



DWSRF PROJECT PLAN







PREPARED BY:

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HUBBELL, ROTH & CLARK, INC CONSULTING ENGINEERS SINCE 1915

2101 Aurelius Road, Suite 2A Holt, Michigan 48842

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Table of Contents

1	Executive Summary	
1.1	Summary	1-1
1.2	Conclusions	1-1
1.3	Recommendations	
2	Project Background	
2.1	Summary of Project Need	
2.2	Study Area Description	
2.3	Population Data	
2.4	Economic Characteristics	
2.5	Cultural and Environmental Settings	
2.6	Existing Water Supply System	
3	Alternative Analysis	
3.1	Alternatives Considered	
3.2	No Action	
3.3	Water Treatment Plant Improvements	
3.4	Operational System Improvements	
3.5	Distribution System Improvements	
3.5	Cost of Alternatives	
3.6	Impacts of Alternatives	
4	Selected Alternatives	
4.1	Proposed Improvements	4-1
4.2	Design Parameters	
4.3	Water Main Installation and Materials	
4.4	Proposed Schedule	
4.5	Cost Estimate	
4.6	User Costs and Cost Sharing	
4.7	Authority to Implement Selected Alternative	
5	Environmental Impacts	5-1
5.1	General	5-1
5.2	Analysis of Impacts	
6	Mitigation	
6.1	Short-Term, Construction Related Mitigation	
6.2	Mitigation of Long-Term Impacts	
6.3	Mitigation of Indirect Impacts	
7	Public Participation	
7.1	General	
7.2	Public Hearing	
7.3	ResolutionError!	Bookmark not defined.



List of Figures

Figure 2-1, Water System Service Area	2-2
Figure 2-2. BWL Water Distribution System	2-3
Figure 2-3. BWL Zoning Map	2-4
Figure 2-4. Future Land Use Map	2-5
Figure 2-5 Wetlands Map	2-11
Figure 2-6. City of Lansing and Surrounding Area Floodplain Map A	2-12
Figure 2-7. City of Lansing and Surrounding Area Floodplain Map B	2-13
Figure 2-8. City of Lansing and Surrounding Area Floodplain Map C	2-14
Figure 2-9. City of Lansing and Surrounding Area Floodplain Map D	2-15
Figure 2-10. City of Lansing and Surrounding Area Floodplain Map E	2-16
Figure 2-11. City of Lansing and Surrounding Area Floodplain Map F	2-17
Figure 2-12. City of Lansing and Surrounding Area Floodplain Map G	2-18
Figure 2-13. City of Lansing and Surrounding Area Floodplain Map H	2-19
Figure 2-14. City of Lansing and Surrounding Area Floodplain Map I	2-20
Figure 2-15. City of Lansing and Surrounding Area Floodplain Map J	2-21
Figure 2-16. City of Lansing and Surrounding Area Floodplain Map K	2-22
Figure 2-17. City of Lansing and Surrounding Area USGS Topo Map A	2-23
Figure 2-18. City of Lansing and Surrounding Area USGS Topo Map B	2-24
Figure 2-19. City of Lansing and Surrounding Area USGS Topo Map C	2-25
Figure 2-20. City of Lansing and Surrounding Area USGS Topo Map D	2-26
Figure 2-21. City of Lansing and Surrounding Area USGS Topo Map E	2-27
Figure 2-22. City of Lansing and Surrounding Area USGS Topo Map F	2-28
Figure 2-23. City of Lansing and Surrounding Area USGS Topo Map G	2-29
Figure 2-24. City of Lansing and Surrounding Area USGS Topo Map H	2-30
Figure 2-25. City of Lansing and Surrounding Area USGS Topo Map I	2-31
Figure 2-26. City of Lansing and Surrounding Area USGS Topo Map J	2-32
Figure 2-27. City of Lansing and Surrounding Area USGS Topo Map K	2-33
Figure 2-28. City of Lansing and Surrounding Area USGS Topo Map L	2-34
Figure 2-29. City of Lansing and Surrounding Area USGS Topo Map M	2-35
Figure 2-30. City of Lansing and Surrounding Area USGS Topo Map N	2-36
Figure 2-31. City of Lansing and Surrounding Area USGS Topo Map O	2-37
Figure 2-32. City of Lansing and Surrounding Area USGS Topo Map P	2-38
Figure 2-33. City of Lansing and Surrounding Area USGS Topo Map Q	2-39
Figure 2-34. City of Lansing and Surrounding Area USGS Topo Map R	2-40
Figure 2-35. City of Lansing and Surrounding Area USGS Topo Map S	2-41
Figure 2-36. Dye WCP Treatment Process	2-43
Figure 3-1. Project and Improvement Locations Overview	3-2

List of Tables

Table 2-1 Population Projections	2-6
	2-0
Table 2-2. Study Area Household Income	2-7
Table 2-3. High Serivce Pumping at WCPs	2-44
Table 2-4.Water Storage	2-44
Table 2-5. Water Main Length by Pipe Diameter	2-46
Table 2-6. Water Main Length by Material	2-46



Table 2-7. Distribution System Booster Stations	2-47
Table 3-1. Summary of SRF Projects (by Fiscal Year)	3-5
Table 4-1. Fiscal Year of WTP Projects	4-1
Table 4-2. Fiscal Year of Distribution System Projects	4-1
Table 4-3. Project Plan Task Schedule	4-2
Table 4-4. Residential Water Connections	4-3
Table 4-5. Estimated User Cost Summary by Phase	4-4

List of Appendices

- Appendix A: Agency Correspondance Appendix B: Nationwide Rivers Inventory
- Appendix C: Web Soils Survey Results
- Appendix D: Michigan Natural Features Inventory Endangered Species
- Appendix E: Detailed Cost Estimates
- Appendix F: Public Participation Documentation



1.1 Summary

This Project Plan was prepared for the BWL to address Water Conditioning Plant (WCP) and Water Distribution System deficiencies and aging facilities. This Project Plan, as prepared by Hubbell, Roth & Clark, describes the existing condition of various Drinking Water Distribution System components and the BWL's WCPs with alternatives to meet those needs and the most cost-effective alternative.

The Project Plan will be submitted to the Michigan Department of Environment, Great Lakes, and Energy (EGLE) in order to qualify for possible Drinking Water State Revolving Fund (DWSRF) loan assistance. While the rates have not been set yet for FY2023, the rates in 2022 is 1.875% for 20-year loans and 2.125% for 30-year loans. The Project Plan has been prepared following the DWSRF Project Plan Preparation Guidance Outline administered by The Office of Drinking Water and Municipal Assistance. These rules call for compliance with the basic Federal Planning Requirements and the National Environmental Policy Act (NEPA). The Project Plan will also serve as the basis for project prioritization and must be submitted to EGLE by July 1, 2022, in order to be considered for funding on the project priority list for the fiscal year 2023. These projects below provide an initial framework for evaluation and assessment.

1.2 Conclusions

The following is a summary of the existing issues identified in the 2021 Water Reliability Study and recommended by the BWL.

- Water Treatment Plant Improvements
 - Dye WCP Convert Ammonia Systems to Aqueous Forms
 - BWL plans to convert to Aqueous Forms to reduce potential significant safety hazards associated with current plant operations. The equipment is currently at the end of its life cycle and in need of replacement.
 - Dye WCP Chemical Handling Project Phase B
 - BWL plans to update the dry chemical handling through three phases. The second phase (Phase B) addresses the lime chemical issues primarily the delivery and slaking equipment. This phase includes tasks such as lime bin slide gates, lime bin 9" screw feeders, lime screw feeder discharge chute, lime slaking equipment and controls, demo of existing chemical feed equipment, and miscellaneous electrical improvements.
 - Wise Rd WCP New Chemical Building
 - BWL plans to construct a chemical building adjacent to the storage room to include an additional 2,350-gallon storage tank, a day tank and chemical metering pumps. The storage facility will accommodate full truckload delivery of chemicals on a monthly basis with adequate reserve for 30 days of operation to ensure the water quality of the system.
- - Elevated Storage Evaluation and Implementation
 - o BWL plans to construct an elevated storage to increase the reliability of the system
 - Well Drilling to replace aged wells



- BWL plans to replace two (2) wells per year to improve the reliability of the system
- - Water Main Replacements (multiple locations throughout BWL jurisdiction)
 - o BWL plans to replace significantly aged section of water main (i.e., 100 year old water main)
 - Raw Water Main Installation
 - o 2,300 linear feet of raw water main to connect Hughes Rd well (drilled in 2020) to existing network

1.3 Recommendations

The BWL should pass a resolution formally adopting the Project Plan and agree to implement the Drinking Water Distribution System and Water Treatment Plant Improvements outlined herein.

The BWL should submit this report to EGLE in order to attempt to qualify for a low-interest loan through the DWSRF Loan Program.

The John F. Dye Water Conditioning Plant is experiencing significant problems with the lime and soda ash systems. This project is one phase of the overall dry chemical handling project which consist of three separate phases. The first phase (Phase A) addresses the severe dust issues associated with chemical delivery. The second phase (Phase B) addresses the lime chemical issues primarily the delivery and slaking equipment. The third phase (Phase C) is similar to Phase B, but is associated with the soda ash systems.. The phase the BWL is seeking funding for includes tasks such as lime bin slide gates, lime bin 9" screw feeders, lime screw feeder discharge chute, lime slaking equipment and controls, demo of existing chemical feed equipment, and miscellaneous electrical improvements.



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1-2

2 Project Background

2.1 Summary of Project Need

In an effort to meet various recently revised State requirements, improve system reliability, and address aging infrastructure that has reached its useful life, the BWL is proposing various projects within their Drinking Water Distribution System seeking financial assistance for this work through a low-interest rate loan offered by EGLE. This Project Plan identifies projects that will include improvements to both the water treatment plant and the distribution system on a fiscal year basis.

2.2 Study Area Description

2.2.1 Delineation of Study Area

The BWL located in Lansing, Michigan, is a regional system supplying water to the City of Lansing and a large portion of the surrounding community. The study area includes the BWL service area. The water system supplies water for 208,909 retail and wholesale customers. The retail customers include the entire City of Lansing, and portions of Alaiedon Township, Bath Township, City of Dewitt, Delhi Township Dewitt Township, Lansing Township, Watertown Township and Windsor Township. The wholesale customers include Lansing Township West Side water, Delta Township and the East Lansing Meridian Water & Sewer Authority (feed to south side of Merdian Township).

Figure 2-1 illustrates the BWL service area. Figure 2-2 presents the major water system components, including water treatment facilities and booster stations.

2.2.2 Land Use

The existing land use in the study area varies greatly from agriculture, residential to heavy residential and industrial. All of the Townships and Cities have residential located within. The townships all contain some agricultural use. City of Dewitt, East Lansing and Lansing all contain commercial and mixed use. Delta Township, Delhi Township, Windsor Township and City of Lansing also contain industrial areas. The City of Lansing metropolitan area, in which the proposed project is located, is the industrial, commercial, and institutional center for central Michigan. Major existing commercial areas are located along arterial roadways, including Cedar Street, Martin Luther King Jr. Boulevard, Pennsylvania, Washington Avenue, east of Pennsylvania Avenue in southeast Lansing, between I-496 and the Grand River, along Sunset Avenue and North Grand River Avenue, and along the Larch/Cedar Streets corridor from the Grand River north to the corporate limits.

Public and institutional properties are distributed across the City, with a concentration in the core downtown area. Single and multifamily residential properties and parks fill out most of the remaining areas. Future land use and development is generally expected to parallel existing use, while moving toward implementation of Smart Growth principles such as: development of existing communities, mixed land uses, walkable neighborhoods, and preservation of open space. Land use across the study area can be seen in Figure 2-3.











2.2.3 Water Demands

The existing project areas are comprised of residential, commercial, and industrial properties. The proposed project areas are largely built out, and not much growth is expected.

2.3 Population Data

The City of Lansing's 2010 population, in which the proposed project is located, was reported at 114,297 by the U.S. Census Bureau. This was down approximately 4% from 119,100 recorded in the 2000 census, and down by just over 10% compared to the 127,321 population recorded in the 1990 census. Michigan is projected to gain population at a modest rate of approximately 0.1% per year during the period 2010-2040 (*The Economic and Demographic Outlook for Michigan*, March 2012, Institute for Research on Labor Employment and the Economy, University of Michigan), and Ingham County is expected to slightly exceed Michigan's projected growth rate. The Tri-County Regional Transportation Plan estimates an annual growth rate of 0.4% for the 2010-2040 period. Table 2-2 shows the 2010 census population for all the communities that the BWL services, and projected population over the next, 5, 10 and 20 years. It should be noted that this represents the population of the entire jurisdictional boundary and may not reflect the BWL service territory.

Unit of Government	Census Population	Census Population	Project Planning Period Calculated Population (5 yr., 10 yr., 20 yr.)		
	2010	2020	2025	2030	2040
Alaiedon Township	2,894	2,910	3,059	3,548	4,325
Bath Township	11,598	13,292	13,970	14,683	17,899
City of Dewitt	4,507	4,776	5,019	5,275	6,431
City of Lansing	114,297	112,644	118,390	124,429	151,679
Delhi Township	25,877	27,710	29,124	30,610	37,314
Dewitt Township	14,321	15,073	15,842	16,650	20,297
Lansing Township	8,126	8,143	8,559	8,996	10,966
Meridian Township	39,688	43,916	46,157	48,512	59,136
Watertown Township	4,836	5,563	5,847	6,145	7,491
Windsor Township	6,838	7,140	7,504	7,378	8,994
Wholesale – Delta Twp	32,408	33,119	34,809	36,585	44,597

Table 2-1. Population Projections

2.4 Economic Characteristics

The major industries in the City of Lansing are Government (15,729 people), Education (13,397 people), Healthcare (10,600 people), Manufacturing (9,059 people), and Insurance (5,078 people). The median household income for the City of Lansing was \$41,674 in 2019. The median household income is approximately 27.07% lower than the median Michigan household income and 38.28% less than the U.S. median household income. Table 2-3 shows the City of Lansing, City of Dewitt, Ingham County, Eaton County, Delhi Township, Delta Township, Lansing Township, Meridian Township, Watertown Township, and Windsor Township median household income comparison below.



Municipality	Median Annual Household Income
City of Lansing	\$41,674
City of Dewitt	\$66,213
Ingham County	\$52,872
Eaton County	\$64,348
Delhi Township	\$66,498
Delta Township	\$67,930
Lansing Township	\$47,524
Merdian Township	\$72,463
Watertown Township	\$82,542
Windsor Township	\$74,913

Table 2-2. Study Area Household Income

*Source: https://www.census.gov/quickfacts/lansingcitymichigan

2.5 Cultural and Environmental Settings

2.5.1 Cultural Setting

The City of Lansing has 1 historical district and 9 historical properties listed under the National Register of Historic Places. The State Historic Preservation Office (SHPO) is to be contacted for proposed work within the affected Historic Districts. The relatively shallow excavations needed to complete the proposed work will be contained within public right-of-way and on private properties. All the proposed work will occur at the same location as existing facilities and lines. Restoration of surface features disturbed by this construction will match existing conditions as much as practicable. Therefore, there is no anticipated permanent impacts on any historical, archeological, geological, cultural, or recreational areas due to this construction. EGLE will be coordinating with the SHPO for final determination of historic properties impacted.

2.5.2 The Natural Environment

<u>Climate</u>

The project area's climate is controlled by its location with respect to major storm tracks that pass through the Midwest and by the influence of Lake Michigan. Lake Michigan tends to moderate and smooth out most climate extremes. Consequently, the city generally experiences warm, mild summers and severe winters. The summer high is around 82 degrees Fahrenheit, and the winter low is around 16 degrees Fahrenheit. Precipitation is distributed through all months of the year. Lake-effect snowfall constitutes a large percentage of the total annual snow accumulation, which averages around 46 inches. Periods of snowfall typically last from November to April, although light snow as late as May or as early as late September sometimes occur. Rain averages around 33 inches annually.



The growing season averages 179 days in length. Average date of the last freezing is May 4; average date of the first freezing temperature is October 5.

Climatological data is collected by the National Oceanic and Atmospheric Administration (NOAA). This project, and the alternatives discussed, will have no impact on the climate of the project.

Air Quality:

Mobile source emissions, mainly from automobiles, are the primary source of outdoor air pollution in this area. No noise pollution problems exist in residential areas, other than from traffic noise from adjacent major roadways. Commercial and business areas experience only normal traffic noise.

Air quality is not anticipated to be an issue for this project, apart from temporary dust and debris from construction and minimal odors from the Cured-in-Place-Pipe curing material. All necessary notifications will be distributed to the public when this occurs and all regulations for this odor will be followed.

Wetlands:

There are no localized wetlands within the existing project footprint where the work is anticipated. For final design, any wetlands that may be impacted would be flagged and the appropriate EGLE and USACE permits will be applied for. However, it is not anticipated to be an issue for this project. Wetland maps are shown in Figure 2-5.

Coastal Zones

There are no coastal zones in the project area.

Floodplains & Surface Waters:

The study area is located in three watersheds including the Red Cedar River Watershed, the Grand River Watershed, and the Looking Glass River Watershed. The Red Cedar River Watershed encompasses 461 square miles, in Livingston and Ingham Counties and flows into the Grand River in Lansing. The Grand River Watershed encompasses 5,572 square miles that flows into Lake Michigan and located in Hillsdale, Jackson, Ingham, Eaton, Clinton, Ionia, Kent, Ottawa, Newago, and Muskegon Counties. The Looking Glass River Watershed encompasses 312 square miles that flows into the Grand River in Portland, primarily in Shiawassee and Clinton Counties, with small areas in Ingham, Ionia, Livingston, and Eaton Counties.

Area groundwater is used as a source of drinking water by the BWL. The water supply for the service area is obtained via 125 existing wells that go to the BWL Water Treatment Plant. There will be no major impacts to the great lake coastal zones, floodplains, and surface waters, however, proper permits will be acquired, and steps will be taken to avoid any damage or permanent disruption which could affect the nearby floodplain. Any work which impacts the floodplain will only be undertaken after first contacting EGLE and obtaining the appropriate permits.

FEMA floodplain maps are shown in Figure 2-6 to Figure 2-27.



Natural or Wild and Scenic Rivers:

The scope of this project is throughout the City of Lansing and surrounding townships and cities. There are no Wild and Scenic Rivers in the project area that will be impacted by the projects. The location of the improvements and construction will be planned to not occur or impact the nearby rivers. See Appendix B for the attached documentation of the Nationwide Rivers Inventory correspondence.

Major Surface Waters

Figure 2.1 presents the overall study area and major surface waters, including the Grand and Red Cedar Rivers, and Sycamore Creek.

Agricultural Resources

There are no prime agricultural resources in areas of proposed work.

National Natural Landmarks:

The Toumey Woodlot is the only registered natural landmark in Ingham County. The site is located outside of the BWL service limits; therefore, no National Natural Landmarks will be affected.

Topography:

The terrain within the City of Lansing and surrounding area is characterized as relatively flat but has low spots near the Grand River. The lowest point at about 805.5 feet above sea level along the Grand River in the City. The highest point is about 800 feet above sea level on the far south side of Lansing near the Northrup Street and Cedar Street intersection.

A set of United States Geological Survey (USGS) topography maps of the city and surrounding townships and cities are shown in Figure 2-28 through Figure 2-35.

Geology:

Three types of bedrock make up the bedrock surface in the City of Lansing and surrounding area, Grand River Formation, Saginaw Formation and Red Beds, which are Meso–Cenozoic continental sedimentary strata that are mainly composed of gravel stone, sandstone, siltstone, mudstone, and shale.

Soils:

According to the USDA Natural Resources Conservation Service Web Soil Survey, the City of Lansing and surrounding area the 4 main soils located within the City are Loamy Sand (65%), Sandy Loam (15%), Clay (5%) and Mucks and Peats (15%). See Appendix C for documentation of the Web Soil Survey results.

As part of the final design process, soil borings will be taken near the proposed work areas to determine if any special construction methods will be needed.

Agricultural Resources:

There is no agricultural land located within the project limits. The project area is within developed and human use land cover; therefore, no agricultural resources will be impacted by the proposed work.



Fauna and Flora

According to the U.S. Fish and Wildlife Service website, the Indiana Bat is the only possible endangered species in the project area. Indiana Bats are found over most of the eastern half of the United States. Almost half of them hibernate in caves in southern Indiana. They hibernate during winter in caves or, occasionally, in abandoned mines. During summer, they roost under the peeling bark of dead and dying trees. Indiana Bats eat a variety of flying insects found along rivers or lakes and in uplands.

The Northern long-eared bat is a possible threatened species in the project area. Northern long-eared bats hibernate in caves and mines. They swarm in surrounding wooded areas in autumn. The bats roost and forage in upland forests during spring and summer.

The proposed project includes sewer and water main work in established road ROWs and developed urban areas. If any tree removal is necessary during construction, it will be completed between November 15 and March 31 to comply with bat restrictions. Consideration will also be taken for migratory birds if nesting areas may be impacted by the project.

A list of all endangered and threatened species generated by the Michigan Natural Features Inventory can be seen in Appendix D.





This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local disringer sources of small size. The community map repeakacy should be consulted for possible updated or additional flood hazard information.

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Please refer to the separately printed Map Index for an overview map of th countr showing the layout of map panels, community map repository address and a Listing of Communities table containing National Flood Insurance Progradates for each community as well as a listing of the panels on which each community

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FIGURE 2.6

FLOODPLAINS MAP

2022 DWSRF Project Plan



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FIGURE 2.7 FLOODPLAINS MAP B

2022 DWSRF Project Plan March 2022 HRC#: 20220131



This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The commanity map negository should be consulted for research understored or additional flood house information.

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FIGURE 2.8

FLOODPLAINS MAP C

2022 DWSRF

Project Plan

March 2022



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This map is for use in administering the National Flood insurance Progam. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of armali size. The community map repository should be consulted for possible undered or additional flood hazard information.

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Certain areas not in Special Flood Hazand Areas may be protected by **Boed centrol** attractures, Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

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you have questions about this map or questions concerning the Natonal Flood reurance Program in general, piezes call 1- 877-FEMA MAP (1-877-396-2527) or





FIGURE 2.9

FLOODPLAINS MAP D

2022 DWSRF Project Plan



This rup is for use in administering the National Flood Insurance Program. It does not recessarily identify all areas subject to flooding, particularly from local drainage source of small size. The commanity map repeakiony should be consulted for provide under or additional flood hazard information.

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Certainareas not in Special Flood Hazard Areas may be protected by **Bood centrol structures**. Refer to Section 2.4 "Flood Protection Measure" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

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FIGURE 2.10 FLOODPLAINS MAP E 2022 DWSRF Project Plan



This rup is for use in administering the National Flood Insurance Progam. It does not recessarily identify all areas subject to flooding, particularly from local drainage source of small size. The community map repeakacy should be consulted for prostable undered or additional flood hazard information.

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FIGURE 2.11 FLOODPLAINS MAP F 2022 DWSRF Project Plan



This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding particularly from local dharrage sources of small size. The community map repaidory should be consulted for possible updated or additional flood hazard information.

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FIGURE 2.12 FLOODPLAINS MAP G 2022 DWSRF Project Plan



This map is for use in administering the National Flood Insurance Engran II does not necessarily identify all areas subject to flooding, particularly fron local drainage ources of small size. The community map repeaticry should be consulted for

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Certain areas not in Special Rood Hazard Areas may be protected by flood contenstructures. Refer to Section 2.4 "Flood Protection Measures" of the Food insuranc Study Record for information on flood control structures for this jurisdiction.

The projection used in the proparation of this map was Universal Transver Mercator (UTM) zone 16. The **horizontal datum** was NAB 33, GES 1980 ophenod. Differences in datum, spheroid, popeldion or UTM zones and in the production of FIRMs for adjuster juridictions may result in slight solitional differences in may inductive zones. The differences do no the production of the statuters across publicition boundaries. These differences do no the statute of the statuter across the statute of the statuters.

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To obtair current elevation, description, and/or location information for bench marshown on this map, please contact the Information Services Bianch of the Natio Geodetic Survey at (301) 713-3242, or visit its website at <u>http://www.tos.noaa.oov</u>

Base map information shown on this FIRM was derived from the National Agriculture Imagery Program at a scale of 1:12,000 from imagery dated July 7, 2005.

The profile baselines depicted on this map represent the hydraulic modeling baseliner that match the flood profiles in the FIS report. As a result of improved topographic data the profile baseline, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexators may hav occurred after this map was published, map users should context appropriat community officials to verity correct to coprode limit locations.

Please refer to the separately printed Map ladex for an overview map of the county showing the layout of map panets; community map respositry addresses; and a Lating of Communities table containing National Hood Insurance Plogram dates for each community as well as a listing of the panets on which each community is located.

For information on available products associated with this FI/BI visit the Map Service Center (MSC) vestels at <u>http://msc.tent.agov</u>, Available products may include previously issued Letters of Nac Changa. a Flood Insurand Shufy Report, and/or dpdal vestion. of this map. Many of these products can be ordered or obtained directly from the MSC website.

