SRF Project Plan

City of Gladstone
Wastewater Treatment Plant Improvements
Vol. 2 (Appendices only)

April 7, 2021

c2ae
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Escanaba, MI 49829

APPENDIX A

Previous Study Summary Excerpts

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APPENDIX A

Part 1 – 2018 Flow Monitoring Report

2018 Sanitary Sewer Flow Monitoring

City of Gladstone, Michigan

Project No. 12345018

January 2019

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Appendix A

2018 Sanitary Sewer Flow Monitoring

City of Gladstone, Michigan

Project No. 12345018

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TABLE OF CONTENTS

				Page
EXECUTIVE SUMMARY				II
I.	INTRODUCTION			3
	A.	Background		3
		1.	**Service Area**	3
		2.	**Geologic and Hydrologic Setting**	3
	B.	Purpose and Scope		3
II.	EXISTING CONDITIONS			4
	A.	Existing Sanitary Sewer System		4
		1.	Collection System.	4
		2.	WWTF.	4
	B.	Historical Flow Datum at WWTF		4
		1.	WWTF	4
		2.	Base Flow Determination	5
III.	TESTING AND INVESTIGATING PROCEDURES			5
	A.	Flow Monitoring		5
		1.	**Meter Location Determination**	5
	B.	Meter Analysis		6
		1.	**Meter #1 – MH SA0034** at S 4th Street and Dakota Avenue	6
		2.	**Meter #2 – MH SA0076** at S 5th Street and Montana Avenue	7
		3.	**Meter #3 – MH SA0122** at N 7th Street and Superior Avenue	7
		4.	**Meter #4 – MH SA0334** at STH-35 and N 17th Street	8
	C.	Summary of Peaking Factors		9
		1.	**Base Flow Determination**	9
		2.	**Dry Weather I/I**	10
		3.	**Maximum 7-day Average Wet Weather Flow**	11
		4.	**Wet Weather I/I**	11
		5.	**Peak Day I/I**	12
IV.	CONCLUSIONS			13

LIST OF APPENDICES

APPENDIX A SOIL SURVEY MAP OF STUDY AREA AND SUMMARY
APPENDIX B WWTP INFLUENT FLOW MONTHLY REPORTS (STUDY PERIOD & HISTORICAL)
APPENDIX C WEATHER AND PRECIPITATION DATA DURING STUDY
APPENDIX D CHARTS OF 24 HOUR TOTAL FLOWS FOR ALL 4 METERS AND WWTF
APPENDIX E CHARTS OF PEAK INSTANTANEOUS FLOW RATES IN GPM FOR ALL 4 METERS
APPENDIX F MAPS OF METER LOCATIONS

EXECUTIVE SUMMARY

The City of Gladstone, Michigan has historically experienced problems with excessive clear-water flows, inflow and infiltration (I/I), in the sanitary sewer collection system (SSCS) during periods of wet weather and snow melt resulting in flows that overwhelm the capacity of the WWTF. In the fall of 2018 MSA Professional Services, Inc. was hired to complete a Flow Monitoring Study for City of Gladstone.

This report summarizes the results of flow monitoring data collected. The information provided herein will be used to develop recommendations of improvements to the sanitary sewer collection system in a separate report.

Flow monitoring using 4 each ISCO 2150 Area Velocity Meters at 4 different manhole locations was performed from September 7th to December 4th 2018. The flow meter locations were determined by C2AE with input from the City of Gladstone staff, the locations targeted were sewers where I/I flow was thought to be the most prevalent in the SSCS. This flow monitoring was done to determine potential sources of I/I and identify potential improvements that will reduce clear-water flows. This report provides the results of the flow monitoring that can be used to make recommendations for sanitary sewer I/I reduction and identify pipe segments that are overloaded during peak flows in the SSCS.

The flow monitoring at all 4 manhole locations showed large volumes of I/I coming from all areas monitored with flow meters during rain events. The peak flow rates observed in the study area range from 3.28 to 4.03. See Table III-1 for Peak Flow rate determination at each meter location.

The flow monitoring data obtained during this study period confirms that large amounts of clear water Infiltration and Inflow (I/I) is entering the sanitary sewer collection system (SSCS).

I. INTRODUCTION

MSA Professional Services, Inc. was contracted by C2AE to conduct a Flow Monitoring Study at 4 separate collection points in the sanitary sewer collection system for the City of Gladstone. This report identifies base flows and peak flows from Inflow and Infiltration (I/I) in the Sanitary Sewer Collection System (SSCS).

A. Background

1. Service Area

The City of Gladstone is located in Delta County, Michigan and has a population of approximately 5000 according to 2010 Census. The general location of the City of Gladstone is shown on location maps in Appendix F. The City of Gladstone SSCS has historically experienced problems with I/I during periods of wet weather and snow melt. The Flow Study Meter Locations are also shown in Appendix F.

2. Geologic and Hydrologic Setting

City of Gladstone and surrounding topographies consist of gently to moderately sloping terrain. Soils in the area are generally very sandy, moderately to excessively drained. The soil in the area of the study is primary Rubicon sand complexes, 0 to 6 percent slopes, very sandy with rapid permeability. Limestone bedrock is generally greater than 15 feet below the ground surface, and ground water tables are generally greater than 6 feet deep. The soil survey map for the area studied is provided in Appendix A. Data from the Soil Survey of Delta County shows the average annual precipitation for the City of Gladstone area is approximately 30 inches of rain and 55 inches of snowfall.

B. Purpose and Scope

The purpose of this report is to present the findings of the Flow Monitoring Study. This information will be used in a subsequent report to recommend improvements intended to extend the service life of the SSCS and minimize peak hydraulic loadings to the Gladstone Waste Water Treatment Facility (WWTF).

The scope of this report is as follows:

- Describe and identify base flows and determine peak flows resulting from I/I entering the sanitary sewer collection system during rainfall events in the study period.
- Present the findings of the flow metering.

II. EXISTING CONDITIONS

A. Existing Sanitary Sewer System

1. Collection System.
   a) City of Gladstone SSCS consists of mostly older clay tile and some concrete piping constructed before 1970 and numerous newer sewers consisting of PVC constructed after 1970. The system is conventional in design and operation, containing both gravity flow sections and low-pressure forced flow sections. The gravity flow sections converge to a low-lying area, where a sewage lift station transports the collected sewage. The collection system also receives flows from Masonville Township, these flows are approximately 30,000 gpd during normal flows, the flow from Masonville enters the system at MH SA0325, see map in Appendix F.

2. WWTF.
   a) Influent Flow Data from the WWTF is included in this report. The WWTF is located adjacent to Lake Michigan just east of intersection of Minneapolis Avenue and S 4th Street in Gladstone, see location map in Appendix F. The Influent flow information from City of Gladstone Public Works Staff for the monitoring period from September to December 2018 along with historical flow information at the WWTF is included in Appendix B.

B. Historical Flow Datum at WWTF

1. WWTF
   a) Historically, City of Gladstone SSCS shows signs of I/I based on the analysis of discharge flow data measured at the WWTF. This data indicates high peak flows during days of significant precipitation (rainfall events in excess of 1 inch) and rapid snow melt. Historical daily 24 hour total flows provided by City of Gladstone are in Table II-1 below.

Table II-1
Historical 24 Hour Total Flow Influent Data in MGD at WWTF
Data from City of Gladstone

Date	Volume (MGD)	Rainfall (inches)	Duration (hrs)
9-16-16	1.020	1.00	24 hours
6-20-17	1.525	2.10	24 hours
10-10-18	1.640	3.30	4 days (10/7 to 10/10/18)
10-11-18	1.520	3.30	4 days (10/7 to 10/10/18)

2. Base Flow Determination.

a) City of Gladstone has a population of approximately 5,000 according to latest census data. Using the standard per capita residential water usage of approximately 100 gpcd you get a projected base flow of approximately 500,000 gpd. The base flow determined from this study period at the WWTF during times of normal low flows is estimated to be about 500,000 gpd (see charts in Appendix D and see Table III-1).

III. TESTING AND INVESTIGATING PROCEDURES

Area Velocity Flow Meters were placed in 4 different sections (basins) of the SSCS to determine where problematic areas are located. These areas indicate significant flow peaking factors (elevated sewage flow above the average flow for the study area).

A. Flow Monitoring

Flow monitoring was completed from September 7 thru December 4, 2018; during this period, the SSCS experienced about a dozen rainfall events. The most significant rain event occurred during the middle of the study when the soils were saturated, a 4-day rain event from October 7 to October 10, 2018 when a total of 3.30 inches was recorded at the WWTF, see Precipitation Chart in Appendix C.

1. Meter Location Determination

Flow meters were installed in manholes at 4 locations in the SSCS. Locations were determined by C_2AE and City of Gladstone. The locations of the four flow meters are shown in Appendix F.

A summary of the specific monitoring locations are as follows:

- **Meter #1** – MH SA0034 at S 4th Street and Dakota Avenue
- **Meter #2** – MH SA0076 at S 5th Street and Montana Avenue
- **Meter #3** – MH SA0122 at N 7th Street and Superior Avenue
- **Meter #4** – MH SA0334 at STH-35 and N 17th Street

Sewage flows were measured using ISCO Model 2150 area velocity flow meters. The flow meters operate by measuring the velocity and height of water flowing in a particular size pipe. The instrument converts these values to a volume of water per unit of time, in this case, gallons per minute (gpm).

The meters were installed on September 7, 2018 and collected flow data until December 4, 2018. Appendices D & E provide a chart summary of daily flow totals and instantaneous flows recorded by all 4 of the flow meters and the WWTF influent flow. Appendix C shows the weather data for the study period. This information illustrates the effects of rain on sewage flows in the system.

B. Meter Analysis

The flow monitoring results are analyzed in the following sections. Peaking factors calculated are based on the flow data measured. The peaking factors are based on the maximum flow rate in relation to the average flow rate recorded during this time period. The peaking factors calculated correspond to rainfall events and data obtained during the entire study period.

The flow meters were installed in an attempt to isolate specific sections of the SSCS to determine different peaking factors throughout the system and as an indicator of the sections that are more highly influenced by snowmelt and rainfall.

1. **Meter #1 – MH SA0034** at S 4th Street and Dakota Avenue
   a) Meter #1 was placed in the upstream pipe (24-inch VCP) of an old concrete block MH that is located in the pavement at S 4th Street and Dakota Avenue. This collection point measured the flows from the Collection System basin area shown on Figure 2 in Appendix F. See picture below:

   b) Meter #1 collected data from 9-14 thru 12-4-18, on 9-19 the sensor was placed with an offset from the bottom due to silt buildup. The flow level with offset sensor during low flows at this meter was about 1.5 inches deep and the highest level recorded was 13.1 inches deep. The velocity in the pipe ranged from 0.70 f/s during low flows to 1.74 f/s during high flows.
   c) The average dry weather flow is 165 gpm – See chart in Appendix E.
   d) The peak instantaneous flow recorded at this meter was 1085 gpm on 10/10/18 resulting from 3.3 inches of rain occurring October 7 to October 10 – see chart in Appendix E.
   e) The peak day flow of 937,000 gallons was recorded on October 11 with an average of 649 gpm, See chart in Appendix D.
   f) Flow data collected at this meter indicates the normal base flow is 232,000 gallons per day or approximately 161 gpm, see chart in Appendix D.

The flow at this meter site has a peaking factor of 4.03 based on 24 hour totals.

2. **Meter #2 – MH SA0076** at S 5th Street and Montana Avenue

   a) Meter #2 was placed in the upstream pipe (20-inch diameter VCP) in concrete block MH SA0076 located in the intersection of S. 5th Street and Montana Avenue. This collection point measured the flows from the Collection System basin areas shown on Figure 2 in Appendix F. See picture below:

   b) Meter #2 collected data during the entire flow monitoring timeframe from 9-7 to 12-4-18. The flow level during low flows at this meter was about 1.5 inch deep and a maximum of 6.6 inches deep during high flows. The velocity at this site was ideal for flow monitoring - ranging from 0.7 f/s during low flow to a maximum of 2.1 f/s during the highest recorded flow.

   c) The average dry weather flow is 65 gpm – See chart in Appendix E.

   d) The peak instantaneous flow recorded at this meter was 587 gpm on 10/10/18 resulting from the 4 day rain event from October 7 - 10 – see chart in Appendix E.

   e) The peak day flow of 308,000 gallons was recorded on October 12 with an average of 214 gpm, see chart in Appendix D.

   f) Flow data collected at this meter indicates the normal base flow is 92,000 gallons per day or approximately 63 gpm, see chart in Appendix D. The flow at this meter site has a peaking factor of 3.35 based on 24 hour totals.

3. **Meter #3 – MH SA0122** at N 7th Street and Superior Avenue

   a) Meter #3 was placed in the upstream 12-inch diameter vitrified clay pipe in precast MH SA0122 located in the intersection of Superior Avenue and N 7th Street. This collection point measured the flows from the Collection System basin area shown on Figure 2 in Appendix F. See picture below:

b) Meter #3 collected data during the entire flow-monitoring period from 9-7-18 to 12-4-18. This meter was subject to very frequent lift station cycling which may have affected accuracy. The flow level during low flows at this meter was about 1.5 inches deep minimum and a maximum of 26.7 inches deep recorded during the rainfall event on 10/9/18, this meter location surcharged during heavy flows. The velocity at this site was good for flow monitoring - ranging from 0.66 f/s to a maximum of 2.42 f/s.

c) The average dry weather flow is 99 gpm – See chart in Appendix E.

d) The peak instantaneous flow recorded at this meter was 492 gpm on 10/9/18 during the 3 day rain event – see chart in Appendix E.

e) The peak day flow of 457,000 gallons was recorded on 10/11/18 with an average of 317 gpm, see chart in Appendix D.

Flow data collected at this meter indicates the normal base flow is 140,000 gallons per day or approximately 97 gpm, see chart in Appendix D. The flow at this meter site has a peaking factor of 3.26 based on 24 hour totals.

4. **Meter #4** – **MH SA0334** at STH-35 and N 17th Street

a) Meter #4 was placed in the upstream 12-inch diameter vitrified clay pipe in precast MH SA0334 located in the outer edge of pavement in the north bound lane of STH-35 at N 17th Street. This collection point measured the flows from the areas of the collection system basins shown on Figure 2 in Appendix F. See picture below:

b) Meter #4 was located just downstream of a lift station discharge pipe which cycled frequently and may have affected accuracy. The flow level during low flows at this meter was about 2.1 inch deep minimum and a maximum of 5.5 inches deep was recorded on 10/10/18. The velocity at this site was ideal for flow monitoring - ranging from a low of 0.7 f/s to a maximum of 2.95 f/s during the highest recorded flow on 10/10/18.

c) The average dry weather flow is 64 gpm – See chart in Appendix E.

d) The peak instantaneous flow recorded at this meter was 382 gpm on 11/5/18 during this rain event – see chart in Appendix E.

e) The peak day flow of 332,000 gallons was recorded on 11/6/18 with an average of 231 gpm, see chart in Appendix D.

f) Flow data collected at this meter indicates the normal base flow is 90,000 gallons per day or approximately 62 gpm, see chart in appendix D. The flow at this meter site has a peaking factor of 3.69 based on 24 hour totals.

C. <u>Summary of Peaking Factors</u>

1. Base Flow Determination

a) The base flows utilized for this report were estimated for each meter basin based on the lowest 24-hour total flows that were recorded during the study period. These estimated base flows are indicative of minor infiltration during the driest periods of the months studied taking into consideration that the ground water table is at a low stage in the well-drained sandy soils that are prominent in the study area. See charts in Appendix D and Table III-1 below for estimated Base Flows in the monitoring areas.

<u>Table III-1</u> below provides a summary of the peak flow conditions observed at each meter location during the study period. Charts are located in **Appendix D** showing the flow rates recorded at the individual meter locations, this data was used to determine the following;

Table III-1 Base Flow Summary [1]			
Meter	Base Flow [2] (gpd)	Peak Flow Rate [3] (gpd)	Peak Factor
Meter #1 MH SA0034	232,000	937,000	4.03
Meter #2 MH SA0076	92,000	308,000	3.35
Meter #3 MH SA0122	140,000	457,000	3.26
Meter #4 MH SA0334	90,000	332,000	3.69
WWTF Influent Flow	500,000	1,640,000 [4]	3.28

[1] Based on flows measured during flow monitoring from 9/7/18 to 12/4/18, includes rainfall events of 3.30 inches over 4 days inches maximum.
[2] Denotes an estimated average lowest value of the measured total flows for 24-hour periods occurring during the study that best represents normal flows.
[3] Denotes a measured value of highest 24 hour total flow recorded at each meter location during entire monitoring period from September 7 to December 4, 2018.
[4] This total Peak flow is based on 24 hour totals recorded from the flow meter at the WWTF by City of Gladstone (Appendix B).

2. Dry Weather I/I

a) Dry Weather I/I can best be evaluated from flows during the late winter/early spring months when very little inflow is encountered because of frozen surface conditions. Dry Weather I/I for this study period was difficult to quantify due to; the timeframe studied, frequent rainfalls, and the nature of the well-drained soils. Dry Weather I/I is determined by subtracting the average base flow from the average Dry Weather flow (for this study - flow during periods of normal ground water with no precipitation for an extended period). A 7-day timeframe with no rainfall at the end of September was evaluated as the best "dry period" for this study to quantify Dry Weather I/I. See Table III-2 for Dry Weather I/I in the monitoring areas.

Table III-2 below provides a summary of the dry weather flow conditions observed in each meter location. Charts are located in **Appendix D** showing the flow rates recorded at the individual meter locations, this data was used to determine the following;

Table III-2 Dry Weather I/I Summary			
Meter	7-Day Average Dry Weather Flow (gpd)	Dry Weather Period	Dry Weather I/I[1] (gpd)
Meter #1 MH SA0034	237,000	Sept 25 – Oct 1	5,000
Meter #2 MH SA0076	101,000	Sept 25 – Oct 1	9,000

Meter #3 MH SA0122	146,000	Sept 25 – Oct 1	6,000
Meter #4 MH SA0334	98,000	Sept 16 – Sept 22	8,000
WWTF Influent Flow	534,000	Sept 25 – Oct 1	34,000[2]

[1]The Dry Weather I/I values are derived by subtracting the base flows noted in Table III-1 from the Dry Weather Flows noted in Column 1.
[2]This Dry Weather I/I value is based on 24-hour totals recorded from the flow meters and the WWTF influent flows provided by the City of Gladstone (Appendix B). The base flow from that data is the estimated low flow as shown on the charts in Appendix D.

3. Maximum 7-day Average Wet Weather Flow

a) The Maximum 7-day Wet Weather flow is determined by analyzing periods of significant precipitation. The maximum 7-day period of wet weather flow is shown on the charts for each Meter Basin shown in Appendix D. Wet weather flows are indicative of periods of saturated soils from heavy rains and/or an elevated groundwater table. See Table III-3 for a summary of the 7-day period used and the average wet weather flows calculated in the monitoring areas.

4. Wet Weather I/I

a) The Wet Weather I/I is determined by subtracting the base flow from the Maximum 7-day Average Wet Weather Flow. The average flow rate during the wet periods when substantial inflow from rainfall is expected as well as infiltration from an elevated groundwater table is used to estimate average maximum wet weather flow. See Table III-3 for a summary of the Wet Weather I/I calculated in the monitoring areas.

Table III-3 below provides a summary of the Average Wet Weather I/I conditions observed in each meter location and the WWTF. Charts are located in **Appendix D** showing the flow rates recorded at the individual meter locations, this data was used to determine the following;

Table III-3
Average Wet Weather I/I

Meter	Maximum 7-day Wet Weather Flow (gpd)	Wet Weather Period	Wet Weather I/I[1] (gpd)
Meter #1 MH SA0034	648,000	October 10 - 16	416,000
Meter #2 MH SA0076	251,000	October 11 - 17	159,000
Meter #3 MH SA0122	338,000	October 10 - 16	198,000
Meter #4 MH SA0334	280,000	November 5 - 11	190,000
WWTF Influent flow	1,291,000	October 9 - 15	791,000[2]

[1]The Wet Weather I/I values are derived by subtracting the base flows noted in Table III-1 from the Maximum 7-day Wet Weather Flows noted in Column 1.
[2] This 7-day Average Wet Weather I/I value is based on 24 hour totals recorded from the flow meter at the WWTF by City of Gladstone (Appendix B). The base flow from that data is the average of flows as shown in Appendix D

5. Peak Day I/I

a) Peak day I/I considers the worst case flows for one day. Heavy rains that produce large peak flows can be attributed to both inflow and infiltration. The Peak Flow Rate for each of the monitoring areas is shown in Table III-1. The Peak Day 24 hour flows at each meter location and the WWTF are shown on the charts in Appendix D.

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IV. CONCLUSIONS

This flow monitoring study was conducted during the fall months of 2018, this time period produced many moderate and sustained rainfall events when the soils were saturated. The results from this study showed large amounts of I/I entering the system, especially at the middle of the study period when the most significant rainfall event occurred over a 4-day period (October 7- 10). Historical flow records supplied by City of Gladstone are highlighted on the WWTF influent data located in Appendix B and indicate the peak flows encountered during this study are as high as recorded in recent history based on the information available.

- Peaking factors for sewage flows in the system vary. The range of peaking factors for the duration of the flow monitoring included in this investigation is from 3.28 to 4.03. These peaking factors are high due to higher ground water levels and associated infiltration during the study period. Lower base flows would be encountered during winter low precipitation periods which would make these peaking factors higher. The peaking factors are based on average 24-hour total flows for the study period.
- The peaking factor data is based on peak flows occurring during the fall months during this study period. It is likely that a more intense rainfall event when the soils are saturated would result in higher peaking factors than those recorded during this investigation.
- The historical data listed in Table III-1 shows that these peak flows are as high as recorded in recent years. The monthly WWTF flows located in Appendix B show; during the 4-day period from October 9 to October 12, 2018 the average influent flow at the WWTF was 1.425 MGD with a peak flow of 1.64 MGD on October 10, 2018. The highest flow recorded at the WWTF in recent years was during this study at 1.64 MGD.

This flow monitoring study shows that inflow and infiltration are both contributing to clear-water entering the City of Gladstone SSCS. The flow monitoring data exhibited very characteristic, extreme, short duration responses typically associated with inflow at all of the 4 meters locations. Typical instantaneous peak flows recorded during the study were about 5 to 10 times the normal flow; see flow rate charts in Appendix E.

The study period flow data exhibited the equally characteristic, lengthy, elevated flow tail associated with infiltration. This elevated flow tail was evident in all 4 meter locations. Historical WWTF influent flow data shown in Appendix B indicate the sanitary sewer collection system is subject to excessive infiltration when the water table rises from successive rainfall events and when the water level of Lake Michigan rises.

Flow rate increases from I/I in the City of Gladstone SSCS are not uncommon. Reducing clear-water flows has become a priority in many communities. The goal of the flow monitoring study is to determine deficiencies to be used to recommend corrective rehabilitation to reduce the peak I/I flows in the system. Reducing I/I flows will ultimately extend the life of the SSCS and improve the performance of the sewage treatment facility.

END OF REPORT

Appendix A

Soil Survey Map of Study Area and Summary

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

Delta County, Michigan

City of Gladstone, MI - 2018 Flow Monitoring

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

Preface......2
Soil Map......5
Soil Map......6
Legend......7
Map Unit Legend......8
Map Unit Descriptions......8
Delta County, Michigan......11
Ad—Alluvial land......11
AuB—Au Gres sand, 0 to 3 percent slopes......11
Bp—Borrow pits......13
Cb—Carbondale, Lupton, and Rifle soils......13
CrA—Croswell sand, 0 to 3 percent slopes......16
Dm—Deford and Leafriver soils, 0 to 2 percent slopes......17
EeB—Eastport-Roscommon sands, 0 to 6 percent slopes......20
GrB—Grayling sand, 0 to 6 percent slopes......21
Ma—Made land......22
Rc—Roscommon mucky loamy sand, 0 to 2 percent slopes......23
RuB—Rubicon sand, 0 to 6 percent slopes......24
Ta—Tawas muck......26
W—Water......27
WaA—Wainola fine sand, 0 to 4 percent slopes......28

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map

Map Scale: 1:21,800 if printed on A landscape (11" x 8.5") sheet.

Meters: 0, 300, 600, 1200, 1800

Feet: 0, 1000, 2000, 4000, 6000

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Delta County, Michigan
Survey Area Data: Version 11, Sep 11, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 31, 2009—Oct 17, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Ad	Alluvial land	38.1	1.5%
AuB	Au Gres sand, 0 to 3 percent slopes	45.4	1.8%
Bp	Borrow pits	14.9	0.6%
Cb	Carbondale, Lupton, and Rifle soils	30.2	1.2%
CrA	Croswell sand, 0 to 3 percent slopes	26.3	1.1%
Dm	Deford and Leafriver soils, 0 to 2 percent slopes	5.7	0.2%
EeB	Eastport-Roscommon sands, 0 to 6 percent slopes	160.3	6.5%
GrB	Grayling sand, 0 to 6 percent slopes	14.9	0.6%
Ma	Made land	193.8	7.9%
Rc	Roscommon mucky loamy sand, 0 to 2 percent slopes	39.1	1.6%
RuB	Rubicon sand, 0 to 6 percent slopes	1,093.4	44.3%
Ta	Tawas muck	85.5	3.5%
W	Water	6.2	0.3%
WaA	Wainola fine sand, 0 to 4 percent slopes	42.2	1.7%
Totals for Area of Interest		**2,465.9**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Delta County, Michigan

Ad—Alluvial land

Map Unit Setting

National map unit symbol: 1q9g7
Elevation: 570 to 1,390 feet
Mean annual precipitation: 28 to 33 inches
Mean annual air temperature: 39 to 43 degrees F
Frost-free period: 90 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition

Alluvial land: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Alluvial Land

Setting

Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip, talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Woody organic material over sandy alluvium

Typical profile

Oa - 0 to 6 inches: muck
C - 6 to 80 inches: sand

Properties and qualities

Slope: 0 to 2 percent
Natural drainage class: Poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 6.00 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: Frequent
Available water storage in profile: Moderate (about 6.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7w
Hydric soil rating: Yes

AuB—Au Gres sand, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2xxht
Elevation: 570 to 1,820 feet
Mean annual precipitation: 27 to 38 inches

Mean annual air temperature: 36 to 45 degrees F
Frost-free period: 70 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

Au gres and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Au Gres

Setting

Landform: Terraces, flats, till-floored lake plains, flats, drainageways
Landform position (three-dimensional): Tread, talf
Down-slope shape: Linear
Across-slope shape: Linear, concave
Parent material: Sandy glaciofluvial deposits

Typical profile

Oa - 0 to 2 inches: highly decomposed plant material
E - 2 to 8 inches: sand
Bhs - 8 to 11 inches: sand
Bs1 - 11 to 14 inches: sand
Bs2 - 14 to 28 inches: sand
C - 28 to 79 inches: sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 6.00 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 4.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: A/D
Forage suitability group: Low AWC, high water table (G090AY001WI)
Other vegetative classification: Tsuga-Maianthemum-Coptis/Tsuga-Maianthemum-Coptis, Vaccinium phase (TMC/TMC-V)
Hydric soil rating: No

Minor Components

Kinross

Percent of map unit: 5 percent
Landform: Depressions, drainageways, depressions, drainageways
Down-slope shape: Concave, linear
Across-slope shape: Concave
Other vegetative classification: Not Assigned (wet mineral soils) (Nmin)
Hydric soil rating: Yes

Croswell

Percent of map unit: 5 percent
Landform: Flats, flats, terraces, till-floored lake plains
Landform position (three-dimensional): Tread, rise
Down-slope shape: Linear
Across-slope shape: Convex, linear
Other vegetative classification: Acer rubrum-Quercus/Vaccinium (ArQV), Pinus/Maianthemum-Vaccinium (PMV)
Hydric soil rating: No

Deford

Percent of map unit: 3 percent
Landform: Drainageways, depressions, drainageways, depressions
Down-slope shape: Linear, concave
Across-slope shape: Concave
Other vegetative classification: Not Assigned (wet mineral soils) (Nmin)
Hydric soil rating: Yes

Rubicon

Percent of map unit: 2 percent
Landform: Beach ridges, flats, hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope, rise
Down-slope shape: Convex
Across-slope shape: Convex
Other vegetative classification: Acer-Quercus-Vaccinium/Quercus-Acer-Epigea (AQV/QAE)
Hydric soil rating: No

Bp—Borrow pits

Map Unit Composition

Borrow pits: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Borrow Pits

Setting

Landform: Lake plains, moraines, outwash plains

Cb—Carbondale, Lupton, and Rifle soils

Map Unit Setting

National map unit symbol: 1q9gq
Elevation: 570 to 2,000 feet
Mean annual precipitation: 25 to 44 inches
Mean annual air temperature: 39 to 46 degrees F

Frost-free period: 60 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition

Carbondale and similar soils: 35 percent
Lupton and similar soils: 30 percent
Rifle and similar soils: 25 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Carbondale

Setting

Landform: Depressions, lake plains, moraines, outwash plains

Typical profile

H1 - 0 to 4 inches: mucky peat
H2 - 4 to 32 inches: muck
H3 - 32 to 60 inches: mucky peat

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 5.95 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Available water storage in profile: Very high (about 27.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: A/D
Hydric soil rating: Yes

Description of Lupton

Setting

Landform: Moraines, outwash plains, depressions, lake plains

Typical profile

H1 - 0 to 46 inches: muck
H2 - 46 to 60 inches: muck

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 5.95 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Available water storage in profile: Very high (about 23.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: A/D
Hydric soil rating: Yes

Description of Rifle

Setting

Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Herbaceous organic material

Typical profile

Oi - 0 to 4 inches: peat
Oe - 4 to 80 inches: mucky peat

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Available water storage in profile: Very high (about 30.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: A/D
Hydric soil rating: Yes

Minor Components

Cathro

Percent of map unit: 4 percent
Landform: Moraines, outwash plains, depressions, lake plains
Hydric soil rating: Yes

Tacoosh

Percent of map unit: 3 percent
Landform: Lake plains, outwash plains, till plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Talf, dip
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

Tawas

Percent of map unit: 3 percent
Landform: Depressions, lake plains, moraines, outwash plains

Hydric soil rating: Yes

CrA—Croswell sand, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2xtn4
Elevation: 570 to 1,800 feet
Mean annual precipitation: 27 to 38 inches
Mean annual air temperature: 36 to 45 degrees F
Frost-free period: 70 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

Croswell and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Croswell

Setting

Landform: Flats, terraces, flats
Landform position (three-dimensional): Tread, rise
Down-slope shape: Linear
Across-slope shape: Convex, linear
Parent material: Sandy glaciofluvial deposits

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
E - 2 to 4 inches: sand
Bs1 - 4 to 8 inches: sand
Bs2 - 8 to 18 inches: sand
BC - 18 to 31 inches: sand
C - 31 to 79 inches: sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)
Depth to water table: About 18 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 4.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: A
Forage suitability group: Low AWC, adequately drained (G090AY002WI)
Other vegetative classification: Acer rubrum-Quercus/Vaccinium (ArQV), Pinus/Maianthemum-Vaccinium (PMV)
Hydric soil rating: No

Minor Components

Au gres

Percent of map unit: 8 percent
Landform: Flats, flats, drainageways, terraces
Landform position (three-dimensional): Tread, talf
Down-slope shape: Linear
Across-slope shape: Linear, concave
Other vegetative classification: Tsuga-Maianthemum-Coptis/Tsuga-Maianthemum-Coptis, Vaccinium phase (TMC/TMC-V)
Hydric soil rating: No

Rubicon

Percent of map unit: 5 percent
Landform: Flats, hillslopes, beach ridges
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope, rise
Down-slope shape: Convex
Across-slope shape: Convex
Other vegetative classification: Acer-Quercus-Vaccinium/Quercus-Acer-Epigea (AQV/QAE)
Hydric soil rating: No

Kinross

Percent of map unit: 2 percent
Landform: Drainageways, depressions, drainageways, depressions
Down-slope shape: Linear, concave
Across-slope shape: Concave
Other vegetative classification: Not Assigned (wet mineral soils) (Nmin)
Hydric soil rating: Yes

Dm—Deford and Leafriver soils, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2xxj3
Elevation: 570 to 1,770 feet
Mean annual precipitation: 27 to 35 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 80 to 160 days
Farmland classification: Farmland of local importance

Map Unit Composition

Deford and similar soils: 50 percent
Leafriver and similar soils: 35 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Deford

Setting

Landform: Depressions, drainageways, flats, depressions, drainageways
Landform position (three-dimensional): Talf
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Parent material: Sandy glaciofluvial deposits

Typical profile

Oa - 0 to 6 inches: muck
A - 6 to 8 inches: mucky loamy sand
Cg - 8 to 14 inches: sand
C1 - 14 to 28 inches: sand
C2 - 28 to 79 inches: sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 6.00 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 5.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: A/D
Forage suitability group: Low AWC, high water table (G095AY001WI)
Other vegetative classification: Tsuga-Maianthemum-Coptis/Tsuga-Thuja-Sphagnum (TMC/TTS)
Hydric soil rating: Yes

Description of Leafriver

Setting

Landform: Depressions, depressions
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Organic material over sandy glaciofluvial deposits

Typical profile

Oe - 0 to 2 inches: mucky peat
Oa - 2 to 12 inches: muck
Cg1 - 12 to 28 inches: sand

Cg2 - 28 to 79 inches: sand

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 6.00 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: A/D
Other vegetative classification: Fraxinus-Impatiens (FI)
Hydric soil rating: Yes

Minor Components

Tawas

Percent of map unit: 8 percent
Landform: Depressions, depressions
Down-slope shape: Concave
Across-slope shape: Concave
Other vegetative classification: Tsuga Thuja Mitchella (TTM_1), Tsuga Thuja Sphagnum (TTS_1)
Hydric soil rating: Yes

Au gres

Percent of map unit: 5 percent
Landform: Flats, terraces, flats
Landform position (three-dimensional): Tread, talf
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Wet Sandy Drainageways (F094DY009WI)
Other vegetative classification: Tsuga-Maianthemum-Coptis/Tsuga-Maianthemum-Coptis, Vaccinium phase (TMC/TMC-V)
Hydric soil rating: No

Croswell

Percent of map unit: 2 percent
Landform: Flats, terraces, flats
Landform position (three-dimensional): Tread, rise
Down-slope shape: Linear
Across-slope shape: Convex, linear
Other vegetative classification: Pinus/Maianthemum-Vaccinium (PMV), Acer rubrum-Quercus/Vaccinium (ArQV)
Hydric soil rating: No

EeB—Eastport-Roscommon sands, 0 to 6 percent slopes

Map Unit Setting

National map unit symbol: 1q9hc
Elevation: 570 to 1,500 feet
Mean annual precipitation: 22 to 35 inches
Mean annual air temperature: 39 to 46 degrees F
Frost-free period: 70 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition

Eastport and similar soils: 50 percent
Roscommon and similar soils: 30 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Eastport

Setting

Landform: Lake plains, moraines, outwash plains

Typical profile

H1 - 0 to 4 inches: sand
H2 - 4 to 19 inches: sand
H3 - 19 to 60 inches: sand

Properties and qualities

Slope: 0 to 6 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Hydric soil rating: No

Description of Roscommon

Setting

Landform: Depressions, lake plains, moraines, outwash plains

Typical profile

H1 - 0 to 4 inches: sand
H2 - 4 to 60 inches: sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Calcium carbonate, maximum in profile: 10 percent
Available water storage in profile: Low (about 4.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: A/D
Hydric soil rating: Yes

Minor Components

Au gres

Percent of map unit: 5 percent
Landform: Lake plains, outwash plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope, crest, rise, talf
Down-slope shape: Linear, concave
Across-slope shape: Linear
Other vegetative classification: Tsuga-Maianthemum-Coptis, Vaccinium phase (TMC-V)
Hydric soil rating: No

Tawas

Percent of map unit: 5 percent
Landform: Depressions, lake plains, moraines, outwash plains
Hydric soil rating: Yes

GrB—Grayling sand, 0 to 6 percent slopes

Map Unit Setting

National map unit symbol: 1q9hn
Elevation: 600 to 1,800 feet
Mean annual precipitation: 27 to 34 inches
Mean annual air temperature: 39 to 46 degrees F
Frost-free period: 80 to 150 days

Farmland classification: Not prime farmland

Map Unit Composition

Grayling and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Grayling

Setting

Landform: Outwash plains, lake plains, moraines

Typical profile

H1 - 0 to 3 inches: sand
H2 - 3 to 15 inches: sand
H3 - 15 to 60 inches: sand

Properties and qualities

Slope: 0 to 6 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Rubicon

Percent of map unit: 3 percent
Landform: Outwash plains, lake plains, moraines
Hydric soil rating: No

Croswell

Percent of map unit: 2 percent
Landform: Lake plains, moraines, outwash plains
Hydric soil rating: No

Ma—Made land

Map Unit Composition

Made land: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Made Land

Setting

Landform: Lake plains, moraines, outwash plains

Rc—Roscommon mucky loamy sand, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2tnyw
Elevation: 570 to 1,480 feet
Mean annual precipitation: 28 to 37 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 80 to 160 days
Farmland classification: Not prime farmland

Map Unit Composition

Roscommon and similar soils: 87 percent
Minor components: 13 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Roscommon

Setting

Landform: Depressions, depressions, drainageways, drainageways
Down-slope shape: Concave, linear
Across-slope shape: Concave
Parent material: Sandy glaciofluvial deposits and/or sandy glaciolacustrine deposits

Typical profile

Oa - 0 to 2 inches: muck
A - 2 to 7 inches: mucky loamy sand
Cg - 7 to 35 inches: sand
C - 35 to 79 inches: sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 6.00 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Calcium carbonate, maximum in profile: 10 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: A/D

Forage suitability group: Low AWC, high water table (G090AY001WI)
Other vegetative classification: Not Assigned (wet mineral soils) (Nmin)
Hydric soil rating: Yes

Minor Components

Markey

Percent of map unit: 5 percent
Landform: Depressions on depressions
Down-slope shape: Concave
Across-slope shape: Concave
Other vegetative classification: Not Assigned (non-acid organic soils) (Nnor)
Hydric soil rating: Yes

Au gres

Percent of map unit: 5 percent
Landform: Flats
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Tsuga/Maianthemum Coptis=(Vaccinium) (TMC-V), Tsuga/Maianthemum-Coptis (TMC)
Hydric soil rating: No

Brevort

Percent of map unit: 3 percent
Landform: Depressions, depressions, drainageways, drainageways
Down-slope shape: Concave, linear
Across-slope shape: Concave
Other vegetative classification: Not Assigned (wet mineral soils) (Nmin)
Hydric soil rating: Yes

RuB—Rubicon sand, 0 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2v8dd
Elevation: 420 to 1,710 feet
Mean annual precipitation: 28 to 37 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 80 to 160 days
Farmland classification: Not prime farmland

Map Unit Composition

Rubicon and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rubicon

Setting

Landform: Ground moraines, outwash plains, beach ridges

Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex, linear
Parent material: Sandy glaciofluvial deposits

Typical profile

A - 0 to 1 inches: sand
E - 1 to 7 inches: sand
Bs1 - 7 to 11 inches: sand
Bs2 - 11 to 18 inches: sand
BC - 18 to 38 inches: sand
C - 38 to 79 inches: sand

Properties and qualities

Slope: 0 to 6 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 3.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Ecological site: Sand Barrens (F094DY007WI)
Forage suitability group: Low AWC, adequately drained (G090AY002WI)
Other vegetative classification: Acer-Quercus-Vaccinium/Quercus-Acer-Epigea (AQV/QAE)
Hydric soil rating: No

Minor Components

Kalkaska

Percent of map unit: 5 percent
Landform: Outwash plains
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Other vegetative classification: Acer-Tsuga-Dryopteris, Dryopteris phase (ATD-D)
Hydric soil rating: No

Croswell

Percent of map unit: 5 percent
Landform: Ground moraines, outwash plains, beach ridges
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex, linear
Ecological site: Sandy Terraces And Plains (F094DY008WI)

Other vegetative classification: Acer-Quercus-Vaccinium (AQV)
Hydric soil rating: No

Au gres

Percent of map unit: 4 percent
Landform: Outwash plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Other vegetative classification: Tsuga-Maianthemum-Coptis, Vaccinium phase (TMC-V)
Hydric soil rating: No

Kinross

Percent of map unit: 1 percent
Landform: Outwash plains, ground moraines
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: Wet Sandy Depressions (F094DY010WI)
Other vegetative classification: Tsuga-Thuja-Sphagnum (TTS)
Hydric soil rating: Yes

Ta—Tawas muck

Map Unit Setting

National map unit symbol: 1q9kn
Elevation: 600 to 2,000 feet
Mean annual precipitation: 22 to 44 inches
Mean annual air temperature: 39 to 46 degrees F
Frost-free period: 60 to 140 days
Farmland classification: Not prime farmland

Map Unit Composition

Tawas and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tawas

Setting

Landform: Moraines, outwash plains, depressions, lake plains

Typical profile

H1 - 0 to 4 inches: muck
H2 - 4 to 31 inches: muck
H3 - 31 to 60 inches: sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 5.95 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Available water storage in profile: Very high (about 13.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: A/D
Hydric soil rating: Yes

Minor Components

Roscommon

Percent of map unit: 5 percent
Landform: Depressions, lake plains, moraines, outwash plains
Hydric soil rating: Yes

Lupton

Percent of map unit: 4 percent
Landform: Moraines, outwash plains, depressions, lake plains
Hydric soil rating: Yes

Rifle

Percent of map unit: 3 percent
Landform: Moraines, outwash plains, depressions, lake plains
Hydric soil rating: Yes

Carbondale

Percent of map unit: 3 percent
Landform: Depressions, lake plains, moraines, outwash plains
Hydric soil rating: Yes

W—Water

Map Unit Composition

Water: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

WaA—Wainola fine sand, 0 to 4 percent slopes

Map Unit Setting

National map unit symbol: 1q9kv
Elevation: 600 to 1,400 feet
Mean annual precipitation: 27 to 34 inches
Mean annual air temperature: 41 to 46 degrees F
Frost-free period: 70 to 140 days
Farmland classification: Farmland of local importance

Map Unit Composition

Wainola and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wainola

Setting

Landform: Lake plains, moraines, outwash plains

Typical profile

H1 - 0 to 9 inches: fine sand
H2 - 9 to 24 inches: fine sand
H3 - 24 to 60 inches: fine sand

Properties and qualities

Slope: 0 to 4 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: About 6 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: A/D
Hydric soil rating: No

Minor Components

Rousseau

Percent of map unit: 5 percent
Landform: Outwash plains, lake plains, moraines
Hydric soil rating: No

Appendix B

WWTP Influent Flow Monthly Reports (Study Period & Historical)

24-Hours Flows and Precipitation at Gladstone WWTF for Fall 2018

September	MGD	Precip.	October	MGD	Precip.	November	MGD	Precip.
1	.568			.527	.20		.631	
2	.548			.581	.50		.593	
3	.665	.75		.902	.70		.725	
4	.822	.60		.850	.15		1.06	.50
5	.927	.30		.799	.10		1.09	.10
6	.763			.751			1.29	.55
7	.730			.714	.20		1.05	.10
8	.699			.938	1.00		1.00	
9	.692			1.24	1.15		.968	.20
10	.653			**1.64**	.95		.902	
11	.628			1.52			.886	
12	.618			1.30			.857	
13	.637			1.15			.807	
14	.588			1.11	.40		.786	
15	.584			1.08			.755	
16	.596			.983			.735	
17	.580			.946			.736	
18	.561			.984			.730	.10
19	.560			1.02	.20		.695	.10
20	.630	.35		.836	.25		.693	
21	.611	.05		.850			.655	.10
22	.627			.975			.688	.15
23	.544			.793	.10		.699	.15
24	.544			.777			.766	.20
25	.562	.25		.772	.10		.760	
26	.560			.881	.25		.720	
27	.507	.20		.827	.10		.701	
28	.534	.20		.783			.647	
29	.530			.742			.673	
30	.505			.743			.670	
31				.707				

Gladstone, MI
SAW Grant Asset Management Plan
17-0120

INFILTRATION AND INFLOW (I/I) EVALUATION

03/12/18
Rev: 03-13-18

Based on MDEQ guidance for SRF project finncing and Project Plan preparation (as of 03-09-18).
>For SRF (Project Plan) Funding: Perform I&I Evaluation, if conditions exist, do I&I Analysis, then SSES if warranted<

Collection System

Description:	**Entire to WWTP**
Population:	**4,973**
Total Footage:	**139,000**
Total Inch-Miles:	**328.00**

INFILTRATION DURING HIGH GROUNDWATER CONDITIONS

Year	Non-precipitation Days (7 - 14 day worst case avg)	Number of Days (consecutive)	Avg. Day (mgd)	Per Capita (gpcd)	Per Inch-Mile (gpd/in-mi)
2015	Mar-Apr-May	7	0.643	129	1,960
2015	Sep-Oct-Nov	4	0.514	103	1,567
2016	Mar-Apr-May	13	0.767	154	2,338
2016	Sep-Oct-Nov	8	0.849	171	2,588
2017	Mar-Apr-May	9	0.854	172	2,604
2017	Sep-Oct-Nov	6	0.783	157	2,387
	Guidance Limits			**120**	**2,000 - 3,000**

INFLOW DURING STORM (RAIN) EVENTS

Year	6 Minimum Highest Rainfall Days	Date	Precipitation (in)	Flow (mgd)	Per Capita (gpcd)
2015	Apr 01 - Oct 31	09/02/15	1.55	0.729	147
		05/03/15	1.20	0.713	143
		07/24/15	1.05	0.609	122
		05/29/15	1.00	0.700	141
		06/24/15	0.90	0.757	152
		05/11/15	0.75	0.766	154
2016	Apr 01 - Oct 31	07/16/16	2.00	0.833	168
		08/20/16	1.30	0.824	166
		06/25/16	1.20	0.668	134
		09/16/16	1.00	1.020	205
		10/17/16	1.00	0.875	176
		07/17/16	0.80	0.913	184
2017	Apr 01 - Oct 31	**06/24/17**	**2.10**	**1.525**	**307**
		06/11/17	2.00	1.127	227
		07/11/17	1.45	1.340	269
		08/01/17	1.20	1.076	216
		06/18/17	**1.00**	**1.482**	**298**
		09/20/17	1.00	0.823	165
	Guidance Limits				**275**

Appendix C

Weather and Precipitation Data during Study

Delta County Weather Station 2018 - Weather Underground

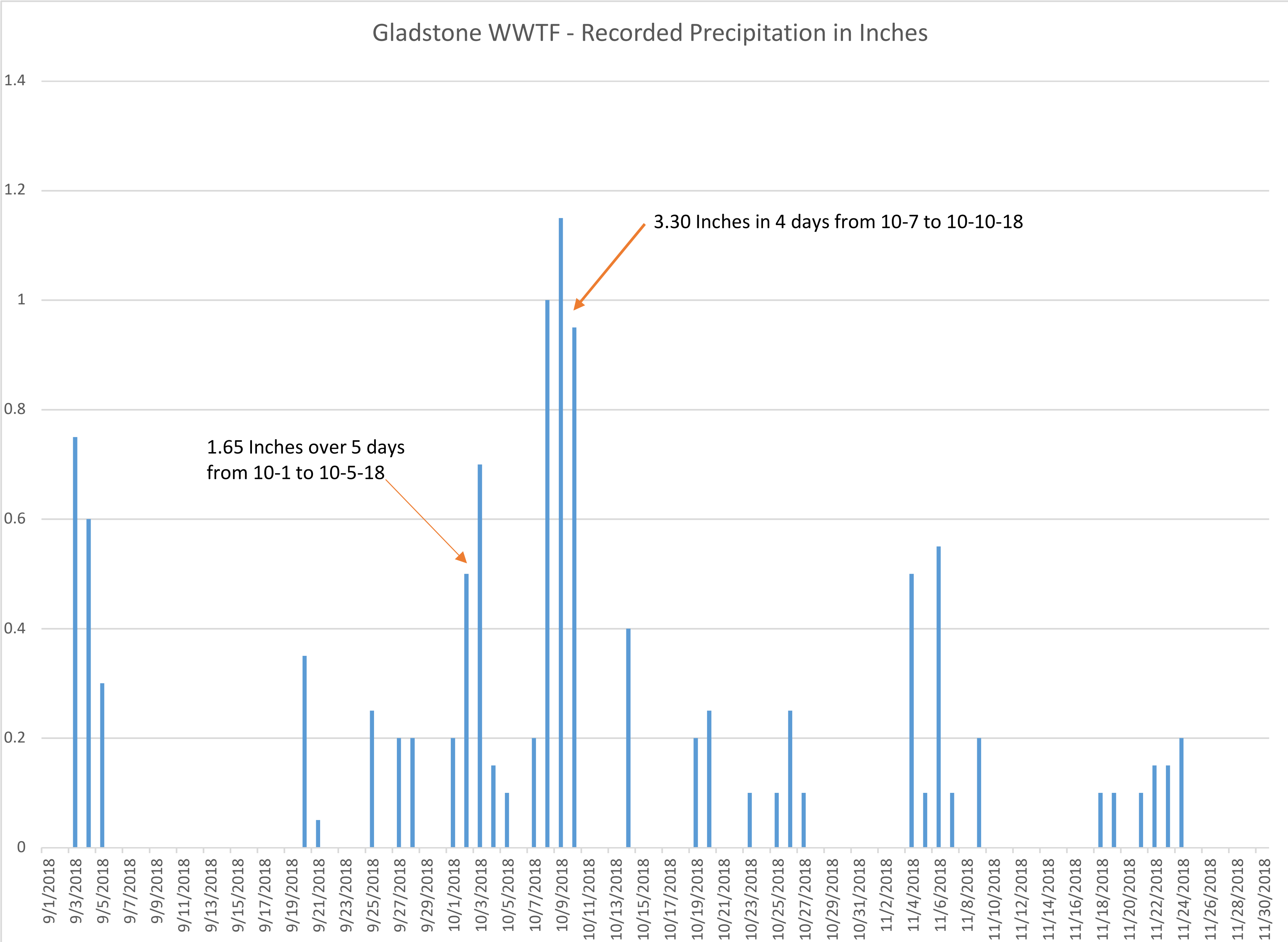
Time	Temperature (° F)			Precipation (in)		
Sep	Max	Avg	Min	Max	Avg	Min
1	77	70	64	-	0	-
2	78	66	60	-	0.01	-
3	75	68	64	-	0	-
4	80	72	64	-	0.04	-
5	72	64	55	-	0.02	-
6	70	58	48	-	0.04	-
7	72	57	43	-	0.04	-
8	64	54	45	-	0.04	-
9	64	55	46	-	0.03	-
10	66	54	41	-	0.02	-
11	73	60	48	-	0.04	-
12	75	68	60	-	0.03	-
13	73	62	50	-	0.02	-
14	73	62	50	-	0	-
15	78	67	57	-	0	-
16	77	65	55	-	0	-
17	84	70	55	-	0	-
18	63	56	50	-	0	-
19	61	54	48	-	0.01	-
20	69	60	55	-	0.08	-
21	71	58	42	-	0.35	-
22	62	49	37	-	0	-
23	64	54	45	-	0	-
24	64	60	57	-	0	-
25	70	58	48	-	0.01	-
26	60	48	39	-	0	-
27	57	47	37	-	0	-
28	55	47	39	-	0.02	-
29	48	38	30	-	0.02	-
30	52	44	39	-	0.02	-

Time	Temperature (° F)			Precipation (in)		
Oct	Max	Avg	Min	Max	Avg	Min
1	55	49	43	-	0.14	-
2	57	50	46	-	0	-
3	71	63	55	-	1.72	-
4	64	52	39	-	0	-
5	52	44	37	-	0.09	-
6	55	50	44	-	0	-
7	48	44	41	-	0	-
8	57	52	46	-	0.76	-
9	57	50	44	-	0.71	-

10	55	48	44	-	0.78	-
11	55	46	36	-	0	-
12	39	34	32	-	0.01	-
13	48	37	26	-	0	-
14	46	39	32	-	0.12	-
15	39	34	30	-	0.08	-
16	54	43	32	-	0	-
17	43	34	26	-	0	-
18	55	39	23	-	0	-
19	53	49	46	-	0.09	-
20	45	39	33	-	0.07	-
21	42	35	28	-	0	-
22	53	38	23	-	0	-
23	46	40	35	-	0.06	-
24	45	37	30	-	0	-
25	50	40	30	-	0.02	-
26	46	44	42	-	0.15	-
27	46	44	42	-	0.03	-
28	43	40	39	-	0.07	-
29	52	44	36	-	0	-
30	50	41	32	-	0	-
31	55	44	30	-	0	

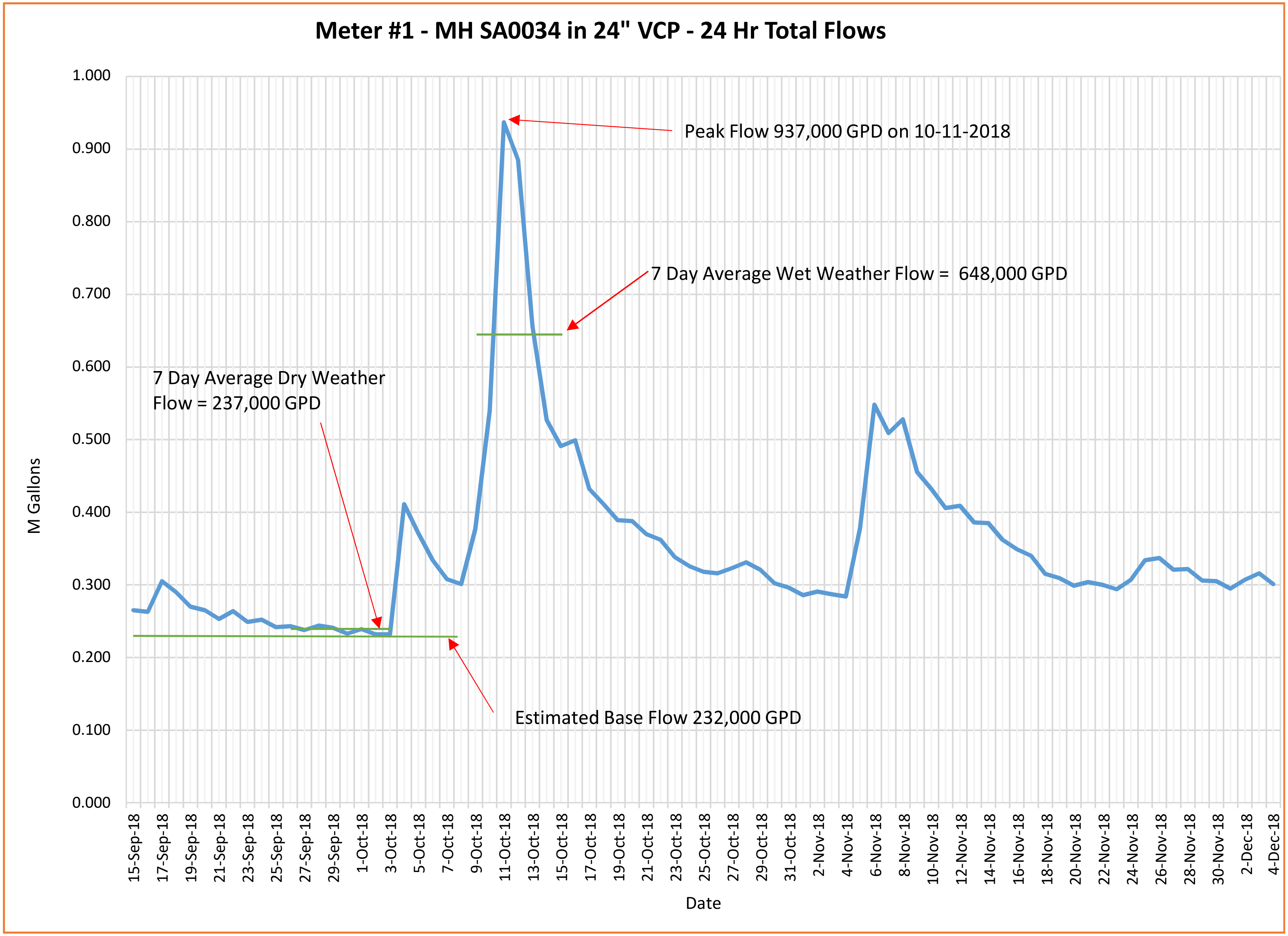
Time	**Temperature (° F)**			**Precipation (in)**		
Nov	Max	Avg	Min	Max	Avg	Min
1	45	35	26	-	0	-
2	41	36	30	-	0	-
3	45	36	27	-	0	-
4	46	36	27	-	0.64	-
5	48	45	42	-	0.06	-
6	45	42	39	-	0.34	-
7	41	36	30	-	0.05	-
8	33	32	30	-	0	-
9	30	26	21	-	0	-
10	30	24	18	-	0	-
11	30	24	19	-	0	-
12	28	24	19	-	0	-
13	21	16	10	-	0	-
14	28	20	12	-	0	-
15	37	30	23	-	0	-
16	39	34	28	-	0	-
17	28	21	14	-	0	-
18	28	19	10	-	0	-
19	28	22	15	-	0.01	-
20	24	17	10	-	0	-
21	23	18	12	-	0	-

22	32	18	6	-	0	-
23	43	38	33	-	0	-
24	43	38	33	-	0.28	-
25	35	30	26	-	0.01	-
26	27	26	24	-	0	-
27	26	24	21	-	0	-
28	27	24	21	-	0	-
29	34	29	24	-	0.01	-
30	36	33	30	-	0.02	-

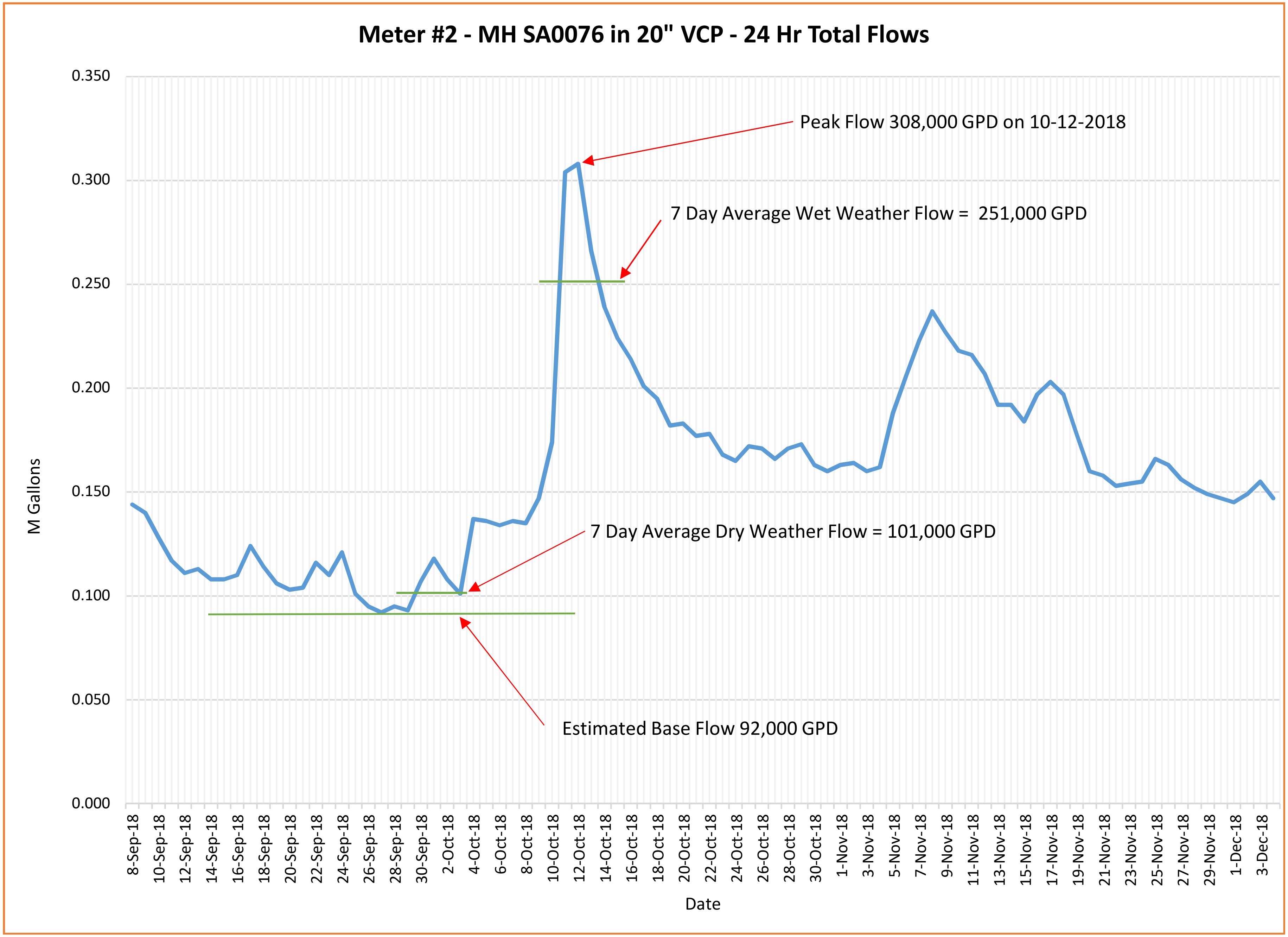

Gladstone WWTF - Recorded Precipitation in Inches
3.30 Inches in 4 days from 10-7 to 10-10-18
1.65 Inches over 5 days
from 10-1 to 10-5-18
1.4
1.2
1
0.8
0.6
0.4
0.2
0
9/1/2018
9/3/2018
9/5/2018
9/7/2018
9/9/2018
9/11/2018
9/13/2018
9/15/2018
9/17/2018
9/19/2018
9/21/2018
9/23/2018
9/25/2018
9/27/2018
9/29/2018
10/1/2018
10/3/2018
10/5/2018
10/7/2018
10/9/2018
10/11/2018
10/13/2018
10/15/2018
10/17/2018
10/19/2018
10/21/2018
10/23/2018
10/25/2018
10/27/2018
10/29/2018
10/31/2018
11/2/2018
11/4/2018
11/6/2018
11/8/2018
11/10/2018
11/12/2018
11/14/2018
11/16/2018
11/18/2018
11/20/2018
11/22/2018
11/24/2018
11/26/2018
11/28/2018
11/30/2018

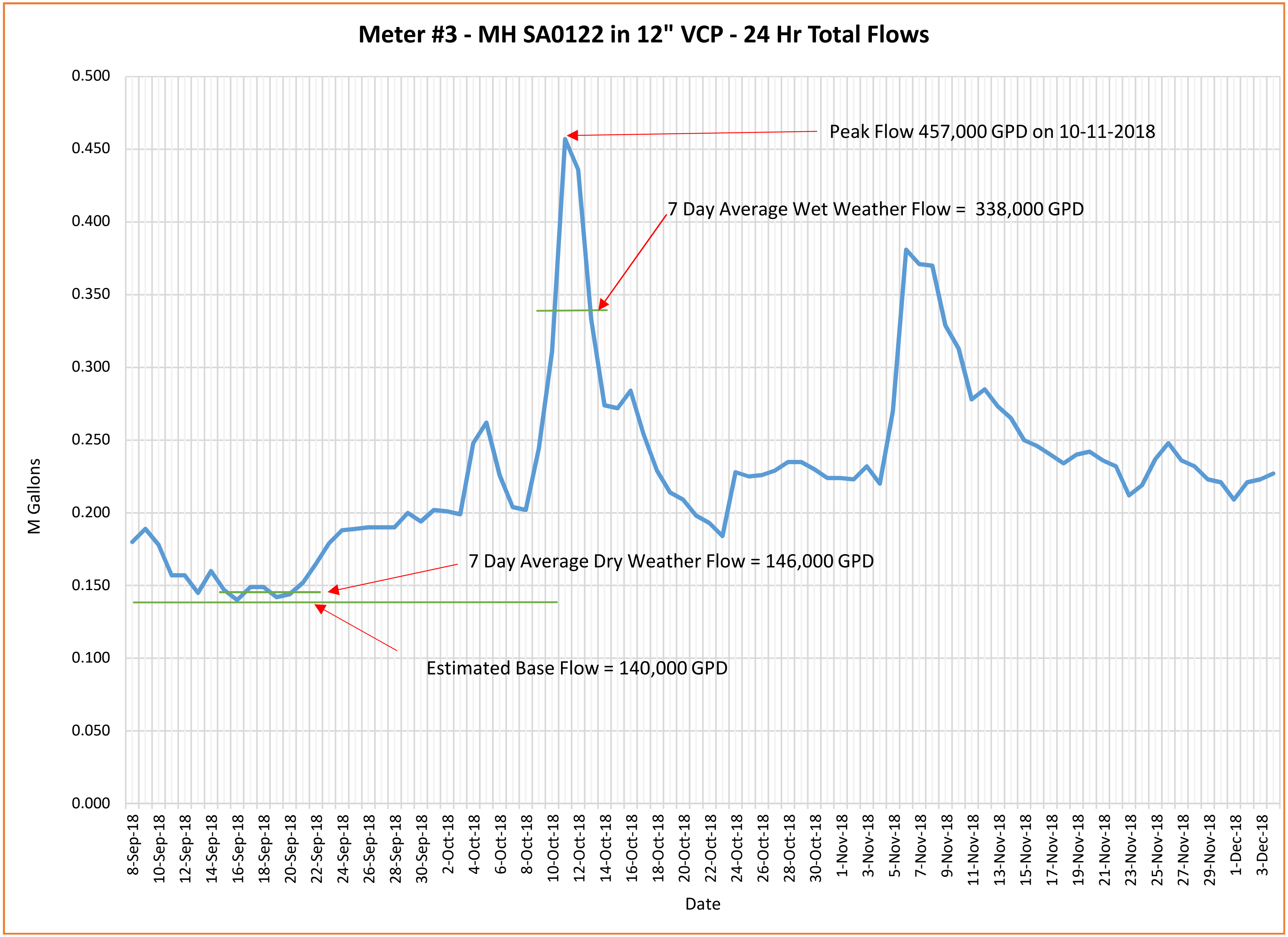
Appendix D

Charts of 24 Hour Total Flows for all 4 Meters and WWTF

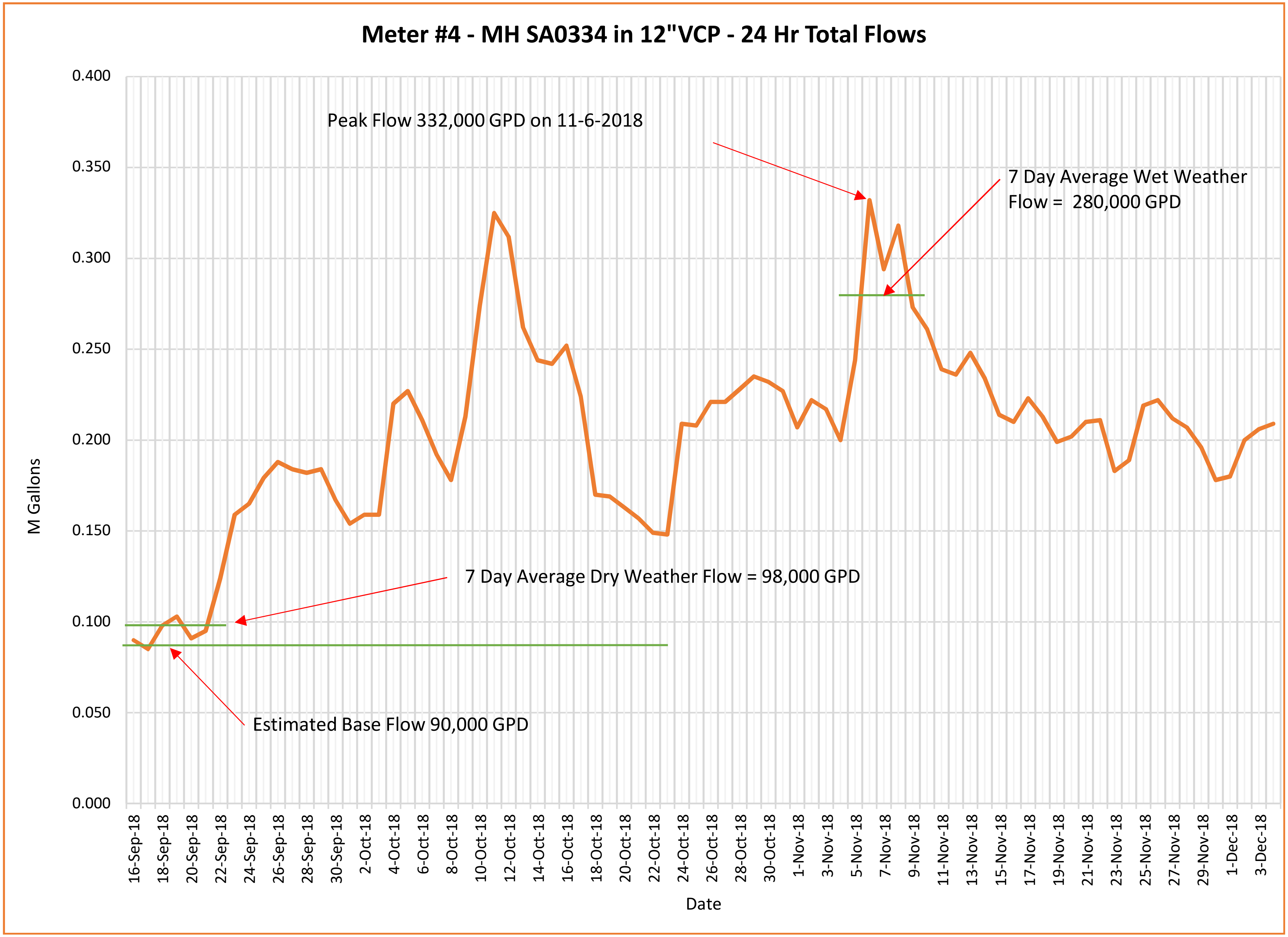


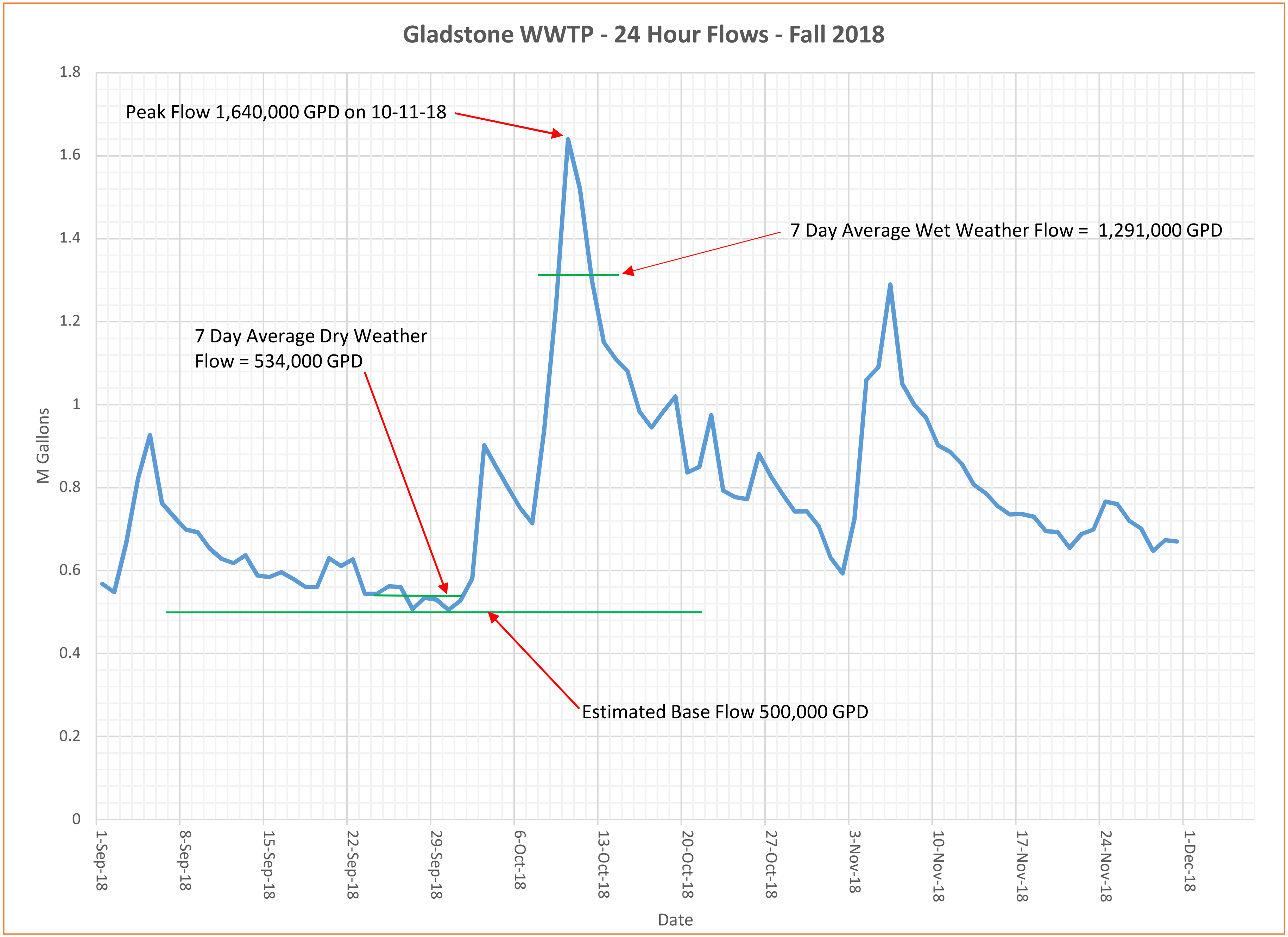
Meter #1 - MH SA0034 in 24" VCP - 24 Hr Total Flows
Peak Flow 937,000 GPD on 10-11-2018
7 Day Average Wet Weather Flow = 648,000 GPD
7 Day Average Dry Weather Flow = 237,000 GPD
Estimated Base Flow 232,000 GPD
M Gallons
Date


