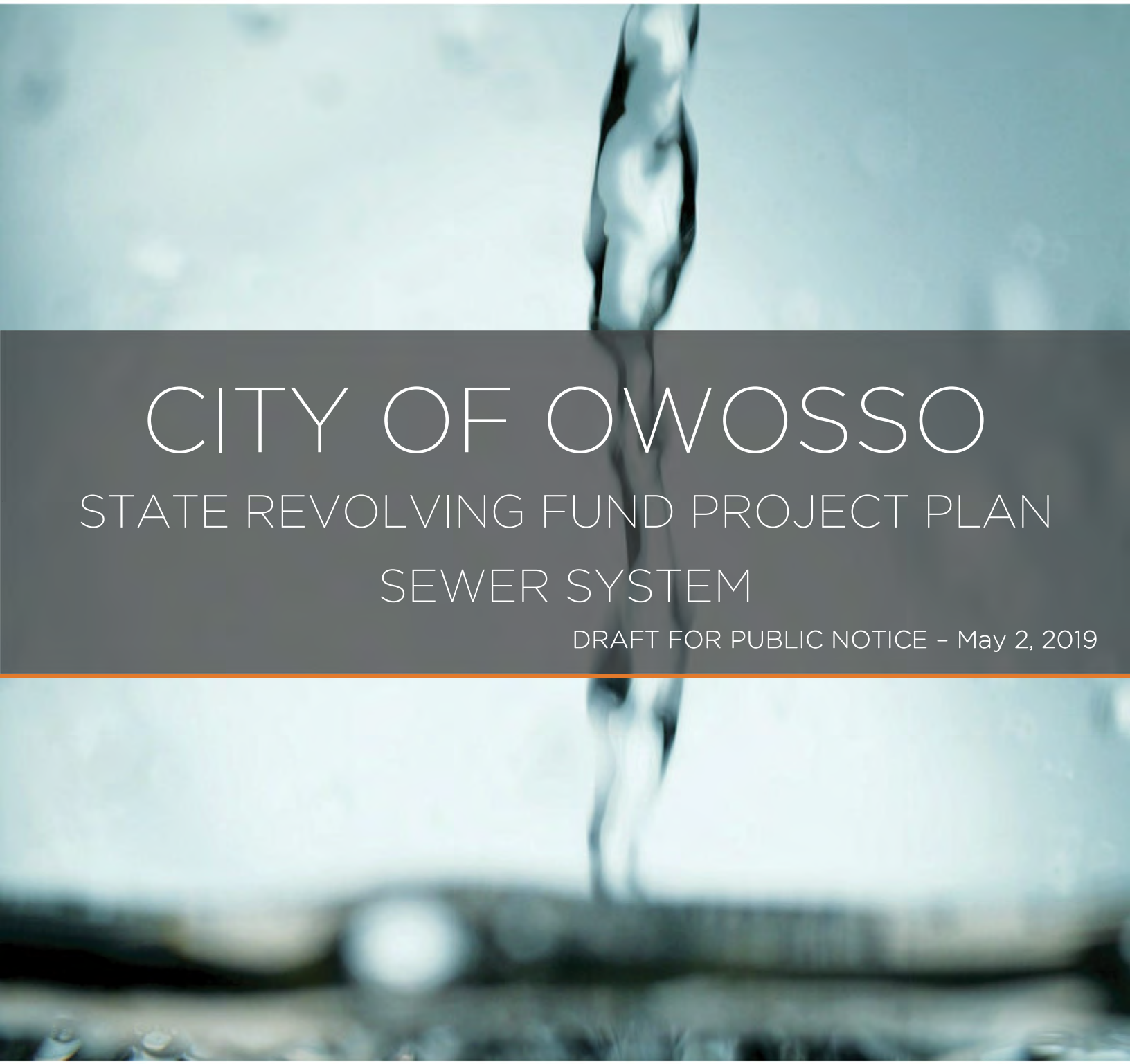

CITY OF OWOSSO

STATE REVOLVING FUND PROJECT PLAN

SEWER SYSTEM

DRAFT FOR PUBLIC NOTICE – May 2, 2019

OHM Advancing Communities®

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Introduction and Executive Summary

This 2019 State Resolving Fund (SRF) Project Plan provides a comprehensive strategy for planned improvements to the City of Owosso's sewer conveyance system. Implementing this Project Plan will help ensure continued reliable operation of the sewer conveyance system, and compliance with current and future regulatory requirements. In addition, this Project Plan is required for the necessary improvements to the sewage system to be eligible for potential low interest financing under the SRF Project Program administered by the Michigan Department of Environmental Quality (MDEQ).

The City of Owosso's primary sewer service area is contained within the city limits. This approximate area is bounded by North Street to the north, Krouse Road to the south, Chestnut Street to the west and Gould Street to the east. The city's wastewater flows to the Owosso Wastewater Treatment Plant (WWTP) located north of the City. The WWTP also processes wastewater flows from Owosso Township, Caledonia Township, and the City of Corunna.

Recognizing the importance of preserving the integrity of the sewer conveyance system, the City of Owosso initiated a comprehensive assessment of its wastewater infrastructure in 2017. The City completed an Asset Management Program (AMP) in October 2017 for their wastewater system using grant funding from the State of Michigan Stormwater Asset Management and Wastewater (SAW) Grant Program.

The City of Owosso is planning the following two projects, which were outlined in the 2017 AMP's capital improvement plan, to improve its sewer conveyance system as well as the 2006 and 2016 SSO Correction Plans:

> **Project 1 – Select Sewer Pipe and Manhole Rehabilitation**: As part of the SAW grant, approximately 620 manholes and 57 miles of pipe were inspected. Based on the reported defects, rehabilitation and restoration recommendations were generated. Sewer pipes and manholes that were identified to be in critical need of improvement will be rehabilitated and restored as part of this project
>
> **Project 2 – SSO Detention Tank:** Currently, the main sewer interceptor that runs through the city to the WWTP is too small to handle all the wastewater that enters the sewers during large rain events (10-year). Installation of this tank is an economic alternative to replacing the interceptor with a larger pipe or disconnecting residential footing drains. The tank will allow the system to store wastewater temporarily during large rain events to prevent the sewers from backing up into homes or discharging untreated sewage to the Shiawassee River.

The City of Owosso has prepared this SRF Project Plan with the intent to apply for a low interest rate loan associated with the construction work. The loan-closing period is proposed as fourth quarter of FY 2020. The estimated total project cost for the work is $4,917,000.

Project Background

Delineation of the Study Area

The City of Owosso (City) is the largest city within Shiawassee County. The Charter Township of Owosso and the Charter Township of Caledonia border the City. The City of Corunna is the nearest city to the City of Owosso; located roughly three miles to the southeast of the City.

The proposed service area are identified in Figure 5 – Project Areas Located in Appendix A – Maps. The proposed projects are located within Township 07 North, Range 02 East, Section 12, 13, 14, 23, 24 and Township 07 North Range 03 East Section 18, 19. All projects areas are within the city limits.

Environmental Setting

Cultural Resources

Of the five historic districts listed in the National Park Service's National Register of Historic Places, four of them are within areas of potential effects of the proposed projects. Potential impacts, due to the sanitary sewer pipe and manhole rehabilitations are expected to be minimal since construction is limited to existing facilities. Construction sites will be restored to their original condition following all construction activities.

The SHPO and Tribal Historical Preservation Officers within Shiawassee County were contacted for an opportunity to comment on the proposed project(s) prior to the completion of this report. Clearances will need to be obtained from these offices during the design process.

The Natural Environment

A. Air Quality

The primary focus of the proposed projects are improvements to the City's existing wastewater collection system. Impact to current and future air quality are not anticipated as a result of the rehabilitation of sanitary sewer pipes and manholes.

Measures will be taken to prevent long-term odor issues pertaining to the SSO detention tank including means for cleaning the tank after use.

B. Wetlands

Freshwater emergent, forested and shrub wetlands present in the proposed project areas are identified in Figure 6 – Natural Features in Appendix A - Maps. The construction work associated with the rehabilitation of sanitary sewer pipes and manholes will be contained within the limits of the existing infrastructure and no wetlands will be impacted. The proposed location of the new detention tank on the south side of Beehler Street is not located within the vicinity of any wetlands.

C. Coastal Zones

There are no shore lands, coastal zones or coastal management areas present within the proposed project areas.

D. Floodplains

There are nine sanitary sewers and one manhole identified for rehabilitation that are within the 100–Year Flood Zone. The floodplain pertaining to the project areas is identified in Figure 7 – Appendix A – Maps. Reliability of wastewater service to residents necessitates the rehabilitation be located in the floodplains as no practicable alternative exists.

A MDEQ/USACE "Joint Permit Application" (JPA) for this work will be obtained during design, as well as fulfilling the requirement for JPA Public Notice Period. It is the intent of the project that floodplain areas will be restored to "better than" current conditions and that no floodplains will be adversely impacted by the proposed project(s). The proposed work will conform to all state and local floodplain protection standards.

E. Natural or Wild and Scenic Rivers

There are no rivers designated for national protection located within the proposed project areas per the National Wild and Scenic Rivers System.

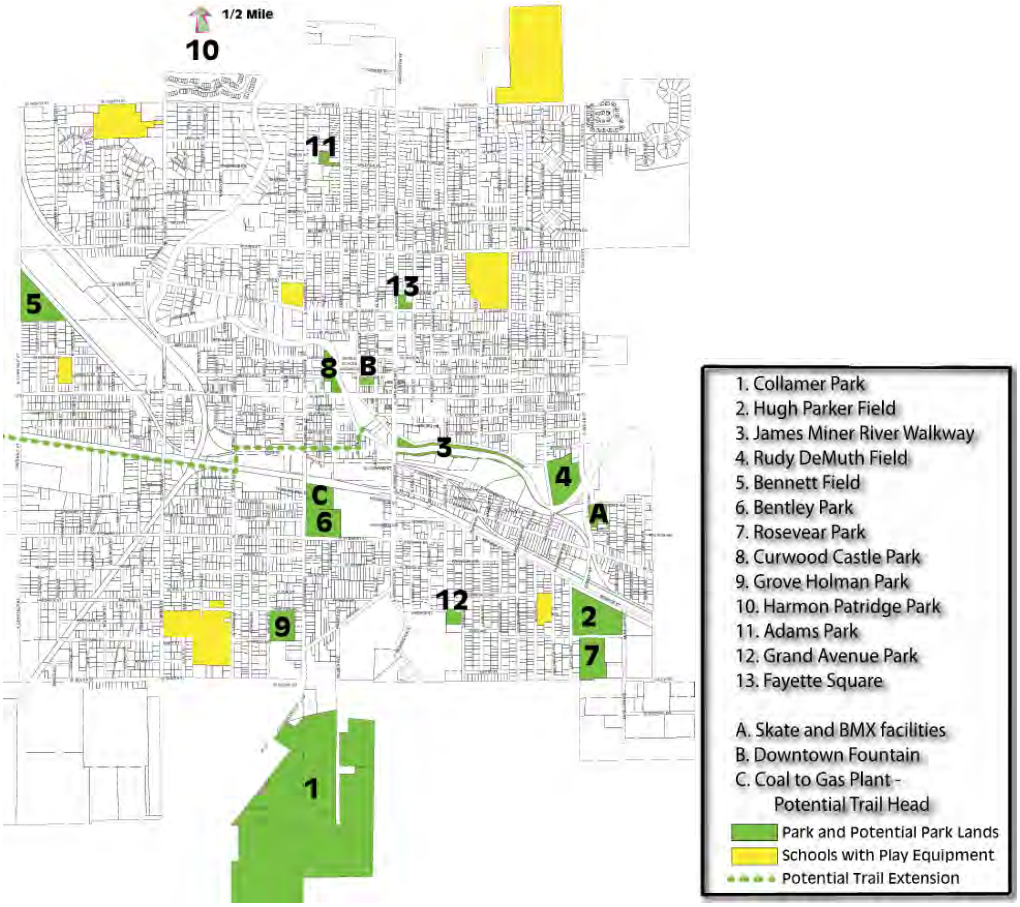
F. Major Surface Waters

The Shiawassee River runs through the center of the City and is shown in Figure 6 – Natural Features (see Appendix A – Maps) along with other nearby surface water bodies.

G. Recreational Facilities

Figure 1 below identifies the public parks located in the City of Owosso. No public parks are anticipated to be adversely affected because of these projects.

Figure 1 - City of Owosso Parks



Source: City of Owosso

H. Topography

The topography of the study area for the proposed projects is shown in Figure 5 – Project Areas (See Appendix A – Maps). While most of the City is generally flat, some areas, including the Shiawassee River corridor in northern part of the City, contain 12% slopes or greater. The construction work associated with the rehabilitation of the sanitary sewers and manholes will be within the existing infrastructure. The new detention tank will be located on the south side of Beehler Street, on a property formerly occupied by a manufacturing facility. This area is relatively flat and suitable for the tank construction. None of the improvements is within steeply sloped areas.

I. Geology

The bedrock geology of Owosso originates from the Saginaw Formation, which was formed during the Pennsylvanian period per the Western Michigan University - Michigan Geological Survey. The Saginaw Formation is mainly composed of sandstone, shale, coal and lime stone.

No major geological structures or formations will be affected due to the proposed projects.

J. Soils

The prevalent soil type in the City of Owosso is loam per the United States Department of Agriculture (USDA) – Natural Resources Conservation Service (NRCS) – Web Soil Survey.

A geotechnical investigation, including soil borings, will be performed to aid in the structural design of the new detention tank project.

K. Agricultural Resources

The focus of the proposed projects are improvements to the City of Owosso wastewater collection system in primarily residential and central business districts, conservation and open space districts (see Figure 2 – Zoning Map). No farmlands will be impacted because of the proposed projects.

L. Fauna and Flora

State and Federal listings per U.S. Fish and Wildlife Services (USFWS) and the Michigan Natural Features Inventory (MNFI) for threatened and endangered species have been reviewed. According to these sources, there are currently two threatened species (Northern Long-Eared Bat, Eastern Massasauga Rattlesnake) and one endangered species (Indiana Bat) listed for Shiawassee County.

- In regards to the Indiana Bat and the Northern Long Eared Bat, any tree removal or tree trimming required will be completed during the non-active season for both species. Specifically, tree removal will only occur between the months of October to March.
- In regards to the Eastern Massasauga Rattlesnake (EMR), wildlife-safe materials for erosion control and site restoration will be utilized over the course of the project.

The USFWS was sent a notice of opportunity to comment on the proposed projects and the findings are aforementioned. The MNFI was also contacted to request a Rare Species Review. Correspondence with these agencies will be documented in the final draft of the Project Plan.

Land Use in the Study Area

Greater than 62% of the City of Owosso consists of improved residential parcels, 11.6% are improved commercial parcels, 10.4% are improved industrial parcels, 6.7% are city used parcels (mainly parks), and about 5% are vacant parcels.

Figures 1 and 2 are the zoning district map and legend for the City as of November 2018. A complete description of each zoning type and the regulations for each district are provided in the City of Owosso's Zoning Ordinance, which is available on the City's website (http://www.ci.owosso.mi.us/).

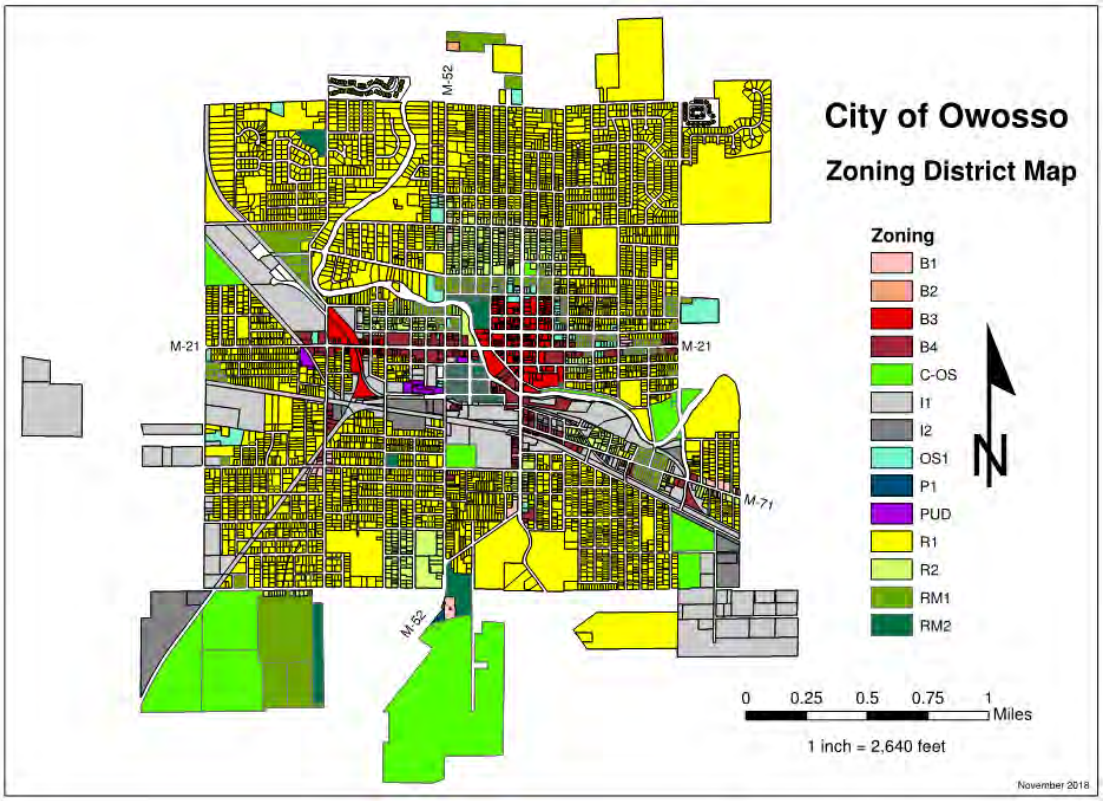


Figure 2. Existing Land Use – Zoning Map
Source: City of Owosso

B1	Local Business District
B2	Planned Shopping Center District
B3	Central Business District
B4	General Business District
C-OS	Conservation/Open Space District
I1	Light Industrial District
I2	General Industrial District
OS1	Office Service District
P1	Vehicular Parking District
PUD	Planned Unit Development District
R1	One-family Residential District
R2	Two-family Residential District
RM1	Multiple-family Residential Districts
RM2	Multiple-family Residential Districts – High Rise

Figure 3. Zoning Map - Legend

Population

The 2017 population of the City of Owosso was 14,539 per the United States Census Bureau (USCB). Since 2010, the population of the City has been steadily declining (4.1%). The USCB also provides population data for Shiawassee County, which shows that the population data for the County has also declined at a similar rate from 2010 to 2017 (3.1%). There is no seasonal variance in the population within the City of Owosso, as the population remains constant throughout the year. To be conservative, the future planning periods were completed based on the existing population (reference **Error! Reference source not found.**) with no population declines included.

Table 1. Population Data

	2017	2019	2030
Service Area Year-Round	14,539	14,539	14,539
Service Area Seasonal	N/A	N/A	N/A

The City of Owosso has 6,386 operational service connections, with 95% of those being single-family residential locations. Currently, the City of Owosso has approximately 7,964 Residential Equivalency Units (REUs). See Table 2. REU Calculation Based on Meter Size for REU calculations.

Table 2. REU Calculation Based on Meter Size

Size (in)	Number in Operation	Equivalent Factor*	REU
5/8	6,039	1.0	6039
3/4	53	1.5	79.5
1	112	2.5	280
1.5	91	5.0	455
2	55	8.0	440
3	28	15.0	420
4	6	25.0	150
6	2	50.0	100
Total	6,386		7,964

* Based on AWWA Manual M6, Water Meters--Selection, Installation, Testing and Maintenance

Economic Characteristics

The major employment sectors located within the City of Owosso are education and health care services i.e., professional services (20%), manufacturing sector (20%) and retail trade (14%) per the 2012 Master Plan. Over the past 30 years, manufacturing has experienced a significant decline. The largest driver of Owosso's economy by jobs is the education and health care sector given the presence of Baker College, Memorial Healthcare and the provision of standard K-12 educational services.

The median household income for the City of Owosso in 2009 was $34,000, which has doubled from 1980. From 2000 to 2009, median household income in Owosso has risen 6%. Percent changes in median household income from 2005 to 2009 estimates are similar across Owosso, Shiawassee County and the State of Michigan, i.e., single digit percent income increases.

Existing Facilities

The City of Owosso wastewater collection system consists of approximately 69 miles of gravity sewers ranging from 8-inch sewers to 30-inch interceptors, 1,380 manholes, 3 pumping stations, and 5,500 building sewer connections. The majority of piping is vitrified clay tile with the 30-inch main interceptor being concrete pipe and newer sewers being polyvinyl chloride (PVC) pipe. Over half of the wastewater collection system was constructed prior to the 1930s to serve the core of the City. Sewers were extended outward to the City limits between 1940 and 1980.

The capacity of the three pump stations is adequate for the needs of the system. All three stations have alarms that are connected to the City's *drinking* water SCADA system. The Gould Street pump station is located in the northeast side of the City south of Moore Street; the Palmer Street station is south of the City at the corner of Palmer Street and Hopkins Lake Drive; and the Wright Street station is near the corner of Allendale Avenue across from the City's water treatment plant. A map of the existing facilities is included in Appendix A: Maps.

The service area for the proposed projects are within the following quadrants: Township 07 North, Range 02 East, Section 12, 13, 14, 23, 24 and Township 07 North Range 03 East Section 18, 19.

The City of Owosso 2017 Wastewater Asset Management Program for their wastewater collection system is a comprehensive assessment of its wastewater infrastructure (sewers, manholes and pump stations). As part of this work, the condition of 45 percent of the 1,380 manhole structure network and 82 percent of the 69 miles of sanitary sewer pipe infrastructure was assessed. The condition of the infrastructure is based on the NASSCO condition grading system, which uses a scale of one to five (one indicates the infrastructure is in very good condition while five indicates infrastructure is in very poor condition or has already failed). Key observations from the assessment include:

- A large percentage of the City's manholes are in fair to poor structural condition with an average overall rating of 3.08 and an average age of 84 years;
- From the assessed infrastructure, 207 pipe segments and 18 manholes received a structural rating of five, which signals the need for extensive repair or replacement;
- The three (3) pump stations each have numerous failing assets based on condition and age that should be closely monitored.

The Capital Improvement Plan (CIP) is based on the assets identified in the AMP in need of major rehabilitation or replacement over a five (5) year planning period. The CIP is the basis for the proposed projects in this Project Plan.

The Owosso/Mid Shiawassee County wastewater treatment plant (WWTP) was constructed in 1980 as a physical-chemical plant but was expanded in 1981 to include biological treatment. The WWTP receives flow

from the City of Owosso, Owosso Township, Caledonia Township, and the City of Corunna. The WWTP uses primary clarifiers, trickling filters, and pressure filters to treat the wastewater from the four communities, which is discharged into the Shiawassee River.

Current flows to the WWTP from individual municipalities have been averaged over a 10-year period and are summarized in Table 3. WWTP Current Average and Peak Flows by Community. The average day flow is 4.0 MGD and the modeled 10-year peak flow is 19.1 MGD. The WWTP design average capacity is 6.0 MGD with a peak capacity of 18.0 MGD. Based on the flows currently observed at the WWTP, the peak flow is exceeding the design peak capacity of the plant. Additional information can be found in the results of antecedent moisture model in Appendix L - Regional System Flow Evaluation 2019.

Table 3. WWTP Current Average and Peak Flows by Community

	Average Day (GPM)	10-Year Modeled Peak Flow (GPM)
City of Owosso	1,925	8,755
Owosso Township	265	585
City of Corunna	360	1,650
Caledonia Township	235	2,255
WWTP Total	2,785 (4.0 MGD)	13,245 (19.1 MGD)

The typical characteristics of flows entering the WWTP for the last five (5) years are 118 milligrams per liter (mg/L) carbonaceous BOD, 19 mg/L ammonia, 3.5 mg/L phosphorous and 149 mg/L total suspended solids.. These values are lower than traditional residential sewage and could be an indicator that excessive inflow and infiltration is entering the sewer system.

Residual sludge from the plant is thickened and transported offsite to Waste Management Venice Park Landfill at in Lennon Michigan. A Residuals Management Program is not required as the sludge is not land applied.

Within the collection system, there is one Significant Industrial User that is classified as a Categorical Industrial User subject to categorical pretreatment standards under 40 CFR 403.6 and 40 CFR chapter I, subchapter N. The total estimated industrial discharge contribution to the WWTP is 100,000 gallons per day. Three industrial users operate private industrial pretreatment facilities.

The City has experienced forty-four (35) sanitary sewer overflows over the last ten (10) years. A summary of the events over the last 17 years is detailed in City of Owosso Sanitary Sewer Overflow Event Summary table located in Appendix I including the location of all system bypasses, with their known frequency, duration, and cause. There are no combined sewers present within the City wastewater collection system.

The City has three (3) sanitary sewage pump stations within their collection system: Wright, Palmer and Gould Road Pump Stations. The design capacity for each of the pump stations is between 100 to 150 gallons per minute and is sufficient to meet the needs of the areas they serve. Additional information

Fiscal Sustainability Plan

The 2017 Wastewater Collection System Asset Management Plan (AMP) documents the following information pertaining to the City's sewer conveyance system:

- An evaluation of the condition and performance of inventoried assets (sanitary sewer pipe, manholes, pumping stations)
- An inventory of the City's critical assets
- An annual operation and maintenance program that Township staff can perform to preserve the functionality of the system

A separate AMP including similar information was developed for the Owosso/Mid Shiawassee County wastewater treatment plant.

Need for the Project

Compliance Status

The City of Owosso has had National Pollutant Discharge Elimination System (NPDES) violations in the past. The NPDES violations from the WWTP permit (No. MI0023752) are included in Appendix K – Owosso WWTP Permit Violations, while Appendix J contains a list of sanitary sewer overflows (SSOs). Violations at the WWTP have mainly been for total suspended solids (TSS) NPDES exceedances. The collection system's response to wet weather is the principal contributor to these violations, as well as the SSOs.

Orders

The City is currently under an administrative consent order, ACO-SW05-015 (see Appendix I) in response to reoccurring SSOs experienced between 1991 and 2004. The construction of the proposed SSO Detention Tank described within this project plan is one of the mitigation option described in the ACO section III. Compliance Program.

Water Quality Problems

The City continues to experience sanitary sewer overflows (SSOs) along the main sanitary interceptor that transports flow to the Wastewater Treatment Plant (WWTP). In 2006, OHM Advisors investigated potential solutions for the City to meet MDEQ regulatory requirements. The modeled 10-year peak flow rate from the City collection system has decreased since the 2006 report, but still exceeds to the 30-inch sanitary sewer interceptor capacity. The historic and current 10-year flow rates are summarized in Table 4. The reductions in peak flow are likely the result of the City's source removal efforts over the last 10 years. Modeling performed in 2016 predicts the need to remove at least 4.0 cfs to eliminate the 10-year frequency SSOs. Alternatively, the City could store a minimum of 0.5 million gallons during a storm event to eliminate the 10-yr SSOs; however 1.0 million gallons is recommended. Additional information can be found in the 2016 Antecedent Moisture Model Technical Memo in Appendix I

Table 4. 2016 Antecedent Moisture Model Results Summary

	10-Year Peak Flow Rate (cfs)	10-Year Peak Flow Rate (GPM)
City of Owosso at WWTP, 2006 Report	23.1	10,400
City of Owosso at WWTP, 2004-2006	21.0	9,500
City of Owosso at WWTP, 2013-2015	19.5	8,800
30" Interceptor Capacity (n=0.017)	15.5	7,800
AV-4 upstream of 30" Interceptor, 2015	12.7	5,700

There are no additional point or nonpoint sources (NPS) of pollution from on-site systems, storm water runoff, municipalities, industries or agriculture impacting water quality that are being addressed by the proposed projects.

Projected Needs for the Next 20 Years

The Capital Improvement Plan component of the 2017 Collection System Wastewater Asset Management Plan (AMP) identifies and prioritizes critical assets within the City wastewater collection system over a five (5) year planning period. The AMP also identifies an annual operation and maintenance strategy to maintain the functionality of the wastewater collection system. An additional AMP was compiled for the WWTP; however, it is not addressed in this SRF project plan since there are no proposed projects at the WWTP considered within this plan.

Future Environment without the Proposed Project

If the proposed rehabilitation of sanitary sewer pipe and manholes are not undertaken, the aged components, which are deficient or substandard, will compromise the integrity of the wastewater collection system. This will increase the likelihood of direct discharge of sanitary sewage to the Shiawassee River, into the basements of Owosso residents, onto the streets of the city of Owosso, or into the subsurface around the sanitary system. The reliability of the wastewater service to residents and customers will continue to decrease as the structural issues in the sanitary sewers lead to more serious issues.

The proposed detention tank located on the south side of Beehler Street will address sanitary sewer overflows (SSO) events that occur in response to heavy rainfall events because of infiltration and rainfall. Without the proposed SSO Detention Tank, the SSOs that have repeatedly occurred at the locations listed below will continue to occur.

Locations of reoccurring SSOs into the Shiawassee River in the City of Owosso

- Northwest side of the M-52 bridge over Shiawassee River;
- 100 feet east of Union Street on the south bank of river or at the manhole north of Beehler Street near Chipman Street;
- Northeast side of the Washington Street Bridge over the Shiawassee River at the manhole on Jerome Street.

Analysis of Alternatives

The analysis of alternatives section has been separated by project type for ease of discussion.

Project 1 - Structural Issues in Wastewater Collection System

No Action

If no action is taken to rehabilitate the aged sanitary sewer pipe and manholes, which are structurally deficient, the integrity of the wastewater collection system in those areas will be compromised. This will increase the likelihood of direct discharge of sanitary sewage, as well as decrease reliability of wastewater service to residents and customers. No action is not a principal alternative.

Optimum Performance of Existing Facilities

Since the sanitary sewers have deteriorated to the point in the service area that the structural integrity of the pipe is compromised, optimizing the existing facilities is not a realistic option. Replacement or rehabilitation of these structurally deficient sewers is required. The City already conducts an annual maintenance program to maintain the functionality of the existing wastewater collection system. Optimum performance of existing facilities is not a principal alternative.

Water and Energy Efficiency

The focus of the proposed projects are improvements to preserve the structural integrity of certain components within the existing wastewater collection system. Therefore, no improvements to water or energy efficiency are associated with this component of the project.

Regional Alternative

A regional alternative will not address the deficiencies of the existing wastewater collection system owned by the City; current concerns pertaining to defective structures and local system reliability cannot be solved by a regional approach. A regional alternative is not a principal alternative.

Rehabilitation and/or Replacement of Sanitary Sewer Pipe and Manholes

The rehabilitation recommendations for sanitary sewers and manholes summarized in the 2017 Wastewater Asset Management Plan report are based on field inspections followed by an analysis of reasonable alternatives for each asset.

For sanitary sewer pipe, each of the following alternatives listed below were considered for a pipe segment before the optimal rehabilitation method was recommended.

A. Full Length Lining
B. Sectional Lining
C. Grouting
D. Combination of Spot Lining, Full Lining, and Other Rehabilitation Methods as Necessary
E. Sewer Replacement

Each of these alternatives as they pertain to the proposed projects are further detailed below.

A. Full Length Lining

This alternative involves lining the entire length of the sanitary sewers and manholes identified as having significant structural defects. Lining is typically used to address structural defects within pipes and manholes. However, in some cases, a pipe or manhole may only have a structural deficiency on a small section of the pipe or manhole, and not necessarily along the entire length of the facility. In this case, lining would only be necessary on this small section. In most cases, lining the entire length of a sewer or manhole would be more expensive than just lining the section(s) that have structural issues. For this reason, this alternative is not a principal alternative.

B. Sectional Lining

This alternative is similar to the full-length lining as it is used to correct sewers and manholes with significant structural defects. In sectional lining, only the areas with defects would be lined. However, there could be numerous structural defects along the entire length of a sewer or manhole. In these instances, it would be better to line the entire length of the sewer as opposed to spot lining multiple sections. For this reason, this alternative is not a principal alternative.

C. Grouting

This alternative involves grouting the sanitary sewers and manholes identified as having significant structural defects. Grouting is typically used to address sources of inflow and infiltration into a sewer main or manhole, but is not effective in resolving structural defects. For this reason, this alternative is not a principal alternative.

D. Combination of Spot Lining, Full Lining, and Other Rehabilitation Methods as Necessary

This alternative involves using a variety of rehabilitation methods to rehabilitate the existing sanitary sewers and manholes identified as having significant structural defects. Various rehabilitation methods include sectional lining, full lining sewers, as well as point repair and component replacement in manholes. This alternative allows for the consideration of the needs for each main and manhole on a case-by-case basis to optimize the selection of the rehabilitation method. This alternative is cost-effective in that it ensures that each main and manhole receives the rehabilitation it needs, and nothing in excess. It is important to note that while rehabilitation will prolong the lives of the existing mains and manholes, deterioration will still occur, especially in cases where only portions of the facilities are rehabilitated. This alternative is a principal alternative.

E. Sewer Replacement

This alternative involves removing and replacing the existing sanitary sewers and manholes identified as having significant structural defects. In considering only the sanitary sewer mains and manholes with significant structural defects, a case may be made to replace these facilities completely instead of rehabilitating them. New mains and manholes would be expected to last longer than rehabilitation of

the existing mains and manholes. While rehabilitation will prolong the lives of the existing mains and manholes, deterioration will still occur. This alternative would also save time by eliminating the need to optimize rehabilitation for each sanitary sewer main and manhole. This alternative is a principal alternative.

Project 2 - Sanitary Sewer Overflows

No Action

The City has experienced 44 sanitary sewer overflow events from 2001 through 2018 of which approximately 33 were in the city and attributable to the surcharging of the interceptor that runs between the Beehler/Chipman intersection and the WWTP. No action will result in reoccurring sanitary sewer overflow events to the Shiawassee River within the city. No action is not a principle alternative.

Optimum Performance of Existing Facilities

1. Public I/I Removal

The City has already completed a 2008 SRF project to repair manholes that were identified as sources of I/I. This has reduced the 10-year peak City flow rate (Meter M-0) at the Wastewater Treatment Plant (WWTP) measured at the plant, but has not reduced the flow to the 30-inch sanitary sewer interceptor capacity. The historic and current 10-year flow rates are summarized in Table *4*. 2016 Antecedent Moisture Model Results Summary. The reductions in peak flow are likely the result of the City's source removal efforts over the last 10 years. Additional structural repairs to manholes and sewers are proposed under as part of the SRF Project plan, which may have an effect on I/I. This is not a principal alternative.

2. Private I/I Removal

The City of Owosso has approximately 1,000 homes with potential footing drain connections and the City suspects there are as many as 200 illegal sump pump connections to the sanitary system. Removing these sources of I/I could help solve the SSO issues. This is a principal alternative.

Water and Energy Efficiency

The focus of this project component is to address SSO events that occur during wet weather. Water or energy efficiency is not a consideration for analyzing alternatives.

Regional Alternatives

Connecting to a regional disposal system will not serve the immediate needs of the existing facility, which include address SSO events during wet weather.

Construction of a SSO Detention Tank

The remaining alternatives detail the construction of a detention tank, diversion chamber and pumping station in three separate configurations. Each of the three layout alternatives were evaluated in the OHM

2018 Alternatives Evaluation – One Million Gallon SSO Detention Tank (See Appendix D). The result of the evaluation is listed as Tank Layout Alternative T1A and is a principal alternative.

1. Construct Detention Tank on Industrial Site and Construct Diversion Chamber and Pumping Station on Residential Lot

Alternative T1A involves constructing an above ground detention tank on the industrial site south of Beehler Street and the diversion chamber and pumping station on a single residential lot north of Beehler Street. This layout offers a direct connection from the Riverside Pumping Station to the detention tank on the industrial property. Acquisition of the residential property is currently in negotiation. Alternative T1B is a below ground tank constructed in the same configuration as alternative T1A.

2. Construct Detention Tank on Industrial Site and Construct Diversion Chamber and Pumping Station on Triangular Parcel owned by City

Alternative T2 involves constructing the detention tank on the industrial site south of Beehler Street and the diversion chamber and pumping station on a triangular parcel at the intersection of Beehler Street and North Chipman Street of which the City owns. Pipes connecting the pumping station and diversion chamber to the detention tank would be installed by a directional drilling method. A proposed sewer connecting the pumping station to the existing 27-inch interceptor would be build parallel to an existing 12-inch sewer beside the river. Acquisition of three additional easements across the backlines of three residential properties would be required.

3. Construction Detention Tank, Diversion Chamber and Pumping Station on Residential Lots Only

Alternative T3 involves constructing the detention tank, diversion chamber and pumping station on residential lots north of Beehler Street next to the river. Technical and cost considerations associated with contaminated soils at the industrial site would not be required for this alternative; however, acquisition of three (3) residential properties would be required by the City.

Principle Alternatives

Project 1 -Structural Issues in Wastewater Collection System

The two principal alternatives to address the significant structural issues in various sanitary sewer mains and manholes throughout the City include rehabilitating the sanitary sewer mains and manholes according to their specific structural defects and removing and replacing all of the sanitary mains and manholes identified as having significant structural defects.

Monetary Evaluation

A present worth analysis was performed considering both rehabilitating the sanitary sewer mains and manholes with significant structural defects throughout the City, and also removing and replacing these mains and manholes. The present worth analysis located in Appendix B – Cost Analysis indicates that rehabilitating the existing sanitary sewer mains and manholes according to their specific structural defects has the lowest Total Present Worth.

Table 5. Cost Opinion for Sewer and Manhole Rehabilitation

	Alternative 1 Rehabilitation	Alternative 2 Replacement
Construction Cost Opinion	$1,593,000	$3,364,500
Total Present Worth	$1,148,800	$1,466,870

Environmental Evaluation

Construction impacts due to this alternative include dust, noise and traffic disruption. City, County, and State regulations associated with these impacts will be addressed during design as well as in the construction contracts associated with the work.

Implementability and Public Participation

User fees associated with the rehabilitation of sanitary sewer pipe and manholes include capital costs. These may be of concern to the public. The proposed projects and user costs will be reviewed with residents during the public hearing on June 3 in the Council Chambers at the Owosso City Hall. The costs were also published in the Owosso Press and Guide on Thursday, May 2, 2019.

Adoption of this alternative would maintain compliance with applicable wastewater standards as well as increase reliability of wastewater service to residents and customers.

Technical and Other Considerations

Structural Integrity

All the manholes and sewer sections proposed for rehabilitation or replacement in this project plan have been televised and have NASSCO structural ratings of either Significant (Grade 4) or Most Significant (Grade 5). These are documented and detailed in Appendix E. Sewer and Manhole Rehabilitation Summary.

Project Locations with Potential Contamination

There are six sanitary sewer pipe and one manhole rehabilitation projects located in close proximity to contaminated sites according to the state's list of contaminated sites (https://secure1.state.mi.us/facilitiesinventoryqueries).

- Sewer (SGM-1402-018): West Main Street (from Chestnut Street to Lafayette Boulevard)
- Sewer (SGM-1302-015): West Exchange Street (from North Water Street to North Ball Street)
- Sewer (SGM-1304-085): Shiawassee Street (from Elizabeth Street to West King Street)
- Sewer (SGM-2401-056): East Comstock Street (west of North Park Street)
- Sewer (SGM-2401-059): East Comstock Street (east of North Park Street)
- Sewer (SGM-2401-062): Jerome Avenue and Saginaw Street
- Manhole (SNM-2403-068): Shiawassee Street and Milwaukee Street

Two (2) sanitary sewer pipe projects (SGM-1402-018 and SGM-2041-059) involve pipe replacement. Construction procedures to install the pipe will address the risks and mitigations of disturbing and handling contaminated soils during the subsequent design phase of the project. The remaining projects are not pipe replacement locations and therefore no contaminated soils will be disturbed during the rehabilitation activities.

Project 2 - Sanitary Sewer Overflows in City

The two principal alternatives considered to address future SSO events during wet weather include removal of private I/I and construction of an above-ground SSO Detention Tank (Alternative T1A).

Monetary Evaluation

The City of Owosso has roughly 1,000 homes with potential footing drain connections. It is assumed that each footing drain can contribute up to 0.009 cfs (4 gpm) of flow during wet weather conditions. The estimated opinion of probable cost for the removal of a footing drain is $12,000 for construction, plus contingencies. In addition, the City of Owosso feels that they may have as many as 200 sump pumps illegally tied into the sanitary sewer system. The City has an existing ordinance preventing such connections. As part of the system upgrade, the City can inspect and remove these connections at little or no cost. The benefit of removing these connections would be similar to that of the footing drains. It is estimated that there is potential to remove 1.78 cfs (800 gpm) by eliminating 200 sump pump

connections. In order to remove the 4.0 cfs required to eliminate the 10-year SSOs, the cost would be approximately $7,500,000.

The modeled 10-year frequency SSO volumes for the existing conditions within the system, compared to the actual observed SSO volumes, were used to determine the detention tank size. The City of Owosso has experienced ten SSO events since the last analysis (2008-2014), averaging an estimated overflow of 389,000 gallons per event, with half of the events meeting or exceeding 500,000 gallons. The modeling predicts a minimum 10-year overflow volume with the existing Manning's *n* of 0.017 of 302,000 gallons. Based on both the observed SSO's, model results, and operational safety factors, a minimum storage volume of 1,000,000 gallons is recommended. Additional details can be found in the SSO Correction Plan Antecedent Moisture Model Technical Memorandum dated October 13, 2016 included in Appendix I.

The present worth analysis located in Appendix B – Cost Analysis indicates that building the SSO Detention tank has the lowest construction cost as well as the lowest Total Present Worth.

Table 6. Cost Opinion for SSO Mitigation Alternatives

	Alternative 1: SSO Detention Tank (1.0 MG)	Alternative 2: Footing Drain Disconnections (4.0 cfs removal)
Construction Cost Opinion	$3,526,300	$7,450,000
Total Present Worth	$1,833,390	$3,159,090

Environmental Evaluation

Construction impacts of this alternative include dust, noise and traffic disruption. City, County, and State regulations associated with these impacts will be addressed during design as well as in the construction contracts associated with the work. The general location of the proposed detention tank is in an urban area and therefore no natural features are anticipated to be adversely impacted as a result.

Implementability and Public Participation

User fees associated with the detention tank, diversion chamber and pumping station include capital costs. These may be of concern to the public. The proposed projects and user costs will be reviewed with residents during the public hearing on June 3 in the Council Chambers at the Owosso City Hall. The costs were also published in the Owosso Press and Guide on Thursday May 2, 2019.

Adoption of this alternative would maintain compliance with applicable wastewater standards as well as increase reliability of wastewater service to residents and customers.

Technical and Other Considerations

Technical considerations for the proposed SSO Detention Tank are discussed in the alternatives analysis in Appendix D of this project plan. Analysis of I/I in the City collection system is discussed at length in Appendix I ACO in the 2006 SSO Correction Plan and the 2016 update to the SSO Correction Plan.

The recommendation for manhole rehabilitation from the 2006 SSO Correction Plan was completed in a 2008 SRF Project; however, the construction of the SSO Detention Tank was deferred to this year.

The proposed location for the detention tank was formerly occupied by a manufacturing facility and is documented as a site of environmental contamination (Part 201 Environmental Remediation Program). Phase 1 and Phase 2 Environmental Assessments have been performed at the site and are summarized in a Baseline Environmental Assessment (BEA) on file with the MDEQ. The constituents include heavy metals, benzene and other organic pollutants. Construction procedures to install the detention tank and associated facilities will address the risks and mitigations of disturbing and handling contaminated soils during the subsequent design phase of the project. An environmental mitigation line item is included in the budget for use during design and construction. This allowance will cover costs associated with creating a Due Care Plan, obtaining permits and approvals, excavation, testing, removal, handling, transportation, and disposal of any contaminated materials that may be removed from the site.

Selected Alternative

Rehabilitation of Sanitary Sewer Pipe and Manholes

A list of all sanitary sewer pipe and manholes to be rehabilitated, along with details of the existing material, size, and condition is found in Appendix E – Sanitary Sewer and Manhole Rehabilitation Summary.

Based on the principal alternatives analysis and cost analysis, the selected alternative for addressing the sanitary sewer mains and manholes with significant structural defects is to rehabilitate each main and manhole according to their specific structural defects. Rehabilitating these mains and manholes will prolong the useful lives of these facilities while ensuring system reliability. Additionally, it will be more cost-effective to rehabilitate these facilities to the extent needed as opposed to replacing all of the facilities.

Applicable MDEQ procedures, 10 States Standards for Wastewater Facilities, MDEQ/USACE JPE permit requirements, SHPO clearances, County road regulations, as well as additional local ordinances will be followed design and construction.

Sanitary Sewer Overflow (SSO) Detention Tank

The technical memorandum located in Appendix D – Detention Tank further details the relevant design considerations as part of this alternatives analysis, including material selection and selection of an above or below ground detention tank.

Based on the principal alternatives analysis and cost analysis, the selected alternative for addressing the sanitary sewer overflows (SSO) is Alternative 1, which is to construct the above ground detention tank south of Beehler Street and place associated equipment north of Beehler Street on the residential lot. This alternative offers the most direct connection from the riverside pumping station to the detention tank on the industrial property. Acquisition of the vacant residential property is currently underway. A schematic of this alternative is included in Appendix D.

Applicable MDEQ procedures, 10 States Standards for Wastewater Facilities, as well as local ordinances will be followed during design and construction.

Project Maps

The following figures are included in Appendix A – Maps:

- Existing Facilities (Figure 4) – the extent of the existing wastewater collection system as it pertains to the proposed projects
- Project Areas (Figure 5) – the proposed project areas i.e., sanitary sewer pipe and manhole rehabilitations and detention tank
- Natural Features (Figure 6) – existing water bodies and wetlands present in the City
- Floodplains (Figure 7) – the 100-Year and 500-Year Shiawassee River flood zones

- Sites of Contamination (Figure 8) – known sites of leaking underground storage tanks (open and closed) and sites of environmental contamination
- Sanitary Sewer Pipe and Manhole Rehabilitations (Figure 9 through Figure 12) – four (4) section maps detailing the locations of water main replacements

Sensitive Features

No environmentally sensitive features, including wetlands, floodplains, prime or unique agricultural lands, archaeological sites or threatened or endangered species habitats will be altered as a result of the proposed projects. Note that some of the sewer rehab segments are located in the floodplain; however, the elevations and streets in these areas will be restored to pre-project conditions.

The focus of the proposed projects are improvements to the City of Owosso wastewater collection system. Construction activities will pertain primarily to existing facilities, with the exception of the location of the new detention tank on Beehler Street. No environmentally sensitive features are present within the location of the detention tank.

Schedule for Design and Construction

SRF Loan Year 2020 – 4th Quarter Closing

Engineering Design - SSO Detention Tank and Sewer Rehab	10/17/19 - 5/17/2020
Draft Documents Submittal to MDEQ	3/27/2020
Rate Methodology Approved	4/24/2020
Environmental Assessments Published No Later Than	4/24/2020
Part I and Part II Application	5/15/2020
Final Documents Submittal to MDEQ	5/15/2020
Finding of No Significant Impacts Clearance; Plans & Specs Approved	5/26/2020
Bid Ad Published No Later Than	5/26/2020
Part III of Application; Bid Data Submittal (With Tentative Contract Award)	7/6/2020
DEQ Order of Approval Issued	8/97/2020
Borrower's Pre-Closing with the MFA	8/20/2020
MFA CLOSING	8/28/2020
Notice to Proceed Issued	10/27/2020
SSO Detention Tank Submittals started	10/27/2020
2020 Sewer Lining and MH Repair	10/27/20 – 10/1/2021
SSO Detention Tank – Substantial Completion	11/1/2021

Cost Summary

Detailed cost estimates for each project component are included in Appendix B – Cost Analysis.

Table 7. Total Loan Cost Summary

Description	SRF Loan Amount
MH/Sewer Rehab	$ 1,391,100
SSO Detention Tank	$ 3,526,300
Total Loan Amount	**$ 4,917,400**

Authority to Implement the Selected Alternative

The selected alternatives will be implemented by the City of Owosso. All work is under the jurisdiction of the City and requires no inter-municipal agreements. All work will be performed in road rights-of-way, utility easements, or on property owned by the City of Owosso.

User Costs

Assuming a 20-year loan at 2.25%, the quarterly rate increase for the average resident is listed below.

Description	SRF Loan Amount	Quarterly Resident Payment
MH/Sewer Rehab	$ 1,391,100	$2.74
Detention Tank	$ 3,526,300	$6.93
Total Quarterly Increase		**$9.67**

Disadvantaged Community

A completed Disadvantaged Community Status Determination Worksheet is included in Appendix H – Disadvantaged Community Documentation.

Useful Life

Sanitary Sewer Pipe and Manholes

The remaining useful life of the sanitary sewer pipe and manholes is expected to prolong the structural integrity of each component for at 30 to 50 years following the proposed rehabilitations.

Detention Tank

The new detention tank has an expected useful life of 30-50 years with proper construction, operation and maintenance.

Evaluation of Environmental Impacts

The following agencies were given a notice of opportunity to comment on the proposed projects:

- Michigan Department of Environmental Quality - Water Resources Division
- Michigan Natural Features Inventory
- Southeast Michigan Council of Government
- The twelve (12) corresponding Tribal Historic Preservation Officers pertaining to the City of Owosso
- United States Fish and Wildlife Services

Documentation of correspondence with the agencies listed above are located in Appendix C – Agency Correspondence. All responses received from review agencies will be included in the final draft of the Project Plan.

Analysis of the Impacts

Direct Impacts

A. Construction and Operational Impacts

Traffic will be disrupted along the roads where the sanitary sewer pipe and manhole projects are proposed. Similar traffic disruption will occur on the site of the new detention tank, diversion chamber and pumping station. This impact will primarily affect the residents in the project area.

B. Social Impacts

Impacts on materials, land, and energy will be minimized by selection of qualified contractors. The existing road materials will be recycled during the sanitary sewer and manhole rehabilitations when possible. The asphalt surface once removed is crushed and sized, and then added to new paving mixes or used as an aggregate base. Sustainable recycling of existing materials not only helps the environment, but can also provide cost savings for the community.

All construction activities for the sanitary sewer pipe and manhole rehabilitations will take place within the limits of existing facilities. Construction of the new detention tank requires that the City acquire a vacant residential property north of Beehler Street.

Once the sanitary sewer pipe and manhole projects located in the roadway are completed, the surface will be paved completely.

Rehabilitation of the City's wastewater mains will have a positive, direct impact on the value of residential and commercial properties due to increased reliability of wastewater service.

Indirect Impacts

- Development – There are no anticipated impacts to the rate, density, or type of development due to of this project.

- Land Use – A property formerly occupied by a manufacturing facility will be used as the location for the new pump station south of Beehler Street. All other projects will take place within the limits of existing facilities.
- Air and Water Quality - There are no expected changes in air quality due to this project. Impacts related to air quality (i.e., dust, debris, airborne particles) are limited to direct impacts during construction. Reliability of wastewater service to residents and customers will improve due to this project.
- Natural Areas - Anticipated changes to the natural setting or ecosystem will be limited to the direct impacts as a result of any necessary tree clearing.
- Aesthetic Changes - Impacts on cultural, human, social, and economic sources are expected to be minimal and short-term during the construction phase as a result of the traffic routing around the construction areas. If aesthetics are important pertaining to the detention tank, measures taken to minimize aesthetic impacts on residents will be taken based on the preference of the City.

Cumulative impacts

No cumulative impacts, for example population growth, are anticipated due to the improvement projects.

Mitigation

Short-Term Construction-Related Mitigation

Environmental disruption will occur during construction. Guidelines will be established for cover vegetation removal, dust reduction, traffic control, and accident prevention. Access to some roads may be temporarily restricted to provide a safe working environment. Soil erosion and sedimentation control measures will be required during the sanitary sewer pipe and manhole rehabilitations to ensure nearby sewers or storm drains are not impacted by the construction process. A water truck may be used if dust becomes an issue on dry, windy days. Any vegetation or road way disrupted by the construction process will be rehabilitated to its original condition.

Mitigation of Long-Term Impacts

Construction of the sanitary sewer pipe and manhole rehabilitations will not occur in any sensitive environments. There is no long-term impact anticipated for the existing wetlands.

Appropriate cover will be provided SSO Detention Tank on Beehler Street to address any odor and aesthetic issues that may affect neighboring residents.

Mitigation of Indirect Impacts

The proposed project is intended to improve the wastewater service reliability and functionality of the existing system and is not intended to induce growth within the City of Owosso.

Public Participation

The Formal Public Hearing

The formal public hearing will be held Monday June 3, 2019 from 7:30 P.M. to 9:30 P.M. in the City Hall Council Chambers, 301 West Main Street, Owosso, Michigan 48867.

Public Hearing Advertisement

The public hearing advertisement ran in the Owosso Press and Guide on Thursday, May 2, 2019. A copy of the advertisement and an affidavit confirming its publication is included in Appendix F – Public Hearing.

Public Hearing Transcript

Following the public hearing, a transcript will be appended to the final draft of the Project Plan.

Comments Received and Answered

The names and addresses of the people who attended the public hearing, written comments, applicants' responses, and a description of any changes made to the project as a result of the public participation process will be appended to the final draft of the Project Plan.

Adoption of the Project Plan

If the Project Plan is adopted, the resolution will be included in the final draft of the Project Plan.

The intent of this Project Plan is to improve immediate deficiencies in wastewater system reliability. These improvements include rehabilitating aged sanitary sewer pipes and manholes (Project 1) and reducing SSOs (Project 2).

The sanitary sewer pipes and manholes that are proposed to be rehabilitated and the replacement of the pump station will have an immediate benefit on the existing customers. Over time, defective sanitary sewer pipes or manholes can potentially result in direct discharge of sanitary sewage. The construction of a new detention tank will reduce the likelihood of sanitary sewer overflows (SSOs).

Adverse impacts to the environment will be limited to the construction phase of the proposed projects. Such short-term impacts could include temporary noise, dust, traffic, and wastewater service disruptions. There may be temporary air quality impacts due to dust and emissions from heavy equipment during the construction phase. Any dust, debris, or airborne particles will be contained to the extent required by City, County, State, and Federal guidelines. Appropriate erosion control measures will be utilized to prevent disrupted soil from entering storm sewers and streams.

The short-term impacts of this project will be due to the construction associated with the proposed project. The long-term positive impact of this project will be improving the reliability of the City's sewage disposal system.

Appendix A. Maps

Owosso SRF Existing Facilities Figure 4

Wastewater Treatment Plant Outfall

Gould Street Pump Station

Wright Street Lift Station

Palmer Street Lift Station

- WTP Wastewater Plant
- Outfall
- Pump Station
- Lift Station
- Sanitary Manhole
- Sanitary Sewer
- City Boundary

N

0 1,600 3,200

Feet

1" = 1,600'

Source: Data provided by City of Owosso and ESRI. OHM Advisors does not warrant the accuracy of the data and/or the map. This document is intended to depict the approximate spatial location of the mapped features within the Community and all use is strictly at the user's own risk.

Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 IntlFeet

Map Published: April 8, 2019

Owosso SRF Project Areas Figure 5

- Sanitary Manhole
- Sanitary Sewer
- SSO Detention Basin
- City Boundary

N

0 1,250 2,500

Feet

1" = 1,250'

Source: Data provided by City of Owosso and ESRI. OHM Advisors does not warrant the accuracy of the data and/or the map. This document is intended to depict the approximate spatial location of the mapped features within the Community and all use is strictly at the user's own risk.

Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 IntlFeet

Map Published: April 10, 2019

Owosso SRF Natural Features Figure 6

Kiwanis Village Dr
Chippewa Trl
N Chipman St
Chipman Ln
Mason Rd
W North St
Sandra St
Willow St
Marion St
Hanover St
Riverside Dr
West of Campbell Dr
Campbell Dr
Ada St
Shiawassee St
Cherry Ln
Velma Ave
Owosso High School
Malla Cir
Jackson Dr
Center St
Alturas Dr
Meadow Dr
Buckley Dr
Irene St
Harding Ave
Olmstead St
Stinson St
West St
Memorial Healthcare
Adams St
N Water St
Jennett St
Elizabeth St
W King St
N Hickory St
N Saginaw St
N Park St
Stratford Dr
Dingwall Dr
Summit St
Rube
Moore Ave
North St and Krust Dr
Krust Dr
Whitehaven Ct
Huntington Dr
Brandon St
Abbott St
Wiltshire Dr
E King St
N Gould St
Queen St
Goodhue St
N Dewey St
E Oliver St
Gilbert St
Randolph St
Dimmick St
Laverock Aly
E Mason St
E Exchange St
E Williams St
W Williams St
N Oak St
Hazelton Rd
Venice Ave
N Hintz Rd
E M-21
Cleveland Ave
N Delaney Rd
W King St
Bennett Field Park
N Chipman St
7th St
5th St
3rd Ave
1st St
Clark St
Lee St
Oliver St
W Oliver St
Union Ave
Curwood Dr
Pine St
N Adams St
N Water St
N Shiawassee St
Marion St
Cleveland St
Keifer St
Donald St
Lafayette Blvd
Hoyt St
Chestnut St
Beech St
N Lansing St
N Cedar St
Bradley St
River St
N Elm St
S Curwood Castle Dr
W Exchange St
W Main St
W M-21
W Main St
Youngs St
Young St
Lynn St
Robbins St
State St
S Howell St
Clinton St
South of Lynn St
Mack St
Great Lakes Central
Great Lakes Central Ry
Martin St
Martin St
769 ft
Dowling Dr
Huron and Eastern Ry
S Delaney Rd
Chestnut St
Ash St
Ash St
W Stewart St
S Cedar St
Fletcher St
Ryan St
Bentley Park
W Stewart St
S Shiawassee St
Ament St
Bock Dr
Bock Dr
Sequoia Trl
Henry St
Tracy St
Nafus St
Nafus St
Isham St
Hammont St
Kenwood Dr
George St
S Chipman St
Lyon St
Clyde St
S Pearce St
Grace St
Michigan Ave
W Ridge St
S Ball St
S Washington St
S Park St
Saginaw St
Division St
Grand Ave
Franklin St
Woodlawn Ave
Maple St
Corunna Ave
E Stewart St
E Monroe St
Frederick St
Nelson St
Nelson St
Freeman St
Herman St
Mary St
Hampton St
Grove Holman Park
Prindle St
Auburndale Ave
Harrison St
S Saginaw St
Alger Ave
Algerdale
Glenwood Ave
Lincoln Ave
Farr Ave
McMillan Ave
McMillan Rd
Etta St
Carr St
Hiram St
W South St
Mansfield St
St Paul
Gute St
College Ln
Baker College Owosso
Oak Hill Cemetery
Grand Ave
Lingle Ave
Broadway Ave
Woodlawn Ave
Keyte St
E South St
Jerome Ave and Saginaw St
Jerome Ave
E Howard St
Cass St
Michigan Ave
S Washington St
S Hickory St
S Oak St
E Comstock St
Grover St
S Dewey St
Comstock
Oakwood Ave
S Cedar St
Bullard St
Allendale Ave
Abbey Ave
Beck Ave
Griffin Ave
Melinda St
Byerly St
Rowley St
Johnson St
Linwood St
Aiken St
Kilbourn Ave
Union St
May St
Owosso Ave
Corunna Ave
Middle
Wright
Frazer
Lake Central
Owosso

Project Areas

- Sanitary Sewer
- Sanitary Manhole
- SSO Detention Basin

Natural Features

- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake or River
- City Boundary

N

0 1,250 2,500

Feet

1" = 1,250'

Source: Data provided by City of Owosso, U.S. Fish and Wildlife Service, State of Michigan, and ESRI. OHM Advisors does not warrant the accuracy of the data and/or the map. This document is intended to depict the approximate spatial location of the mapped features within the Community and all use is strictly at the user's own risk.

Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 IntlFeet

Map Published: April 10, 2019

Owosso SRF Floodplain Areas Figure 7

Project Areas

- Sanitary Sewer
- Sanitary Manhole
- City Boundary
- SSO Detention Basin

Floodplain Areas

- Floodway
- 100 Year Flood Zone
- 500 Year Flood Zone

N

0 1,250 2,500

Feet

1" = 1,250'

Source: Data provided by City of Owosso, FEMA, and ESRI. OHM Advisors does not warrant the accuracy of the data and/or the map. This document is intended to depict the approximate spatial location of the mapped features within the Community and all use is strictly at the user's own risk.

Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 IntlFeet

Map Published: April 10, 2019

Owosso SRF Contamination Sites Figure 8

Project Areas

- Sanitary Sewer
- Sanitary Manhole
- SSO Detention Basin

Contamination Sites

- Leaking Underground Storge Tank - Part 213 Closed
- Leaking Underground Storage Tanks - Part 213 Open
- Sites of Environmental Contamination - Part 201
- City Boundary

N

0 1,250 2,500

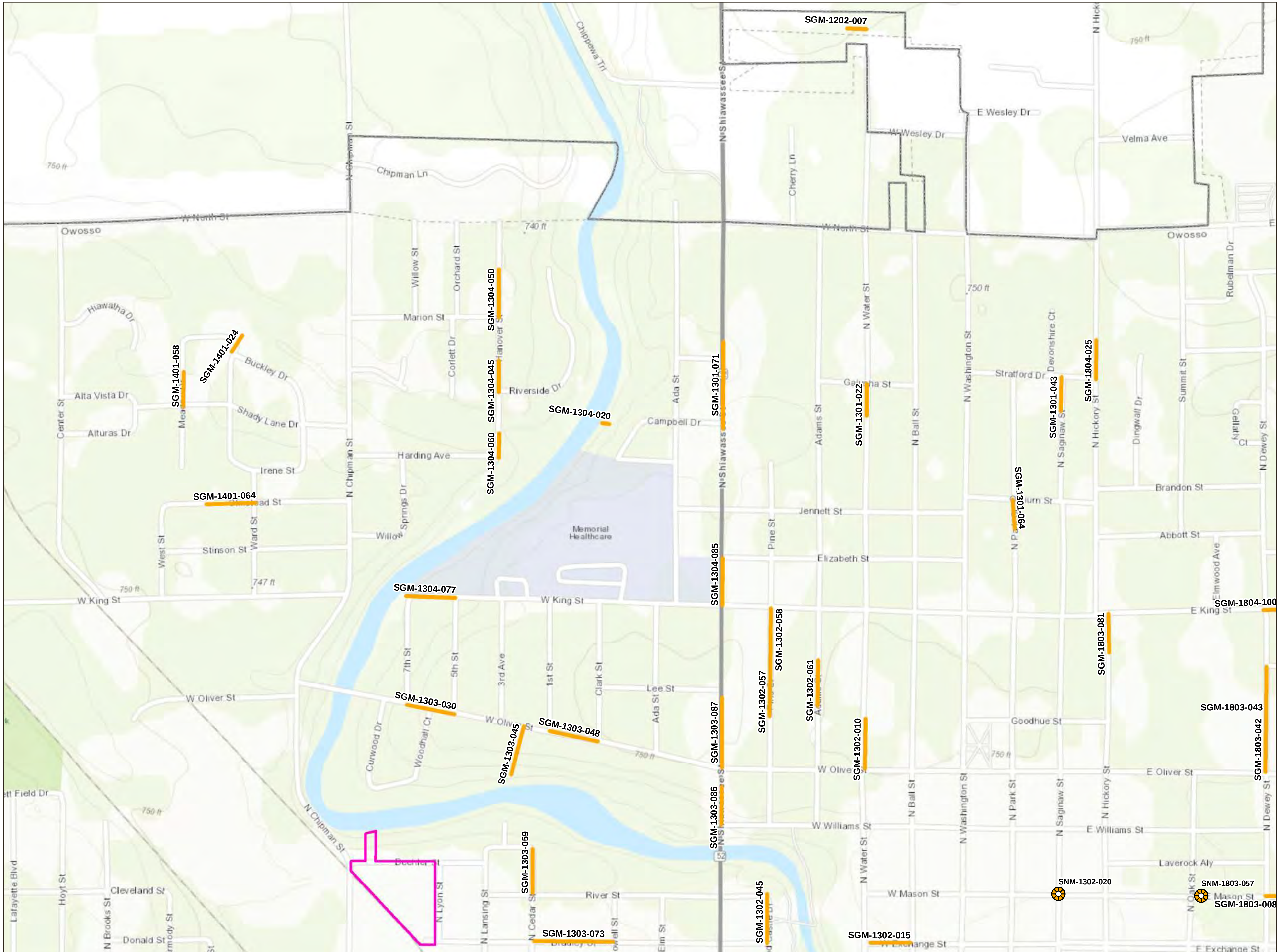
Feet

1" = 1,250'

Source: Data provided by City of Owosso, EPA, and ESRI. OHM Advisors does not warrant the accuracy of the data and/or the map. This document is intended to depict the approximate spatial location of the mapped features within the Community and all use is strictly at the user's own risk.

Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 IntlFeet

Map Published: April 10, 2019



Owosso SRF Project Areas T7N R2E Section 13 Figure 9

- Sanitary Manhole
- Sanitary Sewer
- SSO Detention Basin
- City Boundary

N

0 650 1,300
Feet

1" = 650'

Source: Data provided by City of Owosso and ESRI. OHM Advisors does not warrant the accuracy of the data and/or the map. This document is intended to depict the approximate spatial location of the mapped features within the Community and all use is strictly at the user's own risk.

Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 IntlFeet

Map Published: April 10, 2019

Owosso SRF Project Areas T7N R2E Section 24 Figure 10

SGM-1402-018
SGM-2301-044
SGM-2301-042
SGM-2301-043
SGM-2301-018
SGM-2404-078
SGM-2401-059
SGM-2401-056
SGM-2401-062
SNM-2404-004
SGM-2404-005
SNM-2301-021
SGM-2301-022
SNM-2301-019
SNM-2404-021
SNM-2301-058
SNM-2301-008
SGM-2301-024
SGM-2402-026
SNM-2302-013
SNM-2403-068
SGM-2403-048
SGM-2402-024
SNM-2403-008
SGM-2302-053
SGM-2302-031
SGM-2402-047
SGM-2402-015
SGM-2302-041
SGM-2403-054
SGM-2403-026

Owosso
W Main St
Young St
Lynn St
Great Lakes Central
Mack St
Clinton St
Genesee St
Cass St
Milwaukee St
Fletcher St
Ryan St
W Stewart St
E Stewart St
Bentley Park
Universal Dr
Ament St
W Ridge St
E Ridge St
Grace St
Prindle St
Hampton St
Freeman St
Herman St
Mary St
Hiram St
W South St
Mansfield St
Roslyn Dr
Frederick St
Henry St
Gute St
College Ln
Baker College Owosso
Grove Holman Park
St Paul Cemetery
Oak Hill Cemetery
Bentley Park
Lilian St
Robbins St
State St
S Lansing St
S Elm St
S Ball St
S Water St
S Washington St
S Hickory St
Himbus Dr
Morris St
S Chipman St
S Cedar St
S Shiawassee St
Michigan Ave
Green St
Martin St
Coventry Ave
Wilkinson St
Hammond St
Isham St
Tracy St
Kenwood Dr
George St
S Walnut St
S Clinton St
S Park St
S Saginaw St
Division St
Palmer Ave
Baker Dr
Harper St
Francis St
S Chestnut St
Carr St
Nelson St
750 ft
790 ft
783 ft

Sanitary Manhole
Sanitary Sewer
City Boundary

N

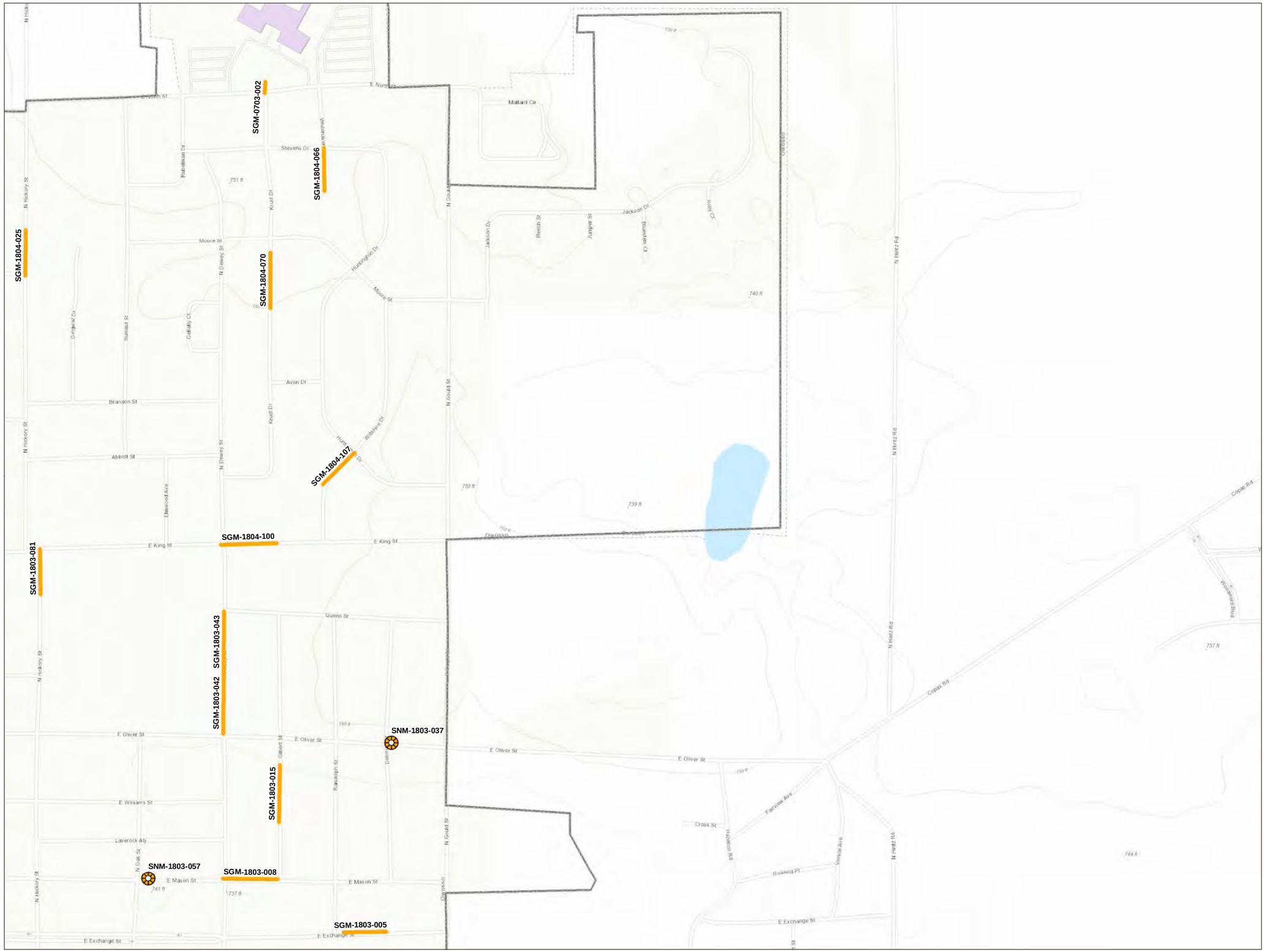
0 600 1,200
Feet

1" = 600'

Source: Data provided by City of Owosso and ESRI. OHM Advisors does not warrant the accuracy of the data and/or the map. This document is intended to depict the approximate spatial location of the mapped features within the Community and all use is strictly at the user's own risk.

Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 IntlFeet

Map Published: April 10, 2019



Owosso SRF Project Areas T7N R3E Section 18 Figure 11

- Sanitary Sewer
- Sanitary Manhole
- City Boundary

N

0 550 1,100

Feet

1" = 550'

Source: Data provided by City of Owosso and ESRI. OHM Advisors does not warrant the accuracy of the data and/or the map. This document is intended to depict the approximate spatial location of the mapped features within the Community and all use is strictly at the user's own risk.

Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 IntlFeet

Map Published: April 10, 2019

Owosso SRF Project Areas T7N R3E Section 19 Figure 12

Sanitary Sewer

City Boundary

N

0 550 1,100

Feet

1" = 550'

Source: Data provided by City of Owosso and ESRI. OHM Advisors does not warrant the accuracy of the data and/or the map. This document is intended to depict the approximate spatial location of the mapped features within the Community and all use is strictly at the user's own risk.

Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 IntlFeet

Map Published: April 10, 2019

OHM

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Appendix B. Cost Analysis

Section 1. Opinion of Probable Project Cost

OPINION OF PROBABLE PROJECT COST

301 W Main St, Owosso, Miichigan 48867
City of Owosso SRF Project Plan
Owosso, Michigan
Description: SSO Detention Basin Design and Construction, Sewer and Manhole Rehabilitation

DESCRIPTION	Length/ Unit	ALL COSTS
COLLECTION		
SNM-2404-004 Reset Frame, Full Manhole Liner	MH	$ 4,200
SNM-2403-068 Replace Chimney	MH	$ 1,950
SNM-1302-020 Sewer Cleaning/Vactoring, Replace Chimney	MH	$ 2,450
SNM-2301-008 Sewer Cleaning/Vactoring, Replace Chimney	MH	$ 2,450
SNM-2403-008 Sewer Cleaning/Vactoring, Replace Chimney, Full Manhole Liner	MH	$ 5,450
SNM-2301-021 Sewer Cleaning/Vactoring, Replace Chimney, Full Manhole Liner	MH	$ 5,450
SNM-2301-019 Sewer Cleaning/Vactoring, Replace Chimney, Full Manhole Liner	MH	$ 5,450
SNM-2302-013 Sewer Cleaning/Vactoring, Replace Chimney	MH	$ 2,450
SNM-1803-057 Sewer Cleaning/Vactoring, Replace Chimney	MH	$ 2,450
SNM-2301-058 Sewer Cleaning/Vactoring, Replace Chimney, Full Manhole Liner	MH	$ 5,450
SNM-2404-021 Replace Chimney	MH	$ 1,950
SGM-0703-002 North & Krust: Full Liner	59.0	$ 2,360
SGM-1202-007 : Spot Liner(s), Cleaning	48.3	$ 2,968
SGM-1301-022 Water: Full Liner	145.3	$ 8,675
SGM-1301-043 Saginaw: Spot Liner(s), Cutting and Grouting	230.4	$ 6,935
SGM-1301-064 Park: Full Liner	171.3	$ 8,730
SGM-1301-071 Shiawassee: Full Liner	462.1	$ 23,953
SGM-1302-010 Water: Full Liner	123.7	$ 13,707
SGM-1302-015 Exchange: Full Liner	213.3	$ 8,532
SGM-1302-045 Curwood Castle: Spot Liner(s), Letter to Customer(s)	342.4	$ 2,510
SGM-1302-057 Pine: Full Liner, Letter to Customer(s)	303.8	$ 12,518
SGM-1302-058 Pine: Full Liner, Letter to Customer(s)	440.9	$ 17,646
SGM-1302-061 Adams: Full Liner, Cutting and Grouting, Letter to Customer(s)	305.5	$ 23,726
SGM-1303-030 Oliver: Remove and Replace	67.5	$ 30,050
SGM-1303-045 Union: Full Liner	141.6	$ 5,664
SGM-1303-048 Oliver: Cleaning, Spot Liner(s), Letter to Customer(s)	334.0	$ 10,194
SGM-1303-059 Cedar: Spot Liner(s), Cutting and Grouting	95.1	$ 8,357
SGM-1303-073 Bradley: Full Liner	437.2	$ 24,524
SGM-1303-086 Shiawassee: Relocate External Pipe (REPLACE 16'), Letter to Customer(s)	130.0	$ 4,325
SGM-1303-087 Shiawassee: Remove and Replace	42.4	$ 5,724
SGM-1304-020 West of Campbell: Full Liner	13.3	$ 7,529
SGM-1304-045 Hanover: Full Liner	224.1	$ 8,964
SGM-1304-050 Hanover: Spot Liner(s), Letter to Customer(s)	329.2	$ 2,510
SGM-1304-060 Hanover: Full Liner	161.4	$ 6,456
SGM-1304-077 King: Full Liner	350.9	$ 14,036
SGM-1304-085 Shiawassee: Full Liner	320.7	$ 12,828
SGM-1401-024 Buckley: Full Liner	91.9	$ 5,285
SGM-1401-058 Meadow: Remove and Replace, Letter to Customer(s)	348.3	$ 31,409
SGM-1401-064 Olmstead: Spot Liner(s), Lateral Cutting, Letter to Customer(s)	45.5	$ 3,005
SGM-1402-018 Main: Relocate External Pipe (REPLACE 16'), Spot Liner(s)	332.1	$ 6,820
SGM-1803-005 Exchange: Full Liner	491.1	$ 10,134
SGM-1803-008 Mason: Spot Liner(s), Cleaning	323.7	$ 6,133
SGM-1803-015 Gilbert: Full Liner	322.9	$ 13,530
SGM-1803-042 Dewey: Full Liner	345.0	$ 18,182
SGM-1803-043 Dewey: Full Liner, Letter to Customer(s)	488.8	$ 18,164
SGM-1803-081 Hickory: Full Liner	264.6	$ 10,584
SGM-1804-025 Hickory: Spot Liner(s), Letter to Customer(s)	180.1	$ 9,005

OPINION OF PROBABLE PROJECT COST

301 W Main St, Owosso, Miichigan 48867
City of Owosso SRF Project Plan
Owosso, Michigan
Description: SSO Detention Basin Design and Construction, Sewer and Manhole Rehabilitation

DESCRIPTION	Length/ Unit	ALL COSTS
COLLECTION		
SGM-1804-066 Whitehaven: Grouting, Spot Liner(s), Lateral Cutting, Letter to Customer(s)	422.6	$ 7,279
SGM-1804-070 Krust: Spot Liner(s), Cutting and Grouting, Letter to Customer(s)	262.7	$ 8,775
SGM-1804-100 King: Spot Liner(s)	325.9	$ 2,500
SGM-1804-107 Wiltshire: Full Liner, Letter to Customer(s)	66.0	$ 10,552
SGM-1902-030 McMillan: Full Liner	347.4	$ 14,122
SGM-1903-011 Corunna: Full Liner	283.3	$ 12,749
SGM-1903-039 Alger: Relocate External Pipe (REPLACE 16'), Spot Liner(s), Heavy Cleaning, Lateral Cutting, Letter to Customer(s),	88.0	$ 11,409
SGM-1903-063 Grand: Full Liner, Letter to Customer(s)	297.3	$ 11,897
SGM-1904-017 Grover: Relocate External Pipe (REPLACE 16') (even though sturctural, losing capacity)	209.1	$ 23,715
SGM-1904-028 Dewey: Spot Liner(s)	312.4	$ 5,000
SGM-1904-040 Woodlawn: Relocate External Pipe (REPLACE 16'), Spot Liner(s)	285.9	$ 7,320
SGM-1904-045 Maple: Full Liner, Letter to Customer(s)	691.7	$ 13,991
SGM-2301-022 Martin: Spot Liner(s), Cutting and Grouting, Lateral Cutting, Letter to Customer(s)	324.1	$ 9,290
SGM-2301-024 Ash: Spot Liner(s), Cleaning	240.7	$ 5,847
SGM-2301-042 Youngs: Full Liner, Letter to Customer(s)	583.3	$ 11,057
SGM-2301-043 Youngs: Full Liner	247.3	$ 9,892
SGM-2301-044 Youngs: Full Liner	230.5	$ 9,220
SGM-2302-031 Nelson: Spot Liner(s), Letter to Customer(s)	396.3	$ 5,005
SGM-2302-041 Herman: Spot Liner, Cutting and Grouting, Letter to Customer(s)	567.6	$ 8,531
SGM-2302-053 Nafus: Full Liner, Letter to Customer(s)	65.4	$ 11,913
SGM-2401-056 Comstock: Full Liner, Letter to Customer(s)	298.0	$ 14,123
SGM-2401-059 Comstock: Heavy Cleaning, spot liner @32', replace 16'@189', Letter to Customer(s)	200.3	$ 8,042
SGM-2401-062 Jerome & Saginaw: Spot Liner(s), Letter to Customer(s)	344.9	$ 5,015
SGM-2402-015 Saginaw: Relocate External Pipe (REPLACE 16'), Full Liner, Letter to Customer(s)	83.1	$ 16,161
SGM-2402-024 Michigan: Relocate External Pipe (REPLACE 16'), Spot Liner(s), Letter to Customer(s)	13.1	$ 6,830
SGM-2402-026 Stewart: Relocate External Pipe (REPLACE 16'), Spot Liner(s)	389.0	$ 6,820
SGM-2402-047 Shiawassee: Remove and Replace (10 foot section), Full Liner	263.1	$ 18,300
SGM-2403-026 Pearce: Remove and Replace, Letter to Customer(s)	271.4	$ 23,816
SGM-2403-048 Lyon: Spot Liner(s)	253.8	$ 2,500
SGM-2403-054 Mary: Grouting, Spot Liner(s)	100.9	$ 5,898
SGM-2404-005 South of Lynn: Grouting, Full Liner	579.9	$ 162,443
SGM-2404-078 Howell: Full Liner, Letter to Customer(s)	371.9	$ 12,012
SUBTOTAL COLLECTION		**$ 927,395**
STORAGE		
Tank, Diversion Chamber, Piping, Site Improvements		$ 2,070,000
Environmental Mitigation		$ 100,000
SUBTOTAL STORAGE		**$ 2,170,000**
SUMMARIES		
SUBTOTAL CONSTRUCTION		**$ 3,097,395**
CONTINGENCY (25%)		**$ 774,349**
TOTAL CONSTRUCTION COST		**$ 3,871,744**
DESIGN/CONSTRUCTION ENGINEERING (15% for collection, 25% for Basin)		**$ 852,012**
LEGAL/FINANCIAL (5% TCC)		**$ 193,587**
TOTAL PROJECT COST		**$ 4,917,400**

Appendix B. Cost Analysis

Section 2. Sewer and Manhole Rehabilitation Present Worth Analysis

City of Owosso

Appendix B. Engineer's Opinion of Probable Cost - Rehabilitation of Sanitary Sewer Mains and Manholes

Alternative No. 1 Project Description: This opinion of probable cost is for the rehabilitation of various sanitary sewer mains and manholes throughout the City as identified by the 2017 Wastewater Asset Management Plan.

Table 1 - Sanitary Sewer Mains REHAB

Item	Units	Quantity	Oct 2017 Unit Price	Oct 2017 Cost
SGM-0703-002 - Full Liner	LS	1	$2,360	$2,360
SGM-1202-007 - Spot Liner(s), Cleaning	LS	1	$2,968	$2,968
SGM-1301-022 - Full Liner	LS	1	$8,675	$8,675
SGM-1301-043 - Spot Liner(s), Cutting & Grouting	LS	1	$6,935	$6,935
SGM-1301-064 - Full Liner	LS	1	$8,730	$8,730
SGM-1301-071 - Full Liner	LS	1	$23,953	$23,953
SGM-1302-010 - Full Liner	LS	1	$13,707	$13,707
SGM-1302-015 - Full Liner	LS	1	$8,532	$8,532
SGM-1302-045 - Spot Liner(s), Letter to Customer(s)	LS	1	$2,510	$2,510
SGM-1302-057 - Full Liner, Letter to Customer(s)	LS	1	$12,518	$12,518
SGM-1302-058 - Full Liner, Letter to Customer(s)	LS	1	$17,646	$17,646
SGM-1302-061 - Full Liner, Cutting & Grouting, Letter to Customer(s)	LS	1	$23,726	$23,726
SGM-1303-030 - Remove & Replace	LS	1	$30,050	$30,050
SGM-1303-045 - Full Liner	LS	1	$5,664	$5,664
SGM-1303-048 - Cleaning, Spot Liner(s), Letter to Customer(s)	LS	1	$10,194	$10,194
SGM-1303-059 - Spot Liner(s), Cutting & Grouting	LS	1	$8,357	$8,357
SGM-1303-073 - Full Liner	LS	1	$24,524	$24,524
SGM-1303-086 - Relocate 16 Foot Section, Letter to Customer(s)	LS	1	$4,325	$4,325
SGM-1303-087 - Remove & Replace	LS	1	$5,724	$5,724
SGM-1304-020 - Full Liner	LS	1	$7,529	$7,529
SGM-1304-045 - Full Liner	LS	1	$8,964	$8,964
SGM-1304-050 - Spot Liner(s), Letter to Customer(s)	LS	1	$2,510	$2,510
SGM-1304-060 - Full Liner	LS	1	$6,456	$6,456
SGM-1304-077 - Full Liner	LS	1	$14,036	$14,036
SGM-1304-085 - Full Liner	LS	1	$12,828	$12,828
SGM-1401-024 - Full Liner	LS	1	$5,285	$5,285
SGM-1401-058 - Remove & Replace, Letter to Customer(s)	LS	1	$31,409	$31,409
SGM-1401-064 - Spot Liner(s), Lateral Cutting, Letter to Customer(s)	LS	1	$3,005	$3,005
SGM-1402-018 - Relocate 16 Foot Section, Spot Liner(s)	LS	1	$6,820	$6,820
SGM-1803-005 - Full Liner	LS	1	$10,134	$10,134
SGM-1803-008 - Spot Liner(s), Cleaning	LS	1	$6,133	$6,133
SGM-1803-015 - Full Liner	LS	1	$13,530	$13,530
SGM-1803-042 - Full Liner	LS	1	$18,182	$18,182
SGM-1803-043 - Full Liner, Letter to Customer(s)	LS	1	$18,164	$18,164
SGM-1803-081 - Full Liner	LS	1	$10,584	$10,584
SGM-1804-025 - Spot Liner(s), Letter to Customer(s)	LS	1	$9,005	$9,005
SGM-1804-066 - Grouting, Spot Liner(s), Lateral Cutting, Letter to Customer(s)	LS	1	$7,279	$7,279
SGM-1804-070 - Spot Liner(s), Cutting & Grouting, Letter to Customer(s)	LS	1	$8,775	$8,775
SGM-1804-100 - Spot Liner(s)	LS	1	$2,500	$2,500
SGM-1804-107 - Full Liner, Letter to Customer(s)	LS	1	$10,552	$10,552
SGM-1902-030 - Full Liner	LS	1	$14,122	$14,122
SGM-1903-011 - Full Liner	LS	1	$12,749	$12,749
SGM-1903-039 - Relocate 16 Foot Section, Spot Liner(s), Heavy Cleaning, Lateral Cutting	LS	1	$11,409	$11,409
SGM-1903-063 - Full Liner, Letter to Customer(s)	LS	1	$11,897	$11,897
SGM-1904-017 - Relocate 16 Foot Section	LS	1	$23,715	$23,715
SGM-1904-028 - Spot Liner(s)	LS	1	$5,000	$5,000
SGM-1904-040 - Relocate 16 Foot Section, Spot Liner(s)	LS	1	$7,320	$7,320
SGM-1904-045 - Full Liner, Letter to Customer(s)	LS	1	$13,991	$13,991
SGM-2301-022 - Spot Liner(s), Cutting & Grouting, Lateral Cutting, Letter to Customer(s)	LS	1	$9,290	$9,290
SGM-2301-024 - Spot Liner(s), Cleaning	LS	1	$5,847	$5,847
SGM-2301-042 - Full Liner, Letter to Customer(s)	LS	1	$11,057	$11,057
SGM-2301-043 - Full Liner	LS	1	$9,892	$9,892
SGM-2301-044 - Full Liner	LS	1	$9,220	$9,220
SGM-2302-031 - Spot Liner(s), Letter to Customer(s)	LS	1	$5,005	$5,005
SGM-2302-041 - Spot Liner, Cutting & Grouting, Letter to Customer(s)	LS	1	$8,531	$8,531
SGM-2302-053 - Full Liner, Letter to Customer(s)	LS	1	$11,913	$11,913
SGM-2401-056 - Full Liner, Letter to Customer(s)	LS	1	$14,123	$14,123
SGM-2401-059 - Heavy Cleaning, Spot Liner(s), Relocate 16 Foot Section, Letter to Customer(s)	LS	1	$8,042	$8,042
SGM-2401-062 - Spot Liner(s), Letter to Customer(s)	LS	1	$5,015	$5,015
SGM-2402-015 - Relocate 16 Foot Section, Full Liner, Letter to Customer(s)	LS	1	$16,161	$16,161
SGM-2402-024 - Relocate 16 Foot Section, Spot Liner(s), Letter to Customer(s)	LS	1	$6,830	$6,830
SGM-2402-026 - Relocate 16 Foot SEction, Spot Liner(s)	LS	1	$6,820	$6,820
SGM-2402-047 - Remove & Replace 10 Foot Section, Full Liner	LS	1	$18,300	$18,300

SGM-2403-026 - Remove & Replace, Letter to Customer(s)	LS	1	$23,816	$23,816
SGM-2403-048 - Spot Liner(s)	LS	1	$2,500	$2,500
SGM-2403-054 - Grouting, Spot Liner(s)	LS	1	$5,898	$5,898
SGM-2404-005 - Grouting, Full Liner	LS	1	$162,443	$162,443
SGM-2404-078 - Full Liner, Letter to Customer(s)	LS	1	$12,012	$12,012
			Subtotal Construction Cost	**$888,000**
			Contingency 25%	$222,000
			Engineering + Legal 20%	$222,000
			Total Sewer Project Cost	**$1,332,000**

Table 2 - Sanitary Sewer Manholes REHAB

Item	Units	Quantity	Oct 2017 Unit Price	Oct 2017 Cost
SNM-2404-004 - Reset Frame, Full Manhole Liner	LS	1	$4,200	$4,200
SNM-2403-068 - Replace Chimney	LS	1	$1,950	$1,950
SNM-1302-020 - Sewer Cleaning/Vactoring, Replace Chimney	LS	1	$2,450	$2,450
SNM-2301-008 - Sewer Cleaning/Vactoring, Replace Chimney	LS	1	$2,450	$2,450
SNM-2403-008 - Sewer Cleaning/Vactoring, Replace Chimney, Full Manhole Liner	LS	1	$5,450	$5,450
SNM-2301-021 - Sewer Cleaning/Vactoring, Replace Chimney, Full Manhole Liner	LS	1	$5,450	$5,450
SNM-2301-019 - Sewer Cleaning/Vactoring, Replace Chimney, Full Manhole Liner	LS	1	$5,450	$5,450
SNM-2302-013 - Sewer Cleaning/Vactoring, Replace Chimney	LS	1	$2,450	$2,450
SNM-1803-057 - Sewer Cleaning/Vactoring, Replace Chimney	LS	1	$2,450	$2,450
SNM-2301-058 - Sewer Cleaning/Vactoring, Replace Chimney, Full Manhole Liner	LS	1	$5,450	$5,450
SNM-2404-021 - Replace Chimney	LS	1	$1,950	$1,950
			Subtotal Construction Cost	**$40,000**
			Contingency 25%	$10,000
			Engineering + Legal 20%	$10,000
			Total Manhole Project Cost	**$60,000**
			Total REHAB Project Cost	**$1,392,000**

Notes and Assumptions:
Bonds and Insurance not included.
Impacts to roadway, other utilities, and tree impacts are not known and therefore, not included in estimate.
Wetlands are not assumed to be within project area.
Easement acquisition costs have not been included, if necessary.
Unit cost subtotalswere rounded up to nearest $100s; Subtotal Construction Cost rounded up to nearest $1000.
Price escalation from 2017 to current day based on ENR construction cost index of 10817 from

City of Owosso

Appendix B. Engineer's Opinion of Probable Cost - Removal and Replacement of Sanitary Sewer Mains and Manholes

Alternative No. 2 Project Description: This opinion of probable cost is for the rehabilitation of various sanitary sewer mains and manholes throughout the City as identified by the 2017 Wastewater Asset Management Plan.

Table 3 - Sanitary Sewer Main REPLACEMENT

Item	Units	Quantity	Oct 2017 Unit Price	Oct 2017 Cost
SGM-0703-002 - Remove & Replace	FT	66	$90	$5,932.31
SGM-1202-007 - Remove & Replace	FT	134	$90	$12,034
SGM-1301-022 - Remove & Replace	FT	217	$90	$19,518
SGM-1301-043 - Remove & Replace	FT	235	$90	$21,132
SGM-1301-064 - Remove & Replace	FT	201	$90	$18,079
SGM-1301-071 - Remove & Replace	FT	599	$90	$53,895
SGM-1302-010 - Remove & Replace	FT	343	$90	$30,841
SGM-1302-015 - Remove & Replace	FT	274	$90	$24,675
SGM-1302-045 - Remove & Replace	FT	337	$90	$30,330
SGM-1302-057 - Remove & Replace	FT	312	$90	$28,108
SGM-1302-058 - Remove & Replace	FT	435	$90	$39,162
SGM-1302-061 - Remove & Replace	FT	313	$113	$35,219
SGM-1303-030 - Remove & Replace	FT	334	$90	$30,050
SGM-1303-045 - Remove & Replace	FT	342	$90	$30,823
SGM-1303-048 - Remove & Replace	FT	340	$90	$30,586
SGM-1303-059 - Remove & Replace	FT	304	$90	$27,385
SGM-1303-073 - Remove & Replace	FT	545	$90	$49,048
SGM-1303-086 - Remove & Replace	FT	254	$90	$22,897
SGM-1303-087 - Remove & Replace	FT	481	$90	$43,316
SGM-1304-020 - Remove & Replace	FT	50	$180	$9,035
SGM-1304-045 - Remove & Replace	FT	218	$90	$19,664
SGM-1304-050 - Remove & Replace	FT	331	$90	$29,761
SGM-1304-060 - Remove & Replace	FT	170	$90	$15,284
SGM-1304-077 - Remove & Replace	FT	338	$90	$30,459
SGM-1304-085 - Remove & Replace	FT	325	$90	$29,253
SGM-1401-024 - Remove & Replace	FT	132	$90	$11,890
SGM-1401-058 - Remove & Replace	FT	239	$90	$21,552
SGM-1401-064 - Remove & Replace	FT	337	$90	$30,287
SGM-1402-018 - Remove & Replace	FT	334	$90	$30,021
SGM-1803-005 - Remove & Replace	FT	253	$113	$28,501
SGM-1803-008 - Remove & Replace	FT	324	$90	$29,172
SGM-1803-015 - Remove & Replace	FT	338	$90	$30,442
SGM-1803-042 - Remove & Replace	FT	364	$113	$40,909
SGM-1803-043 - Remove & Replace	FT	363	$113	$40,825
SGM-1803-081 - Remove & Replace	FT	268	$90	$24,164
SGM-1804-025 - Remove & Replace	FT	269	$90	$24,229
SGM-1804-066 - Remove & Replace	FT	254	$90	$22,844
SGM-1804-070 - Remove & Replace	FT	326	$90	$29,339
SGM-1804-100 - Remove & Replace	FT	329	$90	$29,648
SGM-1804-107 - Remove & Replace	FT	264	$90	$23,731
SGM-1902-030 - Remove & Replace	FT	353	$90	$31,774
SGM-1903-011 - Remove & Replace	FT	289	$90	$25,978
SGM-1903-039 - Remove & Replace	FT	264	$90	$23,756
SGM-1903-063 - Remove & Replace	FT	293	$90	$26,333
SGM-1904-017 - Remove & Replace	FT	210	$90	$18,929
SGM-1904-028 - Remove & Replace	FT	312	$90	$28,111
SGM-1904-040 - Remove & Replace	FT	275	$90	$24,765
SGM-1904-045 - Remove & Replace	FT	349	$90	$31,447
SGM-2301-022 - Remove & Replace	FT	326	$90	$29,335
SGM-2301-024 - Remove & Replace	FT	222	$90	$19,948
SGM-2301-042 - Remove & Replace	FT	276	$90	$24,833
SGM-2301-043 - Remove & Replace	FT	256	$90	$23,026
SGM-2301-044 - Remove & Replace	FT	219	$90	$19,734
SGM-2302-031 - Remove & Replace	FT	402	$90	$36,172
SGM-2302-041 - Remove & Replace	FT	312	$90	$28,125
SGM-2302-053 - Remove & Replace	FT	298	$90	$26,783
SGM-2401-056 - Remove & Replace	FT	353	$90	$31,731
SGM-2401-059 - Remove & Replace	FT	205	$90	$18,459
SGM-2401-062 - Remove & Replace	FT	334	$90	$30,052
SGM-2402-015 - Remove & Replace	FT	296	$90	$26,631
SGM-2402-024 - Remove & Replace	FT	352	$90	$31,641
SGM-2402-026 - Remove & Replace	FT	299	$90	$26,904
SGM-2402-047 - Remove & Replace	FT	263	$90	$23,682
SGM-2403-026 - Remove & Replace	FT	264	$90	$23,801
SGM-2403-048 - Remove & Replace	FT	250	$90	$22,465
SGM-2403-054 - Remove & Replace	FT	194	$90	$17,474
SGM-2404-005 - Remove & Replace	FT	585	$180	$105,218
SGM-2404-078 - Remove & Replace	FT	300	$90	$27,016

Subtotal Construction Cost		**$1,909,000**
Contingency	25%	$477,250
Engineering + Legal	20%	$477,300
Total Sewer Project Cost		**$2,863,550**

Table 4 - Sanitary Sewer Manhole REPLACEMENT

Item	Units	Quantity	Oct 2017	Oct 2017
SNM-2404-004 - Remove & Replace	EA	1	$5,000	$5,000
SNM-2403-068 - Remove & Replace	EA	1	$5,000	$5,000
SNM-1302-020 - Remove & Replace	EA	1	$5,000	$5,000
SNM-2301-008 - Remove & Replace	EA	1	$5,000	$5,000
SNM-2403-008 - Remove & Replace	EA	1	$5,000	$5,000
SNM-2301-021 - Remove & Replace	EA	1	$5,000	$5,000
SNM-2301-019 - Remove & Replace	EA	1	$5,000	$5,000
SNM-2302-013 - Remove & Replace	EA	1	$5,000	$5,000
SNM-1803-057 - Remove & Replace	EA	1	$5,000	$5,000
SNM-2301-058 - Remove & Replace	EA	1	$5,000	$5,000
SNM-2404-021 - Remove & Replace	EA	1	$5,000	$5,000
			Subtotal Construction Cost	**$55,000**
			Contingency 25%	$13,750
			Engineering + Legal 20%	$13,800
			Total Manhole Project Cost	**$82,550**
			Total REPLACEMENT Project Cost	**$2,946,100**

Notes and Assumptions:

Bonds and Insurance not included.

Impacts to roadway, other utilities, and tree impacts are not known and therefore, not included in estimate.

Wetlands are not assumed to be within project area.

Easement acquisition costs have not been included, if necessary.

Unit cost subtotalswere rounded up to nearest $100s; Subtotal Construction Cost rounded up to nearest $1000.

Price escalation from 2017 to current day based on ENR construction cost index of 10817 from October 2017 and 11227.88 from March 2019.

Appendix B - Table 5A: Alternative 1 - Sanitary Sewer Rehabilitation - O&M Cost Estimate Over 20 Years

City of Owosso, Michigan
Alternative 1: Sanitary Sewer Rehabilitation
Operation and Maintenance Cost Estimate Over 20 Years

Item No.	Item	Total Cost	Useful Life (Yrs)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
1	Sewer Televising and Cleaning	$ 10,700	10										$ 10,916
			Payment Per Year:	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 10,916

Item No.	Item	Total Cost	Useful Life (Yrs)	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
1	Sewer Televising and Cleaning	$ 10,700	10										$ 10,916
			Payment Per Year:	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 10,916

ANNUAL INFLATION RATE **0.200%**
TOTAL VALUE FOR YEARS 1-20 **$ 22,000**
AVERAGE ANNUAL O&M COST **$ 1,100**

NOTES:
1. Projected Annual Inflation Rate was applied to all Items. Inflation assumed to compound after Year 0.

Appendix B - Table 5B: Alternative 2 - Sanitary Sewer Replacement - O&M Cost Estimate Over 20 Years

City of Owosso, Michigan
Alternative 2: Sanitary Sewer Replacement
Operation and Maintenance Cost Estimate Over 20 Years

Item No.	Item	Total Cost	Useful Life (Yrs)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
1	Sewer Televising and Cleaning	$ 10,700	10										$ 10,916
			Payment Per Year:	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 10,916

Item No.	Item	Total Cost	Useful Life (Yrs)	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
1	Sewer Televising and Cleaning	$ 10,700	10										$ 10,916
			Payment Per Year:	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 10,916

ANNUAL INFLATION RATE **0.200%**
TOTAL VALUE FOR YEARS 1-20 **$ 22,000**
AVERAGE ANNUAL O&M COST **$ 1,100**

NOTES:
1. Projected Annual Inflation Rate was applied to all Items. Inflation assumed to compound after Year 0.

Appendix B - Table 6: Present Worth Analysis

INPUTS					
Item No.	Item	Variable ID	Equation	Alternative 1: Rehabilitation of Sanitary Sewer	Alternative 2: Remove and Replace Sanitary
1	Design and Construction Costs	A		$ 1,392,000	$ 2,946,100
2	EPA Discount Rate	i		0.200%	0.200%
3	Life Expectancy	L		30	50
4	Cost Recovery Period (in Years)	n		20	20

SALVAGE VALUE (Straight Line Depreciation)					
Item No.	Item	Variable ID	Equation	Alternative 1: Rehabilitation of Sanitary Sewer	Alternative 2: Remove and Replace Sanitary
4	Constant Yearly Depreciation	Dx	=A/L	$ 46,400	$ 58,922
5	Value Remaining after n-Years	Vn	=Dx*(L-n)	$ 464,000	$ 1,767,660
6	Present Worth Factor of Remaining Value	PWf	=(1+i)^-n	0.9608	0.9608
7	**Present Worth of Salvage Value**	**PWsalv**	**=PWf*Vn**	**$ 445,830**	**$ 1,698,420**

OPERATION, MAINTENANCE and REPLACEMENT (OM&R)					
Item No.	Item	Variable ID	Equation	Alternative 1: Rehabilitation of Sanitary Sewer	Alternative 2: Remove and Replace Sanitary
8	Present Worth Factor for Uniform Series of Payments	PWf	=((1+i)^n*-1) / (i * (1+i)^n)		
9	Projected Annual OM&R Costs (Aomr), Average	Aomr	From Tables 4 (Alt 1) and 5 (Alt 2)		
8	**Present Worth for OM&R**	**PWomr**		**$ 22,000**	**$ 22,000**

TOTAL PRESENT WORTH (2015 dollars)					
Item No.	Item	Variable ID	Equation	Alternative 1: Rehabilitation of Sanitary Sewer	Alternative 2: Remove and Replace Sanitary
9	Equivalent Annual Cost Factor Over 20 Years	EAf	=(i*((1+i)^20))/(((1+i)^20)-1)	0.0511	0.0511
11	**Total Present Worth**	**PWtot**	**=A + PWomr - PWsalv**	**$ 968,170**	**$ 1,269,680**
10	**Average Equivalent Annual Cost**		**=EAf*PWtot**	**$ 49,432**	**$ 64,826**

Notes:

(1) Capital and O&M Costs based on information provided in Tables 1 through 3.

(2) Interest during construction is not included herein.

(3) EPA Real Discount Rate is 0.2%

Appendix B. Cost Analysis

Section 3. Detention Tank Present Worth Analysis

City of Owosso
Appendix B. Engineer's Opinion of Probable Cost - Beehler Street SSO Detention Tank

Alternative No. 1 Project Description: This opinion of probable cost is for the constructing the detention tank on the industrial site south of Beehler Street and the diversion chamber and pumping station on a residential lot north of Beehler Street.

Table 1 - Industrial Site & Residential Lot

Item	Units	Quantity	Nov 2018 Unit Price	Nov 2018 Cost	Mar 2019 Cost
1 Million Gallon Ground Level Detention Tank, Glass-Fused-to-Steel	LS	1	$850,000	$850,000	$853,400
Diversion Chamber, Pumping Station and Meter Chamber including Generator and Control Devices	LS	1	$870,000	$870,000	$873,500
Conveyance Piping Between Structures	LS	1	$200,000	$200,000	$200,800
Site Improvements	LS	1	$150,000	$150,000	$150,600
Environmental Mitigation				**$100,000**	**$100,000**
Subtotal Construction Cost				**$2,170,000**	**$2,179,000**
Contingency			25%	$542,500	$544,750
Engineering + Legal			30%	$813,800	$817,200
Total Project Cost				**$3,526,300**	**$3,540,950**

Notes and Assumptions:

1 Additional cost of easements that may be required are not included.
2 Additional cost of residential properties that may be required are not included.
3 Additional cost of handling contaminated soils are not included.

City of Owosso
Appendix B. Engineer's Opinion of Probable Cost - Footing Drain Disconnections

Alternative No. 2 Project Description: This opinion of probable cost is for disconnection of 450 Footing Drains in the sanitary districts with the highest peaking factors.

Table 2 - Footing Drain Disconnections

Item	Units	Quantity	Nov 2018 Unit Price	Nov 2018 Cost	Mar 2019 Cost
Footing Drain Disconnections	LS	450	$12,000.00	$5,400,000	$5,421,200
			Subtotal	**$5,400,000**	**$5,422,000**
			Contingency 20%	$1,080,000	$1,084,400
			Engineering + Legal 15%	$970,000	$976,000
			Total Project Cost	**$7,450,000**	**$7,482,400**

Notes and Other Assumptions:

1 Additional cost of easements that may be required are not included
2 Additional cost of residential properties that may be required are not included
3 Additional cost of handling contaminated soils are not included

Appendix B - TABLE 3: Alternative 1 - Beehler Street SSO Detention Tank - (O&M) Cost Estimate for Annual Power Consumption at Beehler Street Pump Station

Item	Units	Equations	Alternative1: SSO Detention Tank	Alternative 2: Footing Drain Disconnections
Electrical Cost	$/kwH	e	$ 0.13	$ 0.13
Hours Per Day Pump Runtime	hours	t	6	6
Calendar Days Used	days	T	2	100
Total Flow Required by Pump Station	gpm	Q_GPM	3,500	2
Number of Pumps In Service		N	3	3
Estimated Flow Rate Per Pump	gpm	Qpump=Q_GPM*N	1,167	1
Total Flow Required by Pump Station	gpm	Qtot=Qpump*N	3,500	2
Required pump TDH during cycling (See Note 5)	ft	TDH	50	10
Assumed pump efficiency		n	0.70	0.70
Estimated Horsepower for Booster Station Pumps, Total	HP	P=Qtot*TDH/3960/n	63	0
Estimated HP Per Pump	HP	=P/N	21	0
Annual Electrical Usage	KWH	=P*0.7547*T*t	571.74	3.27
		TOTAL ANNUAL POWER CONSUMPTION COSTS	$ 74	$ 0
		TOTAL ANNUAL POWER CONSUMPTION	**$ 100**	**$ 100**

Notes:

(1) Total Annual Power Consumption based on Cost per KWH of $0.13.

Appendix B - TABLE 4A: Alternative 1 - Beehler Street SSO Detention Tank - O&M Cost Estimate Over 20 Years

City of Owosso, Michigan
Alternative 1: Beehler Street SSO Detention Tank
Operation and Maintenance Cost Estimate Over 20 Years

Item No.	Item	Total Cost	Useful Life (Yrs)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
1	Tank Cleaning (labor, water)			$ 7,000	$ 7,000	$ 7,000	$ 7,000	$ 7,000	$ 7,000	$ 7,000	$ 7,000	$ 7,000	$ 7,000
2	Tank Inspection			$ -	$ -	$ -	$ -	$ 30,000	$ -	$ -	$ -	$ -	$ 30,000
3	Generator & equipment maintenance			$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000
4													
5													
6													
7				$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
8													
9													
10				$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
11								$ -					$ -
12										$ -			
13				$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
14				$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
15													
		Payment Per Year:		$ 11,000	$ 11,000	$ 11,000	$ 11,000	$ 41,000	$ 11,000	$ 11,000	$ 11,000	$ 11,000	$ 41,000

Item No.	Item	Total Cost	Useful Life (Yrs)	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
1	Tank Cleaning (labor, water)	$ -		$ 7,000	$ 7,000	$ 7,000	$ 7,000	$ 7,000	$ 7,000	$ 7,000	$ 7,000	$ 7,000	$ 7,000
2	Tank Inspection	$ -		$ -	$ -	$ -	$ -	$ 30,000	$ -	$ -	$ -	$ -	$ 30,000
3	Generator & equipment maintenance	$ -		$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000
4	0	$ -											
5	0	$ -											
6	0	$ -											
7	0	$ -		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
8	0	$ -											
9	0	$ -											$ -
10	0	$ -		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
11	0	$ -						$ -					$ -
12	0	$ -					$ -						
13	0	$ -		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
14	0	$ -		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
15	0												
		Payment Per Year:		$ 11,000	$ 11,000	$ 11,000	$ 11,000	$ 41,000	$ 11,000	$ 11,000	$ 11,000	$ 11,000	$ 41,000

ANNUAL INFLATION RATE **0.200%**
TOTAL VALUE FOR YEARS 1-20 **$ 340,000**
AVERAGE ANNUAL O&M COST **$ 17,000**

NOTES:

1. Projected Annual Inflation Rate was applied to all Items. Inflation assumed to compound after Year 0.

Appendix B - TABLE 4B: Alternative 2 - Footing Drain Disconnections - O&M Cost Estimate Over 20 Years

City of Owosso, Michigan
Alternative 2: Footing Drain Disconnections
Operation and Maintenance Cost Estimate Over 20 Years

Item No.	Item	Total Cost	Useful Life (Yrs)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
1	Sump pump replacement							$ 300					$ 300
2	Inspection/cleaning			$ 100	$ 100	$ 100	$ 100	$ 100	$ 100	$ 100	$ 100	$ 100	$ 100
3				$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
4				$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
5				$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
6													
7				$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
8													
9													
10				$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
11								$ -					$ -
12										$ -			
13				$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
14				$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
15													
		Payment Per Year:		$ 100	$ 100	$ 100	$ 100	$ 400	$ 100	$ 100	$ 100	$ 100	$ 400

Item No.	Item	Total Cost	Useful Life (Yrs)	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
1	Sump pump replacement	$ -						$ 300					$ 300
2	Inspection/cleaning	$ -		$ 100	$ 100	$ 100	$ 100	$ 100	$ 100	$ 100	$ 100	$ 100	$ 100
3		$ -		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
4		$ -		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
5		$ -		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
6		$ -											
7		$ -		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
8		$ -											
9		$ -											$ -
10		$ -		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
11		$ -						$ -					$ -
12		$ -					$ -						
13		$ -		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
14		$ -		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
15													
		Payment Per Year:		$ 100	$ 100	$ 100	$ 100	$ 400	$ 100	$ 100	$ 100	$ 100	$ 400

ANNUAL INFLATION RATE **0.200%**
TOTAL VALUE FOR YEARS 1-20 **$ 4,000**
AVERAGE ANNUAL O&M COST **$ 200**

NOTES:

1. Projected Annual Inflation Rate was applied to all Items. Inflation assumed to compound after Year 0.

Appendix B - TABLE 5: Present Worth Analysis

INPUTS					
Item No.	Item	Variable ID	Equation	Alternative 1: SSO Detention Basin	Alternative 2: 450 Footing Drain Disconnections
1	Design and Construction Costs	A		$ 3,526,300	$ 7,450,000
2	EPA Discount Rate	i		0.200%	0.200%
3	Life Expectancy (See Note 5)	L		50	50
4	Cost Recovery Period (in Years)	n		20	20

SALVAGE VALUE (Straight Line Depreciation)					
Item No.	Item	Variable ID	Equation	Alternative 1: SSO Detention Basin	Alternative 2: 450 Footing Drain Disconnections
4	Constant Yearly Depreciation	Dx	=A/L	$ 70,526	$ 149,000
5	Value Remaining after n-Years	Vn	=Dx*(L-n)	$ 2,115,780	$ 4,470,000
6	Present Worth Factor of Remaining Value	PWf	=(1+i)^-n	0.9608	0.9608
7	**Present Worth of Salvage Value**	**PWsalv**	**=PWf*Vn**	**$ 2,032,910**	**$ 4,294,910**

OPERATION, MAINTENANCE and REPLACEMENT (OM&R)					
Item No.	Item	Variable ID	Equation	Alternative 1: SSO Detention Basin	Alternative 2: 450 Footing Drain Disconnections
8	**Present Worth for OM&R**	**PWomr**		**$ 340,000**	**$ 4,000**

TOTAL PRESENT WORTH (2015 dollars)					
Item No.	Item	Variable ID	Equation	Alternative 1: SSO Detention Basin	Alternative 2: 450 Footing Drain Disconnections
9	Equivalent Annual Cost Factor Over 20 Years	EAf	=(i*((1+i)^20))/(((1+i)^20)-1)	0.0511	0.0511
11	**Total Present Worth**	**PWtot**	**=A + PWomr - PWsalv**	**$ 1,833,390**	**$ 3,159,090**
10	**Average Equivalent Annual Cost**		**=EAf*PWtot**	**$ 93,607**	**$ 161,293**

Notes:

(1) Capital and O&M Costs based on information provided in Tables 1 through 4.

(2) Interest during construction is not included herein.

(3) EPA Real Discount Rate is 0.2%.

Appendix B. Cost Analysis

Section 4. User Rate Charges

City of Owosso, Michigan
SRF Project Plan FY 2020
SRF User Rate Charges

Interest:	2.25%
Time Period:	20
Number of REUs:[(1)]	7964

All Projects

	SRF Loan				
Description	**SRF Loan Amount**	**Monthly**	**Quarterly**	**Annual**	**Quarterly Resident Fee**
2020 MH/Sewer Rehab	$1,391,100.00	$7,261.78	$21,785.35	$87,141.38	$2.74
2020 SSO Detention Basin	$3,526,300.00	$18,407.89	$55,223.68	$220,894.73	$6.93
Total Loan Amount	**$4,917,400.00**	**$25,669.68**	**$77,009.03**	**$308,036.12**	**$9.67**

Note 1 - Number of operational REUs from updated meter information 2019

Appendix C. Agency Correspondence

ARCHITECTS. ENGINEERS. PLANNERS.

OHM Advancing Communities℠

March 20, 2019

MDEQ Water Resources Division
Lansing District Office
525 Allegan (Constitution Hall, 1S)
P.O Box 30242
Lansing, Michigan 48909

RE: City of Owosso – State Revolving Fund (SRF) Project Plan

The City of Owosso is in the process of submitting a SRF project plan for improvements to their sewage disposal system. We have been notified by the Michigan Department of Environmental Quality (MDEQ) that information regarding SRF Project Plans are required to be sent to the attention of the corresponding MDEQ Water Resources Division district office for comments regarding the proposed project. The Floodplain Areas map shows the various proposed project areas within the City with respect to the floodway, 100 – Year Flood Zone and 500 – Year Flood Zone. The enclosed Description of Project Work document details the proposed construction and the possible impacts of the proposed action.

The proposed work consists of the following:

- Installation of a new sanitary sewer overflow (SSO) detention tank at the southeast corner of Beehler Street and Chipman Street. The proposed diversion chamber and pumping station will be located on a single residential lot at 1110 Beehler Street
- Rehabilitation of sanitary sewer pipe and manholes at various locations across the City

The locations of rehabilitation for nine (9) sanitary sewer pipes and one (1) manhole are observed to be located within the 100 – Year Flood Zone. Reliability of wastewater service to residents and customers necessitates the rehabilitations be located in the floodplains as no practicable alternative exists.

No floodplains will be adversely impacted by the proposed project and therefore conforms to all state and local floodplain protection standards.

Please review and verify the enclosed information regarding the City of Owosso SRF Project Plan. Please return any comments within 60 days. You may also send comments to my attention via email at Franky.Hang@ohm-advisors.com.

Sincerely,
OHM Advisors

Franky Hang

Franky Hang, Engineer

Encl: Floodplain Areas
Description of Project Work

OHM Advisors
34000 PLYMOUTH ROAD
LIVONIA, MICHIGAN 48150
T 734.522.6711
F 734.522.6427
OHM-Advisors.com

Owosso SRF Floodplain Areas

- Sanitary Sewer
- Sanitary Manhole
- EQ Basin
- Floodway
- 100 Year Flood Zone
- 500 Year Flood Zone
- City Boundary

N

0 1,200 2,400

Feet

1" = 1,200'

Source: Data provided by City of Owosso, FEMA, and ESRI. OHM Advisors does not warrant the accuracy of the data and/or the map. This document is intended to depict the approximate spatial location of the mapped features within the Community and all use is strictly at the user's own risk.

Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 IntlFeet

Map Published: March 8, 2019

ARCHITECTS. ENGINEERS. PLANNERS.

OHM Advancing Communities℠

March 20, 2019

Genesee County Metropolitan Planning Commission
1101 Beach Street, Room 223
Flint, MI 48502

RE: City of Owosso – State Revolving Fund (SRF) Project Plan

The City of Owosso is in the process of submitting a SRF Project Plan for improvements to their sewage disposal system. SRF applicants are required by the Michigan Department of Environmental Quality (MDEQ) to send information to the appropriate regional planning agency for the City of Owosso during project planning to seek input regarding the impacts of the proposed project upon local development plans.

The attached Project Areas map shows the proposed project areas within the City in which potential construction impacts may occur. The Description of Project Work document enclosed details the proposed construction and the possible impacts of the proposed action.

Enclosed is the population data and projections for the City of Owosso to be included in the SRF Project Plan. Population data was obtained from the United States Census Bureau (USCB).

Please review and verify the enclosed information and return any comments within 60 days. You may also send comments to my attention via email at Franky.Hang@ohm-advisors.com.

Sincerely,
OHM Advisors

Franky Hang, Engineer

Encl: Project Areas
Description of Project Work
Population Data

OHM Advisors
34000 PLYMOUTH ROAD
LIVONIA, MICHIGAN 48150
T 734.522.6711
F 734.522.6427
OHM-Advisors.com

Population Data

The population data obtained from the United States Census Bureau for the City of Owosso in the year 2017 was used to determine a twenty-year (20) population projection. This information will be included in the City of Owosso – SRF Project Plan.

According to the United States Census Bureau (USCB), the 2017 population of the City of Owosso was 14,539. Since 2010, the population of the City of Owosso has been steadily declining (4.1%). To be conservative, the future planning periods were completed based on the existing population (see Table 1). The USCB also possesses population data for Shiawassee County. The population at the County level is observed to have declined at a similar rate from 2010 to 2017 (3.1%). There is no seasonal variance in the population within the City of Owosso as the population remains constant throughout the year.

Table 1: Population Data

	2017	2019	2030
Service Area Year-Round	14,539	14,539	14,539
Service Area Seasonal	N/A	N/A	N/A

ARCHITECTS. ENGINEERS. PLANNERS.

OHM Advancing Communities

March 20, 2019

Bay Mills Indian Community
Paula Carrick, THPO
12140 W. Lakeshore Drive
Brimley, MI 49715

RE: City of Owosso – State Revolving Fund (SRF) Project Plan

Dear Paula Carrick:

We have been notified by the Michigan Department of Environmental Quality (MDEQ) that information regarding SRF Project Plans should be sent to your attention for comments regarding the proposed project.

The City of Owosso is in the process of submitting an SRF project plan for improvements to their sewage disposal system. The attached Project Area map shows the various proposed project areas within the City in which potential construction impacts may occur. The enclosed Description of Project Work document details the proposed construction and the possible impacts of the proposed action.

