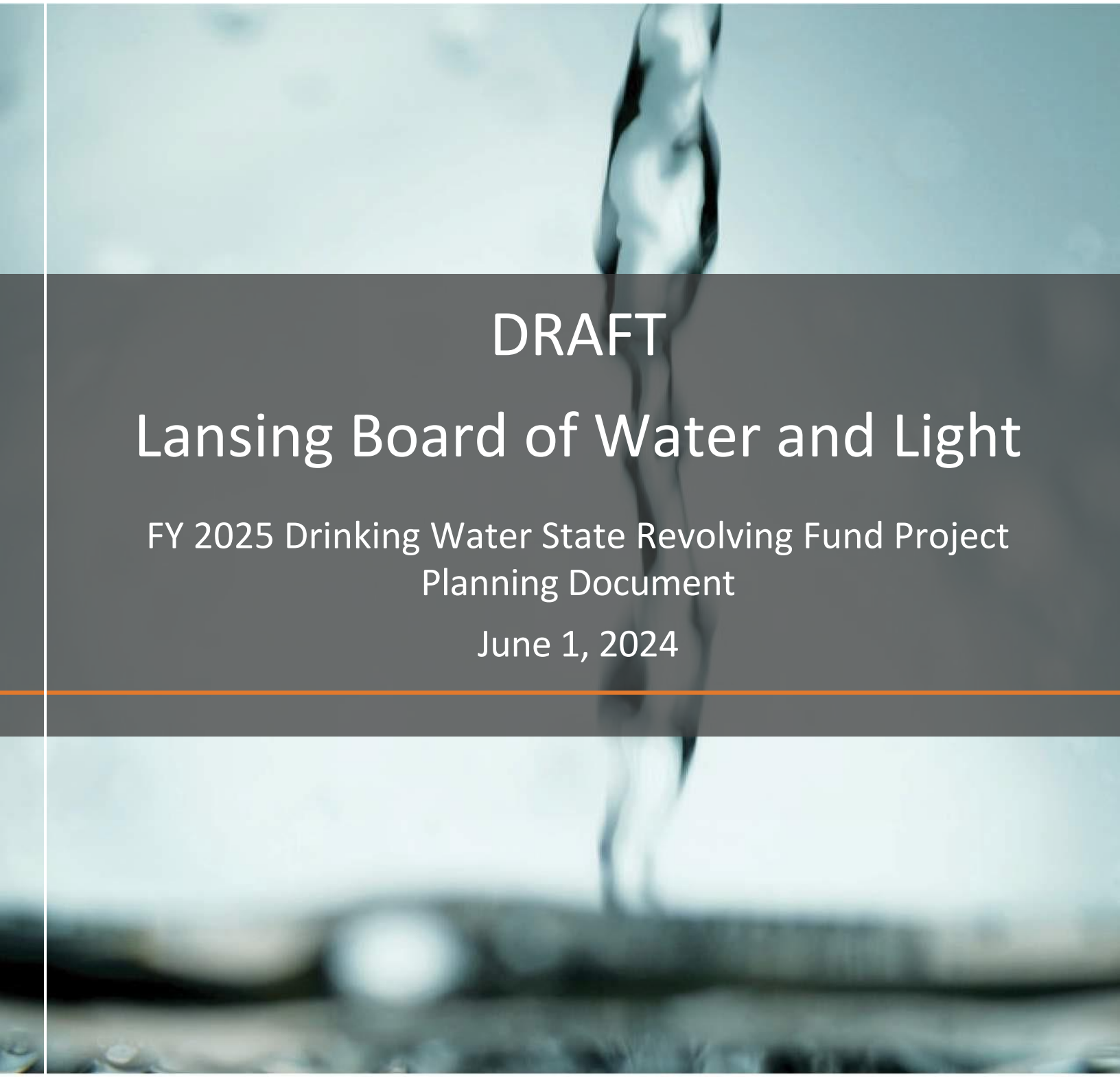

DRAFT

Lansing Board of Water and Light

FY 2025 Drinking Water State Revolving Fund Project Planning Document

June 1, 2024

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ABBREVIATIONS

AMI	Advanced Metering Infrastructure
BWL	Board of Water and Light
CIP	Capital Improvement Plan
DWSRF	Drinking Water State Revolving Fund
EGLE	Michigan Department of Environment, Great Lakes and Energy
GAC	Granular Activated Carbon
GPM	Gallons per Minute
HP	Horsepower
MDNR	Michigan Department of Natural Resources
MG	Million Gallons
MGD	Million Gallons per Day
MNFI	Michigan Natural Features Inventory
NAAQS	National Ambient Air Quality Standard
NLCD	National Land Cover Database
NO.	Number
O&M	Operation and Maintenance
PFAS	Per- and Polyfluoroalkyl Substances
PSI	Pounds per Square Inch
PVC	Polyvinyl chloride
SCADA	Supervisory Control and Data Acquisition
SHPO	State Historical Preservation Office
S.U.	Specific Units
U.S.	United States
USFWS	U.S. Fish and Wildlife Services
USGS	United States Geological Survey
VFD	Variable Frequency Drive
WRS	Water Reliability Study
WCP	Water Conditioning Plant

I. INTRODUCTION

The Lansing Board of Water and Light (BWL) is submitting this project planning document to apply for a Drinking Water State Revolving Fund (DWSRF) low interest loan to design and replace water main, install looping water mains, complete system consolidation projects, replace radios at wells, install strategic meters, construct an elevated storage tank, refurbish and replace wells and equipment at the John Dye and Wise Road Water Conditioning Plants (WCPs). Proposed projects at the treatment facilities include filter press piping replacement, high service pump and sludge pump improvements, filter media replacement, plant optimization, replacing basin chains, reservoir and basin refurbishments and disinfection system replacement. The project planning document has been developed using the Michigan Department of Environment, Great Lakes and Energy (EGLE), DWSRF Project Planning Guidance Document.

An Intent to Apply was submitted to EGLE on October 31, 2023. The Intent to Apply form, Tracking No. 1031-5323, included a description of the desired project and a preliminary cost. This report incorporates the required level of detail as presented in the project planning document preparation guidance and will be submitted to EGLE by June 1, 2024, for consideration of funding during fiscal year 2025 through fiscal year 2029.

II. BACKGROUND

A. STUDY AND SERVICE AREAS

The Lansing Board of Water and Light is a 124-square mile regional supplier serving the City of Lansing and surrounding communities including sections of Alaiedon Township, Bath Township, City of DeWitt, Delhi Township, DeWitt Township, Watertown Township and Windsor Township. Delta Township, Lansing Township, West Side Water and the southern portion of Meridian Township are wholesale customers. The service area is bordered by Grand Ledge to the west and East Lansing to the east. The northern edge of the service area is in DeWitt near West Cutler Road and the southern edge is near Holt. Michigan State University is partially included at the east border near US 127. Interstate I-496, parallel to the Grand River, traverses through the center of the service area as its principal commercial corridor.

Currently, the BWL treats groundwater collected through 124 wells that extract water from the Saginaw Aquifer. Potable well water is conveyed through the system's 52 miles of raw water main to one of two WCPs owned and operated by the BWL. Seven of these 124 wells are owned by Lansing Township, and BWL owns additional wells that are not connected to the existing raw water supply main. Bath Township wells and DeWitt Township wells are examples of non-connected wells. Once treated at either the Wise Road WCP located in the southwest of the service area or the John Dye (Dye) WCP located in the center of the service area, the water is distributed to the community through 808 miles of distribution water main.

Figure 1 presents a map of the BWL's existing water system and service area.

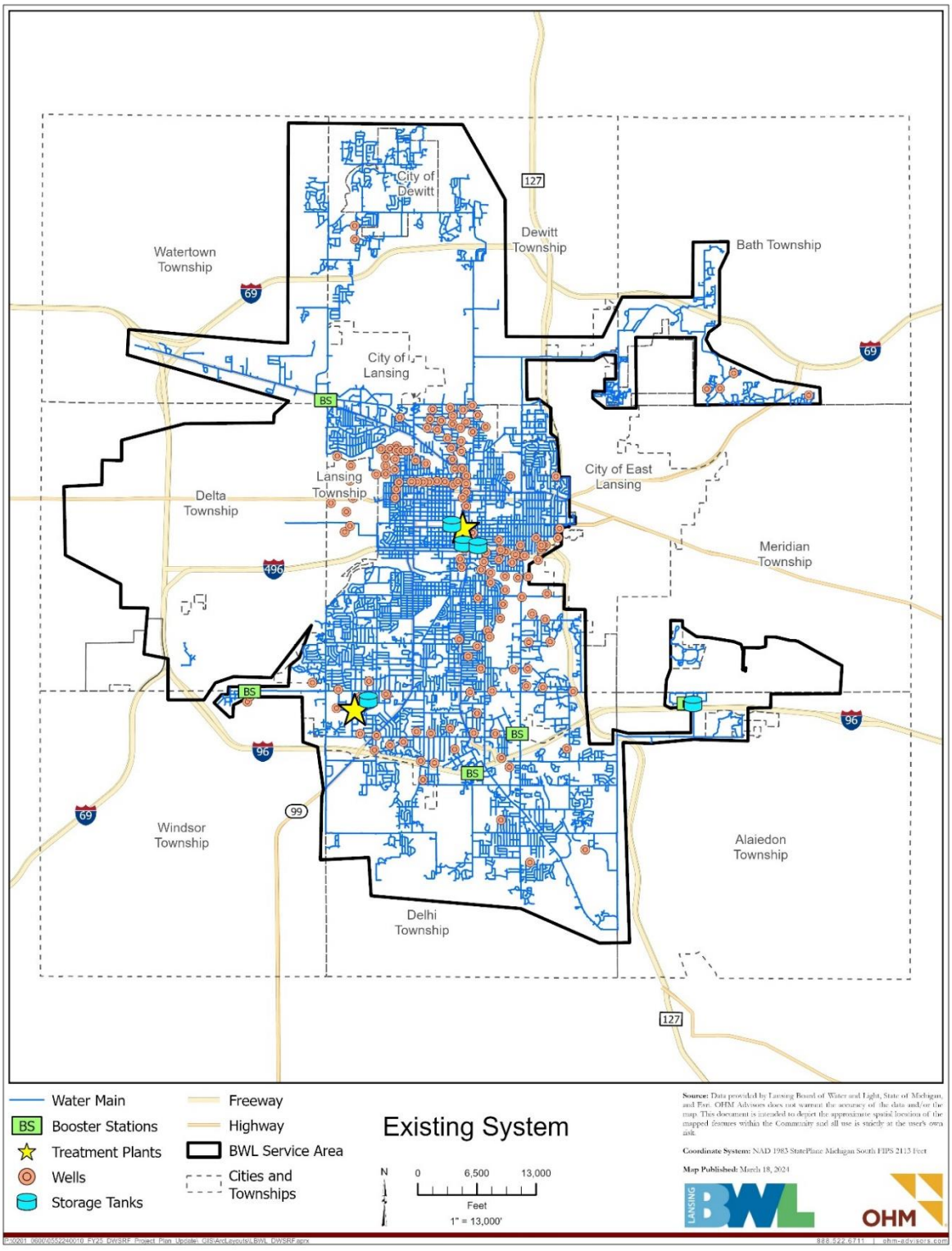

Figure 1 - BWL Existing Water System and Service Area

B. POPULATION

The population of the City of Lansing at the time of the 2020 Census was 112,644 according to the United States (U.S.) Census Bureau. The population decreased by 1.4% from the 2010 Census to the 2020 Census. According to Michigan's Bureau of Labor Market Information and Strategic Initiatives (LMISI) population projection for Ingham County, the 10-year growth rate from 2020 to 2030 was 8.9% (0.0089 annual equivalent decimal rate; Population_Projections_2045.pdf (milmi.org), 2019). The projected population for 2045 using this rate is 140,714. Table 1 displays demographic data obtained from the U.S. Census Bureau and extrapolated data using the 0.0089 annual growth rate for the remaining municipalities serviced in part by the BWL. Populations reflect the entire boundary of municipal jurisdictions and should not be used as a representation of the BWL service area.

Table 1 - Present and Future Population Projections for BWL Service Communities

Municipal Jurisdiction	U.S. Census Bureau Population		Population Projections		
	2010	2020	2030	2040	2045
Alaiedon Township	2,894	2,910	3,181	3,477	3,635
Bath Township	11,598	13,292	14,529	15,882	16,604
City of DeWitt	4,507	4,776	5,221	5,706	5,966
City of Lansing	114,297	112,644	123,129	134,590	140,714
Delhi Township	25,877	27,710	30,289	33,109	34,615
DeWitt Township	14,321	15,073	16,476	18,010	18,829
Lansing Township	8,126	8,143	8,901	9,729	10,172
Meridian Township	39,688	43,916	48,004	52,472	54,860
Watertown Township	4,836	5,563	6,081	6,647	6,949
Windsor Township	6,838	7,140	7,805	8,531	8,919
Wholesale – Delta Twp	32,408	33,119	36,202	39,571	41,372

C. EXISTING ENVIRONMENTAL EVALUATION

15. Cultural and Historic Resources

There are eighty-three historical sites within the BWL service area. These sites are listed in the National Park Service, National Geospace Program Data Services, National Register of Historic Places and the State of Michigan/MiDNR Michigan Historical Markers GIS database. A complete list of these historic locations can be found in Appendix A.

Proposed work located in the vicinity of cultural or historic resources will be performed in areas previously disturbed. It is unlikely that cultural or historic resources will be encountered during construction, and water system improvements are not anticipated to negatively impact

the appearance or structural integrity of the homes. Figure 2 provides historical site locations and district boundaries. Figure 3 provides a more refined view of the historical sites in downtown Lansing.

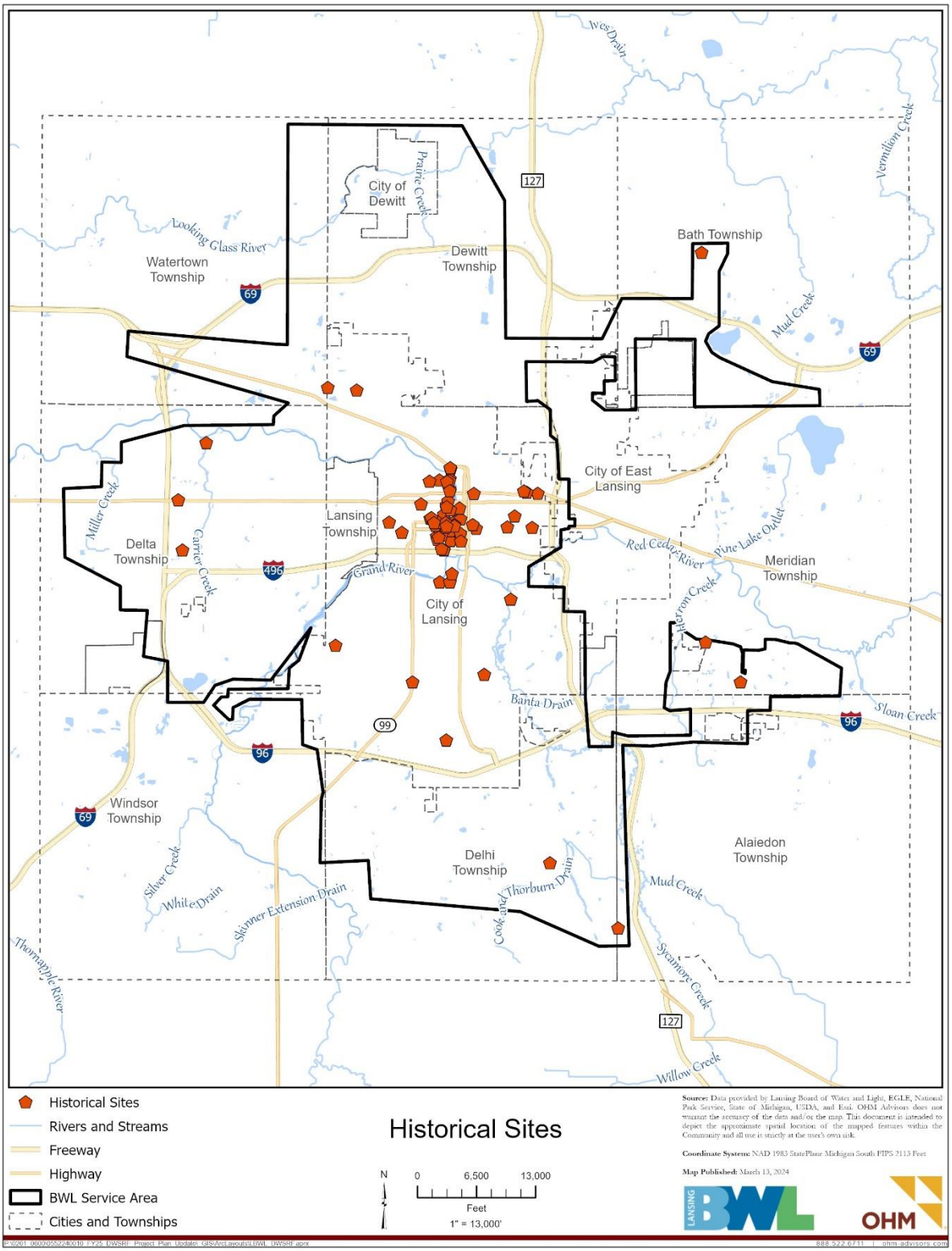

Figure 2 - Historical Site Locations in BWL Service Area

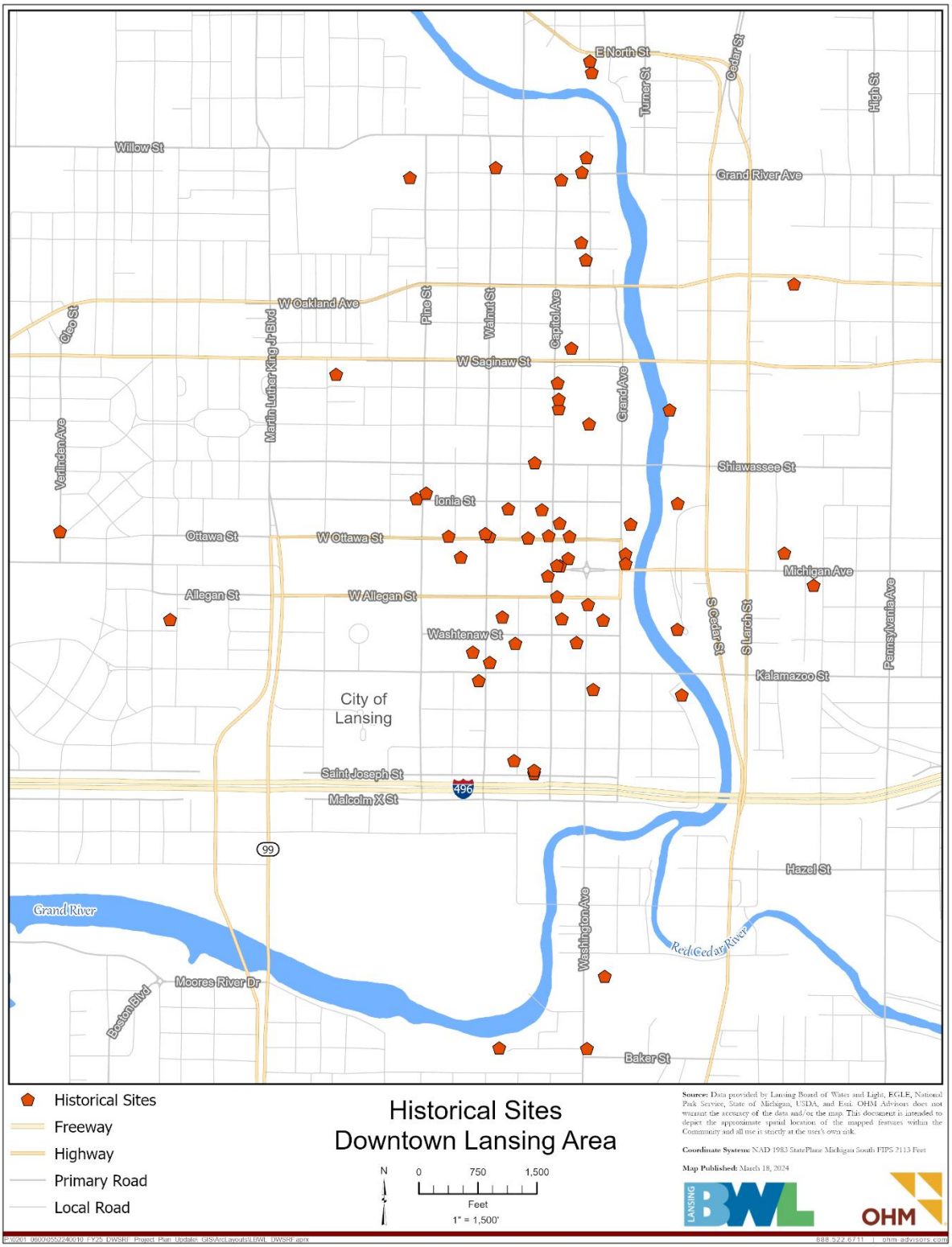

Figure 3 - Downtown Lansing Historical Sites

The State Historical Preservation Office (SHPO) Part 106 requirements for DWSRF will be fulfilled after EGLE's release of the DWSRF FY 2025 Intended Use Plan (IUP) in the event the BWL is determined to be in the fundable range and is required by the awarded funding source.

16. Air Quality

According to the 2022 Michigan Air Quality Report from the Michigan Department of Health and Human Services, the entire state of Michigan was in attainment for carbon monoxide, lead, nitrogen dioxide and particulate matter. Portions of the state are designated as nonattainment areas for sulfur dioxide, however, the monitoring site in Lansing remains consistently under the National Ambient Air Quality Standard (NAAQS) level. Portions of the state are designated as nonattainment areas for ozone, with West Michigan having eight ozone exceedance days in the 2022 ozone season (May to October) and Southeast Michigan having four. The monitoring site in Lansing, however, remained consistently under the NAAQS level.

17. Wetlands

Wetlands and wetland soils are found within the service area. Generally, wetlands are surrounding the shallow water bodies, rivers and lakes within the service area. Wetland soils are also found throughout the service area and are generally in proximity to bodies of water or waterways. Figure 4 shows the wetlands and waterways within the BWL service area. Construction and or installation of projects will be planned in such a way that protection and restoration of wetlands will be properly completed in accordance with issued permits.

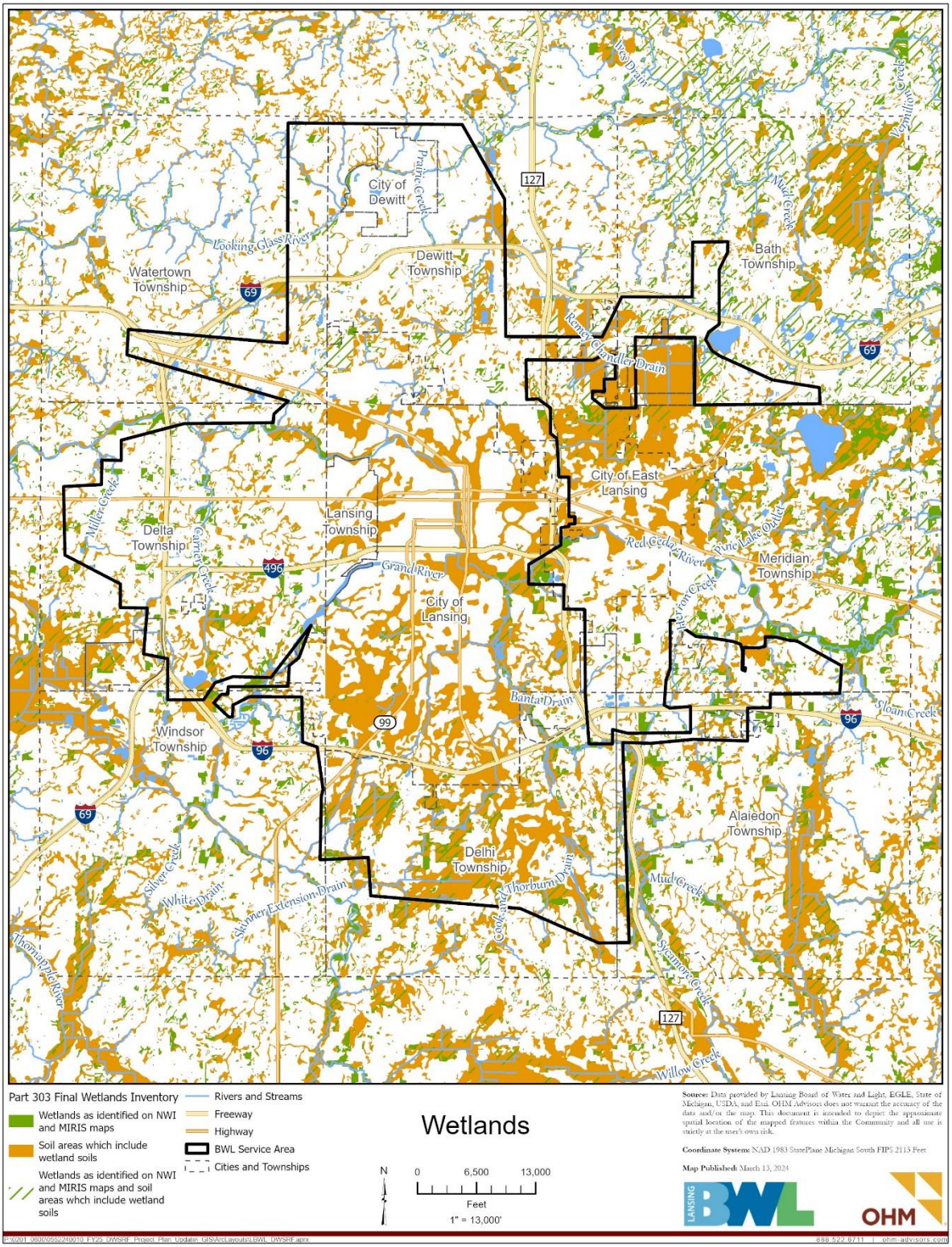

Figure 4 - Wetlands in BWL Service Area

18. Great Lakes Shorelands, Coastal Zones and Coastal Management Areas

This section is not applicable since there are no coastal zones within the study area.

19. Floodplains

Areas designated to be within the 100-year floodplain are found near the Grand River, Red Cedar River and Looking Glass River, as well as in some low laying areas surrounding these waterways. Figure 5 shows the location of the 100-year floodplain.

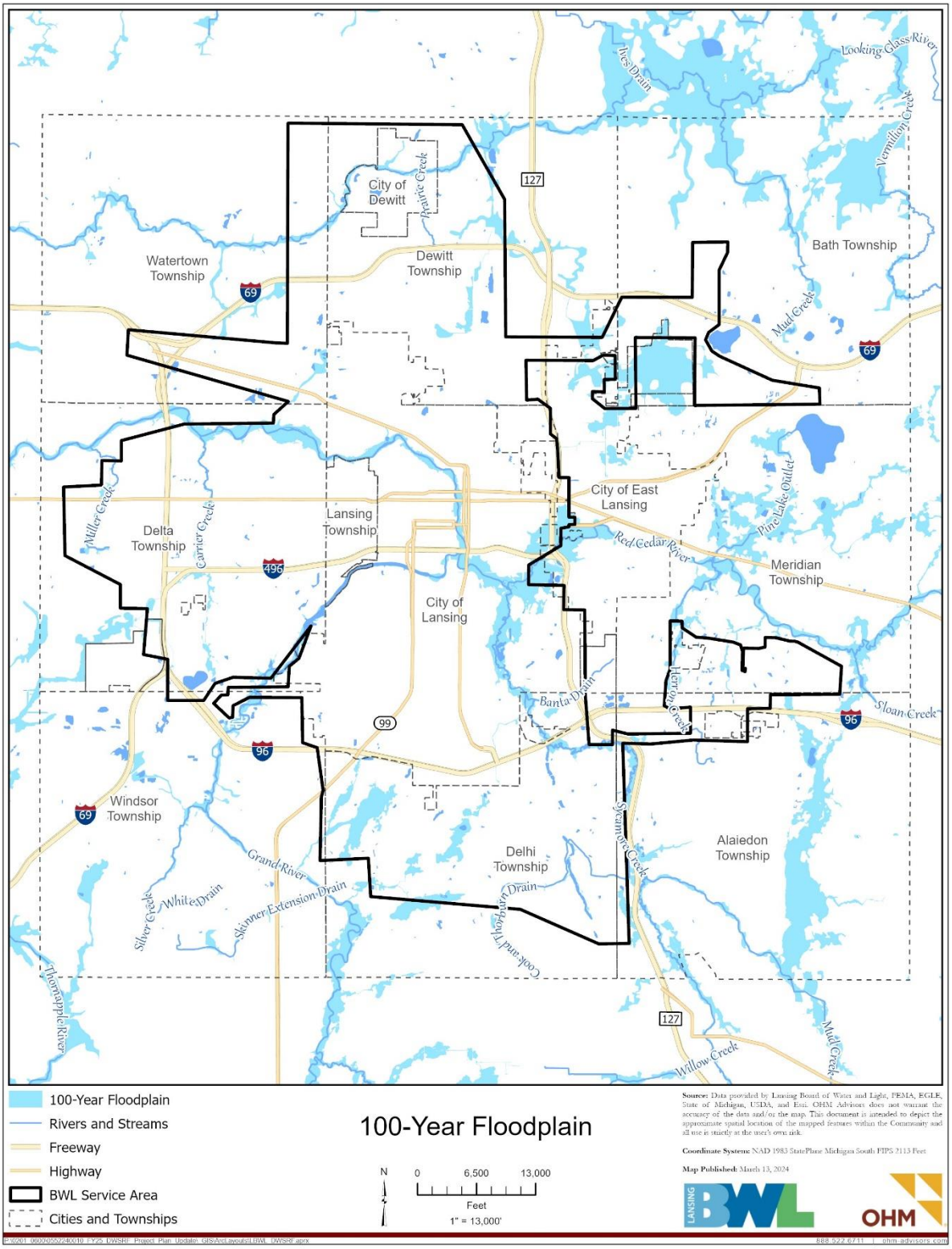

Figure 5 - Floodplains in BWL Service Area

20. Natural or Wild and Scenic Rivers

There are no natural rivers as designated by the Michigan Department of Natural Resources (MDNR) or wild and scenic rivers as designated by the National Fisheries and Wildlife Service's National and Scenic Rivers System in the service area.