It you have questions about this map, how to order products, or the National Flood insurance Program in general, please call the FEMA Map information atchange (#MX) at 1477/FEMA MAP (1477-336-2827) or visit the FEMA website at <u>Into Jewew fema povolusiness/rfip</u>.





FIGURE 2.13 FLOODPLAINS MAP H

> 2022 DWSRF Project Plan



This map is for use in administrating the National Flood Insurance Resperse. It doe to necessarily identify all areas subject to flooding, particularly from local disimage ources of small size. The commanity map repeations should be consulted for explain understore additional flood harmoni information.

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Certain areas not in Special Rood Hazard Areas may be protected by flood certa atructures. Refer to Section 2.4 "Flood Protection Measures" of the Rood Insuranc Study Record for information on flood control structures for this suriadiction.

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To obtain current elevation, description, and/or location information for bench mar shown on this map, please contact the Information Services Branch of the Natio Geodetic Survey at (301) 713-3242, or visit its website at <u>http://www.ngn.noas.gov</u>

Base map information shown on this FIRM was derived from the National Agriculture Imagery Program at a scale of 1:12,000 from imagery dated July 7, 2005.

The profile baselines depicted on this map represent the hydraulic modeling baseline that match the flood profiles in the FIS report. As a result of improved topographic data the profile baseline, in some cases, may deviate significantly from the channe centerline or appear outside the SFHA.

Corporate limits shown on this map are based on the best data available at the tim opublication. Because changes due to annexations or de-annexations may han occurred after this map was published, map users should contact appropria community officials to verify correct corporate limit locations.

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For information on available products associated with this Fifth visit the Map Service Center (MSC) website at <u>implicituations and services</u> may include previously insued Letters of New Change, a Foldor Insuance Study Report, and/or diplat ventions of this map. Many of these products can be ordered or obtained directly from the MC vestime.

If you have questions about this map, how to order products, or the National Food insurance Program in general, please call the FEMA Map Information aKohange (FMIX) at 1-877-FEMA-MAP (1-87-336-2827) or visit the FEMA website althour wire form acrobalinesishifts.





FIGURE 2.14 FLOODPLAINS MAP I

2022 DWSRF Project Plan



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Boundaries of the **Boodways** were computed at cross sections and interpolated between cross sections. The Boodways were based on hydraunic considerations with regard to requirements of the National Flood Insurance Program. Tockways width and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

Certain areas not in Special Rood Hazard Areas may be protected by flood conte atructures. Refer to Section 2.4 "Flood Protection Measures" of the Rood Insuran Study Record for information on flood control structures for this suriadiction.

The projection used in the preparation of this map was Universal Transver Mercalar (UTM) zone 16. The horizontal datam was NuD 83, CMS 1980 production of PTMINE for ediporter provided market and the production of the PTMINE for ediporter providence of the second across jurisdiction boundaries. These differences do nation the converse of the FTML second second across production across for the second seco

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To obtain current elevation, description, and/or location information for banch ma shown on this map, please contact the Information Services Branch of the Nati Geodetic Survey at (\$91) 713-3242, or visit its website at http://www.ngs.noaa.go

Base map information shown on this FIRM was derived from the National Agriculture Imagery Program at a scale of 1:12,000 from imagery dated July 7, 2005.

The profile baselines depicted on this map represent the hydraulic modeling baseline that match the flood profiles in the FIS report. As a nexult of improved topographic data the profile baseline, in some cases, may deviate significantly from the channe centerline or appear outside the SIFIA.

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Please refer to the separately pinted Map ladex for an overview map of the county showing the layout of map panelis: community map repositivy addresses; and a Lating of Communities table containing National Flood Insurance Plogram dates for each community as vell as a listing of the panelis on which each community is loosted.

For information on available products associated with this FIRM visit the Map Service Center (MSC) weakle at <u>http://mc.htm.acv</u>. Available products may include previously insed Letters of Map Change, a Flood insurance Satyl Report, and/or diplai versions of that map. Many of these products can be ordered or obtained directly from the MSC service.

If you have questions about this map, how to order products or the National Food instrance Program in general, peaks call the FEMA Map Intermation ackloange (FMK) at 1477-FEMA.4MAP (1-877-338-2827) or valt the FEMA website at <u>http://www.fema.gov/business/http:</u>



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FIGURE 2.15 FLOODPLAINS MAP J

2022 DWSRF Project Plan



This map is for use in administering the National Flood Insurance Program. It of necessarily identify all aeas subject to flooding, particularly from local dra ources of small size. The community map repeatory should be consults existing updated or additional flood hazare information.

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Certain areas not in Special Rood Hazard Areas may be protected by flood contro structures. Refer to Section 2.4 "Rood Protection Measures" of the Flood Insurance Study Record for information on flood control structures for this acristication.

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To obtain current elevation, description, and/or location information for bench mas shown on this map, please curtact the information Services Branch of the Natio Geodetic Survey at (301) 713-3242, or visit its website at http://www.ngs.noae.op

Base map information shown on this FIRM was derived from the National Agriculture imagery Program at a scale of 1:12,000 from imagery dated July 7, 2005.

The profile baselines depicted on this map represent the hydraulic modeling baseline that match the flood profiles is the FIS report. As a result of improved topographic data the profile baseline, in some cases, may deviate significantly from the channe centerline or appear outside the SFHA.

Corporate limits shown on his map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have necessaril affect this area was published, map used should contact appropriate community officials to verify overef corporate infol locations.

Please refer to the separately printed Map ledex for an overview map of the county showing the layout of map panels; community map repository addresses; and a lating of communities table containing National Flood Imsuance Thogare dates for each community as well as a lating of the panels on which each community is located.

For information on available products associated with this FIRM visit the Map Service Center (MSC) website at <u>the information</u>, Available products may include previously associal cases of Map Change, a Flood Insurance Guide, Report, and/or diplati versions of the map. Many of these products can be ordered or obtained directly from the MSC vehicle.

If you have questions about this map, how to order products, or the National Flood insurance Program in general, please call the FEMA Map Information ackhange (FMA) at 1427-FEMA.MAP (1-427-336-2627) or visit the FEMA website at <u>http://www.fema.gov/business/info</u>





FIGURE 2.16 FLOODPLAINS MAP K

> 2022 DWSRF Project Plan



This map is for use in administering the National Flood Insurance Program. It of necessarily identify all areas subject to flooding, particularly from local drais ources of small size. The community map repeatory should be consulte oscillate or delitional flood hazard information.

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Certain areas not in Special Flood Hazard Areas nay be protected by flood contra structures. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurant Study Record for information on flood control structures for this subsidiction.

The projection used in the preparation of the map was Universal Transverse to the term of the sphereci CTRT zones in data termination and the term of the term observation of FINItia for adjacent projection or UTM zones used in the observation of FINItia for adjacent projections and the termination offerences in map hatures across jurisdiction bundaries. These differences do n affect the accuracy of the FINItia

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To obtain current elevation, description, and/or location information for bench ma shown on this map, please contact the information Services Branch of the Natio Geodetic Survey at (301) 713-3242, or visit its website at <u>http://www.ngs.nosa.go</u>

Base map information shown on this FIRM was derived from the National Agriculture imagery Program at a scale of 1.12,000 from imagery dated July 7, 2005.

The profile baselines depicted on this map represent the hydraulic modeling baseline that match the flood profiles in the FIS report. As a result of improved topographic data the profile baseline, in some cases, may deviate significantly from the channe centerline or appear outside the SFHA.

Corporate limits shown on this map are based in the best data available at the tir of publication. Because changes due to annexitions or de-annexations may ha occurrent where this map, ware chainbert, may users whould contact appropria community officials to verify current corporate limit locations.

Please refer to the separately printed Map ladex for an overview map of the county showing the layout of map panelis, community map repository addresses, and a Lating of Communities table containing National Flood Insurance Plogram dates for each community as vell as a listing of the panelis on which each community is located.

For information on available products associated with this FIRM visit the Map Service Center (MSC) website at <u>http://machima.gov</u>. Available products may include previously insel Letters of Map Change. a Flood insurance Sately Report, and/or dipal vensions of that map. Many of hese products can be ordered or obtained directly from the MSC website.

If you have questions about this map, how to order products, or the National Fixed insurance Program in general jesses usi the FEMA Map information eXchange (FMX) at 1-877-FEMA-MAAP (1-87-336-2827) or visit the FEMA website althour your form acrobustnessimilia





FIGURE 2.17 FLOODPLAINS MAP L

2022 DWSRF Project Plan



This map is for use in administering the National Flood Insurance Program. It of necessarily identify all areas subject to flooding, particularly from local drait ources of small size. The community map repository should be consulte oussible undisted or additional flood hazard information.

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Certain areas not in Special Flood Hazard Areas may be protected by flood contenstructures. Refer to Section 2.4 "Flood Protection Measures" of the Flood insuranc Study Record for information on flood control structures for this jurisdiction.

The projection used in the preparation of this map was licitorial Transfer by the DRE zone its The horizontal provides was NoD 35 CHS transfer special DRE zone its the horizontal properties of the DS to CHS transfer providence of FIRMS to adjacent providencies may result in sight positional differences in map hearves across unadiction boundaries. These differences do n affect the accuracy of the FIRM.

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To obtain current elevation, description, and/or location information for bench ma shown on this map, please contact the information Services Branch of the Natio Geodetic Survey at (301) 713-3242, or visit its website at <u>http://www.nps.noaa.po</u>

Base map information shown on this FIRM was derived from the National Agriculture Imagery Program at a scale of 1:12,000 from imagery dated July 7, 2005.

The profile baselines depicted on this map represent the hydraulic modeling baseline that match the flood profiles in the FIS report. As a result of improved topographic data the profile baseline, in some cases, may deviate significantly from the channe centerline or appear outside the SFHA.

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Please effer to the separately printed Map ladex for an overview map of the county showing the layout of map panels, community map responsitry addresses, al a Lating of Communities table containing National Hood Insurance Plogaem dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM visit the Map Service Cester (MSC) website at <u>the introduction and</u>. Available products may include previously asset Letters of Map Change, a Flood insurance Sately Report, and/or diplai versions of this map. Many of these products can be ordered or obtained directly from the MSC setukie.

If you have questions about this map, how to order products, or the National Fixed insurance Program in general, piezes call the FEMA Map information ackhange (FEMX) at 5477-FEMA.MAP (1-877-036-2627) or visit the FEMA website at http://www.fema.gov/businessim/fp



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FIGURE 2.18 FLOODPLAINS MAP M 2022 DWSRF

Project Plan



This map is for use in administering the National Flood Insurance Program. It not necessarily identify all areas subject to flooding, particularly from local drain ources of small size. The community map repository should be consulter oscillar underford or additional flood hourand information.

To obtain none detailed information in areas where **Base Flood Elevations** (BFE) and/or **Rootways** have beer determined, users are noncurregate to conside the Floor Profess and Floorese Data indire Garmany of Bilwater Elevations takes containe within the Flood Instance Suby (FIR) paper that accompanies the FIRM. Use should be assess that BFEs are insteaded to thood Instances stating proposes only an elevations. These BFEs are insteaded to thood Instances stating proposes only and flood elevation data prevention the FIR Report hand be utilized in conjunction with flood elevation takes prevention the FIR Report hand be utilized in conjunction with the FIRM for purposed construction and its flogial register.

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Boundaries of the **Boodways** were computed at cross sections and interpolatio between rows excloses. The foodways were based on syndaucic constentations we regard to requirements of the National Flood Insurance Program. Floodway width and other pertinent floodway data are provided in the Flood Insurance Study Rep for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by flood contra structures. Refer to Section 2.4 "Flood Protection Measures" of the Rood Insuranc Study Record for information on flood control structures for this jurisdiction.

The projection used in the proparation of this map was Universal Transver Mercalio (UTM) zone 15. The hosticostal datum was NAD 83, CRS 1950 exploration. Differential projection of UTM zones used on the optimum of the second secon

Flood elevations on the major ensettemend to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and grand elevations inferenced to the same vertical datams. For information regarding conversion between the National Geodetic Vertical Datum of 1500, and the North American Vertical Datum of 1988, visit the National Geodetic Survey estable as the National Datament of 1988, the National Geodetic Survey at the Makwing Dataments

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To obtain current elevation, description, and/or location information for bench ma shown on this map, please contact the Information Services Branch of the Natio Geodetic Survey at (301) 713-3242, or visit its website at <u>http://www.npr.noaa.go</u>

Base map information shown on this FIRM was derived from the National Agriculture Imagery Program at a scale of 1.12,000 from imagery dated July 7, 2000

The profile baselines depicted on this map represent the hydraulic modeling baselin that match the flood profiles in the FIS myont. As a result of improved topographic dat the profile baseline, in some cases, may deviate significantly from the chann contentine or appear outside the SFHA.

Corporate limits shown on this map are based on the best data available at the tim of publication. Because changes due to annexisions or de-annexations may ha anounced after this map was published, map users should contact appropria community officials to verify current corporate limit locations.

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If you have questions about this map, how to order products, or the National Flood Insurance Program in general, please call the FEMA Map Information ackChange (FMK) at 1437-FEMAAMP (1-87-336-2627) or valit the FEMA website at <u>http://www.fema.gov/businessinfp</u>.





FIGURE 2.19

2022 DWSRF Project Plan



This map is for use in administering the National Flood Insurance Program. It of necessarily identify all areas subject to flooding, particularly from local dis ources of small size. The community map repository should be consult oscible updated or additional flood hazard information.

To obtain nons detailed information in areas where Base Flood Elevations (UFL) and/or Bodways have beet determined, users are encourged to counsit the Flood Profess and Floodway Data and/or Summay of Siltwater Elevations tables contained within the Tood Insures Dady (UFL) paper that accompanies The ITML users shade to assaw that BTER are insteaded by the other summaries that IBML and the elevations. These BTER are insteaded to the other state of the poperation stytemets and the second state of the Disk Temporary and the other flood elevation data presented in the TIS Report head/us be utilized in companies of motion of the Disk of the Disk Temporary and the Disk of th

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Certain areas not in Special Rood Hazard Areas may be protected by **flood contra** atructures. Refer to Section 2.4 "Flood Protection Measures" of the Rood Insuranc Study Record for information on flood control structures for this jurisdiction.

The projection used in the properties of this may was University Termson Memorate (UTM) core 16. The Methodal datam was NAD 53, G55 1980 spheroid. Otherwones in datam spheroid, projection or UTM zones used in the production of PTMMs for adjacent privations may result in signity positional differences in map features across jurisdiction hourdaries. These differences do n affect the accuracy of this FRM.

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To obtain current elevation, description, and/or location information for bench man shown on this map, please contact the Information Services Branch of the Natio Geodetic Survey at (301) 713-3242, or visit its website at <u>http://www.nps.noaa.gov</u>

Base map information shown on this FIRM was derived from the National Agriculture Imagery Program at a scale of 1:12,000 from imagery dated July 7, 2005.

The profile baselines depicted on this map represent the hydraulic modeling baseliner that match the flood profiles in the FIS report. As a result of improved topographic data the profile baseline, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

Corporate limits shown on this map are based on the best data available at the tim of publication. Because changes due to annexations or de-annexations may hav occurred affect this area, was published, map users should content appropriat community officials to verify correct occorate limit locations.

Please effer to the separately printed Map ladex for an overview map of the county showing the layout of map panels, community map respectivey addresses; al a Lating of Communities tables containing National Flood Insurance Plogram dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM visit the Map Service Center (MSC) website at <u>the informations age</u>, Available products may include previously asked Letters of Map Change, as Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have questions about this map, how to order products, or the National Floot Insurance Program in general, please call the FEMA Map Information ackloange (FBMX) at 1477-FEMA.MAP (1-677-336-3627) or visit the FEMA website at <u>http://www.forma.gov/businessinfig</u>.





FIGURE 2.20 FLOODPLAINS MAP O 2022 DWSRF

Project Plan



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tu have questions about this map, how to order product in insurance Program in general, please call the FEMA. hange (FMIX) at 1-877-FEMA-MAP (1-877-336-2827) or





FIGURE 2.21 FLOODPLAINS MAP P

> 2022 DWSRF **Project Plan**

March 2022 HRC#: 20220131





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This map is for use in administering the National Flood Insurance Program. It of necessarily identify all areas subject to flooding, particularly from local dra ources of small size. The community map repeatory should be consulte osable undered or additional flood hazard information.

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To obtain current elevation, description, and/or location information for bench ma shown on this map, please contact the Information Services Branch of the Natio Geodetic Survey at (301) 713-3242, or visit its website at <u>http://www.nps.ncaa.go</u>

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For information on available products associated with this FiRMs visit for Map Service Center (MSC) website at <u>http://msc.tera.app</u>, Available products may include previously assed Letters of Map Changa, a Flood Insuance Study Report, and/or diplai versions of his map. Many of hese products can be ordered or obtained directly from the MSC vebsite.

If you have questions about this map, how to order products, or the National Food insurance Program in general, piesae call the FEMA Map Information a&change (FMX) at 1-877-FEMA-MAP (1-877-386-2827) or visit the FEMA website at http://www.form.cov/businessinflo.



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FIGURE 2.22 FLOODPLAINS MAP Q

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The profile baselines depicted on this map represent the hydraulic modeling baseline that math the flood profiles in the FIS report. As a result of improved topographic data the profile baseline, in some cases, may deviate significantly from the channe contentino or appear outside the STHA.

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FIGURE 2.23 FLOODPLAINS MAP R 2022 DWSRF

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FIGURE 2.24 FLOODPLAINS MAP S

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FIGURE 2.25

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FIGURE 2.26 FLOODPLAINS MAP U

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FIGURE 2.27 FLOODPLAINS MAP V

> 2022 DWSRF Project Plan



















2.6 Existing Water Supply System

2.6.1 Water Supply and Conditioning

The BWL water supply utilizes groundwater from the Saginaw Aquifer, delivered in varying amounts by deep rock wells located throughout the greater Lansing area. BWL has 122 wells that are either in active or out of service status, with 7 of those wells owned by Lansing Township West Side Water. Wells that are out of service are for routine maintenance or reduced water usage during the winter. All wells are connected by a system of raw water transmission mains to either the Dye Water Conditioning Plant (WCP) or the Wise Road WCP.

The Dye WCP was built in 1939 with a rated capacity of 30 million gallons per day (MGD). In 1949, the plant was expanded to 40 MGD, due to an increase in demand. Current treatment consists of two-stage split treatment softening, granular media filtration, and chloramine disinfection. Approximately 80% of the incoming groundwater undergoes excess lime treatment at a pH above 11 in the primary treatment basins to precipitate calcium and magnesium hardness as calcium carbonate (CaCO3) and magnesium hydroxide (Mg (OH)2), respectively. The primary treatment train is comprised of two rapid mix basins, two flocculation basins (five bays each, each containing paddle flocculators), and two settling basins. Ammonia is added to the primary basin influent line, and lime is added at the primary rapids mix stage. After water is passed through rapid mix, it flows into the flocculation basins where, through the five bays, flocs form and grow in size as they progress towards the settling basins. In the settling basins, these flocs settle out and get transferred to the sludge thickening system and the clean water overflows to secondary treatment. Settled water from the primary basins is blended with untreated groundwater (approximately 20% of the incoming flow) prior to entering the secondary treatment basins to reduce the pH of the blended water and to maintain a pH of approximately 9.5 in the finished water leaving the plant. This reduced pH also promotes precipitation of excess lime as CaCO3 within the secondary settling basins. Sodium hypochlorite and fluoride are added to the secondary basin influent line, and soda ash is added at the rapid mix stage of the secondary train. The effluent from the secondary basins flows to final settling prior to the sand filters. A polyphosphate/orthophosphate chemical blend is added to the final settling basins as a scale inhibitor in the filters and a corrosion inhibitor in the distribution system. The backwash pump supplies water to clean the filters. The filter effluent flow is transmitted to one of three finished water reservoirs, which supply flow to the high-service pumping stations. This facility has two high-service pumping stations, Dye High Lift and Cedar Pumping Station, which operate simultaneously and pump water to the distribution system. Dye High Lift contains three high service pumps (and one filter backwash pump), and Cedar contains four high service pumps (Pump 1 is directly wired to the generator and Pump 4 is not operable). The residual backwash water is sent to the cistern and then reintroduced at the head of the plant. Sludge from the thickener underflow is processed through a filter press and hauled off-site for land application and/or reclamation, while the residual water is conveyed to the head of the primary basins. The schematic on the following page shows the treatment process through the Dye WCP.



Figure 2-36. Dye WCP Treatment Process



The Wise WCP was constructed in 1966 in the southern portion of Lansing, Michigan. It has a design capacity of 10 MGD. Current treatment consists of two-stage split treatment softening, granular media filtration, and chloramine disinfection. The general treatment processes are the same as the Dye WCP, but on a smaller scale. This plant generally receives water from 21 wells dedicated to this plant, and BWL can send water to Wise from an additional 23 wells by opening or closing valves on the raw water transmission line, depending on demand. Just as at Dye, the raw water is split 80% primary and 20% secondary in which each train consists of two rapid mix basins, two flocculation basins, and two settling basins. The remainder of the process mimics that at Dye, ending at four sand filters and finished water piped to a reservoir on site. The high service pumping station contains four pumps, which pump water to the distribution system. The Wise WCP does not contain any solids processing equipment; the solids are pumped nearly seven miles to the Dye WCP for processing.

Climate change has multiple potential impacts on water quality and water quantity. Therefore, it is important to consider and plan for these impacts. In the Great Lakes region, there has been an increase in storm intensity which has led to increased runoff from farms and cities, and flooding, which leads to more pollutants entering waterways and groundwater. In addition, there is more stress on the aquifer from fluctuating temperatures. Other items that can be affected are excessive frost penetration, resulting in water main breaks, pressure loss and associated coliform outbreaks. There is an increase in demands to prevent freezing services, and 1920s era water main tends to not meet current depth of bury standards that would prevent mains and services from freezing. The BWL has completed and certified completion of the Risk and Resilience Assessment, as well as the Emergency Response Plan, which was an all hazards approach evaluating risk to the system from malevolent



acts and natural hazards. Natural hazards include items such as power outage (from things such as an ice storm or other), flood, tornado, earthquakes, and pandemics.

2.6.1.1 High Service Pumping

The BWL has high service pumping at both of its WCPs and owns and operates 5 booster stations. The high service pumps are listed below in the table:

h Lift	Year Installed	Pump Number	Capacity (MGD)
Hig	1995	Pump 1	20.0
)ye	1995	Pump 2	20.0
	1995	Pump 3	10.0
t.	1952	Pump 1 – Emergency Use	20.0
ar o	1984	Pump 2	12.5
eda	1953	Pump 3	18.0
0	1953	Pump 4 (Out of Service)	15.0
-	1966	Pump 1	5.0
Å Å	1966	Pump 2	5.0
Vise	1966	Pump 3	10.0
>	1966	Pump 4	10.0

Table 2-3. High Service Pumping at WCPs

2.6.2 Storage Facilities

Storage at the BWL is in ground level reservoirs at Dye Water and Wise Road Conditioning Plants and at the Hulett Booster Pump Station. The BWL has five (5) storage tanks within the water system with a total storage capacity of 24 MG. Three of the storage tanks are located at the Dye WCP, one storage tank is located at the Wise Road WCP, and one storage tank is located adjacent to the Hulett Pumping Station. All three storage tanks at the Dye WCP are hydraulically interconnected and each tank is capable of being isolated from the other two as necessary for maintenance.

Table 2-4.Water Storage

Location Description	Volume
Dye/Cedar North 3.5	3.5 MG
Dye/Cedar South 3.5	3.5 MG
Dye/Cedar East 10.0	10.0 MG
Wise WCP	5.0 MG
Hulett	2.0 MG
Total	24.0 MG



2.6.3 Water Distribution Piping

The BWL owns and operates the raw water mains, finished water mains, and water services to the outlet side of the water meter including all appurtenances that make up the distribution system such as booster pumping stations, water valves, hydrants, curb stops and boxes, etc. The system comprises of 52 miles of raw water main, 275 raw water main valves, 808 miles of finished water main, and 828 miles of water services.

The condition of water mains is currently being assessed based on the following criteria:

- Pipe Age
- Number of main breaks, main breaks per 100 miles per year by pipe "category" and by pipe segment
- C factor, hydraulic deficiencies
- Available fire flow based on zoned land use
- Water quality related parameters

Pipe age can be indicator for several criteria listed above. For example, aging unlined cast iron pipe will typically contribute to lower C factors, resulting in greater pumping energy used, increased maintenance and flushing, reduced fire flow, and faster degradation of chlorine residuals, increasing the likelihood of coliform bacteria outbreaks and nitrification. Excessive tuberculation of unlined cast iron pipe in the distribution system promotes bio-growth that in turn reduces chlorine residual. The reduction in chlorine frees up ammonia, creating food for nitrite oxidizing bacteria causing nitrification issues. Nitrification can reduce pH and alkalinity, decreasing the effectiveness of the corrosion control. As bio-growth increases, chemical dosages must be increased to achieve the same disinfection and corrosion control results. Eventually, the deteriorating main could impair disinfection and corrosion goals to the point that treatment technique requirements are not met, and water quality standard violations occur. By replacing older unlined cast iron pipe, BWL helps ensure that disinfection and corrosion control chemical costs are lowered, and public health protection remains intact. Unlined cast iron pipe was primarily used as the material of choice in the BWL water system until the late 1950s to early 1960s. Approximately 35.2% of the system is currently cast iron pipe material.