The proposed work consists of the following:

- Installation of a new sanitary sewer overflow (SSO) detention tank at the southeast corner of Beehler Street and Chipman Street. The proposed diversion chamber and pumping station will be located on a single residential lot at 1110 Beehler Street
- Rehabilitation of sanitary sewer pipe and manholes at various locations across the City

Typical construction disturbances such as noise, dust, and traffic disruptions along existing roads are expected, which will be addressed by the City, County, and State regulations as well as in the construction contracts associated with the work. A positive impact as a result of this proposed project work will be reduced sewer backups for residents and customers and reduced sewage overflows to the Shiawassee River.

City of Owosso has confirmed that there are no cultural resources to the best of their knowledge that would be affected as a result of this project work.

Please review and verify the enclosed information regarding the City of Owosso SRF Project Plan. Please return any comments within 60 days. You may also send comments to my attention via email at Franky.Hang@ohm-advisors.com.

Sincerely,
OHM Advisors

Franky Hang

Franky Hang, Engineer

Encl: Project Areas
Description of Project Work

OHM Advisors
34000 PLYMOUTH ROAD
LIVONIA, MICHIGAN 48150
T 734.522.6711
F 734.522.6427
OHM-Advisors.com

ARCHITECTS. ENGINEERS. PLANNERS.

OHM Advancing Communities

March 20, 2019

Grand Traverse Band of Ottawa and Chippewa Indians
Cindy Winslow
2605 NW Bayshore Drive
Suttons Bay, MI 49682

RE: City of Owosso – State Revolving Fund (SRF) Project Plan

Dear Cindy Winslow:

We have been notified by the Michigan Department of Environmental Quality (MDEQ) that information regarding SRF Project Plans should be sent to your attention for comments regarding the proposed project.

The City of Owosso is in the process of submitting an SRF project plan for improvements to their sewage disposal system. The attached Project Area map shows the various proposed project areas within the City in which potential construction impacts may occur. The enclosed Description of Project Work document details the proposed construction and the possible impacts of the proposed action.

The proposed work consists of the following:

- Installation of a new sanitary sewer overflow (SSO) detention tank at the southeast corner of Beehler Street and Chipman Street. The proposed diversion chamber and pumping station will be located on a single residential lot at 1110 Beehler Street
- Rehabilitation of sanitary sewer pipe and manholes at various locations across the City

Typical construction disturbances such as noise, dust, and traffic disruptions along existing roads are expected, which will be addressed by the City, County, and State regulations as well as in the construction contracts associated with the work. A positive impact as a result of this proposed project work will be reduced sewer backups for residents and customers and reduced sewage overflows to the Shiawassee River.

City of Owosso has confirmed that there are no cultural resources to the best of their knowledge that would be affected as a result of this project work.

Please review and verify the enclosed information regarding the City of Owosso SRF Project Plan. Please return any comments within 60 days. You may also send comments to my attention via email at Franky.Hang@ohm-advisors.com.

Sincerely,
OHM Advisors

Franky Hang

Franky Hang, Engineer

Encl: Project Areas
Description of Project Work

OHM Advisors
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ARCHITECTS. ENGINEERS. PLANNERS.

OHM Advancing Communities

March 20, 2019

Hannahville Potawatomi Indian Community
Earl Meshigaud
N-14911 Hannahville B-1 Road
Wilson, MI 49896

RE: City of Owosso – State Revolving Fund (SRF) Project Plan

Dear Earl Meshigaud:

We have been notified by the Michigan Department of Environmental Quality (MDEQ) that information regarding SRF Project Plans should be sent to your attention for comments regarding the proposed project.

The City of Owosso is in the process of submitting an SRF project plan for improvements to their sewage disposal system. The attached Project Area map shows the various proposed project areas within the City in which potential construction impacts may occur. The enclosed Description of Project Work document details the proposed construction and the possible impacts of the proposed action.

The proposed work consists of the following:

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City of Owosso has confirmed that there are no cultural resources to the best of their knowledge that would be affected as a result of this project work.

Please review and verify the enclosed information regarding the City of Owosso SRF Project Plan. Please return any comments within 60 days. You may also send comments to my attention via email at Franky.Hang@ohm-advisors.com.

Sincerely,
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March 20, 2019

Keweenaw Bay Indian Community
Gary Loonsfoot, Jr., THPO
16429 Bear Town Road
Baraga, MI 49908

RE: City of Owosso – State Revolving Fund (SRF) Project Plan

Dear Gary Loonsfoot, Jr.:

We have been notified by the Michigan Department of Environmental Quality (MDEQ) that information regarding SRF Project Plans should be sent to your attention for comments regarding the proposed project.

The City of Owosso is in the process of submitting an SRF project plan for improvements to their sewage disposal system. The attached Project Area map shows the various proposed project areas within the City in which potential construction impacts may occur. The enclosed Description of Project Work document details the proposed construction and the possible impacts of the proposed action.

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March 20, 2019

Lac Vieux Desert Band of Lake Superior Chippewa Indians
Daisy McGeshick, THPO
P.O. Box 249
Watersmeet, MI 49969

RE: City of Owosso – State Revolving Fund (SRF) Project Plan

Dear Daisy McGeshick:

We have been notified by the Michigan Department of Environmental Quality (MDEQ) that information regarding SRF Project Plans should be sent to your attention for comments regarding the proposed project.

The City of Owosso is in the process of submitting an SRF project plan for improvements to their sewage disposal system. The attached Project Area map shows the various proposed project areas within the City in which potential construction impacts may occur. The enclosed Description of Project Work document details the proposed construction and the possible impacts of the proposed action.

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Franky Hang

Franky Hang, Engineer

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March 20, 2019

Little River Band of Ottawa Indians
Jonnie J. Sam, Director
2608 Government Center Drive
Manistee, MI 49660

RE: City of Owosso – State Revolving Fund (SRF) Project Plan

Dear Jonnie J. Sam:

We have been notified by the Michigan Department of Environmental Quality (MDEQ) that information regarding SRF Project Plans should be sent to your attention for comments regarding the proposed project.

The City of Owosso is in the process of submitting an SRF project plan for improvements to their sewage disposal system. The attached Project Area map shows the various proposed project areas within the City in which potential construction impacts may occur. The enclosed Description of Project Work document details the proposed construction and the possible impacts of the proposed action.

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City of Owosso has confirmed that there are no cultural resources to the best of their knowledge that would be affected as a result of this project work.

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Sincerely,
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Franky Hang

Franky Hang, Engineer

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March 20, 2019

Little Traverse Bay Band of Odawa
Melissa Wiatrolik
7500 Odawa Circle
Harbor Springs, MI 49740

RE: City of Owosso – State Revolving Fund (SRF) Project Plan

Dear Melissa Wiatrolik:

We have been notified by the Michigan Department of Environmental Quality (MDEQ) that information regarding SRF Project Plans should be sent to your attention for comments regarding the proposed project.

The City of Owosso is in the process of submitting an SRF project plan for improvements to their sewage disposal system. The attached Project Area map shows the various proposed project areas within the City in which potential construction impacts may occur. The enclosed Description of Project Work document details the proposed construction and the possible impacts of the proposed action.

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Sincerely,
OHM Advisors

Franky Hang

Franky Hang, Engineer

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March 20, 2019

Match-e-be-nash-shee-wish Gun Lake Band of Potawatomi Indians
JoAnne Cook
2872 Mission Drive
Shelbyville, MI 49344

RE: City of Owosso – State Revolving Fund (SRF) Project Plan

Dear JoAnne Cook:

We have been notified by the Michigan Department of Environmental Quality (MDEQ) that information regarding SRF Project Plans should be sent to your attention for comments regarding the proposed project.

The City of Owosso is in the process of submitting an SRF project plan for improvements to their sewage disposal system. The attached Project Area map shows the various proposed project areas within the City in which potential construction impacts may occur. The enclosed Description of Project Work document details the proposed construction and the possible impacts of the proposed action.

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Sincerely,
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Franky Hang, Engineer

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March 20, 2019

Nottawaseppi Band of Huron Potawatomi
Fred Jacko Jr.
1485 Mno-Bmadzewen Way
Fulton, MI 49052

RE: City of Owosso – State Revolving Fund (SRF) Project Plan

Dear Fred Jacko Jr.:

We have been notified by the Michigan Department of Environmental Quality (MDEQ) that information regarding SRF Project Plans should be sent to your attention for comments regarding the proposed project.

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Please review and verify the enclosed information regarding the City of Owosso SRF Project Plan. Please return any comments within 60 days. You may also send comments to my attention via email at Franky.Hang@ohm-advisors.com.

Sincerely,
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Franky Hang

Franky Hang, Engineer

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March 20, 2019

Pokagon Band of Potawatomi
Matthew J.N. Bussler, THPO/GIS Specialist
57824 East Potawatomi Road.
P.O. Box 180 Dowagiac, MI 49047

RE: City of Owosso – State Revolving Fund (SRF) Project Plan

Dear Matthew Bussler:

We have been notified by the Michigan Department of Environmental Quality (MDEQ) that information regarding SRF Project Plans should be sent to your attention for comments regarding the proposed project.

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Sincerely,
OHM Advisors

Franky Hang

Franky Hang, Engineer

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March 20, 2019

Saginaw Chippewa Indian Tribe of Michigan
Sarah Jones
6650 E. Broadway
Mt. Pleasant, MI 48858

RE: City of Owosso – State Revolving Fund (SRF) Project Plan

Dear Sarah Jones:

We have been notified by the Michigan Department of Environmental Quality (MDEQ) that information regarding SRF Project Plans should be sent to your attention for comments regarding the proposed project.

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Please review and verify the enclosed information regarding the City of Owosso SRF Project Plan. Please return any comments within 60 days. You may also send comments to my attention via email at Franky.Hang@ohm-advisors.com.

Sincerely,
OHM Advisors

Franky Hang

Franky Hang, Engineer

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OHM Advancing Communities

March 20, 2019

Sault Ste. Marie Tribe of Chippewa
Colleen Medicine
523 Ashmun
Sault Ste. Marie, MI 49783

RE: City of Owosso - State Revolving Fund (SRF) Project Plan

Dear Colleen Medicine:

We have been notified by the Michigan Department of Environmental Quality (MDEQ) that information regarding SRF Project Plans should be sent to your attention for comments regarding the proposed project.

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OHM Advancing Communities

March 20, 2019

U.S. Fish and Wildlife Service
East Lansing Field Office
2651 Coolidge Road
Lansing, MI 48823

RE: Section 7 Endangered Species Act Consultation
City of Owosso - State Revolving Fund (SRF) Project Plan

OHM is requesting concurrence from the U.S. Fish and Wildlife Service that activities in the proposed project areas for the City of Owosso SRF Project Plan may affect but are not likely to adversely affect the Northern Long-Eared Bat, Rufa Red Knot, Eastern Massasauga and Indiana Bat. The proposed SRF project plan includes improvements to the City's sewage disposal system. The proposed project areas are located at T 07 N R 02 E sections 13, 24 and T 07 N R 03 E sections 18, 19. The attached Project Area map shows the various project areas within the City in which potential construction impacts may occur. The enclosed Description of Project Work document details the proposed construction and the possible impacts of the proposed action.

Construction activities are expected to begin in April 2020. Tank construction is anticipated to conclude in November of 2022 and all other sewer activities will conclude by November of 2024.

The proposed work consists of the following:

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OHM has reviewed current State and Federal listings for threatened and endangered species according to the U.S. Fish and Wildlife and the Michigan Natural Features Inventory. According to these sources, Shiawassee County is home to three (3) threatened species (Northern Long-Eared Bat, Rufa Red Knot, Eastern Massasauga Rattlesnake) and one (1) endangered species (Indiana Bat). No work is anticipated to occur within wetlands for the proposed project areas, therefore the Rufa Red Knot is not anticipated to be affected.

In regards to the Eastern Massasauga Rattlesnake (EMR), no Tier 1 or Tier 2 habitat is present within the project areas. Rather than conduct surveys, we plan to utilize the following best management practices assuming that that the EMR may be present within the project areas:

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- Use of wildlife-safe materials for erosion control and site restoration (i.e. net-less erosion control blankets (for example, made of excelsior), loose mulch, hydraulic mulch, soil binders, unreinforced silt fences, and straw bales. Other options are made from natural fibers (such as jute) and loosely woven together in a manner that allows wildlife to wiggle free.).

- To increase human safety and awareness of EMR, the contractor, engineer, and all others that will be on site for the project will be required to watch MDNR's "60- Second Snakes: The Eastern Massasauga Rattlesnake" video and review the EMR factsheet. These materials are available at: https://www.youtube.com/watch?v=-PFnXe_e02w and https://www.fws.gov/midwest/endangered/reptiles/eam a/pdf/EMRfactsheetSept2016.pdf .

- The reporting of any EMR observation, or observation of any other listed threatened or endangered species (T&E), during the project construction is required within 24 hours of said observation. EMR or T&E Species siting will be reported to the Lansing, MI USFWS Office at: 517-351-2555.

In regards to the Indiana Bat and the Northern Long Eared Bat, we plan to utilize the following best management practices:

- All tree removals and tree trimming required for this project will be completed during the non-active season for both species. Specifically, tree removal will only occur between the months of October to March. In the event, however, that any additional, unanticipated tree requires clearing between the months of April to September, the USFWS office in Lansing Michigan will be contacted for further evaluation. Furthermore, extra precaution will be taken to avoid tree removal during the months of June and July, the period in which young bats are unable to fly.
- Any Indiana Bat or Northern Long Eared Bat observation, or observation of any other listed threatened or endangered species, will be reported within 24 hours of said observation. The USFWS office in Lansing Michigan (517-351-2555) will be contacted to report species sighting.

Based on the best management practices identified above, we conclude that activities in the proposed project areas for the City of Owosso SRF Project Plan may affect but are not likely to adversely affect the listed threatened and endangered species. The management practices will be identified in future bidding documents for the project(s) and would be considered requirements of the contract.

Please review and verify the enclosed information regarding the City of Owosso SRF Project Plan. Please return any comments within sixty (60) days. You may also send comments to my attention via email at Franky.Hang@ohm-advisors.com.

Sincerely,
OHM Advisors

Franky Hang, Engineer

Encl: Project Areas
Description of Project Work

Franky Hang

From: Franky Hang
Sent: Friday, February 22, 2019 3:52 PM
To: 'Sanders, Michael'
Cc: Adkins, Ashley
Subject: RE: City of Owosso - DWRF Project Plan
Attachments: AreaPotentialEffects.pdf

Dear Michael,

I hope this email finds you well and thank you for your response.

In addition to the DWRF Project Plan, we're concurrently working on an SRF Project Plan that encompasses the same overall area within the City (see figure attached). Additionally, construction activities associated with both projects are aligned within the same time frame (2020 to 2024).

The SRF Project Plan consists of sewer and manhole repairs and replacements. It also includes construction of a detention tank on the southwest corner of Beehler and Lyon Street. A positive impact as a result of these projects will be reduced surcharges and sanitary sewer overflows as a result of infiltration and inflow.

We would like to request to designate this RSR be performed to satisfy the consultation requirement with MNFI for **both projects** given that they encompass approximately the same overall area – please advise on any further materials that may be required from us.

Thank you,

FRANKY HANG | **OHM** Advisors®
ENGINEER

D (734) 466-4520 **O** (734) 522-6711

franky.hang@ohm-advisors.com | OHM-Advisors.com

From: Sanders, Michael <sander75@msu.edu>
Sent: Friday, February 8, 2019 4:46 PM
To: Franky Hang <Franky.Hang@ohm-advisors.com>
Cc: Adkins, Ashley <hurdashl@msu.edu>
Subject: City of Owosso - DWRF Project Plan

Hello,

Thank you for allowing MNFI to evaluate this activity for possible impacts to protected species.
Attached is the project invoice plus our standard Information Agreement (IA) detailing how our data can be used/shared.

Please let me know if you have questions. We will begin processing this request once payment is received and the signed IA is returned.

NOTE: The total cost represents a $230.00 base fee plus an area fee of $306.00 factored at $12.78/mi^2

V/r,

Mike Sanders

Michael A. Sanders
Environmental Review Specialist/Zoologist
Michigan Natural Features Inventory
MSU Extension Service
PO Box 13036
Lansing, MI 48901
Office: 517-284-6215
Cell: 517-980-5632
Sander75@msu.edu

Description of Project Work

OHM is in the process of preparing a project plan for the City of Owosso to apply for State Revolving Fund (SRF) program funds from the Michigan Department of Environmental Quality (MDEQ). The proposed work consists of the following:

- Installation of a new sanitary sewer overflow (SSO) detention tank at the southeast corner of Beehler Street and Chipman Street. The proposed diversion chamber and pumping station will be located on a single residential lot at 1110 Beehler Street
- Rehabilitation of sanitary sewer pipe and manholes at various locations across the City

Construction activities are expected to begin in April 2020. Tank construction is anticipated to conclude in November of 2022 and all other activities will conclude by November of 2024.

The proposed project plan will be prepared for submittal to the MDEQ for SRF funding through the Environmental Protection Agency.

Typical construction disturbances such as noise, dust, and traffic disruptions along existing roads are expected, which will be addressed by the City, County, and State regulations as well as in the construction contracts associated with the work. A positive impact as a result of this proposed project work will be reduced sewer backups for residents and customers and reduced sewage overflows to the Shiawassee River.

Owosso SRF Project Areas

Sanitary Sewer

Sanitary Manhole

EQ Basin

City Boundary

N

0 1,200 2,400

Feet

1" = 1,200'

Source: Data provided by City of Owosso and ESRI. OHM Advisors does not warrant the accuracy of the data and/or the map. This document is intended to depict the approximate spatial location of the mapped features within the Community and all use is strictly at the user's own risk.

Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 IntlFeet

Map Published: March 8, 2019

P:\0000_0100\002019010_Owosso_2019_SRF_Application_GIS\ArcLayouts\ProjectAreas.mxd

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Franky Hang

From: Sanders, Michael <sander75@msu.edu>
Sent: Monday, April 1, 2019 12:19 PM
To: Franky Hang
Subject: Rare Species Review #2316 - City of Owosso DWRF Project Plan
Attachments: RSR_2316_Section 7 Comments -Shiawassee County.pdf; RSR #2316 Response Letter.pdf

Hi Franky,

Please find our response letter for Rare Species Review #2316 in Shiawassee County, Michigan. Also included are comments for projects involving federal funding or a federal agency authorization.

Please let me know if you have questions or comments.

Thank you,

Mike Sanders

Michael A. Sanders
Environmental Review Specialist/Zoologist
Michigan Natural Features Inventory
MSU Extension Service
PO Box 13036
Lansing, MI 48901
Office: 517-284-6215
Cell: 517-980-5632
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MICHIGAN STATE UNIVERSITY | Extension

Franky Hang
Engineer
OHM Advisors
34000 Plymouth Road
Livonia, MI 48150
Franky.Hang@ohm-advisors.com

April 1, 2019

Re: Rare Species Review #2316 – City of Owosso – DWRF Project Plan, Shiawassee County, MI.

Mr. Hang,

The location for the proposed project was checked against known localities for rare species and unique natural features, which are recorded in the Michigan Natural Features Inventory (MNFI) natural heritage database. This continuously updated database is a comprehensive source of existing data on Michigan's endangered, threatened, or otherwise significant plant and animal species, natural plant communities, and other natural features. Records in the database indicate that a qualified observer has documented the presence of special natural features. The absence of records in the database for a particular site may mean that the site has not been surveyed. The only way to obtain a definitive statement on the status of natural features is to have a competent biologist perform a complete field survey.

Under Act 451 of 1994, the Natural Resources and Environmental Protection Act, Part 365, Endangered Species Protection, "a person shall not take, possess, transport, …fish, plants, and wildlife indigenous to the state and determined to be endangered or threatened," unless first receiving an Endangered Species Permit from the Michigan Department of Natural Resources (MDNR), Wildlife Division. Responsibility to protect endangered and threatened species is not limited to the lists below. Other species may be present that have not been recorded in the database.

Several protected and/or rare natural features have been documented in the project area. However, all of the records are **Historic,** and **it is not likely** that negative impacts will occur. Keep in mind that MNFI cannot fully evaluate this project without visiting the project site. MNFI offers several levels of Rare Species Reviews, including field surveys which I would be happy to discuss with you.

Sincerely,

Michael A. Sanders

Michael A. Sanders
Environmental Review Specialist/Zoologist
Michigan Natural Features Inventory

MSU EXTENSION

Michigan Natural Features Inventory

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Lansing MI 48901

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Comments for Rare Species Review #2316: It is important to note that it is the applicant's responsibility to comply with both state and federal threatened and endangered species legislation. Therefore, if a state listed species occurs at a project site, and you think you need an endangered species permit please contact: Casey Reitz, Wildlife Division, Michigan Department of Natural Resources, 517-284-6210, or ReitzC@michigan.gov. If a federally listed species is involved and, you think a permit is needed, please contact Carrie Tansy, Endangered Species Program, U.S. Fish and Wildlife Service, East Lansing office, 517-351-8375, or Carrie_Tansy@fws.gov.

Special concern species and natural communities are not protected under endangered species legislation, but efforts should be taken to minimize any or all impacts. Species classified as special concern are species whose numbers are getting smaller in the state. If these species continue to decline they would be recommended for reclassification to threatened or endangered status.

Please consult MNFI's Rare Species Explorer for additional information regarding the listed species: http://mnfi.anr.msu.edu/explorer/search.cfm.

Table 1: Occurrences of threatened & endangered species within 1.5 miles of #2316

ELCAT	SNAME	SCOMNAME	USESA	SPROT	G_RANK	S_RANK	FIRSTOBS	LASTOBS
Animal	*Alasmidonta viridis*	Slippershell		T	G4G5	S2S3	1934	1934
Plant	*Galearis spectabilis*	Showy orchis		T	G5	S2	1889	1890-05
Plant	*Plantago cordata*	Heart-leaved plantain		E	G4	S1	1885	1889-05-18
Plant	*Dennstaedtia punctilobula*	Hay-scented fern		T	G5	S1	1889-06-17	1889-06-17

Of concern: No concerns

Table 2: Occurrences of special concern species & rare natural features within 1.5 miles of #2316

ELCAT	SNAME	SCOMNAME	USESA	SPROT	G_RANK	S_RANK	FIRSTOBS	LASTOBS
Animal	*Venustaconcha ellipsiformis*	Ellipse		SC	G4	S3	1934	1934
Animal	*Ptychobranchus fasciolaris*	Kidney shell		SC	G4G5	S2	1932	1934
Animal	*Alasmidonta marginata*	Elktoe		SC	G4	S3?	1926	1926
Animal	*Pleurobema sintoxia*	Round pigtoe		SC	G4G5	S3	1926	1934
Animal	*Villosa iris*	Rainbow		SC	G5Q	S3	1934-09	1934-09
Animal	*Pupilla muscorum*	Widespread column		SC	G5	S2	1947-07-10	1947-07-10
Animal	*Lasmigona costata*	Flutedshell		SC	G5	SNR	1926	1926
Animal	*Bombus auricomus*	Black and gold bumble bee		SC	G4G5	SNR	1948-07-01	1948-07-01

Of concern: No concerns

Codes to accompany Tables 1 and 2:

State Protection Status Code Definitions (SPROT)
E: Endangered
T: Threatened
SC: Special concern

Federal Protection Status Code Definitions (USESA)
LE = listed endangered
LT = listed threatened
LELT = partly listed endangered and partly listed threatened
PDL = proposed delist
E(S/A) = endangered based on similarities/appearance
PS = partial status (federally listed in only part of its range)
C = species being considered for federal status

Global Heritage Status Rank Definitions (GRANK)
The priority assigned by NatureServe's national office for data collection and protection based upon the element's status throughout its entire world-wide range. Criteria not based only on number of occurrences; other critical factors also apply. Note that ranks are frequently combined.
G1 = critically imperiled globally because of extreme rarity (5 or fewer occurrences range-wide or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extinction.
G2 = imperiled globally because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extinction throughout its range.
G3: Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range (e.g. a single western state, a physiographic region in the East) or because of other factor(s) making it vulnerable to extinction throughout its range; in terms of occurrences, in the range of 21 to 100.
G4: Apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery.
G5: Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.
Q: Taxonomy uncertain

State Heritage Status Rank Definitions (SRANK)
The priority assigned by the Michigan Natural Features Inventory for data collection and protection based upon the element's status within the state. Criteria not based only on number of occurrences; other critical factors also apply. Note that ranks are frequently combined.
S1: Critically imperiled in the state because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extirpation in the state.
S2: Imperiled in state because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extirpation from the state.
S3: Rare or uncommon in state (on the order of 21 to 100 occurrences).
S4 = apparently secure in state, with many occurrences.
S5 = demonstrably secure in state and essentially ineradicable under present conditions.
SX = apparently extirpated from state.

Rare Species Review #2316
OHM Advisors
DWRF Project Plan
City of Owosso
Shiawassee County, MI
April 1, 2019

For projects involving Federal funding or a Federal agency authorization

The following information is provided to assist you with Section 7 compliance of the Federal Endangered Species Act (ESA). The ESA directs all Federal agencies "to work to conserve endangered and threatened species. Section 7 of the ESA, called "Interagency Cooperation," is the means by which Federal agencies ensure their actions, including those they authorize or fund, do not jeopardize the existence of any listed species."

The project falls within the range of four (4) federally listed/proposed species which have been identified by the U.S. Fish and Wildlife Service (USFWS) to occur in Shiawassee County, Michigan.

Federally Endangered

Indiana bat - there appears to be suitable habitat in our standard 1.5-mile search buffer. Indiana bats (*Myotis sodalis*) are found only in the eastern United States and are typically confined to the southern three tiers of counties in Michigan. Indiana bats that summer in Michigan winter in caves in Indiana and Kentucky. This species forms colonies and forages in riparian and mature floodplain habitats. Nursery roost sites are usually located under loose bark or in hollows of trees near riparian habitat. Indiana bats typically avoid houses or other artificial structures and typically roost underneath loose bark of dead elm, maple and ash trees. Other dead trees used include oak, hickory and cottonwood.

Foraging typically occurs over slow-moving, wooded streams and rivers as well as in the canopy of mature trees. Movements may also extend into the outer edge of the floodplain and to nearby solitary trees. A summer colony's foraging area usually encompasses a stretch of stream over a half-mile in length. Upland areas isolated from floodplains and non-wooded streams are generally avoided.

Management and Conservation: the suggested seasonal tree cutting range for Indiana bat is between October 1 and March 31 (i.e., no cutting April 1-September 30). This applies throughout the Indiana bat range in Michigan.

Federally Threatened

Northern long-eared bat - Northern long-eared bat (*M. septentrionalis*) numbers in the northeast US have declined up to 99 percent. Loss or degradation of summer habitat, wind turbines, disturbance to hibernacula, predation, and pesticides have contributed to declines in Northern long-eared bat populations. However, no other threat has been as severe to the decline as White-nose Syndrome (WNS). WNS is a fungus that thrives in the cold, damp conditions in caves and mines where bats hibernate. The disease is believed to disrupt the hibernation cycle by causing bats to repeatedly awake thereby depleting vital energy reserves. This species was federally listed in May 2015 primarily due to the threat from WNS.

Although no known hibernacula or roost trees have been documented within 1.5 miles of the project area, this activity occurs within the designated WNS zone (i.e., within 150 miles of positive counties/districts impacted by WNS. In addition, there appears to be suitable habitat within the 1.5-mile buffer. The USFWS has prepared

a dichotomous key to help determine if this action may cause prohibited take of this bat. Please consult the USFWS Endangered Species Page for more information. In addition, there appears to be suitable habitat within the 1.5-mile search buffer.

Also called northern bat or northern myotis, this bat is distinguished from other *Myotis* species by its long ears. In Michigan, northern long-eared bats hibernate in abandoned mines and caves in the Upper Peninsula; they also commonly hibernate in the Tippy Dam spillway in Manistee County. This species is a regional migrant with migratory distance largely determined by locations of suitable hibernacula sites.

Northern long-eared bats typically roost and forage in forested areas. During the summer, these bats roost singly or in colonies underneath bark, in cavities or in crevices of both living and dead trees. Roost trees are selected based on the suitability to retain bark or provide cavities or crevices. Common roost trees in southern Lower Michigan include species of ash, elm and maple. Foraging occurs primarily in areas along woodland edges, woodland clearings and over small woodland ponds. Moths, beetles and small flies are common food items. Like all temperate bats this species typically produces only 1-2 young per year.

Management and Conservation: when there are no known roost trees or hibernacula in the project area, we encourage you to conduct tree-cutting activities and prescribed burns in forested areas during October 1 through March 31 when possible, but you are not required by the ESA to do so. When that is not possible, we encourage you to remove trees prior to June 1 or after July 31, as that will help to protect young bats that may be in forested areas but are not yet able to fly.

Rufa red knot - there does not appear to be suitable habitat within our standard 1.5-mile search buffer. The rufa red knot (*Calidris canutus rufa*) is one of the longest-distance migrants in the animal kingdom, flying some 18,000 miles annually between its breeding grounds in the Canadian Arctic to the wintering grounds at the southern-most tip of South America. Primarily occurring along the Atlantic and Gulf coasts, small groups of this shorebird regularly use the interior of the United States such as the Great Lakes during the annual migration. The Great Lakes shorelines provide vital stopover habitat for resting and refueling during their long annual journey.

The largest concentration of rufa red knots is found in May in Delaware Bay, where the birds stop to gorge on the eggs of spawning horseshoe crabs; a spectacle attracting thousands of birdwatchers to the area. In just a few days, the birds nearly double their weight to prepare for the final leg of their long journey to the Arctic. This species may be especially vulnerable to climate change which affects coastal habitats due to rising sea levels.

Management and Conservation: applies to actions that occur along coastal areas during the Red Knot migratory window of MAY 1 - SEPTEMBER 30.

Eastern massasauga rattlesnake – the project occurs outside of Tier 1 (occupied/high potential habitat) and Tier 2 (potential habitat) eastern massasauga habitat as designated by the US Fish and Wildlife Service. The federal and state threatened eastern massasauga rattlesnake *(Sistrurus catenatus)* is found in a variety of wetland habitats including bogs, fens, shrub swamps, wet meadows, marshes, moist grasslands, wet prairies, and floodplain forests. Eastern massasaugas occur throughout the Lower Peninsula but are not found in the Upper Peninsula. Populations in southern Michigan are typically associated with open wetlands, particularly prairie fens, while those in northern Michigan are better known from lowland coniferous forests, such as cedar swamps. These snakes normally overwinter in crayfish or small mammal burrows often close to the groundwater level and emerge in spring as water levels rise. During late spring, these snakes move into

adjacent uplands they spend the warmer months foraging in shrubby fields and grasslands in search of mice and voles, their favorite food.

Often described as “shy and sluggish”, these snakes avoid human confrontation and are not prone to strike, preferring to leave the area when they are threatened. However, like any wild animal, they will protect themselves from anything they see as a potential predator. Their short fangs can easily puncture skin and they do possess potent venom. Like many snakes, the first human reaction may be to kill the snake, but it is important to remember that all snakes play vital roles in the ecosystem. Some may eat harmful insects. Others like the massasauga consider rodents a delicacy and help control their population. Snakes are also a part of a larger food web and can provide food to eagles, herons, and several mammals.

Management and Conservation: any sightings of these snakes should be reported to the Michigan Department of Natural Resources, Wildlife Division. If possible, a photo of the live snake is also recommended.

USFWS Section 7 Consultation Technical Assistance can be found at:

https://www.fws.gov/midwest/endangered/section7/s7process/index.html

The website offers step-by-step instructions to guide you through the Section 7 consultation process with prepared templates for documenting “no effect.” as well as requesting concurrence on "may affect, but not likely to adversely affect" determinations.

Please let us know if you have questions.

Mike Sanders
Environmental Review Specialist/Zoologist
Sander75@msu.edu
517-284-6215

United States Department of the Interior

FISH AND WILDLIFE SERVICE

2651 Coolidge Road, Suite 101
East Lansing, Michigan 48823-6360

IN REPLY REFER TO:

April 3, 2019

Mr. Frankie Hang
OHM Advisors
3400 Plymouth Road
Livonia, Michigan 48150

Re: Endangered Species Act Section 7 Consultation for City of Owosso State Revolving Fund Project Plan, Shiawassee County, Michigan

Dear Mr. Hang:

Thank you for your letter of March 20, 2019, requesting consultation under the Endangered Species Act of 1973, as amended (Act). The U.S. Environmental Protection Agency (USEPA) regulates your project and you are acting as the non-federal applicant on behalf of your client, City of Owosso (City).

The City proposes to install a new sanitary sewer overflow (SSO) detention tank, diversion chamber and pumping station, and rehabilitation of sanitary sewer pipes and manholes. See project description letter for locations of installations. Proposed activities will occur in Township 7N, Range 2W, Sections 13 and 24, and Township 7N, Range 3E, Sections 18 and 19.

Based on habitat characteristics at the proposed sites, you determined that the project is "not likely to adversely affect" the endangered Indiana bat (*Myotis sodalis*), and threatened northern long-eared bat (*Myotis septentrionalis*; NLEB) and eastern massassauga rattlesnake (*Sistrurus catenatus*) and request our concurrence with your determination.

Indiana Bat

In Michigan, summering Indiana bats roost in trees in riparian, bottomland, and upland forests from approximately April through September. Indiana bats may summer in a wide range of habitats, from highly altered landscapes to intact forests. Roost trees vary considerably in size, but those used by Indiana bat maternity colonies are typically greater than 9 inches dbh. Male Indiana bats have been observed roosting in trees as small as 3 inches dbh.

Northern Long-eared Bats (NLEB)

During the summer, NLEBs typically roost singly or in colonies underneath bark or in cavities, crevices, or hollows of both live and dead trees and/or snags (typically ≥3 inches dbh). This species also roosts in structures, such as barns and sheds, occasionally (particularly when suitable tree roosts are unavailable). These bats forage for insects in upland and lowland woodlots and tree-lined corridors. During the winter, NLEBs hibernate predominantly in caves and abandoned mine portals.

According to your letter and emails, the proposed project may contain suitable habitat for Indiana bat and NLEB, and tree removal will be necessary for this project. You have confirmed that all clearing of potential roost trees would be completed between October 1 and March 31 of the year the project is under construction, when bats are unlikely to be on the landscape. Removing roost trees while the bats are not present on the landscape would avoid direct take of Indiana bats and NLEBs, and any effects to bats returning in spring would be insignificant. We therefore concur that the proposed action is not likely to adversely affect Indiana bat or NLEB.

Eastern Massasauga Rattlesnake (EMR)

Massasaugas are rare and unique snakes found in the upper Midwest and southern Ontario. They live in shallow wetlands areas that have grassy upland areas nearby and use the grassy areas (with few trees and shrubs) to hunt and bask in the sun. Massasaugas eat mostly mice and other small animals, and when not hibernating they are often traveling from one wetland to another. During the winter, the snakes hibernate inside crayfish burrows or beneath vegetation in wetland areas.

We concur with your determination that the proposed project is not likely to affect the massasauga rattlesnake. Although our records do not indicate the presence of Tiers 1 and 2 habitat within or near your project area, your client proposes to assume presence of EMR and implement the below best management practices to ensure no adverse effect.

1. Use wildlife-safe materials for erosion control and site restoration.
2. To increase human safety and awareness of EMR, those implementing the project will watch MDNR's "60-Second Snakes: The Eastern Massasauga Rattlesnake" video (available at https://youtu.be/~PFnXe_e02w), and review the EMR factsheet (available at (https://www.fws.gov/midwest/Endangered/reptiles/eama/eama-fct-sht.html) or call (517) 351-2555.
3. During project implementation, report observations of any federally listed species, including EMR, to the U.S. Fish and Wildlife Service within 24 hours.

Conclusion

This precludes the need for further action on this project as required by the Act. If the project is modified or new information becomes available that indicates listed species or critical habitat may be affected in a manner or to an extent not previously considered, you should reinitiate consultation with this office.

We appreciate the opportunity to cooperate with you in conserving endangered species. If you have any questions regarding these comments, please contact Ms. Tameka Dandridge of this office at 517-351-8315 or tameka_dandridge@fws.gov.

Sincerely,

for Scott Hicks
Field Supervisor

cc: Dan Kennedy, MDNR, Wildlife Division, Lansing

Appendix D.

SSO Detention Tank Site Alternative Analysis

SSO Detention Tank Alternatives Evaluation City of Owosso, Michigan November 20, 2018

INTRODUCTION

The City of Owosso is proceeding with a proposed a 1.0 million gallon (MG) detention tank to reduce the Sanitary Sewer Overflows (SSOs) into the Shiawassee River just downstream from the Shiawassee Street bridge. The SSOs occur in response to heavy rainfall events when the sanitary sewers are overwhelmed with infiltration and inflow. The proposed detention tank will temporarily store the excess flows from the sanitary sewer until the high sewer flow event subsides. Once the flows in the sanitary sewer have decreased, the stored wastewater will be returned to the sanitary sewer at a controlled rate.

The purpose of this report is to describe and compare several alternatives and to recommend a course of action for installing the detention tank. The comparisons will include costs but will also include other factors such as land availability, access for operation and maintenance, ease of operations and logical placement of improvements for future repair work.

Two sites are being considered for the detention tank. One site is located on the south side of Beehler Street between North Chipman and North Lyon Streets on the property formerly occupied by a manufacturing facility. The second site is nearby but on the north side of Beehler Street. The second site currently consists of three privately owned residential lots, two of which have occupied houses. Refer to the proposed tank sites on Figures A, B and C in the Appendix. In each of the alternatives considered, a new connection would be made to the existing 27" sewer next to the river crossing. New sewer pipe would run from the new connection to a diversion chamber and then to the detention tank. There are several alternatives to consider regarding the locations for the tank, diversion chamber, pumping station and interconnecting pipes.

The size of the detention tank was initially recommended and accepted based on the October 2016 SSO CORRECTION PLAN report. The 1.0 MG size is expected to have sufficient storage for a 25-year rainfall event. The proposed pumping station will be capable of producing a maximum filling rate of 2,900 gpm which corresponds to a 10-year frequency storm event. The pumping rate of the station could be increased in the future, if necessary, by installing larger pumps.

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SITE CONTAMINATION

For nearly a century, the site south of Beehler Street had been used for the manufacturing of various items, storage of building materials, the application and storage of industrial liquids including paints, solvents and isocyanates and as a storage facility for vintage automobiles. The most recent building to occupy the site burned down in 2004. The site is currently unoccupied and only a concrete floor slab and below-ground foundations remain.

The site is contaminated and detailed information regarding the contamination can be found in the 2006 Phase I and Phase II Environmental Site Assessments and the 2007 Baseline Environmental Assessment. Soil samples were taken at four locations on the property and at one location on the RR property immediately adjacent to the property. All the samples had exceedances of the Generic Residential Cleanup Criteria (GRCC) and the constituents included heavy metals, benzene and other organic pollutants. Construction procedures to install the retention tank and associated facilities must address the risks of disturbing and handling contaminated soils. If the tank is to be built on the industrial site, then the recommended approach would be to minimize the amount of soils that would be removed from the site.

PROJECT COMPONENTS

The proposed 1.0 MG detention tank, along with several associated facilities, will function to receive, store and return excess flows from the sanitary sewer system. The components of the project include a sewer diversion chamber, a pumping station, the retention tank, a metering vault and the necessary pipes, sewers and manholes to convey flow to and from the separate components of the system. For each component, there are alternatives to consider regarding their location and how they will be constructed.

ONE MILLION GALLON DETENTION TANK

There are two major features of the detention tank that must be considered. The first feature to determine is whether the tank will be above or below ground. A below ground tank can only be considered at the industrial site. Construction of a below ground tank beside the river would be prohibitively expensive due to costs for sheet piling and dewatering. The first decision to make is whether the 1.0 MG tank should be above ground or below ground. The result of that decision drives the feasibility of the remaining alternatives.

The second feature is the tank's material of construction.

Below Ground Tank – For a below ground tank on the industrial site, the excess flows from the 27-inch interceptor sewer along the river would flow to the detention tank by a gravity sewer. An influent metering chamber would regulate the flow into the tank. Small submersible pumps would be used to return the stored liquid back to the river interceptor. The influent metering chamber and pumps would be located at the tank site. The tank would be relatively deep because all of the liquid volume must be stored below the elevation of the sanitary sewer. The tank material would be concrete and it would be installed by cast in place construction. Based on a tank with a footprint of 140 feet by 100 feet and 10 feet of water depth, the bottom of the excavation would be about 30 feet below the ground

surface. Excavated soils equal to the entire volume of the tank would have to be removed from the site. The contamination in the upper several feet of soil could require that some portions of the excavated soils must be disposed of in a landfill. Also, it would be necessary to lower the local groundwater table for some duration of the construction and the liquid may have to be treated or discharged to a sanitary sewer. Localized dewatering for the construction of the tank would likely cause a migration of soluble contaminates known to exist on the adjacent railroad property.

Above Ground Tank – The retention tank can be installed above ground and thereby greatly reduce the disturbance of the soils on the site. For an above ground tank, there must be an associated diversion chamber and pumping station at the riverside interceptor. The submersible pumps would be larger in this alternative because they must respond quickly to relieve the sewer of excessive flows caused by intense rainfall events. The meter chamber in the above ground alternative would be used to control the rate of flow when returning the stored liquid back to the sanitary sewer. The tank would also have an overflow pipe to prevent accidental discharges to the ground if the tank is overfilled.

TABLE 1

COMPARISON OF BELOW GROUND AND ABOVE GROUND DETENTION TANKS

TANK SETTING	PROs	CONs
BELOW GROUND	• Simple Influent structure • Site above the tank can be used for other purposes • Smaller Pumps are required • All mechanical equipment can be at the tank site • The tank can be filled without power • A power failure or a mechanical failure during a storm would not prevent the tank from filling	• Higher cost: Approximately $3,000,000 for constructing the basic tank structure excluding other necessary facilities • Additional cost for landfilling of contaminated soils • Extended dewatering costs • Possible requirement for treating dewatering flow due to contamination • Liability of a deep excavation in the vicinity of an active railroad • The tank would be subject to continuous infiltration pressure from groundwater
ABOVE GROUND	• Lower cost: Range for the basic structure of $810,000 for glass-fused-to-steel to $1,100,000 for pre-stressed concrete • Shorter construction period • Easier and safer access to the tank for inspection or cleaning	• Larger Pumps are required • Larger Generator is required • Pumping Station is located at the River • The tank may not be aesthetically acceptable

SOILS CONSIDERATIONS

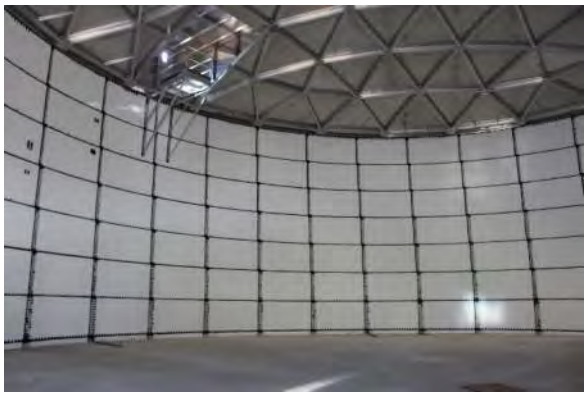
The native soils at the potential tank site on the industrial property are generally lean clays with occasional sand seams that can act as water bearing layers. These clays are overlain with concrete at the surface and about 5 to 6 feet of imported sand fill. The potential tank site on the north side of Beehler Street has lean clays overlain by about 8 inches of topsoil. The lean clay is a suitable bearing material for a tank but the concrete and imported sand fill at the industrial site must be removed and replaced with compacted, engineered fill material.

TANK MATERIAL ALTERNATIVES

Due to the high risks and high costs associated with a below ground detention tank, that option will not be further considered. For the above ground tank, the shape would be circular with a diameter of about 75 feet. The design water depth would be about 31 feet and the freeboard and domed roof would add another 9 feet. The total height would be compatible with the zoning requirements for an I-1 property. Two viable alternatives for the above ground tank are pre-stressed concrete and glass fused-to-steel. Other types of concrete and steel tanks are available but the two alternatives named are the economical and low-maintenance types of these structures.

Pre-Stressed Concrete - This method of construction uses composite wall and roof panels that have a steel core sandwiched between exposed concrete sides. The panels are cast at the job site. After the wall panels have been placed, they are wound with steel pre-stressing wires and a final concrete coating is applied to the exterior. A concrete dome roof encloses the tank. The tank floor is concrete. This type of tank is commonly used in both water and wastewater facilities and it is constructed in conformance with AWWA D110 Type III requirements. If aesthetics are important, a brick façade can be installed around the tank. A plain concrete exterior will exhibit staining and other surface discolorations due to weathering over the course of many years. The concrete could be painted but that would require periodic maintenance and may not present a uniform shade. A brick façade would provide a pleasing appearance with little maintenance but it would add about $100,000 to the cost of the tank. Below are two pictures of pre-stressed concrete tanks. The plain concrete tank is about 14 years old. The tank with the brick façade is four years old.

Glass Fused-to-Steel - This type of tank is comprised of steel panels with glass fused to the steel surface. The panels are bolted together and the lap joints are sealed with a polyurethane compound. The tank is constructed according to AWWA D103 with the glass coating system conforming to Section 12.4 of that specification. The floor is concrete and the geodesic dome is aluminum. The structure does not require painting and maintains a uniform appearance for many decades. The interior of the tank is white which makes visual inspection easier. The typical color is cobalt blue but a limited number of other colors are available. An additional feature is that the tank height could be increased in the future if more storage volume is needed. The ability to raise the tank height must be incorporated into the tank's design at its initial construction. In the pictures below, the left image is of a 12 year old tank and the picture on the right was installed in 2017. The third picture is of the interior of a new tank.



PUMPING STATION, DIVERSION CHAMBER AND METERING VAULT

The pumping station and diversion chamber need to be built near the river interceptor. The station would be connected to the 27" interceptor so that excess flows from the large sewer can be drawn and pumped to the detention tank. The diversion chamber and the pumping station can be built as one structure. Based on the recent study of the Owosso's collection system and based on a 10-year storm event, the diversion chamber and pumping station must be able to draw and pump excess flows at a rate of 2,900 gpm to the detention tank. The estimated cost for the pumping station is based on three submersible pumps with VFDs and a below ground valve vault. The diversion chamber would have gates to separate the flows from the 27" sewer from the return flow from the tank. The pumping station

would be about 18 feet deep. The meter chamber would have an actuated valve or gate to control the return flow from the tank back to the sewer system. Other accessories at these structures include primary power and a backup power generator, flow meters and level sensors, telemetry for SCADA purposes, lighting, fencing, access drive, landscaping, and other site improvements.

ALTERNATIVE LOCATIONS FOR THE PROPOSED FACILITIES

Alternative 1

Refer to Appendix Figure A in which the detention tank is located on the industrial site and the diversion chamber and pumping station are on a single residential lot directly across Beehler Street. This offers the most direct connection from the riverside pumping station to the detention tank on the industrial property. This alternative requires that the City acquire the vacant residential property.

Alternative 2

Refer to Appendix Figure B in which the detention tank is located on the industrial site and the diversion chamber and pumping station are on a triangular parcel at the intersection of Beehler Street and North Chipman Street. The City owns the triangular parcel. The pipes connecting the pumping station and diversion chamber to the detention tank would primarily be installed by a directional drilling method. A proposed sewer connecting the pumping station to the existing 27-inch interceptor would be built parallel to an existing 12-inch sewer beside the river. This alternative requires that the City acquire three additional easements across the backlines of three residential properties.

Alternative 3

Refer to Appendix Figure C in which the detention tank, diversion chamber and pumping station are all located on residential lots directly on the north side of Beehler Street. This alternative puts all the elements of the detention facility together next to the river. The problems and costs associated with contaminated soils at the industrial site would be eliminated in this alternative. However, this alternative requires that Owosso acquires three residential properties for the project. Two of these properties have occupied houses.

TABLE 2

COMPARISON OF ALTERNATIVE TANK DETENTION LOCATIONS

PROJECT ELEMENT	Alternative 1	Alternative 2	Alternative 3
1.0 Million Gallon Ground Level Detention Tank, Glass-Fused-to-Steel	$ 850,000	$ 850,000	$ 810,000
Diversion Chamber, Pumping Station and Meter Chamber including Generator and Control Devices	$ 870,000	$ 870,000	$ 870,000
Conveyance Piping Between Structures	$ 200,000	$ 300,000	$ 100,000
Site Improvements	$ 150,000	$ 150,000	$ 100,000
Subtotal	**$ 2,070,000**	**$ 2,170,000**	**$ 1,880,000**
Contingencies & Technical Services (35%)	$ 730,000	$ 760,000	$ 670,000
Preliminary & Partial Estimate of Project Costs	**$ 2,800,000**	**$ 2,930,000**	**$ 2,550,000**
Additional Cost Considerations – Not Priced Herein			
Number of Easements To Acquire	0	3	0
Number of Residential Properties to Acquire	1	0	3
Requires Some Handling of Contaminated Soils	Y	Y	N

RECOMMENDATION

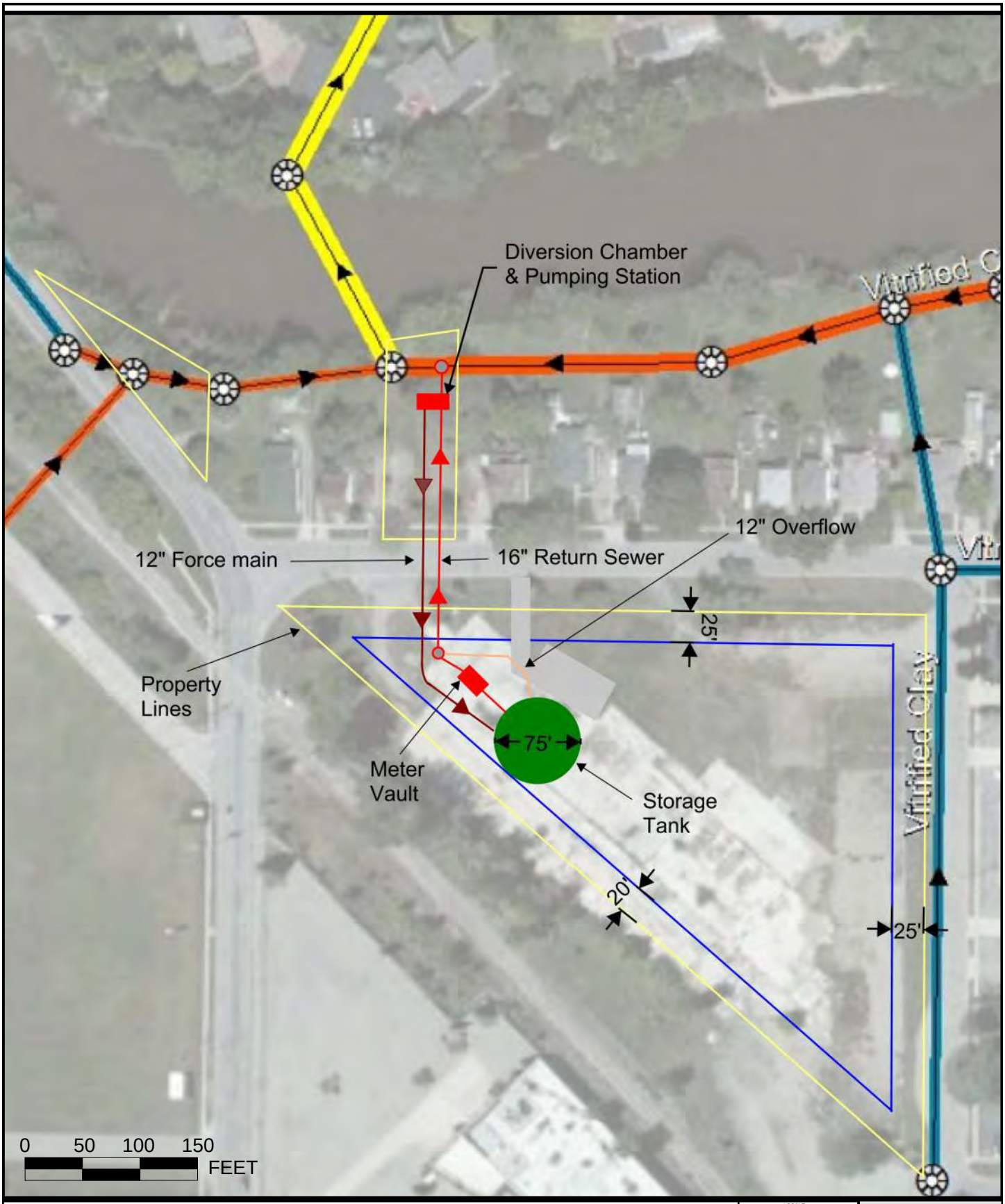
We recommend that Alternative 1 be pursued as the best location for an above ground, glass-fused-to-steel detention tank. It offers the quickest and least complicated means of securing property necessary for installing this facility. If the cost of land acquisition is added into the comparison table, then Alternative 1 is probably also the least-cost alternative. The tank would be located on the industrial site and the diversion chamber and pumping station would be located on the vacant lot across Beehler Street.

Alternative 3 could be considered if the City uses the future proceeds from selling the industrial property to offset the costs to acquire three residential properties. However, the fact remains that the viability of this alternative would be uncertain until all three residential properties, two of which are occupied, can be purchased. The property acquisition requirements of this alternative could be lengthy and complicated.

APPENDIX FIGURES

ALTERNATIVE LOCATIONS FOR THE DETENTION TANK, DIVERSION CHAMBER AND PUMPING STATION

Figure A	Alternative 1
Figure B	Alternative 2
Figure C	Alternative 3



ALTERNATIVE 1

ALTERNATIVE LOCATIONS FOR THE DETENTION TANK, DIVERSION CHAMBER, AND PUMPING STATION

SCALE
H: N/A V: N/A

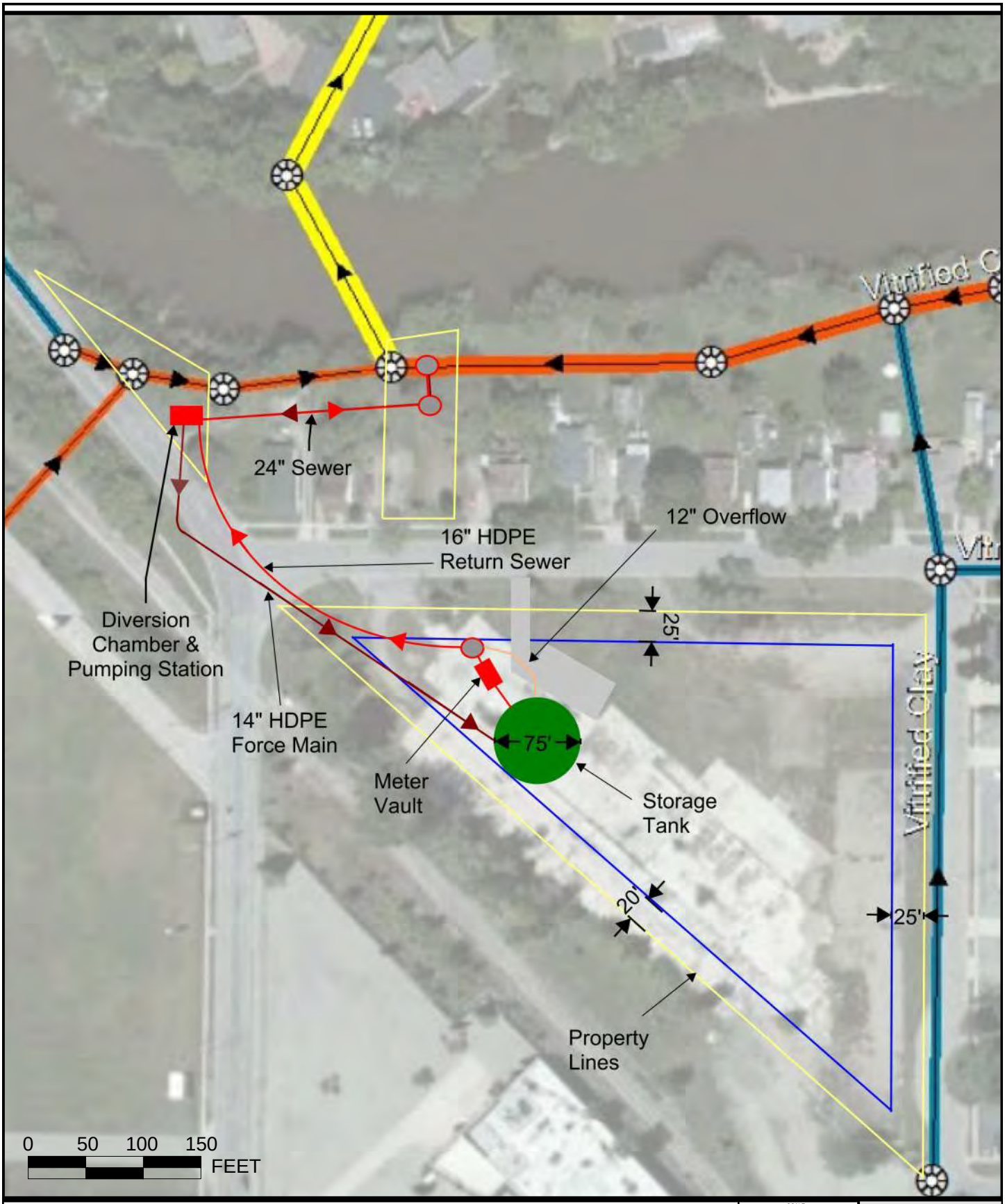
SHEET
FIG. A

CLIENT:
CITY OF OWOSSO

JOB #
0020-18-0020

34000 Plymouth Road | Livonia, MI 48150 | P (734) 522-6711 | F (734) 522-6427 | WWW.OHM-ADVISORS.COM

DRAWING PATH: P:\0000_0100\0020180020_Retention_Basin_Alternatives\Drawings\Facilities\Figures.dwg Oct 26, 2018 - 5:00pm



ALTERNATIVE 2

ALTERNATIVE LOCATIONS FOR THE DETENTION TANK, DIVERSION CHAMBER, AND PUMPING STATION

SCALE
H: N/A V: N/A

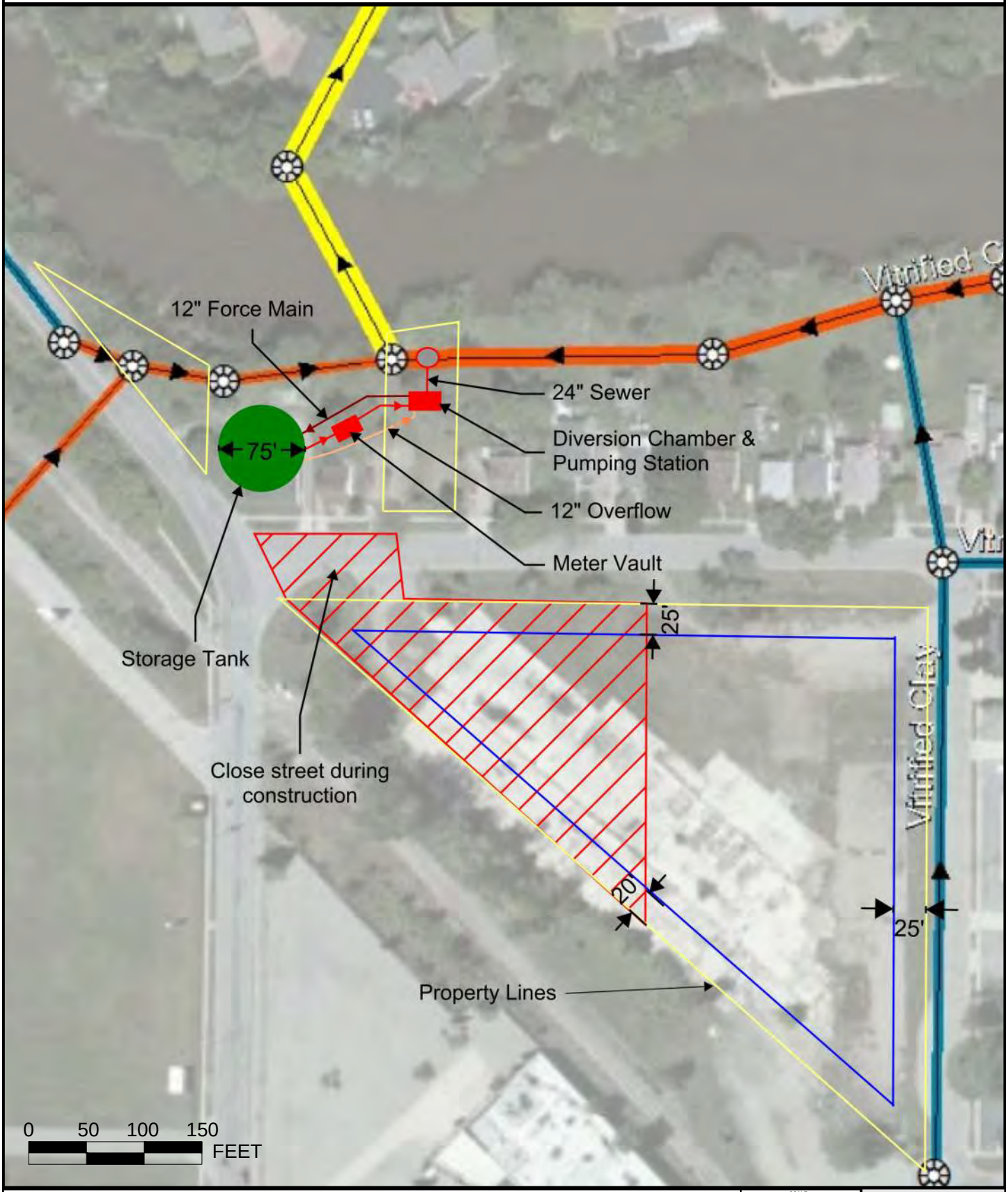
SHEET
FIG. B

CLIENT:
CITY OF OWOSSO

JOB #
0020-18-0020

34000 Plymouth Road | Livonia, MI 48150 | P (734) 522-6711 | F (734) 522-6427 | WWW.OHM-ADVISORS.COM

DRAWING PATH: P:\0000_0100\0020180020_Retention_Basin_Alternatives\Drawings\Facilities\Figures.dwg Oct 26, 2018 - 5:01pm



ALTERNATIVE 3

ALTERNATIVE LOCATIONS FOR THE DETENTION TANK, DIVERSION CHAMBER, AND PUMPING STATION

SCALE
H: N/A V: N/A

SHEET
FIG. C

CLIENT:
CITY OF OWOSSO

JOB #
0020-18-0020

34000 Plymouth Road | Livonia, MI 48150 | P (734) 522-6711 | F (734) 522-6427 | WWW.OHM-ADVISORS.COM

DRAWING PATH: P:\0000_0100\0020180020_Retention_Basin_Alternatives\Drawings\Facilities\Figures.dwg Oct 26, 2018 - 5:01pm

Appendix E.

