

**CHARTER TOWNSHIP OF WHITE LAKE  
COUNTY OF OAKLAND  
A RESOLUTION ADOPTING A FINAL PROJECT PLAN FOR SANITARY SEWER  
SYSTEM IMPROVEMENTS AND DESIGNATING AN AUTHORIZED PROJECT  
REPRESENTATIVE**

**RESOLUTION #22-021**

**WHEREAS,** The Charter Township of White Lake recognizes the need to make improvements to its existing sanitary sewer water system; and

**WHEREAS,** The Charter Township of White Lake authorized DLZ-Michigan, Inc. to prepare a Project Plan, which recommends lining of 14,011 lineal feet of gravity main with Cast-In-Place (CIP) pipe lining methods to protect sewer from Hydrogen Sulfide corrosion; lining of 21 gravity manholes with Cast-In-Place (CIP) lining methods; and lining of 22 pressure manholes with Cast-In-Place lining methods; and

**WHEREAS,** said Project Plan was presented at a Public Hearing on May 17, 2022 and all public comments have been considered and addressed;

**NOW THEREFORE BE IT RESOLVED,** that the Charter Township of White Lake formally adopts said Project Plan and agrees to implement the selected alternative (Alternative 4).

**BE IT FURTHER RESOLVED,** that the Township Department of Public Services Director, a position currently held by Aaron Potter, is designated as the authorized representative for all activities associated with the project referenced above, including the submittal of said Project Plan as the first step in applying to the State of Michigan for a Clean Water State Revolving Fund Loan to assist in the implementation of the selected alternative.

**MOTION TO APPROVE RESOLUTION** on May 17, 2022 by \_\_\_\_\_ and support by \_\_\_\_\_.

Yeas:  
Nays:  
Abs:

**RESOLUTION DECLARED ADOPTED.**

State of Michigan            )  
  ) ss.  
County of Oakland         )

I, the undersigned duly qualified Township Clerk of the Charter Township of White Lake, Oakland County, Michigan, do hereby certify the foregoing is a true and complete copy of the proceedings taken by the Township Board of the Charter Township of White Lake at a meeting held on the 17<sup>th</sup> day of May, 2022.

**CHARTER TOWNSHIP OF WHITE LAKE**

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Anthony L. Noble,  
Township Clerk  
Dated: May \_\_\_\_, 2022



INNOVATIVE IDEAS  
EXCEPTIONAL DESIGN  
UNMATCHED CLIENT SERVICE

**CHARTER TOWNSHIP OF WHITE LAKE  
FY2023 CLEAN WATER STATE REVOLVING FUND  
WASTEWATER ASSET MANAGEMENT PLAN IMPROVEMENTS  
PROJECT PLAN**



Prepared By:



DLZ Job No. 2245-7049-00

April 7, 2022

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## EXECUTIVE SUMMARY

The Charter Township of White Lake completed and submitted a Stormwater, Asset Management, and Wastewater (SAW) Grant project in December 2019. The SAW Wastewater Asset Management Plan (WWAMP) document identified 14,011 feet of sanitary sewer, 22 gravity manholes, and 21 pressure manholes that are in need of repair and rehabilitation.

A general concern with the existing infrastructure is the accumulation of hydrogen sulfide resulting in the corrosion and damage of the concrete structures. This buildup of hydrogen sulfide is due to low flows from the current lack of connections made to the sanitary system, hence the absence of adequate flow results in stagnant zones for hydrogen sulfide to accumulate. Because of the excessive hydrogen sulfide, the Township has conducted CCTV inspections on an annual basis and has confirmed structural damage and corrosion in their existing infrastructure. The most prominent location of hydrogen sulfide buildup is at the intersection of Elizabeth Lake Road and Union Lake Road, where the pressure sewer discharges into the gravity main. Based on the CCTV inspection results showing where the excessive hydrogen sulfide buildup is located, the Township has proposed to conduct Cast in Place (CIP) Pipe Lining to rehabilitate and protect 14,011 feet of sanitary sewer, 22 gravity manholes, and 21 pressure manholes from corrosion due to hydrogen sulfide.

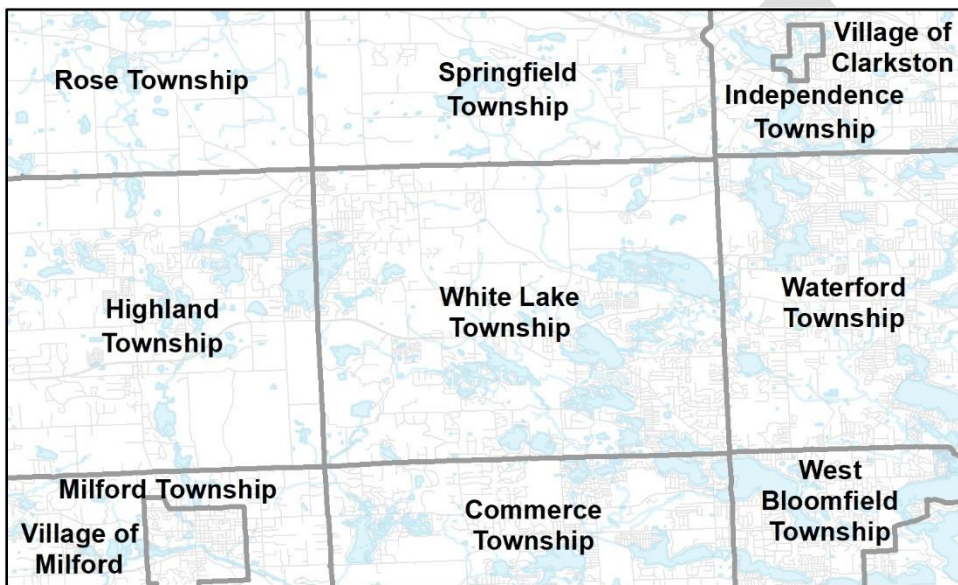
In 2021, the Township authorized the preparation of this 2022 Clean Water State Revolving Fund (CWSRF) Project Plan to develop a strategy to rehabilitate their existing infrastructure. Information from this plan will be incorporated into an application document that will be submitted to the Michigan Department of Environment, Great Lakes, and Energy (EGLE) for consideration to receive a CWSRF low interest construction loan to line the gravity main and manholes to be more reliable and to prevent failure of the wastewater conveyance system. The Township submitted an Intent to Apply Form in January 2022 to EGLE, which is also included in Appendix I for reference.

Proposed projects that have been identified to be included in the Project Plan are:

- Cast in Place Pipe Lining of 14,011 feet of Gravity Sewer Main.
  - Cast in Place Lining of 22 Gravity Manholes.
  - Cast in Place Lining of 21 Pressure Manholes.
-

## 1.0 PROJECT BACKGROUND

The Charter Township of White Lake (Township) encompasses 37.1 square miles. The Township is located in the northwest portion of the greater Detroit metropolitan area and near the geographic center of Oakland County, Michigan. The Township lies adjacent to Waterford Township to the east, Springfield Township to the north, Highland Township to the west, and Commerce Township to the south. Over 25 lakes, comprising 2,255 acres, are located in White Lake Township. The 2020 Census reported the Township population at 30,950 persons. Figure 1 below is a vicinity map of White Lake Township and surrounding communities.



**Figure 1 – White Lake Township Vicinity Map**

The Township’s wastewater collection system serves approximately 4,500 people in the Township. Sewer mains were constructed largely in 1999 or later. There are approximately 20 miles of gravity sewer mains and an approximately 22 miles of pressured mains. The Township’s sanitary system contains ten (10) pumping stations. The wastewater flow is ultimately discharged into Commerce Township’s collection system and is conveyed to the Commerce Township Wastewater Treatment Plant for treatment. Refer to Figure 2 on page 3 for a map of the Township’s sanitary sewer distribution system.

The Township has experienced a major amount of growth in the southeastern portion of the Township and along the Highland Road/M-59 corridor in recent years. Moderate growth is expected throughout the Township in the next 10 to 20 years. The Township is located in an area of Oakland County that is currently popular for residential developments because of its rural character and many lakes. The residential development has promoted commercial developments along Highland including Fisk Corners and the White Lake Marketplace located at Highland Road and Fisk Road, the Meijer development located on Highland Road



at Bogie Lake Road, and the Village Lakes shopping center at Highland and Elizabeth Lake Roads. This growth should lead to additional users on the wastewater system. It is likely that the expansion of the wastewater collection system to currently unsewered areas of the Township will also occur and add to the number of users on the wastewater system.

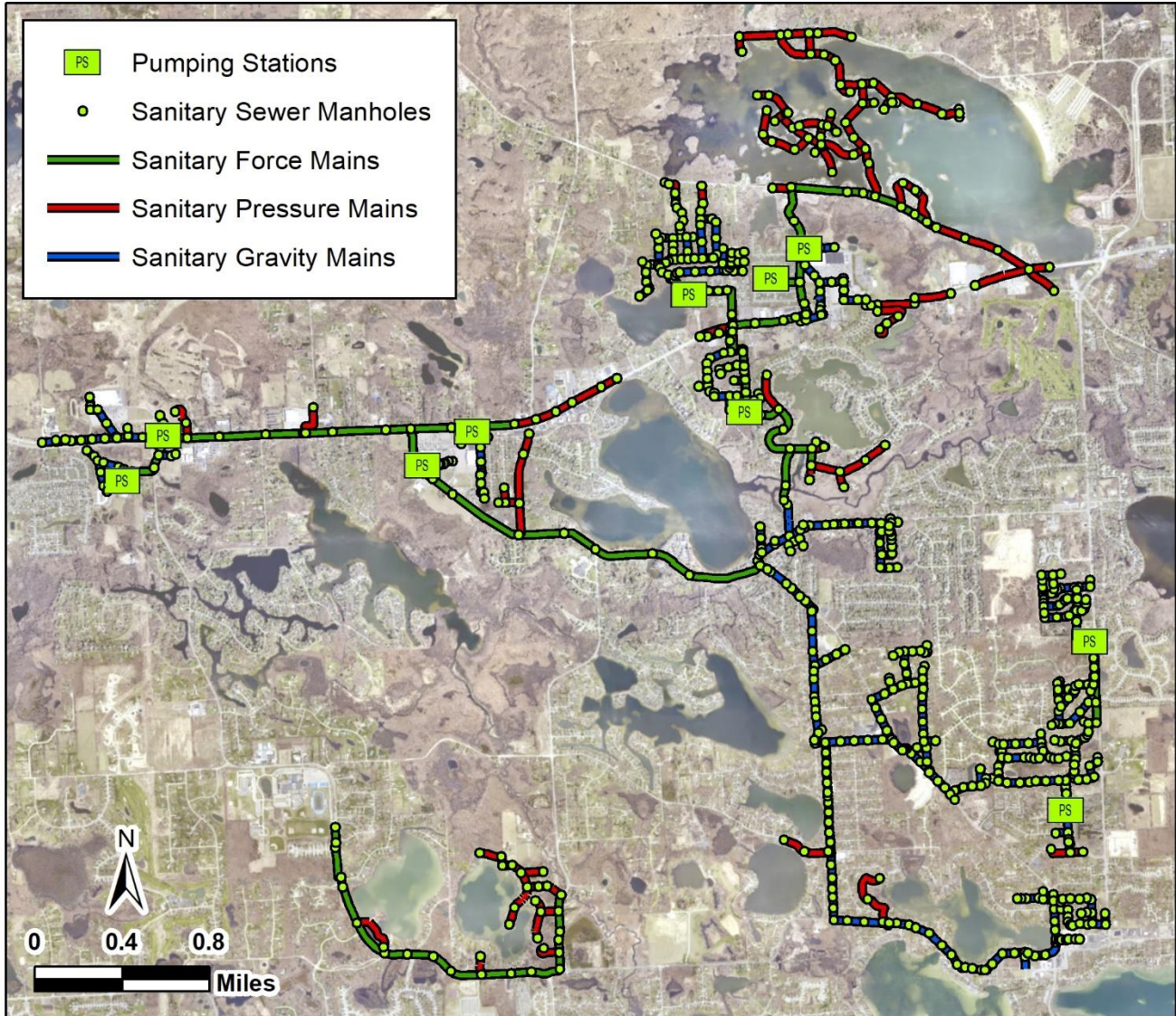


Figure 2 – White Lake Township Sanitary Sewer Distribution System

It is the intent of the Township to submit the final Project Plan by June 1, 2022 to EGLE to qualify for a low interest CWSRF loan to finance the proposed upgrades to provide high-quality sanitary sewer service to existing and future customers.

### **1.1 STUDY AREA**

The study area for this project is spread throughout White Lake Township and the northern border of Commerce Township. The work will primarily occur in the eastern portion of the Township. The town code for the Township is 03N in the Michigan Public Land Survey. The Range of the project area is 08E.

The gravity sewer repairs are located in Sections 26, 34, 35, and 36 of the Township and Section 01 of Commerce Township (T02N, R08E). The gravity manhole repairs are located in Sections 25, 26, and 36 of the Township and Section 01 of Commerce Township. The pressure manhole repairs are located in Sections 12, 13, 14, and 23 of the Township. Refer to Figure 3 through Figure 13 on the following pages for maps of the study areas.

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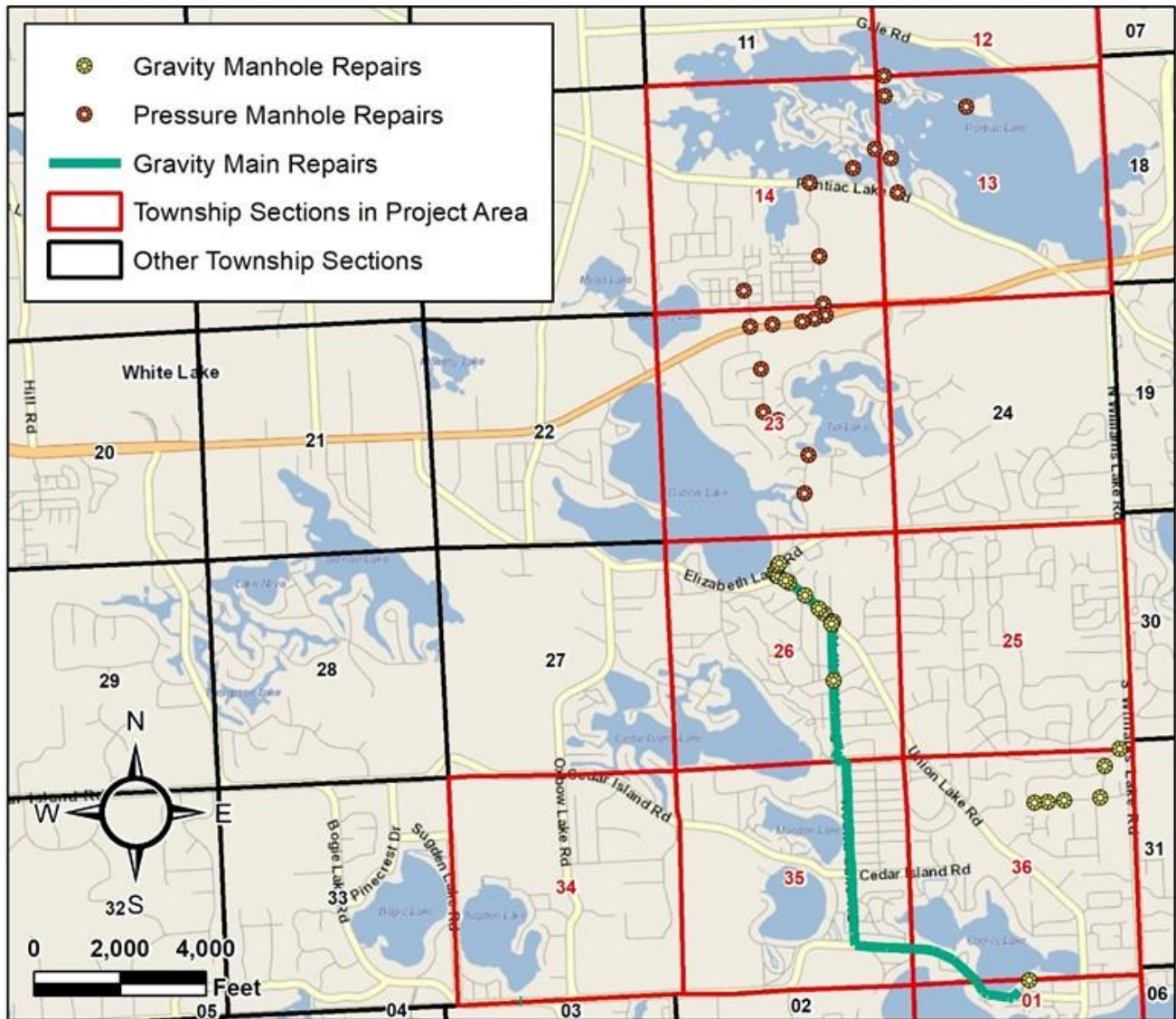


Figure 3 – Section Map of Study Areas

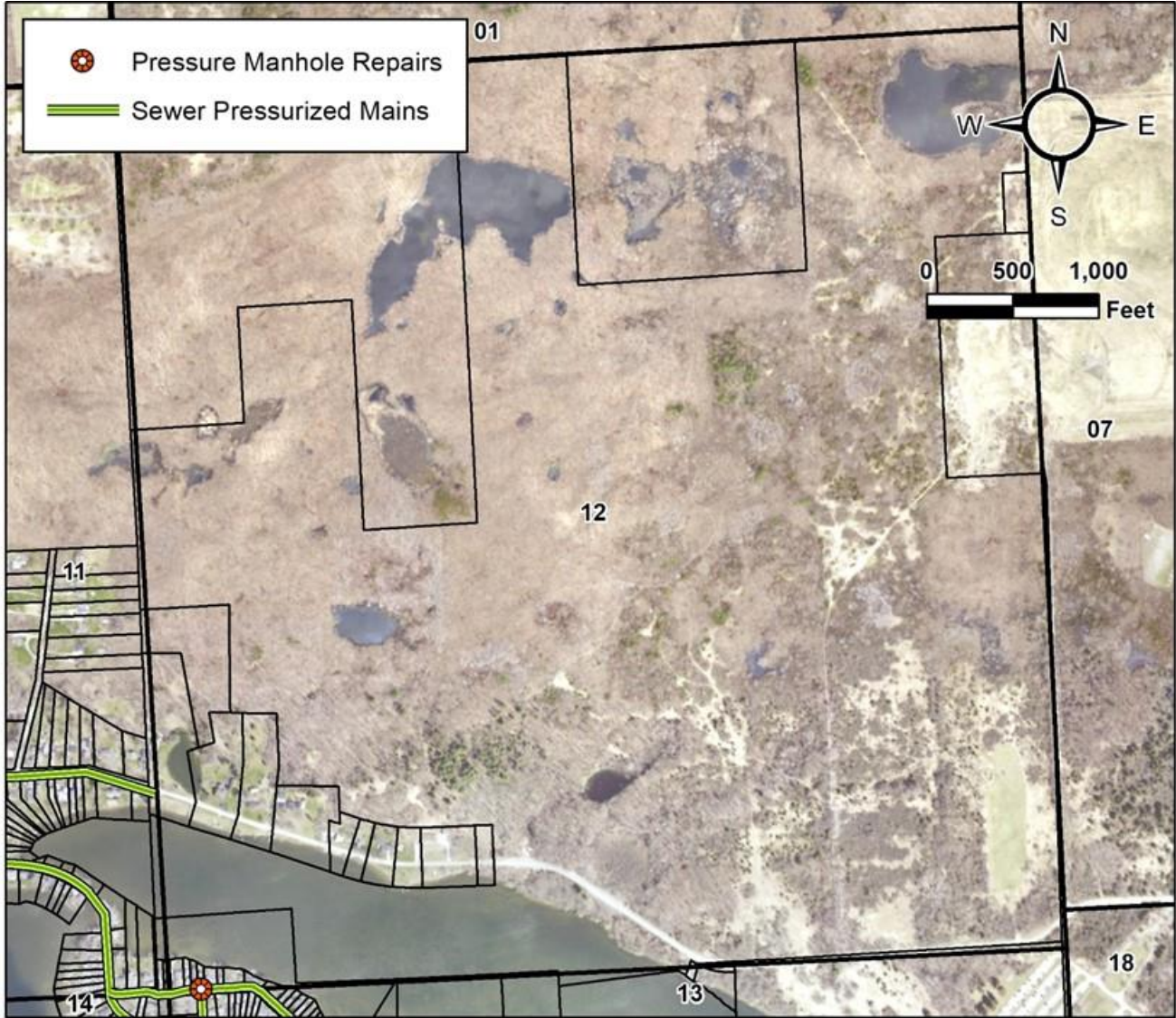


Figure 4 – Section 12 Repair Locations

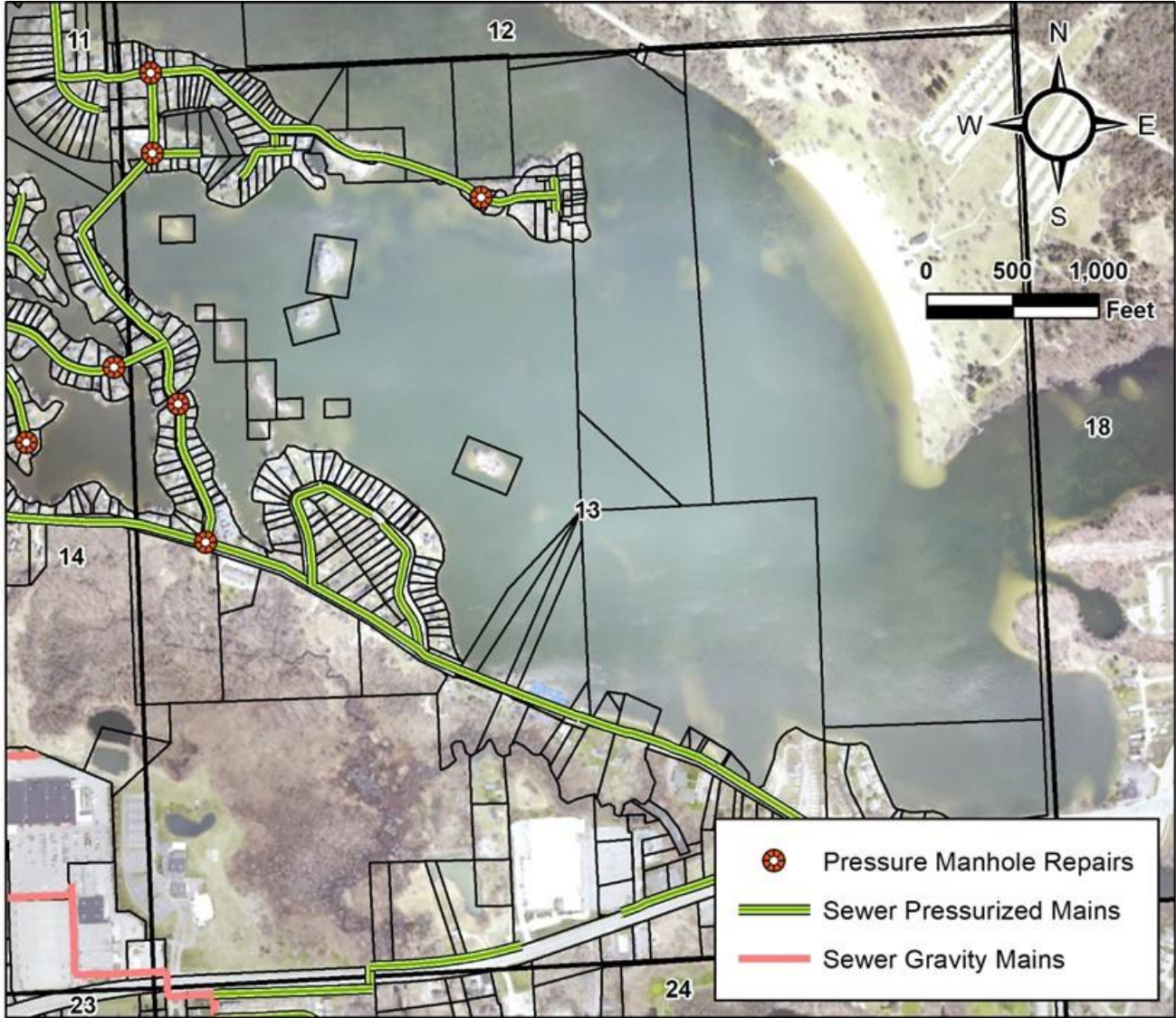


Figure 5 – Section 13 Repair Locations

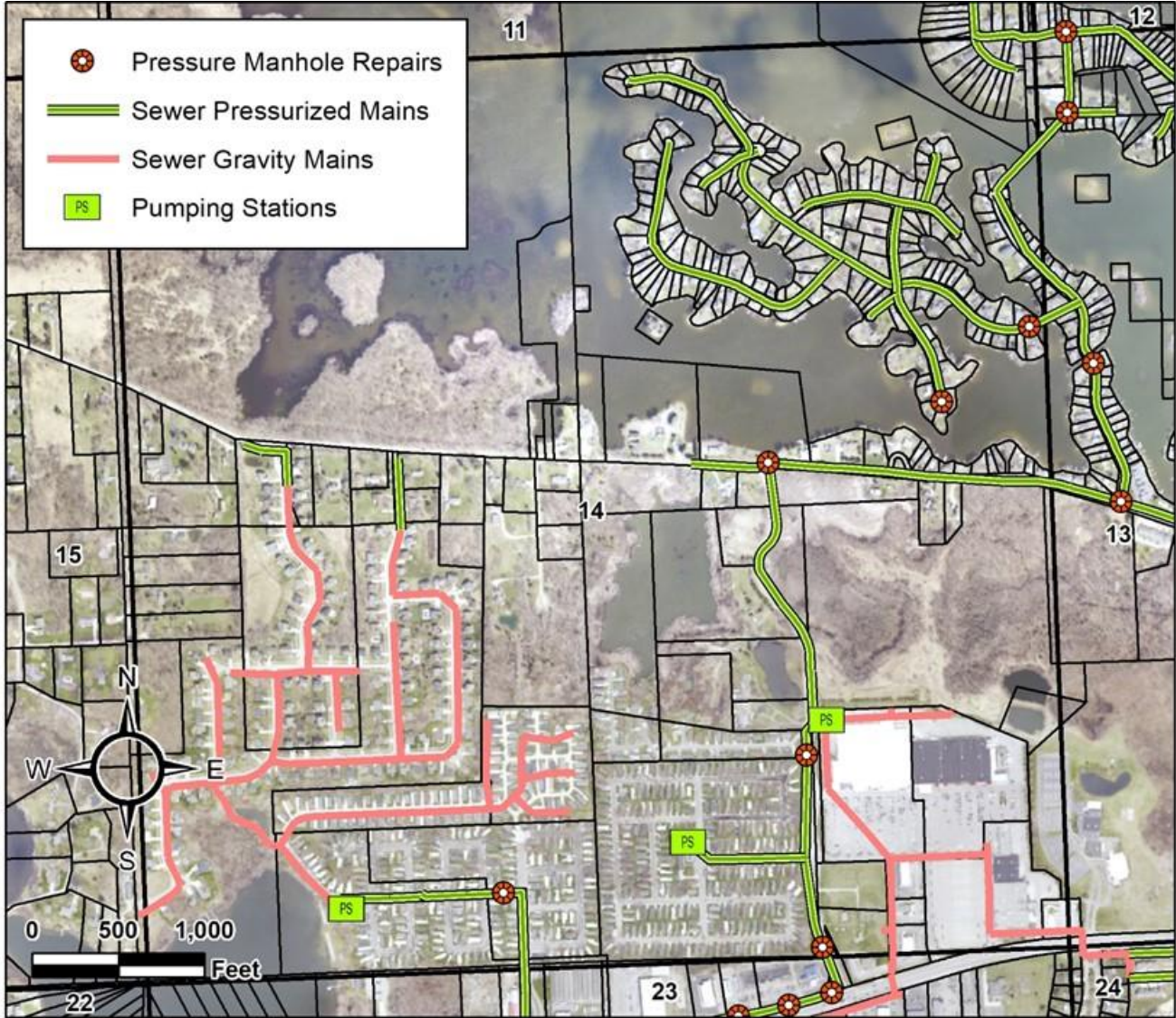


Figure 6 – Section 14 Repair Locations



Figure 7 – Section 23 Repair Locations

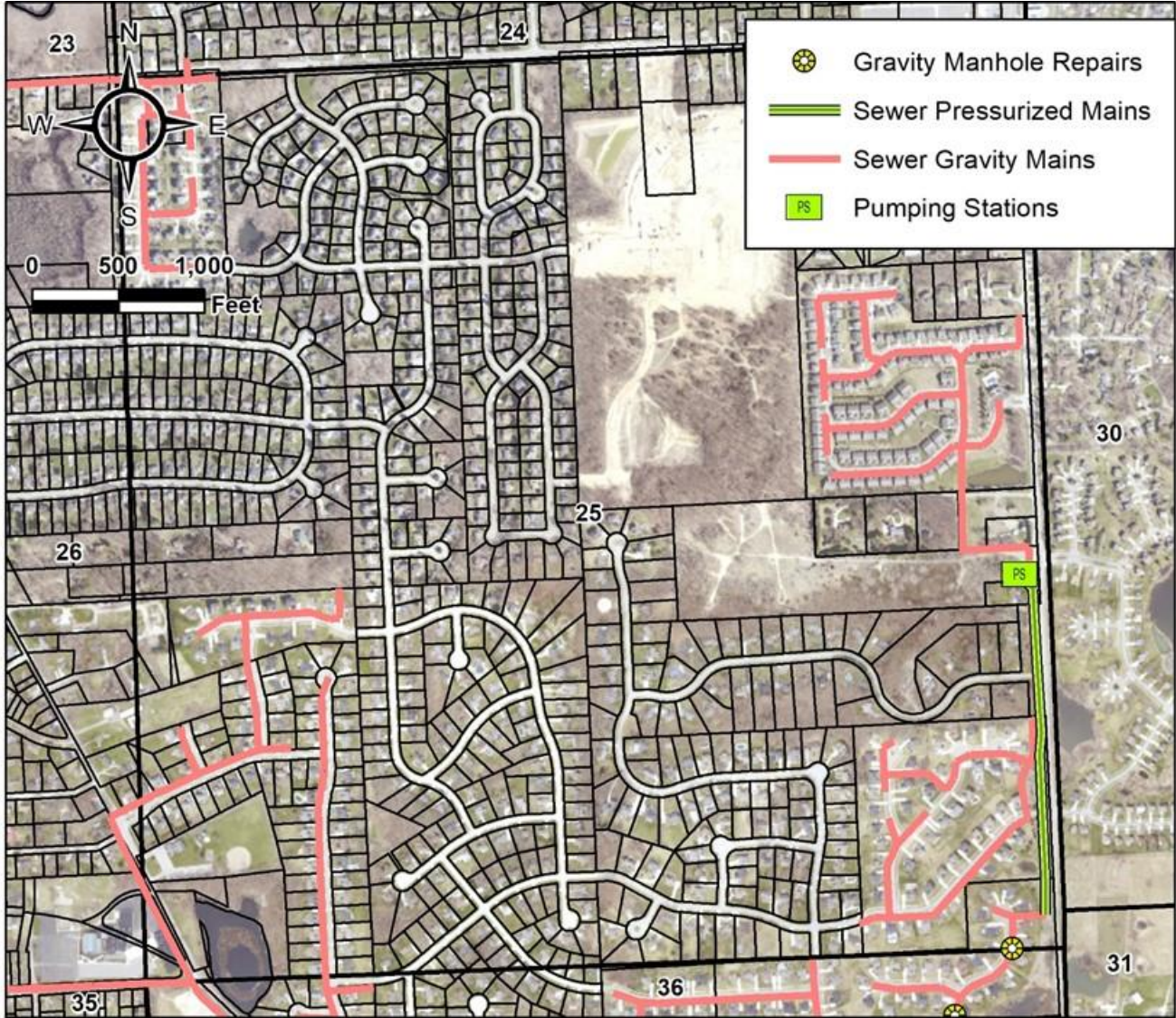


Figure 8 – Section 25 Repair Locations



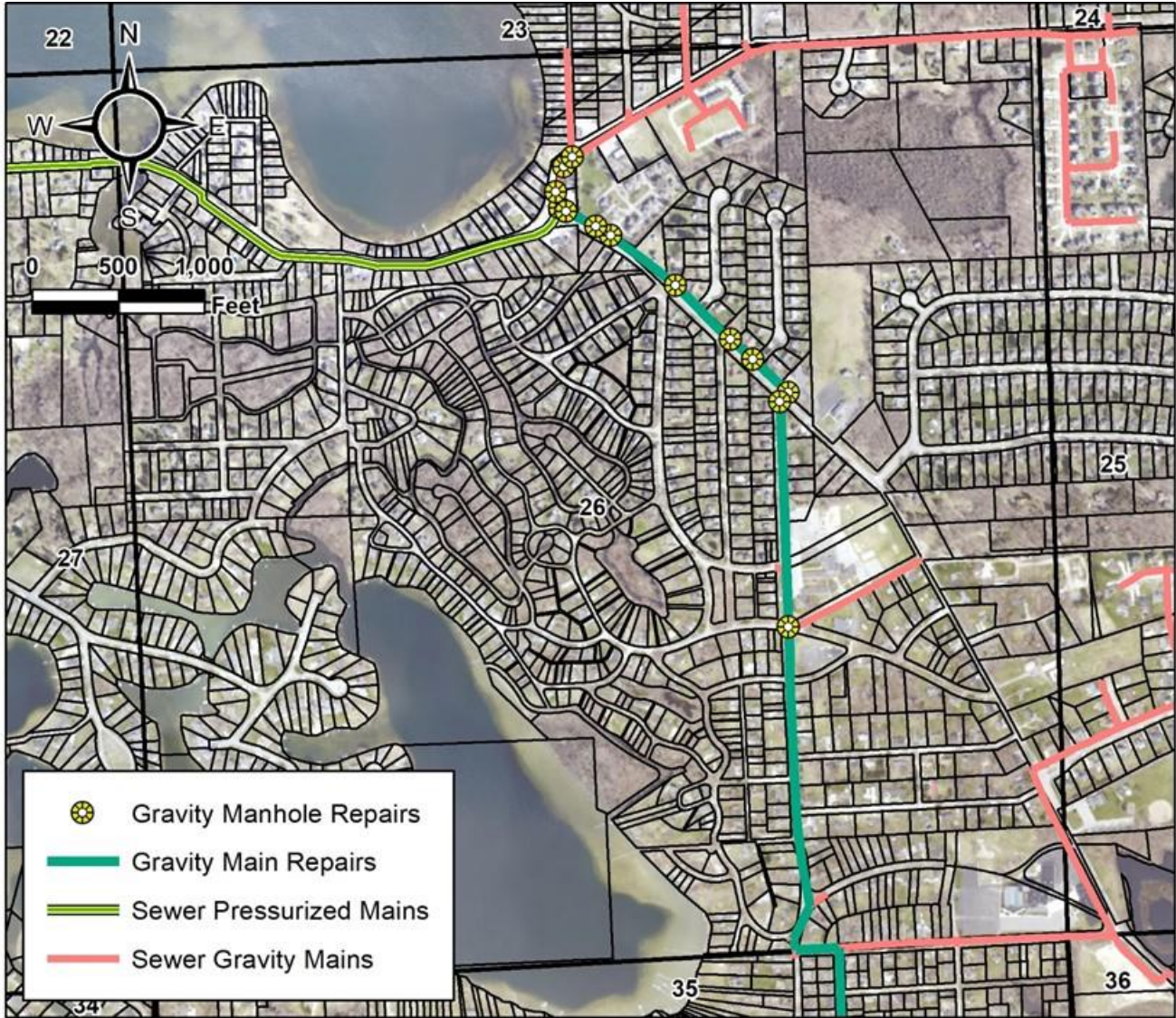


Figure 9 – Section 26 Repair Locations

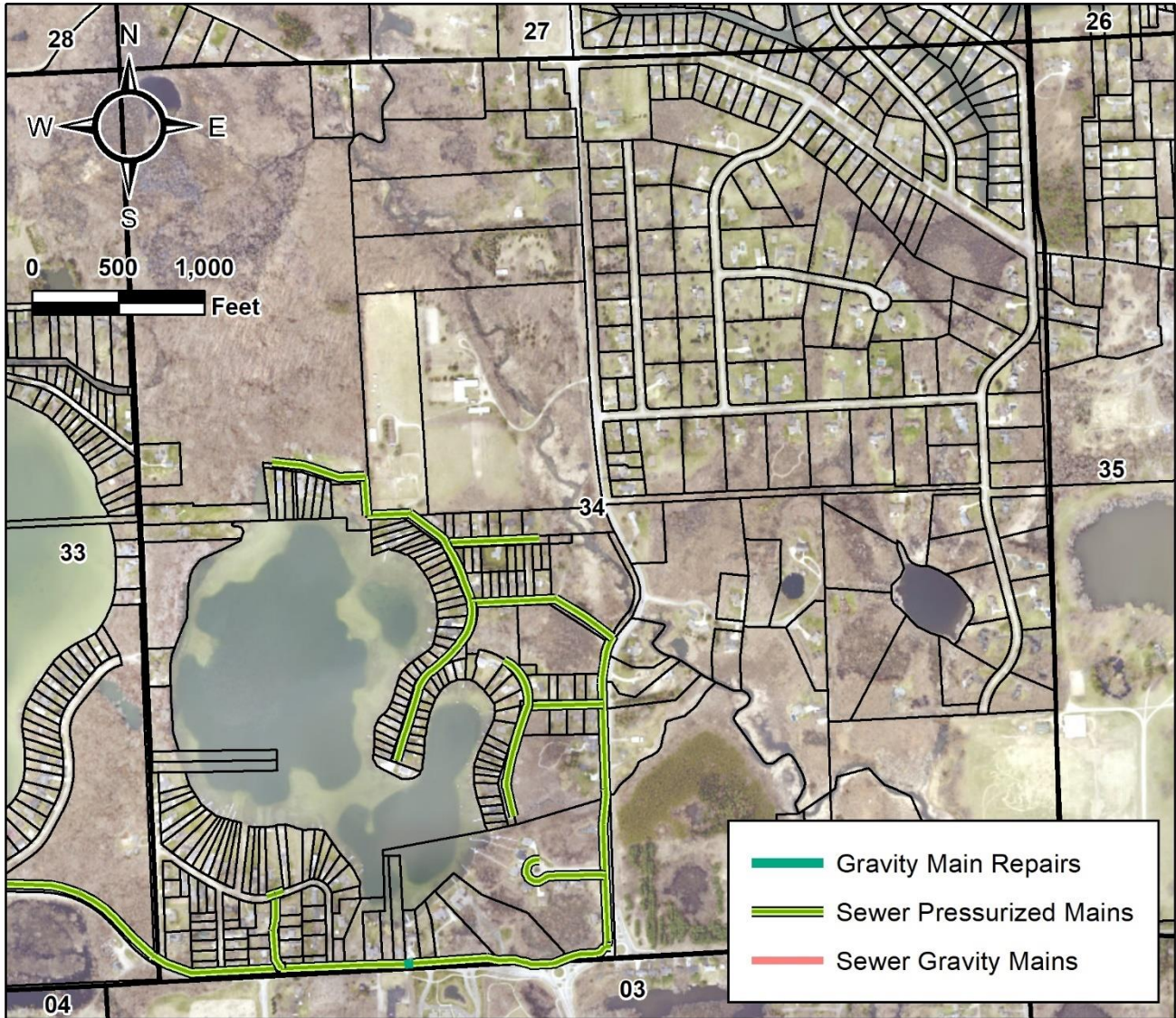


Figure 10 – Section 34 Repair Locations

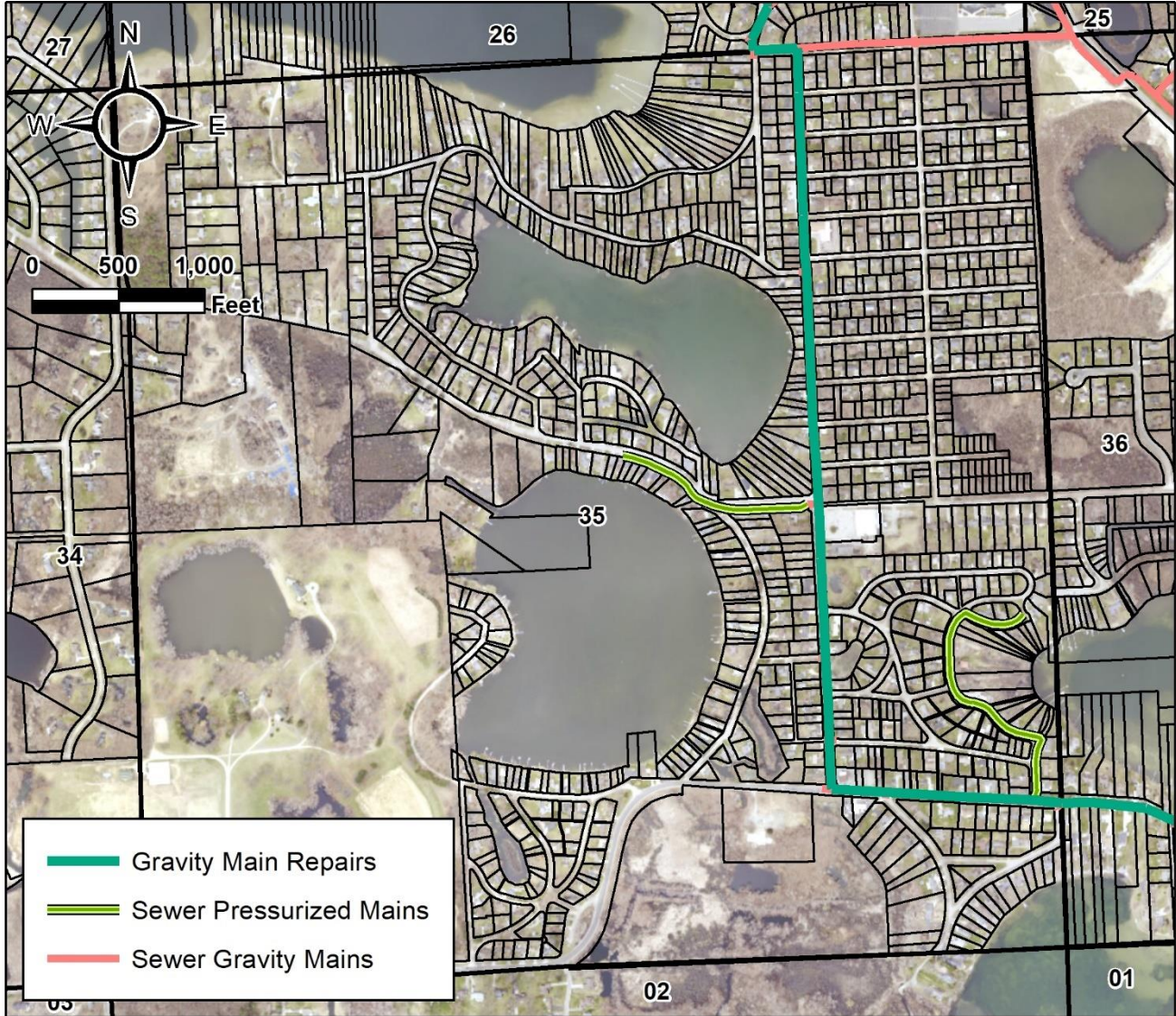


Figure 11 – Section 35 Repair Locations

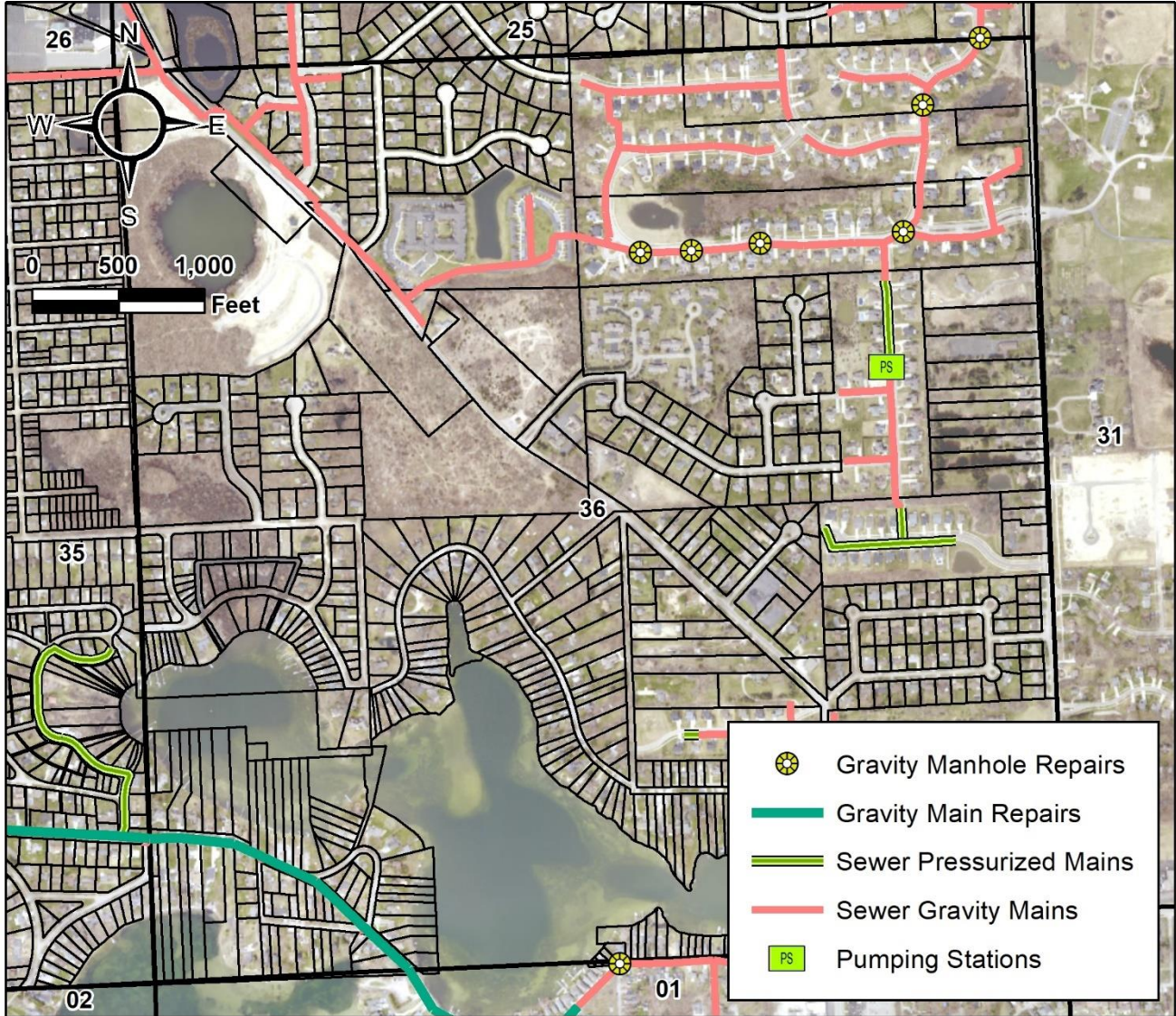


Figure 12 – Section 36 Repair Locations

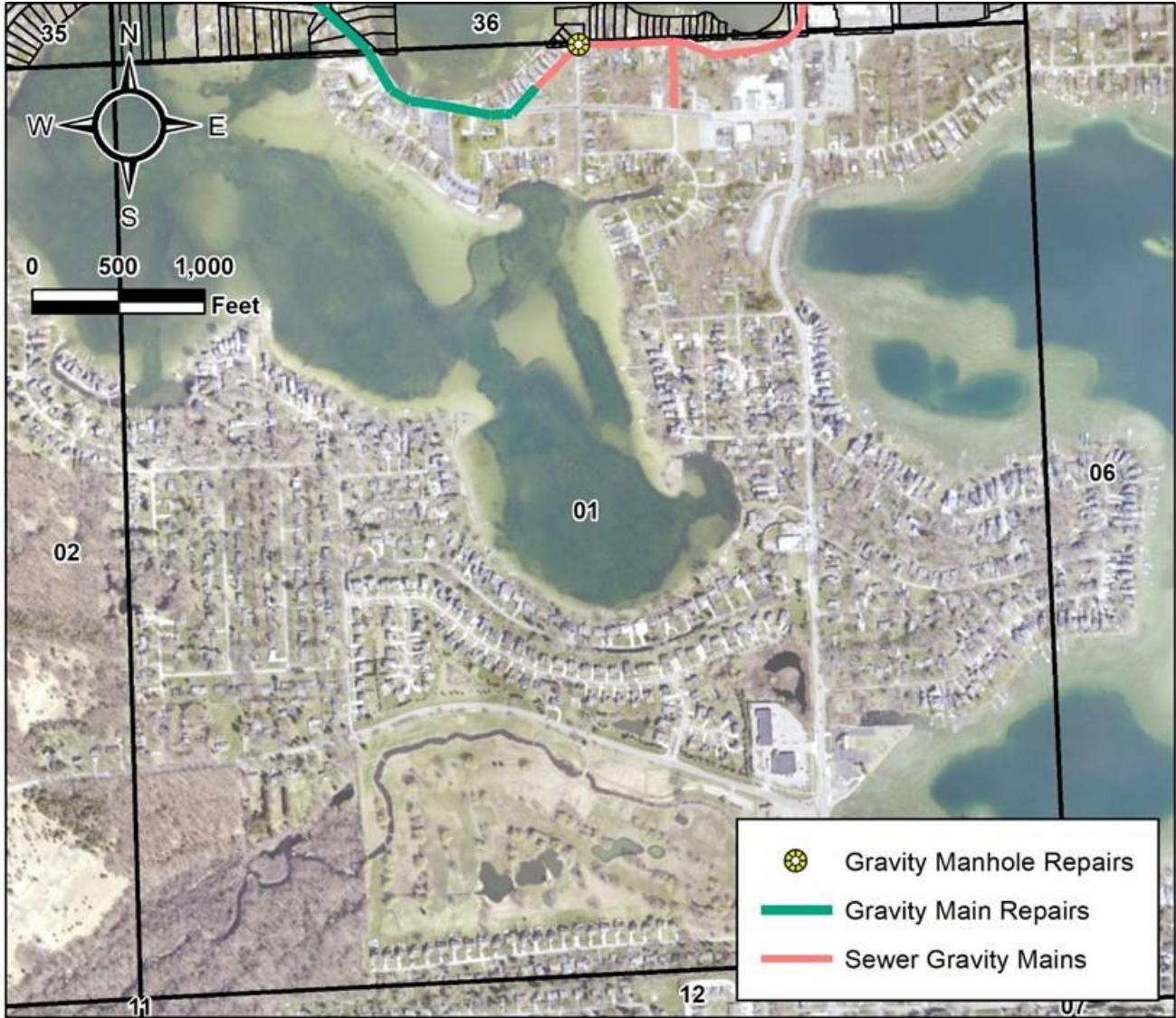


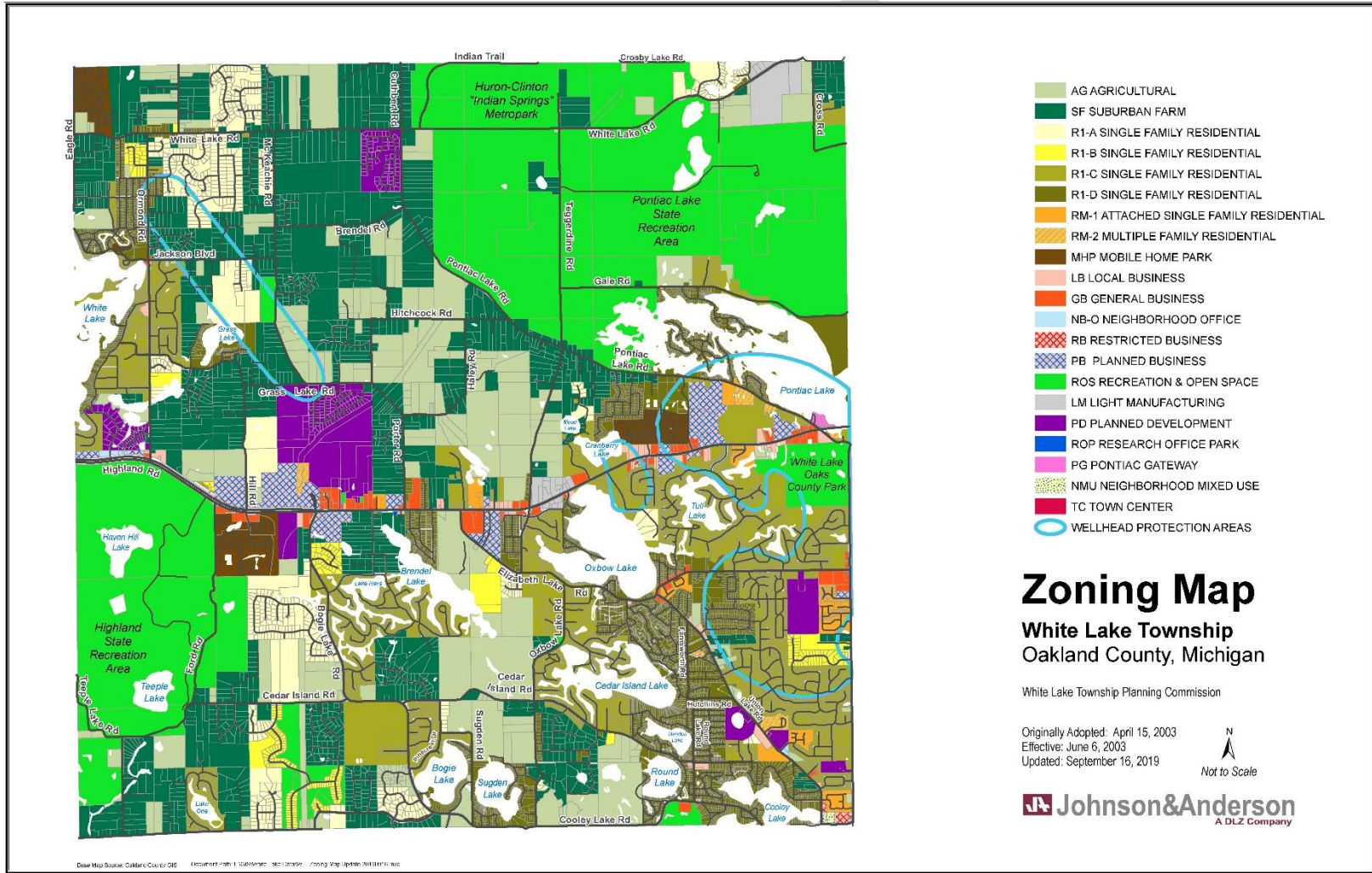
Figure 13 – Section 01 Repair Locations

## 1.2 LAND USE/ZONING

The Township’s Land Use, according to SEMCOG’s 2020 Land Use/Land Cover analysis (Table 1), indicates approximately 43% of the total land use is for single-, multi-, and rural-residential customers. Multi-family housing and mixed use have seen the greatest growth over the past 5 years at 64.8% and 81.7% change, respectively. Recreation/Open Spaces makes up almost 24% of the total land use with vacant land comprising a further 12.1%. Approximately 1.5% of the land use is classified as retail or office. Commercial corridors are mainly located along Highland Road, with minor entities located along other well-traveled roads including Cooley Lake Road, Elizabeth Lake Road, and Bogie Lake Road. The Township’s Zoning Map is provided in Figure 14 on page 18.

**Table 1 – White Lake Township SEMCOG Land Use/Land Cover – 2020**

Land Use	Acres	Percent
Single-Family Residential	5,441.7	22.95%
Attached Condo Housing	90.2	0.38%
Multi-Family Housing	88.6	0.37%
Mobile Home	348.6	1.47%
Agricultural/Rural Residential	4,164.1	17.56%
Mixed Use	4.9	0.02%
Retail	290.9	1.23%
Office	51.5	0.22%
Hospitality	53.0	0.22%
Medical	16.3	0.07%
Institutional	313.4	1.32%
Industrial	41.6	0.18%
Recreational/Open Space	5,667.8	23.90%
Cemetery	10.5	0.04%
Golf Course	150.6	0.64%
Parking	3.9	0.02%
Extractive	0.0	0.00%
Transportation/Communication/Utility (TCU)	224.9	0.95%
Vacant	2,871.2	12.11%
Water	2,379.1	10.03%
Not Parceled	1,502.2	6.33%



- AG AGRICULTURAL
- SF SUBURBAN FARM
- R1-A SINGLE FAMILY RESIDENTIAL
- R1-B SINGLE FAMILY RESIDENTIAL
- R1-C SINGLE FAMILY RESIDENTIAL
- R1-D SINGLE FAMILY RESIDENTIAL
- RM-1 ATTACHED SINGLE FAMILY RESIDENTIAL
- RM-2 MULTIPLE FAMILY RESIDENTIAL
- MHP MOBILE HOME PARK
- LB LOCAL BUSINESS
- GB GENERAL BUSINESS
- NB-O NEIGHBORHOOD OFFICE
- RB RESTRICTED BUSINESS
- PB PLANNED BUSINESS
- ROS RECREATION & OPEN SPACE
- LM LIGHT MANUFACTURING
- PD PLANNED DEVELOPMENT
- ROP RESEARCH OFFICE PARK
- PG PONTIAC GATEWAY
- NMU NEIGHBORHOOD MIXED USE
- TC TOWN CENTER
- WELLHEAD PROTECTION AREAS



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**Figure 14 – White Lake Township Zoning Map**

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### **1.3 DEVELOPMENT AREAS IN THE TOWNSHIP**

Over 90% of the gravity sewer and gravity manhole repairs are located within the single-family residential zoning areas. The remaining parcels in the area are zoned for business (general and local), neighborhood office, and recreation & open space. Approximately 60% of the pressure manhole repairs are located within single-family residential zoning areas. The remaining parcels are primarily zoned as business (general, local, and planned business development) with a few parcels zoned for mobile home parks.

### **1.4 TOPOGRAPHY**

According to the White Lake Township contours from the Oakland County GIS, the rolling terrain of the Township varies in elevation by approximately 214 feet from its lowest point to its highest point. In general, the lowest elevations of the Township occur in the south-central portion and rise going north. The lowest elevation in the Township is near the Huron River crossing of Cooley Lake Road, at Ivory Farms, in Section 35 at 930 feet above National Geodetic Vertical Datum (NGVD). The highest elevation, disregarding the artificial hill at Alpine Valley Ski Area, is 1,144 feet NGVD, located in the northwest portion of the Township adjacent to the access road for the radio tower in Springfield Township. The elevation along the gravity main to be lined ranges from 936 feet NGVD to 959 feet NGVD. Maps of the topography along the gravity mains are in Figure 15 through Figure 20.

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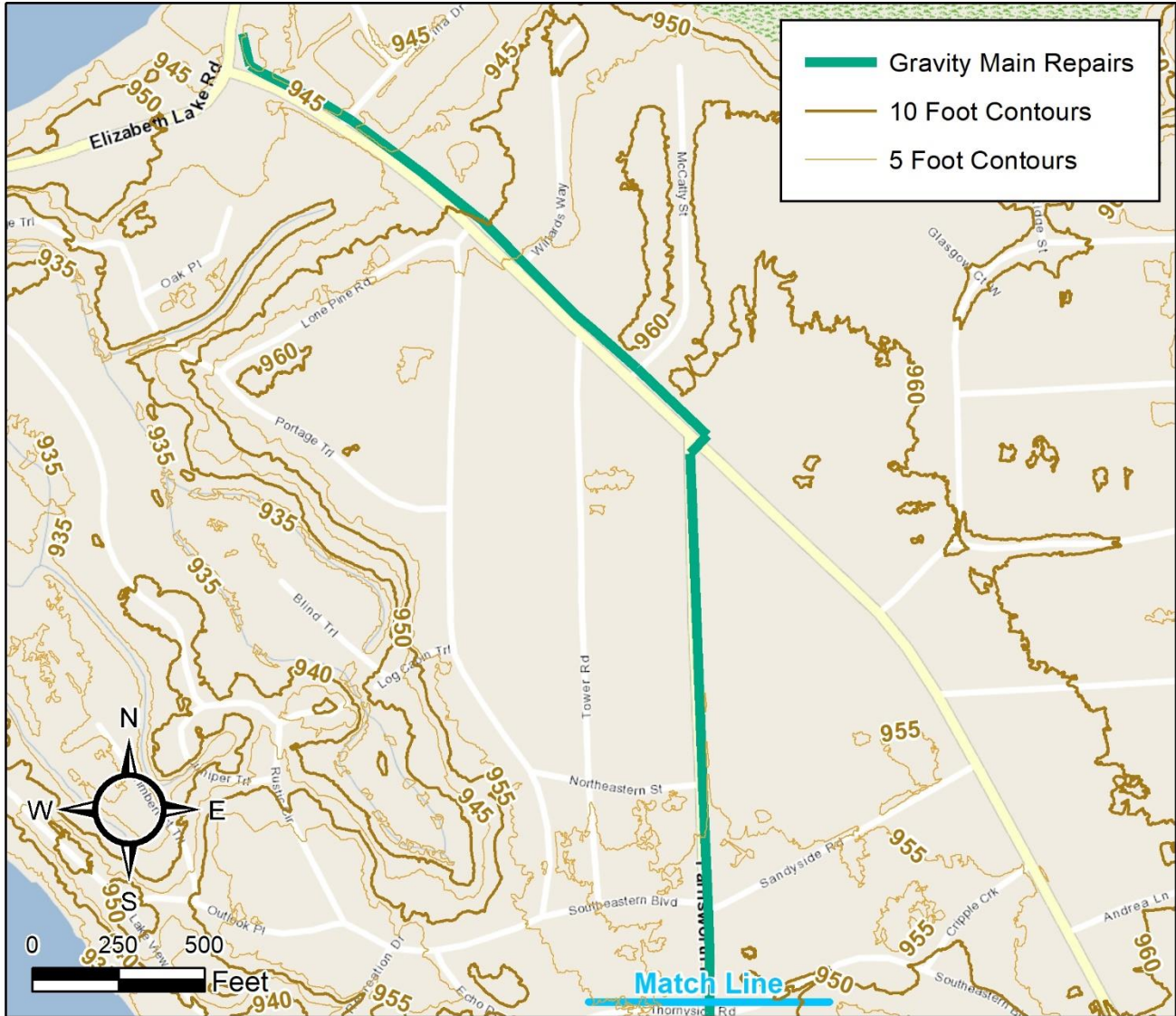


Figure 15 – Topographic Map of Project Areas 1

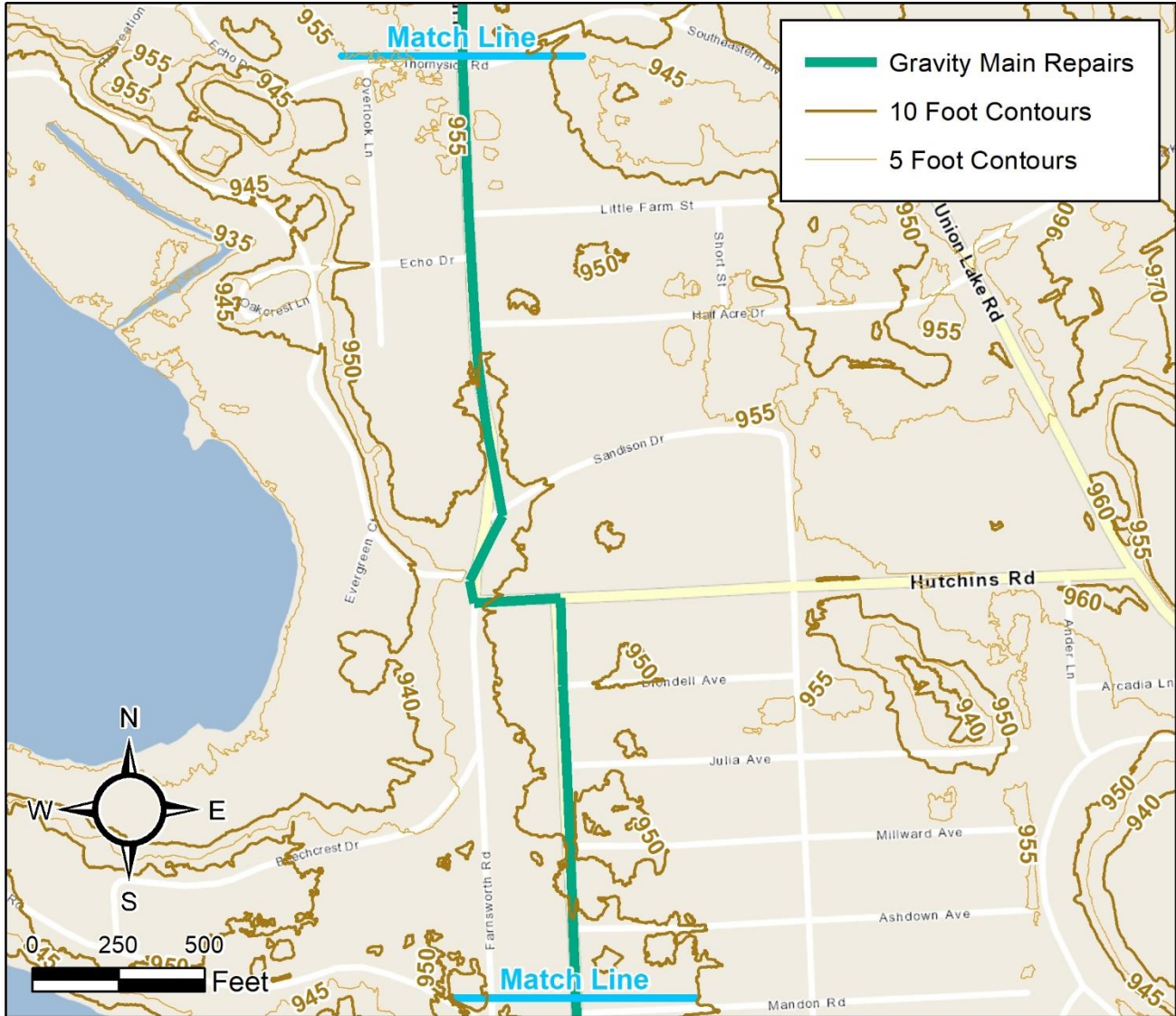


Figure 16 – Topographic Map of Project Areas 2



Figure 17 – Topographic Map of Project Areas 3

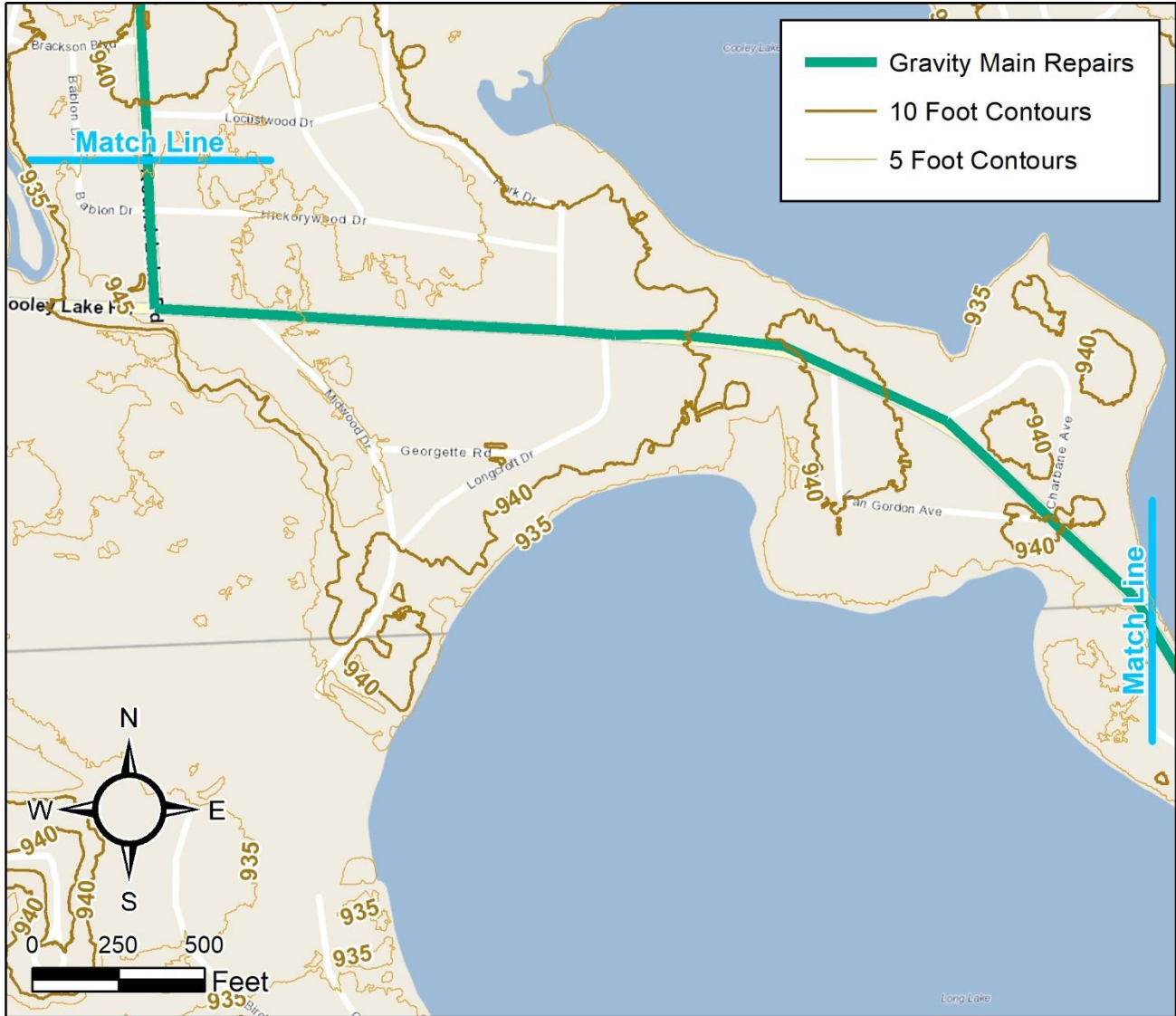


Figure 18 – Topographic Map of Project Areas 4

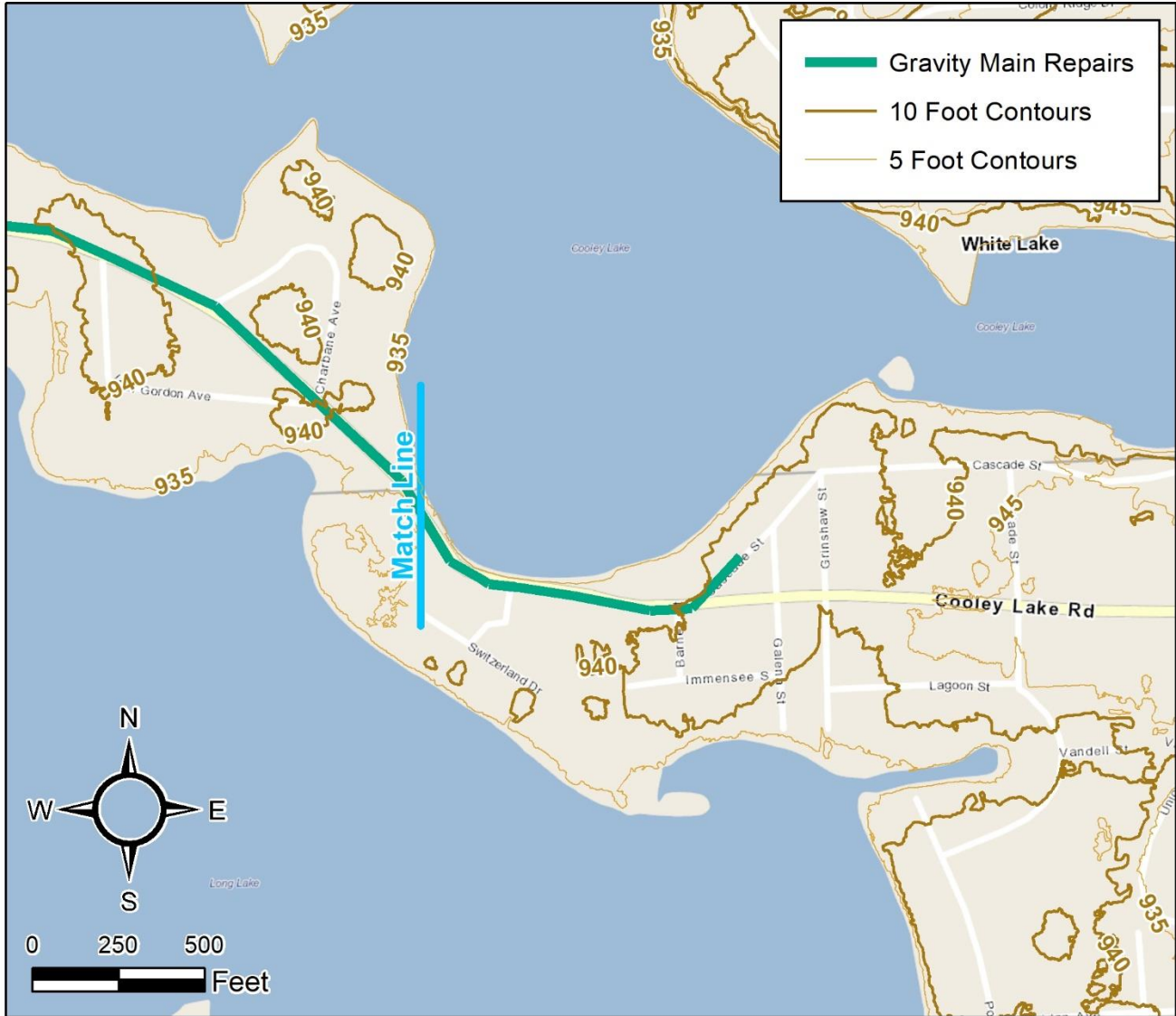
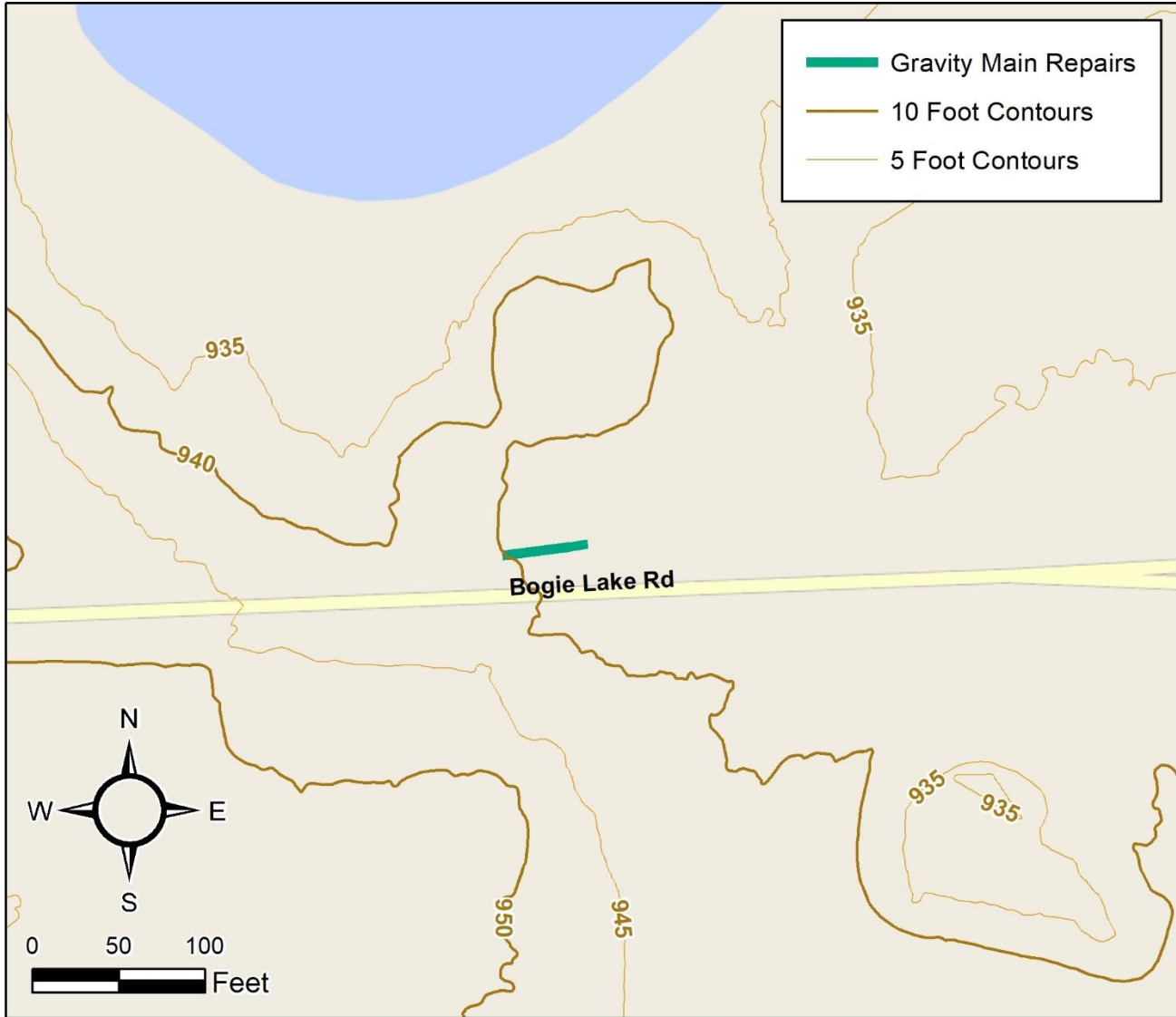


Figure 19 – Topographic Map of Project Areas 5



**Figure 20 – Topographic Map of Project Areas 6**

**1.5 ENVIRONMENTAL SETTING**

There are multiple lakes within the Township, some of which feed the Huron River, which runs from north to south through the center of the Township. Along these watercourses are large areas of wetlands. The wetland areas are shown on the overall sewer system map in Figure 21 on page 26 and account for a large amount of land that is not developable. No proposed repair sections are located within the limits of the wetlands.

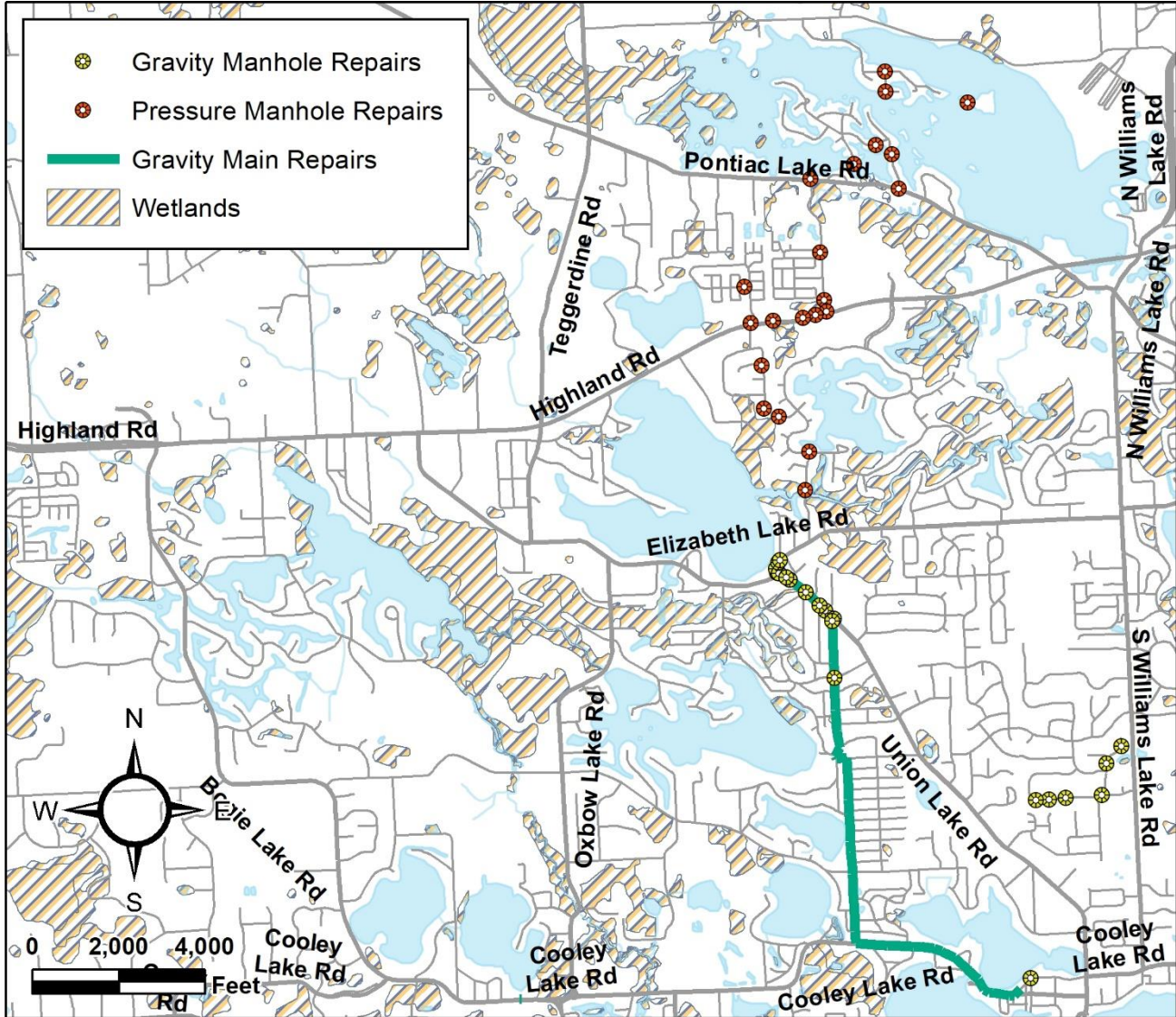


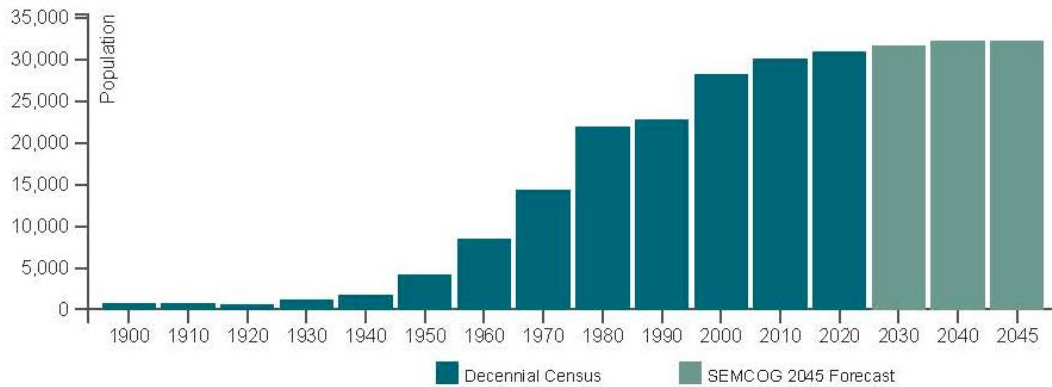
Figure 21 – White Lake Township Wetlands Map

### 1.6 POPULATION DATA

The Township has a population of 30,950 according to the 2020 U.S. Census. The total population of the Township is expected to increase by approximately 1,300 in the 2020-2040 period with a small decrease of less than 50 in the 2040-2045 period. The Township is not expected to experience a rapid growth in population in the coming few decades. Southeast Michigan Council of Governments’ (SEMCOG) population forecast for the Township indicates very little change in population from 2030 to 2045. The projected population in 2030 and



2045 is 31,578 and 32,194, respectively. Refer to Figure 22 below for more details. A copy of the *White Lake Township SEMCOG Community Profile* can be found in Appendix II.



**Figure 22 – White Lake Township SEMCOG Community Profile – Population Forecast 2030-2045**

**1.7 ECONOMIC CHARACTERISTICS**

The Township’s working population is 27% of its total daytime population according to SEMCOG’s 2016 assessment, with a daytime population of 27,201. The remaining approximately three-quarters of the population consists of non-working residents. Of these non-working residents, approximately 42% are peoples aged 15 or under. The remaining non-working residents are categorized as not in the labor force (± 91%) or unemployed (± 9%). SEMCOG forecasts 224 total jobs to be added in the 2015-2045 period with a slow, gradual increase in overall job numbers. The median household income for the Township in 2019 was \$85,384 according to the U.S. Census Bureau. Retail makes up the largest percentage of jobs in White Lake (± 21). The largest employers in White Lake are Kroger, Meijer, Home Depot, and Walmart. Both employment and population are forecasted to increase in a slow and gradual manner, a focus should be placed on improvement and optimization of the existing sanitary system infrastructure rather than expansion.

The project areas are fully developed, in primarily residentially zoned districts, therefore long-term sewer system capacity is not a concern for the Township.

**1.8 CUSTOMERS AND DEMANDS**

White Lake Township’s wastewater system currently serves 4,500 people, only 15% of the Township’s total population. With an expected increase in population through to 2040 of about 1,300 people, it is anticipated that the sanitary sewer system loading will increase slightly over the next twenty (20) years.

Over this twenty-year period, the Township’s sanitary sewer assets will continue to depreciate; and the level of service expected by the Township customers may become compromised as operation and maintenance (O&M) costs continue to increase. In December of 2019, the Township completed a Wastewater Asset

Management Plan (WWAMP). The goal of this Plan was for the Township to identify and mitigate the deterioration of their wastewater assets through a rigorous and practical methodology to meet established level of service goals (LOS). These LOS Goals incorporated a triple bottom line approach to incorporate social, environmental, and economic criteria; these criteria have been broken down into the follow sub-criteria, called indicators, in Table 2 below.

**Table 2 – Level of Service Goals & Criteria**

Social	Environmental	Economic
Customer Service	Environmental Stewardship Regulatory Compliance	Financial
Reliability		
Health & Safety		
Administration/Organizational Development		

An in-depth LOS Goals Table from the 2019 SAW Grant can be found in Appendix III.

A list of White Lake Critical Customers is provided below:

- Dublin Community Senior Center
- Independence Village
- New Hope
- Oxbow Elementary School
- St. Patrick Catholic School
- White Lake Middle School
- Harbor Alternative High School
- The Neighborhoods of White Lake
- Sandyside Senior Living
- Houghton Elementary School
- Lakewood Elementary School
- English Oaks Montessori Christian Academy
- Lakeland High School
- International Academy West

Not all of the critical customers are on public sewer and none of the critical customers are located within the project areas. Additionally, there are no industrial users within the project areas.

### 1.9 OVERVIEW OF CURRENT SEWER SYSTEM SERVICE AREA

White Lake Township’s wastewater system is operated and maintained under a contractual agreement with the Oakland County Water Resource Commissioner’s Office (OCWRC). Wastewater flow from this collection system is ultimately discharged into Commerce Township’s wastewater system, where it is treated at the Commerce Township Wastewater Treatment Plant.

The Township’s wastewater system spans approximately 42 miles and is comprised of approximately 22 miles of pressure sanitary sewer and 20 miles of gravity sanitary sewer, utilizing 10 sanitary sewage pumping stations and 27 commercial grinder pumping stations.

The ten pumping stations were constructed from 1995 to 2017; and due to changes in technology over that time, as well as various rehabilitation projects, and differences in pumping requirements, the Township has several different styles of pumping stations and pump manufacturers. These pumping station capacities range from 112.5 GPM to 400 GPM.

In recent years, the Township has struggled with Hydrogen Sulfide buildup in several sections of sewer main, which causes odor issues and pipe corrosion. Excess Hydrogen Sulfide is generated when flows are not meeting required minimum pipe velocities. This low flow is due to having limited connections to the sanitary sewer system. This system was designed to handle the ultimate contribution, however, many of the connections to the sanitary sewer have not been made yet, leading to flow rates and flow velocities lower than the minimum cleansing velocity for pipes.

Another issue that has been a localized problem within the Township is with fats, oils, and grease (FOG). FOG primarily comes as a byproduct from commercial properties involved with meat cutting activities and food and drink preparation. Six (6) of the ten of the Township's pumping stations have had excessive accumulation of FOG. The Township and the WRC have coordinated to combat FOG in the wastewater system through cleanings, repairs, and the development and implementation of a commercial kitchen inspection program.

### **1.10 STUDY AREA CHARACTERISTICS**

White Lake Township owns and co-maintains its sanitary sewer system with the WRC and discharges to Commerce Township's wastewater distribution system. The Township is home to 21 lakes and is encompassed by 2,240 acres of water. Most of the Township's wastewater system is located towards the Eastern half of the Township.

### **1.11 EXISTING FACILITIES**

The Township currently has 42 miles of gravity and pressure sanitary sewer combined, an estimated 771 manholes (gravity and pressure manholes), 10 pumping stations, and 629 grinder pumping stations (of which 27 are commercial) that serve the community. This system is split between two districts, District A in the east and District B in the west, with both discharging into different points within the Commerce Township wastewater system.

District A, the area where the project is located, is currently set up such that pressure sewers from the West and Northeast discharge to gravity main on Elizabeth Lake Road. This flows south down Round Lake Road to Cooley Lake Road where it discharges into Commerce Township's wastewater system. This section of gravity main is mostly 30-inch pipe and is designed for a peak capacity of 11.63 cfs or 7.5 MGD of flow. However, the Township is only using a portion of this purchase capacity as many of the expected connections to the sanitary system have not yet been made. A summary of the Sanitary District Capacity can be seen in Table 3 on page 30 and a detailed summary can be seen in Appendix IV.

**Table 3 - Summary of Sanitary District Capacity**

Sanitary District	Purchase Capacity	Available Capacity	% of Purchase Capacity Used
A	2.07 MGD	0.90 MGD	56.5%
B	1.43 MGD	1.35 MGD	5.3%

Sanitary sewer main materials in older sections of the system are primarily Vitrified Clay Pipe (VCP), with newer sections constructed after 1999 consisting mostly of High-Density Polyethylene (HDPE), Polyvinyl Chloride (PVC), or reinforced concrete. The pipe diameter ranges from two (2) inches to thirty (30) inches. Sanitary sewer details are provided in Table 4 below.

**Table 4 – Sanitary Sewer Main Distribution by Pipe Diameter**

Gravity Main Distribution by Size	Lineal Feet*	Pressure Main Distribution by Size	Lineal Feet*
6 inch	65	2 inch	16,264
8 inch	59,329	3 inch	20,434
10 inch	15,316	4 inch	27,297
12 inch	4,404	6 inch	12,691
15 inch	2,689	8 inch	7,523
18 inch	5,578	10 inch	5,095
21 inch	958	12 inch	25,117
24 inch	1,097	---	
27 inch	2,274	---	
30 inch	13,044	---	
<b>Total</b>	<b>104,754</b>	<b>Total</b>	<b>114,421</b>

\*lengths are approximate and based on GIS information

To date, OCWRC has televised approximately 70% of the sanitary sewer system with the remaining 30% scheduled to be completed by 2023. Through cleaning and televising, the sanitary system has been found to be in good condition overall with the exception of the aforementioned Hydrogen Sulfide buildup.

There are approximately 771 manholes, including approximately 571 gravity and 200 pressure manholes, within the Township's sanitary sewer system. As part of the SAW grant outlined in the 2019 WWAMP, approximately 60% of the manholes were inventoried using three-dimensional camera technology. Additional evidence of the Hydrogen Sulfide buildup was found during these scans.

Ten pumping stations are owned and operated by the Township; these include:

1. Village Lakes
2. White Lake Estates
3. Williams Lake Road
4. Suburban Knolls
5. White Lake Market Place
6. Cranberry Lake Estates
7. Worthington Crossing
8. Bocavina
9. Meijer
10. Kroger

Supervisory Control and Data Acquisition (SCADA) was incorporated into these pumping stations within the mid-1990s. This system allows the Township and WRC to control and assess the pumping stations.

Inspections conducted as part of the SAW grant documented deteriorations and deficiencies for each of the pumping stations and a Business Risk Evaluation was performed for each pumping station.

Two major issues that White Lake’s wastewater system faces is Hydrogen Sulfide accumulation and Fats, Oils, and Grease. Due to the corrosive nature of Hydrogen Sulfide, the system has experienced several structural defects which contribute to ongoing odor issues along Elizabeth Lake Road. Based on the 2019 WWAMP report, six of the ten pumping stations in White Lake have moderate to excessive grease buildup. These pumping stations also require minor rehabilitation in the form of part upgrades, pump maintenance, and overall improvements.

Table 5 below presents the Township’s sanitary sewer system assets and estimated total replacement/repair cost over 20 years for each item, from the 2019 WWAMP.

**Table 5 – Summary of the Township's Sanitary Sewer System Assets and 20 Year Costs**

Asset	Quantity	Replacement/Repair Cost
Gravity Main	104,754 feet	\$9,530,057
Pressure Main	114,421 feet	\$4,909,746
Gravity Manhole	571	\$444,000
Pressure Manhole	200	\$298,000
Pumping Station	10	\$1,973,000

## **2.0 SUMMARY OF PROJECT NEED**

With the growing concerns of Hydrogen Sulfide accumulation and FOG, it has become a priority for the Township to repair and perform rehabilitation on gravity sanitary main, gravity manholes, and pressure manholes. If the Hydrogen Sulfide continues, the risk of failure increases; and the public health, environmental, legal, and financial consequences of a system failure is prompting the Township to rehabilitate and repair their system sooner than later. It is essential to conduct repairs to provide a high level of water quality and service to the Township residents.

### **2.1 ORDERS OF ENFORCEMENT ACTIONS**

There are no known court orders, federal or state enforcement orders, or administrative consent orders addressed to White Lake Township.

### **2.2 TOWNSHIP'S SANITARY SYSTEM QUALITY**

As previously mentioned, there are growing concerns with the accumulation of Hydrogen Sulfide and fats, oils, and grease (FOG) within the Township's wastewater system. In 2019, the Township and Oakland County Water Resources Commissioner's Office (OCWRC) conducted Closed-Circuit Television (CCTV) analysis to determine the current quality of their sanitary system. Approximately 590 sewer manholes were inventoried and located with a Global Positioning System (GPS) and CCTV. Using the National Association of Sewer Service Companies (NASSCO) guidelines, the Township conducted sewer main and manhole inspections using CCTV technology; and found multiple segments of sanitary sewer and manholes with significant Hydrogen Sulfide buildup, causing corrosion and structural damage in the sanitary system. Though not all sections were designated a four (4) or five (5) rating in the NASSCO rating system, the excess of Hydrogen Sulfide warranted a response from the Township to repair and line the affected sections.

In recent years, the area at which the pressure sewer discharges into gravity sewer at the intersection of Elizabeth Lake Road and Union Lake Road has demonstrated the buildup of Hydrogen Sulfide. Excessive Hydrogen Sulfide causes odor issues and corrosion in the pipe. Sulfide generation can be caused when the sewer flow is slower than the minimum cleansing velocity, due to the limited number of users utilizing the system. White Lake Township has also had a history of issues with FOG in the wastewater system. Grease buildups within sanitary sewers can cause issues such as: backups in residential and commercial properties, sewer line degradation, grinder station backups, and can deplete community labor and monetary resources.

### **2.3 PROJECTED NEEDS FOR THE NEXT 20 YEARS**

Sanitary system inspections were conducted from 2017 to 2019 as part of the SAW Grant project. The purpose of these inspections was to determine the condition of the Township's wastewater assets. Using the NASSCO system, eligible sewer main and manhole structures were given a rating to evaluate the condition of the infrastructure. Several sections of sewer main and manhole structures were deemed to have severe structural defects due to the excessive buildup of Hydrogen Sulfide.

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A Capital Improvement Plan was developed for the entire sanitary sewer system in 2019 as part of the SAW Grant and WWAMP. The following capital improvements over the next 20 years are as follows:

- Gravity Manhole Repairs - \$444,000
- Pressure Manhole Repairs - \$298,000
- Gravity Main Repairs - \$9,531,000
- Pressure Main Repairs - \$4,910,000

Also summarized in the WWAMP are costs associated with Township Operations and Maintenance:

- OCWRC CCTV of Sanitary Sewer - \$1,341,000
- Pumping Station Improvements - \$1,973,000
- Elizabeth Lake Road/Oxbow Road Odor Control Program - \$826,000
- FOG Program - \$20,000

Due to the scope of work being repairs and improvements rather than installation of new infrastructure, future demand growth is not anticipated with this project. The capacity of the sanitary system will remain unchanged, and there is no expected need to increase the capacity of the sewer.

#### **2.4 FUTURE ENVIRONMENT WITHOUT THE PROPOSED PROJECT**

Without the implementation of the recommended improvements to the gravity main, gravity manholes, and pressure manholes, water quality and public health may be adversely affected. Continued corrosion of the sanitary main and structures may lead to heavy structural damage and leak raw sewage into the community and groundwater.

#### **2.5 GEOGRAPHIC INFORMATION SYSTEMS**

White Lake Township utilizes an ESRI based Geographic Information System (GIS) program that allows the Township to map their wastewater collection system assets such as sanitary manholes, sewer main, and pumping stations with real-world coordinates. Information about each asset such as pipe length, diameter, and elevation can be individually stored within the asset; allowing the Township staff to easily locate and gather information on their wastewater system. The Township's GIS system should be updated periodically as asset information changes and new infrastructure is added to the system. Currently, the Township has implemented the use of a GIS-Centric Computer Maintenance Management Software (CMMS) by Azteca called Cityworks to keep inventory of their GIS information, and to also track labor, equipment, and material costs that are essential to maintaining the wastewater collection system.

A copy of the *Wastewater Asset Management Plan (WWAMP)* is provided in Appendix V.

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## 3.0 ANALYSIS OF ALTERNATIVES

### 3.1 IDENTIFICATION OF POTENTIAL ALTERNATIVES

#### ALTERNATIVE 1 – NO-ACTION

The No-Action alternative is representative of a do-nothing scenario where no changes are made to the Township's sanitary sewer system. In this scenario, the gravity mains, gravity manholes, and pressure manholes will be left to function as they currently are, even with the evidence of severe structural damage. If no action is taken, the gravity main and manhole structures will eventually break down and cease to function properly resulting in potential sanitary sewer overflows (SSOs), reduced capacity of flow due to spalling and debris buildup, or potential leaking of sanitary sewage into the surrounding soils and groundwater table. A failure in the Township's sanitary system poses a potential detriment to the human and environmental health of the surrounding community.

The No-Action alternative will not be considered for selection due to the need of reliable and safe transport of wastewater to designated treatment sites.

#### ALTERNATIVE 2 – REPLACEMENT OF EXISTING INFRASTRUCTURE

In its current state, the Township's sanitary system will continue to have a buildup of Hydrogen Sulfide due to inadequate flow rates because of an insufficient customer base in the immediate service area. To address this, one alternative is to replace the affected sanitary gravity main and manhole structures with more adequately sized and pitched conveyance sewers to meet current expected flows. Deteriorating portions of sewer main can be removed and replaced, either in a spot repair fashion or in a complete replacement of the existing gravity sewer. Gravity manholes along this stretch of sewer main will also be replaced to minimize any potential failures at these structures.

The replacement of the existing infrastructure would require open excavations from the connection between the pressure sewer and gravity sewer at Elizabeth Lake and Union Lake Road to the sewer discharge into the Commerce Township system. A complete replacement would be required as spot replacements near the source of Hydrogen Sulfide buildup would allow Hydrogen Sulfide to affect segments of sanitary main further downstream. These downstream sections would require continued maintenance and replacement as Hydrogen Sulfide continues to deteriorate the infrastructure. Total project costs are estimated to be more than two (2) times the cost of lining the existing system as outlined in Alternative 4.

A complete replacement and downsizing of the existing infrastructure will not be considered for selection. Downsizing the infrastructure will only temporarily solve the current Hydrogen Sulfide issue and does not consider the expected future connections to the sanitary system. The sanitary system was designed to the service area; therefore, future loadings above the capacity of the downsized system would stress the system and potentially cause system failure.



### **ALTERNATIVE 3 – OPTIMUM PERFORMANCE OF EXISTING FACILITIES**

The optimum performance of existing facilities requires primarily operational changes, the addition of new equipment, and the training of operating personnel. White Lake Township actively works towards the optimization of the existing system. The DPS and OCWRC will routinely conduct inspections, maintenance, and repairs on a regular basis to ensure the sanitary system is operating the best that it can with the given circumstances. For example, the Township has worked with a local wastewater management service to biologically degrade Hydrogen Sulfide along Elizabeth Lake Road.

Again, the Township has actively conducted inspections, maintenance, and repairs to keep the system running at an optimum performance. This alternative will not be considered as it does not provide adequate improvements the way repair and rehabilitation methods can.

### **ALTERNATIVE 4 – REPAIR AND REHABILITATION OF SYSTEM WITH PIPE LINING**

One alternative is to repair and provide rehabilitation to the existing gravity main, gravity manholes, and pressure manholes. This would involve the use of full length and sectional cured-in-place pipe (FCIPP/SCIPP) sewer main lining to address the deteriorating gravity main. Manhole structures, both gravity and pressure, would also take a similar approach by using cured-in-place (CIP) lining to rehabilitate the manholes that have severe defects and/or structural damage.

Utilizing CIP lining methods serves as both a rehabilitation and preventative measures since the lining will protect segments of pipe further downstream from the Hydrogen Sulfide buildup. If spot repair methods are used, then only the section of pipe that currently has severe structural damage would be lined. This would only push the Hydrogen Sulfide further into the sanitary main and corrode segments of pipe that were not lined and protected. However, lining the entire sewer main provides an extra layer of redundancy and resilience and will further protect the community from any potential failures. Rehabilitation via lining is also less disruptive as it utilizes a trenchless method of installation and does not require open excavating to apply.

The Township has budgeted funds within their Capital Improvement Plan to provide a means to repair their sanitary system infrastructure. Repairing the gravity mains and manholes adds a layer of redundancy and resilience in the protection of their sanitary sewer system and has been chosen as the selected alternative.

## **3.2 ANALYSIS OF PRINCIPAL ALTERNATIVES**

### **A. CULTURAL RESOURCES**

There are no historic districts or historic properties within White Lake Township, therefore the project will not impact any historic properties in the Township.

There are four (4) Michigan History Center Historical Markers in White Lake Township. These markers are: White Lake Cemetery at 6190 White Lake Road, White Lake Township Hall at 7500 Highland Road, Kelley-Fisk Farm at 9180 Highland Road, and St. Patrick Church at 9086 Hutchins Road. One pressure manhole proposed for repair is located on Kelley-Fisk Farm; however, project activities are limited to CIP lining and will not cause direct impacts to this or any other Historical Marker.

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## **B. THE NATURAL ENVIRONMENT**

### **1. Climate Resiliency**

The impacts of climate change on wastewater infrastructure and utilities may include increased sediment and nutrient runoff from watersheds, and loss of wetlands. Using standard construction practices, no unusual complications are expected for the project due to adverse climate/weather conditions.

### **2. Air Quality**

There are no known air quality issues in the Township. During construction, machinery may cause airborne dust. Relevant procedures for dust control are discussed in the Mitigation section of the Project Plan.

### **3. Wetlands**

Wetlands are defined by Michigan's wetland statute, Part 303, Wetlands Protection, of the Natural Resources and Environmental Protection Act (NREPA), 1994 PA 451, as amended. Based on the National Wetlands Inventory (NWI) map there are no repair locations within wetlands. Additionally, proposed construction methods for the selected alternatives will have no impact on nearby wetlands.

### **4. Coastal Zones**

There are no coastal zones in the project area.

### **5. Floodplains**

There are no repair locations within the floodplains and the selected alternative will have no impact on floodplains. Figure 23 on page 38 is a map of the gravity main and manhole structures in relation to the Federal Emergency Management Agency (FEMA) flood hazard areas. Flood Insurance Rate Maps (FIRM) for the project areas are provided in Appendix VI.

### **6. Natural, Wild or Scenic Rivers**

There are no natural, wild, or scenic rivers within White Lake Township, according to the National Wild and Scenic Rivers System.

### **7. Major Surface Waters**

The Township is primarily located within the Kent Lake-Upper Huron sub-watershed of the Huron River Watershed (HUC 04090005). There are two gravity manholes proposed for repair located within the Upper Clinton sub-watershed of the Clinton River Watershed (HUC 04090003). White Lake Township includes portions of the Huron River and many inland lakes. The Huron River system and several lakes, including Pontiac Lake, Oxbow Lake, and Cooley Lake, are all within proximity to the project areas. No flowing watercourses are located within the project areas. Selected alternative 4 is not anticipated to cause direct impacts on the surface waters in the project areas. All required permits will be obtained, as necessary.

### **8. Recreational Facilities**

White Lake Township contains state, county, regional, and township parks as well as a number of private/commercial recreational facilities. One pressure manhole proposed for repair is located at one of the township parks, Kelley-Fisk Farm; however, project activities are limited to CIP lining and will not cause direct impacts to this park. No parks or recreational facilities are anticipated to be impacted because of the project. A map of the project areas in relation to these parks and recreational facilities is provided in Figure 24 on page 39.

### **9. Topography**

Any disturbance to the ground during the repair work will be temporary and will not result in permanent topographic alteration.

