





**Part 115: Vanadium, MW-8**

ID: 5\_40\_08





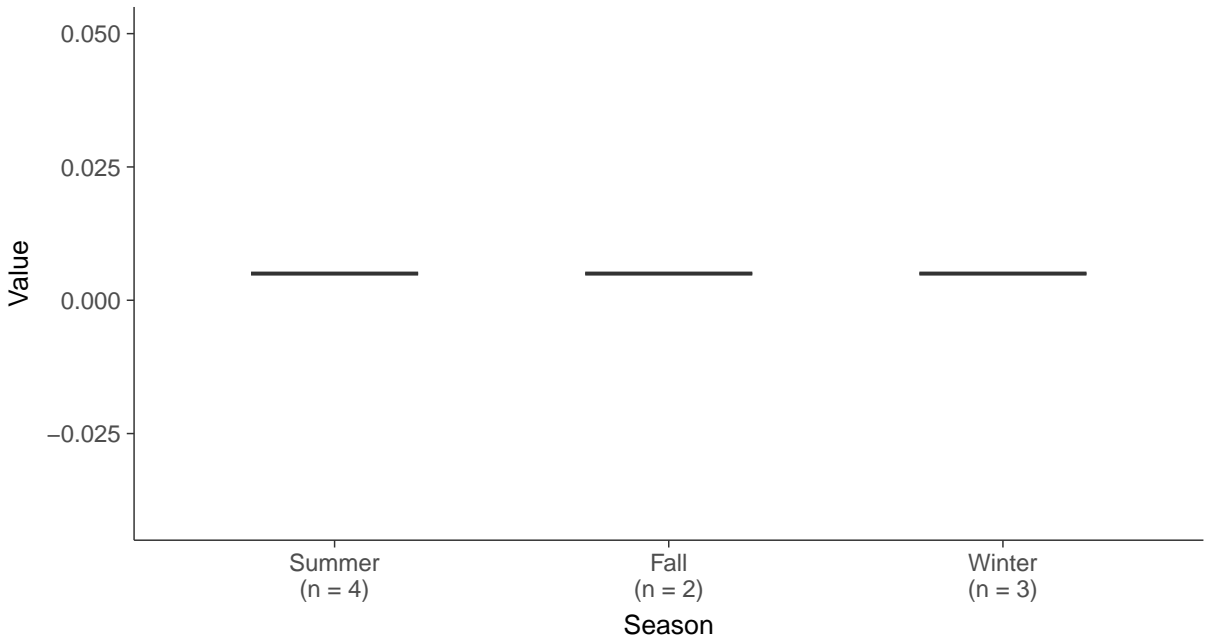
**Boxplot**

Vanadium, MW-8 (mg/L)



**Boxplot by Season**

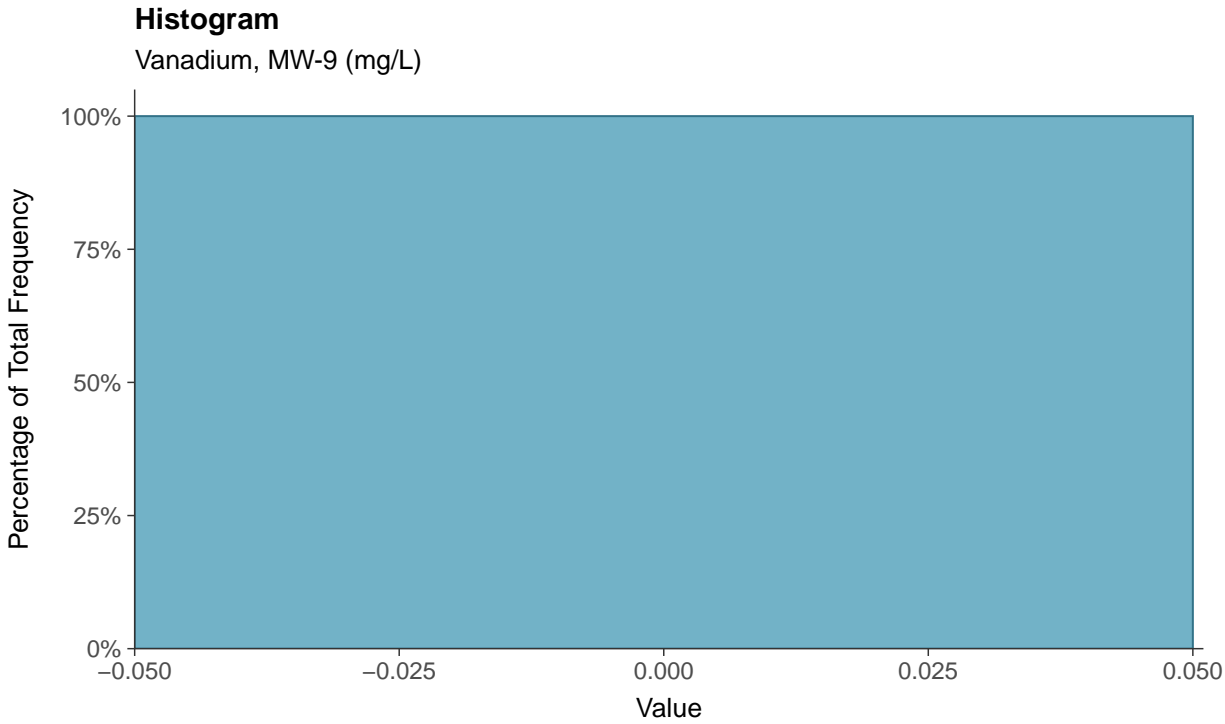
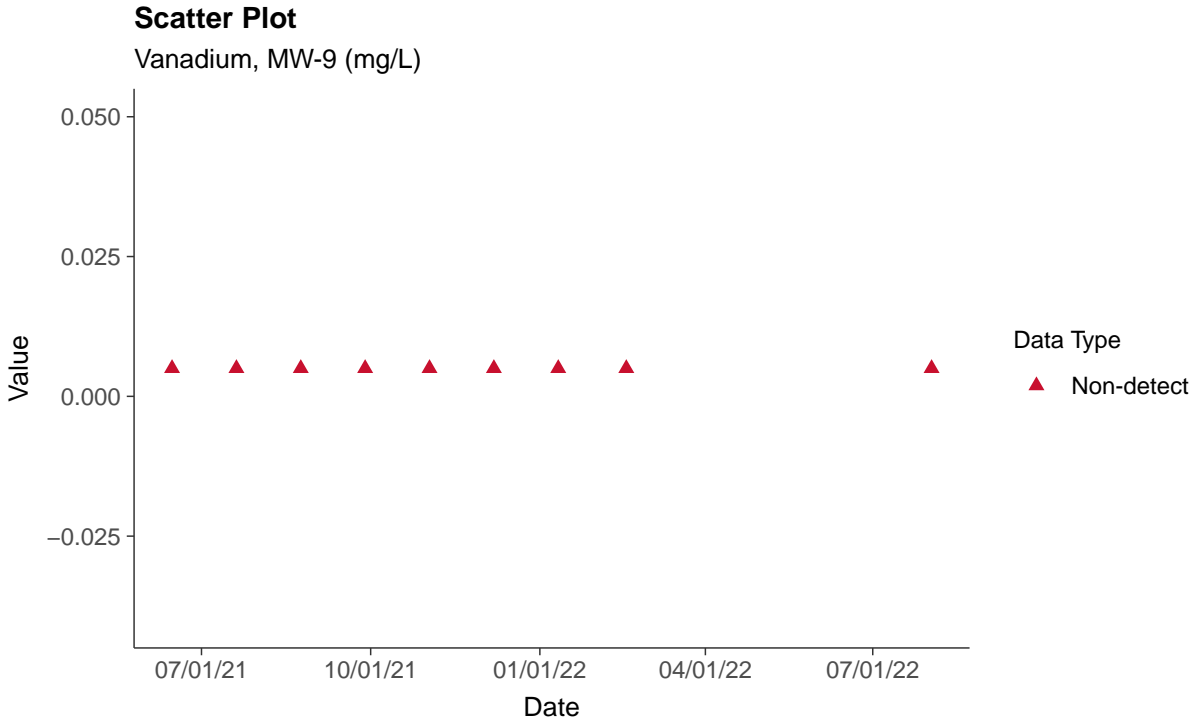
Vanadium, MW-8 (mg/L)





**Part 115: Vanadium, MW-9**

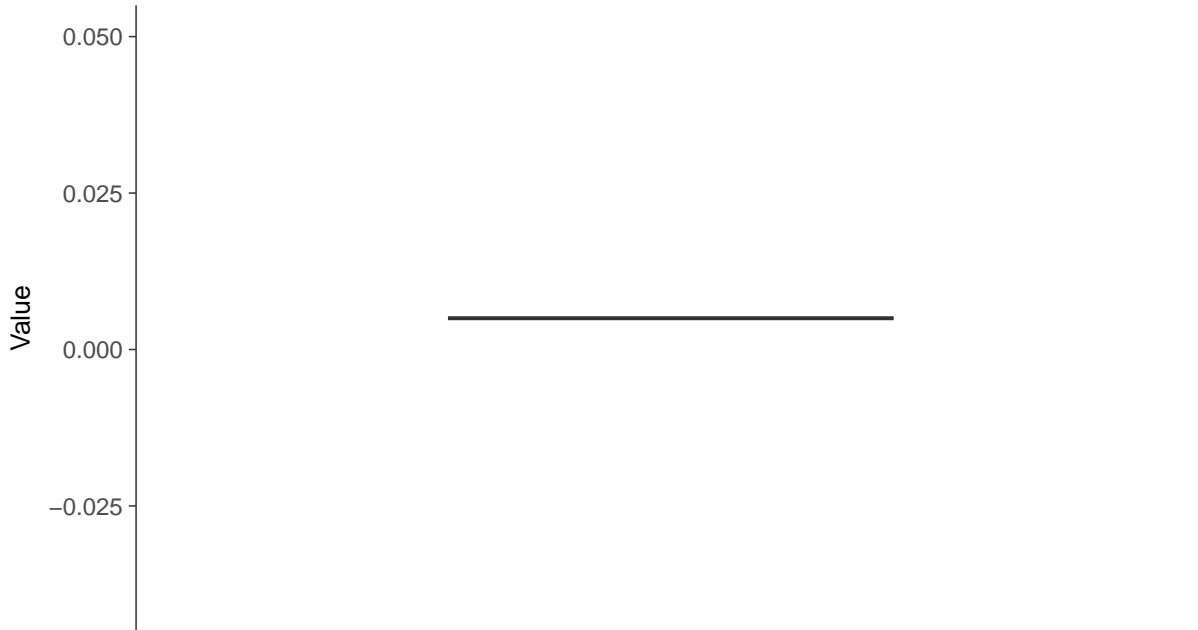
ID: 5\_40\_09





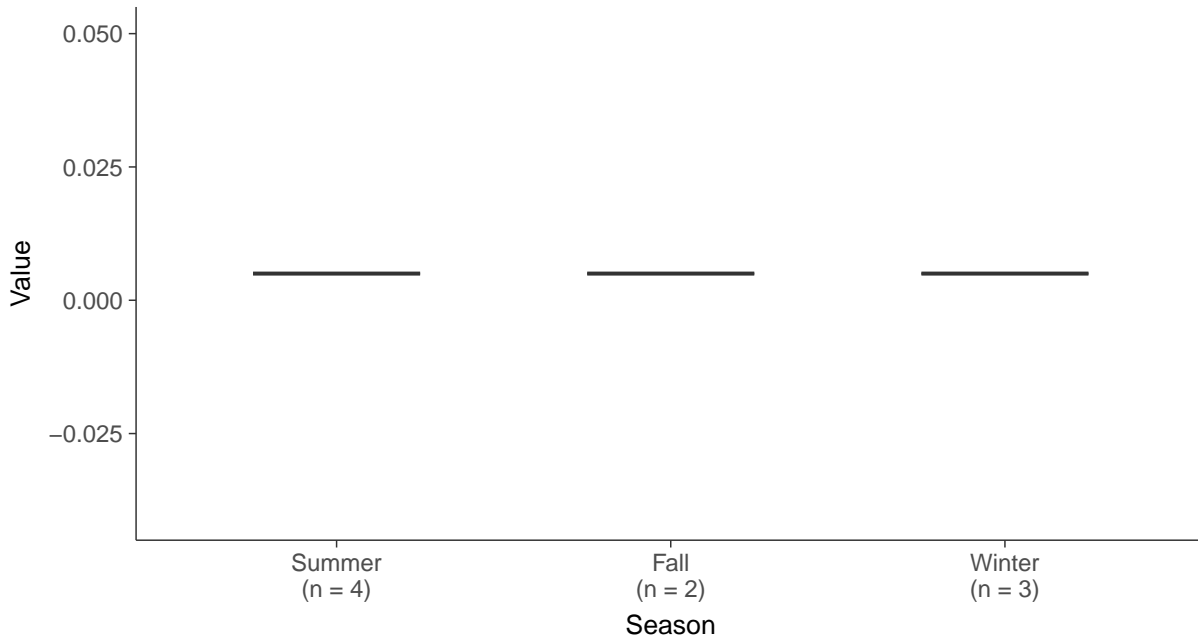
### Boxplot

Vanadium, MW-9 (mg/L)



### Boxplot by Season

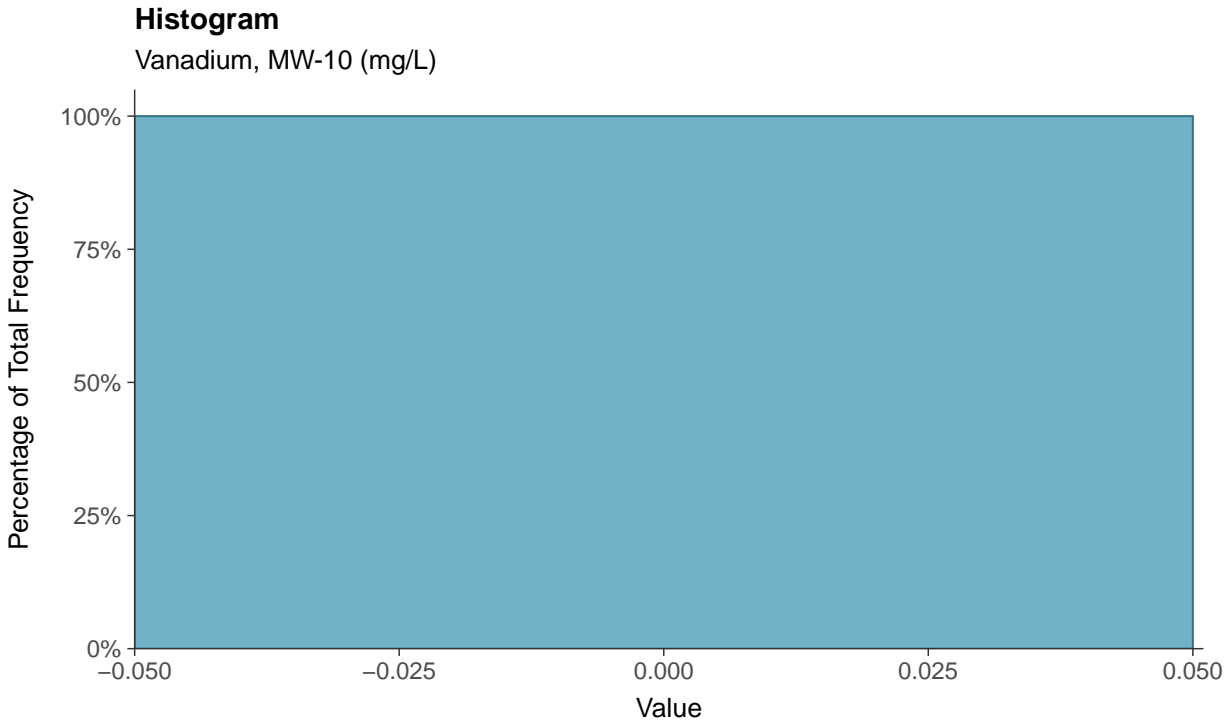
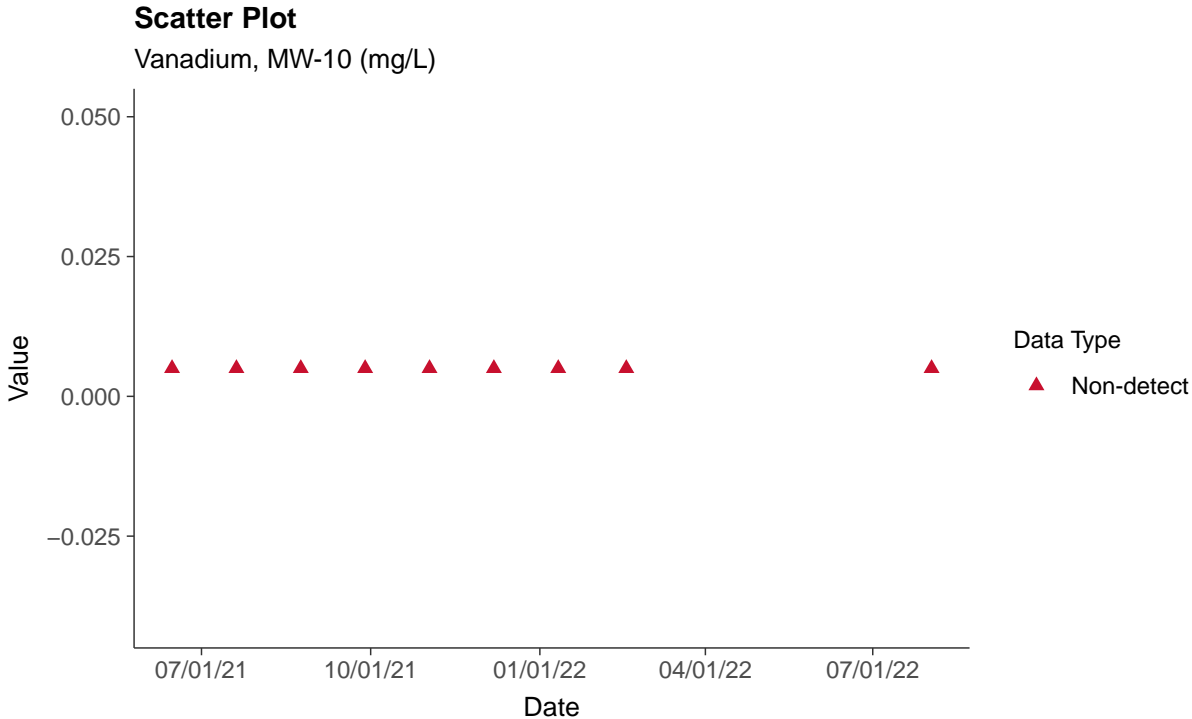
Vanadium, MW-9 (mg/L)





**Part 115: Vanadium, MW-10**

ID: 5\_40\_10

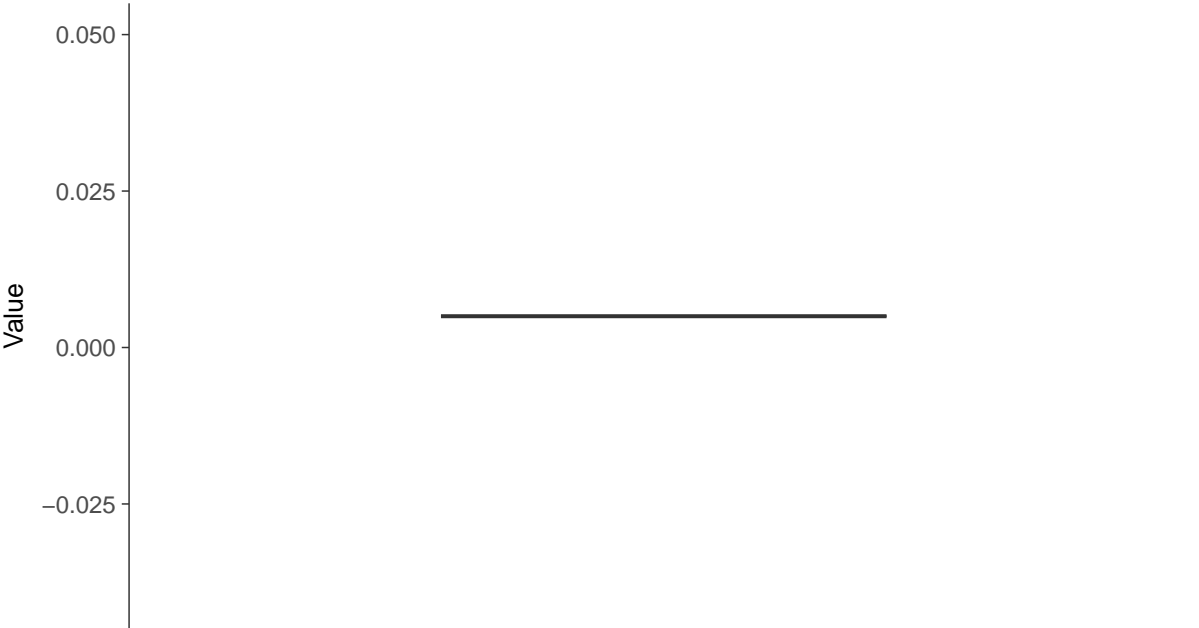






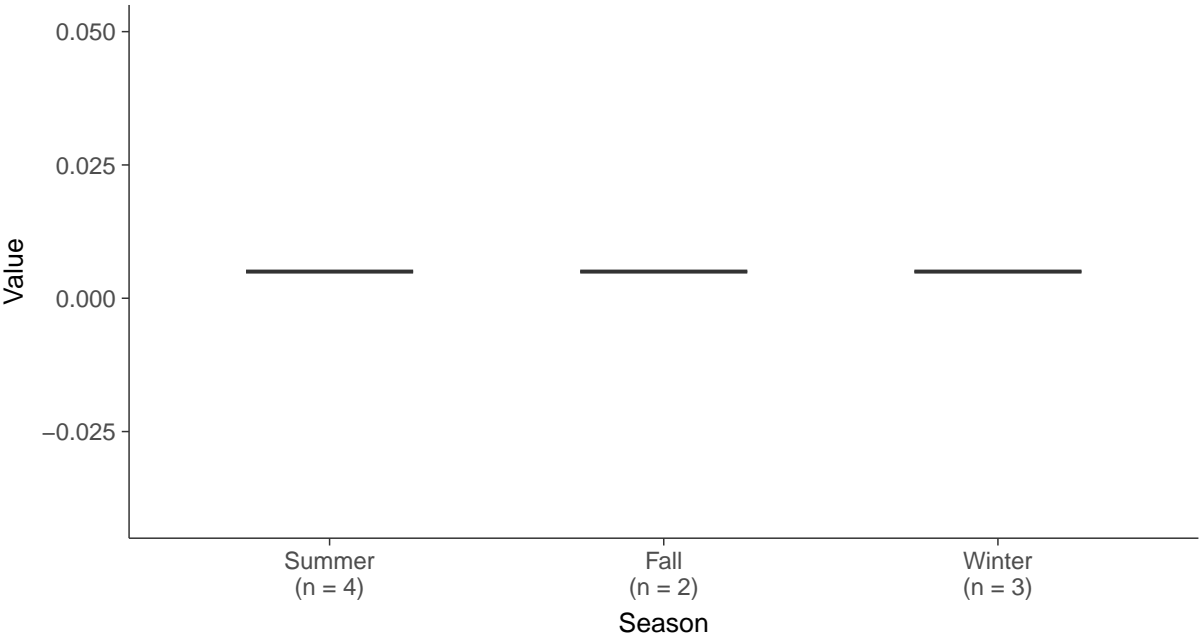
**Boxplot**

Vanadium, MW-10 (mg/L)