Meter #2 - MH SA0076 in 20" VCP - 24 Hr Total Flows
Peak Flow 308,000 GPD on 10-12-2018
7 Day Average Wet Weather Flow = 251,000 GPD
7 Day Average Dry Weather Flow = 101,000 GPD
Estimated Base Flow 92,000 GPD
M Gallons
0.350
0.300
0.250
0.200
0.150
0.100
0.050
0.000
Date
8-Sep-18
10-Sep-18
12-Sep-18
14-Sep-18
16-Sep-18
18-Sep-18
20-Sep-18
22-Sep-18
24-Sep-18
26-Sep-18
28-Sep-18
30-Sep-18
2-Oct-18
4-Oct-18
6-Oct-18
8-Oct-18
10-Oct-18
12-Oct-18
14-Oct-18
16-Oct-18
18-Oct-18
20-Oct-18
22-Oct-18
24-Oct-18
26-Oct-18
28-Oct-18
30-Oct-18
1-Nov-18
3-Nov-18
5-Nov-18
7-Nov-18
9-Nov-18
11-Nov-18
13-Nov-18
15-Nov-18
17-Nov-18
19-Nov-18
21-Nov-18
23-Nov-18
25-Nov-18
27-Nov-18
29-Nov-18
1-Dec-18
3-Dec-18



Meter #3 - MH SA0122 in 12" VCP - 24 Hr Total Flows
Peak Flow 457,000 GPD on 10-11-2018
7 Day Average Wet Weather Flow = 338,000 GPD
7 Day Average Dry Weather Flow = 146,000 GPD
Estimated Base Flow = 140,000 GPD
M Gallons
Date


Meter #4 - MH SA0334 in 12"VCP - 24 Hr Total Flows
Peak Flow 332,000 GPD on 11-6-2018
7 Day Average Wet Weather Flow = 280,000 GPD
7 Day Average Dry Weather Flow = 98,000 GPD
Estimated Base Flow 90,000 GPD
M Gallons
Date
0.400
0.350
0.300
0.250
0.200
0.150
0.100
0.050
0.000
16-Sep-18
18-Sep-18
20-Sep-18
22-Sep-18
24-Sep-18
26-Sep-18
28-Sep-18
30-Sep-18
2-Oct-18
4-Oct-18
6-Oct-18
8-Oct-18
10-Oct-18
12-Oct-18
14-Oct-18
16-Oct-18
18-Oct-18
20-Oct-18
22-Oct-18
24-Oct-18
26-Oct-18
28-Oct-18
30-Oct-18
1-Nov-18
3-Nov-18
5-Nov-18
7-Nov-18
9-Nov-18
11-Nov-18
13-Nov-18
15-Nov-18
17-Nov-18
19-Nov-18
21-Nov-18
23-Nov-18
25-Nov-18
27-Nov-18
29-Nov-18
1-Dec-18
3-Dec-18

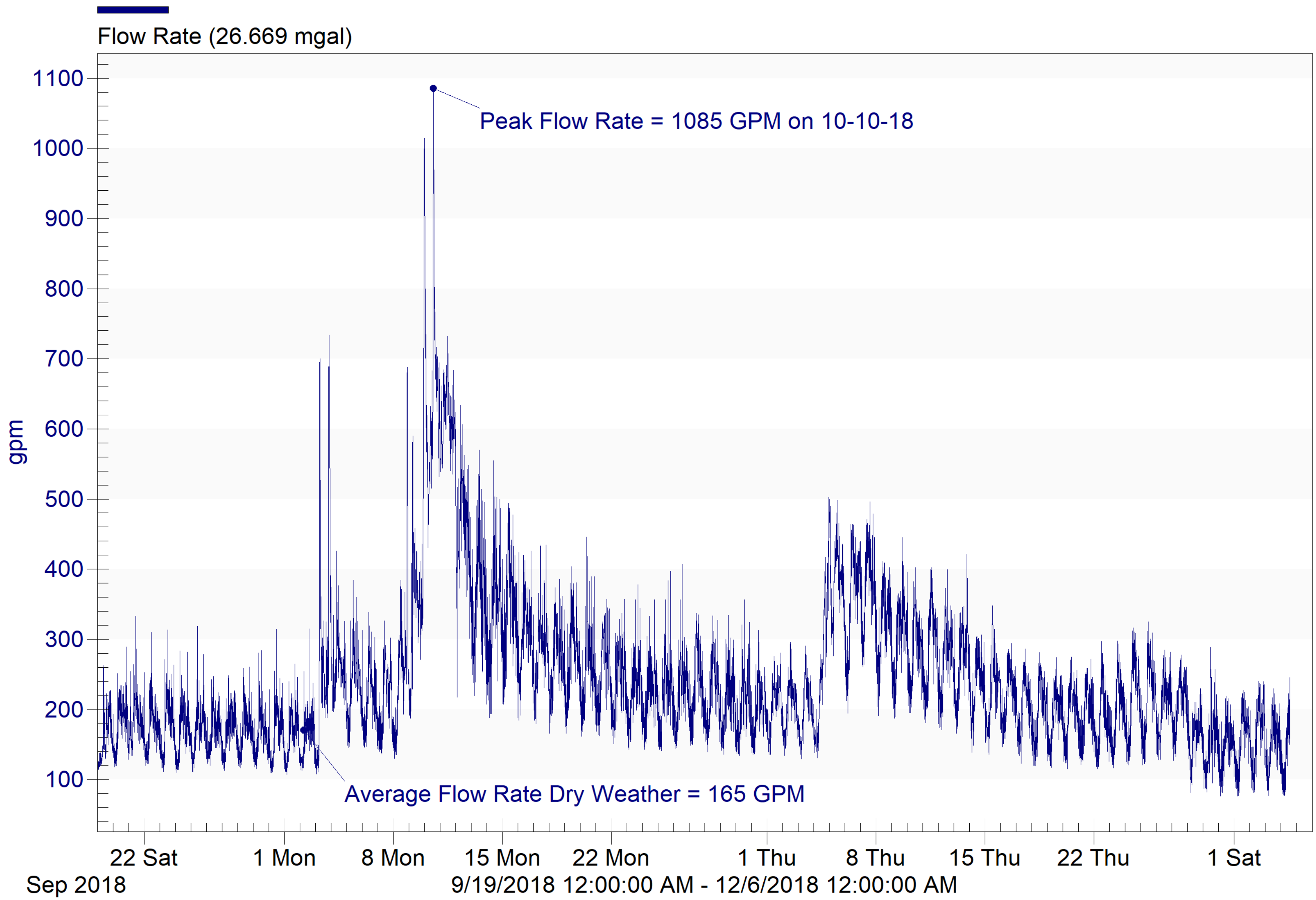

Gladstone WWTP - 24 Hour Flows - Fall 2018
Peak Flow 1,640,000 GPD on 10-11-18
7 Day Average Wet Weather Flow = 1,291,000 GPD
7 Day Average Dry Weather Flow = 534,000 GPD
Estimated Base Flow 500,000 GPD
M Gallons
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
1-Sep-18
8-Sep-18
15-Sep-18
22-Sep-18
29-Sep-18
6-Oct-18
13-Oct-18
20-Oct-18
27-Oct-18
3-Nov-18
10-Nov-18
17-Nov-18
24-Nov-18
1-Dec-18
Date

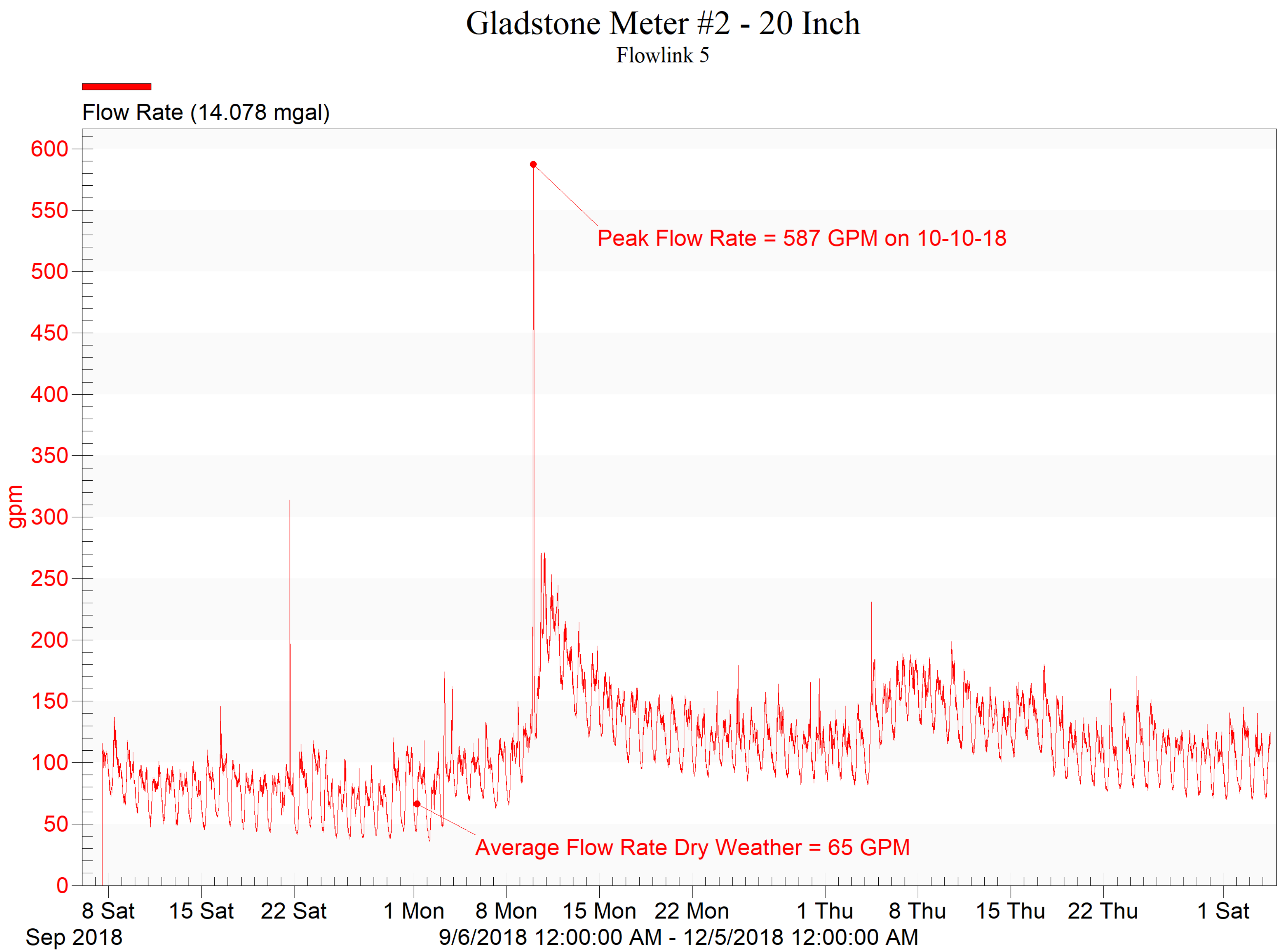
Appendix E

Charts of Peak Instantaneous Flow Rates in GPM for all 4 Meters

Gladstone Meter #1 - 24 Inch

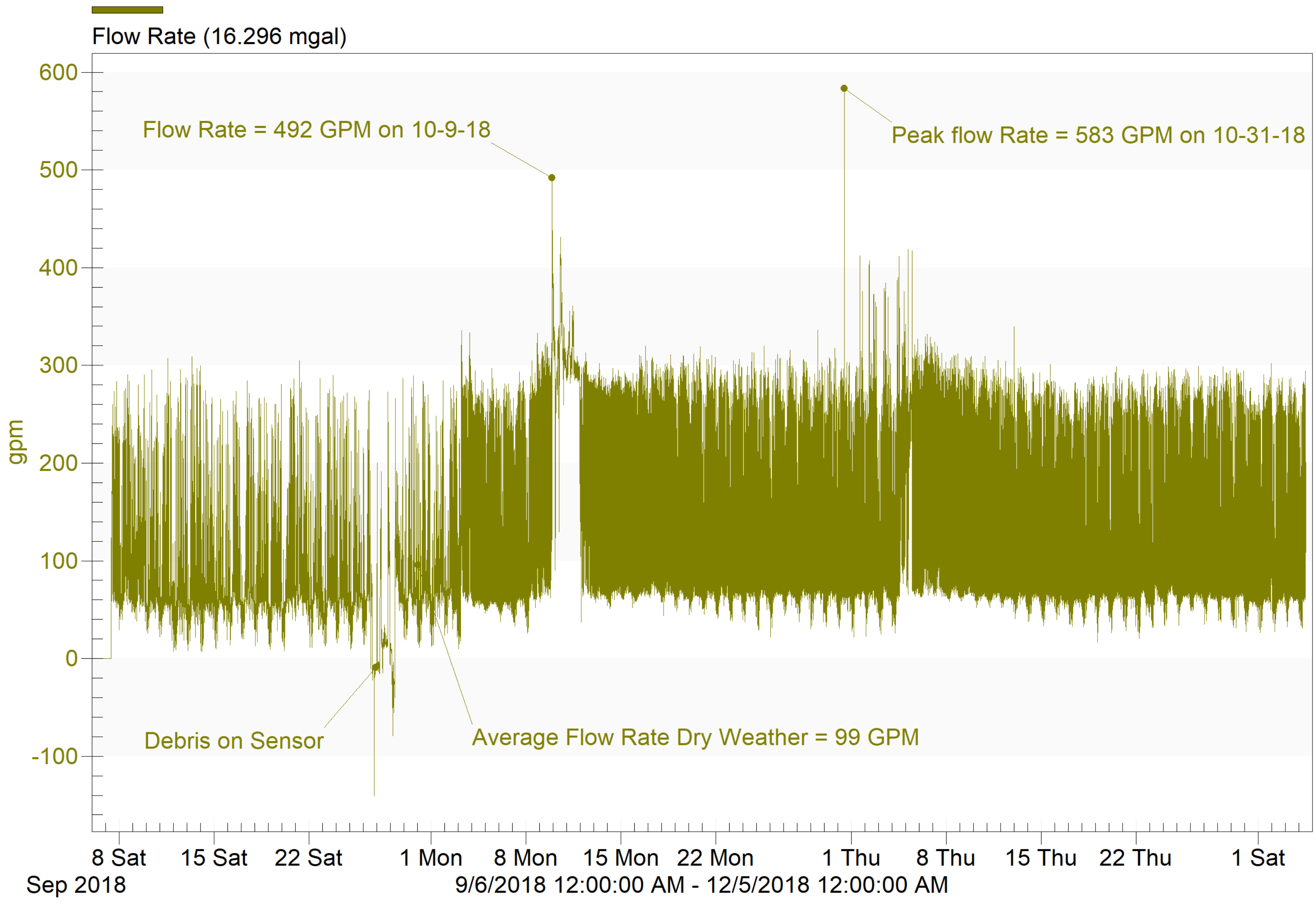
Flowlink 5




Gladstone Meter #2 - 20 Inch
Flowlink 5
Flow Rate (14.078 mgal)
gpm
600
550
500
450
400
350
300
250
200
150
100
50
0
Peak Flow Rate = 587 GPM on 10-10-18
Average Flow Rate Dry Weather = 65 GPM
8 Sat
15 Sat
22 Sat
1 Mon
8 Mon
15 Mon
22 Mon
1 Thu
8 Thu
15 Thu
22 Thu
1 Sat
Sep 2018
9/6/2018 12:00:00 AM - 12/5/2018 12:00:00 AM

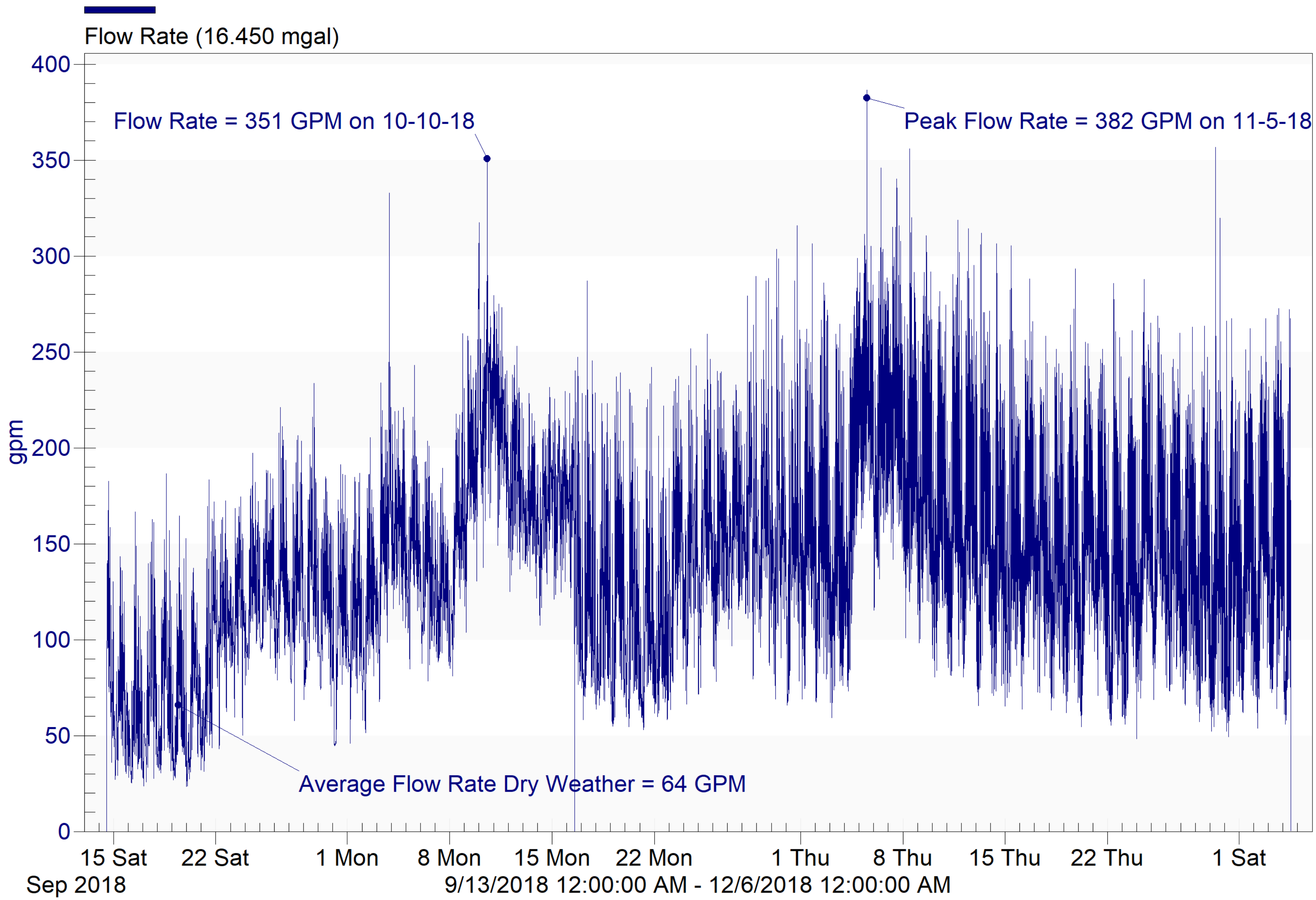
Gladstone Meter 3 - 12 Inch

Flowlink 5



Gladstone Meter #4 - 12 Inch

Flowlink 5

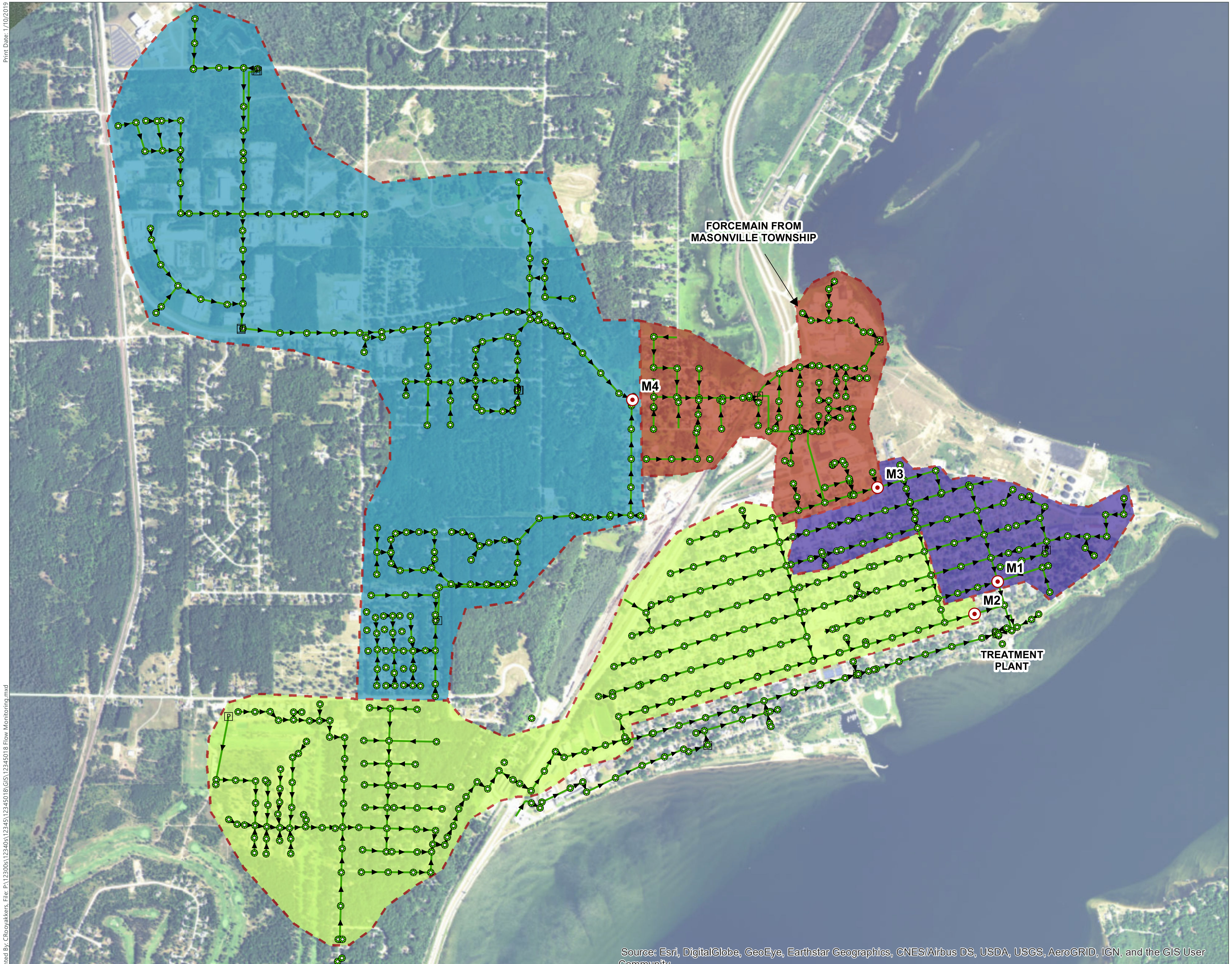


Appendix F

Maps of Meter Locations

2018 SANITARY SEWER FLOW MONITORING

CITY OF GLADSTONE
DELTA COUNTY, MI



- Flow Meter
- Sanitary Manholes
- Pump Station
- Sanitary Pipes
- M1 Basin
- M2 Basin
- M3 Basin
- M4 Basin

Data Sources:
Sanitary Sewer Lines and Manholes provided by C2AE
for reference use only

0 600 1,200 Feet

MSA

Print Date: 1/10/2019

Printed By: CRooyakkers, File: P:\12300s\12340s\12345\12345018\GIS\12345018 Flow Monitoring.mxd

Print Date: 1/10/2019

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Project Location

0 1,000 2,000 Feet

Flow Meter

2018 SANITARY SEWER FLOW MONITORING

METER LOCATIONS

CITY OF GLADSTONE
DELTA COUNTY, MI

MSA

APPENDIX A

Part 2 – 2019 Infiltration/Inflow Study Summary

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1211 Ludington St.
Escanaba, MI 49829
O: 906.233.9360
www.c2ae.com

MEMO

To: Gladstone City Commissioners

From: C2AE Escanaba

Date: December 3, 2019

Re: Gladstone Infiltration and Inflow Report Results

The following is a brief summary of the City of Gladstone Infiltration and Inflow Report, 2019. This work was authorized by the Gladstone City Commission on February 11, 2019 by letter proposal from the Manager. The intent of the report is to identify the source and severity of wastewater treatment plant (WWTP) capacity concerns.

1. **Relationship to Previous Work**: Studies related to stormwater and groundwater effects and sewer system capacity were prepared in 1980, 1982, 1995, 1999, 2005, and 2019. The progressive inventories have shown moderate degradation of collection pipe and numerous improvements which could be made to the WWTP. Gladstone has made numerous repairs and replacements in response to these needs. The most extensive inventory of Storm and Wastewater (SAW), Asset Management Planning is entering its third year.

2. **Excessive I/I Allowance Criteria and Results**: Inflow is defined as clear water entering the sanitary collection system during rain events while infiltration is groundwater entering the sanitary system during periods of high groundwater. EPA criteria for a system of Gladstone's size is 3,000-6,000 gallons per day per inch-mile of sewer (i.e. per 660 feet of 8" sewer). MDEQ/EGLE guidelines are stormwater inflow <275 gallons per capita per day and groundwater infiltration <120 gallons per capita per day during high water.

   Gladstone has exceeded both measures by a moderate amount, with infiltration exceedance in 2016, 2017, and 2018 up to 158 gpcd and inflow exceedance in 2017, 2018 and 2019 up to 318 gpcd.

3. **Inventory and Evaluation Results**: Collection system conditions were graded during televising of nearly 11 miles of sanitary sewer, showing several areas of problematic roots and sand. Flow monitoring in four areas indicated excess flows in Downtown and east Gladstone and problems with the underpass lift station. The City has made efforts to clean and address the surplus flows at the lift station.

   The inventory includes estimates of flat, commercial roof runoff which may be directed into sanitary sewers (up to 326,650 square feet). The report also details a hydraulic model prepared by C2AE to simulate sanitary flows and storm events. The 25 year, 24-hour storm simulation (3.9 inches of rainfall) estimates a peak flow rate of 4.2 million gallons per day which may reach the WWTP.

4. **Cost Effectiveness of Alternatives**: Comparisons were made based on the need to increase capacity to 4.2 MGD peak influent to the treatment plant. WWTP improvements will increase capacity and

efficiency, even if operations and maintenance increases. Equalization is more simplistic approach, similarly less expensive but does not address process component deficiencies. Replacement and rehabilitation will reduce clear water flows and some operations and maintenance costs, but face higher initial capital costs for the amount of I/I addressed.

5. **Recommendations**: Improving existing WWTP processes will address infiltration and inflow volume and benefit operational capacity, efficiency, and effluent quality. Incremental improvements to collection system sewers should be planned alongside adjacent road and utilities improvements. Results should be monitored for impact at WWTP plant, starting with 9th Street Project and continuing as possible in central Gladstone, Buckeye/North Buff, and Lakeshore areas.

With permission of the City of Gladstone, the draft Infiltration and Inflow Report can be submitted for review and record with MDEQ/EGLE. EGLE may recommend an additional Sanitary Sewer Evaluation Survey (SSES) to more narrowly identify problem areas. The I/I report as written includes many of the components of the SSES, and therefore it is the opinion of C2AE that no SSES is necessary at this time.

As a part of the SAW program, C2AE and the City of Gladstone are preparing a project plan for the State Revolving Fund. Next steps in addressing infiltration and inflow volume and wastewater treatment plant processes will be submission of project plan and application in 2020.

APPENDIX A

Part 3 – 2015 – 2019 I/I Evaluation

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APPENDIX A

Gladstone, MI

SAW Grant Asset Management Plan

17-0120

INFILTRATION AND INFLOW (I/I) EVALUATION

03/12/18

Rev: 04-03-18

Rev: 05-10-19

Rev: 03-05-20

Based on EGLE guidance for SRF project financing and Project Plan preparation (as of 03-09-18).

>For SRF (Project Plan) Funding: Perform I&I Evaluation, if conditions exist, do I&I Analysis, then SSES if warranted<

Collection System

Description:	**Entire to WWTP**	
Population:	**5,373**	(4,973 City + 400 Masonville)
Total Footage:	**156,000**	(139,000 City + 17,000 Masonville)
Total Inch-Miles:	**353.00**	(328 City + 25 Masonville)

GLADSTONE AND MASONVILLE

INFILTRATION DURING HIGH GROUNDWATER CONDITIONS

Year	Non-precipitation Days (7 - 14 day worst case avg)	Number of Days (consecutive)	Avg. Day (mgd)	Per Capita (gpcd)	Per Inch-Mile (gpd/in-mi)
2015	Mar-Apr-**May**	7	0.643	**120**	1,822
2015	Sep-Oct-**Nov**	4	0.514	96	1,456
2016	Mar-**Apr**-May	13	0.767	**143**	2,173
2016	Sep-**Oct**-Nov	8	0.849	**158**	2,405
2017	Mar-Apr-**May**	9	0.854	**159**	2,419
2017	Sep-Oct-**Nov**	6	0.783	**146**	2,218
2018	Mar-**Apr**-May	15	0.792	**147**	2,244
2018	Sep-Oct-**Nov**	7	0.808	**150**	2,289
2019	Mar-Apr-**May**	8	1.411	**263**	**3,997**
2019	Sep-Oct-**Nov**	9	0.878	**163**	**2,487**
	Guidance Limits			**120**	**2,000 - 3,000**

INFLOW DURING STORM (RAIN) EVENTS

Year	6 Minimum Highest Rainfall Days	Date	Precipitation (in)	Flow (mgd)	Per Capita (gpcd)
2015	Apr 01 - Oct 31	09/02/15	1.55	0.729	136
		05/03/15	1.20	0.713	133
		07/24/15	1.05	0.609	113
		05/29/15	1.00	0.700	130
		06/24/15	0.90	0.757	141
		05/11/15	0.75	0.766	143
2016	Apr 01 - Oct 31	07/16/16	2.00	0.833	155
		08/20/16	1.30	0.824	153
		06/25/16	1.20	0.668	124
		09/16/16	1.00	1.020	190
		10/17/16	1.00	0.875	163
		07/17/16	0.80	0.913	170
2017	Apr 01 - Oct 31	**06/24/17**	**2.10**	**1.525**	**284**
		06/11/17	2.00	1.127	210
		07/11/17	1.45	1.340	249
		08/01/17	1.20	1.076	200
		06/18/17	**1.00**	**1.482**	**276**
		09/20/17	1.00	0.823	153
2018	Apr 01 - Oct 31	06/16/18	1.25	1.008	188
		10/09/18	1.15	1.240	231
		04/15/18	1.00	0.771	143
		10/08/18	1.00	0.938	175
		10/10/18	**0.95**	**1.640**	**305**
		06/17/18	0.80	1.016	189
2019	Apr 01 - Oct 31	09/18/19	1.65	1.399	260
		5/19/2019	**1.30**	**2.058**	**383**
		8/26/2019	1.30	0.833	155
		4/17/2019	**1.25**	**1.842**	**343**
		9/12/2019	1.10	1.062	198
		5/27/2019	**0.85**	**1.829**	**340**
	Guidance Limits				**275**

Appendix A

APPENDIX A

Part 4 – 2019 Sanitary Model Memo

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TECHNICAL MEMO

To: Rodney Schwartz

From: Ashley Hendricks

CC: Charles Lawson

Daren Pionk

Date: August 28, 2019

Re: Wastewater Model
City of Gladstone, Delta County, MI

INTRODUCTION

In conjunction with the City's SAW Grant and the Infiltration and Inflow Study, a wastewater model was developed to predict flow to the wastewater treatment plant (WWTP) for a 25-year, 24-hour storm event of 3.9 inches. Under these the conditions, the peak instantaneous inflow is 4.2 MGD to the WWTP. The following summarizes the model development and results.

The City of Gladstone wastewater system consists of approximately 176,000 feet of 2-to 30-inch diameter sanitary sewers and forcemain, 600 sanitary manholes, 10 City-owned lift stations, and a discharge to the Wastewater Treatment Plant. Additionally, the City's WWTP receives flow from Masonville Township. The WWTP discharges into Little Bay de Noc of Lake Michigan via EGLE NPDES Permit No. MI0057676.

MODEL DEVELOPMENT

The model developed utilizes manhole inventories, population data, structure counts, land use/zoning information, water meter billing data, pump runtime data, and drawdown testing results to estimate wastewater flows; wastewater flows were assigned to applicable sanitary manholes throughout the system. For baseline flows, an assumed flow rate of 150 GPD/REU was used for residential dwellings (gallon per day per Residential Equivalent Unit), whereas water usage data was estimated for commercial users. EPA software Sanitary Sewer Overflow Analysis and Planning (SSOAP) Toolbox coupled with flow monitoring data, pump run time hours, and draw down testing was used to determine the dry weather flows. The following flows were used as baseline and dry weather flows to the WWTP, broken down by flow monitor:

Table 1. Baseline Flows, Ground Water Infiltration, and Dry Weather Flows

Meter	Baseline Flow (GD)	Ground Water Infiltration (GD)	Dry Weather Flow (GD)
Meter 1	194,000	91,000	285,000
Meter 2	144,000	11,000	155,000
Meter 3	136,000	62,000	198,000
Meter 4	61,000	19,000	80,000
Not Metered	44,000	36,000	80,000
WWTP	382,000	138,000	520,000

The model was skeletonized in Autodesk Storm and Sanitary Analysis to include the parts of the wastewater system which have a significant impact on the behavior of the system and to optimize the efficiency, usability, and focus of the model. The parts of the system that are not modeled directly are accounted for within the simplified connectivity scheme in the model. Lift Stations included in the model are the East End, Industrial Park, Underpass, State Police, and Wastewater Plant Lift Station. Flows to the other City lift stations (High School, Lake Shore Drive, North Bluff, South Bluff, and Oakwoods Lift Station), Masonville Township lift stations, and several small residential lift stations are included/assigned to manholes within the wastewater systems; similarly, flows to the Masonville Township and Kipling lift stations are included/assigned to manholes within the wastewater system.

The model was calibrated using flow meter data from four portable flow meters, which MSA installed in manholes during August 6th to December 4th, 2018:

- Meter 1: SA0034 near the intersection of South 4th Street and Dakota Avenue
- Meter 2: SA0076 near the intersection of Montana Avenue and South 5th Street
- Meter 3: SA0122 near the intersection of Superior Avenue and South 7th Street
- Meter 4: SA0344 near the intersection of North 4th Avenue and North 17th Street

Dry weather calibration consisted of comparing the diurnal hydrographs, and via an iterative process, adjusting the diurnal time pattern(s) to “correspond to” the dry weather flow meter data. Similarly, SSA used flow meter data from significant rainfall events to accomplish the wet weather model calibration at the flow meter site by developing relationships between rainfall events and RDII (rainfall derived infiltration/inflow) using RTK values for the wastewater system. Defined by SSA and SSOAP, the R value is the amount of precipitation that is received by the sanitary sewers expressed as a percentage or fraction, T is the duration between the start of the precipitation event to the peak of the event, and K is the ratio of the time to recession of the unit hydrograph to the time to peak. Rainfall data was obtained from Weather Underground station KMIGLADS3.

Under a dry weather scenario, there are two areas with surcharged pipe. In SSA, a surcharged pipe is defined as the flow condition is where the water is above the crown of the pipe; flow is greater than the design capacity of the pipe. These areas are both right upstream of the State Police Lift Station and the Underpass Lift Station. The model dry weather flow compared with the flow monitor observed dry weather flows for Meter 1 and 2 are shown in the figures below.

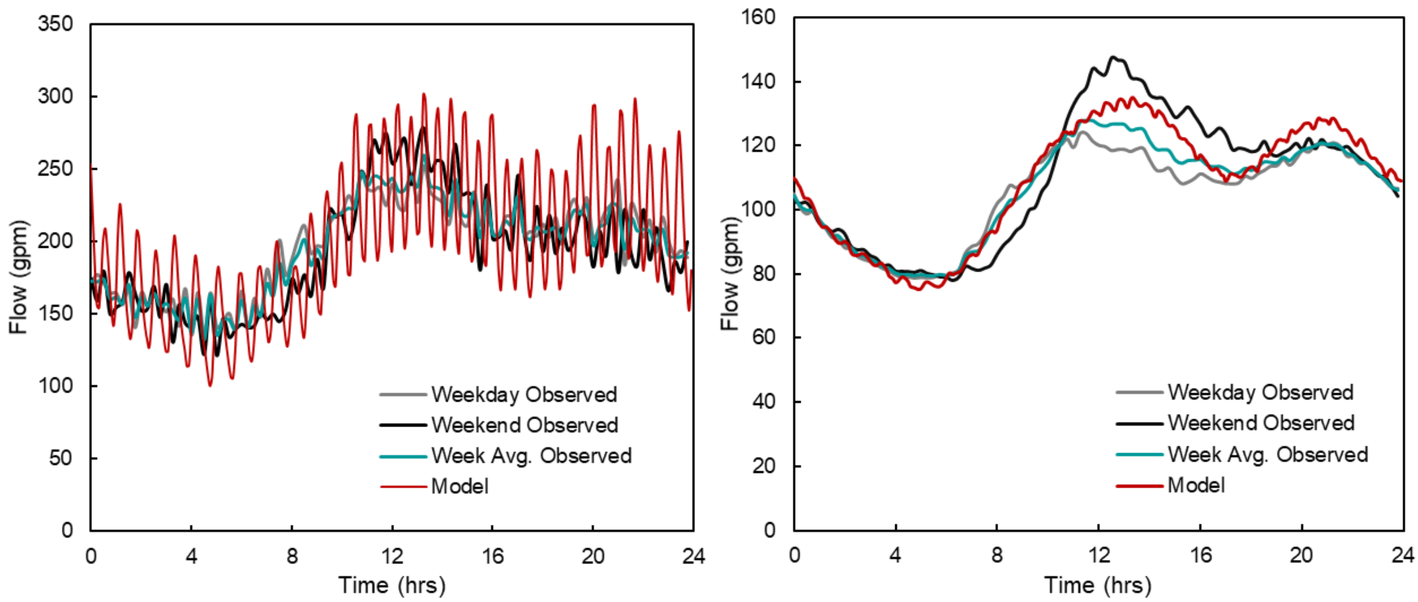


Figure 1. Modeled dry weather flows compared with observed dry weather flows from the flow monitors for Meter 1 (left) and Meter 2 (right).

Significant rainfall events during flow monitoring occurred on October 3rd to 4th, 2018 (1.41 inches of precipitation) and October 9th to 10th, 2018 (1.36 inches of precipitation). The following table summarizes the RTK values used in the calibrated model, where 1 refers to the short-term response and 3 denotes the long-term response. The non-metered area was assigned average RTK values from Meter 1 and 2 due to the two meters being closest in proximity. Figures 2 and 3 compare modeled and observed wet weather events.

Table 2. Calibrated RTK Values

Meter	R1	R2	R3	T1	T2	T3	K1	K2	K3
Meter 1	0.0119	0.0190	0.0395	0.75	3.5	7.5	3.0	6.0	13.5
Meter 2	0.0100	0.0030	0.0021	1.0	2.0	3.0	2.0	5.0	6.0
Meter 3	0.0070	0.0095	0.0033	0.5	3.0	7.0	7.0	10.0	15.0
Meter 4	0.0020	0.0035	0.0043	1.0	3.0	5.0	2.0	4.0	7.0
Not Metered	0.0109	0.0110	0.0208	0.875	2.75	5.25	2.5	5.5	9.75

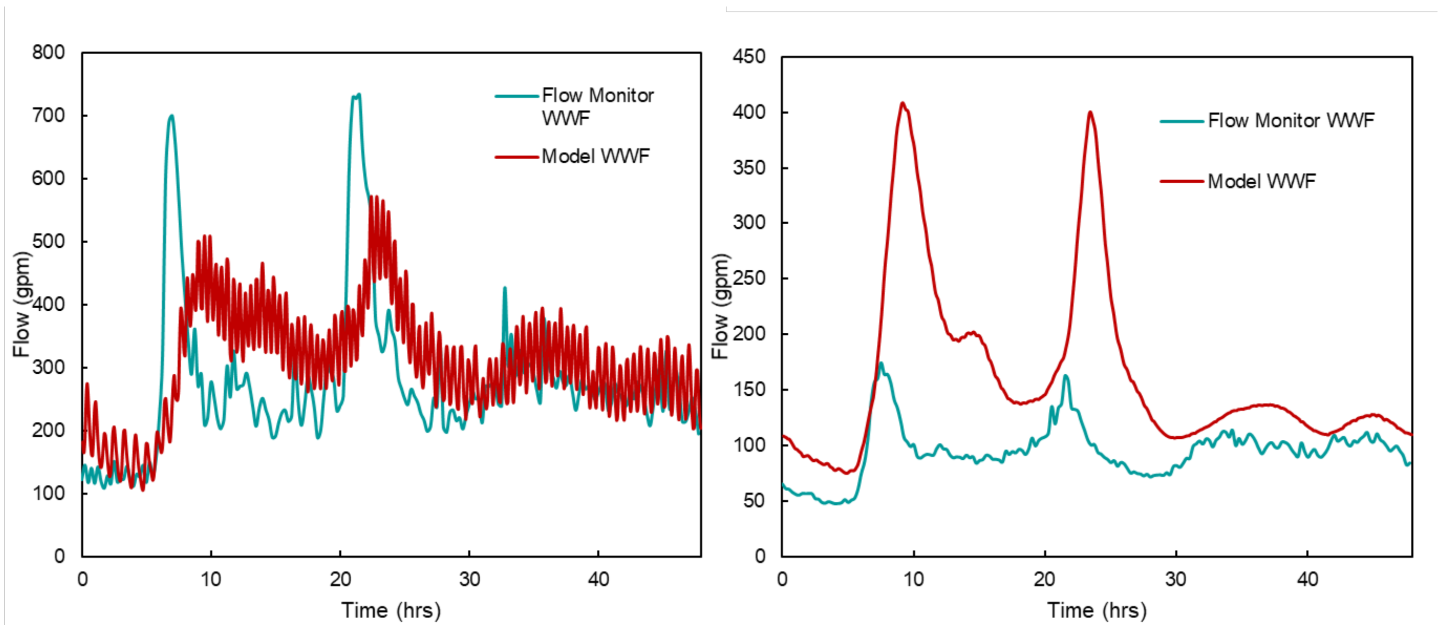


Figure 2. Modeled wet weather flows for storm event occurring on October 3rd to 4th, 2018 compared with observed flows from the flow monitoring for Meter 1 (left) and Meter 2 (right).

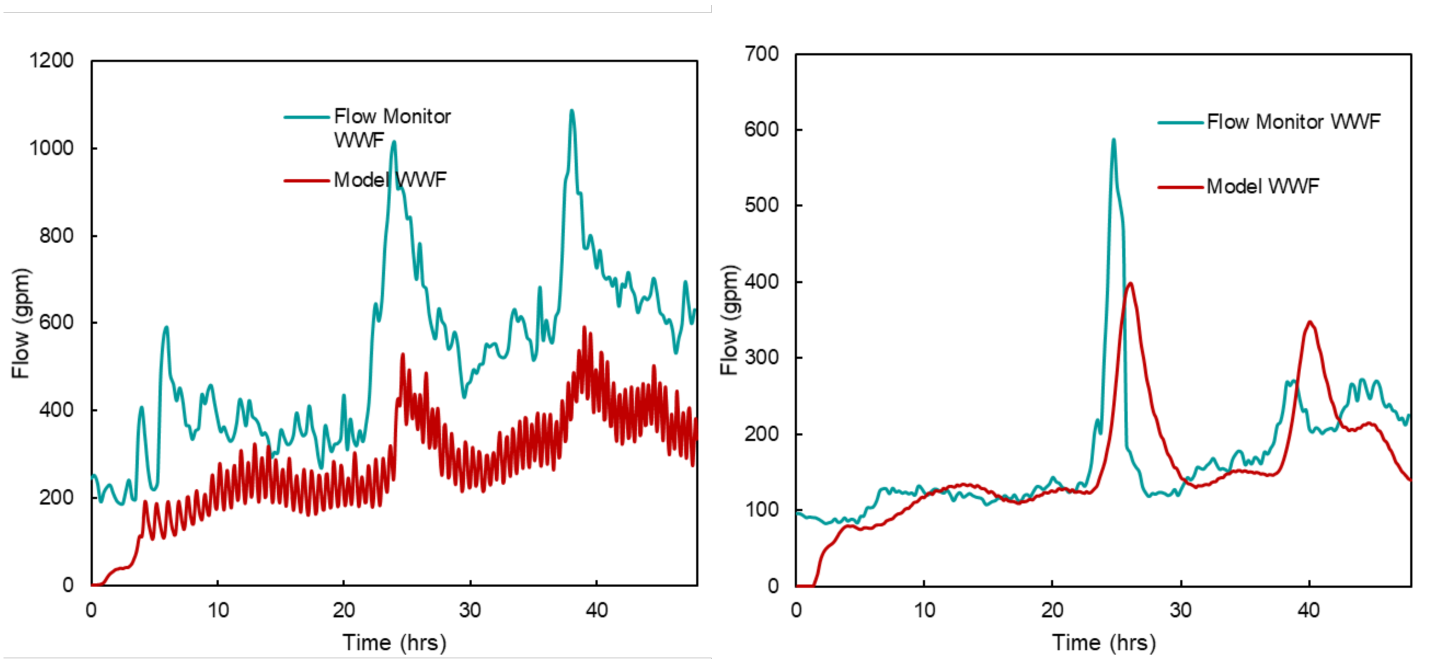


Figure 3. Modeled wet weather flows for storm event occurring on October 9th to 10th, 2018 compared with observed flows from the flow monitoring for Meter 1 (left) and Meter 2 (right).

RESULTS AND DISCUSSION

The calibrated model was used to evaluate/confirm the capacity of the sanitary sewer system relative to the EPA and EGLE stipulated storm event (25-year, 24-hour with SCS Type II Rainfall Distribution). Although Delta County records suggest 3.5 inches of rain, the more conservative estimate is to anticipate 3.9 inches of rain. The peak instantaneous inflow to the WWTP for the storm is 4.2 MGD. The following figure shows the hydrograph of the inflow to the WWTP.

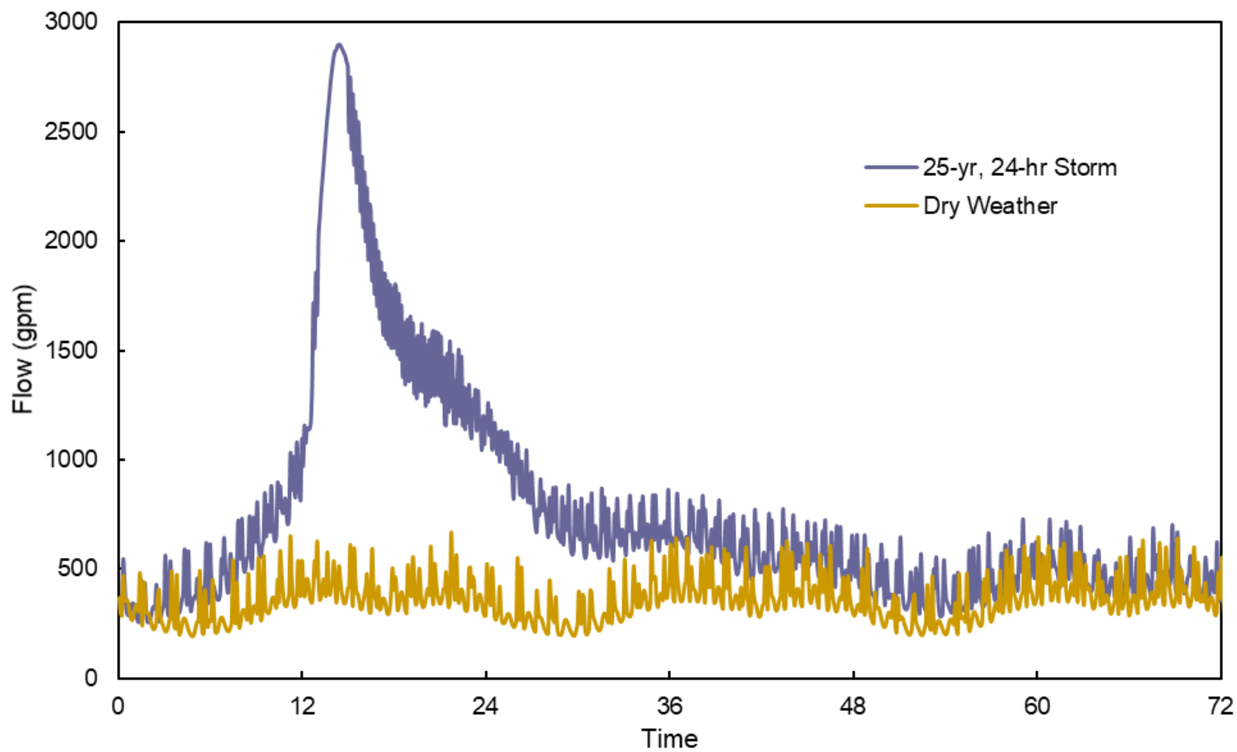


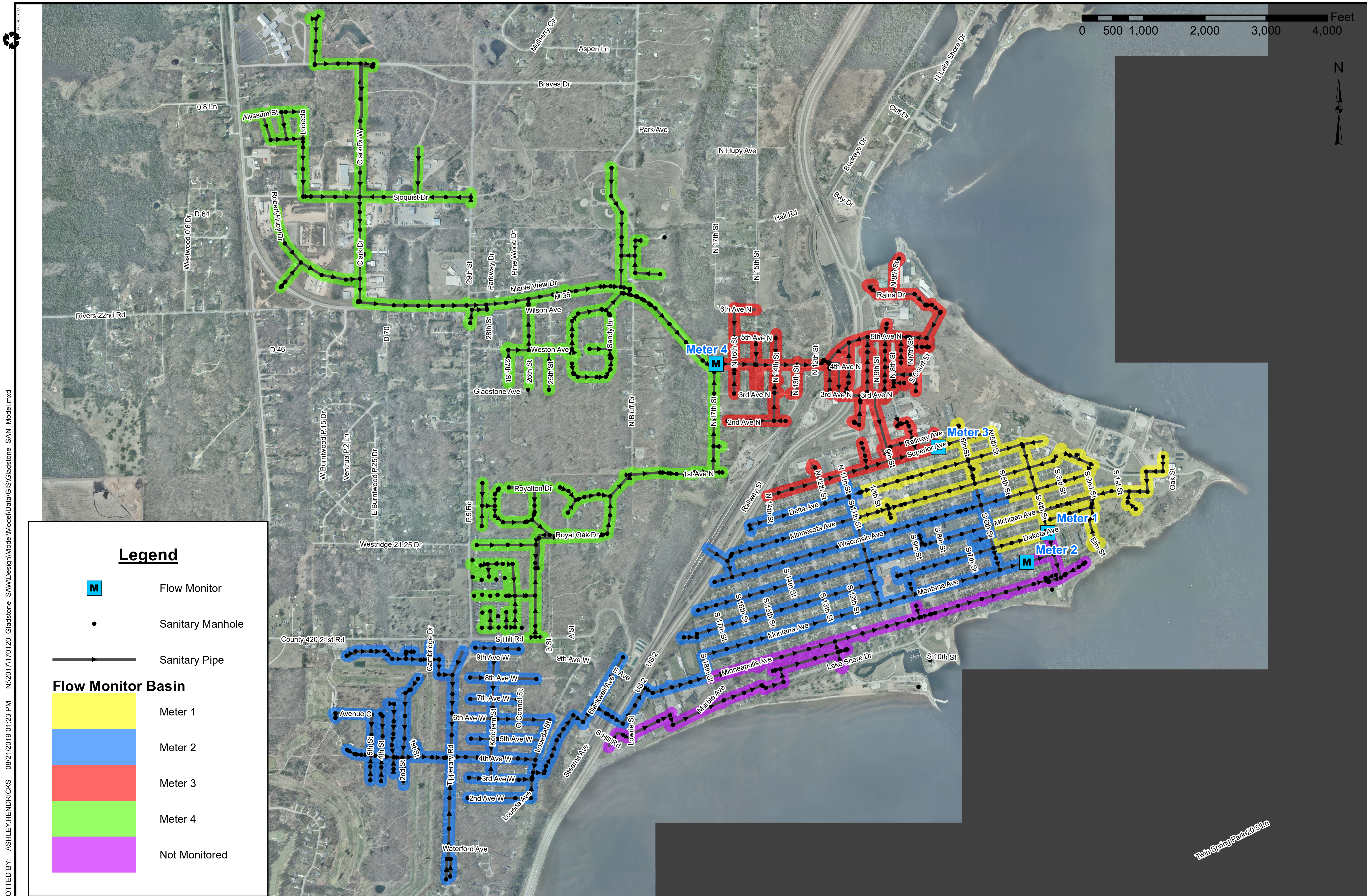
Figure 4. Inflow to the WWTP during a 25-year, 24-hour storm of 3.9 inches.

Refer to the attached maps for a summary of the results of the wastewater modeling; the maps illustrate the surcharged pipes for the 25-year, 24-hour storm event; these areas include upstream of the Underpass and State Police Lift Station, and upstream of the WWTP along South 4th Street, Dakota Avenue, and Montana Avenue. Three manholes exhibit a hydraulic grade line that extends above the rim elevation of the manhole:

- SA0218 – manhole downstream of Little Bay Concrete Products along North 8th Street
- SA0319 – manhole upstream of the Industrial Park Lift Station on North Court Street
- SA0338 – along 4th Avenue North near the railroad tracks and Underpass Lift Station

Attached maps:

a. Map 1: System Map with Flow Monitor Locations & Basins
b. Map 2: 25-Year, 24-Hour SCS Storm Results



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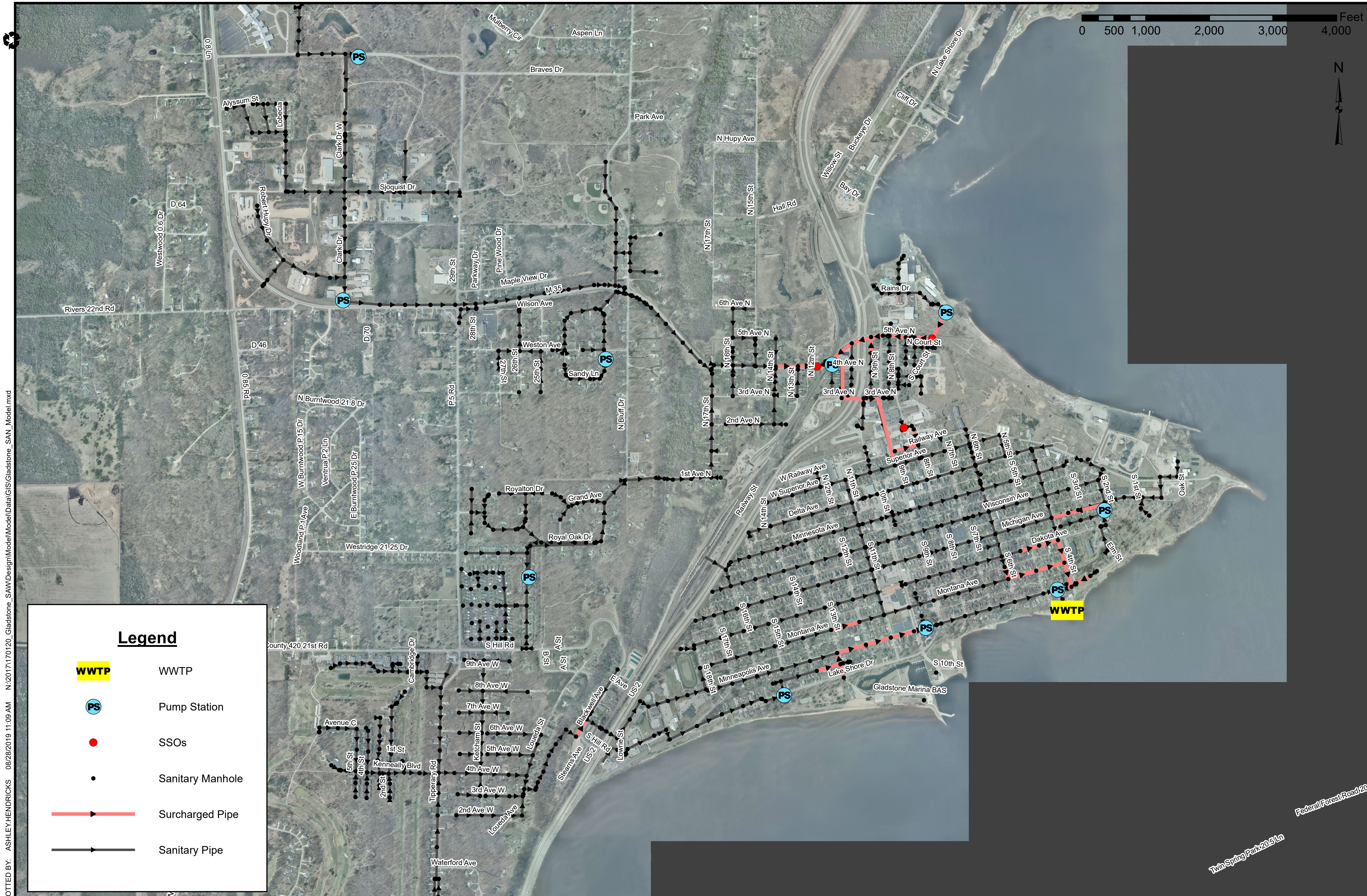
CITY OF GLADSTONE
PROJECT: 170120
DELTA COUNTY, MICHIGAN

SANITARY FLOW MONITORING
FLOW MONITOR LOCATION AND BASIN AREAS

Appendix A



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CITY OF GLADSTONE
PROJECT: 170120
DELTA COUNTY, MICHIGAN

SANITARY FLOW MONITORING 25-YR, 24-HR STORM RESULTS

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APPENDIX A

Part 5 – 2014 to 2020 Monthly Operating Reports Summary

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APPENDIX A

GLADSTONE WWTP - ASSET MANAGEMENT PLAN
MONTHLY OPERATING REPORT SUMMARY - (2014 THROUGH 2020)
3/1/2021

Month	Gladstone Precipitation	Rapid River Wastewater Flow		Gladstone Sewage Flow (Mgd)			Temp. (F°)	pH	Raw Sewage (Mg/l)			Primary Effluent (Mg/l)				Final Effluent (Mg/l)					Chemicals (Lbs/day)			Raw Sludge			Remarks
	Inches	Influent (MGD)	Precipitation (Inches)	Average	Max Day	Pk Rate	Raw	Raw	BOD_5	TSS	P	BOD_5	TSS	P	VSS	BOD_5	TSS	P	DO	Fecal #/100ml	Alum.	Poly	Chlorine	Gallon x 100	Solids %	VS %	Note: 11,000 Gal./Acre for Sludge Land Application
Jan-14	1.70	0.022	1.70	0.44	0.54	1.08	42	7.4	255	178	4.4	127	74	2.3	64	26	13	0.9	7.6	5	221	0.3	5	26.0	3.5	77.0	
Feb-14	1.00	0.028	1.00	0.50	0.80	1.37	41	7.4	240	179	4.0	131	76	2.3	62	21	10	0.9	8.0	1	184	0.3	4	28.0	3.2	78.0	
Mar-14	1.50	0.031	1.50	0.63	0.84	1.44	40	7.4	224	147	3.0	129	68	2.1	54	23	13	0.9	8.8	1	192	0.3	4	28.0	3.5	78.0	
Apr-14	2.30	0.123	2.30	0.99	1.26	1.80	41	7.3	134	230	2.3	79	55	1.4	43	18	16	0.6	8.7	5	209	0.2	3	28.0	3.3	73.0	
May-14	2.60	0.044	2.60	0.74	1.26	1.62	46	7.2	160	146	2.9	91	56	1.7	56	15	11	0.8	7.5	18	216	0.3	3	29.0	3.3	78.0	
Jun-14	3.60	0.025	3.60	0.57	0.80	1.55	52	7.3	192	171	3.6	92	71	2.0	61	18	12	0.9	7.3	115	253	0.3	4	31.0	3.9	77.0	
Jul-14	1.91	0.021	1.91	0.53	0.72	1.44	54	7.2	204	182	4.5	91	64	2.0	55	13	11	0.9	6.4	34	262	0.5	6	30.0	3.5	79.0	1.6 Acre of Land Application
Aug-14	4.31	0.017	4.31	0.50	0.83	1.80	56	7.2	174	196	4.4	71	67	1.9	54	9	9	0.9	6.9	44	244	0.4	7	28.0	3.3	78.0	8.5 Acres of Land Application
Sep-14	4.00	0.024	4.00	0.68	1.14	2.34	53	7.2	153	159	3.5	78	55	1.8	49	10	9	0.8	6.6	61	247	0.5	7	29.0	3.8	77.0	4.9 Acres of Land Application
Oct-14	3.96	0.025	3.96	0.62	0.80	1.48	51	7.3	159	174	3.4	80	60	1.8	52	12	10	0.8	7.2	42	221	0.4	7	30.0	3.9	76.0	3.5 Acres of Land Application
Nov-14	2.45	0.032	1.79	0.67	0.79	1.80	53	7.2	115	141	3.4	59	57	1.8	50	13	11	0.8	7.7	65	212	0.4	7	31.0	3.4	78.0	
Dec-14	1.79	0.029	2.45	0.59	0.79	1.44	49	7.3	174	147	3.3	97	67	2.2	59	19	13	0.9	7.7	20	208	0.4	7	27.0	3.0	79.0	
Annual Ave.	**2.59**	**0.035**		**0.62**			**48**	**7.3**	**182**	**171**	**3.6**	**94**	**64**	**1.9**	**55**	**16**	**12**	**0.8**	**7.5**	**34**	**222**	**0.4**	**5**	**28.8**	**3.5**	**77.3**	
Summer Ave.	**3.41**			**0.57**																							
Winter Ave.	**1.40**			**0.52**																							
Jan-15	0.50	0.024	0.50	0.57	0.65	1.11	46	7.3	180	160	3.9	101	59	2.2	50	17	13	0.7	7.7	2	239	0.4	4	30.0	3.4	78.0	
Feb-15	1.06	0.034	1.06	0.52	0.58	1.08	44	7.5	193	170	4.0	110	67	2.5	57	17	15	0.9	8.1	1	219	0.3	4	30.0	3.1	79.0	
Mar-15	0.80	0.039	0.80	0.60	0.73	1.37	43	7.5	179	142	3.3	102	57	1.9	46	22	14	0.7	8.2	2	216	0.4	3	30.0	3.6	80.0	
Apr-15	1.80	0.052	1.80	0.67	0.82	1.69	45	7.4	151	133	2.9	90	72	1.9	50	14	18	0.8	8.2	5	207	0.4	3	30.0	3.0	78.0	
May-15	4.50	0.028	4.50	0.63	0.77	2.09	47	7.4	156	144	3.4	82	64	2.1	56	13	12	0.9	7.7	10	252	0.4	3	31.0	3.7	78.0	
Jun-15	3.30	0.039	3.30	0.70	0.85	1.73	52	7.4	173	182	3.7	81	65	2.1	56	15	11	0.9	7.2	22	196	0.4	3	31.0	3.9	77.0	
Jul-15	1.95	0.021	1.95	0.56	0.67	1.37	57	7.4	177	172	4.4	81	64	2.3	55	12	10	1.0	6.4	11	234	0.3	4	30.0	3.7	78.0	6.5 Acres of Land Application
Aug-15	2.47	0.023	2.47	0.49	0.56	1.15	60	7.4	189	184	4.5	80	53	2.1	45	12	9	1.0	6.2	165	242	0.4	5	30.0	3.2	78.0	14.2 Acres of Land Application
Sep-15	3.50	0.025	3.50	0.53	0.73	1.80	63	7.4	140	191	4.0	65	60	2.0	49	7	10	0.9	7.5	40	196	0.4	6	30.0	3.4	76.0	10.6 Acres of Land Application
Oct-15	2.25	0.019	2.25	0.46	0.65	1.33	61	7.5	188	181	4.7	83	48	1.9	42	8	7	1.0	7.3	52	252	0.4	6	30.0	3.4	77.0	9.8 Acres of Land Application
Nov-15	2.60	0.033	2.60	0.57	0.70	1.40	56	7.6	153	161	3.7	74	54	1.8	47	11	11	0.8	7.9	89	220	0.4	6	29.0	2.8	78.0	
Dec-15	3.70	0.042	3.70	0.74	1.36	1.94	53	7.5	142	161	3.1	76	58	1.7	50	12	13	0.9	7.6	15	216	0.3	6	30.0	3.0	78.0	
Annual Ave.	**2.37**	**0.032**		**0.59**			**52**	**7.4**	**168**	**165**	**3.8**	**85**	**60**	**2.0**	**50.25**	**13**	**12**	**0.9**	**7.5**	**35**	**224**	**0.4**	**4**	**30.1**	**3.4**	**77.9**	
Summer Ave.	**2.64**			**0.53**																							
Winter Ave.	**0.79**			**0.56**																							
Jan-16	1.30	0.028	1.03	0.59	0.75	1.15	48	7.6	158	151	4.0	87	66	2.2	57	14	15	1.0	7.9	2	234	0.3	5	29.0	2.7	78.0	
Feb-16	1.05	0.030	1.05	0.50	0.59	1.08	47	7.5	190	175	4.2	96	61	2.2	54	13	12	0.8	7.9	1	222	0.4	5	30.0	3.1	77.0	
Mar-16	2.35	0.028	2.35	0.71	1.10	1.37	46	7.5	137	140	3.1	85	56	1.9	46	14	13	0.8	7.9	1	195	0.4	5	28.0	2.6	80.0	
Apr-16	2.20	0.028	2.20	0.77	0.86	1.26	46	7.5	122	139	3.1	66	56	1.9	50	14	13	0.8	7.5	22	199	0.4	5	22.0	2.1	80.0	
May-16	2.85	0.028	2.85	0.68	0.87	1.80	52	7.5	131	175	3.6	77	80	2.4	66	17	19	1.0	7.8	164	216	0.4	5	29.0	3.3	79.0	
Jun-16	4.10	0.028	4.10	0.67	0.86	1.62	58	7.5	112	159	2.8	59	67	1.7	57	8	12	0.7	8.1	58	204	0.4	5	32.0	4.0	75.0	
Jul-16	3.95	0.028	3.95	0.65	0.91	1.80	62	7.4	112	152	3.3	54	57	1.8	50	7	12	0.9	7.7	57	235	0.3	5	31.0	4.0	74.0	
Aug-16	3.40	0.028	3.40	0.56	0.82	1.80	62	7.3	169	162	3.7	81	60	1.8	53	9	11	0.9	6.7	55	229	0.3	5	27.0	3.0	74.0	
Sep-16	4.15	0.028	4.15	0.67	1.02	1.80	65	7.3	145	132	3.3	93	62	2.0	55	13	10	0.9	6.2	236	226	0.3	5	30.0	3.4	75.0	
Oct-16	3.65	0.028	3.65	0.73	1.07	1.55	62	7.3	124	132	2.9	74	53	1.7	45	14	12	0.7	7.3	36	234	0.3	8	30.0	3.3	74.0	16.7 Acres of Land Application
Nov-16	1.15	0.028	1.15	0.60	0.79	1.26	57	7.3	166	142	3.6	11	9	0.9	7	11	9	0.9	7.7	11	208	0.3	7	30.0	3.3	77.0	5.7 Acres of Land Application
Dec-16	2.00	0.028	2.00	0.60	1.01	2.16	52	7.4	164	141	3.5	93	49	1.9	42	13	12	0.9	8.4	27	198	0.3	6	29.0	3.1	79.0	
Annual Ave.	**2.68**	**0.028**		**0.64**			**55**	**7.4**	**144**	**150**	**3.4**	**73**	**56**	**1.9**	**49**	**12**	**13**	**0.9**	**7.6**	**56**	**217**	**0.3**	**6**	**28.9**	**3.2**	**76.8**	
Summer Ave.	**3.83**			**0.62**																							
Winter Ave.	**1.57**			**0.60**																							
Jan-17	1.88	0.029	1.88	0.54	0.65	1.33	49	7.4	177	144	3.9	104	54	2.1	43	13	12	0.9	8.5	9	210	0.3	6	29.0	3.2	75.0	
Feb-17	0.90	0.033	0.90	0.56	0.75	1.37	46	7.4	188	150	3.9	105	53	2.0	43	13	93	0.9	8.1	2	231	0.3	5	28.0	3.0	77.0	
Mar-17	1.52	0.029	1.52	0.62	0.77	1.37	47	7.4	162	137	3.3	91	49	1.9	44	12	11	0.8	8.4	2	190	0.3	5	29.0	3.2	76.0	
Apr-17	4.75	0.030	4.75	0.82	1.10	1.80	47	7.4	148	143	3.1	80	45	1.9	38	11	10	0.9	8.3	15	212	2.0	5	30.0	3.0	77.0	
May-17	4.07	0.029	4.07	0.83	1.09	1.80	52	7.4	110	136	2.9	57	52	1.8	47	9	13	0.9	8.7	39	229	0.3	5	32.0	3.5	76.0	
Jun-17	8.85	0.030	8.85	1.13	1.65	1.82	56	7.3	86	116	2.2	46	45	1.4	40	8	9	0.8	8.4	209	191	0.3	6	32.0	3.8	74.0	
Jul-17	4.25	0.029	4.25	1.03	1.37	1.84	61	7.2	89	122	2.4	48	42	1.3	36	9	12	0.9	7.6	159	184	0.3	8	30.0	3.2	76.0	5.7 Acres of Land Application
Aug-17	4.25	0.029	4.25	0.85	1.08	1.80	63	7.3	115	129	2.7	53	43	1.5	35	10	11	0.9	7.3	75	202	0.3	9	30.0	3.3	72.0	6.3 Acres of Land Application
Sep-17	2.70	0.030	2.70	0.72	0.85	1.80	7	7.3	114	137	3.0	49	42	1.5	34	7	11	0.9	7.7	29	207	0.3		28.0	3.5	72.0	12.5 Acres of Land Application
Oct-17	3.06	0.029	3.06	0.70	0.96	1.44	62	7.4	121	150	3.0	56	41	1.4	36	10	10	0.9	8.2	81	213	0.3	9	30.0	3.3	75.0	
Nov-17	2.56	0.030	2.56	0.73	0.88	1.44	55	7.4	133	123	3.0	66	44	1.5	37	14	10	0.9	8.4	26	196	0.3	9	28.0	2.8	78.0	
Dec-17	1.95	0.029	1.95	0.74	1.23	2.16	51	7.4	124	145	3.0	71	50	1.7	42	18	13	0.8	8.7	24	187	0.3	7	29.0	3.1	79.0	
Annual Ave.	**3.40**	**0.030**		**0.77**			**50**	**7.4**	**131**	**136**	**3.0**	**69**	**47**	**1.7**	**40**	**11**	**18**	**0.9**	**8.2**	**56**	**204**	**0.4**	**7**	**29.6**	**3.2**	**75.6**	
Summer Ave.	**3.73**			**0.87**																							
Winter Ave.	**1.43**			**0.57**																							

Appendix A

Month	Gladstone Precipitation	Rapid River Wastewater Flow		Gladstone Sewage Flow (Mgd)			Temp. (F°)	pH	Raw Sewage (Mg/l)			Primary Effluent (Mg/l)				Final Effluent (Mg/l)					Chemicals (Lbs/day)			Raw Sludge			Remarks
	Inches	Influent (MGD)	Precipitation (Inches)	Average	Max Day	Pk Rate	Raw	Raw	BOD_5	TSS	P	BOD_5	TSS	P	VSS	BOD_5	TSS	P	DO	Fecal #/100ml	Alum.	Poly	Chlorine	Gallon x 100	Solids %	VS %	Note: 11,000 Gal./Acre for Sludge Land Application
Jan-18	2.75	0.021	2.75	0.58	0.64	1.22	47	7.4	189	152	3.8	102	54	2.0	44	21	13	0.9	7.9	46	237	0.3	5	30.0	3.0	77.0	
Feb-18	0.45	0.022	0.45	0.52	0.63	1.26	46	7.2	197	158	4.0	102	51	2.0	43	15	11	0.8	8.5	6	207	0.3	4	30.0	3.2	78.0	
Mar-18	1.05	0.028	1.05	0.57	0.78	1.76	45	7.5	171	140	3.9	93	47	2.1	39	19	12	0.8	8.9	55	216	0.3	5	30.0	3.0	78.0	
Apr-18	1.50	0.050	1.50	0.75	0.87	1.80	46	7.3	139	130	2.8	90	51	2.9	41	27	16	0.9	7.9	27	183	0.3	5	30.0	3.2	76.0	
May-18	2.92	0.025	2.92	0.71	0.86	1.80	51	7.2	162	143	3.4	86	57	2.1	49	17	15	0.9	7.7	51	190	0.3	5	30.0	3.5	77.0	
Jun-18	3.85	0.025	3.85	0.77	1.02	2.45	56	7.4	124	149	2.9	60	61	1.7	53	9	11	0.8	7.5	203	148	0.3	7	31.0	3.8	77.0	
Jul-18	3.15	0.025	3.15	0.62	0.83	1.85	62	7.4	176	182	3.7	84	54	1.8	45	10	12	1.0	6.7	121	202	0.3	9	30.0	3.3	75.0	12.3 Acres of Land Application
Aug-18	3.20	0.023	3.20	0.60	0.73	1.86	64	7.3	176	163	3.6	86	43	1.7	36	10	9	0.9	7.2	96	232	0.3	10	30.0	3.5	75.0	
Sep-18	2.70	0.030	2.70	0.62	0.93	1.80	64	7.5	153	154	3.4	95	44	1.6	37	9	9	0.8	7.6	114	247	0.4	10	30.0	3.2	73.0	10.4 Acres of Land Application
Oct-18	6.35	0.049	6.35	0.93	1.64	2.34	60	7.4	113	124	2.8	61	41	1.5	31	9	10	0.8	7.6	124	208	0.4	11	31.0	3.2	71.0	
Nov-18	2.25	0.031	2.25	0.80	1.30	1.62	55	7.4	113	114	2.8	65	43	1.7	32	11	12	0.8	7.9	64	204	0.3	9	30.0	3.2	73.0	
Dec-18	0.70	0.022	0.70	0.61	0.91	1.51	50	7.5	159	140	3.8	81	48	2.1	38	12	11	0.9	8.1	3	234	0.3	0	29.0	2.8	74.0	
Annual Ave.	**2.57**	**0.029**		**0.67**			**54**	**7.4**	**156**	**146**	**3.4**	**84**	**50**	**1.9**	**41**	**14**	**12**	**0.9**	**7.8**	**76**	**209**	**0.3**	**7**	**30.1**	**3.2**	**75.3**	
Summer Ave.	**3.02**			**0.61**																							
Winter Ave.	**1.42**			**0.56**																							
Jan-19	1.55	0.026	1.55	0.52	0.58	1.26	47	7.6	158	154	4.2	76	45	2.0	34	10	11	0.9	8.3	3	225	0.3	5	29.0	3.1	76.0	
Feb-19	4.55	0.027	4.55	0.50	0.65	1.22	45	7.6	194	153	4.0	87	48	2.0	36	19	14	0.9	8.0	4	241	0.3	5	30.0	3.4	76.0	
Mar-19	1.25	0.067	1.25	0.75	1.26	1.80	43	7.5	184	139	3.1	93	55	1.6	40	27	18	0.8	8.5	5	244	0.3	4	29.0	3.2	77.0	
Apr-19	3.23	0.087	3.23	1.34	1.98	2.23	45	7.6	101	103	2.0	62	50	1.3	36	19	22	0.8	8.7	28	255	0.3	6	30.0	3.3	73.0	
May-19	5.25	0.063	5.25	1.48	2.05	3.24	48	7.6	80	88	1.8	54	47	1.2	33	16	23	0.8	8.2	44	255	0.3	8	30.0	3.6	73.0	
Jun-19	2.17	0.034	2.17	1.10	1.42	1.98	54	7.6	104	108	2.0	59	52	2.0	41	14	17	0.8	7.4	37	212	0.3	8	30.0	3.6	72.0	1.6 Acres of Land Application
Jul-19	1.51	0.023	1.51	0.75	0.87	1.80	60	7.6	152	144	3.2	74	53	1.6	43	14	14	0.9	6.7	25	221	0.3	8	30.0	3.5	76.0	19.1 Acres of Land Application
Aug-19	2.90	0.030	2.90	0.67	0.83	1.87	61	7.5	158	173	3.4	81	52	1.6	44	11	14	0.8	6.8	48	226	0.3	8	30.0	3.3	75.0	8.7 Acres of Land Application
Sep-19	6.90	0.054	6.90	1.08	1.76	2.34	60	7.5	117	166	2.3	82	147	1.7	82	12	21	0.5	7.1	97	223	0.3	9	32.0	3.6	65.0	
Oct-19	3.40	0.067	3.40	1.32	1.70	2.34	59	7.6	77	89	1.7	65	44	1.2	33	12	16	0.7	6.7	68	175	0.4	11	32.0	4.4	65.0	
Nov-19	2.25	0.037	2.25	0.86	1.01	1.80	53	7.7	126	113	2.4	69	41	1.4	29	14	14	0.8	7.7	10	199	0.4	8	30.0	2.8	77.0	
Dec-19	3.15	0.038	3.15	0.90	1.67	2.70	48	7.7	122	120	2.4	69	51	1.5	38	15	14	0.7	7.5	24	208	0.3	6	29.0	2.8	79.0	
Annual Ave.	**3.18**	**0.046**		**0.94**			**52**	**7.6**	**131**	**129**	**2.7**	**73**	**57**	**1.6**	**41**	**15**	**17**	**0.8**	**7.6**	**33**	**224**	**0.3**	**7**	**30.1**	**3.4**	**73.7**	
Summer Ave.	**3.77**			**0.83**																							
Winter Ave.	**2.45**			**0.59**																							
Jan-20	1.70			0.95	1.46	2.16	47	7.7	107	111	2.4	56	46	1.5	33	15	15	0.7	7.9	5	200	0.3	6	30.0	3.0	76.0	
Feb-20	4.55			0.50	0.65	1.22	45	7.6	194	153	4.0	87	48	2.0	36	19	14	0.9	8.0	4	241	0.3	5	30.0	3.4	76.0	
Mar-20	2.30			1.24	2.82	3.00	45	7.7	112	98	2.2	68	49	1.4	37	23	17	0.6	7.4	9	262	0.3	6	29.0	2.8	78.0	
Apr-20	2.66			1.37	1.88	2.38	45	7.5	76	72	2.3	48	39	1.3	29	21	15	0.7	8.5	2	228	0.3	8	29.0	2.5	76.0	
May-20	1.50			0.95	1.13	1.80	49	7.6	106	139	2.7	54	43	1.3	31	16	15	0.7	7.7	2	247	0.3	5	30.0	3.3	74.0	
Jun-20	3.55			1.00	1.40	2.27	55	7.5	89	118	2.5	48	45	1.3	35	11	11	0.7	7.0	66	242	0.3	6	30.0	3.6	75.0	5.5 Acres of Land Application
Jul-20	5.40			1.06	1.52	2.24	62	7.5	99	137	2.5	44	52	1.4	40	8	11	0.7	6.9	193	252	0.3	9	30.0	3.9	71.0	11.5 Acres of Land Application
Aug-20	3.05			0.91	1.17	1.80	63	7.5	109	146	2.7	48	46	1.4	34	7	14	0.8	6.7	61	262	0.3	10	30.0	3.4	73.0	5.5 Acres of Land Application
Sep-20	2.75			0.96	1.27	1.84	62	7.5	108	128	2.7	46	44	1.4	35	8	14	0.9	7.4	28	253	0.3	12	30.0	3.2	75.0	6.8 Acres of Land Application
Oct-20	2.15			0.89	1.21	1.80	59	7.5	117	126	3.2	49	43	1.5	31	9	16	0.9	7.4	3	277	0.3	10	-	3.1	73.0	
Nov-20	2.75			1.02	1.65	1.88	54	7.6	112	113	2.5	53	47	1.5	38	10	13	0.7	7.5	11	239	0.3	9	28.0	2.9	75.0	
Dec-20	1.20			0.73	0.87	1.51	51	7.7	149	141	3.1	73	44	1.5	34	9	10	0.7	6.6	4	252	0.3	8	29.0	3.0	76.0	
Annual Ave.	**2.80**	#DIV/0!		**0.96**			**53**	**7.6**	**115**	**124**	**2.7**	**56**	**46**	**1.5**	**34**	**13**	**14**	**0.8**	**7.4**	**32**	**246**	**0.3**	**8**	**29.5**	**3.2**	**74.8**	
Summer Ave.	**3.73**			**0.97**																							
Winter Ave.	**2.85**			**0.90**																							
7 Yr. Annual Ave.	**2.80**			**0.74**			**52**	**7.4**	**147**	**146**	**3.2**	**76**	**54**	**1.8**	**44**	**14**	**14**	**0.8**	**7.7**	**46**	**221**	**0.4**	**6**	**29.6**	**3.3**	**75.9**	
7 Yr. Summer Ave.	**3.45**			**0.71**																							
7 Yr. Winter Ave.	**1.70**			**0.62**																							

Notes and Observations

The red highlighted data represents the largest data values within the column.