Sewer and Manhole Condition Assessment and Rehabilitation Summary

Appendix E - Table 1 - Sanitary Sewer Pipe Rehabilitation Summary

	Pipe ID	Upstream Manhole ID	Downstream Manhole ID	Street	Diameter	Pipe Material	Pipe Length	PACP Quick Rating			Rehabilitation Method(s)	Rehabilitation Cost
								Structural	OM	Overall		
1	SGM-0703-002	SNM-0703-003	SNM-0703-002	North & Krust	8	Vitrified Clay Pipe	59	5100	5100	5100	Full Liner	$2,360
2	SGM-1202-007	SNM-1202-007	SNM-1202-006	Kiwanis Village	8	Vitrified Clay Pipe	48	5100	5100	5100	Spot Liner(s), Cleaning	$2,968
3	SGM-1301-022	SNM-1301-021	SNM-1301-020	Water	8	Vitrified Clay Pipe	145	4133	4133	4133	Full Liner	$8,675
4	SGM-1301-043	SNM-1301-042	SNM-1301-041	Saginaw	8	Vitrified Clay Pipe	230	5100	5100	5100	Spot Liner(s), Cutting & Grouting	$6,935
5	SGM-1301-064	SNM-1301-057	SNM-1301-009	Park	8	Vitrified Clay Pipe	171	5142	5142	5142	Full Liner	$8,730
6	SGM-1301-071	SNM-1301-062	SNM-1301-001	Shiawassee	8	Vitrified Clay Pipe	462	5146	5146	5146	Full Liner	$23,953
7	SGM-1302-010	SNM-1302-040	SNM-1302-039	Water	8	Vitrified Clay Pipe	124	5145	5145	5145	Full Liner	$13,707
8	SGM-1302-015	SNM-1302-060	SNM-1302-005	Exchange	8	Vitrified Clay Pipe	213	5342	5342	5342	Full Liner	$8,532
9	SGM-1302-045	SNM-1302-034	SNM-1302-033	Curwood Castle	8	Polyvinyl Chloride	342	5241	5241	5241	Spot Liner(s),	$2,510
10	SGM-1302-057	SNM-1302-026	SNM-1302-025	Pine	8	Vitrified Clay Pipe	304	5241	5241	5241	Full Liner,	$12,518
11	SGM-1302-058	SNM-1301-061	SNM-1302-026	Pine	8	Vitrified Clay Pipe	441	4422	4422	4422	Full Liner,	$17,646
12	SGM-1302-061	SNM-1302-031	SNM-1302-030	Adams	12	Vitrified Clay Pipe	306	534D	534D	534D	Full Liner, Cutting & Grouting,	$23,726
13	SGM-1303-030	SNM-1303-029	SNM-1303-028	Oliver	10	Vitrified Clay Pipe	68	5141	5141	5141	Remove & Replace	$30,050
14	SGM-1303-045	SNM-1303-031	SNM-1303-030	Union	8	Vitrified Clay Pipe	142	5342	5342	5342	Full Liner	$5,664
15	SGM-1303-048	SNM-1303-033	SNM-1303-032	Oliver	8	Vitrified Clay Pipe	334	5132	5132	5132	Cleaning, Spot Liner(s),	$10,194
16	SGM-1303-059	SNM-1303-067	SNM-1303-066	Cedar	6	Vitrified Clay Pipe	95	5121	5121	5121	Spot Liner(s), Cutting & Grouting	$8,357
17	SGM-1303-073	SNM-1303-037	SNM-1303-036	Bradley	10	Polyvinyl Chloride	437	513D	513D	513D	Full Liner	$24,524
18	SGM-1303-086	SNM-1303-072	SNM-1303-071	Shiawassee	8	Vitrified Clay Pipe	130	0000	0000	0000	Relocate 16 Foot Section,	$4,325
19	SGM-1303-087	SNM-1303-074	SNM-1303-073	Shiawassee	8	Vitrified Clay Pipe	42	5131	5131	5131	Remove & Replace	$5,724
20	SGM-1304-020	SNM-1304-020	SNM-1304-019	West of Campbell	24	Reinforced Concrete Pipe	13	5322	5322	5322	Full Liner	$7,529
21	SGM-1304-045	SNM-1304-041	SNM-1304-040	Hanover	8	Vitrified Clay Pipe	224	5244	5244	5244	Full Liner	$8,964
22	SGM-1304-050	SNM-1304-046	SNM-1304-045	Hanover	8	Vitrified Clay Pipe	329	5131	5131	5131	Spot Liner(s),	$2,510
23	SGM-1304-060	SNM-1304-058	SNM-1304-025	Hanover	8	Vitrified Clay Pipe	161	5145	5145	5145	Full Liner	$6,456
24	SGM-1304-077	SNM-1304-071	SNM-1304-013	King	8	Vitrified Clay Pipe	351	5242	5242	5242	Full Liner	$14,036
25	SGM-1304-085	SNM-1304-076	SNM-1304-075	Shiawassee	8	Vitrified Clay Pipe	321	5249	5249	5249	Full Liner	$12,828
26	SGM-1401-024	SNM-1401-024	SNM-1401-023	Buckley	8	Vitrified Clay Pipe	92	5433	5433	5433	Full Liner	$5,285
27	SGM-1401-058	SNM-1401-055	SNM-1401-042	Meadow	8	Vitrified Clay Pipe	348	5231	5231	5231	Remove & Replace,	$31,409
28	SGM-1401-064	SNM-1401-061	SNM-1401-060	Olmstead	8	Brick	46	4100	4100	4100	Spot Liner(s), Lateral Cutting,	$3,005
29	SGM-1402-018	SNM-1402-017	SNM-1402-016	Main	8	Vitrified Clay Pipe	332	5141	5141	5141	Relocate 16 Foot Section, Spot Liner(s)	$6,820
30	SGM-1803-005	SNM-1803-076	SNM-1803-083	Exchange	12	Vitrified Clay Pipe	491	5434	5434	5434	Full Liner	$10,134
31	SGM-1803-008	SNM-1803-058	SNM-1803-003	Mason	8	Polyvinyl Chloride	324	5141	5141	5141	Spot Liner(s), Cleaning	$6,133
32	SGM-1803-015	SNM-1803-067	SNM-1803-066	Gilbert	8	Vitrified Clay Pipe	323	5A4A	5A4A	5A4A	Full Liner	$13,530
33	SGM-1803-042	SNM-1803-006	SNM-1803-005	Dewey	12	Vitrified Clay Pipe	345	5244	5244	5244	Full Liner	$18,182
34	SGM-1803-043	SNM-1803-007	SNM-1803-006	Dewey	12	Vitrified Clay Pipe	489	5144	5144	5144	Full Liner,	$18,164
35	SGM-1803-081	SNM-1803-030	SNM-1804-115	Hickory	8	Vitrified Clay Pipe	265	5141	5141	5141	Full Liner	$10,584
36	SGM-1804-025	SNM-1804-025	SNM-1804-024	Hickory	10	Vitrified Clay Pipe	180	5141	5141	5141	Spot Liner(s),	$9,005
37	SGM-1804-066	SNM-1804-064	SNM-1804-062	Whitehaven	8	Vitrified Clay Pipe	423	5141	5141	5141	Grouting, Spot Liner(s), Lateral Cutting,	$7,279
38	SGM-1804-070	SNM-1804-068	SNM-1804-067	Krust	8	Vitrified Clay Pipe	263	5121	5121	5121	Spot Liner(s), Cutting & Grouting,	$8,775
39	SGM-1804-100	SNM-1804-092	SNM-1804-019	King	8	Vitrified Clay Pipe	326	5121	5121	5121	Spot Liner(s)	$2,500
40	SGM-1804-107	SNM-1804-099	SNM-1804-098	Wiltshire	8	Vitrified Clay Pipe	66	5443	5443	5443	Full Liner,	$10,552
41	SGM-1902-030	SNM-1902-027	SNM-1902-026	McMillan	8	Vitrified Clay Pipe	347	4300	4300	4300	Full Liner	$14,122
42	SGM-1903-011	SNM-1903-008	SNM-1903-007	Corunna	10	Vitrified Clay Pipe	283	5141	5141	5141	Full Liner	$12,749

	Pipe ID	Upstream Manhole ID	Downstream Manhole ID	Street	Diameter	Pipe Material	Pipe Length	PACP Quick Rating			Rehabilitation Method(s)	Rehabilitation Cost
								Structural	OM	Overall		
43	SGM-1903-039	SNM-1903-039	SNM-1903-038	Alger	8	Vitrified Clay Pipe	88	4132	4132	4132	Relocate 16 Foot Section, Spot Liner(s), Heavy Cleaning, Lateral Cutting,	$11,409
44	SGM-1903-063	SNM-1903-010	SNM-1903-009	Grand	8	Polyvinyl Chloride	297	5241	5241	5241	Full Liner,	$11,897
45	SGM-1904-017	SNM-1904-024	SNM-1904-010	Grover	8	Vitrified Clay Pipe	209	3123	5122	5131	Relocate 16 Foot Section	$23,715
46	SGM-1904-028	SNM-1803-001	SNM-1904-051	Dewey	8	Vitrified Clay Pipe	312	5141	5141	5141	Spot Liner(s)	$5,000
47	SGM-1904-040	SNM-1903-063	SNM-1904-021	Woodlawn	10	Vitrified Clay Pipe	286	5846	5846	5846	Relocate 16 Foot Section, Spot Liner(s)	$7,320
48	SGM-1904-045	SNM-1904-049	SNM-1904-022	Maple	10	Vitrified Clay Pipe	692	4H22	4H22	4H22	Full Liner,	$13,991
49	SGM-2301-022	SNM-2301-020	SNM-2301-019	Martin	8	Vitrified Clay Pipe	324	513J	513J	513J	Spot Liner(s), Cutting & Grouting, Lateral Cutting,	$9,290
50	SGM-2301-024	SNM-2301-022	SNM-2301-004	Ash	8	Vitrified Clay Pipe	241	5431	5431	5431	Spot Liner(s), Cleaning	$5,847
51	SGM-2301-042	SNM-2301-037	SNM-2301-036	Youngs	8	Vitrified Clay Pipe	583	5344	5344	5344	Full Liner,	$11,057
52	SGM-2301-043	SNM-2301-038	SNM-2301-037	Youngs	8	Vitrified Clay Pipe	247	5444	5444	5444	Full Liner	$9,892
53	SGM-2301-044	SNM-2301-039	SNM-2301-038	Youngs	8	Vitrified Clay Pipe	231	5344	5344	5344	Full Liner	$9,220
54	SGM-2302-031	SNM-2302-050	SNM-2302-049	Nelson	8	Vitrified Clay Pipe	396	5122	5122	5122	Spot Liner(s),	$5,005
55	SGM-2302-041	SNM-2302-060	SNM-2302-057	Herman	8	Vitrified Clay Pipe	568	5121	5121	5121	Spot Liner, Cutting & Grouting,	$8,531
56	SGM-2302-053	SNM-2302-029	SNM-2302-009	Nafus	8	Vitrified Clay Pipe	65	5443	5443	5443	Full Liner,	$11,913
57	SGM-2401-056	SNM-2401-045	SNM-2401-044	Comstock	8	Vitrified Clay Pipe	298	4134	4134	4134	Full Liner,	$14,123
58	SGM-2401-059	SNM-2401-048	SNM-2401-047	Comstock	8	Vitrified Clay Pipe	200	5241	5241	5241	Heavy Cleaning, Spot Liner(s), Relocate 16 Foot Section,	$8,042
59	SGM-2401-062	SNM-2401-049	SNM-2401-025	Jerome & Saginaw	8	Vitrified Clay Pipe	345	5234	5234	5234	Spot Liner(s),	$5,015
60	SGM-2402-015	SNM-2402-047	SNM-2402-046	Saginaw	8	Vitrified Clay Pipe	83	4531	4531	4531	Relocate 16 Foot Section, Full Liner,	$16,161
61	SGM-2402-024	SNM-2402-030	SNM-2402-029	Michigan	8	Vitrified Clay Pipe	13	4100	4100	4100	Relocate 16 Foot Section, Spot Liner(s),	$6,830
62	SGM-2402-026	SNM-2402-023	SNM-2402-022	Stewart	8	Vitrified Clay Pipe	389	5241	5241	5241	Relocate 16 Foot Section, Spot Liner(s)	$6,820
63	SGM-2402-047	SNM-2402-016	SNM-2402-017	Shiawassee	8	Vitrified Clay Pipe	263	5231	5231	5231	Remove & Replace 10 Foot Section, Full Liner	$18,300
64	SGM-2403-026	SNM-2403-048	SNM-2403-047	Pearce	8	Vitrified Clay Pipe	271	5200	5200	5200	Remove & Replace,	$23,816
65	SGM-2403-048	SNM-2403-011	SNM-2403-010	Lyon	8	Vitrified Clay Pipe	254	5141	5141	5141	Spot Liner(s)	$2,500
66	SGM-2403-054	SNM-2403-018	SNM-2403-017	Mary	8	Vitrified Clay Pipe	101	5100	5100	5100	Grouting, Spot Liner(s)	$5,898
67	SGM-2404-005	SNM-2404-004	SNM-2404-003	South of Lynn	25	Vitrified Clay Pipe	580	4236	4236	4236	Grouting, Full Liner	$162,443
68	SGM-2404-078	SNM-2404-029	SNM-2404-028	Howell	8	Vitrified Clay Pipe	372	463B	463B	463B	Full Liner,	$12,012
	Total Sanitary Sewer Pipe Rehabilitation Cost without contingency, engineering, legal, administration											$887,695

Appendix E - Table 2 - Manhole Rehabilitation Summary

	Structure ID	MACP Quick Rating			Rehabilitation Method	Rehabilitation Cost	Associated Restoration		Total Cost
		Structural	OM	Overall			Structure Location	Estimated Cost	
1	SNM-2404-004	412A	2400	412A	Reset Frame, Full Manhole Liner	$3,400	Driveway	$800	$4,200
2	SNM-2403-068	4126	2100	4127	Replace Chimney	$1,000	Roadway	$950	$1,950
3	SNM-1302-020	4100	2A00	412A	Sewer Cleaning/Vactoring, Replace Chimney	$1,500	Roadway	$950	$2,450
4	SNM-2301-008	4700	2400	4724	Sewer Cleaning/Vactoring, Replace Chimney	$1,500	Roadway	$950	$2,450
5	SNM-2403-008	5136	2100	5136	Sewer Cleaning/Vactoring, Replace Chimney, Full Manhole Liner	$4,500	Roadway	$950	$5,450
6	SNM-2301-021	4124	3321	4133	Sewer Cleaning/Vactoring, Replace Chimney, Full Manhole Liner	$4,500	Roadway	$950	$5,450
7	SNM-2301-019	4114	5121	5141	Sewer Cleaning/Vactoring, Replace Chimney, Full Manhole Liner	$4,500	Roadway	$950	$5,450
8	SNM-2302-013	4100	5121	5141	Sewer Cleaning/Vactoring, Replace Chimney	$1,500	Roadway	$950	$2,450
9	SNM-1803-057	4200	2300	4223	Sewer Cleaning/Vactoring, Replace Chimney	$1,500	Roadway	$950	$2,450
10	SNM-2301-058	4138	2600	4138	Sewer Cleaning/Vactoring, Replace Chimney, Full Manhole Liner	$4,500	Roadway	$950	$5,450
11	SNM-2404-021	4800	2200	4822	Replace Chimney	$1,000	Roadway	$950	$1,950
								Total Manhole Rehabilitation Cost	$39,700

Appendix F.
Public Hearing

NOTICE OF PUBLIC HEARING

The City of Owosso will hold a public hearing on proposed improvements to the City's wastewater collection system for the purpose of receiving comments from interested persons.

The hearing will be held during the Owosso City Council meeting on Monday June 3rd, 2019 from 7:30 P.M. to 9:30 P.M. in the City Hall Council Chambers, 301 West Main Street, Owosso, Michigan 48867.

The purpose of the proposed project is to address improvements at the facilities to comply with regulatory requirements and increase reliability of wastewater service to residents and customers.

Proposed project construction will involve rehabilitation of sanitary sewer pipe and manholes and the construction of a detention tank. The projects will take place in 2020, 2021 and 2022.

Construction-related impacts during sanitary sewer pipe and manhole rehabilitations include temporary soil erosion impacts, utility excavation, noise, and dust generation.

The City is proposing to fund the project with money collected from user charges. The estimated cost to users for the proposed projects result in a total increase of up to $7.38 per quarter. Total cost of the project is estimated at $4,917,000.

Copies of the plan detailing the proposed projects are available for review beginning on Thursday, May 2nd, 2019 at the City of Owosso Clerk's Office located at 301 West Main Street, Owosso, Michigan 48867.

Written comments received before the hearing record is closed on Monday, June 3rd, 2019 at 7:30 P.M. will receive responses in the final project plan. Written comments should be sent to:

Amy K. Kirkland, City Clerk
301 West Main Street
Owosso, Michigan 48867

Appendix H.

Disadvantaged Community Documentation

Disadvantaged Community Status Determination Worksheet

The following data is required from each municipality in order to assess the disadvantaged community status. Please provide the necessary information and return to:

Robert Schneider
Revolving Loan Section
Drinking Water and Municipal Assistance Division
P.O. Box 30817
Lansing, MI 48909-8311
Schneiderr@michigan.gov

If you have any questions please contact Robert Schneider at 517-388-6466

Please check the box this determination is for:

☐ DWRF ☑ SRF

1. Total amount of anticipated debt for the proposed project, if applicable.

   $4,917,400

2. Annual payments on the existing debt for the system.

   $51,975

3. Total operation, maintenance and replacement expenses for the system on an annual basis.

   $1,828,528

4. Number of "residential equivalent users" in the system.

   7964

For determinations made using anticipated debt, a final determination will be made based upon the awarded loan amount.

Appendix I. Administrative Consent Order

Section 1. City of Owosso Sanitary Sewer Overflow Event Summary

Appendix I - City of Owosso Sanitary Sewer Overflow Event Summary

	Event Number	Start Date	End Date	Feature Location	Precipitation [Inch]	Volume [MG]	Description
1	CSO-SSO-19329	2/20/2018	2/23/2018	North bank of Shiawassee River & west of M-52 Bridge	2.76	0.25	Heavy rainfall event resulted in high river elevations & sewer system flow exceeding capacity.
2	CSO-SSO-19329	2/20/2018	2/23/2018	Northwest of M-52 Bridge over Shiawassee River	2.76	0.25	
3	CSO-SSO-19328	2/20/2018	2/23/2018	Manhole at WWTP on Chippewa Trail	2.76	1.2	Bypass pump wastewater from WWTP headworks to Shiwassee River due to extremely high flow during heavy rainfall event.
4	CSO-SSO-18653	4/6/2017	4/6/2017	Northwest of M-52 Bridge over Shiawassee River	2.95	0.069	
5	CSO-SSO-18653	4/6/2017	4/6/2017	Manhole at WWTP on Chippewa Trail	2.95	0.258	
6	CSO-SSO-17886	3/31/2016	3/31/2016	Northwest of M-52 Bridge over Shiawassee River	2.03	0.25	Heavy rainfall & inflow & infiltration resulted in flow exceeding capacity of the system. Overflow from manhole.
7	CSO-SSO-17038	5/15/2014	5/15/2014	North bank of Shiawassee River & west of M-52 Bridge	3.57	0.5	
8	CSO-SSO-17038	5/15/2014	5/15/2014	South bank of Shiawassee River & 100 feet east of Union Street	3.57	0.5	
9	CSO-SSO-17038	5/15/2014	5/15/2014	Manhole at WWTP on Chippewa Trail	3.57	0.5	
10	CSO-SSO-15681	12/22/2013	12/24/2013	Manhole at WWTP on Chippewa Trail	N/A	4	Widespread ice storms downed power lines resulting in total power failure at WWTP. Sewer system surcharge & overflow.
11	CSO-SSO-15705	8/27/2013	8/28/2013	North bank of Shiawassee River & west of M-52 Bridge	3.65	0.5	
12	CSO-SSO-15705	8/27/2013	8/28/2013	South bank of Shiawassee River & 100 feet east of Union Street	3.65	0.015	
13	CSO-SSO-15705	8/27/2013	8/28/2013	Manhole at WWTP on Chippewa Trail	3.65	0.08	
14	CSO-SSO-15680	4/18/2013	4/20/2013	Northwest of M-52 Bridge over Shiawassee River	2.51	0.04	
15	CSO-SSO-15680	4/18/2013	4/20/2013	South bank of Shiawassee River & 100 feet east of Union Street	2.51	0.4	
16	CSO-SSO-15680	4/18/2013	4/20/2013	Manhole at WWTP on Chippewa Trail	2.51	0.3	
17	CSO-SSO-15680	4/18/2013	4/20/2013	Manhole near Corlett Creek outlet & along west bank of Shiawassee River	2.51	0.5	
18	CSO-SSO-15680	4/18/2013	4/19/2013	Manhole along west bank of Shiawassee River by Riverlane Drive	2.51	0.5	
19	CSO-SSO-15679	4/12/2013	4/12/2013	Northwest of M-52 Bridge over Shiawassee River	4.66	0.02	
20	CSO-SSO-15679	4/12/2013	4/12/2013	South bank of Shiawassee River & 100 feet east of Union Street	4.66	0.12	
21	CSO-SSO-14230	3/3/2012	3/3/2012	Chipman Street & south of Oliver Street	N/A	0.5	Plugged sewer resulting in overflow from manhole located in the street.
22	CSO-SSO-13539	6/28/2011	6/28/2011	South bank of Shiawassee River & 100 feet east of Union Street	2.7	0.04	
23	CSO-SSO-13340	5/18/2011	5/20/2011	Northwest of M-52 Bridge over Shiawassee River	3.2	0.25	
24	CSO-SSO-13340	5/18/2011	5/20/2011	South bank of Shiawassee River & 100 feet east of Union Street	3.2	0.5	
25	CSO-SSO-13340	5/18/2011	5/20/2011	Manhole at Jerome Street & east of M-71 (Washington Street) Bridge	3.2	0.25	
26	CSO-SSO-13341	5/15/2011	5/15/2011	Northwest of M-52 Bridge over Shiawassee River	2.84	0.05	
27	CSO-SSO-13341	5/15/2011	5/15/2011	South bank of Shiawassee River & 100 feet east of Union Street	2.84	0.1	
28	CSO-SSO-13341	5/15/2011	5/15/2011	Manhole at Jerome Street & east of M-71 (Washington Street) Bridge	2.84	0.05	
29	CSO-SSO-13184	4/28/2011	4/29/2011	South bank of Shiawassee River & 100 feet east of Union Street	2.4	0.25	
30	CSO-SSO-13184	4/28/2011	4/29/2011	Northwest of M-52 Bridge over Shiawassee River	2.4	0.125	
31	CSO-SSO-13184	4/28/2011	4/29/2011	Manhole at Jerome Street & east of M-71 (Washington Street) Bridge	2.4	0.125	
32	CSO-SSO-12356	4/15/2010	4/15/2010	North bank of Shiawassee River & west of M-52 Bridge	N/A	0.05	Overflow occurred while a construction crew was working to clean an inverted siphon.
33	CSO-SSO-11830	4/28/2009	4/29/2009	Northwest of M-52 Bridge over Shiawassee River	2.8	0.1	
34	CSO-SSO-11830	4/28/2009	4/29/2009	South bank of Shiawassee River & north of intersection of Chipman & Beehler Street	2.8	0.3	
35	CSO-SSO-11830	4/28/2009	4/28/2009	South bank of Shiawassee River & 100 feet east of Union Street	2.8	0.1	
36	CSO-SSO-11146	9/14/2008	9/14/2008	Downstream of M-52 Bridge & upstream of M-71 Bridge	4.65	0.03	
37	CSO-SSO-11146	9/14/2008	9/14/2008	South bank of Shiawassee River & north of intersection of Chipman & Beehler Street	4.65	0.11	
38	CSO-SSO-5950	1/13/2005	1/14/2005	Downstream of M-52 Bridge & upstream of M-71 Bridge	N/A	0.5	Heavy rainfall & snowmelt.
39	CSO-SSO-5187	7/24/2004	7/24/2004	Northwest of M-52 Bridge over Shiawassee River	N/A	0.1	Failure of clay sewer pipe during excavation of a bridge reconstruction project. Overflow from heavy rainfall & snowmelt.
40	CSO-SSO-4801	5/23/2004	5/27/2004	Downstream of M-52 Bridge & upstream of M-71 Bridge	N/A	1	Manhole overflow due to rain & frozen ground.
41	CSO-SSO-3477	3/24/2003	3/24/2003	North bank of Shiawassee River & west of M-52 Bridge	N/A	N/A	Blockage of 6" inverted siphon crossing river. Soil boring pierced clay pipe causing pieces of pipe to block the line.
42	CSO-SSO-2873	7/7/2002	7/8/2002	North bank of Shiawassee River & west of M-52 Bridge	N/A	0.5	Inverted siphon blocked.
43	CSO-SSO-1665	7/16/2001	7/16/2001	Shiawassee Street (M-52) & South Street	N/A	N/A	Sewer blockage (roots). No actual discharge to land surface or water. Green grass surrounding manhole.
44	CSO-SSO-1234	2/9/2001	2/10/2001	Downstream of M-52 Bridge & upstream of M-71 Bridge	N/A	N/A	Manhole overflow due to rain & frozen ground.

Appendix I. Administrative Consent Order

Section 2. ACO Scan

ADMINISTRATIVE CONSENT ORDER

This document results from allegations by the Water Bureau (WB) of the Department of Environmental Quality (DEQ). The DEQ alleges the City of Owosso (City), which owns and operates the Owosso/Mid-Shiawassee Co. Wastewater Treatment Plant located at 1410 Chippewa Trail, Owosso, Shiawassee County, Michigan, is in violation of Part 31, Water Resources Protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA) MCL 324.3101 et seq. The City and the DEQ agree to resolve the violations set forth in the Findings section of this Administrative Consent Order (Consent Order) and to resolve this matter by entry of this Consent Order.

I. STIPULATIONS

The City and the DEQ stipulate as follows:

1.1 The NREPA MCL 324.101 et seq. is an act that controls pollution to protect the environment and natural resources in the state.

1.2 Pollution Control, Part 31, Water Resources Protection, of the NREPA (Part 31), MCL 324.3101 et seq., and the rules promulgated pursuant thereto, provides for the protection, conservation, and the control of pollution of the water resources of the state.

1.3 The DEQ is authorized by Section 3112(2) of Part 31 of the NREPA to enter orders requiring persons to abate pollution, and the director of the DEQ or his designee is delegated under Section 301(b) of the NREPA, MCL 324.301(b) to enter into this Consent Order with the City.

1.4 The City stipulates to the issuance and entry of this Consent Order to comply by consent and stipulates that the termination of this matter by a final order to be entered as a Consent Order is proper and acceptable. The City further agrees not to contest the issuance of this Consent Order. This Consent Order, thus, shall be considered a final order of the DEQ and shall become effective on the date it is signed by the Chief of the WB, delegee of the director, pursuant to Section 301(b) of the NREPA.

1.5 The City and the DEQ agree that the signing of this Consent Order is for settlement purposes only and does not constitute an admission by the City that the law has been violated.

1.6 The city manager as signatory to this Consent Order on behalf of the City agrees and attests that he is fully authorized to assure the compliance of the City with all requirements under this Consent Order.

1.7 The City shall achieve compliance with the aforementioned regulations in accordance with

the requirements contained in Section III, Compliance Program, of this Consent Order.

II. FINDINGS

2.1 Section 3109(2) of Part 31 of the NREPA states: "The discharge of any raw sewage of human origin, directly or indirectly, into any of the waters of the state shall be considered prima facie evidence of a violation of this part by the municipality in which the discharge originated..."

2.2 Section 3109(4) of Part 31 of the NREPA states: A violation of this section is prima fade evidence of the existence of a public nuisance and in addition to the remedies provided for in this part may be abated according to law in an action brought by the attorney general in a court of competent jurisdiction."

2.3 The City is authorized to discharge treated municipal wastewaters from the Owosso/Mid-Shiawassee County wastewater treatment plant (WWTP) to the Shiawassee River in accordance with the effluent limitations and monitoring requirements and other conditions as set forth in its National Pollutant Discharge Elimination System (NPDES) Permit number MI0023752 issued April 20, 2004 and expiring October 1, 2006.

2.4 The City of Corunna, Owosso Township, and Caledonia Township are all tributary to the City's WWTP, but each municipality maintains its own collection system.

2.5 The WWTP has a rated maximum capacity of 12 million gallons/day (MGD). The NPDES permit is based on a design flow rate of 6 MGD. During wet weather conditions, the WWTP has received in excess of 14 MGD. During some storm events, the inflow and infiltration (I/I) into the plant is greater than can be processed by all treatment systems at the WWTP.

2.6 The City has experienced numerous sanitary sewer overflows (SSOs) in the recent past that discharged into surface waters of the state. The chart below lists the SSO events:

Location	Date	Volume	Receiving Water	Cause	Date of Resolution
Wright Street Force Main	12/26/1991	Unknown	Shiawassee River	Force Main Failure	12/2001
Wright Street Force Main	01/09/1996	Unknown	Shiawassee River	Force Main Failure	12/2001

WWTP	01/17/1996	400,000	Shiawassee River	Power outage	01/29/1996
Main Interceptor	02/21/1997-02/22/1997	1,000,000*	Shiawassee River	Main Interceptor unable to handle flow	
Wright Street Force Main	03/24/1997-03/26/1997	30,000	Shiawassee River	Force Main Failure	12/2001
WWTP	05/31/1998	600,000	Shiawassee River	Power outage	05/31/1998
Manhole by Chipman Drain	08/12/1998	600	Shiawassee River	Root mass in manhole blocked flow	
Palmer Street Lift Station	03/18/1999	<1,000	Hopkins Lake	Power outage	05/11/2001
Main Interceptor	09/19/2000	2,000,000*	Shiawassee River	Main Interceptor unable to handle flow	
Manhole by Chipman Drain	09/23-24/00	90,000	Shiawassee River	Roots and Drain unable to handle flow	
Manholes by Chipman Drain and M-52	02/10/2001	<1,000,000*	Shiawassee River	Collection system unable to handle flow	
Shiawassee St @ W South St	07/16/2001	Unknown	No discharge to surface water	Overflow from manhole 07/16/2001	
N bank Shiawassee River W of M-52	07/07/02-07/08/02	5,000	Shiawassee River	Blockage of inverted siphon	

Bridge					
N bank Shiawassee River W of M-52 Bridge	03/24/2003	500	Shiawassee River	Blockage of Inverted siphon by pieces of pipe due to soil borings	08/19/2004
Manhole Overflows just downstream of M-52 Bridge and just upstream of M-71 Bridge	05/23/2004-05/27/2004	>1,000,000*	Shiawassee River	Collection System unable to handle flow	

*Approximate overflow volume

III. COMPLIANCE PROGRAM

IT IS THEREFORE AGREED AND ORDERED THAT the City will take the following actions to prevent further violations of Part 31:

3.1 The City agrees to submit to the DEQ for review and approval an initial work plan based on the existing assessment of the sewer collection system that has priority areas to be remediated identified on it within 30 days of entry into this Consent Order, to the address located in paragraph 3.8 of this Consent Order. The City agrees to submit to the DEQ for review and approval a final work plan within 30 days after receiving approval of the plan from the DEQ addressing the planned remediation of illicit public sector Inflow and Infiltration (I/I) and other major areas of public sector I/I that are upstream of the areas in the City experiencing sanitary sewer overflows (SSO's). The City agrees to submit a summary report annually, due on March 1, with the first one due on March 1, 2006 and the last one due the year after all of the planned illicit I/I and other major I/I removal efforts has been completed, in accordance with the City's final approved work plan. The annual summary report shall consist of the most recent assessment of the sewer collection system. The annual assessment of the sewer collection system shall include the results of the City conducting television inspections of all sewer lines in the priority subbasins, all manhole inspections in the collection system, and smoke testing of the lines; any new information that the assessments of the sewer system identify; a summary of the investigation, assessment and remediation activities completed in the previous calendar year, and the work that is left to be completed in the complete identification and removal of illicit I/I and other major public sector I/I connections to the City's sewer collection system. The City agrees

that the complete assessment of the sewer collection system and the illicit I/I and other major public sector Ill separation efforts will last no longer than five years, beginning with the date that the DEQ approves the final work plan.

3.2 The City agrees to conduct a private sector inspection program in year I and 2 of the five year work plan in paragraph 3.1 of this Consent Order to quantify the number and location of illicit private sector connections to the sewer collection system. When existing sump pump and roof drains connecting to the sanitary sewer are located, the City will immediately initiate an enforcement process beginning with a certified letter from the City to the homeowner in accordance with the City's rules and regulations pursuant to Article IV, Sewer Service, Section 34-101 to Section 34-245 of Chapter 34, Utilities and Services, of the City Code of Ordinances for the City of Owosso. This enforcement process will be initiated with the goal of removing the existing sump pumps and roof drains from the City's sewerage system. A pilot program conducted during year 1 and 2 for the removal of gravity footing drains will also be conducted in order to better define the private sector I/I contribution in the overall sewer model and the actual cost of corrective actions.

3.3 The City agrees to conduct flow monitoring and report the results of the monitoring in its annual report due by no later than March 1 of 2006 and 2007, to the DEQ, Water Bureau, Lansing District Office and as required by paragraph 3.1 of this Consent Order. The City agrees to conduct flow monitoring on the southwest quadrant of the City's sewer collection system and complete it in 2005 and to conduct and complete the flow monitoring for the southeast quadrant in 2006.

3.4 The City agrees that by January 1, 2007, the City will submit a work plan for review and approval that will list a schedule with dates, beginning in 2007, not to exceed ten years for an efficient and appropriate control strategy to reduce or contain I/I from private sector sources and that is equivalent to the remedial design standard of the 25-year/24-hourstorm, using growth conditions and normal soil moisture and in accordance with the DEQ Sanitary Sewer Overflow Policy of December 27, 2002

Some initial options include:

1. I/I reduction including gravity footing drain separation, or

2. Public sector I/I reduction; private sector inflow reduction without gravity footing drain removal, and retention of flow which exceeds system capacity through the use of satellite retention basins or a single basin, or

3. A combination of gravity footing drain separation, retention, and storage.

3.5 If the City and the DEQ determine that retention and related facilities are needed based on the results of the flow monitoring conducted in 2005 and 2006, the City will submit a work plan for review and approval describing necessary size, planned location(s), design, and financing by June 1, 2007. Construction of these facilities shall be completed by December 1, 2010. If the City and the DEQ determine that a combination of gravity footing drain separation, retention, and storage is needed, the work plan for review and approval describing necessary size, planned location(s), design, and financing of the gravity footing drain separation, retention and storage shall be submitted by June 1, 2007. The construction of the retention and storage shall be completed by December 1, 2010 and the gravity footing drain separation shall be completed no later than June 1, 2017.

3.6 The City agrees to submit annual performance reviews to the DEQ Lansing District Office of the operation of the City's sewerage system, including an analysis of the effectiveness of the work completed, pursuant to this Consent Order, in eliminating illicit public and private connections to the sewerage system, thereby reducing the I/I to the sewerage system. The City shall include its first five years of annual performance reviews with its summary report due annually on March 1, in accordance with paragraph 3.1 of this Consent Order. The City shall continue to submit annual performance reviews on March 1 until this Consent Order is terminated in accordance with Section XII of this Consent Order.

3.7 The City agrees to create and pass Rules and Regulations pursuant to its authority of Section 34-203 of Ordinance No 433 of 1985, entitled Rules and Regulations" of the City Code of Ordinances for the City of Owosso. The City shall submit these Rules and Regulations to the DEQ for review and approval within 30 days of entry of this Consent Order. The Rules and Regulations shall be created to ban the construction and connection of potential public and private I/I sources to the City's sewerage system that are not strictly approved by the City and other applicable local, state or federal permitting authorities, including, but not limited to footing drains, rooftop drains and sump pumps; the Rules and Regulations shall list policies and standards for the elimination of existing illicit I/I sources; and the Rules and Regulations shall list an enforcement procedure that the City shall undertake if new illicit connections are discovered.

3.8 The City shall submit all reports, work plans, specifications, schedules, or any other writing required by this section to the Lansing District Supervisor, DEQ-WB-Lansing District, P.O. Box 30242, 4th Floor, North Tower, Lansing, Michigan, 48909. Alternatively, mailings requiring a street address may be sent to the Lansing District Supervisor at DEQ-WB-Lansing District, Constitution Hall, 525 W. Allegan, 4th Floor, North Tower, Lansing, Michigan, 48933. The cover letter with each submittal shall identify the specific paragraph and requirement of this Consent Order that the submittal is intended to satisfy.

IV. DEQ APPROVAL OF SUBMITTALS

4.1 For any work plan, proposal, or other document, excluding applications for permits or licenses, that are required by this Consent Order to be submitted to the DEQ by the City, the following process and terms of approval shall apply.

4.2 All work plans, proposals, and other documents required to be submitted by this Consent Order shall include all of the information required by the applicable statute and/or rule, and all of the information required by the applicable paragraph(s) of this Consent Order.

4.3 In the event the DEQ disapproves a work plan, proposal, or other document, it will notify the City, in writing, specifying the reasons for such disapproval. The City shall submit, within 30 days of receipt of such disapproval, a revised work plan, proposal, or other document which adequately addresses the reasons for the DEQ's disapproval. If the revised work plan, proposal, or other document is still not acceptable to the DEQ, the DEQ will notify the City of this disapproval.

4.4 In the event the DEQ approves with specific modifications, a work plan, proposal, or other document, it will notify the City, in writing, specifying the modifications required to be made to such work plan, proposal, or other document prior to its implementation and the specific reasons for such modifications. The DEQ may require the City to submit, prior to implementation and within 30 days of receipt of such approval with specific modifications, a revised work plan, proposal, or other document which adequately addresses such modifications. If the revised work plan, proposal, or other document is still not acceptable to the DEQ, the DEQ will notify the City of this disapproval.

4.5 Upon DEQ approval, or approval with modifications, of a work plan, proposal, or other document, such work plan, proposal, or other document shall be incorporated by reference into this Consent Order and shall be enforceable in accordance with the provisions of this Consent Order.

4.6 Failure by the City to submit an approvable work plan, proposal, or other document, within the applicable time periods specified above, constitutes a violation of this Consent Order and shall subject the City to the enforcement provisions of this Consent Order, including the stipulated penalty provisions specified in paragraph 9.3.

4.7 Any delays caused by the City's failure to submit an approvable work plan, proposal, or other document when due shall in no way affect or alter the City's responsibility to comply with any other deadline(s) specified in this Consent Order.

4.8 No informal advice, guidance, suggestions, or comments by the DEQ regarding reports, work plans, plans, specifications, schedules or any other writing submitted by the City will be construed as relieving the City of its obligation to obtain written approval, if and when required by this Consent Order.

V. EXTENSIONS

5.1 The City and the DEQ agree that the DEQ may grant the City a reasonable extension of the specified deadlines set forth in this Consent Order. Any extension shall be preceded by a written request in duplicate to the DEQ, WB, Enforcement Unit Chief, Constitution Hall, 525 W. Allegan, P.O. Box 30273, Lansing, Michigan, 48909-7773, and the Lansing District Supervisor at the address in paragraph 3.8, no later than ten business days prior to the pertinent deadline, and shall include:

a. Identification of the specific deadline(s) of this Consent Order that will not be met.

b. A detailed description of the circumstances that will prevent the City from meeting the deadline(s).

c. A description of the measures the City has taken and/or intends to take to meet the required deadline; and

d. The length of the extension requested and the specific date on which the obligation will be met.

The Lansing District Supervisor, in consultation with the Enforcement Unit Chief, shall respond in writing to such requests. No change or modification to this Consent Order shall be valid unless in writing from the DEQ, and if applicable, signed by both parties.

VI. REPORTING

6.1 The City shall verbally report any violation(s) of the terms and conditions of this Consent Order to the Lansing District Supervisor by no later than the close of the next business day following detection of such violation(s) and shall follow such notification with a written report within five business days following detection of such violation(s). The written report shall include a detailed description of the violation(s), as well as a description of any actions proposed or taken to correct the violation(s). The City shall report any anticipated violation(s) of this Consent Order to the above-referenced individual in advance of the relevant deadlines whenever possible.

VII. RETENTION OF RECORDS

7.1 Upon request by an authorized representative of the DEQ, the City shall make available to the DEQ all records, plans, logs, and other documents required to be maintained under this Consent Order or pursuant to Part 31 or its rules. All such documents shall be retained by the City for at least a period of three years from the

date of generation of the record unless a longer period of record retention is required by Part 31 or its rules.

VIII. RIGHT OF ENTRY

8.1 The City shall allow any authorized representative or contractor of the DEQ, upon presentation of proper credentials, to enter upon the premises of the facility at all reasonable times for the purpose of monitoring compliance with the provisions of this Consent Order. This paragraph in no way limits the authority of the DEQ to conduct tests and inspections pursuant to the NREPA and the rules promulgated thereunder, or any other applicable statutory provision.

IX. PENALTIES

9.1 The City agrees to pay to the State of Michigan $2,500 as partial compensation for the cost of investigations and enforcement activities arising from the violations specified in Section II of this Consent Order. Payment shall be made within 30 days of the effective date of this Consent Order in accordance with paragraph 9.6.

9.2 The City agrees to pay a civil fine of $20,000 for the violations specified in Section II of this Consent Order. Payment shall be made within 30 days of the effective date of this Consent Order in accordance with paragraph 9.6.

9.3 For each failure to comply with the provisions of Section III and IV of this Consent Order, the City shall pay stipulated penalties of **$500** per violation per day for 1 to 7 days of violation, **$1000** per violation per day for 8 to 14 days of violation, and **$1500** per violation per day for each day of violation thereafter. Failure to perform any of the following requirements shall be considered separate violations of this Consent Order and are subject to stipulated penalties under this paragraph:

a. Failure to submit an approvable work plan, proposal, or other document by the required dates in accordance with Section III.

b. Failure to implement, complete or comply with any activity or condition required by Section III, including those contained in any approved work plan or other document required to be implemented and completed by Section III; and

c. Failure to submit approvable revised work plans, proposals, or other documents addressing a DEQ disapproval or approval with modifications by the required dates in accordance with paragraphs 4.3 or 4.4.

9.4 For each failure to comply with any other provision of this Consent Order not specified in paragraph 9.3, the City shall pay stipulated penalties of **$500** per violation per day for each day of violation. Failure to perform any of the following

requirements shall be considered separate violations of this Consent Order and are subject to stipulated penalties under this paragraph:

a. Failure to verbally report violations and submit written reports by the required dates in accordance with paragraph 6.1.

b. Failure to retain records on site in accordance with paragraph 7.1.

c. Failure to pay civil fines, costs, or stipulated or interest penalties by the required dates in accordance with this section; and

d. Any other requirement of this Consent Order.

9.5 Stipulated penalties accruing under paragraphs 9.3 or 9.4 shall be paid within 30 days after written demand by the DEQ in accordance with paragraph 9.6.

9.6 The City agrees to pay all funds due pursuant to this agreement by check made payable to the State of Michigan and delivered to the DEQ, Revenue Control Unit, P 0 Box 30657, 525 West Allegan Street, 5th Floor, South Tower, Lansing, Michigan, 48909-8157 To ensure proper credit, all payments made pursuant to this Consent Order must include the **Payment Identification Number WTR3034**.

9.7 The City agrees not to contest the legality of the civil fine or costs paid pursuant to paragraphs 9.1, and 9.2, above. The City further agrees not to contest the legality of any stipulated penalties or interest penalties assessed pursuant to paragraphs 9.3, 9.4 and 9.5, above, but reserves the right to dispute the factual basis upon which a demand by the DEQ for stipulated penalties or interest penalties is made.

X. DISPUTE RESOLUTION

10.1 Unless otherwise provided in this Consent Order, the dispute resolution procedures of this section shall be the City's exclusive mechanism to resolve disputes arising under or with respect to this Consent Order. However, the procedures set forth in this section shall not apply to actions by the state to enforce obligations of the City under this Consent Order. Initiation of dispute resolution shall not be cause for the City to delay the performance of any compliance requirements or response activity.

10.2 Any dispute by the City that arises under this Consent Order shall in the first instance be the subject of informal negotiations between the City and the DEQ (parties). The period of negotiations shall not exceed 20 days from the date of written notice by the City to the DEQ that a dispute has arisen, unless the time period for negotiations is modified by written agreement between the parties. A dispute under this section shall occur when the City sends the DEQ a written notice of dispute. If agreement cannot be reached on any issue within this 20-day

period, the DEQ shall provide a written statement of its decision to the City and, in the absence of initiation of formal dispute resolution by the City under paragraph 10.3, the DEQ's position as outlined in its written informal decision, shall be binding on the parties.

10.3 If the City and the DEQ cannot informally resolve a dispute under paragraph 102, the City may initiate formal dispute resolution by requesting review of the disputed issues by the DEQ, WB Chief. This written request must be filed with the DEQ, WB Chief within 15 days of the City's receipt of the DEQ's informal decision that is issued at the conclusion of the informal dispute resolution procedure set forth in paragraph 10.2. The City's request shall state the issues in dispute; the relevant facts upon which the dispute is based; any factual data, analysis, or opinion supporting its position; and all supporting documentation upon which the City bases its position. Within 21 days of the WB Chief's receipt of the City's request for a review of disputed issues, the WB Chief will provide a written statement of decision to the City, which will include a statement of his/her understanding of the issues in dispute; the relevant facts upon which the dispute is based; any factual data, analysis, or opinion supporting her/his position; and all supporting documentation relied upon by the WB Chief in review of the disputed issues. The WB Chief's time period for review of the disputed issues may be extended by written agreement of the parties.

10.4 The written statement of the WB Chief issued under paragraph 10.3 shall be a final decision and is binding on the parties unless, within 21 days under the Revised Judicature Act after receipt of the DEQ's written statement of decision, the City files a petition for judicial review in a court of competent jurisdiction that shall set forth a description of the matter in dispute, the efforts made by the parties to resolve it, the relief requested, and the schedule, if any, within which the dispute must be resolved to ensure orderly implementation of this Consent Order.

10.5 An administrative record of the dispute shall be maintained by the DEQ. The administrative record shall include all of the information provided by the City pursuant to paragraph *10.3,* as well as any other documents relied upon by the DEQ in making its final decision pursuant to paragraph 10.3. Where appropriate, the DEQ shall allow submission of supplemental statements of position by the parties to the dispute.

10.6 In documented form on any dispute, the City shall have the burden of demonstrating on the administrative record that the position of the DEQ is arbitrary and capricious or otherwise not in accordance with law. In documented form on any dispute initiated by the City, it shall bear the burden of persuasion on factual issues

10.7 Notwithstanding the invocation of dispute resolution procedures under this section, stipulated penalties shall accrue from the first day of any failure or refusal to comply with any term or condition of this Consent Order, but payment shall be

stayed pending resolution of the dispute. Stipulated penalties shall be paid within 30 days after resolution of the dispute. The City shall pay that portion of a demand for payment of stipulated penalties that is not subject to dispute resolution procedures in accordance with and in the manner provided in Section IX (Penalties).

XI. FORCE MAJEURE

11.1 The City shall perform the requirements of this Consent Order within the time limits established herein, unless performance is prevented or delayed by events that constitute a "Force Majeure." Any delay in the performance attributable to a "Force Majeure" shall not be deemed a violation of the City's obligations under this Consent Order in accordance with this section.

11.2 For the purpose of this Consent Order, "Force Majeure" means an occurrence or nonoccurrence arising from causes not foreseeable, beyond the control of, and without the fault of the City, such as: an Act of Cod, untimely review of permit applications or submissions by the DEQ or other applicable authority, and acts or omissions of third parties that could not have been avoided or overcome by the City's diligence and that delay the performance of an obligation under this Consent Order. "Force Majeure" does not include, among other things, unanticipated or increased costs, changed financial circumstances, or failure to obtain a permit or license as a result of the City's actions or omissions.

11.3 The City shall notify the DEQ, by telephone, within 48 hours of discovering any event that causes a delay in its compliance with any provision of this Consent Order. Verbal notice shall be followed by written notice within ten calendar days and shall describe, in detail, the anticipated length of delay, the precise cause or causes of delay, the measures taken by the City to prevent or minimize the delay, and the timetable by which those measures shall be implemented. The City shall adopt all reasonable measures to avoid or minimize any such delay.

11.4 Failure of the City to comply with the notice requirements and time provisions under paragraph 11.3 shall render this Section Xl void and of no force and effect as to the particular incident involved. The DEQ may, at its sole discretion and in appropriate circumstances, waive in writing the notice requirements of paragraph 11.3, above.

11.5 If the parties agree that the delay or anticipated delay was beyond the control of the City, this may be so stipulated, and the parties to this Consent Order may agree upon an appropriate modification of this Consent Order, If the parties to this Consent Order are unable to reach such agreement, the dispute shall be resolved in accordance with Section X (Dispute Resolution) of this Consent Order. The burden of proving that any delay was beyond the reasonable control of the City, and that all the requirements of this Section Xl have been met by the City, rests with the City.

11.6 An extension of one compliance date based upon a particular incident does not necessarily mean that the City qualifies for an extension of a subsequent compliance date without providing proof regarding each incremental step or other requirement for which an extension is sought.

XII. GENERAL PROVISIONS

12.1 With respect to any violations not specifically addressed and resolved by this Consent Order, the DEQ reserves the right to pursue any other remedies to which it is entitled for any failure on the part of the City to comply with the requirements of the NREPA and its rules.

12.2 The DEQ and the City consent to enforcement of this Consent Order in the same manner and by the same procedures for all final orders entered pursuant to Part 31, MCL 324.3101 et seq.; and enforcement pursuant to Part 17, Michigan Environmental Protection Act, of the NREPA, MCL 324.1701 et seq.

12.3 This Consent Order in no way affects the City's responsibility to comply with any other applicable state, federal, or local laws or regulations.

12.4 The WB, at its discretion, may seek stipulated fines or statutory fines for any violation of this Consent Order. However, the WB is precluded from seeking both a stipulated fine under this Consent Order and a statutory fine for the same violation.

12.5 Nothing in this Consent Order is or shall be considered to affect any liability the City may have for natural resource damages caused by the City's ownership and/or operation of the facility. The State of Michigan does not waive any rights to bring an appropriate action to recover such damages to the natural resources.

12.6 In the event the City sells or transfers the facility, it shall advise any purchaser or transferee of the existence of this Consent Order in connection with such sale or transfer. Within 30 calendar days, the City shall also notify the WB Lansing District Supervisor, in writing, of such sale or transfer, the identity and address of any purchaser or transferee, and confirm the fact that notice of this Consent Order has been given to the purchaser and/or transferee. The purchaser and/or transferee of this Consent Order must agree, in writing, to assume all of the obligations of this Consent Order. A copy of that agreement shall be forwarded to the WB Lansing District Supervisor within 30 days of assuming the obligations of this Consent Order.

12.7 The provisions of this Consent Order shall apply to and be binding upon the parties to this action, and their successors and assigns.

12.8 This Consent Order constitutes a civil settlement and satisfaction as to the resolution of the violations specifically addressed herein; however, it does not resolve any criminal action that may result from these same violations.

XIII. TERMINATION

13.1 This Consent Order shall remain in full force and effect until terminated by a written Termination Notice (TN) issued by the DEQ. Prior to issuance of a written TN, the City shall submit a request consisting of a written certification that the City has fully complied with the requirements of this Consent Order and has made payment of any fines, including stipulated penalties, required in this Consent Order. Specifically, this certification shall include:

a. The date of compliance with each provision of the compliance program in Section Ill, and the date any fines or penalties were paid.

b. A statement that all required information has been reported to the district supervisor; and

c. Confirmation that all records required to be maintained pursuant to this Consent Order are being maintained at the facility.

The DEQ may also request additional relevant information. The DEQ shall not unreasonably withhold issuance of a TN.

Signatories

The undersigned CERTIFY they are fully authorized by the party they represent to enter into this Consent Order to comply by consent and to EXECUTE and LEGALLY BIND that party to it.

DEPARTMENT OF ENVIRONMENTAL QUALITY

Richard A. Powers, Chief
Water Bureau

Appendix I. Administrative Consent Order

Section 3. SSO Correction Plan Antecedent Moisture Model Technical Memorandum – October 13, 2016

SSO Correction Plan
Antecedent Moisture Model
Technical Memorandum
City of Owosso MI
October 13, 2016

Introduction

The City of Owosso is experiencing sanitary sewer overflows (SSOs) along the main sanitary interceptor that transports flow to the Wastewater Treatment Plant (WWTP). In 2006 OHM Advisors investigated potential solutions for the City to meet MDEQ regulatory requirements. The 2006 study examined three techniques for addressing the wet weather flows in the City's sanitary sewer system; (1) inflow and infiltration (I/I) source removal, (2) storage, and (3) transport and treat.

With steps taken by the City to reduce wet weather flow from the sanitary system from the 2006 report, the City desires to understand the effectiveness of their past efforts and the future steps they can take to further reduce SSOs. The system was modeled under current conditions to compare to the past model and conditions. This memorandum summarizes the results from the Antecedent Moisture Model (AMM) method, the existing EPA Storm Water Management Model (SWMM) model to calculate the system hydraulics and evaluates improvements.

Key Findings

The 10-year peak City flow rate (Meter M-0) at the Wastewater Treatment Plant (WWTP) has decreased since the 2006 report but has not been reduced to the 30" sanitary sewer interceptor capacity. The historic and current 10-year flow rates are summarized in Table 1. The reductions in peak flow are likely the result of the City's source removal efforts over the last 10 years.

Table 1 Model Results Summary

	10-Year Peak Flow Rate (cfs)	10-Year Peak Flow Rate (GPM)
City of Owosso, 2006 Report	23.1	10,400
City of Owosso, 2004-2006	21.0	9,500
City of Owosso, 2013-2015	19.5	8,800
30" Interceptor Capacity (n=0.017)	15.5	7,800
AV-4, 2015	12.7	5,700

Alternatives were examined using the model to address the remaining capacity deficiency in the interceptor. The most feasible options are construction of a 1 Million Gallon storage basin or the removal of approximately 450 footing drains.

Background

Purpose and Scope

1. *Collect background data and data processing* - The purpose of this task was to gather available rain and flow meter data throughout the City in order to develop the AMM (see Figure 1). Once the data were gathered, meter math was conducted to obtain total flow.
2. *Antecedent Moisture Modeling* - The purpose of using the AMM was to create a continuous hydrologic model that predicts the effects of a wet weather response. The model is calibrated to optimize the accuracy of fit of the predicted model to the observed conditions.
3. *Frequency Analyses* - The purpose of the frequency analyses was to identify the Sanitary Sewer Overflow (SSO) volume for a 10-year recurrence interval for the model using 49 years of rain data from the National Weather Service and air temperature data.

Antecedent Moisture Model

This study utilizes the AMM, which is a continuous hydrologic model that can accurately account for antecedent moisture and its effect on sanitary sewer wet weather response over continually varying climate conditions. Antecedent moisture is a term that describes the relative wetness or dryness of a sewershed. The AMM takes into consideration the ground's moisture and more accurately predicts the sewershed response over an extended period of time using rainfall and air temperature data. A more in-depth description of the AMM is provided in Appendix A.

Hydrology

Development of Antecedent Moisture Models for the City of Owosso Meter M-0 and Meter AV-4

An AMM was developed for the City of Owosso flow entering the WWTP, meter M-0. This is an existing meter installed to collect the sewer flow from the City of Owosso. An existing gauge at the WWTP collected the rain data.

An AMM was developed for the flow entering the temporary meter AV-4. Upstream of the AV-4 meter a temporary gauge was installed to collect the rain data.

Rain and temperature data from the National Weather Service and City of Detroit (1956-2005) were used for the long-term AMM used for the flow frequency analysis. The Detroit long term record was readily available and is in the same climatological region of Owosso to accurately represent the likely statistics of future rainfall and air temperature.