**Boxplot by Season**

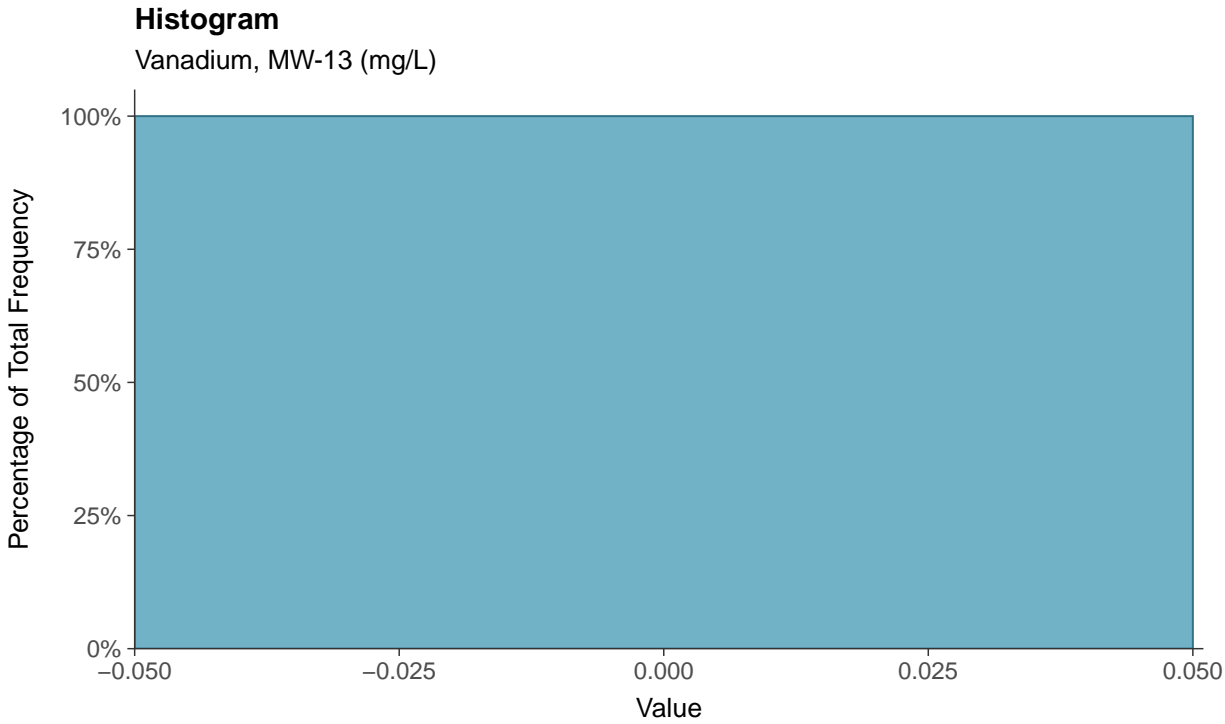
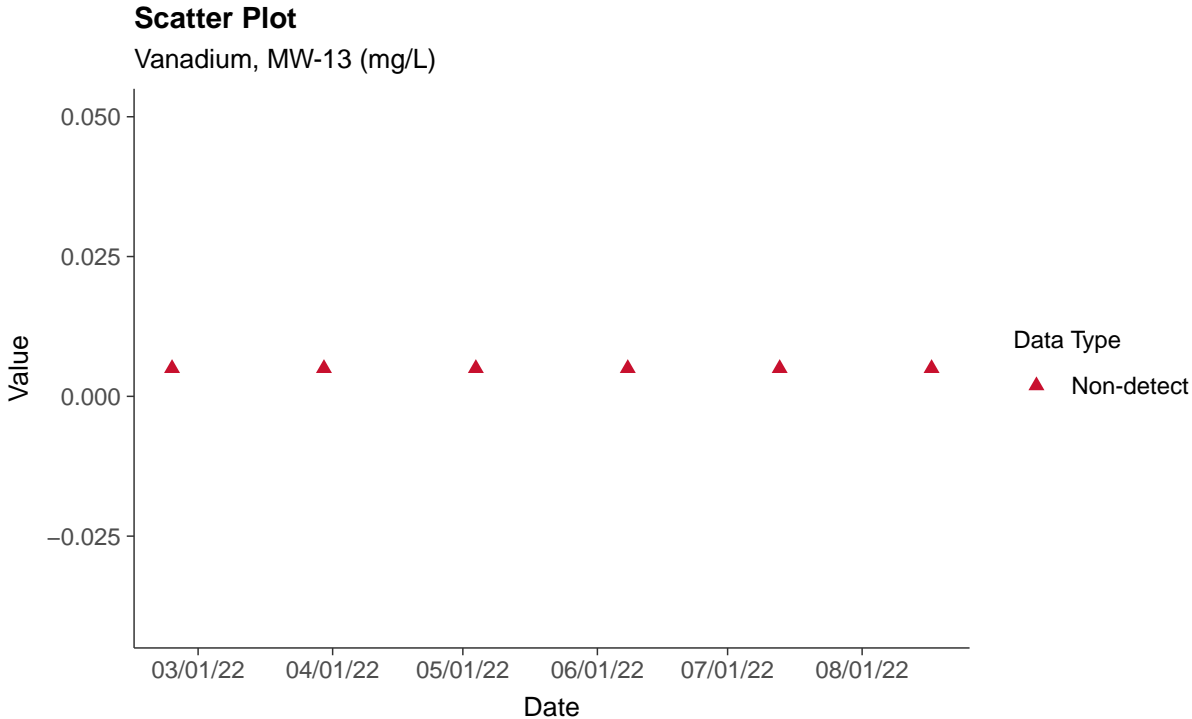
Vanadium, MW-10 (mg/L)





**Part 115: Vanadium, MW-13**

ID: 5\_40\_13





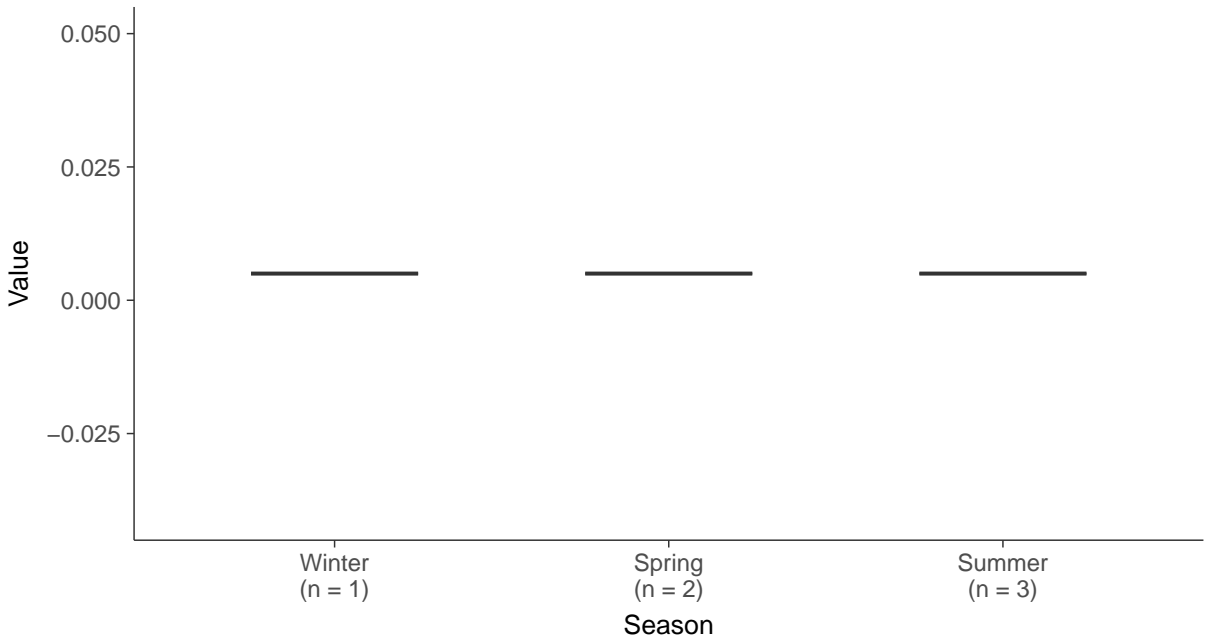
**Boxplot**

Vanadium, MW-13 (mg/L)



**Boxplot by Season**

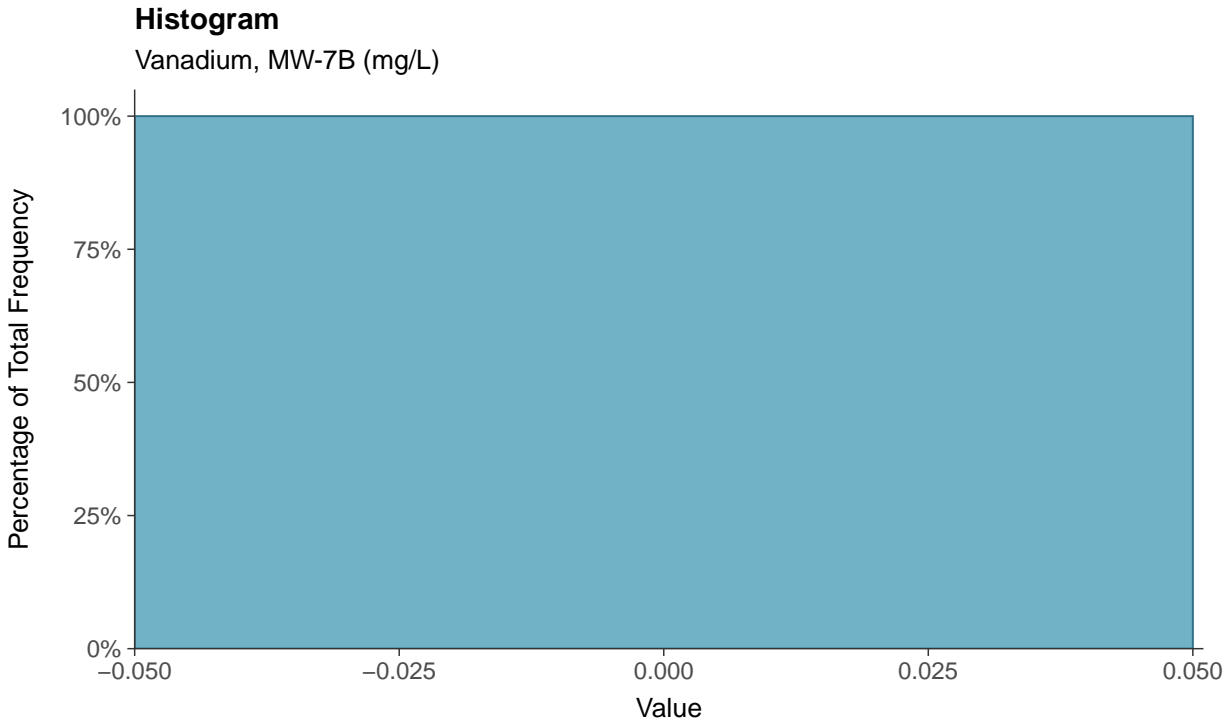
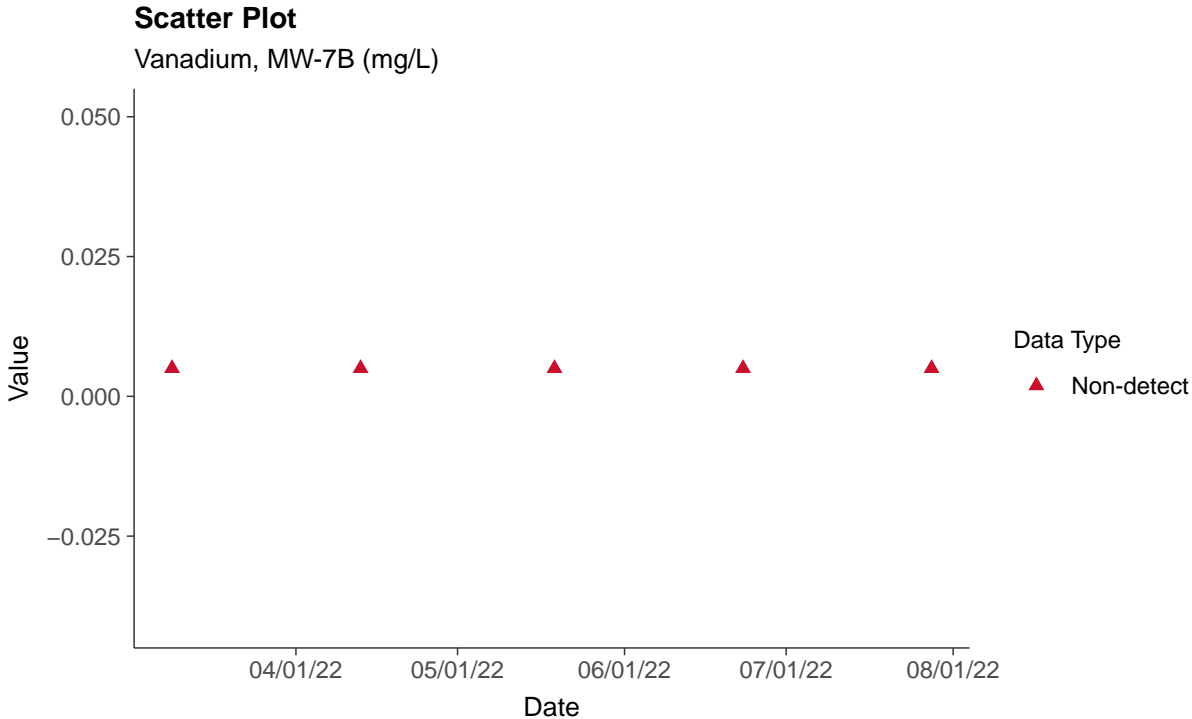
Vanadium, MW-13 (mg/L)





**Part 115: Vanadium, MW-7B**

ID: 5\_40\_7B





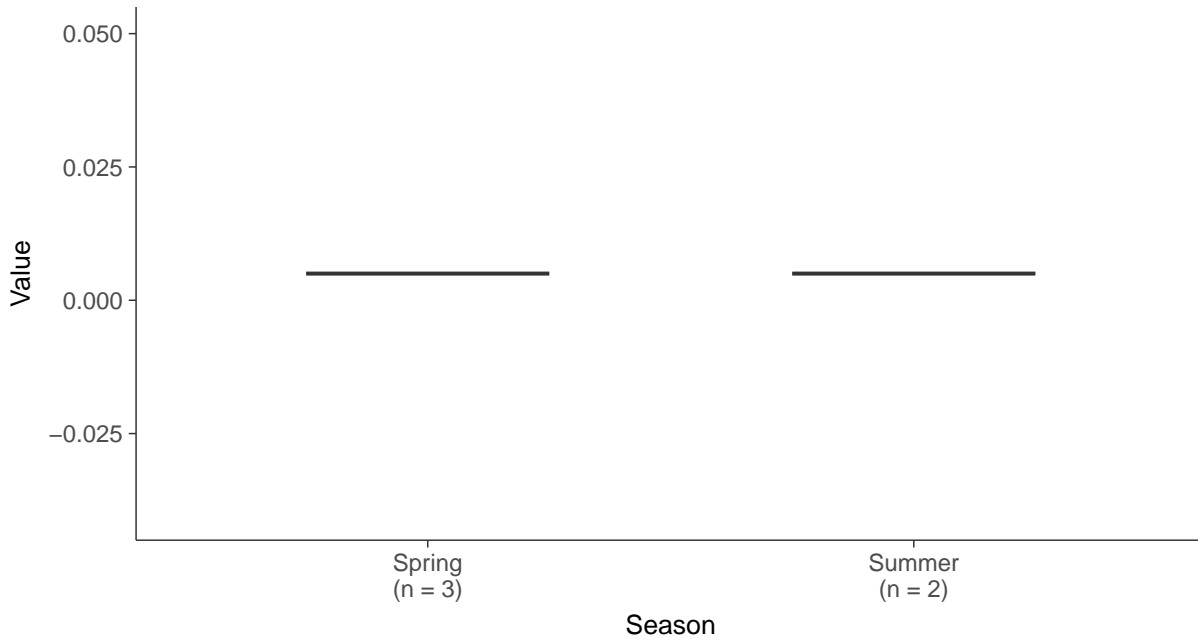
### Boxplot

Vanadium, MW-7B (mg/L)



### Boxplot by Season

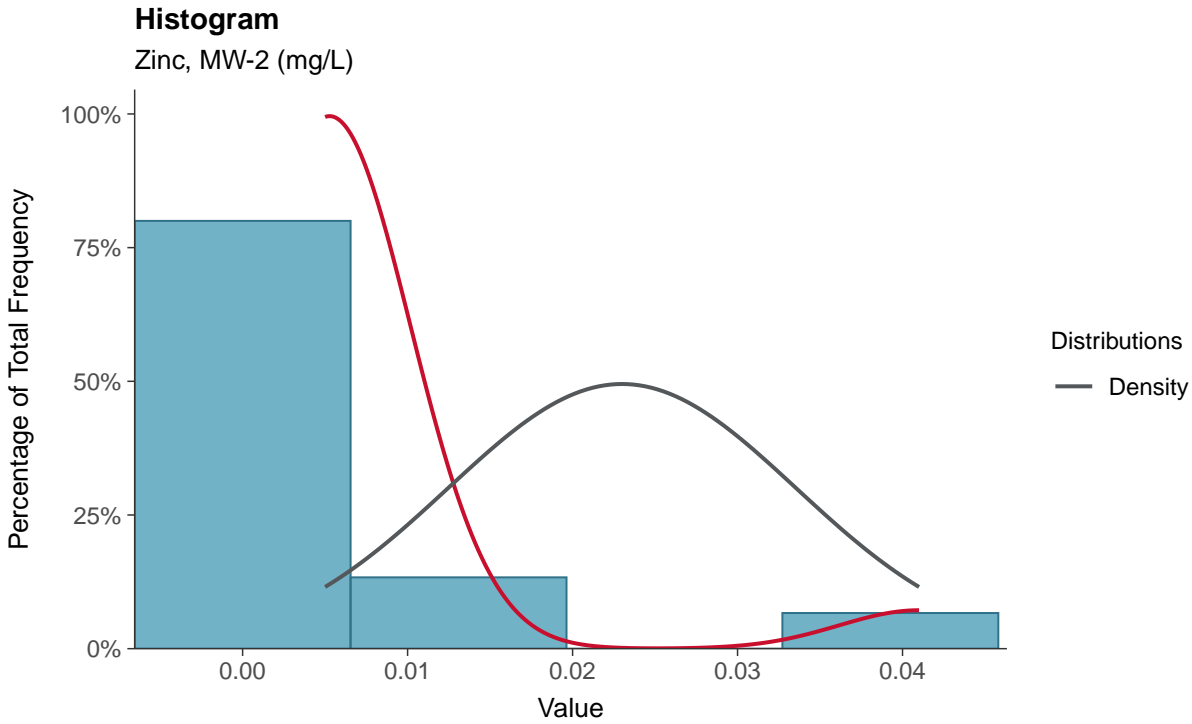
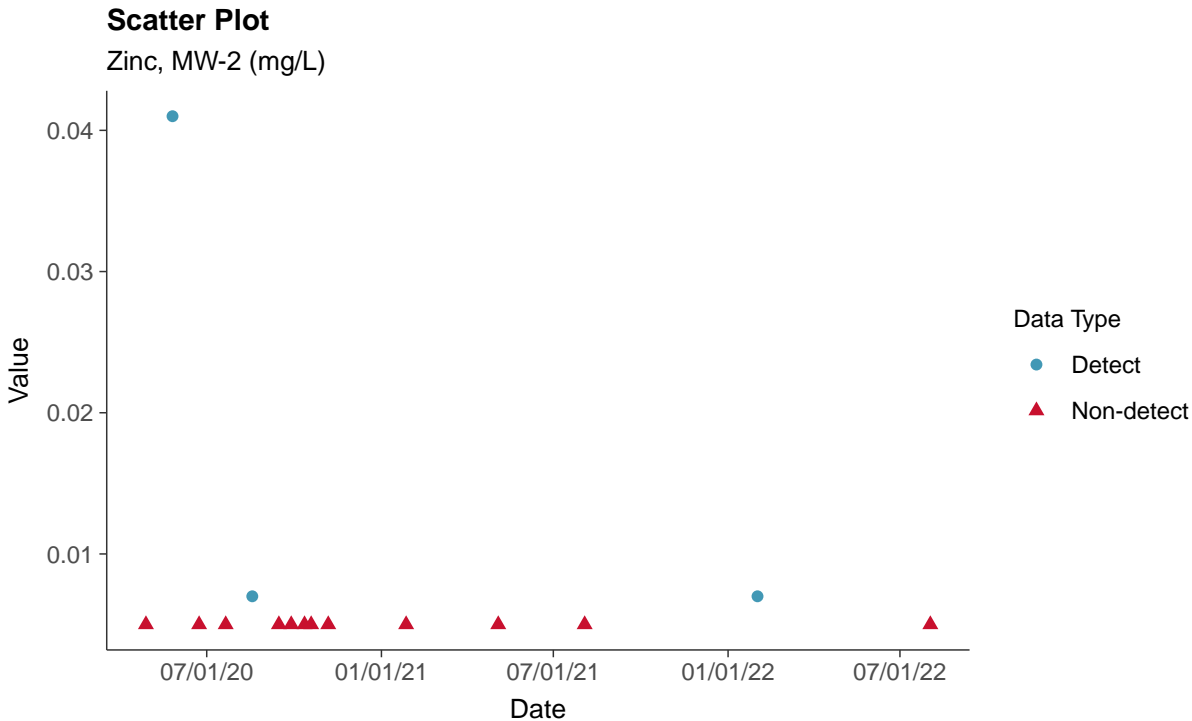
Vanadium, MW-7B (mg/L)





