Reed City Wastewater Treatment Plant
Clean Water State Revolving Fund
Draft Project Plan

Project No. 181682
March 26, 2021

fishbeck
Engineers | Architects | Scientists | Constructors

Reed City
Wastewater Treatment Plant
State Revolving Fund Draft Project Plan

Prepared For:
City of Reed City, Michigan

March 26, 2021
Project No. 181682

List of Figures

List of Tables

List of Appendices

List of Abbreviations/Acronyms

ACS	American Community Survey
AMP	asset management plan
City	City of Reed City
CO	carbon monoxide
CSO	combined sewer overflow
EGLE	Michigan Department of Environment, Great Lakes, and Energy
EQ	equalization
FEMA	Federal Emergency Management Agency
FSP	fiscal sustainability plan
gpcd	gallons per capita per day
gpm	gallons per minute
GPR	Green Project Reserve
hp	horsepower
I/I	infiltration and inflow
MGD	million gallons per day
NAAQS	National Ambient Air Quality Standards
NFPA	National Fire Protection Association
NO_2	nitrogen dioxide
O&M	operations and maintenance
O_3	ozone
PM10	10 microns
SAD	Special Assessment District
SAW	Stormwater, Asset Management, and Wastewater
SESC	soil erosion and sedimentation control
SBR	sequencing batch reactor
SHPO	State Historical Preservation Office
SO_2	sulfur dioxide
SRF	State Revolving Fund
SSO	sanitary sewer overflow
THPO	Tribal Historic Preservation Offices
TSP	suspended particulate matter
USEPA	U.S. Environmental Protection Agency
UV	ultraviolet
VFD	variable frequency drive
WAS	waste activated sludge
WRD	Water Resources Division
WWTP	wastewater treatment plant

1.0 Background

This Project Plan was prepared to obtain a State Revolving Fund (SRF) loan from the Michigan Department of Environment, Great Lakes, and Energy (EGLE) for the construction of proposed improvements to the Reed City Wastewater Treatment Plant (WWTP) in Reed City, MI. The City of Reed City (City) is located along the US-131 corridor at the crossroads of US-10 in northwestern Michigan, approximately 15 miles north of Big Rapids, 27 miles south of Cadillac, and 13 miles west of Evart. One of only two cities in the county, Reed City is the county seat of Osceola County.

The City's WWTP is comprised of two facilities referred to as the North Plant and the South Plant. The South Plant, residing on the south bank of the Hersey River, has served the City for nearly 60 years. The South Plant houses the preliminary treatment equipment, raw influent lift station, chemical feed facilities for polymer and disinfection chemical addition, final effluent polishing clarifiers, and the disinfection contact tank. The remaining treatment processes are located at the North Plant site, situated north of the Hersey River, including the equalization basins, secondary treatment batch reactors (SBRs), and the sludge handling facilities. The WWTP serves the local community, businesses, and industrial customer General Mills-Yoplait.

The study area is defined as the area within the City serviced by the City's WWTP. See Figure 1 for a delineation of the study area.

The Study Area provides the basis for planning the proposed project and covers the geographic area served by the existing wastewater system. A map of the existing Sewer District can be found in Figure 1. The current Sewer District represents the area that is currently served by the Reed City WWTP. Specific plans to expand the sewer district do not currently exist. 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.

1.1 Environmental Setting

1.1.1 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 only historic listing, the Reed City Community Building which has since been demolished, was found on the list of Michigan State Historic Sites by County. Therefore, no historic sites will be impacted by the proposed project.

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

1.1.2 The Natural Environment

1.1.2.1 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: 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 (PM10).

The current Air Quality Standards for Michigan are summarized by pollutant in the table below. EGLE conducts air quality monitoring throughout the state. Non-attainment areas are those that have concentrations over the NAAQS standards. 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	0.075 ppm (147 µg/ m^3)	Same as Primary Standard	
Particle Matter	PM10 (10 micron) 24-hour	150 µg/ m^3	Same as Primary Standard	
	PM2.5 (2.5 micron) annual arithmetic mean	15 µg/ m^3	Same as Primary Standard	
	PM2.5 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)		

The WWTP site 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.

1.1.2.2 Wetlands

Both freshwater emergent wetlands and freshwater forested/shrub wetlands are present in the study area, as depicted in Figure 2. These wetlands are most highly concentrated along the Hersey River and at the southern limits of the study area.

1.1.2.3 Coastal Zones

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

1.1.2.4 Floodplains

Reed City does not participate in the (FEMA) flood insurance studies.

1.1.2.5 Natural or Wild and Scenic Rivers

Hersey River is designated as a natural river by the MDNR. It is a 13.4 mile-long stream rising in Lincoln Township in northwest Osceola County and flows southward into Lake No Sho Mo, continuing southward under US-10 into Reed City where it turns east and continues to the Village of Hersey where it empties into the Muskegon River.

1.1.2.6 Major Surface Waters

Figure 3 depicts the major surface waters within the study area. Lake No Sho Mo, located to the north of the City, is classified as a natural inland lake. Hersey River flows both in to and out of Lake No Sho Mo.

1.1.2.7 Recreational Facilities

There are four outdoor recreational areas in the City, three of which are owned and/or operated by the City. Another six sites are owned by the Reed City Public School System. The parks and outdoor recreational facilities in Reed City are depicted on Figure 4.

Based on the MDNR's recreation standards, there is sufficient total acreage in the City for both neighborhood and community parkland, but not enough playground locations. The City's recreation plan, *Strategic Plan for Parks, Recreation and Tourism in the Greater Reed City Area*, includes a provision for upgrading Westerburg Park, Linear Park, and Rambadt Park. The plan also includes upgrading the existing softball/baseball fields to league-play standards and to work with the school system in designing new and upgrading existing playgrounds and athletic field and facilities.

1.1.2.8 Topography

Elevations within the City range from 1,020 to 1,100 feet above mean sea level. Along the Hersey River the elevation is approximately 1,020 feet above mean sea level. Heading southwest in the City, elevations climb to approximately 1,100 feet above mean sea level. Figure 5 depicts the topography in the study area.

1.1.2.9 Geology

No geological structures or formations affected the choice of alternatives.

1.1.2.10 Soils

The predominant soils within the downtown area consist of Group A and Group B of the hydrologic soil groups from the USDA. These soils are primarily sand and loamy sand and have a low runoff potential.

1.1.2.11 Agricultural Resources

The study area contains several areas of prime farmland as depicted in Figure 6. These are generally concentrated around the Hersey River and along the southern portion of the study area.

1.1.2.12 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.

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

1.1.3 Land Use in the Study Area

1.1.3.1 Existing Land Use

The existing land use map, last amended in 2014, can be found in Figure 7. According to the 2005 *City of Reed City Community Comprehensive Plan*, the predominant land use in the City is residential, as shown in Table 4. Single-family residential areas surround the downtown, with the greatest concentration being west of Chestnut Street. Lot sizes near the downtown core are relatively small (5,000 to 10,000 square feet), with those in most other areas consistently in the 10,000 to 20-000 square foot range.

Some multiple-family housing is located in the southern portion of the City, including a 101-unit apartment complex, managed and operated by the Reed City Housing Commission, consisting of senior citizens,

handicapped, disabled, and low- and moderate-income housing. In this area there are also three other multiple-family complexes, one of which is low to moderate income.

The downtown area is primarily commercial property, offering a mix of general merchandise and specialty shops. These activities are generally located along Upton and Chestnut Streets, between the north City limits and Todd Avenue. A second commercial area is located south of the Central Business District on Chestnut Street, between Lincoln and Three Mile Road. Other commercial properties may be found at a few isolated locations.

The major industrial area of the City is southeast of the City center; however, some industry is directly adjacent to the downtown. Public lands and institutional uses are located throughout the City.

Table 4 - Existing Land Use Totals

Use	Total Acres	Percent of Total Area
Agricultural	102	8.1
Single-Family Residential	378	30.0
Multiple-Family Residential	39	3.1
Commercial	80	6.3
Industrial/Utilities	93	7.4
Public/Institutional	141	11.1
Vacant/Open Space/Right-of-Ways	429	34.0
Total	**1,262**	**100**

The most significant land use change in the City in recent years has been the expansion of Yoplait/Colombo at their downtown site. Other notable land use changes affecting the City have been the expanded hospital facilities and 40 multi-family units constructed on South Chestnut. Commercial property in the downtown has not changed significantly. Single-family residential areas have not experienced significant land use changes.

1.1.3.2 Future Land Use

The future land use is reflected in Figure 8. The information below reflects future planned growth areas discussed in the 2005 *City of Reed City Community Comprehensive Plan*. Not all the areas identified for future growth are within the City limits. This infers a need to communicate and coordinate future development and land use regulations with Richmond Township.

Residential

Three areas are set aside for residential usage.

- The first area is located northeast of the City. This area is high and dry and would be ideal for continued residential use. The sanitary sewer collection system in this area has adequate capacity. The available vacant land in this area is approximately 80 acres.
- The second area is located southwest of the City, along Patterson Road. This area would be appropriate for residential use and would provide excellent housing opportunities. The available vacant land in this area is approximately 80 acres.
- The third area for residential growth is the southeast quadrant of the City. This area has good potential for lower density residential home sites.

Commercial, Retail, and Office Component

The plan recommends future commercial development in four areas.

- The first is within and immediately surrounding the downtown Central Business District. This area has a very limited amount of vacant land but there are several properties that have been abandoned or are significantly underused. Parking is available and more could be developed. There are several parcels of land on the fringes of the existing downtown core that are either vacant or underutilized or that are currently residential properties that could be converted to business use.
- The second area for commercial growth is along the old US-131 corridor on South Chestnut Street. There are many vacant parcels and land is available for development.
- The third area is located northwest of the City at the Patterson Road/US-10/US-131 interchange area. This has the greatest amount of vacant land, has visibility from the expressway and probably has the greatest long-term potential for large-scale development.
- The large tract of land in City ownership west of US-131 is a sizeable portion of land appropriate for office use.

Industrial

The most appropriate area for future industrial development primarily because of its access to US-10 is the proposed new industrial area on the south side of US-10, between Roth and Dailey Streets. This area is mostly vacant with a few existing businesses and a small amount of lowland that could serve as part of a stormwater management system.

Much of the proposed industrial area is well drained, and there are several large industrial tenants currently in place. A limited portion of this entire area could be specifically developed as a certified industrial park. Of the 110 acres planned for exclusive and intensive industrial use, east to the sewage treatment lagoons and north of the railroad right-of-way, about one-quarter are currently in industrial use or in wetlands. As additional industrial land is required in the future, the plan recommends expansion to the south, across the railroad right-of-way, and west to Roth Street to complete the industrial component in that area. These areas are separated from residential uses, include the sewage lagoons, and have access to US-10.

1.1.3.3 Zoning and Land Use Regulations

The 2005 *City of Reed City Community Comprehensive Plan* includes a discussion of the zoning and land use regulations that must be considered for sensitive features, including wetlands, floodplains, and groundwater management.

Wetlands

There are numerous areas intended for preservation including relatively large wetlands areas in and around the City. Wetlands serve important functions such as flood control, groundwater recharge, and water purification. In addition, they provide passive recreational opportunities and support biological habitats. These areas should be preserved in their natural state and utilized as valuable local resources for education, environmental protection, and recreation while encouraging development to locate elsewhere.

Floodplains

Floodplain management is an overall program of corrective and preventive measures for reducing flood damage, including but not limited to emergency preparedness plans and regulations aimed at the future use of the floodplain. These regulations can be implemented through the zoning ordinance, subdivision control regulations, building code restrictions or an ordinance specific to floodplains. Minimum floodplain management standards published by the Federal Insurance Administration include review of building permits for all new construction and, when improvements to existing structures are more than 50 percent of market value, to assure that sites are reasonably free from flooding. In flood-prone areas, the community must also require proper anchoring of structures, the use of proper construction materials, methods that will minimize flood damage, adequate

drainage for new development, and new or replacement utility systems must be located and designed to minimize or entirely preclude flood loss.

Zoning is the most widely used tool to regulate land use within floodplains. Utilizing performance standards for permitted uses in the flood fringe and floodway minimizes potential flood damage. The floodplain management plan should ensure judicious utilization of the floodplain.

Groundwater Management

Avoiding undesirable development in recharge areas and wetlands will help to protect groundwater quality. Good surface water management is the basis for groundwater protection measures. Consideration should be given to the extent of groundwater contamination by septic tanks and the potential for chemical or toxic substance leaks and spills by industrial or transportation activities.

1.2 Population

The population of the City has remained largely constant since the 2000 Census. Based on the American Community Survey (ACS) Demographic and Housing Estimates program by the US Census, the 2019 population in Reed City was 2,472 persons. The 2010 Michigan West Regional Planning Committee provided the following population projections for Reed City:

Table 5 - West Michigan Regional Planning Committee Population Projections

Year	Population Projection
2015	2,441
2020	2,456
2025	2,472
2030	2,488

Similarly, the *2010 Reed City Community Comprehensive Plan* developed population projections for Reed City from the years 2010-2040. Those projections are listed in the table below:

Table 6 - Reed City Community Comprehensive Plan Population Projections

Year	Population Projection
2010	2,519
2020	2,632
2030	2,765
2040	2,882

Currently, the WWTP services all residential, commercial, and industrial users located in the City. The proposed projects will not alter the current boundary of the service area and it is expected that the existing population served by the WWTP will remain the same after implementation of the proposed project.

Some population growth is anticipated within the City. The City projects the population to reach 2,882 by 2040. This projected growth will not affect the ability of the WWTP to provide service to additional users.

1.3 Economic Characteristics

1.3.1 Employment

Per the 2019 ACS Survey of Industry by Occupation for the Civilian Employed Population in Reed City, 1,381 persons in the age group of 20-64 are eligible for employment. 277 of these persons have a reported disability status, and 62.2% of the eligible population participates in the labor force. An 8% unemployment rate is reported. Table 7Error! Reference source not found. provides a breakdown of employment by industry.

