City of Grand Ledge
Wastewater Treatment Plant and Sanitary Sewer System Improvements

CWSRF Project Plan Public Hearing

The City of Grand Ledge

fishbeck

Engineers | Architects | Scientists | Constructors

Public Hearing Contents

- Description of the water quality problems to be addressed by the project and the principal alternatives that were considered.
- Description of the recommended alternative.
  - Capital costs
  - Cost breakdown by project components
- Discussion of project financing and costs to users.
  - Proposed method of project financing and estimated monthly debt retirement
  - Proposed annual, quarterly, or monthly charge to the typical residential customer
  - Any special fees that will be assessed
- Description of the anticipated social and environmental impacts associated with the recommended alternative and the measures that will be taken to mitigate adverse impacts.
- In the event no one from the public attends the hearing (a reporter would be considered a member of the public, as would members of the applicant's governing body), the public hearing may be opened and closed without a formal presentation of the project plan. However, a transcript or recording must still be submitted with the final project plan documenting this action.

Agenda

- SRF Background & Description
- Collection System Overview
- Treatment Plant Overview
- Water Quality Problems Addressed
- Alternatives Considered
- Principal Alternatives
- Monetary Evaluation
- Social and Environmental Impacts Evaluation
- Next Steps

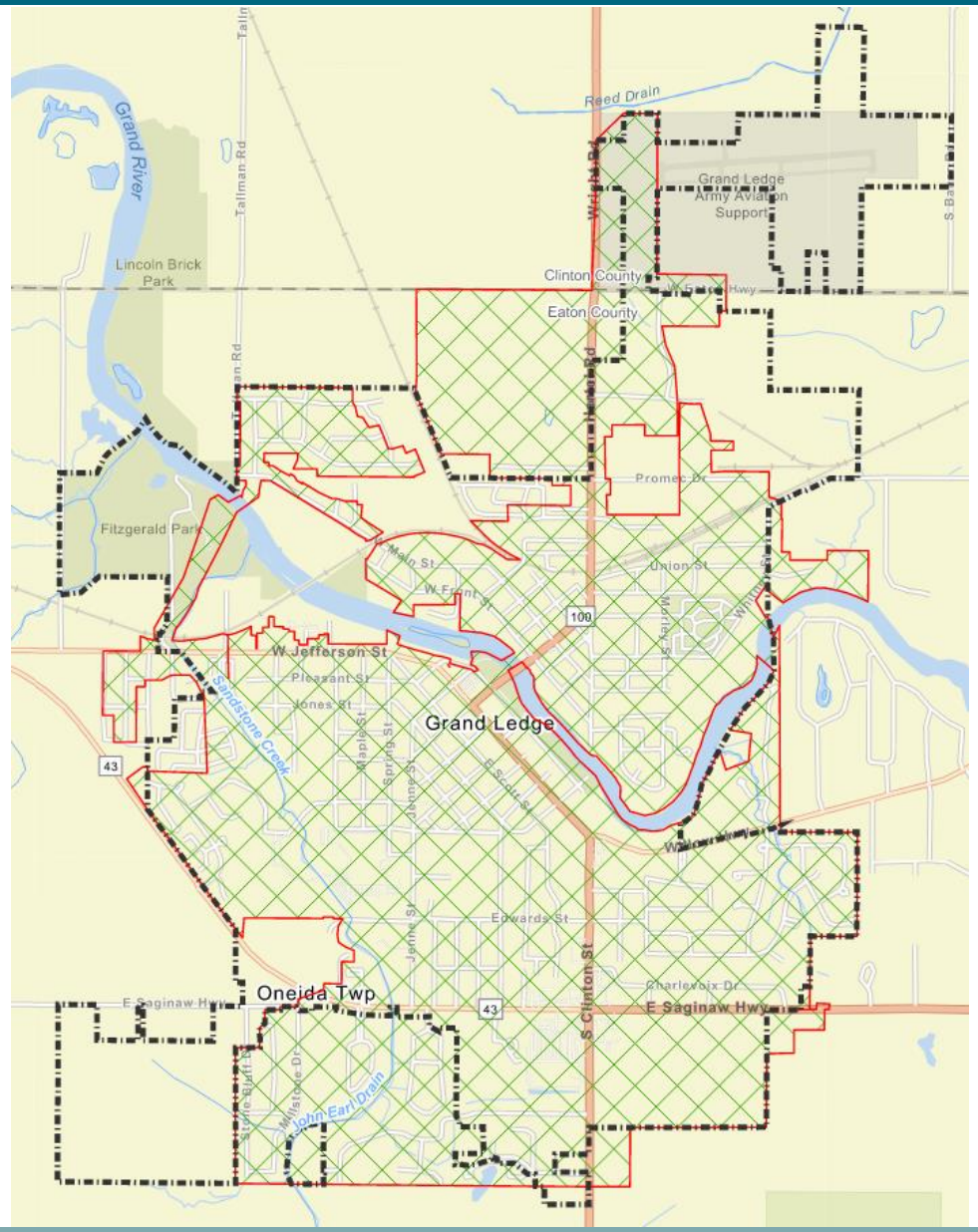
Existing Aeration Tanks

Clean Water State Revolving Fund (CWSRF)

- Came from 1987 amendments to the Clean Water Act.
- Administered by the Michigan Department of Environment, Great Lakes, and Energy (EGLE).
- Aimed to address water quality needs of communities.
- Provides low-interest funding to assist in studies & improvements to drinking and wastewater systems.

EGLE

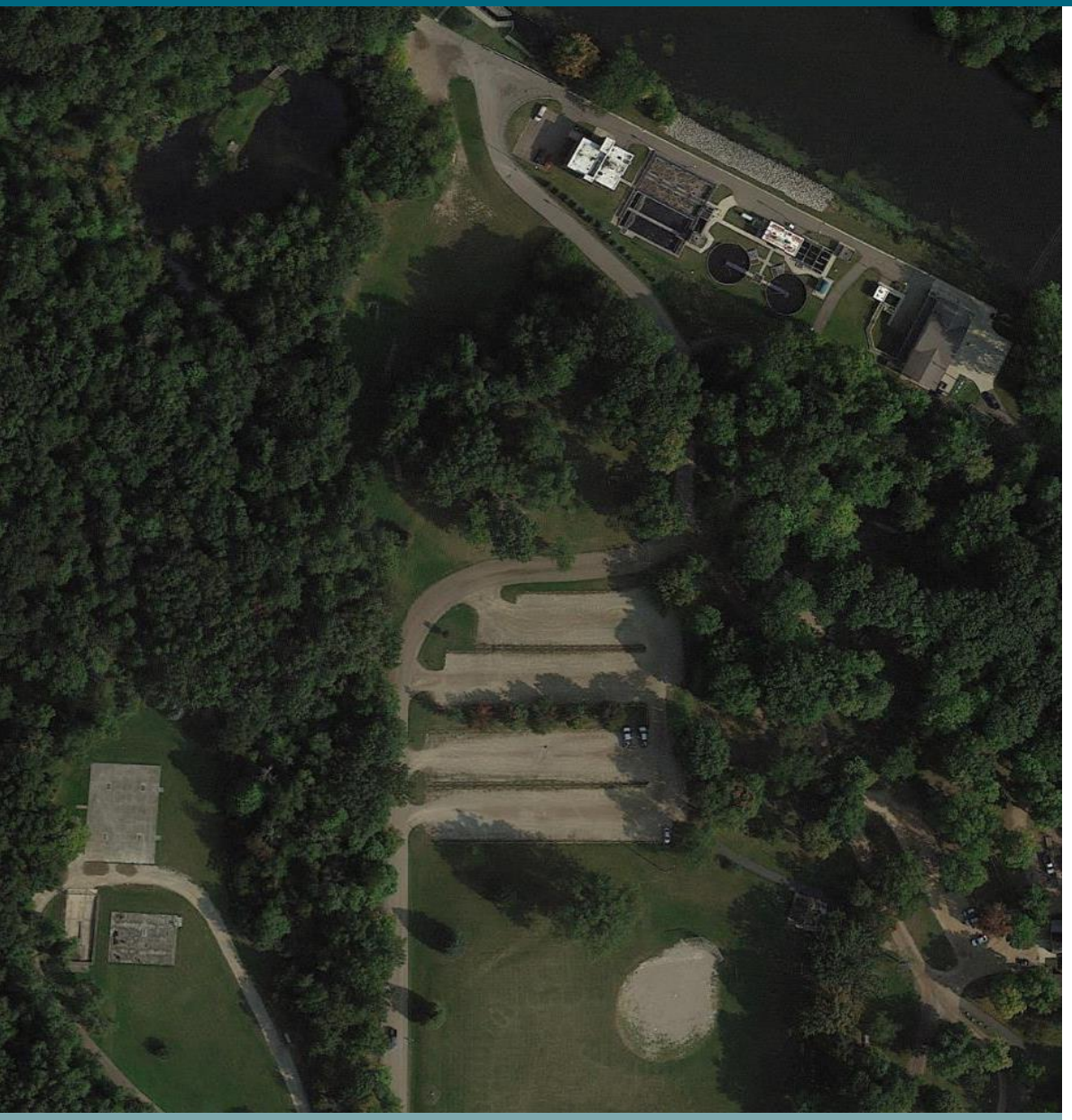
MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY



Sanitary Sewer Service Area

Collection System Overview

- Originally combined storm and sanitary sewer system
- Separated in 1991
- Persistent high flows associated with wet weather events
- West River Pump Station pumps a large portion of flow into an interceptor sewer to the WWTP



Aerial View of Existing WWTP

Wastewater Treatment Plant Overview

- **Treatment Processes**
  - Retention Basin
  - Mechanical Bar Screen
  - Aerated Grit Removal
  - Intermediate Pump Station
  - Primary Clarification
  - Aeration
  - Secondary Clarification
  - Chlorine Disinfection
- **Solids Handling**
  - Lime stabilize biosolids from primary and secondary clarifiers
  - Biosolids storage and liquid land application

Need for Project – Collection System

- History of overflows from the collection system.
  - Russell Street Manhole
  - West River Pump Station (WRPS)
  - Interceptor Sewer to WWTP
- Violation Notice from EGLE received on March 11, 2021.
- Meeting request from EGLE received on August 25, 2023 (during storm Declaration of State of Emergency) to discuss an amendment to the ACO.
- Need to convey the 25-year, 24-hour design storm to the WWTP without overflow.

Need for Project - WWTP

- Available Capacity of Existing WWTP
  - Designed to treat 1.5 MGD.
  - Exceeding biological treatment capacity.
  - At ~73% of hydraulic capacity.
  - Discharges from the retention treatment basin during wet weather events
  - WWTP capacity is a limiting factor for new residential, commercial, and industrial development.
- Aging Infrastructure – Mechanical equipment from 1975
- Ineffective Treatment – Grit removal
- Chemical Handling – Lime for solids stabilization and chlorine for disinfection

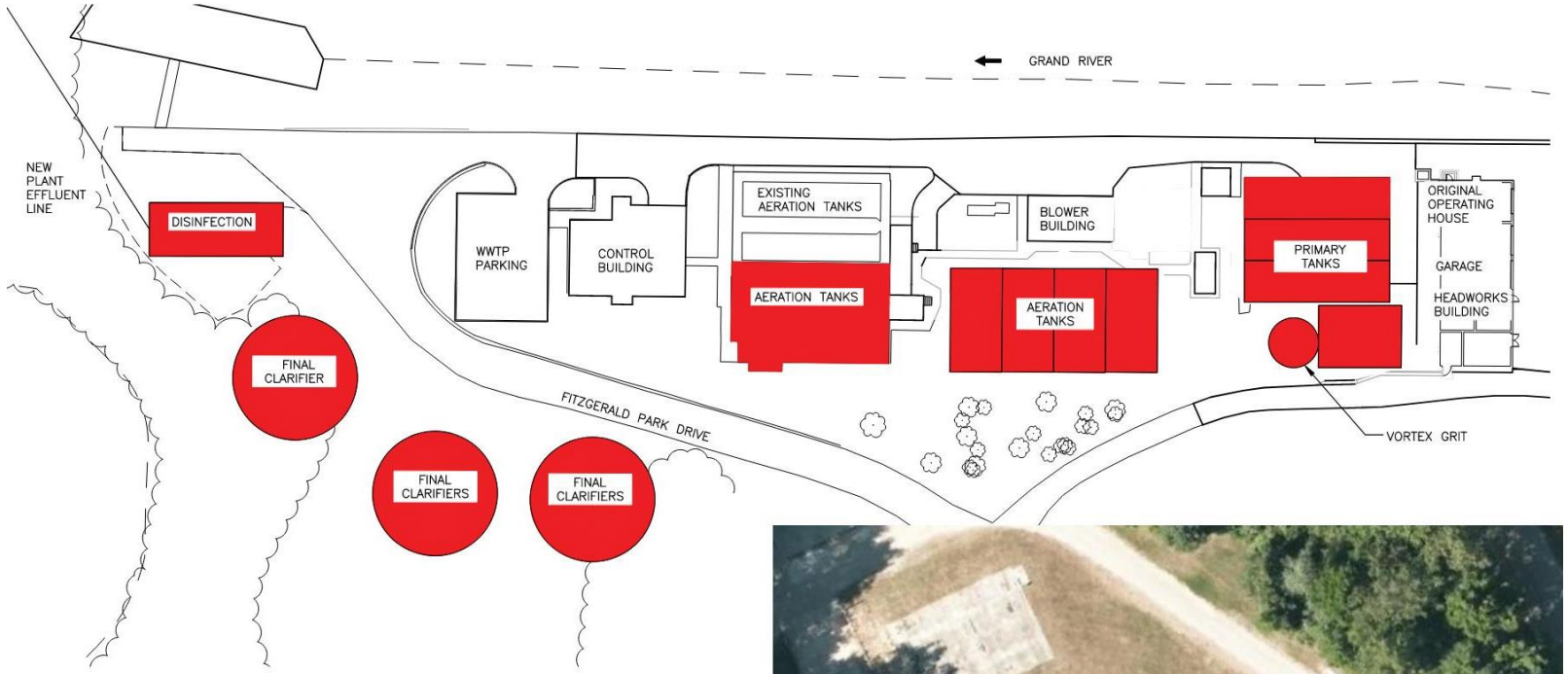
Alternatives Considered

- Alternative 1 – No Action
  - Does not address need for project; not a principal alternative.
- Alternative 2 – Optimization of Existing Facilities: Expansion of Conventional Activated Sludge
  - Principal alternative.
- Alternative 3 – Optimization of Existing Facilities: Conversion to Extended Aeration
  - Principal alternative.
- Alternative 4 – Optimization of Existing Facilities: Conversion to Membrane Bioreactors (MBR)
  - Principal alternative.
- Alternative 5 – Regional Alternative: Connection to Existing Regional WWTP
  - Capacity limitations, cost of service, loss of autonomy; not a principal alternative.
- Alternative 6 – Construction of New Satellite WWTP
  - Collection system modification, operational difficulties, restrictive additional NPDES permit; not a principal alternative.
- Alternative 7 – Construction of new WWTP
  - Convert existing WWTP into pump station, new WWTP near existing WWTP or at alternate location, new outfall to Grand River; higher anticipated capital cost and operating cost; not a principal alternative.