Meter District	Meter Math	Area (Acres)
Northwest	M0 - AV1 - AV3 - AV4	421
East Central	AV4 - AV6 - AV7	569
Southwest	AV7	519
Northeast	AV3	430
West Central	AV1	157
Southeast	AV6	594

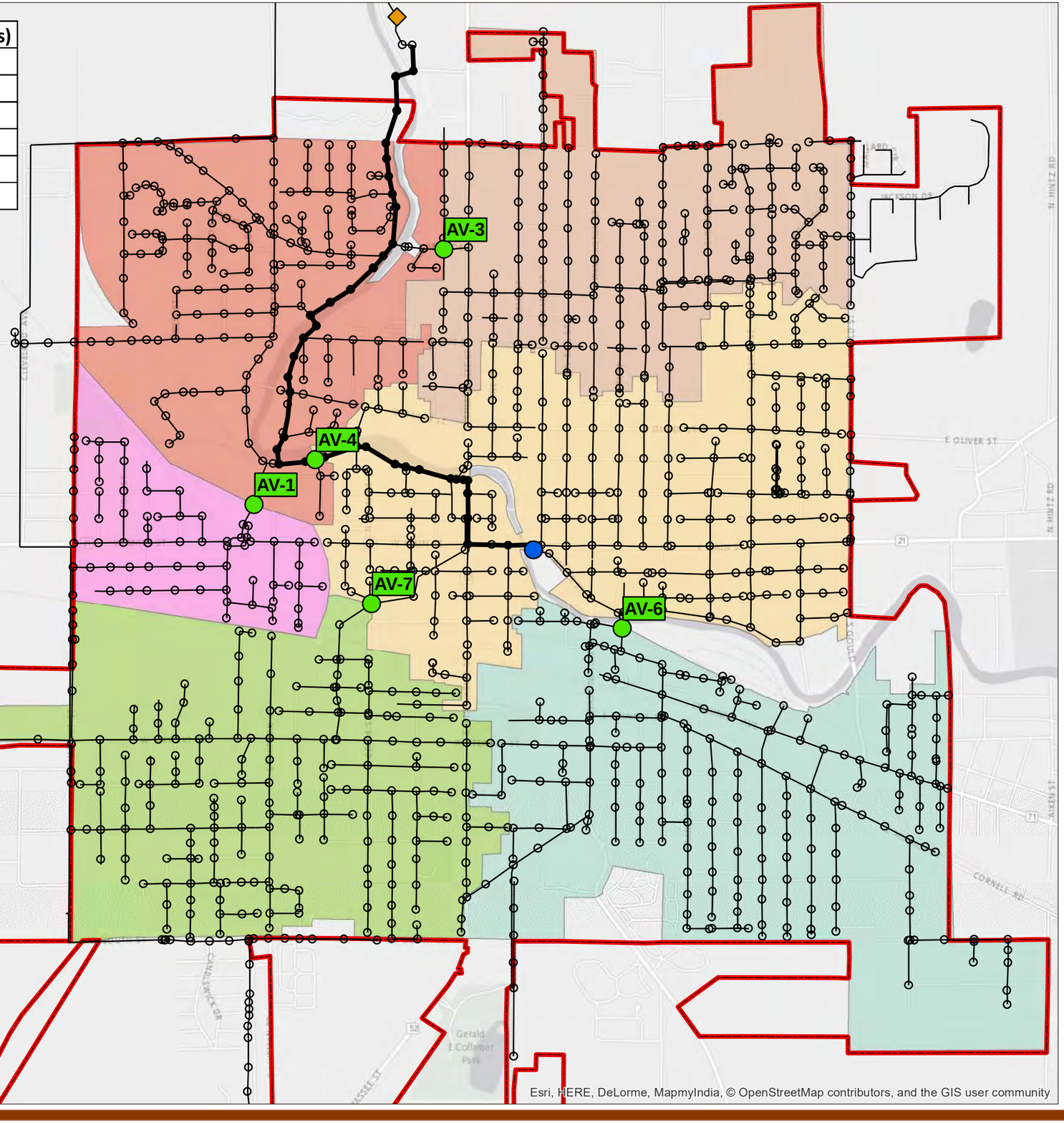


Figure 1
Owosso
SAW Grant
Metering/Modeling

Legend

- WWTP
- 2015 Rain Gauge
- 2015 Meter Locations
- Manholes
- Modeled Manholes
- Sewer
- Modeled Sewer
- Owosso Municipal Boundary

Meter District

- East Central
- Northeast
- Northwest
- Southeast
- Southwest
- West Central

0 1,600 3,200
Feet

1" = 1,600'

Source: Data provided by the City of Owosso and ESRI. OHM Advisors does not warrant the accuracy of the data and/or the map. This document is intended to depict the approximate spatial location of the mapped features within the Community and all use is strictly at the user's own risk.

Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 IntlFeet

Map Published: July 26, 2016

OHM
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P:\0000_0100\0020150011_City_of_Owosso_SAW_Grant_Project_EWRG\GIS\Meter Locations Map_Districts.mxd

Hydrology Model Calibration

Three years (January 2013 through November 2015) of meter data was used to build and calibrate the M-0 AMM. Eleven months (January 2015 – November 2015) of meter data was used to build and calibrate the AV-4 AMM. To calibrate the models, the diurnal flow pattern was filtered out and specific storms were defined. The daily diurnal flow pattern was filtered so that the resulting observed flow signal only contained Inflow and Infiltration (I/I). Storms were chosen based off of the following criteria: the storms had to have a minimum of 0.5 inches of total rainfall and generally consist of uniform rainfall distribution, and the meter data collected during the storm must have a sensible response to the rainfall (i.e. no meter errors or drop-outs). Storms during which the meter data had excess noise or possible errors were excluded. The storms used for AMM's calibration are listed in Table 2.

Table 2 Calibrated Storms

WWTP, M-0	
Storm	Total Rainfall (in)
04/08/13	4.50
05/20/13	0.70
05/22/13	1.10
05/28/13	1.90
07/07/13	0.90
08/27/13	3.90
10/31/13	1.40
05/12/14	1.90
05/14/14	1.68
05/20/14	1.30
05/26/14	1.11
06/18/14	1.07
06/24/14	1.36
07/06/14	2.12
08/19/14	1.27
05/29/15	1.94
06/14/15	1.08
07/07/15	0.76
08/02/15	0.99

AV-4	
Storm	Total Rainfall (in)
06/12/15	0.51
06/14/15	0.82
07/07/15	0.65
07/14/15	0.74
07/16/15	0.52
08/02/15	0.90
09/03/15	0.97
09/07/15	0.96

Hydraulic Model Calibration

Historic hydraulic grade line (HGL) information (2004-2006), collected from the City along the main 30" interceptor during large storm events, was used to calibrate the SWMM hydraulic model. A Manning's n equal to 0.013 would represent a roughness coefficient similar to new concrete. The 2006 analysis yielded a Manning's n equal to 0.015 which is typical for an aging system. When using the historic Manning's n, the modeling yielded SSO's that were a lot smaller than the observed SSO's. Assuming in the past 10 years that the main interceptor has aged, resulting in a larger Manning's n, the recommended roughness coefficient of 0.017 should be used for the existing conditions.

Results

Accuracy of Fit

To quantify the accuracy of the model for peak flows and volumes for each storm, the total errors for peak flow and volume were calculated for each storm as well as the net error of each. Storm events were not included in the analysis when observed data was flawed due to meter malfunction. Net error is the average of all the errors and allows positive and negative values to cancel each other. Total error is the average of the absolute value of the errors. Net error is an indication of the model bias and total error is an indication of the predictive accuracy of the model for specific storms. The goal of this study was to reach a net error close to 0 percent and a total error less than 20 percent. The summary of the calculated net and total errors is listed in Table 3. Negative values indicate that the AMM under-predicts and positive values indicate that the AMM over-predicts the observed flows.

Table 3 Summary of Net and Total Error for the AM Model

WWTP, M-0			
Net Peak Error	Total Peak Error	Net Volume Error	Total Volume Error
0.1%	14.0%	0.2%	9.0%

AV-4			
Net Peak Error	Total Peak Error	Net Volume Error	Total Volume Error
-0.3%	12.9%	1.1%	9.8%

The errors listed in Table 3 reveal that the models were successfully calibrated. The total errors indicate that the AMM's predicted peak flows and peak volumes to within 10-15% of observed values for any given storm. Net errors indicate that the AMM's were not biased towards over- or under-prediction of flows or volumes. These model performances are excellent for a continuous hydrologic model.

Frequency Analyses

Frequency analyses were performed for each model to determine the expected 10-year frequency peak flow rates and SSO volumes. SSO volumes were found by subtracting the capacity of the 30" interceptor, 7800 gpm (17.2 cfs), from the modeled flow rate across the whole 49-year time series and computing the volumes above the WWTP capacity, meter M-0, for each storm event that exceeded the interceptor capacity.

Analyses were performed for the average daily flow rate conditions: the existing daily average flow rate to meter M-0 of 4.9 cfs (2200 gpm) based on yearly data from 2013-2015 and the historic daily average flow rate to meter M-0 of 4.0 cfs (1800 gpm) based on the yearly data from 2003-2006. The expected peak flows and SSO volumes are listed in Tables 4 and 5, respectively.

Table 4 Summary of Peak Flows

	Daily Average Flow Rate (cfs)	10-Year Peak Flow Rate(cfs) (0.10 Annual Probability)	25-Year Peak Flow Rate(cfs) (0.04 Annual Probability)
Historic Conditions (2003-2006), M-0	4.0	21.0	26.0
Existing Conditions (2013-2015), M-0	4.9	19.5	24.2
Existing Conditions (2015), AV-4	1.2	13.2	16.1

Table 5 Summary of SSO Volumes

	Daily Average Flow Rate (cfs)	10-Year SSO Volume (gallons) (0.10 Annual Probability)	25-Year SSO Volume (gallons) (0.04 Annual Probability)
Existing Conditions (2015), AV-4, n=0.013	1.2	14,000	88,000
Existing Conditions (2015), AV-4, n=0.015	1.2	124,000	296,000
Existing Conditions (2015), AV-4, n=0.017	1.2	302,000	1,183,000

The Log Pearson Type III probability was used to describe the peak flow data. The parameters of the function are the mean, variance, and skewness of the data. The plots also include the 95% confidence interval and are illustrated in Appendix B. The 10-year and 25-year SSO volumes were found by linear interpolation of the two points with return frequencies adjacent to the desired return frequency. Different scenarios were completed by changing Manning's n in the model. If the 30" interceptor were to be replaced, the Manning's n would reduce and a smaller storage volume would be needed. But if the interceptor continues to age, increasing Manning's n, a larger storage volume would be required. A table of modeled SSO volumes along with their return frequencies is shown in Appendix C.

The return rates of actual and modeled SSOs were compared. The model predicted an SSO return frequency of once every six years. Table 6 shows recorded SSOs from 2013 to 2015. There are four observed SSOs during this time period which corresponds to a SSO return frequency of roughly once every year. The difference between the modeled SSO frequency and that observed in 2013-2015 can be attributed to the extreme rain events that occurred during these years. The frequency of 3-5 inch and larger rains, which represent 10- or 50-year events, in 2013 and 2014 in Owosso, MI is an unusual rate of large rains. When this is considered, the frequency of SSOs observed is consistent with that predicted by the model. This consistency between the model and the observed SSO frequency provides additional confidence in the model beyond the individual storm accuracy of fits.

Table 6 Estimated SSOs Volume provided by City of Owosso WWTP from 2013 to 2015

Date	Location	Duration (hrs)	Volume (gallons)	Return Period** (year)	Rainfall (in)
04/12/2013	Union, M-52	13	140,000	53	4.66
04/18/2013	Union, M-52, Jerome, Plant	43	770,000	3	2.50
08/27/2013	Union, M-52, Plant	4	100,000	15	3.65
05/15/2014*	Union, M-52, Plant	8	500,000	14	3.57

*No SSOs have been observed since 05/15/2014
**Return Period is assumed based on the 24-hour recurrence interval from Rainfall Atlas of the Midwest.

Alternative Analysis

Two techniques for addressing wet weather flows in a sanitary sewer system considered for this analysis are (1) inflow and infiltration (I/I) source removal and (2) storage. Transport and treat was not considered a viable option due to the anticipated high cost of relieving the interceptor and expanding the plant.

Source removal involves locating defects in the sewer system that are potential sources of I/I, typically, through a sanitary sewer evaluation survey (SSES). Sources of I/I can include manholes, pipes, footing drains, broken cleanouts, roof drains tied into the sanitary system and other system defects. The removal of sewer defects may be cost effective depending on the severity of the defects. Typical repairs include manhole rehabilitation, service lead repairs, spot pipe repairs, grouting of pipe cracks, grouting or joints and sewer replacements. This can remove a substantial amount of I/I from the system and effectively reduce peak flows.

Another potential solution is to provide sufficient storage in the system at an appropriate location to limit flows downstream to the available capacity. This option can allow water above the sewer capacity to be retained in a storage facility during peak flows and be released back into the system when capacity is available after the storm event. This allows a community to utilize their existing sewer system and treatment plant capacity while preventing or limiting the occurrence of SSOs.

The cost-effective solution for any system may include one of these techniques or a combination. Both options were explored and preliminary sizing information is given below. Preliminary opinions of probable costs can be found in Appendix D.

Private I/I Removal

The City of Owosso has approximately 1,000 homes with potential footing drains. It is assumed that each footing drain can contribute up to 0.009 cfs (4 gpm) of flow during wet weather conditions. The estimated opinion of probable cost for the removal of a footing drain is $12,000 for construction, plus contingencies. Based on the existing conditions and the estimated SSO volumes, the total flow removed, footing drain disconnects, and approximate costs are listed in Table 7. In addition, the City of Owosso feels that they may have as many as 200 sump pumps illegally tied into the sanitary sewer system. The City has an existing ordinance preventing such connections. As part of the system upgrade the City can inspect and remove these connections at little or no cost. The benefit of removing these connections would be similar to that of the footing drains. It is estimated that there is potential to remove 1.78 cfs (800 gpm) by eliminating 200 sump pump connections.

Table 7 Summary of SSO Volumes

	Flow Rate Removed (cfs)	Footing Drain Disconnections (FDD's)	Approximate Cost
Existing Conditions (2015), AV-4, n=0.013	0.3	40	$660,000
Existing Conditions (2015), AV-4, n=0.015	2.3	260	$4,310,000
Existing Conditions (2015), AV-4, n=0.017	4.0	450	$7,450,000

Equalization Storage Basin

The modeled 10-year frequency SSO volumes for the existing conditions within the system, compared to the actual observed SSO volumes, will be used to determine the equalization storage basin size.

The City of Owosso has experienced ten SSO events since the last analysis (2008-2014), averaging an estimated overflow of 389,000 gallons per event, with half of the events meeting or exceeding 500,000 gallons. The modeling predicts a 10-year overflow volume with the existing Manning's n of 0.017 of 302,000 gallons. Based on both the observed SSO's and the model results, we recommend a storage volume of at least 500,000 gallons. However due to the economies of scale for construction of an equalization basin, the City may desire to upsize the storage tank to the 25-year storage volume of 1 Million Gallons. The options for basin sizing and the preliminary engineering opinion of probable cost for construction and engineering design are listed in Table 8.

Table 8 Summary of SSO Volumes

	Option #1 10-year Storage	Option #2 25-year Storage	Option #3 Max Site
Gallons	500,000	1,000,000	3,000,000
Cost	$8,800,000	$10,300,000	$16,400,000

The costs in Table 8 are based on completed storage basin construction dollars, the constructed storage volume size and the current Construction Cost Index (CCI). Options #1 and #2 were based on the SSO volume frequency analysis completed for Meter AV-4. Option #3 was based on the proposed location of the storage basin, the site size and assumes that site is suitable for construction.

Conclusions

- The flow and rain data collected from the Owosso, MI collection system was good quality data and sufficient for developing an accurate model.

- The developed continuous antecedent moisture model accurately matched the observed flow data and is consistent with the observed SSO frequency. This provides a high degree of confidence in the use of the model for sizing SSO control improvements.

- Although the Federal Clean Water Act prohibits SSOs, the State of Michigan had accepted a 10-year frequency as a reasonable design standard for facilities to control SSOs. The resulting 10-year storage volume for the Owosso 30" Interceptor near AV-4 is 302,000 gallons for a Manning's n of 0.017 (estimated existing conditions).

- Two options were provided for the City to address the SSO's; private I/I removal and an equalization storage basin. The City may choose one or a combination of these techniques. The City may desire to upsize the storage tank to account for various design factors such as a greater design standard, aging of the system, the number of observed SSO's or an increase in rainfall due to climate change. This report provides the resulting storage volumes for several scenarios to aid the City in selecting a design basis they are comfortable with.

Appendix A: Antecedent Moisture Model (AMM) Description

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Antecedent Moisture Model (AMM) Description

I/I into sanitary collection systems occurs through a complex series of mechanisms that include direct and indirect inflow, seepage into manholes, sewer defects, footing drains and numerous other sources. Because of the complex transport mechanisms of these flow sources, they are heavily dependent on variables that are not normally included in traditional stormwater-based models for I/I such as soil moisture conditions and ground water levels. These variables continuously change during storms and in between storms in response to antecedent moisture conditions. The AMM used for this study takes into account the overall antecedent moisture condition of the sewershed, resulting in a more accurate model based on the sewer system's response to wet weather.

In order to account for the effects of antecedent moisture, the AM modeling technique is based on system identification theory. The model utilizes tools from the fields of digital signal processing, control systems and time series analysis to model variable I/I using data-based models. System identification is the approach of identifying the most appropriate and simplest numerical model that accurately describes the observed data and then gaining insight into the physical characteristics of the system through interpretation of the resulting model structure. A block diagram of the resulting antecedent model structure is depicted in Figure 1. Note that the model structure contains an antecedent moisture block that is automatically modified based on the recent rainfall and temperature conditions. This approach allows the model to simulate the variation in capture coefficients that occur as a result of antecedent moisture conditions. The resulting numerical model structure identifies physical phenomenon from the data such as fast dynamics (inflow) and slow dynamics (infiltration), long term ground water flow variations, and responses to previous rainfall and temperature (antecedent moisture). In some cases, the system identification process also uncovers other phenomenon such as river inflow or system deterioration.

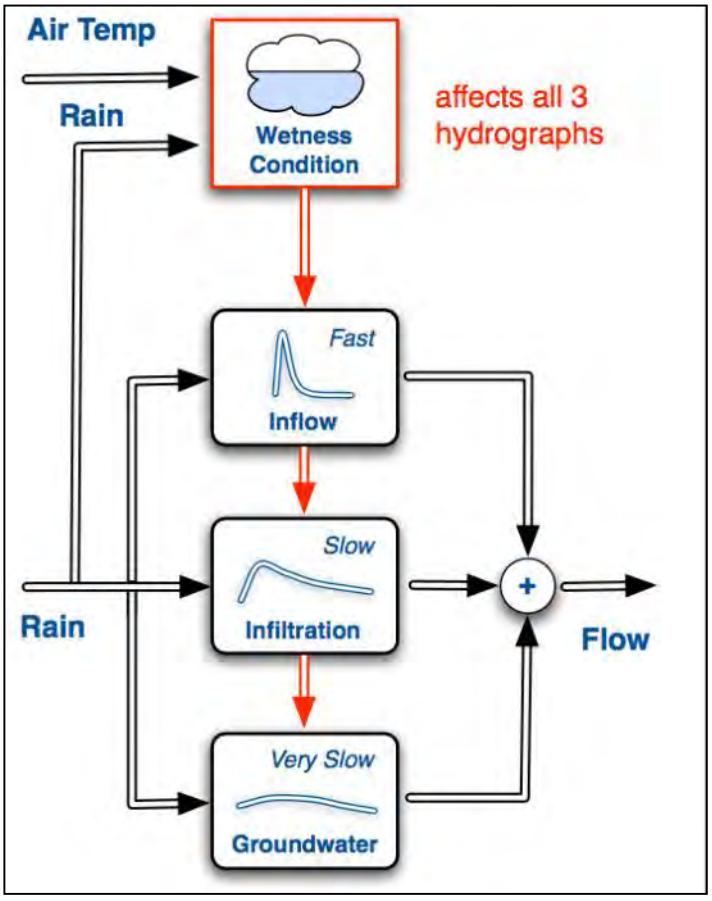

Figure 1 Antecedent Moisture Model Structure

Appendix B: Peak Flow Rate Frequency Analysis

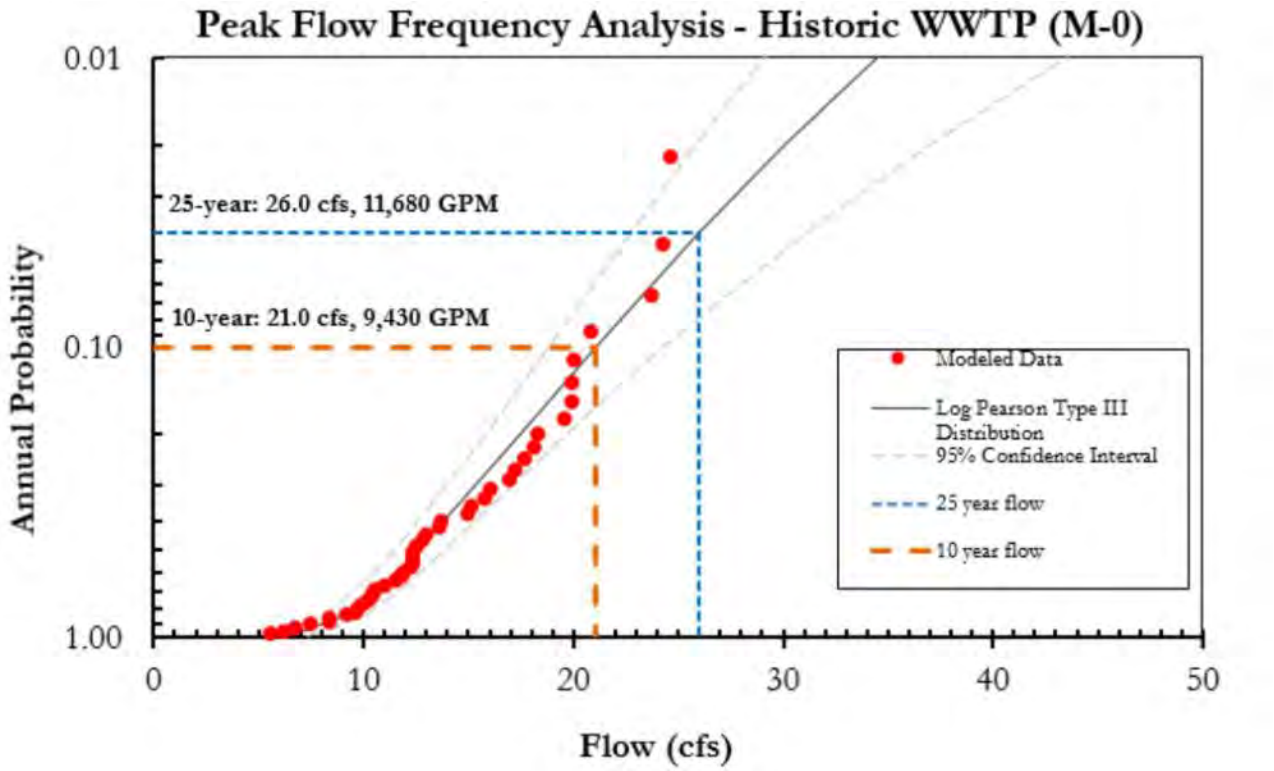

Figure 2 Peak Flow Frequencies for Historic Conditions
Average Daily Flow of 4.0 cfs
2003-2006

Table 1 Peak Flow Frequencies for Existing Conditions
Average Daily Flow of 4.0 cfs
2003-2006

Rank	Year	Annual Peak Q (cfs)	Annual Peak Q (gpm)	Log(Q)	Annual Probability	Return Frequency
1	1975	24.62	11,100	1.39	0.02	45.0
2	1956	24.29	10,900	1.39	0.04	22.5
3	1981	23.80	10,700	1.38	0.07	15.0
4	1986	20.87	9,400	1.32	0.09	11.3
5	1964	20.09	9,100	1.30	0.11	9.0
6	2000	20.00	9,000	1.30	0.13	7.5
7	2005	19.93	9,000	1.30	0.16	6.4
8	1967	19.65	8,900	1.29	0.18	5.6
9	1968	18.38	8,300	1.26	0.20	5.0
10	1965	18.17	8,200	1.26	0.22	4.5
11	1972	17.72	8,000	1.25	0.24	4.1
12	2004	17.24	7,800	1.24	0.27	3.8
13	1988	16.96	7,700	1.23	0.29	3.5
14	1985	16.09	7,300	1.21	0.31	3.2
15	1974	15.82	7,100	1.20	0.33	3.0
16	1957	15.19	6,900	1.18	0.36	2.8
17	1976	14.98	6,800	1.18	0.38	2.6
18	1960	13.75	6,200	1.14	0.40	2.5
19	1993	13.63	6,200	1.13	0.42	2.4
20	1969	13.00	5,900	1.11	0.44	2.3
21	1989	12.79	5,800	1.11	0.47	2.1
22	1999	12.56	5,700	1.10	0.49	2.0
23	1997	12.42	5,600	1.09	0.51	2.0
24	1970	12.37	5,600	1.09	0.53	1.9
25	2003	12.34	5,600	1.09	0.56	1.8
26	2001	12.31	5,600	1.09	0.58	1.7
27	1961	11.93	5,400	1.08	0.60	1.7
28	1958	11.87	5,400	1.07	0.62	1.6
29	1994	11.58	5,200	1.06	0.64	1.6
30	1987	11.01	5,000	1.04	0.67	1.5
31	1990	10.54	4,800	1.02	0.69	1.5
32	1979	10.51	4,800	1.02	0.71	1.4
33	1963	10.39	4,700	1.02	0.73	1.4
34	1991	10.21	4,600	1.01	0.76	1.3
35	1966	9.95	4,500	1.00	0.78	1.3
36	1980	9.79	4,400	0.99	0.80	1.3
37	1962	9.70	4,400	0.99	0.82	1.2
38	1977	9.18	4,200	0.96	0.84	1.2
39	1971	8.45	3,800	0.93	0.87	1.2
40	1959	8.39	3,800	0.92	0.89	1.1
41	1998	7.51	3,400	0.88	0.91	1.1
42	1978	6.81	3,100	0.83	0.93	1.1
43	2002	6.25	2,900	0.80	0.96	1.0
44	1983	5.64	2,600	0.75	0.98	1.0

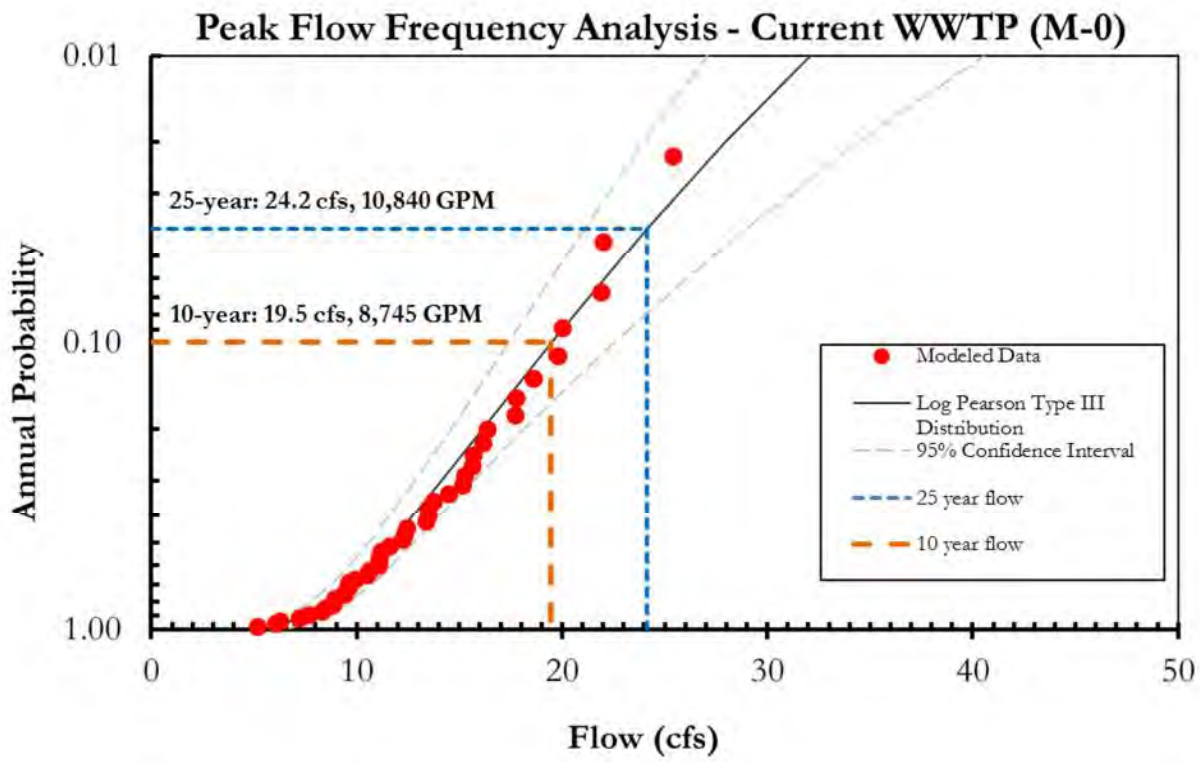

Figure 3 Peak Flow Frequencies for Current Conditions
Average Daily Flow of 4.9 cfs
2013-2015

Table 2 Peak Flow Frequencies for Current Conditions
Average Daily Flow of 4.9 cfs
2013-2015

Rank	Year	Annual Peak Q (cfs)	Annual Peak Q (gpm)	Log(Q)	Annual Probability	Return Frequency
1	1956	25.36	11,400	1.40	0.02	45.00
2	1981	21.98	9,900	1.34	0.04	22.50
3	1975	21.91	9,900	1.34	0.07	15.00
4	2000	20.00	9,000	1.30	0.09	11.25
5	1967	19.80	8,900	1.30	0.11	9.00
6	1986	18.60	8,400	1.27	0.13	7.50
7	2005	17.75	8,000	1.25	0.16	6.43
8	1964	17.70	8,000	1.25	0.18	5.63
9	1968	16.35	7,400	1.21	0.20	5.00
10	1965	16.12	7,300	1.21	0.22	4.50
11	1972	15.68	7,100	1.20	0.24	4.09
12	1974	15.59	7,000	1.19	0.27	3.75
13	2004	15.22	6,900	1.18	0.29	3.46
14	1988	15.16	6,900	1.18	0.31	3.21
15	1985	14.45	6,500	1.16	0.33	3.00
16	1993	13.71	6,200	1.14	0.36	2.81
17	1976	13.49	6,100	1.13	0.38	2.65
18	1957	13.47	6,100	1.13	0.40	2.50
19	1999	13.38	6,100	1.13	0.42	2.37
20	1969	12.40	5,600	1.09	0.44	2.25
21	1961	12.31	5,600	1.09	0.47	2.14
22	1960	12.23	5,500	1.09	0.49	2.05
23	1989	11.57	5,200	1.06	0.51	1.96
24	1997	11.17	5,100	1.05	0.53	1.88
25	1970	11.12	5,000	1.05	0.56	1.80
26	2003	11.07	5,000	1.04	0.58	1.73
27	2001	11.07	5,000	1.04	0.60	1.67
28	1958	10.59	4,800	1.02	0.62	1.61
29	1994	10.47	4,700	1.02	0.64	1.55
30	1987	9.90	4,500	1.00	0.67	1.50
31	1991	9.60	4,400	0.98	0.69	1.45
32	1979	9.59	4,400	0.98	0.71	1.41
33	1990	9.42	4,300	0.97	0.73	1.36
34	1963	9.37	4,300	0.97	0.76	1.32
35	1966	8.93	4,100	0.95	0.78	1.29
36	1980	8.87	4,000	0.95	0.80	1.25
37	1962	8.81	4,000	0.95	0.82	1.22
38	1959	8.44	3,800	0.93	0.84	1.18
39	1977	8.28	3,800	0.92	0.87	1.15
40	1971	7.65	3,500	0.88	0.89	1.13
41	1998	7.18	3,300	0.86	0.91	1.10
42	1978	6.25	2,900	0.80	0.93	1.07
43	2002	6.05	2,800	0.78	0.96	1.05
44	1983	5.13	2,400	0.71	0.98	1.02

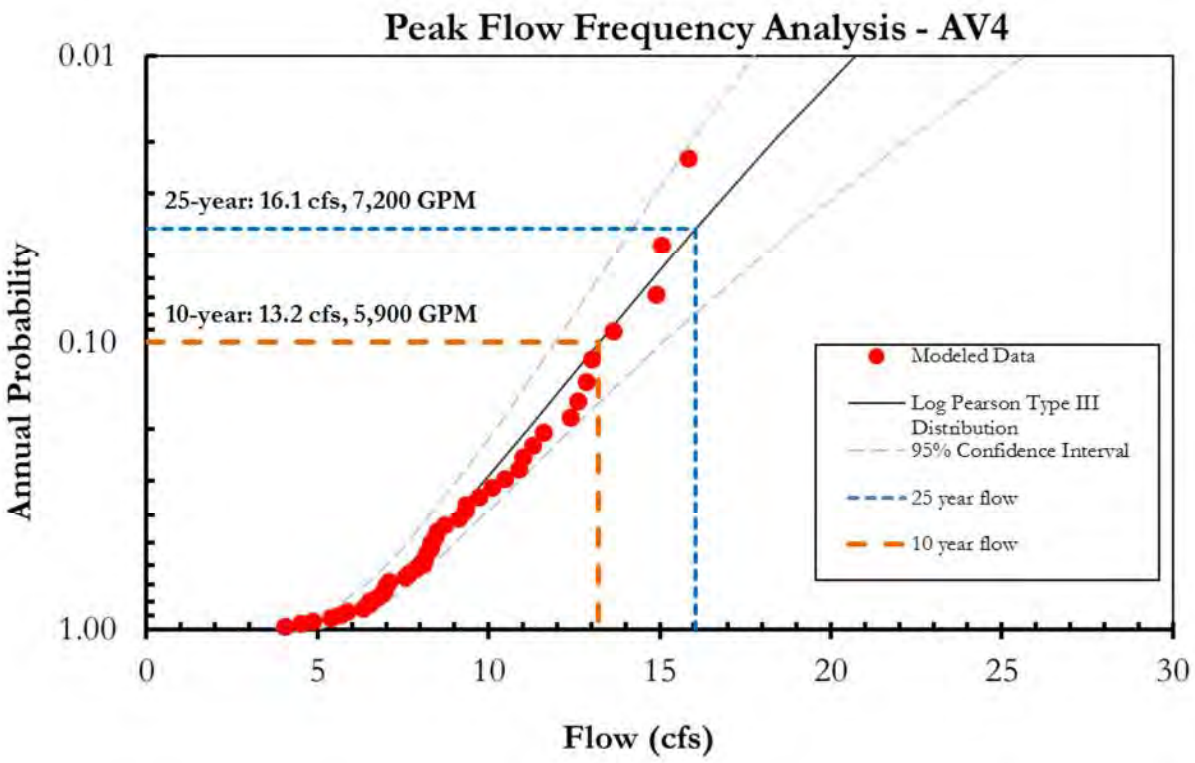

Figure 4 Peak Flow Frequencies for AV-4
Average Daily Flow of 1.2 cfs
2015

Table 3 Peak Flow Frequencies for AV-4
Average Daily Flow of 1.2 cfs
2015

Rank	Year	Annual Peak Q (cfs)	Annual Peak Q (gpm)	Log(Q)	Annual Probability	Return Frequency
1	1956	15.81	7,100	1.20	0.02	44.00
2	1975	15.05	6,800	1.18	0.05	22.00
3	1981	14.90	6,700	1.17	0.07	14.67
4	1986	13.63	6,200	1.13	0.09	11.00
5	1967	13.01	5,900	1.11	0.11	8.80
6	1964	12.84	5,800	1.11	0.14	7.33
7	2005	12.61	5,700	1.10	0.16	6.29
8	1968	12.39	5,600	1.09	0.18	5.50
9	1965	11.61	5,300	1.06	0.20	4.89
10	1972	11.29	5,100	1.05	0.23	4.40
11	1974	10.98	5,000	1.04	0.25	4.00
12	1988	10.87	4,900	1.04	0.27	3.67
13	2004	10.46	4,700	1.02	0.30	3.38
14	1985	10.08	4,600	1.00	0.32	3.14
15	1957	9.71	4,400	0.99	0.34	2.93
16	1993	9.34	4,200	0.97	0.36	2.75
17	1976	9.30	4,200	0.97	0.39	2.59
18	1960	9.12	4,100	0.96	0.41	2.44
19	1999	8.70	4,000	0.94	0.43	2.32
20	2001	8.48	3,900	0.93	0.45	2.20
21	2003	8.42	3,800	0.93	0.48	2.10
22	1997	8.31	3,800	0.92	0.50	2.00
23	1969	8.29	3,800	0.92	0.52	1.91
24	1961	8.18	3,700	0.91	0.55	1.83
25	1989	8.10	3,700	0.91	0.57	1.76
26	1970	8.09	3,700	0.91	0.59	1.69
27	1958	7.87	3,600	0.90	0.61	1.63
28	1994	7.68	3,500	0.89	0.64	1.57
29	1987	7.56	3,400	0.88	0.66	1.52
30	1963	7.09	3,200	0.85	0.68	1.47
31	1991	6.99	3,200	0.84	0.70	1.42
32	1990	6.95	3,200	0.84	0.73	1.38
33	1979	6.90	3,100	0.84	0.75	1.33
34	1966	6.74	3,100	0.83	0.77	1.29
35	1962	6.52	3,000	0.81	0.80	1.26
36	1980	6.51	3,000	0.81	0.82	1.22
37	1977	6.32	2,900	0.80	0.84	1.19
38	1971	5.84	2,700	0.77	0.86	1.16
39	1959	5.67	2,600	0.75	0.89	1.13
40	1998	5.37	2,500	0.73	0.91	1.10
41	1978	4.84	2,200	0.69	0.93	1.07
42	2002	4.50	2,100	0.65	0.95	1.05
43	1983	4.04	1,900	0.61	0.98	1.02

Appendix C: SSO Volume Frequency Analysis

Table 4 SSO Volumes for Existing Conditions
Average Daily Flow of 4.9 cfs, Mannings n = 0.013

Rank	Year	Annual Peak Volume (gallons)	Annual Probability	Return Frequency
1	1956	161,074	0.02	44.0
2	1975	64,347	0.05	22.0
3	1981	54,039	0.07	14.7
4	1986	19,756	0.09	11.0
5	1967	3,146	0.11	8.8
6	1957	0	0.14	7.3
7	1958	0	0.16	6.3
8	1959	0	0.18	5.5
9	1960	0	0.20	4.9
10	1961	0	0.23	4.4
11	1962	0	0.25	4.0
12	1963	0	0.27	3.7
13	1964	0	0.30	3.4
14	1965	0	0.32	3.1
15	1966	0	0.34	2.9
16	1968	0	0.36	2.8
17	1969	0	0.39	2.6
18	1970	0	0.41	2.4
19	1971	0	0.43	2.3
20	1972	0	0.45	2.2
21	1974	0	0.48	2.1
22	1976	0	0.50	2.0
23	1977	0	0.52	1.9
24	1978	0	0.55	1.8
25	1979	0	0.57	1.8
26	1980	0	0.59	1.7
27	1983	0	0.61	1.6
28	1985	0	0.64	1.6
29	1987	0	0.66	1.5
30	1988	0	0.68	1.5
31	1989	0	0.70	1.4
32	1990	0	0.73	1.4
33	1991	0	0.75	1.3
34	1993	0	0.77	1.3
35	1994	0	0.80	1.3
36	1997	0	0.82	1.2
37	1998	0	0.84	1.2
38	1999	0	0.86	1.2
39	2001	0	0.89	1.1
40	2002	0	0.91	1.1
41	2003	0	0.93	1.1
42	2004	0	0.95	1.0
43	2005	0	0.98	1.0

A linear interpolation of the SSO volumes ranked 4 and 5 gives a 10-Year SSO volume of 14,000 gallons.
A linear interpolation of the SSO volumes ranked 1 and 2 gives a 25-Year SSO volume of 88,000 gallons.

Table 5 SSO Volumes for Existing Conditions
Average Daily Flow of 4.9 cfs, Mannings n = 0.015

Rank	Year	Annual Peak Volume (gallons)	Annual Probability	Return Frequency
1	1956	548,823	0.02	44.0
2	1975	215,970	0.05	22.0
3	1981	167,530	0.07	14.7
4	1967	147,565	0.09	11.0
5	1986	86,603	0.11	8.8
6	1964	78,360	0.14	7.3
7	2005	46,046	0.16	6.3
8	1968	40,149	0.18	5.5
9	1965	19,093	0.20	4.9
10	1972	10,651	0.23	4.4
11	1974	2,357	0.25	4.0
12	1957	0	0.27	3.7
13	1958	0	0.30	3.4
14	1959	0	0.32	3.1
15	1960	0	0.34	2.9
16	1961	0	0.36	2.8
17	1962	0	0.39	2.6
18	1963	0	0.41	2.4
19	1966	0	0.43	2.3
20	1969	0	0.45	2.2
21	1970	0	0.48	2.1
22	1971	0	0.50	2.0
23	1976	0	0.52	1.9
24	1977	0	0.55	1.8
25	1978	0	0.57	1.8
26	1979	0	0.59	1.7
27	1980	0	0.61	1.6
28	1983	0	0.64	1.6
29	1985	0	0.66	1.5
30	1987	0	0.68	1.5
31	1988	0	0.70	1.4
32	1989	0	0.73	1.4
33	1990	0	0.75	1.3
34	1991	0	0.77	1.3
35	1993	0	0.80	1.3
36	1994	0	0.82	1.2
37	1997	0	0.84	1.2
38	1998	0	0.86	1.2
39	1999	0	0.89	1.1
40	2001	0	0.91	1.1
41	2002	0	0.93	1.1
42	2003	0	0.95	1.0
43	2004	0	0.98	1.0

A linear interpolation of the SSO volumes ranked 4 and 5 gives a 10-Year SSO volume of 124,000 gallons.
A linear interpolation of the SSO volumes ranked 1 and 2 gives a 25-Year SSO volume of 296,000 gallons.

Table 6 SSO Volumes for Existing Conditions
Average Daily Flow of 4.9 cfs, Mannings n = 0.017

Rank	Year	Annual Peak Volume (gallons)	Annual Probability	Return Frequency
1	1956	3,556,605	0.02	44.0
2	1967	432,262	0.05	22.0
3	1981	387,905	0.07	14.7
4	1975	373,342	0.09	11.0
5	1964	193,597	0.11	8.8
6	1986	178,159	0.14	7.3
7	2005	160,566	0.16	6.3
8	1968	102,521	0.18	5.5
9	1965	84,756	0.20	4.9
10	1972	84,180	0.23	4.4
11	1974	66,445	0.25	4.0
12	1988	49,556	0.27	3.7
13	2004	34,120	0.30	3.4
14	1985	31,542	0.32	3.1
15	1957	13,840	0.34	2.9
16	1993	3,959	0.36	2.8
17	1976	2,805	0.39	2.6
18	1958	0	0.41	2.4
19	1959	0	0.43	2.3
20	1960	0	0.45	2.2
21	1961	0	0.48	2.1
22	1962	0	0.50	2.0
23	1963	0	0.52	1.9
24	1966	0	0.55	1.8
25	1969	0	0.57	1.8
26	1970	0	0.59	1.7
27	1971	0	0.61	1.6
28	1977	0	0.64	1.6
29	1978	0	0.66	1.5
30	1979	0	0.68	1.5
31	1980	0	0.70	1.4
32	1983	0	0.73	1.4
33	1987	0	0.75	1.3
34	1989	0	0.77	1.3
35	1990	0	0.80	1.3
36	1991	0	0.82	1.2
37	1994	0	0.84	1.2
38	1997	0	0.86	1.2
39	1998	0	0.89	1.1
40	1999	0	0.91	1.1
41	2001	0	0.93	1.1
42	2002	0	0.95	1.0
43	2003	0	0.98	1.0

A linear interpolation of the SSO volumes ranked 4 and 5 gives a 10-Year SSO volume of 302,000 gallons.
A linear interpolation of the SSO volumes ranked 1 and 2 gives a 25-Year SSO volume of 1,183,000 gallons.

Appendix D: Cost Analysis

OHM Advancing Communities
Engineering Advisors

City of Owosso Project Plan

10/13/2016

Equalization Basin: Alternative #1 (Option #1)

Item	Unit Description	Est. Qty	Unit	Unit Price	Amount
1	500,000 Gallon Equalization Basin	500,000	gal	$6.60	$3,300,000
2	Control/Diversion Structure	1	EA	$100,000	$100,000
3	Excavation	1	LS	$130,000	$130,000
4	Thickened Slab	1	LS	$100,000	$100,000
5	Flushing System	1	LS	$290,000	$290,000
6	Pumping Station (Prefab)	1	LS	$250,000	$250,000
7	Generator	1	LS	$100,000	$100,000
8	Demolition - below grade	1	LS	$130,000	$130,000
9	Site Work and Restoration (10%)	1	LS	$420,000	$420,000
10	Electrical (15%)	1	LS	$610,000	$610,000
11	Insumentation (10%)	1	LS	$400,000	$400,000
	Estimated Construction Cost				$5,830,000
	Construction Contingency (20%)				$1,170,000
	Estimated Total Construction Cost				$7,000,000
	Estimated Design Engineering and CA/CE Cost (25%)				$1,750,000
	TOTAL PROJECT COST				**$8,800,000**

Footing Drain Removal: Alternative #2

Item	Unit Description	Est. Qty	Unit	Unit Price	Amount
1	Footing Drain Removal	450	EA	$ 10,000	$4,500,000
2	Connection to storm system	450	EA	$ 2,000	$900,000
	Estimated Construction Cost				$5,400,000
	Construction Contingency (20%)				$1,080,000
	Estimated Total Construction Cost				$6,480,000
	Estimated CA/CE Cost (15%)				$972,000
	TOTAL PROJECT COST				**$7,500,000**

Equalization Basin: Alternative #1 (Option #2)

Item	Unit Description	Est. Qty	Unit	Unit Price	Amount
1	1 Million Gallon Equalization Basin	1,000,000	gal	$4.05	$4,050,000
2	Control/Diversion Structure	1	EA	$100,000	$100,000
3	Excavation	1	LS	$130,000	$130,000
4	Thickened Slab	1	LS	$100,000	$100,000
5	Flushing System	1	LS	$290,000	$290,000
6	Pumping Station (Prefab)	1	LS	$250,000	$250,000
7	Generator	1	LS	$100,000	$100,000
8	Demolition - below grade	1	LS	$130,000	$130,000
9	Site Work and Restoration (10%)	1	LS	$500,000	$500,000
10	Electrical (15%)	1	LS	$720,000	$720,000
11	Insumentation (10%)	1	LS	$470,000	$470,000
	Estimated Construction Cost				$6,840,000
	Construction Contingency (20%)				$1,370,000
	Estimated Total Construction Cost				$8,210,000
	Estimated Design Engineering and CA/CE Cost (25%)				$2,060,000
	TOTAL PROJECT COST				**$10,300,000**

Equalization Basin: Alternative #1 (Option #3)

Item	Unit Description	Est. Qty	Unit	Unit Price	Amount
1	3 Million Gallon Equalization Basin	3,000,000	gal	$2.80	$8,400,000
2	Control/Diversion Structure	1	EA	$100,000	$100,000
3	Excavation	1	LS	$130,000	$130,000
4	Thickened Slab	1	LS	$100,000	$100,000
5	Flushing System	1	LS	$290,000	$290,000
6	Pumping Station (Prefab)	1	LS	$250,000	$250,000
7	Generator	1	LS	$100,000	$100,000
8	Demolition - below grade	1	LS	$130,000	$130,000
9	Site Work and Restoration (10%)	1	LS	$420,000	$420,000
10	Electrical (15%)	1	LS	$610,000	$610,000
11	Insumentation (10%)	1	LS	$400,000	$400,000
	Estimated Construction Cost				$10,930,000
	Construction Contingency (20%)				$2,190,000
	Estimated Total Construction Cost				$13,120,000
	Estimated Design Engineering and CA/CE Cost (25%)				$3,280,000
	TOTAL PROJECT COST				**$16,400,000**

Notes: River Inflow will be removed as part of this project on a priority basis with non SRF funds.
Total Project Costs are being rounded to the nearest $100,000

Appendix J. NPDES Permit

Section 1. 2018 NPDES Permit

PERMIT NO. MI0023752

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY

AUTHORIZATION TO DISCHARGE UNDER THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of the Federal Water Pollution Control Act (33 U.S.C. 1251 *et seq*., as amended; the "Federal Act"); Part 31, Water Resources Protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA); Part 41, Sewerage Systems, of the NREPA; and Michigan Executive Order 2011-1,

City of Owosso
301 West Main Street
Owosso, MI 48867

is authorized to discharge from the Owosso Mid-Shiawassee County Wastewater Treatment Plant located at

1410 Chippewa Trail
Owosso, MI 48867

designated as **Owosso/Mid Shiawassee Co WWTP**

to the receiving water named the Shiawassee River in accordance with effluent limitations, monitoring requirements, and other conditions set forth in this permit.

This permit is based on a complete application submitted on April 15, 2016, and a Department action initiated on November 16, 2018.

This permit took effect on October 1, 2018; the modified permit takes effect on January 1, 2019. The provisions of this permit are severable. After notice and opportunity for a hearing, this permit may be modified, suspended, or revoked in whole or in part during its term in accordance with applicable laws and rules. On its original effective date, this permit superseded National Pollutant Discharge Elimination System (NPDES) Permit No. MI0023752 (expiring October 1, 2016).

This permit and the authorization to discharge shall expire at midnight, **October 1, 2021**. In order to receive authorization to discharge beyond the date of expiration, the permittee shall submit an application which contains such information, forms, and fees as are required by the Department of Environmental Quality (Department) by **April 4, 2021**.

Issued: September 24, 2018. **Modified (minor):** December 17, 2018.

Original signed by Christine Alexander
Christine Alexander, Manager
Permits Section
Water Resources Division

PERMIT FEE REQUIREMENTS

In accordance with Section 324.3120 of the NREPA, the permittee shall make payment of an annual permit fee to the Department for each October 1 the permit is in effect regardless of occurrence of discharge. The permittee shall submit the fee in response to the Department's annual notice. The fee shall be postmarked by January 15 for notices mailed by December 1. The fee is due no later than 45 days after receiving the notice for notices mailed after December 1.

Annual Permit Fee Classification: Municipal Major, less than 10 MGD (Individual Permit)

In accordance with Section 324.3118 of the NREPA, the permittee shall make payment of an annual storm water fee to the Department for each January 1 the permit is in effect regardless of occurrence of discharge. The permittee shall submit the fee in response to the Department's annual notice. The fee shall be postmarked by March 15 for notices mailed by February 1. The fee is due no later than 45 days after receiving the notice for notices mailed after February 1.

In accordance with Section 324.3132 of the NREPA, the permittee shall make payment of an annual biosolids land application fee to the Department if the permittee land applies biosolids. In response to the Department's annual notice, the permittee shall submit the fee, which shall be postmarked no later than January 31 of each year.

CONTACT INFORMATION

Unless specified otherwise, all contact with the Department required by this permit shall be made to the Lansing District Office of the Water Resources Division. The Lansing District Office is located at 525 West Allegan Street, 1st Floor, South Tower, Lansing, MI 48933, Telephone: 517-284-6651, Fax: 517-241-3571.

CONTESTED CASE INFORMATION

Any person who is aggrieved by this permit may file a sworn petition with the Michigan Administrative Hearing System within the Michigan Department of Licensing and Regulatory Affairs, c/o the Michigan Department of Environmental Quality, setting forth the conditions of the permit which are being challenged and specifying the grounds for the challenge. The Department of Licensing and Regulatory Affairs may reject any petition filed more than 60 days after issuance as being untimely.

PART I

Section A. Limitations and Monitoring Requirements

1. Final Effluent Limitations, Monitoring Point 001A

During the period beginning on the effective date of this permit and lasting until the expiration date of this permit, the permittee is authorized to discharge treated municipal wastewater from Monitoring Point 001A through Outfall 001. Outfall 001 discharges to the Shiawassee River at Latitude 43.01667, Longitude -84.18055. Such discharge shall be limited and monitored by the permittee as specified below.

	Maximum Limits for Quantity or Loading				Maximum Limits for Quality or Concentration					
Parameter	**Monthly**	**7-Day**	**Daily**	**Units**	**Monthly**	**7-Day**	**Daily**	**Units**	**Monitoring Frequency**	**Sample Type**
Flow	(report)	---	(report)	MGD	---	---	---	---	Daily	Report Total Daily Flow
Carbonaceous Biochemical Oxygen Demand ($CBOD_5$)										
June	750	1100	(report)	lbs/day	15	---	23	mg/l	5×Weekly	24-Hr Composite
July – September	500	730	(report)	lbs/day	10	---	15	mg/l	5×Weekly	24-Hr Composite
October	900	1400	(report)	lbs/day	18	---	27	mg/l	5×Weekly	24-Hr Composite
November – May	1300	2000	(report)	lbs/day	25	---	40	mg/l	5×Weekly	24-Hr Composite
Total Suspended Solids	1500	2300	(report)	lbs/day	30	45	(report)	mg/l	5×Weekly	24-Hr Composite
Ammonia Nitrogen (as N)										
June	---	400	(report)	lbs/day	---	---	8.0	mg/l	5×Weekly	24-Hr Composite
July – September	---	150	(report)	lbs/day	---	---	3.0	mg/l	5×Weekly	24-Hr Composite
October	---	550	(report)	lbs/day	---	---	11	mg/l	5×Weekly	24-Hr Composite
November - May	530	750	(report)	lbs/day	11	---	15	mg/l	Weekly	24-Hr Composite
Total Phosphorus (as P)	50	---	(report)	lbs/day	1.0	---	(report)	mg/l	5×Weekly	24-Hr Composite
Fecal Coliform Bacteria	---	---	---	---	200	400	(report)	cts/100 ml	5×Weekly	Grab
Total Residual Chlorine	---	---	---	---	---	---	38	µg/l	5×Weekly	Grab
Total Mercury										
-- Corrected	(report)	---	(report)	lbs/day	(report)	---	(report)	ng/l	Monthly	Calculation
-- Uncorrected	---	---	---	---	---	---	(report)	ng/l	Monthly	Grab
-- Field Duplicate	---	---	---	---	---	---	(report)	ng/l	Monthly	Grab
-- Field Blank	---	---	---	---	---	---	(report)	ng/l	Monthly	Preparation
-- Laboratory Method Blank	---	---	---	---	---	---	(report)	ng/l	Monthly	Preparation
	12-Month Rolling Average				**12-Month Rolling Average**					
	0.00040	---	---	lbs/day	8.0	---	---	ng/l	Monthly	Calculation
					Minimum Monthly		**Minimum Daily**			
$CBOD_5$ Minimum % Removal										
November - May	---	---	---	---	85	---	(report)	%	Monthly	Calculation
Total Suspended Solids Minimum % Removal	---	---	---	---	85	---	(report)	%	Monthly	Calculation

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Parameter	Maximum Limits for Quantity or Loading: Monthly	7-Day	Daily	Units	Maximum Limits for Quality or Concentration: Monthly	7-Day	Daily	Units	Monitoring Frequency	Sample Type
					Minimum Daily		Maximum Daily			
pH	---	---	---	---	6.5	---	9.0	S.U.	5×Weekly	Grab
Dissolved Oxygen										
June	---	---	---	---	5.0	---	---	mg/l	5×Weekly	Grab
July – September	---	---	---	---	6.0	---	---	mg/l	5×Weekly	Grab
October	---	---	---	---	5.0	---	---	mg/l	5×Weekly	Grab
November – May	---	---	---	---	3.0	---	---	mg/l	5×Weekly	Grab

The following design flow was used in determining the above limitations, but is not to be considered a limitation or actual capacity: 6.0 MGD.

a. Narrative Standard

The receiving water shall contain no turbidity, color, oil films, floating solids, foams, settleable solids, or deposits, as a result of this discharge in unnatural quantities which are or may become injurious to any designated use.

b. Sampling Locations

Samples for $CBOD_5$, Total Suspended Solids, Ammonia Nitrogen, Total Phosphorus, Dissolved Oxygen, Fecal Coliform Bacteria, Total Residual Chlorine, Total Mercury, and pH shall be taken after disinfection. The Department may approve alternate sampling locations which are demonstrated by the permittee to be representative of the effluent.

c. Total Residual Chlorine

Compliance with the Total Residual Chlorine limit shall be determined on the basis of one or more grab samples. If more than one (1) sample per day is taken, the additional samples shall be collected in near equal intervals over at least eight (8) hours. The samples shall be analyzed immediately upon collection and the average reported as the daily concentration. Samples shall be analyzed in accordance with Part II.B.2. of this permit.

d. Percent Removal Requirements

These requirements shall be calculated based on the monthly (30-day) effluent $CBOD_5$ and Total Suspended Solids concentrations and the monthly influent concentrations for approximately the same period.

e. Final Effluent Limitation for Total Mercury

The final limit for total mercury is the Discharge Specific Level Currently Achievable (LCA) based on a multiple discharger variance from the water quality-based effluent limit of 1.3 ng/l, pursuant to R 323.1103(9) of the Water Quality Standards. Compliance with the LCA shall be determined as a 12-month rolling average, the calculation of which may be done using blank-corrected sample results. The 12-month rolling average shall be determined by adding the present monthly average result to the preceding 11 monthly average results then dividing the sum by 12. For facilities with quarterly monitoring requirements for total mercury, quarterly monitoring shall be equivalent to 3 months of monitoring in calculating the 12-month rolling average. Facilities that monitor more frequently than monthly for total mercury must determine the monthly average result, which is the sum of the results of all data obtained in a given month divided by the total number of samples taken, in order to calculate the 12-month rolling average. If the 12-month rolling average for any month is less than or equal to the LCA, the permittee will be considered to be in compliance for total mercury for that month, provided the permittee is also in full compliance with the Pollutant Minimization Program for Total Mercury, set forth in Part I.A.5.

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After a minimum of 24 monthly data points have been collected, the permittee may request a reduction in the monitoring frequency for total mercury. This request shall contain an explanation as to why the reduced monitoring is appropriate and shall be submitted to the Department. Upon receipt of written approval and consistent with such approval, the permittee may reduce the monitoring frequency for total mercury indicated in Part I.A.1. of this permit to no less than quarterly. The Department may revoke the approval for reduced monitoring at any time upon notification to the permittee.

f. Total Mercury Testing and Additional Reporting Requirements

The analytical protocol for total mercury shall be in accordance with EPA Method 1631, Revision E, "Mercury in Water by Oxidation, Purge and Trap, and Cold Vapor Atomic Fluorescence Spectrometry," EPA-821-R-02-019, August 2002. The quantification level for total mercury shall be 0.5 ng/l, unless a higher level is appropriate because of sample matrix interference. Justification for higher quantification levels shall be submitted to the Department within 30 days of such determination.

The use of clean technique sampling procedures is required unless the permittee can demonstrate to the Department that an alternative sampling procedure is representative of the discharge. Guidance for clean technique sampling is contained in EPA Method 1669, "Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels," EPA-821-R96-001, July 1996. Information and data documenting the permittee's sampling and analytical protocols and data acceptability shall be submitted to the Department upon request.

In order to demonstrate compliance with EPA Method 1631E and EPA Method 1669, the permittee shall report, on the daily sheet, the analytical results of all field blanks and field duplicates collected in conjunction with each sampling event, as well as laboratory method blanks when used for blank correction. The permittee shall collect at least one (1) field blank and at least one (1) field duplicate per sampling event. If more than ten (10) samples are collected during a sampling event, the permittee shall collect at least one (1) additional field blank AND field duplicate for every ten (10) samples collected. Only field blanks or laboratory method blanks may be used to calculate a concentration lower than the actual sample analytical results (i.e., a blank correction). Only one (1) blank (field OR laboratory method) may be used for blank correction of a given sample result, and only if the blank meets the quality control acceptance criteria. If blank correction is not performed on a given sample analytical result, the permittee shall report under 'Total Mercury – Corrected' the same value reported under 'Total Mercury – Uncorrected.' The field duplicate is for quality control purposes only; its analytical result shall not be averaged with the sample result.

