CITY of TRAVERSE CITY MICHIGAN

DWSRF PROJECT PLAN

PREPARED BY:

HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915

1925 Breton Road SE, Suite 100
Grand Rapids, Michigan 49506

HRC Job Number 20210137

JUNE 2021

Versions:

Draft May 6, 2021 (Submittal to EGLE)

Draft May 21, 2021 (Submittal to Public)

Final June 29, 2021 (Submittal to EGLE)

CHANGES MADE SINCE DRAFT PUBLICATION

The following items summarize the modifications made to this Final 2021 DWSRF Project Plan, since the draft 2021 DWSRF Project Plan was issued on Thursday, May 6, 2021.

- Minor typographic and/or grammar corrections.
- Addition of "Regional Alternatives" section to examine the feasibility of connecting the City's Drinking Water Distribution System to a regional water supply to service the existing water demands of the study area.
- Adjustment of the Fiscal Year in which projects are projected to be completed based on new data provided by the City of Traverse City.
- Agency correspondence letters were added to Appendix A.
- The public hearing information was added to Appendix G.
    - Affidavit of Publication
    - Copy of Presentation
    - Public Hearing Verbatim Transcript and List of Attendees
- The Commission Resolution was included in Appendix G.
- Project Plan Submittal Form was added to Appendix G.

Table of Contents

List of Figures

List of Tables

List of Appendices

1 Executive Summary

1.1 Summary

This Project Plan was prepared for the City of Traverse City to address Water Treatment Plant (WTP) and Water Distribution System deficiencies and aging facilities. This Project Plan, as prepared by Hubbell, Roth & Clark, describes the existing condition of various Drinking Water Distribution System components and the City's WTP with alternatives to meet those needs and the most cost-effective alternative.

The Project Plan will be submitted to the Michigan Department of Environment, Great Lakes, and Energy (EGLE) in order to qualify for possible Drinking Water State Revolving Fund (DWSRF) loan assistance. While the rates have not been set yet for FY2022, the rates in 2021 is 1.875% for 20-year loans. The Project Plan has been prepared following the DWSRF Project Plan Preparation Guidance Outline administered by The Office of Drinking Water and Municipal Assistance. These rules call for compliance with the basic Federal Planning Requirements and the National Environmental Policy Act (NEPA). The Project Plan will also serve as the basis for project prioritization and must be submitted to EGLE by July 1, 2021, in order to be considered for funding on the project priority list for the fiscal year 2022. These projects below provide an initial framework for evaluation and assessment.

1.2 Conclusions

The following is a summary of the existing issues identified in the Water Reliability Study and recommended by the City.

- Water Treatment Plant Improvements
  - WTP Emergency Generator
  - WTP High Service Pump Station Valves
  - WTP Backwash and Surface Wash Pumps
  - WTP Sodium Hypochlorite Storage Tanks and Building
  - WTP Electrical Switchgear Improvements
  - WTP Freight Elevator
  - WTP and Low Service Annual Pump Repair
- Distribution System Improvements
  - Watermain Replacments (multiple locations throughout City)
  - Wayne Hill Booster Station Improvements

1.3 Recommendations

The City of Traverse City should pass a resolution formally adopting the Project Plan and agree to implement the Drinking Water Distribution System and Water Treatment Plant Improvements outlined herein.

The City should submit this report to EGLE in order to attempt to qualify for a low-interest loan through the DWSRF Loan Program.

2 Project Background

2.1 Summary of Project Need

In an effort to meet various recently revised State requirements, improve system reliability, and address aging infrastructure that has reached its useful life, The City of Traverse City is proposing various projects within their Drinking Water Distribution System seeking financial assistance for this work through a low-interest rate loan offered by EGLE. This Project Plan identifies projects that will include improvements to both the water treatment plant and the distribution system on a fiscal year basis.

2.2 Study Area Description

2.2.1 Delineation of Study Area

The City of Traverse City is located in Grand Traverse County in the northwest Lower Peninsula. The City is situated on the southern shores of Grand Traverse Bay. The City maintains great pride in ensuring high-quality drinking water and reliability to its residents as well as protecting the clean waters of Grand Traverse Bay.

The City supplies potable drinking water to the City and three surrounding townships through bulk water agreements with Garfield Township (5 mgd maximum), Elmwood Township (0.75 mgd maximum), and Peninsula Township (1 mgd maximum). An emergency connection is also provided with the East Bay Township water distribution system which operates at a higher system pressure and a dissimilar water quality (groundwater source).

Figure 2-1 depicts the water system service area and Figure 2-2 depicts the City's water distribution system

The City's raw water supply is from an intake structure from the east arm of Grand Traverse Bay (East Bay). The City's original water supply was located near the City in West Bay in the 1890s and was relocated to East Bay, which is more protected from runoff and potential contamination sources, in 1965. Treatment is provided by a 20 million gallon per day (mgd) Water Treatment Plant (WTP) located in the City near the intake in East Bay. The WTP was converted to direct filtration in 1993 and is equipped with four low service pumps (raw water), two flocculators, five rapid sand filters, two clear wells, finished water storage, and five high service pumps (finished water).

The City's water distribution system provides water service for water use and fire flows throughout the City's service area. The City's system comprises 660,340 feet (125 miles) of water main and two booster pumping stations. Approximately two-thirds of the piping is cast iron and the majority of the water mains were constructed in the 1960s and prior. New ductile iron mains have been installed since the 1980s.

2.2.2 Land Use

The largest land use types within the City of Traverse City (excluding open spaces and utilities) are residential and commercial. A map with the current zoning districts within the City of Traverse City can be seen in the attached Figure 2-3. In addition, a map of the future land use within the City of Traverse City can be seen in the attached Figure 2-4. Future land use for the City was obtained from the City of Traverse City Master Plan.

West Arm of Grand Traverse Bay

PENINSULA TOWNSHIP

PD-PT_Underwood (950')

PENINSULA TANK
0.3 MG 840' (HWL)

Peninsula
Booster Station

PD-PT_1 (750')

PD-PT_Huron_Hills (920')

PD-PT_Hidden_Ridge (850')

PD-7 (920')

WCV-7

WCV-8

PD-5 (875')

PD-6 (850')

ELMWOOD TOWNSHIP

PROPOSED
MORGAN FARMS PUD
EXPANSION

PD-2 (885')

WCV-1340

WCV-1341

WCV-1328

WCV-1329

PD-3 (885')

PD-4 (1000')

WCV-1300

GRELICKVILLE
MASTER METER

WAYNE HILL GROUND
STORAGE TANK
1.3 MG 741' (HWL)

Wayne Hill
Booster Station

Low Service
Pump Station

Huron Hills
Booster Station

Water
Treatment
Plant

East Arm of Grand Traverse Bay

CEDAR RUN TANK
(APPROX. LOCATION)
1.0 MG 1200' (HWL)

Grayhawk Booster Station (Abandoned?)

Red Drive
Booster Station

PD-GT_Grayhawk (1200')

PD-GT_Munson (975')

PD-GT_TCAPS (1200')

PD-1 (750')

WTP
RESERVOIR
1.5 MG 610' (HWL)

TRAVERSE CITY

Boardman Lake

Copper Ridge PRV #2

Copper Ridge PRV #1

PD-8 (850')

VETERANS DRIVE
MASTER METER
(TO CITY)

CASS ROAD
MASTER METER

GARFIELD
MASTER METER

Herkner
Booster Station

HERITAGE ESTATES
STANDPIPE
0.3 MG 1090' (HWL)
ABANDONED IN PLACE

SummerHill PRV

Silver Lake PRV

Franke Road PRV

PD-GT_Supply (750')

StoneRidge PRV

SilverFarms PRV

PD-GT_Silver Farms (1000')

Cass Road PRV

PD-GT_Stone Ridge (875')

Garfield #1
Booster Station

BARLOW GROUND
STORAGE TANKS
6.0 MG 751' (HWL)

Garfield #2
Booster Station

EAST BAY TOWNSHIP
INTERCONNECTION
(EMERGENCY ONLY,
NORMALLY CLOSED)

EAST BAY TOWNSHIP

Arbors PRV

McCrae PRV

PD-GT_1 (875')

PD-GT_Heritage (1090')

PD-GT_Birmley (875')

SILVER PINES
BOOSTER STATION

MCRAE HILL TANK
2.25 MG 940' (HWL)

BIRMLEY ESTATES TANK
0.3 MG 879.0' (HWL)

TRADITIONS BOOSTER
STATION

PD-GT_Traditions (1090')

CITY of TRAVERSE CITY MICHIGAN

HRC
HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915

1925 BRETON ROAD SE SUITE 100
GRAND RAPIDS, MI 49506
(616) 454-4286
www.hrcengr.com

N
W E
S

0 1,250 2,500 5,000 Feet

LEGEND

- Check Valve
- PRV
- Water System Service Area
- County
- City/Township

Pressure Zone

750, 875, 1000, 1100, 1200

6", 8", 10", 12", 16", 18", 20", 24", 30", 36, Active

Pressure District HGL

750, 751 - 825, 826 - 884, 885 - 999, 1000 - 1090, 1091 - 1200

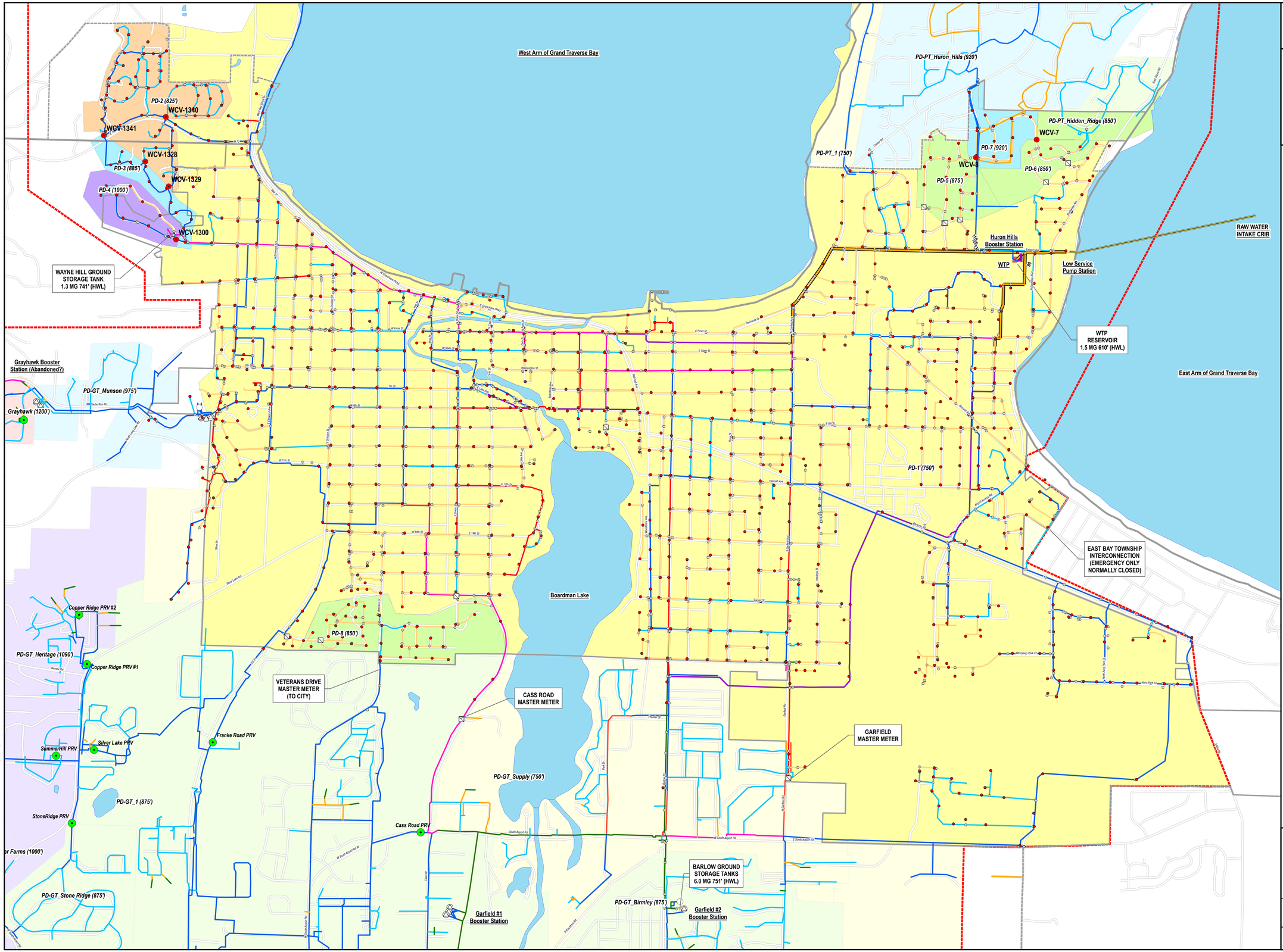
FIGURE 2.1

WATER SYSTEM SERVICE AREA AND PRESSURE DISTRICTS

2021 DWSRF
Project Plan

May 2021 | HRC #: 20210137

Date: 5/19/2021 Document Path: Y:\20210101\20210137\03_Studies\Working\GIS\Figure_2.1_Pressure_Districts.mxd



Document Path: V:\2019\01\20190111\03_Studies\Working\Lining

Date: 2/22/2021

CITY of TRAVERSE CITY MICHIGAN

HRC
HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915

1925 BRETON ROAD SE SUITE 100
GRAND RAPIDS, MI 49506
(616) 454-4286
www.hrcengr.com

N
W E
S

0 500 1,000 2,000 Feet

LEGEND

- Check Valve
- PRV
- Hydrant
- System Valve
- City/Township
- Water System Service Area
- County

Water Main

- 6"
- 8"
- 10"
- 12"
- 16"
- 18"
- 20"
- 24"
- 30"
- 36"

Pressure District HGL

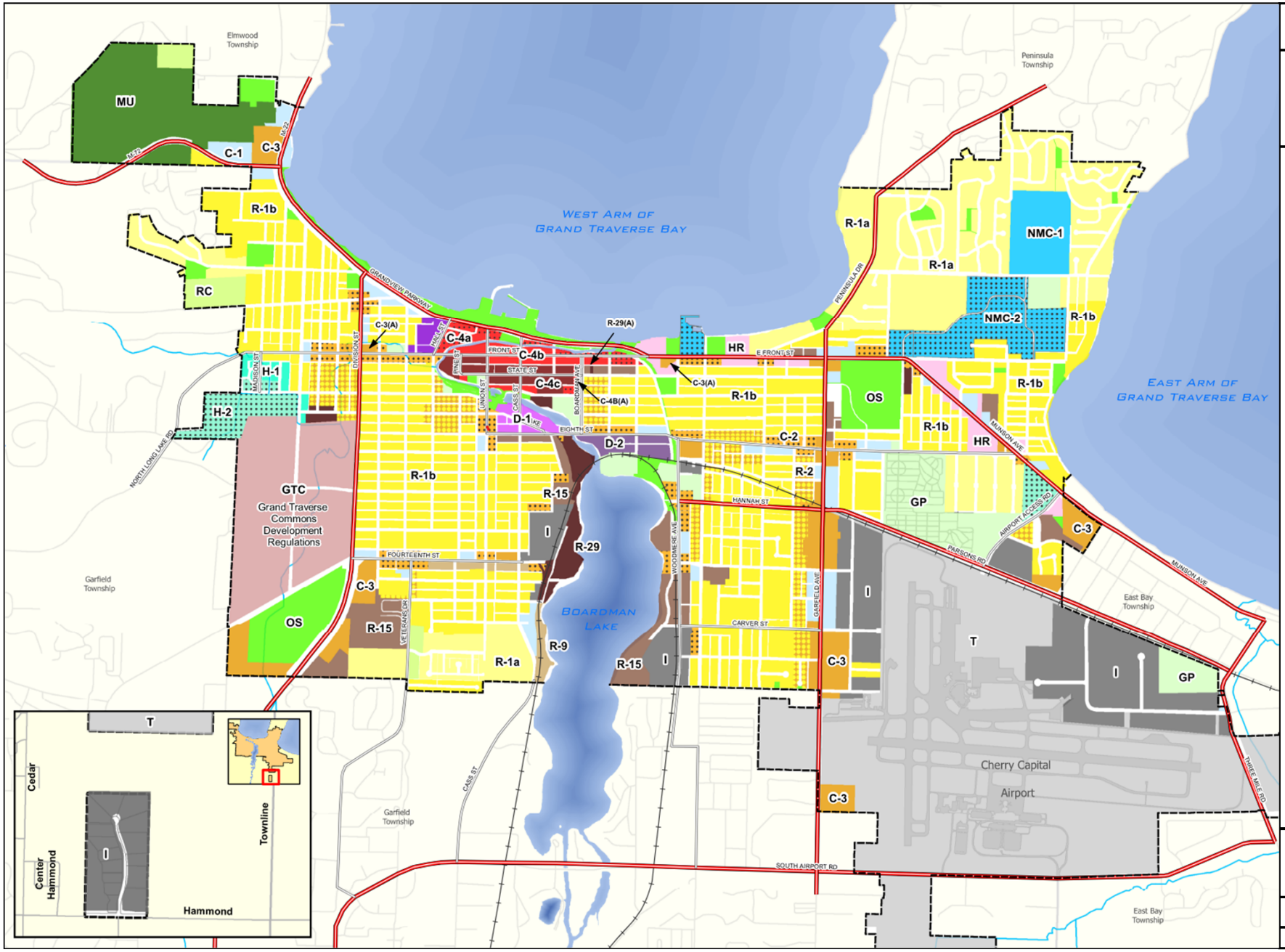
- 750
- 751 - 825
- 826 - 884
- 885 - 999
- 1000 - 1090
- 1091 - 1200

FIGURE 2.2

TRAVERSE CITY WATER DISTRIBUTION SYSTEM

2021 DWSRF
Project Plan

May 2021 | HRC#: 20210137



CITY of TRAVERSE CITY MICHIGAN

HRC
HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915
1925 BRETON ROAD SE SUITE 100
GRAND RAPIDS, MI 49506
(616) 454-4286
www.hrcengr.com

STREET CLASSIFICATION

- Arterial
- Collector

ZONING DISTRICTS

- C-1 Office Service
- C-2 Neighborhood Center
- C-3 Community Center
- C-4a Regional Center
- C-4b Regional Center
- C-4c Regional Center
- D-1 Development
- D-2 Development
- D-3 Development
- GP Government/Public
- H-1 Hospital
- H-2 Hospital
- HR Hotel Resort
- I Industrial
- R1/b Mixed Use
- NMC-1 University
- NMC-2 University
- OS Open Space
- GTC Grand Traverse Commons
- R-15 Multi Family Dwelling
- R-1a Single Family Dwelling
- R-1b Single Family Dwelling
- R-2 Two Family Dwelling
- R-29 Multi Family Dwelling
- R-9 Multi Family Dwelling
- RC Residental Conservation
- T Transportation
- (A) - Zoning Agreement

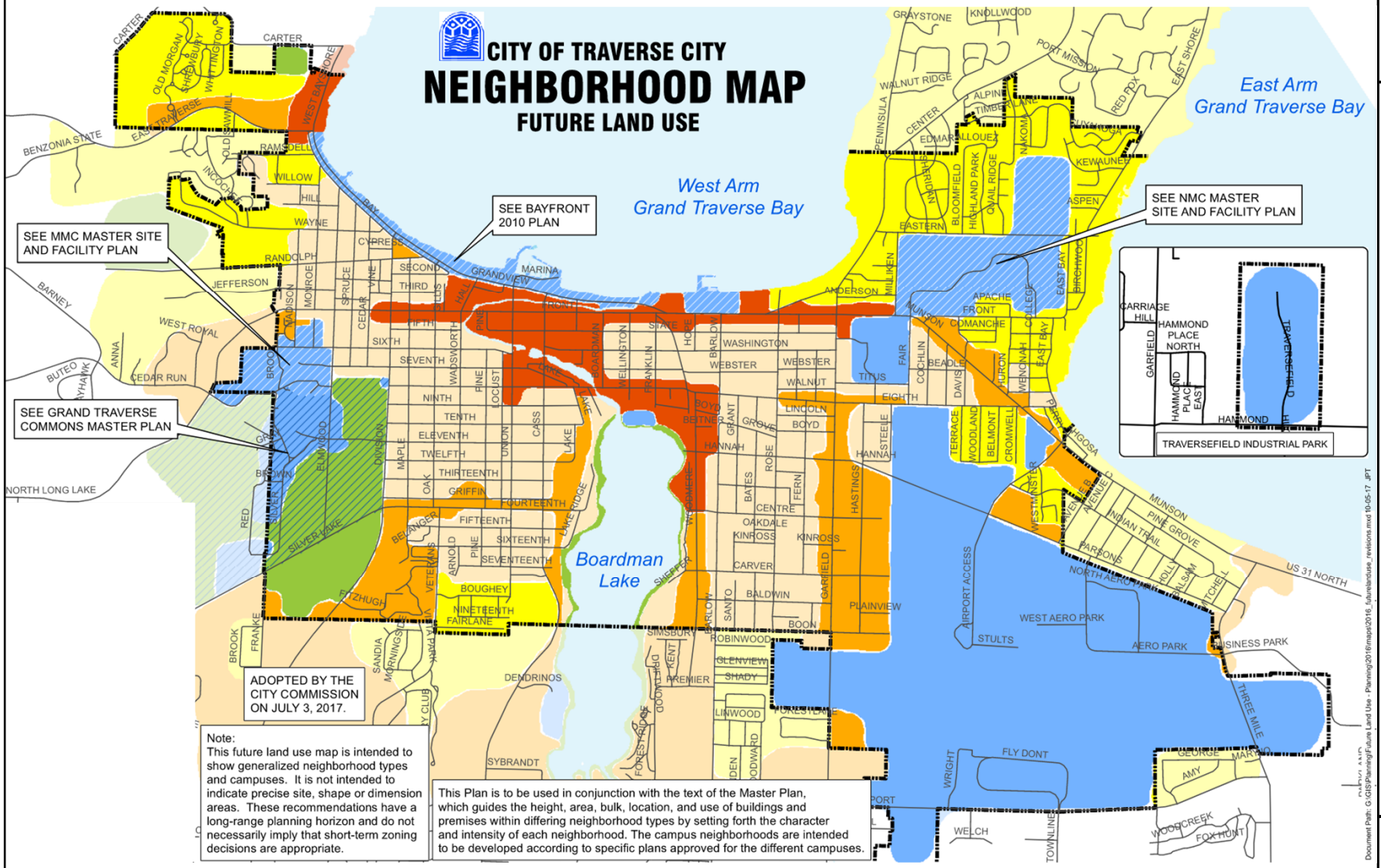
COURTESY OF TRAVERSE CITY PLANNING DEPARTMENT

FIGURE 2.3

CITY OF TRAVERSE CITY ZONING MAP

2021 DWSRF PROJECT PLAN

MAY 2021 | HRC#: 20210137



CITY of TRAVERSE CITY MICHIGAN

HRC
HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915
1925 BRETON ROAD SE SUITE 100
GRAND RAPIDS, MI 49506
(616) 454-4286
www.hrcengr.com

FIGURE 2.4

CITY OF TRAVERSE CITY
FUTURE LAND USE MAP

2021 DWSRF
PROJECT PLAN

MAY 2021 | HRC#: 20210137

2.2.3 Water Demands

The water consumption data was provided by the City and is provided in Table 2-1 provides a summary of the water use records in the City and each customer community.

Table 2-1. Water System Demands

Fiscal Year	Total Supplied (mgd)	Traverse City (mgd)	Garfield Township (mgd)	Peninsula Township (mgd)	Elmwood Township (mgd)	Total Billed (mgd)	Unaccounted Water (mgd)	Loss (as % of Supplied)
2010	4.81	2.17	1.58	0.13	0.019	3.90	0.91	18.9%
2011	5.38	2.15	1.64	0.13	0.017	3.93	1.45	27.0%
2012	5.89	2.30	1.71	0.16	0.020	4.19	1.70	28.9%
2013	6.00	2.33	1.55	0.16	0.031	4.08	1.92	32.0%
2014	5.69	2.49	1.35	0.15	0.032	4.03	1.67	29.3%
2015	5.71	2.17	1.41	0.16	0.041	3.74	1.93	33.8%
2016	5.83	2.32	1.63	0.19	0.031	4.18	1.66	28.4%
2017	5.34	2.39	1.68	0.17	0.031	4.26	1.08	20.2%
2018	5.19	2.06	1.80	0.18	0.032	4.07	1.12	21.6%
2019	5.41	2.47	1.69	0.17	0.028	4.35	1.06	19.6%
2020	4.85	1.94	1.79	0.20	0.039	3.97	0.88	18.1%

Notes:

1. From City's Water Output and Financial History Report
2. Community demands from Township meter records

Unaccounted for water or water loss in the system from unmetered losses were determined by tabulating the water pumped and comparing the billed amount for the City and each Township. Water loss estimates before 2017 are less accurate as the new high service pump station flow meters were installed in November 2015. Since 2017, the unaccounted water comprises approximately 19.9% of the total water supplied. The typical goal of unaccounted water in municipal water systems is 10%. The estimated losses are not adjusted for seasonal flushing and fire flows which can comprise up to 2% of the water loss.

2.3 Population Data

Population numbers and projections for Grand Traverse County and the City of Traverse City came from the United States Census Bureau database. The U.S. 2010 Census Bureau data estimated the average household size in the City at 2.18 people per household. The population projections for the City of Traverse City and Grand Traverse County are shown below in Table 2-2.

Table 2-2. Population Projections

Year	Grand Traverse County	City of Traverse City		Garfield Township		Elmwood Township		Peninsula Township		Total
	Total	Total	Service	Total	Service	Total	Service	Total	Service	Service
1990	64,273	15,115	15,115	10,516	NA	3,427	NA	4,340	NA	NA
2000	77,654	14,532	14,532	13,840	9,985	4,264	321	5,265	1,570	26,408
2010	86,986	14,674	14,674	16,526	11,923	4,503	339	5,433	1,620	28,556
2015	91,541	15,323	15,323	16,953	12,231	4,500	339	5,696	1,699	29,591
2020	98,023	14,818	14,674	20,028	14,450	4,762	358	5,609	1,673	31,155
2025	104,056	14,891	14,674	22,049	15,907	4,897	369	5,699	1,700	32,649
2030	110,461	14,963	14,674	24,273	17,512	5,036	379	5,790	1,727	34,292
2040	124,477	15,110	14,674	29,417	21,223	5,325	401	5,978	1,783	38,081
Growth Rate	1.20%	0.10%		1.94%		0.56%		0.32%		0.81%

Notes:
1. Population data from the US Census Bureau, Networks Northwest, and City of Traverse City
2. 5-year planning period will be 2025 and the 20-year planning period will be 2040
3. Correspondence with City

2.4 Economic Characteristics

The major industries in the City of Traverse City are Health Care & Social Assistance (1,396 people), Retail Trade (1,008 people), and Accommodation & Food Services (844 people). The median household income for the City of Traverse City was $57,076 in 2019. The median household income is approximately 0.11% lower than the median Michigan household income and 9.18% less than the U.S. median household income. Table 2-3 shows the City of Traverse City, Grand Traverse County, and Leelanau County median household income comparison below.

Table 2-3. Study Area Household Income

Municipality	Median Annual Household Income
City of Traverse City	$57,076
Grand Traverse County	$61,485
Leelanau County	$63,575

*Source: https://www.census.gov/quickfacts/fact/table/MI,traversecitycitymichigan,grandtraversecountymichigan/PST045219

2.5 Cultural and Environmental Settings

2.5.1 Cultural Setting

The City of Traverse City has 4 historical districts and 5 historical properties listed under the National Register of Historic Places. The State Historic Preservation Office (SHPO) is to be contacted for proposed work within the affected Historic Districts. The relatively shallow excavations needed to complete the proposed work will be contained within public right-of-way and on private properties. All the proposed work will occur at the same location as existing facilities and lines. Restoration of surface features disturbed by this construction will match existing conditions as much as practicable. Therefore, there is no anticipated permanent impacts on any historical, archeological, geological, cultural, or recreational areas due to this construction. EGLE will be coordinating with the SHPO for final determination of historic properties impacted.

2.5.2 The Natural Environment

Climate

The project area's climate is controlled by its location with respect to major storm tracks that pass through the Midwest and by the influence of Lake Michigan and the Grand Traverse Bay. Lake Michigan tends to moderate and smooth out most climate extremes. Consequently, the City generally experiences warm, mild summers and severe winters. The summer high is around 80 degrees Fahrenheit, and the winter low is around 16 degrees Fahrenheit. Precipitation is distributed through all months of the year. Lake-effect snowfall constitutes a large percentage of the total annual snow accumulation, which averages around 118 inches. Periods of snowfall typically last from November to April, although light snow as late as May or as early as late September sometimes occur. Rain averages around 33 inches annually.

The growing season averages 152 days in length. Average date of the last freezing is May 27; average date of the first freezing temperature is October 1.

Climatological data is collected by the National Oceanic and Atmospheric Administration (NOAA). This project, and the alternatives discussed, will have no impact on the climate of the project.

Air Quality:

Mobile source emissions, mainly from automobiles, are the primary source of outdoor air pollution in this area. The area has the noise pollution characteristics of a typical, tourist-driven community. No noise pollution problems exist in residential areas, other than from traffic noise from adjacent major roadways. Commercial and business areas experience only normal traffic noise.

Air quality is not anticipated to be an issue for this project, apart from temporary dust and debris from construction and minimal odors from the Cured-in-Place-Pipe curing material. All necessary notifications will be distributed to the public when this occurs and all regulations for this odor will be followed.

Wetlands:

There are no localized wetlands associated within the existing project footprint where the work is anticipated. For final design, any wetlands that may be impacted would be flagged and the appropriate EGLE and USACE permits will be applied for. However, it is not anticipated to be an issue for this project. Wetland maps are shown in Figure 2-5.

Great Lake Coastal Zones:

The major body of water north of the City of Traverse City is Grand Traverse Bay, which is approximately 0.25 miles from the WTP. The WTP is located on southeast sector of the peninsula jutting out into the Bay. For this project plan, no impacts will be made to the Bay or tributary areas.

Floodplains & Surface Waters:

The study area is located entirely in the Grand Traverse Bay Watershed. The watershed encompasses 976 square miles with nine sub watersheds that drain directly into the Grand Traverse Bay.

The City of Traverse City is located along the Grand Traverse Bay. Area groundwater is not used as a source of drinking water within the City. Water supply for the City is obtained via the City of Traverse City Water Treatment Plant from Lake Michigan. There will be no major impacts to the great lake coastal zones, floodplains, and surface waters, however, proper permits will be acquired, and steps will be taken to avoid any damage or permanent disruption which could affect the nearby floodplain. Any work which impacts the floodplain will only be undertaken after first contacting EGLE and obtaining the appropriate permits.

FEMA floodplain maps are shown in Figure 2-6.

Natural or Wild and Scenic Rivers:

The scope of this project is throughout the City of Traverse City and associated townships. Kids Creek and the Boardman River are located within the City. The location of these improvements and construction will be planned to not occur or impact the nearby rivers. See Appendix B for the attached documentation of the Nationwide Rivers Inventory correspondence.

Recreation Facilities:

The City of Traverse City owns 34 parks and recreational properties, ranging from a small downtown parcel to the larger Hickory Hills Ski Area, Grand Traverse Commons and Brown Bridge Quite Area. Much of the park land is heavily concentrated along the Boardman River and along the shoreline of the West Grand Traverse Bay. In total, over 1,600 City-owned acres are currently dedicated to the recreational pursuits including Hickory Hills Ski Area and Grand Traverse Commons that are each approximately 125 acres and Brown Bridge Quite Area, located 10 miles southeast of the City, has nearly two square miles (1,310 acres) of natural area along the Boardman River. No parks or other publicly owned facilities will be impacted by the proposed work.

National Natural Landmarks:

There are no registered natural landmarks in Grand Traverse county, therefore no National Natural Landmarks will be affected.

Topography:

The terrain within the City of Traverse City is characterized as relatively flat but has relative low spots near the Grand Traverse Bay. The lowest point at about 600 feet above sea level is in the north region of the City on the bay along the shoreline. The highest point is about 800 feet above sea level on the outskirts of the City heading out toward the Chillier project associated townships.

A set of United States Geological Survey (USGS) topography maps of the city and surrounding townships are shown in Figure 2-7 through Figure 2-11.

Geology:

The City of Traverse City is typified by eolian, lake, and glacial deposits. The lake sand deposits make up the larger portion of the City of Traverse City. Two types of bedrock make up the bedrock surface in the City of Traverse City, Ellsworth Shale and Coldwater Shale.

Soils:

According to the USDA Natural Resources Conservation Service Web Soil Survey, the City of Traverse City the 3 main soils located within the City are Loamy Sand (27.53%), Sandy Loam (14.78%), and Sand (39.73%). See Appendix C for documentation of the Web Soil Survey results.

As part of the final design process, soil borings will be taken near the proposed work areas to determine if any special construction methods will be needed.

Agricultural Resources:

There is no agricultural land located within the project limits. The project area is within developed and human use land cover; therefore, no agricultural resources will be impacted by the proposed work.

Existing Plant and Animal Communities:

Wildlife within the study area includes animals and birds normally associated with urban or agricultural environments. Because this project will be contained in an urban area where no suitable wildlife habitat is present as well as limited to existing structures, it is not necessary to contact U.S. Fish and Wildlife (USFW) to confirm that there will be no effect to endangered or threatened species. A list of all endangered and threatened species generated by the Michigan Natural Features Inventory can be seen in Appendix D.

CITY of TRAVERSE CITY MICHIGAN

HRC
HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915
1925 BRETON ROAD SE SUITE 100
GRAND RAPIDS, MI 49506
(616) 454-4286
www.hrcengr.com

LEGEND

WETLANDS

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

RIPARIAN

- Forested/Shrub
- Herbaceous

COURTESY OF U.S. FISH & WILDLIFE SERVICE

FIGURE 2.5

CITY OF TRAVERSE CITY
WETLANDS MAP

2021 DWSRF
PROJECT PLAN

MAY 2021 | HRC#: 20210137

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) Report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS Report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study Report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 16. The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713- 3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was provided in digital format by the National Agricultural Imagery Program (NAIP). This information was photogrammetrically compiled at a scale of 1:12,000 from aerial photography dated 2007 or later.

The **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have **questions about this map,** how to order products, or the National Flood Insurance Program in general, please call the **FEMA Map Information eXchange (FMIX)** at **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0113C

FIRM

FLOOD INSURANCE RATE MAP

GRAND TRAVERSE COUNTY, MICHIGAN
(ALL JURISDICTIONS)

PANEL 113 OF 425
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

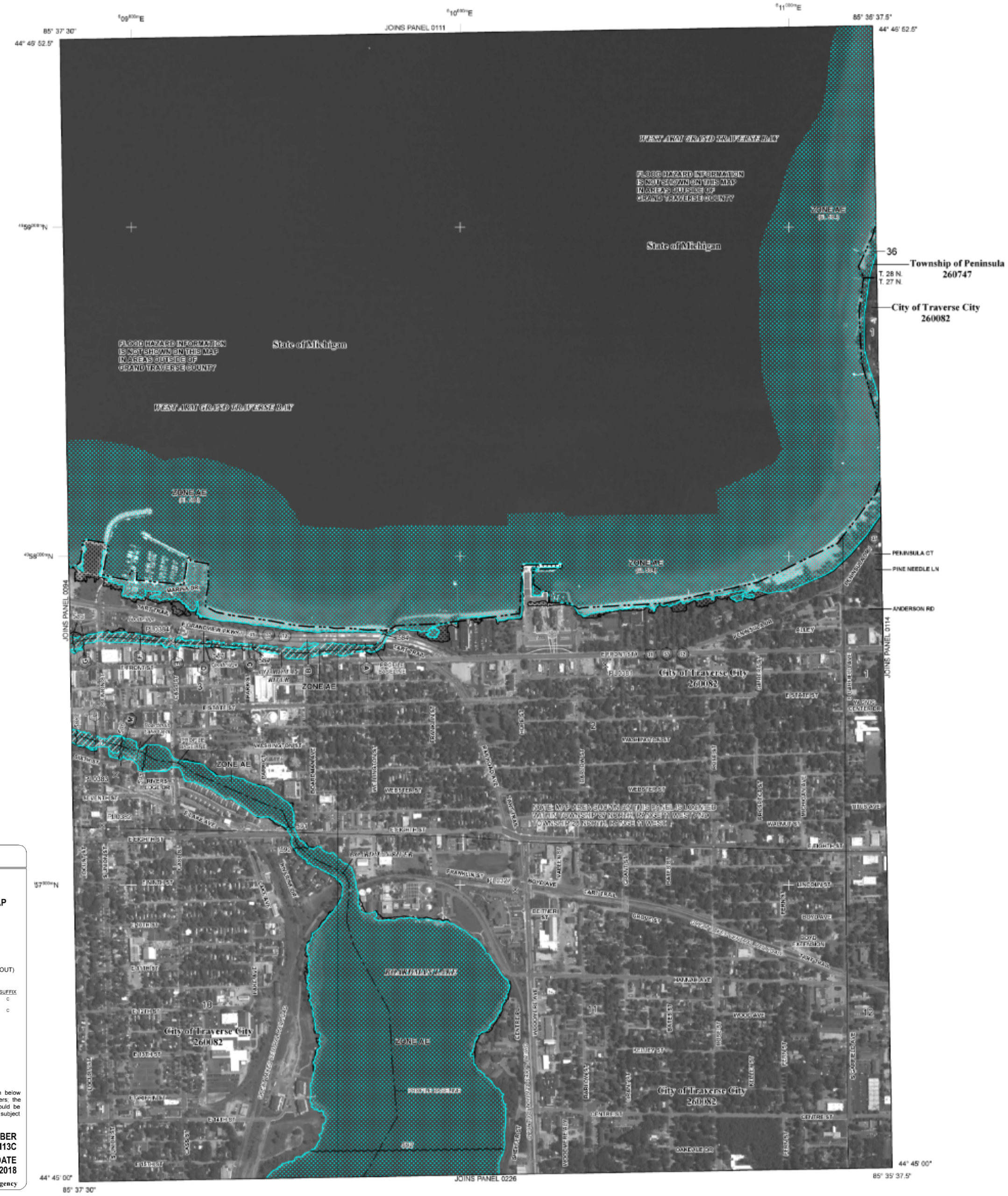
COMMUNITY	NUMBER	PANEL	SUFFIX
PENINSULA, TOWNSHIP OF	260747	0113	C
TRAVERSE CITY, CITY OF	260082	0113	C

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
26055C0113C

EFFECTIVE DATE
AUGUST 28, 2018

Federal Emergency Management Agency



CITY of TRAVERSE CITY MICHIGAN

HRC
HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915

1925 BRETON ROAD SE SUITE 100
GRAND RAPIDS, MI 49506
(616) 454-4286
www.hrcengr.com

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X — Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X — Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D — Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

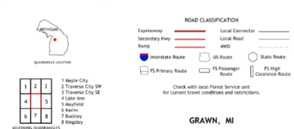
CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% Annual Chance Floodplain Boundary
0.2% Annual Chance Floodplain Boundary
Floodway boundary
Zone D boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.
~~~513~~~ Base Flood Elevation line and value; elevation in feet*
(EL 987) Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

A—A Cross section line
23- - -23 Transect line
45° 02' 08", 93° 02' 12" Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere
4989000m N 1000-meter Universal Transverse Mercator grid values, zone 16
DX5510 × Bench mark (see explanation in Notes to Users section of this FIRM panel)
• M1.5 River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
August 28, 2018

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'
250 0 500 1000 FEET
150 0 150 300 METERS

FIGURE 2.6

CITY OF TRAVERSE CITY
FLOODPLAIN MAP

2021 DWSRF
PROJECT PLAN

MAY 2021 | HRC#: 20210137
~~~

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

The National Map
US Topo

GRAWN QUADRANGLE
MICHIGAN - GRAND TRAVERSE COUNTY
7.5-MINUTE SERIES



GRAWN, MI
2019

CITY of TRAVERSE CITY MICHIGAN

HRC
HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915
1925 BRETON ROAD SE SUITE 100
GRAND RAPIDS, MI 49506
(616) 454-4286
www.hrcengr.com

Produced by the United States Geological Survey
North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and
1 000-meter grid:Universal Transverse Mercator, Zone 16T
This map is not a legal document. Boundaries may be generalized for this map scale. Private lands within government reservations may not be shown. Obtain permission before entering private lands.

Imagery....NAIP, July 2016 - October 2016
Roads.... U.S. Census Bureau, 2016
Roads within US Forest Service Lands....FSTopo Data with limited Forest Service updates, Not Available
Names....GNIS, 1980 - 2019
Hydrography....National Hydrography Dataset, 2004 - 2019
Contours....National Elevation Dataset, 2017
Boundaries....Multiple sources; see metadata file 2017 - 2018
Public Land Survey System....BLM, 2018
Wetlands....FWS National Wetlands Inventory 2005

CONTOUR INTERVAL 10 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the
National Geospatial Program US Topo Product Standard, 2011.
A metadata file associated with this product is draft version 0.6.18

UTM GRID AND 2019 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

FIGURE 2.7
CITY OF TRAVERSE CITY
USGS TOPO MAP A

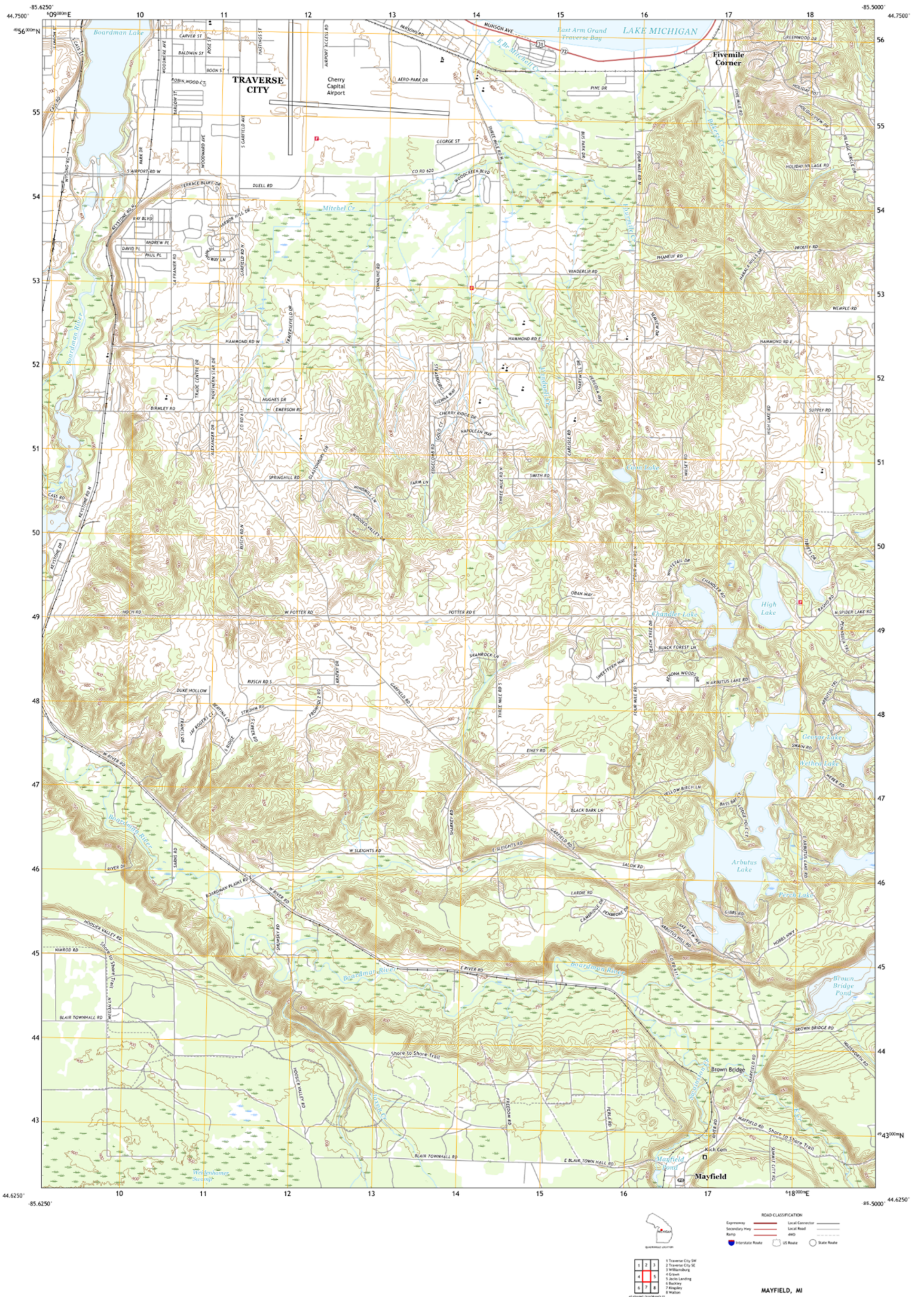
2021 DWSRF
PROJECT PLAN

MAY 2021 | HRC#: 20210137

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

The National Map
US Topo

MAYFIELD QUADRANGLE
MICHIGAN - GRAND TRAVERSE COUNTY
7.5-MINUTE SERIES



Produced by the United States Geological Survey
North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and 1 000-meter grid: Universal Transverse Mercator, Zone 16T
This map is not a legal document. Boundaries may be generalized for this map scale. Private lands within government reservations may not be shown. Obtain permission before entering private lands.