Table 7 - Employment by Industry

Industry	Population	Percent of Total Employment
Agriculture/forestry/fishing/hunting	21	2.4
Construction	23	2.7
Manufacturing	168	19.6
Wholesale/retail trade	106	12.3
Information	32	3.7
Finance and insurance	53	6.2
Real estate, rental/leasing	13	1.5
Professional, scientific, technical	23	2.7
Waste management services	31	3.6
Educational services	64	7.5
Health care and social assistance	142	16.5
Arts, entertainment, recreation	5	0.6
Food services	72	8.4
Public administration	58	6.8
Other services	48	5.6
TOTAL EMPLOYMENT	859	100%

72% of the workforce reported driving alone to work and 52% of commuters reported traveling 20 or more minutes to work.

The major employers in Reed City are as follows:

Table 8 - Major Employers

Rank	Employer	Approximate Number of Employees	Industry
1	Spectrum Health	460	Health Care
2	General Mills-Yoplait	380	Manufacturing
3	Reed City Public Schools	130	Education
4	Krafttube	105	Manufacturing
5	Reed City Group	90	Manufacturing

1.3.2 Median Annual Household Income

As reported in the 2019 ACS Survey of Median Annual Household Income, the median household income metrics in Reed City, Osceola County, and the State of Michigan were as follows:

Table 9 - Median Annual Income Evaluation (2019)

Metric of Evaluation	Reed City Median Annual Income	Osceola County Median Annual Income	State of Michigan Median Annual Income
Household	$35,658	$44,032	$57,144
Families	$37,319	$52,628	$72,600
Married-couple families	$51,711	$59,971	$86,923
Nonfamily households	$30,739	$25,337	$33,711
Percentage of all families below poverty	21%	13%	10%

Reed City has a slightly lower household median income than the rest of the communities in Osceola County, except for non-family households. Reed City's median income is considerably lower than the State of Michigan's

in all respects. Of notable concern is Reed City's high percentage of all families below the poverty level when compared to the County and State.

1.3.3 Economic Trends

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. Historically, General Mills-Yoplait has brought investment into the City and has consistently provided regional employment opportunities.

1.4 Existing Facilities

The following section provides a description of the existing facilities associated with the Reed City WWTP. The City has also completed an asset management plan (AMP) under the Stormwater, Asset Management, and Wastewater (SAW) grant program. A more detailed facility description and condition assessment is included in the AMP. Pertinent excerpts from the AMP are included in Appendix 1. The full AMP report can be provided upon request.

1.4.1 Method of Wastewater Treatment

1.4.1.1 South Plant

The South Plant was constructed as a part of the original primary treatment and lagoon plant and has served the City for 60 years. Wastewater flows by gravity into the South Plant from two directions. Most of the flow enters from the east, flowing down Lincoln Avenue. A smaller portion of the influent flow enters the South Plant by gravity from the west. The portion that enters from the west must cross over the Hersey River to reach the South Plant. The gravity sewer from the west is supported by an aging trestle bridge.

Influent flows from the collection system converge at a manhole located to the south of the South Plant's sampler area. From this manhole, water flows through an 18-inch gravity sewer to the head end of the manually cleaned grit removal channels. The grit channels are two narrow channels that produce low velocity laminar flow conditions to promote the settling of grit material. This method of grit removal is antiquated, ineffective, labor intensive and presents a safety hazard. The two grit channels recombine prior to entering a 6-inch Parshall flume used to measure the wastewater flow rate. The flume is equipped with a stilling well and an ultrasonic sensor located within the nearby sampler area. The reported influent flow rate to the plant is currently being monitored at the North Plant. A bypass channel is installed alongside the grit channels and the Parshall flume.

Wastewater then flows through a grinder unit which reduces the size of the influent solids prior to screening, using an auger-style perforated plate screen. Both the grinder and the screen were newly installed in 2002. Following the screening process, wastewater flows to a 10-foot diameter raw wastewater pump wet well. The raw wastewater pumps are in an adjacent 8-foot diameter, below grade, dry-pit pump station. The influent pump station force main transports the wastewater flow to the North Plant.

The remainder of the South Plant piping, structures and buildings are used to treat the secondary effluent from the North Plant prior to discharge to the Hersey River. The secondary effluent from the North Plant is transported through an 8-inch gravity line that runs from the North Plant SBR effluent polishing pond, crosses under the river, and delivers the secondary effluent to a rapid mix chamber installed in the bottom floor of the main treatment building at the South Plant. A mechanical mixer installed in the chamber completely mixes liquid polymer with the incoming secondary effluent. Water overflows the chamber into a small flocculation basin, and then leaves through a 12-inch line leading to the final effluent polishing clarifiers.

Secondary effluent is then polished using two, 30-foot diameter, center feed clarifiers that were installed as a part of the 1990 plant expansion. Each clarifier has a 12-foot side water depth and is equipped with scraper style clarifier mechanisms and fiberglass dome covers.

Clarifier effluent flows to the disinfection area of the main treatment building. The disinfection area consists of 3 chlorine contact chambers and a disinfection chemical room. Sodium hypochlorite is injected for disinfection and from there water flows onto the second chamber for additional contact time. These tanks are in the settling tank building and were originally used as primary settling tanks in the 1950s until their conversion to chlorine contact tanks in 1990. Effluent from chamber two flows to chamber three located on the grade floor of the main treatment building. Chamber 3 is a split serpentine style contact basin with masonry baffle walls, constructed in 1971 along with the associated facilities and the main treatment building. Overall, the concrete structure of the three chlorine contact basins appears to be satisfactory with minimal visual signs of cracking or spalling. The chlorine contact basins overflow into a final effluent box. A v-notch overflow weir equipped with an ultrasonic level sensor is installed at the entrance to the effluent box and monitors the plant effluent flow rate. Sodium bisulfate is injected into the flow at the head end of chamber 3 to allow more time for mixing and reacting with the plant flow to remove any residual chlorine prior to final discharge in the Hersey River. An 18-inch outfall pipe carries the finished effluent from the effluent box to the Hersey River.

The South Plant currently utilizes an abandoned anaerobic digester built as a part of the original plant to serve as a flow equalization wet well for the South Plant pump station. The tank is uncovered, normally empty, and has no equipment inside. The interior and exterior of the 60-year-old tank structure are in adequate condition for influent equalization but the structure is approaching the end of a normally expected useful life. Overflow and suction piping, and valves that connect the former digester tank to two sludge pumps remain in the basement of the sampler building but are not in useable condition.

1.4.1.2 North Plant

The remaining wastewater from the City is pumped from the influent pump station at the South Plant to the basement of the North Plant control building. Supernatant recycle from the supernatant pump station also discharges into the influent line. Sampling ports for the plant influent are in the basement of the control building. An ORP and pH probe are used for pacing the feed based on fluctuating influent loads. Sulfuric acid and sodium hydroxide are added to the wastewater in the EQ tank. Influent wastewater from the City passes through two parallel inline grinder units before discharging into either the EQ tank or SBR basins.

After EQ, wastewater flows to one of the three SBR basins, which make up the heart of the wastewater treatment system. The SBR basins are above-grade, open-top, glass-lined bolted steel tanks with elevated steel walkways and handrail installed between each basin and the control building.

The compressor building houses the turbo aeration blowers, piping and valves and associated electrical equipment. The turbo aeration blowers provide air that is used in the SBR treatment reactors to process the wastewater. Effluent from the SBRs is then directed to an effluent polishing lagoon. The effluent from the polishing lagoon flows to the South Plant, where it enters the rapid mix chamber as described above.

1.4.2 Sludge Handling and Disposal

Sludge pumps located in the basement of the sampler building are used to pump settled sludge from the clarifiers. Two sludge pumps are used to transfer settled solids from the clarifiers to the grit channel. This sludge combines with the plant flow and is carried to the North Plant for further processing. Sludge can also be loaded onto trucks at the South Plant.

Waste activated sludge (WAS) is pumped from the SBRs directly to the aerobic digester. The WAS basin, a concrete basin installed alongside the influent equalization (EQ) basin, is used by the plant staff during the

emptying process of an SBR for routine maintenance of the SBR basins. It also provides 3 to 4-days of storage for WAS during periods when the sludge storage tank and aerobic digester are full or near full capacity.

The rotary drum thickener system is used to thicken sludge. The sludge is aerated using diffused aerators mounted to the bottom of the digester tank and supplied by one of two 125hp centrifugal blowers. Digested biosolids are then pumped to one of two sludge storage tanks, one 1.12 million gallon above grade bolted steel tank located at the North Plant, and a 0.6 million gallon below grade concrete storage tank installed at the South Plant.

1.4.3 Collection System

The Reed City sanitary sewer collection system consists of six pump stations, approximately 19.3 miles of sanitary sewer and 348 manholes. The recently completed AMP provides a complete description of the collection system. The AMP provides an asset inventory, identifies the critical assets, and provides a capital improvements plan. A copy of the collection system AMP can be provided upon request.

Proposed collection system improvements are limited to those necessitated by the construction of the Commerce Pump Station and the Influent Pump Station.

1.4.4 Location Map

An existing system location map is provided in Figure 9.

1.4.5 Design Capacity, Existing Flows, and Characteristics of Waste

The existing basis of design for the SBR WWTP is attached in Appendix 2. The table below provides a summary of the design flow and loading used to size the existing plant along with a summary of the current annual average flow and loading.

Table 9 – Design and Current: Flows and Loadings

Flow/Characteristic	Units	Design Value	Current Value
Average Flow	MGD	0.95	0.70
Max Flow	MGD	1.80	1.50
BOD_5	mg/L	1140	1,110.5
	lbs.	9,032.2	9,095.5
TSS	mg/L	530	383.5
	lbs.	4,199.2	3,127.4
Phosphorus	mg/L	15	5.9
	lbs.	118.8	41.47
Ammonia	mg/L	40	10.9
	lbs.	316.9	74.6

1.4.6 Septage Receiving Facilities

The Reed City WWTP does not accept septage and does not have plans to accept septage within the 20-year planning period.

1.4.7 Major Industrial Discharges

The only major industrial discharge contributing to the existing facility is General Mills-Yoplait. The table below shows Yoplait's annual average flows and loads from 2013-2019. Yoplait's discharges are not expected to change significantly over the planning period.

Table 10 – Yoplait Annual Average Flow and Load

	2013	2014	2015	2016	2017	2018	2019
Daily Avg. Flow	0.270	0.244	0.262	0.314	0.346	0.356	0.376
Max Flow	0.558	0.372	0.4	0.485	0.506	0.598	0.586
Min Flow	0.015	0.006	0.016	0.017	0.010	0.037	0.064
Daily Avg. BOD (lbs.)	3,443	3,404	3,466	3,668	3,102	3,528	3,469
Max BOD (lbs.)	9,796	9,950	13,988	10,727	10,563	14,693	7,804
Min BOD (lbs.)	0	380	26	22	14	35	484

1.4.8 Average and Peak Dry-Weather and Wet-Weather Flows

The average and peak dry-weather flows were evaluated as part of the collection system AMP. This evaluation concluded that the average dry weather flows are generally in excess of 70 gallons per capita per day (gpcd), which could indicate infiltration present in the system. Additionally, the AMP noted that wet weather events can result in inflow to the sanitary collection system. The AMP provides recommendations to lower the average dry-weather flow rate and the peak wet-weather flow. The City does not have hydraulic capacity issues in the collection system or at the WWTP.

1.4.9 Infiltration and Inflow

An evaluation of infiltration and inflow (I/I) was completed as part of the recent collection system AMP. This evaluation identifies issues within the collection system. The capital improvements plan included in the AMP incorporates improvements to the collection system to help address known I/I issues.

1.4.10 Combined Sewers, System Bypasses & CSOs

There are no known combined sewers, system bypasses (including sanitary sewer overflows), or combined sewer overflows (CSOs) within the collection system.

1.4.11 Pump Station Capacities

The existing influent pump station is equipped with two, 40 horsepower (hp), and 1,000 gallon per minute (gpm) pumps controlled with variable frequency drives (VFDs). The pumps were installed in 1993. The pumps transfer raw wastewater through an 8-inch cast iron force main that is installed under the Hersey River. The force main transports the wastewater flow to the North Plant. The pump station firm capacity of 1,000 gpm is adequate for the system.

1.4.12 Adequacy of Pump Stations

The influent pump station was originally built in 1971 and requires immediate replacement. The pumps require frequent maintenance to remain in operation; their poor condition is likely exacerbated by the current lack of influent screening or adequate grit removal. There are operational concerns regarding the condition of the force main under the river. It was constructed as a part of the earlier upgrades of the WWTP. Since there is only one pipe crossing below the river, the force main pipeline can never be taken offline for condition evaluation, maintenance, or repairs. In the event this pipeline fails, the City has no backup method of transferring flow to the North Plant, and the City would temporarily lose the ability to treat wastewater and possibly release untreated wastewater into the Hersey River.

1.4.13 Physical Condition, Operation or Maintenance Problems

Nearly all assets at the South Plant are beyond their expected useful lives. While the existing facility has served the community well during this time, the facility is generally in poor physical condition and operation and maintenance difficulties have developed.

1.4.13.1 South Plant

The structural condition of the trestle bridge supporting the influent gravity sewer from the west is extremely poor. The continued degradation of the trestle bridge places the existing gravity sewer at risk for failure. A failure of the trestle bridge would likely result in raw sewage entering the Hersey River.

The plant staff's care and continuous maintenance had allowed the headworks units to remain in operation. The outdoor installation makes it difficult to perform maintenance under inclement weather conditions and has caused deterioration of the equipment. The original grit concrete channels appear to be in satisfactory condition but are not covered and present a safety concern. Grit material must be removed manually from the channels and must be attended to by plant staff daily. The grit removal system is only marginally effective. As a result, grit passes into the influent pump station and remaining treatment processes and pumping equipment. The grit remaining in the wastewater flow causes excessive wear on the moving parts of equipment and premature equipment rehabilitation and replacement. The screening unit at the South Plant is not functional. The side wall baffles that direct wastewater into the screen basket are not completely watertight and can allow some string material, solids and wastewater to bypass the screen at times. The screening unit has failed and has been removed from operation.