### **10. Geology**

No geological resources will be impacted because of the project.

### **11. Soils**

Soils will not be impacted because of the project.

### **12. Agricultural Resources**

No prime or unique agricultural areas are located within the influence of the project and agricultural resources will not be impacted because of the project.

### **13. Fauna and Flora**

According to the USFWS list, the Rayed Bean, Snuffbox mussel, Poweshiek Skipperling, Indiana bat, Northern Long-Eared bat, and Eastern Massasauga are all endangered or threatened species potentially found in Oakland County. Lakes, ponds, streams, and Pontiac Lake State Park are located in the Township; therefore, a suitable habitat is present, and species may be present. Selected alternative 4, however, involves CIP lining of existing infrastructure and is therefore not anticipated to have any effect on the habitats that host the above listed species.

### **14. Unique Features**

No unique features or critical habitats are located within the project area.

### **15. Construction Activities**

Typical machinery noise and airborne dust because of construction of Selected Alternative 4 is not expected to have an impact on the surroundings.

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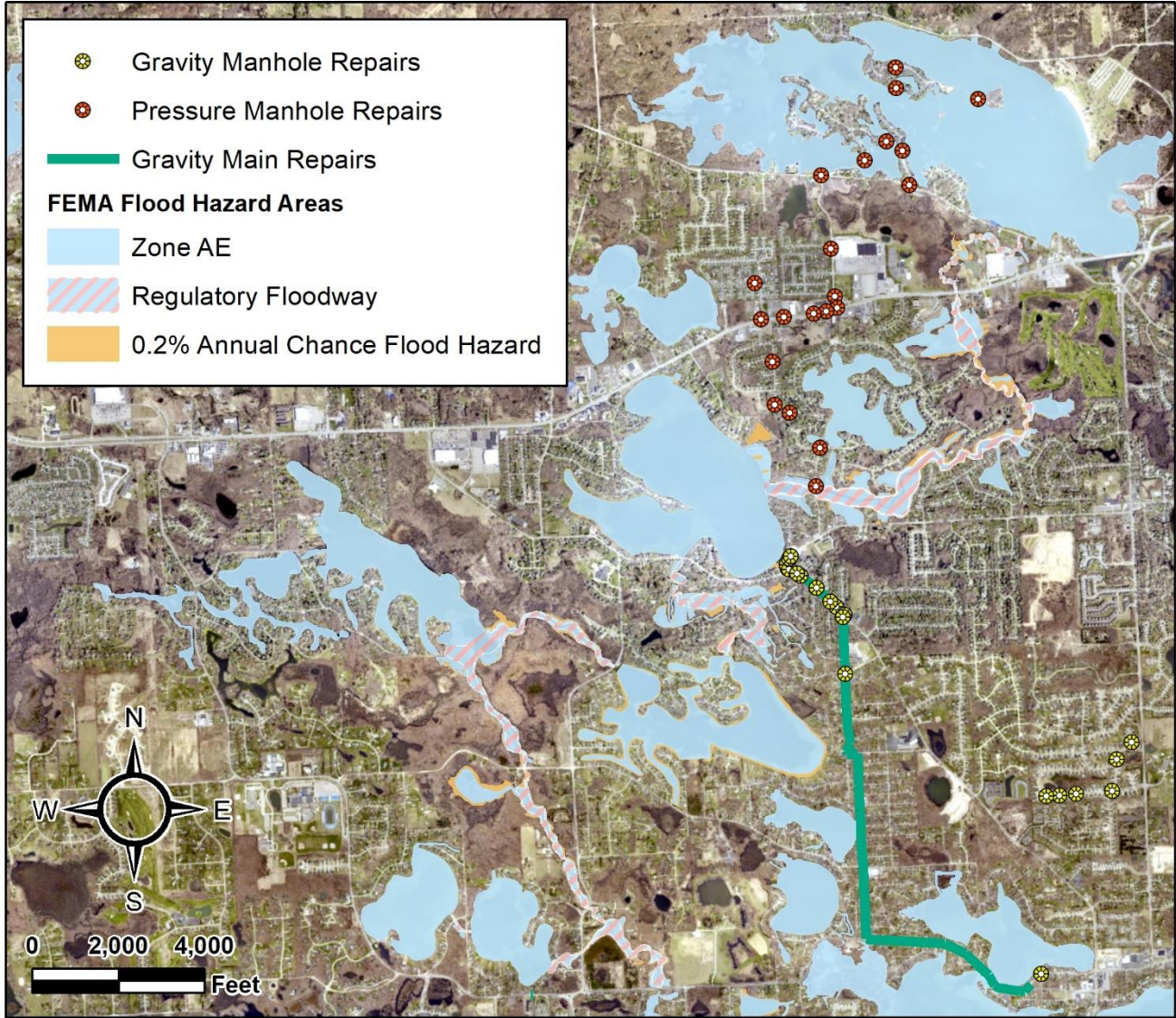
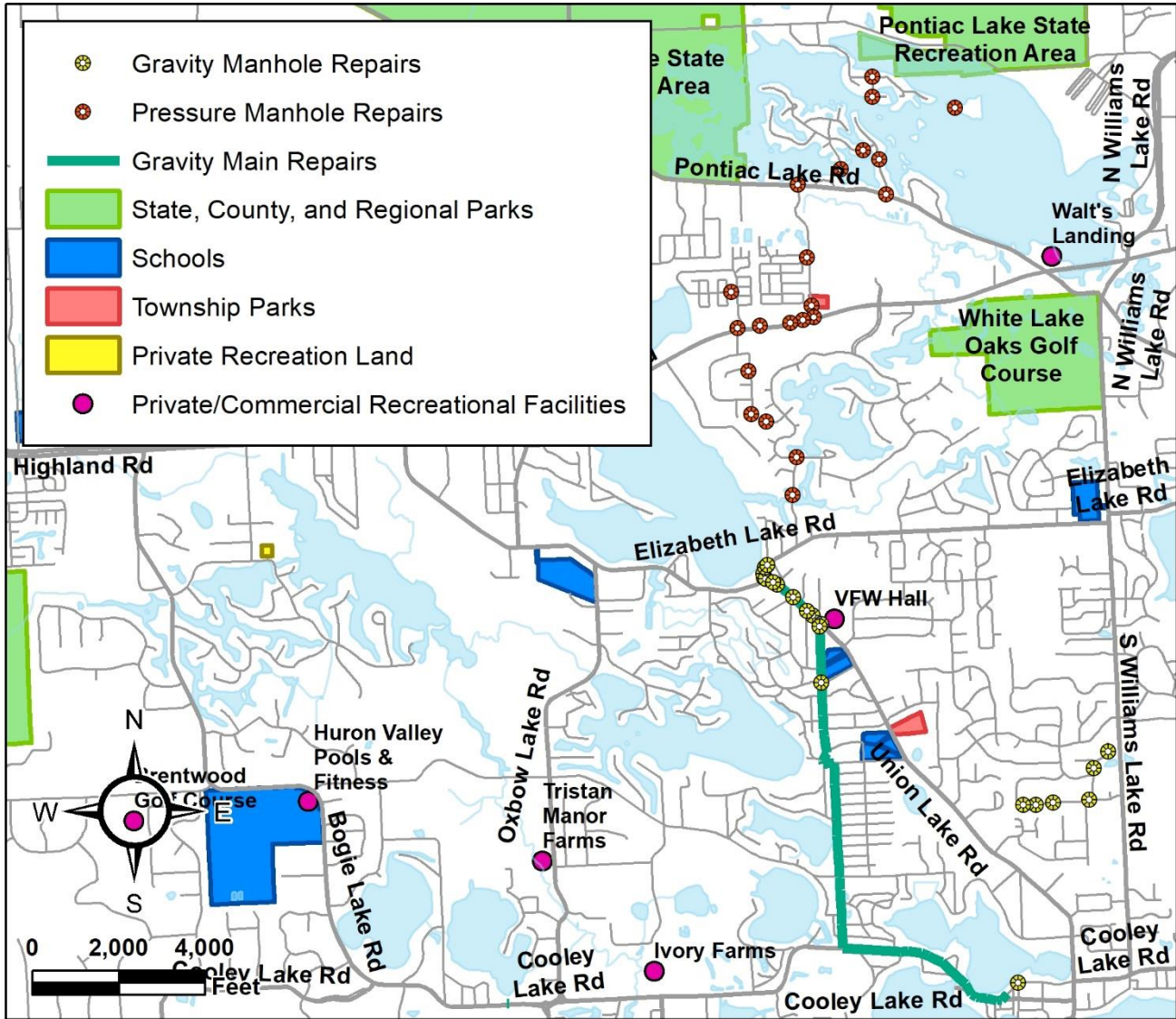


Figure 23 – FEMA Flood Hazard Areas



**Figure 24 – Parks & Recreation Facilities**

**C. MITIGATION**

Permits necessary for the scope of the project will be applied for and obtained prior to project work. Mitigation during the replacement and improvement procedures are the responsibility of the contractor. Examples of mitigation procedures which may be taken include airborne dust control measures and construction noise control measures. The contractor shall follow all construction standards and work to minimize all potential environmental impacts which may occur during construction.

#### D. TECHNICAL CONSIDERATIONS

The existing infrastructure consists of a system of pressure sanitary main discharging into gravity sewer main to transport wastewater south to Commerce Township. With excessive hydrogen sulfide buildup, there is a concern with the structural integrity of the system. Inspections have been annually conducted on portions of sanitary sewer and manholes to determine NASSCO Pipeline Assessment Certification Program (PACP) and Manhole Assessment Certification Program (MACP) structural ratings. Though the PACP ratings for the hydrogen sulfide affected portions of pipe have not yet rated at the 4 (significant) or 5 (most significant) grade for defects, the confirmed corrosion due to hydrogen sulfide are severe enough to warrant repairs and rehabilitation. A structural failure in this system would discharge raw sewage into the environment; and with an area surrounded by wetlands and lakes, raw sewage leaking into the surrounding ground and surface waters would be a significant environmental issue.

#### E. RESIDUALS

The Township has been experiencing development and redevelopment in recent years and will continue to experience redevelopment. However, as mentioned previously, these changes in development will not contribute an excessive amount to the current system and will not affect future demand within the existing service areas.

#### F. CONTAMINATION

Table 6 below summarizes the sites of known contamination identified on the EGLE Environmental Mapper web portal within a one-half mile radius along the pipe sections and manholes that are to be rehabilitated. These sites are also present in Figure 25 on page 44.

**Table 6 – Sites of Known Contamination in Reference to Project Areas**

Site Name	Site Address	Rehabilitation
Cornell Sign Co.	1047 Round Lake Road	Gravity Main
Union Lake Road Contamination/PCSI, Inc./ Great Lakes Landing, LLC/ Richman D. and H. Excavating Co.	1095 Union Lake Road	Gravity Manhole
Breens IGA	1111 Round Lake Road	Gravity Main
Michigan Department of Natural Resources	1125 Lakeview	Gravity Main Gravity Manhole
Round Lk and Locustwood Residence	1243 Round Lake Road	Gravity Main
JSB Engines	1320 Round Lake Road	Gravity Main

Site Name	Site Address	Rehabilitation
Wayne Repair	2749 Tackles Drive	Pressure Manhole
Bryan's Auto Repair	455 Union Lake Road	Gravity Main Gravity Manhole
County of Oakland	51 East Oxhill Drive	Pressure Manhole
William Hepfer	714 Ranveen Drive	Gravity Main
Lionel Lloyd	761 Farnsworth Avenue	Gravity Main Gravity Manhole
William/Cooley Mobile/Exxon Mobil Oil Corp.	8000 Cooley Lake Road	Gravity Manhole
Advance Auto Parts	8010 Cooley Lake Road	Gravity Main Gravity Manhole
Elias White Lake LLC	8040 Cooley Lake Road	Gravity Main Gravity Manhole
Union Lake Clinic	8080 Cooley Lake Road	Gravity Main Gravity Manhole
Jim Schlenkert	8110 Casa Mia Street	Gravity Manhole
4 Corners Square LLC/BP Products North America/ Top Value Muffler	8198 Cooley Lake Road	Gravity Main Gravity Manhole
Elsarelli Residence	835 Hilltop Drive	Pressure Manhole
Campbell's Auto Salvage and Parts	8372 Pontiac Lake Road	Pressure Manhole
Last Resort Inc.	8560 Pontiac Lake Road	Pressure Manhole
Kasaab Associates	8990 Pontiac Lake Road	Pressure Manhole
Bed Bath & Beyond Inc.	9050 Highland Road	Pressure Manhole
Home Depot USA Inc.	9078 Highland Road	Pressure Manhole
Henry's Corvette Repair	9104 Georgette Street	Gravity Main

Site Name	Site Address	Rehabilitation
Sprengers Deco Center	9145 Highland Road	Pressure Manhole
Wal-Mart Stores East	9190 Highland Road	Pressure Manhole
Belle Tire Distributors Inc.	9201 Highland Road	Pressure Manhole
Six Lakes Service	9241 Cooley Lake Road	Gravity Main
Terry Simpson	925 Ennest Street	Gravity Main
County of Oakland Drain Commissioner/ Needels Six Lake Sub #1	9260 Cooley Lake Road	Gravity Main
Dublin Elementary	9260 Sandyside Street	Gravity Main Gravity Manhole
Professional Imaging	9320 Elizabeth Lake Road	Gravity Main Gravity Manhole Pressure Manhole
Gale Road Sand & Gravel	9400 Gale Road	Pressure Manhole
Performance Plus Quick Lube	9410 Elizabeth Lake Rod	Gravity Main Gravity Manhole Pressure Manhole
Inter Lakes Steel Prod. Co/McMachen White Lake LLC	9434 Highland Road	Pressure Manhole
Mikes Auto Clinic/Marathon Oil Company LLC	9555 Elizabeth Lake Road	Gravity Main Gravity Manhole Pressure Manhole
Oxbow Car Wash	9581 Elizabeth Lake Road	Gravity Main Gravity Manhole Pressure Manhole
Speedway LLC	9601 Highland Road	Pressure Manhole
Cars Inc.	9640 Highland Road	Pressure Manhole
Watkins Septic	9731 Portage Trail	Gravity Main Gravity Manhole



Site Name	Site Address	Rehabilitation
Oakland Appliance Service/Estate of Gloria R. Pohl	9805 Elizabeth Lake Road	Gravity Main Gravity Manhole
Walter Pohl	9807 Elizabeth Lake Road	Gravity Main Gravity Manhole
Moores Tire Service	9860 Pal moor Street	Gravity Main Gravity Manhole
Interlakes Steel Products	9934 Highland Road	Pressure Manhole
AAA Oxbow Oil	9970 Sedlock Street	Gravity Main Gravity Manhole

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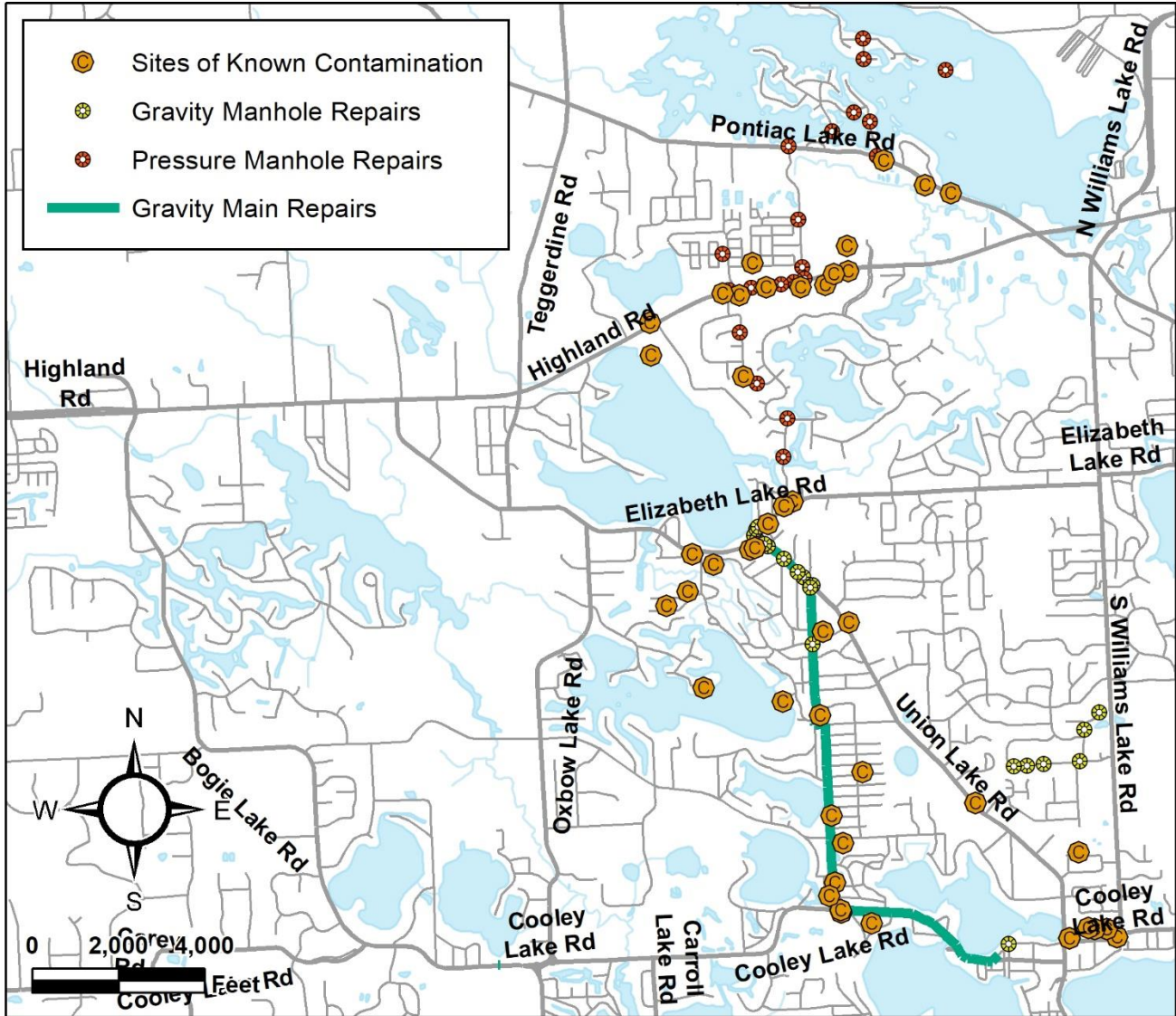


Figure 25 – Sites of Known Contamination in Reference to Project Areas Map

## 4.0 SELECTED ALTERNATIVE – ALTERNATIVE 4

### 4.1 DESCRIPTION OF THE SELECTED ALTERNATIVE

Alternative 4 has been selected as the most operational and cost-effective option for the Township. The repairs and rehabilitation of the gravity main, gravity manholes, and pressure manholes will assure continued reliable sanitary service to the community.

Over the next five years, the Township seeks to repair 14,011 feet of gravity main, 22 gravity manholes, and 21 pressure manholes using CIP lining methods.

Estimated construction costs for each option are summarized in Table 7 below. Due to the additional costs associated with the complete replacement of the Township’s sanitary system, ease of repair and lining compared to replacement, and the ability to remediate the deterioration and extend the life of the existing infrastructure, Alternative 4 is the optimal choice for design. Alternative 1 is not ideal as the system will continue to deteriorate, adding costs for continuous maintenance, and there are too many potential risks to community and environmental health if the sanitary system were to fail. Alternative 2 is not only extremely expensive when compared to repairing and lining the sanitary system, but also a much more invasive process as it requires open cutting to remove and replace the sanitary system. Open cutting would more than likely require lane closure along the sanitary main and would have many more short-term impacts and mitigation to consider. Alternative 3 is not a viable solution as running the system at an optimum performance will not remedy existing corrosion due to Hydrogen Sulfide.

**Table 7 – Sewer Repair Cost Estimation**

Alternative	Description	Gravity Main Cost	Gravity Manhole Cost	Pressure Manhole Cost	Total	Present Worth
1	No-Action	See Note 1	See Note 1	See Note 1	See Note 1	See Note 1
2	Complete Replacement	See Note 2	See Note 2	See Note 2	\$4,663,531.58	\$4,577,699.35
3	Optimum Performance	See Note 1	See Note 1	See Note 1	See Note 1	See Note 1
4	Repairs and Rehabilitation	\$1,966,931.25	\$87,120.00	\$34,807.50	\$2,297,744.63	\$2,249,670.40

Note 1: Option 1 and 3 will have no initial construction cost due to leaving the system as-is (alternative 1) and operating the system to an optimum performance, which the Township is currently doing (alternative 3). However, the assets will continue to deteriorate due to the Hydrogen Sulfide buildup and costs will continue to increase as time progresses for routine maintenance and spot repairs. This option is not recommended.

Note 2: Costs for pavement removal and replacement, curb and gutter removal and replacement, and restoration are not broken down individually for each asset.

Detailed cost breakdowns and estimation for each asset is provided in Table 8 below. Details on alternatives 2 and 4 rehabilitation scenarios are provided in the Present Worth Calculations included in Appendix VII.

**Table 8 – Alternative 4 – Sanitary Sewer System Repair/Rehabilitation Cost Estimate**

Item No	Description	Qty	Units	Unit Price	Total
1	Mobilization	1	LS	\$ 208,885.88	\$ 208,885.88
2	CIP Lining Gravity Sewer 30 inch	11,607	LF	\$ 145.00	\$ 1,683,051.25
3	CIP Lining Gravity Sewer 27 inch	2,273	LF	\$ 120.00	\$ 272,760.00
4	CIP Lining Gravity Sewer 24 inch	96	LF	\$ 95.00	\$ 9,120.00
5	CIP Lining Gravity Sewer 21 inch	35	LF	\$ 80.00	\$ 2,000.00
6	CIP Lining Gravity Manhole	22	EA	\$ 3,960.00	\$ 87,120.00
7	CIP Lining Pressure Manhole	21	EA	\$ 1,657.50	\$ 34,807.50
8	Bypass Pumping	1	LS	\$ 40,000.00	\$ 40,000.00
<b>Total Construction Cost</b>					<b>\$ 2,337,744.63</b>

#### 4.2 WATER AND ENERGY EFFICIENCY

Water and energy efficiency efforts were also considered in the selection of the alternative. Water efficiency typically considers water reuse, water efficient devices, water meters, water audits and conservation plans. However, in this scope of work, the efficiency of wastewater conveyance as considered. Pipe lining provides a means of protecting the pipe structure from corrosion due to hydrogen sulfide, will eliminate any sources of leaks from the pipe, as well as eliminate source of inflow and infiltration (I&I). This increases the efficiency at which the wastewater is transported to the designated treatment plant; where the water has potential to be reclaimed and used as a resource.

In terms of energy efficiency, CIP pipe lining methods require much less equipment and machinery on-site than traditional excavation methods for pipe repair. Having to use less equipment means less fuel to transport said equipment to the project site, reducing emissions.

#### 4.3 ALTERNATIVE 4 TOTAL PROJECT BUDGET

Table 9 on page 47 outlines the total project budget including the construction, design, construction administration/ engineering/inspection, ancillary costs and 10% project contingency costs. The total project budget is \$2,855,538.66 and is the amount that the Township would request to be made eligible for the SRF low interest funding.

**Table 9 – Alternative 4 – Total Project Budget**

Item No	Description	Total Cost
1	Design (8%)	\$ 187,019.57
2	Construction	\$ 2,337,744.63
3	Construction Administration, Construction Engineering, Inspection (10%)	\$ 233,774.46
4	Project Plan	\$ 30,000.00
5	Legal/Financial Service	\$ 32,000.00
6	Bond Counsel	\$ 35,000.00
<b>Total Project Budget</b>		<b>\$ 2,855,538.66</b>

The 2022 discount rate, as determined by the Federal Register, is 1.875% with a project planning period of twenty (20) years.

#### **4.4 SALVAGE VALUES & REPLACEMENT COST**

Given the nature of the alternative, the proposed infrastructure improvements are designed to have an expected life of 40 years, double the 20-year planning period for the monetary present worth evaluation. As a result, all lining items (sanitary main and manholes) will have a salvage value worth half of their estimated cost at the end of the 20-year planning period. There are no items related to the alternative that have an expected life of less than 20 years, therefore there will be no replacement costs associated with the present worth analysis. These values are outlined in Table 10 for Alternative 2 and Table 11 for Alternative 4 on pages 48 and 49, respectively.

**Table 10 – White Lake Township Alternative 2: Complete Replacement Cost Estimation**

Item No	Description	Qty	Units	Unit Price	Total	Salvage Years	Salvage Value	Replacement Cost
1	Mobilization	1	LS	\$ 395,348.20	\$ 395,348.20	0		
2	Gravity Sewer 30 inch	11,607	LF	\$ 141.00	\$ 1,636,622.25	40	\$ 818,311.13	
3	Gravity Sewer 27 inch	2,273	LF	\$ 123.00	\$ 279,579.00	40	\$ 139,789.50	
4	Gravity Sewer 24 inch	96	LF	\$ 90.00	\$ 8,640.00	40	\$ 4,320.00	
5	Gravity Sewer 21 inch	35	LF	\$ 65.00	\$ 2,275.00	40	\$ 1,137.50	
6	Gravity Manhole Replacement	22	EA	\$ 6,000.00	\$ 132,000.00	40	\$ 66,000.00	
7	Pressure Manhole Replacement	21	EA	\$ 6,000.00	\$ 126,000.00	40	\$ 63,000.00	
8	Sewer Removal 24-48 inch	14,011	LF	\$ 30.00	\$ 420,337.50	0		
9	Road Pavement Removal	5,202	TON	\$ 100.00	\$ 520,167.66	0		
10	Road Pavement Replace	5,202	TON	\$ 110.00	\$ 572,184.42	15	\$ 429,138.32	\$ 572,184.42
11	Curb and Gutter, Rem	7,006	LF	\$ 10.00	\$ 70,056.25	0		
12	Curb and Gutter, Replace	7,006	LF	\$ 24.00	\$ 168,135.00	40	\$ 84,067.50	
13	Restoration	23,352	SYD	\$ 13.00	\$ 303,577.08	0		
<b>Total Construction Cost</b>					<b>\$ 4,663,531.58</b>		<b>\$ 1,605,763.94</b>	<b>\$ 572,184.42</b>

**Table 11 – White Lake Township Alternative 4: Repair and Rehabilitation Cost Estimate**

Item No	Description	Qty	Units	Unit Price	Total	Salvage Years	Salvage Value
1	Mobilization	1	LS	\$ 208,885.88	\$ 208,885.88	0	
2	CIP Lining Gravity Sewer 30 inch	11,607	LF	\$ 145.00	\$ 1,683,051.25	40	\$ 841,525.63
3	CIP Lining Gravity Sewer 27 inch	2,273	LF	\$ 120.00	\$ 272,760.00	40	\$ 136,380.00
4	CIP Lining Gravity Sewer 24 inch	96	LF	\$ 95.00	\$ 9,120.00	40	\$ 4,560.00
5	CIP Lining Gravity Sewer 21 inch	35	LF	\$ 80.00	\$ 2,000.00	40	\$ 1,000.00
6	CIP Lining Gravity Manhole	22	EA	\$ 3,960.00	\$ 87,120.00	40	\$ 43,560.00
7	CIP Lining Pressure Manhole	21	EA	\$ 1,657.50	\$ 34,807.50	40	\$ 17,403.75
8	Bypass Pumping	1	LS	\$ 40,000.00	\$ 40,000.00	0	
<b>Total Construction Cost</b>					<b>\$ 2,337,744.63</b>		<b>\$ 1,044,429.38</b>

Note – there are no replacement costs associated with this alternative as all the items for this alternative have a useful life greater than the 20-year planning period; and will therefore not require replacement over the 20-year period.

#### 4.5 OPERATION & MAINTENANCE ANNUAL COSTS

Operations and Maintenance (O&M) for the sanitary sewer system will include various maintenance and inspection activities. These estimated O&M costs are included in the present worth calculations. Note that the estimated annual O&M for chosen Alternative 4 is based on the current budget that White Lake Township pays to have CCTV inspections of their sanitary sewer system, which is \$40,000/year.

Table 12 below summarizes the calculated present worth for the repair and rehabilitation project including construction, annual O&M, and salvage figures for the options under Alternative 2 and 4. Detailed present worth calculations for each alternative option can be found in Appendix VII.

**Table 12 – Present Worth Analysis**

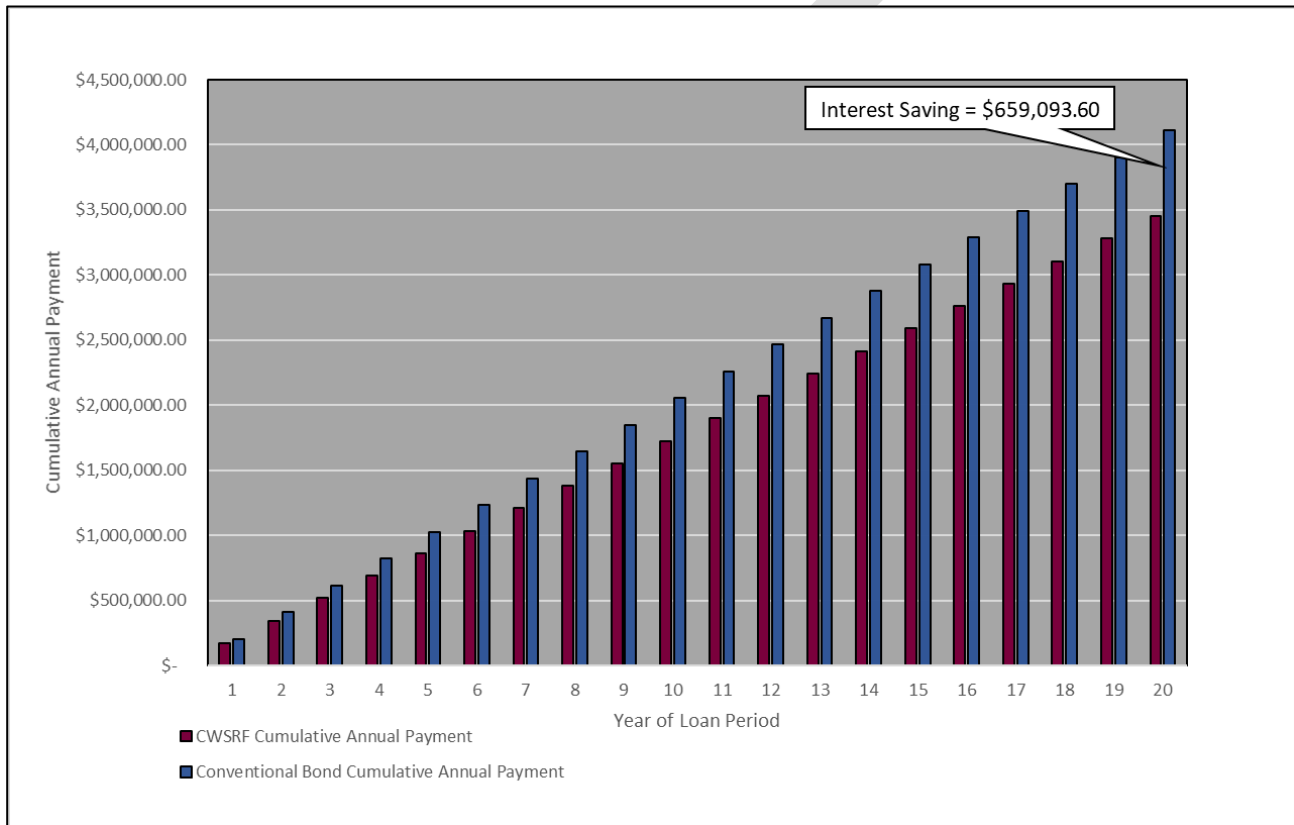
Description	Total Cost – Alternative 2	Total Cost – Alternative 4
Capital Cost	\$ 4,663,531.58	\$ 2,337,744.63
Discount Rate (%)	1.875	1.875
Planning Period (years)	20	20
Capital Present Worth	\$ 4,577,699.35	\$ 2,294,718.65
Salvage Value	\$ 1,605,763.94	\$ 1,044,429.38
Salvage Value Present Worth	\$ 1,087,080.35	\$ 707,064.48
Replacement Cost	\$ 572,184.42	\$ 0.00
Replacement Cost Present Worth	\$ 425,063.76	\$ 0.00
O&M Cost per year	\$ 40,000.00	\$ 40,000.00
O&M Cost Present Worth	\$ 662,016.23	\$ 662,016.23
<b>Total Present Worth</b>	<b>\$ 4,201,518.49</b>	<b>\$ 2,249,670.40</b>

#### 4.6 INTEREST RATE SAVINGS

The latest low interest loan rate (discount rate) from EGLE is from 2022 and is 1.875%. This interest rate is used in the annual Principal and Interest loan calculation to determine the annual amount of Principal and Interest to be paid by the Township for the 20-year load project period, the annual principal and interest payment would be approximately \$169,722.00.



An estimated interest rate of 3.75% was used to calculate the annual Principal and Interest payment of the Township should they choose to finance the project using the bond market and their bond rating over the 20-year load period. The annual Principal and Interest payment would approximately be \$205,490.55. The estimated annual principal and interest savings that the Township would realize by utilizing the SRF low interest load rate of 1.875% is \$32,954.68. This savings projected over the entire 20-year loan period results in the Township saving approximately \$659,093.60 as seen below in Figure 26 below.



**Figure 26 – Savings for CWSRF Low Interest Loan at 1.875% vs. Conventional Bond at 3.75% for Selected Alternative 4**

**4.7 AUTHORITY TO IMPLEMENT THE SELECTED ALTERNATIVE**

Legal, financial, and managerial authority to implement the selected alternative for the sanitary system lining and improvements lies with White Lake Township. It should be noted, however, that Oakland County Water Resources Commissioner’s Office (OCWRC) operates the sanitary sewer system for White Lake Township under an existing contract. A small portion of the sewer lining and one gravity manhole are located on the northern border of Commerce Township; however, the entire service area falls within the White Lake Township limits.

The Township maintains a sewer maintenance savings account that will be utilized to finance the project, with the help of the low interest state loan. The Township has the Management, Engineering, and Operational staff to implement the project.

The Township has the legal authority, capability, and willingness to plan, finance, build, operate, and maintain the proposed station upgrades. The responsibility for implementing these improvements rests solely with White Lake Township. The Township is prepared to meet the appropriate schedule milestones to start construction of the project in July 2023. A proposed project schedule is presented in Table 13 below.

**Table 13 – Proposed CWSRF Project Schedule**

<b>Milestone Description</b>	<b>On or Before Date</b>
Public Hearing Advertisement	April 13, 2022
Public Hearing, Resolution from Township Board Passed & Signed	May 17, 2022
Final Project Plan Submitted to EGLE	June 1, 2022
Publication of Environmental Assessment	February 6, 2023
Public Notice Clearance	March 10, 2023
EGLE Approval of Project Plan	March 10, 2023
Submittal of Draft Rate Methodology and Legal Documents	October 23, 2022
EGLE Comments of Draft Rate Methodology and Legal Documents	November 22, 2022
Submittal of Final Rate Methodology and Legal Documents	December 27, 2022
EGLE Approval of Rate Methodology and Legal Documents	January 27, 2023
Submittal of Draft Plans and Specifications to EGLE	December 7, 2022
EGLE Comments of Draft Plans and Specifications	January 6, 2023
Submittal of Final Design/Plans and Specifications to EGLE	February 10, 2023
All Permit Applications Submitted	February 10, 2023
Issuance of Construction Permit by EGLE	March 1, 2023
EGLE Approval of Plans and Specifications	March 10, 2023
Submittal of Application Part I and Part II	February 14, 2023
Bid Ad Published	March 10, 2023
Bids Received and Opened	April 10, 2023
Submittal of DWRF Application Part III (w/tentative contract awards)	April 17, 2023
Resolution of Tentative Contract Award by Governing Body	April 17, 2023
EGLE Order of Approval Issued	May 17, 2023
Borrower's Pre-Closing w/MMBA	June 1, 2023
MMBA Closing	June 12, 2023
Notice to Proceed Issued No Later Than	July 26, 2023
Begin Project Construction	July 26, 2023
Project Construction Complete	October 31, 2024

## 5.0 EVALUATION OF ENVIRONMENTAL IMPACTS

### 5.1 WETLANDS/WATER QUALITY

There are several areas of this project that are near wetland areas, particularly the areas with pressure manholes as many of these are situated around Pontiac Lake. No project areas, however, are located within the wetlands. Due to the nature of the project, there will be no water quality impacts anticipated from the direct discharges or nonpoint sources with the proposed project. There will be no direct impacts to rivers, streams, or creeks as part of the proposed rehabilitation within the project area.

### 5.2 THREATENED AND ENDANGERED SPECIES

The State of Michigan Natural Features Inventory (MNFI) and the United States Fish and Wildlife (USFWS) were not required to perform a Rare Species Review for this project area. Michigan includes the state species statuses: Endangered (E), Threatened (T), and Special Concern (SC). Search results from the USFWS Environmental Conservation Online system and the MNFI indicate five (5) occurrences of E, T, or SC species that have been noted within the area of Oakland County.

Rayed Bean (state endangered; *Villosa fabalis*) – is a small freshwater mussel that is typically found in small shallow rivers, often near aquatic vegetation. The activities of this project will not impact any water resources and therefore no impacts are expected to occur.

Snuffbox mussel (state endangered; *Epioblasma triquetra*) – is a small to medium-sized mussel that lives in rivers with steady current and sand and gravel substrates. The activities of this project will not impact any water resources and therefore no impacts are expected to occur.

Eastern Prairie Orchid (state endangered; *Platanthera leucophaea*) – a member of the Orchid family, this plant was once abundant across wet tallgrass prairies, sedge meadows, and old fields. These types of habitats will not be impacted by this project.

Indiana bat (state endangered; *Myotis sodalis*) – is a small bat that roost and form maternity colonies in the floodplain forest. The activities of this project are not expected to affect roosting locations and therefore no impacts are expected to occur to this bat.

Eastern Massasauga Rattlesnake (state special concern; *Sistrurus catenatus*) – a small to medium sized, thick bodied, snake with distinctive color pattern along the body. These snakes have been found in open wetlands. The activities of this project will not impact open wetlands and therefore no impacts are expected to occur.

The various project locations all fall within the range of the five species that occur in Oakland County, Michigan. It is important to recognize that the project work will not impact the habitats for these species.

### 5.3 HISTORICAL/ARCHAEOLOGICAL/TRIBAL RESOURCES

It was determined that there are no historical districts or properties within the project areas. There is one Michigan History Center Historical Markers within the project area; it is the Kelley-Fish Farm. One pressure

manhole proposed for repair is located on Kelley-Fisk Farm; however, project activities are limited to CIP lining and will not cause direct impacts to this Historical Marker.

#### **5.4 AGRICULTURAL LAND**

There will be no impacts to agricultural land as part of the proposed sanitary system lining and rehabilitation within the project areas.

#### **5.5 SOCIAL/ECONOMIC IMPACT**

The Township is not proposing monetary user fee increases at this time.

#### **5.6 CONSTRUCTION/OPERATIONAL IMPACT**

At the specific project sites throughout White Lake Township, there will be minimal impacts to traffic patterns in areas where the construction will occur. No direct impacts are anticipated in major thoroughfares. There is no expected impact for dewatering at any of the sites since the Township will only be conducting pipe lining rather than trenching and excavating.

#### **5.7 INDIRECT IMPACTS**

It is not expected that the pumping station improvements to the sanitary sewer system will prompt growth within the Township. Changes to natural areas, sensitive species, and ecosystems are not expected due to the project work.

The project includes CIP lining and will have minimal impacts during the construction period. It is not expected that there will be lasting impacts on aesthetics, land use, density, or resource consumption over the useful life of the project.

There will be impacts during the construction phase of this project, however, it is expected that there will not be lasting impacts on land use and aesthetics over the life of the project.

#### **5.8 CUMULATIVE IMPACTS**

No obvious cumulative impacts are associated with the selected Alternative 4.

### **6.0 MITIGATION**

#### **6.1 GENERAL**

Where adverse impacts cannot be avoided, mitigation methods will be implemented. Mitigating measures for the projects such as soil erosion and sedimentation control, if required, will be utilized as necessary and in accordance with applicable laws. Details will be further specified in the construction contract documents used for the project.

---

## 6.2 SHORT-TERM IMPACTS

Short-term impacts due to construction activities such as traffic disruption cannot be avoided. However, efforts will be made to minimize the adverse impacts by use of thorough design and well-planned construction sequencing.

Site restoration will minimize the adverse impacts of construction, and adherence to the Soil Erosion and Sedimentation Act will minimize the impacts due to disturbance of the soil structure, if such disturbance is found to be necessary. Specific techniques will be specified in the construction contract documents.

## 6.3 LONG-TERM IMPACTS

Adverse long-term impacts due to the proposed project are not anticipated. The aesthetic impacts of construction within the boundaries of the project areas will be mitigated by site restoration.

## 6.4 INDIRECT IMPACTS

In general, it is not anticipated that mitigative measures to address indirect impacts will be necessary for the recommended improvements addressed in this Project Plan. The proposed improvements are located within the project area, so they do not promote growth in areas not currently served by White Lake Township. Therefore, indirect impacts are not likely to be a significant concern for these improvements.

## 7.0 PUBLIC PARTICIPATION

A Public Hearing Notice was published on April 13, 2022, in the *Spinal Column*, notifying the public of a hearing to be held on May 17, 2022 at 7:00 PM. The Project Plan is made available to the public on the Township's main page of the website. A hard copy of the Plan will also be made available at the Public Hearing.

A copy of the Project Plan was submitted to the Southeast Michigan Council of Governments (SEMCOG) for review.

The operation, costs, and impacts of the project will be summarized at the Public Hearing.

## 8.0 SITE PHOTOS

Do we have any site photos from the SAW Grant we could incorporate?

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## **APPENDIX I**

CWSRF PROJECT PLAN SUBMITTAL FORM

## **APPENDIX II**

WHITE LAKE TOWNSHIP SEMCOG COMMUNITY PROFILE

## **APPENDIX III**

LEVEL OF SERVICE (LOS) GOAL TABLE

## **APPENDIX IV**

WHITE LAKE SANITARY SYSTEM CAPACITY

## **APPENDIX V**

WASTEWATER ASSET MANAGEMENT PLAN

## **APPENDIX VI**

FEMA FIRM FLOOD MAPS

## **APPENDIX VII**

PRESENT WORTH CALCULATIONS

DRAFT



INNOVATIVE IDEAS  
EXCEPTIONAL DESIGN  
UNMATCHED CLIENT SERVICE

White Lake Township  
FY2023 CWSRF Wastewater Asset Management Plan  
Improvements Project Plan

## APPENDIX I

### PROJECT PLAN SUBMITTAL FORM

DRAFT



MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY  
 FINANCE DIVISION  
 CLEAN WATER AND DRINKING WATER STATE REVOLVING FUND/  
 STRATEGIC WATER QUALITY INITIATIVES FUND

**INTENT TO APPLY FORM**

This form should be submitted by all applicants seeking funding in the next five years. Applicants participating in the ITA process receive early indication of the funding outlook for their project(s).

**DATE:** [Click here to enter text.](#)

**PROJECT(S) NAME** (Brief Identifier): White Lake Township Wastewater Asset Management Plan Improvements

**PROJECT(S) PURPOSE** (Including general location and public health or water quality issue being addressed): From an earlier SAW grant asset inventory and assessment, the Township has created a Capital Improvement Plan to repair and replace sewer main and manholes to ensure the reliable operation of the Township’s wastewater system. Currently, the Township is prioritizing four project categories for the years 2020-2024: Pumping Station Projects, Gravity Manhole Repairs, Gravity Main Repairs, and Pressure Manhole Repairs. Condition assessments inspected under NASSCO guidelines with PACP and MACP standards found multiple segments of Gravity Main and Gravity Manholes to have significant structural damage due to high Hydrogen Sulfide concentrations (Grades 4&5); these projects have been prioritized by the Township for rehabilitation and/or replacement.

Pumping Station Projects: Upgrades at 10 Pumping Stations  
 Gravity Main Repairs: 12,041 ft of Gravity Main  
 Gravity Manhole Repairs: 20 Gravity Manholes  
 Pressure Manhole Repairs: 21 Pressure Manholes

Applicant Legal Name: Charter Township of White Lake

Applicant Contact Name: Aaron Potter Title: Director, Dept. of Public Services

Mailing Address (street, city, state, zip+4): 7525 Highland Rd, White Lake, MI 48383-2938

Phone No.: (248) 698-7700 x226 Email: apotter@whitelaketwp.com

Consulting Engineer Name (if applicable): Mike Leuffgen Firm: DLZ-Michigan, Inc.

Mailing Address (street, city, state, zip+4): 4494 Elizabeth Lake Rd., Waterford, MI 48328-2825

Phone No.: (248) 240-1019 Email: mleuffgen@dlz.com

**PROJECT INFORMATION**

Applicant Population: 31,384 Population Served by Project: 4,500

Treatment Facility Name (if applicable): Commerce Township

**Estimated Total Project Cost: \$2,950,410.60**

Year 1 Costs: \$223,451.57	Estimated Year 1 Costs Financed Through SRF: \$223,451.57
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Future Year Costs (if applicable): \$2,726,959.03	Estimated Future Costs Financed Through SRF: \$2,726,959.03
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Other Funding Sources (check all that apply): MDOT MEDC USDA Rural Development  
Other Financing/Funding Agency: N/A

Proposed Construction Start Date (mm/yyyy): August 1, 2023



Completed Project-Related Planning Documents (check all that apply; do not need to submit at this time):  
Capital Improvements Plan Asset Management Plan Preliminary Engineering Report  
Environmental Report Project Plan Infiltration & Inflow Study Sanitary Sewer Evaluation Study  
NASSCO Report Watershed Management Plan Master Plan Reliability Study Other: [Click here to enter text.](#)

## ADDITIONAL INFORMATION

Disadvantaged Community (as determined by EGLE)?  Yes  No  Unknown

For a preliminary determination from EGLE, complete and attach the [Disadvantaged Community Status Determination Worksheet](#).

Does the proposed project include any green infrastructure, water or energy efficiency improvements, or other environmentally innovative activities?  Yes  No  Unknown

If yes, please describe: [Click here to enter text](#).

For Clean Water State Revolving Loan projects, does the community use a qualifications-based selection process to obtain architectural/engineering services?  Yes  No

**Deadlines:** The ITA form may be submitted at any time, but is due on or before January 31, to allow for sufficient time for the pre-application meeting and to be placed on the DWSRF or CWSRF/SWQIF Project Priority List (PPL).

**Pre-Application Meeting:** The applicant will be contacted by an assigned Water Infrastructure Financing Section (WIFS) project manager within 14 days of receipt of this ITA form to schedule a pre-application discussion. This meeting can help to identify project funding opportunities and challenges earlier in the planning stage to better guide the efforts of the applicant and their consulting engineer. Suggested attendees would include the WIFS project manager, EGLE district engineer, applicant representative(s), and any other applicable attendees.

**Questions:** Please visit our website at [Michigan.gov/CWSRF](http://Michigan.gov/CWSRF) or [Michigan.gov/DWSRF](http://Michigan.gov/DWSRF) or call 517-284-5433.

Please submit this form by email to [EGLE-WIFS@Michigan.gov](mailto:EGLE-WIFS@Michigan.gov).

For information or assistance on this publication, please contact the (program), through EGLE Environmental Assistance Center at 800-662-9278. This publication is available in alternative formats upon request.

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This form and its contents are subject to the Freedom of Information Act and may be released to the public.



INNOVATIVE IDEAS  
EXCEPTIONAL DESIGN  
UNMATCHED CLIENT SERVICE

White Lake Township  
FY2023 CWSRF Wastewater Asset Management Plan  
Improvements Project Plan

## APPENDIX II

### WHITE LAKE TOWNSHIP SEMCOG COMMUNITY PROFILE

DRAFT

# Community Profiles

YOU ARE VIEWING DATA FOR:

## White Lake Township

7525 Highland Rd  
White Lake, MI 48383-  
2938



Census 2020 Population:  
30,950  
Area: 37.1 square miles

<http://www.whitelaketwp.com/>

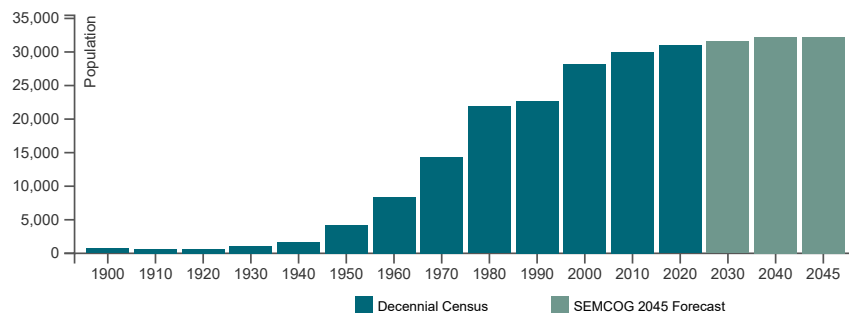
[VIEW COMMUNITY EXPLORER MAP](#)

[VIEW 2020 CENSUS MAP](#)

## Population and Households

Link to American Community Survey (ACS) Profiles: **Select a Year**  **Social | Demographic**  
**Population and Household Estimates for Southeast Michigan, 2021**

### Population Forecast



## Population and Households

Population and Households	Census 2020	Census 2010	Change 2010-2020	Pct Change 2010-2020	SEMCOG Jul 2021	SEMCOG 2045
<b>Total Population</b>	30,950	30,019	931	3.1%	31,168	32,194
<b>Group Quarters Population</b>	88	76	12	15.8%	88	179
<b>Household Population</b>	30,862	29,943	919	3.1%	31,080	32,015
<b>Housing Units</b>	12,776	12,214	562	4.6%	12,845	-
<b>Households (Occupied Units)</b>	12,089	11,262	827	7.3%	12,236	13,570
<b>Residential Vacancy Rate</b>	5.4%	7.8%	-2.4%	-	4.7%	-
<b>Average Household Size</b>	2.55	2.66	-0.11	-	2.54	2.36

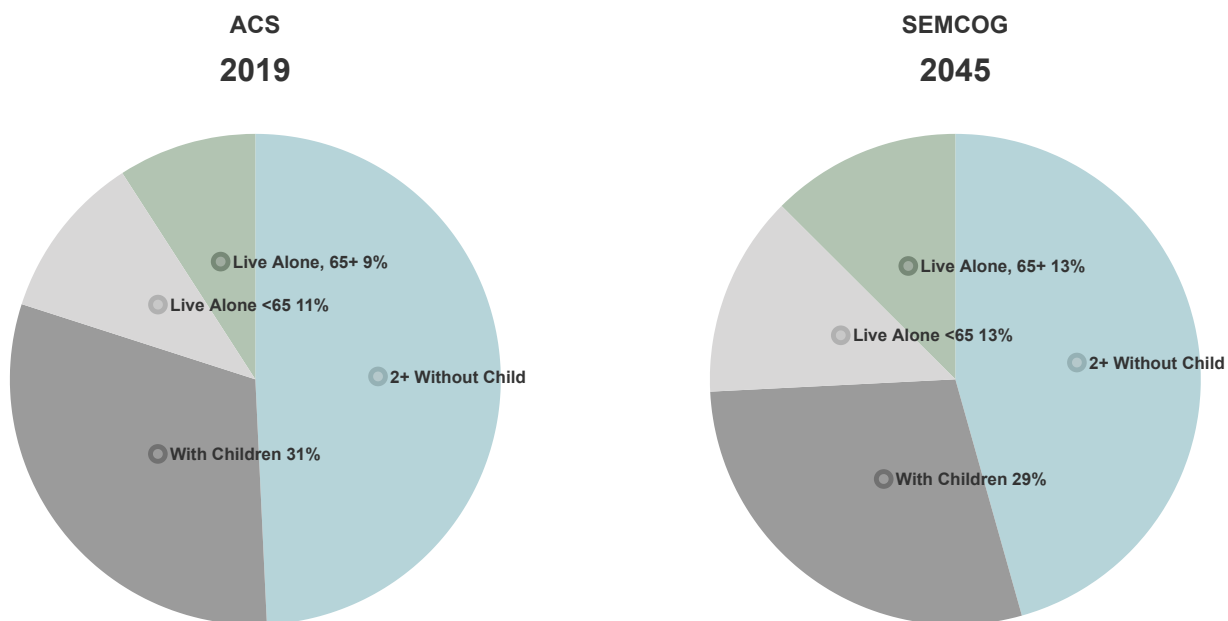
Source: U.S. Census Bureau and SEMCOG 2045 Regional Development Forecast

## Components of Population Change

Components of Population Change	2000-2005 Avg.	2006-2010 Avg.	2011-2018 Avg.
<b>Natural Increase (Births - Deaths)</b>	218	89	22
<b>Births</b>	424	309	284
<b>Deaths</b>	206	220	262
<b>Net Migration (Movement In - Movement Out)</b>	112	-59	58
<b>Population Change (Natural Increase + Net Migration)</b>	330	30	80

Source: Michigan Department of Community Health Vital Statistics, U.S. Census Bureau, and SEMCOG

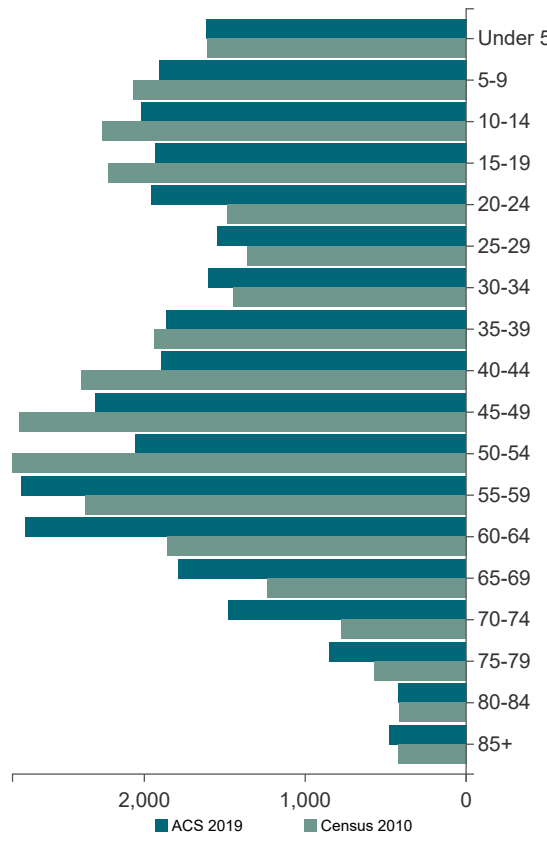
## Household Types



Household Types	Census 2010	ACS 2019	Change 2010-2019	Pct Change 2010-2019	SEMCOG 2045
<b>With Seniors 65+</b>	2,520	3,509	989	39.2%	5,835
<b>Without Seniors</b>	8,742	8,160	-582	-6.7%	7,735
<b>Live Alone, 65+</b>	882	1,064	182	20.6%	1,699
<b>Live Alone, &lt;65</b>	1,406	1,275	-131	-9.3%	1,802
<b>2+ Persons, With children</b>	4,009	3,583	-426	-10.6%	3,877
<b>2+ Persons, Without children</b>	4,965	5,747	782	15.8%	6,192
<b>Total Households</b>	11,262	11,669	407	3.6%	13,570

Source: U.S. Census Bureau, Decennial Census, 2015-2019 American Community Survey 5-Year Estimates, and SEMCOG 2045 Regional Development Forecast

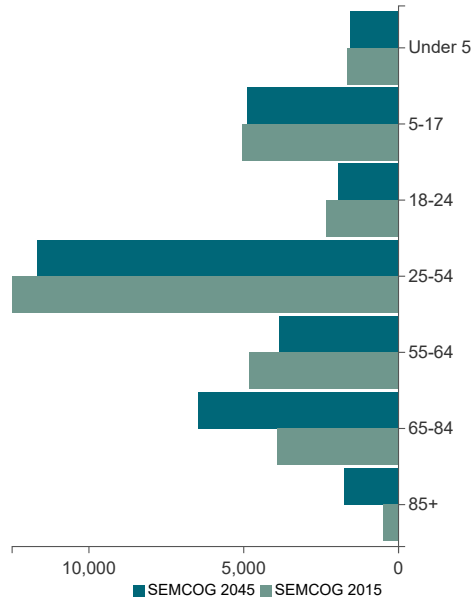
# Population Change by Age, 2010-2019



Age Group	Census 2010	Change 2000-2010	ACS 2019	Change 2010-2019
<b>Under 5</b>	1,607	-414	1,616	9
<b>5-9</b>	2,071	-234	1,908	-163
<b>10-14</b>	2,260	54	2,018	-242
<b>15-19</b>	2,224	261	1,933	-291
<b>20-24</b>	1,482	258	1,954	472
<b>25-29</b>	1,358	-170	1,543	185
<b>30-34</b>	1,446	-681	1,601	155
<b>35-39</b>	1,940	-772	1,865	-75
<b>40-44</b>	2,389	-512	1,896	-493
<b>45-49</b>	2,777	272	2,305	-472
<b>50-54</b>	2,819	725	2,054	-765
<b>55-59</b>	2,365	895	2,763	398
<b>60-64</b>	1,859	904	2,739	880
<b>65-69</b>	1,236	484	1,787	551
<b>70-74</b>	776	185	1,475	699
<b>75-79</b>	573	139	849	276
<b>80-84</b>	413	173	423	10
<b>85+</b>	424	233	479	55
<b>Total</b>	30,019	1,800	31,208	1,189
<b>Median Age</b>	41.3	4.9	42.8	1.5

Source: U.S. Census Bureau, Decennial Census, and 2015-2019 American Community Survey 5-Year Estimates

## Forecasted Population Change 2015-2045



Age Group	2015	2020	2025	2030	2035	2040	2045	Change 2015 - 2045	Pct Change 2015 - 2045
<b>Under 5</b>	1,670	1,624	1,604	1,686	1,640	1,579	1,571	-99	-5.9%
<b>5-17</b>	5,065	4,706	4,505	4,598	4,649	4,801	4,884	-181	-3.6%
<b>18-24</b>	2,344	2,505	2,072	1,883	1,815	1,907	1,952	-392	-16.7%
<b>25-54</b>	12,481	11,429	11,043	11,573	11,659	11,622	11,682	-799	-6.4%
<b>55-64</b>	4,814	4,826	4,520	4,219	3,871	3,716	3,859	-955	-19.8%
<b>65-84</b>	3,924	4,884	5,826	6,845	7,138	7,067	6,478	2,554	65.1%
<b>85+</b>	488	460	554	774	1,148	1,544	1,768	1,280	262.3%
<b>Total</b>	30,786	30,434	30,124	31,578	31,920	32,236	32,194	1,408	4.6%

Source: SEMCOG 2045 Regional Development Forecast



## Older Adults and Youth Populations

Older Adults and Youth Population	Census 2010	ACS 2019	Change 2010-2019	Pct Change 2010-2019	SEMCOG 2045
<b>60 and over</b>	5,281	7,752	2,471	46.8%	10,175
<b>65 and over</b>	3,422	5,013	1,591	46.5%	8,246
<b>65 to 84</b>	2,998	4,534	1,536	51.2%	6,478
<b>85 and Over</b>	424	479	55	13%	1,768
<b>Under 18</b>	7,398	6,720	-678	-9.2%	6,455
<b>5 to 17</b>	5,791	5,104	-687	-11.9%	4,884
<b>Under 5</b>	1,607	1,616	9	0.6%	1,571

Note: Population by age changes over time because of the aging of people into older age groups, the movement of people, and the occurrence of births and deaths.

Source: **U.S. Census Bureau, Decennial Census, 2015-2019 American Community Survey 5-Year Estimates, and SEMCOG 2045 Regional Development Forecast**

## Race and Hispanic Origin

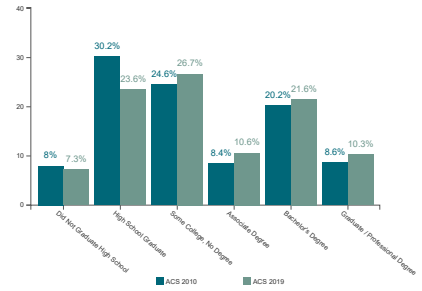
Race and Hispanic Origin	Census 2010	Percent of Population 2010	Census 2020	Percent of Population 2020	Percentage Point Change 2010-2020
<b>Non-Hispanic</b>	29,120	97%	29,839	96.4%	-0.6%
<b>White</b>	28,000	93.3%	27,391	88.5%	-4.8%
<b>Black</b>	321	1.1%	496	1.6%	0.5%
<b>Asian</b>	271	0.9%	367	1.2%	0.3%
<b>Multi-Racial</b>	398	1.3%	1,405	4.5%	3.2%
<b>Other</b>	130	0.4%	180	0.6%	0.1%
<b>Hispanic</b>	899	3%	1,111	3.6%	0.6%
<b>Total</b>	30,019	100%	30,950	100%	0%

Source: **U.S. Census Bureau Decennial Census**

## Highest Level of Education

Highest Level of Education*	ACS 2010	ACS 2019	Percentage Point Chg 2010-2019
Did Not Graduate High School	8%	7.3%	-0.7%
High School Graduate	30.2%	23.6%	-6.6%
Some College, No Degree	24.6%	26.7%	2.1%
Associate Degree	8.4%	10.6%	2.2%
Bachelor's Degree	20.2%	21.6%	1.3%
Graduate / Professional Degree	8.6%	10.3%	1.7%

\* Population age 25 and over

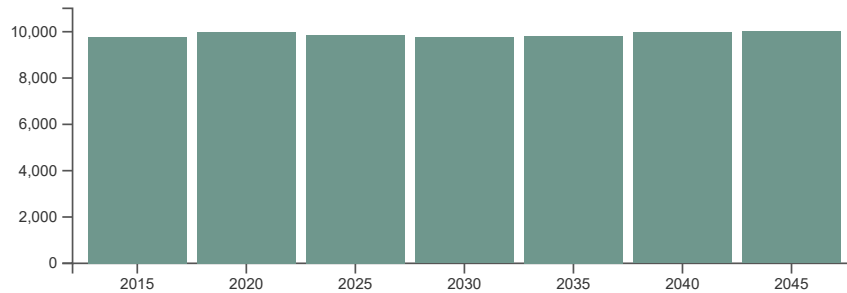


Source: **U.S. Census Bureau, 2006-2010 and 2015-2019 American Community Survey 5-Year Estimates**

## Economy & Jobs

Link to American Community Survey (ACS) Profiles: **Select a Year**  **Economic**

### Forecasted Jobs



Source: **SEMOG 2045 Regional Development Forecast**

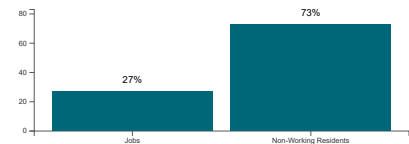
## Forecasted Jobs by Industry Sector

Forecasted Jobs By Industry Sector	2015	2020	2025	2030	2035	2040	2045	Change 2015-2045	Pct Change 2015-2045
<b>Natural Resources, Mining, &amp; Construction</b>	916	1,060	1,011	994	1,007	1,022	1,035	119	13%
<b>Manufacturing</b>	228	218	206	191	181	173	164	-64	-28.1%
<b>Wholesale Trade</b>	257	262	262	259	259	259	257	0	0%
<b>Retail Trade</b>	2,198	2,109	2,008	1,936	1,858	1,857	1,805	-393	-17.9%
<b>Transportation, Warehousing, &amp; Utilities</b>	219	225	225	226	227	233	236	17	7.8%
<b>Information &amp; Financial Activities</b>	1,435	1,470	1,449	1,428	1,439	1,448	1,446	11	0.8%
<b>Professional and Technical Services &amp; Corporate HQ</b>	621	606	606	631	668	720	746	125	20.1%
<b>Administrative, Support, &amp; Waste Services</b>	1,210	1,245	1,261	1,268	1,295	1,324	1,342	132	10.9%
<b>Education Services</b>	805	841	841	831	837	841	849	44	5.5%
<b>Healthcare Services</b>	293	323	359	368	398	434	462	169	57.7%
<b>Leisure &amp; Hospitality</b>	935	955	969	968	993	1,000	1,025	90	9.6%
<b>Other Services</b>	520	529	516	507	505	502	495	-25	-4.8%
<b>Public Administration</b>	148	150	150	148	147	147	147	-1	-0.7%
<b>Total Employment Numbers</b>	9,785	9,993	9,863	9,755	9,814	9,960	10,009	224	2.3%

Source: SEMCOG 2045 Regional Development Forecast

## Daytime Population

Daytime Population	ACS 2016
Jobs	5,496
Non-Working Residents	14,870
Age 15 and under	6,198
Not in labor force	7,856
Unemployed	816
<b>Daytime Population</b>	<b>20,366</b>



Source: 2012-2016 American Community Survey 5-Year Estimates and 2012-2016 Census Transportation Planning Products Program (CTPP). For additional information, visit SEMCOG's [Interactive Commuting Patterns Map](#)

Note: The number of residents attending school outside Southeast Michigan is not available. Likewise, the number of students commuting into Southeast Michigan to attend school is also not known.

## Where Workers Commute From 2016

Rank	Where Workers Commute From *	Workers	Percent
1	<b>White Lake Twp</b>	2,261	41.1%
2	<b>Waterford Twp</b>	763	13.9%
3	<b>Highland Twp</b>	383	7%
4	<b>Commerce Twp</b>	236	4.3%
5	<b>Independence Twp</b>	182	3.3%
6	<b>Out of the Region, Instate</b>	140	2.5%
7	<b>West Bloomfield Twp</b>	134	2.4%
8	<b>Hartland Twp</b>	91	1.7%
9	<b>Pontiac</b>	85	1.5%
10	<b>Van Buren Twp</b>	77	1.4%
-	<b>Elsewhere</b>	1,144	20.8%
* Workers, age 16 and over employed in White Lake Twp		<b>5,496</b>	<b>100%</b>

Source: **U.S. Census Bureau** - 2012-2016 CTPP/ACS Commuting Data and **Commuting Patterns in Southeast Michigan**

## Where Residents Work 2016

Rank	Where Residents Work *	Workers	Percent
1	<b>White Lake Twp</b>	2,261	15%
2	<b>Waterford Twp</b>	1,060	7%
3	<b>Commerce Twp</b>	973	6.4%
4	<b>Farmington Hills</b>	762	5%
5	<b>Auburn Hills</b>	706	4.7%
6	<b>Troy</b>	703	4.7%
7	<b>Pontiac</b>	652	4.3%
8	<b>Southfield</b>	551	3.6%
9	<b>West Bloomfield Twp</b>	497	3.3%
10	<b>Novi</b>	493	3.3%
-	<b>Elsewhere</b>	6,444	42.7%
* Workers, age 16 and over residing in White Lake Twp		<b>15,102</b>	<b>100%</b>

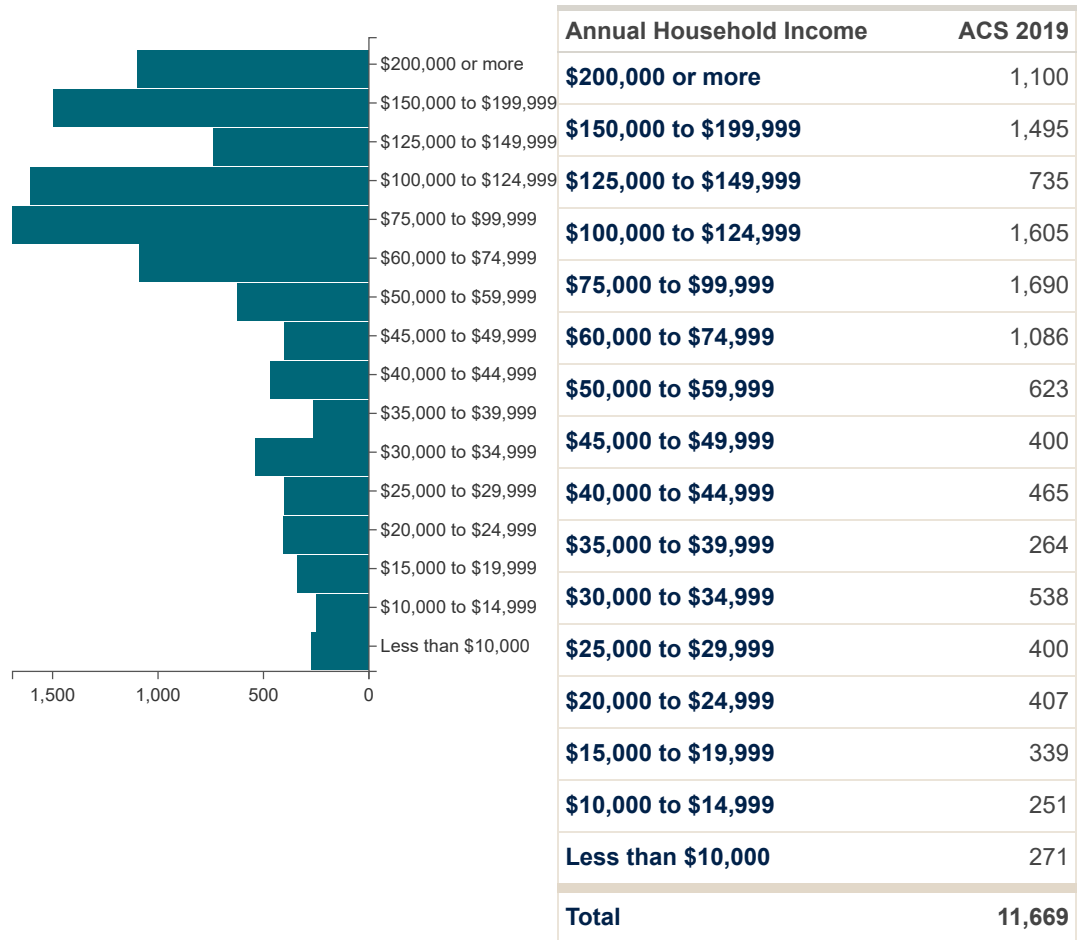
Source: **U.S. Census Bureau** - 2012-2016 CTPP/ACS Commuting Data and **Commuting Patterns in Southeast Michigan**

## Household Income

Income (in 2019 dollars)	ACS 2010	ACS 2019	Change 2010-2019	Percent Change 2010-2019
<b>Median Household Income</b>	\$82,639	\$85,384	\$2,745	3.3%
<b>Per Capita Income</b>	\$35,936	\$38,467	\$2,531	7%

Source: U.S. Census Bureau, 2006-2010 and 2015-2019 American Community Survey 5-Year Estimates

## Annual Household Income



Source: U.S. Census Bureau, 2015-2019 American Community Survey 5-Year Estimates

## Poverty

Poverty	ACS 2010	% of Total (2010)	ACS 2019	% of Total (2019)	% Point Chg 2010-2019
<b>Persons in Poverty</b>	1,896	6.4%	1,992	6.4%	0%
<b>Households in Poverty</b>	736	6.5%	720	6.2%	-0.4%

Source: U.S. Census Bureau, 2006-2010 and 2015-2019 American Community Survey 5-Year Estimates

# Housing

Link to American Community Survey (ACS) Profiles: **Select a Year**  **Housing**

## Building Permits 2000 - 2021

Year	Single Family	Two Family	Attach Condo	Multi Family	Total Units	Total Demos	Net Total
2000	161	0	0	0	161	8	153
2001	158	0	0	0	158	7	151
2002	127	0	15	0	142	7	135
2003	175	0	65	0	240	13	227
2004	201	0	104	0	305	7	298
2005	158	0	51	0	209	11	198
2006	61	0	8	0	69	23	46
2007	31	0	0	0	31	4	27
2008	7	0	0	0	7	0	7
2009	16	0	0	0	16	10	6
2010	34	0	0	0	34	7	27
2011	28	0	0	0	28	6	22
2012	41	0	0	0	41	8	33
2013	43	0	0	0	43	10	33
2014	47	0	0	0	47	8	39
2015	43	0	0	0	43	6	37
2016	61	0	0	0	61	1	60
2017	66	0	0	66	132	3	129
2018	53	0	0	44	97	11	86
2019	28	0	0	121	149	2	147
2020	54	0	17	0	71	3	68
2021	88	0	20	0	108	11	97
<b>2000 to 2021 totals</b>	1,681	0	280	231	2,192	166	2,026

Source: **SEMCOG Development**

Note: Permit data for most recent years may be incomplete and is updated monthly.

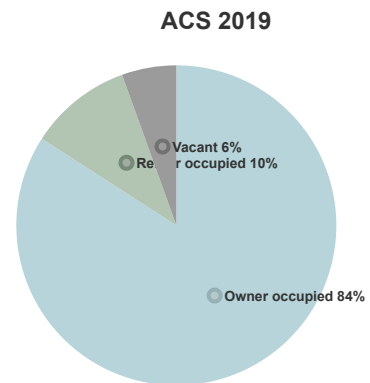
## Housing Types

Housing Type	ACS 2010	ACS 2019	Change 2010-2019	New Units Permitted Since 2018
<b>Single Unit</b>	9,545	9,973	428	223
<b>Multi-Unit</b>	967	929	-38	202
<b>Mobile Homes or Other</b>	1,533	1,447	-86	0
<b>Total</b>	12,045	12,349	304	425
Units Demolished				-27
Net (Total Permitted Units - Units Demolished)				398

Source: U.S. Census Bureau, 2006-2010 and 2015-2019 American Community Survey 5-Year Estimates, SEMCOG Development

## Housing Tenure

Housing Tenure	Census 2010	ACS 2019	Change 2010-2019
<b>Owner occupied</b>	9,868	10,386	518
<b>Renter occupied</b>	1,394	1,283	-111
<b>Vacant</b>	952	680	-272
<b>Seasonal/migrant</b>	268	196	-72
<b>Other vacant units</b>	684	484	-200
<b>Total Housing Units</b>	12,214	12,349	135



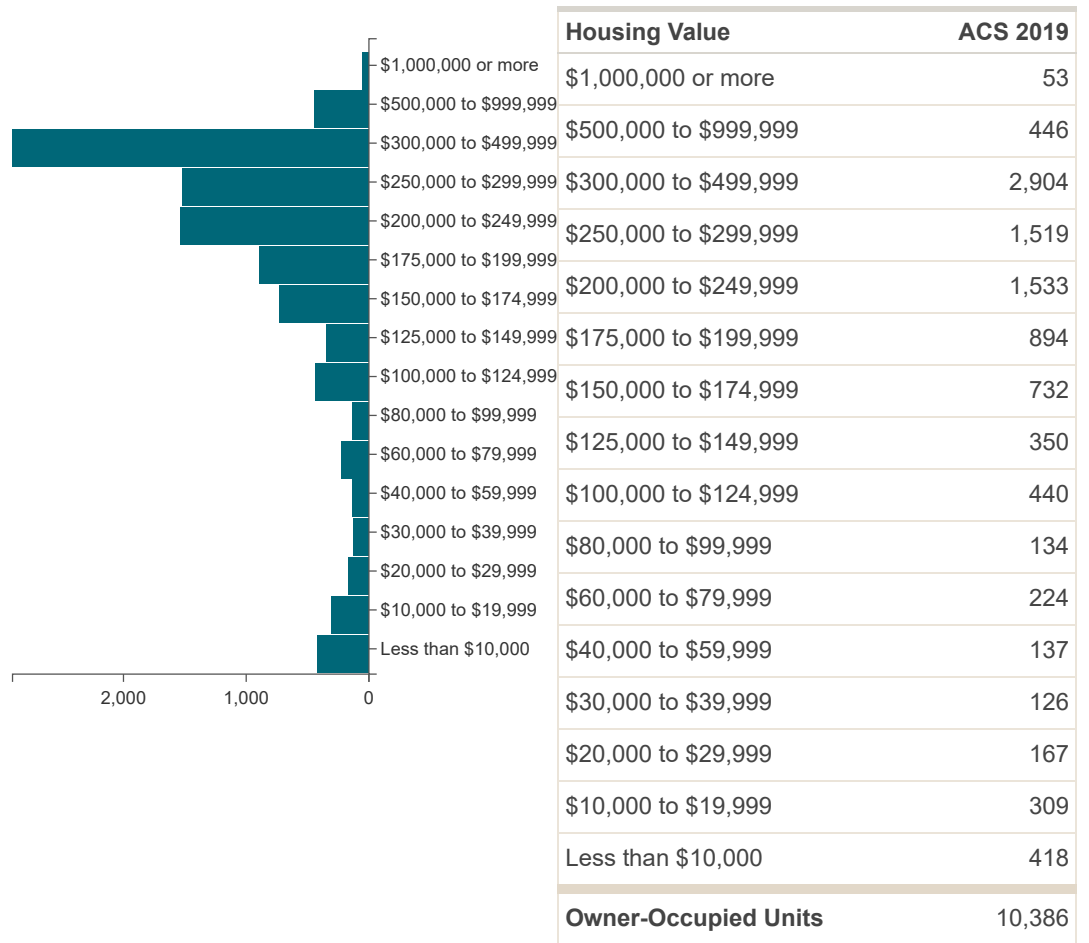
Source: U.S. Census Bureau, 2006-2010 and 2015-2019 American Community Survey 5-Year Estimates

## Housing Value and Rent

Housing Value (in 2019 dollars)	ACS 2010	ACS 2019	Change 2010-2019	Percent Change 2010-2019
<b>Median housing value</b>	\$259,119	\$241,200	-\$17,919	-6.9%
<b>Median gross rent</b>	\$1,087	\$1,126	\$39	3.6%

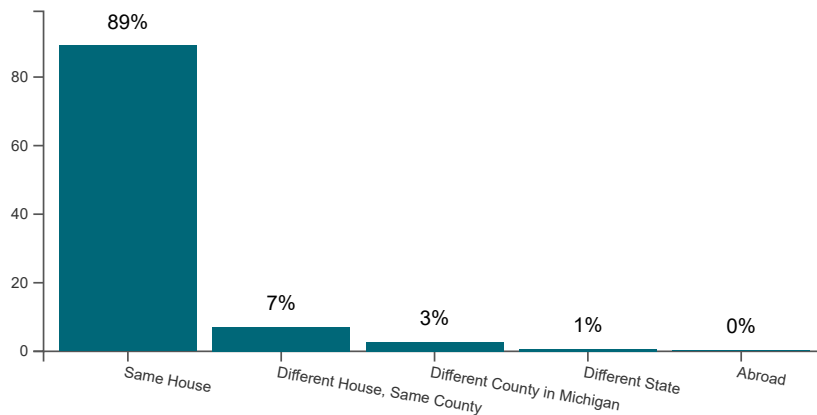
Source: U.S. Census Bureau, Census 2000, 2006-2010 and 2015-2019 American Community Survey 5-Year Estimates

## Housing Value



Source: U.S. Census Bureau, 2015-2019 American Community Survey 5-Year Estimates

## Residence One Year Ago \*



\* This table represents persons, age 1 and over, living in White Lake Township from 2015-2019. The table does not represent person who moved out of White Lake Township from 2015-2019.

Source: U.S. Census Bureau, 2015-2019 American Community Survey 5-Year Estimates

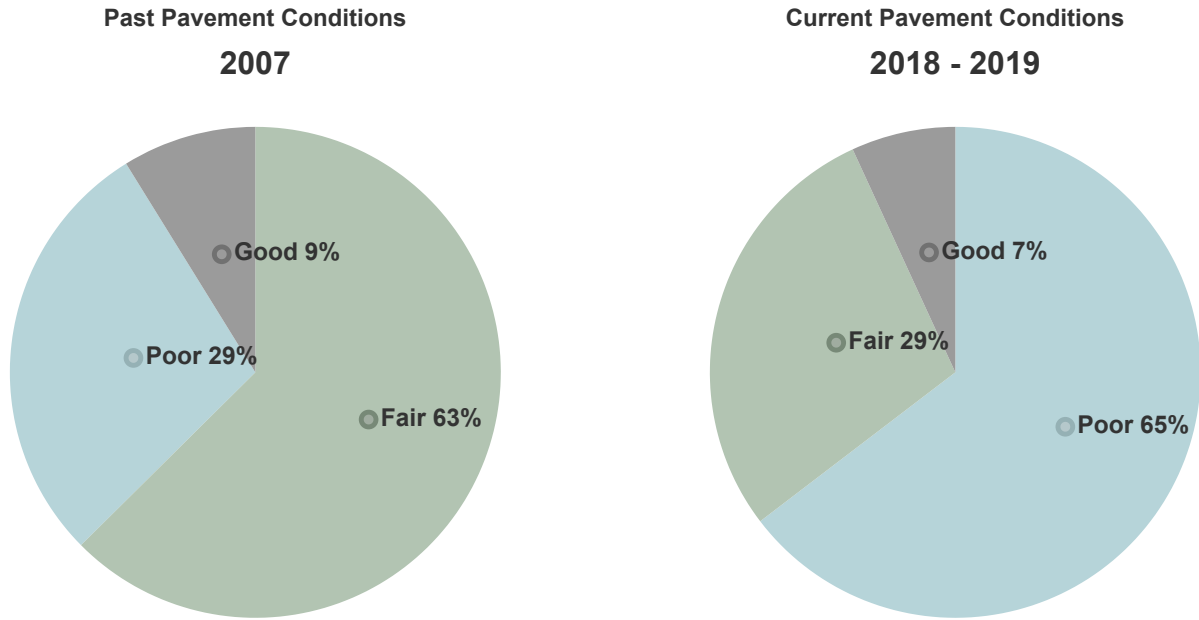


# Transportation

Miles of public road (including boundary roads): 157

Source: Michigan Geographic Framework

## Pavement Condition (in Lane Miles)



Note: Poor pavements are generally in need of rehabilitation or full reconstruction to return to good condition. Fair pavements are in need of capital preventive maintenance to avoid deteriorating to the poor classification. Good pavements generally receive only routine maintenance, such as street sweeping and snow removal, until they deteriorate to the fair condition.

Source: SEMCOG

## Bridge Status

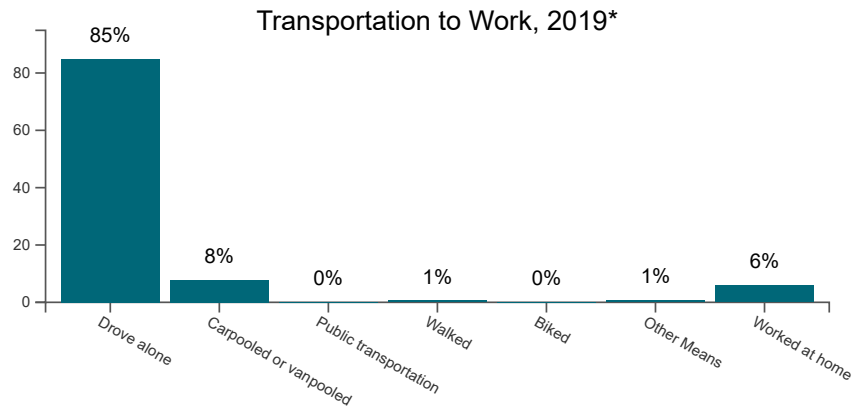
Bridge Status	2008	2008 (%)	2009	2009 (%)	2010	2010 (%)	Percent Point Chg 2008-2010
<b>Open</b>	3	100%	1	33.3%	6	100%	0%
<b>Open with Restrictions</b>	0	0%	2	66.7%	0	0%	0%
<b>Closed*</b>	0	0%	0	0%	0	0%	0%
<b>Total Bridges</b>	3	100.0%	3	100.0%	6	100.0%	0.0%
<b>Deficient Bridges</b>	0	0%	2	66.7%	0	0%	0%

\* Bridges may be closed because of new construction or failed condition.

Note: A bridge is considered deficient if it is structurally deficient (in poor shape and unable to carry the load for which it was designed) or functionally obsolete (in good physical condition but unable to support current or future demands, for example, being too narrow to accommodate truck traffic).

Source: Michigan Structure Inventory and Appraisal Database

### Detailed Intersection & Road Data



\* Resident workers age 16 and over

## Transportation to Work

Transportation to Work	ACS 2010	% of Total (ACS 2010)	ACS 2019	% of Total (ACS 2019)	% Point Chg 2010-2019
<b>Drove alone</b>	12,417	87%	13,325	84.9%	-2.1%
<b>Carpooled or vanpooled</b>	981	6.9%	1,233	7.9%	1%
<b>Public transportation</b>	18	0.1%	6	0%	-0.1%
<b>Walked</b>	133	0.9%	97	0.6%	-0.3%
<b>Biked</b>	49	0.3%	9	0.1%	-0.2%
<b>Other Means</b>	70	0.5%	106	0.7%	0.2%
<b>Worked at home</b>	603	4.2%	922	5.9%	1.7%
<b>Resident workers age 16 and over</b>	14,271	100.0%	15,698	100.0%	0.0%

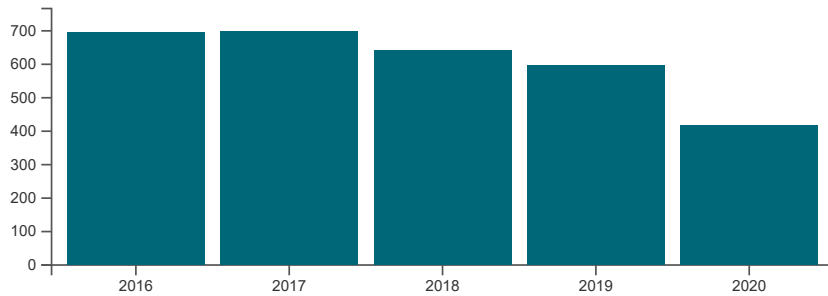
Source: U.S. Census Bureau, 2006-2010 and 2015-2019 American Community Survey 5-Year Estimates

## Mean Travel Time to Work

Mean Travel Time To Work	ACS 2010	ACS 2019	Change 2010-2019
<b>For residents age 16 and over who worked outside the home</b>	32.1 minutes	30.3 minutes	-1.8 minutes

Source: U.S. Census Bureau, 2006-2010 and 2015-2019 American Community Survey 5-Year Estimates

## Crashes, 2016-2020



Source: Michigan Department of State Police with the Criminal Justice Information Center and SEMCOG

Note: Crash data shown is for the entire city.

## Crash Severity

Crash Severity	2016	2017	2018	2019	2020	Percent of Crashes 2016 - 2020
<b><u>Fatal</u></b>	4	4	4	2	3	0.6%
<b><u>Serious Injury</u></b>	12	12	8	10	8	1.6%
<b><u>Other Injury</u></b>	148	132	151	95	67	19.5%
<b><u>Property Damage Only</u></b>	532	549	478	490	339	78.3%
<b><u>Total Crashes</u></b>	696	697	641	597	417	100%

## Crashes by Type

Crashes by Type	2016	2017	2018	2019	2020	Percent of Crashes 2016 - 2020
<b><u>Head-on</u></b>	16	9	11	8	9	1.7%
<b><u>Angle or Head-on/Left-turn</u></b>	141	141	124	100	82	19.3%
<b><u>Rear-End</u></b>	255	242	219	201	118	34%
<b><u>Sideswipe</u></b>	94	82	86	87	66	13.6%
<b><u>Single Vehicle</u></b>	171	193	167	176	124	27.3%
<b><u>Backing</u></b>	3	11	17	9	9	1.6%
<b><u>Other or Unknown</u></b>	16	19	17	16	9	2.5%

## Crashes by Involvement

Crashes by Involvement	2016	2017	2018	2019	2020	Percent of Crashes 2016 - 2020
<b><u>Red-light Running</u></b>	16	11	11	8	13	1.9%
<b><u>Lane Departure</u></b>	118	122	115	109	74	17.7%
<b><u>Alcohol</u></b>	30	24	30	22	16	4%
<b><u>Drugs</u></b>	12	9	6	4	6	1.2%
<b><u>Deer</u></b>	71	71	63	78	56	11.1%
<b><u>Train</u></b>	0	0	0	0	0	0%
<b><u>Commercial Truck/Bus</u></b>	15	22	25	15	8	2.8%
<b><u>School Bus</u></b>	2	4	3	4	1	0.5%
<b><u>Emergency Vehicle</u></b>	3	10	4	2	1	0.7%
<b><u>Motorcycle</u></b>	9	14	13	6	7	1.6%
<b><u>Intersection</u></b>	277	265	237	217	160	37.9%
<b><u>Work Zone</u></b>	5	5	13	4	1	0.9%
<b><u>Pedestrian</u></b>	3	3	2	1	6	0.5%
<b><u>Bicyclist</u></b>	2	6	1	3	0	0.4%
<b><u>Distracted Driver</u></b>	16	53	56	72	48	8%
<b><u>Older Driver (65 and older)</u></b>	116	125	127	105	81	18.2%
<b><u>Young Driver (16 to 24)</u></b>	295	277	240	191	140	37.5%
<b><u>Secondary</u></b>	0	0	0	0	0	0%

## High Frequency Intersection Crash Rankings

Local Rank	County Rank	Region Rank	Intersection	Annual Avg 2016-2020
1	72	196	<u>Highland Rd @ Teggerdine Rd</u>	26.4
2	134	363	<u>Cooley Lake Rd @ Williams Lake Rd S</u>	20.8
3	149	422	<u>Highland Rd @ Fisk Rd</u>	19.2
4	158	441	<u>Highland Rd @ Ormond Rd</u>	18.8
5	197	593	<u>Highland Rd @ Pontiac Lake Rd</u>	16.4
6	404	1,218	<u>Highland Rd @ Bogie Lake Rd</u>	11.4
7	422	1,272	<u>Highland Rd @ Elizabeth Lake Rd</u>	11
8	448	1,343	<u>Highland Rd @ Bogie Lake Rd</u>	10.6
9	561	1,755	<u>Williams Lake Rd N @ Elizabeth Lake Rd</u>	9
10	705	2,235	<u>Williams Lake Rd N @ Pontiac Lake Rd</u>	7.6

Note: Intersections are ranked by the number of reported crashes, which does not take into account traffic volume. Crashes reported occurred within 150 feet of the intersection.

Source: **Michigan Department of State Police with the Criminal Justice Information Center** and **SEMCOG**

## High Frequency Road Segment Crash Rankings

Local Rank	County Rank	Region Rank	Segment	From Road - To Road	Annual Avg 2016-2020
1	2	7	<u>Highland Rd</u>	Teggerdine Rd - Pontiac Lake Rd	92.2
2	60	161	<u>Highland Rd</u>	Highland Rd - Elizabeth Lake Rd	45.2
3	181	482	<u>Williams Lake Rd S</u>	Cooley Lake Rd - Elizabeth Lake Rd	30
4	256	679	<u>Highland Rd</u>	Elizabeth Lake Rd - Teggerdine Rd	26
5	295	774	<u>Highland Rd</u>	Pontiac Lake Rd - Williams Lake Rd N	24.4
6	306	796	<u>Ormond Rd</u>	Highland Rd - Jackson Blvd	24.2
7	484	1,267	<u>Highland Rd</u>	Highland Rd - Bogie Lake Rd	19
8	498	1,300	<u>Bogie Lake Rd</u>	Bogie Lake Rd - Highland Rd	18.8
9	507	1,325	<u>Highland Rd</u>	Highland Rd - Ormond Rd	18.6
10	528	1,384	<u>White Lake Rd</u>	Ormond Rd - Teggerdine Rd	18.2

Note: Segments are ranked by the number of reported crashes, which does not take into account traffic volume.

## Environment

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## SEMCOG 2020 Land Use

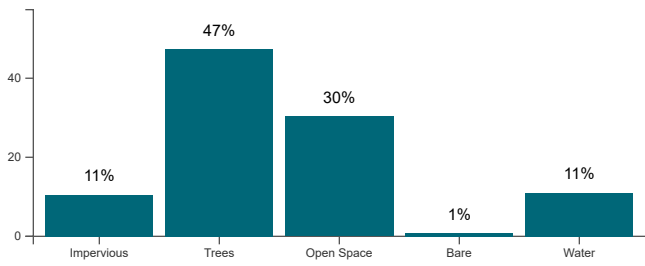
Parcel Land Use	Acres 2015	Acres 2020	Change 2015-2020	Pct Change 2015-2020
<b>Single-Family Residential</b>	5,298.6	5,441.7	143.1	2.7%
<b>Attached Condo Housing</b>	81.1	90.2	9.2	11.3%
<b>Multi-Family Housing</b>	53.7	88.6	34.8	64.8%
<b>Mobile Home</b>	348.6	348.6	0	0%
<b>Agricultural/Rural Residential</b>	4,041.3	4,164.1	122.8	3%
<b>Mixed Use</b>	2.7	4.9	2.2	81.7%
<b>Retail</b>	303.3	290.9	-12.4	-4.1%
<b>Office</b>	60.4	51.5	-8.9	-14.7%
<b>Hospitality</b>	56.7	53	-3.7	-6.6%
<b>Medical</b>	16.3	16.3	0	0%
<b>Institutional</b>	312.6	313.4	0.8	0.2%
<b>Industrial</b>	46.1	41.6	-4.5	-9.7%
<b>Recreational/Open Space</b>	5,658.1	5,667.8	9.7	0.2%
<b>Cemetery</b>	10.5	10.5	0	0%
<b>Golf Course</b>	150.6	150.6	0	0%
<b>Parking</b>	3.9	3.9	0	0%
<b>Extractive</b>	0	0	0	0%
<b>TCU</b>	224.9	224.9	0	0%
<b>Vacant</b>	3,101.3	2,871.2	-230.2	-7.4%
<b>Water</b>	2,379.1	2,379.1	0	0%
<b>Not Parceled</b>	1,565.1	1,502.2	-62.9	-4%
<b>Total</b>	23,715	23,715	0	0%

1. **Agricultural / Rural Res** includes any residential parcel containing 1 or more homes where the parcel is 3 acres or larger.
2. **Mixed Use** includes those parcels containing buildings with Hospitality, Retail, or Office square footage and housing units.
3. **Not Parceled** includes all areas within a community that are not covered by a parcel legal description.
4. Parcels that do not have a structure assigned to the parcel are considered vacant unless otherwise indicated, even if the parcel is part of a larger development such as a factory, school, or other developed series of lots.

Note: Land Cover was derived from SEMCOG's 2010 Leaf off Imagery.

Source: **SEMCOG**

SEMCOG Land Cover in 2010



Source Data  
SEMCOG - Detailed Data

Type	Description	Acres	Percent
<b>Impervious</b>	buildings, roads, driveways, parking lots	2,494.2	10.5%
<b>Trees</b>	woody vegetation, trees	11,235.2	47.3%
<b>Open Space</b>	agricultural fields, grasslands, turfgrass	7,190.7	30.3%
<b>Bare</b>	soil, aggregate piles, unplanted fields	190.4	0.8%
<b>Water</b>	rivers, lakes, drains, ponds	2,617.8	11%
Total Acres		23,728.2	



# Community Profiles

YOU ARE VIEWING DATA FOR:

## White Lake Township

7525 Highland Rd  
White Lake, MI 48383-  
2938



Census 2020 Population:  
30,950  
Area: 37.1 square miles

<http://www.whitelaketwp.com/>

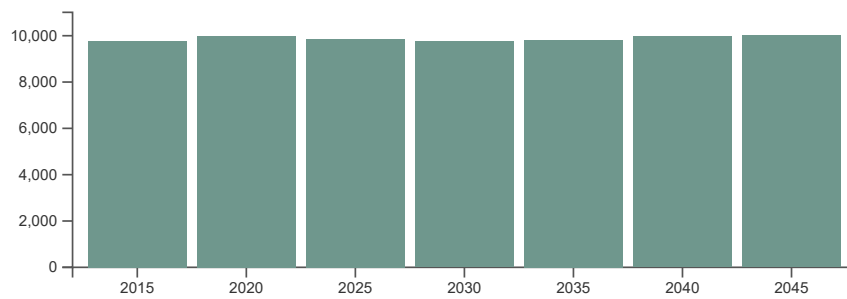
[VIEW COMMUNITY EXPLORER MAP](#)

[VIEW 2020 CENSUS MAP](#)

## Economy & Jobs

Link to American Community Survey (ACS) Profiles: **Select a Year**  **Economic**

### Forecasted Jobs



Source: SEMCOG 2045 Regional Development Forecast

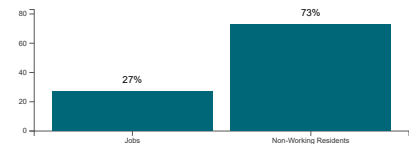
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Forecasted Jobs By Industry Sector	2015	2020	2025	2030	2035	2040	2045	Change 2015-2045	Pct Change 2015-2045
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<b>Manufacturing</b>	228	218	206	191	181	173	164	-64	-28.1%
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<b>Information &amp; Financial Activities</b>	1,435	1,470	1,449	1,428	1,439	1,448	1,446	11	0.8%
<b>Professional and Technical Services &amp; Corporate HQ</b>	621	606	606	631	668	720	746	125	20.1%
<b>Administrative, Support, &amp; Waste Services</b>	1,210	1,245	1,261	1,268	1,295	1,324	1,342	132	10.9%
<b>Education Services</b>	805	841	841	831	837	841	849	44	5.5%
<b>Healthcare Services</b>	293	323	359	368	398	434	462	169	57.7%
<b>Leisure &amp; Hospitality</b>	935	955	969	968	993	1,000	1,025	90	9.6%
<b>Other Services</b>	520	529	516	507	505	502	495	-25	-4.8%
<b>Public Administration</b>	148	150	150	148	147	147	147	-1	-0.7%
<b>Total Employment Numbers</b>	9,785	9,993	9,863	9,755	9,814	9,960	10,009	224	2.3%

Source: SEMCOG 2045 Regional Development Forecast

## Daytime Population

Daytime Population	ACS 2016
Jobs	5,496
Non-Working Residents	14,870
Age 15 and under	6,198
Not in labor force	7,856
Unemployed	816
<b>Daytime Population</b>	<b>20,366</b>



Source: 2012-2016 American Community Survey 5-Year Estimates and 2012-2016 Census Transportation Planning Products Program (CTPP). For additional information, visit SEMCOG's [Interactive Commuting Patterns Map](#)

Note: The number of residents attending school outside Southeast Michigan is not available. Likewise, the number of students commuting into Southeast Michigan to attend school is also not known.

## Where Workers Commute From 2016

Rank	Where Workers Commute From *	Workers	Percent
1	<b>White Lake Twp</b>	2,261	41.1%
2	<b>Waterford Twp</b>	763	13.9%
3	<b>Highland Twp</b>	383	7%
4	<b>Commerce Twp</b>	236	4.3%
5	<b>Independence Twp</b>	182	3.3%
6	<b>Out of the Region, Instate</b>	140	2.5%
7	<b>West Bloomfield Twp</b>	134	2.4%
8	<b>Hartland Twp</b>	91	1.7%
9	<b>Pontiac</b>	85	1.5%
10	<b>Van Buren Twp</b>	77	1.4%
-	<b>Elsewhere</b>	1,144	20.8%
* Workers, age 16 and over employed in White Lake Twp		<b>5,496</b>	<b>100%</b>

Source: **U.S. Census Bureau** - 2012-2016 CTPP/ACS Commuting Data and **Commuting Patterns in Southeast Michigan**

## Where Residents Work 2016

Rank	Where Residents Work *	Workers	Percent
1	<b>White Lake Twp</b>	2,261	15%
2	<b>Waterford Twp</b>	1,060	7%
3	<b>Commerce Twp</b>	973	6.4%
4	<b>Farmington Hills</b>	762	5%
5	<b>Auburn Hills</b>	706	4.7%
6	<b>Troy</b>	703	4.7%
7	<b>Pontiac</b>	652	4.3%
8	<b>Southfield</b>	551	3.6%
9	<b>West Bloomfield Twp</b>	497	3.3%
10	<b>Novi</b>	493	3.3%
-	<b>Elsewhere</b>	6,444	42.7%
* Workers, age 16 and over residing in White Lake Twp		<b>15,102</b>	<b>100%</b>

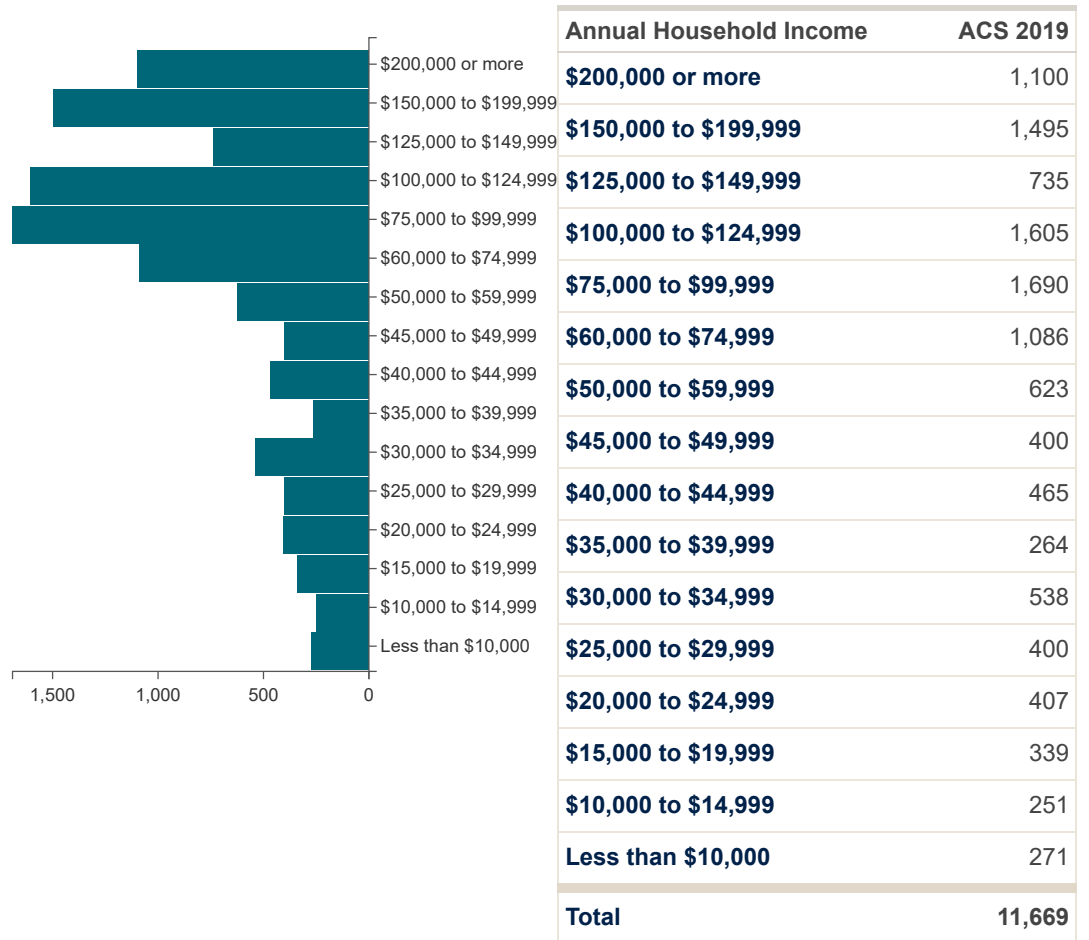
Source: **U.S. Census Bureau** - 2012-2016 CTPP/ACS Commuting Data and **Commuting Patterns in Southeast Michigan**

## Household Income

Income (in 2019 dollars)	ACS 2010	ACS 2019	Change 2010-2019	Percent Change 2010-2019
<b>Median Household Income</b>	\$82,639	\$85,384	\$2,745	3.3%
<b>Per Capita Income</b>	\$35,936	\$38,467	\$2,531	7%

Source: U.S. Census Bureau, 2006-2010 and 2015-2019 American Community Survey 5-Year Estimates

## Annual Household Income



Source: U.S. Census Bureau, 2015-2019 American Community Survey 5-Year Estimates

## Poverty

Poverty	ACS 2010	% of Total (2010)	ACS 2019	% of Total (2019)	% Point Chg 2010-2019
<b>Persons in Poverty</b>	1,896	6.4%	1,992	6.4%	0%
<b>Households in Poverty</b>	736	6.5%	720	6.2%	-0.4%

Source: U.S. Census Bureau, 2006-2010 and 2015-2019 American Community Survey 5-Year Estimates

# Housing

Link to American Community Survey (ACS) Profiles: **Select a Year**  **Housing**

## Building Permits 2000 - 2021

Year	Single Family	Two Family	Attach Condo	Multi Family	Total Units	Total Demos	Net Total
2000	161	0	0	0	161	8	153
2001	158	0	0	0	158	7	151
2002	127	0	15	0	142	7	135
2003	175	0	65	0	240	13	227
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<b>2000 to 2021 totals</b>	1,681	0	280	231	2,192	166	2,026

Source: **SEMCOG Development**

Note: Permit data for most recent years may be incomplete and is updated monthly.