Imagery .... NAIP, July 2016 - October 2016
Roads .... U.S. Census Bureau, 2016
Names .... GNIS, 1980 - 2019
Hydrography .... National Hydrography Dataset, 2006 - 2019
Contours .... National Elevation Dataset, 2017
Boundaries .... Multiple sources; see metadata file 2017 - 2018
Public Land Survey System .... BLM, 2018
Wetlands .... FWS National Wetlands Inventory 2005

CONTOUR INTERVAL 10 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the National Geospatial Program US Topo Product Standard, 2011.
A metadata file associated with this product is draft version 0.6.18

UTM GRID AND 2019 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

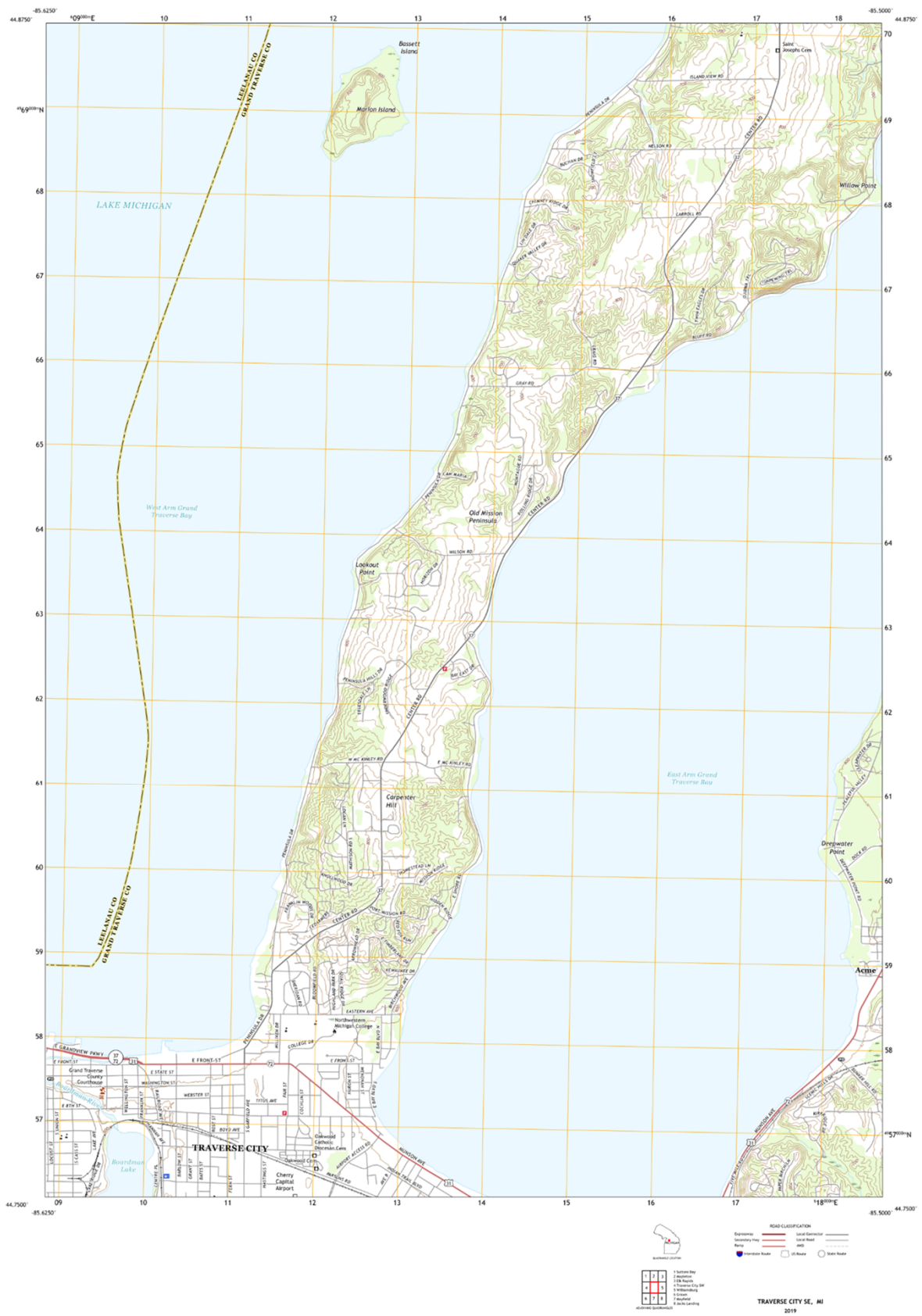
CITY of TRAVERSE CITY MICHIGAN

HRC
HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915
1925 BRETON ROAD SE SUITE 100
GRAND RAPIDS, MI 49506
(616) 454-4286
www.hrcengr.com

FIGURE 2.8
CITY OF TRAVERSE CITY
USGS TOPO MAP B

2021 DWSRF
PROJECT PLAN

MAY 2021 | HRC#: 20210137



CITY of TRAVERSE CITY MICHIGAN

HRC
HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915

1925 BRETON ROAD SE SUITE 100
GRAND RAPIDS, MI 49506
(616) 454-4286
www.hrcengr.com

Produced by the United States Geological Survey

North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and 1 000-meter grid: Universal Transverse Mercator, Zone 16T

This map is not a legal document. Boundaries may be generalized for this map scale. Private lands within government reservations may not be shown. Obtain permission before entering private lands.

Imagery	NAIP, July 2016 - October 2016	
Roads	U.S. Census Bureau,	2016
Names	GNIS, 1980 - 2019	
Hydrography	National Hydrography Dataset, 2006 - 2019	
Contours	National Elevation Dataset,	2017
Boundaries	Multiple sources; see metadata file	2017 - 2018
Public Land Survey System	BLM,	2018
Wetlands	FWS National Wetlands Inventory	2005

KILOMETERS 0 0.5 1 2
METERS 0 500 1000 2000
MILES 0 0.5 1
FEET 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000

CONTOUR INTERVAL 20 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

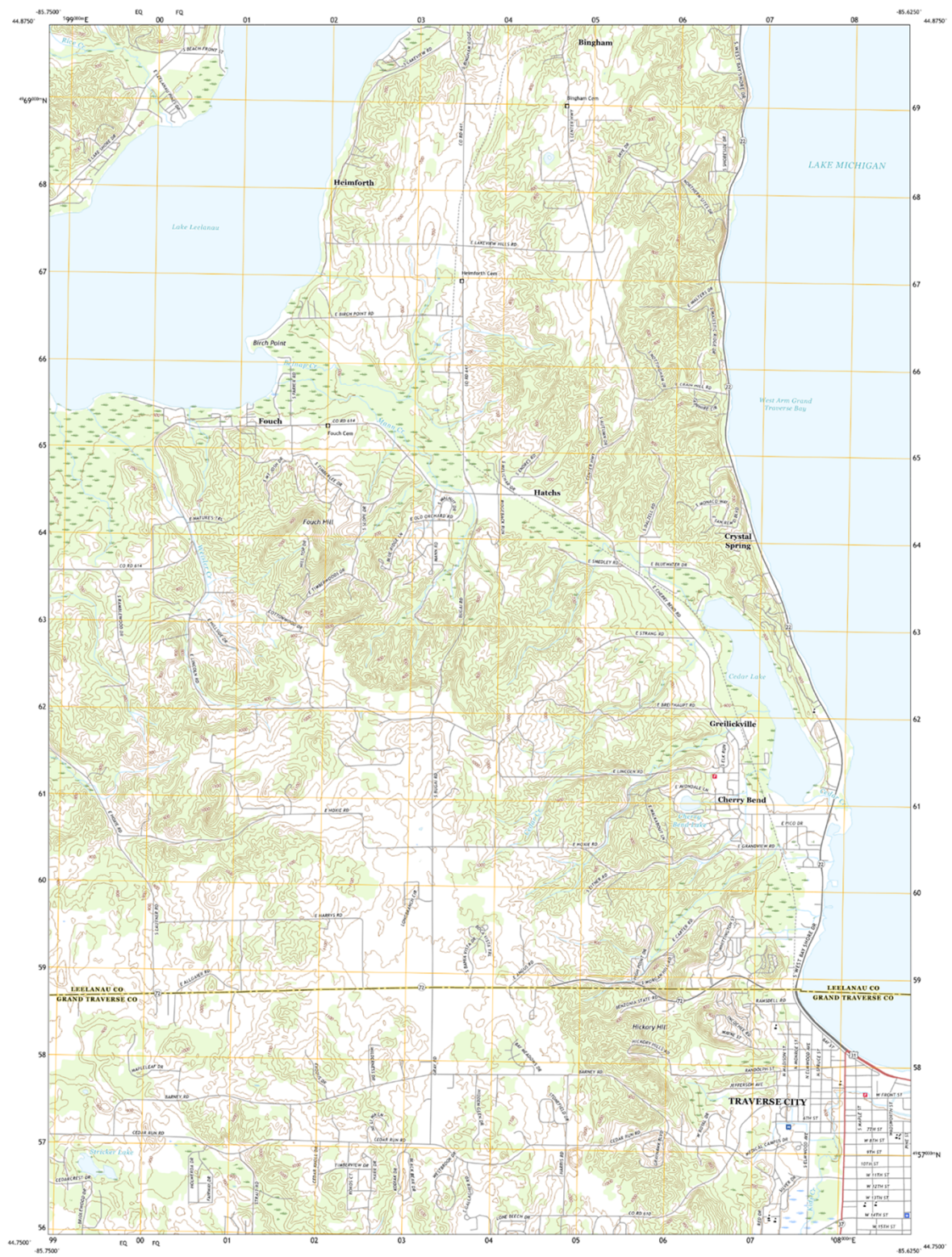
This map was produced to conform with the National Geospatial Program US Topo Product Standard, 2011. A metadata file associated with this product is draft version 0.6.18

UTM GRID AND 2019 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

FIGURE 2.9
CITY OF TRAVERSE CITY
USGS TOPO MAP C

2021 DWSRF
PROJECT PLAN

MAY 2021 | HRC#: 20210137



CITY of TRAVERSE CITY MICHIGAN

HRC
HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915
1925 BRETON ROAD SE SUITE 100
GRAND RAPIDS, MI 49506
(616) 454-4286
www.hrcengr.com

Produced by the United States Geological Survey
North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and
1 000-meter grid: Universal Transverse Mercator, Zone 16T
This map is not a legal document. Boundaries may be
generalized for this map scale. Private lands within government
reservations may not be shown. Obtain permission before
entering private lands.

Imagery	NAIP, July 2016 - October 2016	
Roads	U.S. Census Bureau,	2016
Names	GNIS, 1980 - 2019	
Hydrography	National Hydrography Dataset, 2004 - 2019	
Contours	National Elevation Dataset,	2017
Boundaries	Multiple sources; see metadata file	2017 - 2018
Public Land Survey System	BLM,	2018
Wetlands	FWS National Wetlands Inventory	2005

KILOMETERS 0 0.5 1 2
METERS 0 500 1000 2000
MILES 0 0.5 1
FEET 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000

CONTOUR INTERVAL 20 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

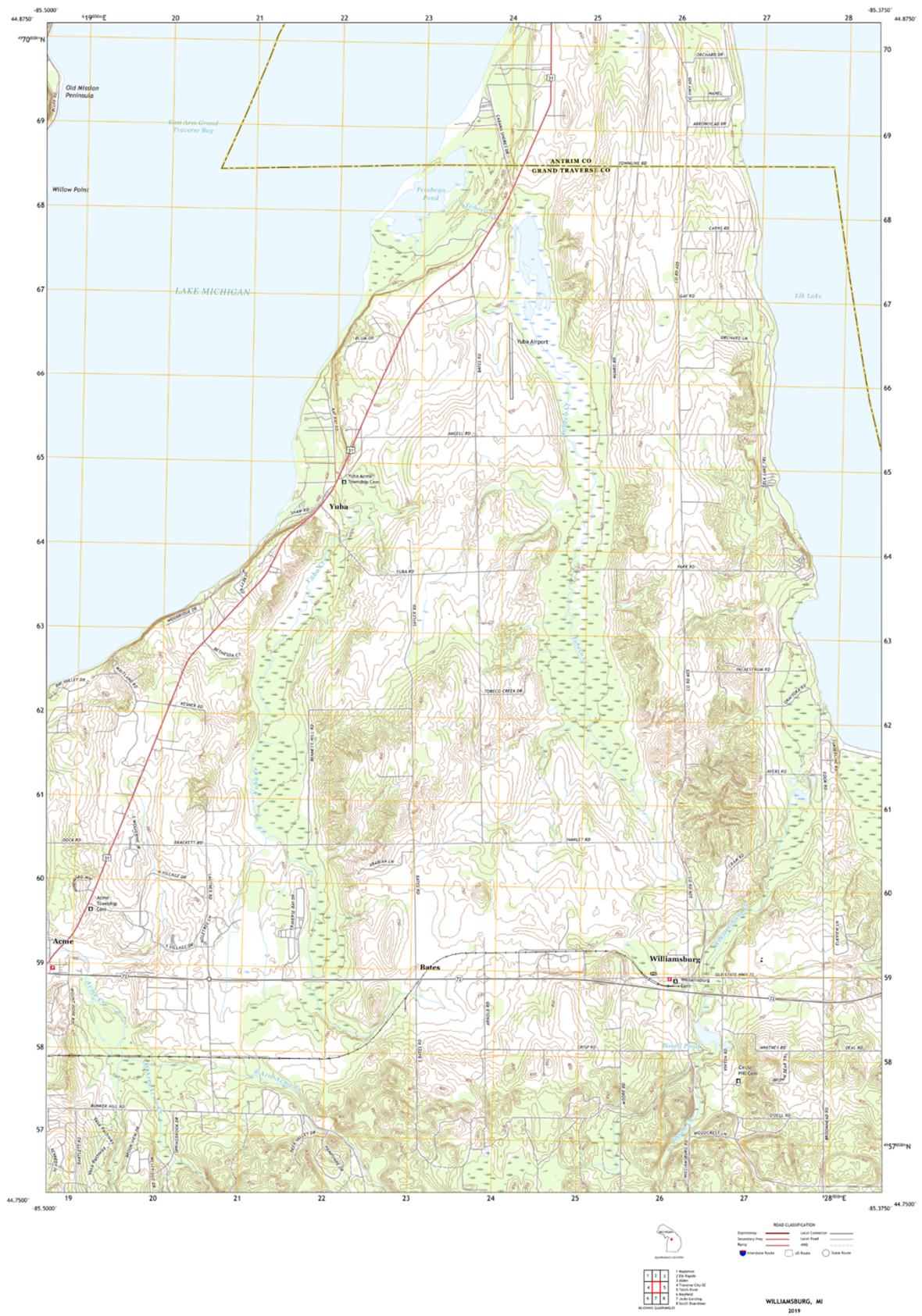
This map was produced to conform with the
National Geospatial Program US Topo Product Standard, 2011.
A metadata file associated with this product is draft version 0.6.18

UTM GRID AND 2019 MAGNETIC NORTH
DECLINATION AT CENTER OF SHEET

FIGURE 2.10
CITY OF TRAVERSE CITY
USGS TOPO MAP D

2021 DWSRF
PROJECT PLAN

MAY 2021 | HRC#: 20210137



CITY of TRAVERSE CITY MICHIGAN

HRC
HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915

1925 BRETON ROAD SE SUITE 100
GRAND RAPIDS, MI 49506
(616) 454-4286
www.hrcengr.com

Produced by the United States Geological Survey

North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and 1 000-meter grid: Universal Transverse Mercator, Zone 16T

This map is not a legal document. Boundaries may be generalized for this map scale. Private lands within government reservations may not be shown. Obtain permission before entering private lands.

Imagery	NAIP, July 2016 - October 2016	Roads	U.S. Census Bureau, 2016
Names	GNIS, 1980 - 2019	Hydrography	National Hydrography Dataset, 2006 - 2019
Contours	National Elevation Dataset, 2017	Boundaries	multiple sources; see metadata file - 2017
Public Land Survey System	BLM, 2018	Wetlands	FWS National Wetlands Inventory 2005

1 KILOMETERS 0.5 0 1 2
1000 500 0 METERS 1000 2000
1 0.5 0 1
MILES
1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000
FEET

CONTOUR INTERVAL 10 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the National Geospatial Program US Topo Product Standard, 2011. A metadata file associated with this product is draft version 0.6.18

UTM GRID AND 2019 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

FIGURE 2.11
CITY OF TRAVERSE CITY
USGS TOPO MAP E

2021 DWSRF
PROJECT PLAN

MAY 2021 | HRC#: 20210137

2.6 Existing Water Supply System

2.6.1 Water Supply and Treatment

2.6.1.1 Raw Water Pumping and Intake

The City treats water from the east arm of Grand Traverse Bay in Lake Michigan. The Low Service Pump Station (LSPS) is located on Eastern Avenue pumps water from a 36-inch diameter raw water intake pipe and crib structure (located 4,000 feet offshore) to the Water Treatment Plant. The station is a 38-ft diameter circular caisson with a split wet well and a total of four vertical turbine pumps. Low Service Pumps No. 1, 2, and 4 are constant speed pumps, and pump No. 3 motor was replaced in 2019 and operates on a VFD and the speed is controlled to vary the raw water flow rate to the WTP. The pumps discharge to a single 30-inch cast-iron raw water main along Eastern Avenue.

2.6.1.2 Rapid Mix and Flocculation

Raw water entering the treatment plant flows through the 30-inch pipe in the lower level. Raw water is measured by a single 30-inch magnetic flow meter installed in 2015. The single 30-inch line splits into two 24-inch pipes that are installed in parallel, each equipped with inline mixers. Ferric sulfate is applied before each of the mixers. The water then flows to two flocculation basins each having a center draft tube and variable speed flocculator (mixer). The flocculation tanks provide 27 minutes of detention time at their rated capacity of 10 mgd each (20 mgd total). A circular weir launder controls the water surface within the tanks and discharges the flow to a 36-inch pipe before it is applied to the filters.

2.6.1.3 Filtration

Filtration is provided by five filters and each is rated for 4 mgd at a filtration rate of 4 gallons per minute (gpm) per square foot sf). Each filter is comprised of two 14-ft by 25-ft cells configured for simultaneous normal operation and individual surface wash and backwash. Filters 4 and 5 were rehabilitated in 2014 and equipped with HDPE underdrains with four layers of gravel for an overall depth of 9-inches for media support. 30 inches of dual media is comprised of 18-inches of sand and 12-inches inches of anthracite. Each cell contains two rotating surface wash assemblies. Filters 1, 2, and 3 currently have clay block and gravel for media support, and the underdrains are scheduled to be inspected and rehabilitated in 2021-2022. The gravel and sand media and the influent, surface wash, backwash drain, filter effluent, and backwash supply valves for Filters 1, 2, and 3 will also be replaced in 2021-2022.

The filtered water production is monitored and controlled by a dedicated rate of flow controller connected to SCADA. Individual filter effluent turbidity is monitored, and each filter console provides monitoring and control for washing of its associated filter(s). Three filter consoles are located on the filter operating level. The original consoles were constructed in 1964 for Filters 1 and 2. Filter 3 console was installed in 1973 and Filter 4 and 5 consoles were constructed in 1993.

A surface wash pump provides suitable supply and pressure to rotate the pair of surface washers in each bay. The surface wash pump is rated at 225 gpm at 176 feet TDH. There is no redundant supply.

The filters are backwashed by closing the filter effluent valve and opening the wash water supply and backwash drain valves for each cell. The backwash water is supplied by the filter backwash pump, which is rated at 8,000

gpm at 40-ft TDH. Backwash water can also be supplied by a 14-inch line from the high service pump station efflux using the filter backwash control valve located in the basement level. The filters are backwashed when the filter head loss is at 8.5 to 10 feet. Filters are typically washed for 10 to 15 minutes at 3,000 to 4,000 gpm. The average run time between backwashes is 80 to 100 hours in the winter and 40-60 hours in the summer. Typically, up to 75,000 gallons are used per filter backwash. The monthly average backwash volume ranges from 90,000 gal during low demand periods up to 150,000 gal during higher demand summer months.

Filter piping is in the filter gallery on the lower level of the WTP. Each filter is served by a total of nine (9) valves; one modulating valve for filter rate control and eight that are in either the open or closed position. Pneumatic valve actuators serve Filters 1, 2, and 3 and electric valve actuators serve Filters 4 and 5. Filters are flow-paced based on magnetic flow meter information. Filter-to-waste capability is provided for Filters 4 and 5. There is no filter-to-waste currently available on Filters 1, 2, and 3.

2.6.1.4 Clear Wells and Treated Water Reservoir

Filtered water flows to two clear wells located beneath Filters 1, 2, and 3. One clear well is below Filters 1 and 2 and the other clear well is below Filter 3. Filters 4 and 5 and can be piped to either of the clear wells. From the clear wells, the water passes through piping where fluoride is applied before entering the 1.5-million-gallon rectangular storage reservoir which is partially below grade and located south of the WTP building. Chlorine can also be applied near the fluoride application point. The reservoir is baffled to provide suitable contact time to achieve satisfactory disinfection contact time. Water exiting the treated water storage reservoir flows through a 36-inch finished water main to the high service pump suction well. A separate 12-inch finished water main feeds the Huron Hills Pump Station suction well.

2.6.1.5 Chemical Feed

Coagulant

The WTP uses ferric sulfate as its primary coagulant which replaced the original equipment which fed aluminum sulfate (alum). This system, which was installed in 2017, is equipped with three 1000-gallon double-walled fiberglass storage tanks, three metering pumps, and a 100-gallon day tank and scale. The ferric bulk storage provides sufficient storage for a minimum of 30 days at maximum daily demand. The storage tank valves are manually opened to fill the 100-gallon day tank. Coagulant aids such as polymers are not used.

Fluoride

The WTP feeds hydrofluosilicic acid using a feed system that consists of two 1000-gallon double-walled fiberglass storage tanks, one transfer pump, one 100-gallon day tank, and a metering pump. The storage tank and day tank have sufficient storage for maximum daily demands.

Disinfection

The WTP feeds sodium hypochlorite using a feed system including two 8,200-gallon bulk storage tanks, two transfer pumps, a 450-gallon day tank with scale, and three metering pumps. Chlorine is fed to several locations in the WTP including the raw water intake for zebra mussel control.

Antiscalant

The WTP adds sodium hexametaphosphate to prevent calcification within the disinfection feed piping. The sodium hexametaphosphate feed system is comprised of a batch tank and chemical pump located in the chlorine room.

2.6.1.6 Wash Water and Sludge Lagoons

Two lagoons are used for wash water and sludge waste from the filter backwash and flocculation tank drain water. The two lagoons are approximately 61,000 cubic feet and 66,000 cubic feet respectively. The water is decanted and the decant drains by gravity through an 8-inch drain to a 5-ft diameter sump in the WTP basement. There are two sump pumps which return discharge to the storm sewer on Eastern Avenue with an NPDES permitted outfall to East Bay. These sump pumps were replaced in 2015 and 2017 and are each rated for 500 gpm. Sodium thiosulfate is added to dechlorinate the discharge per the NPDES permit.

2.6.1.7 High Service Pumping

The High Service Pump Station (HSPS) pumps treated water from the WTP to the distribution system from two wet wells which are connected to the Finished Water Storage Reservoir. The HSPS has five vertical turbine pumps which discharge to two 24-inch water mains that connect to the 30-inch water main on Eastern Avenue. A surge relief valve is provided on the discharge main for surge protection. The flows in each water main are measured using 24-inch magnetic flow meters which were installed in November 2015.

2.6.1.8 Plant Capacities and Redundancy

A summary of the current unit processes is provided in Table 2-4.

Table 2-4. Unit Process Capacities

Unit Process	Total Capacity (mgd)	Firm Capacity (mgd)	Basis of Capacity
Intake	24.0	24.0	Max head loss
Low Service Pump Station	27.6	19.7	Pump test (2020)
Flocculation Tanks	20.0	20.0	30 min residence time
Filters	20.2	20.2	Filter rate 4 gpm/sf
Clearwell/Reservoir	38.2	38.2	Capacity to maintain C*T = 61
High Service Pump Station	27.4	19.9	Pump test (2015)
Lagoons	32.0	32.0	3% of Design Flow (0.95 mgd)

2.6.2 Storage Facilities

The City's water system includes four ground level finished water storage tanks. These include the one water storage tank at the WTP having a total of 1.5 million gallons (mgal) of storage, two water storage tanks located on LaFranier Road south of South Airport Road with a total of 6.0 mgal of storage, and Wayne Hill tank with 1.3 mgal of storage. Due to hydraulic limitations with the booster pump suction piping that draws from the Wayne Hill tank, the available volume in the Wayne Hill tank is 0.67 mgal. The Barlow and Wayne Hill tanks are located at higher elevations within the City and essentially function as elevated tanks, providing the required pressure of the Central PD-1 distribution system. Several other tanks provide storage for separate pressure districts in the City, Garfield Township, and Peninsula Township. The total available storage in the City is 6.74 mgal.

2.6.3 Water Distribution Piping

The City's water distribution system provides water service for potable use and fire flow throughout the City's service area. The system comprises 660,340 feet (125 miles) of water main and approximately two-thirds of the system is cast iron and the majority of the water mains were constructed in the 1960s and prior. New ductile iron mains have been installed since the 1980s.

2.6.4 Pressure Districts and PRVs

The City's water system operates in eight pressure districts with several incorporated into the surrounding Township's pressure districts. The pressure districts are controlled by the ground storage tanks, booster pump stations, and various pressure reducing valves (PRVs). These districts are summarized in Table 2-5.

Table 2-5. City Pressure Districts

District ID	District Name	HGL (ft)	Controlled by:
PD-1	Central	750	Barlow and Wayne Hill Tanks
PD-2	Morgan Farms/Incochee	825	Control Valves WCV-1341, WCV-1328, WCV-1329
PD-3	Incochee Upper	875	PRV at Wayne Hill Booster Station, WCV-1300
PD-4	Wayne Hills Upper	1000	Wayne Hill Booster Pumps
PD-5	Huron Hills Lower	850	Huron Hills PRV WCV-7
PD-6	Timber Lane	875	Timber Lane PRV WCV-8
PD-7	Huron Hills Upper	920	Huron Hills Booster Station
PD-8	Veterans Drive (from Garfield)	875	McRae Hill PRV (Garfield Township)

Pressure District PD-1 is the main pressure district in the City and encompasses most of the service area within the City limits as well as lower elevations of Elmwood, Garfield, and Peninsula Townships. This district's pressure is maintained by the Barlow and Wayne Hill ground storage facilities and has an operating hydraulic grade line (HGL) of 750 feet. Three other pressure districts are maintained by the Wayne Hill Booster Station (described below). PD-4 is maintained at an HGL of 1000 feet to service customers on Wayne Hill. Pressure District 3 (PD-3) is currently maintained at an HGL of 885 feet using a pressure sustaining valve (PSV) that down-feeds from PD-4 located at the Wayne Hill Booster Station (WCV-1300). The lower pressure district, PD-2, is maintained at an HGL of 825 feet using PSVs: WCV-1328, WCV-1329, and WCV 1341 that are down-fed from PD-3 through.

A Pressure Regulating Valve (PRV) located at M-72 (WCV 1340) is also used to supplement fire flows to the City's main pressure district PD-1 for the far northwest portion of this district.

Three higher pressure districts in the City limits are controlled by the Huron Hill Booster Station system. This station feeds the intermediate pressure district in the southern portion of Peninsula Township (HGL = 920 feet) as well as higher elevations in the City adjacent to the Township including Pressure District PD-7 (HGL = 920 feet), PD-6 (HGL=875 feet), and PD-5 (HGL=850 feet). Two City PRVs downfeed from PD-7 to maintain pressures in districts PD-5 and PD-6. Pressure District PD-6 is maintained by WCV-7 (HGL = 875 feet) and Pressure district PD-5 is controlled by WCV-8 (HGL = 850 feet). Check valves in the lower elevations of these districts are installed at the boundaries of district PD-1 to maintain minimum system pressures in these districts during extreme conditions or during interruptions of supply in the higher elevation districts.

One pressure district (PD-8) is back-fed from Garfield Township (Veteran's Drive Pressure District) to the City, east and west of Veterans Dr. south of Boughey Drive and operates at an HGL of 875 feet. Check valves in the lower elevations of PD-8 are installed near the boundaries of district PD-1 to maintain minimum system pressures in PD-8 during extreme conditions or during interruptions of supply from the higher districts.

2.6.5 Booster Stations

The City operates two major booster stations, the Huron Hill Booster Station at the WTP and the Wayne Hill Booster Station located adjacent to the Wayne Hill Storage Tank.

2.6.5.1 Huron Hills Booster Station

The Huron Hills Booster Station is located at the WTP and consists of three vertical turbine pumps that draw from the WTP storage reservoir. Backup power is provided by the 700 kW WTP generator. Two 720-gallon pressurized bladder tanks are installed on the pump discharge piping and are set to 100 psi.

This booster station feeds the southern portion of the Peninsula Township intermediate district including the Peninsula Booster Station that draws from the adjacent 0.3 mgal Peninsula Storage Tank. This station and tank are owned and operated by Peninsula Township. This tank has a 6-inch actuated valve that opens and closes to regulate the tank level and four pumps (one jockey, two larger pumps, and one large fire pump) that are used to boost the pressures to the upper-pressure district in Peninsula Township. A 2-inch hydraulically actuated valve is used to back feed from the upper district to PD-7 if the pressure falls below 40 psi. The 6-inch fill valve to the tank is controlled such that the 2-inch back feed valve does not open simultaneously and overfill the tank.

2.6.5.2 Wayne Hills Booster Station

The Wayne Hill reservoir and pump station were originally constructed in 1945. This 1.3 mgal reinforced concrete reservoir is maintained approximately 5-10 feet lower than the two Barlow Tanks of PD-1. Accordingly, the fill line contains an electrically actuated control valve to limit the tank from over-filling. The tank was originally constructed to provide additional fire flow storage for the western portion of PD-1. In the early 1960s, the reservoir fill valve vault was enlarged, and a building was constructed. Booster pumps were installed in the building on the suction side of the reservoir drain line to provide pressure to a relatively high portion of the northwestern section of the City that was too high to be served by PD-1. This initial upper-pressure district was also provided with a steel hydro-pneumatic storage tank including a compressor to provide some storage for this small pressure district.

In 2006, this district was expanded to the north to provide service to some additional areas within the City and neighboring Elmwood Township which were still too high to be serviced by the main pressure district (PD-1) but were lower than the initial area serviced by the Booster Pumps and hydropneumatics tank. Since these areas of the upper district were slightly lower, pressure reducing valves were provided to drop the pressure from the original Wayne Hill district down into the lower districts. This area is broken into three distinct pressure districts designated as PD-2, PD-3, and PD-4.

When the Wayne Hill District was first expanded, the original booster pumps and the hydro-pneumatic tank were demolished. The current pumping station includes a prefabricated skid-mounted pump station with three vertical multistage centrifugal booster pumps and two bladder tanks to provide a storage cushion between pump cycles. All the flow from the station is pumped to the pressure of PD-4 (HGL = 1000 feet) before splitting to the lower pressure districts. A pressure reducing valve down feeds a portion of the flow from PD-4 to PD-3 (HGL= 875 feet) within the station. PD-2 (HGL = 825 feet) is down-fed from PD-3 using remote PRVs located in the system. Backup power is provided by a 275-kW generator.

As part of the 2006 improvements, a 12-inch main was added along Wayne Street to provide a loop in this pressure district (now PD-4). This 12-inch main has been alleged to be causing some of the difficulties in the loss of pressure when hydrants are opened since water can more rapidly flow to the hydrant. The higher-pressure district service area (PD-4) supplied by this station experiences pressure issues at the highest elevations of Wayne Hill during hydrant openings that include temporary pressure drops in system pressure (to near atmospheric). To minimize the potential for these transient pressure issues, EGLE recommended that the City partially close many of the hydrant isolation gate valves to limit the hydrant flow in this service area.

3 Alternative Analysis

3.1 Alternatives Considered

Each project was assessed to follow one of the following alternate classifications. Each upgrade or rehabilitative method was chosen on a technical basis and cost comparisons are presented for each alternative analysis, where applicable. Figure 3-1 shows the overall locations of these projects in the City and Figure 3-2 depicts the scope of work for the proposed projects at the WTP.

#	Projects
W1	WTP Pump Rehabilitation
W2	WTP Electrical Improvements
W3	WTP High Service Pump Station Valve Replacement
W4	WTP Sodium Hypochlorite Storage Tank and Building Improvements
W5	WTP Backwash and Surface Wash Pumps
W6	WTP Freight Elevator
W7	WTP Generator Replacement
D1	Wayne Hill Booster Station
D2	Service Line Replacement
D3	North Madison and Jefferson WM
D4	US-31 MDOT Project, 16-inch from US-31/Union to US-31/Bay and 12-inch from US-31/Railroad to US-31/Garfield
D5	16-inch on East Front from Franklin to Park Street
D6	24-inch from Lake/Cass to Lake/Union
D7	24-inch from Lake/Union to Lake/Wadsworth
D8	24-inch from Webster/Rose to 8th/Railroad
D9	24-inch from Garfield/Washington to Webster/Rose

D1
WAYNE HILL GROUND STORAGE TANK 1.3 MG 741' (HWL)
WAYNE HILL BOOSTER STATION IMPROVEMENTS
NORTH MADISON & JEFFERSON WATER MAIN IMPROVEMENTS
D3
D4
16-INCH
16-INCH
12-INCH
D5
D4
D7
D6
D9
24-INCH
D8
W1 to W7
Peninsula Booster Station
Huron Hills Booster Station
WTP
Low Service Pump Station
WTP IMPROVEMENTS
WTP RESERVOIR 1.5 MG 610' (HWL)
East Arm of Grand Traverse Bay
Grayhawk Booster Station (Abandoned?)
Red Drive Booster Station
Boardman Lake
VETERANS DRIVE MASTER METER (TO CITY)
CASS ROAD MASTER METER
GARFIELD MASTER METER
EAST BAY TOWNSHIP INTERCONNECTION (EMERGENCY ONLY NORMALLY CLOSED)

Document Path: Y:\2021\01\20210137\03_Studies\Working\GIS\20210415_RecommendedImprovements_NAC.mxd
Date: 5/20/2021

CITY of TRAVERSE CITY MICHIGAN

HRC
HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915
1925 BRETON ROAD SE SUITE 100
GRAND RAPIDS, MI 49506
(616) 454-4286
www.hrcengr.com

LEGEND

- Check Valve
- PRV
- Hydrant
- System Valve
- City/Township
- Water System Service Area
- County

Water Main

- 6"
- 8"
- 10"
- 12"
- 16"
- 18"
- 20"
- 24"
- 30"
- 36"

Pressure District HGL

- 750
- 751 - 825
- 826 - 884
- 885 - 999
- 1000 - 1090
- 1091 - 1200

Recommended Project

- Project Plan

N W E S

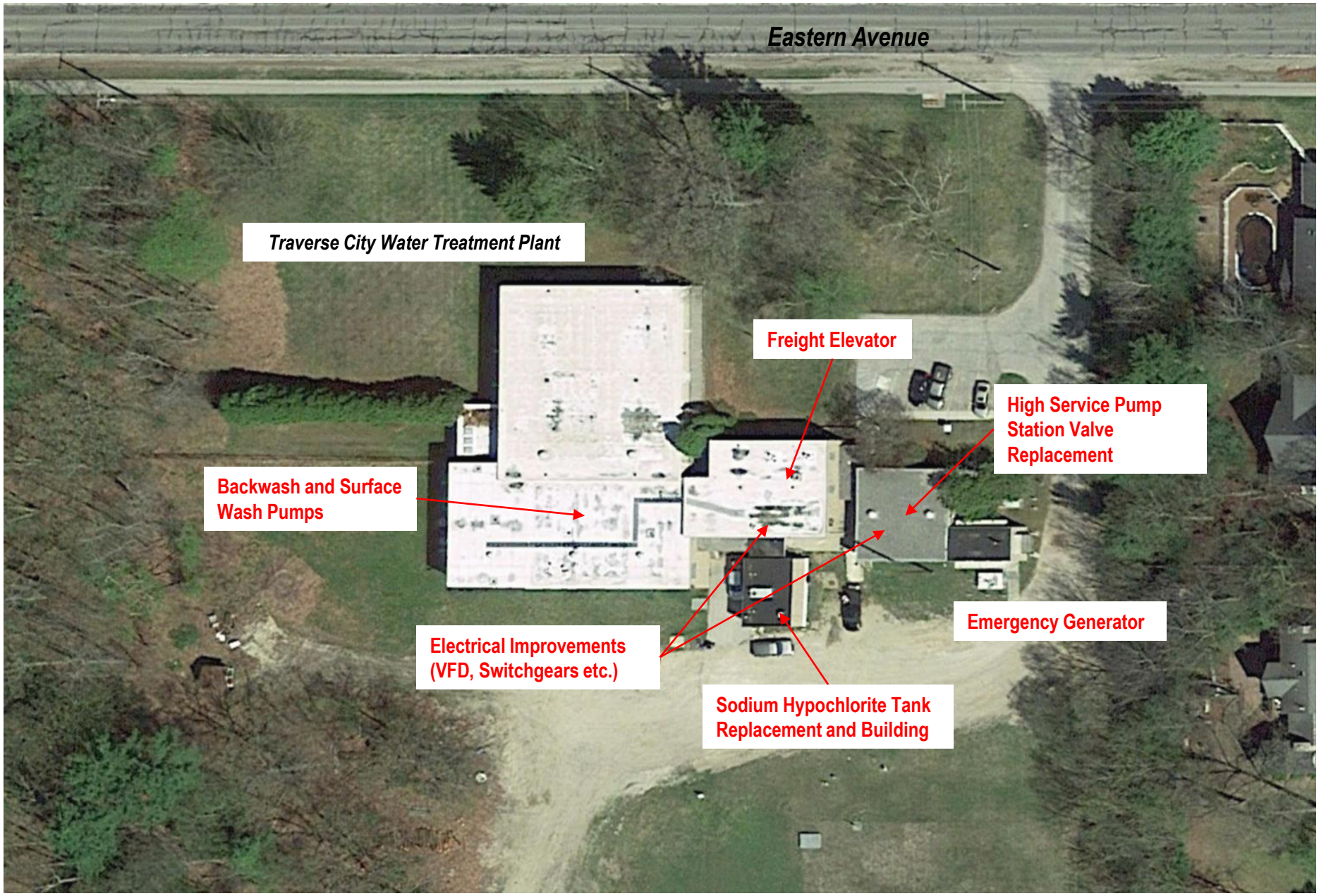
0 1,000 2,000 4,000 Feet

FIGURE 3.1
TRAVERSE CITY RECOMMENDED IMPROVEMENTS

2021 DWSRF PROJECT PLAN

MAY 2021 | HRC #: 20210137

Y:\202101\20210137\03_Studies\Working\Project_Plan\Draft\Figures\20210137_Figures.pptx



HRC

Traverse City – 2021 DWSRF Project Plan

Water Treatment Plant Proposed Improvements

Job No.
20210137

Date
May 2021

Figure No.
3.2

3.2 No Action

The "No-Action" alternative is not an option as it fails to meet the requirements of the Michigan Safe Drinking Water Act (MI-SDWA) and the mission and goals of the City to provide safe and clean water to its customers.

3.3 Regional Alternatives

The Regionalization alternative examines the feasibility of connecting the City's Drinking Water Distribution System to a regional water supply to service the existing water demands of the study area. The Traverse City WTP service area includes the City as well as customer communities fo Garfield Township, Peninsula Township, and Elmwood Township. The adjacent East Bay Township is already served by a water treatment plant that is at higher hydraulic grade line (pressure) and different quality than Traverse City with a groundwater source. Incorportaing this community is therefore not feasible. The City's water is currently supplied by Grand Traverse Bay and provides the City of Traverse City with sufficient capacity to meet the City's water needs and all nearby facilities also obtain their water supply from Grand Traverse Bay. Additionally, the work proposed as part of this Project Plan is addressing site specific issues in which regional solutions are not necessary or applicable. Whether the water services to be replaced or material verified are supplied by the current system or an alternative system is irrelevant. Thus, there are no regional alternatives to be evaluated.

3.4 Water Treatment Plant Improvements

3.4.1 WTP Generator Replacement

This includes the construction of a new 750 kW generator for the WTP as well as an automatic transfer switch. Included in this construction are the concrete pads and site work associated with the new generator which will replace the current 750 kW generator at the WTP.

3.4.2 WTP High Service Pump Station Valve Replacement

The four existing high service pump station control valves are cone valves with associated hydraulic controls that are experiencing mechanical failures due to the equipment age. The existing control valve for pump #5 is an actuated plug valve that is operating effectively. Four new control valves and isolation butterfly valves would be replaced with this project.

3.4.3 WTP Backwash and Surface Wash Pumps

The existing backwash pump provides backwashing capabilities for individually backwashing the filters. This pump needs to be rehabilitated which would include impeller replacement, seal replacement, refurbishing the motor, and other required improvements. The surface wash pump needs to be replaced and this work would include the installation of a new pump and isolation valves.

3.4.4 WTP Sodium Hypochlorite Storage Tank and Building Improvements

This project includes the replacement existing sodium hypochlorite storage tanks as well as the transfer pumps, piping, and fill lines. The existing fiberglass bulk storage tanks have reached the end of life and require frequent repairs. Leakage beneath the tank has caused damage to the concrete tank pads which increases the safety risks associated with sodium hypochlorite. Two new 8,100 gallon polyethylene tanks would be installed and the new concrete pads and floor would be coated with a high performance chemically resistant coating.

3.4.5 WTP Electrical Improvements

The existing VFDs at both the HSPS and LSPS variable frequency drives (VFDs) as well as the basement, high service pump station, and low service pump station electrical switchgears need to be replaced to ensure reliability for the operation and control of the WTP.

3.4.6 WTP Freight Elevator

The existing freight elevator at the WTP provides the ability to transport bulk items within the WTP main building. This project would include the replacement of the existing car and hydraulics.

3.4.7 WTP Pump Rehabilitation

This item includes the rehabilitation of four vertical turbine pumps at the LSPS and three vertical turbine pumps at the HSPS necessary to implement the electrical improvements that include VFD inverter duty rated motors.

3.5 Distribution System Improvements

3.5.1 LCR Service Line Replacement

Due to the changes implemented in June of 2018 to the Michigan Lead and Copper Rule (LCR) within the Safe Drinking Water Act 399 of 1976, the City of Traverse City is required to complete full water service line replacements where lead and galvanized water services exist from the existing water main or newly installed water main into the existing dwelling for each property regardless if the service line is on public or private property.

The changes to the LCR requirements effective in June of 2018 require communities to replace all lead and galvanized service lines at an average of 5-percent per year beginning in 2021, not to exceed 20 years, or in accordance with an alternative schedule incorporated into a drinking water asset management plan and approved by EGLE.

3.5.2 Water Main Construction

The evaluation of the existing water system capacity concludes that redundancy and reliability improvements are recommended to replace aging and undersized water mains through the following projects over the next five years.

1. 24-inch from Lake/Cass to Lake/Union (Installed in 1965, 8-inch and 12-inch cast iron)
2. 24-inch from Lake/Union to Lake/Wadsworth (Installed in 1965, 6-inch cast iron)
3. 24-inch from Webster/Rose to 8th/Railroad (Installed in 1954, 16-inch cast iron)
4. 16-inch from US-31/Union to US-31/Bay and 12-inch from US-31/Railroad to US-31/Garfield (Installed in 1950-1965, 18-inch cast iron)
5. 24-inch from Garfield/Washington to Webster/Rose (Installed in 1954-1964, 18-inch cast iron)
6. 16-inch on East Front from Franklin to Park Street (Installed in 1930, 18-inch cast iron)
7. North Madison and Jefferson Water Main

Additional projects to be completed as part of the City's capital improvements plan (beyond 5 years) include the following:

1. Construct approximately 12,200 feet of 16-inch and 24-inch main on Webster Street, 8th Street, Lake Street, 7th Street, and Spruce Street replacing the existing, older distribution main and providing redundancy of transmission to the west side of town.
2. Construction of a parallel 30-inch raw service water line from the LSPS to the WTP
3. Construction of 12-inch water main on Hannah Avenue from Bates to Garfield
4. Construction of 12-inch water main on Veterans Drive from 14th Street to Georgetown
5. Removal of the 12-inch water main across the Union Street Dam and replacing it with a new 12-inch main under the Boardman River just east of Union Street bridge by directional drilling with the Fish Pass Construction Project.

There is no practical alternative to accomplish the same outcome. Replacing and upsizing the above-mentioned distribution mains advances the proper resolution of the pressure and reliability problems throughout the distribution system. The occurrence of improved fire protection capabilities because of these water main replacements is a secondary benefit.

3.5.3 Wayne Hill Booster Station

Three options were considered to address the pumping capacity and suction issues at the booster station. They are as followed.

3.5.3.1 Option 1 – Install Three New Booster Pumps on the Lower Level

This option includes the replacement of the three pumps with one pump sized with the capability of providing the MDD and 3 pumps used for fire flow conditions. The pumps would be located on the lower level and would take suction from the existing reservoir suction line with their discharge connecting to the existing 8-inch discharge header from the skid-mounted pumps.

3.5.3.2 Option 2 – Relocate Existing Booster Pumps to Lower Level and Provide an Elevated Storage Tank

This option includes relocating the existing booster pumps to the lower level and a new suction header from the low-level reservoir suction line would be installed to connect to the pumps. One pump would provide the MDD and fire flow would be provided by the three pumps. Construction of a new elevated storage tank (150,000 gallons) in PD-3 would provide the required fire flows for the proposed commercial development in PD-3 as well as PD-2. Fire flow for PD-4 would continue to be provided solely by the pumps.

3.5.3.3 Option 3 – Supplemental Booster Pumps on Lower Level

It is also possible to address the current low NPSH problem by providing a booster pump at the elevation of the suction line from the reservoir. This booster pump would operate when the reservoir level at or below elevation 732'. This booster pump should be located so that the pump volute elevation is always at or below the lowest water surface in the reservoir. Adding a supplemental booster pump to push water against the existing prefabricated booster pump skid would enable the existing pumps on the skid to operate adequately under any condition of reservoir elevation and thus allow the full reservoir to be utilized during fires or other high demand periods. This pump would be sized to provide enough capacity for all three of the skid-mounted pumps to be utilized, if desired the increased head would increase the capacity of the three existing pumps and provide sufficient fire flow.