### Part 115: Zinc, MW-2

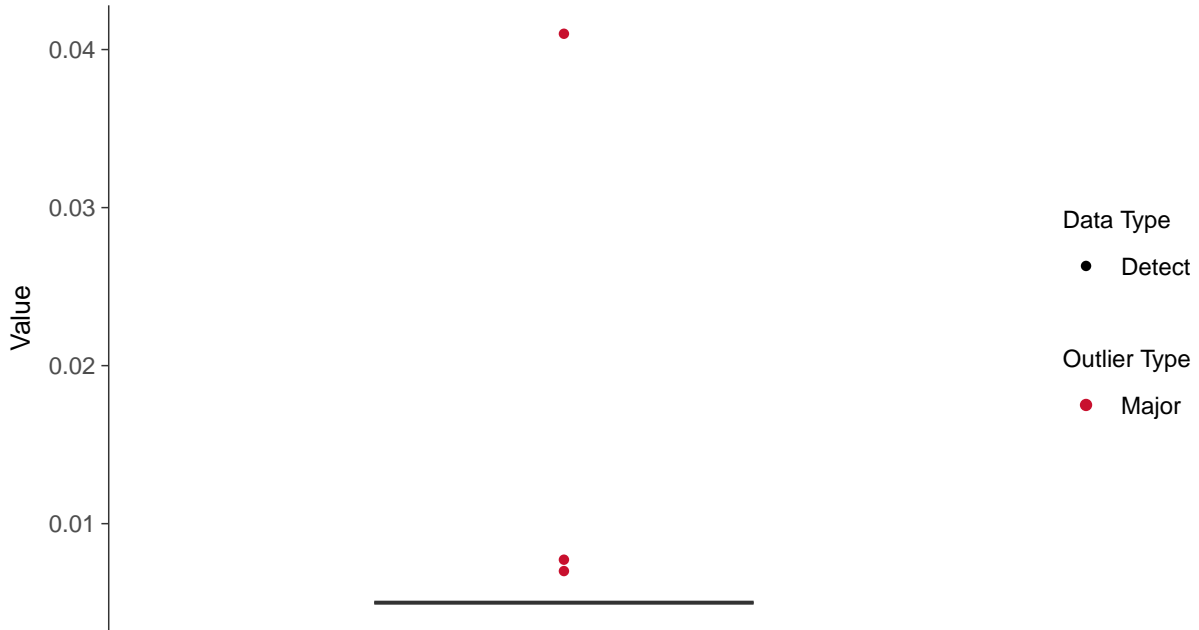
ID: 5\_41\_02





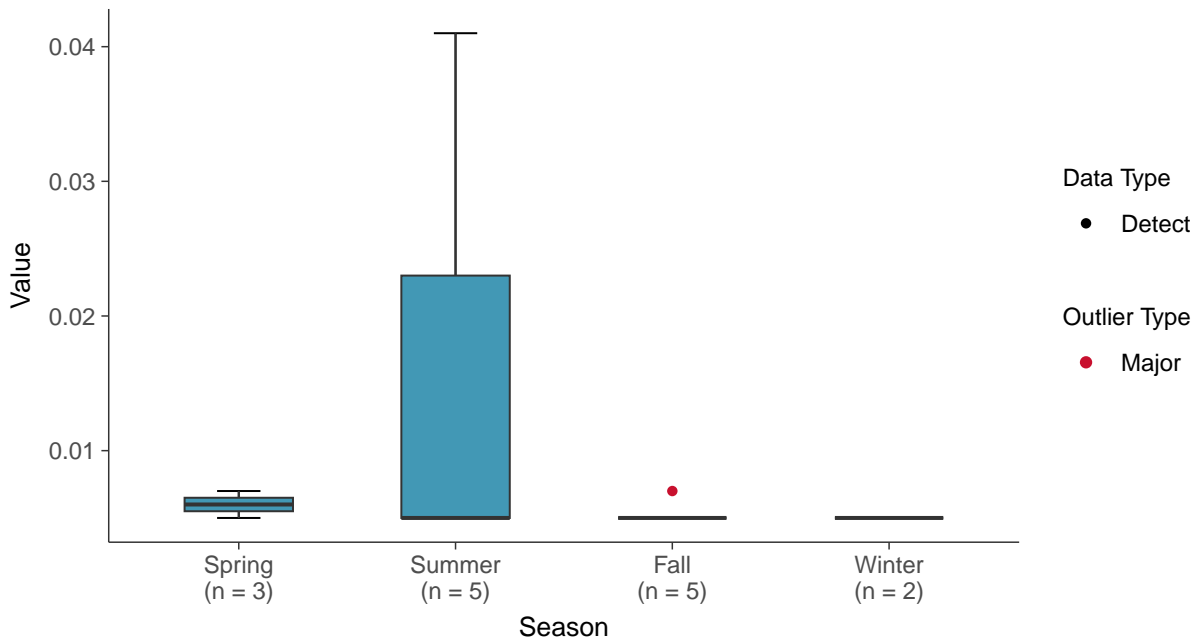
### Boxplot

Zinc, MW-2 (mg/L)



### Boxplot by Season

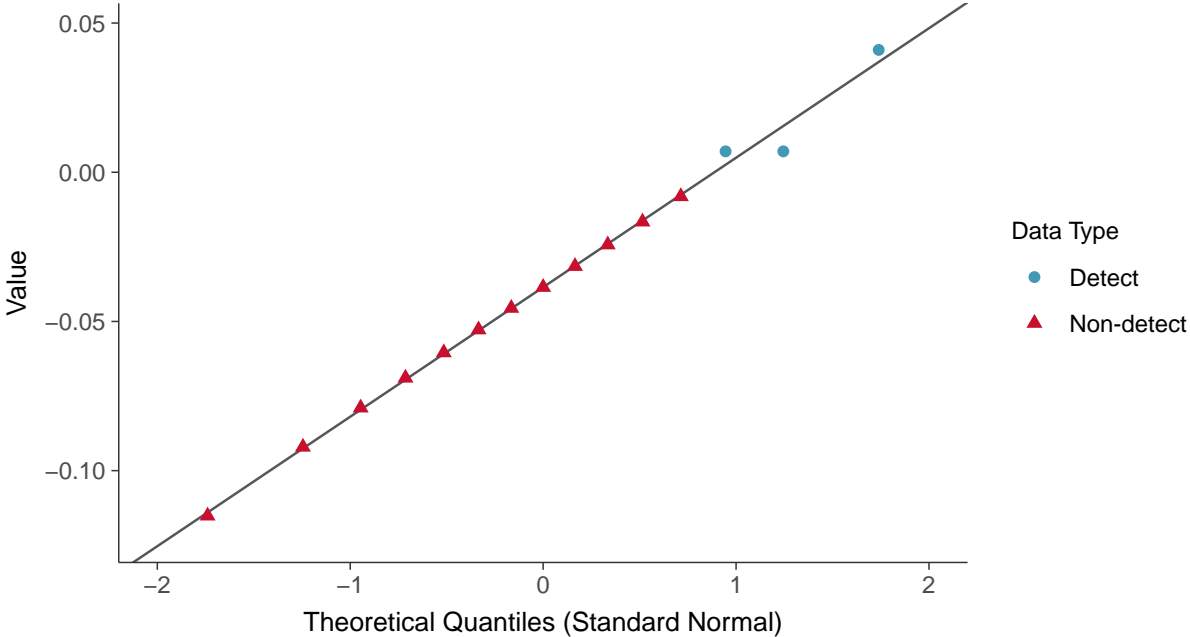
Zinc, MW-2 (mg/L)





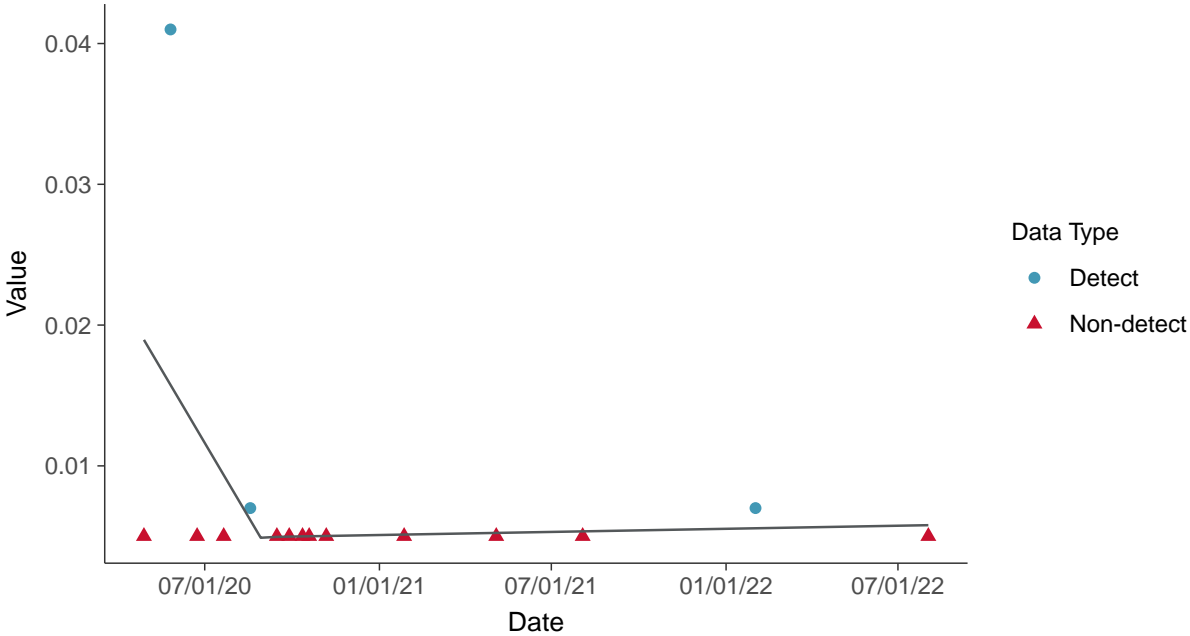
### Normal Q-Q plot using ROS Imputed Estimates

Zinc, MW-2 (mg/L)



### Trend Regression: Piecewise Linear-Linear

Zinc, MW-2 (mg/L)

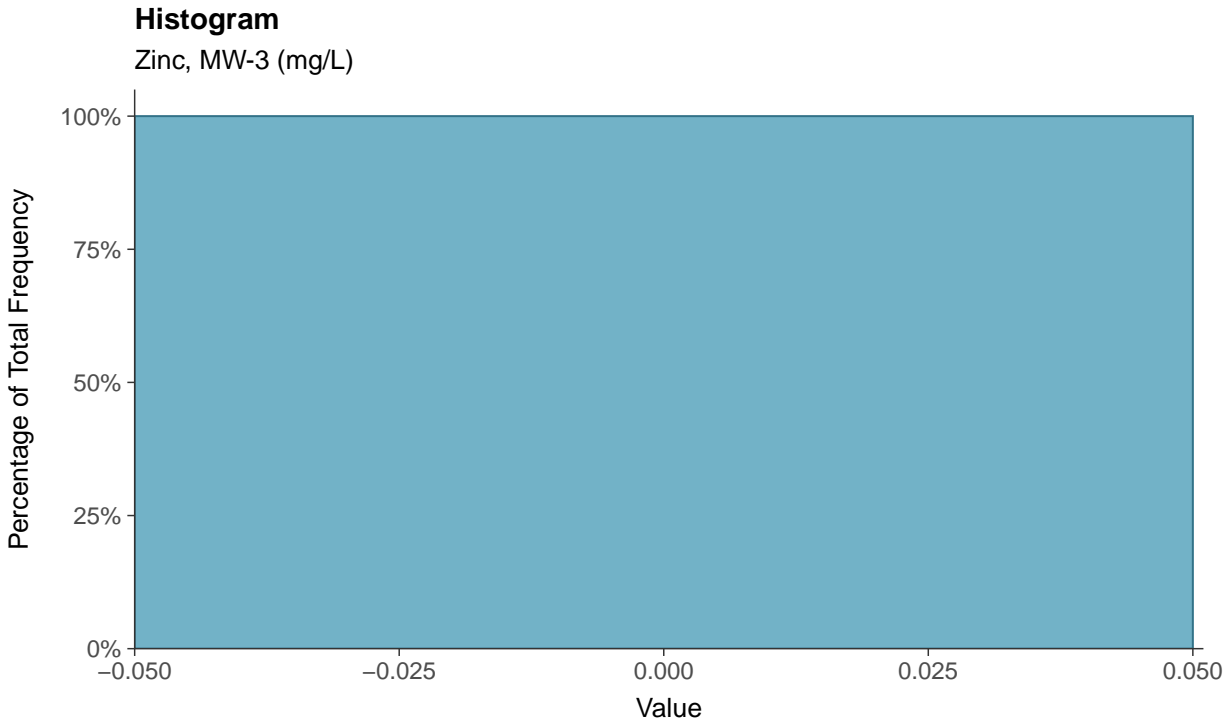
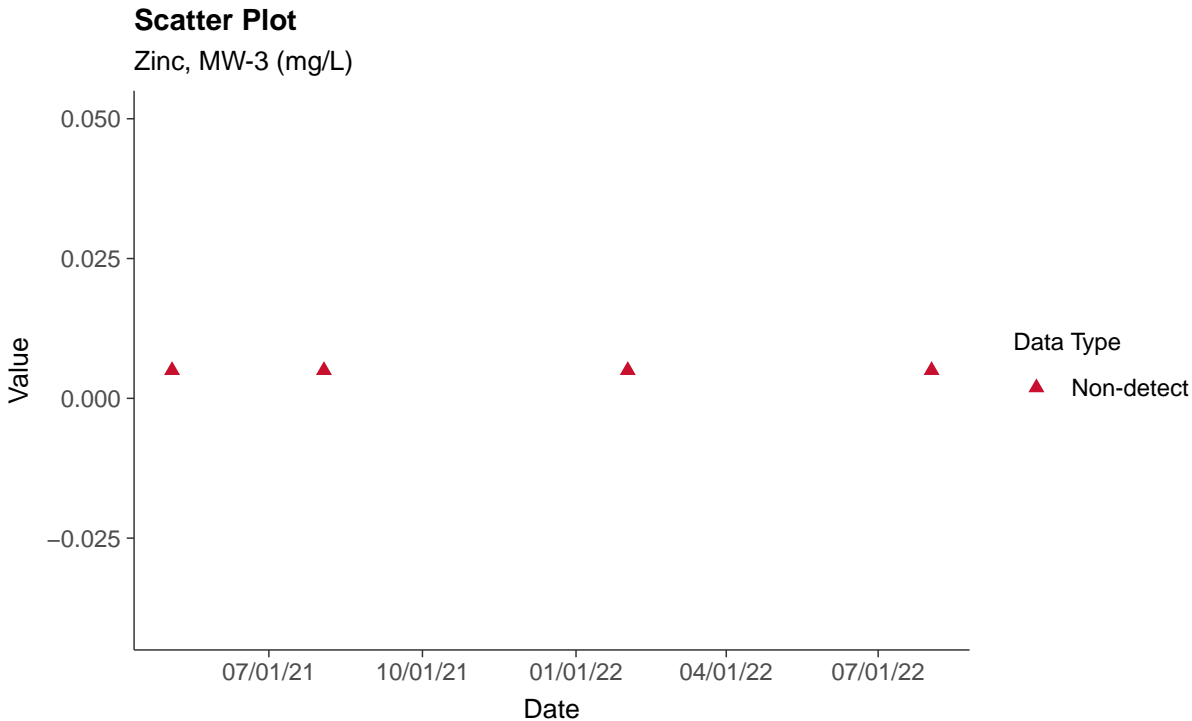






**Part 115: Zinc, MW-3**

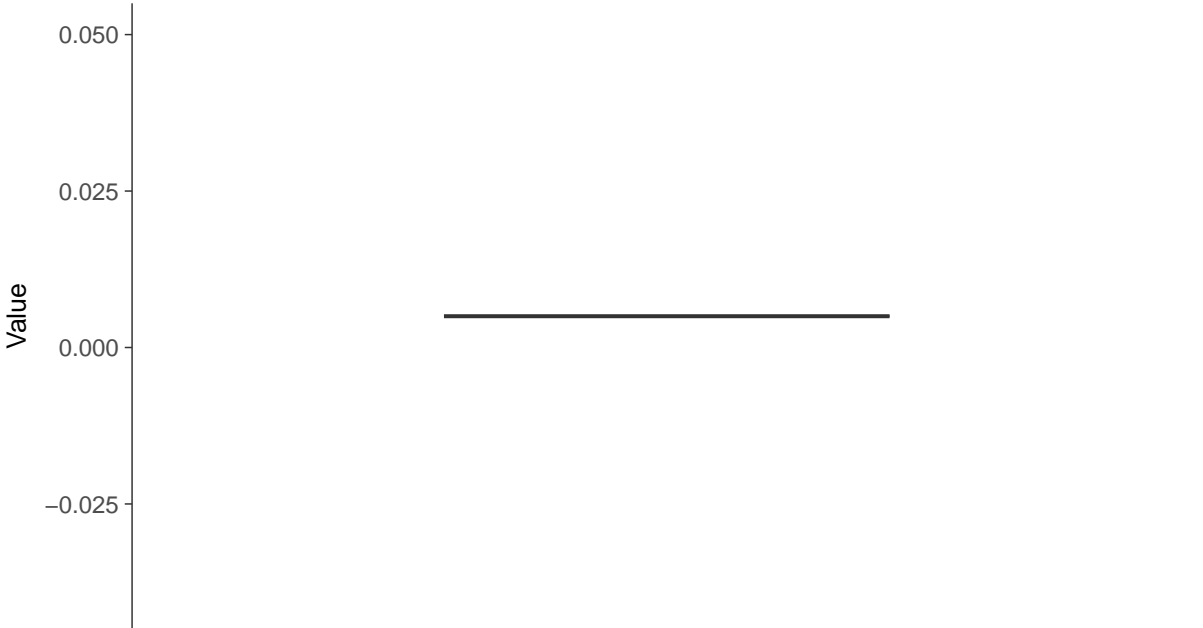
ID: 5\_41\_03





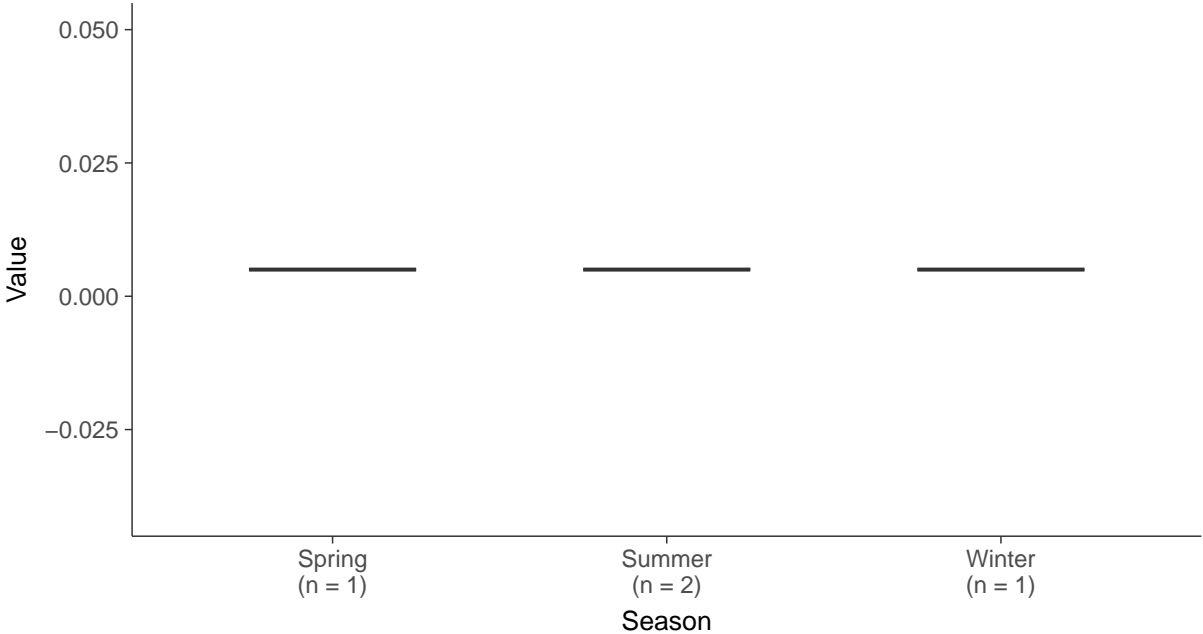
**Boxplot**

Zinc, MW-3 (mg/L)



**Boxplot by Season**

Zinc, MW-3 (mg/L)