The green highlighted data represents the lowest data values within the column.

7 Yr. Annual Ave. represents data from 2014-2020

Appendix A

APPENDIX A

Part 6 – 2020 SAW WWTP Asset Identification and Business Risk List

CITY OF GLADSTONE, MICHIGAN - Wastewater Asset Management Plan
Field Inventory Workbook - Summary with Business Risk

`	Equipment Description	Asset Type	Asset ID	Original Cost	Year Installed (enter as 01/01/YYYY)	Equipment Age	Expected Useful Life (years)	Remaining Useful Life (years)	Depreciated Value	Replacement Cost	Average number of units in service	Total Number of units	Redundancy (Number)	Redundancy (Percent)	Redundancy Score (R) (Reduces (C))	Criticality (C) (see back-up sheets) 1 = very low 5 = very high	Probability of Failure (P) (see back-up sheets) 1 = very low 5 = very high	Business Risk (BRE=PxCxR) 1 = very low 25 = very high
1	Pump Station Structure	Treatment Plant	PS-TK-001	$ -	1935	84	90	6	$ -	$ 6,808	1	1	0	0%	1.00	4.0	3.0	12.00
2	Pump Station Submersible Pumps, 2 Pumps	Treatment Plant	PS-P-001	$ 23,975	2006	13	30	17	$ 13,585.93	$ 31,014	1.75	2	0.25	14%	0.75	4.5	2.5	8.44
3	Pump Station Electrical	Treatment Plant	PS-E-001	$ 548	2016	3	30	27	$ 493.18	$ 582	1	1	0	0%	1.00	4.0	2.5	10.00
4	Service Building, 1935 Primary Treatment Building, 1974 Secondary Treatment Addition	Treatment Plant	AS-BD-001	$ 297,620	1974	45	75	30	$ 119,048.15	$ 725,555	1	1	0	0%	1.00	3.0	3.5	10.50
5	Wastewater Treatment Plant Doors and Windows	Treatment Plant	AS-BD-002	$ 15,505	1974	45	50	5	$ 1,550.50	$ 37,799	1	1	0	0%	1.00	3.0	3.0	9.00
6	Wastewater Treatment Plant Ballasted Membrane Roofs	Treatment Plant	AS-BD-003	$ 11,375	1991	28	35	7	$ 2,275.02	$ 19,804	1	1	0	0%	1.00	3.0	4.0	12.00
7	Laboratory Casework and Accessory Cabinets	Treatment Plant	AS-BD-004	$ 18,100	1974	45	50	5	$ 1,810.04	$ 44,126	1	1	0	0%	1.00	3.0	3.5	10.50
8	Automatic Samplers, Influent and Primary Sample Pumps	Treatment Plant	AS-P-001	$ 14,987	2007	12	30	18	$ 8,992.19	$ 19,007	2	2	0	0%	1.00	4.0	3.5	14.00
9	Service Building Heating System	Treatment Plant	AS-M-001	$ 16,936	1974	45	50	5	$ 1,693.59	$ 41,287	1	1	0	0%	1.00	4.0	3.5	14.00
10	Service Building Ventilation System	Treatment Plant	AS-M-002	$ 7,965	1974	45	50	5	$ 796.53	$ 19,418	1	1	0	0%	1.00	3.0	3.5	10.50
11	Service Building Potable and Service Water System	Treatment Plant	AS-M-003	$ 33,429	1987	32	50	18	$ 12,034.40	$ 62,998	1	1	0	0%	1.00	4.0	3.5	14.00
12	Service Building Compressed Air System	Treatment Plant	AS-M-004	$ 4,487	2014	5	30	25	$ 3,738.93	$ 4,954	1	1	0	0%	1.00	4.0	2.5	10.00
13	Service Building Simplex Sump Pump	Treatment Plant	AS-M-005	$ 785	2014	5	30	25	$ 654.31	$ 867	2	2	0	0%	1.00	3.0	3.0	9.00
14	Main Electrical Transformer, DPP	Treatment Plant	AS-E-001	$ 12,369	1974	45	50	5	$ 1,236.86	$ 30,153	1	1	0	0%	1.00	5.0	2.5	12.50
15	MCC-A and MCC-B, 480.3.60 Electrical Distribution	Treatment Plant	AS-E-002	$ 61,976	1974	45	50	5	$ 6,197.57	$ 151,088	2	2	0	0%	1.00	4.0	2.5	10.00
16	Service Building, Electrical Distribution P.P.A, Digester Area	Treatment Plant	AS-E-003	$ 6,184	1974	45	50	5	$ 618.43	$ 15,076	1	1	0	0%	1.00	4.0	2.5	10.00
17	Service Building Low Voltage Electrical Distribution, LP-A and Distribution System	Treatment Plant	AS-E-004	$ 8,393	1974	45	50	5	$ 839.30	$ 20,461	1	1	0	0%	1.00	3.0	2.0	6.00
18	Service Building Low Voltage Electrical Distribution, LP-B and Distribution System	Treatment Plant	AS-E-005	$ 8,393	1974	45	50	5	$ 839.30	$ 20,461	1	1	0	0%	1.00	3.0	2.0	6.00
19	Service Building Low Voltage Electrical Distribution, LP-C and Distribution System	Treatment Plant	AS-E-006	$ 3,534	1974	45	50	5	$ 353.39	$ 8,615	1	1	0	0%	1.00	3.0	2.0	6.00
20	Service Building Low Voltage Electrical Distribution, LP-D and Distribution System	Treatment Plant	AS-E-007	$ 8,393	1974	45	50	5	$ 839.30	$ 20,461	1	1	0	0%	1.00	3.0	2.0	6.00
21	Service Building Lighting	Treatment Plant	AS-E-008	$ 25,360	2014	5	30	25	$ 21,133.08	$ 27,999	1	1	0	0%	1.00	3.0	2.5	7.50
22	Instrumentation, Main Control Panel (MCP)	Treatment Plant	AS-I-001	$ -	1974	45	50	5	$ -	$ -	1	1	0	0%	1.00	5.0	3.5	17.50
23	Service Building Flow Meters and Level Senors, Process and Sludge	Treatment Plant	AS-I-002	$ 11,343	2009	10	25	15	$ 6,805.91	$ 13,827	2	2	0	0%	1.00	3.0	2.5	7.50
24	Laboratory Equipment	Treatment Plant	AS-OM-001	$ 34,455	2002	17	30	13	$ 14,930.31	$ 48,245	1	1	0	0%	1.00	4.0	3.0	12.00
25	Office Equipment and Administrative Support	Treatment Plant	AS-OM-002	$ 5,036	2006	13	30	17	$ 2,854.01	$ 6,515	1	1	0	0%	1.00	2.0	3.0	6.00
26	General Maintenance Equipment	Treatment Plant	AS-OM-003	$ 13,561	2008	11	30	19	$ 8,588.47	$ 16,861	1	1	0	0%	1.00	3.0	2.5	7.50
27	Headworks Room	Treatment Plant	HW-BD-001	$ 31,695	1974	45	75	30	$ 12,677.85	$ 77,267	1	1	0	0%	1.00	3.0	3.5	10.50
28	Influent Wet Well	Treatment Plant	HW-TK-001	$ 13,963	1974	45	75	30	$ 5,585.28	$ 34,040	1	1	0	0%	1.00	4.0	3.0	12.00
29	Grit Chambers, Including Both Parshall Flumes	Treatment Plant	HW-TK-002	$ 6,723	1974	45	75	30	$ 2,689.21	$ 16,390	1.75	2	0.25	14%	0.75	4.0	3.5	10.50
30	Raw Sewage Primary Pump and VFD, No. 1	Treatment Plant	HW-P-001	$ 26,443	2005	14	50	36	$ 19,039.11	$ 34,891	1	1	0	0%	1.00	5.0	3.0	15.00
31	Raw Sewage Primary Pump and VFD, No. 2	Treatment Plant	HW-P-002	$ 25,925	2004	15	50	35	$ 18,147.30	$ 34,891	1	1	0	0%	1.00	5.0	3.5	17.50
32	Raw Sewage Primary Pump and VFD, No. 3	Treatment Plant	HW-P-003	$ 23,950	2000	19	50	31	$ 14,849.27	$ 34,891	1	1	0	0%	1.00	5.0	3.5	17.50
33	RS Grinder, Muffin Monster	Treatment Plant	HW-P-004	$ 47,067	2003	16	30	14	$ 21,964.78	$ 64,613	1	1	0	0%	1.00	4.0	3.0	12.00
34	Headworks Process Piping	Treatment Plant	HW-P-005	$ 2,061	1974	45	75	30	$ 824.58	$ 5,026	1	1	0	0%	1.00	3.0	3.0	9.00
35	Headworks Process Valves	Treatment Plant	HW-P-006	$ 5,071	1974	45	50	5	$ 507.11	$ 12,363	1	1	0	0%	1.00	3.0	3.5	10.50
36	Primary Treatment , Settling Tank and Channels	Treatment Plant	PT-TK-001	$ -	1935	84	90	6	$ -	$ 189,113	1	1	0	0%	1.00	4.0	3.5	14.00
37	Primary Settling Equipment (Chain, Rake, Drives, Scum Collectors, Effluent Weirs)	Treatment Plant	PT-P-001	$ 94,902	2006	13	30	17	$ 53,777.66	$ 122,766	1	1	0	0%	1.00	4.0	3.0	12.00
38	Primary Treatment Process and Sludge Piping	Treatment Plant	PT-P-002	$ 32,112	2007	12	75	63	$ 26,974.16	$ 40,726	1	1	0	0%	1.00	3.0	3.0	9.00
39	Primary Treatment Process and Sludge Valves	Treatment Plant	PT-P-003	$ 15,231	2007	12	75	63	$ 12,794.13	$ 19,317	1	1	0	0%	1.00	3.0	3.0	9.00
40	RBC Concrete Tanks and Channels	Treatment Plant	ST-TK-001	$ 178,419	1974	45	75	30	$ 71,367.48	$ 434,959	2	2	0	0%	1.00	4.0	3.5	14.00
41	Wet Well No. 1 and No. 2, Connected to RBC Structure	Treatment Plant	ST-TK-002	$ 18,618	1974	45	75	30	$ 7,447.04	$ 45,387	1.75	2	0.25	14%	0.75	4.0	3.5	10.50
42	Final Settling Tank Rectangular, Clarifier No. 1 and No. 2	Treatment Plant	ST-TK-003	$ 279,249	2009	10	75	65	$ 242,015.46	$ 340,403	1.75	2	0.25	14%	0.75	4.0	3.0	9.00
43	RBC Shafts, Media, Mechanical Drive, 1A	Treatment Plant	ST-P-001	$ 90,408	1993	26	35	9	$ 23,247.71	$ 151,290	1	1	0	0%	1.00	4.0	3.5	14.00
44	RBC Shafts, Media, Mechanical Drive, 1B	Treatment Plant	ST-P-002	$ 62,059	1974	45	50	5	$ 6,205.87	$ 151,290	1	1	0	0%	1.00	4.0	3.0	12.00
45	RBC Shafts, Media, Mechanical Drive, 1C	Treatment Plant	ST-P-003	$ 62,059	1974	45	50	5	$ 6,205.87	$ 151,290	1	1	0	0%	1.00	4.0	3.0	12.00
46	RBC Shafts, Media, Mechanical Drive, 2A	Treatment Plant	ST-P-004	$ 90,408	1993	26	35	9	$ 23,247.71	$ 151,290	1	1	0	0%	1.00	4.0	3.5	14.00
47	RBC Shafts, Media, Mechanical Drive, 2B	Treatment Plant	ST-P-005	$ 62,059	1974	45	50	5	$ 6,205.87	$ 151,290	1	1	0	0%	1.00	4.0	3.0	12.00
48	RBC Shafts, Media, Mechanical Drive, 2C	Treatment Plant	ST-P-006	$ 62,059	1974	45	50	5	$ 6,205.87	$ 151,290	1	1	0	0%	1.00	4.0	3.0	12.00
49	Secondary Treatment, RBC Process and Sludge Piping	Treatment Plant	ST-P-007	$ 8,080	1974	45	75	30	$ 3,231.93	$ 19,697	1	1	0	0%	1.00	3.0	3.0	9.00
50	Secondary Treatment, RBC Process and Sludge Valves	Treatment Plant	ST-P-008	$ 21,190	1974	45	50	5	$ 2,119.01	$ 51,658	1	1	0	0%	1.00	3.0	3.0	9.00
51	Final Settling Tank Process and Sludge Piping	Treatment Plant	ST-P-009	$ 8,783	1974	45	75	30	$ 3,513.05	$ 21,411	1	1	0	0%	1.00	3.0	3.0	9.00
52	Final Settling Tank Process and Sludge Valves	Treatment Plant	ST-P-010	$ 2,898	1974	45	50	5	$ 289.78	$ 7,064	1	1	0	0%	1.00	3.0	3.5	10.50

CITY OF GLADSTONE, MICHIGAN - Wastewater Asset Management Plan
Field Inventory Workbook - Summary with Business Risk

`	Equipment Description	Asset Type	Asset ID	Original Cost	Year Installed (enter as 01/01/YYYY)	Equipment Age	Expected Useful Life (years)	Remaining Useful Life (years)	Depreciated Value	Replacement Cost	Average number of units in service	Total Number of units	Redundancy (Number)	Redundancy (Percent)	Redundancy Score (R) (Reduces (C))	Criticality (C) (see back-up sheets) 1 = very low 5 = very high	Probability of Failure (P) (see back-up sheets) 1 = very low 5 = very high	Business Risk (BRE=PxCxR) 1 = very low 25 = very high
53	Final Settling Tank Skimming and Collection Equipment	Treatment Plant	ST-P-011	$ 213,750	2012	7	30	23	$ 163,874.67	$ 245,531	1	1	0	0%	1.00	4.0	3.0	**12.00**
54	Secondary Pumps With VFD's, 2 Pumps	Treatment Plant	ST-P-012	$ 94,020	2005	14	30	16	$ 50,144.16	$ 124,058	1.75	2	0.25	14%	0.75	4.0	3.0	**9.00**
55	Final Settling Tank Electrical Distribution	Treatment Plant	ST-E-001	$ 11,927	1974	45	50	5	$ 1,192.69	$ 29,076	1	1	0	0%	1.00	5.0	2.5	**12.50**
56	Chlorine Contact Tank and Disinfection Chamber	Treatment Plant	DF-TK-001	$ 53,526	1974	45	75	30	$ 21,410.24	$ 130,488	1	1	0	0%	1.00	5.0	3.0	**15.00**
57	Outfall, Manhole A	Treatment Plant	DF-TK-002	$ 815	1974	45	75	30	$ 326.00	$ 1,987	1	1	0	0%	1.00	5.0	2.5	**12.50**
58	Chlorine Storage, Handling, and Feed Equipment	Treatment Plant	DF-P-001	$ 53,223	2000	19	30	11	$ 19,515.17	$ 77,536	1	1	0	0%	1.00	5.0	2.5	**12.50**
59	Chlorine Contact Tank and Disinfection Chamber Hydraulic Gates	Treatment Plant	DF-P-002	$ 14,670	1974	45	50	5	$ 1,467.01	$ 35,764	1	1	0	0%	1.00	3.0	3.5	**10.50**
60	Alum Metering Pumps, Piping, and Accessories	Treatment Plant	CT-P-001	$ 7,023	2014	5	30	25	$ 5,852.24	$ 7,754	1	1	0	0%	1.00	3.0	2.5	**7.50**
61	Alum Bulk Storage Tanks	Treatment Plant	CT-P-002	$ 22,264	1974	45	75	30	$ 8,905.42	$ 54,275	2	2	0	0%	1.00	3.0	2.5	**7.50**
62	Anionic Polymer Storage, Handling, Feed, and Accessory Equipment	Treatment Plant	CT-P-003	$ 4,241	1974	45	50	5	$ 424.07	$ 10,338	1	1	0	0%	1.00	3.0	3.0	**9.00**
63	Digester Building	Treatment Plant	SH-BD-001	$ 38,652	1974	45	75	30	$ 15,460.80	$ 94,228	1	1	0	0%	1.00	3.0	3.5	**10.50**
64	Digester Building Roof	Treatment Plant	SH-BD-002	$ 1,373	1991	28	35	7	$ 274.57	$ 2,390	1	1	0	0%	1.00	3.0	4.0	**12.00**
65	Digester Tank No. 1, Primary Tank (1935's)	Treatment Plant	SH-TK-001	$ 75,849	1974	45	75	30	$ 30,339.80	$ 184,910	1	1	0	0%	1.00	3.5	3.0	**10.50**
66	Digester Tank No. 2, Secondary Tank (1974)	Treatment Plant	SH-TK-002	$ 71,109	1974	45	75	30	$ 28,443.56	$ 173,353	1	1	0	0%	1.00	3.5	2.5	**8.75**
67	Digester Gas Mixing System, Primary Digester Tank No. 1	Treatment Plant	SH-P-001	$ 82,745	1974	45	50	5	$ 8,274.49	$ 201,720	1	1	0	0%	1.00	3.0	3.5	**10.50**
68	Floating Digester Cover, Secondary Digester Tank No. 2	Treatment Plant	SH-P-002	$ 194,123	2014	5	30	25	$ 161,769.18	$ 214,328	1	1	0	0%	1.00	3.0	4.0	**12.00**
69	Digester Gas Handling System	Treatment Plant	SH-P-003	$ 56,189	1974	45	50	5	$ 5,618.90	$ 136,980	1	1	0	0%	1.00	3.0	3.5	**10.50**
70	Digester Sludge Transfer Pumps No. 1	Treatment Plant	SH-P-004	$ 36,841	2007	12	30	18	$ 22,104.50	$ 46,723	1	1	0	0%	1.00	4.0	2.5	**10.00**
71	Digester Sludge Transfer Pumps No. 2	Treatment Plant	SH-P-005	$ 36,841	2007	12	30	18	$ 22,104.50	$ 46,723	1	1	0	0%	1.00	4.0	3.0	**12.00**
72	Hot Water Jacket Heat Exchanger	Treatment Plant	SH-P-006	$ 23,324	1974	45	50	5	$ 2,332.37	$ 56,860	1	1	0	0%	1.00	4.0	3.5	**14.00**
73	Waste Gas Burner	Treatment Plant	SH-P-007	$ 21,733	1974	45	50	5	$ 2,173.35	$ 52,983	1	1	0	0%	1.00	3.0	4.0	**12.00**
74	Sludge Piping, Digesters No. 1 and 2	Treatment Plant	SH-P-008	$ 15,107	1974	45	75	30	$ 6,042.73	$ 36,828	1	1	0	0%	1.00	3.0	2.5	**7.50**
75	Sludge Valving, Digesters No. 1 and 2	Treatment Plant	SH-P-009	$ 7,856	1974	45	50	5	$ 785.57	$ 19,151	1	1	0	0%	1.00	3.0	3.5	**10.50**
76	Main Digester Heating Boiler	Treatment Plant	SH-M-001	$ 45,587	1974	45	50	5	$ 4,558.73	$ 111,135	1	1	0	0%	1.00	4.0	3.5	**14.00**
77	Bio-solids Storage Tank, Pumping Station Structures	Treatment Plant	SD-TK-001	$ 1,186,350	2008	11	75	64	$ 1,012,352.27	$ 1,475,078	1	1	0	0%	1.00	3.0	2.0	**6.00**
78	Bio-solids Storage Tank Process and Sludge Piping	Treatment Plant	SD-P-001	$ 39,194	2007	12	75	63	$ 32,922.58	$ 49,707	1	1	0	0%	1.00	3.0	2.0	**6.00**
79	Bio-solids Storage Tank Process and Sludge Valves	Treatment Plant	SD-P-002	$ 19,800	2007	12	50	38	$ 15,048.33	$ 25,112	1	1	0	0%	1.00	3.0	2.0	**6.00**
80	Submersible Sludge Transfer Pumps, 2 Pumps	Treatment Plant	SD-P-003	$ 23,436	2007	12	30	18	$ 14,061.44	$ 29,722	1.5	2	0.5	33%	0.50	3.0	2.0	**3.00**
81	Sludge Storage Tank Mixers, 20 Hp Submerged Mixers, 4 Units	Treatment Plant	SD-P-004	$ 56,772	2007	12	30	18	$ 34,062.91	$ 72,000	3	4	1	33%	0.50	4.0	2.0	**4.00**
82	Bio-solids Storage Tank Electrical Distribution	Treatment Plant	SD-E-001	$ 97,399	2006	13	45	32	$ 69,261.63	$ 125,996	1	1	0	0%	1.00	4.0	2.0	**8.00**
83	Bio-solids Storage Tank Instrumentation, CP-Sludge Transfer, and Metering	Treatment Plant	SD-I-001	$ 15,284	2007	12	25	13	$ 7,947.77	$ 19,384	1	1	0	0%	1.00	3.0	2.0	**6.00**
84	Facilities Garage and Office	Treatment Plant	F-BD-001	$ 63,684	2007	12	75	63	$ 53,494.62	$ 80,767	1	1	0	0%	1.00	3.0	2.0	**6.00**
85	Flow Control Structures, Manholes and Miscellaneous Structures	Treatment Plant	F-TK-001	$ 14,100	2007	12	75	63	$ 11,843.71	$ 17,882	1	1	0	0%	1.00	4.0	2.5	**10.00**
86	Access Road Bituminous Pavement	Treatment Plant	F-C-001	$ 14,280	2008	11	30	19	$ 9,044.09	$ 17,756	1	1	0	0%	1.00	3.0	2.5	**7.50**
87	Isolation and Safety Fencing with Gates	Treatment Plant	F-C-002	$ 24,876	2008	11	30	19	$ 15,754.91	$ 30,930	1	1	0	0%	1.00	3.0	3.5	**10.50**
88	Gravity Storm and Sanitary Sewer	Treatment Plant	F-C-003	$ 4,913	1974	45	75	30	$ 1,965.07	$ 11,976	1	1	0	0%	1.00	3.0	2.5	**7.50**
89	Process Yard Piping	Treatment Plant	F-P-001	$ 108,548	1974	45	75	30	$ 43,419.10	$ 264,624	1	1	0	0%	1.00	3.0	3.0	**9.00**
90	Garage Heating Systems	Treatment Plant	F-M-001	$ 13,301	2007	12	30	18	$ 7,980.53	$ 16,869	1	1	0	0%	1.00	3.0	2.0	**6.00**
91	Garage Electrical Distribution, 480 Volt, MCC-C	Treatment Plant	F-E-001	$ 28,021	2007	12	45	33	$ 20,548.73	$ 35,537	1	1	0	0%	1.00	4.0	2.0	**8.00**
92	Garage Low Voltage Electrical Distribution and Lighting	Treatment Plant	F-E-002	$ 2,038	2007	12	40	28	$ 1,426.52	$ 2,585	1	1	0	0%	1.00	3.0	2.0	**6.00**
93	Site Electrical and Lighting	Treatment Plant	F-E-003	$ 8,835	1974	45	50	5	$ 883.47	$ 21,538	1	1	0	0%	1.00	3.0	2.5	**7.50**
94	4wd Utility Truck, Equipment No. 1, ¾ Ton Towing Capacity, 2009 GMC Gasoline Engine	Treatment Plant	F-OM-001	$ 35,337	2009	10	30	20	$ 23,558.01	$ 43,076	1	1	0	0%	1.00	3.0	3.0	**9.00**
95	4wd Utility Truck, Equipment No. 2, ½ Ton Towing Capacity, 1999 Ford Gasoline Engine	Treatment Plant	F-OM-002	$ 28,989	1999	20	30	10	$ 9,662.89	$ 43,076	1	1	0	0%	1.00	3.0	3.5	**10.50**
96	Lawn Tractor Equipment No. 3, 60" Cutting Deck, 1994 John Deere	Treatment Plant	F-OM-003	$ 12,623	2017	2	30	28	$ 11,781.33	$ 13,133	1	1	0	0%	1.00	3.0	1.5	**4.50**
97	Sludge Tanker Truck, 2006 Peterbilt, Diesel Engine	Treatment Plant	F-OM-004	$ 121,155	2006	13	30	17	$ 68,654.40	$ 156,727	1	1	0	0%	1.00	3.0	2.0	**6.00**
98	Vactor Truck, 2005 Sterling, Diesel Engine	Treatment Plant	F-OM-005	$ 281,035	2005	14	30	16	$ 149,885.24	$ 370,819	1	1	0	0%	1.00	3.0	2.5	**7.50**
99	Portable Pump, Trailer Mounted, 1975 Air Cooled, Wisconsin Ave. Service Area	Treatment Plant	F-OM-006	$ 11,655	2006	13	30	17	$ 6,604.27	$ 15,076	1	1	0	0%	1.00	3.0	3.0	**9.00**
100	Lift Station Power Generator, Trailer Mounted, 2001 Cummins Diesel Fired, Underpass LS	Treatment Plant	F-OM-007	$ 21,112	2001	18	50	32	$ 13,511.59	$ 30,153	1	1	0	0%	1.00	4.0	2.0	**8.00**
																		0.00
	Total			$ 5,331,660					$ 3,042,112	$ 8,973,235								**0.00**

APPENDIX A

Part 7 – 2021 Gladstone EcoBELT Pilot Report

EcoBELT Pilot Report

Revision 00

February 1, 2021

GLADSTONE, MI

technologies for cleaner water

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CONTENTS

PILOT SUMMARY.......... 3
OBJECTIVES OF THE PILOT STUDY.......... 6
PILOT METHODS AND OPERATION.......... 7
  Pilot Equipment.......... 7
  Unit Operation and Process Settings.......... 7
DISCUSSION.......... 9
CONCLUSIONS.......... 10
Appendix A: Pilot Data.......... 11
Appendix B: ALS Lab Report - TCLP.......... 16

PILOT SUMMARY

A turnkey EcoBELT® pilot system was piloted onsite at the wastewater treatment facility (WWTF) in Gladstone, MI. The pilot was conducted to:

1. Treat raw wastewater while measuring efficiencies for screening and TSS reduction
2. Determine hydraulic and surface solids loading limits of the EcoBELT technology
3. Define scale-up design parameters
4. Provide engineers and operators opportunities to observe standard O&M for EcoBELT equipment.

The pilot was coordinated through Rodney Schwartz on behalf of the Gladstone WWTF. Nexom participated in pre-pilot conferences to coordinate logistics of personnel, equipment, and to effectively commission and operate the equipment on-site. Preparation was critical to the success of the pilot project, and Nexom coordinated with Gladstone's engineer and staff in putting together a thorough operations plan. The demonstration was conducted with Nexom's EcoBelt EB-3 RBF as a primary treatment technology for the facility.

It was observed that the pilot system removed a significant amount of hair and plastics. This observation was qualitative only. Quantitative performance metrics are summarized in Table 1.

Table 1: Summary of pilot performance metrics.

Phase	TSS Removal	BOD Removal	VSS of Inlet TSS	Cake Total Solids (TS)	Cake dry basis lb/d/MGD	Cake wet basis lb/d/MGD	Cake VSS
350 µm	34%	18%	82%	41%	540	1,300	82%
250 µm	40%	23%	83%	31%	520	1,700	90%
250 µm[1]	34%	-	-	-	-	-	-
120 µm[1,2]	49%	-	-	-	-	-	-

1. Nexom updated its PLC program and fixed a programming error prior to operations in November with the 250 and 120 µm belts.
2. Nexom does not recommend the 120 µm media for the application as belt replacement would be expected every 2-4 months.

VSS was measured during the first two phases of the pilot while operating with the 350 and 250 µm media. VSS averaged ~83% of the inlet TSS. It was also observed that the VSS of the dewatered cake had a similar ratio of VSS.

Capture rate varied with changes in flow rate and inlet solids concentration. TSS and BOD removal were observed at the low end of the expected efficiency ranges. Generally, TSS removal is expected between 40-60% removal and BOD at 20-40% removal with inlet solids of 200-300 mg/L. However, Gladstone inlet TSS is much weaker than was anticipated. Average inlet TSS for the entirety of the pilot was ~160 mg/L. Historical plant data shows that TSS concentrations will be at or below that witnessed on the pilot, with the plant inlet averaging 122 mg/L TSS from September through November 2020.

Solids accumulation averaged 520 lb/d/MGD dry solids for the first two phases of operation with a cake pilot average TS of 31-41%, which corresponds to 1,300-1,700 lb/d/MGD wet solids depending on TS. A TCLP analysis was performed on cake collected on October 1, 2020, and that analysis is appended. There were no constituents for concern from the TCLP, confirming the applicability of the cake to land application.

Results of operations with the 350 µm belt are summarized in Table 2. This phase showed the weakest removal for TSS and BOD for the pilot. Nexom would later identity a software bug in the PLC that may have contributed to lower efficiency, though the impact is not quantifiable given the changing inlet water quality during the pilot. The cake dewatering averaged 41% TS.

Table 2: Summary results for the EcoBELT with 350 µm filter belt.

		TSS, mg/L			BOD_5			Collected Cake		
	Flow, gpm	Inlet	Outlet	Removal, %	Inlet	Outlet	Removal, %	TS, %	TVS, %	Lab basis, lb/d
Average	130	163	101	34%	101	82	18%	41%	82%	101
Min	46	64	56	-4%	75	70	7%	35%	62%	0
Max	200	282	184	74%	140	110	30%	49%	94%	389

Results of operations with the 250 µm belt are summarized in Table 3. This phase showed the improved removal for TSS and BOD. The software bug remained an unquantifiable factor that Nexom would address before further operations in November.

Table 3: Summary results for the EcoBELT with 250 µm filter belt (October).

		TSS, mg/L			BOD_5			Collected Cake		
	Flow, (gpm)	Inlet	Outlet	Removal, %	Inlet	Outlet	Removal, %	TS, %	TVS, %	Lab basis, dry lb/d
Average	170	161	95	40%	142	105	23%	31%	90%	127
Min	50	60	24	7%	109	101	7%	15%	89%	22
Max	250	270	150	60%	174	108	38%	37%	91%	244

The PLC software bug was fixed before resuming operations with the 250 μm belt in November, and results of further operations are included in Table 4. The inlet TSS average concentration during this period dropped by nearly 25% from prior periods obscuring a direct comparison of the earlier performance with this belt and the impacts of the PLC bug.

Table 4: Summary results for the EcoBELT with 250 μm filter belt (November).

		TSS, mg/L			Solids Removed
	Flow, (gpm)	Inlet	Outlet	Removal, %	Lab basis dry lb/d
Average	94	123.5	81.5	34%	54
Min	50	100	60	15%	15
Max	165	136	106	46%	123

Operators made a final belt change to a 120 μm belt. This belt is generally not recommended for commercial applications unless the owner accepts that belt changes may be required every 2-4 months.

Table 5: Summary results for the EcoBELT pilot with 120 μm filter belt.

		TSS, mg/L			Solids Removed
	Flow, (gpm)	Inlet	Outlet	Removal, %	Lab basis dry lb/d
Average	127	186	90	49%	155
Min	75	114	56	33%	34
Max	175	342	118	65%	471

Efficiency of the TSS removal was observed to be more closely associated with the surface solids loading rate of the media rather than the media pore size. All performance data is compiled in the appendices.

The pilot averaged inlet TSS of 162 mg/L and BOD of 123 mg/L. Historical plant data from September through November showed an inlet average TSS of < 122 mg/L and BOD < 113 mg/L. EcoBELT effluent under average conditions for the entirety of the pilot (all belts, all conditions) averaged < 95 mg/L TSS and < 90 mg/L BOD. It is anticipated that these filtrate averages with a reasonable safety factor can be used for downstream biological system design.

OBJECTIVES OF THE PILOT STUDY

The pilot testing results serve as a basis for a full-scale EcoBELT design and implementation. Pilot operating parameters and performance are indicative of operations at full scale implementation.

The specific objectives of the pilot study were to:

- Treat raw wastewater, measuring efficiencies for screening and TSS reduction
- Determine hydraulic and surface solids loading limits of the EcoBELT technology
- Define scale-up design parameters
- Provide engineers and operators opportunities to observe standard O&M for EcoBELT equipment.

PILOT METHODS AND OPERATION

Pilot Equipment

Nexom provided a small package treatment system for the pilot demonstration consisting of one EB-3 filter configured for Gladstone's application. The EcoBELT pilot system was mobilized to the site on a 7 ft x 10.5 ft pilot skid. The skid was offloaded and placed in a level space by Gladstone proximate to the wastewater sources for treatment. Power connection was provided by Gladstone electricians.

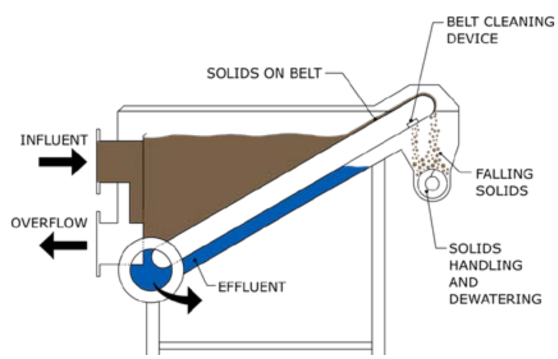
Figure 1: Pilot System

The EcoBELT pilot included all process pumps and plumbing required for operation. Nexom provided submersible pumps for priming the influent lines to the pilot unit. The pilot system is pictured in Figure 1. The control panel housed all controls for instrumentation and the automated operation of the pilot.

Unit Operation and Process Settings

The EcoBELT reduces TSS and BOD, in a compact footprint with a low whole-lifecycle cost.

Figure 2: Process Flow through the EcoBELT



The EcoBELT removes solids using a continuous-loop fine mesh belt screen. Solids accµmulate on the screen to build a mat of solids resulting in porous filter depth and autofiltraiton benefits. The screen moves to maintain a headloss setpoint. The screens functions as a conveyor and carries solids out of the incoming wastewater as operating head is maintained. The patent-pending cleaning system discharges the solids from the belt screen and deposits them into the screenings hopper. Periodic duty hot-water automatically flushes oil and grease that may accµmulate over time. An optional screw press

Figure 3: EcoBELT Process Cutaway

dewaters the collected screenings to between 20-40% dry solids while screened wastewater continuously passes through the unit.

The EcoBELT uses a doctor blade as part of the cleaning process, which results in reduced energy costs compared to blower-based or constant-wash cleaning. The doctor blade is adjusted to a tight tolerance to lift and peel the solids off the belt without making direct blunt contact with the belt.

EcoBELT's patent-pending, engineered belt support structure facilitates maximum use of available surface area without losses from media backing and structural support members, while minimizing stresses to the belt media and extending the belt lifecycle.

The pilot EB-3 filter was commissioned and operated at Gladstone per parameters recorded in Appendix A.

Figure 4: Example system Installed

DISCUSSION

Figure 5: Site aerial from Google.

Figure 5 is an aerial view of the Gladstone WWTF. Samples were collected as noted in Appendix A of this report during pilot operations. Influent and effluent samples were taken at the same time to represent operational performances. The testing plan included testing of TSS, VSS and BOD. All sample analysis was coordinated by the site, and sample were analyzed within the required hold times and temperature specifications for standard methods.

Although it may be tempting to look at the average TSS percent removal for each phase to select the highest performing belt, it should be observed in the data that removal percentage has a stronger correlation to surface solids loading rate than for the belt sieve size. With that observation in mind, a 250 µm belt is recommended as the 250 µm belt generally will allow for a thicker filter cake or mat on the filter belt. It allows capture of a lower or shifted particle size distribution, interlacing of the largest particles and autofiltration depth when inlet TSS is dilute.

Nexom has revised its EcoBELT proposal under separate cover based on the results of this pilot. A lifecycle analysis is included with Nexom system designs.

Nexom's EcoBelt is recommended for the Gladstone WWTF as a simple solution to achieve screening, primary treatment, and odor management without chemical enhancement. The EcoBelt unit requires significantly less energy that other primary treatment technologies, and this power saving translate to the full-scale installation. The main power draw for the units will be for the belt and auger motors on VFDs.

The facility will not require any additional labor resources to operate an RBF system, and operators can oversee the system averaging oversight of 15 to 30 minutes per day with periodic planned maintenance. Plant personnel were collaborated closely with Nexom's field technicians in the commissioning and decommissioning of the pilot system, and observed and participated in belt changes.

CONCLUSIONS

The EcoBELT system is recommended for Gladstone as a flexible solution for screening and primary filtration, while approaching typical primary treatment benefits.

- The pilot achieved screening of hair and similar particulate as well as 34-40% average TSS removal, which can be expected at full scale within a design envelope similar to that observed during the pilot.
- Hydraulic and surface solids loading rate data was collected for the EcoBELT technology.
- A budget proposal with design parameters reflecting pilot observations is available under separate cover.
- Operators were able to familiarize themselves with the EcoBELT technology.

Appendix A: Pilot Data

Table A1: Nexom Field Log

Date	Time	Belt, µm	Flow, gpm	Level, in	Belt Speed, %	Auger Speed, %	Cold Wash Cycle, h/s	Hot Wash Cycle, h/s	TSS, mg/L							VSS, mg/L			BOD_5			Collected Cake	
									Start Time	End Time	Collected, lb	Lab basis, lb/d	Inlet	Outlet	Removal, %	Inlet	Outlet	Removal, %	Inlet	Outlet	Removal, %	TS, %	TVS, %
28-Sep	15:00	350	46	15.0	25%	25%	4; 60	4; 60	14:00	15:00	10												
28-Sep	16:00	350	53	15.0	20%	35%						62	180	76	58%	150	30	80%				36%	87%
29-Sep	8:30	350	53	14.0	30%	30%																	
29-Sep	9:30	350	52	15.5	30%	30%	1;60	1;60	8:30	9:30	2												
29-Sep	10.:30	350	56	14.1	20%	40%	1;60	1;60															
29-Sep	11:30	350	53	14.2	28%	40%	1;60	1;60				63	224	126	44%	186	108	42%	100	70	30%	38%	87%
29-Sep	12:30	350	57	13.0	20%	40%	1;60	1;60															
29-Sep	13:30	350	57	14.0	20%	20%	1;60	1;60															
29-Sep	2:30	350	56	15.0	20%	40%	1;60	1;60															
29-Sep	3:30	350	54	15.0	27%	40%	1;60	1;60	2:30	3:30	2	0	184	184	0%	164	146	11%					
30-Sep	8:00	350	98	15.0	25%	40%																	
30-Sep	9:00	350	102	15.0	30%	40%																	
30-Sep	10:00	350	99	15.0	30%	40%																	
30-Sep	11:00	350	102	15.0	40%	40%						0%	112	116	-4%	88	84	5%	75	70	7%	49%	64%
30-Sep	12:00	350	103	15.0	40%	40%			11:15	12:15	2												
30-Sep	13:00	350	101	15.0	40%	40%																	
30-Sep	14:00	350	105	15.0	40%	40%																	
30-Sep	15:00	350	104	14.0	25%	40%																	
30-Sep	16:00	350	102	14.0	25%	40%			15:00	16:00	2	78	172	108	37%	132	68	48%					
1-Oct	8:00	350	156	12.3	30%	40%			7:00	8:00	2												
1-Oct	9:00	350	154	13.0	30%	50%																	
1-Oct	10:00	350	152	14.1	35%	75%																	
1-Oct	11:00	350	161	15.3	35%	30%						389	282	74	74%	194	56	71%	90	78	13%	47%	62%
1-Oct	12:00	350	155	15.2	30%	50%																	
1-Oct	13:00	350	160	15.4	35%	50%																	
1-Oct	14:00	350	159	14.3	40%	50%																	
1-Oct	15:00	350	160	12.5	35%	50%																	
1-Oct	16:00	350	161	15.8	43%	50%			15:00	16:00	2	65	144	110	24%	134	82	39%					
2-Oct	8:00	350	193	16.0	55%	50%																	
2-Oct	9:30	350	193	16.0	55%	55%			8:30	9:30	11												
2-Oct	10:30	350	190	14.5	40%	45%																	
2-Oct	11:30	350	195	14.0	41%	40%			10:00	11:00	17	157	168	100	40%	152	88	42%				41%	89%

Date	Time	Belt, µm	Flow, gpm	Level, in	Belt Speed, %	Auger Speed, %	Cold Wash Cycle, h/s	Hot Wash Cycle, h/s	TSS, mg/L								VSS, mg/L			BOD$_5$			Collected Cake	
									Start Time	End Time	Collected, lb	Lab basis, lb/d	Inlet	Outlet	Removal, %	Inlet	Outlet	Removal, %	Inlet	Outlet	Removal, %	TS, %	TVS, %
2-Oct	12:30	350	195	14.5	40%	40%																	
2-Oct	15:50	350	195	14.5	35%	30%			11:00	13:00	15	155	176	110	38%	152	94	38%					
3-Oct	8:30	350	172	14.0	25%	30%																	
3-Oct	9:00	350	169	15.0	30%	30%						16	64	56	13%	44	40	9%					
5-Oct	9:00	350	200	15.0	35%	45%			8:15	9:15	8												
5-Oct	10:00	350	200	15.0	25%	45%			9:20	10:20	9												
5-Oct	11:00	350	200	15.0	30%	45%			10:30	11:30	8	135	140	84	40%	114	58	49%	140	110	21%	39%	94%
5-Oct	14:00	350	196	13.0	27%	45%			13:40	14:40	13												
5-Oct	15:00	350	196	14.0	32%	45%																	
5-Oct	15:30	350	195	15.0	35%	45%						136	164	106	35%	134	78	42%					
6-Oct	8:00	350	108	12.6	30%	43%			8:00	9:00	2												
6-Oct	9:00	350	109		35%	34%																	
6-Oct	10:00	350	105		43%	10%																	
6-Oct	11:00	350	106		34%	10%						59	106	60	43%	88	52	41%				35%	92%
6-Oct	14:00	250	105	12.3	30%	65%																	
6-Oct	15:00	250	141	14.1	30%	40%			15:00	16:00	2												
6-Oct	16:00	250	112	15.1	25%	40%						186	270	140	48%	226	112	50%					
7-Oct	8:00	250	199	12.4	35%	45%																	
7-Oct	9:00	250	194	12.3	35%	45%			9:00	10:00	2												
7-Oct	10:00	250	193	14.2	32%	45%																	
7-Oct	11:00	250	197	14.3	35%	45%						122	120	68	43%	110	54	51%	109	101	7%		
7-Oct	12:00	250	195	12.6	30%	45%																	
7-Oct	13:00	250	225	15.5	90%	45%			13:00	13:50	2												
7-Oct	14:00	250	246	15.3	35%	45%			14:00	15:00	2												
7-Oct	15:00	250	243	15.6	35%	45%						22	112	104	7%	104	68	35%					
7-Oct	16:00	250	147	13.1	40%	45%						244	238	100	58%	222	94	58%					
8-Oct	8:00	250	155	14.1	25%	30%																	
8-Oct	9:00	250	150	16	25%	30%																	
8-Oct	10:00	250	150	16	35%	45%			10:00	11:00	16												
8-Oct	11:00	250	157	15.5	35%	45%						88	118	70	41%	112	66	41%	174	108	38%	15%	91%
8-Oct	12:00	250	150	15	35%	45%																	
8-Oct	13:00	250	150	15	33%	38%																	
8-Oct	14:00	250	155	15	33%	38%			14:00	15:00	13	120	170	104	39%	148	96	35%					
8-Oct	15:00	250	250	15	33%	38%						180	148	88	41%	138	84	39%					
9-Oct	9:00	250	230	16	45%	55%																	
9-Oct	10:00	250	230	15.5	48%	55%			10:00	11:00	18												
9-Oct	11:00	250	230	15	48%	55%						188	136	68	50%	120	58	52%				35%	89%
9-Oct	12:00	250	230	15.5	48%	55%																	
9-Oct	13:00	250	230	15	48%	55%																	

Date	Time	Belt, µm	Flow, gpm	Level, in	Belt Speed, %	Auger Speed, %	Cold Wash Cycle, h/s	Hot Wash Cycle, h/s	TSS, mg/L							VSS, mg/L			BOD$_5$			Collected Cake	
									Start Time	End Time	Collected, lb	Lab basis, lb/d	Inlet	Outlet	Removal, %	Inlet	Outlet	Removal, %	Inlet	Outlet	Removal, %	TS, %	TVS, %
9-Oct	14:00	250	230	15	48%	55%			13:00	14:00	13	127	144	98	32%	120	90	25%					
9-Oct	15:00	250	230	15	48%	55%						99	60	24	60%	56	20	64%					
10-Oct	8:30	250	50	16	25%	50%																	
10-Oct	9:30	250	150	15	26%	50%			8:45	9:45	5												
10-Oct	10:30	250	150	14	30%	50%																	
10-Oct	11:30	250	150	14	35%	50%						117	180	102	43%							35%	89%
10-Oct	12:30	250	150	15	25%	55%			12:30	13:30	7	130	204	132	35%								
11-Oct	9:00	250	115	14	25%	50%																	
11-Oct	10:00	250	115	14	25%	50%																	
11-Oct	11:00	250	115	14	25%	50%						47	122	88	28%	114	78	32%				37%	91%
11-Oct	12:00	250	115	14	25%	50%			12:45	1:45	9												
11-Oct	13:00	250	115	14	25%	50%																	
11-Oct	13:45	250	115	14	25%	50%						108	228	150	34%								
11-Nov	8:00	300	50	16.0	25%	20%	4; 60	4; 60	8:00	8:35	10												
11-Nov	10:40	250	75	13.5	12%	45%	Constant																
11-Nov	11:00	250	75	13.5	12%	45%	Constant																
11-Nov	11:30	250	75	13.0	12%	45%	Constant					15	124	106	15.0%								
11-Nov	12:00	250	75	13.0	12%	45%	Constant																
11-Nov	12:30	250	75	13.0	12%	45%	Constant																
11-Nov	13:00	250	75	13.0	12%	45%	Constant																
11-Nov	13:30	250	75	13.0	12%	45%	Constant																
11-Nov	14:00	250	75	13.0	12%	45%	Constant																
11-Nov	14:30	250	75	13.0	12%	45%	Constant					43	136	88	35.0%								
12-Nov	10:00	250	75	13.0	13%	45%	Constant																
12-Nov	10:30	250	75	13.0	13%	45%	Constant																
12-Nov	11:00	250	75	13.0	13%	45%	Constant																
12-Nov	11:30	250	75	13.0	13%	45%	Constant					36	100	60	40.0%								
12-Nov	12:00	250	165	14.0	18%	45%	Constant																
12-Nov	12:30	250	165	13.5	23%	45%	Constant																
12-Nov	13:00	250	165	13.0	18%	45%	Constant																
12-Nov	13:30	250	165	13.0	18%	45%	Constant					123	134	72	46.0%								
14-Nov	9:30	120	110	12.0	14%	45%	Constant					116	144	56	61.1%								
14-Nov	10:00	120	115	14.0	16%	45%	Constant																
14-Nov	10:30	120	116	13.0	14%	45%	Constant																
14-Nov	11:00	120	115	12.0	14%	45%	Constant					79	146	88	40.0%								
14-Nov	11:30	120	150	12.0	23%	45%	Constant																
14-Nov	12:00	120	150	12.0	23%	45%	Constant																
14-Nov	12:30	120	150	12.0	25%	45%	Constant					151	200	116	42.0%								
15-Nov	8:00	120	75	15.0	10%	45%	Constant					76	168	84	50.0%								

Date	Time	Belt, µm	Flow, gpm	Level, in	Belt Speed, %	Auger Speed, %	Cold Wash Cycle, h/s	Hot Wash Cycle, h/s	TSS, mg/L							VSS, mg/L			BOD_5			Collected Cake	
									Start Time	End Time	Collected, lb	Lab basis, lb/d	Inlet	Outlet	Removal, %	Inlet	Outlet	Removal, %	Inlet	Outlet	Removal, %	TS, %	TVS, %
15-Nov	8:30	120	75	15.0	10%	45%	Constant																
15-Nov	9:00	120	75	15.0	13%	45%	Constant																
15-Nov	9:30	120	75	15.0	13%	45%	Constant					34	114	76	33.0%								
15-Nov	10:00	120	175	13.0	25%	45%	Constant																
15-Nov	10:30	120	175	13.0	26%	45%	Constant																
15-Nov	11:40	120	175	13.0	28%	45%	Constant																
15-Nov	12:10	120	175	13.0	27%	45%	Constant					471	342	118	65.0%								

Table A2: Data summary, 350 µm belt (Sep 28-Oct 6).

	Flow, gpm	TSS, mg/L			VSS, mg/L			% of TSS as VSS		BOD_5			Collected Cake		
		Inlet	Outlet	Removal, %	Inlet	Outlet	Removal, %	Inlet	Outlet	Inlet	Outlet	Removal, %	TS, %	TVS, %	Lab basis, PPD
Average	130	163	101	34%	133	76	40%	82%	75%	101	82	18%	41%	82%	101
Min	46	64	56	-4%	44	30	5%	69%	54%	75	70	7%	35%	62%	0
Max	200	282	184	74%	194	146	80%	69%	79%	140	110	30%	49%	94%	389

1. Dry basis of solids accumulation was 540 lb/d/MGD; wet basis of solids accumulation is 1,300 lb/d/MGD (41% TS)

Table A3: Data summary, 250 µm belt (Oct 7-11).

	Flow, gpm	TSS, mg/L			VSS, mg/L			% of TSS as VSS		BOD_5			Collected Cake		
		Inlet	Outlet	Removal, %	Inlet	Outlet	Removal, %	Inlet	Outlet	Inlet	Outlet	Removal, %	TS, %	TVS, %	Lab basis, PPD
Average	170	161	95	40%	134	75	44%	83%	78%	142	105	23%	31%	90%	127
Min	50	60	24	7%	56	20	25%	93%	83%	109	101	7%	15%	89%	22
Max	250	270	150	60%	226	112	64%	84%	75%	174	108	38%	37%	91%	244

1. Dry basis of solids accumulation was 520 lb/d/MGD; wet basis of solids accumulation is 1,702 lb/d/MGD (31% TS).

Table A4: Data summary, 250 µm belt (Nov 11-12).

	Flow, gpm	TSS, mg/L			
		Inlet	Outlet	Removal, %	Lab basis, PPD
Average	94	123.5	81.5	34%	54
Min	50	100	60	15%	15
Max	165	136	106	46%	123

Table A5: Data summary, 120 µm belt (Nov 14-15).

	Flow, gpm	TSS, mg/L			
		Inlet	Outlet	Removal, %	Lab basis, PPD
Average	127	186	90	49%	155
Min	75	114	56	33%	34
Max	175	342	118	65%	471

Table A6: Plant historical data averages.

DAY	WEATHER		FLOW					
	TYPE	PRECIP.	TOTAL	MAX RATE	CBOD-5		SS	
	9	14	19	24	39	44	49	54
	Code	Inches	MGD	MGD	mg/l	LBS.	mg/l	LBS.
PN	00033	00045	50050	50051	00310	85001	00530	85002
SF								
MEAN	Spetember		0.958	1.46	108	850	128	1017
MEAN	October		0.886	1.31	117	850	126	912
MEAN	November		1.018	1.37	113	956	113	950

Appendix B: ALS Lab Report - TCLP

14-Oct-2020

Rodney Schwartz
City of Gladstone WWTP
1100 Delta Avenue
Gladstone, MI 49878

Re: **Eco Belt Cake** Work Order: **20100431**

Dear Rodney,

ALS Environmental received 1 sample on 05-Oct-2020 11:00 AM for the analyses presented in the following report.

The analytical data provided relates directly to the samples received by ALS Environmental - Holland and for only the analyses requested.

Sample results are compliant with industry accepted practices and Quality Control results achieved laboratory specifications. Any exceptions are noted in the Case Narrative, or noted with qualifiers in the report or QC batch information. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained from ALS Environmental. Samples will be disposed in 30 days unless storage arrangements are made.

The total number of pages in this report is 9.

If you have any questions regarding this report, please feel free to contact me:

ADDRESS: 3352 128th Avenue, Holland, MI, USA
PHONE: +1 (616) 399-6070 FAX: +1 (616) 399-6185

Sincerely,

Electronically approved by: Bill Carey

Bill Carey
Project Manager

Report of Laboratory Analysis

Certificate No: MN 026-999-449

Appendix A

ALS Group, USA

Date: 14-Oct-20

Client: City of Gladstone WWTP
Project: Eco Belt Cake
Work Order: **20100431**

Work Order Sample Summary

Lab Samp ID	Client Sample ID	Matrix	Tag Number	Collection Date	Date Received	Hold
20100431-01	Eco Belt Cake	Tclp Extract		10/1/2020 12:00	10/5/2020 11:00	☐

ALS Group, USA

Date: 14-Oct-20

Client: City of Gladstone WWTP
Project: Eco Belt Cake
WorkOrder: **20100431**

QUALIFIERS, ACRONYMS, UNITS

Qualifier	Description
*	Value exceeds Regulatory Limit
**	Estimated Value
a	Analyte is non-accredited
B	Analyte detected in the associated Method Blank above the Reporting Limit
E	Value above quantitation range
H	Analyzed outside of Holding Time
Hr	BOD/CBOD - Sample was reset outside Hold Time, value should be considered estimated.
J	Analyte is present at an estimated concentration between the MDL and Report Limit
ND	Not Detected at the Reporting Limit
O	Sample amount is > 4 times amount spiked
P	Dual Column results percent difference > 40%
R	RPD above laboratory control limit
S	Spike Recovery outside laboratory control limits
U	Analyzed but not detected above the MDL
X	Analyte was detected in the Method Blank between the MDL and Reporting Limit, sample results may exhibit background or reagent contamination at the observed level.

Acronym	Description
DUP	Method Duplicate
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LOD	Limit of Detection (see MDL)
LOQ	Limit of Quantitation (see PQL)
MBLK	Method Blank
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
PQL	Practical Quantitation Limit
RPD	Relative Percent Difference
TDL	Target Detection Limit
TNTC	Too Numerous To Count
A	APHA Standard Methods
D	ASTM
E	EPA
SW	SW-846 Update III

Units Reported	Description
mg/L	Milligrams per Liter

ALS Group, USA

Date: *14-Oct-20*

Client: City of Gladstone WWTP
Project: Eco Belt Cake
Work Order: 20100431
Sample ID: Eco Belt Cake
Lab ID: 20100431-01
Collection Date: 10/1/2020 12:00 PM
Matrix: TCLP EXTRACT

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
TCLP MERCURY BY CVAA			**SW7470A**		Prep: SW7470 10/9/20 12:10	Analyst: **MAC**
Mercury	ND		0.0020	mg/L	1	10/9/2020 01:22 PM
TCLP METALS ANALYSIS BY ICP			**SW6010D**		Prep: SW3015A 10/12/20 14:26	Analyst: **DSC**
Arsenic	ND		0.050	mg/L	1	10/13/2020 07:56 PM
Barium	**0.088**		**0.050**	**mg/L**	1	10/13/2020 07:56 PM
Cadmium	ND		0.10	mg/L	1	10/13/2020 07:56 PM
Chromium	ND		0.10	mg/L	1	10/13/2020 07:56 PM
Lead	ND		0.050	mg/L	1	10/13/2020 07:56 PM
Selenium	ND		0.10	mg/L	1	10/13/2020 07:56 PM
Silver	ND		0.050	mg/L	1	10/13/2020 07:56 PM

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: 14-Oct-20

Client: City of Gladstone WWTP
Work Order: 20100431
Project: Eco Belt Cake

QC BATCH REPORT

Batch ID: **165679** Instrument ID **HG4** Method: **SW7470A**

MBLK	Sample ID: **MBLK-165679-165679**				Units: **mg/L**		Analysis Date: **10/9/2020 12:56 PM**			
Client ID:	Run ID: **HG4_201009A**				SeqNo: **6776855**		Prep Date: **10/9/2020**		DF: **1**	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Mercury	ND	0.00020								

LCS	Sample ID: **LCS-165679-165679**				Units: **mg/L**		Analysis Date: **10/9/2020 12:58 PM**			
Client ID:	Run ID: **HG4_201009A**				SeqNo: **6776856**		Prep Date: **10/9/2020**		DF: **1**	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Mercury	0.002085	0.00020	0.002	0	104	80-120	0			

MS	Sample ID: **20100403-02AMS**				Units: **mg/L**		Analysis Date: **10/9/2020 01:19 PM**			
Client ID:	Run ID: **HG4_201009A**				SeqNo: **6776868**		Prep Date: **10/9/2020**		DF: **1**	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Mercury	0.01845	0.0020	0.02	-0.0003	93.8	75-125	0			

MSD	Sample ID: **20100403-02AMSD**				Units: **mg/L**		Analysis Date: **10/9/2020 01:21 PM**			
Client ID:	Run ID: **HG4_201009A**				SeqNo: **6776869**		Prep Date: **10/9/2020**		DF: **1**	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Mercury	0.01935	0.0020	0.02	-0.0003	98.2	75-125	0.01845	4.76	20	

The following samples were analyzed in this batch: 20100431-01A

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: City of Gladstone WWTP
Work Order: 20100431
Project: Eco Belt Cake

QC BATCH REPORT

Batch ID: **165795** Instrument ID **ICP2** Method: **SW6010D**

MBLK Sample ID: **MBLK-165795-165795** Units: **mg/L** Analysis Date: **10/13/2020 06:15 PM**

Client ID: Run ID: **ICP2_201013B** SeqNo: **6787535** Prep Date: **10/12/2020** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Arsenic	ND	0.0050								
Barium	ND	0.0050								
Cadmium	ND	0.010								
Chromium	ND	0.0050								
Lead	ND	0.0050								
Selenium	ND	0.010								
Silver	ND	0.0050								

LCS Sample ID: **LCS-165795-165795** Units: **mg/L** Analysis Date: **10/13/2020 06:20 PM**

Client ID: Run ID: **ICP2_201013B** SeqNo: **6787536** Prep Date: **10/12/2020** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Arsenic	0.09207	0.0050	0.1	0	92.1	80-120	0			
Barium	0.1021	0.0050	0.1	0	102	80-120	0			
Cadmium	0.0946	0.010	0.1	0	94.6	80-120	0			
Chromium	0.102	0.0050	0.1	0	102	80-120	0			
Lead	0.1014	0.0050	0.1	0	101	80-120	0			
Selenium	0.09823	0.010	0.1	0	98.2	80-120	0			
Silver	0.1005	0.0050	0.1	0	101	80-120	0			

MS Sample ID: **20100337-02CMS** Units: **mg/L** Analysis Date: **10/13/2020 07:31 PM**

Client ID: Run ID: **ICP2_201013B** SeqNo: **6787550** Prep Date: **10/12/2020** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Arsenic	0.09581	0.0050	0.1	0.001077	94.7	75-125	0			
Barium	0.2045	0.0050	0.1	0.1129	91.7	75-125	0			
Cadmium	0.09416	0.010	0.1	-0.0004488	94.6	75-125	0			
Chromium	0.09966	0.0050	0.1	0.0007392	98.9	75-125	0			
Lead	0.09812	0.0050	0.1	0.0009944	97.1	75-125	0			
Selenium	0.1014	0.010	0.1	-0.0007436	102	75-125	0			
Silver	0.09966	0.0050	0.1	-0.0008844	101	75-125	0			

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: City of Gladstone WWTP
Work Order: 20100431
Project: Eco Belt Cake

QC BATCH REPORT

Batch ID: **165795** Instrument ID **ICP2** Method: **SW6010D**

MSD	Sample ID: **20100337-02CMSD**				Units: **mg/L**		Analysis Date: **10/13/2020 07:46 PM**			
Client ID:		Run ID: **ICP2_201013B**			SeqNo: **6787553**		Prep Date: **10/12/2020**		DF: **1**	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Arsenic	0.09592	0.0050	0.1	0.001077	94.8	75-125	0.09581	0.115	20	
Barium	0.2121	0.0050	0.1	0.1129	99.3	75-125	0.2045	3.65	20	
Cadmium	0.09427	0.010	0.1	-0.0004488	94.7	75-125	0.09416	0.117	20	
Chromium	0.09933	0.0050	0.1	0.0007392	98.6	75-125	0.09966	0.332	20	
Lead	0.09793	0.0050	0.1	0.0009944	96.9	75-125	0.09812	0.19	20	
Selenium	0.09724	0.010	0.1	-0.0007436	98	75-125	0.1014	4.21	20	
Silver	0.09966	0.0050	0.1	-0.0008844	101	75-125	0.09966	0	20	

The following samples were analyzed in this batch: 20100431-01A

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Appendix A

Cincinnati, OH +1 513 733 5336
Everett, WA +1 425 356 2600
Fort Collins, CO +1 970 490 1511
Holland, MI +1 616 399 6070
Houston, TX +1 281 530 5656
Middletown, PA +1 717 944 5541
Spring City, PA +1 610 948 4903
Salt Lake City, UT +1 801 266 7700
South Charleston, WV +1 304 356 3168
York, PA +1 717 505 5280

Chain of Custody Form

Page ____ of ____

COC ID: 223640

ALS Project Manager:

ALS Work Order #: 2010 0451

Customer Information		Project Information		Parameter/Method Request for Analysis	
Purchase Order		Project Name		A	TCP metals
Work Order		Project Number		B	
Company Name	City of Gladstone WWTP	Bill To Company	City of Gladstone WWTP	C	
Send Report To	Rodney Schwartz	Invoice Attn		D	
Address	1100 Delta Avenue	Address	1100 Delta Avenue	E	
				F	
City/State/Zip	Gladstone, MI 49878	City/State/Zip	Gladstone, MI 49878	G	
Phone	(906) 428-1757	Phone	(906) 428-1757	H	
Fax	(906) 428-3122	Fax	(906) 428-3122	I	
e-Mail Address		e-Mail Address		J	

No.	Sample Description	Date	Time	Matrix	Pres.	# Bottles	A	B	C	D	E	F	G	H	I	J	Hold
1	ECO Belt Cake	10-1-20	12:00pm				X										
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	

Sampler(s) Please Print & Sign: Jason Swanson [signature]

Shipment Method: UPS

Required Turnaround Time: (Check Box) ☐ Std 10 WK Days ☐ 5 WK Days ☐ 2 WK Days ☐ 24 Hour ☐ Other ____

Results Due Date:

Relinquished by:	Date:	Time:	Received by:
Jason Swanson	10-1-20	12:20pm	
Relinquished by:	Date:	Time:	Received by (Laboratory):
	10-5-20	11:00	[signature]
Logged by (Laboratory):	Date:	Time:	Checked by (Laboratory):
MJG	10-5-20	16:57	[signature]

Notes:

Cooler ID	Cooler Temp.
	20.3°C / 21.3°C IR B

QC Package: (Check One Box Below)
☑ Level II Std QC
☐ Level III Std QC/Raw Data
☐ Level IV SW846/CLP
☐ Other ____
☐ TRRP CheckList
☐ TRRP Level IV

Preservative Key: 1-HCl 2-HNO_3 3-H_2SO_4 4-NaOH 5-$Na_2S_2O_3$ 6-$NaHSO_4$ 7-Other 8-4°C 9-5035

Note: 1. Any changes must be made in writing once samples and COC Form have been submitted to ALS Environmental.
2. Unless otherwise agreed in a formal contract, services provided by ALS Environmental are expressly limited to the terms and conditions stated on the reverse.
3. The Chain of Custody is a legal document. All information must be completed accurately.

ALS Group, USA

Sample Receipt Checklist

Client Name:	**GLADWWTP**	Date/Time Received:	**05-Oct-20 11:00**
Work Order:	**20100431**	Received by:	**MJG**

Checklist completed by	Matthew Gaylord (eSignature)	05-Oct-20 (Date)	Reviewed by:	Bill Carey (eSignature)	06-Oct-20 (Date)

Matrices: Solid
Carrier name: UPS

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on shipping container/cooler?	Yes ☐	No ☐	Not Present ☑
Custody seals intact on sample bottles?	Yes ☐	No ☐	Not Present ☑
Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time?	Yes ☑	No ☐	
Container/Temp Blank temperature in compliance?	Yes ☑	No ☐	
Sample(s) received on ice?	Yes ☑	No ☐	
Temperature(s)/Thermometer(s):	20.3/21.3C	IR3	
Cooler(s)/Kit(s):			
Date/Time sample(s) sent to storage:	10/5/2020 4:59:06 PM		
Water - VOA vials have zero headspace?	Yes ☐	No ☐	No VOA vials submitted ☑
Water - pH acceptable upon receipt?	Yes ☐	No ☐	N/A ☑
pH adjusted?	Yes ☐	No ☐	N/A ☑
pH adjusted by:	-		

Login Notes:

Client Contacted:	Date Contacted:	Person Contacted:
Contacted By:	Regarding:	

Comments:

CorrectiveAction:

Appendix A

APPENDIX B

NPDES PERMIT

architecture • engineering

PERMIT NO. MI0057676

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., Section 1251 *et seq*., as amended; 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 Gladstone
1100 Delta Avenue
Gladstone, MI 49837

is authorized to discharge from the **Gladstone Wastewater Treatment Plant** located at

413 Minneapolis Avenue
Gladstone, MI 49837

designated as **Gladstone WWTP**

to the receiving water named Lake Michigan 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 September 30, 2016.

This permit takes effect on December 1, 2018. 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 effective date, this permit shall supersede National Pollutant Discharge Elimination System (NPDES) Permit No. MI0057676 (expiring October 1, 2016).

This permit and the authorization to discharge shall expire at midnight on **October 1, 2023**. In order to receive authorization to discharge beyond the date of expiration, the permittee shall submit an application that contains such information, forms, and fees as are required by the Michigan Department of Environmental Quality (Department) by **April 4, 2023**.

Issued: October 23, 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 Minor, 1 MGD to less than 10 MGD (Individual Permit)

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 Upper Peninsula District Office of the Water Resources Division. The Upper Peninsula District Office is located at 1504 West Washington Street, Marquette, MI 49855, Telephone: 906-228-4853, Fax: 906-228-4940.

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 Lake Michigan at Latitude 45.84040, Longitude -87.01016. 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 (CBOD5)	210	330	(report)	lbs/day	25	40	(report)	mg/l	5×Weekly	24-Hr Composite
Total Suspended Solids (TSS)	250	380	(report)	lbs/day	30	45	(report)	mg/l	5×Weekly	24-Hr Composite
Ammonia Nitrogen (as N)	(report)	---	(report)	lbs/day	(report)	---	(report)	mg/l	5×Weekly	24-Hr Composite
Total Phosphorus (as P)	8.0	---	(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	---	---	---	---	---	---	0.1	mg/l	5×Weekly	Grab
Total Copper	---	---	0.4	lbs/day	---	---	48	ug/l	Monthly	24-Hr Composite
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 Avg				**12-Month Rolling Avg**					
Total Mercury	0.000058	---	---	lbs/day	7.0	---	---	ng/l	Monthly	Calculation
					Minimum % Monthly		**Minimum % Daily**			
CBOD5 Minimum % Removal	---	---	---	---	85	---	(report)	%	Monthly	Calculation
TSS Minimum % Removal	---	---	---	---	85	---	(report)	%	Monthly	Calculation
					Minimum Daily		**Maximum Daily**			
pH	---	---	---	---	6.5	---	9.0	S.U.	5×Weekly	Grab
Dissolved Oxygen	---	---	---	---	4.0	---	---	mg/l	5×Weekly	Grab

PART I

Section A. Limitations and Monitoring Requirements

The following design flow was used in determining the above limitations, but is not to be considered a limitation or actual capacity: 1 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 CBOD5, Total Suspended Solids, Ammonia Nitrogen, Total Phosphorus, Total Mercury, Dissolved Oxygen, Fecal Coliform Bacteria, Total Residual Chlorine, and pH shall be taken at a location representative of the effluent. Samples for CBOD5 shall be properly dechlorinated and seeded prior to analysis. The Department may approve alternate sampling locations which are demonstrated by the permittee to be representative of the effluent.

c. Total Residual Chlorine (TRC)
Compliance with the TRC 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 CBOD5 and TSS concentrations and the monthly influent concentrations for approximately the same period.

e. Monitoring Frequency Reduction for Total Copper
After the submittal of 12 months of data, the permittee may request, in writing, Department approval for a reduction in monitoring frequency for Total Copper. This request shall contain an explanation as to why the reduced monitoring is appropriate. Upon receipt of written approval and consistent with such approval, the permittee may reduce the monitoring frequency indicated in Part I.A.1. of this permit. The monitoring frequency for Total Copper shall not be reduced to less than quarterly. The Department may revoke the approval for reduced monitoring at any time upon notification to the permittee.

f. 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 WQBEL of 1.3 ng/l, pursuant to Rule 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 three (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.4. of this permit.