2. Quantification Levels and Analytical Methods for Selected Parameters

Quantification levels (QLs) are specified for selected parameters in the table below. These QLs shall be considered the maximum acceptable unless a higher QL is appropriate because of sample matrix interference. Justification for higher QLs shall be submitted to the Department within 30 days of such determination. Where necessary to help ensure that the QLs specified can be achieved, analytical methods may also be specified in the table below. The sampling procedures, preservation and handling, and analytical protocol for all monitoring conducted in compliance with this permit, including monitoring conducted to meet the requirements of the application for permit reissuance, shall be in accordance with the methods specified in the table below, or in accordance with Part II.B.2. of this permit if no method is specified in the table below, unless an alternate method is approved by the Department. With the exception of total mercury, all units are in ug/l. The table is continued on the following page:

Parameter	QL	Units	Analytical Method
1,2-Diphenylhydrazine (as Azobenzene)	3.0	ug/l	
2,4,6-Trichlorophenol	5.0	ug/l	
2,4-Dinitrophenol	19	ug/l	
3,3'-Dichlorobenzidine	1.5	ug/l	EPA Method 605
4,4'-DDD	0.05	ug/l	EPA Method 608
4,4'-DDE	0.01	ug/l	EPA Method 608
4,4'-DDT	0.01	ug/l	EPA Method 608
Acrylonitrile	1.0	ug/l	

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Parameter	QL	Units	Analytical Method
Aldrin	0.01	ug/l	EPA Method 608
Alpha-Hexachlorocyclohexane	0.01	ug/l	EPA Method 608
Antimony, Total	1	ug/l	
Arsenic, Total	1	ug/l	
Barium, Total	5	ug/l	
Benzidine	0.1	ug/l	EPA Method 605
Beryllium, Total	1	ug/l	
Beta-Hexachlorocyclohexane	0.01	ug/l	EPA Method 608
Bis (2-Chloroethyl) Ether	1.0	ug/l	
Boron, Total	20	ug/l	
Cadmium, Total	0.2	ug/l	
Chlordane	0.01	ug/l	EPA Method 608
Chromium, Hexavalent	5	ug/l	
Chromium, Total	10	ug/l	
Copper, Total	1	ug/l	
Cyanide, Available	2	ug/l	EPA Method OIA 1677
Cyanide, Total	5	ug/l	
Delta-Hexachlorocyclohexane	0.01	ug/l	EPA Method 608
Dieldrin	0.01	ug/l	EPA Method 608
Di-N-Butyl Phthalate	9.0	ug/l	
Endosulfan I	0.01	ug/l	EPA Method 608
Endosulfan II	0.01	ug/l	EPA Method 608
Endosulfan Sulfate	0.01	ug/l	EPA Method 608
Endrin	0.01	ug/l	EPA Method 608
Endrin Aldehyde	0.01	ug/l	EPA Method 608
Fluoranthene	1.0	ug/l	
Heptachlor	0.01	ug/l	EPA Method 608
Heptachlor Epoxide	0.01	ug/l	EPA Method 608
Hexachlorobenzene	0.01	ug/l	EPA Method 612
Hexachlorobutadiene	0.01	ug/l	EPA Method 612
Hexachlorocyclopentadiene	0.01	ug/l	EPA Method 612
Hexachloroethane	5.0	ug/l	
Lead, Total	1	ug/l	
Lindane	0.01	ug/l	EPA Method 608
Lithium, Total	10	ug/l	
Mercury, Total	0.5	**ng/l**	EPA Method 1631E
Nickel, Total	5	ug/l	
PCB-1016	0.1	ug/l	EPA Method 608
PCB-1221	0.1	ug/l	EPA Method 608
PCB-1232	0.1	ug/l	EPA Method 608
PCB-1242	0.1	ug/l	EPA Method 608
PCB-1248	0.1	ug/l	EPA Method 608
PCB-1254	0.1	ug/l	EPA Method 608
PCB-1260	0.1	ug/l	EPA Method 608
Pentachlorophenol	1.8	ug/l	
Phenanthrene	1.0	ug/l	
Selenium, Total	1.0	ug/l	
Silver, Total	0.5	ug/l	

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Parameter	QL	Units	Analytical Method
Strontium, Total	1000	ug/l	
Sulfides, Dissolved	20	ug/l	
Thallium, Total	1	ug/l	
Toxaphene	0.1	ug/l	EPA Method 608
Vinyl Chloride	0.25	ug/l	
Zinc, Total	10	ug/l	

4. Additional Monitoring Requirements

As a condition of this permit, the permittee shall monitor the discharge from Monitoring Point 001A for the constituents listed below. This monitoring is an application requirement of 40 CFR 122.21(j), effective December 2, 1999. Testing shall be conducted in May 2019, March 2020, and August 2020, October 2020. Grab samples shall be collected for available cyanide, total phenols, and the Volatile Organic Compounds identified below. For all other parameters, 24-hour composite samples shall be collected.

Test species for whole effluent toxicity monitoring shall include fathead minnow **and** *Ceriodaphnia dubia*. If the permittee has received Department approval to conduct chronic toxicity testing using the more sensitive species identified in the toxicity database, the first three (3) tests required above may be performed using the more sensitive species. The last (4^{th}) test shall be conducted using both species. Testing and reporting procedures shall follow procedures contained in EPA600/4-91/002, "Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms (Fourth Edition)." When the effluent ammonia nitrogen (as N) concentration is greater than 3 mg/l, the pH of the toxicity test shall be maintained at a pH of 8 Standard Units. Acute and chronic toxicity data shall be included in the reporting for the toxicity test results. Toxicity test data acceptability is contingent upon the validation of the test method by the testing laboratory. Such validation shall be submitted to the Department upon request.

For selected parameters required under this section, the quantification levels and analytical methods shall be as specified under Quantification Levels and Analytical Methods for Selected Parameters, below, unless a higher quantification level is appropriate because of sample matrix interference. Justification for higher quantification levels shall be submitted to the Department within 30 days of such determination.

The results of such additional monitoring shall be submitted with the application for reissuance (see the cover page of this permit for the application due date). The permittee shall notify the Department within 14 days of completing the monitoring for each month specified above in accordance with Part II.C.5. Additional reporting requirements are specified in Part II.C.11. The permittee shall report to the Department any whole effluent toxicity test results greater than 1.0 TU_A or 1.0 TU_C within five (5) days of becoming aware of the result. If, upon review of the analysis, it is determined that additional requirements are needed to protect the receiving waters in accordance with applicable water quality standards, the permit may then be modified by the Department in accordance with applicable laws and rules.

Whole Effluent Toxicity
acute toxicity chronic toxicity

Hardness
calcium carbonate

Metals (Total Recoverable), Cyanide and Total Phenols

antimony	arsenic	available cyanide	barium
beryllium	boron	cadmium	chromium
copper	lead		nickel
selenium	silver	thallium	zinc

total phenolic compounds

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Volatile Organic Compounds			
acrolein	acrylonitrile	benzene	bromoform
carbon tetrachloride	chlorobenzene	chlorodibromomethane	chloroethane
2-chloroethylvinyl ether	chloroform	dichlorobromomethane	1,1-dichloroethane
1,2-dichloroethane	trans-1,2-dichloroethylene	1,1-dichloroethylene	1,2-dichloropropane
Volatile Organic Compounds (continued)			
1,3-dichloropropylene	ethylbenzene	methyl bromide	methyl chloride
methylene chloride	1,1,2,2,-tetrachloroethane	tetrachloroethylene	toluene
1,1,1-trichloroethane	1,1,2-trichloroethane	trichloroethylene	vinyl chloride
Acid-Extractable Compounds			
p-chloro-m-cresol	2-chlorophenol	2,4-dichlorophenol	2,4-dimethylphenol
4,6-dinitro-o-cresol	2,4-dinitrophenol	2-nitrophenol	4-nitrophenol
Pentachlorophenol	phenol	2,4,6-trichlorophenol	
Base/Neutral Compounds			
acenaphthene	acenaphthylene	anthracene	benzidine
benzo(a)anthracene	benzo(a)pyrene	3,4-benzofluoranthene	benzo(ghi)perylene
benzo(k)fluoranthene	bis(2-chloroethoxy)methane	bis(2-chloroethyl)ether	bis(2-chloroisopropyl)ether
bis(2-ethylhexyl)phthalate	4-bromophenyl phenyl ether	butyl benzyl phthalate	2-chloronaphthalene
4-chlorophenyl phenyl ether	chrysene	di-n-butyl phthalate	di-n-octyl phthalate
dibenzo(a,h)anthracene	1,2-dichlorobenzene	1,3-dichlorobenzene	1,4-dichlorobenzene
3,3'-dichlorobenzidine	diethyl phthalate	dimethyl phthalate	2,4-dinitrotoluene
2,6-dinitrotoluene	1,2-diphenylhydrazine	fluoranthene	fluorene
Hexachlorobenzene	hexachlorobutadiene	hexachlorocyclo-pentadiene	hexachloroethane
indeno(1,2,3-cd)pyrene	isophorone	naphthalene	nitrobenzene
n-nitrosodi-n-propylamine	n-nitrosodimethylamine	n-nitrosodiphenylamine	phenanthrene
pyrene	1,2,4-trichlorobenzene		

5. Pollutant Minimization Program for Total Mercury

The goal of the Pollutant Minimization Program is to maintain the effluent concentration of total mercury at or below 1.3 ng/l. The permittee shall continue to implement the Pollutant Minimization Program approved on July 7, 2011, and modifications thereto, to proceed toward the goal. The Pollutant Minimization Program includes the following:

a. an annual review and semi-annual monitoring of potential sources of mercury entering the wastewater collection system;

b. a program for quarterly monitoring of influent and periodic monitoring of sludge for mercury; and

c. implementation of reasonable cost-effective control measures when sources of mercury are discovered. Factors to be considered include significance of sources, economic considerations, and technical and treatability considerations.

On or before March 31 of each year, the permittee shall submit a status report for the previous calendar year to the Department that includes 1) the monitoring results for the previous year, 2) an updated list of potential mercury sources, and 3) a summary of all actions taken to reduce or eliminate identified sources of mercury.

Any information generated as a result of the Pollutant Minimization Program set forth in this permit may be used to support a request to modify the approved program or to demonstrate that the Pollutant Minimization Program requirement has been completed satisfactorily.

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A request for modification of the approved program and supporting documentation shall be submitted in writing to the Department for review and approval. The Department may approve modifications to the approved program (approval of a program modification does not require a permit modification), including a reduction in the frequency of the requirements under items a. and b.

This permit may be modified in accordance with applicable laws and rules to include additional mercury conditions and/or limitations as necessary.

6. Untreated or Partially Treated Sewage Discharge Reporting and Testing Requirements

In accordance with Section 324.3112a of the NREPA, if untreated sewage, including sanitary sewer overflows (SSO) and combined sewer overflows (CSO), or partially treated sewage is directly or indirectly discharged from a sewer system onto land or into the waters of the state, the entity responsible for the sewer system shall immediately, but not more than 24 hours after the discharge begins, notify, by telephone, the Department, local health departments, a daily newspaper of general circulation in the county in which the permittee is located, and a daily newspaper of general circulation in the county or counties in which the municipalities whose waters may be affected by the discharge are located that the discharge is occurring.

The permittee shall also annually contact municipalities, including the superintendent of a public drinking water supply with potentially affected intakes, whose waters may be affected by the permittee's discharge of combined sewage, and if those municipalities wish to be notified in the same manner as specified above, the permittee shall provide such notification. Such notification shall also include a daily newspaper in the county of the affected municipality.

At the conclusion of the discharge, written notification shall be submitted in accordance with and on the "Report of Discharge Form" available via the internet at: http://www.deq.state.mi.us/csosso/ , or, alternatively for combined sewer overflow discharges, in accordance with notification procedures approved by the Department.

In addition, in accordance with Section 324.3112a of the NREPA, each time a discharge of untreated sewage or partially treated sewage occurs, the permittee shall test the affected waters for *Escherichia coli* to assess the risk to the public health as a result of the discharge and shall provide the test results to the affected local county health departments and to the Department. The testing shall be done at locations specified by each affected local county health department but shall not exceed 10 tests for each separate discharge event. The affected local county health department may waive this testing requirement, if it determines that such testing is not needed to assess the risk to the public health as a result of the discharge event. The results of this testing shall be submitted with the written notification required above, or, if the results are not yet available, submit them as soon as they become available. This testing is not required, if the testing has been waived by the local health department, or if the discharge(s) did not affect surface waters.

Permittees accepting sanitary or municipal sewage from other sewage collection systems are encouraged to notify the owners of those systems of the above reporting and testing requirements.

7. Facility Contact

The "Facility Contact" was specified in the application. The permittee may replace the facility contact at any time, and shall notify the Department in writing within 10 days after replacement (including the name, address and telephone number of the new facility contact).

a. The facility contact shall be (or a duly authorized representative of this person):
   - for a corporation, a principal executive officer of at least the level of vice president; or a designated representative if the representative is responsible for the overall operation of the facility from which the discharge originates, as described in the permit application or other NPDES form,
   - for a partnership, a general partner,
   - for a sole proprietorship, the proprietor, or

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- for a municipal, state, or other public facility, either a principal executive officer, the mayor, village president, city or village manager or other duly authorized employee.

b. A person is a duly authorized representative only if:

- the authorization is made in writing to the Department by a person described in paragraph a. of this section; and
- the authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the facility (a duly authorized representative may thus be either a named individual or any individual occupying a named position).

Nothing in this section obviates the permittee from properly submitting reports and forms as required by law.

8. Monthly Operating Reports

Part 41 of Act 451 of 1994 as amended, specifically Section 324.4106 and associated R 299.2953, requires that the permittee file with the Department, on forms prescribed by the Department, reports showing the effectiveness of the treatment facility operation and the quantity and quality of liquid wastes discharged into waters of the state.

Since this permit includes modifications to the monitoring requirements in the previously-issued permit, the previously approved treatment facility monitoring program shall be revised. Within thirty (30) days of the effective date of this permit, the permittee shall submit to the Department a revised treatment facility monitoring program to meet this requirement. Upon approval by the Department the permittee shall implement the revised treatment facility monitoring program. The reporting forms and guidance are available on the DEQ web site at http://www.michigan.gov/deq/0,1607,7-135-3313_44117---,00.html. The permittee may use alternative operating forms if they are consistent with the approved monitoring program. These forms shall be maintained on site and shall be provided to the Department for review upon request. These treatment facility monitoring records shall be maintained for a minimum of three years.

9. Asset Management

The permittee shall at all times properly operate and maintain all facilities (i.e., the sewer system and treatment works as defined in Part 41 of the NREPA), and control systems installed or used by the permittee to operate the sewer system and treatment works and achieve and maintain compliance with the conditions of this permit (also see Part II.D.3 of this permit). The requirements of an Asset Management Program function to achieve the goals of effective performance, adequate funding, and adequate operator staffing and training. Asset management is a planning process for ensuring that optimum value is gained for each asset and that financial resources are available to rehabilitate and replace those assets when necessary. Asset management is centered on a framework of five (5) core elements: the current state of the assets; the required sustainable level of service; the assets critical to sustained performance; the minimum life-cycle costs; and the best long-term funding strategy.

a. Asset Management Program Requirements

On or before May 1, 2019, the permittee shall submit to the Department an Asset Management Plan for review and approval. An approvable Asset Management Plan shall contain a schedule for the development and implementation of an Asset Management Program that meets the requirements outlined below in 1) – 4). A copy of any Asset Management Program requirements already completed by the permittee should be submitted as part of the Asset Management Plan. Upon approval by the Department the permittee shall implement the Asset Management Plan. (The permittee may choose to include the Operation and Maintenance Manual required under Part II.C.14. of this permit as part of their Asset Management Program).

1) *Maintenance Staff.* The permittee shall provide an adequate staff to carry out the operation, maintenance, repair, and testing functions required to ensure compliance with the terms and conditions of this permit. The level of staffing needed shall be determined by taking into account the work involved in operating

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the sewer system and treatment works, planning for and conducting maintenance, and complying with this permit.

2) *Collection System Map.* The permittee shall complete a map of the sewer collection system it owns and operates. The map shall be of sufficient detail and at a scale to allow easy interpretation. The collection system information shown on the map shall be based on current conditions and shall be kept up-to-date and available for review by the Department. **Note: Items below referencing combined sewer systems are not applicable to separate sewer systems.** Such map(s) shall include but not be limited to the following:

a) all sanitary sewer lines and related manholes;

b) all combined sewer lines, related manholes, catch basins and CSO regulators;

c) all known or suspected connections between the sanitary sewer or combined sewer and storm drain systems;

d) all outfalls, including the treatment plant outfall(s), combined sewer treatment facility outfalls, untreated CSOs, and any known SSOs;

e) all pump stations and force mains;

f) the wastewater treatment facility(ies), including all treatment processes;

g) all surface waters (labeled);

h) other major appurtenances such as inverted siphons and air release valves;

i) a numbering system which uniquely identifies manholes, catch basins, overflow points, regulators and outfalls;

j) the scale and a north arrow;

k) the pipe diameter, date of installation, type of material, distance between manholes, and the direction of flow; and

l) the manhole interior material, rim elevation (optional), and invert elevations.

3) *Inventory and assessment of fixed assets.* The permittee shall complete an inventory and assessment of operations-related fixed assets. Fixed assets are assets that are normally stationary (e.g., pumps, blowers, and buildings). The inventory and assessment shall be based on current conditions and shall be kept up-to-date and available for review by the Department.

a) The fixed asset inventory shall include the following:

(1) a brief description of the fixed asset, its design capacity (e.g., pump: 120 gallons per minute), its level of redundancy, and its tag number if applicable;

(2) the location of the fixed asset;

(3) the year the fixed asset was installed;

(4) the present condition of the fixed asset (e.g., excellent, good, fair, poor); and

(5) the current fixed asset (replacement) cost in dollars for year specified in accordance with approved schedules;

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b) The fixed asset assessment shall include a "Business Risk Evaluation" that combines the probability of failure of the fixed asset and the criticality of the fixed asset, as follows:

(1) Rate the probability of failure of the fixed asset on a scale of 1-5 (low to high) using criteria such as maintenance history, failure history, and remaining percentage of useful life (or years remaining);

(2) Rate the criticality of the fixed asset on a scale of 1-5 (low to high) based on the consequence of failure versus the desired level of service for the facility; and

(3) Compute the Business Risk Factor of the fixed asset by multiplying the failure rating from (1) by the criticality rating from (2).

4) *Operation, Maintenance & Replacement (OM&R) Budget and Rate Sufficiency for the Sewer System and Treatment Works.* The permittee shall complete an assessment of its user rates and replacement fund, including the following:

a) beginning and end dates of fiscal year;

b) name of the department, committee, board, or other organization that sets rates for the operation of the sewer system and treatment works;

c) amount in the permittee's replacement fund in dollars for year specified in accordance with approved schedules;

d) replacement fund strategy of all assets with a useful life of 20 years or less;

e) expenditures for maintenance, corrective action and capital improvement taken during the fiscal year;

f) OM&R budget for the fiscal year; and

g) rate calculation demonstrating sufficient revenues to cover OM&R expenses. If the rate calculation shows there are insufficient revenues to cover OM&R expenses, the permittee shall document, within three (3) fiscal years after submittal of the Asset Management Plan, that there is at least one rate adjustment that reduces the revenue gap by at least 10 percent. The permittee may prepare and submit an alternate plan, subject to Department approval, for addressing the revenue gap. The ultimate goal of the Asset Management Program is to ensure sufficient revenues to cover OM&R expenses.

b. Annual Reporting

Following Department approval of the permittee's Asset Management Plan, the permittee shall develop a written report that summarizes asset management activities completed during the previous year and planned for the upcoming year. The written report shall be submitted to the Department on or before August 1 of each year. The written report shall include:

1) a description of the staffing levels maintained during the year;

2) a description of inspections and maintenance activities conducted and corrective actions taken during the previous year;

3) expenditures for collection system maintenance activities, treatment works maintenance activities, corrective actions, and capital improvement during the previous year;

4) a summary of assets/areas identified for inspection/action (including capital improvement) in the upcoming year based on the five (5) core elements and the Business Risk Factors;

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5) a maintenance budget and capital improvement budget for the upcoming year that take into account implementation of an effective Asset Management Program that meets the five (5) core elements;

6) an updated asset inventory based on the original submission; and

7) an updated OM&R budget with an updated rate schedule that includes the amount of insufficient revenues, if any.

10. Discharge Monitoring Report – Quality Assurance Study Program

The permittee shall participate in the Discharge Monitoring Report – Quality Assurance (DMR-QA) Study Program. The purpose of the DMR-QA Study Program is to annually evaluate the proficiency of all in-house and/or contract laboratory(ies) that perform, on behalf of the facility authorized to discharge under this permit, the analytical testing required under this permit. In accordance with Section 308 of the Clean Water Act (33 U.S.C. § 1318); and R 323.2138 and R 323.2154 of Part 21, Wastewater Discharge Permits, promulgated under Part 31 of the NREPA, participation in the DMR-QA Study Program is required for all major facilities, and for minor facilities selected for participation by the Department.

Annually and in accordance with DMR-QA Study Program requirements and submittal due dates, the permittee shall submit to the Michigan DMR-QA Study Program state coordinator all documentation required by the DMR-QA Study. DMR-QA Study Program participation is required only for the analytes required under this permit and only when those analytes are also identified in the DMR-QA Study.

If the permitted facility's status as a major facility should change, participation in the DMR-QA Study Program may be reevaluated. Questions concerning participation in the DMR-QA Study Program should be directed to the Michigan DMR-QA Study Program state coordinator.

All forms and instructions required for participation in the DMR-QA Study Program, including submittal due dates and state coordinator contact information, can be found at http://www.epa.gov/compliance/discharge-monitoring-report-quality-assurance-study-program.

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Section B. Storm Water Pollution Prevention

1. Final Effluent Limitations and Monitoring Requirements

The permittee is authorized to discharge storm water associated with industrial activity, as defined under 40 CFR 122.26(b)(14)(i-ix), to the surface waters of the state. Such discharge shall be limited and monitored by the permittee as specified below.

a. Narrative Standard

The receiving water shall contain no turbidity, color, oil films, floating solids, foams, settleable solids, suspended solids, or deposits as a result of this discharge in unnatural quantities which are or may become injurious to any designated use.

b. Visual Assessment of Storm Water Discharges

To ensure that storm water discharges from the facility do not violate the narrative standard in the receiving waters, storm water discharges shall be visually assessed in accordance with this permit.

c. Implementation of Storm Water Pollution Prevention Plan

The permittee shall implement an acceptable Storm Water Pollution Prevention Plan (SWPPP) as required by this permit.

d. Certified Operator

The permittee shall have an Industrial Storm Water Certified Operator who has supervision over the facility's storm water treatment and control measures included in the SWPPP.

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Section B. Storm Water Pollution Prevention

The Storm Water Pollution Prevention Plan (SWPPP) is a written procedure to reduce the exposure of storm water to significant materials and to reduce the amount of significant materials in the storm water discharge. An acceptable SWPPP shall identify potential sources of contamination and describe the controls necessary to reduce their impacts in accordance with Part I.B.2. through Part I.B.8. of this permit.

2. Source Identification

To identify potential sources of significant materials that can pollute storm water and subsequently be discharged from the facility, the SWPPP shall, at a minimum, include the following:

a. A site map identifying:

1) buildings and other permanent structures;

2) storage or disposal areas for significant materials;

3) secondary containment structures and descriptions of the significant materials contained within the primary containment structures;

4) storm water discharge points (which include outfalls and points of discharge), numbered or otherwise labeled for reference;

5) location of storm water and non-storm water inlets (numbered or otherwise labeled for reference) contributing to each discharge point;

6) location of NPDES-permitted discharges other than storm water;

7) outlines of the drainage areas contributing to each discharge point;

8) structural controls or storm water treatment facilities;

9) areas of vegetation (with brief descriptions such as lawn, old field, marsh, wooded, etc.);

10) areas of exposed and/or erodible soils and gravel lots;

11) impervious surfaces (e.g., roofs, asphalt, concrete, etc.);

12) name and location of receiving water(s); and

13) areas of known or suspected impacts on surface waters as designated under Part 201 (Environmental Response) of the NREPA.

b. A list of all significant materials that could pollute storm water. For each material listed, the SWPPP shall include each of the following descriptions:

1) the ways in which each type of significant material has been, or has reasonable potential to become, exposed to storm water (e.g., spillage during handling; leaks from pipes, pumps, and vessels; contact with storage piles, contaminated materials, or soils; waste handling and disposal; deposits from dust or overspray; etc.);

2) identification of the discharge point(s) and the inlet(s) contributing the significant material to each discharge point through which the significant material may be discharged if released; and

3) an evaluation of the reasonable potential for contribution of significant materials to storm water from at least the following areas or activities:

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a) loading, unloading, and other significant material-handling operations;

b) outdoor storage, including secondary containment structures;

c) outdoor manufacturing or processing activities;

d) significant dust- or particulate-generating processes;

e) discharge from vents, stacks, and air emission controls;

f) on-site waste disposal practices;

g) maintenance and cleaning of vehicles, machines, and equipment;

h) areas of exposed and/or erodible soils;

i) Sites of Environmental Contamination listed under Part 201 (Environmental Response) of the NREPA;

j) areas of significant material residues;

k) areas where animals (wild or domestic) congregate and deposit wastes; and

l) other areas where storm water may come into contact with significant materials.

c. A listing of significant spills and significant leaks of polluting materials that occurred in areas that are exposed to precipitation or that discharge to a point source at the facility. The listing shall include spills that occurred over the three (3) years prior to the effective date of a permit authorizing discharge. The listing shall include the date, volume, and exact location of the release, and the action taken to clean up the material and/or prevent exposure to storm water or contamination of surface waters of the state. Any release that occurs after the SWPPP has been developed shall be controlled in accordance with the SWPPP and is cause for the SWPPP to be updated as appropriate within 14 calendar days of obtaining knowledge of the spill or loss.

d. A determination as to whether its facility discharges storm water to a water body for which an EPA-approved Total Maximum Daily Load (TMDL) has been established. If so, the permittee shall assess whether the TMDL requirements for the facility's discharge are being met through the existing SWPPP controls or whether additional control measures are necessary. The permitee's assessment of whether the TMDL requirements are being met shall focus on the effectiveness, adequacy, and implementation of the permitee's SWPPP controls.

e. A summary of existing storm water discharge sampling data (if available), describing pollutants in storm water discharges at the facility. This summary shall be accompanied by a description of the suspected source(s) of the pollutants detected.

3. Nonstructural Controls

To prevent significant materials from contacting storm water at the source, the SWPPP shall, at a minimum, include each of the following nonstructural controls:

a. Written procedures and a schedule for routine preventive maintenance. Preventive maintenance procedures shall describe routine inspections and maintenance of storm water management and control devices (e.g., cleaning of oil/water separators and catch basins, routine housekeeping activities, etc.), as well as inspecting and testing plant equipment and systems to uncover conditions that could cause breakdowns or failures resulting in discharges of pollutants to the storm sewer system or the surface waters of the state. The routine inspection shall include areas of the facility in which significant materials

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have the reasonable potential to contaminate storm water. A written report of the inspection and corrective actions shall be retained in accordance with Record Keeping, below.

b. Written procedures and a schedule for good housekeeping to maintain a clean, orderly facility. Good housekeeping procedures shall include routine inspections that focus on the areas of the facility that have a reasonable potential to contaminate storm water entering the property. The routine housekeeping inspections may be combined with the routine inspections for the preventive maintenance program. A written report of the inspection and corrective actions shall be retained in accordance with Record Keeping, below.

c. Written procedures and a schedule for **quarterly** comprehensive site inspections, to be conducted by the Industrial Storm Water Certified Operator. At a minimum, one inspection shall be performed within each of the following quarters: January-March, April-June, July-September, and October-December. The comprehensive site inspections shall include, but not be limited to, inspection of structural controls in use at the facility, and the areas and equipment identified in the routine preventive maintenance and good housekeeping procedures. These inspections shall also include a review of the routine preventive maintenance reports, good housekeeping inspection reports, and any other paperwork associated with the SWPPP. The permittee may request Department approval of an alternate schedule for comprehensive site inspections. A written report of the inspection and corrective actions shall be retained in accordance with Record Keeping, below, and the following shall be included on the comprehensive inspection form/report:

1) Date of the inspection.

2) Name(s), title(s), and certification number(s) of the personnel conducting the inspection.

3) Precipitation information (i.e., a description of recent rainfall/snowmelt events).

4) All observations relating to the implementation of control measures. Items to include if applicable:

   a) updates on corrective actions implemented due to previously identified pollutant and/or discharge issues;

   b) any evidence of, or the potential for, pollutants to discharge to the drainage system or receiving waters and the condition of and around the discharge point including flow dissipation measures needing maintenance or repairs;

   c) any control measures needing maintenance or repairs; and

   d) any additional control measures needed to comply with permit requirements.

5) Any required revisions to the SWPPP resulting from the inspection.

6) A written certification stating the facility is in compliance with this permit and the SWPPP, or, if there are instances of noncompliance, they are identified.

7) Written procedures and a schedule for **quarterly** visual assessments of storm water discharges. At a minimum, one visual assessment shall be conducted within each of the following quarters: January-March, April-June, July-September, and October-December. These assessments shall be conducted as part of the comprehensive site inspection within one month of control measure observations made in accordance with 4), above. If the Department has approved an alternate schedule for the comprehensive site inspection, the visual assessment may likewise be conducted in accordance with the same approved alternate schedule.

The following are the requirements of the visual assessment. The permittee shall develop and clearly document, in writing, procedures for meeting these requirements:

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a) Within six (6) months of the effective date of this permit, the permittee shall develop written procedures for conducting the visual assessment and incorporate these procedures into the SWPPP. If Qualified Personnel rather than an Industrial Storm Water Certified Operator will collect storm water samples, these procedures shall include a written description of the training given to these personnel to qualify them to collect the samples, as well as documentation verifying that these personnel have received this training. The first visual assessment shall be conducted in conjunction with the next occurring comprehensive inspection. If changes resulting in altered drainage patterns occur at the facility, the permittee shall modify the procedures for conducting the visual assessment in accordance with the requirements of Keeping SWPPPs Current, below, and these modifications shall be incorporated into the SWPPP prior to conducting the next visual assessment.

b) A visual assessment shall be conducted of a representative storm water **sample** collected **from each storm water discharge point**. Storm water samples shall be visually assessed for conditions that could cause a violation of water quality standards as defined in Water Quality Standards, below. The visual assessment shall be made of the storm water sample in a clean, clear glass or plastic container. Only an Industrial Storm Water Certified Operator shall conduct this visual assessment. Visual assessment of the storm water sample shall be conducted within 48 hours of sample collection.

Representative storm water samples shall be collected:

(1) from each storm water discharge point identified as set forth under Source Identification, above. These samples may be collected by one or more of the following: an Industrial Storm Water Certified Operator; and/or an individual who meets qualifications acceptable to the Department and who is authorized by an Industrial Storm Water Certified Operator to collect the sample ("Qualified Personnel"); and/or an automated sampling device; and

(2) within the first 30 minutes of the start of a discharge from a storm event and on discharges that occur at least 72 hours (3 days) from the previous discharge. If it is not possible to collect the sample within the first 30 minutes of discharge, the sample shall be collected as soon thereafter as practicable, but not exceeding 60 minutes. In the case of snowmelt, samples shall be collected during a period with measurable discharge from the site.

c) A visual assessment shall be conducted of the storm water **discharge at each storm water discharge point**. (If an automated sampling device is used to collect the storm water sample, this requirement is waived). Either an Industrial Storm Water Certified Operator and/or Qualified Personnel may conduct this visual assessment. This visual assessment may be conducted directly – by someone physically present at the storm water discharge at each storm water discharge point; or it may be conducted indirectly – through the use of a visual recording taken of the storm water discharge at each storm water discharge point. Direct visual assessment shall be conducted at the same time that the storm water sample is collected. Indirect visual assessment shall be conducted using a visual recording taken of the storm water discharge at the same time that the storm water sample was collected.

d) Visual assessments shall be documented. This documentation shall be retained in accordance with Record Keeping, below, and shall include the following:

(1) sampling location(s) at the storm water discharge point(s) identified on the site map (see Source Identification, above);

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(2) storm event information (i.e., length of event expressed in hours, approximate size of event expressed in inches of precipitation, duration of time since previous event that caused a discharge, and date and time the discharge began);

(3) date and time of the visual assessment of each storm water **discharge** at each storm water discharge point;

(4) name(s) and title(s) of the Industrial Storm Water Certified Operator or Qualified Personnel who conducted the visual assessment of the storm water **discharge** at each storm water discharge point. If an automated sampling device was used to collect the storm water sample associated with this discharge point, this documentation requirement is waived;

(5) observations made during visual assessment of the storm water **discharge** at each storm water discharge point. If an automated sampling device was used to collect the storm water sample associated with this discharge point, this documentation requirement is waived;

(6) if applicable, any visual recordings used to conduct the visual assessment of the storm water **discharge** at each storm water discharge point;

(7) date and time of sample collection for each storm water **sample**;

(8) name(s) and title(s) of the Industrial Storm Water Certified Operator or Qualified Personnel who collected the storm water **sample**. If an automated sampling device was used to collect the storm water sample, the permittee shall document that, instead;

(9) date and time of the visual assessment of each storm water **sample**;

(10) name(s), title(s), and operator number(s) of the Industrial Storm Water Certified Operator(s) who conducted the visual assessment of each storm water **sample**;

(11) observations made during visual assessment of each storm water **sample**;

(12) full-color photographic evidence of the storm water **sample** against a white background;

(13) nature of the discharge (i.e., rainfall or snowmelt);

(14) probable sources of any observed storm water contamination; and

(15) if applicable, an explanation for why it was not possible to collect samples within the first 30 minutes of discharge .

e) When adverse weather conditions prevent a visual assessment during the quarter, a substitute visual assessment shall be conducted during the next qualifying storm event. Documentation of the rationale for no visual assessment during a quarter shall be included with the SWPPP records as described in Record Keeping, below. Adverse conditions are those that are dangerous or create inaccessibility for personnel, such as local flooding, high winds, electrical storms, or situations that otherwise make sampling impractical such as drought or extended frozen conditions.

f) If the facility has two (2) or more discharge points that are believed to discharge substantially identical storm water effluents, the facility may conduct visual assessments of the discharge at just one (1) of the discharge points and report that the results also apply to the other substantially identical discharge point(s). The determination of substantially identical discharge points is to be based on the significant material

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evaluation conducted as set forth under Source Identification, above, and shall be clearly documented in the SWPPP. Visual assessments shall be conducted on a rotating basis of each substantially identical discharge point throughout the period of coverage under this permit.

d. A description of material handling procedures and storage requirements for significant materials. Equipment and procedures for cleaning up spills shall be identified in the SWPPP and made available to the appropriate personnel. The procedures shall identify measures to prevent spilled materials or material residues from contaminating storm water entering the property. The SWPPP shall include language describing what a reportable spill or release is and the appropriate reporting requirements in accordance with Part II.C.6. and Part II.C.7. The SWPPP may include, by reference, requirements of either a Pollution Incident Prevention Plan (PIPP) prepared in accordance with the Part 5 Rules (R 324.2001 through R 324.2009 of the Michigan Administrative Code); a Hazardous Waste Contingency Plan prepared in accordance with 40 CFR 264 and 265 Subpart D, as required by Part 111 of the NREPA; or a Spill Prevention Control and Countermeasure (SPCC) plan prepared in accordance with 40 CFR 112.

e. Identification of areas which, due to topography, activities, or other factors, have a high potential for significant soil erosion. Gravel lots shall be included. The SWPPP shall also identify measures used to control soil erosion and sedimentation.

f. A description of the employee training program that will be implemented on an annual basis to inform appropriate personnel at all levels of their responsibility as it relates to the components and goals of the SWPPP. The SWPPP shall identify periodic dates for the employee training program. Records of the employee training program shall be retained in accordance with Record Keeping, below.

g. Identification of actions to limit the discharge of significant materials in order to comply with TMDL requirements, if applicable.

h. Identification of significant materials expected to be present in storm water discharges following implementation of nonstructural preventive measures and source controls.

4. Structural Controls

Where implementation of the measures required by Nonstructural Controls, above, does not control storm water discharges in accordance with Water Quality Standards, below, the SWPPP shall provide a description of the location, function, design criteria, and installation/construction schedule of structural controls for prevention and treatment. Structural controls may be necessary:

a. to prevent uncontaminated storm water from contacting, or being contacted by, significant materials; or

b. if preventive measures are not feasible or are inadequate to keep significant materials at the site from contaminating storm water. Structural controls shall be used to treat, divert, isolate, recycle, reuse, or otherwise manage storm water in a manner that reduces the level of significant materials in the storm water and provides compliance with water quality standards as identified in Water Quality Standards, below.

5. Keeping SWPPPs Current

a. The permittee and/or the Industrial Storm Water Certified Operator shall review the SWPPP annually after it is developed and maintain a written report of the review in accordance with Record Keeping, below. Based on the review, the permittee or the Industrial Storm Water Certified Operator shall amend the SWPPP as needed to ensure continued compliance with the terms and conditions of this permit. The written report shall be submitted to the Department on or before January 10 of each year.

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b. The SWPPP developed under the conditions of a previous permit shall be amended as necessary to ensure compliance with this permit.

c. The SWPPP shall be updated or amended whenever changes at the facility have the potential to increase the exposure of significant materials to storm water, significant spills occur at the facility, or when the SWPPP is determined by the permittee or the Department to be ineffective in achieving the general objectives of controlling pollutants in storm water discharges associated with industrial activity. Updates based on increased activity or spills at the facility shall include a description of how the permittee intends to control any new sources of significant materials, or respond to and prevent spills in accordance with the requirements of this permit (see Source Identification; Nonstructural Controls; and Structural Controls, above).

d. The Department may notify the permittee at any time that the SWPPP does not meet minimum requirements of this permit. Such notification shall identify why the SWPPP does not meet minimum requirements of this permit. The permittee shall make the required changes to the SWPPP within 30 days after such notification from the Department or authorized representative and shall submit to the Department a written certification that the requested changes have been made.

e. Amendments to the SWPPP shall be signed and retained on-site with the SWPPP pursuant to Signature and SWPPP Review, below.

6. Industrial Storm Water Certified Operator Update

If the Industrial Storm Water Certified Operator is changed or an Industrial Storm Water Certified Operator is added, the permittee shall provide the name and certification number of the new Industrial Storm Water Certified Operator to the Department. If a facility has multiple Industrial Storm Water Certified Operators, the names and certification numbers of all shall be included in the SWPPP.

7. Signature and SWPPP Review

a. The SWPPP shall be reviewed and signed by the Industrial Storm Water Certified Operator(s) and by either the permittee or an authorized representative in accordance with 40 CFR 122.22. The SWPPP and associated records shall be retained on-site at the facility that generates the storm water discharge.

b. The permittee shall make the SWPPP, reports, log books, storm water discharge sampling data (if collected), and items required by Record Keeping, below, available upon request to the Department. The Department makes the non-confidential business portions of the SWPPP available to the public.

8. Record Keeping

The permittee shall maintain records of all SWPPP-related inspection and maintenance activities. Records shall also be kept describing incidents such as spills or other discharges that can affect the quality of storm water. All such records shall be retained for three (3) years. The following records are required by this permit (see Nonstructural Controls; and Keeping SWPPPs Current, above):

a. routine preventive maintenance inspection reports;

b. routine good housekeeping inspection reports;

c. comprehensive site inspection reports;

d. documentation of visual assessments;

e. employee training records; and

f. written summaries of the annual SWPPP review.

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Section B. Storm Water Pollution Prevention

9. Water Quality Standards

At the time of discharge, there shall be no violation of water quality standards in the receiving waters as a result of the storm water discharge. This requirement includes, but is not limited to, the following conditions:

a. In accordance with R 323.1050 of the Part 4 Rules promulgated pursuant to Part 31 of the NREPA, the receiving waters shall not have any of the following unnatural physical properties as a result of this discharge in quantities which are, or may become, injurious to any designated use: turbidity, color, oil films, floating solids, foams, settleable solids, suspended solids, or deposits.

b. Any unusual characteristics of the discharge (i.e., unnatural turbidity, color, oil film, floating solids, foams, settleable solids, suspended solids, or deposits) shall be reported within 24 hours to the Department, followed by a written report within five (5) days detailing the findings of the investigation and the steps taken to correct the condition.

c. Any pollutant for which a level of control is specified to meet a TMDL established by the Department shall be controlled at the facility so that its discharge is reduced by/to the amount specified in the TMDL.

10. Prohibition of Non-Storm Water Discharges

Discharges of material other than storm water shall be in compliance with an NPDES permit issued for the discharge. Storm water shall be defined to include all of the following non-storm water discharges, provided pollution prevention controls for the non-storm water component are identified in the SWPPP:

a. discharges from fire hydrant flushing;

b. potable water sources, including water line flushing;

c. water from fire system testing and fire-fighting training without burned materials or chemical fire suppressants;

d. irrigation drainage;

e. lawn watering;

f. routine building wash-down that does not use detergents or other compounds;

g. pavement wash waters where contamination by toxic or hazardous materials has not occurred (unless all contamination by toxic or hazardous materials has been removed) and where detergents are not used;

h. uncontaminated condensate from air conditioners, coolers, and other compressors and from the outside storage of refrigerated gases or liquids;

i. springs;

j. uncontaminated groundwater;

k. foundation or footing drains where flows are not contaminated with process materials such as solvents; and

l. discharges from fire-fighting activities. Discharges from fire-fighting activities are exempted from the requirement to be identified in the SWPPP.

11. Tracer Dye Discharges

This permit does not authorize the discharge of tracer dyes without approval from the Department. Requests to discharge tracer dyes shall be submitted to the Department in accordance with Rule 1097 (R 323.1097 of the Michigan Administrative Code).

PART I

Section C. Industrial Pretreatment Program

1. Federal Industrial Pretreatment Program

a. The permittee shall implement the Federal Industrial Pretreatment Program approved on June 27, 1985, and any subsequent modifications approved up to the issuance of this permit. Approval of substantial program modifications after the issuance of this permit shall be incorporated into this permit by minor modification in accordance with 40 CFR 122.63.

b. The permittee shall comply with R 323.2301 through R 323.2317 of the Michigan Administrative Code (Part 23 Rules), the General Pretreatment Regulations for Existing and New Sources of Pollution (40 CFR Part 403), and the approved Federal Industrial Pretreatment Program.

c. The permittee shall have the legal authority and necessary interjurisdictional agreements that provide the basis for the implementation and enforcement of the approved Federal Industrial Pretreatment Program throughout the service area. The legal authority and necessary interjurisdictional agreements shall include, at a minimum, the authority to carry out the activities specified in R 323.2306(a).

d. The permittee shall develop procedures which describe, in sufficient detail, program commitments which enable implementation of the approved Federal Industrial Pretreatment Program, 40 CFR Part 403, and the Part 23 Rules in accordance with R 323.2306(c).

e. The permittee shall establish an interjurisdictional agreement (or comparable document) with all tributary governmental jurisdictions. Each interjurisdictional agreement shall contain, at a minimum, the following:

1) identification of the agency responsible for the implementation and enforcement of the approved Federal Industrial Pretreatment Program within the tributary governmental jurisdiction's boundaries; and

2) the provision of the legal authority which provides the basis for the implementation and enforcement of the approved Federal Industrial Pretreatment Program within the tributary governmental jurisdiction's boundaries.

f. The permittee shall prohibit discharges that:

1) cause, in whole or in part, the permittee's failure to comply with any condition of this permit or the NREPA;

2) restrict, in whole or in part, the permittee's management of biosolids;

3) cause, in whole or in part, operational problems at the treatment facility or in its collection system;

4) violate any of the general or specific prohibitions identified in R 323.2303(1) and (2);

5) violate categorical standards identified in R 323.2311; and

6) violate local limits established in accordance with R 323.2303(4).

g. The permittee shall maintain a list of its nondomestic users that meet the criteria of a significant industrial user as identified in R 323.2302(cc).

h. The permittee shall develop an enforcement response plan which describes, in sufficient detail, program commitments which will enable the enforcement of the approved Federal Industrial Pretreatment Program, 40 CFR Part 403, and the Part 23 Rules in accordance with R 323.2306(g).

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Section C. Industrial Pretreatment Program

i. The Department may require modifications to the approved Federal Industrial Pretreatment Program which are necessary to ensure compliance with 40 CFR Part 403 and the Part 23 Rules in accordance with R 323.2309.

j. The permittee shall not implement changes or modifications to the approved Federal Industrial Pretreatment Program without notification to the Department. Any substantial modification shall be subject to Department public noticing and approval in accordance with R 323.2309.

k. The permittee shall maintain an adequate revenue structure and staffing level for effective implementation of the approved Federal Industrial Pretreatment Program.

l. The permittee shall develop and maintain, for a minimum of three (3) years, all records and information necessary to determine nondomestic user compliance with 40 CFR Part 403, Part 23 Rules and the approved Federal Industrial Pretreatment Program. This period of retention shall be extended during the course of any unresolved enforcement action or litigation regarding a nondomestic user or when requested by the Department or the United States Environmental Protection Agency. All of the aforementioned records and information shall be made available upon request for inspection and copying by the Department and the United States Environmental Protection Agency.

m. The permittee shall evaluate the approved Federal Industrial Pretreatment Program for compliance with the 40 CFR Part 403, Part 23 Rules and the prohibitions stated in item f. (above). Based upon this evaluation, the permittee shall propose to the Department all necessary changes or modifications to the approved Federal Industrial Pretreatment Program no later than the next Industrial Pretreatment Program Annual Report due date (see item o. below).

n. The permittee shall develop and enforce local limits to implement the prohibitions listed in item f above. Local limits shall be based upon data representative of actual conditions demonstrated in a maximum allowable headworks loading analysis. An evaluation of whether the existing local limits need to be revised shall be submitted to the Department by October 1, 2019. The submittal shall provide a technical evaluation of the basis upon which this determination was made which includes information regarding the maximum allowable headworks loading, collection system protection criteria, and worker health and safety, based upon data collected since the last local limits review.

The following pollutants shall be evaluated:

1) Arsenic, Cadmium, Chromium, Copper, Cyanide, Lead, Mercury, Nickel, Silver, and Zinc;

2) Pollutants that are subject to limits or monitoring in this permit;

3) Pollutants that have an existing local limit; and,

4) Other pollutants of concern which would reasonably be expected to be discharged or transported by truck or rail or otherwise introduced into the POTW.

o. o. On or before April 1 of each year, the permittee shall submit to the Department, as required by R 323.2310(8), an Industrial Pretreatment Program Annual Report on the status of program implementation and enforcement activities. The reporting period shall begin on January 1st and end on December 31st. At a minimum, the Industrial Pretreatment Program Annual Report shall contain the following items:

1) additions, deletions, and any other modifications to the permittee's previously submitted nondomestic user inventory (R 323.2306(c)(i));

2) additions, deletions, and any other modifications to the permittee's approved Significant Industrial User List (R 323.2306(h));

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Section C. Industrial Pretreatment Program

3) a listing of the names of Significant Industrial Users not inspected by the permittee at least once during the reporting period or at the frequency committed to in the approved Federal Industrial Pretreatment Program;

4) a listing of the names of Significant Industrial Users not sampled for all required pollutants by the permittee at least once during the reporting period or at the frequency committed to in the approved Federal Industrial Pretreatment Program;

5) a listing of the names of Significant Industrial Users without a permit at any time during the reporting period;

6) a listing of the names of nondomestic industrial users in significant noncompliance for each of the criteria as defined in R 323.2302(dd)(i)-(viii);

7) proof of publication of all nondomestic users in significant noncompliance in the largest daily newspaper in the permittee's area;

8) a summary of the enforcement activities by the permittee during the report period. This Summary shall include:

a) a listing of the names of nondomestic users which were the subject of an enforcement action;

b) the enforcement action taken and the date the action was taken; and

c) whether the nondomestic user returned to compliance by the end of the reporting period (include date nondomestic user returned to compliance).

9) a listing of the names of Significant Industrial Users who did not submit pretreatment reports in accordance with requirements specified in their permit during the reporting period;

10) a listing of the names of Significant Industrial Users who did not self-monitor in accordance with requirements specified in their permit during the reporting period;

11) a summary of results of all the sampling and analyses performed of the wastewater treatment plant’s influent, effluent, and biosolids conducted in accordance with approved methods during the reporting period. The summary shall include the monthly average, daily maximum, quantification level, and number of samples analyzed for each pollutant. At a minimum, the results of analyses for all locally limited parameters for at least one monitoring event that tests influent, effluent and biosolids during the reporting period shall be submitted with each report, unless otherwise required by the Department. Sample collection shall be at intervals sufficient to provide pollutant removal rates, unless the pollutant is not measurable; and

12) any other relevant information as requested by the Department.

PART I

Section D. Residuals Management Program

1. Residuals Management Program for Land Application of Biosolids

A permittee seeking authorization to land-apply bulk biosolids or prepare bulk biosolids for land application shall develop and submit a Residuals Management Program (RMP) to the Department (see Part I.D.1.e) for approval. Effective upon Department approval of the permittee's RMP, the permittee is authorized to land-apply bulk biosolids or prepare bulk biosolids for land application in accordance with the requirements established in R 323.2401 through R 323.2418 of the Michigan Administrative Code (Part 24 Rules) which can be obtained via the internet (http://www.michigan.gov/deq/ and on the left side of the screen click on Water, Biosolids & Industrial Pretreatment, Biosolids, then click on Biosolids Laws and Rules Information which is under the Laws & Rules banner in the center of the screen). The permittee's approved RMP, and any approved modifications thereto, are enforceable requirements of this permit. Incineration, landfilling and other residual disposal activities shall be conducted in accordance with Part II.D.7. of this permit.

a. RMP Approval and Implementation
A permittee seeking approval of an RMP shall submit the RMP to the Department (see Part I.D.1.e) at least 180 days prior to the land application of biosolids. The permittee may utilize the RMP Electronic Form which can be obtained via the internet (http://www.michigan.gov/biosolids then click on RMP Electronic Form which is under the Downloads banner in the center of the screen) or obtain detailed requirements from the Department. The RMP shall become effective and shall be implemented by the permittee upon written approval by the Department.

b. Annual Report
On or before October 30 of each year, the permittee shall submit an annual report to the Department for the previous fiscal year of October 1 through September 30. The report shall be submitted electronically via the Department's MiWaters system at https://miwaters.deq.state.mi.us. At a minimum, the report shall contain:

1) a certification that current residuals management practices are in accordance with the approved RMP, or a proposal for modification to the approved RMP; and

2) a completed Biosolids Annual Report Form, available at https://miwaters.deq.state.mi.us.

c. Modifications to the Approved RMP
Prior to implementation of modifications to the RMP, the permittee shall submit proposed modifications to the Department (see Part I.D.1.e.) for approval. The approved modification shall become effective upon the date of approval. Upon written notification, the Department may impose additional requirements and/or limitations to the approved RMP as necessary to protect public health and the environment from any adverse effect of a pollutant in the biosolids.

d. Record Keeping
Records required by the Part 24 Rules shall be kept for a minimum of five years. However, the records documenting cumulative loading for sites subject to cumulative pollutant loading rates shall be kept as long as the site receives biosolids.

e. Contact Information
RMP-related submittals shall be made to the Department.

PART II

Section A. Definitions

Part II may include terms and /or conditions not applicable to discharges covered under this permit.

Section A. Definitions

Acute toxic unit (TU_A) means $100/LC_{50}$ where the LC_{50} is determined from a whole effluent toxicity (WET) test which produces a result that is statistically or graphically estimated to be lethal to 50% of the test organisms.

Annual monitoring frequency refers to a calendar year beginning on January 1 and ending on December 31. When required by this permit, an analytical result, reading, value or observation shall be reported for that period if a discharge occurs during that period.

Authorized public agency means a state, local, or county agency that is designated pursuant to the provisions of section 9110 of Part 91 of the NREPA to implement soil erosion and sedimentation control requirements with regard to construction activities undertaken by that agency.

Best management practices (BMPs) means structural devices or nonstructural practices that are designed to prevent pollutants from entering into storm water, to direct the flow of storm water, or to treat polluted storm water.

Bioaccumulative chemical of concern (BCC) means a chemical which, upon entering the surface waters, by itself or as its toxic transformation product, accumulates in aquatic organisms by a human health bioaccumulation factor of more than 1000 after considering metabolism and other physiochemical properties that might enhance or inhibit bioaccumulation. The human health bioaccumulation factor shall be derived according to R 323.1057(5). Chemicals with half-lives of less than 8 weeks in the water column, sediment, and biota are not BCCs. The minimum bioaccumulation concentration factor (BAF) information needed to define an organic chemical as a BCC is either a field-measured BAF or a BAF derived using the biota-sediment accumulation factor (BSAF) methodology. The minimum BAF information needed to define an inorganic chemical as a BCC, including an organometal, is either a field-measured BAF or a laboratory-measured bioconcentration factor (BCF). The BCCs to which these rules apply are identified in Table 5 of R 323.1057 of the Water Quality Standards.

Biosolids are the solid, semisolid, or liquid residues generated during the treatment of sanitary sewage or domestic sewage in a treatment works. This includes, but is not limited to, scum or solids removed in primary, secondary, or advanced wastewater treatment processes and a derivative of the removed scum or solids.

Bulk biosolids means biosolids that are not sold or given away in a bag or other container for application to a lawn or home garden.

Certificate of Coverage (COC) is a document, issued by the Department, which authorizes a discharge under a general permit.

Chronic toxic unit (TU_C) means $100/MATC$ or $100/IC_{25}$, where the maximum acceptable toxicant concentration (MATC) and IC_{25} are expressed as a percent effluent in the test medium.

Class B biosolids refers to material that has met the Class B pathogen reduction requirements or equivalent treatment by a Process to Significantly Reduce Pathogens (PSRP) in accordance with the Part 24 Rules. Processes include aerobic digestion, composting, anaerobic digestion, lime stabilization and air drying.

Combined sewer system is a sewer system in which storm water runoff is combined with sanitary wastes.

PART II

Section A. Definitions

Daily concentration is the sum of the concentrations of the individual samples of a parameter divided by the number of samples taken during any calendar day. If the parameter concentration in any sample is less than the quantification limit, regard that value as zero when calculating the daily concentration. The daily concentration will be used to determine compliance with any maximum and minimum daily concentration limitations (except for pH and dissolved oxygen). When required by the permit, report the maximum calculated daily concentration for the month in the "MAXIMUM" column under "QUALITY OR CONCENTRATION" on the Discharge Monitoring Reports (DMRs).

For pH, report the maximum value of any *individual* sample taken during the month in the "MAXIMUM" column under "QUALITY OR CONCENTRATION" on the DMRs and the minimum value of any *individual* sample taken during the month in the "MINIMUM" column under "QUALITY OR CONCENTRATION" on the DMRs. For dissolved oxygen, report the minimum concentration of any *individual* sample in the "MINIMUM" column under "QUALITY OR CONCENTRATION" on the DMRs.

Daily loading is the total discharge by weight of a parameter discharged during any calendar day. This value is calculated by multiplying the daily concentration by the total daily flow and by the appropriate conversion factor. The daily loading will be used to determine compliance with any maximum daily loading limitations. When required by the permit, report the maximum calculated daily loading for the month in the "MAXIMUM" column under "QUANTITY OR LOADING" on the DMRs.

Daily monitoring frequency refers to a 24-hour day. When required by this permit, an analytical result, reading, value or observation shall be reported for that period if a discharge occurs during that period.

Department means the Michigan Department of Environmental Quality.

Detection level means the lowest concentration or amount of the target analyte that can be determined to be different from zero by a single measurement at a stated level of probability.

Discharge means the addition of any waste, waste effluent, wastewater, pollutant, or any combination thereof to any surface water of the state.

EC_{50} means a statistically or graphically estimated concentration that is expected to cause 1 or more specified effects in 50% of a group of organisms under specified conditions.

Fecal coliform bacteria monthly
FOR WWSLs THAT COLLECT AND STORE WASTEWATER AND ARE AUTHORIZED TO DISCHARGE ONLY IN THE SPRING AND/OR FALL ON AN INTERMITTENT BASIS – Fecal coliform bacteria monthly is the geometric mean of all daily concentrations determined during a discharge event. Days on which no daily concentration is determined shall not be used to determine the calculated monthly value. The calculated monthly value will be used to determine compliance with the maximum monthly fecal coliform bacteria limitations. When required by the permit, report the calculated monthly value in the "AVERAGE" column under "QUALITY OR CONCENTRATION" on the DMR. If the period in which the discharge event occurred was partially in each of two months, the calculated monthly value shall be reported on the DMR of the month in which the last day of discharge occurred.

FOR ALL OTHER DISCHARGES – Fecal coliform bacteria monthly is the geometric mean of all daily concentrations determined during a reporting month. Days on which no daily concentration is determined shall not be used to determine the calculated monthly value. The calculated monthly value will be used to determine compliance with the maximum monthly fecal coliform bacteria limitations. When required by the permit, report the calculated monthly value in the "AVERAGE" column under "QUALITY OR CONCENTRATION" on the DMR.

PART II

Section A. Definitions

Fecal coliform bacteria 7-day
FOR WWSLs THAT COLLECT AND STORE WASTEWATER AND ARE AUTHORIZED TO DISCHARGE ONLY IN THE SPRING AND/OR FALL ON AN INTERMITTENT BASIS – Fecal coliform bacteria 7-day is the geometric mean of the daily concentrations determined during any 7 consecutive days of discharge during a discharge event. If the number of daily concentrations determined during the discharge event is less than 7 days, the number of actual daily concentrations determined shall be used for the calculation. Days on which no daily concentration is determined shall not be used to determine the value. The calculated 7-day value will be used to determine compliance with the maximum 7-day fecal coliform bacteria limitations. When required by the permit, report the maximum calculated 7-day geometric mean value for the month in the "MAXIMUM" column under "QUALITY OR CONCENTRATION" on the DMRs. If the 7-day period was partially in each of two months, the value shall be reported on the DMR of the month in which the last day of discharge occurred.

FOR ALL OTHER DISCHARGES – Fecal coliform bacteria 7-day is the geometric mean of the daily concentrations determined during any 7 consecutive days in a reporting month. If the number of daily concentrations determined is less than 7, the actual number of daily concentrations determined shall be used for the calculation. Days on which no daily concentration is determined shall not be used to determine the value. The calculated 7-day value will be used to determine compliance with the maximum 7-day fecal coliform bacteria limitations. When required by the permit, report the maximum calculated 7-day geometric mean for the month in the "MAXIMUM" column under "QUALITY OR CONCENTRATION" on the DMRs. The first calculation shall be made on day 7 of the reporting month, and the last calculation shall be made on the last day of the reporting month.

Flow-proportioned sample is a composite sample with the sample volume proportional to the effluent flow.

General permit means a National Pollutant Discharge Elimination System permit issued authorizing a category of similar discharges.

Geometric mean is the average of the logarithmic values of a base 10 data set, converted back to a base 10 number.

Grab sample is a single sample taken at neither a set time nor flow.

IC_{25} means the toxicant concentration that would cause a 25% reduction in a nonquantal biological measurement for the test population.

Illicit connection means a physical connection to a municipal separate storm sewer system that primarily conveys non-storm water discharges other than uncontaminated groundwater into the storm sewer; or a physical connection not authorized or permitted by the local authority, where a local authority requires authorization or a permit for physical connections.

Illicit discharge means any discharge to, or seepage into, a municipal separate storm sewer system that is not composed entirely of storm water or uncontaminated groundwater. Illicit discharges include non-storm water discharges through pipes or other physical connections; dumping of motor vehicle fluids, household hazardous wastes, domestic animal wastes, or litter; collection and intentional dumping of grass clippings or leaf litter; or unauthorized discharges of sewage, industrial waste, restaurant wastes, or any other non-storm water waste directly into a separate storm sewer.