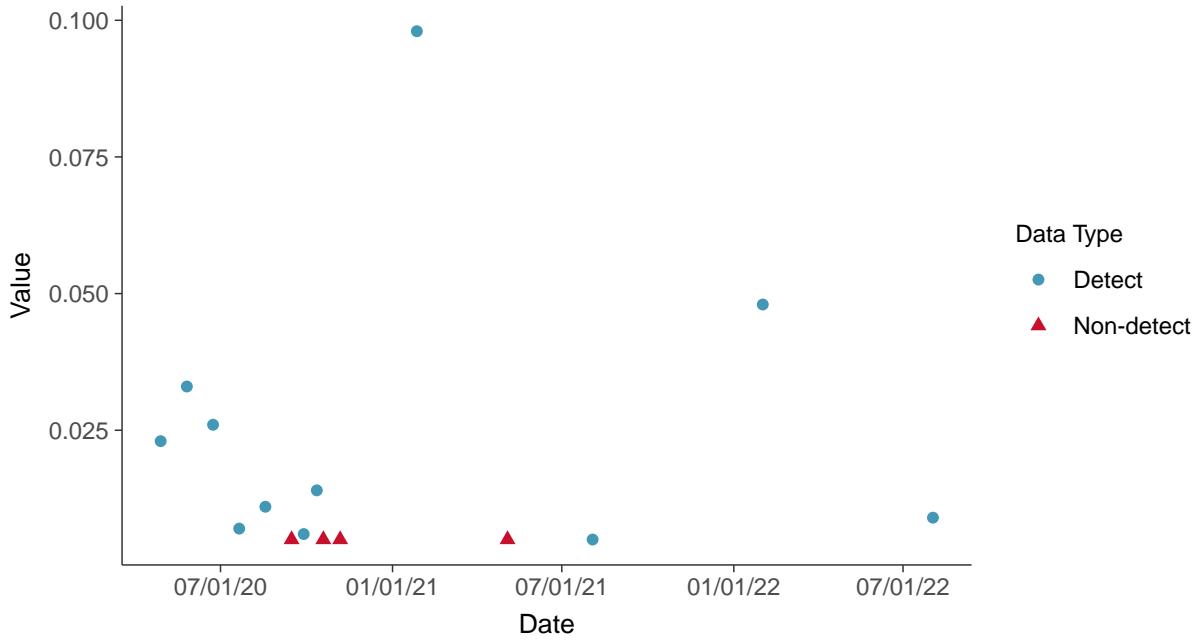


### Part 115: Zinc, MW-5

ID: 5\_41\_05

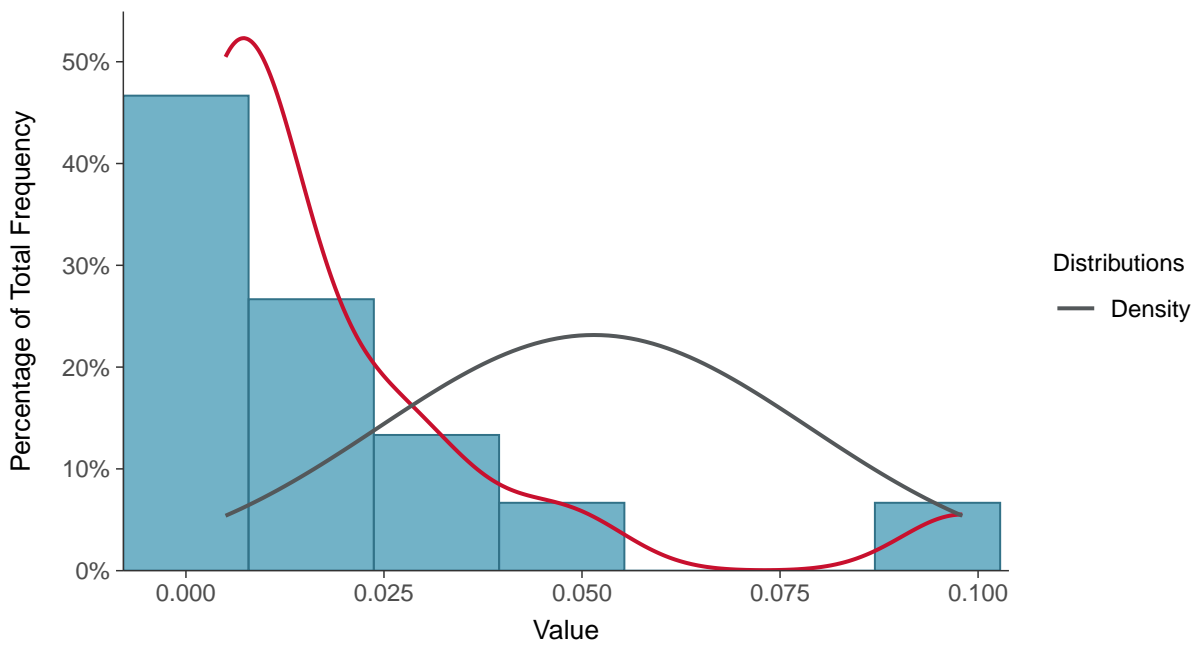
#### Scatter Plot

Zinc, MW-5 (mg/L)



#### Histogram

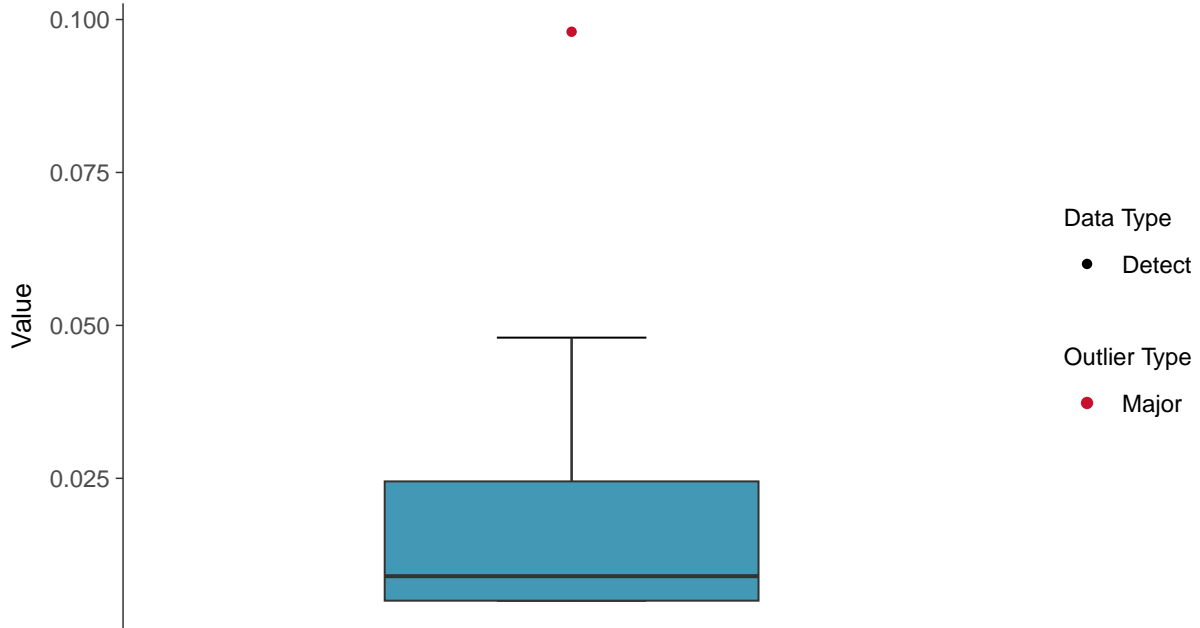
Zinc, MW-5 (mg/L)





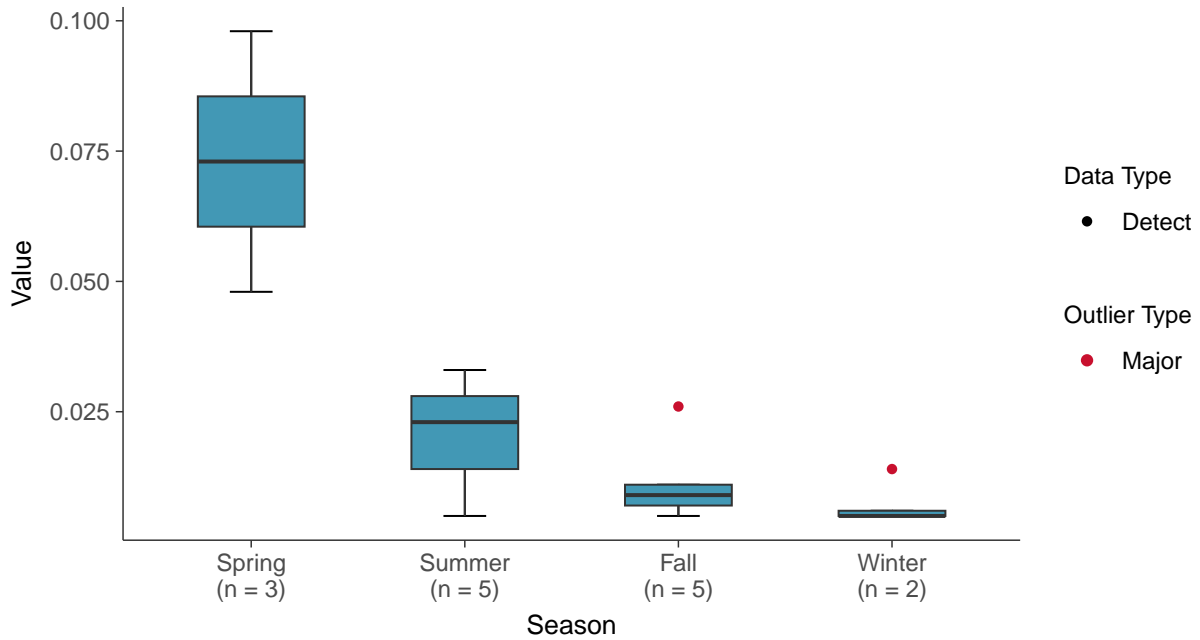
### Boxplot

Zinc, MW-5 (mg/L)



### Boxplot by Season

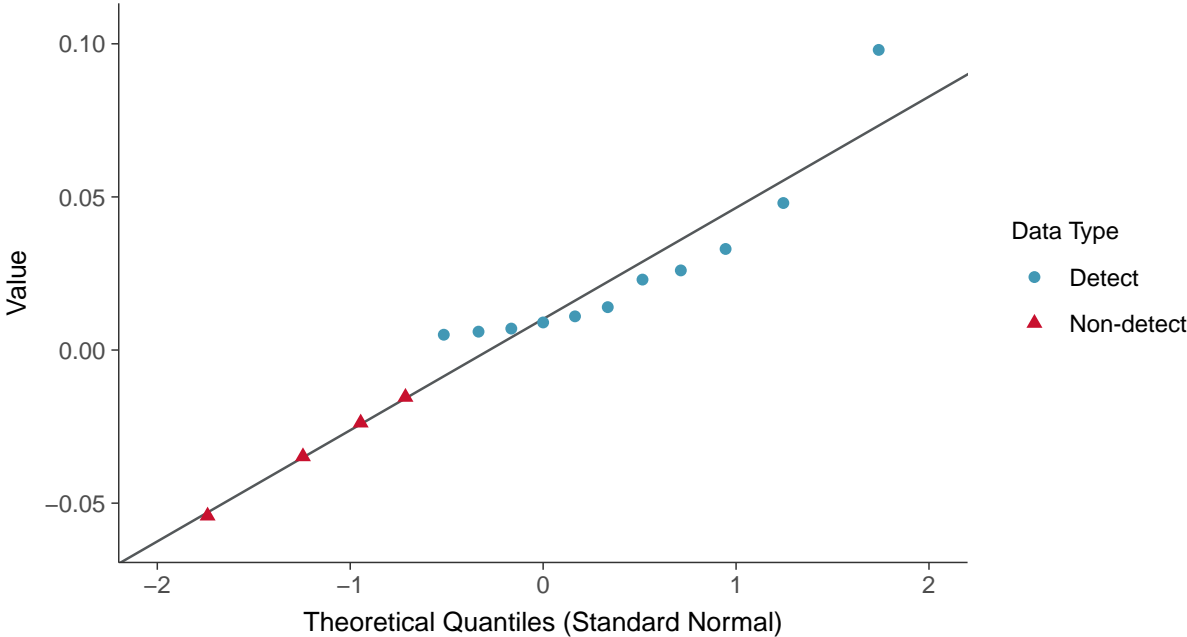
Zinc, MW-5 (mg/L)





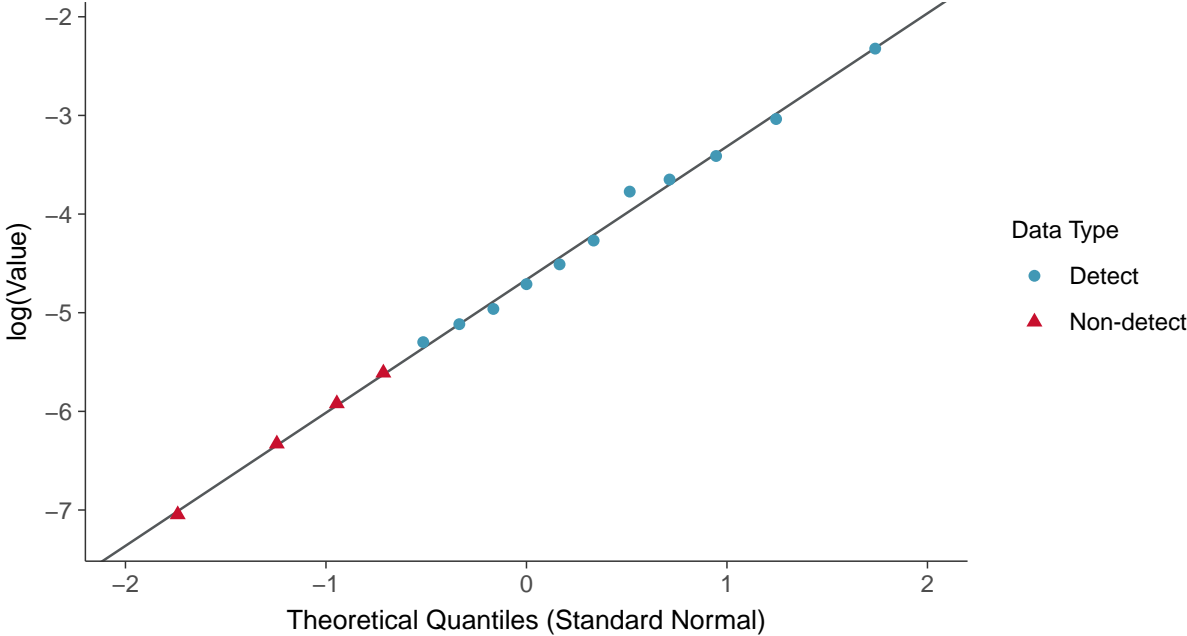
### Normal Q-Q plot using ROS Imputed Estimates

Zinc, MW-5 (mg/L)



### Lognormal Q-Q plot using ROS Imputed Estimates

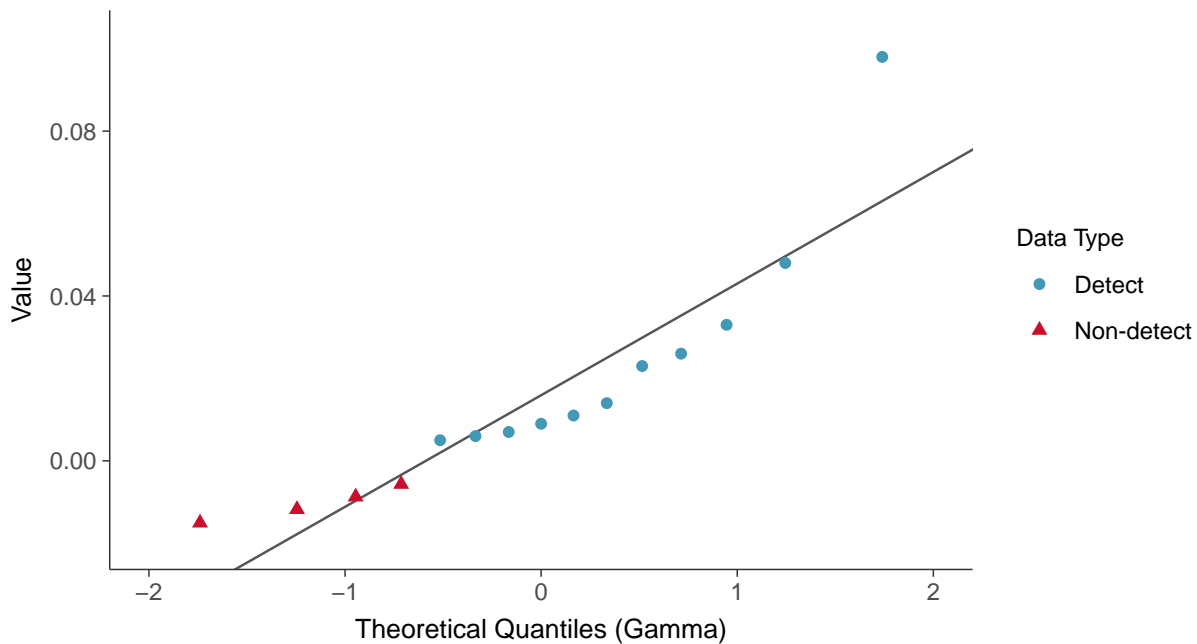
Zinc, MW-5 (mg/L)





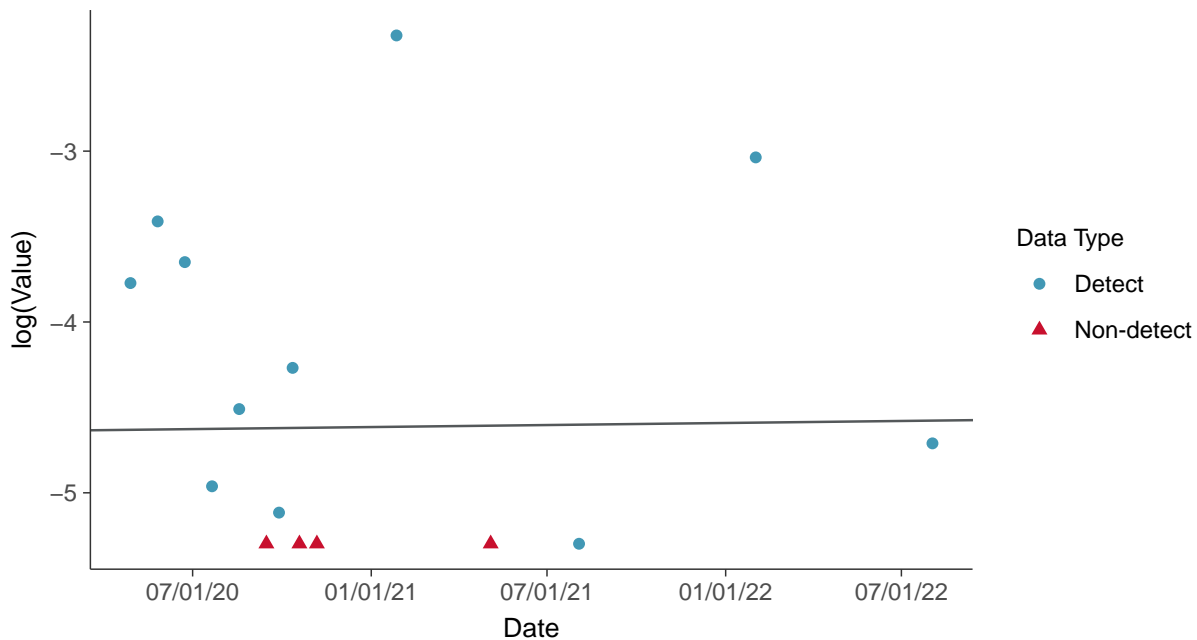
### Gamma Q-Q plot using ROS Imputed Estimates

Zinc, MW-5 (mg/L)



### Trend Regression: Lognormal MLE

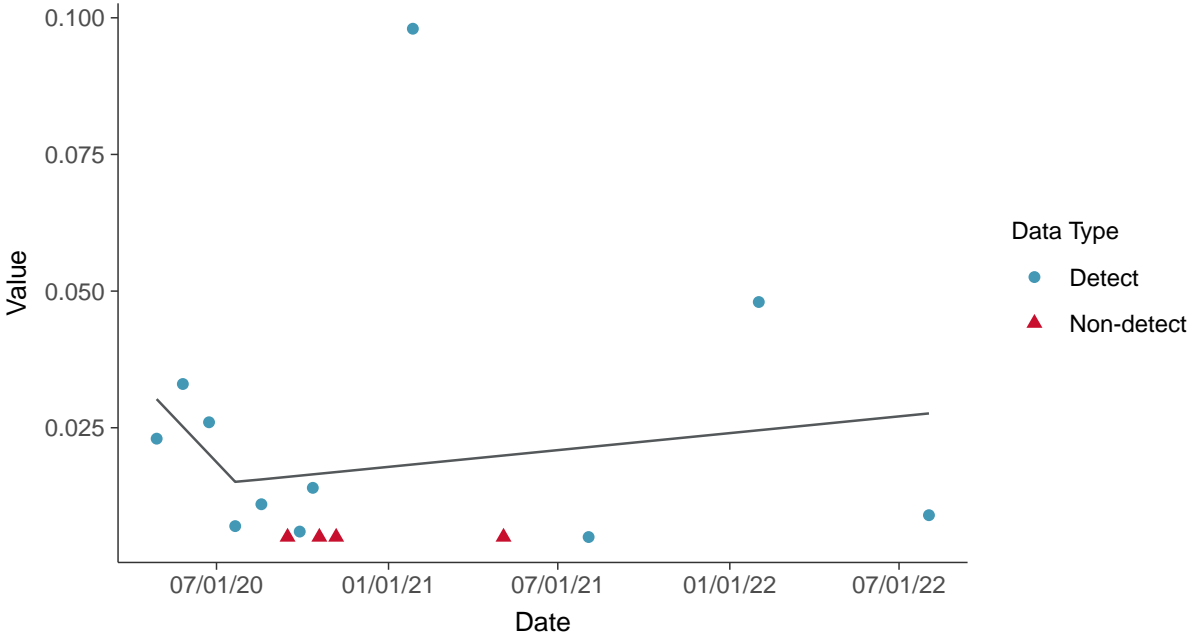
Zinc, MW-5 (mg/L)