Main breaks are another driver for assessing the condition of the water system. The BWL spatially tracks main breaks within a database and analyzes patterns to better understand how pipes are performing. Main break data is ultimately input into a GIS based system and this data feeds into the capital improvement planning process as one of the criteria for likelihood of failure. Over the years, the BWL has recognized main break related patterns based on installation era and pipe material. The BWL currently analyzes main break related data based on the following categories, in addition to by pipe segment:

- "Landel" System a community water system the BWL acquired, which is also unlined cast iron pipe
- Cast iron pipes installed after 1945
- Cast iron pipes installed prior to 1945
- Ductile iron pipe

The "Landel" system, in terms of main breaks, has a higher likelihood of failing than any other category. This followed by post-1945 installed cast iron pipe, pre-1945 installed cast iron pipe, and ductile iron. Ductile iron pipe has the least likelihood of failure of any pipe material in the BWL system.

The BWL has a capital improvement plan in place to replace aging infrastructure. The BWL has already replaced lead service lines. Additionally, the BWL coordinates with the City of Lansing and other jurisdictions to team up on projects that are mutually beneficial, saving on restoration costs and optimizing capital dollars.



The tables below show an overview of the age, material, and size of finished water mains within the BWL water distribution system.

Туре	Diameter (inch)	Length (miles)	Percentage	
	< = 6-inch	343.30	42.5%	
	8-inch	215.05	26.6%	
	10-inch	11.15	1.4%	
	12-inch	143.94	17.8%	
Maii	14-inch	4.48	0.6%	
er I	16-inch	68.80	8.5%	
Vat	18-inch	1.13	0.1%	
> p	20-inch	2.24	0.3%	
she	24-inch	5.14	0.6%	
ini	30-inch	12.50	1.5%	
–	36-inch	0.04	0.0%	
	42-inch	0.11	0.0%	
	60-inch	0.00	0.0%	
	72-inch	0.07	0.0%	
Total	Total Finished WM 807.95 100.00%			

Table 2-5	. Water Mai	n Length by	Pipe Diameter
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Table 2-6. Water Main Length by Material

Material	Percent of Total	Length (Miles)
Cast Iron	35.2%	284.7
Ductile Iron	61.8%	499.4
Other	1.4%	11.4
Unclassified	1.5%	12.4
Grand Total	100.0%	808.0

2.6.4 Booster Stations

The BWL operates five major booster stations, the Windsor Booster Station, Watertown Booster Station, Hulett Booster Station, Eifert Booster Station, and Aurelius Road Booster Station.



Location	Year Installed	Pump Number	Pump Install Year	Capacity (MGD)
Aurelius	1993	Pump 1	1993	6.3
Eifert	1973	Pump 1	1973	6.3
	2003	Pump 1 – Fire Pump	2003	2.8
Windsor	2003	Pump 2 – Fire Pump	2003	2.8
VIIIUSUI	2003	Pump 3	2003	0.2
	2003	Pump 4	2003	0.2
	2000	Pump 1	2000	2.5
	2000	Pump 2	2000	2.5
Hulott	2000	Pump 3	2000	2.5
nulell	2000	Pump 4	2000	1.3
	2000	Pump 5	2000	0.6
	2000	Pump 6	2000	0.6
Watertown		Pump 1		5.0
(Out of Service)		Pump 2 (impeller removed)		0.0

Table 2-7. Distribution System Booster Stations

2.7 Summary of Project Need

The BWL is proposing to replace aging water main, valves, fire hydrants and appurtenances located within two of the City of Lansing's Combined Sewer Separation Areas. The City of Lansing is under Administrative Consent Order (ACO) for their sewer system and Wastewater Treatment Plant to separate their system and reduce sanitary sewer overflows (SSOs). ACO-05153 was entered in on December 19, 2019. The BWL works with the City of Lansing on the City's Combined Sewer Overflow (CSO) program to coordinate the replacement of the aging water main while the streets and sidewalks are under construction as part of the CSO work to help reduce costs for both organizations. Many of these water main pipes are the oldest in the BWL's system and have severe tuberculation – the formation of small mounds of corrosion produces on the inside of the pipe - that impact water quality and hydraulic performance. Main breaks in this era of pipe are generally 7 times more likely to occur than ductile iron pipe (newer era pipe).

The BWL also works to replace water main located outside of CSO areas for similar reasons. The BWL is currently targeting the replacement of a poor performing water main system that was acquired in the 1940s, that consists of unlined cast iron pipe. These pipes are typically 40 times more likely to break than that of new pipe and approximately 6 times more likely to break than the average pipe within the BWL system. These areas are also known to have severe tuberculation resulting in water quality and hydraulic performance issues mentioned above.

The BWL uses a chloramination process for disinfection at two water treatment plants (Dye and Wise Road). The plants currently use 150-pound cylinders of anhydrous ammonia gas in conjunction with chlorine to form chloramines as part of the disinfection process. An Ammonia Alternative Study was completed by Fishbeck in April 2016 for the BWL. This study recommends the conversion of the plant from anhydrous ammonia to ammonium hydroxide. The project includes construction of two (2) new 3,100 gallon FRP bulk storage tanks, new tank fill and vapor return lines and the storage area would be enclosed to isolate it from the rest of the plant. Additionally, a new chemical storage/feed room would be constructed adjacent to the storage room and would include an additional 2,350 gallon storage tank, a day tank and chemical metering pumps.



The BWL currently does not have any elevated water storage within its system. This proves to be a risk to the system as they rely on back up generators and pumps to supply pressure during a power outage. If the system currently in place were to fail, the water distribution system will lose pressure within minutes and the BWL would not be able to supply water to their customers. Over the past two years, the BWL has experienced several instances where the pumps have been impacted by a loss of power or voltage changes that triggered the emergency generator and emergency pump to startup and maintain pressures in the system. These events result in pressure fluctuations over a short period of time within the system which increases the likelihood of causing main breaks putting customers at risk of lost service.

Within the BWL system, there are 122 active wells that are used as source water. Of these 125 active wells, approximately 75% off them are over 50 years old and 32% of the wells are over 70 years old. In addition, the vast majority of the aged wells are associated with the Dye Water Treatment Plant which is the primary treatment facility for the Board. The aging infrastructure that is critical to the water distribution of the area relies on these point sources. According to the BWL 2017 Asset Management Plan the probability of failure of an individual well is high based on the age of the wells. If multiple wells were to fail due to structural conditions resulting from age, this could cause a significant impact to the BWL's ability to supply water to their customers.

The John F. Dye Water Conditioning Plant is experiencing significant problems with the lime and soda ash systems. This project is one phase of the overall dry chemical handling project which consist of three separate phases. The first phase (Phase A) addresses the severe dust issues associated with chemical delivery. The second phase (Phase B) addresses the lime chemical issues primarily the delivery and slaking equipment. The third phase (Phase C) is similar to Phase B, but is associated with the soda ash systems. The phase the BWL is seeking funding for includes tasks such as lime bin slide gates, lime bin 9" screw feeders, lime screw feeder discharge chute, lime slaking equipment and controls, demo of existing chemical feed equipment, and miscellaneous electrical improvements.

Based on a feasibility study completed in 2019, the BWL drilled a new well in 2021 on Hughes Road, south of Jolly Road. This well has the potential to produce 350 to 400 gpm. The purpose of this project is to connect the newly drilled well to the raw water piping network so the well can feed water to the water conditioning plant.

All of the above-described projects will improve the reliability of the system.

2.7.1 Compliance with Drinking Water Standards

No court or enforcement orders, or written enforcement actions have been issued to the BWL regarding the water system.

2.7.2 Drinking Water Quality Problems

The BWL has recognized patterns with unlisted cast iron pipes contributing to chlorine degradation over a much shorter period of time than cement lined ductile iron pipe. This can ultimately lead to additional water quality related problems in the distribution system such as nitrification and increased likelihood of coliform outbreaks. The BWL is addressing these issues through proactive water main replacement.

Delta Township, a wholesale customer of the BWL, performed a Level 1 Assessment due to excessive positive total coliform samples in 2018. Implementation of this project plan and replacement of unlined cast iron pipes (i.e., Aging infrastructure) will ultimately improve water quality in the distribution system. There are no other known water quality concerns.



2.7.3 Projected Needs for the Next 20 Years

Over the next 20 years, the BWL is planning to ramp up water main replacement to address aging infrastructure within the distribution system. Below is a summary of the needs over the 20 years related to water main replacement.

- There are currently 60 miles of water main in service that is over 100 years old in need of replacement.
- There will be an additional 60 miles of water main that will reach end of useful life over the next 20 years.
- The BWL has 50 miles of "Landel" pipes (a system that fails 7 times more frequently than the average pipe in the system) that is in need of replacement.
- The total of these three is 170 miles of pipe that needs to be replaced over the next 20 years. This is approximately 8.5 miles per year. By applying for DWSRF funding, the BWL is hoping they can ramp up water main replacement more quickly, since current rates cannot support this footage of replacement.



3 Alternative Analysis

3.1 Alternatives Considered

Each project was assessed to follow one of the following alternate classifications. Each upgrade or rehabilitative method was chosen on a technical basis and cost comparisons are presented for each alternative analysis, where applicable. Figure 3-1 shows the overall locations of these projects in Lansing Board of Water & Light jurisdiction.





3.2 No Action

The "No-Action" alternative is not an option as it fails to meet the requirements of the Michigan Safe Drinking Water Act (MI-SDWA) and the mission and goals of the Lansing Board of Water & Light to provide safe and clean water to its customers.

3.3 Water Treatment Plant Improvements

3.3.1 Dye WCP – Convert Ammonia Systems to Aqueous Forms

The Lansing Board of Water and Light (BWL) uses a chloramination process for disinfection at two water treatment plants (Dye and Wise Road). The plants currently use 150-pound cylinders of anhydrous ammonia gas in conjunction with chlorine to form chloramines as part of the disinfection process. An Ammonia Alternative Study was completed by Fishbeck in April 2016 for the BWL. This study recommends the conversion of the plant from anhydrous ammonia to ammonium hydroxide. The project includes construction of two (2) new 3,100 gallon FRP bulk storage tanks, new tank fill and vapor return lines and the storage area would be enclosed to isolate it from the rest of the plant. Additionally, a new chemical storage/feed room would be constructed adjacent to the storage room and would include an additional 2,350 gallon storage tank, a day tank and chemical metering pumps.

There is no practical alternative to accomplish the same outcome to reduce significant safety hazards associated with the current WCP operations.

3.3.2 Dye Chemical Handling – Phase B

The John F. Dye Water Conditioning Plant is experiencing significant problems with the lime and soda ash systems. This project is one phase of the overall dry chemical handling project which consist of three separate phases. The first phase (Phase A) addresses the severe dust issues associated with chemical delivery. The second phase (Phase B) addresses the lime chemical issues primarily the delivery and slaking equipment. The third phase (Phase C) is similar to Phase B, but is associated with the soda ash systems. The phase the BWL is seeking funding for includes tasks such as lime bin slide gates, lime bin 9" screw feeders, lime screw feeder discharge chute, lime slaking equipment and controls, demo of existing chemical feed equipment, and miscellaneous electrical improvements.

There is no practical alternative to accomplish the same outcome to address significant issues that are occurring with the lime system. This will improve reliability and control of these systems and improve severe dust issues associated with chemical deliveries that expose employees to safety risks.

3.3.3 Wise Rd – Chemical Building

A new chemical/storage building would be constructed adjacent to the storage room at Wise Rd WCP and would include an additional 2,350-gallon storage tank, a day tank and chemical metering pumps. This additional storage facility will allow full truckload delivery of chemicals on a monthly basis with adequate reserve for 30 days of operation.

There is no practical alternative to accomplish the same outcome to provide additional storage and isolate the chemicals from the rest of the plant and provide a 30 day reserve for the system.



3.4 Operational System Improvements

3.4.1 Elevated Storage

This includes the construction of an elevated storage facility, as the BWL system currently does not have one. The elevated storage facility would be strategically located to best support the system and hold 2-3 million gallons. This storage would allow the BWL to have enough water pressure to provide water to their customers for approximately two hours after a power outage allowing the BWL a cushion of time to trouble shoot any mechanical and electrical issues or for the restoration of the permanent power to the area.

There is no practical alternative to accomplish the same outcome as the system currently does not have an elevated storage facility. If the system currently in place were to fail, the water distribution system will lose pressure within minutes and the BWL would not be able to supply water to their customers. Over the past two years, the BWL has experienced eight (8) instances where the pumps have been impacted by a loss of power or voltage changes to the pumps.

3.4.2 Well Drilling to Replace Aged Wells

This includes the construction of two (2) wells per years to replace aging infrastructure within the system and improve the reliability. Given the large number of aged wells within the system, slowing abandoning the oldest wells and replacing with new wells increase the longevity of the system. The location of the two (2) wells to be replaced in 2023 are adjacent to existing wells that are the oldest within the inventory.

There is no practical alternative to accomplish the same outcome as the system is drastically aging and wells need to be replaced to ensure the system has an adequate source water.

3.5 Distribution System Improvements

3.5.1 Water Main Construction

The BWL works with the City of Lansing on the City's Combined Sewer Overflow (CSO) program to coordinate the replacement of the aging water main while the streets and sidewalks are under construction as part of the CSO work to help reduce costs for both organizations. Many of these water main pipes are the oldest in the BWL's system and have severe tuberculation – the formation of small mounds of corrosion produced on the inside of the pipe - that impact water quality and hydraulic performance. Main breaks in this era of pipe are generally 7 times more likely to occur than ductile iron pipe (newer era pipe).

The BWL also works to replace water main located outside of CSO areas for similar reasons. The BWL is currently targeting the replacement of a poor performing water main system that was acquired in the 1940s, that consists of unlined cast iron pipe. These pipes are typically 40 times more likely to break than that of new pipe and approximately 6 times more likely to break than the average pipe within the BWL system. These areas are also known to have severe tuberculation resulting in water quality and hydraulic performance issues mentioned above.

There is no practical alternative to accomplish the same outcome. Replacing and upsizing the above-mentioned distribution mains advances the proper resolution of the pressure and reliability problems throughout the distribution system.



3.6 Cost of Alternatives

The costs of the improvements detailed previously are shown in Table 3-1 by Fiscal Year.

Projects	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027		
Water Treatment Plant	Water Treatment Plant						
Dye – Convert Ammonia Systems to Aqueous Forms	\$2,055,000						
Dye Dry Chemical Handling	\$3,533,803						
Wise Rd – Chemical Building					\$1,358,000		
Operations System							
Elevated Storage	\$100,000	\$9,306,000					
Well Drilling to replace aged wells	\$712,856	\$712,856	\$712,856	\$712,856	\$712,856		
Distribution System							
Water Main Replacement	\$12,423,950	\$11,339,000	\$2,489,400				
Total FY Project Cost	\$18,725,609	\$21,457,856	\$3,202,256	\$712,856	\$2,070,856		
Total Projects Cost	\$46,169,433						

Table 3-1	Summary	of SRF	Projects	(b	v Fiscal Year	۱
	ourninary	01010	1 10/00/0	(v.	y 1 13001 1 001	1

3.7 Impacts of Alternatives

The recommended alternatives include improvements listed in the above projects which are a mixture of work at the Water Treatment Plant (WTP) and Distribution System. The long and short-term impacts of the alternatives are described in Section 5.



4.1 Proposed Improvements

4.1.1 Proposed Water Treatment Plant Improvements

The following projects noted in Table 4-1 are the proposed WTP improvements under this Project Plan.

Table 4-1.	Fiscal	Year of	WTP	Projects
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Project	Fiscal Year
Dye – Convert Ammonia System to Aqueous Form	2023
Elevated Storage Evaluation and Implementation	2023-2024
Well Drilling to replace aged wells	2023-2027
Wise Chemical Building	2027

The design period of each project phase is estimated start in the year prior to the project fiscal year. The projects would be advertised and bid upon receipt of all the necessary permits. The general schedule would follow the consecutive phases, and specific, dates would be adjusted to meet the DWSRF Financing and Milestone Schedules adopted for each year of the project.

4.1.2 Proposed Distribution System Improvements

The following projects noted in Table 4-2 are the proposed distribution system improvements under this Project Plan.

Project	Fiscal Year
034E	2023
Ottawa	2023
015S	2024-2025
Ionia/Pine	2024
Shiawassee	2025
016	2025
E Michigan Ave	2023-2024
Raw Water Main Extension	2023

Table 4-2. Fiscal Year of Distribution System Projects



The BWL works with the City of Lansing on the City's Combined Sewer Overflow (CSO) program to coordinate the replacement of the aging water mains while the streets and sidewalks are under construction as part of the CSO work to help reduce costs for both organizations. The water main replacement projects are designed and constructed as individual projects or combined into one phase of projects for each fiscal year. The BWL has approximately 10% non-revenue water in its system. Most of the older cast iron mains are over 80 to 100 years old. Many of these main pipes are the oldest in the BWL's system and have severe tuberculation – the formation of small mounds of corrosion produced on the inside of the pipe – that impact the water quality and hydraulic performance. These older pipes contribute to the risk of water reliability concerns and water mains breaks which can compromise system water quality. Areas of low flow due to smaller pipe size and reduced friction factors associated with older pipe can cause safety concerns from reduced fire flows. Implementing the water main replacements recommended in the 2021 Water System Reliability Study will address the reliability, quality, and safety concerns.

4.2 Design Parameters

The proposed WTP improvements listed in Table 4-1 will be installed to meet the Michigan Safe Drinking Water Act 399 requirements as well as the BWL's design standards and Recommended Standards for WaterWorks (Ten States Standards).

The proposed distribution system improvements listed in Table 4-2 will be installed to meet the Act 399 requirements and the Lansing Board of Water and Light design standards for water distribution system.

4.3 Water Main Installation and Materials

The installation methods for the water main replacement projects will primarily be completed using open cut methods. The site conditions may dictate other methods of replacement to accommodate the public and environment and construction efficiencies. Open-cut methods will be implemented to coordinate with street paving activities. Horizontal directional drilling (HDD) may be used in applications with the appropriate clearances to underground utilities is provided and where there are limited service connections, tees, bends and other fittings along a particular length of main.

New water mains will be AWWA C151 ductile iron pipe, Thickness Class 52 or Pressure Class 350 in accordance the BWL's standards. If used, pipe installed by HDD methods would be AWWA C906 HDPE with a minimum DR11 wall thickness.

4.4 Proposed Schedule

Table 4-3 below shows the completed Project Plan submittal task dates.

Table 4-3. Project Plan Task Schedule

Project Plan Task	Scheduled Date
Draft Project Plan to EGLE	April 8, 2022
Public Hearing Notice	April 8, 2022
Formal Public Hearing	May 9, 2022



Board of Water and Light Board Resolution of Adoption of Plan	May 24, 2022
Submit Final Project Plan to EGLE	June 1, 2022

4.5 Cost Estimate

The estimated total project cost for the proposed SRF projects is \$46,169,433.25. Detailed cost estimates for the distribution system improvements and WTP improvements are both shown in Appendix E. The estimated project costs do not incorporate any potential principal forgiveness the projects may be eligible for.

4.6 User Costs and Cost Sharing

The BWL Water Conditioning Plants provide residential connections to BWL residents including City of Lansing, City of Dewitt, City of East Lansing, Delhi Township, Delta Township, Dewitt Township, Bath Township, Alaiedon Township, Lansing Township, Merdian Township, Watertown Township, and Windsor Township. Table 4-4 denotes the number of residential connections for each that make up the total of 50,463 residential water connections.

Community	Residential Water Connections	Commercial Water Connections	Industrial Water Connections	Total
Alaiedon Township	4	22	0	26
Bath Township	1,041	106	0	1,147
City of East Lansing	20	90	0	110
Dewitt Township	2,143	415	0	2,558
City of Lansing	36,968	5,530	78	42,576
City of Dewitt	899	93	0	992
Delhi Township	7,446	786	9	8,241
Delta Township	78	74	4	156
Lansing Township	1,282	273	0	1,555
Meridian Township	4	23	0	27
Watertown Township	559	119	4	682
Windsor Township	19	0	0	19
Grand Total	50,463	7,531	95	58,089

Table 4-4. Water Connections

The estimated costs for all proposed projects and fiscal years are presented below. User charges are developed based on cost of service studies to recover the operations, maintenance, depreciation, and interest expenses that benefit the water utility's customers.

Table 4-5 presents a summary of the estimated user costs by Fiscal year which were developed based on the estimated capital costs for the proposed project costs over the next five fiscal years. Project costs are typically allocated between fixed and variable charges, with most of the cost assumed fixed on a customer's bill. For simplicity in this bill impact analysis, it is assumed the incremental cost of these projects will be an incremental fixed charge on the bill. For reference, the average monthly residential user in the BWL system consumers 5 CCF per month. 1 CCF is 100 cubic feet of water or 748 gallons.



Table 4-5.	Estimated	User	Cost	Summary	/ by	Phase

Descriptions	FY2023	FY2024	FY2025	FY2026	FY2027	Total
Total Phase Project Cost	\$18,825,609	\$21,357,856	\$3,202,256	\$712,856	\$2,070,856	\$46,169,433
Interest Rate	1.875%	1.875%	1.875%	1.875%	1.875%	
Term (years)	20	20	20	20	20	
No. of Residential Connections*	58,089	58,089	58,089	58,089	58,089	
Total Annual Debt Repayment	\$1,137,471	\$1,290,473	\$3,202,256	\$712,856	\$2,070,856	\$2,789,625
Total Monthly Cost for Project per REU	\$0.36	\$0.53	\$0.06	\$0.01	\$0.04	\$1.00
Total Cost of Loan	\$22,749,423	\$25,809,465	\$3,869,701	\$861,436	\$2,502,484	\$55,792,509
Interest Paid	\$2,844,728	\$3,988,734	\$645,515	\$148,580	\$431,628	\$9,623,076

*Notes:

1. Assumes interest rate of 1.8750%, pricing in 2022.

2. No. of Residential Connections is based on Residential Equivalent Units (REUs) of 145,839 assuming 123 gpd per REU.

4.7 Authority to Implement Selected Alternative

Implementation of the proposed project assumes that the project will be financed by a low-interest loan from the SRF program. The Lansing Board of Water & Light has the necessary legal, institutional, financial, and managerial resources available to ensure the construction, operation, and maintenance of the proposed facilities.

Most of the water main replacements will occur in the local jurisdiction's road right-of-way but portions of the proposed project will occur in the road right-of-way under the jurisdiction of the Michigan Department of Transportation (MDOT). MDOT jurisdiction includes I-496(BUS) and during the construction plan development the necessary MDOT permits will be acquired.



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5.1 General

The anticipated environmental impacts resulting from the construction of the selected plan include beneficial & adverse, short term & long term, and irreversible impacts. The following is a discussion of the environmental impacts of the selected plan.

5.1.1 Beneficial and Adverse Impacts

The two (2) WCPs are the BWL drinking water conditioning facilities. The WCPs provide drinking water to all commercial and domestic (residential) residents. Drinking water to homes and businesses is conveyed from the WCP after being treated from the BWL's raw water supply from existing wells that access the Saginaw Aquifer. Without the diligent work of WCP employees to operate and maintain the facilities, the clean water would not be distributed throughout the BWL's jurisdiction.

Construction activities associated with the proposed WCP improvements and Drinking Water Distribution System improvements will take place on the existing facilities. Construction and equipment manufacturing related jobs would be generated, and local contractors would have an equal opportunity to bid on the construction contracts.

The environmental impacts for each alternative are expected to be minimal to none. All elements of improvement efforts in this project aim to have the least impact possible on the community and environment. No long-lasting impacts are expected for any alternative. Implementation of the Project Plan would create temporary disruption due to required construction. This includes noise and dust generated by the work and possible erosion of soils from open excavation. The assessment of alternate solutions and sites for the proposed project included identification of any important resources of either historic or environmental value which are protected by law and should be avoided.

No registered contamination sites were found within the WCP projects using the EGLE site contamination online mapper tool.

5.1.2 Short-Term and Long-Term Impacts

The short-term adverse impacts associated with construction activities would be minimal, and mitigatable, in comparison to the resulting long-term beneficial impacts. Impacts from the Drinking Water Distribution System and WCP improvements include temporary site disturbance, temporary damage to surface vegetation, and temporary water shut-off for residents. All restoration required post-replacement should return the impacted area to existing conditions. No long-term negative impacts are anticipated.

The long-term positive impacts include upgrading failing infrastructure, improved efficiency at the plant, and the ability to continue providing adequate clean water throughout the BWL jurisdiction. These impacts also include improved processing at the plant and reduced wear on the plant equipment.