21. Major Surface Waters

The Grand River, Red Cedar River and Looking Glass River are within the study area and have recreational and aesthetic value. Both the Red Cedar River and Looking Glass Rivers begin in Livingston County and flow west-northwest toward the Grand River. The Grand River is expansive. The headwaters for the Grand River watershed begin in Hillsdale County and flow north to the BWL service area. From there it continues west to Lake Michigan, subject to the larger Lake Michigan Watershed. The river valleys are distinct topographic features, contributing to the service area and the surrounding area's unique character. The rivers also aid in groundwater replenishment.

22. Topography

The terrain in the BWL service area is relatively flat but contains lower areas near the Grand River. The elevations range from approximately 805 feet above sea level along the Grand River to over 890 feet above sea level near Northrup and Cedar Streets. A map showing the BWL service area topography can be found in Figure 6.

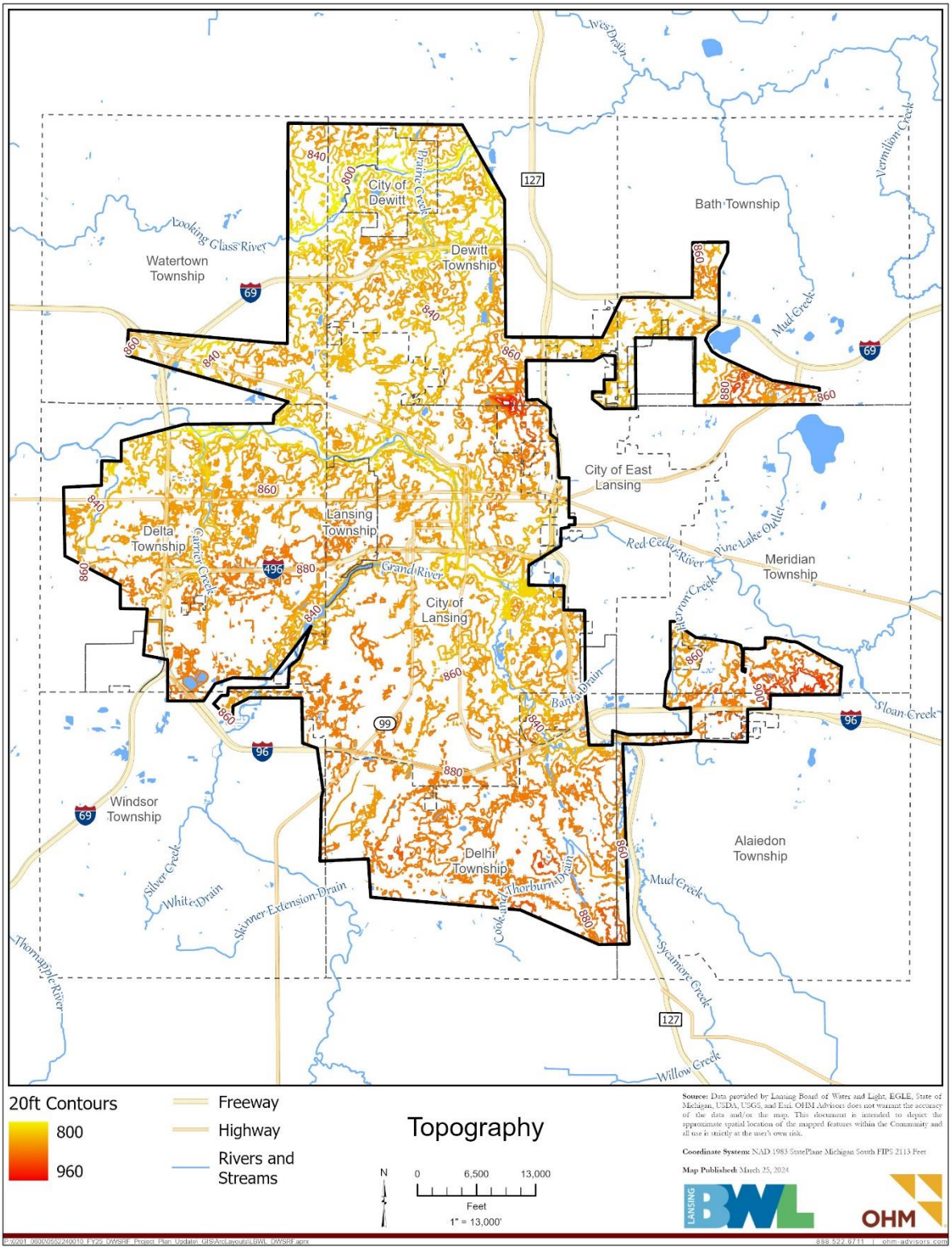

Figure 6 - Topography in BWL Service Area

23. Geology

The bedrock geology varies but is mostly comprised of Saginaw Formation. Mixed Grand River Formation and Red Beds fill the area near and north of I-69. Saginaw Formation lies below Red Beds and is majorly comprised of sandstone and shale with a thickness range of 75 to 350 feet (Michigan.gov, GeoWebFaceMap).

24. Soil Types

Figure 7 presents a summary of the types of soils found in the service area, which are mainly comprised of loam. Wet loamy soils and underlying till are present at the northern edge of the service area.

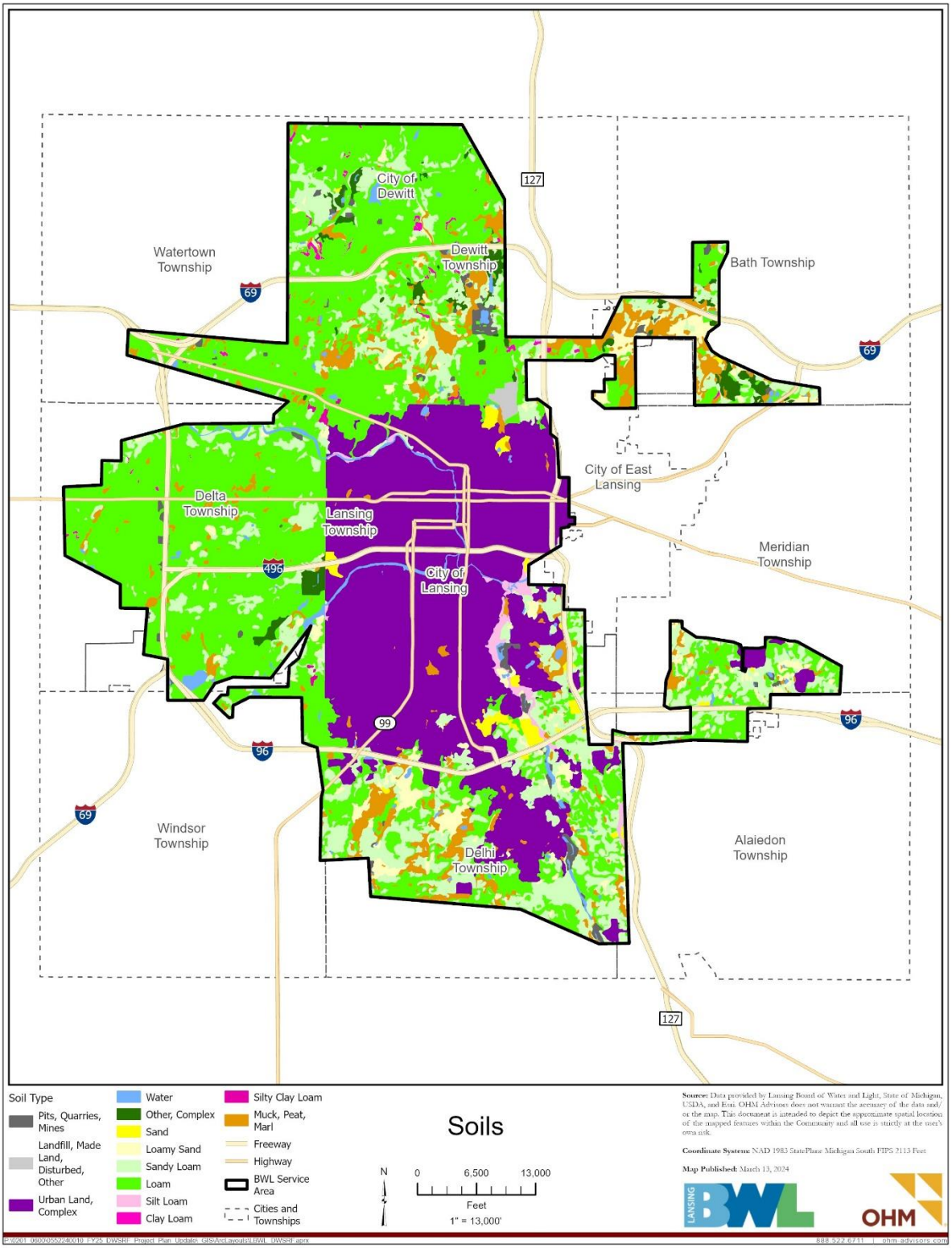

Figure 7 - Soil Types in BWL Service Area

25. Agricultural Resources

Much of the BWL service area, including the project areas discussed later in this project planning document, are in developed areas. Agricultural land in the form of pastures and crops exist closer to the boundaries of the service area. Figure 8 shows the land cover based on the 2021 United States Geological Survey (USGS) National Land Cover Database.

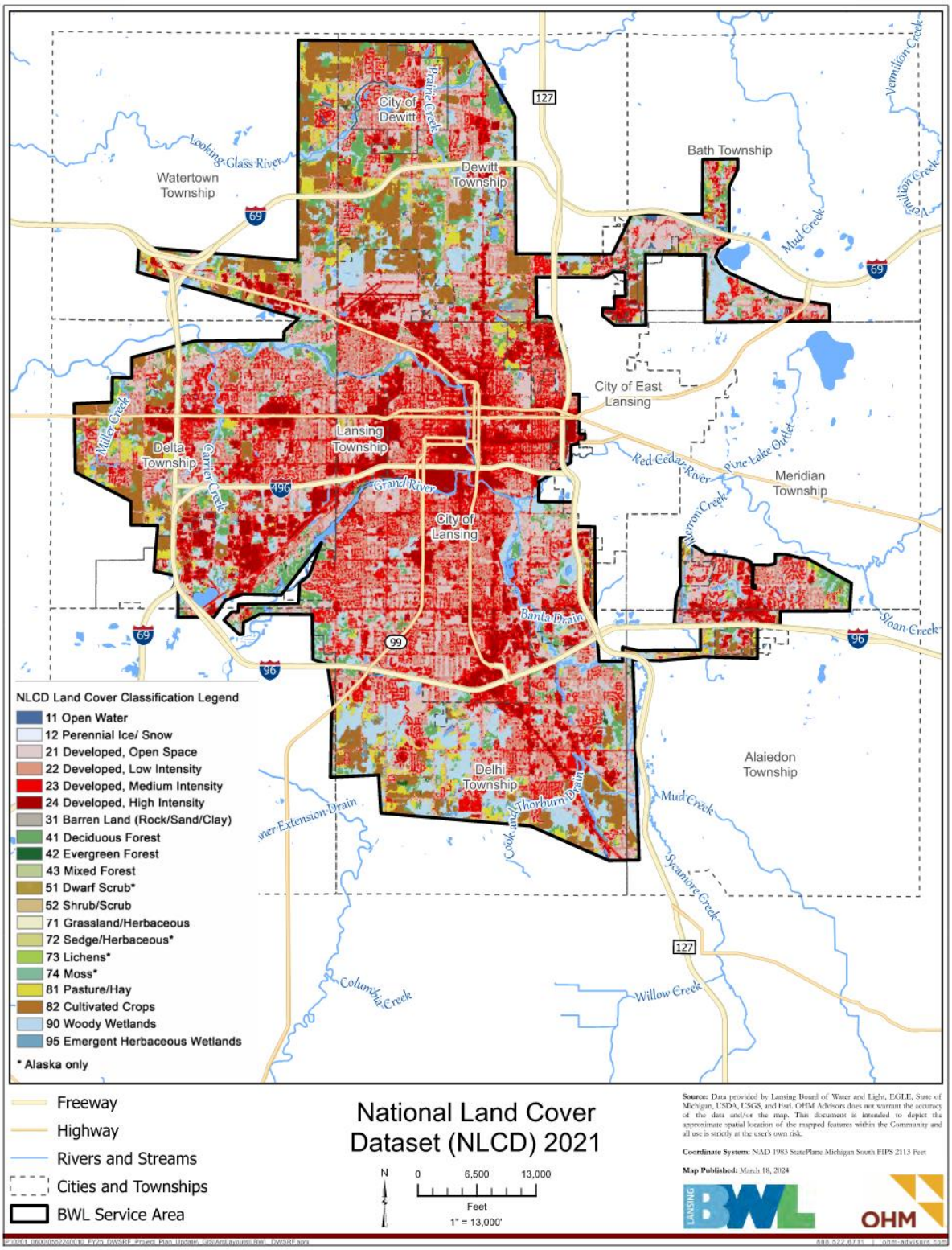

Figure 8 - Land Cover in BWL Service Area

26. Fauna and Flora

The Michigan Natural Features Inventory (MNFI) web database was reviewed for the presence of protected species. The full inventory can be found in Appendix B. The MNFI database identified a total of 29 State threatened, endangered, or species of special concern documented within a 1.5-mile project area buffer. Additionally, as per the U.S. Fish and Wildlife Services (USFWS) Information for Planning and Consultation website, a total of seven Federally listed threatened, endangered or candidate species were identified. Additional information is provided in Section IV.F. Environmental Evaluation.

D. EXISTING SYSTEM

BWL receives all its potable water from the Saginaw Aquifer by way of wells, pumping varying amounts throughout the greater Lansing Area. Raw water is pumped through transmission mains to either the Dye WCP or the Wise Road WCP. Treated groundwater is either stored in one of five storage reservoirs or distributed to the 58,089 customers through water main as large as 30-inches in diameter. BWL owns and operates their own treatment facilities, storage tanks and five pumping facilities displayed in Figure 1.

1. Condition of Source Facilities

BWL draws groundwater from 124 wells. Seven of these wells are owned by Lansing Township West Side Water. Some wells are out of service for routine maintenance or because of reduced water usage during the winter. Combined, these wells are capable of producing a total capacity of 67.56 million gallons per day (MGD) as stated in the BWL's Water Reliability Study (WRS). Wells connected to either the Dye WCP or the Wise Road WCP deliver water through the BWL's 52 miles of raw water transmission main. Table 2 details the age of the wells in the system.

Table 2 - Age of Wells in the System

Age of the Well	Number of wells	Percent of System
<30 years old	4	3.2%
30 – 39 years old	7	5.6%
40 – 49 years old	12	9.7%
50 – 59 years old	29	23.4%
60 – 69 years old	25	20.1%
>= 70 years old	47	38.0%
Total	**124**	**100%**

2. Water Treatment

There are two WCPs owned and operated by BWL. The Dye WCP was constructed in 1939 with a rated capacity of 30 MGD. In 1949, the plant was expanded to meet a rated capacity of 40

MGD, due to an increase in demand. Current treatment consists of two-stage split treatment softening, granular media filtration and chloramine disinfection. Of the incoming groundwater, approximately 80% undergoes excess lime treatment at a pH above 11specific units (s.u.) in the primary treatment basins to precipitate calcium and magnesium hardness in the form of calcium carbonate ($CaCO_3$) and magnesium hydroxide ($Mg(OH)_2$), respectively. The primary treatment train is comprised of two rapid mix basins, two flocculation basins (five bays each, with one paddle flocculator in the first four bays, and no paddle flocculator in the fifth bay) and two settling basins. Ammonia is added to the primary basin influent line and lime is added at the primary rapid mixing stage. After water is passed through rapid mixing, it flows into the flocculation basins where, through the five bays, flocs form and grow in size, as they progress towards the settling basins. Clean water at the top of the settling basins overflow into secondary treatment while the flocs settle out and get transferred to the sludge thickening system. Clean water from the primary basins is blended with untreated groundwater (approximately 20% of the incoming flow) prior to entering the secondary treatment basin to reduce the pH of the blended water and to maintain a pH of approximately 9.5 s.u. in the finished water leaving the plant. This reduced pH also promotes precipitation of excess lime as $CaCO_3$ 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 Station and Cedar Pumping Station, which operate simultaneously and pump water to the distribution system. Dye High Lift Station contains three high service pumps (and one filter backwash pump), and Cedar Pumping Station 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. Figure 9 shows a schematic of the treatment process through the Dye WCP.

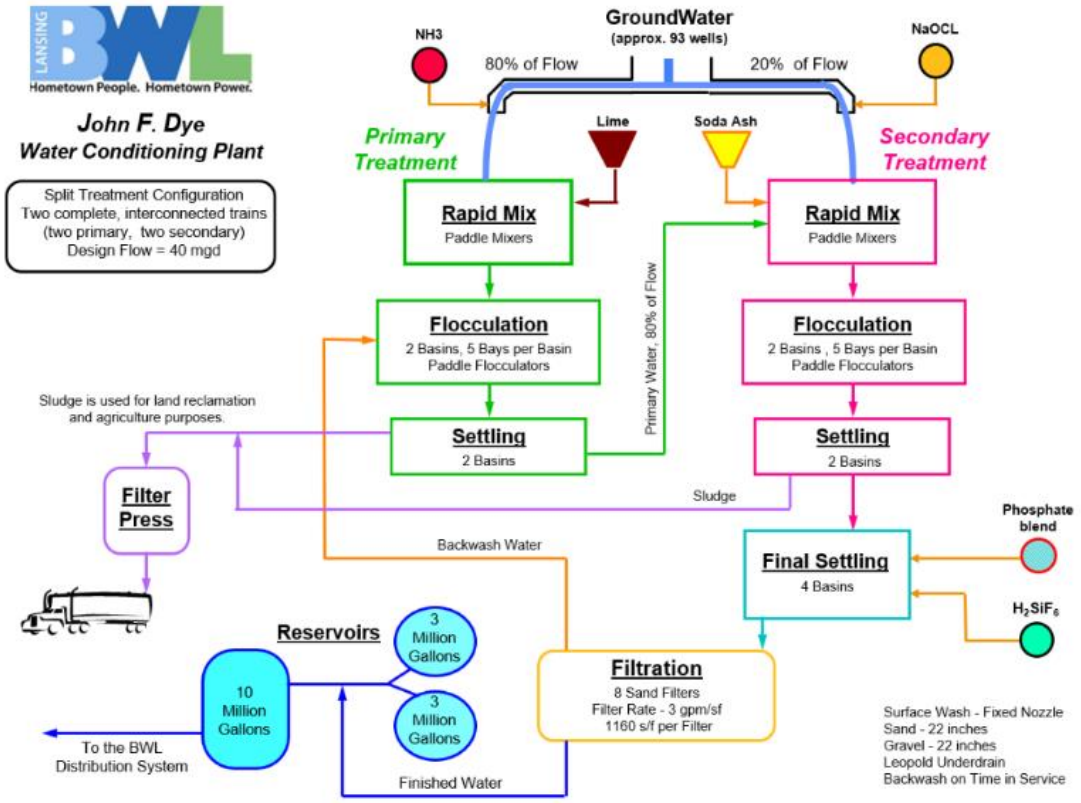

Figure 9 - Dye WCP Treatment Process

The Wise Road 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 the Wise Road WCP 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 Road WCP does not contain any solids processing equipment; the solids are pumped nearly seven miles to the Dye WCP for processing.

3 . Storage Tank and Pump Station Facilities

The BWL has high service pumping at both of its WCPs and at its Cedar Pump Station. It also owns and operates four (4) additional distribution pump stations. Details on these pump

stations are listed in Table 3. The oldest pumps the BWL owns are 71 and 72 years old and are located in the Cedar Pump Station.

Table 3 - System Pump Data

Location	Type	Number of Pumps	Pressure Zone	Design Capacity (MGD)	Year Installed
Dye WCP	High Service Pumping	Pump 1	30-inch and City of Lansing	20	1995
		Pump 2	30-inch and City of Lansing	20	1995
		Pump 3	30-inch and City of Lansing	10	1995
Wise Road WCP	High Service Pumping	Pump 1	City of Lansing	5	1966
		Pump 2	City of Lansing	5	1966
		Pump 3	City of Lansing	10	1966
		Pump 4	City of Lansing	10	1966
Cedar Pumping	High Service Pumping	Pump 1 (Emergency Backup)	City of Lansing	20	1952
		Pump 2	City of Lansing	12.5	1984
		Pump 3	City of Lansing	18	1953
		Pump 4 (Not in Service)	City of Lansing	15	1953
Aurelius	Remote Booster	Pump 1	Delhi	5	1993
Eifert	Remote Booster	Pump 1	Delhi	5	1973
Hulett	Remote Booster	Pump 1	Alaiedon and Meridian South	2.5	2000
		Pump 2	Alaiedon and Meridian South	2.5	2000
		Pump 3	Alaiedon and Meridian South	2.5	2000
		Pump 4	Alaiedon and Meridian South	1.25	2000
		Pump 5	Alaiedon and Meridian South	0.5	2000
		Pump 6	Alaiedon and Meridian South	0.5	2000
Windsor	Remote Booster	Pump 1	Windsor Twp	2.5	2003
		Pump 2	Windsor Twp	2.5	2003
		Pump 3	Windsor Twp	0.3	2003
		Pump 4	Windsor Twp	0.3	2003

The BWL has five storage tanks within the water system with a total storage capacity of 24 million gallons (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. These storage facilities range in age from 25 to 106 years old. See Table 4 for a summary of available water storage tanks in the BWL system.

Table 4 - Storage Tank Data

Location	Volume (MG)	Year Constructed
Dye WCP (North Tank)	3.5	1918
Dye WCP (South Tank)	3.5	1918
Dye WCP (East Tank)	10.0	1949
Wise Road WCP	5.0	1966
Hulett	2.0	1999
Total	**24.0**	

4. Service Lines

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.

There is a total of 50,463 residential services, 7,531 commercial and 95 industrial services in the water distribution system. The majority of the population served, and service connections are within the City of Lansing.

To comply with the Michigan Lead and Copper Rule and to protect residents, the BWL was the second in the nation and first in Michigan to begin replacing all of its lead water service lines in 2004. Twelve years later, in 2016, they had identified and completed the replacement of known lead service lines in the BWL service area.

5. Condition of Transmission/Distribution System

The BWL has 52 miles of raw water main ranging in diameter from less than 6-inches to 36-inches.Table 5 summarizes the distribution of raw water main by diameter and length.

Table 5 – Raw Water Main Pipe Diameter and Lengths

Water Main Size (inch)	Length of Water Main (miles)	Percent of System
≤ 6-inch	4.5	8.7%
8-inch	10.3	19.9%
10-inch – 12-inch	7.8	15.0%
13-inch – 18-inch	6.4	12.3%
20-inch – 24-inch	15.5	29.7%
30-inch	4.8	9.2%
36-inch	2.7	5.2%
Total	52	100%

Portions of BWL raw water mains were installed prior to 1950 and have surpassed their useful life (74 years old, or older). Thirty-three (33) percent of the raw mains are older than 50 years. Table 6 contains the raw water mains age and percent of the raw water system.

Table 6 - Year of Raw Water Main Installation

Year of Installation	Length of Raw Water Main (Miles)	Percent of System
Pre 1950	3	6.1%
1951-1960	4	7.8%
1961-1970	10	19.7%
1971-1980	19	36.0%
1981-2020	6	11.5%
Unknown	10	18.9%
Total	52	100%

The BWL water distribution system is made up of water main ranging from 4-inches to 30-inches in diameter with approximately 808 miles of total water main. Table 7 contains the water main size and lengths.

Table 7 - Water Main Pipe Diameter and Lengths

Water Main Size (inch)	Length of Water Main (miles)	Percent of System
≤ 6-inch	343.30	42.50%
8-inch	215.05	26.62%
10-inch	11.15	1.38%
12-inch	143.94	17.82%
14-inch	4.48	0.55%
16-inch	68.80	8.52%
18-inch	1.13	0.14%
20-inch	2.24	0.28%
24-inch	5.14	0.64%
30-inch	12.50	1.55%
Total	807.73	100%

Approximately 70% of the water main is 8-inches in diameter or smaller. The 6-inch or smaller water mains account for about 43% of all the water main in the BWL's system. The existing BWL water distribution system is shown in Figure 1 - BWL Existing Water System and Service Area.

Portions of the BWL's water distribution system has aged beyond its recommended service life, with some of the existing mains dating back to the 1880s. 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% of the system is currently constructed of cast iron pipe. Based on the BWL WRS, over 42% of the system was installed prior to 1970, making the material over 50 years old and past its useful life as defined by DWSRF Project Planning Document Preparation Guidance and Professional Engineer's opinion.

Over the years, the BWL has recognized water 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 is followed by post-1945 installed cast iron pipe, pre-1945 installed cast iron pipe and ductile iron in terms of water main-break data. Ductile iron pipe has the least likelihood of failure of any pipe material in the BWL system.

Table 8 and Table 9 summarize the water main material and age in the system.

Table 8 - Water Main Pipe Material and Lengths

Material	Length of Water Main (Miles)	Percent of System
Cast Iron	284.7	35.2%
Ductile Iron	499.4	61.8%
Other	11.4	1.4%
Uknown	12.4	1.5%
Total	**807.9**	**100%**

Table 9 - Year of Water Main Installation

Year of Installation	Length of Water Main (Miles)	Percent of System
Pre 1920	63	7.8%
1921-1930	42	5.3%
1931-1940	17	2.1%
1941-1950	50	6.2%
1951-1960	53	6.6%
1961-1970	119	14.7%
1971-1980	89	11.0%
1981-1990	45	5.5%
1991-2000	135	16.7%
2001-2010	148	18.3%
2011-2020	30	3.7%
Unknown	17	2.1%
Total	**808**	**100%**

The BWL has a record of water main breaks dating back to 1987. They have experienced over one thousand breaks from 2018 to 2023 (WRS, 2021), as summarized in Table 10. This timeframe equates to an average of 168 water main breaks per year.

Table 10 - Summary of Water Main Breaks

Time Period	Number of Water Main Breaks
2018	181
2019	164
2020	159
2021	186
2022	177
2023	145
Total	**1,012**

The BWL is very concerned about portions of their aging infrastructure and the number of water main breaks that have occurred. Additionally, the BWL is concerned that several older mains may contain tuberculation which decrease the system's capacity and ability to provide consistent design fire flows. Additionally, many of the older mains may no longer be structurally sound due to their age. Because of this, water main replacements are needed to provide and maintain a reliable source of water to their customers, provide fire protection, prevent water emergencies and protect water quality, as well as reduce costs associated with emergency water main break repairs.

Emergency repair of these breaks is a large contributor to the BWL's operation and maintenance (O&M) costs for the water system. Additionally, 35% of the system consists of cast iron pipe. Much of this pipe is old and prone to tuberculation. Replacing old, tuberculated, break-prone water main will improve transmission capacity, water flow, water pressure and reduce frequency and cost of emergency system repairs.

The projects will improve the BWL's reliability of drinking water quality for residents and customers. Aged water mains have a higher probability of breaking and subsequent contamination, which leads to boil water advisories or loss of service.

6. Residuals Handling

The residual backwash water is sent to the cistern and then reintroduced at the head of the Dye WCP. Sludge from the thickener underflow is processed through a filter press and hauled off-site for land application, while the residual water is conveyed to the head of the primary basins. Solids from the Wise Road WCP are pumped to the Dye WCP for dewatering and disposal.