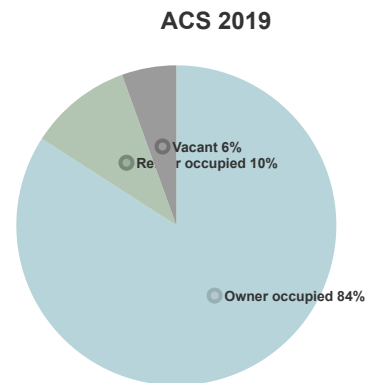
## Housing Types

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<b>Single Unit</b>	9,545	9,973	428	223
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<b>Mobile Homes or Other</b>	1,533	1,447	-86	0
<b>Total</b>	12,045	12,349	304	425
Units Demolished				-27
Net (Total Permitted Units - Units Demolished)				398

Source: U.S. Census Bureau, 2006-2010 and 2015-2019 American Community Survey 5-Year Estimates, SEMCOG Development

## Housing Tenure

Housing Tenure	Census 2010	ACS 2019	Change 2010-2019
<b>Owner occupied</b>	9,868	10,386	518
<b>Renter occupied</b>	1,394	1,283	-111
<b>Vacant</b>	952	680	-272
<b>Seasonal/migrant</b>	268	196	-72
<b>Other vacant units</b>	684	484	-200
<b>Total Housing Units</b>	12,214	12,349	135



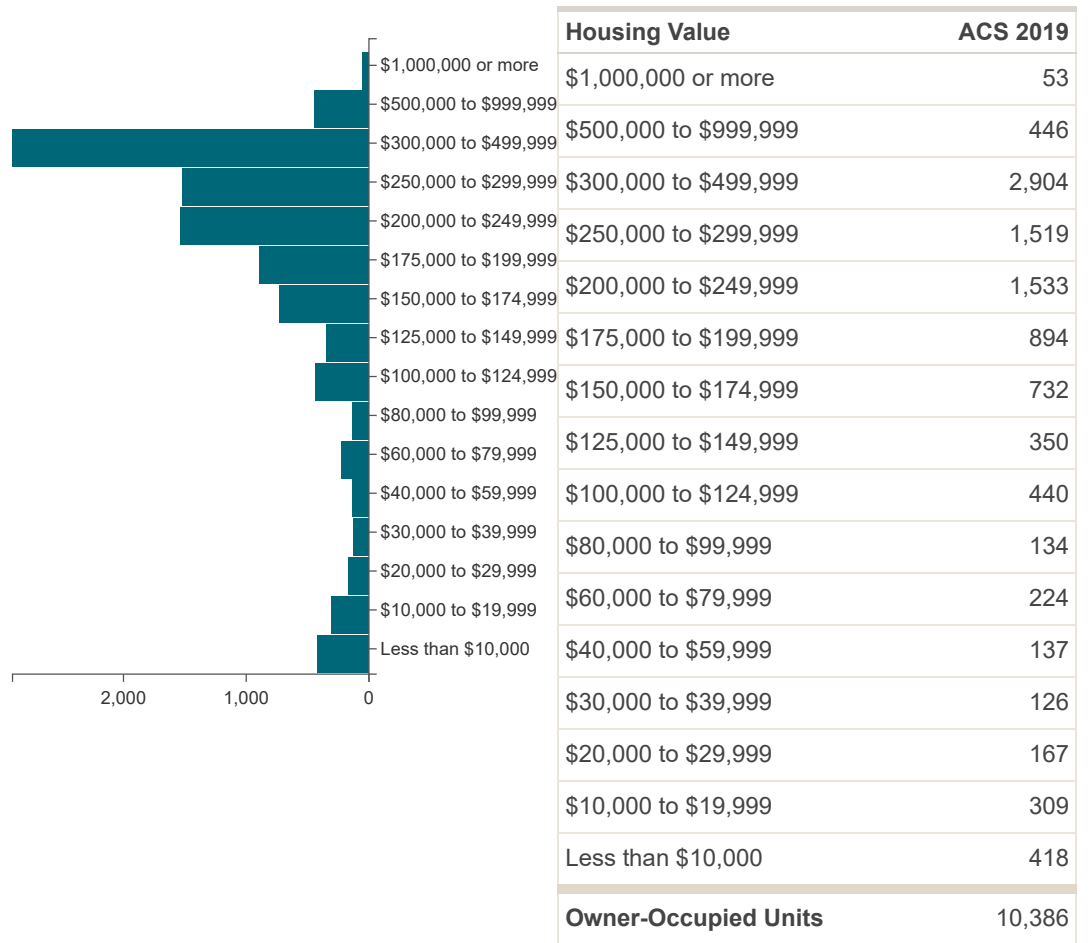
Source: U.S. Census Bureau, 2006-2010 and 2015-2019 American Community Survey 5-Year Estimates

## Housing Value and Rent

Housing Value (in 2019 dollars)	ACS 2010	ACS 2019	Change 2010-2019	Percent Change 2010-2019
<b>Median housing value</b>	\$259,119	\$241,200	-\$17,919	-6.9%
<b>Median gross rent</b>	\$1,087	\$1,126	\$39	3.6%

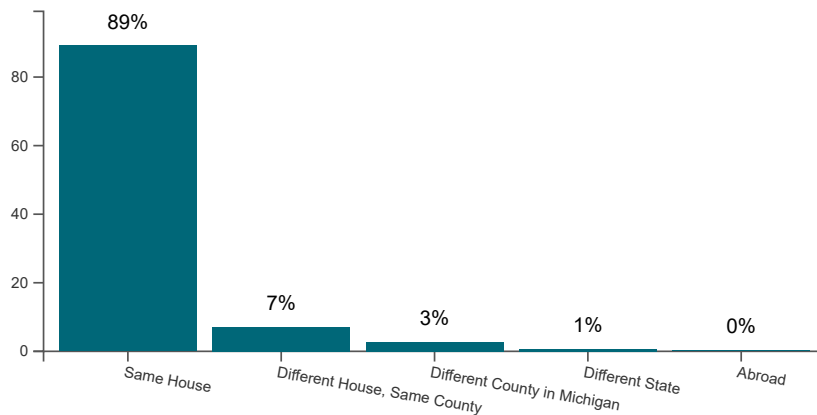
Source: U.S. Census Bureau, Census 2000, 2006-2010 and 2015-2019 American Community Survey 5-Year Estimates

## Housing Value



Source: U.S. Census Bureau, 2015-2019 American Community Survey 5-Year Estimates

## Residence One Year Ago \*



\* This table represents persons, age 1 and over, living in White Lake Township from 2015-2019. The table does not represent person who moved out of White Lake Township from 2015-2019.

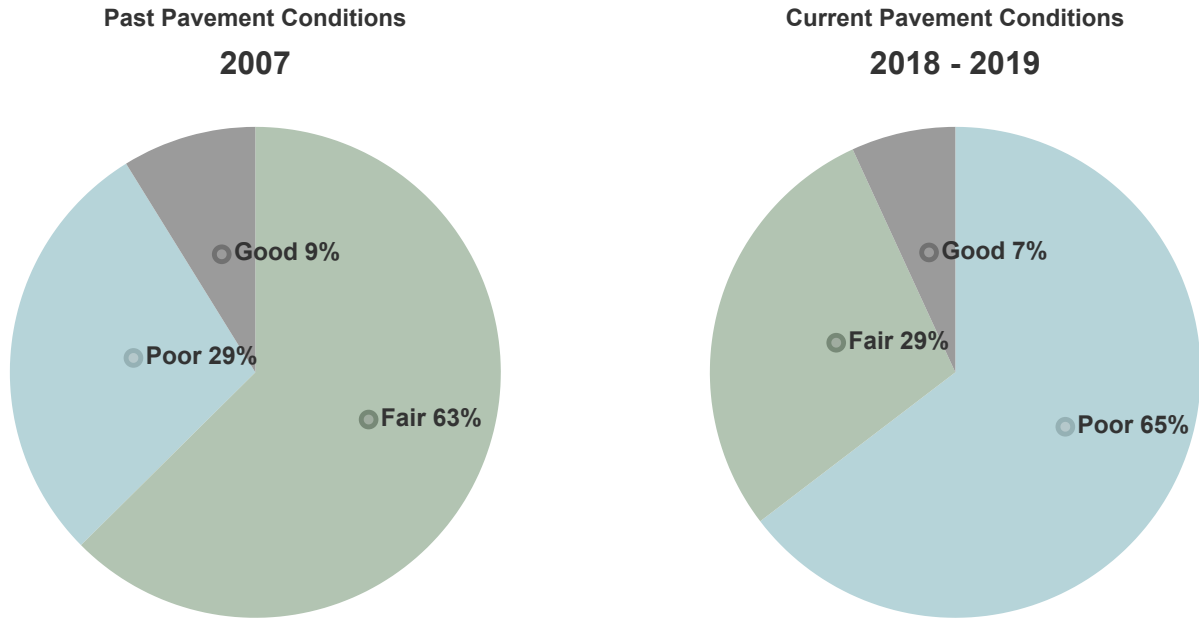
Source: U.S. Census Bureau, 2015-2019 American Community Survey 5-Year Estimates

# Transportation

Miles of public road (including boundary roads): 157

Source: Michigan Geographic Framework

## Pavement Condition (in Lane Miles)



Note: Poor pavements are generally in need of rehabilitation or full reconstruction to return to good condition. Fair pavements are in need of capital preventive maintenance to avoid deteriorating to the poor classification. Good pavements generally receive only routine maintenance, such as street sweeping and snow removal, until they deteriorate to the fair condition.

Source: SEMCOG

## Bridge Status

Bridge Status	2008	2008 (%)	2009	2009 (%)	2010	2010 (%)	Percent Point Chg 2008-2010
Open	3	100%	1	33.3%	6	100%	0%
Open with Restrictions	0	0%	2	66.7%	0	0%	0%
Closed*	0	0%	0	0%	0	0%	0%
<b>Total Bridges</b>	<b>3</b>	<b>100.0%</b>	<b>3</b>	<b>100.0%</b>	<b>6</b>	<b>100.0%</b>	<b>0.0%</b>
<b>Deficient Bridges</b>	<b>0</b>	<b>0%</b>	<b>2</b>	<b>66.7%</b>	<b>0</b>	<b>0%</b>	<b>0%</b>

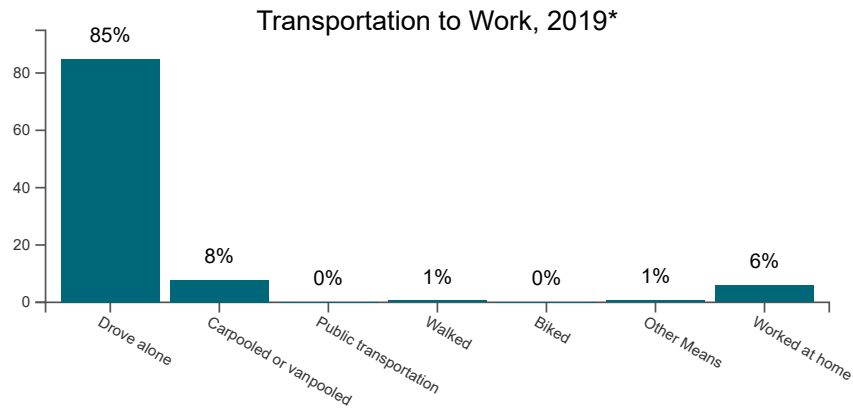
\* Bridges may be closed because of new construction or failed condition.

Note: A bridge is considered deficient if it is structurally deficient (in poor shape and unable to carry the load for which it was designed) or functionally obsolete (in good physical condition but unable to support current or future demands, for example, being too narrow to accommodate truck traffic).

Source: Michigan Structure Inventory and Appraisal Database

### Detailed Intersection & Road Data





\* Resident workers age 16 and over

## Transportation to Work

Transportation to Work	ACS 2010	% of Total (ACS 2010)	ACS 2019	% of Total (ACS 2019)	% Point Chg 2010-2019
<b>Drove alone</b>	12,417	87%	13,325	84.9%	-2.1%
<b>Carpooled or vanpooled</b>	981	6.9%	1,233	7.9%	1%
<b>Public transportation</b>	18	0.1%	6	0%	-0.1%
<b>Walked</b>	133	0.9%	97	0.6%	-0.3%
<b>Biked</b>	49	0.3%	9	0.1%	-0.2%
<b>Other Means</b>	70	0.5%	106	0.7%	0.2%
<b>Worked at home</b>	603	4.2%	922	5.9%	1.7%
<b>Resident workers age 16 and over</b>	14,271	100.0%	15,698	100.0%	0.0%

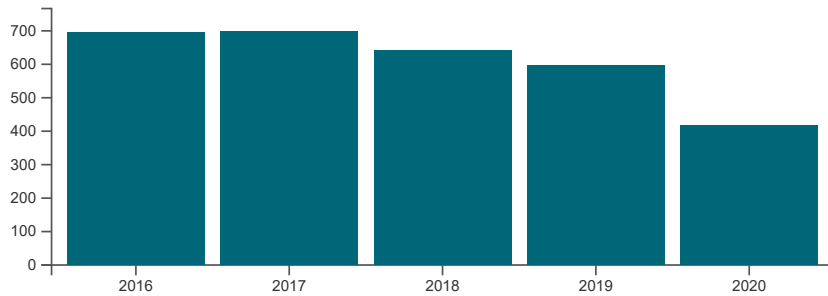
Source: U.S. Census Bureau, 2006-2010 and 2015-2019 American Community Survey 5-Year Estimates

## Mean Travel Time to Work

Mean Travel Time To Work	ACS 2010	ACS 2019	Change 2010-2019
<b>For residents age 16 and over who worked outside the home</b>	32.1 minutes	30.3 minutes	-1.8 minutes

Source: U.S. Census Bureau, 2006-2010 and 2015-2019 American Community Survey 5-Year Estimates

## Crashes, 2016-2020



Source: Michigan Department of State Police with the Criminal Justice Information Center and SEMCOG

Note: Crash data shown is for the entire city.

## Crash Severity

Crash Severity	2016	2017	2018	2019	2020	Percent of Crashes 2016 - 2020
<b><u>Fatal</u></b>	4	4	4	2	3	0.6%
<b><u>Serious Injury</u></b>	12	12	8	10	8	1.6%
<b><u>Other Injury</u></b>	148	132	151	95	67	19.5%
<b><u>Property Damage Only</u></b>	532	549	478	490	339	78.3%
<b><u>Total Crashes</u></b>	696	697	641	597	417	100%

## Crashes by Type

Crashes by Type	2016	2017	2018	2019	2020	Percent of Crashes 2016 - 2020
<b><u>Head-on</u></b>	16	9	11	8	9	1.7%
<b><u>Angle or Head-on/Left-turn</u></b>	141	141	124	100	82	19.3%
<b><u>Rear-End</u></b>	255	242	219	201	118	34%
<b><u>Sideswipe</u></b>	94	82	86	87	66	13.6%
<b><u>Single Vehicle</u></b>	171	193	167	176	124	27.3%
<b><u>Backing</u></b>	3	11	17	9	9	1.6%
<b><u>Other or Unknown</u></b>	16	19	17	16	9	2.5%

## Crashes by Involvement

Crashes by Involvement	2016	2017	2018	2019	2020	Percent of Crashes 2016 - 2020
<b><u>Red-light Running</u></b>	16	11	11	8	13	1.9%
<b><u>Lane Departure</u></b>	118	122	115	109	74	17.7%
<b><u>Alcohol</u></b>	30	24	30	22	16	4%
<b><u>Drugs</u></b>	12	9	6	4	6	1.2%
<b><u>Deer</u></b>	71	71	63	78	56	11.1%
<b><u>Train</u></b>	0	0	0	0	0	0%
<b><u>Commercial Truck/Bus</u></b>	15	22	25	15	8	2.8%
<b><u>School Bus</u></b>	2	4	3	4	1	0.5%
<b><u>Emergency Vehicle</u></b>	3	10	4	2	1	0.7%
<b><u>Motorcycle</u></b>	9	14	13	6	7	1.6%
<b><u>Intersection</u></b>	277	265	237	217	160	37.9%
<b><u>Work Zone</u></b>	5	5	13	4	1	0.9%
<b><u>Pedestrian</u></b>	3	3	2	1	6	0.5%
<b><u>Bicyclist</u></b>	2	6	1	3	0	0.4%
<b><u>Distracted Driver</u></b>	16	53	56	72	48	8%
<b><u>Older Driver (65 and older)</u></b>	116	125	127	105	81	18.2%
<b><u>Young Driver (16 to 24)</u></b>	295	277	240	191	140	37.5%
<b><u>Secondary</u></b>	0	0	0	0	0	0%

## High Frequency Intersection Crash Rankings

Local Rank	County Rank	Region Rank	Intersection	Annual Avg 2016-2020
1	72	196	<u>Highland Rd @ Teggerdine Rd</u>	26.4
2	134	363	<u>Cooley Lake Rd @ Williams Lake Rd S</u>	20.8
3	149	422	<u>Highland Rd @ Fisk Rd</u>	19.2
4	158	441	<u>Highland Rd @ Ormond Rd</u>	18.8
5	197	593	<u>Highland Rd @ Pontiac Lake Rd</u>	16.4
6	404	1,218	<u>Highland Rd @ Bogie Lake Rd</u>	11.4
7	422	1,272	<u>Highland Rd @ Elizabeth Lake Rd</u>	11
8	448	1,343	<u>Highland Rd @ Bogie Lake Rd</u>	10.6
9	561	1,755	<u>Williams Lake Rd N @ Elizabeth Lake Rd</u>	9
10	705	2,235	<u>Williams Lake Rd N @ Pontiac Lake Rd</u>	7.6

Note: Intersections are ranked by the number of reported crashes, which does not take into account traffic volume. Crashes reported occurred within 150 feet of the intersection.

Source: **Michigan Department of State Police with the Criminal Justice Information Center** and **SEMCOG**

## High Frequency Road Segment Crash Rankings

Local Rank	County Rank	Region Rank	Segment	From Road - To Road	Annual Avg 2016-2020
1	2	7	<u>Highland Rd</u>	Teggerdine Rd - Pontiac Lake Rd	92.2
2	60	161	<u>Highland Rd</u>	Highland Rd - Elizabeth Lake Rd	45.2
3	181	482	<u>Williams Lake Rd S</u>	Cooley Lake Rd - Elizabeth Lake Rd	30
4	256	679	<u>Highland Rd</u>	Elizabeth Lake Rd - Teggerdine Rd	26
5	295	774	<u>Highland Rd</u>	Pontiac Lake Rd - Williams Lake Rd N	24.4
6	306	796	<u>Ormond Rd</u>	Highland Rd - Jackson Blvd	24.2
7	484	1,267	<u>Highland Rd</u>	Highland Rd - Bogie Lake Rd	19
8	498	1,300	<u>Bogie Lake Rd</u>	Bogie Lake Rd - Highland Rd	18.8
9	507	1,325	<u>Highland Rd</u>	Highland Rd - Ormond Rd	18.6
10	528	1,384	<u>White Lake Rd</u>	Ormond Rd - Teggerdine Rd	18.2

Note: Segments are ranked by the number of reported crashes, which does not take into account traffic volume.

## Environment

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## SEMCOG 2020 Land Use

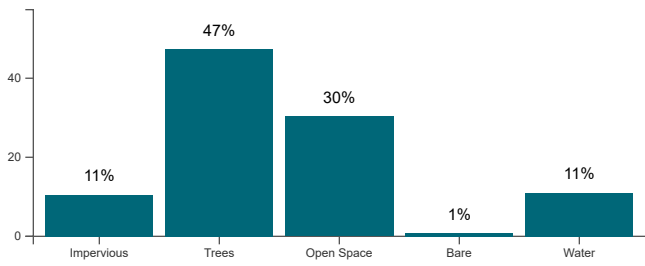
Parcel Land Use	Acres 2015	Acres 2020	Change 2015-2020	Pct Change 2015-2020
<b>Single-Family Residential</b>	5,298.6	5,441.7	143.1	2.7%
<b>Attached Condo Housing</b>	81.1	90.2	9.2	11.3%
<b>Multi-Family Housing</b>	53.7	88.6	34.8	64.8%
<b>Mobile Home</b>	348.6	348.6	0	0%
<b>Agricultural/Rural Residential</b>	4,041.3	4,164.1	122.8	3%
<b>Mixed Use</b>	2.7	4.9	2.2	81.7%
<b>Retail</b>	303.3	290.9	-12.4	-4.1%
<b>Office</b>	60.4	51.5	-8.9	-14.7%
<b>Hospitality</b>	56.7	53	-3.7	-6.6%
<b>Medical</b>	16.3	16.3	0	0%
<b>Institutional</b>	312.6	313.4	0.8	0.2%
<b>Industrial</b>	46.1	41.6	-4.5	-9.7%
<b>Recreational/Open Space</b>	5,658.1	5,667.8	9.7	0.2%
<b>Cemetery</b>	10.5	10.5	0	0%
<b>Golf Course</b>	150.6	150.6	0	0%
<b>Parking</b>	3.9	3.9	0	0%
<b>Extractive</b>	0	0	0	0%
<b>TCU</b>	224.9	224.9	0	0%
<b>Vacant</b>	3,101.3	2,871.2	-230.2	-7.4%
<b>Water</b>	2,379.1	2,379.1	0	0%
<b>Not Parceled</b>	1,565.1	1,502.2	-62.9	-4%
<b>Total</b>	23,715	23,715	0	0%

1. **Agricultural / Rural Res** includes any residential parcel containing 1 or more homes where the parcel is 3 acres or larger.
2. **Mixed Use** includes those parcels containing buildings with Hospitality, Retail, or Office square footage and housing units.
3. **Not Parceled** includes all areas within a community that are not covered by a parcel legal description.
4. Parcels that do not have a structure assigned to the parcel are considered vacant unless otherwise indicated, even if the parcel is part of a larger development such as a factory, school, or other developed series of lots.

Note: Land Cover was derived from SEMCOG's 2010 Leaf off Imagery.

Source: **SEMCOG**

SEMCOG Land Cover in 2010



Source Data  
SEMCOG - Detailed Data

Type	Description	Acres	Percent
<b>Impervious</b>	buildings, roads, driveways, parking lots	2,494.2	10.5%
<b>Trees</b>	woody vegetation, trees	11,235.2	47.3%
<b>Open Space</b>	agricultural fields, grasslands, turfgrass	7,190.7	30.3%
<b>Bare</b>	soil, aggregate piles, unplanted fields	190.4	0.8%
<b>Water</b>	rivers, lakes, drains, ponds	2,617.8	11%
Total Acres		23,728.2	

## Community Profiles

YOU ARE VIEWING DATA FOR:

### White Lake Township

7525 Highland Rd  
White Lake, MI 48383-  
2938  
<http://www.whitelaketwp.com/>



Census 2020 Population:  
30,950  
Area: 37.1 square miles

[VIEW COMMUNITY EXPLORER MAP](#)

[VIEW 2020 CENSUS MAP](#)

## Housing

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Link to American Community Survey (ACS) Profiles: **Select a Year**  **Housing**



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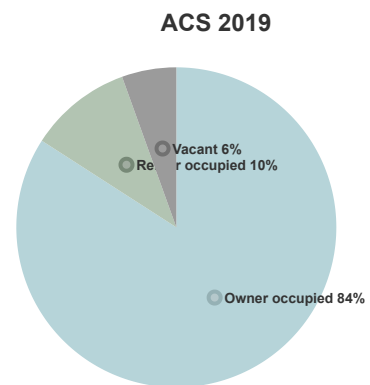
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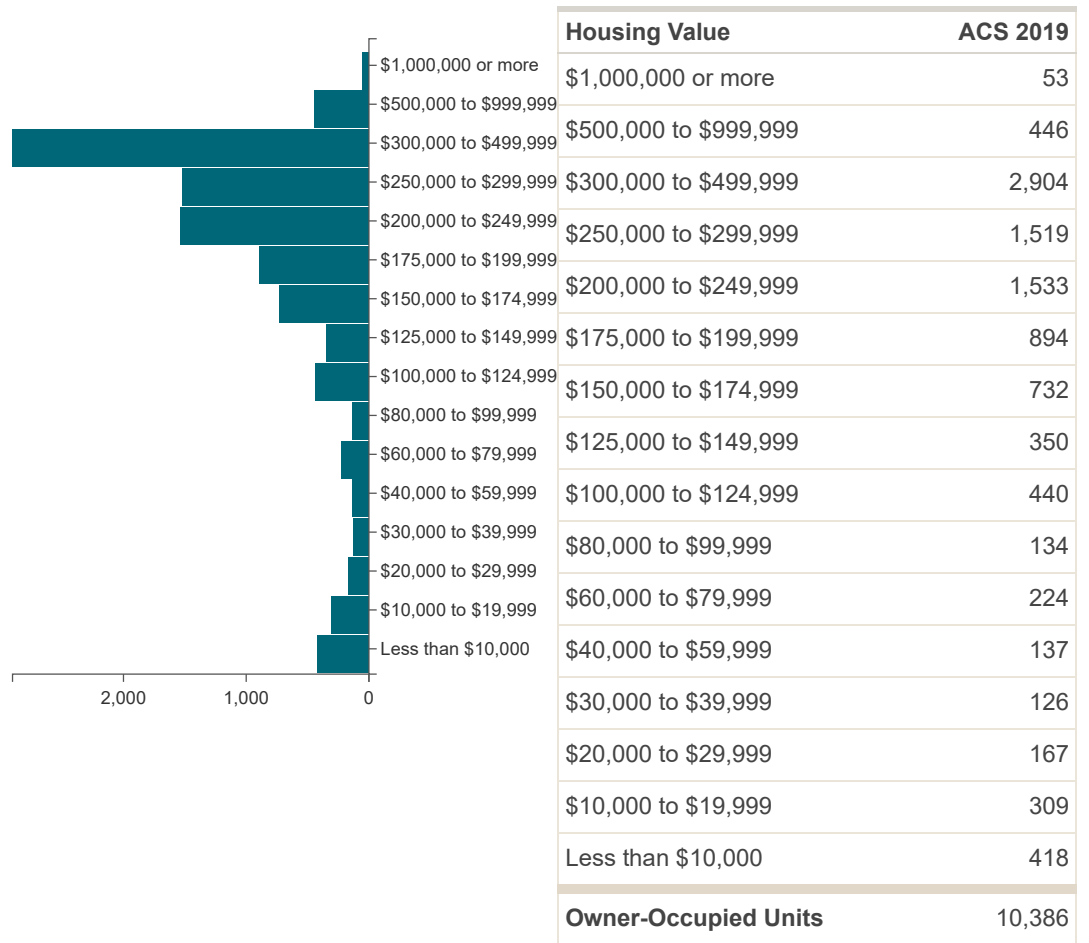
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<b>Median gross rent</b>	\$1,087	\$1,126	\$39	3.6%

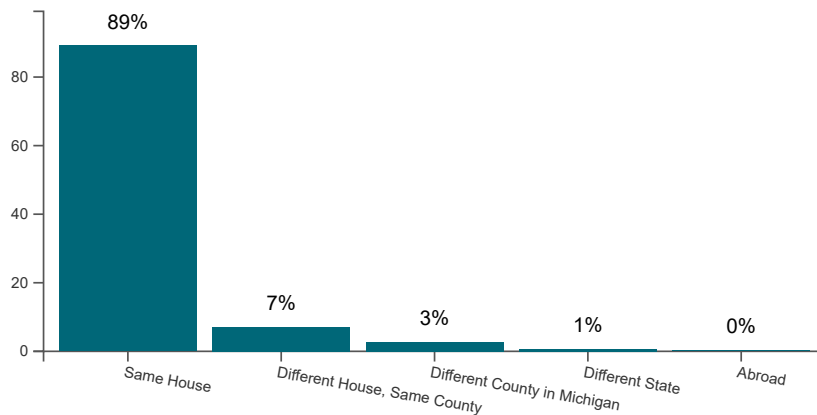
Source: U.S. Census Bureau, Census 2000, 2006-2010 and 2015-2019 American Community Survey 5-Year Estimates

## Housing Value



Source: U.S. Census Bureau, 2015-2019 American Community Survey 5-Year Estimates

## Residence One Year Ago \*



\* This table represents persons, age 1 and over, living in White Lake Township from 2015-2019. The table does not represent person who moved out of White Lake Township from 2015-2019.

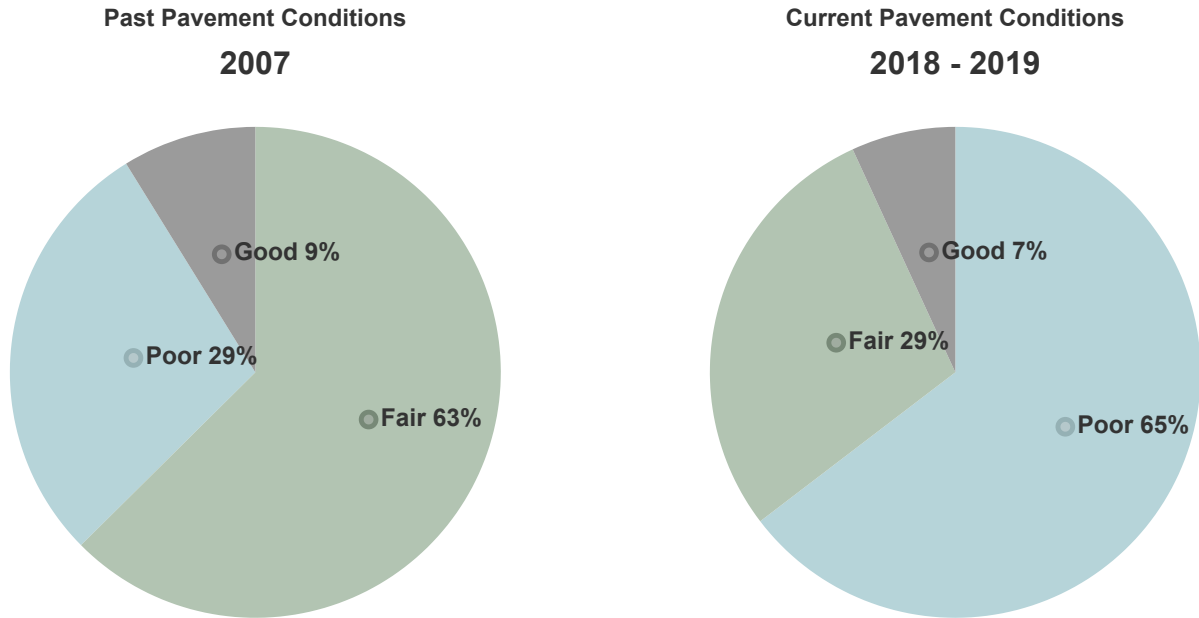
Source: U.S. Census Bureau, 2015-2019 American Community Survey 5-Year Estimates

# Transportation

Miles of public road (including boundary roads): 157

Source: Michigan Geographic Framework

## Pavement Condition (in Lane Miles)



Note: Poor pavements are generally in need of rehabilitation or full reconstruction to return to good condition. Fair pavements are in need of capital preventive maintenance to avoid deteriorating to the poor classification. Good pavements generally receive only routine maintenance, such as street sweeping and snow removal, until they deteriorate to the fair condition.

Source: SEMCOG

## Bridge Status

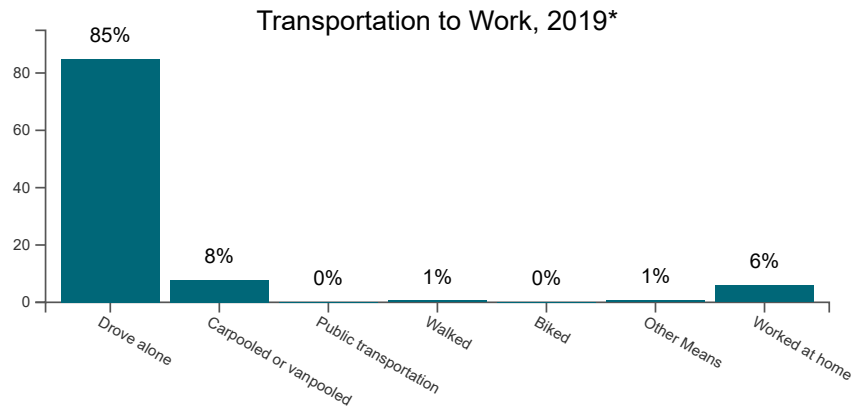
Bridge Status	2008	2008 (%)	2009	2009 (%)	2010	2010 (%)	Percent Point Chg 2008-2010
Open	3	100%	1	33.3%	6	100%	0%
Open with Restrictions	0	0%	2	66.7%	0	0%	0%
Closed*	0	0%	0	0%	0	0%	0%
<b>Total Bridges</b>	<b>3</b>	<b>100.0%</b>	<b>3</b>	<b>100.0%</b>	<b>6</b>	<b>100.0%</b>	<b>0.0%</b>
<b>Deficient Bridges</b>	<b>0</b>	<b>0%</b>	<b>2</b>	<b>66.7%</b>	<b>0</b>	<b>0%</b>	<b>0%</b>

\* Bridges may be closed because of new construction or failed condition.

Note: A bridge is considered deficient if it is structurally deficient (in poor shape and unable to carry the load for which it was designed) or functionally obsolete (in good physical condition but unable to support current or future demands, for example, being too narrow to accommodate truck traffic).

Source: Michigan Structure Inventory and Appraisal Database

### Detailed Intersection & Road Data



\* Resident workers age 16 and over

## Transportation to Work

Transportation to Work	ACS 2010	% of Total (ACS 2010)	ACS 2019	% of Total (ACS 2019)	% Point Chg 2010-2019
<b>Drove alone</b>	12,417	87%	13,325	84.9%	-2.1%
<b>Carpooled or vanpooled</b>	981	6.9%	1,233	7.9%	1%
<b>Public transportation</b>	18	0.1%	6	0%	-0.1%
<b>Walked</b>	133	0.9%	97	0.6%	-0.3%
<b>Biked</b>	49	0.3%	9	0.1%	-0.2%
<b>Other Means</b>	70	0.5%	106	0.7%	0.2%
<b>Worked at home</b>	603	4.2%	922	5.9%	1.7%
<b>Resident workers age 16 and over</b>	14,271	100.0%	15,698	100.0%	0.0%

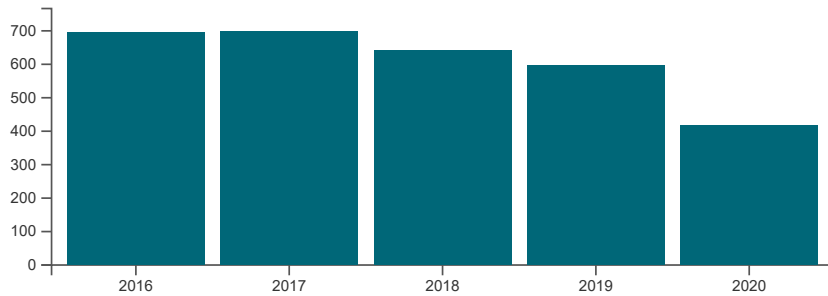
Source: U.S. Census Bureau, 2006-2010 and 2015-2019 American Community Survey 5-Year Estimates

## Mean Travel Time to Work

Mean Travel Time To Work	ACS 2010	ACS 2019	Change 2010-2019
<b>For residents age 16 and over who worked outside the home</b>	32.1 minutes	30.3 minutes	-1.8 minutes

Source: U.S. Census Bureau, 2006-2010 and 2015-2019 American Community Survey 5-Year Estimates

## Crashes, 2016-2020



Source: Michigan Department of State Police with the Criminal Justice Information Center and SEMCOG

Note: Crash data shown is for the entire city.

## Crash Severity

Crash Severity	2016	2017	2018	2019	2020	Percent of Crashes 2016 - 2020
<b><u>Fatal</u></b>	4	4	4	2	3	0.6%
<b><u>Serious Injury</u></b>	12	12	8	10	8	1.6%
<b><u>Other Injury</u></b>	148	132	151	95	67	19.5%
<b><u>Property Damage Only</u></b>	532	549	478	490	339	78.3%
<b><u>Total Crashes</u></b>	696	697	641	597	417	100%

## Crashes by Type

Crashes by Type	2016	2017	2018	2019	2020	Percent of Crashes 2016 - 2020
<b><u>Head-on</u></b>	16	9	11	8	9	1.7%
<b><u>Angle or Head-on/Left-turn</u></b>	141	141	124	100	82	19.3%
<b><u>Rear-End</u></b>	255	242	219	201	118	34%
<b><u>Sideswipe</u></b>	94	82	86	87	66	13.6%
<b><u>Single Vehicle</u></b>	171	193	167	176	124	27.3%
<b><u>Backing</u></b>	3	11	17	9	9	1.6%
<b><u>Other or Unknown</u></b>	16	19	17	16	9	2.5%

## Crashes by Involvement

Crashes by Involvement	2016	2017	2018	2019	2020	Percent of Crashes 2016 - 2020
<b><u>Red-light Running</u></b>	16	11	11	8	13	1.9%
<b><u>Lane Departure</u></b>	118	122	115	109	74	17.7%
<b><u>Alcohol</u></b>	30	24	30	22	16	4%
<b><u>Drugs</u></b>	12	9	6	4	6	1.2%
<b><u>Deer</u></b>	71	71	63	78	56	11.1%
<b><u>Train</u></b>	0	0	0	0	0	0%
<b><u>Commercial Truck/Bus</u></b>	15	22	25	15	8	2.8%
<b><u>School Bus</u></b>	2	4	3	4	1	0.5%
<b><u>Emergency Vehicle</u></b>	3	10	4	2	1	0.7%
<b><u>Motorcycle</u></b>	9	14	13	6	7	1.6%
<b><u>Intersection</u></b>	277	265	237	217	160	37.9%
<b><u>Work Zone</u></b>	5	5	13	4	1	0.9%
<b><u>Pedestrian</u></b>	3	3	2	1	6	0.5%
<b><u>Bicyclist</u></b>	2	6	1	3	0	0.4%
<b><u>Distracted Driver</u></b>	16	53	56	72	48	8%
<b><u>Older Driver (65 and older)</u></b>	116	125	127	105	81	18.2%
<b><u>Young Driver (16 to 24)</u></b>	295	277	240	191	140	37.5%
<b><u>Secondary</u></b>	0	0	0	0	0	0%

## High Frequency Intersection Crash Rankings

Local Rank	County Rank	Region Rank	Intersection	Annual Avg 2016-2020
1	72	196	<u>Highland Rd @ Teggerdine Rd</u>	26.4
2	134	363	<u>Cooley Lake Rd @ Williams Lake Rd S</u>	20.8
3	149	422	<u>Highland Rd @ Fisk Rd</u>	19.2
4	158	441	<u>Highland Rd @ Ormond Rd</u>	18.8
5	197	593	<u>Highland Rd @ Pontiac Lake Rd</u>	16.4
6	404	1,218	<u>Highland Rd @ Bogie Lake Rd</u>	11.4
7	422	1,272	<u>Highland Rd @ Elizabeth Lake Rd</u>	11
8	448	1,343	<u>Highland Rd @ Bogie Lake Rd</u>	10.6
9	561	1,755	<u>Williams Lake Rd N @ Elizabeth Lake Rd</u>	9
10	705	2,235	<u>Williams Lake Rd N @ Pontiac Lake Rd</u>	7.6

Note: Intersections are ranked by the number of reported crashes, which does not take into account traffic volume. Crashes reported occurred within 150 feet of the intersection.

Source: **Michigan Department of State Police with the Criminal Justice Information Center** and **SEMCOG**



## High Frequency Road Segment Crash Rankings

Local Rank	County Rank	Region Rank	Segment	From Road - To Road	Annual Avg 2016-2020
1	2	7	<u>Highland Rd</u>	Teggerdine Rd - Pontiac Lake Rd	92.2
2	60	161	<u>Highland Rd</u>	Highland Rd - Elizabeth Lake Rd	45.2
3	181	482	<u>Williams Lake Rd S</u>	Cooley Lake Rd - Elizabeth Lake Rd	30
4	256	679	<u>Highland Rd</u>	Elizabeth Lake Rd - Teggerdine Rd	26
5	295	774	<u>Highland Rd</u>	Pontiac Lake Rd - Williams Lake Rd N	24.4
6	306	796	<u>Ormond Rd</u>	Highland Rd - Jackson Blvd	24.2
7	484	1,267	<u>Highland Rd</u>	Highland Rd - Bogie Lake Rd	19
8	498	1,300	<u>Bogie Lake Rd</u>	Bogie Lake Rd - Highland Rd	18.8
9	507	1,325	<u>Highland Rd</u>	Highland Rd - Ormond Rd	18.6
10	528	1,384	<u>White Lake Rd</u>	Ormond Rd - Teggerdine Rd	18.2

Note: Segments are ranked by the number of reported crashes, which does not take into account traffic volume.

## Environment

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## SEMCOG 2020 Land Use

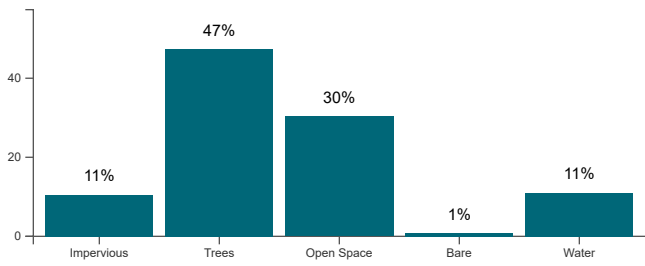
Parcel Land Use	Acres 2015	Acres 2020	Change 2015-2020	Pct Change 2015-2020
<b>Single-Family Residential</b>	5,298.6	5,441.7	143.1	2.7%
<b>Attached Condo Housing</b>	81.1	90.2	9.2	11.3%
<b>Multi-Family Housing</b>	53.7	88.6	34.8	64.8%
<b>Mobile Home</b>	348.6	348.6	0	0%
<b>Agricultural/Rural Residential</b>	4,041.3	4,164.1	122.8	3%
<b>Mixed Use</b>	2.7	4.9	2.2	81.7%
<b>Retail</b>	303.3	290.9	-12.4	-4.1%
<b>Office</b>	60.4	51.5	-8.9	-14.7%
<b>Hospitality</b>	56.7	53	-3.7	-6.6%
<b>Medical</b>	16.3	16.3	0	0%
<b>Institutional</b>	312.6	313.4	0.8	0.2%
<b>Industrial</b>	46.1	41.6	-4.5	-9.7%
<b>Recreational/Open Space</b>	5,658.1	5,667.8	9.7	0.2%
<b>Cemetery</b>	10.5	10.5	0	0%
<b>Golf Course</b>	150.6	150.6	0	0%
<b>Parking</b>	3.9	3.9	0	0%
<b>Extractive</b>	0	0	0	0%
<b>TCU</b>	224.9	224.9	0	0%
<b>Vacant</b>	3,101.3	2,871.2	-230.2	-7.4%
<b>Water</b>	2,379.1	2,379.1	0	0%
<b>Not Parceled</b>	1,565.1	1,502.2	-62.9	-4%
<b>Total</b>	23,715	23,715	0	0%

1. **Agricultural / Rural Res** includes any residential parcel containing 1 or more homes where the parcel is 3 acres or larger.
2. **Mixed Use** includes those parcels containing buildings with Hospitality, Retail, or Office square footage and housing units.
3. **Not Parceled** includes all areas within a community that are not covered by a parcel legal description.
4. Parcels that do not have a structure assigned to the parcel are considered vacant unless otherwise indicated, even if the parcel is part of a larger development such as a factory, school, or other developed series of lots.

Note: Land Cover was derived from SEMCOG's 2010 Leaf off Imagery.

Source: **SEMCOG**

SEMCOG Land Cover in 2010



Source Data  
SEMCOG - Detailed Data

Type	Description	Acres	Percent
<b>Impervious</b>	buildings, roads, driveways, parking lots	2,494.2	10.5%
<b>Trees</b>	woody vegetation, trees	11,235.2	47.3%
<b>Open Space</b>	agricultural fields, grasslands, turfgrass	7,190.7	30.3%
<b>Bare</b>	soil, aggregate piles, unplanted fields	190.4	0.8%
<b>Water</b>	rivers, lakes, drains, ponds	2,617.8	11%
Total Acres		23,728.2	

## Community Profiles

YOU ARE VIEWING DATA FOR:

### White Lake Township

7525 Highland Rd  
White Lake, MI 48383-  
2938



Census 2020 Population:  
30,950  
Area: 37.1 square miles

<http://www.whitelaketwp.com/>

[VIEW COMMUNITY EXPLORER MAP](#)

[VIEW 2020 CENSUS MAP](#)

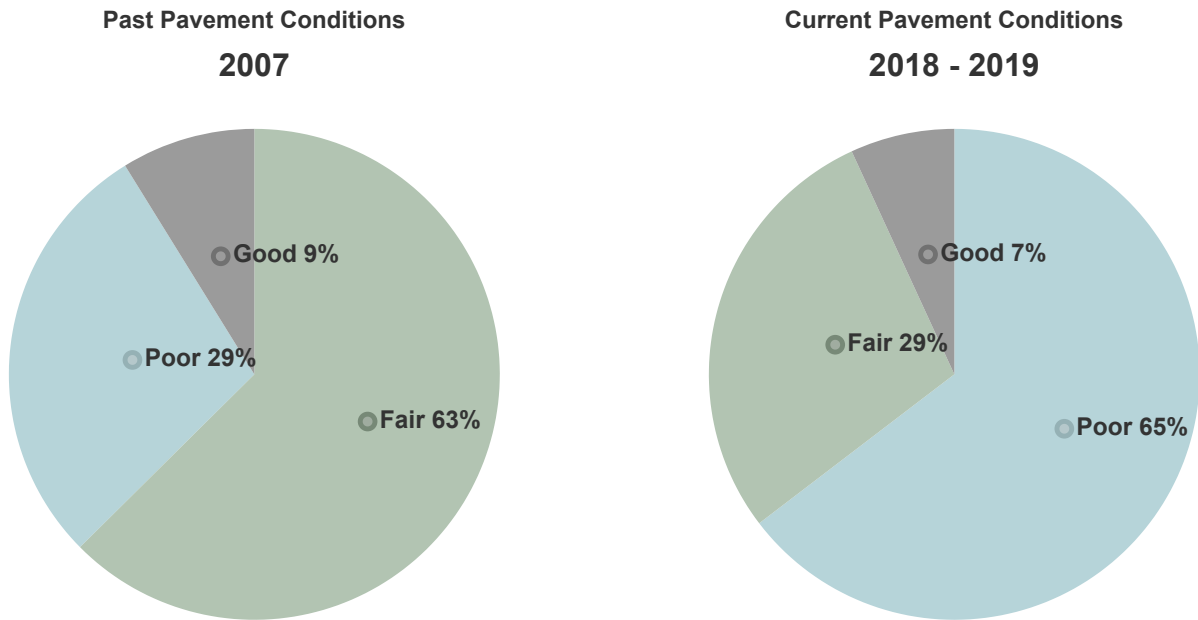
## Transportation

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Miles of public road (including boundary roads): 157

Source: Michigan Geographic Framework

## Pavement Condition (in Lane Miles)



Note: Poor pavements are generally in need of rehabilitation or full reconstruction to return to good condition. Fair pavements are in need of capital preventive maintenance to avoid deteriorating to the poor classification. Good pavements generally receive only routine maintenance, such as street sweeping and snow removal, until they deteriorate to the fair condition.

Source: SEMCOG

## Bridge Status

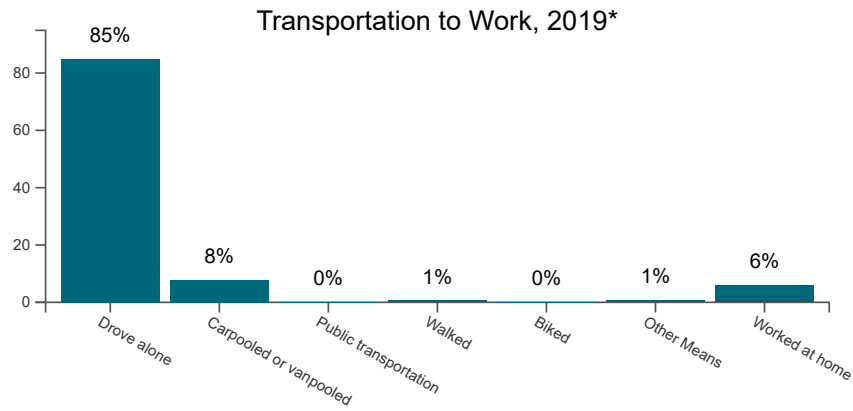
Bridge Status	2008	2008 (%)	2009	2009 (%)	2010	2010 (%)	Percent Point Chg 2008-2010
Open	3	100%	1	33.3%	6	100%	0%
Open with Restrictions	0	0%	2	66.7%	0	0%	0%
Closed*	0	0%	0	0%	0	0%	0%
<b>Total Bridges</b>	3	100.0%	3	100.0%	6	100.0%	0.0%
<b>Deficient Bridges</b>	0	0%	2	66.7%	0	0%	0%

\* Bridges may be closed because of new construction or failed condition.

Note: A bridge is considered deficient if it is structurally deficient (in poor shape and unable to carry the load for which it was designed) or functionally obsolete (in good physical condition but unable to support current or future demands, for example, being too narrow to accommodate truck traffic).

Source: Michigan Structure Inventory and Appraisal Database

### Detailed Intersection & Road Data



\* Resident workers age 16 and over

## Transportation to Work

Transportation to Work	ACS 2010	% of Total (ACS 2010)	ACS 2019	% of Total (ACS 2019)	% Point Chg 2010-2019
<b>Drove alone</b>	12,417	87%	13,325	84.9%	-2.1%
<b>Carpooled or vanpooled</b>	981	6.9%	1,233	7.9%	1%
<b>Public transportation</b>	18	0.1%	6	0%	-0.1%
<b>Walked</b>	133	0.9%	97	0.6%	-0.3%
<b>Biked</b>	49	0.3%	9	0.1%	-0.2%
<b>Other Means</b>	70	0.5%	106	0.7%	0.2%
<b>Worked at home</b>	603	4.2%	922	5.9%	1.7%
<b>Resident workers age 16 and over</b>	14,271	100.0%	15,698	100.0%	0.0%

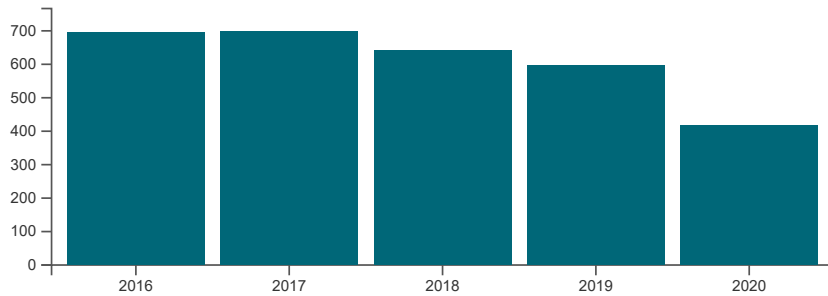
Source: U.S. Census Bureau, 2006-2010 and 2015-2019 American Community Survey 5-Year Estimates

## Mean Travel Time to Work

Mean Travel Time To Work	ACS 2010	ACS 2019	Change 2010-2019
<b>For residents age 16 and over who worked outside the home</b>	32.1 minutes	30.3 minutes	-1.8 minutes

Source: U.S. Census Bureau, 2006-2010 and 2015-2019 American Community Survey 5-Year Estimates

## Crashes, 2016-2020



Source: Michigan Department of State Police with the Criminal Justice Information Center and SEMCOG

Note: Crash data shown is for the entire city.

## Crash Severity

Crash Severity	2016	2017	2018	2019	2020	Percent of Crashes 2016 - 2020
<b><u>Fatal</u></b>	4	4	4	2	3	0.6%
<b><u>Serious Injury</u></b>	12	12	8	10	8	1.6%
<b><u>Other Injury</u></b>	148	132	151	95	67	19.5%
<b><u>Property Damage Only</u></b>	532	549	478	490	339	78.3%
<b><u>Total Crashes</u></b>	696	697	641	597	417	100%

## Crashes by Type

Crashes by Type	2016	2017	2018	2019	2020	Percent of Crashes 2016 - 2020
<b><u>Head-on</u></b>	16	9	11	8	9	1.7%
<b><u>Angle or Head-on/Left-turn</u></b>	141	141	124	100	82	19.3%
<b><u>Rear-End</u></b>	255	242	219	201	118	34%
<b><u>Sideswipe</u></b>	94	82	86	87	66	13.6%
<b><u>Single Vehicle</u></b>	171	193	167	176	124	27.3%
<b><u>Backing</u></b>	3	11	17	9	9	1.6%
<b><u>Other or Unknown</u></b>	16	19	17	16	9	2.5%

## Crashes by Involvement

Crashes by Involvement	2016	2017	2018	2019	2020	Percent of Crashes 2016 - 2020
<u>Red-light Running</u>	16	11	11	8	13	1.9%
<u>Lane Departure</u>	118	122	115	109	74	17.7%
<u>Alcohol</u>	30	24	30	22	16	4%
<u>Drugs</u>	12	9	6	4	6	1.2%
<u>Deer</u>	71	71	63	78	56	11.1%
<u>Train</u>	0	0	0	0	0	0%
<u>Commercial Truck/Bus</u>	15	22	25	15	8	2.8%
<u>School Bus</u>	2	4	3	4	1	0.5%
<u>Emergency Vehicle</u>	3	10	4	2	1	0.7%
<u>Motorcycle</u>	9	14	13	6	7	1.6%
<u>Intersection</u>	277	265	237	217	160	37.9%
<u>Work Zone</u>	5	5	13	4	1	0.9%
<u>Pedestrian</u>	3	3	2	1	6	0.5%
<u>Bicyclist</u>	2	6	1	3	0	0.4%
<u>Distracted Driver</u>	16	53	56	72	48	8%
<u>Older Driver (65 and older)</u>	116	125	127	105	81	18.2%
<u>Young Driver (16 to 24)</u>	295	277	240	191	140	37.5%
<u>Secondary</u>	0	0	0	0	0	0%



## High Frequency Intersection Crash Rankings

Local Rank	County Rank	Region Rank	Intersection	Annual Avg 2016-2020
1	72	196	<u>Highland Rd @ Teggerdine Rd</u>	26.4
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9	561	1,755	<u>Williams Lake Rd N @ Elizabeth Lake Rd</u>	9
10	705	2,235	<u>Williams Lake Rd N @ Pontiac Lake Rd</u>	7.6

Note: Intersections are ranked by the number of reported crashes, which does not take into account traffic volume. Crashes reported occurred within 150 feet of the intersection.

Source: **Michigan Department of State Police with the Criminal Justice Information Center** and **SEMCOG**

## High Frequency Road Segment Crash Rankings

Local Rank	County Rank	Region Rank	Segment	From Road - To Road	Annual Avg 2016-2020
1	2	7	<u>Highland Rd</u>	Teggerdine Rd - Pontiac Lake Rd	92.2
2	60	161	<u>Highland Rd</u>	Highland Rd - Elizabeth Lake Rd	45.2
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5	295	774	<u>Highland Rd</u>	Pontiac Lake Rd - Williams Lake Rd N	24.4
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10	528	1,384	<u>White Lake Rd</u>	Ormond Rd - Teggerdine Rd	18.2

Note: Segments are ranked by the number of reported crashes, which does not take into account traffic volume.

## Environment

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## SEMCOG 2020 Land Use

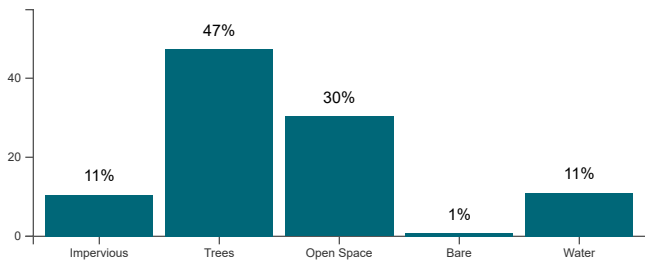
Parcel Land Use	Acres 2015	Acres 2020	Change 2015-2020	Pct Change 2015-2020
<b>Single-Family Residential</b>	5,298.6	5,441.7	143.1	2.7%
<b>Attached Condo Housing</b>	81.1	90.2	9.2	11.3%
<b>Multi-Family Housing</b>	53.7	88.6	34.8	64.8%
<b>Mobile Home</b>	348.6	348.6	0	0%
<b>Agricultural/Rural Residential</b>	4,041.3	4,164.1	122.8	3%
<b>Mixed Use</b>	2.7	4.9	2.2	81.7%
<b>Retail</b>	303.3	290.9	-12.4	-4.1%
<b>Office</b>	60.4	51.5	-8.9	-14.7%
<b>Hospitality</b>	56.7	53	-3.7	-6.6%
<b>Medical</b>	16.3	16.3	0	0%
<b>Institutional</b>	312.6	313.4	0.8	0.2%
<b>Industrial</b>	46.1	41.6	-4.5	-9.7%
<b>Recreational/Open Space</b>	5,658.1	5,667.8	9.7	0.2%
<b>Cemetery</b>	10.5	10.5	0	0%
<b>Golf Course</b>	150.6	150.6	0	0%
<b>Parking</b>	3.9	3.9	0	0%
<b>Extractive</b>	0	0	0	0%
<b>TCU</b>	224.9	224.9	0	0%
<b>Vacant</b>	3,101.3	2,871.2	-230.2	-7.4%
<b>Water</b>	2,379.1	2,379.1	0	0%
<b>Not Parceled</b>	1,565.1	1,502.2	-62.9	-4%
<b>Total</b>	23,715	23,715	0	0%

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Note: Land Cover was derived from SEMCOG's 2010 Leaf off Imagery.

Source: **SEMCOG**

SEMCOG Land Cover in 2010



Source Data  
SEMCOG - Detailed Data

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<b>Trees</b>	woody vegetation, trees	11,235.2	47.3%
<b>Open Space</b>	agricultural fields, grasslands, turfgrass	7,190.7	30.3%
<b>Bare</b>	soil, aggregate piles, unplanted fields	190.4	0.8%
<b>Water</b>	rivers, lakes, drains, ponds	2,617.8	11%
Total Acres		23,728.2	

## Community Profiles

YOU ARE VIEWING DATA FOR:

### White Lake Township

7525 Highland Rd  
White Lake, MI 48383-  
2938  
<http://www.whitelaketwp.com/>



Census 2020 Population:  
30,950  
Area: 37.1 square miles

[VIEW COMMUNITY EXPLORER MAP](#)

[VIEW 2020 CENSUS MAP](#)

## Environment

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## SEMCOG 2020 Land Use

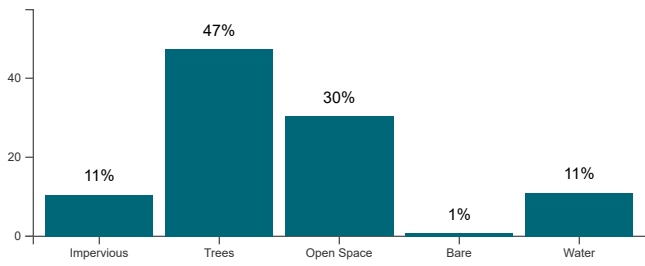
Parcel Land Use	Acres 2015	Acres 2020	Change 2015-2020	Pct Change 2015-2020
<b>Single-Family Residential</b>	5,298.6	5,441.7	143.1	2.7%
<b>Attached Condo Housing</b>	81.1	90.2	9.2	11.3%
<b>Multi-Family Housing</b>	53.7	88.6	34.8	64.8%
<b>Mobile Home</b>	348.6	348.6	0	0%
<b>Agricultural/Rural Residential</b>	4,041.3	4,164.1	122.8	3%
<b>Mixed Use</b>	2.7	4.9	2.2	81.7%
<b>Retail</b>	303.3	290.9	-12.4	-4.1%
<b>Office</b>	60.4	51.5	-8.9	-14.7%
<b>Hospitality</b>	56.7	53	-3.7	-6.6%
<b>Medical</b>	16.3	16.3	0	0%
<b>Institutional</b>	312.6	313.4	0.8	0.2%
<b>Industrial</b>	46.1	41.6	-4.5	-9.7%
<b>Recreational/Open Space</b>	5,658.1	5,667.8	9.7	0.2%
<b>Cemetery</b>	10.5	10.5	0	0%
<b>Golf Course</b>	150.6	150.6	0	0%
<b>Parking</b>	3.9	3.9	0	0%
<b>Extractive</b>	0	0	0	0%
<b>TCU</b>	224.9	224.9	0	0%
<b>Vacant</b>	3,101.3	2,871.2	-230.2	-7.4%
<b>Water</b>	2,379.1	2,379.1	0	0%
<b>Not Parceled</b>	1,565.1	1,502.2	-62.9	-4%
<b>Total</b>	23,715	23,715	0	0%

1. **Agricultural / Rural Res** includes any residential parcel containing 1 or more homes where the parcel is 3 acres or larger.
2. **Mixed Use** includes those parcels containing buildings with Hospitality, Retail, or Office square footage and housing units.
3. **Not Parceled** includes all areas within a community that are not covered by a parcel legal description.
4. Parcels that do not have a structure assigned to the parcel are considered vacant unless otherwise indicated, even if the parcel is part of a larger development such as a factory, school, or other developed series of lots.

Note: Land Cover was derived from SEMCOG's 2010 Leaf off Imagery.

Source: **SEMCOG**

SEMCOG Land Cover in 2010



Source Data  
SEMCOG - Detailed Data

Type	Description	Acres	Percent
<b>Impervious</b>	buildings, roads, driveways, parking lots	2,494.2	10.5%
<b>Trees</b>	woody vegetation, trees	11,235.2	47.3%
<b>Open Space</b>	agricultural fields, grasslands, turfgrass	7,190.7	30.3%
<b>Bare</b>	soil, aggregate piles, unplanted fields	190.4	0.8%
<b>Water</b>	rivers, lakes, drains, ponds	2,617.8	11%
Total Acres		23,728.2	



INNOVATIVE IDEAS  
EXCEPTIONAL DESIGN  
UNMATCHED CLIENT SERVICE

White Lake Township  
FY2023 CWSRF Wastewater Asset Management Plan  
Improvements Project Plan

**APPENDIX III**  
**LEVEL OF SERVICE (LOS) GOAL TABLE**

DRAFT



**White Lake Township SAW Grant  
Wastewater Utilities  
Level of Service Standards / Goals**

Strategic Area	LOS Driver	Level of Service Standard/Goal		Industry Standard	Performance Measures	Data	Reporting Procedure	Current Rating
		Current Target	Future Target					
<b>Wastewater Collection</b>								
<b>Social</b>								
<b>Customer Service</b>	Customer	Maintain trust with the public, regulatory agencies, and non-government organizations	No change	NA	# of Complaint Calls / Year; Department Coordination Meetings	Sewer complaint reports; Service Requests; Work Orders	Annual Reports to Board	
	Customer / Self-Imposed	Proactively maintain the wastewater collection system to minimize service disruptions	No change	Develop a Corrective Action Program (CAP) to address SSOs	# of sewer backups/SSOs per year shall be less than reported national averages; Continue to maintain compliance with Public Act 222; Reductions in insurance claims	# of sewer backups/SSOs; Work Orders; Grease Interceptor inspections	Annual Reports to Board	
	Self-Imposed	Educate residents/businesses on sewer complaint process (who to call and when)	No change	Public Act 222 (Sewer Backup Legislation)	Post complaint procedure on website; Compliance w/ NPDES Permit	Website content; Newsletter articles; Social Media content	Annual Reports to Board	
	Self-Imposed	Provide efficient and timely service to customers - Coordinate with the OCWRC to respond to complaints within 24 hours of notification	No change	45 days after notification (Public Act 222)	Coordinate with OCWRC to respond to complaints within 24 hours of notification	Sewer complaint reports; OCWRC Reports; SCADA logs	Annual Reports to Board	
	Customer / Self-Imposed	Maintain sanitary sewer capacity to Township residents and businesses in the most cost effective manner possible	No change	NA	# of Complaint Calls / Year	Sewer complaint reports; OCWRC Reports	Annual Reports to Board	
<b>Reliability</b>	Self-Imposed	Coordinate with the County to televise and clean sewers as necessary to minimize sewer system problems	Televise ALL sewers within the Township	Inspect ALL infrastructure every 7-10 years	OCWRC CCTV & Sewer Maintenance Reports and costs	CCTV reports/data; GIS	Annual Reports to Board	
	Regulatory / Customer	Minimize system failure - determine criticality of assets for Capital Improvement Planning	Assure funding is available to make necessary improvements to assets	SAW Grant requirement to develop criticality of assets	Criticality of Assets Report	AMP data/report	Annual Reports to Board	

**White Lake Township SAW Grant  
Wastewater Utilities  
Level of Service Standards / Goals**

Strategic Area	LOS Driver	Level of Service Standard/Goal		Industry Standard	Performance Measures	Data	Reporting Procedure	Current Rating
		Current Target	Future Target					
<b>Wastewater Collection</b>								
<b>Social</b>								
Reliability	Self-Imposed	Maintain and replace equipment as necessary to maintain compliance and meet level of service goals	No change	SAW Grant requirement to develop level of service goals	Vehicle/Equipment maintenance & purchase costs / Year	Depreciation data; Equipment purchases	Annual Reports to Board	
	Self-Imposed	Coordinate with the County to perform asset rehabilitation as necessary	No change	SAW Grant Implementation / Public Act 222	Project Implementation; Review of previous reports/studies	Project Implementation	Annual Reports to Board	
	Self-Imposed	Initiate better coordination/information from OCWRC for specific sewer maintenance activities	Continue to initiate better coordination/information from OCWRC for specific sewer maintenance activities	NA	OCWRC Sewer Maintenance Reports and costs	OCWRC Sewer Maintenance Reports and costs; Cityworks integration	Annual Reports to Board	
	Self-Imposed	Coordinate utility and road projects to limit repair of underground utilities for roadways with new pavement replacement	No change	NA	Department Coordination Meetings; Project Implementation	Project Implementation	Annual Reports to Board	
Health & Safety	Regulatory	Meet all MIOSHA, USEPA, and MDEQ regulations and increase training opportunities for sanitary sewer maintenance staff	No change	MIOSHA	Zero violations	Notice of Violations	Annual Reports to Board	
	Customer / Self-Imposed	Protect community from hazards associated with wastewater collection system (basement backups, traffic disturbance, etc.)	No change	Engineering reviews required by MDEQ (Wastewater Construction Permits)	Zero public injuries	# of private property backups; vehicle accidents associated with wastewater collection system; # of pump station facility intrusions	Annual Reports to Board	
	Self-Imposed	Zero Loss Time Accidents	No change	Provide training to each newly assigned employee on operating procedures, hazards and safeguards of the job (MIOSHA)	Zero Loss Time / Year	Accident Reports / Claims, Worker's Comp Analysis	Claims made to Insurance Provider; Annual Reports to Board	
<b>Environmental</b>								
Administration Organizational Development	Self-Imposed	Optimize resources and reduce overall O&M, planning, and engineering costs	Allocate resources to deficient areas as necessary	NA	Department Coordination Meetings	Mtg minutes; AMP; Review of reports/studies	Annual Reports to Board	

**White Lake Township SAW Grant  
Wastewater Utilities  
Level of Service Standards / Goals**

Strategic Area	LOS Driver	Level of Service Standard/Goal		Industry Standard	Performance Measures	Data	Reporting Procedure	Current Rating
		Current Target	Future Target					
<b>Wastewater Collection</b>								
<b>Environmental</b>								
<b>Environmental Stewardship</b>	Customer / Self-Imposed	Enhance the protection of public health and the environment	No change	NA	SSO reductions; FOG sewer maintenance reductions; pump station rehabilitation	OCWRC Sewer Maintenance Reports and costs; Cityworks integration	Annual Reports to Board	
	Regulatory	Minimize Sanitary Sewer Overflows (SSOs) & provide better education to individual grinder station owners	No change	Contact MDEQ within 24 hrs of SSO; Develop Corrective Action Program	Minimize SSOs to 1 every 10 years	SSO reports; OCWRC Sewer Maintenance Reports and costs;	Reports to DEQ; Annual Reports to Board	
	Self-Imposed	Provide sanitary sewer extensions in development and redevelopment projects, where feasible	Reduce onsite septic systems by 10% in the Township by 2040; Target sensitive lake areas as the first priority to receive sanitary sewer service	Township goal established in Master Plan	Plan reviews; OSDS reductions	Plan reviews; DPW Reports	Annual Reports to Board	
	Self-Imposed	Develop and Implement a Fats, Oil, and Grease (FOG) Program	Continue to implement a FOG Program	Non-domestic users must not introduce any materials that would prohibit the POTW system	Cityworks and GIS implementation	Cityworks; GIS; Work Orders; DPW Reports	Annual Reports to Board	
	Customer / Self-Imposed	Reduce Inflow & Infiltration (I/I) from the system	Continue to reduce I/I from the system	I/I evaluation is required for SRF/SWQIF study	10% reductions in I/I / Year	Cityworks; GIS; OCWRC Sewer Maintenance Reports and costs	Annual Reports to Board	
	Self-Imposed	Improve knowledge of system components - Integrate Computer Maintenance and Management System (CMMS) into the Wastewater Collection Program (i.e. Cityworks, SEDARU, GIS Updates)	Implement and Maintain the CMMS Program; Continue to improve knowledge of system components	NA	CMMS implementation; Work order generation	Cityworks; GIS; Work Orders; DPW Reports	GIS updates; Annual Reports To Board; Annual Maintenance Registrations	
<b>Regulatory Compliance</b>	Regulatory	100% IPP Compliance with MDEQ, GLWA, Township Ordinance	No change	Industrial User (IU) Enforcement Response; IU Permitting and Reporting; Meet Wastewater Discharge Standards	# of Notice of Violations / Year	Ordinance reviews/updates; Notice of Violations; Work Orders	Annual Reports to Board	

**White Lake Township SAW Grant  
Wastewater Utilities  
Level of Service Standards / Goals**

Strategic Area	LOS Driver	Level of Service Standard/Goal		Industry Standard	Performance Measures	Data	Reporting Procedure	Current Rating
		Current Target	Future Target					
<b>Wastewater Collection</b>								
<b>Environmental</b>								
Regulatory Compliance	Regulatory	100% IPP Compliance with MDEQ, GLWA, Township Ordinance	No change	Industrial User (IU) Enforcement Response; IU Permitting and Reporting; Meet Wastewater Discharge Standards	# of Notice of Violations / Year	Ordinance reviews/updates; Notice of Violations; Work Orders	Annual Reports to Board	
	Regulatory	Meet the requirements of the Part 41 NPDES Permit	No change	Submit POTW construction permits to MDEQ	# of Permits issued / Year	Permit Applications	Annual Reports to Board	
	Regulatory	Report 100% of SSOs as required by State	No change	100% Reported SSOs	# of SSOs / Year	SSO reports; Work Orders	Annual Reports to Board	
	Self-Imposed	Minimize exposure and liability from claims, enforcement, or litigation	No change	NA	# of Claims / Year	Claims; Work Orders; Annual Reports	Annual Reports to Board	
<b>Economic</b>								
Financial	Customer / Self-Imposed	Operate in a fiscally responsible manner	Continue to operate in a fiscally responsible manner	SAW Grant Requirement	Rate Structure Review	Review of previous reports/studies; CIP; Master Plan; AMP data/report	Annual Reports to Board	
	Self-Imposed	Generate consistent and reliable planning and forecasting information to improve management decisions	Continue to provide consistent and reliable planning and forecasting information to improve management decisions	NA	Cityworks implementation; Department Coordination Meetings	Review of previous reports/studies; CIP; Master Plan; AMP data/report	Annual Reports to Board	
	Regulatory	Perform review of wastewater rates to balance rehabilitation efforts and encourage business development	Perform review of wastewater rates every 3-5 years	SAW Grant Requirement	Rate Structure Review; Updated Rate Structure	Review of previous reports/studies; CIP; Master Plan; AMP data/report	Annual Reports to Board	
	Self-Imposed	Review the County's Updated Schedule of Unit Assignment Factors to determine impact on Capital Connection Fees	Update the Township's Schedule as necessary	NA	Updated Schedule	Review of previous reports/studies; CIP; Master Plan; AMP data/report	Annual Reports to Board	
	Self-Imposed	Coordinate with OCWRC to better track costs of repairing or maintaining specific assets and performance against targets	Continue to coordinate with OCWRC to better track costs of repairing or maintaining specific assets and performance against targets	NA	OCWRC Sewer Maintenance Reports and costs	Cityworks implementation; Tracking reports	Annual Reports to Board	

**White Lake Township SAW Grant  
Wastewater Utilities  
Level of Service Standards / Goals**

Strategic Area	LOS Driver	Level of Service Standard/Goal		Industry Standard	Performance Measures	Data	Reporting Procedure	Current Rating
		Current Target	Future Target					
Wastewater Collection								
Economic								
Financial	Customer / Self-Imposed	Continue to apply for and obtain grants and/or low-interest loans for capital improvement projects	No change	NA	# Awarded Grant Projects / 10 Years	Project implementation	Annual Reports to Board; Quarterly Grant Reports to EGLE	
<p><b>Mission Statement:</b> Strive for a sustainable Township that balances the community's economic, environmental, and social needs. Promote the identity of White Lake Township as a small country town with big City amenities by protecting and preserving natural features, encouraging redevelopment of obsolete properties, and directing growth and redevelopment to a central community core.</p>								

	No Improvement Needed
	Acceptable
	Improvement Needed



INNOVATIVE IDEAS  
EXCEPTIONAL DESIGN  
UNMATCHED CLIENT SERVICE

White Lake Township  
FY2023 CWSRF Wastewater Asset Management Plan  
Improvements Project Plan

## APPENDIX IV

### WHITE LAKE SANITARY SYSTEM CAPACITY

DRAFT

# WHITE LAKE TOWNSHIP - ACT 451 PERMIT TRACKING SYSTEM

										Eastern	Western							
Updated: 3/4/22										District A	District B	Available						
										MGD	MGD	Capacity						
										2.07	1.43	Average						
										0	0	District A						
										0	0	YES						
										0	0	A= 30 inch sewer =		11.63	cfs			
										4.5	4.5	B= 18 inch sewer =						
District A	Permit #	Permit Date	REUs	PP	TCPE	PPF	TCPF	QP	QPI	Average Outlet Eq. Capacity (allocated)		Peak Outlet Eq. Capacity		District A Available Capacity				
										cfs	cfs	MGD			cfs	% Used	MGD	% Used
1	White Lake Estates Mobile Home Park		87.3	235.8	235.8	4.12	4.12	0.15	0.15	0.02		0.15	1.29%	2.05	1.14%			
2	Cranberry Lake Mobile Home Park		191.7	517.5	753.3	3.97	3.88	0.32	0.31	0.08		0.45	3.88%	1.99	3.64%			
3	Suburban Knolls Subdivision		145.0	391.5	1145	4.03	3.76	0.24	0.23	0.11		0.67	5.73%	1.96	5.53%			
4	Adjacent to Phase I Sewer		0.0	0	1145	4.50	3.76	0.00	0.00	0.11		0.67	5.73%	1.96	5.53%			
5	Meijers Sanitary (Off-Site)	019392x	69.3	187.2	1332	4.16	3.72	0.12	0.11	0.13		0.77	6.59%	1.94	6.43%			
6	White Lake Market Place	S969358	212.0	572.4	1904	3.94	3.60	0.35	0.32	0.19		1.06	9.13%	1.88	9.20%			
7	Bocovina	S029119	32.0	86.4	1991	4.26	3.59	0.06	0.05	0.20		1.10	9.50%	1.87	9.62%			
8	Cranberry Meadows #2	S019043	24.0	64.8	2056	4.29	3.58	0.04	0.04	0.21		1.14	9.78%	1.86	9.93%			
9	Pontiac Lake LPS	S999093	505.0	1363.5	3419	3.71	3.39	0.78	0.72	0.34		1.80	15.44%	1.73	16.52%			
10	Cascade/Union Lake	S999105	19.0	51.3	3470	4.31	3.39	0.03	0.03	0.35		1.82	15.64%	1.72	16.77%			
11	North Broadmore Sub No. 1 & 2	S989369	10/2/1998	82.0	221.4	3692	4.13	3.36	0.14	0.12	0.37	1.92	16.52%	1.70	17.83%			
12	Cranberry Meadows Condo		300.3	810.9	4503	3.86	3.29	0.48	0.41	0.45		2.29	19.69%	1.62	21.75%			
13	Independence Village	S999239	130.7	352.8	4856	4.05	3.26	0.22	0.18	0.49		2.45	21.04%	1.58	23.46%			
14	Twin Lakes Village Gravity	S098938	8/28/1998	6.0	16.2	4872	4.39	3.26	0.01	0.01	0.49	2.45	21.10%	1.58	23.53%			
15	Crown Ridge	S999267	28.0	75.6	4947	4.27	3.25	0.05	0.04	0.49		2.49	21.38%	1.58	23.90%			
16	Twin Lakes Village	S009220	46.0	124.2	5072	4.22	3.24	0.08	0.06	0.51		2.54	21.85%	1.56	24.50%			
17	Autumn Glen Subdivision	S009155	4/17/2000	140.0	378	5450	4.03	3.21	0.24	0.19	0.54	2.71	23.27%	1.53	26.33%			
18	Wheatherstone Condos	S019075	3/20/2001	135.3	365.4	5815	4.04	3.18	0.23	0.18	0.58	2.86	24.63%	1.49	28.09%			
19	Belle Tire	S009194	3/8/2000	19.7	53.1	5868	4.31	3.18	0.04	0.03	0.59	2.89	24.82%	1.48	28.35%			
19A	Mojave Cantina	Pending	11/15/2018	5.6	15.093	5883	4.40	3.18	0.01	0.01	0.59	2.89	24.88%	1.48	28.42%			
20	Reserve at Tull Lake	S039024	1/30/2003	62.0	167.4	6050	4.18	3.17	0.11	0.08	0.61	2.96	25.49%	1.46	29.23%			
21	Williams Lake Road San Ext.	S029428	12/17/2002	8.1	21.87	6072	4.38	3.17	0.01	0.01	0.61	2.97	25.57%	1.46	29.34%			
22	North Broadmoore Sub #3	S039140	5/23/2003	18.0	48.6	6121	4.32	3.16	0.03	0.02	0.61	2.99	25.75%	1.46	29.57%			
23	Parkview Heights Sub. #2	S039009	1/14/2003	52.0	140.4	6261	4.20	3.15	0.09	0.07	0.63	3.05	26.26%	1.44	30.25%			
24	Blackberry Hills Condos	S039148	5/30/2003	50.3	135.9	6397	4.20	3.14	0.09	0.07	0.64	3.11	26.76%	1.43	30.90%			
25	Steepollow LP Extension	S039035	2/7/2003	16.3	44.1	6441	4.33	3.14	0.03	0.02	0.64	3.13	26.92%	1.43	31.12%			
26	Meijer #227 On Site	S039116	5/2/2003	0.0	0	6441	4.50	3.14	0.00	0.00	0.64	3.13	26.92%	1.43	31.12%			
27	Williams Lake Crossing (On-Site)	S029428	109.0	294.3	6736	4.08	3.12	0.19	0.14	0.67		3.25	27.98%	1.40	32.54%			
27A	The Bluffs at Williams Lake Crossing (Phase 1)	S029428	37.0	99.9	6836	4.24	3.12	0.07	0.05	0.68		3.30	28.34%	1.39	33.02%			
28	Pontiac Lake (W of Fisk)	S999093	2.0	5.4	6841	4.44	3.12	0.00	0.00	0.68		3.30	28.36%	1.39	33.05%			
29	Elizabeth Trace Condominiums	S049146	5/14/2004	27.7	74.7	6916	4.28	3.11	0.05	0.04	0.69	3.33	28.63%	1.38	33.41%			
30	Round Lake & Cooley Lake Rd Improvements	S049375	10/8/2004	0.0	0	6916	4.50	3.11	0.00	0.00	0.69	3.33	28.63%	1.38	33.41%			

DLZ Michigan, Inc  
4494 Elizabeth Lake Road  
Waterford, Michigan 48328  
248-681-7800

# WHITE LAKE TOWNSHIP - ACT 451 PERMIT TRACKING SYSTEM

		Updated: 3/4/22										District A	District B	Available				
Purchase Capacity												MGD	MGD	Capacity				
Baseline Peak Flow												2.07	1.43	Average				
Baseline Average Flow												0	0	District A				
Baseline Equivalent Population												0	0	YES				
Baseline Peaking Factor												0	0	A= 30 inch sewer = 11.63 cfs				
												4.5	4.5	B= 18 inch sewer =				
District A	Permit #	Permit Date	REUs	PP	TCPE	PPF	TCPF	QP	QPI	Average Outlet Eq. Capacity (allocated)		Peak Outlet Eq. Capacity		District A Available Capacity				
								cfs	cfs	MGD		cfs	% Used	MGD	% Used			
31	Nordic Drive Sanitary Sewer	1001116	12/21/2004	6.0	16.2	6932	4.39	3.11	0.01	0.01	0.69		3.34	28.69%	1.38	33.49%		
31A	Nordic Drive Sanitary Sewer (Extension)		Pending	9.4	25.4	6957	4.37	3.11	0.02	0.01	0.70		3.35	28.78%	1.37	33.61%		
32	Lowe's Off Site Sanitary Sewer	1001099	12/21/2004	31.1	83.97	7041	4.26	3.10	0.06	0.04	0.70		3.38	29.08%	1.37	34.02%		
33	M-59 Sewer Extension (Trainor Law Office)	1001271	2/24/2005	15.0	40.5	7082	4.33	3.10	0.03	0.02	0.71		3.40	29.22%	1.36	34.21%		
34	Colony Ridge Site Condominiums	1001864	7/13/2005	16.0	43.2	7125	4.33	3.10	0.03	0.02	0.71		3.42	29.37%	1.36	34.42%		
35	Glenmore Village - Not Constructed			0.0	0	7125	4.50	3.10	0.00	0.00	0.71		3.42	29.37%	1.36	34.42%		
36	White Lake Retail Center	1003234	7/14/2006	8.0	21.6	7147	4.38	3.10	0.01	0.01	0.71		3.43	29.45%	1.36	34.52%		
37	Cooley Lk Rd Rear Yard San Sewer			7.7	20.7	7167	4.38	3.10	0.01	0.01	0.72		3.43	29.53%	1.35	34.62%		
38	White Lake Crossing	1003992	3/7/2007	65.7	177.3	7345	4.17	3.09	0.11	0.08	0.73		3.51	30.16%	1.34	35.48%		
39	Cedar Island Road San SAD			22.0	59.4	7404	4.30	3.08	0.04	0.03	0.74		3.53	30.37%	1.33	35.77%		
39A	Clearwater Low Pressure Extension			10.0	27	7431	4.36	3.08	0.02	0.01	0.74		3.54	30.46%	1.33	35.90%		
40	Teggerdine Road San SAD			56.0	151.2	7582	4.19	3.07	0.10	0.07	0.76		3.60	31.00%	1.31	36.63%		
40A	Decca Drive Extension			2.0	5.4	7588	4.44	3.07	0.00	0.00	0.76		3.61	31.01%	1.31	36.65%		
41	M-59 Sewer Extension (E. of Elizabeth Lk Rd)	1004000	6/21/2007	262.3	708.3	8296	3.89	3.03	0.43	0.33	0.83		3.90	33.49%	1.24	40.08%		
42	Village Lakes Commercial	1004524	10/25/2007	141.3	381.6	8677	4.03	3.02	0.24	0.18	0.87		4.05	34.81%	1.20	41.92%		
43	Kohl's Commercial	1004059	4/18/2007	4.8	12.96	8690	4.40	3.01	0.01	0.01	0.87		4.05	34.86%	1.20	41.98%		
44	Park Drive pressure sewer	1004657	11/27/2007	34.3	92.7	8783	4.25	3.01	0.06	0.04	0.88		4.09	35.17%	1.19	42.43%		
45	Danforth Drive Sewer Extension	1005041	7/21/2008	18.0	48.6	8832	4.32	3.01	0.03	0.02	0.88		4.11	35.34%	1.19	42.67%		
46	M-59 East/Pontiac Lake Road pressure sewer			122.6	331.02	9163	4.06	2.99	0.21	0.15	0.92		4.24	36.47%	1.15	44.26%		
47	Wal-Mart expansion			60.0	162	9325	4.18	2.98	0.10	0.07	0.93		4.31	37.03%	1.14	45.05%		
48	Ivy Glenn	1008257	3/4/2015	21.0	56.7	9381	4.30	2.98	0.04	0.03	0.94		4.33	37.22%	1.13	45.32%		
49	Caswell Sewer Extension	1008293	4/9/2015	2.0	5.4	9387	4.44	2.98	0.00	0.00	0.94		4.33	37.24%	1.13	45.35%		
50	Kroger D-759	P41000084	2/26/2016	66.4	179.28	9566	4.16	2.97	0.12	0.08	0.96		4.40	37.84%	1.11	46.21%		
51	Worthington Crossing Phase 1	P41000215	5/9/2016	86.0	232.2	9798	4.12	2.96	0.15	0.11	0.98		4.49	38.63%	1.09	47.33%		
52	Worthington Crossing Phase2	Pending		58.0	156.6	9955	4.18	2.96	0.10	0.07	1.00		4.55	39.15%	1.07	48.09%		
53	The Bluffs at Williams Lake Crossing (Phase 2&3)	P41000252	5/9/2016	25.0	67.5	10022	4.29	2.95	0.04	0.03	1.00		4.58	39.38%	1.07	48.42%		
54	Castlewood SAD	1000430	8/2/2016	106.0	286.2	10309	4.09	2.94	0.18	0.13	1.03		4.69	40.34%	1.04	49.80%		
55	Lakeview Sewer Extension SAD - Not Constructed	Pending		0.0	0	10309	4.50	2.94	0.00	0.00	1.03		4.69	40.34%	1.04	49.80%		
56	4 Corners Square	P41001247	1/9/2018	72.8	196.452	10505	4.15	2.93	0.13	0.09	1.05		4.77	40.99%	1.02	50.75%		
57	Preserve at Hidden Lake (Phase 1 Units Only)	P41002175	8/2/2019	30.0	81	10586	4.27	2.93	0.05	0.04	1.06		4.80	41.26%	1.01	51.14%		
57A	Preserve at Hidden Lake (Phase 2 & 3)	P41002613	6/15/2020	47.0	126.9	10713	4.21	2.92	0.08	0.06	1.07		4.85	41.68%	1.00	51.75%		
57B	Preserve at Hidden Lake (Phase 4)			17.4	46.98	10760	4.32	2.92	0.03	0.02	1.08		4.87	41.84%	0.99	51.98%		
58	Trailside Meadows (Phase 1)	P41002341	11/1/2019	73.0	197.1	10957	4.15	2.92	0.13	0.09	1.10		4.94	42.49%	0.97	52.93%		
58A	Trailside Meadows (Phase 2 & 3)	P41003261	7/9/2021	111.0	299.7	11257	4.08	2.90	0.19	0.13	1.13		5.06	43.48%	0.94	54.38%		

DLZ Michigan, Inc  
4494 Elizabeth Lake Road  
Waterford, Michigan 48328  
248-681-7800



# WHITE LAKE TOWNSHIP - ACT 451 PERMIT TRACKING SYSTEM

Updated: 3/4/22											District A	District B	Available			
Purchase Capacity											MGD	MGD	Capacity			
Baseline Peak Flow											2.07	1.43	Average			
Baseline Average Flow											0	0	District A			
Baseline Equivalent Population											0	0	YES			
Baseline Peaking Factor											0	0	A= 30 inch sewer = 11.63 cfs			
											4.5	4.5	B= 18 inch sewer =			
District A	Permit #	Permit Date	REUs	PP	TCPE	PPF	TCPF	QP	QPI	Average Outlet Eq. Capacity (allocated)		Peak Outlet Eq. Capacity		District A Available Capacity		
								cfs	cfs	MGD		cfs	% Used	MGD	% Used	
59	New Hope White Lake	P41002903	11/10/2020	45.6	123.12	11380	4.22	2.90	0.08	0.06	1.14		5.10	43.88%	0.93	54.98%
60	West Valley (on site)	Pending	Pending	41.4	111.78	11492	4.23	2.89	0.07	0.05	1.15		5.15	44.25%	0.92	55.52%
60A	Lake Pointe	Pending	Pending	47.9	129.33	11621	4.21	2.89	0.08	0.06	1.16		5.20	44.67%	0.91	56.14%
61	Hulbert Street Sanitary Sewer SAD	Pending	Pending	19.0	51.3	11672	4.31	2.89	0.03	0.02	1.17		5.21	44.84%	0.90	56.39%
62	Aspen Meadows Backwash	Pending	Pending	9.0	24.3	11697	4.37	2.89	0.02	0.01	1.17		5.22	44.92%	0.90	56.51%
	Total			4332.1	11697											

East Area - District A  
West Area - District B

**Notes:**

- Column E - Population Equivalent based on 2.7 people per household. **Updated 3-18-2016 MDL**
- Column K - Average Contract capacity allocated if all projects were built.
- Column N - Design peak flow allocated if all projects were built.
- Column M - Percentage of the pipe capacity used for all approved projects.
- 30 inch sewer was installed at a 0.08% slope - capacity is 11.63 cfs @ 2.36 fps.

- PP = Project Population**
- TCPE = Total Cumulative Population Equivalent**
- PPF = Project Peaking Factor**
- TCPF = Total Cumulative Peaking Factor**
- QP = Project Peak Flow**
- QPI = Project Peak Flow impact at the outlet.**
- REU = Residential Equivalent Units**



INNOVATIVE IDEAS  
EXCEPTIONAL DESIGN  
UNMATCHED CLIENT SERVICE

White Lake Township  
FY2023 CWSRF Wastewater Asset Management Plan  
Improvements Project Plan

## APPENDIX V

### WASTEWATER ASSET MANAGEMENT PLAN

DRAFT

# CHARTER TOWNSHIP OF WHITE LAKE WASTEWATER ASSET MANAGEMENT PLAN (WWAMP)

SAW Grant No. 1244-01



December 2019



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**APPENDICES**

**APPENDIX A SAW GRANT AGREEMENT**

**APPENDIX B LEVEL OF SERVICE GOALS TABLE**

**APPENDIX C 2 ½ YEAR RATE METHODOLOGY, MASTER FEE SCHEDULE & CASH FLOW ANALYSIS**

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**APPENDIX E PUMPING STATION INVENTORY & ASSESSMENT**

**APPENDIX F FATS, OILS & GREASE (FOG) ASSESSMENT REPORT**

## DEFINITIONS

*ArcGIS* – A mapping and analytics software platform that provides contextual tools for mapping and spatial reasoning, so you can explore data and share location-based insights. (Esri)

*Assets* – Physical components of the wastewater system that can include: sewer main, valves, tanks, pumps, outfalls, storage basins, treatment facilities, and other components that make up the system. (Credit: EGLE)

*Asset Inventory* – An inventory of the components of the system. (Credit: EGLE)

*Asset Management* – A continuous process that guides the acquisition, use, and disposal of infrastructure assets to optimize service delivery and minimize costs over the asset's entire life. (Credit: EPA)

*Asset Management Program* – Managing infrastructure capital assets to minimize the total cost of owning, operating, and maintaining assets at acceptable levels of service. (Credit: Esri)

*Business Risk Evaluation (BRE)* – The process used to assess the criticality of an asset by defining and analyzing the dangers to individuals, businesses, and government agencies against a given set of criteria to mitigate the life cycle impacts of new infrastructure assets on the environment and enhance positive social and economic impacts.

*Capital Improvement Plan (CIP)* – is a short-range plan, usually four to ten years, which identifies capital projects and equipment purchases, provides a planning schedule and identifies options for financing the plan. The CIP considers the following capital needs: future regulations, major asset replacement, system expansion, system consolidation, and improved technology. (Credit: EGLE)

*Cityworks* – A software platform that provides comprehensive public asset and work management solutions for infrastructure to leverage the community's GIS investment. (Credit: Cityworks)

*Consequence of Failure (COF)* – is one part of the BRE equation to determine risk by reviewing and ranking the potential consequences for the equipment, personnel, environment, etc. in the event of equipment failure.

*Criticality* – How likely it is the asset will fail (probability of failure) and the consequence of failure. Criticality scores range from 1 to 25, where scores above 16 are considered to be critical. (Credit: EGLE)

*Fats, Oils, and Grease (FOG)* – Means any hydrocarbons, fatty acids, soaps, fats, waxes, oils, and any other nonvolatile material of animal, vegetable, or mineral origin that is extractable by solvent in accordance with standard methods.



*Geographic Information System (GIS)* – A geographical information system designed to capture, store, and manage all types of geographical data.

*Infiltration* – Groundwater that infiltrates a sewer system through defective sewer main, Sewer main joints, connections, or manholes. Infiltration is generally measured during seasonally high ground water conditions, during a dry period. (Credit: EPA)

*Inflow* – Water other than sanitary flow that enters a sewer system from sources which include, but are not limited to: roof drains, sump pumps, yard drains, area drains, drains from wet areas, cross connections between storm sewers and sanitary sewers, catch basins, cooling towers, stormwater, surface runoff (including leaking manhole covers), street wash-water, or drainage. Inflow is generally measured during wet weather. (Credit: EPA)

*Level of Service (LOS)* – A basic level of service definition for most collection systems will be to deliver reliable sewer collection services at a minimum cost, consistent with applicable environmental and health regulations. Level of service criteria will be system-specific but should include: ensuring adequate system capacity for all service areas, eliminating system bottlenecks due to sewer main blockages, reducing peak flow volumes through inflow/infiltration (I/I) controls, providing rapid and effective emergency response service, and minimizing cost while maximizing effectiveness of maintenance programs. (Credit: EPA)

*Michigan Department of Environment, Great Lakes, and Energy (EGLE)* – The EGLE administers and oversees environmental regulatory programs for the state.

*Mission Statement* – Defines the Asset Management Program and provides an overarching purpose for managing the program. (Credit: EGLE)

*Probability of Failure (POF)* – Defines the likelihood that a piece of equipment will fail at a given time based on an assets age, condition, failure history, historical knowledge, maintenance records, and knowledge regarding how that type of asset is likely to fail. The POF is half of the equation when determining risk as part of the BRE methodology.

## ACRONYMS USED

*AMP* – Asset Management Plan

*BRE* – Business Risk Evaluation

*CMMS* – Computer Maintenance Management System

*COF* – Consequence of Failure

*EPA* – Environmental Protection Agency

*EGLE* – Michigan Department of Environment, Great Lakes, and Energy

*FOG* – Fats, Oils, and Grease

*FCIPP* – Full Length Cured-In-Place-Pipe-Liner

*GIS* – Graphic Information System

*LOS* – Level of Service

*MACP* – Manhole Assessment Certification Program

*MDNR* – Michigan Department of Natural Resources

*NASSCO* – National Association of Sewer Service Companies

*PACP* – Pipeline Assessment Certification Program

*POF* – Probability of Failure

*PVC* – Polyvinyl Chloride Pipe

*RCP* – Reinforced Concrete Pipe

*RPM* – Reinforced Plastic Mortar Pipe (Truss Pipe)

*SCIPP* – Sectional- Cured-In-Place-Pipe-Liner

*SWAMP* – Stormwater Asset Management Plan

*WWAMP* – Wastewater Asset Management Plan

## EXECUTIVE SUMMARY

### INTRODUCTION

The Charter Township of White Lake (Township) applied for and was subsequently awarded a Stormwater, Asset Management, and Wastewater (SAW) Grant for \$570,514 with a local match of \$57,051, from the Michigan Department of Environment, Great Lakes, and Energy (EGLE) for the purposes of development and implementation of a Wastewater Asset Management Plan (WWAMP). A Grant Agreement between the Township and the EGLE was entered into in December 2016 with an effective grant period from January 2017 to December 2019. Please refer to Appendix A for a copy of the grant agreement.

A project team consisting of pertinent Township staff as well as engineering and financial consultants undertook the mission of developing and implementing the WWAMP with the final goal of receiving approval from the EGLE. The final WWAMP report will be placed on file at Township Hall and made available to the public for a period of 15 years, beginning in December 2019.

The Oakland County Water Resources Commissioner's Office (WRC) has a contractual agreement with the Township to operate and maintain the Township's wastewater collection system. The Township desires to proactively manage the wastewater collection system assets in a cost-effective manner because:

- these assets represent a major public investment and trust;
- well-run utilities are important for economic development;
- asset management promotes efficiency and accountability in the operation of the system;
- these assets provide an essential customer service; and
- proper management of the assets provides the basis for self-sufficiency.

The assets that make up the Township's wastewater collection system depreciate over time as they age and deteriorate. As this happens, the level of service expected by Township customers may become compromised while operation and maintenance (O&M) costs continue to increase. The goal of WWAMP development is to mitigate the deterioration of the assets through development of a practical and rigorous methodology for wastewater collection system asset management designed to meet established level of service goals in a cost-effective way through the creation, acquisition, operation, maintenance, rehabilitation, and disposal of assets. Successful execution of a WWAMP will help to ensure cost effective, efficient, and accountable operations to ensure long-term cost-effective sustainability.

As part of the WWAMP project, an asset management team was convened to oversee development and implementation. A list of the team members is outlined in Table 1 on the following page.

**Table 1 Asset Management Team Members**

<b>Member Name</b>	<b>Position</b>	<b>Organization</b>
Rik Kowall Terry Lilley Aaron Potter	Township Supervisor Township Clerk Public Services Director	White Lake Township
Terry Biederman, P.E. Michael Leuffgen, P.E. Leigh Merrill, P.E. Kathryn Maki, P.E. Tim Weir, P.S. Laura Gruzowski Andrew Murray Sean Weeder	Consulting Engineers	J&A-DLZ
Tom Traciak	Financial Consultant	Baker Tilly

The Township’s wastewater collection system is comprised of both pressure sanitary sewers and gravity sanitary sewers (approximately 40 miles), serving 4,500 people (approximately 15% of the Township’s population). The wastewater collection system generally flows from north to south, utilizing ten (10) sanitary sewage pumping and six hundred and twenty-nine (629) grinder pumping stations (approximately 27 of which are commercial). The wastewater flow is ultimately discharged into Commerce Township’s collection system and is conveyed to the Commerce Township Wastewater Treatment Plant for treatment.

Due to the age of the system, none of the wastewater collection system was televised as part of this project. Four hundred and seventy-eight (478) gravity sewer and one hundred and twelve (112) pressure sewer manholes were GPS located and assessed (76.5% of the wastewater collection system); all ten (10) pumping stations were inventoried; and WRC CCTV data was incorporated into GIS and Cityworks as part of the project.

**BACKGROUND**

The Township’s strategic timeframe for the WWAMP is for planning years 2020-2039. It outlines the framework to provide proactive asset management guidance and planning of the wastewater collection system. It was developed to meet the EGLE SAW grant program outline requirements over a twenty (20) year planning and operational period to ensure optimal asset management and Capital Improvement Planning (CIP) for the Township’s wastewater collection system infrastructure.

The five (5) core components of an EGLE approvable WWAMP are listed as follows:

- 1) Asset Inventory
- 2) Level of Service
- 3) Asset Criticality
- 4) Revenue Structure
- 5) Capital Improvement Project Plan

## ASSET INVENTORY

Approximately 15% of the Township is served with a wastewater collection system that consists of gravity main, pressure main, manhole, pumping station, and grinder station assets. The remainder of the system is served by onsite sewage disposal systems (individual septic systems). In 2013, the Township completed the Bogie Lake Road Low Pressure and Huron Valley Schools Force Main project, located in the Western District service area, to allow for future expansion of the system.

A total of 590 sewer manholes were inventoried and located with a GPS and Robotic Total Station to establish State Plan Coordinates (northing, easting, and elevation of rims and inverts). These asset types and locations were then incorporated into the Township’s GIS. The Township’s base GIS information includes parcels, road centerline, and other feature layers.



*Wastewater Manhole Structure*

Several manholes that were initially in the Township’s GIS were located, but could not be inspected due to: vehicles parked over the structures, structures within the roadway that were eventually paved over, lids that were bolted down, etc.

Of the manholes that were GPS located and assessed, 171 manholes were buried, not found, or the manhole cover bolts were damaged, preventing access. Please refer to Table 2 for the manhole asset survey summary.

**Table 2 Wastewater Collection System Asset Inventory Summary**

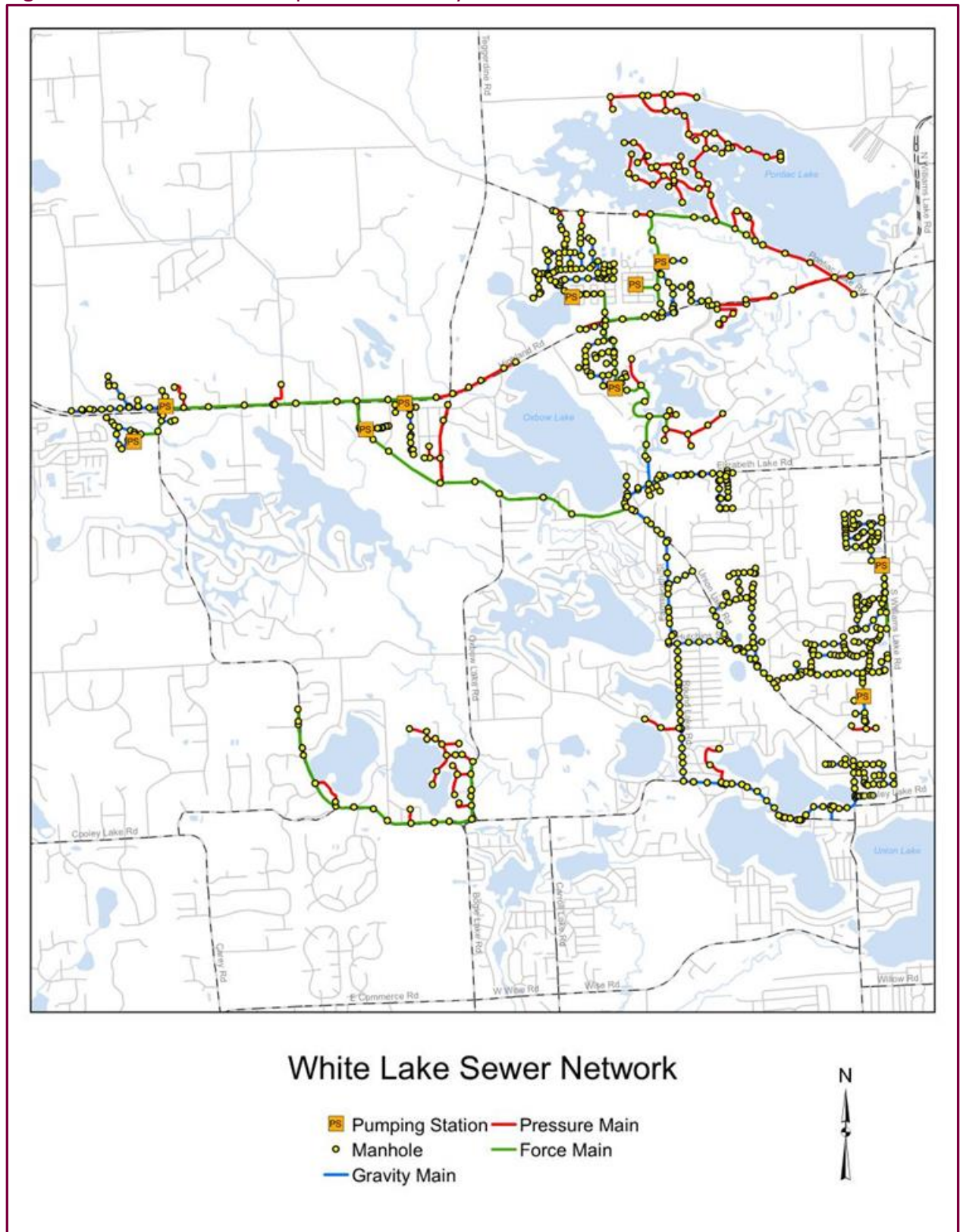
<b>Wastewater Asset</b>	<b>Number Inspected/Comments</b>
Estimated Total Manhole Count	771
Manholes Located and Inspected	590
Manholes Not Located/Found	171

Table 3 and Figure 1 quantify and graphically summarize the Township’s wastewater collection system.

Table 3 White Lake Township Wastewater System Asset Inventory

System Asset	Quantity	Unit
Gravity Sewer Main - 6 inch	65	LF
Gravity Sewer Main - 8 inch	59,329	LF
Gravity Sewer Main - 10 inch	15,316	LF
Gravity Sewer Main - 12 inch	4,404	LF
Gravity Sewer Main - 15 inch	2,689	LF
Gravity Sewer Main - 18 inch	5,578	LF
Gravity Sewer Main - 21 inch	958	LF
Gravity Sewer Main - 24 inch	1,097	LF
Gravity Sewer Main - 27 inch	2,274	LF
Gravity Sewer Main - 30 inch	13,044	LF
Unknown	3,841	LF
Gravity Manholes	571	Ea
Gravity Laterals	774	Ea
Pressure Sewer Main - 2 inch	16,264	LF
Pressure Sewer Main - 3 inch	20,434	LF
Pressure Sewer Main - 4 inch	27,297	LF
Pressure Sewer Main - 6 inch	12,691	LF
Pressure Sewer Main - 8 inch	7,523	LF
Pressure Sewer Main - 10 inch	5,095	LF
Pressure Sewer Main - 12 inch	25,117	LF
Pressure Manholes	200	Ea
Pressure Laterals	625	Ea
Grinder Stations	629	Ea
Pumping Stations	10	Ea

Figure 1 White Lake Township Wastewater System



Due to the age of the Township wastewater collection system and grant implementation requirements, SAW Grant funds were not used to televise and clean the Township’s sewer main. However, the Township gathered WRC CCTV data from previous years for the preparation of the Township Business Risk Evaluation and Capital Improvement Plan.