Principal Alternatives

- Alternative 2 – Optimization of Existing Facilities: Expansion of Conventional Activated Sludge
- Alternative 3 – Optimization of Existing Facilities: Conversion to Extended Aeration
- Alternative 4 – Optimization of Existing Facilities: Conversion to MBR

Alternative 2 –Conventional Activated Sludge



ALTERNATIVE 2 SITE MAP

SCALE: 1" = 50'

NORTH

0 25 50 100

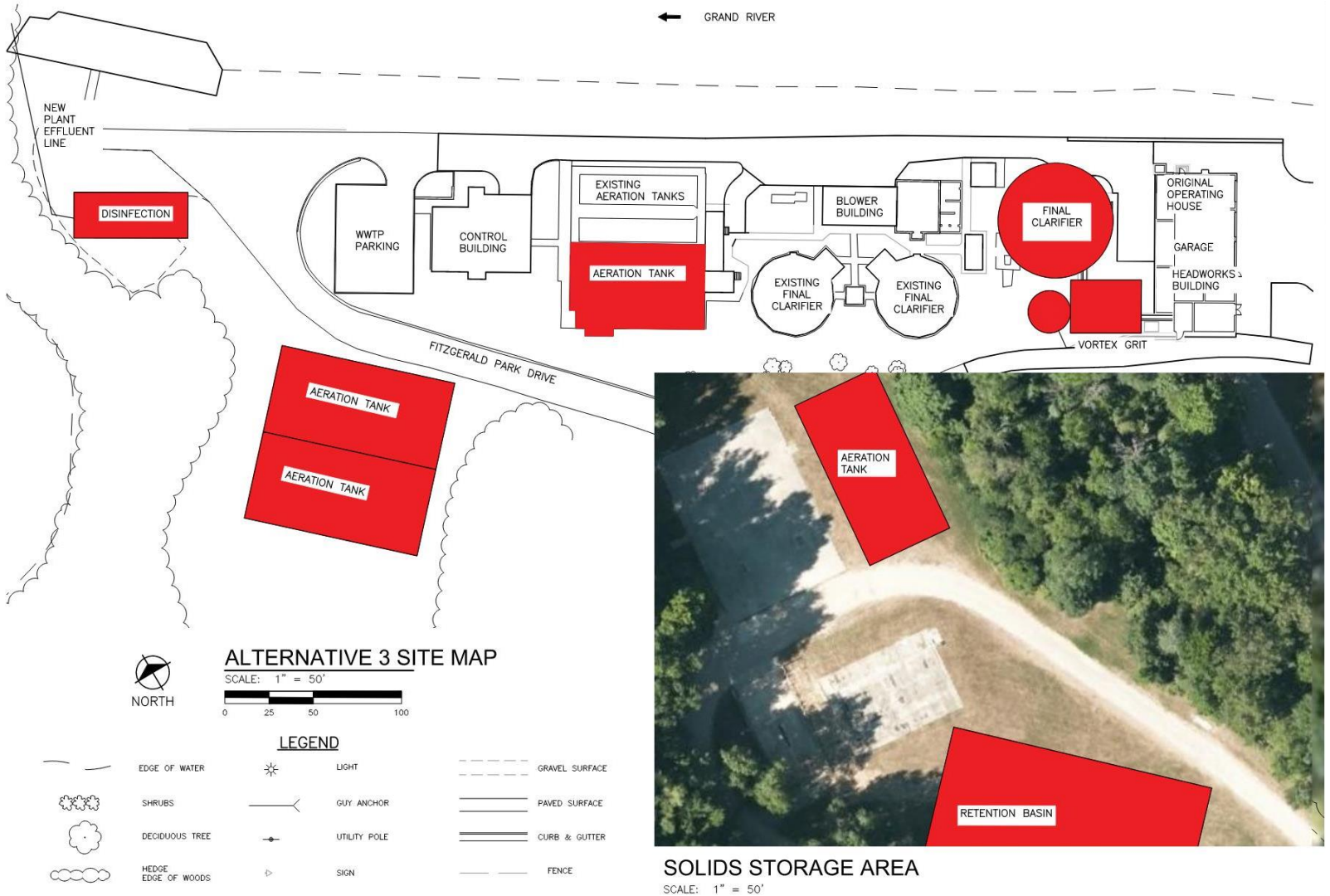
LEGEND

EDGE OF WATER
SHRUBS
DECIDUOUS TREE
HEDGE EDGE OF WOODS
LIGHT
GUY ANCHOR
UTILITY POLE
SIGN
GRAVEL SURFACE
PAVED SURFACE
CURB & GUTTER
FENCE

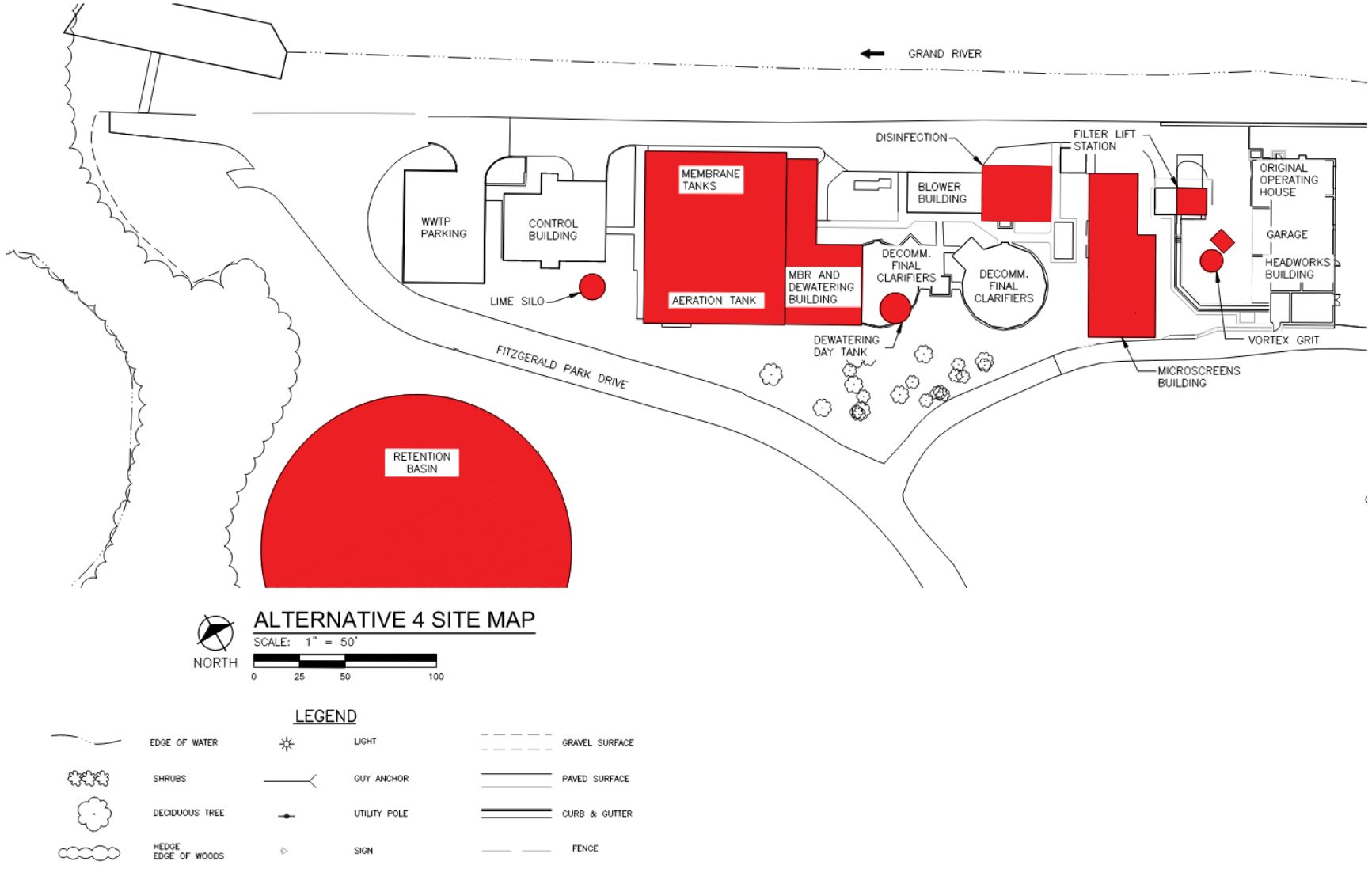
SOLIDS STORAGE AREA

SCALE: 1" = 50'

Alternative 3 – Extended Aeration



Alternative 4 – MBR



Sanitary Sewer System Improvements

- WRPS Wet Weather Pumps
- Force main from WRPS to EQ Basin at WWTP Site

	Alternative 2: Conventional Activated Sludge	Alternative 3: Extended Aeration	Alternative 4: MBR
Capital Cost	$142,158,000	$140,103,000	$95,225,000
Annual OM&R Cost	$897,507	$1,021,995	$1,117,049
Salvage Value	$40,582,933	$43,903,933	$19,849,333
Present Worth of 20 Years of OM&R Cost	$17,042,000	$19,406,000	$21,210,000
Present Worth of Salvage Value	$36,730,108	$39,735,821	$17,964,895
20-Year Total Present Worth	$122,469,892	$119,773,179	$98,470,105

Alternative 4 has the lowest capital cost and the lowest 20-year total present worth.

Principal Alternative – Monetary Evaluation

Additional information available in Appendix 6 of the Draft Project Plan.

Social and Environmental Impacts Evaluation

Social Impacts

- Short term construction related impacts.
  - Construction activities managed to maintain access to adjacent park.
- Traffic impacts.
- User costs.
- Temporary construction job.

Environmental Impacts

- Will adhere to local, state, and federal regulations for work within floodplains.
  - Mitigated by soil erosion and sedimentation control measures.
- Land use.
  - Prefer smaller footprint.
- Effluent water quality.
  - Improve water quality in Grand River.
- Energy and chemical use.
- Positive impact to operations and overall sewer system reliability.
- No impact to threatened or endangered species.

Recommended: Alternative 4 - MBR

- Capital Cost = $95,225,000
- Finance through SRF
  - 30-year loan: 2.75%
- Costs for Average Sewer User: $102.70 per month based on 48,834 Annual REU Equivalents
  - $94.44 per month for debt repayment
  - $8.26 per month for OM&R
- Note: This capital cost in the amount of $95M+ is only viable with direct and/or indirect State and Federal Appropriations.

Category	2023 Opinion of Probable Construction Cost
Flow Retention	$13,953,000
Preliminary Treatment	$10,943,000
Primary Treatment	$10,428,000
Biological Treatment	$33,801,000
Final Clarification	$1,036,000
Disinfection	$2,971,000
Solids Handling	$5,773,000
Sanitary Sewer System Improvements	$16,320,000
Total Capital Cost	$95,225,000

Next Steps

- Project Plan
  - Resolution Adopting a Final Project Plan and Designating an Authorized Project Representative during the October 9, 2023 City Council Meeting
  - Submit Final Project Plan on October 10, 2023
- Confirm Milestone Schedule with EGLE project manager
- Part I Application to MFA – Financial Review
- Part II Application – SRF program requirements
- Bid Project according to Milestone Schedule
  - Advertise for Bids on October 10, 2023
  - Receive Bids on November 21, 2023
  - Review Bid results with City Council on December 11, 2023
  - Part III Application due on December 12, 2023
- Construction: February 2024 – July 2027

Thank You

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Grand Ledge
Wastewater Treatment Plant and
Sanitary Sewer System Improvements
Clean Water State Revolving Fund
Final Project Plan

Prepared For:
City of Grand Ledge, Michigan

June 1, 2022
Revised September 11, 2023
Revised October 9, 2023
Project No. 201424

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List of Abbreviations/Acronyms

AMC	antecedent moisture conditions
AMP	Asset Management Plan
City	City of Grand Ledge
CSO	combined sewer overflow
EGLE	Michigan Department of Environment, Great Lakes, and Energy
FSP	Fiscal Sustainability Plan
gpm	gallons per minute
I/I	inflow and infiltration
lbs	pounds
MBR	membrane bioreactor
mgd	million gallons per day
mg/L	milligrams per liter
NAAQS	National Ambient Air Quality Standards
NFPA	National Fire Protection Association
NPDES	National Pollutant Discharge Elimination System
OM&R	operations, maintenance, and repair
RAS	return activated sludge
REU	residential equivalent unit
RTB	retention treatment basin
SAD	Special Assessment District
SCCUMA	Southern Clinton County Municipal Utility Authority
SESC	soil erosion and sedimentation control
SRF	State Revolving Fund
SSO	sanitary sewer overflow
Total-P	total phosphorus
TSS	total suspended solids
USEPA	U.S. Environmental Protection Agency
UV	ultraviolet
WRPS	West River Pump Station
WTP	water treatment plant
WWTP	wastewater treatment plant

1.0 Background

1.1 Introduction

The City of Grand Ledge (City) sanitary sewer system and wastewater treatment plant (WWTP) require improvements. The sanitary sewer system experiences high levels of inflow and infiltration (I/I) and periodic sanitary sewer overflows (SSOs). The WWTP is generally able to maintain compliance with the National Pollutant Discharge Elimination System (NPDES) permit; however, it is at the hydraulic and organic loading capacity.

This Project Plan was prepared to obtain financing through the State Revolving Fund (SRF) from the Michigan Department of Environment, Great Lakes, and Energy (EGLE) for the construction of proposed improvements to the WWTP and sanitary sewer system. The WWTP requires expansion to provide capacity to the service area's residents, businesses, and industries. There is current demand for capacity from residential and commercial developments and the potential for future demand from industrial park growth. An evaluation of the wastewater treatment system capacity was conducted by Fishbeck in 2017. This study determined the WWTP was at 73% of its current 1.5 million gallon per day (mgd) hydraulic capacity and was exceeding its biological treatment capacity, and therefore has no excess capacity for future growth or development.