3.5.3.4 Selected Option

Based on the above analysis, Wayne Hill Booster Station Option 3 – Supplemental Booster Pumps is recommended but

3.6 Cost of Alternatives

The costs of the improvements detailed previously are shown in Table 3-1 by Fiscal Year.

Table 3-1. Summary of SRF Projects (by Fiscal Year)

Projects	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026
Water Treatment Plant					
WTP Pump Rehabilitation	$560,000				
WTP Electrical Improvements	$1,597,000				
WTP High Service Pump Station Valve Replacement		$427,000			
WTP Sodium Hypochlorite Storage Tank and Building Improvements		$385,000			
WTP Backwash and Surface Wash Pumps		$172,000			
WTP Freight Elevator			$300,000		
WTP Generator Replacement				$589,000	
Distribution System					
Wayne Hill Booster Station	$432,000				
LCR Service Line Replacement	$399,000	$399,000	$399,000	$399,000	$399,000
North Madison and Jefferson WM		$816,000			
US-31 MDOT Project, 16-inch from US-31/Union to US-31/Bay and 12-inch from US-31/Railroad to US-31/Garfield			$1,983,000		
16-inch on East Front from Franklin to Park Street			$1,079,000		
24-inch from Lake/Cass to Lake/Union, (Phase 3B)				$488,000	
24-inch from Lake/Union to Lake/Wadsworth, (Phase 4)				$807,000	
24-inch from Webster/Rose to 8th/Railroad, (Phase 5B)					$1,655,000
24-inch from Garfield./Washington to Webster/Rose, (Phase 5A)					$1,465,000
Total FY Project Cost	**$2,988,000**	**$2,199,000**	**$3,761,000**	**$2,283,000**	**$3,519,000**
Total Projects Cost	**$14,750,000**				

3.7 Impacts of Alternatives

The recommended alternatives include improvements listed in the above projects which are a mixture of work at the Water Treatment Plant (WTP) and Distribution System. The long and short-term impacts of the alternatives are described in Section 5.

4 Selected Alternatives

4.1 Proposed Improvements

4.1.1 Proposed Water Treatment Plant Improvements

The following projects noted in Table 4-1 are the proposed WTP improvements under this Project Plan.

Table 4-1. Fiscal Year of WTP Projects

Project	Fiscal Year
WTP Pump Rehabilitation	2022
WTP Electrical Improvements	2022
WTP High Service Pump Station Valve Replacement	2023
WTP Sodium Hypochlorite Tank and Building Improvements	2023
WTP Backwash and Surface Wash Pumps	2023
WTP Freight Elevator	2024
WTP Generator Replacement	2025

The design period of each project phase is estimated start in the year prior to the project fiscal year. The projects would be advertised and bid upon receipt of all the necessary permits. The general schedule would follow the consecutive phases, and specific, dates would be adjusted to meet the DWSRF Financing and Milestone Schedules adopted for each year of the project.

4.1.2 Proposed Distribution System Improvements

The following projects noted in Table 4-2 are the proposed distribution system improvements under this Project Plan.

Table 4-2. Fiscal Year of Distribution System Projects

Project	Fiscal Year
LCR Service Line Replacement	2022-2026
Wayne Hill Booster Station	2022
North Madison and Jefferson Watermain	2023
US-31 MDOT Project, 16-inch from US-31/Union to US-31/Bay and 12-inch from US-31/Railroad to US-31/Garfield	2024
16-inch on East Front from Franklin to Park Street	2024
24-inch from Lake/Cass to Lake/Union	2025
24-inch on Lake/Union to Lake/Wadsworth	2025
24-inch from Webster/Rose to 8th/Railroad	2026
24-inch from Garfield/Washington to Webster/Rose	2026

To address the current low NPSH problem new supplemental booster pumps are the recommended alternative for the Wayne Hill Improvements proposed work. This option would provide a booster pump at the elevation of the suction line from the reservoir and would operate when the reservoir level is at or below an elevation of 732 feet. Adding a supplemental booster pump would enable the existing pumps on the skid to operate adequately under any condition of reservoir elevation and thus allow the full reservoir to be utilized during fires or other high-demand periods.

The water main replacement projects could be designed and constructed as individual projects or combined into one phase of projects for each fiscal year. The City has an approximately 20% water loss in its system and much of the older cast iron mains are over 60 years old. These older pipes contribute to the risk of water reliability concerns and water mains breaks which can compromise system water quality. Areas of low flow due to smaller pipe size and reduced friction factors associated with older pipe can cause safety concerns from reduced fire flows. Implementing the water main replacments recommended in the 2020 Water System Reliability Study will address the reliability, quality, and safety concerns. The hydraulic modeling of the water system demonstrates that the new 16-inch and 24-inch water mains will improve system flows especially to maintain the storage levels of the Wayne Hill Reservoir.

4.2 Design Parameters

The proposed WTP improvements will be installed to meet the Michigan Safe Drinking Water Act 399 requirements as well as the City's design standards and Recommended Standards for WaterWorks (Ten States Standards).

The proposed water mains will be installed to meet the Act 399 requirements and the City of Traverse City design standards for water distribution system.

4.3 Water Main Installation and Materials

The installation methods for the water main replacement projects will primarily be completed using open cut methods. The site conditions may dictate other methods of replacement to accommodate the public and environment and

construction efficiencies. Open-cut methods will be implemented to coordinate with street paving activities. Horizontal directional drilling (HDD) may be used in applications with the appropriate clearances to underground utilities is provided and where there are limited service connections, tees, bends and other fittings along a particular length of main.

New water mains will be AWWA C151 ductile iron pipe, Thickness Class 52 or Pressure Class 250 or 350 in accordance the City's standards. If used, pipe installed by HDD methods would be AWWA C906 HDPE with a minimum DR11 wall thickness.

4.4 LCR Service Line Replacement

Due to the changes implemented in June of 2018 to the Michigan Lead and Copper Rule (LCR) within the Safe Drinking Water Act 399 of 1976, the City of Traverse City is required to complete full water service line replacements where lead and galvanized water services exist from the existing water main or newly installed water main into the existing dwelling for each property regardless if the service line is on public or private property. Based upon analysis of the water mains service lines required to be replaced as they are identified according to the EGLE guidance and regulations for the full replacement of the service line.

The changes to the LCR requirements effective in June of 2018 require communities to replace all lead and galvanized service lines at an average of 5-percent per year beginning in 2021, not to exceed 20 years, or in accordance with an alternative schedule incorporated into a drinking water asset management plan and approved by EGLE. The majority of the service lines in the City required to be replaced are galvanized.

4.5 Proposed Schedule

Table 4-3 below shows the completed Project Plan submittal task dates.

Table 4-3. Project Plan Task Schedule

Project Plan Task	Scheduled Date
Draft Project Plan to EGLE	May 5, 2021
Public Hearing Notice	May 20, 2021
Formal Public Hearing	June 21, 2021
City Commission Resolution of Project Plan Adoption	June 21, 2021
Submit Final Project Plan to EGLE	July 1, 2021

4.6 Cost Estimate

The estimated total project cost for the proposed SRF projects is $14,750,000. Detailed cost estimates for the distribution system improvements and WTP improvements are both shown in Appendix E. The estimated project costs do not incorporate any potential principal forgiveness the projects may be eligible for.

4.7 User Costs and Cost Sharing

The City of Traverse City Water Treatment Plant provides residential connections to City residents as well as residents from Elmwood, Garfield, and Peninsula Township. Table 4-4 denotes the number of residential connections for each that make up the total of 8,743 residential water connections.

Table 4-4. Residential Water Connections

Community	Residential Water Connections
City of Traverse City	5,870
Elmwood Township	46
Garfield Township	2273
Peninsula Township	554
Total	**8,743**

The estimated costs for all proposed projects and fiscal years are presented below. User charges are developed and adopted by the City annually and these charges vary based on:

1. Actual operational maintenance costs
2. Future increases in water pricing
3. Allocation of funding for future capital improvements and system replacement

Table 4-5 presents a summary of the estimated user costs by Fiscal year which were developed based on the estimated capital costs for the proposed project costs over the next five fiscal years. The entire debt retirement will be allocated based on the water consumed. Fixed charges and other non-flow related fees may be adjusted based on the results of the project. The annual equivalent costs for the project are provided below. The estimated cost per resident was allocated as the proportion of the project impact on the residential connections in the townships

Table 4-5. Estimated User Cost Summary by Phase

Descriptions	FY2022	FY2023	FY2024	FY2025	FY2026	Total
Total Phase Project Cost	$2,988,000	$2,199,000	$3,761,000	$2,283,000	$3,519,000	**$14,750,000**
Interest Rate	2.0%	2.0%	2.0%	2.0%	2.0%	
Term (years)	20	20	20	20	20	
No. of Residential Connections	8,743	8,743	8,743	8,743	8,743	
Total Annual Debt Repayment	$182,800	$134,500	$230,100	$139,700	$215,300	**$902,400**
Total Annual Debt Repayment, Residential*	$118,637	$87,291	$149,335	$90,665	$139,730	**$585,658**
Total Monthly Cost for Project per Residential Connection	$1.13	$0.83	$1.42	$0.86	$1.33	**$5.58**
Total Cost of Loan	$3,656,000	$2,690,000	$4,602,000	$2,794,000	$4,306,000	**$18,048,000**
Interest Paid	$668,000	$491,000	$841,000	$511,000	$787,000	**$3,298,000**

**Notes:*
1. Assumes interest rate of 2.0%, pricing in 2021 dollars with 30% contingency
2. Assumes 65% residential contribution to fund (estimated per water billing records)
3. As of April 2021, 5,870 residential connections in Traverse City and 2,873 residential connections from Townships

4.8 Authority to Implement Selected Alternative

Implementation of the proposed project assumes that the project will be financed by a low-interest loan from the SRF program. The City of Traverse City has the necessary legal, institutional, financial, and managerial resources available to ensure the construction, operation, and maintenance of the proposed facilities.

Most of the water main replacements will occur in the City road right-of-way but portions of the proposed project will occur in the road right-of-way under the jurisdiction of the Michigan Department of Transportation (MDOT). MDOT jurisdicition includes US-31 and during the construction plan development the necessary MDOT permits will be acquired.

5 Environmental Impacts

5.1 General

The anticipated environmental impacts resulting from the construction of the selected plan include beneficial & adverse, short term & long term, and irreversible impacts. The following is a discussion of the environmental impacts of the selected plan.

5.1.1 Beneficial and Adverse Impacts

The WTP is the City of Traverse City's drinking water treatment facility. The WTP provides drinking water to all commercial and domestic (residential) residents. Drinking water to homes and businesses is conveyed from the WTP after being treated from the City's raw water supply from an intake structure from the east arm of Grand Traverse Bay (East Bay). Without the diligent work of WTP employees to operate and maintain the facilities, the clean water would not be distributed throughout the City and associated townships.

Construction activities associated with the proposed WTP improvements and Drinking Water Distribution System improvements will take place on the existing facilities. Construction and equipment manufacturing related jobs would be generated, and local contractors would have an equal opportunity to bid on the construction contracts.

The environmental impacts for each alternative are expected to be minimal to none. All elements of improvement efforts in this project aim to have the least impact possible on the community and environment. No long-lasting impacts are expected for any alternative. Implementation of the Project Plan would create temporary disruption due to required construction. This includes noise and dust generated by the work and possible erosion of soils from open excavation. The assessment of alternate solutions and sites for the proposed project included identification of any important resources of either historic or environmental value which are protected by law and should be avoided.

No registered contamination sites were found within the WTP projects using the EGLE site contamination online mapper tool. One site may be impacted with the construction of water main on East Front Street. Documentation of the research of the can be found in Appendix F.

5.1.2 Short-Term and Long-Term Impacts

The short-term adverse impacts associated with construction activities would be minimal, and mitigatable, in comparison to the resulting long-term beneficial impacts. Impacts from the Drinking Water Distribution System and WTP improvements include temporary site disturbance, temporary damage to surface vegetation, and temporary water shut-off for residents. All restoration required post-replacement should return the impacted area to existing conditions. No long-term negative impacts are anticipated.

The long-term positive impacts include upgrading failing infrastructure, compliance with MI-SDWA, improved efficiency at the plant, and the ability to continue providing adequate clean water throughout the City and associated townships. These impacts also include improved processing at the plant and reduced wear on the plant equipment.

5.1.3 Irreversible Impacts

The investment in non-recoverable resources committed to the Project Plan would be traded off for the improved performance of the facilities during the life of the system. The commitment of resources includes public capital,

energy, labor, and unsalvageable materials. These non-recoverable resources would be foregone for the provision of the proposed improvements.

Construction accidents associated with this project may cause irreversible bodily injuries or death. Accidents may also cause damage to or destruction of equipment and other resources.

5.2 Analysis of Impacts

5.2.1 Direct Impacts

Local Air Quality

There will be minimal direct impacts on local air quality during the construction phases of these projects. Any effects on air quality will be due to dust and emissions from construction equipment.

Archeological, Historical, or Cultural Resources

There are no impacts on archaeological, tribal, historical, or cultural resources due to this project. However, the appropriate affiliates will be contacted and informed about the project upon any changes in conditions.

Impacts Upon the Existing or Future Quality of Local Groundwater and Surface Waters

Construction will occur of the WTP site as well as throughout the Drinking Water Distribution System. No impact will be made to Grand Traverse Bay and surrounding waterways, but appropriate measures will be taken during construction to avoid impact to these neighboring bodies of water. All necessary permits will be obtained before the proposed activities. There are no impacts anticipated to the local groundwater.

Impacts Upon Sensitive Features

Since the work is expected to take place within the existing Drinking Water Distribution System and WTP facilities, the construction will take place outside of the designated floodplain, wetland areas, or other sensitive areas. Any work that takes place within floodplain limits, proper mitigation measures, and permits will be obtained before the proposed activities.

Impacts Upon People and The Local Economy

Short-term impacts on people will occur during the construction phase. Increased construction traffic will occur in the localized area of the WTP. The City of Traverse City and associated townships water users will experience beneficial long-term impacts due to the level of service to which they expect to be maintained by these improvements.

The local economy will be stimulated for contractors and suppliers of the materials, labor, and equipment necessary to construct the project.

Operational Impacts

The proposed projects will improve the operation efficiency of the WTP and lower future operation and maintenance (O&M) costs for the Drinking Water Distribution System.

5.2.1 Indirect Impacts

Changes in Rate, Density, Or Type of Residential, Commercial, or Industrial Development and the Associated Transportation Changes

No changes are anticipated to the above.

Changes in Land Use

No changes are anticipated to the above. All improvements to the WTP and the Drinking Water Distribution System will be completed on the existing WTP site and existing system facilities.

Changes in Air or Water Quality Due to Facilitated Development

There will be no changes to air quality due to development.

Changes to The Natural Setting or Sensitive Features Resulting from Secondary Growth

There should be no changes to the natural setting or sensitive features resulting from secondary growth.

Impacts on Cultural, Human, Social and Economic Resources

No changes are anticipated to the above.

Impacts of Area Aesthetics

All the proposed WTP work will be completed on the existing site which is largely isolated from public view and the Drinking Water Distribution System will be completed on existing structures which are mainly underground.

Resource Consumption Over the Useful Life of the Treatment Works, Especially the Generation of Solid Wastes

No changes are anticipated to the above.

5.2.1 Cumulative Impacts

Siltation

Siltation may occur during the construction phase of the project. Proper soil erosion and sedimentation control practices will be followed to reduce the impacts of siltation on surrounding areas.

Water Quality Impacts from Direct Discharges and Non-Point Sources

There should not be any impacts to the above as a result of this project.

Indirect Impacts from Development

There should not be development as a result of this project.

The Impacts from Multiple Public Works Projects Occurring in the Same Vicinity

There will only be short-term traffic impacts during the construction phase of this project and proper traffic control measures will be followed.

6 Mitigation

6.1 Short-Term, Construction Related Mitigation

Environmental disruption will occur during construction. Guidelines will be established for cover vegetation removal, dust control, traffic control and accident prevention. Once construction is completed those short-term effects will stop and the area will be returned to the original conditions.

The soil erosion impact would be mitigated through the contractor's required compliance with a program for control of soil erosion and sedimentation as specified in Part 91 of Michigan Act 451, P.A. of 1994. The use of soil erosion and sedimentation controls (i.e., straw bales, sedimentation basins, catch basin inserts, silt fencing, etc.) will protect the Boardman River, Boardman Lake, Kids Creek, and the Grand Traverse Bay.

Careful considerations will be taken during the construction planning process to ensure that the plant remains in service while the improvements are underway. Construction equipment will be maintained in good condition to decrease noise. All access roads will be swept as necessary to avoid tracking sediment onto public roads.

6.2 Mitigation of Long-Term Impacts

General construction activities will prohibit the disposal of soils in wetlands, floodplains, or other sensitive areas. Catch basins will be protected where earth-changing activities will take place.

6.3 Mitigation of Indirect Impacts

The current trend in Grand Traverse County and the City of Traverse City is that the land use is largely dominated by residential properties. According to the City of Traverse City's master planning for land use, this will not change. Considering that a vast majority of the residents within the City limits are connected to the water system, a substantial increase in flow is not expected from within the City limits.

The City of Traverse City's Master Plan and ordinances can also be found on their websites.

7 Public Participation

7.1 General

The Project Plan will be advertised in the local newspaper before May 20, 2021 (refer to Appendix G for all public participation documentation.) A copy of the Project Plan will be placed at the following location for review:

- City Hall
- Online at the City of Traverse City's Website

A formal public hearing will be held on June 21, 2021 to review the work associated with the proposed Project Plan. The hearing will review the information presented in the Project Plan, including estimated user costs and to receive comments and views of interested persons. Copies of correspondence related to agency notifications, as well as other relevant correspondence, will also be included in Appendix G.

7.2 Public Hearing

Appendix G will include a transcribed copy of the public hearing, commission members attendance list, the Project Plan resolution, comments received and answered, and a photocopy of the slides presented at the hearing.

7.3 Resolution

The City Commission made a formal resolution regarding this Plan at a Commission meeting following the public hearing scheduled for June 21, 2021. The resolution is included in Appendix G.

APPENDIX A: AGENCY CORRESPONDANCE

HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915

STREET: 1925 Breton Road SE
Suite 100
Grand Rapids, MI 49506
PHONE: 616-454-4286
WEBSITE: hrcengr.com

May 17, 2021

NESHAP Asbestos Program
Department of Environment, Great Lakes & Energy – Air Quality Division
P.O. Box 30260
Lansing, MI 48909-7760

Attn: Ms. Karen Kajiya-Mills, Program Manager

Re: Impact Review
Drinking Water Improvements Program
City of Traverse City, Michigan

HRC Job No. 20210137

Dear Ms. Kajiya-Mills:

The City of Traverse City is submitting a Project Plan to the Michigan Department of Environment, Great Lakes, and Energy (EGLE) for acceptance into the Drinking Water State Revolving Fund (DWSRF) Loan Program. The Project plan requires a review to determine any potential impacts due to removal of building materials containing asbestos in the vicinity of the project.

On behalf of the City of Traverse City, we are requesting information regarding the impacts of the above referenced proposed project upon National Emission Standards for Hazardous Air Pollutants (NESHAP) regulations. The project work will involve the following:

- Improvements to the distribution systems including:
  - Replacement of aging water mains
  - Addressing water booster station reliability issues
- Addressing limitations at the water treatment plant including:
  - Raw water main and pumping
  - Aging chemical feed and storage issues
  - Improving low service and high service pumping efficiency using VFD's
  - Electrical system reliability

The City's raw water supply is from an intake structure from the east arm of Grand Traverse Bay (East Bay). The City's original water supply was located near the City in West Bay in the 1890s and was relocated to East Bay, which is more protected from runoff and potential contamination sources, in 1965. Treatment is provided by a 20 million gallon per day (mgd) Water Treatment Plant (WTP) located in the City near the intake in East Bay. The WTP was converted to direct filtration in 1993 and is equipped with four low service pumps (raw water), two flocculators, five rapid sand filters, two clear wells, finished water storage, and five high service pumps (finished water). The service area location of the WTP is provided in the attached figures.

The proposed project site covers primarily commercial and residential areas. Excavations will be made in paved areas, primarily where water mains are preexisting. All land will be returned to pre-construction condition.

Since the proposed project does not plan for the removal of any building materials containing asbestos, no impacts are expected from the proposed project upon any NESHAP regulations. Should any asbestos or other hazardous material be

encountered, proper precautions in accordance with State and Federal Regulation will be taken for handling and disposal. On behalf of the City of Traverse City, we are requesting a review to confirm that the above referenced project will not cause an impact to NESHAP regulations in the project vicinity.

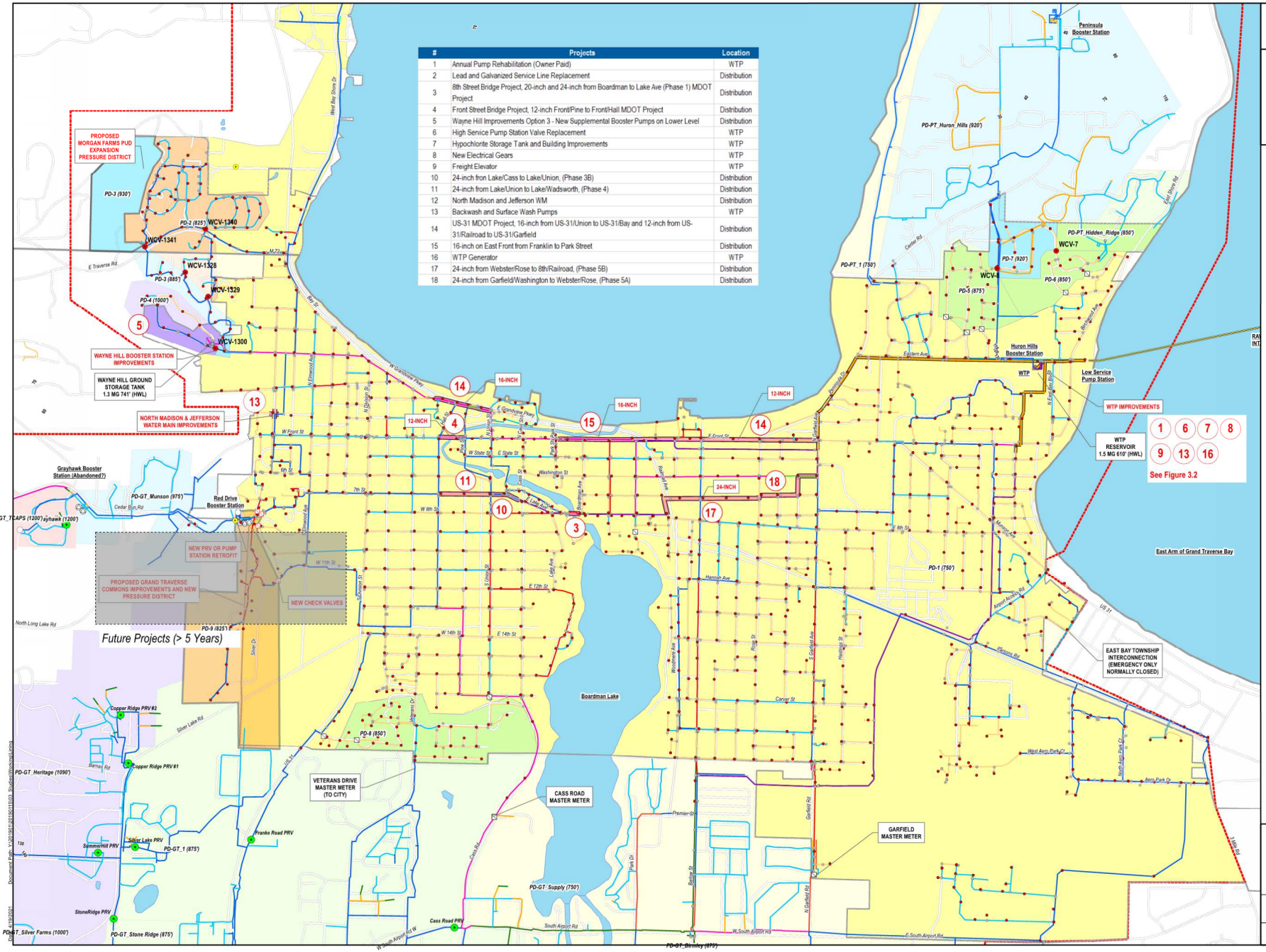
We request, on behalf of the City of Traverse City, your concurrence with this determination. We appreciate your review and would be grateful for a response as soon as possible so that we may meet program deadlines. If you have any questions or require any additional information, please contact the undersigned.

Very truly yours,

HUBBELL, ROTH & CLARK, INC.

Adeline Hummel
Graduate Engineer I

Attachment
Recommended Improvements
Water Treatment Plant Proposed Improvements



#	Projects	Location
1	Annual Pump Rehabilitation (Owner Paid)	WTP
2	Lead and Galvanized Service Line Replacement	Distribution
3	8th Street Bridge Project, 20-inch and 24-inch from Boardman to Lake Ave (Phase 1) MDOT Project	Distribution
4	Front Street Bridge Project, 12-inch Front/Pine to Front/Hall MDOT Project	Distribution
5	Wayne Hill Improvements Option 3 - New Supplemental Booster Pumps on Lower Level	Distribution
6	High Service Pump Station Valve Replacement	WTP
7	Hypochlorite Storage Tank and Building Improvements	WTP
8	New Electrical Gears	WTP
9	Freight Elevator	WTP
10	24-inch fron Lake/Cass to Lake/Union, (Phase 3B)	Distribution
11	24-inch from Lake/Union to Lake/Wadsworth, (Phase 4)	Distribution
12	North Madison and Jefferson WM	Distribution
13	Backwash and Surface Wash Pumps	WTP
14	US-31 MDOT Project, 16-inch from US-31/Union to US-31/Bay and 12-inch from US-31/Railroad to US-31/Garfield	Distribution
15	16-inch on East Front from Franklin to Park Street	Distribution
16	WTP Generator	WTP
17	24-inch from Webster/Rose to 8th/Railroad, (Phase 5B)	Distribution
18	24-inch from Garfield/Washington to Webster/Rose, (Phase 5A)	Distribution

CITY of TRAVERSE CITY MICHIGAN

HRC
HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915
1925 BRETON ROAD SE SUITE 100
GRAND RAPIDS, MI 49506
(616) 454-4286
www.hrcengr.com

LEGEND

- Check Valve
- PRV
- Hydrant
- System Valve
- City/Township
- Water System Service Area
- County

Water Main

- 6"
- 8"
- 10"
- 12"
- 16"
- 18"
- 20"
- 24"
- 30"
- 36"

Pressure District HGL

- 750
- 751 - 825
- 826 - 884
- 885 - 999
- 1000 - 1090
- 1091 - 1200

Recommended Project

- Project Plan

N W E S

0 750 1,500 3,000 Feet

FIGURE 3.1
TRAVERSE CITY RECOMMENDED IMPROVEMENTS

2021 DWSRF PROJECT PLAN

MAY 2021 | HRC #: 20210137

Y:\202101\20210137\03_Studies\Working\Project_Plan\Draft\Figures\20210137_Figures.pptx

HRC

Traverse City – 2021 DWSRF Project Plan

Water Treatment Plant Proposed Improvements

Job No.
20210137

Date
May 2021

Figure No.
3.2

HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915

STREET: 1925 Breton Road SE
Suite 100
Grand Rapids, MI 49506
PHONE: 616-454-4286
WEBSITE: hrcengr.com

May 17, 2021

Michigan Department of Environment, Great Lakes, and Energy (EGLE)
Cadillac District Office
120 West Chapin Street
Cadillac, MI 49601-2158

Re: Regional Environmental Planning Review
Drinking Water Improvements Program
City of Traverse City, Michigan

HRC Job No. 20210137

To Whom it May Concern:

The City of Traverse City is submitting a Project Plan to the Michigan Department of Environment, Great Lakes, and Energy (EGLE) for acceptance into the Drinking Water State Revolving Fund (DWSRF) Loan Program. The Project plan requires a review to determine any potential impacts on land-water interfaces, including Inland Lakes and Streams, Floodplains, Wetlands, Great Lakes Shorelands, Navigable Waters and Army Corps of Engineers (ACE) Regulated Activities.

On behalf of the City of Traverse City, we are requesting information regarding the impacts of the above referenced proposed project upon the previously detailed land-water interfaces in the vicinity of the project. The project work will involve the following:

- Improvements to the distribution systems including:
  - Replacement of aging water mains
  - Addressing water booster station reliability issues
- Addressing limitations at the water treatment plant including:
  - Raw water main and pumping
  - Aging chemical feed and storage issues
  - Improving low service and high service pumping efficiency using VFD's
  - Electrical system reliability

The City's raw water supply is from an intake structure from the east arm of Grand Traverse Bay (East Bay). The City's original water supply was located near the City in West Bay in the 1890s and was relocated to East Bay, which is more protected from runoff and potential contamination sources, in 1965. Treatment is provided by a 20 million gallon per day (mgd) Water Treatment Plant (WTP) located in the City near the intake in East Bay. The WTP was converted to direct filtration in 1993 and is equipped with four low service pumps (raw water), two flocculators, five rapid sand filters, two clear wells, finished water storage, and five high service pumps (finished water). The service area location of the WTP is provided in the attached figures.

The proposed project plan site encompasses pre-existing water mains beneath paved roadways or along bridges. In addition to this, construction will take place within the existing water treatment plant.

Based on the attached FEMA Floodplain Maps, it can be concluded that no construction is expected to be within floodplains. All proper permits and precautions will be implemented during this construction. On behalf of the City of Traverse City, we are requesting a review to confirm that the above referenced project will not cause any long-term impacts to any floodplains

in the project vicinity.

The proposed project locations are mainly within previously attained easements. Since the work will be primarily within existing structures in these easements, no impacts to any existing wetland areas are expected. However, if project work is required within an existing wetland, necessary mitigation measures will be undertaken to protect the wetlands influenced by the project. On behalf of the City of Traverse City, we are requesting a review to confirm that the above referenced project will not cause an impact to any wetlands in the project vicinity.

Since the proposed project involves improvements to existing facilities, no impacts are expected from the proposed project upon Great Lakes Shorelands, Navigable Waters or ACE Regulated Activities. On behalf of the City of Traverse City, we are requesting a review to confirm that the above referenced project will not cause an impact to any Great Lakes Shorelands, Navigable Waters or ACE Regulated Activities.

If not already obtained, the appropriate joint permit applications will be completed, and the necessary permits obtained prior to any construction activities in this project area.

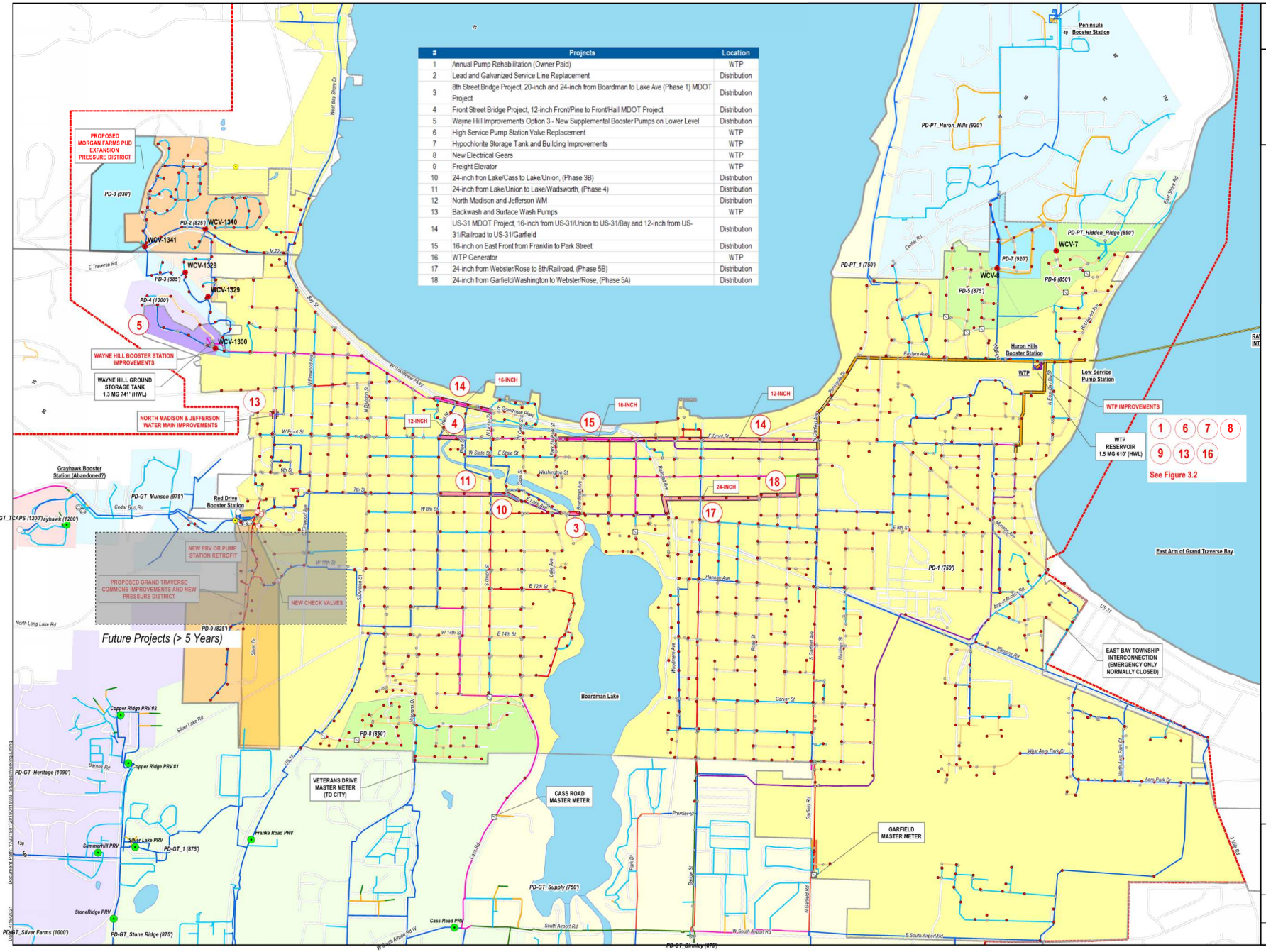
We request, on behalf of the City of Traverse City, your concurrence with this determination. We appreciate your review and would be grateful for a response as soon as possible so that we may meet program deadlines. If you have any questions or require any additional information, please contact the undersigned.

Very truly yours,

HUBBELL, ROTH & CLARK, INC.

Adeline Hummel
Graduate Engineer I

Attachment
Recommended Improvements
Water Treatment Plant Proposed Improvements
FEMA Floodplain



#	Projects	Location
1	Annual Pump Rehabilitation (Owner Paid)	WTP
2	Lead and Galvanized Service Line Replacement	Distribution
3	8th Street Bridge Project, 20-inch and 24-inch from Boardman to Lake Ave (Phase 1) MDOT Project	Distribution
4	Front Street Bridge Project, 12-inch Front/Pine to Front/Hall MDOT Project	Distribution
5	Wayne Hill Improvements Option 3 - New Supplemental Booster Pumps on Lower Level	Distribution
6	High Service Pump Station Valve Replacement	WTP
7	Hypochlorite Storage Tank and Building Improvements	WTP
8	New Electrical Gears	WTP
9	Freight Elevator	WTP
10	24-inch fron Lake/Cass to Lake/Union, (Phase 3B)	Distribution
11	24-inch from Lake/Union to Lake/Wadsworth, (Phase 4)	Distribution
12	North Madison and Jefferson WM	Distribution
13	Backwash and Surface Wash Pumps	WTP
14	US-31 MDOT Project, 16-inch from US-31/Union to US-31/Bay and 12-inch from US-31/Railroad to US-31/Garfield	Distribution
15	16-inch on East Front from Franklin to Park Street	Distribution
16	WTP Generator	WTP
17	24-inch from Webster/Rose to 8th/Railroad, (Phase 5B)	Distribution
18	24-inch from Garfield/Washington to Webster/Rose, (Phase 5A)	Distribution

CITY of TRAVERSE CITY MICHIGAN

HRC
HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915
1925 BRETON ROAD SE SUITE 100
GRAND RAPIDS, MI 49506
(616) 454-4286
www.hrcengr.com

LEGEND

- Check Valve
- PRV
- Hydrant
- System Valve
- City/Township
- Water System Service Area
- County

Water Main

- 6"
- 8"
- 10"
- 12"
- 16"
- 18"
- 20"
- 24"
- 30"
- 36"

Pressure District HGL

- 750
- 751 - 825
- 826 - 884
- 885 - 999
- 1000 - 1090
- 1091 - 1200

Recommended Project

- Project Plan

N W E S

0 750 1,500 3,000 Feet

FIGURE 3.1
TRAVERSE CITY RECOMMENDED IMPROVEMENTS

2021 DWSRF PROJECT PLAN

MAY 2021 | HRC #: 20210137

Y:\202101\20210137\03_Studies\Working\Project_Plan\Draft\Figures\20210137_Figures.pptx

HRC

Traverse City – 2021 DWSRF Project Plan

Water Treatment Plant Proposed Improvements

Job No.
20210137

Date
May 2021

Figure No.
3.2

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) Report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS Report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study Report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 16. The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713- 3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was provided in digital format by the National Agricultural Imagery Program (NAIP). This information was photogrammetrically compiled at a scale of 1:12,000 from aerial photography dated 2007 or later.

The **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have **questions about this map,** how to order products, or the National Flood Insurance Program in general, please call the **FEMA Map Information eXchange (FMIX)** at **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.

Figure 2-6 FEMA Floodplain Map

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% Annual Chance Floodplain Boundary
- 0.2% Annual Chance Floodplain Boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

- A — A — Cross section line
- 23 — 23 — Transect line
- 45° 02' 08", 93° 02' 12" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere
- 4989000mN — 1000-meter Universal Transverse Mercator grid values, zone 16
- DX5510 × — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 • — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
August 28, 2018

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'
250 0 500 1000 FEET
150 0 150 300 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0113C

FIRM

FLOOD INSURANCE RATE MAP

GRAND TRAVERSE COUNTY, MICHIGAN (ALL JURISDICTIONS)

PANEL 113 OF 425
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
PENINSULA, TOWNSHIP OF	260747	0113	C
TRAVERSE CITY, CITY OF	260082	0113	C

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
26055C0113C
EFFECTIVE DATE
AUGUST 28, 2018

Federal Emergency Management Agency

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Michigan Ecological Services Field Office
2651 Coolidge Road Suite 101
East Lansing, MI 48823-6360
Phone: (517) 351-2555 Fax: (517) 351-1443
http://www.fws.gov/midwest/EastLansing/

In Reply Refer To: May 05, 2021
Consultation Code: 03E16000-2021-SLI-1367
Event Code: 03E16000-2021-E-05011
Project Name: Traverse City DWSRF

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The attached species list identifies any federally threatened, endangered, proposed and candidate species that may occur within the boundary of your proposed project or may be affected by your proposed project. The list also includes designated critical habitat if present within your proposed project area or affected by your project. This list is provided to you as the initial step of the consultation process required under section 7(c) of the Endangered Species Act, also referred to as Section 7 Consultation.

Section 7 of the Endangered Species Act of 1973 requires that actions authorized, funded, or carried out by Federal agencies not jeopardize federally threatened or endangered species or adversely modify designated critical habitat. To fulfill this mandate, Federal agencies (or their designated non-federal representative) must consult with the Fish and Wildlife Service if they determine their project may affect listed species or critical habitat.

There are several important steps in evaluating the effects of a project on listed species. Please use the species list provided and visit the U.S. Fish and Wildlife Service's Region 3 Section 7 Technical Assistance website at http://www.fws.gov/midwest/endangered/section7/s7process/index.html. This website contains step-by-step instructions to help you determine if your project may affect listed species and lead you through the section 7 consultation process.

Under 50 CFR 402.12(e) (the regulations that implement section 7 of the Endangered Species Act), the accuracy of this species list should be verified after 90 days. You may verify the list by visiting the ECOS-IPaC website (http://ecos.fws.gov/ipac/) at regular intervals during project planning and implementation and completing the same process you used to receive the attached list.

For all **wind energy projects** and **projects that include installing towers that use guy wires or are over 200 feet in height**, please contact this field office directly for assistance, even if no federally listed plants, animals or critical habitat are present within your proposed project area or may be affected by your proposed project.

Please see the "Migratory Birds" section below for important information regarding incorporating migratory birds into your project planning. Our Migratory Bird Program has developed recommendations, best practices, and other tools to help project proponents voluntarily reduce impacts to birds and their habitats. The Bald and Golden Eagle Protection Act prohibitions include the take and disturbance of eagles. If your project is near an eagle nest or winter roost area, see our Eagle Permits website at https://www.fws.gov/midwest/eagle/permits/index.html to help you avoid impacting eagles or determine if a permit may be necessary.

Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit https://www.fws.gov/birds/policies-and-regulations/administrative-orders/executive-orders.php.

We appreciate your concern for threatened and endangered species. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Migratory Birds
- Wetlands

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Michigan Ecological Services Field Office
2651 Coolidge Road Suite 101
East Lansing, MI 48823-6360
(517) 351-2555

Project Summary

Consultation Code: 03E16000-2021-SLI-1367
Event Code: 03E16000-2021-E-05011
Project Name: Traverse City DWSRF
Project Type: WATER SUPPLY / DELIVERY
Project Description: This project would provide several improvements for the existing Water Treatment Plant including a new generator, high service pump station valves, rehabilitated backwash and surface wash pumps, a new sodium hypochlorite tank and building, new electrical gears, freight elevator rehabilition, and annual pump repairs. In addition to the Water Treatment Plant improvements, several outdated and undersized water mains throughout the city will be replaced, as well as a booster station rehabilitation. The exact location for these mains can be seen in the attached site plan.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@44.762999300000004,-85.61180626179808,14z

Counties: Grand Traverse County, Michigan

Endangered Species Act Species

There is a total of 4 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Note that 2 of these species should be considered only under certain conditions.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

---

1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Northern Long-eared Bat *Myotis septentrionalis*	Threatened

No critical habitat has been designated for this species.
Species profile: https://ecos.fws.gov/ecp/species/9045
General project design guidelines:
https://ecos.fws.gov/docs/tess/ipac_project_design_guidelines/doc5664.pdf

Birds

NAME	STATUS
Red Knot *Calidris canutus rufa*	Threatened

No critical habitat has been designated for this species.
This species only needs to be considered under the following conditions:
- Only actions that occur along coastal areas during the Red Knot migratory window of MAY 1 - SEPTEMBER 30.

Species profile: https://ecos.fws.gov/ecp/species/1864

Reptiles

NAME	STATUS
Eastern Massasauga (=rattlesnake) *Sistrurus catenatus*	Threatened

No critical habitat has been designated for this species.

This species only needs to be considered under the following conditions:

- For all Projects: Project is within EMR Range

Species profile: https://ecos.fws.gov/ecp/species/2202

General project design guidelines:

https://ecos.fws.gov/docs/tess/ipac_project_design_guidelines/doc5280.pdf

Flowering Plants

NAME	STATUS
Pitcher's Thistle *Cirsium pitcheri*	Threatened

No critical habitat has been designated for this species.