7. Water Meters

The BWL owns and operates water services to the outlet side of the water meter including all appurtenances that make up the distribution system, water valves, hydrants, curb stops and boxes, etc. The BWL is in the final phase of implementing an Advanced Metering Infrastructure

(AMI) system. All older style meters will be replaced with meters that support the AMI network. The new AMI meters will allow customers increased access to their water usage data. A summary of these meters, hydrants and valves is presented in Table 11.

Table 11 - Water Distribution Assets

Asset	Number of units
Valves	8,119
Hydrants	6,269
Meters	59,441

8. *Operation and Maintenance*

The BWL has a valve turning program and hydrant inspection program that is performed to better understand the condition of these assets and make necessary repairs that are needed. The program consists of inspecting hydrants annually and turning valves on a 2-year cycle.

During the 2000s, the BWL was replacing approximately 5 miles of water main per year. This was reduced to approximately 2 miles per year during the 2010s due to lead service line replacement ramp up, in addition to the combined sewer overflow (CSO) project being put on hold. The CSO project is back up and running and the BWL is planning to ramp up water main replacement significantly. There are plans in place to ramp up from approximately 3 miles of water main replaced annually to 8 miles over the next 6 years. This is reflected in the proposed 6-year and 20-year capital budget for water distribution. Additional details on the Capital Improvement Plan (CIP) and capital budget can be found in the WRS in Appendix C.

9. *Design Capacity of Waterworks System*

The water system was designed to provide drinking water to the City of Lansing and its surrounding communities. The BWL wells have a firm supply capacity of 42.31 MGD according to 2021 capacity tests and the treatment facilities have a combined capacity of 50 MGD and the high service pumps have a firm capacity of 90.5 MGD. The available storage volume of 24 MG exceeds the average day for all demand conditions.

The distribution system performance was assessed for existing conditions, 5-year and 20-year planning periods. The model was used to estimate pressures during peak hour demand conditions. The minimum pressure during peak hour demands remained above 35 psi at all points for existing conditions in addition to the 5-year and 20-year planning periods. There is a fair amount of head loss in the DeWitt and Bath areas during peak hour conditions, which will continue to be monitored. The reason for this is degradation in C factor (roughness coefficient) for unlined cast iron pipe. The head losses for the 5-year and 20-year planning periods improves for many areas due to the capital improvement plans and replacing aging unlined cast iron pipes.

10. Climate Resiliency

The BWL 24 MG-gallon storage can provide for a one-day average demand if water service is disrupted due to climate events.

The high service pumps are fed from multiple sources of electrical supply. Pumps are also fed from different circuits at different substations. Additionally, the BWL has backup generators that provide supplemental power to each of the high service pumping stations. There are two emergency generators located near the Cedar Pump Station. One of the generators provides backup power to Pump 2 at Dye High Lift. The other generator provides power to Cedar Pump 1, which is used for emergency conditions only. The combination of these provides 50 MGD pumping capacity at the Dye WCP that is backed up by an alternate power source.

Table 12 provides additional details as to the backup power sources at pumping stations.

Table 12 - Auxiliary Power Sources

Power Source	Capacity, kW	Location	Backup Capacity (MGD)
Diesel Generator (Emergency Generator #2)	2,000	Cedar Pump 1	30
Diesel Generator (Emergency Generator #1)	1,000	Dye WCP Pump 2	20
Diesel Generator	500	Wise Road WCP 2 or 3	10
Diesel Generator	600	Hulett Pump 1-4	8.5
Total	4,100		68.5

E. NEED FOR THE PROJECT

A WRS was prepared in 2021 and is attached as Appendix C. The findings of the study were used to generate recommendations for a CIP which was used as a basis to identify the project areas contained in the project planning document. A summary of the project areas and proposed improvements have been provided below:

FY2025 Projects:

- Project 1. Well Installation
  Installation of one new and two offset wells located at well sites 55-04, 25-24 and 25-25.

The BWL receives its potable water from the Saginaw Aquifer via 124 wells. The source water supply infrastructure is aging and there is a need to begin investing in replacing this infrastructure. Approximately 82% of the BWL's wells are over 50 years old and 58% are older than 65 years. (WRS, 2021) The BWL has identified targeted well locations where an offset and

redrill of the existing well at the same site or near the existing site is feasible. These locations will be targeted first while a more comprehensive plan of new well sites is developed. BWL has identified fifteen well installation locations that will be installed between 2025 and 2029 at a rate of three per year. The first of these well installations are designated as Project 1 and include one new well and two offset wells. These offset wells are located at well 25-24 and well 25-25 and are shown in Figure 12. The new well will be located at 55-04, as shown in Figure 17, and will be installed to increase source water redundancy. Section III of this planning document provides an overview of the necessary steps involved, which include conducting an initial feasibility evaluation for the new well installation.

- Project 2. Chemical Feed System at Wise Road WCP

BWL uses a chlorination process for disinfection at the two WCPs (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; however, BWL is seeking alternatives to the use of anhydrous ammonia due to operational issues and potential safety hazards associated with the use of the gaseous form. In addition to the potential hazards with the existing system, much of the existing equipment is near the end of its useful life and in need of replacement. This project plan includes replacing the existing gas system at the Wise Road WCP with a new liquid chemical feed system. The Dye WCP recently underwent a conversion of its chemical disinfection system and now uses Ammonium Hydroxide (19.5%).

- Project 3. Filter Press Service Pipes at Dye WCP
  Replacement in kind of two, steel, 8-inch sludge pipes. (520-ft in length)

The Dye WCP uses two filter presses to dewater lime softening sludge resulting from the water softening process. Each filter press receives sludge for dewatering from a sludge consolidating area through 8-inch steel pipes fed from positive displacement sludge pumps. These steel pipes are in very poor condition, already experiencing leaks and are critical parts of the sludge removal process. This project will replace the two pipes with new pipes of equal capacity.

- Project 4. Cedar Pump 4 at the Dye WCP
  Refurbish or Replace Cedar Pump 4 and install a VFD at the Dye WCP

Cedar Pump 4 is a high service pump located at the Dye WCP and has been out of service for several years. With the addition of elevated storage currently being constructed as part of the FY2023 DWSRF funded improvements, it is a good opportunity to refurbish or replace Cedar Pump 4. The refurbishment will include cutting down the impeller to achieve a new pump curve. A replacement pump would be sized to reduce flows to a desired level. In either scenario, a variable-frequency drive (VFD) will be installed so that it can be used in conjunction with elevated storage to optimize pumping operations and reduce energy usage during peak periods.

- Project 5. North Reservoir at Dye WCP
  Various repairs to the 3.5 MG North Reservoir located at Dye WCP.

The BWL operates three ground storage reservoirs for the treated water produced at Dye WCP. Water is pumped by the high service pumps from these reservoirs to the distribution system. An inspection performed in 2023 identified deficiencies and provided recommendations to make certain repairs. This report is included in Appendix H of this project plan. This project will complete the recommended repairs. These repairs consist of interior concrete repair of spalled concrete, interior piping repair and painting, overflow piping modifications, roof membrane repairs and fall protection devices.

- Project 6. Sunset Looping
  Sunset loop will provide redundancy to the Industrial corridor. (1,100 ft of 12-inch diameter water main)

The Industrial corridor at the south end of Sunset Ave., (including the City of Lansing Wastewater Treatment Plant) is currently fed from one direction. This project will connect the water main in Kaplan Street to the main in Tecumseh River Road to provide a redundant feed. These two locations are in the same pressure zone as there is a check valve just east of the intersection of Sunset Ave. and Willow.

- Project 7. Bath Looping
  Bath loop will create redundancy by providing a second feed to the water service in the area. (2,200 ft of 12-inch diameter water main)

Currently, customers north of I-69 in Bath Township are fed from a single pipe under I-69. This project will connect the water main in Timothy Lane to the water main in Webster Rd. on the north side of I-69 and provide a redundant feed for the section of pipe under the expressway. This is critical, as a failure of the pipe directly under the expressway would take an extended period of time to repair as opposed to a standard repair.

- Project 8. CSO 019 Water Main Replacement.
  Replacement of 7,588 ft of water main within the CSO 19 project area.
  (2,000 ft of 12-in diameter and 5,588 ft of 8-in diameter water main)

The BWL has isolated seven areas in which it will coordinate with the City of Lansing's CSO program to replace aging water mains in the CSO project areas. Water main replacement at CSO 019 is included in this project plan for FY 2025. The CSO 019 area contains 2.05 miles (10,840 feet) of water main installed between 1887 and 1938. These unlined cast iron pipes have not only surpassed their useful life, but they contain heavy tuberculation and chlorine degradation. This project will replace 70% of the pipes in this area.

- Project 9. Pennsylvania Water Main Replacement
  Replacement of the water main in Pennsylvania from Mt. Hope to Fayette.
  (3,015 ft of 12-inch diameter water main)

The BWL is coordinating with the City of Lansing road reconstruction project to replace aging water mains on Pennsylvania, from Mount Hope to Fayette, during the reconstruction of the street. The water main in this area is an unlined cast iron pipe installed prior to 1920 and has

heavy tuberculation leading to chlorine degradation. This project will replace this water main that is past its useful life.

- Project 10. Mt. Hope Water Main Replacement
  Replacement of the water main in Mt. Hope from Pennsylvania to Aurelius.
  (4,000 ft of 24-inch diameter water main)

The BWL is coordinating with the City of Lansing's road reconstruction project to replace aging water mains in Mt. Hope, from Pennsylvania to Aurelius, during the reconstruction of the street. This project will replace the water main in this area which was installed prior to 1938 and has surpassed its useful life.

FY2026 – Projects

- Project 11. Well Installation – FY2026-FY2029

As stated in the previous section, to combat an aging source water system, BWL has identified fifteen well installation locations that will be installed between 2025 and 2029 at a rate of three per year. The first three of these wells are included above for consideration for fiscal year 2025. This project includes the installation of the remaining 12 wells and are included for funding consideration for fiscal years 2026 through 2029.

- Project 12. Secondary Basin 1&2 at the Dye WCP
  Refurbishment of Secondary Basin 1&2 at the Dye WCP include replacement of a steel shaft, steel chain and wood flight system.

Secondary Basin 1 and 2, located at the Dye WCP, were inspected and determined to be in need of refurbishment. While the system has been maintained well, the equipment, installed more than 20 years ago and past useful life for mechanical systems, is beginning to show wear anticipated with design and materials such as this. Aging steel chain and wood flight systems have additional safety hazards associated with them due to the sheer weight of each component. The extreme weight of these components also translates to extreme difficulty in performing routine O&M, as well as the need for relatively large inefficient drives that consume larger amounts of power. Updated options for chain and flight equipment are available and will be considered as part of the refurbishment included in the project.

- Project 13. Radios for Wells
  Replace 124 radios for production wells.

The BWL accessory well components are aging along with the other well infrastructure. Many of the existing radios at the wells are outdated and may not be reliable. Replacing radios at the wells would mitigate communication issues during an emergency at a well location. This project is included for funding consideration for FY 2026.

- Project 14. State Secondary Complex Consolidation
  Consolidation of State Secondary Complex will provide redundancy under emergency conditions. (7,500 ft of 16-inch diameter water main)

The State Secondary Complex currently received its potable water from Delta Township, a wholesale customer of BWL, via a single feed to supply its 13-building campus. The campus is comprised of the State's police academy, police post, and a test and research lab facility, among other essential facilities. This project will provide a redundant water service to the State Secondary Complex campus to reduce the risk of service failures and loss of service in the event of an emergency. Additionally, the consolidation of the State Secondary Complex will allow a supplementary connection to the Windsor Township water system, which is currently a single feed. This project is included for funding consideration for FY2026.

- Project 15. Windsor Estates Mobile Home Park Consolidation
  Consolidation of Windsor Estates Mobile Home Park will provide an enhanced quality of water to the mobile home park. (3,000 ft of 12-inch diameter water main)

In the past, EGLE has expressed concerns with the Windsor Estates Mobile Home Park's current water source quality and desires a connection to a community water supply to remediate water quality issues. This project will provide a connection from the BWL system to the Windsor Estates Mobile Home Park's current system. It is assumed the Windsor Estates will continue to own and operate their own distribution system and the BWL is only providing a connection to it. This project is included for funding consideration for FY2026.

- Project 16. CSO 026 Water Main Replacement
  Replacement of 16,025 ft of water main within the CSO 026 project area. (15,100 ft of 8-in diameter water main, 675 ft of 12-inch diameter water main and 250 ft of 14-in diameter water main)

The BWL has identified 3.04 miles (16,025 ft) of water main within the City of Lansing's CSO 026 project area that was installed between the years 1909 and 1931. This project will replace these water mains that consists of unlined cast iron pipe known to have heavy tuberculation, low C factor, chlorine degradation and have surpassed their useful life. Additionally, undersized water main will be upsized to meet the minimum water main size standard of 8-inch in diameter as set by the BWL. This project is included for funding consideration for FY 2026.

FY2027 – Projects

- Project 17. South Reservoir at Dye WCP
  Various repairs to the 3.5 MG South Reservoir located at Dye WCP.

As described above, the BWL operates three ground storage reservoirs for the treated water produced at Dye WCP. Water is pumped by the high service pumps from these reservoirs to the distribution system. An inspection performed in 2023, included in Appendix I of this project plan, identified deficiencies and provided recommendations to make certain repairs. This project will complete the recommended repairs to the South Reservoir. These repairs consist of

repairing spalled concrete, interior piping repair and painting, overflow piping modifications, roof membrane repairs and fall protection devices. This project is included for funding consideration for FY2027.

- Project 18. Dye WCP Filter Media Replacement
  Replace existing sand filter media.

The BWL currently uses a sand filter media technology that has is nearing the end of its useful life at the Dye WCP. The current filter media does not protect potable drinking water from emerging contaminants such as Per- and Polyfluoroalkyl Substances (PFAS) which are anticipated to be regulated in the future. Granular Activated Carbon (GAC) is widely considered the best treatment method for PFAS. This project will convert the sand filter media to GAC. This conversion will be beneficial from a proactive treatment approach as well as aesthetic water quality approach. This project is included for funding consideration for FY 2027.

- Project 19. Wise Road WCP Filter Media Replacement
  Replace existing sand filter media.

Similar to the Dye WCP, the BWL currently uses a sand filter media technology that has served its useful life at the Wise Road WCP. The current filter media does not protect potable drinking water from emerging contaminants such as PFAS which are anticipated to be regulated in the future. GAC is widely considered the best treatment method for PFAS. This project will convert the sand filter media at the Wise Road WCP to GAC. This conversion will be beneficial from a proactive treatment approach as well as aesthetic water quality approach. This project is included for funding consideration for FY2027.

- Project 20. Abel Pumps No. 3 & 4 at Dye WCP
  Replace Abel Pumps No. 3 and 4 and install VFDs at Dye WCP.

The BWL water production process currently operates four filter press pumps, which are used to convert sludge from the water softening process into transportable cakes, at which point it is then land applied for disposal purposes. Abel Pumps No. 3 and 4, two of the four filter press pumps, are older than 20 years and have exceeded their useful life and require greater than normal maintenance to maintain operating capacity. The replacement of Abel Pumps No. 1 and 2 in 2022 has proven to drastically reduced maintenance operations. Upgrading Abel Pumps No. 3 and 4 will further this efficiency in operations. This project is included for funding consideration for FY2027.

- Project 21. Grand Pointe Subdivision Consolidation
  Consolidation of Grand Point Subdivision will provide redundancy to the area. (5,085 ft of 8-inch diameter water main)

The Grand Pointe Subdivision is currently provided potable water by a different water service entity. Conversations have taken place for Grand Pointe Subdivision to connect to the BWL

system. This project will install a connection between the systems and will provide redundancy to the area. This project is included for funding consideration for 2027.

- Project 22. CSO 022 Water Main Replacement
  Replacement of 21,675 ft of water main within the CSO 022 project area.
  (13,500 ft of 8-inch diameter and 2,600 ft of 12-inch diameter, 1,450 ft of 14-inch diameter and 4,125 ft of 16-inch diameter water main)

In conjunction with the City of Lansing's CSO 022 project, the BWL has identified 4.11 miles (21,675 ft) of water main contained in the CSO 022 project area that was constructed between 1888 and 1939 and is comprised of unlined cast iron pipe. This project will replace water main identified as concerns due to heavy tuberculation, low C factors, chlorine degradation and have surpassed their useful life. This project is included for funding consideration for FY2027.

- Project 23. Landel System Replacement, Grossbeck Area
  Replacement of 18,140 ft of water main within the Grossbeck area. (18,140 ft of 8-inch diameter water main)

The Grossbeck area within the Landel system is a water distribution network, which was acquired by the BWL in the 1940's. Historically, this area experiences above average water main breaks per linear feet of pipe with approximately 250 water main breaks per 100 miles of pipe annually. This project would replace 18,140 feet of water main within the Grossbeck area. This project is included for funding consideration for FY 2027.

FY2028 – Projects

- Project 24. CSO Kalamazoo Street and N. Pine Street Water Main Replacement
  Replacement of 1,900 ft of water main within the CSO Kalamazoo Street and N. Pine Street project area. (1,900 ft of 8-inch diameter water main)

The BWL has identified 1,900 ft of water main within the City of Lansing's CSO Kalamazoo Street and N. Pine Street project area that was installed in 1890. This water main consists of 6-inch diameter, unlined cast iron pipe and is known to have heavy tuberculation, low C factor, chlorine degradation and has surpassed its useful life. This project will replace and upsize this water main to meet the minimum water main size standard of 8-inch in diameter as set by the BWL. This project is included for funding consideration for FY 2028.

- Project 25. CSO Cherry Street Water Main Replacement
  Replacement of 2,620 ft of water main within the CSO Cherry Street project area. (2,300 ft of 8-inch diameter and 320 feet of 24-inch diameter water main)

Within the City of Lansing's proposed CSO Cherry Street project area, the BWL has identified 2,300 feet of water main that was constructed between 1890 and 1928 and 320 feet of water main constructed in 1950. This project will replace these water mains known to be constructed of unlined cast iron pipes. Heavy tuberculation, low C factors and chlorine degradation are known to be issues with water mains that match these criteria. Additionally, these water mains

have surpassed their expected useful life. This project is included for funding consideration for FY 2028.

FY2029 – Projects

- Project 26. Second Elevated Storage Tank
  Installation of second 2.5-million-gallon elevated storage tank in the service area's southern pressure zone.

A feasibility study was performed for the BWL to determine system deficiencies. As a result of this feasibility study, it was recognized that the system would benefit from a second elevated water storage tank located in Lansing's southern pressure district. This project is for the construction of the recommended elevated storage tank. This tank will provide hydraulic advantages to the system and will reduce the need for the BWL to rely on backup generators and pumps to supply pressure during a power outage. This project is included for funding consideration for FY2029.

- Project 27. Wise Road WCP Plant Optimization

The BWL had an optimization study completed to identify bottlenecks and to guide optimization efforts to improve overall performance Wise Road WCP. Identified optimization efforts focused on existing process adjustments rather than undertaking new construction projects. Optimization will include retrofitting sedimentation basins with Lamella plates. This project is included for funding consideration for FY 2029.

- Project 28. Master Meter Installation

This project includes the installation of five master meters. These meters will be connected to BWL's SCADA system to track flows and create historical data. Additionally, they will allow for improved monitoring of the system. Strategic locations for these meters will be on the distribution line to DeWitt Township, on the distribution line to Bath Township, at the Shubel pressure reducing valve, at the Aurelius Booster Station and at the Eifert Booster Station. This project is included for funding consideration for FY 2029.

- Project 29. CSO 008 Water Main Replacement
  Replacement of 21,685 ft of water main within the CSO 008 project area. (16,950 ft of 8-inch diameter and 4,675 ft of 12-inch diameter, 10 ft of 16-inch diameter and 50 ft of 20-inch diameter water main)

In conjunction with the City of Lansing's CSO 008 project, the BWL has identified 2.99 miles (15,775 ft) of water main constructed between 1920 and 1940 and 1.12 miles of water main (5,910 ft) constructed between 1940 and 1968. This project will replace these water mains that are comprised of unlined cast iron pipe. These water mains have been identified as concerns due to heavy tuberculation, low C factors, chlorine degradation and they have surpassed their useful life. This project is included for funding consideration for FY 2029.

- Project 30. Landel System Replacement, Howard Street and Vine Street
  Replacement of 3,150 ft of water main along Howard Street and Vine Street. (3,150 ft of 6-inch diameter water main)

The Howard Street and Vine Street area of the Landel system is primarily comprised of undersized, cast-iron water main, which has historically experienced greater than average water main breaks. Annually, there are approximately 250 water main breaks per 100 miles of pipe. This greater than average water main break rate is anticipated to continue until the water main is replaced. This project will replace and right size these water mains to improve system reliability. This project is included for funding consideration for FY 2029.

The location of all thirty proposed projects is shown in Figure 10 through Figure 20.