5.1.3 Irreversible Impacts

The investment in non-recoverable resources committed to the Project Plan would be traded off for the improved performance of the facilities during the life of the system. The commitment of resources includes public capital, energy, labor, and unsalvageable materials. These non-recoverable resources would be foregone for the provision of the proposed improvements.



Construction accidents associated with this project may cause irreversible bodily injuries or death. Accidents may also cause damage to or destruction of equipment and other resources.

5.2 Analysis of Impacts

5.2.1 Direct Impacts

Local Air Quality

There will be minimal direct impacts on local air quality during the construction phases of these projects. Any effects on air quality will be due to dust and emissions from construction equipment.

Archeological, Historical, or Cultural Resources

There are no impacts on archaeological, tribal, historical, or cultural resources due to this project. However, the appropriate affiliates will be contacted and informed about the project upon any changes in conditions.

Impacts Upon the Existing or Future Quality of Local Groundwater and Surface Waters

Construction will occur at the WCP site as well as throughout the Drinking Water Distribution System. No impact will be made to Grand River, Red Cedar River, or Looking Glass River and surrounding waterways, but appropriate measures will be taken during construction to avoid impact to these neighboring bodies of water. All necessary permits will be obtained before the proposed activities. There are no impacts anticipated to the local groundwater.

Impacts Upon Sensitive Features

Since the work is expected to take place within the existing Drinking Water Distribution System and WCP facilities, the construction will take place outside of the designated floodplain, wetland areas, or other sensitive areas. Any work that takes place within floodplain limits, proper mitigation measures, and permits will be obtained before the proposed activities.

Impacts Upon People and The Local Economy

Short-term impacts on people will occur during the construction phase. Increased construction traffic will occur in the localized area of the WCPs. The BWL jurisdiction water users will experience beneficial long-term impacts due to the level of service to which they expect to be maintained by these improvements.

The local economy will be stimulated for contractors and suppliers of the materials, labor, and equipment necessary to construct the project.

Operational Impacts

The proposed projects will improve the operation efficiency of the WCP and lower future operation and maintenance (O&M) costs for the Drinking Water Distribution System.



5.2.1 Indirect Impacts

Changes in Rate, Density, Or Type of Residential, Commercial, or Industrial Development and the Associated Transportation Changes

No changes are anticipated to the above.

Changes in Land Use

No changes are anticipated to the above. All improvements to the WCP and the Drinking Water Distribution System will be completed on the existing WCP site and existing system facilities.

Changes in Air or Water Quality Due to Facilitated Development

There will be no changes to air quality due to development.

Changes to The Natural Setting or Sensitive Features Resulting from Secondary Growth

There should be no changes to the natural setting or sensitive features resulting from secondary growth.

Impacts on Cultural, Human, Social and Economic Resources

No changes are anticipated to the above.

Impacts of Area Aesthetics

All the proposed WCP work will be completed on the existing site which is largely isolated from public view and the Drinking Water Distribution System will be completed on existing structures which are mainly underground.

Resource Consumption Over the Useful Life of the Treatment Works, Especially the Generation of Solid Wastes

No changes are anticipated to the above.

5.2.1 Cumulative Impacts

Siltation

Siltation may occur during the construction phase of the project. Proper soil erosion and sedimentation control practices will be followed to reduce the impacts of siltation on surrounding areas.

Water Quality Impacts from Direct Discharges and Non-Point Sources

There should not be any impacts to the above as a result of this project.

Indirect Impacts from Development

There should not be development as a result of this project.



The Impacts from Multiple Public Works Projects Occurring in the Same Vicinity

There will only be short-term traffic impacts during the construction phase of this project and proper traffic control measures will be followed.



6 Mitigation

6.1 Short-Term, Construction Related Mitigation

Environmental disruption will occur during construction. Guidelines will be established for cover vegetation removal, dust control, traffic control and accident prevention. Once construction is completed those short-term effects will stop and the area will be returned to the original conditions.

The soil erosion impact would be mitigated through the contractor's required compliance with a program for control of soil erosion and sedimentation as specified in Part 91 of Michigan Act 451, P.A. of 1994. The use of soil erosion and sedimentation controls (i.e., straw bales, sedimentation basins, catch basin inserts, silt fencing, etc.) will protect the Grand River, Red Cedar River, and Looking Glass River.

Careful considerations will be taken during the construction planning process to ensure that the plant remains in service while the improvements are underway. Construction equipment will be maintained in good condition to decrease noise. All access roads will be swept as necessary to avoid tracking sediment onto public roads.

6.2 Mitigation of Long-Term Impacts

General construction activities will prohibit the disposal of soils in wetlands, floodplains, or other sensitive areas. Catch basins will be protected where earth-changing activities will take place.

6.3 Mitigation of Indirect Impacts

The current trend in the Lansing Board of Water & Light's jurisdiction is that the land use is largely dominated by commercial and residential properties. According to the Lansing Board of Water & Light's master planning for land use, this will not change. Considering that a vast majority of the residents within BWL jurisdiction are connected to the water system, a substantial increase in flow is not expected from within the BWL jurisdiction.

The Lansing Board of Water & Light's Master Plan and ordinances can also be found on their websites.



7.1 General

The Project Plan will be advertised in the local newspaper before April 8, 2022 (refer to Appendix G for all public participation documentation.) A copy of the Project Plan will be placed at the following location for review:

- Lansing Board of Water & Light 1201 S. Washington Ave., Lansing, MI 48910
- Online at the Lansing Board of Water & Light's Website

A formal public hearing will be held on May 9, 2022, to review the work associated with the proposed Project Plan. The hearing will review the information presented in the Project Plan, including estimated user costs and to receive comments and views of interested persons. Copies of correspondence related to agency notifications, as well as other relevant correspondence, will also be included in Appendix G.

7.2 Public Hearing

Appendix G will include a transcribed copy of the public hearing, commission members attendance list, the Project Plan resolution, comments received and answered, and a photocopy of the slides presented at the hearing.



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APPENDIX A: AGENCY CORRESPONDANCE
HUBBELL, ROTH & CLARK, INC CONSULTING ENGINEERS SINCE 1915

March 11, 2022

MDOT Bureau of Aeronautics 2700 Port Lansing Road Lansing, MI 48906-2160

Attn: Mr. Steve Houtteman, Aeronautics Environmental Specialist

Re: Impact Review Drinking Water Improvements Project Lansing Board of Water & Light City of Lansing, Michigan

Dear Mr. Houtteman:

The Lansing Board of Water & Light is submitting a Project Plan to the Michigan Department of Environment, Great Lakes, and Energy (EGLE) for acceptance into the Drinking Water State Revolving Fund (DWSRF) Loan Program. The Project Plan requires a review to determine any potential impacts on airspace and airports in the vicinity of the project.

On behalf of the Lansing Board of Water & Light, we are requesting information regarding the impacts of the above referenced proposed project upon Federal Aviation Administration (FAA) regulations and the Michigan Tall Structure Act (1950 PA 327). The project construction will involve the following:

- \equiv Improvements to the distribution systems including:
 - o Replacement of aging water mains
 - Well Drilling to replace aging wells
- \equiv Addressing limitations at the water conditioning plant including:
 - Converting Ammonia Systems to Aqueous Form
 - Elevated Storage Evaluation and Implementation

The BWL's raw water supply is from 125 wells that are used to extract water from the Saginaw Aquifer, 7 of which are owned by Lansing Township. Water is conveyed from the wells through raw water transmission mains to one of the two conditioning plants. The total capacity of all the wells is 67.56 million gallons per day (MGD). Treatment is provided by two (2) Water Conditioning Plants (WCP), the John Dye WCP and Wise Road WCP, that provide 40 MGD and 10 MGD respectively located in the City of Lansing. The WCPs are equipped with four rapid mix basins, four flocculation basins, and four settling basins, and twelve sand filters, finished water storage, and seven high service pumps (finished water). The service area location of the WCPs is provided in the attached figures.

The proposed project site covers mostly urban areas with construction taking place at existing facilities. Excavations will be used throughout the site to help with the rehabilitation of existing facilities. Since the proposed project involves improvements to existing facilities, no impacts are expected from the proposed project upon any airspace and airports. Since construction will occur within 5-miles of a licensed airport, we are requesting on behalf of the Lansing Board of Water & Light, a review to confirm that the above referenced project will not cause an impact to any airspace or airports in the project vicinity.

We request, on behalf of the Lansing Board of Water & Light, your concurrence with this determination. We appreciate

Delhi Townshin	Detroit	Grand Rapids	Howell	lackson	Kalamazoo	Lansing
2101 Aurelius Rd	535 Griswold St	1925 Breton Boad SE	105 W. Grand River	401 S. Mechanic St	834 King Highway	215 S Washington SO
Suito 2A	Bubl Building Ste 1650	Suite 100	Howell MI 48843	Suite B	Suite 107	Suite D
Holt ML 19912	Detroit ML 48226	Grand Papids MI 49506	517-552-0100	Jackson MI 49201	Kalamazoo MI 49001	Lansing ML/8022
517-604-7760	212-065-2220	616-454-4286	517 552 5155	517-202-1205	269-665-2005	517-202-1/02
517-094-7700	313-303-3330	010-454-4280		517-292-1295	209-005-2005	517-292-1400

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MAILING: PO Box 824 Bloomfield Hills, MI 48303-0824

SHIPPING: 555 Hulet Drive Bloomfield Hills, MI 48302-0360

PHONE: 248-454-6300 WEBSITE: hrcengr.com

HRC Job No. 20220131



Mr. Steve Houtteman March 11, 2022 HRC Job Number 20210996 Page 2 of 2

your review and would be grateful for a response by Monday, April 4, 2022 so that we may meet program deadlines.

If you have any questions or require any additional information, please contact the undersigned.

Very truly yours,

HUBBELL, ROTH & CLARK, INC.

Brittany R. lovault

Brittany R. Covault, E.I.T. Graduate Engineer II

Attachments Project Location Map





March 11, 2022

Michigan Department of Environment, Great Lakes, and Energy (EGLE) Lansing District Office 525 W. Allegan St. P.O. Box 30242 Lansing, MI 48909-7742

STREET: 2101 Aurelius Road Suite 2A Holt, MI 48842 PHONE: 517-694-7760 WEBSITE: hrcengr.com

HRC Job No. 20220131

Re: Regional Environmental Planning Review Drinking Water Improvements Program Lansing Board of Water & Light City of Lansing, Michigan

To Whom it May Concern:

The Lansing Board of Water & Light (BWL) is submitting a Project Plan to the Michigan Department of Environment, Great Lakes, and Energy (EGLE) for acceptance into the Drinking Water State Revolving Fund (DWSRF) Loan Program. The Project plan requires a review to determine any potential impacts on land-water interfaces, including Inland Lakes and Streams, Floodplains, Wetlands, Great Lakes Shorelands, Navigable Waters and Army Corps of Engineers (ACE) Regulated Activities.

On behalf of the Lansing Board Water & Light, we are requesting information regarding the impacts of the above referenced proposed project upon the previously detailed land-water interfaces in the vicinity of the project. The project work will involve the following:

- \equiv Improvements to the distribution systems including:
 - Replacement of aging water mains
 - Well Drilling to replace aging wells
- \equiv Addressing limitations at the water conditioning plant including:
 - Converting Ammonia Systems to Aqueous Form
 - Elevated Storage Evaluation and Implementation

The BWL's raw water supply is from 125 wells that are used to extract water from the Saginaw Aquifer, 7 of which are owned by Lansing Township. Water is conveyed from the wells through raw water transmission mains to one of the two conditioning plants. The total capacity of all the wells is 67.56 million gallons per day (MGD). Treatment is provided by two (2) Water Conditioning Plants (WCP), the John Dye WCP and Wise Road WCP, that provide 40 MGD and 10 MGD respectively located in the City of Lansing. The WCPs are equipped with four rapid mix basins, four flocculation basins, and four settling basins, and twelve sand filters, finished water storage, and seven high service pumps (finished water). The service area location of the WCPs is provided in the attached figures.

The proposed project plan site encompasses pre-existing water mains beneath paved roadways or along bridges. In addition to this, construction will take place within the existing water treatment plant.

Based on the attached FEMA Floodplain Maps, it can be concluded that no construction is expected to be within floodplains. All proper permits and precautions will be implemented during this construction. On behalf of the Lansing Board of Water

Bloomfield Hills 555 Hulet Drive Bloomfield Hills, MI 48302 248-454-6300 **Delhi Township** 2101 Aurelius Rd. Ste. 2A Holt, MI 48842 517-694-7760 Detroit 535 Griswold Street Buhl Building Suite 1650 Detroit, MI 48226-3698 Howell 105 W. Grand River Howell, MI 48843 517-552-9199 Jackson 401 S. Mechanic St. Suite B Jackson, MI 49201 517-292-1295 Kalamazoo 834 King Highway Suite 107 Kalamazoo, MI 49001 269-665-2005 Lansing 215 S. Washington SQ Suite D Lansing, MI 48933 517-292-1488



& Light, we are requesting a review to confirm that the above referenced project will not cause any long-term impacts to any floodplains in the project vicinity.

The proposed project locations are mainly within previously attained easements. Since the work will be primarily within existing structures in these easements, no impacts to any existing wetland areas are expected. However, if project work is required within an existing wetland, necessary mitigation measures will be undertaken to protect the wetlands influenced by the project. On behalf of the Lansing Board of Water & Light, we are requesting a review to confirm that the above referenced project will not cause an impact to any wetlands in the project vicinity.

Since the proposed project involves improvements to existing facilities, no impacts are expected from the proposed project upon Great Lakes Shorelands, Navigable Waters or ACE Regulated Activities. On behalf of the Lansing Board of Water & Light, we are requesting a review to confirm that the above referenced project will not cause an impact to any Great Lakes Shorelands, Navigable Waters or ACE Regulated Activities.

If not already obtained, the appropriate joint permit applications will be completed, and the necessary permits obtained prior to any construction activities in this project area.

We request, on behalf of the Lansing Board of Water & Light, your concurrence with this determination. We appreciate your review and would be grateful for a response as soon as possible so that we may meet program deadlines. If you have any questions or require any additional information, please contact the undersigned.

Very truly yours,

HUBBELL, ROTH & CLARK, INC.

Brittany R. Locault Brittany R. Covault, E.I.T. Graduate Engineer II

Attachment Project Location Map Recommended Improvements FEMA Floodplain





Memorandum

SHIPPING: 555 Hulet Drive Bloomfield Hills, MI 48302-0360

PHONE: 248-454-6300 WEBSITE: hrcengr.com

To:	Bethel Skinker David Worthington	
From:	Todd Sneathen Kelly Ferencz	
Date:	March 17, 2022	
Subject:	Lansing Board of Water and Light DWSRF Preliminary Scoring Project Summary	HRC Job No. 20220131

The Lansing Board of Water & Light plans to include the following projects in their submittal of 2022 Project Plan associated with the Drinking Water State Revolving Fund (DWSRF) Application.

Dye Plant – Convert Gas Ammonia Systems to Aqueous Form

Background: The Lansing Board of Water and Light (BWL) uses a chloramination process for disinfection at two water treatment plants (Dye and Wise Road). The plants currently use 150-pound cylinders of anhydrous ammonia gas in conjunction with chlorine to form chloramines as part of the disinfection process. An Ammonia Alternative Study was completed by Fishbeck in April 2016 for the BWL. This study recommends the conversion of the plant from anhydrous ammonia to ammonium hydroxide. The project includes construction of two (2) new 3,100 gallon FRP bulk storage tanks, new tank fill and vapor return lines and the storage area would be enclosed to isolate it from the rest of the plant. Additionally, a new chemical storage/feed room would be constructed adjacent to the storage room and would include an additional 2,350 gallon storage tank, a day tank and chemical metering pumps.

Improvements/Upgrades: The improvements recommended in the Fishbeck Study are needed due to the age of the existing equipment, much of the existing equipment is at the end of its life cycle and in need of replacement, as well as to address operational issues and reduce potential significant safety hazards associated with the current plant operations. Utilizing a gaseous form of ammonia in anhydrous ammonia can pose significant safety concerns. Additionally, the storage facilities will allow full truckload delivery of chemicals on a monthly basis with adequate reserve for 30 days of operation.

Elevated Storage

Background: The Lansing Board of Water and Light (BWL) currently does not have any elevated water storage within its system. This proves to be a risk to the system as they rely on backup generators and pumps to supply pressure during a power outage. If the system currently in place were to fail, the water distribution system will lose pressure within minutes and the BWL would not be able to supply water to their customers. Over the past two years, the BWL has experienced several instances where the pumps have been impacted by a loss of power or voltage changes that triggered the emergency generator and emergency pump to startup and maintain pressures in the system. . These events result in pressure fluctuations over a short period of time within the system which increases the likelihood of causing main breaks putting customers at risk of lost service.

Delhi Township 2101 Aurelius Rd. Suite 2A Holt, MI 48842 517-694-7760 Y:\202201\20220131\03 Studies\Working\20220317 BWL ITA Memo Final.docx

Detroit 535 Griswold St. Buhl Building, Ste 1650 Detroit, MI 48226 313-965-3330

Grand Rapids 81925 Breton Road SE Suite 100 Grand Rapids, MI 49506 616-454-4286

Howell 105 W. Grand River Howell MI 48843 517-552-9199

Jackson 401 S. Mechanic St. Suite B Jackson, MI 49201 517-292-1295

Kalamazoo 834 King Highway Suite 107 Kalamazoo, MI 49001 269-665-2005

Lansing 215 S. Washington SQ Suite D Lansing, MI 48933 517-292-1488



Recipient Name March 17, 2022 HRC Job Number 20220131 Page 2 of 3

<u>Improvements/Upgrades</u>: The proposed elevated storage tank dramatically increases the reliability of the BWL system. The elevated storage would be located strategically to best support the system and is proposed to hold between 2-3 million gallons. This storage volume would allow the BWL to provide water to customers at adequate pressures for approximately two hours in case the backup generator or emergency pump had any issues during an unplanned power outage or any other issue at the plant that may result in the inability to deliver water out of the plant. This would provide the BWL extra time to trouble shoot any mechanical and electrical issues or for the restoration of the permanent power to the area compared to having no elevated storage.

Well Drilling to Replace Aged Wells

<u>Background</u> Within the BWL system, there are 122 active wells that are used as source water. Of these 125 active wells, approximately 75% off them are over 50 years old and 32% of the wells are over 70 years old. In addition, the vast majority of the aged wells are associated with the Dye Water Treatment Plant which is the primary treatment facility for the Board. The aging infrastructure that is critical to the water distribution of the area relies on these point sources. According to the BWL 2017 Asset Management Plan the probability of failure of an individual well is high based on the age of the wells. If multiple wells were to fail due to structural conditions resulting from age, this could cause a significant impact to the BWL's ability to supply water to their customers.

<u>Improvements/Upgrades</u>: The BWL plans to replace two (2) wells per year to improve the reliability of the system. Given the large number of aged wells, slowly abandoning the oldest wells and replacing with new wells increases the longevity of the system. The location of the first two wells to be replaced in 2023 are adjacent to existing wells and will be off-set wells. These will be from some of the oldest wells in the inventory.

Dry Chemical Handling Project – Phase B

<u>Background</u> The John F. Dye Water Conditioning Plant is experiencing significant problems with the lime and soda ash systems. This project is one phase of the overall dry chemical handling project which consist of three separate phases. The first phase (Phase A) addresses the severe dust issues associated with chemical delivery. The second phase (Phase B) addresses the lime chemical issues primarily the delivery and slaking equipment. The third phase (Phase C) is similar to Phase B, but is associated with the soda ash systems. The phase the BWL is seeking funding for includes tasks such as lime bin slide gates, lime bin 9" screw feeders, lime screw feeder discharge chute, lime slaking equipment and controls, demo of existing chemical feed equipment, and miscellaneous electrical improvements.

Improvements/Upgrades:

The BWL plans to upgrade the dry chemical handling system to address significant issues that are occurring with the lime and soda ash systems. This will improve reliability and control of these systems and improve severe dust issues associated with chemical deliveries that expose employees to safety risks.

Watermain Replacement

<u>Background:</u> The BWL works with the City of Lansing on the City's Combined Sewer Overflow (CSO) program to coordinate the replacement of the aging water main while the streets and sidewalks are under construction as part of the CSO work to help reduce costs for both organizations. Many of these water main pipes are the oldest in the BWL's system and have severe tuberculation – the formation of small mounds of corrosion produces on the inside of the pipe - that impact water quality and hydraulic performance. These impacts result in a reduction in chlorine levels, increase in suspended solids, discolored water, nitrification, excess ammonia and high levels of iron. Main breaks in this era of pipe are generally 7 times more likely to occur than ductile iron pipe (newer era pipe).



Recipient Name March 17, 2022 HRC Job Number 20220131 Page 3 of 3

The BWL also works to replace water main located outside of CSO areas for similar reasons. The BWL is currently targeting the replacement of a poor performing water main system that was acquired in the 1940s, that consists of unlined cast iron pipe. These pipes are typically 40 times more likely to break than that of new pipe and approximately 6 times more likely to break than the average pipe within the BWL system. These areas are also known to have severe tuberculation resulting in water quality and hydraulic performance issues mentioned above.

<u>Improvements/Upgrades</u>: The BWL plans to replace the significantly aged sections of water main (i.e. 100 year old sections along Michigan Avenue and areas within CSO boundaries) as well as areas outside of CSO that has experienced main breaks at a rate of 40 times more than ductile iron and 6 times more than the average pipe within the BWL system. The amount of planned watermain replacement in conjunction with the City of Lansing's CSO work is approximately half of the planned watermain. The replacements will improve the reliability of the system to the areas of the network that are currently experiencing significant breaks as well improve the quality of the water delivered to the customers.

Raw Watermain Installation

<u>Background:</u> Based on a feasibility study completed in 2019, the BWL drilled a new well in 2022 on Hughes Road, south of Jolly Road. This well has the potential to produce 350 to 400 gpm. The purpose of this project is to connect the newly drilled well to the raw water piping network so the well can feed water to the water conditioning plant.

<u>Improvements/Upgrades</u>: This project includes the construction of approximately 2,300 of raw watermain to connect this new well to existing network. By connecting this newly drilled well into the overall network, the BWL will be improving reliability of providing water.

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FIGURE 2.6

FLOODPLAINS MAP

2022 DWSRF Project Plan

March 2022 HRC#: 20220131



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FIGURE 2.7 FLOODPLAINS MAP B

Project Plan March 2022 HRC#: 20220131



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FIGURE 2.8

FLOODPLAINS MAP C

2022 DWSRF

Project Plan

March 2022

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FIGURE 2.9

FLOODPLAINS MAP D

2022 DWSRF Project Plan

March 2022 HRC#: 20220131



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FIGURE 2.10 FLOODPLAINS MAP E 2022 DWSRF Project Plan

HRC#: 20220131

March 2022



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FIGURE 2.12 FLOODPLAINS MAP G 2022 DWSRF Project Plan

HRC#: 20220131

March 2022



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FIGURE 2.13 FLOODPLAINS MAP H

Project Plan







March 11, 2022

Tri-County Regional Planning Commission 3135 Pine Tree Road #2C Lansing, MI 48911

Re: Regional Environmental Planning Review Drinking Water Improvements Project Lansing Board of Water & Light City of Lansing, MI STREET: 1925 Breton Road SE Suite 100 Grand Rapids, MI 49506 PHONE: 616-454-4286 WEBSITE: hrcengr.com

HRC Job No. 20220131

To Whom It May Concern:

The Lansing Board of Water & Light (BWL) is submitting a Project Plan to the Michigan Department of Environment, Great Lakes, and Energy (EGLE) for acceptance into the Drinking Water State Revolving Fund (DWSRF) Loan Program. The Project Plan requires a review to determine any potential impacts on any local development plans, area wide waste treatment management plans and/or regional water quality management plans.

On behalf of the Lansing Board of Water & Light, we are requesting information regarding the impacts of the above referenced proposed project upon any local development plans, area wide waste treatment management plans and/or regional water quality management plans in the vicinity of the project. The project work will involve the following:

- \equiv Improvements to the distribution systems including:
 - Replacement of aging water mains
 - Well Drilling to replace aging wells
- \equiv Addressing limitations at the water conditioning plant including:
 - Converting Ammonia Systems to Aqueous Form
 - Elevated Storage Evaluation and Implementation

The BWL's raw water supply is from 125 wells that are used to extract water from the Saginaw Aquifer, 7 of which are owned by Lansing Township. Water is conveyed from the wells through raw water transmission mains to one of the two conditioning plants. The total capacity of all the wells is 67.56 million gallons per day (MGD). Treatment is provided by two (2) Water Conditioning Plants (WCP), the John Dye WCP and Wise Road WCP, that provide 40 MGD and 10 MGD respectively located in the City of Lansing. The WCPs are equipped with four rapid mix basins, four flocculation basins, and four settling basins, and twelve sand filters, finished water storage, and seven high service pumps (finished water). The service area location of the WCPs is provided in the attached figures.

All population figures and projections referenced in the project plan were collected from the United States Census Bureau.

We request, on behalf of the Lansing Board of Water & Light, notification if an alternative source for the population data is recommended.