Species profile: https://ecos.fws.gov/ecp/species/8153

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

USFWS National Wildlife Refuge Lands And Fish Hatcheries

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

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

Migratory Birds

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

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

---

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

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

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

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Dec 1 to Aug 31
Black-billed Cuckoo *Coccyzus erythropthalmus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9399	Breeds May 15 to Oct 10

NAME	BREEDING SEASON
Bobolink *Dolichonyx oryzivorus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 20 to Jul 31
Canada Warbler *Cardellina canadensis* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 20 to Aug 10
Cape May Warbler *Setophaga tigrina* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Jun 1 to Jul 31
Dunlin *Calidris alpina arcticola* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds elsewhere
Eastern Whip-poor-will *Antrostomus vociferus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 1 to Aug 20
Golden Eagle *Aquila chrysaetos* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1680	Breeds Jan 1 to Aug 31
Harris's Sparrow *Zonotrichia querula* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Least Bittern *Ixobrychus exilis* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/6175	Breeds Aug 16 to Oct 31
Lesser Yellowlegs *Tringa flavipes* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9679	Breeds elsewhere
Olive-sided Flycatcher *Contopus cooperi* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/3914	Breeds May 20 to Aug 31
Red-headed Woodpecker *Melanerpes erythrocephalus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Sep 10
Ruddy Turnstone *Arenaria interpres morinella* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds elsewhere

NAME	BREEDING SEASON
Rusty Blackbird *Euphagus carolinus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Jul 20
Semipalmated Sandpiper *Calidris pusilla* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Whimbrel *Numenius phaeopus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9483	Breeds elsewhere
Wood Thrush *Hylocichla mustelina* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Aug 31

Probability Of Presence Summary

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

Probability of Presence (■)

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

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

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

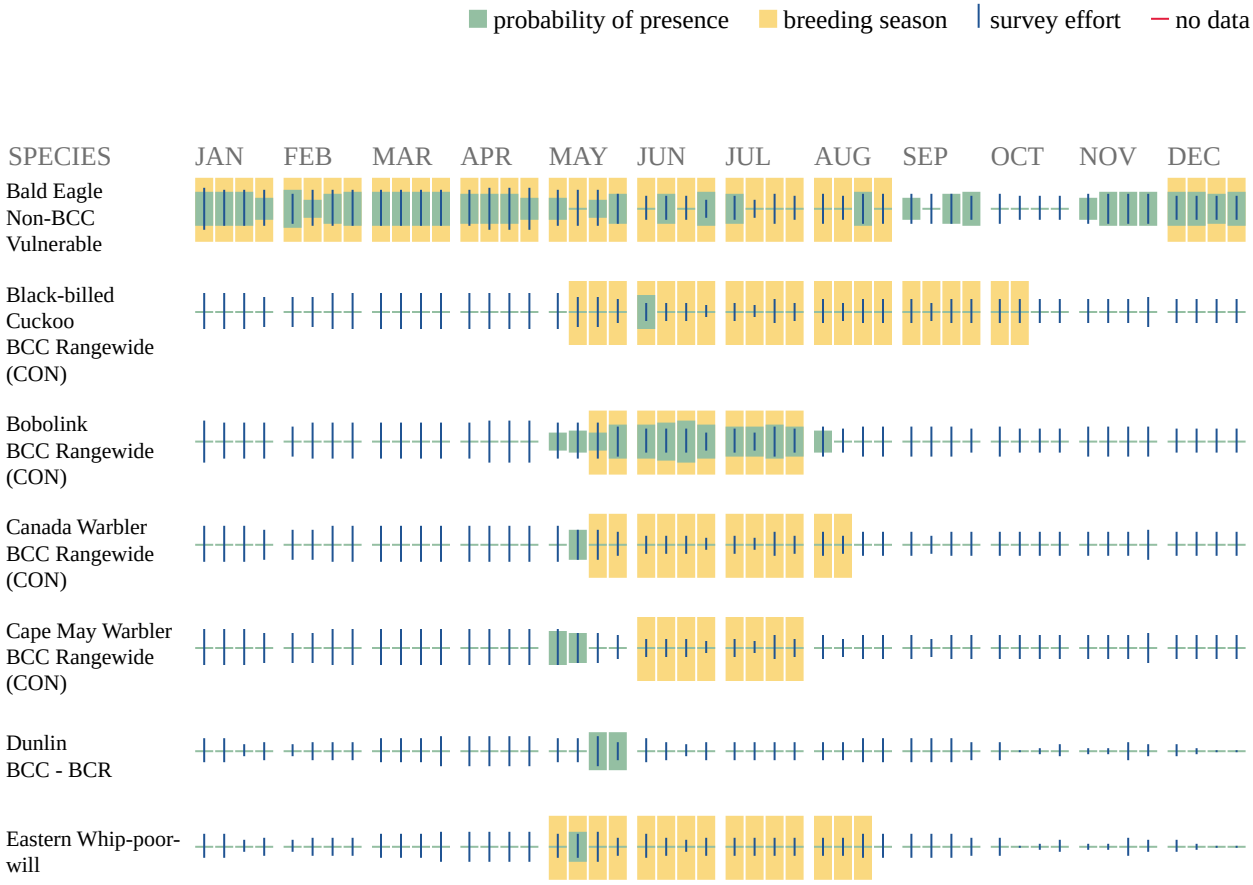
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

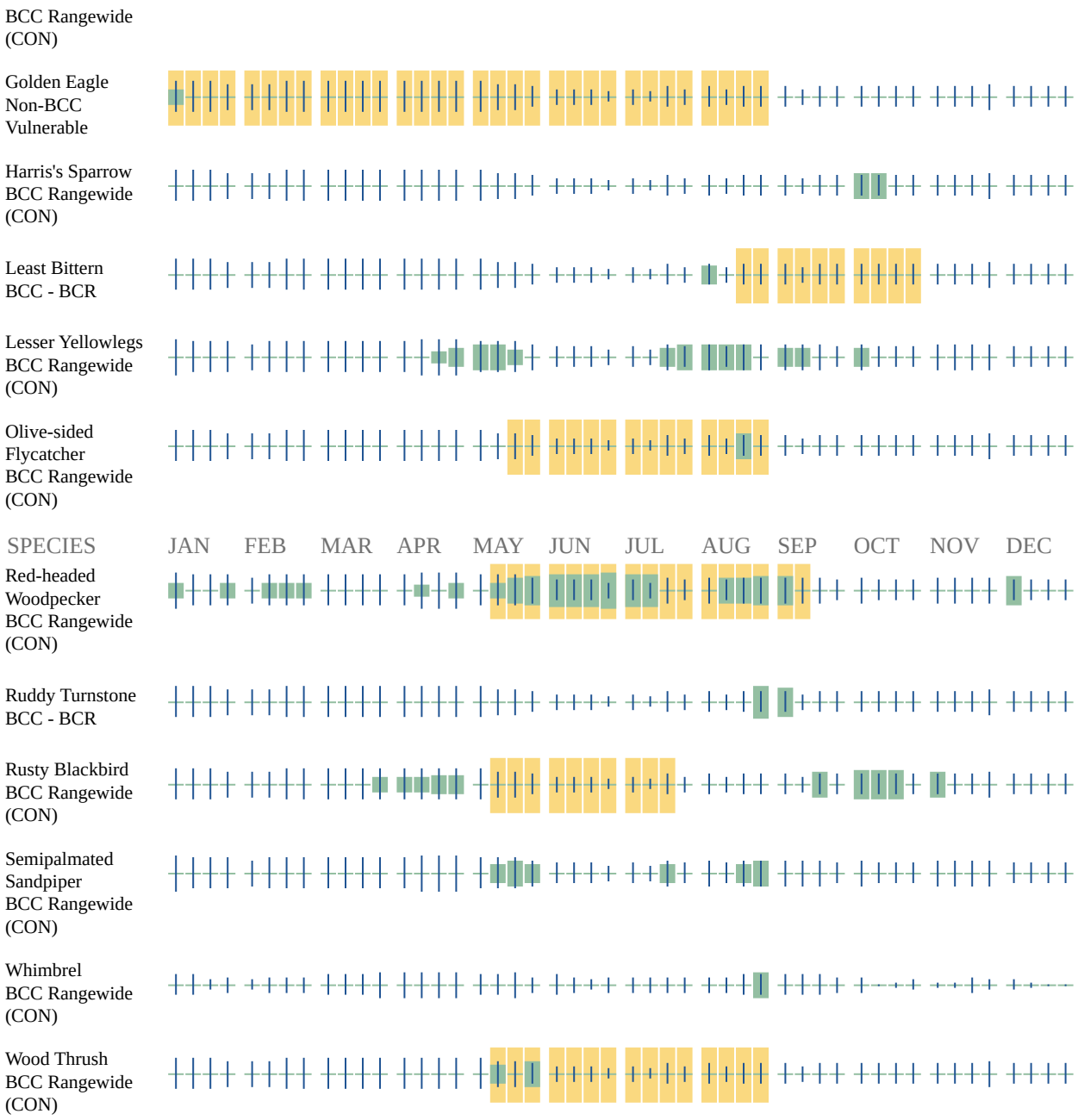
Breeding Season (■)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

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

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

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





Additional information can be found using the following links:

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

Migratory Birds FAQ

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

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

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

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

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

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

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

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

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

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

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your

project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?
Migratory birds delivered through IPaC fall into the following distinct categories of concern:

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

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

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

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

What if I have eagles on my list?
If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report
The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no

data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Wetlands

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

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

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

LAKE

- L1UBHh

RIVERINE

- R5UBH
- R2UBH

HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915

STREET: 1925 Breton Road SE
Suite 100
Grand Rapids, MI 49506
PHONE: 616-454-4286
WEBSITE: hrcengr.com

May 17, 2021

Michigan Department of Environment, Great Lakes, & Energy
Office of Waste Management and Radiological Protection Division
P.O. Box 30473
Lansing, MI 48909-7973

Re: Impact Review
Drinking Water Improvements Program
City of Traverse City, Michigan

HRC Job No. 20210137

To Whom it May Concern:

The City of Traverse City is submitting a Project Plan to the Michigan Department of Environment, Great Lakes, and Energy (EGLE) for acceptance into the Drinking Water State Revolving Fund (DWSRF) Loan Program. The Project plan requires a review to determine any potential impacts due to the disposal of waste materials in accordance with Michigan's Natural Resources and Environmental Protection Act (NREPA) as a result of the project.

On behalf of the City of Traverse City, we are requesting information regarding the potential impacts of the above referenced project based on Part 111, Part 115 and Part 121 of Michigan's Natural Resources and Environmental Protection Act (NREPA) and the Hazardous Materials Transportation Act. The project work will involve the following:

- Improvements to the distribution systems including:
  - Replacement of aging water mains
  - Addressing water booster station reliability issues
- Addressing limitations at the water treatment plant including:
  - Raw water main and pumping
  - Aging chemical feed and storage issues
  - Improving low service and high service pumping efficiency using VFD's
  - Electrical system reliability

The City's raw water supply is from an intake structure from the east arm of Grand Traverse Bay (East Bay). The City's original water supply was located near the City in West Bay in the 1890s and was relocated to East Bay, which is more protected from runoff and potential contamination sources, in 1965. Treatment is provided by a 20 million gallon per day (mgd) Water Treatment Plant (WTP) located in the City near the intake in East Bay. The WTP was converted to direct filtration in 1993 and is equipped with four low service pumps (raw water), two flocculators, five rapid sand filters, two clear wells, finished water storage, and five high service pumps (finished water). The service area location of the WTP is provided in the attached figures.

The proposed project involves replacement of existing facilities. No removal or disposal of building materials which contain lead, mercury, PCBs, or similar contaminants is expected. There may be existing facilities that were constructed during a period when lead paint was being used. However, in any case contaminants are discovered on the premises during construction, precaution and proper disposal will be implemented to follow regulations. We are requesting a review to confirm that the above referenced project will not impact Part 111, Part 115, or Part 121 of the NREPA.

We request, on behalf of the City of Traverse City, your concurrence with this determination. We appreciate your review

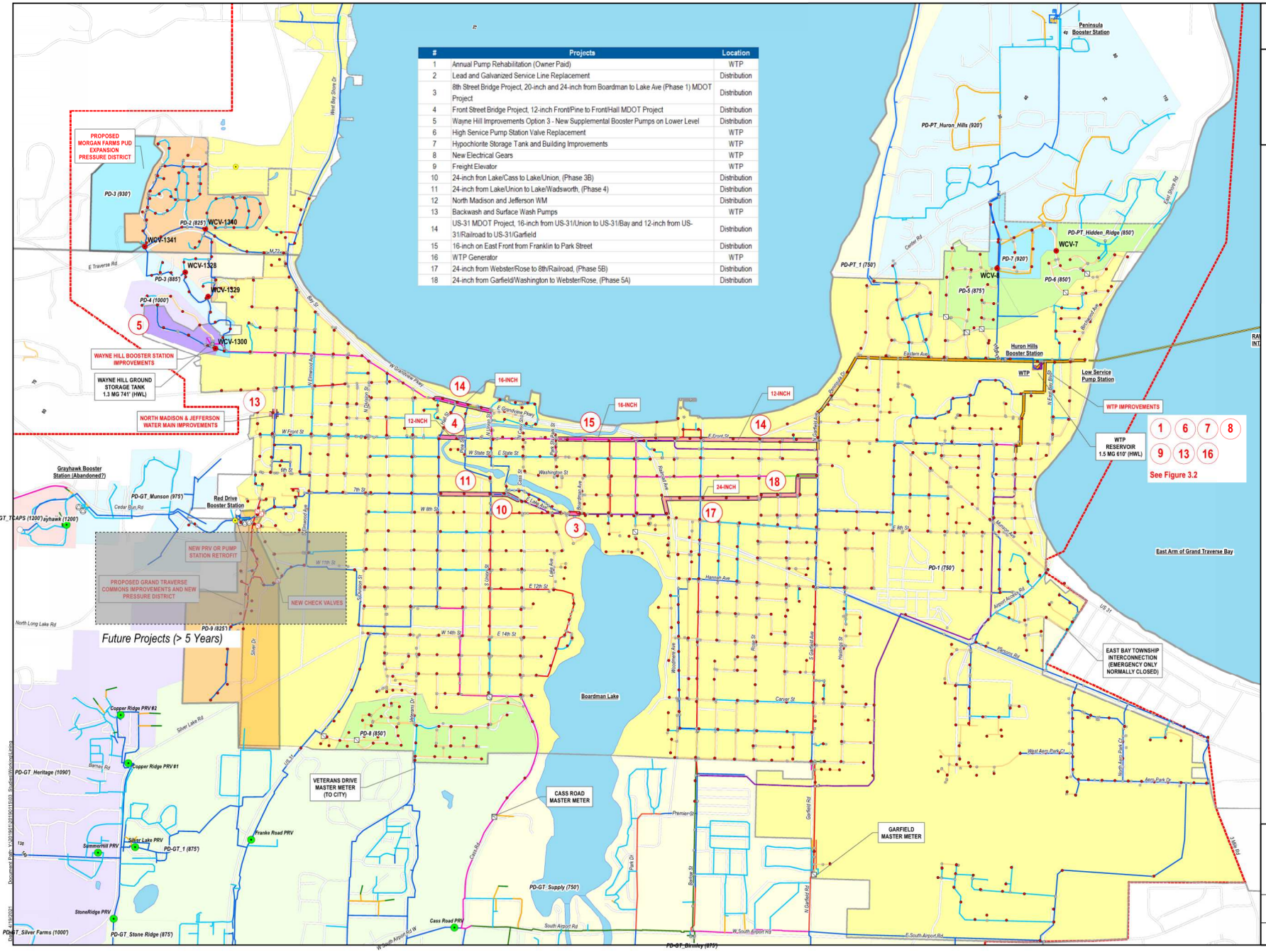
and would be grateful for a response as soon as possible so that we may meet program deadlines. If you have any questions or require any additional information, please contact the undersigned.

Very truly yours,

HUBBELL, ROTH & CLARK, INC.

Adeline Hummel
Graduate Engineer I

Attachment
Recommended Improvements
Proposed WTP Improvements
EGLE RRD Listed Facilities Map



#	Projects	Location
1	Annual Pump Rehabilitation (Owner Paid)	WTP
2	Lead and Galvanized Service Line Replacement	Distribution
3	8th Street Bridge Project, 20-inch and 24-inch from Boardman to Lake Ave (Phase 1) MDOT Project	Distribution
4	Front Street Bridge Project, 12-inch Front/Pine to Front/Hall MDOT Project	Distribution
5	Wayne Hill Improvements Option 3 - New Supplemental Booster Pumps on Lower Level	Distribution
6	High Service Pump Station Valve Replacement	WTP
7	Hypochlorite Storage Tank and Building Improvements	WTP
8	New Electrical Gears	WTP
9	Freight Elevator	WTP
10	24-inch fron Lake/Cass to Lake/Union, (Phase 3B)	Distribution
11	24-inch from Lake/Union to Lake/Wadsworth, (Phase 4)	Distribution
12	North Madison and Jefferson WM	Distribution
13	Backwash and Surface Wash Pumps	WTP
14	US-31 MDOT Project, 16-inch from US-31/Union to US-31/Bay and 12-inch from US-31/Railroad to US-31/Garfield	Distribution
15	16-inch on East Front from Franklin to Park Street	Distribution
16	WTP Generator	WTP
17	24-inch from Webster/Rose to 8th/Railroad, (Phase 5B)	Distribution
18	24-inch from Garfield/Washington to Webster/Rose, (Phase 5A)	Distribution

CITY of TRAVERSE CITY MICHIGAN

HRC
HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915
1925 BRETON ROAD SE SUITE 100
GRAND RAPIDS, MI 49506
(616) 454-4286
www.hrcengr.com

LEGEND

- Check Valve
- PRV
- Hydrant
- System Valve
- City/Township
- Water System Service Area
- County

Water Main

- 6"
- 8"
- 10"
- 12"
- 16"
- 18"
- 20"
- 24"
- 30"
- 36"

Pressure District HGL

- 750
- 751 - 825
- 826 - 884
- 885 - 999
- 1000 - 1090
- 1091 - 1200

Recommended Project

- Project Plan

N W E S

0 750 1,500 3,000 Feet

FIGURE 3.1
TRAVERSE CITY RECOMMENDED IMPROVEMENTS

2021 DWSRF PROJECT PLAN

MAY 2021 | HRC #: 20210137

Y:\202101\20210137\03_Studies\Working\Project_Plan\Draft\Figures\20210137_Figures.pptx

HRC

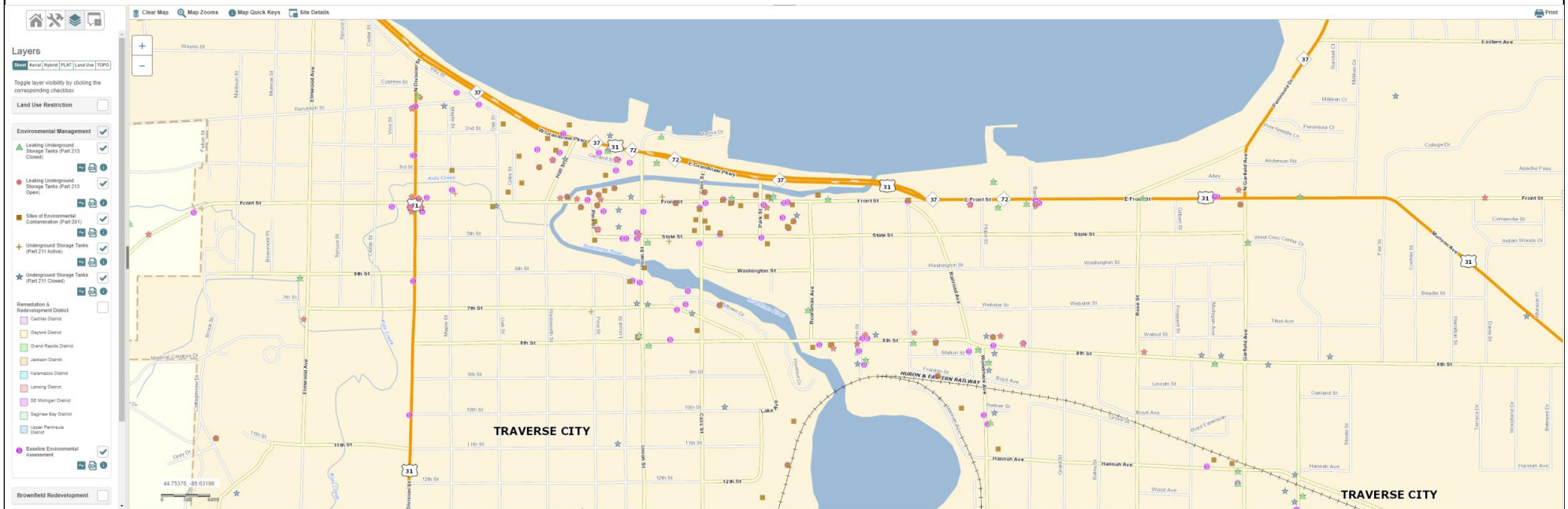
Traverse City – 2021 DWSRF Project Plan

Water Treatment Plant Proposed Improvements

Job No.
20210137

Date
May 2021

Figure No.
3.2



HRC	Traverse City Drinking Water Improvements	
	EGLE RRD Listed Facilities Map	Date 5/14/2021
		Figure No. 2

HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915

STREET: 1925 Breton Road SE
Suite 100
Grand Rapids, MI 49506
PHONE: 616-454-4286
WEBSITE: hrcengr.com

May 17, 2021

Networks Northwest
600 East Front Street, Suite 104
PO Box 506
Traverse City, MI 49685-0506

Re: Regional Environmental Planning Review
Drinking Water Improvements Project
City of Traverse City, Michigan

HRC Job No. 20210137

To Whom It May Concern:

The City of Traverse City is submitting a Project Plan to the Michigan Department of Environment, Great Lakes, and Energy (EGLE) for acceptance into the Drinking Water State Revolving Fund (DWSRF) Loan Program. The Project Plan requires a review to determine any potential impacts on any local development plans, area wide waste treatment management plans and/or regional water quality management plans.

On behalf of the City of Traverse City, we are requesting information regarding the impacts of the above referenced proposed project upon any local development plans, area wide waste treatment management plans and/or regional water quality management plans in the vicinity of the project. The project work will involve the following:

- Improvements to the distribution systems including:
  - Replacement of aging water mains
  - Addressing water booster station reliability issues
- Addressing limitations at the water treatment plant including:
  - Raw water main and pumping
  - Aging chemical feed and storage issues
  - Improving low service and high service pumping efficiency using VFD's
  - Electrical system reliability

The City's raw water supply is from an intake structure from the east arm of Grand Traverse Bay (East Bay). The City's original water supply was located near the City in West Bay in the 1890s and was relocated to East Bay, which is more protected from runoff and potential contamination sources, in 1965. Treatment is provided by a 20 million gallon per day (mgd) Water Treatment Plant (WTP) located in the City near the intake in East Bay. The WTP was converted to direct filtration in 1993 and is equipped with four low service pumps (raw water), two flocculators, five rapid sand filters, two clear wells, finished water storage, and five high service pumps (finished water). The service area location of the WTP is provided in the attached figures.

All population figures and projections referenced in the project plan will be collected from the Networks Northwest Website.

We request, on behalf of the City of Traverse City, notification if an alternative source for the population data is recommended.

Since the proposed project involves improvements to existing facilities, no impacts are expected from the proposed project

upon local development plans, area wide waste treatment management plans and/or regional water quality management plans. On behalf of the City of Traverse City, we are requesting a review to confirm that the above referenced project will not cause an impact to any local development plans, area wide waste treatment management plans and/or regional water quality management plans.

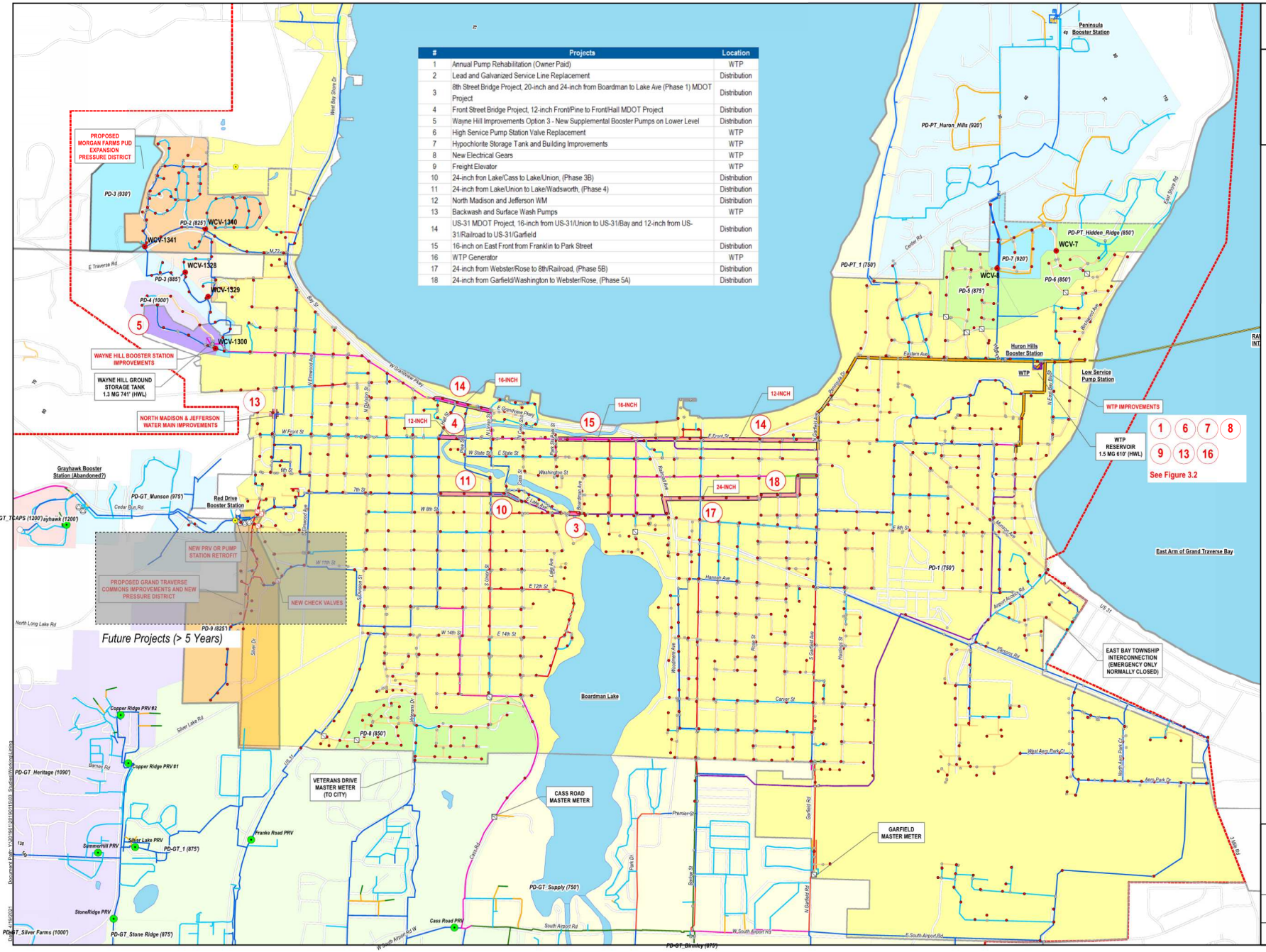
We request, on behalf of the City of Traverse City, your concurrence with this determination. We appreciate your review and would be grateful for a response as soon as possible so that we may meet program deadlines. If you have any questions or require any additional information, please contact the undersigned.

Very truly yours,

HUBBELL, ROTH & CLARK, INC.

Adeline Hummel
Graduate Engineer I

Attachment
Recommended Improvements
Proposed WTP Improvements



#	Projects	Location
1	Annual Pump Rehabilitation (Owner Paid)	WTP
2	Lead and Galvanized Service Line Replacement	Distribution
3	8th Street Bridge Project, 20-inch and 24-inch from Boardman to Lake Ave (Phase 1) MDOT Project	Distribution
4	Front Street Bridge Project, 12-inch Front/Pine to Front/Hall MDOT Project	Distribution
5	Wayne Hill Improvements Option 3 - New Supplemental Booster Pumps on Lower Level	Distribution
6	High Service Pump Station Valve Replacement	WTP
7	Hypochlorite Storage Tank and Building Improvements	WTP
8	New Electrical Gears	WTP
9	Freight Elevator	WTP
10	24-inch fron Lake/Cass to Lake/Union, (Phase 3B)	Distribution
11	24-inch from Lake/Union to Lake/Wadsworth, (Phase 4)	Distribution
12	North Madison and Jefferson WM	Distribution
13	Backwash and Surface Wash Pumps	WTP
14	US-31 MDOT Project, 16-inch from US-31/Union to US-31/Bay and 12-inch from US-31/Railroad to US-31/Garfield	Distribution
15	16-inch on East Front from Franklin to Park Street	Distribution
16	WTP Generator	WTP
17	24-inch from Webster/Rose to 8th/Railroad, (Phase 5B)	Distribution
18	24-inch from Garfield/Washington to Webster/Rose, (Phase 5A)	Distribution

CITY of TRAVERSE CITY MICHIGAN

HRC
HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915
1925 BRETON ROAD SE SUITE 100
GRAND RAPIDS, MI 49506
(616) 454-4286
www.hrcengr.com

LEGEND

- Check Valve
- PRV
- Hydrant
- System Valve
- City/Township
- Water System Service Area
- County

Water Main

- 6"
- 8"
- 10"
- 12"
- 16"
- 18"
- 20"
- 24"
- 30"
- 36"

Pressure District HGL

- 750
- 751 - 825
- 826 - 884
- 885 - 999
- 1000 - 1090
- 1091 - 1200

Recommended Project

- Project Plan

N W E S

0 750 1,500 3,000 Feet

FIGURE 3.1
TRAVERSE CITY RECOMMENDED IMPROVEMENTS

2021 DWSRF PROJECT PLAN

MAY 2021 | HRC #: 20210137

Y:\202101\20210137\03_Studies\Working\Project_Plan\Draft\Figures\20210137_Figures.pptx

HRC

Traverse City – 2021 DWSRF Project Plan

Water Treatment Plant Proposed Improvements

Job No.
20210137

Date
May 2021

Figure No.
3.2

HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915

STREET: 1925 Breton Road SE
Suite 100
Grand Rapids, MI 49506
PHONE: 616-454-4286
WEBSITE: hrcengr.com

May 17, 2021

Farmland Preservation Program
USDA Natural Resources Conversation Service
3001 Coolidge Road, Suite 250
East Lansing, MI 48823-6362

Re: Impact Review
Drinking Water Improvements Project
City of Traverse City, Michigan

HRC Job No. 20210137

To Whom it May Concern:

The City of Traverse City is submitting a Project Plan to the Michigan Department of Environment, Great Lakes, and Energy (EGLE) for acceptance into the Drinking Water State Revolving Fund (DWSRF) Loan Program. The Project Plan requires a review to determine any potential impacts on prime and unique farmland in the vicinity of the project.

On behalf of the City of Traverse City, we are requesting information regarding the impacts of the above referenced proposed project upon the Farmland Protection Policy Act regulations. The project work will involve the following:

- Improvements to the distribution systems including:
  - Replacement of aging water mains
  - Addressing water booster station reliability issues
- Addressing limitations at the water treatment plant including:
  - Raw water main and pumping
  - Aging chemical feed and storage issues
  - Improving low service and high service pumping efficiency using VFD's
  - Electrical system reliability

The City's raw water supply is from an intake structure from the east arm of Grand Traverse Bay (East Bay). The City's original water supply was located near the City in West Bay in the 1890s and was relocated to East Bay, which is more protected from runoff and potential contamination sources, in 1965. Treatment is provided by a 20 million gallon per day (mgd) Water Treatment Plant (WTP) located in the City near the intake in East Bay. The WTP was converted to direct filtration in 1993 and is equipped with four low service pumps (raw water), two flocculators, five rapid sand filters, two clear wells, finished water storage, and five high service pumps (finished water). The service area location of the WTP is provided in the attached figures.

The proposed project site covers only urban areas, mainly zoned as single family residential or commercial. All excavated land will be restored to pre-construction condition. Since the proposed project involves improvements to existing facilities, no conversions of farmland to nonagricultural uses are expected. Please see attached map which shows a lack of existing significant farmlands in the project area. On behalf of the City of Traverse City, we are requesting a review to confirm that the above referenced project will not cause an impact to any significant farmland or agricultural lands in the project vicinity.

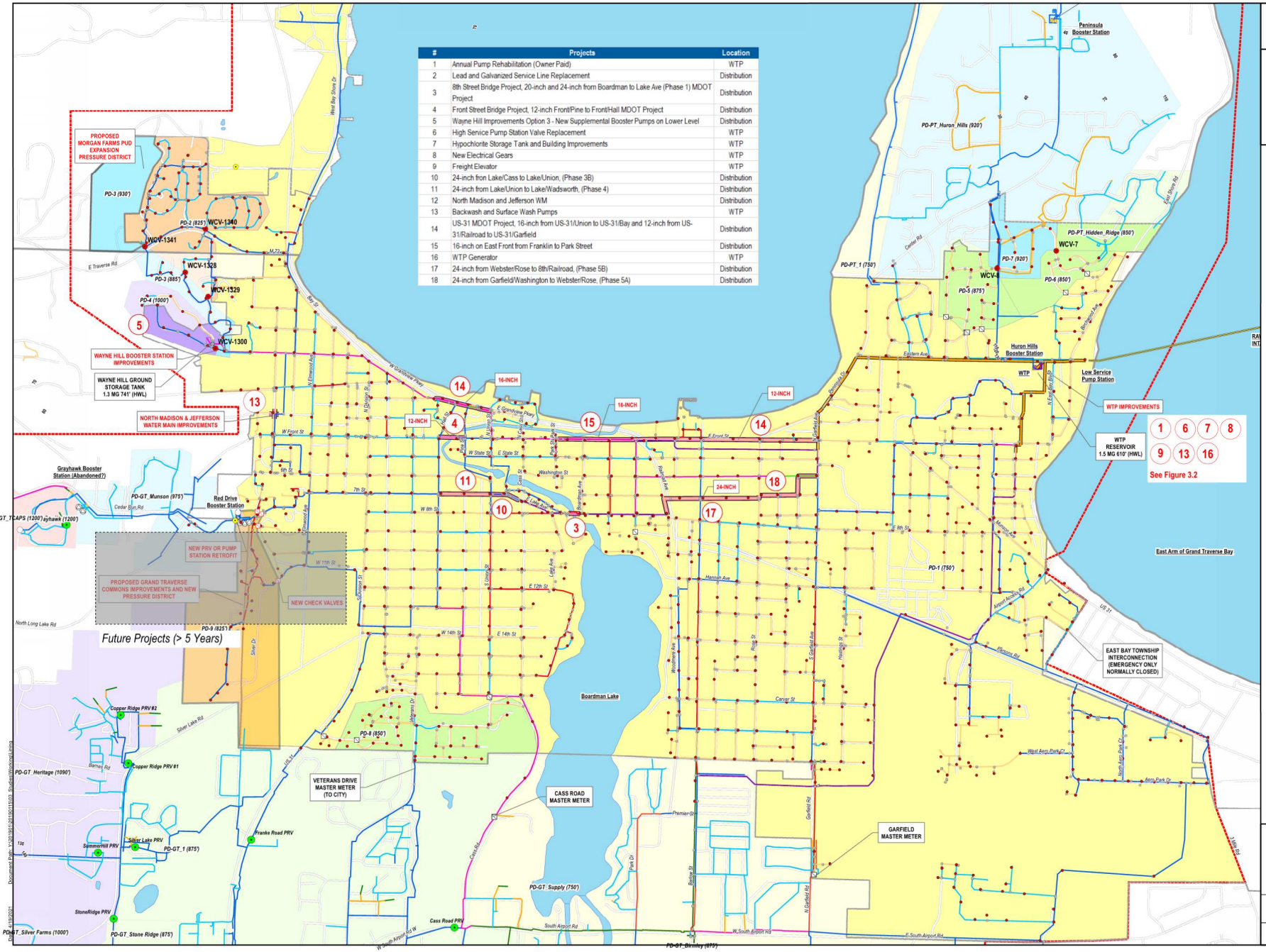
We request, on behalf of the City of Traverse City, your concurrence with this determination. We appreciate your review and would be grateful for a response as soon as possible so that we may meet program deadlines. If you have any questions or require any additional information, please contact the undersigned.

Very truly yours,

HUBBELL, ROTH & CLARK, INC.

Adeline Hummel
Graduate Engineer I

Attachment
Recommended Improvements
Water Treatment Plant Proposed Improvements
Agriculture Map



#	Projects	Location
1	Annual Pump Rehabilitation (Owner Paid)	WTP
2	Lead and Galvanized Service Line Replacement	Distribution
3	8th Street Bridge Project, 20-inch and 24-inch from Boardman to Lake Ave (Phase 1) MDOT Project	Distribution
4	Front Street Bridge Project, 12-inch Front/Pine to Front/Hall MDOT Project	Distribution
5	Wayne Hill Improvements Option 3 - New Supplemental Booster Pumps on Lower Level	Distribution
6	High Service Pump Station Valve Replacement	WTP
7	Hypochlorite Storage Tank and Building Improvements	WTP
8	New Electrical Gears	WTP
9	Freight Elevator	WTP
10	24-inch fron Lake/Cass to Lake/Union, (Phase 3B)	Distribution
11	24-inch from Lake/Union to Lake/Wadsworth, (Phase 4)	Distribution
12	North Madison and Jefferson WM	Distribution
13	Backwash and Surface Wash Pumps	WTP
14	US-31 MDOT Project, 16-inch from US-31/Union to US-31/Bay and 12-inch from US-31/Railroad to US-31/Garfield	Distribution
15	16-inch on East Front from Franklin to Park Street	Distribution
16	WTP Generator	WTP
17	24-inch from Webster/Rose to 8th/Railroad, (Phase 5B)	Distribution
18	24-inch from Garfield/Washington to Webster/Rose, (Phase 5A)	Distribution

CITY of TRAVERSE CITY MICHIGAN

HRC
HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915
1925 BRETON ROAD SE SUITE 100
GRAND RAPIDS, MI 49506
(616) 454-4286
www.hrcengr.com

LEGEND

- Check Valve
- PRV
- Hydrant
- System Valve
- City/Township
- Water System Service Area
- County

Water Main

- 6"
- 8"
- 10"
- 12"
- 16"
- 18"
- 20"
- 24"
- 30"
- 36"

Pressure District HGL

- 750
- 751 - 825
- 826 - 884
- 885 - 999
- 1000 - 1090
- 1091 - 1200

Recommended Project

- Project Plan

N W E S

0 750 1,500 3,000 Feet

FIGURE 3.1
TRAVERSE CITY RECOMMENDED IMPROVEMENTS

2021 DWSRF PROJECT PLAN

MAY 2021 | HRC #: 20210137

Y:\202101\20210137\03_Studies\Working\Project_Plan\Draft\Figures\20210137_Figures.pptx

HRC

Traverse City – 2021 DWSRF Project Plan

Water Treatment Plant Proposed Improvements

Job No.
20210137

Date
May 2021

Figure No.
3.2

HRC

Traverse City Drinking Water Improvements

Agriculture Map

Date
5/14/2021

Figure No.
3

USDA

United States Department of Agriculture

Natural Resources Conservation Service

Michigan State Office

3001 Coolidge Road
Suite 250
East Lansing, MI
48823-6321

Telephone:
(517) 324-5270
Fax:
(855) 701-4363

www.mi.nrcs.usda.gov

June 7, 2021

Adeline Hummel
Hubbell, Roth & Clark, Inc.
1925 Breton Road SE
Suite 100
Grand Rapids, Michigan 49506

RE: Traverse City Drinking Water Improvements Project

Dear Ms. Hummel:

The Natural Resources Conservation Service (NRCS) under Part 523 of the Farmland Protection Policy Act has reviewed the proposed Traverse City Drinking Water Improvements Project. This review was conducted with respect to the effect(s) that the proposal may have on prime and/or unique farmland. Since the proposed project involves improvements to existing facilities, we have concluded that this proposal will have no negative impact on prime and/or unique farmland.

Should the scope of the project change to where expansion will occur, please resubmit the proposal for our review.

Sincerely,

GARRY LEE Digitally signed by GARRY LEE Date: 2021.06.07 14:05:11 -04'00'

GARRY LEE
State Conservationist

cc:
William Elder, Area Conservationist, NRCS, Gaylord, MI
Jason Kimbrough, District Conservationist, NRCS, Traverse City, MI

HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915

STREET: 1925 Breton Road SE
Suite 100
Grand Rapids, MI 49506
PHONE: 616-454-4286
WEBSITE: hrcengr.com

May 17, 2021

Natural River Administrator
DNR Fisheries Division
PO Box 30446
Lansing, MI 48909-7946

Re: Wild and Scenic Rivers Review
DWSRF Project Plan
City of Traverse City, Michigan

HRC Job No. 20210137

To Whom it May Concern:

The City of Traverse City is submitting a Project Plan to the Michigan Department of Environment, Great Lakes, and Energy (EGLE) for acceptance into the Drinking Water State Revolving Fund (DWSRF) Loan Program. The Project Plan requires a review to determine any potential impacts on state or federally designated wild, scenic, or natural rivers or tributaries in the vicinity of the project.

On behalf of the City of Traverse City, we are requesting information regarding the impacts of the above referenced proposed project upon protected state or federally designated wild, scenic, natural rivers, or tributaries. The project work will involve the following:

- Improvements to the distribution systems including:
  - Replacement of aging water mains
  - Addressing water booster station reliability issues
- Addressing limitations at the water treatment plant including:
  - Raw water main and pumping
  - Aging chemical feed and storage issues
  - Improving low service and high service pumping efficiency using VFD's
  - Electrical system reliability

The City's raw water supply is from an intake structure from the east arm of Grand Traverse Bay (East Bay). The City's original water supply was located near the City in West Bay in the 1890s and was relocated to East Bay, which is more protected from runoff and potential contamination sources, in 1965. Treatment is provided by a 20 million gallon per day (mgd) Water Treatment Plant (WTP) located in the City near the intake in East Bay. The WTP was converted to direct filtration in 1993 and is equipped with four low service pumps (raw water), two flocculators, five rapid sand filters, two clear wells, finished water storage, and five high service pumps (finished water). The service area location of the WTP is provided in the attached figures.

The proposed project site covers primarily commercial and residential areas. Excavations will be made in paved areas, primarily where water mains are preexisting. All land will be returned to pre-construction condition.

The project scope will cover only preexisting water treatment sites and water distribution sites, thus it is not anticipated that it will interfere with any wild, scenic, or natural river. Therefore, we are requesting on behalf of the City of Traverse City for a review to confirm that the above referenced project will not cause an impact to any state or federally designated wild, scenic, or natural rivers or tributaries.

We request, on behalf of the City of Traverse City, your concurrence with this determination. We appreciate your review and would be grateful for a response as soon as possible so that we may meet program deadlines.

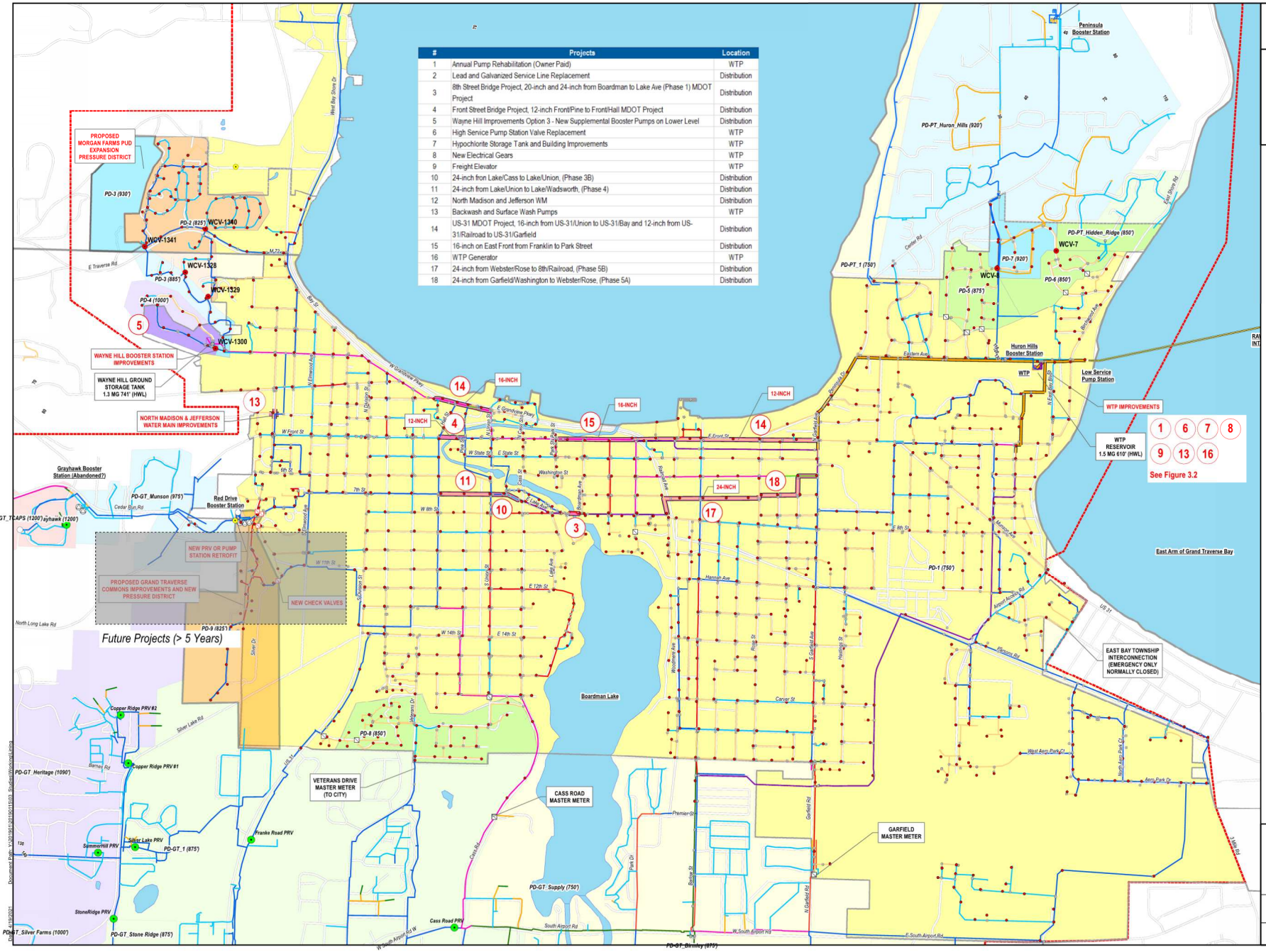
If you have any questions or require any additional information, please contact the undersigned.

Very truly yours,

HUBBELL, ROTH & CLARK, INC.