The sanitary sewer system has hydraulic bottlenecks and issues with I/I that limit system capacity and ability to transport sanitary wastewater to the WWTP. Sanitary sewer system improvements are required in conjunction with WWTP improvements.

1.2 Delineation of the Study Area

A map of the project planning area, delineating the existing service area, is provided in Figure 1. The project planning area is comprised of regions within Eaton and Clinton Counties.

The existing service area includes the City and residential and commercial customers located in portions of Oneida and Eagle Townships. These customers are served by the existing centralized sanitary sewer system and WWTP owned and operated by the City. The sanitary sewer system is divided into five main sewer districts: West Main, North End, Sandstone, West Jefferson, and Clinton, which all connect into the River Interceptor that flows by gravity to the WWTP from Franklin Street, east of M-100, along the south side of the Grand River. The existing sewer district map is identified in Figure 1.

The WWTP is located within City owned Fitzgerald Park. The existing WWTP facilities are located at the north edge of the property along the Grand River.

1.3 Environmental Setting

1.3.1 Cultural Resources

To identify sites of historical and cultural significance, the National Register of Historic Places, Michigan Historical Markers, and the list of Michigan State Historic Sites by County were reviewed. The following cultural resources have been identified within the project planning area.

The Grand Ledge Chair Company Plant, located at 101 Perry Street, Grand Ledge, Michigan, is included in the National Register of Historic Places. While this site is located within the planning area, proposed improvements are not anticipated to impact this historic site.

The River Ledge Historic District includes Jefferson, Scott, and Lincoln Streets between Franklin and Maple Streets. The River Ledge Historic District is included in the National Register of Historic Places. Improvements to

the sanitary sewer system within the River Ledge Historic District are not anticipated to adversely impact the historic properties within the historic district.

The existing WWTP is located within City owned Fitzgerald Park, which is identified in the register of Michigan Historical Markers. The site has been used for numerous activities throughout history. The following description was provided by the Michigan History Center. Care will be taken throughout the project to minimize the impact to Fitzgerald Park. Because the WWTP is located within Fitzgerald Park, modification to the WWTP will necessitate that there will be some impacts to Fitzgerald Park.

> *Migrant Indian tribes led by the famous Chief Okemos called this area "Big Rocks." They came here in early spring to tap the sugar maples. Later, the beauty of the ledges and woods attracted the Grand Ledge Spiritualist Camp Association, which, in 1894, established a summer campground and erected the large pavilion which still stands. Thousands of spiritualists came here for summer encampments until the turn of the century. In 1919 the city of Grand Ledge bought the property and named it Riverside Park. The pavilion was used for dances, roller skating, and basketball. During World War II it housed a factory. This park's name commemorates Grand Ledge native Governor Frank D. Fitzgerald, who died in office in 1939. The pavilion was refurbished as a summer theater by the Grand Ledge Improvement Association in 1955.*

The Governor Frank D. Fitzgerald Home, located at 219 West Jefferson, Grand Ledge, Michigan, is identified in the register of Michigan Historical Markers. While the home is located within the planning area, proposed improvements are not expected to impact the historic site. The site was the home of Governor Frank D. Fitzgerald during his time as governor from 1935 through 1939.

Second Island is identified in the register of Michigan Historical Markers. Second Island is located in the Grand River and is not anticipated to be impacted by proposed improvements.

Blake's Opera House, located at 121 S. Bridge Street, Grand Ledge, Michigan, is identified in the register of Michigan Historical Markers. While Blake's Opera House is located within the planning area, proposed improvements are not expected to impact the historic site.

Because this has been deemed a non-equivalency project, correspondence with the State Historical Preservation Office and the Tribal Historic Preservation Offices was not required.

Appendix 1 contains detailed information on each of the identified historic sites.

1.3.2 The Natural Environment

1.3.2.1 Air Quality

The Federal Clean Air Act of 1963, as amended in 1970, 1977, and 1990, requires the U.S. Environmental Protection Agency (USEPA) to establish National Ambient Air Quality Standards (NAAQS) which define the maximum permissible concentrations for certain pollutants. In 1971, the USEPA established standards for five criteria pollutants: total suspended particulate matter (TSP), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), and photochemical oxidants. On October 5, 1978, the USEPA promulgated an additional ambient air quality standard for lead (Pb). A new air quality standard for ozone (O_3) replaced the photochemical oxidant standard on February 8, 1979. In July 1987, the particulate matter standards were revised by the USEPA to place greater importance on fine particles with diameters less than 10 microns (PM_{10}). The NAAQS Standards are provided in Table 1 for reference.

Table 1 – Air Quality Standards

Criteria Pollutant	Primary Criteria (Health Related)		Secondary Criteria (Welfare Related)	
	Type of Average	Standard Level Concentration	Type of Average	Standard Level Concentration
Carbon Monoxide (CO)	2nd highest 8-hour	9 ppm (10 mg/m^3)	No Secondary Standard	
	2nd highest 1-hour	35 ppm (40 mg/m^3)		
Lead (Pb)	Maximum 3-month average	0.15 µg/ m^3	Same as Primary Standard	
Nitrogen Dioxide (NO_2)	Annual arithmetic mean	0.053 ppm (100 µg/ m^3)	Same as Primary Standard	
Ozone (O_3)	4th highest 8-hour daily maximum averaged over 3 years	0. ppm (147 µg/ m^3)	Same as Primary Standard	
Particle Matter	PM_{10} (10 micron) 24-hour	150 µg/ m^3	Same as Primary Standard	
	$PM_{2.5}$ (2.5 micron) annual arithmetic mean	15 µg/ m^3	Same as Primary Standard	
	$PM_{2.5}$ 98th percentile 24-hour averaged over 3 years	35 µg/ m^3	Same as Primary Standard	
Sulfur Dioxide (SO_2)	Annual arithmetic mean	0.03 ppm (80 µg/ m^3)	3-hour	0.5 ppm (1300 µg/m^3)
	2nd highest 24-hour	0.14 ppm (365 µg/ m^3)		

EGLE conducts air quality monitoring throughout the state. Non-attainment areas are those that have concentrations over the NAAQS standards. The study area resides in an area that is within attainment with all air quality standards. The proposed work will have no significant effect on the local air quality. Heavy equipment used for construction will temporarily increase emissions in work areas but is not expected to produce a significant or lasting effect.

1.3.2.2 Wetlands

Figure 2 identifies wetlands in the study area. The major water feature in the study area is the Grand River. Wetlands within the study area include freshwater emergent wetlands, freshwater forested/shrub wetlands, freshwater ponds, and riverine wetlands.

1.3.2.3 Coastal Zones

Grand Ledge is an inland city; there are no coastal areas within or adjacent to the City.

1.3.2.4 Floodplains

Figure 3 contains a Federal Emergency Management Agency (FEMA) floodplain map for the study area. Many of the 100-year floodplain areas are located adjacent to the Grand River and Sandstone Creek. Portions of the existing WWTP site are within the 100-year floodplain.

1.3.2.5 Natural or Wild and Scenic Rivers

Rivers within the planning area are not considered Natural or Wild and Scenic Rivers, as defined by the regulations.

1.3.2.6 Major Surface Waters

Major surface waters within the planning area include the Grand River and Sandstone Creek, which are identified in Figure 2.

1.3.2.7 Recreational Facilities

The City recently developed a *2022 – 2026 Parks and Recreation Master Plan*. This master plan identifies four existing neighborhood parks (Elaine Dible Memorial Park, Colonial Park, Fieldview Open Space, and Oakwood Greenspace), three neighborhood parks coming available in 2022 (West Washington Street Greenspace, West Main Street Greenspace, and West Front Street Greenspace), two community parks (City Hall Park and GLPS School Recreation Facility), nine regional parks (Island Park, Jaycee Park, Fitzgerald Memorial Field, Oak Park, Riverfront Park, Bridge Street Plaza, Little Fitz, Future Ball Field Complex, and Fitzgerald Park). In addition to the identified parks, the City is also home to a trail system. Recreational facilities are identified in Figure 4.

1.3.2.8 Topography

Elevations within the study area range from approximately 840 to 890 feet above mean sea level. Figure 5 depicts the topography in the study area.

1.3.2.9 Geology

The predominant geological features within the planning area that impact the choice of alternatives are the sandstone ledges along the Grand River. The sandstone ledges are an important regional geologic feature and limit the usable space near the existing WWTP site.

The study area is dominated with medium-textured glacial till with a small section of glacial outwash sand and gravel and postglacial alluvium in the southern portion of the study area. The quaternary geology of the study area is shown in Figure 6.

1.3.2.10 Soils

The study area includes soils classified as USA Soils Hydrogeologic Group A, Group B, Group C, Group A/D, Group B/D, and Group C/D. Figure 7 shows the soil distribution within the Study Area. While soils are not anticipated to have an adverse impact on construction activities, underlying sandstone features near the WWTP site must be considered during design.

1.3.2.11 Agricultural Resources

Prime farmland and farmland of local importance is identified in Figure 8. Proposed improvements are not anticipated to require the use or conversion of prime farmland or farmland of local importance.

1.3.2.12 Fauna and Flora

Endangered or threatened species are defined as those species that are or could become endangered or threatened and, therefore, are protected under the Endangered Species Act. The objective of the act is to preserve and restore species threatened with extinction. The federally listed endangered and threatened species are detailed in Table 2. Table 3 details the state listed endangered, threatened, rare, and special concern species for Osceola County. The Michigan Natural Features Inventory was not contacted, as this has been deemed a non-equivalency project. A natural features inventory is map is provided in Figure 9.

Table 2 – Federally Threatened and Endangered Species

Name	Status
Eastern Prairie Fringed Orchid	Threatened
Northern Long-Eared Bat	Threatened

Table 3 – State Threatened, Endangered, Rare, and Special Concern Species

Name	Status
Elktoe	Special Concern
Slippershell	Threatened
Henslow's sparrow	Endangered
Grasshopper sparrow	Special Concern
Sort-eared owl	Endangered
Northern amber bumble bee	Special Concern
Three-seed sedge	Special Concern
Blanding's turtle	Special Concern
Common loon	Threatened
Wood turtle	Special Concern
Bald eagle	Special Concern
Vasey's rush	Threatened
Migrant loggerhead shrike	Endangered
Creek heelsplitter	Special Concern
Flutedshell	Special Concern
Black sandshell	Endangered
Pickerel frog	Special Concern
Little brown bat	Special Concern
Bigmouth shiner	Special Concern
Osprey	Special Concern
Round pigtoe	Special Concern
Eastern massasauga	Special Concern
Dickicissel	Special Concern
Butler's garter snake	Special Concern

1.3.3 Land Use in the Study Area

1.3.3.1 Existing Land Use

Existing land uses within the study area include single family residential, 2-family residential, multiple family residential, mobile home community, central business district, commercial/highway services, office, industrial, churches/schools/public facilities, city and county parks, agricultural, and vacant land. Figure 10 shows the existing land use within the study area as of January 2018.

1.3.3.2 Predicted Land Use

The predicted land use is shown in Figure 11. Development within the study area includes additional residential development, multi-family residential development, and further expansion of the industrial areas.

1.4 Population

A population review was conducted for the City and the townships that are served by the sanitary sewer system, with the resulting data provided in Table 4. Census data was obtained for the City as well as Oneida and Eagle Townships for 2000 and 2010. According to the City's 2018 Master Plan, the Tri-County Regional Planning Commission projected a 7.8% population increase between 2010 and 2020. However, according to U.S. Census Bureau data, only a 1.4% increase was seen from 2010 to 2019 (i.e., 0.16% annual growth) for the City. With a

lack of data available at this time, populations for Oneida and Eagle Townships were estimated for 2019 and 2022 based on the actual 0.16% annual growth seen for the City. The previous Tri-County Regional Planning Commission projected 7.8% rate of growth per 10 years was then applied for future projections for 2032 and 2042.

Table 4 – Regional Municipal Population Trends

Year	City of Grand Ledge	Oneida Township	Eagle Township	Total
2000	7,813*	3,703*	2,332*	13,848
2010	7,786*	3,861**	2,548**	14,195
2020	7,896*	3,914*	2,713*	14,253
2022 projection	7,921	3,928	2,722	14,571
2027 projection	8,230	4,081	2,828	15,139
2032 projection	8,551	4,240	2,934	15,725
2042 projection	9,217	4,571	3,162	16,950

*U.S. Census Bureau
**Tri-County Regional Planning Commission

The total municipal populations do not represent the projected planning area or the existing service area, as some areas of the population are served by other sanitary means. In general, population trends and projections are valuable indicators of overall regional growth. The current population served by the existing WWTP is estimated to be 8,855. The 20-year projected population served by the proposed project is estimated to be 10,305.

1.5 Economic Characteristics

Table 5 lists the major employers within the study area as well as the number of employees at each location and the product developed/service rendered, as provided by the City.

Table 5 – Study Area Major Employers

Employer	Product / Service	Number of Employees
Grand Ledge Public Schools	Education	559
Lowes	Supply chain/shipping	550
E.T. Mackenzie	Construction/Demolition	430
Meijer Inc.	Retail/Grocery	320
E-T-M Corporation	Fiberglass Molding	130
City of Grand Ledge	Government	105
Robert Sinto Corporation	Automatic Pouring Systems	100
American Bottling Company	Automation Systems and Equipment Manufacturing	50
Independence Village	Housing	48
McDonalds	Restaurant	45

As reported in the 2019 American Community Survey of Median Annual Household Income, the median household income metrics in Grand Ledge, Eaton County, and the State of Michigan were as follows:

Table 6 – Median Annual Income Evaluation (2019)

Metric of Evaluation	Grand Ledge Median Annual Income	Eaton County Median Annual Income	State of Michigan Median Annual Income
Household	$61,095	$59,584	$57,144
Families	$99,686	$75,703	$72,600

Table 6 – Median Annual Income Evaluation (2019)

Metric of Evaluation	Grand Ledge Median Annual Income	Eaton County Median Annual Income	State of Michigan Median Annual Income
Nonfamily households	$45,968	$35,755	$33,711
Percentage of all families below poverty	8%	9%	10%

Economic trends in the planning period are not anticipated to affect the need for wastewater facilities. The City will continue to encourage investment into the community and seek ways to provide employment opportunities. Further development of the existing industrial park may help provide economic opportunities within the planning area.

1.6 Existing Facilities

1.6.1 Sanitary Sewer System

1.6.1.1 Overview

The collection system was originally a combined sewer system, but the City completed construction of a sewer separation project in 1991. The current sanitary sewer system is comprised of seven pump stations, over 40 miles of gravity sewer, over two miles of force main, and includes three river crossings.