PART I

Section A. Limitations and Monitoring Requirements

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. The monitoring frequency shall not be reduced to less than quarterly. The Department may revoke the approval for reduced monitoring at any time upon notification to the permittee.

g. 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." 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 alternate 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 (Sampling Guidance), 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:

PART I

Section A. Limitations and Monitoring Requirements

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	
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

PART I

Section A. Limitations and Monitoring Requirements

Parameter	QL	Units	Analytical Method
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	
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	

3. 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 January 2019, May 2019, March 2020, and 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** either *Daphnia magna, Daphnia pulex* or *Ceriodaphnia dubia*, for a total of four (4) tests on each species. Testing and reporting procedures shall follow procedures contained in EPA-821-R-02-012, "Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms" (Fifth Edition). When the effluent ammonia nitrogen (as N) concentration is greater than 5 mg/l, the pH of the toxicity test shall be maintained at the pH of the effluent at the time of sample collection. 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.

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
chronic toxicity

Hardness
calcium carbonate

Metals (Total Recoverable), Cyanide and Total Phenols

antimony	arsenic	available cyanide	barium
beryllium	boron	cadmium	chromium
lead	nickel	selenium	silver
thallium	zinc	total phenolic compounds	

PART I

Section A. Limitations and Monitoring Requirements

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
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

4-chloro-3-methylphenol	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		

4. 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 April 26, 2006, and modifications thereto, to proceed toward the goal.

On or before June 1, 2019, the permittee shall submit to the Department an updated Pollutant Minimization Program for mercury designed to proceed toward the goal. The Pollutant Minimization Program shall include 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.

PART I

Section A. Limitations and Monitoring Requirements

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.

5. 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.

PART I

Section A. Limitations and Monitoring Requirements

6. 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
   - 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 releases the permittee from properly submitting reports and forms as required by law.

7. 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, operating reports showing the effectiveness of the treatment facility operation and the quantity and quality of liquid wastes discharged into waters of the state.

Within 30 days of the effective date of this permit, the permittee shall submit to the Department a revised treatment facility monitoring program to address monitoring requirement changes reflected in this permit, or submit justification explaining why monitoring requirement changes reflected in this permit do not necessitate revisions to the treatment facility monitoring program. The permittee shall implement the revised treatment facility monitoring program upon approval from the Department. Applicable forms and guidance are available on the Department's web site at http://www.michigan.gov/deq/0,1607,7-135-3313_44117---,00.html. The permittee may use alternate forms if they are consistent with the approved treatment facility monitoring program. Unless the Department provides written notification to the permittee that monthly submittal of operating reports is required, operating reports that result from implementation of the approved treatment facility monitoring program shall be maintained on site for a minimum of three (3) years and shall be made available to the Department for review upon request.

PART I

Section B. Storm Water Pollution Prevention

Section B. Storm Water Pollution Prevention is not required for this permit.

PART I

Section C. Industrial Waste Pretreatment Program

1. Industrial Waste Pretreatment Program

It is understood that the permittee does not receive the discharge of any type or quantity of substance which may cause interference with the operation of the treatment works; and, therefore, the permittee is not required to immediately develop an industrial pretreatment program in accordance with Section 307 of the Federal Water Pollution Control Act. The permittee is required to comply with Section 307 of the Federal Water Pollution Control Act upon accepting any such discharge for treatment. The permittee is required to notify the Department within thirty (30) days if any user discharges or proposes to discharge such wastes to the permittee for treatment.

Under no circumstances shall the permittee allow introduction of the following wastes into the waste treatment system:

a. pollutants which cause pass-through or interference;

b. pollutants which create a fire hazard or explosion hazard in the sewerage system, including, but not limited to waste streams with a closed cup flashpoint of less than 140 degrees Fahrenheit or 60 degrees Centigrade using the test methods specified in 40 CFR 261.21;

c. pollutants which will cause corrosive structural damage to the sewerage system; but in no case, discharges with pH less than 5.0, unless the works is specifically designed to accommodate such discharges;

d. solid or viscous pollutants in amounts which will cause obstruction to the flow in the sewerage system resulting in interference;

e. any pollutant, including oxygen demanding pollutants (BOD, etc.) released in a discharge at a flow rate and/or pollutant concentration which will cause interference with the treatment plant;

f. heat in amounts which will inhibit biological activity in the treatment plant resulting in interference; but in no case, heat in such quantities that the temperature at the treatment plant exceeds 40 degrees Centigrade (104 degrees Fahrenheit) unless the Department, upon request of the permittee, approves alternate temperature limits;

g. pollutants which result in the presence of toxic gases, vapors or fumes within the sewerage system in a quantity that may cause acute worker health and safety problems; and

h. any trucked or hauled pollutants, except at discharge points designated by the permittee.

If information is gained by the Department that the permittee receives or is about to receive industrial wastes, then this permit may be modified in accordance with applicable laws and rules to incorporate the requirements of Section 307 of the Federal Water Pollution Control Act.

PART I

Section D. Residuals Management Program

1. Residuals Management Program for Land Application of Biosolids

The permittee is authorized to land-apply bulk biosolids or prepare bulk biosolids for land application in accordance with the permittee's approved Residuals Management Program (RMP) approved on June 8, 2000, and approved modifications thereto, in accordance with the requirements established in R 323.2401 through R 323.2418 of the Michigan Administrative Code (Part 24 Rules). The 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. The Part 24 Rules 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).

a. Annual Report
On or before <u>October 30 of each year</u>, 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.

b. Modifications to the Approved RMP
Prior to implementation of modifications to the RMP, the permittee shall submit proposed modifications to the Department 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.

c. 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.

d. Contact Information
RMP-related submittals shall be made to the Department.

PART II

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. 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.

PART II

Section A. Definitions

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.

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 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.

PART II

Section C. Reporting Requirements

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.

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, on forms provided by the Department.

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, <u>within a reasonable time</u>, 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 C

ENVIRONMENTAL INFORMATION AND CORRESPONDENCE

Appendix C

Typical Review Package as Distributed

PROJECT SUMMARY
For Environmental Reviews

CITY OF GLADSTONE, MICHIGAN
WASTEWATERTREATMENT PLANT IMPROVEMENTS
(SRF PROJECT PLAN)

January 2020

Administrative

The City of Gladstone, Michigan has contracted with C2AE Engineers of Escanaba to prepare an EGLE SRF Program Project Plan. The purpose of the Project Plan is to evaluate needs and recommend alternatives for improvements to the Gladstone Wastewater Treatment Plant (WWTP).

Project Planning Area

The planning area includes the Gladstone existing and potential immediate future wastewater collection system service area. Project planning concentrates on the existing WWTP within the City limits **(T40N, R22W, Section 22).** The City is located in Delta County near the south end of Michigan's Upper Peninsula

Existing Facilities

Gladstone owns and operates its wastewater collection and treatment system. In addition to the City, the system also serves the town Rapid River in Masonville Township and a small portion of Brampton Township in the Kipling area.

Wastewater is collected via a system of gravity collector and interceptor sewers along with pump stations, where dictated by terrain, then pumped to the treatment plant where the treated effluent is discharged to Lake Michigan under NPDES Permit MI-0057676. The treatment plant is located in the southeast quadrant of the City along the shores of Lake Michigan.

The oldest portions of City's collection system are about 100 years old. The WWTP was originally constructed in 1938 with a significant upgrade in 1972 and minor upgrades in 1994.

Need for the Project

The Gladstone WWTP generally operates in compliance with the NPDES permit, and does not have any active consent orders or legal actions requiring improvements to the wastewater system.

The WWTP is showing its age and needs physical improvements/replacements to preserve the reliability of the effluent quality, prevent overflows, reduce energy use, protect the integrity of the existing physical facility, and incorporate modern cost effective technologies.

Some equipment and facility assets are at the point that maintenance cost will be much higher if improvements are delayed any longer. The primary premise of asset management is that monies spent at the appropriate time and location can dramatically reduce overall use of resources.

Alternatives Considered

Cost effectiveness of treatment and collection alternatives were evaluated in the Gladstone Infiltration and Inflow Study in 2019 and the SRF Project Plan currently being assembled. Based on the cost effectiveness evaluation and long term desires of the City, this SRF application will be focused on WWTP Improvements only. The following alternatives were considered.

- No Action – continued use of existing system as is.
- Optimize Performance of Existing Facilities with minimal new construction
- Regional Alternatives –Reroute the flow to a neighboring facility.
- Upgrade Current WWTP Process to fully comply with regulatory requirements, prevent inadequately treated discharges, and rehabilitate existing systems to sustain reliability.

Recommended Alternative

The recommended alternative pending environmental and other evaluations is to upgrade the current WWTP. This alternative is evaluated to be the most cost effective approach. As funding becomes available, the collection system, including the gravity sewer and pump stations, will be improved to help in decreasing the I/I issues. All immediate proposed work is within the exiting WWTP site limits.

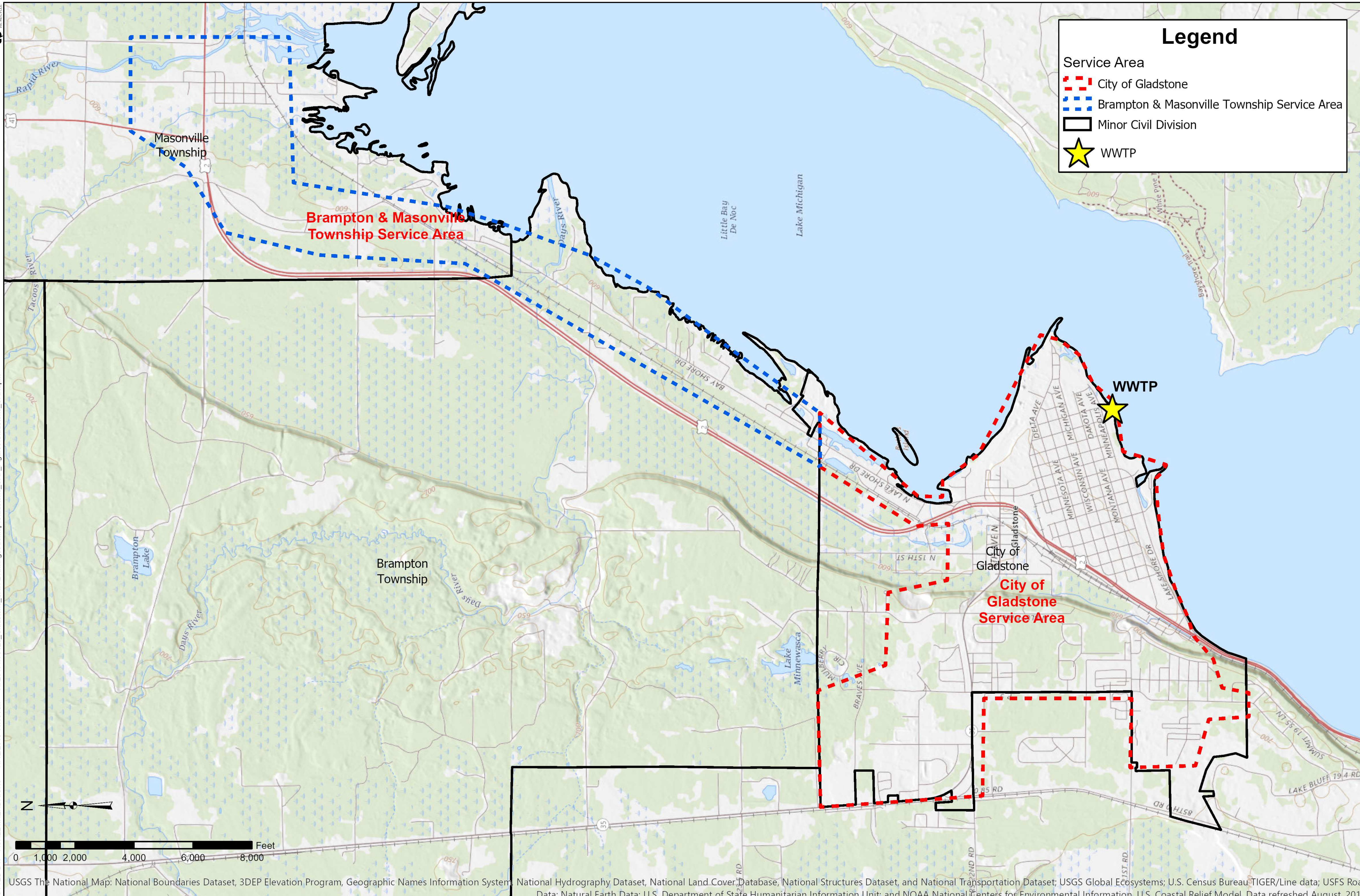
Recommended Improvements are outlined in the 2019-20 Gladstone Process and Facilities Evaluation Report conducted under the EGLE SAW Grant funded Asset Management Planning, and include:

- New Screening and Grit Removal Process
- New Primary Effluent Pumps and Settling Tank
- Raw Sewage Pump Improvements
- Secondary Treatment Pump Improvements
- New RBC Train
- RBC Shaft and Media Replacement
- New Final Clarifier and Secondary Effluent Piping
- Facility Piping and Valves
- Chemical Feed replacements
- Site Improvements
- New outfall from WWTP extending from shoreline of Little Bay De Noc to 800 feet offshore

Anticipated Schedule

The initial project is scheduled for submission of a EGLE Project Plan in 2020 with construction in 2021 - 2023.

CITY OF GLADSTONE
Lake Superior
Lake Michigan
Lake Huron
UNITED STATES
MICHIGAN
WISCONSIN
ILLINOIS
ONTARIO
CANADA
Gladstone
Escanaba
Marquette
Green Bay
Milwaukee
Madison
Grand Rapids
Lansing
Sault Ste. Marie



PLOTTED BY: ASHLEY.HENDRICKS 11/12/2019 11:13 AM N:\2017\170120_Gladstone_SAW\Drawings\ArcMap\Gladstone_SRF_Figures\Gladstone_SRF.aprx

c2ae architecture • engineering

CITY OF GLADSTONE
SRF PROJECT PLAN
DELTA COUNTY, MICHIGAN

FIGURE 2: STUDY & SERVICE AREA

Appendix C

Part 1: Air Quality

1211 Ludington St.
Escanaba, MI 49829
O: 906.233.9360
www.c2ae.com

November 13, 2019

Ed Lancaster, Air Quality Division
1504 W. Washington Street
Marquette, MI 49855

Re: **City of Gladstone, Michigan**
Delta County
Wastewater Treatment Plant Improvements
To Evaluate Needs and Recommend Alternatives for Improvements
Environmental Review and Evaluation

Dear Mr. Lancaster,

On behalf of the City of Gladstone, Delta County, we are requesting review and comment of plans for improvements to their existing wastewater treatment plant.

The City of Gladstone is preparing an EGLE SRF Program Project Plan to evaluate needs and recommended alternatives for improvements to the Wastewater Treatment Plant. The treatment plant is in T40N, R22W, Section 22.

We have enclosed a Project Summary and Location Maps. We are requesting your review and comment. Comments received within 30 days will allow them to be incorporated into the project plan prior to the preparation of the final SRF Project Plan.

Comments can be mailed to our Escanaba office or emailed to ashley.hendricks@c2ae.com.

Sincerely,
C2AE

Ashley N. Hendricks, E.I.T.

Enclosure
cc: 17-0120 File B-10

Hendricks, Ashley

From: Lancaster, Edward (EGLE) <LANCASTERE1@michigan.gov>
Sent: Tuesday, December 3, 2019 8:59 AM
To: Hendricks, Ashley
Cc: Scanlan, Joseph (EGLE)
Subject: Gladstone WWTP Improvements

Good morning Ashley,

Based on your letter dated November 13, 2019, the only concerns the Air Quality Division would have is if the project would involve the removal or demolition of any structures that may contain asbestos and any fugitive dust that may occur during the project.

Feel free to call me if you have any questions.

Sincerely,

Ed Lancaster
District Supervisor
Air Quality Division/Marquette District Office
Department of Environment, Great Lakes, and Energy
906-250-5124
Lancastere1@michigan.gov

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1211 Ludington St.
Escanaba, MI 49829
O: 906.233.9360
www.c2ae.com

January 14, 2020

Ed Lancaster, Air Quality Division
1504 W. Washington Street
Marquette, MI 49855

Re: City of Gladstone, Michigan
Delta County
Wastewater Treatment Plant Improvements
To Evaluate Needs and Recommend Alternatives for Improvements
Environmental Review and Evaluation

Dear Mr. Lancaster,

On behalf of the City of Gladstone, Delta County, we are requesting review and comment of plans for improvements to their existing wastewater treatment plant.

The City of Gladstone is preparing an EGLE SRF Program Project Plan to evaluate needs and recommended alternatives for improvements to the Wastewater Treatment Plant. The treatment plant is in T40N, R22W, Section 22. The scope of the project has been revised since the letter sent on November 13, 2019. The project now includes a new outfall, starting at the wastewater treatment plant on the shores of Little Bay de Noc, extending 800 feet offshore.

We have enclosed a Project Summary and Location Maps. We are requesting your review and comment. Comments received within 30 days will allow them to be incorporated into the project plan prior to the preparation of the final SRF Project Plan.

Comments can be mailed to our Escanaba office or emailed to ashley.hendricks@c2ae.com.

Sincerely,
C2AE

Ashley N. Hendricks, E.I.T.

Enclosure
cc: 17-0120 File B-10

Hendricks, Ashley

From: Lancaster, Edward (EGLE) <LANCASTERE1@michigan.gov>
Sent: Friday, January 24, 2020 9:45 AM
To: Hendricks, Ashley
Cc: Bruestle, Sydney (EGLE)
Subject: Gladstone WWTP improvements

Good morning Ashley,

I am following up on your letter dated January 14, 2020, regarding the revisions to the project since the November 13, 2019 letter. AQD's concerns remain the same, in that, if the project involves the removal or demolition of any structures that may contain asbestos proper notification is received by this office, and there is a site plan to address any fugitive dust that may occur during the project.

Sincerely,

Ed Lancaster
District Supervisor
Air Quality Division/Marquette District Office
Department of Environment, Great Lakes, and Energy
906-250-5124
Lancastere1@michigan.gov

1211 Ludington St.
Escanaba, MI 49829
O: 906.233.9360
www.c2ae.com

1. Air Quality

The MDEQ was contacted to review and comment on the potential direct or indirect air pollutant emissions impact that would result from the construction or operation of the proposed project. Fugitive dust emissions on the worksite are a potential during construction. If this would become an issue, dust suppressants will be used to control the fugitive dust to prevent violations of Rule 901.

Appendix C

Part 2: Archeological and Historic Resources

Hendricks, Ashley

From:	MSF-SHPOResearch <MSF-SHPOResearch@michigan.gov>
Sent:	Wednesday, November 20, 2019 10:30 AM
To:	Hendricks, Ashley
Subject:	Re: SHPO Research Request for Gladstone Wastewater Treatment Plant (170120)
Attachments:	Gladstone Quad Image.png; MICHIGAN ARCHAEOLOGICAL SITE FILE (20DE650).pdf

Ms. Hendricks,

One previously recorded site has come up within the TRS you have listed. I have attached the site form, as well as a photo of the quad image for you to compare to your APE. If you require information concerning the surveys (marked in Red), then form a list and I can provide summary of the work completed.

Please note that for the purposes of Section 106, a "historic property" is defined as: *Any prehistoric or historic district, site, building, structure, or object that is included,* ***or is eligible for inclusion*** *in the National Register of Historic Places*
The entire State has not been Surveyed, so **there is no comprehensive list** of National Register listed properties, nor of those eligible for listing. Therefore, simply checking with the SHPO files does not necessarily fulfill an agency's responsibility to identify historic properties. It is the responsibility of the federal agency, *not the SHPO,* to fulfill the requirements of Section 106, thus, it is *the federal agency's* responsibility to apply the criteria for listing on the National Register of Historic Places to properties within the project's area of potential effects and *provide the SHPO* with a determination regarding the impact on historic properties. The SHPO must then respond, either with concurrence or non-concurrence. **SHPO staff does not conduct research on behalf of others during Section 106.**

Respectfully,

Luke Pickrahn
Student Assistant
State Historic Preservation Office
Michigan Economic Development Corporation
300 N. Washington Square | Lansing, MI 48913
Desk: 517.241-6607
PickrahnL@michigan.gov

From: Hendricks, Ashley <ashley.hendricks@C2AE.COM>
Sent: Thursday, November 14, 2019 1:25 PM
To: MSF-SHPOResearch <MSF-SHPOResearch@michigan.gov>
Subject: SHPO Research Request for Gladstone Wastewater Treatment Plant (170120)

The City of Gladstone, Michigan has contracted with C2AE to prepare an EGLE SRF Program Project Plan. The purpose of the project will be to make improvements on their existing Wastewater Treatment Plant located on 413 Minneapolis Avenue in the City of Gladstone, Delta County (Township 40N, Range 22W, Section 22). Please refer to attached USGS Quadrangle Map of Gladstone showing research area. Are there relevant files available for us to view, and if so, can we request a research appointment?

Hendricks, Ashley

From:	MSF-SHPOResearch <MSF-SHPOResearch@michigan.gov>
Sent:	Wednesday, January 15, 2020 11:33 AM
To:	Hendricks, Ashley
Subject:	Re: SHPO Research Request UPDATE - Gladstone Wastewater Treatment Plant (170120)

Ms. Hendricks,

There were no new sites reported within that TRS since you have last contacted the office. Be advised, as was previously stated, we can only comment on what we are aware of.

Respectfully,

Luke Pickrahn
Student Assistant
State Historic Preservation Office
Michigan Economic Development Corporation
300 N. Washington Square | Lansing, MI 48913
Desk: 517.241-6607
PickrahnL@michigan.gov

From: Hendricks, Ashley <ashley.hendricks@C2AE.COM>
Sent: Tuesday, January 14, 2020 1:14 PM
To: MSF-SHPOResearch <MSF-SHPOResearch@michigan.gov>
Subject: SHPO Research Request UPDATE - Gladstone Wastewater Treatment Plant (170120)

The City of Gladstone, Michigan has contracted with C2AE to prepare an EGLE SRF Program Project Plan. The purpose of the project will be to make improvements on their existing Wastewater Treatment Plant located on 413 Minneapolis Avenue in the City of Gladstone, Delta County (Township 40N, Range 22W, Section 22). Please refer to attached USGS Quadrangle Map of Gladstone showing research area.

On November 14, 2019, I contacted SHPO regarding whether or not there are relevant files available to view in regards to this project. Since then, there has been an addition to the scope of the project. The project now includes a new outfall, starting at the wastewater treatment plant on the shores of Little Bay de Noc of Lake Michigan, extending 800 feet offshore. It will be in the same disturbed location as the previous outfall. I have attached the response from SHPO that was provided to the original project scope on November 20, 2019, along with the attachments.

I am sending this email to confirm that these still are the only nearby applicable Archaeological sites that were sent in the previous emails and that there is nothing nearby the WWTP in Little Bay De Noc of Lake Michigan. The outfall location extends from the WWTP circled on the attached Topo Map to the coordinates N 45° 50’ 24”, W 87° 00’ 39”.

Thank you,

Ashley Hendricks, EIT
Civil Engineer

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architecture | engineering
1211 Ludington Street

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1211 Ludington St.
Escanaba, MI 49829
O: 906.233.9360
www.c2ae.com

January 15, 2020

State Historic Preservation Office
Michigan Economic Development Corporation
300 N. Washington Square
Lansing, MI 48913

Re: **City of Gladstone, Michigan**
Delta County
Wastewater Treatment Plant Improvements
To Evaluate Needs and Recommend Alternatives for Improvements
Environmental Review and Evaluation

Dear Mr. or Ms.,

On behalf of the City of Gladstone, Delta County, we are requesting review and comment of plans for improvements to their existing wastewater treatment plant.

The City of Gladstone is preparing an EGLE SRF Program Project Plan to evaluate needs and recommended alternatives for improvements to the Wastewater Treatment Plant. The treatment plant is in T40N, R22W, Section 22. The scope of the project has been revised since the letter sent on November 13, 2019. The project now includes a new outfall, starting at the wastewater treatment plant on the shores of Little Bay de Noc, extending 800 feet offshore.

We have enclosed a Section 106 Review Application, Project Summary, Location Maps, APE photos, and previous correspondence from SHPO. We are requesting your review and comment.

Comments can be mailed to our Escanaba office or emailed to ashley.hendricks@c2ae.com.

Sincerely,
C2AE

Ashley N. Hendricks, E.I.T.

Enclosure
cc: 17-0120 File B-10

STATE HISTORIC PRESERVATION OFFICE
Application for Section 106 Review

SHPO Use Only				
☐ IN	Received Date	____ / ____ / ____	Log In Date	____ / ____ / ____
☐ OUT	Response Date	____ / ____ / ____	Log Out Date	____ / ____ / ____
	Sent Date	____ / ____ / ____		

Submit one copy for each project for which review is requested. This application is required. Please type. Applications must be complete for review to begin. Incomplete applications will be sent back to the applicant without comment. Send only the information and attachments requested on this application. Materials submitted for review cannot be returned. Due to limited resources we are unable to accept this application electronically.

I. GENERAL INFORMATION

☒ THIS IS A NEW SUBMITTAL ☐ THIS IS MORE INFORMATION RELATING TO ER#

a. Project Name: City of Gladstone, Wastewater Treatment Plant Improvements
b. Project Address (if available): 413 Minneapolis Avenue, Gladstone, MI 49837
c. Municipal Unit: City of Gladstone, County: Delta
d. Federal Agency, Contact Name and Mailing Address (*If you do not know the federal agency involved in your project please contact the party requiring you to apply for Section 106 review, not the SHPO, for this information.*): EPA/MDEQ SRF Program, Project Manager, Valerie White, 517-284-5420
e. State Agency (if applicable), Contact Name and Mailing Address: MDEQ SRF Program, Valerie White, 517-284-5420
f. Consultant or Applicant Contact Information (if applicable) *including mailing address*: CONSULANT: C2AE, Attn. Ashley Hendricks, 1211 Ludington Street, Escanaba, MI 49829, ashley.hendricks@c2ae.com, 906-233-9360 APPLICANT: City of Gladstone, Attn: Rodney Schwartz, Superintendent, 413 Minneapolis Avenue, Gladstone, MI 49837, rschwartz@gladstonemi.org, 906-428-1757

II. GROUND DISTURBING ACTIVITY (INCLUDING EXCAVATION, GRADING, TREE REMOVALS, UTILITY INSTALLATION, ETC.)

DOES THIS PROJECT INVOLVE GROUND-DISTURBING ACTIVITY? ☒ YES ☐ NO (If no, proceed to section III.)

Exact project location must be submitted on a USGS Quad map (portions, photocopies of portions, and electronic USGS maps are acceptable as long as the location is clearly marked).

a. USGS Quad Map Name: Gladstone, MI
b. Township: 40N, Range: 22W, Section: 22
c. Description of width, length and depth of proposed ground disturbing activity: The following components of the WWTP improvements will involve disturbances of soil: New Administration Building, New Screen and Grit Structure, New (Second) Primary Settling Tank, Added Train of Rotating Biological Contactors, New (Third) Final Settling Tank, Upgraded Secondary Effluent Piping, and a New Outfall. The total estimated ground disturbance is estimated to be an area 100’ wide by 170’ long by 15’ deep within the fenced site of the WWTP. The new outfall will be located in the same location of the previous outfall, extending from the WWTP to 800 feet offshore on Little Bay de Noc of Lake Michigan (N 45° 50’ 24”, W 87° 00’ 39”).
d. Previous land use and disturbances: The Gladstone WWTP was originally constructed in 1938 with a significant upgrade in 1972 and minor upgrades in 1994.
e. Current land use and conditions: Same as above
f. Does the landowner know of any archaeological resources found on the property? ☐ YES ☒ NO
Please describe: Excavation since 1938 has been extensive, no archeological artifactes have been unearthed.

III. PROJECT WORK DESCRIPTION AND AREA OF POTENTIAL EFFECTS (APE)
Note: Every project has an APE.

a. Provide a detailed written description of the project (plans, specifications, Environmental Impact Statements (EIS), Environmental Assessments (EA), etc. **cannot** be substituted for the written description): See attached project summary.
b. Provide a localized map indicating the location of the project; road names must be included and legible.
c. On the above-mentioned map, identify the APE.
d. Provide a written description of the APE (physical, visual, auditory, and sociocultural), the steps taken to identify the APE, and the justification for the boundaries chosen. The APE is outlined based on the areas that could be potentially afftected by improvements of the treatment plant improvements to the wastewater system. It is not expected that APE related impacts will be increased above what currently exists for the WWTP.

IV. IDENTIFICATION OF HISTORIC PROPERTIES

a. List and date **all** properties 50 years of age or older located in the APE. If the property is located within a National Register eligible, listed or local district it is only necessary to identify the district: Most of the buildings in the City are over 50 years old. The only impact on them will be that they will be within the visual distance of construction.
b. Describe the steps taken to identify whether or not any **historic** properties exist in the APE and include the level of effort made to carry out such steps: Reviewed the Register of Historic Places wesbite and did not find any near the vicinity of the APE. Contacted SHPO for a preliminary investigation on whether there are applicable files for fruther research; their response is attached on the last pages of this application. The previously recorded archaeological sites provided by SHPO are not in the APE of this project.
c. Based on the information contained in "b", please choose one:
   - ☐ Historic Properties Present in the APE
   - ☒ No Historic Properties Present in the APE
d. Describe the condition, previous disturbance to, and history of any historic properties located in the APE: The older buildings in the City of Gladstone fall within water distribution and wastewater collection service areas with most street right-of-ways previously disturbed for those utility installations.

V. PHOTOGRAPHS

Note: All photographs must be keyed to a localized map.

a. Provide photographs of the site itself.
b. Provide photographs of all properties 50 years of age or older located in the APE (faxed or photocopied photographs are not acceptable).

VI. DETERMINATION OF EFFECT

☒ No historic properties affected based on [36 CFR § 800.4(d)(1)], please provide the basis for this determination.

☐ No Adverse Effect [36 CFR § 800.5(b)] on historic properties, explain why the criteria of adverse effect, 36 CFR Part 800.5(a)(1), were found not applicable.

☐ Adverse Effect [36 CFR § 800.5(d)(2)] on historic properties, explain why the criteria of adverse effect, [36 CFR Part 800.5(a)(1)], were found applicable.

Please print and mail completed form and required information to:

State Historic Preservation Office, Environmental Review Office, Michigan Historical Center, 702 W. Kalamazoo Street, P.O. Box 30740, Lansing, MI 48909-8240

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architecture • engineering

1211 Ludington St.
Escanaba, MI 49829
O: 906.233.9360
www.c2ae.com

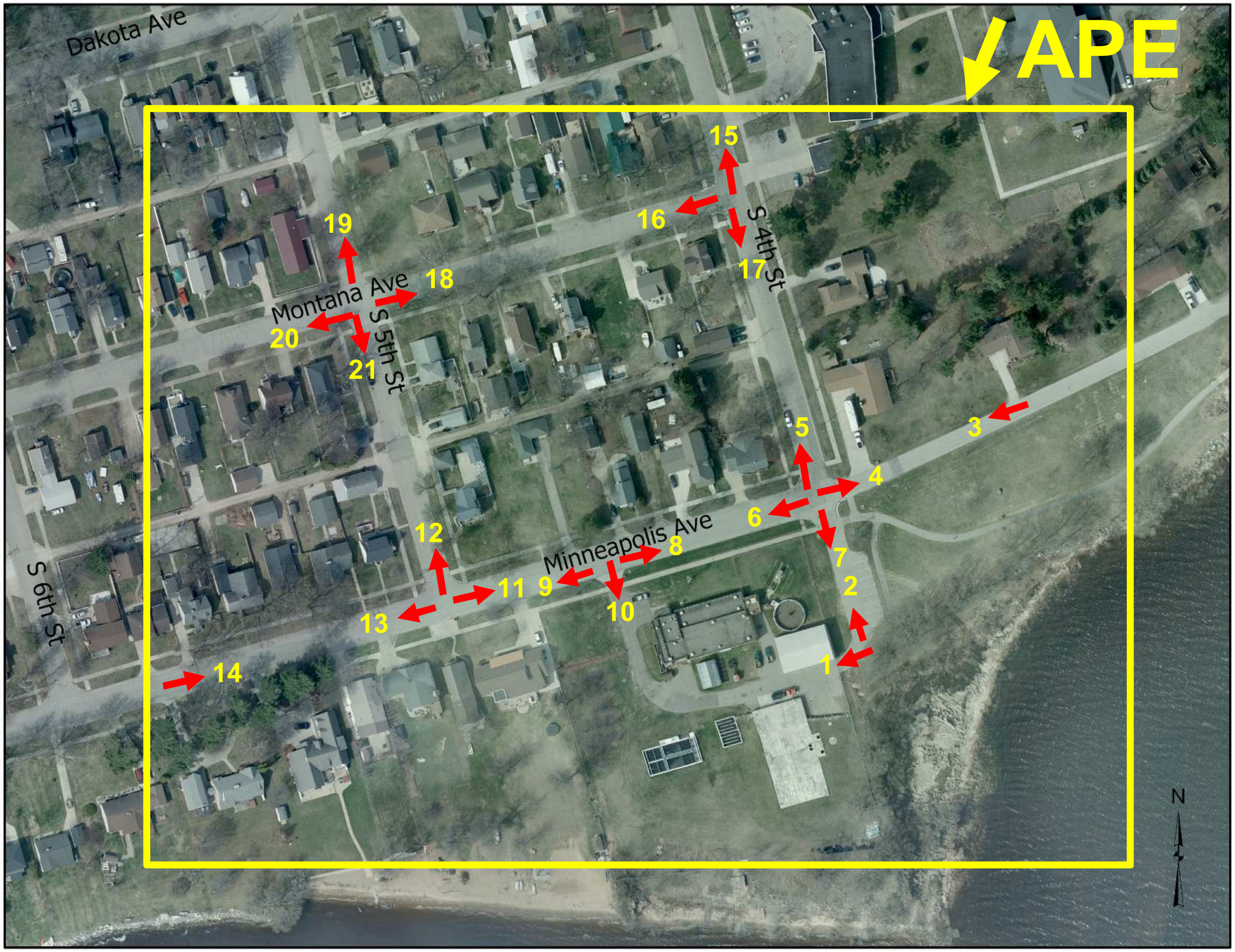

Figure 3: Localized Map, APE, and Photo Locations

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O: 906.233.9360
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1. S. 4th Street, south of Minneapolis Ave, looking east at the Gladstone WWTP.

2. 4th Street, south of Minneapolis Ave, looking north

3. Minneapolis Ave, East of S. 4th Street, looking west.

4. Intersection of S. 4th Street and Minneapolis Ave looking east.

5. Intersection of S. 4th Street and Minneapolis Ave looking north.

6. Intersection of S. 4th Street and Minneapolis Ave looking west.

7. Intersection of S. 4th Street and Minneapolis Ave looking south.

8. On Minneapolis Ave in front of Gladstone WWTP, between S. 4th Street and S. 5th Street, looking east.

9. On Minneapolis Ave in front of Gladstone WWTP, between S. 4th Street and S. 5th Street, looking west.

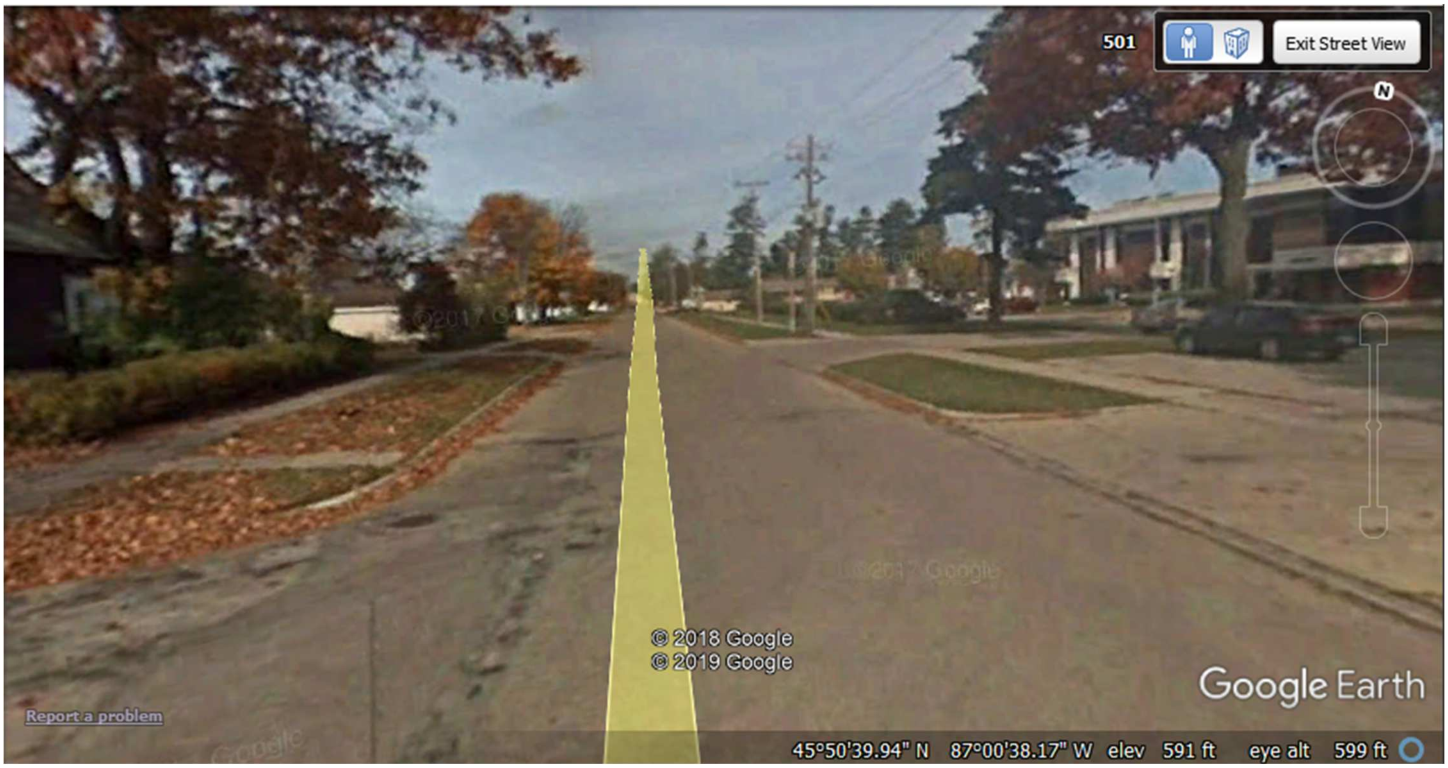
10. On Minneapolis Ave looking south at Gladstone WWTP, between S. 4th Street and S. 5th Street.

11. Intersection of Minneapolis Ave of S. 5th Street looking east.

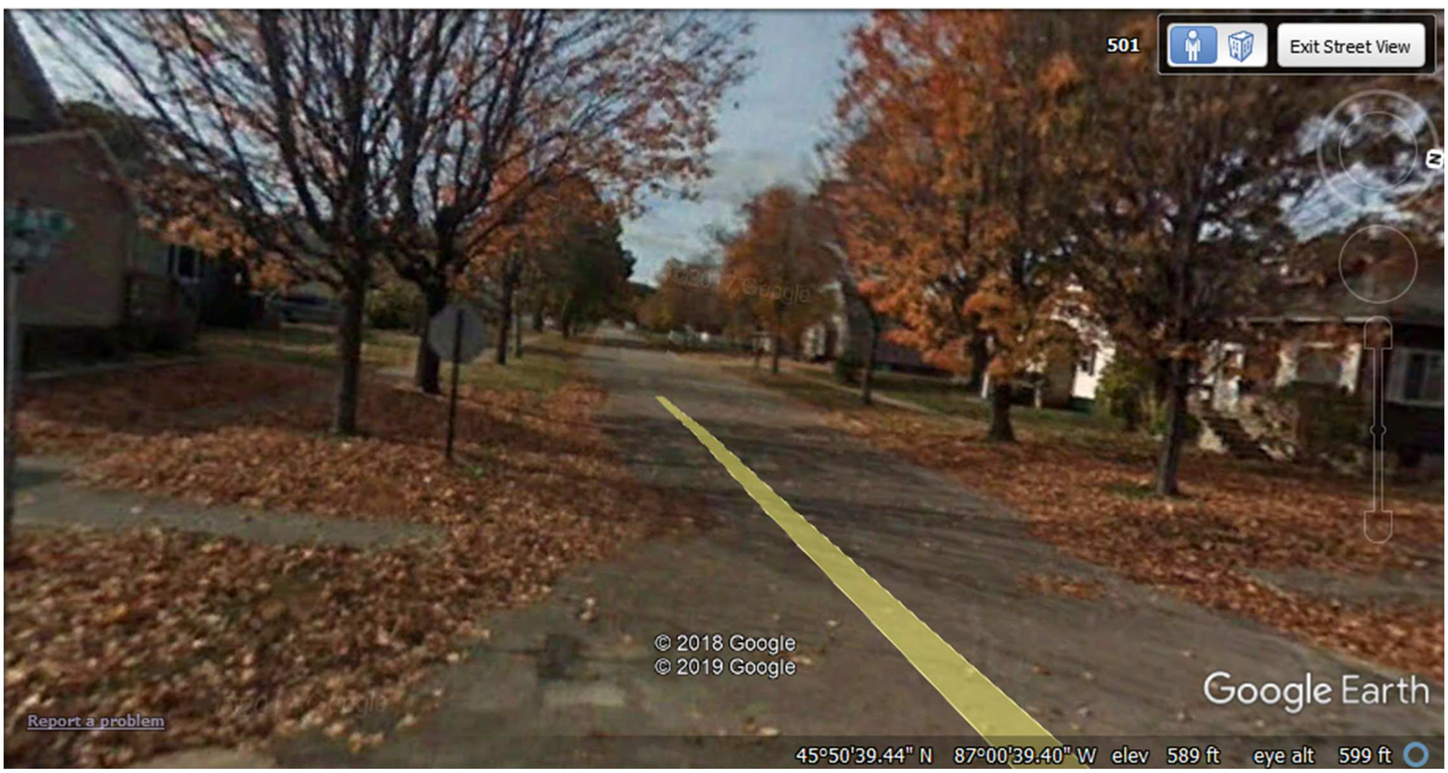
12. Intersection of Minneapolis Ave of S. 5th Street looking north.

13. Intersection of Minneapolis Ave of S. 5th Street looking west.

14. Minneapolis Ave, between S. 5th Street and S. 6th Street, looking east.



15. Intersection of Montana Ave and S. 4th Street looking north.



16. Intersection of Montana Ave and S. 4th Street looking west.

17. Intersection of Montana Ave and S. 4th Street looking south.

18. Intersection of Montana Ave and S. 5th Street looking east.

19. Intersection of Montana Ave and S. 5th Street looking north.

20. Intersection of Montana Ave and S. 5th Street looking west.

21. Intersection of Montana Ave and S. 5th


Gladstone WWTP
LAKE MICHIGAN
LITTLE BAY DE NOC
APPROXIMATE MEAN LAKE ELEVATION 177
GLADSTONE
ESCANABA
Lake Bluff
Wells
Kipling
Squaw Point
HIAWATHA NATIONAL FOREST
INDUSTRIAL WASTE PONDS
West Gladstone
Carroll Corners
Groos
Soo Hill
North Escanaba
Willow Creek
Radio Towers

MICHIGAN ECONOMIC
DEVELOPMENT CORPORATION

January 23, 2020

SONYA T BUTLER
MICHIGAN DEPARTMENT OF ENVIRONMENT GREAT LAKES AND ENERGY
P O BOX 30817
LANSING MI 48909

RE: ER20-173 Gladstone Wastewater Treatment Plant Improvements, 413 Minneapolis Avenue, Sec. 22, T40N, R22W, City of Gladstone, Delta County (EPA)

Dear Ms. Butler:

Under the authority of Section 106 of the National Historic Preservation Act of 1966, as amended, we have reviewed the above-cited undertaking at the location s noted above. Based on the information provided for our review, it is the opinion of the State Historic Preservation Officer (SHPO) that **no historic properties are affected** within the area of potential effects of this undertaking.

This letter evidences the EPA's compliance with 36 CFR § 800.4 "Identification of historic properties," and the fulfillment of the EPA's responsibility to notify the SHPO, as a consulting party in the Section 106 process, under 36 CFR § 800.4(d)(1) "No historic properties affected." **If the scope of work changes in any way, or if artifacts or bones are discovered, please notify this office immediately.**

We remind you that federal agency officials or their delegated authorities are required to involve the public in a manner that reflects the nature and complexity of the undertaking and its effects on historic properties per 36 CFR § 800.2(d). The National Historic Preservation Act also requires that federal agencies consult with any Indian tribe and/or Tribal Historic Preservation Officer (THPO) that attach religious and cultural significance to historic properties that may be affected by the agency's undertakings per 36 CFR § 800.2(c)(2)(ii).

The State Historic Preservation Office is not the office of record for this undertaking. You are therefore asked to maintain a copy of this letter with your environmental review record for this undertaking.

If you have any questions, please contact Brian Grennell, Cultural Resource Management Coordinator, at 517-335-2721 or by email at GrennellB@michigan.gov. **Please reference our project number in all communication with this office regarding this undertaking.** Thank you for this opportunity to review and comment, and for your cooperation.

Sincerely,

Brian G. Grennell

Brian G. Grennell
Cultural Resource Management Coordinator

for Brian D. Conway
State Historic Preservation Officer

BGG:SAT:lrp

Copy: Valerie White, EGLE
Ashley Hendricks, C2AE
Rodney Schwartz, City of Gladstone

Appendix C

Part 3: Archeological and Historic Resources

(Tribal Historic Preservation Officers and Federally Recognized Tribes)

1211 Ludington St.
Escanaba, MI 49829
O: 906.233.9360
www.c2ae.com

November 13, 2019

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

Re: City of Gladstone, Michigan
Delta County
Wastewater Treatment Plant Improvements
To Evaluate Needs and Recommend Alternatives for Improvements
Environmental Review and Evaluation

Dear Ms. Carrick,

On behalf of the City of Gladstone, Delta County, we are requesting review and comment of plans for improvements to their existing wastewater treatment plant.

The City of Gladstone is preparing an EGLE SRF Program Project Plan to evaluate needs and recommended alternatives for improvements to the Wastewater Treatment Plant. The treatment plant is in T40N, R22W, Section 22.

We have enclosed a Project Summary and Location Maps. We are requesting your review and comment. Comments received within 30 days will allow them to be incorporated into the project plan prior to the preparation of the final SRF Project Plan.

Comments can be mailed to our Escanaba office or emailed to ashley.hendricks@c2ae.com.

Sincerely,
C2AE

Ashley N. Hendricks, E.I.T.

Enclosure
cc: 17-0120 File B-10

1211 Ludington St.
Escanaba, MI 49829
O: 906.233.9360
www.c2ae.com

January 14, 2020

Bay Mills Indian Community
Paula Carrick, THPO
12140 W. Lakeshore Drive
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Delta County
Wastewater Treatment Plant Improvements
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Enclosure
cc: 17-0120 File B-10

1211 Ludington St.
Escanaba, MI 49829
O: 906.233.9360
www.c2ae.com

November 13, 2019

Earl Meshigaud, Hannahville Indian Community
N-14911 Hannahville B1 Rd.
Wilson, MI 49896

Re: City of Gladstone, Michigan
Delta County
Wastewater Treatment Plant Improvements
To Evaluate Needs and Recommend Alternatives for Improvements
Environmental Review and Evaluation

Dear Mr. Meshigaud,

On behalf of the City of Gladstone, Delta County, we are requesting review and comment of plans for improvements to their existing wastewater treatment plant.

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Sincerely,
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Ashley N. Hendricks, E.I.T.

Enclosure
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architecture • engineering

1211 Ludington St.
Escanaba, MI 49829
O: 906.233.9360
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January 14, 2020

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Wilson, MI 49896

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Delta County
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Enclosure
cc: 17-0120 File B-10

1211 Ludington St.
Escanaba, MI 49829
O: 906.233.9360
www.c2ae.com

November 13, 2019

Daisy McGeshick, THPO
P.O. Box 249
Watersmeet, MI 49969

Re: City of Gladstone, Michigan
Delta County
Wastewater Treatment Plant Improvements
To Evaluate Needs and Recommend Alternatives for Improvements
Environmental Review and Evaluation

Dear Ms. McGeshick,

On behalf of the City of Gladstone, Delta County, we are requesting review and comment of plans for improvements to their existing wastewater treatment plant.

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C2AE

Ashley N. Hendricks, E.I.T.

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Escanaba, MI 49829
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P.O. Box 249
Watersmeet, MI 49969

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To Evaluate Needs and Recommend Alternatives for Improvements
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C2AE

Ashley N. Hendricks, E.I.T.

Enclosure
cc: 17-0120 File B-10

1211 Ludington St.
Escanaba, MI 49829
O: 906.233.9360
www.c2ae.com

November 13, 2019

Melissa Wiatrolik, THPO
7500 Odawa Cir.
Harbor Springs, MI 49740

Re: City of Gladstone, Michigan
Delta County
Wastewater Treatment Plant Improvements
To Evaluate Needs and Recommend Alternatives for Improvements
Environmental Review and Evaluation

Dear Ms. Wiatrolik,

On behalf of the City of Gladstone, Delta County, we are requesting review and comment of plans for improvements to their existing wastewater treatment plant.

The City of Gladstone is preparing an EGLE SRF Program Project Plan to evaluate needs and recommended alternatives for improvements to the Wastewater Treatment Plant. The treatment plant is in T40N, R22W, Section 22.

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Sincerely,
C2AE

Ashley N. Hendricks, E.I.T.

Enclosure
cc: 17-0120 File B-10

1211 Ludington St.
Escanaba, MI 49829
O: 906.233.9360
www.c2ae.com

January 14, 2020

Melissa Wiatrolik, THPO
7500 Odawa Cir.
Harbor Springs, MI 49740

Re: **City of Gladstone, Michigan**
Delta County
Wastewater Treatment Plant Improvements
To Evaluate Needs and Recommend Alternatives for Improvements
Environmental Review and Evaluation

Dear Ms. Wiatrolik,

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Ashley N. Hendricks, E.I.T.

Enclosure
cc: 17-0120 File B-10

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1211 Ludington St.
Escanaba, MI 49829
O: 906.233.9360
www.c2ae.com

November 13, 2019

Colleen Medicine, Cultural Repatriation Specialist
523 Ashmun St.
Sault Ste Marie, MI 49783

Re: City of Gladstone, Michigan
Delta County
Wastewater Treatment Plant Improvements
To Evaluate Needs and Recommend Alternatives for Improvements
Environmental Review and Evaluation

Dear Ms. Medicine,

On behalf of the City of Gladstone, Delta County, we are requesting review and comment of plans for improvements to their existing wastewater treatment plant.

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Sincerely,
C2AE

Ashley N. Hendricks, E.I.T.

Enclosure
cc: 17-0120 File B-10

1211 Ludington St.
Escanaba, MI 49829
O: 906.233.9360
www.c2ae.com

January 14, 2020

Colleen Medicine, Cultural Repatriation Specialist
523 Ashmun St.
Sault Ste Marie, MI 49783

Re: City of Gladstone, Michigan
Delta County
Wastewater Treatment Plant Improvements
To Evaluate Needs and Recommend Alternatives for Improvements
Environmental Review and Evaluation

Dear Ms. Medicine,

On behalf of the City of Gladstone, Delta County, we are requesting review and comment of plans for improvements to their existing wastewater treatment plant.

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Sincerely,
C2AE

Ashley N. Hendricks, E.I.T.

Enclosure
cc: 17-0120 File B-10

Appendix C

Part 4: Facility Discharge Permits

4. Facility Discharge Permit

The proposed project does not require the current NPDES permit to be modified. A copy of the current NPDES permit (Permit No. MI0057676) can be found in Appendix B. The proposed new outfall would replace the old outfall in the same location, and because of this, it is not anticipated that a new or modified NPDES permit would be required.

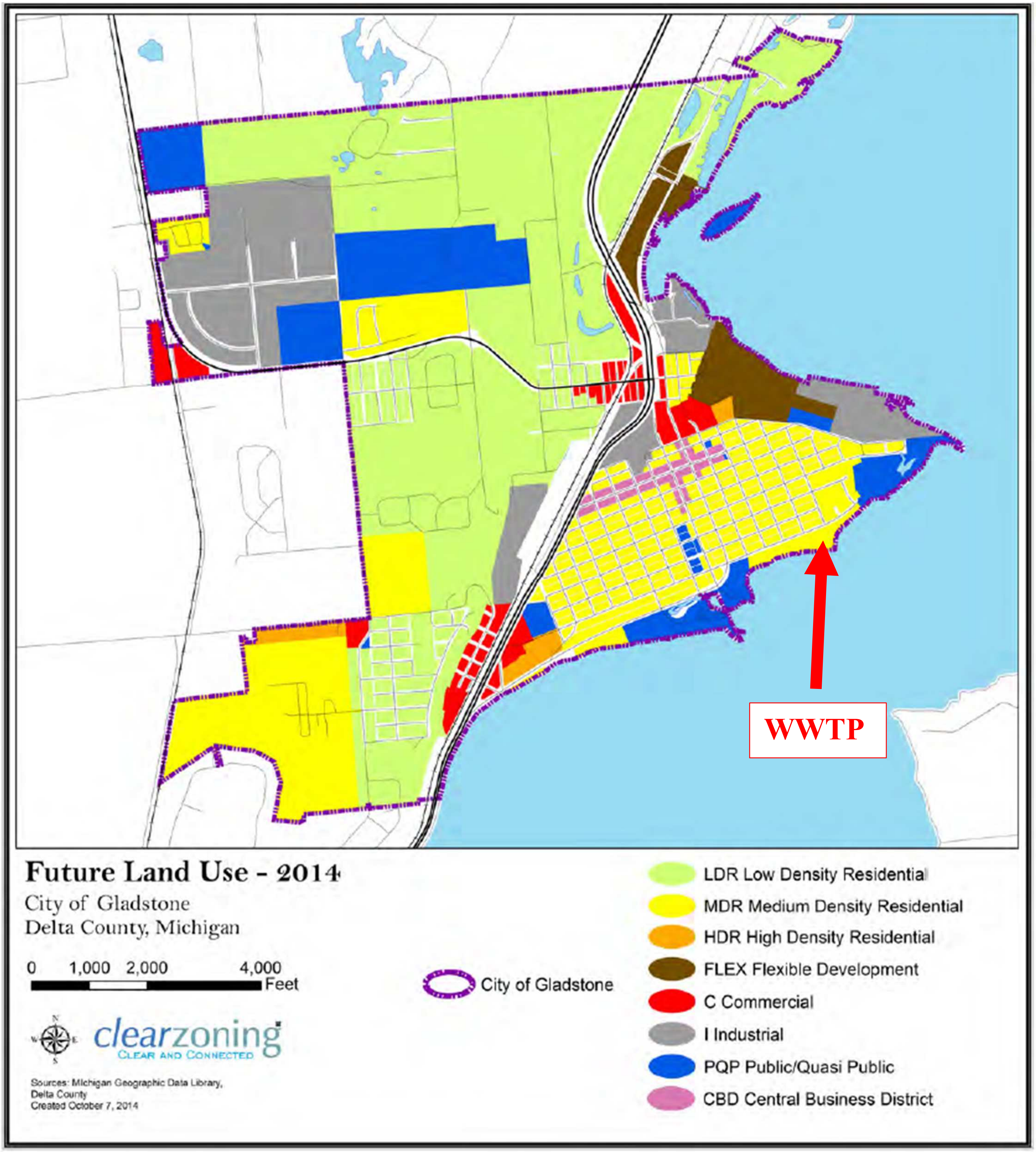
Appendix C

Part 5: Farmland and Open Space Preservation

1211 Ludington St.
Escanaba, MI 49829
O: 906.233.9360
www.c2ae.com

5. Farmland and Open Space Preservation

A map of the Land Uses in the City of Gladstone from the 2015 Master Plan illustrates that project location is not in the vicinity of agricultural lands nor will it impact agricultural lands.


WWTP
Future Land Use - 2014
City of Gladstone
Delta County, Michigan
0 1,000 2,000 4,000 Feet
City of Gladstone
LDR Low Density Residential
MDR Medium Density Residential
HDR High Density Residential
FLEX Flexible Development
C Commercial
I Industrial
PQP Public/Quasi Public
CBD Central Business District
clearzoning
CLEAR AND CONNECTED
Sources: Michigan Geographic Data Library,
Delta County
Created October 7, 2014

Appendix C

Part 6: Health Department Permits

1211 Ludington St.
Escanaba, MI 49829
O: 906.233.9360
www.c2ae.com

6. Health Department Permits

The proposed project does not involve the construction, alteration, extension, or replacement of onsite septic systems. Thus the local health department was not contacted.

Appendix C

Part 7: Lagoon Berm Permits

1211 Ludington St.
Escanaba, MI 49829
O: 906.233.9360
www.c2ae.com

7. Lagoon Berm Permits

The proposed project will not impact a lagoon as defined where the berm encloses more than five acres. Thus the DEQ WRD Damstaff was not contacted.

Appendix C

Part 8: National Natural Landmarks

1211 Ludington St.
Escanaba, MI 49829
O: 906.233.9360
www.c2ae.com

8. National Natural Landmarks

A list of national natural landmarks was reviewed, the following three designated National Natural Landmarks in the Upper Peninsula of Michigan were found:

1. Dukes Research Natural Area (Marquette County): 231 acres in the U.S. Forest Service Upper Peninsula Experimental Station, 22 miles southeast of Marquette near Maple Grove.
2. Porcupine Mountains (Gogebic and Ontonagon Counties): 47,761 acres on the southern shore of Lake Superior, 14 miles north of Wakefield.
3. Strangmoor Bog (Schoolcraft County): 9,700 acres within the Seney National Wildlife Refuge, 14 miles southwest of Seney.

None of which are near the vicinity of the project location.

Appendix C

Part 9: Project Site Contamination

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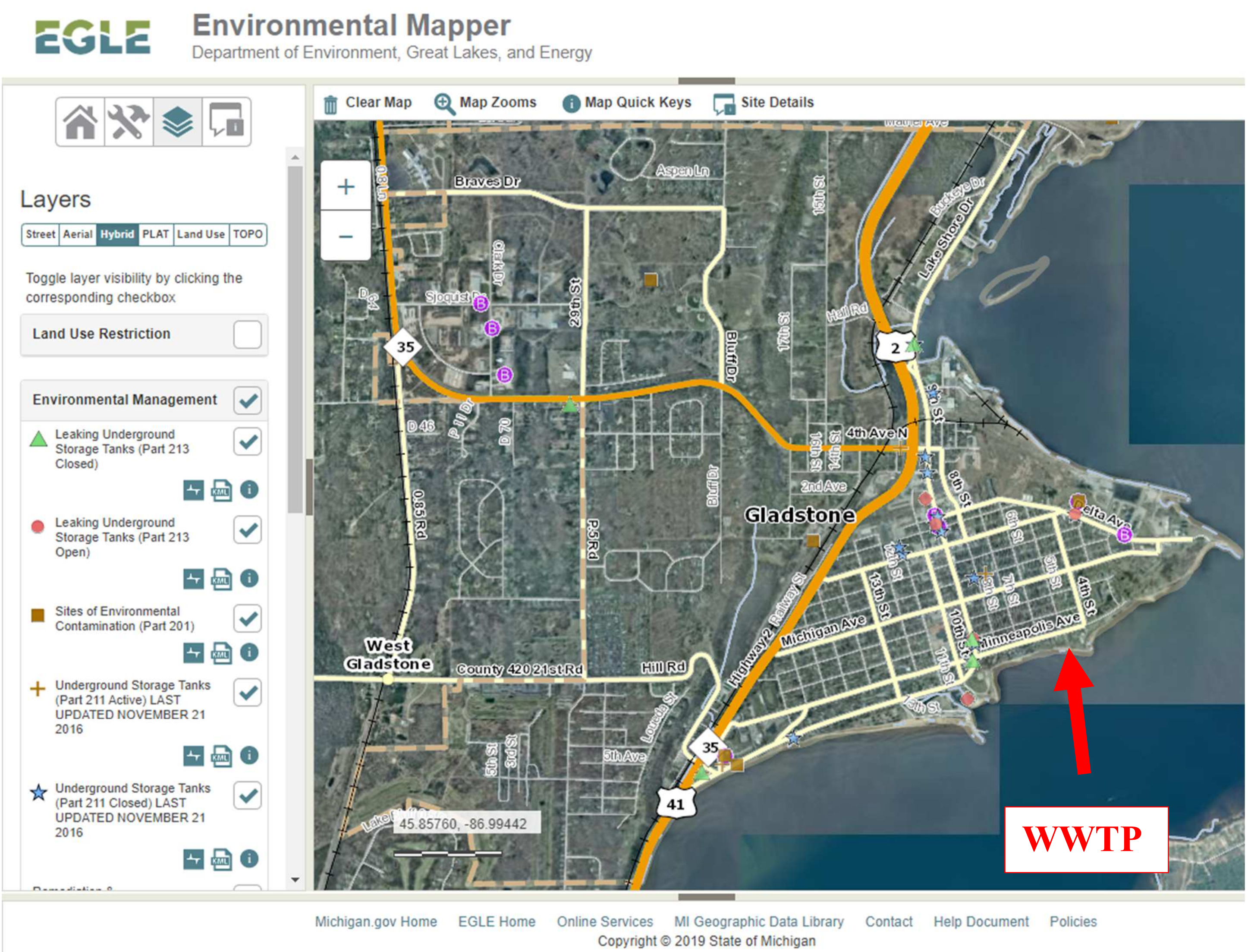
architecture • engineering

1211 Ludington St.
Escanaba, MI 49829
O: 906.233.9360
www.c2ae.com

9. Project Site Contamination

Construction of the project plan is not expected to involve any site contamination or cleanup issues. The MDEQ Environmental Mapper was used to examine for potential areas with contamination (see map below). There are no known areas with hazardous building materials at the WWTP. However, an environmental investigation is planned, and if found, appropriate mitigation measures will be followed when handling hazardous building materials.



Appendix C

Part 10: Protected Plants and Animals

1211 Ludington St.
Escanaba, MI 49829
O: 906.233.9360
www.c2ae.com

November 14, 2019

Michigan Natural Features Inventory
PO Box 13036
Lansing, MI 48901-3036

Re: City of Gladstone, Michigan
Delta County
Wastewater Treatment Plant Improvements
To Evaluate Needs and Recommend Alternatives for Improvements
Environmental Review and Evaluation

Dear Mr. or Ms.,

On behalf of the City of Gladstone, Delta County, we are requesting review and comment of plans for improvements to their existing wastewater treatment plant.

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Sincerely,
C2AE

Ashley N. Hendricks, E.I.T.

Enclosure
cc: 17-0120 File B-10

MICHIGAN STATE UNIVERSITY | Extension

Information Agreement

The Michigan Natural Features Inventory (MNFI) is a member of the Natural Heritage Program Network and is part of Michigan State University Extension. MNFI is an organization of professionals dedicated to the conservation of Michigan's special natural features. MNFI has the responsibility for inventorying and collecting information about the state's "elements of biological diversity". These data are used to guide conservation and land management activities throughout the state.

MNFI manages an ongoing and continuously updated information and research database. The database is proprietary and the most comprehensive single source of existing information on Michigan's endangered, threatened, or otherwise significant plant and animal species, natural plant communities, and other natural features. This database cannot provide a definitive statement on the presence, absence, or condition of the natural features in any given locality, since most sites have not been specifically or thoroughly surveyed. Furthermore, plant and animal populations and natural communities change with time. Therefore, the information services provided should not be regarded as a complete statement on the occurrence of special natural features of the area in question. In many cases the information may require the interpretation of a trained scientist.

The recipient(s) of the information understand that state endangered and threatened species are protected under state law (Act 451 of 1994, the Natural Resources and Environmental Protection Act, Part 365, Endangered Species Protection). Any questions, observations, new findings, violations or permitting of project activities should be conducted with the Michigan Department of Natural Resources, Wildlife Division. Contact the Endangered Species Coordinator at (517) 284-6194. The recipient(s) of the information understand that federally endangered and threatened species are protected under federal law (Endangered Species Act of 1973). Any questions, observations, new findings, violations or permitting of project activities should be conducted with the U.S. Fish and Wildlife Service in East Lansing. Their phone number is (517) 351-2555. Recipients of the information are responsible for ensuring the protection of protected species before project activities begin.

MNFI is a not-for-profit entity and fees for the data are turned back into database maintenance and program support. The costs for information can be obtained on our website MNFI.ANR.MSU.EDU under the services heading.

By acceptance of the information services made available through MNFI, the recipient understands that access to the information is provided for primary use only. MNFI requests that the user respect the confidential and sensitive nature of the information and restrict access to only those individuals requiring the information for the primary use. There should be no redistribution of the information. Distribution of information regarding locations of many rare species represents a threat to their protection. Additionally, since the information is constantly being updated MNFI requests that any information service provided by MNFI is destroyed upon completion of the primary use. This information should be considered valid for one year only.

The user should identify MNFI as information contributors on any map or publication using MNFI information, as follows: **Michigan Natural Features Inventory. [Year]. Biotics 5 - Michigan's Natural Heritage Database. Lansing, Michigan. (Accessed: Month Day, Year).** Abbreviations are acceptable on maps if referenced in full on accompanying documents.

MSU EXTENSION

Michigan Natural Features Inventory

P.O. Box 13036
Lansing, MI 48901

(517) 284-6200
fax: (517) 373-9566

mnfi.anr.msu.edu

Rare Species Review #2509 - Wastewater Treatment Plant Upgrades, City of Gladstone, Delta County, MI

☒ Standard turn around

☐ Eight-day turn around

Project or primary use of Information: Review of data for potential impacts to protected and rare species

Description of information: For the intended area (T40N R22W Section 22) and 1.5 miles surrounding

Ashley Hendricks
Recipient (Please Print)

Signature

C2AE
Organization/Association

11/14/19
Date

November 14, 2019

Ashley Hendricks, EIT
C2AE
1211 Ludington Street
Escanaba, MI 49829
O: 906-217-1014

Rare Species Review - INVOICE #:2509

Wastewater Treatment Plant Upgrades City of Gladstone Delta County, MI T40N R22W Section 22	$340.00 Standard order

*Please note: Prices will change as of October 1st.

Payment Options:

If you would like to pay with credit card you can go out to the MNFI web site and use MSU's secure credit card server. Under the Information Requests section you will see the Credit Card Payment heading, a link to this site is listed below. Please enter your own information and submit your payment accordingly. If you have any questions feel free to contact the MNFI staff person you have been working with

Link to credit card payment:
http://mnfi.anr.msu.edu/services/rare-species-review.cfm

If paying with check or money order, please make payable to Michigan State University. If needed, our Federal Identification Number is 38-6005984

Mail to: Michigan Natural Features Inventory
P.O. Box 13036
Lansing, MI 48901-3036

MSU EXTENSION

Michigan Natural Features Inventory

P.O. Box 13036
Lansing, MI 48901

(517) 284-6200
fax: (517) 373-9566

mnfi.anr.msu.edu

Ms. Ashley Hendricks, EIT
C2AE
1211 Ludington Street
Escanaba, MI 49829
(906) 217-1014

December 2, 2019

Re: Rare Species Review #2509 – Wastewater Treatment Plant Improvements, City of Gladstone, Delta County, MI (T40N, R22W Section 22).

Ms. Hendricks:

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.

At-risk species have been documented within 1.5 miles of the project site. However, the occurrences are Historic and/or far removed from the proposed activity 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

PO Box 13036
Lansing MI 48901

(517) 284-6200
Fax (517) 373-9566

mnfi.anr.msu.edu

Comments for Rare Species Review #2509: 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, Michigan DNR Wildlife Division, 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.

Please consult MNFI's Rare Species Explorer for additional information regarding the table below.

Table 1: Occurrences of threatened & endangered species within 1.5 miles of RSR #2509

ELCAT	SNAME	SCOMNAME	USESA	SPROT	G_RANK	S_RANK	FIRSTOBS	LASTOBS
Animal	*Hiodon tergisus*	Mooneye		T	G5	S1	1938-09-18	1938-09-18

Of concern: no concerns with these listed species.

Codes to accompany Tables:

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.

Section 7 Comments for Rare Species Review #2509
C2AE
WWTP Improvements
City of Gladstone
Delta County, MI
December 2, 2019

<u>For projects involving Federal funding or a Federal agency authorization</u>

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 eight (8) federally listed species which have been identified by the U.S. Fish and Wildlife Service (USFWS) to occur in Delta County, Michigan:

<u>Federally Endangered</u>

Gray wolf – there does not appear to be suitable habitat within the 1.5-mile search buffer. The gray wolf (*Canis lupus*) is the largest member of the Canid (dog) family, which includes coyotes, red fox and gray fox. Wolves have no specific habitat requirements, other than minimal disturbance from humans and a sufficiently large mammal prey base (primarily white-tailed deer but also snowshoe hare, beaver, and other mammals). Gray wolves require large extensive tracts of contiguous forests in which to range; home ranges are over 100 mi^2.

Management and Conservation: general management recommendations for the gray wolf include maintaining large areas of mature vegetation, maintaining a healthy prey base (primarily deer), and reducing probability of encounters with humans (settlements as well as roads). One of the greatest threats is an anti-wolf attitude by the general public based on erroneous beliefs. Education and outreach to increase public awareness and understanding of gray wolf ecology, behavior and management would enhance conservation efforts for this species.

Piping plover – there does not appear to be suitable habitat within the 1.5-mile search buffer. In the Great Lakes region, the piping plover (*Charadrius melodus*) prefers to nest and forage on sparse or non-vegetated sand-pebble beaches, averaging 100 feet in width. Vegetative cover is usually less than 5 %. Associated bodies of water and interdunal wetlands enhance these areas by increasing food availability. Optimal foraging areas are especially crucial along Lake Superior, where shoreline and benthic invertebrate communities are known to be naturally sparse. Nests are generally placed in level areas between the water's edge and the first dune. While feeding, open shoreline is preferred to vegetated beach areas. Piping plovers begin arriving in mid- to late-April. The nesting season is under way by mid-May and lasts until mid-August. The nests are simple depressions in the sand and are difficult to see. This species is declining throughout the Midwest due to habitat destruction and disturbance. People walking on the beach may inadvertently destroy nests. Dogs on the beach can be especially dangerous for chicks and adults.

Management and Conservation: this species is declining throughout the Midwest due to habitat destruction and disturbance. The nests are simple depressions in the sand and are difficult to see. People walking on the beach may inadvertently destroy nests. Dogs on the beach can be especially dangerous for chicks and adults. Piping plovers are protected under the Federal Endangered Species Act and are very sensitive to human disturbance. Please avoid activity along the shoreline in this compartment between May and September.

Kirtland's warbler – there does not appear to be suitable habitat within the 1.5-mile search buffer. The Kirtland's warbler (*Setophaga kirtlandii*) is dependent upon large, relatively homogenous stands of jack pine with scattered small openings. Stands less than 80 acres in size are seldom occupied. Warblers will start using a jack pine stand when the height of the trees reaches 5 to 7 feet. Nests are built on the ground, concealed in the low cover of grasses, sedges, blueberries, and other ground cover vegetation. Once jack pines reach a height greater than 18 feet, the lower branches begin to die and the ground cover vegetation changes in composition, thereby leading to unfavorable nesting conditions. Kirtland's warbler feed on flying insects, larvae, and ripe berries. The majority of male Kirtland's warblers arrive on Michigan breeding grounds in early to mid-May. The warbler migrates to the Bahama Archipelago in late August and September.

Management and Conservation: each year several thousand acres of jack pines are burned (occasionally), seeded, planted, and commercially harvested on a 50-year rotation cycle. This system is designed to provide enough suitable nesting habitat at all times to support the target population of 1,000 singing males. Kirtland's warbler breeding habitat is short-lived and progresses rapidly to an unsuitable condition as the trees age, so continuous intensive management practices cannot stop once reclassification or delisting occurs. Occupied Kirtland's warbler habitats are closed to visitors during the May 1 through August 15 (September 10 for selected areas) breeding season except for guided tours originating from the Grayling Holiday Inn or U.S. Forest Service District Ranger Office in Mio.

Federally Threatened

Northern long-eared bat - Northern long-eared bat (*Myotis septentrionalis)* numbers in the northeast US have decline 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 as well. 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.

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 appears to be suitable habitat within the 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.

Lynx – there does not appear to be suitable habitat within the 1.5-mile search buffer. With its large paws and long hind legs, the Canada lynx (*Lynx canadensis*) is adapted to hunting its primary prey, the snowshoe hare (*Lepus americanus*). Lynx and hares are associated with moist, cool, boreal spruce-fir forests. Hares require forests with dense understories that provide food and cover, especially during periods of deep snow. Snowshoe hares comprise a majority of the lynx diet throughout its range. Lynx prey opportunistically on other small mammals, particularly red squirrels (*Tamiasciurus hudsonicus*), and birds, especially when hare numbers are low. Canada lynx experience widespread food shortages and many die of starvation or abandon home ranges to search for adequate prey.