Since specific areas of sewer main and interceptor structural issues that may need repair or lining were not identified during the development of the WWAMP, it is recommended that as project limits for water main replacement projects or street rehabilitation projects are determined, that sewer main within these project limits are inspected via televising to identify potential problems. This will allow for the sewer main in the project areas to be analyzed to determine how best to correct them and, if replacement or rehabilitation is needed, these tasks can be completed in advance of completion of new road work or during other infrastructure upgrades.

### **Condition Assessment/Remaining Useful Life**

To perform a condition assessment, eligible sewer main and manholes were inspected using the guidelines of the National Association of Sewer Service Companies (NASSCO) Pipe/Manhole Assessment and Certification Program (PACP) standards. This system is the North American standard for pipeline and manhole defect identification and assessment, providing standardization and consistency to methods in which conditions are identified, evaluated, and managed. Under the SAW grant, sewer main older than twenty (20) years of age are eligible to be inspected using closed-circuit television (CCTV) equipment. Approximately 590 manholes were inspected using NASSCO standards.



*Wastewater Manhole Structure*

The NASSCO system refers to the North American standard for pipeline and manhole defect identification and assessment providing standardization and consistency to methods in which conditions are identified, evaluated, and managed. Please refer to Table 4 for the NASSCO rating system utilized to rate the sewer manholes.

Township pumping stations were also evaluated and scored with input and historical information provided by Department of Public Services (DPS) and WRC staff. Ratings of sewer main, manholes, and pump stations were catalogued into a spreadsheet to be used for analysis, financing and CIP development. Please refer to Table 4 for the NASSCO rating system utilized to rate the Township’s sanitary sewer infrastructure.



Table 4 NASSCO Condition Grades

Condition Grade	Definition
5	Most significant defect grade
4	Significant defect grade
3	Moderate defect grade
2	Minor to moderate defect grade
1	Minor defect grade

An asset reaches the end of its useful life when it is physically non-functioning, no longer performs as it was intended, and/or is no longer the most cost-effective solution to maintain a certain level of performance. The estimated remaining useful life is different for every type of asset. For the purpose of the SAW grant project evaluation, the wastewater collection system sewer mains were estimated to have a useful life of approximately 80 years.

### Replacement Cost

The replacement cost of the wastewater collection system assets was determined by multiplying the total quantity of each asset by an estimated replacement unit cost for each asset. The estimated replacement unit costs for each asset were derived from recent related local bids and estimated cost of materials. The total replacement cost for all of wastewater collection system assets was estimated to be approximately \$80.7 million. Table 5 summarizes the wastewater collection system asset replacement costs.

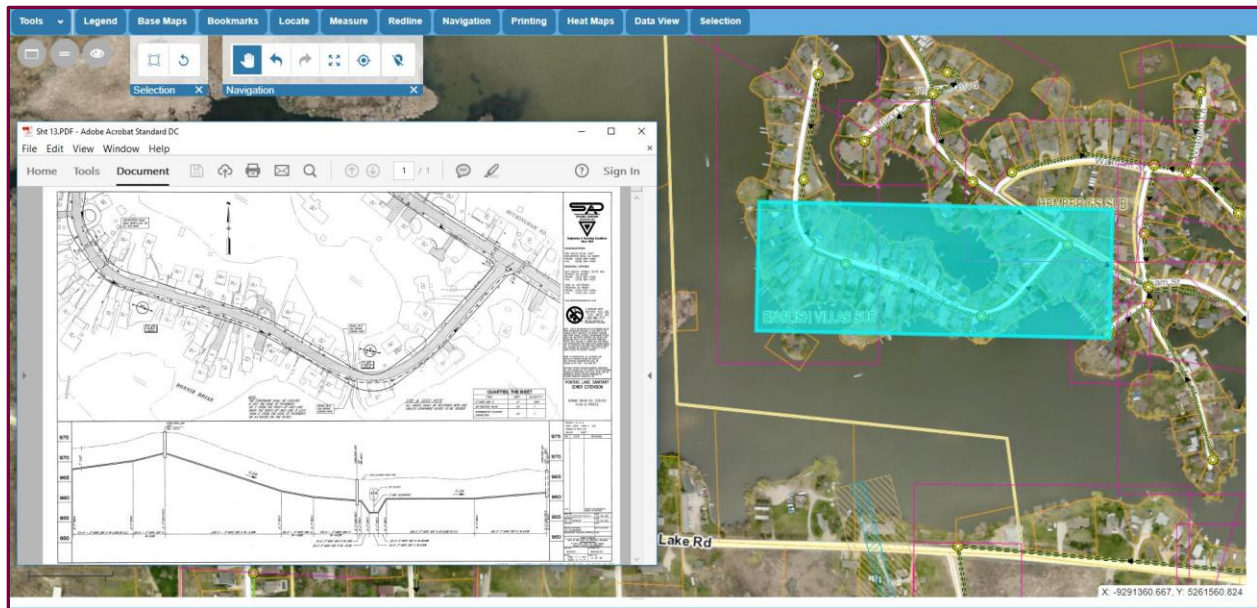
Table 5 Wastewater Asset Summary & Replacement Costs

System Asset	Quantity	Unit	Replacement Cost (estimated)
Gravity Sewer Main - 6 inch	65	LF	\$8,840
Gravity Sewer Main - 8 inch	59,329	LF	\$8,068,744
Gravity Sewer Main - 10 inch	15,316	LF	\$1,715,392
Gravity Sewer Main - 12 inch	4,404	LF	\$528,480
Gravity Sewer Main - 15 inch	2,689	LF	\$430,240
Gravity Sewer Main - 18 inch	5,578	LF	\$1,115,600
Gravity Sewer Main - 21 inch	958	LF	\$229,920
Gravity Sewer Main - 24 inch	1,097	LF	\$307,160
Gravity Sewer Main - 27 inch	2,274	LF	\$727,680
Gravity Sewer Main - 30 inch	13,044	LF	\$5,217,600
Unknown	3,841	LF	\$460,964
Gravity Manholes	571	Ea	\$4,796,400
Gravity Laterals	774	Ea	\$2,105,280
Pressure Sewer Main - 2 inch	16,264	LF	\$3,903,360
Pressure Sewer Main - 3 inch	20,434	LF	\$6,538,880
Pressure Sewer Main - 4 inch	27,297	LF	\$10,918,800
Pressure Sewer Main - 6 inch	12,691	LF	\$6,599,320
Pressure Sewer Main - 8 inch	7,523	LF	\$3,611,040
Pressure Sewer Main - 10 inch	5,095	LF	\$3,719,350
Pressure Sewer Main - 12 inch	25,117	LF	\$14,065,520
Pressure Manholes	200	Ea	\$1,600,000
Pressure Laterals	625	Ea	\$1,600,000
Commercial Grinder Stations	27	Ea	\$648,000
Pumping Stations	10	Ea	\$1,800,000
<b>Total</b>			<b>\$80,716,646</b>

## Asset Management Hardware & Software Tools

All wastewater collection system manholes located and inventoried in the Township, as part of the SAW grant project, were located using Global Positioning System (GPS) equipment and have latitude and longitude coordinates with accuracies in the inch range. Those coordinates were then utilized to map the manholes and connect the associated sewer and pressure mains into an updated and spatially accurate Township wastewater collection system GIS. In addition, existing Township wastewater collection system construction plans and other drawings were scanned and electronically integrated into the Township's wastewater collection system ESRI based GIS system infrastructure layers as well as all sewer main CCTV inspection videos obtained from WRC for quick retrieval and review by Township staff. Please refer to Figure 2 for an example of a wastewater lead card that was scanned and digitized to GIS.

Figure 2 Sewer Main As-Built Drawing & Lead Card in GIS/Cityworks



A SAW grant project total of \$98,368.16, per SAW grant population guidelines, was allocated for hardware and software purchases as well as training for DPS staff.

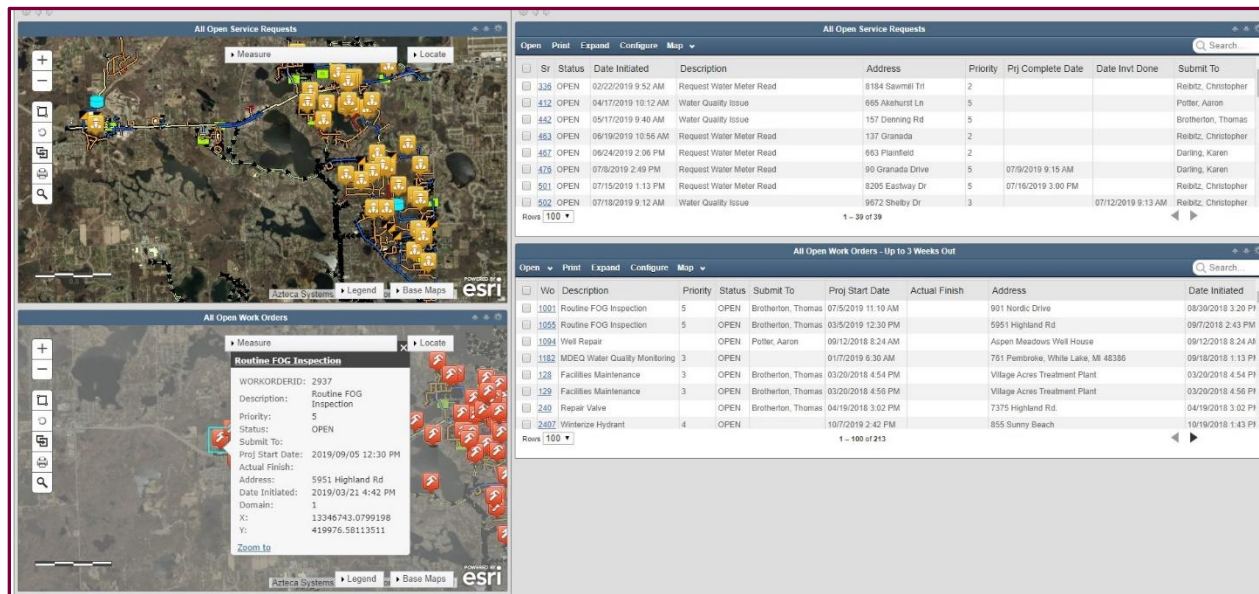
As part of hardware procurement, a Trimble R2 GNSS receiver (rent to own agreement) and GNSS Tablet were purchased for the purpose of GPS locating sanitary sewer assets. Dell laptops, computer monitors, and tablets were also purchased for the purpose of record retrieval and access to the Township's GIS and Cityworks Computer Maintenance Management System (CMMS) implementation. The tablets were also equipped with 4G/LTE cell modems to provide staff with remote field access capability to the information anywhere and anytime.

Licenses for the Azteca Cityworks CMMS application were also obtained and implemented providing the Township with a GIS-Centric CMMS application to manage work orders and to aid in the development of the wastewater collection system CIP. This software application allows the

Township to optimize staff resources through the reduction of manual paperwork and scheduling by logging in resident complaints and work processes through customer service requests and work orders to ensure staff are focused on doing the right things at the right times while capturing labor, equipment, and materials needed to complete the work. The CMMS application was developed and implemented to work with the mobile capable tablets and laptops that were purchased for the Township under the SAW grant.

Another component of the AMP also included the development and implementation of a Fats, Oils, and Grease (FOG) program for commercial kitchen properties in the Township. This program will serve to minimize labor and material costs of program management, ensure regulatory compliance, and reduce potential wastewater system problems due to accumulations of FOG in the Township’s wastewater collection system. Each commercial kitchen property in the Township that generates FOG was integrated into the Township’s GIS and Cityworks CMMS applications. Inspections and work orders are generated and completed in the Cityworks CMMS along with attached business pump-out records, equipment photos and other information providing fast and accurate information retrieval and use by DPS staff. Figure 3 illustrates the Cityworks/GIS interface where a work order was created for a routine FOG inspection.

Figure 3 Cityworks Work Order Illustration



## LEVEL OF SERVICE

A Level of Service (LOS) plan was developed by the SAW team members, which defines how the Township wants the wastewater collection system to perform against established operational, planning and best management practices. The LOS standards and goals were developed with review and input from the Township DPS staff. Issues addressed in the development of the LOS included:

- Is the Township ever out of compliance with regulations? If so, how often?
- How do the Township and WRC track and respond to customer needs and complaints?

- Are current staffing levels sufficient to provide proper customer service?
- Are current O&M activities cost-effective and are they being maximized?
- How can current processes be improved?
- Are assets being properly maintained to insure reliability and sustainability?
- How will improvement costs be funded?

In the development of the LOS goals, several tools were reviewed and analyzed, such as:

- existing and proposed land uses;
- areas of development and redevelopment;
- population trends and population loss;
- review of previous reports and studies; and
- staff and consultant knowledge of the systems.

During review, it was identified that:

- better coordination and information transfer with the WRC is needed to more efficiently and effectively clean and televise the Township sanitary sewer assets and track the costs of repairing and maintaining specific assets and performance against targets.

The analytical framework for the LOS is a triple bottom line approach that incorporates social, environmental, and economic criteria. The social component was divided into four indicators including customer service, reliability, health/safety and administration/organizational development. The environmental component was divided into two (2) indicators that included environmental stewardship and regulatory compliance. The economic component was centered on financial criteria. The LOS impetus was determined to be either self, customer, or regulatory driven with current and future targets identified with their respective performance measures, data, and reporting procedure. Table 6 outlines the triple bottom line performance indicators utilized in the WWAMP.

**Table 6 Triple Bottom Line LOS Performance Indicators**

Social	Environmental	Economic
<ul style="list-style-type: none"> <li>• Customer Service</li> <li>• Reliability</li> <li>• Health &amp; Safety</li> <li>• Administration / Organizational Development</li> </ul>	<ul style="list-style-type: none"> <li>• Environmental Stewardship</li> <li>• Regulatory Compliance</li> </ul>	<ul style="list-style-type: none"> <li>• Financial</li> </ul>

For social indicators, customer service LOS goals focus primarily on the Township’s responsiveness and efficiency (how effectively operations, maintenance, and daily tasks are

performed with limited staff and budget). Reliability was determined to be the dependability of the wastewater collection system to convey flow throughout the system without sewer backups. The health and safety indicator includes the protection of the community’s health and the health of Township staff maintaining the system in accordance with local, state, and federal safety standards. The administration/organizational development indicator considered the optimization of resources and reduction of overall O&M, planning, and engineering costs.

The Environmental LOS goals include environmental stewardship and regulatory compliance. The Township and its residents are committed to protecting their waterways and the environmental stewardship focuses on protecting the water quality of the rivers, creeks, and lakes that flow through the Township including Bogie Lake, Brendel Lake, Cedar Island Lake, Cooley Lake, Haven Hill Lake, Lake Neva, Mandon Lake, Oxbow Lake, Pontiac Lake, Round Lake, Sugden Lake, Thompson Lake, White Lake, and its tributaries. Recreation, open space, and water contribute to 35.2% of the land use within the Township, so environmental stewardship and regulatory compliance are vital to the Township asset management program. Furthermore, vacant land accounts for 13.2% of the Township’s land use, therefore future development and expansion of the Township’s existing wastewater collection system infrastructure is anticipated.

The regulatory compliance component focuses on complying with all the local, state, and federal regulations regarding the wastewater collection system. The Township has already taken measures to reduce overflows of wastewater into local rivers, creeks and lakes through feasibility studies, planning, and project implementation.

LOS goals for the financial indicator have been developed to ensure adequate funding is available to maintain the wastewater collection system.

A rating or color code system was developed to identify strategic areas that do not need improvement, are acceptable with additional improvement needed, and those that require improvement. Table 7 illustrates the rating/color code system.

**Table 7 LOS Goals Rating System**

Color Code	Rating
	No Improvement Needed
	Acceptable (Perhaps Some Improvement Needed)
	Improvement Necessary

As part of its mission, the Township strives to provide reliable wastewater services at the minimum cost necessary to meet environmental and health regulations. The LOS plan has been developed, in part, to reinforce the Mission Statement, which is outlined below:

*Strive for a sustainable Township that balances the community’s economic, environmental, and social needs. Promote the identity of White Lake Township as a small country town with City*

*amenities by protecting and preserving natural features, encouraging redevelopment of obsolete properties, and directing growth and redevelopment to a central community core.*

Due to limited staffing and financial resources, WRC currently primarily takes a reactive approach regarding wastewater collection O&M activities. The Township is working to improve this through an organized FOG program, inspection, and Cityworks CMMS implementation. To optimize improvements, the Township will also continue to coordinate utility infrastructure, including wastewater and water infrastructure projects to maximize reinvestment dollars and reduce long term capital costs.

By instituting a WWAMP, which includes conducting condition assessments and determining the criticality of assets, the Township can embark on a proactive approach to managing wastewater collection system assets. The effort will also assist DPS staff to prioritize project development, reduce overall project costs, and improve project planning and management.

The LOS Goals summary table, located in Appendix B, should be viewed as a living document that should be updated and modified as tasks and initiatives are developed and implemented.

## **ASSET CRITICALITY**

The criticality of wastewater collection system assets including sewer manholes, gravity main, pressure main, and pumping stations were examined in regard to their overall functional importance to the operation of the wastewater collection system and their impacts if they failed. To determine the criticality of system assets, a Business Risk Evaluation (BRE) was performed by analyzing the Consequence of Failure (COF) and Probability of Failure (POF) for each asset.

The COF was determined for sewer mains and manholes using the following factors:

- Economic Impacts (Diameter of Asset, Surface Type Above Asset)
- Environmental/Regulatory Compliance (Distance to Surface Water)
- Social/Community Disruption (Number of Customers, Roadway Impact)

The COFs and POFs varied depending on asset type. The COF for the gravity mains were determined based upon factor and weighting percentages outlined in Table 8 on the following page.

**Table 8 Consequence of Failure Triple Bottom Line Weighting Factors for Gravity Main**

Social/Community Disruption – 45%	Environmental – 20%	Economic – 35%
<ul style="list-style-type: none"> <li>• Number of Customers Served – 35%</li> <li>• Surface Traffic Disturbance – 10%</li> </ul>	<ul style="list-style-type: none"> <li>• Pipeline Proximity to Water – 20%</li> </ul>	<ul style="list-style-type: none"> <li>• Pipe Diameter – 20%</li> <li>• Depth of Pipe – 10%</li> <li>• Surface Above Asset – 5%</li> </ul>

The COF for the gravity manholes were determined based upon factor and weighting percentages outlined in Table 9 below.

**Table 9 Consequence of Failure Triple Bottom Line Weighting Factors for Gravity Manholes**

Social/Community Disruption – 50%	Environmental – 20%	Economic – 35%
<ul style="list-style-type: none"> <li>• Number of Customers Served – 35%</li> <li>• Surface Traffic Disturbance – 15%</li> </ul>	<ul style="list-style-type: none"> <li>• Distance to Water – 20%</li> </ul>	<ul style="list-style-type: none"> <li>• Diameter – 10%</li> <li>• Depth of Pipe – 15%</li> <li>• Surface Above Asset – 5%</li> </ul>

The COF for the pressure main were determined based upon factor and weighting percentages outlined in Table 10 on the following page.



**Table 10 Consequence of Failure Triple Bottom Line Weighting Factors for Pressure Main**

Social/Community Disruption – 45%	Environmental – 20%	Economic – 35%
<ul style="list-style-type: none"> <li>• Number of Customers Served – 30%</li> <li>• Surface Traffic Disturbance – 15%</li> </ul>	<ul style="list-style-type: none"> <li>• Distance to Water – 20%</li> </ul>	<ul style="list-style-type: none"> <li>• Diameter – 30%</li> <li>• Surface Above Main – 5%</li> </ul>

The COF for the pressure manholes were determined based upon factor and weighting percentages outlined in Table 11 below.

**Table 11 Consequence of Failure Triple Bottom Line Weighting Factors for Pressure Manholes**

Social/Community Disruption – 55%	Environmental – 40%	Economic – 5%
<ul style="list-style-type: none"> <li>• Number of Customers Served – 40%</li> <li>• Surface Traffic Disturbance – 15%</li> </ul>	<ul style="list-style-type: none"> <li>• Distance to Water – 40%</li> </ul>	<ul style="list-style-type: none"> <li>• Surface Around Manhole – 5%</li> </ul>

Each of the weighting factors were reviewed and agreed upon by DPS staff. The more customers out of service due to a wastewater collection system failure, the more severe the situation. As service is disrupted to a larger number of residents and businesses, additional costs are also incurred to reroute and bypass sewer main, to set up temporary pumping equipment and to notify the public in an expedient manner. Sewer mains associated with critical business facilities and roadway areas are also an important component of this analysis.

Environmental/Regulatory Compliance was established as 20% of the COF for gravity main, manholes, and pressure main, and 40% for pressure manholes. It is assumed that, if community disruptions are kept to a minimum, the Township will remain in compliance with environmental and regulatory standards. Non-compliance can result in the need for public notification, fines and

consent orders to eliminate the problem from reoccurring. Additionally, a wastewater collection system asset further away from surface water is less critical because there is more time to contain and mitigate a Sanitary Sewer Overflow (SSO) if one occurs.

Replacement costs of a section of sewer main and a sewer manhole are directly related to the diameter of the sewer main or manhole and the type of surface above the asset. The factors for each have been assigned scores of 35% and 30% respectively for gravity/pressure mains and manholes and 5% for pressure manholes in the COF analysis. Each sewer main and manhole were assigned an overall COF rating of 1 to 5, with a rating of 1 being a slight effect to 5 being a severe disruption to the wastewater collection system.

The POF was determined for sewer mains using the following factor:

- Structural Condition Rating – Condition ratings were assigned to wastewater mains based on WRC CCTV data, pipe age, pipe material, and hydrogen sulfide concern

The POF was determined for sewer manholes using the following factor:

- NASSCO Structural Rating of the manhole

The structural condition of a sewer main is important given that the wastewater collection system infrastructure is designed to be a sealed system with breaks, or openings, in the sealed system resulting in increased I/I and greater costs to convey and treat the resultant flows. Sewer main structural condition scoring was utilized for the POF to account for the increased likelihood of catastrophic failure for assets in poor condition. An overall POF rating of 1 to 5 was assigned to each sewer main based on structural condition with a rating of 1 being excellent condition and 5 being unserviceable.

The structural condition of a sewer manhole is directly related to the remaining useful life. As the greater amount of structural damage to a structure occurs, the sooner the manhole is likely to fail. An overall POF rating of 1 to 5 was assigned to each sewer manhole based on asset NASSCO structural score with a rating of 1 being excellent condition and 5 being unserviceable.

An overall POF rating of 1 to 5 was assigned to each sewer main and pumping station, with a rating of 1 being excellent condition and 5 being unserviceable.

Comprehensive BRE's were developed for sewer main and manholes. The BRE's were created using sewer main age and NASSCO ratings for the sewer manholes and a COF and POF scoring matrix model. Based on asset scoring, a total BRE score was developed, which is the mathematical product of COF and POF. The BRE score was utilized to rank overall wastewater collection system assets, determine areas of concern, and to guide operation and maintenance and timing of CIP project development. Table 12 provides an outline of the BRE scale.

Table 12 Business Risk Evaluation (BRE) Scale

<b>Business Risk Evaluation (BRE) Total Score</b>	
<b>Business Risk Evaluation Scoring</b>	
<b>Business Risk</b>	<b>Total BRE Score</b>
Critical / Intolerable Risk	16.00 - 25.00
High Risk – Tolerable and Manageable – Aggressive Monitoring	10.00 - 15.99
Medium Risk –Tolerable and Manageable – Monitoring	5.00 - 9.99
Low Risk –Failure is Tolerable	0.00 - 4.99

Based on BRE analysis, there were fourteen (14) sewer main segments that were rated critical. Additionally, forty-five (45) sewer mains and ten (10) manholes were rated high risk. The critical and high-risk sewer mains are scheduled for rehabilitation or continued inspection as part of the Township’s twenty (20) year CIP program. SAW grant project manhole rehabilitation funding levels and scheduling have been developed and are included in the twenty (20) year planning period and outlined in the CIP.

Please refer to Figures 4-7 for BRE maps of the sewer main and manholes.

Figure 4 Gravity Sewer Main Business Risk Evaluation Map

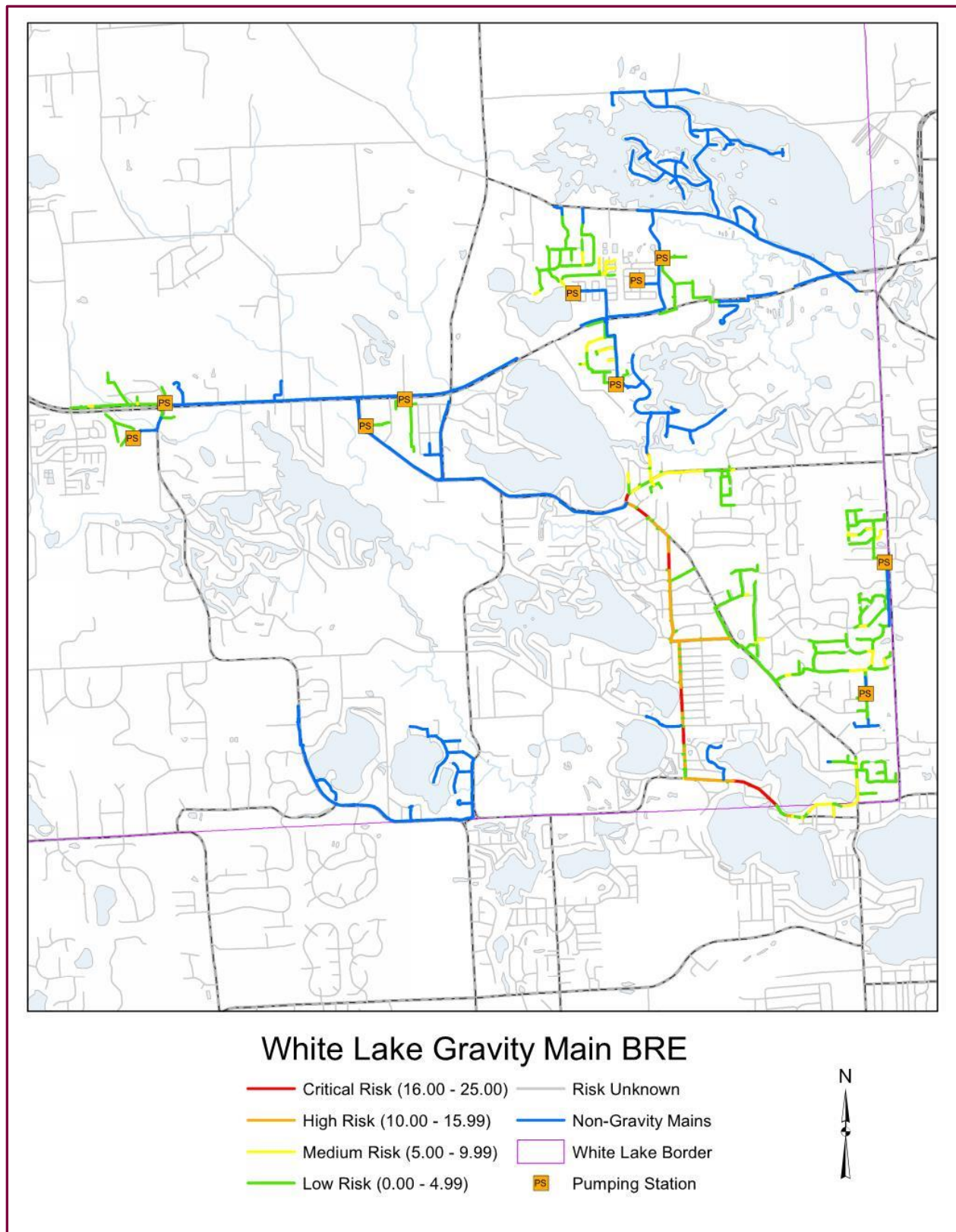


Figure 5 Pressure Main Business Risk Evaluation Map

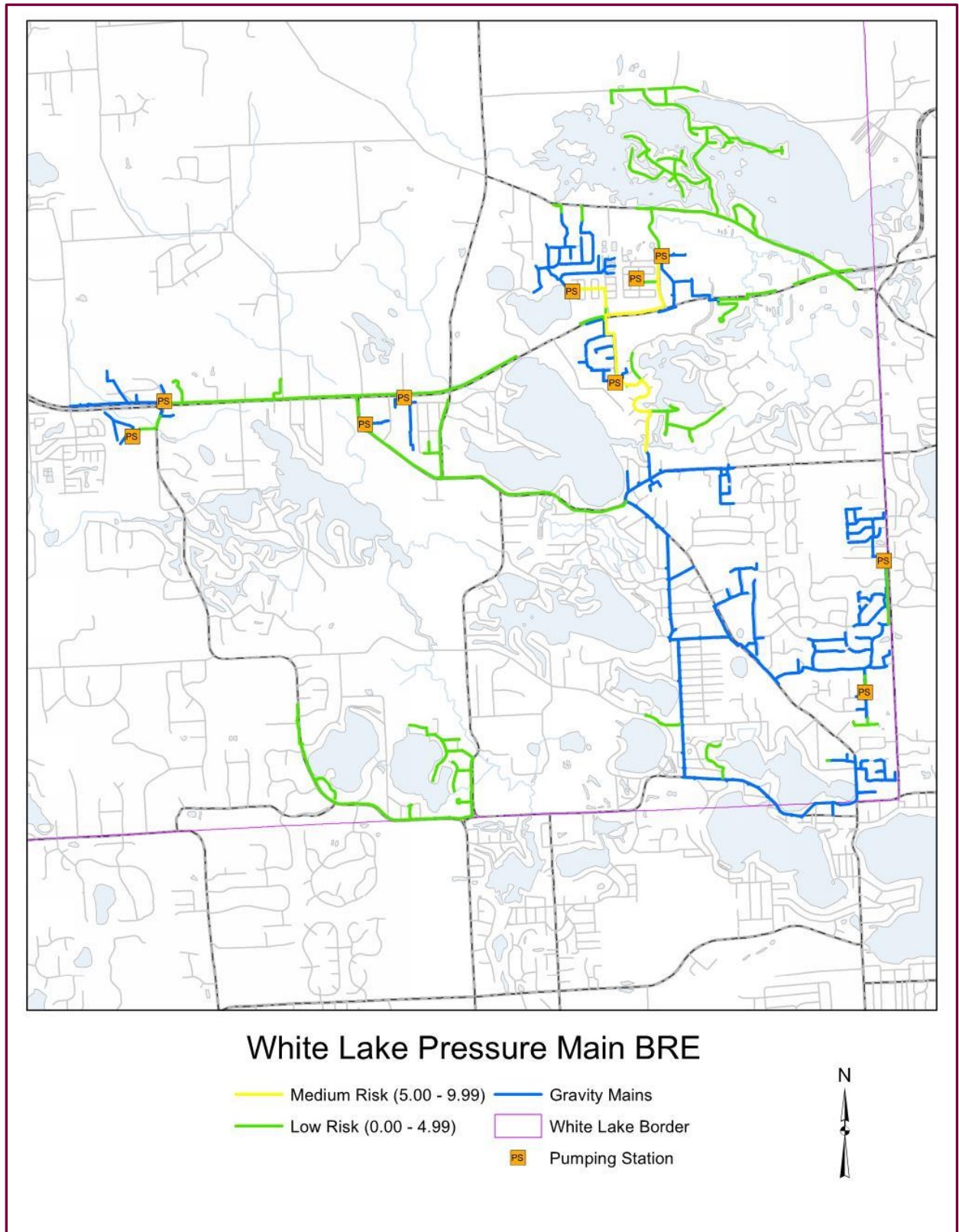


Figure 6 Gravity Manhole Business Risk Evaluation Map

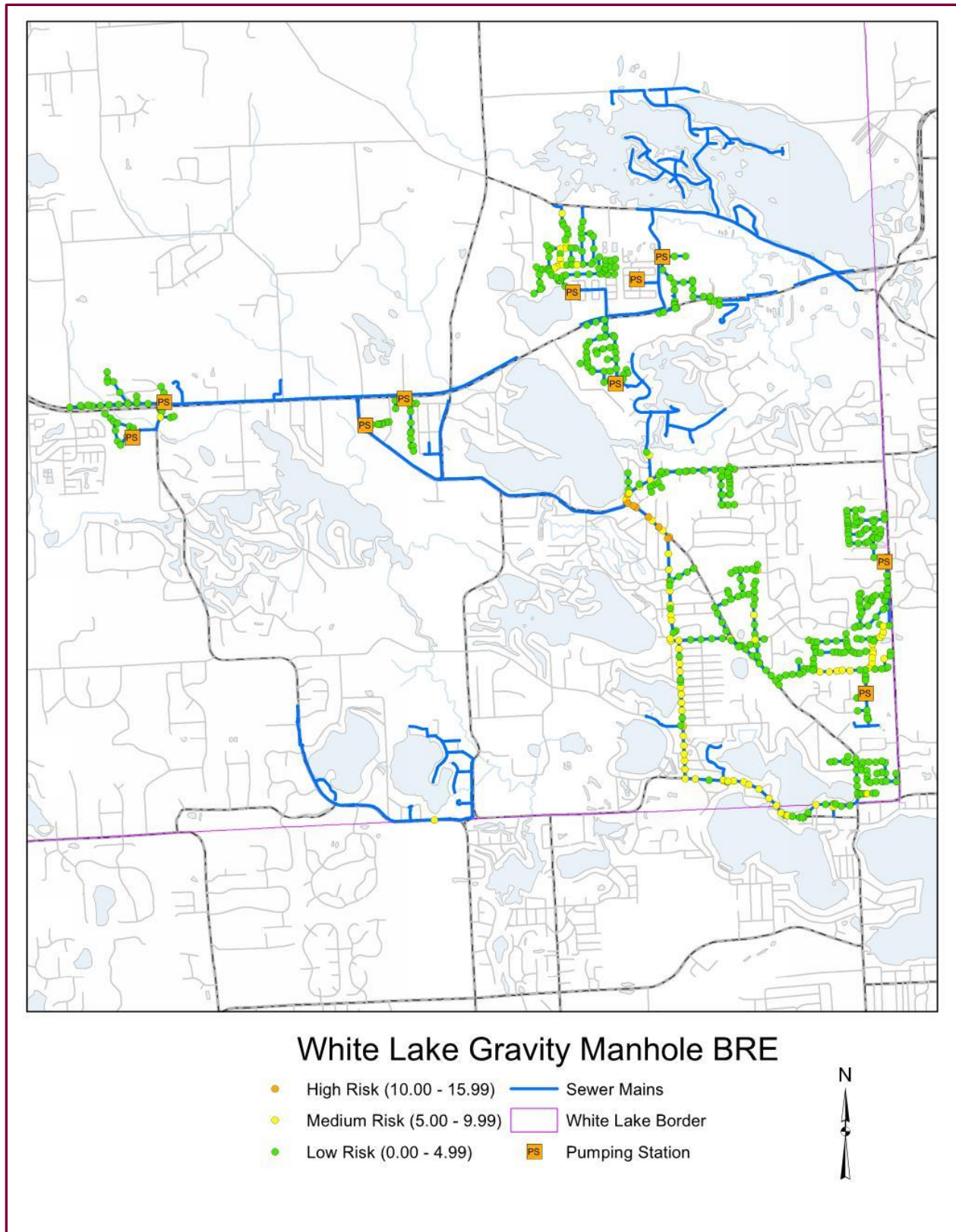
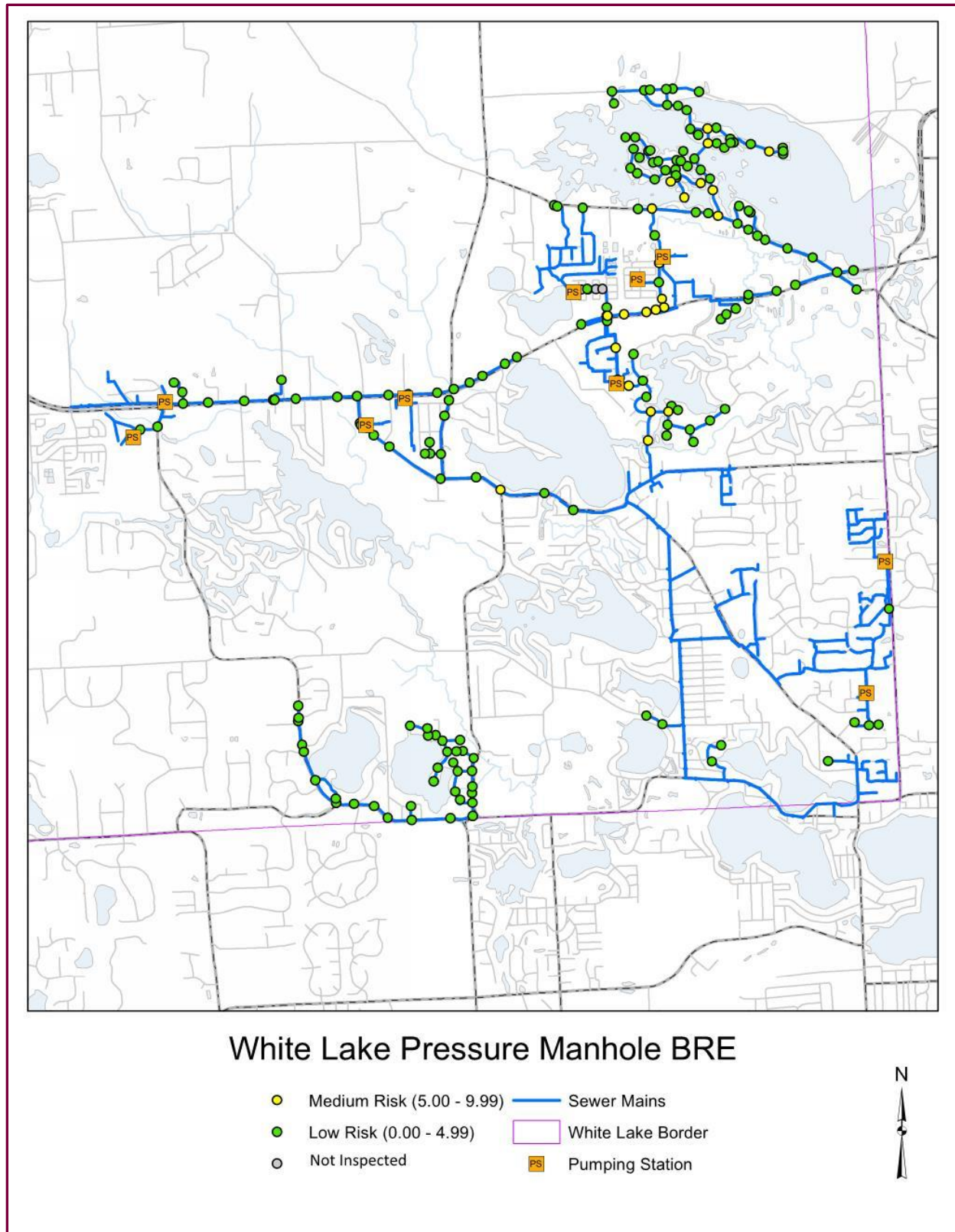


Figure 7 Pressure Manhole Business Risk Evaluation Map



## CAPITAL IMPROVEMENT PROJECT PLAN

Using the information obtained during the SAW grant asset inventory and assessment phases, a recommended CIP outline for the twenty (20) year planning period was developed to identify and outline cost and schedules related to the repair and replacement of sewer main, manholes, and pumping stations to ensure reliable operation of the wastewater collection system and to meet new and existing LOS goals.

The largest recurring component of the annual budget costs for the wastewater collection system CIP is gravity main repairs. It is recommended that the Township develop a comprehensive Infrastructure Management Plan (IMP) that encompasses coordinating water and sewer infrastructure repairs and replacements for the entire Township. Continuing coordination with WRC is needed to ensure efficiency. As the remaining portion of the Township wastewater collection system infrastructure is inspected over the twenty (20) year planning period, this information should also be implemented into the GIS and evaluated to further enhance CIP and wastewater asset planning and coordination.

The WRC intends to implement an annual sewer main cleaning and televising program. Therefore, funds have been allocated in the CIP for some of these activities.

Table 13 contains a summary of costs associated with each asset class for the CIP projects identified over the twenty (20) year planning period.

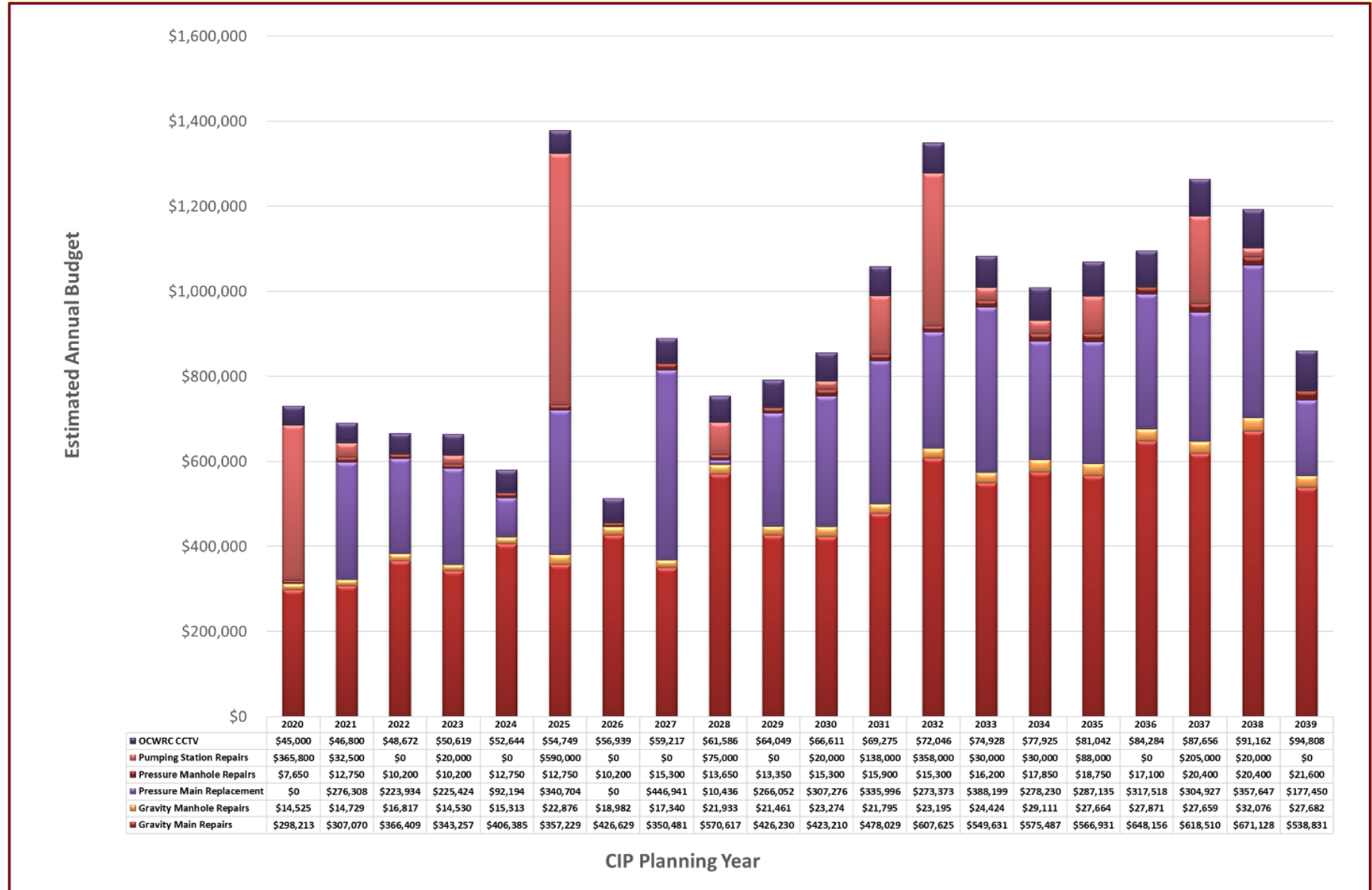
Table 13 Capital Improvements & O&M

Item Description	Cost
<b>Capital Improvement Costs</b>	
Gravity Manhole Repairs	\$444,000
Pressure Manhole Repairs	\$298,000
Gravity Main Repairs	\$9,531,000
Pressure Main Repairs	\$4,910,000
<b>Capital Improvement Subtotal</b>	<b>\$15,181,000</b>
<b>Township Operation &amp; Maintenance Costs</b>	
OCWRC CCTV of Sanitary Sewer	\$1,341,000
Pumping Station Improvements	\$1,973,000
Elizabeth Lake Road/Oxbow Road Odor Control Program	\$826,000
FOG Program	\$20,000
<b>Operations &amp; Maintenance Subtotal</b>	<b>\$4,160,000</b>
<b>Wastewater System Total</b>	<b>\$19,341,000</b>

Figure 8 summarizes all CIP and identified O&M expenses over the twenty (20) year planning period. Appendix D outlines the City CIP and O&M Project Summary.



Figure 8 White Lake Township Total Wastewater System CIP & O&M Costs/Year



## REVENUE STRUCTURE

As required by the SAW Grant Implementation Project guidelines, a non-detailed wastewater collection system revenue/expense budget review was developed and submitted to the EGLE prior to the June 2019 deadline. The review was conducted by financial consultant, Baker Tilly. Upon completion of the review, Baker Tilly submitted a “*Schedule of 2019 Budgeted Operating Expenses and Adjustments*” to EGLE for review and approval. The required review indicated no wastewater collection system revenue gap and the Township subsequently received an October 17, 2019 letter from EGLE affirming the Township had successfully fulfilled the significant progress requirement and that they were in compliance with Section 5204e(3)(a), Part 52, Clean Water Assistance, of the Natural Resource and Environmental Protection Act, 1994, PA 451, as amended.

Projected twenty (20) year planning period wastewater collection system annual capital projects start at \$771,597 in 2020 and have a high of \$1,436,488 in 2025, but almost always between \$331,000 and \$1,143,000 annually. It must be pointed out that the CIP funding outline over the twenty (20) year planning period does not include unforeseen infrastructure projects, emergencies or repairs and rehabilitations that will be needed as the sanitary sewer main system is inspected and continues to age.

Annual O&M costs included in the report are annual maintenance activities that need to be performed on the wastewater collection system to ensure proper operation. Annual maintenance activities in the WWAMP are comprised of odor control at Elizabeth Lake/Oxbow Road, FOG inspections, and OCWRC CCTVing, which are expected to range from approximately \$87,000 to \$136,000 annually over the twenty (20) year period. The list is not all inclusive and does not include other recurring annual expenses such as labor, retirement, insurance, administrative payments, power and other expenses in the general Sewer Fund budget.

A financial forecasting model was also developed using Township budget information and the WWAMP developed CIP as part of the SAW Grant to review Township funding and financing alternatives over the twenty (20) year planning period. As part of the forecasting model development, it is recommended, and a best management practice, to review the water and sewer rates every 2-3 years to determine their ability to provide the necessary funding for wastewater collection system O&M, CIP activities and debt retirement obligations. As these reviews are completed, the information can be updated into the forecasting model over the twenty (20) year planning period to provide an accurate and comprehensive financing dashboard that outlines the Township’s alternatives for funding necessary O&M, CIP and debt retirement.

## SUMMARY

The Township’s WWAMP has been designed and constructed to provide a living and dynamic framework to provide the most cost effective, efficient and accountable wastewater collection system service to the residents and businesses. The analysis framework consists of five (5) main

asset management components: Asset Inventory, Level of Service, Critical Assets, Revenue Structure, and the Capital Improvement Project Plan. The asset inventory and condition assessment were based on as-built information supplemented with field inspection, asset location, and metering information.

Three (3) LOS goal criteria levels including social, environmental and economic were developed to provide an effective framework to gauge program performance. Each level has identified service and goal criteria that can be improved upon. The BRE was based on the product of COF and POF scores, which include economic impacts, regulatory compliance, community disruption, operational condition and structural condition. The analysis provided the basis, over the twenty (20) year planning period, to develop a realistic CIP to cost effectively provide needed wastewater collection system asset repair, replacement and O&M improvements.

The WWAMP also included the development of an accurate and comprehensive GIS that includes a geometric network of the wastewater collection system as well as asset attribute information including sewer main and manhole diameter, date of installation, rim and invert elevations, electronic As-Built drawings, lead locations and photos. A comprehensive hydraulic wastewater collection system model was developed to analyze performance, identify deficiencies and provide planning capabilities. A Cityworks CMMS was also developed and implemented to schedule and track customer complaints as well as staff labor, equipment, and material costs to perform the various operational and capital improvements completed on the wastewater collection system. The GIS and CMMS were also developed to be mobile, enabling staff to utilize and interact with the information in the field using laptops or other mobile devices including tablets and smart phones. These innovative implementations will provide Township staff, and management, with powerful cost tracking, scheduling and project development capabilities to allow continual updating of the CIP.

## **CONCLUSIONS**

The Asset Inventory effort revealed that, overall, the Township's sewer main and sewer manholes are in fairly good condition, which is not surprising, due to the young age of the infrastructure. The CIP development has identified a range of recommended CIP improvements and O&M activities ranging from \$554,070 to \$1,419,628 annually. As the WWAMP is deployed and additional wastewater collection system inspection information is obtained and created, the Township's GIS, hydraulic sewer model and WWAMP can methodically be updated to modify CIP planning and O&M priorities over the twenty (20) year planning period and beyond.

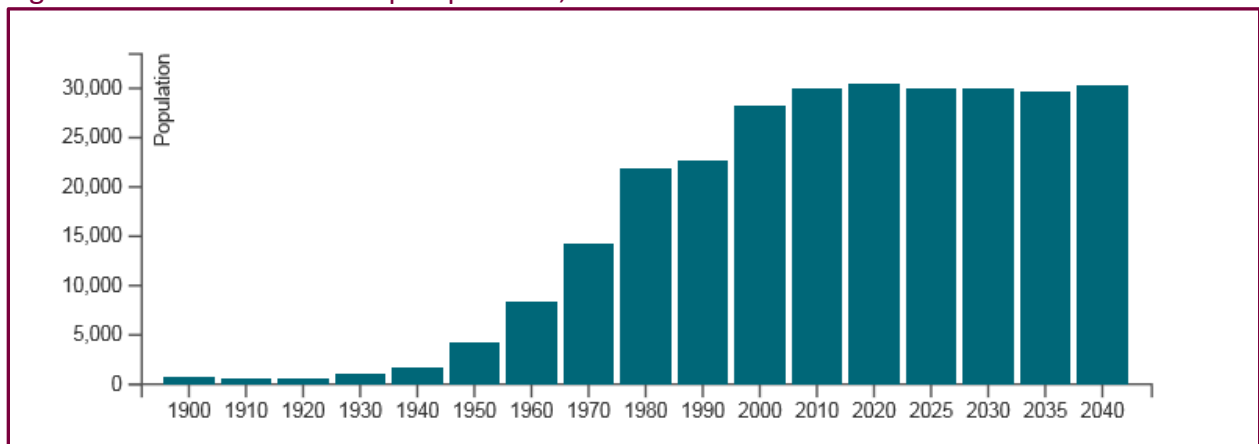
## TOWNSHIP PROFILE & BACKGROUND

### POPULATION

According to the Southeast Michigan Council of Governments (SEMCOG), the Township population is currently at 30,434 and will continue to slightly increase to 32,235 by 2040 (but will decline in 2045) which should lead to additional users on the wastewater system. It is likely that expansion of the wastewater collection system to currently unsewered areas of the Township will occur and add to the number of users on the wastewater system. Current tracking forms indicate White Lake Township is currently utilizing less than 32% of the available 3.5 MGD purchase capacity based on calculated average daily flows, and less than 42% of peak pipe capacity. This is likely far in excess of actual use as the tracking forms assume all benefited properties are connected to the wastewater system which is certainly not the case. Regardless, the existing infrastructure sizing appears adequate for the twenty (20) year planning period.

By 2045, senior populations (ages 65 and older) are expected to increase by 327% and pre-school aged populations (children under 5) are expected to decrease 5.9%.

Figure 9 White Lake Township Population, 1900-2040



(Source: SEMCOG)

### ECONOMY

According to the US Census Data, the 2015 median household income was \$74,442 and the per capita income was \$34,261, which is slightly lower than the County average of \$39,280.

### TOWNSHIP LAND USE/ZONING & CHARACTER

The Township encompasses approximately 37.18 square miles. It is bordered by Waterford Township to the east, Highland Township to the west, Commerce Township to the south, and Springfield Township to the north.

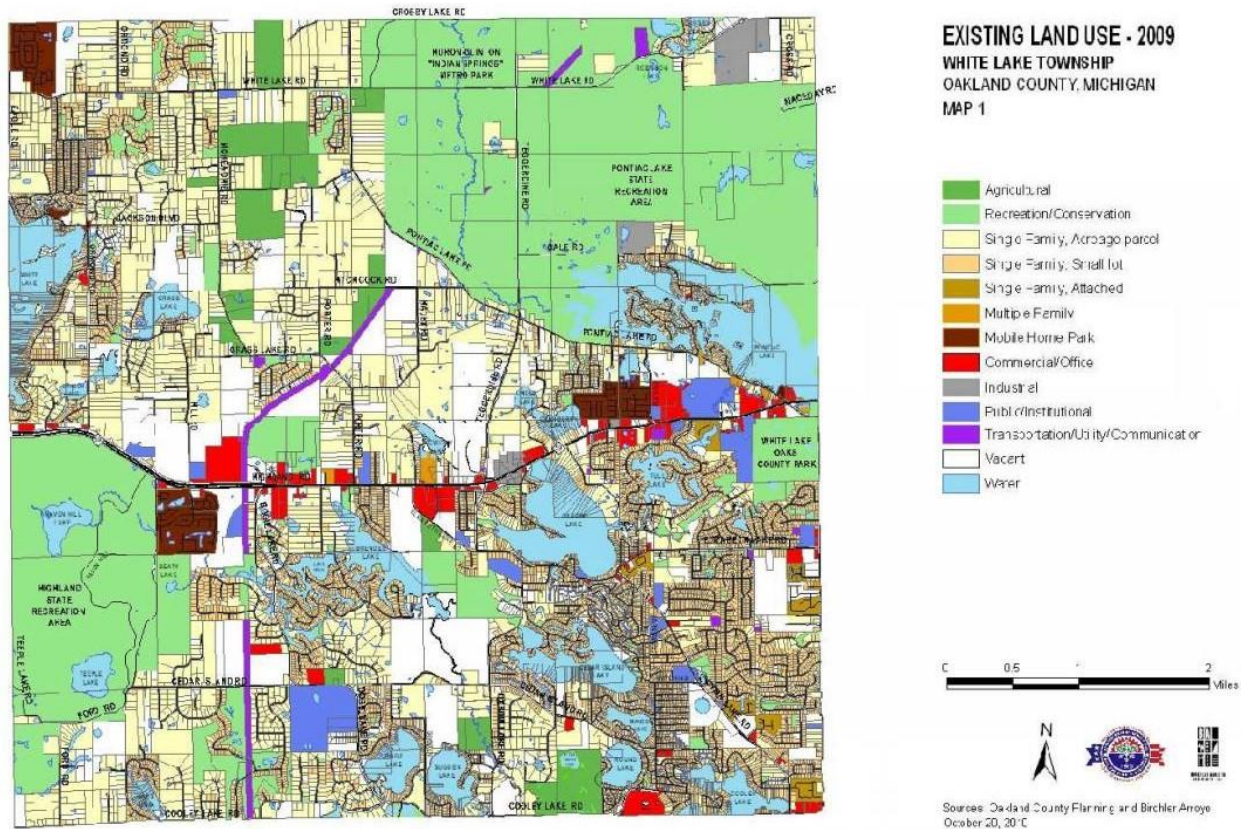
White Lake was organized as a Township in 1836 and is a full-service community offering residents, visitors, and businesses several municipal services including a Police Department, Fire, EMS, fully developed and natural setting parks, pathways, multi-purpose recreation fields, and a Department of Public Services.

The Township offers a diverse mixture of residential land uses from: single and multi-family residential; retail; industrial; agricultural; community open space and recreation; and institutional. Residential land makes up just over 33% of the total land use in the Township. Recreation and open space comprise 24.2% of the total land use and water comprises 11%. The land use table identifies opportunities for development with over 3,000 acres in vacant land. Land use is summarized in Table 14 and is also illustrated in the Land Use Map on Figure 10.

**Table 14 Existing Land Use**

<b>Existing Land Use</b>	<b>Acres</b>	<b>% Acres</b>
Single-Family Residential	7,885.4	33.1%
Multi-Family Residential	134.4	0.6%
Retail	293.7	1.2%
Office	62.5	0.3%
Hospitality	58.6	0.2%
Medical	16.2	0.1%
Institutional	311.2	1.3%
Industrial	46.5	0.2%
Agricultural	1,829.3	7.7%
Recreation/Open Space	5,736.7	24.2%
Cemetery	10.7	0%
Parking	3.8	0%
Transportation/Communication/Utilities	1,624	6.8%
Vacant	3,127.5	13.2%
Water	2,617.8	11%
<b>Total</b>	<b>23,728.2</b>	<b>100.00%</b>

Figure 10 Land Use Map



White Lake Township

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## KEY ISSUES FACED

There are several issues that impact how the wastewater collection system is operated and maintained. Key issues and how the Township intends to, or is already addressing these issues include:

- Managing Rising System Costs
  - Developing a Long-Term Funding Strategy to repair or replace failed assets within the Township
  - Updating residential sewer rates to balance revenue against expenditure
  - Improving staff effectiveness through GIS, Cityworks CMMS, etc.
- Increasing Age of Infrastructure
  - Developing a Capital Improvement Plan
  - Securing funding for repairs and rehabilitation
  - Regular cleaning and maintenance of sewer mains and structures
- Transfer Knowledge of the System as Key Employees Retire
  - Increasing data transfer through GIS, Cityworks CMMS, etc.
- Reducing Levels of Hydrogen Sulfide in the System
  - Program implementation – televising, system inspections, metering/modeling
  - Implementing odor control programs
- Fats, Oils, and Grease (FOG) in the System
  - Implementing a FOG inspection program

Asset review tasks to be completed post SAW project completion include:

- Completion of sewer main and manhole assessments in the Township’s wastewater system that weren’t eligible and/or completed in the SAW project; and
- Completion of a calibrated wastewater system hydraulic sewer model to predict wastewater system performance and to determine, hydraulically, critical assets in the wastewater system that can be used to enhance the twenty (20) year CIP.

## HISTORY OF TOWNSHIP WASTEWATER SYSTEM

### WASTEWATER SYSTEM DESCRIPTION

The Township's wastewater collection system is comprised of both pressure sanitary sewers and gravity sanitary sewers (approximately 41 miles), serving 4,500 people (approximately 15% of the Township's population). The system generally flows from north to south, utilizing ten (10) sanitary sewage pumping and twenty-seven (27) commercial grinder pumping stations. The wastewater flow is ultimately discharged into Commerce Township's collection system and is conveyed to the Commerce Township Wastewater Treatment Plant for treatment.

Sewer main materials in the older sections of the wastewater system are primarily VCP. Truss, PVC, HDPE, and concrete sewer main are typically found in the newer sections of the wastewater system. Sewer main diameters range from 2 to 30 inches.

The (10) pumping stations that are owned and operated by the Township are:

1. Village Lakes
2. White Lake Estates
3. Williams Lake Road
4. Suburban Knolls
5. White Lake Market Place
6. Cranberry Lake Estates
7. Worthington Crossings
8. Bocavina
9. Meijer
10. Kroger

The twenty-seven (27) commercial grinder pumping stations are owned by private entities and operated and maintained by the Oakland County Water Resource Commissioner's Office (WRC) as well as the ten (10) pumping stations identified above.

The WRC has a contractual agreement with the Township to operate and maintain the Township's wastewater collection system. The Township desires to proactively manage the wastewater collection system assets in a cost-effective manner because:

- these assets represent a major public investment and trust;
- well-run utilities are important for economic development;
- asset management promotes efficiency and accountability in the operation of the system;
- these assets provide an essential customer service; and
- proper management of the assets provides the basis for self-sufficiency.

In recent years, several sewer mains have demonstrated signs of hydrogen sulfide buildup, which causes odor issues and corrosion in the pipe. Sulfide generation can be caused when the sewer velocities are slower in the main (due to a limited number of residents utilizing the sanitary sewer system). The Township has started working with Eganix, a local wastewater management services



company, to biologically degrade the hydrogen sulfide along Elizabeth Lake Road and Oxbow Road. Funds have been allocated in the CIP for continuing this effort and to embark on a more proactive approach to help prevent hydrogen sulfide accumulation in other portions of the wastewater collection system to ensure a longer operational life.

### **FATS, OILS & GREASE (FOG)**

The Township has a history of localized problems with fats, oils, and grease in the wastewater system. These are primarily from the commercial districts, which have a number of restaurants. FOG is a byproduct of food and drink preparation, and meat cutting activities. It enters sewer main through restaurant, residential, and commercial sink drains. Several pumping stations within the Township have historically had excessive amounts of FOG accumulation. These stations are as follows:

- White Lake Market Place
- Suburban Knolls
- Village Lakes
- White Lake Estates
- Cranberry Lake Estates; and
- Meijer.

The Township and the WRC have been coordinating efforts to combat FOG in the wastewater collection system. WRC spends approximately \$112,718 on labor and materials annually on sewer cleaning and grinder station repairs. An initiative of the SAW Grant project was to implement a FOG Inspection Program to improve the FOG situation. In August 2018, the Township initiated a FOG inspection program, to help eliminate FOG from entering the Township sanitary sewer system. Over the past year, the Township has spent just under \$1,000 to perform FOG property inspections and to administer the program. Moving forward, the Township is reviewing cost recovery opportunities through ordinance revisions and standards development.

Detailed information on the FOG program and scope are located in the Asset Management Tools section of this document and in Appendix F FOG Assessment Report.



*Standard In-Kitchen Grease Control Device*

## INTRODUCTION & PURPOSE

The assets that make up the Township's wastewater collection system deteriorate over time as they age. As this happens, the level of service expected by Township residents and businesses may become compromised while O&M costs increase. The goal of the WWAMP development is to mitigate the deterioration of the assets through development of a rigorous methodology for wastewater collection system asset management. The WWAMP is designed to meet established level of service goals in a cost-effective way through the creation, acquisition, operation, maintenance, rehabilitation, and disposal of assets. Successful execution and maintenance of the WWAMP will help to ensure cost effective, efficient, and accountable wastewater collection system operations while ensuring long-term sustainability.

### ASSET TYPES

There are approximately 219,175 linear feet of sewer main owned by the Township and operated by WRC. The WWAMP has been developed around the components of the wastewater collection system including:

- Gravity Main
- Pressure Main
- Service Leads
- Gravity Manholes
- Pressure Manholes
- Pumping/Grinder Stations

The assessments for the pumping stations can be found in Appendix E.

Figures 11 and 12 provide a summary of the Township wastewater collection system based on sewer main diameter and replacement costs. The total wastewater collection system replacement cost is estimated to be approximately \$80.7 million dollars. The Township continues to work on building a functional reserve and replacement fund to properly manage the wastewater collection system.

Figure 11 Wastewater System Summary – Gravity Sewer Main Diameter & Replacement Cost

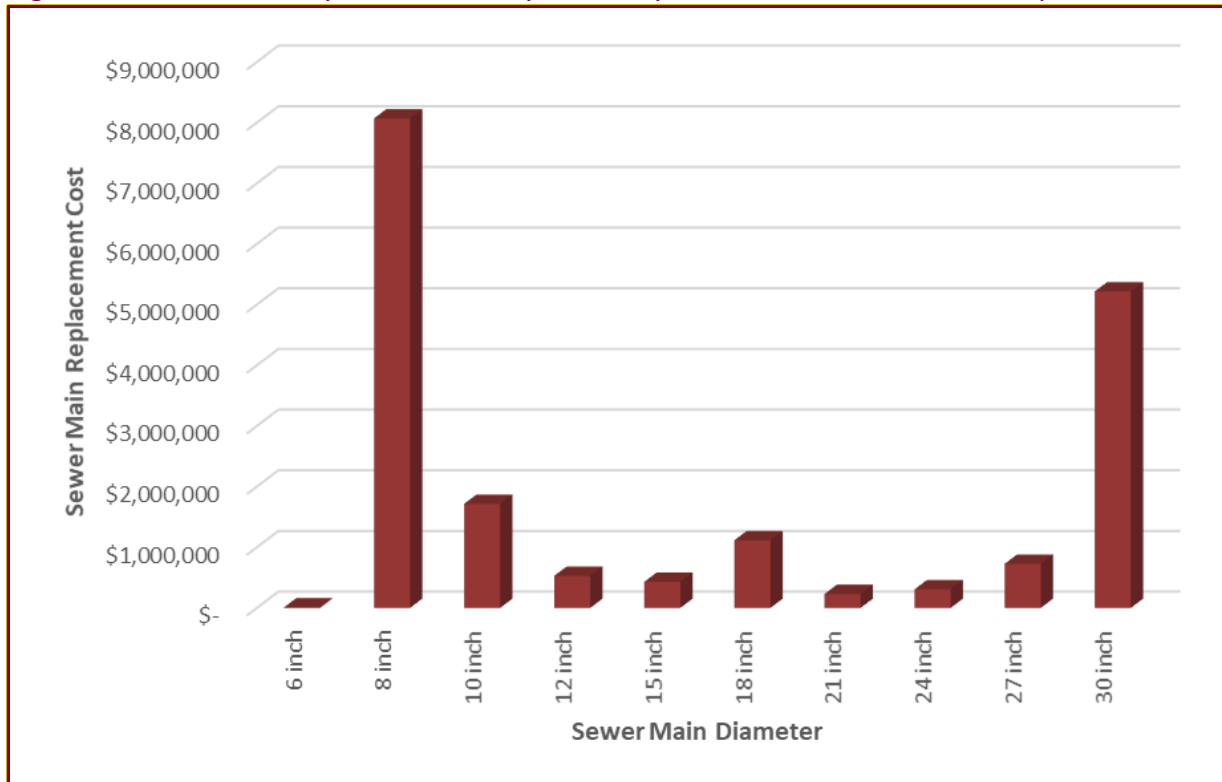
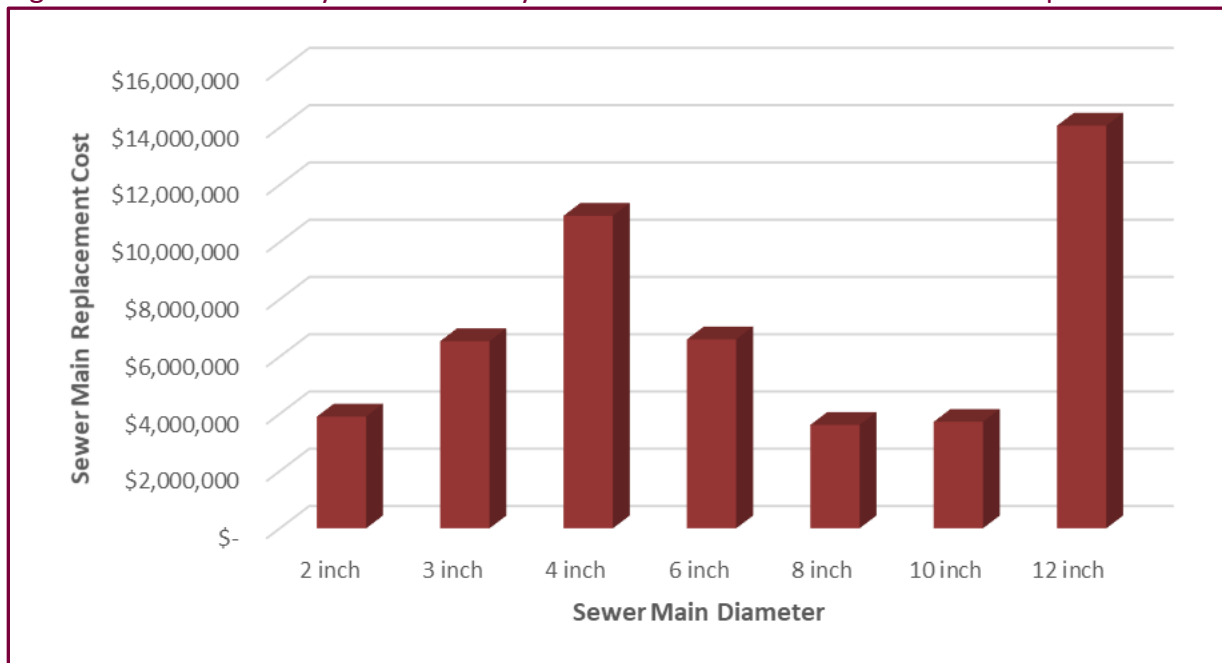


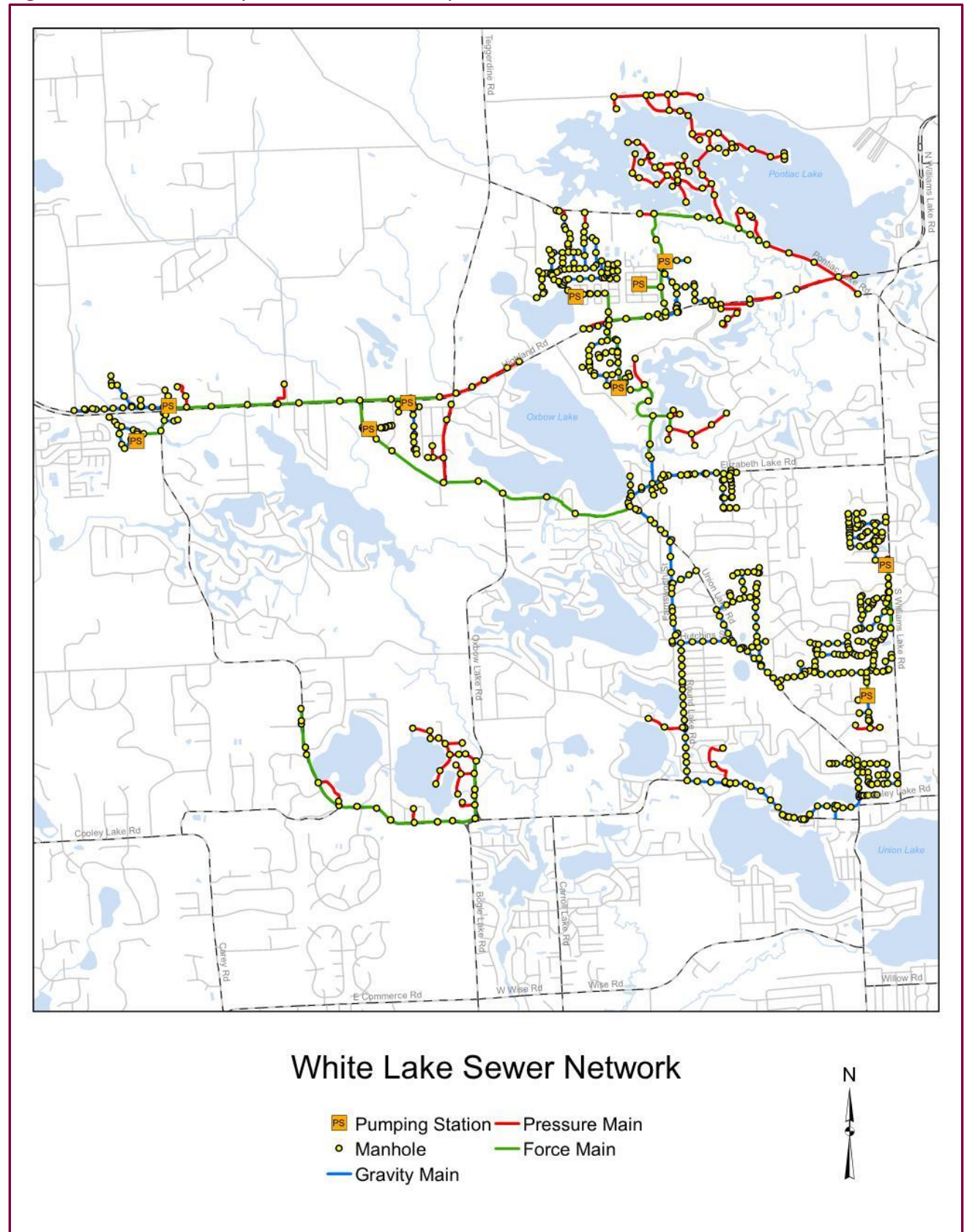
Figure 12 Wastewater System Summary – Pressure Sewer Main Diameter & Replacement Cost



The Township's wastewater collection system consists of a variety of different sewer main materials. Some of these sewer main materials include: ABS truss, Polyvinyl Chloride (PVC), reinforced concrete, Vitrified Clay sewer main (VCP), high-density polyethylene (HDPE), and ductile iron/steel sewer main (DIP/SP). This information is based on current GIS data and as-built information. Because not all sewer main CCTV video of the entire sewer system were reviewed and assessed, sewer lead locations were identified using existing as-built plans to provide position data to within a few feet. Where as-built sewer main plans were not available, leads were spatially located at the center of the house in the Township's ESRI based GIS. Moving forward, the goal of the Township is to identify the material of all sewer segments, the exact location of service leads, and the structural condition of the sewer mains as they are cleaned and inspected.

Figure 13 represents the entire existing wastewater system using the GIS.

Figure 13 Wastewater System in the Township



## PROJECT APPROACH

The analysis approach developed for this project is intended to provide the Township with EGLE approvable WWAMP and is comprised of the following components:

1. Asset Inventory and Condition Assessment
2. Level of Service
3. Criticality of Assets
4. Revenue Structure
5. Capital Improvement Project Plan

The wastewater collection system manhole assets were inventoried and located with a GPS and Robotic Total Station to establish State Plane Coordinates (northing, easting, and elevation of rims and inverts) within an accuracy of an inch. These asset types and locations were then incorporated into the Township's ESRI based GIS, which also includes other spatial parcel, road centerline and other feature layers.

Due to the young age of the system and SAW Grant requirements, only a portion of the sanitary sewer manholes were inventoried and assessed and none of the sewer main was televised. Previous WRC CCTV data was acquired, reviewed, and assessed (using NASSCO level standards) under this assignment. A community-wide plan to continue cleaning and inspection of all the sewer main in the Township and a proactive odor control program are provided in the CIP.

The wastewater collection system sewer main and manholes were rated using the guidelines of the NASSCO Pipe/Manhole Assessment and Certification Program standards. Sewer main inspections utilize closed-circuit television equipment that travels along the sewer main where crews collect video and catalog defects and other anomalies. As a part of the SAW grant, the manholes were GPS located and a Level 2 field-inspection was conducted. NASSCO manhole inspections include completion of a Level 1 inspection first and, if deficiencies are discovered, a Level 2 assessment is recommended for the Township to further document defects. Information collected during a Level 2 inspection includes photographs, manhole characteristics and defects. All manhole ratings collected were catalogued into a master data base for review and analysis and integration into GIS and Cityworks.

A comprehensive BRE was developed for sewer main and manholes using Level 2 NAASCO ratings for sewer manholes and POF and COF models. Individual asset COF and POF condition ratings were calculated based on evaluation criteria and used to calculate a total BRE score, which is the mathematical product of the COF multiplied by the POF with a maximum score of 25.

A LOS plan was developed, with input from DPS staff, which incorporates a triple bottom line approach regarding social, environmental, and economic criteria as prime goal indicators. The LOS review and development included current and future LOS targets and a current indicator scoring of red (not satisfactory), yellow (partially satisfactory) and green (satisfactory). Additional

criteria evaluation information included industry standards, performance ratings, and reporting procedures are also utilized. Appendix B contains a summary of the LOS Goals table.

The revenue structure of the wastewater collection system was reviewed including current budget year revenue and expenditures by, financial consultant, Baker Tilly. A test year was developed to reflect a baseline of wastewater collection system revenue and operating costs. The customer base was reviewed to identify the number of billing customers and volumetric sales. As required by EGLE for the SAW project, a 2½ year Rate Methodology was submitted and subsequently received EGLE approval. The existing annual debt service was included in the CIP funding development for the twenty (20) year planning period. Appendix C provides detailed information on the financial review and EGLE’s 2½ year Rate Methodology notification of approval.

A twenty (20) year planning period CIP was developed to outline annual O&M, repairs, replacement, and rehabilitation of sewer main, manholes, and pumping stations. Unit cost information was determined using bid tabulations and other local project information. A description of each asset and its corresponding recommended year for replacement or rehabilitation was developed using the BRE analysis, historical knowledge of the assets and guidance from Township staff. Appendix D outlines a detailed list of the identified CIP projects over the twenty (20) year WWAMP planning period.

### WASTEWATER SYSTEM DESCRIPTION

The Township's wastewater collection system is comprised of both pressure sanitary sewers and gravity sanitary sewers (approximately 41 miles), serving 4,500 people (approximately 15% of the Township's population). The system generally flows from north to south, utilizing ten (10) sanitary sewage pumping and six hundred and twenty-nine grinder pumping stations (approximately 29 of which are commercial). The wastewater flow is ultimately discharged into Commerce Township's collection system and is conveyed to the Commerce Township Wastewater Treatment Plant for treatment. Sewer main diameters range from 2 to 30 inches.

The (10) pumping stations that are owned and operated by the Township are:

1. Village Lakes
2. White Lake Estates
3. Williams Lake Road
4. Suburban Knolls
5. White Lake Market Place
6. Cranberry Lake Estates
7. Worthington Crossings
8. Bocavina
9. Meijer
10. Kroger

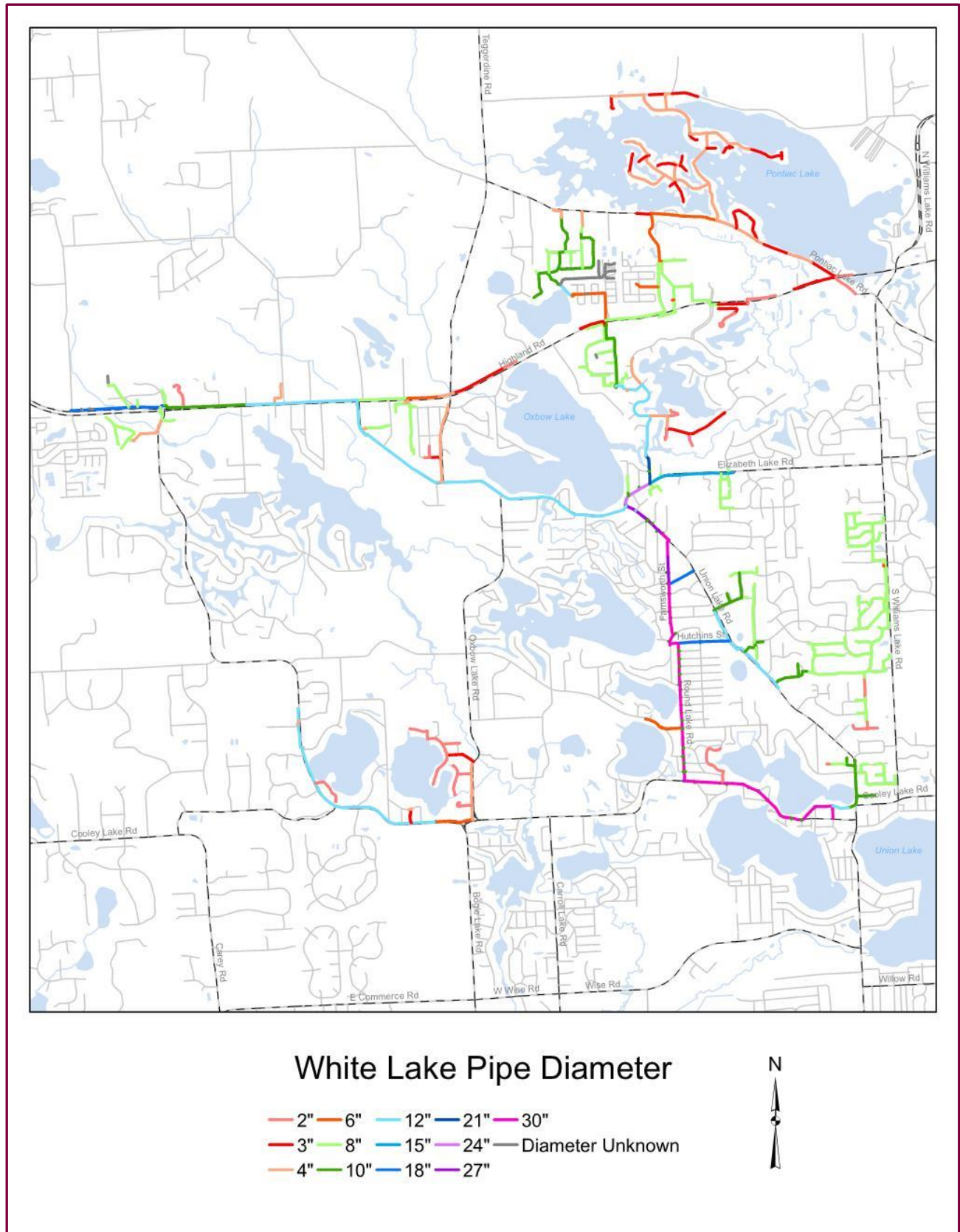
Most of the sewer mains were constructed in 1999 or later and consist mostly of HDPE, reinforced concrete, and PVC. The manholes are either block or precast concrete. The WRC is responsible for the operation, maintenance, and monitoring of the wastewater collection system infrastructure within the Township limits.

As previously stated, the Township has identified some hydrogen sulfide accumulation within the sanitary sewer system in recent years and is taking a proactive approach to these and other odor issues.

Please refer to Figure 14 on the following page for an illustration of the sewer main diameters within the Township.



Figure 14 Wastewater System – Sewer Main Diameter



## PUMPING STATIONS

There are ten (10) pumping stations that are owned and operated by the Township. They include:

1. Village Lakes
2. White Lake Estates
3. Williams Lake Road
4. Suburban Knolls
5. White Lake Market Place
6. Cranberry Lake Estates
7. Worthington Crossing
8. Bocavina
9. Meijer
10. Kroger

WRC provides operations and maintenance on the pumping stations on behalf of the Township. The maintenance program consists of monthly site visits at 8 pumping stations: Bocavina, Cranberry Lake Estates, Meijer, Suburban Knolls, Village Lakes, White Lake Estates, White Lake Market Place, and Williams Lake Road stations. Provided records indicate annual inspections have been performed at the Kroger and Worthington Crossing stations. Inspections include performing telemetry, alarm, and electrical checks as well as pump megger (insulation/moisture) testing and inspection of the panel wiring.

All pumping stations are equipped with a supervisory control and data acquisition (SCADA) system, which was installed in the mid-1990s. The existing system provides site-specific alarms back to WRC's Safety Dispatch.

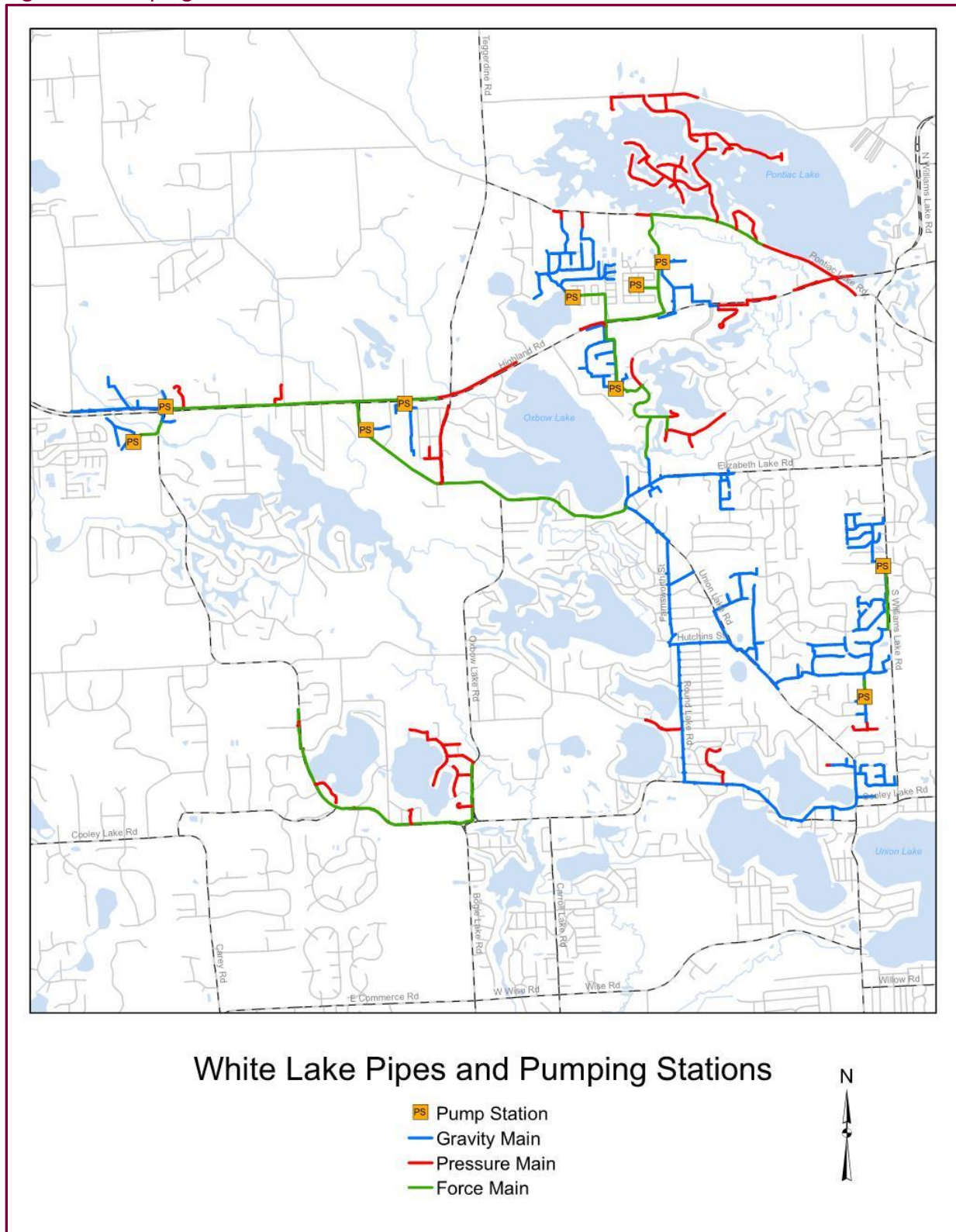
The full Pumping Station Inventory & Assessment Report is provided in Appendix E.



*Village Lake Estates Pumping Station*

Refer to Figure 15 below for a map identifying the locations of the Township pumping stations.

Figure 15 Pumping Station Locations



Prior to performing inspections at the ten (10) pumping stations, DLZ-J&A reviewed existing pumping station documentation. Each pumping station inspection included:

- visual inspection of the exterior conditions at each pumping station;
- digital photos of each station and structures;
- condition assessment of the wet well and valve chamber structures using NASSCO standards;
- condition of electrical panels and alarm systems;
- inventory and notes of equipment and features;
- review of the level control systems; and
- draw down test for each pump individually as well as a draw down test with both pumps running

Based on the pumping station site visits and maintenance information provided by WRC, the following observations regarding pumping station O&M effectiveness and efficiency include:

- Moderate to excessive grease buildup was noted in 6 of the 10 stations. Through this SAW Grant project, the Township has implemented a Fats, Oils, and Grease (FOG) inspection program in hopes to minimize FOG accumulation in these stations moving forward.
- The Township has received odor complaints over the years from the wastewater collection system that runs along Elizabeth Lake Road and southeast to Oxbow Road where the Meijer and Kroger pumping stations feed into. The Township and WRC have contracted with Eganix, Inc., to treat this line and a comprehensive odor control program has been implemented.
- At the time of inspection, it was determined by the WRC that four (4) Air Release Valves (ARV) were not functioning properly. There was also one (1) ARV structure, which was buried and has since been brought up to grade.

The following deficiencies for each pumping station were documented from pumping station site visits, review of operational and maintenance data and from discussions with WRC staff:

#### Bocavina Pumping Station

- The wet well rails are flimsy and will need to be tightened/repared.
- The Arborvitae in this area will need to be trimmed back.
- The Control Panel/Cabinet is starting to rust.

#### Cranberry Lake Estates Pumping Station

- The wet well structure has a few small areas of infiltration.
- The wet well top is fair with some aggregate showing.
- The hatch, hatch hold open, guide rails, and float rack are in fair to poor condition.
- The hatch does not have any safety grating and should be upgraded.
- Small amount of infiltration at the vault joints.
- The Arborvitae in this area will need to be trimmed back – minor restrictions to site functions.

- The Control Panel/Cabinet is starting to rust.
- The equipment insulation is loose.
- Minor wet well, valve vault pump, electrical equipment surface corrosion.
- Surface cracking in the fiberglass.
- Excessive grease buildup.

#### Kroger Pumping Station

- The wet well and piping are showing signs of high hydrogen sulfide and will require attention.

#### Meijer Pumping Station

- Missing sealing compound in seal-off fittings going to wet well.
- The top of the Cabinet is rusting and in need of maintenance.
- Pump 1 was out of service and removed at time of inspection. A replacement pump was installed this past August.
- Minor wet well surface corrosion.
- Surface chalking in the fiberglass.
- Small amount of infiltration at the vault joints.
- The wet well hatch does not have any safety grating; leaks present and minor infiltration.
- Moderate grease buildup.

#### Suburban Knolls Pumping Station

- Control panel cabinet insulation is loose and will need to be reattached or replaced.
- Valve vault joints displaying minor infiltration.
- Wet well has minor surface corrosion and no safety grating.
- Wet well hatch and guide rails are in fair to poor condition and will require attention.
- Small amount of infiltration at the vault joints.
- Wet well float rack and chains need replacement; minor infiltration.
- Surface chalking in the fiberglass.
- Gooseneck vent needs painting.
- Minor corrosion observed in Pumps 1 and 2, wet well piping, and electrical equipment.
- Moderate grease buildup.

#### Village Lakes Pumping Station

- Control panel cabinet is rusted. Replacement likely.
- Ragging in impeller of Pump 1 – unable to get out.
- Gooseneck vent was capped (not venting).
- High amount of damage to Pump 1 – needs replacing.
- VFD controller at Pump 2 is broken and will need repair or replacement.
- Maintenance required at access door seal – some seals peeling off.
- There are no individual lockouts for the pump breakers.

- Minor wet well piping and instrumentation surface corrosion.
- Surface chalking in the fiberglass.
- No safety grating at the wet well.
- Some infiltration at the valve vault joints.
- Excessive grease buildup.

#### White Lake Estates Pumping Station

- Electrical boxes in control panel could be updated – Door interlocks on disconnects not functional.
- Maintenance required on access door seal.
- Check valve sticking in partially closed position at Pump 2; free end bearing wear upon performance of vibrational analysis – will require repair or replacement.
- Wet well in fair to poor condition with small areas of infiltration – maintenance required.
- Aggregate is showing on the manhole block.
- Wet well steps rusted and in poor condition – Replacement required.
- Wet well floats not properly attached to float rack and will require adjustment.
- There are no individual lockouts for the pump breakers.
- Small amount of infiltration present at valve vault joints.
- Maintenance required at access door seal – failed; door rusted in some areas where seal used to be.
- The door interlocks on the disconnects are not functional.
- Staining/minor erosion, minor surface rust.
- Surface chalking in the fiberglass.
- Minor corrosion observed in Pumps 1 and 2.
- Vibration analysis showed ‘free end bearing wear’ on Pump 2.
- The Pump 2 check valve was sticking partially closed.
- Excessive grease buildup.

#### White Lake Market Place Pumping Station

- Door sprung and panel/cabinet rusting; access door seal in very poor condition – failure imminent.
- Exterior corrosion on electrical equipment disconnects.
- Failure imminent at access door seal.
- Minor exterior corrosion on the disconnects.
- Exposed aggregate/pitting and some material loss/surface cracking in the fiberglass.
- The Cabinet has exterior rust.
- Some infiltration and rust present at valve vault joints.
- Minor corrosion observed in Pumps 1 and 2 and wet well piping.
- Small areas of infiltration in wet well structure.
- Wet well top in poor condition with aggregate showing on corner. Tripping hazard is a result.

- Replace impeller and wear rings at Pumps 1 and 2; Rebuild the wet end of the pump to prevent premature failure and/or performance issues.
- No safety grating at wet well hatch – installation needed.
- Hatch, hatch hold open, guide rails, and float rack in fair to poor condition.
- Landscaping shrubs need trimming.
- Moderate grease buildup.

#### Williams Lake Road Pumping Station

- Bottom of control panel cabinet is rusted – replacement likely.
- Pumps 1 and 2 – Replace impeller and wear rings. Voltage and amperage balance >1%. Rebuild the wet end of the pump including impeller and wear ring.
- Existing chain link fence is rusting and covered with vegetation – Replacement recommended.
- Infiltration at the valve vault (west wall) and wet well – Will require attention.
- No safety grating present at wet well hatch – Installation recommended.
- Driveway to station is cracking and may require repair.
- Minor wet well piping, equipment, instrumentation, and antenna structure corrosion.
- Surface chalking in the fiberglass.
- The wet well hatch has no safety grating.
- No grease buildup.

#### Worthington Crossing Pumping Station

- No deficiencies identified.

Currently, pumping station upgrades are addressed on an as-needed basis. Pumps are maintained and/or replaced when a problem or failure occurs. Table 15 on the following page identifies the remaining useful life of each of the station's pumps.

Table 15 Pump Remaining Useful Life

Pumps	Pump Install Date	Remaining Useful Life in Years (Based on Typical Useful Life of 15 years)
Bocavina Pump 1	02/25/2016	12
Bocavina Pump 2	02/25/2016	12
Cranberry Lake Estates Pump 1	12/05/2017	13
Cranberry Lake Estates Pump 2	12/30/2015	11
Kroger Pump 1	03/24/2017	13
Kroger Pump 2	03/24/2017	13
Meijer Pump 1	8/1/2019	15
Meijer Pump 2	Original 2003	0
Suburban Knolls Pump 1	Unknown	4 (assumed)
Suburban Knolls Pump 2	Unknown	4 (assumed)
Village Lakes Pump 1	12/01/2017	0
Village Lakes Pump 2	12/01/2017	0
White Lake Estates Pump 1	05/01/2015	0
White Lake Estates Pump 2	05/01/2015	0
White Lake Market Place Pump 1	05/01/2015	0
White Lake Market Place Pump 2	05/01/2015	0
Williams Lake Road Pump 1	05/01/2015	0
Williams Lake Road Pump 2	05/01/2015	0
Worthington Crossing Pump 1	2017	13
Worthington Crossing Pump 2	2017	13



## SCADA Upgrades

The existing pumping station SCADA system is over 20 years old. Because of this, J&A-DLZ and WRC are recommending SCADA upgrades to improve:

- equipment failures
- low transmission speeds
- communication failures
- data exporting and
- operator efficiencies.

Each pumping station will require a sheet metal cabinet, multiple circuit breakers, a programmable logic controller (PLC), several relays, and a radio and antenna with a mast. DLZ-J&A has provided capital improvement costs for SCADA upgrades at 9 of the Township's 10 stations (SCADA upgrades are not needed at the Kroger station due to its age). The estimated cost for each site is \$24,400 and all these upgrades are proposed for 2020 (Year 1), for a total cost of \$210,200.

In addition, SCADA equipment upgrades will be needed at two Township sewer metering sites. The cost for these upgrades is \$13,800 for each site, anticipated in 2020, for a total of \$27,600. This cost is accounted for in the capital improvement plan.

## Business Risk Evaluation

Based on the condition assessments, a numerical rating from 1 to 5 was given for the overall condition of each station's sub-system. A description of the Condition Assessment Rating is shown in Table 3 below. Based upon the sub-system age, a Probability of Failure Performance Rating was also given to each sub-system as described in Table 4 below. These two factors were each weighted at 50% in determining the Probability of Failure (POF) of each sub-system. The POF factors that were used for the pumping station assessment were: Equipment (i.e. the control panel and telemetry) (10%), Electrical Components (i.e. generators and hookups) (30%), Pumps (i.e. number of pumps, pump TDH, GPM, HP, and layout) (50%), and Structure (i.e. wet well and valve vault condition) (10%). Please see Figure 16 for the POF factor weighting.

The Consequence of Failure (COF) of each sub-system was based upon the Asset Criticality Rating factors outlined in Table 5. The COF factors that were used for the pumping station assessment were: Distance from Surface Water (40%) and Number of Upstream Laterals (60%). Pumping station cost estimates are provided in Appendix A of this report. Please see Figure 17 for the COF factor weighting.

Figure 16 Probability of Failure Factor Weighting

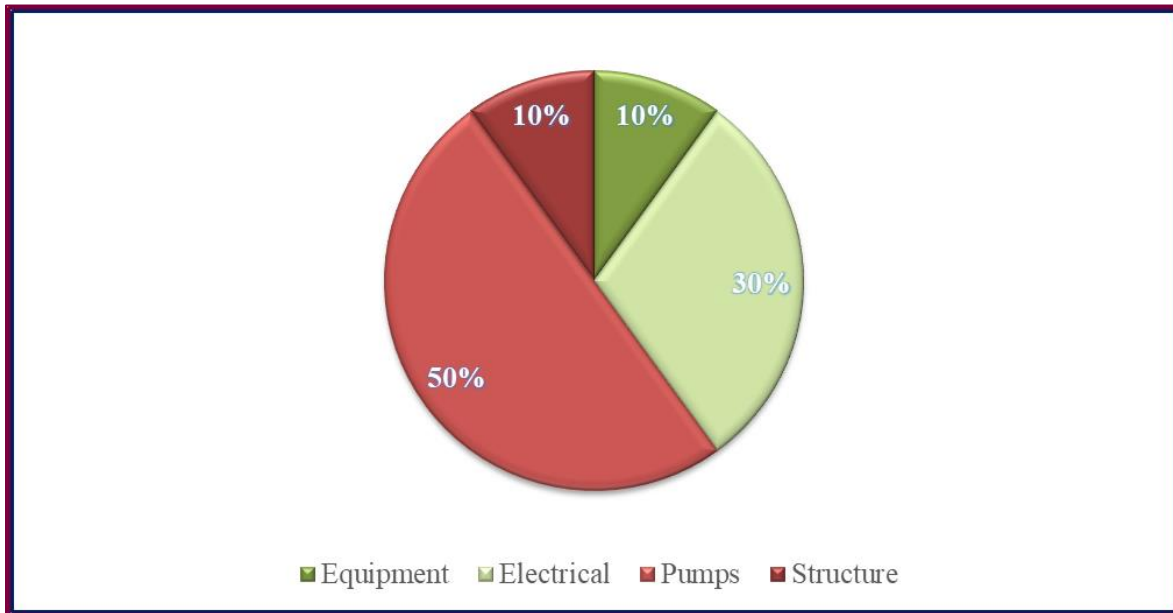
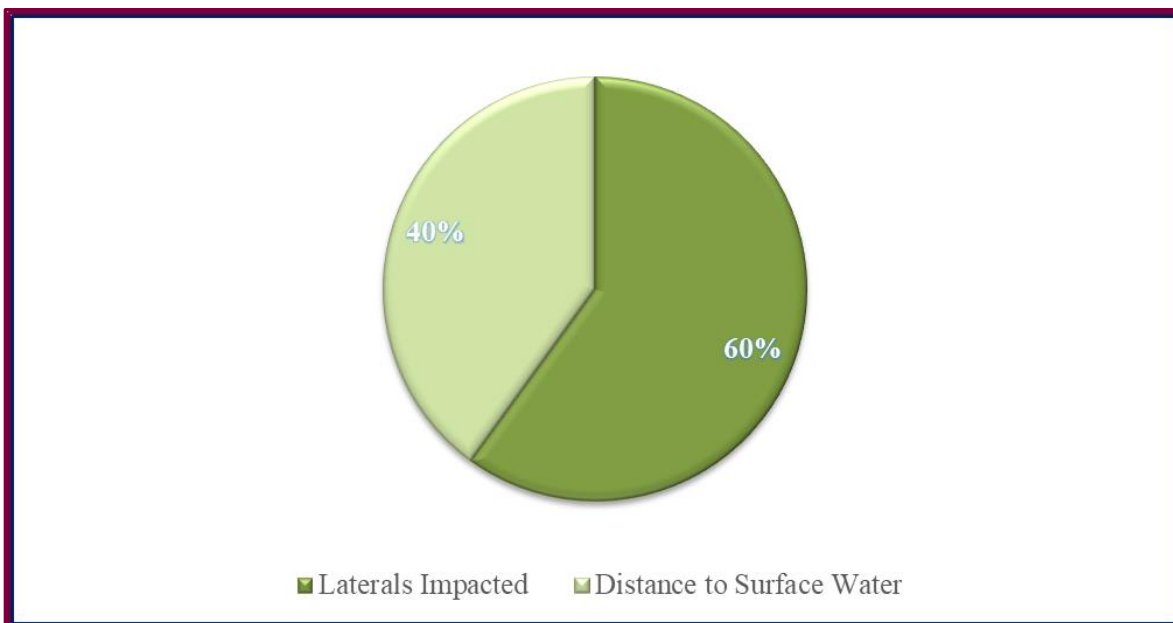


Figure 17 Consequence of Failure Factor Weighting



Please refer to Table 16 on the following page for a Pumping Station BRE Summary.

Table 16 Pumping Station BRE Summary – Asset Characteristics

Site Name	Equipment (Control Panel & Telemetry)	Electrical (Generator Information)	Pumps – Useful Life Remaining (Yrs)	Structure (Wet Well & Valve Vault)	# of Customers	Distance to Surface Water (LF)	Install Year
<b>Bocavina</b>	Fair	Portable Generator Connection	12	Good	Unknown	906	2001
<b>Cranberry Lake Estates</b>	Fair to Poor	Generator on site	11	Fair	441	161	1995
<b>Kroger</b>	Good	Generator on site	13	Wet Well – Fair to Poor; Valve Vault – Good	4	385	2017
<b>Meijer</b>	Fair to Poor	Portable Generator Connection	15 Pump 1 0 Pump 2	Wet Well – Good; Valve Vault – Fair to Good	6	782	2003
<b>Suburban Knolls</b>	Fair to Poor	Portable Generator Connection	4	Wet Well – Good; Valve Vault – Fair to Good	1329	896	1995
<b>Village Lakes</b>	Fair to Poor	Generator on site	0	Wet Well – Good; Valve Vault – Fair to Good	4	1121	2007
<b>White Lake Estates</b>	Fair to Poor	Portable Generator Connection	0	Fair to Poor	0	794	1995
<b>White Lake Market Place</b>	Fair to Poor	Portable Generator Connection	0	Fair to Good	24	181	1998
<b>Williams Lake Road</b>	Fair	Portable Generator Connection	0	Good	52	482	2002
<b>Worthington Crossing</b>	Good	Generator on site	13		1	555	2017

## SEWER MAIN

The entire existing wastewater collection system consists of approximately 41 miles of sewer main ranging in size from 2-inch to 30-inch in diameter. Table 17 outlines the sewer main distribution by diameter.

Table 17 Sewer Main Distribution by Size

Gravity Main Distribution by Size	Lineal Feet*		Pressure Main Distribution by Size	Lineal Feet*
6 inch	65		2 inch	16,264
8 inch	59,329		3 inch	20,434
10 inch	15,316		4 inch	27,297
12 inch	4,404		6 inch	12,691
15 inch	2,689		8 inch	7,523
18 inch	5,578		10 inch	5,095
21 inch	958		12 inch	25,117
24 inch	1,097		---	
27 inch	2,274		---	
30 inch	13,044		---	
<b>Total</b>	<b>104,754</b>		<b>Total</b>	<b>114,421</b>

\*lengths are approximate and based on GIS information

## Condition Of Assets

Due to the young age of the system and SAW Grant requirements, only a portion of the sanitary sewer manholes were inventoried and assessed and none of the sewer main was televised. Previous WRC CCTV data was acquired, reviewed, and assessed (using NASSCO level standards) under this assignment. A wastewater collection system wide plan to continue cleaning and inspection of all the sewer main in the Township and a proactive odor control program are provided in the CIP.

Table 18 outlines the NASSCO grading system used for determining the severity of identified sewer main defects.

Table 18 NASSCO Condition Grades

Condition Grade	Definition
5	Most significant defect grade
4	Significant defect grade
3	Moderate defect grade
2	Minor to moderate defect grade
1	Minor defect grade

Structural defects are conditions where the structural integrity of the sewer main is compromised. These defects can be cracks or even collapsed sewer main. O&M defects are conditions which interfere with the ability of the sewer main to convey flow. These defects can include such things as a root ball in the sewer main, which impedes the flow from the upstream manhole to the downstream manhole. Another defect recorded as an O&M issue is infiltration, which is essentially ground or surface water entering a sewer main through cracks or other means.

The Structural and O&M condition of each sewer main is based upon the condition assessments of the attached manholes, with the sewer main assuming the worst of the two (2) scores on a 1-5 scale.