1.6.1.2 Previous Sanitary Sewer System Improvements

Prior to improvements completed between 2009 and 2012, the City entered into an administrative consent order because of overflows from a manhole, MH-94, on the interceptor between the West River Pump Station (WRPS) and the WWTP and from the WRPS. There were two master planned improvements to address the flow issues. The first planned improvement was to remove the overflow at MH-94 and raise the overflow from the interceptor to WRPS which would allow the interceptor to surcharge and send more flow to the WWTP. The second planned improvement was to reroute the WRPS with a new force main directly to the WWTP. The City applied for and received an S2 grant to do flow monitoring and modeling. The flow monitoring showed that there was a significantly higher response when the antecedent moisture conditions (AMC) were high than in the summer. Also, the system appeared to have a significant response from sump pumps and footing drains. Due to the high cost of building the improvements necessary for the footing drains, it was decided to design for the summer hydrology and the City would pursue footing drain disconnections. Therefore, included in the previous sanitary sewer system improvements were.

1. Plug the overflow at MH-94.
2. Construct a retention treatment basin (RTB) at the WWTP with the largest size that would fit on the current footprint.
3. Raise the overflow at MH-S2.
4. Increase the capacity of the WRPS to 950 gallons per minute (gpm).

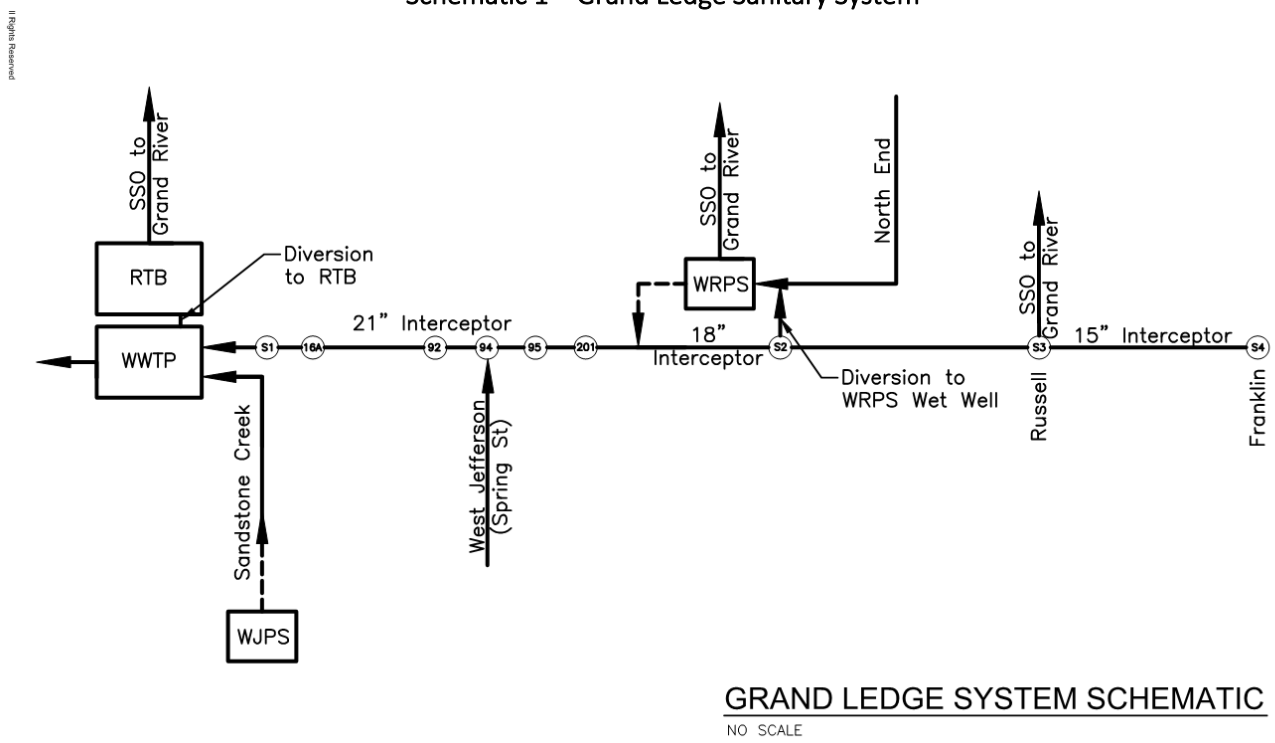
Following the improvements, the interceptor experienced more surcharging than anticipated, some of which led to SSOs. The City removed a bulkhead they had at an old SSO point at MH-S4 at Russel Street to protect that area of the system. They had the interceptor cleaned and found substantial amount of sediment and solids between MH-94 and the WWTP.

1.6.1.3 Sanitary Sewer Overflows

Since completing sanitary sewer system improvements, the system has operated better and has only seen issues during high AMC events. Peak wet weather events can result in SSOs from two structures in the sanitary sewer system. Outfall 004 is located at the WRPS which serves the North End District. The Russel Street overflow is

located at Manhole 211 (Outfall 005) on the River Interceptor, where the West Jefferson District discharges to the River Interceptor. Both overflows discharge to the Grand River. Below is a schematic of the system.

Schematic 1 – Grand Ledge Sanitary System



1.6.2 WWTP Facility

1.6.2.1 Overview

The original WWTP was constructed in the late 1930s and provided primary settling treatment and disinfection, with digesters for biosolids treatment. A major upgrade in the mid-1970s added preliminary treatment with a grinder and grit removal, installed new primary treatment tanks, and added the secondary treatment process. Essentially, everything from the original facility was removed, abandoned, or filled in at this time or since.

Two biosolids storage tanks were installed in the mid-1980s. A third biosolids storage tank was installed in the mid-1990s; a maintenance upgrade to the aeration system diffusers occurred around the same time. The most recent upgrade, in the early 2010s, included an influent diversion structure and retention tank, an upgrade to the headworks with a mechanical bar screen and Parshall flume, and expansion of the chlorine contact tank. Throughout the late 2010s, maintenance upgrades of other equipment have occurred.

The majority of the WWTP process equipment is from 1975 and largely approaching the end of its useful life. The headworks mechanical bar screen, retention treatment tank system, and intermediate lift station pumps were installed in 2010 and have remaining life suitable for continued use. The remaining process units and associated equipment are beyond their useful life, and many are at capacity. A schematic of the process unit capacities is provided in Figure 12.

Table 7 presents the WWTP influent flow characteristics from 2017 through 2020. Influent flow is metered at the Parshall flume following screening, and includes flow returned from the retention tank. Flow diversion to the retention tank is metered separately.

Table 7 – WWTP Influent Annual Average Flow Characteristics

	Flow	$CBOD_5$		TSS		Total-P	
Year	mgd	mg/L	lbs/day	mg/L	lbs/day	mg/L	lbs/day
2017	1.11	297	2,489	278	2,344	5.03	42.24
2018	0.99	316	2,439	318	2,445	4.95	38.53
2019	1.11	275	2,507	234	2,048	4.37	37.49
2020	1.07	233	1,891	252	2,133	4.71	37.79
4-Year Average	1.06	291	2,395	275	2,258	4.86	39.47

$CBOD_5$ five-day carbonaceous biochemical oxygen demand
lbs pounds
mg/L milligrams per liter
Total-P total phosphorus
TSS total suspended solids

1.6.2.2 Treatment Processes

Wastewater is transported to the WWTP from the east through a 21-inch interceptor sewer and a 12-inch sewer, both of which transition to 24-inch pipes before entering a flow diversion structure. Under normal flow conditions, influent wastewater passes through the structure to preliminary treatment. Influent flow above 4 mgd is diverted at the flow diversion structure to the influent retention tank, which is divided into three basins. When high flow has receded, wastewater in the influent retention tank is pumped out and returned to preliminary treatment and through the WWTP. In an emergency high-flow situation where the influent retention tank fills to capacity, wastewater overflows to the plant outfall and discharges to the river. A tablet chlorinator provides chlorination of wastewater in the influent retention tank in the event of a potential overflow. The influent retention treatment tank system and tablet chlorinator were installed in 2010 and are in good condition.

Preliminary treatment includes a dual channel with a mechanical bar screen equipped with a washing screw compactor and a backup channel grinder. The mechanical bar screen and compactor were installed in the 2010 upgrade. The channel grinder is beyond its useful life and could potentially be upgraded to an additional mechanical bar screen.

Screened flow passes through a Parshall flume for influent flow metering and then through an aerated grit chamber. The grit chamber was originally installed with a mechanical screw type grit washer, which was ineffective and removed from service. In lieu, plant staff periodically employ a Vactor truck to remove collected grit and other materials from the bottom hopper of the grit chamber. Vactored material is placed in an onsite drying bed for dewatering prior to landfill disposal. Vactoring is rarely required as the grit chamber is over-aerated. Grit material remains in suspension and does not settle out. Overall, the grit collection system does not meet current treatment expectations for grit removal, washing, and dewatering.

Following the grit chamber, wastewater flows by gravity through a channel and a 20-inch pipe to an intermediate lift station wet well. Three submersible pumps with variable frequency drives are used to raise the wastewater flow to primary and secondary treatment. The pumps have been in service for approximately 10 years and are in good condition.

Wastewater from the intermediate lift station flows to the primary clarifiers. Ferric chloride and polymer are added at the primary tanks to promote the removal of phosphorus and solids, respectively. There are two rectangular primary treatment tanks with chain and flight internal mechanisms with spiral screw cross collectors. The flight mechanisms were replaced in the mid-2000s; independent drive motors were installed in 2020. The

tanks are generally well maintained and may require minor equipment upgrades to assure reliability. There are two rotary lobe sludge pumps that serve the primary clarifiers.

Primary effluent flows directly into two aeration tanks equipped with fine bubble diffusers. Due to inoperable slide gates, the aeration tanks currently operate only in parallel. The diffusers were replaced approximately 13 years ago as part of plant maintenance. Process air is provided by three centrifugal aeration blowers that are controlled and throttled manually. The blowers were replaced in the late 1990s, and subsequently rebuilt one at a time between 2008 and 2014.

Mixed liquor from the aeration tanks is split and distributed to two circular final clarifiers. The final clarifiers have an 11-foot sidewall depth and do not meet current design standards. The clarifier mechanisms are original to 1975. One clarifier drive failed and had to be replaced unexpectedly in 2018. Plant staff proactively replaced the other clarifier drive the following year.

From the final clarifiers, settled sludge is pumped and returned to the aeration tanks, or wasted to the primary clarifiers, by three return activated sludge (RAS) pumps. The three RAS pumps include one original to 1975, and two new dry-pit submersible-type pumps.

Effluent from the final clarifiers combines in a chamber and flows over a rectangular weir for final effluent metering; however, effluent metering is not considered reliable. Following the weir, effluent is disinfected using chlorine gas, passing through one of three chambers of the chlorine contact tank. Chlorine gas is automatically flow-proportioned. The chlorine contact tank was expanded to a third channel in 2010, with the existing gas chlorination system relocated. The gas chlorination system equipment has been recently updated and is currently working well.

Effluent from the chlorine contact tank is mixed with sodium bisulfite to reduce residual chlorine to meet NPDES permit requirements. Final effluent is discharged to the Grand River through the 24-inch outfall pipe.

Primary sludge, waste activated sludge, and scum are pumped and injected with lime slurry prior to transfer to the three underground sludge storage tanks. The tanks are a precast concrete type. Two tanks were installed in the mid-1980s that are 250,000 gallons each, and a third tank was installed in the mid-1990s with 200,000-gallon nominal capacity. The sludge storage tanks are located on the WWTP property but are remote from the central facility. Lime slurry is metered and fed into the sludge pump discharge piping. In storage, the limed solids settle and thicken. Liquid supernatant is periodically decanted off the storage tanks and returned by gravity to the primary clarifiers. Settled solids from the storage tanks are trucked and hauled for land application. The primary sludge pumps are in fair condition. The RAS pumps are in new condition. The majority of the lime system equipment is original to 1975, converted for sludge stabilization in the early 1980s. The lime feed system is at the end of its useful life and poses operational concerns. The sludge storage tanks may need further evaluation to determine their condition and to identify any need for concrete or joint rehabilitation.

1.6.2.3 Electrical Power

The plant is serviced by two primary circuits: the Academy Circuit and the Business Circuit. Both circuits enter from the south side of the property and terminate at a transfer switch located west of the Blower Building. An electrical service grounding system was installed during the 2010 upgrades to the Headworks Building, Blower Building, and the intermediate lift station. A 500-kilowatt, diesel engine powered, electric generator was installed in 2010, providing backup power to most of the plant. The generator is exercised weekly to maintain reliability.

1.7 Fiscal Sustainability Plan

A fiscal sustainability plan (FSP) per SRF requirements state that treatment works proposed for repair, replacement, and expansion must develop an FSP that includes an inventory of critical assets, evaluation of

condition and performance of the inventoried assets, certification of water and energy conservation efforts, and a plan for operations and maintenance and funding.

The recently completed Asset Management Plan (AMP) includes many of the same components and meets the FSP requirements for SRF funding. Excerpts from the AMP which are pertinent to the SRF FSP are provided in Appendix 2. The full AMP report is available for review by request.

1.7.1 Inventory of Critical Assets

An inventory of all WWTP and lift station assets was completed as a part of the AMP and is provided in Appendix 2. This list consists of 56 WWTP assets and 50 lift station assets. In general, the existing assets have a low or medium probability of failure and a low or medium consequence of failure.

1.7.2 Condition and Performance Evaluation

A condition assessment and performance evaluation for the WWTP and lift stations were completed as a part of the AMP and are provided in Appendix 2.

1.7.3 Water and Energy Conservation

Water and energy conservation efforts will be implemented where fiscally and operationally practical throughout the proposed project. A certification that the City has evaluated and will strive to implement water and energy conservation efforts as a part of the proposed project plan will be submitted with the Part III Application. A blank certification form is included as Appendix 3.

1.7.4 Plan for Maintaining, Repairing, Funding, and Replacing the Treatment Works

Replacement costs for WWTP and lift station assets were identified as a part of the AMP. A summary of these costs can be found in Appendix 1. The City's AMP is designed to allow for maintenance, repairing, funding, and replacement planning. A formal plan will be submitted with the Part III application.

1.8 Need for Project

1.8.1 Compliance Status

The WWTP has generally maintained compliance with its NPDES permit over the past 5 years with violations limited to unpermitted discharges (two instances) and clerical delinquencies (3 instances). The City received a Violation Notice on March 11, 2021, which outlined SSOs that EGLE determined to be violations of the City's existing NPDES permit. The Violation Notice is included in Appendix 4. A copy of the current NPDES permit is included in Appendix 5.