Individual permit means a site-specific NPDES permit.

Inlet means a catch basin, roof drain, conduit, drain tile, retention pond riser pipe, sump pump, or other point where storm water or wastewater enters into a closed conveyance system prior to discharge off site or into waters of the state.

PART II

Section A. Definitions

Interference is a discharge which, alone or in conjunction with a discharge or discharges from other sources, both: 1) inhibits or disrupts the POTW, its treatment processes or operations, or its sludge processes, use or disposal; and 2) therefore, is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation) or, of the prevention of sewage sludge use or disposal in compliance with the following statutory provisions and regulations or permits issued thereunder (or more stringent state or local regulations): Section 405 of the Clean Water Act, the Solid Waste Disposal Act (SWDA) (including Title II, more commonly referred to as the Resource Conservation and Recovery Act (RCRA), and including state regulations contained in any state sludge management plan prepared pursuant to Subtitle D of the SWDA), the Clean Air Act, the Toxic Substances Control Act, and the Marine Protection, Research and Sanctuaries Act. [This definition does not apply to sample matrix interference].

Land application means spraying or spreading biosolids or a biosolids derivative onto the land surface, injecting below the land surface, or incorporating into the soil so that the biosolids or biosolids derivative can either condition the soil or fertilize crops or vegetation grown in the soil.

LC_{50} means a statistically or graphically estimated concentration that is expected to be lethal to 50% of a group of organisms under specified conditions.

Maximum acceptable toxicant concentration (MATC) means the concentration obtained by calculating the geometric mean of the lower and upper chronic limits from a chronic test. A lower chronic limit is the highest tested concentration that did not cause the occurrence of a specific adverse effect. An upper chronic limit is the lowest tested concentration which did cause the occurrence of a specific adverse effect and above which all tested concentrations caused such an occurrence.

Maximum extent practicable means implementation of best management practices by a public body to comply with an approved storm water management program as required by a national permit for a municipal separate storm sewer system, in a manner that is environmentally beneficial, technically feasible, and within the public body's legal authority.

MGD means million gallons per day.

Monthly concentration is the sum of the daily concentrations determined during a reporting period divided by the number of daily concentrations determined. The calculated monthly concentration will be used to determine compliance with any maximum monthly concentration limitations. Days with no discharge shall not be used to determine the value. When required by the permit, report the calculated monthly concentration in the "AVERAGE" column under "QUALITY OR CONCENTRATION" on the DMR.

For minimum percent removal requirements, the monthly influent concentration and the monthly effluent concentration shall be determined. The calculated monthly percent removal, which is equal to 100 times the quantity [1 minus the quantity (monthly effluent concentration divided by the monthly influent concentration)], shall be reported in the "MINIMUM" column under "QUALITY OR CONCENTRATION" on the DMRs.

Monthly loading is the sum of the daily loadings of a parameter divided by the number of daily loadings determined during a reporting period. The calculated monthly loading will be used to determine compliance with any maximum monthly loading limitations. Days with no discharge shall not be used to determine the value. When required by the permit, report the calculated monthly loading in the "AVERAGE" column under "QUANTITY OR LOADING" on the DMR.

Monthly monitoring frequency refers to a calendar month. When required by this permit, an analytical result, reading, value or observation shall be reported for that period if a discharge occurs during that period.

Municipal separate storm sewer means a conveyance or system of conveyances designed or used for collecting or conveying storm water which is not a combined sewer and which is not part of a publicly-owned treatment works as defined in the Code of Federal Regulations at 40 CFR 122.2.

PART II

Section A. Definitions

Municipal separate storm sewer system (MS4) means all separate storm sewers that are owned or operated by the United States, a state, city, village, township, county, district, association, or other public body created by or pursuant to state law, having jurisdiction over disposal of sewage, industrial wastes, storm water, or other wastes, including special districts under state law, such as a sewer district, flood control district, or drainage district, or similar entity, or a designated or approved management agency under Section 208 of the Federal Act that discharges to the waters of the state. This term includes systems similar to separate storm sewer systems in municipalities, such as systems at military bases, large hospital or prison complexes, and highways and other thoroughfares. The term does not include separate storm sewers in very discrete areas, such as individual buildings.

National Pretreatment Standards are the regulations promulgated by or to be promulgated by the Federal Environmental Protection Agency pursuant to Section 307(b) and (c) of the Federal Act. The standards establish nationwide limits for specific industrial categories for discharge to a POTW.

No observed adverse effect level (NOAEL) means the highest tested dose or concentration of a substance which results in no observed adverse effect in exposed test organisms where higher doses or concentrations result in an adverse effect.

Noncontact cooling water is water used for cooling which does not come into direct contact with any raw material, intermediate product, by-product, waste product or finished product.

Nondomestic user is any discharger to a POTW that discharges wastes other than or in addition to water-carried wastes from toilet, kitchen, laundry, bathing or other facilities used for household purposes.

Outfall is the location at which a point source discharge enters the surface waters of the state.

Part 91 agency means an agency that is designated by a county board of commissioners pursuant to the provisions of section 9105 of Part 91 of the NREPA; an agency that is designated by a city, village, or township in accordance with the provisions of section 9106 of Part 91 of the NREPA; or the Department for soil erosion and sedimentation activities under Part 615, Part 631, or Part 632 pursuant to the provisions of section 9115 of Part 91 of the NREPA.

Part 91 permit means a soil erosion and sedimentation control permit issued by a Part 91 agency pursuant to the provisions of Part 91 of the NREPA.

Partially treated sewage is any sewage, sewage and storm water, or sewage and wastewater, from domestic or industrial sources that is treated to a level less than that required by the permittee's National Pollutant Discharge Elimination System permit, or that is not treated to national secondary treatment standards for wastewater, including discharges to surface waters from retention treatment facilities.

Point of discharge is the location of a point source discharge where storm water is discharged directly into a separate storm sewer system.

Point source discharge means a discharge from any discernible, confined, discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, or rolling stock. Changing the surface of land or establishing grading patterns on land will result in a point source discharge where the runoff from the site is ultimately discharged to waters of the state.

Polluting material means any material, in solid or liquid form, identified as a polluting material under the Part 5 Rules (R 324.2001 through R 324.2009 of the Michigan Administrative Code).

POTW is a publicly owned treatment work.

PART II

Section A. Definitions

Pretreatment is reducing the amount of pollutants, eliminating pollutants, or altering the nature of pollutant properties to a less harmful state prior to discharge into a public sewer. The reduction or alteration can be by physical, chemical, or biological processes, process changes, or by other means. Dilution is not considered pretreatment unless expressly authorized by an applicable National Pretreatment Standard for a particular industrial category.
Public (as used in the MS4 individual permit) means all persons who potentially could affect the authorized storm water discharges, including, but not limited to, residents, visitors to the area, public employees, businesses, industries, and construction contractors and developers.

Public body means the United States; the state of Michigan; a city, village, township, county, school district, public college or university, or single-purpose governmental agency; or any other body which is created by federal or state statute or law.

Qualified Personnel means an individual who meets qualifications acceptable to the Department and who is authorized by an Industrial Storm Water Certified Operator to collect the storm water sample.

Qualifying storm event means a storm event causing greater than 0.1 inch of rainfall and occurring at least 72 hours after the previous measurable storm event that also caused greater than 0.1 inch of rainfall. Upon request, the Department may approve an alternate definition meeting the condition of a qualifying storm event.

Quantification level means the measurement of the concentration of a contaminant obtained by using a specified laboratory procedure calculated at a specified concentration above the detection level. It is considered the lowest concentration at which a particular contaminant can be quantitatively measured using a specified laboratory procedure for monitoring of the contaminant.

Quarterly monitoring frequency refers to a three month period, defined as January through March, April through June, July through September, and October through December. When required by this permit, an analytical result, reading, value or observation shall be reported for that period if a discharge occurs during that period.

Regional Administrator is the Region 5 Administrator, U.S. EPA, located at R-19J, 77 W. Jackson Blvd., Chicago, Illinois 60604.

Regulated area means the permittee's urbanized area, where urbanized area is defined as a place and its adjacent densely-populated territory that together have a minimum population of 50,000 people as defined by the United States Bureau of the Census and as determined by the latest available decennial census.

Secondary containment structure means a unit, other than the primary container, in which significant materials are packaged or held, which is required by State or Federal law to prevent the escape of significant materials by gravity into sewers, drains, or otherwise directly or indirectly into any sewer system or to the surface or ground waters of this state.

Separate storm sewer system means a system of drainage, including, but not limited to, roads, catch basins, curbs, gutters, parking lots, ditches, conduits, pumping devices, or man-made channels, which is not a combined sewer where storm water mixes with sanitary wastes, and is not part of a POTW.

Significant industrial user is a nondomestic user that: 1) is subject to Categorical Pretreatment Standards under 40 CFR 403.6 and 40 CFR Chapter I, Subchapter N; or 2) discharges an average of 25,000 gallons per day or more of process wastewater to a POTW (excluding sanitary, noncontact cooling and boiler blowdown wastewater); contributes a process waste stream which makes up five (5) percent or more of the average dry weather hydraulic or organic capacity of the POTW treatment plant; or is designated as such by the permittee as defined in 40 CFR 403.12(a) on the basis that the industrial user has a reasonable potential for adversely affecting the POTW's treatment plant operation or violating any pretreatment standard or requirement (in accordance with 40 CFR 403.8(f)(6)).

PART II

Section A. Definitions

Significant materials Significant Materials means any material which could degrade or impair water quality, including but not limited to: raw materials; fuels; solvents, detergents, and plastic pellets; finished materials such as metallic products; hazardous substances designated under Section 101(14) of Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (see 40 CFR 372.65); any chemical the facility is required to report pursuant to Section 313 of Emergency Planning and Community Right-to-Know Act (EPCRA); polluting materials as identified under the Part 5 Rules (R 324.2001 through R 324.2009 of the Michigan Administrative Code); Hazardous Wastes as defined in Part 111 of the NREPA; fertilizers; pesticides; and waste products such as ashes, slag, and sludge that have the potential to be released with storm water discharges.

Significant spills and significant leaks means any release of a polluting material reportable under the Part 5 Rules (R 324.2001 through R 324.2009 of the Michigan Administrative Code).

Special-use area means secondary containment structures required by state or federal law; lands on Michigan's List of Sites of Environmental Contamination pursuant to Part 201, Environmental Remediation, of the NREPA; and/or areas with other activities that may contribute pollutants to the storm water for which the Department determines monitoring is needed.

Stoichiometric means the quantity of a reagent calculated to be necessary and sufficient for a given chemical reaction.

Storm water means storm water runoff, snow melt runoff, surface runoff and drainage, and non-storm water included under the conditions of this permit.

Storm water discharge point is the location where the point source discharge of storm water is directed to surface waters of the state or to a separate storm sewer. It includes the location of all point source discharges where storm water exits the facility, including *outfalls* which discharge directly to surface waters of the state, and *points of discharge* which discharge directly into separate storm sewer systems.

SWPPP means the Storm Water Pollution Prevention Plan prepared in accordance with this permit.

Tier I value means a value for aquatic life, human health or wildlife calculated under R 323.1057 of the Water Quality Standards using a tier I toxicity database.

Tier II value means a value for aquatic life, human health or wildlife calculated under R 323.1057 of the Water Quality Standards using a tier II toxicity database.

Total maximum daily loads (TMDLs) are required by the Federal Act for waterbodies that do not meet water quality standards. TMDLs represent the maximum daily load of a pollutant that a waterbody can assimilate and meet water quality standards, and an allocation of that load among point sources, nonpoint sources, and a margin of safety.

Toxicity reduction evaluation (TRE) means a site-specific study conducted in a stepwise process designed to identify the causative agents of effluent toxicity, isolate the sources of toxicity, evaluate the effectiveness of toxicity control options, and then confirm the reduction in effluent toxicity.

Water Quality Standards means the Part 4 Water Quality Standards promulgated pursuant to Part 31 of the NREPA, being R 323.1041 through R 323.1117 of the Michigan Administrative Code.

Weekly monitoring frequency refers to a calendar week which begins on Sunday and ends on Saturday. When required by this permit, an analytical result, reading, value or observation shall be reported for that period if a discharge occurs during that period.

WWSL is a wastewater stabilization lagoon.

WWSL discharge event is a discrete occurrence during which effluent is discharged to the surface water up to 10 days of a consecutive 14 day period.

PART II

Section A. Definitions

3-portion composite sample is a sample consisting of three equal-volume grab samples collected at equal intervals over an 8-hour period.

7-day concentration
FOR WWSLs THAT COLLECT AND STORE WASTEWATER AND ARE AUTHORIZED TO DISCHARGE ONLY IN THE SPRING AND/OR FALL ON AN INTERMITTENT BASIS – The 7-day concentration is the sum of the daily concentrations determined during any 7 consecutive days of discharge during a WWSL discharge event divided by the number of daily concentrations determined. If the number of daily concentrations determined during the WWSL discharge event is less than 7 days, the number of actual daily concentrations determined shall be used for the calculation. The calculated 7-day concentration will be used to determine compliance with any maximum 7-day concentration limitations. When required by the permit, report the maximum calculated 7-day concentration for the WWSL discharge event in the "MAXIMUM" column under "QUALITY OR CONCENTRATION" on the DMR. If the WWSL discharge event was partially in each of two months, the value shall be reported on the DMR of the month in which the last day of discharge occurred.

FOR ALL OTHER DISCHARGES – The 7-day concentration is the sum of the daily concentrations determined during any 7 consecutive days in a reporting month divided by the number of daily concentrations determined. If the number of daily concentrations determined is less than 7, the actual number of daily concentrations determined shall be used for the calculation. The calculated 7-day concentration will be used to determine compliance with any maximum 7-day concentration limitations in the reporting month. When required by the permit, report the maximum calculated 7-day concentration for the month in the "MAXIMUM" column under "QUALITY OR CONCENTRATION" on the DMR. The first 7-day calculation shall be made on day 7 of the reporting month, and the last calculation shall be made on the last day of the reporting month.

7-day loading
FOR WWSLs THAT COLLECT AND STORE WASTEWATER AND ARE AUTHORIZED TO DISCHARGE ONLY IN THE SPRING AND/OR FALL ON AN INTERMITTENT BASIS – The 7-day loading is the sum of the daily loadings determined during any 7 consecutive days of discharge during a WWSL discharge event divided by the number of daily loadings determined. If the number of daily loadings determined during the WWSL discharge event is less than 7 days, the number of actual daily loadings determined shall be used for the calculation. The calculated 7-day loading will be used to determine compliance with any maximum 7-day loading limitations. When required by the permit, report the maximum calculated 7-day loading for the WWSL discharge event in the "MAXIMUM" column under "QUANTITY OR LOADING" on the DMR. If the WWSL discharge event was partially in each of two months, the value shall be reported on the DMR of the month in which the last day of discharge occurred

FOR ALL OTHER DISCHARGES – The 7-day loading is the sum of the daily loadings determined during any 7 consecutive days in a reporting month divided by the number of daily loadings determined. If the number of daily loadings determined is less than 7, the actual number of daily loadings determined shall be used for the calculation. The calculated 7-day loading will be used to determine compliance with any maximum 7-day loading limitations in the reporting month. When required by the permit, report the maximum calculated 7-day loading for the month in the "MAXIMUM" column under "QUANTITY OR LOADING" on the DMR. The first 7-day calculation shall be made on day 7 of the reporting month, and the last calculation shall be made on the last day of the reporting month.

24-hour composite sample is a flow-proportioned composite sample consisting of hourly or more frequent portions that are taken over a 24-hour period. A time-proportioned composite sample may be used upon approval of the Department if the permittee demonstrates it is representative of the discharge.

PART II

Section B. Monitoring Procedures

1. Representative Samples

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge.

2. Test Procedures

Test procedures for the analysis of pollutants shall conform to regulations promulgated pursuant to Section 304(h) of the Federal Act (40 CFR Part 136 – Guidelines Establishing Test Procedures for the Analysis of Pollutants), unless specified otherwise in this permit. **Test procedures used shall be sufficiently sensitive to determine compliance with applicable effluent limitations**. Requests to use test procedures not promulgated under 40 CFR Part 136 for pollutant monitoring required by this permit shall be made in accordance with the Alternate Test Procedures regulations specified in 40 CFR 136.4. These requests shall be submitted to the Section Manager of the Permits Section, Water Resources Division, Michigan Department of Environmental Quality, P.O. Box 30458, Lansing, Michigan, 48909-7958. The permittee may use such procedures upon approval.

The permittee shall periodically calibrate and perform maintenance procedures on all analytical instrumentation at intervals to ensure accuracy of measurements. The calibration and maintenance shall be performed as part of the permittee's laboratory Quality Control/Quality Assurance program.

3. Instrumentation

The permittee shall periodically calibrate and perform maintenance procedures on all monitoring instrumentation at intervals to ensure accuracy of measurements.

4. Recording Results

For each measurement or sample taken pursuant to the requirements of this permit, the permittee shall record the following information: 1) the exact place, date, and time of measurement or sampling; 2) the person(s) who performed the measurement or sample collection; 3) the dates the analyses were performed; 4) the person(s) who performed the analyses; 5) the analytical techniques or methods used; 6) the date of and person responsible for equipment calibration; and 7) the results of all required analyses.

5. Records Retention

All records and information resulting from the monitoring activities required by this permit including all records of analyses performed and calibration and maintenance of instrumentation and recordings from continuous monitoring instrumentation shall be retained for a minimum of three (3) years, or longer if requested by the Regional Administrator or the Department.

PART II

Section C. Reporting Requirements

1. Start-up Notification

If the permittee will not discharge during the first 60 days following the effective date of this permit, the permittee shall notify the Department within 14 days following the effective date of this permit, and then 60 days prior to the commencement of the discharge.

2. Submittal Requirements for Self-Monitoring Data

Part 31 of the NREPA (specifically Section 324.3110(7)); and R 323.2155(2) of Part 21, Wastewater Discharge Permits, promulgated under Part 31 of the NREPA, allow the Department to specify the forms to be utilized for reporting the required self-monitoring data. Unless instructed on the effluent limitations page to conduct "Retained Self-Monitoring," the permittee shall submit self-monitoring data via the Department's MiWaters system.

The permittee shall utilize the information provided on the MiWaters website, located at https://miwaters.deq.state.mi.us, to access and submit the electronic forms. Both monthly summary and daily data shall be submitted to the Department no later than the 20th day of the month following each month of the authorized discharge period(s). The permittee may be allowed to submit the electronic forms after this date if the Department has granted an extension to the submittal date.

3. Retained Self-Monitoring Requirements

If instructed on the effluent limits page (or otherwise authorized by the Department in accordance with the provisions of this permit) to conduct retained self-monitoring, the permittee shall maintain a year-to-date log of retained self-monitoring results and, upon request, provide such log for inspection to the staff of the Department. Retained self-monitoring results are public information and shall be promptly provided to the public upon request.

The permittee shall certify, in writing, to the Department, on or before January 10th (April 1st for animal feeding operation facilities) of each year, that: 1) all retained self-monitoring requirements have been complied with and a year-to-date log has been maintained; and 2) the application on which this permit is based still accurately describes the discharge. With this annual certification, the permittee shall submit a summary of the previous year's monitoring data. The summary shall include maximum values for samples to be reported as daily maximums and/or monthly maximums and minimum values for any daily minimum samples.

Retained self-monitoring may be denied to a permittee by notification in writing from the Department. In such cases, the permittee shall submit self-monitoring data in accordance with Part II.C.2., above. Such a denial may be rescinded by the Department upon written notification to the permittee. Reissuance or modification of this permit or reissuance or modification of an individual permittee's authorization to discharge shall not affect previous approval or denial for retained self-monitoring unless the Department provides notification in writing to the permittee.

4. Additional Monitoring by Permittee

If the permittee monitors any pollutant at the location(s) designated herein more frequently than required by this permit, using approved analytical methods as specified above, the results of such monitoring shall be included in the calculation and reporting of the values required in the Discharge Monitoring Report. Such increased frequency shall also be indicated.

Monitoring required pursuant to Part 41 of the NREPA or Rule 35 of the Mobile Home Park Commission Act (Act 96 of the Public Acts of 1987) for assurance of proper facility operation shall be submitted as required by the Department.

PART II

Section C. Reporting Requirements

5. Compliance Dates Notification

Within 14 days of every compliance date specified in this permit, the permittee shall submit a *written* notification to the Department indicating whether or not the particular requirement was accomplished. If the requirement was not accomplished, the notification shall include an explanation of the failure to accomplish the requirement, actions taken or planned by the permittee to correct the situation, and an estimate of when the requirement will be accomplished. If a written report is required to be submitted by a specified date and the permittee accomplishes this, a separate written notification is not required.

6. Noncompliance Notification

Compliance with all applicable requirements set forth in the Federal Act, Parts 31 and 41 of the NREPA, and related regulations and rules is required. All instances of noncompliance shall be reported as follows:

a. 24-Hour Reporting
Any noncompliance which may endanger health or the environment (including maximum and/or minimum daily concentration discharge limitation exceedances) shall be reported, verbally, within 24 hours from the time the permittee becomes aware of the noncompliance. A written submission shall also be provided within five (5) days.

b. Other Reporting
The permittee shall report, in writing, all other instances of noncompliance not described in a. above at the time monitoring reports are submitted; or, in the case of retained self-monitoring, within five (5) days from the time the permittee becomes aware of the noncompliance.

Written reporting shall include: 1) a description of the discharge and cause of noncompliance; and 2) the period of noncompliance, including exact dates and times, or, if not yet corrected, the anticipated time the noncompliance is expected to continue, and the steps taken to reduce, eliminate and prevent recurrence of the noncomplying discharge.

7. Spill Notification

The permittee shall immediately report any release of any polluting material which occurs to the surface waters or groundwaters of the state, unless the permittee has determined that the release is not in excess of the threshold reporting quantities specified in the Part 5 Rules (R 324.2001 through R 324.2009 of the Michigan Administrative Code), by calling the Department at the number indicated on the second page of this permit (or, if this is a general permit, on the COC); or, if the notice is provided after regular working hours, call the Department's 24-hour Pollution Emergency Alerting System telephone number, 1-800-292-4706 (calls from **out-of-state** dial 1-517-373-7660).

Within ten (10) days of the release, the permittee shall submit to the Department a full written explanation as to the cause of the release, the discovery of the release, response (clean-up and/or recovery) measures taken, and preventive measures taken or a schedule for completion of measures to be taken to prevent reoccurrence of similar releases.

PART II

Section C. Reporting Requirements

8. Upset Noncompliance Notification

If a process "upset" (defined as an exceptional incident in which there is unintentional and temporary noncompliance with technology based permit effluent limitations because of factors beyond the reasonable control of the permittee) has occurred, the permittee who wishes to establish the affirmative defense of upset, shall notify the Department by telephone within 24 hours of becoming aware of such conditions; and within five (5) days, provide in writing, the following information:

a. that an upset occurred and that the permittee can identify the specific cause(s) of the upset;

b. that the permitted wastewater treatment facility was, at the time, being properly operated and maintained (note that an upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation); and

c. that the permittee has specified and taken action on all responsible steps to minimize or correct any adverse impact in the environment resulting from noncompliance with this permit.

No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.

In any enforcement proceedings, the permittee, seeking to establish the occurrence of an upset, has the burden of proof.

9. Bypass Prohibition and Notification

a. Bypass Prohibition
Bypass is prohibited, and the Department may take an enforcement action, unless:

1) bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;

2) there were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate backup equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass; and

3) the permittee submitted notices as required under 9.b. or 9.c. below.

b. Notice of Anticipated Bypass
If the permittee knows in advance of the need for a bypass, it shall submit prior notice to the Department, if possible at least ten (10) days before the date of the bypass, and provide information about the anticipated bypass as required by the Department. The Department may approve an anticipated bypass, after considering its adverse effects, if it will meet the three (3) conditions listed in 9.a. above.

c. Notice of Unanticipated Bypass
The permittee shall submit notice to the Department of an unanticipated bypass by calling the Department at the number indicated on the second page of this permit (if the notice is provided after regular working hours, use the following number: 1-800-292-4706) as soon as possible, but no later than 24 hours from the time the permittee becomes aware of the circumstances.

PART II

Section C. Reporting Requirements

d. Written Report of Bypass
A written submission shall be provided within five (5) working days of commencing any bypass to the Department, and at additional times as directed by the Department. The written submission shall contain a description of the bypass and its cause; the period of bypass, including exact dates and times, and if the bypass has not been corrected, the anticipated time it is expected to continue; steps taken or planned to reduce, eliminate, and prevent reoccurrence of the bypass; and other information as required by the Department.

e. Bypass Not Exceeding Limitations
The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to ensure efficient operation. These bypasses are not subject to the provisions of 9.a., 9.b., 9.c., and 9.d., above. This provision does not relieve the permittee of any notification responsibilities under Part II.C.11. of this permit.

f. Definitions

1) Bypass means the intentional diversion of waste streams from any portion of a treatment facility.

2) Severe property damage means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

10. Bioaccumulative Chemicals of Concern (BCC)

Consistent with the requirements of R 323.1098 and R 323.1215 of the Michigan Administrative Code, the permittee is prohibited from undertaking any action that would result in a lowering of water quality from an increased loading of a BCC unless an increased use request and antidegradation demonstration have been submitted and approved by the Department.

11. Notification of Changes in Discharge

The permittee shall notify the Department, in writing, as soon as possible but no later than 10 days of knowing, or having reason to believe, that any activity or change has occurred or will occur which would result in the discharge of: 1) detectable levels of chemicals on the current Michigan Critical Materials Register, priority pollutants or hazardous substances set forth in 40 CFR 122.21, Appendix D, or the Pollutants of Initial Focus in the Great Lakes Water Quality Initiative specified in 40 CFR 132.6, Table 6, which were not acknowledged in the application or listed in the application at less than detectable levels; 2) detectable levels of any other chemical not listed in the application or listed at less than detection, for which the application specifically requested information; or 3) any chemical at levels greater than five times the average level reported in the complete application (see the first page of this permit, for the date(s) the complete application was submitted). Any other monitoring results obtained as a requirement of this permit shall be reported in accordance with the compliance schedules.

PART II

Section C. Reporting Requirements

12. Changes in Facility Operations

Any anticipated action or activity, including but not limited to facility expansion, production increases, or process modification, which will result in new or increased loadings of pollutants to the receiving waters must be reported to the Department by a) submission of an increased use request (application) and all information required under R 323.1098 (Antidegradation) of the Water Quality Standards or b) by notice if the following conditions are met: 1) the action or activity will not result in a change in the types of wastewater discharged or result in a greater quantity of wastewater than currently authorized by this permit; 2) the action or activity will not result in violations of the effluent limitations specified in this permit; 3) the action or activity is not prohibited by the requirements of Part II.C.10.; and 4) the action or activity will not require notification pursuant to Part II.C.11. Following such notice, the permit or, if applicable, the facility's COC may be modified according to applicable laws and rules to specify and limit any pollutant not previously limited.

13. Transfer of Ownership or Control

In the event of any change in control or ownership of facilities from which the authorized discharge emanates, the permittee shall submit to the Department 30 days prior to the actual transfer of ownership or control a written agreement between the current permittee and the new permittee containing: 1) the legal name and address of the new owner; 2) a specific date for the effective transfer of permit responsibility, coverage and liability; and 3) a certification of the continuity of or any changes in operations, wastewater discharge, or wastewater treatment.

If the new permittee is proposing changes in operations, wastewater discharge, or wastewater treatment, the Department may propose modification of this permit in accordance with applicable laws and rules.

14. Operations and Maintenance Manual

For wastewater treatment facilities that serve the public (and are thus subject to Part 41 of the NREPA), Section 4104 of Part 41 and associated Rule 2957 of the Michigan Administrative Code allow the Department to require an Operations and Maintenance (O&M) Manual from the facility. An up-to-date copy of the O&M Manual shall be kept at the facility and shall be provided to the Department upon request. The Department may review the O&M Manual in whole or in part at its discretion and require modifications to it if portions are determined to be inadequate.

At a minimum, the O&M Manual shall include the following information: permit standards; descriptions and operation information for all equipment; staffing information; laboratory requirements; record keeping requirements; a maintenance plan for equipment; an emergency operating plan; safety program information; and copies of all pertinent forms, as-built plans, and manufacturer's manuals.

Certification of the existence and accuracy of the O&M Manual shall be submitted to the Department at least sixty days prior to start-up of a new wastewater treatment facility. Recertification shall be submitted sixty days prior to start-up of any substantial improvements or modifications made to an existing wastewater treatment facility.

15. Signatory Requirements

All applications, reports, or information submitted to the Department in accordance with the conditions of this permit and that require a signature shall be signed and certified as described in the Federal Act and the NREPA.

The Federal Act provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance, shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than 6 months per violation, or by both.

PART II

Section C. Reporting Requirements

The NREPA (Section 3115(2)) provides that a person who at the time of the violation knew or should have known that he or she discharged a substance contrary to this part, or contrary to a permit, COC, or order issued or rule promulgated under this part, or who intentionally makes a false statement, representation, or certification in an application for or form pertaining to a permit or COC or in a notice or report required by the terms and conditions of an issued permit or COC, or who intentionally renders inaccurate a monitoring device or record required to be maintained by the Department, is guilty of a felony and shall be fined not less than $2,500.00 or more than $25,000.00 for each violation. The court may impose an additional fine of not more than $25,000.00 for each day during which the unlawful discharge occurred. If the conviction is for a violation committed after a first conviction of the person under this subsection, the court shall impose a fine of not less than $25,000.00 per day and not more than $50,000.00 per day of violation. Upon conviction, in addition to a fine, the court in its discretion may sentence the defendant to imprisonment for not more than 2 years or impose probation upon a person for a violation of this part. With the exception of the issuance of criminal complaints, issuance of warrants, and the holding of an arraignment, the circuit court for the county in which the violation occurred has exclusive jurisdiction. However, the person shall not be subject to the penalties of this subsection if the discharge of the effluent is in conformance with and obedient to a rule, order, permit, or COC of the Department. In addition to a fine, the attorney general may file a civil suit in a court of competent jurisdiction to recover the full value of the injuries done to the natural resources of the state and the costs of surveillance and enforcement by the state resulting from the violation.

16. Electronic Reporting

Upon notice by the Department that electronic reporting tools are available for specific reports or notifications, the permittee shall submit electronically all such reports or notifications as required by this permit.

PART II

Section D. Management Responsibilities

1. Duty to Comply

All discharges authorized herein shall be consistent with the terms and conditions of this permit. The discharge of any pollutant identified in this permit, more frequently than, or at a level in excess of, that authorized, shall constitute a violation of the permit.

It is the duty of the permittee to comply with all the terms and conditions of this permit. Any noncompliance with the Effluent Limitations, Special Conditions, or terms of this permit constitutes a violation of the NREPA and/or the Federal Act and constitutes grounds for enforcement action; for permit or Certificate of Coverage (COC) termination, revocation and reissuance, or modification; or denial of an application for permit or COC renewal.

It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

2. Operator Certification

The permittee shall have the waste treatment facilities under direct supervision of an operator certified at the appropriate level for the facility certification by the Department, as required by Sections 3110 and 4104 of the NREPA. Permittees authorized to discharge storm water shall have the storm water treatment and/or control measures under direct supervision of a storm water operator certified by the Department, as required by Section 3110 of the NREPA.

3. Facilities Operation

The permittee shall, at all times, properly operate and maintain all treatment or control facilities or systems installed or used by the permittee to achieve compliance with the terms and conditions of this permit. Proper operation and maintenance includes adequate laboratory controls and appropriate quality assurance procedures.

4. Power Failures

In order to maintain compliance with the effluent limitations of this permit and prevent unauthorized discharges, the permittee shall either:

a. provide an alternative power source sufficient to operate facilities utilized by the permittee to maintain compliance with the effluent limitations and conditions of this permit; or

b. upon the reduction, loss, or failure of one or more of the primary sources of power to facilities utilized by the permittee to maintain compliance with the effluent limitations and conditions of this permit, the permittee shall halt, reduce or otherwise control production and/or all discharge in order to maintain compliance with the effluent limitations and conditions of this permit.

5. Adverse Impact

The permittee shall take all reasonable steps to minimize or prevent any adverse impact to the surface waters or groundwaters of the state resulting from noncompliance with any effluent limitation specified in this permit including, but not limited to, such accelerated or additional monitoring as necessary to determine the nature and impact of the discharge in noncompliance.

PART II

Section D. Management Responsibilities

6. Containment Facilities

The permittee shall provide facilities for containment of any accidental losses of polluting materials in accordance with the requirements of the Part 5 Rules (R 324.2001 through R 324.2009 of the Michigan Administrative Code). For a Publicly Owned Treatment Work (POTW), these facilities shall be approved under Part 41 of the NREPA.

7. Waste Treatment Residues

Residuals (i.e. solids, sludges, biosolids, filter backwash, scrubber water, ash, grit, or other pollutants or wastes) removed from or resulting from treatment or control of wastewaters, including those that are generated during treatment or left over after treatment or control has ceased, shall be disposed of in an environmentally compatible manner and according to applicable laws and rules. These laws may include, but are not limited to, the NREPA, Part 31 for protection of water resources, Part 55 for air pollution control, Part 111 for hazardous waste management, Part 115 for solid waste management, Part 121 for liquid industrial wastes, Part 301 for protection of inland lakes and streams, and Part 303 for wetlands protection. Such disposal shall not result in any unlawful pollution of the air, surface waters or groundwaters of the state.

8. Right of Entry

The permittee shall allow the Department, any agent appointed by the Department, or the Regional Administrator, upon the presentation of credentials and, for animal feeding operation facilities, following appropriate biosecurity protocols:

a. to enter upon the permittee's premises where an effluent source is located or any place in which records are required to be kept under the terms and conditions of this permit; and

b. at reasonable times to have access to and copy any records required to be kept under the terms and conditions of this permit; to inspect process facilities, treatment works, monitoring methods and equipment regulated or required under this permit; and to sample any discharge of pollutants.

9. Availability of Reports

Except for data determined to be confidential under Section 308 of the Federal Act and Rule 2128 (R 323.2128 of the Michigan Administrative Code), all reports prepared in accordance with the terms of this permit, shall be available for public inspection at the offices of the Department and the Regional Administrator. As required by the Federal Act, effluent data shall not be considered confidential. Knowingly making any false statement on any such report may result in the imposition of criminal penalties as provided for in Section 309 of the Federal Act and Sections 3112, 3115, 4106 and 4110 of the NREPA.

10. Duty to Provide Information

The permittee shall furnish to the Department, within a reasonable time, any information which the Department may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or the facility's COC, or to determine compliance with this permit. The permittee shall also furnish to the Department, upon request, copies of records required to be kept by this permit.

Where the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Department, it shall promptly submit such facts or information.

PART II

Section E. Activities Not Authorized by This Permit

1. Discharge to the Groundwaters

This permit does not authorize any discharge to the groundwaters. Such discharge may be authorized by a groundwater discharge permit issued pursuant to the NREPA.

2. POTW Construction

This permit does not authorize or approve the construction or modification of any physical structures or facilities at a POTW. Approval for the construction or modification of any physical structures or facilities at a POTW shall be by permit issued under Part 41 of the NREPA.

3. Civil and Criminal Liability

Except as provided in permit conditions on "Bypass" (Part II.C.9. pursuant to 40 CFR 122.41(m)), nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance, whether or not such noncompliance is due to factors beyond the permittee's control, such as accidents, equipment breakdowns, or labor disputes.

4. Oil and Hazardous Substance Liability

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee may be subject under Section 311 of the Federal Act except as are exempted by federal regulations.

5. State Laws

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable state law or regulation under authority preserved by Section 510 of the Federal Act.

6. Property Rights

The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize violation of any federal, state or local laws or regulations, nor does it obviate the necessity of obtaining such permits, including any other Department of Environmental Quality permits, or approvals from other units of government as may be required by law.

Appendix J. NPDES Permit

Section 2. Owosso WWTP Permit Violations Summary Table

City of Owosso
Owosso Mid-Shiawassee County Wastewater Treatment Plant
NPDES Permit Violations (2009 to Present)

	Violation Description
2009	
April	Total Phosphorous - 30 Day Average (Loading)
2010	
April	Fecal Coliform - 7 Day Average, TSS - 7 Day Average (Loading)
2011	
March	TSS - Percent Removal
May	TSS - Percent Removal, TSS - 7 Day Average (Loading), TSS - 30 Day Average (Loading), Total Phosphorous - 30 Day Average (Loading)
June	TSS - Percent Removal, Total Phosphorous - 30 Day Average (Concentration)
July	Carbonaceous BOD5 - Max Day (Concentration)
2013	
April	Fecal Coliform - 7 Day Average, TSS - 7 Day Average (Loading), TSS - 30 Day Average (Loading), Total Phosphorous - 30 Day Average (Loading)
May	TSS - Percent Removal, TSS - 7 Day Average (Loading), TSS - 30 Day Average (Loading), Total Phosphorous - 30 Day Average (Loading)
2014	
May	TSS - 7 Day Average (Loading)
June	TSS - Percent Removal, Total Phosphorous - 30 Day Average (Concentration)
2015	
June	Carbonaceous BOD5 - Max Day (Concentration), Ammonia Nitrogen - Max Day (Concentration), Total Phosphorous - 30 Day Average (Concentration)
September	Carbonaceous BOD5 - Max Day (Concentration), Ammonia Nitrogen - Max Day (Concentration)
October	Carbonaceous BOD5 - Max Day (Concentration), Total Phosphorous - 30 Day Average (Concentration)
2016	
March	TSS - Percent Removal
April	TSS - Percent Removal
2017	
January	TSS - Percent Removal
February	TSS - Percent Removal
March	TSS - 7 Day Average (Concentration), TSS - 30 Day Average (Concentration), TSS - 7 Day Average (Loading), TSS - Percent Removal
April	TSS - 7 Day Average (Loading), TSS - 30 Day Average (Loading), TSS - Percent Removal, Feval Coliform - 7 Day Average
May	TSS - 7 Day Average (Concentration), TSS - 30 Day Average (Concentration), TSS - Percent Removal, Total Phosphorous - 30 Day Average (Concentration)
June	TSS - Percent Removal
2018	
February	TSS - Percent Removal, TSS - 7 Day Average (Loading), Fecal Coliform - 7 Day Average
August	Carbonaceous BOD5 - Max Day (Concentration), Ammonia Nitrogen - Max Day (Concentration)

Appendix K.

2019 Regional System Flow Evaluation

Regional System Flow Evaluation
Technical Memorandum
City of Owosso MI
March 22, 2019

Introduction

The City of Owosso is currently under an Administrative Consent Order (ACO) from the Michigan Department of Environmental Quality (MDEQ) due to sanitary sewer overflows (SSOs) within the City's system and at the Wastewater Treatment Plant (WWTP) during wet weather events. Initial investigation has shown that excess flow at the WWTP contributes to the SSOs. Because there are other communities that contribute flows to the WWTP, the overflow issue is a regional concern. The regional communities consist of the Cities of Owosso and Corunna and Caledonia and Owosso Townships.

This memorandum summarizes the results from the data collection, flow analysis and modeling to assist the City with the following objectives:

1) Determine the sources of peak wet weather flow by community.

2) Develop the 10-year design peak flow reaching the WWTP and compare to acceptable peaking factors. The 10-year frequency flow is critical in Michigan, as the 2002 SSO Policy (MDEQ) makes a specific reference to collection systems being designed to overflow less than once in ten years; in other words, systems should be designed to safely convey the 10-year recurrence interval flow rate.

The next phase of this project is conceptual engineering. Once there is an understanding of the flow distribution in the regional system, conceptualizing potential improvements and improvements costs at the WWTP can be developed.

Key Findings

Flow data was collected from the City of Owosso owned meters (M-0, M-1, and M-2) for 2017-2018 flows to understand the peak wet weather flow contributing to the WWTP from each of the communities. The flow data collected was used to perform modeling to extrapolate the observed flow data to the 10-year design peak flow rates for each community. The key findings of the modeling and observed flow data analysis are as follows:

1) Observed flows from 2017-2018 showed communities exceeding or nearly exceeding a peaking factor of 4.0 when compared to average daily flows from 2008-2018.

2) The modeling shows that all the communities, except Owosso Township, exceed a peaking factor of 4.0 when compared to the average daily flows and the 10-year design peak flow.

3) The total modeled 10-year design peak flow of 13,245 GPM for the communities is greater than WWTP capacity of 12,500 GPM.

Based on the above conclusions, it appears that all communities require some I/I removal in their system or additional storage in the individual communities or at the WWTP to remain within the 10-year design flows and address the SSOs at the WWTP. It may be advantageous to coordinate these improvements as a regional project to address the joint needs of both Cities and Townships.

Background

Purpose and Scope

The purpose of this analysis was to monitor the wet weather flows from the communities that contribute to the Owosso WWTP, and use the data collected to evaluate the 10-year design peak flow reaching the WWTP. Below is a detailed description of the analysis performed.

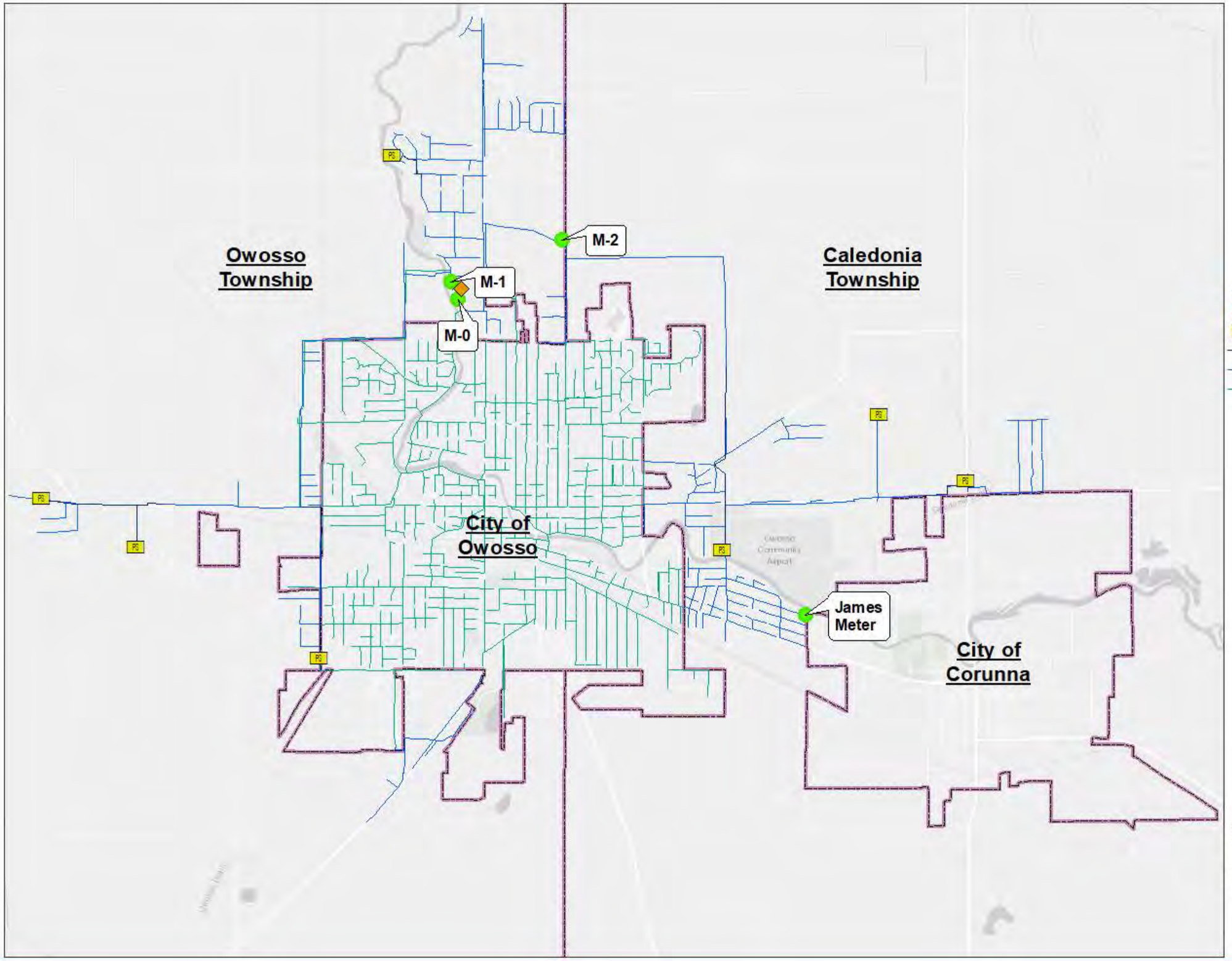
1) *Flow Metering Data* - In order to determine the sources of peak wet weather flow and develop the 10-year design peak flow reaching the WWTP, the City of Owosso owned meters (M-0, M-1 and M-2) were used to collect the community flows. Data was also collected from the City of Corunna's pump station.

2) *Antecedent Moisture Modeling* - The purpose of using the AMM was to create a continuous hydrologic models that predicts the effects of a wet weather response. The models are calibrated to optimize the accuracy of fit of the predicted model to the observed conditions.

3) *Frequency Analyses* - The purpose of the frequency analyses was to identify the 10-year design peak flow recurrence interval for the communities using 50 years (1969-2018) of rain data and air temperature data from the City of Detroit.

4) *Peak flow evaluation* – The peak flows developed above were then compared to the average day flows from each community and the calculated acceptable peaking factor of 4.0.

Figure 1
Meter Locations



- Waste Water Treatment Plant
- City of Owosso Meters
- PS Pump Station
- Force Main
- Owosso/Caledonia Twp Sanitary Sewer
- City of Owosso Sanitary Sewer

N

0 3,000 6,000

Feet

1" = 3,000'

Source: Data provided by the City of Owosso OHM Advisors does not warrant the accuracy of the data and/or the map. This document is intended to depict the approximate spatial location of the mapped features within the Community and all use is strictly at the user's own risk.

Coordinate System: NAD 1983StatePlane Michigan South FIPS 2113 IntFeet

Map Published: March 11, 2019

OHM

Regional Flows

The regional system is made up of four communities, the Cities of Owosso and Corunna and Caledonia and Owosso Townships. To calculate community flows, meter math has to be completed as shown in Figure 2.

The City of Owosso's flow to the WWTP is directly metered and requires no meter math. Owosso Township's flow can be calculated easily by subtracting the M-1 and M-2 meters. For the City of Corunna there are two metered flows that leave their system, enter into Caledonia Township, and then flows from Corunna and Caledonia flow together through the M-2 meter. To calculate the City of Corunna's flow, the Corunna Pump Station and the James meter need to be added together. The sewage pumping flow records and equalization pumping flow reports for Corunna's Pump Station were submitted to OHM monthly and could be used to calculate this summation of flow. Caledonia Township's flow could then be calculated by subtracting the City of Corunna flow from the M-2 meter.

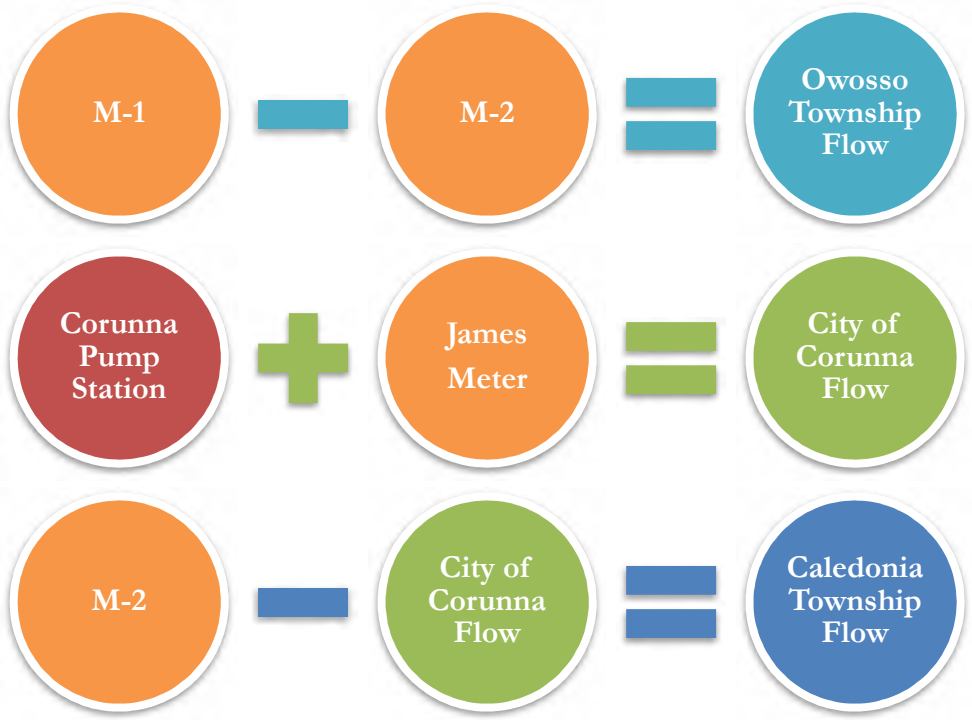


Figure 2: Community Flow Meter Math

Modeling was performed for the M-0, M-1 and M-2 meters to determine the 10-year design peak flows for the City of Owosso and Owosso Township. To determine the 10-year design peak flow for Caledonia Township and the City of Corunna, the max pumping station capacity was subtracted from M-2 10-year design peak flow.

Hydrology

Development of Antecedent Moisture Models for the City of Owosso Meter and Community Meters

This study utilizes the Antecedent Moisture Model (AMM), which is a continuous hydrologic model that can accurately account for antecedent moisture and its effect on sanitary sewer wet weather response over continually varying climate conditions. Antecedent moisture is a term that describes the relative wetness or dryness of a sewershed. The AMM takes into consideration the ground's moisture and more accurately predicts the sewershed response over an extended period of time using rainfall and air temperature data. A more in-depth description of the AMM is provided in Appendix A.

An AMM was developed for the City of Owosso flow entering the WWTP. An existing gauge at the WWTP collected the rain data. The M-2 meter collected flow from Caledonia Township and the City of Corunna, and the M-1 meter collects the flow from the M-2 meter and Owosso Township.

Rain and temperature data from the City of Detroit (1969-2018) were used for the long-term AMM used for the flow frequency analysis. The Detroit long term record was readily available and is in the same climatological region of Owosso to accurately represent the likely statistics of future rainfall and air temperature.

Hydrology Model Calibration

One year (August 2017 through July 2018) of meter data was used to build and calibrate the M-1 and M-2 AM models. The City of Owosso M-0 meter model incorporated past flow data to include the current year and the historic 2013-2015 data. To calibrate the models, the diurnal flow pattern was filtered out and specific storms were defined. The daily diurnal flow pattern was filtered so that the resulting observed flow signal only contained Inflow and Infiltration (I/I). Storms were chosen based on the following criteria: the storms had to have a minimum of ~0.5 inches of total rainfall and generally consist of uniform rainfall distribution, and the meter data collected during the storm must have a sensible response to the rainfall (i.e. no meter errors, drop-outs, SSO events or equalization basin storage being used). Storms during which the meter data had excess noise or possible errors were excluded. The storms used for AMM's calibration are listed on the next page in Table 1.

Table 1 Calibrated Storms

M-0 (City of Owosso)	
Storm	Total Rainfall (in)
04/08/2013	4.50
05/20/2013	0.70
05/22/2013	1.10
05/28/2013	1.90
07/07/2013	0.90
08/27/2013	3.90
10/31/2013	1.40
05/12/2014	1.90
05/14/2014	1.68
05/20/2014	1.30
05/26/2014	1.11
06/18/2014	1.07
06/24/2014	1.36
07/06/2014	2.12
08/19/2014	1.27
05/29/2015	1.94
06/14/2015	1.08
07/07/2015	0.76
08/02/2015	0.99
10/10/2017	0.91
10/14/2017	2.18
10/23/2017	1.96
04/03/2018	0.58
04/13/2018	0.94
06/09/2018	2.06

M-1 (M-2 + Owosso Township)	
Storm	Total Rainfall (in)
10/11/2017	0.90
10/14/2017	2.22
10/24/2017	0.75
04/03/2018	0.59
04/13/2018	0.94
05/30/2018	0.45
06/09/2018	2.06

M-2 (Caledonia + Corunna)	
Storm	Total Rainfall (in)
10/14/2017	1.01
10/15/2017	0.67
04/03/2018	0.49
04/14/2018	0.93
05/15/2018	0.51
05/30/2018	0.45

Hydrology Model Results

Accuracy of Fit

To quantify the accuracy of the model for peak flows and volumes for each storm, the total errors for peak flow and volume were calculated for each storm as well as the net error of each. Storm events were not included in the analysis when observed data was flawed due to meter malfunction. Net error is the average of all the errors and allows positive and negative values to cancel each other. Total error is the average of the absolute value of the errors. Net error is an indication of the model bias and total error is an indication of the predictive accuracy of the model for specific storms. The goal of this study was to reach a net error close to 0 percent and a total error less than 20 percent. The summary of the calculated net and total errors is listed in Table 2 and the accuracy of fit plots can be found in Appendix B. Negative values indicate that the AMM under-predicts and positive values indicate that the AMM over-predicts the observed flows.

Table 2 Summary of Net and Total Error for the AM Models

	Net Peak Error	Total Peak Error	Net Volume Error	Total Volume Error
M-0	0.4%	12.5%	-0.3%	7.0%
M-1	-0.2%	8.0%	0.1%	5.3%
M-2	0.1%	5.7%	-0.1%	2.0%

The errors listed in Table 2 reveal that the models were successfully calibrated. The total errors indicate that the AMM's predicted peak flows and peak volumes to within 0-15% of observed values for any given storm. Net errors indicate that the AMM's were not biased towards over- or under-prediction of flows or volumes. These model performances are excellent for a continuous hydrologic model and demonstrate that the model is suitable for use in a long-term continuous simulation to support a frequency analysis to develop the 10-year design flows.

Frequency Analyses

Frequency analyses were performed for each model to determine the expected 10-year frequency design peak flow rates. The 10-year design peak flows for M-0, M-1 and M-2 are listed in Table 3.

Table 3 Summary of Peak Flows

	10-Year Design Peak Flow Rate (0.10 Annual Probability)	
	CFS	GPM
M-0 (City of Owosso)	19.5	8,755
M-1 (M-2 + Owosso Township)	10.0	4,490
M-2 (Caledonia + Corunna)	8.7	3,905

The Log Pearson Type III probability was used to describe the peak flow data. The parameters of the function are the mean, variance, and skewness of the data. The plots also include the 95% confidence interval and are illustrated in Appendix C.

Based on the meter math of the regional system the City of Owosso and Owosso Township 10-year design peak flows could be easily calculated based on the modeling. To calculate Caledonia Township and the City of Corunna's 10-year design peak flows an assumption that Corunna's pump station would be maxed out during the 10-year design flow rate was made. Subtracting the max pumping rate of 1,650 GPM from meter M-2's 10-year design peak flow yielded Caledonia Township's 10-year design peak flow. The 10-year design peak flow rates for each community are tabulated below in Table 4.

Table 4 Modeled/Calculated Community Peak Flows

	10-Year Design Peak Flow Rate (GPM)
City of Owosso (M-0)	8,755
Owosso Township (M1 – M2)	585
City of Corunna (Max Pumping + James)	1,650
Caledonia Township (M2 – Corunna)	2,255
WWTP Total	13,245

Community Flows and Storm Analysis

Flow Evaluation

The scope of this project was to determine peak flows for each community and compare them to average daily flow rate conditions. Average daily flow rates were computed by using the City of Owosso historic flows from 2008-2018 data. The daily flow rates, the 10-year design peak flows and peaking factors for the communities are listed in Table 5.

Table 5 Community Average Day Flows, 10-Year Design Flows and Peaking Factors

	10-Year Average Day (GPM)	10-Year Design Peak Flow Rate (GPM)	10-Year Peaking Factor
City of Owosso (M-0)	1,925	8,755	4.5
Owosso Township (M1 – M2)	265	585	2.2
City of Corunna (Max Pumping + James)	360	1,650	4.6
Caledonia Township (M2 – Corunna)	235	2,255	9.6
WWTP Total	2,785	13,245	5.2

Storm Analysis

During the 2017-2018 metering period, observed storm flows showed that community peak flows yielded peaking factors close to or greater than 4.0. Table 6 shows the community average day flows, storm peak flows and the peaking factors. These storms, based on frequency, are expected to occur on a yearly or every two years basis. Rainfall frequencies are based on NOAA Atlas 90% confidence intervals that can be found in Appendix D.

Table 6 Observed Storm Flows

4/15/2018 Storm
1.25", 48 Hour Rain (Yearly Occurrence)

Community	Flow (GPM)		Peaking Factor
	Average Day	Peak Hour	
City of Owosso	1,925	5,995	3.1
Owosso Township	265	990	3.7
City of Corunna	360	1,325	3.7
Caledonia Township	235	825	3.5
Total (WWTP)	2,785	9,135	3.3

5/26/2018 Storm
1.1", 1 Hour Rain (1-2 Year Occurrence)

Community	Flow (GPM)		Peaking Factor
	Average Day	Peak Hour	
City of Owosso	1,925	6,865	3.6
Owosso Township	265	982	3.7
City of Corunna	360	1,290	3.6
Caledonia Township	235	1,743	7.4
Total (WWTP)	2,785	10,880	3.9

Table 5 shows that all communities, except for Owosso Township, have peaking factors greater than 4.0. Table 6 shows that all communities for yearly storm events are close to or over the 4.0 peaking factor. To keep flows at the WWTP less than the 12,500 GPM capacity for the 10-Year design event, communities could remove I/I in their system, add additional storage or take part of a regional WWTP improvement.

Conclusions

1) Owosso Township has the lowest 10-year design peaking factor of 2.2, yet during yearly rain events their peaking factor reaches 3.7. Larger rain events could yield a peaking factor greater than 4.0.

2) Caledonia Township has a high 10-year design peaking factor of 9.6 and high observed peaking factors that reach 7.4 during yearly storm events.

3) The City of Corunna and the City of Owosso have a 10-year design peaking factor greater than 4.0 and observed peaking factors during yearly storm events that are close to 4.0. Larger rain events will most likely result in peak flows greater than the 4.0 peaking factor.

4) The City of Owosso is planning to construct a 1 MG storage facility to relieve their 30-inch interceptor and eliminate upstream SSOs in the system.

5) The total WWTP capacity is 12,500 GPM and the 10-year design flow for the combined communities is 13,245 GPM.

Based on the above conclusions, it appears that all communities require some I/I removal in their system or additional storage in the individual communities or at the WWTP to remain within the 10-year design flows and address the SSOs at the WWTP. It may be advantageous to coordinate these improvements as a regional project to address the joint needs of both Cities and Townships.

Next Steps

Conceptual Engineering

Now that there is an understanding of the flow distribution in the system, the next steps are to conceptualize potential improvements. The tasks associated with this are listed below.

- Develop options for improvements at the WWTP to meet the 10-year design peak flows for the Cities of Owosso and Corunna and Caledonia Township. This may include storage at the WWTP, additional WWTP capacity or individual community I/I removal.

- Develop conceptual improvement plan for potential improvements.

- Develop conceptual cost estimates for potential improvements.

- Develop recommendations for cost allocation methodology amongst the communities that will benefit from a regional improvement project.

Appendix A: Antecedent Moisture Model (AMM) Description

Antecedent Moisture Model (AMM) Description

I/I into sanitary collection systems occurs through a complex series of mechanisms that include direct and indirect inflow, seepage into manholes, sewer defects, footing drains and numerous other sources. Because of the complex transport mechanisms of these flow sources, they are heavily dependent on variables that are not normally included in traditional stormwater-based models for I/I such as soil moisture conditions and ground water levels. These variables continuously change during storms and in between storms in response to antecedent moisture conditions. The AM model used for this study takes into account the overall antecedent moisture condition of the sewershed, resulting in a more accurate model based on the sewer system's response to wet weather.