Figures 18 and 19 on the following pages identify the sewer main in the Township, based on previous CCTV, by condition rating.

Figure 18 Gravity Main Condition Ratings

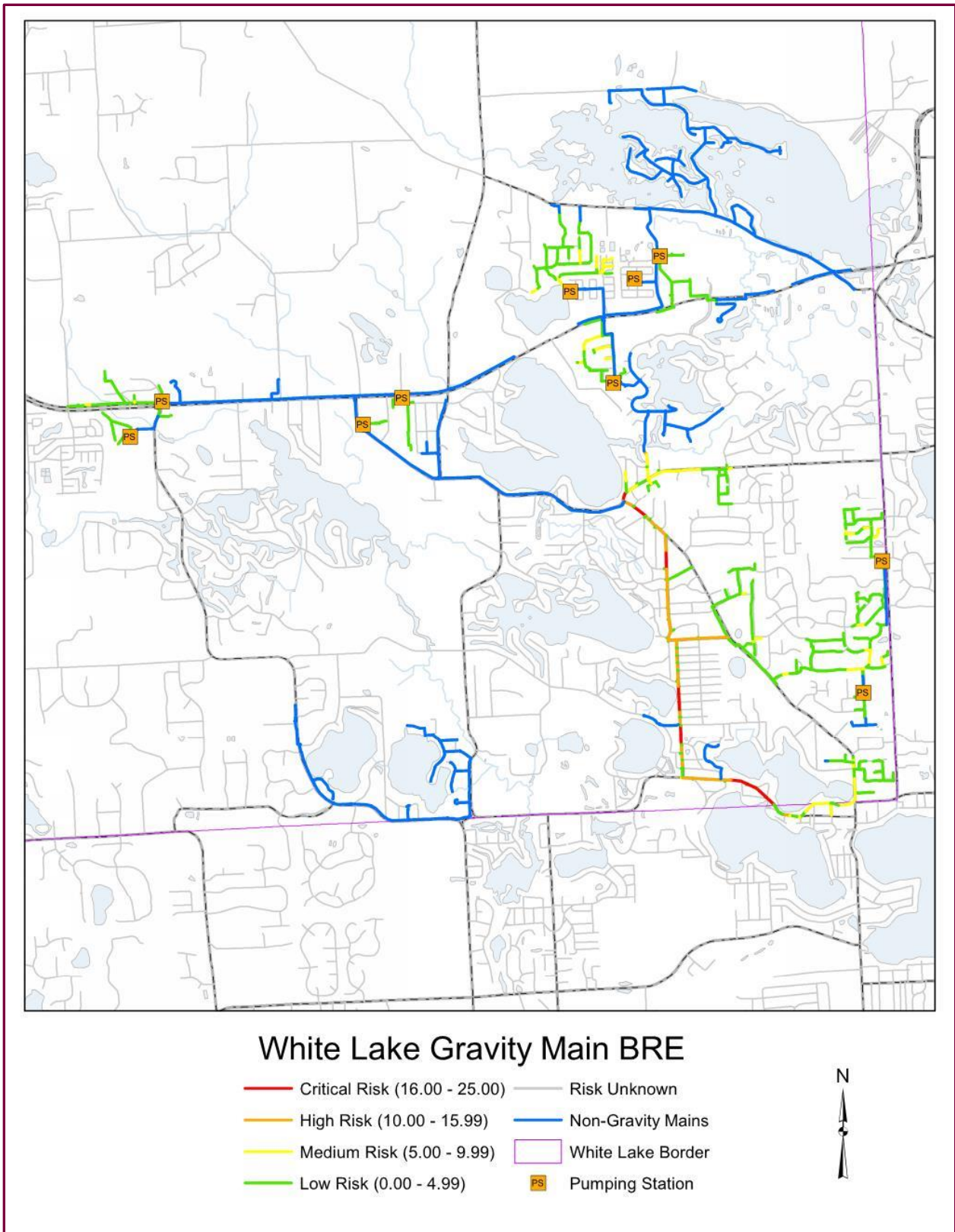
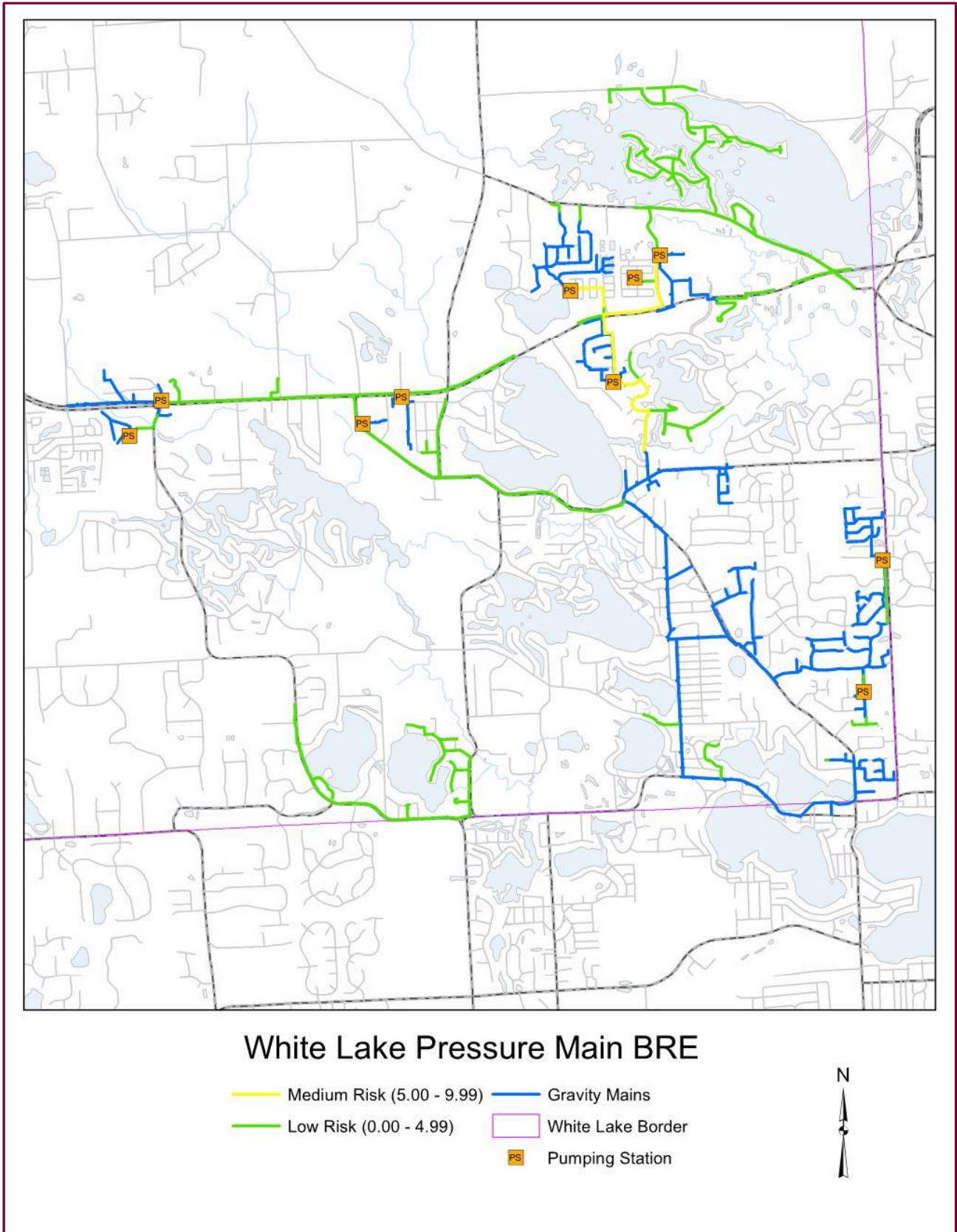


Figure 19 Pressure Main Condition Ratings



## MANHOLES

The existing wastewater collection system consists of approximately 771 manholes (571 gravity manholes; 200 pressure manholes). Manhole diameters range from 24 inches to 72 inches.

### Condition Of Assets

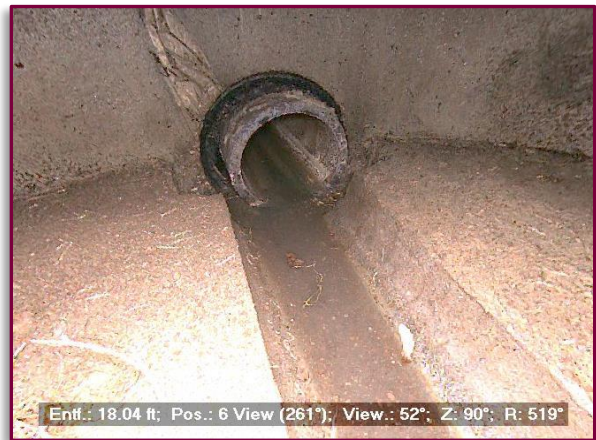
The wastewater collection system sewer manholes were rated using the guidelines of the NASSCO Manhole Assessment and Certification Program standards. As a part of the SAW grant, the manholes were GPS located and a Level 2 field-inspection was conducted. NASSCO manhole inspections include completion of a Level 1 inspection first and, if deficiencies are discovered, a Level 2 assessment is recommended for the Township to further document defects. Information collected during a Level 2 inspection includes photographs, manhole characteristics and defects. All manhole ratings collected were catalogued into a master data base for review and analysis and integration into GIS and the Cityworks CMMS.

Four hundred and fifty-seven (457) manholes were inventoried and assessed using a 3D panoramic camera, as shown below. This scanning option provides the ability to capture every inch of the manhole from multiple angles. In the interest of time, the remaining 114 manholes were inventoried and assessed using standard methods with a GPS unit and camera.

Figure 20 Manhole Scanning



Figure 21 Manhole Scanning Photo



Structural defects are conditions where the structural integrity of the manhole is compromised. These defects can be cracks or holes in the manhole walls. O&M defects are conditions which interfere with the ability of the manhole to convey flow. These defects can include such things as root balls and debris, which impede the flow from the upstream main to the downstream main. Another defect recorded as an O&M issue is infiltration, which is essentially ground or surface water entering a manhole through cracks or other means.

A comprehensive BRE was developed for sewer main and manholes using Level 2 NAASCO ratings for sewer manholes and POF and COF models. Individual asset COF and POF condition ratings were calculated based on evaluation criteria and used to calculate a total BRE score, which is the



mathematical product of the COF multiplied by the POF with a maximum score of 25. Figures 22 and 23 on the following pages identify the manholes in the Township by condition rating.

Figure 22 Gravity Manhole Condition Ratings

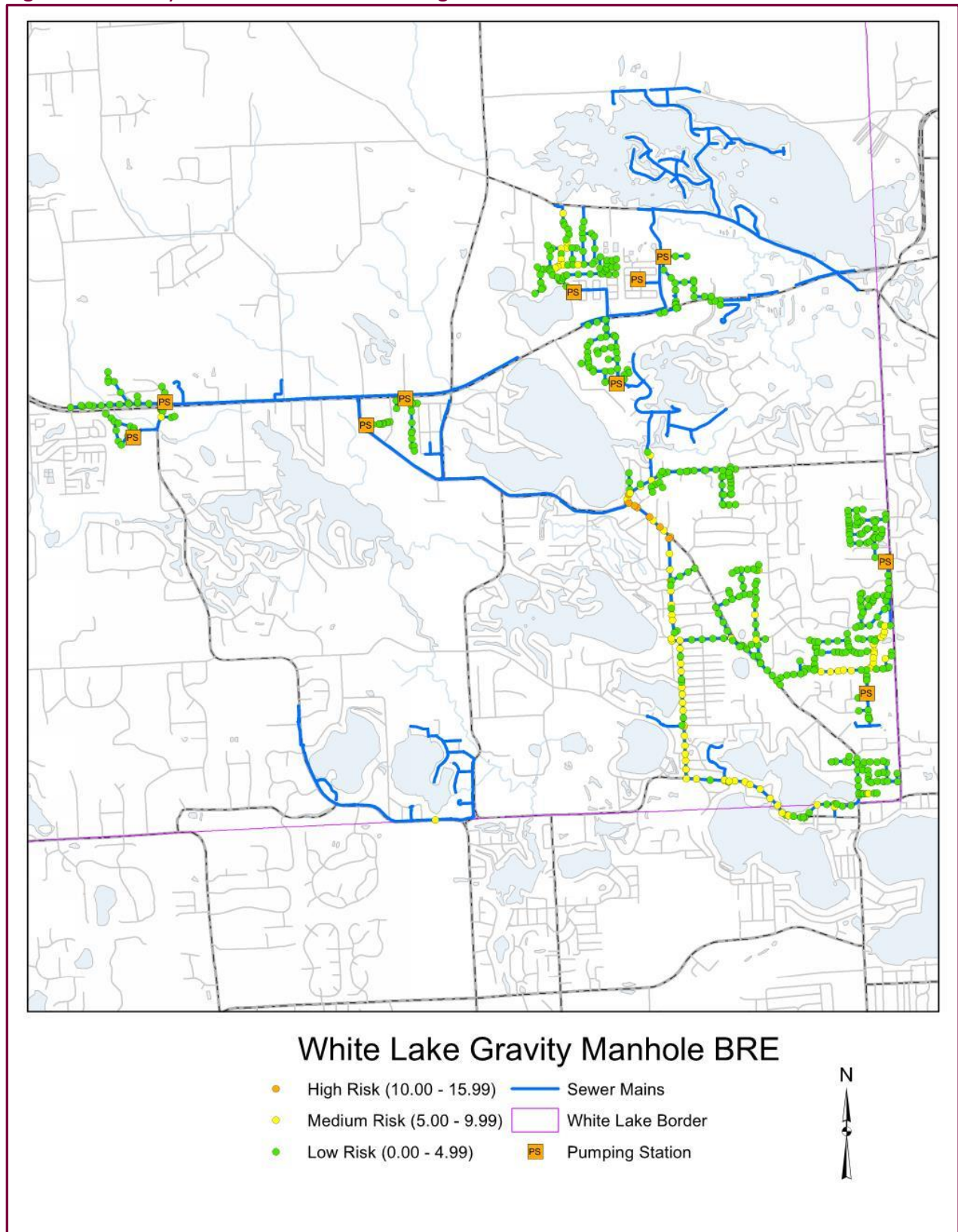
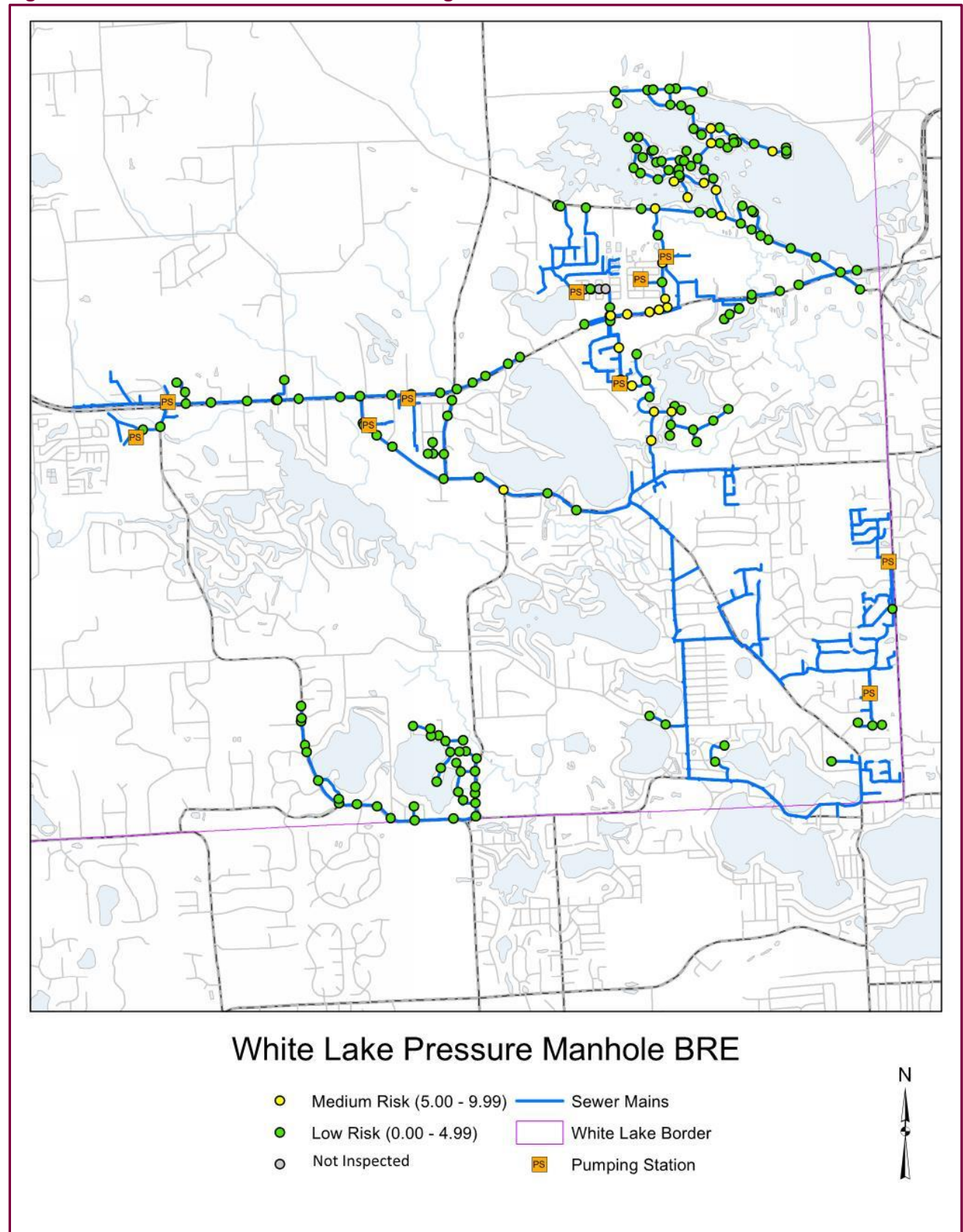


Figure 23 Pressure Manhole Condition Ratings



## **GEOGRAPHIC INFORMATION SYSTEMS / CITYWORKS CMMS**

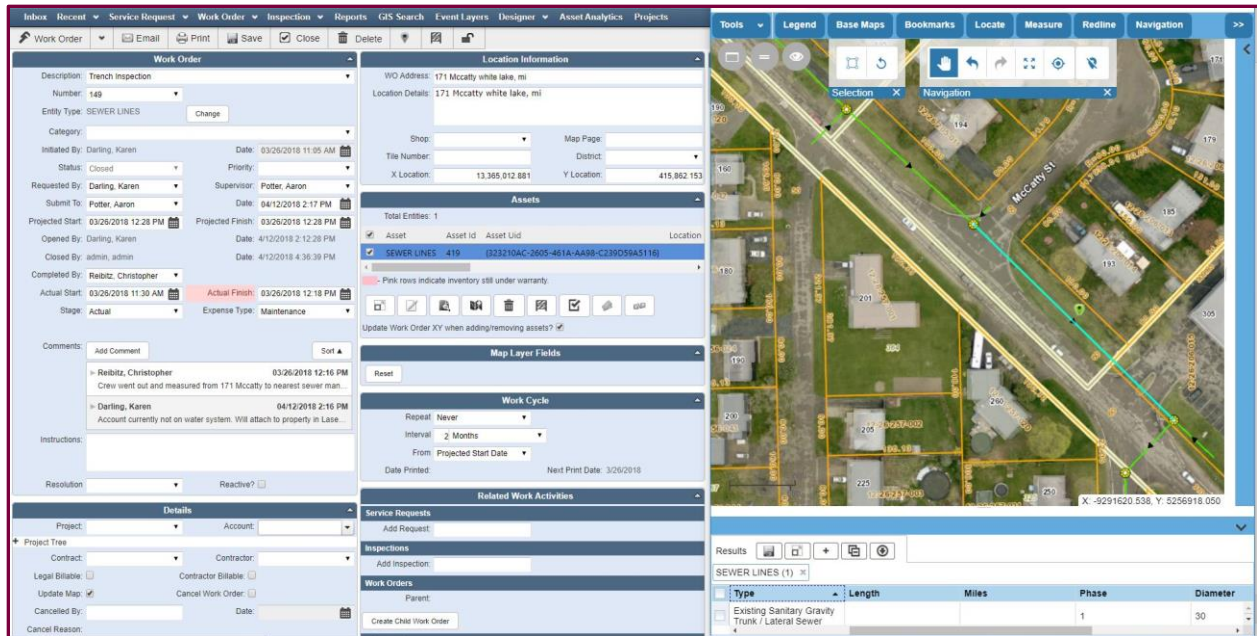
The Township utilizes an ESRI based GIS program that provides the capability to map wastewater collection system assets such as sewer main, manholes, and sewer pumping stations with spatial real-world coordinates. The assets are also populated with information including sewer main diameter, age, condition, material, and date of installation. The GIS system allows the Township to inventory, edit, analyze, and display all their wastewater and potable water collection and distribution networks as well as other operations including parks and recreation into an easy to use electronic mapping interface.

Most Township wastewater collection system manholes have GPS latitude and longitude coordinates surveyed under the SAW grant, which are then used to map them into the Township's GIS. This allows DPS staff to locate structures more precisely and quickly during normal and emergency situations. It also provides for very precise infrastructure information such as sewer main length and manhole elevations and inverts, which also provides the framework for a more accurate hydraulic sewer model.

The Township's wastewater collection system GIS should be updated periodically as asset information changes and new infrastructure is added to the wastewater collection system. Effectively developed and managed, GIS will provide the core information and operational business application platform for the DPS and the Township now and into the future. It also has mobile use capability enabling DPS staff to have access to the information anytime and anywhere.

As part of the SAW grant project, the Township has implemented a GIS-Centric CMMS by Azteca called Cityworks to track labor, equipment, and material costs used in maintaining the wastewater collection system. It can also be used to develop service requests and to schedule work tasks and keep track of inventory. This application configuration leverages the Township's GIS investment and facilitates proactive planning and operational capabilities for the DPS. Figure 24 illustrates the Cityworks/GIS interface where a sewer main segment has been selected with associated digitized site plans for that segment.

Figure 24 Cityworks/GIS Wastewater Asset Information Illustration



## SCANNING & DIGITIZATION INTO GIS

Manhole Inspection Reports, Sewer Inspection Reports, plot plans, construction plans, and as-built sewer drawings for the wastewater collection system were scanned and electronic pdf documents created. These documents are linked to their respective manholes and sewer main segments in GIS for fast and accurate retrieval and use. The information can be accessed by using ArcMap or through Cityworks. Refer to Figure 25 on the following page for an example of a scanned and digitized as-built drawing.

## Sewer Metering & Modeling

As part of the SAW grant program, a comprehensive hydraulic sewer model was created for both the low pressure and gravity main sewer collection system. The model was also calibrated using sewer flow meter data that was taken from the portable sewer flow metering task of the SAW grant program. The model can be used in the future as a tool to evaluate the predicted performance of the sewer collection system as well as aid in the analysis of proposed development impacts in the future. As the system continues to grow and age, the model will need to be updated and recalibrated to ensure accuracy.

Manhole, sewer main, pressure main, pumping station operational and other data from the GIS was used to create the model's geometric network. Model hydraulic loadings were created from utility billing residential equivalent unit (REU) and water meter consumption data. Model calibration was performed using data collected from the portable sewer flow metering task of the SAW grant program. The model was created using Innovyze®'s InfoSWIMM software. Figure 26 shows a schematic of the White Lake Township sewer model screenshot.

Figure 25 As-Built Drawing Scanned & Digitized for GIS

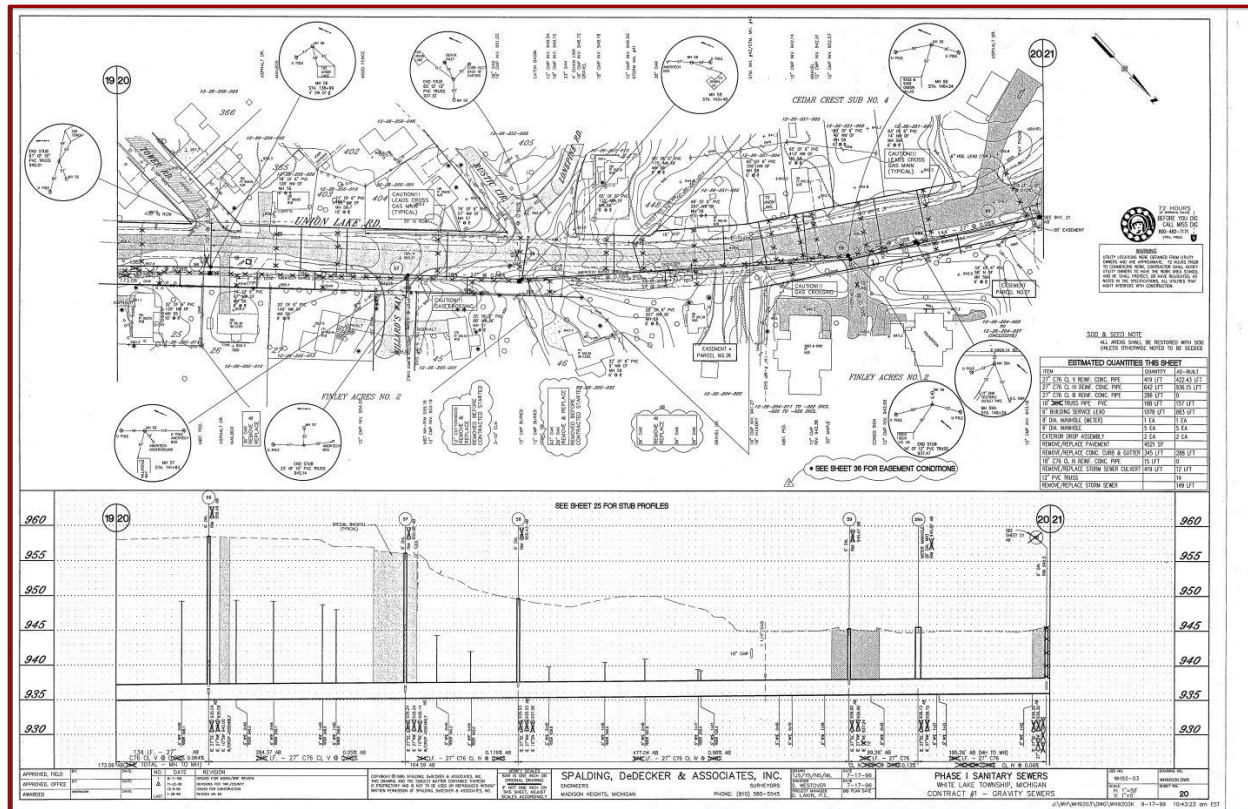
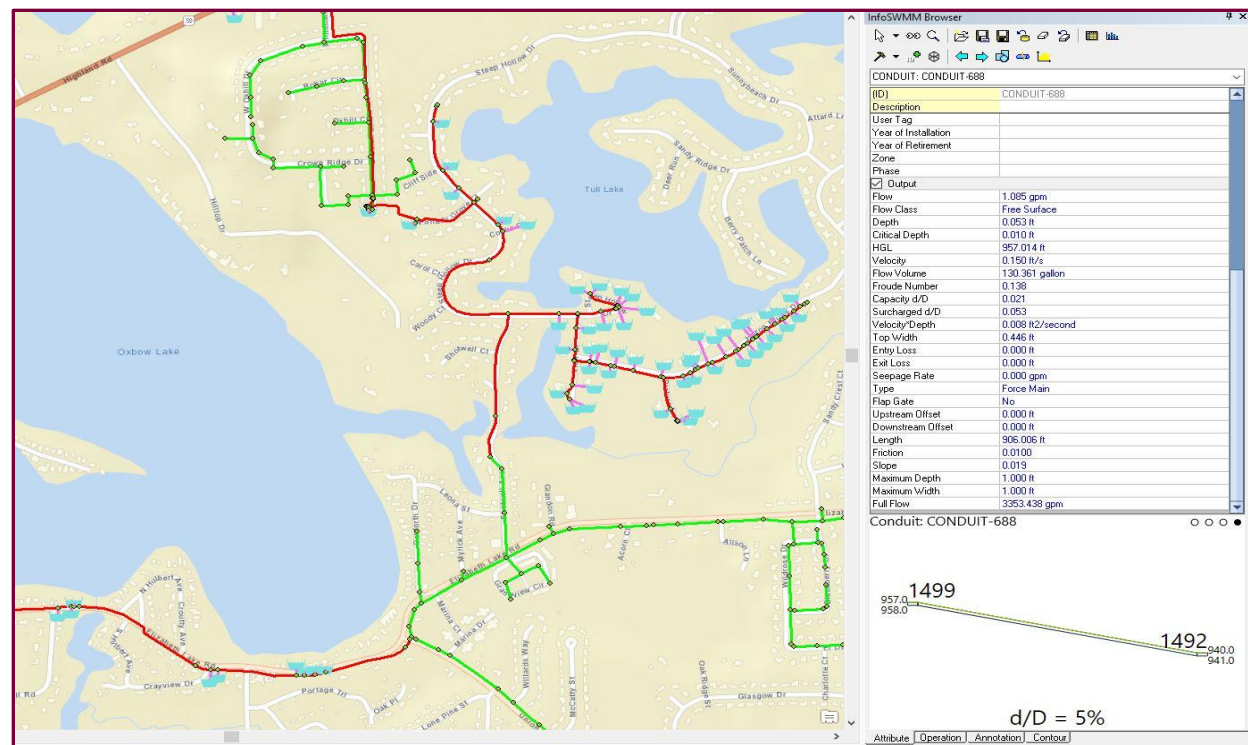


Figure 26 InfoSWMM Modeling Screenshot



## LEVEL OF SERVICE

The LOS outlines the criteria in which White Lake Township desires the wastewater collection system to perform over the long term and aids in the Capital Improvement Planning process.

The framework for the LOS is a triple bottom line approach with three (3) components: Social, Environmental, and Economic. The Social component was divided into three (3) strategic areas; customer service, reliability, and health & safety. The Environmental component was divided into two (2) strategic areas that included environmental stewardship and regulatory compliance. The Economic component was placed into a single strategic area, financial. The LOS driver was determined to be either self, customer, or regulatory driven. The current and future targets were identified with their respective performance measures, data, and reporting procedure. Industry standards, if applicable were also developed, to help determine specific targets and measures of rating. A rating or color-coded system (No Improvement Needed, Acceptable, or Improvement Needed) was developed to identify strategic areas that are acceptable or need improvements, as shown in Table 19.

Table 19 LOS Goals Rating System

Color Code	Rating
Green	No Improvement Needed
Yellow	Acceptable (Perhaps Some Improvement Needed)
Red	Improvement Necessary

### LEVEL OF SERVICE COMPONENTS

- 1) Social
  - a) Customer Service
  - b) Reliability
  - c) Health & Safety
- 2) Environmental
  - a) Administration & Organizational Development
  - b) Environmental Stewardship
  - c) Regulatory Compliance
- 3) Economic
  - a) Financial

Examples of Current and Future Targets are:

- Maintain and replace equipment as necessary to retain compliance and meet the level of service goals.
- Protect community from hazards associated with wastewater system (basement backups, traffic disturbance, etc.).
- Minimize Sanitary Sewer Overflows (SSOs) and provide better education to individual grinders station owners.

- Coordinate with the County to televise and clean sewers as necessary to minimize sewer system problems.

Detailed LOS Standards and Goals can be found in Appendix B and are designed to be modified periodically, as necessary, as performance measures and current and future targets change and are developed over time.



## ASSET CRITICALITY

The criticality of wastewater collection system assets was examined regarding their overall functional importance to the operation of the wastewater collection system and their impacts if they failed. To determine the criticality of system assets, a BRE was performed by analyzing the COF and POF for each asset.

Together, the COF total score and POF total score were mathematically multiplied to achieve a BRE Score based on a maximum of 25 as shown in Table 20. Development of this BRE Score was integral in helping to determine wastewater collection system assets of concern and to guide the development and timing of CIP projects over the twenty (20) year WWAMP planning period.

Table 20 Business Risk Evaluation (BRE) Scale

<b>Business Risk Evaluation (BRE) Total Score</b>	
<b>Business Risk Evaluation Scoring</b>	
<b>Business Risk</b>	<b>Total BRE Score</b>
Critical / Intolerable Risk	16.00 - 25.00
High Risk – Tolerable and Manageable – Aggressive Monitoring	10.00 - 15.99
Medium Risk – Tolerable and Manageable – Monitoring	5.00 - 9.99
Low Risk – Failure is Tolerable	0.00 - 4.99

## CONSEQUENCE OF FAILURE

### Sewer Main

The COF was determined for the pressure and gravity main taking into account the Economic, Environmental, and Social Impacts to the community (Triple Bottom Line Impacts). Within these Impact Categories, six (6) factors were weighted to determine the COF. They are listed below:

#### Economic Impact

- Diameter of Asset
- Surface Type Above Asset
- Depth of Pipe (for Gravity Main only)

#### Environmental/Regulatory Compliance

- Distance to Surface Water

Social/Community Disruption

- Number of Customers
- Roadway Impact

Figure 27 shows how the Economic, Environmental, and Social Impacts were weighted in the gravity main analysis.

Figure 27 Gravity Main COF Factor Weighting

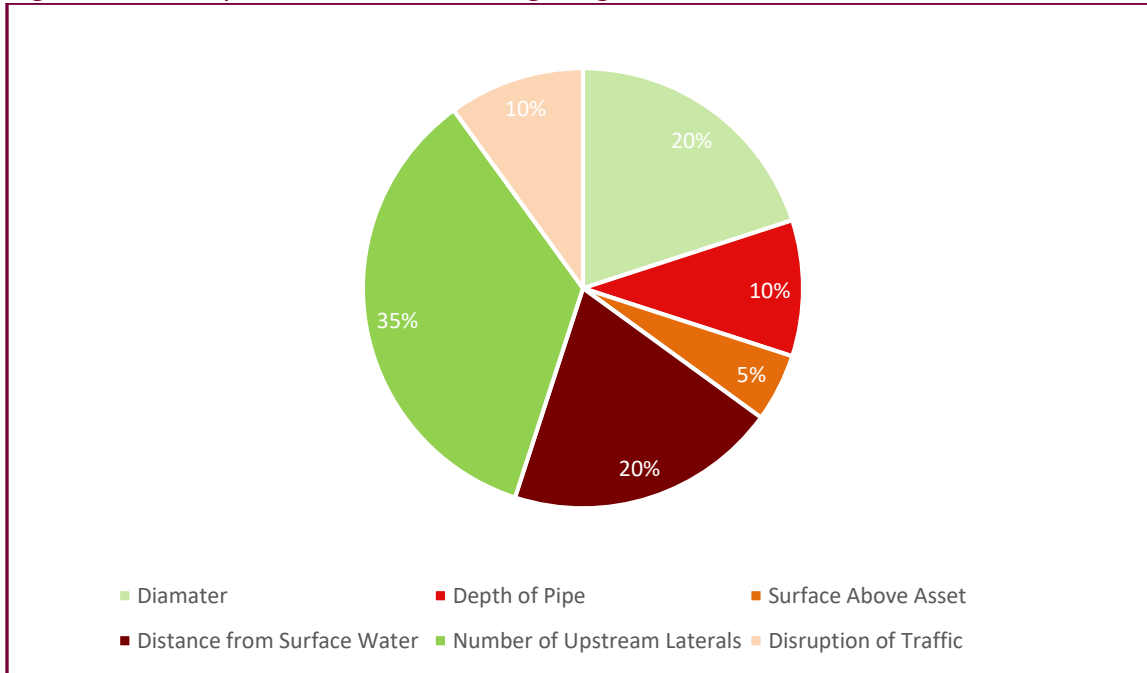
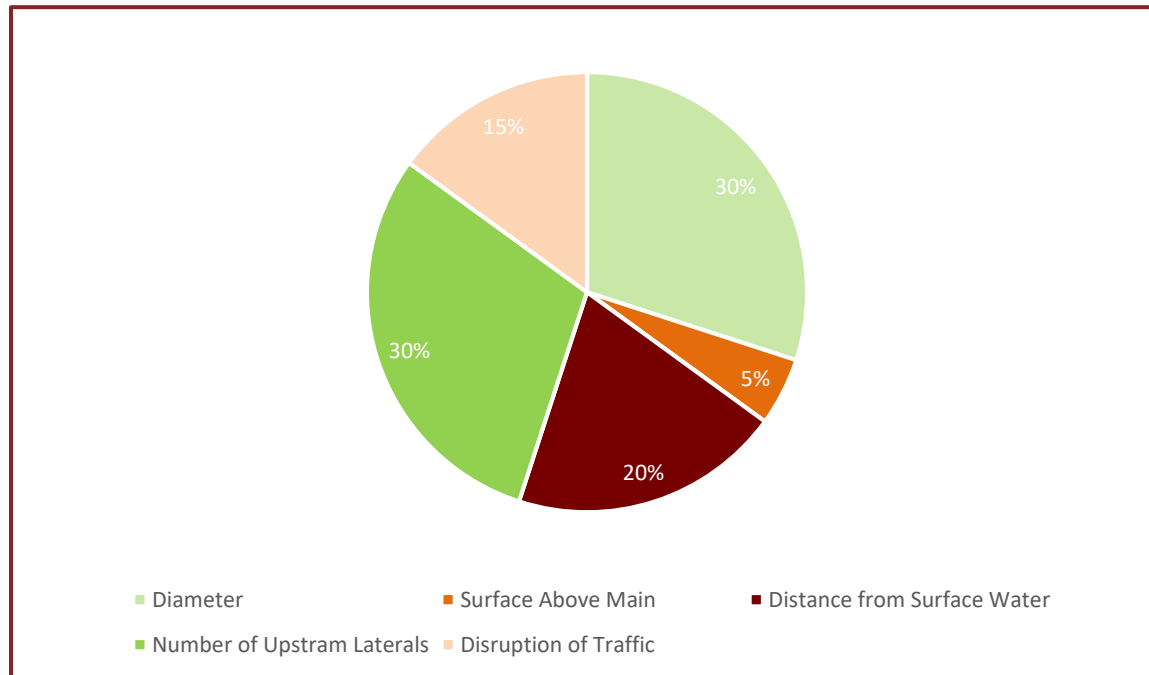


Figure 28 shows how the Economic, Environmental, and Social Impacts were weighted in the pressure main analysis.

Figure 28 Pressure Main COF Factor Weighting



Tables 21 and 22 show the criticality rating scales used for each of the 6 factors evaluated. Replacement costs of a section of sewer main are directly related to the diameter of the sewer main as well as the type of surface above the gravity and pressure main and have been assigned a score of 35% in the COF analysis. In the event of an asset failure, the costs to replace that asset may be much greater than the cost to make repairs.

Environmental/Regulatory Compliance contributed 20% to the COF for both gravity and pressure main. Non-compliance can result in the need for public notification and/or fines and consent orders to eliminate the problem from happening again if it continues to occur. Should a sewer main fail that is in close proximity to surface water, there are serious ramifications related to public health, and negative environmental impacts. A sewer main further away from surface water is less critical because there is more time to contain the overflow before it reaches the water body. The criticality rating scales for gravity and pressure main distance to surface water are shown on Tables 21 and 22.

Community disruption was allocated 45% of determining the COF for both gravity and pressure main. The more customers out of service due to a wastewater collection system failure, the more severe the situation. As service is disrupted to a larger number of users, additional costs are incurred to reroute and bypass mains, set up temporary pumping equipment to key areas, and notify the public in an expedient manner. Sewer main associated with critical facilities and roadway areas were also considered as part of the analysis. The criticality rating scales for the number of upstream customers, roadway classification, and critical facilities are shown on Tables 21 and 22.

Table 21 Gravity Main COF Component Rating Scales

<b>SOCIAL/COMMUNITY DISRUPTION (45%)</b>	
<b>Loss of Service Factor (35%)</b>	
<b>Criticality Rating</b>	<b>Number of Upstream Laterals Served</b>
5	More than 500
4	Between 251 and 500
3	Between 151 and 250
2	Between 76 and 150
1	Less than 75
<b>Roadway Impact Factor (10%)</b>	
<b>Criticality Rating</b>	<b>FCC Roadway Classification</b>
5	Limited Access Interstate, Ramp to Limited Access Highway
4	Unlimited Access Highway, State Owned Surface Street, Unlimited Access
3	Principal Arterial Road, Minor Arterial Road
2	Residential Road, General Non-certified Road
1	Unnamed Road, Transportation Structure, Certified Road Right-of-Way
<b>REGULATORY COMPLIANCE / ENVIRONMENTAL (20%)</b>	
<b>Distance to Surface Water (20%)</b>	
<b>Criticality Rating</b>	<b>Distance in Feet</b>
5	< 50
4	50-75
3	76-100
2	101-150
1	>150
<b>ECONOMIC (35%)</b>	
<b>Diameter (20%)</b>	
<b>Criticality Rating</b>	<b>Diameter in Inches</b>
5	24" – 102"
4	18"-21"
3	12"-15"
2	10"
1	6"-8"
<b>Criticality Rating</b>	<b>Depth of Pipe in inches (10%)</b>
5	>11
4	9.01-11
3	7.01-9
2	5.01-7
1	<=5
<b>Surface Type (5%)</b>	
<b>Criticality Rating</b>	<b>Type of Surface Around Main</b>
5	Pavement
4	N/A
3	Unknown
2	Gravel
1	Grass, Dirt

Table 22 Pressure Main COF Component Rating Scales

<b>SOCIAL/COMMUNITY DISRUPTION (45%)</b>	
<b>Loss of Service Factor (30%)</b>	
<b>Criticality Rating</b>	<b>Number of Upstream Laterals Served</b>
5	More than 500
4	Between 251 and 500
3	Between 151 and 250
2	Between 76 and 150
1	Less than 75
<b>Roadway Impact Factor (15%)</b>	
<b>Criticality Rating</b>	<b>FCC Roadway Classification</b>
5	Limited Access Interstate, Ramp to Limited Access Highway
4	Unlimited Access Highway, State Owned Surface Street, Unlimited Access
3	Principal Arterial Road, Minor Arterial Road
2	Residential Road, General Non-certified Road
1	Unnamed Road, Transportation Structure, Certified Road Right-of-Way
<b>REGULATORY COMPLIANCE / ENVIRONMENTAL (20%)</b>	
<b>Distance to Surface Water (20%)</b>	
<b>Criticality Rating</b>	<b>Distance in Feet</b>
5	< 50
4	50-75
3	76-100
2	101-150
1	>150
<b>ECONOMIC (35%)</b>	
<b>Diameter (30%)</b>	
<b>Criticality Rating</b>	<b>Diameter in Inches</b>
5	24" – 102"
4	18"-21"
3	12"-15"
2	10"
1	6"-8"
<b>Surface Type (5%)</b>	
<b>Criticality Rating</b>	<b>Type of Surface Around Main</b>
5	Pavement
4	N/A
3	Unknown
2	Gravel
1	Grass, Dirt

## MANHOLES

The COF was determined for the pressure and gravity manholes taking into account the Economic, Environmental, and Social Impacts to the community (Triple Bottom Line Impacts).

Within these Impact Categories, five (5) factors were weighted to determine the COF. They are listed below:

**Economic Impact**

- Surface Type Around Asset
- Depth of Manhole (for Gravity Manholes only)

**Environmental/Regulatory Compliance**

- Distance to Surface Water

**Social/Community Disruption**

- Number of Customers
- Roadway Impact

Figures 29 and 30 show how the Economic, Environmental, and Social Impacts were weighted in the gravity and pressure manhole analysis.

Figure 29 Gravity Manhole COF Factor Weighting

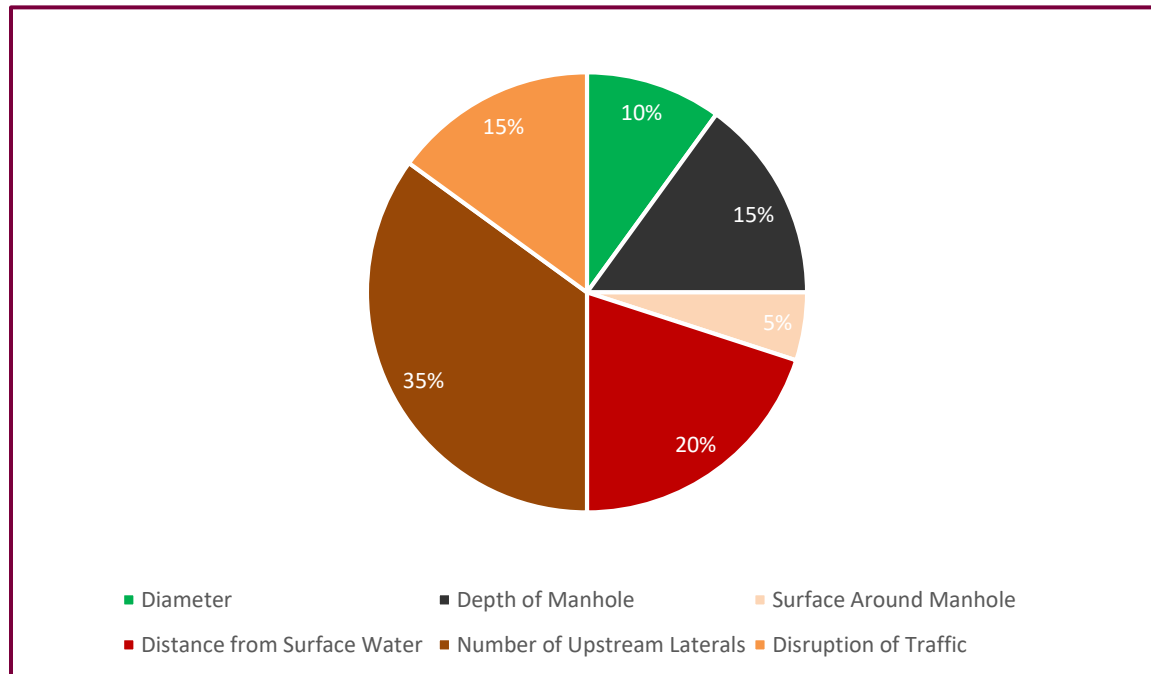
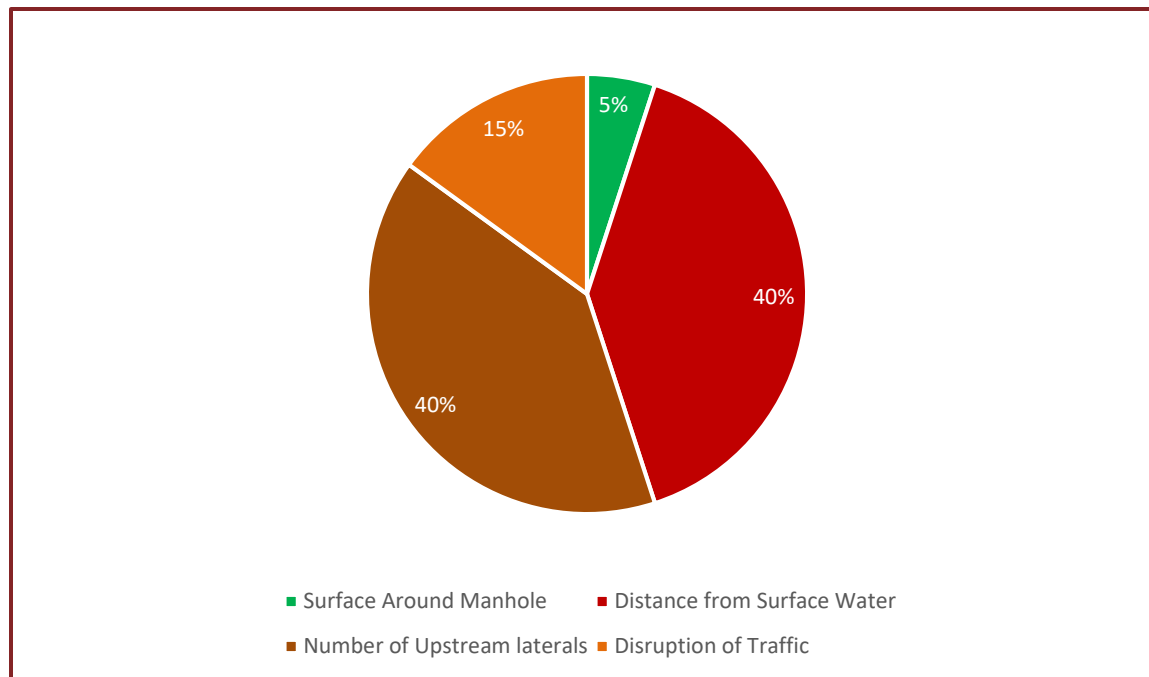


Figure 30 Pressure Manhole COF Factor Weighting



Tables 23 and 24 show the criticality rating scales used for each of the 5 factors evaluated. Replacement costs of a manhole are directly related to the type of surface around the manhole and has been assigned a score of 5% in the COF analysis. In the event of an asset failure, the costs to replace that asset may be much greater than the cost to make repairs.

Environmental/Regulatory Compliance contributed 20% for gravity manholes and 40% for pressure manholes to the COF. Non-compliance can result in the need for public notification and/or fines and consent orders to eliminate the problem from happening again if it continues to occur. Should a manhole fail that is in close proximity to surface water, there are serious ramifications related to public health and negative environmental impacts. A manhole further away from surface water is less critical because there is more time to contain the overflow before it reaches the water body. The criticality rating scales for manhole distance to surface water are shown on Tables 23 and 24.

Community disruption was allocated 50% and 55% of determining the COF respectively for gravity and pressure manholes. The more customers out of service due to a wastewater collection system failure, the more severe the situation. As service is disrupted to a larger number of users, additional costs are incurred to reroute and bypass mains, set up temporary pumping equipment to key areas, and notify the public in an expedient manner. Sewer main associated with critical facilities and roadway areas were also considered as part of the analysis. The criticality rating scales for the number of upstream customers, roadway classification, and critical facilities are shown below on Tables 23 and 24.

Table 23 Gravity Manhole COF Component Rating Scales

<b>SOCIAL/COMMUNITY DISRUPTION (50%)</b>	
<b>Loss of Service Factor (35%)</b>	
<b>Criticality Rating</b>	<b>Number of Upstream Laterals Served</b>
5	More than 500
4	Between 251 and 500
3	Between 151 and 250
2	Between 76 and 150
1	Less than 75
<b>Roadway Impact Factor (15%)</b>	
<b>Criticality Rating</b>	<b>FCC Roadway Classification</b>
5	Limited Access Interstate, Ramp to Limited Access Highway
4	Unlimited Access Highway, State Owned Surface Street, Unlimited Access Ramp
3	Principal Arterial Road, Minor Arterial Road
2	Residential Road, General Non-certified Road
1	Unnamed Road, Transportation Structure, Certified Road Right-of-Way
<b>REGULATORY COMPLIANCE / ENVIRONMENTAL (20%)</b>	
<b>Distance to Surface Water (20%)</b>	
<b>Criticality Rating</b>	<b>Distance in Feet</b>
5	< 50
4	50-75
3	76-100
2	101-150
1	>150
<b>ECONOMIC (30%)</b>	
<b>Diameter (10%)</b>	
<b>Criticality Rating</b>	<b>Diameter in Inches</b>
5	24" – 102"
4	18"-21"
3	12"-15"
2	10"
1	6"-8"
<b>Criticality Rating</b>	<b>Depth of Manhole (15%)</b>
5	>11
4	9.01-11
3	7.01-9
2	5.01-7
1	<=5
<b>Surface Type (5%)</b>	
<b>Criticality Rating</b>	<b>Type of Surface Around Manhole</b>
5	Pavement
4	N/A
3	Unknown
2	Gravel
1	Grass, Dirt



Table 24 Pressure Manhole COF Component Rating Scales

<b>SOCIAL/COMMUNITY DISRUPTION (70%)</b>	
<b>Loss of Service Factor (45%)</b>	
<b>Criticality Rating</b>	<b>Number of Upstream Laterals Served</b>
5	More than 500
4	Between 251 and 500
3	Between 151 and 250
2	Between 76 and 150
1	Less than 75
<b>Roadway Impact Factor (20%)</b>	
<b>Criticality Rating</b>	<b>FCC Roadway Classification</b>
5	Limited Access Interstate, Ramp to Limited Access Highway
4	Unlimited Access Highway, State Owned Surface Street, Unlimited Access
3	Principal Arterial Road, Minor Arterial Road
2	Residential Road, General Non-certified Road
1	Unnamed Road, Transportation Structure, Certified Road Right-of-Way
<b>Critical Infrastructure Factor (5%)</b>	
<b>Criticality Rating</b>	<b>Critical Infrastructure</b>
5	Critical Infrastructure
1	Non-Critical Infrastructure
<b>REGULATORY COMPLIANCE / ENVIRONMENTAL (20%)</b>	
<b>Distance to Surface Water (20%)</b>	
<b>Criticality Rating</b>	<b>Distance in Feet</b>
5	< 50
4	50-75
3	76-100
2	101-150
1	>150
<b>ECONOMIC (10%)</b>	
<b>Surface Type (10%)</b>	
<b>Criticality Rating</b>	<b>Type of Surface Above Main</b>
5	Pavement
4	N/A
3	Unknown
2	Gravel
1	Grass, Dirt

## PROBABILITY OF FAILURE

### Sewer Main

For sewer main that was televised, the POF is directly related to the existing condition of an asset. For main not televised, the POF is based on pipe age, pipe material, and hydrogen sulfide concern (H2S). Refer to Figure 31 below for the gravity main POF analysis. Refer to Figure 32 for the pressure main POF analysis.

Figure 31 Gravity Main Probability of Failure Analysis

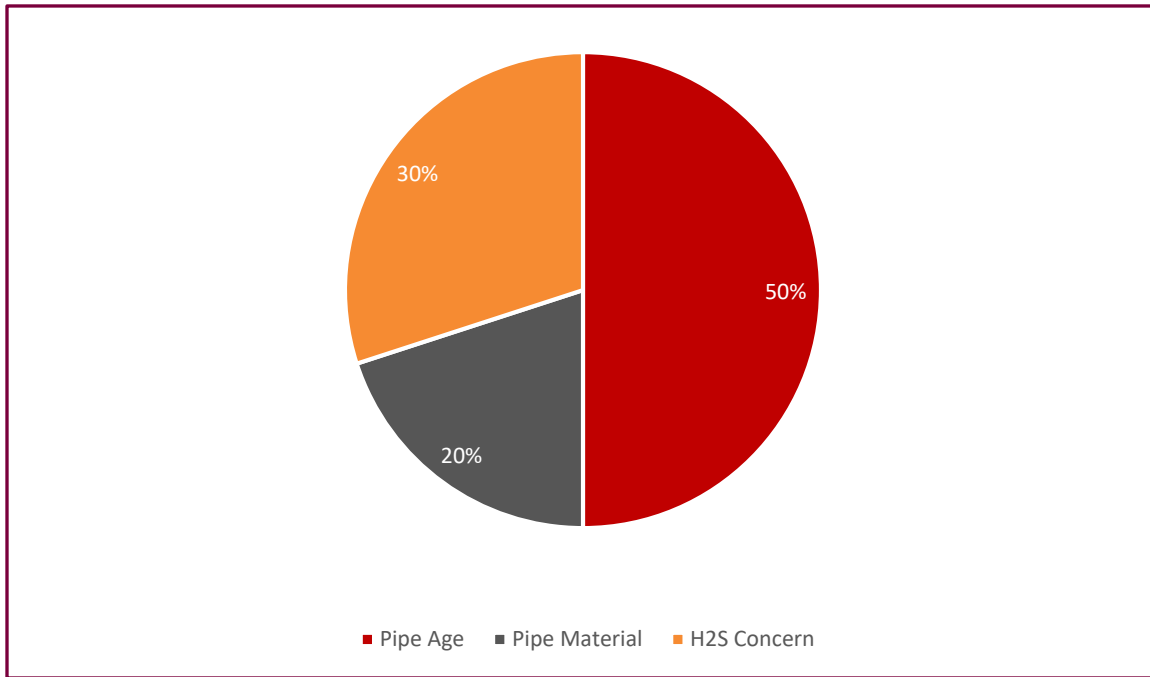
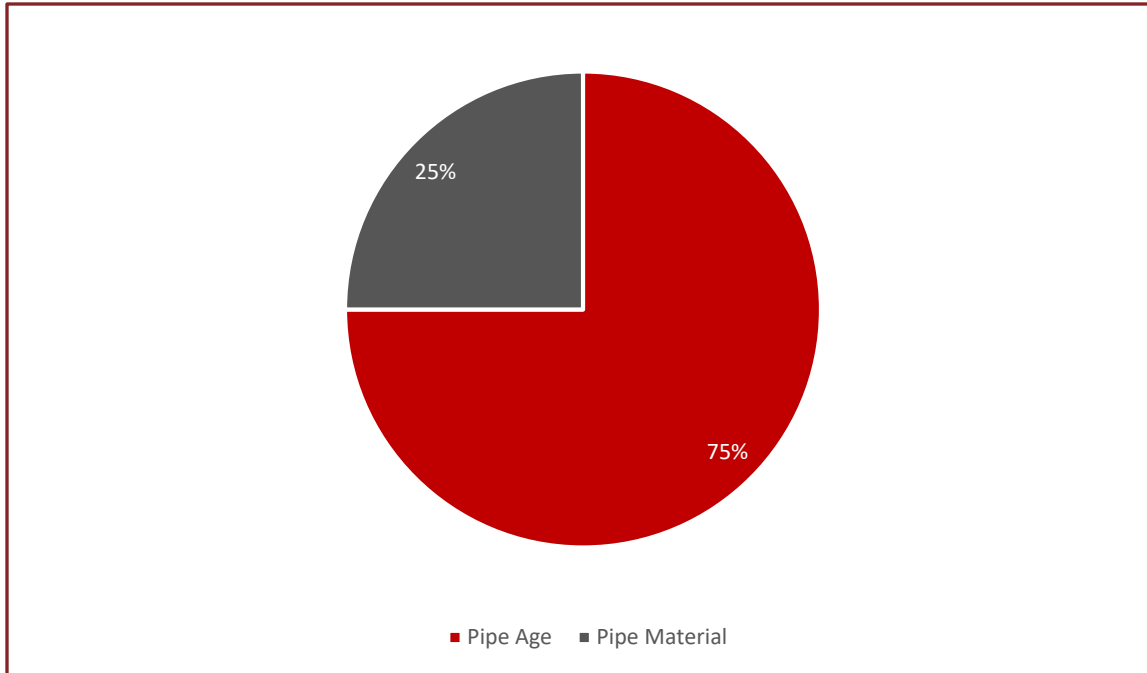


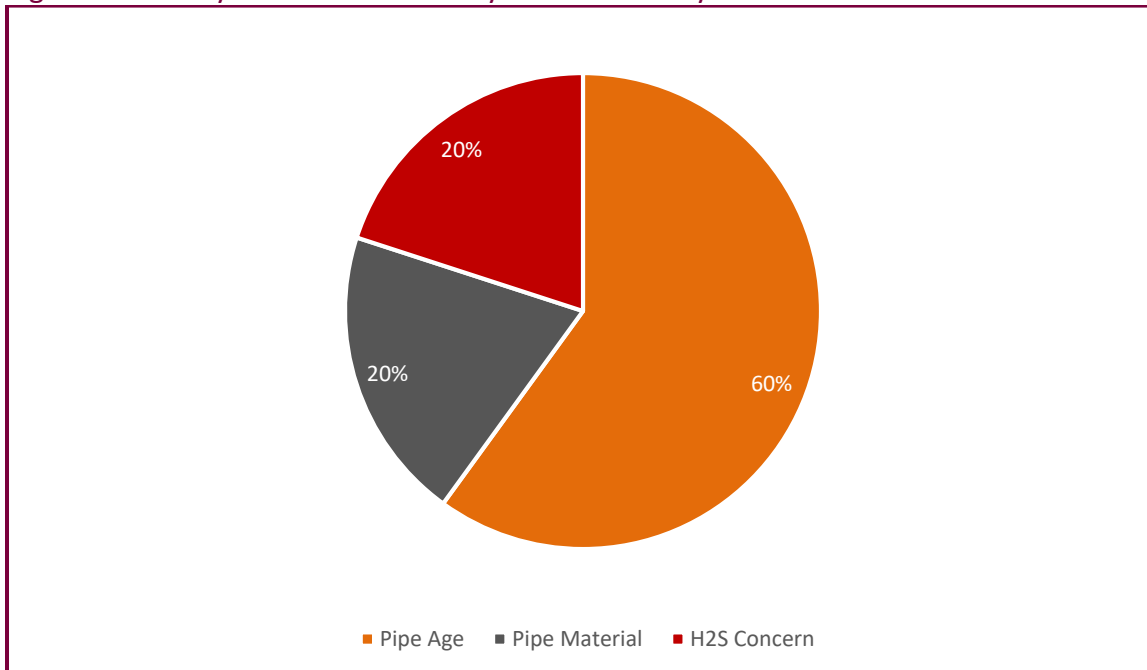
Figure 32 Pressure Main Probability of Failure Analysis



### MANHOLES

For gravity manholes, the POF was based on pipe age, pipe material, and hydrogen sulfide concern (H2S). Refer to Figure 33 for the gravity manhole POF analysis. For pressure manholes, the POF was based on manhole age (100%). Manholes were evaluated for their structural condition during their Level 2 NASSCO evaluations.

Figure 33 Gravity Manhole Probability of Failure Analysis



## BUSINESS RISK EVALUATION (BRE)

The Business Risk was evaluated for each sewer main segment and manhole. The Business Risk is the mathematical product of the COF and the POF with a resulting maximum possible score of 25. The BRE matrix is shown in Table 25. The BRE scale defining the risk factors is shown in Table 26.

Table 25 Business Risk Evaluation Matrix

		Risk Rating		BRE Score				
Probability of Failure	Certain	5	5	10	15	20	25	
	Probable	4	4	8	12	16	20	
	Possible	3	3	6	9	12	15	
	Unlikely	2	2	4	6	8	10	
	Rare	1	1	2	3	4	5	
Risk Rating		1	2	3	4	5		
		Insignificant	Minor	Moderate	Major	Catastrophic		
<b>Consequence of Failure</b>								

The BRE helps define maintenance and CIP Strategies and maximizes the expenditure of resources. Areas of relatively low business risk can be addressed over a much longer period of time with preventative maintenance strategies or could potentially run to failure with minor impacts to the system. Assets with medium to high risk will require more frequent monitoring and replacement or rehabilitation needs and should be addressed in the near term. Assets rated as critical should address rehabilitated or replacement needs as soon as possible.

Table 26 Business Risk Evaluation Scale

BRE	Risk	Definition
0.00 – 4.99	Low Risk	Consequence of Failure is acceptable
5.00 – 9.99	Medium Risk	Failure consequences tolerable, managed through design redundancy, spares, and condition monitoring
10.00 – 15.99	High Risk	Aggressive Monitoring and Management
16.00 – 25.00	Critical/Intolerable Risk	Intolerable Condition

Tables 27-30 provide summaries of the BRE for the sewer main and manholes. As the tables show there are approximately 4,094 linear feet of sewer main (4.0%) that received a critical BRE score

of 16.00-25.00; additionally, 10,486 lineal feet of sewer main (9.7%) and 10 manholes (1.8%) received a BRE score of 10.00-15.99.

**Table 27 Gravity Main Business Risk Evaluation Summary**

Business Risk - Gravity Sewer Main						
Probability of Failure	Sewer Length (ft)	0.00-4.99	5.00-9.99	10.00-15.99	16.00-25.00	% of System by Pipe Structural Condition
5.00	735	0	735	0	0	0.7%
4.00	905	0	257	0	648	0.8%
3.00	33,452	25,207	7,554	138	552	30.8%
2.00	15,178	2,141	2,044	8,098	2,894	14.0%
1.00	58,321	50,606	5,465	2,250	0	53.7%
Sewer Lengths (ft)	108,590	77,955	16,056	10,486	4,094	
<b>% of System by Business Risk</b>		<b>71.8%</b>	<b>14.8%</b>	<b>9.7%</b>	<b>4%</b>	<b><u>100.0%</u></b>

**Table 28 Pressure Main Business Risk Evaluation Summary**

Business Risk - Total System						
Pressure Main Probability of Failure	Sewer Length (ft)	0.00-4.99	5.00-9.99	10.00-15.99	16.00-25.00	% of System by Pipe Structural Condition
5.00	0	0	0	0	0	0.0%
4.00	0	0	0	0	0	0.0%
3.00	5,819	783	5,036	0	0	5.1%
2.00	11,960	1,807	10,153	0	0	10.5%
1.00	96,642	96,642	0	0	0	84.5%
Sewer Lengths (ft)	114,421	99,232	15,189	0	0	
<b>% of System by Business Risk</b>		<b>86.7%</b>	<b>13.3%</b>	<b>0.0%</b>	<b>0%</b>	<b><u>100.0%</u></b>

Table 29 Gravity Manhole Business Risk Evaluation Summary

Business Risk - Total System						
Structural Condition	Manholes (ea)	0.00-4.99	5.00-9.99	10.00-15.99	16.00-25.00	% of System by Pipe Structural Condition
5.00	0	0	0	0	0	0.0%
4.00	2	1	1	0	0	0.4%
3.00	12	7	2	3	0	2.1%
2.00	190	152	31	7	0	33.3%
1.00	27	20	7	0	0	4.7%
0.00	318	280	38	0	0	
Unknown	22	18	4	0	0	
Manholes (ea)	571	478	83	10	0	
<b>% of System by Business Risk</b>		<b>83.7%</b>	<b>14.5%</b>	<b>1.8%</b>	<b>0%</b>	<b><u>100.0%</u></b>

Table 30 Pressure Manhole Business Risk Evaluation Summary

Business Risk - Total System						
Pressure Manhole Probability of Failure	Pressure Manholes (ea)	0.00-4.99	5.00-9.99	10.00-15.99	16.00-25.00	% of System by Pipe Structural Condition
5.00	0	0	0	0	0	0.0%
4.00	0	0	0	0	0	0.0%
3.00	3	1	2	0	0	1.5%
2.00	68	46	22	0	0	34.0%
1.00	129	129	0	0	0	64.5%
Pressure Manholes (ea)	200	176	24	0	0	
<b>% of System by Business Risk</b>		<b>88.0%</b>	<b>12.0%</b>	<b>0.0%</b>	<b>0%</b>	<b><u>100.0%</u></b>

## REVENUE STRUCTURE

As required by the SAW Grant Implementation Project guidelines, a wastewater collection system revenue/expense review needed to be developed and submitted to EGLE by June 2019. The Township’s utility finances were reviewed by financial consultant, Baker Tilly. Upon completion of the review, Baker Tilly submitted a “*Schedule of 2019 Budgeted Operating Expenses and Adjustments*” to EGLE for review and approval in June 2019. Table 31 contains a synopsis of the review schedule, which shows a wastewater system revenue gap of \$0.00. The Township subsequently received an October 17, 2019 letter from EGLE outlining the Township had successfully fulfilled the significant progress requirement and that they were in compliance with Section 5204e(3)(a), Part 52, Clean Water Assistance, of the Natural Resource and Environmental Protection Act, 1994, PA 451, as amended.

Table 31 2019 Budgeted Wastewater Operating Expenses & Adjustments

Operating Expense or Revenue	Budget
Wastewater Operating Expenses	\$237,299
Administrative Fee Revenue	\$145,163
Debt Service Fee Revenue	\$205,093
Reserve Fund Fee Revenue	\$116,130
Total Wastewater Revenue	\$466,386
GAP	\$0

It was identified by Baker Tilly that an approximate \$82.00/quarter increase in water and sewer rates would be adequate to support both Township operations and capital improvement and estimated debt service payments to pay for the developed CIP as part of a forecasting model they developed to aid the Township in financial planning.

Please refer to the Township 20-Year Cash Flow Analysis on the following pages, which provides total operating expenditures, net operating revenue, debt service payments due to the sale of potential bonds, cash and investments, and net cash flow.

Utilizing the digital version of the 20-Year Cash Flow Analysis, the Township will have the ability to continue updating their budget as well as run several different scenarios that can vary criteria such as rate increases, bonds, and cash balance payments to determine the best way to fund their CIP Projects over the 20-Year planning period.

WHITE LAKE TOWNSHIP (MICHIGAN) SEWER FUND

CASH FLOW ANALYSIS - SEWER

	2019	Increase Per Year	2020	2021	2022	2023	2024	2025	2026	2027	2028
<b>Assumptions</b>											
Admin fee - REUs	3,040.17		3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17
Admin fee (quarterly)[1]	\$12.50	0.00%	\$12.50	\$12.50	\$12.50	\$12.50	\$12.50	\$12.50	\$12.50	\$12.50	\$12.50
Debt service fee - REUs	3,040.17		3,040.17	3,040.17	3,040.17	0.00	0.00	0.00	0.00	0.00	0.00
Debt service fee (quarterly)[1][3]	\$18.00	0.00%	\$18.00	\$18.00	\$18.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Reserve fund fee - REUs	3,040.17		3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17
Reserve fund fee (quarterly)[1][3]	\$10.00	0.00%	\$10.00	\$10.00	\$10.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00
OC charges - REUs	3,040.17		3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17
OC charges (quarterly)	\$128.38		\$128.38	\$128.38	\$128.38	\$128.38	\$128.38	\$128.38	\$128.38	\$128.38	\$128.38
OC reserve charges - REUs	3,040.17		3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17
OC reserve charges (quarterly)	\$4.36		\$4.36	\$4.36	\$4.36	\$4.36	\$4.36	\$4.36	\$4.36	\$4.36	\$4.36
<i>Typical Township homeowner's quarterly bill</i>	<i>\$168.88</i>		<i>\$168.88</i>	<i>\$168.88</i>	<i>\$168.88</i>	<i>\$168.88</i>	<i>\$168.88</i>	<i>\$168.88</i>	<i>\$168.88</i>	<i>\$168.88</i>	<i>\$168.88</i>
<b>Township Revenues</b>											
Admin fee	\$152,009		\$152,009	\$152,009	\$152,009	\$152,009	\$152,009	\$152,009	\$152,009	\$152,009	\$152,009
Debt service fee	218,892		218,892	218,892	218,892	-	-	-	-	-	-
Reserve fund fee	121,607		121,607	121,607	121,607	340,499	340,499	340,499	340,499	340,499	340,499
Total revenues	492,508		492,508	492,508	492,508	492,508	492,508	492,508	492,508	492,508	492,508
Less: Total operating expenditures	(225,250)		(255,000)	(260,100)	(270,608)	(276,020)	(281,541)	(287,171)	(292,915)	(298,773)	(304,749)
Net operating revenue	267,258		237,508	232,408	221,900	216,487	210,967	205,336	199,593	193,734	187,759
Less: Current Pontiac Lake debt debt service payments	(272,875)		(271,563)	(275,063)	(273,375)	-	-	-	-	-	-
Estimated cash funded Township O&M capital expenditures	-		(41,000)	(61,160)	(41,320)	(41,320)	(41,320)	(41,320)	(41,320)	(41,320)	(41,320)
Estimated cash funded Pumping station capital expenditures	-		(365,800)	(32,500)	-	(20,000)	-	(590,000)	-	-	(75,000)
Estimated cash funded Main & Manhole capital expenditures	-		(319,797)	(635,556)	(629,531)	(620,969)	(499,864)	(750,419)	(232,935)	(1,080,941)	(544,751)
Net cash flow	(\$5,617)		(\$760,652)	(\$771,871)	(\$722,327)	(\$465,802)	(\$330,217)	(\$1,176,403)	(\$74,662)	(\$928,527)	(\$475,312)
<i>Cash &amp; investments</i>	<i>\$1,186,019</i>		<i>\$425,367</i>	<i>(\$346,504)</i>	<i>(\$1,068,850)</i>	<i>(\$1,534,632)</i>	<i>(\$1,864,849)</i>	<i>(\$3,041,252)</i>	<i>(\$3,115,914)</i>	<i>(\$4,044,441)</i>	<i>(\$4,517,753)</i>
<b>Annual Revenue Requirement Summary</b>											
Total estimated operating expenses, debt and capital improvements [2]			1,253,160	\$1,264,379	\$1,214,834	\$958,309	\$822,725	\$1,668,910	\$567,170	\$1,421,034	\$965,820
Current annual rate [1][3]			\$40.50	\$40.50	\$40.50	\$40.50	\$40.50	\$40.50	\$40.50	\$40.50	\$40.50
Annual rate needed to fund expenses, capital improvements and debt			\$103.05	\$103.97	\$99.90	\$78.80	\$67.65	\$137.24	\$46.64	\$116.85	\$79.42
Estimated shortage in rates			(\$62.55)	(\$63.47)	(\$59.40)	(\$38.30)	(\$27.15)	(\$96.74)	(\$6.14)	(\$76.35)	(\$38.92)
Total estimated cash funded capital improvements			\$726,597	\$729,216	\$670,851	\$682,289	\$541,184	\$1,381,739	\$274,255	\$1,122,261	\$661,071
Annual rate needed to fund capital improvements only			\$59.75	\$59.97	\$55.17	\$56.11	\$44.50	\$113.62	\$22.55	\$92.29	\$54.36
Average annual rate needed to fund capital improvements only			\$62.03	\$62.03	\$62.03	\$62.03	\$62.03	\$62.03	\$62.03	\$62.03	\$62.03

[1] Current annual rate is equal to the cumulative Admin, Debt Service and Reserve Fund fees

[2] Includes Township total operating expenses, Pontiac Lake debt service payments and estimated cash funded capital expenditures

[3] Assumes \$18 debt service fee is added into reserve fund fee after defeasance of Pontiac Lake debt in 2022



WHITE LAKE TOWNSHIP (MICHIGAN) SEWER FUND

(Continued)

CASH FLOW ANALYSIS - SEWER

		2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039
	<b>Increases Per Year</b>											
Assumptions												
Admin fee - REUs		3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17
Admin fee (quarterly) [1]	0.00%	\$12.50	\$12.50	\$12.50	\$12.50	\$12.50	\$12.50	\$12.50	\$12.50	\$12.50	\$12.50	\$12.50
Debt service fee - REUs		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Debt service fee (quarterly) [1][3]	0.00%	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Reserve fund fee - REUs		3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17
Reserve fund fee (quarterly) [1][3]	0.00%	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00
OC charges - REUs		3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17
OC charges (quarterly)	0.00%	\$128.38	\$128.38	\$128.38	\$128.38	\$128.38	\$128.38	\$128.38	\$128.38	\$128.38	\$128.38	\$128.38
OC reserve charges - REUs		3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17
OC reserve charges (quarterly)	0.00%	\$4.36	\$4.36	\$4.36	\$4.36	\$4.36	\$4.36	\$4.36	\$4.36	\$4.36	\$4.36	\$4.36
<i>Typical Township homeowner's quarterly bill</i>												
Township Revenues												
Admin fee		\$152,009	\$152,009	\$152,009	\$152,009	\$152,009	\$152,009	\$152,009	\$152,009	\$152,009	\$152,009	\$152,009
Debt service fee		-	-	-	-	-	-	-	-	-	-	-
Reserve fund fee		340,499	340,499	340,499	340,499	340,499	340,499	340,499	340,499	340,499	340,499	340,499
Total revenues		492,508	492,508	492,508	492,508	492,508	492,508	492,508	492,508	492,508	492,508	492,508
Less: Total operating expenditures		(310,844)	(317,060)	(323,402)	(329,870)	(336,467)	(343,196)	(350,060)	(357,062)	(364,203)	(371,487)	(378,917)
Net operating revenue		181,664	175,447	169,106	162,638	156,040	149,311	142,447	135,446	128,305	121,021	113,591
Less: Current Pontiac Lake debt debt service payments		-	-	-	-	-	-	-	-	-	-	-
Estimated cash funded Township O&M capital expenditures		(41,320)	(41,320)	(41,320)	(41,320)	(41,320)	(41,320)	(41,320)	(41,320)	(41,320)	(41,320)	(41,320)
Estimated cash funded Pumping station capital expenditures		-	(20,000)	(138,000)	(358,000)	(30,000)	(30,000)	(88,000)	-	(205,000)	(20,000)	-
Estimated cash funded Main & Manhole capital expenditures		(681,766)	(900,758)	(871,815)	(802,179)	(1,013,213)	(801,573)	(929,971)	(1,017,119)	(909,924)	(1,174,548)	(903,622)
Net cash flow		(\$541,422)	(\$786,631)	(\$882,029)	(\$1,038,861)	(\$928,493)	(\$723,582)	(\$916,844)	(\$922,993)	(\$1,027,939)	(\$1,114,847)	(\$831,351)
Cash & investments		(\$5,059,175)	(\$5,845,806)	(\$6,727,835)	(\$7,766,696)	(\$8,695,189)	(\$9,418,771)	(\$10,335,614)	(\$11,258,607)	(\$12,286,547)	(\$13,401,394)	(\$14,232,745)
<b>Annual Revenue Requirement Summary</b>												
Total estimated operating expenses, debt and capital improvements [2]		1,033,930	1,279,138	1,374,537	1,531,369	1,421,000	1,216,089	1,409,351	1,415,501	1,520,447	1,607,555	1,323,859
Current annual rate [1][3]		\$40.50	\$40.50	\$40.50	\$40.50	\$40.50	\$40.50	\$40.50	\$40.50	\$40.50	\$40.50	\$40.50
Annual rate needed to fund expenses, capital improvements and debt		\$85.02	\$105.19	\$113.03	\$125.93	\$116.85	\$100.00	\$115.89	\$116.40	\$125.03	\$132.18	\$108.86
Estimated shortage in rates		(\$44.52)	(\$64.69)	(\$72.53)	(\$85.43)	(\$76.35)	(\$59.50)	(\$75.39)	(\$75.90)	(\$84.53)	(\$91.69)	(\$68.66)
Total estimated cash funded capital improvements		\$723,086	\$962,078	\$1,051,135	\$1,201,499	\$1,084,533	\$872,893	\$1,059,291	\$1,058,439	\$1,156,244	\$1,235,868	\$944,942
Annual rate needed to fund capital improvements only		\$59.46	\$79.11	\$86.44	\$98.80	\$89.18	\$71.78	\$87.11	\$87.04	\$95.08	\$101.63	\$77.70
Average annual rate needed to fund capital improvements only		\$84.85	\$84.85	\$84.85	\$84.85	\$84.85	\$84.85	\$84.85	\$84.85	\$84.85	\$84.85	\$84.85

[1] Current annual rate is equal to the cumulative Admin, Debt Service and Reserve Fund fees  
 [2] Includes Township total operating expenses, Pontiac Lake debt service payments and estimated cash funded capital expenditures  
 [3] Assumes \$18 debt service fee is added into reserve fund fee after defeasance of Pontiac Lake debt in 2022

### INTRODUCTION

Using the information obtained during the SAW grant asset inventory and assessment phases, a recommended CIP for the twenty (20) year planning period was developed to identify and outline cost and timelines related to the repair and replacement of sewer main and manholes to ensure reliable operation of the wastewater collection system and to meet new and existing LOS goals.

A large and recurring cost component of the annual budget costs for the wastewater collection system CIP are related to O&M. As part of the proposed CIP, it is recommended that the entire wastewater collection system be cleaned and televised, at least once, over the twenty (20) year WWAMP planning period.

It is also understood that the Township will be utilizing the CIP to coordinate both water and sewer infrastructure repair and replacement for the entire Township throughout the twenty (20) year planning period. FOG inspections and hydrogen sulfide improvements are also anticipated to continue to improve the longevity of the Township infrastructure. Continuing coordination with WRC is vital to allow for the most efficient use of Township funds and to minimize disruption to residents and businesses. As the Township wastewater collection system infrastructure is inspected over the twenty (20) year planning period, this information should be updated into the GIS and evaluated to further enhance CIP planning and coordination.

### METHODOLOGY

A recommended CIP strategy was developed that outlines O&M, repairs, replacement and rehabilitation of sewer main and manholes for the twenty (20) year planning period. Individual project cost information was determined using recent similar project bid tabulations and local project cost information. A description of each asset and suggested year for potential improvement implementation was developed using the BRE, historical knowledge of the assets, and input from Township staff. The timing of the capital improvements was based on the scored BRE and budgetary constraints.

### PROJECT TYPES

Wastewater System CIP project categories include:

1. Sewer main (pressure and gravity) repair and replacement;
2. Manhole repair and replacement;
3. Annual sewer main cleaning and inspection (system O&M);
4. Odor control;
5. Pumping Station improvements;
6. Annual FOG inspections; and
6. Twenty (20) year CIP summary.

## **SEWER MAIN REPAIR & REPLACEMENT**

Sewer main CIP repair projects have been developed and are presented in this section.

The wastewater collection system was scored based on a variety of factors to help determine locations where the Township should concentrate efforts. Sewer main that resulted in a BRE score of over 16 were deemed to be the most critical for inspection. Rehabilitative or replacement methods were then analyzed to estimate the costs of correcting identified sewer main deficiencies. Costs for rehabilitating sewer main were estimated using full length and sectional cured-in-place (FCIPP/SCIPP) sewer main lining. Rehabilitation of sewer main O&M defects such as blockages and leaks at sewer main joints were not able to be estimated at this time.

Fourteen (14) sewer main segments fall into the critical range (16.0 to 25.0). An additional forty-six (46) segments fall into the high risk range (10.0-15.9). Sewer main BRE scores were utilized to establish the timing of sewer main repairs with the highest BRE scores being prioritized for rehabilitation first. Sewer mains with lower BRE scores are also grouped according to rehab method and addressed as budgetary considerations in the twenty (20) year planning period. Sewer main with a BRE score of 16.0 or higher is scheduled to be rehabilitated first. Table 32 lists the length of sewer main recommended for rehabilitation in the twenty (20) year planning period by rehab method for each budgetary year.

Table 32 Estimated Sewer Main Length & CIP Year

CIP Year	Gravity Sewer Main Length (Ft)	Estimated Cost		CIP Year	Pressure Sewer Main Length (Ft)	Estimated Cost
2020	1,273.9	\$298,213		2020	0.0	\$0
2021	1,332.6	\$307,070		2021	1,421.4	\$276,308
2022	1,010.2	\$366,409		2022	1,421.4	\$276,308
2023	1,441.6	\$343,257		2023	1,119.7	\$223,934
2024	1,608.5	\$406,385		2024	1,127.1	\$225,424
2025	1,373.3	\$357,229		2025	461.0	\$92,194
2026	1,802.5	\$426,629		2026	2,268.1	\$340,704
2027	1,963.7	\$350,481		2027	0.0	\$0
2028	2,286.7	\$570,617		2028	935.6	\$446,941
2029	1,863.0	\$426,230		2029	69.6	\$10,436
2030	4,879.3	\$423,210		2030	554.3	\$266,052
2031	4,994.8	\$478,029		2031	1,024.1	\$307,276
2032	5,910.4	\$607,625		2032	1,083.9	\$335,996
2033	5,425.4	\$549,631		2033	569.5	\$273,373
2034	5,773.4	\$575,487		2034	1,759.8	\$388,199
2035	5,946.4	\$566,931		2035	2,501.5	\$278,230
2036	7,995.3	\$648,156		2036	1,568.6	\$287,135
2037	7,692.3	\$618,510		2037	2,145.4	\$317,518
2038	9,101.1	\$671,128		2038	1,525.2	\$304,927
2039	9,806.1	\$538,831		2039	2,414.7	\$357,647
<b>Total</b>	<b>83,480.7</b>	<b>\$9,530,057</b>		<b>Total</b>	<b>23,436.7</b>	<b>\$4,909,746</b>

Figures 33 and 34 identify the proposed sewer main rehabilitation locations by year as identified in Table 23.

Figure 33 Proposed Gravity Main Rehabilitation Locations By Year, 2020-2039

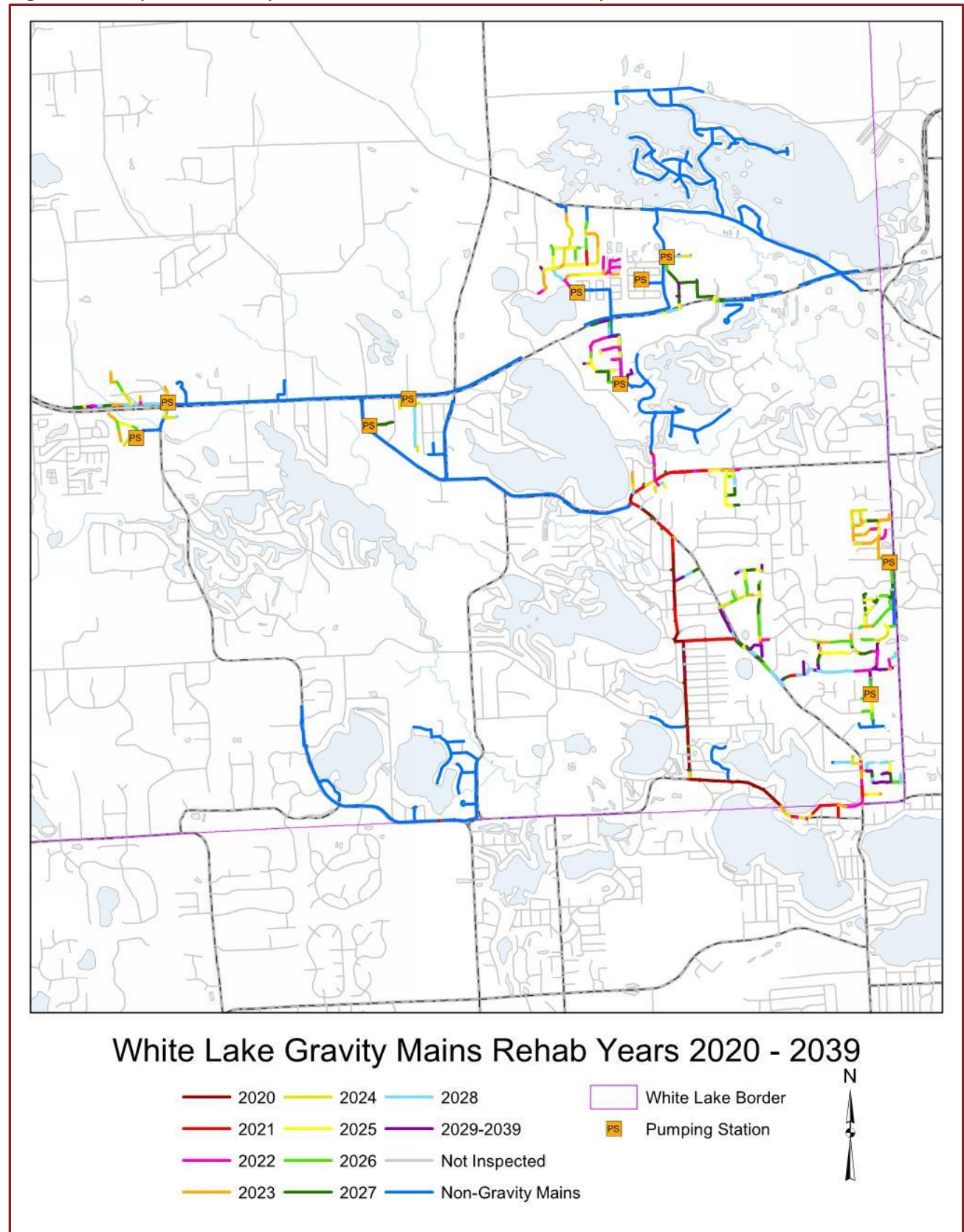
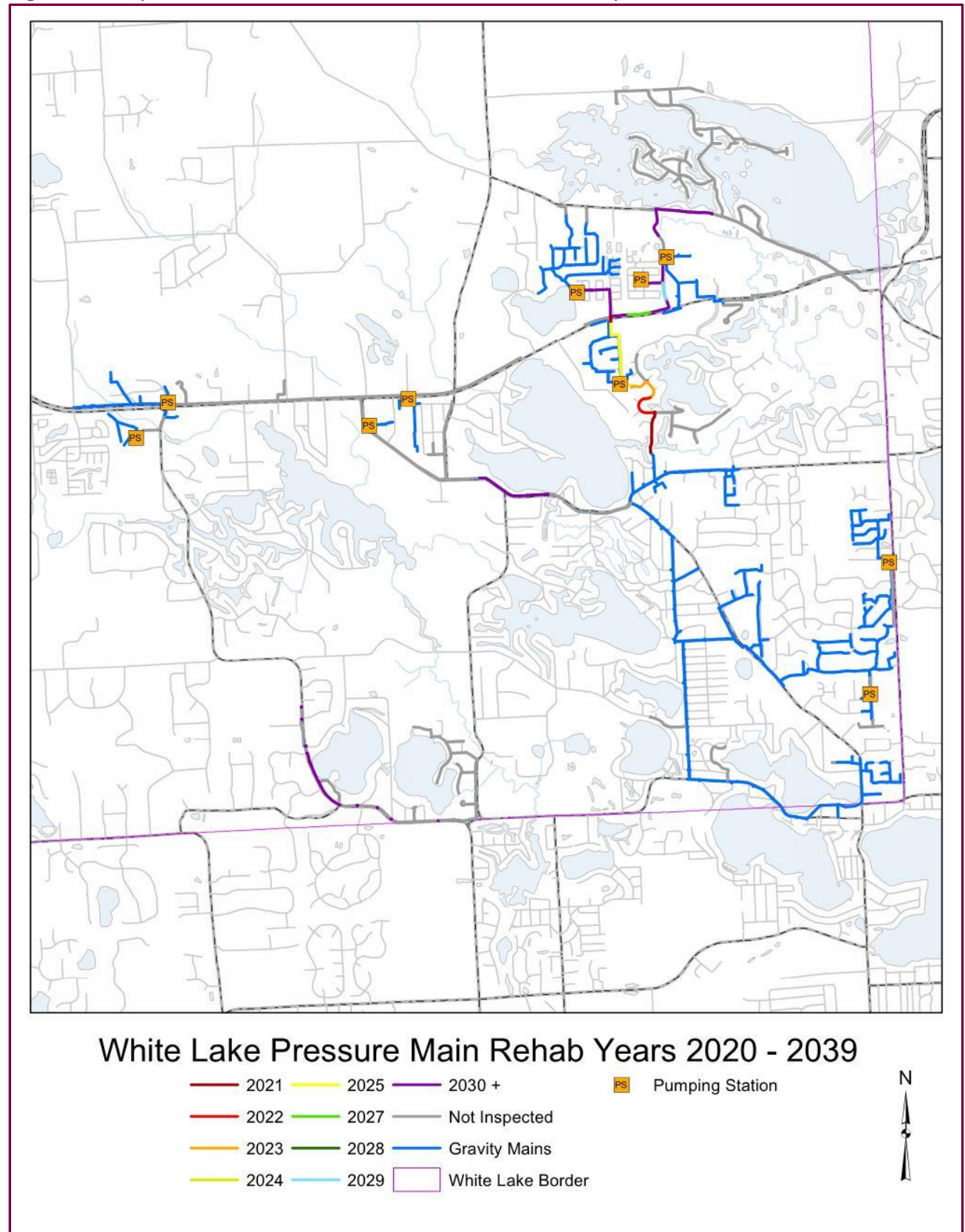


Figure 34 Proposed Pressure Main Rehabilitation Locations By Year, 2020-2039



## **MANHOLE REPAIR & REPLACEMENT**

Manhole CIP repair projects have been developed and are presented in this section.

The wastewater collection system was scored based on a variety of factors to help determine the locations where the Township should concentrate their efforts. Manholes that resulted in a BRE score of over 16 were deemed to be the most critical for inspection. Rehabilitative or replacement methods were then analyzed to estimate the costs of correcting identified sewer main deficiencies. Cured-in-place (CIPP) lining rehabilitation costs were applied to manholes who were found to have many or severe defects or structural damage, whose structural condition ratings were greater than or equal to three (3). Grouting rehabilitation costs were applied to manholes who were found with relatively few defects, whose structural condition was less than or equal to two (2).

Ten (10) manholes were rated high risk (10.0 – 15.9) and fourteen (14) sewer main segments falling into the critical range (16.0 to 25.0). Manhole BRE scores were utilized to establish the timing of manhole repairs with the highest BRE scores being prioritized for rehabilitation first. Manholes with lower BRE scores are addressed as budgetary considerations in the twenty (20) year planning period. Manholes with a BRE score of 16.0 or higher is scheduled to be rehabilitated first. Figures 35 and 36 identifies the manholes recommended for rehabilitation in the twenty (20) year planning period for each budgetary year.

Figure 35 Proposed Gravity Manhole Rehabilitation Locations By Year, 2020-2029

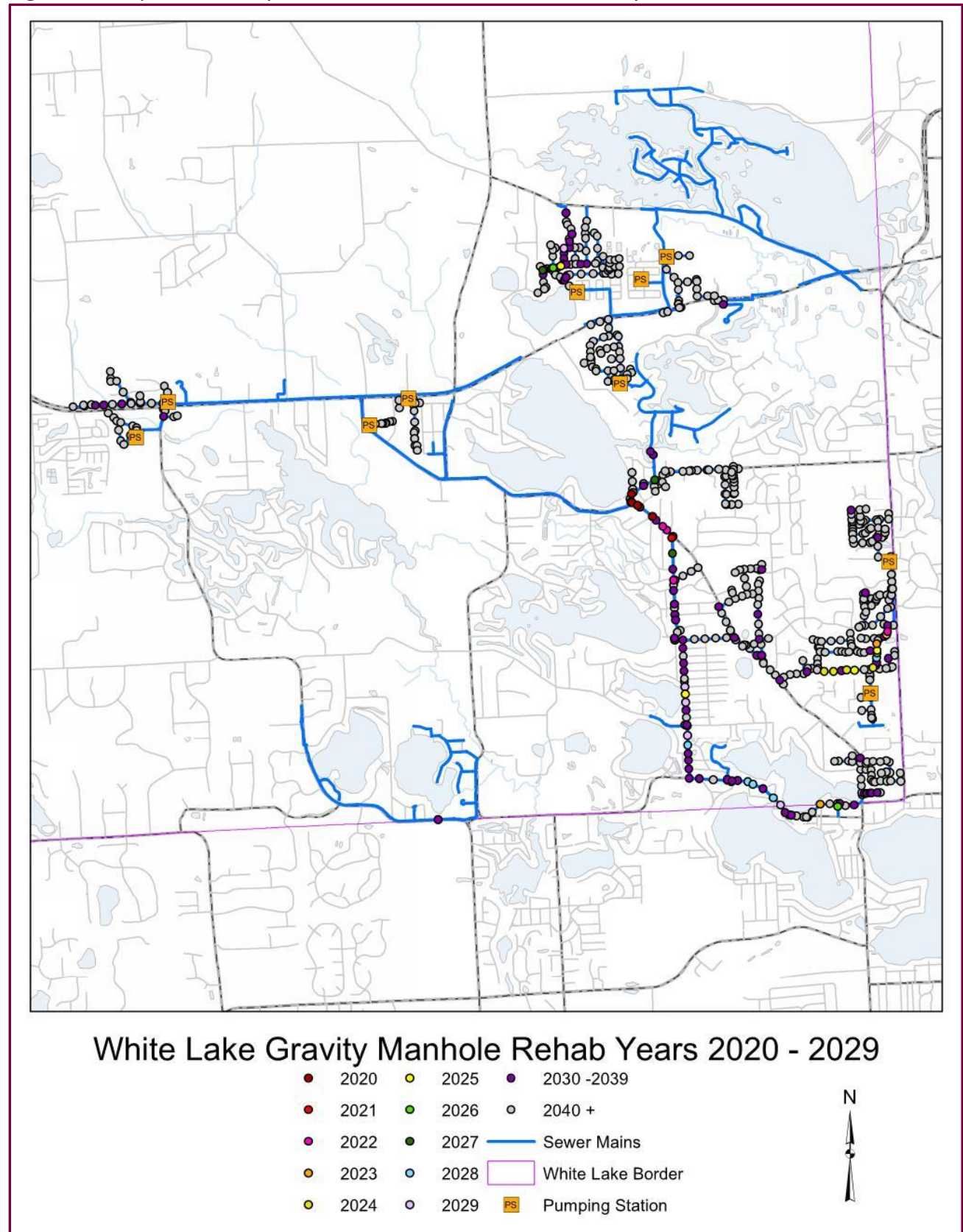




Figure 36 Proposed Gravity Manhole Rehabilitation Locations By Year, 2030-2039

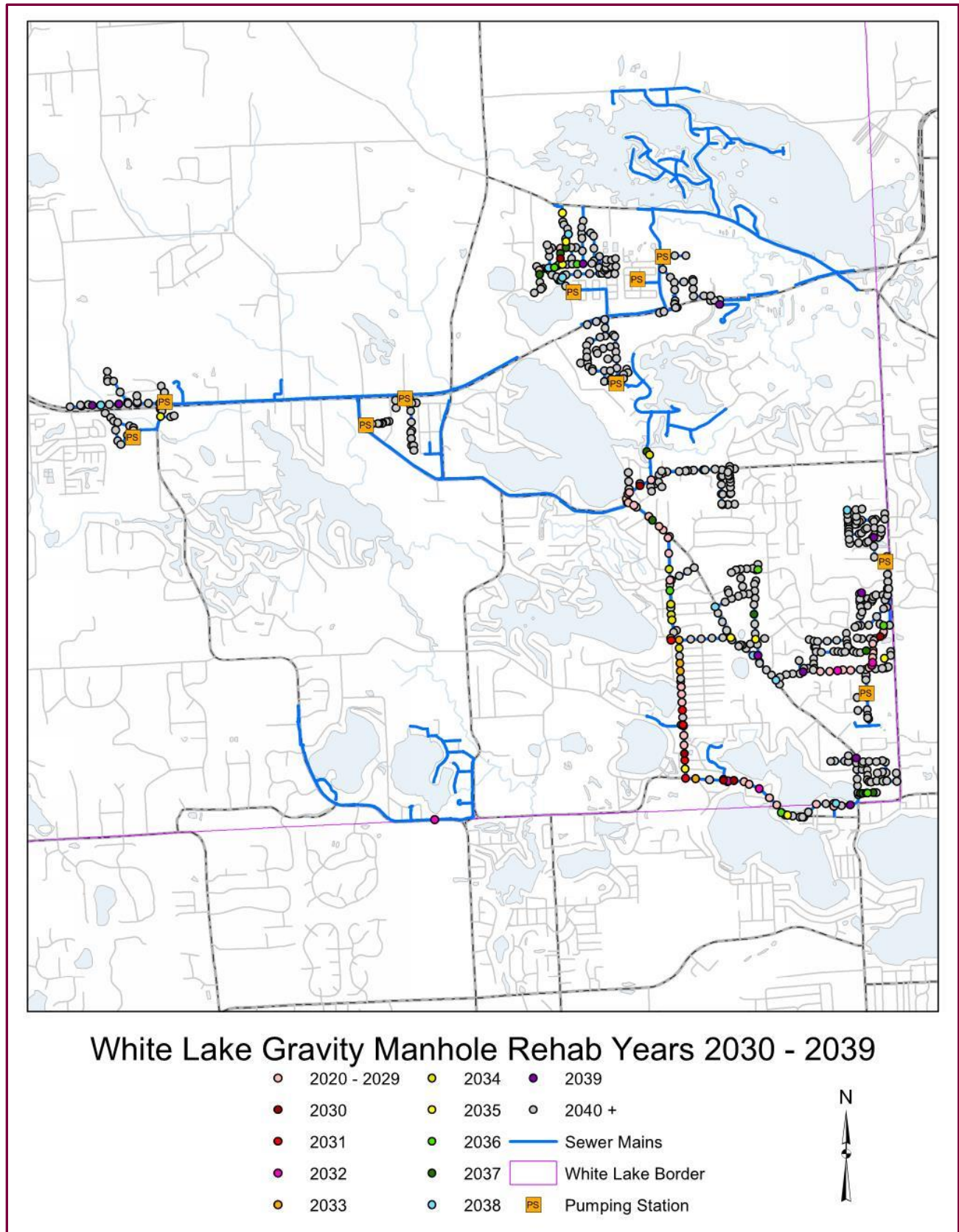


Figure 37 Proposed Pressure Manhole Rehabilitation Locations By Year, 2020-2029

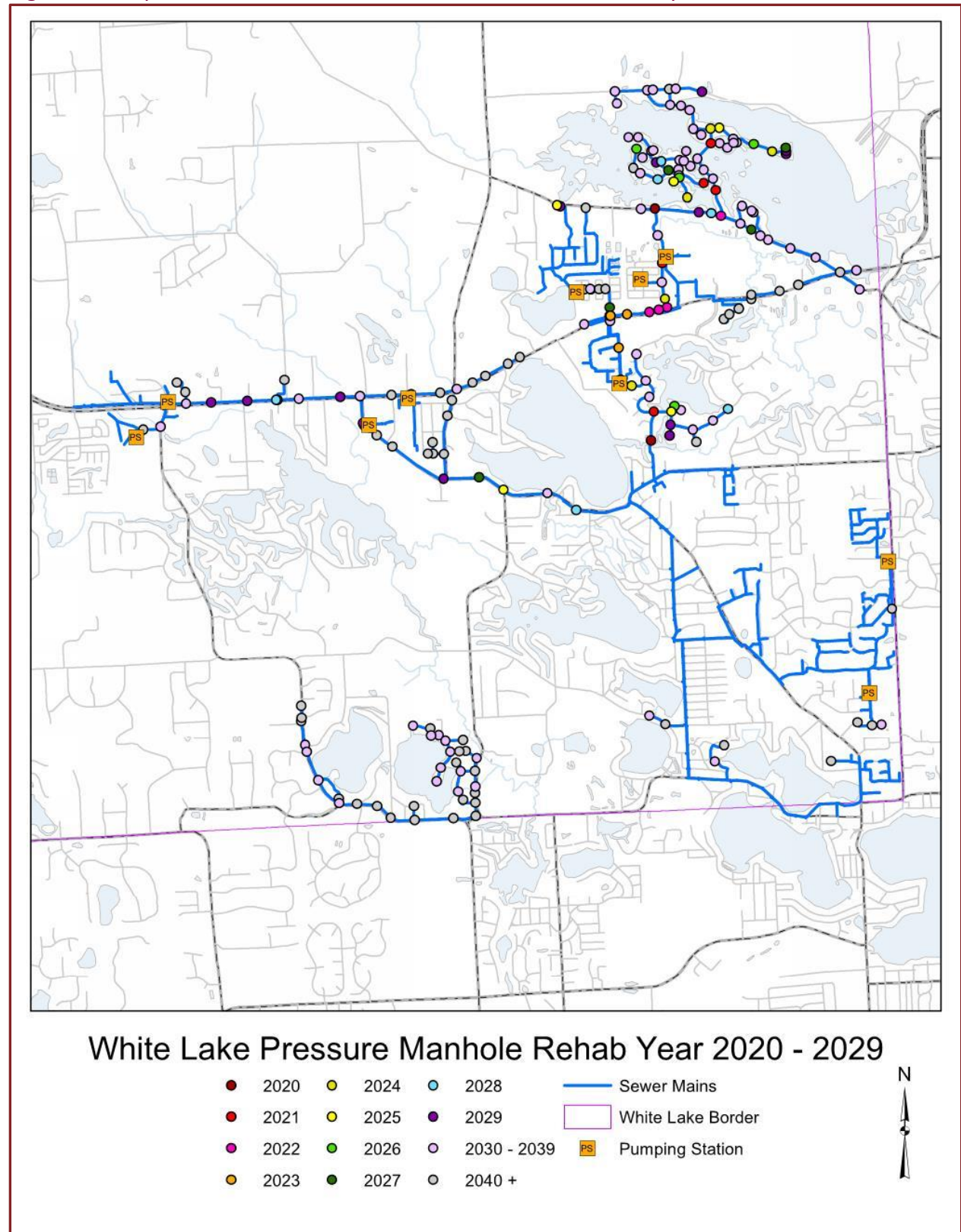
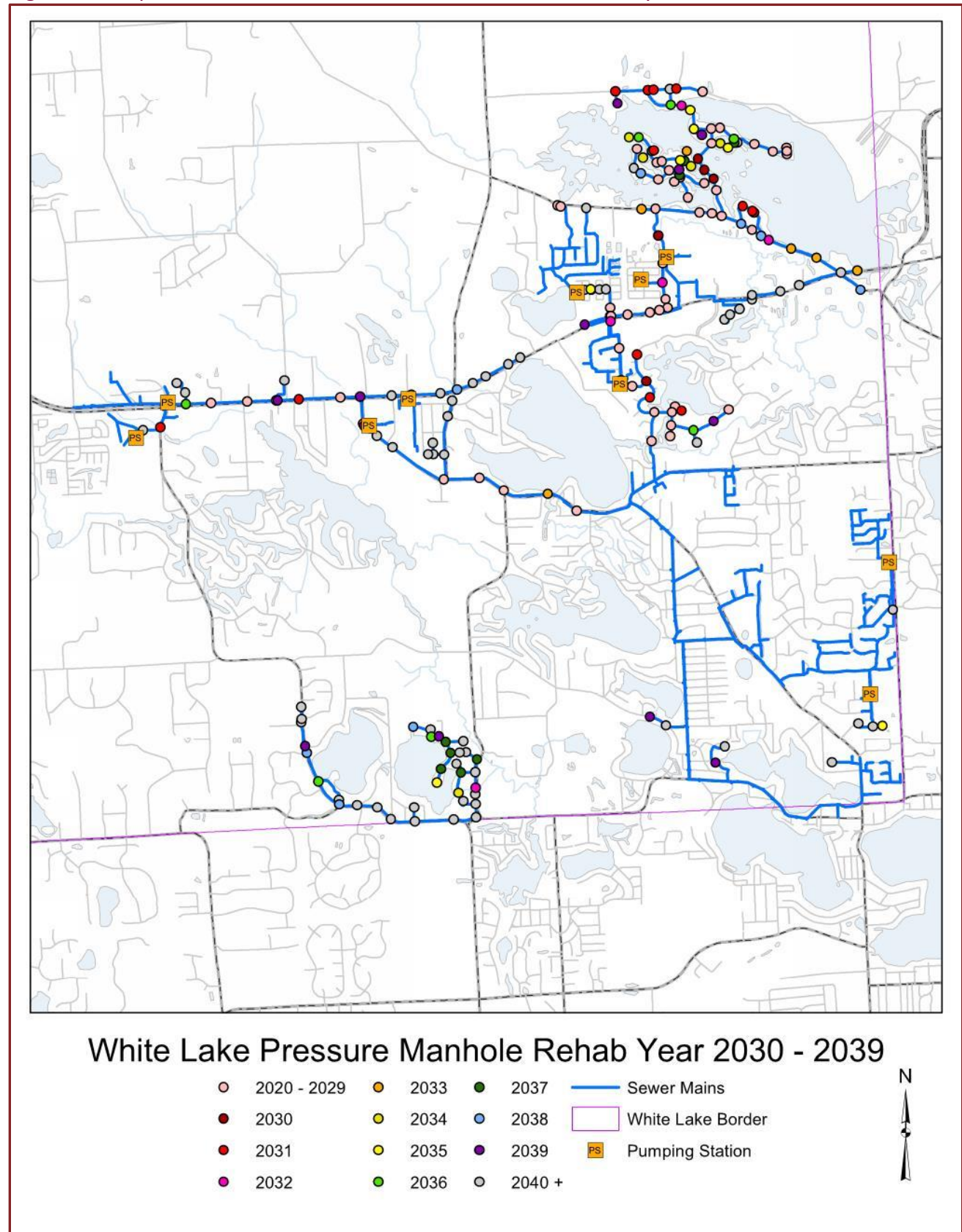


Figure 38 Proposed Pressure Manhole Rehabilitation Locations By Year, 2030-2039



## **ANNUAL SEWER MAIN CLEANING & INSPECTION (SYSTEM O&M)**

Until recent years, WRC has historically taken a reactive approach related to the O&M of White Lake Township's wastewater collection system. This has resulted in deterioration of the wastewater collection system where substantial expenditures over the planning period are required ensure reliable operations. Through the development and implementation of the WWAMP, future O&M strategies can be modified and developed that include:

- Better record keeping of infrastructure repairs and rehabilitation;
- FOG program development and implementation to reduce overall O&M costs;
- CCTV of the entire sewer main system;
- GIS updates of the system when updated information becomes available including repairs, rehabilitations, new infrastructure and retired infrastructure; and
- Continued efforts to reduce hydrogen sulfide in the wastewater system.