1.8.2 Orders

There are currently no orders, federal or state enforcement orders, or administrative consent orders that impact the WWTP. EGLE has indicated that the Violation Notice may be escalated to a consent order.

On August 25, 2023, EGLE sent an email to the City requesting a meeting to discuss the plans to upgrade the wastewater treatment plant. This email indicated that that EGLE intends to amend the previously closed Administrative Consent Order with the City to address recent sanitary sewer overflow violations.

1.8.3 Water Quality Problems

Discharges from the sanitary sewer system and from the existing RTB present a water quality problem. If the WWTP were to attempt to process all water that is currently being discharged from the sanitary sewer system or

from the RTB, further treatment problems, including degradation of the biological treatment process due to a loss of nitrifying bacteria, could exacerbate water quality problems currently associated with the SSOs.

1.8.4 Projected Needs for the Next 20 Years

The WWTP capacity is recognized as the limiting factor to regional development in the area. The City has been unable to accept new industrial business interested in building in the area due to a lack of sanitary service capacity.

City staff provided guidance and input on expected growth and development to determine the specific areas with the largest growth potential in and around the City. These areas reflect available land such as undeveloped parcels in the industrial park and recent interest expressed to the City for residential, commercial, and industrial development. Projected growth can be grouped into three general areas: 1) South/East, 2) West, and 3) North.

Available land area was converted to residential equivalent units (REUs) based on typical development patterns in the area and commercial REUs per acre. Table 8 presents the projected REUs by region, along with existing REUs currently served, and the resulting total REUs to be served in the future. This does not include projected industrial demand, which was determined separately.

Table 8 – Projected Residential Equivalent Units to be Served

Region	REUs
1 – South/East	2,400
2 – West	2,000
3 – North	700
Subtotal – New Regions	*5,100*
Existing Service*	3,300
Total To Be Served	8,400

* From 2020 City billing information

1.8.5 Projected Flows and Loads

Total projected flow and loading is summarized in Table 9. Utilizing the population growth projection and REU development projections, average flows were projected for future residential and commercial demand based on 250 gallons per day per REU. This flow rate for new developments is consistent with observed flows within the service area. Typical domestic wastewater strength values have been used to project the additional residential and commercial loading.

The WWTP currently experiences peak loads during wet weather events due to flushing of the sewers. For simplicity, the industrial and Water Treatment Plant (WTP) flows are assumed to be equalized, with no significant peaking factor.

In addition to these base flows with diurnal peaking factors, peak wet weather flows were considered: specifically, excess flows diverted to the retention tank or overflows in the sanitary sewer system. As noted previously, overflows can occur from three locations: the retention tank at the WWTP outfall, at the WRPS, and the Russel Street location (Manhole 211). Based on recent records for overflows from these three locations, the typical instantaneous SSO rate is estimated at approximately 10 mgd. As a simple conservative estimate, it was assumed that any future expansion of the WWTP should accommodate these current overflow volumes.

Total peak flows also account for the City's WTP expansion and the potential backwash reject water. With anticipated equalization of the reject water, there would be no significant peak; therefore, the same WTP average values were used here.

Table 9 – WWTP Basis of Design – Existing and 20-Year Projected Flow and Loading

Parameter	Flow (mgd)	$CBOD_5$ (lbs/day)	TSS (lbs/day)	NH_3-N* (lbs/day)	Total-P (lbs/day)
Existing Design Average	1.5	2,250	2,250	n/a	150
Future Design Average	3.9	6,449	7,332	864	145
Future Design Peak	14.3	9,930	12,938	1,333	209

*ammoniacal nitrogen (NH_3 N)

1.8.6 Future Environment without the Proposed Project

Multiple sanitary sewer system pump stations and major WWTP process equipment are approaching or beyond their expected useful life.

Current WWTP equipment that is original to 1975 includes:

- Grit chamber
- Primary clarifiers
- Aeration tanks
- Process blowers
- Final clarifiers
- Activated sludge pumps
- Primary sludge pumps
- Lime system
- Chlorination system

Due to the age of the equipment, plant staff address major equipment failures, such as a final clarifier drive, in a reactive manner rather than a proactive manner. Replacement of such critical equipment unexpectedly causes great disruption to operations, compromises the reliability of the treatment services, and can be more costly than taking a proactive approach. The proposed improvements are necessary to ensure the continued reliability of sanitary service and will address aging infrastructure that presents a health and sanitation risk to the residents of Grand Ledge. These improvements are intended to maintain the existing infrastructure, provide resilient sanitary service, and protect the natural features within the community. The improvements will mitigate the risk of SSOs directly into the Grand River and provide redundancy to allow for condition evaluation, maintenance, and repairs.

2.0 Analysis of Alternatives

2.1 Identification of Potential Alternatives

The following treatment alternatives were developed considering this design criteria:

- Alternative 1 – No Action
- Alternative 2 – Optimization of Existing Facilities: Expansion of Conventional Activated Sludge
- Alternative 3 – Optimization of Existing Facilities: Conversion to Extended Aeration
- Alternative 4 – Optimization of Existing Facilities: Conversion to Membrane Bioreactors (MBRs)
- Alternative 5 – Regional Alternative: Connection to Existing Regional WWTP
- Alternative 6 – Regional Alternative: Construction of New Satellite WWTP
- Alternative 7 – Construction of a New WWTP

Current improvements are based on meeting full projected flow and load. Consideration has been given to each alternative's ability to be built in phases, as needed to meet existing treatment and future treatment

requirements. An in-depth analysis for each principal alternative includes a monetary evaluation, an Implementability assessment, an evaluation of potential environmental impacts, and an evaluation of technical differences between alternatives.

2.1.1 Alternative 1 – No Action

Alternative 1 would maintain the existing mode of operation for the sanitary sewer system and the WWTP. Alternative 1 would not involve capital expenditure and would not have construction impacts to Fitzgerald Park. Due to current sanitary sewer system, WWTP capacity limitations, WWTP equipment age, and the projected flow and loading increases, Alternative 1 is not considered a principal alternative and will not be considered further.

2.1.2 Alternative 2 – Optimization of Existing Facilities: Expansion of Conventional Activated Sludge

Alternative 2 would expand the treatment capacity while maintaining the current mode of conventional activated sludge biological treatment. Under Alternative 2, the following improvements would be required to provide the basis of design treatment capacity:

Flow Retention

- 150-foot-long by 80-foot-wide concrete basin with 25-foot sidewalls near solids storage area.
- Force main connecting raw influent to retention basin.
- Pumps to transfer raw influent through force main.
- Gravity sewer connecting retention basin to headworks.

Preliminary Treatment

- Demolish existing aerated grit system and building.
- Relocate new vortex grit to south side of site.

Primary Clarification

- Demolish existing primary clarifier mechanical equipment.
- Construct two 70-foot-long by 20-foot-wide rectangular primary clarifiers on east side of site.

Aeration System

- Convert existing primary clarifiers to aeration tanks.
- Four 50-foot-long by 25-foot-wide aeration tanks constructed in place of demolished final clarifiers.
- Process and sludge piping.
- Replacement of blowers in Process Building.

Final Clarifiers

- Demolish existing final clarifiers.
- Two 60-foot-diameter clarifiers in Fitzgerald Park.

Disinfection and Outfall

- Decommission existing chlorine disinfection system.
- Ultraviolet (UV) disinfection system on west end of the site.
- Construct new plant effluent pipe to discharge downstream of the low head dam in the Grand River.
- New outfall to be permitted by EGLE.

Solids Handling

- Two rotary drum thickeners and associated piping and equipment modifications to reduce biosolids volume.
- Bulk lime storage and lime handling equipment for biosolids stabilization.

Alternative 2 improvements are identified in Figure 13. Construction of Alternative 2 would require utilization of approximately 1.3 acres of Fitzgerald Park. Alternative 2 meets the project objectives, is considered a principal alternative, and will be evaluated further.

2.1.3 Alternative 3 – Optimization of Existing Facilities: Conversion to Extended Aeration

Alternative 3 would expand the treatment capacity by converting the treatment process to provide extended aeration biological treatment. While this treatment is very similar to the current conventional activated sludge treatment, an extended hydraulic retention time in the treatment tanks allows for nitrification treatment. Under Alternative 3, the following improvements would be required to provide the basis of design treatment capacity:

Flow Retention

- 150-foot-long by 80-foot-wide concrete basin with 25-foot sidewalls near the solids storage area.
- New force main connecting raw influent to retention basin.
- Pumps to transfer raw influent through force main.
- New gravity sewer connecting retention basin to headworks.

Grit Removal

- Demolish existing aerated grit system and building.
- Build new vortex grit system.

Primary Clarification

- Demolish existing primary clarifier mechanical equipment.
- Convert to aeration tanks upstream of new extended aeration tanks.

Aeration System

- Convert existing primary clarifiers to aeration tanks.
- Build three 100-foot-long by 50-foot-wide extended aeration tanks with 24-foot sidewalls in Fitzgerald Park.
- Site piping modifications and pumping systems to and from the additional aeration tanks.

Final Clarifier

- Build one new 65-foot-diameter clarifier.
- Site piping modifications for flow split between clarifiers.

Disinfection and Outfall

- Decommission existing chlorine disinfection system.
- Build new UV disinfection system on west end of the site.
- Construct new plant effluent pipe to discharge downstream of the low head dam in the Grand River.
- New outfall to be permitted by EGLE.

Solids Handling

- Two rotary drum thickeners and associated piping and equipment modifications to reduce biosolids volume.
- Bulk lime storage and lime handling equipment for biosolids stabilization.

Alternative 3 improvements are identified in Figure 14. Construction of Alternative 3 would require approximately 1.4 acres of additional space within Fitzgerald Park and will entail some area disturbed for new piping to and from the new flow retention basin near the current solids storage area. Alternative 3 meets the project objectives, is considered a principal alternative, and will be evaluated further.

2.1.4 Alternative 4 – Optimization of Existing Facilities: Conversion to MBR

Alternative 4 would expand the treatment capacity by converting to an MBR treatment process. The primary clarifiers would be replaced with microscreens to provide primary sludge removal. The conventional activated sludge secondary treatment system would be converted into an MBR treatment system allowing for the elimination of the final clarifiers. This is a significant change to the treatment process; however, these progressive technologies can produce a very high-quality effluent in a reduced footprint. Under Alternative 4, the following improvements would be required to provide the basis of design treatment capacity:

Flow Retention

- 150-foot-long by 80-foot-wide concrete basin with 25-foot sidewalls in Fitzgerald Park.
- New force main connecting raw influent to retention basin.
- Pumps to transfer raw influent through force main.
- New gravity sewer connecting retention basin to headworks.

Preliminary Treatment

- Demolish existing aerated grit system and building.
- Relocate new vortex grit to south side of site.
- Construct a 30-foot by 40-foot building addition to the headworks building.

Primary Treatment

- Demolish existing primary clarifiers.
- Install microscreens for MBR protection and to replace primary clarifiers.

MBR System

- Three trains of membranes in existing final clarifiers.
- Update aeration system as needed for MBR biological treatment.
- Decommission existing final clarifiers and demolish mechanisms.

Disinfection

- Decommission existing chlorine disinfection system.
- Build new UV disinfection system within the existing chlorine contact tanks.

Solids Handling

- Two rotary drum thickeners and associated piping and equipment modifications to reduce biosolids volume.
- Bulk lime storage and lime handling equipment for biosolids stabilization.

Alternative 4 improvements are identified in Figure 15. Construction of Alternative 4 would require less than 1 acre of Fitzgerald Park and will entail that some area be disturbed by new piping to and from the new flow retention basin. Alternative 4 meets the project objectives, is considered a principal alternative, and will be evaluated further.

2.1.5 Alternative 5 – Regional Alternative: Connection to Existing Regional WWTP

The most practical regional alternative would be provided by connecting to either the Southern Clinton County Municipal Utility Authority (SCCUMA) WWTP in DeWitt or the Delta Township WWTP.

The SCCUMA WWTP is located approximately 9.5 miles from the Grand Ledge WWTP. Based on a potential route, a 12.4-mile force main could be required to make this regional connection. Additional improvements within the SCCUMA sanitary sewer system may be required to route flow to the SCCUMA WWTP. The existing SCCUMA WWTP has a rated capacity of 5.0 mgd. This rated capacity is anticipated to serve the growing needs of Bath Township, DeWitt Township, Watertown Township, and the City of Dewitt past the year 2030. Adding flow from Grand Ledge could necessitate improvements to the SCCUMA WWTP sooner than currently anticipated. Given the distance and capacity limitations, connection to the SCCUMA WWTP is a not a viable alternative.

The Delta Township WWTP is located approximately 5.5 miles from the Grand Ledge WWTP, and the Delta Township sanitary sewer system is located such that an approximate 3.3-mile force main would be required to make this regional connection. Additional improvements within the Delta Township sanitary sewer system may be required to route flow to the Delta Township WWTP. The Delta Township WWTP is currently in the process of expanding their facility. The existing facility has a rated capacity of 6.0 mgd, while the proposed improvements are intended to expand the capacity to 8.0 mgd. Currently, the Delta Township WWTP receives an annual average flow of 4.9 mgd. The increase in the Delta Township WWTP rated capacity is to accommodate the projected 30-year growth within their existing service area and does not include accommodations for additional flow from Grand Ledge.

Considerations beyond the physical limitations of connecting to a regional alternative must be evaluated. By connecting to a regional alternative, Grand Ledge would not be able to control the future cost of treatment, or the rates assessed to users within the Grand Ledge service area. Additionally, future connections to or expansions of the Grand Ledge service area may need to be approved by the regional authority. If treatment capacity is limited, future connections could be denied. This could limit growth within Grand Ledge. Maintaining autonomy and control over future costs are important factors in creating a prosperous future in Grand Ledge. Given the distance, limited capacity, and the potentially restrictive nature of a regional approach, Alternative 5 is not considered a principal alternative and will not be evaluated further.

2.1.6 Alternative 6 – Regional Alternative: Construction of New Satellite WWTP

Alternative 6 would maintain the capacity of the existing WWTP and provides additional capacity at a second remote WWTP located near the anticipated growth within the industrial park. While significant improvements would not be required currently at the existing WWTP, substantial sanitary sewer system improvements would be required to redirect flow to the remote WWTP site. In addition, loading to the remote WWTP would be low until growth within the industrial park is realized. Once growth within the industrial park is realized, the remote facility would be highly dependent upon loading from a small number of industrial users. This underloading and potential future variable loading could create significant operational difficulties.