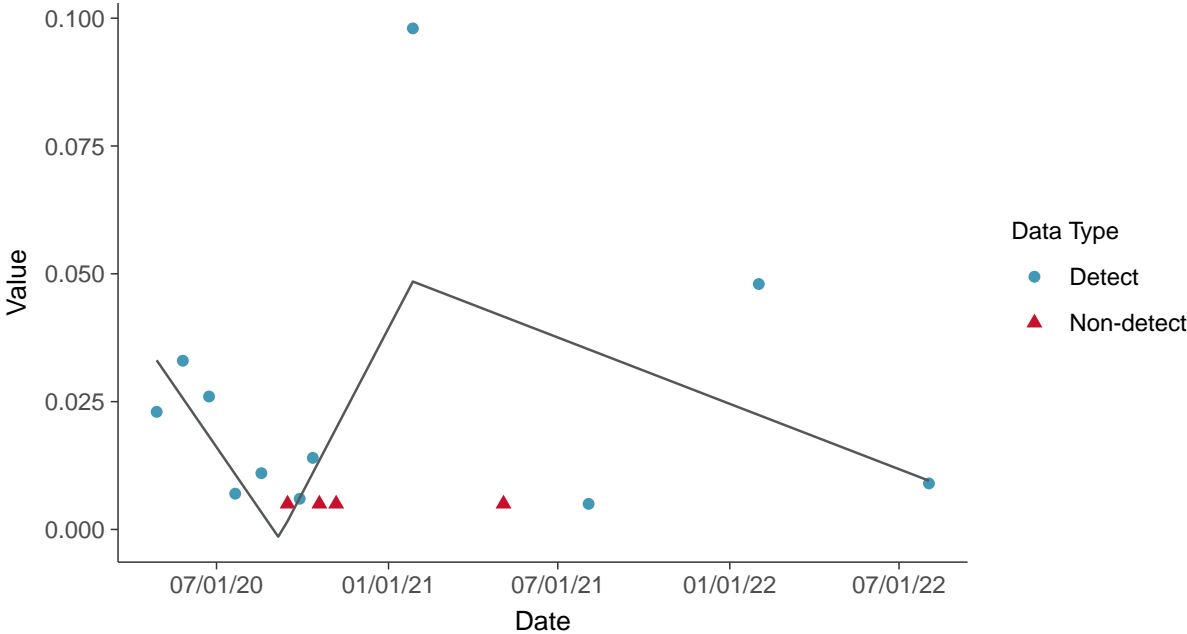
**Trend Regression: Piecewise Linear-Linear**

Zinc, MW-5 (mg/L)



**Trend Regression: Piecewise Linear-Linear-Linear**

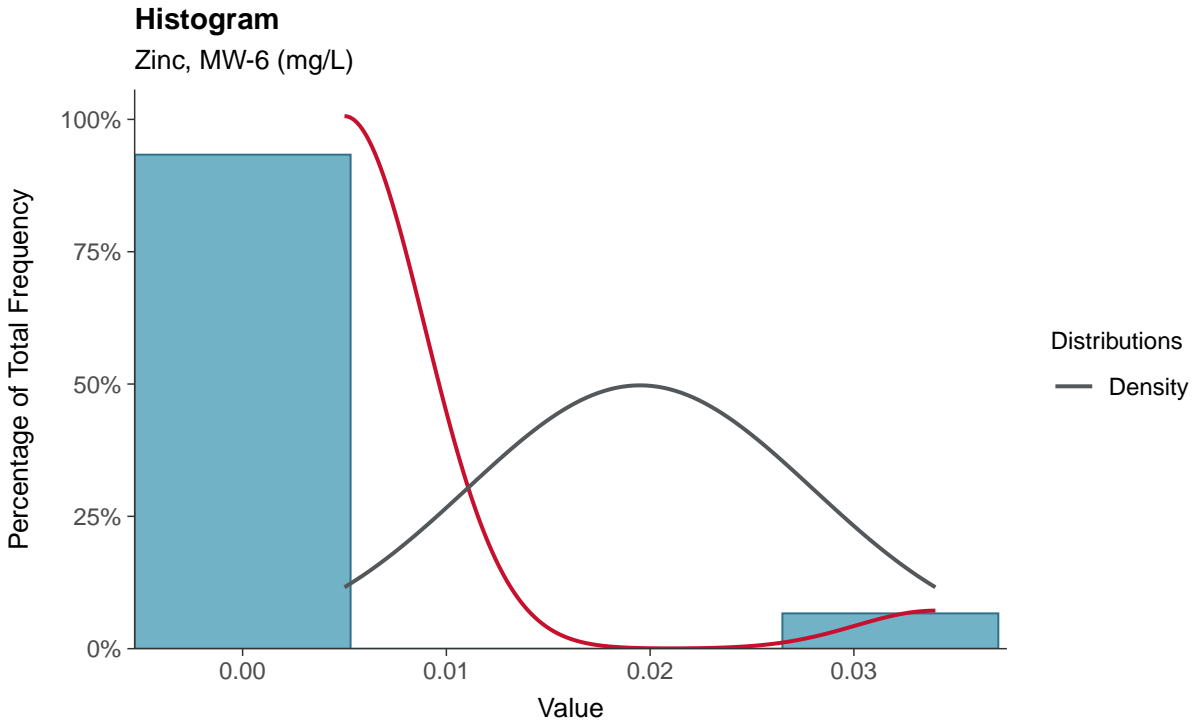
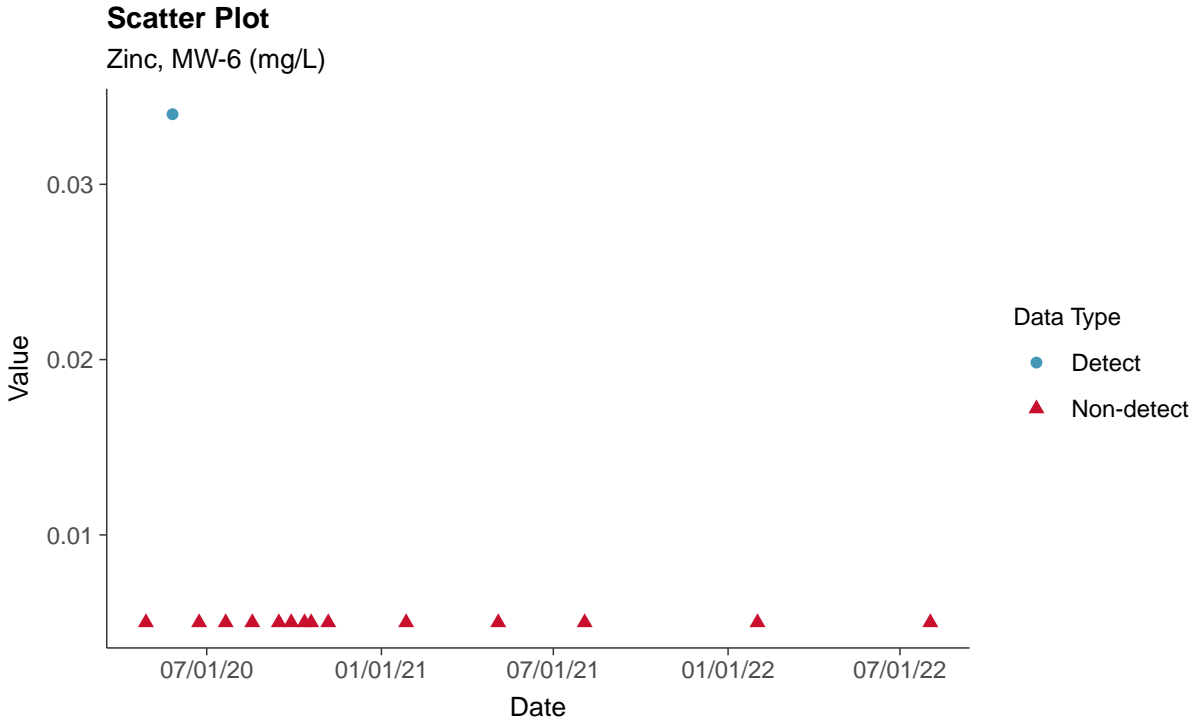
Zinc, MW-5 (mg/L)





**Part 115: Zinc, MW-6**

ID: 5\_41\_06

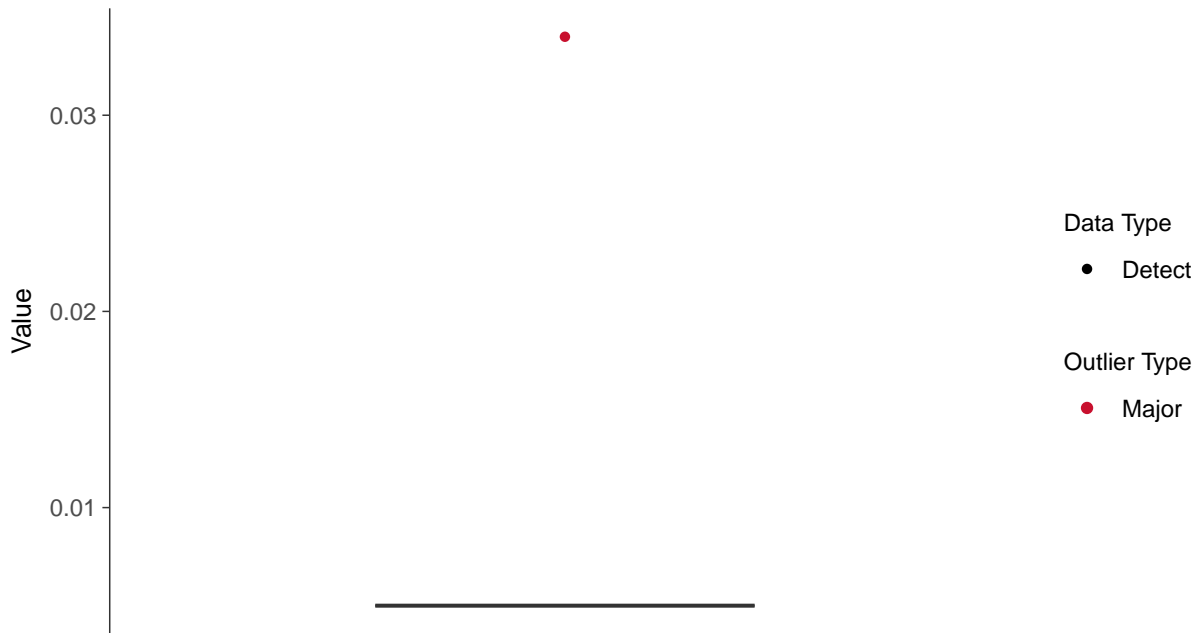






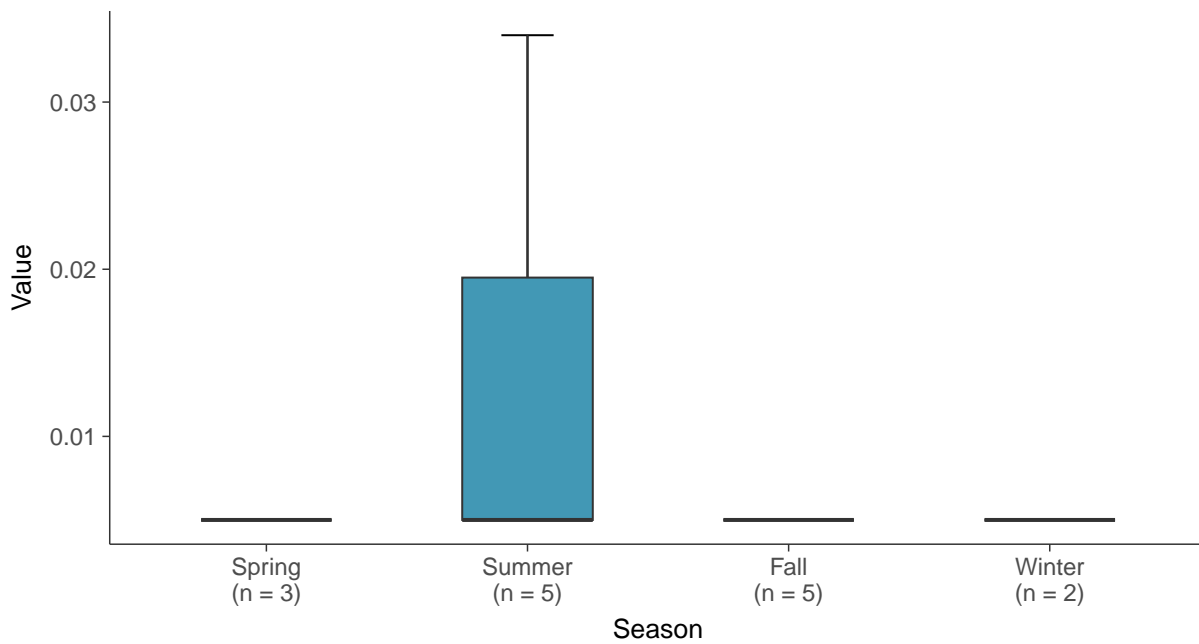
### Boxplot

Zinc, MW-6 (mg/L)



### Boxplot by Season

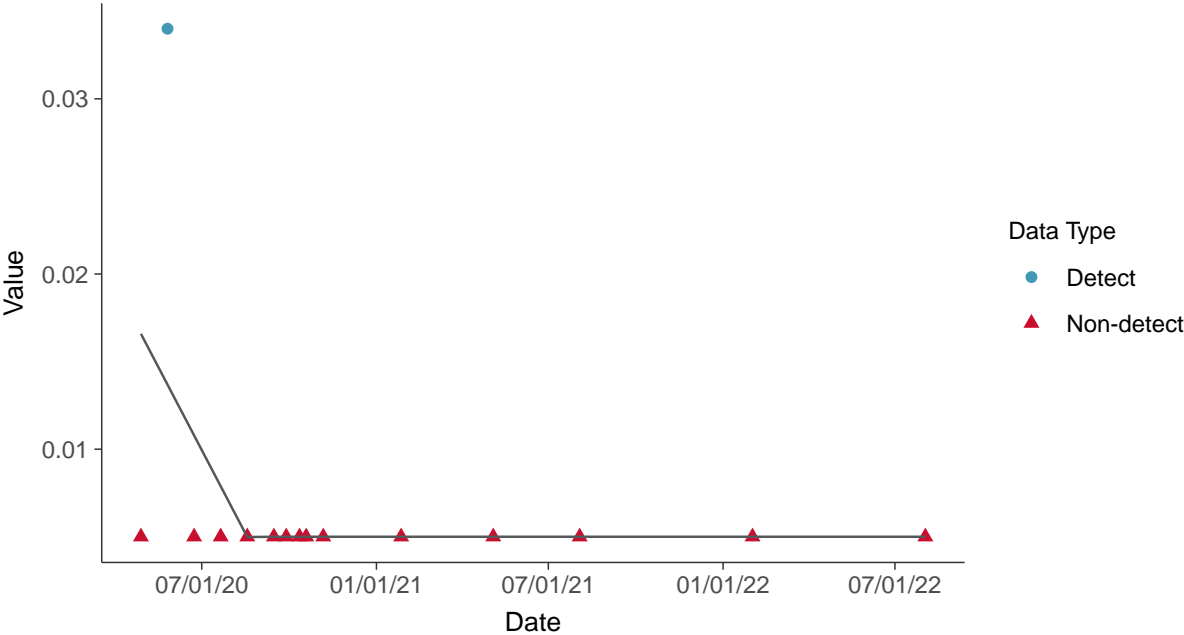
Zinc, MW-6 (mg/L)





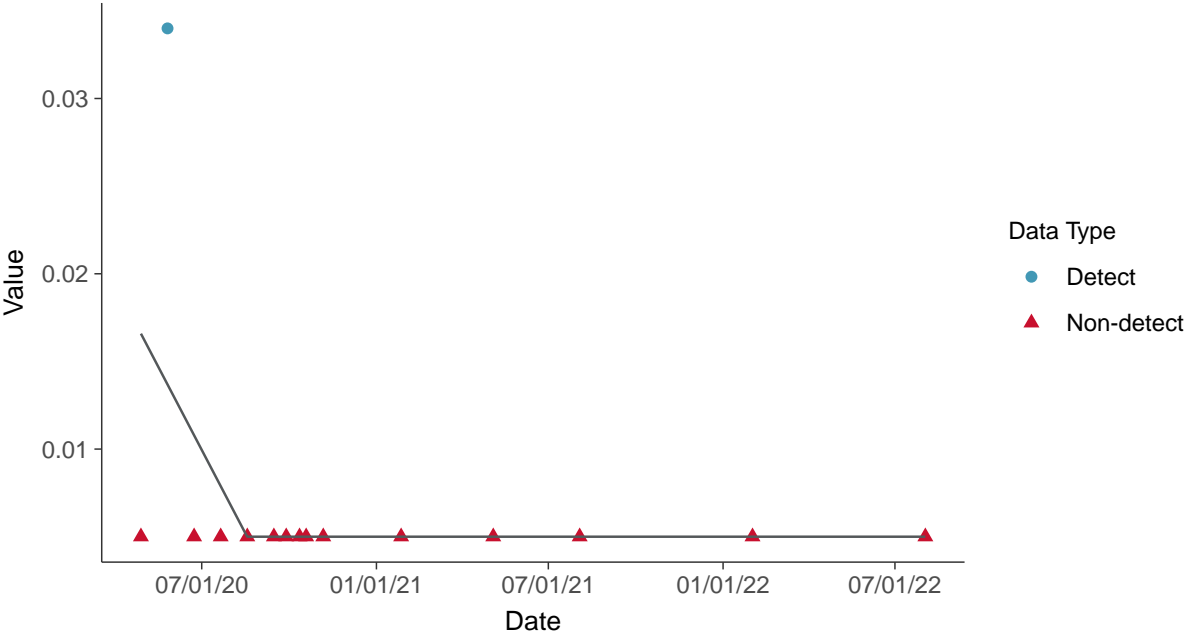
**Trend Regression: Piecewise Linear-Linear**

Zinc, MW-6 (mg/L)



**Trend Regression: Piecewise Linear-Linear-Linear**

Zinc, MW-6 (mg/L)



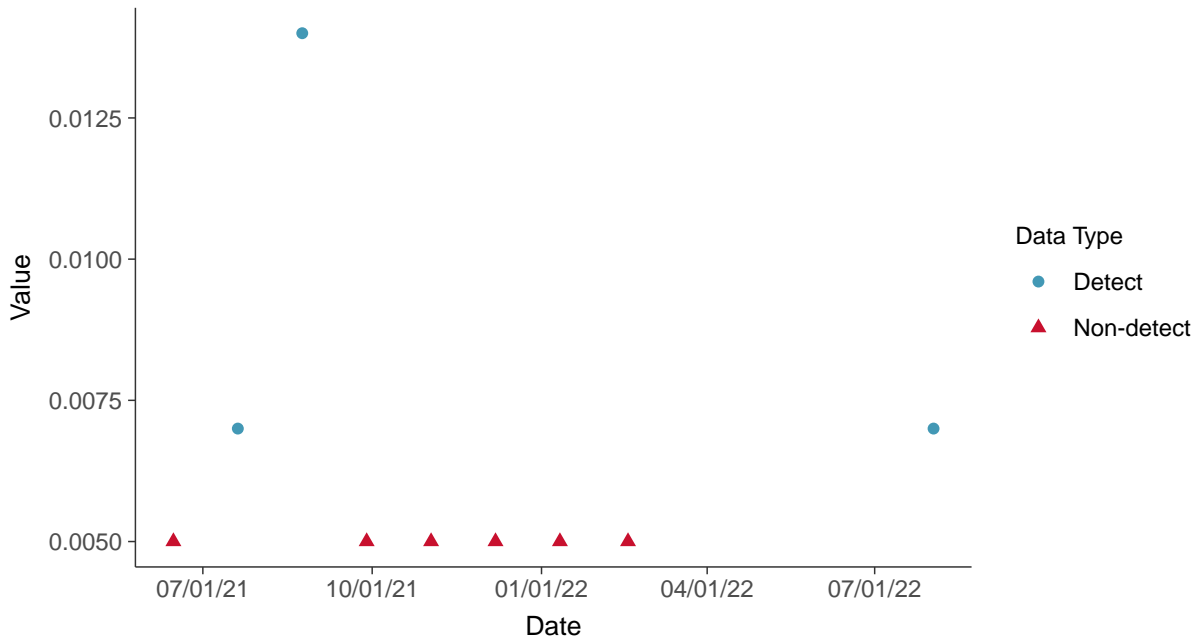


### Part 115: Zinc, MW-7

ID: 5\_41\_07

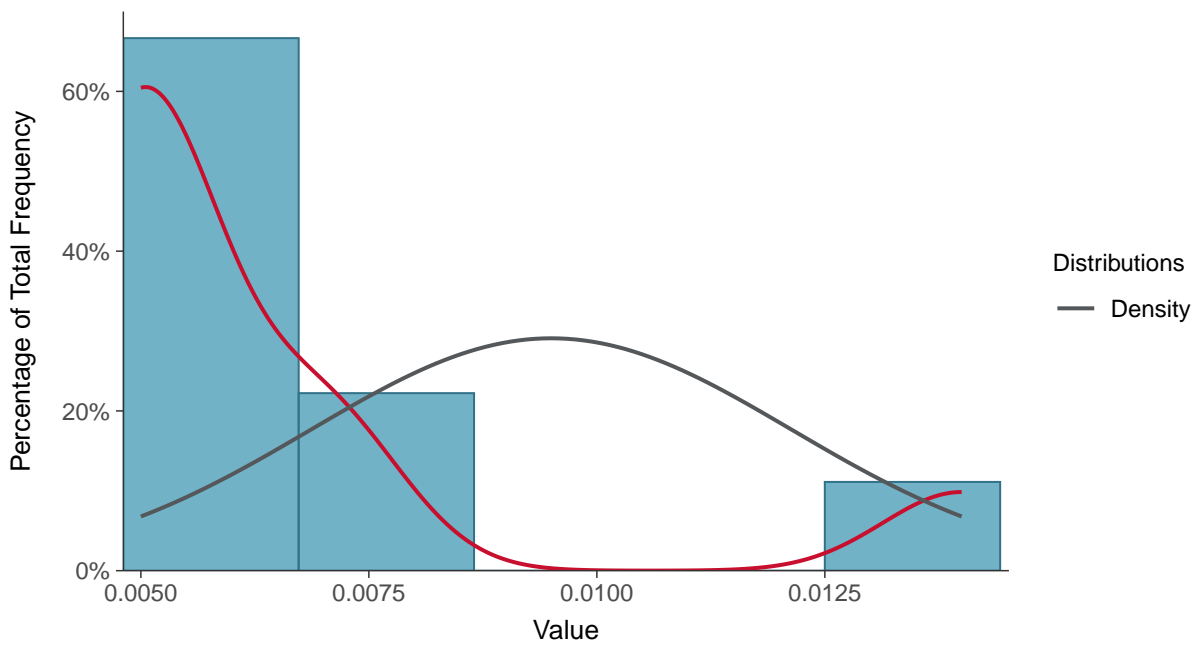
#### Scatter Plot

Zinc, MW-7 (mg/L)