Adeline Hummel
Graduate Engineer I

Attachments:
Recommended Improvements
Water Treatment Plant Proposed Improvements
National Wild and Scenic Rivers System with Project Location
Nationwide Rivers Inventory with Site Location



#	Projects	Location
1	Annual Pump Rehabilitation (Owner Paid)	WTP
2	Lead and Galvanized Service Line Replacement	Distribution
3	8th Street Bridge Project, 20-inch and 24-inch from Boardman to Lake Ave (Phase 1) MDOT Project	Distribution
4	Front Street Bridge Project, 12-inch Front/Pine to Front/Hall MDOT Project	Distribution
5	Wayne Hill Improvements Option 3 - New Supplemental Booster Pumps on Lower Level	Distribution
6	High Service Pump Station Valve Replacement	WTP
7	Hypochlorite Storage Tank and Building Improvements	WTP
8	New Electrical Gears	WTP
9	Freight Elevator	WTP
10	24-inch fron Lake/Cass to Lake/Union, (Phase 3B)	Distribution
11	24-inch from Lake/Union to Lake/Wadsworth, (Phase 4)	Distribution
12	North Madison and Jefferson WM	Distribution
13	Backwash and Surface Wash Pumps	WTP
14	US-31 MDOT Project, 16-inch from US-31/Union to US-31/Bay and 12-inch from US-31/Railroad to US-31/Garfield	Distribution
15	16-inch on East Front from Franklin to Park Street	Distribution
16	WTP Generator	WTP
17	24-inch from Webster/Rose to 8th/Railroad, (Phase 5B)	Distribution
18	24-inch from Garfield/Washington to Webster/Rose, (Phase 5A)	Distribution

CITY of TRAVERSE CITY MICHIGAN

HRC
HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915
1925 BRETON ROAD SE SUITE 100
GRAND RAPIDS, MI 49506
(616) 454-4286
www.hrcengr.com

LEGEND

- Check Valve
- PRV
- Hydrant
- System Valve
- City/Township
- Water System Service Area
- County

Water Main

- 6"
- 8"
- 10"
- 12"
- 16"
- 18"
- 20"
- 24"
- 30"
- 36"

Pressure District HGL

- 750
- 751 - 825
- 826 - 884
- 885 - 999
- 1000 - 1090
- 1091 - 1200

Recommended Project

- Project Plan

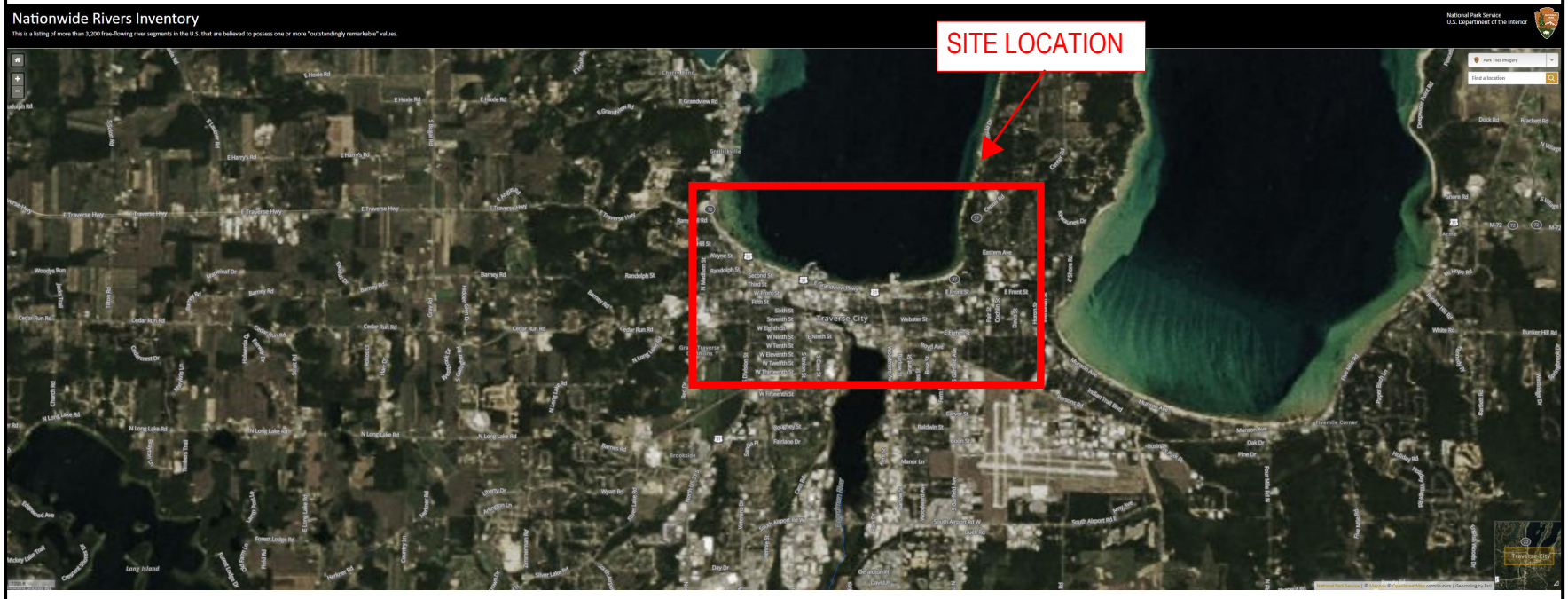
N W E S

0 750 1,500 3,000 Feet

FIGURE 3.1
TRAVERSE CITY RECOMMENDED IMPROVEMENTS

2021 DWSRF PROJECT PLAN

MAY 2021 | HRC #: 20210137



CITY of TRAVERSE CITY MICHIGAN

HRC
HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915

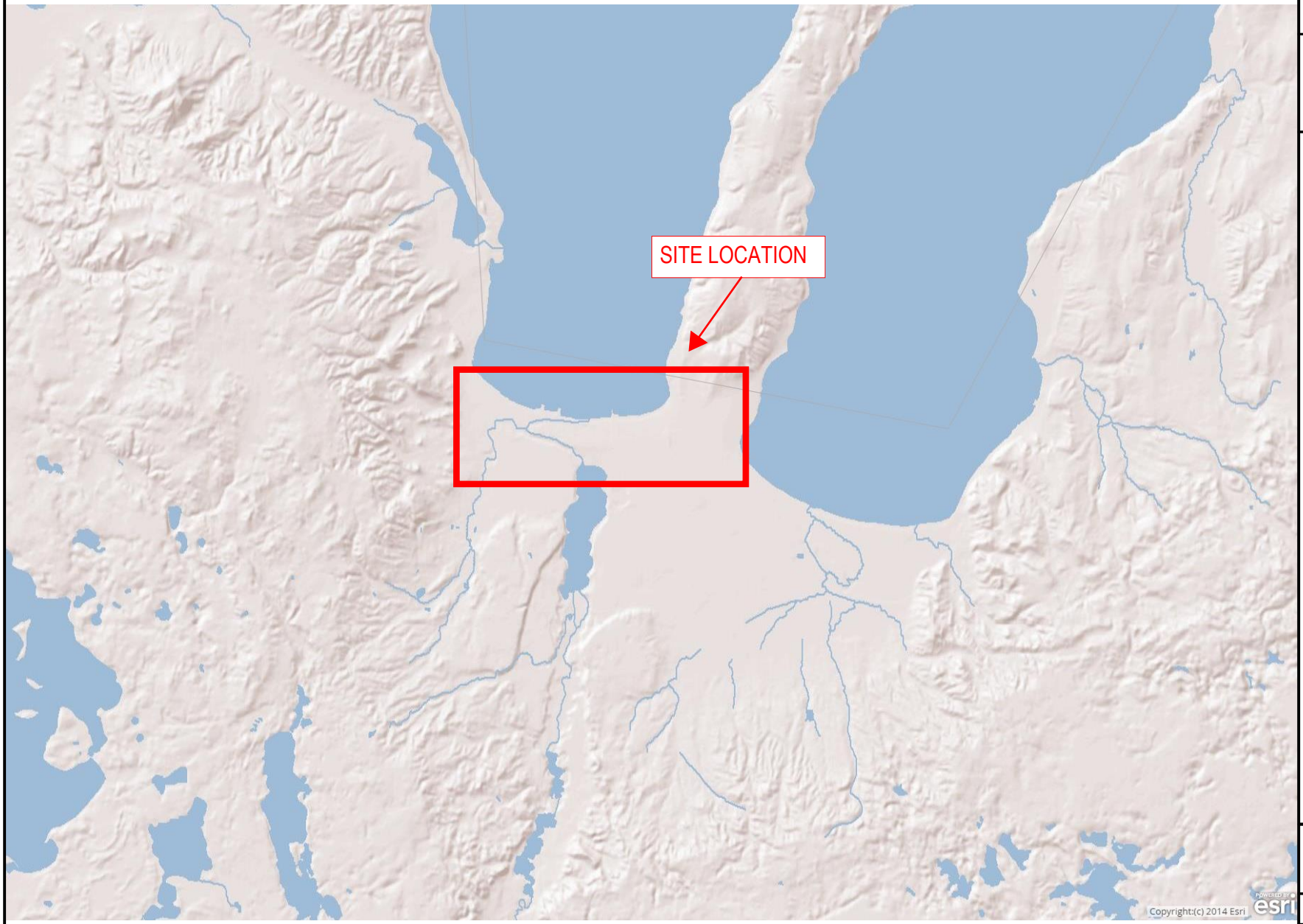
1925 BRETON ROAD SE SUITE 100
GRAND RAPIDS, MI 49506
(616) 454-4286
www.hrcengr.com

FIGURE 1

NATIONAWIDE RIVERS INVENTORY

2021 DWSRF PROJECT PLAN

MAY 2021 | HRC#: 20210137



CITY of TRAVERSE CITY MICHIGAN

HRC
HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915

1925 BRETON ROAD SE SUITE 100
GRAND RAPIDS, MI 49506
(616) 454-4286
www.hrcengr.com

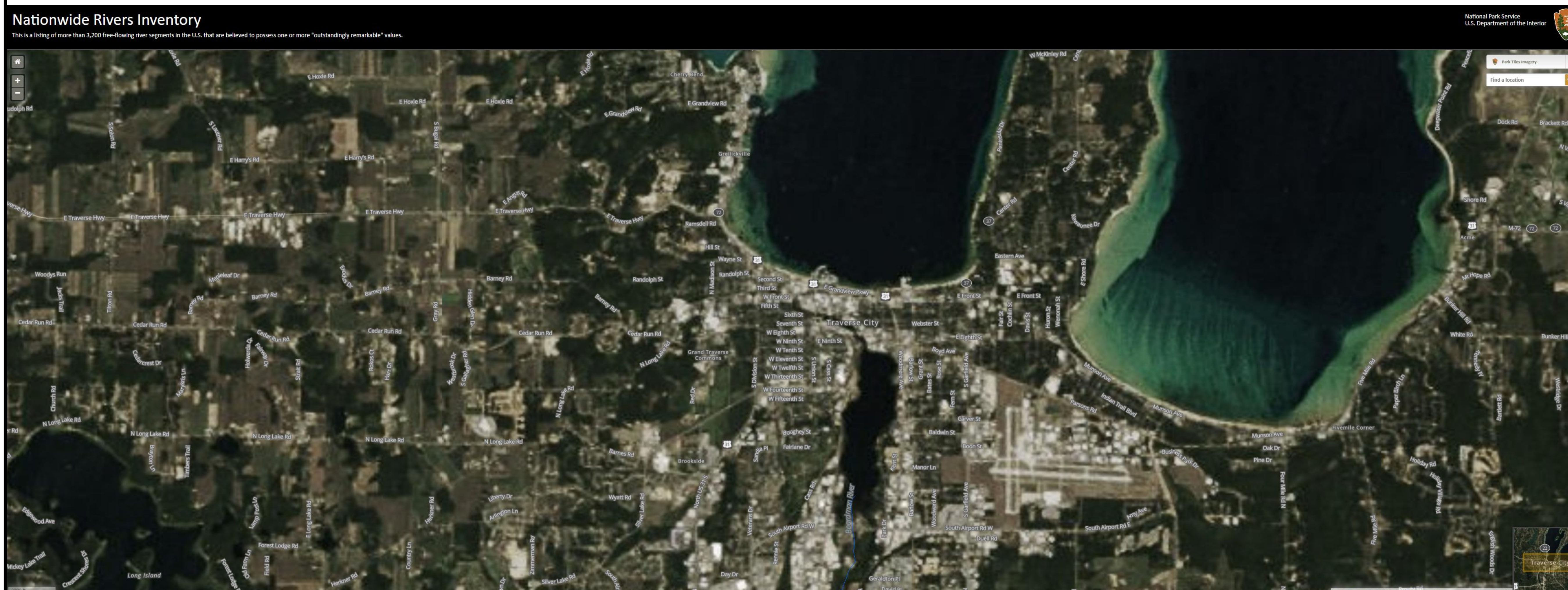
FIGURE 1

NATIONAL WILD AND SCENIC RIVERS MAP

2021 DWSRF
PROJECT PLAN

MAY 2021 | HRC#: 20210137

APPENDIX B: NATIONWIDE RIVERS INVENTORY



CITY of TRAVERSE CITY MICHIGAN

HRC
HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915
1925 BRETON ROAD SE SUITE 100
GRAND RAPIDS, MI 49506
(616) 454-4286
www.hrcengr.com

FIGURE 1

NATIONAWIDE RIVERS INVENTORY

2021 DWSRF
PROJECT PLAN

MAY 2021	HRC#: 20210137

CITY of TRAVERSE CITY MICHIGAN

HRC
HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915

1925 BRETON ROAD SE SUITE 100
GRAND RAPIDS, MI 49506
(616) 454-4286
www.hrcengr.com

FIGURE 1

NATIONAL WILD AND SCENIC RIVERS MAP

2021 DWSRF
PROJECT PLAN

MAY 2021 | HRC#: 20210137

APPENDIX C: WEB SOILS SURVEY RESULTS

Search

Area of Interest

Open All Close All

AOI Properties

Clear AOI

AOI Information

Name

Map Unit Symbols

- Use Soil Survey Area Map Unit Symbols
- Use National Map Unit Symbols

Area (acres) 282.3

Soil Data Available from Web Soil Survey

Grand Traverse County, Michigan (MI055)

Data Availability	Tabular and Spatial, complete
Tabular Data	Version 14, Jun 8, 2020
Spatial Data	Version 7, Jun 8, 2020

Clear AOI

Import AOI

Export AOI

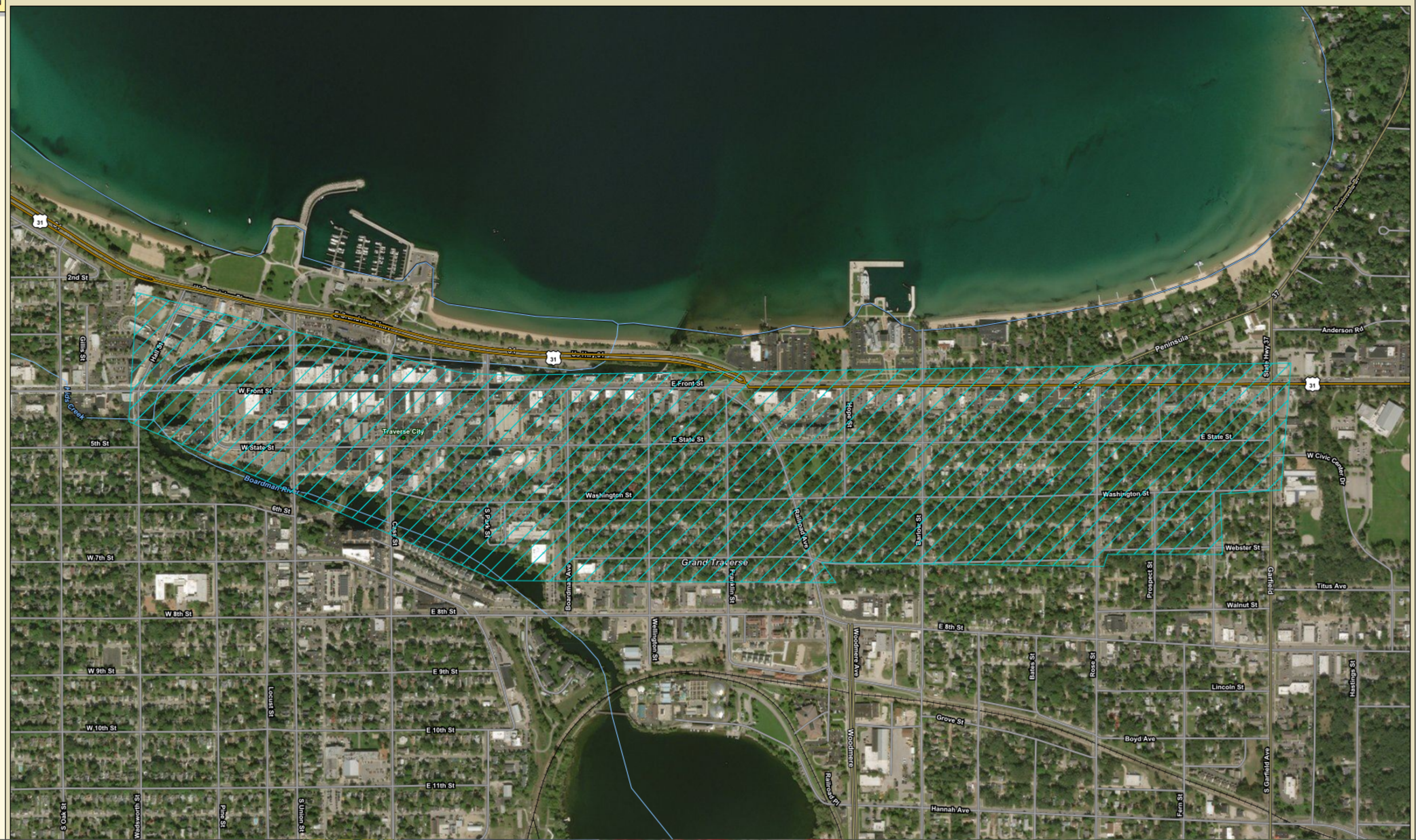
Quick Navigation

- Address
- State and County
- Soil Survey Area
- Latitude and Longitude or Current Location
- PLSS (Section, Township, Range)
- Bureau of Land Management
- Department of Defense
- Forest Service
- National Park Service
- Hydrologic Unit

Legend

Area of Interest Interactive Map

View Extent: Contiguous U.S. | Scale: (not to scale)



Search

Suitabilities and Limitations Ratings

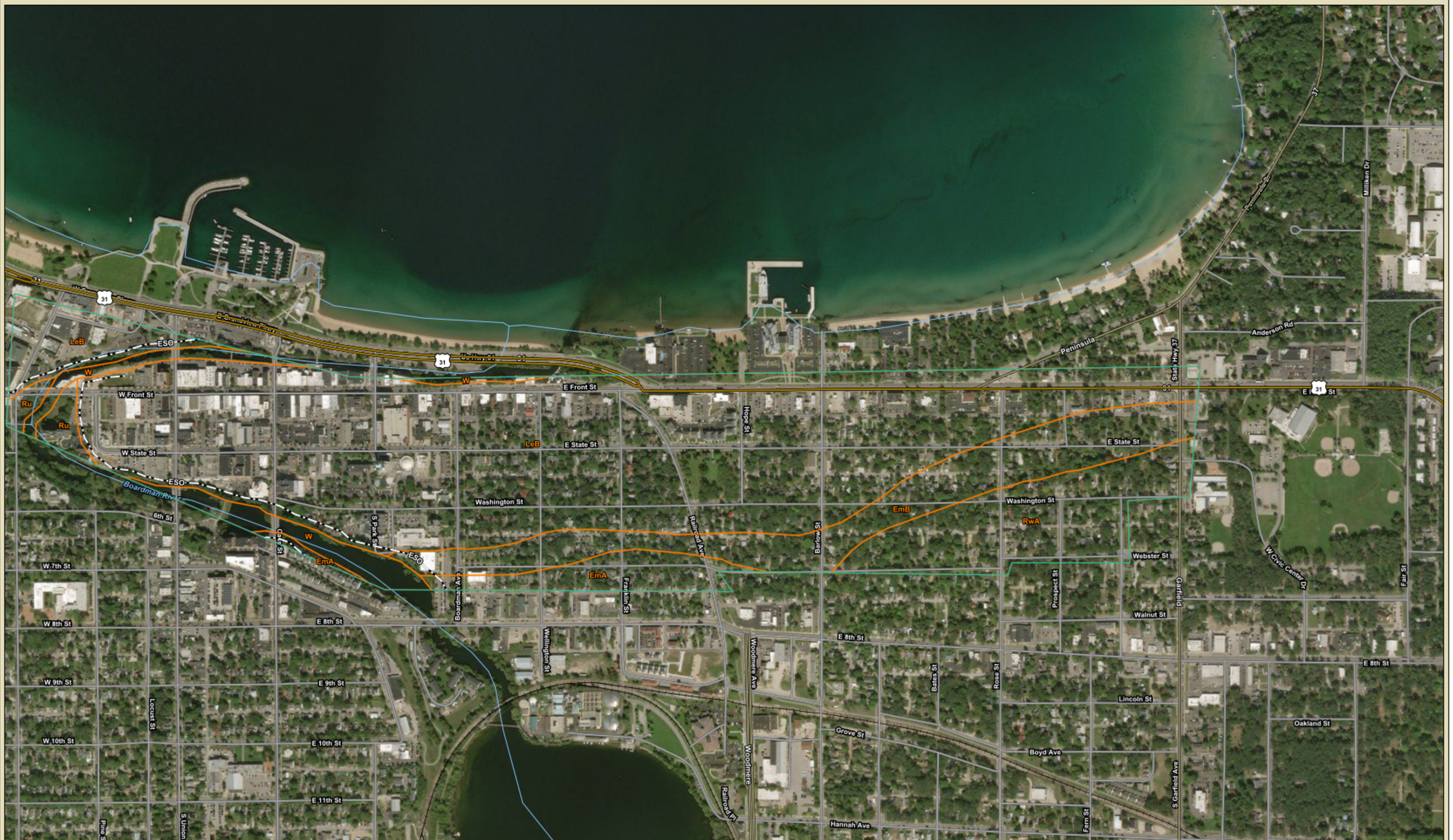
Open All | Close All

- Building Site Development
- Construction Materials
- Disaster Recovery Planning
- Land Classifications
- Land Management
- Military Operations
- Recreational Development
- Sanitary Facilities
- Soil Health
- Vegetative Productivity
- Waste Management
- Water Management

Legend

Soil Map

Scale (not to scale)



Search

Map Unit Legend

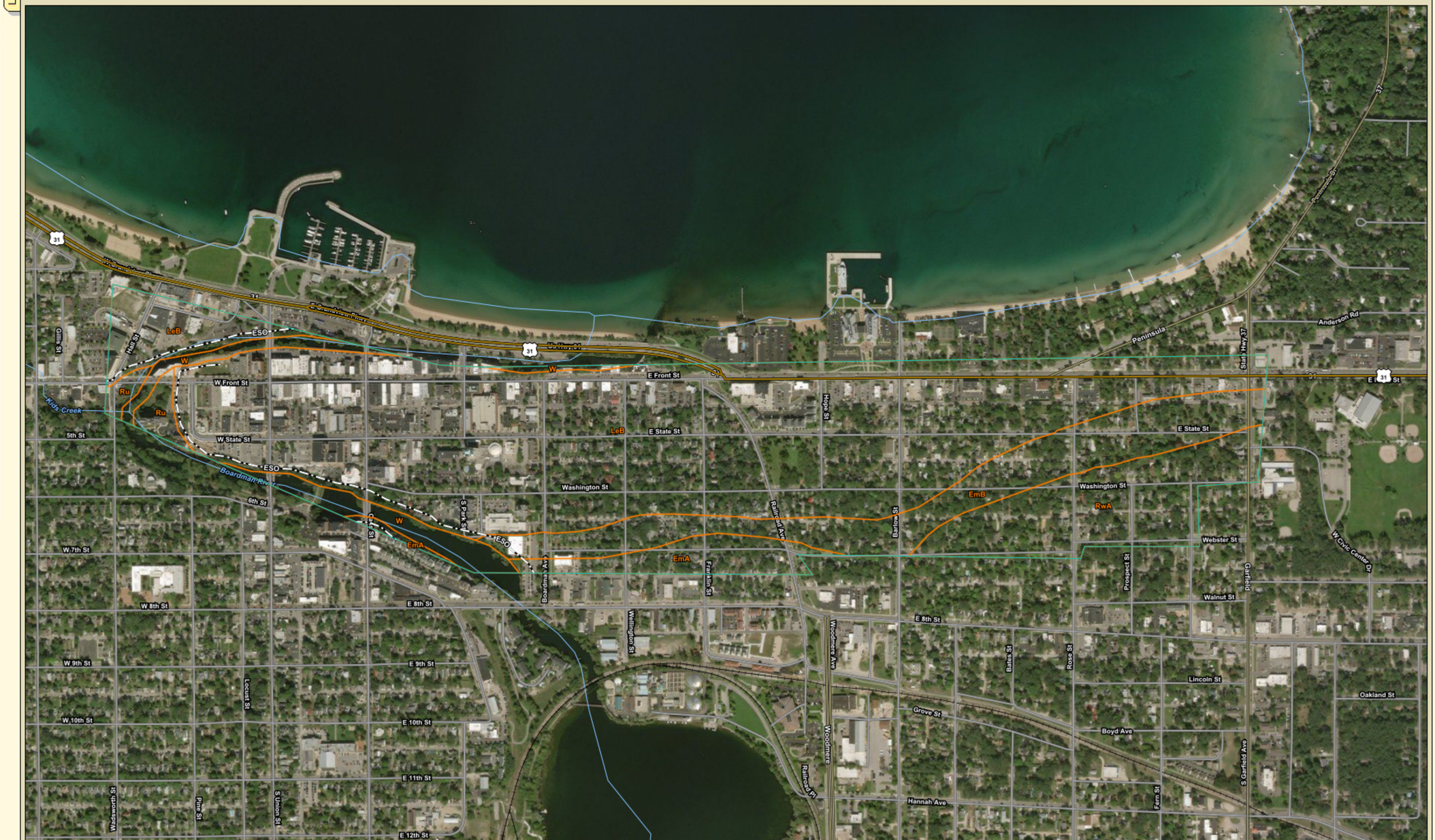
(MI055)

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
EmA	East Lake-Mancelona loamy sands, 0 to 2 percent slopes	11.4	4.0%
EmB	East Lake-Mancelona loamy sands, 2 to 6 percent slopes	36.7	13.0%
LeB	Lake beach and Eastport sand, 0 to 6 percent slopes	187.7	66.5%
Ru	Roscommon mucky loamy sand	4.3	1.5%
RwA	Rubicon sand, 0 to 2 percent slopes	29.8	10.6%
W	Water	12.3	4.4%
Totals for Area of Interest		**282.3**	**100.0%**

Legend

Soil Map

Scale (not to scale)



APPENDIX D: MICHIGAN NATURAL FEATURES INVENTORY ENDANGERED SPECIES

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Michigan Ecological Services Field Office
2651 Coolidge Road Suite 101
East Lansing, MI 48823-6360
Phone: (517) 351-2555 Fax: (517) 351-1443
http://www.fws.gov/midwest/EastLansing/

In Reply Refer To: May 05, 2021
Consultation Code: 03E16000-2021-SLI-1367
Event Code: 03E16000-2021-E-05011
Project Name: Traverse City DWSRF

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The attached species list identifies any federally threatened, endangered, proposed and candidate species that may occur within the boundary of your proposed project or may be affected by your proposed project. The list also includes designated critical habitat if present within your proposed project area or affected by your project. This list is provided to you as the initial step of the consultation process required under section 7(c) of the Endangered Species Act, also referred to as Section 7 Consultation.

Section 7 of the Endangered Species Act of 1973 requires that actions authorized, funded, or carried out by Federal agencies not jeopardize federally threatened or endangered species or adversely modify designated critical habitat. To fulfill this mandate, Federal agencies (or their designated non-federal representative) must consult with the Fish and Wildlife Service if they determine their project may affect listed species or critical habitat.

There are several important steps in evaluating the effects of a project on listed species. Please use the species list provided and visit the U.S. Fish and Wildlife Service's Region 3 Section 7 Technical Assistance website at http://www.fws.gov/midwest/endangered/section7/s7process/index.html. This website contains step-by-step instructions to help you determine if your project may affect listed species and lead you through the section 7 consultation process.

Under 50 CFR 402.12(e) (the regulations that implement section 7 of the Endangered Species Act), the accuracy of this species list should be verified after 90 days. You may verify the list by visiting the ECOS-IPaC website (http://ecos.fws.gov/ipac/) at regular intervals during project planning and implementation and completing the same process you used to receive the attached list.

For all **wind energy projects** and **projects that include installing towers that use guy wires or are over 200 feet in height**, please contact this field office directly for assistance, even if no federally listed plants, animals or critical habitat are present within your proposed project area or may be affected by your proposed project.

Please see the "Migratory Birds" section below for important information regarding incorporating migratory birds into your project planning. Our Migratory Bird Program has developed recommendations, best practices, and other tools to help project proponents voluntarily reduce impacts to birds and their habitats. The Bald and Golden Eagle Protection Act prohibitions include the take and disturbance of eagles. If your project is near an eagle nest or winter roost area, see our Eagle Permits website at https://www.fws.gov/midwest/eagle/permits/index.html to help you avoid impacting eagles or determine if a permit may be necessary.

Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit https://www.fws.gov/birds/policies-and-regulations/administrative-orders/executive-orders.php.

We appreciate your concern for threatened and endangered species. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Migratory Birds
- Wetlands

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Michigan Ecological Services Field Office
2651 Coolidge Road Suite 101
East Lansing, MI 48823-6360
(517) 351-2555

Project Summary

Consultation Code: 03E16000-2021-SLI-1367
Event Code: 03E16000-2021-E-05011
Project Name: Traverse City DWSRF
Project Type: WATER SUPPLY / DELIVERY
Project Description: This project would provide several improvements for the existing Water Treatment Plant including a new generator, high service pump station valves, rehabilitated backwash and surface wash pumps, a new sodium hypochlorite tank and building, new electrical gears, freight elevator rehabilition, and annual pump repairs. In addition to the Water Treatment Plant improvements, several outdated and undersized water mains throughout the city will be replaced, as well as a booster station rehabilitation. The exact location for these mains can be seen in the attached site plan.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@44.762999300000004,-85.61180626179808,14z

Counties: Grand Traverse County, Michigan

Endangered Species Act Species

There is a total of 4 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Note that 2 of these species should be considered only under certain conditions.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

---

1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Northern Long-eared Bat *Myotis septentrionalis*	Threatened

No critical habitat has been designated for this species.
Species profile: https://ecos.fws.gov/ecp/species/9045
General project design guidelines:
https://ecos.fws.gov/docs/tess/ipac_project_design_guidelines/doc5664.pdf

Birds

NAME	STATUS
Red Knot *Calidris canutus rufa*	Threatened

No critical habitat has been designated for this species.
This species only needs to be considered under the following conditions:
- Only actions that occur along coastal areas during the Red Knot migratory window of MAY 1 - SEPTEMBER 30.

Species profile: https://ecos.fws.gov/ecp/species/1864

Reptiles

NAME	STATUS
Eastern Massasauga (=rattlesnake) *Sistrurus catenatus*	Threatened

No critical habitat has been designated for this species.

This species only needs to be considered under the following conditions:

- For all Projects: Project is within EMR Range

Species profile: https://ecos.fws.gov/ecp/species/2202

General project design guidelines:

https://ecos.fws.gov/docs/tess/ipac_project_design_guidelines/doc5280.pdf

Flowering Plants

NAME	STATUS
Pitcher's Thistle *Cirsium pitcheri*	Threatened

No critical habitat has been designated for this species.

Species profile: https://ecos.fws.gov/ecp/species/8153

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

USFWS National Wildlife Refuge Lands And Fish Hatcheries

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

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

Migratory Birds

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

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

---

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

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

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

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Dec 1 to Aug 31
Black-billed Cuckoo *Coccyzus erythropthalmus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9399	Breeds May 15 to Oct 10

NAME	BREEDING SEASON
Bobolink *Dolichonyx oryzivorus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 20 to Jul 31
Canada Warbler *Cardellina canadensis* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 20 to Aug 10
Cape May Warbler *Setophaga tigrina* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Jun 1 to Jul 31
Dunlin *Calidris alpina arcticola* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds elsewhere
Eastern Whip-poor-will *Antrostomus vociferus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 1 to Aug 20
Golden Eagle *Aquila chrysaetos* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1680	Breeds Jan 1 to Aug 31
Harris's Sparrow *Zonotrichia querula* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Least Bittern *Ixobrychus exilis* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/6175	Breeds Aug 16 to Oct 31
Lesser Yellowlegs *Tringa flavipes* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9679	Breeds elsewhere
Olive-sided Flycatcher *Contopus cooperi* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/3914	Breeds May 20 to Aug 31
Red-headed Woodpecker *Melanerpes erythrocephalus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Sep 10
Ruddy Turnstone *Arenaria interpres morinella* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds elsewhere

NAME	BREEDING SEASON
Rusty Blackbird *Euphagus carolinus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Jul 20
Semipalmated Sandpiper *Calidris pusilla* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Whimbrel *Numenius phaeopus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9483	Breeds elsewhere
Wood Thrush *Hylocichla mustelina* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Aug 31

Probability Of Presence Summary

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

Probability of Presence (■)

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

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

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

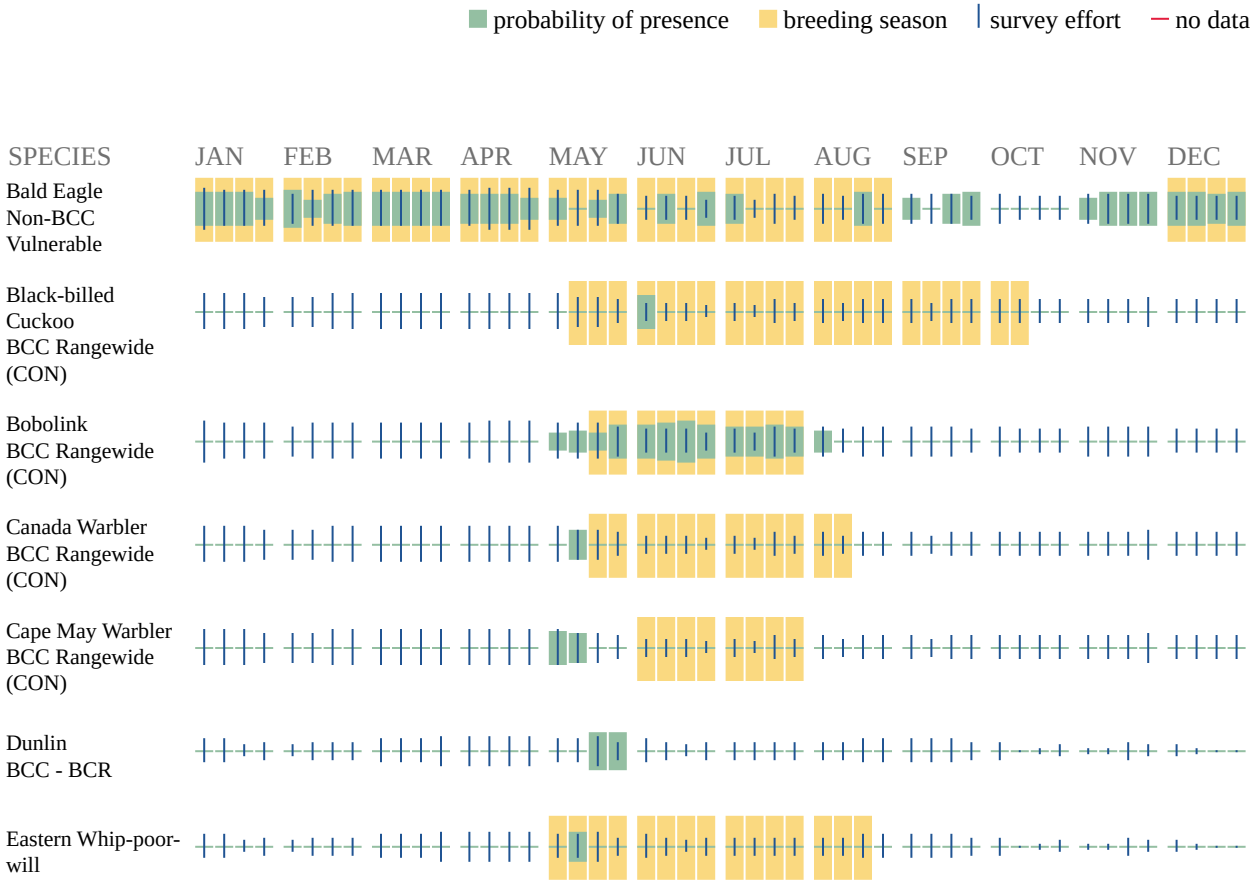
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

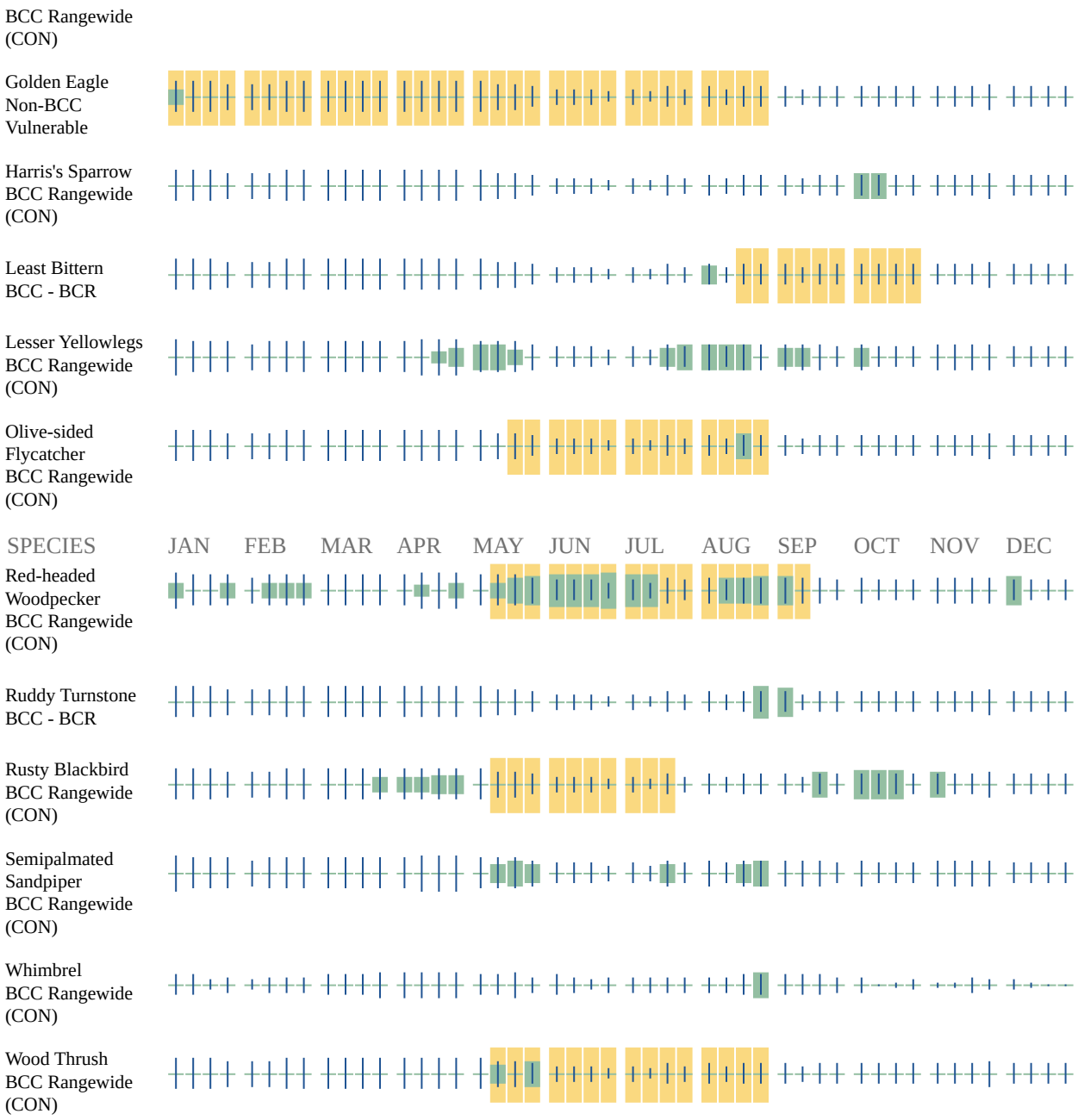
Breeding Season (■)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

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

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

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





Additional information can be found using the following links:

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

Migratory Birds FAQ

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

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

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

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

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

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

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

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

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

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

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your

project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?
Migratory birds delivered through IPaC fall into the following distinct categories of concern:

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

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

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

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

What if I have eagles on my list?
If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report
The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no

data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Wetlands

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

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

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

LAKE

- L1UBHh

RIVERINE

- R5UBH
- R2UBH

APPENDIX E: DETAILED COST ESTIMATES

HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915

Engineering. Environment. Excellence.

1925 Breton Road SE, Suite 100; Grand Rapids, MI 49506

Telephone: (616) 454-4286

PROJECT:	**Traverse City DWSRF**	DATE:	**5/1/2021**
LOCATION:	**Traverse City, Michigan**	PROJECT NO.	**20210137**
		ESTIMATOR:	**ARH**
WORK:	**WTP Pump Rehabilitation**	CHECKED BY:	**DIU**
		CURRENT ENR:	

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
1	Pump Rehabilitation	5	EA	$80,000	$400,000
	Construction Subtotal				**$400,000**
	Contingencies	20	%		$80,000
	Engineering, Legal, and Administrative	20	%		$80,000
	TOTAL PROJECT COST				**$560,000**

HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915

Engineering. Environment. Excellence.

1925 Breton Road SE, Suite 100; Grand Rapids, MI 49506

Telephone: (616) 454-4286

PROJECT:	**Traverse City DWSRF**	DATE:	**5/1/2021**
LOCATION:	**Traverse City, Michigan**	PROJECT NO.	**20210137**
		ESTIMATOR:	**ARH**
WORK:	**WTP Electrical Improvements**	CHECKED BY:	**DIU**
		CURRENT ENR:	

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
1	Install VFDs on HSPS Pumps 2 and 4	2	EA	$50,000	$100,000
2	Install VFDs on LSPS Pumps 1, 2, and 4	3	EA	$35,000	$105,000
3	Replace Basement Switchgear	1	LS	$80,000	$80,000
4	Replace High Service Pump Station Switchgear	1	LS	$250,000	$250,000
4	Replace Low Service Pump Station Switchgear	1	LS	$250,000	$250,000
5	Equipment Installation	15	%	$785,000	$117,750
6	Misc Metal	1	%	$902,750	$9,028
7	Misc Mechanical	1	%	$902,750	$9,028
8	Misc Painting	1	%	$902,750	$9,028
9	Electrical and SCADA Allowance	25	%	$535,000	$133,750
	Construction Subtotal				**$1,064,000**
	Contingencies	30	%		$320,000
	Engineering, Legal, and Administrative	20	%		$213,000
	TOTAL PROJECT COST				**$1,597,000**

HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915

Engineering. Environment. Excellence.

1925 Breton Road SE, Suite 100; Grand Rapids, MI 49506

Telephone: (616) 454-4286

PROJECT:	**Traverse City DWSRF**	DATE:	**5/1/2021**
LOCATION:	**Traverse City, Michigan**	PROJECT NO.	**20210137**
		ESTIMATOR:	**ARH**
WORK:	**WTP High Service Pump Station Valve Replacement**	CHECKED BY:	**DIU**
		CURRENT ENR:	

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
1	14-inch Plug Valve (100% Port)	3	EA	$15,000	$45,000
2	12-inch Plug Valve (100% Port)	1	EA	$12,000	$12,000
3	Electro-Pneumatic Actuators	4	EA	$20,000	$80,000
4	14-inch Butterfly Valve	3	EA	$12,000	$36,000
5	12-inch Butterfly Valve	1	EA	$10,000	$10,000
6	Equipment Installation	40	%	$183,000	$73,200
7	Misc Metal	1	%	$256,200	$2,562
8	Misc Mechanical	1	%	$256,200	$2,562
9	Misc Painting	1	%	$256,200	$2,562
10	Electrical and SCADA Allowance	25	%	$80,000	$20,000
	Construction Subtotal				**$284,000**
	Contingencies	30	%		$86,000
	Engineering, Legal, and Administrative	20	%		$57,000
	TOTAL PROJECT COST				**$427,000**

HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915

Engineering. Environment. Excellence.

1925 Breton Road SE, Suite 100; Grand Rapids, MI 49506

Telephone: (616) 454-4286

PROJECT:	**Traverse City DWSRF**	DATE:	**5/1/2021**
LOCATION:	**Traverse City, Michigan**	PROJECT NO.	**20210137**
		ESTIMATOR:	**ARH**
WORK:	**WTP Sodium Hypochlorite Storage Tank and Building Improvements**	CHECKED BY:	**DIU**
		CURRENT ENR:	

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
1	Demo Existing Wall	1	LS	$10,000	$10,000
2	New 15' x 15' FRP Panel Wall	225	SF	$100	$22,500
3	Wall Header and Jams	1	LS	$25,000	$25,000
4	8100 Gallon Polyethylene Tank	2	EA	$25,000	$50,000
5	Level Transducers	2	EA	$2,000	$4,000
6	Transfer Pumps	2	EA	$10,000	$20,000
7	Chemical Resistant Coating	1200	SF	$25	$30,000
8	Concrete Surface Repairs	200	SF	$50	$10,000
9	4" Fill Piping	50	LF	$40	$2,000
10	4" Ball Valves	2	EA	$1,000	$2,000
11	4" Camlock Fittings	2	EA	$500	$1,000
12	Equipment Installation	40	%	$176,500	$70,600
13	Misc Metal	1	%	$247,100	$2,471
14	Misc Mechanical	1	%	$247,100	$2,471
15	Misc Painting	1	%	$247,100	$2,471
16	Electrical and SCADA Allowance	25	%	$4,000	$1,000
	Construction Subtotal				**$256,000**
	Contingencies	30	%		$77,000
	Engineering, Legal, and Administrative	20	%		$52,000
	TOTAL PROJECT COST				**$385,000**

HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915

Engineering. Environment. Excellence.