The influent pump station has frequent clogging issues. The pumps, motors and motor starters are in frequent need of costly repair to remain functional. Maintenance on the existing pumps is difficult and dangerous due to the deep installation and lack of permanent lifting equipment.

The pumps used to transfer settled sludge from the clarifier to the grit channel were provided to the City by Yoplait and are not designed for this application. The plant staff have installed the pumps in a manner that allows them to pump the sludge. Overall, the clarifier and sludge handling and storge equipment is working, though all are at or near the end of their expected useful life.

The main treatment building at the South Plant houses chemical feed equipment for both disinfection and polymer feed. The polymer makeup and feed equipment were installed as a part of the 1970 improvements. The system remains in fair working condition based on the operations staff's diligence in maintaining the equipment. The sodium hypochlorite and sodium bisulfate feeds were assembled by City staff. The equipment is functional, however; the staff must keep a close watch on the system maintenance by repairing or replacing piping and equipment as needed.

The three areas of the main treatment building described above are of various ages and conditions. The sampler area is approximately 60 years of age, and of brick and masonry construction. The age of the disinfection area is difficult to verify since it does not appear on the 1971 expansion drawings. The roof and masonry walls of both buildings have weathered to the point where significant repairs are required. Both buildings exhibit significant horizontal and vertical wall cracks, as well as some masonry spalling. The cracks in the walls of the disinfection area indicate some settling may have occurred that would require further investigation. The office/laboratory area of the main treatment building is also of masonry construction and was constructed as a part of the other two areas installed as a part of the 1971 plant expansion. The office/laboratory area is also in poor condition due to long term water damage from the leaking roof. The water damage caused by the leaking roof would involve roofing replacement, and repair and replacement of the roof structure. The office area walls are covered in what appears to be black mold. Access to this area of the facility is restricted. There is monitoring equipment in the office area.

Given the existing conditions and the cost of repairs and upgrades to electrical and mechanical systems that would be required by code, it would appear the main treatment building has reached the end of its useful life. It is best advised that the building be demolished rather than allow the condition to continue to decline. It currently poses a safety concern to any stored property and worker's safety. The tanks within the building remain in

useable condition, however, significant costs would likely be incurred if the tanks were to be used in some manner in the future.

1.4.13.2 North Plant

The North Plant originally consisted of two treatment lagoons, which were replaced in 1997 with a two basin SBR treatment system. The plant improvements also included an influent equalization basin, a control building, a digester blower building, and a new aerobic digestion and biosolids handling and storage system. The treatment system was expanded in 2001 to include a third SBR basin. In 2003, modifications were made to the influent EQ basin to allow for better pH control and load equalization of Yoplait's industrial wastewater. This project also included a new wastewater lift station and dedicated force main from Yoplait's production facility to the WWTP. In 2010, the plant was upgraded by adding an additional EQ basin, upgrading the SBR aeration system by installing turbo-blowers, a blower building, replacement of the SBR aeration diffusers and piping, upgrading the SBR Control System, repairing the SBR and digester tank walls and replacing the cathodic protection anodes for the SBR, and digester and sludge holding tanks. Most of the equipment and structures at the North Plant are relatively new and remain in good working condition.

The East EQ tank has a liquid volume of 312,000 gallons and is equipped with three, 15 hp floating aspirating aerator mixers. The tank is used to equalize Yoplait's wastewater or a combination of the City's and Yoplait's wastewaters. Modifications to the EQ basin were made in 2003 which allowed the basin to better handle Yoplait's wastewater. This project included a new modified urethane elastomeric coating to withstand wide swings in pH, and a pH adjustment chemical feed system and building. The physical condition of the east EQ tank and piping is good; however, the aerators are in poor condition and lack sufficient mixing and aeration capacity for the wastewater from Yoplait. This can result in a significant quantity of caustic being fed to maintain moderate pH levels and minimize occasional odor excursions that are produced within the basin. The west EQ tank is equipped with a jet aeration system consisting of a jet aspirating aerator header and one 50hp pump mixer. The tank is used as an emergency spill control system, but it can be used to equalize wastewater to allow the east EQ basin to be serviced. The physical condition of the EQ tank as well as the piping and jet aeration system is good. The EQ tank has a cover as an odor control mechanism and to keep debris from entering the tank. The SBR system, including the tanks, walkways, mixers, diffusers, and associated equipment are all in good working condition.

The polishing lagoon was installed in 1970 as part of the lagoon treatment plant and was designed to have a minimum 2-foot-thick clay liner. The current condition of the clay liner is unknown. The polishing lagoon does not have a bypass valve and cannot be easily taken out of service for routine maintenance. The lagoon eventually fills with solids which can rise to the surface and negatively affect effluent quality. The perimeter lagoon banks have been affect by erosion. The lagoon is in poor condition and will either need to be replaced or have significant improvements for reliable service from the earthed structure.

The thickener system was installed as part of the 1998 plant expansion and is in good overall working condition. One concern that has been noted is the inadequacy of the existing sludge tank mixing pump/recirculation pump. An externally mounter mixer would improve overall mixing efficiency, though it is likely to result in significant improvement of the blended solids during thickening. This would provide greater consistency of the feed sludge and improved control of chemicals used to thicken the plant sludge.

There are four buildings located at the North Plant. The control building and the digester blower building were both constructed in 1998 and remain in good condition. The aeration blower building that houses the turbo-blowers used by the SBRs was constructed in 2010 and is in good condition. The control building may benefit from the installation of a recycle sump in the basement of the control building. The top of the sump is not gas or liquid tight which could potentially release liquids or odors, or sewer gases into the basement of the control building. The chemical feed building, originally constructed in 1990, houses the ferric chloride bulk tank and feed pumps and is in fair condition.

1.4.14 Evaluation of System's Climate Resiliency

Climate changes, including more frequent and intense storms and flooding events could result in increased flow to the Caledonia WWTP. Increasingly severe wet weather events may also result in more frequent loss of utility power. The existing facility is equipped with the ability to equalize wastewater during high flow events, which would allow the Reed City WWTP to accommodate increased flows that may result from climate change.

The facility is also equipped with a standby generator that provides back-up power for the critical infrastructure at WWTP in the event of a power outage.

1.5 Fiscal Sustainability Plan

A fiscal sustainability plan (FSP) per SRF requirements state that treatment works for 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 O&M and funding.

The recently completed 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 1. The full AMP report is available for review by request.

1.5.1 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 1. This list consists of 134 WWTP assets and 75 lift station assets. In general, the existing assets have a low or medium probability of failure and a low or medium consequence of failure. 24 WWTP assets and 24 lift station assets were rated to have a high probability of failure. Many of these WWTP assets are located at the South Plant.

1.5.2 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 1.

1.5.3 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.

1.5.4 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.

1.6 Need for Project

1.6.1 Compliance Status

The City is authorized to discharge flow from the Reed City WWTP in accordance with NPDES Permit Number MI0020036 issued by Michigan Department of Environmental Quality (MDEQ). A copy of the most recent permit issued September 26, 2018, and effective through October 1, 2022 is provided in Appendix 4. Discharges from Reed City WWTP are permitted to the Hersey River via Outfall 001. The plant does not have a history of regular permit violations. This is a testament to the dedication of the City and WWTP operations staff. The permittee has successfully demonstrated that the Reed City WWTP provides adequate treatment of wastewater and complies

with the water quality standards set forth by its permit. There are no outstanding violations of the NPDES requirements, nor are there any additional reporting requirements for the facility.

If improvements are not implemented, the risk of sanitary sewer overflows (SSO) or permit violations increases.

1.6.2 Orders

There are currently no current orders, federal or state enforcement orders, or administrative consent orders that impact the WWTP.

Michigan Department of Energy, Great Lakes, and the Environment (EGLE) has expressed its general support for the proposed improvements, discussed in subsequent sections, at the Reed City WWTP. EGLE Water Resources Division (WRD) staff out of the Cadillac District Office have visited the South Plant on several occasions and oversee the NPDES permit compliance for Reed City WWTP. A letter documenting EGLE's support of the improvements is provided in Appendix 5.

1.6.3 Water Quality Problems

The Muskegon River Watershed (MRW) drains a sizeable area located in north-central Michigan bounded by Crawford County on the upstream end and its discharge to Lake Michigan in Muskegon, Michigan on the downstream end. The watershed incorporates 9 counties and is one of the largest watersheds in Michigan, second to only the Grand River Watershed. The main branch of the Muskegon River is 219 miles long and drains over 2,700 square miles of forest and agricultural land. The Muskegon River sustains population of trout and cold-water aquatic species and has a wide range of recreational uses from fishing, kayaking, canoeing, and boating.

The Hersey River is one of approximately 94 tributaries to the Muskegon River. The Hersey River is approximately 13.4 miles long and drains area from Osceola County and Lake County. The Reed City WWTP discharges to the Hersey River via an outfall located at the WWTP site approximately 2 miles downstream of Lake Sho No Mo in Richmond Township. The Reed City WWTP is the only facility that discharges into the Hersey River, which ultimately discharges into the Muskegon River at the midpoint of the MRW. The 2020 USEPA Waterbody Report states that there are no probable sources of impairment identified from the Hersey River.

1.6.4 Projected Needs for the Next 20 Years

The Reed City WWTP serves the local community, businesses, and industrial customer General Mills-Yoplait. According to the 2005 Master Plan, the predominant land use within the City is residential. The population of the City has remained largely consistent during the period of 2000 to 2010 based on the U.S. Decennial Census of Population and Housing. The population currently served by Reed City WWTP is estimated at 2,472 according to the 2019 Community Survey (ACS) program by the United States Census Bureau. Projections by the West Michigan Regional Planning Commission suggest that minimal growth is expected through 2040. The 2005 *City of Reed City Community Comprehensive Plan* corroborates these projections.

Based on the information provided, it is estimated that minimal growth will occur over the 20-year planning period, and flow and loading are not expected to change significantly. The proposed improvements will be designed to treat the influent flow and loadings and remain in compliance with the NPDES surface water discharge requirements.

1.6.5 Future Environment Without the Proposed Project

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 Reed City. 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 Hersey River and provide redundancy to allow for condition evaluation, maintenance, and repairs.

2.0 Analysis of Alternatives

An analysis of alternatives for improvements to the Reed City WWTP is included in this report. Alternatives considered included:

Alternative 1 – No Action

Alternative 2 – Optimize Existing Facilities and Relocate South Plant Assets

Alternative 3 – Optimize Existing Facilities and Maintain South Plant

Alternative 4 – Regional Alternative

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 Identification of Potential Alternatives

The analysis that follows presents options for the Reed City WWTP.

2.1.1 Alternative 1 - No Action

The existing South Plant is in a state of failure. The trestle bridge that supports the influent sewer is in poor structural condition. The existing grit removal is ineffective. He existing screen is not operational. The influent pumps require frequent maintenance to remain operational. The roof on the existing building has partially collapsed. The chlorination system is antiquated. The phosphorus removal clarifiers result in excessive recycle flows.

While the plant currently remains in compliance with their NPDES permit and have not had SSO issues, taking no action will likely result in SSO events or permit violations in the near future. The “no action” alternative is not acceptable.

2.1.2 Alternative 2 - Optimum Performance of Existing Facilities and Relocate South Plant Assets

Alternative 2 involves optimizing the existing facility while relocating treatment processes from the South Plant to the North Plant. Currently, preliminary treatment (screening and grit removal), tertiary treatment (phosphorus removal clarifiers) and disinfection (chlorination) are located at the South Plant. Maintaining these facilities is difficult due to their remote location and age of the facility. Operating two sites also poses a safety risk.

Alternative 2 includes demolition the existing South Plant buildings, demolition of the trestle bridge, construction of a pump station on the South Plant site, construction of a pump station along Commerce Drive (Commerce Drive Pump Station), construction of a screening and grit removal facility (headworks building) at the North Plant, construction of a tertiary equalization and UV disinfection facility, and ancillary improvements necessary of implementation of these larger systems. Alternative 2 is a principal alternative and is further evaluated below.

2.1.3 Alternative 3 - Optimum Performance of Existing Facilities and Maintain South Plant

Alternative 3 involves optimizing the existing facility while maintaining the existing assets at the South Plant. The current operations team has spent considerable time and effort to optimize the existing treatment system. Unfortunately, many assets at the South Plant site are inefficient and failing. Alternative 2 includes, demolition of the existing South Plant buildings, construction of a screening and grit removal facility at the South Plant, construction of a new pump station at the South Plant, construction of a new forcemain from the South Plant to the North Plant for the influent wastewater, reconstruction of the trestle bridge, construction of a tertiary

filtration and UV disinfection facility on the South Plant. Alternative 3 largely mirrors Alternative 2 with the major differences being that:

- Alternative 2 locates the headworks facility along with the tertiary treatment and disinfection facility at the North Plant, while Alternative 3 locates these facilities at the south plant.
- Alternative 3 includes reconstruction of the trestle bridge rather than construction of the Commerce Drive Pump Station.

Overall, the cost estimate for Alternative 3 is comparable to Alternative 2. Maintaining two treatment sites makes operations and maintenance more difficult and potentially more dangerous as operators may be alone at one of the sites at any given time to operate and maintain the facilities. Consolidating the treatment assets at a single site will streamline operations, reduce O&M costs, and increase safety. Because Alternative 2 and Alternative 3 have comparable construction costs and Alternative 2 provides significant non-financial benefit over Alternative 2, Alternative 3 is not recommended.