This remote facility could potentially discharge to the Whitney Drain, a small tributary of the Grand River. Given this potential discharge location, the effluent limits for the remote facility would be very restrictive and necessitate a high degree of reliable treatment. Providing a facility able to meet such treatment requirements may be cost prohibitive.

By introducing a remote facility, the City would need to maintain compliance with its existing NPDES permit at the current WWTP and would also need to maintain compliance with a new NPDES permit at the remote facility. Maintenance costs and system reliability would also be a concern in maintaining two WWTPs.

Given the loading concerns, the restrictive treatment requirements, the cost of construction, and the cost and logistical concerns associated with maintaining multiple facilities, Alternative 6 is not considered a principal alternative and will not be evaluated further.

2.1.7 Alternative 7 – Construction of New WWTP

Alternative 7 would include the construction of a new WWTP at a new location. All wastewater would continue to be directed from the collection system to the current WWTP site. A new pump station would be constructed to direct wastewater from the current WWTP site to the site of a new WWTP. Collection system improvements at the West River Pump Station and downstream from the West Jefferson Pump station would be required to direct wet weather flows to a new influent flow equalization tank located adjacent to the current WWTP. This tank would be used to normalize flow to the new pump station at the existing WWTP site. Portions of the existing WWTP site could be repurposed with demolition of unused facilities.

Locating the new WWTP near the existing WWTP would reduce the cost for the new pump station and force main piping for conveyance of wastewater to the WWTP. Non-monetary considerations may restrict the use of land in or adjacent to Fitzgerald Park for a new WWTP. Land acquisition may be required to implement Alternative 7. Increasing the distance between the existing WWTP and the proposed site of the new WWTP would increase the capital cost for the pump station and would increase the O&M cost associated with operating the pump station. Depending upon the new WWTP location, either a new gravity outfall or a new effluent pump station to the Grand River would be required. Increasing the distance between the new WWTP and the Grand River further increases the capital cost of Alternative 7.

Replacing the existing WWTP with a WWTP at a new location would require a more significant capital investment since existing assets (tanks, buildings, pipes and equipment) would not be reused and would have to be reconstructed at the new site. Given the additional capital investment and the additional anticipated O&M cost associated with converting the existing WWTP into a pump station and relocating the existing WWTP, Alternative 7 is not considered a principal alternative and will not be evaluated further.

2.1.8 Water and Energy Efficiency

Water and energy efficiency have been considered while determining the selected alternative. A further explanation of the potential for water and energy efficiency with the selected alternative is provided with the relevant design parameters for the selected alternative.

2.2 Sanitary Sewer System Improvements

To properly size WWTP improvements, sanitary sewer system improvements will be required. Since the interceptor along the Grand River between the WWTP and the WRPS runs along the ledges, it is not possible to increase its capacity by replacing it with a larger sewer. The primary viable alternative for transporting more flow to the WWTP is to install larger pumps at the WRPS and installing a new force main along Grand River Avenue directly to the proposed RTB at the WWTP. The WRPS will likely require larger pumps. Final pump sizing will be based on flow monitoring and modeling.

Structural deficiencies in the existing clay sanitary sewer in Green Street from Seminary Street to South Street have resulted in localized I/I. This section of sanitary sewer should be replaced to address the structural deficiencies and to help reduce I/I.

The following are the anticipated sanitary sewer system improvements:

- New pumps in the space provided at WRPS with a firm wet weather capacity of 1,500 gpm (estimated).

- Approximately 7,000 lineal feet of 12-inch PVC (polyvinyl chloride) force main from WRPS to the new retention basin at the WWTP, including a jack a bore of the railroad, and 5,300 lineal feet along the road including restoration.
- Replacement of approximately 868 feet of 8-inch gravity sewer along with sanitary sewer service replacement and restoration in Green Street from Seminary Street to South Street.

2.3 Analysis of Principal Alternatives

The alternatives analysis identified Alternatives 2, 3, and 4 as principal alternatives. The following section provides the monetary evaluation, environmental evaluation, and evaluates other technical aspects for the principal alternative.

2.3.1 Monetary Evaluation

A monetary evaluation has been completed for the principal alternatives using a 20-year net present worth analysis. A present worth analysis evaluates the total cost of treatment of each principal alternative by evaluating its 20-year life cycle cost. This net present worth analysis includes an evaluation of the capital cost for construction, the operation, maintenance, and replacement (OM&R) costs and the salvage value for the proposed improvements.

OM&R costs account for labor costs, supply and chemical costs, utility costs, maintenance costs, and additional expenses required to operate and maintain the proposed facility. The present worth for 20 years of OM&R costs are included in the analysis. A real discount rate of 0.5% has been assumed for this analysis.

Salvage values for the proposed improvements are included in the net present worth analysis. Items included in the current project will retain value at the end of the design life of the project and may continue to provide value. The present worth of the salvage value is included in the net present worth analysis, again assuming a real discount rate of 0.5%.

In general, the alternative with the lowest net present worth can be viewed as the alternative that provides the lowest cost of treatment. All principal alternatives are intended to meet the current treatment requirements.

A summary table for the monetary evaluation is provided in Table 10. Each alternative includes the cost associated with the required sanitary sewer system improvements. Additional information on the monetary evaluation can be found in Appendix 6.

Table 10 – Monetary Evaluation Summary

Work Items	Alternative 2	Alternative 3	Alternative 4
Capital Cost	$142,158,000	$140,103,000	$95,225,000
Annual OM&R Cost	$897,507	$1,021,995	$1,117,049
Salvage Value	$40,582,933	$43,903,933	$19,849,333
Present Worth of 20 Years of OM&R Cost	$17,042,000	$19,406,000	$21,210,000
Present Worth of Salvage Value	$36,730,108	$39,735,821	$17,964,895
20-Year Total Present Worth	**$122,469,892**	**$119,773,179**	**$98,470,105**

2.3.1.1 Sunk Costs

Sunk costs are the investments or financial commitments made before or during project planning. Sunk costs have not been included in the cost-effectiveness analysis since they have already been committed regardless of the alternative selected.

2.3.1.2 Present Worth

Present worth is the sum that if invested now at a given interest (discount) rate, would provide exactly the funds required to pay all present and future costs. Total present worth, used to compare alternatives, is the sum of the initial capital cost plus the present worth of OM&R costs minus the present worth of the salvage value at the end of the 20-year planning period. The summary of present worth values for the OM&R for the current operation and principal alternatives are provided in Table 11. Additional OM&R information can be found in Appendix 6.

Table 11 – Projected OM&R Costs

	Budget 2021-2022	Alternative 2	Alternative 3	Alternative 4
Labor	$356,189	$458,398	$458,398	$458,398
Maintenance Supplies	$42,500	$53,669	$62,381	$54,569
Chemicals	$55,000	$53,778	$53,778	$19,167
Contractual	$80,000	$80,000	$80,000	$80,000
Utilities	$105,000	$160,663	$243,438	$363,916
Maintenance	$72,500	$88,500	$121,500	$138,500
Transfer to Parks and Recreation	$2,500	$2,500	$2,500	$2,500
TOTAL	$713,689	$897,507	$1,021,995	$1,117,049
Present Worth of 20 Years of OM&R Costs	**$13,552,000**	**$17,042,000**	**$19,406,000**	**$21,210,000**

2.3.1.3 Salvage Value

The planning period for the monetary evaluation is 20 years. At the end of this period, portions of the proposed structures and equipment will have a salvage value. A straight-line depreciation has been used to calculate the salvage values for the principal alternatives. The present worth of the salvage value for the assets has been computed using the real discount rate. The present worth of the salvage value for each of the principal alternatives is shown in Table 10.

2.3.1.4 Escalation

The monetary evaluation allows for energy costs and land values to be escalated. The cost of labor, equipment, and materials is not escalated. For this monetary evaluation, energy costs have not been escalated and land values are not included in the evaluation.

2.3.1.5 Interest During Construction

Interest during construction is not anticipated to be significant and is not expected to influence the choice of alternatives. Interest has been calculated on a yearly basis.

2.3.1.6 Mitigation Costs

No mitigation costs are anticipated as part of the project.

2.3.1.7 User Costs

Alternative 4 is anticipated to cost an average sewer user $102.70 per month. This cost impact does not include any potential principal forgiveness or the use of the existing sewer fund to offset project costs. Repayment of the estimated capital expense is anticipated to cost an average sewer user $94.44 per month while impacts to OM&R costs are anticipated to cost an average sewer user $8.26 per month. Additional information on user costs is presented below. This capital cost in the amount of $95,225,000 is only viable with direct and/or indirect State and Federal Appropriations.

2.3.1.8 Additional Monetary Considerations

The future expandability of the proposed alternative is an important consideration. The site constraints observed at the existing location necessitate an efficient use of available space. Expanding Alternative 2 or Alternative 3 will require additional land for treatment plant use. Alternative 4 can continue to expand while maintaining the existing treatment plant footprint.

2.3.2 Partitioning the Project

There is extensive and urgent need to complete the expansion of the WWTP and make improvements to the sanitary sewer system. Delay of these improvements could result in detrimental financial and environmental impacts. Partitioning the project is not recommended.

2.3.3 Environmental Evaluation

All three principal alternatives will require expansion of the WWTP within Fitzgerald Park. Alternatives 2 and 3 will require more disturbance of park space than Alternative 4. Construction activities will have short-term environmental impact and a long-term impact by converting a portion of the park. Soil erosion and sedimentation control (SESC) will be used to mitigate impacts of excavation and construction vehicle traffic to the Grand River. Excavation will not affect the sandstone ledges.

All principal alternatives can meet the current effluent limits contained within the existing NPDES permit. Alternatives 2 and 3 may not provide as high a level of treatment as Alternative 4, due to the high level of solids separation provided by the membrane technology selected in Alternative 4. This higher level of treatment can provide a positive impact on the health of the receiving waters.

Energy and chemical use efficiency of the treatment processes will be considered to lessen the long-term environmental impact of the WWTP operation. Energy consumption for Alternatives 2 and 3 would be less than Alternative 4. Conversely, anticipated chemical usage for Alternative 4 may be less than the anticipated chemical usage for Alternative 2 or Alternative 3.

2.3.4 Implementability and Public Participation

While the implementability restrictions for this project are minimal, the financial burden of the project will be difficult to manage for Grand Ledge given the current estimated capital cost. Intermunicipal agreements are not necessary for this project as the project serves the residents of Grand Ledge and the WWTP is owned and operated by the City.

The public has been and will continue to be provided with opportunities to comment on the project. Public concerns may be considered throughout the design and construction of the proposed improvements.

2.3.5 Technical and Other Considerations

2.3.5.1 I/I Removal

I/I is defined as clear water entering the system during wet weather or high groundwater conditions. In certain instances, I/I removal may be cost-effective compared to the operational costs for transport and treatment of the clear water. An evaluation of the level of I/I in the sanitary sewer system has been conducted. I/I causes high flow in the sanitary sewer system during storm events and during times of high AMC. Storm events can result in overflows in the sanitary sewer system and discharges from the RTB.

Ongoing flow monitoring is being used to complete an I/I analysis. Initial findings show that sanitary sewer system improvements are required to address the ongoing overflows from the sanitary sewer system and that additional influent flow equalization at the WWTP is required to avoid discharges from the existing retention treatment

basin during a design storm event. Removing sufficient I/I from the sanitary sewer system as required to avoid SSOs and limiting discharges from the existing RTB is not cost-effective and would not address the violation notice issued by EGLE. SSOs may persist until proposed improvements intended to transport and treat existing I/I are implemented. I/I removal will continue to be pursued through ongoing collection system improvements, such as the proposed sanitary sewer replacement in Green Street.

2.3.5.2 Structural Integrity

Structural sewer problems in the sanitary sewer system are not suspected to be a widespread problem. The sanitary sewer system was evaluated as part of a recently completed sanitary sewer systems AMP. The National Association of Sewer Services Companies Pipeline Assessment Certification Program grading system was used to define the severity of pipe defects. The sanitary sewer system AMP will be made available upon request.

The clay sanitary sewer pipe in Green Street between Seminary Street and South Street has structural deficiencies. These deficiencies have resulted in high levels of I/I in the area. The City intends to continue to replace aging sanitary sewer pipes as structural deficiencies develop.

2.3.5.3 Sludge Residuals

The Grand Ledge WWTP currently produces lime stabilized biosolids and utilizes liquid land application for ultimate disposal. Alternatives 2 and 3 are anticipated to produce similar volumes of biosolids of similar quality to what is currently being produced. Alternative 4 will produce less biosolids by eliminating the primary clarifiers from the treatment process. Conversely, the finer screening requirements of Alternative 4 will result in larger volumes of material being removed during preliminary treatment. Screened material in Alternative 4 would likely be disposed of in a landfill.

2.3.5.4 Industrial Pretreatment

There is no industrial pretreatment program. There are no categorical users that have implemented a pretreatment program. Pretreatment requirements may be considered for future industrial users.

2.3.5.5 Growth Capacity

The capacity of the proposed facilities under all principal alternatives consider the wastewater needs during the 20-year planning period. A balance has been struck between building facilities for the entire planning period and building facilities that will require expansion in less than 20 years.

2.3.5.6 Areas Currently Without Sewers

There are no specific intentions of expanding the existing sewer district. On a case-by-case basis, sanitary sewer service may be extended to areas upon the request of landowners. The current Sewer District represents the 20-Year Study Area.

2.3.5.7 Reliability

Each principal alternative has been evaluated based on its ability to meet and consistently maintain permit limitation throughout the useful life of the project. All principal alternative improvements would meet the USEPA reliability requirements for wastewater treatment plants. Alternative 4 provides the best overall system reliability of the alternatives evaluated in terms of its ability to meet and consistently maintain permit compliance throughout the useful life of the project.

2.3.5.8 Alternative Sites and Routings

Because of the existing sanitary sewer system and treatment infrastructure already in place, relocating the existing treatment plant was found to be infeasible.

2.3.5.9 Combined Sewer Overflows

The sanitary sewer system for the Grand Ledge WWTP is a separated system and does not have any combined sewer overflows (CSOs). Sewer separation work has generally been effective at separating the storm sewer system from the sanitary sewer system. I/I, largely from building footing drains remains an ongoing issue which can result in SSOs from the sanitary sewer system and discharges from the existing RTB. Continuing to eliminate I/I has proven to be difficult. Additional equalization capacity and sanitary sewer system improvements to handle I/I have been incorporated into the principal alternatives. These improvements are intended to address SSOs in the sanitary sewer system.