1925 Breton Road SE, Suite 100; Grand Rapids, MI 49506

Telephone: (616) 454-4286

PROJECT:	**Traverse City DWSRF**	DATE:	**5/1/2021**
LOCATION:	**Traverse City, Michigan**	PROJECT NO.	**20210137**
		ESTIMATOR:	**ARH**
WORK:	**WTP Backwash and Surface Wash Pumps**	CHECKED BY:	**DIU**
		CURRENT ENR:	

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
	Surface Wash Pump				
1	New Surface Wash Pump	1	EA	$25,000	$25,000
2	4" Gate Valves	2	EA	$3,000	$6,000
3	Equipment Installation	100	%	$31,000	$31,000
4	Misc Metal	1	%	$62,000	$620
5	Misc Mechanical	1	%	$62,000	$620
6	Misc Painting	1	%	$62,000	$620
	Backwash Pump				
7	Rehab Backwash Pump	1	EA	$50,000	$50,000
	Construction Subtotal				**$114,000**
	Contingencies	30	%		$35,000
	Engineering, Legal, and Administrative	20	%		$23,000
	TOTAL PROJECT COST				**$172,000**

HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915

Engineering. Environment. Excellence.

1925 Breton Road SE, Suite 100; Grand Rapids, MI 49506

Telephone: (616) 454-4286

PROJECT:	**Traverse City DWSRF**	DATE:	**5/1/2021**
LOCATION:	**Traverse City, Michigan**	PROJECT NO.	**20210137**
		ESTIMATOR:	**ARH**
WORK:	**WTP Freight Elevator**	CHECKED BY:	**DIU**
		CURRENT ENR:	

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
1	Car and Hydraulics	1	LS	$200,000	$200,000
	Construction Subtotal				**$200,000**
	Contingencies	30	%		$60,000
	Engineering, Legal, and Administrative	20	%		$40,000
	TOTAL PROJECT COST				**$300,000**

HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915

Engineering. Environment. Excellence.

1925 Breton Road SE, Suite 100; Grand Rapids, MI 49506

Telephone: (616) 454-4286

PROJECT:	**Traverse City DWSRF**	DATE:	**5/1/2021**
LOCATION:	**Traverse City, Michigan**	PROJECT NO.	**20210137**
		ESTIMATOR:	**ARH**
WORK:	**WTP Generator Replacement**	CHECKED BY:	**DIU**
		CURRENT ENR:	

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
1	New 750 kW Generator	1	LS	$265,000	$265,000
2	Generator Switchgear for New Generator and ATS	1	LS	$25,000	$25,000
3	Concrete Pad and Sitework	1	LS	$20,000	$20,000
4	Equipment Installation	1	LS	$10,000	$10,000
5	Misc Metal	1	%	$320,000	$3,200
6	Misc Mechanical	1	%	$320,000	$3,200
7	Misc Painting	0.5	%	$320,000	$1,600
8	Electrical and SCADA Allowance	20	%	$320,000	$64,000
	Construction Subtotal				**$392,000**
	Contingencies	30	%		$118,000
	Engineering, Legal, and Administrative	20	%		$79,000
	TOTAL PROJECT COST				**$589,000**

HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915

Engineering. Environment. Excellence.

1925 Breton Road SE, Suite 100; Grand Rapids, MI 49506

Telephone: (616) 454-4286

PROJECT:	**Traverse City DWSRF**	DATE:	**5/1/2021**
LOCATION:	**Traverse City, Michigan**	PROJECT NO.	**20210137**
		ESTIMATOR:	**ARH**
WORK:	**Wayne Hill Booster Station**	CHECKED BY:	**DIU**
		CURRENT ENR:	

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
1	Excavate for New Suction Line	26	CY	$1,000	$26,000
2	Live Tap 12-inch Line (TS&V)	1	LS	$2,000	$2,000
3	12-inch Suction Line	20	LF	$400	$8,000
4	Core thru PS Wall	2	EA	$800	$1,600
5	Sawcut Floor	20	LF	$60	$1,200
6	Excavate for Discharge Line (Hand)	5	CY	$2,000	$10,000
7	New Supplemental Booster Pumps	2	EA	$39,000	$78,000
8	Discharge Header 10-inch	24	LF	$300	$7,200
9	Discharge Pipe Fittings 10-inch	6	EA	$1,000	$6,000
10	Lifting Eyes for Motor & Pump	2	EA	$600	$1,200
11	New Genset	0	LS	$150,000	$0
12	New Supplemental Pump Starters	2	EA	$25,000	$50,000
13	Reprogramming Control Scheme	1	LS	$20,000	$20,000
14	New 726 Gallon Bladder Tank	1	LS	$10,000	$10,000
15	Wayne Hill 8-inch Combination Pressure Sustaining/Reducing Valve	1	EA	$20,000	$20,000
16	Misc Metal	1	%	$241,200	$2,500
17	Misc Mechanical	1	%	$241,200	$3,000
18	Misc Painting	1	%	$241,200	$2,500
19	Electrical Allowance	15	%	$241,200	$37,000
	Construction Subtotal				**$287,000**
	Contingencies	30	%		$87,000
	Engineering, Legal, and Administrative	20	%		$58,000
	TOTAL PROJECT COST				**$432,000**

HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915

Engineering. Environment. Excellence.

1925 Breton Road SE, Suite 100; Grand Rapids, MI 49506

Telephone: (616) 454-4286

PROJECT:	**Traverse City DWSRF**	DATE:	**5/1/2021**
LOCATION:	**Traverse City, Michigan**	PROJECT NO.	**20210137**
		ESTIMATOR:	**ARH**
WORK:	**Service Line Replacement**	CHECKED BY:	**DIU**
		CURRENT ENR:	

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
1	Replacement of lead service lines	300	LEAD	$6,650	$1,995,000
	Construction Subtotal				**$1,995,000**
	Contingencies	0	%		$0
	Engineering, Legal, and Administrative	0	%		$0
	TOTAL PROJECT COST				**$1,995,000**

HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915

Engineering. Environment. Excellence.

1925 Breton Road SE, Suite 100; Grand Rapids, MI 49506

Telephone: (616) 454-4286

PROJECT:	**Traverse City DWSRF**	DATE:	**5/1/2021**
LOCATION:	**Traverse City, Michigan**	PROJECT NO.	**20210137**
		ESTIMATOR:	**ARH**
WORK:	**North Madison and Jefferson Watermain**	CHECKED BY:	**DIU**
		CURRENT ENR:	

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
1	N Madison St (W Front St to Wayne St) 8"	1875	FT	$250	$468,750
2	Jefferson St (City Limits to N Elmwood Ave) 8"	630	FT	$250	$157,500
	Construction Subtotal				**$627,000**
	Contingencies	20	%		$126,000
	Engineering, Legal, and Administrative	10	%		$63,000
	TOTAL PROJECT COST				**$816,000**

HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915

Engineering. Environment. Excellence.

1925 Breton Road SE, Suite 100; Grand Rapids, MI 49506
Telephone: (616) 454-4286

PROJECT:	**Traverse City DWSRF**	DATE:	**5/1/2021**
LOCATION:	**Traverse City, Michigan**	PROJECT NO.	**20210137**
		ESTIMATOR:	**ARH**
WORK:	**US-31 MDOT Project, 16-inch from US-31/Union to US-31/Bay**	CHECKED BY:	**DIU**
	and 12-inch from US-31/Railroad to US-31/Garfield	CURRENT ENR:	

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
1	Garfield Ave to Railroad Ave - 12" Water Main Upgrade	4100	Ft	$195	$799,500
2	Cass St to Union St - 8" Water Main Upgrade	800	Ft	$180	$144,000
3	Union St to US-31 ROW & Bay St projected - 16" Water Main Upgrade	1370	Ft	$275	$376,750
	Construction Subtotal				**$1,321,000**
	Contingencies	30	%		$397,000
	Engineering, Legal, and Administrative	20	%		$265,000
	TOTAL PROJECT COST				**$1,983,000**

HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915

Engineering. Environment. Excellence.

1925 Breton Road SE, Suite 100; Grand Rapids, MI 49506

Telephone: (616) 454-4286

PROJECT:	**Traverse City DWSRF**	DATE:	**5/1/2021**
LOCATION:	**Traverse City, Michigan**	PROJECT NO.	**20210137**
		ESTIMATOR:	**ARH**
WORK:	**16-inch on East Front from Franklin to Park Street**	CHECKED BY:	**DIU**
		CURRENT ENR:	

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
1	New 16-inch Water Main (RJ,CL 52, DIP, 5' Cover)	1800	LF	$150	$270,000
2	Hydrants	4	EA	$5,000	$20,000
3	16-inch Gate Valve and Box (1 every 500 ft)	5	EA	$15,000	$69,000
4	Water Service Connection	42	EA	$5,000	$210,000
5	Connection to Existing Main	5	EA	$10,000	$50,000
6	Pavement Replacement	1800	LF	$50	$90,000
7	Traffic Control	1	LS	$10,000	$10,000
	Construction Subtotal				**$719,000**
	Contingencies	30	%		$216,000
	Engineering, Legal, and Administrative	20	%		$144,000
	TOTAL PROJECT COST				**$1,079,000**

HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915

Engineering. Environment. Excellence.

1925 Breton Road SE, Suite 100; Grand Rapids, MI 49506

Telephone: (616) 454-4286

PROJECT:	**Traverse City DWSRF**	DATE:	**5/1/2021**
LOCATION:	**Traverse City, Michigan**	PROJECT NO.	**20210137**
		ESTIMATOR:	**ARH**
WORK:	**24-inch from Lake Cass/Union to Lake/Union**	CHECKED BY:	**DIU**
		CURRENT ENR:	

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
1	New 24 inch Water Main (RJ, CL 52, DIP, 5' Cover)	664	LF	$250	$166,000
2	Hydrants (1 every 350 ft)	3	EA	$5,000	$15,000
3	24-inch Gate Valve and Box (1 every 500 ft)	2	EA	$20,000	$40,000
4	Water Service Connection	2	EA	$5,000	$10,000
5	Connection to Existing Main	5	EA	$10,000	$50,000
6	Pavement Replacement	664	LF	$50	$33,200
7	Traffic Control	1	LS	$10,000	$10,000
	Construction Subtotal				**$325,000**
	Contingencies	30	%		$98,000
	Engineering, Legal, and Administrative	20	%		$65,000
	TOTAL PROJECT COST				**$488,000**

HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915

Engineering. Environment. Excellence.

1925 Breton Road SE, Suite 100; Grand Rapids, MI 49506

Telephone: (616) 454-4286

PROJECT:	**Traverse City DWSRF**	DATE:	**5/1/2021**
LOCATION:	**Traverse City, Michigan**	PROJECT NO.	**20210137**
		ESTIMATOR:	**ARH**
WORK:	**24-inch on Lake/Union to Lake/Wadsworth**	CHECKED BY:	**DIU**
		CURRENT ENR:	

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
1	New 24-inch Water Main (RJ, CL 52, DIP, 5' Cover)	1190	LF	$250	$297,500
2	Hydrants (1 every 350 ft)	4	EA	$5,000	$20,000
3	24-inch Gate Valve and Box (1 every 500 ft)	3	EA	$20,000	$60,000
4	Water Service Connection	8	EA	$5,000	$40,000
5	Connection to Existing Main	5	EA	$10,000	$50,000
6	Pavement Replacement	1190	LF	$50	$59,500
7	Traffic Control	1	LS	$10,000	$10,000
	Construction Subtotal				**$537,000**
	Contingencies	30	%		$162,000
	Engineering, Legal, and Administrative	20	%		$108,000
	TOTAL PROJECT COST				**$807,000**

HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915

Engineering. Environment. Excellence.

1925 Breton Road SE, Suite 100; Grand Rapids, MI 49506

Telephone: (616) 454-4286

PROJECT:	**Traverse City DWSRF**	DATE:	**5/1/2021**
LOCATION:	**Traverse City, Michigan**	PROJECT NO.	**20210137**
		ESTIMATOR:	**ARH**
WORK:	**24-inch from Webster/Rose to 8th/Railroad**	CHECKED BY:	**DIU**
		CURRENT ENR:	

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
1	New 24-inch Water Main (RJ, CL 52, DIP, 5' Cover)	2610	LF	$250	$652,500
2	Hydrants (1 every 350 ft)	8	EA	$5,000	$40,000
3	24-inch Gate Valve and Box (1 every 500 ft)	6	EA	$20,000	$120,000
4	Water Service Connection	20	EA	$5,000	$100,000
5	Connection to Existing Main	5	EA	$10,000	$50,000
6	Pavement Replacement	2610	LF	$50	$130,500
7	Traffic Control	1	LS	$10,000	$10,000
	Construction Subtotal				**$1,103,000**
	Contingencies	30	%		$331,000
	Engineering, Legal, and Administrative	20	%		$221,000
	TOTAL PROJECT COST				**$1,655,000**

HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915

Engineering. Environment. Excellence.

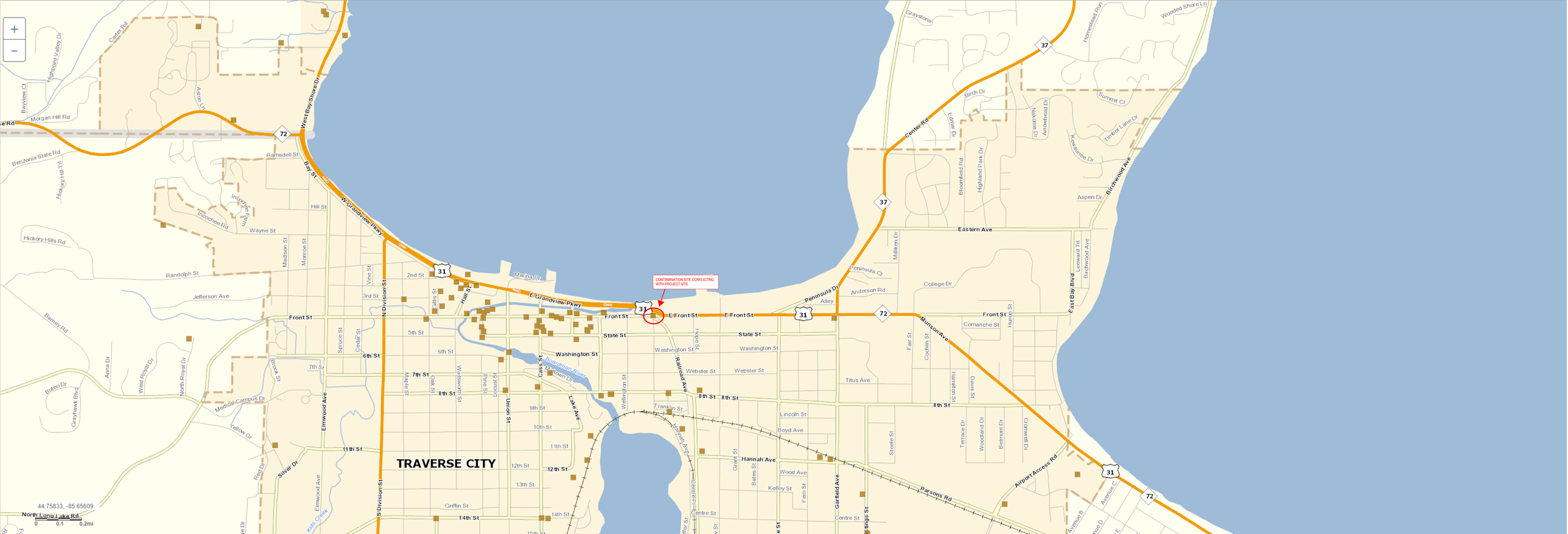
1925 Breton Road SE, Suite 100; Grand Rapids, MI 49506

Telephone: (616) 454-4286

PROJECT:	**Traverse City DWSRF**	DATE:	**5/1/2021**
LOCATION:	**Traverse City, Michigan**	PROJECT NO.	**20210137**
		ESTIMATOR:	**ARH**
WORK:	**24-inch from Garfield/Washington to Webster/Rose**	CHECKED BY:	**DIU**
		CURRENT ENR:	

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
1	New 24-inch Water Main (RJ, CL 52, DIP, 5' Cover)	1720	LF	$250	$430,000
2	Hydrants (1 every 350 ft)	6	EA	$5,000	$30,000
3	24-inch Gate Valve and Box (1 every 500 ft)	5	EA	$20,000	$100,000
4	Water Service Connection	40	EA	$5,000	$200,000
5	Connection to Existing Main	12	EA	$10,000	$120,000
6	Pavement Replacement	1720	LF	$50	$86,000
7	Traffic Control	1	LS	$10,000	$10,000
	Construction Subtotal				**$976,000**
	Contingencies	30	%		$293,000
	Engineering, Legal, and Administrative	20	%		$196,000
	TOTAL PROJECT COST				**$1,465,000**

APPENDIX F: EGLE SITE CONTAMINATION ONLINE MAPPER TOOL


CONTAMINATION SITE CONFLICTING WITH PROJECT SITE
TRAVERSE CITY
E Grandview Pkwy
W Grandview Pkwy
West Bay Shore Dr
Bay St
Ramsdell St
Hill St
Wayne St
Hickory Hills Rd
Randolph St
Jefferson Ave
Barney Rd
Front St
Spruce St
Cedar St
N Division St
S Division St
Vine St
2nd St
3rd St
5th St
6th St
7th St
8th St
9th St
10th St
11th St
12th St
13th St
14th St
Griffin St
Centre St
Hall St
Sills St
Oak St
Maple St
Locust St
Union St
Cass St
Boardman River
Boardman Lake
Lake Ave
Elmwood Ave
Silver Dr
Kids Creek
Wellington St
Railroad Ave
Hope St
State St
Washington St
Webster St
Franklin St
Hannah Ave
Lincoln St
Boyd Ave
Wood Ave
Kelley St
Fern St
Garfield Ave
Grant St
Bates St
Steele St
Titus Ave
Eastern Ave
Peninsula Dr
Peninsula Cir
Anderson Rd
College Dr
Alley
Millikin Dr
Center Rd
Bloomfield Rd
Highland Park Dr
Edmund Dr
Birch Dr
Nakoma Dr
Arrowhead Dr
Summit Ct
Timber Lane Dr
Kewaunee Dr
Aspen Dr
Birchwood Ave
Leeward Trl
East Bay Blvd
Munson Ave
Comanche St
Huron St
Fair St
Cochin St
Hamilton St
Davis St
Terrace Dr
Woodland Dr
Belmont Dr
Crawford Dr
Airport Access Rd
Parsons Rd
Avenue B
Avenue C
Avenue D
Avenue E
Grayhawk Blvd
Bates Dr
Anna Dr
West Royal Dr
North Royal Dr
Medical Campus Dr
Yellow Dr
Red Dr
Elmwood Ave
Morgan Hill Rd
Benzonia State Rd
Hickory Hill Ln
Highpoint Valley Dr
Bayview Ct
Carter Rd
Aston Ln
Incochee Rd
Incochee Trail
Makinaw Dr
Graystone
Homestead Run
Wooded Shore Ln
North Long Lake Rd
37
72
31
44.75833, -85.65609
0
0.1
0.2mi

APPENDIX G: PUBLIC PARTICIPATION DOCUMENTATION

...really look out for each other."

Alexis Shepherd drove in four runs in the night-cap win, with Addison Wangler adding two. Braleigh Miller scored three runs on two hits and a walk and Taylor Moeggenberg doubled in a run. Jones and Avery Parker added two hits and an RBI each and Catilin Robbins scored twice and drove in a run.

The Devils broke out the offense early in the twinbill, scoring five runs in the first frame.

Radulski hit the first of her two bombs over the left-center fence in the first inning for a 5-0 lead and Gaylord led 7-2 at one point.

St. Francis rallied back

energy sometimes (against West). I think just keeping our heads up high and keeping a positive mentality just kept us higher than the other team."

Wangler drove in two runs in the 10-8 win and Shepherd, Alexis Kozlowski and Radulski each scored two runs. Radulski also picked up the win, scattering eight hits and four earned runs over six innings. She recorded a 1-2-3 fifth inning on just four pitches.

With Gaylord holding a 10-4 lead headed in St. Francis' last at-bat, Leah Simetz led off the frame with a solo home run to dead center. Quinn Boyle was plunked, Hunter St. Peter singled and Allee Shepherd hit to left for a

dar is booked in the week ahead. They host Elk Rapids on Monday and face Boyne City on Thursday in Lake Michigan Conference play, but also have games Wednesday against Traverse City Central and May 29 versus TC West.

"We put these games on the challenge the girls," Meeker said. "We've talked about it before we went into the game, that we can either win and get better or we can lose and get better and today, we did a little bit of both. We didn't win, but we had some winning opportunities so we got better as a team with them."

St. Francis also drew Kingsley (27-6) in the opening round of districts.

Follow @Jamescook14 on

AFFIDAVIT OF PUBLICATION

STATE OF MICHIGAN
County of Grand Traverse

Paul Heidbreder being duly sworn deposes and says the annexed printed copy of notice was taken from the Traverse City RECORD EAGLE, a newspaper printed and circulated in said State and County, and that said notice was published in said newspaper on the following dates:

05/21/2021

that he or she is the agent of the printers of said newspaper, and knows well the facts stated herein

Paul T. Heidbreder

Subscribed and sworn to before
this 21st of May, 2021 .

Denise A. Lingerfelt

Denise A. Lingerfelt
Notary Public, State of MI
County of Grand Traverse
09/28/2023
Acting in County of Grand Traverse

City of Traverse City
Public Hearing Notice Regarding
the Application to the Michigan Department of Environment, Great Lakes, and Energy (EGLE) for funding assistance through the Drinking Water State Revolving Fund

The City of Traverse City will hold a public hearing on the application to the Michigan Department of Environment, Great Lakes, and Energy (EGLE) for funding assistance through the Drinking Water State Revolving Fund, better known as the State Revolving Fund (SRF) Program for the proposed Drinking Water System Improvements project. The public hearing is being held for the purpose of receiving comments from interested persons.

The hearing will be held at 7:00 p.m. on Monday, June 21, 2021, during the City Commission Regular Meeting, conducted as a Remote Participation Meeting. The meeting will be conducted over the Zoom Platform, and any individual may give public comment during the meeting by calling (312) 626-6799; meeting ID is 840-0545-0036. Alternatively, you may give public comment by joining the meeting using the following link: **https://us02web.zoom.us/j/84005450036**

The proposed Drinking Water System Improvements project descriptions and details are organized into a comprehensive 20-year Project Plan. If the SRF application is successful, the City will have the ability to employ the grant program to fund the proposed project. The project construction will include improvements within the Water Treatment Plant including the hypochlorite storage tank and building, new electrical switch gears and variable frequency drives for improved electrical efficiency, freight elevator, backwash and surface wash pumps, a standby generator, and pump station control valves. In addition, the project will include Wayne Hill booster station improvements, EGLE lead and copper rule required service line replacements, and replacement of aging and undersized water mains throughout the distribution system. Work will occur at the existing water treatment plant site, located at 2010 Eastern Avenue, as well as other locations throughout the City within the distribution system.

Impacts of the proposed project may include:

Noise: Noise due to construction activities such as construction equipment, machinery, generators, compressors, etc., will be kept to a minimum, as practicable. The work hours will be maintained in accordance with local ordinances.

Traffic Disturbance: Traffic control devices and temporary lane closures will be necessary during construction in the collection system. This may impact vehicular and pedestrian traffic flow patterns. Construction activities will be coordinated by location to mitigate any cumulative impacts.

The total cost of the improvements is estimated to be $14.75 million. The repayment of the SRF loan, if approved, will be apportioned to City water customers at a monthly rate of approximately $5.58 per residential service. The estimated user costs to finance the proposed project have been determined assuming SRF financing with a 2.0% interest rate (current SRF interest rate) and a 20-year debt retirement. The apportionment costs are based on an annual average over a 20-year period to provide an estimate of the average charge per residential service.

Copies of the Drinking Water System Draft Project Plan detailing the proposed project are available for review beginning on Friday, May 21, 2020 at:

City of Traverse City - City Hall, 400 Boardman Avenue, Traverse City, Michigan 49684 and at the City's website **www.traversecitymi.gov**.

Written comments received before the hearing record is closed on June 21, 2021 will receive responses in the Final Project Plan. Written questions should be sent to:

Benjamin Marentette, City Clerk, City Hall, 400 Boardman Avenue, Traverse City, Michigan 49684 **Or** tcclerk@traversecitymi.gov

IF YOU ARE PLANNING TO ATTEND THE PUBLIC MEETING AND YOU HAVE A DISABILITY REQUIRING ANY SPECIAL ASSISTANCE, PLEASE NOTIFY THE ADA COORDINATOR AT 992-4440 OR TDD #922-4412 AS SOON AS POSSIBLE.

The City of Traverse City does not discriminate on the basis of disability in the admission or access to, or treatment or employment in, its programs or activities. Penny Hill, Assistant City Manager, has been designated to coordinate compliance with the nondiscrimination requirements contained within Section 35.107 of the Department of Justice regulations. Information concerning the provisions of the Americans with Disabilities Act, and the rights provided thereunder, are available from the ADA Coordinator.

Published on May 21 2021 in the Traverse City Record-Eagle
Benjamin Marentette, MMC, City Clerk

City of Traverse City
Drinking Water Distribution System & Water Treatment Plant Improvements

2021 DWSRF Project Plan
Public Hearing Presentation
June 21, 2021

HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915

CITY of TRAVERSE CITY MICHIGAN

Overview

Project Plan

Cost

Impacts

Schedule

Questions

PURPOSE OF THE PUBLIC HEARING

- Present Drinking Water State Revolving Fund (DWSRF) Project Plan

- Provide a Forum for Community Participation
  - DWSRF Loan Program Overview
  - Project Plan and Alternatives
  - User and Overall Project Costs
  - Social & Environmental Impacts
  - Mitigation of the Impacts
  - Schedule
  - Questions

HRC

CITY of TRAVERSE CITY MICHIGAN

WHAT IS THE DWSRF LOAN PROGRAM?

Provides low-interest loans (currently 2.0%) for planning, designing, and construction eligible drinking water projects. Administered by EGLE Water Infrastructure Finance Division.

To qualify, the City must:

- Prepare and submit an EGLE approvable Project Plan
- Provide a Public Hearing and Comment Opportunity for the Plan
- Pass a Council Resolution adopting the Plan

Final EGLE approval and City acceptance of the loan is decided later in the DWSRF Loan Program.

HISTORY OF THE TRAVERSE CITY SYSTEM

- The original water supply was located near the City in West Bay in the 1890s and was relocated to East Bay in 1965.
- Treatment is provided by a 20 million gallon per day water treatment plant (WTP) located in the City near the intake in East Bay
  - Converted to direct filtration in 1993
  - The WTP is equipped with four low service pumps, two flocculators, five rapid sand filters, two clear wells, finished water storage, and five high service pumps
- Provides water for City and customer communities (Garfield Township and portions of Elmwood and Peninsula Township)

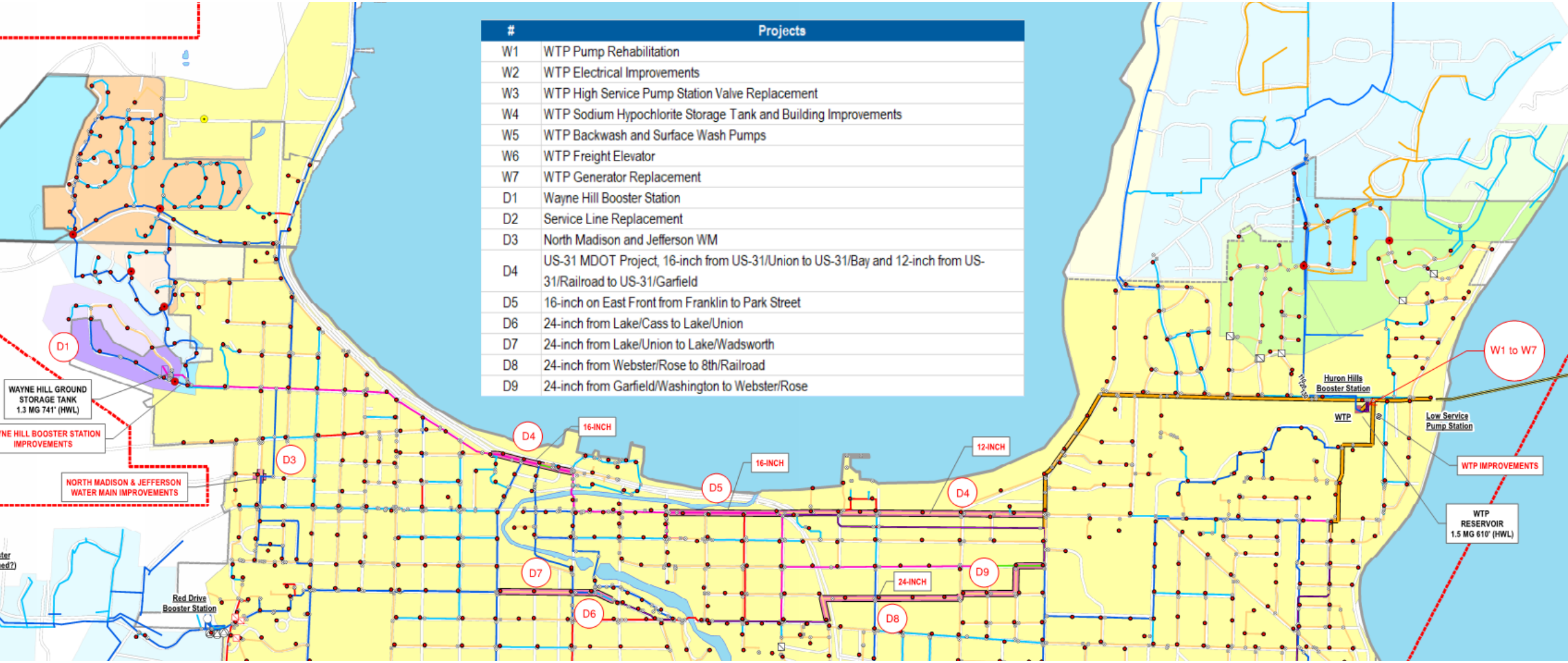
WTP PROJECT LOCATION

HRC

CITY of TRAVERSE CITY MICHIGAN

DISTRIBUTION SYSTEM PROJECT LOCATIONS

#	Projects
W1	WTP Pump Rehabilitation
W2	WTP Electrical Improvements
W3	WTP High Service Pump Station Valve Replacement
W4	WTP Sodium Hypochlorite Storage Tank and Building Improvements
W5	WTP Backwash and Surface Wash Pumps
W6	WTP Freight Elevator
W7	WTP Generator Replacement
D1	Wayne Hill Booster Station
D2	Service Line Replacement
D3	North Madison and Jefferson WM
D4	US-31 MDOT Project, 16-inch from US-31/Union to US-31/Bay and 12-inch from US-31/Railroad to US-31/Garfield
D5	16-inch on East Front from Franklin to Park Street
D6	24-inch from Lake/Cass to Lake/Union
D7	24-inch from Lake/Union to Lake/Wadsworth
D8	24-inch from Webster/Rose to 8th/Railroad
D9	24-inch from Garfield/Washington to Webster/Rose



IMPROVEMENT & PROJECT NEED

- WTP Upgrades
- Distribution System Upgrades
- Need for Projects
  - Aging Infrastructure
  - Water Quality Improvement
  - Improved Treatment Efficiency and Electrical Energy Reduction

ALTERNATIVE ANALYSIS

- No Action Alternative
  - Not considered a favorable option
  - No Action will result in:
    - Continued degradation of existing facilities
    - Risk of water quality issues
    - More costly intervention in the future

ALTERNATIVE ANALYSIS cont'd

- Proposed Water Treatment Plant Improvements
  - **Pump Rehabilitation**
  - Electrical Improvements
  - High Service Pump Station Valve Replacement
  - Sodium Hypochlorite Tank and Building Improvements
  - Freight Elevator
  - Backwash and Surface Wash Pumps
  - Emergency Generator

HRC

CITY of TRAVERSE CITY MICHIGAN

ALTERNATIVE ANALYSIS cont'd

- Proposed Water Treatment Plant Improvements
  - Pump Rehabilitation
  - **Electrical Improvements**
  - High Service Pump Station Valve Replacement
  - Sodium Hypochlorite Tank and Building Improvements
  - Freight Elevator
  - Backwash and Surface Wash Pumps
  - Emergency Generator

ALTERNATIVE ANALYSIS cont'd

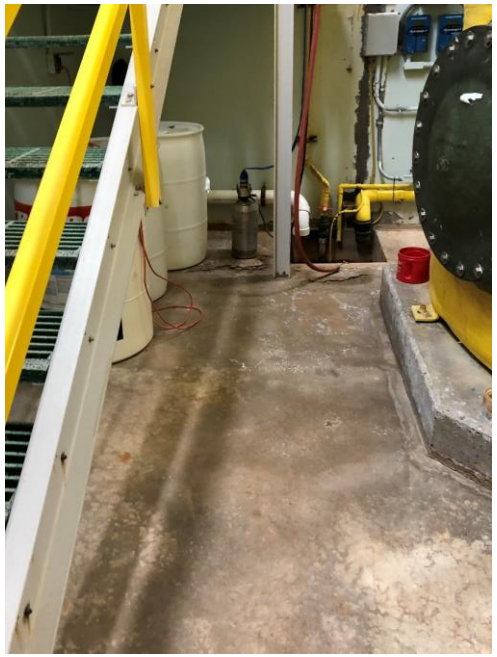
- Proposed Water Treatment Plant Improvements
  - Pump Rehabilitation
  - Electrical Improvements
  - **High Service Pump Station Valve Replacement**
  - Sodium Hypochlorite Tank and Building Improvements
  - Freight Elevator
  - Backwash and Surface Wash Pumps
  - Emergency Generator

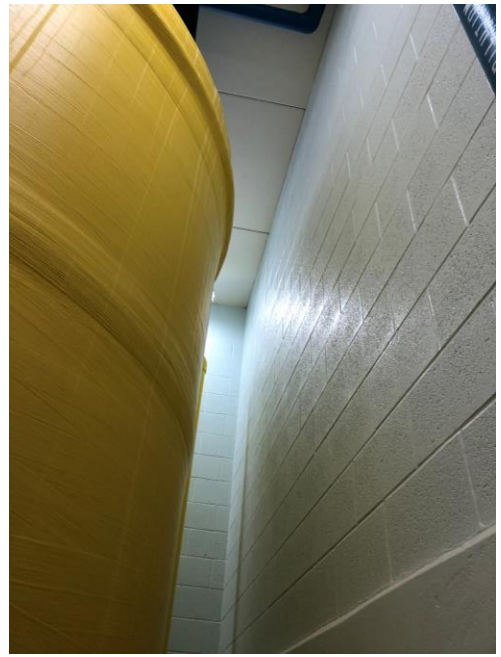
HRC

CITY of TRAVERSE CITY MICHIGAN

ALTERNATIVE ANALYSIS cont'd

- Proposed Water Treatment Plant Improvements
  - Pump Rehabilitation
  - Electrical Improvements
  - High Service Pump Station Valve Replacement
  - **Sodium Hypochlorite Tank and Building Improvements**
  - Freight Elevator
  - Backwash and Surface Wash Pumps
  - Emergency Generator





ALTERNATIVE ANALYSIS cont'd

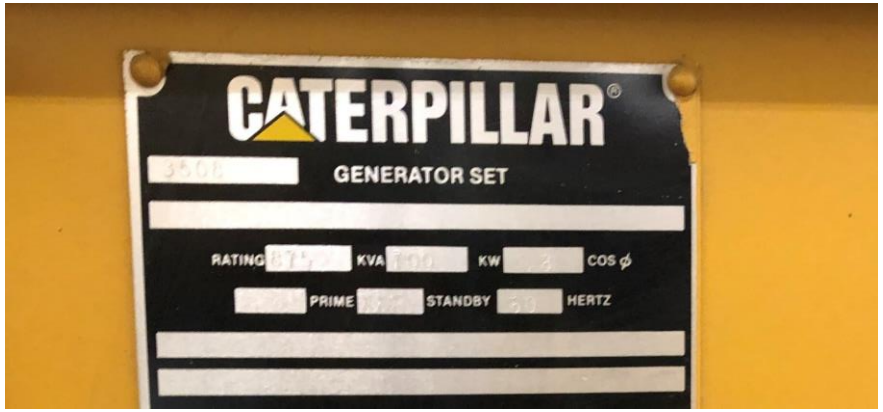
- Proposed Water Treatment Plant Improvements
  - Pump Rehabilitation
  - Electrical Improvements
  - High Service Pump Station Valve Replacement
  - Sodium Hypochlorite Tank and Building Improvements
  - **Freight Elevator**
  - Backwash and Surface Wash Pumps
  - Emergency Generator

ALTERNATIVE ANALYSIS cont'd

- Proposed Water Treatment Plant Improvements
  - Pump Rehabilitation
  - Electrical Improvements
  - High Service Pump Station Valve Replacement
  - Sodium Hypochlorite Tank and Building Improvements
  - Freight Elevator
  - **Backwash and Surface Wash Pumps**
  - Emergency Generator

ALTERNATIVE ANALYSIS cont'd

- Proposed Water Treatment Plant Improvements
  - Pump Rehabilitation
  - Electrical Improvements
  - High Service Pump Station Valve Replacement
  - Sodium Hypochlorite Tank and Building Improvements
  - Freight Elevator
  - Backwash and Surface Wash Pumps
  - **Emergency Generator**

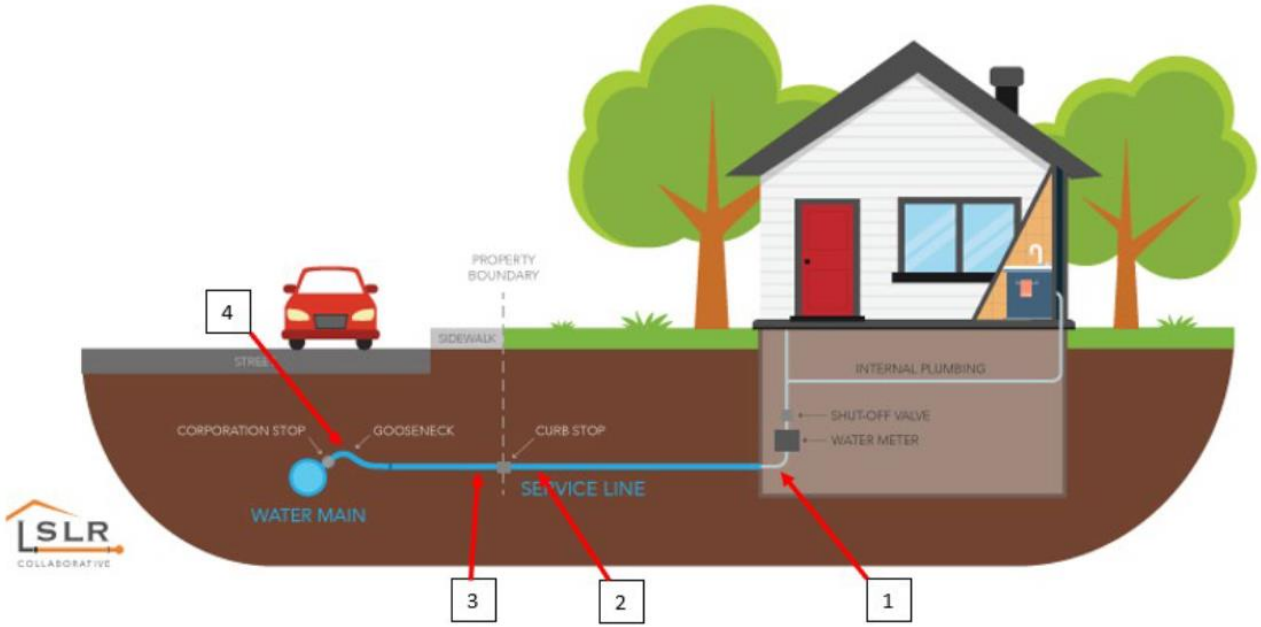


HRC

CITY of TRAVERSE CITY MICHIGAN

ALTERNATIVE ANALYSIS cont'd

- Proposed Distribution System Improvements
  - **Service Line Replacement**
  - Wayne Hill Booster Station
  - Watermain Construction (various locations)



ALTERNATIVE ANALYSIS cont'd

- Proposed Distribution System Improvements
  - Service Line Replacement
  - **Wayne Hill Booster Station**
  - Watermain Construction (various locations)

ALTERNATIVE ANALYSIS cont'd

- Proposed Distribution System Improvements
  - Service Line Replacement
  - Wayne Hill Booster Station
  - **Watermain Construction (various locations)**

PROJECT COST ESTIMATES

Water Treatment Plant (WTP)

Project	Estimated Cost
WTP Pump Rehabilitation	$560,000
WTP Electrical Improvements	$1,597,000
WTP High Service Pump Station Valve Replacement	$427,000
WTP Sodium Hypochlorite Storage Tank and Building Improvements	$385,000
WTP Backwash and Surface Wash Pumps	$172,000
WTP Freight Elevator	$300,000
WTP Emergency Generator	$589,000

PROJECT COST ESTIMATES cont'd

Distribution System

Project	Estimated Cost
Service Line Replacement	$1,995,000
Wayne Hill Booster Station	$432,000
North Madison and Jefferson WM	$816,000
US-31 MDOT Project, 16-inch from US-31/Union to US-31/Bay and 12-inch from US-31/Railroad to US-31/Garfield	$1,983,000
16-inch on East Front from Franklin to Park Street	$1,079,000
24-inch from Lake/Cass to Lake/Union	$488,000
24-inch from Lake/Union to Lake/Wadsworth	$807,000
24-inch from Webster/Rose to 8th/Railroad	$1,655,000
24-inch from Garfield/Washington to Webster/Rose	$1,465,000
Total (WTP and Distribution System)	**$14,750,000**

PROJECT USER COST ESTIMATES

- Project cost over a 20-year period

Funding Source	Total Cost of Projects	Monthly Cost for Project Per Residential Connection
DWSRF at 2.00%	$14,750,000	$5.58

$1.13 for first year

CITY of TRAVERSE CITY MICHIGAN

Overview

Project Plan

Cost

Impacts

Schedule

Questions

IMPACTS OF PROJECT PLAN

- Long-Term Impacts:
  - Positive Impacts
    - WTP improved efficiency
    - Ability to continue providing clean drinking water and public health protection
    - Improved processing and reduced equipment wear
  - Negative Impacts
    - None
- Short-Term Impacts:
  - Positive Impacts
    - Increase in jobs, and workers utilizing community amenities and local contractors
  - Negative Impacts
    - Noise, dust, & traffic related to construction

HRC

IMPACTS OF PROJECT PLAN

- Irreversible Direct/Indirect Impacts:
  - Non-recoverable resources (public capital, energy, labor & materials) committed to project are traded off to provide necessary repair and replacement of aging and worn-out structures and equipment
  - Possible construction damage or accidents

MITIGATION OF IMPACTS

- Mitigation of Long-Term Impacts
  - Activities will prohibit the disposal of soils in wetlands, floodplains, or other sensitive areas
- Mitigation of Short-Term Impacts related to Construction Activities
  - Comply with any required permits (soil erosion, endangered species, etc.)
  - Follow regulations related to disposal and handling of asbestos containing material, lead paint, and any contaminated soils/groundwater, if encountered
  - Resident notifications for construction within their neighborhood

Overview

Project Plan

Cost

Impacts

Schedule

Questions

DRINKING WATER SYSTEM IMPROVEMENT SRF SCHEDULE

Task	Completion
Public Hearing Notice	May 20, 2021
Draft Project Plan Available	May 20, 2021
Formal Public Hearing	June 21, 2021
City Commission Adoption of Project Plan	June 21, 2021
Submit Final Project Plan to EGLE	July 1, 2021

HRC

CITY of TRAVERSE CITY MICHIGAN

DRINKING WATER SYSTEM IMPROVEMENT PROJECTS SCHEDULE

Project	Fiscal Year
WTP Pump Rehabilitation	2022
WTP Electrical Improvements	2022
WTP High Service Pump Station Valve Replacement	2023
WTP Sodium Hypochlorite Tank and Building Improvements	2023
WTP Freight Elevator	2023
WTP Backwash and Surface Wash Pumps	2024
WTP Emergency Generator	2025

Overview

Project Plan

Cost

Impacts

Schedule

Questions

DRINKING WATER SYSTEM IMPROVEMENT PROJECTS SCHEDULE

Project	Fiscal Year
Service Line Replacement	2022-2026
Wayne Hill Booster Station	2022
North Madison and Jefferson Watermain	2023
US-31 MDOT Project, 16-inch from US-31/Union to US-31/Bay and 12-inch from US-31/Railroad to US-31/Garfield	2023
16-inch on East Front from Franklin to Park Street	2023
24-inch from Lake/Cass to Lake/Union	2024
24-inch from Lake/Union to Lake/Wadsworth	2024
24-inch from Webster/Rose to 8th/Railroad	2026
24-inch from Garfield/Washington to Webster/Rose	2026

HRC

CITY of TRAVERSE CITY MICHIGAN

QUESTIONS?

- Overview
- Project Plan
- Cost
- Impacts
- Schedule
- Questions

HRC

CITY of TRAVERSE CITY MICHIGAN

CITY OF TRAVERSE CITY

PUBLIC HEARING

CITY COUNCIL MEETING

June 21, 2021

EXCERPT RE: Drinking Water State Revolving Fund Project

DATE: Monday, June 21, 2021

TIME: 7:00 p.m.

LOCATION: Remotely VIA Zoom

CITY COMMISSION MEMBERS:

Mayor Jim Carruthers
Mayor Pro-Tem Amy Shamroe
Commissioner Christine Minervini
Commissioner Timothy Werner
Commissioner Ashlea Walter
Commissioner Lauren Trible
Commissioner Roger Putman
Commissioner Brian McGillivary

CITY STAFF MEMBERS:

Lauren Trible-Laucht, City Attorney
Martin Colburn, City Manager
Benjamin Marentette, City Clerk
Harry Burkholder, Downtown Department Authority Chief Operating officer
Timothy Lodge, City Engineer
Zack Cole, Engineering Department
Art Krueger, Director Municipal Utilities
Liz Hart, Managing Wastewater Treatment Plant
Frank Dituri, Director of Public Services
Jean Derenzy, Downtown Development Authority CEO
Jeff O'Brien, Police Chief
Jim Tuller, Fire Chief
Kelly Martin, City Treasure and Finance Director
Karla Myers-Beman, Traverse City Light and Power Controller
Nicole Vanes, Transportation Mobility Director
Penny Hill, Assistant City Manager
Shawn Winter, Planning Director
Tim Ahrens, Traverse City Light and Power Executive Director

OTHERS PRESENT:

Todd Sneathen, Consultant, Hubbell, Roth, & Clark, Inc.