Management and Conservation: any management that promotes snowshoe hare populations while retaining large blocks of conifers on the larger landscape will likely benefit this species. It is quite shy of humans, so areas of minimal intrusion (roads, snowmobile trails, campsites, etc.) should be maintained. The species is still threatened by illegal poaching, natural population lows combined with continued human-induced mortality, mismanagement of mature coniferous forests, and incidental trapping.

Dwarf lake Iris – there appears to be suitable habitat within the 1.5-mile search buffer. Dwarf lake iris (*Iris lacustris*) usually occurs near Great Lakes shorelines on sand or in thin soils over calcareous gravel or bedrock. It tolerates full sun to nearly complete shade, but appears to flower best in semi-open edge or ecotonal habitats, typically amongst scattered trees or on shoreline forest margins where is occurs with northern white cedar (*Thuja occidentalis*) and balsam fir (*Abies balsamea*). Dwarf lake iris is almost invariably associated with northern white cedar, though spruce (principally white spruce, *Picea glauca*), balsam fir, and trembling aspen *(Populus tremuloides)* may also be present in the overstory. This species has demonstrated that under certain conditions it can readily spread into artificially cleared areas with dryish, calcareous substrates, where it may clone aggressively. This species usually flowers from mid-May to early June, depending on site exposure and annual weather variations. Each flower remains open approximately three days.

Management and Conservation: since *Iris lacustris* is largely restricted to the Great Lakes shores, it is highly vulnerable to ongoing shoreline development and intensive recreation. Fortunately, this species is a persistent and rather ecologically resilient plant, and can often withstand less-than-catastrophic disturbances (e.g. overstory removal, occasional trampling, shading). It is clearly sensitive to mechanical disturbance or removal of its substrate but can often recolonize small disturbed areas if it flourishes nearby.

Pitcher's thistle – there does not appear to be suitable habitat within 1.5 miles of the search buffer. Pitcher's thistle (*Cirsium pitcheri*) grows on the open and grassland sand dunes and along the shorelines of Lakes Michigan, Superior and Huron. It is occasionally found on lag gravel associated with dunes. It is mainly found in near-shore plant communities but can also grow in all non-forested areas of a dune system. This monocarpic (once-flowering) plant produces a rosette that will mature to flowering in 2-8 years, after which the plant dies. Seeds germinate in June, and most seedlings (rosettes) appear within 1-3 meters of parent plants. The taproot of this thistle, which can reach 2 m in length, enhances its ability to survive the often desiccating conditions of its dune habitat. Pitcher's thistle blooms from approximately late-June to early September. The blooms are pollinated by insects mainly bees; some thirty insect species have been observed visiting the blooms.

Management and Conservation: - Pitcher's thistle can be locally extirpated by destruction or major disturbance of its habitat (e.g. by shoreline development, vehicular or ORV traffic, heavy foot traffic and/or intensive recreation).

USFWS Section 7 Consultation Technical Assistance can be found at:

https://www.fws.gov/midwest/endangered/section7/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

1211 Ludington St.
Escanaba, MI 49829
O: 906.233.9360
www.c2ae.com

January 14, 2020

Michigan Natural Features Inventory
PO Box 13036
Lansing, MI 48901-3036

Re: **City of Gladstone, Michigan**
Delta County
Wastewater Treatment Plant Improvements
To Evaluate Needs and Recommend Alternatives for Improvements
Environmental Review and Evaluation

Dear Mr. or Ms.,

On behalf of the City of Gladstone, Delta County, we are requesting review and comment of plans for improvements to their existing wastewater treatment plant.

The City of Gladstone is preparing an EGLE SRF Program Project Plan to evaluate needs and recommended alternatives for improvements to the Wastewater Treatment Plant. The treatment plant is in T40N, R22W, Section 22. The scope of the project has been revised since the letter sent on November 14, 2019. The project now includes a new outfall, starting at the wastewater treatment plant on the shores of Little Bay de Noc, extending 800 feet offshore.

We have enclosed a Project Summary and Location Maps. We are requesting your review and comment. Comments received within 30 days will allow them to be incorporated into the project plan prior to the preparation of the final SRF Project Plan.

Comments can be mailed to our Escanaba office or emailed to ashley.hendricks@c2ae.com.

Sincerely,
C2AE

Ashley N. Hendricks, E.I.T.

Enclosure
cc: 17-0120 File B-10

Hendricks, Ashley

From: Sanders, Mike (DNR-Contractor) <SandersM1@michigan.gov>
Sent: Monday, January 20, 2020 1:52 PM
To: Hendricks, Ashley
Subject: RE: Rare Species Review for City of Gladstone WWTP (Revise to Review #2509)

Hi Ashley,

The advised project will not need a new review.
You are good to go.

Thank you for checking!

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

From: Hendricks, Ashley <ashley.hendricks@C2AE.COM>
Sent: Tuesday, January 14, 2020 12:03 PM
To: mnfi@msu.edu
Subject: Rare Species Review for City of Gladstone WWTP (Revise to Review #2509)

Good Morning,

On November 14, 2019, on the behalf of the City of Gladstone, I requested a rare species review for the City's SRF Project Plan. The scope of the project has been revised since the review took place. The project now includes a new outfall, starting at the wastewater treatment plant on the shores of Little Bay de Noc of Lake Michigan, extending 800 feet offshore. It will be in the same disturbed location as the previous outfall.

On the documents provided by MNFI on December 12, 2019, this was review #2509. I have attached the documents that were originally sent to us for the initial rare species review. Will the addition of an outfall to project require a new species review to take place? If so, please use attached documents summarizing the project and maps of the project. This would not require a rush order.

Thank you,

Ashley Hendricks, EIT
Civil Engineer

1211 Ludington St.
Escanaba, MI 49829
O: 906.233.9360
www.c2ae.com

10. Protected Plants and Animals

The U.S. Fish and Wildlife Services technical assistance website on Section 7 Endangered Species Act Consultation was used to determine if the project will impact any federally listed species. According to the website, there may be the following endangered and/or threatened species present in Delta County: Canada Lynx, Gray Wolf, Northern Long-eared Bat, Piping Plover, Red Knot, Dwarf Lake Iris, and Pitcher's Thistle. There were no critical habitats found at the Action Area location. Also possibly present in Delta County includes the migratory birds: Bald Eagle, Cape May Warbler, Lesser Yellowlegs, Red-headed Woodpecker, and Rusty Blackbird. Furthermore, there are no refuge lands, fish hatcheries, or known wetlands at the location.

The action area will be limited to already developed area (an area that is already paved or supports structures and the only vegetation is limited to frequently mowed grass or conventional landscaping) and will not involve removing native vegetation. Therefore, this project will not affect suitable habitat for federally listed species. For these reasons, it can be concluded that the project will have "no effect" on listed species, their habitats, or proposed or designated critical habitat.

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S7 Consultation Technical Assistance

Decision Process for "No Effect" Determinations

Projects within a Develped Area - Step 6

Step 6. "No Effect" Determination and Documentation

Your project will have "no effect" on federally listed species. A "No Effect" determination is appropriate because your project is

- within a Developed Area (an area that is already paved or supports structures and the only vegetation is limited to frequently mowed grass or conventional landscaping), and
- does not involve removing native vegetation.

Since it will not affect suitable habitat for listed species, no listed species or designated critical habitat is anticipated to be directly or indirectly affected by this action.

To document your section 7 review and "no effect" determination, we recommend that you print this page (go to File<Print Preview), fill-in the project name and date, attach your species list, and file in your administrative record.

Project Name: Gladstone WWTP SRF Project Plan

Date: January 20, 2020

Back
Home - "No Effect" Determination Process

In the Midwest

USFWS Midwest Home

Midwest Ecological Services Home

Contact Us

Section 7 Consultation

Section 7 Home

Section 7: A Brief Explanation

Section 7: Technical Assistance

IPaC **U.S. Fish & Wildlife Service**

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

Delta County, Michigan

Local office

Michigan Ecological Services Field Office

(517) 351-2555
(517) 351-1443

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

http://www.fws.gov/midwest/endangered/section7/s7process/step1.html

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population, even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

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1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information.
2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS

Canada Lynx Lynx canadensis There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/3652	Threatened
Gray Wolf Canis lupus There is **final** critical habitat for this species. The location of the critical habitat is not available. https://ecos.fws.gov/ecp/species/4488	Endangered
Northern Long-eared Bat Myotis septentrionalis No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9045	Threatened

Birds

NAME	STATUS
Piping Plover Charadrius melodus There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/6039	Endangered
Red Knot Calidris canutus rufa This species only needs to be considered if the following condition applies: • Only actions that occur along coastal areas during the Red Knot migratory window of MAY 1 - SEPTEMBER 30. No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/1864	Threatened

Flowering Plants

NAME	STATUS
Dwarf Lake Iris Iris lacustris No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/598	Threatened
Pitcher's Thistle Cirsium pitcheri No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/8153	Threatened

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

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

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

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

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

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

NAME	BREEDING SEASON (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED,

WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS ELSEWHERE" INDICATES THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.)

Bald Eagle Haliaeetus leucocephalus — Breeds Dec 1 to Aug 31

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.
https://ecos.fws.gov/ecp/species/1626

Cape May Warbler Setophaga tigrina — Breeds Jun 1 to Jul 31

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Lesser Yellowlegs Tringa flavipes — Breeds elsewhere

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9679

Red-headed Woodpecker Melanerpes erythrocephalus — Breeds May 10 to Sep 10

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Rusty Blackbird Euphagus carolinus — Breeds May 10 to Jul 20

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Probability of Presence Summary

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

Probability of Presence (■)

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

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

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

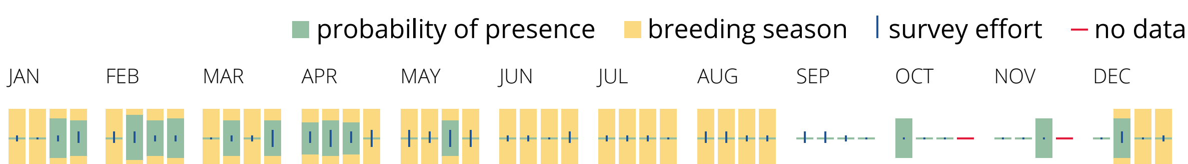
Breeding Season (■)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

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

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

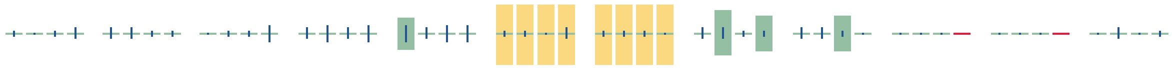
Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



SPECIES

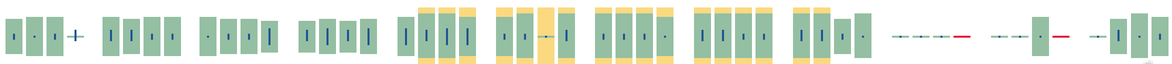
Bald Eagle
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)

Cape May Warbler
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

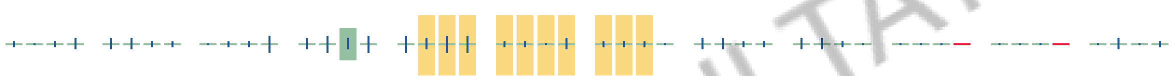


Lesser Yellowlegs
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Red-headed Woodpecker
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



Rusty Blackbird
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



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

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

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

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

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

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

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

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

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

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

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

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

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

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

Details about birds that are potentially affected by offshore projects

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

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

What if I have eagles on my list?

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

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Facilities

National Wildlife Refuge lands

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

THERE ARE NO REFUGE LANDS AT THIS LOCATION.

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

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

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

THERE ARE NO KNOWN WETLANDS AT THIS LOCATION.

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

Appendix C

Part 11: Regional Planning

1211 Ludington St.
Escanaba, MI 49829
O: 906.233.9360
www.c2ae.com

November 18, 2019

Dotty LaJoye
Executive Director
Central Upper Peninsula Planning & Development Regional Commission
2950 College Avenue
Escanaba, MI 49829

Re: **City of Gladstone, Michigan**
Delta County
Wastewater Treatment Plant Improvements
To Evaluate Needs and Recommend Alternatives for Improvements
Environmental Review and Evaluation

Dear Ms. LaJoye,

On behalf of the City of Gladstone, Delta County, we are requesting review and comment of plans for improvements to their existing wastewater treatment plant.

The City of Gladstone is preparing an EGLE SRF Program Project Plan to evaluate needs and recommended alternatives for improvements to the Wastewater Treatment Plant. The treatment plant is in T40N, R22W, Section 22.

We have enclosed a Project Summary and Location Maps. On behalf of the City of Gladstone, we are requesting input regarding the impacts of the proposed project upon local development plans and area wide waste treatment management. Comments received within 30 days will allow them to be incorporated into the project plan prior to the preparation of the final SRF Project Plan.

Comments can be mailed to our Escanaba office or emailed to ashley.hendricks@c2ae.com.

Sincerely,
C2AE

Ashley N. Hendricks, E.I.T.

Enclosure
cc: 17-0120 File B-10

c2ae
architecture + engineering

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Escanaba, MI 49829
O: 906.233.9360
www.c2ae.com

January 14, 2020

Dotty LaJoye
Executive Director
Central Upper Peninsula Planning & Development Regional Commission
2950 College Avenue
Escanaba, MI 49829

Re: City of Gladstone, Michigan
Delta County
Wastewater Treatment Plant Improvements
To Evaluate Needs and Recommend Alternatives for Improvements
Environmental Review and Evaluation

Dear Ms. LaJoye,

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The City of Gladstone is preparing an EGLE SRF Program Project Plan to evaluate needs and recommended alternatives for improvements to the Wastewater Treatment Plant. The treatment plant is in T40N, R22W, Section 22. The scope of the project has been revised since the letter sent on November 18, 2019. The project now includes a new outfall, starting at the wastewater treatment plant on the shores of Little Bay de Noc, extending 800 feet offshore.

We have enclosed a Project Summary and Location Maps. On behalf of the City of Gladstone, we are requesting input regarding the impacts of the proposed project upon local development plans and area wide waste treatment management. Comments received within 30 days will allow them to be incorporated into the project plan prior to the preparation of the final SRF Project Plan.

Comments can be mailed to our Escanaba office or emailed to ashley.hendricks@c2ae.com.

Sincerely,
C2AE

Ashley N. Hendricks, E.I.T.

Enclosure
cc: 17-0120 File B-10

CUPPAD
Central Upper Peninsula Planning And Development Regional Commission

2950 College Ave., Escanaba, MI 49829 • www.cuppad.org • cuppad@cuppad.org
Phone: 906-786-9234

January 16, 2020

Ashley N. Hendricks, E.I.T,
c2ae
1211 Ludington Street
Escanaba, MI 49829

Re: Letter of Consistency for the City of Gladstone: wastewater treatment improvements

Dear Ms. Hendricks:

The Central Upper Peninsula Planning and Development (CUPPAD) Regional Commission supports the City of Gladstone's EGLE SRF Program Project Plan to evaluate the needs of and define improvements to the Gladstone Wastewater Treatment Plant.

With the last significant upgrade to the city's wastewater treatment plant 48 years ago, physical improvements to preserve its reliability would certainly be in order. .

A number of improvements were identified in a recent EGLE SAW grant funded Asset Management Planning report to upgrade the current wastewater treatment plant. The improvements will allow the city to continue providing a level of service to not only the residents of Gladstone but the communities of Rapid River and Kipling with a wastewater system which is in compliance with standards set by the EGLE. The planning for and implementation of the improvements are consistent with the CUPPAD Regional Development Guide and the Central Upper Peninsula's Comprehensive Economic Development Strategy (CEDS).

Goal I of the Regional Water Quality Goals and Policies documented on page X-10 of the CUPPAD Regional Development Guide reads, "To protect and improve the health and well-being of the public in the region." Listed under said goal is Policy I-A stating that "Existing municipal wastewater systems should be maintained and periodically rehabilitated and improved". Leveraging funds to complete the improvements is consistent with Policy III-A of "Federal, state, and local governments should cooperate to the fullest in planning and financing municipal wastewater systems."

The Comprehensive Economic Development Strategy (CEDS) for the central Upper Peninsula serves as a development plan for the region. Tasked with the development of this plan is the CEDS Committee, consisting of representatives from a broad number of regional public, private, and non-profit organizations. Goal 3 of the CEDS Action Plan listed on page 41 is to "Improve infrastructure networks, connectivity, and affordability." This is supported by Strategy 3.5 "Plan for and provided needed utility infrastructure to communities throughout the region."

The project supports a goal identified in the *UPWARD 2025 A Framework for Prosperity,* a ten-year economic development strategy for the central Upper Peninsula. The document acknowledges the aging infrastructure found in the region and has established a goal to "Improve infrastructure networks, connectivity, and affordability."

Based upon our review of the proposed City of Gladstone Wastewater Treatment Plant Improvement (SRF Project Plan) project, is consistent with existing regional plans. The project is also consistent with adopted Commission policies of "Federal, state and local governments should fully cooperate with planning, financing and operating water and wastewater systems."

Sincerely,

Pete Van Steen

Peter Van Steen
Transportation Planner

cc: Eric Buckman, Gladstone City Manager

Appendix C

Part 12: Stormwater Discharge Permits

1211 Ludington St.
Escanaba, MI 49829
O: 906.233.9360
www.c2ae.com

November 13, 2019

Mitch Koetje
EGLE Construction Stormwater Division
1504 W. Washington Street
Marquette, MI 49855

Re: City of Gladstone, Michigan
Delta County
Wastewater Treatment Plant Improvements
To Evaluate Needs and Recommend Alternatives for Improvements
Environmental Review and Evaluation

Dear Mr. Koetje,

On behalf of the City of Gladstone, Delta County, we are requesting review and comment of plans for improvements to their existing wastewater treatment plant.

The City of Gladstone is preparing an EGLE SRF Program Project Plan to evaluate needs and recommended alternatives for improvements to the Wastewater Treatment Plant. The treatment plant is in T40N, R22W, Section 22.

We have enclosed a Project Summary and Location Maps. We are requesting your review and comment. Comments received within 30 days will allow them to be incorporated into the project plan prior to the preparation of the final SRF Project Plan.

Comments can be mailed to our Escanaba office or emailed to ashley.hendricks@c2ae.com.

Sincerely,
C2AE

Ashley N. Hendricks, E.I.T.

Enclosure
cc: 17-0120 File B-10

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January 14, 2020

Mitch Koetje
EGLE Construction Stormwater Division
1504 W. Washington Street
Marquette, MI 49855

Re: **City of Gladstone, Michigan**
Delta County
Wastewater Treatment Plant Improvements
To Evaluate Needs and Recommend Alternatives for Improvements
Environmental Review and Evaluation

Dear Mr. Koetje,

On behalf of the City of Gladstone, Delta County, we are requesting review and comment of plans for improvements to their existing wastewater treatment plant.

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We have enclosed a Project Summary and Location Maps. We are requesting your review and comment. Comments received within 30 days will allow them to be incorporated into the project plan prior to the preparation of the final SRF Project Plan.

Comments can be mailed to our Escanaba office or emailed to ashley.hendricks@c2ae.com.

Sincerely,
C2AE

Ashley N. Hendricks, E.I.T.

Enclosure
cc: 17-0120 File B-10

Hendricks, Ashley

From: Koetje, Mitch (EGLE) <KOETJEM@michigan.gov>
Sent: Thursday, January 16, 2020 10:53 AM
To: Hendricks, Ashley
Cc: Asmus, Tom (DEQ); Soucy, Sean (EGLE)
Subject: RE: Gladstone WWTP Improvements

Hello Ashley,

I received your letter dated 1/14/2020 describing a change in project scope. My comments below remain consistent with the EGLE programs that I help administer in Delta County. Sean Soucy (906-250-0588) helps administer EGLE programs that would be involved with the placement of structures and discharge pipes in and along the Great Lakes. If you have not already done so, please contact him for further details.

Mitch Koetje
Water Resources Division, Marquette District Office
Michigan Department of Environment, Great Lakes, and Energy (EGLE)
906-202-1464 | KoetjeM@Michigan.gov
Follow Us | Michigan.gov/EGLE

From: Koetje, Mitch (EGLE)
Sent: Friday, December 20, 2019 3:27 PM
To: ashley.hendricks@c2ae.com
Cc: Asmus, Tom (EGLE) <AsmusT@michigan.gov>
Subject: Gladstone WWTP Improvements

Hello Ashley,

The proposed project will likely meet one or more of the programs and permitting requirements below. These are only the permit programs that I help to administer so there may certainly be other programs to check into. Please ensure that the project determines the appropriate permit coverage and complies with the programs and rules described below. More detailed information is contained at the website links below. Please let me know if you have any further questions.

Part 91, Soil Erosion and Sedimentation Control, comes in play for any project within 500 feet of a lake or stream regardless of size, or for any project OVER 1 acre in earth disturbance. The City of Gladstone is a Part 91 Authorized Public Agency and is responsible for meeting the Part 91 requirements for projects completed on their property/right of way and are under their contractual control. For more information about Part 91 please visit https://www.michigan.gov/egle/0,9429,7-135-3311_4113-365526--,00.html

All projects with an earth disturbance of 1 acre or greater are required to obtain permit coverage from the local Soil Erosion Permitting Entity or Authorized Public Agency. Sites disturbing equal to or greater than 1 acre, but less than five acres, are also required to follow permit by rule. Coverage is automatic if you are an Authorized Public Agency or covered under a Part 91/Soil Erosion permit, but a certified storm water operator is also required to inspect the site weekly and within 24 hours of a rain event resulting in a discharge of storm water from the site. https://www.michigan.gov/egle/0,9429,7-135-3311_4113-365524--,00.html

Sites disturbing over five acres, with a point source discharge to the waters of the state, are required to obtain permit coverage from the local Soil Erosion Permitting Entity, or be designated an APA, and then submit an application for Notice of coverage (NOC) in MiWaters. Along with the NOC application, the applicant/permittee must submit a copy of the SESC permit, approved SESC plan, site location map, and the appropriate fee to the Department of Environment, Great Lakes, and Energy. https://www.michigan.gov/egle/0,9429,7-135-3311_4113-365525--,00.html

Please let me know if you have any further questions.

Mitch Koetje
Water Resources Division, Marquette District Office
Michigan Department of Environment, Great Lakes, and Energy (EGLE)
906-202-1464 | KoetjeM@Michigan.gov
Follow Us | Michigan.gov/EGLE

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O: 906.233.9360
www.c2ae.com

12. Stormwater Discharge Permit

The proposed project does not involve additional stormwater discharges nor does it include separation of combine sewer system. Construction activities are part of the WWTP upgrades only. Construction activity will be limited to the area encompassing the WWTP footprint or site area. Disturbance during construction will most likely be greater than one acre. Therefore, a Part 91 SESC permit and Notice of Coverage shall be required for this project. The WWTP stormwater runoff is captured into an existing storm sewer and conveyed to Little Bay de Noc of Lake Michigan located to the south of the site. An SESC plan will be prepared to minimize soil erosion and sedimentation leaving the site during construction. Best Management Practices will be incorporated for review and approval by ELGE.


N
WWTP
Stormwater System
Little Bay de Noc of Lake Michigan

Appendix C

Part 13: Water Withdrawal and Dewatering

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Escanaba, MI 49829
O: 906.233.9360
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13. Water Withdrawal and Dewatering

The proposed project will not require consumptive uses or diversions that would result in significant impacts to the water and water dependent natural resources. There is some dewatering that may be needed temporarily during construction. Construction is not anticipated to exceed depths more than twenty feet.

Appendix C

Part 14: Wild and Scenic Rivers

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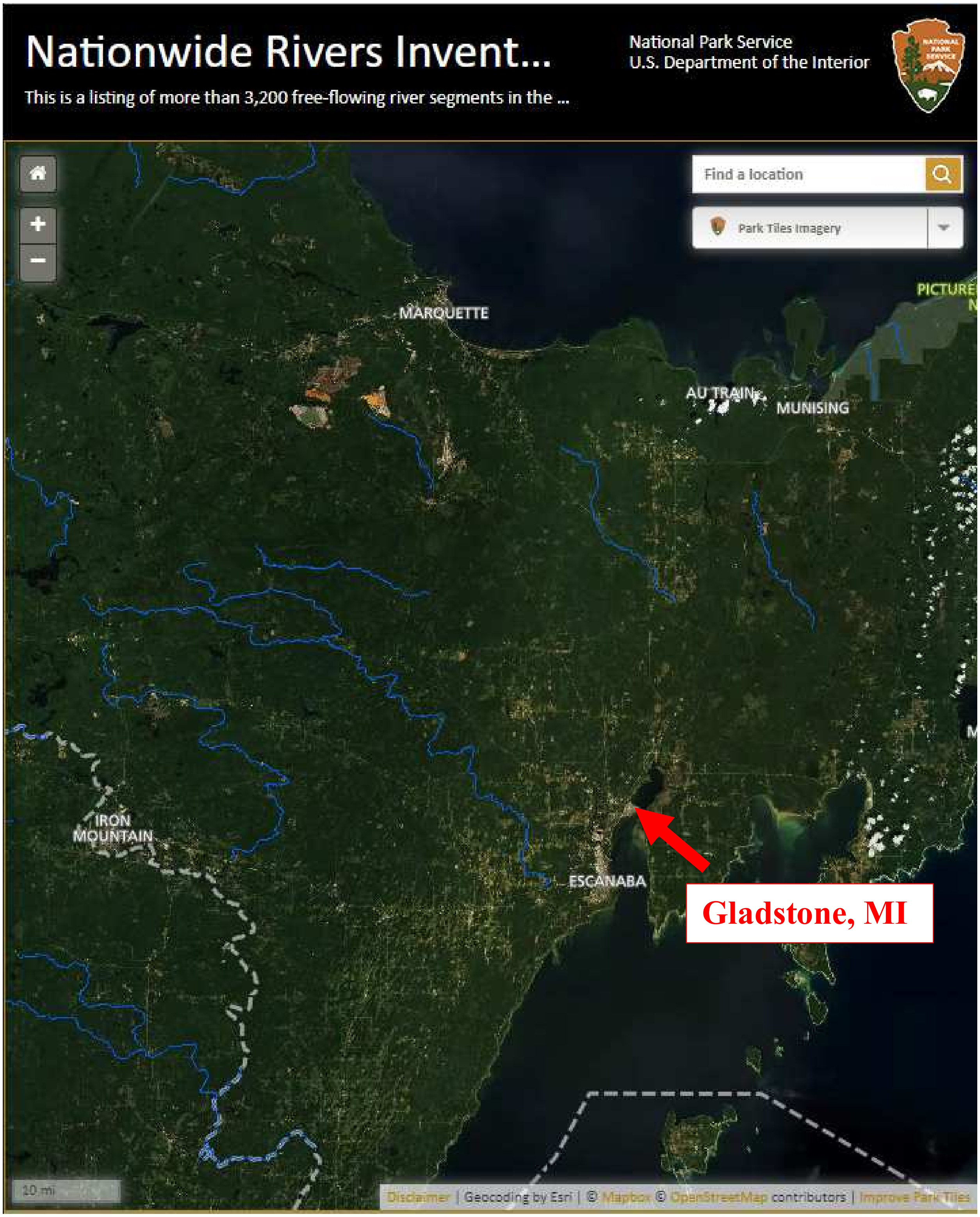
14. Wild and Scenic Rivers

The proposed project will not impact a wild, scenic, or natural river or tributary. Maps illustrating the proximity of the project location to these rivers are shown on the following pages.

National Wild and Scenic Rivers
(https://www.rivers.gov/michigan.php)

National Park Service – Nationwide Rivers Inventory

(https://www.nps.gov/maps/full.html?mapId=8adbe798-0d7e-40fb-bd48-225513d64977)



Michigan's Designated Natural Rivers

(https://www.michigan.gov/dnr/0,4570,7-350-79136_79236_82211---,00.html)

MICHIGAN'S DESIGNATED NATURAL RIVERS

Appendix C

Part 15: Airspace and Airports

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Escanaba, MI 49829
O: 906.233.9360
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15. Airspace and Airports

The Delta County Airport is about 9 miles south of the Gladstone WWTP. The Federal Aviation Administration's Notice Criteria Tool was used to determine if there is a need to apply to the Part 77 Notice Criteria. It was found that there is no exceedance of the Notice Criteria.

The system will be going offline at 7pm ET on Thursday, October 24th 2019 for scheduled upgrades.

Federal Aviation Administration

« OE/AAA

Notice Criteria Tool

Notice Criteria Tool - Desk Reference Guide V_2018.2.0

The requirements for filing with the Federal Aviation Administration for proposed structures vary based on a number of factors: height, proximity to an airport, location, and frequencies emitted from the structure, etc. For more details, please reference CFR Title 14 Part 77.9.

You must file with the FAA at least 45 days prior to construction if:

- your structure will exceed 200ft above ground level
- your structure will be in proximity to an airport and will exceed the slope ratio
- your structure involves construction of a traverseway (i.e. highway, railroad, waterway etc...) and once adjusted upward with the appropriate vertical distance would exceed a standard of 77.9(a) or (b)
- your structure will emit frequencies, and does not meet the conditions of the FAA Co-location Policy
- your structure will be in an instrument approach area and might exceed part 77 Subpart C
- your proposed structure will be in proximity to a navigation facility and may impact the assurance of navigation signal reception
- your structure will be on an airport or heliport
- filing has been requested by the FAA

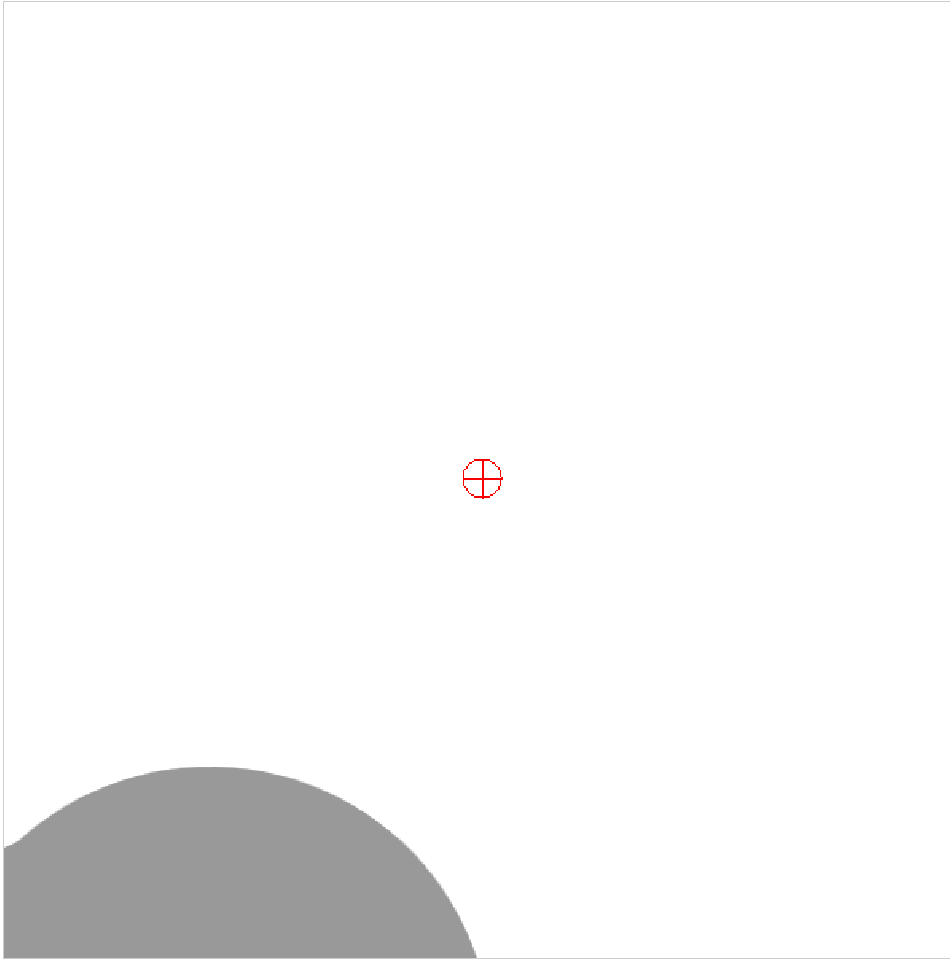
If you require additional information regarding the filing requirements for your structure, please identify and contact the appropriate FAA representative using the Air Traffic Areas of Responsibility map for Off Airport construction, or contact the FAA Airports Region / District Office for On Airport construction.

The tool below will assist in applying Part 77 Notice Criteria.

Latitude:	45 Deg 50 M 34.34 S N
Longitude:	87 Deg 0 M 38.19 S W
Horizontal Datum:	NAD83
Site Elevation (SE):	591 (nearest foot)
Structure Height :	50 (nearest foot)
Traverseway:	No Traverseway (Additional height is added to certain structures under 77.9(c)) User can increase the default height adjustment for Traverseway, Private Roadway and Waterway
Is structure on airport:	(●) No ( ) Yes

Results

You do not exceed Notice Criteria.



Appendix C

Part 16: Land-Water Interfaces

1211 Ludington St.
Escanaba, MI 49829
O: 906.233.9360
www.c2ae.com

November 14, 2019

Ryan McCone
EGLE Water Resources Division
1504 W. Washington Street
Marquette, MI 49855

Re: **City of Gladstone, Michigan**
Delta County
Wastewater Treatment Plant Improvements
To Evaluate Needs and Recommend Alternatives for Improvements
Environmental Review and Evaluation

Dear Mr. McCone,

On behalf of the City of Gladstone, Delta County, we are requesting review and comment of plans for improvements to their existing wastewater treatment plant.

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Comments can be mailed to our Escanaba office or emailed to ashley.hendricks@c2ae.com.

Sincerely,
C2AE

Ashley N. Hendricks, E.I.T

Enclosure
cc: 17-0120 File B-10

Hendricks, Ashley

From: Soucy, Sean (EGLE) <SoucyS@michigan.gov>
Sent: Monday, December 16, 2019 4:27 PM
To: Hendricks, Ashley
Cc: White, Valorie (DEQ)
Subject: Gladstone WWTP SRF Improvements

RE: Gladstone WWTP SRF Improvements
Proposed Project Environmental Review Comments

Dear Ms. Hendricks:

This letter is being provided to you in response to your inquiry dated November 14, 2019 to the Michigan Department of Environment, Great Lakes, and Energy (EGLE) Water Resources Division (WRD) regarding proposed improvements to the Gladstone Wastewater Treatment Plant (WWTP) in Gladstone, Michigan. We understand you are inquiring with EGLE regarding the potential for Great Lakes bottomlands, wetlands, or inland lakes and streams impacts within or near the project area.

Based on a review of the project location and the figures provided by C2AE, we understand and advise the following:

- The proposed project is in close proximity to Lake Michigan. Any dredge, fill, or placement of materials on the bottomlands of Lake Michigan will require a permit under Part 325, Great Lakes Submerged Lands of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended.

- Project plans did not include the complete impact areas. Any impacts to wetlands resulting from excavation (e.g., trenching, dredging, and/or directional drilling), filling, grading or draining activities may require issuance of a permit from EGLE under Part 303, Wetlands Protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended.

We must stress that this information is based only on a desktop review of the information you've provided to date, and that without a formal wetland/waterway determination and/or delineation and review of the proposed project details, it cannot be determined with certainty if an EGLE\WRD permit is required.

We recognize and thank you for your preliminary consultation with EGLE WRD regarding this project. If you need additional information, please contact me at (906) 250-0588 or soucys@michigan.gov.

Sincerely,

Sean Soucy
Environmental Quality Analyst
Water Resources Division
Marquette District Office

Sean Soucy
Water Resources Division – Marquette District Office
Department of Environment, Great Lakes, and Energy
Phone: 906-250-0588
Michigan.gov/EGLE

1211 Ludington St.
Escanaba, MI 49829
O: 906.233.9360
www.c2ae.com

January 14, 2020

Ryan McCone
EGLE Water Resources Division
1504 W. Washington Street
Marquette, MI 49855

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Delta County
Wastewater Treatment Plant Improvements
To Evaluate Needs and Recommend Alternatives for Improvements
Environmental Review and Evaluation

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Comments can be mailed to our Escanaba office or emailed to ashley.hendricks@c2ae.com.

Sincerely,
C2AE

Ashley N. Hendricks, E.I.T

Enclosure
cc: 17-0120 File B-10

Hendricks, Ashley

From: Soucy, Sean (EGLE) <SoucyS@michigan.gov>
Sent: Wednesday, January 15, 2020 2:48 PM
To: Hendricks, Ashley; Holmgren, David; Pionk, Darren
Cc: Parent, Jay (EGLE); Richards, Scott (EGLE); Asmus, Tom (DEQ)
Subject: Gladstone WWTP
Attachments: MiWaters Digital JPA How-To-Apply.pdf

Hello Ashley,

This e-mail is in regard to your January 14, 2020 letter, "Wastewater Treatment Plant Improvements, To Evaluate Needs and Recommend Alternatives for Improvements, Environmental Review and Evaluation". The letter states that a new outfall will be proposed in Lake Michigan, extending 800 feet offshore.

Placing a structure on Great Lakes bottomlands will require review and permitting under the authority of Part 325, *Great Lakes Submerged Lands*. There is a 'minor project' category for outfalls, however, to meet the construction criteria in that category, the outfall must conform to the shoreline slope and not extend into the receiving waters. Because the outfall extends 800 feet into the lake, the permit application will have to be an 'individual permit' with a $500 application fee, and go through a 20-day Public Notice process.

<u>Be sure to include with your permit application:</u>
-Overhead site plan drawing
-Cross section drawing
-Location map
-Volumes and dimensions of the proposed excavation, and dimensions of the outfall pipe
-Construction sequence that includes a plan for dredging, turbidity curtain, dewatering (if needed), etc.

I've attached a guidance document for submitting permit applications using our web-based permitting system, MiWater's. Please let me know if you have further questions.

Sean Soucy
Water Resources Division – Marquette District Office
Department of Environment, Great Lakes, and Energy
Phone: 906-250-0588
Michigan.gov/EGLE

Appendix C

Part 16: Land-Water Interfaces
A. Inland Lakes and Streams

1211 Ludington St.
Escanaba, MI 49829
O: 906.233.9360
www.c2ae.com

16. Land – Water Interfaces

A. Inland Lakes and Streams

It is not anticipated that the project plan will result in the control or structural modification of any natural stream or inland body of water.

Appendix C

Part 16: Land-Water Interfaces
B. Floodplains

1211 Ludington St.
Escanaba, MI 49829
O: 906.233.9360
www.c2ae.com

November 18, 2019

Linda Hansen
EGLE Flood Plain Regulation
1504 W. Washington Street
Marquette, MI 49855

Re: City of Gladstone, Michigan
Delta County
Wastewater Treatment Plant Improvements
To Evaluate Needs and Recommend Alternatives for Improvements
Environmental Review and Evaluation

Dear Ms. Hansen,

On behalf of the City of Gladstone, Delta County, we are requesting review and comment of plans for improvements to their existing wastewater treatment plant.

The City of Gladstone is preparing an EGLE SRF Program Project Plan to evaluate needs and recommended alternatives for improvements to the Wastewater Treatment Plant. The treatment plant is in T40N, R22W, Section 22.

We have enclosed a Project Summary and Location Maps. On behalf of the City of Gladstone, we are requesting your assistance of your office in identifying possible flood plain, and/or permit requirements in the project area relative to construction of the proposed project. Comments received within 30 days will allow them to be incorporated into the project plan prior to the preparation of the final SRF Project Plan.

Comments can be mailed to our Escanaba office or emailed to ashley.hendricks@c2ae.com.

Sincerely,
C2AE

Ashley N. Hendricks, E.I.T.

Enclosure
cc: 17-0120 File B-10

Hendricks, Ashley

From: Hansen, Linda (EGLE) <HansenL6@michigan.gov>
Sent: Thursday, December 19, 2019 12:14 PM
To: Hendricks, Ashley
Subject: RE: Floodplains Consultation - Gladstone WWTP Improvements

Hi Ashley – all of the requirements regarding floodplains- related building requirements in Appendix G of the 2015 (most current year) Michigan Building Code.

I searched through the code quick and found this entry:

G401.3 Sewer facilities All new or replaced sanitary sewer facilities, private sewage treatment plants (including all pumping stations and collector systems) and on-site waste disposal systems shall be designed in accordance with Chapter 7, ASCE 24, to minimize or eliminate infiltration of floodwaters into the facilities and discharge from the facilities into floodwaters, or impairment of the facilities and systems.

I do not administer building code, and therefore I can't answer your questions about how that pertains to WWTP facilities. I just know that there are some standards for 'critical buildings' or "critical facilities" such as WWTPs, drinking water facilities, hospitals, electrical generation facilities, etc. You will need to contact a building official or an engineer who knows the code well. Or you could contact Randy Conroy, Tom Asmus or Scott Richards who are Water Quality staff with EGLE in Marquette who regulate WWTP discharges….

As far as activities that would be regulated by the state (EGLE):

- They would only be in the floodplains of the Days and Rapid Rivers (as they are the only rivers/streams in the work area that are regulated under state floodplain authority found in Part 31).
- And only above ground disturbances, building construction or earthwork would be regulated in those rivers' floodplains and would need a Part 31 permit from EGLE.
- And if you need 100-year floodplain elevations in order to determine if certain above-ground activities are in the 100-year floodplains of the Days and Rapid – you can submit a Floodplain Elevation Request in MiWaters.

So unless you have further questions about Part 31 permitting, there's not much more I can tell you… ?
Let me know…

~Linda

From: Hendricks, Ashley <ashley.hendricks@C2AE.COM>
Sent: Thursday, December 19, 2019 9:53 AM
To: Hansen, Linda (EGLE) <HansenL6@michigan.gov>
Subject: RE: Floodplains Consultation - Gladstone WWTP Improvements

Hi Linda,

Could we setup a meeting to discuss the Floodplain regulations and requirements governing WWTPs that are based on the 100-year floodplain elevation of the nearest water body? After the holidays would probably work best.

Thank you,

Ashley Hendricks, EIT
Civil Engineer

C2AE
architecture | engineering
1211 Ludington Street
Escanaba, MI 49829
O: 906.217.1014

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From: Hansen, Linda (EGLE) [mailto:HansenL6@michigan.gov]
Sent: Monday, December 9, 2019 12:07 PM
To: Hendricks, Ashley <ashley.hendricks@C2AE.COM>
Subject: Floodplains Consultation - Gladstone WWTP Improvements

Hello Ashley,

This letter is being provided to you in response to your November 18, 2019 letter submitted to the Michigan Department of Environment, Great Lakes and Energy (EGLE) Water Resources Division (WRD) inquiring about Part 31 (Floodplains) regulations and/or impacts related to completion of wastewater treatment plant and sewer system improvements within the City of Gladstone and the associated Brampton & Masonville service areas.

Based on the maps and information you have provided, the following information and recommendations are being provided regarding the projects' applicable regulatory authority under Part 31 (Floodplains) of Michigan's Natural Resources and Environmental Protection Act (NREPA):

- **City of Gladstone**:
  a. The Floodplain Authority found in Part 31 applies only to the floodplains of rivers and streams with drainage areas greater than 2.0 square miles (per Rule 312(a) of the Administrative Rules for Floodplains & Floodways). There are no rivers or streams within the City of Gladstone service area that meet this criterion. Therefore, regulation under Part 31 Floodplain Authority is not a concern.

  b. However, other regulations governing wastewater treatment facilities do include design and construction requirements that are based on the 100-year floodplain elevation of the nearest water body (stream, river or lake). Per the FEMA Flood Insurance Rate Map (FIRM) you included with your letter, the current, legally effective 100-year floodplain elevation of Lake Michigan is 585 feet, NAVD 88. <u>Please note</u> that recent changes to FEMA policy have required the use of this flood elevation rounded to the nearest foot (i.e. 585.0 feet, as shown on the FIRM) instead of rounded to the tenth of a foot (i.e. 584.9 feet) as provided in the FEMA Flood Insurance Study (FIS) document.
     i. It is recommended that prior to completing formal design, a Floodplain Elevation Service Request is submitted within MiWaters, for any future construction locations in which knowing the exact 100-year floodplain elevation is critical.

  c. Additionally – FEMA is currently working to re-map the 100-year floodplain elevations of all Great Lakes shorelines in the U.S. These maps are highly detailed and are generated using LIDAR topographic data. Currently draft maps have been made for the entire Lake Michigan shoreline in Delta County, however they are not finalized or "effective" yet, and are therefore legally irrelevant at this time. Based on the last scheduling data provided to me by FEMA:
     i. August 2020 - FEMA should be holding a public workshop for discussing the new coastal flood maps for Delta County.

ii. September 2020 – Preliminary coastal flood maps planned to be published and provided to local units of government.
iii. November 2020 – Estimated final coastal flood maps go effective.
*Note – schedules for map finalization often change, and may have changed since the last schedule was written.

- **Brampton & Masonville Township Service Areas:**
  a. Days River & Rapid River - The 100-year floodplains of the Days River and Rapid River are regulated under the Floodplain Authority as found in Part 31. If needed, it is recommended that a Floodplain Elevation Service Request be submitted within MiWaters in order to obtain official documentation of the river's 100-year floodplain elevation(s) within the Service Area.

  b. It appears no other streams or rivers within this Service Area are regulated under the Floodplain Authority as found in Part 31.

  c. Both comments "b" and "c" under the City of Gladstone regarding the 100-year floodplain elevation(s) of Lake Michigan apply within the Brampton & Masonville Service Areas.

- **Additional Comments:**
  a. Rule 312(j) of the Administrative Rules for Floodplains and Floodways indicates that **utility crossings of a floodplain where the floodplain (i.e. ground surface) will be restored essentially to existing elevations, is exempt from regulation under Part 31**. → Therefore only above-ground disturbances, building construction or earthwork where fill will be placed or ground elevations will be changed, are regulated under Floodplain Authority.

  b. Portions of Michigan Building Code apply to what are called "**Critical Facilities**". Wastewater and Water Treatment Facilities, among others, are classified as such. Building code that applies to these types of facilities often require that design and construction consider the **500-year floodplain elevation** of nearby water bodies. I am unclear at this time if this only applies to rivers and streams (I presume so), or if it also applies to inland lakes & the Great Lakes. If this issue becomes a concern and you need more assistance, please contact me and I can look into it further.

Thank you for your inquiry.

Please let me know if I can be of further assistance,

Linda D. Hansen, PE PWS | UP District Floodplain Engineer | Water Resources Division
47420 State Highway M26, Suite 62, Houghton, MI 49931 | Ph: 906-483-3896
EGLE MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

Hendricks, Ashley

From: Granskog, Andy - RD, East Lansing, MI <andy.granskog@usda.gov>
Sent: Wednesday, January 8, 2020 1:20 PM
To: Richards, Scott (EGLE); Hansen, Linda (EGLE); Pionk, Darren; Rodney Schwartz; Hendricks, Ashley; ebuckman@gladstonemi.org
Cc: Parent, Jay (EGLE); Asmus, Tom (DEQ)
Subject: RE: Gladstone WWTP: MI Building Code FP Regs + Andy (USDA) Federal $ FP Regs

I would add the following:

In our 7 CFR 1970 Subpart F floodplain regulations, like SRF, we also comply with Executive Order 11988. See the clip below regarding Executive Order 11988/13690. Subpart F was issued in 2015. The point is that critical actions or critical facilities (wastewater treatment plants among others) should be to the 0.2 percent annual chance flood elevation which is the 500 year flood elevation. Is it a deal breaker to build to the 500 year? What is the difference in elevation? Half a foot? To my knowledge, RD is not financing this project. If we were it would be the 500-year. I am just throwing in my two cents, not trying to be a troublemaker!

(b) Floodplain Determination. The new impleme
Executive Orders 11988/13690 note that "The mi
Federal actions … is the 1-percent-annual-char
corresponding horizontal floodplain for non-cr
Agencies should continue to use the 0.2-percer
elevation and corresponding horizontal floodpl
Use of these standards has been Agency practic
so until revised guidance is issued.

Andrew H. Granskog, PE | State Engineer
Rural Development
U.S. Department of Agriculture
3001 Coolidge Rd, Suite 200 | East Lansing, MI 48823
Phone: 517.324.5209 www.rd.usda.gov

"Committed to the future of rural communities"
"Estamos dedicados al futuro de las comunidades rurales"

Note: my email is changing to andy.granskog@usda.gov; please update your address book.

From: Richards, Scott (EGLE) <RichardsS3@michigan.gov>
Sent: Wednesday, January 8, 2020 11:35 AM
To: Hansen, Linda (EGLE) <HansenL6@michigan.gov>; darren.pionk@c2ae.com; Rodney Schwartz <RSchwartz@gladstonemi.org>; Hendricks, Ashley <ashley.hendricks@C2AE.COM>; ebuckman@gladstonemi.org
Cc: Parent, Jay (EGLE) <PARENTJ@michigan.gov>; Asmus, Tom (EGLE) <AsmusT@michigan.gov>; Granskog, Andy - RD,

East Lansing, MI <andy.granskog@usda.gov>
Subject: RE: Gladstone WWTP: MI Building Code FP Regs + Andy (USDA) Federal $ FP Regs

Folks,
Valorie White (SRF) returned my call this morning. She indicated SRF uses the 100 year BFE, as per the below image snipped from the attached Project Planning document.

B. Floodplains

Federal **Executive Order 11988**, "Floodplain Management" (42 FR 26951) mandates the evaluation of the potential effects of a federally-assisted project upon floodplains in order to avoid adverse effects associated with direct and indirect development of the floodplains. The executive order further forbids federally-assisted project construction in a 100-year floodplain unless no practicable alternative exists.

Applicant Action

The applicant must indicate in the project plan whether any project construction will occur within the 100-year floodplain. The initial contact letter should include a Federal Emergency Management Agency (FEMA) floodplain map, obtained from the local community, with the areas affected by the proposed construction clearly marked. If a floodplain map is not available, the description of the proposed construction must include the elevation of the ground surface at the construction site and its distance from the water course.

If floodplains may be impacted by the proposed project, the final project plan must include all of the following:

(1) A map showing the 100-year floodplains in the vicinity of the proposed project.

(2) A discussion of the direct and indirect effects of the proposed project upon the floodplains.

(3) A description of the alternate sites or actions that were considered to avoid those effects.

(4) The reasons why the project must be located in or affect the floodplains.

(5) A description of the mitigative measures that will be used to minimize adverse impacts.

(6) A statement of whether or not the project conforms to applicable state or local floodplain protection standards.

All of these items must be discussed at the formal public hearing held prior to the adoption of the final project plan and public notices of scheduled meetings and hearings must mention that floodplains will be affected by the proposed project.

If floodplains will be adversely impacted by the proposed project, the applicant must either select an alternate project site or integrate into the project design the mitigative measures that have been recommended by the DEQ WRD.

Scott Richards, P.E.
Direct: 906.869.1239

Water Resources Division
Michigan Department of Environment, Great Lakes, and Energy
1504 W. Washington Street
Marquette, MI 49855
Follow Us | **Michigan.gov/EGLE**

From: Hansen, Linda (EGLE) <HansenL6@michigan.gov>
Sent: Tuesday, January 7, 2020 5:55 PM

To: Richards, Scott (EGLE) <RichardsS3@michigan.gov>; darren.pionk@c2ae.com; Rodney Schwartz <RSchwartz@gladstonemi.org>; Hendricks, Ashley <ashley.hendricks@C2AE.COM>; ebuckman@gladstonemi.org
Cc: Parent, Jay (EGLE) <PARENTJ@michigan.gov>; Asmus, Tom (EGLE) <AsmusT@michigan.gov>; Granskog, Andy - RD, East Lansing, MI <andy.granskog@usda.gov>
Subject: RE: Gladstone WWTP: MI Building Code FP Regs + Andy (USDA) Federal $ FP Regs
Importance: High

Thanks for summarizing Scott. I read the ASCE 24 tables a bit closer and have a clarification/correction I didn't see earlier today. Here are my thoughts:

1. In using the Guidance in Building Code & ASCE 24 Ch. 7 for a Class 3 facility:
    a. Please see the table on Page 4 of the document Scott sent the link for below.
    b. Look at the 2nd column from the left for the first two rows → The first row, 2nd column says "*Zone A not identified as Coastal A Zone*" → This means the first row does NOT apply to the WWTP because it is in a Coastal A Zone (a coastal AE Zone actually)…i.e. that line refers to Riverine A Zones only.
    c. Therefore it appears that the **2nd row applies** (as well as some of the lower rows) because it says "Coastal High Hazard Areas (Zone V) and Coastal A Zones" → For Class 3 Facility = **BFE + 2 ft. or DFE, whichever is higher** is actually what I think would apply.
        i. Note: in looking at the table **it appears that DFE (Design Flood Elevation) is not the same as 500 year** – so I am seeking clarification on what "DFE" means specifically. **("BFE" means Base Flood Elevation** which is FEMA's term and refers to the 585.0 ft. NAVD 88).
        ii. Also I have a 'feeler' out to FEMA regarding a 500 year elevation for Lake Michigan as Scott said.

2. The items above will need to be fleshed out a bit – but a double check still should made with Andy G. of USDA regarding if the funding requirements dictate use of the 500 yr flood elevation (per NEPA / CFR);
    a. If yes – we will have to compare it to what elevation the building code / ASCE 24 is requiring (and use the higher of the two).
    b. If no – we defer to the building code / ASCE 24 only.

3. Lastly, our statewide NFIP coordinator indicated to me that the facility class number has been interpreted by individual building use in other parts of the state – and so for example the Admin Building may not classify as Class 3 like the RBCs, Screen/Grit and Settling Tank buildings.

Apologies as I muddle through this…. And I will get back to you all on DFE and the 500 year elevation.

Linda D. Hansen, PE PWS | UP District Floodplain Engineer | Water Resources Division
47420 State Highway M26, Suite 62, Houghton, MI 49931 | Ph: 906-483-3896
EGLE MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

From: Richards, Scott (EGLE) <RichardsS3@michigan.gov>
Sent: Tuesday, January 7, 2020 2:39 PM
To: darren.pionk@c2ae.com; Rodney Schwartz <RSchwartz@gladstonemi.org>; Hendricks, Ashley <ashley.hendricks@C2AE.COM>; ebuckman@gladstonemi.org
Cc: Parent, Jay (EGLE) <PARENTJ@michigan.gov>; Hansen, Linda (EGLE) <HansenL6@michigan.gov>; Asmus, Tom (EGLE) <AsmusT@michigan.gov>; Granskog, Andy - RD, East Lansing, MI <andy.granskog@usda.gov>
Subject: FW: Gladstone WWTP: MI Building Code FP Regs + Andy (USDA) Federal $ FP Regs
Importance: High

Folks,

As a follow up to our meeting today, Linda Hansen (EGLE) forwarded the excerpt from RD Instruction 1970-F, which she had discussed with Andy Granskog (USDA). See below thread.

Linda also reviewed Michigan Building Code, which references Chapter 7, ASCE 24. Following is a link to the highlights of this ASCE document:
https://www.fema.gov/media-library-data/1436288616344-93e90f72a5e4ba75bac2c5bb0c92d251/ASCE24-14_Highlights_Jan2015_revise2.pdf

Note that page 5 of the ASCE document defines the WWTP as a Class 3 facility. See the table on page 4 of the document for the Flood Design requirements. While Ten State Standards requires 100 year flood protection, it appears MI building code will require greater protection. I understand the Base Flood Elevation (100 yr) is about 585, so we're likely looking at the greater of about 585+1=586 or the 500 yr elevation.

Linda is looking into the 500 year Lake Michigan floodplain elevation with FEMA.

Linda – please correct me if I'm out of step on any of the above.

Scott Richards, P.E.
Direct: 906.869.1239

Water Resources Division
Michigan Department of Environment, Great Lakes, and Energy
1504 W. Washington Street
Marquette, MI 49855
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From: Hansen, Linda (EGLE) <HansenL6@michigan.gov>
Sent: Tuesday, January 7, 2020 1:48 PM
To: Richards, Scott (EGLE) <RichardsS3@michigan.gov>
Cc: Parent, Jay (EGLE) <PARENTJ@michigan.gov>
Subject: Gladstone WWTP: MI Building Code FP Regs + Andy (USDA) Federal $ FP Regs
Importance: High

Hi Scott-

Here is the section of **MI Building Code** that references flooding / floodplain related requirements for sewer facilities:

G401.3 Sewer facilities All new or replaced sanitary sewer facilities, private sewage treatment plants (including all pumping stations and collector systems) and on-site waste disposal systems shall be designed in accordance with Chapter 7, ASCE 24, to minimize or eliminate infiltration of floodwaters into the facilities and discharge from the facilities into floodwaters, or impairment of the facilities and systems.

*Note: **Because the City of Gladstone participates in the NFIP - they must enforce Appendix G of the Building Code** (from which the above excerpt came), in order to stay in compliance with the NFIP. And as you said the new buildings will require building permits.

➔ **Here is the section of the Code of Federal Regulations (from NEPA) that Andy G. w/ USDA was referencing – regarding floodplains requirements for federally funded projects including SRF and RD. (See attached email for entire discussion between us.)**

RD Instruction 1970-F
§ 1970.255 (Con.)

(h) Critical action refers to an action for which even a slight chan of flooding is too great because such flooding might result in loss o life, injury to persons, or damage to property. The minimum floodpla of concern for critical actions is the 500-year floodplain, i.e., the critical action floodplain. Critical actions include but are not limi to actions that create, or extend the useful life of, structures or facilities such as:

(1) Those which produce, use, or store highly volatile, flammab explosive, toxic, or water-reactive materials;

(2) Schools, hospitals and nursing homes, child care facilities disabled/handicapped facilities, housing for the elderly, and ot buildings which are likely to contain occupants who may not be sufficiently mobile to avoid death or injury during flood and st events;

(3) Emergency operation centers that provide essential services

(4) Data storage centers that contain records that may become or damaged during flood and storm events; and

(5) Utility systems vital to public health and safety, includin potable water, wastewater, electric generation, communication systems and other principal utility infrastructure elements.

Linda D. Hansen, PE PWS | UP District Floodplain Engineer | Water Resources Division
47420 State Highway M26, Suite 62, Houghton, MI 49931 | Ph: 906-483-3896
EGLE MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

law and subject the violator to civil or criminal penalties. If you believe you have received this message in error, please notify the sender and delete the email immediately.

Hendricks, Ashley

From: Hansen, Linda (EGLE) <HansenL6@michigan.gov>
Sent: Wednesday, January 8, 2020 6:17 PM
To: Granskog, Andy - RD, East Lansing, MI; Richards, Scott (EGLE); Pionk, Darren; Rodney Schwartz; Hendricks, Ashley; ebuckman@gladstonemi.org
Cc: Parent, Jay (EGLE); Asmus, Tom (DEQ); Hill, Charles (EGLE)
Subject: Final Info - Floodplain Elevations: Gladstone WWTP
Attachments: Appendix G_2015 MI Code.pdf; COE Open Coast Study Phase I.pdf; Draft Coastal Map Clip Gladstone WWTP.png; Gladstone WWTP Current FIRM.pdf

Importance: High

Hello All:

After much discussion, research, Scott's help and even discussion with FEMA, I have come to the following conclusions on flood elevations:

- **MI Building Code Requirements:** The WWTP buildings (with the exception of possibly the Admin Building) are subject to Minimum Elevation of Lowest Floor = BFE + 1 = 585.0 ft. + 1.0 = **586.0 ft. NAVD 88 currently**. After the new coastal flood maps become effective (estimated Sept. 2020), the building code requirement will change to BFE + 2 = 583.0 ft. + 2.0 = **585.0 ft. NAVD 88 in future.**

  Explanation as follows:

  - This section of **Appendix G of the Building Code** applies: **G401.3 Sewer facilities** All new or replaced sanitary sewer facilities, private sewage treatment plants (including all pumping stations and collector systems) and on-site waste disposal systems shall be designed in accordance with Chapter 7, ASCE 24, to minimize or eliminate infiltration of floodwaters into the facilities and discharge from the facilities into floodwaters, or impairment of the facilities and systems.

  - Chapter 7 of ASCE 24 – Highlights are found here: https://www.fema.gov/media-library-data/1436288616344-93e90f72a5e4ba75bac2c5bb0c92d251/ASCE24-14_Highlights_Jan2015_revise2.pdf.
    - Per Table 1-1, the design class of the WWTP facility buildings is "Flood Design Class 3"
    - Go to Table on Page 4:
      - **Currently** – The flood zone of Lake Michigan at the WWTP is "Zone AE" and <u>is NOT actually designated as an official "Coastal A Zone"</u> → Therefore the first row of the table applies ("Zone A not identified as Coastal A Zone") and the "Class 3" column = "BFE + 1 ft. or DFE, whichever is higher"
        - BFE (Base Flood Elevation) = 585.0 ft. which is FEMA's 100 yr flood elevation from the Flood Insurance Study & Flood Map
        - DFE (Design Flood Elevation) = Any elevation not produced by FEMA such as in areas that are not currently mapped by FEMA, or where a special flood study has been completed by others such as USACE. Gladstone uses FEMA data.
        - Therefore – the answer for the WWTP = 585.0 ft. + 1.0 = **586.0 ft. NAVD 88**

      - **After New Coastal Flood Maps are Finalized** – The <u>draft version</u> of these maps I have indicate the new 100-year flood elevation at the WWTP (the BFE) = 583.0 ft. NAVD 88 (Yes, that's right, it went down.) Also – these new elevations <u>WILL BE designated as official "Coastal A Zones"</u> → Therefore the 2nd row of the table applies ("Coastal High

Hazard Areas (Zone V) and Coastal A Zone") and the "Class 3" column = "BFE + 2 ft. or DFE, whichever is higher"

- BFE = 583.0 ft. NAVD 88
- No DFE
- Therefore – the answer for the WWTP = 583.0 ft. + 2.0 **= 585.0 ft. NAVD 88**
- ***NOTE:** This number is based on a DRAFT value, and the effective date of Sept. 2020 could easily get pushed back.

➢ **IF the 500-year floodplain elevation was to apply** (for grant requirements reasons per previous discussions):

- FEMA's Flood Insurance Study (FIS) for Delta County does not provide any 500 year floodplain elevations (unlike other counties FISs);
- Upon consultation with FEMA, they directed me to 2 other sources – one corresponding with the current/effective 100 year and the other corresponding with the future/coastal study 100 year:
  - **Current/Effective 500 year:** *Phase I Revised Report on Great Lakes Open Coast Flood Levels, April 1988* – indicates a 500 year floodplain elevation at the WWTP of **585.3 ft. NGVD 29**.
  - **Future/Coastal (Draft) Study 500 year**: *Delta County Coastal Flood Hazards Workmap released by FEMA in 2017* – *As best I can tell – it indicates a "still water" 500 year floodplain elevation at the WWTP of **583.6 ft. NAVD 88.** Note – this could actually be higher if they select a final elevation that includes wave run-up. ***I should verify this number with FEMA before it is used for design.***

➢ **CONCLUSION**: In both the current and future flood map scenarios, **the Building Code requirements are higher than the 500 year, and therefore should be used**.

Regarding the concept of when your project actually "starts" – is another question… But I would not advise counting on the draft Coastal Study data (either the 100 or 500 yr elevations) until it becomes effective as there is a slight chance it could still change.

Thanks for your patience everyone,

Linda D. Hansen, PE PWS | UP District Floodplain Engineer | Water Resources Division
47420 State Highway M26, Suite 62, Houghton, MI 49931 | Ph: 906-483-3896
EGLE MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

c2ae
architecture • engineering

1211 Ludington St.
Escanaba, MI 49829
O: 906.233.9360
www.c2ae.com

January 14, 2020

Linda Hansen
EGLE Flood Plain Regulation
1504 W. Washington Street
Marquette, MI 49855

Re: City of Gladstone, Michigan
Delta County
Wastewater Treatment Plant Improvements
To Evaluate Needs and Recommend Alternatives for Improvements
Environmental Review and Evaluation

Dear Ms. Hansen,

On behalf of the City of Gladstone, Delta County, we are requesting review and comment of plans for improvements to their existing wastewater treatment plant.

The City of Gladstone is preparing an EGLE SRF Program Project Plan to evaluate needs and recommended alternatives for improvements to the Wastewater Treatment Plant. The treatment plant is in T40N, R22W, Section 22. The scope of the project has been revised since the letter sent on November 18, 2019. The project now includes a new outfall, starting at the wastewater treatment plant on the shores of Little Bay de Noc, extending 800 feet offshore.

We have enclosed a Project Summary and Location Maps. On behalf of the City of Gladstone, we are requesting your assistance of your office in identifying possible flood plain, and/or permit requirements in the project area relative to construction of the proposed project. Comments received within 30 days will allow them to be incorporated into the project plan prior to the preparation of the final SRF Project Plan.

Comments can be mailed to our Escanaba office or emailed to ashley.hendricks@c2ae.com.

Sincerely,
C2AE

Ashley N. Hendricks, E.I.T

Enclosure
cc: 17-0120 File B-10

1211 Ludington St.
Escanaba, MI 49829
O: 906.233.9360
www.c2ae.com

16. Land – Water Interfaces

B. Floodplains

Localized floodplains exist along the shore of Little Bay de Noc of Lake Michigan. The floodplains are generally not developed. EGLE has provided a 100-year floodplain elevation of 585 ft (NAVD 88). Ground elevations at the WWTP site run from 582 to 590 ft. The maps on the following pages show the proximity of the project location with the 100-year floodplain (FEMA FIRM Flood Insurance Rate Map) and a map of the contour elevations and surveyed elevations of structures at the Gladstone WWTP.

Due to preexisting structure locations within the site and lack of area for new development close by the site, it is unavoidable that some of the upgrades may occur within the floodplain. Because of the size of Lake Michigan, the project construction will have minimal effects on the 100-year floodplain. All restorative efforts will return the ground surface to existing elevations. New Structures will be designed or elevated above the 100-year flood elevation.

The project will conform to applicable state and local floodplain protection standards; this includes Michigan's Building Code under ASCE 24 standards. Appropriate mitigative measures will be used and permitting process will be followed. This will be discussed at the formal public hearing held prior to the adoption of the final project plan and public notices of scheduled meetings and hearings.

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program; it does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size, or all planimetric features outside Special Flood Hazard Areas. The community map repository should be consulted for possible updated flood hazard information prior to use of this map for property purchase or construction purposes

Coastal base flood elevations apply only landward of 0.0' National Geodetic Vertical Datum of 1929 (NGVD), and include the effects of wave action; these elevations may also differ significantly from those developed by the National Weather Service for hurricane evacuation planning.

Areas of special flood hazard (100-year flood) include Zones A, AE, AH, AO, A99, V, and VE.

Certain areas not in Special Flood Hazard Areas may be protected by flood control structures.

Boundaries of the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the Federal Emergency Management Agency.

Floodway widths in some areas may be too narrow to show to scale. Floodway widths are provided in the Flood Insurance Study Report.

Corporate limits shown on this map are based on the best data available. The user should contact appropriate community officials to verify the corporate limit delineations shown on this map.

For community map revision history prior to countywide mapping, see section 6.0 of the Flood Insurance Study Report

For adjoining map panels see separately printed Map Index.

DIGITAL DATA AVAILABILITY: Digital files containing the thematic floodplain information shown on these maps are published by the Federal Emergency Management Agency in DLG-3 Optional format on CD-ROM. Requests for data should include the full name of the community or county and the Flood Insurance Rate Map panel numbers covered by the request. Contact the Federal Emergency Management Agency Map Service Center 6730 Santa Barbara Court, Baltimore Maryland 21227-5832. Telephone 1-800-358-9616.

NOTE: The coordinate system used for the production of this Flood Insurance Rate Map (FIRM) is Universal Transverse Mercator (UTM), North American Datum of 1927 (NAD27), Clarke 1866 spheroid. Corner coordinates shown on the FIRM are in latitude and longitude referenced to the Universal Transverse Mercator projection, NAD27. Differences in the datum and spheroid used in the production of FIRMs for adjacent counties may result in slight positional differences in map features at the county boundaries. These differences do not affect the accuracy of the information shown on the FIRM.

ATTENTION: Flood elevations on this map are referenced to the National Geodetic Vertical Datum of 1929. These flood elevations must be compared to structure and ground elevations referenced to the same datum. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, contact the National Geodetic Survey at the following address:

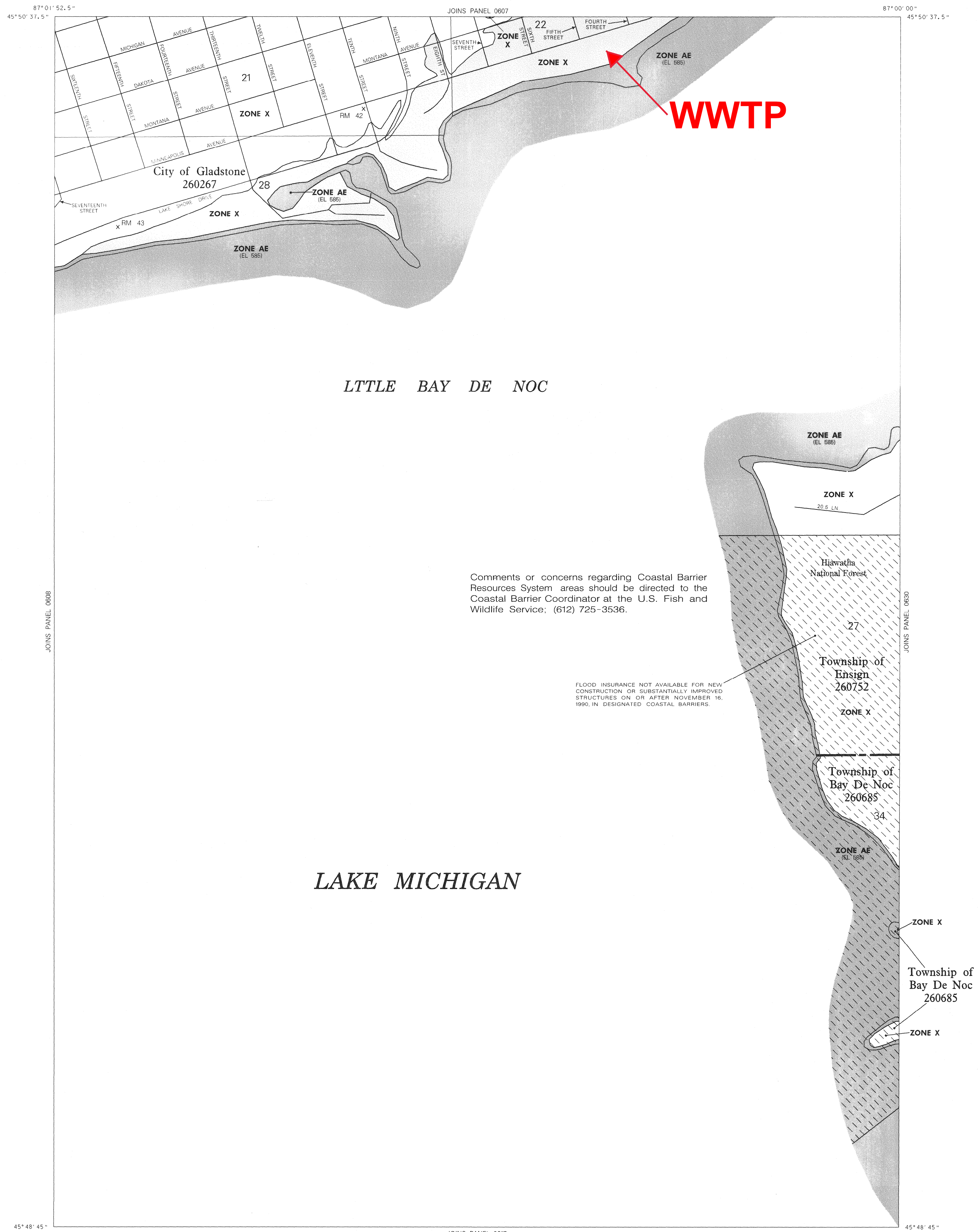
Vertical Network Branch, N/CG13
National Geodetic Survey, NOAA
Silver Spring Metro Center 3
1315 East-West Highway
Silver Spring, Maryland 20910
(301) 713-3191

BASE MAP SOURCE: Base map files were provided by the Michigan Department of Natural Resources. These files were compiled at a scale of 1:24,000 from U.S. Geological Survey 7.5-Minute Series Topographic Maps. Users of this FIRM should be aware that minor adjustments may have been made to specific base map features.

ELEVATION REFERENCE MARKS

REFERENCE MARK	ELEVATION IN FT. (NGVD)[1]	DESCRIPTION OF LOCATION
RM 42	587.70	North rim of manhole casting approximately 22 feet west of centerline of Tenth Street and approximately 34 feet south of centerline of Minneapolis Avenue.
RM 43	590.80	Railroad spike in north side of power pole on south side of Lake Shore Drive, approximately 1,300 feet west of 13th Street at house No. 1607.

[1] National Geodetic Vertical Datum of 1929



LEGEND

SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD

ZONE A	No base flood elevations determined.
ZONE AE	Base flood elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE A99	To be protected from 100-year flood by Federal flood protection system under construction; no base flood elevations determined.
ZONE V	Coastal flood with velocity hazard (wave action); no base flood elevations determined.
ZONE VE	Coastal flood with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

ZONE X	Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.

OTHER AREAS

ZONE X	Areas determined to be outside 500-year floodplain.
ZONE D	Areas in which flood hazards are undetermined.

UNDEVELOPED COASTAL BARRIERS*

Identified 1983 | Identified 1990 or Later | Otherwise Protected Areas Identified 1991 or Later

*Coastal barrier areas are normally located within or adjacent to Special Flood Hazard Areas.

Floodplain Boundary

Floodway Boundary

Zone D Boundary

Boundary Dividing Special Flood Hazard Zones, and Boundary Dividing Areas of Different Coastal Base Flood Elevations Within Special Flood Hazard Zones.