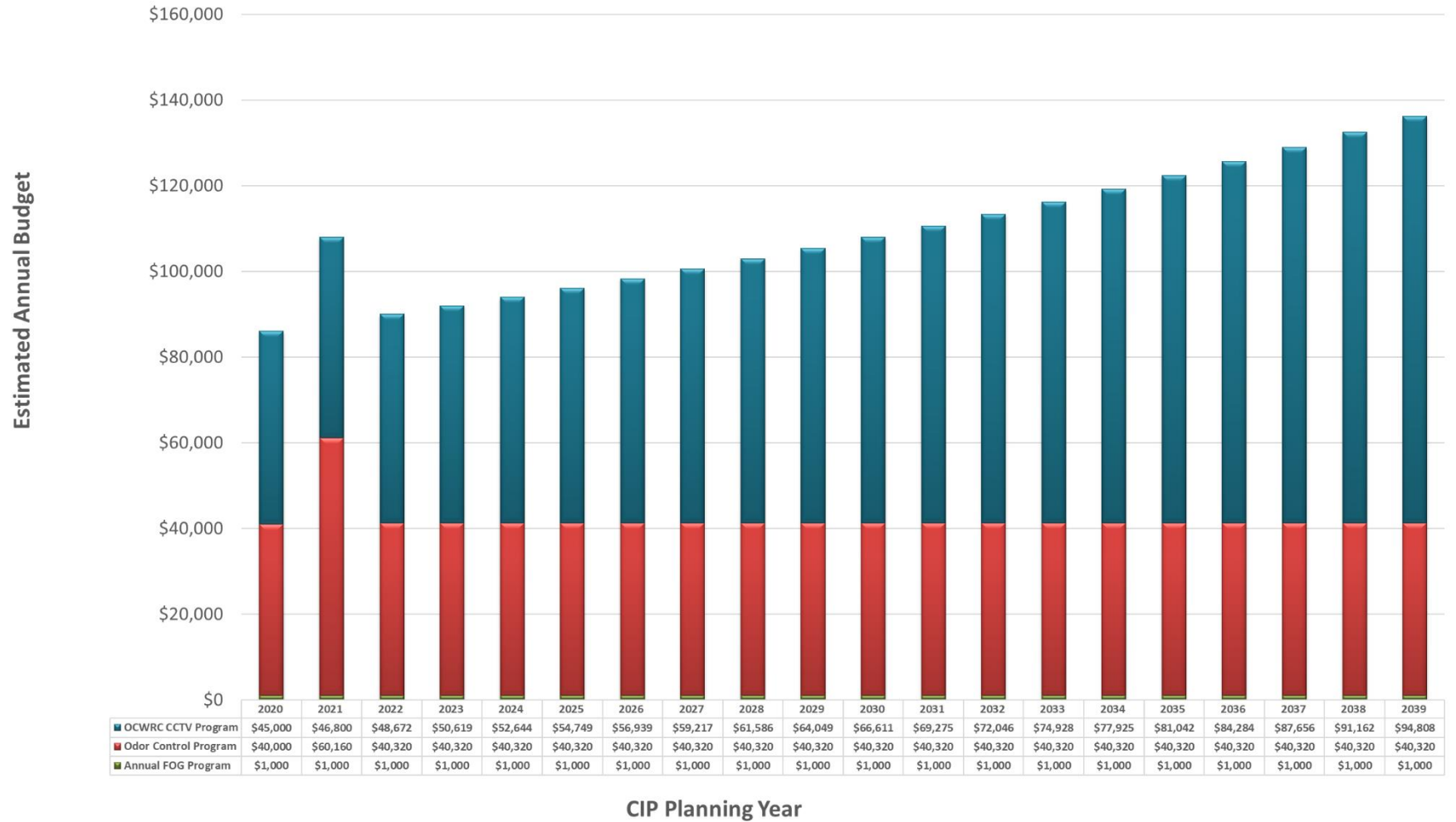
To meet defined LOS goals, WRC will need to implement routine sewer main cleaning and inspection procedures over the twenty (20) year planning period and beyond. This will help to ensure more consistent and reliable wastewater collection system operations including reduced sewer backups due to plugged or other sewer main deficiencies. The CIP Project Plan calls for cleaning and inspecting all the Township's sewer mains over the next twenty (20) years, of which, none were inspected during the SAW project. Sewer main with the highest BRE scores should be prioritized to be repaired or replaced as they are identified, and the CIP Project Plan updated to accommodate them. Figure 24 outlines sewer main to be inspected with estimated BRE scores based on data obtained from the SAW project assessment effort. Budget estimates for this activity were based on an inspection and cleaning cost as shown in Table 33 with a total average annual budget allocation of \$45,000 to \$94,808 over the 20-year period. Once the sewer main inspection program begins to mature, it is recommended that previous higher scored BRE sewer main, that hasn't been repaired or replaced, be scheduled to be inspected first during the re-inspection.

Table 33 Sewer Main Cleaning & Inspection System O&M Budgets

Pipe Size	Clean Unit Price (\$/LF)	CCTV Unit Price (\$/LF)	Clean & CCTV Unit Price
2	\$3.00	\$1.50	\$4.50
3	\$3.00	\$1.50	\$4.50
4	\$3.00	\$1.50	\$4.50
6	\$3.00	\$1.50	\$4.50
8	\$3.00	\$1.50	\$4.50
10	\$3.00	\$1.50	\$4.50
12	\$3.00	\$1.50	\$4.50
16	\$3.00	\$1.50	\$4.50
24	\$3.00	\$1.50	\$4.50
30	\$3.00	\$1.50	\$4.50

Figure 37 outlines annual O&M costs over the twenty (20) year planning period.

Figure 39 Sewer Main & Manhole Operation & Maintenance Costs/Year



## TWENTY (20) YEAR CIP SUMMARY

Table 34 outlines the annual recommended CIP budget estimates for sewer main, manholes, and O&M project categories of the WWAMP. The table includes BRE scoring priorities for the various CIP project and O&M activities over the twenty (20) year planning period. CIP BRE based budget estimates are grouped by multiple budget years with critical and high-risk items addressed in CIP years 1-5 and medium to low risk items budgeted in years 6-20.

Table 34 Recommended Wastewater System CIP Schedule & Costs

Wastewater Capital Improvement Project Description	Business Risk Evaluation Score				Total over 5 years	Total over 20 years
	Year 1-3	Year 4-5	Year 6-10	Year 11-20		
	2020-2022	2023-2024	2025-2029	2030-2039		
Pumping Station Projects	\$398,300	\$20,000	\$665,000	\$889,000	\$419,000	\$1,973,000
Gravity Manhole Repairs	\$46,071	\$29,843	\$102,592	\$264,750	\$76,000	\$444,000
Gravity Main Repairs	\$971,692	\$749,642	\$2,131,185	\$5,677,537	\$1,722,000	\$9,531,000
Pressure Main Replacement	\$500,242	\$317,618	\$1,064,134	\$3,027,751	\$818,000	\$4,910,000
Pressure Manhole Repairs	\$30,600	\$22,950	\$65,250	\$178,800	\$54,000	\$298,000
CIP Project Total	\$1,946,905	\$1,140,053	\$4,028,161	\$10,037,839	\$3,087,000	\$17,153,000
System O&M Total	\$144,000	\$83,000	\$207,000	\$414,000	\$227,000	\$848,000
Odor Control Program	\$140,480	\$80,640	\$201,600	\$403,200	\$221,120	\$825,920
FOG Program	\$3,000	\$2,000	\$5,000	\$10,000	\$5,000	\$20,000
OCWRC Contributions	\$140,472	\$103,263	\$296,540	\$799,739	\$243,735	\$1,340,014
<b>Wastewater System Totals CIP and O&amp;M</b>	<b>\$2,232,000</b>	<b>\$1,327,000</b>	<b>\$4,532,000</b>	<b>\$11,252,000</b>	<b>\$3,560,000</b>	<b>\$19,341,010</b>

A White Lake Township capital improvement costs per year summary is shown in Figure 38.

Figure 40 Capital Improvement Project Costs/Year

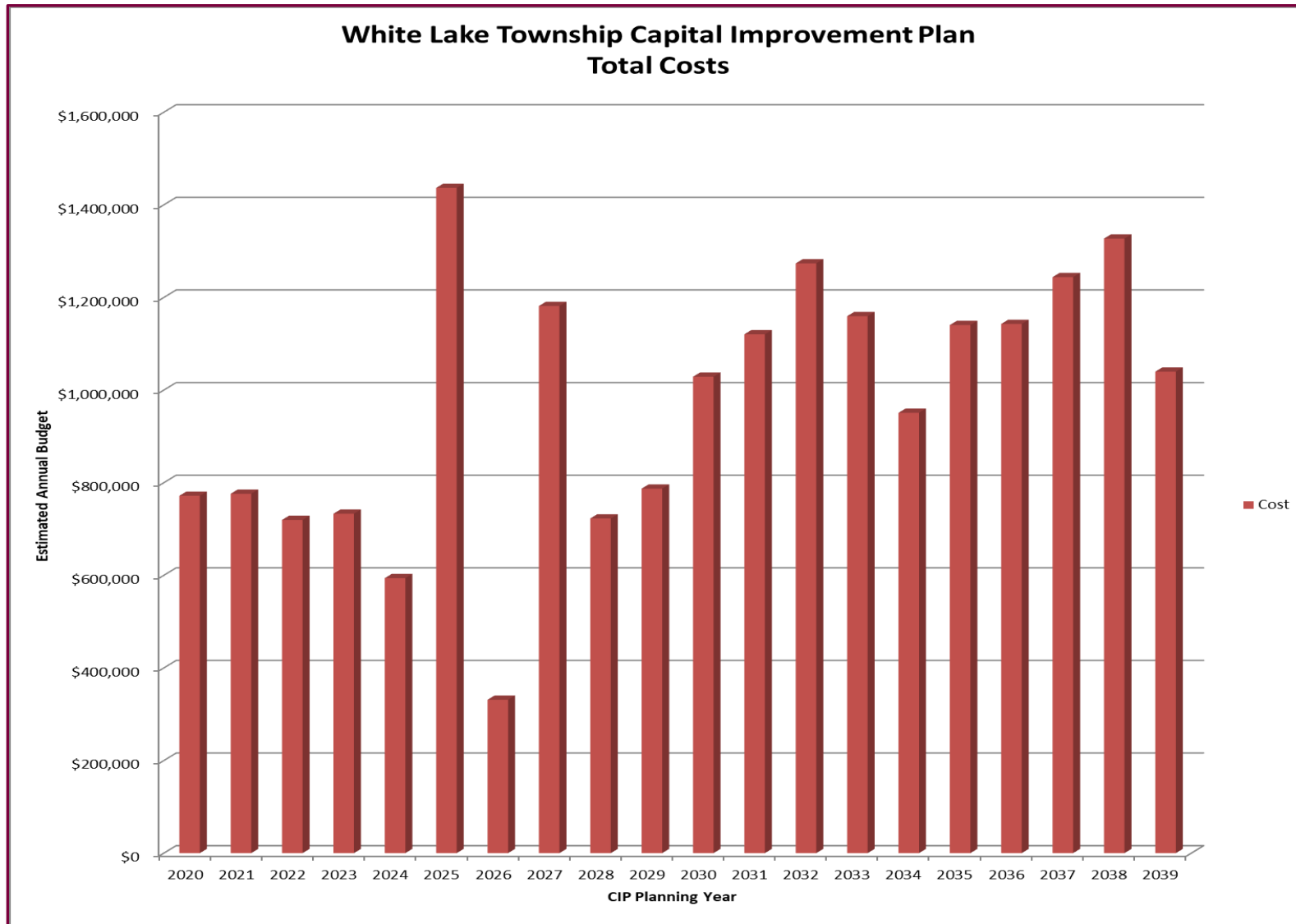




Table 35 outlines total CIP cost summaries per year as taken from Figure 28.

**Table 35 Capital Improvement Project Costs/Year**

<b>Year</b>	<b>Cost</b>		<b>Year</b>	<b>Cost</b>
2020 - 1	\$771,597		2030 - 11	\$1,028,689
2021 - 2	\$776,016		2031 - 12	\$1,120,411
2022 - 3	\$719,523		2032 - 13	\$1,273,545
2023 - 4	\$732,908		2033 - 14	\$1,159,461
2024 - 5	\$593,828		2034 - 15	\$950,819
2025 - 6	\$1,436,488		2035 - 16	\$1,140,333
2026 - 7	\$331,194		2036 - 17	\$1,142,723
2027 - 8	\$1,181,478		2037 - 18	\$1,243,900
2028 - 9	\$722,657		2038 - 19	\$1,327,030
2029 - 10	\$787,135		2039 - 20	\$1,039,750

Appendix D outlines the comprehensive CIP project list identifying a project description with associated costs, annual cost allocations, and the CIP total budget over the twenty (20) year planning period.

## CONCLUSIONS & RECOMMENDATIONS

Projected wastewater collection system annual capital projects are over \$772,000 in 2020 and as high as \$1,419,628 in 2025, but primarily between \$719,000 and \$1,270,000 during the twenty (20) year WWAMP planning period. It must be pointed out that the CIP funding outline over the twenty (20) year planning period does not include unforeseen infrastructure projects, emergencies or repairs and rehabilitations that will be needed as sewer main and manholes are inspected over the next twenty (20) years.

Annual O&M costs that are included in this report are annual maintenance activities that need to be performed every year. The list is not all inclusive and does not include other recurring annual expenses such as labor, retirement, insurance, administrative payments, power and other expenses as outlined in the Township's Wastewater budget.

Annual maintenance activities in the WWAMP that are comprised of sewer main cleaning and inspection, odor control, and FOG, are expected to range from \$127,000 to \$177,000 annually. It is recommended that once the comprehensive financial review is reviewed by Township staff and the Board, the information be used to update the annual O&M expense projections over the twenty (20) year planning period.

As part of wastewater collection system revenue needs, it is recommended and a best management practice to review the sewer rates every 2-3 years to determine their ability to provide the necessary funding for sewer O&M and CIP. As these reviews are completed, the information can also be included in the O&M portion of the twenty (20) year planning period to provide an accurate and comprehensive single version of the truth on the Township's ability to operate and maintain the wastewater collection system.

### SUMMARY

The Township's WWAMP will provide a living and dynamic framework to provide the most cost effective, efficient and accountable wastewater collection system service to the community. It consists of five (5) main asset management components: Asset Inventory, Level of Service, Critical Assets, Revenue Structure, and the Capital Improvement Project Plan. The asset inventory and condition assessment were based on as-built information supplemented with field inspection, location and metering information. Three (3) LOS goal criteria levels including social, environmental and economic were developed to provide a framework to gauge program performance. Each level has identified service and goal criteria that can be improved upon. The BRE was based on the product of COF and POF scores, which include economic impacts, regulatory compliance, community disruption, operational condition and structural condition. A comprehensive twenty (20) year planning period CIP was developed to cost effectively provide needed wastewater system asset repair, replacement and O&M improvements.

The WWAMP also included the development of a comprehensive GIS that includes a geometric network of the wastewater collection system as well as asset attribute information including sewer main and manhole diameter, material, date of installation, rim and invert elevations, As-Built drawings, lead locations and photos. A Cityworks CMMS was also developed and implemented to schedule and track customer complaints as well as staff labor, equipment and material costs to perform the various operational and capital improvements completed on the wastewater collection system. The GIS and CMMS were also developed to be mobile enabling Township staff to utilize and interact with the information in the field through the use of laptops or other mobile devices including tablets and smart phones. These innovative implementations will provide Township staff and management with powerful cost tracking, scheduling and project development capabilities to allow continual updating of the CIP and efficient use of resources.

## **CONCLUSIONS**

The largest recurring component of the annual budget costs for the wastewater collection system CIP is gravity main repairs. It is recommended that the Township develop a comprehensive Infrastructure Management Plan (IMP) that encompasses coordinating water and sewer infrastructure repairs and replacements for the entire Township. Continuing coordination with WRC is needed to ensure efficiency. As the remaining portion of the Township wastewater collection system infrastructure is inspected over the twenty (20) year planning period, this information should also be implemented into the GIS and evaluated to further enhance CIP and wastewater asset planning and coordination.

The WRC intends to implement an annual sewer main cleaning and televising program. Therefore, funds should be allocated annually in the CIP for further CCTV inspection of the Township's wastewater collection system.

The asset inventory effort revealed that, overall, the Township's sewer main and sewer manholes are in fairly good condition, which intuitively makes sense, due to the young age of the infrastructure. There are a number of pumping station improvements that are needed in year 1 (2020), in addition to station rehabilitation and pump replacements over the twenty (20) year span. The CIP development has identified a range of recommended CIP improvements and O&M activities ranging from \$554,070 to \$1,419,628 annually. As the WWAMP is deployed and additional wastewater collection system inspection information is obtained and created, the Township's GIS and WWAMP can methodically be updated to modify CIP planning and O&M priorities over the twenty (20) year planning period and beyond.

## REFERENCES

Michigan Department of Environment, Great Lakes, and Energy - *Asset Management Guidance for Wastewater and Stormwater*: [http://www.michigan.gov/documents/deg/deg-ess-mfs-formsguidance-SRFassetmngmntguide\\_426745\\_7.pdf](http://www.michigan.gov/documents/deg/deg-ess-mfs-formsguidance-SRFassetmngmntguide_426745_7.pdf)

Michigan Department of Environment, Great Lakes, and Energy - *Asset Management Plan Workbook for Wastewater Utilities*: [http://www.michigan.gov/documents/deg/deg-ess-mfs-formsguidance-am-ww-sw\\_426763\\_7.xls](http://www.michigan.gov/documents/deg/deg-ess-mfs-formsguidance-am-ww-sw_426763_7.xls)

NASSCO. *Pipeline Assessment & Certification Program*. November 2010. <http://nassco.org>. Web

NASSCO. *Manhole Assessment & Certification Program*. November 2010. <http://nassco.org>. Web

NASSCO. *Lateral Assessment & Certification Program*. November 2010. <http://nassco.org>. Web

U.S. Census Bureau. *Population*. May 2018. <https://www.census.gov/topics/population.html>  
Web

## **WWAMP APPENDICES**

**Appendix A – SAW Grant Agreement**

**Appendix B – Level of Service Goals Table**

**Appendix C – 2 ½ Year Rate Methodology, Master Fee Schedule & Cash Flow Analysis**

**Appendix D – CIP & O&M Project Summary**

**Appendix E – Pumping Station Assessment Report**

**Appendix F – FOG Assessment Report**

**WWAMP APPENDIX A – SAW GRANT AGREEMENT**



## Michigan Finance Authority

### Stormwater, Asset Management, and Wastewater (SAW) GRANT AGREEMENT

This Grant Agreement ("Agreement") is made as of November 22, 2016, among the Michigan Department of Environmental Quality, Office of Drinking Water and Municipal Assistance (the "DEQ"), the Michigan Finance Authority (the "Authority") (the DEQ and the Authority are, collectively, the "State") and the Charter Township of White Lake, County of Oakland ("Grantee") in consideration for providing grant assistance to the Grantee.

The purpose of this Agreement is to provide funding for the project named below. The State is authorized to provide grant assistance pursuant to the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. Legislative appropriation of funds for grant disclosure is set forth in 2013 Public Act 59.

**The Grantee shall be required to repay the grant made under this Agreement (the "Grant"), within 90 days of being informed by the State to do so, under certain conditions, as set forth in Section XVIII. Program Specific Requirements: SAW Grant.**

Award of a Grant under this Agreement and completion of the activities identified in Exhibit A does not guarantee loan assistance from the State Revolving Fund, Strategic Water Quality Initiatives Fund, or Stormwater, Asset Management or Wastewater.

#### GRANTEE INFORMATION:

Gregory Baroni, Supervisor  
Name/Title of Authorized Representative  
7525 Highland Road  
Address  
White Lake, MI 48383  
Address  
248-698-3300  
Telephone number

#### GRANT INFORMATION:

Project Name: WW Asset Mgt Plan  
Project #: 1244-01  
Amount of Grant: \$ 513,463  
Amount of Match \$ 57,051  
Project \$ 570,514 (grant plus match)  
Start Date: 1/27/2013 End Date: 11/27/2019

#### DEQ REPRESENTATIVE:

Sonya T. Butler, Chief  
Name/Title  
525 West Allegan St., PO Box 30473  
Address  
Lansing, MI 48909-7973  
Address  
(517) 373-2161  
Telephone number  
Butlers2@michigan.gov  
E-mail address

#### AUTHORITY REPRESENTATIVE:

Mary G. Martin, Executive Director, MFA  
Name/Title  
430 W. Allegan St., Austin Building  
Address  
Lansing, MI 48922  
Address  
(517) 335-0994  
Telephone number  
treas\_bondfinance@michigan.gov  
E-mail

The individuals signing below certify by their signatures that they are authorized to sign this Grant Agreement on behalf of their respective parties, and that the parties will fulfill the terms of this Agreement, including the attached Exhibit A, and use this Grant only as set forth in this Agreement.

GRANTEE

Murray R. Baron  
Signature of Grantee

November 22, 2016  
Date

GREGORY R. BARON WHITE LAKE TWP. SUPERVISOR  
Name and title (typed or printed)

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

Sanya T. Buddles  
Its Authorized Officer

November 22, 2016  
Date

MICHIGAN FINANCE AUTHORITY

Mary H. Martin  
Its Authorized Officer

November 22, 2016  
Date

**I. PROJECT SCOPE**

This Agreement shall be in addition to any other contractual undertaking by the Grantee contained in the Resolution authorizing the Grant (the "Resolution").

This Agreement, including its exhibit(s), constitutes the entire agreement between the DEQ, the Authority, and the Grantee.

(A) The scope of this Grant is limited to the activities specified in Exhibit A (the "Project"), and such activities as are authorized by the State under this Agreement. Any change in project scope requires prior written approval in accordance with Section III, Changes, in this Agreement.

(B) By acceptance of this Agreement, the Grantee commits to complete the Project identified in Exhibit A within the time period allowed for in this Agreement and in accordance with the terms and conditions of this Agreement.

**II. AGREEMENT PERIOD**

This Agreement shall take effect on the date that it has been signed by all parties (the "Effective Date"). The Grantee shall complete the Project in accordance with all the terms and conditions specified in this Agreement no later than the End Date shown on page one. **Only costs incurred on or after January 2, 2013 and between the Start Date and the End Date shall be eligible for payment under this Grant.**

**III. CHANGES**

Any decreases in the amount of the Grantee's compensation, significant changes to the Project, or extension of the End Date, shall be requested by the Grantee in writing, and approved in writing by the State in advance. The State reserves the right to deny requests for changes to the Agreement including its Exhibit A. No changes can be implemented without approval by the State.

October 6, 2016



#### **IV. GRANTEE PAYMENTS AND REPORTING REQUIREMENTS**

The Grantee shall meet the reporting requirements specified in Section XVIII of this Agreement.

#### **V. GRANTEE RESPONSIBILITIES**

(A) The Grantee agrees to abide by all local, state, and federal laws, rules, ordinances and regulations in the performance of this Grant.

(B) All local, state, and federal permits, if required, are the responsibility of the Grantee. Award of this Grant is not a guarantee of permit approval by the state.

(C) The Grantee shall be solely responsible to pay all taxes, if any, that arise from the Grantee's receipt of this Grant.

(D) The Grantee is responsible for the professional quality, technical accuracy, timely completion, and coordination of all designs, drawings, specifications, reports, and other services furnished by its subcontractors under this Agreement. The State will consider the Grantee to be the sole point of contact concerning contractual matters, including payment resulting from this Grant. The Grantee or its subcontractor shall, without additional grant award, correct or revise any errors, omissions, or other deficiencies in designs, drawings, specifications, reports, or other services.

(E) The DEQ's approval of drawings, designs, specifications, reports, and incidental work or materials furnished hereunder shall not in any way relieve the Grantee of responsibility for the technical adequacy of the work. The DEQ's review, approval, acceptance, or payment for any of the services shall not be construed as a waiver of any rights under this Agreement or of any cause of action arising out of the performance of this Agreement.

(F) The Grantee acknowledges that it is a crime to knowingly and willfully file false information with the State for the purpose of obtaining this Agreement or any payment under the Agreement, and that any such filing may subject the Grantee, its agents, and/or employees to criminal and civil prosecution and/or termination of the Grant.

#### **VI. ASSIGNABILITY**

The Grantee shall not assign this Agreement or assign or delegate any of its duties or obligations under this Agreement to any other party without the prior written consent of the State. The State does not assume responsibility regarding the contractual relationships between the Grantee and any subcontractor.

#### **VII. NON-DISCRIMINATION**

The Grantee shall comply with the Elliott Larsen Civil Rights Act, 1976 PA 453, as amended, MCL 37.2101 *et seq*, the Persons with Disabilities Civil Rights Act, 1976 PA 220, as amended, MCL 37.1101 *et seq*, and all other federal, state, and local fair employment practices and equal opportunity laws and covenants that it shall not discriminate against any employee or applicant for employment, to be employed in the performance of this Agreement, with respect to his or her hire, tenure, terms, conditions, or privileges of employment, or any matter directly or indirectly related to employment, because of his or her race, religion, color, national origin, age, sex, height, weight, marital status, or physical or mental disability that is unrelated to the individual's ability to perform the duties of a particular job or position. The Grantee agrees to include in every subcontract entered into for the performance of this Agreement this covenant not to discriminate in employment. A breach of this covenant is a material breach of this Agreement.

October 6, 2016

## **VIII. UNFAIR LABOR PRACTICES**

The Grantee shall comply with the Employers Engaging in Unfair Labor Practices Act, 1980 PA 278, as amended, MCL 423.321 *et seq.*

## **IX. LIABILITY**

(A) The Grantee, not the State, is responsible for all liabilities as a result of claims, judgments, or costs arising out of activities to be carried out by the Grantee under this Agreement, if the liability is caused by the Grantee, any subcontractor, or anyone employed by the Grantee.

(B) All liability as a result of claims, demands, costs, or judgments arising out of activities to be carried out by the State in the performance of this Agreement is the responsibility of the State and not the responsibility of the Grantee if the liability is materially caused by any State employee or agent.

(C) In the event that liability arises as a result of activities conducted jointly by the Grantee and the State in fulfillment of their responsibilities under this Agreement, such liability is held by the Grantee and the State in relation to each party's responsibilities under these joint activities.

(D) Nothing in this Agreement should be construed as a waiver of any governmental immunity by the Grantee, the State, its agencies, or their employees as provided by statute or court decisions.

## **X. CONFLICT OF INTEREST**

No government employee or member of the legislative, judicial, or executive branches or member of the Grantee's governing body, its employees, partner, agencies or their families shall have benefit financially from any part of this Agreement.

## **XI. AUDIT AND ACCESS TO RECORDS**

See Section XVIII (C).

## **XII. INSURANCE**

(A) The Grantee shall maintain insurance or self-insurance that will protect it from claims that may arise from the Grantee's actions under this Agreement or from the actions of others for whom the Grantee may be held liable.

(B) The Grantee must comply with applicant workers' compensation laws while engaging in activities authorized under this Agreement.

## **XIII. OTHER SOURCES OF FUNDING**

The Grantee guarantees that any claims for reimbursement made to the State under this Agreement shall not be financed by any source other than the State under the terms of this Agreement. If funding is received through any other source, the Grantee agrees to delete from Grantee's billings or to immediately refund to the State, the total amount representing such duplication of funding.

## **XIV. COMPENSATION**

(A) A breakdown of Project costs covered under this Agreement is identified in Exhibit A. The State will pay the Grantee a total amount not to exceed the amount on page one of this Agreement, in accordance with Exhibit A, and only for expenses incurred. All other costs over and above the Grant amount, necessary to complete the Project, are the sole responsibility of the Grantee.

October 6, 2016

(B) The Grantee is committed to the match amount on page one of this Agreement, in accordance with Exhibit A. The Grantee shall expend all local match committed to the Project by the End Date of this Agreement.

(C) The State will approve payment requests after approval of reports and related documentation as required under this Agreement.

(D) The State reserves the right to request additional information necessary to substantiate payment requests.

#### **XV. CLOSEOUT**

(A) A determination of Project completion shall be made by the DEQ after the Grantee has met any match obligations and satisfactorily completed the activities and provided products and deliverables described in Exhibit A.

(B) Upon issuance of final payment from the State, the Grantee releases the State of all claims against the State arising under this Agreement. Unless otherwise provided in this Agreement or by State law, final payment under this Agreement shall not constitute a waiver of the State's claims against the Grantee.

(C) The Grantee shall immediately refund to the State any payments or funds in excess of the costs allowed by this Agreement.

#### **XVI. CANCELLATION**

This Agreement may be canceled by the State, upon 30 days written notice, due to Executive Order, budgetary reduction, or other lack of funding upon request by Grantee or upon mutual agreement by the State and Grantee. The State reserves the right to provide just and equitable compensation to the Grantee for all satisfactory work completed under this Agreement.

#### **XVII. TERMINATION**

(A) This Agreement may also be terminated by the State for any of the following reasons upon 30 days written notice to the Grantee:

(1) If the Grantee fails to comply with the terms and conditions of the Agreement or with the requirements of the authorizing legislation cited on page 1 or the rules promulgated thereunder, or with other applicable law or rules.

(2) If the Grantee knowingly and willfully presents false information to the State for the purpose of obtaining this Agreement or any payment under this Agreement.

(3) If the State finds that the Grantee, or any of the Grantee's agents or representatives, offered or gave gratuities, favors, or gifts of monetary value to any official, employee, or agent of the State in an attempt to secure a subcontract or favorable treatment in awarding, amending, or making any determinations related to the performance of this Agreement.

(4) During the 30-day written notice period, the State shall also withhold payment for any findings under subparagraphs 1 through 3, above.

(5) If the Grantee or any subcontractor, manufacturer, or supplier of the Grantee appears in the register of persons engaging in unfair labor practices that is compiled by the Michigan Department of Licensing and Regulatory Affairs or its successor.

(B) The State may immediately terminate this Agreement without further liability if the Grantee, or any agent of

*October 6, 2016*

the Grantee, or any agent of any subagreement, is:

(1) Convicted of a criminal offense incident to the application for or performance of a state, public, or private contract or subcontract;

(2) Convicted of a criminal offense, including but not limited to any of the following: embezzlement, theft, forgery, bribery, falsification or destruction of records, receiving stolen property, or attempting to influence a public employee to breach the ethical conduct standards for State of Michigan employees;

(3) Convicted under state or federal antitrust statutes;

(4) Convicted of any other criminal offense which, in the sole discretion of the State, reflects on the Grantee's business integrity; or

(C) If a grant is terminated, the State reserves the right to require the Grantee to repay all or a portion of funds received under this Agreement.

### **XVIII. PROGRAM-SPECIFIC REQUIREMENTS: SAW REPAYABLE GRANT**

(A) General Representations. The Grantee represents and warrants to, and agrees with, the Authority and DEQ, as of the date hereof as follows:

(1) Grant funds shall be expended only to cover costs for the development of an Asset Management Plan, Stormwater Management Plan, innovative wastewater or stormwater technology, construction costs for disadvantaged communities, or for planning, design and user charge development.

(2) Grant funds used for administrative activities or activities performed by municipal employees shall be limited to work that is directly related to the Project and is conducted by employees of the Grantee.

(3) The Grantee has full legal right, power and authority to execute this Agreement, and to consummate all transactions contemplated by this Agreement, the Resolution, and any and all other agreements relating thereto. The Grantee has duly authorized and approved the execution and delivery of this Agreement, the performance by the Grantee of its obligations contained in this Agreement, and this Agreement is a valid, legally binding action of the Grantee, enforceable in accordance with the terms thereof except as enforceability may be limited by bankruptcy, insolvency, reorganization, moratorium and other similar laws affecting the rights of creditors generally, and by principles of equity if equitable remedies are sought.

(4) The Resolution has been duly adopted by the Grantee, acting through its executive(s) or governing body, is in full force and effect as of the date hereof, and is a valid, legally binding action of the Grantee, enforceable in accordance with the terms thereof except as enforceability may be limited by bankruptcy, insolvency, reorganization, moratorium and other similar laws affecting the rights of creditors generally, and by principles of equity if equitable remedies are sought.

(5) The execution and delivery of this Agreement by the Grantee, and the fulfillment of the terms and conditions of, and the carrying out of the transactions contemplated by the Resolution and this Agreement do not and will not conflict with or constitute on the part of the Grantee a breach of, or a default under any existing law (including, without limitation, the Michigan Constitution), any court or administrative regulation, decree or order or any agreement, indenture, mortgage, obligation, lease or other instrument to which the Grantee is subject or by which it is bound and which breach or default would materially affect the validity or binding effect of the Grant, or result in a default or lien on any assets of the Grantee. No event has occurred or is continuing which with the lapse of time or the giving of notice, or both, would constitute a default by the Grantee under the Resolution or this Agreement.

(6) No consent or approval of, or registration or declaration with, or permit from, any federal, state or other governmental body or instrumentality, is or was required in connection with enactment by the Grantee of the

*October 6, 2016*

Resolution, or execution and delivery by the Grantee of this Agreement which has not already been obtained, nor is any further election or referendum of voters required in connection therewith which has not already been held and certified and all applicable referendum periods have expired.

(7) Proceeds of the Grant will be applied (i) to the financing of the Project or a portion thereof as set forth in the Resolution and Exhibit A or (ii) to reimburse the Grantee for a portion of the cost of the Project. The Grantee will expend the proceeds of each disbursement of the Grant for the governmental purpose for which the Grant was issued.

(8) The attached Exhibit A contains a summary of the estimated cost of the Project, which the Grantee certifies is a reasonable and accurate estimate.

(9) The Grantee reasonably expects (i) to fulfill all conditions set forth in this Agreement to receive and to keep the Grant, and (ii) that no event will occur as set forth in this Agreement which will require the Grantee to repay the Grant.

(B) Repayment of Grant. The Grantee shall repay the Grant, within 90 days of being informed to do so, with interest calculated from the date Grant funds are first drawn at a rate not to exceed 8% per year, to be determined by the Authority, to the Authority for deposit into the SWQIF.

“(a) A grant recipient (shall) proceed with a project for which grant funding is provided within 3 years after the department approves the grant (executed grant agreement). For asset management programs related to sewage collection and treatment systems, this includes significant progress, as determined by the department, toward achieving the funding structure necessary to implement the program.

(b) The grant recipient (shall) repay the grant, within 90 days of being informed to do so, with interest at a rate not to exceed 8 percent per year, to the Authority for deposit into the fund if the applicant is unable to, or decides not to, proceed with a construction project or begin implementation of an asset management program for which grant funding is provided.”

SAW grant recipients for wastewater system asset management plans are required to make significant progress on the funding structure. Significant progress is defined as a 5-year plan to eliminate the gap with a minimum initial rate increase to close at least 10 percent of the funding gap. The first rate increase must be implemented within three years of the executed grant. The applicant will need to certify that all grant activities have been completed at the end of three years. Asset management plans for stormwater systems are to be implemented. Stormwater management grant recipients must develop a stormwater management plan. Innovative project grant recipients must proceed with full implementation or certify that the project is not financially or technically feasible.

(C) Covenants and Certifications.

(1) The Grantee has the legal, managerial, institutional, and financial capability to plan, design, and build the Project, or cause the Project to be built, and cause all facilities eventually constructed to be adequately operated.

(2) The Grantee certifies that no undisclosed fact or event, or pending litigation, will materially or adversely affect the Project, the prospects for its completion, or the Grantee's ability to make timely repayments of the grant if any of the two (2) conditions identified under Section XVIII(B) occur.

(3) The Grantee agrees to provide the minimum appropriate local match for grant-eligible costs and disburse match funds to service providers concurrent with grant disbursements.

(4) The Grantee agrees to maintain complete books and records relating to the grant and financial affairs of the Project in accordance with generally accepted accounting principles ("GAAP") and generally accepted

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government auditing standards ("GAGAS").

(5) The Grantee agrees that all municipal contracts related to the Project will provide that the contractor and any subcontractor may be subject to a financial audit and must comply with GAAP and GAGAS.

(6) The Grantee agrees to provide any necessary written authorizations to the DEQ and the Authority for the purpose of examining, reviewing, or auditing the financial records of the Project. The applicant also agrees to require similar authorizations from all contractors, consultants, property owners or agents with which the applicant negotiates an agreement.

(7) The Grantee agrees that all pertinent records shall be retained and available to the DEQ and the Authority for a minimum of three years after satisfactory completion of the Project and final payment. If litigation, a claim, an appeal, or an audit is begun before the end of the three-year period, records shall be retained and available until the three years have passed or until the action is completed and resolved, whichever is longer.

(8) The Grantee agrees to ensure that planning and design activities of the Project are conducted in compliance with the requirements of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended, its Administrative Rules; and all applicable state and federal laws, executive orders, regulations, policies, and procedures.

(9) The Grantee agrees that the Project shall proceed in a timely fashion and will exercise its best efforts to satisfy the program requirements as identified under Section XVIII(B) within three years of award of the SAW Grant from the Strategic Water Quality Initiatives Fund in accordance with Section 5204(e) of the Natural Resources and Environmental Protection Act 1994, PA 451, as amended.

(10) The Grantee acknowledges that acceptance of a wastewater asset management grant will subsequently affect future NPDES permits to include asset management language as applicable.

(D) Grantee Reimbursements and Deliverables

The Grantee may request grant disbursements no more frequently than monthly, using the Disbursement Request Form provided by the DEQ. Upon receipt of a disbursement request, the DEQ will notify the Authority, which will in turn disburse grant funds equal to 75 percent, 90 percent, or 100 percent of eligible costs, whichever percentage is applicable, that have been adequately documented. The forms provided by the State will include instructions on their use and shall be submitted to the DEQ representative at the address on page 1. All required supporting documentation (invoices) for expenses must be included with the disbursement request form. The Grantee is responsible for the final submittal of all documents prepared under this Grant and included in the Project Scope identified in Exhibit A.

(E) Miscellaneous Provisions.

(1) Applicable Law and Nonassignability. This Agreement shall be governed by the laws of the State of Michigan.

(2) Severability. If any clause, provision or section of this Agreement be ruled invalid or unenforceable by any court of competent jurisdiction, the invalidity or unenforceability of such clause, provision or section shall not affect any of the remaining clauses, provisions or sections.

(3) Execution of Counterparts. This Agreement may be executed in several counterparts each of which shall be regarded as an original and all of which shall constitute one and the same document.

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## **XIX. USE OF MATERIAL**

Unless otherwise specified in this Agreement, the Grantee may release information or material developed under this Agreement, provided it is acknowledged that the DEQ funded all or a portion of its development.

## **XX. SUBCONTRACTS**

The State reserves the right to deny the use of any consultant, contractor, associate or other personnel to perform any portion of the project. The Grantee is solely responsible for all contractual activities performed under this Agreement. Further, the State will consider the Grantee to be the sole point of contact with regard to contractual matters, including payment of any and all charges resulting from the anticipated Grant. All subcontractors used by the Grantee in performing the project shall be subject to the provisions of this Agreement and shall be qualified to perform the duties required.

## **XXI. ANTI-LOBBYING**

If all or a portion of this Agreement is funded with state funds, then the Grantee shall not use any of the grant funds awarded in this Agreement for the purpose of lobbying as defined in the State of Michigan's lobbying statute, MCL 4.415(2). "Lobbying" means communicating directly with an official of the executive branch of state government or an official in the legislative branch of state government for the purpose of influencing legislative or administrative action." The Grantee shall not use any of the grant funds awarded in this Agreement for the purpose of litigation against the State. Further, the Grantee shall require that language of this assurance be included in the award documents of all subawards at all tiers.

## **XXII. IRAN SANCTIONS ACT**

By signing this Agreement, the Grantee is certifying that it is not an Iran linked business, and that its contractors are not Iran linked businesses as outlined in Michigan Compiled Law 129.312

## **XXIII. DEBARMENT AND SUSPENSION**

By signing this Agreement, the Grantee certifies to the best of its knowledge and belief that it, its agents, and its subcontractors:

- (1) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any federal department or the state.
- (2) Have not within a 3-year period preceding this Agreement been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (federal, state, or local) transaction or contract under a public transaction as defined in 45 CFR 1185; violation of federal or state antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property.
- (3) Are not presently indicted or otherwise criminally or civilly charged by a government entity (federal, state, or local) with commission of any of the offenses enumerated in subsection (2).
- (4) Have not within a 3-year period preceding this Agreement had one or more public transactions (federal, state, or local) terminated for cause or default.
- (5) Will comply with all applicable requirements of all other state or federal laws, executive orders, regulations, and policies governing this program.

October 6, 2016

**SAW Grant Program**

**Exhibit A**

Grantee: Charter Township of White Lake

Project Name: Wastewater Asset Management Plan

DEQ Approved Grant Amount: \$513,463 (Five Hundred Thirteen Thousand Four Hundred Sixty-three Dollars)

Time Period for Eligible Costs: Start Date January 2013

End Date November 2019

Description of Approved Project Scope:

Preparation of a wastewater asset management plan.

<b>DEQ Approved Project Costs</b>	
1. Project Planning Costs	\$0
2. Design Engineering Costs	\$0
3. User Charge System Development Costs	\$0
4. Wastewater Asset Management Plan Costs	\$570,514
5. Stormwater Asset Management Plan Costs	\$0
6. Stormwater Management Plan Costs	\$0
7. Innovative Wastewater and Stormwater Technology Costs	\$0
8. Disadvantaged Community Construction Costs	\$0
9. Eligible Cost Subtotal	\$570,514
10. LESS Local Match (if applicable)	\$57,051
11. Requested SAW Grant Amount (Line 9 minus Line 10)	\$513,463



**WWAMP APPENDIX B – LEVEL OF SERVICE GOALS TABLE**

**White Lake Township SAW Grant  
Wastewater Utilities  
Level of Service Standards / Goals**

Strategic Area	LOS Driver	Level of Service Standard/Goal		Industry Standard	Performance Measures	Data	Reporting Procedure	Current Rating
		Current Target	Future Target					
<b>Wastewater Collection</b>								
<b>Social</b>								
Customer Service	Customer	Maintain trust with the public, regulatory agencies, and non-government organizations	No change	NA	# of Complaint Calls / Year; Department Coordination Meetings	Sewer complaint reports; Service Requests; Work Orders	Annual Reports to Board	
	Customer / Self-Imposed	Proactively maintain the wastewater collection system to minimize service disruptions	No change	Develop a Corrective Action Program (CAP) to address SSOs	# of sewer backups/SSOs per year shall be less than reported national averages; Continue to maintain compliance with Public Act 222; Reductions in insurance claims	# of sewer backups/SSOs; Work Orders; Grease Interceptor inspections	Annual Reports to Board	
	Self-Imposed	Educate residents/businesses on sewer complaint process (who to call and when)	No change	Public Act 222 (Sewer Backup Legislation)	Post complaint procedure on website; Compliance w/ NPDES Permit	Website content; Newsletter articles; Social Media content	Annual Reports to Board	
	Self-Imposed	Provide efficient and timely service to customers - Coordinate with the OCWRC to respond to complaints within 24 hours of notification	No change	45 days after notification (Public Act 222)	Coordinate with OCWRC to respond to complaints within 24 hours of notification	Sewer complaint reports; OCWRC Reports; SCADA logs	Annual Reports to Board	
	Customer / Self-Imposed	Maintain sanitary sewer capacity to Township residents and businesses in the most cost effective manner possible	No change	NA	# of Complaint Calls / Year	Sewer complaint reports; OCWRC Reports	Annual Reports to Board	
Reliability	Self-Imposed	Coordinate with the County to televise and clean sewers as necessary to minimize sewer system problems	Televise ALL sewers within the Township	Inspect ALL infrastructure every 7-10 years	OCWRC CCTV & Sewer Maintenance Reports and costs	CCTV reports/data; GIS	Annual Reports to Board	
	Regulatory / Customer	Minimize system failure - determine criticality of assets for Capital Improvement Planning	Assure funding is available to make necessary improvements to assets	SAW Grant requirement to develop criticality of assets	Criticality of Assets Report	AMP data/report	Annual Reports to Board	

**White Lake Township SAW Grant  
Wastewater Utilities  
Level of Service Standards / Goals**

Strategic Area	LOS Driver	Level of Service Standard/Goal		Industry Standard	Performance Measures	Data	Reporting Procedure	Current Rating
		Current Target	Future Target					
<b>Wastewater Collection</b>								
<b>Social</b>								
Reliability	Self-Imposed	Maintain and replace equipment as necessary to maintain compliance and meet level of service goals	No change	SAW Grant requirement to develop level of service goals	Vehicle/Equipment maintenance & purchase costs / Year	Depreciation data; Equipment purchases	Annual Reports to Board	
	Self-Imposed	Coordinate with the County to perform asset rehabilitation as necessary	No change	SAW Grant Implementation / Public Act 222	Project Implementation; Review of previous reports/studies	Project Implementation	Annual Reports to Board	
	Self-Imposed	Initiate better coordination/information from OCWRC for specific sewer maintenance activities	Continue to initiate better coordination/information from OCWRC for specific sewer maintenance activities	NA	OCWRC Sewer Maintenance Reports and costs	OCWRC Sewer Maintenance Reports and costs; Cityworks integration	Annual Reports to Board	
	Self-Imposed	Coordinate utility and road projects to limit repair of underground utilities for roadways with new pavement replacement	No change	NA	Department Coordination Meetings; Project Implementation	Project Implementation	Annual Reports to Board	
Health & Safety	Regulatory	Meet all MIOSHA, USEPA, and MDEQ regulations and increase training opportunities for sanitary sewer maintenance staff	No change	MIOSHA	Zero violations	Notice of Violations	Annual Reports to Board	
	Customer / Self-Imposed	Protect community from hazards associated with wastewater collection system (basement backups, traffic disturbance, etc.)	No change	Engineering reviews required by MDEQ (Wastewater Construction Permits)	Zero public injuries	# of private property backups; vehicle accidents associated with wastewater collection system; # of pump station facility intrusions	Annual Reports to Board	
	Self-Imposed	Zero Loss Time Accidents	No change	Provide training to each newly assigned employee on operating procedures, hazards and safeguards of the job (MIOSHA)	Zero Loss Time / Year	Accident Reports / Claims, Worker's Comp Analysis	Claims made to Insurance Provider; Annual Reports to Board	
<b>Environmental</b>								
Administration Organizational Development	Self-Imposed	Optimize resources and reduce overall O&M, planning, and engineering costs	Allocate resources to deficient areas as necessary	NA	Department Coordination Meetings	Mtg minutes; AMP; Review of reports/studies	Annual Reports to Board	

**White Lake Township SAW Grant  
Wastewater Utilities  
Level of Service Standards / Goals**

Strategic Area	LOS Driver	Level of Service Standard/Goal		Industry Standard	Performance Measures	Data	Reporting Procedure	Current Rating
		Current Target	Future Target					
<b>Wastewater Collection</b>								
<b>Environmental</b>								
<b>Environmental Stewardship</b>	Customer / Self-Imposed	Enhance the protection of public health and the environment	No change	NA	SSO reductions; FOG sewer maintenance reductions; pump station rehabilitation	OCWRC Sewer Maintenance Reports and costs; Cityworks integration	Annual Reports to Board	
	Regulatory	Minimize Sanitary Sewer Overflows (SSOs) & provide better education to individual grinder station owners	No change	Contact MDEQ within 24 hrs of SSO; Develop Corrective Action Program	Minimize SSOs to 1 every 10 years	SSO reports; OCWRC Sewer Maintenance Reports and costs;	Reports to DEQ; Annual Reports to Board	
	Self-Imposed	Provide sanitary sewer extensions in development and redevelopment projects, where feasible	Reduce onsite septic systems by 10% in the Township by 2040; Target sensitive lake areas as the first priority to receive sanitary sewer service	Township goal established in Master Plan	Plan reviews; OSDS reductions	Plan reviews; DPW Reports	Annual Reports to Board	
	Self-Imposed	Develop and Implement a Fats, Oil, and Grease (FOG) Program	Continue to implement a FOG Program	Non-domestic users must not introduce any materials that would prohibit the POTW system	Cityworks and GIS implementation	Cityworks; GIS; Work Orders; DPW Reports	Annual Reports to Board	
	Customer / Self-Imposed	Reduce Inflow & Infiltration (I/I) from the system	Continue to reduce I/I from the system	I/I evaluation is required for SRF/SWQIF study	10% reductions in I/I / Year	Cityworks; GIS; OCWRC Sewer Maintenance Reports and costs	Annual Reports to Board	
	Self-Imposed	Improve knowledge of system components - Integrate Computer Maintenance and Management System (CMMS) into the Wastewater Collection Program (i.e. Cityworks, SEDARU, GIS Updates)	Implement and Maintain the CMMS Program; Continue to improve knowledge of system components	NA	CMMS implementation; Work order generation	Cityworks; GIS; Work Orders; DPW Reports	GIS updates; Annual Reports To Board; Annual Maintenance Registrations	
<b>Regulatory Compliance</b>	Regulatory	100% IPP Compliance with MDEQ, GLWA, Township Ordinance	No change	Industrial User (IU) Enforcement Response; IU Permitting and Reporting; Meet Wastewater Discharge Standards	# of Notice of Violations / Year	Ordinance reviews/updates; Notice of Violations; Work Orders	Annual Reports to Board	

**White Lake Township SAW Grant  
Wastewater Utilities  
Level of Service Standards / Goals**

Strategic Area	LOS Driver	Level of Service Standard/Goal		Industry Standard	Performance Measures	Data	Reporting Procedure	Current Rating
		Current Target	Future Target					
<b>Wastewater Collection</b>								
<b>Environmental</b>								
Regulatory Compliance	Regulatory	100% IPP Compliance with MDEQ, GLWA, Township Ordinance	No change	Industrial User (IU) Enforcement Response; IU Permitting and Reporting; Meet Wastewater Discharge Standards	# of Notice of Violations / Year	Ordinance reviews/updates; Notice of Violations; Work Orders	Annual Reports to Board	
	Regulatory	Meet the requirements of the Part 41 NPDES Permit	No change	Submit POTW construction permits to MDEQ	# of Permits issued / Year	Permit Applications	Annual Reports to Board	
	Regulatory	Report 100% of SSOs as required by State	No change	100% Reported SSOs	# of SSOs / Year	SSO reports; Work Orders	Annual Reports to Board	
	Self-Imposed	Minimize exposure and liability from claims, enforcement, or litigation	No change	NA	# of Claims / Year	Claims; Work Orders; Annual Reports	Annual Reports to Board	
<b>Economic</b>								
Financial	Customer / Self-Imposed	Operate in a fiscally responsible manner	Continue to operate in a fiscally responsible manner	SAW Grant Requirement	Rate Structure Review	Review of previous reports/studies; CIP; Master Plan; AMP data/report	Annual Reports to Board	
	Self-Imposed	Generate consistent and reliable planning and forecasting information to improve management decisions	Continue to provide consistent and reliable planning and forecasting information to improve management decisions	NA	Cityworks implementation; Department Coordination Meetings	Review of previous reports/studies; CIP; Master Plan; AMP data/report	Annual Reports to Board	
	Regulatory	Perform review of wastewater rates to balance rehabilitation efforts and encourage business development	Perform review of wastewater rates every 3-5 years	SAW Grant Requirement	Rate Structure Review; Updated Rate Structure	Review of previous reports/studies; CIP; Master Plan; AMP data/report	Annual Reports to Board	
	Self-Imposed	Review the County's Updated Schedule of Unit Assignment Factors to determine impact on Capital Connection Fees	Update the Township's Schedule as necessary	NA	Updated Schedule	Review of previous reports/studies; CIP; Master Plan; AMP data/report	Annual Reports to Board	
	Self-Imposed	Coordinate with OCWRC to better track costs of repairing or maintaining specific assets and performance against targets	Continue to coordinate with OCWRC to better track costs of repairing or maintaining specific assets and performance against targets	NA	OCWRC Sewer Maintenance Reports and costs	Cityworks implementation; Tracking reports	Annual Reports to Board	

**White Lake Township SAW Grant  
Wastewater Utilities  
Level of Service Standards / Goals**

Strategic Area	LOS Driver	Level of Service Standard/Goal		Industry Standard	Performance Measures	Data	Reporting Procedure	Current Rating
		Current Target	Future Target					
Wastewater Collection								
Economic								
Financial	Customer / Self-Imposed	Continue to apply for and obtain grants and/or low-interest loans for capital improvement projects	No change	NA	# Awarded Grant Projects / 10 Years	Project implementation	Annual Reports to Board; Quarterly Grant Reports to EGLE	
<p><b>Mission Statement:</b> Strive for a sustainable Township that balances the community's economic, environmental, and social needs. Promote the identity of White Lake Township as a small country town with big City amenities by protecting and preserving natural features, encouraging redevelopment of obsolete properties, and directing growth and redevelopment to a central community core.</p>								

	No Improvement Needed
	Acceptable
	Improvement Needed

**WWAMP APPENDIX C – 2 ½ YR RATE METHODOLOGY, MASTER FEE SCHEDULE & CASH FLOW ANALYSIS**

**WHITE LAKE TOWNSHIP (MICHIGAN) SEWER FUND**

**COMPARATIVE STATEMENT OF NET POSITION**

	As of			
	<u>12/31/2015</u>	<u>12/31/2016</u>	<u>12/31/2017</u>	<u>12/31/2018</u>
	(----- Per Audit -----)			
<b>Assets</b>				
Current assets:				
Cash and investments	\$931,180	\$1,096,875	\$1,165,075	\$1,120,403
Accounts receivable:				
Other receivables	995	2,454	20,994	33,429
Due from other governmental units	63,215	-	-	-
Due from other funds	-	719	1,187	-
Total current assets	<u>995,390</u>	<u>1,100,048</u>	<u>1,187,256</u>	<u>1,153,832</u>
 Total Assets	 <u>\$995,390</u>	 <u>1,100,048</u>	 <u>\$1,187,256</u>	 <u>\$1,153,832</u>
 <b>Liabilities</b>				
Current liabilities:				
Accounts payable	\$24,609	\$5,702	\$96,217	\$23,028
Due to other funds	79,015	105,626	131,870	142,736
Accrued liabilities and other	7,475	-	-	-
Total current liabilities	<u>111,099</u>	<u>111,328</u>	<u>228,087</u>	<u>165,764</u>
 Total Liabilities and Deferred Inflows	 <u>111,099</u>	 <u>111,328</u>	 <u>228,087</u>	 <u>165,764</u>
 <b>Fund Balances</b>				
Restricted				
Sewer	884,291	988,720	959,169	988,068
Total Fund Balances	<u>884,291</u>	<u>988,720</u>	<u>959,169</u>	<u>988,068</u>
 <b>Total Liabilities, Deferred Inflows and Fund Balances</b>	 <u>\$995,390</u>	 <u>1,100,048</u>	 <u>\$1,187,256</u>	 <u>\$1,153,832</u>



**WHITE LAKE TOWNSHIP (MICHIGAN) SEWER DEBT FUND**

**COMPARATIVE STATEMENT OF NET POSITION**

	As of			
	<u>12/31/2015</u>	<u>12/31/2016</u>	<u>12/31/2017</u>	<u>12/31/2018</u>
	(----- Per Audit -----)			
<b>Assets</b>				
Current assets:				
Cash and investments	\$443,429	\$264,227	\$442,853	\$65,616
Accounts receivable:				
Other receivables	-	-	-	15,762
Due from other governmental units	41,631	-	-	-
Total current assets	<u>485,060</u>	<u>264,227</u>	<u>442,853</u>	<u>81,378</u>
 Total Assets	 <u><u>\$485,060</u></u>	 <u><u>\$264,227</u></u>	 <u><u>\$442,853</u></u>	 <u><u>\$81,378</u></u>
 <b>Liabilities</b>				
Current liabilities:				
Accounts payable	\$4,896	\$19,584	-	\$9,792
Total current liabilities	<u>4,896</u>	<u>19,584</u>	<u>-</u>	<u>9,792</u>
 Total Liabilities and Deferred Inflows	 <u>4,896</u>	 <u>19,584</u>	 <u>-</u>	 <u>9,792</u>
 <b>Fund Balances</b>				
Assigned				
Sewer debt service	480,164	244,643	442,853	71,586
Capital projects	-	-	-	-
Total Fund Balances	<u>480,164</u>	<u>244,643</u>	<u>442,853</u>	<u>71,586</u>
 <b>Total Liabilities, Deferred Inflows and Fund Balances</b>	 <u><u>\$485,060</u></u>	 <u><u>\$264,227</u></u>	 <u><u>\$442,853</u></u>	 <u><u>\$81,378</u></u>

**WHITE LAKE TOWNSHIP (MICHIGAN) SEWER SAD FUND**

**COMPARATIVE STATEMENT OF NET POSITION**

	As of			
	<u>12/31/2015</u>	<u>12/31/2016</u>	<u>12/31/2017</u>	<u>12/31/2018</u>
	(----- Per Audit -----)			
<b>Assets</b>				
Current assets:				
Cash and investments	\$1,327,634	\$1,201,594	\$1,067,578	\$938,215
Accounts receivable:				
Special assessments receivable	452,045	723,400	572,831	474,832
Accrued interest receivable	16,011	20,391	16,836	13,655
Other receivables	-	-	-	-
Due from other governmental units	7,956	-	-	-
Due from other funds	-	-	5,637	-
Prepaid expenses and other assets	-	-	-	-
Total current assets	<u>1,803,646</u>	<u>1,945,385</u>	<u>1,662,882</u>	<u>1,426,702</u>
 Total Assets	 <u>\$1,803,646</u>	 <u>\$1,945,385</u>	 <u>\$1,662,882</u>	 <u>\$1,426,702</u>
 <b>Liabilities</b>				
Current liabilities:				
Accounts payable	-	-	-	-
Due to other funds	-	\$35,789	\$35,789	\$58,045
Accrued liabilities and other	-	-	-	-
Total current liabilities	<u>-</u>	<u>35,789</u>	<u>35,789</u>	<u>58,045</u>
 <b>Deferred Inflows</b>				
Unavailable special assessment revenue	<u>439,327</u>	<u>682,570</u>	<u>541,846</u>	<u>445,127</u>
 Total Liabilities and Deferred Inflows	 <u>439,327</u>	 <u>718,359</u>	 <u>577,635</u>	 <u>503,172</u>
 <b>Fund Balances</b>				
Restricted				
Debt service	<u>1,364,319</u>	<u>1,227,026</u>	<u>1,085,247</u>	<u>923,530</u>
Total Fund Balances	<u>1,364,319</u>	<u>1,227,026</u>	<u>1,085,247</u>	<u>923,530</u>
 Total Liabilities, Deferred Inflows and Fund Balances	 <u>\$1,803,646</u>	 <u>\$1,945,385</u>	 <u>\$1,662,882</u>	 <u>\$1,426,702</u>

**WHITE LAKE TOWNSHIP (MICHIGAN) SEWER FUND**

**COMPARATIVE STATEMENT OF REVENUES, EXPENSES AND CHANGES IN NET POSITION**

	<b>Fiscal Year Ended</b>			
	<u>12/31/2015</u>	<u>12/31/2016</u>	<u>12/31/2017</u>	<u>12/31/2018</u>
	(----- Per Audit -----)			
<b>Operating Revenues</b>				
Intergovernmental	-	-	\$74,778	\$108,023
Charges for services	\$1,588,523	\$1,744,578	1,723,891	1,813,289
Investment income and rentals	246	784	1,665	2,066
Total operating revenue	<u>1,588,769</u>	<u>1,745,362</u>	<u>1,800,334</u>	<u>1,923,378</u>
<b>Operating Expenses</b>				
Public works	<u>1,473,294</u>	<u>1,640,933</u>	<u>1,829,885</u>	<u>1,894,479</u>
Total operating expense	<u>1,473,294</u>	<u>1,640,933</u>	<u>1,829,885</u>	<u>1,894,479</u>
Net operating income (loss)	<u>115,475</u>	<u>104,429</u>	<u>(29,551)</u>	<u>28,899</u>
<b>Change in Fund Balances</b>	115,475	104,429	(29,551)	28,899
<b>Fund Balances - Beginning of Year</b>	<u>768,816</u>	<u>884,291</u>	<u>988,720</u>	<u>959,169</u>
<b>Fund Balances - End of Year</b>	<u><u>\$884,291</u></u>	<u><u>\$988,720</u></u>	<u><u>\$959,169</u></u>	<u><u>\$988,068</u></u>

**WHITE LAKE TOWNSHIP (MICHIGAN) SEWER DEBT FUND**

**COMPARATIVE STATEMENT OF REVENUES, EXPENSES AND CHANGES IN NET POSITION**

	<b>Fiscal Year Ended</b>			
	<u>12/31/2015</u>	<u>12/31/2016</u>	<u>12/31/2017</u>	<u>12/31/2018</u>
	(----- Per Audit -----)			
<b>Operating Revenues</b>				
Charges for services	\$332,288	\$346,061	\$446,035	\$509,271
Investment income and rentals	65	143	6,413	301
<b>Total operating revenue</b>	<u>332,353</u>	<u>346,204</u>	<u>452,448</u>	<u>509,572</u>
<b>Operating Expenses</b>				
Debt service	578,931	581,725	579,238	580,839
<b>Total operating expense</b>	<u>578,931</u>	<u>581,725</u>	<u>579,238</u>	<u>580,839</u>
<b>Net operating income (loss)</b>	<u>(246,578)</u>	<u>(235,521)</u>	<u>(126,790)</u>	<u>(71,267)</u>
<b>Other Financing Sources (Uses)</b>				
Face value of debt issue	-	-	-	-
Transfers in	370,000	-	325,000	100,000
Transfers out	-	-	-	(400,000)
<b>Total other financing sources (uses)</b>	<u>370,000</u>	<u>-</u>	<u>325,000</u>	<u>(300,000)</u>
<b>Change in Fund Balances</b>	123,422	(235,521)	198,210	(371,267)
<b>Fund Balances - Beginning of Year</b>	<u>356,742</u>	<u>480,164</u>	<u>244,643</u>	<u>442,853</u>
<b>Fund Balances - End of Year</b>	<u><u>\$480,164</u></u>	<u><u>\$244,643</u></u>	<u><u>\$442,853</u></u>	<u><u>\$71,586</u></u>

**WHITE LAKE TOWNSHIP (MICHIGAN) SEWER SAD FUND**

**COMPARATIVE STATEMENT OF REVENUES, EXPENSES AND CHANGES IN NET POSITION**

	<b>Fiscal Year Ended</b>			
	<u>12/31/2015</u>	<u>12/31/2016</u>	<u>12/31/2017</u>	<u>12/31/2018</u>
	(----- Per Audit -----)			
<b>Operating Revenues</b>				
Charges for services	\$31,824	\$31,824	\$31,860	\$31,860
Investment income and rentals	30,006	32,903	35,310	32,616
Special assessments	116,443	146,219	140,784	132,507
<b>Total operating revenue</b>	<u>178,273</u>	<u>210,946</u>	<u>207,954</u>	<u>196,983</u>
<b>Operating Expenses</b>				
Public works	254	36,038	125	120
Debt service	308,426	312,201	355,245	358,580
<b>Total operating expense</b>	<u>308,680</u>	<u>348,239</u>	<u>355,370</u>	<u>358,700</u>
<b>Net operating income (loss)</b>	<u>(130,407)</u>	<u>(137,293)</u>	<u>(147,416)</u>	<u>(161,717)</u>
<b>Other Financing Sources (Uses)</b>				
Face value of debt issue	-	-	-	-
Transfers in	-	-	5,637	-
Transfers out	(170,000)	-	-	-
<b>Total other financing sources (uses)</b>	<u>(170,000)</u>	<u>-</u>	<u>5,637</u>	<u>-</u>
<b>Change in Fund Balances</b>	(300,407)	(137,293)	(141,779)	(161,717)
<b>Fund Balances - Beginning of Year</b>	<u>1,664,726</u>	<u>1,364,319</u>	<u>1,227,026</u>	<u>1,085,247</u>
<b>Fund Balances - End of Year</b>	<u><u>\$1,364,319</u></u>	<u><u>\$1,227,026</u></u>	<u><u>\$1,085,247</u></u>	<u><u>\$923,530</u></u>

**WHITE LAKE TOWNSHIP (MICHIGAN) SEWER FUND**

**COMPARATIVE DETAIL OF OPERATING EXPENSES**

		<b>Fiscal Year Ended</b>			<b>Test Year</b>	<b>Multiplier</b>
		<u>12/31/2018</u>	<u>12/31/2019</u>	<u>12/31/2020</u>		
		(-----Per Client-----)				
<b>Operating Expenditures</b>						
Sewer Maintenance Fund Budget						
296-000-803.000	SAW Grant Expenditures	\$120,332	\$100,000	-	-	0.00%
296-000-851.000	Repairs & Maintenance	37,954	250,000	\$250,000	-	0.00%
296-000-851.001	Oakland County Expenses	1,537,249	1,700,000	1,800,000	-	0.00%
296-000-998.000	Administrative Costs	142,245	175,000	195,000	\$195,000	2.00%
296-536-801.000	Professional Fees	57,100	50,000	60,000	60,000	2.00%
296-905-997.000	Miscellaneous Fees	-	250	-	-	0.00%
	<b>Total Sewer Maintenance Fund Budget</b>	<u>\$1,894,880</u>	<u>\$2,275,250</u>	<u>\$2,305,000</u>	<u>\$255,000</u>	

**WHITE LAKE TOWNSHIP (MICHIGAN) SEWER FUND**

**SCHEDULE OF AMORTIZATION OF \$1,040,000 PRINCIPAL AMOUNT OUTSTANDING  
OF PONTIAC LAKE SEWER BONDS**

<u>Payment Date</u>	<u>Principal Balance</u> (In Dollars)	<u>Interest Rate</u> (%)	<u>Debt Service</u>			<u>Fiscal Year Total</u>
			<u>Principal</u>	<u>Interest</u>	<u>Total</u>	
			(-----In Dollars-----)			
4/1/2019	1,040,000	2.50	\$250,000	13,000.00	\$263,000.00	
10/1/2019	790,000			9,875.00	9,875.00	\$272,875.00
4/1/2020	790,000	2.50	255,000	9,875.00	264,875.00	
10/1/2020	535,000			6,687.50	6,687.50	271,562.50
4/1/2021	535,000	2.50	265,000	6,687.50	271,687.50	
10/1/2021	270,000			3,375.00	3,375.00	275,062.50
4/1/2022	270,000	2.50	270,000	3,375.00	273,375.00	273,375.00
	Totals		<u>\$1,040,000</u>	<u>\$52,875.00</u>	<u>\$1,092,875.00</u>	<u>\$1,092,875.00</u>

**WHITE LAKE TOWNSHIP (MICHIGAN) SEWER FUND**

**CASH FLOW ANALYSIS - SEWER**

	<u>2019</u>	<u>Increases Per Year</u>	<u>2020</u>	<u>2021</u>	<u>2022</u>	<u>2023</u>	<u>2024</u>	<u>2025</u>	<u>2026</u>	<u>2027</u>	<u>2028</u>
<b>Assumptions</b>											
Admin fee - REUs	3,040.17		3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17
Admin fee (quarterly) [1]	\$12.50	0.00%	\$12.50	\$12.50	\$12.50	\$12.50	\$12.50	\$12.50	\$12.50	\$12.50	\$12.50
Debt service fee - REUs	3,040.17		3,040.17	3,040.17	3,040.17	0.00	0.00	0.00	0.00	0.00	0.00
Debt service fee (quarterly) [1][3]	\$18.00	0.00%	\$18.00	\$18.00	\$18.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Reserve fund fee - REUs	3,040.17		3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17
Reserve fund fee (quarterly) [1][3]	\$10.00	0.00%	\$10.00	\$10.00	\$10.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00
OC charges - REUs	3,040.17		3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17
OC charges (quarterly)	\$128.38		\$128.38	\$128.38	\$128.38	\$128.38	\$128.38	\$128.38	\$128.38	\$128.38	\$128.38
OC reserve charges - REUs	3,040.17		3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17
OC reserve charges (quarterly)	\$4.36		\$4.36	\$4.36	\$4.36	\$4.36	\$4.36	\$4.36	\$4.36	\$4.36	\$4.36
<i>Typical Township homeowner's quarterly bill</i>	<i>\$168.88</i>		<i>\$168.88</i>	<i>\$168.88</i>	<i>\$168.88</i>	<i>\$168.88</i>	<i>\$168.88</i>	<i>\$168.88</i>	<i>\$168.88</i>	<i>\$168.88</i>	<i>\$168.88</i>
<b>Township Revenues</b>											
Admin fee	\$152,009		\$152,009	\$152,009	\$152,009	\$152,009	\$152,009	\$152,009	\$152,009	\$152,009	\$152,009
Debt service fee	218,892		218,892	218,892	218,892	-	-	-	-	-	-
Reserve fund fee	121,607		121,607	121,607	121,607	340,499	340,499	340,499	340,499	340,499	340,499
Total revenues	492,508		492,508	492,508	492,508	492,508	492,508	492,508	492,508	492,508	492,508
Less: Total operating expenditures	(225,250)		(255,000)	(260,100)	(270,608)	(276,020)	(281,541)	(287,171)	(292,915)	(298,773)	(304,749)
Net operating revenue	267,258		237,508	232,408	221,900	216,487	210,967	205,336	199,593	193,734	187,759
Less: Current Pontiac Lake debt debt service payments	(272,875)		(271,563)	(275,063)	(273,375)	-	-	-	-	-	-
Estimated cash funded Township O&M capital expenditures	-		(41,000)	(61,160)	(41,320)	(41,320)	(41,320)	(41,320)	(41,320)	(41,320)	(41,320)
Estimated cash funded Pumping station capital expenditures	-		(365,800)	(32,500)	-	(20,000)	-	(590,000)	-	-	(75,000)
Estimated cash funded Main & Manhole capital expenditures	-		(319,797)	(635,556)	(629,531)	(620,969)	(499,864)	(750,419)	(232,935)	(1,080,941)	(544,751)
Net cash flow	<u>(\$5,617)</u>		<u>(\$760,652)</u>	<u>(\$771,871)</u>	<u>(\$722,327)</u>	<u>(\$465,802)</u>	<u>(\$330,217)</u>	<u>(\$1,176,403)</u>	<u>(\$74,662)</u>	<u>(\$928,527)</u>	<u>(\$473,312)</u>
<i>Cash &amp; investments</i>	<i>\$1,186,019</i>		<i>\$425,367</i>	<i>(\$346,504)</i>	<i>(\$1,068,830)</i>	<i>(\$1,534,632)</i>	<i>(\$1,864,849)</i>	<i>(\$3,041,252)</i>	<i>(\$3,115,914)</i>	<i>(\$4,044,441)</i>	<i>(\$4,517,753)</i>
<b><u>Annual Revenue Requirement Summary</u></b>											
Total estimated operating expenses, debt and capital improvements [2]			1,253,160	\$1,264,379	\$1,214,834	\$958,309	\$822,725	\$1,668,910	\$567,170	\$1,421,034	\$965,820
Current annual rate [1][3]			\$40.50	\$40.50	\$40.50	\$40.50	\$40.50	\$40.50	\$40.50	\$40.50	\$40.50
Annual rate needed to fund expenses, capital improvements and debt			\$103.05	\$103.97	\$99.90	\$78.80	\$67.65	\$137.24	\$46.64	\$116.85	\$79.42
Estimated shortage in rates			<u>(\$62.55)</u>	<u>(\$63.47)</u>	<u>(\$59.40)</u>	<u>(\$38.30)</u>	<u>(\$27.15)</u>	<u>(\$96.74)</u>	<u>(\$6.14)</u>	<u>(\$76.35)</u>	<u>(\$38.92)</u>
Total estimated cash funded capital improvements			\$726,597	\$729,216	\$670,851	\$682,289	\$541,184	\$1,381,739	\$274,255	\$1,122,261	\$661,071
Annual rate needed to fund capital improvements only			\$59.75	\$59.97	\$55.17	\$56.11	\$44.50	\$113.62	\$22.55	\$92.29	\$54.36
Average annual rate needed to fund capital improvements only			\$62.03	\$62.03	\$62.03	\$62.03	\$62.03	\$62.03	\$62.03	\$62.03	\$62.03

[1] Current annual rate is equal to the cumulative Admin, Debt Service and Reserve Fund fees

[2] Includes Township total operating expenses, Pontiac Lake debt service payments and estimated cash funded capital expenditures

[3] Assumes \$18 debt service fee is added into reserve fund fee after defeasance of Pontiac Lake debt in 2022



WHITE LAKE TOWNSHIP (MICHIGAN) SEWER FUND

(Continued)

CASH FLOW ANALYSIS - SEWER

		2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039
	<b>Increases</b>											
	<b>Per Year</b>											
<b>Assumptions</b>												
Admin fee - REUs		3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17
Admin fee (quarterly) [1]	0.00%	\$12.50	\$12.50	\$12.50	\$12.50	\$12.50	\$12.50	\$12.50	\$12.50	\$12.50	\$12.50	\$12.50
Debt service fee - REUs		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Debt service fee (quarterly) [1][3]	0.00%	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Reserve fund fee - REUs		3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17
Reserve fund fee (quarterly) [1][3]	0.00%	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00
OC charges - REUs		3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17
OC charges (quarterly)	0.00%	\$128.38	\$128.38	\$128.38	\$128.38	\$128.38	\$128.38	\$128.38	\$128.38	\$128.38	\$128.38	\$128.38
OC reserve charges - REUs		3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17	3,040.17
OC reserve charges (quarterly)	0.00%	\$4.36	\$4.36	\$4.36	\$4.36	\$4.36	\$4.36	\$4.36	\$4.36	\$4.36	\$4.36	\$4.36
<i>Typical Township homeowner's quarterly bill</i>												
<b>Township Revenues</b>												
Admin fee		\$152,009	\$152,009	\$152,009	\$152,009	\$152,009	\$152,009	\$152,009	\$152,009	\$152,009	\$152,009	\$152,009
Debt service fee		-	-	-	-	-	-	-	-	-	-	-
Reserve fund fee		340,499	340,499	340,499	340,499	340,499	340,499	340,499	340,499	340,499	340,499	340,499
Total revenues		492,508	492,508	492,508	492,508	492,508	492,508	492,508	492,508	492,508	492,508	492,508
<b>Less: Total operating expenditures</b>												
		(310,844)	(317,060)	(323,402)	(329,870)	(336,467)	(343,196)	(350,060)	(357,062)	(364,203)	(371,487)	(378,917)
Net operating revenue		181,664	175,447	169,106	162,638	156,040	149,311	142,447	135,446	128,305	121,021	113,591
<b>Less: Current Pontiac Lake debt debt service payments</b>												
		-	-	-	-	-	-	-	-	-	-	-
Estimated cash funded Township O&M capital expenditures		(41,320)	(41,320)	(41,320)	(41,320)	(41,320)	(41,320)	(41,320)	(41,320)	(41,320)	(41,320)	(41,320)
Estimated cash funded Pumping station capital expenditures		-	(20,000)	(138,000)	(358,000)	(30,000)	(30,000)	(88,000)	-	(205,000)	(20,000)	-
Estimated cash funded Main & Manhole capital expenditures		(681,766)	(900,758)	(871,815)	(802,179)	(1,013,213)	(801,573)	(929,971)	(1,017,119)	(909,924)	(1,174,548)	(903,622)
Net cash flow		(\$541,422)	(\$786,631)	(\$882,029)	(\$1,038,861)	(\$928,493)	(\$723,582)	(\$916,844)	(\$922,993)	(\$1,027,939)	(\$1,114,847)	(\$831,351)
<i>Cash &amp; investments</i>		(\$5,059,175)	(\$5,845,806)	(\$6,727,835)	(\$7,766,696)	(\$8,695,189)	(\$9,418,771)	(\$10,335,614)	(\$11,258,607)	(\$12,286,547)	(\$13,401,394)	(\$14,232,745)
<b>Annual Revenue Requirement Summary</b>												
Total estimated operating expenses, debt and capital improvements [2]		1,033,930	1,279,138	1,374,537	1,531,369	1,421,000	1,216,089	1,409,351	1,415,501	1,520,447	1,607,355	1,323,859
Current annual rate [1][3]		\$40.50	\$40.50	\$40.50	\$40.50	\$40.50	\$40.50	\$40.50	\$40.50	\$40.50	\$40.50	\$40.50
Annual rate needed to fund expenses, capital improvements and debt		\$85.02	\$105.19	\$113.03	\$125.93	\$116.85	\$100.00	\$115.89	\$116.40	\$125.03	\$132.18	\$108.86
Estimated shortage in rates		(\$44.52)	(\$64.69)	(\$72.53)	(\$85.43)	(\$76.35)	(\$59.50)	(\$75.39)	(\$75.90)	(\$84.53)	(\$91.68)	(\$68.36)
Total estimated cash funded capital improvements		\$723,086	\$962,078	\$1,051,135	\$1,201,499	\$1,084,533	\$872,893	\$1,059,291	\$1,058,439	\$1,156,244	\$1,235,868	\$944,942
Annual rate needed to fund capital improvements only		\$59.46	\$79.11	\$86.44	\$98.80	\$89.18	\$71.78	\$87.11	\$87.04	\$95.08	\$101.63	\$77.70
Average annual rate needed to fund capital improvements only		\$84.85	\$84.85	\$84.85	\$84.85	\$84.85	\$84.85	\$84.85	\$84.85	\$84.85	\$84.85	\$84.85

[1] Current annual rate is equal to the cumulative Admin, Debt Service and Reserve Fund fees

[2] Includes Township total operating expenses, Pontiac Lake debt service payments and estimated cash funded capital expenditures

[3] Assumes \$18 debt service fee is added into reserve fund fee after defeasance of Pontiac Lake debt in 2022

**WHITE LAKE TOWNSHIP (MICHIGAN) SEWER FUND**

**PROOF OF RATES TO REVENUE**

<u>SEWER</u>		<u>Q1</u>	<u>Q2</u>	<u>Q3</u>	<u>Q4</u>	<u>Annual</u>
Admin Fees	REUs	3,040.2	3,040.2	3,040.2	3,040.2	
	Times: Rate per Quarter	\$12.50	\$12.50	\$12.50	\$12.50	
	Total Billed Amount	<u>\$38,002</u>	<u>\$38,002</u>	<u>\$38,002</u>	<u>\$38,002</u>	<u>\$152,009</u>
Debt Service Fees	REUs	3,040.2	3,040.2	3,040.2	3,040.2	
	Times: Rate per Quarter	\$18.00	\$18.00	\$18.00	\$18.00	
	Total Billed Amount	<u>\$54,723</u>	<u>\$54,723</u>	<u>\$54,723</u>	<u>\$54,723</u>	<u>\$218,892</u>
Reserve Fund Fees	REUs	3,040.2	3,040.2	3,040.2	3,040.2	
	Times: Rate per Quarter	\$10.00	\$10.00	\$10.00	\$10.00	
	Total Billed Amount	<u>\$30,402</u>	<u>\$30,402</u>	<u>\$30,402</u>	<u>\$30,402</u>	<u>\$121,607</u>
Sewer Debt Charges	REUs	3,040.2	3,040.2	3,040.2	3,040.2	
	Times: Rate per quarter	\$128.38	\$128.38	\$128.38	\$128.38	
	Annual Billed	<u>\$390,297</u>	<u>\$390,297</u>	<u>\$390,297</u>	<u>\$390,297</u>	<u>\$1,561,188</u>
Maintenance Reserve	REUs	3,040.2	3,040.2	3,040.2	3,040.2	
	Times: Rate per quarter	\$4.36	\$4.36	\$4.36	\$4.36	
	Annual Billed	<u>\$13,255</u>	<u>\$13,255</u>	<u>\$13,255</u>	<u>\$13,255</u>	<u>\$53,021</u>
	Total Sewer Billed	<u>\$526,679</u>	<u>\$526,679</u>	<u>\$526,679</u>	<u>\$526,679</u>	<u>\$2,106,716</u>

**WWAMP APPENDIX D – CIP & O&M PROJECT SUMMARY**

Item No.	Item Description	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Total over 20 Years
		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	
		\$772,188	\$751,317	\$707,352	\$705,350	\$620,605	\$1,419,628	\$554,070	\$930,599	\$794,541	\$832,462	\$896,990	\$1,100,315	\$1,390,858	\$1,124,702	\$1,049,923	\$1,110,843	\$1,136,249	\$1,305,471	\$1,233,733	\$901,692	
	<b>CIP Costs</b>																					
1	Gravity Manhole Repairs	\$14,525	\$14,729	\$16,817	\$14,530	\$15,313	\$22,876	\$18,982	\$17,340	\$21,933	\$21,461	\$23,274	\$21,795	\$23,195	\$24,424	\$29,111	\$27,664	\$27,871	\$27,659	\$32,076	\$27,682	\$444,000
2	Pressure Manhole Repairs	\$7,650	\$12,750	\$10,200	\$10,200	\$12,750	\$10,200	\$10,200	\$15,300	\$13,650	\$13,350	\$15,300	\$15,900	\$15,300	\$16,200	\$17,850	\$18,750	\$17,100	\$20,400	\$20,400	\$21,600	\$298,000
3	Gravity Main Repairs	\$298,213	\$307,070	\$366,409	\$343,257	\$406,385	\$357,229	\$426,629	\$350,481	\$570,617	\$426,230	\$423,210	\$478,029	\$607,625	\$549,631	\$575,487	\$566,931	\$648,156	\$618,510	\$671,128	\$538,831	\$9,531,000
4	Pressure Main Repairs	\$0	\$276,308	\$223,934	\$225,424	\$92,194	\$340,704	\$0	\$446,941	\$10,436	\$266,052	\$307,276	\$335,996	\$273,373	\$388,199	\$278,230	\$287,135	\$317,518	\$304,927	\$357,647	\$177,450	\$4,910,000
	<b>CIP Total</b>	<b>\$320,388</b>	<b>\$610,857</b>	<b>\$617,360</b>	<b>\$593,411</b>	<b>\$526,642</b>	<b>\$733,559</b>	<b>\$455,811</b>	<b>\$830,062</b>	<b>\$616,636</b>	<b>\$727,093</b>	<b>\$769,059</b>	<b>\$851,719</b>	<b>\$919,492</b>	<b>\$978,454</b>	<b>\$900,678</b>	<b>\$900,480</b>	<b>\$1,010,645</b>	<b>\$971,496</b>	<b>\$1,081,252</b>	<b>\$765,564</b>	<b>\$15,181,000</b>
	<b>O&amp;M Costs</b>																					
5	O&M - FOG Program	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$20,000
6	Elizabeth Lake Road/Oxbow Road Odor Control Program	\$40,000	\$60,160	\$40,320	\$40,320	\$40,320	\$40,320	\$40,320	\$40,320	\$40,320	\$40,320	\$40,320	\$40,320	\$40,320	\$40,320	\$40,320	\$40,320	\$40,320	\$40,320	\$40,320	\$40,320	\$826,000
	<b>Township O&amp;M Total</b>	<b>\$41,000</b>	<b>\$61,160</b>	<b>\$41,320</b>	<b>\$41,320</b>	<b>\$41,320</b>	<b>\$41,320</b>	<b>\$41,320</b>	<b>\$41,320</b>	<b>\$41,320</b>	<b>\$41,320</b>	<b>\$41,320</b>	<b>\$41,320</b>	<b>\$41,320</b>	<b>\$41,320</b>	<b>\$41,320</b>	<b>\$41,320</b>	<b>\$41,320</b>	<b>\$41,320</b>	<b>\$41,320</b>	<b>\$41,320</b>	<b>\$846,000</b>
5	OCWRC - CCTV of Sanitary Sewer	\$45,000	\$46,800	\$48,672	\$50,619	\$52,644	\$54,749	\$56,939	\$59,217	\$61,586	\$64,049	\$66,611	\$69,275	\$72,046	\$74,928	\$77,925	\$81,042	\$84,284	\$87,656	\$91,162	\$94,808	\$1,341,000
6	Pumping Station - Bocavina	\$24,400										\$138,000										\$163,000
7	Pumping Station - Cranberry Lake Estates	\$24,400					\$230,000					\$20,000		\$20,000								\$295,000
8	Pumping Station - Kroger													\$46,000								\$46,000
9	Pumping Station - Meijer	\$54,400												\$140,000	\$30,000	\$30,000						\$255,000
10	Pumping Station - Suburban Knolls	\$24,400			\$20,000		\$160,000													\$20,000		\$225,000
11	Pumping Station - Village Lakes	\$69,400															\$20,000		\$205,000			\$295,000
12	Pumping Station - White Lake Estates	\$64,400					\$200,000									\$40,000						\$305,000
13	Pumping Station - White Lake Market Place	\$36,400	\$22,500							\$75,000						\$12,000						\$146,000
14	Pumping Station - Williams Lake Road	\$40,400	\$10,000											\$130,000		\$16,000						\$197,000
15	Pumping Station - Worthington Crossing													\$22,000								\$22,000
16	Gravity Flow Meter Site 6600	\$13,800																				\$14,000
17	Gravity Flow Meter Site 6610	\$13,800																				\$14,000
	<b>Pumping Station Improvements Total</b>	<b>\$365,800</b>	<b>\$32,500</b>	<b>\$0</b>	<b>\$20,000</b>	<b>\$0</b>	<b>\$590,000</b>	<b>\$0</b>	<b>\$0</b>	<b>\$75,000</b>	<b>\$0</b>	<b>\$20,000</b>	<b>\$138,000</b>	<b>\$358,000</b>	<b>\$30,000</b>	<b>\$30,000</b>	<b>\$88,000</b>	<b>\$0</b>	<b>\$205,000</b>	<b>\$20,000</b>	<b>\$0</b>	<b>\$1,973,000</b>
																						<b>\$19,341,000</b>



# White Lake Township

## Sanitary Sewer Pumping Station Evaluation Report



December 2019

## INTRODUCTION

Johnson & Anderson, Inc., a DLZ Company, was engaged by White Lake Township to complete an assessment of Township-owned and operated sanitary sewage pumping stations as part of a Stormwater, Asset Management, and Wastewater (SAW) Grant Implementation Project which the Township was awarded in January 2017. As part of the project, J&A-DLZ has completed field inspections at all ten (10) pumping station locations: Bocavina, Cranberry Lake Estates, Kroger, Meijer, Suburban Knolls, Village Lakes, White Lake Estates, White Lake Market Place, Williams Lake Road, and Worthington Crossing. Due to their size and importance in the system, pump drawdown tests were performed at these stations.

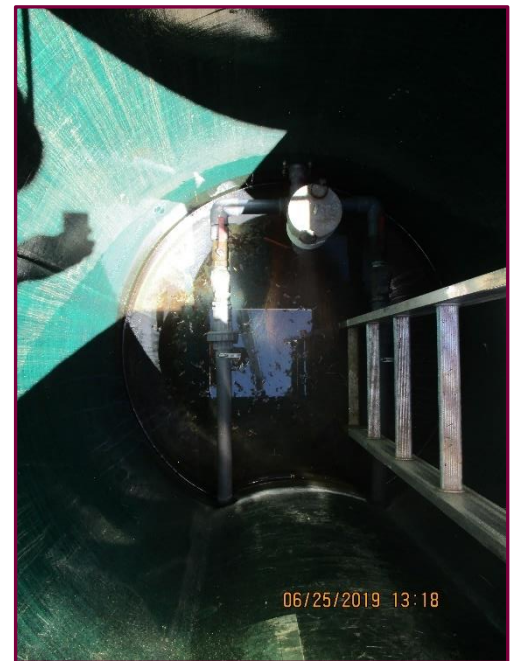
The Township has an ongoing maintenance program with the Oakland County Water Resources Commissioner's Office (WRC) for all 10 stations. The maintenance program consists of monthly visits at 8 stations Bocavina, Cranberry Lake Estates, Meijer, Suburban Knolls, Village Lakes, White Lake Estates, White Lake Market Place, and Williams Lake Road stations. Provided records indicate only annual inspections have been performed at the Kroger and Worthington Crossing stations. Inspections include: performing telemetry, alarm, and electrical checks, pump megger (insulation/moisture) testing, and inspection of the panel wiring.

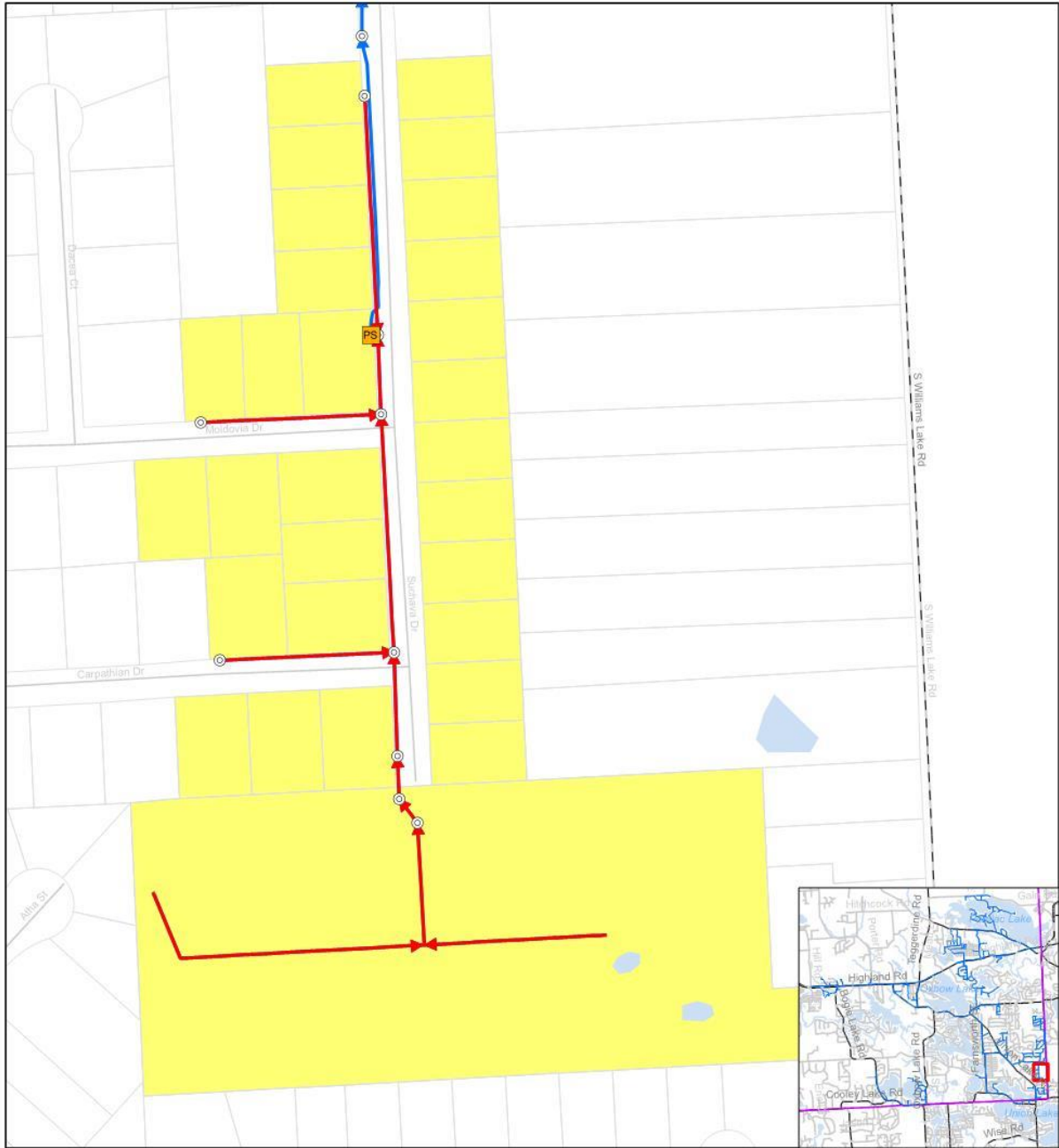
All pumping stations are equipped with a supervisory control and data acquisition (SCADA) system, which was installed in the mid-1990s. The existing system provides site-specific alarms back to Oakland County Safety Dispatch.

### **Bocavina Pumping Station**

#### *Location and Design*

Bocavina Pumping Station is located on Suchava Drive, west of Williams Lake Road. The station was built in 2001 to serve the Bocavina East development and was designed by Powell Engineering as part of the overall development. The initial service district was intended to accommodate the 30 residential properties in the Bocavina East development but has since been expanded to also include the 21 residential properties from the Ivy Glen development to the south. It contains two (2) Flygt Model 3085.891 submersible pumps with 259 impellers installed in 2016, in a duplex arrangement. Please see the Pumping Station Contributing Area Map on the following page.





### Bocavina Pumping Station Contributing Area

- PS Pumping Station
- Sewer Main
- Manhole
- Service Area
- Upstream Trace



## Cranberry Lake Estates Pumping Station

### *Location and Design*

Cranberry Lake Estates Pumping Station is located on Cranberry Boulevard, east of Cranberry Lake Road, north of M-59. The station was built in 1995 and contains two (2) Flygt Model 3152.091 submersible pumps with 454 impellers in a duplex arrangement. Pump #1 was replaced in 2017 and Pump #2 was replaced in 2015 per OCWRC records.



The pumping station was part of the Contract #3 State Revolving Fund Project #5059 and was designed by Spalding DeDecker & Associates (SDA). The basis of design for the station is not on the plan set for the station, however the Township Sanitary Sewer Tracking form originally developed by SDA indicates 191.7 REUs for this district and the Oakland County

pump records indicate a design point of 390 GPM and 76 feet Total Dynamic Head (TDH) for the pump station design. Please see the Pumping Station Contributing Area Map on the following page.

## Kroger Pumping Station

### *Location and Design*

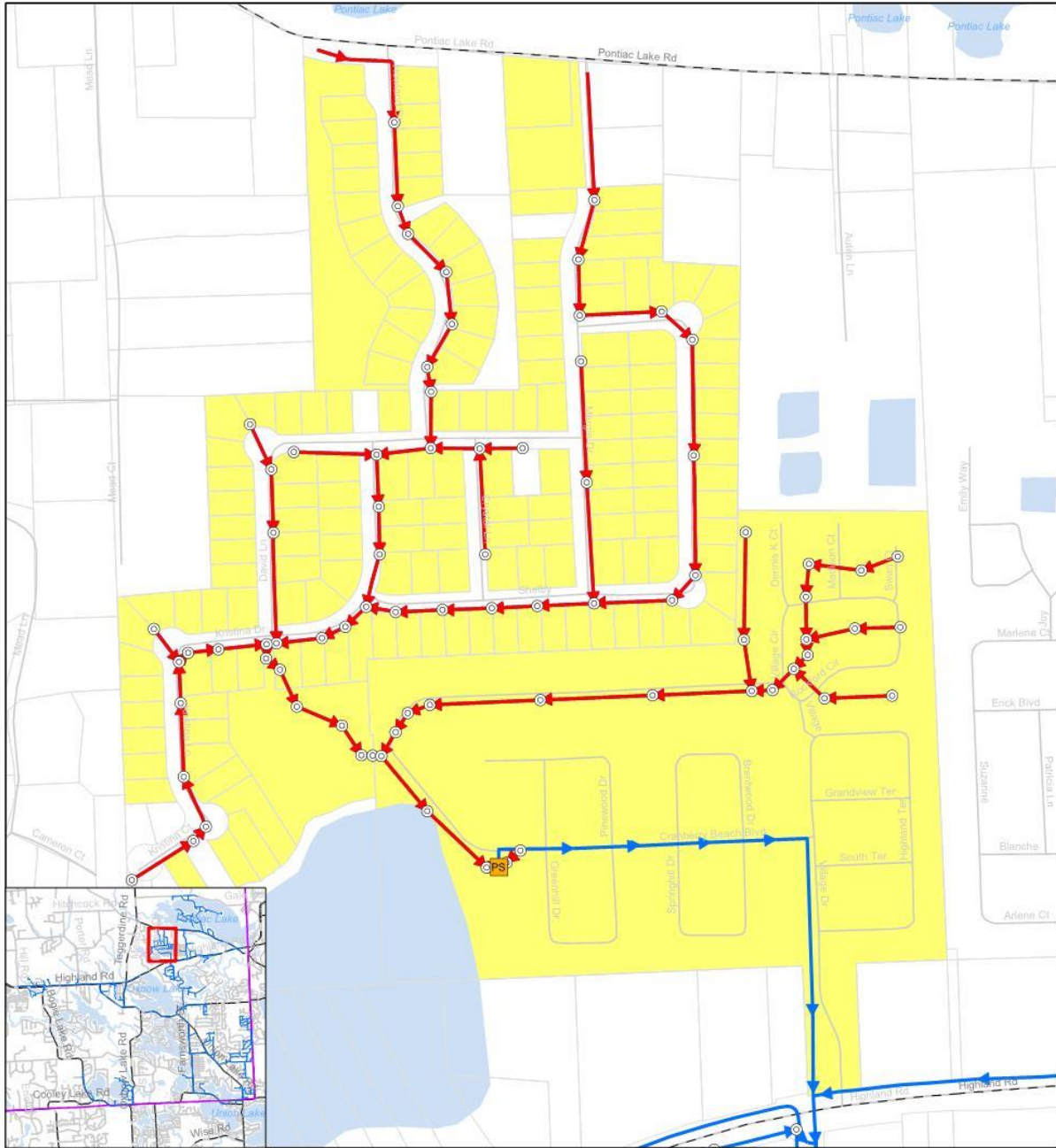
The Kroger Pumping Station is located east of Elizabeth Lake Road, south of M-59. The station was built in 2017 and has a service area including Arby's, Ulta Beauty, Hobby Lobby, and Kroger. The station was designed by Johnson & Anderson under project # 17710 in conjunction with the redevelopment of the old Kmart building at the present location of the Kroger store.



The pumping station design included Variable Frequency Drive (VFD) control of the pumps due to the wide range of possible head conditions on the discharge pressure sewer in Elizabeth Lake Road (28.4 to 161 feet) depending on what other pump stations are active at a given time. The station design utilizes the VFDs to vary pump speed based on

input from the magnetic flow meter to maintain a discharge rate of 215 GPM until pump shut off. This configuration prevents the pump from pumping off the curve in the event there are periods of low pressure in the discharge pressure sewer. It contains two (2) Flygt Model 3153.095 submersible pumps with 274 impellers in a duplex arrangement. Please see the Pumping Station Contributing Area Map on Page 5.

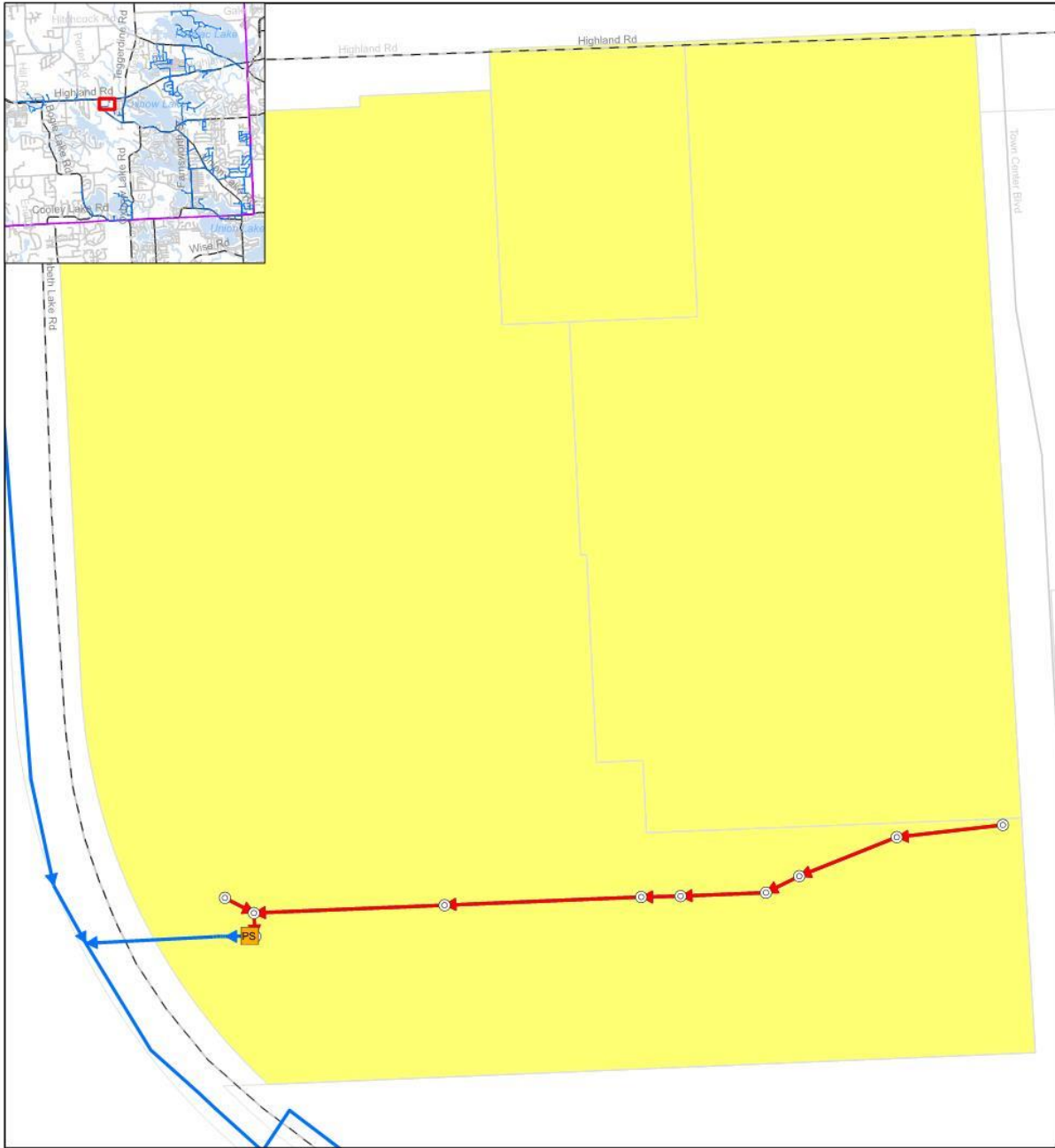




Cranberry Lake Estates Pumping Station Contributing Area N

- PS Pumping Station
- Manhole
- Service Area
- Upstream Trace
- Sewer Main





### Kroger Pumping Station Contributing Area

- PS Pumping Station
- Manhole
- Service Area
- Sewer Main
- Upstream Trace



## Meijer Pumping Station

### *Location and Design*

The Meijer Pumping Station is located at the Meijer complex off of Highland Road. The station was designed by Spalding DeDecker & Associates (SDA) along with the force main that ultimately discharges to gravity sewer at Elizabeth Lake Road and Union Lake Road. The station and force main were installed in 2003.