2.1.4 Regional Alternatives

Reed City is the county seat of Osceola County and the largest community in the area. The potential regional alternative is the Big Rapids WWTP which is approximately 12.7 miles from the Reed City WWTP. The Big Rapids WWTP is designed to effectively treat a maximum hydraulic flow of 2.4 million gallons per day (MGD). Although the Big Rapids WWTP can handle this hydraulic flow rate, including temporarily higher flow spikes, continuous treatment is practical with typical daily flows of 1.0 to 1.2 MGD. Given the distance and the limited capacity of the Big Rapids WWTP, no viable regional alternative exists.

2.1.5 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 Analysis of Principal Alternatives

The alternatives analysis identified Alternative 2 as the only principal alternative. The following section provides the monetary evaluation, environmental evaluation, and evaluates other technical aspects of Alternative 2.

2.2.1 The Monetary Evaluation

A monetary evaluation has been completed for Alternative 2 using a 20-year net present worth analysis. A summary table for the monetary evaluation is provided in Table 10. Additional information on the monetary evaluation for Alternative 2 can be found in Appendix 6.

Table 10 - Monetary Evaluation Summary

Category	Alternative 2
Capital Cost	$14,000,000
Annual OM&R Cost	$1,473,954
Salvage Value	$3,521,867
Present Worth of OM&R Cost	$28,868,995
Present worth of Salvage Value	$3,383,907
20-Year Total Present Worth	**$39,485,088**

2.2.1.1 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.

2.2.1.2 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 operation, maintenance, and replacement (OM&R) costs minus the present worth of the salvage value at the end of the 20-year planning period. The present worth values for the OM&R and salvage value for Alternative 2 and the current operation are provided in Table 11.

Table 11 - Projected OM&R Costs

Category	2020 Actual OM&R	Alternative 2 Projected OM&R
Personnel Services	$503,489.00	$503,489.00
Contractual Services	$655,640.00	$655,640.00
Materials and Supplies	$72,080.00	$57,664.00
Utilities	$297,169.00	$222,877.00
Repairs and Maintenance	$44,781.00	$22,391.00
Equipment Rentals	$3,049.00	$3,049.00
Miscellaneous	$8,844.00	$8,844.00
Total	**$1,585,052.00**	**$1,473,954.00**

2.2.1.3 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 is shown in Table 10.

2.2.1.4 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.

2.2.1.5 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.

2.2.1.6 Mitigation Costs

No mitigation costs are anticipated as part of the project.

2.2.1.7 User Costs

Alternative 2 is anticipated to cost an average sewer user $22.33 per month. Thanks to diligent planning efforts, the City has been anticipating the significant investment required to implement the recommended improvements and has a health sewer fund balance. Additionally, Reed City qualifies as an economically Disadvantaged Community as defined by the State, which should allow some level of principal forgiveness through the SRF program. Portions of Alternative 2 may also be eligible for Green Project Reserve (GPR) principal forgiveness through SRF. The amount of potential principal forgiveness won't be known until EGLE is able to evaluate the project as presented in this report. Final impacts to sewer users are unknown currently. Assuming no principal forgiveness and if the City decides to not use the existing sewer fund to offset the cost of the project cost result in an increase in the monthly sewer bill of the averages sewer user of $22.33. This is a worst-case scenario based on the estimated project cost. Additional information on user costs is presented below.

2.2.2 Partitioning the Project

There is extensive and urgent need to complete the recommended Alternative 2. Delay of these improvements could result in detrimental financial and environmental impacts. Partitioning the project is not recommended.

2.2.3 The Environmental Evaluation

Alternative 2 eliminates the existing trestle bridge crossing. A break in this bridge could result in a SSO directly into the Hersey River. Alternative 2 will also provide a redundant influent forcemain under the Hersey River. If a failure were to occur with the current influent forcemain, the City would not be able to pump raw wastewater to the North Plant, which could result in adverse environmental impacts. Relocating the outfall to the North Plant will also make it easier to monitor plant effluent. Construction activities for Alternative 2 would be limited to the existing WWTP site and developed areas adjacent to the existing WWTP site.

2.2.4 Implementability and Public Participation

The implementability restrictions for this project are minimal. The financial burden of the project will be manageable for Reed City given the current state of the sewer fund. Intermunicipal agreements are not necessary for this project as the project serves the residents of Reed City 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 will be considered whenever possible throughout the design and construction of the proposed improvements.

2.2.5 Technical and Other Considerations

2.2.5.1 Infiltration and Inflow 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 collection system has been conducted. While I/I is present and the annual average dry weather flow is above 70 gpcd, hydraulic capacity in the collection system is not currently and has not historically been an issue. The City will continue to maintain the collection system and remove sources of I/I through their current O&M program. Based on this evaluation, I/I removal is not considered a cost-effective option for improving the WWTP performance.

2.2.5.2 Structural Integrity

The collection system was evaluated as part of a recently completed collection systems AMP. The National Association of Sewer Services Companies (NASSCO) Pipeline Assessment Certification Program (PACP) grading system was used to define the severity of pipe defects. Any possible structural deficiencies in the collection system will be addressed separately from this project. The collection system AMP will be made available upon request.

2.2.5.3 Sludge and Residuals

The Reed City WWTP currently produces aerobically digested biosolids and utilized liquid land application for ultimate disposal. Alternative 2 is not anticipated to impact biosolids quantity volume or disposal methods.

2.2.5.4 Industrial Pretreatment

The Reed City WWTP receives a significant portion of influent flow and load from one significant industrial user, General Mills-Yoplait. The City has a good working relationship with General Mills-Yoplait. Wastewater from General Mills-Yoplait is degritted prior to arrival at the Reed City WWTP. Reed City closely monitors the flow and load received from General Mills-Yoplait and bills are generated accordingly. Additional industrial pretreatment measures would not be effective at reducing the scope of improvements required.

2.2.5.5 Growth Capacity

The capacity of the proposed facilities under both Alternative 2 and Alternative 3 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. Alternative 2 improvements are planned to provide treatment for the projected 20-year flows and loadings.

2.2.5.6 Areas Currently Without Sewers

Reed City does not currently have any specific intentions of expanding the 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.

2.2.5.7 Reliability

Each alternative has been evaluated based on its ability to meet and consistently maintain permit limitation throughout the useful life of the project. Alternative 2 improvements will be designed to meet all USEPA reliability requirements for wastewater treatment plants. Alternative 2 provides the best overall system reliability of the alternatives evaluated.

2.2.5.8 Alternative Sites and Routings

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

2.2.5.9 Combined Sewer Overflows

The collection system for the Reed City WWTP is a separated system and does not have any combined sewer overflows (CSOs).

2.2.5.10 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, 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.

2.2.5.11 Green Project Reserve

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 2 are GPR eligible and may be eligible for partial principal forgiveness based on funding availability.

Removal of the trestle bridge and construction of the Commerce Drive Pump station will prevent water pollution and potential aquatic and riparian habitat degradation. Because this portion of the project protects water quality, the cost of these improvements may be GPR eligible. The removal of the trestle bridge will also allow for the restoration of wetlands and the Hersey River in accordance with 1.2-7 of the Guidance for Determining Project Eligibility.

The proposed tertiary filters replace the existing phosphorus removal clarifiers. The proposed tertiary filters will greatly reduce the amount of water that is recycled through the plant from approximately 30% of the forward flow to approximately 2% of the forward flow. This reduction in the recycle flow rate will have the added benefit of reducing the flow rate through the WWTP and will reduce the amount of energy required at the WWTP in accordance of 2.4-3 of the Guidance for Determining Project Eligibility.

The proposed equalization tank mixing systems are an innovative technology that will reduce energy consumption. Currently, surface mixers are used to mix the influent equalization tanks. Compressed gas mixing systems are proposed for these tanks. This innovative approach is expected to reduce the connected horsepower and energy consumption required for mixing by more than 20% in accordance with 3.2-2 of the Guidance for Determining Project Eligibility.

3.0 Selected Alternative

Based on a detailed evaluation, Alternative 2 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 Commerce Drive Pump Station

A collection system pump station is proposed on the north side of the Hersey River to eliminate the failing trestle bridge utility crossing. The existing trestle bridge spanning the Hersey River is a timber structure carrying an 8-inch sewer. An engineering condition assessment performed in 2017 identified a myriad of problems, stating that nearly every structural component of the bridge is in some form of disrepair or outright failure. The rotted and hollow condition of the longitudinal and transverse beams, in addition to the cracking of the vertical columns and braces, creates a hazard with an unpredictable failure timeframe. A failure of the trestle bridge would likely result in a SSO directly into the Hersey River, a designated trout stream. Because the Hersey River is a recreational river frequented by fisherman and kayakers, a failure of the structure presents a significant concern. A letter summarizing this evaluation is included in Appendix 7. The proposed Commerce Drive Pump Station project will eliminate the operational and environmental concerns associated with the failing trestle bridge. This pump station is proposed to have a rated capacity of 500 gpm (one duty, one standby). The force main from the Commerce Drive Pump Station will connect with the existing influent force mains at a proposed junction chamber near the entrance to the existing WWTP.

3.1.2 Influent Pump Station

An influent pump station is proposed on the South Plant site. This station will replace the existing influent pump station which is at the ended of its expected useful life. The existing influent pump station has a single force main crossing the Hersey River. There are operational concerns regarding the condition of the force main under the river, which was constructed as a part of earlier upgrades to the WWTP. Due to a lack of redundancy, the force main cannot be taken offline for condition evaluation, maintenance, or repairs. In the event of a pipeline failure, the City would have no backup method of transferring flow to the North Plant, resulting in a temporary inability to treat wastewater and the possible release of untreated wastewater to the Hersey River. The proposed Influent Pump Station improvement project provide a redundant force main and improve system reliability with a triplex, suction lift pump station. A redundant force main under the Hersey River is proposed; this second force main will improve system reliability, allow for periodic maintenance on the force mains, and alleviate concerns associated with a potential catastrophic failure of a single force main. The proposed influent pump station will maintain a firm pumping capacity of 1,000 gpm by providing three 500 gpm pumps (two duty, one standby).

3.1.3 Headworks Facility

The proposed headworks facility will replace the existing ineffective grit channel and the aging influent screen. The existing grit channels are not covered and present a safety concern. Because the grit channels are ineffective at removing grit, downstream processes are adversely impacted. The grit channels are functionally antiquated and should be replaced to improve safety and ease of operation. The proposed headworks facility includes a mechanical fine screen and a modern vortex grit removal system, each rated for an average flow rate of 1.8 MGD and a peak flow of 3 MGD, that will vastly improve grit removal effectiveness. The outdoor installation of the influent screen makes it difficult to perform maintenance in inclement weather conditions and has caused premature deterioration of the equipment. The proposed headworks facility includes an indoor mechanical screen that will improve operation efficiency, allow operators to perform maintenance in a controlled

environment, and will promote the longevity of the screening equipment. The headworks facility will be equipped with proper heating, ventilation and gas detection systems as required by National Fire Protection Association (NFPA) 820.

3.1.4 Influent Equalization

The existing surface aerators in the East and West EQ Basins are past their useful life and do not provide adequate mixing or aeration. Compressed gas mixing systems are proposed to provide reliable operation and reduce the overall energy consumption associated with influent mixing and aeration.

3.1.5 Biological Treatment

While the existing SBR treatment system is in fair overall condition, some of the existing instrumentation and controls are aging and finding replacement parts is becoming more difficult. Replacing the obsolete controls equipment will provide continued system reliability. Surface mixers, decanters, floats, and motors associated with the SBR system are also approaching the end of their useful life. Replacement of the existing mixers, decanters, floats, and motors is included in the scope of the project. The existing tanks require inspection and replacement of their seals and cathodic protection. Modifications are required for the existing air valves and actuators, and the decant valves and actuators. The existing diffusers in the SBR tanks are also aging and require replacement.

3.1.6 Tertiary Filtration

The exiting earthen equalization pond, ferric chloride storage and feed equipment, gravity river crossing, phosphorus removal clarifiers, and other assets associated with phosphorus removal located at the South Plant site have either reached their expected useful life or are in poor condition. Additionally, the current phosphorus removal clarifiers produce excessive recycle flows that increase the hydraulic loading on the facility. A tertiary equalization tank and new treatment building are proposed to be located within the footprint of the existing earthen equalization pond. The treatment building will house tertiary filters, ferric chloride storage, chemical feed pumps, and ultraviolet (UV) disinfection equipment.

3.1.7 UV Disinfection

The existing chlorine disinfection system equipment is aging and can be difficult to operate. The existing disinfection system will be eliminated and replaced with a UV disinfection system. The proposed disinfection system will be housed in the Tertiary Filtration and UV Disinfection Building. Disinfected plant effluent will be discharged to the Hersey River through a new gravity outfall.

3.1.8 Solids Handling

The existing aerobic digester and sludge storage tanks are generally in good condition. Minor improvements and modifications are required at this time, including mixing system upgrades and controls improvements.

3.1.9 Electrical Improvements

Relocating the headworks, tertiary filtration and disinfection to the north plant will necessitate a larger standby generator on the North Plant site as well as electrical distribution system improvements, which are included in Alternative 2.

3.1.10 Site Improvements

The existing driveway for the WWTP is currently sand, which can cause issues for biosolids haulers. Paving of the driveway, site lighting improvements, site security improvements are included in Alternative 2.

3.1.11 Building Modifications

The existing control building is over 20 years old and in need of improvement. The mechanical systems in the building need to be upgraded; failing doors, lighting and flooring need to be replaced, replaced; exterior catwalks need to be modified to allow better site access and safety.

3.2 Project Maps

Figure 10 depicts the proposed site plan for the selected alternative. Elements of this layout may change through the detailed design phase. Figure 11 shows a preliminary proposed WWTP flow schematic. 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, which is not expected to grow significantly as discussed in Section 1.7.4. The selected alternative is intended to provide treatment for the current influent waste strength which will provide treatment for the required 20-year planning horizon. The selected alternative is intended to meet the discharge permit requirements set in the NPDES permit. No court orders, federal or state enforcement orders, or administrative consent orders have been issued for the Reed City WWTP. The proposed improvements are intended to mitigate environmental impacts related to wastewater treatment.