Figure 10 - Project Map 1: Project 7

Figure 11 - Project Map 2: Project 28

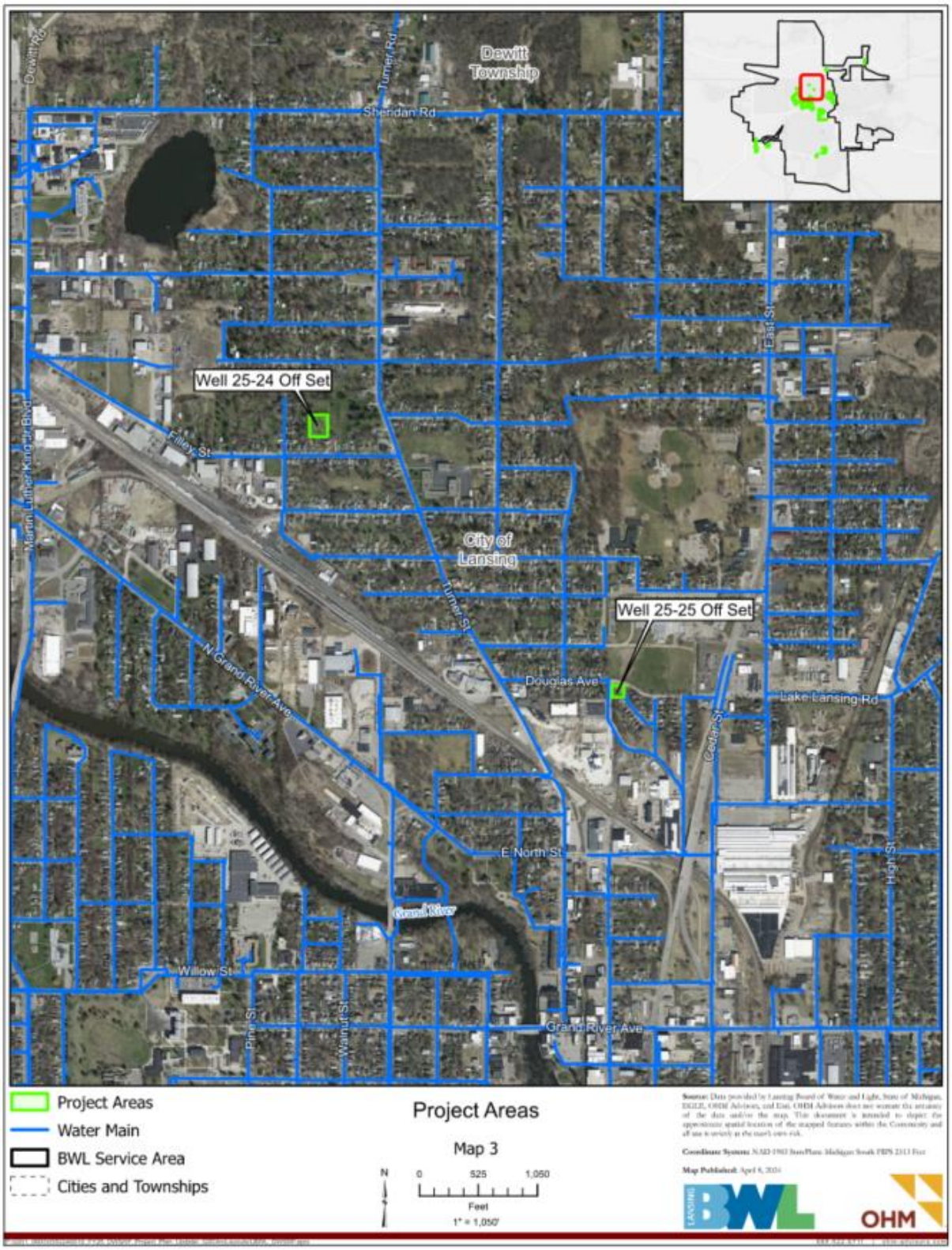

Figure 12 - Project Map 3: Project 1

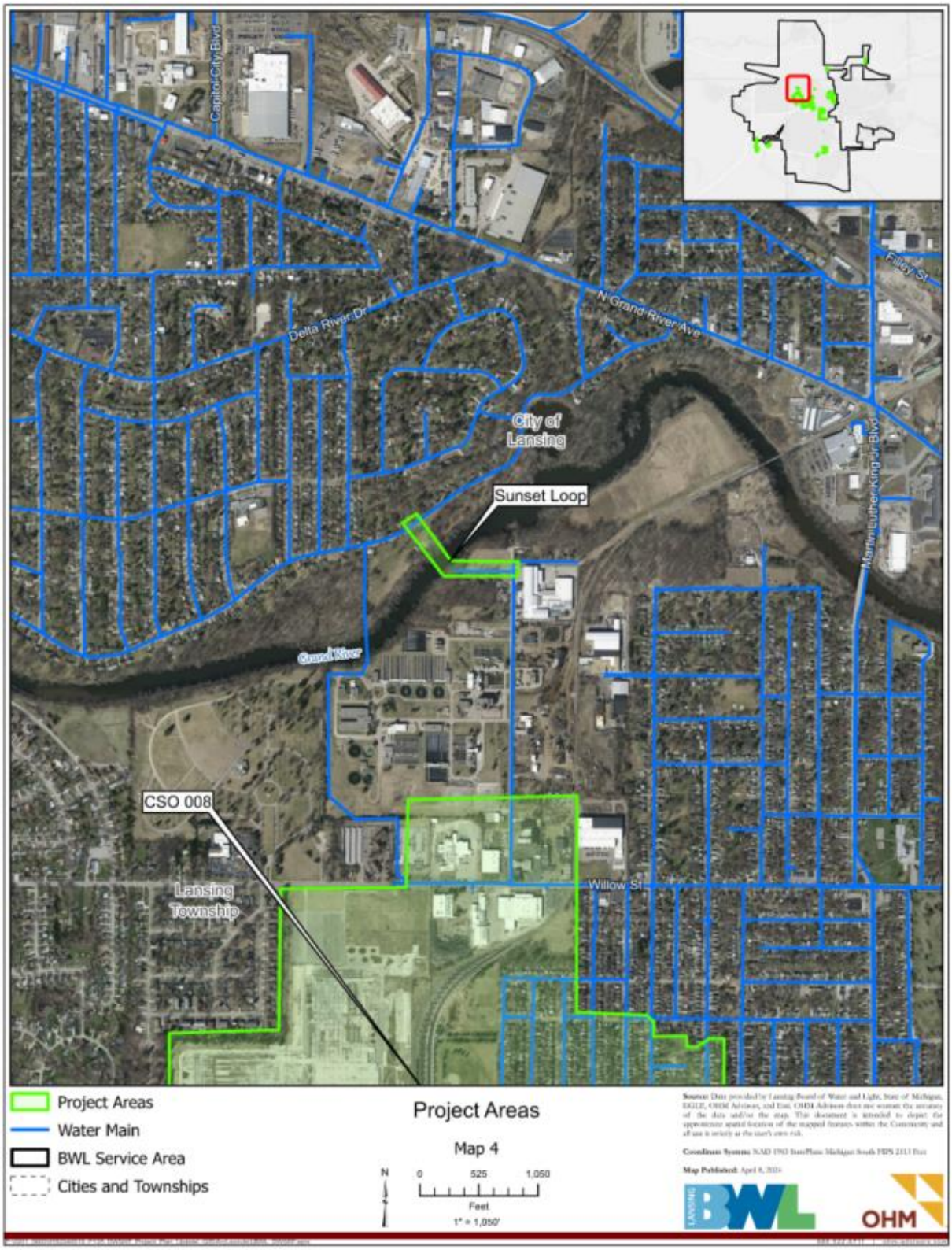

Figure 13 - Project Map 4: Projects 6 and 29

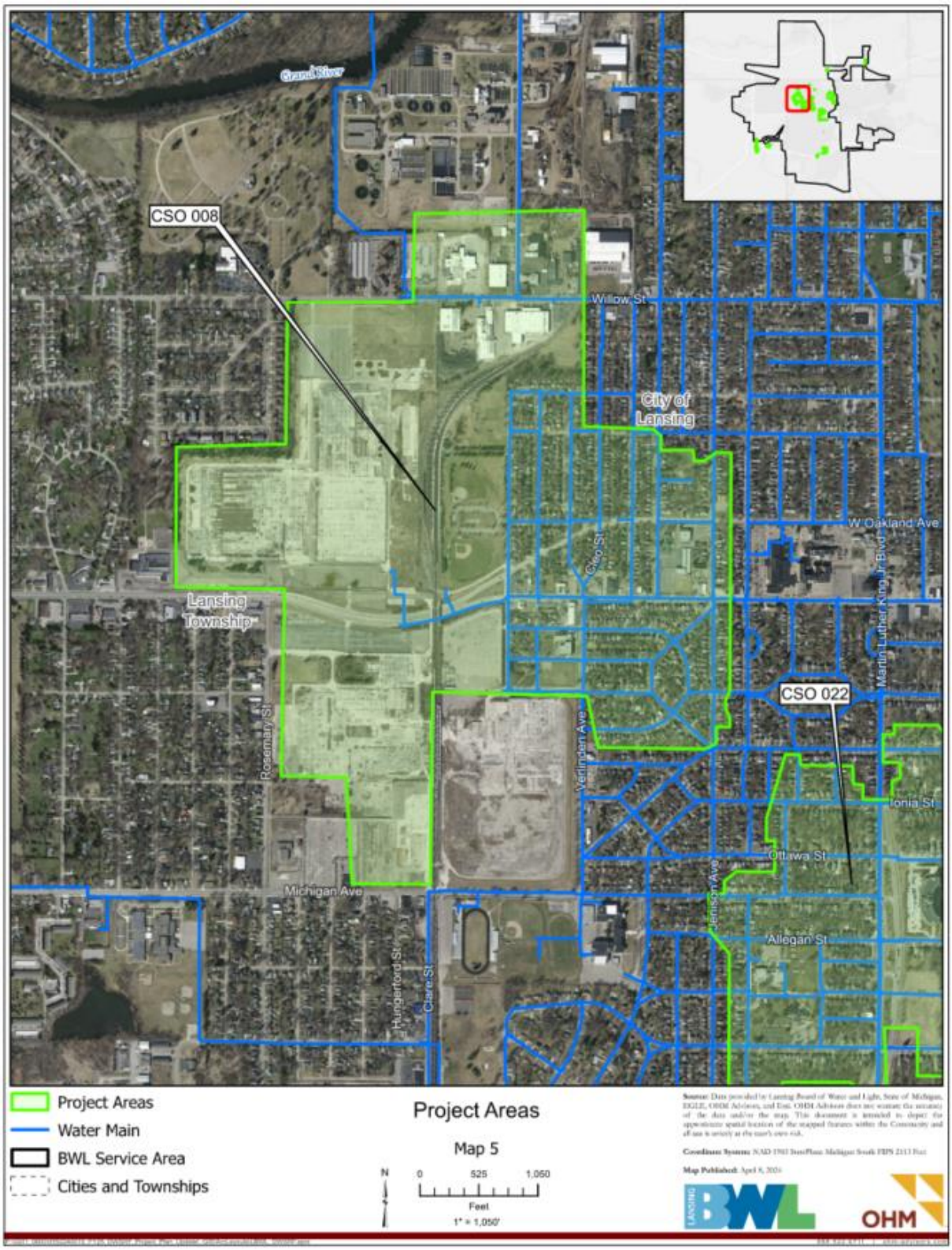

Figure 14 - Project Map 5: Projects 22 and 29

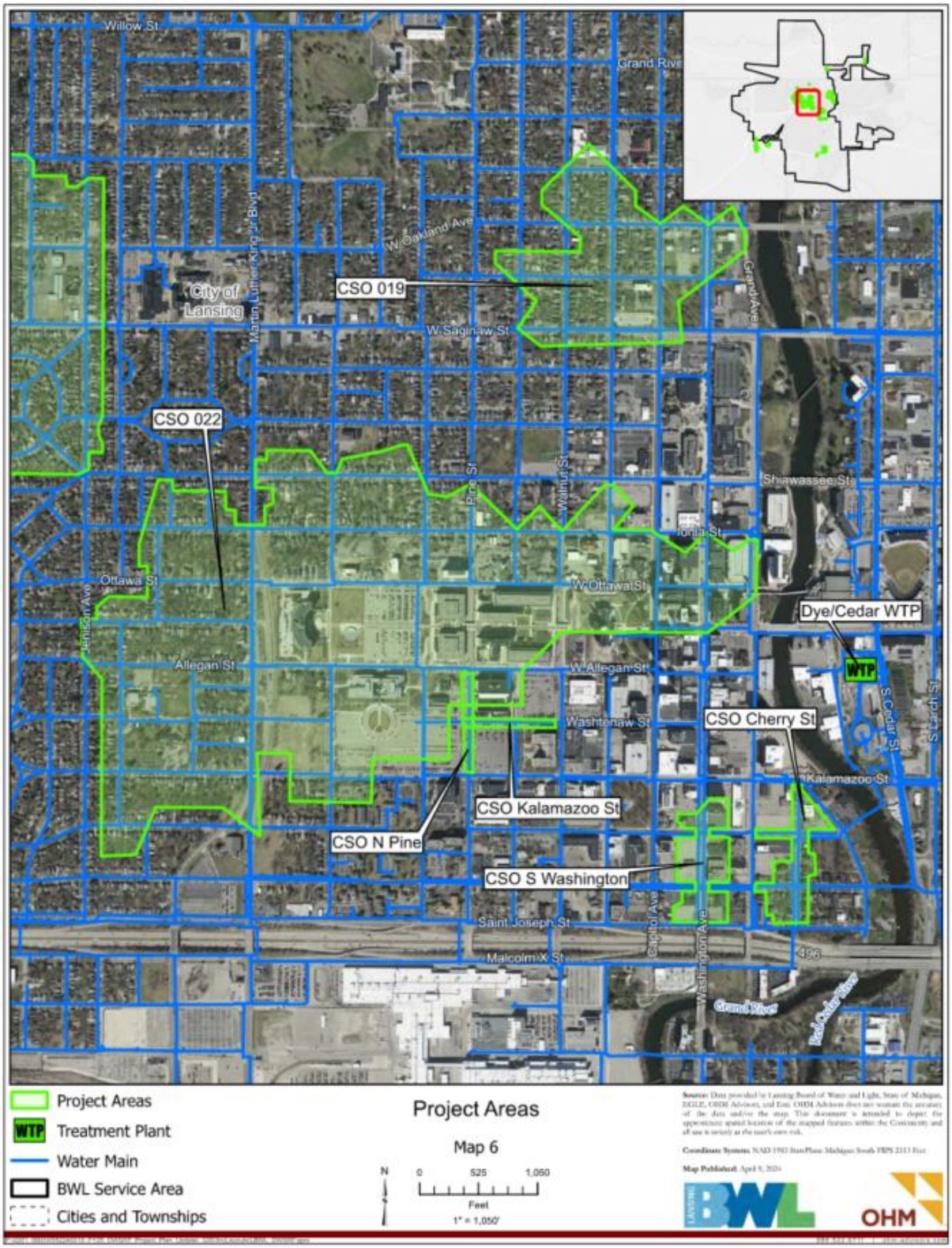

Figure 15 - Project Map 6: Projects 3, 4, 5, 8, 12, 17, 18, 20, 22, 24, and 25

Figure 16 - Project Map 7: Projects 23 and 30

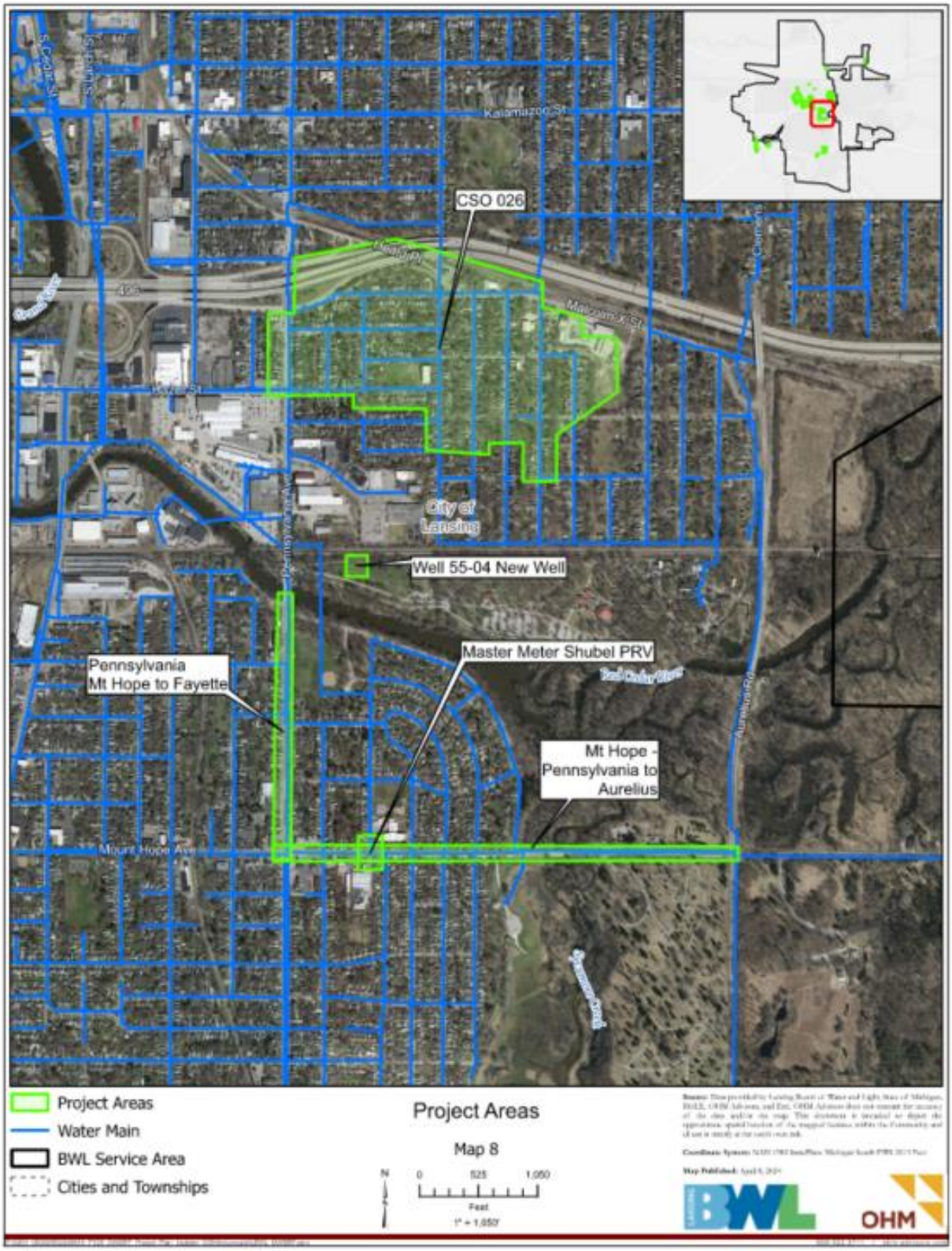

Figure 17 - Project Map 8: Projects 1, 9, 10, 16 and 28

Figure 18 - Project Map 9: Projects 14, 15 and 21

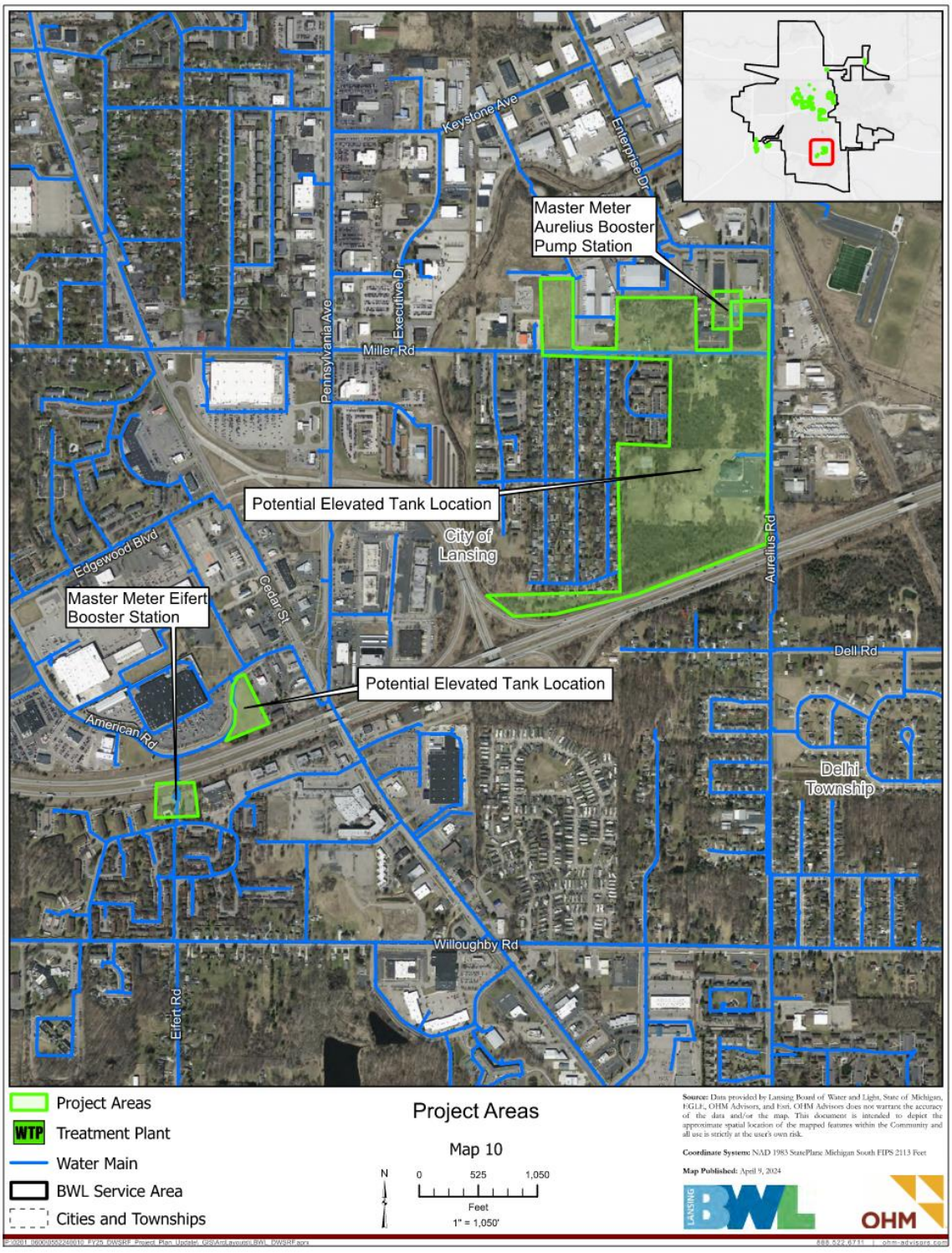

Figure 19 - Project Map 10: Projects 26 and 28

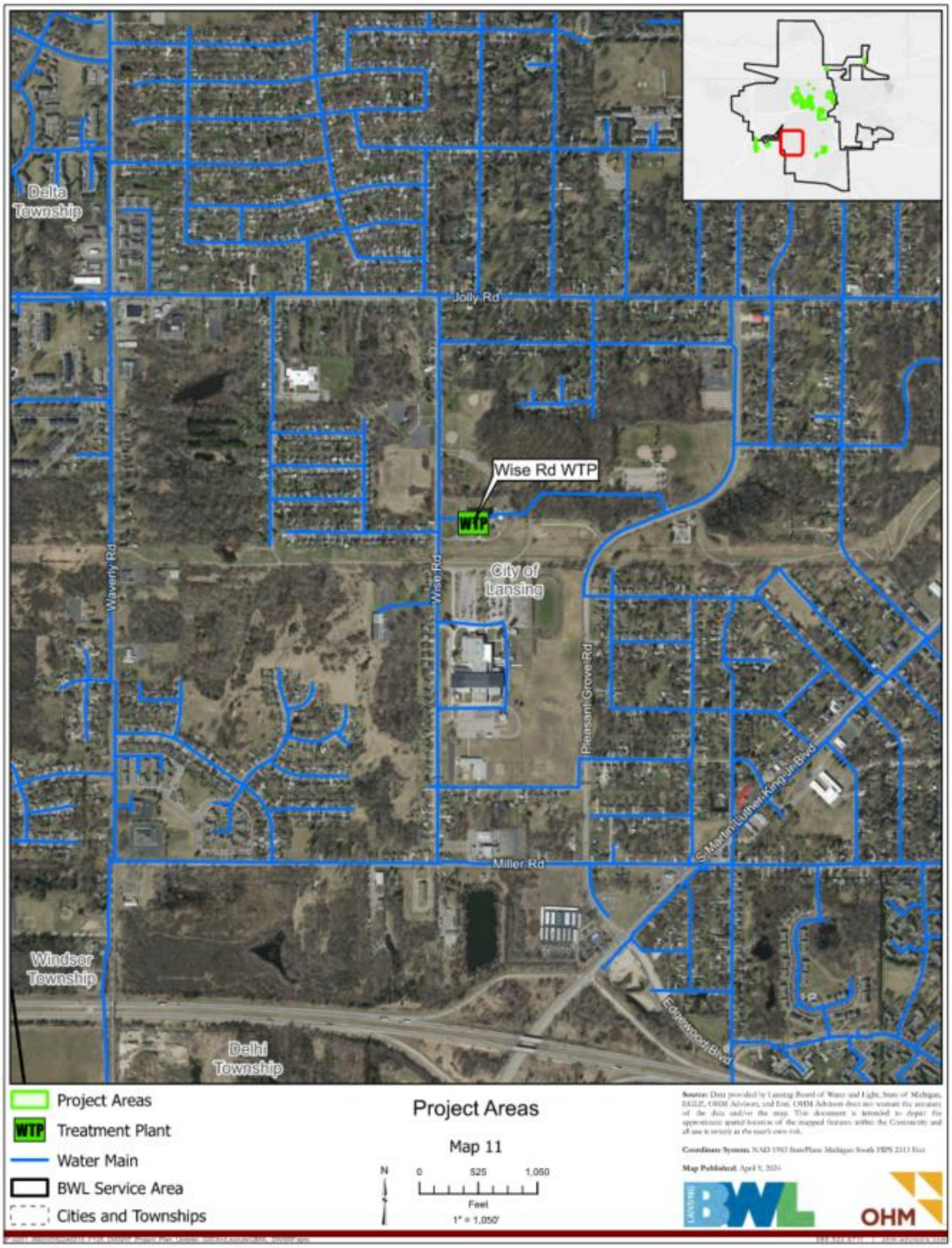

Figure 20 - Project Map 11: Projects 2, 19 and 27

F. PROJECTED FUTURE NEEDS

To address aging infrastructure, BWL is planning both well and water main replacement at planned rates over the next 5 to 20 years.

With 83% of BWL's production wells older than 50 years and passed useful life (as useful life is defined by values provided in the DWSRF Project Planning Document Preparation Guidance and Professional Engineer's opinion) BWL is planning on installing offset or redundant wells at 3 locations each year for the next 5 years. These wells are included in this plan, however, to maintain this aging system, well replacement work must continue past the projects included in this project plan and into the future.

Over 33% of BWL raw water main and 42% of its finished water main is older than 50 years and past their useful life. This represents approximately 360 miles of water main installed prior to 1970 in need of replacement. Of these 360 miles of main that has surpassed useful life, 60 miles is over 100 years old, 60 more is over 80 years old and an additional 50 miles is "Landel" piping which has breaks seven times more frequently than other pipes in the system. BWL has identified these 170 miles of water main as priority projects and is planning, with financial support from DWSRF funding, to replace approximately 8 miles of water main per year for the next 20 years to replace all 170 miles of water main.

III. NEW WATER SUPPLY WELL PROCEDURES

BWL is requesting 2025 funding to construct three new or offset groundwater wells and additional funding in 2026 through 2029 for three wells per year. The projects encompass conducting a feasibility evaluation, designing, obtaining permits, and constructing the new wells within FY 2025 through 2029. The first step towards establishing the new water supply well is a feasibility evaluation. The evaluation is intended to include identification of suitable parcels for hydrogeological testing.

For each parcel and/or well site, the work will include the construction of a 16-inch test/production well, approximately 400 feet deep. Along with the test/production well construction, one to two monitoring wells will be constructed to assist in the 24-to-72-hour hydro-geo pump test. After pumping, the data collected will be compiled into a report and submitted to EGLE for review and approval of the well as a Type I Production Well. In addition to the hydro-geo test, water sampling will be conducted to determine suitability of the water for production purposes. After approval of the well as a Type I Production Well, the well will be equipped with new pump, raw water collection main, controls, electrical and other necessary appurtenances and improvements to cause it to be a fully commissioned and functioning water supply well.

IV. ANALYSIS OF ALTERNATIVES

This section includes a discussion of alternatives that were considered for the water system improvements in the BWL system.

A. NO-ACTION

The first alternative to consider is no-action. It must be determined that no project is viable for the community to select this alternative. As the existing infrastructure ages, the likelihood of a system failure increases, which would leave users without water.

1. New Well Construction

If new or offset wells are not constructed in the future, the BWL's well supply firm capacity may lack redundancy as older wells are at risk of failure. There are no viable alternatives available to meet BWL's firm capacity requirements. The related activities, including feasibility evaluation, design and construction of new wells, are planned to be completed at a rate of three per year from 2025 through 2029.

2. Water Conditioning Plant Improvements

If improvements to the Wise Road WCP (chemical feed system) are not completed, it exposes staff and local residents to increased health and safety risks associated with the continued use of gaseous anhydrous ammonia. Additionally, the existing equipment is near the end of its useful life and not replacing it will risk failure, which will result in the BWL's drinking water not receiving the required disinfection levels. Low levels of disinfection residuals could potentially allow pathogens to grow within the water main causing illness to the consumers.

If the improvements to the Dye and Wise Road WCP [filter press service pipes, pumps, corroded appurtenances and piping, filter media, installation of Lamella plates and repair of aging reservoirs and basins] are not completed, it could result in the treatment system not functioning as required, leading to BWL's drinking water not receiving proper treatment prior to being sent into the distribution system.

3. Water Main Replacement, Looping and Consolidations

If the aging and unreliable water main is not replaced, a water main break may occur. This would adversely affect the system reliability and the health and safety of users.

In addition, if the water main dead-ends are not looped throughout the BWL's water distribution system, it could result in low disinfection residuals and loss of service if a main break were to occur.

If connections are not made to consolidate Grand Point Subdivision, Windsor Estates, and State Secondary Complex, these areas are at increased risk of service failures due to lack of redundant feeds. Additionally, they will continue to experience reduced water quality.

4. Elevated Water Storage Tank

If an elevated water storage tank is not constructed in the Lansing southern pressure district, the BWL will have to continue to rely on backup generators and pumps to supply the required minimum system pressures during power outages. Additionally, the location of the elevated water storage tank will provide improved static system water pressures during peak demand events and provide more stable and consistent water pressures which often helps in reducing main breaks.

5. Master Meters and Radios

If master meters are not installed at strategic locations in the distribution system, the BWL lacks real-time visibility into jurisdictional water use. This will result in the inability to optimize system operations.

B. OPTIMUM PERFORMANCE OF EXISTING FACILITIES

The second alternative is to consider optimization of the existing system. Optimizing the performance of the existing facilities will not protect residents from broken water mains, provide increased reliability, or decrease possible WCP failures, therefore this alternative will not be pursued.

C. REGIONALIZATION

The third alternative is to consider joining a regional system. Lansing Board of Water and Light is already a regional system; therefore, a regional alternative has already been implemented and is not considered as part of this plan.

D. PRINCIPAL ALTERNATIVES

This project plan document contains thirty primary projects presented for funding consideration for fiscal years 2025 through 2029. These projects include new redundant and offset well installation, WCP improvements, water main replacements, looping and consolidation projects. These project areas are shown in Figure 10 through Figure 20 and are discussed in detail in the following paragraphs.

FY2025 – Projects

Project 1: Well Installation

To increase reliability of aging wells, the BWL is proposing to install a new redundant well and two new offset wells at well locations 55-04, 25-24 and 25-25. The locations of these wells are

shown in Figure 10 and Figure 14. A new well at location 55-04 will provide critical redundancy to the aging system, while offset wells at locations 25-24 and 25-25 will replace wells that have reached the end of their useful life and are at risk of failure, thereby decreasing the resiliency of the system.

Alternative 1: Installation of one new and two offset wells

There is only one alternative for this project.

Project 2: Chemical Feed System at Wise Road WCP

This project will replace the anhydrous ammonia disinfection system currently in use at the Wise Road WCP due to operational issues and potential safety hazards associated with the use of the gaseous form of disinfectant. In addition to the potential hazards with the existing system, much of the existing equipment is near the end of its useful life and in need of replacement.

Alternative 2A: Use of Ammonium Hydroxide (19.5%) as a replacement.

Alternative 2A evaluates replacing the existing anhydrous ammonia with ammonium hydroxide (19.5%). Implementation of the new disinfection system would include installation of two, 785-gallon storage tanks. A day tank and chemical metering pumps, along with the storage tanks, would be provided with secondary containment. New walls would be provided to separate the storage/feed area from the rest of the facility.

Alternative 2B: Use of Liquid Ammonium Sulfate as a replacement.

Under Alternative 2B, the existing anhydrous ammonia would be replaced with liquid ammonium sulfate. Implementation of the new disinfections system would include installation of two, 900-gallon storage tanks. A day tank and chemical metering pumps, along with the storage tanks, would be provided with secondary containment. New walls would be provided to separate the storage/feed area from the rest of the facility.

Project 3: Filter Press Service Pipes at Dye WCP

This project will replace the two, 8-inch steel sludge pipes that convey sludge from the consolidation area to the filter press for dewatering at the Dye WCP. These pipes are leaking and in poor condition and are in need of replacement.

Alternative 3A: Replace two 8-inch steel pipes, 260-feet long with two, 8-inch carbon steel pipes, 260-feet long (520 feet of piping total).

Alternative 3B: Replace two 8-inch steel pipes, 260-feet long with two, 8-inch stainless steel pipes, 260-ft long (520 feet of piping total).

Project 4: Cedar Pump 4 at Dye WCP

This project will refurbish or replace Cedar Pump 4 located at the Dye WCP. The project will optimize operations and reduce energy usage during peak hours by either trimming the impeller of the pump, achieving a new pump curve and installing a variable-frequency drive (VFD), or installing a new smaller pump and VFD so that it can be used in conjunction with elevated storage.

Alternative 4A: Refurbish Cedar Pump 4 and install an 800 HP VFD.

Alternative 4B: Replace Cedar Pump 4 with a smaller 150 HP pump and install a 150 HP VFD to achieve a pumping range of 3.5 to 8 MGD.

Project 5: North Reservoir at Dye WCP

This project will refurbish the North Reservoir located at the Dye WCP. The project will include interior concrete repair of spalled concrete, interior piping repair and painting, overflow piping modifications, roof membrane repair, fall protection devices and seal sidewall penetrations. The North Reservoir was originally constructed in 1918 and requires consistent maintenance to ensure the reliability of the WCP.

Alternative 5: Refurbish North Reservoir at Dye WCP.

The only alternative to reservoir refurbishment is reservoir replacement. However, due to lack of available space at the Dye WCP location, constructing a new reservoir is not feasible. Additionally, it is not possible to maintain service to the customers while replacing the reservoir in the same location as the current one. Therefore, no alternative will be considered further in the project planning document.

Project 6: Sunset Looping

This project will install 1,100 feet of 12-inch water main to create a redundant feed in the industrial corridor at the south end of Sunset Avenue. Completion of this loop will increase the reliability and water quality in the area.

Alternative 6A: Installation of 1,100 linear feet of 12-inch diameter pipe using open cut technique in the roadways and directional drilling under the river crossing.

Alternative 6B: Installation of 1,100 linear feet of 12-inch diameter pipe using directional drilling technique the full length of the install.

Project 7: Bath Looping

This project will install 2,200 feet of 12-inch water main to create a redundant feed to customers north of I-69 in Bath Township, providing a critical redundancy in an area where repairs to the current system would be difficult due to the location relative to I-69. Completion of this project will increase the reliability and water quality in the area.

Alternative 7A: Installation of 2,200 linear feet of 12-inch diameter pipe using open cut technique in Webster Road, with directional drilling under the I-69 crossing.

Alternative 7B: Installation of 2,200 linear feet of 12-inch diameter pipe using directional drilling technique the full length of installation.

Project 8: CSO 019 Water Main Replacement

This project will replace 2,000 feet of 12-inch water main and 5,588 feet of 8-inch water main within the CSO 019 area. Water main in this area was installed between 1887 and 1938 and has surpassed its useful life. This project will be completed in coordination with the City's CSO program. Completion of this project will increase the reliability and water quality in the area.

Alternative 8A: Replacement of 2,000 linear feet of 12-inch diameter pipe and 5,588 linear feet of 8-inch diameter pipe using open cut technique.

Alternative 8B: Replacement of 2,000 linear feet of 12-inch diameter pipe and 5,588 linear feet of 8-inch diameter pipe using directional drilling technique.