#### Histogram

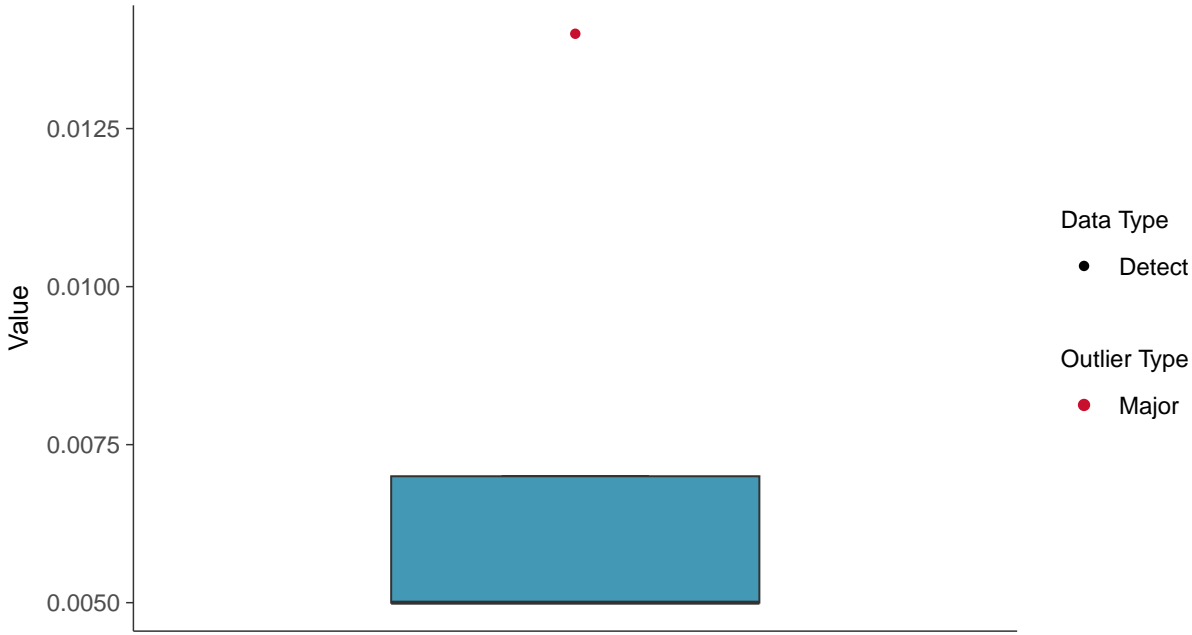
Zinc, MW-7 (mg/L)





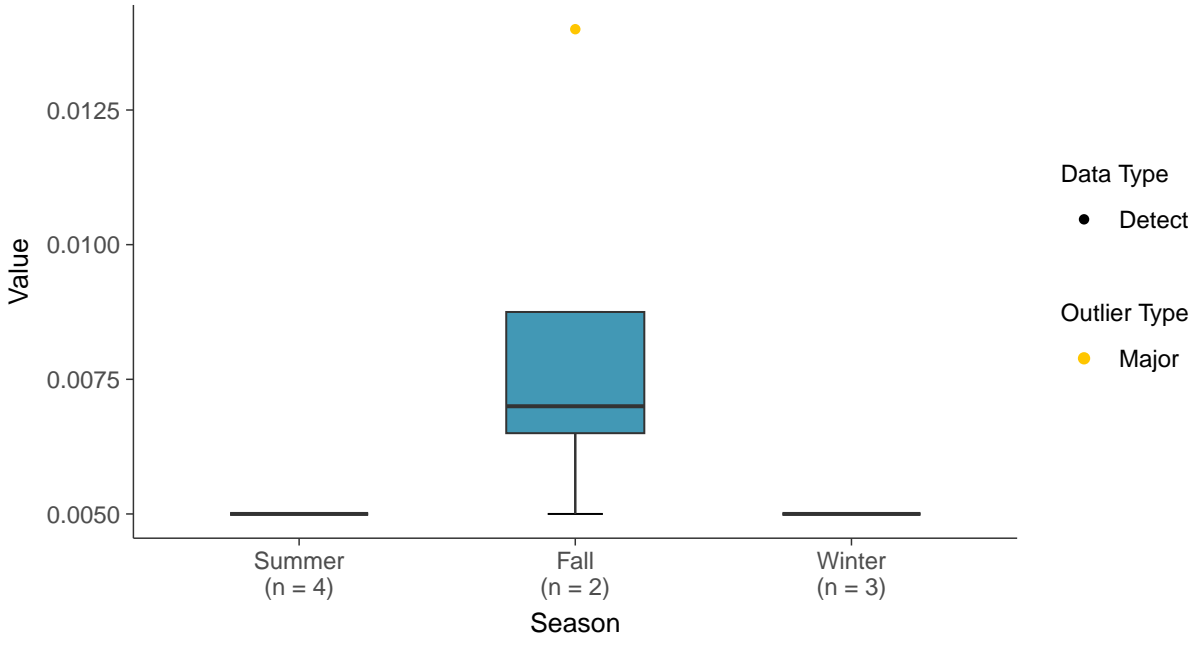
**Boxplot**

Zinc, MW-7 (mg/L)



**Boxplot by Season**

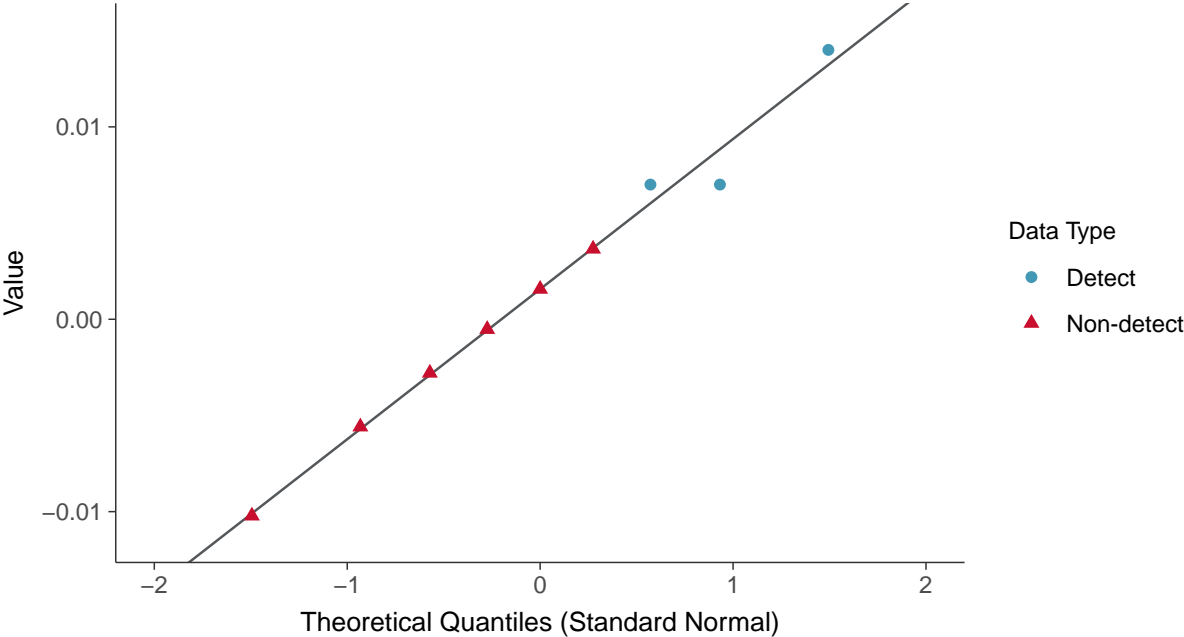
Zinc, MW-7 (mg/L)





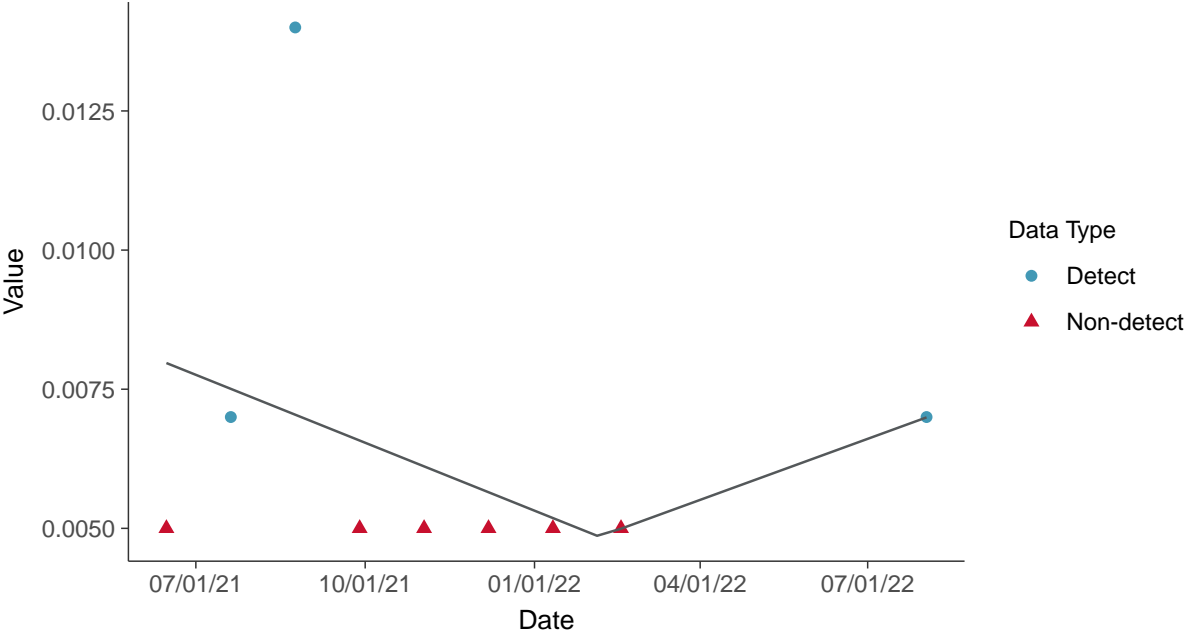
### Normal Q-Q plot using ROS Imputed Estimates

Zinc, MW-7 (mg/L)



### Trend Regression: Piecewise Linear-Linear

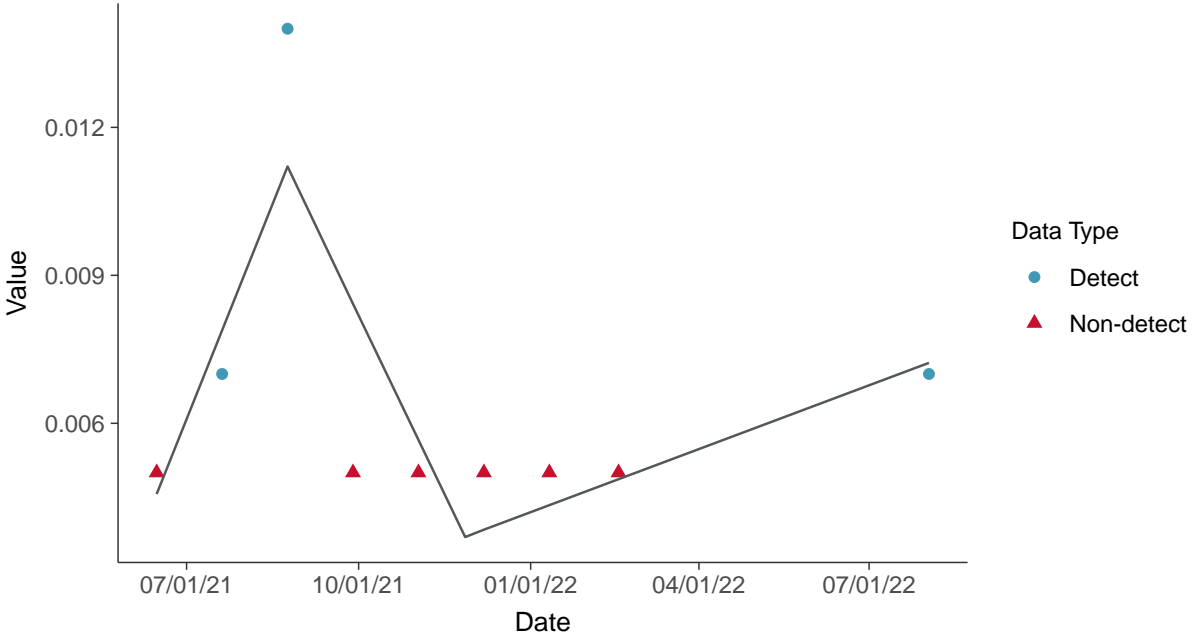
Zinc, MW-7 (mg/L)





### Trend Regression: Piecewise Linear-Linear-Linear

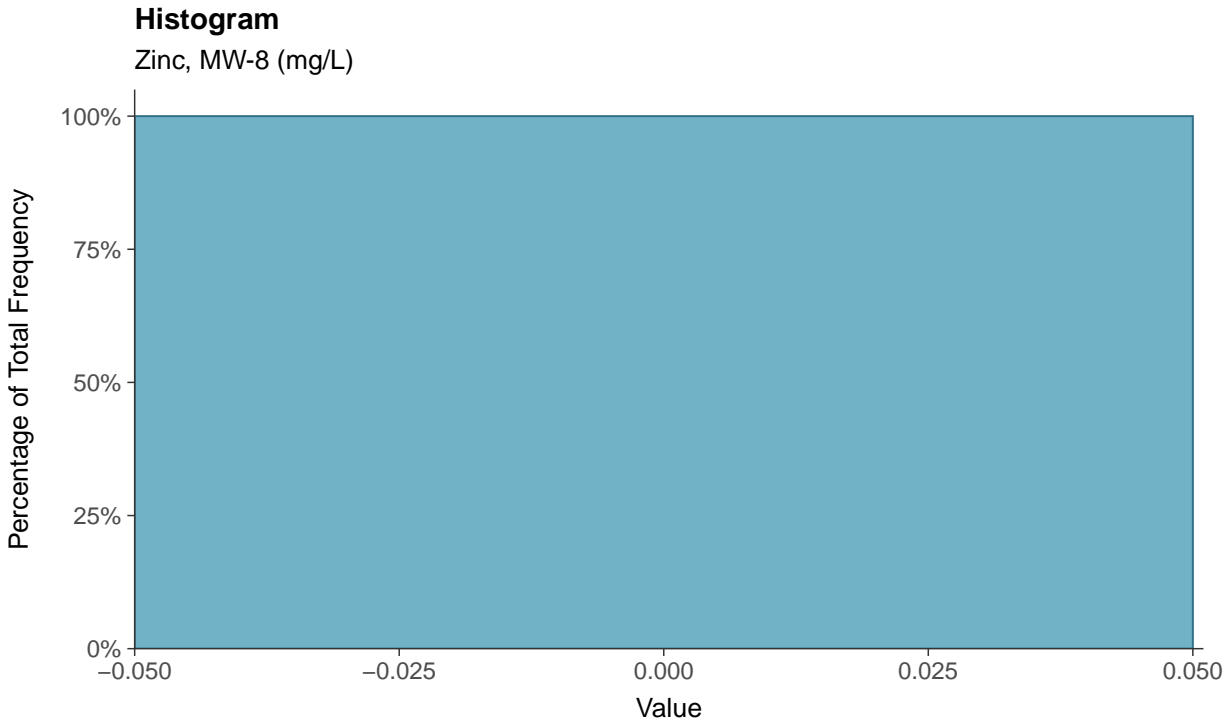
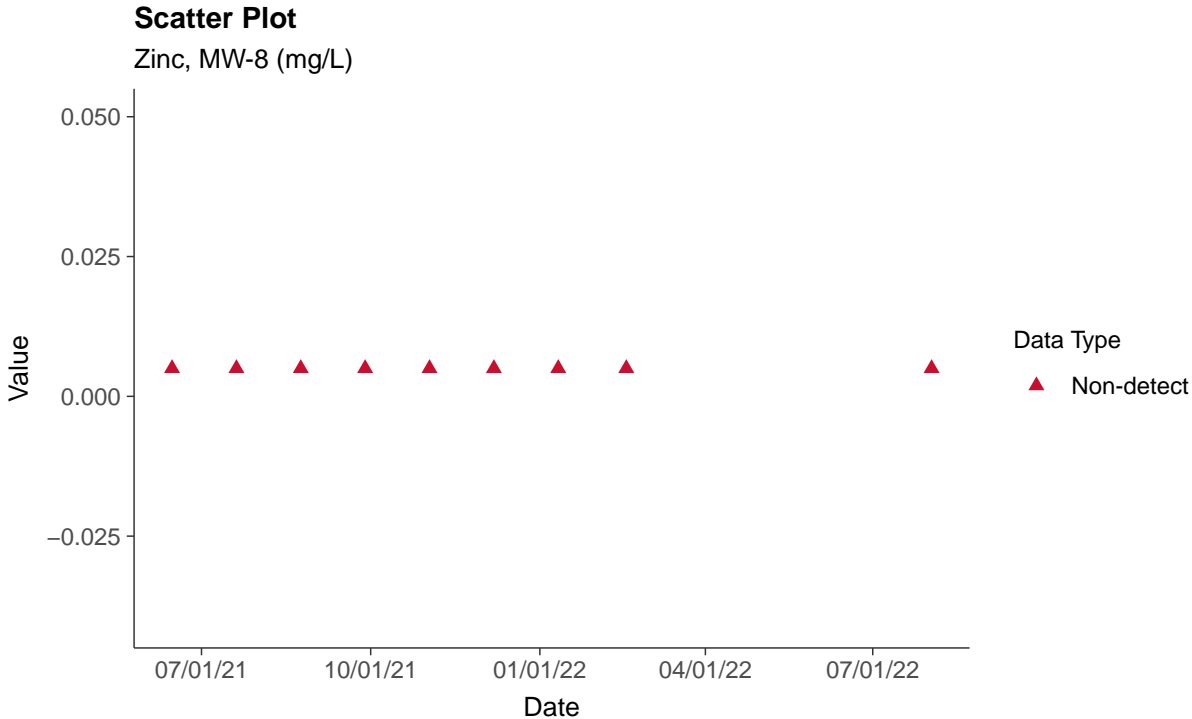
Zinc, MW-7 (mg/L)





**Part 115: Zinc, MW-8**

ID: 5\_41\_08





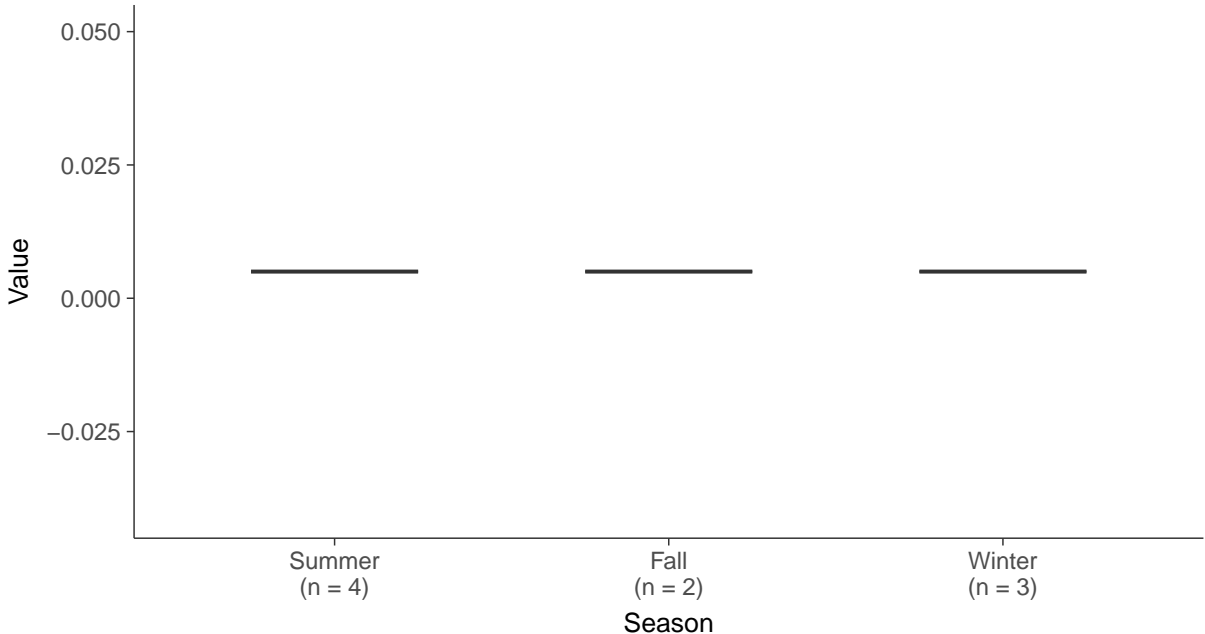
**Boxplot**

Zinc, MW-8 (mg/L)



**Boxplot by Season**

Zinc, MW-8 (mg/L)