Since the proposed project involves improvements to existing facilities and properties, no impacts are expected from the proposed project upon local development plans, area wide waste treatment management plans and/or regional water quality management plans. On behalf of the Lansing Board of Water & Light, we are requesting a review to confirm that the above

Bloomfield Hills 555 Hulet Drive Bloomfield Hills, MI 48302 248-454-6300 **Delhi Township** 2101 Aurelius Rd. Ste. 2A Holt, MI 48842 517-694-7760 Detroit 535 Griswold Street Buhl Building Suite 1650 Detroit, MI 48226-3698 Howell 105 W. Grand River Howell, MI 48843 517-552-9199 Jackson 401 S. Mechanic St. Suite B Jackson, MI 49201 517-292-1295 Kalamazoo 834 King Highway Suite 107 Kalamazoo, MI 49001 269-665-2005 Lansing 215 S. Washington SQ Suite D Lansing, MI 48933 517-292-1488



Networks Northwest March 11, 2022 HRC Job Number 20210137 Page 2 of 2

referenced project will not cause an impact to any local development plans, area wide waste treatment management plans and/or regional water quality management plans.

We request, on behalf of the Lansing Board of Water & Light, your concurrence with this determination. We appreciate your review and would be grateful for a response as soon as possible so that we may meet program deadlines. If you have any questions or require any additional information, please contact the undersigned.

Very truly yours,

HUBBELL, ROTH & CLARK, INC.

Brittany R. locault Brittany R. Covault, E.I.T. Graduate Engineer II

Attachment Project Location Map Recommended/Proposed Improvements Memo





Memorandum

SHIPPING: 555 Hulet Drive Bloomfield Hills, MI 48302-0360

PHONE: 248-454-6300 WEBSITE: hrcengr.com

To:	Bethel Skinker David Worthington	
From:	Todd Sneathen Kelly Ferencz	
Date:	March 17, 2022	
Subject:	Lansing Board of Water and Light DWSRF Preliminary Scoring Project Summary	HRC Job No. 20220131

The Lansing Board of Water & Light plans to include the following projects in their submittal of 2022 Project Plan associated with the Drinking Water State Revolving Fund (DWSRF) Application.

Dye Plant – Convert Gas Ammonia Systems to Aqueous Form

Background: The Lansing Board of Water and Light (BWL) uses a chloramination process for disinfection at two water treatment plants (Dye and Wise Road). The plants currently use 150-pound cylinders of anhydrous ammonia gas in conjunction with chlorine to form chloramines as part of the disinfection process. An Ammonia Alternative Study was completed by Fishbeck in April 2016 for the BWL. This study recommends the conversion of the plant from anhydrous ammonia to ammonium hydroxide. The project includes construction of two (2) new 3,100 gallon FRP bulk storage tanks, new tank fill and vapor return lines and the storage area would be enclosed to isolate it from the rest of the plant. Additionally, a new chemical storage/feed room would be constructed adjacent to the storage room and would include an additional 2,350 gallon storage tank, a day tank and chemical metering pumps.

Improvements/Upgrades: The improvements recommended in the Fishbeck Study are needed due to the age of the existing equipment, much of the existing equipment is at the end of its life cycle and in need of replacement, as well as to address operational issues and reduce potential significant safety hazards associated with the current plant operations. Utilizing a gaseous form of ammonia in anhydrous ammonia can pose significant safety concerns. Additionally, the storage facilities will allow full truckload delivery of chemicals on a monthly basis with adequate reserve for 30 days of operation.

Elevated Storage

Background: The Lansing Board of Water and Light (BWL) currently does not have any elevated water storage within its system. This proves to be a risk to the system as they rely on backup generators and pumps to supply pressure during a power outage. If the system currently in place were to fail, the water distribution system will lose pressure within minutes and the BWL would not be able to supply water to their customers. Over the past two years, the BWL has experienced several instances where the pumps have been impacted by a loss of power or voltage changes that triggered the emergency generator and emergency pump to startup and maintain pressures in the system. . These events result in pressure fluctuations over a short period of time within the system which increases the likelihood of causing main breaks putting customers at risk of lost service.

Delhi Township 2101 Aurelius Rd. Suite 2A Holt, MI 48842 517-694-7760 Y:\202201\20220131\03 Studies\Working\20220317 BWL ITA Memo Final.docx

Detroit 535 Griswold St. Buhl Building, Ste 1650 Detroit, MI 48226 313-965-3330

Grand Rapids 81925 Breton Road SE Suite 100 Grand Rapids, MI 49506 616-454-4286

Howell 105 W. Grand River Howell MI 48843 517-552-9199

Jackson 401 S. Mechanic St. Suite B Jackson, MI 49201 517-292-1295

Kalamazoo 834 King Highway Suite 107 Kalamazoo, MI 49001 269-665-2005

Lansing 215 S. Washington SQ Suite D Lansing, MI 48933 517-292-1488



Recipient Name March 17, 2022 HRC Job Number 20220131 Page 2 of 3

<u>Improvements/Upgrades</u>: The proposed elevated storage tank dramatically increases the reliability of the BWL system. The elevated storage would be located strategically to best support the system and is proposed to hold between 2-3 million gallons. This storage volume would allow the BWL to provide water to customers at adequate pressures for approximately two hours in case the backup generator or emergency pump had any issues during an unplanned power outage or any other issue at the plant that may result in the inability to deliver water out of the plant. This would provide the BWL extra time to trouble shoot any mechanical and electrical issues or for the restoration of the permanent power to the area compared to having no elevated storage.

Well Drilling to Replace Aged Wells

<u>Background</u> Within the BWL system, there are 122 active wells that are used as source water. Of these 125 active wells, approximately 75% off them are over 50 years old and 32% of the wells are over 70 years old. In addition, the vast majority of the aged wells are associated with the Dye Water Treatment Plant which is the primary treatment facility for the Board. The aging infrastructure that is critical to the water distribution of the area relies on these point sources. According to the BWL 2017 Asset Management Plan the probability of failure of an individual well is high based on the age of the wells. If multiple wells were to fail due to structural conditions resulting from age, this could cause a significant impact to the BWL's ability to supply water to their customers.

<u>Improvements/Upgrades</u>: The BWL plans to replace two (2) wells per year to improve the reliability of the system. Given the large number of aged wells, slowly abandoning the oldest wells and replacing with new wells increases the longevity of the system. The location of the first two wells to be replaced in 2023 are adjacent to existing wells and will be off-set wells. These will be from some of the oldest wells in the inventory.

Dry Chemical Handling Project – Phase B

<u>Background</u> The John F. Dye Water Conditioning Plant is experiencing significant problems with the lime and soda ash systems. This project is one phase of the overall dry chemical handling project which consist of three separate phases. The first phase (Phase A) addresses the severe dust issues associated with chemical delivery. The second phase (Phase B) addresses the lime chemical issues primarily the delivery and slaking equipment. The third phase (Phase C) is similar to Phase B, but is associated with the soda ash systems. The phase the BWL is seeking funding for includes tasks such as lime bin slide gates, lime bin 9" screw feeders, lime screw feeder discharge chute, lime slaking equipment and controls, demo of existing chemical feed equipment, and miscellaneous electrical improvements.

Improvements/Upgrades:

The BWL plans to upgrade the dry chemical handling system to address significant issues that are occurring with the lime and soda ash systems. This will improve reliability and control of these systems and improve severe dust issues associated with chemical deliveries that expose employees to safety risks.

Watermain Replacement

<u>Background:</u> The BWL works with the City of Lansing on the City's Combined Sewer Overflow (CSO) program to coordinate the replacement of the aging water main while the streets and sidewalks are under construction as part of the CSO work to help reduce costs for both organizations. Many of these water main pipes are the oldest in the BWL's system and have severe tuberculation – the formation of small mounds of corrosion produces on the inside of the pipe - that impact water quality and hydraulic performance. These impacts result in a reduction in chlorine levels, increase in suspended solids, discolored water, nitrification, excess ammonia and high levels of iron. Main breaks in this era of pipe are generally 7 times more likely to occur than ductile iron pipe (newer era pipe).



Recipient Name March 17, 2022 HRC Job Number 20220131 Page 3 of 3

The BWL also works to replace water main located outside of CSO areas for similar reasons. The BWL is currently targeting the replacement of a poor performing water main system that was acquired in the 1940s, that consists of unlined cast iron pipe. These pipes are typically 40 times more likely to break than that of new pipe and approximately 6 times more likely to break than the average pipe within the BWL system. These areas are also known to have severe tuberculation resulting in water quality and hydraulic performance issues mentioned above.

<u>Improvements/Upgrades</u>: The BWL plans to replace the significantly aged sections of water main (i.e. 100 year old sections along Michigan Avenue and areas within CSO boundaries) as well as areas outside of CSO that has experienced main breaks at a rate of 40 times more than ductile iron and 6 times more than the average pipe within the BWL system. The amount of planned watermain replacement in conjunction with the City of Lansing's CSO work is approximately half of the planned watermain. The replacements will improve the reliability of the system to the areas of the network that are currently experiencing significant breaks as well improve the quality of the water delivered to the customers.

Raw Watermain Installation

<u>Background:</u> Based on a feasibility study completed in 2019, the BWL drilled a new well in 2022 on Hughes Road, south of Jolly Road. This well has the potential to produce 350 to 400 gpm. The purpose of this project is to connect the newly drilled well to the raw water piping network so the well can feed water to the water conditioning plant.

<u>Improvements/Upgrades</u>: This project includes the construction of approximately 2,300 of raw watermain to connect this new well to existing network. By connecting this newly drilled well into the overall network, the BWL will be improving reliability of providing water.



April 4, 2022

Brittany R. Covault, E.I.T. Graduate Engineer II Hubbell, Roth & Clark, Inc 1925 Breton Road SE, Suite 100 Grand Rapids, MI 49506

Dear Ms. Covault:

Thank you for reaching out regarding the Lansing Board of Water & Light's project plan for the Drinking Water State Revolving Fund Loan Program. We have reviewed the plan and the requests laid out within your letter. Below are our responses to the listed inquires:

- Regarding the inquiry for all population figures, population projection references, and median annual household income in the Project Plan, we suggest incorporating the 2020 census data to the best of your abilities for the purposes of this project(s).
- We have reviewed and concur that the referenced project(s) will not cause an impact to any local development plans, area wide waste treatment management plans, and/or regional water quality management plans.

Should you have additional questions, please do not hesitate to reach out.

Sincerely,

amenth

Lauren Schnoebelen Environmental Sustainability Planner



March 11, 2022

Natural River Administrator DNR Fisheries Division PO Box 30446 Lansing, MI 48909-7946

Re: Wild and Scenic Rivers Review Drinking Water Improvements Program Lansing Board of Water & Light City of Lansing, Michigan MAILING: PO Box 824 Bloomfield Hills, MI 48303-0824

SHIPPING: 555 Hulet Drive Bloomfield Hills, MI 48302-0360

PHONE: 248-454-6300 WEBSITE: hrcengr.com

HRC Job No. 20220131

To Whom it May Concern:

The Lansing Board of Water & Light is submitting a Project Plan to the Michigan Department of Environment, Great Lakes, and Energy (EGLE) for acceptance into the Drinking Water State Revolving Fund (DWSRF) Loan Program. The Project Plan requires a review to determine any potential impacts on state or federally-designated wild, scenic, or natural rivers or tributaries in the vicinity of the project.

On behalf of the Lansing Board of Water & Light, we are requesting information regarding the impacts of the above referenced proposed project upon protected state or federally-designated wild, scenic, or natural rivers or tributaries. The project work will involve the following:

- \equiv Improvements to the distribution systems including:
 - o Replacement of aging water mains
 - Well Drilling to replace aging wells
- \equiv Addressing limitations at the water conditioning plant including:
 - Converting Ammonia Systems to Aqueous Form
 - o Elevated Storage Evaluation and Implementation

The BWL's raw water supply is from 125 wells that are used to extract water from the Saginaw Aquifer, 7 of which are owned by Lansing Township. Water is conveyed from the wells through raw water transmission mains to one of the two conditioning plants. The total capacity of all the wells is 67.56 million gallons per day (MGD). Treatment is provided by two (2) Water Conditioning Plants (WCP), the John Dye WCP and Wise Road WCP, that provide 40 MGD and 10 MGD respectively located in the City of Lansing. The WCPs are equipped with four rapid mix basins, four flocculation basins, and four settling basins, and twelve sand filters, finished water storage, and seven high service pumps (finished water). The service area location of the WCPs is provided in the attached figures.

The proposed project site covers mostly urban areas with construction taking place at existing facilities. Excavations will be used throughout the site to help with the rehabilitation of existing facilities. The location of these improvements and construction will not occur or impact the any nearby Lakes and/or Rivers. The Wild and Scenic Rivers Inventory in Michigan and the National Park Service National Rivers Inventory maps are attached.

On behalf of the Lansing Board of Water & Light, we are requesting a review to confirm that the above referenced project will not cause an impact to any state or federally designated wild, scenic, or natural rivers or tributaries.

We request, on behalf of the Lansing Board of Water & Light, your concurrence with this determination. We appreciate

Delhi Township	Detroit	Grand Rapids	Howell	Jackson	Kalamazoo	Lansing
2101 Aurelius Rd.	535 Griswold St.	1925 Breton Road SE	105 W. Grand River	401 S. Mechanic St.	834 King Highway	215 S. Washington SQ
Suite 2A	Buhl Building, Ste 1650	Suite 100	Howell, MI 48843	Suite B	Suite 107	Suite D
Holt, MI 48842	Detroit, MI 48226	Grand Rapids, MI 49506	517-552-9199	Jackson, MI 49201	Kalamazoo, MI 49001	Lansing, MI 48933
517-694-7760	313-965-3330	616-454-4286		517-292-1295	269-665-2005	517-292-1488
2101 Aurelius Rd. Suite 2A Holt, MI 48842 517-694-7760	535 Griswold St. Buhl Building, Ste 1650 Detroit, MI 48226 313-965-3330	1925 Breton Road SE Suite 100 Grand Rapids, MI 49506 616-454-4286	105 W. Grand River Howell, MI 48843 517-552-9199	401 S. Mechanic St. Suite B Jackson, MI 49201 517-292-1295	834 King Highway Suite 107 Kalamazoo, MI 49001 269-665-2005	215 S. Washington S Suite D Lansing, MI 48933 517-292-1488

Y:\202201\20220131\03_Studies\Working\Project_Plan\Draft\Appendices\Appendix A - Agency Corres\Wild_Scenic Rivers\Wild and Scenic Rivers.docx



DNR Fisheries Division March 11, 2022 HRC Job Number 20220131 Page 2 of 2

your review and would be grateful for a response by Monday, April 4, 2022 so that we may meet program deadlines.

If you have any questions or require any additional information, please contact the undersigned.

Very truly yours,

HUBBELL, ROTH & CLARK, INC.

Brittany R. Corault Brittany R. Covault, E.I.T.

Graduate Engineer II

<u>Attachments</u> Project Location Map Michigan Wild & Scenic River Map National Rivers Inventory Map



Michigan Wild and Scenic Rivers



National Wild and Scenic Rivers System Source: National Wild and Scenic Rivers System Website (https://www.rivers.gov/mapping-gis.php).





APPENDIX B: NATIONWIDE RIVERS INVENTORY



APPENDIX C: WEB SOILS SURVEY RESULTS





Natural Resources Conservation Service

<u>50</u>4

Web Soil Survey National Cooperative Soil Survey



Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Ad	Adrian muck, 0 to 1 percent slopes	214.5	0.3%
BdA	Blount loam, 0 to 2 percent slopes	1.9	0.0%
Bh	Borrow land	201.6	0.3%
BnB	Boyer sandy loam, 0 to 6 percent slopes	1,312.2	1.6%
BnC	Boyer sandy loam, 6 to 12 percent slopes	348.5	0.4%
ВоВ	Boyer complex, 0 to 6 percent slopes	306.9	0.4%
BoC	Boyer complex, 6 to 12 percent slopes	98.4	0.1%
BoD	Boyer complex, 12 to 18 percent slopes	84.9	0.1%
BoE	Boyer complex, 18 to 25 percent slopes	91.5	0.1%
СьВ	Capac-Marlette loams, 1 to 6 percent slopes	3,849.4	4.8%
Се	Ceresco fine sandy loam	3.2	0.0%
Ch	Cohoctah loam	111.8	0.1%
Со	Colwood loam	690.3	0.9%
Cr	Corunna sandy loam	87.4	0.1%
CvraaB	Conover loam, 0 to 4 percent slopes	5,372.3	6.7%
Ed	Edwards muck, 0 to 1 percent slopes	44.5	0.1%
Gf	Gilford sandy loam, 0 to 2 percent slopes, gravelly subsoil	208.5	0.3%
Gr	Granby loamy sand, 0 to 2 percent slopes	27.7	0.0%
Но	Houghton muck, 0 to 1 percent slopes	1,436.6	1.8%
KbA	Kibbie loam, 0 to 3 percent slopes	301.6	0.4%
LaB	Lapeer sandy loam, 2 to 6 percent slopes	84.5	0.1%
МаВ	Marlette loam, 2 to 6 percent slopes	5,186.5	6.5%
MaC	Filer loam, 6 to 12 percent slopes	2,262.2	2.8%


Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
MaD	Filer loam, 12 to 18 percent slopes	234.8	0.3%
MaE	Filer loam, 18 to 35 percent slopes	69.8	0.1%
MbC3	Marlette clay loam, 6 to 12 percent slopes, severely eroded	64.0	0.1%
MbD3	Marlette clay loam, 12 to 18 percent slopes, severely eroded	207.7	0.3%
MdA	Matherton loam, 0 to 3 percent slopes	207.2	0.3%
MeA	Metamora-Capac sandy loams, 0 to 4 percent slopes	249.5	0.3%
MhB	Metea loamy sand, 2 to 6 percent slopes	11.3	0.0%
OaB	Oakville fine sand, 0 to 6 percent slopes	13.2	0.0%
OsB	Oshtemo sandy loam, 2 to 6 percent slopes	73.8	0.1%
OtA	Owosso sandy loam, 0 to 2 percent slopes	105.7	0.1%
OwB	Owosso-Marlette sandy loams, 2 to 6 percent slopes	652.7	0.8%
OwC	Owosso-Marlette sandy loams, 6 to 12 percent slopes	178.1	0.2%
Ра	Palms muck, 0 to 1 percent slopes	381.6	0.5%
Pg	Pits, gravel	221.4	0.3%
Pr	Parkhill loam, non dense till subsoil, 0 to 2 percent slopes	1,263.3	1.6%
Sb	Sebewa loam, 0 to 2 percent slopes	315.4	0.4%
SeA	Selfridge loamy sand, till plain, 0 to 4 percent slopes	24.4	0.0%
Sg	Sewage lagoons	2.4	0.0%
Sh	Shoals loam	8.2	0.0%
SI	Sanitary landfill	328.4	0.4%
Sm	Sims silty clay loam	14.6	0.0%
SnB	Sisson fine sandy loam, 2 to 6 percent slopes	269.9	0.3%
So	Sloan loam	573.0	0.7%
SpB	Spinks loamy sand, 0 to 6 percent slopes	450.2	0.6%
SpC	Spinks loamy sand, 6 to 12 percent slopes	77.3	0.1%



Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
ThA	Thetford loamy sand, 0 to 3 percent slopes	17.2	0.0%
UdB	Udorthents, loamy, 0 to 8 percent slopes	1,143.9	1.4%
W	Water	348.1	0.4%
Wa	Wallkill loam	51.2	0.1%
WbA	Wasepi sandy loam, 0 to 3 percent slopes	492.0	0.6%
Wd	Washtenaw loam	494.0	0.6%
Subtotals for Soil Survey Area		30,871.0	38.6%
Totals for Area of Interest		80,018.3	100.0%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Ad	Adrian muck, 0 to 1 percent slopes	108.5	0.1%
Aq	Aquents and Histosols, ponded	19.2	0.0%
Bh	Borrow land	427.4	0.5%
BnB	Boyer loamy sand, 0 to 6 percent slopes	213.9	0.3%
BnC	Boyer loamy sand, 6 to 12 percent slopes	69.4	0.1%
ВоВ	Boyer sandy loam, 0 to 6 percent slopes	141.1	0.2%
BoC	Boyer sandy loam, 6 to 12 percent slopes	71.4	0.1%
BpD	Boyer-Spinks loamy sands, 12 to 18 percent slopes	34.1	0.0%
BrA	Brady-Bronson sandy loams, 0 to 3 percent slopes	341.5	0.4%
СьВ	Capac-Marlette loams, 1 to 6 percent slopes	2,500.9	3.1%
Ch	Cohoctah fine sandy loam, frequently flooded	131.0	0.2%
Со	Colwood loam	811.1	1.0%
Ср	Colwood loam, depressional	37.4	0.0%
CvraaB	Conover loam, 0 to 4 percent slopes	5,106.3	6.4%
Ed	Edwards muck, 0 to 1 percent slopes	65.8	0.1%
Gf	Gilford sandy loam, 0 to 2 percent slopes, gravelly subsoil	223.2	0.3%
НаВ	Hillsdale sandy loam, 2 to 6 percent slopes	68.3	0.1%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
HaC	Hillsdale sandy loam, 6 to 12 percent slopes	97.8	0.1%
Но	Houghton muck, 0 to 1 percent slopes	555.0	0.7%
KbA	Kibbie fine sandy loam, 0 to 3 percent slopes	309.9	0.4%
Le	Lenawee silty clay loam, depressional	55.3	0.1%
МаВ	Marlette loam, 2 to 6 percent slopes	5,692.6	7.1%
МаС	Filer loam, 6 to 12 percent slopes	1,364.6	1.7%
MaD	Filer loam, 12 to 18 percent slopes	299.9	0.4%
MaE	Filer loam, 18 to 35 percent slopes	175.4	0.2%
MbC3	Marlette clay loam, 6 to 12 percent slopes, severely eroded	38.0	0.0%
MdA	Matherton loam, 0 to 3 percent slopes	33.9	0.0%
MeA	Metamora-Capac sandy loams, 0 to 4 percent slopes	500.3	0.6%
OwB	Owosso-Marlette sandy loams, 1 to 6 percent slopes	1,414.1	1.8%
OwC	Owosso-Marlette sandy loams, 6 to 12 percent slopes	442.2	0.6%
OwD	Owosso-Marlette sandy loams, 12 to 18 percent slopes	143.3	0.2%
Pa	Palms muck, 0 to 1 percent slopes	326.9	0.4%
Pg	Pits, gravel	85.3	0.1%
Pr	Parkhill loam, non dense till subsoil, 0 to 2 percent slopes	2,241.7	2.8%
Sb	Sebewa loam, 0 to 2 percent slopes	110.9	0.1%
Sh	Shoals-Sloan loams	682.0	0.9%
SpB	Spinks loamy sand, 0 to 6 percent slopes	209.6	0.3%
SpC	Spinks loamy sand, 6 to 12 percent slopes	103.2	0.1%
StB	Spinks-Metea loamy sands, 0 to 6 percent slopes	154.4	0.2%
StC	Spinks-Metea loamy sands, 6 to 12 percent slopes	14.8	0.0%
TuA	Tuscola fine sandy loam, 0 to 4 percent slopes	90.0	0.1%



Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
UdB	Udorthents, nearly level and undulating	346.1	0.4%
W	Water	690.6	0.9%
WaA	Wasepi sandy loam, 0 to 3 percent slopes	116.5	0.1%
Subtotals for Soil Survey Area		26,664.8	33.3%
Totals for Area of Interest		80,018.3	100.0%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Ad	Adrian muck, 0 to 1 percent slopes	116.8	0.1%
AnA	Aubbeenaubbee-Capac sandy loams, 0 to 3 percent slopes	105.6	0.1%
Во	Boots muck	15.4	0.0%
BrB	Boyer sandy loam, 0 to 6 percent slopes	0.4	0.0%
BsD	Boyer-Spinks loamy sands, 12 to 18 percent slopes	10.8	0.0%
BsE	Boyer-Spinks loamy sands, 18 to 30 percent slopes	9.9	0.0%
ВуА	Brady sandy loam, 0 to 3 percent slopes	72.0	0.1%
Се	Ceresco fine sandy loam	21.8	0.0%
Ch	Cohoctah silt loam	344.6	0.4%
Со	Colwood-Brookston loams	655.7	0.8%
CvraaB	Conover loam, 0 to 4 percent slopes	943.7	1.2%
Ed	Edwards muck, 0 to 1 percent slopes	1.3	0.0%
Gf	Gilford sandy loam, 0 to 2 percent slopes, gravelly subsoil	185.7	0.2%
Gr	Granby loamy fine sand, 0 to 2 percent slopes	87.4	0.1%
Hn	Houghton muck, 0 to 1 percent slopes	292.2	0.4%
Ка	Keowns very fine sandy loam	19.2	0.0%
KbA	Kibbie loam, 0 to 3 percent slopes	97.9	0.1%
Ln	Lenawee silty clay loam	8.9	0.0%
МаВ	Marlette fine sandy loam, 2 to 6 percent slopes	135.7	0.2%
МаС	Filer fine sandy loam, Saginaw Lobe, 6 to 12 percent slopes	48.6	0.1%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
MeD2	Marlette loam, 12 to 18 percent slopes, eroded	19.5	0.0%
MtB	Metea loamy sand, 2 to 6 percent slopes	72.2	0.1%
Na	Napoleon muck	15.2	0.0%
OsB	Oshtemo sandy loam, 0 to 6 percent slopes	3.1	0.0%
OtB	Oshtemo-Spinks loamy sands, 0 to 6 percent slopes	46.3	0.1%
OtC	Oshtemo-Spinks loamy sands, 6 to 12 percent slopes	9.1	0.0%
OwB	Owosso-Marlette sandy loams, 2 to 6 percent slopes	242.6	0.3%
OwC	Owosso-Marlette sandy loams, 6 to 12 percent slopes	14.5	0.0%
Pa	Palms muck, 0 to 1 percent slopes	105.0	0.1%
Pt	Pits	49.7	0.1%
RdB	Riddles-Hillsdale sandy loams, 2 to 6 percent slopes	21.4	0.0%
RdC	Riddles-Hillsdale sandy loams, 6 to 12 percent slopes	13.1	0.0%
SI	Sanitary landfill	56.0	0.1%
SnB	Sisson fine sandy loam, 2 to 6 percent slopes	13.0	0.0%
SnC	Sisson fine sandy loam, 6 to 12 percent slopes	0.1	0.0%
SpB	Spinks loamy sand, 0 to 6 percent slopes	125.1	0.2%
SpC	Spinks loamy sand, 6 to 12 percent slopes	100.2	0.1%
ThA	Thetford loamy sand, 0 to 3 percent slopes	20.4	0.0%
Ud	Udorthents and Udipsamments	366.5	0.5%
UeB	Urban land-Boyer-Spinks complex, 0 to 10 percent slopes	850.6	1.1%
UpA	Urban land-Capac-Colwood complex, 0 to 4 percent slopes	6,057.7	7.6%
UtB	Urban land-Marlette complex, 2 to 12 percent slopes	10,100.0	12.6%
Uu	Urban land-Fluvaquents complex	618.6	0.8%
W	Water	380.5	0.5%
Subtotals for Soil Survey A	Area	22,473.7	28.1%
Totals for Area of Interest		80,018.3	100.0%

<u>ISDAL</u>

APPENDIX D: MICHIGAN NATURAL FEATURES INVENTORY ENDANGERED SPECIES



United States Department of the Interior

FISH AND WILDLIFE SERVICE Michigan Ecological Services Field Office 2651 Coolidge Road Suite 101 East Lansing, MI 48823-6360 Phone: (517) 351-2555 Fax: (517) 351-1443 http://www.fws.gov/midwest/EastLansing/



In Reply Refer To: Project Code: 2022-0015429 Project Name: LBWL DWSRF March 03, 2022

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

Official Species List

The attached species list identifies any Federally threatened, endangered, proposed and candidate species that may occur within the boundary of your proposed project or may be affected by your proposed project. The list also includes designated critical habitat if present within your proposed project area or affected by your project. This list is provided to you as the initial step of the consultation process required under section 7(c) of the Endangered Species Act, also referred to as Section 7 Consultation.