The basis of design for the station is not on the plan set for the station, however the Township Sanitary Sewer Tracking form originally developed by SDA indicates 69.3 REUs for offsite

and 0 REUs for onsite contributions. This will require further evaluation as there are certainly flows developed by the site. The Oakland County pump records indicate design points of 400 GPM and 130.11 feet Total Dynamic Head (TDH) for the pump station design. The station is plumbed for a triplex configuration, however only two pumps are currently installed, Flygt Model 3170.090 pumps with 463 impellers. Upon our investigation it was discovered that Pump #1 was near failure and was replaced in 2019, Pump #2 has been in service since 2003. Please see the Pumping Station Contributing Area Map on the following page.



## Suburban Knolls Pumping Station

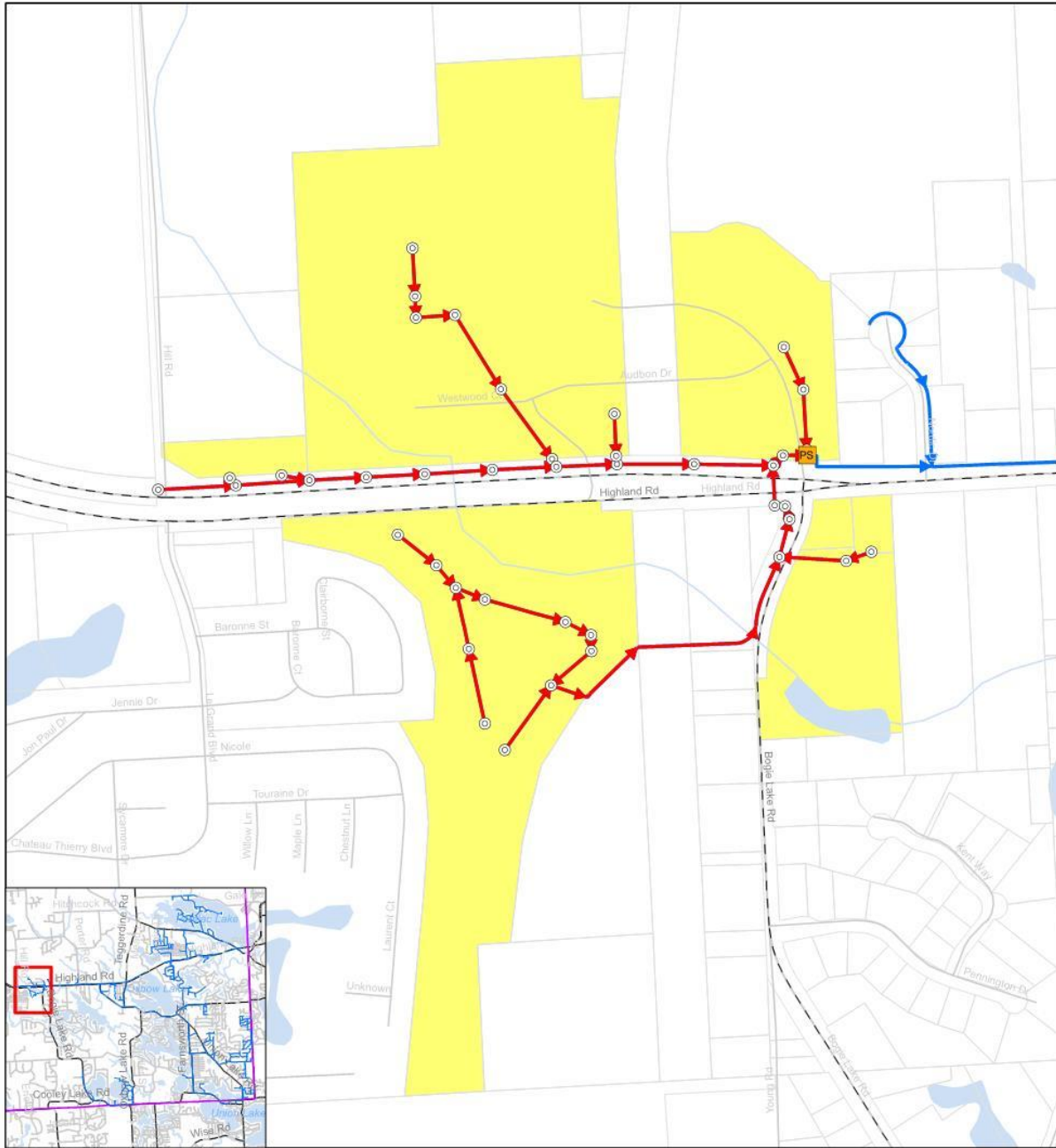
### *Location and Design*

The Suburban Knolls Pumping Station is located at 511 Oxhill Drive, south of Highland Road. The station was built in 1995 and contains two (2) ABS Model AFP1046EXM90/4-22 submersible pumps in a duplex arrangement. The pump ages are unknown, for the purpose of this report we will assume they are original and were installed with the station construction.

The pumping station was part of the Contract #3 State Revolving Fund Project #5059 and was designed by Spalding DeDecker & Associates (SDA). The basis of design for the station is not on the plan set for the



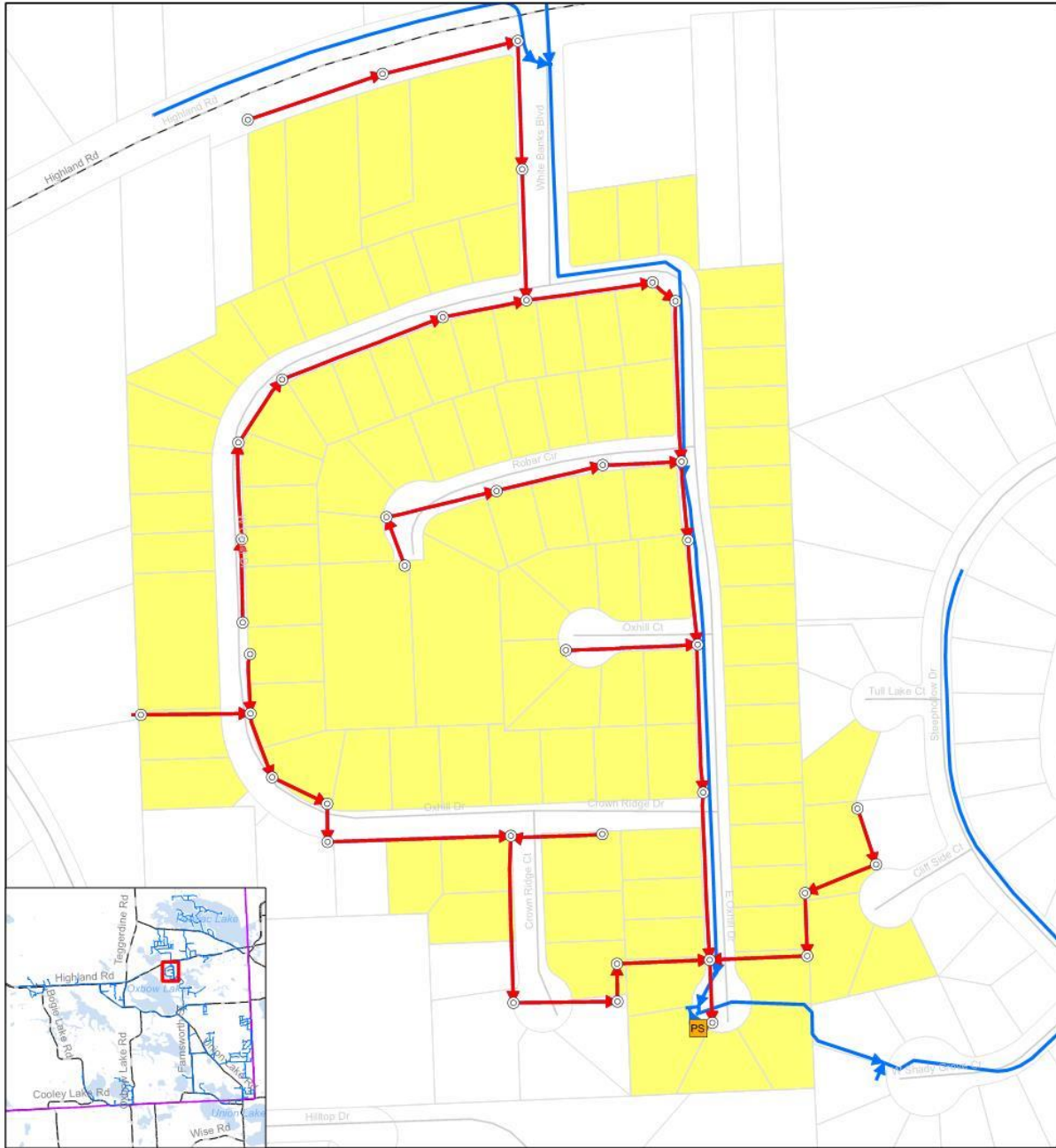
station, however the Township Sanitary Sewer Tracking form originally developed by SDA indicates 145 REUs for this district and the Oakland County pump records indicate a design point of 210 GPM and 72 feet Total Dynamic Head (TDH) for the pump station design. Please see the Pumping Station Contributing Area Map on Page 8.



### Meijer Pumping Station Contributing Area

- PS Pumping Station
- Sewer Main
- Manhole
- Service Area
- Upstream Trace





### Suburban Knolls Pumping Station Contributing Area

- PS Pumping Station
- Sewer Main
- Manhole
- Service Area
- Upstream Trace



## Village Lakes Pumping Station

### *Location and Design*

The Village Lakes Pumping Station is located at 10775 Highland Road. The station was built in 2007 as part of the Village Lakes commercial development. The development basis of design called for an initial population of 244 people at 90 gallons per person per day and an ultimate population of 338.5 people at 90 gallons per person per day. The Township Sanitary Sewer Tracking form indicates 141.3 REUs for this development, at 2.7 people per REU this population works out to over 381 people so this is likely over reporting on the tracking sheet. Further investigation to currently connected REUs is recommended.



The pumping station Basis of Design calls for lead and lag pumps to be operated with VFDs to pace flow at a minimum flow rate of 112.5 gallons per minute to a maximum 160 gallons per minute. The flow is paced off feedback from the magnetic flow meter, head pressures can range from as low as 28.4 up to 165 feet Total Dynamic Head (TDH) depending on what other pumps are on in the system. It contains two (2) Flygt 3153-275 submersible pumps installed in a duplex arrangement. Please see the Pumping Station Contributing Area Map on the following page.

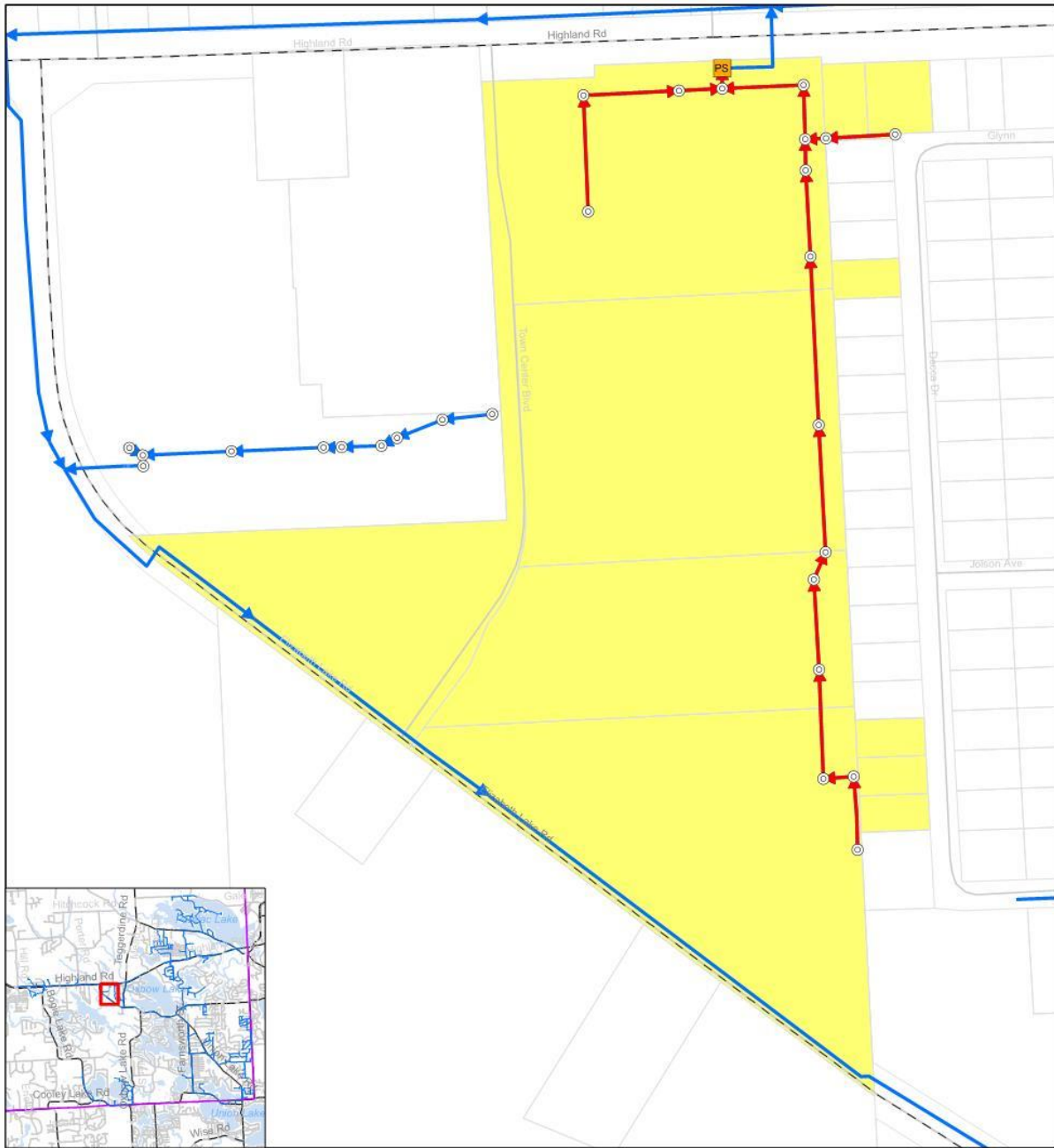
## White Lake Estates Pumping Station

### *Location and Design*

The White Lake Estates Pumping Station is located on Sherry Boulevard, west of Fisk Road. The station was built in the 1970s and rehabilitated in 1995 as part of the Contract #3 State Revolving Fund Project #5059. The station rehabilitation was designed by Spalding DeDecker & Associates (SDA) and the design reutilized the existing wet well and drywell can structure. The pumps consist of two (2) Smith and Loveless Model MD4A 215 TTDR8672BN-L dry well pumps in a duplex arrangement. The pump ages are unknown, for the purpose of this report we will assume they were installed with the station rehabilitation.



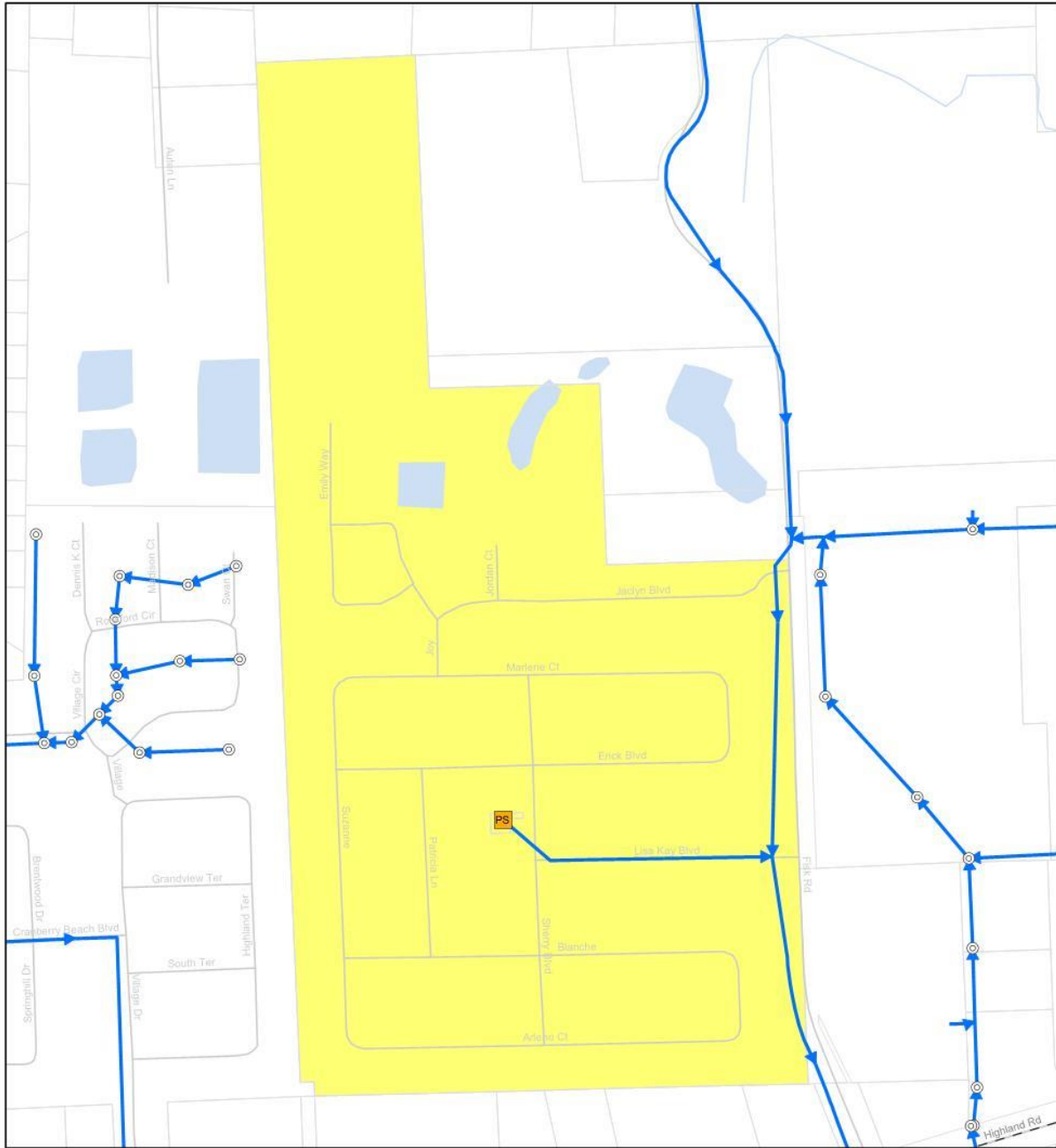
The basis of design for the station is not on the plan set for the station, however the Township Sanitary Sewer Tracking form originally developed by SDA indicates 87.3 REUs for this district and the Oakland County pump records indicate design points of 210 GPM and 72 feet Total Dynamic Head (TDH) for the pump station design. Please see the Pumping Station Contributing Area Map on Page 11.



### Village Lakes Pumping Station Contributing Area

- PS Pumping Station
- Sewer Main
- ⊙ Manhole
- Service Area
- Upstream Trace





### White Lake Estates Pumping Station Contributing Area

- PS Lift Station
- Manhole
- Service Area
- Sewer Main
- Upstream Trace





## White Lake Market Place Pumping Station

### *Location and Design*

The White Lake Market Place Pumping Station is located at the Walmart/Home Depot complex off of Highland Road. The station was built in 1998. The pump station basis of design indicates the station is sized for 232 REUs or a population of 812 people at a flow rate of 100 gallons per person per day and a peak flow rate of 217 gallons per minute.

The Oakland County pump records indicate a design point of 248 GPM and 84 feet Total Dynamic Head (TDH) for the required duty point. The station has two (2) Flygt 3140.180 submersible pumps installed with 481 impellers in a duplex arrangement. Please see the Pumping Station Contributing Area Map on the following page.



## Williams Lake Road Pumping Station

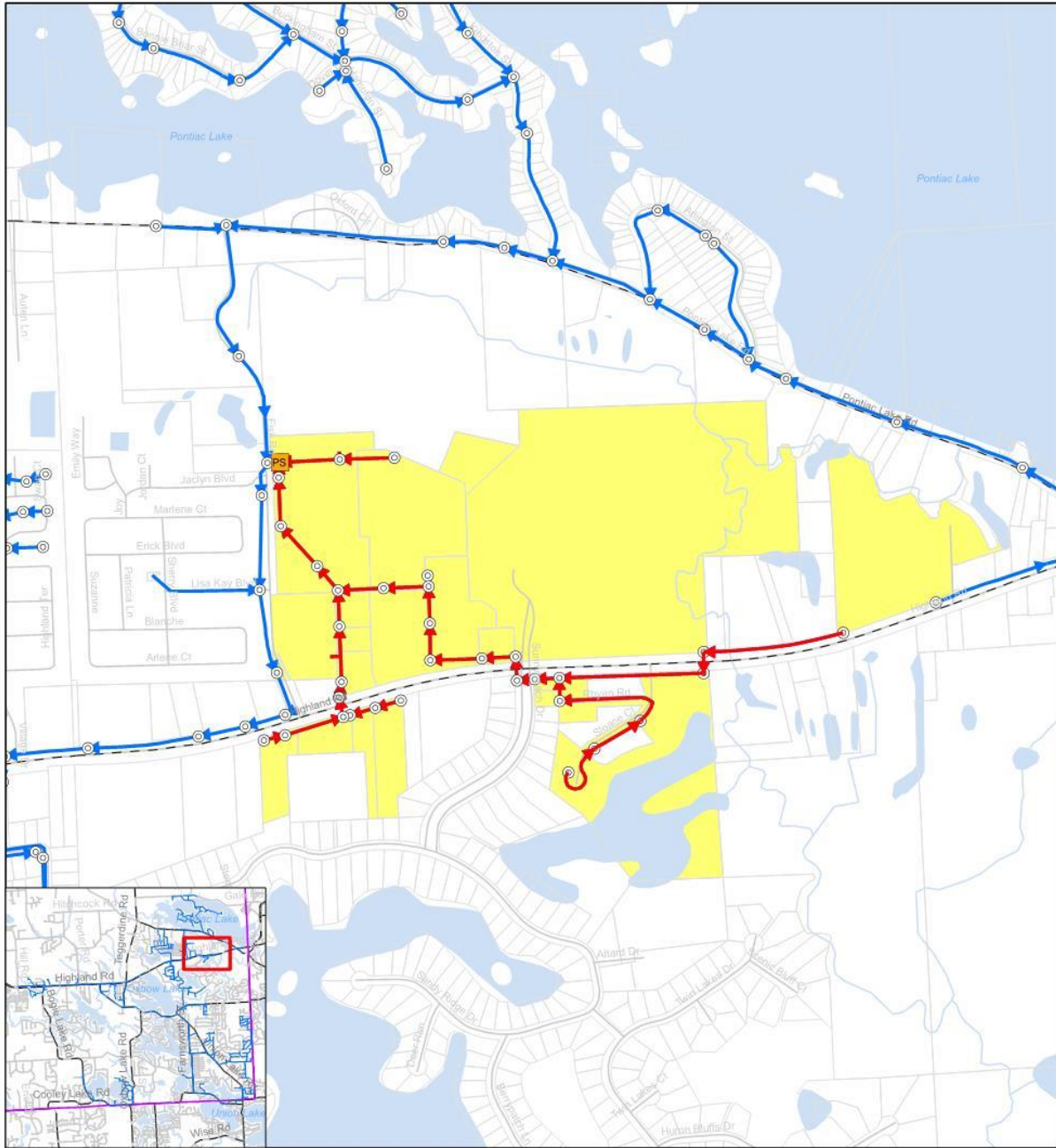
### *Location and Design*

The Williams Lake Road Pumping Station is located 474 Williams Lake Road, just south of Rookery Boulevard. The station was built in 2002 as part of the Williams Lake Road sanitary sewer extension project. The original sanitary design for this station was completed by Spalding DeDecker & Associates (SDA) and included a district of 335 single family units and a peak inflow of 288 gallons per minute.



The Oakland County pump records indicate a design point of 280 GPM and 50 feet Total Dynamic Head (TDH) for the required duty point. The station contains two (2) Flygt 3127.090 submersible pumps with 483 impellers installed in a duplex arrangement.

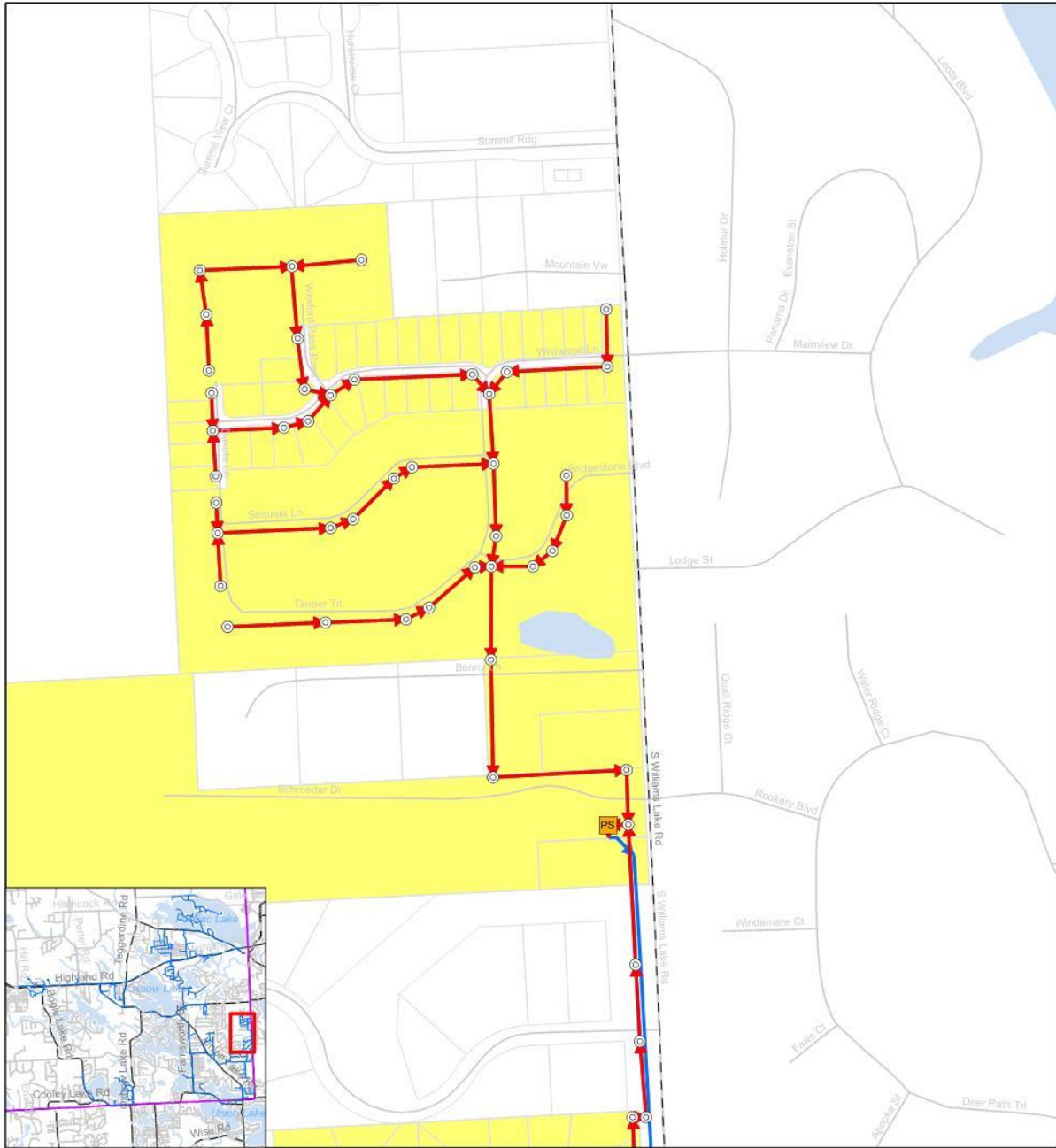
Please see the Pumping Station Contributing Area Map on Page 14.



White Lake Market Place Pumping Station Contributing Area N

- PS Pumping Station    → Sewer Main
- Manhole     Service Area
- Upstream Trace





### Williams Lake Road Pumping Station Contributing Area

- PS Pumping Station
- ⊙ Manhole
- Upstream Trace
- Sewer Main
- Service Area



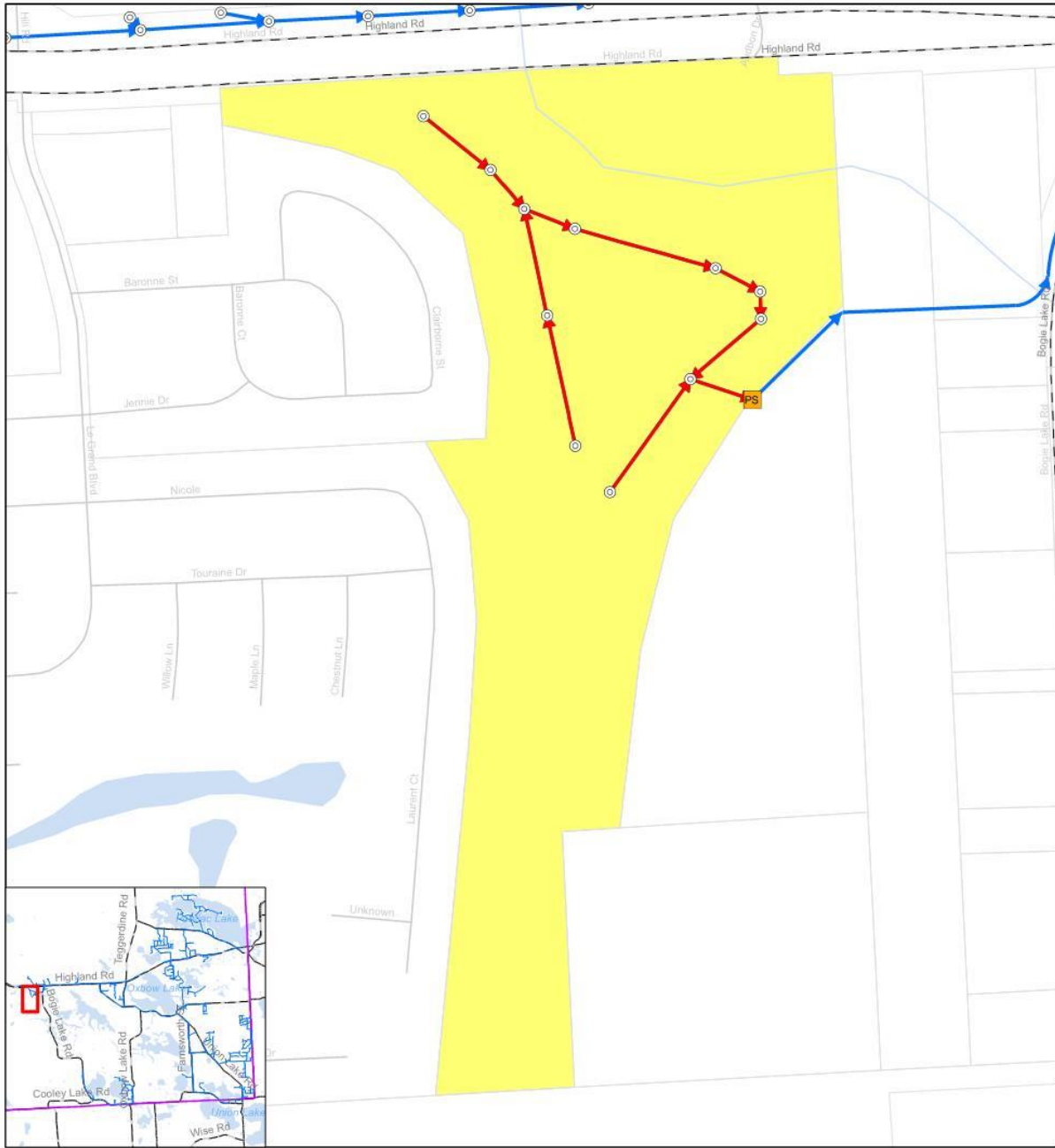
## Worthington Crossing Pumping Station

### *Location and Design*

The Worthington Crossing Pumping Station is located on the south side of M-59, west of Bogie Lake Road. The station was built in 2017 as part of the Worthington Crossing apartment development. The Powell Engineering design plans indicate the station is designed for 144 condominiums with a peak flow rate of 119 gallons per minute inflow to the station.

The station contains two (2) Flygt 3085.190.0456 4 horsepower submersible pumps installed in a duplex arrangement. Please see the Pumping Station Contributing Area Map on the following page.





### Worthington Crossing Pumping Station Contributing Area<sup>N</sup>

- PS Pumping Station
- ⊙ Manhole
- Upstream Trace
- Sewer Main
- Service Area



## CONDITION OF ASSETS

The following tasks were performed to complete the pumping station evaluations:

1. Collection and review of available record plan and design information;
2. Obtain and review of WRC maintenance log sheets for the past 3 years;
3. Execution of field visits to document existing conditions at each pumping station and to perform pump drawdown tests;
4. Development of a pump station inventory, qualitative condition assessment and risk rating for each pump station component;
5. Preparation of a Capital Improvement Plan (CIP) to outline equipment replacement and other updates as well as estimated costs over the 20-year planning period for each pump station.

Each of the following pumping station components as well as site information was evaluated by J&A-DLZ and WRC staff in Winter/Spring 2019 with a replacement plan of action for each pumping station compiled. These findings were reviewed based upon historical knowledge and maintenance records from the WRC. The twenty-three (23) pumping station components for each station are as follows:

1. Controls - Instrumentation, Control Panel, and Cabinet
2. Controls - Level Control System
3. Controls - Actuator
4. Electrical - General
5. Electrical - Transformer
6. Electrical - On Site Generator/ Portable Generator Connection- Emergency Power
7. Electrical - Motor Control Center
8. Equipment - General
9. Equipment - Motor and Variable Speed Control
10. Equipment - Compressor
11. Equipment - Communications/Antenna Structures, Telemetry
12. Equipment - Bypass Pump Connection
13. Equipment - Discharge Pressure Gauges
14. Heating, Ventilation and Cooling (HVAC) - Forced Air and Ventilation
15. Piping
16. Pump System - Pump #1
17. Pump System - Pump#2
18. Pump System - Meter
19. Site Conditions - General, including Structure
20. Site Conditions - Fence, where present
21. Site Conditions - Security and Access
22. Structure/Equipment - Wet Well and Appurtenances
23. Structure/Equipment - Valve Vault and Valve

If critical components were missing, deficiencies were noted.

Per Michigan Department of Environment, Great Lakes, and Energy (EGLE) Asset Management Rating Guidance outlined in the tables below, a Business Risk Evaluation (BRE) was performed on each pumping station sub-system to identify and develop an illustrative schedule for equipment rehabilitation or replacement during the 20-year Capital Improvement Planning (CIP) period.

Although the focus of the pumping station evaluations was related to condition assessment, information on past pumping station maintenance was also obtained and evaluated from WRC's maintenance records provided by Township staff. Based on the pumping station site visits and maintenance information provided, the following general conditions were noted:

- Moderate to excessive grease buildup was noted in 6 of the 10 stations. Through this SAW Grant project, the Township has implemented a Fats, Oils, and Grease (FOG) inspection program in hopes to minimize FOG accumulation in these stations moving forward.
- The Township has received odor complaints over the years from the wastewater system that runs along Elizabeth Lake Road and southeast to Oxbow Road. The Meijer, Kroger, and Village Lakes pumping stations feed into this system. The Township and WRC have contracted with Eganix, Inc., to treat this line and a comprehensive odor control program is in place.
- It was determined by the WRC that four (4) Air Release Valves were not functioning properly. These valves were replaced. There was also one ARV structure which was buried. WRC exposed that structure and cleared it of debris. WRC also could not locate the ARV located at approximately 9035 Oakwood and recommended that a survey be conducted to locate and expose the ARV, as it may not be performing properly since it is buried.

The ages of the existing components were considered as well as the frequency of repairs of those components. Through this review, a plan of refurbishment at each pumping station was determined based on which components needed replacement.

**Table 1 Pumping Station Refurbishment Items**

Component	Bocavina	Cranberry Lake Estates	Kroger	Meijer	Suburban Knolls	Village Lakes	White Lake Estates	White Lake Market Place	Williams Lake Road	Worthington Crossing
Controls – Instrumentation, Control Panel, Cabinet		X		X	X	X	X	X		
Controls – Level Control System						X				
Controls – Actuator										
Electrical- General				X	X	X	X	X		
Electrical – Transformer										
Electrical – On Site Generator/ Portable Generator Connection- Emergency Power										
Electrical – Motor Control Center										
Equipment – General										
Equipment- Motor and Variable Speed Control										
Equipment- Compressor										
Equipment- Communications/Antenna Structures, Telemetry					X					
Equipment -Bypass Pump Connection										
Equipment- Discharge Pressure Gauges										
HVAC- Forced Air and Ventilation										
Piping										
Pump System- Pump#1		X		X		X		X	X	
Pump System – Pump#2		X				X	X	X	X	
Pump System- Meter										
Site Conditions- General, Including Structure	X	X						X	X	
Site Conditions- Fence, Where Present									X	
Site Conditions – Security & Access	X	X					X	X	X	
Structure/Equipment- Wet Well and Appurtenances	X	X	X	X	X	X	X	X	X	
Structure/Equipment- Valve Vault and Valve		X		X	X	X	X	X	X	



Currently, pumping station upgrades are addressed on an as-needed basis. Pumps are maintained and/or replaced when a problem or failure occurs. It was determined by the WRC during the time of inspection, that six (6) Pumps were in need of being replaced or rebuilt. Pump #1 at the Meijer Pumping Station demonstrated a low electrical resistance which is indicative of near future pump failure. As a result, this pump was removed from service and replaced in August 2019.

**Table 2 Pump Remaining Useful Life**

<b>Pumps</b>	<b>Pump Install Date</b>	<b>Remaining Useful Life in Years (Based on Typical Useful Life of 15 years)</b>
Bocavina Pump 1	02/25/2016	12
Bocavina Pump 2	02/25/2016	12
Cranberry Lake Estates Pump 1	12/05/2017	13
Cranberry Lake Estates Pump 2	12/30/2015	11
Kroger Pump 1	03/24/2017	13
Kroger Pump 2	03/24/2017	13
Meijer Pump 1	8/1/2019	15
Meijer Pump 2	Original 2003	0
Suburban Knolls Pump 1	Unknown	4 (assumed)
Suburban Knolls Pump 2	Unknown	4 (assumed)
Village Lakes Pump 1	Original 2007	0
Village Lakes Pump 2	Original 2007	0
White Lake Estates Pump 1	1995	0
White Lake Estates Pump 2	1995	0
White Lake Market Place Pump 1	1998	0
White Lake Market Place Pump 2	1998	0
Williams Lake Road Pump 1	2002	0
Williams Lake Road Pump 2	2002	0
Worthington Crossing Pump 1	2017	13
Worthington Crossing Pump 2	2017	13

## **PUMPING STATION OBSERVATIONS, DEFICIENCIES & RECOMMENDATIONS**

### Bocavina Pumping Station

- The wet well rails are flimsy and will need to be tightened/repaired.
- The Arborvitae in this area will need to be trimmed back.
- The Control Panel/Cabinet is starting to rust.
- Instruments free of debris/unobstructed.

### Cranberry Lake Estates Pumping Station

- The wet well structure is in fair condition with a few small areas of infiltration.
- The wet well top is fair with some aggregate showing.
- The hatch, hatch hold open, guide rails, and float rack are in fair to poor condition.
- The hatch does not have any safety grating and should be upgraded.
- The valve vault structure, steps, hatch, and piping are in good to fair condition.
- Small amount of infiltration at the vault joints.
- The Arborvitae in this area will need to be trimmed back – minor restrictions to site functions.
- The Control Panel/Cabinet is starting to rust.
- The equipment insulation is loose.
- Excellent condition of access door seal.
- Minor wet well, valve vault pump, electrical equipment surface corrosion.
- Surface cracking in the fiberglass.
- Instruments free of debris/unobstructed.
- Excessive grease buildup.

### Kroger Pumping Station

- The wet well and piping are showing signs of high hydrogen sulfide and will require attention.
- Instruments free of debris/unobstructed.

### Meijer Pumping Station

- Excellent condition of access door seal.
- Missing sealing compound in seal-off fittings going to wet well.
- The top of the Cabinet is rusting and in need of maintenance.
- Pump 1 is out of service and has been removed. A replacement pump was installed this past August.
- Minor wet well surface corrosion.
- Surface chalking in the fiberglass.
- Small amount of infiltration at the vault joints.
- The wet well hatch does not have any safety grating; leaks present and minor infiltration.
- Instruments free of debris/unobstructed.

- Moderate grease buildup.

#### Suburban Knolls Pumping Station

- Control panel cabinet insulation is loose and will need to be reattached or replaced.
- Valve vault joints displaying minor infiltration.
- Wet well has minor surface corrosion and no safety grating.
- Wet well hatch and guide rails are in fair to poor condition and will require attention.
- Small amount of infiltration at the vault joints.
- Wet well float rack and chains need replacement; minor infiltration.
- Surface chalking in the fiberglass.
- Instruments free of debris/unobstructed.
- Gooseneck vent needs painting.
- Minor corrosion observed in Pumps 1 and 2, wet well piping, and electrical equipment.
- Moderate grease buildup.

#### Village Lakes Pumping Station

- Control panel cabinet is rusted. Replacement likely.
- Ragging in impeller of Pump 1 – unable to get out.
- Gooseneck vent needs painting.
- High amount of damage to Pump 1 – needs replacing.
- VFD controller at Pump 2 is broken and will need repair or replacement.
- Maintenance required at access door seal – some seals peeling off.
- There are no individual lockouts for the pump breakers.
- Minor wet well piping and instrumentation surface corrosion.
- Surface chalking in the fiberglass.
- No safety grating at the wet well.
- Some infiltration at the valve vault joints.
- Instruments free of debris/unobstructed.
- Excessive grease buildup.

#### White Lake Estates Pumping Station

- Electrical boxes in control panel could be updated – Door interlocks on disconnects not functional.
- Maintenance required on access door seal.
- Check valve sticking in partially closed position at Pump 2; free end bearing wear upon performance of vibrational analysis – will require repair or replacement.
- Wet well in fair to poor condition with small areas of infiltration – maintenance required.
- Aggregate is showing on the manhole block.
- Wet well steps rusted and in poor condition – Replacement required.

- Wet well floats not properly attached to float rack and will require adjustment.
- There are no individual lockouts for the pump breakers.
- Small amount of infiltration present at valve vault joints.
- Maintenance required at access door seal – failed; door rusted in some areas where seal used to be.
- The door interlocks on the disconnects are not functional.
- Staining/minor erosion, minor surface rust.
- Surface chalking in the fiberglass.
- Instruments free of debris/unobstructed.
- Minor corrosion observed in Pumps 1 and 2.
- Vibration analysis showed ‘free end bearing wear’ on Pump 2.
- The Pump 2 check valve was sticking partially closed.
- Excessive grease buildup.

#### White Lake Market Place Pumping Station

- Door sprung and panel/cabinet rusting; access door seal in very poor condition – failure imminent.
- Exterior corrosion on electrical equipment disconnects.
- Failure imminent at access door seal.
- Minor exterior corrosion on the disconnects.
- Exposed aggregate/pitting and some material loss/surface cracking in the fiberglass.
- The Cabinet has exterior rust.
- Some infiltration and rust present at valve vault joints.
- Minor corrosion observed in Pumps 1 and 2 and wet well piping.
- Small areas of infiltration in wet well structure.
- Wet well top in poor condition with aggregate showing on corner. Tripping hazard is a result.
- Replace impeller and wear rings at Pumps 1 and 2; Rebuild the wet end of the pump to prevent premature failure and/or performance issues.
- No safety grating at wet well hatch – installation needed.
- Hatch, hatch hold open, guide rails, and float rack in fair to poor condition.
- Instruments free of debris/unobstructed.
- Landscaping shrubs need trimming.
- Moderate grease buildup.

#### Williams Lake Road Pumping Station

- Bottom of control panel cabinet is rusted – replacement likely.
- Pumps 1 and 2 – Replace impeller and wear rings. Voltage and amperage balance >1%. Rebuild the wet end of the pump including impeller and wear ring.
- Existing chain link fence is rusting and covered with vegetation – Replacement recommended.
- Infiltration at the valve vault (west wall) and wet well – Will require attention.
- No safety grating present at wet well hatch – Installation recommended.
- Driveway to station is cracking and may require repair.

- Minor wet well piping, equipment, instrumentation, and antenna structure corrosion.
- Surface chalking in the fiberglass.
- The wet well hatch has no safety grating.
- Instruments free of debris/unobstructed.
- No grease buildup.

#### Worthington Crossing Pumping Station

- Instruments free of debris/unobstructed.

#### **SCADA UPGRADES**

The existing pumping station SCADA system is over 20 years old. OCWRC is requesting the existing SCADA equipment be upgraded to improve deficiencies, including:

- equipment failures
- low transmission speeds
- communication failures
- data exporting and
- operator efficiencies
- existing platform no longer has software support

Each site will require a sheet metal cabinet, multiple circuit breakers, a programmable logic controller (PLC), several relays, and a radio and antenna with a mast. The costs for these items have been included in the capital improvement costs for 9 of the Township's 10 stations (SCADA upgrades are not needed at the Kroger station due to its age). The estimated cost for each site is \$24,400, except for the Worthington Crossing site which is estimated to cost \$15,000. All these upgrades are proposed for 2020 (Year 1), for a total cost of \$210,200. Additional information can be found in Appendix B, the OCWRC Pumping Station Assessment Report Summary.

In addition, SCADA equipment upgrades will be needed at two Township metering sites. The costs for these upgrades are \$13,800 for each site, anticipated in 2020, for a total of \$27,600.

The new SCADA network will be accessible to White Lake Township upon request.

#### **BUSINESS RISK EVALUATION**

Based on the condition assessments, a numerical rating from 1 to 5 was given for the overall condition of each station's sub-system. A description of the Condition Assessment Rating is shown in Table 3 below. Based upon the sub-system age, a Probability of Failure (POF) Performance Rating was also given to each sub-system as described in Table 4 below. These two factors were each weighted at 50% in determining the Probability of Failure of each sub-system. The POF factors that were used for the pumping station assessment were: Equipment (i.e. the control panel and telemetry) (10%), Electrical Components (i.e. generators and hookups) (30%), Pumps (i.e. number of pumps, pump TDH, GPM, HP, and layout) (50%), and Structure (i.e. wet well and valve vault condition) (10%). Please see Figure 2 for the POF factor weighting.

The Consequence of Failure (COF) of each sub-system was based upon the Asset Criticality Rating factors outlined in Table 5. The COF factors that were used for the pumping station assessment were: Distance from Surface Water (40%) and Number of Upstream Laterals (60%). Pumping station cost estimates are provided in Appendix A of this report. Please see Figure 3 for the COF factor weighting.

<b>Table 3 - Condition Assessment Rating</b>	
Condition Rating	Description
5	Asset Unserviceable - Over 50% of asset requires replacement
4	Significant deterioration - significant renewal/upgrade required (20 -40%)
3	Moderate deterioration - Significant maintenance required (10 -20%)
2	Minor Deterioration - Minor maintenance required (5%)
1	New or Excellent Condition - Only normal maintenance required

<b>Table 4 - Probability of Failure Performance Rating</b>	
Performance Rating	Description
5	Certain - Likely to occur in the life of the item
4	Probable - Will occur several times in the life of an item
3	Possible - Likely to occur some- time in the life of an item
2	Unlikely - Unlikely but possible to occur in the life of an item
1	Rare - So unlikely, it can be assumed occurrence may not be experienced

<b>Table 5 - Asset Criticality Rating</b>	
Performance Rating	Description
5	Catastrophic disruption
4	Major disruption
3	Moderate disruption
2	Minor disruption
1	Insignificant disruption

The overall POF was then multiplied by the COF to obtain a Business Risk score on a scale of 0-25 per Figure 1 on the following page.

Figure 1 - Business Risk Evaluation Matrix

		Condition Rating 50%	Age Rating 50%	Risk Rating						
Probability of Failure	5	5	Certain	5	5	10	15	20	25	
	4	4	Probable	4	4	8	12	16	20	
	3	3	Possible	3	3	6	9	12	15	
	2	2	Unlikely	2	2	4	6	8	10	
	1	1	Rare	1	0	2	3	4	5	
				Risk Rating	1	2	3	4	5	
					Insignificant	Minor	Moderate	Major	Catastrophic	
<b>Consequence of Failure</b>										

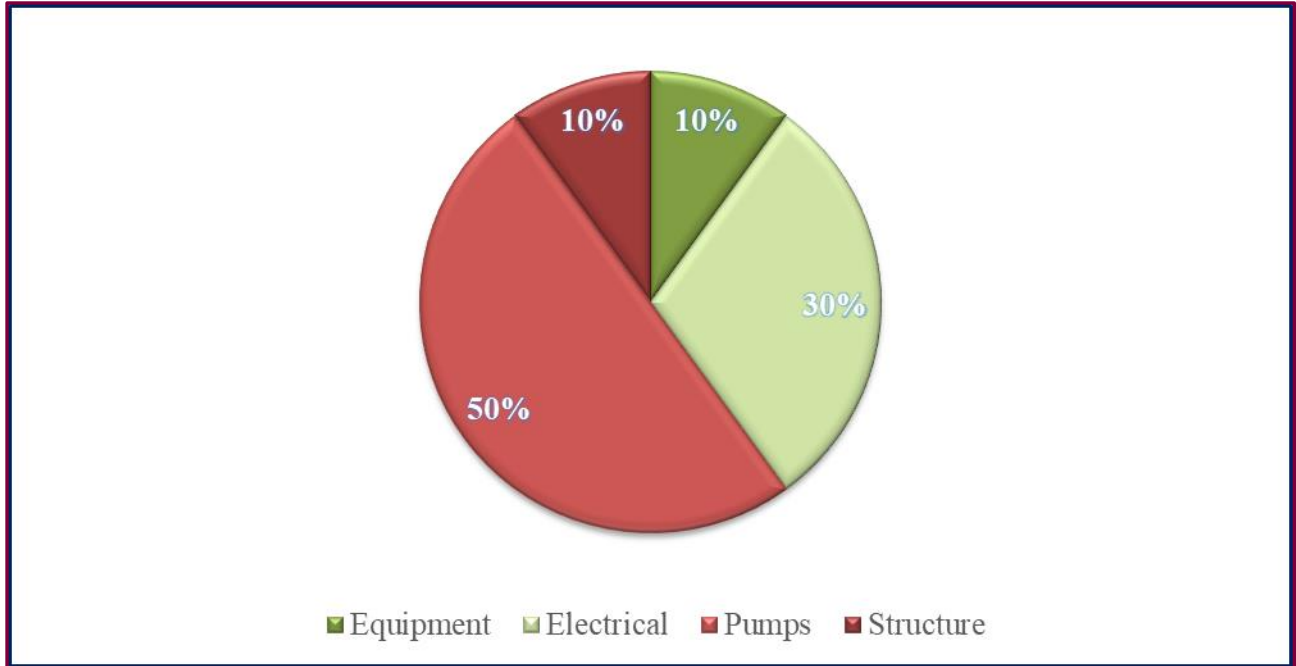
The risk of failure is categorized on Table 6 below.

Table 6 – Business Risk Rating Register

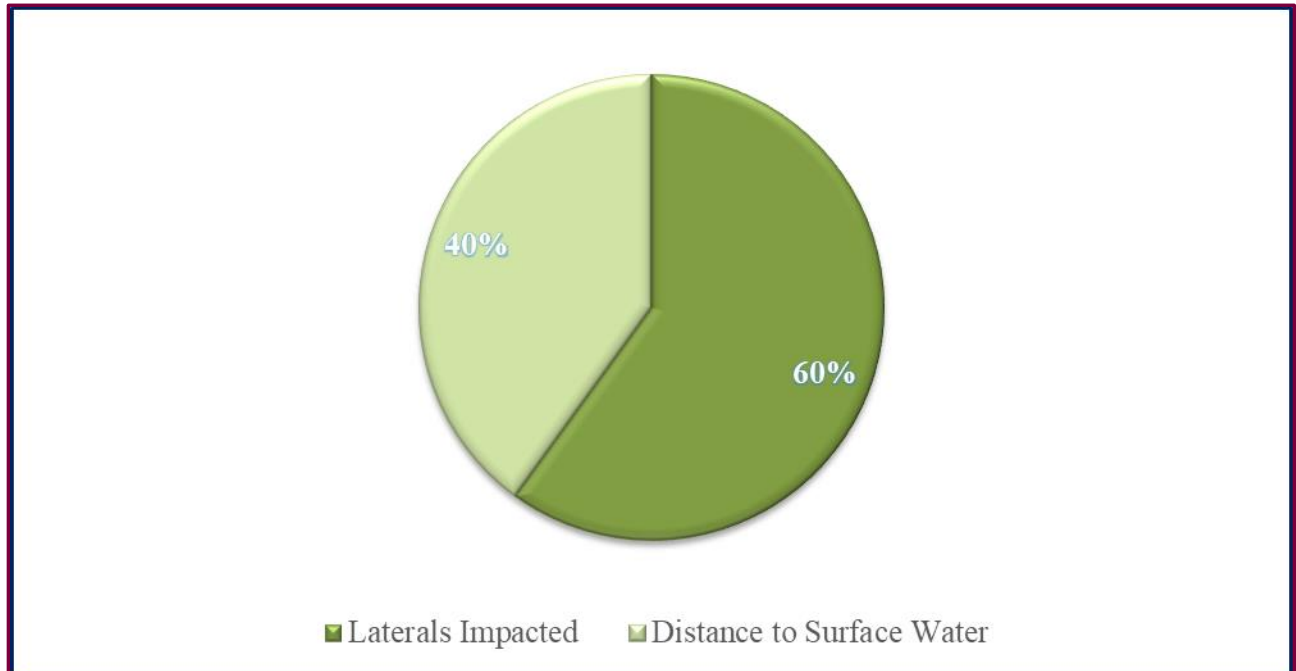
<u>Risk Type</u>	<u>BRE Rating Register</u>
Low Risk (Repeatable Risk)	0.00-4.99
Medium Risk (Tolerable and Manageable)	5.00-9.99
High Risk (Tolerable and Manageable)	10.00-15.99
Critical / Intolerable Risk	16.00-25.00

Refer to Figures 2 and 3 below for the Probability of Failure and Consequence of Failure factor weightings.

**Figure 2 Probability of Failure Factor Weighting**



**Figure 3 Consequence of Failure Factor Weighting**





Please refer to Table 7 below for a Pumping Station BRE Summary.

**Table 7 Pumping Station BRE Summary – Asset Characteristics**

Site Name	Equipment (Control Panel & Telemetry)	Electrical (Generator Information)	Pumps – Useful Life Remaining (Yrs)	Structure (Wet Well & Valve Vault)	# of Customers	Distance to Surface Water (LF)	Install Year
<b>Bocavina</b>	Fair	Portable Generator Connection	12	Good	Unknown	906	2001
<b>Cranberry Lake Estates</b>	Fair to Poor	Generator on site	11	Fair	441	161	1995
<b>Kroger</b>	Good	Generator on site	13	Wet Well – Fair to Poor; Valve Vault – Good	4	385	2017
<b>Meijer</b>	Fair to Poor	Portable Generator Connection	15 Pump 1 0 Pump 2	Wet Well – Good; Valve Vault – Fair to Good	6	782	2003
<b>Suburban Knolls</b>	Fair to Poor	Portable Generator Connection	4	Wet Well – Good; Valve Vault – Fair to Good	1329	896	1995
<b>Village Lakes</b>	Fair to Poor	Generator on site	0	Wet Well – Good; Valve Vault – Fair to Good	4	1121	2007
<b>White Lake Estates</b>	Fair to Poor	Portable Generator Connection	0	Fair to Poor	0	794	1995
<b>White Lake Market Place</b>	Fair to Poor	Portable Generator Connection	0	Fair to Good	24	181	1998
<b>Williams Lake Road</b>	Fair	Portable Generator Connection	0	Good	52	482	2002
<b>Worthington Crossing</b>	Good	Generator on site	13		1	555	2017

## **CAPITAL IMPROVEMENT PLANNING**

DLZ-J&A has developed a comprehensive capital improvement plan for pumping station pump replacements, control panel and cabinet upgrades, electrical and mechanical improvements, SCADA system upgrades, and additional rehabilitation needs over the 20-year period (2020-2039). The Pumping Station Capital Improvement Plan can be found in Appendix A.

**APPENDIX A –  
PUMPING STATION CAPITAL IMPROVEMENT PLAN**



**APPENDIX B –  
OCWRC PUMPING STATION  
ASSESSMENT REPORT SUMMARY**



*Jim Nash*

November 20, 2019

Aaron Potter, Water and Sewer Director  
Charter Township of White Lake  
7525 Highland Road  
White Lake, MI 48383

Mr. Potter:

Thank you for the opportunity to conduct condition assessments for the sanitary sewer lift stations located within the Township. WRC appreciates the opportunity to continue to provide White Lake Township with quality services for your sanitary sewer system.

The purpose of this letter is to provide you with a summary of expenses associated with the condition assessment for the sanitary sewer lift stations, summarize our findings, and provide you with recommended improvements and estimated costs.

These condition assessments were conducted as part of the Michigan Department of Environment, Great Lakes, and Energy's Stormwater, Asset Management, and Wastewater (SAW) program and in conjunction with the Township's engineer, Johnson and Anderson, Inc.

#### **SUMMARY OF EXPENSES**

WRC utilized a team of skilled maintenance mechanics (electricians) and pump mechanics to evaluate the structural, mechanical, and electrical assets within the lift stations listed below. Lift station condition assessments were conducted between March 11 and March 15, 2019 and between June 25 and June 26, 2019. WRC performed condition assessments for air release valves in August 2018.

WRC conducted condition assessment at ten lift stations. Below is a summary of expenses associated with condition assessments at these lift stations. Additionally, WRC conducted assessments for 16 air release valves within the township.

Please see the incurred costs for each of these assessments:

Village Lakes Lift Station - \$892.73

White Lake Estates Lift Station - \$1,347.89

Williams Lake Road Lift Station - \$1,323.03

Suburban Knolls Lift Station - \$1,230.13

White Lake Market Place Lift Station - \$1,111.25



Cranberry Lake Estates - \$1,259.69

Meijer Lift Station - \$815.14

Kroger Lift Station - \$857.74

Bocavina Lift Station - \$1,008.05

Worthington Crossings Lift Station - \$1,051.05

Air Release Valve Assessments (16) - \$2,189.78

**TOTAL EXPENSES = \$13,086.43**

### **RECOMMENDATIONS**

#### **Air Release Valves**

Our condition assessment discovered four (4) ARVs that were not functioning properly. WRC replaced these ARVs using the general operating budget. Additionally, WRC encountered one ARV structure that had been buried; WRC exposed this structure and left it free and clear of debris.

Furthermore, WRC was unable to locate the ARV located at approximately 9035 Oakwood. Per your directive, WRC retained a contractor to expose and adjust this structure.

#### **Meijer Lift Station (0769HR) - \$30,000. New Pump 1.**

WRC conducted a condition assessment of the site on March 14, 2019. During the condition assessment the electrical resistance for the submersible pump was measured at a value of less than one ohm. A value this low indicates a potential issue with the pump motor. Values in this range indicate failure of the pump motor is likely. As a result WRC removed the pump from service.

This lift station was designed for three pumps; however, the third pump was designed for future use. As such, with this pump out of service there is no redundancy at this site.

As of the date of this letter, this pump has been replaced.

#### **Village Lakes - \$7,500. Pump 1 & 2 Rebuild.**

The Village Lake Lift Station, pumps #1 and #2 were observed to have impeller damage. Additionally, these pumps were performing well below their optimal location on the pump curve. As such, WRC is recommending rebuilding the wet end of the pumps to prevent premature failure and/or performance issues. We're estimating the cost of these repairs to be on the order of \$7,500.

#### **White Lake Market - \$6,000. Pump 1 & 2 Rebuild.**



*Jim Nash*

Significant damage to pumps #1 and #2 impeller were observed. The wear ring for the pump was completely missing. As such, WRC is recommending rebuilding the wet end of the pumps to prevent premature failure and/or performance issues. We're estimating the cost of these repairs to be on the order of \$6,000.

In addition to the aforementioned issues with the pumps, the control cabinet is exhibiting signs of corrosion and the door seals are failing. These issues should be addressed soon to prevent significant damages to the controls and electrical equipment.



*Figure 1 - Marketplace Lift Station Impeller Damage*







*Jim Nash*

*Figure 2 - Marketplace Lift Station Cabinet Corrosion*

**Williams Lake - \$3,500. Pump #1 Rebuild.**

WRC observed substantial damage to the pump 1 impeller. WRC is recommending rebuilding the wet end of the pump; including, but not limited to, the impeller and wear ring.

Thank you again for the opportunity to conduct these condition assessments. In addition to the recommendations generated from the condition assessments, I have included our recommended long range plan for your lift stations. This long range plan does not include the cost associated with upgrading the existing supervisory control and data acquisition (SCADA) system. I have included with this letter a memorandum that provides an estimated cost for the SCADA system improvements.

I would be glad to review these comments with you in person if you have any questions.

Sincerely,

M. Drew Sandahl, P.E.  
Assistant Chief Engineer

Enclosures



**OAKLAND COUNTY  
WATER RESOURCES COMMISSIONER****MEMORANDUM**

**TO:** Aaron Potter, White Lake Township Department of Public Works Director

**FROM:** Drew Sandahl, OCWRC Civil Engineer III

**SUBJECT:** White Lake Township  
Sanitary Sewer Lift Stations and Meters  
Supervisory Control and Data Acquisition System Upgrades

**DATE:** September 20, 2018

The intent of this memo is to provide you supporting documentation for proposed upgrades to the supervisory control and data acquisition system (SCADA) for sanitary sewer lift station and meter sites within White Lake Township.

The existing SCADA system is a complex network of radios, servers, and computers utilized to monitor the operations of the sanitary sewer system. The existing system also provides site-specific alarms back to Oakland County Safety Dispatch. The existing SCADA system was installed in the early to mid-1990s. Therefore, the existing SCADA system is dependent on technology and equipment that is over 20 years old.

We are recommending upgrading your SCADA system to improve system deficiencies, including:

- Customized and special-order parts are required in many instances when pieces of equipment fail for the existing system. As such, the ability to correct issues in a timely manner is adversely impacted.
- The existing radio network has a low transmission speed and experiences communication failures due to the configuration of the radio network. This can potential result in the loss of communication of alarms at the sites.
- Observation of real-time data is done through a MS-DOS-based platform. The user interfacing with the MS-DOS platform reduces operator efficiencies and also complicates data exporting.
- There is no longer software support from the platform developer for the existing system.

**Proposed Site Upgrades**

WRC will provide SCADA equipment, assembly, and field installation for the proposed site upgrades. Our staff has performed installation for multiple sites and are efficient in these installation and startups. WRC will utilize a contractor for programming and system integration.

The following paragraphs identified the proposed sites for SCADA upgrades.

## Lift Stations

There are several components that require replacement to bring each site up to more modern technology. Each sites will require a sheet metal cabinet, multiple circuit breakers, a programmable logic controller (PLC), several relays, and a radio and antenna with a mast. The PLC will require programming from a controls engineer. The PLC will be programmed per Oakland County standards for similar lift stations. The estimated cost for each of the existing lift stations is \$24,400 per site. That includes the following sites:

- Suburban Knolls Lift Station
- Cranberry Lake Estates Lift Station
- White Lake Estates Lift Station
- White Lake Market Place Lift Station
- Meijer-White Lake Lift Station
- Bocavina Lift Station
- Williams Lake Road Lift Station
- Village Lake Lift Station

White Lake recently constructed two lift stations: Kroger Lift Station and Worthington Crossing Lift Station. These lift stations were constructed using WRC's standard equipment for the proposed new SCADA. The Kroger lift station has been programmed and integrated into the Oakland County SCADA network. The Worthington Crossings site needs to be programmed and integrated into the Oakland County Network.

The estimated cost to program and integrate the Worthington Crossing lift station is \$15,000.

Therefore, the estimated cost to upgrade the SCADA system for the White Lake lift stations is \$210,200.

## Metering Sites

WRC anticipates upgrading SCADA at two metering sites in White Lake. The metering sites requiring the same equipment upgrades as the lift stations; however, the PLC is less expensive. The estimated cost to upgrade the SCADA at each meter site is \$13,800.

Therefore, the estimated cost to upgrade the SCADA system for the White Lake lift stations is \$27,600.

## Combined Estimated Total

Based on the sections above, WRC estimates the cost to upgrade the White Lake SCADA network to be \$237,800.

## White Lake Usability

The new SCADA network will be accessible for White Lake upon request. WRC has staff available to provide White Lake with specific data requests. Specific data requests should be submitted to the WRC operations engineer. WRC will provide White Lake with data in an Excel format upon request.



White Lake Township  
Lift Station Long Range Plan

Wet Well Transducer	1	2002				\$ 5,000						
Site	1.2	2002										
<b>Williams Lake</b>	<b>3</b>	<b>2004</b>										
Pump 1	1.2	2004			\$ 4,000							
Pump 2	1.2	2004				\$ 4,000						
Wet Well	2.8	2004										
Valve Vault	2.4	2004										
Controls	1.4	2004										
Electrical Service Equipment	1.2	2004										
General Electric	1.2	2004										
Radio	1	2004										
Wet Well Transducer	1	2004				\$ 5,000						
Antenna Mast	1.4	2004										
Site	1.2	2004										
<b>Village Lakes</b>	<b>2.6</b>	<b>2008</b>										
Pump 1	1.2	2008		\$ 5,000							\$ 22,000	
Pump 2	1.2	2008			\$ 5,000						\$ 22,000	
Wet Well	2.4	2008										
Valve Vault	2.4	2008										
Generator	2	2008										
Mag Meter	1.2	2008										
Controls	1.4	2008										
Electrical Service Equipment	1.2	2008										
General Electric	1.2	2008										
Radio	1	2008										
Wet Well Transducer	1	2008					\$ 5,000					
System Header Pressure Transmitter	1	2008					\$ 5,000					
<b>Kroger</b>	<b>3.2</b>	<b>2017</b>										
Pump 1	1.2	2017							\$ 3,000			
Pump 2	1.2	2017							\$ 3,000			
Wet Well	2.4	2017										
Valve Vault	2.4	2017										
Controls	1.6	2017										
Electrical Service Equipment	1.2	2017										
General Electric	1.2	2017										
Cell	1	2017										
Wet Well Transducer	1	2017										
Generator	1.6	2017										
Mag Meter	1	2017										
Pressure Transmitter	1	2017										
<b>Worthington Crossings</b>	<b>2.6</b>	<b>2018</b>										
Pump 1	1.2	2018								\$ 3,000		
Pump 2	1.2	2018								\$ 3,000		
Wet Well	2.8	2018										
Valve Vault	2.4	2018										
Generator	2	2018										
Controls	1.6	2018										
Electrical Service Equipment	1.2	2018										
General Electric	1.2	2018										
Radio	1	2019										
Wet Well Transducer	1	2018										
Site	1	2018										
<b>TOTAL PUMP STATION IMPROVEMENTS</b>				\$ -	\$ 39,000	\$ 36,000	\$ 159,000	\$ 369,000	\$ -	\$ 22,000	\$ 12,000	\$ 44,000

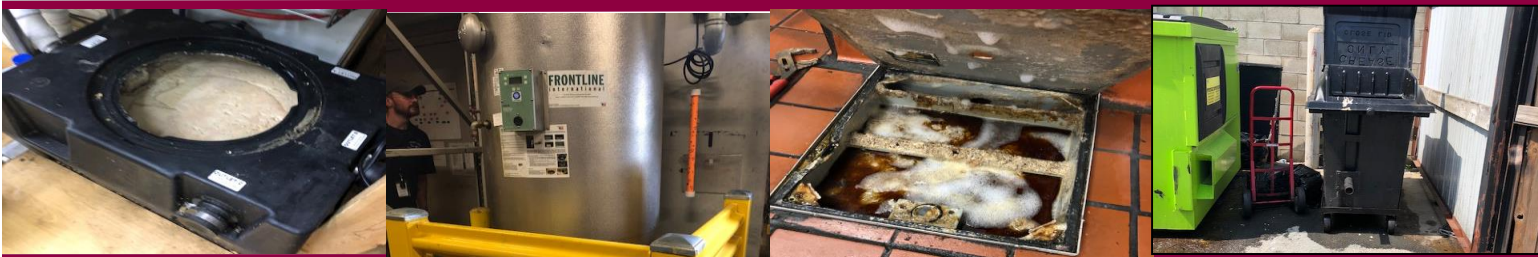


# CHARTER TOWNSHIP OF WHITE LAKE

## WASTEWATER ASSET MANAGEMENT PLAN (AMP) FATS, OILS & GREASE (FOG) ASSESSMENT REPORT



December 2019



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## DEFINITIONS

**25 PERCENT RULE** – The combined depth of oil and grease and other solids (floating and settled) in any chamber of grease control device shall not be equal to or greater than 25 percent of the total operating depth of the grease control device. The operating depth of a grease control device is determined by measuring the internal depth from the water outlet invert elevation to the inside bottom of the grease control device. FOG must be removed and hauled off site for proper disposal any time the volume of grease and solids exceed 25% of the interceptor's or trap's functional volume.

**COMMERCIAL KITCHEN PROPERTY** – Any property where there is or can be any discharge into the sewage system other than normal domestic waste because of the particular type of operation, including, but not limited to: hotel kitchens, hospitals, churches, school cafeterias, senior housing facilities, bakeries, bars, and restaurants.

**FATS, OILS & GREASE (FOG)** – A byproduct of (is not limited to, but may include) cooking, food and drink preparation, and meat cutting. FOG can be found in meat fats, shortening, butter, margarine, sauces, and dairy products.

**GREASE CONTROL DEVICE** – Any grease interceptor, grease trap, or other mechanism, device, or process, which attaches to, or is applied to, wastewater plumbing fixtures and lines, for the purpose of trapping, collecting, or treating FOG prior to discharge into the sewer system that is collected in food preparation areas, such as commercial kitchen properties.

**GREASE INTERCEPTOR** – A device commonly associated with commercial kitchen properties, to collect oil and grease and prevent it from infiltrating into the sanitary sewer system and otherwise prohibiting the free flow of wastewater within the system. These interceptors are typically located outside and underground of the facility; however some interceptors are located in the facility basement.

**GREASE TRAP** – A device commonly associated with commercial kitchen properties, to collect oil and grease and prevent it from infiltrating into the sanitary sewer system and otherwise prohibit the free flow of wastewater within the system. These traps are typically located inside the facility, under the sink or on the floor.



Grease Trap (Under the Sink) Example



Grease Interceptor (In Basement) Example

## INTRODUCTION & PURPOSE

### WHAT IS FOG?

Fats, Oils, and Grease (FOG) are byproducts of cooking, food and drink preparation, and meat cutting. FOG enters sanitary sewer pipes through restaurant, residential, and commercial sink drains.

Once in the sewer, FOG sticks to the pipe and thickens. FOG can build up and eventually block the entire pipe. Blockages in sewer pipes can cause surcharging, resulting in overflows into the environment and property. These sewage overflows:

- Can pollute the environment;
- Increase system maintenance and inspection costs;
- Can expose communities to potential litigation;
- Creates potential violations of Great Lakes Water Authority and other sewage requirements; and
- Costs communities millions of dollars in sewer repairs.

### BACKGROUND/STATEMENT OF THE PROBLEM

Over the last several years, the Township has been faced with:

- sanitary sewer backups in residential and commercial properties;
- grinder station backups;
- sewer line degradation (as a result of excessive sewer cleaning, jetting, and chemical injections to remove the FOG blockages); and
- poor utilization of Oakland County Water Resources Commission (WRC) and Township Department of Public Services (DPS) staff forces and budget as a result of FOG in the Township's sanitary sewer system.

FOG waste is often washed into the plumbing and drainage system and into the wastewater collection system, usually through a kitchen sink or process of floor drains. Grease hardens to the insides of sewer pipes and, over time, the buildup can block the entire pipe.

Some of the commercial kitchen properties in White Lake Township are introducing large amounts of FOG into the Township sanitary sewer system and when FOG blockages occur, it causes raw sewage to back up into neighboring businesses and homes. This is very unpleasant for the residents and can be a health risk for business owners. This could become a liability for the Township if these problems are not addressed.

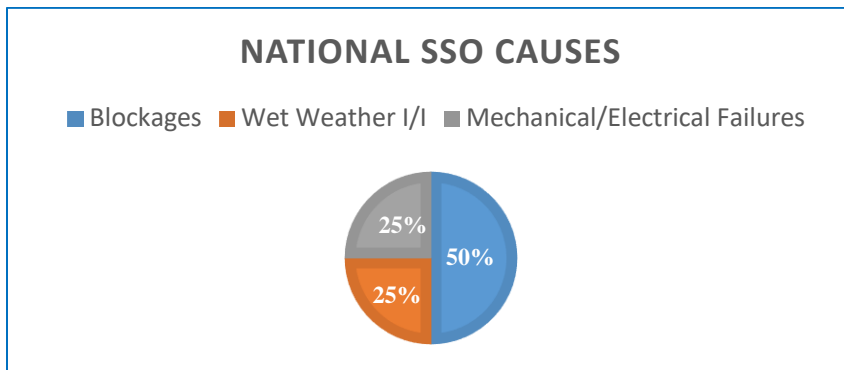
The FOG is entering the Township's system due to:

- lack of grease control devices in commercial kitchens;
- lack of grease control device maintenance; and
- lack of pumping station maintenance.

It is possible for a grease control device to become completely ineffective without proper maintenance.

## FOG – A NATIONWIDE PROBLEM

Sanitary Sewer Overflows (SSOs) remain a problem in the State and Nation, with sewer blockages (FOG and other items) being a major cause. It is estimated that on average, FOG generated from each commercial kitchen in the United States is 800 to 17,000 pounds per year, which can create havoc for community wastewater collection systems if not properly treated and maintained. Residential properties can also generate large amounts of FOG to the system. More and more communities across the U.S. and Michigan are implementing FOG Programs to help alleviate sewer backups, repairs, and maintenance. Refer to the chart on the following page, that illustrates on average, 50% of all SSOs caused in the United States are created by blockages to the system.



The *Michigan Plumbing Code/2006 International Plumbing Code* requires the installation of interceptors and traps for commercial kitchen properties to prevent the discharge of oil, grease, sand, and other harmful substances to the public or private sewage disposal system. The Code provides requirements on sizing of these interceptors based on grease retention capacity. In addition, the Code requires access maintenance of these structures. White Lake Township's *Sanitary Sewers Ordinance (#18-001)* is supported by this Code. Despite this, FOG is a growing concern for municipalities across the State, with the increase in commercial kitchens, poor management of FOG by commercial kitchen property owners, and lack of community resources.

## FOG IMPACTS ON THE TOWNSHIP SANITARY SEWER SYSTEM

White Lake Township owns approximately 41 miles of pressurized and gravity sanitary sewer main. Operations and maintenance of these sewers, as well as commercial pumping stations, are performed by the WRC. An abundance of FOG in the Township Sanitary Sewer System can create:

- Sewer backups to downstream customers;
- Sewer line degradation;
- Pumping station degradation; and
- Poor utilization of WRC and Township DPS staff forces and budget.

Furthermore, the WRC spends approximately \$112,718 on labor forces and materials each year to treat FOG in the Township's system, which includes: sewer and grinder station inspections, cleaning, and disposal of FOG. From September to December 2018, the WRC received 35 grease related grinder station calls within White Lake Township. Six (6) of the Township's 10 stations consistently have moderate to excessive grease buildup within the station.

## **SAW GRANT COMPONENT**

As part of the Storm, Asset Management, and Wastewater (SAW) Grant Implementation Project, White Lake Township wanted to implement a proactive, robust Fats, Oils, and Grease (FOG) Program to help alleviate the abundance of FOG in their sanitary sewer system. The goals of the program are to:

- Minimize the amount of FOG from commercial kitchen properties entering the Township's sanitary sewer system;
- Minimize the need for sanitary sewer and pumping station maintenance and rehabilitation as a result of FOG;
- Develop a robust FOG inspection program (by DPS staff) at commercial kitchen properties within the Township;
- Provide better, stronger communication between the DPS, the property owners, and business managers; and
- Increase public awareness on FOG maintenance and its impacts.

This document outlines the processes by which this FOG Program was implemented.

## **COMMERCIAL KITCHEN PROPERTIES IN THE CHARTER TOWNSHIP OF WHITE LAKE**

The Charter Township of White Lake has a population of over 30,000 people and encompasses approximately 37.2 miles. The Township prides itself on a small country town feel with big City amenities and natural resources that attract growth and development.

There are currently 32 commercial kitchen properties located within the Township limits that have the potential to generate FOG. These properties include the following:

- Family Style Restaurants;
- Bar/Grill Restaurants Serving Alcohol;
- Bakeries;
- Pizza Shops;
- Party Stores;
- Big Box Grocery Stores;
- Churches;
- Elementary, Junior High, and High Schools; and
- Senior Living Centers.

Property owner and contact information was gathered and integrated into GIS and Cityworks. A baseline inventory/meeting with the property owners and managers was held in 2018 to identify proper contact information for each property, and classify the types of grease control device equipment that is available on site.

The majority of the commercial kitchen properties are located along Highland Road.



*Outdoor Grease Bin at Tubby's Restaurant*



*Grease Control Device at Sonic Restaurant*

## SCOPE OF WORK

The Township DPS realized that the FOG in the system was not going away, and decided to integrate a proactive approach to eliminating FOG, and thus better allocating WRC and Township DPS staff time and resources.

As a consultant to the Township and a partner on the SAW Grant Implementation Project, Johnson & Anderson, Inc. (a DLZ Company) was tasked with developing a FOG Program for the Township (funded by the SAW Project), which includes:

- Review of Existing Township Ordinances;
- Review of Statewide Community Ordinances & Programs;
- Ordinance Updates;
- Meetings with Township Staff;
- Site Inspections;
- Developing FOG Program Requirements;
- Developing FOG Inspection Documents;
- Integrating FOG Inspection Documents into GIS and Cityworks;
- Developing FOG Inspection/Enforcement Procedures and Schedules; and
- Developing FOG Education Documents for Residents and Businesses.

More details on each of the Program Scope items are illustrated below.

### REVIEW OF EXISTING TOWNSHIP ORDINANCES

In addition to the Michigan and International Plumbing Codes, the Township wanted to ensure that its local ordinances properly addressed FOG prevention and maintenance.

DLZ-J&A thoroughly reviewed the Township's Code of Ordinances, as they relate to:

- FOG prevention and maintenance;
- Outdoor spent grease bin storage and maintenance;
- Township's authority to perform FOG inspections at commercial kitchen properties; and
- Cost recovery for sanitary sewer maintenance and rehabilitation.

Chapter 38 Utilities, Article IV, *Sanitary Sewers Ordinance*, particularly was reviewed at length. The following limitations were noted:

- Grease control devices were not required to be installed or maintained at existing and maintained properties;
- Outdoor spent grease bins were not required to be maintained (and is not adequately addressed in the Zoning Ordinance); and
- The Cost Recovery language was missing.

### REVIEW OF STATEWIDE COMMUNITY ORDINANCES AND FOG PROGRAMS

During the Township ordinance and FOG Program review, J&A provided a thorough assessment of statewide community FOG and sanitary sewer ordinances and FOG programs as they compare to the Township's. DLZ-J&A reviewed 16 programs in communities with varying population densities and downtown development areas. The community programs that were assessed were:

- City of Ann Arbor
- City of Auburn Hills
- City of Birmingham
- City of Farmington Hills
- City of Grand Rapids
- City of Jackson
- City of Madison Heights
- City of Muskegon
- City of Rochester
- City of Royal Oak
- City of Sterling Heights
- City of Wyoming
- Delhi Township
- Independence Township
- Port Huron Township
- Waterford Township

Of these communities, DLZ-J&A identified varying degrees of FOG implementation. Some communities are integrating a robust FOG inspection, enforcement, and education program, while some communities are relying more heavily on educating residents and business on proper FOG management, and yet others are still in the process of implementing a FOG inspection and enforcement program.

The Cities of Rochester and Wyoming and Delhi Township were found to have high quality FOG language within their ordinances and FOG inspection programs. As such, DLZ-J&A integrated some of those communities' ordinance language into the *Township's Sanitary Sewers Ordinance*.

A spreadsheet that outlines each community's program as it relates to FOG inspections, FOG related ordinances, and education is found in Appendix B.

#### **MEETINGS WITH TOWNSHIP STAFF**

DLZ-J&A met with the Township Public Services Director early in the ordinance review stages to gain input on potential changes and FOG Program scope. The Township Attorney also reviewed the proposed ordinance revisions for content and consistency with State and federal law.

The revised ordinance now enables the Township to recoup some costs of the necessary sewer maintenance; however, a preventative, inspection program (as described on the following page) will be much more cost effective and will likely reduce sewer backups, complaint calls, and potential liability from sewage backing up into people's homes and businesses.

#### **TOWNSHIP ORDINANCE UPDATES**

The Sanitary Sewers Ordinance revisions have been officially adopted by the Township Board in October 2018. A copy of this newly adopted document is found in Appendix C.

#### **Ordinance Revision Highlights**

The following changes were made to the Sanitary Sewers Ordinance:

- Added definitions;
- Grease control devices are required for any development or redevelopment in accordance with the International/State Plumbing Code;
- Grease control devices are required to be maintained as needed;
- Authorized Township employees or agents are permitted to enter upon all properties for the purposes of inspection and observation.
- Outdoor spent oil bins are required to be maintained and properly labeled.

The Township has also developed some educational materials that have been distributed to commercial kitchen property owners and managers. Information has also been made available at Township Hall.

### Food Service Best Management Practices

## FOG: Fats, Oils & Grease

Pour cooled grease into a garbage can or container. Once the grease has solidified, dispose of it with regular garbage. Commercial establishments must use a licensed hauler to dispose of yellow grease.

Don't discharge FOG down drains, sinks, or storm drains.

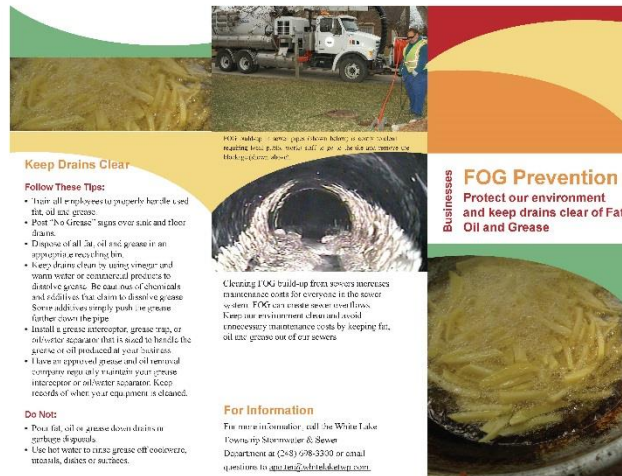
Scrape food scraps into the garbage bin. Dry wipe dishes free of FOG prior to washing to remove grease.

Clean grease spills with absorbent material and then dispose of it in the garbage.

Ensure the grease control devices are accessible for maintenance and inspection.

Maintain the grease control devices in accordance with manufacturer's specifications, industry standards and Township requirements.

**For more information, call the Charter Township of White Lake Department of Public Services at: (248) 698-3300 Ext. 8**

### Keep Drains Clear

**Follow These Tips:**

- Train all employees to properly handle and fit, oil and grease.
- Post "No Grease" signs over sink and floor drains.
- Dispose of all fat, oil and grease in an appropriate recycling bin.
- Keep drains clean by using vinegar and warm water or commercial products to dissolve grease. Be sure not to chemically and acidic as they claim to dissolve grease. Some additives simply push the grease further down the pipe.
- Install a grease interceptor, grease trap, or oil/water separator that is sized to handle the grease or oil produced at your business.
- Have an approved grease and oil removal company regularly maintain your grease interceptor or oil/water separator. Keep records of when your equipment is cleaned.

**Do Not:**

- Pour fat, oil or grease down drains or curbside drop-offs.
- Use hot water to melt grease off cookware, pans, dishes or surfaces.

**For Information**

For more information, call the White Lake Township Stormwater & Sewer Department at (248) 698-3300 or email questions to [gsu@tlmich.net](mailto:gsu@tlmich.net)

**Businesses**  
Protect our environment and keep drains clear of Fat, Oil and Grease

### FOG Brochure for Commercial Kitchen Properties

*Laminated FOG BMPs poster distributed to all commercial kitchen property owners/managers*

### FOG PROGRAM REQUIREMENTS

- **Have a properly sized, installed, and functioning grease control device.** To be effective, all grease control devices are to be sized and installed in accordance with the International and Michigan Plumbing Code.
- **Clean and maintain the grease control device(s) frequently enough to comply with the 25% Rule.** Cleaning frequency will depend on the number of fixtures discharging to it, the seating



capacity of the establishment and the volume of the device. Implementing kitchen best management practices can reduce the required cleaning frequency;

- **Keep a grease interceptor maintenance log up-to date and on-site.** The maintenance log must document all grease interceptor inspections, maintenance and disposal activities performed. In addition, records such as waste hauler manifests must be retained for three years;
- **Properly collect and dispose of FOG.** FOG should be disposed of as solid waste or stored in a covered, leak-proof receptacle until it can be taken off-site by a licensed hauler.
- **Educate commercial kitchen employees on proper FOG disposal and grease control device management.** Display FOG posters/fact sheets where necessary and provide better communication and training to ensure program success.

## **SITE INSPECTIONS**

The Township felt that implementing regular FOG site inspections at each commercial kitchen property and better solidifying the Township-business owner relationship would greatly deter future FOG accumulation in the Township's sanitary sewer system.

### **Personnel**

The Public Services Department administers the FOG Program. Township DPS staff, with assistance from DLZ-J&A, performed the initial FOG inspections. Follow-up and routine inspections are currently being performed solely by Township DPS staff.

### **Equipment Needed**

The following equipment was utilized during the FOG inspections:

- Business Cards for distribution to property owners and managers
- FOG Educational Brochures and Fact Sheets for distribution to property owners and managers
- Badge/ID for clear recognition
- Microsoft Surface for entering in inspection data
- Pry Bar for pulling manhole covers
- Gloves
- Safety Vest
- Road Safety Cones
- Flashlight
- Wrench to open cleanouts
- Measuring Rod Ruler to check FOG depth
- Sanitary Wipes

### **Procedures**

There are 2 types of FOG inspections at commercial kitchen properties:

- Routine scheduled inspection (i.e. every 3-6 months or annual)
- Follow-Up inspection due to a violation

Routine inspections are those that are pre-planned as part of the proactive program. If the food establishment passes this initial inspection, the next regularly scheduled inspection will occur every 3 months, every 6 months, or every year, depending on the inspection history. The Public Services Department has the right to schedule additional inspections if an establishment is located in areas with frequent sanitary sewer backups resulting from FOG or has recurring violations. Potential causes of inspection violations include:

- Lack of cleaning/maintenance of the grease control device;
- Excess of FOG in the grease control device (per the 25% rule as identified in the proposed ordinances changes);
- Poor maintenance of the outdoor spent grease bin;
- FOG residue/Poor housekeeping inside the kitchen area;
- FOG residue/Poor housekeeping outside of the facility;
- Evidence of FOG dumping/spilling; or
- Uncovered outdoor mop sinks.

Follow-Up inspections are those made after 14 days of the initial inspection to verify if the violations have been remedied or not.

During the periodic inspections:

- The inspector will meet with the property owner and/or manager and explain the purpose of the site visit.
- The inspector will review existing grease control device cleaning and FOG handling practices, as well as good housekeeping practices in the kitchen.
- Observations will be made of the employee kitchen practices and an inventory of plumbing fixtures is taken.
- Any inside grease trap or outside grease interceptor will be inspected for proper maintenance and cleaning per the 25% rule.
- Maintenance logs will be reviewed.
- Grease disposal methods will be observed.
- Outdoor spent grease bins will be inspected.
- Photo documentation will be provided for each inspection report.

### **Scheduling**

Prior to the commencement of inspections, in August 2017, Township staff and DLZ-J&A visited each commercial kitchen property to: identify the proper contact person(s) for each facility; identify which FOG control equipment was installed at each property; to communicate to the property owners the need and scope of the new program; and to begin educating these owners on proper FOG prevention and management.

The properties that have been identified as historically having FOG issues are inspected every 3 or 6 months until these properties can maintain program compliance. Once these properties come into compliance and reduce their FOG generation into the Township's system, then they can be moved to the annual inspection list.

The remaining properties are inspected annually. If any of these properties begin to consistently become in violation, then they will be added to the more frequent inspection list.

### **Enforcement Procedures**

The White Lake Township Public Services Department manages the FOG Program through a combination of inspections, education, and violation notices or letters.

### **Initial Notification Made to Property Manager or Owner**

Upon a failing routine inspection, notification is made to the onsite property manager and/or the property owner to discuss the onsite deficiencies at the time of inspection. Violation information is tracked into Cityworks via a FOG Work Order and automatically triggers a follow-up inspection 14-30 days following the initial inspection. If the DPS is not contacted by the property owner within that timeframe, then they will contact the property owner and a contractor to properly clean the grease control device(s), at the expense of the property owner.

### **DEVELOPMENT OF FOG INSPECTION DOCUMENTS**

J&A reviewed existing statewide and national FOG inspection documents and worked with Township Public Services staff to develop a FOG work order sheet and corresponding notification letters to residents and businesses specific for White Lake Township. The following documents were developed:

#### **Grease Control Device Inspection Work Order**

This worksheet will be utilized during commercial kitchen property inspections and will provide specific grease control device and equipment information found at each property. This document is integrated into Cityworks for use by the inspector(s).

#### **Violation Letter #1**

Following a follow-up site inspection, if an accumulation of FOG is identified in the property's grease control device and/or if an outdoor spent grease bin is found to be improperly maintained, then a violation letter is sent to the property owner giving them 14-30 days to have the issue addressed and to come into compliance.

#### **Grease Trap / Interceptors Suppliers Sheet**

If a property owner is in need of new grease control device and/or equipment, this one-page sheet will be supplied with Violation Letter #1, which provides grease trap and interceptor supplier information. This sheet will be updated as new suppliers are identified or others that need to be taken off the list.

#### **Grease Trap / Interceptors Cleaning Contractors Sheet**

If a grease control device and/or equipment is in need of cleaning, this one-page sheet will be supplied with Violation Letter #1, which provides contractor information. This sheet will be updated as new suppliers are identified or others that need to be taken off the list.

#### **FOG Educational Brochures for Businesses**

These brochures were distributed to each property owner or manager during the initial site visits. These brochures will be hand delivered, mailed, or emailed to commercial kitchen property owners and will supplement the Violation Letters. These brochures provide awareness and 'tips' to property owners and managers on how to properly keep drains clear of FOG and protect the environment.

#### **FOG Program Information For Food Service Establishments**

This fact sheet can be mailed, emailed, or hand delivered to commercial kitchen property owners and managers and supplemented with Violation Letter #1, which provides best management practices for FOG prevention and general information on the Township's FOG Program.

**FOG Educational Brochures for Residents**

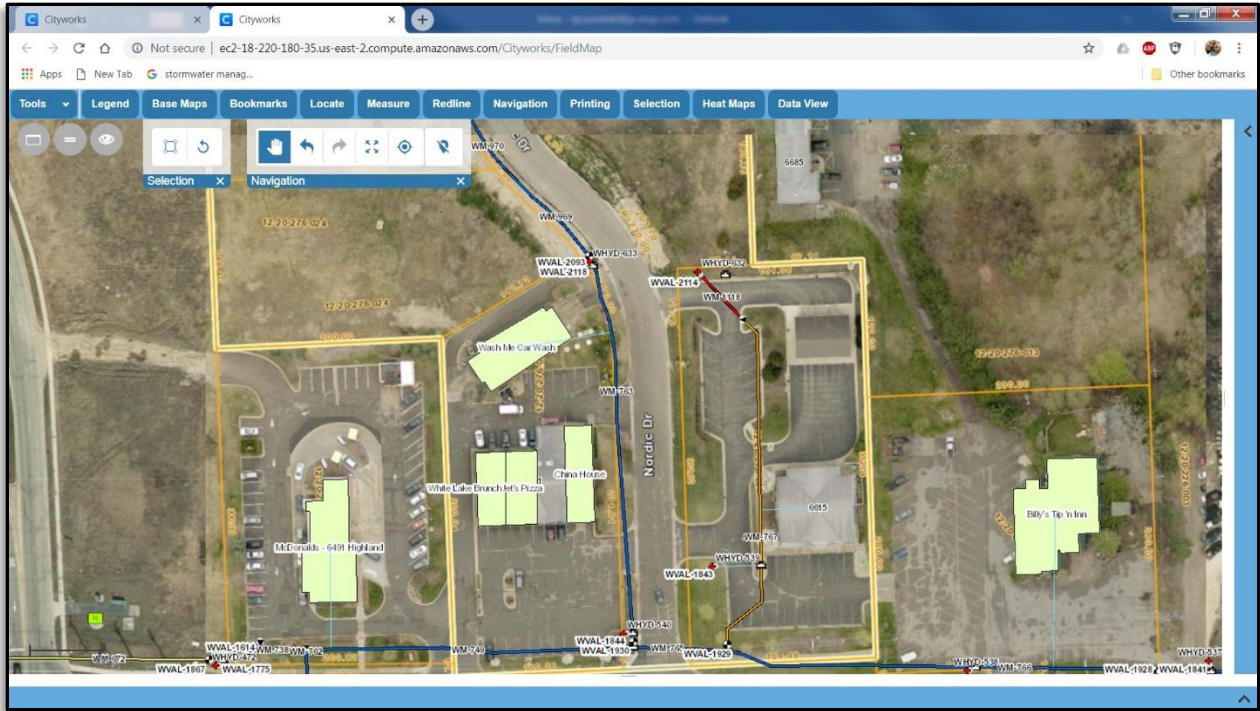
These brochures are available at Township Hall and provide awareness and 'tips' to residents on how to properly keep drains clear of FOG and protect the environment.

**INTEGRATION INTO GIS/CITYWORKS**

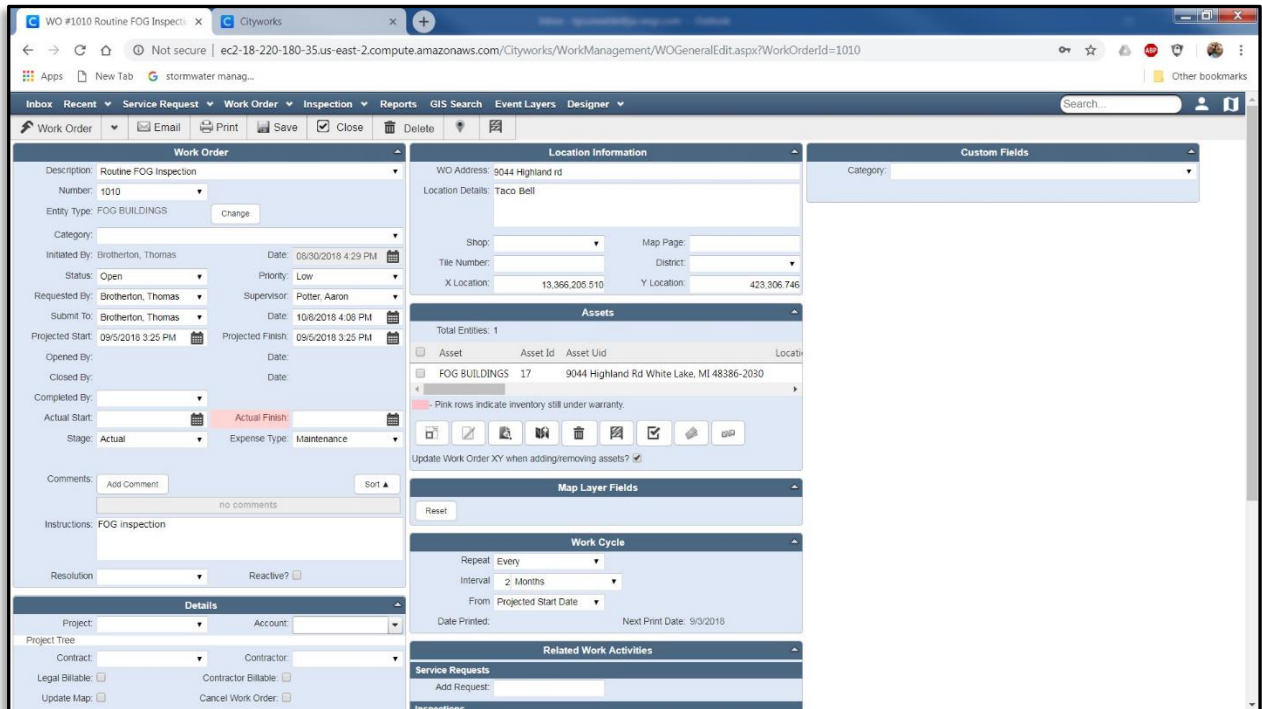
All commercial kitchen property information has been integrated into GIS and Cityworks. All properties are linked to an address and owner and/or manager. Contact information such as mailing addresses, phone numbers, and email addresses are also provided in GIS/Cityworks. The property and contact information will be reviewed annually by the Township DPS and DLZ-J&A in order to keep the information current and to update as businesses open or close.

All inspection documents and educational brochures are also integrated into Cityworks for easy distribution.

Refer to the images on the following pages for additional details.



Cityworks screen shot – FOG properties shown in yellow



Cityworks Open FOG Work Order Form (blank) for Taco Bell

## FOG EDUCATION

The Township has begun educating its residents and the general public on the impacts of FOG through the distribution of FOG brochures at Township Hall and information provided on their website and Facebook page. Moving forward, FOG information will continue to be posted on Facebook and website. The Southeast Michigan Council of Governments (SEMCOG) has launched a 'One Water Campaign' to promote public awareness on drinking water, stormwater, and wastewater issues. The Township will coordinate efforts with SEMCOG and neighboring communities on promotion of this campaign.

Over the next few years, DLZ-J&A will work with Township staff to evaluate what educational materials and outlet avenues are working best and disseminate information accordingly.



*Screen shot of Township Facebook post from February 2019*

## FOG PROGRAM ASSESSMENT

### PROGRAM ASSESSMENT

The Township and DLZ-J&A will annually assess the FOG Program effectiveness, based on the following measurables:

- Is the Township's GIS and Cityworks system up to date with all current FOG property information?
- Is the communication between the Township and property owner sufficient?
- Are there any known recurring issues with specific commercial kitchen properties and/or the owner or manager of these facilities?
- Are our current FOG education and enforcement initiatives deterring poor housekeeping and improper FOG management?
- Is the FOG Program decreasing grinder station O&M costs for the Township and WRC?
- Are inspections frequent enough to ensure compliance?
- Does the Township DPS have the proper staff and monetary resources to effectively manage the program after the SAW Grant period has ended?

Since the program's inception, the Township has spent approximately \$800 annually on FOG inspections. To date, the commercial property owners and managers have been very receptive to the Township's new proactive FOG program. Upon identifying an issue on site, the Township DPS staff follow-up and notify the various owners and managers and most often, the issue is corrected within 7-14 days. No violation letters or corrective action has been needed. However, there are a few properties that consistently do not properly maintain their grease control device; therefore, several follow-up inspections by Township staff are needed, with very little impact.

Because of this, the Township is planning on revising the existing Sanitary Sewers Ordinance to supply more stringent cost recovery language. This language will allow the Township to recover some of their labor being utilized for follow-up inspections.

As stated earlier, it costs approximately \$112,718 per year to clean and maintain the White Lake Township sanitary sewer grinder and pumping stations. Moving forward, DLZ-J&A will coordinate with the Township and WRC to assess the cost benefit associated with FOG program implementation and system operations and maintenance.