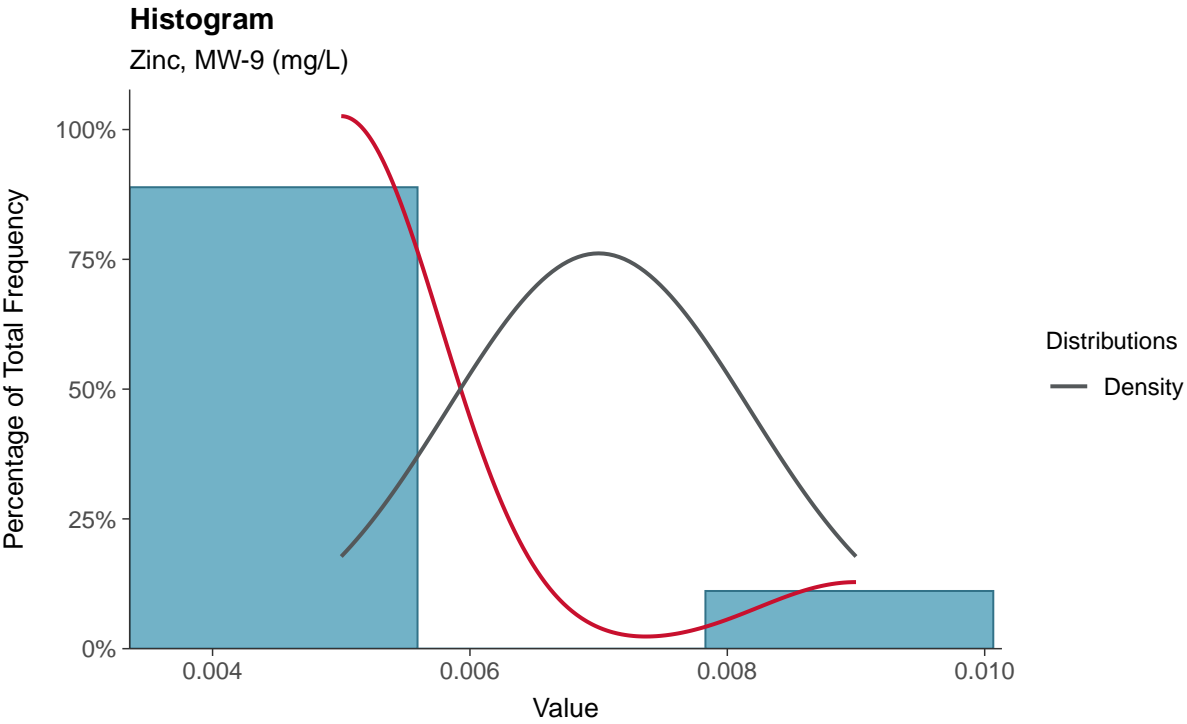
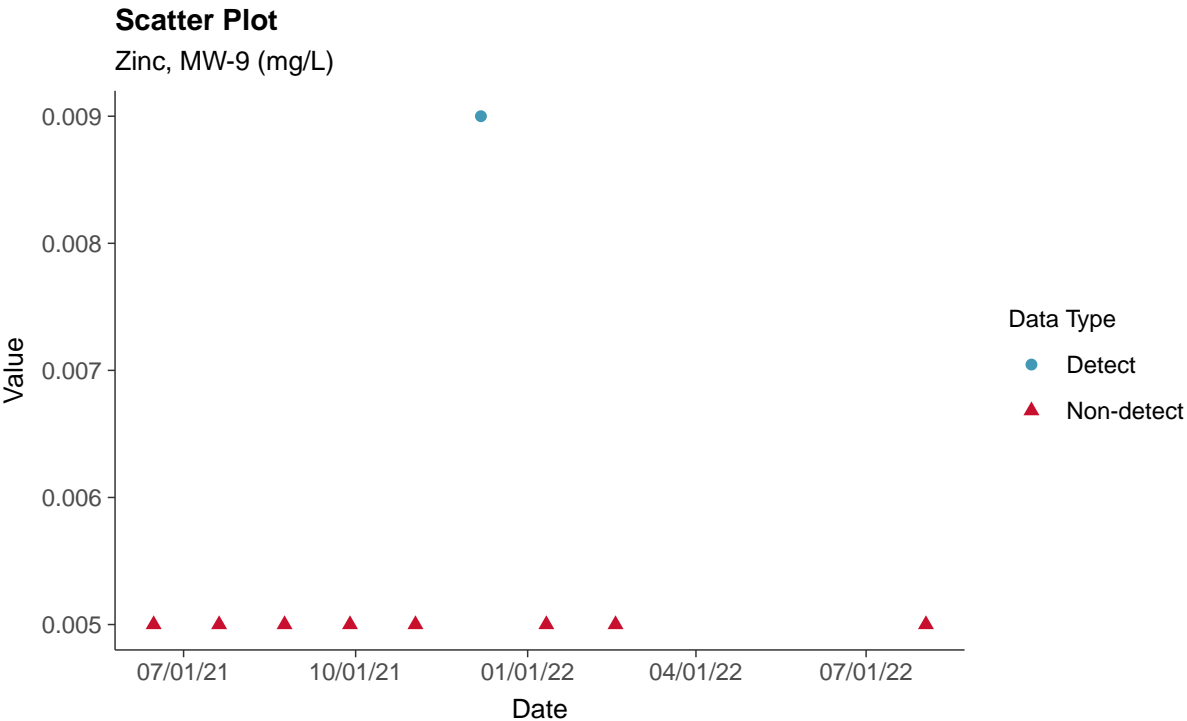






**Part 115: Zinc, MW-9**

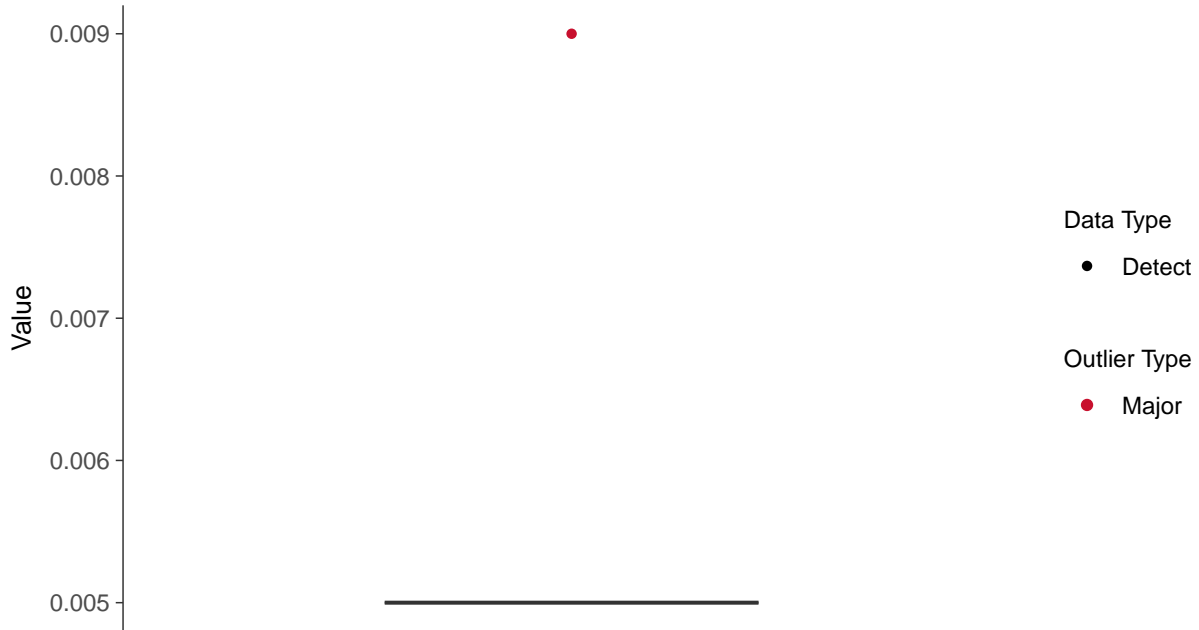
ID: 5\_41\_09





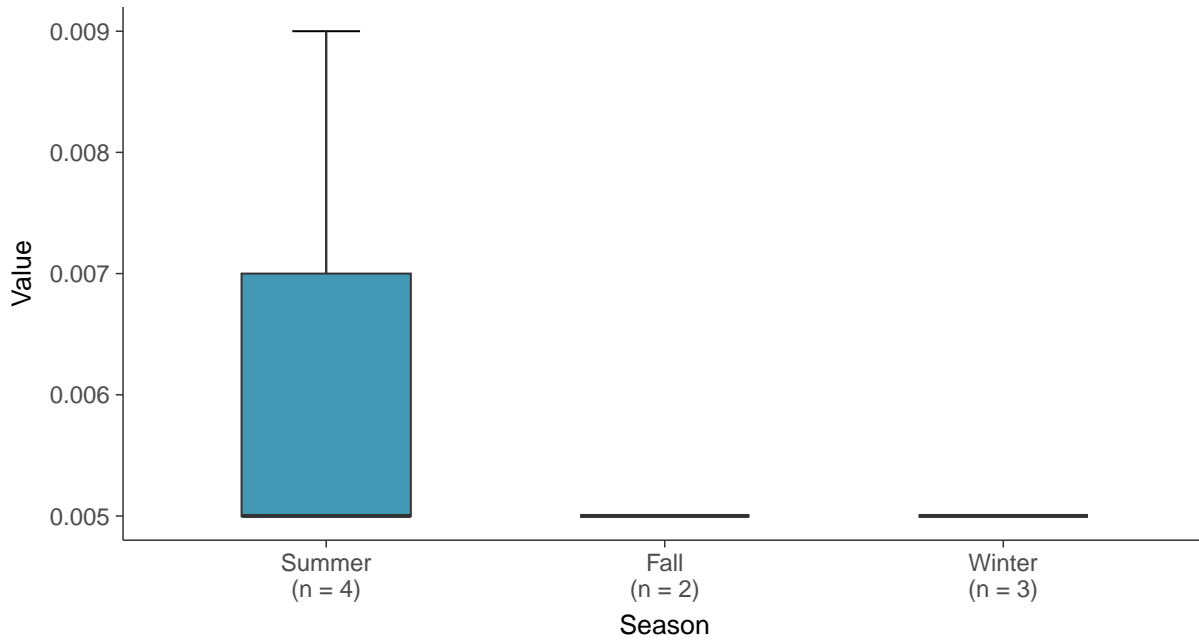
### Boxplot

Zinc, MW-9 (mg/L)



### Boxplot by Season

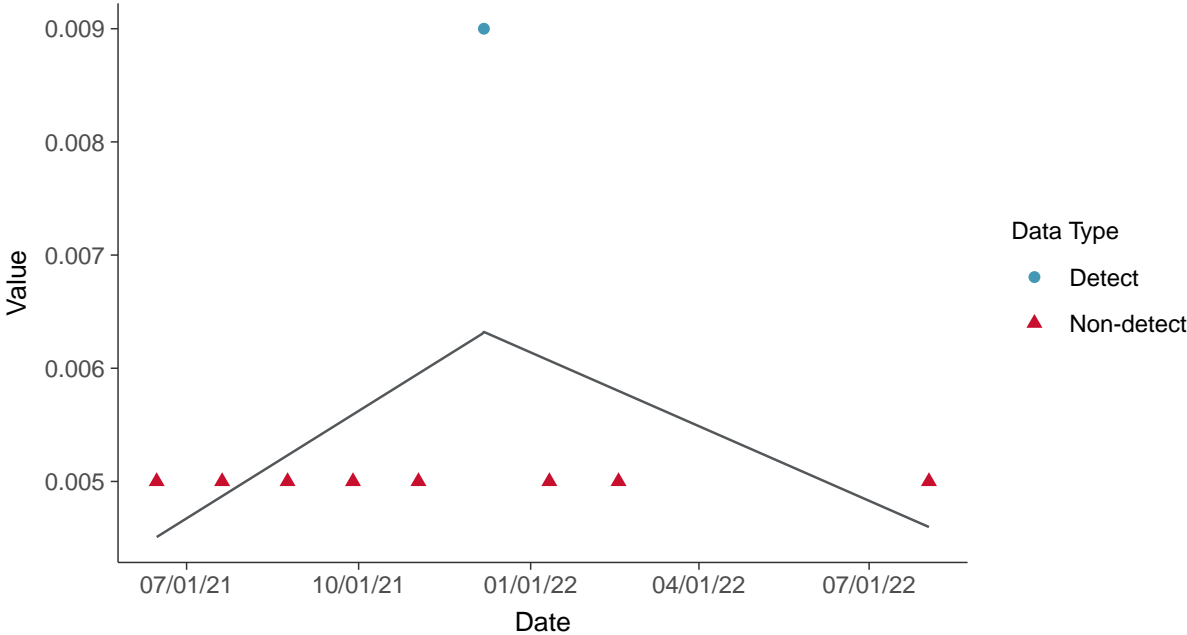
Zinc, MW-9 (mg/L)





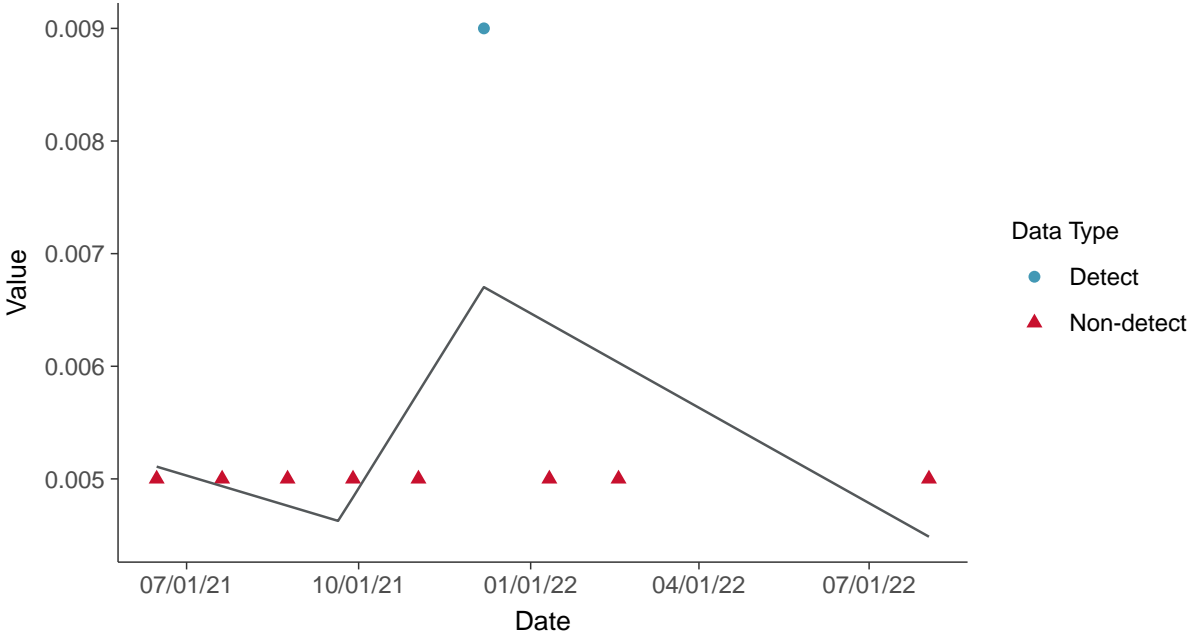
**Trend Regression: Piecewise Linear-Linear**

Zinc, MW-9 (mg/L)



**Trend Regression: Piecewise Linear-Linear-Linear**

Zinc, MW-9 (mg/L)



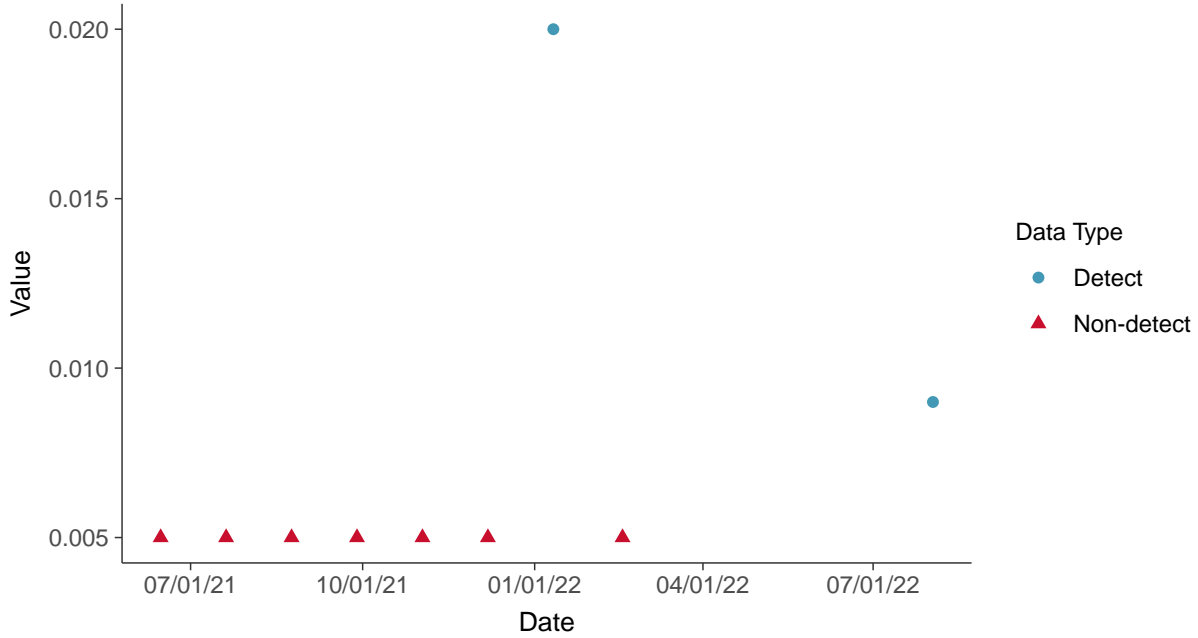


### Part 115: Zinc, MW-10

ID: 5\_41\_10

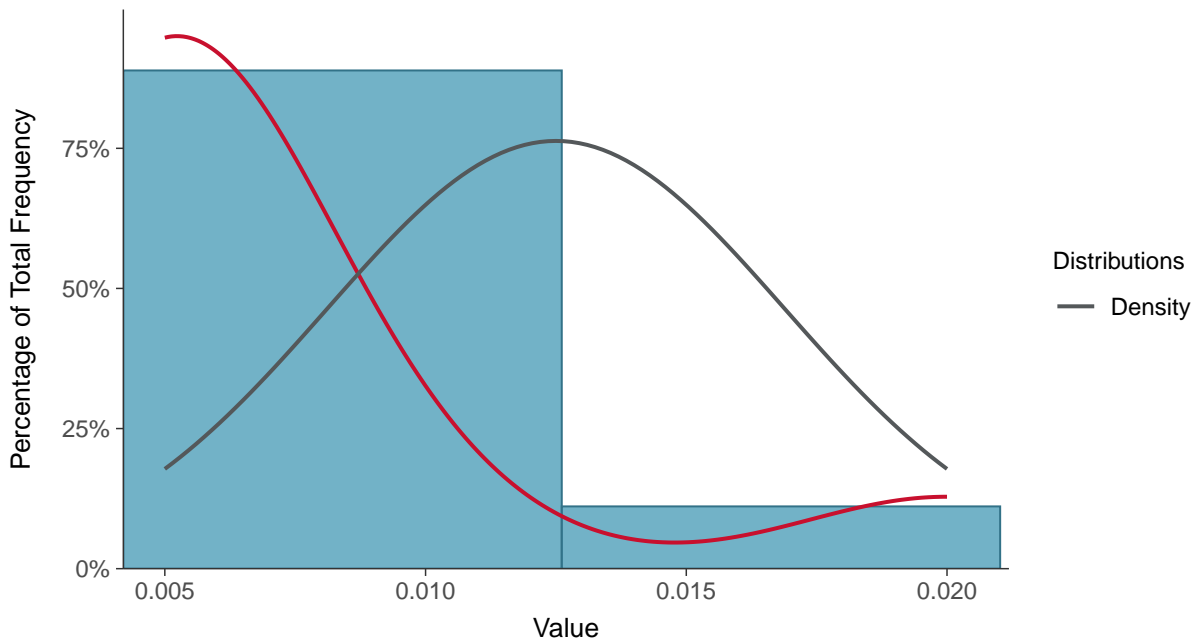
#### Scatter Plot

Zinc, MW-10 (mg/L)



#### Histogram

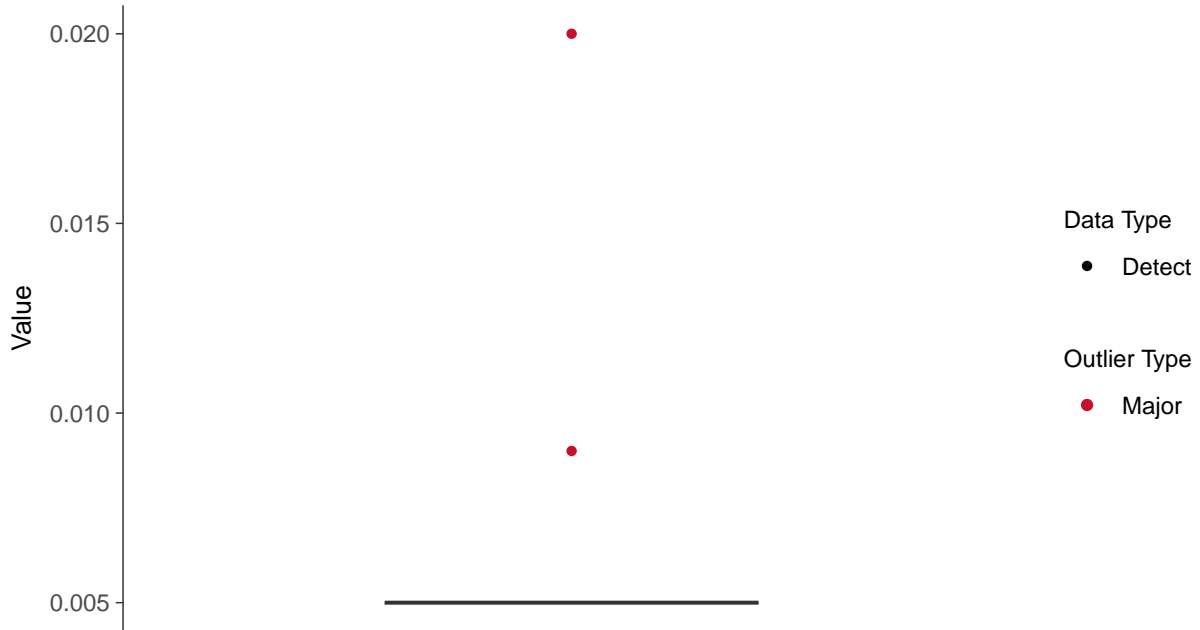
Zinc, MW-10 (mg/L)





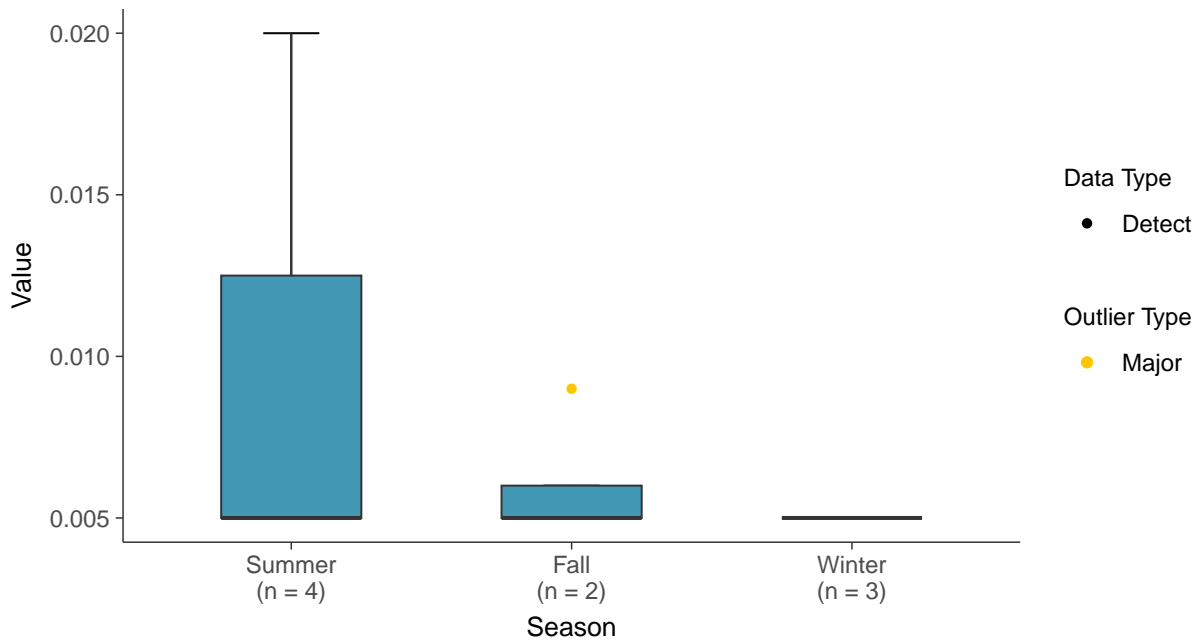
### Boxplot

Zinc, MW-10 (mg/L)