Under 50 CFR 402.12(e) (the regulations that implement section 7 of the Endangered Species Act), the accuracy of this species list should be verified after 90 days. You may verify the list by visiting the IPaC website (<u>https://ipac.ecosphere.fws.gov/</u>) at regular intervals during project planning and implementation. To update an Official Species List in IPaC: from the My Projects page, find the project, expand the row, and click Project Home. In the What's Next box on the Project Home page, there is a Request Updated List button to update your species list. Be sure to select an "official" species list for all projects.

Consultation requirements and next steps

Section 7 of the Endangered Species Act of 1973 requires that actions authorized, funded, or carried out by Federal agencies not jeopardize Federally threatened or endangered species or adversely modify designated critical habitat. To fulfill this mandate, Federal agencies (or their designated non-Federal representative) must consult with the Fish and Wildlife Service if they determine their project may affect listed species or critical habitat.

There are two approaches to evaluating the effects of a project on listed species.

<u>Approach 1. Use the All-species Michigan determination key in IPaC.</u> This tool can assist you in

making determinations for listed species for some projects. In many cases, the determination key will provide an automated concurrence that completes all or significant parts of the consultation process. Therefore, we strongly recommend screening your project with the **All-Species Michigan Determination Key (Dkey)**. For additional information on using IPaC and available Determination Keys, visit <u>https://www.fws.gov/midwest/EastLansing/te/pdf/</u> MIFO IPAC instructions v1 Jan2021.pdf. Please carefully review your Dkey output letter to determine whether additional steps are needed to complete the consultation process.

<u>Approach 2. Evaluate the effects to listed species on your own without utilizing a determination key</u>. Once you obtain your official species list, you are not required to continue in IPaC, although in most cases using a determination key should expedite your review. If the project is a Federal action, you should review our section 7 step-by-step instructions before making your determinations: <u>http://www.fws.gov/midwest/endangered/section7/s7process/index.html</u>. If you evaluate the details of your project and conclude "no effect," document your findings, and your listed species review is complete; you do not need our concurrence on "no effect" determinations. If you cannot conclude "no effect," you should coordinate/consult with the Michigan Ecological Services Field Office. The preferred method for submitting your project description and effects determination (if concurrence is needed) is electronically to EastLansing@fws.gov. Please include a copy of this official species list with your request.

For all **wind energy projects** and **projects that include installing communications towers that use guy wires**, please contact this field office directly for assistance, even if no Federally listed plants, animals or critical habitat are present within your proposed project area or may be affected by your proposed project.

Migratory Birds

Please see the "Migratory Birds" section below for important information regarding incorporating migratory birds into your project planning. Our Migratory Bird Program has developed recommendations, best practices, and other tools to help project proponents voluntarily reduce impacts to birds and their habitats. The Bald and Golden Eagle Protection Act prohibits the take and disturbance of eagles without a permit. If your project is near an eagle nest or winter roost area, see our Eagle Permits website at https://www.fws.gov/midwest/eagle/ permits/index.html to help you avoid impacting eagles or determine if a permit may be necessary.

Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit https://www.fws.gov/birds/policies-and-regulations/administrative-orders/executive-orders.php.

We appreciate your consideration of threatened and endangered species during your project planning. Please include a copy of this letter with any request for consultation or correspondence

about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Migratory Birds
- Wetlands

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Michigan Ecological Services Field Office

2651 Coolidge Road Suite 101 East Lansing, MI 48823-6360 (517) 351-2555

Project Summary

Project Code:	2022-0015429
Event Code:	None
Project Name:	LBWL DWSRF
Project Type:	Distribution Line - Maintenance/Modification - Below Ground
Project Description:	This project would provide several improvements for the existing Water
	Treatment Plans and distribution system including water main
	replacement (outdated), converting the ammonia system to aqueous form,
	updates to the Wise Road WCP chemical building, elevated storage, and
	well drilling.

Project Location:

Approximate location of the project can be viewed in Google Maps: <u>https://www.google.com/maps/@42.7474135,-84.58971573450552,14z</u>



Counties: Clinton, Eaton, and Ingham counties, Michigan

Endangered Species Act Species

There is a total of 7 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Note that 1 of these species should be considered only under certain conditions.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries¹, as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

1. <u>NOAA Fisheries</u>, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Indiana Bat Myotis sodalis There is final critical habitat for this species. The location of the critical habitat is not available. Species profile: <u>https://ecos.fws.gov/ecp/species/5949</u> General project design guidelines: <u>https://ipac.ecosphere.fws.gov/project/RB4LPB726FB2DN4RYND2T7XRYQ/documents/</u> <u>generated/5663.pdf</u>	Endangered
Northern Long-eared Bat <i>Myotis septentrionalis</i> No critical habitat has been designated for this species. Species profile: <u>https://ecos.fws.gov/ecp/species/9045</u> General project design guidelines: <u>https://ipac.ecosphere.fws.gov/project/RB4LPB726FB2DN4RYND2T7XRYQ/documents/generated/5664.pdf</u>	Threatened

Birds

NAME	STATUS
Whooping Crane <i>Grus americana</i> Population: U.S.A. (AL, AR, CO, FL, GA, ID, IL, IN, IA, KY, LA, MI, MN, MS, MO, NC, NM, OH, SC, TN, UT, VA, WI, WV, western half of WY) No critical habitat has been designated for this species. Species profile: <u>https://ecos.fws.gov/ecp/species/758</u>	Experimental Population, Non- Essential

NAME	STATUS
Eastern Massasauga (=rattlesnake) Sistrurus catenatus No critical habitat has been designated for this species. This species only needs to be considered under the following conditions: • For all Projects:Project is within Tier1 Habitat • For all projects:Project is within Tier2 Habitat • For all Projects: Project is within EMR Range Species profile: https://ecos.fws.gov/ecp/species/2202 General project design guidelines: https://ipac.ecosphere.fws.gov/project/RB4LPB726FB2DN4RYND2T7XRYQ/documents/ generated/5280.pdf	Threatened
Clams	
NAME	STATUS
Snuffbox Mussel <i>Epioblasma triquetra</i> No critical habitat has been designated for this species. Species profile: <u>https://ecos.fws.gov/ecp/species/4135</u>	Endangered
Insects	
NAME	STATUS
Monarch Butterfly <i>Danaus plexippus</i> No critical habitat has been designated for this species. Species profile: <u>https://ecos.fws.gov/ecp/species/9743</u>	Candidate
Flowering Plants	STATUS
Eastern Prairie Fringed Orchid Platanthera leucophaea No critical habitat has been designated for this species. Species profile: <u>https://ecos.fws.gov/ecp/species/601</u>	Threatened

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

USFWS National Wildlife Refuge Lands And Fish Hatcheries

Any activity proposed on lands managed by the <u>National Wildlife Refuge</u> system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

Migratory Birds

Certain birds are protected under the Migratory Bird Treaty Act^{1} and the Bald and Golden Eagle Protection Act^{2} .

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described <u>below</u>.

- 1. The Migratory Birds Treaty Act of 1918.
- 2. The <u>Bald and Golden Eagle Protection Act</u> of 1940.
- 3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

The birds listed below are birds of particular concern either because they occur on the <u>USFWS</u> <u>Birds of Conservation Concern</u> (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ <u>below</u>. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the <u>E-bird data</u> <u>mapping tool</u> (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found <u>below</u>.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
American Golden-plover <i>Pluvialis dominica</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Bald Eagle <i>Haliaeetus leucocephalus</i> This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Dec 1 to Aug 31

NAME	BREEDING SEASON
Black Tern <i>Chlidonias niger</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. <u>https://ecos.fws.gov/ecp/species/3093</u>	Breeds May 15 to Aug 20
Black-billed Cuckoo Coccyzus erythropthalmus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. <u>https://ecos.fws.gov/ecp/species/9399</u>	Breeds May 15 to Oct 10
Bobolink <i>Dolichonyx oryzivorus</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 20 to Jul 31
Canada Warbler <i>Cardellina canadensis</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 20 to Aug 10
Eastern Whip-poor-will Antrostomus vociferus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 1 to Aug 20
Golden Eagle Aquila chrysaetos This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1680	Breeds elsewhere
Golden-winged Warbler Vermivora chrysoptera This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. <u>https://ecos.fws.gov/ecp/species/8745</u>	Breeds May 1 to Jul 20
Henslow's Sparrow Ammodramus henslowii This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. <u>https://ecos.fws.gov/ecp/species/3941</u>	Breeds May 1 to Aug 31
Lesser Yellowlegs <i>Tringa flavipes</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. <u>https://ecos.fws.gov/ecp/species/9679</u>	Breeds elsewhere
Long-eared Owl <i>asio otus</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. <u>https://ecos.fws.gov/ecp/species/3631</u>	Breeds Mar 1 to Jul 15
Red-headed Woodpecker <i>Melanerpes erythrocephalus</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Sep 10

NAME	BREEDING SEASON
Ruddy Turnstone Arenaria interpres morinella This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds elsewhere
Rusty Blackbird <i>Euphagus carolinus</i> This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds elsewhere
Short-billed Dowitcher Limnodromus griseus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9480	Breeds elsewhere
Wood Thrush <i>Hylocichla mustelina</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Aug 31

Probability Of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

- 1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
- 2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.

3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

Breeding Season (=)

Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)

Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

No Data (-)

A week is marked as having no data if there were no survey events for that week.

Survey Timeframe

Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



Eastern Whip-poor- will BCC Rangewide (CON)	++++	++++	++++	++++	<mark>∳</mark> ┼∳┼	++++	++++	↓ ↓ ↓ ↓ ↓ ↓	++++	++++	++++	++++
Golden Eagle Non-BCC Vulnerable	++++	++++	++++	++1+	++++	-+++	++++	+++	++++	++ +	++++	++++
Golden-winged Warbler BCC Rangewide (CON)	++++	++++	++++	++++	 ₩ ₩	┼┼┼┼	++++	┼┼╋┼	*** +	++++	++++	++++
Henslow's Sparrow BCC Rangewide (CON)	++++	++++	++++	++++	+ <u>∎</u> ++	++++	++++	++++	++++	++++	++++	++++
Lesser Yellowlegs BCC Rangewide (CON)	++++	++++	++++	┼╪╪║	₩ ₩₩+	┼┼ᡎ┼	┼║║║	III	# # ##	₩₩┼┼	++++	++++
Long-eared Owl BCC Rangewide (CON)	++++	++++	++++	 	++++	++++	++++	++++	++++	++++	++++	++++
SPECIES	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Red-headed Woodpecker BCC Rangewide (CON)	++++	++++	• +++	┼┼╪┿	 	IIII	11++	†III†	<mark>₽∔</mark> ∎+	++++	++++	++++
Ruddy Turnstone BCC - BCR	++	+	+-+	++++	+ I +		+-+-		++	++++	+++++	
Rusty Blackbird BCC - BCR	++++	++++	- 	+##+	┼┿┼┼	++++	++++	++++	++++	† # # #	₩₩ ++	++++
Short-billed Dowitcher BCC Rangewide (CON)	++			++++	+1+		+-+		+	++++	+++++	
Wood Thrush BCC Rangewide (CON)	++++	++++	++++	++++	 		II+#	┼┼┼╪	₩₩₩┼	₩ ┼┼┼	++++	++++

Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds <u>http://www.fws.gov/birds/</u> <u>management/project-assessment-tools-and-guidance/</u> <u>conservation-measures.php</u>
- Nationwide conservation measures for birds <u>http://www.fws.gov/migratorybirds/pdf/</u> management/nationwidestandardconservationmeasures.pdf

Migratory Birds FAQ

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS <u>Birds of Conservation Concern</u> (<u>BCC</u>) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the <u>Avian</u> <u>Knowledge Network (AKN)</u>. The AKN data is based on a growing collection of <u>survey</u>, <u>banding</u>, <u>and citizen science datasets</u> and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (<u>Eagle Act</u> requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the <u>AKN Phenology Tool</u>.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the <u>Avian Knowledge Network (AKN)</u>. This data is derived from a growing collection of <u>survey, banding, and citizen science datasets</u>.

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: <u>The Cornell Lab</u> of <u>Ornithology All About Birds Bird Guide</u>, or (if you are unsuccessful in locating the bird of interest there), the <u>Cornell Lab of Ornithology Neotropical Birds guide</u>. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your

project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

- 1. "BCC Rangewide" birds are <u>Birds of Conservation Concern</u> (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
- 2. "BCC BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
- 3. "Non-BCC Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the <u>Eagle Act</u> requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the <u>Northeast Ocean Data Portal</u>. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the <u>NOAA NCCOS Integrative Statistical</u> <u>Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf</u> project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the <u>Diving Bird Study</u> and the <u>nanotag studies</u> or contact <u>Caleb Spiegel</u> or <u>Pam Loring</u>.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to <u>obtain a permit</u> to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no

data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Wetlands

Impacts to <u>NWI wetlands</u> and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local <u>U.S. Army Corps of</u> <u>Engineers District</u>.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

WETLAND INFORMATION WAS NOT AVAILABLE WHEN THIS SPECIES LIST WAS GENERATED. PLEASE VISIT <u>HTTPS://WWW.FWS.GOV/WETLANDS/DATA/MAPPER.HTML</u> OR CONTACT THE FIELD OFFICE FOR FURTHER INFORMATION.

IPaC User Contact Information

Agency:	Lansing city (Clinton County, MI; Eaton County, MI; Ingham County, MI)
Name:	Brittany Covault
Address:	2101 Aurelius Road
Address Line 2:	Suite 2A
City:	Holt
State:	MI
Zip:	48842
Email	bcovault@hrcengr.com
Phone:	5172921936

APPENDIX E: DETAILED COST ESTIMATES

HUBBELL, ROTH & CLARK, INC CONSULT NG ENGINEERS SINCE 1915 401 S. Mechanic St. Suite B Jackson, MI 49201 P: (517) 889-5189

OPINION OF PROBABLE

CONSTRUCTION COST

PROJECT: CSO Subarea 034E	DATE: March 10, 2022
LOCATION: Lansing Board of Water & Light	PROJECT #: 20220131
WORK: DWSRF Cost Estimate - Open Cut Option w/CSO	ESTIMATOR: BRC
	CHECKED BY: KKF
	CURRENT ENR:

Item Code	Item Description	Quantity	Unit	I	U nit Price	Total Cost
1	Audiovisual Coverage	1	LSUM	\$	10,000.00	\$ 10,000.00
2	Mobilization, Max 5%	1	LSUM	\$	94,597.75	\$ 94,597.75
3	Curb and Gutter, Rem	820	Ft	\$	10.00	\$ 8,200.00
4	Pavt, Rem	7,840	Syd	\$	10.00	\$ 78,400.00
5	Erosion Control	1	LSUM	\$	15,000.00	\$ 15,000.00
6	Subbase, CIP	2,620	Cyd	\$	20.00	\$ 52,400.00
7	Aggregate Base, 8 inch	7,840	Syd	\$	12.00	\$ 94,080.00
8	HMA, LVSP	1,785	Ton	\$	125.00	\$ 223,125.00
9	Curb and Gutter, Conc, Det F4, Modified	820	Ft	\$	25.00	\$ 20,500.00
10	Pavement Markings	1	LSUM	\$	5,000.00	\$ 5,000.00
11	Traffic Control	1	LSUM	\$	20,000.00	\$ 20,000.00
12	Lawn Restoration	1	LSUM	\$	15,000.00	\$ 15,000.00
13	Water Main, Connect to Existing	11	Ea	\$	750.00	\$ 8,250.00
14	Water Main, DI, 8 inch, Tr Det G, Modified	7,050	Ft	\$	120.00	\$ 846,000.00
15	Gate Valve and Box, 8 inch, Modified	20	Ea	\$	2,500.00	\$ 50,000.00
16	Hydrant Assembly	8	Ea	\$	5,000.00	\$ 40,000.00
17	Water Service	203	Ea	\$	2,000.00	\$ 406,000.00
		Estin	nated Co	nstru	uction Cost:	\$ 1,986,552.75
Engineering, Legal, and Admin. (25%):					\$ 496,638.19	
Contingency (20%):					\$ 397,310.55	
	TOTAL OPINION OF P	ROBABLE CO	ONSTRU	СТІ	ON COST =	\$ 2,880,501.49



HUBBELL, ROTH & CLARK, INC CONSULT NG ENGINEERS SINCE 1915 401 S. Mechanic St. Suite B Jackson, MI 49201 P: (517) 889-5189

OPINION OF PROBABLE

CONSTRUCTION COST

PROJECT: CSO Subarea 034E	DATE: March 10, 2022
LOCATION: Lansing Board of Water & Light	PROJECT #: 20220131
WORK: DWSRF Cost Estimate - Open Cut Option without CSO	ESTIMATOR: BRC
	CHECKED BY: KKF
	CURRENT ENR:

Item Code	Item Description	Quantity	Unit	ι	Unit Price	Total Cost
1	Audiovisual Coverage	1	LSUM	\$	10,000.00	\$ 10,000.00
2	Mobilization, Max 5%	1	LSUM	\$	94,518.75	\$ 94,518.75
3	Curb and Gutter, Rem	820	Ft	\$	10.00	\$ 8,200.00
4	Pavt, Rem	7,840	Syd	\$	10.00	\$ 78,400.00
5	Erosion Control	1	LSUM	\$	15,000.00	\$ 15,000.00
6	Subbase, CIP	2,620	Cyd	\$	20.00	\$ 52,400.00
7	Aggregate Base, 8 inch	7,840	Syd	\$	12.00	\$ 94,080.00
8	HMA, LVSP	4,365	Ton	\$	125.00	\$ 545,625.00
9	Cold Milling HMA Surface	10,835	Syd	\$	2.00	\$ 21,670.00
10	Curb and Gutter, Conc, Det F4, Modified	820	Ft	\$	25.00	\$ 20,500.00
11	Pavement Markings	1	LSUM	\$	10,000.00	\$ 10,000.00
12	Traffic Control	1	LSUM	\$	40,000.00	\$ 40,000.00
13	Lawn Restoration	1	LSUM	\$	15,000.00	\$ 15,000.00
14	Water Main, Connect to Existing	11	Ea	\$	750.00	\$ 8,250.00
15	Water Main, DI, 8 inch, Tr Det G, Modified	7,050	Ft	\$	125.00	\$ 881,250.00
16	Gate Valve and Box, 8 inch, Modified	20	Ea	\$	2,500.00	\$ 50,000.00
17	Hydrant Assembly	8	Ea	\$	5,000.00	\$ 40,000.00
18	Water Service	203	Ea	\$	2,500.00	\$ 507,500.00
		Estin	nated Cor	nstru	uction Cost:	\$ 2,492,393.75
	E	Ingineering, L	egal, and	Adı	min. (25%):	\$ 623,098.44
			Con	ting	ency (20%):	\$ 498,478.75
	TOTAL OPINION OF PR	ROBABLE CO	ONSTRU	СТІ	ON COST =	\$ 3,613,970.94



HUBBELL, ROTH & CLARK, INC CONSULT NG ENGINEERS SINCE 1915 401 S. Mechanic St. Suite B Jackson, MI 49201

P: (517) 889-5189

OPINION OF PROBABLE

CONSTRUCTION COST

PROJECT: CSO Subarea 034E	DATE: March 10, 2022
LOCATION: Lansing Board of Water & Light	PROJECT #: 20220131
WORK: DWSRF Cost Estimate - Directional Drill Option	ESTIMATOR: BRC
	CHECKED BY: KKF
	CURRENT ENR:

Item Code	Item Description	Quantity	Unit	1	Unit Price		Total Cost
	1	-					
1	Audiovisual Coverage	1	LSUM	\$	10,000.00	\$	10,000.00
2	Mobilization, Max 5%	1	LSUM	\$	141,618.25	\$	141,618.25
3	Curb and Gutter, Rem	820	Ft	\$	10.00	\$	8,200.00
4	Pavt, Rem	370	Syd	\$	10.00	\$	3,700.00
5	Erosion Control	1	LSUM	\$	15,000.00	\$	15,000.00
6	Subbase, CIP	20	Cyd	\$	20.00	\$	400.00
7	Aggregate Base, 8 inch	370	Syd	\$	12.00	\$	4,440.00
8	HMA, LVSP	75	Ton	\$	125.00	\$	9,375.00
9	Curb and Gutter, Conc, Det F4, Modified	820	Ft	\$	25.00	\$	20,500.00
10	Pavement Markings	1	LSUM	\$	5,000.00	\$	5,000.00
11	Traffic Control	1	LSUM	\$	20,000.00	\$	20,000.00
12	Lawn Restoration	1	LSUM	\$	15,000.00	\$	15,000.00
13	Water Main, Connect to Existing	11	Ea	\$	750.00	\$	8,250.00
14	Water Main, DI, 8 inch, Tr Det G, Modified	7,050	Ft	\$	300.00	\$	2,115,000.00
15	Gate Valve and Box, 8 inch, Modified	20	Ea	\$	2,500.00	\$	50,000.00
16	Hydrant Assembly	8	Ea	\$	5,000.00	\$	40,000.00
17	Water Service	203	Ea	\$	2,500.00	\$	507,500.00
	·						
		Estin	nated Co	nstr	uction Cost:	\$	2,973,983.25
		Engineering, L	egal, and	Ad	min. (25%):	\$	743,495.81
	Contingency (20%): <u>\$</u>					594,796.65	

TOTAL OPINION OF PROBABLE CONSTRUCTION COST = $\frac{1}{3}$ 4,312,275.71



HUBBELL, ROTH & CLARK, INC CONSULT NG ENGINEERS SINCE 1915 401 S. Mechanic St. Suite B Jackson, MI 49201 P: (517) 889-5189

OPINION OF PROBABLE

CONSTRUCTION COST

PROJECT: CSO Subarea 015S	DATE: March 10, 2022
LOCATION: Lansing Board of Water & Light	PROJECT #: 20220131
WORK: DWSRF Cost Estimate - Open Cut Option w/CSO	ESTIMATOR: BRC
	CHECKED BY: KKF
	CURRENT ENR:

Item Code	Item Description	Quantity	Unit	1	Unit Price	Total Cost
1	Audiovisual Coverage	1	LSUM	\$	25,000.00	\$ 25,000.00
2	Mobilization, Max 5%	1	LSUM	\$	403,827.50	\$ 403,827.50
3	Curb and Gutter, Rem	2,850	Ft	\$	10.00	\$ 28,500.00
4	Pavt, Rem	33,000	Syd	\$	10.00	\$ 330,000.00
5	Erosion Control	1	LSUM	\$	60,000.00	\$ 60,000.00
6	Subbase, CIP	11,000	Cyd	\$	20.00	\$ 220,000.00
7	Aggregate Base, 8 inch	33,000	Syd	\$	12.00	\$ 396,000.00
8	HMA, LVSP	8,270	Ton	\$	125.00	\$ 1,033,750.00
9	Curb and Gutter, Conc, Det F4, Modified	2,850	Ft	\$	25.00	\$ 71,250.00
10	Pavement Markings	1	LSUM	\$	20,000.00	\$ 20,000.00
11	Traffic Control	1	LSUM	\$	100,000.00	\$ 100,000.00
12	Lawn Restoration	1	LSUM	\$	80,000.00	\$ 80,000.00
13	Water Main, Connect to Existing	23	Ea	\$	750.00	\$ 17,250.00
14	Water Main, DI, 8 inch, Tr Det G, Modified	29,690	Ft	\$	120.00	\$ 3,562,800.00
15	Water Main, DI, 16 inch, Tr Det G, Modified	1,670	Ea	\$	150.00	\$ 250,500.00
16	Gate Valve and Box, 8 inch, Modified	105	Ea	\$	2,500.00	\$ 262,500.00
17	Gate Valve and Box, 16 inch, Modified	5	Ea	\$	4,000.00	\$ 20,000.00
18	Hydrant Assembly	35	Ea	\$	5,000.00	\$ 175,000.00
19	Water Service	712	Ea	\$	2,000.00	\$ 1,424,000.00
Estimated Construction Cost:						\$ 8,480,377.50
Engineering, Legal, and Admin. (25%):					\$ 2,120,094.38	
Contingency (20%):					\$ 1,696,075.50	
TOTAL OPINION OF PROBABLE CONSTRUCTION COST =					\$ 12,296,547.38	



HUBBELL, ROTH & CLARK, INC CONSULT NG ENGINEERS SINCE 1915 401 S. Mechanic St. Suite B Jackson, MI 49201 P: (517) 889-5189

Т

OPINION OF PROBABLE

CONSTRUCTION COST

PROJECT: CSO Subarea 015S	DATE: March 10, 2022
LOCATION: Lansing Board of Water & Light	PROJECT #: 20220131
WORK: DWSRF Cost Estimate - Open Cut Option without CSO	ESTIMATOR: BRC
	CHECKED BY: KKF
	CURRENT ENR:

Item Code	Item Description	Quantity	Unit	Unit Price		Unit Price Total Cost	
1	Audiovisual Coverage	1	LSUM	\$	25,000.00	\$	25,000.00
2	Mobilization, Max 5%	1	LSUM	\$	540,265.75	\$	540,265.75
3	Curb and Gutter, Rem	2,850	Ft	\$	10.00	\$	28,500.00
4	Pavt, Rem	33,000	Syd	\$	10.00	\$	330,000.00
5	Erosion Control	1	LSUM	\$	60,000.00	\$	60,000.00
6	Subbase, CIP	11,000	Cyd	\$	20.00	\$	220,000.00
7	Aggregate Base, 8 inch	33,000	Syd	\$	12.00	\$	396,000.00
8	HMA, LVSP	24,065	Ton	\$	125.00	\$	3,008,125.00
9	Cold Milling HMA Surface	58,220	Syd	\$	2.00	\$	116,440.00
10	Curb and Gutter, Conc, Det F4, Modified	2,850	Ft	\$	25.00	\$	71,250.00
11	Pavement Markings	1	LSUM	\$	20,000.00	\$	20,000.00
12	Traffic Control	1	LSUM	\$	150,000.00	\$	150,000.00
13	Lawn Restoration	1	LSUM	\$	80,000.00	\$	80,000.00
14	Water Main, Connect to Existing	23	Ea	\$	750.00	\$	17,250.00
15	Water Main, DI, 8 inch, Tr Det G, Modified	29,690	Ft	\$	125.00	\$	3,711,250.00
16	Water Main, DI, 16 inch, Tr Det G, Modified	1,670	Ft	\$	200.00	\$	334,000.00
17	Gate Valve and Box, 8 inch, Modified	105	Ea	\$	2,500.00	\$	262,500.00
18	Gate Valve and Box, 16 inch, Modified	5	Ea	\$	4,000.00	\$	20,000.00
19	Hydrant Assembly	35	Ea	\$	5,000.00	\$	175,000.00
20	Water Service	712	Ea	\$	2,500.00	\$	1,780,000.00
Estimated Construction Cost:					\$	11,345,580.75	

Engineering, Legal, and Admin. (25%): \$ 2,836,395.19

Contingency (20%): <u>\$ 2,269,116.15</u>

TOTAL OPINION OF PROBABLE CONSTRUCTION COST = <u>\$ 16,451,092.09</u>



E HXC **HUBBELL, ROTH & CLARK, INC** CONSULT NG ENGINEERS SINCE 1915 401 S. Mechanic St. Suite B Jackson, MI 49201

P: (517) 889-5189

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OPINION OF PROBABLE

CONSTRUCTION COST

PROJECT: CSO Subarea 015S	DATE: March 10, 2022
LOCATION: Lansing Board of Water & Light	PROJECT #: 20220131
WORK: DWSRF Cost Estimate - Directional Drill Option	ESTIMATOR: BRC
	CHECKED BY: KKF
	CURRENT ENR:

Item Code	Item Description	Quantity	Unit		Unit Price		Total Cost
1	Audiovisual Coverage	1	LSUM	\$	25,000.00	\$	25,000.00
2	Mobilization, Max 5%	1	LSUM	\$	630,896.00	\$	630,896.00
3	Curb and Gutter, Rem	2,850	Ft	\$	10.00	\$	28,500.00
4	Pavt, Rem	1,235	Syd	\$	10.00	\$	12,350.00
5	Erosion Control	1	LSUM	\$	60,000.00	\$	60,000.00
6	Subbase, CIP	50	Cyd	\$	20.00	\$	1,000.00
7	Aggregate Base, 8 inch	1,235	Syd	\$	12.00	\$	14,820.00
8	HMA, LVSP	330	Ton	\$	125.00	\$	41,250.00
9	Curb and Gutter, Conc, Det F4, Modified	2,850	Ft	\$	25.00	\$	71,250.00
10	Pavement Markings	1	LSUM	\$	20,000.00	\$	20,000.00
11	Traffic Control	1	LSUM	\$	100,000.00	\$	100,000.00
12	Lawn Restoration	1	LSUM	\$	80,000.00	\$	80,000.00
13	Water Main, Connect to Existing	23	Ea	\$	750.00	\$	17,250.00
14	Water Main, DI, 8 inch, Tr Det G, Modified	29,690	Ft	\$	300.00	\$	8,907,000.00
15	Water Main, DI, 16 inch, Tr Det G, Modified	1,670	Ft	\$	600.00	\$	1,002,000.00
16	Gate Valve and Box, 8 inch, Modified	105	Ea	\$	2,500.00	\$	262,500.00
17	Gate Valve and Box, 16 inch, Modified	5	Ea	\$	4,000.00	\$	20,000.00
18	Hydrant Assembly	35	Ea	\$	5,000.00	\$	175,000.00
19	Water Service	712	Ea	\$	2,500.00	\$	1,780,000.00
	·						
		Estin	nated Co	nstr	uction Cost:	\$	13,248,816.00
		Engineering L	egal and	Ad	lmin (25%).	\$	3 312 204 00
Engineering, Eegai, and Aumin. (2576).					¢	2,512,201.00	

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Contingency (20%): <u>\$ 2,649,763.20</u>

TOTAL OPINION OF PROBABLE CONSTRUCTION COST = <u>\$ 19,210,783.20</u>



HUBBELL, ROTH & CLARK, INC CONSULT NG ENGINEERS SINCE 1915 401 S. Mechanic St. Suite B Jackson, MI 49201

P: (517) 889-5189

OPINION OF PROBABLE

CONSTRUCTION COST

PROJECT: CSO E Ionia St	DATE: March 18, 2022
LOCATION: Lansing Board of Water & Light	PROJECT #: 20220131
WORK: DWSRF Cost Estimate - Open Cut Option w/CSO	ESTIMATOR: BRC
	CHECKED BY: KKF
	CURRENT ENR:

Item Code	Item Description	Quantity	Unit	Unit Price			Total Cost
1	Audiovisual Coverage	1	LSUM	\$	25,000.00	\$	25,000.00
2	Mobilization, Max 5%	1	LSUM	\$	102,671.60	\$	102,671.60
3	Curb and Gutter, Rem	3,220	Ft	\$	10.00	\$	32,200.00
4	Pavt, Rem	10,111	Syd	\$	10.00	\$	101,110.00
5	Erosion Control	1	LSUM	\$	60,000.00	\$	60,000.00
6	Subbase, CIP	2,250	Cyd	\$	20.00	\$	45,000.00
7	Aggregate Base, 8 inch	10,111	Syd	\$	12.00	\$	121,332.00
8	HMA, LVSP	2,230	Ton	\$	125.00	\$	278,750.00
9	Curb and Gutter, Conc, Det F4, Modified	3,220	Ft	\$	25.00	\$	80,500.00
10	Pavement Markings	1	LSUM	\$	20,000.00	\$	20,000.00
11	Traffic Control	1	LSUM	\$	100,000.00	\$	100,000.00
12	Lawn Restoration	1	LSUM	\$	50,000.00	\$	50,000.00
13	Water Main, DI, 4 inch, Tr Det G, Modified	20	Ft	\$	90.00	\$	1,800.00
14	Water Main, DI, 6 inch, Tr Det G, Modified	40	Ft	\$	96.00	\$	3,840.00
15	Water Main, DI, 8 inch, Tr Det G, Modified	2,380	Ft	\$	120.00	\$	285,600.00
16	Water Main, DI, 16 inch, Tr Det G, Modified	4,000	Ea	\$	150.00	\$	600,000.00
17	Gate Valve and Box, 4 inch, Modified	1	Ea	\$	1,800.00	\$	1,800.00
18	Gate Valve and Box, 6 inch, Modified	2	Ea	\$	2,000.00	\$	4,000.00
19	Gate Valve and Box, 8 inch, Modified	1	Ea	\$	2,500.00	\$	2,500.00
20	Gate Valve and Box, 16 inch, Modified	7	Ea	\$	4,000.00	\$	28,000.00
21	Live Tap, 8 inch by 8 inch	15	Ea	\$	5,000.00	\$	75,000.00
22	Live Tap, 8 inch by 12 inch	2	Ea	\$	6,000.00	\$	12,000.00
23	Hydrant Assembly	5	Ea	\$	5,000.00	\$	25,000.00
24	Water Service	50	Ea	\$	2,000.00	\$	100,000.00

Estimated Construction Cost: \$ 2,156,103.60

Engineering, Legal, and Admin. (25%): \$ 539,025.90

Contingency (20%): <u>\$ 431,220.72</u>

TOTAL OPINION OF PROBABLE CONSTRUCTION COST = <u>\$ 3,126,350.22</u>



HUBBELL, ROTH & CLARK, INC CONSULT NG ENGINEERS SINCE 1915 401 S. Mechanic St. Suite B Jackson, MI 49201

P: (517) 889-5189

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OPINION OF PROBABLE

CONSTRUCTION COST

PROJECT: CSO E Ionia St	DATE: March 18, 2022
LOCATION: Lansing Board of Water & Light	PROJECT #: 20220131
WORK: DWSRF Cost Estimate - Open Cut Option w/out CSO	ESTIMATOR: BRC
	CHECKED BY: KKF
	CURRENT ENR:

Item Code	Item Description	Quantity	Unit	Unit Price			Total Cost
1	Audiovisual Coverage	1	LSUM	\$	25,000.00	\$	25,000.00
2	Mobilization, Max 5%	1	LSUM	\$	108,302.50	\$	108,302.50
3	Curb and Gutter, Rem	1,625	Ft	\$	10.00	\$	16,250.00
4	Pavt, Rem	10,250	Syd	\$	10.00	\$	102,500.00
5	Erosion Control	1	LSUM	\$	60,000.00	\$	60,000.00
6	Subbase, CIP	2,250	Cyd	\$	20.00	\$	45,000.00
7	Aggregate Base, 8 inch	10,250	Syd	\$	12.00	\$	123,000.00
8	HMA, LVSP	3,343	Ton	\$	125.00	\$	417,875.00
9	Cold Milling HMA Surface	10,250	Syd	\$	2.00	\$	20,500.00
9	Curb and Gutter, Conc, Det F4, Modified	1,625	Ft	\$	25.00	\$	40,625.00
10	Pavement Markings	1	LSUM	\$	20,000.00	\$	20,000.00
11	Traffic Control	1	LSUM	\$	100,000.00	\$	100,000.00
12	Lawn Restoration	1	LSUM	\$	50,000.00	\$	50,000.00
13	Water Main, DI, 4 inch, Tr Det G, Modified	20	Ft	\$	90.00	\$	1,800.00
14	Water Main, DI, 6 inch, Tr Det G, Modified	100	Ft	\$	96.00	\$	9,600.00
15	Water Main, DI, 8 inch, Tr Det G, Modified	2,380	Ft	\$	120.00	\$	285,600.00
16	Water Main, DI, 16 inch, Tr Det G, Modified	4,000	Ea	\$	150.00	\$	600,000.00
17	Gate Valve and Box, 4 inch, Modified	1	Ea	\$	1,800.00	\$	1,800.00
18	Gate Valve and Box, 6 inch, Modified	2	Ea	\$	2,000.00	\$	4,000.00
19	Gate Valve and Box, 8 inch, Modified	1	Ea	\$	2,500.00	\$	2,500.00
20	Gate Valve and Box, 16 inch, Modified	7	Ea	\$	4,000.00	\$	28,000.00
21	Live Tap, 8 inch by 8 inch	15	Ea	\$	5,000.00	\$	75,000.00
22	Live Tap, 8 inch by 12 inch	2	Ea	\$	6,000.00	\$	12,000.00
23	Hydrant Assembly	5	Ea	\$	5,000.00	\$	25,000.00
24	Water Service	50	Ea	\$	2,000.00	\$	100,000.00

Estimated Construction Cost: \$ 2,274,352.50

Engineering, Legal, and Admin. (25%): \$ 568,588.13

Contingency (20%): <u>\$</u> 454,870.50

TOTAL OPINION OF PROBABLE CONSTRUCTION COST = <u>\$</u> 3,297,811.13



HKC HUBBELL, ROTH & CLARK, INC **CONSULT NG ENGINEERS SINCE 1915** 401 S. Mechanic St. Suite B Jackson, MI 49201

P: (517) 889-5189

OPINION OF PROBABLE

CONSTRUCTION COST

PROJECT: CSO E Ionia St	DATE: March 18, 2022
LOCATION: Lansing Board of Water & Light	PROJECT #: 20220131
WORK: DWSRF Cost Estimate - Directional Drill	ESTIMATOR: BRC
	CHECKED BY: KKF
	CURRENT ENR:

Item Code	Item Description	Quantity	Unit	Unit Price		Unit Price Total Co	
1	Audiovisual Coverage	1	LSUM	\$	25,000.00	\$	25,000.00
2	Mobilization, Max 5%	1	LSUM	\$	160,189.85	\$	160,189.85
3	Curb and Gutter, Rem	1,625	Ft	\$	10.00	\$	16,250.00
4	Pavt, Rem	506	Syd	\$	10.00	\$	5,060.00
5	Erosion Control	1	LSUM	\$	60,000.00	\$	60,000.00
6	Subbase, CIP	112	Cyd	\$	20.00	\$	2,240.00
7	Aggregate Base, 8 inch	506	Syd	\$	12.00	\$	6,072.00
8	HMA, LVSP	112	Ton	\$	125.00	\$	14,000.00
9	Curb and Gutter, Conc, Det F4, Modified	1,625	Ft	\$	25.00	\$	40,625.00
10	Pavement Markings	1	LSUM	\$	5,000.00	\$	5,000.00
11	Traffic Control	1	LSUM	\$	20,000.00	\$	20,000.00
12	Lawn Restoration	1	LSUM	\$	15,000.00	\$	15,000.00
13	Water Main, Connect to Existing	23	Ea	\$	750.00	\$	17,250.00
14	Water Main, DI, 4 inch, Tr Det G, Modified	20	Ft	\$	100.00	\$	2,000.00
15	Water Main, DI, 6 inch, Tr Det G, Modified	40	Ft	\$	200.00	\$	8,000.00
16	Water Main, DI, 8 inch, Tr Det G, Modified	2,380	Ft	\$	300.00	\$	714,000.00
17	Water Main, DI, 16 inch, Tr Det G, Modified	4,000	Ea	\$	500.00	\$	2,000,000.00
18	Gate Valve and Box, 4 inch, Modified	1	Ea	\$	1,800.00	\$	1,800.00
19	Gate Valve and Box, 6 inch, Modified	2	Ea	\$	2,000.00	\$	4,000.00
20	Gate Valve and Box, 8 inch, Modified	1	Ea	\$	2,500.00	\$	2,500.00
21	Gate Valve and Box, 16 inch, Modified	7	Ea	\$	4,000.00	\$	28,000.00
22	Live Tap, 8 inch by 8 inch	15	Ea	\$	5,000.00	\$	75,000.00
23	Live Tap, 8 inch by 12 inch	2	Ea	\$	6,000.00	\$	12,000.00
24	Hydrant Assembly	6	Ea	\$	5,000.00	\$	30,000.00
25	Water Service	50	Ea	\$	2,000.00	\$	100,000.00

Estimated Construction Cost: \$ 3,363,986.85

 Engineering, Legal, and Admin. (25%):
 \$
 840,996.71

 Contingency (20%):
 \$
 672,797.37

TOTAL OPINION OF PROBABLE CONSTRUCTION COST = \$ 4,877,780.93



HUBBELL, ROTH & CLARK, INC CONSULT NG ENGINEERS SINCE 1915 401 S. Mechanic St. Suite B Jackson, MI 49201 P: (517) 889-5189

OPINION OF PROBABLE

CONSTRUCTION COST

PROJECT: Raw Water Main Extension - Hughes Rd	DATE: March 18, 2022
LOCATION: Lansing Board of Water & Light	PROJECT #: 20220131
WORK: DWSRF Cost Estimate	ESTIMATOR: BRC
	CHECKED BY: KKF
	CURRENT ENR:

Item Code	Item Description	Quantity	Unit	Unit Price			Total Cost	
				-				
1	Audiovisual Coverage	1	LSUM	\$	25,000.00	\$	25,000.00	
2	Mobilization, Max 5%	1	LSUM	\$	25,219.50	\$	25,219.50	
3	Pavt, Rem	2,200	Syd	\$	10.00	\$	22,000.00	
4	Erosion Control	1	LSUM	\$	30,000.00	\$	30,000.00	
5	Subbase, CIP	112	Cyd	\$	20.00	\$	2,240.00	
6	Aggregate Base, 8 inch	2,200	Syd	\$	12.00	\$	26,400.00	
7	HMA, LVSP	500	Ton	\$	140.00	\$	70,000.00	
8	Pavement Markings	1	LSUM	\$	5,000.00	\$	5,000.00	
9	Traffic Control	1	LSUM	\$	20,000.00	\$	20,000.00	
10	Lawn Restoration	1	LSUM	\$	15,000.00	\$	15,000.00	
11	Water Main, Connect to Existing	1	Ea	\$	750.00	\$	750.00	
12	Water Main, DI, 8 inch, Tr Det G, Modified	2,400	Ft	\$	120.00	\$	288,000.00	
Estimated Construction Cost:						\$	529,609.50	
Engineering Legal and Admin (25%) :						\$	132 402 38	
Engineering, Eegai, and Admin. (2576).						¢	105 921 90	
Contingency (20%):							105,721.90	
TOTAL OPINION OF PROBABLE CONSTRUCTION COST =						\$	767,933.78	



HUBBELL, ROTH & CLARK, INC CONSULT NG ENGINEERS SINCE 1915 401 S. Mechanic St. Suite B Jackson, MI 49201 P: (517) 889-5189

OPINION OF PROBABLE

CONSTRUCTION COST

PROJECT: CSO Michigan Ave	DATE: March 18, 2022
LOCATION: Lansing Board of Water & Light	PROJECT #: 20220131
WORK: DWSRF Cost Estimate - Open Cut Option w/out CSO	ESTIMATOR: BRC
	CHECKED BY: KKF
	CURRENT ENR:

Item Code	Item Description	Quantity	Unit	Unit Price		Total Cost		
	T							
1	Audiovisual Coverage	1	LSUM	\$	25,000.00	\$	25,000.00	
2	Mobilization, Max 5%	1	LSUM	\$	145,033.75	\$	145,033.75	
3	Curb and Gutter, Rem	200	Ft	\$	10.00	\$	2,000.00	
4	Pavt, Rem	14,080	Syd	\$	10.00	\$	140,800.00	
5	Erosion Control	1	LSUM	\$	60,000.00	\$	60,000.00	
6	Subbase, CIP	3,126	Cyd	\$	20.00	\$	62,520.00	
7	Aggregate Base, 8 inch	14,080	Syd	\$	12.00	\$	168,960.00	
8	HMA, LVSP	4,647	Ton	\$	125.00	\$	580,875.00	
9	Curb and Gutter, Conc, Det F4, Modified	200	Ft	\$	25.00	\$	5,000.00	
9	Cold Milling HMA Surface	14,080	Syd	\$	2.00	\$	28,160.00	
11	Pavement Markings	1	LSUM	\$	20,000.00	\$	20,000.00	
12	Traffic Control	1	LSUM	\$	100,000.00	\$	100,000.00	
13	Lawn Restoration	1	LSUM	\$	50,000.00	\$	50,000.00	
14	Water Main, DI, 6 inch, Tr Det G, Modified	35	Ft	\$	96.00	\$	3,360.00	
15	Water Main, DI, 8 inch, Tr Det G, Modified	2,000	Ft	\$	120.00	\$	240,000.00	
16	Water Main, DI, 16 inch, Tr Det G, Modified	6,700	Ea	\$	150.00	\$	1,005,000.00	
17	Gate Valve and Box, 16 inch, Modified	11	Ea	\$	4,000.00	\$	44,000.00	
18	Live Tap, 8 inch by 8 inch	27	Ea	\$	5,000.00	\$	135,000.00	
19	Hydrant Assembly	16	Ea	\$	5,000.00	\$	80,000.00	
20	Water Service	75	Ea	\$	2,000.00	\$	150,000.00	
Estimated Construction Cost:						\$	3,045,708.75	
Engineering, Legal, and Admin. (25%):							761,427.19	
Contingency (20%):								
TOTAL OPINION OF PROBABLE CONSTRUCTION COST =							4,416,277.69	


OPINION OF PROBABLE

CONSTRUCTION COST

PROJECT: CSO Michigan Ave	DATE: March 18, 2022
LOCATION: Lansing Board of Water & Light	PROJECT #: 20220131
WORK: DWSRF Cost Estimate - Directional Drill	ESTIMATOR: BRC
	CHECKED BY: KKF
	CURRENT ENR:

Item Code	Item Description	Quantity	Unit		Unit Price	Total Cost
	· ·					
1	Audiovisual Coverage	1	LSUM	\$	25,000.00	\$ 25,000.00
2	Mobilization, Max 5%	1	LSUM	\$	229,418.60	\$ 229,418.60
3	Curb and Gutter, Rem	200	Ft	\$	10.00	\$ 2,000.00
4	Pavt, Rem	506	Syd	\$	10.00	\$ 5,060.00
5	Erosion Control	1	LSUM	\$	60,000.00	\$ 60,000.00
6	Subbase, CIP	112	Cyd	\$	20.00	\$ 2,240.00
7	Aggregate Base, 8 inch	506	Syd	\$	12.00	\$ 6,072.00
8	HMA, LVSP	112	Ton	\$	125.00	\$ 14,000.00
9	Curb and Gutter, Conc, Det F4, Modified	200	Ft	\$	25.00	\$ 5,000.00
10	Pavement Markings	1	LSUM	\$	5,000.00	\$ 5,000.00
11	Traffic Control	1	LSUM	\$	20,000.00	\$ 20,000.00
12	Lawn Restoration	1	LSUM	\$	15,000.00	\$ 15,000.00
15	Water Main, DI, 6 inch, Tr Det G, Modified	350	Ft	\$	200.00	\$ 70,000.00
16	Water Main, DI, 8 inch, Tr Det G, Modified	2,000	Ft	\$	300.00	\$ 600,000.00
17	Water Main, DI, 16 inch, Tr Det G, Modified	6,700	Ea	\$	500.00	\$ 3,350,000.00
21	Gate Valve and Box, 16 inch, Modified	11	Ea	\$	4,000.00	\$ 44,000.00
22	Live Tap, 8 inch by 8 inch	27	Ea	\$	5,000.00	\$ 135,000.00
24	Hydrant Assembly	16	Ea	\$	5,000.00	\$ 80,000.00
25	Water Service	75	Ea	\$	2,000.00	\$ 150,000.00
Estimated Construction Cost-						\$ 4,817,790.60
Engineering, Legal, and Admin. (25%):						\$ 1,204,447.65
Contingency (20%):						\$ 963,558.12
TOTAL OPINION OF PROBABLE CONSTRUCTION COST =						\$ 6,985,796.37