2.3.5.10 Contamination at the Project Site

Typically, four types of contamination may be encountered during project construction: soils contaminated by petroleum or other chemicals; discarded materials such as chemical drums or insulation; groundwater or surface waters contaminated by chemical leachate or runoff; and materials to be removed or disturbed in the existing facility that contain asbestos, lead, mercury, PCBs (polychlorinated biphenyls), or similar contaminants.

A review of past activities at the site has not identified any activities that might have caused site contamination, such as leaking underground storage tanks. A visual survey of the project site did not identify any abandoned containers. No contamination is suspected at this time, and as such no soil or groundwater sampling has been conducted. An examination of the state's list of contaminated sites did not reveal any contaminated sites near the project.

2.3.5.11 Green Project Reserve (GPR)

GPR funding is provided to address green infrastructure, water or energy efficiency improvements, or other environmentally innovative activities. Portions of the improvements included in Alternative 4 may be GPR eligible and may be eligible for partial principal forgiveness based on funding availability.

The proposed fine screening facility would reduce biochemical oxygen demand (BOD) and TSS loading to the secondary treatment process. By removing these materials prior to the secondary treatment process, overall energy consumption can be reduced, and additional aeration capacity would be required if these materials were not removed. Additionally, chemical usage in the secondary treatment process may be reduced by removing these materials prior to the secondary treatment process.

2.3.5.12 Land Requirements

Each of the remaining alternatives will require additional land for construction within the Fitzgerald Park area.

Alternative 2 will require approximately 1.3 acres for additional treatment area and will disturb an additional 0.3 acres for buried piping modifications.

Alternative 3 will require approximately 1.4 acres for additional treatment area and will disturb an additional 0.3 acres for buried piping modifications. The steep slope of the area south of the WWTP and the size of the proposed extended air tanks requires the Phase 2 tank to be constructed adjacent to the existing biosolids storage tank in the biosolids handling area. This would require further air piping, process water piping, and sludge piping. This alternative requires the largest expansion footprint.

Alternative 4 will require less than 1 acre for additional treatment area, including the grass hill and the gravel parking lot west of the WWTP.

2.3.5.13 Potential Construction Problems

Continuing existing WWTP operation is the main concern when decommissioning or demolishing treatment cells. To remove a tank, the replacement tank and process piping or a temporary bypass must already be in place. Phase 1a construction for all alternatives will need to be coordinated to allow for uninterrupted treatment. Yard piping protection, when converting and constructing treatment tanks, will be essential to uninterrupted service. A detailed survey of yard piping is needed during design to determine the allowable footprint of new tanks and the alignments of new piping.

There will be natural factors to contend with during construction such as the steep grade across the site and Fitzgerald Park, as well as the bedrock that exists close to grade. The steep grade will necessitate the need for pumps to reach treatment that is built uphill and necessitates some of the extended aeration tanks in Alternative 4 to be built further into Fitzgerald Park. Increased difficulty of excavation into bedrock for tanks, building additions, or piping must be considered during cost and schedule estimation. These factors will dictate the future site plan and impact the construction cost.

With the current supply chain issues, volatile material pricing, and uncertain labor availability experienced across the country, the estimates provided in this report are less certain than before the Covid-19 pandemic. It is unclear if these issues will have resolved or worsened by the time construction of Phase 1a would begin.

3.0 Selected Alternative

Based on a detailed evaluation, Alternative 4 is the selected alternative. The following description of the selected alternative provides detail on the project and discusses the benefits as well as its adverse impacts. An explanation of how the proposed project fits into comprehensive plans to address wastewater for the planning period is included in the sections below.

3.1 Relevant Design Parameters

3.1.1 Influent Wastewater Storage Tank

Influent flow retention is required to address I/I and limit discharges from the existing RTB. The existing RTB does not provide adequate influent flow equalization to prevent peak flow capacity concerns at the WWTP. A new influent wastewater storage tank will be constructed to retain the peak wet weather flow and reduce the peak hourly flow design requirement of the downstream processes such as the new preliminary treatment, primary treatment, and MBR system. The influent wastewater storage tank will be sized to handle the flow above the design maximum day flow of 7.9 mgd.

A new force main from the WRPS will be directed to the new retention basin. The new influent wastewater storage tank will gravity drain back to the headworks once wet weather flows have subsided. The influent wastewater storage tank will be in Fitzgerald Park and is planned to be approximately 165-foot diameter circular structure with 25-foot sidewalls and a concrete roof. Wet weather flow monitoring and historic rainfall data was used to determine the required retention volume. The influent wastewater storage tank will include required level monitoring, drain flow control and a flushing system.

3.1.2 Preliminary Treatment

The existing aerated grit chamber is ineffective and requires frequent manual removal of grit. Because the grit removal system is ineffective, the downstream processes are currently adversely impacted. A new vortex grit removal system will be installed to reduce the maintenance requirements, improve grit removal, and lower the energy consumption of this unit process. The proposed system will include one vortex chamber rated for an

average flow rate of 3.9 mgd and a peak flow rate of at least 7.9 mgd. This will vastly improve grit removal effectiveness and operational efficiency across the WWTP. The grit removal system will include a vortex grit tank, grit pump, grit classifier, and a bypass channel. The grit pump will be installed in a vault adjacent to the vortex grit chamber. The grit classifier will be housed in the adjacent building equipped with proper heating, ventilation, and gas detection systems as required by National Fire Protection Association (NFPA) 820.

3.1.3 Primary Treatment

Primary treatment is currently accomplished in two rectangular primary clarifiers. Alternative 4 will replace the primary clarifiers with microscreens designed to have comparable removal efficiencies for BOD and TSS to those currently observed in the primary clarifiers. The microscreens also prevent fouling and extend the useful life of the membranes used in the MBR system. This allows for the elimination of the existing primary clarifiers. The microscreens will be housed in a building that will allow for the efficient collection and disposal of screened material. The screening system will be sized for the design average and equalized design peak instantaneous flow. The building will be equipped with proper heating, ventilation, and gas detection systems as required by NFPA 820.

3.1.4 MBR System

Alternative 4 will convert the existing secondary treatment process into an MBR treatment process. The existing aeration tanks will be modified to facilitate MBR biological treatment. The existing primary clarifiers will be replaced with new aeration tanks to provide additional aeration capacity. The existing aeration system will be replaced with new blowers and air piping. One of the existing aeration tanks will be modified to house membrane modules and pumping equipment. The existing final clarifiers would be demolished since the MBR process does not require final clarifier tanks. Aeration systems would be sized to provide treatment for the design peak hour loading.

3.1.5 Disinfection

The existing chlorine disinfection system equipment is aging, poses safety risks, and can be difficult to operate. Alternative 4 includes conversion of the existing chlorine contact tank to a UV disinfection system. The UV disinfection system will be sized to provide two channels each capable of treating the maximum daily flow through the WWTP. Disinfected plant effluent will continue to be discharged through the existing outfall to the Grand River.

3.1.6 Solids Handling

Primary and secondary waste solids are currently lime stabilized to create Class B biosolids, stored, and disposed of through a liquid land application program. Decant from the biosolids storage tanks is manually returned to the head of the plant to accommodate biosolids thickening. Currently, individual sacks of lime are manually loaded into feed equipment for dosing. The existing system is labor intensive and poses health and safety concerns. Alternative 4 includes the addition of a centrifuge dewatering system, primary and secondary sludge pumps, a solids holding tank, associated piping, and equipment modifications along with a new bulk lime storage and lime handling silo. The centrifuge will help reduce the volume of biosolids by separating water from the waste activated sludge stream prior to landfill disposal. This will help control lime use. Bulk lime storage and lime handling equipment will help improve operations and operator safety. Solids handling will be sized to address anticipated waste sludge production.

3.1.7 Electrical Improvements

Electrical needs will be addressed throughout the WWTP. Existing MCCs (motor control centers), distribution equipment, and standby power systems will be updated as required to accommodate modifications and expansion of the existing system.

3.1.8 Site Improvements

The area around the proposed retention basin will be improved to maintain the area for use within Fitzgerald Park.

3.1.9 Building Modifications

The existing buildings throughout the WWTP are in fair condition but may require mechanical upgrades associated with planned improvements. The heating, cooling and ventilation in the existing Control Building will be replaced. Existing doors will be replaced and abandoned louvers will be filled and insulated to improve heating and cooling efficiency.

Two flow diversion chambers will be installed in the collection system. A flow diversion chamber upstream from the WRPS will be used to allow flow to be diverted to the WRPS wet well from the existing 18-inch trunk sewer if the sewer begins to surcharge. A flow diversion chamber downstream from the West Jefferson Pump Station will allow flow to be diverted to the influent wastewater storage tank during wet weather events.

3.1.10 Sanitary Sewer System Improvements

Additional pumping capacity will be installed in the WRPS to address high flow that results from I/I during wet weather events. A new sanitary force main will be installed from the WRPS to the proposed retention basin at the WWTP site to allow for hydraulic relief of the gravity sewer along the Grand River from the WRPS to the WWTP and to transport and treat I/I.

The sanitary sewer in Green Street from Seminary Street to South Street will be replaced to address structural deficiencies and help reduce I/I. Sanitary sewer laterals will be replaced to further reduce I/I. Sanitary manholes will be installed along the gravity sewer.

3.2 Project Maps

Figure 16 depicts the proposed site location for the proposed improvements including the sanitary sewer system improvements. Elements of this layout may change through the detailed design phase. These layouts will all be modified through the detailed design process.

3.3 Controlling Factors

The selected alternative is intended to provide treatment for the 20-year projected service area population, as discussed in Section 1.4, and the associated 20-year design flows and loads discussed in Section 1.8.5. The selected alternative is intended to meet the discharge permit requirements set in the current NPDES permit. EGLE has issued a Violation Notice (Appendix 4). The proposed improvements are intended to address the issues identified in this Violation Notice.

Electrical and mechanical upgrades will be designed to meet Class I Division 1 requirements (NFPA 70 – NEC, 820 – WWTP) in applicable areas to provide safe lighting and ventilation to the station. Electrical and mechanical upgrades in unclassified areas will be designed to provide safe entry and operation by WWTP personnel. Construction is limited to the confines of the existing WWTP footprint and the parking lot of Fitzgerald Park. The site is limited by the Grand River and the Grand Ledges to the north and west, Fitzgerald Park to the south and

east. Possible expansion of the facility outside the area listed in the project description is not currently feasible. The WWTP should visually integrate into the surroundings and limit odor production that may impact activities in Fitzgerald Park.

3.4 Special Assessment District Projects

A Special Assessment District (SAD) will not be created as a part of the project. As the proposed improvements are for the benefit of all sewer users within the sewer district, the creation of a SAD will not be necessary.

3.5 Sensitive Features

Environmentally sensitive features such as wetlands, floodplains, prime or unique agricultural lands, archaeological sites, or threatened/endangered species were evaluated when assessing alternatives. The proposed project work will occur in the floodplain and will require an EGLE Part 31 Floodplain permit to move forward with construction. Additionally, the sandstone ledges prevenient in the area have been considered when developing and evaluating the principal alternatives. The proposed improvements of the selected alternative are not anticipated to have a negative impact on these sensitive features.

3.6 Schedule for Design and Construction

The City pursued a Fiscal Year 2023, Quarter 4 project schedule. Bidding activities occurred, but the bid price prevented the City from moving forward with the project. These past activities will allow bidding activities to proceed upon completion of this Project Plan. See Table 12 for a summary of the project schedule.

Table 12 – Design and Construction Schedule

Activities	Start Date	End Date
Design Engineering	November 2022	May 2023
Permitting	February 2023	May 2023
Bidding	October 2023	December 2023
Construction	February 2024	July 2027

Note that funding availability may impact the construction schedule. The project will require an Act 451 Part 41 Permit (Wastewater Construction) and an Act 451 Part 31 Permit (Floodplain).

3.7 Cost Summary

A high-level summary of the project cost is provided in Table 13. The detailed breakdown of the costs associated with planning, design, and construction of the selected alternative is included in Appendix 6. The total project cost of $95.2 million represents the preliminary project cost at this time as detailed design and bidding has not yet been completed.

Table 13 – Proposed Project Cost Summary

Item	Estimated Cost
Sanitary Sewer System Improvements	$16,320,000
Flow Retention	$13,953,000
Preliminary Treatment	$10,943,000
Primary Treatment	$10,428,000
Biological Treatment	$33,801,000
Final Clarification	$1,036,000
Disinfection	$2,971,000

Table 13 – Proposed Project Cost Summary

Item	Estimated Cost
Solids Handling	$5,773,000
Total Cost of Proposed Project	**$95,225,000**

3.8 Authority to Implement the Selected Alternative

Grand Ledge owns and operates the sanitary sewer system and WWTP facilities. The City owns the land on which the WWTP is located and has authority to implement the proposed improvements. The City is responsible for providing adequate wastewater treatment to its customers. With the support of the City's staff and professional consultants, the City has the authority, capability, and willingness to plan, seek funding, finance, build, operate, and maintain the wastewater facilities.

3.9 User Costs

The costs associated with the total project cost are the responsibility of the City, and ultimately will be funded by user rates. Applying for SRF funding includes a low-interest 30-year loan that will help mitigate the increase in rates to the users. The City may qualify as a disadvantaged community and portions of the project are GPR eligible. There may be an associated principal forgiveness to offset user rate increases. Since principal forgiveness depends on the availability of grant funds and is not guaranteed, it is not used in the analysis on the impact of user costs.

To assess the effect of the proposed project on current user rates, the annual future costs based on the 30-year loan period were calculated based on the following assumptions.

- The total estimated project cost is $95,225,000.
- The fiscal year 2024 SRF interest rate for a 30-year loan is set at 2.75%.
- The projected annual OM&R costs are $1,117,049.

The monthly sewer bill of the average sewer user is anticipated to increase by $XX.XX per month, assuming no principal forgiveness and financing all of the estimated project cost with a low-interest loan through SRF. This is based on the repayment of the estimated capital expense and the estimated impacts to OM&R costs.

3.10 Overburdened Community

The City submitted the Overburdened and Significantly Overburdened Community Status Determination Worksheet. The blended Median Annual household Income (MAHI) for the service area is $67,471. The MAHI for the service area must be below 100% of the statewide MAHI, which is $63,498 for the 2024 fiscal year, to be considered an overburdened community. Additionally, the blended taxable value per capita for the service area is $33,307. The taxable value per capita for the service area must be within the lowest 20% of Michigan's population, which for the 2024 fiscal year was $22,920 to be considered an overburdened community. Because the blended MAHI and the blended taxable value per capital both exceed the limits established by the State, Grand Ledge is not considered an overburdened community. The submitted Overburdened and Significantly Overburdened Community Status Determination Worksheet is provided in Appendix 7.