### Boxplot by Season

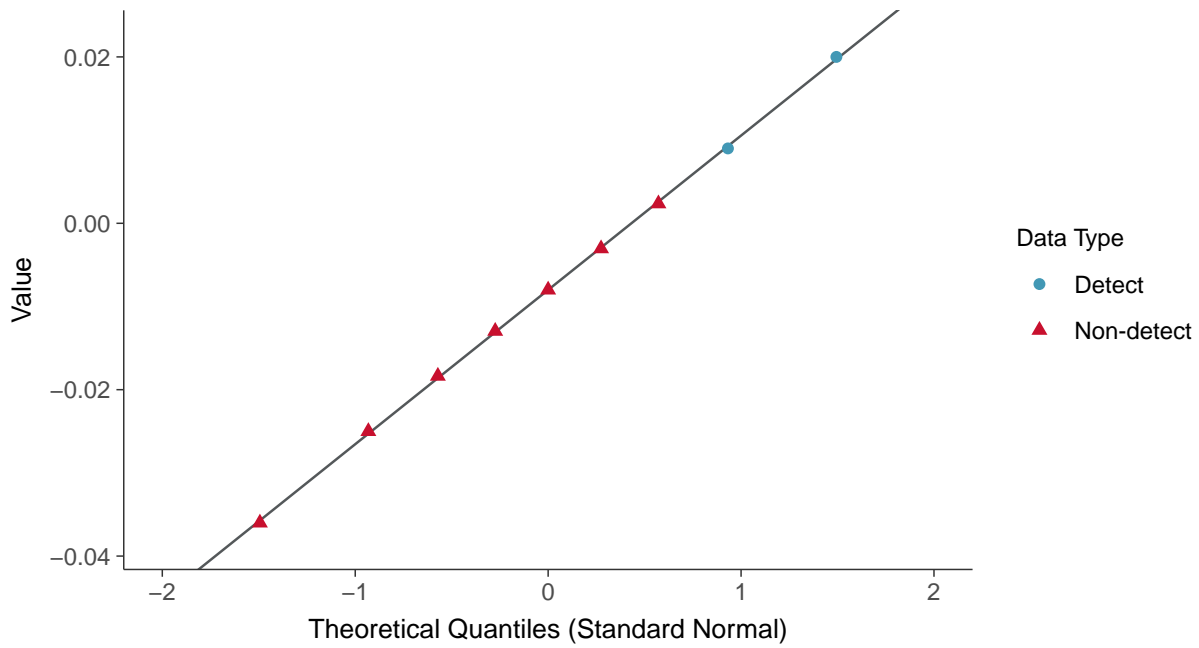
Zinc, MW-10 (mg/L)





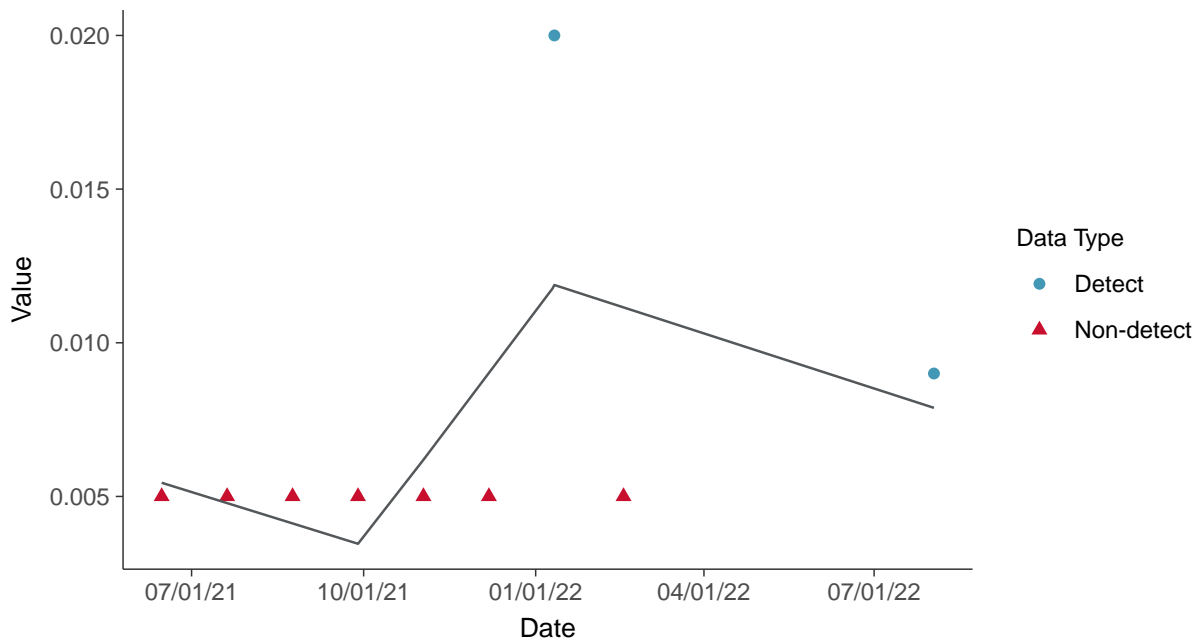
### Normal Q-Q plot using ROS Imputed Estimates

Zinc, MW-10 (mg/L)



### Trend Regression: Piecewise Linear-Linear-Linear

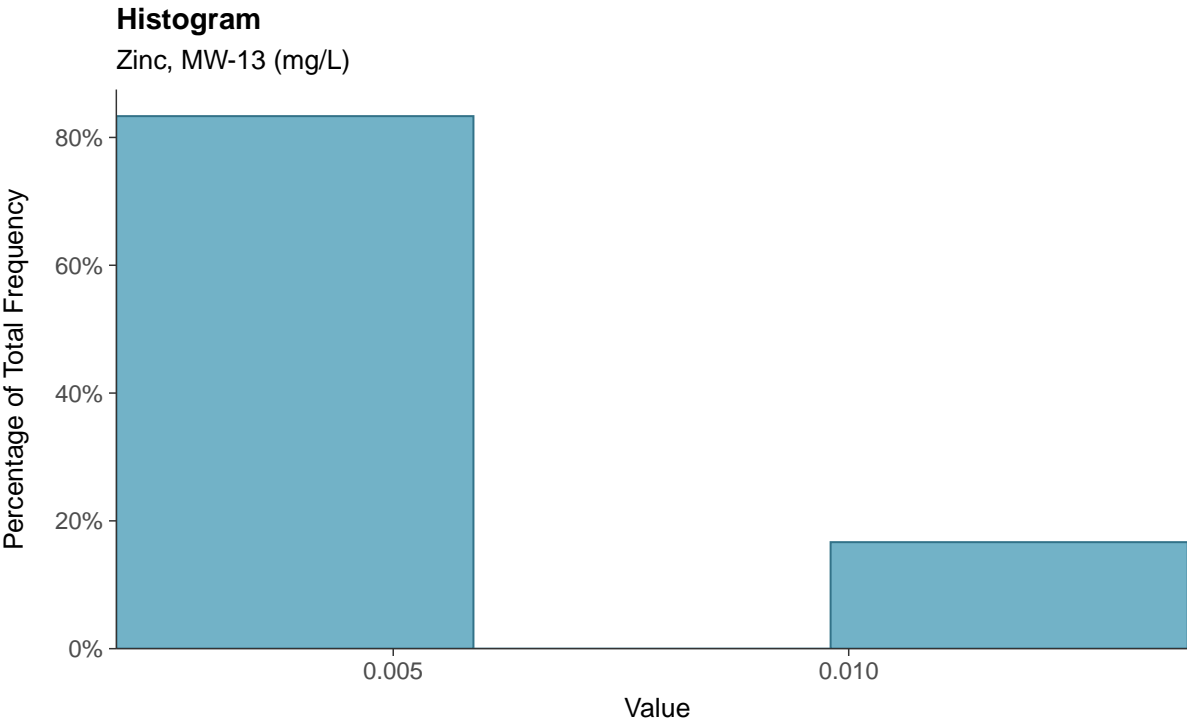
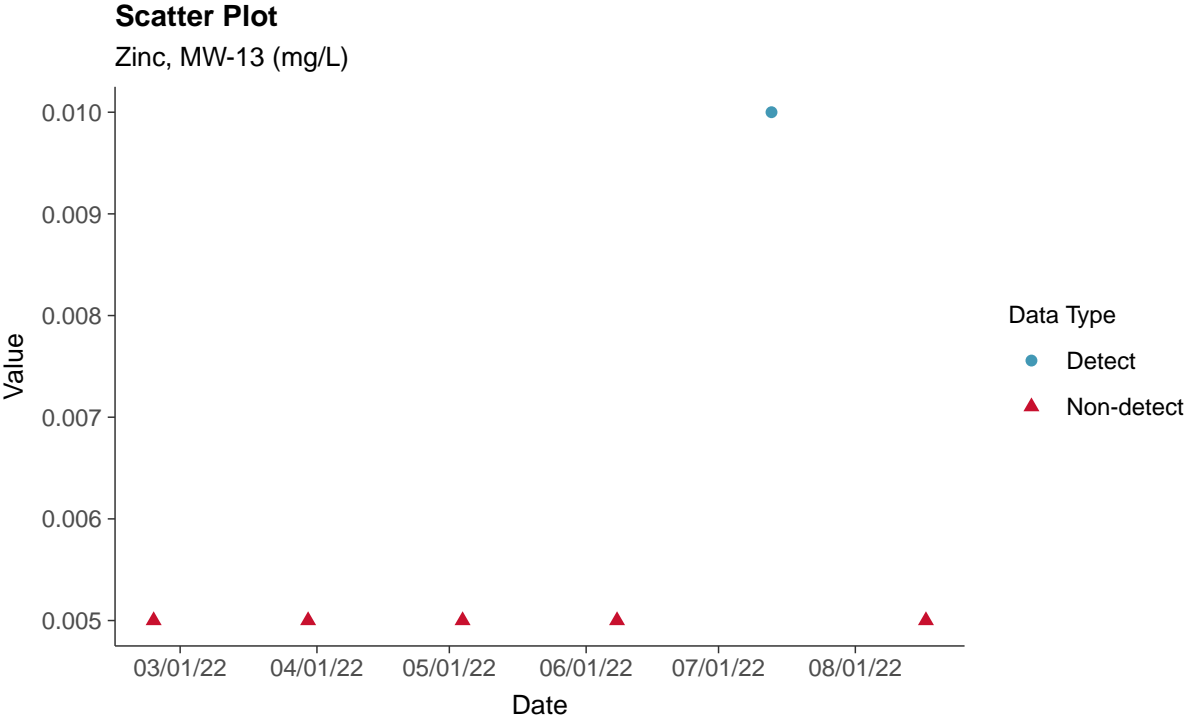
Zinc, MW-10 (mg/L)





**Part 115: Zinc, MW-13**

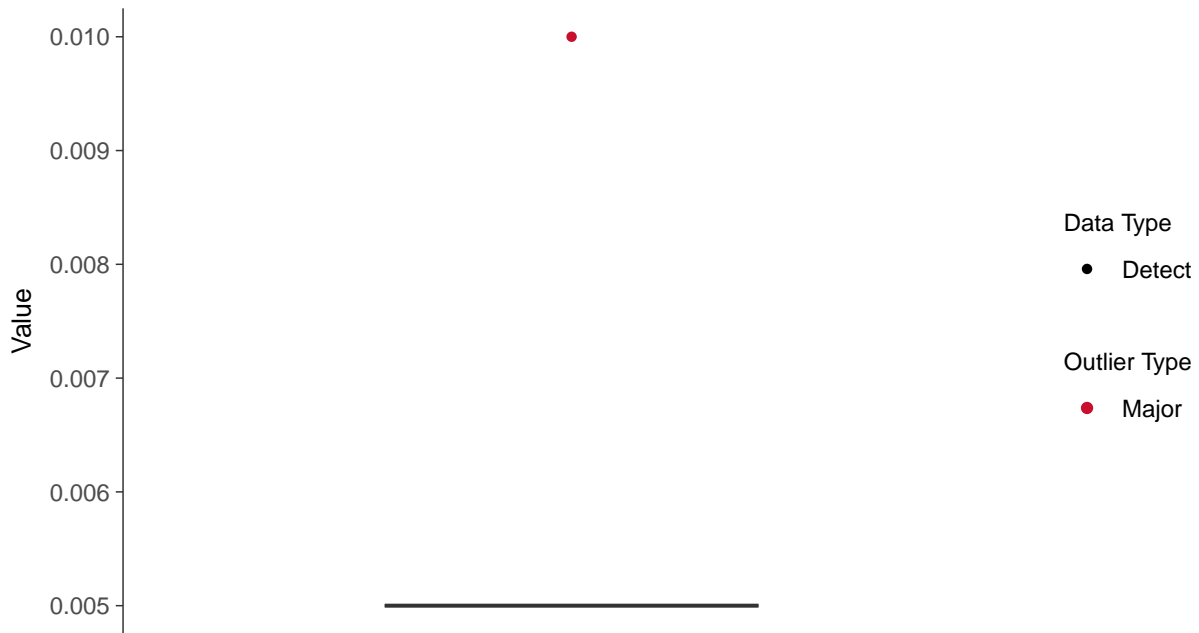
ID: 5\_41\_13





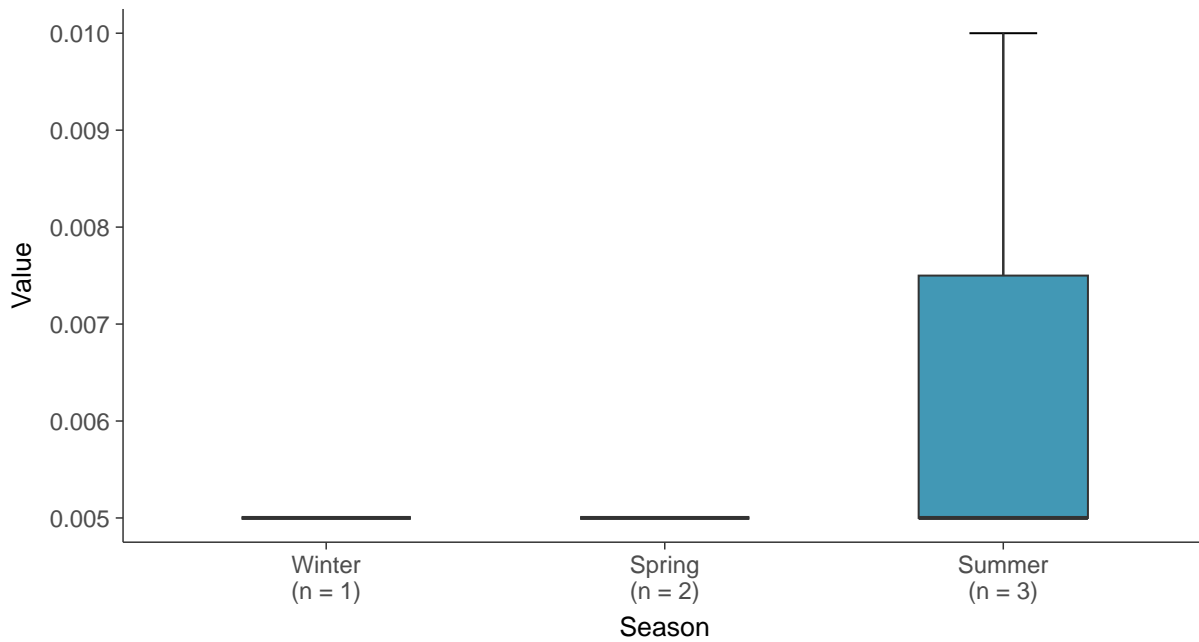
### Boxplot

Zinc, MW-13 (mg/L)



### Boxplot by Season

Zinc, MW-13 (mg/L)

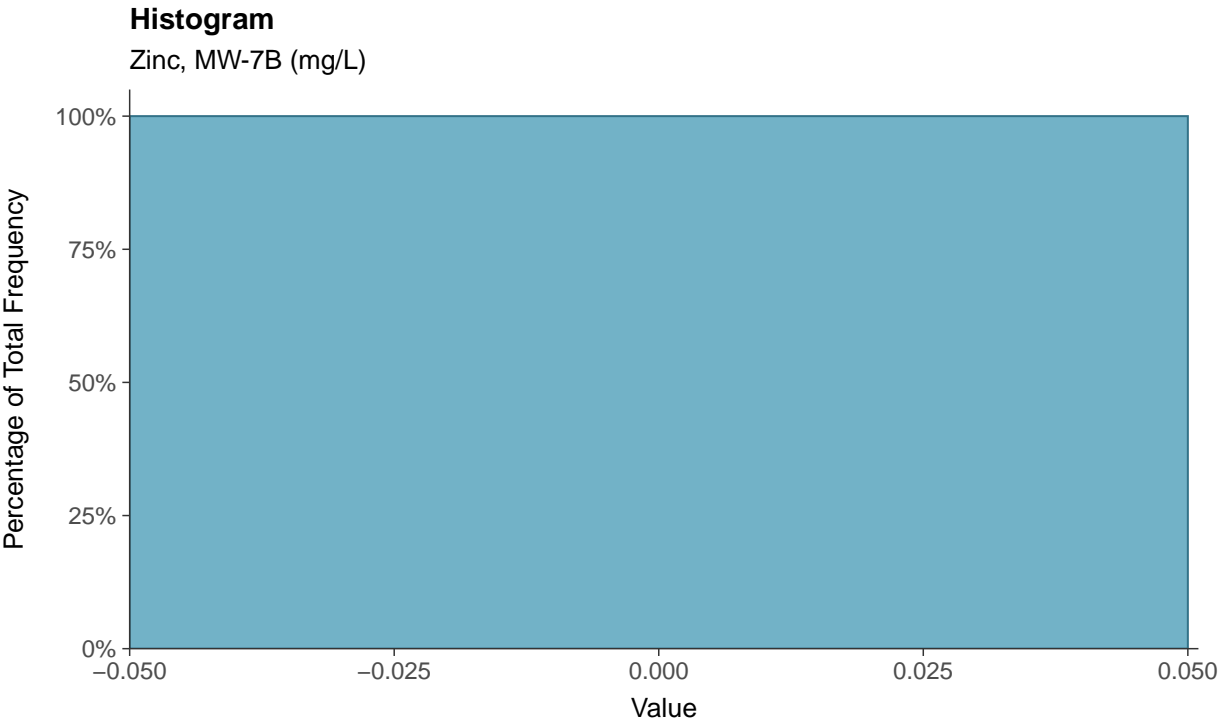
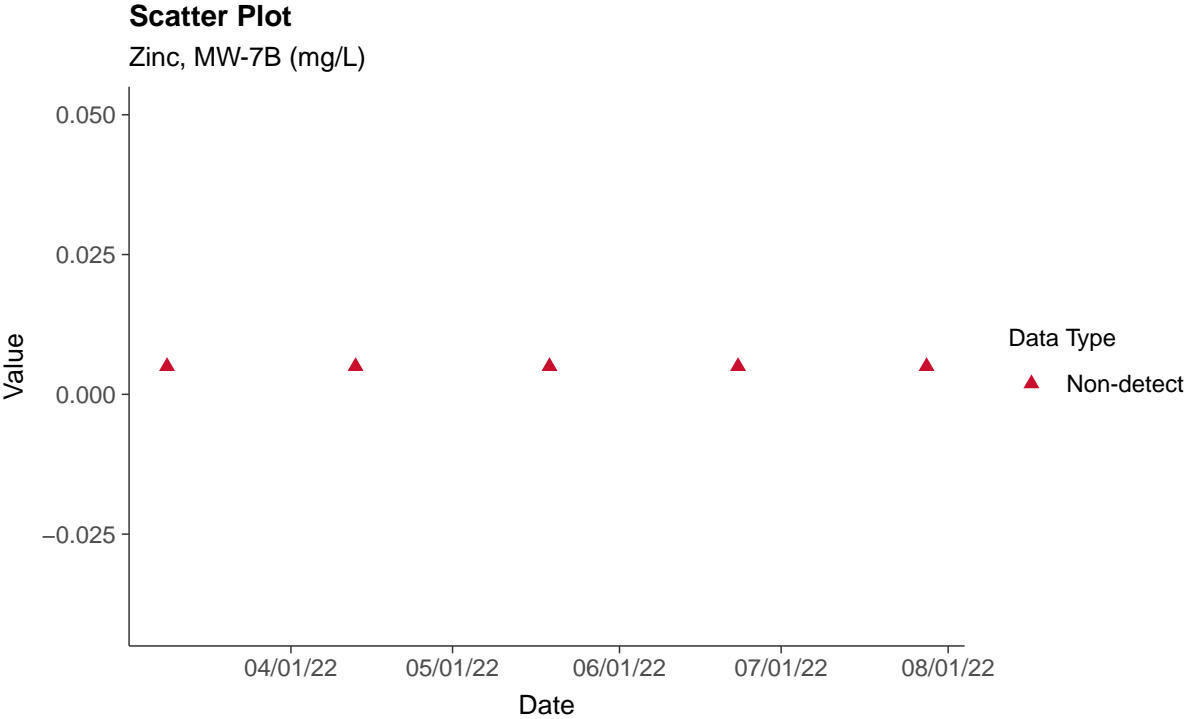






**Part 115: Zinc, MW-7B**

ID: 5\_41\_7B





### Boxplot

Zinc, MW-7B (mg/L)



### Boxplot by Season

Zinc, MW-7B (mg/L)