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 move forward with construction. However, other sensitive features are not anticipated to be affected by the project after review of the wildlife and cultural resources within the project vicinity.

3.6 Schedule for Design and Construction

Many preliminary design tasks have been completed through past actions taken by the City. These past activities will allow the design for the proposed improvement to proceed upon completion of this Project Plan. See Table 12 for a summary of the design and construction activities schedule.

Table 12 - Design and Construction Schedule

Activities	Start Date	End Date
Design Engineering	June 2021	December 2021
Permitting	September 2021	December 2021
Bidding	December 2021	January 2022
Construction	February 2022	February 2024

Note that funding availability and permitting 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 $14 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
Influent Pump Station	$990,000
Commerce Drive Pump Station	$520,000
Headworks	$1,930,000
Influent Equalization, Biological Treatment, Tertiary Filtration and UV Disinfection	$10,380,000
Total Cost of Proposed Project	**$14,000,000**

3.8 Authority to Implement the Selected Alternative

Reed City owns the and operates the WWTP facilities and the land on which they are located. 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. Since the City qualifies as a disadvantaged community and portions of the project are GPR eligible, there may be an associated principal forgiveness to offset user rate increases even more. However, 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 present worth total cost of $14 million for the project. The monthly cost of the project over the life of the loan is $52,626.23.

- The present-day principal amount of loan is $14,000,000
- The total interest accrued at a 2.125% interest rate after the 30-year loan period is approximately $4,950,000.
- The future-value of the loan after the 30-year loan period is $18,950,000.
- Over 360 months (30 years), the monthly cost of the future-value of the project is approximately $52,640.

The average annual influent flow at the WWTP is 0.6 MGD. Of this total influent flow, approximately 60% is received from the General Mills-Yoplait facility. On average, 0.25 MGD of the influent is used by residential and commercial users, while 0.35 MGD is used by Yoplait. As such, approximately 60% of the monthly cost of the project will be allocated to Yoplait, while 40% of the allocation will be incurred by the remaining users in the system. Reed City reported 944 total wastewater customers during its 2020 fiscal year. Assuming no principal forgiveness and if the City decides to not use the existing sewer fund to offset the cost of the project cost result in an increase in the monthly sewer bill of the averages sewer user of $22.33. This is a worst-case scenario based on the estimated project cost. Table 14 presents some of the metrics used in the analysis.

Table 14 - Metrics Used in User Cost Evaluation

Calculation Parameters	Value
PROJECT COST ($)	
Principal Loan Amount	$14,000,000
Total Interest Accrued	$4,950,000
Future-Value of Loan Amount	$18,950,000
Monthly Value of Loan Amount	$52,640
Daily Value of Loan Amount	$1,731
AVERAGE DAILY DEMAND (MGD)	
Industry-Yoplait (MGD)	0.35
Residential and All Other Users	0.25
Total Daily Demand at WWTP	0.60
WASTEWATER USERS (#)	
Industry-Yoplait	1
Residential	943
CONTRIBUTION OF USERS TO DEMAND (%)	
Industry-Yoplait	60%
Residential	40%
MONTHLY COSTS OF PROJECT	
Industry-Yoplait	$31,583
Residential	$21,056
MONTHLY COST INCREASE PER USER	
Industry-Yoplait	$31,583
Residential (Per Wastewater User)	$22.33

3.10 Disadvantaged Community

Part 53, Clean Water Assistance, of the Natural Resources Environmental Protection Act, 1994 PA 451, as amended, provides benefits to municipalities who meet the state's criteria for disadvantaged community status. Reed City submitted the Disadvantaged Community Status Determination Worksheet with the Intent-to-Apply and confirmed it qualifies as a disadvantaged community. The submitted Disadvantaged Community Status Determination Worksheet is provided in Appendix 8.

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 15.

Table 15 - Proposed Project Useful Life

Proposed Improvement Activity	Activity Weighted Useful Life
Influent Pump Station	30.0
Commerce Drive Pump Station	30.5
Headworks	39.9
Influent Equalization, Biological Treatment, Tertiary Filtration & UV Disinfection	27.9

Proposed Improvement Activity	Activity Weighted Useful Life
Overall Project Weighted Useful Life	**30.4**

As shown in Table 15, the composite useful life for the project is 30.4 years. The total useful life exceeds the disadvantaged community loan terms for the SRF.

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 project includes the elimination of an aging trestle bridge that supports a sanitary sewer over the Hersey River. The project will also include the construction of a new sanitary sewer force main under the Hersey River. This work will occur in a floodplain and will meet all required 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 directional drilling operations. This is not anticipated to result in the removal of large trees or extensive areas of vegetation removal.

Rare, threatened, endangered, and special concern species have been identified in Section 1.2.2.1.2. It is not anticipated that construction activities will have a long-term impact on any of these species.

There no known historical and 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 Hersey River may be experienced, but mitigation efforts such as soil erosion and sedimentation control (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. Bore pits associated with the directional drilling will be constructed. No soils will be disposed of in, and no excess material will be stockpiled in a manner that will impact the Hersey River. Construction of the new outfall will be completed in a manner to minimize the direct impacts on the Hersey 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 am to 7:00 pm Monday through Friday, and 7:00 am to 1:00 pm on Saturday. Vehicular and pedestrian access will be maintained throughout construction.

4.1.2 Operational Impacts

The proposed project will relocate the existing discharge to the Hersey River. Consolidating treatment to the north plant site will improve the ability to maintain and operate the WWTP. The redundant force main under the Hersey River will improve system reliability, allow for periodic maintenance on the force mains, and alleviate

concerns associated with a potential catastrophic failure of a single force main. No proposed improvements will impact odors, noise, or traffic.

4.1.3 Social Impacts

Increased user costs are a social impact. Large increase in rates can create a negative impact. The user cost increase can be offset by using the existing sewer fund balance to offset project costs. Additionally, grant funding is anticipated to be available to reduce the total construction cost.

The construction phase of the projects will create temporary jobs and contribute favorably to the local economy. While the proposed improvements are not adding capacity, they are maintaining a critical service necessary for sustaining the local economy. A lack of action would negatively impact the significant industrial users in the community, thereby adversely impacting the economics of Reed City and the region.

4.2 Indirect Impacts

The proposed projects include the elimination of a failing sanitary crossing and the addition of a force main. These projects will protect the health, sanitation, and security of the community and the environment.

Following construction, the project site will be restored to its original condition. It is unlikely that the project will result in any adverse indirect impacts.

4.3 Cumulative Impacts

Water quality improvements to the Hersey River are the primary cumulative impacts that are anticipated. The surface water discharge will remain in accordance with NPDES permit regulations and is not anticipated to have a negative impact on the surface water quality of the receiving stream.

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 Mitigation of Short Term-Impacts

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 soil erosion and sedimentation control 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.
- All areas will be restored to their existing grade.
- The proposed improvements taking place at the WWTP are adjacent to the Hersey 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 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 short-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 had odor, aerosol, or noise issues. The proposed improvements are not anticipated to result in any odor, aerosol, or noise issues. Operational accidents are always possible. The proposed improvements provide redundancy and resiliency in the event of a WWTP upset. The existing plant does not currently have many provisions for handling a WWTP upset. Chemicals used in the treatment process

will be stored indoors in a bulk storage tank, 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.

5.3 Mitigation of Indirect Impacts

The WWTP capacity will remain the same with the completion of the improvement project. This capacity accommodates expected residential, commercial, and industrial growth within the sewer district for the foreseeable future. There are no negative indirect impacts identified that would be detrimental to the goals outlined in the *Reed City Community Comprehensive Plan.*

6.0 Public Participation

6.1.1 Public Hearing Advertisement

The public hearing was advertised in the *The Herald Review* on March 23, 2021. The advertisement listed the public hearing date, described the availability of the report for viewing, and briefly described the proposed projects and estimated costs. Due to the ongoing COVID-19 pandemic, the Project Plan was made available both online and at Reed City - City Offices 227 East Lincoln Avenue, Reed City for public review and comment.

The advertisement will be included in Appendix 9 of the final report.

6.1.2 Public Hearing Transcript

The online public hearing will be recorded. The video recording and verbatim transcript will accompany the final submittal of the Amendment.

6.1.3 Public Hearing Contents

The public hearing, to be held on April 26, 2021 will discuss the following:

- 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., treatment plant, 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.

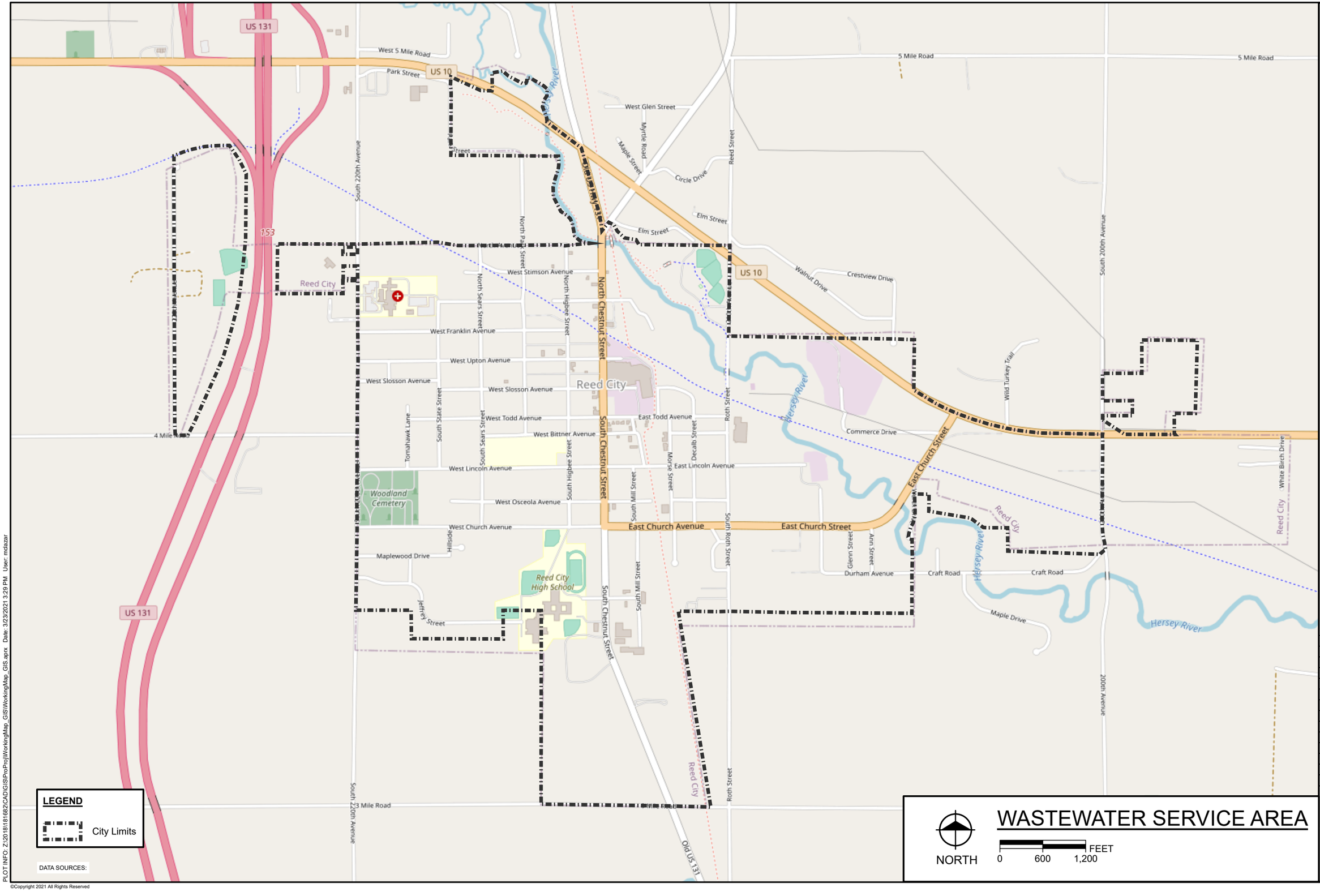
6.1.4 Comments Received and Answered

Following the formal public hearing, Appendix 10 will contain the following information:

- A typed list with the names and addresses of the people who attend the public hearing.
- A copy of any written comments that were received during the public comment period for the proposed project.
- The applicant's responses to the comments received.
- A description of any changes that were made to the project because of the public participation process.

6.2 Adoption of the Project Plan

The final project plan will be presented to the Reed City Council during the May 17, 2021, regular session. Following this meeting, Appendix 11 will include the Resolution Adopting the Final Project Plan and the CWSRF Project Plan Submittal Form.