513 — Base Flood Elevation Line; Elevation in Feet**

A — A Cross Section Line

(EL 987) Base Flood Elevation in Feet Where Uniform Within Zone**

RM7 × Elevation Reference Mark

• M1.5 River Mile

**Referenced to the National Geodetic Vertical Datum of 1929

MAP REPOSITORY

Refer to Repository Listing on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
JUNE 8, 1998

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

Refer to the FLOOD INSURANCE RATE MAP effective date shown on this map to determine when actuarial rates apply to structures in the zones where elevations or depths have been established.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at (800) 638-6620.

APPROXIMATE SCALE
500 0 500 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP
DELTA COUNTY,
MICHIGAN
(ALL JURISDICTIONS)

PANEL 609 OF 1105

(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
BAY DE NOC, TOWNSHIP OF	260685	0609	C
ENSIGN, TOWNSHIP OF	260752	0609	C
GLADSTONE, CITY OF	260267	0609	C

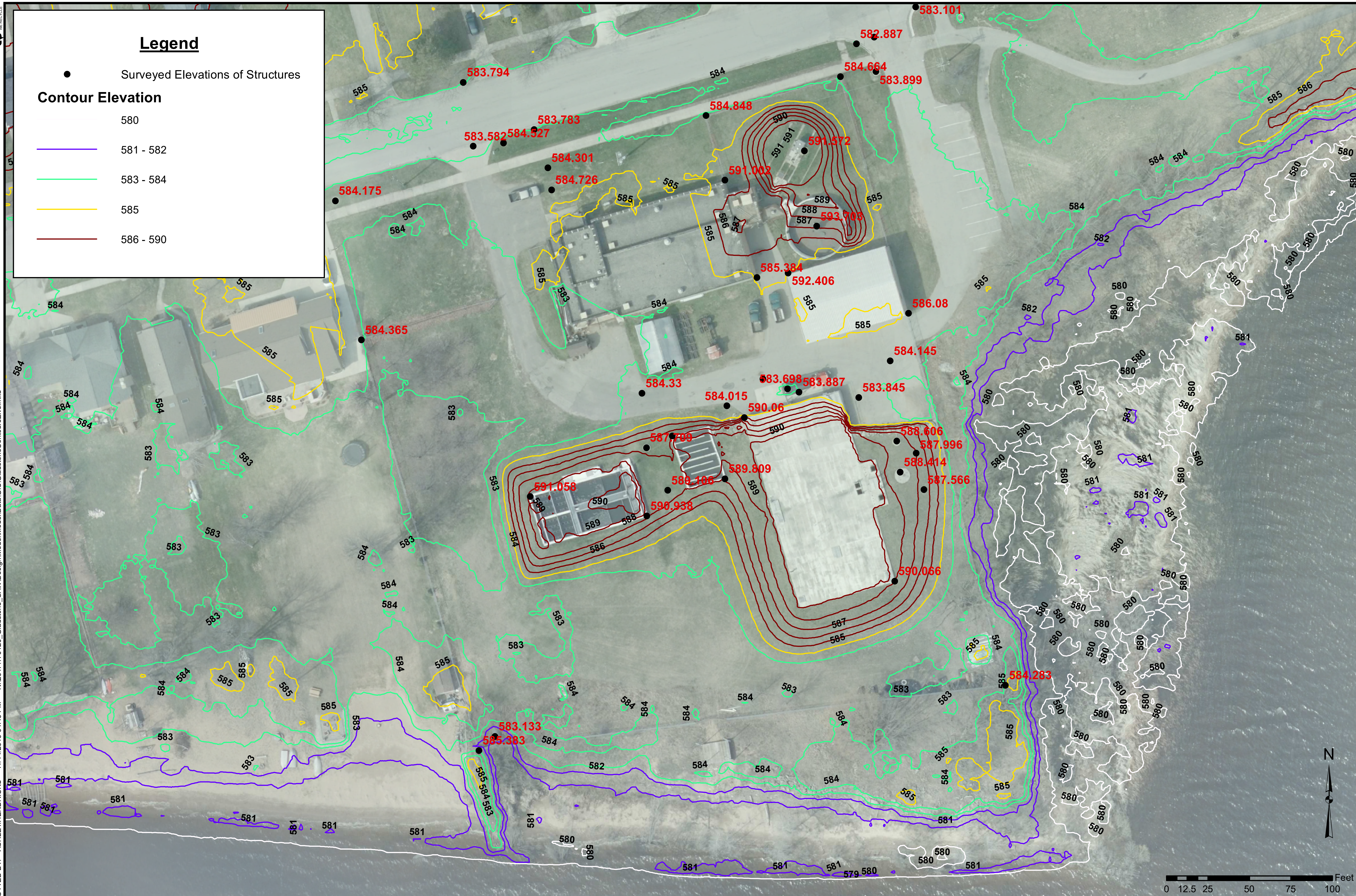
-NOTE-
THIS MAP INCORPORATES APPROXIMATE BOUNDARIES OF COASTAL BARRIER RESOURCES SYSTEM UNITS AND/OR OTHERWISE PROTECTED AREAS ESTABLISHED UNDER THE COASTAL BARRIER IMPROVEMENT ACT OF 1990 (PL 101-591).

Notice to User: The MAP NUMBER shown below should be used when placing map orders; the COMMUNITY NUMBER shown above should be used on insurance applications for the subject community.

MAP NUMBER 26041C0609 C

EFFECTIVE DATE: JUNE 8, 1998

Federal Emergency Management Agency



WWTP SITE WITH ELEVATIONS

CITY OF GLADSTONE
PROJECT: 170120
DELTA COUNTY, MICHIGAN

c2ae architecture + engineering

PLOTTED BY: ASHLEY.HENDRICKS 11/14/2019 04:46 PM N:\2017\170120_Gladstone_SAW\Design\Model\Data\GIS\GladstoneContoursElevs.mxd

Appendix C

Part 16: Land-Water Interfaces
C. Wetlands

1211 Ludington St.
Escanaba, MI 49829
O: 906.233.9360
www.c2ae.com

16. Land – Water Interfaces

C. Wetlands

It is not anticipated that the project plan construction or operation will have wetland impacts. The project location is shown on a map from the National Wetlands Inventory from the US Fish and Wildlife Services on the following page.

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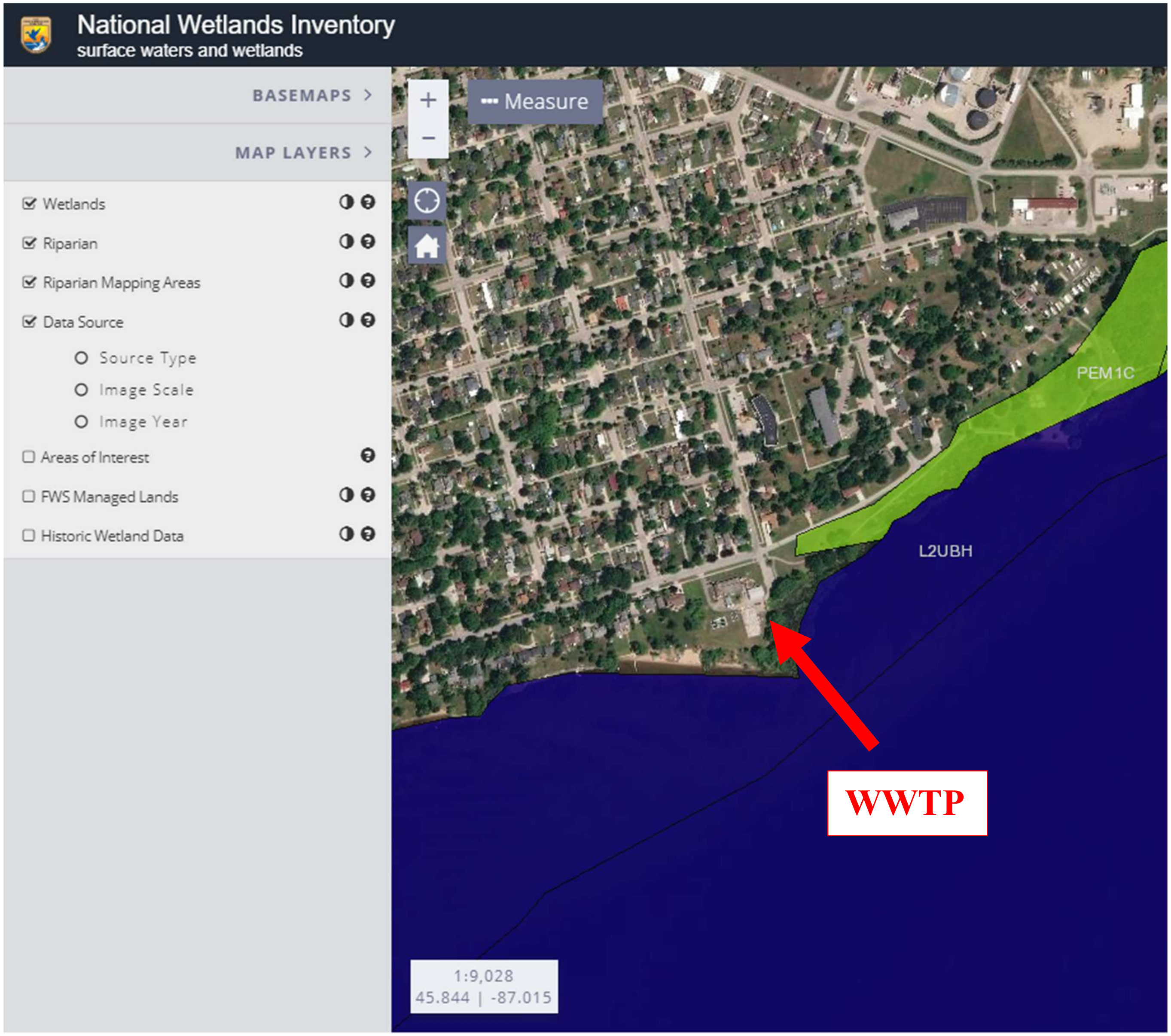

Appendix C

Part 16: Land-Water Interfaces
D. Great Lakes Shorelands Protection

1211 Ludington St.
Escanaba, MI 49829
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November 18, 2019

Ronda Wuycheck, Program Manager
EGLE, Michigan Coastal Management Program
P.O. Box 30458
Lansing, Michigan 48909-7958

Re: City of Gladstone, Michigan
Delta County
Wastewater Treatment Plant Improvements
To Evaluate Needs and Recommend Alternatives for Improvements
Environmental Review and Evaluation

Dear Ms. Wuycheck,

On behalf of the City of Gladstone, Delta County, we are requesting review and comment of plans for improvements to their existing wastewater treatment plant.

The City of Gladstone is preparing an EGLE SRF Program Project Plan to evaluate needs and recommended alternatives for improvements to the Wastewater Treatment Plant. The treatment plant is in T40N, R22W, Section 22.

We have enclosed a Project Summary and Location Maps. On behalf of the City of Gladstone, we are requesting that your office review the proposed project and determine if it is consistent with the approved coastal zone management plan. Comments received within 30 days will allow them to be incorporated into the project plan prior to the preparation of the final SRF Project Plan.

Comments can be mailed to our Escanaba office or emailed to ashley.hendricks@c2ae.com.

Sincerely,
C2AE

Ashley N. Hendricks, E.I.T.

Enclosure
cc: 17-0120 File B-10

STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
LANSING

GRETCHEN WHITMER
GOVERNOR

EGLE

LIESL EICHLER CLARK
DIRECTOR

December 18, 2019

Ashley Hendricks
C2AE
1211 Ludington Street
Escanaba, MI 49829

Dear Ms. Hendricks:

Subject: Federal Consistency Determination, SRF Project for City of Gladstone Wastewater Treatment Plant Improvements, Delta County, Michigan

Staff of the Water Resources Division has reviewed this phase of the project for consistency with Michigan's Coastal Management Program (MCMP), as required by Section 307 of the Coastal Zone Management Act, PL 92-583, as amended (CZMA). Thank you for providing the opportunity to review this proposed activity.

Our review indicates that portions of these projects are located within Michigan's coastal management boundary and are subject to consistency requirements.

A determination of consistency with MCMP requires evaluation of a project to determine if it will have an adverse impact on coastal land or water uses or coastal resources. Projects are evaluated using the permitting criteria contained in the regulatory statutes administered by the Department of Environment, Great Lakes, and Energy. These statutes constitute the enforceable policies of the Coastal Management Program.

Provided all required permits are issued and complied with, no adverse impacts to coastal resources are anticipated from these projects as described in the information you forwarded to our office. Issuance of all required permits will certify the activity for which the permits were issued as consistent with MCMP. If no permits are required, these projects shall be considered consistent as of the date of this letter.

This consistency determination does not waive the need for permits that may be required under other federal, state or local statutes. Please call me if you have any questions regarding this review.

Sincerely,

Chris Antieau
Field Operations Support Section
Water Resources Division
517-290-5732

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Escanaba, MI 49829
O: 906.233.9360
www.c2ae.com

January 14, 2020

Ronda Wuycheck, Program Manager
EGLE, Michigan Coastal Management Program
P.O. Box 30458
Lansing, Michigan 48909-7958

Re: **City of Gladstone, Michigan**
Delta County
Wastewater Treatment Plant Improvements
To Evaluate Needs and Recommend Alternatives for Improvements
Environmental Review and Evaluation

Dear Ms. Wuycheck,

On behalf of the City of Gladstone, Delta County, we are requesting review and comment of plans for improvements to their existing wastewater treatment plant.

The City of Gladstone is preparing an EGLE SRF Program Project Plan to evaluate needs and recommended alternatives for improvements to the Wastewater Treatment Plant. The treatment plant is in T40N, R22W, Section 22. The scope of the project has been revised since the letter sent on November 18, 2019. The project now includes a new outfall, starting at the wastewater treatment plant on the shores of Little Bay de Noc, extending 800 feet offshore.

We have enclosed a Project Summary and Location Maps. On behalf of the City of Gladstone, we are requesting that your office review the proposed project and determine if it is consistent with the approved coastal zone management plan and to obtain a Coastal Zone Management (CZM) Certification. Comments received within 30 days will allow them to be incorporated into the project plan prior to the preparation of the final SRF Project Plan.

Comments can be mailed to our Escanaba office or emailed to ashley.hendricks@c2ae.com.

Sincerely,
C2AE

Ashley N. Hendricks, E.I.T.

Enclosure
cc: 17-0120 File B-10

STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
LANSING

GRETCHEN WHITMER
GOVERNOR

LIESL EICHLER CLARK
DIRECTOR

February 6, 2020

Ashley Hendricks
C2AE
1211 Ludington Street
Escanaba, MI 49829

Dear Ms. Hendricks:

Subject: Federal Consistency Determination, SRF Project for City of Gladstone Wastewater Treatment Plant Improvements, Delta County, Michigan

Staff of the Water Resources Division has reviewed this phase of the project for consistency with Michigan's Coastal Management Program (MCMP), as required by Section 307 of the Coastal Zone Management Act, PL 92-583, as amended (CZMA). Thank you for providing the opportunity to review this proposed activity.

Our review indicates that portions of these projects are located within Michigan's coastal management boundary and are subject to consistency requirements.

A determination of consistency with MCMP requires evaluation of a project to determine if it will have an adverse impact on coastal land or water uses or coastal resources. Projects are evaluated using the permitting criteria contained in the regulatory statutes administered by the Department of Environment, Great Lakes, and Energy. These statutes constitute the enforceable policies of the Coastal Management Program.

Provided all required permits are issued and complied with, no adverse impacts to coastal resources are anticipated from these projects as described in the information you forwarded to our office. Issuance of all required permits will certify the activity for which the permits were issued as consistent with MCMP. If no permits are required, these projects shall be considered consistent as of the date of this letter.

This consistency determination does not waive the need for permits that may be required under other federal, state or local statutes. Please call me if you have any questions regarding this review.

Sincerely,

Chris Antieau
Field Operations Support Section
Water Resources Division
517-290-5732

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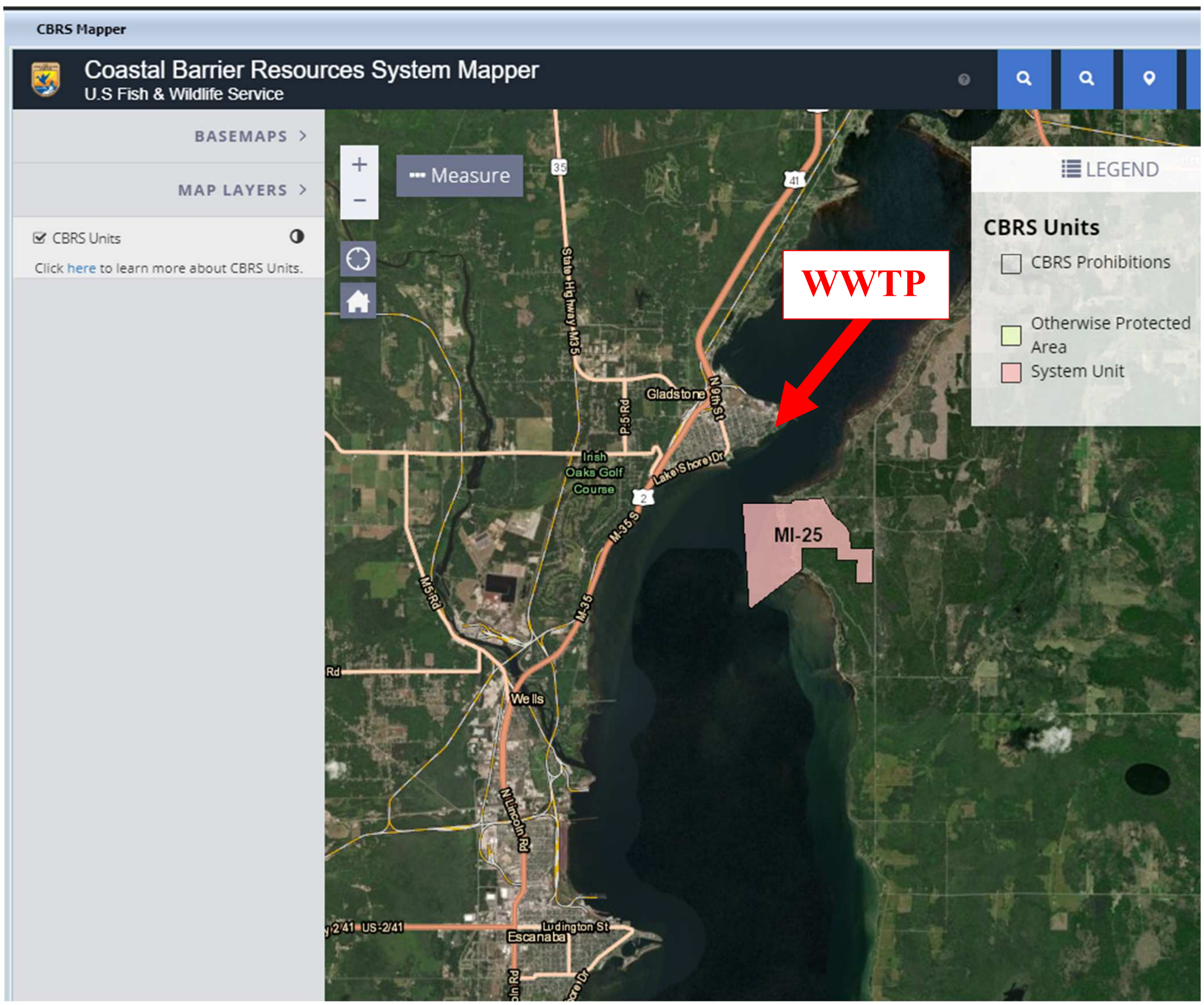
16. Land – Water Interfaces

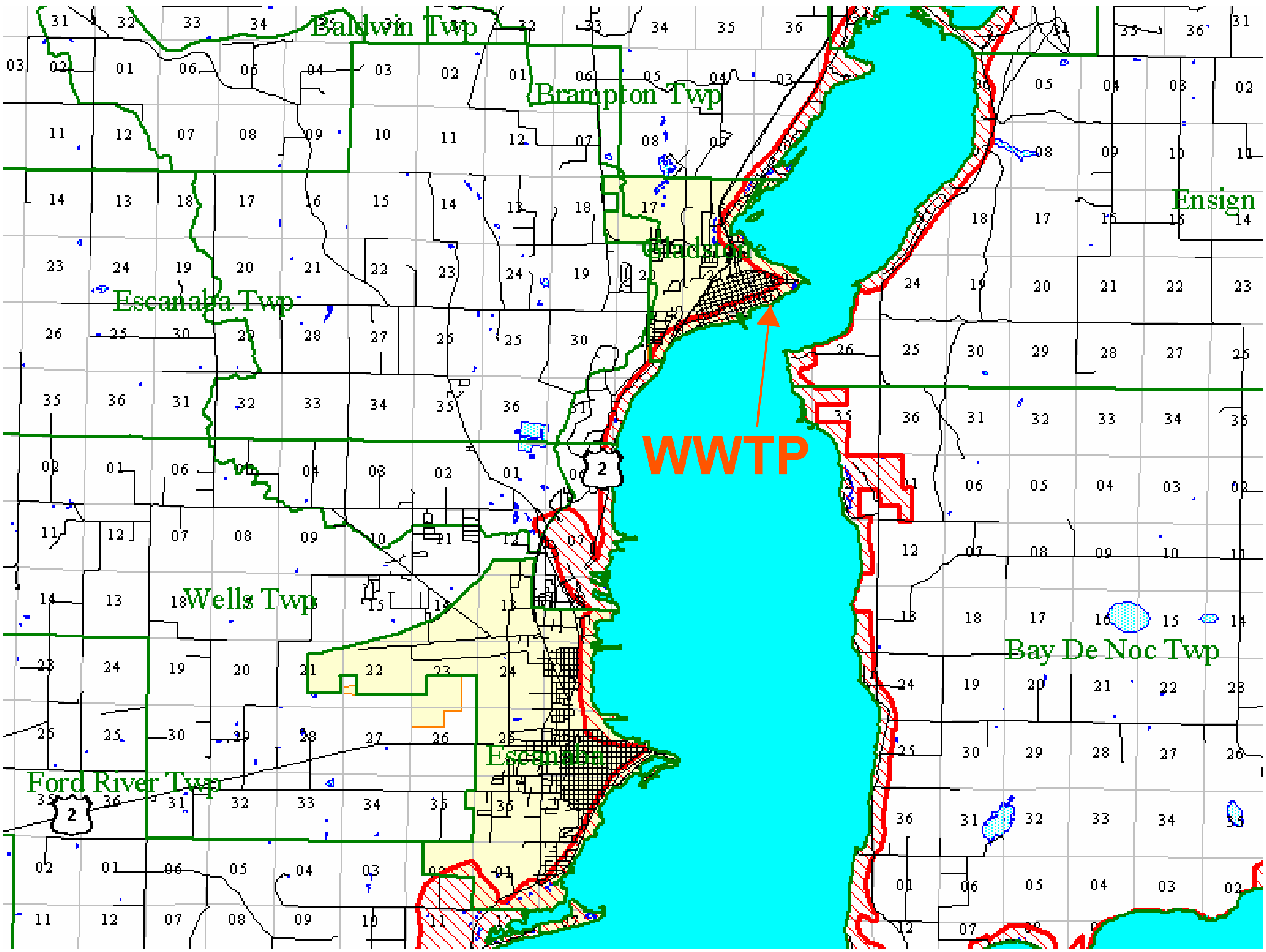
D. Great Lakes Shorelands Protection

The City of Gladstone's WWTP is located along the shorelands of Little Bay De Noc of Lake Michigan. It is not anticipated that the project plan construction or operation will affect any shoreland included in the Coastal Barrier Resource System. A map showing the project location in the vicinity of any shoreland included Coastal Barrier Resource System is shown below. However, the WWTP is located in the Coastal Zone Management Area shown on the following page.



Delta County
Brampton Township, T40N R22W
Gladstone, T40N R22W
Escanaba Township, T40N R22W
Wells Township, T39N R22W and T39N R23W
Escanaba City, T38N R22W, T38N R23W and T39N R22W

The heavy red line is the ***Coastal Zone Management Boundary***
The red hatched area is the ***Coastal Zone Management Area***



Appendix C

Part 16: Land-Water Interfaces
E. Army Corps of Engineers Regulated Activities

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November 25, 2019

US Army Corps of Engineers
Regulatory Marquette Field Office
115 South Lakeshore Blvd. Suite C
Marquette, MI 49855

Re: **City of Gladstone, Michigan**
Delta County
Wastewater Treatment Plant Improvements
To Evaluate Needs and Recommend Alternatives for Improvements
Environmental Review and Evaluation

Dear Mr. or Ms.,

On behalf of the City of Gladstone, Delta County, we are requesting review and comment of plans for improvements to their existing wastewater treatment plant.

The City of Gladstone is preparing an EGLE SRF Program Project Plan to evaluate needs and recommended alternatives for improvements to the Wastewater Treatment Plant. The treatment plant is in T40N, R22W, Section 22.

We have enclosed a Project Summary and Location Maps. We are requesting your review and comment. Comments received within 30 days will allow them to be incorporated into the project plan prior to the preparation of the final SRF Project Plan.

Comments can be mailed to our Escanaba office or emailed to ashley.hendricks@c2ae.com.

Sincerely,
C2AE

Ashley N. Hendricks, E.I.T.

Enclosure
cc: 17-0120 File B-10

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, DETROIT DISTRICT
477 MICHIGAN AVENUE
DETROIT MI 48226-2550

January 7, 2020

REPLY TO
ATTENTION OF:

Engineering & Technical Services
Regulatory Office
File No. LRE-2005-560610-A19

Ashley Hendricks
c2ae
1211 Ludington Street
Escanaba, Michigan 49829

Dear Ms. Hendricks:

This is in response to your November 25, 2019 letter requesting the Corps of Engineers' (Corps) input regarding the proposed improvements to the City of Gladstone's wastewater treatment plant at 413 Minneapolis Avenue in Gladstone, Delta County, Michigan. Specifically, the project involves improvements to the collection system, including gravity and sewer pump stations, new screening and grit removal process, new primary effluent pumps and settling tank, raw sewage pump improvements, secondary treatment pump improvements, new RBC train, BBC shaft and media replacement, new final clarifier and secondary effluent piping, facility piping and valves, chemical fee replacements, and general site improvements.

In Lake Michigan, as in all navigable waters of the United States including adjacent wetlands, any construction or other work, including the discharge of dredged and/or fill material into waters of the United States, must be authorized by the Department of the Army. The authority of the Corps of Engineers to regulate construction or other work in navigable waters of the United States is contained in Section 10 of the Rivers and Harbors Act, Section 404 of the Clean Water Act and regulations promulgated pursuant to these acts. Filling and grading work, mechanized landclearing, ditching or other excavation activity, and piling installation constitute or otherwise involve discharges of dredged and/or fill material under the Corps' regulatory authority.

For your convenience, the necessary permit application can be found on our website at http://www.lre.usace.army.mil/Missions/RegulatoryProgramandPermits.aspx. Plan view and cross-sectional view drawings, in 8½" x 11" format, should accompany the application. Drawings and a narrative on the form should specifically identify and describe all of the structures, work, and discharges which we regulate as described above, including temporary or construction measures. A map of all waters and wetlands on the project site should also accompany the application. Please ensure that you have also included a vicinity map indicating the exact location of your proposed project with your plan view and cross-sectional view drawings. Applications without all the above information cannot be processed. Send the application package to the address listed above.

Your November 25, 2019 request noted the project may entail work in Lake Michigan and/or adjacent wetlands. We recommend that you identify and map any waters and adjacent wetlands on the project site. Wetlands should be delineated via the 1987 Federal Wetlands Delineation Manual and the appropriate Regional Supplement. The wetland delineation report and map should be forwarded to us with the above-noted application package. Our application review will include a determination of jurisdiction over any waters/wetlands on the project site. We may ask to meet with you on the project site to review the Corps' jurisdiction and field check wetland delineations.

Should you have any questions, please contact me at the above address, by E-Mail at Laura.A.Garrett@usace.army.mil, or by telephone at (313) 226-1327. In all communications, please refer to File Number LRE-2005-560610-A19.

We are interested in your thoughts and opinions concerning your experience with the Detroit District, Corps of Engineers Regulatory Program. If you are interested in letting us know how we are doing, you can complete an electronic Customer Service Survey from our web site at: http://corpsmapu.usace.army.mil/cm_apex/f?p=regulatory_survey. Alternatively, you may contact us and request a paper copy of the survey that you may complete and return to us by mail or fax. Thank you for taking the time to complete the survey, we appreciate your feedback.

Sincerely,

Laura A Garrett

Laura A. Garrett
Regulatory Project Manager
Compliance & Enforcement Branch

Copy Furnished
EGLE, Marquette District Office
Marquette Field Office

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Escanaba, MI 49829
O: 906.233.9360
www.c2ae.com

January 14, 2020

US Army Corps of Engineers
Regulatory Marquette Field Office
115 South Lakeshore Blvd. Suite C
Marquette, MI 49855

Re: **City of Gladstone, Michigan**
Delta County
Wastewater Treatment Plant Improvements
To Evaluate Needs and Recommend Alternatives for Improvements
Environmental Review and Evaluation

Dear Mr. or Ms.,

On behalf of the City of Gladstone, Delta County, we are requesting review and comment of plans for improvements to their existing wastewater treatment plant.

The City of Gladstone is preparing an EGLE SRF Program Project Plan to evaluate needs and recommended alternatives for improvements to the Wastewater Treatment Plant. The treatment plant is in T40N, R22W, Section 22. The scope of the project has been revised since the letter sent on November 25, 2019. The project now includes a new outfall, starting at the wastewater treatment plant on the shores of Little Bay de Noc, extending 800 feet offshore.

We have enclosed a Project Summary and Location Maps. We are requesting your review and comment. Comments received within 30 days will allow them to be incorporated into the project plan prior to the preparation of the final SRF Project Plan.

Comments can be mailed to our Escanaba office or emailed to ashley.hendricks@c2ae.com.

Sincerely,
C2AE

Ashley N. Hendricks, E.I.T.

Enclosure
cc: 17-0120 File B-10

Appendix C

Part 16: Land-Water Interfaces
F. Joint Permit Applications

1211 Ludington St.
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O: 906.233.9360
www.c2ae.com

16. Land – Water Interfaces

F. Joint Permit Applications

It is anticipated that a Joint Permit will be needed for construction of a new outfall from the City of Gladstone WWTP to Little Bay de Noc of Lake Michigan. Appropriate permitting processes will be followed.

Appendix C

Part 17: Soils and Geology

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

Delta County, Michigan

Gladstone WWTP Soil Survey

November 14, 2019

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

Preface.......... 2
How Soil Surveys Are Made.......... 5
Soil Map.......... 8
Soil Map.......... 9
Legend.......... 10
Map Unit Legend.......... 11
Map Unit Descriptions.......... 11
Delta County, Michigan.......... 13
EeB—Eastport-Roscommon sands, 0 to 6 percent slopes.......... 13
References.......... 15

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map

Map Scale: 1:1,100 if printed on A landscape (11" x 8.5") sheet.

Meters: 0, 15, 30, 60, 90

Feet: 0, 50, 100, 200, 300

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Delta County, Michigan
Survey Area Data: Version 12, Sep 16, 2019

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 31, 2009—Oct 17, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
EeB	Eastport-Roscommon sands, 0 to 6 percent slopes	2.8	99.4%
Totals for Area of Interest		**2.8**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Delta County, Michigan

EeB—Eastport-Roscommon sands, 0 to 6 percent slopes

Map Unit Setting

National map unit symbol: 1q9hc
Elevation: 570 to 1,500 feet
Mean annual precipitation: 22 to 35 inches
Mean annual air temperature: 39 to 46 degrees F
Frost-free period: 70 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition

Eastport and similar soils: 50 percent
Roscommon and similar soils: 30 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Eastport

Setting

Landform: Lake plains, moraines, outwash plains

Typical profile

H1 - 0 to 4 inches: sand
H2 - 4 to 19 inches: sand
H3 - 19 to 60 inches: sand

Properties and qualities

Slope: 0 to 6 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Hydric soil rating: No

Description of Roscommon

Setting

Landform: Moraines, outwash plains, depressions, lake plains

Typical profile

H1 - 0 to 4 inches: sand
H2 - 4 to 60 inches: sand

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Calcium carbonate, maximum in profile: 10 percent
Available water storage in profile: Low (about 4.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: A/D
Hydric soil rating: Yes

Minor Components

Au gres

Percent of map unit: 5 percent
Landform: Outwash plains, lake plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope, crest, talf, rise
Down-slope shape: Linear, concave
Across-slope shape: Linear
Other vegetative classification: Tsuga-Maianthemum-Coptis, Vaccinium phase (TMC-V)
Hydric soil rating: No

Tawas

Percent of map unit: 5 percent
Landform: Depressions, lake plains, moraines, outwash plains
Hydric soil rating: Yes

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APPENDIX D

BASIS OF COST

APPENDIX D

Part 1 – WWTP Cost Basis

C2AE

1211 Ludington St., Escanaba, Michigan 49829 **Date** March 3, 2021

CITY OF GLADSTONE, MICHIGAN

COST SUMMARY AND PRESENT WORTH EVALUATION

Description Construction Cost Opinion		Alternative 1 RBC S&G-Pri clarification	Alternative 2 RBF - RBC Anaerobic Digestion	Alternative 3 Oxidation Ditch S&G	Alternative 4 RBF - MBBR S&G, Aerobic Digestion	Alternative 5 Primary Tank - MBBR S&G, Anaerobic
Construction Cost Opinion		$14,208,000	$12,510,000	$18,757,000	$13,842,000	$13,728,000
Engineering, Planning, Legal and Admin	30.0%	$4,262,000	$3,753,000	$5,627,000	$4,153,000	$4,118,000
CAPITAL PROJECT COST		$18,470,000	$16,263,000	$24,384,000	$17,995,000	$17,846,000
Green Project Reserve Credit	50.0%	$780,500	$780,500			$780,500
Escalation to 2024 construction	10.0%	$78,050	$78,050			$78,050
Total Green Project Credit		$858,550	$858,550			$858,550
CITY OF GLADSTONE PROJECT COST		$17,611,450	$15,404,450	$24,384,000	$17,995,000	$16,987,450

Description Annual Operations Maintenance and Replacement Costs		Alternative 1 RBC S&G-Pri clarification	Alternative 2 RBF - RBC Anaerobic Digestion	Alternative 3 Oxidation Ditch S&G	Alternative 4 RBF - MBBR Aerobic Digestion	Alternative 5 Primary Tank - MBBR S&G, Anaerobic
2019 Budgeted O&M		$480,000	$480,000	$480,000	$480,000	$480,000
Differential Electrical Power Costs		$0	$4,900	$168,600	$88,600	$31,000
Incremental Manpower/Labor Cost		$0	$22,356	$0	$22,356	$0
Solids disposal		$32,674	$33,174	$28,798	$32,462	$32,674
Replacement parts		$0	$15,000	$5,000	$15,000	$15,000
Equipment Replacement		$81,150	$111,650	$234,463	$81,150	$81,150
Total Annual Costs		$594,000	$668,000	$917,000	$720,000	$640,000

Present Worth Analysis		Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Project Cost		$18,470,000	$16,263,000	$24,384,000	$17,995,000	$17,846,000
Annual O&M		$594,000	$668,000	$917,000	$720,000	$640,000
Real Interest/Discount Rate		-0.5%	-0.5%	-0.5%	-0.5%	-0.5%
Years		20	20	20	20	20
Salvage		$5,186,000	$4,567,000	$6,847,000	$5,053,000	$5,011,000
$(1+i)^N$		0.9046	0.9046	0.9046	0.9046	0.9046
Present Value of Annual O&M		$12,528,000	$14,088,000	$19,340,000	$15,185,000	$13,498,000
Present Value of Salvage		$5,733,000	$5,049,000	$7,570,000	$5,586,000	$5,540,000
Present Value		**$25,265,000**	**$25,302,000**	**$36,154,000**	**$27,594,000**	**$25,804,000**

C2AE

1211 Ludington St., Escanaba, Michigan 49829 Date February 19, 2021

CITY OF GLADSTONE, MICHIGAN

ENGINEERS OPINION OF PROBABLE CONSTRUCTION COSTS

Description Process Items	Alternative 1 RBC S&G-Pri clarification	Alternative 2 RBC - RBF Anaerobic Digestion	Alternative 3 Oxidation Ditch S&G	Alternative 4 MBBR Aerobic Digestion	Alternative 5 MBBR S&G-Pri Clar., Anaerobic
Administration Building	$1,367,000	$1,367,000	$1,367,000	$1,367,000	$1,367,000
Building Modifications for RBF Units				$495,000	
Digester Gas Handling System	$95,000	$95,000			$95,000
Digester Gas Piping and Valves	$60,000	$60,000			$60,000
Engineering Studies and Evaluations	$82,000	$82,000	$82,000	$82,000	$82,000
Facility Coating, Painting, Masonry and Concrete	$412,000	$412,000	$412,000	$412,000	$412,000
Facility Piping and Valve Improvements	$488,000	$488,000	$488,000	$488,000	$488,000
Final Clarifier	$1,333,000	$1,333,000		$1,333,000	$1,333,000
HGL - Effluent Booster Station					
HGL - Raise Secondary Cl Tank Walls	$364,000	$364,000	$364,000	$364,000	$364,000
HVAC Rehabilitation (SAW)	$96,000	$96,000	$96,000	$96,000	$96,000
MBBR Equipment				$1,541,000	$1,541,000
MBBR Tanks				$788,000	$788,000
New Building to House RBF Units		$1,064,000			
New Circular Final Clarifiers and Piping			$3,502,000		
New Oxidation Ditch			$6,174,000		
New RBC Train In Ex. Primary Tank		$543,000			
New Rotating Biological Contactor Train	$543,000				
New Screen and Grit Process	$2,723,000		$2,723,000		
New Screen and Grit Process Abbreviated Option 1				$1,921,000	$1,921,000
Primary Anaerobic Digester (No. 1) Conversion To Aerobic			$805,000	$805,000	
Primary Anaerobic Digester (No. 1) Mixing and Rehabilitation	$801,000	$801,000			$801,000
Primary Clarifier No. 2	$1,942,000				$1,942,000
Primary Digester Heating Boiler and Exchanger Replacements	$400,000	$400,000			$400,000
Primary Electrical Service Area Upgrade	$298,000	$298,000	$298,000	$298,000	$298,000
Raw Sewage Pump Improvements	$356,000	$356,000	$356,000	$356,000	$356,000
Existing RBC Rehab	$1,961,000	$1,961,000			
RBF Units with Dewatering Screw Press					
RBF Units with Sludge Pump		$1,903,000		$1,903,000	
Chlorine Contact Tank Rehabilitation (SAW)	$50,000	$50,000	$50,000	$50,000	$50,000
Return Sludge Pumping			$994,000	$497,000	$497,000
Roof Rehabilitation (SAW)	$83,000	$83,000	$83,000	$83,000	$83,000

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
SCADA System	$240,000	$240,000	$240,000	$240,000	$240,000
Secondary Digester Conversion			$414,000	$414,000	
Secondary Digester (No. 2) Rehabilitation	$205,000	$205,000			$205,000
Secondary Treatment Pumps	$146,000	$146,000	$146,000	$146,000	$146,000
Site Improvements	$121,000	$121,000	$121,000	$121,000	$121,000
Window and Door Replacement (SAW)	$42,000	$42,000	$42,000	$42,000	$42,000
Total Construction Costs	**$14,208,000**	**$12,510,000**	**$18,757,000**	**$13,842,000**	**$13,728,000**

Green Project Reserve	**Alternative 1**	**Alternative 2**	**Alternative 3**	**Alternative 4**	**Alternative 5**
	RBC	**RBC - RBF**	**Oxidation Ditch**	**MBBR**	**MBBR**
Items eligible for 50% Loan Forgiveness	**S&G-Pri clarification**	**Anaerobic Digestion**	**S&G**	**Aerobic Digestion**	**S&G-Pri Clar., Anaerobic**
Digester Gas Handling System	$95,000	$95,000			$95,000
Digester Gas Piping and Valves	$60,000	$60,000			$60,000
Primary Digester Heating Boiler and Exchanger Replacements	$400,000	$400,000			$400,000
Primary Anaerobic Digester (No. 1) Mixing and Rehabilitation	$801,000	$801,000			$801,000
Secondary Digester (No. 2) Rehabilitation	$205,000	$205,000			$205,000
	$1,561,000	$1,561,000			$1,561,000

*Selected Alternative

CITY OF GLADSTONE, MICHIGAN

ALTERNATIVE 1: ROTATING BIOLOGICAL CONTACTOR WITH PRIMARY CLARIFICATION

Construction costs	Costs
Administration Building	$1,367,000
Digester Gas Handling System	$95,000
Digester Gas Piping and Valves	$60,000
Primary Digester Heating Boiler and Exchanger Replacen	$400,000
Engineering Studies and Evaluations	$82,000
Facility Piping and Valve Improvements	$488,000
Facility Coating, Painting, Masonry and Concrete	$412,000
HGL - Raise Secondary Cl Tank Walls	$364,000
HVAC Rehabilitation (SAW)	$96,000
Final Clarifier	$1,333,000
Primary Clarifier No. 2	$1,942,000
New Rotating Biological Contactor Train	$543,000
New Screen and Grit Process	$2,723,000
Primary Anaerobic Digester (No. 1) Mixing and Rehabilit	$801,000
Primary Electrical Service Area Upgrade	$298,000
Raw Sewage Pump Improvements	$356,000
Existing RBC Rehab	$1,961,000
Chlorine Contact Tank Rehabilitation (SAW)	$50,000
Roof Rehabilitation (SAW)	$83,000
SCADA System	$240,000
Secondary Digester (No. 2) Rehabilitation	$205,000
Secondary Treatment Pumps	$146,000
Site Improvements	$121,000
Window and Door Replacement (SAW)	$42,000
Sub total	**$14,208,000**

Operational and Maintenance Costs	Amount	
2019 Budgeted O&M	$	480,000
Differential Electrical Power Costs	$	-
Incremental Manpower/Labor Cost	$	-
Sludge Disposal	$	32,674
Replacement parts	$	-
Equipment Replacement	$	81,150
	$	**593,824**

CITY OF GLADSTONE, MICHIGAN

ALTERNATIVE 1: ROTATING BIOLOGICAL CONTACTOR WITH PRIMARY CLARIFICATION

Raw Sewage Pumps	96,000.00	From Drh July 2019
Secondary Pumps	40,000.00	
Screening Equipment	310,000.00	
Grit Equipment	140,000.00	
Primary Settling Equipment	190,000.00	
RBC Equipment	525,000.00	
Final Settling Equipment	50,000.00	
DG Boiler and Heat Exchanger	100,000.00	
Digester Mixing Equipment	102,000.00	
Digester Floating Cover	70,000.00	
Total Base Equipment Costs	1,623,000.00	
Assumed Equipment Life	20.00	
Annual Equipment Replace Cost	81,150.00	

Annual Biosolids Handling Costs (Full Anaerobic Digestion and Land Application)		
Digester O&M		
Digester Routine Labor (Hrs/Yr	100	$2,850
Digester Physical Maintenance ($/Yr)	Estimated	$1,000
Digester Cleaning ($/Yr)	Estimated	$750
Land Application, Disposal		
Trucking Miles Per Trip	22	
Trucking Trips Per Year	98	
Trucking Miles Per Year	2156	
Trucking Cost Per Mile	$1.25	$2,695
Annual Trucking Cost		
Labor Hours Per Truck Load	3	
Hauling Labor		$8,379
Testing/Lab Analysis		$2,000
Disposal Land, Future Purchase Set Aside		
Acres Required	80	
Cost Per Acre	$2,000	
Year To Purchase	20	
Annual Disposal Land Set Aside		$8,000
Equipment Replacement		
Haul Truck	$100,000	
Disposal Site Equipment	$40,000	
Total	$140,000	
Evaluated Life	20	
Annual Biosolids Equipment Replacement		$7,000
Total Annual Biosolids Disposal		$32,674

CITY OF GLADSTONE, MICHIGAN
OPINION OF COST FOR PROCESS CAPITAL IMPROVEMENTS

ALTERNATIVE 2: ROTATING BIOLOGICAL CONTACTOR UPGRADE WITH RBF & ANAEROBIC DIGESTIO

Description	Costs
Administration Building	$1,367,000
Chlorine Contact Tank Rehabilitation (SAW)	$50,000
Digester Gas Handling System	$95,000
Digester Gas Piping and Valves	$60,000
Engineering Studies and Evaluations	$82,000
Existing RBC Rehab	$1,961,000
Facility Coating, Painting, Masonry and Concrete	$412,000
Facility Piping and Valve Improvements	$488,000
Final Clarifier	$1,333,000
HGL - Raise Secondary Cl Tank Walls	$364,000
HVAC Rehabilitation (SAW)	$96,000
New Building to House RBF Units	$1,064,000
New RBC Train In Ex. Primary Tank	$543,000
Primary Anaerobic Digester (No. 1) Mixing and Rehabilitatic	$801,000
Primary Digester Heating Boiler and Exchanger Replacement	$400,000
Primary Electrical Service Area Upgrade	$298,000
Raw Sewage Pump Improvements	$356,000
RBF Units with Sludge Pump	$1,903,000
Roof Rehabilitation (SAW)	$83,000
SCADA System	$240,000
Secondary Digester (No. 2) Rehabilitation	$205,000
Secondary Treatment Pumps	$146,000
Site Improvements	$121,000
Window and Door Replacement (SAW)	$42,000
Sub total	**$12,510,000**

CITY OF GLADSTONE, MICHIGAN
OPINION OF COST FOR PROCESS CAPITAL IMPROVEMENTS

ALTERNATIVE 2: ROTATING BIOLOGICAL CONTACTOR UPGRADE WITH RBF & ANAEROBIC DIGESTIO

Operational and Maintenance Costs	Amount	
2019 Budgeted O&M	$	480,000
Differential Electrical Power Costs	$	4,900
Incremental Treatment Manpower/Labor Cost	$	22,356
Biosolids Disposal	$	33,174
Replacement parts	$	15,000
Equipment Replacement	$	111,650
	$	667,080

Differential Costs Calculations		
RBF drives Electrical	$	4,900
	$	4,900

RBF Operation Labor	hrs.		
Laborer. Hrs./day	1.5	$	42.75
SRF Laborer, Hrs./day	0.5	$	15.00
Superintendent, Hrs./day	0.1	$	3.50
Annual Labor		$	22,356.25

Equipment Replacement	Equipment Cost	
Base From Alternative 1	$1,623,000	
Additional RBF Equipment	$800,000	
Reduced Primary Settling Equipment	-$190,000	
	$2,233,000	
Evaluated Life	20	
Equipment Replacement	$111,650	$111,650

CITY OF GLADSTONE, MICHIGAN
OPINION OF COST FOR PROCESS CAPITAL IMPROVEMENTS

ALTERNATIVE 2: ROTATING BIOLOGICAL CONTACTOR UPGRADE WITH RBF & ANAEROBIC DIGESTIO

Annual Biosolids Handling Costs (Full Anaerobic Digestion and Land Application)		
RBF Sludge, Pumping To Digester, Estimated		$500
Digester O&M		
Digester Routine Labor (Hrs/Yr	100	$2,850
Digester Physical Maintenance ($/Yr)	Estimated	$1,000
Digester Cleaning ($/Yr)	Estimated	$750
Land Application, Disposal		
Trucking Miles Per Trip	22	
Trucking Trips Per Year	98	
Trucking Miles Per Year	2156	
Trucking Cost Per Mile	$1.25	$2,695
Annual Trucking Cost		
Labor Hours Per Truck Load	3	
Hauling Labor		$8,379
Testing/Lab Analysis		$2,000
Disposal Land, Future Purchase Set Aside		
Acres Required	80	
Cost Per Acre	$2,000	
Year To Purchase	20	
Annual Disposal Land Set Aside		$8,000
Equipment Replacement		
Haul Truck	$100,000	
Disposal Site Equipment	$40,000	
Total	$140,000	
Evaluated Life	20	
Annual Biosolids Equipment Replacement		$7,000
Total Annual Biosolids Disposal		$33,174
(100% Anaerobic Digestion and Land Application		

CITY OF GLADSTONE, MICHIGAN
OPINION OF COST FOR PROCESS CAPITAL IMPROVEMENTS

ALTERNATIVE 3: OXIDATION DITCH

Description	Costs
Administration Building	$1,367,000
Engineering Studies and Evaluations	$82,000
Facility Piping and Valve Improvements	$488,000
Facility Coating, Painting, Masonry and Concrete	$412,000
HGL - Raise Secondary Cl Tank Walls	$364,000
HVAC Rehabilitation (SAW)	$96,000
New Circular Final Clarifiers and Piping	$3,502,000
New Screen and Grit Process	$2,723,000
New Oxidation Ditch	$6,174,000
Primary Anaerobic Digester (No. 1) Conversion To Aerol	$805,000
Primary Electrical Service Area Upgrade	$298,000
Return Sludge Pumping	$994,000
Raw Sewage Pump Improvements	$356,000
Chlorine Contact Tank Rehabilitation (SAW)	$50,000
Roof Rehabilitation (SAW)	$83,000
SCADA System	$240,000
Secondary Digester Conversion	$414,000
Secondary Treatment Pumps	$146,000
Site Improvements	$121,000
Window and Door Replacement (SAW)	$42,000
Sub total	**$18,757,000**

Operation and Maintenance Costs	Amount	
2019 Budgeted O&M	$	480,000
Differential Electrical Power Costs	$	168,600
Incremental Manpower/Labor Cost	$	-
Sludge Disposal	$	28,798
Replacement parts	$	5,000
Equipment Replacement	$	119,400
	$	801,798

Differential Costs Calculations		
Differential electrical cost		
Aerobic Digestion	$	19,600
Oxidation Ditch Aerators	$	149,000
	$	168,600

CITY OF GLADSTONE, MICHIGAN
OPINION OF COST FOR PROCESS CAPITAL IMPROVEMENTS

ALTERNATIVE 3: OXIDATION DITCH

New Circular Final Clarifiers and Piping	$125,000
New Screening and Grit Removal Process	$350,000
New Oxidation Ditches - Equipment	$950,000
Return Sludge Pumping	$497,000
Raw Sewage Pump Improvements	$356,000
Secondary Treatment Pumps	$75,000
Aerobic Digestion Equipment (Blowers)	35000
	$2,388,000
Assumed Equipment Life	20
Annual Equipment Replace Cost	$119,400

Annual Biosolids Handling Costs (Full Aerobic Digestion and Land Application)		
Digester O&M		
Digester Routine Labor (Hrs/Yr	75	$2,138
Digester Physical Maintenance ($/Yr)	Estimated	$1,000
Digester Cleaning ($/Yr)	Estimated	$750
Land Application, Disposal		
Trucking Miles Per Trip	22	
Trucking Trips Per Year	70	
Trucking Miles Per Year	1540	
Trucking Cost Per Mile	$1.25	$1,925
Annual Trucking Cost		
Labor Hours Per Truck Load	3	
Hauling Labor		$5,985
Testing/Lab Analysis		$2,000
Disposal Land, Future Purchase Set Aside		
Acres Required	80	
Cost Per Acre	$2,000	
Year To Purchase	20	
Annual Disposal Land Set Aside		$8,000
Equipment Replacement		
Haul Truck	$100,000	
Disposal Site Equipment	$40,000	
Total	$140,000	
Evaluated Life	20	
Annual Biosolids Equipment Replacement		$7,000
Total Annual Biosolids Disposal		$28,798
(100% Anaerobic Digestion and Land Application		

CITY OF GLADSTONE, MICHIGAN
OPINION OF COST FOR PROCESS CAPITAL IMPROVEMENTS

ALTERNATIVE 4: MOVING BED BIOLOGICAL REACTOR
RBF primary solids removal with aerobic digestion all solids

Description	Costs
Administration Building	$1,367,000
Building Modifications for RBF Units	$495,000
Engineering Studies and Evaluations	$82,000
Facility Piping and Valve Improvements	$488,000
Facility Coating, Painting, Masonry and Concrete	$412,000
Final Clarifier	$1,333,000
HGL - Raise Secondary Cl Tank Walls	$364,000
HVAC Rehabilitation (SAW)	$96,000
MBBR Equipment	$1,541,000
MBBR Tanks	$788,000
New Screen and Grit Process Abbreviated Option 1	$1,921,000
Primary Anaerobic Digester (No. 1) Conversion To Aerol	$805,000
Primary Electrical Service Area Upgrade	$298,000
Raw Sewage Pump Improvements	$356,000
Return Sludge Pumping	$497,000
RBF Units with Sludge Pump	$1,903,000
Chlorine Contact Tank Rehabilitation (SAW)	$50,000
Roof Rehabilitation (SAW)	$83,000
SCADA System	$240,000
Secondary Digester Conversion	$414,000
Secondary Treatment Pumps	$146,000
Site Improvements	$121,000
Window and Door Replacement (SAW)	$42,000
Sub total	**$13,842,000**

Operational and Maintenance Costs	Amount
2019 Budgeted O&M	$ 480,000
Differential Electrical Power Costs	$ 88,600
Incremental Manpower	$ 22,356
Sludge Disposal	$ 32,462
Replacement parts	$ 15,000
Equipment Replacement	$ 81,150
	$ 719,568

CITY OF GLADSTONE, MICHIGAN
OPINION OF COST FOR PROCESS CAPITAL IMPROVEMENTS

ALTERNATIVE 4: MOVING BED BIOLOGICAL REACTOR
RBF primary solids removal with aerobic digestion all solids

Raw Sewage Pumps	96,000.00
Secondary Pumps	40,000.00
Screening Equipment	310,000.00
Grit Equipment	140,000.00
Primary Settling Equipment	190,000.00
MBBR Equipment	750,000.00
Final Settling Equipment	125,000.00
Aerobic Digestion Equipment (Blowers)	95,000.00
Total Base Equipment Costs	1,746,000.00
Assumed Equipment Life	20.00
Annual Equipment Replace Cost	81,150.00

Differential Costs Calculations		
Differential electrical cost		
MBBR Aeration	$	31,000
RBF drives	$	6,800
Aerobic Digestion	$	50,800
	$	88,600

Incremental RBF Operation Labor	hrs.		
Laborer. Hrs./day	1.5	$	42.75
SRF Laborer, Hrs./day	0.5	$	15.00
Superintendent, Hrs./day	0.1	$	3.50
Annual Labor		$	22,356.25

CITY OF GLADSTONE, MICHIGAN
OPINION OF COST FOR PROCESS CAPITAL IMPROVEMENTS

ALTERNATIVE 4: MOVING BED BIOLOGICAL REACTOR
RBF primary solids removal with aerobic digestion all solids

Annual Biosolids Handling Costs (Full Aerobic Digestion and Land Application)		
Digester O&M		
RBF Sludge, Pumping To Digester, Estimated		$500
Digester Routine Labor (Hrs/Yr	75	$2,138
Digester Physical Maintenance ($/Yr)	Estimated	$1,000
Digester Cleaning ($/Yr)	Estimated	$750
Land Application, Disposal		
Trucking Miles Per Trip	22	
Trucking Trips Per Year	98	
Trucking Miles Per Year	2156	
Trucking Cost Per Mile	$1.25	$2,695
Annual Trucking Cost		
Labor Hours Per Truck Load	3	
Hauling Labor		$8,379
Testing/Lab Analysis		$2,000
Disposal Land, Future Purchase Set Aside		
Acres Required	80	
Cost Per Acre	$2,000	
Year To Purchase	20	
Annual Disposal Land Set Aside		$8,000
Equipment Replacement		
Haul Truck	$100,000	
Disposal Site Equipment	$40,000	
Total	$140,000	
Evaluated Life	20	
Annual Biosolids Equipment Replacement		$7,000
Total Annual Biosolids Disposal		$32,462
(100% Anaerobic Digestion and Land Application		

CITY OF GLADSTONE, MICHIGAN
OPINION OF COST FOR PROCESS CAPITAL IMPROVEMENTS

ALTERNATIVE 5: MOVING BED BIOLOGICAL REACTOR
Headworks Package, Additional Primary Clarifier, MBBR, Additional Final Clarifier

Description	Costs
Administration Building	$1,367,000
Digester Gas Handling System	$95,000
Digester Gas Piping and Valves	$60,000
Engineering Studies and Evaluations	$82,000
Primary Digester Heating Boiler and Exchanger Replacer	$400,000
Facility Piping and Valve Improvements	$488,000
Facility Coating, Painting, Masonry and Concrete	$412,000
Final Clarifier	$1,333,000
Primary Clarifier No. 2	$1,942,000
HGL - Raise Secondary Cl Tank Walls	$364,000
HVAC Rehabilitation (SAW)	$96,000
MBBR Equipment	$1,541,000
MBBR Tanks	$788,000
New Screen and Grit Process Abbreviated Option 1	$1,921,000
Primary Anaerobic Digester (No. 1) Mixing and Rehabili	$801,000
Primary Electrical Service Area Upgrade	$298,000
Raw Sewage Pump Improvements	$356,000
Return Sludge Pumping	$497,000
Chlorine Contact Tank Rehabilitation (SAW)	$50,000
Roof Rehabilitation (SAW)	$83,000
SCADA System	$240,000
Secondary Digester (No. 2) Rehabilitation	$205,000
Secondary Treatment Pumps	$146,000
Site Improvements	$121,000
Window and Door Replacement (SAW)	$42,000
Sub total	**$13,728,000**

Operational and Maintenance Costs	Amount
2019 Budgeted O&M	$ 480,000
Differential Electrical Power Costs	$ 31,000
Incremental Manpower	$ -
Sludge Disposal	$ 32,674
Replacement parts	$ 15,000
Equipment Replacement	$ 81,150
	$ 639,824

CITY OF GLADSTONE, MICHIGAN
OPINION OF COST FOR PROCESS CAPITAL IMPROVEMENTS

ALTERNATIVE 5: MOVING BED BIOLOGICAL REACTOR
Headworks Package, Additional Primary Clarifier, MBBR, Additional Final Clarifier

Raw Sewage Pumps	96,000.00
Secondary Pumps	40,000.00
Screening Equipment	310,000.00
Grit Equipment	140,000.00
Primary Settling Equipment	190,000.00
MBBR Equipment	750,000.00
Final Settling Equipment	125,000.00
DG Boiler and Heat Exchanger	100,000.00
Digester Mixing Equipment	102,000.00
Digester Floating Cover	70,000.00
Total Base Equipment Costs	1,923,000.00
Assumed Equipment Life	20.00
Annual Equipment Replace Cost	81,150.00

Differential Costs Calculations		
Differential electrical cost		
MBBR Aeration (30 Bhp@$0.15/Kwh)	$	31,000
	$	31,000

	hrs.		
Laborer. Hrs./day		$	-
SRF Laborer, Hrs./day		$	-
Superintendent, Hrs./day		$	-
Annual Labor		$	-

CITY OF GLADSTONE, MICHIGAN
OPINION OF COST FOR PROCESS CAPITAL IMPROVEMENTS

ALTERNATIVE 5: MOVING BED BIOLOGICAL REACTOR
Headworks Package, Additional Primary Clarifier, MBBR, Additional Final Clarifier

Annual Biosolids Handling Costs (Full Anaerobic Digestion and Land Application)		
Digester O&M		
Digester Routine Labor (Hrs/Yr	100	$2,850
Digester Physical Maintenance ($/Yr)	Estimated	$1,000
Digester Cleaning ($/Yr)	Estimated	$750
Land Application, Disposal		
Trucking Miles Per Trip	22	
Trucking Trips Per Year	98	
Trucking Miles Per Year	2156	
Trucking Cost Per Mile	$1.25	$2,695
Annual Trucking Cost		
Labor Hours Per Truck Load	3	
Hauling Labor		$8,379
Testing/Lab Analysis		$2,000
Disposal Land, Future Purchase Set Aside		
Acres Required	80	
Cost Per Acre	$2,000	
Year To Purchase	20	
Annual Disposal Land Set Aside		$8,000
Equipment Replacement		
Haul Truck	$100,000	
Disposal Site Equipment	$40,000	
Total	$140,000	
Evaluated Life	20	
Annual Biosolids Equipment Replacement		$7,000
Total Annual Biosolids Disposal		$32,674

C2AE
1211 Ludington St., Escanaba, Michigan 49829

PROJECT	CITY OF GLADSTONE, MICHIGAN	PROJECT NO.	21-0088
	SRF Project Plan	BY:	JAH
ALTERNATIVE			
		DATE:	2/19/21

SALVAGE VALUE OF ALTERNATIVES

		Option 1		Option 2		Option 3		Option 4		Option 5	
		Original Cost	Salvage Value	Original Cost	Salvage Value	Original Cost	Salvage Value	Original Cost	Salvage Value	Original Cost	Salvage Value
	Structures (40 year Life)	$5,683,200	$2,841,600	$5,004,000	$2,502,000	$7,502,800	$3,751,400	$5,536,800	$2,768,400	$5,491,200	$2,745,600
	Piping and Valves (50 Year Life)	$4,972,800	$1,989,120	$4,378,500	$1,751,400	$6,564,950	$2,625,980	$4,844,700	$1,937,880	$4,804,800	$1,921,920
	Equipment (20 year life)	$3,552,000	$355,200	$3,127,500	$312,750	$4,689,250	$468,925	$3,460,500	$346,050	$3,432,000	$343,200
	Total	$14,208,000	$5,186,000	$12,510,000	$4,567,000	$18,757,000	$6,847,000	$13,842,000	$5,053,000	$13,728,000	$5,011,000
Equipment Replacement											
	Equipment $/useful life	$177,600		$156,375		$234,463		$173,025		$171,600	

Gladstone budget WWTP		Actual 2016-2017	Budgeted 2017-2018	Proposed 2018-2019	Estimated 2019-2020	Estimated 2020-2021	Estimated 2021-2022
702-000	Payroll	$ 50,247	$ 48,000	$ 48,960	$ 50,430	$ 51,950	$ 53,510
702-100	Social Security	$ 3,005	$ 2,980	$ 3,160	$ 3,260	$ 3,360	$ 3,470
702-200	Medicare	$ 703	$ 700	$ 710	$ 740	$ 770	$ 800
702-600	MERS Defined Contribution	$ 1,926	$ 320	$ 5,390	$ 5,560	$ 5,730	$ 5,910
733-000	Tools	$ 330	$ 500	$ 600	$ 620	$ 640	$ 660
740-000	Materials Supplies	$ 7,108	$ 7,000	$ 7,000	$ 7,210	$ 7,430	$ 7,660
796-000	Treatment Chemicals	$ 14,418	$ 15,500	$ 16,000	$ 16,480	$ 16,980	$ 17,490
921-000	Electricity	$ 26,200	$ 31,200	$ 31,000	$ 31,930	$ 32,890	$ 33,880
922-000	Natural Gas	$ 5,330	$ 6,000	$ 6,000	$ 6,180	$ 6,370	$ 6,570
923-000	Water Sewer	$ 3,013	$ 750	$ 800	$ 830	$ 860	$ 890
940-000	Contracted Services	$ 6,063	$ 3,000	$ 5,000	$ 5,150	$ 5,310	$ 5,470
970-000	Capital Outlay	-	-	$ 45,000	$ 46,350	$ 47,750	$ 49,190
		$ 118,343	$ 115,950	$ 169,620	$ 174,740	$ 180,040	$ 185,500
Lab							
702-000	Payroll	$ 39,090	$ 38,000	$ 38,760	$ 39,930	$ 41,130	$ 42,370
702-100	Social Security	$ 2,340	$ 2,360	$ 2,510	$ 2,590	$ 2,670	$ 2,760
702-200	Medicare	$ 547	$ 550	$ 560	$ 580	$ 600	$ 620
702-600	MERS Defined Contribution	$ 1,377	$ 200	$ 4,260	$ 4,390	$ 4,530	$ 4,670
740-000	Materials & Supplies	$ 3,269	$ 3,500	$ 3,500	$ 3,610	$ 3,720	$ 3,840
940-000	Contracted Services	$ 7,880	$ 6,000	$ 6,000	$ 6,180	$ 6,370	$ 6,570
970-000	Capital Outlay			$ 3,000	$ 3,090	$ 3,190	$ 3,290
		$ 54,503	$ 50,610	$ 58,590	$ 60,370	$ 62,210	$ 64,120
		$ 172,846	$ 166,560	$ 228,210	$ 235,110	$ 242,250	$ 249,620

CITY OF GLADSTONE - SOLIDS DESIGN DATA

Design Values	Value	Units	Notes
Average Day Flow	1.5	MGD	
BOD loading	1952	lbs/day	Based on Average loading
SS loading	1927	lbs/day	
Primary clarifier removal, BOD	48.7%		4 year MOR Average
Primary Clarifier Removal, SS	63.2%		5 year MOR Average
RBF Removal, BOD	30%		Worse case for solids generation
RBF Removal, SS	50%		Worse case for solids generation
RBF Volume Removal	60	Cft/MGD/Day	
RBF Solids density	50	lb/cft	SWAG by MPF
Primary Sludge concentration	1.0%		
Secondary Sludge Concentration	0.5%		
Thickened Sludge Concentration	4.3%		Per City
Primary An. Digester Volume	18,450	cft	
Secondary An, Digester Vol	13,662	cft	
Sludge Storage Tank Volume	551,351	cft	for storage only

Primary Digester 1 - Fixed	
ft. dia	35
bottom cone section	4
ft. Wall ht - Estimated above cone	18
Volume, top section ne Cft	17,167
Volume Cone Section. Cft	1,283
total volume cft	18,450
Volume, Gal	129,147

Primary Digester 2 - Floating	
ft. dia	35
ft. Wall ht- max	14.2
Anaerobic Volume cft	13,662
Volume, Gal	102,189
ft. Wall ht without lid	20.5
ft. freeboard	2
Aerobic volume, cft	17,799
Aerobic Volume, Gal	133,133

Sludge Storage	
Number tanks	2
Length	59
Width	60
Depth	12
Ft, Freeboard for storage	1
Volume Each, cft	36,855
Total Volume, cft	73,710
total Volume, Gal	551,351
ft, Digester Freeboard	2
Digester Volume	33,345
Total volume cft	66,690
Total volume gal	498,841

Distance to Escanaba WWTP R/T	22	Miles	
Truckload volume	3,000	Gallons	Per City
Current Average Loads PR YEAR	98		Per city
Trucking cost per Mile	1.25		
On site land application equipment	45.00	$/hr.	
Time per truckload	3.00	hours	
Loads for aerobic secondary sludge	45.00		
Loads for full aerobic sludge	107.80		
Laborer	28.50	$/hr.	With fringes
Sr Laborer	30.00	$/hr.	
Superintendent	35.00	$/hr.	
Landfall tipping fee	60	$/ton	

Nexon Sludge Numbers		35%	Assumed Reduction fro Gladstone
At 150 mg/L TSS inlet, dewatered sludge production, lb/h	241	84	
At 300 mg/L TSS inlet, dewatered sludge production, lb/h	554	194	
At 150 mg/L TSS inlet, dewatered sludge production, cf/h	3.5	1	
At 300 mg/L TSS inlet, dewatered sludge production, cf/h	8	3	

RBF Power 10

=160 Hp x .746 Kw/Hp x 365 Days x 24 Hrs. x 0.15 $/kw)/.95 =

secondary digester conversion to aerobic					
Remove/demo floating cap		$ 25,000			
Clean and recoat		$ 45,000			
Interior piping		$ 5,000		$/sft	0
Aluminum dome cover		$ 28,863	30		
Aeration system (ecomix)		$ 150,000			
Compressor		$ 15,000			
		$ 268,900			
Electric	$/kwhr	0.13			
RBF electric	HP	10			
Duty cycle		80%			
	kw/hp	0.746			
cost		$ 6,800			
Digester electric	HP	80			
Duty cycle		75%			
	kw/hp	0.746			
cost		$ 50,800.00			

APPENDIX D

Part 2 – Biosolids Cost Analysis

C2AE

1211 Ludington St., Escanaba, Michigan 49829 **Date** March 30, 2021

CITY OF GLADSTONE, MICHIGAN

COST SUMMARY AND PRESENT WORTH EVALUATION - BIOSOLIDS IMPROVEMENTS

Description Construction Cost Opinion		Alternative A Blended RS/SS Press and Drying	Alternative B Anaerobic Digestion Land Application	Alternative C Aerobic Digestion Land Application	Alternative D Primary>Landfill Secondary>Landfill	Alternative E Primary>Landfill Secondary>Anaer. Dig
Capital Cost Opinion		$1,762,000	$1,636,000	$1,294,000	$1,272,000	$2,628,000
Engineering, Planning, Legal and Admin	30.0%	$528,600	$490,800	$388,200	$381,600	$788,400
PROJECT COST		$2,291,000	$2,127,000	$1,683,000	$1,654,000	$3,417,000
Green Project Reserve Credit	50.0%		$780,500			
Escalation to 2024 construction	10.0%		$78,050			
Total Green Project Credit			$858,550			
CITY OF GLADSTONE PROJECT COST		$2,291,000	$1,268,450	$1,683,000	$1,654,000	$3,417,000

Description Annual Operations Maintenance and Replacement Costs		Alternative A Blended RS/SS Press and Drying	Alternative B Anaerobic Digestion Land Application	Alternative C Aerobic Digestion Land Application	Alternative D Primary>Landfill Secondary>Landfill	Alternative E Primary>Landfill Secondary>Anaer. Dig
Differential Electrical Power Costs		$30,991	$5,174	$10,333	$125,207	$5,644
Annual Routine O&M		$30,750	$8,775	$13,350	$4,413	$8,100
Solids Landfill Disposal		$2,000	-	-	$27,958	$27,958
Sludge Land Application		-	$20,613	$21,206	-	$17,861
Land Application-Replacement Site		-	$12,000	$12,000	-	$12,000
Equipment Replacement		$24,425	$13,600	$8,500	$29,176	$14,850
Total Annual Costs		$88,200	$60,200	$65,400	$186,800	$86,500

Present Worth Analysis		Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Project Cost		$2,291,000	$2,127,000	$1,683,000	$1,654,000	$3,417,000
Annual O&M		$88,200	$60,200	$65,400	$186,800	$86,500
Interest Rate		-0.5%	-0.5%	-0.5%	-0.5%	-0.5%
Years		20	20	20	20	20
Salvage		$599,080	$638,040	$504,660	$432,480	$893,520
$(1+i)^N$		0.9046	0.9046	0.9046	0.9046	0.9046
Present Value of Annual O&M		$1,861,000	$1,270,000	$1,380,000	$3,940,000	$1,825,000
Present Value of Salvage		$663,000	$706,000	$558,000	$479,000	$988,000
Present Value		**$3,489,000**	**$2,691,000**	**$2,505,000**	**$5,115,000**	**$4,254,000**

C2AE

1211 Ludington St., Escanaba, Michigan 49829 Date March 30, 2021

CITY OF GLADSTONE, MICHIGAN

ENGINEERS OPINION OF PROBABLE CONSTRUCTION COSTS - BIOSOLIDS IMPROVEMENTS

Description **Process Items**	**Alternative A** **Blended RS/SS** **Press and Drying**	**Alternative B** **Anaerobic Digestion** **Land Application**	**Alternative C** **Aerobic Digestion** **Land Application**	**Alternative D** **Primary>Landfill** **Secondary>Landfill**	**Alternative E** **Primary>Landfill** **Secondary>Anaer. Dig**
Digester Gas Handling System		$95,000			$95,000
Digester Gas Piping and Valves		$60,000			$60,000
Primary Anaerobic Digester (No. 1) Conversion To Aerobic			$805,000		
Primary Anaerobic Digester (No. 1) Mixing and Rehabilitation		$801,000			$801,000
Primary Digester Heating Boiler and Exchanger Replacements		$400,000			$400,000
Secondary Digester Conversion			$414,000		
Secondary Digester (No. 2) Rehabilitation		$205,000		$205,000	$205,000
Primary and Secondary Sludge Drying Improvements	$1,462,000				
RBF Sludge Pump Capital		$75,000	$75,000		
Secondary Sludge Thickening Facility				$1,067,000	$1,067,000
Sludge Blending and Storage, Reservoir Improvements	$300,000				
	$1,762,000	$1,636,000	$1,294,000	$1,272,000	$2,628,000

Green Project Reserve **Items eligible for 50% Loan Forgiveness**	**Alternative A** **Blended RS/SS** **Press and Drying**	**Alternative B** **Anaerobic Digestion** **Land Application**	**Alternative C** **Aerobic Digestion** **Land Application**	**Alternative D** **Primary>Landfill** **Secondary>Landfill**	**Alternative E** **Primary>Landfill** **Secondary>Anaer. Dig**
Digester Gas Handling System		$95,000			
Digester Gas Piping and Valves		$60,000			
Primary Digester Heating Boiler and Exchanger Replacements		$400,000			
Primary Anaerobic Digester (No. 1) Mixing and Rehabilitation		$801,000			
Secondary Digester (No. 2) Rehabilitation		$205,000			
		$1,561,000			

CITY OF GLADSTONE, MICHIGAN

OPINION OF COST FOR PROCESS CAPITAL IMPROVEMENTS

BIOSOLID ALTERNATIVE A: DEHYDRATION (DRYING) OF BOTH PRIMARY AND SECONDARY SLUDGES

This alternative includes blending of primary and secondary sludge's. A screw press will be used to dewater blended sludge to 20% solids. An electric sludge dehydrator (dryer) will be used to produce a Class A product for public distribution. Existing digesters are rehabilitated and improved to provide tankage for blending and gravity thickening of the primary and secondary sludge mixture. All dried biosolids will be distributed to the public as a soil supplement.