REPORTED BY: Tulane Woodworth, Hubbell, Roth & Clark, Inc

MR. CARRUTHERS: Public hearing regarding the city program project plan and program application for the Michigan Department of Environmental Great Lakes and Energy drinking water state revolving loan fund, to assist in making drinking water improvements and considerations of adopting a resolution authorizing the submission of the application. So this is public hearing Mr. Colburn do you want to a review of this and then have the clerk open up the public hearing.

MR. COLBURN: Certainly. Honorable Mayor and city commissioners this is in regard to a process that were to follow and be able to address and to request support from the state revolving loan fund. As your aware we just went through with the wastewater treatment and wastewater type infostructure and so now that we are doing this with the drinking water as well. In essence we are getting our financial ducks in a row. It’s still a competitive process in which we would have to apply for the dollars to do some of these projects and some of these improvements would be done over a period of time, but we do look at our different access to resources and how to best fund and get the appropriate bang for our buck for the city. Now were looking at loans we already talk to our financial planner in regard to bonds however at this time due to the rates that the sate is providing he recommended going after these funds first. Bonds are always an option of course but the price is very good for what the state is currently offering which is

typically right now 2% or slightly under. So there's a number of projects that are listed within this plan in terms of the um what's been presented and we have Mr. Art Krueger here the utilities director that can go over if you so desire in more detail but we are also going to be looking at multiple other sources particularly through our ARA right now and terms of timing that's always an issue as well to see what we can acquire to try to reduce the pressure on our own dollars. Meaning those dollars that the city, that the citizen pay in for the use of their water and waste water. We are always looking for what we can do best to make our dollars spread as far as we can. At this time, we have Mr. Art Krueger to answer any technical questions.

MR. CARRUTHERS: Are there any questions for Mr. Krueger or Mr. Colburn before I open the public hearing? I don't see any. Oh sorry Mr. McGillivary.

MR. MCGILLIVARY: Is there a presentation being made or not?

MR KRUEGER: Yes, once we open the public hearing, I believe the presentation will be made and give an overview of the project plan

MR. MCGILLIVARY: Ok thank you

MR. CARRUTHERS: So, then Mr. Marentette do you want to open the public meeting and then Mr. Krueger can give his presentation.

MR. CARRUTHERS: Yes, I will open the public hearing but are we going to have Mr. Krueger go over his presentation first?

MR. MARENTETTE: We can do that sure we will begin with you Mr. Krueger.

MR. KRUEGER: Ok um I actually got Todd Sneathen who presented the

clean water SRF presentation for the public hearing that we did last month on with us. He's planning on, I'm having him prepare and I'm sorry provide that presentation. So, I would like to turn it over to Todd Sneathen of Hubbell, Roth, and Clark our consultants for this project and let him give you the presentation now. He's going to share his screen as well this time.

MR. SNEATHEN: Good evening Mr. Mayor and city counsel members. Can people see my screen? Ok So this is the public hearing for the 2021 Drinking water state revolving fund project plan. So, the purpose of the public hearing is present the drinking water state revolving project plan. This public hearing provides a forum for community participation to discuss the loan program, project plans and alternatives, user and overall project costs associated with the project included, social and environmental impacts, mitigation of the impacts, a schedule for the project plan, and to answer any questions.

The project plan, first of all what the loan program the drinking the DWSRF or drinking water state revolving loan fund is a low interest loan through the state of Michigan for planning, designing and construction eligible drinking water projects. This is administered by EGLE Water Infrastructure Finance Division. To qualify for the funds the city must do 3 things. Prepare and submit an EGLE approvable plan, the project plan has been prepared the next step would be submitting it. Provide a public hearing and comment opportunity for the public, which is currently the public hearing and then the comment opportunity. This project plan has been available for 30 days for any written comment for

review. Then the final step in this process is pass a council resolution adopting the plan. The final EGLE approval and the city acceptance of any loans or funds will be decided later in the DWSRF loan program and as Mr. Colburn commented this is not a commitment to anything on the city behalf this is just an opportunity to get in line to have the opportunity to have these funds.

So, a little brief history of the Travers City water system. The original water supply was located near the city in the West Bay in the 1890's and was relocated to East Bay in 1965. The treatment plant provides 20 million gallon per day of water, located in the city near the intake to the Bay. This plant was converted to a direct filtration plant and has number of pieces of equipment that are associated with the treatment process that are in various ages and need of repair, replacement, or upgrade. The city provides water for its customer for the city, I'm sorry the plant provides water for the city and customer communities of Garfield Township and parts of Elmwood and Peninsula Township.

Here is an overall areal view of the water treatment plant. We have various text boxes which are shown on here which show the various locations of the proposed project.

So now go to the distribution system, this is a schematic of the distribution system of the city of Traverse City with a text box inserted to show the various projects that are proposed as part of this project plan to not only work at the wastewater, I'm sorry at the water treatment plant but also do some work at the Wayne Hill booster station and do some

other projects though out the distribution system.

So, what is the purpose of this project plan and the improvement and project needs. As I discussed there needs to be upgrades to the water treatment plant and the distribution system is also in need of upgrades. The reason for these projects is the infrastructure is aging to continue to have high quality water within the community and to improve the efficiencies currently and ultimately to also reduce electrical energy cost and usage.

So, the first alternative that has to be reviewed is the no action alternative. This is not considered a favorable option, due to the fact that no action in any of these facilities would result in continued degradation of the current facilities, a risk to the community's water quality and if nothing was done a more costly intervention or project in the future.

Several project that were proposed. The projects that are proposed at the water treatment plant would be the pump rehabilitation project. This pumps are at an age where they need to be replaced, this will also help with electrical efficiency at the plant. These are both the high service pumps and low service pumps, so this is really just a project in need of moving forward.

Electrical improvements which involve the electrical switch gear at the plant and some of the motor starters that are out there. This as well a replacement of these would involve, improve electrical efficiency ultimately at the plant and would also provide, we also be looking to replacement of the pump motors using variable frequency drives and those

allow better control from at the water treatment plant to better utilizing existing pump capacity, new capacity that will be installed.

High service pump station valve replacement just like a number of things at the plant the staff has done a very good job of continued the useful life and maintenance on these pieces of equipment but becoming extremely difficult to maintain just due to there age. They are extremely important valves because they need to be closed in order to protect the very valuable high service pump that provide water to community.

Sodium hypochlorite tank and building improvements. Sodium hypochlorite tanks there are two of those, which hypochlorite is use for disinfection of the water. They are currently made out of fiberglass. They have aged and are currently some leaking. Hypochlorite is very corrosive and due to that corrosive nature its recommended that these tanks be replaced which would improve, which would help save the infrastructure that's there, the concrete floor and also would reduce any spills or any concerns with regards to that. There are also some building improvements that would be associated with that work as well.

The freight elevator is just aging. Really needs to have um services 3 floors of the plant, needs to be upgraded to have a new elevator car installed and new hydraulics.

Backwash and surface wash pumps those are related with the sand filters at the plant. Replacement of these pumps just based on there age will provide better efficiency at the backwash and cleaning of your sand filters and provide better hydraulic compacity.

And then finally emergency generator at the plant. This generator

reached the end of its service life. It will replace the existing generator on site and ensure that the city can reliably provide emergency power for average daily use water remains.

Those are projects at the water treatment plant now there's the distribution system improvements. As part of the new rules, called the lead and copper rule by 2041 the city needs to replace all service lines that fall under these rules. The service lines in the city are galvanized are included as part of this rule for replacement. This is something the city has already started with replacing these, but this is an opportunity to use some additional funds from the state or borrow some funds from the state to continue the replacement to meet the goal of 2041. Also there has been grant money available and by including this in the five-year plan there's a potential that if grant money comes available again that you would be in a very good position to access that money.

The Wayne Hill booster station there has been some low-pressure problem. There are low pressure issues during fire flow conditions at some of the lower elevations throughout the community. This limitation and some issues with regards to pump capacity, I'm sorry not pump capacity reservoir issues by upgrading this would provide additional opportunities due to fire protection for build out throughout the system.

Finally, watermain construction there are a number of locations which were shown were shown on that schematic map all throughout the city where there is a number of cast iron pipes throughout the community that have reached the end of useful life. Number of them were installed in the 60's or earlier than that and by installing these pipes with new duct

iron you will reduce water loss throughout your system and also reduce pumping cost due to the ability to have cleaner pipes that then would allow water to flow easier through the system.

These are some of the project costs for water treatment plant. You can see each one of these costs, this is right around a $4 million dollar worth of project. I'm not sure I mentioned originally but this plan is for 5 years, and I know I didn't mention this is work that needs to be done. This just get you in line to access the money to do these projects and provide low interest loans and funding for them.

Then throughout the distribution system I talked about service line Wayne Hill Booster station but then here are the location of where would be proposed to install new water main throughout the distribution system. The total cost for both the water treatment plant and distribution system is estimated currently at $14.75 million dollars.

With that the project costs using an interest rate of 2% that would be a $5.58 monthly cost per residential connection. That would be the increase. One of the things to know is that not all of these projects would be done at the same time. You can below that the projects that are included in the first year would amount to $1.13 monthly increase for each residential connection for the first years' worth of projects. One of the things to note is that currently the water systems has no existing debit and as it relates to water rate for communities of your size or similar size you have very reasonable price for your current water rates.

We need to discuss what the impacts of these projects are. So the long term impacts positives are water treatment plant efficiency which

would result in decrease in energy as well as being able to portable water. Another positive ability to continue providing clean drinking water and the protection from a public health perspective of the water source. And finally improved processing and reduced equipment wear on the current system.

Some negatives long term affects based on our analysis there would be none.

So, from a short-term perspective obviously with any construction project comes the positive increase in jobs and works utilizing community amenities and potential for local contractors to do work close to home. As with any construction project the negative impacts would include noise, dust and traffic related to and impacts the traffic related to the construction.

There are some irreversible direct and indirect impacts which we have to review. That would be the use of non-recoverable resources such as public capital, energy, labor, and materials. Which would be committed to the project and that the trade off to provide necessary repair and replacement of the existing infrastructure and equipment. The other potential irreversible and indirect impact would be construction damage or accidents that occur during the course of the projects.

How do we mitigate those impacts from a long-term perspective? Some of the ways to mitigate those would be that the activities will prohibit additional soil, prohibit construction soil and the number of natural features throughout the Traverse City area including wetlands, floodplains, and other sensitive areas. Some of the short-term impacts

that would be mitigated due to the number of required permits that need to be applied for in a year to include soil erosion, some review of the wetlands, and endangered species. The projects would be required to follow regulations regarding any hazardous material such as asbestos, lead paint, or any contaminated soil or ground water that was encountered. Finally work on the distribution system to notify residents weather through a number of different methods to have the discussion about what the projects are so they understand what the impacts are and what the potentials are moving forward.

Here's what the drinking water system SRF plan schedule is the public hearing, which is occurring right, with the notice I'm sorry which was done May 20th and the draft budget plan was made available at that time for review by the public and any comments to be made. Formal public hearing which is occurring right now. After the public hearing will be a adoption of resolution by the city commission. Finally, submittal of the project plan by July 1st to EGLE.

As we said this a 5-year project plan, the project are spread out over the 5 years. As you can see looking at the fiscal year when projects would occur, potentially the first project the water treatment plant would occur in fiscal year 2022. And that is the state's fiscal year, which is October 1 to September 30th fiscal year, which is a little different that the city which is July 1st to June 30th. So, the first two projects would be pump rehabilitation and electrical improvements, then you can see the various projects I discussed earlier and what year those would occur in.

Then finally the distribution system. The service line replacement would be a project that would continue on an annual basis throughout the 5 years of this plan. Also, to do the Wayne Hill booster station as a start for the distribution system. We talked about this with the clean water improvement project schedule these are based on discussions looking at the CIP, a number of conversations with the city staff but that does not necessarily mean that these priorities can't change, and can the project plan can be amended and projects moved into the plan or actually changed to different fiscal years.

Finally, I don't really have anything else to discuss. Id be happy to answer anybody questions if there are any.

MR. CARRUTHER: Are there any questions for Mr. Sneathen? I don't think I see any. Oh Mr. McGillivary.

MR. MCGILLVARY: The water line, the water main replacement are these just replacing existing water mains with the same size or are we upgrading the size of these water mains?

MR. SNEATHEN: In most cases we are upgrading the size of the water main as well as replacement of the. So, were putting new pipes in the ground which would be of larger size and better materials.

MR. MCGILLVARY: And for the Wayne Hill project is that just to address an existing problem or to create an ability to draw more, provide services for a greater build out on the western or northwestern side part of the city?

MR. KRUEGER: I can answer that one. Primarily its to address existing situation issues that we've had at the booster station and the

tank to provide water more efficiently to that service area which is around Wayne Hill and around high point plus across M72 to the North, the Morgan Farms area. They deal with when say fire flows are needed in certain areas for the model, we have some low-pressure areas that are forming during that time so, were looking to boost better pressure during a fire flow event and also utilize a larger depth of the tank. Currently were pumping from about half up the tank so the lower half of the tank really isn't available during a high demand time of the year, or I guess any time of the year. Were looking to rectify that situation and give us a little more storage that's usable at the tank. So those are the things we are trying to address with that project.

MR. MCGILLVARY: My other questions was more to do with the reports than project. When you talk about impacts, and you say negative impacts are none you don't consider increase water rates to residents a negative impact?

MR. SNEATHEN: NO.

MR. MCGILLVARY: It doesn't qualify as a negative impact?

MR. SNEATHEN: No, its existing infrastructure that installed and ultimately had to be maintained to supply water to people and so do to that it's not, based on the way the study is put together and guidance from, in preparing these plans it not considered a negative impact.

MR. MCGILLIVARY: Guidance from the state?

MR. SNEATHEN: Yes

MR. MCGILLIVARY: Ok, thank you

MR. CARRUTHERS: Anyone else, any questions? Thank you, Mr.

Sneathen and thank you Mr. Krueger. This is a public hearing so I would ask that the clerk invite anybody in the public to state their information.

MR MARENTETTE: Certainly, we turn next to Mitchell Treadwell. Mr. Treadwell do you have a comment or are you passing. Oh, you unmuted for a minute. Ill unmute you again. Mr. Treadwell do you have a comment or are you passing?

MR. TREADWELL: If you can hear me. Ah yes, I think that this is a good investment in the future of our city. Yes, residence will have to p ay somewhat more but to have fresh water to drink, do our dishes, and to take showers and whatever is important part of a well-functioning city. I look forward to this as what seems to be a cost-effective long-term solution applying for this fund. Thank you

MR. MARENTETTE: That is everyone Mr. Carruthers.

MR. CARRUTHERS: Ok thank you Mr. Marentette. I will close the public hearing and bring it back to the commission. Are there any comments concerns or recommendations?

(Whereupon this excerpt was concluded at 8:13 p.m.)

City of Traverse City

Office of the City Clerk

GOVERNMENTAL CENTER
400 Boardman Avenue
Traverse City, MI 49684
(231) 922-4480
tcclerk@traversecitymi.gov

TRAVERSE CITY
CITY COMMISSION RESOLUTION

ADOPTION OF A FINAL PROJECT PLAN FOR DRINKING WATER IMPROVEMENTS AND DESIGNATION OF AN AUTHORIZED PROJECT REPRESENTATIVE

WHEREAS, the City of Traverse City recognizes the need to make improvements to its existing water treatment and distribution system; and

WHEREAS, the City of Traverse City authorized Hubbell, Roth and Clark to prepare a Project Plan, which recommends the construction of Drinking Water Improvements; and

WHEREAS, said Project Plan was presented at Public Hearing June 21, 2021 and all public comments have been considered and addressed;

WHEREAS, adoption of the Project Plan and approval of the loan program does not obligate the City to accept any funding that may be approved through the application process, if approved by the State, it allows the City to be a candidate for SRF loan consideration; and

NOW THEREFORE BE IT RESOLVED, that the City of Traverse City formally approves and adopts said Project Plan and Program Application for the Michigan Department of Environment, Great Lakes and Energy State Revolving Fund Loan.

BE IT FURTHER RESOLVED, that the City Manager, a position currently held by Martin Colburn, is designated as the authorized representative for all activities associated with the project referenced above, including the submittal of said Project Plan as the first step in applying to the State of Michigan for a Drinking Water State Revolving Fund (DWSRF) Loan to assist in the implementation of the selected alternative.

I, Benjamin Marentette, City Clerk of the City of Traverse City, do hereby certify that the above is a true and correct copy of a resolution adopted at the meeting of the City Commission of the City of Traverse City on June 21, 2021, at which a quorum was present and voted.

Benjamin Marentette, Clerk
City of Traverse City, Michigan

MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY
FINANCE DIVISION

DRINKING WATER STATE REVOLVING FUND
PROJECT PLAN SUBMITTAL

Part 54, Safe Drinking Water Assistance, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended

Name of the Project	**Applicant's Federal Employer Identification Number (EIN)**
DWSRF Water Improvements	386027348

Legal Name of Applicant (The legal name of the applicant may be different than the name of the project. For example, a county may be the applicant for bonding purposes, while the project may be named for the particular village or township it serves.)

City of Traverse City

Address of Applicant

Street Address
400 Boardman Avenue

PO Box
592

City	State	Zip
Traverse City	MI	49686

Areas Served by this Project

Counties
Grand Traverse, Leelanau

Congressional Districts
1st

State Senate Districts
35, 37

State House Districts
101, 104

Population Served by the Water Supplier	**Water Supply Serial Number (WSSN)**
31,155	06640

Brief Description of the Project

Improvements to the City of Traverse City drinking water distribution system and water treatment plant.

Estimated Total Cost of the Project	**Construction Start Target Date**
$14,750,000	03/01/2022

Name and Title of Applicant's Authorized Representative	**Telephone**	**E-mail Address**
Name Marty Colburn **Title** City Manager	(231) 922-4440	mcolburn@traversecitymi.gov

Address of Authorized Representative - if same as address above, check here ☑

Street Address

PO Box

City State Zip

Signature of Authorized Representative	**Date**
	6-22-2021

State approval of the water supplier's Surface Water Intake Protection Program is attached (if applicable) check here ☐

State approval of the water supplier's Wellhead Protection Program is attached (if applicable) check here ☐

Joint Resolution of Project Plan Adoption/Authorized Representative Designation is attached check here ☑

A final project plan, prepared and adopted in accordance with the Department's *Drinking Water State Revolving Fund Program Project Plan Preparation Guidance*, must be submitted by July 1st in order for a proposed project to be considered for placement on Michigan's Project Priority List for the next fiscal year.

Please send your final project plan with this form to your EGLE Water Infrastructure Financing Section Project Manager. Electronic submittal to Project Manager is acceptable.

WATER INFRASTRUCTURE FINANCING SECTION
FINANCE DIVISION
MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY
P O BOX 30457
LANSING MI 48909-7957

For information or assistance on this publication, please contact the Drinking Water State Revolving Fund, through EGLE Environmental Assistance Center at 800-662-9278. This publication is available in alternative formats upon request.

EGLE does not discriminate on the basis of race, sex, religion, age, national origin, color, marital status, disability, political beliefs, height, weight, genetic information, or sexual orientation in the administration of any of its programs or activities, and prohibits intimidation and retaliation, as required by applicable laws and regulations.

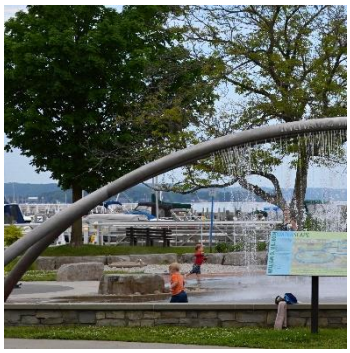
This form and its contents are subject to the Freedom of Information Act and may be released to the public.

APPENDIX H: 2020 WATER SYSTEM RELIABILITY STUDY

CITY of TRAVERSE CITY MICHIGAN

WATER RELIABILITY STUDY

WSSN #6440



PREPARED BY:

HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915

1925 Breton Road SE, Suite 100
Grand Rapids, Michigan 49506

HRC Job Number 20200232

FEBRUARY 2021

Table of Contents

List of Figures

List of Tables

List of Appendices

1 Executive Summary

The purpose of this study is to satisfy the requirements of the Michigan Department of Energy, Environment and Great Lakes (EGLE) Michigan Safe Drinking Water Act which indicates that Type 1 water suppliers (community supply) are required to conduct a reliability study every five (5) years to determine the adequacy of the system to meet the water demands at a certain pressure.

The *normal system working conditions* as published by the "Recommended Standards for Water Works, 2012 Edition" by the Great Lakes Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers (Ten State Standards), Section 8.2.1, indicates the following:

> *"The system shall be designed to maintain a minimum pressure of 20 psi (140 kPa) at ground level at all points in the distribution system under all conditions of flow. The normal working pressure in the distribution system should be approximately 60 to 80 psi (410-550 kPa) and not less than 35 psi (240 kPa)."*

The existing and future demands for the projected 5-year and 20-year conditions were determined and summarized below. The estimates demonstrate that the current maximum demand can be met by the firm water supply capacity (19.7 mgd) of the WTP but the 20-year maximum daily demand will be approaching the firm water supply capacity. EGLE requires communities plan for expansion when maximum daily demands are in excess of 80% of the firm capacity.

Year	Averaged Daily Demand (mgd)	Maximum Daily Demand (mgd)	Peak Hourly Demand (mgd)
2020	5.43	13.48	22.66
2025	5.72	14.19	23.86
2030	5.96	14.78	24.85
2040	6.46	16.03	26.95

As of 2020, the City had 5,870 residential connections and 1,428 commercial connections. The total number of residential equivalent units (REUs) in the City was 13,010. The total estimated residential service population in the City and customer communities was 31,155.

In order to address EGLE's requirement, a hydraulic model of the City of Traverse City's water distribution system was created using Bentley's WaterGEMS to evaluate the City's existing and future potable water needs. The existing conditions model was updated for 2020 and re-calibrated using previous hydrant tests completed by the City in 2019 and 2020. The future conditions model using was created by utilizing the calibrated existing conditions model and adding to it, potential system expansion limits and future demands. The existing and future conditions models were

analyzed under typical demand conditions and fire flow demand conditions, (fire flows available at maximum day demand while maintaining 20 psi in the system).

All the larger system water mains (8-inch to 24-inch), pressure reducing valves, bypass valves, pumping facilities and storage facilities were input into the computer model to simulate existing and future distribution system hydraulics. Minor areas of smaller water main (4-inch and 6-inch) were included in the model to provide looping and more accurately represent system operations. The developed model is a schematic of the actual system and should be utilized as a tool to simulate actual system operations and reactions.

The City's water supply system (existing and future conditions) maintains satisfactory pressures between 35 psi and 135 psi through normal demand conditions (average day, maximum day, and peak hour demands). Per Ten States Standards guidelines, it is City policy that any areas of the system that routinely experience pressures over 100 psi be equipped with pressure regulating valves on their service lines. The model was also used to analyze some specific areas of operational concern that relate to the City's outlying higher elevation pressure districts on the northwest side of the City. Improvements were developed and tested using the model for viability.

The City currently meets the minimum requirements to provide potable drinking water in a safe, efficient, and reliable manner. The City continues to enhance the system's reliability, performance, capacity, and firefighting capabilities, with its ongoing water main replacement program (water main replacement/extensions/looping).

There are several system improvements (water main replacements/looping) that, when made, will further enhance the system's reliability, performance, and capacity. In addition, some specific improvements were developed for the northwest area of the system as stated above and to address capacity limitations at the Water Treatment Plant (WTP) at the low service pump station. Recommended improvements are detailed in Table 8-1 for the water treatment plant and distribution system to be completed as part of the 5-year, 10-year, and 20-year planning periods. The 5-year planning period CIP is summarized as follows:

Category	Estimated Cost
WTP Improvements Projects (5-Yr)	$2,114,000
Distribution System Improvements Projects (5-Yr)	$6,835,000
Total Estimated Cost of Projects (5-Yr)	**$8,949,000**

2 Introduction

2.1 Background

The City of Traverse City is located in Grand Traverse County in the northwest Lower Peninsula. The City is situated on the southern shores of Grand Traverse Bay. The City maintains great pride in ensuring high-quality drinking water and reliability to its residents as well as protecting the clean waters of Grand Traverse Bay.

The City's raw water supply is from an intake structure from the east arm of Grand Traverse Bay (East Bay). The City's original water supply was located near the City in West Bay in the 1890s and was relocated to East Bay, which is more protected from runoff and potential contamination sources, in 1965. Treatment is provided by a 20 million gallon per day (mgd) Water Treatment Plant (WTP) located in the City near the intake in East Bay. The WTP was converted to direct filtration in 1993 and is equipped with four low service pumps (raw water), two flocculators, five rapid sand filters, two clear wells, finished water storage, and five high service pumps (finished water).

The City's water distribution system provides water service for water use and fire flows throughout the City's service area. The City's system comprises 660,340 feet (125 miles) of water main and two booster pumping stations. Approximately two-thirds of the piping is cast iron and the majority of the water mains were constructed in the 1960s and prior. New ductile iron mains have been installed since the 1980s.

The City also supplies the surrounding townships through bulk water agreements with Garfield Township (5 mgd maximum), Elmwood Township (0.75 mgd maximum), and Peninsula Township (1 mgd maximum). An emergency connection is also provided with the East Bay Township water distribution system which operates at a higher system pressure and a dissimilar water quality (groundwater source).

2.2 Purpose

The purpose of this study is to satisfy the requirements of the Michigan Department of Environment, Great Lakes and Energy (EGLE) Michigan Safe Drinking Water Act (SDWA), and the Rules promulgated pursuant to the Act (P.A. 399 of 1976, as amended). Part 12 of the Rules indicates that Type 1 water suppliers (community supply) are required to conduct a reliability study every five (5) years to determine the adequacy of the system to meet the water demands at a certain pressure. The principal elements of this Reliability Study, which provide the requirements to satisfy of Part 12 of Michigan's Safe Drinking Water Act (SDWA), include the following:

1. Study of Water Supply Requirements
    a. Present, 5-Year and 20-Year projected average daily, maximum daily and peak hour demands

   b. Present, 5-Year and 20-Year projected fire flow demands
   c. Basis of demand projections
2. Required Capacity of Waterworks System
   a. Rated capacity from the treatment system
   b. Finished water storage capacity in excess of the established normal waterworks system requirements
3. Interruption of Power Service
4. Interruption in Water Service to Distribution System

The existing conditions model was created using Bentley's WaterGEMS water distribution modeling software. Model calibration was accomplished by utilizing field data collected by the City. The future conditions model was created by utilizing the calibrated existing conditions model and adding to it the expected future conditions within the City and potential expansion of the water system.

This Reliability Study includes information that will satisfy the requirements of Part 16 of the SDWA and the rules promulgated by the Act (P.A 399 of 1976, as amended) which indicates that certain suppliers of water shall submit and maintain an up-to-date waterworks system General Plan. The principal elements of the General Plan, which are provided to satisfy these requirements, include the following:

1. General layout of the entire waterworks systems.
2. A hydraulic analysis of the distribution system showing pressure contours under peak demands.
3. Identification of the entire area served or proposed to be served by the public water supply.
4. Rated capacity of the waterworks system.
5. An inventory of water main by size, material and age.
6. A Capital Improvements Plan (CIP) that identifies needs for 5- and 20-year planning periods.

3 Existing Water Supply System

3.1 Water Supply and Treatment

3.1.1 Raw Water Pumping and Intake

The City treats water from the east arm of Grand Traverse Bay in Lake Michigan. The Low Service Pump Station (LSPS) is located on Eastern Avenue pumps water from a 36-inch diameter raw water intake pipe and crib structure (located 4,000 feet offshore) to the Water Treatment Plant. The station is a 38-ft diameter circular caisson with a split wet well and a total of four vertical turbine pumps. Low Service Pumps No. 1, 2, and 4 are constant speed pumps, and pump No. 3 motor was replaced in 2015 and operates on a VFD and the speed is controlled to vary the raw water flow rate to the WTP. The pumps discharge to a single 30-inch cast-iron raw water main along Eastern Avenue. Table 3-1 summarizes the LSPS capacities and information.

Table 3-1: Low Service Pump Station

#	LSPS Clear Well	Speed (rpm)	Date of Construction	Make	Model	Motor HP	Stages	Design Capacity		Current Capacity	
								Flow (mgd)	TDH (ft)	Flow (mgd)	TDH (ft)
1	South	1160	1965	Worthington	20H-500-W	75	2	5.0	62.4	6.4	47.6
2	North	1160	1965	Worthington	20H-500-W	75	2	5.0	62.4	5.6	45.2
3	North	1775	1993	Worthington	18H-500-1	200	1	8.0	62.4	7.7	46.5
4	South	1175	1973	Johnston	14PS	150	2	8.0	62.4	7.8	51.2
							Total Capacity (mgd)			27.6	
							Firm Capacity (mgd)			19.7	
							Operating Capacity (mgd)			16.7	

Notes:

1. Current capacities from flow testing completed in December 2020
2. Firm capacity with the largest pump out of service
3. Operating capacity is determined by transmission constraints with the largest pump out of service

HRC reviewed and checked the hydraulics based on recordings taken during pumping in August 2020 and pump testing completed in December 2020. The measured current firm capacity of the pump station during the pump testing is 19.7 mgd for the largest pump 3 out of service. The measured operating capacity of the pump station is 16.7 mgd and the hydraulics indicate the friction factor on the 30-inch raw water main (constructed in the 1960s) has been reduced (estimated C Factor = 80).

3.1.2 Rapid Mix and Flocculation

Raw water entering the treatment plant flows through the 30-inch pipe in the lower level. Raw water is measured by a single 30-inch magnetic flow meter installed in 2015. The single 30-inch line splits into two 24-inch pipes that are installed in parallel, each equipped with inline mixers. Ferric sulfate is applied before each of the mixers. The water

then flows to two flocculation basins each having a center draft tube and variable speed flocculator (mixer). The flocculation tanks provide 27 minutes of detention time at their rated capacity of 10 mgd each (20 mgd total). A circular weir launder controls the water surface within the tanks and discharges the flow to a 36-inch pipe before it is applied to the filters.

3.1.3 Filtration

Filtration is provided by five filters and each is rated for 4 mgd at a filtration rate of 4 gallons per minute (gpm) per square foot sf). Each filter is comprised of two 14-ft by 25-ft cells configured for simultaneous normal operation and individual surface wash and backwash. Filters 4 and 5 were rehabilitated in 2014 and equipped with HDPE underdrains with four layers of gravel for an overall depth of 9-inches for media support. 30 inches of dual media is comprised of 18-inches of sand and 12-inches inches of anthracite. Each cell contains two rotating surface wash assemblies. Filters 1, 2, and 3 currently have clay block and gravel for media support, and the underdrains are scheduled to be inspected and rehabilitated in 2021. The gravel and sand media and the influent, surface wash, backwash drain, filter effluent, and backwash supply valves for Filters 1, 2, and 3 will also be replaced in 2021.

The filtered water production is monitored and controlled by a dedicated rate of flow controller connected to SCADA. Individual filter effluent turbidity is monitored and each filter console provides monitoring and control for washing of its associated filter(s). Three filter consoles are located on the filter operating level. The original consoles were constructed in 1964 for Filters 1 and 2. Filter 3 console was installed in 1973 and Filter 4 and 5 console was constructed in 1993.

A surface wash pump provides suitable supply and pressure to rotate the pair of surface washers in each bay. The surface wash pump is rated at 225 gpm at 176 feet TDH. There is no redundant supply.

The filters are backwashed by closing the filter effluent valve and opening the washwater supply and backwash drain valves for each cell. The backwash water is supplied by the filter backwash pump, which is rated at 8,000 gpm at 40-ft TDH. Backwash water can also be supplied by a 14-inch line from the high service pump station efflux using the filter backwash control valve located in the basement level. The filters are backwashed when the filter head loss is at 8.5 to 10 feet. Filters are typically washed for 10 to 15 minutes at 3,000 to 4,000 gpm. The average run time between backwashes is 80 to100 hours. Typically, up to 75,000 gallons are used per filter backwash. The monthly average backwash volume ranges from 90,000 gal during low demand periods up to 200,000 gal during higher flow months.

Filter piping is located in the filter gallery on the lower level of the WTP. Each filter is served by a total of nine (9) valves; one modulating valve for filter rate control and eight that are in either the open or closed position. Pneumatic valve actuators serve Filters 1, 2, and 3 and electric valve actuators serve Filters 4 and 5. Filters are flow-paced based

on magnetic flow meter information. Filter-to-waste capability is provided for Filters 4 and 5. There is no filter-to-waste currently available on Filters 1, 2, and 3.

3.1.4 Clear Wells and Treated Water Reservoir

Filtered water flows to two clearwells located beneath Filters 1, 2, and 3. One clearwell is below Filters 1 and 2 and the other clearwell is below Filter 3. Filters 4 and 5 and can be piped to either clearwell. From the clearwells, the water passes through piping where fluoride is applied before entering the 1.5-million-gallon rectangular storage reservoir which is partially below grade and located south of the WTP building. Chlorine can also be applied near the fluoride application point. The reservoir is baffled to provide suitable contact time to achieve satisfactory disinfection contact time. Water exiting the treated water storage reservoir flows through a 36-inch finished water main to the high service pump suction well. A separate 12-inch finished water main feeds the Huron Hills Pump Station suction well.

3.1.5 Chemical Feed

3.1.5.1 Coagulant

The WTP uses ferric sulfate as its primary coagulant which replaced the original equipment which fed aluminum sulfate (alum). This system, which was installed in 2017, is equipped with three 1000-gallon double-walled fiberglass storage tanks, three metering pumps, and a 100-gallon day tank and scale. The ferric bulk storage provides sufficient storage for a minimum of 30 days at maximum daily demand. The storage tank valves are manually opened to fill the 100-gallon day tank. Coagulant aids such as polymers are not used.

3.1.5.2 Fluoride

The WTP feeds hydrofluosilicic acid using a feed system that consists of one 1000-gallon double-walled fiberglass storage tank, one transfer pump, one 100-gallon day tank, and a metering pump. The storage tank and day tank have sufficient storage for maximum daily demands.

3.1.5.3 Disinfectant

The WTP feeds sodium hypochlorite using a feed system including two 8,200 gallon bulk storage tanks, two transfer pumps, a 450-gallon day tank with scale, and three metering pumps. Chlorine is fed to several locations in the WTP including the raw water intake for zebra mussel control.

3.1.5.4 Antiscalant

The WTP adds sodium hexametaphosphate to prevent calcification within the disinfection feed piping. The sodium hexametaphosphate feed system is comprised of a batch tank and chemical pump located in the chlorine room.

3.1.6 Wash Water and Sludge Lagoons

Two lagoons are used for washwater and sludge waste from the filter backwash and flocculation tank drain water. The two lagoons are approximately 61,000 cubic feet and 66,000 cubic feet respectively. The water is decanted and the decant drains by gravity through an 8-inch drain to a 5-ft diameter sump in the WTP basement. There are two sump pumps which return discharge to a sewer on Eastern Avenue with an NPDES permitted outfall to East Bay. These sump pumps were replaced in 2015 and 2017 and are each rated for 500 gpm. Sodium thiosulfate is added to dechlorinate the discharge per the NPDES permit.

3.1.7 High Service Pumping

The High Service Pump Station (HSPS) pumps treated water from the WTP to the distribution system from two wet wells which are connected to the Finished Water Storage Reservoir. The HSPS has five vertical turbine pumps which discharge to two 24-inch water mains that connect to the 30-inch water main on Eastern Avenue. A surge relief valve is provided on the discharge main for surge protection. The flows in each main are measured by 24-inch magnetic flow meters which were installed in November 2015. Table 3-2 summarizes the HSPS pump capacities and information.

Table 3-2: High Service Pump Station Pump Capacities

#	WTP Clear Well	Speed (rpm)	Date of Construction	Make	Model	Motor HP	Stages	Design Capacity		Current Capacity	
								Flow (mgd)	TDH (ft)	Flow (mgd)	TDH (ft)
1	West	1160	1964	Worthington	15HH-340	125	6	3.0	180.0	3.2	140
2	East	1180	1964	Worthington	24M425-W	200	2	5.0	180.0	4.7	142
3	West	1180	1964	Worthington	24M425-W	200	2	5.0	180.0	5.0	144
4	East	1180	1964	Worthington	24M425-W	300	2	7.0	180.0	7.0	148
5	West	1775	1993	Worthington	18H500-2	300	1	7.0	180.0	7.5	152
								Total Capacity (mgd)		27.4	
								Firm Capacity (mgd)		19.9	

Notes:

1. Current pump capacities from flow testing completed in June 2014

High Service Pumps 1, 3, and 5 were recently refurbished, equipped with new motors, and their starters were replaced with variable frequency drives (VFDs). High service pump 2 continues to operate at a constant speed. High service pump number 4 utilizes a soft starter.

3.1.8 Plant Capacities and Redundancy

A summary of the current unit processes is provided in Table 3-3.

Table 3-3: Unit Process Capacities

Unit Process	Total Capacity (mgd)	Firm Capacity (mgd)	Basis of Capacity
Intake	24.0	24.0	Max head loss
Low Service Pump Station	27.6	19.7	Pump test (2020)
Flocculation Tanks	20.0	20.0	30 min residence time
Filters	20.2	20.2	Filter rate 4 gpm/sf
Clearwell/Reservoir	38.2	38.2	Capacity to maintain C*T = 61
High Service Pump Station	27.4	19.9	Pump test (2015)
Lagoons	32.0	32.0	3% of Design Flow (0.95 mgd)

3.2 Storage Facilities

The City's water system includes five ground level finished water storage tanks. These include the one water storage tank at the WTP having a total of 1.5 million gallons (mgal) of storage, two water storage tanks located on LaFranier Road south of South Airport Road with a total of 6.0 mgal of storage, and Wayne Hill tank with 1.3 mgal of storage. Due to hydraulic limitations with the booster pump suction piping that draws from the Wayne Hill tank, the available volume in the Wayne Hill tank is 0.67 mgal. The Barlow and Wayne Hill tanks are located at higher elevations within the City and essentially function as elevated tanks, providing the required pressure of the Central PD-1 distribution system. Several other tanks provide storage for separate pressure districts in the City, Garfield Township, and Peninsula Township. The total available storage in the City is 6.74 mgal. Table 3-4 summarizes the information for these tanks.

Table 3-4: Water Storage Facility Information

Tank Name	Base Elev.	LWL	HWL	Dimension	Type	Material	Construction Year	Volume	Volume Available*
	(ft)	(ft)	(ft)	(ft)				(mgal)	(mgal)
Barlow 1	711	715	751	132	Cylindrical	Steel	1972	4.04	4.04
Barlow 2	711	715	751	93	Cylindrical	Steel	2018	2.03	2.03
Wayne Hill	725	734	741	90 x 180	One Cell Rect.	Concrete	1948	1.32	0.67
WTP Storage	580	590	610	110 x 135	One Cell Rect.	Concrete	1965	1.50	1.50

Notes:

2. Available volume represents volume available for system usage/hydraulics. The Wayne Hill Reservoir does not include the lower 7 feet depth of the Wayne Hill tank due to the pump suction header elevation in the booster station.

3.3 Water Distribution Piping

The City's water distribution system provides water service for potable use and fire flow throughout the City's service area. The system comprises 660,340 feet (125 miles) of water main and approximately two-thirds of the system is cast iron and the majority of the water mains were constructed in the 1960s and prior. New ductile iron mains have been installed since the 1960s. Tables 3-5 and 3-6 provide a summary of the materials, installation year, and diameter.

Table 3-5: Water Main Materials and Installation Year

Installation Year	Material							Total Length (ft)
	Cast Iron	Ductile Iron	Steel	Other	PVC	HDPE	Unknown	
Unknown	6,667	0	0	0	1	0	177	6,844
1881-1929	4,532	0	0	0	0	0	0	4,532
1930-1939	6,221	0	0	0	0	0	0	6,221
1940-1949	28,177	0	0	0	0	0	0	28,179
1950-1959	131,702	0	0	0	0	0	11	131,713
1960-1969	222,469	16,200	3,201	537	0	0	7	242,413
1970-1979	28,178	12,032	192	0	0	0	0	40,403
1980-1989	0	18,351	1,766	0	0	0	0	20,117
1990-1999	0	50,585	0	316	4	0	0	50,904
2000-2009	0	93,115	1,989	0	0	0	0	95,104
2010-2019	0	30,257	3,182	2	299	171	1	33,912
Total	**427,946**	**220,540**	**10,330**	**855**	**306**	**171**	**196**	**660,340**

Table 3-6: Water Main Diameters

Diameter	Length (ft)
<6	13,221
6	337,539
8	92,812
10	28,208
12	119,433
16	23,903
18	1,279
20	6,811
24	22,333
30	14,801
Total	**660,340**

3.4 Pressure Districts and PRVs

The City's water system operates in eight pressure districts with several incorporated into the surrounding Township's pressure districts. The pressure districts are controlled by the ground storage tanks, booster pump stations, and various pressure reducing valves (PRVs). These districts are summarized in Table 3-7 and depicted in Figure A-1. Table 3-8 summarizes the City's PRVs and pressure settings.

Table 3-7: City Pressure Districts

District ID	District Name	HGL (ft)	Controlled by:
PD-1	Central	750	Barlow and Wayne Hill Tanks
PD-2	Morgan Farms/Incochee	825	Control Valves WCV-1341, WCV-1328, WCV-1329
PD-3	Incochee Upper	875	PRV at Wayne Hill Booster Station, WCV-1300
PD-4	Wayne Hills Upper	1000	Wayne Hill Booster Pumps
PD-5	Huron Hills Lower	850	Huron Hills PRV WCV-7
PD-6	Timber Lane	875	Timber Lane PRV WCV-8
PD-7	Huron Hills Upper	920	Huron Hills Booster Station
PD-8	Veterans Drive (from Garfield)	875	McRae Hill PRV (Garfield Township)

Pressure District PD-1 is the main pressure district in the City and encompasses most of the service area within the City limits as well as lower elevations of Elmwood, Garfield, and Peninsula Townships. This district's pressure is maintained by the Barlow and Wayne Hill ground storage facilities and has an operating hydraulic grade line (HGL) of 750 feet. Three other pressure districts are maintained by the Wayne Hill Booster Station (described below). PD-4 is maintained at an HGL of 1000 feet to service customers on Wayne Hill. Pressure District 3 (PD-3) is currently maintained at an HGL of 885 feet using a pressure sustaining valve (PSV) that down-feeds from PD-4 located at the Wayne Hill Booster Station (WCV-1300). The lower pressure district, PD-2, is maintained at an HGL of 825 feet using PSVs: WCV-1328, WCV-1329, and WCV-1341 that are down-fed from PD-3 through. A Pressure Regulating Valve (PRV) located at M-72 (WCV-1340) is also used to supplement fire flows to the City's main pressure district PD-1 for the far northwest portion of this district.

Three higher pressure districts in the City limits are controlled by the Huron Hill Booster Station system. This station feeds the intermediate pressure district in the southern portion of Peninsula Township (HGL = 920 feet) as well as higher elevations in the City adjacent to the Township including Pressure District PD-7 (HGL = 920 feet), PD-6 (HGL=875 feet), and PD-5 (HGL=850 feet). Two City PRVs downfeed from PD-7 to maintain pressures in districts PD-5 and PD-6. Pressure District PD-6 is maintained by WCV-7 (HGL = 875 feet) and Pressure district PD-5 is controlled by WCV-8 (HGL = 850 feet). Check valves in the lower elevations of these districts are installed at the

boundaries of district PD-1 to maintain minimum system pressures in these districts during extreme conditions or during interruptions of supply in the higher elevation districts.

One pressure district (PD-8) is back-fed from Garfield Township (Veteran's Drive Pressure District) to the City, east and west of Veterans Dr. south of Boughey Drive and operates at an HGL of 875 feet. Check valves in the lower elevations of PD-8 are installed near the boundaries of district PD-1 to maintain minimum system pressures in PD-8 during extreme conditions or during interruptions of supply from the higher districts.

Table 3-8: City Pressure Reducing Valves

Facility ID	Name	Approx. Elevation (ft)	Size (in)	Upstream Pressure (psi)	Downstream Pressure (psi)	Pressure District From	HGL From (ft)	Pressure District To	HGL To (ft)	Manufacturer
WCV-8	Huron Hills PRV	718	4	84	54	PD-7	920	PD-5	850	OCV
WCV-7	Timberlane PRV	720	6	26	72	PD-7	920	PD-6	875	OCV
WCV-1341	Morgan Farms #2 PRV	698	6	80	67	PD-3	875	PD-2	825	Ames
WCV-1328	Incochee #1 PRV	715	6	73	65	PD-3	875	PD-2	825	Ames
WCV-1329	Incochee #2 PRV	685	12	86	70	PD-3	875	PD-2	825	Ames
WCV-1340	Morgan Farms #1 PRV	650	6	75	25	PD-2	825	PD-1	750	Ames
WCV-1300	Incochee/Morgan Farms PRV, Wayne Hill PS	735	8	115	67	PD-4	1000	PD-3	875	OCV

Notes:

1. PRV pressure settings as of 2020

3.5 Booster Stations

The City operates two major booster stations, the Huron Hill Booster Station at the WTP and the Wayne Hill Booster Station located adjacent to the Wayne Hill Storage Tank. Table 3-9 provides a summary of the pump information at each of these stations.