LEGEND

City Limits

DATA SOURCES:

NORTH

WASTEWATER SERVICE AREA

0 600 1,200 FEET

PLOT INFO: Z:\2018\181682\CAD\GIS\ProPro\WorkingMap_GIS\WorkingMap_GIS.aprx Date: 3/23/2021 3:29 PM User: mdazar

fishbeck
Engineers | Architects | Scientists | Constructors

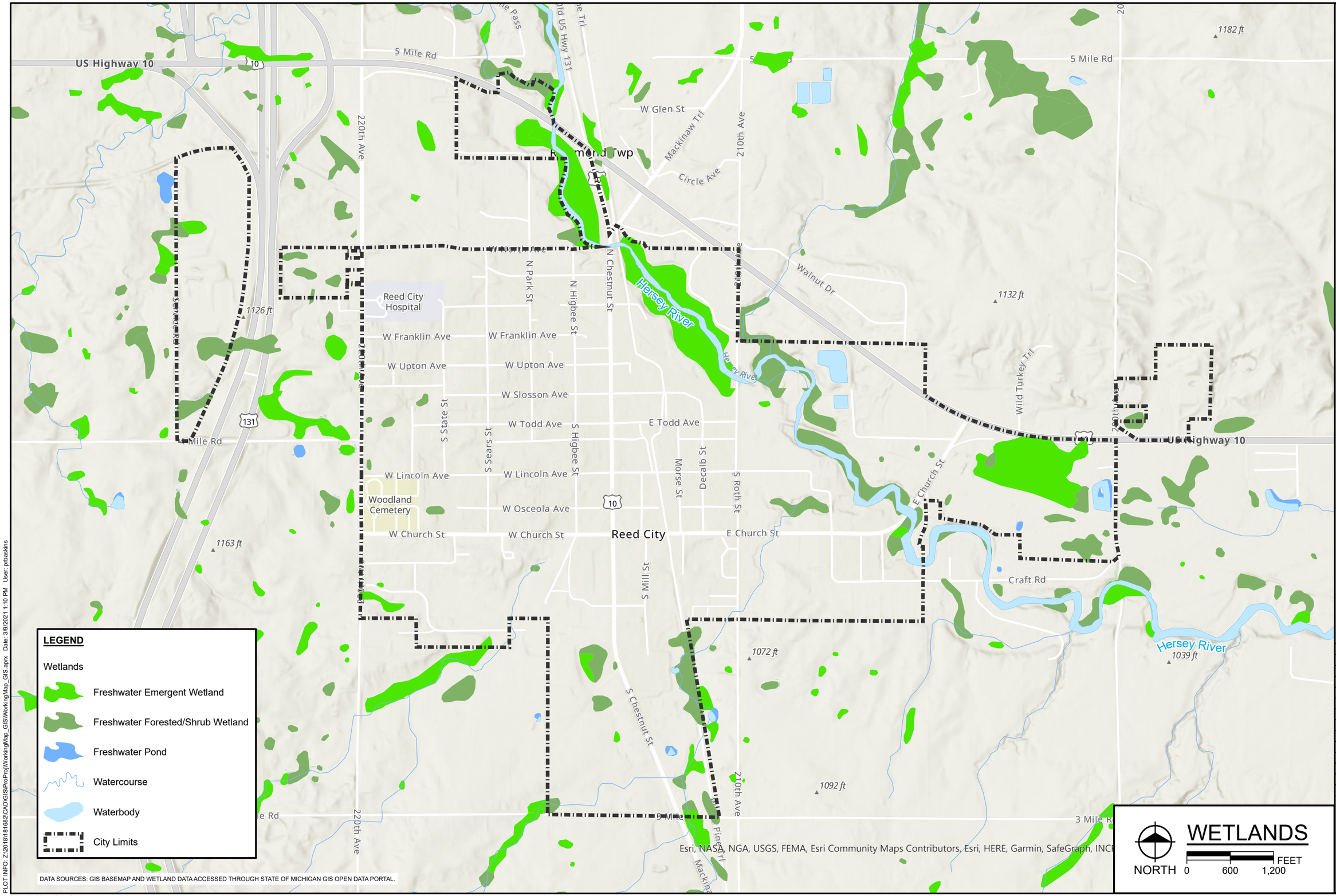
Hard copy is intended to be 11"x17" when plotted. Scale(s) indicated and graphic quality may not be accurate for any other size.

City of Reed City
Osceola County, Michigan

Clean Water State Revolving Fund (CWSRF) Project Plan

PROJECT NO.
181682

FIGURE NO.
1



PLOT INFO: Z:\2018\181682\CAD\GIS\ProPro\WorkingMap_GIS\WorkingMap_GIS.aprx Date: 3/9/2021 1:10 PM User: pbaskins

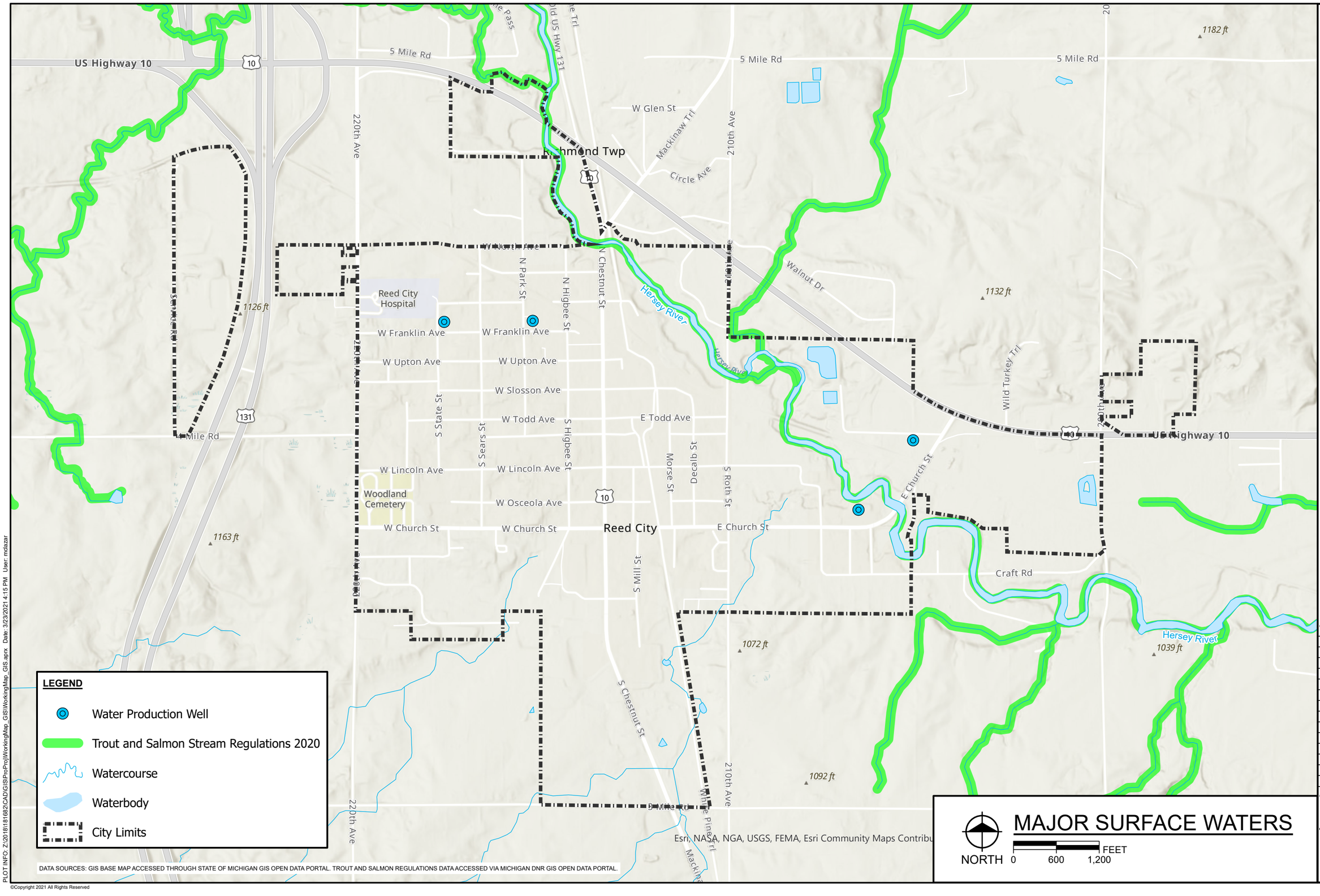
fishbeck
Engineers | Architects | Scientists | Constructors

Hard copy is intended to be 11"x17" when plotted. Scale(s) indicated and graphic quality may not be accurate for any other size.

City of Reed City
Osceola County, Michigan
Clean Water State Revolving Fund (CWSRF) Project Plan

PROJECT NO.
181682

FIGURE NO.
2



LEGEND

- Water Production Well
- Trout and Salmon Stream Regulations 2020
- Watercourse
- Waterbody
- City Limits

DATA SOURCES: GIS BASE MAP ACCESSED THROUGH STATE OF MICHIGAN GIS OPEN DATA PORTAL. TROUT AND SALMON REGULATIONS DATA ACCESSED VIA MICHIGAN DNR GIS OPEN DATA PORTAL.

Esri, NASA, NGA, USGS, FEMA, Esri Community Maps Contribu

NORTH

MAJOR SURFACE WATERS

0 600 1,200 FEET

fishbeck
Engineers | Architects | Scientists | Constructors

Hard copy is intended to be 11"x17" when plotted. Scale(s) indicated and graphic quality may not be accurate for any other size.

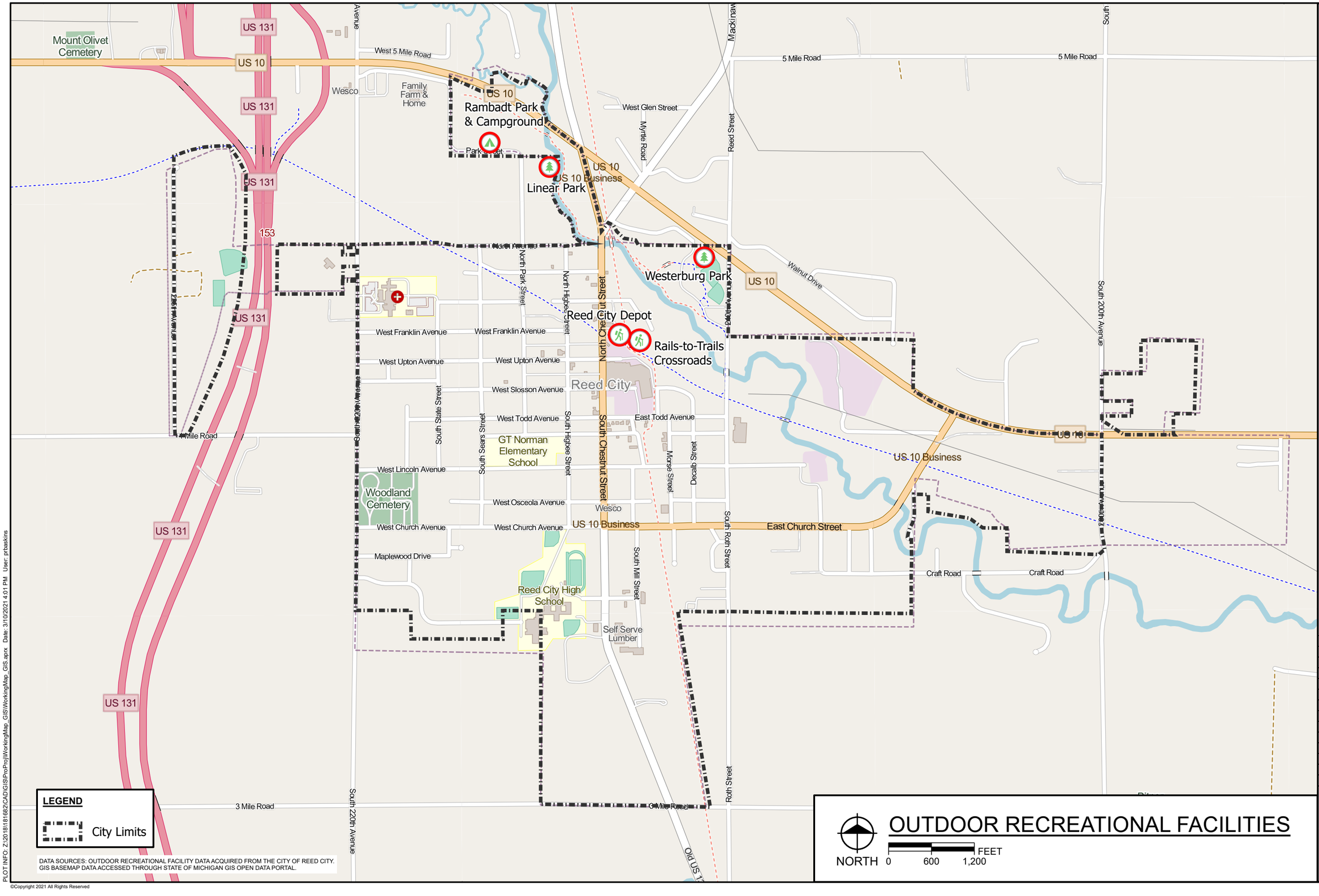
City of Reed City
Osceola County, Michigan

Clean Water State Revolving Fund (CWSRF) Project Plan

PROJECT NO.
181682

FIGURE NO.
3

PLOT INFO: Z:\2018\181682\CAD\GIS\ProjWorkingMap_GIS\WorkingMap_GIS.aprx Date: 3/23/2021 4:15 PM User: mdazar



LEGEND

City Limits

DATA SOURCES: OUTDOOR RECREATIONAL FACILITY DATA ACQUIRED FROM THE CITY OF REED CITY. GIS BASEMAP DATA ACCESSED THROUGH STATE OF MICHIGAN GIS OPEN DATA PORTAL.

NORTH

0 600 1,200 FEET

OUTDOOR RECREATIONAL FACILITIES

fishbeck

Engineers | Architects | Scientists | Constructors

Hard copy is intended to be 11"x17" when plotted. Scale(s) indicated and graphic quality may not be accurate for any other size.