Project 9: Pennsylvania Water Main Replacement

This project will replace 3,015 feet of 12-inch diameter water main in Pennsylvania Ave. from Mt. Hope to Fayette. Water main in this area was installed prior to 1938 and has surpassed its useful life. This project will be completed in coordination with the City's road reconstruction project. Completion of this project will increase the reliability and water quality in the area.

Alternative 9A: Replacement of 2,165 linear feet of 12-inch diameter pipe using open cut technique and 850 linear feet of 12-inch diameter pipe using directional drilling technique within the 100-year floodplain area.

Alternative 9B: Replacement of 3,015 linear feet of 12-inch diameter pipe using directional drilling technique.

Project 10: Mt. Hope Water Main Replacement

This project will replace 4,000 feet of 24-inch diameter water main in Mt. Hope from Pennsylvania to Aurelius. Water main in this area was installed prior to 1920 and has surpassed its useful life. This project will be completed in coordination with the City's road reconstruction project. Completion of this project will increase the reliability and water quality in the area.

Alternative 10A: Replacement of 2,750 linear feet of 24-inch diameter pipe using open cut technique and 1,250 linear feet of 24-inch pipe using directional drilling technique within the 100-year floodplain area.

Alternative 10B: Replacement of 4,000 linear feet of 24-inch diameter pipe using directional drilling technique.

FY2026 – Projects

Project 11. Well Installation – FY2026-FY2029

As stated in the previous section, to combat an aging source water system, BWL will be installing three new or offset wells per year for 2026 through 2029. This project includes the installation of 12 wells from 2026 through 2029.

> Alternative 12: Installation of three (3) new or offset wells per year from 2026 through 2029.

There is only one alternative for this project.

Project 12: Secondary Basin 1&2 at Dye WCP

This project will refurbish Secondary Basins 1 and 2 located at the Dye WCP. The project will include replacement of a steel shaft, steel chain and wood flight system, sprocket motion monitoring, Gritshield® collector and drive chain protector and ball detent torque limiters. The Dye WCP was last expanded in the 1990's so the basins are over 20 years old and many of the mechanical parts are past their useful life. Completion of this project will improve the reliability of the drinking water system.

> Alternative 12: Refurbish Secondary Basins 1 and 2 at Dye WCP.

The only alternative to basin refurbishment is basin replacement. However, due to lack of available space at the Dye WCP location, constructing new basins is not feasible. Additionally, it is not possible to maintain service to the customers while replacing the basins in the same location as the current ones. Therefore, no alternative will be considered further in the project planning document.

Project 13. Radios for Wells

This project will replace the radios at all 124 production wells in the BWL system. The current radios are 20 years old and past useful life and no longer offer reliable communications.

> Alternative 13. Replace radios at 124 production wells.

There is only one alternative for this project.

Project 14. State Secondary Complex Consolidation

This project will install 7,500 feet of 16-inch water main to provide a redundant water service to the State Secondary Complex campus to reduce the risk of service failures and loss of service in the event of an emergency. Additionally, the consolidation of the State Secondary Complex will allow a supplementary connection to the Windsor Township water system, which is currently a single feed.

Alternative 14A: Installation of 6,800 linear feet of 16-inch diameter pipe using open cut technique and 700 linear feet of 16-inch diameter pipe using directional drilling at the railroad crossing and known contaminated soil sites.

Alternative 14B: Installation of 7,500 linear feet of 16-inch diameter pipe using directional drilling technique the full length of the install.

Project 15. Windsor Estates Mobile Home Park Consolidation

This project will install 3,000 feet of 12-inch water main to provide a connection from the BWL system to the Windsor Estates Mobile Home Park's current system. Windsor Estates will continue to own and operate their own distribution system, the BWL is only providing a connection to it.

Alternative 15A: Installation of 2,400 linear feet of 12-inch diameter pipe using open cut technique with 600 linear feet of 12-inch diameter pipe using directional drilling at the wetland area.

Alternative 15B: Installation of 3,000 linear feet of 12-inch diameter pipe using directional drilling technique the full length of the install.

Project 16. CSO 026 Water Main Replacement

This project will replace 15,100 feet of 8-inch water main, 675 feet of 12-inch water main and 250 feet of 14-inch water main within the CSO 026 area. Water main in this area was installed between 1909 and 1931 and has surpassed its useful life. This project will be completed in coordination with the City's CSO program. Completion of this project will increase the reliability and water quality in the area. Additionally, undersized water main will be upsized to meet the minimum water main size standard of 8-inch in diameter as set by the BWL.

Alternative 16A: Replacement and upsizing of 14,650 linear feet of 8-inch diameter pipe, 675 linear feet of 12-inch diameter pipe, 250 linear feet of 14-inch diameter pipe using open cut technique and 450 linear feet of 8-inch diameter pipe using directional drilling technique in areas of known contaminated soil sites.

Alternative 16B: Replacement and upsizing of 15,100 linear feet of 8-inch diameter pipe, 675 linear feet of 12-inch diameter pipe, 250 linear feet of 14-inch diameter pipe using directional drilling technique.

FY2027 – Projects

Project 17. South Reservoir at Dye WCP

This project will refurbish the South Reservoir located at the Dye WCP. The project will include interior concrete repair of spalled concrete, interior piping repair and painting, overflow piping modifications, roof membrane repairs and fall protection devices. The South Reservoir was

originally constructed in 1918 and requires consistent structural maintenance to ensure the reliability of the WCP.

Alternative 17: Refurbish South Reservoir at Dye WCP.

The only alternative to reservoir refurbishment is reservoir replacement. However, due to lack of available space at the Dye WCP location, constructing a new reservoir is not feasible. Additionally, it is not possible to maintain service to the customers while replacing the reservoir in the same location as the current one. Therefore, no alternative will be considered further in the project planning document.

Project 18. Dye WCP Filter Media Replacement

This project will replace the sand filter media at the Dye WCP. The BWL currently uses a sand filter media technology that has served its useful life at the Dye WCP. The current filter media does not protect potable drinking water from emerging contaminants such as PFAS, which are anticipated to be regulated in the future.

Alternative 18. Replace filter media at Dye with Granular Activated Carbon (GAC).

The alternative filter media is anthracite; however, this alternative is not considered in this project planning document as it is incompatible with current processes at the Dye WCP. Therefore, there is only one alternative for this project.

Project 19. Wise Road WCP Filter Media Replacement

This project will replace the sand filter media at the Wise Road WCP. BWL currently uses a sand filter media technology that has served its useful life at the Wise Road WCP. The current filter media does not protect potable drinking water from emerging contaminants such as PFAS which are anticipated to be regulated in the future.

Alternative 19. Replace filter media at Wise Road WCP with GAC.

The alternative filter media is anthracite; however, this alternative is not considered in this project planning document as it is incompatible with current processes at the Wise Road WCP. Therefore, there is only one alternative for this project.

Project 20. Abel Pumps No. 3&4 at Dye WCP

This project will replace Abel Pumps No. 3 and 4 at Dye WCP. The BWL water production process currently operates four filter press pumps, which are used to convert sludge from the water softening process into transportable cakes, at which point it is then land applied for disposal purposes. Abel Pumps No. 3 and 4, two of the four filter press pumps, are older than 20 years and have exceeded their useful life and require greater than normal maintenance to maintain operating capacity.

Alternative 20. Replace Abel Pumps No. 3 and 4 and install VFDs at Dye WCP.

This model of pump has been discontinued and replacement parts are no longer available for refurbishment of Abel Pumps No. 3 and 4. Therefore, this alternative was not considered in this project planning document. Replacement is the only alternative for this project.

Project 21. Grand Pointe Subdivision Consolidation

This project will install 5,085 feet of 8-inch water main to connect the Grand Pointe Subdivision to the BWL system. This project will install a connection between the systems and will provide redundancy to the area.

Alternative 21A: Installation of 5,085 linear feet of 8-inch diameter pipe using open cut technique.

Alternative 21B: Installation of 5,085 linear feet of 8-inch diameter pipe using directional drilling technique.

Project 22. CSO 022 Water Main Replacement

This project will replace 13,500 feet of 8-inch water main, 2,600 feet of 12-inch water main, 1,450 feet of 14-inch water main and 4,125 feet of 16-inch water main within the CSO 022 area. Water main in this area was installed between 1888 and 1939 and has surpassed its useful life. This project will be completed in coordination with the City's CSO program. Completion of this project will increase the reliability and water quality in the area.

Alternative 22A: Replacement of 11,950 linear feet of 8-inch diameter pipe, 2,040 linear feet of 12-inch diameter pipe, 1,450 linear feet of 14-inch diameter pipe and 4,125 linear feet of 16-inch diameter pipe using open cut technique and 1,550 linear feet of 8-inch diameter pipe and 560 linear feet of 12-inch diameter pipe using directional drilling technique in areas of known contaminated soil sites and within the floodplain.

Alternative 22B: Replacement of 13,500 linear feet of 8-inch diameter pipe, 2,600 linear feet of 12-inch diameter pipe, 1,450 linear feet of 14-inch diameter pipe and 4,125 linear feet of 16-inch diameter pipe using directional drilling technique.

Project 23. Landel System Replacement, Grossbeck Area

This project would replace 18,140 feet of 8-inch water mains within the Grossbeck area. Historically, this area experiences above average water main breaks per linear feet of pipe with approximately 250 water main breaks per 100 miles of pipe annually. Completion of this project will increase the reliability and water quality in the area.

Alternative 23A: Replacement of 17,990 linear feet of 8-inch diameter pipe using open cut technique and 150 linear feet of 8-inch diameter pipe using directional drill technique in the area of known contaminated soil sites.

Alternative 23B: Replacement of 18,140 linear feet of 8-inch diameter pipe using directional drilling technique.

FY2028 – Projects

Project 24. CSO Kalamazoo Street and N. Pine Street Water Main Replacement

This project will replace 1,900 feet of 8-inch water main within the City of Lansing's CSO Kalamazoo Street and N. Pine Street project area that was installed in 1890 and has surpassed its useful life. Completion of this project will increase the reliability and water quality in the area.

Alternative 24A: Replacement of 1,900 linear feet of 8-inch diameter pipe using open cut technique.

Alternative 24B: Replacement of 1,900 linear feet of 8-inch diameter pipe using directional drilling technique.

Project 25. CSO Cherry Street Water Main Replacement

This project will replace 2,300 feet of 8-inch water main and 320 feet of 24-inch water main within the City of Lansing's CSO Cherry Street project area that was installed between 1890 and 1950 and has surpassed its useful life. Completion of this project will increase the reliability and water quality in the area.

Alternative 25A: Replacement of 1,400 linear feet of 8-inch diameter pipe and 320 linear feet of 24-inch diameter pipe using open cut technique and 900 linear feet of 8-inch diameter pipe using directional drilling technique in the area of known contaminated soil sites.

Alternative 25B: Replacement of 2,300 linear feet of 8-inch diameter pipe and 320 linear feet of 24-inch diameter pipe using directional drilling technique.

FY2029 – Projects

Project 26. Second Elevated Storage Tank

This project will install a 2.5-million-gallon elevated storage tank in the service area's southern pressure zone. This tank will provide hydraulic advantages to the system and will reduce the need for the BWL to rely on backup generators and pumps to supply pressure during a power outage.

Alternative 26. Installation of a 2.5-million-gallon elevated storage tank west of Aurelius Road north of I-96.

There is only one alternative for this project.

Project 27. Wise Road WCP Plant Optimization

This project will complete optimization opportunities at Wise Road WCP as identified in a 2023 study completed for the BWL. It will install Lamella plates in the sedimentation basins at both WCPs, to enhance the capacity in the sedimentation process while maintaining the same footprint.

> Alternative 27. Installation of a Lamella plates in sedimentation basins at Wise Road WCP.

There is only one alternative for this project.

Project 28. Master Meter Installation

This project will install five master meters within the BWL system. These meters will be tied into the BWL's SCADA system to track flows and to record historical data. Additionally, these meters will allow for improved monitoring of the distribution system.

> Alternative 28A. Installation of five non-invasive master meters located on the distribution line to DeWitt Township, on the distribution line to Bath Township, at the Shubel pressure reducing valve, at the Aurelius Booster Station and at the Eifert Booster Station.

> Alternative 28B. Installation of five insertion master meters located on the distribution line to DeWitt Township, on the distribution line to Bath Township, at the Shubel pressure reducing valve, at the Aurelius Booster Station and at the Eifert Booster Station.

Project 29. CSO 008 Water Main Replacement

This project will replace 16,950 feet of 8-inch water main, 4,675 feet of 12-inch water main, 10 feet of 16-inch water main and 50 feet of 20-inch water main within the CSO 008 area. Water main in this area was installed between 1920 and 1968 and has surpassed its useful life. This project will be completed in coordination with the City's CSO program. Completion of this project will increase the reliability and water quality in the area.

> Alternative 29A: Replacement of 16,950 linear feet of 8-inch diameter pipe, 2,975 linear feet of 12-inch diameter pipe, 10 linear feet of 16-inch diameter pipe and 50 linear feet of 20-inch diameter pipe using open cut technique and replacement of 1,700 linear feet of 12-inch diameter pipe using directional drilling technique in areas of known contaminated soil sites.

> Alternative 29B: Replacement of 16,950 linear feet of 8-inch diameter pipe, 4,675 linear feet of 12-inch diameter pipe, 10 linear feet of 16-inch diameter pipe and 50 linear feet of 20-inch diameter pipe using directional drilling technique.

Project 30. Landel System Replacement, Howard Street and Vine Street

This project would replace and right size 3,150 feet of 6-inch water mains within the Howard Street and Vine Street area. Historically this area experiences above average water main breaks per linear feet of pipe with approximately 250 water main breaks per 100 miles of pipe annually. Completion of this project will increase the reliability and water quality in the area.

Alternative 30A: Replacement and right sizing of 2,820 linear feet of 6-inch diameter pipe with 8-inch diameter pipe using open cut technique and replacement of 330 linear feet of 6-inch diameter pipe with 8-ich diameter pipe using directional drilling technique in areas of known contaminated soils.

Alternative 30B: Replacement and right sizing of 3,150 linear feet of 6-inch diameter pipe with 8-inch diameter pipe using directional drilling technique.

E. MONETARY EVALUATION

To combat the aging source water supply in the BWL system, the BWL is in the process of developing a comprehensive plan for new well sites. While this plan is being developed, BWL has identified 15 well locations where offset wells or new redundant wells can be installed. These wells will be installed at a rate of three per year over the next five years. The detailed cost opinion for construction of the wells is provided in Appendix D and a summary is presented by fiscal year in Table 13 through Table 17. There is no alternative to constructing new and offset wells.

The BWL Dye WCP was constructed in 1939 and Wise Road WCP was constructed in 1966. To ensure the consistency and reliability of both plants and maintain water quality standards of the drinking water being distributed to BWL customers, periodic improvements must be completed at both WCPs. BWL has identified needs and included them in this project planning document. The detailed cost opinions for these improvement projects are provided in Appendix D of this report and a summary of the present worth by fiscal year is presented in Table 13 through Table 17. Where operation and maintenance costs would be similar for the alternatives, they were omitted from the evaluation. Operational chemical costs for the Project 2 alternatives (the chemical feed system) varies and therefore the cost of chemicals for the 20-year useful life of the system was included in the cost opinions.

The opinions of probable costs for each of the water main installation and replacement projects includes the exclusive use of ductile iron DI-CL-54, while installation methods varied between open cut and directional drill. These cost opinions are organized by construction year and are provided in Appendix D of this report. A summary of the present worth by fiscal year is provided in Table 13 through Table 17 . Operation and maintenance costs would be similar for the alternatives and were therefore omitted from the evaluation.

As shown in Table 13 through Table 17, Alternative A, replacing the water mains via open cut appears to have the lower cost for each project. Due to current market conditions, the BWL may choose to bid both PVC and ductile iron piping. Open cut installation would be used to install the piping, except in areas where directional drilling installation is required due to known contaminated soil sites or environmental features such as wetlands or floodplains.

Table 13 – FY2025 Alternatives Present Worth Comparison

Project for FY2025	Alternative A: Well Installation	N/A
Project 1 - New/Offset Well Construction FY2025		
Capital Cost	$2,750,000	
Salvage Value	$230,000	
Present Worth of Salvage Value	$140,000	
Total Present Worth	$2,610,000	
	Alternative A: Ammonia Hydroxide 19.5% as a Replacement	**Alternative B: Liquid Ammonium Sulfate as a Replacement**
Project 2 - Chemical Feed System at Wise Road WCP		
Capital Cost	$450,000	$420,000
Salvage Value	$60,000	$60,000
Present Worth of Salvage Value	$37,000	$37,000
20-yr Chemical Supply Value	$175,000	$835,000
Present Worth of Chemical Supply	$107,000	$510,000
Subtotal Present Worth	**$520,000**	**$893,000**
	Alternative A: Replace with Carbon Steel	**Alternative B: Replace with Stainless Steel**
Project 3 - Filter Press Service Pipes at Dye WCP		
Capital Cost	$170,000	$310,000
Salvage Value	$50,000	$100,000
Present Worth of Salvage Value	$31,000	$61,000
Subtotal Present Worth	**$139,000**	**$249,000**
	Alternative A: Refurbish Cedar Pump	**Alternative B: Replace Cedar Pump**
Project 4 - Cedar Pump 4 at Dye WCP		
Capital Cost	$780,000	$470,000
Salvage Value	$10,000	$10,000
Present Worth of Salvage Value	$6,000	$6,000
Subtotal Present Worth	**$774,000**	**$464,000**

	Alternative A: Refurbish	**N/A**
Project 5 - North Reservoir at Dye WCP		
Capital Cost	$180,000	
Salvage Value	$7,400	
Present Worth of Salvage Value	$5,000	
Subtotal Present Worth	**$175,000**	
	Alternative A: Open Cut with Directional Drill at the Crossing	**Alternative B: Directional Drill**
Project 6 - Sunset Looping		
Capital Cost	$1,070,000	$1,220,000
Salvage Value	$170,000	$250,000
Present Worth of Salvage Value	$104,000	$153,000
Subtotal Present Worth	**$966,000**	**$1,067,000**
Project 7 - Bath Looping		
Capital Cost	$1,910,000	$2,260,000
Salvage Value	$370,000	$480,000
Present Worth of Salvage Value	$226,000	$293,000
Subtotal Present Worth	**$1,684,000**	**$1,967,000**
	Alternative A: Open Cut	**Alternative B: Directional Drill**
Project 8 - CSO 019 Water Main Replacement		
Capital Cost	$5,370,000	$6,900,000
Salvage Value	$1,050,000	$1,500,000
Present Worth of Salvage Value	$641,000	$915,000
Subtotal Present Worth	**$4,729,000**	**$5,985,000**
Project 9 - Pennsylvania Water Main Replacement		
Capital Cost	$2,750,000	$3,190,000
Salvage Value	$540,000	$680,000
Present Worth of Salvage Value	$330,000	$415,000
Subtotal Present Worth	**$2,420,000**	**$2,775,000**
Project 10 - Mt. Hope Water Main Replacement		
Capital Cost	$5,830,000	$7,390,000
Salvage Value	$1,380,000	$1,650,000
Present Worth of Salvage Value	$842,000	$1,007,000
Subtotal Present Worth	**$4,988,000**	**$6,383,000**

Table 14 - FY2026 Alternatives Present Worth Comparison

Project for FY2026	Alternative A: Well Installation	N/A
Project 11- New/Offset Well Construction FY2026		
Capital Cost	$2,860,000	
Salvage Value	$614,300	
Present Worth of Salvage Value	$375,000	
Subtotal Present Worth	**$2,485,000**	
	Alternative A: Refurbish	**N/A**
Project 12 - Secondary Basin 1&2 at Dye WCP		
Capital Cost	$1,680,000	
Salvage Value	$0	
Present Worth of Salvage Value	$0	
Subtotal Present Worth	**$1,680,000**	
	Radio Replacement	**N/A**
Project 13 – Radios for Wells		
Capital Cost	$5,580,000	
Salvage Value	$0	
Present Worth of Salvage Value	$0	
Subtotal Present Worth	**$5,580,000**	
	Alternative A: Open Cut with Directional Drill at the Crossing	**Alternative B: Directional Drill**
Project 14 – State Secondary Complex Consolidation		
Capital Cost	$8,710,000	$10,400,000
Salvage Value	$1,720,000	$2,190,000
Present Worth of Salvage Value	$1,050,000	$1,336,000
Subtotal Present Worth	**$7,660,000**	**$9,064,000**
	Alternative A: Open Cut with Directional Drill at Wetland	**Alternative B: Directional Drill**
Project 15 – Windsor Estates Consolidation		
Capital Cost	$2,530,000	$3,220,000
Salvage Value	$530,000	$680,000
Present Worth of Salvage Value	$323,000	$415,000
Subtotal Present Worth	**$2,207,000**	**$2,805,000**

	Alternative A: Open Cut	Alternative B: Directional Drill
Project 16 - CSO 026 Water Main Replacement		
Capital Cost	$11,880,000	$14,740,000
Salvage Value	$2,260,000	$3,140,000
Present Worth of Salvage Value	$1,379,000	$1,916,000
Subtotal Present Worth	**$10,501,000**	**$12,824,000**

Table 15- FY2027 Alternatives Present Worth Comparison

Projects for FY2027	Alternative A: Well Installation	N/A
Project 11 - New/Offset Well Construction FY2027		
Capital Cost	$2,970,000	
Salvage Value	$638,800	
Present Worth of Salvage Value	$390,000	
Total Present Worth	**$2,580,000**	
	Alternative A: Refurbish	**N/A**
Project 17 – South Reservoir at Dye WCP		
Capital Cost	$410,000	
Salvage Value	$8,200	
Present Worth of Salvage Value	$5,000	
Subtotal Present Worth	**$405,000**	
	Alternative A: Replace with GAC	**N/A**
Project 18 – Dye Filter Media Replacement		
Capital Cost	$1,670,000	
Salvage Value	$0	
Present Worth of Salvage Value	$0	
Subtotal Present Worth	**$1,670,000**	
Project 19 – Wise Road Filter Media Replacement		
Capital Cost	$1,670,000	
Salvage Value	$0	
Present Worth of Salvage Value	$0	
Subtotal Present Worth	**$1,670,000**	

	Alternative A: Replace	**N/A**
Project 20 – Abel Pumps No. 3&4 at Dye WCP		
Capital Cost	$2,970,000	
Salvage Value	$0	
Present Worth of Salvage Value	$0	
Subtotal Present Worth	**$2,970,000**	
	Alternative A: Open Cut	**Alternative B: Directional Drill**
Project 21 – Grand Point Subdivision Consolidation		
Capital Cost	$3,720,000	$4,840,000
Salvage Value	$710,000	$1,010,000
Present Worth of Salvage Value	$433,000	$616,000
Subtotal Present Worth	**$3,287,000**	**$4,224,000**
Project 22 - CSO 022 Water Main Replacement		
Capital Cost	$20,520,000	$24,930,000
Salvage Value	$3,920,000	$5,200,000
Present Worth of Salvage Value	$2,392,000	$3,173,000
Subtotal Present Worth	**$18,128,000**	**$21,757,000**
Project 23 – Landel System Replacement, Grossbeck Area		
Capital Cost	$13,940,000	$17,890,000
Salvage Value	$2,640,000	$3,720,000
Present Worth of Salvage Value	$1,611,000	$2,270,000
Subtotal Present Worth	**$12,329,000**	**$15,620,000**

Table 16 - FY2028 Alternatives Present Worth Comparison

Project for FY2028	Alternative A: Well Installation	N/A
Project 11 - New/Offset Well Construction FY2028		
Capital Cost	$3,090,000	
Salvage Value	$664,400	
Present Worth of Salvage Value	$405,000	
Total Present Worth	**$2,685,000**	
	Alternative A: Open Cut	**Alternative B: Directional Drill**
Project 24 – Kalamazoo and Pine Water Main Replacement		
Capital Cost	$1,710,000	$2,170,000
Salvage Value	$310,000	$440,000
Present Worth of Salvage Value	$189,000	$269,000
Subtotal Present Worth	**$1,521,000**	**$1,901,000**
Project 25 – Cherry Street Water Main Replacement		
Capital Cost	$3,390,000	$3,440,000
Salvage Value	$620,000	$740,000
Present Worth of Salvage Value	$378,000	$452,000
Subtotal Present Worth	**$3,012,000**	**$2,988,000**

Table 17 - FY2029 Alternatives Present Worth Comparison

Project for FY2029	Alternative A: Well Installation	N/A
Project 11 - New/Offset Well Construction FY2029		
Capital Cost	$3,220,000	
Salvage Value	$691,000	
Present Worth of Salvage Value	$422,000	
Total Present Worth	**$2,798,000**	

	Alternative A: Construct Elevate Water Tower	**N/A**
Project 26 – Second Elevated Storage Tank		
Capital Cost	$34,150,000	
Salvage Value	$3,750,000	
Present Worth of Salvage Value	$2,289,000	
Subtotal Present Worth	**$31,861,000**	
	Alternative A: Optimization	**N/A**
Project 27- Wise Road WCP Optimization		
Capital Cost	$7,690,000	
Salvage Value	$0	
Present Worth of Salvage Value	$0	
Subtotal Present Worth	**$7,690,000**	
	Alternative A: Non-Invasive Meter	**Alternative B: Insertion Meter**
Project 28 Master Meter Installation		
Capital Cost	$150,000	$150,000
Salvage Value	$0	$0
Present Worth of Salvage Value	$0	$0
Subtotal Present Worth	**$150,000**	**$150,000**
	Alternative A: Open Cut	**Alternative B: Directional Drill**
Project 29 – CSO 008 Water Main Replacement		
Capital Cost	$18,610,000	$23,580,000
Salvage Value	$3,630,000	$5,130,000
Present Worth of Salvage Value	$2,215,000	$3,131,000
Subtotal Present Worth	**$16,395,000**	**$20,449,000**
Project 30 – Landel System Replacement, Howard and Vine St		
Capital Cost	$3,280,000	$3,910,000
Salvage Value	$600,000	$780,000
Present Worth of Salvage Value	$366,000	$476,000
Subtotal Present Worth	**$2,914,000**	**$3,434,000**

F. ENVIRONMENTAL EVALUATION

The alternatives presented above are not expected to result in major environmental impact. Table 18 depicts the environmental impact from each alternative.

Table 18 - Environmental Impacts

Category	Air	Wetland	Floodplain	Water / Land Resources	Historical / Tribal Resources	Endangered Flora and Fauna
No Action	None	None	None	None	None	None
Optimum Performance of Existing System	N/A	N/A	N/A	N/A	N/A	N/A
Regionalization	N/A	N/A	N/A	N/A	N/A	N/A
Proposed Improvements	Low/ Standard Construction	Low/ Standard Construction	Low/ Standard Construction	Low/ Standard Construction	Low/ Standard Construction	Low/ Standard Construction

The proposed projects will address the necessary improvements and repairs to the drinking water distribution system, which are urgently needed to maintain compliance with State and Federal requirements, improve the function and reliability of the system, and to protect public health. Temporary and/or low impact to the environment and to the public is expected during construction. Permit requirements will be adhered to.

Well installation, Sunset Looping, CSO 022, Pennsylvania, Mt. Hope, Howard and Vine, Grand Point Subdivision and Windsor Estates projects are all partly located in the existing wetlands or hydric soil area or have portions of the project area within the 100-year floodplain. Directionally drilling will be used in the affected area to minimize potential impacts to the wetlands and floodplain as this method is less disruptive to the surface than open cut installation. Furthermore, mitigation of potential impacts will be properly performed to protect the wetlands and floodplain and will be in accordance with permitted requirements.

Six of the thirty projects are located in close proximity to at least one historical site within the BWL service area. The service area has little undeveloped land; thus, all work in these six projects will be performed in areas previously disturbed, and no negative impact to the historical properties are anticipated. Upon receipt of funding, further investigation will be completed, and a SHPO Part 106 application will be completed. Furthermore, mitigation of potential impact will properly be performed to protect the historic sites and will be in accordance with permitted requirements.

The review of the MNFI database identified 29 rare, endangered and threatened species that may be present in the project areas. The MNFI database identifies the type of habitat that is needed to support individual endangered, threatened, or species of special concern. If the needed habitat is no longer present in the area due to changes and development in the area, the

observation is considered historical, and the individual species is not anticipated to be present. Table 19 summarizes the species and possible impacts based on a desktop review of the existing projects areas.