Description		Costs	
Sludge Blending and Storage, Reservoir Improvements		$300,000	Note 1
Primary and Secondary Sludge Drying Improvements		$1,462,000	
Sub total	**$**	**1,762,000**	

Note 1: The cost for Secondary Digester Rehab is provided as an allowance for WAS Sludge Equalization and Gravity Thickening

Operation and Maintenance Costs		Amount
Differential Electrical Power Costs	$	30,991
Annual Routine O&M	$	30,750
Primary Sludge Landfill Disposal	$	2,000
Equipment Replacement	$	24,425
	$	88,166

Biosolids Differential Electrical Power Costs

Dewatered Prim+Sec Sludge Mixing In Storage/Equalization	$5,160	
(5 Bhp x .746 Kwh/Bhp x 24 x 365 x $0.15/Kwh/ 0.95)		
Sludge Pumping To Digester Thickening	$15.05	
(3.5 Bhp x .746 Kwh/Bhp x 0.10 hrs x 365 days x $0.15 per Kwh/.95)		
Primary and Secondary Sludge Drying (1.25 Kwh/gallon sludge)	$24,760	
(4,500 lbs/day 20% P+S/8.34 lbs/gal. x 365 days x 1.25 Kwh/gal. liquid sludge x $0.15/Kwh)		
Shincce Dryer Operating Hp (Pumps & Compressors	$1,056	
(Say 3.0 hp x .746 Kwh/bhp x 12 Hrs/day x 250 Days/yr x $.15/Kwh/.95)		
Sludge Dryer Building Heating ($/Yr)	$0	
Total Differential Electrical Per Year		$30,991.05

CITY OF GLADSTONE, MICHIGAN

OPINION OF COST FOR PROCESS CAPITAL IMPROVEMENTS

BIOSOLID ALTERNATIVE A: DEHYDRATION (DRYING) OF BOTH PRIMARY AND SECONDARY SLUDGES

Annual Biosolid Operation and Maintenance

Polymer Feed		$1,200
(600 ppd solids, 3% sludge, 10 ppm polymer, $2 per lb		
Digester O&M		
Sludge Blending/Store Routine Operating Labor (Hrs/Yr)	50	$1,425
Sludge Blending/Store Maintenance Materials ($/Yr)	Estimated	$500
Sludge Blending/Store Maintenance Labor (Hrs/Yr)	50	$1,425
Grit Disposal, With Primary Sludge		$1,500
(20 Cy x 1.25 Ton/Cy x $60/Ton		
Sludge Dryer Maintenance Materials ($/Yr Shinnci)		$11,000
Sludge Dryer Maintenance Labor (Hr/yr Estimated)	200	$5,700
Sludge Dryer Operator Labor (Hr/yr Estimated)	200	$5,700
WAS Screw Press Maintenance ($/Yr Estimated)		$2,000
Primary Sludge Screw Press Maintenance ($/Yr, Estimated)		$0
Polymer System Maintenance		$300
		$30,750

Landfill Disposal of Primary Sludge

Primary Sludge Production (Tons/Year)	0	
Landfill Tipping Fee ($/Ton)	$60.00	
Annual Landfill Cost ($/Yr)	$0	$0
Landfill Trucking Costs		
Truck	10 Cy Dump	
Trucking Miles Per Trip	14	
Trucking Trips Per Year	0	
Trucking Miles Per Year	0	
Trucking Cost Per Mile	$1.50	
Annual Trucking Cost		$0
Labor Hours Per Truck Load	3	
Hauling Labor		$0
Testing/Lab Analysis		$2,000
Sludge Truck Replacement		
Haul Truck	$50,000	
Total	$50,000	
Evaluated Life	20	
Total Annual Class A Biosolids Disposal		$2,000
(100% Anaerobic Digestion and Land Application		

CITY OF GLADSTONE, MICHIGAN

OPINION OF COST FOR PROCESS CAPITAL IMPROVEMENTS

BIOSOLID ALTERNATIVE A: DEHYDRATION (DRYING) OF BOTH PRIMARY AND SECONDARY SLUDGES

Biosolids Related Equipment Replacement Costs

Blended Sludge Screw Press (1)	$75,000	65000
Secondary Sludge (WAS) Screw Press (1)	$0	
Sludge Dryer (1)	$178,500	
Sludge Conveyors	$50,000	
Sludge Dump Truck	$0	
Primary+Secondary Sludge Pumps	$125,000	
Digester No. 1, Blended Sludge Mixer	$30,000	
Digester No. 2, Blended Sludge Mixer	$30,000	
Total Base Equipment Costs	$488,500	
Assumed Equipment Life	20	
Annual Equipment Replace Cost	$24,425	

CITY OF GLADSTONE, MICHIGAN

OPINION OF COST FOR PROCESS CAPITAL IMPROVEMENTS

BIOSOLID ALTERNATIVE B: ANAEROBIC DIGESTION AND LAND APPLICATION OF SLUDGE

Anaerobic Digestion of Combined Primary and Secondary Solids with Land Application of Digested and Thickened final biosolids. RBF sludge will be pumped to the Anaerobic Digester. Alternative requires regular digester cleaning to remove grit.

Description	Costs
Digester Gas Handling System	$95,000
Digester Gas Piping and Valves	$60,000
Primary Digester Heating Boiler and Exchanger Replacements	$400,000
Primary Anaerobic Digester (No. 1) Mixing and Rehabilitation	$801,000
RBF Sludge Pump Capital	$75,000
Secondary Digester (No. 2) Rehabilitation	$205,000
Capital Cost Subtotal	**$1,636,000**

Annual Operational and Maintenance Cost Summary	Amount
Differential Electrical Power Costs	$5,174
Biosolids Routine Operation and Maintenance	$8,775
Sludge Disposal, Land Application	$20,613
Equipment Replacement	$13,600
Land Application-Replacement Site	$12,000
	$60,162

Biosolids Differential Electrical Power Costs

Anaerobic Digester Mixing (Vaught Rotomix)	$5,159	
(5 Bhp x .746 Kwh/Bhp x 24 x 365 x $0.15/Kwh/ 0.95)		
RBF Sludge Pumping To Digester	$15.05	
(3.5 Bhp x .746 Kwh/Bhp x 0.10 hrs x 365 days x $0.15 per Kwh/.95)		
Total Differential Electrical Per Year		$5,174.05

CITY OF GLADSTONE, MICHIGAN

OPINION OF COST FOR PROCESS CAPITAL IMPROVEMENTS

BIOSOLID ALTERNATIVE B: ANAEROBIC DIGESTION AND LAND APPLICATION OF SLUDGE

Annual Biosolid Routine Operation and Maintenance

Digester O&M		
Digester Routine Labor (Hrs/Yr)	150	$4,275
Digester Physical Maintenance ($/Yr)	Estimated	$1,000
Digester Cleaning ($/Yr)	Estimated	$2,000
Grit Disposal		$1,500
(20 Cy x 1.25 Ton/Cy x $60/Ton		$8,775

Land Application of Digested Sludge

Land Application, Disposal		
Trucking Miles Per Trip	22	
Trucking Trips Per Year	98	
Trucking Miles Per Year	2156	
Trucking Cost Per Mile	$1.50	
Annual Trucking Cost		$3,234
Labor Hours Per Truck Load	3	
Hauling Labor		$8,379
Testing/Lab Analysis		$2,000
Equipment Replacement		
Haul Truck	$100,000	
Disposal Site Equipment	$40,000	
Total	$140,000	
Evaluated Life	20	
Annual Biosolids Equipment Replacement		$7,000
Total Annual Biosolids Disposal By Land Application		$20,613
(100% Anaerobic Digestion and Land Application		
Disposal Land, Future Purchase Set Aside		
Acres Required	80	
Cost Per Acre	$3,000	
Year To Purchase	20	
Annual Disposal Land Set Aside	Approximate	$12,000

CITY OF GLADSTONE, MICHIGAN

OPINION OF COST FOR PROCESS CAPITAL IMPROVEMENTS

BIOSOLID ALTERNATIVE B: ANAEROBIC DIGESTION AND LAND APPLICATION OF SLUDGE

Biosolids Related Equipment Replacement Costs

DG Boiler and Heat Exchanger	$100,000
Primary Digester Mixing Equipment	$102,000
Secondary Digester Floating Cover	$70,000
Total Base Equipment Costs	$272,000
Assumed Equipment Life	20
Annual Equipment Replace Cost	$13,600

CITY OF GLADSTONE, MICHIGAN

OPINION OF COST FOR PROCESS CAPITAL IMPROVEMENTS

BIOSOLID ALTERNATIVE C: AEROBIC DIGESTION AND LAND APPLICATION OF SLUDGE

Aerobic Digestion of Combined Primary and Secondary Sludge and Land Application of Digested and thickened solids. RBF sludge will be pumped to the Aerobic Digester. Alternative requires regular digester cleaning to remove grit. Existing Anaerobic Digester will be converted to a Aerobic Process.

Description	Costs
Primary Anaerobic Digester (No. 1) Conversion To Aerobic	$805,000
RBF Sludge Pump Capital	$75,000
Secondary Digester Conversion	$414,000
Sub total	**$1,294,000**

Operational and Maintenance Costs	Amount	Amount
Differential Electrical Power Costs		$ 10,333
Routine O&M		$ 13,350
Sludge Disposal		$ 21,206
Land Application-Replacement Site		$ 12,000
Equipment Replacement		$ 8,500
		$ 65,389

Biosolids Differential Electrical Power Costs

Aerobic Digester Mixing (Blowers)	$10,318
(10 Bhp x .746 Kwh/Bhp x 24 x 365 x $0.15/Kwh/ 0.95)	
RBF Sludge Pumping To Digester	$15.05
(3.5 Bhp x .746 Kwh/Bhp x 0.10 hrs x 365 days x $0.15 per Kwh/.95)	
Total Differential Electrical Per Year	10,333

CITY OF GLADSTONE, MICHIGAN

OPINION OF COST FOR PROCESS CAPITAL IMPROVEMENTS

BIOSOLID ALTERNATIVE C: AEROBIC DIGESTION AND LAND APPLICATION OF SLUDGE

Annual Biosolid Routine Operation and Maintenance

Digester O&M		
Digester Routine Labor (Hrs/Yr)	100	$2,850
Digester Physical Maintenance ($/Yr)	Estimated	$1,000
Digester Cleaning ($/Yr)	Estimated	$2,000
Biogas, assume 50% Biogas Heating .50x$2/sfx6000sf	Estimated	$6,000
Grit Disposal		$1,500
(20 Cy x 1.25 Ton/Cy x $60/Ton		$13,350

Land Application of Digested Sludge *

Land Application, Disposal		
Trucking Miles Per Trip	22	
Trucking Trips Per Year	103	
Trucking Miles Per Year	2266	
Trucking Cost Per Mile	$1.50	
Annual Trucking Cost		$3,399
Labor Hours Per Truck Load	3	
Hauling Labor		$8,807
Testing/Lab Analysis		$2,000
Equipment Replacement		
Haul Truck	$100,000	
Disposal Site Equipment	$40,000	
Total	$140,000	
Evaluated Life	20	
Annual Biosolids Equipment Replacement		$7,000
Total Annual Biosolids Disposal By Land Application		$21,206
(100% Anaerobic Digestion and Land Application		

* Assumes 5% increase in disposal solids with aerobic digestions

Disposal Land, Future Purchase Set Aside		
Acres Required	80	
Cost Per Acre	$3,000	
Year To Purchase	20	
Annual Disposal Land Set Aside	Approximate	$12,000

CITY OF GLADSTONE, MICHIGAN

OPINION OF COST FOR PROCESS CAPITAL IMPROVEMENTS

BIOSOLID ALTERNATIVE C: AEROBIC DIGESTION AND LAND APPLICATION OF SLUDGE

Biosolids Related Equipment Replacement Costs	
Aeration Blowers	$50,000
Aeration Air Diffusion System	$50,000
Secondary Digester Floating Cover	$70,000
Total Base Equipment Costs	$170,000
Assumed Equipment Life	20
Annual Equipment Replace Cost	$8,500

CITY OF GLADSTONE, MICHIGAN

OPINION OF COST FOR PROCESS CAPITAL IMPROVEMENTS

BIOSOLID ALTERNATIVE D: LANDFILL OF All SLUDGE

Alternative include landfill disposal of Primary RBF sludge and Landfill Disposal of Secondary Sludge. Assumed 20% dry solids for both sludge's, based on screw press dewatering. Requires construction of new Biosolids truck and building south of RBC. Screw presses located in abandoned RBC space. Truck loading building on foundation.

Description	Costs
Secondary Digester (No. 2) Rehabilitation	$205,000
Secondary Sludge Thickening Facility	$1,067,000
Sub total	**$1,272,000**

Note 1: The cost for Secondary Digester Rehab is provided as an allowance for WAS Sludge Equalization and Gravity Thickening

Operation and Maintenance Costs		Amount
Differential Electrical Power Costs	$	125,207
Annual Routine O&M	$	4,413
Primary Sludge Landfill Disposal	$	27,958
Replacement parts	$	5,001
Equipment Replacement	$	24,175
	$	186,754

Biosolids Differential Electrical Power Costs

Dewatered Sludge Mixing (Vaught Rotomix)	$1,032	
(1 Bhp x .746 Kwh/Bhp x 24 x 365 x $0.15/Kwh/ 0.95)		
RBF Sludge Pumping To Digester Thickening	$15.05	
(3.5 Bhp x .746 Kwh/Bhp x 0.10 hrs x 365 days x $0.15 per Kwh/.95)		
Secondary Sludge Drying	$122,000	
(2,932 lbs/day WAS x .80 water x 0.95 x 365 days x 1.0 Kwh/lb liquid sludge x $0.15 Kwh)		
Shincce Dry Operating Hp (Pumps & Compressors	$1,760	
(Say 5.0 hp x .746 Kwh/bhp x 12 Hrs/day x 250 Days/yr x $.15/Kwh/.95)		
Sludge Dryer Building Heating ($/Yr)	$400	
Total Differential Electrical Per Year		$125,207.05

CITY OF GLADSTONE, MICHIGAN

OPINION OF COST FOR PROCESS CAPITAL IMPROVEMENTS

BIOSOLID ALTERNATIVE D: LANDFILL OF All SLUDGE

Annual Biosolid Routine Operation and Maintenance

Digester O&M		
Digester Routine Labor, Thickening (Hrs/Yr)	25	$713
Digester Physical Maintenance ($/Yr)	Estimated	$100
Digester Cleaning ($/Yr)	Estimated (**)	$100
Grit Disposal, With Primary Sludge		$0
(20 Cy x 1.25 Ton/Cy x $60/Ton		
Sludge Dryer Maintenance ($/Yr Estimated)		$2,000
WAS Screw Press Maintenance ($/Yr Estimated)		$500
Primary Sludge Screw Press Maintenance ($/Yr, Estimated)		$1,000
** Reduced For Landfilling of Primary sludge		$4,413

Landfill Disposal of Primary Sludge

Primary (RBF) Sludge Production (Tons/Year)	309	
Landfill Cost ($/Ton)	$60.00	
Landfill Tipping Fee ($/Yr)	$18,540	$18,540
Landfill Trucking Costs		
Truck	10 Cy Dump	
Trucking Miles Per Trip	14	
Trucking Trips Per Year	31	
Trucking Miles Per Year	434	
Trucking Cost Per Mile	$1.50	
Annual Trucking Cost		$651
Labor Hours Per Truck Load	2	
Hauling Labor		$1,767
Testing/Lab Analysis		$2,000
Sludge Truck Replacement		
Haul Truck	$100,000	
Total	$100,000	
Evaluated Life	20	
Annual Biosolids Equipment Replacement		$5,000
Total Annual Biosolids Disposal By Land Application		$27,958
(100% Anaerobic Digestion and Land Application		

CITY OF GLADSTONE, MICHIGAN

OPINION OF COST FOR PROCESS CAPITAL IMPROVEMENTS

BIOSOLID ALTERNATIVE D: LANDFILL OF All SLUDGE

Biosolids Related Equipment Replacement Costs

Primary Sludge (RBF) Screw Press (2)	$150,000
Secondary Sludge (WAS) Screw Press (1)	$75,000
Sludge Dryer (1)	$178,500
Sludge Conveyors	$50,000
Secondary Sludge Storage Mixer	$30,000
Total Base Equipment Costs	$483,500
Assumed Equipment Life	20
Annual Equipment Replace Cost	$24,175

CITY OF GLADSTONE, MICHIGAN

OPINION OF COST FOR PROCESS CAPITAL IMPROVEMENTS

BIOSOLID ALTERNATIVE E: LANDFILL OF PRIMARY SOLIDS AND ANAEROBIC DIGESTION OF THE SECONDARY SLUDGE

Alternative includes landfill disposal of Primary RBF sludge, with Anaerobic Digestion and Land Application of Secondary Sludge.

Description	Costs
Digester Gas Handling System	$95,000
Digester Gas Piping and Valves	$60,000
Primary Digester Heating Boiler and Exchanger Replacements	$400,000
Primary Anaerobic Digester (No. 1) Mixing and Rehabilitation	$801,000
Secondary Digester (No. 2) Rehabilitation	$205,000
Truck Loading Garage(1)	$1,067,000
Capital Cost Sub total	**$2,628,000**

Note (1). Price include new sludge facility without added substructure space and drying systems. Heated garage.

Operation and Maintenance Costs		Amount
Differential Electrical Power Costs	$	5,644
Annual Routine O&M	$	8,100
Primary Sludge Landfill Disposal	$	27,958
Secondary Sludge Land Application	$	17,861
Disposal Land Replacement Fund	$	12,000
Equipment Replacement	$	14,850
	$	86,413

Biosolids Differential Electrical Power Costs

Anaerobic Digester Mixing (Vaught Rotomix)	$5,159	
(5 Bhp x .746 Kwh/Bhp x 24 x 365 x $0.15/Kwh/ 0.95)		
Supplemental NG Heating of Digester (Estimated)	$1,000	
RBF Sludge Conveyor Power	$85.00	
(1.0 Bhp x .746 Kwh/Bhp x 2 hrs x 365 days x $0.15 per Kwh/.95)		
Sludge Disposal Building Heating ($/Yr)	$400	
Total Differential Electrical Per Year		$5,644.00

CITY OF GLADSTONE, MICHIGAN

OPINION OF COST FOR PROCESS CAPITAL IMPROVEMENTS

BIOSOLID ALTERNATIVE E: LANDFILL OF PRIMARY SOLIDS AND ANAEROBIC DIGESTION OF THE SECONDARY SLUDGE

Annual Biosolid Routine Operation and Maintenance

Digester O&M		
Digester Routine Labor (Hrs/Yr)	150	$4,275
Digester Physical Maintenance ($/Yr)	Estimated	$1,000
Sludge Thickening Routine Labor ($/Yr)	50	$1,425
Digester Cleaning ($/Yr)	Estimated (**)	$1,000
Grit Disposal, With Primary Sludge		$0
(20 Cy x 1.25 Ton/Cy x $60/Ton		
Sludge Building Heating		$400
		$8,100

** Reduced For Landfilling of Primary sludge

Landfill Disposal of Primary Sludge

Primary (RBF) Sludge Production (Tons/Year)	309	
Landfill Cost ($/Ton)	$60.00	
Landfill Tipping Fee ($/Yr)	$18,540	$18,540
Landfill Trucking Costs		
Truck	10 Cy Dump	
Trucking Miles Per Trip	14	
Trucking Trips Per Year	31	
Trucking Miles Per Year	434	
Trucking Cost Per Mile	$1.50	
Annual Trucking Cost		$651
Labor Hours Per Truck Load	2	
Hauling Labor		$1,767
Testing/Lab Analysis		$2,000
Sludge Truck Replacement		
Haul Truck	$100,000	
Total	$100,000	
Evaluated Life	20	
Annual Biosolids Equipment Replacement		$5,000
Total Annual Biosolids Disposal By Land Application		$27,958

CITY OF GLADSTONE, MICHIGAN

OPINION OF COST FOR PROCESS CAPITAL IMPROVEMENTS

BIOSOLID ALTERNATIVE E: LANDFILL OF PRIMARY SOLIDS AND ANAEROBIC DIGESTION OF THE SECONDARY SLUDGE

Land Application of Secondary Sludge

Total Secondary Sludge Dry Solids (Lbs/Day)	586	
Total Secondary Sludge VS (Lbs/Day)	440	
Total Digested Sludge Dry Solids (Lbs/Day)	367	Estimated
Digested Sludge Concentration (%)	4.0	
Digested Sludge Wet Weight (Lbs/Day)	9,175	
Digested Sludge Volume (Gpd)	1,100	
Land Application, Disposal		
Truck Capacity (Gal)	3,000	
Trucking Miles Per Trip	22	
Trucking Trips Per Year	134	
Trucking Miles Per Year	2,945	
Trucking Cost Per Mile	$1.50	
Annual Trucking Cost		$4,417
Labor Hours Per Truck Load	3	
Hauling Labor		$11,444
Testing/Lab Analysis		$2,000
		$17,861

Disposal Land, Future Purchase Set Aside

Acres Required	80	
Cost Per Acre	$3,000	
Year To Purchase	20	
Annual Disposal Land Set Aside	Approximate	$12,000

Equipment Replacement

DG Boiler and Heat Exchanger		$100,000
Primary Digester Mixing Equipment		$102,000
Disposal Site Equipment	Estimated	$25,000
Secondary Digester Floating Cover		$70,000
Total Base Equipment Costs		$297,000
Equipment Life (Yr)		20
Annual Biosolids Equipment Replacement		$14,850

C2AE
1211 Ludington St., Escanaba, Michigan 49829

PROJECT	CITY OF GLADSTONE, MICHIGAN	PROJECT NO.	21-0088
	WWTP SAW PROCESS EVALUATION - PROJECT PLAN	BY:	JAH
ALTERNATIVE			
		DATE:	3/30/21

SALVAGE VALUE OF ALTERNATIVES

	Asset Life	Alternative A		Alternative B		Alternative C		Alternative D		Alternative E	
		Original Cost	Salvage Value	Original Cost	Salvage Value	Original Cost	Salvage Value	Original Cost	Salvage Value	Original Cost	Salvage Value
				*	*	*	*	*	*	*	*
	Structures (40 year Life)	$704,800	$281,920	$818,000	$327,200	$647,000	$258,800	$508,800	$203,520	$1,051,200	$420,480
	Piping and Valves (50 Year Life)	$528,600	$264,300	$572,600	$286,300	$452,900	$226,450	$381,600	$190,800	$788,400	$394,200
	Equipment (20 year life)	$528,600	$52,860	$245,400	$24,540	$194,100	$19,410	$381,600	$38,160	$788,400	$78,840
	Total	$1,762,000	$599,080	$1,636,000	$638,040	$1,294,000	$504,660	$1,272,000	$432,480	$2,628,000	$893,520
Equipment Replacement											
	Equipment $/useful life	$26,430		$12,270		$9,705		$19,080		$39,420	

* - Values estimated on a percent basis of the project cost and adjusted per each alternative.

Gladstone budget wwtp		Actual 2016-2017	Budgeted 2017-2018	Proposed 2018-2019	Estimated 2019-2020	Estimated 2020-2021	Estimated 2021-2022
702-000	Payroll	$ 50,247	$ 48,000	$ 48,960	$ 50,430	$ 51,950	$ 53,510
702-100	Social Security	$ 3,005	$ 2,980	$ 3,160	$ 3,260	$ 3,360	$ 3,470
702-200	Medicare	$ 703	$ 700	$ 710	$ 740	$ 770	$ 800
702-600	MERS Defined Contribution	$ 1,926	$ 320	$ 5,390	$ 5,560	$ 5,730	$ 5,910
733-000	Tools	$ 330	$ 500	$ 600	$ 620	$ 640	$ 660
740-000	Materials Supplies	$ 7,108	$ 7,000	$ 7,000	$ 7,210	$ 7,430	$ 7,660
796-000	Treatment Chemicals	$ 14,418	$ 15,500	$ 16,000	$ 16,480	$ 16,980	$ 17,490
921-000	Electricity	$ 26,200	$ 31,200	$ 31,000	$ 31,930	$ 32,890	$ 33,880
922-000	Natural Gas	$ 5,330	$ 6,000	$ 6,000	$ 6,180	$ 6,370	$ 6,570
923-000	Water Sewer	$ 3,013	$ 750	$ 800	$ 830	$ 860	$ 890
940-000	Contracted Services	$ 6,063	$ 3,000	$ 5,000	$ 5,150	$ 5,310	$ 5,470
970-000	Capital Outlay	-	-	$ 45,000	$ 46,350	$ 47,750	$ 49,190
		$ 118,343	$ 115,950	$ 169,620	$ 174,740	$ 180,040	$ 185,500

Lab							
702-000	Payroll	$ 39,090	$ 38,000	$ 38,760	$ 39,930	$ 41,130	$ 42,370
702-100	Social Security	$ 2,340	$ 2,360	$ 2,510	$ 2,590	$ 2,670	$ 2,760
702-200	Medicare	$ 547	$ 550	$ 560	$ 580	$ 600	$ 620
702-600	MERS Defined Contribution	$ 1,377	$ 200	$ 4,260	$ 4,390	$ 4,530	$ 4,670
740-000	Materials & Supplies	$ 3,269	$ 3,500	$ 3,500	$ 3,610	$ 3,720	$ 3,840
940-000	Contracted Services	$ 7,880	$ 6,000	$ 6,000	$ 6,180	$ 6,370	$ 6,570
970-000	Capital Outlay			$ 3,000	$ 3,090	$ 3,190	$ 3,290
		$ 54,503	$ 50,610	$ 58,590	$ 60,370	$ 62,210	$ 64,120
		$ 172,846	$ 166,560	$ 228,210	$ 235,110	$ 242,250	$ 249,620

Design Values	Value	Units	Notes
Average Day Flow	1.0	MGD	
BOD loading	1301	lbs/day	Based on Average loading
SS loading	1284	lbs/day	
Primary clarifier removal, BOD	48.7%		RBF Pilot
Primary Clarifier Removal, SS	63.2%		5 year MOR Average
RBF Removal, BOD	25%		Worse case for solids generation
RBF Removal, SS	40%		Worse case for solids generation
RBF Volume Removal	60	Cft/MGD/Day	
RBF Solids density	50	lb/cft	SWAG by MPF
Primary Sludge concentration	1.0%		
Secondary Sludge Concentration	0.5%		
Thickened Sludge Concentration	4.3%		Per City
Primary An. Digester Volume	17,973	cft	
Secondary An, Digester Volume	13,662	cft	
Sludge Storage Tank Volume	551,351	cft	for storage only

Primary Digester 1 - Fixed	
ft. dia	35
bottom cone section	4
ft. Wall ht - Estimated above cone	17.5
Volume, top section ne Cft	16,690
Volume Cone Section. Cft	1,283
total volume cft	17,973
Volume, Gal	125,809

Primary Digester 2 - Floating	
ft. dia	35
ft. Wall ht- max	14.2
Anaerobic Volume cft	13,662
Volume, Gal	102,189
ft. Wall ht without lid	20.5
ft. freeboard	2
Aerobic volume, cft	17,799
Aerobic Volume, Gal	133,133

Sludge Storage	
Number tanks	2
Length	59
Width	60
Depth	12
Ft, Freeboard for storage	1
Volume Each, cft	36,855
Total Volume, cft	73,710
total Volume, Gal	551,351
ft, Digester Freeboard	2
Digester Volume	33,345
Total volume cft	66,690
Total volume gal	498,841

Distance to Escanaba WWTP R/T	22	Miles	
Truckload volume	3,000	Gallons	Per City
Current Average Loads PR YEAR	98		Per city
Trucking cost per Mile	1.25		
On site land application equipment	45.00	$/hr.	
Time per truckload	3.00	hours	
Loads for aerobic secondary sludge	45.00		
Loads for full aerobic sludge	107.80		
Laborer	28.50	$/hr.	With fringes
Sr Laborer	30.00	$/hr.	
Superintendent	35.00	$/hr.	
Landfall tipping fee	60	$/ton	

Nexon Sludge Numbers		35%	Assumed Reduction fro Gladstone
At 150 mg/L TSS inlet, dewatered sludge production, lb/h	241	84	
At 300 mg/L TSS inlet, dewatered sludge production, lb/h	554	194	
At 150 mg/L TSS inlet, dewatered sludge production, cf/h	3.5	1	
At 300 mg/L TSS inlet, dewatered sludge production, cf/h	8	3	

RBF Power 10

=160 Hp x .746 Kw/Hp x 365 Days x 24 Hrs. x 0.15 $/kw)/.95 =

Secondary Digester Conversion to Aerobic				
Remove/demo floating cap	$ 25,000			
Clean and recoat	$ 45,000			
Interior piping	$ 5,000		$/sft	0
Aluminum dome cover	$ 28,863	30		
Aeration system (ecomix)	$ 150,000			
Compressor	$ 15,000			
	$ 268,900			

Electric	$/kwhr	0.13
RBF electric	HP	10
Duty cycle		80%
	kw/hp	0.746
cost		$ 6,800
Digester electric	HP	80
Duty cycle		75%
	kw/hp	0.746
cost		$ 50,800.00

APPENDIX D

Part 3 – WWTP Improvement Supporting Costs

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1211 Ludington St., Escanaba, Michigan 49829

PROJECT	**Gladstone WWTP - Process Capital Improvement**	**PROJECT NO.**	**21-0088**
		BY:	**MMB**
ALTERNATIVE	**MBBR Tank**		
		DATE:	**2/10/21**

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	Adjusted Unit Amount	TOTAL AMOUNT
1	General Conditions (8%)					
	Contractor Overhead	1	Ls		$ 58,344	$ 58,400
2	Demolition					
	Miscellaneous Demolition	1	Ls	$25,000	$ 31,250	$ 31,300
	Dewatering	1	Ls	$ 75,000	$ 93,750	$ 93,800
3	MBBR Concrete (2 New Common Wall Process Tanks)					
	Concrete Perimeter Wall, 16",	150	Cy	$920	$ 1,150	$ 172,500
	Concrete Interior Wall, 16",	25	Cy	$ 880	$ 1,100	$ 27,500
	Base Slab, 18",	150	Cy	$624	$ 780	$ 117,000
	Supported Slabs and Walkways, 12"	50	Cy	$ 920	$ 1,150	$ 57,500
	Miscellaneous Concrete	100	Cy	$690	$ 863	$ 86,300
	Mud Matt	10	Cy	$ 324	$ 405	$ 4,100
4	Masonry					
	Intentionally Left Blank					
5	Miscellaneous Metals					
	Lintels, Handrail, Grating, Access Hatches, Ladders	1	Ls	$ 50,000	$ 62,500	$ 62,500
7	Thermal and Moisture Protection					
	Intentionally Left Blank					
8	Doors and Windows					
	Intentionally Left Blank					
9	Protective Coatings					
	Intentionally Left Blank					
13	Special Construction					
	Intentionally Left Blank					
22	Plumbing Allowances					
	Intentionally Left Blank					
23	HVAC					
	Intentionally Left Blank					
26	Electrical Systems					

	Intentionally Left Blank					
31	Earthwork					
	Excavation, Total	2,500	Cy	$ 20	$ 25	$ 62,500
	Compacted Backfill	300	Cy	$9	$ 12	$ 3,500
	Restoration	15,000	Sf	$ 1	$ 1	$ 10,800
33	Utilities					
	Intentionally Left Blank					
40	Process Integration					
	Intentionally Left Blank					
44	Process Equipment					
	Intentionally Left Blank					
46	Wastewater Equipment					
	Intentionally Left Blank					
	Miscellaneous					
	Intentionally Left Blank					
	Contruction Total					**$ 788,000**
	Engineering Planning and Contingencies					**$ 237,000**
	TOTAL PROJECT COST					**$ 1,025,000**

Evaluated Annual O&M For Round Primary Clarifiers	
Additional Electrical Power Costs (1)	$0
Chemical Costs (2)	$0
Manpower and Maintenance (3)	$0
Suggested Annual Equipment Replacement Deposit (4)	$0
Facility Heating Costs (5)	$0
Total Annual Additional O&M	**$0**

Notes:

1. Baseline electrical. No additional with equal primary building electrical and less drive motor Hp
2. Chemical costs assumed equal
3. Based on an total 2 hours per week labor and $3,000 per year maintenance
   = (2 hrs/wk x $30/hr x 52) + $3,000
4 Depreciation or equipment replacement for collectors, pumps, blower, and other short lifed equipment over a 20 over a 20 year life. $408,000 approximately/20 yeears.
5. Relative heating cost for heating new primary building enclosure at $0.08 per cf/year.
   31,200 cf x $0.08 = $2,496 per year

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1211 Ludington St., Escanaba, Michigan 49829

PROJECT	**Gladstone WWTP - Process Capital Improvement**	**PROJECT NO.**	**21-0088**
		BY:	**MMB**
ALTERNATIVE	**MBBR Equipment**		
		DATE:	**3/24/20**
		UPDATED:	

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	Adjusted Unit Amount	TOTAL AMOUNT
New MBBR Process						
1	General Conditions (8%)	1	Ls		$ 114,080	$ 114,100
2	Intentionally Left Blank					
3	Intentionally Left Blank					
4 Thru 10	Intentionally Left Blank					
6	Intentionally Left Blank					
7	Intentionally Left Blank					
23	Intentionally Left Blank					
26	Process Electrical Distribution	1	Ls	$ 150,000	$ 187,500	$ 187,500
	Low Voltage Lighting and Electrical Dist.	1	Ls	$ 20,000	$ 25,000	$ 25,000
31	Intentionally Left Blank					
40	Influent Piping, 16" DIP	100	Ls	$ 300	$ 375	$ 37,500
	Effluent Piping, 24" DIP	100	Lf	$ 500	$ 625	$ 62,500
	Drain Piping, 6" DIP	50	Lf	$ 150	$ 188	$ 9,400
	Plug Valves, 16"	3	Lf	$ 3,600	$ 4,500	$ 13,500
	Plug Valves, 6"	2	Ea	$ 1,800	$ 2,250	$ 4,500
	Check Valves 6"	2	Ea	$ 1,920	$ 2,400	$ 4,800
	Process Instrumentation	1	Ls	$ 50,000	$ 62,500	$ 62,500
44	Intentionally Left Blank					
46	MBBR Equipment (Aeration, Media, Screens)	1	Ls	$ 550,000	$ 687,500	$ 687,500
	MBBR Equipment Installation	1	Ls	$ 175,000	$ 218,750	$ 218,800
	PD Blower Control Panel	1	Ls	$ 40,000	$ 50,000	$ 50,000
	Miscellaneous	1	Ls	$ 50,000	$ 62,500	$ 62,500
	Construction Subtotal					**$ 1,541,000**
	Engineering, Planning, Contingencies					**$ 463,000**
	Total Project Cost					**$ 2,004,000**

Annual O&M For Items Which are Not Substantially The Same

Process Electrical Power (1)	$77,789
Maintenance (2)	$2,280
Equipment Replacement (3)	$27,500
Total Annual Additional O&M	**$107,569**

Notes:

1. Process Electrical
   Assume 100 bhp from 2 blowers
   100 % time operation, $0.12 per kwh is

2. Annual Maintenance
   PD Blower Mainteance
   8 hours/quarter @ $40/hr + $1000 parts

   $0

3. Equipment replacement costs including vertical screen, raw sewage pumps, and valves/gates
   Aeration Blower
   Aeration Grid
   MBBR Media

   $550,000

   RRI Per Year For 20 Year Life **$27,500**

4. Estimated Impact of Pass-through Grit
   Digester Cleaning
   General Downstream Maintenance

   $0

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1211 Ludington St., Escanaba, Michigan 49829

PROJECT	Gladstone WWTP - Process Capital Improvement	PROJECT NO.	21-0088
		BY:	TAA/DRH
ALTERNATIVE	RBC Train in Primary Tank		
		DATE:	3/13/20

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	Adjusted Unit Amount	TOTAL AMOUNT
New Rotating Biological Contactor Train in Primary tank						
1	General Conditions	1	LS		$ 40,216	$ 40,300
2	Demolish Existing Primary Collector Mechanisms	1	Ea	$ 15,360	$ 19,200	$ 19,200
	Demolish Ex. Scum Collector Piping	1	Ea	$ 768	$ 960	$ 1,000
	Demolish Ex. Troughs, Weirs, and Baffles	15	Lf	$ 144	$ 180	$ 2,700
	Demolish Existing Piping and Valves	50	Lf	$ 60	$ 75	$ 3,800
	Demolish Existing Mechanical/Electrical	1	Ls	$ 6,000	$ 7,500	$ 7,500
	Hazardous Materials Mitigation	1	Ls	$ 6,000	$ 7,500	$ 7,500
3	**Concrete Construction**					
	Miscellaneous Concrete	10	Cy	$ 600	$ 750	$ 7,500
	Flowable Fill	32	Cy	$ 240	$ 300	$ 9,600
26	Electrical, 480 Volt	1	LS	$ 45,000	$ 56,250	$ 56,300
40	Instrumentation-Control	1	LS	$ 20,000	$ 25,000	$ 25,000
	Pipework, Valves & Gates, General	1	LS	$ 35,000	$ 43,750	$ 43,800
	Gratings and Hardware	1	LS	$ 15,000	$ 18,750	$ 18,800
46	Standard Density RBCs	1	EA	$ 210,000	$ 262,500	$ 262,500
	RBC Installation	1	EA	$ 30,000	$ 37,500	$ 37,500
	Construction Subtotal					**$ 543,000**
	Engineering, Planning, and Contingencies					**$ 163,000**
	Total Project Cost					**$ 706,000**
Final Clarifier						
1	General Conditions (10% of Construction Items)	1	LS		$ 98,680	$ 98,700
3	Concrete Construction					
	Mud Matt	8	CY	$ 360	$ 450	$ 3,600
	Base Slabs	36	CY	$ 624	$ 780	$ 27,800
	Walls	61	CY	$ 960	$ 1,200	$ 73,400
	Supported Slabs & Misc.	15	CY	$ 960	$ 1,200	$ 18,000
31	Excavation and Backfill	627	CY	$ 30	$ 38	$ 23,600
	Dewatering	1	Ls	$ 35,000	$ 43,750	$ 43,800
	Shoring and Bracing	1	LS	$ 23,000	$ 28,750	$ 28,800
40	Pipework, Valves & Gates, General	1	LS	$ 48,000	$ 60,000	$ 60,000
	Flow split revisions	1	Ls	$ 64,500	$ 80,625	$ 80,700
	Gratings and Hardware	1	LS	$ 36,000	$ 45,000	$ 45,000
	Parallel SE Piping, 16"	160	Lf	$ 400	$ 500	$ 80,000
46	Clarifier Chains and Flights	3	LS	$ 72,000	$ 90,000	$ 270,000
	Installation	3	LS	$ 24,000	$ 30,000	$ 90,000
	Clarifier Flow Baffling Improvements	1	Ls	$ 75,000	$ 93,750	$ 93,800
	Ferric/Alum Feed System	1	Ls	$ 50,000	$ 62,500	$ 62,500
40	Pipework, Valves & Gates, General	1	LS	$ 72,000	$ 90,000	$ 90,000
	Gratings and Hardware	1	LS	$ 36,000	$ 45,000	$ 45,000
	Parallel SE Piping, 16"	100	Ls	$ 300	$ 375	$ 37,500

	Electrical and Controls	1	LS	$ 48,000	$ 60,000	$ 60,000
	Construction Subtotal					**$ 1,333,000**
	Engineering, Planning, and Contingencies					**$ 400,000**
	Total Project Costs					**$ 1,733,000**

Annual O&M For Items Which are Not Substantially The Same

Process Electrical Power (1)	$10,000
Maintenance (2)	$750
Equipment Replacement (3)	$16,725
Total Annual Additional O&M	**$27,475**

Notes:

1. Process Electrical

	9802.44	**$10,000**

2. Annual Maintenance

250/unit	$750
	$0
	$750

3. Equipment replacement costs including vertical screen, raw sewage pumps, and valves/gates

RBCs		$262,500
Clarifier		$72,000
		$0
		$334,500
	RRI Per Year For 20 Year Life	**$16,725**

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1211 Ludington St., Escanaba, Michigan 49829

PROJECT	**Gladstone WWTP - Process Capital Improvement**	**PROJECT NO.**	**21-0088**
		BY:	**DRH**
ALTERNATIVE	**Administration Building**		
		DATE:	**3/12/20**
		UPDATED:	

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	Adjusted Unit Amount	TOTAL AMOUNT
Administration Building						
1	General Conditions (8%)	1	Ls		$ 101,232	$ 101,300
2	General Demolition	1	Ls	$ 24,000	$ 30,000	$ 30,000
	Concrete Demolition	12	Cy	$ 300	$ 375	$ 4,500
	Pipe Demolition	1	Ls	$ 1,200	$ 1,500	$ 1,500
	Abandon Sewer, Plug Openings	20	Lf	$ 60	$ 75	$ 1,500
3	Footing Concrete, 3' W x 12" T	12	Cy	$ 720	$ 900	$ 10,800
	Footing Wall Concrete	30	Cy	$ 780	$ 975	$ 29,300
	Interior Partition Concrete (12")	0	Cy	$ 960	$ 1,200	$ -
	Floor Slab, On Grade, 6"	40	Cy	$ 600	$ 750	$ 30,000
	Concrete Stair/Porch Access	4	Cy	$ 1,200	$ 1,500	$ 6,000
	Miscellaneous Concrete	18	Cy	$ 600	$ 750	$ 13,500
	Flowable Fill	8	Cy	$ 240	$ 300	$ 2,400
4 Thru 10	Admin Bldg, Masonry, Wood Truss, Metal	1,800	Sf	$ 336	$ 420	$ 756,000
	Connection To Existing	1	Ls	$ 30,000	$ 37,500	$ 37,500
10	Communication Specialties	1	Ls	$ 30,000	$ 37,500	$ 37,500
	Misc. Specialties	1	Ls	$ 6,000	$ 7,500	$ 7,500
6	Laboratory Casework, Wood,	140	Sf	$ 660	$ 825	$ 115,500
12	Lockers, Metal, 8	1	Ls	$ 2,400	$ 3,000	$ 3,000
	Furniture	1	Ls	$ 24,000	$ 30,000	$ 30,000
	Unit Kitchen	1	Ls	$ 12,000	$ 15,000	$ 15,000
31	Earth Excavation	200	Cy	$ 12	$ 15	$ 3,000
	Backfill	160	Cy	$ 12	$ 15	$ 2,400
	Sheeting and Shoring	75	Sf	$ 36	$ 45	$ 3,400
	Pavement Subbase, 22A, 12"	650	Sy	$ 5	$ 7	$ 4,400
	HMA Pavement, 3"	600	Sy	$ 21	$ 26	$ 15,800
	Landscape	1	Ls	$ 12,000	$ 15,000	$ 15,000
	Fencing	300	Lf	$ 30	$ 38	$ 11,300
	Auto Gate	1	Ls	$ 6,000	$ 7,500	$ 7,500
46	Sample Pumps, Centrifugal	3	Ea	$ 7,200	$ 9,000	$ 27,000
	Samplers	3	Ea	$ 8,160	$ 10,200	$ 30,600
	Sample Piping	600	Lf	$ 18	$ 23	$ 13,500
	Construction Subtotal					**$ 1,367,000**
	Engineering, Planning, Contingencies					**$ 411,000**
	Total Project Cost					**$ 1,778,000**

<u>Annual O&M For Items Which are Not Substantially The Same</u>	
Process Electrical Power (1)	
Maintenance (2)	
Equipment Replacement (3)	
Grit Maintenance	
Total Annual Additional O&M	**$0**

Notes:

1. Process Electrical
   Assume 1050 gpm at 40 ft and .70 hydraulic efficiency for 15.2 bhp
   100 % time operation, $0.12 per kwh is

2. Annual Maintenance
   Fine Screen Maintenance (2 Hrs/Wk at $40/Hrs plus $2,000 parts)
   Raw Sewage Pump Maintenance
   $0

3. Equipment replacement costs including vertical screen, raw sewage pumps, and valves/gates
   Screening Equipment
   Washer Compactor
   Raw Sewage Pumps
   Valves and Gates, Approx
   $0

   RRI Per Year For 20 Year Life **$0**

4. Estimated Impact of Pass-through Grit
   Digester Cleaning
   General Downstream Maintenance
   $0

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1211 Ludington St., Escanaba, Michigan 49829

PROJECT	**Gladstone WWTP - Process Capital Improvement**	**PROJECT NO.**	**21-0088**
		BY:	**DRH**
ALTERNATIVE	**Screen and Grit Facility**		
		DATE:	**3/12/20**
		UPDATED:	

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	Adjusted Unit Amount	TOTAL AMOUNT
New Screen and Grit Process						
1	General Conditions (8%)	1	Ls		$ 201,680	$ 201,700
2	General Demolition	1	Ls	$ 24,000	$ 30,000	$ 30,000
3	Perimeter Footing, 3' x 12" x 90'	10	Cy	$ 720	$ 900	$ 9,000
	Footing Wall Concrete, 12" T	20	Cy	$ 780	$ 975	$ 19,500
	Screen/Grit Bottom Slab	26	Cy	$ 720	$ 900	$ 23,400
	Screen/Grit Channel Walls	30	Cy	$ 960	$ 1,200	$ 36,000
	Additional Grit Vortex Walls	5	Cy	$ 1,800	$ 2,250	$ 11,300
	Grit Bldg Slab On Grade, 6"	15	Cy	$ 480	$ 600	$ 9,000
	Supported Slab	5	Cy	$ 1,200	$ 1,500	$ 7,500
	Front Apron Concrete, 6"	8	Cy	$ 360	$ 450	$ 3,600
	Miscellaneous	1	Ls	$ 12,000	$ 15,000	$ 15,000
	Mud Matt	15	Cy	$ 240	$ 300	$ 4,500
4 Thru 10	Primary Bldg, Masonry, Precast Roof	1,600	Sf	$ 372	$ 465	$ 744,000
	Interface with Exiting and Admin Bldg	1	Ls	$ 24,000	$ 30,000	$ 30,000
6	FRP Grating	150	Sf	$ 180	$ 225	$ 33,800
	FRP Handrail	50	Lf	$ 120	$ 150	$ 7,500
7	Screen Removal Roof Hatch	2	Ea	$ 7,800	$ 9,750	$ 19,500
23	Screen Room, Process HVAC	1	Ls	$ 90,000	$ 112,500	$ 112,500
26	Process Electrical Distribution	1	Ls	$ 180,000	$ 225,000	$ 225,000
	Low Voltage Lighting and Electrical Dist.	1	Ls	$ 24,000	$ 30,000	$ 30,000
13	Hoisting System, Equipment Removal	1	Ls	$ 18,000	$ 22,500	$ 22,500
	Dumpsters	2	Ls	$ 3,600	$ 4,500	$ 9,000
31	Earth Excavation	600	Cy	$ 12	$ 15	$ 9,000
	Backfill	20	Cy	$ 12	$ 15	$ 300
40	Grit Slurry Piping	140	Lf	$ 180	$ 225	$ 31,500
	Screen/Grit Slide Gates, 30" x 30"	7	Ea	$ 11,040	$ 13,800	$ 96,600
44	Sample System	1	Ls	$ 12,000	$ 15,000	$ 15,000
	Grit Slurry Pump, S&L Vertical	1	Ea	$ 30,000	$ 37,500	$ 37,500
	Grit Slurry Pump, Horizontal	1	Ea	$ 36,000	$ 45,000	$ 45,000
	Pump Installation	1	Ls	$ 6,000	$ 7,500	$ 7,500
46	Inclined Bar Screen, 6mm Spacing, 27' Lift	1	Ls	$ 228,000	$ 285,000	$ 285,000
	Screen Equipment Installation	1	Ls	$ 30,000	$ 37,500	$ 37,500
	Washer Compactor W/Grinding	1	Ls	$ 144,000	$ 180,000	$ 180,000
	Manual Bar Screen and Appurtenances	1	Ls	$ 12,000	$ 15,000	$ 15,000
	Compactor Installation	1	Ls	$ 12,000	$ 15,000	$ 15,000
	Grit Vortex Equipment	1	Ls	$ 96,000	$ 120,000	$ 120,000

	Grit Classifier	1	Ls	$ 42,000	$ 52,500	$ 52,500
	Grit Cyclone	1	Ls	$ 12,000	$ 15,000	$ 15,000
	Grit Control Panel	1	Ls	$ 18,000	$ 22,500	$ 22,500
	Grit Equipment Installation	1	Ls	$ 30,000	$ 37,500	$ 37,500
	Screening Chute	1	Ls	$ 3,600	$ 4,500	$ 4,500
	Dumpster	1	Ls	$ 1,200	$ 1,500	$ 1,500
	Miscellaneous	1	Ls	$ 72,000	$ 90,000	$ 90,000
	Construction Subtotal					**$ 2,723,000**
	Engineering, Planning, Contingencies					**$ 817,000**
	Total Project Cost					**$ 3,540,000**

Annual O&M For Items Which are Not Substantially The Same
Process Electrical Power (1)
Maintenance (2)
Equipment Replacement (3)
Grit Maintenance
Total Annual Additional O&M **$0**

Notes:

1. Process Electrical
   Assume 1050 gpm at 40 ft and .70 hydraulic efficiency for 15.2 bhp
   100 % time operation, $0.12 per kwh is

2. Annual Maintenance
   Fine Screen Maintenance (2 Hrs/Wk at $40/Hrs plus $2,000 parts)
   Raw Sewage Pump Maintenance
   $0

3. Equipment replacement costs including vertical screen, raw sewage pumps, and valves/gates
   Screening Equipment
   Washer Compactor
   Raw Sewage Pumps
   Valves and Gates, Approx
   $0

   RRI Per Year For 20 Year Life **$0**

4. Estimated Impact of Pass-through Grit
   Digester Cleaning
   General Downstream Maintenance
   $0

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1211 Ludington St., Escanaba, Michigan 49829

PROJECT	**Gladstone WWTP - Process Capital Improvement**	**PROJECT NO.**	**21-0088**
		BY:	**JAH**
ALTERNATIVE	**Screen and Grit Facility, within Ex. RBC Area**		
	Abbreviated Headworks System Option 1	**DATE:**	**3/2/21**
		UPDATED:	

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	Adjusted Unit Amount	TOTAL AMOUNT
New Screen and Grit Process						
1	General Conditions (8%)	1	Ls		$ 142,272	$ 142,300
2	General Demolition	1	Ls	$ 15,000	$ 18,750	$ 18,800
	Demolish Existing RBC mechanisms	2	Ea	$ 22,000	$ 27,500	$ 55,000
	Demolish Existing Piping and Valves	50	Lf	$ 60	$ 75	$ 3,800
	Demolish Existing Mechanical/Electrical	1	Ls	$ 6,000	$ 7,500	$ 7,500
3	Screen/Grit Bottom Slab	15	Cy	$ 720	$ 900	$ 13,500
	Screen Channel Walls	30	Cy	$ 960	$ 1,200	$ 36,000
	Raw Sewage Drop Well	10	Cy	$ 720	$ 900	$ 9,000
	Miscellaneous	1	Ls	$ 5,000	$ 6,250	$ 6,300
4 Thru 10	8" CMU Partition Wall, C1 D1, 68' x 12' H	816	Sf	$ 24	$ 30	$ 24,500
	Ex. RBC Building Rehab	1	Ls	$ 50,000	$ 62,500	$ 62,500
6	FRP Grating	100	Sf	$ 180	$ 225	$ 22,500
	FRP Handrail	175	Lf	$ 120	$ 150	$ 26,300
7	Screen/Grit Drive Removal Roof Hatch	2	Ea	$ 7,800	$ 9,750	$ 19,500
23	Screen Room, Process HVAC	1	Ls	$ 90,000	$ 112,500	$ 112,500
26	Process Electrical Distribution	1	Ls	$ 180,000	$ 225,000	$ 225,000
	Low Voltage Lighting and Electrical Dist.	1	Ls	$ 24,000	$ 30,000	$ 30,000
13	Hoisting System, Equipment Removal	1	Ls	$ 18,000	$ 22,500	$ 22,500
	Dumpsters	2	Ls	$ 3,600	$ 4,500	$ 9,000
31	Backfill, Compacted	46	Cy	$ 12	$ 15	$ 700
40	Grit Slurry Piping/Valves	100	Lf	$ 180	$ 225	$ 22,500
	Screen/Grit Slide Gates, 30" x 30"	4	Ea	$ 10,000	$ 12,500	$ 50,000
	Proposed HW and Primary Tank, Nema 7	1	Ls		$ 100,000	$ 100,000
44	Sample System	1	Ls	$ 12,000	$ 15,000	$ 15,000
	Grit Slurry Pump, Horizontal	2	Ea	$ 30,000	$ 37,500	$ 75,000
	Pump Installation	1	Ls	$ 6,000	$ 7,500	$ 7,500
46	Inclined Bar Screen, 6mm Spacing	1	Ls		$ 160,000	$ 160,000
	Screen Equipment Installation	1	Ls	$ 30,000	$ 37,500	$ 37,500
	Manual Bar Screen and Appurtenances	1	Ls	$ 12,000	$ 15,000	$ 15,000
	Grit Vortex Equipment, with Coanda (classifie	1	Ls		$ 375,000	$ 375,000
	Grit Control Panel	1	Ls	$ 18,000	$ 22,500	$ 22,500
	Grit Equipment Installation	1	Ls	$ 50,000	$ 62,500	$ 62,500
	Screening Chute	1	Ls	$ 3,600	$ 4,500	$ 4,500
	Dumpster	1	Ls	$ 1,200	$ 1,500	$ 1,500

	Miscellaneous	1	Ls	$ 50,000	$ 62,500	$ 62,500
	Piping Allowance	1	Ls	$ 50,000	$ 62,500	$ 62,500
	Construction Subtotal					**$ 1,921,000**
	Engineering, Planning, Contingencies					**$ 577,000**
	Total Project Cost					**$ 2,498,000**

Annual O&M For Items Which are Not Substantially The Same

Process Electrical Power (1)
Maintenance (2)
Equipment Replacement (3)
Grit Maintenance
Total Annual Additional O&M **$0**

Notes:

1. Process Electrical
   Assume 1050 gpm at 40 ft and .70 hydraulic efficiency for 15.2 bhp
   100 % time operation, $0.12 per kwh is

2. Annual Maintenance
   Fine Screen Maintenance (2 Hrs/Wk at $40/Hrs plus $2,000 parts)
   Raw Sewage Pump Maintenance
   $0

3. Equipment replacement costs including vertical screen, raw sewage pumps, and valves/gates
   Screening Equipment
   Washer Compactor
   Raw Sewage Pumps
   Valves and Gates, Approx
   $0

   RRI Per Year For 20 Year Life **$0**

4. Estimated Impact of Pass-through Grit
   Digester Cleaning
   General Downstream Maintenance
   $0

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1211 Ludington St., Escanaba, Michigan 49829

PROJECT	**Gladstone WWTP - Process Capital Improvement**	**PROJECT NO.**	**21-0088**
		BY:	**JAH**
ALTERNATIVE	**Screen and Grit Facility, West of Existing HW**		
	Abbreviated Headworks System Option 2	**DATE:**	**3/2/21**
		UPDATED:	

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	Adjusted Unit Amount	TOTAL AMOUNT
New Screen and Grit Process						
1	General Conditions (8%)	1	Ls		$ 180,808	$ 180,900
2	General Demolition	1	Ls	$ 15,000	$ 18,750	$ 18,800
3	Perimeter Footing, 3' x 12" x 60'	7.5	Cy	$ 720	$ 900	$ 6,800
	Footing Wall Concrete, 12" T	15	Cy	$ 780	$ 975	$ 14,700
	Grit Base Slab	1	Cy	$ 720	$ 900	$ 500
	Grit Channel Walls	12	Cy	$ 960	$ 1,200	$ 13,800
	Additional Grit Vortex Walls	5	Cy	$ 1,800	$ 2,250	$ 11,300
	Grit Pump Bldg Slab On Grade, 6"	9	Cy	$ 480	$ 600	$ 5,300
	Supported Slab	5	Cy	$ 1,200	$ 1,500	$ 7,500
	Front Apron Concrete, 6"	2	Cy	$ 360	$ 450	$ 800
	Miscellaneous	1	Ls	$ 12,000	$ 15,000	$ 15,000
	Mud Matt, 3"	6	Cy	$ 240	$ 300	$ 1,900
4 Thru 10	Grit Pump Bldg, Masonry, Precast Roof	327	Sf	$ 372	$ 465	$ 152,100
	Interface with Exiting and Admin Bldg	1	Ls	$ 24,000	$ 30,000	$ 30,000
	8" CMU Partition Wall, C1 D1, 68' x 12' H	816	Sf	$ 24	$ 30	$ 24,500
	Ex. RBC Building Rehab	1	Ls	$ 50,000	$ 62,500	$ 62,500
6	FRP Grating/Panel	130	Sf	$ 180	$ 225	$ 29,300
	FRP Handrail	60	Lf	$ 120	$ 150	$ 9,000
7	Screen Removal Roof Hatch	1	Ea	$ 7,800	$ 9,750	$ 9,800
23	Screen Room, Process HVAC	1	Ls	$ 75,000	$ 93,750	$ 93,800
26	Process Electrical Distribution	1	Ls	$ 180,000	$ 225,000	$ 225,000
	Low Voltage Lighting and Electrical Dist.	1	Ls	$ 24,000	$ 30,000	$ 30,000
13	Hoisting System, Equipment Removal	1	Ls	$ 18,000	$ 22,500	$ 22,500
	Dumpsters	2	Ls	$ 3,600	$ 4,500	$ 9,000
31	Earth Excavation	400	Cy	$ 12	$ 15	$ 6,000
	Backfill	20	Cy	$ 12	$ 15	$ 300
40	Raw Sewage Piping, 16" DIP	20	Lf	$ 300	$ 375	$ 7,500
	Primary Influent Piping, 18" DIP	80	Lf	$ 420	$ 525	$ 42,000
	Grit Slurry Piping	40	Lf	$ 180	$ 225	$ 9,000
	Plug Valves, 16/18'	4	Ea	$ 3,600	$ 4,500	$ 18,000
	Plug Valves, 6"	4	Ea	$ 1,800	$ 2,250	$ 9,000
	Check Valves 6"	3	Ea	$ 1,920	$ 2,400	$ 7,200
	Screen/Grit Slide Gates, 30" x 30"	4	Ea	$ 11,040	$ 13,800	$ 55,200
	Screen/Grit Stop Plates, 30" x 30"	3	Ea	$ 3,500	$ 4,375	$ 13,200
	Raw Sewage Level Sensor	1	EA	$ 5,000	$ 6,250	$ 6,300
	Process Instrumentation	1	Ls	$ 48,000	$ 60,000	$ 60,000
	Combustible Gas Monitoring System	1	Ls	$ 12,000	$ 15,000	$ 15,000
	Proposed HW and Primary Tank, Nema 7	1	Ls		$ 100,000	$ 100,000

44	Submersible, Dry Pit, Raw Sewage Pumps W/	3	Ea	$ 38,400	$ 48,000	$ 144,000
	Pump Installation	1	Ls	$ 24,000	$ 30,000	$ 30,000
	Sample System	1	Ls	$ 12,000	$ 15,000	$ 15,000
	Grit Slurry Pump, Horizontal	2	Ea	$ 36,000	$ 45,000	$ 90,000
	Pump Installation	1	Ls	$ 6,000	$ 7,500	$ 7,500
46	Inclined Bar Screen, 6mm Spacing	1	Ls	$ 150,000	$ 187,500	$ 187,500
	Screen Equipment Installation	1	Ls	$ 30,000	$ 37,500	$ 37,500
	Manual Bar Screen and Appurtenances	1	Ls	$ 12,000	$ 15,000	$ 15,000
	Grit Vortex Equipment, with Coanda (classifie	1	Ls	$ 350,000	$ 437,500	$ 437,500
	Grit Control Panel	1	Ls	$ 18,000	$ 22,500	$ 22,500
	Grit Equipment Installation	1	Ls	$ 50,000	$ 62,500	$ 62,500
	Screening Chute	1	Ls	$ 3,600	$ 4,500	$ 4,500
	Dumpster	1	Ls	$ 1,200	$ 1,500	$ 1,500
	Miscellaneous	1	Ls	$ 50,000	$ 62,500	$ 62,500
	Construction Subtotal					**$ 2,441,000**
	Engineering, Planning, Contingencies					**$ 19,000**
	Total Project Cost					**$ 81,500**

Annual O&M For Items Which are Not Substantially The Same

Process Electrical Power (1)
Maintenance (2)
Equipment Replacement (3)
Grit Maintenance
Total Annual Additional O&M **$0**

Notes:

1. Process Electrical
   Assume 1050 gpm at 40 ft and .70 hydraulic efficiency for 15.2 bhp
   100 % time operation, $0.12 per kwh is

2. Annual Maintenance
   Fine Screen Maintenance (2 Hrs/Wk at $40/Hrs plus $2,000 parts)
   Raw Sewage Pump Maintenance

$0

3. Equipment replacement costs including vertical screen, raw sewage pumps, and valves/gates
   Screening Equipment
   Washer Compactor
   Raw Sewage Pumps
   Valves and Gates, Approx

$0

RRI Per Year For 20 Year Life **$0**

4. Estimated Impact of Pass-through Grit
   Digester Cleaning
   General Downstream Maintenance

$0

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1211 Ludington St., Escanaba, Michigan 49829

PROJECT	Gladstone WWTP - Process Capital Improvement	PROJECT NO.	21-0088
		BY:	MPF
ALTERNATIVE	New RBF Building		
		DATE:	
		UPDATED:	

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	Adjusted Unit Amount	TOTAL AMOUNT
Administration Building						
1	General Conditions (8%)	1	Ls		$ 78,800	$ 78,800
2	General Demolition	1	Ls	$ 5,000	$ 6,250	$ 6,300
		12	Cy	$ 300	$ 375	$ 4,500
3	Footing Concrete, 3' W x 12" T	12	Cy	$ 720	$ 900	$ 10,800
	Footing Wall Concrete	25	Cy	$ 780	$ 975	$ 24,400
	Floor Slab, On Grade, 6"	40	Cy	$ 600	$ 750	$ 30,000
	Miscellaneous Concrete	10	Cy	$ 600	$ 750	$ 7,500
	Flowable Fill	8	Cy	$ 240	$ 300	$ 2,400
4 Thru 10	Masonry, Wood Truss, Metal	1,600	Sf	$ 336	$ 420	$ 672,000
10	Communication Specialties	1	Ls	$ 2,500	$ 3,125	$ 3,200
	Misc. Specialties	1	Ls	$ 6,000	$ 7,500	$ 7,500
6	Laboratory Casework, Wood,	140	Sf	$ 660	$ 825	$ 115,500
12	Lockers, Metal, 8	1	Ls	$ 2,400	$ 3,000	$ 3,000
	Furniture	1	Ls	$ 24,000	$ 30,000	$ 30,000
	Unit Kitchen	1	Ls	$ 12,000	$ 15,000	$ 15,000
31	Earth Excavation	120	Cy	$ 12	$ 15	$ 1,800
	Backfill	80	Cy	$ 12	$ 15	$ 1,200
	Sheeting and Shoring	75	Sf	$ 36	$ 45	$ 3,400
	Pavement Subbase, 22A, 12"	650	Sy	$ 5	$ 7	$ 4,400
	HMA Pavement, 3"	600	Sy	$ 21	$ 26	$ 15,800
	Landscape	1	Ls	$ 12,000	$ 15,000	$ 15,000
	Fencing	100	Lf	$ 30	$ 38	$ 3,800
	Auto Gate	1	Ls	$ 6,000	$ 7,500	$ 7,500
	Construction Subtotal					**$ 1,064,000**
	Engineering, Planning, Contingencies					**$ 320,000**
	Total Project Cost					**$ 1,384,000**

<u>Annual O&M For Items Which are Not Substantially The Same</u>	
Process Electrical Power (1)	
Maintenance (2)	
Equipment Replacement (3)	
Grit Maintenance	
Total Annual Additional O&M	**$0**

Notes:

1. Process Electrical

   Assume 1050 gpm at 40 ft and .70 hydraulic efficiency for 15.2 bhp

   100 % time operation, $0.12 per kwh is

2. Annual Maintenance

   Fine Screen Maintenance (2 Hrs/Wk at $40/Hrs plus $2,000 parts)

   Raw Sewage Pump Maintenance

   $0

3. Equipment replacement costs including vertical screen, raw sewage pumps, and valves/gates

   Screening Equipment

   Washer Compactor

   Raw Sewage Pumps

   Valves and Gates, Approx

   $0

   RRI Per Year For 20 Year Life **$0**

4. Estimated Impact of Pass-through Grit

   Digester Cleaning

   General Downstream Maintenance

   $0

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1211 Ludington St., Escanaba, Michigan 49829

PROJECT	**Gladstone WWTP - Process Capital Improvement**	**PROJECT NO.**	**21-0088**
		BY:	**DRH**
ALTERNATIVE	**Anaerobic Digester (No. 2) Conversion To Aerobic Digestion**		
		DATE:	**3/25/20**

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	Adjusted Unit Amount	TOTAL AMOUNT
Anaerobic Digester (No. 2 Conversion To Aerobic Digestion						
1	General Conditions (8%)	1	Ls		$ 30,616	$ 30,700
	Miscellaneous	1	Ls	$ 23,000	$ 28,750	$ 28,800
2	Demolish Existing Mixing Equipment	1	Ls	$ 17,250	$ 21,563	$ 21,600
	Dimolish Existing Gas Handling Equipment	1	Ls	$ 11,500	$ 14,375	$ 14,400
3	Concrete Rehabilitation	1	Ls	$ 28,750	$ 35,938	$ 36,000
13	New Al Dome roof	1200	Sf	$ 22	$ 28	$ 33,000
40	Sludge Aeration Piping, 4", Stainless Steel	200	Lf	$ 104	$ 129	$ 25,900
46	Sludge Aeration Diffusers and Manifold Piping	1	Ls	$ 86,250	$ 107,813	$ 107,900
	Sludge Aeration Blowers	2	Ea	$ 28,750	$ 35,938	$ 71,900
	Miscellaneous	1	Ls	$ 34,500	$ 43,125	$ 43,200
	Construction Subtotal					**$ 414,000**
	Engineering, Planning and Contingencies					**$ 125,000**
	Total Project Cost					**$ 539,000**

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PROJECT	**Gladstone WWTP - Process Capital Improvement**	**PROJECT NO.**	**21-0088**
		BY:	**TAA/DRH**
ALTERNATIVE	**RBF installation in Eexistng building**		
		DATE:	**3/13/20**

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	Adjusted Unit Amount	TOTAL AMOUNT
Modify RBC Building for RBF-Blosers						
1	General Conditions	1	LS		$ 36,608	$ 36,700
2	Demolish Existing RBC mechanisms	2	Ea	$ 22,000	$ 27,500	$ 55,000
	Demolish Existing Piping and Valves	50	Lf	$ 60	$ 75	$ 3,800
	Demolish Existing Mechanical/Electrical	1	Ls	$ 6,000	$ 7,500	$ 7,500
3	**Concrete Construction**					
	Miscellaneous Concrete	30	Cy	$ 600	$ 750	$ 22,500
	Flowable Fill	75	Cy	$ 240	$ 300	$ 22,500
4 Thru 10	Bldg modifications, Masonry, Doors	1,600	Sf	$ 120	$ 150	$ 240,000
	HVAC	1	Ls	$ 85,000	$ 106,250	$ 106,300
	Construction Subtotal					**$ 495,000**
	Engineering, Planning, and Contingencies					**$ 149,000**
	Total Project Cost					**$ 495,000**

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1211 Ludington St., Escanaba, Michigan 49829

PROJECT	**Gladstone WWTP - Process Capital Improvement**	**PROJECT NO.**	**21-0088**
		BY:	**DRH**
ALTERNATIVE	**RBF with Press and Solids disposal**		
		DATE:	**3/12/20**
		UPDATED:	

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	Adjusted Unit Amount	TOTAL AMOUNT
RBF with Solids disposed in Dumpster						
1	General Conditions (8%)	1	Ls		$ 145,096	$ 145,100
13	Solids Belt Conveyor	1	Ls	$ 125,000	$ 156,250	$ 156,300
	Conveyor Installation	1	Ls	$ 80,000	$ 100,000	$ 100,000
	Dumpsters	2	Ls	$ 3,600	$ 4,500	$ 9,000
44	***Process Equipment***					
	Plug Valves, 8"	4	Ea	$ 3,600	$ 4,500	$ 18,000
	Plug Valves, 6"	4	Ea	$ 1,800	$ 2,250	$ 9,000
46	***Wastewater Equipment***					
	Prescreen, 6mm mechanically cleaned	1	Ls	$ 185,000	$ 231,250	$ 231,300
	Screen Equipment Installation	1	Ls	$ 30,000	$ 37,500	$ 37,500
	Rotating Belt Filters	3	LS	$ 279,000	$ 348,750	$ 1,046,300
	RBF Installation	3	LS	$ 55,000	$ 68,750	$ 206,300
	Construction Subtotal					**$ 1,959,000**
	Engineering, Planning, Contingencies					**$ 588,000**
	Total Project Cost					**$ 2,547,000**

Annual O&M For Items Which are Not Substantially The Same

Process Electrical Power (1)

Maintenance (2)

Equipment Replacement (3)

Grit Maintenance

Total Annual Additional O&M **$0**

Notes:

1. Process Electrical
   Assume 1050 gpm at 40 ft and .70 hydraulic efficiency for 15.2 bhp
   100 % time operation, $0.12 per kwh is

2. Annual Maintenance
   Fine Screen Maintenance (2 Hrs/Wk at $40/Hrs plus $2,000 parts)
   Raw Sewage Pump Maintenance
   $0

3. Equipment replacement costs including vertical screen, raw sewage pumps, and valves/gates
   Screening Equipment
   Washer Compactor
   Raw Sewage Pumps

Valves and Gates, Approx

$0

RRI Per Year For 20 Year Life **$0**

4. Estimated Impact of Pass-through Grit
   Digester Cleaning
   General Downstream Maintenance

$0

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1211 Ludington St., Escanaba, Michigan 49829

PROJECT	**Gladstone WWTP - Process Capital Improvement**	**PROJECT NO.**	**21-0088**
		BY:	**DRH**
ALTERNATIVE	**Primary Clarifier No. 2**		
		DATE:	**3/12/20**

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	Adjusted Unit Amount	TOTAL AMOUNT
1	Contractor Overhead	1	Ls		$ 143,840	$ 143,840
				$ -		
2	Demolish Existing Primary Collector Mechanisms	2	Ea	$ 15,360	$ 19,200	$ 38,400
	Demolish Ex. Scum Collector Piping	2	Ea	$ 768	$ 960	$ 2,000
	Demolish Ex. Troughs, Weirs, and Baffles	15	Lf	$ 144	$ 180	$ 2,700
	Demolish Existing Piping and Valves	50	Lf	$ 60	$ 75	$ 3,800
	Demolish Existing Mechanical/Electrical	1	Ls	$ 12,000	$ 15,000	$ 15,000
	Hazardous Materials Mitigation	1	Ls	$ 12,000	$ 15,000	$ 15,000
3	Slab Concrete, 16"	50	Cy	$ 624	$ 780	$ 39,000
	Wall Concrete, 16"	75	Cy	$ 672	$ 840	$ 63,000
	Beam Concrete	20	Cy	$ 960	$ 1,200	$ 24,000
	Effluent Trough Concrete, 8"	2	Cy	$ 1,200	$ 1,500	$ 3,000
	Sludge Hopper Concrete	50	Cy	$ 1,800	$ 2,250	$ 112,500
	Gallery Slab Concrete	10	Cy	$ 624	$ 780	$ 7,800
	Gallery Wall Concrete	98	Cy	$ 672	$ 840	$ 82,400
	Additional Building Foundation Concrete	32	Cy	$ 576	$ 720	$ 23,100
	Miscellaneous Concrete	10	Cy	$ 600	$ 750	$ 7,500
4-10	Miscellaneous Interconnections	1	Ls	$ 60,000	$ 75,000	$ 75,000
5	Lintels, Handrail, Grating, Access Hatches, Ladders	1	Ls	$ 36,000	$ 45,000	$ 45,000
9	Tank Coal Tar Epoxy, Interior Coating	3,000	Sf	$ 7	$ 9	$ 27,000
	Epoxy Paint - Exposed Equipment and Piping	2	Ls	$ 6,000	$ 7,500	$ 15,000
	Coal Tar Paint, Clarifier Equipment	2	Ea	$ 6,000	$ 7,500	$ 15,000
	Exterior Concrete Protection	1,200	Sf	$ 5	$ 6	$ 7,200
13	Aluminum Dome, Rectangular Cover	1,600	Sf	$ 132	$ 165	$ 264,000
	Aluminum Entries to Primary Building	2	Ea	$ 6,000	$ 7,500	$ 15,000
14	Miscellaneous Hoisting Systems	1	Ls	$ 12,000	$ 15,000	$ 15,000
	Effluent Flush Water, Extension and Hydrants	1	Ls	$ 9,600	$ 12,000	$ 12,000
22	Ferric Chloride Feed System	50	Lf	$ 22	$ 27	$ 1,400
	Polymer Feed System	50	Lf	$ 18	$ 23	$ 1,200
	Potable/Service Water	1	Ls	$ 9,600	$ 12,000	$ 12,000
	Sanitary Drainage	50	Lf	$ 36	$ 45	$ 2,300
23	Process Heating and Ventilation, Nema 7 Area	1	Ls	$ 60,000	$ 75,000	$ 75,000
26	Additional Electrical Distribution, Nema 7	1	Ls	$ 46,000	$ 57,500	$ 57,500
31	Excavation For Primaries, Dispose On Site	850	Cy	$ 10	$ 12	$ 10,200
	New Primary, Compacted Backfill	300	Cy	$ 10	$ 12	$ 3,600
	Restoration	40,000	Sf	$ 1	$ 1	$ 30,000
	Bypass Pumping, 2 Wks	7	Days	$ 4,320	$ 5,400	$ 37,800
33	Relocate Utilities	1	Ls	$ 12,000	$ 15,000	$ 15,000

	Extend Utilities	100	Lf	$ 36	$ 45	$ 4,500
40	18" PI Piping	1	Ls	$ 18,000	$ 22,500	$ 22,500
	6" Sludge, DIP, Ground Buried	40	Lf	$ 144	$ 180	$ 7,200
	6" Sludge, DIP, Interior Supported	100	Lf	$ 240	$ 300	$ 30,000
	6" Scum and Misc, Dip, Interior Supported	40	Lf	$ 300	$ 375	$ 15,000
	Sluice Gates, 18" PI	4	Ea	$ 10,560	$ 13,200	$ 52,800
	Plug Valves, 6", Wrench Head and Handwheel	4	Ea	$ 960	$ 1,200	$ 4,800
	Plug Valves, Motor Operated	2	Ea	$ 9,600	$ 12,000	$ 24,000
	Miscellaneous Process Piping and Valves	1	Ls	$ 24,000	$ 30,000	$ 30,000
	Instrumentation (3%)	1	Ls	$ 12,000	$ 15,000	$ 15,000
46	Primary Tank Weirs	108	Lf	$ 144	$ 180	$ 19,500
	Primary Tank Baffles	54	Lf	$ 108	$ 135	$ 7,300
	Collector Mechanisms, 13' W x 80' L,	2	Ea	$ 114,000	$ 142,500	$ 285,000
	Install Collector Mechanisms	1	Ls	$ 24,000	$ 30,000	$ 30,000
	Primary Influent Flash Mixer, 5 Hp	1	Ls	$ 30,000	$ 37,500	$ 37,500
	Miscellaneous					
	Sitework Improvements	1	Ls	$ 30,000	$ 37,500	$ 37,500
	Construction Subtotal					**$ 1,942,000**
	Engineering Planning and Contingencies					**$ 583,000**
	TOTAL PROJECT COST					**$ 2,525,000**

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PROJECT	**Gladstone WWTP - Process Capital Improvement**	**PROJECT NO.**	**21-0088**
		BY:	**Drh**
ALTERNATIVE	**Oxidation Ditch**		
		DATE:	**3/13/20**

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	Adjusted Unit Amount	TOTAL AMOUNT
1	General Conditions (8%)					
	Contractor Overhead	1	Ls		$ 457,296	$ 457,300
2	Demolition					
	Existing Primary Process Equipment and Piping	1	Ls	$ 57,500	$ 71,875	$ 71,900
	Existing RBC Process Equipment and Piping	1	Ls	$ 86,250	$ 107,813	$ 107,900
	Exitsting Secondary clarifiers and mechanisms	1	Ls	$ 91,000	$ 113,750	$ 113,800
	Hazardous Materials Mitigation	1	Ls	$ 23,000	$ 28,750	$ 28,800
3	Oxidation Concrete (1.75 MG Capacity)					
	Ditch 1, Concrete Perimeter Wall, 16",	280	Cy	$ 690	$ 863	$ 241,500
	Ditch 1, Concrete Interior Walls, 16",	140	Cy	$ 633	$ 791	$ 110,700
	Ditch 1, Base Slab, 18",	360	Cy	$ 920	$ 1,150	$ 414,000
	Ditch 1, Supported Slabs and Walkways, 12"	60	Cy	$ 920	$ 1,150	$ 69,000
	Ditch 1, Pretreatment Headbox Structure Concrete	100	Cy	$ 690	$ 863	$ 86,300
	Ditch 2, Concrete Perimeter Wall, 16",	280	Cy	$ 690	$ 863	$ 241,500
	Ditch 2, Concrete Interior Walls, 16",	140	Cy	$ 633	$ 791	$ 110,700
	Ditch 2, Base Slab, 18",	360	Cy	$ 920	$ 1,150	$ 414,000
	Ditch 2, Supported Slabs and Walkways, 12"	60	Cy	$ 920	$ 1,150	$ 69,000
	Ditch 2, Pretreatment Headbox Structure Concrete	100	Cy	$ 690	$ 863	$ 86,300
	Miscellaneous Concrete	100	Cy	$ 690	$ 863	$ 86,300
4	Masonry					
	Primary Building Complete	0	Sf	$ 230	$ 288	$ -
5	Miscellaneous Metals					
	Lintels, Handrail, Grating, Access Hatches, Ladders	1	Ls	$ 28,750	$ 35,938	$ 36,000
7	Thermal and Moisture Protection					
	Exterior concrete Dampproofing		Sf	$ 8	$ 10	
	Thoroseal Arch Finish		Ls	$ 12	$ 14	
8	Doors and Windows					
	Window and Door Allowance	0	Ls	$ 13,800	$ 17,250	$ -
9	Protective Coatings					
	Tank Coal Tar Epoxy, Interior Coating	9,800	Sf	$ 6	$ 7	$ 70,500
	Epoxy Paint - Exposed Equipment and Piping	1	Ls	$ 11,500	$ 14,375	$ 14,400

	Thoroseal Exterior Concrete Protection	4,000	Sf	$ 5	$ 6	$ 23,000
13	Special Construction					
	Aluminum Dome, 66' Dia Clarifier	0	Sf	$ 121	$ 151	$ -
	Aluminum Entries to Primary Building	0	Ea	$ 23,000	$ 28,750	$ -
22	Plumbing Allowances					
	Effluent Flush Water, Extension and Hydrants	1	Ls	$ 9,200	$ 11,500	$ 11,500
	Ferric Chloride Feed System	300	Lf	$ 21	$ 26	$ 7,800
	Polymer Feed System	300	Lf	$ 17	$ 22	$ 6,500
	Potable/Service Water	1	Ls	$ 9,200	$ 11,500	$ 11,500
23	HVAC					
	Heating and Ventilation	0	Ls	$ 115,000	$ 143,750	$ -
26	Electrical Systems					
	Electrical Distribution	1	Ls	$ 172,500	$ 215,625	$ 215,700
31	Earthwork					
	Excavation, Total	6,000	Cy	$ 7	$ 9	$ 51,800
	Dewatering Allowance	1	Ls	$ 350,000	$ 437,500	$ 437,500
	New Ditches, Compacted Backfill	4,000	Cy	$ 9	$ 12	$ 46,000
	Restoration	15,000	Sf	$ 1	$ 1	$ 10,800
	Relocate Underground Utilities	1	Ls	$ 28,750	$ 35,938	$ 36,000
	Bypass Pumping, 4 Wks	28	Days	$ 4,140	$ 5,175	$ 144,900
33	Utilities					
	Sanitary Drainage To Location	50	Lf	$ 35	$ 43	$ 2,200
	Relocate Utilities for Clarifier Construction	1	Ls	$ 5,750	$ 7,188	$ 7,200
40	Process Integration					
	18" OI, DIP, Interior Supported	40	Lf	$ 403	$ 503	$ 20,200
	18" OI, DIP, Ground Buried	300	Lf	$ 345	$ 431	$ 129,400
	18" OE To Final Tanks	160	Lf	$ 368	$ 460	$ 73,600
	Connection to Existing Process Piping	1	Ls	$ 115,000	$ 143,750	$ 143,800
	8" DIP, RAS Piping	300	Lf	$ 230	$ 288	$ 86,300
	6" Sludge, DIP, Ground Buried	200	Lf	$ 138	$ 173	$ 34,500
	6" Sludge, DIP, Interior Supported	200	Lf	$ 230	$ 288	$ 57,500
	6" Scum and Misc, DiP, Interior Supported	100	Lf	$ 288	$ 359	$ 36,000
	Sluice Gates, 18" PI	6	Ea	$ 8,050	$ 10,063	$ 60,400
	Plug Valves, 6", Wrench Head and Handwheel	10	Ea	$ 920	$ 1,150	$ 11,500
	Plug Valves, Motor Operated	2	Ea	$ 9,200	$ 11,500	$ 23,000
	Miscellaneous Process Piping and Valves	1	Ls	$ 46,000	$ 57,500	$ 57,500
	Instrumentation (3%)	1	Ls	$ 57,500	$ 71,875	$ 71,900
44	Process Equipment					
	RAS Pumps	3	Ea	$ 33,350	$ 41,688	$ 125,100
	WAS Pumps	2	Ea	$ 23,000	$ 28,750	$ 57,500
	RAS Pumps, Install	3	Ea	$ 5,750	$ 7,188	$ 21,600
	WAS Pumps Install	2		$ 3,450	$ 4,313	$ 8,700
	Sludge Pumping Allowance	1	Ea	$ 28,750	$ 35,938	$ 36,000
46	Wastewater Equipment					
	Oxidation Ditch Aeration Equipment	4	Ea	$ 172,500	$ 215,625	$ 862,500
	Primary Influent Flash Mixer, 5 Hp	1	Ls	$ 28,750	$ 35,938	$ 36,000

	Miscellaneous					
	Sitework Improvements	1	Ls	$ 28,750	$ 35,938	$ 36,000
	Conceptual Phase, Process Contingencies	1	Ls	$ 273,700	$ 342,125	$ 342,200
	Contruction Total					**$ 6,174,000**
	Engineering Planning and Contingencies					**$ 1,853,000**
	TOTAL PROJECT COST					**$ 8,027,000**

<u>Evaluated Annual O&M For Round Primary Clarifiers</u>

Additional Electrical Power Costs (1)	$0
Chemical Costs (2)	$0
Manpower and Maintenance (3)	$0
Suggested Annual Equipment Replacement Deposit (4)	$0
Facility Heating Costs (5)	$0
Total Annual Additional O&M	**$0**

Notes:

1. Baseline electrical. No additional with equal primary building electrical and less drive motor Hp
2. Chemical costs assumed equal
3. Based on an total 2 hours per week labor and $3,000 per year maintenance
   = (2 hrs/wk x $30/hr x 52) + $3,000

4 Depreciation or equipment replacement for collectors, pumps, blower, and other short lifed equipment over a 20 over a 20 year life. $408,000 approximately/20 yeears.