## Appendix A

**White Lake Township  
Commercial Kitchen Property List**

Property name	Property address	Property Phone #	Contact Name	Contact Phone #	Contact Email	FOG Equipment
China House	901 Nordic Drive White Lake, MI 48383	248-889-2880		248-238-9967	<a href="mailto:shonyinglin@gmail.com">shonyinglin@gmail.com</a>	In-kitchen trap (cleaned monthly) & outdoor bin
White Lake Brunch	901 Nordic Drive White Lake, MI 48383	248-889-3600	Lindita Celaj		<a href="mailto:lindita-c@hotmail.com">lindita-c@hotmail.com</a>	Outdoor Bin
The Root Restaurant	340 Town Center Blvd. White Lake, MI 48386	248-698-2400	Chef Nick Rodgers		<a href="mailto:eat@therootrestaurant.com">eat@therootrestaurant.com</a>	In-kitchen trap
Independence Village Senior Living	935 Union Lake Rd White Lake, MI 48386	248-716-7163	Chef Dan McCoury	248-360-7235	<a href="mailto:dmccoury@independencevillages.com">dmccoury@independencevillages.com</a>	In-kitchen trap (cleaned monthly)
Neighborhoods of White Lake	10770 Elizabeth Lake Road White Lake, MI 48386	248-618-4150	Ann Turner	248-631-6493	<a href="mailto:Anngennette.Turner@trinity-health.org">Anngennette.Turner@trinity-health.org</a>	In-kitchen trap & outdoor bin
Meijer	6001 Highland Rd White Lake, MI 48383-4302	248-889-6800	Jason Briskey	248-889-6809	<a href="mailto:jason.briskey@meijer.com">jason.briskey@meijer.com</a>	Above Floor Bins for fryer grease - cleaned as needed
Tubbys	6370 Highland Rd White Lake, MI 48383- 2835	248-714-8189	Robert Jadan		<a href="mailto:robertzjadan@gmail.com">robertzjadan@gmail.com</a>	In-kitchen trap & outdoor bin
McDonalds	6491 Highland Rd. White Lake, MI 48383-2838	248-889-0026	Jenny Lane	248-889-0026	<a href="mailto:jenny.kassabian@gmail.com">jenny.kassabian@gmail.com</a>	In-Floor Trap; Above Floor Bins for fryer grease
Billy's Tip 'n Inn	6707 Highland Rd White Lake, MI 48383-2844	248-889-7885	Nadine Valentine	248-881-7711		In-kitchen trap & outdoor bin
Leo's Coney Island	6845 Highland Road White Lake, MI 48383-2879	248-889-5361	Jim Christopher	248-889-5361	<a href="mailto:jimi@leoswhitelake.com">jimi@leoswhitelake.com</a>	In-Floor Trap under 3 compartment sink - cleaned every other month; Outdoor Bin
Siam Fusion	6845 Highland Road White Lake, MI 48383	248-887-1300	May or Rouacha			In-kitchen trap & outdoor bin
Graceland Party Store	7505 Highland Rd. White Lake, MI 48383-2938	248-698-1070	Dave & David		<a href="mailto:DavidShrrak@gmail.com">DavidShrrak@gmail.com</a>	In-store trap/grinder
Taco Bell	9044 Highland Rd White Lake, MI 48386-2030	248-698-3871	Maggie Dominguez	248-747-1097	NA	Oil Tank; Outdoor Bin
Little Caesars Pizza	5951 Highland Road White Lake, MI		Bob Angona	248-515-2185		In-kitchen trap (cleaned every 3 weeks)
Applebee's	9100 Highland Road White Lake, MI 48386-2032	248-698-0901	Kristyn Mosier; Jesse Lince	248-698-0901	<a href="mailto:ab8078@teamschostak.com">ab8078@teamschostak.com</a>	Oil Tanks for fryer grease - cleaned every 2 wks; Outdoor/In-Ground Trap - cleaned every 2 wks
Jet's Pizza	901 Nordic Drive White Lake, MI 48383	248-889-0011	Jason Schienle		<a href="mailto:jasonschienle@gmail.com">jasonschienle@gmail.com</a>	In-kitchen trap (inspected monthly)
Walmart	9190 Highland Rd White Lake, MI 48386	248-698-9601	Brad Huesser	248-698-9601	NA	Oil Tank near exit; Outdoor/In-Ground trap - cleaned frequently
Pita Way	10531 Highland Rd. Ste 4, White Lake, MI 48383	248-366-4623	Duane Barbat			
Sonic	9328 Highland Rd. White Lake, MI 48386	248-461-6158	Kayla Salvador	248-461-6158	<a href="mailto:kayla.salvador@yahoo.com">kayla.salvador@yahoo.com</a>	Oil Tank; above floor transfer system to oil tank; outdoor bin
Dave & Amy's	9595 Highland Rd White Lake, MI 48386-2314	248-698-2010	Dave McManninen			Outdoor Bin
McDonalds	9615 Highland Rd. White Lake, MI 48386-2315	248-889-0026	Erin Longley	248-698-2424	NA	In-Floor Trap under 3 compartment sink; Oil Tank for fryer grease
Dairy Queen	10531 Highland Rd White Lake, MI 48386	248-698-2899	Katelyn (General Mgr)			
Arby's	10855 Highland Rd White Lake, MI 48386-2151	248-698-6926	Brandy (General Mgr)	248-698-6926	NA	Above-Floor Trap under 3 compartment sink - cleaned every 2-3 months; Outdoor Bin
Pita Way Mediterranean Grill	10531 Highland Rd. White Lake, MI 48346	248-366-4262	Reed Webb	248-842-4756	<a href="mailto:R.WEBBPITAWAY@GMAIL.COM">R.WEBBPITAWAY@GMAIL.COM</a>	In-Floor Trap under 3 compartment sink - cleaned every 2-3 months; Outdoor Bin for fryer grease
Highland House Café	10719 Highland Rd. White Lake, MI 48386	248-698-4100	Elina or Kelly Nicholas			In-kitchen & outdoor bin
Kroger	10951 Highland Rd White Lake, MI 48386-2152	248-779-6470	Brandy Merciers; Jamira King; Cheri Rushlow	248-854-0367; 248-390-2076; 248-536-1601	NA	Outdoor grease control device?; 2 bins taken to Outdoor Bin
St. Patrick Parish & School	9040/9086 Hutchins Street, White Lake, MI 48386	248-698-3100; 248-698-3240	John Abela	248-341-6142	<a href="mailto:suprajohn1@yahoo.com">suprajohn1@yahoo.com</a>	No trap; collects oil & drops off at Leo's

## Appendix A

White Lake Township  
Commercial Kitchen Property List

Property name	Property address	Property Phone #	Contact Name	Contact Phone #	Contact Email	FOG Equipment
Dublin Elementary	9260 Sandyside Road, White Lake, MI 48386	248-956-3800	Bill Chatfield	248-956-3062	<a href="mailto:williamchatfield@wlcsd.org">williamchatfield@wlcsd.org</a>	In-ktichen trap
Oxbow Elementary	100 Oxbow Lake Road, White Lake, MI 48383	248-684-8085	Mike Hill	248-684-8000	<a href="mailto:m.hill@hvs.org">m.hill@hvs.org</a>	none
Lakeland High School	1630 Bogie Lake Road, White Lake, MI 48383	248-676-8320	Mike Hill	248-684-8000	m.hill@hvs.org	In-floor trap under 3 compartment sink, cleaned and inspected once per year.
Huron Valley School Lakewood	1500 Bogie Lake Road, White Lake, MI 48383	248-698-8030	Mike Hill	248-684-8000	m.hill@hvs.org	none
White Lake Middle School	1450 Bogie Lake Road, White Lake, MI 48383	248-684-8004	Mike Hill	248-684-8000	m.hill@hvs.org	none

**FOG REPORT - APPENDIX B ~ COMMUNITY FOG PROGRAM COMPARISONS**

**APPENDIX B**  
**White Lake Township SAW Grant - Township & Statewide Communities FOG Program Comparison**  
**June 2017**

Community Name	Inspection & Program Details	Ordinance Details	Additional Comments	FOG Education
Waterford Township	<ul style="list-style-type: none"> <li>230 facilities WERE inspected</li> <li>Handled by complaints only now due to lack of staff</li> <li>FOG Management Software</li> <li>CMMS to generate work orders &amp; contributor(s) information</li> </ul>	<ul style="list-style-type: none"> <li>FOG discharge which causes interference with POTW is prohibited</li> <li>FOG cleaned from grease traps every 90 days</li> <li>FOG to be removed &amp; hauled offsite as volumes exceed 25% of the interceptor's or trap's functional volume</li> <li>Documentation of pump out or interceptor maintenance</li> <li>Cost recovery language</li> </ul>		<ul style="list-style-type: none"> <li>Website</li> <li>Brochures</li> </ul>
City of Farmington Hills	<ul style="list-style-type: none"> <li>Currently working with OCWRC on an education and cross connection program</li> </ul>	<ul style="list-style-type: none"> <li>FOG discharge which causes interference with POTW is prohibited</li> <li>Prohibits FOG discharge greater than 100 ppm</li> <li>Prohibits FOG discharge in excess of 1500 mg/l of average of samples collected over 24 hrs</li> <li>\$500 fine for Ordinance violations</li> <li>Language on serving notice and compliance periods</li> <li>Cost recovery language</li> </ul>	<ul style="list-style-type: none"> <li>Plumbing permit application - \$13 for grease trap</li> <li>City will be updating their ordinance and implementing enforcement soon</li> </ul>	<ul style="list-style-type: none"> <li>Website</li> <li>Brochures</li> </ul>
City of Auburn Hills	City does not have a formal inspection program	<ul style="list-style-type: none"> <li>FOG which causes interference with POTW is prohibited</li> <li>Cost recovery language</li> </ul>	<ul style="list-style-type: none"> <li>Underground grease storage units are required during site plan review</li> </ul>	<ul style="list-style-type: none"> <li>Website</li> <li>Brochures</li> <li>Newsletters</li> </ul>
City of Muskegon	<ul style="list-style-type: none"> <li>List of businesses with grease traps are kept on file at City</li> <li>Inspections are performed at a frequency designated by the Plumbing Inspector</li> <li>Inspections are funded through Public Works Department</li> </ul>	<ul style="list-style-type: none"> <li>FOG discharge which causes interference with POTW is prohibited</li> <li>Waste discharges onto streets/sidewalks are prohibited</li> <li>DPW Staff are not authorized to perform inspections (per City Code)</li> </ul>	<ul style="list-style-type: none"> <li>Plumbing permit application fees used for future inspections</li> </ul>	???
City of Jackson	<ul style="list-style-type: none"> <li>List of businesses with grease traps are kept on file at City</li> <li>Inspections performed every 3-4 years; more frequently if there are issues</li> <li>Customers required to submit to City the information of when and how much grease cleaned</li> </ul>	<ul style="list-style-type: none"> <li>Discharge of FOG discharge in excess of 50 mg/l</li> <li>City has right to inspect, observe, measure, sample and test in connection with admin of sewer system</li> <li>City can charge user with cleaning fee; issue a fine up to \$1,000/day/violation</li> <li>City can issue cease and desist</li> <li>Will publish violators once per year in newspaper</li> </ul>	<ul style="list-style-type: none"> <li>Education is paramount</li> <li>Education materials (poster) in three languages</li> <li>City will provide list of firms that pump out grease traps</li> <li>Does training with supervisors and staff</li> </ul>	<ul style="list-style-type: none"> <li>Newspaper</li> <li>Brochures</li> </ul>
City of Grand Rapids	<ul style="list-style-type: none"> <li>Not a full-fledged program yet</li> <li>City vactor technicians notify their department of issues</li> <li>Visit businesses for education as required</li> </ul>	<ul style="list-style-type: none"> <li>Discharge of FOG discharge in excess of 50 mg/l</li> <li>\$1,000 fines per offense (after period of 1 year)</li> </ul>	<ul style="list-style-type: none"> <li>Comprehensive sewer cleaning program to reduce SSOs (reduced by 10%)</li> </ul>	<ul style="list-style-type: none"> <li>Student/Resident Education</li> <li>Website</li> <li>Brochures</li> </ul>
City of Wyoming	<ul style="list-style-type: none"> <li>IPP Non-Domestic User Survey</li> <li>Staff regularly monitor &amp; collect samples from industrial users (at least once every 5 years)</li> <li>All sewer is cleaned on a 5-year basis, does 20% of system per year</li> <li>City staff person spends approx. 3 days per month visiting businesses, checking grease traps</li> </ul>	<ul style="list-style-type: none"> <li>FOG discharge which causes interference with POTW is prohibited</li> <li>Grease traps required where food is manufactured, sold, or prepared (except employee break areas)</li> <li>Grease traps shall be maintained by owner</li> <li>City shall have the right to inspect grease trap maintenance records</li> <li>Operating depth of grease trap cannot exceed 25%</li> <li>Prohibits discharge limits greater than 66% on average of 6 month period</li> <li>FOG discharge limit (daily average concentration) of 470 mg/l</li> <li>Waste discharges onto streets/sidewalks are prohibited</li> <li>Cost recovery language</li> <li>Authorizes the City to inspect properties and conduct sampling as needed</li> </ul>	<ul style="list-style-type: none"> <li>IPP &amp; Cross Connection Programs</li> <li>City provides residents and businesses FOG collector containers</li> </ul>	<ul style="list-style-type: none"> <li>Website</li> <li>Brochures</li> <li>Educational Meetings</li> <li>Video</li> </ul>
City of Ann Arbor	<ul style="list-style-type: none"> <li>Not a full-fledged program yet</li> <li>Sewer Claim Form</li> <li>Inspections on a case by case basis</li> </ul>	<ul style="list-style-type: none"> <li>Discharge of FOG in excess of 50 mg/l</li> <li>Authorizes the City to inspect properties</li> </ul>	<ul style="list-style-type: none"> <li>Biodigester Feasibility Study (2015)</li> <li>Organics Management Plan (2015)</li> <li>Sewer Claim Form</li> </ul>	<ul style="list-style-type: none"> <li>Annual Water Quality Reports</li> <li>Brochures</li> <li>Newsletters</li> </ul>
Delhi Township	<ul style="list-style-type: none"> <li>Monthly grease trap inspections</li> </ul>	<ul style="list-style-type: none"> <li>Grease traps required; design approved by Twp</li> <li>Traps are to be maintained by owner &amp; maintenance records kept</li> <li>Discharge of FOG in excess of 36 mg/l</li> <li>Cost recovery language</li> </ul>	<ul style="list-style-type: none"> <li>Twp-wide grease recycling &amp; grease container distribution program</li> </ul>	<ul style="list-style-type: none"> <li>Brochures</li> <li>Website</li> </ul>
City of Madison Heights	<ul style="list-style-type: none"> <li>No inspections performed at this time – by complaint only</li> </ul>	<ul style="list-style-type: none"> <li>Grease traps required</li> <li>Cost recovery language</li> </ul>		<ul style="list-style-type: none"> <li>Displays &amp; Handouts @ City Hall</li> <li>Website (future)</li> <li>Brochures (future)</li> </ul>

Community Name	Inspection & Program Details	Ordinance Details	Additional Comments	FOG Education
City of Sterling Heights	<ul style="list-style-type: none"> <li>• ?? – Left 2 voicemails with Building Department</li> </ul>	<ul style="list-style-type: none"> <li>• Identifies City Manager as authority over sewer system</li> <li>• Grease, oil, and sand interceptors are required &amp; type/capacity as approved for City</li> <li>• Allows City authority to perform inspections as needed</li> <li>• Cost recovery language</li> <li>• FOG discharge which causes interference with POTW is prohibited</li> <li>• Prohibits FOG discharge greater than 1500 mg/l on average samples collected w/in 24 hr period</li> </ul>		<ul style="list-style-type: none"> <li>• Newsletter Articles</li> </ul>
Independence Township	<ul style="list-style-type: none"> <li>• Will be conducting inspections as part of their SAW Grant implementation</li> </ul>	<ul style="list-style-type: none"> <li>• FOG discharge which causes interference with POTW is prohibited</li> <li>• Prohibits FOG discharge greater than 1500 mg/l on average samples collected w/in 24 hr period</li> <li>• Cost recovery language</li> </ul>		<ul style="list-style-type: none"> <li>• Displays at DPW</li> <li>• Newsletter Articles</li> <li>• Website (future)</li> </ul>
City of Birmingham	<ul style="list-style-type: none"> <li>• Not currently performing inspections – by complaint only, but is planning on implementing a FOG Program in the coming months</li> </ul>	<ul style="list-style-type: none"> <li>• Prohibits FOG discharge greater than 100 ppm by weight</li> <li>• Prohibits FOG discharge greater than 1500 mg/l on average samples collected w/in 24 hr period</li> <li>• Cost recovery language</li> <li>• Outdoor FOG containers shall be maintained and must be labeled with name and address of business</li> </ul>		<ul style="list-style-type: none"> <li>• Newsletter Articles</li> </ul>
City of Royal Oak	<ul style="list-style-type: none"> <li>• Not currently performing inspections – by complaint only</li> </ul>	<ul style="list-style-type: none"> <li>• Prohibits FOG discharge greater than 1500 mg/l on average samples collected w/in 24 hr period</li> <li>• FOG discharge which causes interference with POTW is prohibited</li> <li>• ‘New sources’ are required to install and maintain pollution control equipment (per IPP Standards)</li> <li>• Cost recovery language</li> </ul>		<ul style="list-style-type: none"> <li>• Newsletter Articles</li> </ul>
City of Rochester	<ul style="list-style-type: none"> <li>• Bi-monthly injections of grease inhibitor</li> <li>• Inspections due to complaints only (see attached form)</li> <li>• <i>Eganix</i> working with a few businesses in City to clean grease traps as needed</li> </ul>	<ul style="list-style-type: none"> <li>• FOG discharge which causes interference with POTW is prohibited</li> <li>• Prohibits FOG discharge greater than 1500 mg/l on average samples collected w/in 24 hr period</li> <li>• Cost recovery language (but needs to be updated)</li> </ul>	<ul style="list-style-type: none"> <li>• City does NOT currently require grease traps</li> <li>• Approximately 5 hours spent monthly to facilitate program</li> <li>• Process should be better documented and streamlined through Cityworks &amp; GIS</li> </ul>	<ul style="list-style-type: none"> <li>• Newsletter Article – Summer 2016</li> <li>• Website (future)</li> <li>• Posters (future)</li> <li>• Annual Water Quality Reports (future)</li> </ul>
White Lake Township	<ul style="list-style-type: none"> <li>• As-Needed sewer cleaning by OCWRC</li> </ul>	<ul style="list-style-type: none"> <li>• Identifies Township Supervisor and staff as authority over sewer system</li> <li>• Allows Township authority to perform inspections as needed</li> <li>• Requires maintenance of pre-treatment facilities</li> <li>• Requires monitoring manholes for commercial/industrial wastes</li> <li>• No cost recovery language</li> </ul>		<ul style="list-style-type: none"> <li>• ????</li> </ul>

**White Lake Township Ordinance Recommendations (Article IV – Sanitary Sewers)**

- Include the definition of ‘Commercial User’
- Include the definition of ‘Grease Control Device’
- Require grease control devices for new development, redevelopment & change of ownership
- Provide specific design and maintenance requirements for **new** grease control devices
- Require outdoor grease bins to be maintained & documentation of ownership
- Provide language for issuance of warrant for refusal of entry for inspection
- Provide cost recovery language
- Township Attorney to review ALL existing & proposed language

**White Lake Township FOG Inspection Recommendations**

- Integrate commercial businesses into GIS
- Digitize existing complaint response forms into GIS
- Integrate inspection form & inspection alerts into Cityworks
- Develop & adopt an inspection/complaint response report

**White Lake Township FOG Education Recommendations**

- Publish FOG articles in newsletters (targeted for residents)
- Post FOG information on website (targeted for residents and businesses)
- Distribute FOG brochures at Township Hall (targeted for residents and businesses)
- Post FOG posters at Township Hall & have available for businesses to utilize



**CHARTER TOWNSHIP OF WHITE LAKE  
AN ORDINANCE TO AMEND CHAPTER 38, ARTICLE IV OF THE  
WHITE LAKE TOWNSHIP CODE OF ORDINANCES.  
ORDINANCE #18-001**

THE TOWNSHIP OF WHITE LAKE ORDAINS:

**ARTICLE I – AMENDMENT**

Chapter 38 Article IV of the Township of White Lake Code of Ordinance, commonly referred to as the Sanitary Sewer Ordinance is hereby amended to add, delete or modify various sections as follows. The remaining sections in Chapter 38, Article IV of the Code of Ordinances are otherwise unaffected by this amendment and shall remain in full force and effect.

**Sec. 38-418. – Definitions, amended to read as follows:**

The following words, terms and phrases, when used in this article, shall have the meanings ascribed to them in this section, except where the context clearly indicates a different meaning:

**25 percent rule** means that the combined depth of oil and grease and other solids (floating and settled) in any chamber of a grease control device shall not be equal to or greater than 25 percent of the total operating depth of the grease control device. The operating depth of a grease control device is determined by measuring the internal depth from the water outlet invert elevation to the inside bottom of the grease control device.

**Available public sanitary sewer** means a publicly owned sanitary sewer system located in a right-of-way, easement, highway, street, or public way which crosses, adjoins or abuts upon the premises and passing not more than 200 feet from the boundary line of a property in which a structure within which sanitary sewage originates is located.

**Benefited properties** shall mean all properties which will derive benefit from the construction of a sewer improvement.

**Building sewers** means the extension from the building drain that connects the building in which sanitary sewage originates to the public sewer or other place of disposal and conveys the sewage of only one building.

**Capital Fee** shall mean the amount charged to the property owner for each structure to be connected to the sanitary sewer system. The fee shall be paid prior to connection, based on residential equivalent units, and in accordance with the Township Fee Ordinance. This fee is non-transferable to other properties and non-refundable.

**Commercial User** means any user of the sanitary sewer system where there is or can be any discharge into the sanitary sewer system other than normal domestic waste because of the particular type of operation including, but not limited to: carwashes, hotel kitchens, hospitals, churches, school cafeterias, dry cleaners, senior housing facilities, bakeries, bars, and restaurants.

**County** means Oakland County, Michigan.

**Department (DPS)** means the township Department of Public Services formerly known as the water and sewer departments.



**Director or DPS Director** means the director of the Department of Public Services or his authorized representative, or such other individual as designated by the township board to oversee the township's sewer system.

**Fats, oils, and grease (FOG)** means any hydrocarbons, fatty acids, soaps, fats, waxes, oils, and any other nonvolatile material of animal, vegetable, or mineral origin that is extractable by solvent in accordance with standard methods.

**Grease control device** means any grease interceptor, grease trap, or other mechanism, device, or process, which attaches to, or is applied to, wastewater plumbing fixtures and lines, the purpose of which is to trap, collect, or treat FOG prior to discharge into the sewer system that is collected in food preparation areas, such as restaurants, hotel kitchens, hospitals, bars, school and church cafeterias and the like. Grease control device may also include any proven method to reduce FOG subject to the approval of the township.

**Grease interceptor** is commonly associated with kitchen cleaning appliances such as sinks, woks, and any other drains that collect FOG so as to prevent unreasonable accumulations of fats, oils or grease from infiltrating into the sanitary sewer system and otherwise prohibiting the free flow of wastewater within such system. For purposes of this definition, the term "kitchen" shall refer to a food preparation area located other than in a single family dwelling, primarily intended for activities of preparing, serving or otherwise making available for consumption food, and which are used for one or more of the following preparation activities: washing, trimming or cleaning fish or meat, cooking by frying (all methods), baking (all methods), grilling, sautéing, rotisserie cooking, broiling (all methods) boiling, blanching, roasting, toasting, or poaching; also included are infrared heating, searing, barbecuing, and any other food preparation activity that produces a hot, non-drinkable food product in or on a receptacle that requires washing.

**Lateral Benefit Fee** shall mean the amount charged to the property owner for each structure to be connected to the sanitary sewer system, in addition to the Capital Connection Fee. This fee applies when a property owner has not previously contributed to the cost of construction of the sewer main abutting the property. The fee shall be paid prior to connection, based on residential equivalent units, and in accordance with the Township Fee Ordinance. This fee is non-transferable to other properties and non-refundable.

**Lateral** refers to a pipe or conduit, located within the public right-of-way or an easement granted or dedicated to the public which receives sanitary sewage from abutting properties.

**MDEQ** means the Michigan Department of Environmental Quality, or any successor.

**Off site sewer mains** mean sewer mains constructed off the premises of the owner to be served, which are necessary to afford service to the premises from trunk sewers not adjacent to the premises.

**Owner** includes fee title holders, land contract purchasers or anyone else having a beneficial interest in property.

**Pontiac Lake Sewer District** means that geographic area included within the special assessment district for the Pontiac Lake Sanitary Sewer Extension, the special assessment roll for which was confirmed by the township in November 2002, and which are located north of Pontiac Lake Road and south of Gale Road.

***Premises or property*** means the lands included within a single description as set forth from time to time on the township tax roll as a single tax parcel in the name of a taxpayer at one address, but in the case of platted lots shall be limited to a single platted lot unless an existing building or structure is so located on more than one lot so as to make the same a single description for purposes of assessment or conveyance, now or hereafter.

***Private sewage disposal system*** means a facility for the transportation, collection, processing or treatment of sanitary sewage owned by a nongovernmental entity. The term "private sewage disposal system" includes septic systems.

***Sanitary sewer master plan*** means the latest draft of the plan prepared by the township consulting sewer engineers and approved by the township board.

***Sanitary sewer system or township sanitary sewer system*** means the entire sanitary sewer system of the township under public ownership.

***Septic system*** means the sanitary sewage treatment and/or disposal device installed to service an individual home, business or industrial establishment not connected to the sanitary sewer system.

***Sewage, sanitary sewage or waste water*** means spent water which may be a combination of the liquid and water carried wastes from residences, commercial buildings, industrial plants or other land uses.

***Structure in which sanitary sewage originates or structure*** means a building in which toilet, kitchen, laundry, bathing or other facilities which generate water carrying sewage are used for household, commercial, industrial or other purposes.

***Water resource commissioner*** means the office of the county water resource commissioner.

**Sec. 38-450. - Establishment of department, amended to read as follows:**

A Department of Public Services (DPS) for the township is hereby established.

**Sec. 38-451. – Director, amended to read as follows:**

The construction, operation, management, maintenance, repair and control of the sewer system of the township, whether owned by the township or operated under contract, may be under the control of the DPS director. The director shall be appointed by the township supervisor and confirmed by the township board. The director shall report to the township supervisor.

**Sec. 38-452. - County water resource commission as agent, amended to amend title and to read as follows:**

The office of the county water resource commissioner is hereby appointed as agent of township for the operation, maintenance and management of the sewer system of the township.

**Sec. 38-453. - Authorized to enter property, amended to read as follows:**

The duly authorized employees or agents of the township or county bearing proper credentials and identification shall be permitted to enter upon all properties within the township for the

purposes of inspection, observation, measurement, sampling and testing, to determine compliance with the provisions of this article.

**Sec. 38-476. - Water pollution, amended to read as follows:**

It shall be unlawful to discharge to the waters of the state any sanitary sewage, industrial or commercial wastes, or other polluted waters within the township unless suitable treatment has been provided in accordance with the provisions of this article.

**Sec. 38-478. - New private sewer systems, amended to read as follows:**

- (a) Where connection to a public sanitary sewer is not required pursuant to section 38-479, the building sewer shall be connected with a private sewage disposal system complying with the terms of this article, the requirements of the county health division, MDEQ, and any other applicable law, ordinance or regulation.
- (b) No new private sewer system shall be constructed, installed or operated within the township unless the plans for the installation are approved by, and a permit issued by, the county health division or MDEQ.
- (c) All costs associated with the operation, maintenance and replacement of a private sewage disposal system shall be borne by the property owners served by said systems.

**Sec. 38-479. - Required connection to public sanitary sewer systems, amended to read as follows:**

- (a) All new structures in which sanitary sewage originates lying within the township shall be connected to an *available public sanitary sewer* in the township before a certificate of occupancy shall be issued.
- (b) Existing structures in which sanitary sewage originates lying within the boundaries of the township shall be connected to an *available public sanitary sewer* upon the earlier of the following events:
  - (1) Within 90 days after the date of mailing or posting of written notice by the township or the county health division that a health hazard exists due to the failure of an existing private sewage disposal system due to soil conditions or for any other reason.
  - (2) Where any addition or alteration to an existing structure is proposed, and the county health division has determined that additional volume beyond the capacity of the existing private sewage disposal system is necessary.
- (c) This subsection applies to new structures for which an *available public sanitary sewer* is not immediately available for connection but the township reasonably anticipates that the public sanitary sewer will be extended in the future in reasonable proximity to such new structure. In such event, the township may, as a condition of site plan approval, require the applicant to connect said structure to the public sanitary sewer within 60 days of the date the township notifies the owner of the property (as shown on the last tax assessment roll of the township) that the system is available for connection. In such event, all persons with any interest in the property shall execute a document, in form suitable for recording at the county register of deeds, and approved by the township attorney.

- (d) All structures in which sanitary sewage originates located within the boundaries of the Pontiac Lake Sewer District shall be connected to an available public sanitary sewer. This connection shall be completed promptly, but not later than 90 days after the township sends written notice to the owner of the property on which the structure is located, as shown by the last tax assessment roll of the township, giving notice of the availability of the public sanitary sewer system and the existence of this article.
- (e) In addition to the other remedies provided in this article, the township may bring a civil proceeding for an injunctive order, or for such other remedial relief, to compel connection to the public sanitary sewer system, including damages for the cost or expenses thereof. The township may join in such actions any number of property owners. The relief available under this section shall include an injunctive order allowing the township or its employees, agents or contractors to enter onto the property and connect the structure to the public sanitary sewer system. In the event the township makes the connection pursuant to the preceding sentence, all costs of the township in doing so, including the actual cost of connection, attorney fees, engineering fees and all other costs, shall be a lien on the property which may be enforced by the township in the same manner as provided for collection of delinquent tax assessments, by utilization of the statutory provisions for foreclosure of mortgages by advertisement, or by suit for collection. The selection of remedy shall be at the sole discretion of the township.

**Sec. 38-504. - Plans, permits and bonds, amended to read as follows:**

- (a) Prior to connection and prior to start of construction, all sanitary sewer systems shall have engineering plans and specifications prepared by a professional engineer and shall be approved by the township engineer, water resource commissioner, and a permit issued by MDEQ, if required.
- (b) A connection permit shall be obtained by the owner or contractor from the water resource commission. Said connection permit shall show the location of the work, the extent of the work, information regarding the contractor, the owner and the engineer, and any other pertinent information as shall be determined necessary by the water resource commission.
- (c) Individual building sewers which are directly connected into the township sanitary sewer system shall conform to all applicable requirements of this article. A connection permit, as required by the Oakland County Water Resource Commission, shall be obtained before such connection is made. Prior to the issuance of such connection permit, the person obtaining such permit shall have obtained the written approval of the township. Connection shall be made in a workmanlike manner and in accordance with methods and procedures established by the water resource commissioner. The party to whom such a permit is issued shall be responsible for notifying the water resource commissioner 24 hours in advance of the date and time when such a connection is made so that proper inspection of same can be made by the water resource commissioner.
- (d) Prior to the adjustment, reconstruction or any other altering of the township sanitary sewer system, including manhole structures, the contractor or person responsible for the work shall first obtain a permit to do such work from the water resource commissioner. Said permit fee shall be determined by the water resource commissioner.
- (e) Prior to construction and during the life of permits obtained in accordance with subsections (b), (c) and (d) of this section, all owners or contractors shall:

- (1) Yearly furnish to the water resource commissioner a satisfactory surety bond in the amount of \$5,000.00 as security for the faithful performance of the work in accordance with the plans and specifications and departmental standards; and
- (2) Yearly furnish to the water resource commissioner a cash deposit in the amount of \$500.00. Such deposit shall provide funds for emergency work and/or such other work as may be deemed necessary by the water resource commissioner, arising as a result of construction by the owner or contractor. Such deposits shall not be canceled by the owner, or contractor without first having given ten days' written notice to the water resource commissioner. Cash deposits may be returned to the owner or contractor within ten days of receipt of written request therefor, except that no deposits will be returned until such time as all outstanding permits have received final inspection and approval. In the event that it becomes necessary for the water resource commissioner to expend funds for work arising as a result of construction by the owner or the contractor, then the cost of such work shall be deducted from the aforementioned cash deposit.

The owner or contractor shall have the right and opportunity to correct any deficiencies promptly before any deposit funds will be spent by the water resource commissioner. The owner or contractor shall, within 30 days of the mailing of written notice thereof, pay to the water resource commissioner the entire amount of such cost. Failure to comply with these rules and regulations and the standards of the water resource commissioner may result in the immediate forfeiture of the cash deposit.

**Sec. 38-511. Grease control devices, added title and section to read as follows:**

(a) All new and remodeled establishments, as well as establishments where a change of ownership has occurred, where food is manufactured, sold or prepared, except for small areas designated as employee break areas or the equivalent, discharging wastewater containing fats, oils, and grease (FOG) to the sanitary sewer system shall install, operate, and maintain a sufficiently-sized oil and grease, water and solids control device necessary to achieve and maintain compliance with the limits indicated in this section of the Code and with the Michigan Plumbing Code.

(b) Unless otherwise authorized by the township engineer, all grease control devices shall be of the outdoor, inline variety. With special authorization by the director, grease control devices of the indoor, under- counter, stand-alone variety may be allowed. In this case, maintenance of indoor grease control devices shall be performed at frequencies necessary to protect the capacity of the sewer system against accumulation of grease and oils, as required by the "25 percent rule" as defined herein.

(c) Grease control devices shall be provided when they are necessary for the proper handling of liquid wastes containing grease in excessive amounts or any flammable wastes, sand or other harmful ingredients. Such devices shall not be required for dwelling units. All devices shall be of a type and capacity approved by the director and shall be located so as to be readily accessible for cleaning and inspection. These devices shall provide a minimum capacity of one thousand (1,000) gallons.

(d) Grease control devices shall be constructed of impervious materials capable of withstanding abrupt and extreme changes in temperature. They shall be of substantial construction, watertight

and equipped with easily removable covers which, when bolted in place, shall be gastight and watertight.

(e) Where installed, all devices shall be cleaned and maintained at least quarterly by the owner (unless otherwise specified by the township) and shall be operated continuously in an efficient manner whenever the facility is in operation.

(f) Maintenance of all outdoor grease control devices shall be performed at frequencies necessary to protect the capacity of the sewer system against accumulation of grease and oils, as required by the "25 percent rule".

(g) The user shall be responsible for the proper removal and legal disposal of the grease control device waste. All waste removed from each device must be disposed of at a facility permitted to receive such waste. No device pumpage may be discharged to the township sewer system. Maintenance shall include the complete removal of all contents, including floatable materials, wastewater, sludges and solids and jet flushing to remove measurable build-up on tank walls. Top skimming of outdoor grease traps, decanting or back flushing of the grease control device or its wastes for the purpose of reducing the volume to be hauled is prohibited.

(h) There shall be ample room and reasonable access to these devices to allow accurate sampling and preparation of samples for transport and analysis.

(i) These devices shall be installed in compliance with the current Michigan Plumbing Code, as enforced by the township and county. The DPS Director and the Township Engineer shall make final determination and approval of the required grease control device size. If additional pretreatment and/or maintenance is required to meet the provisions in this section, the township may require that the establishment in existence prior to the effective date of this section upgrade to the requirements provided.

(j) Use of any bacteriological, chemical, or enzymatic addition for the purpose of maintaining a device is prohibited unless written approval is obtained from the township.

(k) The user shall be responsible for maintaining records and/or manifests as to the dates of service, quantity, waste hauler name, and any necessary repairs at the user's location for a period of three years, which records shall be subject to review by the township and/or county without prior notification.

(l) Should any user fail to properly clean and maintain a grease control device as required herein, the township and/or county at its option, clean and maintain, or hire a licensed contractor, at the cost of which shall be collectable by the township from the user at a charge of actual cost.

**38-512. Outdoor storage of grease, added title and section to read as follows:**

Animal or vegetable grease stored by businesses outside of their buildings must be kept in a self-contained, sealed, leak proof grease container which is approved by the township. The container and the area in and around the container must be kept clean. The name and address of the business must be clearly identified on the outside of the container. Any person or business found disposing of FOG in the township sewer system and/or not properly maintaining their

grease container(s) shall be guilty of a misdemeanor and shall be responsible for the costs incurred by the township in cleaning up and disposing of the grease.

**Section 38-513. Refusing entry for inspection; issuance of search warrant, added title and section to read as follows:**

Whenever a township or county representative deems it necessary to enter upon any property at a reasonable hour for the purposes of inspection, observation, measurement, sampling, and testing of enforcement in accordance with the provisions of this article, and is refused such entry, the representative who is refused such entry may make an affidavit in writing, under oath to the district court stating the facts of the case so far as it may be known to the complainant. The court may issue a search warrant or inspection or other order allowing the director, building official or his representatives to enter upon such property to the extent and time necessary to enforce and carry out the provisions of this article.

**Sec. 38-543. - Reimbursement to property owners, amended to read as follows:**

Reimbursement for construction costs advanced by a property owner for sewer system improvement shall be limited to a credit against capital charges otherwise due under this article by charging such owner a ~~indirect~~ *Capital connection fee* but not a *lateral benefit fee*.

**Sec. 38-566. – Township Fee Ordinance, added title and section to read as follows:**

All fees and charges including, but not limited to, connection fees, inspection fees, administrative fees, user fees and debt services fees shall be paid in accordance with the Township Fee Ordinance.

**Sec. 38-567. - Computation of residential equivalent units (REU), amended to read as follows:**

The number of residential equivalent units to be assigned to any particular premises, other than a single family residence, for sewage disposal services shall be determined by the county department of public works unit assignment schedule dated September 15, 1988, as may be amended from time to time by that department or by the township, except that the unit factor for each mobile home, manufactured housing, or multiple-family residence shall be at the rate of 1.0 residential equivalent unit. No less than one residential equivalent unit shall be assigned to each premises but, for purposes of computing sewage disposal services, residential equivalent units in excess of one may be computed and assigned to the nearest tenth. No change in use shall constitute a basis for a retroactive reduction in service charges or capital charges.

**Sec. 38-571. - Capital connection fee and lateral benefit fee, amended title and to read as follows:**

(a) No premises shall be connected to a public sanitary sewer main or sanitary sewer lateral without the payment of *capital connection fees* and *lateral benefit fees* as provided for in this article.

(b) The township board may, as compensation in full or in part, waive the *lateral benefit fee* for premises over which permanent or temporary sewer easements or licenses have been granted

to the township without charge provided there is reasonable expectation that the easement shall lead to future extension of the sanitary sewer system, as determined by the Township DPS director or the township engineer. The total amount of the *lateral benefit fee* waived shall not exceed the value of the easement or license granted to the township as determined by the township assessor utilizing standard appraisal techniques. The township assessor shall execute a certificate stating his conclusions regarding the value of the easement or license granted and the basis for that opinion.

**Sec. 38-573. - Payment of capital connection ~~charges~~ fees and lateral benefit fees, amended title and to read as follows:**

Except as otherwise provided in this section, or as provided by a special assessment district established by the township board, the capital connection fees and applicable lateral benefit fees described in this article shall be paid by the user in cash at the time of connection.

**Sec. 38-575. - Connection charges for existing systems, amended to read as follows:**

The capital connection fees and applicable lateral benefit fees to be charged to various existing units within the Chateau Cranberry Lake Mobile Home Park and the White Lake Mobile Village shall be in accordance with a consent judgment previously approved by the county circuit court.

**Sec. 38-576. - Connection charges for the Pontiac Lake District, tile and section deleted.**

**ARTICLE 2: SEVERABILITY.**

If any section, clause or provision of this Ordinance shall be declared to be unconstitutional, void, illegal or ineffective by any Court of competent jurisdiction, such selection, clause or provision declared to be unconstitutional, void or illegal shall thereby cease to be a part of this Ordinance, but the remainder of the Ordinance shall stand and be in full force and effect.

**ARTICLE 3: EFFECTIVE DATE.**

This Ordinance shall take effect following publication in the manner prescribed by law.

**ARTICLE 4: REPEALER.**

All other ordinances or parts of ordinances in conflict with this ordinance are hereby repealed to the extent necessary to give this ordinance full force and effect.



**ARTICLE 5: ADOPTION.**

This Ordinance is hereby declared to have been adopted by the Township Board of this Charter Township of White Lake at a meeting thereof duly called and held on the 16<sup>th</sup> day of October, 2018, and ordered to be given publication in the manner prescribed by the Charter of the Charter Township of White Lake.

Rik Kowall, Supervisor

Terry Lilley, Clerk



INNOVATIVE IDEAS  
EXCEPTIONAL DESIGN  
UNMATCHED CLIENT SERVICE

White Lake Township  
FY2023 CWSRF Wastewater Asset Management Plan  
Improvements Project Plan

## APPENDIX VI

### FEMA FIRM FLOOD MAPS

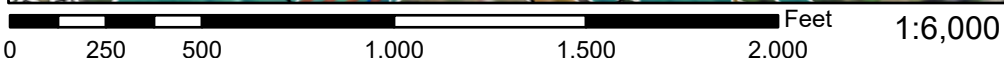
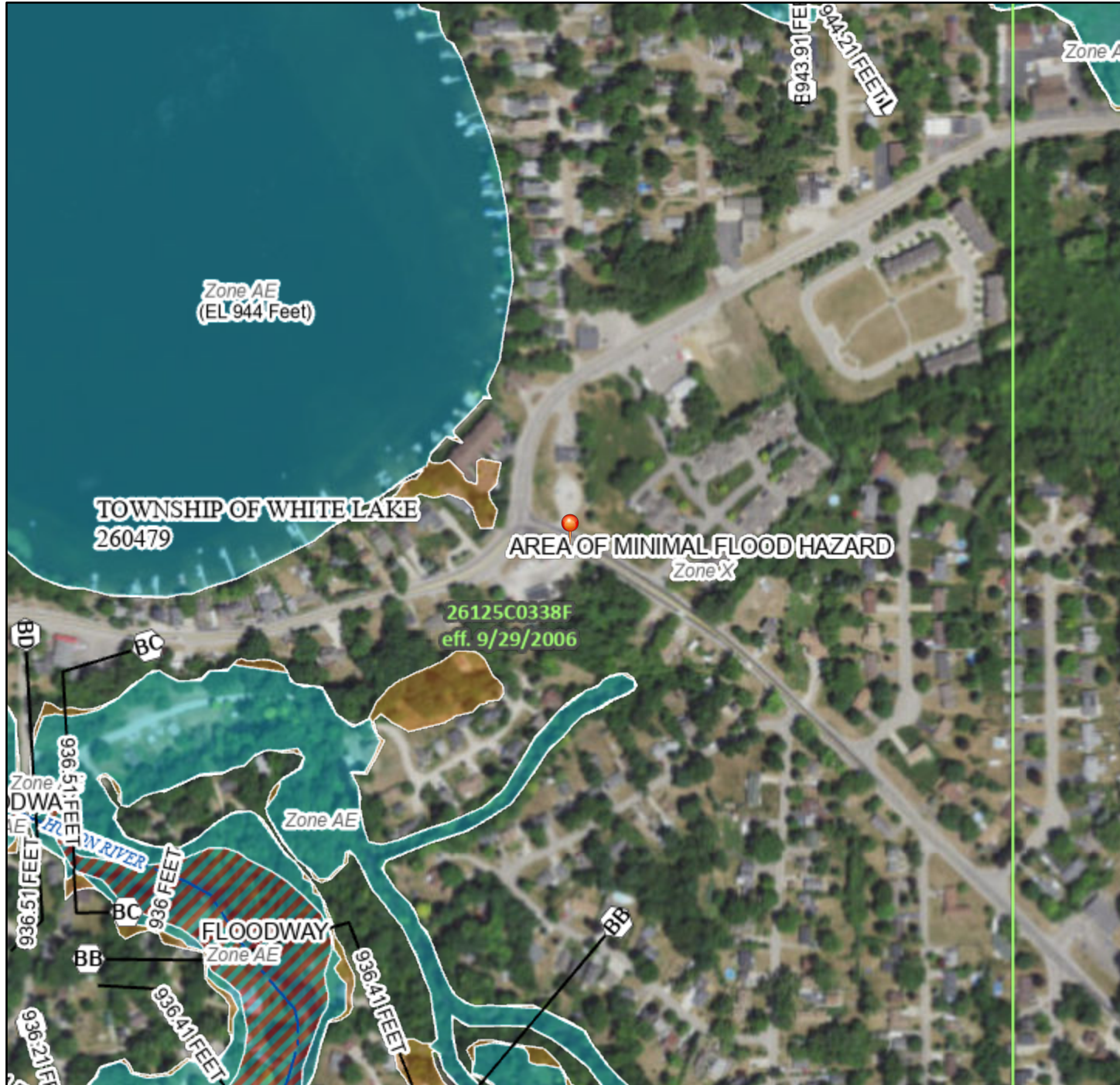
DRAFT



# National Flood Hazard Layer FIRMMette



83°28'41"W 42°38'38"N



Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

## Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) Zone A, V, A99
		With BFE or Depth Zone AE, AO, AH, VE, AR
		Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
		Future Conditions 1% Annual Chance Flood Hazard Zone X
		Area with Reduced Flood Risk due to Levee. See Notes. Zone X
		Area with Flood Risk due to Levee Zone D

OTHER AREAS		NO SCREEN Area of Minimal Flood Hazard Zone X
		Effective LOMRs
		Area of Undetermined Flood Hazard Zone D

GENERAL STRUCTURES		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall

OTHER FEATURES		20.2 Cross Sections with 1% Annual Chance Water Surface Elevation
		17.5 Coastal Transect
		Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
		Coastal Transect Baseline
		Profile Baseline
		Hydrographic Feature

MAP PANELS		Digital Data Available
		No Digital Data Available
		Unmapped



The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

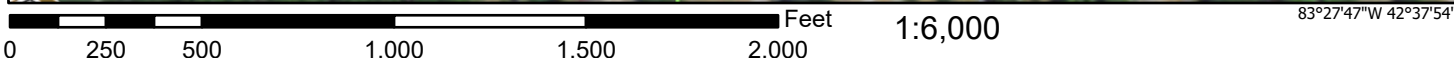
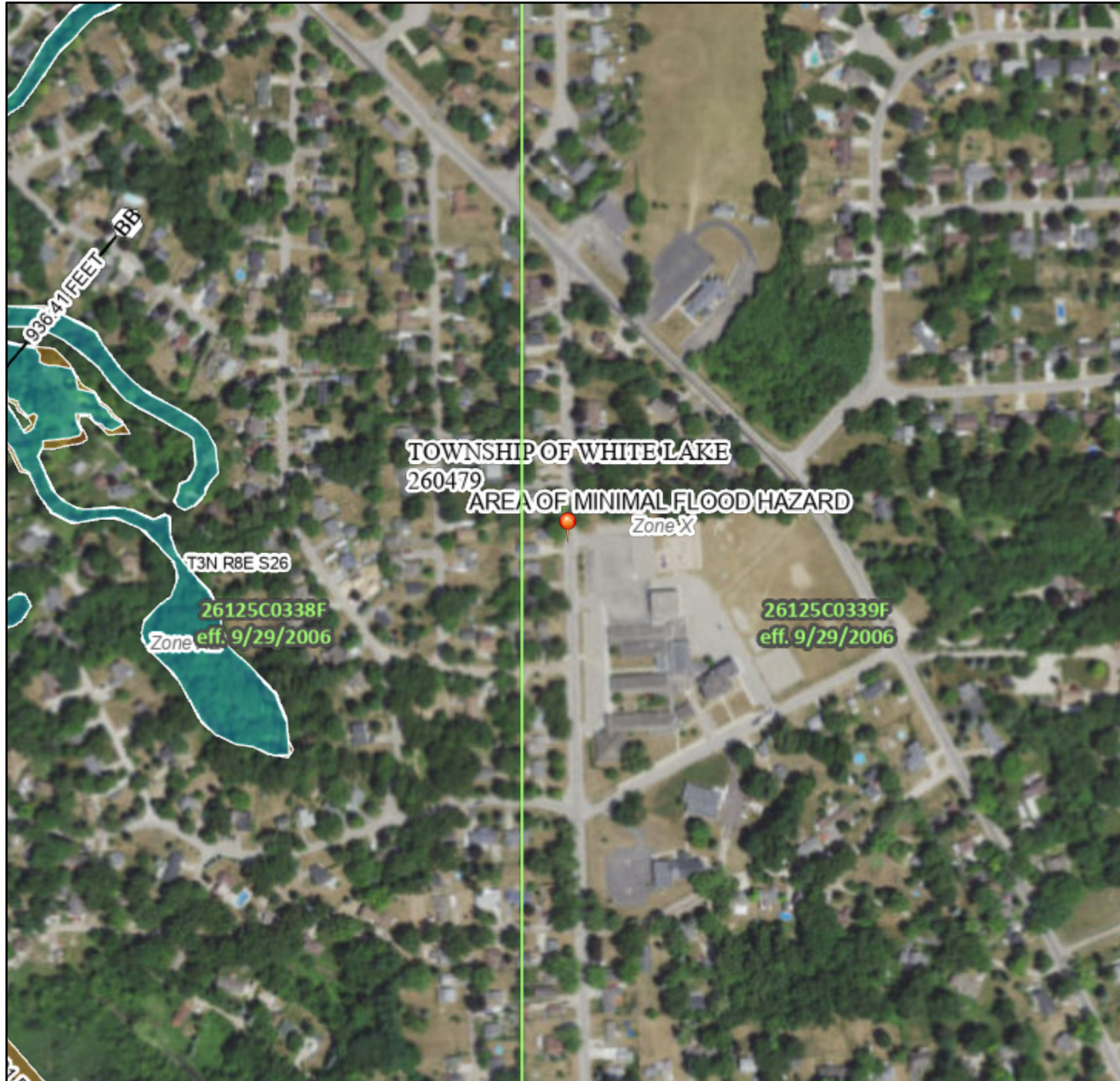
The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 3/3/2022 at 10:22 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

# National Flood Hazard Layer FIRMMette



83°28'25"W 42°38'21"N



Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

## Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) Zone A, V, A99
		With BFE or Depth Zone AE, AO, AH, VE, AR
		Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
		Future Conditions 1% Annual Chance Flood Hazard Zone X
		Area with Reduced Flood Risk due to Levee. See Notes. Zone X
		Area with Flood Risk due to Levee Zone D
OTHER AREAS		NO SCREEN Area of Minimal Flood Hazard Zone X
		Effective LOMRs
GENERAL STRUCTURES		Area of Undetermined Flood Hazard Zone D
		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall
OTHER FEATURES		20.2 Cross Sections with 1% Annual Chance Water Surface Elevation
		17.5 Water Surface Elevation
		Coastal Transect
		Base Flood Elevation Line (BFE)
		Limit of Study
MAP PANELS		Digital Data Available
		No Digital Data Available
		Unmapped
		The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on **3/3/2022 at 10:27 AM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

# National Flood Hazard Layer FIRMMette



83°28'24"W 42°38'6"N



0 250 500 1,000 1,500 2,000 Feet 1:6,000  
 Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

## Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) <i>Zone A, V, A99</i>
		With BFE or Depth <i>Zone AE, AO, AH, VE, AR</i>
		Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile <i>Zone X</i>
		Future Conditions 1% Annual Chance Flood Hazard <i>Zone X</i>
		Area with Reduced Flood Risk due to Levee. See Notes. <i>Zone X</i>
		Area with Flood Risk due to Levee <i>Zone D</i>
OTHER AREAS		NO SCREEN Area of Minimal Flood Hazard <i>Zone X</i>
		Effective LOMRs
GENERAL STRUCTURES		Area of Undetermined Flood Hazard <i>Zone D</i>
		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall
OTHER FEATURES		20.2 Cross Sections with 1% Annual Chance Water Surface Elevation
		17.5 Coastal Transect
		Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
MAP PANELS		Coastal Transect Baseline
		Profile Baseline
		Hydrographic Feature
		Digital Data Available
		No Digital Data Available
		Unmapped

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

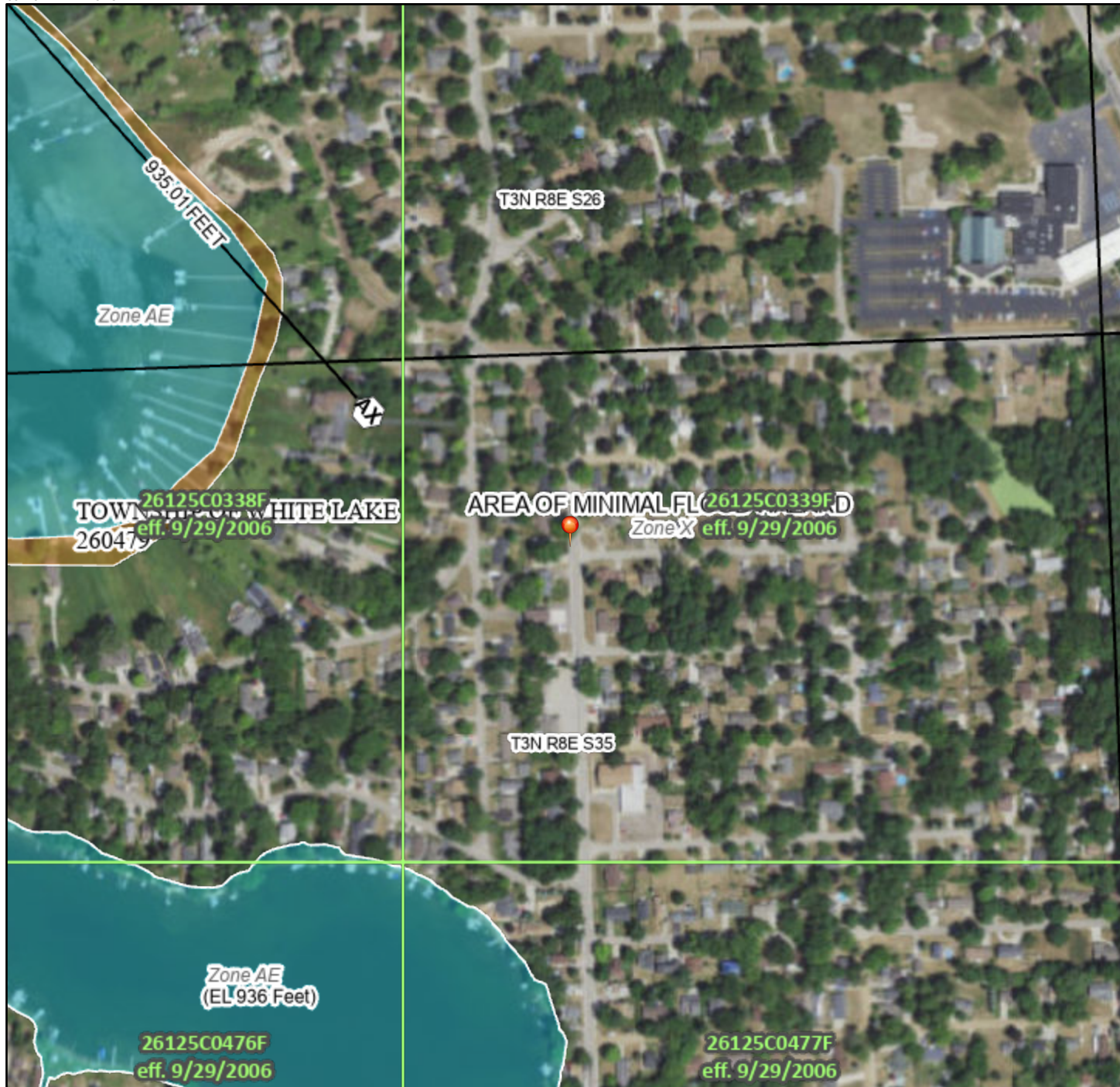
The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on **3/3/2022 at 10:28 AM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

# National Flood Hazard Layer FIRMMette



83°28'21"W 42°37'51"N



## Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) <i>Zone A, V, A99</i>
		With BFE or Depth <i>Zone AE, AO, AH, VE, AR</i>
		Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile <i>Zone X</i>
		Future Conditions 1% Annual Chance Flood Hazard <i>Zone X</i>
		Area with Reduced Flood Risk due to Levee. See Notes. <i>Zone X</i>
		Area with Flood Risk due to Levee <i>Zone D</i>

OTHER AREAS		NO SCREEN Area of Minimal Flood Hazard <i>Zone X</i>
		Effective LOMRs
		Area of Undetermined Flood Hazard <i>Zone D</i>
GENERAL STRUCTURES		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall

OTHER FEATURES		Cross Sections with 1% Annual Chance Water Surface Elevation
		Coastal Transect
		Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
		Coastal Transect Baseline
		Profile Baseline
MAP PANELS		Digital Data Available
		No Digital Data Available
		Unmapped

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

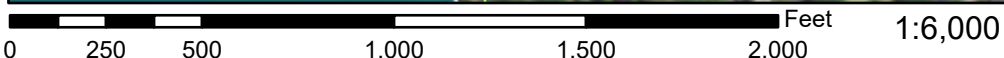
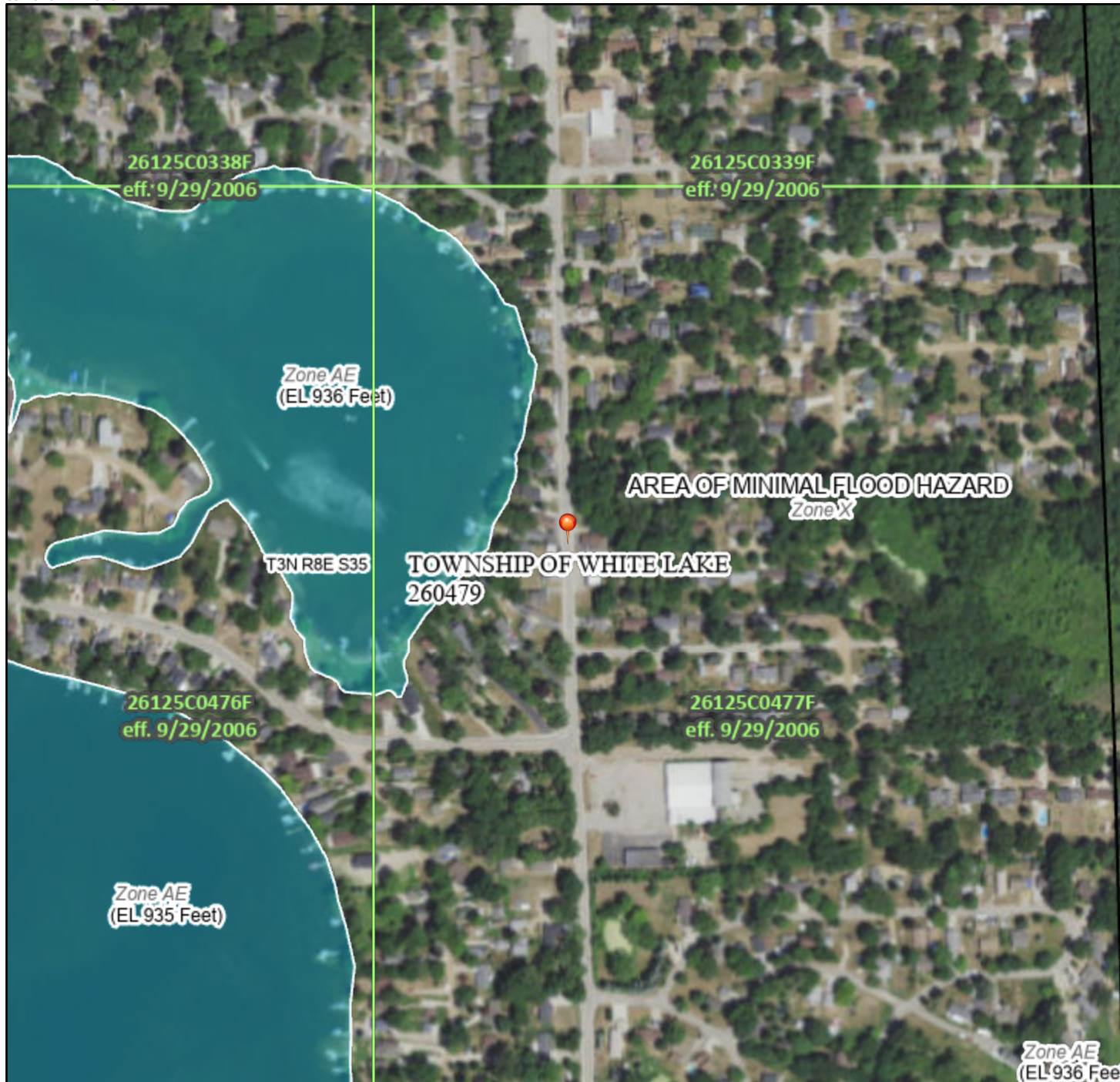
The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on **3/3/2022 at 10:30 AM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

# National Flood Hazard Layer FIRMMette



83°28'20"W 42°37'34"N



Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

## Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) <i>Zone A, V, A99</i>
		With BFE or Depth <i>Zone AE, AO, AH, VE, AR</i>
		Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile <i>Zone X</i>
		Future Conditions 1% Annual Chance Flood Hazard <i>Zone X</i>
		Area with Reduced Flood Risk due to Levee. See Notes. <i>Zone X</i>
		Area with Flood Risk due to Levee <i>Zone D</i>
OTHER AREAS		NO SCREEN Area of Minimal Flood Hazard <i>Zone X</i>
		Effective LOMRs
GENERAL STRUCTURES		Area of Undetermined Flood Hazard <i>Zone D</i>
		Channel, Culvert, or Storm Sewer
OTHER FEATURES		Levee, Dike, or Floodwall
		20.2 Cross Sections with 1% Annual Chance Water Surface Elevation
MAP PANELS		17.5 Coastal Transect
		Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
		Coastal Transect Baseline
		Profile Baseline
		Hydrographic Feature
		Digital Data Available
		No Digital Data Available
		Unmapped



The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on **3/3/2022 at 10:31 AM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

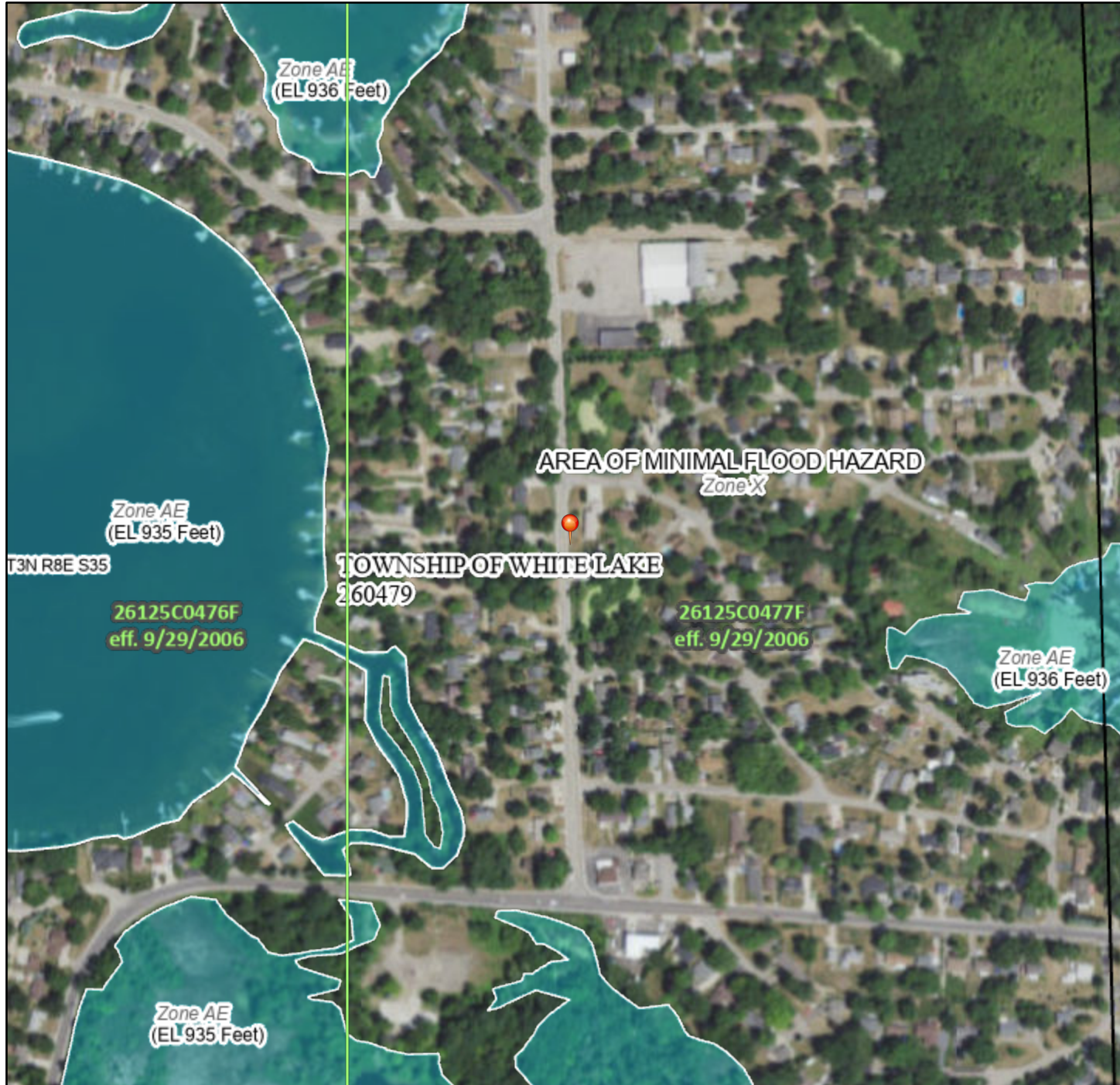
This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.



# National Flood Hazard Layer FIRMMette



83°28'19"W 42°37'22"N



## Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) <i>Zone A, V, A99</i>
		With BFE or Depth <i>Zone AE, AO, AH, VE, AR</i>
		Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile <i>Zone X</i>
		Future Conditions 1% Annual Chance Flood Hazard <i>Zone X</i>
		Area with Reduced Flood Risk due to Levee. See Notes. <i>Zone X</i>
		Area with Flood Risk due to Levee <i>Zone D</i>

OTHER AREAS		NO SCREEN Area of Minimal Flood Hazard <i>Zone X</i>
		Effective LOMRs
		Area of Undetermined Flood Hazard <i>Zone D</i>

GENERAL STRUCTURES		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall

OTHER FEATURES		20.2 Cross Sections with 1% Annual Chance Water Surface Elevation
		17.5 Coastal Transect
		Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
		Coastal Transect Baseline
		Profile Baseline
		Hydrographic Feature

MAP PANELS		Digital Data Available
		No Digital Data Available
		Unmapped

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on **3/3/2022 at 10:33 AM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

# National Flood Hazard Layer FIRMMette



83°28'13"W 42°37'13"N



## Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

- |                                    |   |
|------------------------------------|---|
| <b>SPECIAL FLOOD HAZARD AREAS</b>  | <ul style="list-style-type: none"> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightblue; border: 1px solid black; margin-right: 5px;"></span> Without Base Flood Elevation (BFE)<br/><i>Zone A, V, A99</i></li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightblue; border: 1px solid black; margin-right: 5px;"></span> With BFE or Depth <i>Zone AE, AO, AH, VE, AR</i></li> <li><span style="display: inline-block; width: 15px; height: 10px; background: repeating-linear-gradient(45deg, transparent, transparent 2px, red 2px, red 4px); border: 1px solid black; margin-right: 5px;"></span> Regulatory Floodway</li> </ul>   |
| <b>OTHER AREAS OF FLOOD HAZARD</b> | <ul style="list-style-type: none"> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: orange; border: 1px solid black; margin-right: 5px;"></span> 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile <i>Zone X</i></li> <li><span style="display: inline-block; width: 15px; height: 10px; background: repeating-linear-gradient(45deg, grey, grey 2px, transparent 2px, transparent 4px); border: 1px solid black; margin-right: 5px;"></span> Future Conditions 1% Annual Chance Flood Hazard <i>Zone X</i></li> <li><span style="display: inline-block; width: 15px; height: 10px; background: repeating-linear-gradient(45deg, yellow, yellow 2px, blue 2px, blue 4px); border: 1px solid black; margin-right: 5px;"></span> Area with Reduced Flood Risk due to Levee. See Notes. <i>Zone X</i></li> <li><span style="display: inline-block; width: 15px; height: 10px; background: repeating-linear-gradient(45deg, yellow, yellow 2px, blue 2px, blue 4px); border: 1px solid black; margin-right: 5px;"></span> Area with Flood Risk due to Levee <i>Zone D</i></li> </ul>                                 |
| <b>OTHER AREAS</b>                 | <ul style="list-style-type: none"> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: white; border: 1px solid black; margin-right: 5px;"></span> NO SCREEN Area of Minimal Flood Hazard <i>Zone X</i></li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: white; border: 2px solid blue; margin-right: 5px;"></span> Effective LOMRs</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: orange; border: 1px solid black; margin-right: 5px;"></span> Area of Undetermined Flood Hazard <i>Zone D</i></li> </ul>   |
| <b>GENERAL STRUCTURES</b>          | <ul style="list-style-type: none"> <li><span style="display: inline-block; width: 15px; border-bottom: 2px dashed black; margin-right: 5px;"></span> Channel, Culvert, or Storm Sewer</li> <li><span style="display: inline-block; width: 15px; border-bottom: 2px dashed grey; margin-right: 5px;"></span> Levee, Dike, or Floodwall</li> </ul>  |
| <b>OTHER FEATURES</b>              | <ul style="list-style-type: none"> <li><span style="display: inline-block; width: 15px; border-bottom: 2px solid black; margin-right: 5px;"></span> <b>B</b> 20.2 Cross Sections with 1% Annual Chance Water Surface Elevation</li> <li><span style="display: inline-block; width: 15px; border-bottom: 2px dashed black; margin-right: 5px;"></span> 17.5 Coastal Transect</li> <li><span style="display: inline-block; width: 15px; border-bottom: 2px dashed grey; margin-right: 5px;"></span> Base Flood Elevation Line (BFE)</li> <li><span style="display: inline-block; width: 15px; border-bottom: 2px solid red; margin-right: 5px;"></span> Limit of Study</li> <li><span style="display: inline-block; width: 15px; border-bottom: 2px solid yellow; margin-right: 5px;"></span> Jurisdiction Boundary</li> <li><span style="display: inline-block; width: 15px; border-bottom: 2px dashed black; margin-right: 5px;"></span> Coastal Transect Baseline</li> <li><span style="display: inline-block; width: 15px; border-bottom: 2px solid blue; margin-right: 5px;"></span> Profile Baseline</li> <li><span style="display: inline-block; width: 15px; border-bottom: 2px solid blue; margin-right: 5px;"></span> Hydrographic Feature</li> </ul> |
| <b>MAP PANELS</b>                  | <ul style="list-style-type: none"> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: white; border: 1px solid black; border-style: dashed; margin-right: 5px;"></span> Digital Data Available</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: white; border: 1px solid black; border-style: dotted; margin-right: 5px;"></span> No Digital Data Available</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: white; border: 1px solid black; border-style: dashed; margin-right: 5px;"></span> Unmapped</li> </ul>  |
- The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on **3/3/2022 at 10:35 AM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

0 250 500 1,000 1,500 2,000 Feet 1:6,000

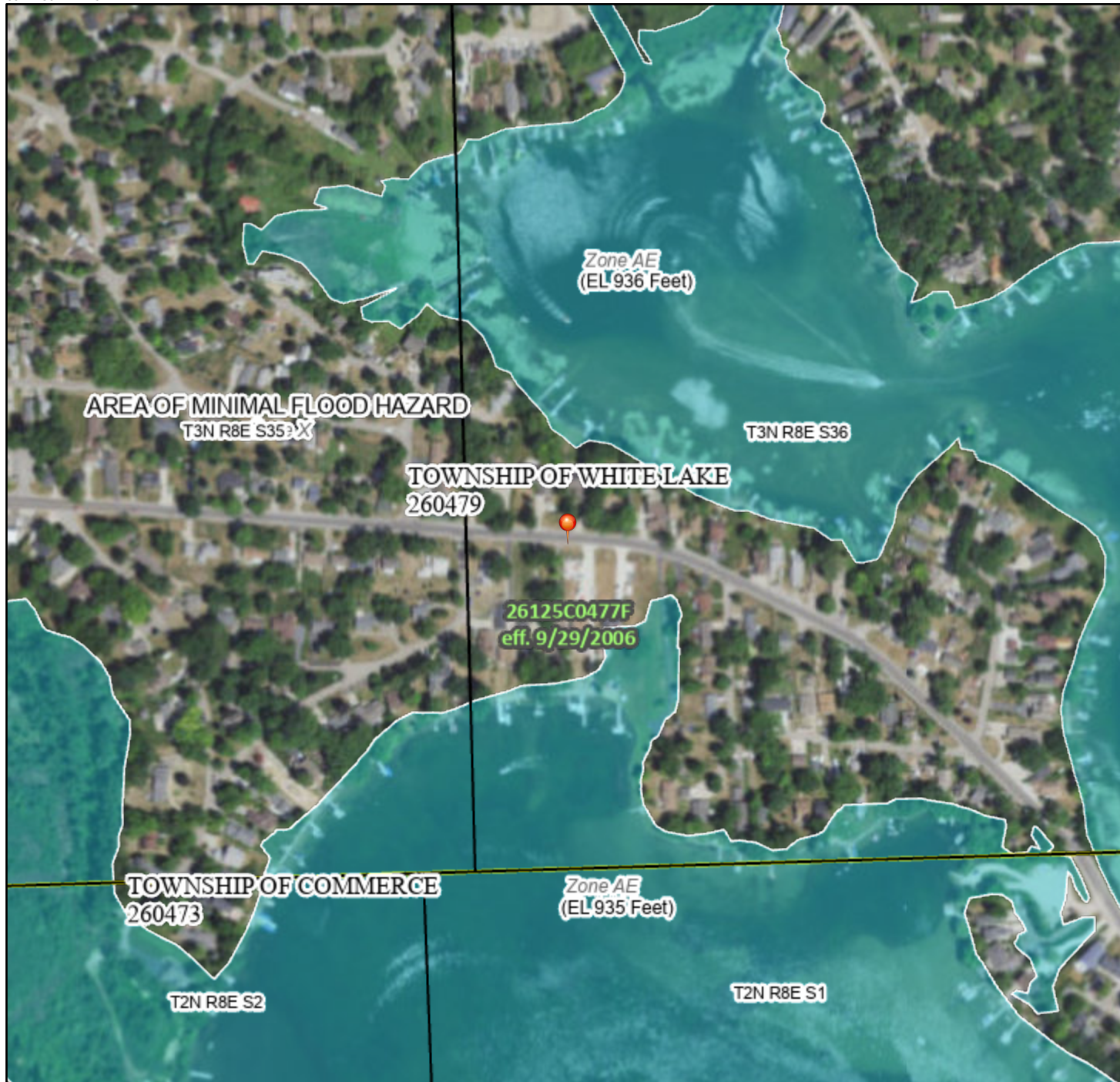
83°27'35"W 42°36'46"N

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

# National Flood Hazard Layer FIRMMette



83°27'58"W 42°37'12"N



## Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

- |                                    |  |  |
|------------------------------------|--|--|
| <b>SPECIAL FLOOD HAZARD AREAS</b>  |  | Without Base Flood Elevation (BFE)<br><i>Zone A, V, A99</i>  |
|                                    |  | With BFE or Depth <i>Zone AE, AO, AH, VE, AR</i>   |
|                                    |  | Regulatory Floodway  |
| <b>OTHER AREAS OF FLOOD HAZARD</b> |  | 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile <i>Zone X</i> |
|                                    |  | Future Conditions 1% Annual Chance Flood Hazard <i>Zone X</i>  |
|                                    |  | Area with Reduced Flood Risk due to Levee. See Notes. <i>Zone X</i>  |
|                                    |  | Area with Flood Risk due to Levee <i>Zone D</i>  |
| <b>OTHER AREAS</b>                 |  | NO SCREEN Area of Minimal Flood Hazard <i>Zone X</i>   |
|                                    |  | Effective LOMRs  |
| <b>GENERAL STRUCTURES</b>          |  | Area of Undetermined Flood Hazard <i>Zone D</i>  |
|                                    |  | Channel, Culvert, or Storm Sewer   |
|                                    |  | Levee, Dike, or Floodwall  |
| <b>OTHER FEATURES</b>              |  | 20.2 Cross Sections with 1% Annual Chance Water Surface Elevation  |
|                                    |  | 17.5 Coastal Transect  |
|                                    |  | Base Flood Elevation Line (BFE)  |
|                                    |  | Limit of Study   |
|                                    |  | Jurisdiction Boundary  |
| <b>MAP PANELS</b>                  |  | Coastal Transect Baseline  |
|                                    |  | Profile Baseline   |
|                                    |  | Hydrographic Feature   |
|                                    |  | Digital Data Available   |
|                                    |  | No Digital Data Available  |
|                                    |  | Unmapped   |
|                                    |  | The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.                                     |



0 250 500 1,000 1,500 2,000 Feet 1:6,000  
 Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020  
 83°27'20"W 42°36'45"N

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

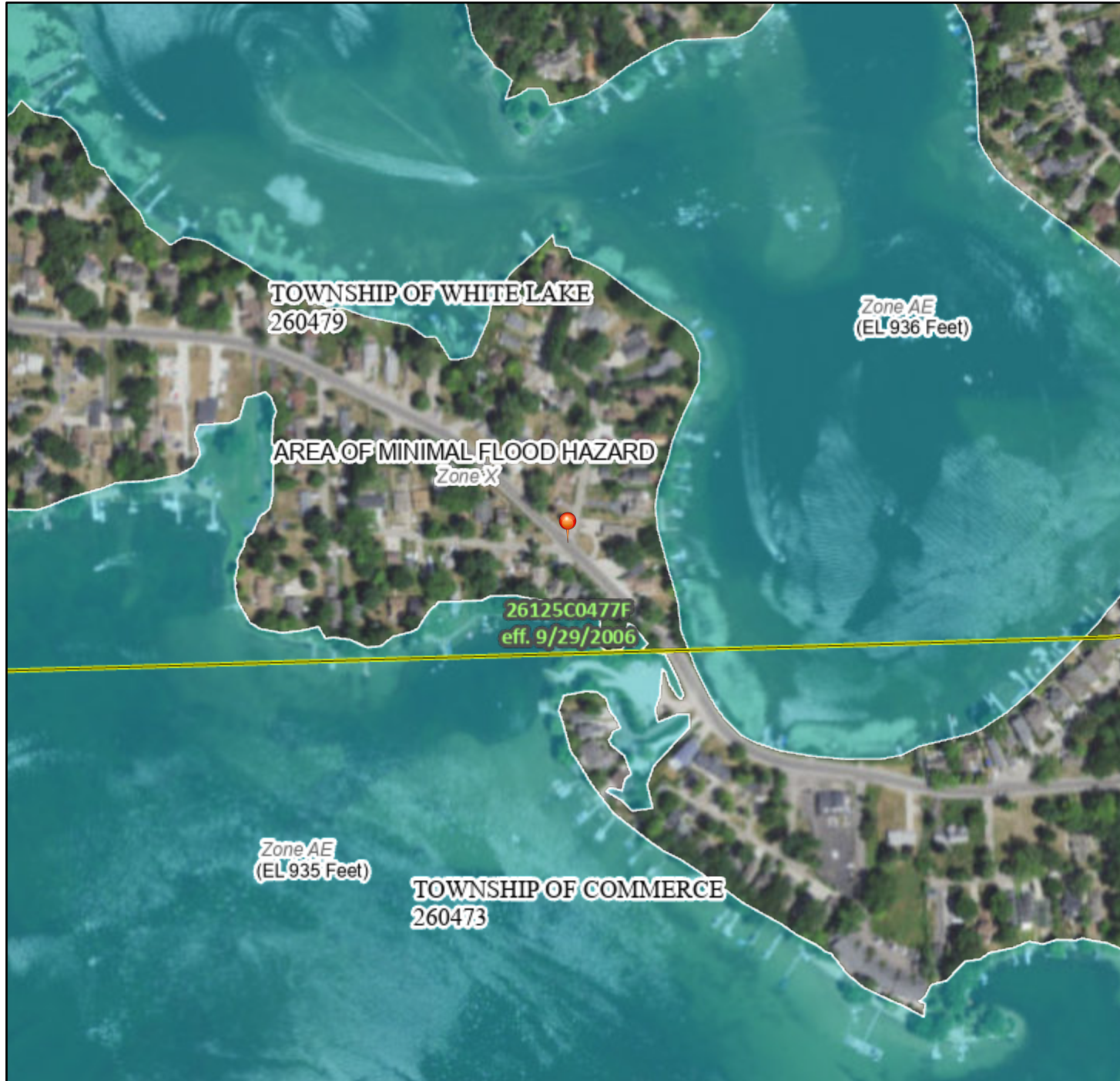
The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on **3/3/2022 at 10:36 AM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

# National Flood Hazard Layer FIRMMette



83°27'44"W 42°37'7"N



## Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

<b>SPECIAL FLOOD HAZARD AREAS</b>		Without Base Flood Elevation (BFE) <i>Zone A, V, A99</i>
		With BFE or Depth <i>Zone AE, AO, AH, VE, AR</i>
		Regulatory Floodway
<b>OTHER AREAS OF FLOOD HAZARD</b>		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile <i>Zone X</i>
		Future Conditions 1% Annual Chance Flood Hazard <i>Zone X</i>
		Area with Reduced Flood Risk due to Levee. See Notes. <i>Zone X</i>
		Area with Flood Risk due to Levee <i>Zone D</i>
<b>OTHER AREAS</b>		NO SCREEN Area of Minimal Flood Hazard <i>Zone X</i>
		Effective LOMRs
<b>GENERAL STRUCTURES</b>		Area of Undetermined Flood Hazard <i>Zone D</i>
		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall
<b>OTHER FEATURES</b>		20.2 Cross Sections with 1% Annual Chance Water Surface Elevation
		17.5 Water Surface Elevation
		Coastal Transect
		Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
<b>MAP PANELS</b>		Digital Data Available
		No Digital Data Available
		Unmapped
		The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 3/3/2022 at 10:37 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

# National Flood Hazard Layer FIRMMette



83°27'32"W 42°37'1"N



Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

## Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) <i>Zone A, V, A99</i>
		With BFE or Depth <i>Zone AE, AO, AH, VE, AR</i>
		Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile <i>Zone X</i>
		Future Conditions 1% Annual Chance Flood Hazard <i>Zone X</i>
		Area with Reduced Flood Risk due to Levee. See Notes. <i>Zone X</i>
		Area with Flood Risk due to Levee <i>Zone D</i>
OTHER AREAS		NO SCREEN Area of Minimal Flood Hazard <i>Zone X</i>
		Effective LOMRs
		Area of Undetermined Flood Hazard <i>Zone D</i>
GENERAL STRUCTURES		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall
OTHER FEATURES		Cross Sections with 1% Annual Chance Water Surface Elevation
		Coastal Transect
		Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
		Profile Baseline
MAP PANELS		Digital Data Available
		No Digital Data Available
		Unmapped
		The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.



This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards.

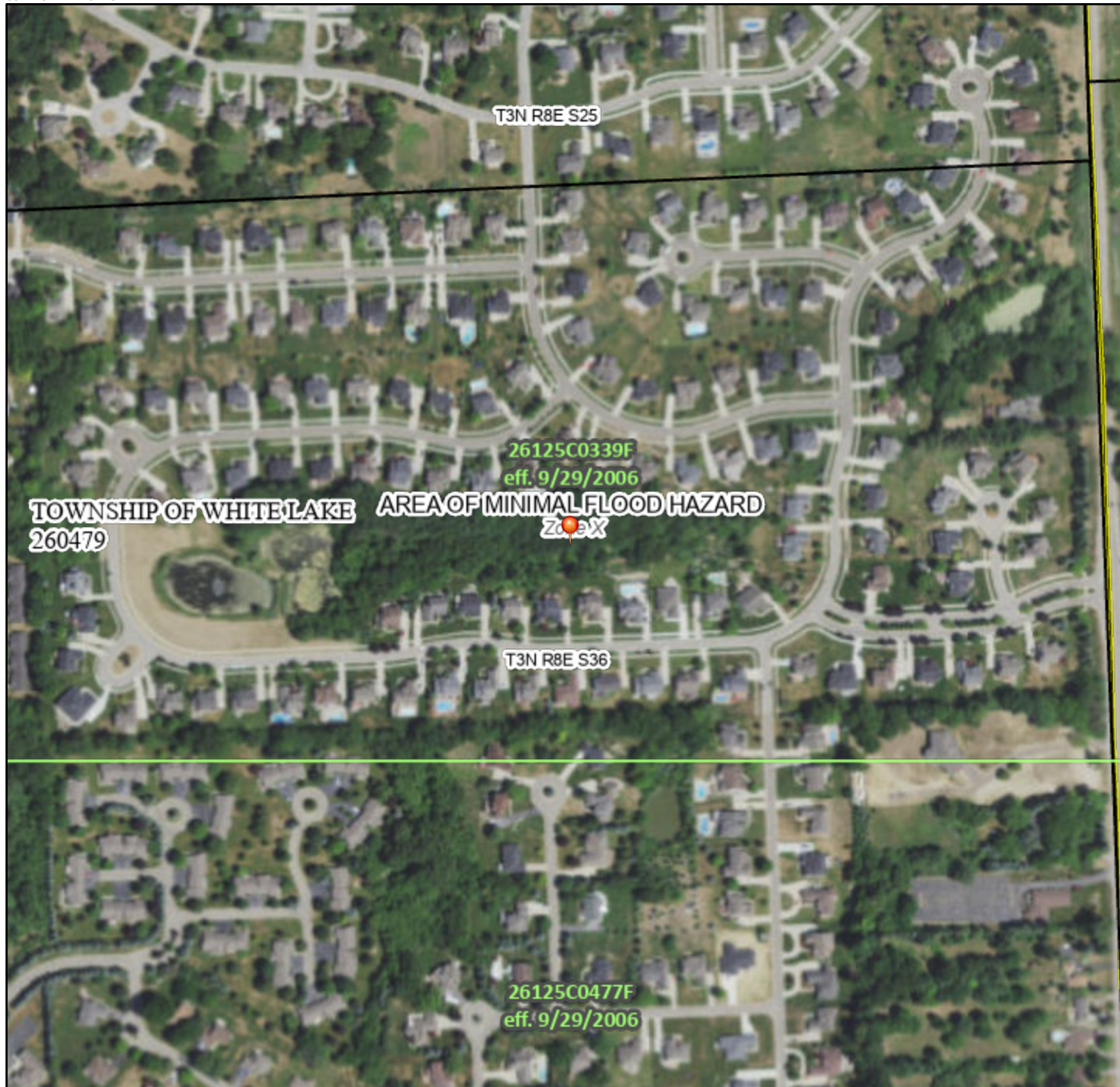
The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on **3/3/2022 at 10:39 AM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

# National Flood Hazard Layer FIRMMette



83°27'9"W 42°37'49"N



## Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

<b>SPECIAL FLOOD HAZARD AREAS</b>		Without Base Flood Elevation (BFE) <i>Zone A, V, A99</i>
		With BFE or Depth <i>Zone AE, AO, AH, VE, AR</i>
		Regulatory Floodway
<b>OTHER AREAS OF FLOOD HAZARD</b>		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile <i>Zone X</i>
		Future Conditions 1% Annual Chance Flood Hazard <i>Zone X</i>
		Area with Reduced Flood Risk due to Levee. See Notes. <i>Zone X</i>
		Area with Flood Risk due to Levee <i>Zone D</i>
<b>OTHER AREAS</b>		NO SCREEN Area of Minimal Flood Hazard <i>Zone X</i>
		Effective LOMRs
<b>GENERAL STRUCTURES</b>		Area of Undetermined Flood Hazard <i>Zone D</i>
		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall
<b>OTHER FEATURES</b>		20.2 Cross Sections with 1% Annual Chance
		17.5 Water Surface Elevation
		Coastal Transect
		Base Flood Elevation Line (BFE)
		Limit of Study
<b>MAP PANELS</b>		Jurisdiction Boundary
		Coastal Transect Baseline
		Profile Baseline
		Hydrographic Feature
		Digital Data Available
		No Digital Data Available
		Unmapped
		The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.



This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

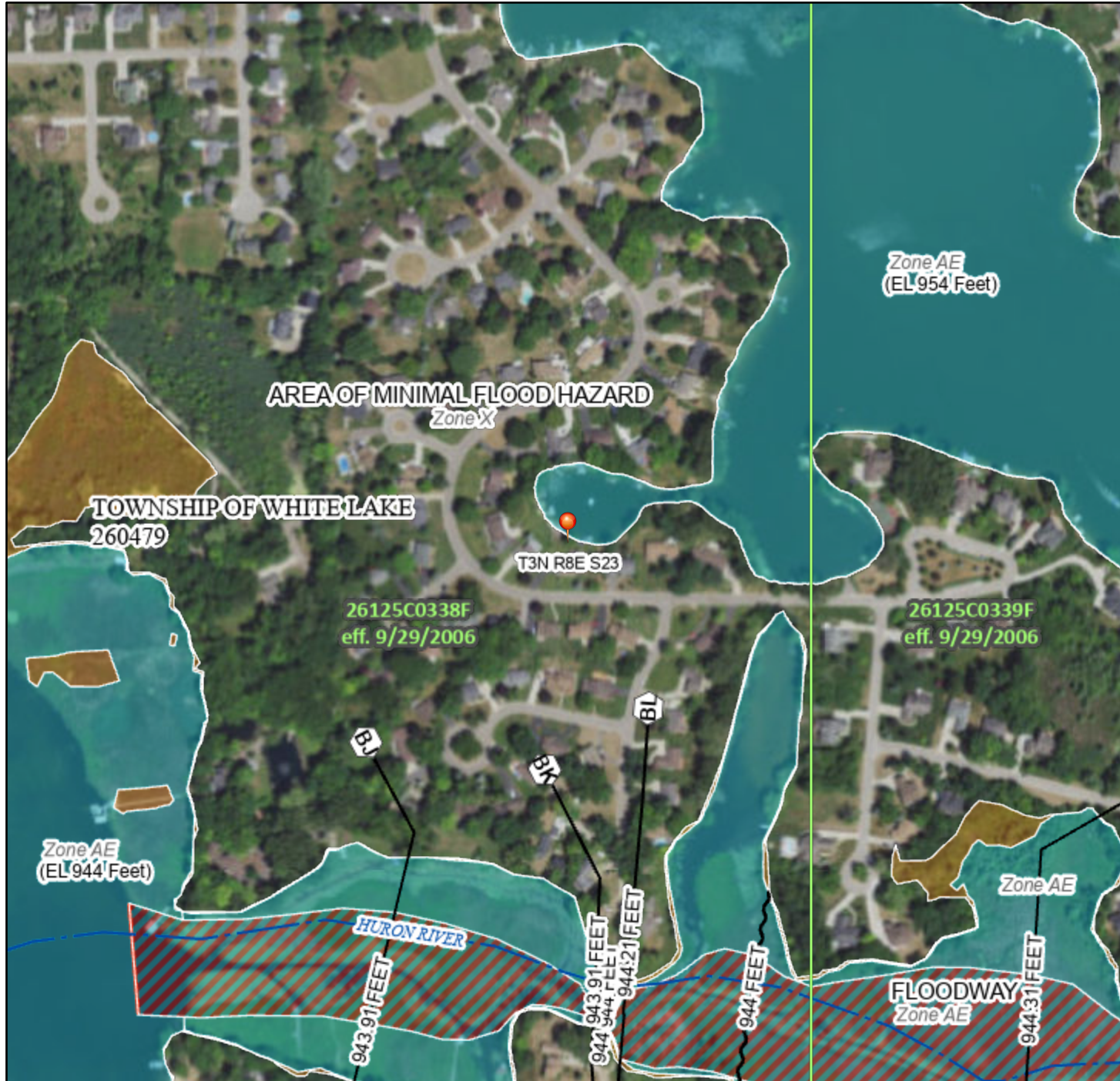
The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on **3/3/2022 at 10:53 AM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

# National Flood Hazard Layer FIRMMette



83°28'34"W 42°39'7"N



## Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

- |                                    |  |  |
|------------------------------------|--|--|
| <b>SPECIAL FLOOD HAZARD AREAS</b>  |  | Without Base Flood Elevation (BFE)<br><i>Zone A, V, A99</i>  |
|                                    |  | With BFE or Depth <i>Zone AE, AO, AH, VE, AR</i>   |
|                                    |  | Regulatory Floodway  |
| <b>OTHER AREAS OF FLOOD HAZARD</b> |  | 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile <i>Zone X</i> |
|                                    |  | Future Conditions 1% Annual Chance Flood Hazard <i>Zone X</i>  |
|                                    |  | Area with Reduced Flood Risk due to Levee. See Notes. <i>Zone X</i>  |
|                                    |  | Area with Flood Risk due to Levee <i>Zone D</i>  |
| <b>OTHER AREAS</b>                 |  | NO SCREEN Area of Minimal Flood Hazard <i>Zone X</i>   |
|                                    |  | Effective LOMRs  |
| <b>GENERAL STRUCTURES</b>          |  | Area of Undetermined Flood Hazard <i>Zone D</i>  |
|                                    |  | Channel, Culvert, or Storm Sewer   |
| <b>OTHER FEATURES</b>              |  | Levee, Dike, or Floodwall  |
|                                    |  | 20.2 Cross Sections with 1% Annual Chance Water Surface Elevation  |
| <b>MAP PANELS</b>                  |  | 17.5 Coastal Transect  |
|                                    |  | Base Flood Elevation Line (BFE)  |
|                                    |  | Limit of Study   |
|                                    |  | Jurisdiction Boundary  |
|                                    |  | Coastal Transect Baseline  |
|                                    |  | Profile Baseline   |
|                                    |  | Hydrographic Feature   |
|                                    |  | Digital Data Available   |
|                                    |  | No Digital Data Available  |
|                                    |  | Unmapped   |
- The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.



This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards.

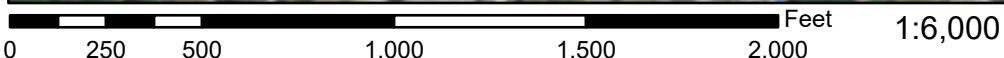
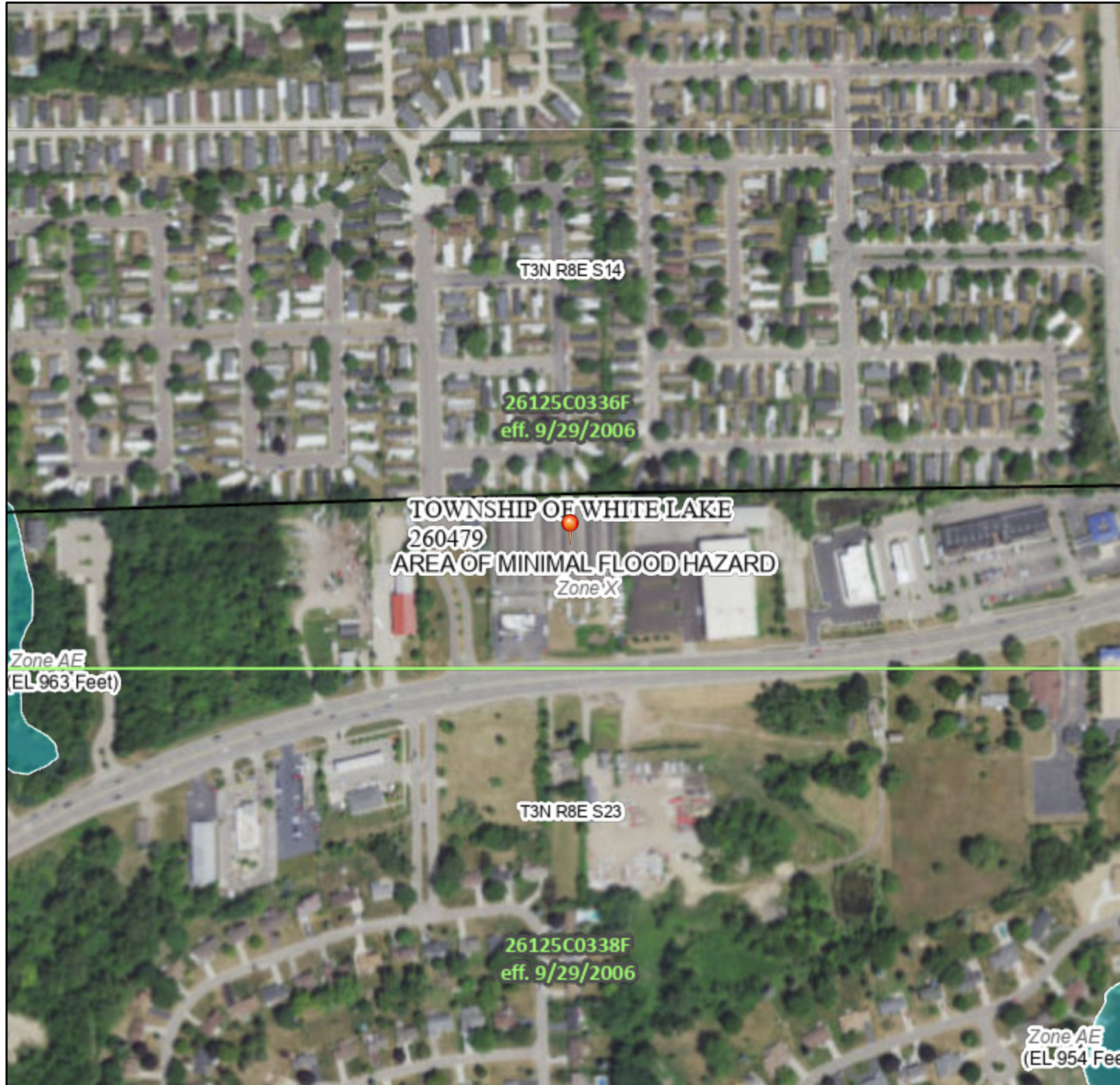
The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 3/3/2022 at 11:10 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

# National Flood Hazard Layer FIRMMette



83°28'45"W 42°39'39"N



Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

## Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) <i>Zone A, V, A99</i>
		With BFE or Depth <i>Zone AE, AO, AH, VE, AR</i>
		Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile <i>Zone X</i>
		Future Conditions 1% Annual Chance Flood Hazard <i>Zone X</i>
		Area with Reduced Flood Risk due to Levee. See Notes. <i>Zone X</i>
		Area with Flood Risk due to Levee <i>Zone D</i>
OTHER AREAS		NO SCREEN Area of Minimal Flood Hazard <i>Zone X</i>
		Effective LOMRs
GENERAL STRUCTURES		Area of Undetermined Flood Hazard <i>Zone D</i>
		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall
OTHER FEATURES		20.2 Cross Sections with 1% Annual Chance
		17.5 Water Surface Elevation
		Coastal Transect
		Base Flood Elevation Line (BFE)
		Limit of Study
MAP PANELS		Jurisdiction Boundary
		Coastal Transect Baseline
		Profile Baseline
		Hydrographic Feature
		Digital Data Available
		No Digital Data Available
		Unmapped



The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on **3/3/2022 at 11:13 AM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

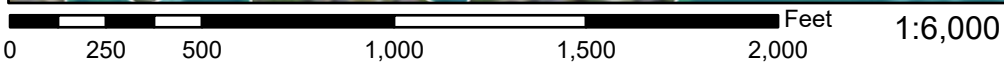
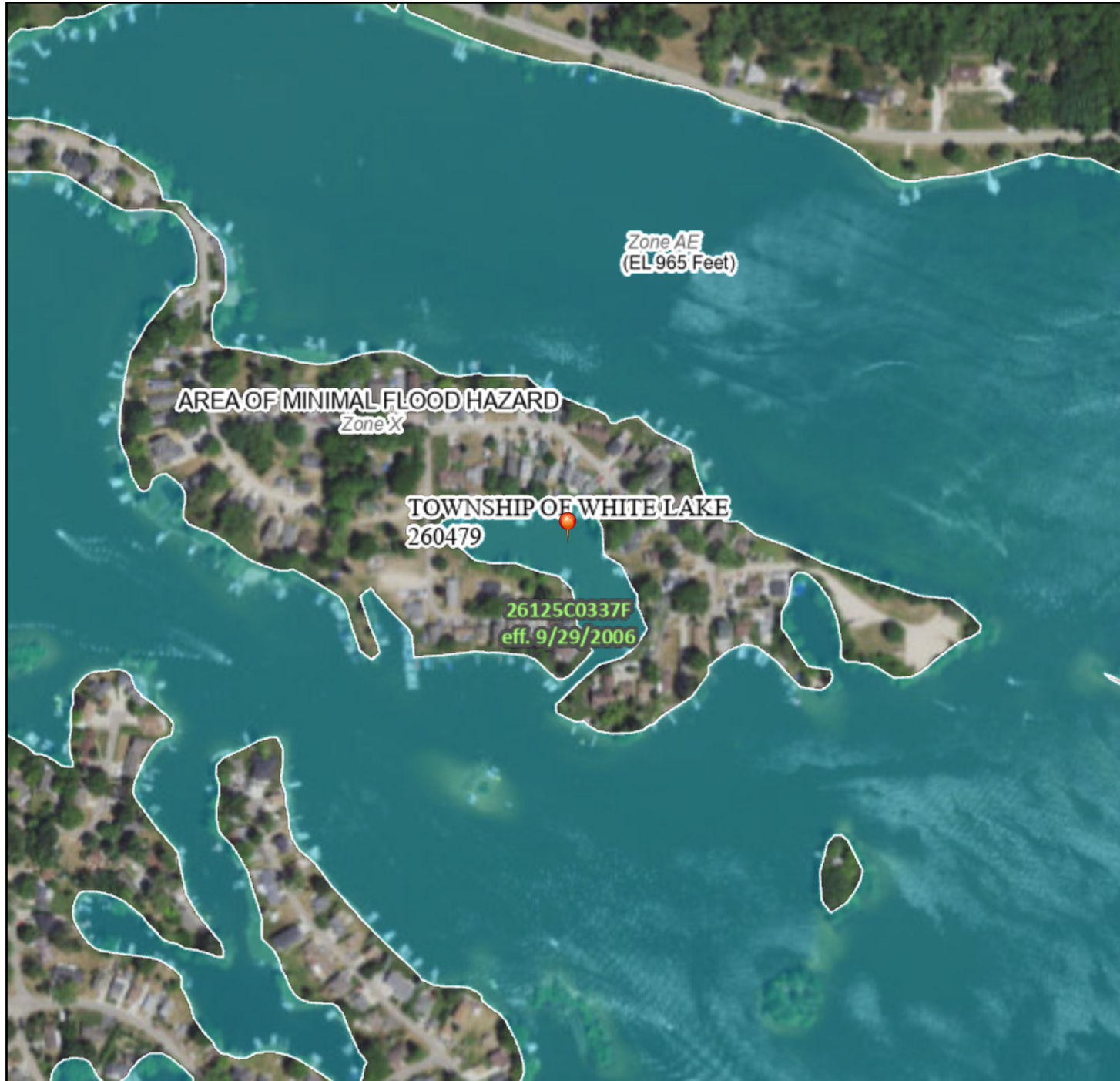
This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.



# National Flood Hazard Layer FIRMMette



83°28'2"W 42°40'30"N



83°27'24"W 42°40'4"N

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

## Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) <i>Zone A, V, A99</i>
		With BFE or Depth <i>Zone AE, AO, AH, VE, AR</i>
		Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile <i>Zone X</i>
		Future Conditions 1% Annual Chance Flood Hazard <i>Zone X</i>
		Area with Reduced Flood Risk due to Levee. See Notes. <i>Zone X</i>
		Area with Flood Risk due to Levee <i>Zone D</i>
OTHER AREAS		NO SCREEN Area of Minimal Flood Hazard <i>Zone X</i>
		Effective LOMRs
GENERAL STRUCTURES		Area of Undetermined Flood Hazard <i>Zone D</i>
		Channel, Culvert, or Storm Sewer
OTHER FEATURES		Levee, Dike, or Floodwall
		20.2 Cross Sections with 1% Annual Chance Water Surface Elevation
MAP PANELS		17.5
		8 Coastal Transect
		Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
		Coastal Transect Baseline
		Profile Baseline
		Hydrographic Feature
		Digital Data Available
		No Digital Data Available
		Unmapped
		The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.



This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on **3/3/2022 at 11:23 AM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

# National Flood Hazard Layer FIRMMette



83°27'41"W 42°40'26"N



Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

## Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

- |                                    |  |  |
|------------------------------------|--|--|
| <b>SPECIAL FLOOD HAZARD AREAS</b>  |  | Without Base Flood Elevation (BFE)<br><i>Zone A, V, A99</i>  |
|                                    |  | With BFE or Depth <i>Zone AE, AO, AH, VE, AR</i>   |
|                                    |  | Regulatory Floodway  |
| <b>OTHER AREAS OF FLOOD HAZARD</b> |  | 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile <i>Zone X</i> |
|                                    |  | Future Conditions 1% Annual Chance Flood Hazard <i>Zone X</i>  |
|                                    |  | Area with Reduced Flood Risk due to Levee. See Notes. <i>Zone X</i>  |
|                                    |  | Area with Flood Risk due to Levee <i>Zone D</i>  |
| <b>OTHER AREAS</b>                 |  | NO SCREEN Area of Minimal Flood Hazard <i>Zone X</i>   |
|                                    |  | Effective LOMRs  |
| <b>GENERAL STRUCTURES</b>          |  | Area of Undetermined Flood Hazard <i>Zone D</i>  |
|                                    |  | Channel, Culvert, or Storm Sewer   |
|                                    |  | Levee, Dike, or Floodwall  |
| <b>OTHER FEATURES</b>              |  | 20.2 Cross Sections with 1% Annual Chance Water Surface Elevation  |
|                                    |  | 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation  |
|                                    |  | Coastal Transect   |
|                                    |  | Base Flood Elevation Line (BFE)  |
|                                    |  | Limit of Study   |
|                                    |  | Jurisdiction Boundary  |
| <b>MAP PANELS</b>                  |  | Coastal Transect Baseline  |
|                                    |  | Profile Baseline   |
|                                    |  | Hydrographic Feature   |
|                                    |  | Digital Data Available   |
|                                    |  | No Digital Data Available  |
|                                    |  | Unmapped   |



The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on **3/3/2022 at 11:25 AM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

# National Flood Hazard Layer FIRMMette



83°28'16"W 42°40'14"N



## Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) <i>Zone A, V, A99</i>
		With BFE or Depth <i>Zone AE, AO, AH, VE, AR</i>
		Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile <i>Zone X</i>
		Future Conditions 1% Annual Chance Flood Hazard <i>Zone X</i>
		Area with Reduced Flood Risk due to Levee. See Notes. <i>Zone X</i>
		Area with Flood Risk due to Levee <i>Zone D</i>

OTHER AREAS		NO SCREEN Area of Minimal Flood Hazard <i>Zone X</i>
		Effective LOMRs
		Area of Undetermined Flood Hazard <i>Zone D</i>

GENERAL STRUCTURES		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall

OTHER FEATURES		20.2 Cross Sections with 1% Annual Chance Water Surface Elevation
		17.5 Coastal Transect
		Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
		Coastal Transect Baseline
OTHER FEATURES		Profile Baseline
		Hydrographic Feature

MAP PANELS		Digital Data Available
		No Digital Data Available
		Unmapped

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 3/3/2022 at 11:21 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.



INNOVATIVE IDEAS  
EXCEPTIONAL DESIGN  
UNMATCHED CLIENT SERVICE

White Lake Township  
FY2023 CWSRF Wastewater Asset Management Plan  
Improvements Project Plan

## APPENDIX VII

### PRESENT WORTH CALCULATIONS

DRAFT

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Present Worth Calculations - Alternative 2 assuming no replacement, and same salvage values as alternative 4  
 20 year term with a 1.875% interest rate

Capital Cost		\$ 4,663,531.58
	÷	1.01875 (Discount 1yr)
		\$ 4,577,699.71 ①
Salvage Value		\$ 1,605,763.94
	÷	1.01875 (Discount 1yr)
		\$ 1,576,210.00
	x	0.689679894 P/F 20yr @ 1.875%
		\$ 1,087,080.35 ②
Replacement Cost		\$ 572,184.42
	÷	1.01875 (Discount 1yr)
		\$ 561,653.42
	x	0.75680793 P/F 15yr @ 1.875%
		\$ 425,063.76 ③
O&M		\$ 40,000.00 (per year)
	x	16.55040568 P/A 20yr @ 1.875%
		\$ 662,016.23 ④

① Capital		\$ 4,577,699.71
② Salvage	-	\$ 1,087,080.35
		\$ 3,490,619.36
③ Replacement	+	\$ 425,063.76
		\$ 3,915,683.12
④ O&M	+	\$ 4,577,699.35
Present Worth =		\$ 4,577,699.35

Present Worth Calculations - Alternative 4 - assuming no replacement  
 20 year term with a 1.875% interest rate

Capital Cost		\$ 2,337,744.63	
	÷	1.01875 (Discount 1yr)	
		\$ 2,294,718.65	①
Salvage Value		\$ 1,044,429.38	
	÷	1.01875 (Discount 1yr)	
		\$ 1,025,206.75	
	x	0.689679894 P/F 20yr @ 1.875%	
		\$ 707,064.48	②
Replacement Cost		\$ -	
	÷	1.01875 (Discount 1yr)	
		\$ -	
	x	0.75680793 P/F 15yr @ 1.875%	
		\$ -	③
O&M		\$ 40,000.00 (per year)	
	x	16.55040568 P/A 20yr @ 1.875%	
		\$ 662,016.23	④
① Capital		\$ 2,294,718.65	
② Salvage	-	\$ 707,064.48	
		\$ 1,587,654.17	
③ Replacement	+	\$ -	
		\$ 1,587,654.17	
④ O&M	+	\$ 2,249,670.40	
Present Worth =		\$ 2,249,670.40	