In order to account for the effects of antecedent moisture, the AM modeling technique is based on system identification theory. The model utilizes tools from the fields of digital signal processing, control systems and time series analysis to model variable I/I using data-based models. System identification is the approach of identifying the most appropriate and simplest numerical model that accurately describes the observed data and then gaining insight into the physical characteristics of the system through interpretation of the resulting model structure. A block diagram of the resulting antecedent model structure is depicted in Figure 1. Note that the model structure contains an antecedent moisture block that is automatically modified based on the recent rainfall and temperature conditions. This approach allows the model to simulate the variation in capture coefficients that occur as a result of antecedent moisture conditions. The resulting numerical model structure identifies physical phenomenon from the data such as fast dynamics (inflow) and slow dynamics (infiltration), long term ground water flow variations, and responses to previous rainfall and temperature (antecedent moisture). In some cases, the system identification process also uncovers other phenomenon such as river inflow or system deterioration.

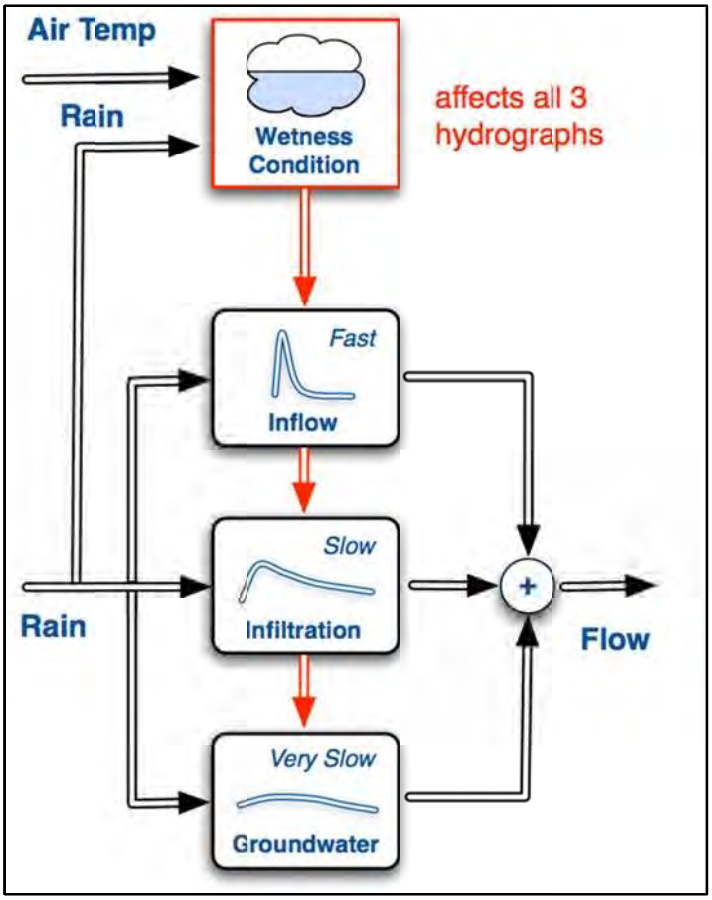


Figure 1: Antecedent Moisture Model Structure

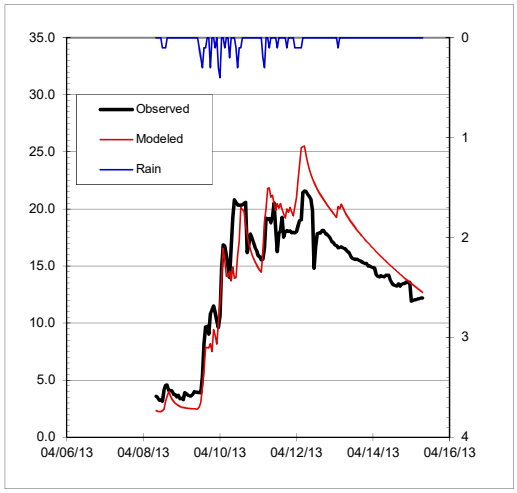
Appendix B: Accuracy of Fit Plots

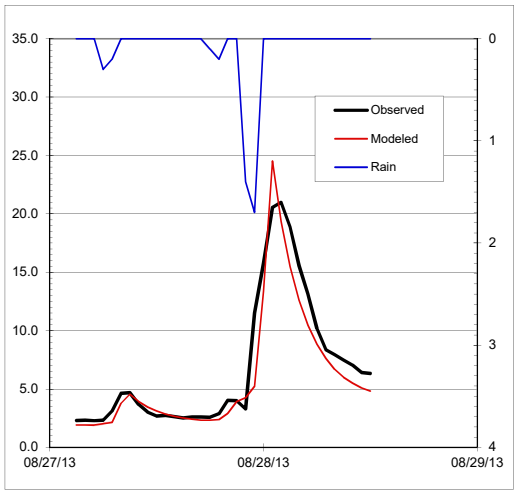
Owosso Sanitary Sewer Capacity Analysis - Antecedent Moisture Model - Accuracy of Fit Analysis
M0 (City of Owosso)

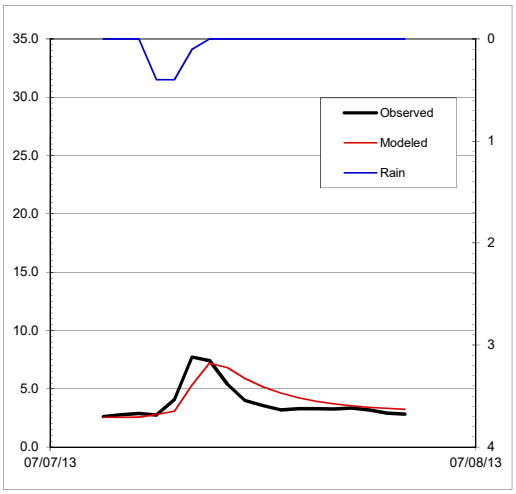
Storm	Rain (in)	Observed Peak (cfs)	Model Peak (cfs)	Peak Flow Error (%)	Observed Vol (1000's cf)	Model Vol (1000's cf)	Volume Error (%)	Notes
04/08/13	4.5	21.57	25.50	18.2%	8,860.0	9,322.8	5.2%	
08/27/13	3.9	20.98	24.52	16.9%	831.4	730.1	-12.2%	
07/07/13	0.9	7.72	7.20	-6.7%	246.5	266.5	8.1%	
05/20/13	0.7	7.60	7.46	-1.8%	216.9	202.8	-6.5%	
10/31/13	1.4	6.38	5.21	-18.4%	630.3	599.6	-4.9%	
05/22/13	1.1	6.30	6.22	-1.3%	771.1	763.6	-1.0%	
05/28/13	1.9	13.86	10.09	-27.2%	797.3	625.7	-21.5%	
05/26/14	1.11	13.06	14.05	7.6%	1,944.5	1,980.0	1.8%	
05/14/14	1.68	20.26	24.88	22.8%	3,782.6	3,631.2	-4.0%	
05/20/14	1.3	21.30	21.32	0.1%	3,332.1	2,999.1	-10.0%	
06/18/14	1.07	13.02	10.28	-21.1%	1,221.1	1,257.6	3.0%	
06/24/14	1.36	11.54	11.67	1.1%	3,114.4	3,354.5	7.7%	
05/12/14	1.9	11.77	15.96	35.6%	1,344.1	1,681.3	25.1%	
07/06/14	2.12	16.42	17.85	8.7%	731.9	831.3	13.6%	
08/19/14	1.27	8.41	9.04	7.5%	481.7	515.9	7.1%	
05/26/14	1.11	13.06	14.05	7.6%	1,944.5	1,980.0	1.8%	
05/29/15	1.94	6.43	6.37	-1.0%	1,387.1	1,334.1	-3.8%	
06/14/15	1.08	10.51	8.09	-23.1%	341.8	305.4	-10.7%	
08/02/15	0.99	9.62	7.23	-24.8%	380.5	352.0	-7.5%	
07/07/15	0.76	6.98	6.12	-12.3%	257.5	236.7	-8.1%	
10/10/17	0.91	3.93	4.06	3.5%	259.2	272.6	5.2%	
10/14/17	2.18	10.26	8.96	-12.7%	527.2	535.1	1.5%	
10/23/17	1.96	5.32	5.22	-2.0%	941.9	923.1	-2.0%	
04/13/18	0.94	9.05	10.49	15.9%	1,008.2	1,022.9	1.5%	
04/03/18	0.58	5.63	6.00	6.6%	469.3	480.9	2.5%	
06/09/18	2.06	8.55	9.99	16.8%	780.6	791.0	1.3%	

Net Average Error	0.6%		-0.3%
Total Average Error	12.3%		6.8%

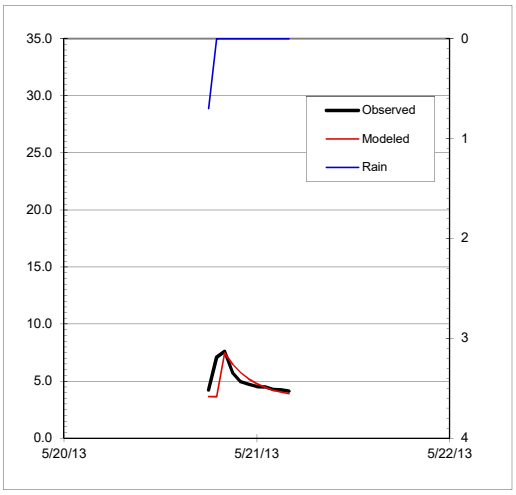
RDII Flow (cfs) on primary Y axis, Rain (in) on secondary Y axis

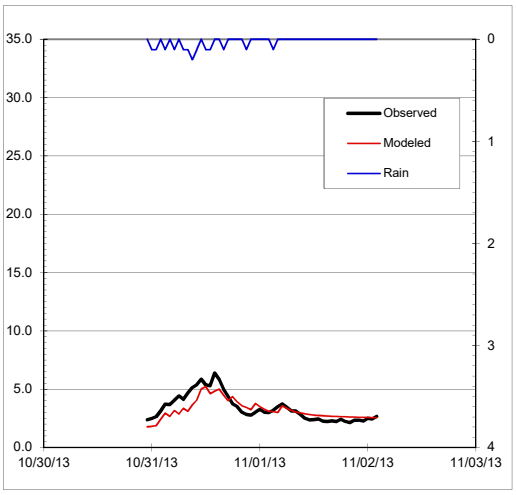


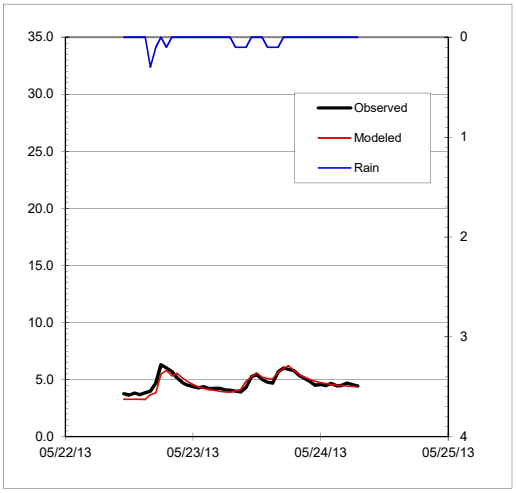


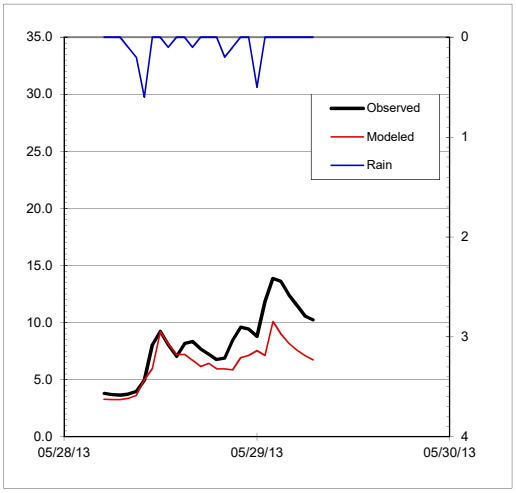


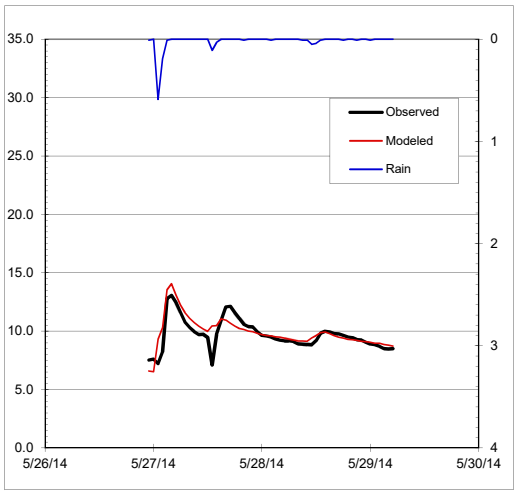
Owosso Sanitary Sewer Capacity Analysis - Antecedent Moisture Model - Accuracy of Fit Analysis
M0 (City of Owosso)

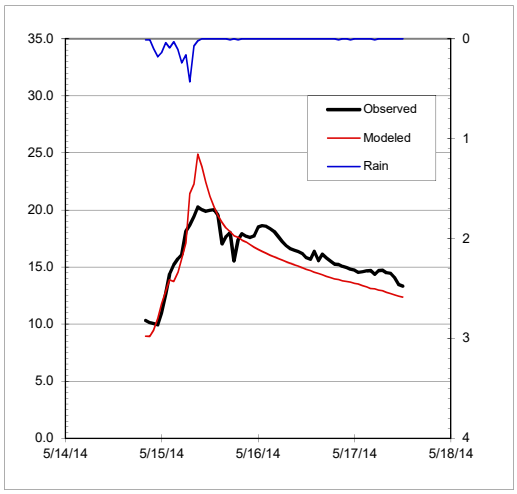




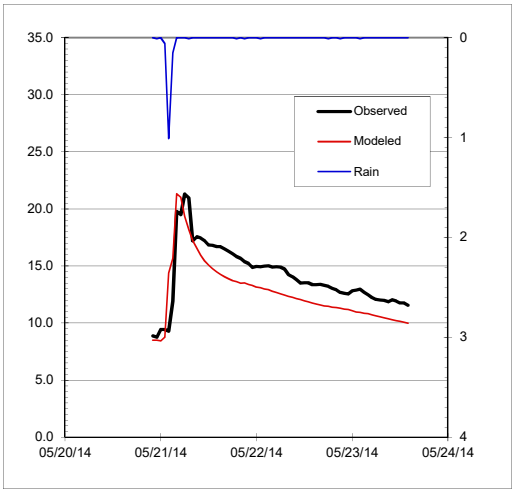


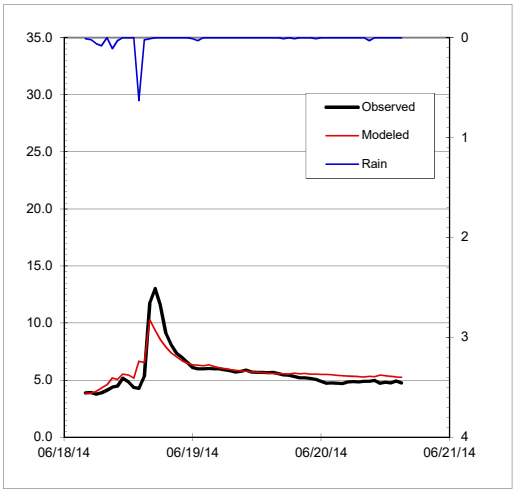


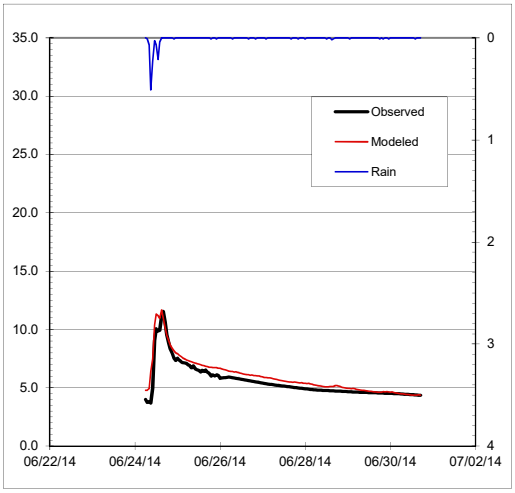


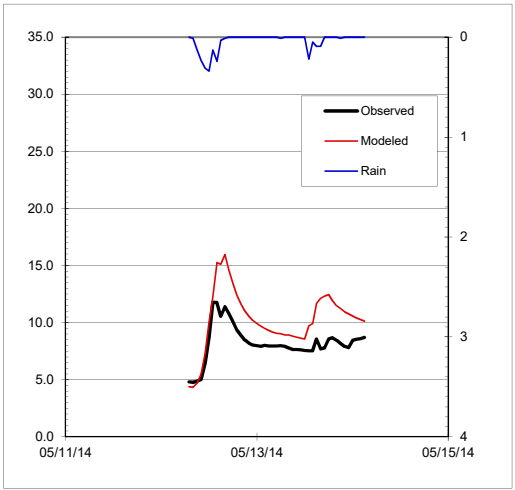


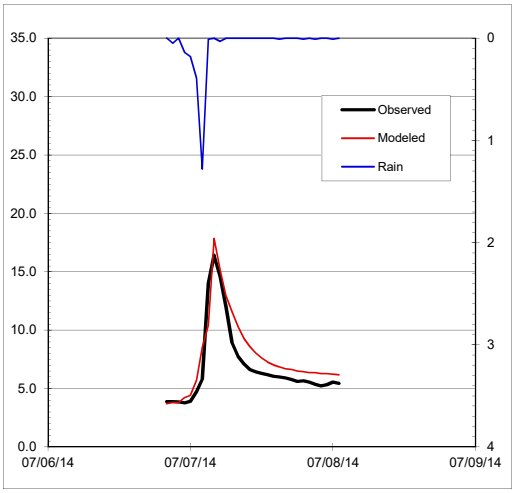
Owosso Sanitary Sewer Capacity Analysis - Antecedent Moisture Model - Accuracy of Fit Analysis
M0 (City of Owosso)

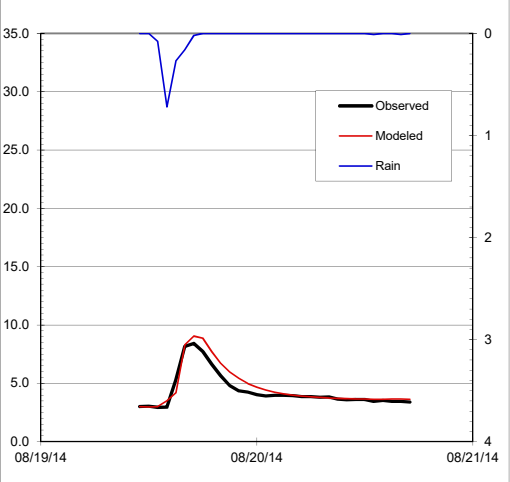




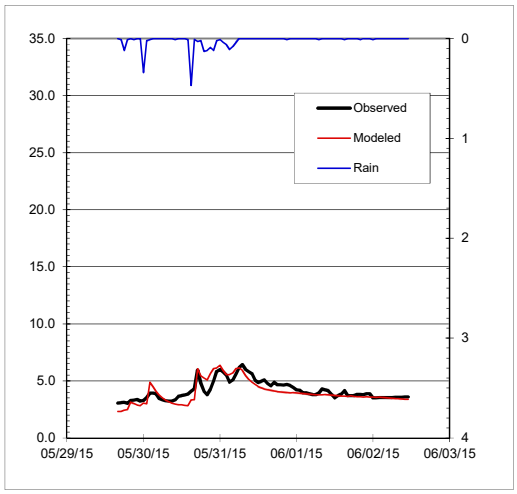


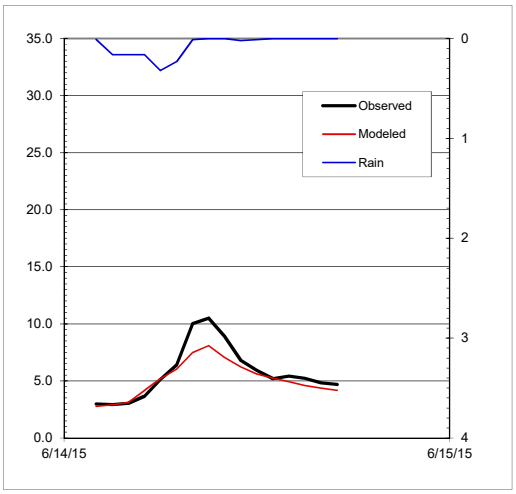


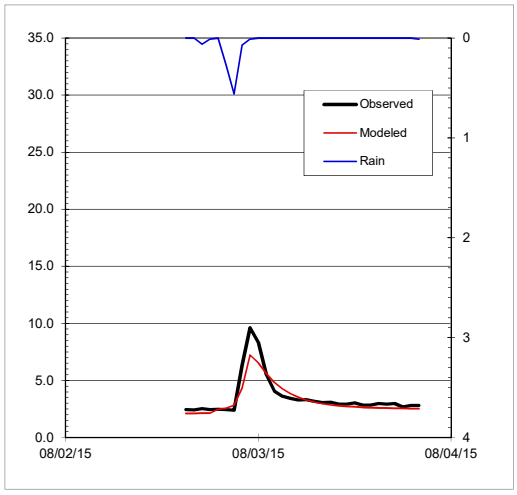


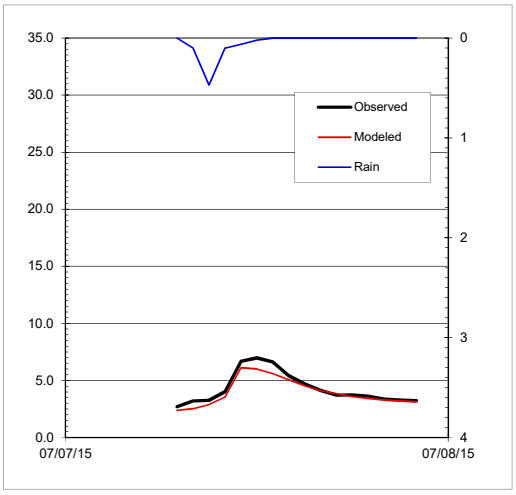


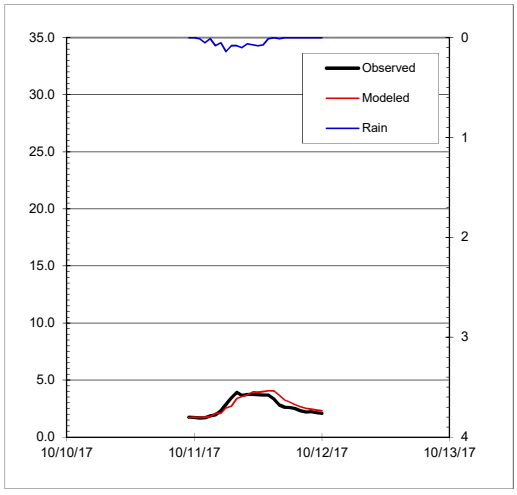
Owosso Sanitary Sewer Capacity Analysis - Antecedent Moisture Model - Accuracy of Fit Analysis
M0 (City of Owosso)

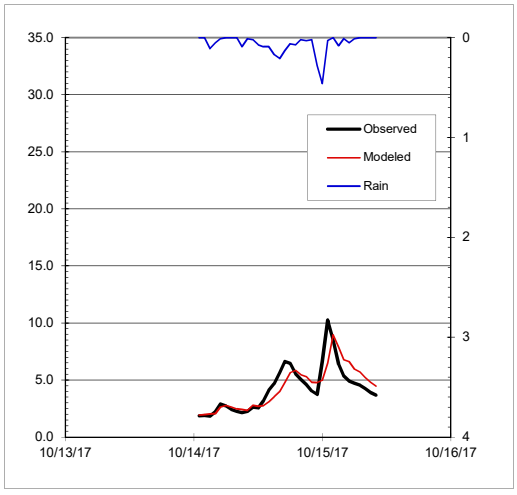




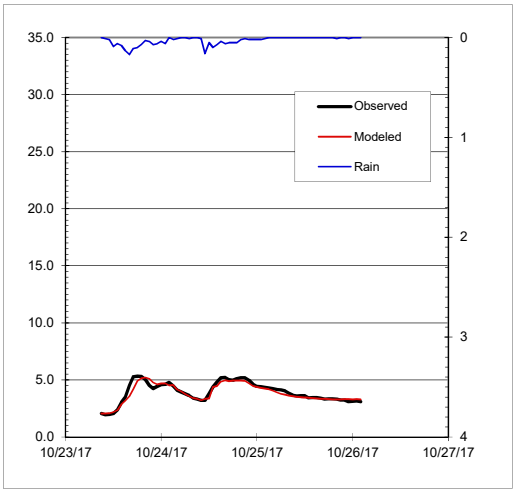


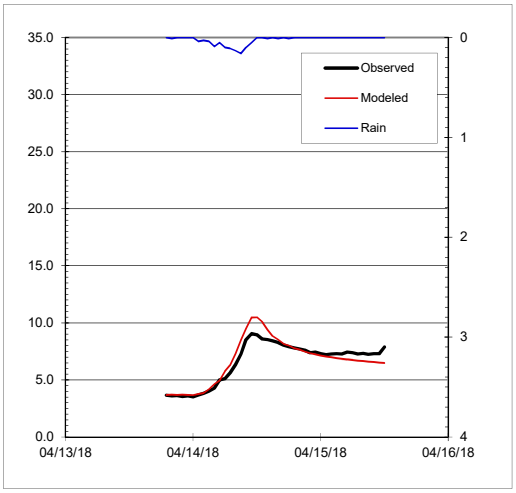


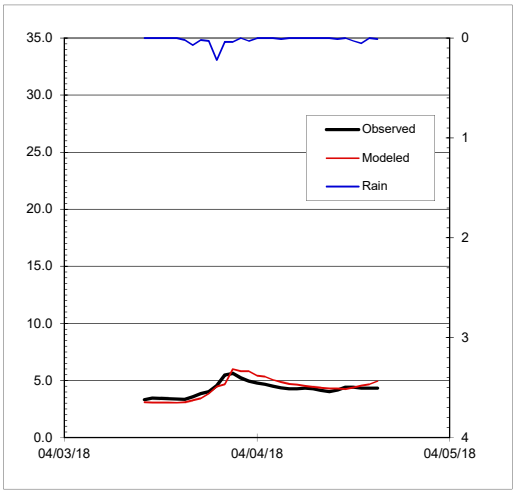


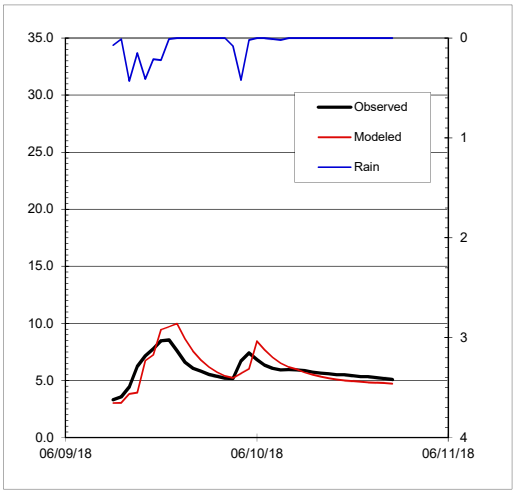


Owosso Sanitary Sewer Capacity Analysis - Antecedent Moisture Model - Accuracy of Fit Analysis
M0 (City of Owosso)







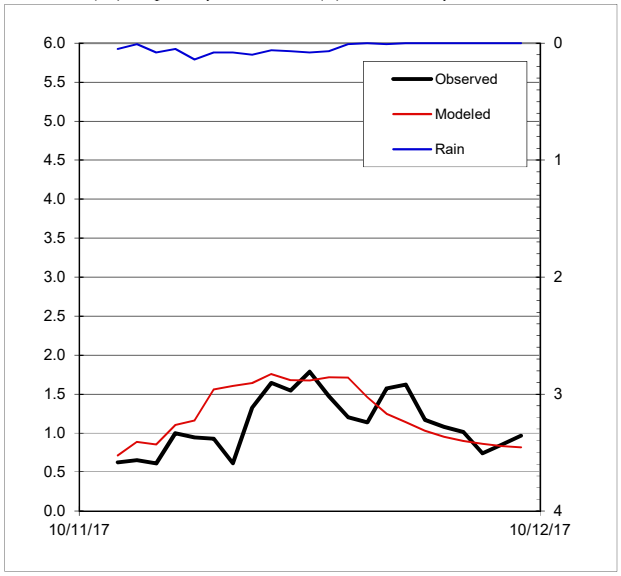


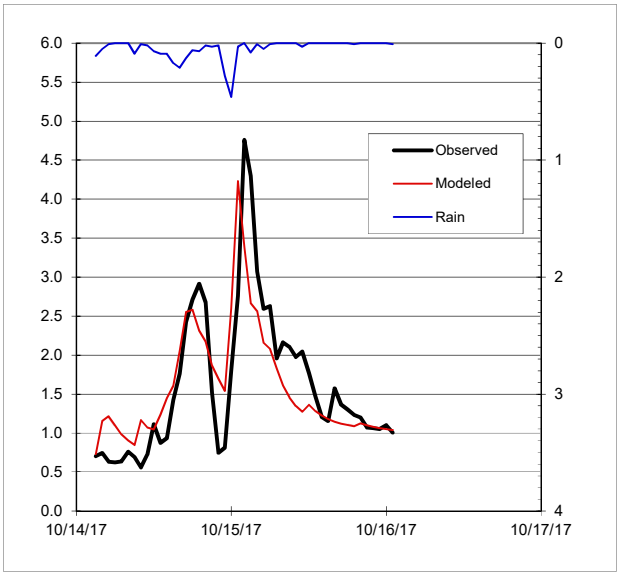
Regional System Flow Evaluation - Antecedent Moisture Model - Accuracy of Fit Analysis
M1 (M2 + Owosso Township)

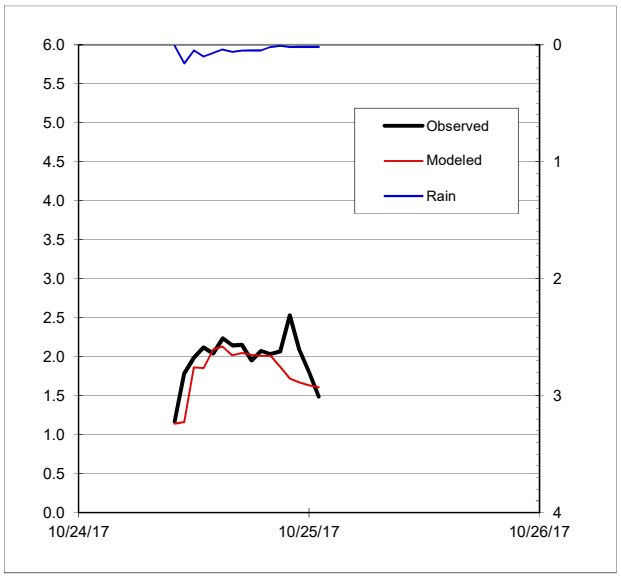
Storm	Rain (in)	Observed Peak (cfs)	Model Peak (cfs)	Peak Flow Error (%)	Observed Vol (1000's cf)	Model Vol (1000's cf)	Volume Error (%)	Notes
10/11/17	0.9	1.79	1.76	-1.6%	90.1	100.8	11.9%	
10/14/17	2.22	4.76	4.23	-11.1%	276.3	270.7	-2.0%	
10/24/17	0.75	2.53	2.13	-15.9%	117.0	108.0	-7.7%	
04/13/18	0.94	5.27	5.30	0.5%	439.1	436.2	-0.7%	
06/09/18	2.06	3.50	3.76	7.3%	185.1	190.3	2.8%	
05/30/18	0.45	1.96	1.99	1.5%	79.0	72.8	-7.8%	
04/03/18	0.59	2.28	2.70	18.1%	225.9	235.3	4.2%	

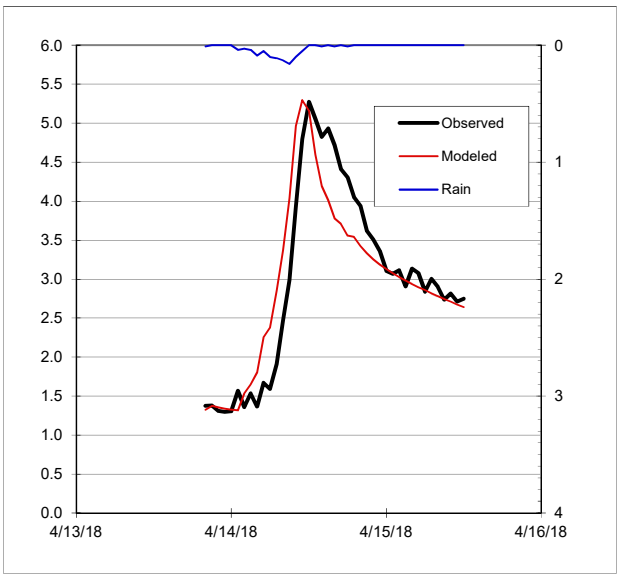
Net Average Error	-0.2%		0.1%
Total Average Error	8.0%		5.3%

RDII Flow (cfs) on primary Y axis, Rain (in) on secondary Y axis

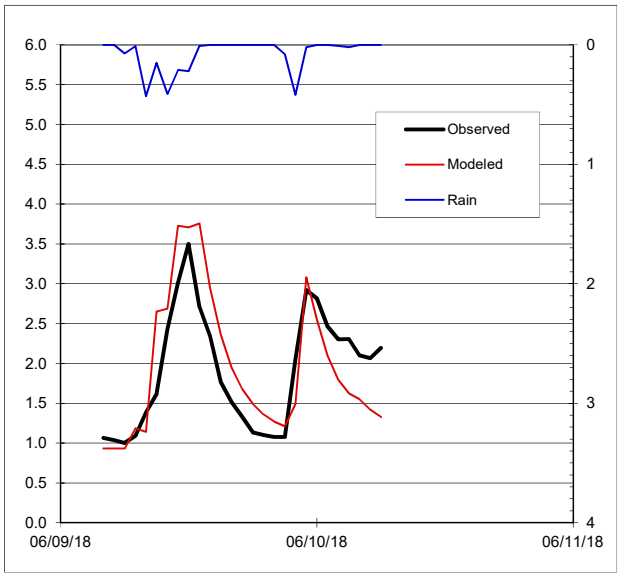


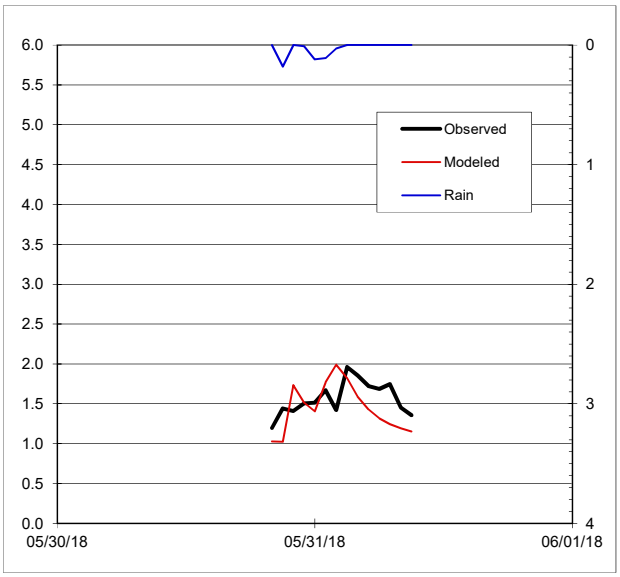


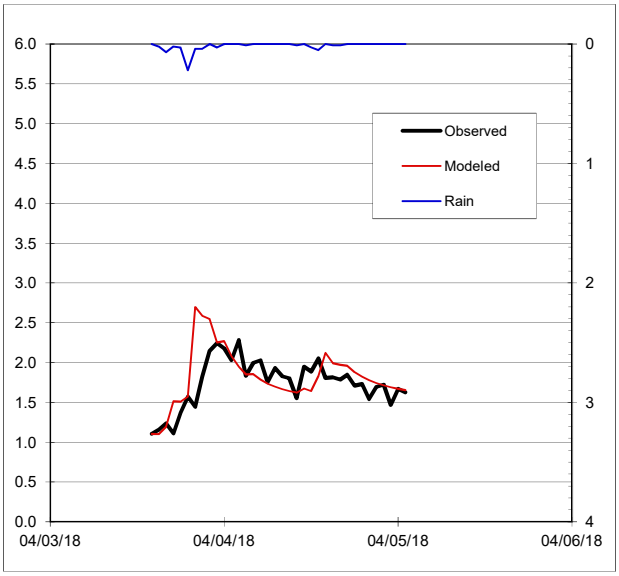




Regional System Flow Evaluation - Antecedent Moisture Model - Accuracy of Fit Analysis
M1 (M2 + Owosso Township)





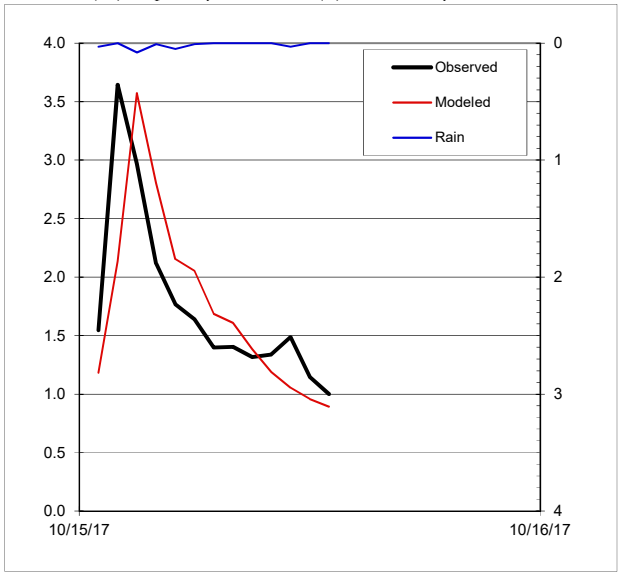


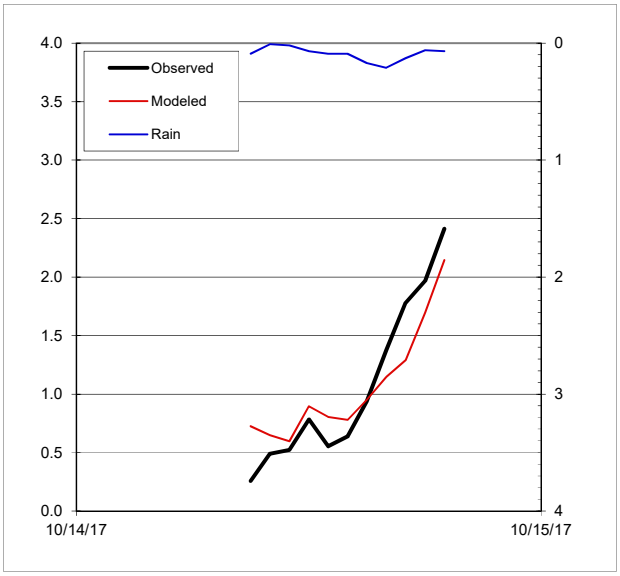
Regional System Flow Evaluation - Antecedent Moisture Model - Accuracy of Fit Analysis
M2 (Caledonia Township + City of Corunna)

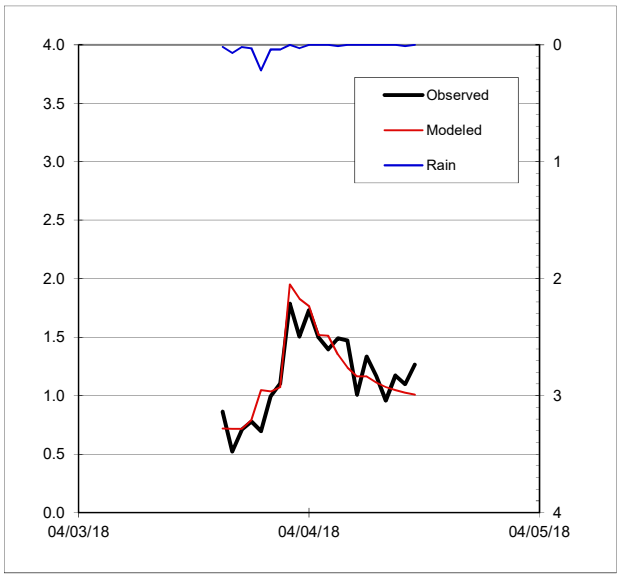
Storm	Rain (in)	Observed Peak (cfs)	Model Peak (cfs)	Peak Flow Error (%)	Observed Vol (1000's cf)	Model Vol (1000's cf)	Volume Error (%)	Notes
10/15/17	0.67	3.64	3.57	-2.0%	84.2	86.4	2.6%	
10/14/17	1.01	2.41	2.15	-11.1%	44.5	45.0	1.3%	
04/03/18	0.49	1.79	1.95	9.2%	90.5	92.0	1.7%	
05/30/18	0.45	1.40	1.37	-2.3%	27.5	27.5	0.0%	
05/15/18	0.51	1.96	1.93	-1.5%	40.7	39.8	-2.4%	
04/14/18	0.93	3.33	3.60	8.1%	273.7	262.6	-4.0%	

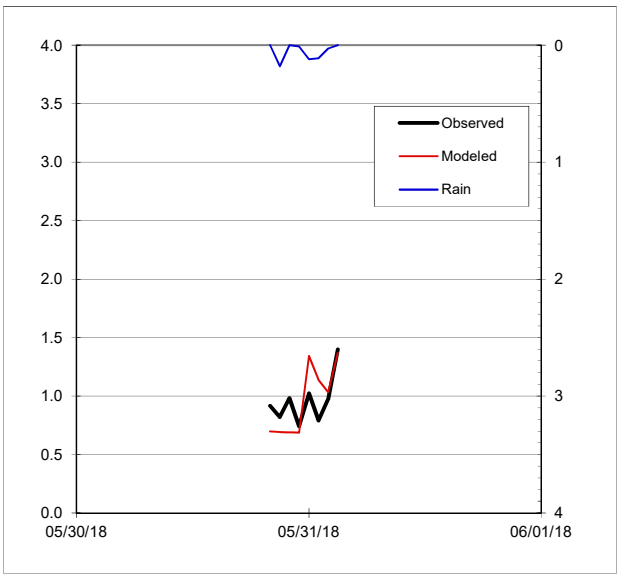
Net Average Error	0.1%		-0.1%
Total Average Error	5.7%		2.0%

RDII Flow (cfs) on primary Y axis, Rain (in) on secondary Y axis

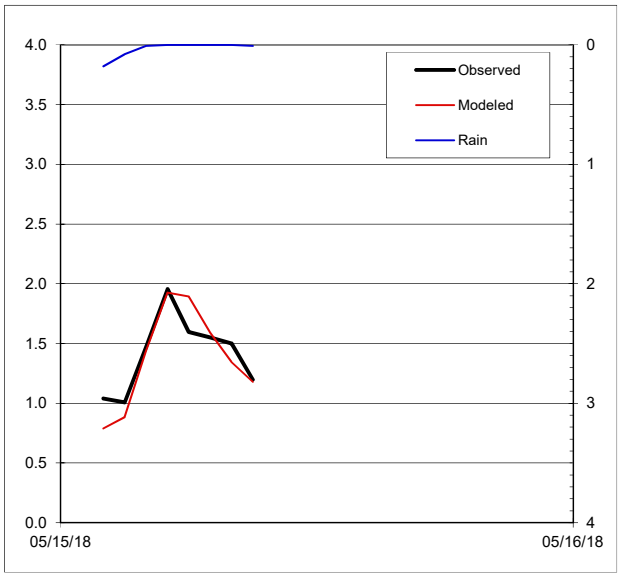


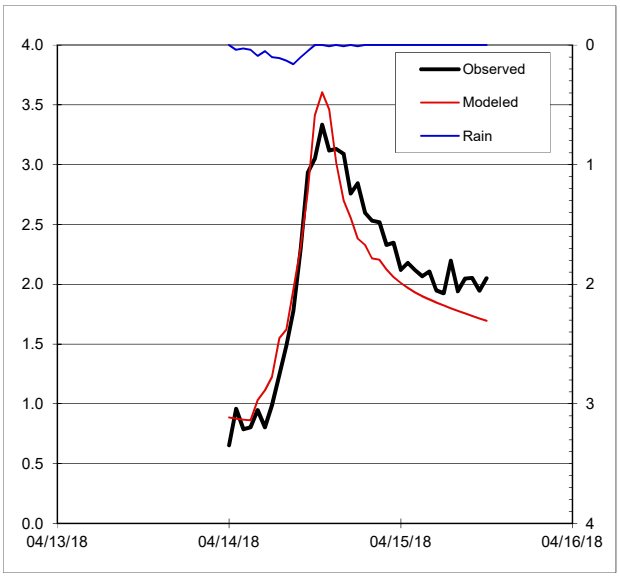




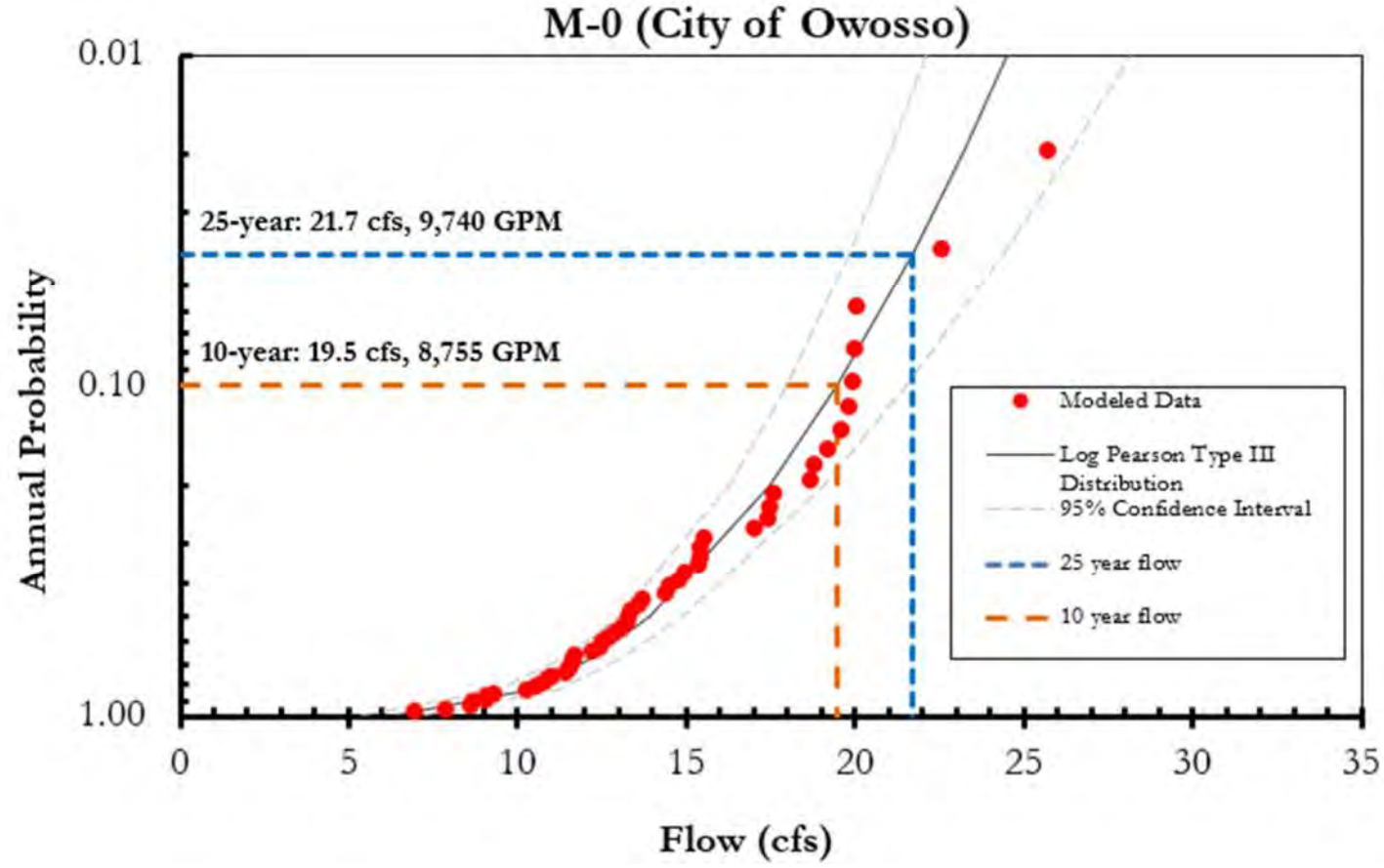


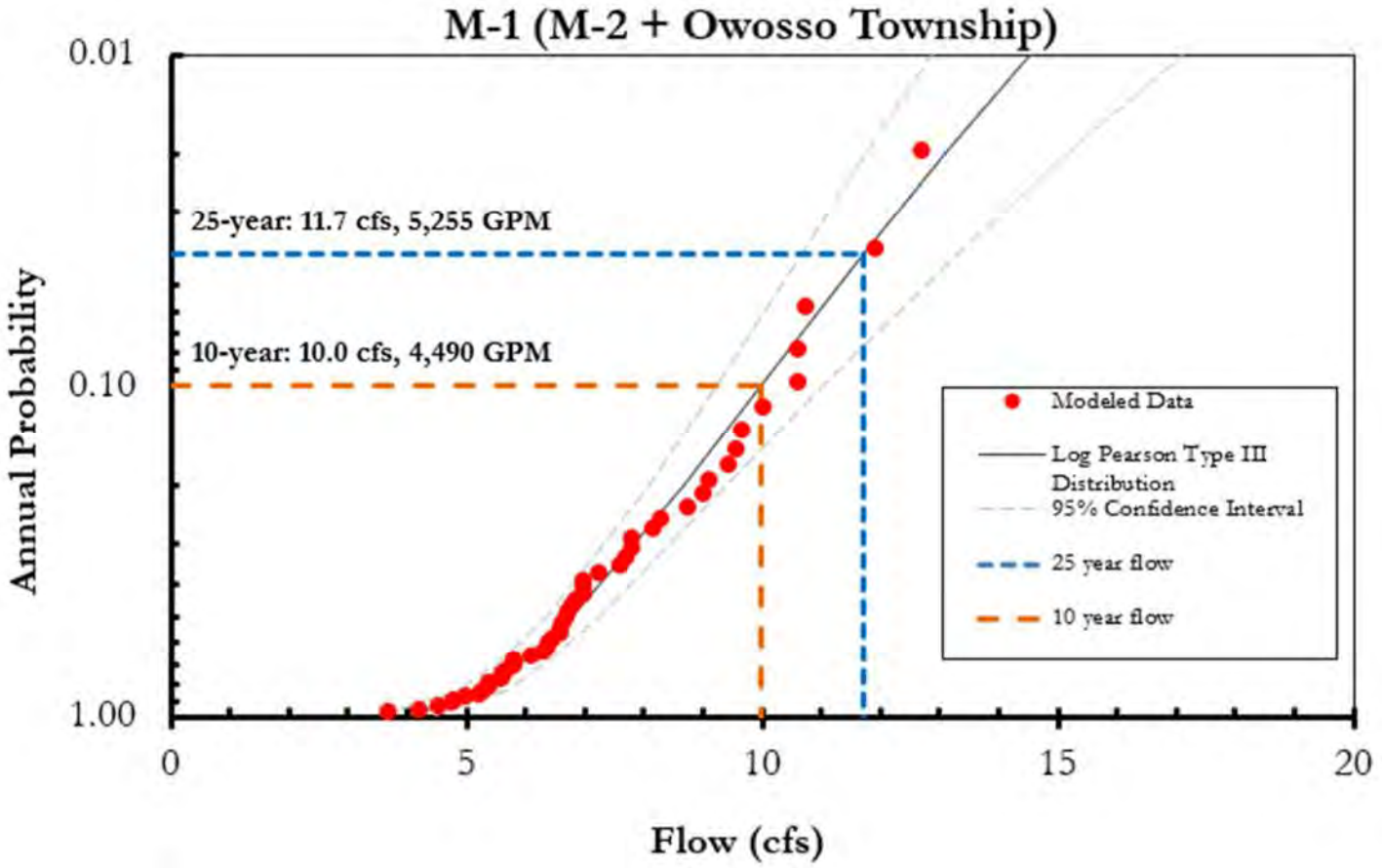
Regional System Flow Evaluation - Antecedent Moisture Model - Accuracy of Fit Analysis
M2 (Caledonia Township + City of Corunna)

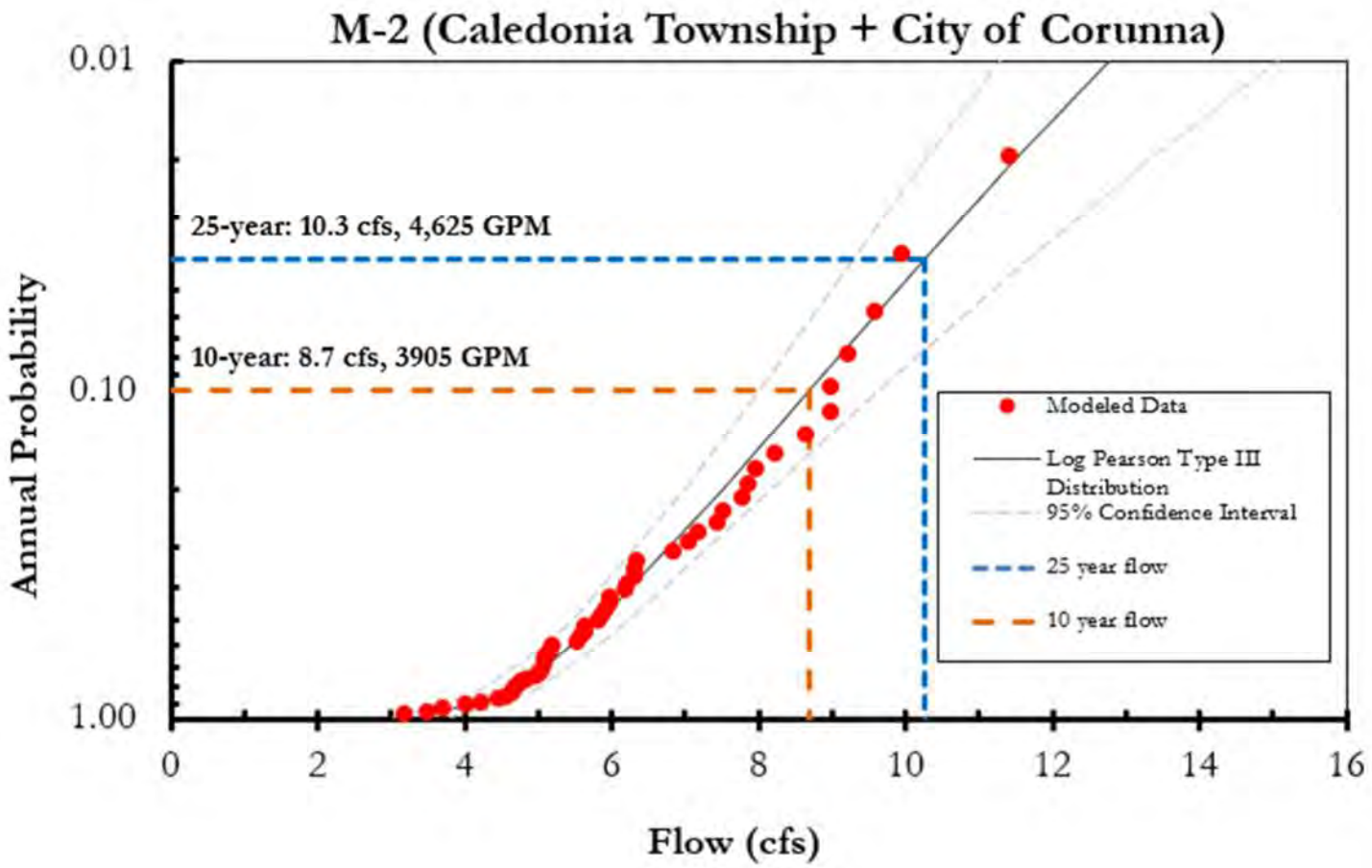




Appendix C: Peak Flow Frequency Analysis Plots


M-0 (City of Owosso)
0.01
0.10
1.00
Annual Probability
25-year: 21.7 cfs, 9,740 GPM
10-year: 19.5 cfs, 8,755 GPM
Modeled Data
Log Pearson Type III Distribution
95% Confidence Interval
25 year flow
10 year flow
0
5
10
15
20
25
30
35
Flow (cfs)


M-1 (M-2 + Owosso Township)
0.01
0.10
1.00
Annual Probability
25-year: 11.7 cfs, 5,255 GPM
10-year: 10.0 cfs, 4,490 GPM
Modeled Data
Log Pearson Type III Distribution
95% Confidence Interval
25 year flow
10 year flow
0
5
10
15
20
Flow (cfs)


M-2 (Caledonia Township + City of Corunna)
0.01
0.10
1.00
Annual Probability
25-year: 10.3 cfs, 4,625 GPM
10-year: 8.7 cfs, 3905 GPM
Modeled Data
Log Pearson Type III Distribution
95% Confidence Interval
25 year flow
10 year flow
0
2
4
6
8
10
12
14
16
Flow (cfs)

Appendix D: NOAA Atlas Precipitation Frequency Estimates

NOAA Atlas 14 Volume 8 Version 2

Owosso, Michigan

Precipitation Frequency Estimates (Inches)

Duration	Average Recurrence Interval (Years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.29	0.34	0.42	0.50	0.61	0.70	0.79	0.89	1.02	1.13
10-min	0.42	0.50	0.62	0.73	0.89	1.02	1.16	1.30	1.50	1.65
15-min	0.52	0.60	0.76	0.89	1.09	1.24	1.41	1.58	1.82	2.01
30-min	0.75	0.88	1.10	1.29	1.58	1.81	2.05	2.31	2.67	2.95
60-min	0.97	1.14	1.44	1.70	2.09	2.41	2.75	3.11	3.61	4.01
2-hr	1.19	1.41	1.78	2.11	2.60	3.01	3.44	3.90	4.54	5.06
3-hr	1.32	1.56	1.97	2.35	2.90	3.37	3.87	4.40	5.15	5.76
6-hr	1.57	1.82	2.29	2.72	3.38	3.94	4.54	5.21	6.15	6.93
12-hr	1.84	2.10	2.58	3.05	3.79	4.43	5.14	5.92	7.06	8.00
24-hr	2.12	2.39	2.93	3.45	4.27	5.00	5.80	6.69	7.99	9.07
2-day	2.40	2.73	3.36	3.96	4.90	5.70	6.59	7.57	8.98	10.10
3-day	2.62	2.97	3.64	4.26	5.23	6.07	6.98	7.98	9.43	10.60
4-day	2.81	3.18	3.85	4.49	5.48	6.32	7.24	8.26	9.71	10.90
7-day	3.31	3.70	4.40	5.06	6.07	6.94	7.89	8.93	10.40	11.60
10-day	3.76	4.17	4.92	5.62	6.69	7.60	8.58	9.66	11.20	12.50
20-day	5.04	5.60	6.59	7.46	8.76	9.83	11.00	12.20	13.90	15.20
30-day	6.16	6.86	8.04	9.06	10.50	11.70	12.90	14.20	15.90	17.30
45-day	7.64	8.50	9.91	11.10	12.70	14.00	15.30	16.60	18.30	19.60
60-day	8.95	9.94	11.50	12.80	14.50	15.80	17.10	18.40	20.00	21.30