Table 19 - MNFI Rare Species Review Summary

Species	Potential Impact
Bald eagle	Field survey required/May affect.
Black and gold bumble bee	Historical; Habitat not present; No effect.
Blue-eyed Mary	Historical; Habitat not present; No effect.
Cattail sedge	Habitat not present; No effect.
Creek heelsplitter	Historical; No effect.
Ellipse	Historical; No effect.
False hop sedge	Historical; Habitat not present; No effect.
Flutted-shell	No effect.
Grasshopper sparrow	Historical; Habitat not present; No effect.
Hairy-fruited sedge	Historical; Habitat not present; No effect.
Hemlock-parsley	Historical; Habitat not present; No effect.
Indiana bat	No likely adverse effect.
Least shrew	Historical; Habitat not present; No effect.
Little brown bat	No effect.
Peregrine falcon	No effect.
Pickerel frog	Field survey required/May affect.
Prairie white-fringed orchid	Section 7 Consultation Submitted with USFWS.
Purple milkweed	Historical; Habitat not present; No effect.
Rainbow	Historical; No effect.
Raven's-footed sedge	Historical; Habitat not present; No effect.
River fingernail clam	No effect.
Round pigtoe	No effect.
Snowy orchis	Historical; Habitat not present; No effect.
Slippershell	No effect.
Torrey's bulrush	Historical; Habitat not present; No effect.
Virginia spiderwort	Historical; Habitat not present; No effect.
White false indigo	Historical; Habitat not present; No effect.
Woodland vole	Historical; Habitat not present; No effect.
Yellow banded bumble bee	Historical; Habitat not present; No effect.

The USFWS identified seven additional species that may be present in the project areas, as summarized in Table 20.

Table 20 - USFWS Rare Species Review Summary

Species	Potential Impact
Indiana Bat	May affect.
Northern Long-Eared Bat	No likely adverse effect.
Tricolored Bat	No effect.
Eastern Massasauga Rattlesnake	No likely adverse effect.
Eastern Prairie Fringed Orchid	May affect.
Monarch Butterfly	No effect.
Whooping Crane	No effect.

Most of the work is proposed at the same sites where existing facilities are located and in areas previously developed. There is minimal habitat present for the listed species and none or low project impact is expected. When the limits of ground-disturbing activities are further refined during the design phases for the various projects, additional review will be completed to determine if the habitat for the species will be impacted. Field survey will be conducted to assess the presence of bald eagles in project areas. If the presence of bald eagles is determined, construction activities will be scheduled from August to February to avoid the breeding season. Field survey will be conducted between the first week of April and the fourth week of October to assess for the presence of pickerel frogs prior to construction activities commencing. If the presence of pickerel frogs is determined, proper conservation procedures will be followed. With the potential presence of the Eastern Mississauga rattle snakes, no soil erosion control products containing plastic netting will be used to avoid entanglement. During design, if it is determined that tree clearing is required, tree clearing will be scheduled between October and March to avoid disturbing the bat species. If there are any concerns, appropriate action would be taken to avoid these areas and/or mitigate any disturbance so that the species are protected. Additionally, any observations will be reported to the MDNR office within 24 hours.

A Section 7 consultation with U.S. Fish and Wildlife has been entered for the Prairie white-fringed orchid. In the event the BWL is determined to be in the fundable range, further investigation will be conducted.

Presence of Contamination

According to EGLE's Inventory of Facilities accessible through the Remediation Information Data Exchange, there are 390 Part 201 and 236 Part 213 Sites within the BWL service areas. A list of these locations, along with the addresses, is provided in Appendix E. These locations are also shown in Figure 21 through Figure 31. The following projects are in the vicinity of Part 201 and/or Part 213 sites:

- Well Installation
    - Well 25-25 Offset
- Wise Road WCP Projects
    - Chemical Feed System at Wise Road WCP

    - Wise Road WCP Filter Media Replacement
    - Wise Road Optimization
- Dye WCP Projects
    - Filter Press Service Pipes at Dye WCP
    - Cedar Pump 4 at Dye WCP
    - North Reservoir at Dye WCP
    - Secondary Basins 1&2 at Dye WCP
    - South Reservoir at Dye WCP
    - Dye WCP Filter Media Replacement
    - Abel Pumps No. 3&4 at Dye WCP
- State Secondary Complex Consolidation
- CSO 022 Water Main Replacement
- CSO 026 Water Main Replacement
- CSO 008 Water Main Replacement
- CSO Cherry Street Water Main Replacement
- Landel System Replacement, Grossbeck Area

The impact of Part 201 and Part 213 sites will require that water main piping placed in the vicinity of these sites be reviewed for compatibility. Specifics on the exact pollutants are not always available; however, precautionary measures will be taken at each location to minimize the possibility of water main contamination, create further spread of contamination, or needlessly expose residents or workers.

Environmental contaminants near the Dye and Wise Road WCPs are not anticipated to be impacted as the proposed work will take place within the existing boundary of the plants. Similarly, the well installation is not anticipated to impact contaminants.

Sites potentially containing volatile organic compounds in the vicinity of proposed water main replacement would preclude the use of PVC materials. Any new water main in the presence of potential contaminants will be installed via directional drilling with ductile iron pipe. This method of installation and material will minimize exposure to potential contaminants as well as reduce pipe failure due to a reaction with the pipe material. Specialized gaskets designed to withstand groundwater contamination at water main joints will be proposed in this area to minimize the likelihood of contaminants entering the system.

Projects that are located within the floodplain or wetland areas are proposed to be installed via directional drilling to reduce impact of construction on the natural features.

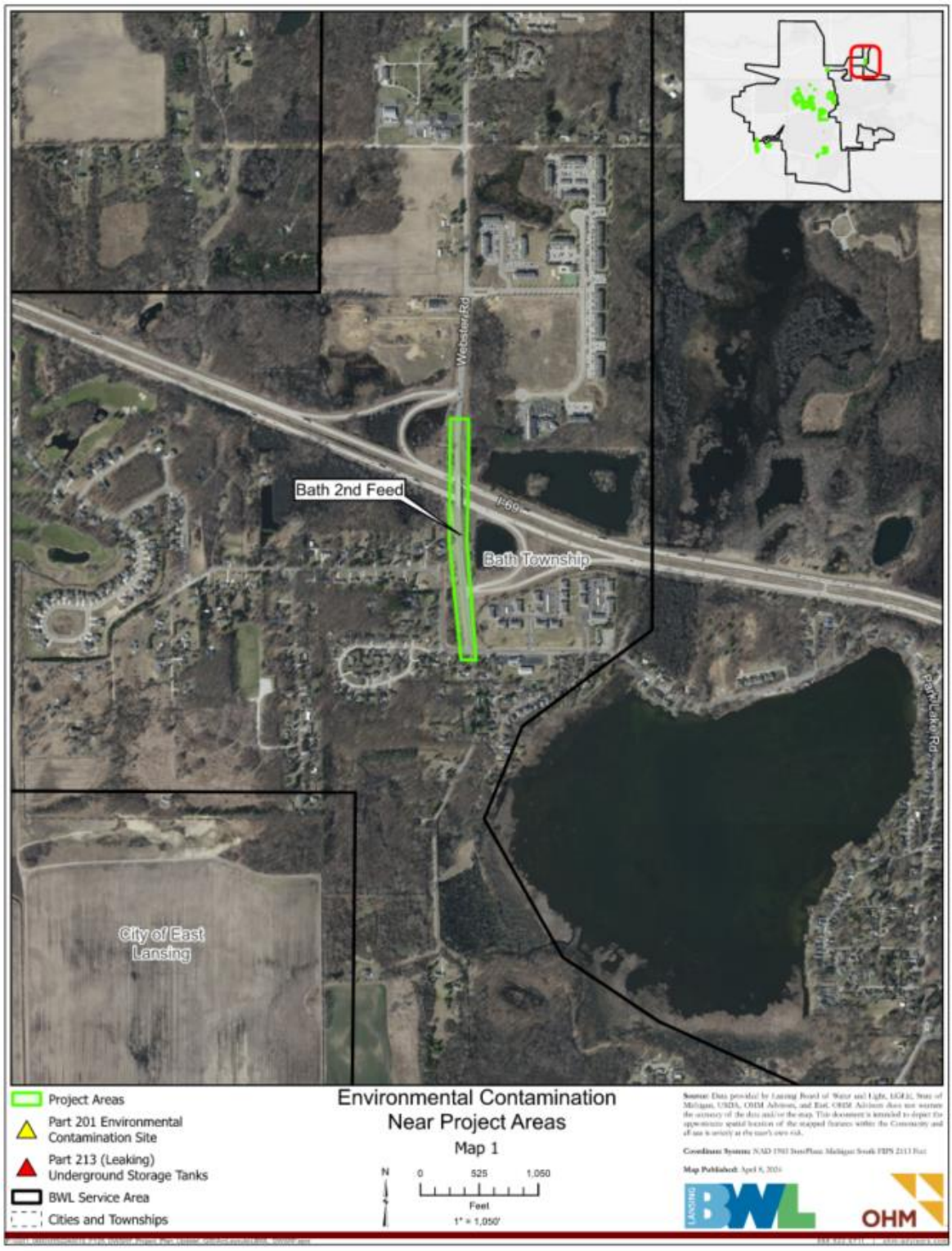

Figure 21 - Environmental Contaminants Map 1

Figure 22 - Environmental Contaminants Map 2

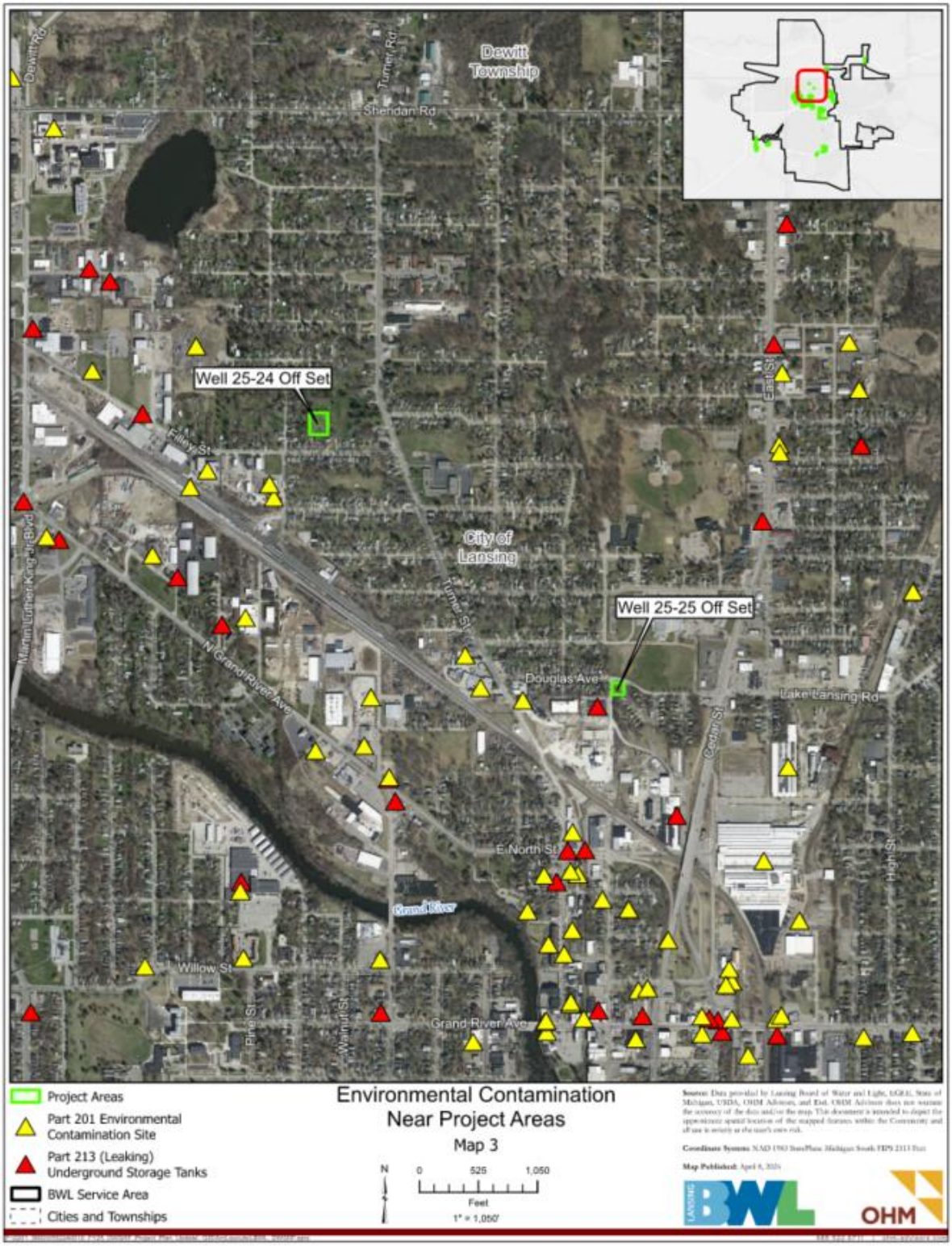

Figure 23 - Environmental Contaminants Map 3

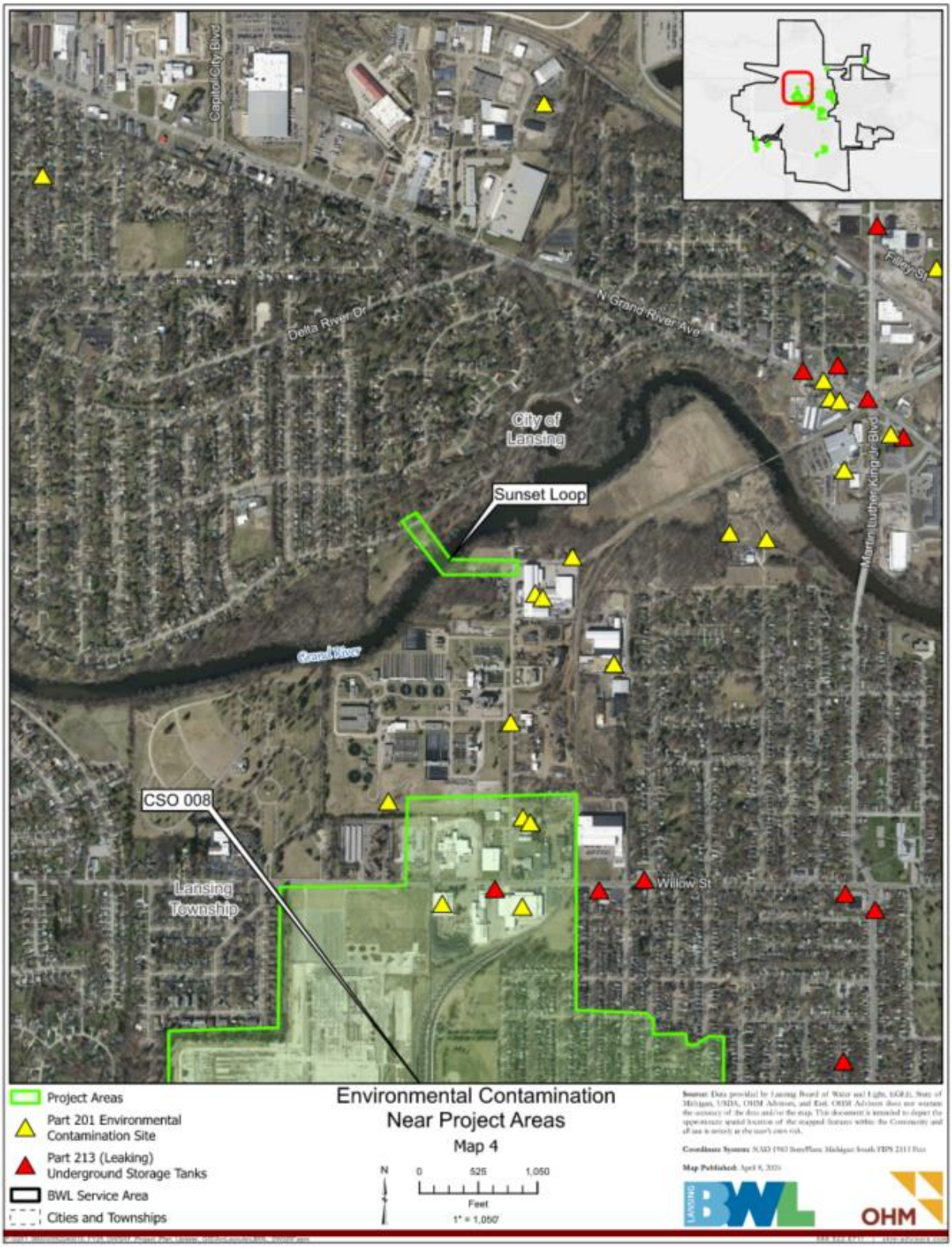

Figure 24 - Environmental Contaminants Map 4

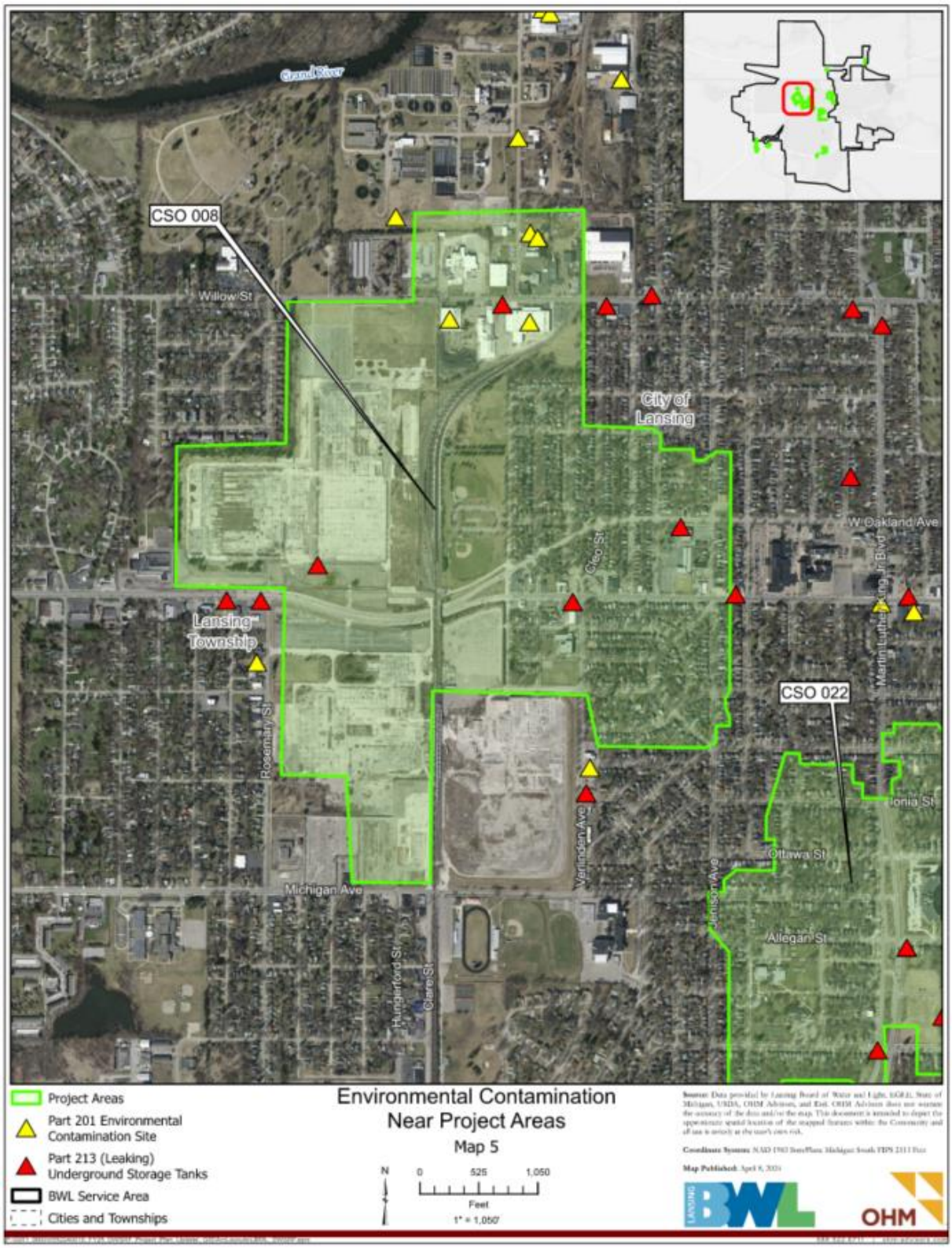

Figure 25 - Environmental Contaminants Map 5

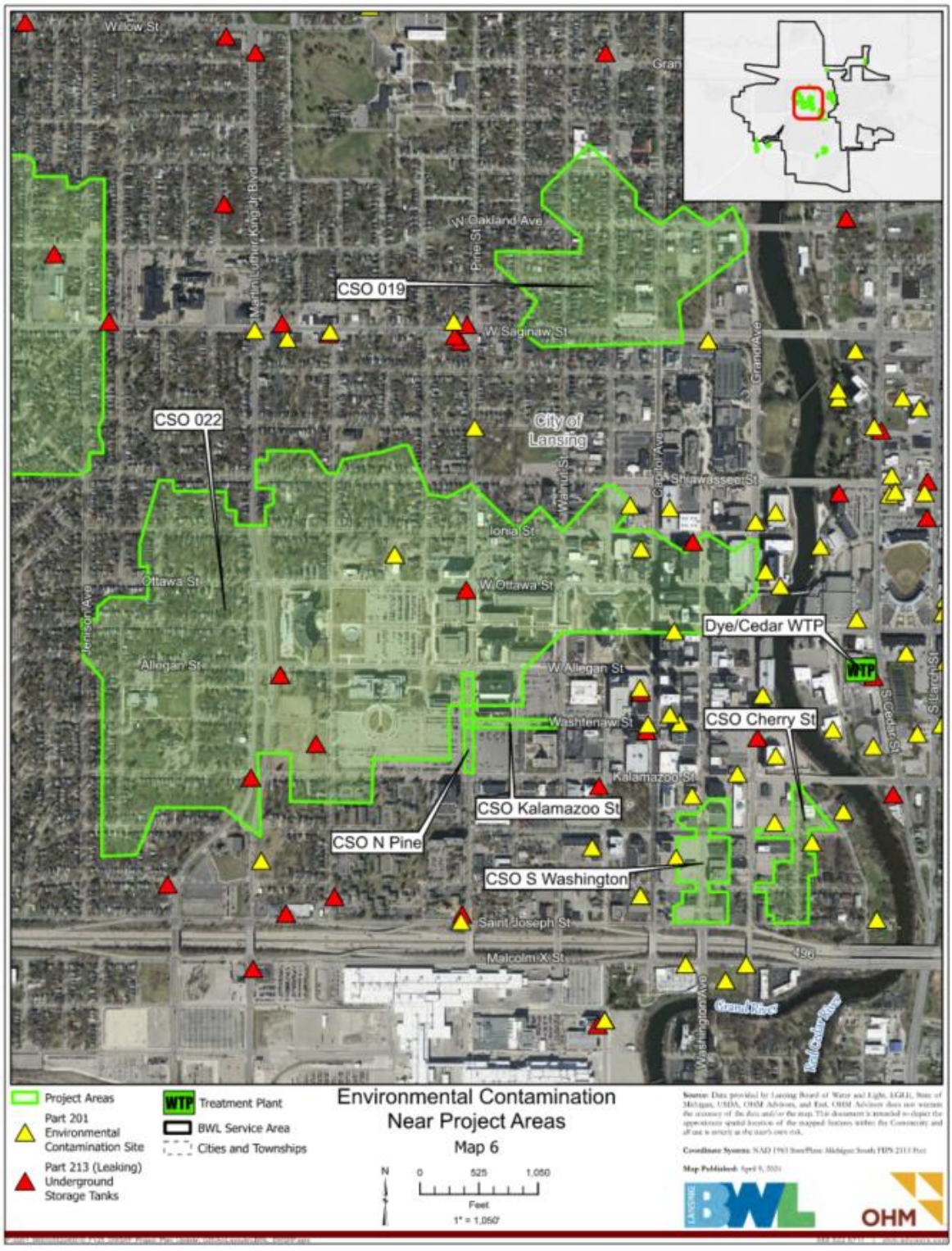

Figure 26 - Environmental Contaminants Map 6

Figure 27 - Environmental Contaminants Map 7

Figure 28 - Environmental Contaminants Map 8

Figure 29 - Environmental Contaminants Map 9

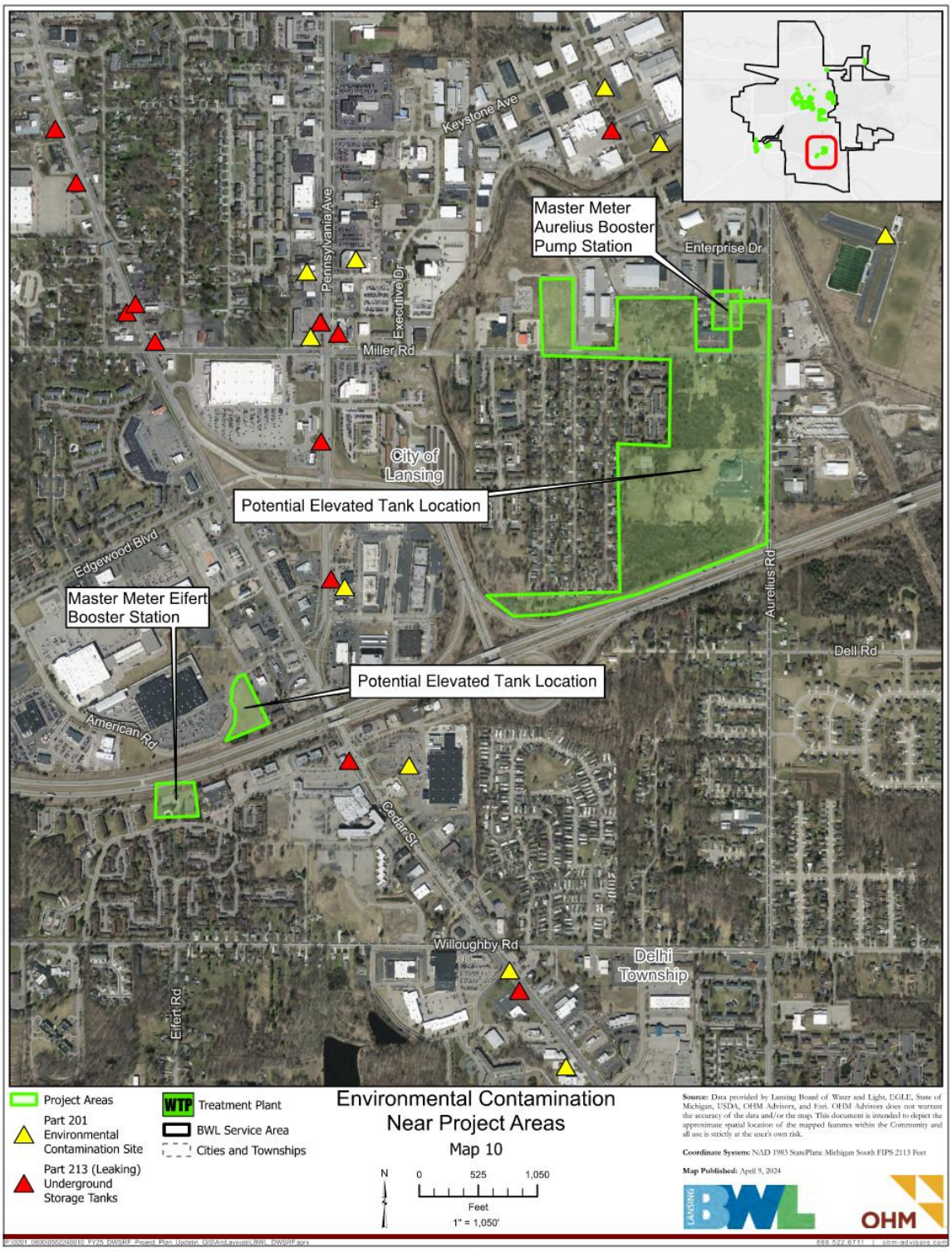

Figure 30 - Environmental Contaminants Map 10

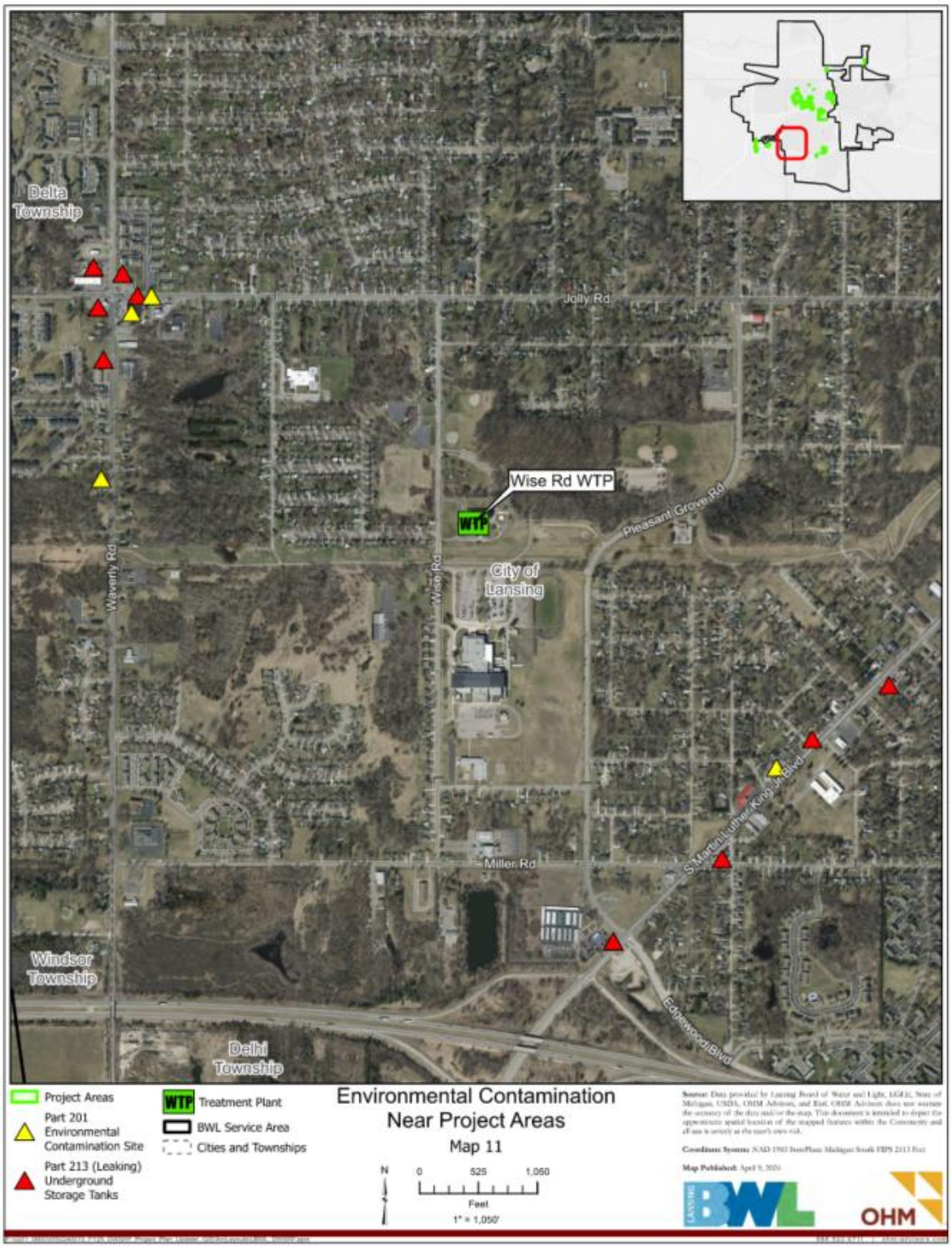

Figure 31 - Environmental Contaminants Map 11

G. TECHNICAL CONSIDERATIONS

Water Production

Installation of one new and two offset wells will increase the redundancy and reliability of the BWL source water system. These three wells are just the first step in a five-year plan to instill redundancy and replace aging source water infrastructure. The following problems will be addressed by this project:

- Increased source water redundancy.
- Two wells that have surpassed the end of useful life will be replaced.