HUBBELL, ROTH & CLARK, INC CONSULT NG ENGINEERS SINCE 1915 401 S. Mechanic St. Suite B Jackson, MI 49201

P: (517) 889-5189

OPINION OF PROBABLE

PROJECT: CSO Ottawa St	DATE: March 18, 2022
LOCATION: Lansing Board of Water & Light	PROJECT #: 20220131
WORK: DWSRF Cost Estimate - Open Cut Option w/CSO	ESTIMATOR: BRC
	CHECKED BY: KKF
	CURRENT ENR:

Item Code	Item Description	Quantity	Unit	τ	Jnit Price		Total Cost
1	Audiovisual Coverage	1	LSUM	\$	25,000.00	\$	25,000.00
2	Mobilization, Max 5%	1	LSUM	\$	18,480.75	\$	18,480.75
3	Curb and Gutter, Rem	200	Ft	\$	10.00	\$	2,000.00
4	Pavt, Rem	1,120	Syd	\$	10.00	\$	11,200.00
5	Erosion Control	1	LSUM	\$	60,000.00	\$	60,000.00
6	Subbase, CIP	249	Cyd	\$	20.00	\$	4,980.00
7	Aggregate Base, 8 inch	1,120	Syd	\$	12.00	\$	13,440.00
8	HMA, LVSP	247	Ton	\$	125.00	\$	30,875.00
9	Curb and Gutter, Conc, Det F4, Modified	200	Ft	\$	25.00	\$	5,000.00
10	Pavement Markings	1	LSUM	\$	5,000.00	\$	5,000.00
11	Traffic Control	1	LSUM	\$	20,000.00	\$	20,000.00
12	Lawn Restoration	1	LSUM	\$	10,000.00	\$	10,000.00
13	Water Main, DI, 4 inch, Tr Det G, Modified	100	Ft	\$	90.00	\$	9,000.00
14	Water Main, DI, 6 inch, Tr Det G, Modified	20	Ft	\$	96.00	\$	1,920.00
15	Water Main, DI, 8 inch, Tr Det G, Modified	600	Ft	\$	120.00	\$	72,000.00
16	Gate Valve and Box, 4 inch, Modified	4	Ea	\$	1,800.00	\$	7,200.00
17	Gate Valve and Box, 6 inch, Modified	4	Ea	\$	2,000.00	\$	8,000.00
18	Live Tap, 8 inch by 8 inch	4	Ea	\$	5,000.00	\$	20,000.00
19	Hydrant Assembly	2	Ea	\$	5,000.00	\$	10,000.00
20	Water Service	27	Ea	\$	2,000.00	\$	54,000.00
		Estin	nated Co	nstru	ction Cost:	\$	388,095.75
		Engineering I	egal and	Adı	min (25%)·	\$	97 023 94
		Zugineering, L	Cor	tina	ency (20%).	\$	77.619.15
Contingency (2076).						Ψ	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
TOTAL OBINION OF BOODADLE CONSTRUCTION COST -						¢	567 739 94
	101AL OPINION OF F	NUDADLE U)1151 KU	CII	011 CUS1 =	3	302,730.84



OPINION OF PROBABLE

CONSTRUCTION COST

PROJECT: CSO Ottawa St	DATE: March 18, 2022
LOCATION: Lansing Board of Water & Light	PROJECT #: 20220131
WORK: DWSRF Cost Estimate - Open Cut Option w/out CSO	ESTIMATOR: BRC
	CHECKED BY: KKF
	CURRENT ENR:

Item Code	Item Description	Quantity	Unit	1	Unit Price		Total Cost
1	Audiovisual Coverage	1	LSUM	\$	25,000.00	\$	25,000.00
2	Mobilization, Max 5%	1	LSUM	\$	26,117.75	\$	26,117.75
3	Curb and Gutter, Rem	200	Ft	\$	10.00	\$	2,000.00
4	Pavt, Rem	1,120	Syd	\$	10.00	\$	11,200.00
5	Erosion Control	1	LSUM	\$	60,000.00	\$	60,000.00
6	Subbase, CIP	249	Cyd	\$	20.00	\$	4,980.00
7	Aggregate Base, 8 inch	1,120	Syd	\$	12.00	\$	13,440.00
8	HMA, LVSP	371	Ton	\$	125.00	\$	46,375.00
9	Curb and Gutter, Conc, Det F4, Modified	200	Ft	\$	25.00	\$	5,000.00
10	Cold Milling HMA Surface	1,120	Syd	\$	2.00	\$	2,240.00
11	Pavement Markings	1	LSUM	\$	20,000.00	\$	20,000.00
12	Traffic Control	1	LSUM	\$	100,000.00	\$	100,000.00
13	Lawn Restoration	1	LSUM	\$	50,000.00	\$	50,000.00
14	Water Main, DI, 4 inch, Tr Det G, Modified	100	Ft	\$	90.00	\$	9,000.00
15	Water Main, DI, 6 inch, Tr Det G, Modified	20	Ft	\$	96.00	\$	1,920.00
16	Water Main, DI, 8 inch, Tr Det G, Modified	600	Ft	\$	120.00	\$	72,000.00
17	Gate Valve and Box, 4 inch, Modified	4	Ea	\$	1,800.00	\$	7,200.00
18	Gate Valve and Box, 6 inch, Modified	4	Ea	\$	2,000.00	\$	8,000.00
19	Live Tap, 8 inch by 8 inch	4	Ea	\$	5,000.00	\$	20,000.00
20	Hydrant Assembly	2	Ea	\$	5,000.00	\$	10,000.00
21	Water Service	27	Ea	\$	2,000.00	\$	54,000.00
Estimated Construction Cost:						\$	548,472.75
Engineering, Legal, and Admin. (25%):						\$	137,118.19
Contingency (20%):						\$	109,694.55
TOTAL OPINION OF PROBABLE CONSTRUCTION COST =						<u>\$</u>	795,285.49



HRC HUBBELL, ROTH & CLARK, INC CONSULT NG ENGINEERS SINCE 1915 401 S. Mechanic St. Suite B Jackson, MI 49201

P: (517) 889-5189

OPINION OF PROBABLE

CONSTRUCTION COST

PROJECT: CSO Ottawa St	DATE: March 18, 2022
LOCATION: Lansing Board of Water & Light	PROJECT #: 20220131
WORK: DWSRF Cost Estimate - Directional Drill	ESTIMATOR: BRC
	CHECKED BY: KKF
	CURRENT ENR:

Item Code	Item Description	Quantity	Unit	I	Unit Price		Total Cost
1	Audiovisual Coverage	1	LSUM	\$	25,000.00	\$	25.000.00
2	Mobilization, Max 5%	1	LSUM	\$	21,379.00	\$	21,379.00
3	Curb and Gutter, Rem	100	Ft	\$	10.00	\$	1,000.00
4	Pavt, Rem	100	Syd	\$	10.00	\$	1,000.00
5	Erosion Control	1	LSUM	\$	60,000.00	\$	60,000.00
6	Subbase, CIP	23	Cyd	\$	20.00	\$	460.00
7	Aggregate Base, 8 inch	100	Syd	\$	12.00	\$	1,200.00
8	HMA, LVSP	22	Ton	\$	125.00	\$	2,750.00
9	Curb and Gutter, Conc, Det F4, Modified	100	Ft	\$	25.00	\$	2,500.00
10	Non-reinforced Conc, 6 inch	50	Syd	\$	71.00	\$	3,550.00
11	Pavement Markings	1	LSUM	\$	5,000.00	\$	5,000.00
12	Traffic Control	1	LSUM	\$	20,000.00	\$	20,000.00
13	Lawn Restoration	1	LSUM	\$	15,000.00	\$	15,000.00
14	Water Main, DI, 4 inch, Tr Det G, Modified	100	Ft	\$	90.00	\$	9,000.00
15	Water Main, DI, 6 inch, Tr Det G, Modified	20	Ft	\$	96.00	\$	1,920.00
16	Water Main, DI, 8 inch, Tr Det G, Modified	600	Ft	\$	300.00	\$	180,000.00
17	Gate Valve and Box, 4 inch, Modified	4	Ea	\$	1,800.00	\$	7,200.00
18	Gate Valve and Box, 6 inch, Modified	4	Ea	\$	2,000.00	\$	8,000.00
19	Live Tap, 8 inch by 8 inch	4	Ea	\$	5,000.00	\$	20,000.00
20	Hydrant Assembly	2	Ea	\$	5,000.00	\$	10,000.00
21	Water Service	27	Ea	\$	2,000.00	\$	54,000.00
	Estimated Construction Cost:						448,959.00
Engineering, Legal, and Admin. (25%):						\$	112,239.75
Contingency (20%):						\$	89,791.80
TOTAL OPINION OF PROBABLE CONSTRUCTION COST =						<u>\$</u>	650,990.55



OPINION OF PROBABLE

PROJECT: CSO Shiawassee St	DATE: March	18, 2022
LOCATION: Lansing Board of Water & Light	PROJECT #:	20220131
WORK: DWSRF Cost Estimate - Open Cut Option w/CSO	ESTIMATOR:	BRC
	CHECKED BY:	KKF
	CURRENT ENR:	

Item Code	Item Description	Quantity	ntity Unit Unit P		Unit Price		Unit Price		Unit Price		Unit Price		Unit Price		Unit Price		Unit Price		Total Cost
1	Audiovisual Coverage	1	LSUM	\$	25,000.00	\$	25,000.00												
2	Mobilization, Max 5%	1	LSUM	\$	33,178.45	\$	33,178.45												
3	Curb and Gutter, Rem	100	Ft	\$	10.00	\$	1,000.00												
4	Pavt, Rem	3,112	Syd	\$	10.00	\$	31,120.00												
5	Erosion Control	1	LSUM	\$	60,000.00	\$	60,000.00												
6	Subbase, CIP	249	Cyd	\$	20.00	\$	4,980.00												
7	Aggregate Base, 8 inch	3,112	Syd	\$	12.00	\$	37,344.00												
8	HMA, LVSP	685	Ton	\$	125.00	\$	85,625.00												
9	Curb and Gutter, Conc, Det F4, Modified	100	Ft	\$	25.00	\$	2,500.00												
10	Pavement Markings	1	LSUM	\$	5,000.00	\$	5,000.00												
11	Traffic Control	1	LSUM	\$	20,000.00	\$	20,000.00												
12	Lawn Restoration	1	LSUM	\$	10,000.00	\$	10,000.00												
15	Water Main, DI, 8 inch, Tr Det G, Modified	2,000	Ft	\$	120.00	\$	240,000.00												
18	Live Tap, 4 inch by 8 inch	1	Ea	\$	2,000.00	\$	2,000.00												
19	Hydrant Assembly	3	Ea	\$	5,000.00	\$	15,000.00												
20	Water Service	62	Ea	\$	2,000.00	\$	124,000.00												
		Estin	nated Co	nstru	iction Cost:	\$	696,747.45												
	ĥ	ngineering L	egal and	۸dı	min (25%)·	\$	174 186 86												
Engineering, Eega, and Admin. (23.99).						\$	139.349.49												
Contingency (20%):																			
							1 010 000 00												
TOTAL OPINION OF PROBABLE CONSTRUCTION COST =						\$	1,010,283.80												



OPINION OF PROBABLE

CONSTRUCTION COST

PROJECT: CSO Shiawassee St	DATE: March 18, 2022
LOCATION: Lansing Board of Water & Light	PROJECT #: 20220131
WORK: DWSRF Cost Estimate - Open Cut Option w/out CSO	ESTIMATOR: BRC
	CHECKED BY: KKF
	CURRENT ENR:

Item Code	Item Description	Quantity	Unit	Unit Price		Unit Price		Unit Price Total Cost	
1	Audiovisual Coverage	1	LSUM	\$	25,000.00	\$	25,000.00		
2	Mobilization, Max 5%	1	LSUM	\$	43,593.40	\$	43,593.40		
3	Curb and Gutter, Rem	620	Ft	\$	10.00	\$	6,200.00		
4	Pavt, Rem	3,112	Syd	\$	10.00	\$	31,120.00		
5	Erosion Control	1	LSUM	\$	60,000.00	\$	60,000.00		
6	Subbase, CIP	249	Cyd	\$	20.00	\$	4,980.00		
7	Aggregate Base, 8 inch	3,112	Syd	\$	12.00	\$	37,344.00		
8	HMA, LVSP	1,028	Ton	\$	125.00	\$	128,500.00		
9	Curb and Gutter, Conc, Det F4, Modified	620	Ft	\$	25.00	\$	15,500.00		
10	Cold Milling HMA Surface	3,112	Syd	\$	2.00	\$	6,224.00		
11	Pavement Markings	1	LSUM	\$	20,000.00	\$	20,000.00		
12	Traffic Control	1	LSUM	\$	100,000.00	\$	100,000.00		
13	Lawn Restoration	1	LSUM	\$	50,000.00	\$	50,000.00		
16	Water Main, DI, 8 inch, Tr Det G, Modified	2,000	Ft	\$	120.00	\$	240,000.00		
19	Live Tap, 4 inch by 8 inch	4	Ea	\$	2,000.00	\$	8,000.00		
20	Hydrant Assembly	3	Ea	\$	5,000.00	\$	15,000.00		
21	Water Service	62	Ea	\$	2,000.00	\$	124,000.00		
		Estin	nated Co	nstr	uction Cost:	\$	915,461.40		
Engineering Legal and Admin (25%) :					\$	228 865 35			
Engineering, Eegai, and Xunni. (2376).						\$	183.092.28		
Contingency (20%):						φ	105,072.20		

TOTAL OPINION OF PROBABLE CONSTRUCTION COST = <u>\$ 1,327,419.03</u>



OPINION OF PROBABLE

CONSTRUCTION COST

PROJECT: CSO Shiawassee St.	DATE: March 18, 2022
LOCATION: Lansing Board of Water & Light	PROJECT #: 20220131
WORK: DWSRF Cost Estimate - Directional Drill	ESTIMATOR: BRC
	CHECKED BY: KKF
	CURRENT ENR:

Item Code	Item Description	Quantity	Unit	ι	Unit Price	Total Cost
1	Audiovisual Coverage	1	LSUM	\$	25,000.00	\$ 25,000.00
2	Mobilization, Max 5%	1	LSUM	\$	44,955.50	\$ 44,955.50
3	Curb and Gutter, Rem	620	Ft	\$	10.00	\$ 6,200.00
4	Pavt, Rem	100	Syd	\$	10.00	\$ 1,000.00
5	Erosion Control	1	LSUM	\$	60,000.00	\$ 60,000.00
6	Subbase, CIP	23	Cyd	\$	20.00	\$ 460.00
7	Aggregate Base, 8 inch	100	Syd	\$	12.00	\$ 1,200.00
8	HMA, LVSP	22	Ton	\$	125.00	\$ 2,750.00
9	Curb and Gutter, Conc, Det F4, Modified	620	Ft	\$	25.00	\$ 15,500.00
11	Pavement Markings	1	LSUM	\$	5,000.00	\$ 5,000.00
12	Traffic Control	1	LSUM	\$	20,000.00	\$ 20,000.00
13	Lawn Restoration	1	LSUM	\$	15,000.00	\$ 15,000.00
16	Water Main, DI, 8 inch, Tr Det G, Modified	2,000	Ft	\$	300.00	\$ 600,000.00
19	Live Tap, 4 inch by 8 inch	4	Ea	\$	2,000.00	\$ 8,000.00
20	Hydrant Assembly	3	Ea	\$	5,000.00	\$ 15,000.00
21	Water Service	62	Ea	\$	2,000.00	\$ 124,000.00
Estimated Construction Cost:						\$ 944,065.50
Engineering, Legal, and Admin. (25%):						\$ 236,016.38
Contingency (20%):						\$ 188,813.10
TOTAL OPINION OF PROBABLE CONSTRUCTION COST =						\$ 1,368,894.98



OPINION OF PROBABLE

PROJECT: Elevated Storage	DATE: March 18, 2022
LOCATION: Lansing Board of Water & Light	PROJECT #: 20220131
WORK: DWSRF Cost Estimate	ESTIMATOR: BRC
	CHECKED BY: KKF
	CURRENT ENR:

Item Code	Item Description	Quantity	Unit		Unit Price		Total Cost
1	Audiovisual Coverage	1	LSUM	\$	25,000.00	\$	25,000.00
2	Mobilization, Max 5%	1	LSUM	\$	308,875.00	\$	308,875.00
3	Clearing and Grubbing	1	LSUM	\$	1,500.00	\$	1,500.00
4	Lawn Restoration	1	LSUM	\$	7,500.00	\$	7,500.00
5	Site Grading	1	LSUM	\$	2,500.00	\$	2,500.00
6	Erosion Control	1	LSUM	\$	5,000.00	\$	5,000.00
7	Electrical	1	LSUM	\$	15,000.00	\$	15,000.00
8	5 1/4" Fire Hydrant Setting	1	Ea	\$	5,000.00	\$	5,000.00
9	Water Main, Connect to Existing	2	Ea	\$	2,500.00	\$	5,000.00
10	Chain Link Fence (6' High)	500	Ft	\$	100.00	\$	50,000.00
11	Gate (4' x 6') (Swing)	1	Ea	\$	1,000.00	\$	1,000.00
12	Water Main	1	LSUM	\$	100,000.00	\$	100,000.00
12	3,000,000 Gallon Pedesphere Water Tower	1	LSUM	\$	5,960,000.00	\$	5,960,000.00
		Esti	imated C	ons	truction Cost:	\$	6,486,375.00
		Engineering,	Legal, an	nd A	dmin. (25%):	\$	1,621,593.75
		8 8/	C	onti	ngency (20%):	\$	1,297,275.00
Contragency (2070).							· · · ·
	TOTAL OPINION OF F	PROBABLEC	ONSTR	UC	TION COST =	\$	9 405 243 75
	101AL OF INON OF I	KODADLE C	JUBIK			φ	2,703,473.73



OPINION OF PROBABLE

PROJECT: Well Replacement	DATE: March 18, 2022
LOCATION: Lansing Board of Water & Light	PROJECT #: 20220131
WORK: DWSRF Cost Estimate	ESTIMATOR: BRC
	CHECKED BY: KKF
	CURRENT ENR:

Item Code	Item Description	Quantity	Unit	I	Unit Price		Total Cost
1	Mobilization, Max 5%	1	LSUM	\$	19,125.00	\$	19,125.00
2	Well Pit and Cabinet	1	LSUM	\$	25,000.00	\$	25,000.00
3	Electrical	1	LSUM	\$	40,000.00	\$	40,000.00
4	Test Well Construction (Convert to Production upon approval)	1	LSUM	\$	150,000.00	\$	150,000.00
5	System Startup and Testing	1	LSUM	\$	27,500.00	\$	27,500.00
6	Pitless Adapter and Pumping	1	LSUM	\$	60,000.00	\$	60,000.00
7	Service Main	1	LSUM	\$	80,000.00	\$	80,000.00
8	Engineering and Testing	1	LUSM		90000	\$	90,000.00
Estimated Construction Cost:							491,625.00
	F	ngineering, L	egal, and	Ad	min. (25%):	\$	122,906.25
Contingency (20%):						\$	98,325.00
TOTAL OPINION OF PROBABLE CONSTRUCTION COST =					\$	712,856.25	



OPINION OF PROBABLE

PROJECT: Dye Ammonia Conversion	DATE: March 18, 2022
LOCATION: Lansing Board of Water & Light	PROJECT #: 20220131
WORK: DWSRF Cost Estimate	ESTIMATOR: BRC
	CHECKED BY: KKF
	CURRENT ENR:

Item Code	Item Description	Quantity	Unit		Unit Price		Total Cost
1	Mobilization, Max 5%	1	LSUM	\$	67,471.50	\$	67,471.50
2	Demo	1	LSUM	\$	120,000.00	\$	120,000.00
3	Tanks	1	LSUM	\$	84,000.00	\$	84,000.00
4	Equipment	1	LSUM	\$	240,000.00	\$	240,000.00
5	Mechanical	1	LSUM	\$	240,000.00	\$	240,000.00
6	Electrical	1	LSUM	\$	245,430.00	\$	245,430.00
7	I&C	1	Ea	\$	180,000.00	\$	180,000.00
8	Misc PED	2	Ea	\$	120,000.00	\$	240,000.00
Estimated Construction Cost:							1,416,901.50
	1	Engineering,	Legal, an	nd A	dmin. (25%):	\$	354,225.38
Contingency (20%):						\$	283,380.30
TOTAL OPINION OF PROBABLE CONSTRUCTION COST =						\$	2,054,507.18



OPINION OF PROBABLE

PROJECT: Wise Road Chemical Building	DATE: March	18, 2022
LOCATION: Lansing Board of Water & Light	PROJECT #:	20220131
WORK: DWSRF Cost Estimate	ESTIMATOR:	BRC
	CHECKED BY:	KKF
	CURRENT ENR:	

Item Code	Item Description	Quantity	Unit		Unit Price		Total Cost
			-				
1	Mobilization, Max 5%	1	LSUM	\$	44,574.50	\$	44,574.50
2	Demo	1	LSUM	\$	36,000.00	\$	36,000.00
3	Building	1	LSUM	\$	270,000.00	\$	270,000.00
4	Tanks	1	LSUM	\$	72,000.00	\$	72,000.00
5	Equipment	1	LSUM	\$	120,000.00	\$	120,000.00
6	Mechanical	1	LSUM	\$	120,000.00	\$	120,000.00
7	Electrical	1	LSUM	\$	125,430.00	\$	125,430.00
8	I&C	1	Ea	\$	102,000.00	\$	102,000.00
9	Misc PED	2	Ea	\$	23,030.00	\$	46,060.00
Estimated Construction Cost:						\$	936,064.50
		Engineering,	Legal, an	d A	dmin. (25%):	\$	234,016.13
Contingency (20%):					\$	187,212.90	
TOTAL OPINION OF PROBABLE CONSTRUCTION COST =						<u>\$</u>	1,357,293.53



OPINION OF PROBABLE

PROJECT: Dye/Cedar Dry Chemical Handling (Lime System)	DATE: March	18, 2022
LOCATION: Lansing Board of Water & Light	PROJECT #:	20220131
WORK: DWSRF Cost Estimate	ESTIMATOR:	BRC
	CHECKED BY:	KKF
	CURRENT ENR:	

Item Code	Item Description	Quantity	Unit		Unit Price		Total Cost
		1 .					
1	Mobilization, Max 5%	1	LSUM	\$	82,200.00	\$	82,200.00
2	Lime Bin Slide Gates	1	LSUM	\$	192,000.00	\$	192,000.00
3	Lime Bine 9" Screw Feeders	1	LSUM	\$	288,000.00	\$	288,000.00
4	Lime Screw Feeder Discharge Chute	1	LSUM	\$	5,000.00	\$	5,000.00
5	Lime Slaking Equipment and Controls	1	LSUM	\$	984,000.00	\$	984,000.00
6	Demolition of Existing Chemical Feed Equipment	1	LSUM	\$	100,000.00	\$	100,000.00
7	Misc Electrical Improvements	1	LSUM	\$	75,000.00	\$	75,000.00
Estimated Construction Cost:							1,726,200.00
	Contractor OHP,	General Con	litions, P	erm	itting (22%):	\$	379,764.00
]	Engineering, I	Legal, an	id Ae	dmin. (50%):	\$	863,100.00
Contingency (20%):						\$	345,240.00
TOTAL OPINION OF PROBABLE CONSTRUCTION COST =						\$	3,314,304.00



APPENDIX F: PUBLIC PARTICIPATION DOCUMENTATION



HRC OFFICE LOCATIONS

Bloomfield Hills

555 Hulet Drive Bloomfield Hills, MI 48302 (248) 454-6300 | Fax: (248) 454-6312

Detroit

Buhl Building, Suite 1650 535 Griswold Street | Detroit, MI 48226 (313) 965-3330

Howell

105 West Grand River Howell, MI 48843 (517) 552-9199

Kalamazoo

834 King Highway, Suite 107 Kalamazoo, MI 49001 (269) 665-2005

- Delhi Township 2101 Aurelius Road, Suite 2 Holt, MI 48842 (517) 694-7760
- Grand Rapids 801 Broadway NW, Suite 215 Grand Rapids, MI 49504 (616) 454-4286

Jackson 401 S. Mechanic Street, Suite B Jackson, MI 49201

(517) 292-1295

Lansing 215 South W

215 South Washington Square Lansing, MI 48933 (517) 292-1488