City of Reed City

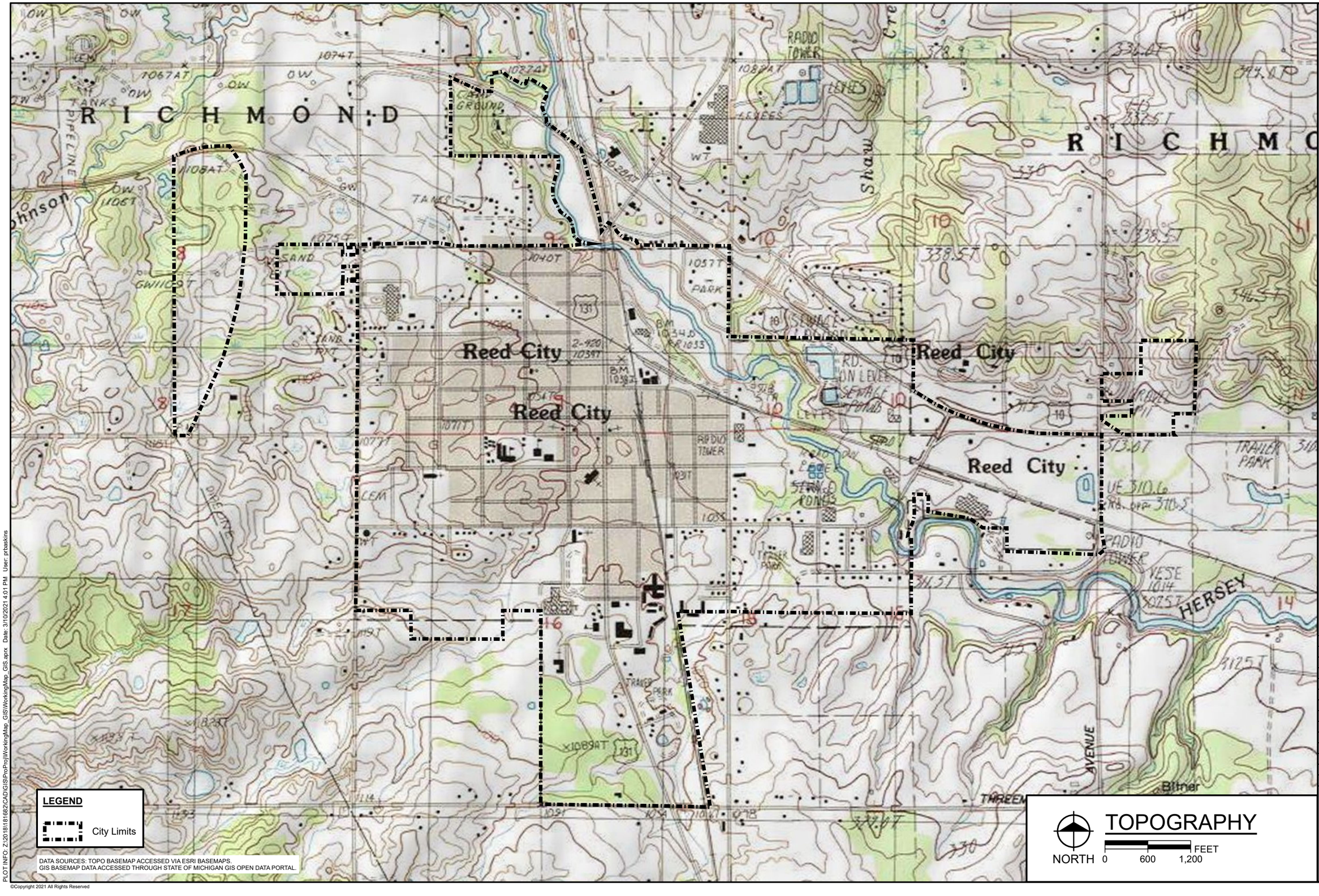
Osceola County, Michigan

Clean Water State Revolving Fund (CWSRF) Project Plan

PROJECT NO. 181682

FIGURE NO. 4

PLOT INFO: Z:\2018\181682\CAD\GIS\ProPro\WorkingMap_GIS\WorkingMap_GIS.aprx Date: 3/10/2021 4:01 PM User: prbaskins



PLOT INFO: Z:\2018\181682\CAD\GIS\ProjWorkingMap_GIS\WorkingMap_GIS.aprx Date: 3/10/2021 4:01 PM User: prbaskins

fishbeck
Engineers | Architects | Scientists | Constructors

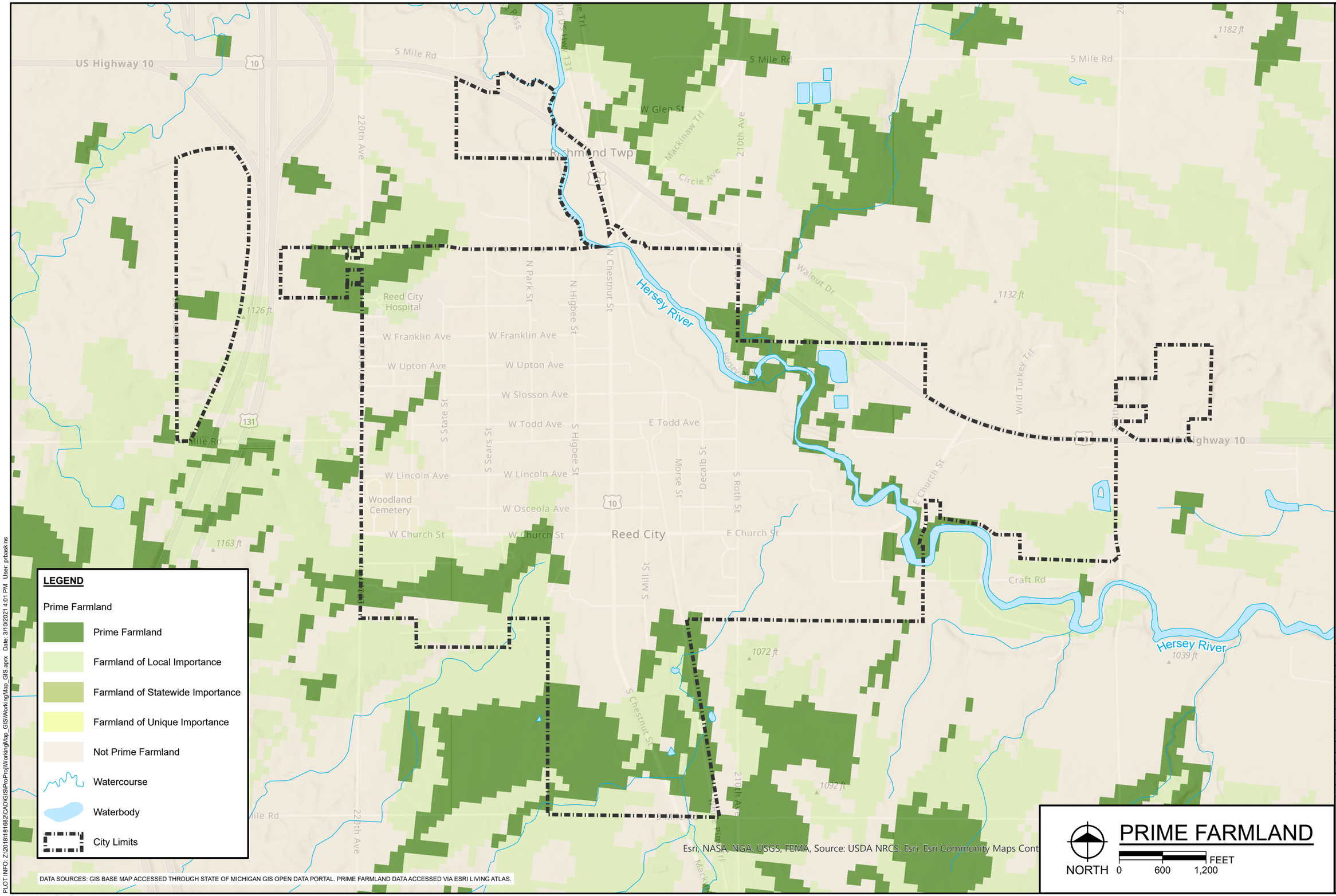
Hard copy is intended to be 11"x17" when plotted. Scale(s) indicated and graphic quality may not be accurate for any other size.

City of Reed City
Osceola County, Michigan

Clean Water State Revolving Fund (CWSRF) Project Plan

PROJECT NO.
181682

FIGURE NO.
5



LEGEND

Prime Farmland

- Prime Farmland
- Farmland of Local Importance
- Farmland of Statewide Importance
- Farmland of Unique Importance
- Not Prime Farmland
- Watercourse
- Waterbody
- City Limits

DATA SOURCES: GIS BASE MAP ACCESSED THROUGH STATE OF MICHIGAN GIS OPEN DATA PORTAL. PRIME FARMLAND DATA ACCESSED VIA ESRI LIVING ATLAS.

Esri, NASA, NGA, USGS, FEMA, Source: USDA NRCS, Esri, Esri Community Maps Cont

NORTH

PRIME FARMLAND

0 600 1,200 FEET

fishbeck
Engineers | Architects | Scientists | Constructors

Hard copy is intended to be 11"x17" when plotted. Scale(s) indicated and graphic quality may not be accurate for any other size.

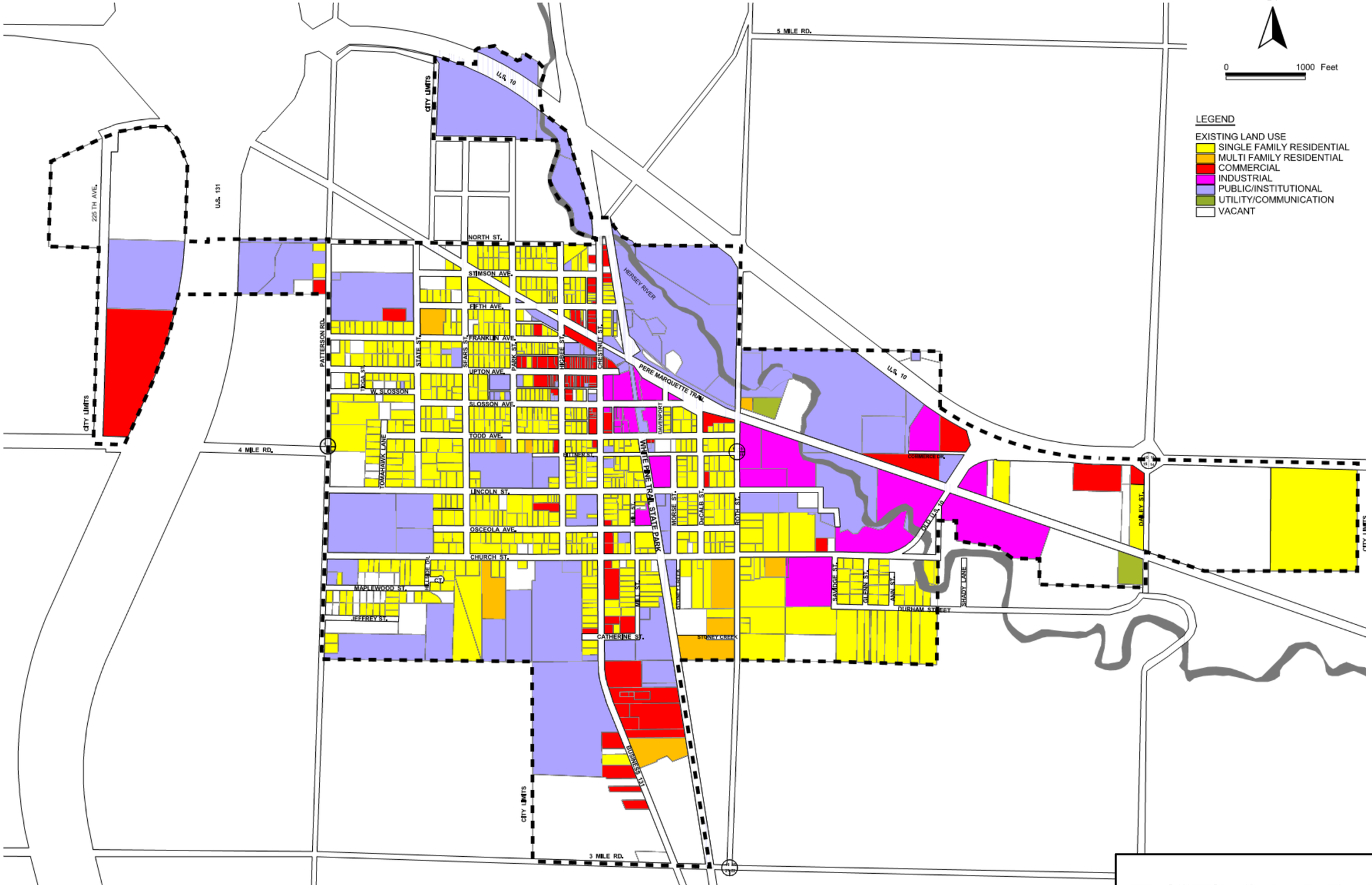
City of Reed City
Osceola County, Michigan

Clean Water State Revolving Fund (CWSRF) Project Plan

PROJECT NO.
181682

FIGURE NO.
6

PLOT INFO: Z:\2018\181682\CAD\GIS\ProjWorkingMap_GIS\WorkingMap_GIS.aprx Date: 3/10/2021 4:01 PM User: prbaskins



DATA SOURCES: CITY OF REED CITY GIS, 2004.
MICHIGAN SPCS CENTRAL ZONE, NAD 27 US FEET.

EXISTING LAND USE

fishbeck
Engineers | Architects | Scientists | Constructors

Hard copy is intended to be 11"x17" when plotted. Scale(s) indicated and graphic quality may not be accurate for any other size.

City of Reed City
Osceola County, Michigan
Clean Water State Revolving Fund (CWSRF) Project Plan

PROJECT NO.
181682

FIGURE NO.
7

PLOT INFO: Z:\2018\181682\CAD\GIS\ProPro\WorkingMap_GIS\WorkingMap_GIS.aprx Date: 3/10/2021 4:01 PM User: prbaskins

DATA SOURCES: CITY OF REED CITY GIS, 2004.
MICHIGAN SPCS CENTRAL ZONE. NAD 27 US FEET.

FUTURE LAND USE

fishbeck
Engineers | Architects | Scientists | Constructors

Hard copy is intended to be 11"x17" when plotted. Scale(s) indicated and graphic quality may not be accurate for any other size.