The BWL is anticipating completing the feasibility evaluation, design, permitting and construction phases of the new and offset wells in FY 2025.

Additional well replacements scheduled for FY 2026 and 2029, would have similar benefits. Three wells are targeted for replacement in each of the four fiscal years.

In FY 2026, the radios on the wells are planned to be replaced to aid in communicating operating conditions and alerting Lansing BWL to alarms or other problems that need to be addressed. The radio replacement will improve the reliability of the system by allowing Lansing BWL to more reliably monitor the system and respond more quickly to issues as they arise.

Water Conditioning Plant Improvements

Completing refurbishments of the North Reservoir will help to ensure uninterupted service of the Dye WCP and increase reliability of the drinking water supply. Replacing the existing outdated disinfection system at Wise Road WCP with a new updated disinfection system will ensure continuation of the disinfecting process. Replacing the leaking sludge pipes will increase the efficiency of the sludge dewatering process and reduce the likelihood of pipe failure leading to operational problems at the Dye WCP. Replacing Cedar Pump 4, which has been out of service for some time, will help to optimize pumping operations and reduce energy usage. The following types of problems will be addressed by these projects in FY2025:

- Equipment and material in the North Reservoir have passed the end of their useful life and will be refurbished.
- Sludge pipes have reached the end of useful life and will be replaced.
- A disinfection system that has reached the end of its useful life will be replaced.
- Cedar Pump 4 will be returned to service and will optimize pumping operations.

FY2026 projects at the WCPs include refurbishing the Secondary Basins 1 and 2 at the Dye WCP. Completing refurbishments of these two basins will help to ensure uninterupted service of the Dye WCP and increase reliability of drinking water supply. The following types of problems will be addressed by these projects in FY2026:

- Equipment and material in the Secondary Basin 1 and 2 have passed the end of useful life and will be refurbished.

FY2027 projects at the WCPs include refurbishement of South Reservoir at Dye, replacing the filter media at the Dye and Wise Road WCPs, and installing new Abel Pumps Nos. 3 and 4 at the Dye WCP.

The South Reservoir requires refurbishment to maintain the tank in operation and increase the reliability of the drinking water system. Replacing the existing filter media with granular activated carbon will provide a higher level of treatment at both the Dye and Wise Road WCPs compared to the existing sand filter media. GAC is capable of removing organics, including low levels of PFAS compounds, if present in the source water. Replacing Abel Pump Nos. 3 and 4 will allow sufficient volume of solids to feed the filter press and dewater the solids at the Dye WCP. Without Abel Pumps 3 and 4, there would not be sufficient firm capacity to feed the filter press and operating expenses would increase due to the solids containing more water. Additional trucks would be needed to land apply the solids produced at the Dye and Wise Road WCPs. The following types of problems will be addressed by these projects in FY2027:

- The tank and piping at the South Reservoir have passed the end of useful life and will be refurbished.
- The level of treatment provided by the filters will be increased by converting the filters at the Dye and Wise Road WCPs to granular activated carbon.
- Replacing Abel Pumps No. 3 and 4 will maintain the firm capacity of the filter press feed system and allow the solids dewatering process to operate as designed.

FY2029 projects include optimziation of the primary and secondary sedimentation basins through the installation of Lamella plates at Wise Road WCP. The Lamella plates will increase the effective settling capacity of the sedimentation basins without the need of adding more basins. Currently, the sedimentation basins are the limiting treatment process at Wise Road WCP. The following problems will be addressed by the FY 2029 projects:

- Increase treatment capacity of the primary and secondary settling basins at Wise Road WCP, elliminating treatment bottlenecks at the facility.

Water Main Installation, Replacement and Looping

Water mains to be installed, replaced and looped are shown in Figure 10 and Figure 13 through Figure 18. Replacing aged and unreliable pipes and looping water main dead-ends will improve water quality and reliability of the water system. Installing new connections to consolidate smaller systems into the BWL system will provide redundancy and improve reliability and water quality to the newly connected customer. Applicable EGLE procedures, Ten States Standards and local ordinances shall be strictly adhered to during design and construction.

The alternatives comply with Act 399 and are designed to meet the standard recommended guidelines established in the 2022 "Recommended Standards for Waterworks", as published by the Great Lakes and Upper Mississippi Board of State Sanitary Engineers. The following types of problems will be addressed by these projects:

- Water main that has surpassed its useful life, experiences high volumes of breaks and has heavy turberculation will be replaced.
- Dead-ends will be looped to reduce stagnant water and improve overall system reliability.
- Consolidation of community systems will recieve a redundant feed and an improvement in drinking water quality.

Second Elevated Storage Tank

Installation of a second elevated storage tank will provide hydraulic advantages to the system and will reduce the need for the BWL to rely on backup generators and pumps to supply pressure during a power outage.

Strategic Master Meter Locations

Installation of master meters within the system connected to BWL's SCADA system will allow BWL to track flows and create historical data. Additionally, they will allow for improved monitoring of the system.

H. NEW/INCREASED WATER WITHDRAWALS

For system redundancy and replacement of aging infrastructure, the BWL is requesting funding for the construction of one new well and two offset wells. The BWL is anticipating completing the feasibility evaluation, design, permitting and construction phases of the new wells in FY 2025.

The BWL is also requesting funding for fiscal years 2026 through 2029 for replacement of three wells per year to combat their aging production well system. The BWL is anticipating completing the feasibility evaluation, design, permitting and construction phases of the new wells within the same fiscal year in which they are applying for funding.

The Adverse Resource Impact for the new well in FY 2025 and any additional new wells between FY2026 and FY 2029 will be completed upon notification of funding through the DWSRF program.

V. SELECTED ALTERNATIVES

The selected alternatives are as follows:

- Project 1: Well Installation.
- Project 2A: Chemical Feed System at Wise Road WCP- Use of Ammonium Hydroxide (19.5%) as a replacement.
- Project 3A: Filter Press Service Pipes at Dye WCP - Replace two, 8-inch steel sludge pipes with carbon steel.
- Project 4B: Cedar Pump 4 at Dye WCP - Replace Cedar Pump 4 and install VFD.
- Project 5: North Reservoir at Dye WCP – Refurbish North Reservoir at Dye WCP.
- Project 6B: Sunset Looping - Installation of water main using directional drilling technique.
- Project 7A: Bath Looping - Installation of water main using open cut with directional drilling technique at the highway crossing.
- Project 8A: CSO 019 Water Main Replacement - Installation of water main using open cut technique.
- Project 9A: Pennsylvania Water Main Replacement – Installation of water main using open cut with directional drilling techniques in the 100-yearr floodplain area.
- Project 10A: Mt. Hope Water Main Replacement - Installation of water main using open cut with directional drilling techniques in the 100-yearr floodplain area.
- Project 11: Well Installation
- Project 12: Secondary Basin 1&2 at Dye WCP - Refurbish Secondary Basin 1&2 at Dye WCP.
- Project 13: Radios for Wells – Replace radios at 124 wells.
- Project 14A: State Secondary Complex Consolidation - Installation of water main using open cut with directional drilling technique at the railroad crossing and known contaminated soil sites.
- Project 15A: Windsor Estates Mobile Home Park Consolidation - Installation of water main using open cut with directional drilling technique at the wetlands area.
- Project 16A: CSO 026 Water Main Replacement - Installation of water main using open cut and directional drilling techniques at known contaminated soil sites.
- Project 17: South Reservoir at Dye WCP – Refurbish South Reservoir at Dye WCP.
- Project 18: Dye WCP Filter Media Replacement - Replace filter media at Dye with GAC.
- Project 19: Wise Road WCP Filter Media Replacement - Replace filter media at Wise Road with GAC.
- Project 20: Abel Pumps No. 3&4 at Dye WCP - Replace Abel Pumps No. 3 and 4 and install VFDs at Dye WCP.
- Project 21A: Grand Pointe Subdivision Consolidation - Installation of water main using open cut with directional drilling technique at the wetlands area.
- Project 22A: CSO 022 Water Main Replacement - Installation of water main using open cut with directional drilling techniques at known contaminated soil areas and within the floodplain.
- Project 23A: Landel System Replacement, Grossbeck Area - Installation of water main using open cut with directional drilling techniques at known contaminated soil areas.

- Project 24A: CSO Kalamazoo and N. Pine Street Water Main Replacement - Installation of water main using open cut technique.
- Project 25A: CSO Cherry Street Water Main Replacement - Installation of water main using open cut with directional drilling techniques in areas of known contaminated soil sites.
- Project 26: Second Elevated Storage Tank - Installation of a 2.5-million-gallon storage tank
- Project 27: Wise Road WCP Plant Optimization – Install optimization equipment.
- Project 28A: Master Meter Installation – Installation of five Non-Invasive Master Meters
- Project 29A: CSO 008 Water Main Replacement - Installation of water main using open cut with directional drilling techniques in areas of known contaminated soil sites.
- Project 30A: Landel System Replacement, Howard and Vine Street - Installation of water main using open cut with directional drilling techniques in the areas of known contaminated soil sites.

Additional information is provided on each of the 30 selected projects below**.**

FY2025 – Projects

Project 1: Well Installation

Alternative 1, well installation is the only alternative for this project. BWL is faced with the challenge of aging infrastructure. Approximately 60% of the wells that service the system were drilled over 65 years ago. Many wells in service today are at or beyond the expected useful life. BWL will be installing new or offset wells at a rate of three wells per year for the next five years to proactively replace older wells to maintain reliable water service to its customers. Project 1 includes the installation of one new well to improve redundancy and two new offset wells. These three wells will include the following:

- Well 55-04 – New redundant well located at Pennsylvania at Red Cedar River inside Potter Park.
    - 16-inch diameter well installed at a depth of 140 feet
    - 5-inch observation well installed at a depth of 445 ft
    - 30 feet of 6-inch water main
    - Submersible pump with a 30-HP motor
    - Concrete pad and stainless-steel enclosure

- Well 25-24 – New offset well located north of Filley St. and east of Taylor St.
    - 16-inch diameter well installed at a depth of 150 feet
    - 5-inch observation well installed at a depth of 400 ft
    - 30 feet of 6-inch water main
    - Submersible pump with a 30-HP motor
    - Concrete pad and stainless-steel enclosure

- Well 25-25 – New offset well located south of Douglas Ave. and east of Benjamin Dr.
    - 16-inch diameter well installed at a depth of 150 feet
    - 5-inch observation well installed at a depth of 400 ft

- 30 feet of 6-inch water main
- Submersible pump with a 30-HP motor
- Concrete pad and stainless-steel enclosure

Project 2A: Chemical Feed System at Wise Road WCP

Alternative 2A, the use of ammonium hydroxide (19.5%) as a replacement for anhydrous ammonia disinfection at the Wise Road WCP is the selected alternative. The current anhydrous ammonia disinfection system is nearing the end of its useful life. This, combined with the potential hazards associated with using a gas disinfection system, led the BWL to pursue replacing the current chemical system for a new disinfection method which offers material handling and safety benefits. Though the capital cost associated with this alternative are higher than Alternative 2B, these costs are offset by the lower annual chemical cost incurred with the use of ammonium hydroxide (19.5%).

This alternative will include the following:

- Two, 785-gallon storage tanks
- One day tank
- Chemical metering pumps
- Secondary containment for pumps
- Construction of new walls to separate storage and feed area from the rest of the facility.

Project 3A: Filter Press Service Pipes at Dye WCP

Alternative 3A, replacement of the two, 8-inch steel sludge pipes at the Dye WCP, with two 8-inch carbon steel pipes is the selected alternative. Each of the two filter presses used to dewater sludge from the sludge consolidation area receives the sludge through 8-inch steel pipes. These pipes have exceeded their useful life and are in very poor condition. Project 3A includes the replacement of both 8-inch steel sludge pipes with new 8-inch carbon steel pipes. This alternative is the less expensive alternative. This alternative will include the following:

- 520 linear feet of 8-inch diameter carbon steel pipe

Project 4B: Cedar Pump 4 at Dye WCP

Alternative 4B, replacement of Cedar Pump 4 and installation of a VFD is the selected alternative for this project. Cedar Pump 4 is a 15 MGD pump installed in 1953 at the Dye WCP. At over 70 years old, it has surpassed its useful life and has been out of service for several years. This alternative will replace the pump with a new 150 HP pump. This alternative will also install a 150 HP VFD to achieve a pump capacity of 3.5 to 8 MGD, that can be used in conjunction with the elevated storage tank at the WCP. This alternative is the less expensive alternative. This alternative will include the following:

- Installation of a new 150 HP pump with capacity range of 3.5 to 8 MGD.
- Installation of a 150 HP VFD

Project 5: North Reservoir at Dye WCP

This project will refurbish North Reservoir at Dye WCP. The North Reservoir was constructed in 1918 and is in need of a full refurbishment in order to continue to reliably supply water to its customers. No alternative was considered due to site specific space constraints at the WCP. Additionally, Dye WCP would not be able to maintain service to its customers if the North Reservoir was removed to make way for a new one in the existing footprint. This project will include the following:

- Interior spall repair
- Interior piping repainting
- Exterior membrane repair
- Overflow pipe modification
- Fall prevention devices
- Seal sidewall penetrations

Project 6B: Sunset Looping

Alternative 6B, installation of 1,100 linear feet of 12-inch water main using directional drilling technique is the selected alternative. The project will provide a redundant water main feed to the industrial corridor at the south end of Sunset Ave. This looping project will connect the water main on the south side of the Grand River in Sunset Ave. to the water main on the north side of the Grand River at Tecumseh River Road. Full directional drilling installation is the selected technique for this project due to the proximity of several Part 201 environmental contaminated sites. This method of installation and material will minimize exposure to potential contaminants as well as reduce pipe failure due to a reaction with the pipe material. Specialized gaskets designed to withstand groundwater contamination at water main joints will be proposed in this area to help prevent contaminants from entering the system. Additionally, this project includes water main installation in a wetlands and floodplain area near the Grand River. Installation via directional drilling is the preferred method in these areas as it is the least disruptive to the wetland habitats. This alternative will include the following:

- 1,100 linear feet of 12-inch ductile iron water main installed from Sunset Ave. and Melvin under the Grand River to Tecumseh River Rd. east of Westbury Rd.

Project 7A: Bath Looping

Alternative 7A, installation of 2,200 linear feet of 12-inch water main using open cut in Webster Road with directional drilling technique at the highway crossing is the selected alternative. This alternative is the more economical alternative. It will provide a redundant water main feed to customers north of I-69 in Bath Township. This looping project will connect the water main in Timothy Lane on the south side of I-69 to the water main in Webster Rd. on the north side of I-69. This alternative will include the following:

- 2,200 linear feet of 12-inch ductile iron water main installed in Webster Rd. from Timothy Lane to the I-69 ramp north of the highway.

Project 8A: CSO 019 Water Main Replacement

Alternative 8A, replacement of 7,588 linear feet of water main using open cut technique, is the selected alternative. This project will be completed in conjunction with the City of Lansing's CSO program. The CSO work involves opening the roadway and will require road restoration so replacing the water main via open cut in this area where road restoration will already be needed is an efficient use of resources. This alternative is also the less expensive option. This project will replace water main installed prior to 1938 that has not only surpassed the useful life but has heavy tuberculation. This alternative will include the following:

- Replacement of 2,000 linear feet of 12-inch water main with 2,000 linear feet of ductile iron 12-inch water main installed in the area east of Pine St., west of Grand Ave., north of Lapeer St. and south of W. Maple St.
- Replacement of 5,588 linear feet of 8-inch water main with 5,588 linear feet of 8-inch ductile iron water main installed in the area east of Pine St., west of Grand Ave, north of Lapeer St. and south of W. Maple St.

Project 9A: Pennsylvania Water Main Replacement

Alternative 9A, replacement of 3,015 linear feet of 12-inch water main using open cut technique with directional drilling 12-inch water main in areas of construction within the 100-year floodplain is the selected alternative. This project will replace water main installed prior to 1938 and has surpassed its useful life. It will be completed in conjunction with the City of Lansing's road reconstruction project. Replacing the water main via open cut in an area where road restoration is already needed is an efficient use of resources. Utilizing directional drilling within the 100-year floodplain will minimize environmental impacts during construction. This alternative is the less expensive alternative and will include the following:

- Replacement of 3,015 linear feet of 12-inch water main with 3,015 linear feet of 12-inch ductile iron water main installed in Pennsylvania Ave. from Mt. Hope to Fayette.

Project 10A: Mt. Hope Water Main Replacement

Alternative 10A, replacement of 2,750 linear feet of 24-inch water main using open cut and 1,250 linear feet of 24-inch water main using directional drilling technique within the 100-year floodplain area is the selected alternative. This project will replace water main installed prior to 1920 and has surpassed its useful life. It will be completed in conjunction with the City of Lansing's road reconstruction project. Replacing the water main via open cut in an area where road restoration is already needed is an efficient use of resources. Utilizing directional drilling in areas within the 100-year floodplain will reduce the risk of environmental impacts during construction. This alternative is the less expensive alternative and will include the following:

- Replacement of 4,000 linear feet of 12-inch water main with 1,750 linear feet of 24-inch ductile iron water main utilizing open cut techniques and 1,250 linear feet of 24-inch water main utilizing directional drilling technique, installed in Mt. Hope Ave. from Pennsylvania Ave. to Aurelius Rd.

FY2026 – Projects

Project 11. Well Installation – FY2026-FY2029

Alternative 11, well installation is the only alternative for this project. BWL is faced with the challenge of aging infrastructure. Approximately 60% of the wells that service the system were drilled over 65 years ago. Many wells in service today are at or beyond the expected useful life. BWL will be installing new or offset wells at a rate of three wells per year for the next five years to proactively replace older wells to maintain reliable water service to its customers. Project 11 includes the installation of three wells per year for FY 2026 through 2029.

Project 12: Secondary Basin 1&2 at Dye WCP

This project will refurbish Secondary Basin 1 and 2 at Dye WCP. The secondary basins were installed in 1990 and though the tanks have more useful life, the mechanical parts are now over 20 years old, have exceeded the useful life and are in need of repair or replacement. No alternative was considered for this project due to site-specific space constraints at the WCP. Additionally, Dye WCP would not be able to maintain service to its customers if the basins were removed to make way for new ones in the existing footprint. This project will include the following:

- Chain and flight equipment
- Sprocket motion monitoring
- Gritshield® collector and drive chain protector
- Ball detent torque limiters

Project 13. Radios for Wells

Alternative 13, replacement of the radios at all 124 production wells in the BWL system is the only alternative for this project. The current radios are outdated and no longer offer reliable communications. This project will replace all 124 radios. This alternative will include the following:

- Replacement of 124 radios at BWL production well locations.

Project 14A. State Secondary Complex Consolidation

Alternative 14A, installation of 6,800 linear feet of 16-inch diameter pipe using open cut technique and 700 linear feet of 16-inch diameter pipe using directional drilling at the railroad crossing and known contaminated soil sites is the selected alternative. This project will provide a redundant water service to the State Secondary Complex campus to reduce the risk of service

failures and loss of service in the event of an emergency. Additionally, the consolidation of the State Secondary Complex will allow a supplementary connection to the Windsor Township water system, which is currently a single feed. This alternative is the more cost-effective alternative. This alternative will include the following:

- 6,800 linear feet of 16-inch diameter water main installed using open cut technique and 700 linear feet of 16-inch diameter water main installed using directional drilling technique in N. Canal Rd from Billwood Highway to I-96.

Project 15A. Windsor Estates Mobile Home Park Consolidation

Alternative 15A, installation of 2,400 linear feet of 12-inch diameter pipe using open cut technique with 600 linear feet of 12-inch diameter pipe using directional drilling at the wetland area is the selected alternative. This project will provide a connection from the BWL system to the Windsor Estates Mobile Home Park's current system. This alternative is the more cost-effective alternative. This alternative will include the following:

- 2,400 linear feet of 12-inch diameter water main installed in Canal Road south of Billwood Highway.

- 600 linear feet of 12-inch diameter water main installed using directional drilling in the wetlands area east of Canal Rd., south of Billwood Highway.

Project 16A. CSO 026 Water Main Replacement

Alternative 16A: Replacement and upsizing of 14,650 linear feet of 8-inch diameter pipe, 675 linear feet of 12-inch diameter pipe, 250 linear feet of 14-inch diameter pipe using open cut technique and 450 linear feet of 8-inch diameter pipe using directional drilling in areas of known contaminated soil sites is the selected alternative. This project will replace water main within the CSO 026 area. Water main in this area was installed between 1909 and 1931 and has surpassed its useful life. This project will be completed in coordination with the City's CSO program. Completion of this project will increase the reliability and water quality in the area. Replacing the water main via open cut in an area where road restoration is already needed is an efficient use of resources. Utilizing directional drilling in areas of known soil contamination will mitigate the risk of spreading contamination during construction. This alternative is the less expensive alternative and will include the following:

- Replacement of 14,650 linear feet of 8-inch water main with 14,650 linear feet of 8-inch diameter water main installed using open cut technique in the areas south of I-496, east of S. Pennsylvania, west of Shepard and north of Perkins.

- Replacement of 450 linear feet of 8-inch water main with 450 linear feet of 8-inch diameter water main install using directional drill technique in the area of known contaminated soil sites.

- Replacement of 675 linear feet of 12-inch diameter water main with 675 linear feet of 12-inch diameter water main installed using open cut technique in the areas south the I-496, east of S. Pennsylvania, west of Shepard and north of Perkins.

- Replacement of 250 linear feet of 14-inch diameter water main with 250 linear feet of 14-inch diameter water main installed using open cut technique in the areas south the I-496, east of S. Pennsylvania, west of Shepard and north of Perkins.

FY2027 – Projects

Project 17. South Reservoir at Dye WCP

This project will refurbish the South Reservoir located at the Dye WCP. The South Reservoir was originally constructed in 1918 and requires consistent structural maintenance to ensure the reliability of the WCP. No alternative was considered due to site specific space constraints at the WCP. Additionally, Dye WCP would not be able to maintain service to its customers if the South Reservoir was removed to make way for a new one in the existing footprint. This project will include the following:

- Interior spall repair
- Interior piping repainting
- Exterior membrane repair
- Exterior spall repair
- Overflow pipe modification
- Fall prevention devices
- Exterior crack repair

Project 18. Dye WCP Filter Media Replacement

Alternative 18, replacement of the filter media at Dye WCP with GAC is the only alternative. This project will replace the sand filter media at the Dye WCP with a media that can protect the potable drinking water from emerging contaminants such as PFAS. The current sand filter media has served its useful life and does not provide the same protections as GAC. This project will include the following:

- Replacement sand filter media with GAC at the Dye WCP.

Project 19. Wise Road WCP Filter Media Replacement

Alternative 19, replacement of the filter media at Wise Road WCP with GAC is the only alternative. This project will replace the sand filter media at the Wise Road WCP with a media that can protect the potable drinking water from emerging contaminants such PFAS. The current sand filter media has served its useful life and does not provide the same protections as GAC. This project will include the following:

- Replacement sand filter media with GAC at the Wise Road WCP.

Project 20. Abel Pumps No. 3&4 at Dye WCP

Alternative 20, replacement of Abel Pumps No. 3 and 4 and installation of VFDs at Dye WCP is the only alternative for this project. Abel Pumps No. 3 and No. 4 are filter press pumps installed in 2004. At over 20 years old, they have surpassed their useful life and are in need or replacement. This alternative will replace the pumps in kind with two new pumps. This alternative will also install two VFDs to work in conjunction with Pumps No. 3 and 4. This alternative will include the following:

- Installation of two new filter press pumps at Dye WCP
- Installation of two new VFDs at Dye WCP

Project 21A. Grand Pointe Subdivision Consolidation

Alternative 21A, installation of 5,085 linear feet of 8-inch diameter pipe using open cut technique is the selected alternative. This project will install water main to connect the Grand Pointe Subdivision to the BWL system. This connection between the systems will provide redundancy to the area. This alternative is the more cost-effective alternative. This alternative will include the following:

- 5,085 linear feet of 8-inch diameter pipe installed in the area north of the Grand River, east of Creyts Rd and south of Carol Ln.

Project 22A. CSO 022 Water Main Replacement

Alternative 22A, replacement of 11,950 linear feet of 8-inch diameter pipe, 2,040 linear feet of 12-inch diameter pipe, 1,450 linear feet of 14-inch diameter pipe and 4,125 linear feet of 16-inch diameter pipe using open cut technique and 1,550 linear feet of 8-inch diameter pipe and 560 linear feet of 12-inch diameter pipe using directional drilling technique in areas of known contaminated soil sites is the selected alternative. This project will replace water main within the CSO 022 area. Water main in this area was installed between 1888 and 1939 and has surpassed its useful life. This project will be completed in coordination with the City's CSO program. Completion of this project will increase the reliability and water quality in the area. Replacing the water main via open cut in an area where road restoration is already needed is an efficient use of resources. Utilizing directional drilling in areas of known soil contamination will mitigate the threat of contamination spread during construction. This alternative is the less expensive alternative and will include the following:

- Replacement of 11,950 linear feet of 8-inch diameter water main with 11,950 linear feet of 8-inch diameter water main installed using open cut technique in the area south of Genesee St., north of I-496, east Jenison Ave. and west of N. Grand Ave.

- Replacement of 1,550 linear feet of 8-inch water main with 1,550 linear feet of 8-inch diameter water main install using directional drill technique along N. Pine St., Martin Luther King Blvd., W. Allegan St., W. Washtenaw St., and S. Butler Blvd.

- Replacement. of 2,040 linear feet of 12-inch diameter water main with 2,040 linear feet of 12-inch diameter water main installed using open cut technique in the area south of Genesee St., north of I-496, east of Jenison Ave. and west of N. Grand Ave.

- Replacement of 560 linear feet of 12-inch water main with 560 linear feet of 12-inch diameter water main installed using directional drill technique along Grand Ave.

- Replacement of 1,450 linear feet of 14-inch diameter water main with 1,450 linear feet of 14-inch diameter water main installed using open cut technique in the area south of Genesee St., north of I-496, east of Jenison Ave. and west of N. Grand Ave.

- Replacement of 4,125 linear feet of 16-inch diameter water main with 4,125 linear feet of 16-inch diameter water main installed using open cut technique in the area south of Genesee St., north of I-496, east of Jenison Ave. and west of N. Grand Ave.