5. Relative heating cost for heating new primary building enclosure at $0.08 per cf/year.
   31,200 cf x $0.08 = $2,496 per year

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1211 Ludington St., Escanaba, Michigan 49829

PROJECT	**Gladstone WWTP - Process Capital Improvement**	**PROJECT NO.**	**21-0088**
		BY:	**Drh**
ALTERNATIVE	**Final Settling Tanks**		
		DATE:	**3/13/20**

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	Adjusted Unit Amount	TOTAL AMOUNT
1	General Conditions (8%)					
	Contractor Overhead	1	Ls		$ 259,336	$ 259,400
2	Demolition					
	Demolish Ex Misc. Process Equipment	1	Ls	$ 11,500	$ 14,375	$ 14,400
	Demolish Ex. Primary Gallery Building	8,000	Cf	$ 1	$ 1	$ 7,500
	Hazardous Materials Mitigation	1	Ls	$ 11,500	$ 14,375	$ 14,400
3	***Concrete***					
	Tank 1, Concrete Bearing Wall, 16", 48' Dia.	95	Cy	$ 667	$ 834	$ 79,300
	Tank 1, Concrete Slab, 18", 50' Dia.	120	Cy	$ 604	$ 755	$ 90,600
	Tank 1, Effluent Trough Concrete, 8"	55	Cy	$ 920	$ 1,150	$ 63,300
	Tank 1, Sump Concrete	5	Cy	$ 1,150	$ 1,438	$ 7,200
	Tank 2, Concrete Bearing Wall, 16", 56' Dia.	95	Cy	$ 667	$ 834	$ 79,300
	Tank 2, Concrete Slab, 18", 60' Dia.	120	Cy	$ 604	$ 755	$ 90,600
	Tank 2, Effluent Trough Concrete, 8"	55	Cy	$ 920	$ 1,150	$ 63,300
	Tank 2, Sump Concrete	5	Cy	$ 1,150	$ 1,438	$ 7,200
4	Masonry					
	Primary Building Complete	0	Sf	$ 230	$ 288	$ -
5	Miscellaneous Metals					
	Lintels, Handrail, Grating, Access Hatches, Ladders	1	Ls	$ 57,500	$ 71,875	$ 71,900
7	Thermal and Moisture Protection					
	Primary Building Roof, Standing Seam Metal	0	Sf	$ 22	$ 27	$ -
	Miscellaneous	1	Ls	$ 5,750	$ 7,188	$ 7,200
8	Doors and Windows					
	Window and Door Allowance	0	Ls	$ 13,800	$ 17,250	$ -
9	Protective Coatings					
	Tank Coal Tar Epoxy, Interior Coating	8,000	Sf	$ 6	$ 7	$ 57,500
	Epoxy Paint - Exposed Equipment and Piping	1	Ls	$ 11,500	$ 14,375	$ 14,400
	Coal Tar Paint, Clarifier Equipment	2	Ea	$ 11,500	$ 14,375	$ 28,800

	Exterior Concrete Protection	1,400	Sf	$ 5	$ 6	$ 8,100
13	Special Construction					
	Aluminum Dome, 48' Dia Clarifier	3,980	Sf	$ 120	$ 150	$ 597,000
	Aluminum Entries to Primary Building	0	Ea	$ 23,000	$ 28,750	$ -
22	Plumbing					
	Effluent Flush Water, Extension and Hydrants	1	Ls	$ 9,200	$ 11,500	$ 11,500
	Ferric Chloride Feed System	300	Lf	$ 21	$ 26	$ 7,800
	Polymer Feed System	300	Lf	$ 17	$ 22	$ 6,500
	Potable/Service Water	1	Ls	$ 9,200	$ 11,500	$ 11,500
23	HVAC					
	Heating and Ventilation	0	Ls	$ 115,000	$ 143,750	$ -
26	Electrical Systems					
	Electrical Distribution	1	Ls	$ 57,500	$ 71,875	$ 71,900
31	Earthwork					
	Excavation For Primaries, Use for Backfill	4,000	Cy	$ 7	$ 9	$ 34,500
	Dewatering Allowance	1	Ls	$ 150,000	$ 187,500	$ 187,500
	New Primary, Compacted Backfill	1,600	Cy	$ 9	$ 12	$ 18,400
	Backfill Demolished Primaries	4,800	Cy	$ 7	$ 9	$ 41,400
	Restoration	15,000	Sf	$ 1	$ 1	$ 10,800
	Relocate Underground Utilities	1	Ls	$ 28,750	$ 35,938	$ 36,000
	Bypass Pumping, 4 Wks	28	Days	$ 3,500	$ 4,375	$ 122,500
	New Administration Building, Excavation and Backfill			$ -	$ -	
33	Utilities					
	Sanitary Drainage To Location	50	Lf	$ 35	$ 43	$ 2,200
	Relocate Utilities for Clarifier Construction	1	Ls	$ 5,750	$ 7,188	$ 7,200
40	Process Integration					
	16" FI, DIP, Interior Supported	100	Lf	$ 345	$ 431	$ 43,200
	16" FI, DIP, Ground Buried	80	Lf	$ 368	$ 460	$ 36,800
	16" FE To CL2 Tank	160	Lf	$ 368	$ 460	$ 73,600
	Connection to Chlorine Tank Piping	1	Ls	$ 57,500	$ 71,875	$ 71,900
	6" Sludge, DIP, Ground Buried	200	Lf	$ 138	$ 173	$ 34,500
	6" Sludge, DIP, Interior Supported	200	Lf	$ 230	$ 288	$ 57,500
	6" Scum and Misc, DiP, Interior Supported	100	Lf	$ 288	$ 359	$ 36,000
	Sluice Gates, 16" PI	4	Ea	$ 7,475	$ 9,344	$ 37,400
	Plug Valves, 6", Wrench Head and Handwheel	30	Ea	$ 920	$ 1,150	$ 34,500
	Plug Valves, Motor Operated	2	Ea	$ 9,200	$ 11,500	$ 23,000
	Miscellaneous Process Piping and Valves	1	Ls	$ 23,000	$ 28,750	$ 28,800
	Instrumentation (3%)	1	Ls	$ 57,500	$ 71,875	$ 71,900
44	Process Equipment					
	Sludge Pumps, Double Disc, 150 gpm	0	Ea	$ 33,350	$ 41,688	$ -
	Primary Sludge Pumps, Install	0	Ea	$ 5,750	$ 7,188	$ -
	Sludge Pumping Allowance	0	Ea	$ 51,750	$ 64,688	$ -
46	Wastewater Equipment					
	Final Tank Weirs	260	Lf	$ 138	$ 173	$ 44,900
	Final Tank Baffles	240	Lf	$ 104	$ 129	$ 31,100
	Collector Mechanisms, 48' dia, Pier Supported	2	Ea	$ 103,500	$ 129,375	$ 258,800

	Install Collector Mechanisms	2	Ea	$ 28,750	$ 35,938	$ 71,900
	Primary Influent Flash Mixer, 5 Hp	1	Ls	$ 28,750	$ 35,938	$ 36,000
	Miscellaneous					
	Sitework Improvements	1	Ls	$ 28,750	$ 35,938	$ 36,000
	Conceptual Phase, Process Contingencies	1	Ls	$ 273,700	$ 342,125	$ 342,200
	Contruction Total					**$ 3,502,000**
	Engineering Planning and Contingencies					**$ 1,051,000**
	TOTAL PROJECT COST					**$ 4,553,000**

Evaluated Annual O&M For Round Primary Clarifiers

Additional Electrical Power Costs (1)	$0
Chemical Costs (2)	$0
Manpower and Maintenance (3)	$0
Suggested Annual Equipment Replacement Deposit (4)	$0
Facility Heating Costs (5)	$0
Total Annual Additional O&M	**$0**

Notes:

1. Baseline electrical. No additional with equal primary building electrical and less drive motor Hp
2. Chemical costs assumed equal
3. Based on an total 2 hours per week labor and $3,000 per year maintenance
   = (2 hrs/wk x $30/hr x 52) + $3,000

4 Depreciation or equipment replacement for collectors, pumps, blower, and other short lifed equipment over a 20 over a 20 year life. $408,000 approximately/20 yeears.

5. Relative heating cost for heating new primary building enclosure at $0.08 per cf/year.
   31,200 cf x $0.08 = $2,496 per year

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1211 Ludington St., Escanaba, Michigan 49829

PROJECT	**Gladstone WWTP - Process Capital Improvement**	**PROJECT NO.**	**21-0088**
		BY:	**DRH**
ALTERNATIVE	**Anaerobic Digester (No. 1) Conversion To Aerobic Digestion**		
		DATE:	**3/13/20**

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	Adjusted Unit Amount	TOTAL AMOUNT
Primary Anaerobic Digester (No. 1) Conversion To Aerobic Digestion						
1	General Conditions (8%)	1	Ls		$ 59,624	$ 59,700
2	Demolish Existing Mixing Equipment	1	Ls	$ 17,750	$ 22,188	$ 22,200
	Dimolish Existing Gas Handling Equipment	1	Ls	$ 11,500	$ 14,375	$ 14,400
3	Concrete Rehabilitation	1	Ls	$ 28,750	$ 35,938	$ 36,000
5	Miscellaneous Steel Repairs	1	Ls	$ 11,500	$ 14,375	$ 14,400
6	Prim. Dig Supernatant Well Improvements	1	Ls	$ 2,300	$ 2,875	$ 2,900
	Primary Digester Overflow Improvements	1	Ls	$ 3,450	$ 4,313	$ 4,400
7	Primary Digester, 3" Dome Insulation	1020	Sf	$ 6	$ 7	$ 7,400
	Primary Digester, EPDM Membrane Roof	1020	Sf	$ 14	$ 17	$ 17,600
	Roof Edge Flashing	120	Lf	$ 46	$ 58	$ 6,900
9	Blast, Recoat PD Int. Dome Steel, 2K Epoxy		Sf	$ 46	$ 58	
	Blast Recoat PD Submerged/Exp. Pipe, 2K Epoxy		Ls	$ 17,250	$ 21,563	
	Blast Recoat PD Ext. Dome Steel, 2K Epoxy		Sf	$ 17	$ 22	
13	New Primary Digester Precast Concrete Roof	2500	Sf	$ 30	$ 38	$ 93,800
40	6" DIP Sludge Recirculation Piping	80	Lf	$ 173	$ 216	$ 17,300
	8" DIP Sludge Recirculation Piping	80	Lf	$ 207	$ 259	$ 20,700
	6" Piping Ecc. Plug Valve	1	Ea	$ 1,265	$ 1,581	$ 1,600
	8" Piping Ecc. Plug Valve	1	Ea	$ 1,725	$ 2,156	$ 2,200
	6" Check Valve	1	Ea	$ 2,300	$ 2,875	$ 2,900
	4" DIP RCS	100	Lf	$ 173	$ 216	$ 21,600
	4" ECC Plug Valve, RCS	4	Ea	$ 1,150	$ 1,438	$ 5,800
	Prim. Digester, Storage Tank Misc.	1	Ls	$ 23,000	$ 28,750	$ 28,800
	Sludge Aeration Piping, 4", Stainless Steel	200	Lf	$ 104	$ 129	$ 25,900
	Gravity Thickening Screens and Piping	1	Ls	$ 57,500	$ 71,875	$ 71,900

44	Rotomix Pumps, Horiz, 1000 gpm	2	Ea	$ 35,650	$ 44,563	$ 89,200
	Pump Installation	1	Ls	$ 11,500	$ 14,375	$ 14,400
46	Sludge Aeration Diffusers and Manifold Piping	1	Ls	$ 86,250	$ 107,813	$ 107,900
	Sludge Aeration Blowers	2	Ea	$ 28,750	$ 35,938	$ 71,900
	Miscellaneous	1	Ls	$ 34,500	$ 43,125	$ 43,200
	Construction Subtotal					**$ 805,000**
	Engineering, Planning and Contingencies					**$ 241,500**
	Total Project Cost					**$ 1,047,000**

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1211 Ludington St., Escanaba, Michigan 49829

PROJECT	**Gladstone WWTP - Process Capital Improvement**	**PROJECT NO.**	**21-0088**
		BY:	**DRH**
ALTERNATIVE	**Primary Anaerobic Digester (No.1) Mixing and Rehab**		
		DATE:	**3/13/20**

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	Adjusted Unit Amount	TOTAL AMOUNT
Primary Anaerobic Digester (No. 1) Mixing and Rehabilitation						
1	General Conditions (8%)	1	Ls		$ 59,280	$ 59,300
	Miscellaneous	1	Ls	$ 24,000	$ 30,000	$ 30,000
2	Demolish Ex. Prim. Dig. Eductor	1	Ls	$ 3,600	$ 4,500	$ 4,500
3	Concrete Pipe Supports	6	Ea	$ 720	$ 900	$ 5,400
5	Miscellaneous Steel Repairs	1	Ls	$ 12,000	$ 15,000	$ 15,000
6	Prim. Dig Supernatant Well Improvements	1	Ls	$ 2,400	$ 3,000	$ 3,000
	Primary Digester Overflow Improvements	1	Ls	$ 3,600	$ 4,500	$ 4,500
7	Primary Digester, 3" Dome Insulation	1020	Sf	$ 6	$ 8	$ 7,700
	Primary Digester, EPDM Membrane Roof	1020	Sf	$ 14	$ 18	$ 18,400
	Roof Edge Flashing	120	Lf	$ 48	$ 60	$ 7,200
9	Blast, Recoat PD Int. Dome Steel, 2K Epoxy	1020	Sf	$ 48	$ 60	$ 61,200
	Blast Recoat PD Submerged/Exp. Pipe, 2K Epoxy	1	Ls	$ 18,000	$ 22,500	$ 22,500
	Blast Recoat PD Ext. Dome Steel, 2K Epoxy	1020	Sf	$ 18	$ 23	$ 23,000
40	6" DIP Sludge Mix Recirculation Piping	80	Lf	$ 180	$ 225	$ 18,000
	8" DIP Sludge Mix Recirculation Piping	80	Lf	$ 216	$ 270	$ 21,600
	6" Mix Piping Ecc. Plug Valve	1	Ea	$ 1,320	$ 1,650	$ 1,700
	8" Mix Piping Ecc. Plug Valve	1	Ea	$ 1,800	$ 2,250	$ 2,300
	6" Check Valve	1	Ea	$ 2,400	$ 3,000	$ 3,000
	4" DIP RCS	100	Lf	$ 180	$ 225	$ 22,500
	4" ECC Plug Valve, RCS	4	Ea	$ 1,200	$ 1,500	$ 6,000
	Prim. Digester, Storage Tank Misc.	1	Ls	$ 24,000	$ 30,000	$ 30,000

44	Rotomix Pumps, Horiz, 1000 gpm	2	Ea	$ 37,200	$ 46,500	$ 93,000
	Pump Installation	1	Ls	$ 12,000	$ 15,000	$ 15,000
46	Jetmix Nozzle Equipment	1	Ls	$ 48,000	$ 60,000	$ 60,000
	Equipment Installation	1	Ea	$ 30,000	$ 37,500	$ 37,500
	Waste Gas Burner Equipment	1	Ls	$ 50,400	$ 63,000	$ 63,000
	Waste Gas Burner Install	1	Ls	$ 8,400	$ 10,500	$ 10,500
	Digester Gas Handling Equipment.	1	Ls	$ 66,000	$ 82,500	$ 82,500
	Rebuild Sludge Recirculation Pumps	2	Ea	$ 10,800	$ 13,500	$ 27,000
	Miscellaneous	1	Ls	$ 36,000	$ 45,000	$ 45,000
	Construction Subtotal					**$ 801,000**
	Engineering, Planning and Contingencies					**$ 240,300**
	Total Project Cost					**$ 1,041,300**

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1211 Ludington St., Escanaba, Michigan 49829

PROJECT	**Gladstone WWTP - Process Capital Improvement**	**PROJECT NO.**	**21-0088**
		BY:	**DRH**
ALTERNATIVE	**Raw Sewage & Secondary Treatment Pumps; Electrical Upgrades**		
		DATE:	**3/13/20**

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	Adjusted Unit Amount	TOTAL AMOUNT
Raw Sewage Pump Improvements						
1	General Conditions	1	Ls		$ 26,344	$ 26,400
	Demolition	1	Ls	$ 12,000	$ 15,000	$ 15,000
	Concrete Work	1	Ls	$ 48,000	$ 60,000	$ 60,000
44	New Dry Pit Submersible, Chopper Pumps, High Qual.	3	Ea	$ 32,400	$ 40,500	$ 121,500
	Pump Installation	1	Ea	$ 30,000	$ 37,500	$ 37,500
40	Piping And Valves	1	Ls	$ 18,000	$ 22,500	$ 22,500
23	Variable Speed Drives	3	Ls	$ 5,400	$ 6,750	$ 20,300
	Electrical and Control	1	Ls	$ 36,000	$ 45,000	$ 45,000
	Miscellaneous	1	Ea	$ 6,000	$ 7,500	$ 7,500
	Construction Subtotal					**$ 356,000**
	Engineering, Planning and Contingencies					**$ 106,800**
	Total Capital Cost					**$ 463,000**
Secondary Treatment Pumps						
1	General Conditions	1	Ls		$ 10,800	$ 10,800
	Demolition	1	Ls	$ 7,200	$ 9,000	$ 9,000
	Concrete Work	1	Ls	$ -	$ -	$ -
44	New Vertical Non Clog Sewage Pumps	2	Ea	$ 24,000	$ 30,000	$ 60,000
	Pump Installation	1	Ea	$ 12,000	$ 15,000	$ 15,000
40	Piping And Valves	1	Ls	$ 6,000	$ 7,500	$ 7,500
23	Variable Speed Drives	2	Ls	$ 5,400	$ 6,750	$ 13,500
	Electrical and Control	1	Ls	$ 18,000	$ 22,500	$ 22,500
	Miscellaneous	1	Ea	$ 6,000	$ 7,500	$ 7,500
	Construction Subtotal					**$ 146,000**
	Engineering Planning, and Contingencies					**$ 43,800**
	Total Capital Cost					**$ 190,000**

Primary Electrical Service Area Upgrade						
	General Conditions	1	Ls		$ 22,024	$ 22,100
	Demolition, Lab Equipment, Etc	1	Ls	$ 3,600	$ 4,500	$ 4,500
	Standby Generator, 300 KW, 300 A, Diesel, W/Enclosure	1	Ls	$ 114,000	$ 142,500	$ 142,500
	Transfer Switch, 480.3.60, 300 Amp	1	Ls	$ 9,000	$ 11,250	$ 11,300
	Generator and Transfer Switch Installation	1	Ls	$ 24,000	$ 30,000	$ 30,000
	MCC A and B Rehabilitation	60	Bkts	$ 600	$ 750	$ 45,000
	Door Abandonment	1	Ea	$ 3,600	$ 4,500	$ 4,500
	SCADA, Main Terminal Panel	1	Ls	$ 24,000	$ 30,000	$ 30,000
	NEC Upgrades	1	Ls	$ 6,000	$ 7,500	$ 7,500
	Construction Subtotal					**$ 298,000**
	Engineering, Planning and Contingencies					**$ 90,000**
	Total Capital Cost					**$ 388,000**

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1211 Ludington St., Escanaba, Michigan 49829

PROJECT	Gladstone WWTP - Process Capital Improvement	PROJECT NO.	21-0088
		BY:	MPF
ALTERNATIVE	RBF Units with Sludge Pumping		
		DATE:	3/17/20
		UPDATED:	

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	Adjusted Unit Amount	TOTAL AMOUNT
RBF Unit with Sludge Pumped to Digester						
1	General Conditions (8%)	1	Ls		$ 140,944	$ 141,000
2	General Demolition	1	Ls	$ 24,000	$ 30,000	$ 30,000
3	sand fill Primary clarifier	10	Cy	$ 720	$ 900	$ 9,000
	Supported Slab	5	Cy	$ 1,200	$ 1,500	$ 7,500
	Overhead door for Equipmetn access	1	Ea	$ 2,500	$ 3,125	$ 3,200
23	Process Heating and Ventilation, Nema 7 Area	1	Ls	$ 60,000	$ 75,000	$ 75,000
26	Additional Electrical Distribution, Nema 7	1	Ls	$ 45,000	$ 56,250	$ 56,300
44	***Process Equipment***					
	Plug Valves, 8"	4	Ea	$ 3,600	$ 4,500	$ 18,000
	Plug Valves, 6"	4	Ea	$ 1,800	$ 2,250	$ 9,000
46	***Wastewater Equipment***					
	Prescreen, 6mm mechanically cleaned	1	Ls	$ 185,000	$ 231,250	$ 231,300
	Screen Equipment Installation	1	Ls	$ 30,000	$ 37,500	$ 37,500
	Rotating Belt Filters	3	LS	$ 229,000	$ 286,250	$ 858,800
	RBF Installation	3	LS	$ 55,000	$ 68,750	$ 206,300
	Temporary Installation/pumping	1	Ls	$ 85,000	$ 106,250	$ 106,300
	Sludge Pumps, Double Disc, 50 gpm	1	Ea	$ 33,350	$ 41,688	$ 41,700
	Primary Sludge Pumps, Install	1	Ea	$ 5,750	$ 7,188	$ 7,200
	Sludge Pumping Allowance	1	Ea	$ 51,750	$ 64,688	$ 64,700
44						
	Construction Subtotal					**$ 1,903,000**
	Engineering, Planning, Contingencies					**$ 571,000**
	Total Project Cost					**$ 2,474,000**

Annual O&M For Items Which are Not Substantially The Same

Process Electrical Power (1)
Maintenance (2)
Equipment Replacement (3)
Grit Maintenance
Total Annual Additional O&M **$0**

Notes:

1. Process Electrical

   Assume 1050 gpm at 40 ft and .70 hydraulic efficiency for 15.2 bhp
   100 % time operation, $0.12 per kwh is

2. Annual Maintenance

Fine Screen Maintenance (2 Hrs/Wk at $40/Hrs plus $2,000 parts)	
Raw Sewage Pump Maintenance	
	$0

3. Equipment replacement costs including vertical screen, raw sewage pumps, and valves/gates		
Screening Equipment		
Washer Compactor		
Raw Sewage Pumps		
Valves and Gates, Approx		
		$0
	RRI Per Year For 20 Year Life	**$0**

4. Estimated Impact of Pass-through Grit	
Digester Cleaning	
General Downstream Maintenance	
	$0

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1211 Ludington St., Escanaba, Michigan 49829

PROJECT	**Gladstone WWTP - Process Capital Improvement**	**PROJECT NO.**	**21-0088**
		BY:	**DRH**
ALTERNATIVE	**SCADA System and Existing RBC Rehab**		
		DATE:	**3/13/20**

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	Adjusted Unit Amount	TOTAL AMOUNT
SCADA System						
	General Conditions	1	Ls		$ 17,760	$ 17,800
	MCP	1	ea	$ 57,600	$ 72,000	$ 72,000
	Remote I/O	2	ea	$ 7,200	$ 9,000	$ 18,000
	VCS N4X	5	ea	$ 1,200	$ 1,500	$ 7,500
	VCS N7	1	ea	$ 1,800	$ 2,250	$ 2,300
	GBCP	1	ea	$ 6,600	$ 8,250	$ 8,300
	Field Devices					
	Smoke detector	1	ea	$ 240	$ 300	$ 300
	Float switch w/cable mount	1	ea	$ 504	$ 630	$ 700
	DP flow transmitter	1	ea	$ 1,200	$ 1,500	$ 1,500
	Flow indicator N4X	1	ea	$ 360	$ 450	$ 500
	4" magmeter	4	ea	$ 5,040	$ 6,300	$ 25,200
	Digester temp transmitter	1	ea	$ 1,080	$ 1,350	$ 1,400
	Gas detectors/cal kits	7	ea	$ 1,800	$ 2,250	$ 15,800
	Two station pipe mount float switches	1	ea	$ 504	$ 630	$ 700
	Sump pipe mount float switches	1	ea	$ 2,160	$ 2,700	$ 2,700
	Current relays	5	ea	$ 120	$ 150	$ 800
	Engineering - drawings/shops	120	hr	$ 156	$ 195	$ 23,400
	Programming	80	hr	$ 156	$ 195	$ 15,600
	Calibration/Startup/demonstration	80	hr	$ 156	$ 195	$ 15,600
	Startup expenses	1	ls	$ 3,000	$ 3,750	$ 3,800
	Training	30	hr	$ 156	$ 195	$ 5,900
	Construction Subtotal					**$ 240,000**
	Engineering, Planning and Contingencies					**$ 72,000**
	Total Capital Cost					**$ 312,000**
Existing RBC Rehab						
	General Conditions	1	EA		$ 145,200	$ 145,200
	Standard Density RBCs	6	EA	$ 210,000	$ 262,500	$ 1,575,000
	RBC Installation	6	EA	$ 30,000	$ 37,500	$ 225,000
	Concrete Rehab Allowance	1	Ls	$ 12,000	$ 15,000	$ 15,000
	Construction Subtotal					**$ 1,961,000**
	Engineering, Planning and Contingencies					**$ 589,000**
	Total Capital Cost					**$ 2,550,000**

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1211 Ludington St., Escanaba, Michigan 49829

PROJECT	**Gladstone WWTP - Process Capital Improvement**	**PROJECT NO.**	**21-0088**
		BY:	**Drh**
ALTERNATIVE	**Return Sludge Pumping**		
		DATE:	**3/13/20**

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	Adjusted Unit Amount	TOTAL AMOUNT
1	General Conditions (8%)					
	Contractor Overhead	1	Ls		$ 36,784	$ 36,800
2	Demolition					
	Demolish Ex Misc. Process Equipment	0	Ls	$ 11,500	$ 14,375	$ -
	Demolish Ex. Primary Gallery Building	0	Cf	$ 1	$ 1	$ -
	Hazardous Materials Mitigation	0	Ls	$ 11,500	$ 14,375	$ -
3	Concrete					
	Wet Well 8' Dia Precast Concrete	1	Ea	$ 6,500	$ 8,125	$ 8,200
4	Masonry					
	Primary Building Complete	0	Sf	$ 230	$ 288	$ -
5	Miscellaneous Metals					
	Lintels, Handrail, Grating, Access Hatches, Ladders	1	Ls	$ 2,000	$ 2,500	$ 2,500
7	Thermal and Moisture Protection					
8	Doors and Windows					
9	Protective Coatings					
	Tank Coal Tar Epoxy, Interior Coating	350	Sf	$ 6	$ 7	$ 2,600
	Epoxy Paint - Exposed Equipment and Piping	1	Ls	$ 2,500	$ 3,125	$ 3,200
13	Special Construction					
			Sf			
			Ea			
22	Plumbing					
	Effluent Flush Water, Extension and Hydrants	1	Ls	$ 3,500	$ 4,375	$ 4,400
23	HVAC					
	Heating and Ventilation	0	Ls	$ 115,000	$ 143,750	$ -
26	Electrical Systems					
	Electrical Distribution	1	Ls	$ 7,500	$ 9,375	$ 9,400
31	Earthwork					
	Excavation For wetwell	30	Cy	$ 7	$ 9	$ 300
	Restoration	200	Sf	$ 1	$ 1	$ 200
33	Utilities					
			Lf	$ 35	$ 43	

40	Process Integration								
	6" Sludge, DIP, Ground Buried	200	Lf	$	138	$	173	$	34,500
	6" Sludge, DIP, Interior Supported	200	Lf	$	230	$	288	$	57,500
	6" Scum and Misc, DiP, Interior Supported	100	Lf	$	288	$	359	$	36,000
	Plug Valves, 6", Wrench Head and Handwheel	30	Ea	$	920	$	1,150	$	34,500
	Plug Valves, Motor Operated	2	Ea	$	9,200	$	11,500	$	23,000
	Miscellaneous Process Piping and Valves	1	Ls	$	1,500	$	1,875	$	1,900
	Instrumentation (3%)	1	Ls	$	57,500	$	71,875	$	71,900
44	Process Equipment								
	Sludge Pumps, submersible non clog	2	Ea	$	30,000	$	37,500	$	75,000
	Sludge Pumps, Install	2	Ea	$	7,500	$	9,375	$	18,800
46	Wastewater Equipment								
	Miscellaneous								
	Sitework Improvements	1	Ls	$	5,000	$	6,250	$	6,300
	Conceptual Phase, Process Contingencies	1	Ls	$	55,677	$	69,596	$	69,600
	Contruction Total							$	497,000
	Engineering Planning and Contingencies							$	150,000
	TOTAL PROJECT COST							**$**	**647,000**

Evaluated Annual O&M For Round Primary Clarifiers

Additional Electrical Power Costs (1)	$0
Chemical Costs (2)	$0
Manpower and Maintenance (3)	$0
Suggested Annual Equipment Replacement Deposit (4)	$0
Facility Heating Costs (5)	$0
Total Annual Additional O&M	**$0**

Notes:

1. Baseline electrical. No additional with equal primary building electrical and less drive motor Hp
2. Chemical costs assumed equal
3. Based on an total 2 hours per week labor and $3,000 per year maintenance
   = (2 hrs/wk x $30/hr x 52) + $3,000

4 Depreciation or equipment replacement for collectors, pumps, blower, and other short lifed equipment over a 20 over a 20 year life. $408,000 approximately/20 yeears.

5. Relative heating cost for heating new primary building enclosure at $0.08 per cf/year.
   31,200 cf x $0.08 = $2,496 per year

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1211 Ludington St., Escanaba, Michigan 49829

PROJECT	**Gladstone WWTP - Process Capital Improvement**	**PROJECT NO.**	**21-0088**
		BY:	**DRH**
ALTERNATIVE	**Misc. page 1**		
		DATE:	**3/13/20**

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	Adjusted Unit Amount	TOTAL AMOUNT
Primary Digester Heating Boiler and Exchanger Replacements						
1	General Conditions (8%)	1	Ls		$ 29,624	$ 29,700
2	Demolish Boiler Heat Exchanger	1	Ls	$ 3,600	$ 4,500	$ 4,500
	Demolish Piping/Valves/Miscellaneous	1	Lf	$ 5,400	$ 6,750	$ 6,800
23	Plumbing Allowance	1	Ls	$ 30,000	$ 37,500	$ 37,500
26	Electrical Allowance	1	Ls	$ 30,000	$ 37,500	$ 37,500
40	4" Sch 10 SS Digester Gas Piping	200	Lf	$ 96	$ 120	$ 24,000
	2"-3" Int. Sch 10 SS Digester Gas	200	Lf	$ 144	$ 180	$ 36,000
	6" Storage Supernatant Valves, Rehab	3	Ea	$ 1,320	$ 1,650	$ 5,000
	4" DIP RCS	100	Lf	$ 180	$ 225	$ 22,500
	4" ECC Plug Valve, RCS	4	Ea	$ 1,200	$ 1,500	$ 6,000
	SCADA (Also See SCADA Costs)	1	Ls	$ 2,400	$ 3,000	$ 3,000
46	4" Spiral Heat Exchanger	1	Ea	$ 66,000	$ 82,500	$ 82,500
	Dual Fired Digester Boiler	1	Ea	$ 54,000	$ 67,500	$ 67,500
	Boiler/ Heat Exchanger Installation	1	Ls	$ 30,000	$ 37,500	$ 37,500
	Construction Subtotal					**$ 400,000**
	Engineering, Planning and Contingencies					**$ 120,000**
	Total Capital Cost					**$ 520,000**
Secondary Digester (No. 2) Rehabilitation						
	General Conditions	1	Ls		$ 15,136	$ 15,200
9	Blast, Recoat SD Interior Dome Steel, 2K Epoxy	1020	Sf	$ 48	$ 60	$ 61,200
	Blast Recoat SD Submerged/Exp. Pipe, 2K Epoxy	1	Ls	$ 18,000	$ 22,500	$ 22,500
	Blast Recoat SD Exterior Dome Steel, 2K Epoxy	1020	Sf	$ 18	$ 23	$ 23,000
	General Repairs and Replacements	1	Ls	$ 24,000	$ 30,000	$ 30,000
	Replace Dome with Concrete Roof	1	Ls	$ 30,000	$ 37,500	$ 37,500
	Miscellaneous Roof Accessories and Revisions	1	Ls	$ 12,000	$ 15,000	$ 15,000
	Construction Subtotal					**$ 205,000**
	Engineering, Planning and Contingencies					**$ 61,500**
	Total Capital Cost					**$ 267,000**

Site Improvements						
	General Conditions	1	Ls		$ 8,960	$ 9,000
	Existing Bituminous Removal	200	Sy	$ 4	$ 5	$ 900
	HMA Drive, 22A Subgrade	1,000	Sy	$ 19	$ 24	$ 24,000
	HMA Drive, 3" Bituminous, 2 Coarse	1,000	Sy	$ 34	$ 42	$ 42,000
	Chain Link Fence	600	Lf	$ 30	$ 38	$ 22,500
	Main Fence Gate, Horizontal Slide, 24'	1	Ls	$ 6,600	$ 8,250	$ 8,300
	Fence Gate Motor Operator, 460.3.60	1	Ls	$ 3,600	$ 4,500	$ 4,500
	Electrical Power and Signal Control	1	Ls	$ 3,000	$ 3,750	$ 3,800
	Bollards	8	Ea	$ 600	$ 750	$ 6,000
	Construction Subtotal					**$ 121,000**
	Engineering, Planning and Contingencies					**$ 37,000**
	Total Capital Cost					**$ 158,000**
Engineering Studies and Evaluations						
	Engineering Proposal 1 (RBF Pilot, ACO)	1	Ls	$ 14,000		$ 14,000
	Engineering Proposal 2 (I/I, SSES, PP Eng.)	1	Ls	$ 68,000		$ 68,000
	Total Cost					**$ 82,000**

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1211 Ludington St., Escanaba, Michigan 49829

PROJECT	**Gladstone WWTP - Process Capital Improvement**	**PROJECT NO.**	**21-0088**
		BY:	**DRH**
ALTERNATIVE	**Misc. page 2**		
		DATE:	**3/13/20**

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	Adjusted Unit Amount	TOTAL AMOUNT
Facility Piping and Valve Improvements						
	General Conditions	1	Ls		$39,000	$ 39,000
	8" and Larger Process Piping	1,000	Lf	$ 210	$ 263	$ 262,500
	6" and Smaller Utility Piping	2,000	Lf	$ 90	$ 113	$ 225,000
	Construction Subtotal					**$ 488,000**
	Engineering, Planning and Contingencies					**$ 147,000**
	Total Capital Cost					**$ 635,000**
Facility Coating, Painting, Masonry Improvements, and Concrete Improvements						
	General Conditions	1	Ls		$30,480	$ 30,500
	Interior Wall Surfaces, Alkyd	4,000	Sf	$ 12	$ 15	$ 60,000
	Interior Wall Surfaces, Epoxy	8,000	Sf	$ 14	$ 18	$ 144,000
	Interior Ferrous Metal, Epoxy Painted	1	Ls	$ 120,000	$ 150,000	$ 150,000
	Exterior Ferrous Metal, Epoxy Painted	1	Ls	$ 12,000	$ 15,000	$ 15,000
	Masonry Restoration, Brick Repair	200	Sf	$ 24	$ 30	$ 6,000
	Concrete Repair, Chip and Patch	200	Sf	$ 24	$ 30	$ 6,000
	Construction Subtotal					**$ 412,000**
	Engineering, Planning and Contingencies					**$ 124,000**
	Total Capital Cost					**$ 536,000**
Window and Door Replacement (SAW)						
	General Conditions	1	Ls		$3,104	$ 3,200
	Partial Replacement of Windows and Doors					
	50 Percent, Demo and Replacement	470	Sf	$ 132	$ 165	$ 38,800
	Construction Subtotal					**$ 42,000**
	Engineering, Planning and Contingencies					**$ 13,000**
	Total Capital Cost					**$ 55,000**
HVAC Rehabilitation (SAW)						
	General Conditions	1	Ls		$ 7,104	$ 7,200
	General HVAC Reconditioning Allowance	1	Ls	$ 71,040	$ 88,800	$ 88,800
	Construction Subtotal					**$ 96,000**
	Engineering, Planning and Contingencies					**$ 29,000**
	Total Capital Cost					**$ 125,000**

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1211 Ludington St., Escanaba, Michigan 49829

PROJECT	**Gladstone WWTP - Process Capital Improvement**	**PROJECT NO.**	**21-0088**
		BY:	**DRH**
ALTERNATIVE	**Digester Gas Improvements & Misc. 3**		
		DATE:	**3/13/20**

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	Adjusted Unit Amount	TOTAL AMOUNT
Digester Gas Handling System						
	General Conditions	1	Ls		$ 7,024	$ 7,100
	Equipment Installation	1	Ls	$ 18,000	$ 22,500	$ 22,500
	Flame Trap Assemblies	2	Ea	$ 4,080	$ 5,100	$ 10,200
	Accumulator, 3"	1	Ls	$ 11,400	$ 14,250	$ 14,300
	Pressure Relief/Flame Trap	1	Ea	$ 7,800	$ 9,750	$ 9,800
	Manometer	1	Ea	$ 1,800	$ 2,250	$ 2,300
	Automatic Drip Trap	1	Ls	$ 6,480	$ 8,100	$ 8,100
	Manual Drip Trap	2	Ls	$ 720	$ 900	$ 1,800
	Flame Check	2	Ls	$ 240	$ 300	$ 600
	Digest Top Pressure Relief/Flame Arrestor	2	Ls	$ 3,120	$ 3,900	$ 7,800
	Tank Pressure Relief Valve	1	Ls	$ 1,080	$ 1,350	$ 1,400
	Gas Meters	3	Ea	$ 2,400	$ 3,000	$ 9,000
	Construction Subtotal					**$ 95,000**
	Engineering, Planning and Contingencies					**$ 29,000**
	Total Capital Cost					**$ 124,000**
Digester Gas Piping and Valves						
	General Conditions	1	Ls		$ 4,408	$ 4,500
	4" Sch 10 SS DG Piping	40	Lf	$ 120	$ 150	$ 6,000
	3" Sch 10 SS DG Piping	200	Lf	$ 96	$ 120	$ 24,000
	2" Sch 10 SS DG Piping	160	Lf	$ 60	$ 75	$ 12,000
	1" Sch 10 SS DG Piping	50	Lf	$ 30	$ 38	$ 1,900
	Plug Valves, SS, 4"	4	Ea	$ 144	$ 180	$ 800
	Plug Valves, SS, 3"	6	Ea	$ 84	$ 105	$ 700
	Plug Valves, SS, 2"	12	Ea	$ 54	$ 68	$ 900
	Plug Valves, SS, 1"	8	Ea	$ 36	$ 45	$ 400
	Pressure Reducing Valve	4	1	$ 1,680	$ 2,100	$ 8,400
	Construction Subtotal					**$ 60,000**
	Engineering, Planning and Contingencies					**$ 18,000**
	Total Capital Cost					**$ 78,000**

Roof Rehabilitation (SAW)						
	General Conditions	1	Ls		$ 6,136	$ 6,200
	Demo. Existing Roofing	6,500	Sf	$ 1	$ 1	$ 7,400
	Membrane Roofing, 60 Mil. EPDM	6,500	Sf	$ 4	$ 5	$ 32,500
	Misc. Pipe Drain Lead Replacement	100	Lf	$ 60	$ 75	$ 7,500
	R20 Insulation, 4" Rigid Board	6,500	Sf	$ 4	$ 5	$ 29,300
	Construction Subtotal					**$ 83,000**
	Engineering, Planning and Contingencies					**$ 24,900**
	Total Capital Cost					**$ 108,000**
Chlorine Contact Tank Rehabilitation (SAW)						
	General Conditions	1	Ls		$ 3,632	$ 3,700
	Design Phase Contingencies	1	Ls	$ 12,000	$ 15,000	$ 15,000
	Abrasive Blast	700	Sf	$ 6	$ 8	$ 5,300
	Paint, Prime Plus 2 Coats, Epoxy	700	Sf	$ 7	$ 9	$ 6,300
	Mobilize and Setup	1	Ls	$ 6,000	$ 7,500	$ 7,500
	Concrete Restoration Allowance	1	Ls	$ 9,000	$ 11,250	$ 11,300
	Construction Subtotal					**$ 50,000**
	Engineering, Planning and Contingencies					**$ 15,000**
	Total Capital Cost					**$ 65,000**

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PROJECT	**Gladstone WWTP - Process Capital Improvement**	**PROJECT NO.**	**21-0088**
		BY:	**Drh**
ALTERNATIVE	**New Secondary Sludge Drying Area**		
	In Existing RBC Tankage	**DATE:**	**12/29/20**
		UPDATED:	**1/5/21**

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	Adjusted Unit Amount	TOTAL AMOUNT
Drying Building						
1	General Conditions (8%)	1	Ls		$ 108,264	$ 108,300
	Planning Level Contingencies	1	Ls	$ 190,000	$ 237,500	$ 237,500
2	General Demolition	1	Ls	$ 15,000	$ 18,750	$ 18,800
3	Base Slab, Reinforced Concrete	18	Cy	$ 500	$ 625	$ 11,300
	Wall Concrete (Sludge Basement)	12	Cy	$ 720	$ 900	$ 10,800
	Supported Slab (sludge handling area)	12	Cy	$ 800	$ 1,000	$ 12,000
	Miscellaneous Concrete	20	Cy	$ 500	$ 625	$ 12,500
	Flowable Fill	10	Cy	$ 600	$ 750	$ 7,500
	RBC Tank Floor Slab	36	Cy	$ 300	$ 375	$ 13,500
4 Thru 10	Sludge Truck Garage	400	Sf	$ 150	$ 188	$ 75,000
	Sludge Area Ingress and Egress	1	Ls	$ 50,000	$ 62,500	$ 62,500
10	Communication Specialties	1	Ls	$ 2,500	$ 3,125	$ 3,200
	Misc. Specialties	1	Ls	$ 6,000	$ 7,500	$ 7,500
	Handrail and Grating	1	Ls	$ 25,000	$ 31,250	$ 31,300
6	Miscellaneous Carpentry	1	Ls	$ 2,000	$ 2,500	$ 2,500
14	One Ton Sludge Truck	1	Ea	$ 60,000	$ 75,000	$ 75,000
26	Process Electrical	1	Ls	$ 125,000	$ 156,250	$ 156,300
31	Earth Excavation	150	Cy	$ 12	$ 15	$ 2,300
	Backfill	75	Cy	$ 12	$ 15	$ 1,200
	RBC Tank Floor Fill	224	Cy	$ 15	$ 19	$ 4,200
	Sheeting and Shoring	80	Sf	$ 36	$ 45	$ 3,600
	Pavement Subbase, 22A, 12"	100	Sy	$ 5	$ 7	$ 700
	HMA Pavement, 3"	100	Sy	$ 21	$ 26	$ 2,700
40	Process Piping and Valves	1	Ls	$ 50,000	$ 62,500	$ 62,500
	SCADA	1	Ls	$ 25,000	$ 31,250	$ 31,300
44	Screw Press Feed Pumps	2	Ea	$ 21,000	$ 26,250	$ 52,500
	Pump Installation	2	Ea	$ 4,000	$ 5,000	$ 10,000
46	Sludge Dryer	1	Ea	$ 178,000	$ 222,500	$ 222,500
	Dryer Installation	1	Ls	$ 25,000	$ 31,250	$ 31,300
	Screw Press	1	Ls	$ 50,000	$ 62,500	$ 62,500
	Screw Press Installation	1	Ls	$ 8,000	$ 10,000	$ 10,000
	WAS Tank Mixer (Primary Digester)	1	Ls	$ 40,000	$ 50,000	$ 50,000
	Sludge Conveyor	60	Lf	$ 500	$ 625	$ 37,500

	Sludge Lift, Cake To Truck	1	Ls	$ 25,000	$ 31,250	$ 31,300
	Construction Subtotal					**$ 1,462,000**
	Engineering, Planning, Contingencies					**$ 439,000**
	Total Project Cost					**$ 1,901,000**

Annual O&M For Items Which are Not Substantially The Same (See Evaluation Worksheet)

Process Electrical Power (1)
Maintenance (2)
Equipment Replacement (3)
Grit Maintenance
Total Annual Additional O&M **$0**

Notes:

1. Process Electrical
   Assume 1050 gpm at 40 ft and .70 hydraulic efficiency for 15.2 bhp
   100 % time operation, $0.12 per kwh is

2. Annual Maintenance
   Fine Screen Maintenance (2 Hrs/Wk at $40/Hrs plus $2,000 parts)
   Raw Sewage Pump Maintenance
   $0

3. Equipment replacement costs including vertical screen, raw sewage pumps, and valves/gates
   Screening Equipment
   Washer Compactor
   Raw Sewage Pumps
   Valves and Gates, Approx
   $0
   RRI Per Year For 20 Year Life **$0**

4. Estimated Impact of Pass-through Grit
   Digester Cleaning
   General Downstream Maintenance
   $0

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PROJECT	**Gladstone WWTP - Process Capital Improvement**	**PROJECT NO.**	**21-0088**
		BY:	**Drh**
ALTERNATIVE	**New Secondary Thickening Area in RBC Building**		
	Screw Press and Haul Truck Facility	**DATE:**	**12/29/20**
		UPDATED:	**1/5/21**

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	Adjusted Unit Amount	TOTAL AMOUNT
Sludge Thickening Facility						
1	General Conditions (8%)	1	Ls		$ 78,976	$ 79,000
	Planning Level Contingencies	1	Ls	$ 190,000	$ 237,500	$ 237,500
2	General Demolition	1	Ls	$ 15,000	$ 18,750	$ 18,800
3	Miscellaneous Concrete	20	Cy	$ 500	$ 625	$ 12,500
	Flowable Fill	10	Cy	$ 600	$ 750	$ 7,500
	RBC Tank Floor Slab	36	Cy	$ 300	$ 375	$ 13,500
4 Thru 10	Sludge Truck Garage	400	Sf	$ 150	$ 188	$ 75,000
	Sludge Area Ingress and Egress	1	Ls	$ 50,000	$ 62,500	$ 62,500
5	Misc. Specialties	1	Ls	$ 6,000	$ 7,500	$ 7,500
	Handrail and Grating	1	Ls	$ 25,000	$ 31,250	$ 31,300
6	Miscellaneous Carpentry	1	Ls	$ 2,000	$ 2,500	$ 2,500
14	5 Cy Sludge Dump Truck	1	Ea	$ 125,000	$ 156,250	$ 156,300
26	Process Electrical	1	Ls	$ 65,000	$ 81,250	$ 81,300
31	Earth Excavation	25	Cy	$ 20	$ 25	$ 700
	Backfill	25	Cy	$ 20	$ 25	$ 700
	Sheeting and Shoring	80	Sf	$ 36	$ 45	$ 3,600
	Pavement Subbase, 22A, 12"	100	Sy	$ 5	$ 7	$ 700
	HMA Pavement, 3"	100	Sy	$ 21	$ 26	$ 2,700
40	Process Piping and Valves	1	Ls	$ 40,000	$ 50,000	$ 50,000
	SCADA	1	Ls	$ 15,000	$ 18,750	$ 18,800
44	Screw Press Feed Pumps	2	Ea	$ 21,000	$ 26,250	$ 52,500
	Pump Installation	2	Ea	$ 4,000	$ 5,000	$ 10,000
46	Screw Press	1	Ls	$ 50,000	$ 62,500	$ 62,500
	Screw Press Installation	1	Ls	$ 8,000	$ 10,000	$ 10,000
	WAS Tank Mixer (Prim or Sec Digester)	1	Ls	$ -	$ -	$ -
	Sludge Conveyor	60	Lf	$ 500	$ 625	$ 37,500
	Sludge Lift, Cake To Truck	1	Ls	$ 25,000	$ 31,250	$ 31,300
	Construction Subtotal					**$ 1,067,000**
	Engineering, Planning, Contingencies					**$ 321,000**
	Total Project Cost					**$ 1,388,000**

<u>Annual O&M For Items Which are Not Substantially The Same (See Evaluation Worksheet)</u>	
Process Electrical Power (1)	
Maintenance (2)	
Equipment Replacement (3)	
Grit Maintenance	
Total Annual Additional O&M	**$0**

Notes:

1. Process Electrical
   Assume 1050 gpm at 40 ft and .70 hydraulic efficiency for 15.2 bhp
   100 % time operation, $0.12 per kwh is

2. Annual Maintenance
   Fine Screen Maintenance (2 Hrs/Wk at $40/Hrs plus $2,000 parts)
   Raw Sewage Pump Maintenance
   $0

3. Equipment replacement costs including vertical screen, raw sewage pumps, and valves/gates
   Screening Equipment
   Washer Compactor
   Raw Sewage Pumps
   Valves and Gates, Approx
   $0

   RRI Per Year For 20 Year Life **$0**

4. Estimated Impact of Pass-through Grit
   Digester Cleaning
   General Downstream Maintenance
   $0

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1211 Ludington St., Escanaba, Michigan 49829

PROJECT	**Gladstone WWTP - Process Capital Improvement**	**PROJECT NO.**	**21-0088**
		BY:	**Drh**
ALTERNATIVE	**HGL - Raise Secondaries Walls**		
	Including Cl Tank	**DATE:**	**12/29/20**
		UPDATED:	**1/5/21**

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	Adjusted Unit Amount	TOTAL AMOUNT
1	General Conditions (8%)	1	Ls		$ 26,952	$ 27,000
2	Demolition					
	CCT Handrail	145	Lf	$ 10.00	$ 13	$ 1,900
	FST Handrail	345	Lf	$ 10.00	$ 13	$ 4,400
	FST Grating and Walk, Salvage	420	Sf	$ 20.00	$ 25	$ 10,500
	FST, Effluent Channel Removal	160	Lf	$ 24.00	$ 30	$ 4,800
	FST Clarifier Equipment Demolition	2	Ea	$ 6,400	$ 8,000	$ 16,000
	CCT Weir Demolition	2	Ea	$ 500.00	$ 625	$ 1,300
3	Concrete					
	CCT Exterior Wall Extention, 10", 3' Raise	145	Lf	$ 110	$ 138	$ 20,000
	CCT Interior Wall Extention, 8", 3' Raise	120	Lf	$ 100	$ 125	$ 15,000
	FST Exterior Wall Extention, 12", 3' Raise	260	Lf	$ 120	$ 150	$ 39,000
	FST Channel Wall Extention, 8", 3' Raise	65	Lf	$ 100	$ 125	$ 8,200
	CCT Exterior Wall Extention, 10", 3' Raise		Lf	$ 400	$ 500	
5	Metals					
	CCT Handrail	145	Lf	$ 50	$ 63	$ 9,100
	FST Handrail	345	Lf	$ 50	$ 63	$ 21,600
	FST Walkway and Grating, Reinstall	1	Ls	$ 5,000	$ 6,250	$ 6,300
	Access Stairs	1	Ls	$ 15,000	$ 18,750	$ 18,800
23	Heating, Cooling and Ventilation	1	Ls	$ -	$ -	$ -
26	Electrical, Reconnect/Reservice					
	Reconnect	1	Ls	$ 5,000	$ 6,250	$ 6,300
	Additional, Allowance	1	Ls	$ 5,000	$ 6,250	$ 6,300
31	Earth Moving					
	Topsoil Stripping/Stockpile	400	Cy	$ 6.00	$ 8	$ 3,000
	Fill	300	Cy	$ 15.00	$ 19	$ 5,700
	Restoration, Topsoil and Seed	2500	Sy	$ 4.00	$ 5	$ 12,500
32	Site Improvements	1	Ls	$ 20,000	$ 25,000	$ 25,000
33	Utilities	1	Ls	$ 1,000	$ 1,250	$ 1,300
40	Process Integration					
	Hopper Pipe Replacement, 6" DIP	40	Lf	$ 100	$ 125	$ 5,000
	Inlet Baffling and Distribution	1	Ls	$ 50,000	$ 62,500	$ 62,500
46	Wastewater Equipment					

	Rehab and Reinstall Scum Pipes	2	Ea	$ 1,500	$ 1,875	$ 3,800
	FST, FRP Effluent Troughts, Reinstall.	1	Ls	$ 9,610	$ 12,013	$ 12,100
	CCT, Extend Gate Shafts, Reinstall Oper.	6	Ea	$ 1,200	$ 1,500	$ 9,000
	CCT Weirs	2	Ea	$ 3,000	$ 3,750	$ 7,500
	Construction Subtotal					**$ 364,000**
	Engineering, Planning, Contingencies					**$ 110,000**
	Total Project Cost					**$ 474,000**

Annual O&M For Items Which are Not Substantially The Same (See Evaluation Worksheet)
Process Electrical Power (1)
Maintenance (2)
Equipment Replacement (3)
Grit Maintenance
Total Annual Additional O&M **$0**

Notes:

1. Process Electrical
   Assume 1050 gpm at 40 ft and .70 hydraulic efficiency for 15.2 bhp
   100 % time operation, $0.12 per kwh is

2. Annual Maintenance
   Fine Screen Maintenance (2 Hrs/Wk at $40/Hrs plus $2,000 parts)
   Raw Sewage Pump Maintenance
   $0

3. Equipment replacement costs including vertical screen, raw sewage pumps, and valves/gates
   Screening Equipment
   Washer Compactor
   Raw Sewage Pumps
   Valves and Gates, Approx
   $0

   RRI Per Year For 20 Year Life **$0**

4. Estimated Impact of Pass-through Grit
   Digester Cleaning
   General Downstream Maintenance
   $0

C2AE
1211 Ludington St., Escanaba, Michigan 49829

PROJECT	**Gladstone WWTP - Process Capital Improvement**	**PROJECT NO.**	**21-0088**
		BY:	**Drh**
ALTERNATIVE	**Hydraulic Gradeline Containment Alternatives**		
	Effluent Booster Pump Station	**DATE:**	**12/29/20**
		UPDATED:	**3/2/21**

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	Adjusted Unit Amount	TOTAL AMOUNT
Sludge Thickening Facility						
1	General Conditions (8%)	1	Ls		$ 37,216	$ 37,300
	Field investigation by Contractor	1	Ls	$ 5,000	$ 6,250	$ 6,300
2	Demolition					
	16" Pipe Removal	15	Lf	$ 300	$ 375	$ 5,700
	Chlorine Tank Overflow Opening	1	Ls	$ 10,000	$ 12,500	$ 12,500
3	Concrete					
	Overflow, Walls and Slab	10	Cy	$ 1,200	$ 1,500	$ 15,000
	Vault Base Slab	4	Cy	$ 850	$ 1,063	$ 4,300
	Vault Walls, 12"	8	Cy	$ 800	$ 1,000	$ 8,000
	Vault Top Slab	4	Cy	$ 1,000	$ 1,250	$ 5,000
	Wet Well Concrete	1	Ls	$ 30,000	$ 37,500	$ 37,500
	Wet Well Fillet	8	Cy	$ 400	$ 500	$ 4,000
	Miscellaneous Concrete	1	Ls	$ 5,000	$ 6,250	$ 6,300
23	Heating, Cooling and Ventilation	1	Ls	$ -	$ -	$ -
26	Electrical					
	Electrical, 480v, 3 Phase	1	Ls	$ 30,000	$ 37,500	$ 37,500
	Pump Control Panel	1	Ls	$ 25,000	$ 31,250	$ 31,300
	Magmeter, 12, Pipe and Controls	1	Ls	$ 7,000	$ 8,750	$ 8,800
31	Earth Moving					
	Excavation	300	Cy	$ 10.00	$ 13	$ 3,800
	Backfill	200	Cy	$ 10.00	$ 13	$ 2,500
	Bypass Pumping	1	Ls	$ 7,500	$ 9,375	$ 9,400
	Dewatering	1	Ls	$ 20,000	$ 25,000	$ 25,000
32	Site Improvements	1	Ls	$ 4,000	$ 5,000	$ 5,000
33	Utilities	1	Ls	$ 1,000	$ 1,250	$ 1,300
40	Process Integration					
	16" DIP	40	Lf	$ 300	$ 375	$ 15,000
	16" Check Valve	1	Ls	$ 12,000	$ 15,000	$ 15,000
	16" Gate Valve	2	Lf	$ 6,000	$ 7,500	$ 15,000
	16" Tees	2	Ea	$ 2,000	$ 2,500	$ 5,000
	16" Sluice Gate, motor operated	1	Ea	$ 10,500	$ 13,125	$ 13,200
	12" Gate Valves	2	Ea	$ 4,200	$ 5,250	$ 10,500
	12" Check Valves	2	EA	$ 5,400	$ 6,750	$ 13,500
	Instrumentation	1	Ls	$ 15,000	$ 18,750	$ 18,800
46	Wastewater Equipment					
	Eff. Booster Pumps w/ VFD	2	Ea	$ 40,000	$ 50,000	$ 100,000

	(Submersible, 4.2 MGD)					
	Pump Installation	2	Ls	$ 12,000	$ 15,000	$ 30,000
	Construction Subtotal					**$ 503,000**
	Engineering, Planning, Contingencies					**$ 151,000**
	Total Project Cost					**$ 654,000**

<u>Annual O&M For Items Which are Not Substantially The Same (See Evaluation Worksheet)</u>

Process Electrical Power (1)
Maintenance (2)
Equipment Replacement (3)
Grit Maintenance
Total Annual Additional O&M **$0**

Notes:

1. Process Electrical
   Assume 1050 gpm at 40 ft and .70 hydraulic efficiency for 15.2 bhp
   100 % time operation, $0.12 per kwh is

2. Annual Maintenance
   Fine Screen Maintenance (2 Hrs/Wk at $40/Hrs plus $2,000 parts)
   Raw Sewage Pump Maintenance
   $0

3. Equipment replacement costs including vertical screen, raw sewage pumps, and valves/gates
   Screening Equipment
   Washer Compactor
   Raw Sewage Pumps
   Valves and Gates, Approx
   $0

   RRI Per Year For 20 Year Life **$0**

4. Estimated Impact of Pass-through Grit
   Digester Cleaning
   General Downstream Maintenance
   $0

APPENDIX D

Part 4 – Regionalization Cost Basis

Opinion of Cost for Alternative to Route Gladstone Wastewater to Escanaba

January 21, 2020

Item	Description	Price	Unit	No. of Units	Cost
	Force Main Construction, Directionally Drilled (Assumed 80% of total LF)				
	12 - 16" Force Main (DIP), Directionally Drilled	$ 260	LF	32,000	$ 8,320,000
	Access Points Restoration	$ 2,000	EA	40	$ 80,000
	Force Main Manhole (Every 1,000')	$ 6,000	EA	32	$ 192,000
				Total	$ 8,592,000
	Force Main Construction, Open Trench (Assumed 20% of total LF)				
	12 - 16" Force Main (DIP), Open Cut	$ 160	LF	8,000	$ 1,280,000
	Restoration	$ 35	LF	8,000	$ 280,000
	Force Main Manhole (Every 1,000')	$ 6,000	EA	8	$ 48,000
				Total	$ 1,608,000
	Pedestrian Bridge Crossing over Escanaba River				
	Pre-insulated Pipe over River on Bridge (support hangers)	$ 900	LF	900	$ 810,000
	Heat Tracing System	$ 23,000	LS	1	$ 23,000
	New 14' wide by 900' long Pedestrian Bridge	$ 2,000,000	LS	1	$ 2,000,000
				Total	$ 2,833,000
	Railroad Crossings				
	Near intersection of Main St and Stephenson Rd (After Bridge)	$ 450	LF	250	$ 112,500
	On Stephenson Rd, just South of 20th Ave N	$ 450	LF	450	$ 202,500
				Total	$ 315,000
	Structures				
	Lift Station	$ 500,000	EA	3	$ 1,500,000
	Odor Control Facilities	$ 60,000	EA	3	$ 180,000
	Improvements at Escanaba WWTP	$ 1,500,000	LS	1	$ 1,500,000
	Equalization Tank & Raw Sewage Pump Upgrades at Gladstone WWTP (Reducing Peak Flows)	$ 1,250,000	LS	1	$ 1,250,000
				Total	$ 4,430,000
	Total Construction Costs			Total	$ 17,778,000
Engineering, Legal, Administrative, and Contingency Fees					
	Engineering, Legal, Administrative, and Contingency Fees (ELAC)	30%			$ 5,333,400
	Connection Fee at Escanaba	$ 1,000,000	LS		$ 1,000,000
Total Project Costs (Including Restoration, General, & ELAC)				Total	$ 23,111,400

Notes:

1) Costs for bridge have been scaled from estimates in 2015; ENR Index of 10,135 for 2015 and 11,496 for 2020, increase of 113%

2) Connection Fee at Escanaba is a guess only and to be determined by the City of Escanaba

Present Worth Analysis on Regionalization Alternative

5/6/2020

Description Construction Cost Opinion		Regionalization
Construction Costs		$17,778,000
Engineering, Planning, Legal and Admin	30%	$5,333,400
Escalation to 2024 construction	10.0%	$2,312,000
Connection Fee to Escanaba		$1,000,000
TOTAL PROJECT COST		$26,423,400

Description Annual Operations Maintenance and Replacement Costs		Regionalization
O&M to Escanaba		$540,000
Gladstone Collection O&M		$175,000
Total Annual O&M Costs		$715,000

Present Worth Analysis		Regionalization
Capital Cost		$26,423,400
Annual O&M		$715,000
Interest Rate		0.3%
Years		20
Salvage		$8,044,000
$(1+i)^N$		1.0617
Present Value of Annual O&M		$13,860,000
Present Value of Salvage		$7,577,000
Present Value		**$32,707,000**

APPENDIX E

Public Participation

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APPENDIX E

Part 1 – Public Hearing Advertising

APPENDIX E

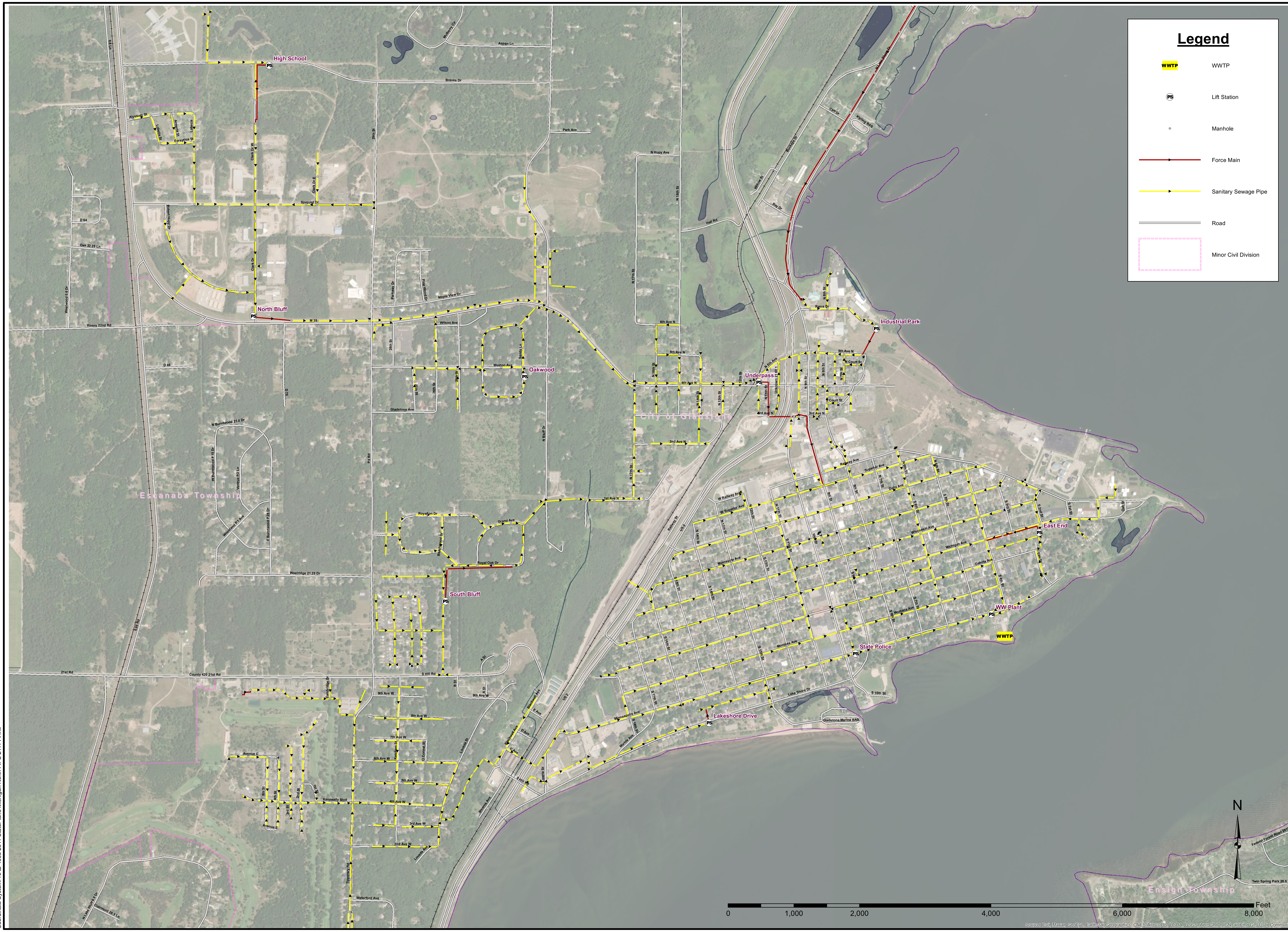
Part 2 – Public Hearing Transcript

APPENDIX E

Part 3 – Comments

APPENDIX F

MAPS



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CITY OF GLADSTONE
PROJECT: 21-0088
SRF PROJECT PLAN
DELTA COUNTY, MICHIGAN

FIGURE 8: COLLECTION SYSTEM AND FACILITY LOCATIONS

WE RECYCLE

PLOTTED BY: ASHLEY.HENDRICKS 02/25/2021 11:20 AM
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