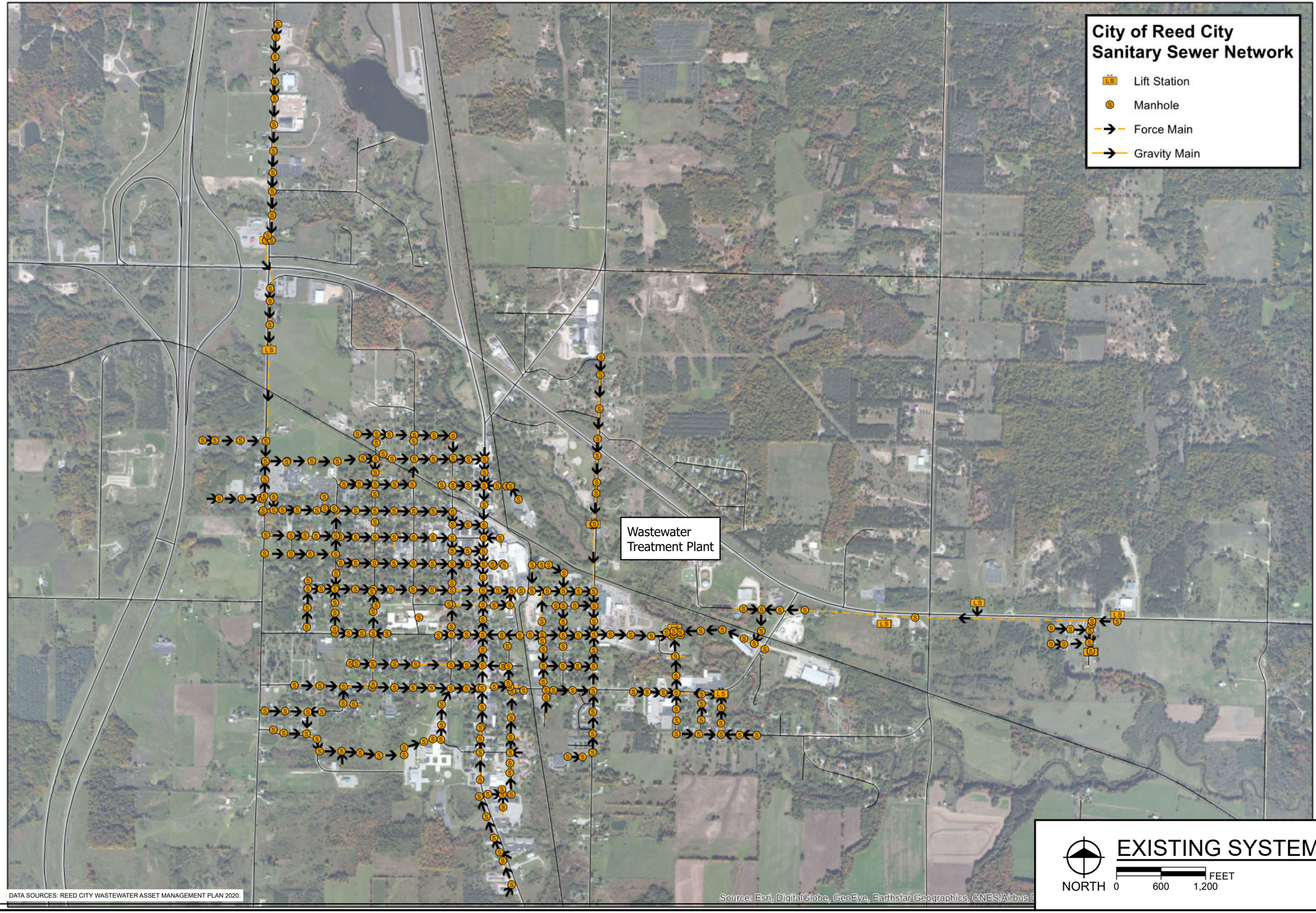
City of Reed City
Osceola County, Michigan

Clean Water State Revolving Fund (CWSRF) Project Plan

PROJECT NO.
181682

FIGURE NO.
8

PLOT INFO: Z:\2018\181682\CAD\GIS\ProjWorkingMap_GIS\WorkingMap_GIS.aprx Date: 3/10/2021 4:01 PM User: prbaskins



DATA SOURCES: REED CITY WASTEWATER ASSET MANAGEMENT PLAN 2020.

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus D

NORTH

EXISTING SYSTEM

0 600 1,200 FEET

fishbeck
Engineers | Architects | Scientists | Constructors

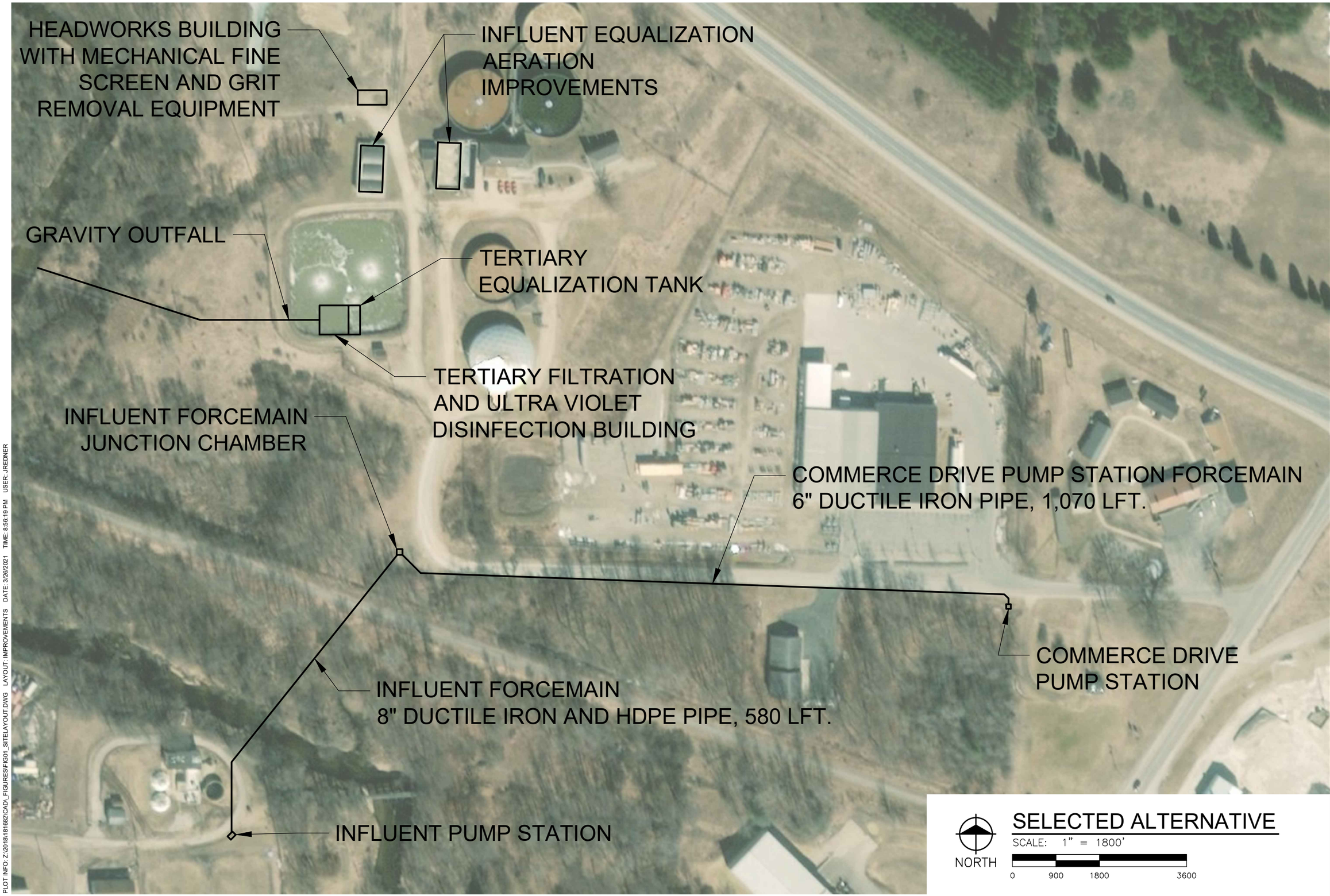
Hard copy is intended to be 11"x17" when plotted. Scale(s) indicated and graphic quality may not be accurate for any other size.

City of Reed City
Osceola County, Michigan
Clean Water State Revolving Fund (CWSRF) Project Plan

PROJECT NO.
181682

FIGURE NO.
9

PLOT INFO: Z:\2018\181682\CAD\GIS\ProjWorkingMap_GIS\WorkingMap_GIS.aprx Date: 3/23/2021 3:48 PM User: mdazar



NORTH

SELECTED ALTERNATIVE

SCALE: 1" = 1800'

0 900 1800 3600

fishbeck

Engineers | Architects | Scientists | Constructors

Hard copy is intended to be 11"x17" when plotted. Scale(s) indicated and graphic quality may not be accurate for any other size.

City of Reed City

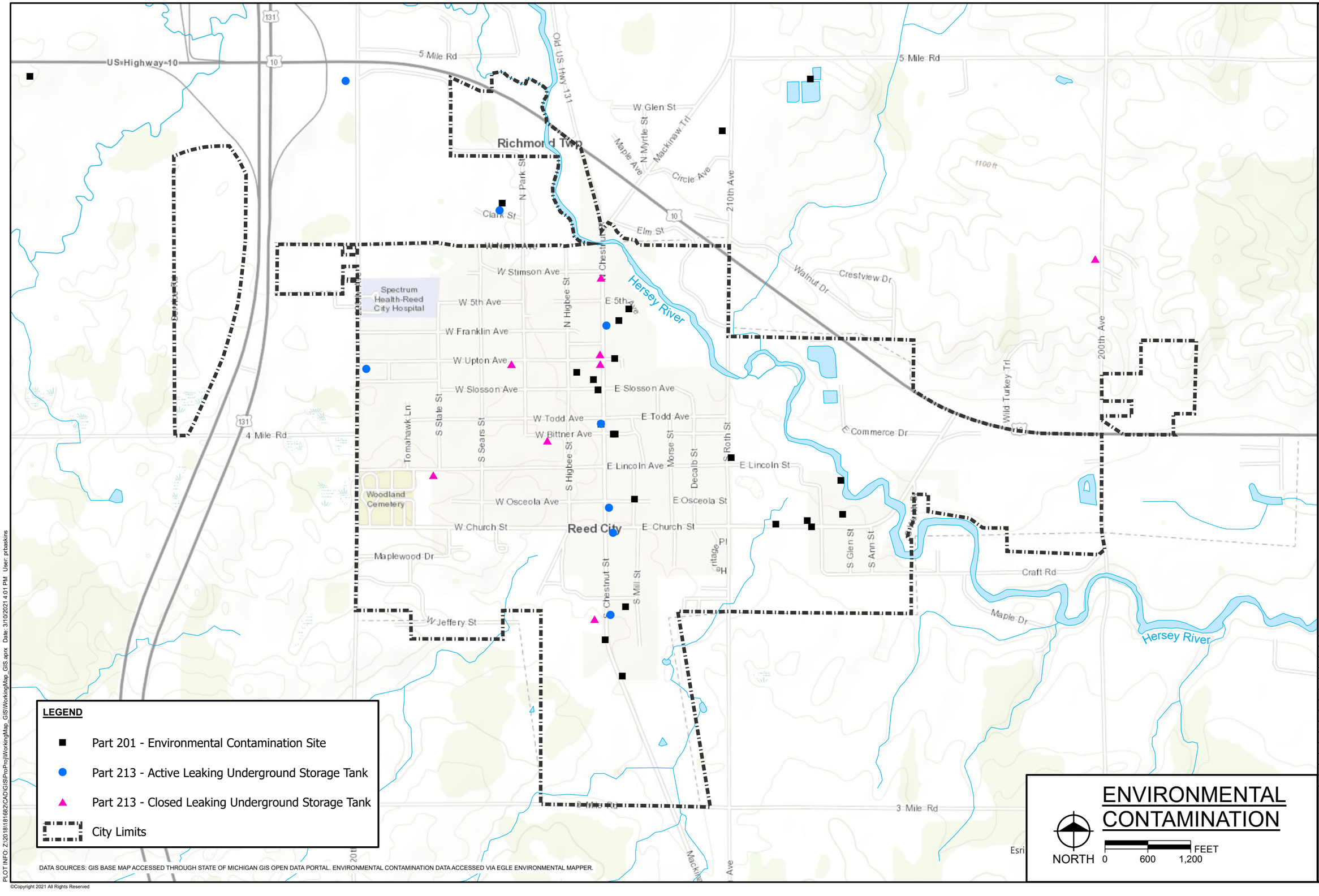
Reed City, Michigan

WWTP IMPROVEMENTS

NOT FOR CONSTRUCTION

PROJECT NO.
181682

FIGURE NO.
10



LEGEND

- Part 201 - Environmental Contamination Site
- Part 213 - Active Leaking Underground Storage Tank
- Part 213 - Closed Leaking Underground Storage Tank
- City Limits

DATA SOURCES: GIS BASE MAP ACCESSED THROUGH STATE OF MICHIGAN GIS OPEN DATA PORTAL. ENVIRONMENTAL CONTAMINATION DATA ACCESSED VIA EGLE ENVIRONMENTAL MAPPER.

ENVIRONMENTAL CONTAMINATION

NORTH 0 600 1,200 FEET

fishbeck
Engineers | Architects | Scientists | Constructors

Hard copy is intended to be 11"x17" when plotted. Scale(s) indicated and graphic quality may not be accurate for any other size.

City of Reed City
Osceola County, Michigan

Clean Water State Revolving Fund (CWSRF) Project Plan

PROJECT NO.
181682

FIGURE NO.
12

PLOT INFO: Z:\2018\181682\CAD\GIS\ProjWorkingMap_GIS\WorkingMap_GIS.aprx Date: 3/10/2021 4:01 PM User: rpbaskins