Project 23A. Landel System Replacement, Grossbeck Area

Alternative 23A replacement of 17,990 linear feet of 8-inch diameter pipe using open cut technique and 150 linear feet of 8-inch diameter pipe using directional drill technique in the area of known contaminated soil sites is the selected alternative. This project will replace water main within the Grossbeck area. Historically, this area experiences above average water main breaks per linear feet of pipe with approximately 250 water main breaks per 100 miles of pipe annually. Completion of this project will increase the reliability and water quality in the area. This alternative is the less expensive alternative and will include the following:

- Replacement of 17,990 linear feet of 8-inch diameter water main with 17,990 linear feet of 8-inch diameter water main installed using open cut technique in the area north of E. Grand River, south of Ridgeline Dr., east of Woods St. and west of US 127.

- Replacement of 150 linear feet of 8-inch diameter water main with 150 linear feet of 8-inch diameter water main installed using directional drilling technique in the area of N. Foster Ave.

FY2028 – Projects

Project 24A. CSO Kalamazoo Street and N. Pine Street Water Main Replacement

Alternative 24A, replacement of 1,900 linear feet of 8-inch diameter pipe using open cut technique is the selected alternative. This project will replace water main within the City of Lansing's CSO Kalamazoo Street and N. Pine Street project area that was installed in 1890 and has surpassed its useful life. Completion of this project will increase the reliability and water quality in the area. This project will be completed in coordination with the City's CSO program. Replacing

the water main via open cut in an area where road restoration is already needed is an efficient use of resources. This alternative is the less expensive alternative and will include the following:

- Replacement of 1,900 linear feet of 8-inch diameter water main with 1,900 linear feet of 8-inch diameter water main installed on Washtenaw from Pine to S. Walnut and on N. Pine from W. Kalamazoo St. to W. Allegan St.

Project 25A. CSO Cherry Street Water Main Replacement

Alternative 25A replacement of 1,400 linear feet of 8-inch diameter pipe and 320 linear feet of 24-inch diameter pipe using open cut technique and 900 linear feet of 8-inch diameter pipe using directional drilling technique in the area of known contaminated soil sites is the selected alternative. This project will replace water main within the City of Lansing's CSO Cherry Street project area. The water main in this area was installed between 1890 and 1950 and has surpassed its useful life. Completion of this project will increase the reliability and water quality in the area. This project will be completed in coordination with the City's CSO program. Replacing the water main via open cut in an area where road restoration is already needed is an efficient use of resources. Performing directional drill in areas of known contaminated soils will mitigate the threat of contamination spread during construction into the adjacent 100-year floodplain. This alternative is the less expensive alternative and will include the following:

- Replacement of 1,400 linear feet of 8-inch diameter water main with 1,400 linear feet of 8-inch diameter water main installed using the open cut technique in the area south of Kalamazoo St., north of I-496, east of S. Grand River Ave. and west of the Grand River.
- Replacement of 900 linear feet of 8-inch diameter water main with 900 linear feet of 8-inch diameter water main using directional drilling technique along Cherry Street in areas of known soil contamination sites.
- Replacement of 320 linear feet of 24-inch diameter water main with 320 linear feet of 24-inch diameter water main installed using open cut technique in the area south of Kalamazoo St., north of I-496, east of S. Grand River Ave. and west of the Grand River.

FY2029 – Projects

Project 26. Second Elevated Storage Tank

Alternative 26, elevated tank installation is the only alternative for this project. This project will install a second elevated storage tank to provide hydraulic advantages to the system and reduce the need for the BWL to rely on backup generators and pumps to supply pressure during a power outage. Two sites will be evaluated for the location of this tank, the area west of Aurelius Road, north of I-96 and the area west of Cedar St, north of I-96 along American Road. This alternative will include the following:

- Installation of a new 2.5-million -gallon tank west of Aurelius Road north of I-96, or west of Cedar St, north of I-96 along American Road.

Project 27. Wise Road WCP Plant Optimization

Alternative 27, completing optimizations at the Wise Road WCP is the only alternative for this project. This project will include implementing optimization opportunities identified in a 2023 study completed for the BWL. By installing Lamella plates in the sedimentation basins at the WCP, the capacity of the sedimentation processes will be enhanced while maintaining the same footprint. This alternative will include the following:

- Installation of Lamella plates in the sedimentation basins at Wise Road WCP.

Project 28A. Master Meter Installation

Alternative 28A, installation of five non-invasive master meters within the BWL system is the selected alternative. This project will install meters on the distribution line to DeWitt Township, on the distribution line to Bath Township, at the Shubel pressure reducing valve, at the Aurelius Booster Station and at the Eifert Booster Station. These meters will be connected to BWL's SCADA system to track flows and create historical data. This alternative has the same cost as the alternative but is the more desirable alternative as it installs non-invasive meters. This alternative will include the following:

- Installation of a non-invasive master meter on the distribution line to DeWitt Township.
- Installation of a non-invasive master meter on the distribution line to Bath Township.
- Installation of a non-invasive master meter at the Shubel pressure reducing valve.
- Installation of a non-invasive master meter at the Aurelius Booster Station.
- Installation of a non-invasive master meter at the Eifert Booster Station.

Project 29A. CSO 008 Water Main Replacement

Alternative 29A, replacement of 16,950 linear feet of 8-inch diameter pipe, 2,975 linear feet of 12-inch diameter pipe, 10 linear feet of 16-inch diameter pipe and 50 linear feet of 20-inch diameter pipe using open cut technique and 1,700 linear feet of 12-inch diameter pipe using directional drilling technique in the area of known contaminated soil sites is the selected alternative. This project will replace water main within the CSO 008 area. Water main in this area was installed between 1920 and 1968 and has surpassed its useful life. This project will be completed in coordination with the City's CSO program. Completion of this project will increase the reliability and water quality in the area. Replacing the water main via open cut in an area where road restoration is already needed is an efficient use of resources. Utilizing directional drilling technique to install water main in areas of known contaminated soils will mitigate the threat of contamination spread. This alternative is the less expensive alternative and will include the following:

- Replacement of 16,950 linear feet of 8-inch diameter water main with 16,950 linear feet of 8-inch diameter water main installed using open cut technique in the area south of Bassett Ave., north of Michigan Ave, east of Westfield Rd. and west of West Moreland Ave.

- Replacement of 2,975 linear feet of 12-inch diameter water main with 2,975 linear feet of 12-inch diameter water main installed using open cut technique in the area south of Bassett Ave., north of Michigan Ave., east of Westfield Rd. and west of West Moreland Ave.
- Replacement of 1,700 linear feet of 12-inch diameter water main with 1,700 linear feet of 12-inch diameter water main installed using direction drill technique in the area of Canal St.
- Replacement of 10 linear feet of 16-inch diameter water main with 10 linear feet of 16-inch diameter water main installed using open cut technique in the area south of Bassett Ave., north of Michigan Ave., east of Westfield Rd. and west of West Moreland Ave.
- Replacement of 50 linear feet of 20-inch diameter water main with 50 linear feet of 20-inch diameter water main installed using open cut technique the area south of Bassett Ave., north of Michigan Ave., east of Westfield Rd. and west of West Moreland Ave.

Project 30A. Landel System Replacement, Howard Street and Vine Street

Alternative 30A replacement and right sizing of 2,820 linear feet of 6-inch diameter pipe with 8-inch diameter pipe using open cut technique and 330 linear feet of 6-inch diameter pipe with 8-inch diameter pipe using directional drilling technique in the area of known contaminated soil sites is the selected alternative. This project would replace and upsize water mains within the Howard Street and Vine Street area. Historically, this area experiences above average water main breaks per linear feet of pipe with approximately 250 water main breaks per 100 miles of pipe annually. Completion of this project will increase the reliability and water quality in the area. This alternative is the less expensive alternative and will include the following:

- Replacement of 2,820 linear feet of 6-inch diameter water main with 2,820 linear feet of 8-inch diameter water main using open cut technique in Vine St. from N. Clippert St. to Howard and in Howard from Vine to E. Saginaw, and then in E. Saginaw from Howard to Newton Ave.
- Replacement of 330 linear feet of 6-inch diameter water main with 330 linear feet of 8-inch diameter water main using directional drilling technique on Vine St.

A. DESIGN PARAMETERS

The location of the new and offset wells for FY 2025 are shown in Figure 12 and Figure 17. The locations of wells to be installed in FY 2026 through FY2029 will be identified as part of the BWL's feability study. The wells will be constructed to create redundency and to replace wells that are past their useful life.

The location of the Dye WCP improvements (Projects 3, 4, 5, 12, 17, 18, and 20) are shown in Figure 15. The replacement and refurbishment projects are discribed in the previous section.

The location of the Wise Road WCP improvements (Project 2, 19 and 27) are shown in Figure 20 and are described in the previous section.

A list of water mains to be installed and those being replaced with the proposed diameter, along with details of the existing size and condition, is included in the previous section and shown in Figure 10 and Figure 13 throug Figure 18. A detailed break history can be found in the BWL's 2021 Water Reliability Study found in Appendix C. The selected material for water main installation and replacement will be ductile iron DI-CL-54 pipe with ductile iron valves, hydrants, fittings and other appurtenances.

The following types of problems will be addressed by these projects:

- Aging source water infrastructure by constructing new and offset wells to maintain the firm capacity of the BWL's source water system.
- Aging WCP facilities by refurbishing and compeleting recommended improvements at both Dye and Wise Road WCP.
- Aging chemical feed system at Wise Road WCP by replacing it with an alternate disinfection system to improve safety.
- Dead-end water mains will be connected and looped to the nearby existing water mains.
- Water mains that have surpassed their useful life will be replaced.
- Water mains that have a history of breakage will be replaced.
- The reliance on backup generators for distribution will be reduced with the installation of an elevated storage tank.
- Three communities will be connected with the BWL system to improve reliability and water quality to these customers.
- Communication and data collection will be improved with new radios at the wells and new meters within the distribution system.

Applicable EGLE procedures, Ten States Standards, as well as local ordinances shall be strictly adhered to during design and construction.

B. USEFUL LIFE

The weighted useful life for the selected projects was calculated to be 34.8 years. The useful life for each asset included in the cost opinions were determined based on the values provided in the DWSRF Project Planning Document Preparation Guidance and Professional Engineer's opinion. Table 21 includes the useful life that was assumed for each asset included in the cost opinions and present worth analysis.

Table 21 - Useful Life of Assets

Asset	Useful Life (Years)
Water Main	50
Fire Hydrant	30
Gate Valve and Well	30
Water Service	50
Well	50
Chemical Feed System	20
Pump	20
Storage Tanks	30
Pump Station Structure	30
Auxiliary Equipment	20

C. WATER AND ENERGY EFFICIENCY

Energy is needed to extract raw water from wells and convey, treat, store and distribute safe drinking water to the customers. Aging distribution systems, most of which are prone to water main breaks, allow extracted and treated drinking water to escape the distribution system thereby decreasing its energy efficiency. By protecting, replacing, and maintaining aging wells, WCP facilities and water mains, as well as eliminating water main dead-ends, the likelihood of plant failures, well failures and main breaks is decreased, thus saving energy and water, and increasing the efficiency of the system.

D. SCHEDULE FOR DESIGN AND CONSTRUCTION

The BWL is requesting consideration for fourth quarter funding under EGLE's DWSRF program. The proposed design and construction schedule is summarized in Table 22.

Table 22 - Design and Construction Schedule

Task	Submittal Date
Draft Design Documents Submittal to EGLE	March 15, 2025
Environmental Assessments Published No Later Than	April 23, 2025
Part I and Part II Application	May 14, 2025
Final Documents Submittal to EGLE	May 1, 2025
Finding of No Significant Impacts Clearance; Plans & Specs Approved	May 23, 2025
Bid Ad Published No Later Than	May 23, 2025
Part III of Application; Bid Data Submittal (With Tentative Contract Award)	July 7, 2025

Task	Submittal Date
EGLE Order of Approval Issued	August 6, 2025
Borrower's Pre-Closing with the MFA	August 20, 2025
MFA Closing	August 28, 2025
Notice to Proceed Issued	October 27, 2025
Construction Completed	**December 31, 2029**

E. COST SUMMARY

A summary of the cost by project is presented for each fiscal year in Table 2324 through Table 2728.

Table 23 - Summary of Costs by project for FY2025

Category	Cost
Project 1- Well Installation	$2,750,000
Project 2A - Chemical Feed System	$450,000
Project 2A - Chemical Costs	$175,000
Project 3A - Filter Press Service Pipes	$170,000
Project 4B - Cedar Pump 4	$470,000
Project 5 - North Reservoir	$180,000
Project 6B - Sunset Looping	$1,220,000
Project 7A - Bath Looping	$1,910,000
Project 8A - CSO 019 Water Main Replacement	$5,370,000
Project 9A - Pennsylvania Water Main Replacement	$2,750,000
Project 10A - Mt. Hope Water Main Replacement	$5,830,000
Total Project	**$21,275,000**

Table 24 - Summary of Costs by project for FY2026

Category	Cost
Project 11 - Well Installation – FY2026	$2,860,000
Project 12 - Secondary Basin 1&2	$1,680,000
Project 13 - Radios for Wells	$5,580,000
Project 14A - State Secondary Complex Consolidation	$8,710,000
Project 15A - Windsor Estates Mobile Home Park Consolidation	$2,530,000
Project 16A - CSO 026 Water Main Replacement	$11,880,000
Total Project	**$33,240,000**

Table 25 - Summary of Costs by project for FY2027

Category	Cost
Project 11 – Well Installation – FY2027	$2,970,000
Project 17 - South Reservoir at Dye WCP	$410,000
Project 18 - Dye WCP Filter Media Replacement	$1,670,000
Project 19 – Wise Road WCP Filter Media Replacement	$1,670,000
Project 20 - Abel Pumps No. 3&4 at Dye WCP	$2,970,000
Project 21A - Grand Pointe Subdivision Consolidation	$3,720,000
Project 22A - CSO 022 Water Main Replacement	$20,520,000
Project 23A - Landel System Replacement, Grossbeck Area	$13,940,000
Total Project	**$47,870,000**

Table 26 - Summary of Costs by project for FY2028

Category	Cost
Project 11 – Well Installation – FY2028	$3,090,000
Project 24A - CSO Kalamazoo Street and N Pine Street	$1,710,000
Project 25A - CSO Cherry Street Water Main Replacement	$3,390,000
Total Project	**$8,190,000**

Table 27 - Summary of Costs by project for FY2029

Category	Cost
Project 11 – Well Installation – FY2029	$3,220,000
Project 26 - Second Elevated Storage Tank	$34,150,000
Project 27 - Wise Road WCP Plant Optimization	$7,690,000
Project 28A - Master Meter Installation	$150,000
Project 29A - CSO 008 Water Main Replacement	$18,610,000
Project 30A - Landel System Replacement, Howard Street and Vine	$3,280,000
Total Project	**$67,100,000**

User costs have been evaluated and an analysis is provided for each fiscal year in Table 28 through Table 32. Loan repayment will be through an adjustment to current user rates.

Table 28 – FY2025 User Cost Analysis

Project Area Name	Initial Capital Investment	Annual Debt Retirement (20 yrs. @ 2.75% interest)	Annual Cost per REU*	Monthly Cost per REU*
Project 1 - Well Installation	$2,750,000	$180,600	$2.01	$0.17
Project 2A- Chemical Feed System	$450,000	$29,600	$0.33	$0.03
Project 2A Chemical Costs	$175,000	$11,500	$0.13	$0.02
Project 3A - Filter Press Service Pipes	$170,000	$11,200	$0.12	$0.01
Project 4B - Cedar Pump 4	$470,000	$30,900	$0.34	$0.03
Project 5 - North Reservoir	$180,000	$11,900	$0.13	$0.01
Project 6B - Sunset Looping	$1,220,000	$80,200	$0.89	$0.07
Project 7A- Bath Looping	$1,910,000	$125,500	$1.39	$0.12
Project 8A - CSO 019 Water Main Replacement	$5,370,000	$352,700	$3.92	$0.33
Project 9A - Pennsylvania Water Main Replacement	$2,750,000	$180,600	$2.01	$0.17
Project 10A - Mt. Hope Water Main Replacement	$5,830,000	$382,900	$4.25	$0.35
Total Project Cost	**$21,275,000**	**$1,397,600**	**$15.52**	**$1.31**

** REU – Residential Equivalency Units (90,061 total) (Source: Determined using meter size; BWL provided)*

Table 29 - FY2026 User Cost Analysis

Project Area Name	Initial Capital Investment	Annual Debt Retirement (20 yrs. @ 2.75% interest)	Annual Cost per REU	Monthly Cost per REU
Project 11 – Well Installation FY2026	$2,860,000	$187,800	$2.09	$0.17
Project 12 - Secondary Basin 1&2	$1,680,000	$110,400	$1.23	$0.10
Project 13 - Radios for Wells	$5,580,000	$366,500	$4.07	$0.34
Project 14A - State Secondary Complex Consolidation	$8,710,000	$572,100	$6.35	$0.53
Project 15A - Windsor Estates Mobile Home Park Consolidation	$2,530,000	$166,200	$1.85	$0.15
Project 16A - CSO 026 Water Main Replacement	$11,880,000	$780,200	$8.66	$0.72
Total Project Cost	**$33,240,000**	**$2,183,200**	**$24.25**	**$2.01**

Table 30 - FY2027 User Cost Analysis

Project Area Name	Initial Capital Investment	Annual Debt Retirement (20 yrs. @ 2.75% interest)	Annual Cost per REU	Monthly Cost per REU
Project 11 – Well Installation – FY2027	$2,970,000	$195,100	$2.17	$0.18
Project 17 - South Reservoir at Dye WCP	$410,000	$27,000	$0.30	$0.02
Project 18- Dye WCP Filter Media Replacement	$1,670,000	$109,700	$1.22	$0.10

Project Area Name	Initial Capital Investment	Annual Debt Retirement (20 yrs. @ 2.75% interest)	Annual Cost per REU	Monthly Cost per REU
Project 19 – Wise Road WCP Filter Media Replacement	$1,670,000	$109,700	$1.22	$0.10
Project 20 - Abel Pumps No. 3&4 at Dye WCP	$2,970,000	$195,100	$2.17	$0.18
Project 21A - Grand Pointe Subdivision Consolidation	$3,720,000	$244,300	$2.71	$0.23
Project 22A - CSO 022 Water Main Replacement	$20,520,000	$1,347,600	$14.96	$1.25
Project 23A - Landel System Replacement, Grossbeck Area	$13,940,000	$915,500	$10.17	$0.85
Total Project Cost	**$47,870,000**	**$3,144,000**	**$34.92**	**$2.91**

Table 31 - FY2028 User Cost Analysis

Project Area Name	Initial Capital Investment	Annual Debt Retirement (20 yrs. @ 2.75% interest)	Annual Cost per REU	Monthly Cost per REU
Project 11 – Well Installation – FY2028	$3,090,000	$203,000	$2.25	$0.19
Project 24A - CSO Kalamazoo Street and N Pine Street	$1,710,000	$112,300	$1.25	$0.10
Project 25A - CSO Cherry Street Water Main Replacement	$3,390,000	$222,700	$2.47	$0.21
Total Project Cost	**$8,190,000**	**$538,000**	**$5.97**	**$0.50**

Table 32 - FY2029 User Cost Analysis

Project Area Name	Initial Capital Investment	Annual Debt Retirement (20 yrs. @ 2.75% interest)	Annual Cost per REU	Monthly Cost per REU
Project 11 – Well Installation – FY2029	$3,220,000	$211,500	$2.35	$0.20
Project 26 - Second Elevated Storage Tank	$34,150,000	$2,242,700	$24.90	$2.08
Project 27 - Wise Road WCP Plant Optimization	$7,690,000	$505,100	$5.61	$0.47
Project 28A - Master Meter Installation	$150,000	$9,900	$0.11	$0.01
Project 29A - CSO 008 Water Main Replacement	$18,610,000	$1,222,200	$13.57	$1.13
Project 30A - Landel System Replacement, Howard Street and Vine	$3,280,000	$215,500	$2.39	$0.20
Total Project Cost	**$67,100,000**	**$4,406,900**	**$48.93**	**$4.09**

F. IMPLEMENTABILITY

The selected alternatives will be implemented by the BWL. All work will be done within the BWL service area and will be coordinated with all local jurusdictions. The BWL has the legal, institutional, technical, financial and managerial capacity to implement the projects. All work will be performed in road right-of-ways, utility easements, or on property owned by the BWL except for Sunset Looping (Project 7B) which will extend under the Grand River and Bath Looping (Project 8A) which will extend under I-69, and State Secondary Complex which is on property owned by the state of Michigan.

VI. ENVIRONMENTAL AND PUBLIC HEALTH IMPACTS

Adoption of these alternatives would protect the public health through protecting the integrity of the facilities at the water conditioning plants. It would improve the reliability of the source water and distribution system by replacing aging wells and water mains, addressing the occurrence of water main breaks, minimizing disruption of water service, and maintaining compliance with drinking water regulations. It would also, decrease reliance on backup generators by installing a second elevated storage tank within the system. In addition, public health would be protected by looping dead-end water mains, thereby reducing chlorine degradation in these areas. Consolidation projects will also improve public health in the connected communities by providing a redundant feed for looping connections to the BWL system.

A. DIRECT IMPACTS

1. Construction Impacts

Water Conditioning Plant Improvements

No construction impacts are expected from the work performed at either of the Water Conditioning Plants. Work at the WCPs will be inside the buildings or on the site, inside of an existing tank or in previously disturbed areas in or near existing tanks.

Water Main Replacements, Looping and Well Installation

New water mains will replace existing water mains in all proposed projects except Projects 6 and 7 where new looping mains will be installed and Projects 14, 15 and 21, where new connection mains will be installed. All water mains will be installed using either directional drilling or open cut techniques. In project areas in the vicinity of wetland, floodplains or potential contaminants, directional drilling will be used, as this technique minimizes the amount of necessary earth work, preserving the surrounding environment along the length of the project and minimizing the risk of exposure to potential contaminants. Impacts to the environment would be low, with standard construction practices and proper mitigation of impact to be observed and included in construction contracts. In areas where open cut installation will be used, the same standards shall be applied. Construction work at the site could result in dust, noise, and traffic disruptions. The existing water main would continue to be in service while the new water mains are installed. However, short term service disruption may occur when connection of the replacement main to the existing main is performed. Any disruption would be properly planned and coordinated with customers to minimize public impact.

Coordination with local city and county enforcement agencies and EGLE will be required to obtain the necessary permits. Sunset Looping, CSO 022, Pennsylvania, Mt. Hope, Howard and Vine, Grand Point Subdivision and Windsor Estates projects are all partly located in the existing wetlands or hydric soil area or is contained within the 100-year floodplain. Permits from EGLE

will be necessary. Upon receipt of funding, during design, the necessary permits for all project areas will be identified and obtained.

Note that some of the water main projects may be located near historic markers in the BWL service area. As work will be performed in the right-of-ways, no negative impact to the historical properties is anticipated. Upon receipt of funding, further investigation will be needed and a SHPO Part 106 application will be completed if necessary. Normal construction activities have the potential to produce noise and dust. Work hours and construction noise will be required to meet local ordinance requirements. Work will be required to comply with the State's Soil Erosion and Sedimentation Control requirements.

2. Operational Impacts

Water Conditioning Plant Improvements

Staging the construction will occur such that water entering the distribution system will receive proper treatment and disinfection.

Water Main Replacements, Installations and Well Installations

The replacement of water mains, installing looping and connecting water mains and installing wells will have some impact on traffic in the vicinity of where the construction is occurring. The project may require lane closures along adjacent segments of road. The existing water mains would continue to be in service while the new water mains are installed. However, short term service disruptions may occur when connection of the replacement main to the existing main is performed.

3. Social Impacts

Water Conditioning Plant Improvements

The WCP improvements will occur within the existing buildings or on the site and are not expected to cause traffic issues and should not impact the public.

Water Main Replacement, Installations and Well Installations

Impacts on materials, land and energy will be minimized by selection of qualified contractors. Construction activities for the water mains will take place in previously served areas, with the exception of the two looping and three consolidation projects. Connection of the proposed water main projects to the existing water system may require closure of road lanes. The work schedule will be planned to minimize traffic disruptions to residents.

4. Indirect Impacts

There are no anticipated impacts to the rate, density or type of development due to this project. The BWL service area is almost completely developed and limited growth, if any, is projected for the area over the next 20 years. There are also no expected changes in land use. While there are

no expected changes in air quality due to primary or secondary development, indirect and limited impacts could result from traffic and construction equipment.

There are no anticipated changes to the natural setting or ecosystem, however as per MNFI and USFWS there are threatened and endangered species that may be present in the project areas. In the event any such species are observed during project activities, observations will be reported to the local county MDNR office within 24 hours. Tree clearing will be avoided to the least extent possible. If tree clearing is necessary, it will occur between October 1st and March 31st to avoid impacting bat species. If the presence of bald eagles is determined, construction activities will be scheduled from August to February to avoid the breeding season. Field survey will be conducted between the first week of April and the fourth week of October to assess for the presence of pickerel frogs prior to construction activities commencing. If the presence of pickerel frogs is determined, proper conservation procedures will be followed. With the potential presence of the Eastern Mississauga rattle snakes, no soil erosion control products containing plastic netting will be used to avoid entanglement.

Impacts on cultural, human, social and economic sources are expected to be minimal and occur during the construction phase as a result of the traffic routing around the construction area. These impacts are expected to be short-term.

Resource consumption will be limited to the materials used for construction. Aesthetic impacts are anticipated to be short-term and occur during the construction phase. Following construction, project areas will be reestablished to their previous conditions.

B. CUMULATIVE IMPACTS

No cumulative impacts (e.g., population growth) are anticipated as a result of the improvement projects.

VII. MITIGATION

A. MITIGATION OF SHORT-TERM IMPACTS

Typical construction mitigation is expected for the selected alternative. Traffic control may be required on larger avenues during the construction of the water mains. Access to some roads may be temporarily restricted to provide a safe working environment. Soil erosion and sedimentation control measures will be required during the water main replacements and looping projects to ensure nearby sewers or storm drains are not impacted by the construction process. Vegetation disrupted by the construction process will be rehabilitated to its original condition. Dredging material will not be stored within the 100-year floodplain. Service will be maintained for residents during construction, with short term disruptions during the connection of new water main into the existing system.

Mitigation of potential impacts will be properly performed to protect the environment and the public and will be in accordance with permit requirements. When the limits of ground-disturbing activities are further refined during the design phases for the various projects, additional review will be made to determine if the habitat for any sensitive species will be impacted. Field surveys will be conducted to determine the presence of bald eagles and pickerel frogs and appropriate measures will be taken to mitigate potential impacts. An evaluation for the need to perform site visits to survey for wetlands will be performed during design. An evaluation of contamination sites and necessary mitigation will also be evaluated during design. Specifics on the exact pollutants are not always available; however, precautionary measures will be taken at each location to reduce the possibility that construction of the new water main further spreads the contamination and to avoid contaminant exposure to residents or workers. Water mains in the presence of contaminants will be installed via directional drilling with ductile iron pipe. This method of installation and material will minimize exposure to potential contaminants as well as reduce the risk of pipe failure due to a reaction with the pipe material. Specialized gaskets designed to withstand groundwater contamination at water main joints will be proposed in these areas to help prevent contaminants from entering the system.

Limited tree clearing may be required. Trees to be removed would be identified during the design phase. Protection measures will be taken to minimize the impact on endangered or threatened species during the tree clearing phase. Trees that are removed would be replaced.

When selecting soil erosion products, selection will be made to exclude the use of plastic netting to avoid impacting the eastern massasauga rattle snakes via possible entanglement.

Construction activities start as early as year 2025. Construction activities are anticipated to conclude in 2029 for FY2025 projects and in 2034 for FY2029 projects.

B. MITIGATION OF LONG-TERM IMPACTS

No long-term impacts are anticipated as part of the proposed projects. Sensitive species and 100-year floodplains are not anticipated to be impacted. However due to the presence of wetland habitat in the vicinity of several projects, additional measures will be taken to minimize any adverse impacts.

C. MITIGATION OF INDIRECT IMPACTS

The proposed project is intended to improve the reliability and increase resiliency of the existing system by replacing aging wells and providing redundancy, installing an elevated storage tank, replacing aging water mains, instilling looping in the system, consolidating nearby communities and rehabilitating and improving the WCPs. The project is not intended to induce growth within the project area.

VIII. PUBLIC PARTICIPATION

A. PUBLIC MEETING

A public meeting was held on April 29, 2024.

B. PUBLIC MEETING ADVERTISEMENT

The public meeting notice was published on April 16, 2024, and posted on the BWL website. A copy of the advertisement for the public meeting can be found in Appendix F.

C. PUBLIC MEETING SUMMARY

The public meeting presentation can be found in Appendix F.

D. ADOPTION OF THE PROJECT PLANNING DOCUMENT

The Lansing BWL Board adopted a resolution following the public meeting on April 29, 2024. A signed copy of the resolution is included in Appendix G, along with the DWSRF Submittal Form.