3.11 Useful Life

The proposed projects involve a variety of different assets including structural, mechanical, electrical, and process equipment. To determine the overall useful life of the projects, a weighted useful life was calculated using each individual dollar value multiplied by the individual useful life for each asset type, divided by the total estimated

project cost. The useful life for the individual components is based on the SRF project guidance documentation. A summary of the costs and useful life for the major components of each project is provided in Table 14.

Table 14 – Proposed Project Useful Life

Proposed Improvement Activity	Activity Weighted Useful Life
Sanitary Sewer System Improvements	36.5
Flow Retention	41.3
Preliminary Treatment	30.5
Primary Treatment	13.4
Biological Treatment	22.1
Final Clarification	0.0
Disinfection	20.0
Solids Handling	34.3
Overall Project Useful Life	**32.1**

As indicated in Table 14, the composite useful life for the project is 32.1 years. The total useful life exceeds the 30-year loan term.

4.0 Evaluation of Environmental Impacts

Because this has been deemed a non-equivalency project, correspondence with the reviewing agencies was not required.

4.1 Direct Impacts

Direct impacts are the social and environmental impacts that are directly attributable to the construction and operation of the project. Direct impacts can be divided into those attributable to project construction, project operation, and social impacts.

4.1.1 Construction Impacts

Environmental Setting

A portion of the work will occur in a floodplain and will be completed in accordance with local, state, and federal regulations. Impacts on other sensitive features are not anticipated as part of the proposed construction activities.

The proposed improvements are not expected to result in significant tree removal. Minor tree removal may be required for construction of the retention basin. This is not anticipated to result in the removal of large trees or extensive areas of vegetation removal.

Proposed improvements, including the retention basin, will be designed to allow for continued public access to the Grand River and the other environmental resources in Fitzgerald Park.

Rare, threatened, endangered, and special concern species have been identified in Section 1.3.2.12. It is not anticipated that construction activities will have a long-term impact on any of these species.

There are no known historical or archaeological sites that will be impacted by construction activities.

Groundwater dewatering is not anticipated to be necessary for construction activities. Short term impacts to the Grand River may be experienced, but mitigation efforts such as SESC measures will be taken to protect and

prevent potential impacts to the surface water. Construction activities are not anticipated to impact groundwater. Drainage features or sidewalks will not be disturbed by the proposed construction activities.

Construction Methods

Construction activities normally create short-term impacts that can be mitigated or reversed through adequate restoration. No long-term, irreversible impacts are anticipated because of the proposed construction activities.

Construction activities will be predominately constrained to the existing WWTP site and the force main routing. No soils will be disposed of in, and no excess material will be stockpiled in a manner that will impact the Grand River.

Traffic Impacts

Construction activities usually create short-term impacts to traffic patterns. Construction hours for projects of this type are generally limited to 7:00 a.m. to 7:00 p.m. Monday through Friday, and 7:00 a.m. to 1:00 p.m. on Saturday. Vehicular and pedestrian access will be maintained throughout construction, including pedestrian access to the Grand River in Fitzgerald Park.

4.1.2 Operational Impacts

Construction activities will impact operations. Project sequence of construction planning and coordination with the contractor will be required to maintain compliance with the existing NPDES permit requirements. Care must be taken during construction to mitigate potential odors that could result from process upsets, plan for required chemical deliveries, and allow construction access to the site.

4.1.3 Social Impacts

Increased user costs are a social impact. A large increase in rates can create a negative impact. Currently, the Draft Intended Use Plan published by EGLE indicates that this project is not eligible for grant funding and, as such, grant funding is not considered in the economic analysis.

The construction phase of the projects will create temporary jobs and contribute favorably to the local economy. The proposed improvements will allow for continued operation and growth to sustain the local economy. A lack of action would negatively impact the community by limiting current and future local development, thereby adversely impacting the economics of Grand Ledge and the region.

4.2 Indirect Impacts

The proposed projects will allow for future residential, commercial, and industrial development within the service area. The City does not anticipate a change in the rate, density, or type of residential, commercial, or industrial development that may occur within the service area as a result of the project. Future development is anticipated to be consistent with existing development in the area. The City does not anticipate changes in land use as a result of the proposed improvements. The proposed improvements are not anticipated to have an impact on air quality within the area. Water quality, especially in the Grand River, will be positively impacted by the proposed improvements. The City does not anticipate changes to the natural setting or to sensitive features resulting from secondary growth that may result from the proposed improvements. The proposed improvements may facilitate a positive impact on the economic resources within the area by promoting commercial and industrial development within the service area. The proposed project is not anticipated to have an indirect impact on area aesthetics.

4.3 Cumulative Impacts

Water quality improvements to the Grand River, both through the elimination of CSO events and through improved effluent quality, are the primary anticipated cumulative positive impacts.

5.0 Mitigation

Where adverse impacts cannot be avoided, structural and non-structural measures will be taken to avoid, eliminate, and mitigate adverse impacts on the environment. Structural measures include mitigation related to the design and construction of the facility. Non-structural measures include mitigation related to governmental, institutional, or private plans/policies/regulations as well as phasing of facility construction.

5.1 Short-Term Construction-Related Mitigation

The following are short-term construction impacts of the project and the associated mitigation measures:

- Construction operations will be limited to hours set by the City. Noise, odor, and dust will be kept to a minimum using SESC procedures established in the project plans and specifications.
- Standard methods for dust control such as water and/or calcium chloride application will be used during construction and restoration of vegetation.
- All ditches and lawns will be re-seeded and/or sodded. Care will be taken to only remove trees necessary for the construction. Vegetation that is removed as a part of the construction will be replaced.
- Any surplus or waste material resulting from construction will be disposed of properly in a suitable upland disposal site.
- When possible, areas will be restored to their existing grade.
- The proposed improvements taking place at the WWTP are adjacent to the Grand River. The project work will be confined to the area of work, and all precautions will be taken not to store, locate, or pile any construction materials near the Grand River.
- The proposed project will be located within the 100-year floodplain. No stockpiling of excess material will be allowed in the 100-year floodplain.

5.2 Mitigation of Long-Term Impacts

Every effort will be made to prevent long-term or irreversible impacts because of the project. The selected alternative has been evaluated to determine any potential of long-term impacts. Where long-term impacts are unavoidable, mitigation measures will be considered to ensure that sensitive features do not suffer permanent or irreversible adverse impacts.

The long-term impacts of the short-term construction activities required to implement the proposed improvements are negligible, relative to the benefits to the environment and the community that the improvements will provide. Significant long-term impacts of the project have not been identified as there are no justifiable long-term impacts associated with the project.

5.2.1 Siting Decisions

Alternative WWTP locations have been evaluated as a part of the selection process. Expanding the WWTP at the existing site was determined to be the preferable option. The proposed improvements have the fewest environmental impacts at the current WWTP location when compared to relocating the WWTP to other proposed locations.

5.2.2 Operational Impacts

Historically, the existing WWTP has not received odor, aerosol, or noise complaints. While treatment upsets remain possible, the proposed improvements are not anticipated to result in any odor, aerosol, or noise issues. The proposed improvements provide redundancy and resiliency in the event of a WWTP upset. Chemicals used in the treatment process will be stored indoors in bulk storage tanks, and all chemical feed piping will be routed such that a break in the pipe will either drain to a treatment tank or to a secondary containment area, thereby mitigating the chance for a chemical spill. The use of chlorine for disinfection will be eliminated as part of the proposed improvements.

5.3 Mitigation of Indirect Impacts

5.3.1 Master Plan and Zoning

The City's existing master planning and zoning recognizes and aims to protect cultural, historical, and natural attributes existing in the study area. Residential development in existing neighborhoods and industrial development within the existing industrial park may be accommodated by the expansion of the treatment facility. Historical features, including the historic district within the City, will not be directly negatively impacted by construction activities, and will not be indirectly impacted by other infrastructure.

5.3.2 Ordinances

Existing City ordinances will be enforced to control increased stormwater and non-point source pollution that may result as an indirect impact from development.

5.3.3 Staging of Construction

Construction of sanitary sewer system improvements and WWTP improvements will be staged to limit indirect impacts. Construction of the retention basin must be complete before sanitary sewer system improvements allow for increased flow from the WRPS to the WWTP. Construction of grit removal equipment and fine screens must be complete before elimination of the primary clarifiers. MBR system improvements must be complete before the final clarifiers can be decommissioned. UV improvements should be completed after modifications to the MBR system.

6.0 Public Participation

6.1 Public Meetings on Project Alternatives

Community engagement is vital to maintain public trust and support. This is especially important as the existing WWTP is a prominent feature adjacent to Fitzgerald Park and includes access to a popular viewing platform on the Grand River. The park includes a trailhead to the geologically significant sandstone cliffs along the Grand River known as The Ledges.

6.2 The Formal Public Hearing

6.2.1 Public Hearing Advertisement

The public hearing for the original Project Plan was advertised in the Grand Ledge Independent on March 20, 2022. The advertisement lists the public hearing date, describes the availability of the report for viewing, and briefly describes the proposed project and estimated costs. The original draft Project Plan was made available for public review and comment both on the City's website at www.cityofgrandledge.com and at

City Hall, 310 Greenwood Street, Grand Ledge, Michigan 48837 on and after April 1, 2022. The advertisement is included in Appendix 8.

The City intends to publicly advertise the revised Project Plan in the Grand Ledge Independent on September 22, 2023. The advertisement will list the public hearing date, describe the availability of the revised report for viewing, and briefly describe the proposed project and estimated costs. The revised draft Project Plan will be made available for public review and comment, both on the City's website at www.cityofgrandledge.com and at City Hall, 310 Greenwood Street, Grand Ledge Michigan 48837, on and after September 22, 2023.

6.2.2 Public Hearing Transcript

A verbatim transcript of the original public hearing has been transcribed by a stenographer attending the proceedings and is included in Appendix 9.

A public hearing for the revised Project Plan will be held on October 9, 2023. Documentation from the public hearing will be included in the final Project Plan.

6.2.3 Public Hearing Contents

The Grand Ledge City Council held a public hearing during its regular meeting at 7:30 p.m. on May 9, 2022, in the Council Chambers, City Hall, 310 Greenwood Street, Grand Ledge Michigan 48837, to consider and receive public input on the original Project Plan. The following items were discussed:

- A description of the water quality problems to be addressed by the project and the principal alternatives that were considered.
- A description of the recommended alternative, including its capital costs and a cost breakdown by project components (e.g., WWTP, sanitary sewer system).
- A discussion of project financing and costs to users, including the proposed method of project financing and estimated monthly debt retirement; the proposed annual, quarterly, or monthly charge to the typical residential customer; and any special fees that will be assessed.
- A description of the anticipated social and environmental impacts associated with the recommended alternative and the measures that will be taken to mitigate adverse impacts.

The Grand Ledge City Council will hold a public hearing during its regular meeting at 7:30 p.m. on October 9, 2023, in the Council Chambers, City Hall, 310 Greenwood Street, Grand Ledge, Michigan 48837, to receive and consider public input on the revised Project Plan. The following items will be discussed:

- A description of the water quality problems to be addressed by the project and the principal alternatives that were considered.
- A description of the recommended alternative, including its capital costs and a cost breakdown by project components (e.g., WWTP, sanitary sewer system).
- A discussion of project financing and costs to users, including the proposed method of project financing and estimated monthly debt retirement; the proposed annual, quarterly, or monthly charge to the typical residential customer and any special fees that will be assessed.
- A description of the anticipated social and environmental impacts associated with the recommended alternative and the measures that will be taken to mitigate adverse impacts.

6.2.4 Comments Received and Answered

Appendix 9 contains a typed list with the names and addresses of the people who attended the original public hearing. Comments and questions received during the original public comment period have received written responses, as documented in Appendix 9.

Appendix 9 will be revised to additionally contain a typed list with the names and addresses of the people who attend the public hearing for the revised Project Plan. Comments and questions received during the current public comment period will receive written responses, which will be documented in Appendix 9.

6.3 Adoption of the Project Plan

The City issued a resolution to adopt the original final Project Plan during its May 23, 2022, City Council meeting. The resolution and the Clean Water State Revolving Fund (CWSRF) Project Plan Submittal Form are included in Appendix 10.

The City intends to consider a resolution to adopt the revised final Project Plan during its October 10, 2023 City Council meeting. If questions or comments are received during the public hearing and need to be addressed, the proposed resolution may be considered at the October 23, 2023 City Council Meeting. The resolution and the CWSRF Project Plan Submittal Form will be included in the revised Appendix 10.

Grand Ledge City Council Resolution #_____ of 2023

A Resolution to Approve a Revised Final Project Plan for Wastewater System Improvements, Revised 09 October 2023, and Designating an Authorized Project Representative.

A resolution adopted by the Grand Ledge City Council, at a regular meeting held on Monday, 09 October 2023, in the Council Chambers, City Hall, 310 Greenwood St., Grand Ledge MI 48837, in compliance with the Open Meetings Act, as amended.

Whereas, the City of Grand Ledge, Michigan ("City") is a municipal corporation organized under the provisions of the Home Rule City Act, Public Act 279 of 1909, as amended, and is governed by the provisions of the Grand Ledge City Charter adopted 07 August 2018, as amended ("Charter"); and

Whereas, Charter §13.1A provides:

"The power to make and to authorize the making of contracts on behalf of the City is vested in the City Council and shall be exercised in accordance with the provisions of law"; and

Whereas, the City previously adopted Resolution #28 of 2022 adopting a Final Project Plan for Wastewater System Improvements and designating an Authorized Project Representative; and

Whereas, staff recommends approving a revised Final Project Plan for Wastewater System Improvements, revised 09 October 2023;

Now, Therefore, It Is Resolved:

1. The City approves a revised Final Project Plan for Wastewater System Improvements and agrees to implement the selected alternative (Alternative No. 4), revised 09 October 2023, as attached.

2. The City designates the City Manager, a position currently held by Adam Smith, as the authorized representative for all activities associated with the project referenced above, including the submittal of said Project Plan as the first step in applying to the State of Michigan for a revolving fund loan to assist in the implementation of the selected alternative

Motion by

Second by

Ayes:

Nays:

Absent:

Approved:

Keith O. Mulder, Mayor

I, Gregory L. Newman, Grand Ledge City Clerk, certify this is Resolution #_____ of 2023, adopted by the Grand Ledge City Council at a regular meeting held on Monday, 09 October 2023; in the Council Chambers, City Hall, 310 Greenwood St., Grand Ledge MI 48837, in compliance with the Open Meetings Act, as amended.

_____

Gregory L. Newman, City Clerk