Table 3-9: Booster Pump Station Data

Pumps	Pump Elevation (ft)	Capacity (gpm)	Head (ft)	Power (hp)	Auxiliary Power	
					Description	Power Rating
Huron Hills Booster Station						
Huron Hills Pump 1	620	500	300	60	WTP Generator, 480V, 3 Ph, Diesel	875 kVA 700 kW
Huron Hills Pump 2	620	500	300	60		
Huron Hills Pump 3	620	500	300	60		
Wayne Hill Booster Station						
Wayne Hill Pump 1	732	500	300	75	Generator, 480V, 3 Ph, Diesel	275 kW
Wayne Hill Pump 2	732	500	300	75		
Wayne Hill Pump 3	732	500	300	75		

3.5.1 Huron Hills Booster Station

The Huron Hills Booster Station is located at the WTP and consists of three vertical turbine pumps that draw from the WTP storage reservoir. Backup power is provided by the 700 kW WTP generator. Two 720-gallon pressurized bladder tanks are installed on the pump discharge piping and are set to 100 psi. The pump station operates to maintain the following pressure settings:

Table 3-10: Huron Hills Booster Station Operating Conditions

Pump	Pump On Setpoint		Pump Off Setpoint		Start Delay (seconds)
	Pressure (psi)	HGL (ft)	Pressure (psi)	HGL (ft)	
Lead	126	911	136	934	2
Lag	124	906	132	925	2
Lag-Lag	120	897	130	920	2

This booster station feeds the southern portion of the Peninsula Township intermediate district including the Peninsula Booster Station that draws from the adjacent 0.3 mgal Peninsula Storage Tank. This station and tank are owned and operated by Peninsula Township. This tank has a 6-inch actuated valve that opens and closes to regulate the tank level and four pumps (one jockey, two larger pumps, and one large fire pump) that are used to boost the pressures to the upper-pressure district in Peninsula Township. A 2-inch hydraulically actuated valve is used to backfeed from the

upper district to PD-7 if the pressure falls below 40 psi. The 6-inch fill valve to the tank is controlled such that the 2-inch backfeed valve does not open simultaneously and overfill the tank.

3.5.2 Wayne Hill Booster Station

The Wayne Hill reservoir and pump station were originally constructed in 1945. This 1.3 mgal reinforced concrete reservoir is maintained approximately 5-10 feet lower than the two Barlow Tanks of PD-1. Accordingly, the fill line contains an electrically actuated control valve to limit the tank from over-filling. The tank was originally constructed to provide additional fire flow storage for the western portion of PD-1. In the early 1960s, the reservoir fill valve vault was enlarged and a building was constructed. Booster pumps were installed in the building on the suction side of the reservoir drain line to provide pressure to a relatively high portion of the northwestern section of the City that was too high to be served by PD-1. This initial upper-pressure district was also provided with a steel hydro-pneumatic storage tank including a compressor to provide some storage for this small pressure district.

In 2006, this district was expanded to the north to provide service to some additional areas within the City and neighboring Elmwood Township which were still too high to be serviced by the main pressure district (PD-1) but were lower than the initial area serviced by the Booster Pumps and hydropneumatic tank. Since these areas of the upper district were slightly lower, pressure reducing valves were provided to drop the pressure from the original Wayne Hill district down into the lower districts. This area is broken into three distinct pressure districts designated as PD-2, PD-3, and PD-4.

When the Wayne Hill District was first expanded, the original booster pumps and the hydro-pneumatic tank were demolished. The current pumping station includes a prefabricated skid-mounted pump station with three vertical multistage centrifugal booster pumps and two bladder tanks to provide a storage cushion between pump cycles. All of the flow from the station is pumped to the pressure of PD-4 (HGL = 1000 feet) before splitting to the lower pressure districts. A pressure reducing valve downfeeds a portion of the flow from PD-4 to PD-3 (HGL= 875 feet) within the station. PD-2 (HGL = 825 feet) is down-fed from PD-3 using remote PRVs located in the system. Backup power is provided by a 275-kW generator. Tables 3-11 summarizes the pump operating conditions and a complete listing of the tanks and down feed valves is included in Table 3-12 below.

Table 3-11: Wayne Hill Booster Station Operating Conditions

Pump	Pump On Setpoint		Pump Off Setpoint		Start Delay (seconds)
	Pressure (psi)	HGL (ft)	Pressure (psi)	HGL (ft)	
Lead	111.5	990	120.0	1009	2
Lag	105.0	975	111.5	990	2
Lag-Lag	95.0	951	100.0	963	2

Table 3-12: Wayne Hill/Incochee/Morgan Farms Pressure District Components

Item	Facility ID	Location	Size/Capacity	Source	Discharges to:	Setting US/DS
CV-1		WHPS	12-inch Butterfly	PD-1	Wayne Res.	741 feet
CV-2		WHPS	8-inch Butterfly	Wayne Res.	WBP 1-3	Open
CV-3		WHPS	8-inch Butterfly	PD-1	WBP 1-3	Open at 105 psi
Two Bladder Tanks		WHPS	720 Gals Total EA 100 Gals Usable EA	WBP 1-3	PD2	90-115 psi
PRV-WH1	WCV-1300	WHPS	8-inch	PD-4	PD-3	115 psi /67psi
PRV-WH2	NA	WHPS	4-inch, Surge Relief	PD-4	Exterior	150 psi /0 psi
PRV-WH3	WCV-1301	WHPS	8-inch	PD-4	PD-1	67 psi / 5 psi
PRV-IN1	WCV-1328	Incochee Woods Dr./ Incochee Hills Dr.	6-inch	PD-3	PD-2	73 psi / 65 psi
PRV-IN2	WCV-1329	Incochee Woods Dr. / Old Incochee Farms Trail	12-inch	PD-3	PD-2	86 psi / 70 psi
PRV-MF1	WCV-1340	Incochee Woods Drive/ M-72	6-inch	PD-2	PD-1	75 psi / 25 psi
PRV-MF2	WCV-1341	Old Morgan Trail/ M-72	6-inch	PD-3	PD-2	80 psi / 67 psi

As part of the 2006 improvements, a 12-inch main was added along Wayne Street to provide a loop in this pressure district (now PD-4). This 12-inch main has been alleged to be causing some of the difficulties in the loss of pressure when hydrants are opened since water can more rapidly flow to the hydrant. The higher-pressure district service area (PD-4) supplied by this station experiences pressure issues at the highest elevations of Wayne Hill during hydrant openings that include temporary pressure drops in system pressure (to near atmospheric). To minimize the potential for these transient pressure issues, the City has partially closed many of the hydrant isolation gate valves to limit the hydrant flow in this service area.

The City had a transient pressure analysis completed in 2018 (Prince-Lund Engineering letter dated February 8, 2018). The report simulated the transient pressure conditions using data from hydrant testing completed in 2016 in the Wayne Hill service area (PD-4). The recommendations from that study included raising the system pressure setpoints and reduce the startup times for the lag pumps (from 15 seconds to 2 seconds) to improve the system response time and maintain residual pressures in the higher elevations of the district during fire flow conditions. Installing a third 726-gallon pressurized bladder tank would also provide approximately an additional 10 seconds of fire flow while the pumps respond to the drop in pressure.

These efforts have corrected the immediate transient pressure drops at the top of Wayne Hill during hydrant openings (typically 30 seconds or shorter). However, several problems continue to occur including:

1. **Numerous pump stop/start cycles** even though the pumps are all equipped with variable frequency drives.

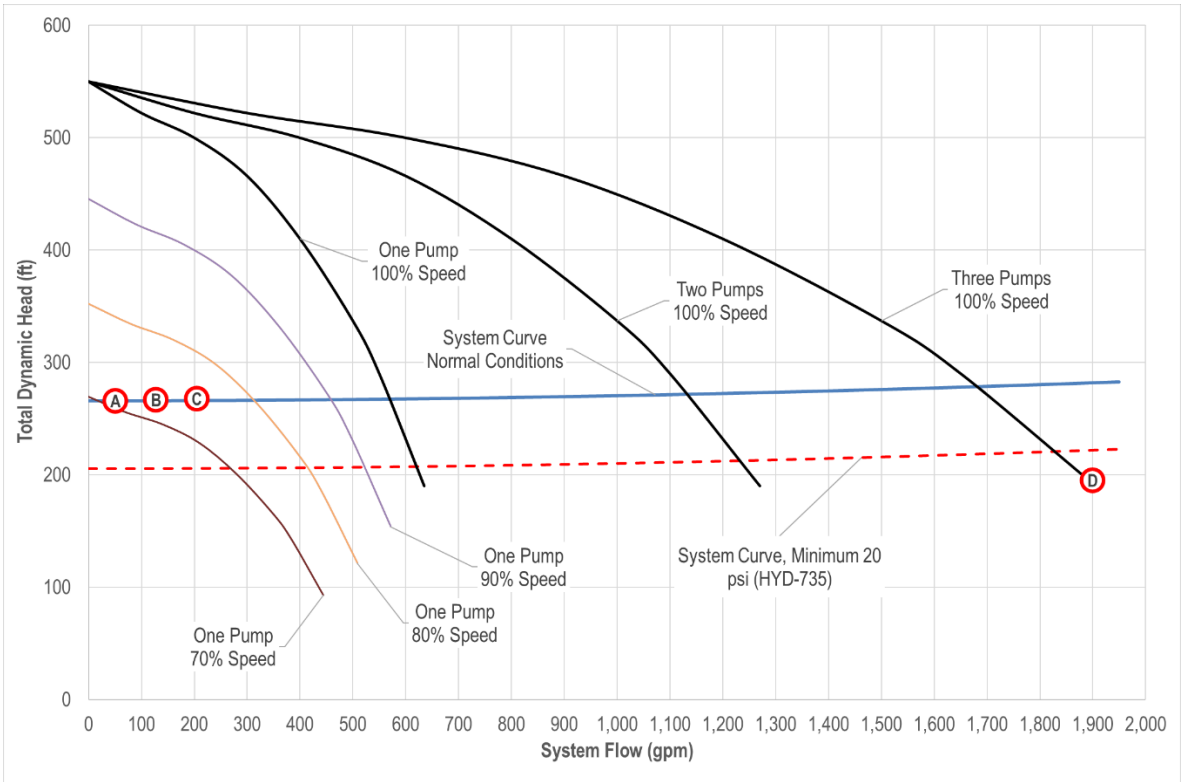
2. **Significant pump ramping** of the pumps up and down in an attempt to control the output pressure.

3. **Limited storage is available in the bladder tanks**. The tanks have a total volume of 720 gallons each but only an available drawdown volume of approximately 100 gallons. This limitation is typical of any bladder tank that does not have a compressor to provide an automatic pressure recharge and is usually limited to a volume determined by the ratio of high to low-pressure setpoints.

4. **Limited $NPSH_A$.** Because the booster pump suction volutes are located approximately 7 feet above the bottom of the reservoir and due to losses, they do not have an available net positive suction head ($NPSH_A$) to operate when the tank level is less than 732 feet and therefore cannot utilize the bottom 7 feet of the tank capacity. For tank levels below 732 feet, the $NPSH_A$ is below the required $NPSH_R$ (28 feet) during high flow conditions (600 gpm). Also, re-priming the pumps when the reservoir is this low is not possible.

5. **The pumps are unable to maintain a residual pressure above 20 psi at the top of Wayne Hill during prolonged hydrant openings near or below the pump station elevation.** Figure 3.1 depicts the pump curve with the various operating conditions and two ranges of system curves – one to maintain 115 psi at the pump station and one to a minimum of 20 psi of residual pressure at the top of Wayne Hill (PD-4) at HYD-735. During normal operating conditions, the pump station can reliably provide adequate pressures for the average daily (Point A), maximum daily (Point B), and peak hourly demands (Point C). However, hydrants in the lower elevations of PD-4 (near the booster station) and the lower elevations of PD-2 can flow above 1800 gpm, according to the hydraulic model. At this flow and head (Point D), the pumps can potentially operate to the far right of their pump curve thus causing system pressures to drop below 20 psi at the highest elevations of PD-4.

Figure 3-1: Wayne Hill Booster Station Existing Pump and System Curves



Notes:

1. Flow Conditions: A – Average Daily Demand, B – Maximum Daily Demand, C – Peak Hourly Demand, D – Fire Flow (Hydrant Opening in lower elevations)

3.6 Population

The population data for the City of Traverse City and surrounding townships, in its entirety, was obtained from U.S. Census Bureau data, the Networks Northwest, and the City of Traverse City. Table 3-13 displays the current and projected total population in the City and serviced Townships. Growth rates are highest in Garfield Township and Elmwood Township and lower in Traverse City and Peninsula Township.

Table 3-13: Population Growth

Year	Grand Traverse County	City of Traverse City		Garfield Township		Elmwood Township		Peninsula Township		Total
	Total	Total	Service	Total	Service	Total	Service	Total	Service	Service
1990	64,273	15,115	15,115	10,516	NA	3,427	NA	4,340	NA	NA
2000	77,654	14,532	14,532	13,840	9,985	4,264	321	5,265	1,570	26,408
2010	86,986	14,674	14,674	16,526	11,923	4,503	339	5,433	1,620	28,556
2015	91,541	15,323	15,323	16,953	12,231	4,500	339	5,696	1,699	29,591
2020	98,023	14,818	14,674	20,028	14,450	4,762	358	5,609	1,673	31,155
2025	104,056	14,891	14,674	22,049	15,907	4,897	369	5,699	1,700	32,649
2030	110,461	14,963	14,674	24,273	17,512	5,036	379	5,790	1,727	34,292
2040	124,477	15,110	14,674	29,417	21,223	5,325	401	5,978	1,783	38,081
Growth Rate	1.20%	0.10%		1.94%		0.56%		0.32%		0.81%

Notes:

1. Population data from the US Census Bureau, Networks Northwest, and City of Traverse City
2. 5-year planning period will be 2025 and the 20-year planning period will be 2040
3. Correspondence with City

3.7 Existing Water Usage and Unaccounted Water

Historical total water use records were supplied by the City. Table 3-14 on the following page provides a summary of the water use records in the City and each customer community.

Table 3-14: Water System Average Water Supplied and Billing

Fiscal Year	Total Supplied (mgd)	Traverse City (mgd)	Garfield Township (mgd)	Peninsula Township (mgd)	Elmwood Township (mgd)	Total Billed (mgd)	Unaccounted Water (mgd)	Loss (as % of Supplied)
2010	4.81	2.17	1.58	0.13	0.019	3.90	0.91	18.9%
2011	5.38	2.15	1.64	0.13	0.017	3.93	1.45	27.0%
2012	5.89	2.30	1.71	0.16	0.020	4.19	1.70	28.9%
2013	6.00	2.33	1.55	0.16	0.031	4.08	1.92	32.0%
2014	5.69	2.49	1.35	0.15	0.032	4.03	1.67	29.3%
2015	5.71	2.17	1.41	0.16	0.041	3.74	1.93	33.8%
2016	5.83	2.32	1.63	0.19	0.031	4.18	1.66	28.4%
2017	5.34	2.39	1.68	0.17	0.031	4.26	1.08	20.2%
2018	5.19	2.06	1.80	0.18	0.032	4.07	1.12	21.6%
2019	5.41	2.47	1.69	0.17	0.028	4.35	1.06	19.6%
2020	4.85	1.94	1.79	0.20	0.039	3.97	0.88	18.1%

Notes:

1. From City's Water Output and Financial History Report
2. Community demands from Township meter records

Unaccounted for water or water loss in the system from unmetered losses were determined by tabulating the water pumped and comparing the billed amount for the City and each Township. Water loss estimates before 2017 are less accurate as the new high service pump station flow meters were installed in November 2015. Since 2017, the unaccounted water comprises approximately 19.9% of the total water supplied. The typical goal of unaccounted water in municipal water systems is 10%. The estimated losses are not adjusted for seasonal flushing and fire flows which can comprise up to 2% of the water loss.

3.8 Benefit Counts

As of 2020, the City had 5,870 residential connections and 1,428 commercial connections. The total number of residential equivalent units (REUs) in the City was 13,010.

4 Model Development

4.1 Existing Model Development

A computerized hydraulic model of the City of Traverse City Water System was originally developed in 2008 as part of the Water System Master Plan and updated for the 2014 Water Reliability Study. This model is used to simulate existing water system operations and evaluate future water system improvements and expansion using WaterGEMS v8i by Bentley Systems, Inc. The software enables the simulation of a variety of usage conditions and predicted resultant system pressures and flows throughout the system for review. In general, the major system data that required input into the model included water main diameters, length, age, and estimated pipe roughness. Additional required input information included; pump performance data, locations and hydraulic gradients, booster station locations with pump operating characteristics, storage facility locations and operating ranges, pressure reducing valve locations with downstream pressure settings; bypass valve and pressure district boundaries, and ground elevations throughout the system.

Refer to Appendix A for Figure A-1 for Overall Water System Map and A-2 for the City of Traverse City Water System Map. Nodes are created in the water model at water main intersections, change in pipe diameter, distribution system facilities, etc. The nodes are used to allocate the demands placed throughout the system.

The model and simulations focus on the City's water distribution system but do incorporate portions of Garfield Township, Peninsula Township, and Elmwood Township as these systems are hydraulically connected with the City. For this study, the interconnection with East Bay Township was not incorporated into the model. Improvements to the water system completed since the original model development were added to the model and system demands were modified to reflect the updated water system supply data and operations. The updates to the model incorporate the following construction projects completed since 2014 include:

- Replacement of 6-inch CIP main with new 8-inch DIP water main on Union Street between 14th and 17th Street (2015)
- Replacement of 6-inch CIP main with new 8-inch DIP main on Lake Street connecting to the 6-inch main approximately 100 feet west of Cass Street (2015)
- Replacement of 6-inch CIP main with new 8-inch DIP main on State Street between Railroad Ave and Boardman Avenue (2016)
- Replacement 6-inch CIP main with new 8-inch DIP main on Front St. between Wadsworth to the western City limits except for 6-inch main under Division Street (2016 east of Division, 2017 west of Division)
- Construction of 12-inch DIP main at Costco east of Airport entrance on South Airport Road (2017)
- Construction of 2 mgal Barlow Tank 2 (2018) adjacent to the existing 4 mgal Barlow Tank 1

- Replacement of 10-inch CIP main with 24-inch DIP water main along with 8th between Railroad and Boardman Ave (2019)
- Replacement of 10-inch CIP main with new 16-inch DIP iron water main in Franklin from Washington to 8th (2019)
- Construction of 8-inch DIP in Moorings Development in PD-2

Revisions to the system operating conditions include

- Configuration of Wayne Hill and Huron Hills Booster Stations as variable speed pumps and control settings maintain the pressure setpoints for each pump as described in Section 3.5
- Updates to the PRV setpoints
- Closure of isolation valves between the East Bay water system.

4.2 Model Demands

Table 4-1 summarizes the Average Day Demand (ADD), Maximum Day Demand (MDD), and Peak Hour Design (PHD) flow rates utilized for the existing conditions models.

Table 4-1: Existing Model Design Flow Rates And Factors

Year	ADD	Max Day Factor	MDD	Peak Hour Factor	PHD
2020	5.43	2.5	13.48	1.7	22.66

4.2.1 Average Daily Demand

The total average daily pumpage was obtained from historical WTP MORs and daily water usage. Supervisory Control and Data Acquisition (SCADA) data were made available by the City, which provided booster and pump station flow information and tank level information. Coordinating all this information permitted a detailed evaluation of the consumption allocation per pressure district. Both average day and maximum day evaluations were completed to determine consumption estimates per pressure district.

Water billing records were utilized to allocate the estimated average daily usage to be input into the model node that corresponded to these locations. The demand calculated for each pressure district outside of the City was allocated uniformly throughout the pressure district. This method of demand allocation is consistent with previous modeling efforts.

The average daily demand (ADD) for the City water supply system utilized in the model is 5.43 million gallons per day (mgd). A summary of the nodal allocation assigned in the model is provided in Appendix C.

4.2.2 Maximum Daily Demand

The total maximum daily pumpage was also obtained from historical City water use data. Peaking factors for each pressure district were developed. These pressure district peaking factors, while most likely non-coincidental to system maximum days, were utilized to compute the estimated maximum day demands in each pressure district, which establishes a system maximum day demand that is more conservative than historical data.

The maximum daily demand (MDD) for the City's water supply system utilized in the model is 13.5 mgd. Tables 4-1 and 4-2 summarizes the historical Maximum Daily design flow rates and peaking factors in the City's water supply system.

4.2.3 Peak Hour Demand

Analysis of the SCADA data was used to estimate hourly treatment and pumpage as well as the volume either stored or drained from the storage tanks to determine the estimated hourly system usage on various high-water usage days in 2020. From these calculations, system demand curves were developed (Appendix D). The peak hour demand (PHD) for the City water supply system utilized in the model is 21.6 mgd. Table 4-2 displays the maximum day daily usage pattern developed from the SCADA data analysis for use in this study. The peak hour usage occurs in the early morning hours from 4:00 AM to 8:00 AM.

Table 4-2: Maximum Day Hourly Usage Factors

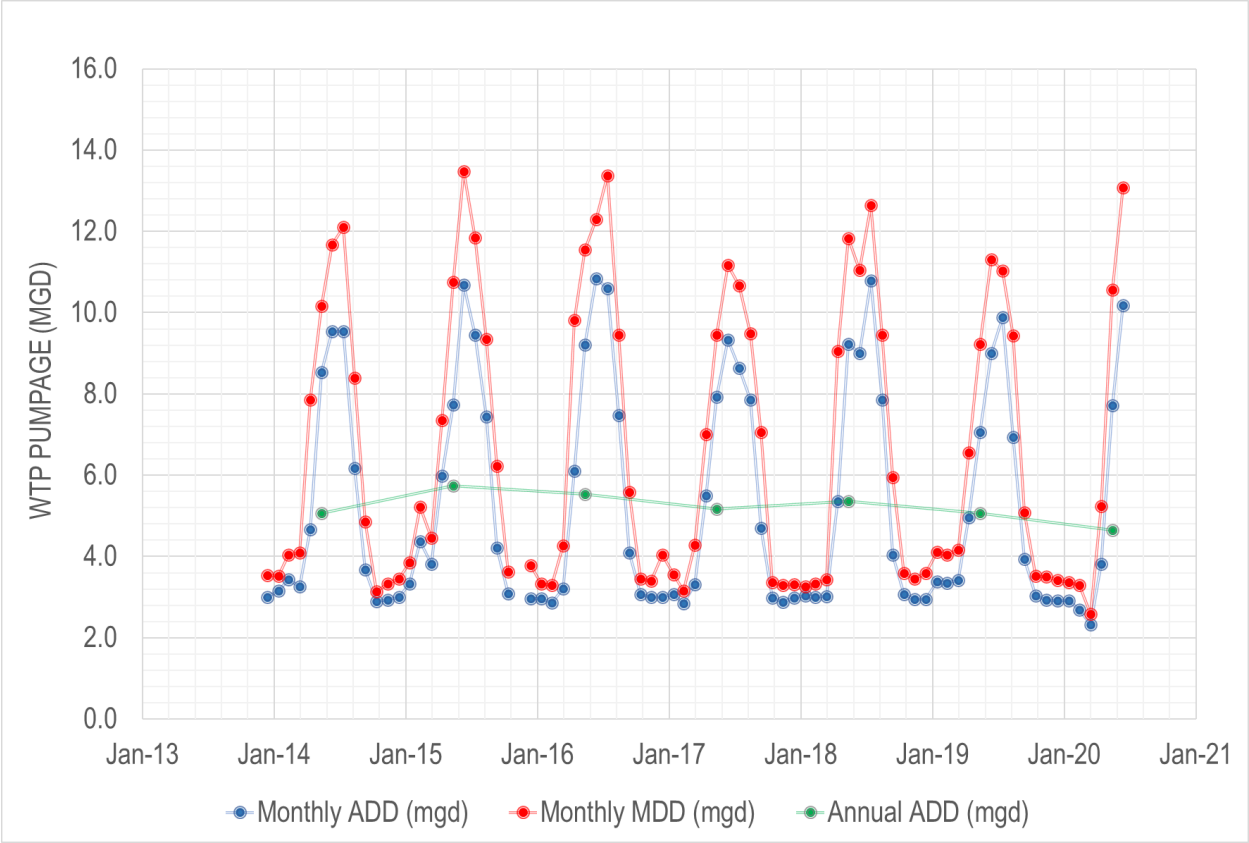
Hour	Factor
0:00	0.99
1:00	1.01
2:00	1.03
3:00	1.05
4:00	1.26
5:00	1.47
6:00	**1.68**
7:00	1.56
8:00	1.43
9:00	1.31
10:00	1.24
11:00	1.16
12:00	1.09
13:00	0.88
14:00	0.67
15:00	0.47
16:00	0.48
17:00	0.50
18:00	0.51
19:00	0.58
20:00	0.64
21:00	0.70
22:00	0.75
23:00	0.89

Table 4-3 summarizes the monthly demand factors utilized for the existing conditions models denoting the monthly average daily demands reported. The data demonstrates the seasonal variability in the City's water system demand. The peak usage month is July which overlaps with the higher number of summer visitors and other water uses. The lowest usage months are December and January.

Table 4-3: Model Design Monthly Factors

Month	Monthly ADD (mgd)	Factor
January	2.95	0.54
February	3.17	0.58
March	3.29	0.61
April	3.25	0.60
May	5.28	0.97
June	8.40	1.55
July	10.54	1.94
August	10.19	1.87
September	7.51	1.38
October	4.37	0.80
November	3.09	0.57
December	2.97	0.55

Figure 4-1: WTP Production since 2014



4.3 Model Input

4.3.1 Pumps

The various pump flow and head information were input into the model. Design data are shown in Section 3. This was used as a starting point for modeling the pump performance. In the hydraulic model, pump curves were modified from the design data to replicate actual conditions. City SCADA data was used to analyze actual discharge (flow and head) patterns from these pumps to simulate more accurately, tank filling and depletion. Refer to Appendix E for the pump curves utilized for the existing conditions hydraulic model.

4.3.2 Water Storage Tanks

The City's water system contains three water storage tanks. Information for each of these tanks is provided in Section 3. No modifications from the design data were necessary for input into the hydraulic model.

4.3.3 Pressure Reducing Valves

Section 3 details the locations, size, and pressure conditions of each PRV in the system. The PRVs have been modeled so that the simulated demand flows are seen through the valve to maintain downstream pressures except at peak demand periods or conditions of uncharacteristically high demand (i.e. fire flow conditions).

4.3.4 Booster Stations

The pump flow and head information for the Booster Stations were input into the model. Design data are shown in Section 3. This was used as a starting point for modeling the booster pump performance. In the hydraulic model, the booster pump curves were modified from the design data to replicate actual conditions. Refer to Appendix E for the pump curves utilized for the existing conditions hydraulic model.

4.4 Model Calibration

The existing hydraulic model has been calibrated during previous hydraulic model simulations. This study updated the calibration based on testing data provided by the City. Based on the age and type of water main, the roughness coefficients for the pipes in the model were estimated. Pipes in this model were separated into different distinct groups, see Table 4-4 and the C factor was adjusted to best fit the hydrant flows and Table 4-5 presents the results of the model calibration. The Wayne Hill Pump Station was also updated to reflect the current operating conditions of the pump station and the PRVs. The residual pressures during hydrant testing in the Wayne Hill Booster Station service area reflect the low residual pressures that occur.

Table 4-4: Calibration Groups and Results

Calibration Group	Pipe Installation	Size	Normal Range[1]	C Factor
1	1965 and older	8-inch and smaller	21 - 49	35
2		12-inch and larger	39 -71	45
3	1965 to 1980	8-inch and smaller	30-58	50
4		12-inch and larger	48-78	60
5	1980 to 2000	8-inch and smaller	59-90	80
6		12-inch and larger	58-107	85
7	2000 to 2010	8-inch and smaller	83-106	95
8		12-inch and larger	97-120	110
9	2010 to 2020	8-inch and smaller	100-133	120
10		12-inch and larger	112-141	130

Notes:
1. Water Distribution Modeling, T. Walski, D.V. Chase and D. Savic. 2001

Table 4-5: Model Calibration, Hydrant Testing vs Model Results

Location Description	Gauge Hydrant ID	Gauge Hydrant Model Node	Flow Hydrant ID	Flow Hydrant Model Node	Hydrant Test			Model Simulation		
					Static (psi)	Residual (psi)	Fire Flow (gpm)	Static (psi)	Residual (psi)	Fire Flow (gpm)
Pine and Seventh	84	J-T237	83	J-T272A	55	49	961	55	49	931
Cass and Seventeenth Alley	156	J-T467	530	J-T465	55	49	859	55	51	843
305 West Front	68	J-T052	67	J-T053A	63	50	1,664	64	58	1,599
Front and Boardman	172	J-T028	171	J-T171	73	60	2,190	73	58	2,222
Randolph and Maple	12	J-T011	11	J-T014A	65	62	1,488	65	59	1,629
710 Carver	730	J-T447B	305	J-T447C	53	38	1,358	61	38	1,041
800 Hastings	449	J-T324	380	J-T350	58	46	1,358	61	46	1,335
Third and Spruce	997	J-T207	734	J-T207A	57	54	1,215	57	55	1,261
Front and Elmwood	997	J-T234A	36	J-T234B	55	42	2,148	56	41	2,445
Union and Thirteenth	144	J-T315A	136	J-T315B	55	35	1,358	58	33	1,385
Gray and Commons	790	J-41	1011	J-166	39	33	1,052	38	33	1,232
Aero Park	655	J-147	656	J-T220	60	44	1,664	60	40	1,785
M-72 Moorings (PD-2, PD-3, PD-4)	735	J-T560	974	J-T497	68	18	1,920	70	17	1,995

5 Existing Water System Analysis

Using the calibrated model, the City's existing water distribution system was analyzed for the average day, maximum day, peak hour, and maximum day plus fire flow conditions in accordance with the EGLE requirements. Results will be compared to the *normal system working conditions* as presented in the "Recommended Standards for Water Works, 2003 Edition" by the Great Lakes Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers (Ten State Standards). In the Ten States Standards, Section 8.2.1 indicates the following:

> *"The system shall be designed to maintain a minimum pressure of 20 psi at ground level at all points in the distribution system under all conditions of flow. The normal working pressure in the distribution system should be approximately 60 to 80 psi and not less than 35 psi."*

This standard suggests that during average day, maximum day, and peak hour demand conditions (considered normal working conditions), the operational pressures in the system should be above 35 psi, and during occasions of fire suppression or system flushing (typically uncharacteristic conditions) the operational pressure should never drop below 20 psi.

The average day demand analysis was run with the storage tanks at their average operating levels. The maximum day and peak hour demand analyses were run with the three water storage tanks at their minimum operating levels.

5.1 Steady State Model Analyses

Based on the steady state model analyses, each pressure district in the City's distribution system experiences pressures in the ranges shown in Table 5-1 for Average Day, Maximum Day, and Peak Hour demand conditions:

Table 5-1: Existing Conditions Model - Distribution System Pressures

Pressure District	Model Pressure Range (psi)					
	Average Day Demand[1]		Maximum Day Demand[2]		Peak Hour Demand[2]	
	Min	Max	Min	Max	Min	Max
PD-1	37	97	33	93	32	93
PD-2	57	102	57	102	57	102
PD-3	45	87	44	87	44	87
PD-4	40	117	40	117	40	117
PD-5	75	115	75	114	75	114
PD-6	92	99	92	99	92	99
PD-7	62	80	58	77	58	77
PD-8	66	94	61	89	60	89

Notes:
1. Average day initial conditions with tank levels at average operating levels (Barlow Tanks 28-ft, Wayne Hill 12-ft)
2. Maximum day and peak hour demand simulated at minimum operating levels (Barlow Tanks 24-ft, Wayne Hill 7-ft)

The distribution system in PD-1 experiences pressures within a reasonable range of "normal working pressures" for the low-end pressures as defined by the Ten States Standards. Because of the varying topology, it is City policy to require the installation of pressure regulating devices on service lines seeing pressures above 90 psi. The pressures in PD-1 which are controlled by the storage tank elevations vary slightly based on the demand conditions while the other pressure districts are generally controlled by the booster stations or water system control valves. The lowest pressure nodes are in PD-1 and mostly located in Hillside Estates which are discussed further in Section 8.

The suction pressures near Cass Road Booster Station in Garfield Townships are lower than 35 psi.

The figures provided in Appendix C display the existing system pressure contours for Average Day, Maximum Day, and Peak Hour demand conditions based on the static model analyses.

5.2 Extended Period Simulation

When the variation of the system attributes over time is important, an extended period simulation (EPS) is appropriate. This type of analysis allows the modeling of tanks filling and draining, pumps starting/stopping, and pressures and flow rates changing throughout the system in response to varying demand conditions.

This Study utilized two 72-hour extended period simulations (EPS) under Minimum and Maximum Day Demands conditions. The EPS provides an example representation of system operations based on tank operating levels, pump discharge information, and pump start and stop levels provided by City Staff. The system demands, flow supplied and storage volumes throughout this 72-hour EPS are displayed in Figures provide in Appendix C.

5.2.1 Minimum Day Demands (Winter)

This simulation for the minimum day demand occurs during the winter. The highest usage occurs during the morning hours and two of the high service pumps operate in response to the levels in the Barlow and Wayne Hill storage tanks. The two pumps operate at full speed. As the levels increase in the late afternoon, the pumps shut down once the tanks reach their high-level setpoints. While the pumps are off, the pressures in the distribution system in PD-1 are only controlled by the tank levels and in the locations near the WTP, the system pressures are noticeably lower. Then the cycle repeats itself as the demands increase again the next day. The pressure districts for the Wayne Hill and Huron Hills booster stations are maintained at the control pressures of the pumps and PRVs.

5.2.2 Maximum Day Demands (Summer)

During this simulation of the maximum day demand during the summer, the highest usage occurs during the early morning hours and two of the high service pumps operate in full speed response to the falling levels in the Barlow and

Wayne Hill storage tanks. Pump number 5 operates on VFD and its speed reduces until the tanks reach their high-level setpoint. This pump is maintained at a minimum speed until the cycle repeats itself as the demands increase again the next day causing the tank levels to reduce again. As at least one high service pump is are running during the full duration of this simulation the pressures in the distribution system in PD-1 near the WTP remain high. The pressure districts for the Wayne Hill and Huron Hills booster stations are maintained at the control pressures of the pumps and PRVs.

5.3 Fire Flow

In addition to providing normal flows, the water distribution system must be capable of supplying adequate fire flows at all locations throughout the City. The fire flow analysis is typically a tedious process that requires the water system modeler to iteratively apply fire flow demands at selected nodes within the model. Most water system models including WaterGEMS, have a Fire Flow Analysis Module to simplify the process of the fire flow analysis. The Fire Flow Analysis Module gives the modeler the ability to select all or a portion of the available nodes for which fire flows are to be determined. The Module automatically performs an iterative analysis of each selected node to determine the maximum available fire flow available without dropping the lowest residual pressure in the system below 20 psi. It is important to note that the Industry Standard is to provide fire flow during maximum day demand conditions and with a residual pressure in the system of at least 20 psi. Typical fire flow requirements are specified by organizations such as the American Water Works Association (AWWA) and the Insurance Services Office (ISO). Fire flow requirements will vary by community based on density, land use, building size and materials of construction, and distance between buildings.

Fire flows can be provided either through a combination of storage or pumping from the booster pumps. The City's minimum fire flow recommendations are summarized as follows:

- Single and Multi-family dwellings less than 3500 sf: 1000 gpm (2 hours)
- Apartment Buildings & Commercial w/fire suppression 1500 gpm (2 hours)

Based on the fire flow modeling results, a majority of the system meets or exceeds the minimum recommended fire flows. Over 95% of the service area in the City's water system can provide the City's minimum recommended fire flows from the distribution system alone. Most of the nodes that did not meet the recommended fire flows are located at dead ends, high elevations of the Wayne Hill service area, and areas supplied by undersized 4-inch and 6-inch water mains. Additionally, the fire flow analysis was run with the storage tanks near their minimum elevation which is a conservative or "worst case" situation. Under lesser demand conditions and with the storage tanks operating closer

to their normal levels, there is a greater ability for the system to fight fires. Furthermore, a closer study of the output data shows that the majority of the nodes that did not meet the minimum recommended fire flow did so due to the minimum residual pressure of 20 psi being reached at unrelated nodes typically located at higher ground elevations within the Pressure District. Appendix C provides the available fire flow contours under the existing conditions.

It is a challenge to provide the recommended fire flow from the water system alone due to the limited sizes of water mains in the areas where only 4-inch and 6-inch water mains exist, however, the City has provided its fire-fighting personnel with the resources to provide its customers proper fire protection. The fire department can utilize auxiliary sources of water (i.e. tanker trucks, etc.) or multiple points to supplement the water supply furnished by the City water system. Additionally, the City is working towards color coding its hydrants so that the fire-fighting personnel can easily recognize hydrants with adequate water supplies to support fire protection services.

Based on the water capacity/storage analysis (See Section 7), there is sufficient supply available to provide needed fire flows to all areas of the water system, as long as these areas have adequate distribution facilities to convey these volumes. Therefore, the fire protection deficiencies in the City's water system as reviewed are not capacity issues.

6 Future Water System Analysis

Following the existing conditions input process and the calibration process; the model was used to simulate the estimated future conditions. The Safe Drinking Water Act recommends 5-Year and 20-Year projections for future demands when developing a Reliability Study, therefore additional demands for undeveloped areas/population increases were entered. Undeveloped areas that have been cited for future expansion are described herein and specific supply and storage considerations are discussed.

6.1 Growth

Much of the projected system expansion within the City limits is anticipated to occur in the Wayne Hill Pump Station service area. This includes expansions of pressure districts PD-2 and PD-3. The estimated number of REUs will increase from 211 to 470 consisting of single family residential, multifamily residential and commercial development in the next 5 years and to 550 REUs in the next 20 years. Additional growth is anticipated in the form of increased housing density. The City estimates an increase in density of approximately 10% in the established neighborhoods of the City. This equates to an estimated increase of 300 REUs in PD-1 over the next 5 years and an additional 300 REUs in the next 20 years.

Pressure districts PD-5, P-6, PD-7 and PD-8 are near full buildout and new growth outside the estimated population growth is not anticipated to increase outside of the current projected population within these pressure districts. Growth in the adjacent Townships is anticipated to increase at the currently projected population growth rates with the highest growth forecast in Garfield Township.

Table 6-1 provides the estimated future demands for the projected 5-year and 20-year conditions. The estimates demonstrate that the current maximum demand can be met by the firm supply capacity (19.7 mgd) of the WTP but the 20-year maximum daily demand will be approaching the firm supply capacity. EGLE requires communities to plan for expansion when maximum daily demands are in excess of 80% of the firm capacity.

Table 6-1: Future Demands

Year	ADD	MDD	PHD
2020	5.43	13.48	22.66
2025	5.72	14.19	23.86
2030	5.96	14.78	24.85
2040	6.46	16.03	26.95

Notes:
1. Current population growth rates
2. Includes 10% growth in established neighborhoods over the next 20 years
3. Assumes estimated future connections in Wayne Hill Service Area

6.2 Normal Working Condition Performance

The projected pressure ranges in each of the Districts are shown in Table 6-2 and reasonable considering the topographic. Several connections in the future connections in PD-3 and PD-2 will require PRVs. The predicted pressures in the Grand Traverse Commons area remain low for during these conditions. The PRV setpoint for WCV-1300 would need to be raised from 67 psi to 85 psi to maintain the HGL of PD-3 at 930 feet, which will be sufficient to provide adequate pressure for all but the one highest lot in the proposed Hillside Estates. This raised setpoint would provide a minimum pressure of 35 psi at the highest elevation of PD-3, during the future MDD conditions.

Table 6-2: Future Conditions Model - Predicted Water System Pressures

Pressure District	Model Pressure Range (psi)					
	Average Day Demand[1]		Maximum Day Demand[2]		Peak Hour Demand[2]	
	Min	Max	Min	Max	Min	Max
PD-1	37	87	33	84	32	84
PD-2	57	102	57	102	57	102
PD-3	23	105	23	105	23	105
PD-4	39	116	39	116	39	116
PD-5	75	115	75	114	75	114
PD-6	92	99	92	99	92	99
PD-7	62	81	61	81	61	81
PD-8	65	94	61	88	61	88

Notes:
1. Average day initial conditions with tank levels at average operating levels (Barlow Tanks 28-ft, Wayne Hill 12-ft)
2. Maximum day and peak hour demand simulated at minimum operating levels (Barlow Tanks 24-ft, Wayne Hill 7-ft)

6.3 Fire Flow

The City's water model was simulated under the fire flow scenario to simulate maintaining a minimum 20-psi residual in the system for the projected 5-year and 20-year buildings for the MDD flow scenario. Based on the fire flow simulation results, the majority of the system meets or exceeds the minimum recommended fire flows. However, fire suppression is limited by the pumping capacity at Wayne Hill Booster Station and this station which has 1,260 gpm available fire flow at the proposed Morgan Farms Phase III and is not sufficient for the proposed development of apartment buildings or commercial buildings with fire suppression, which requires a 1,500 gpm minimum.

7 Water Supply Requirements and Capacity

7.1 Water Supply Requirements

7.1.1 Average Day, Maximum Day and Peak Hour Demands

The present and projected water supply requirements were summarized previously in Section 4.

7.1.2 Fire Flow Demands

The minimum recommended fire flows are commonly dependent on the types of construction and structures present within the City service areas. Table 7-1 summarizes the recommended fire flows that should be provided from the water system as a minimum based on industry-standard equations (ISO, AWWA) for selecting the required fire flow (FF):

Table 7-1: Minimum Recommended Fire Flows

Category	Recommended Fire Flow	Duration
Residential	1,000 gpm	2 hrs.
Multi-Family Residential/Commercial	1,500 gpm	2 hrs.
Downtown Commercial	3,500 gpm	3 hrs.

The duration of the required fire flows is dependent on several factors. Literature sources vary significantly on this subject but the most recent issue of AWWA standard M-31 requires that fire flows in excess of 3,500 GPM be provided for a duration of three hours which is a reasonable expectation for the City water system. Fire flows for the City Wide System can be provided either through a combination of storage or pumping from the firm capacity of the WTP pumps. Fire flows for the pumped storage systems at Wayne Hill and Huron Hill Booster Stations are provided by the pumping capacity but are not included in the calculation for the required storage.

EGLE and the *Ten State Standards* recommend water utilities to provide storage equal to the average day demand. The City's overall available storage capacity (6.7 mgal) can supply both the overall system average daily demand (5.43 mgd) and the City's average daily demand (2.26 mgd). This does not include the approximate 450,000 gallons of stored water available in Wayne Hill Reservoir, which is available under emergency conditions in PD-1. Another approach includes supplying the maximum daily demand plus one hour of peak hourly demand and available volume for fire flows. Due to the emergency power generation capacity, the City assumes the WTP can provide 8.0 mgd supply capacity as a conservative estimate. Table 7.2 provides the storage capacity analysis for the City's system.

Table 7-2: Storage Capacity Analysis

Year	Pumping Capacity (mgd)	System ADD (mgd)	System MDD (mgd)	System PHD (mgd)	Required Fire Flow (gpm)	Fire Flow Duration (hr)	Customer Demand Duration (hr)	Water Supplied (mgal)	Customer Demand, 7hr MDD + 1hr PHD (mgal)	Fire Demand (mgal)	Required Storage (mgal)	City Available Storage (mgal)	System Available Storage (mgal)
City Wide System													
2020	8.0	5.43	13.5	22.7	3500	3.0	8	2.7	5.4	0.6	3.4	6.7	11.0
2025	8.0	5.66	14.0	23.6	3500	3.0	8	2.7	5.7	0.6	3.6	6.7	11.0
2030	8.0	5.89	14.6	24.6	3500	3.0	8	2.7	5.9	0.6	3.9	6.7	11.0
2040	8.0	6.39	15.9	26.7	3500	3.0	8	2.7	6.4	0.6	4.4	6.7	11.0
Wayne Hill Booster Station Service Area (PD-2, PD-3, PD-4)													
2020	1.4	0.07	0.2	0.3	1500	3.0	8	0.5	0.1	0.3	0.3	0.7	0.7
2025	1.4	0.17	0.4	0.7	1500	3.0	8	0.5	0.2	0.3	0.4	0.7	0.7
2030	1.4	0.19	0.47	0.80	1500	3.0	8	0.5	0.2	0.3	0.5	0.7	0.7
2040	1.4	0.23	0.57	0.97	1500	3.0	8	0.5	0.2	0.3	0.5	0.7	0.7
Huron Hills Booster Station Service Area (PD-5, PD-6, and PD-7)													
2020	1.4	0.14	0.7	1.18	1500	3.0	8	0.5	0.3	0.3	0.6	1.5	1.5
2025	1.4	0.15	0.78	1.30	1500	3.0	8	0.5	0.3	0.3	0.6	1.5	1.5
2030	1.4	0.17	0.86	1.44	1500	3.0	8	0.5	0.3	0.3	0.6	1.5	1.5
2040	1.4	0.20	1.04	1.75	1500	3.0	8	0.5	0.4	0.3	0.7	1.5	1.5

Notes:

1. Estimated WTP pumping capacity is 8.0 mgd during auxiliary power
2. Customer demand for 7 hours of MDD and 1 hour of PHD
3. System Demands include City, Garfield Township, Elmwood Township and Peninsula Township
4. Wayne Hill Storage Reservoir Available Storage is 0.67 mgal
5. Required storage = Customer Demand + Fire Demand – Water Supplied (except for pumped storage systems)

The City currently has enough storage volume to accommodate their respective required fire flow capacities through pumping capacities and their storage tanks for gravity storage is PD-1 and pumped storage in the remaining pressure districts. In addition, the Fire Flow Analysis module of the modeling software was run to evaluate the representative firefighting capabilities of the water system. Adequate pressures are generally verified using the model by determining the ability of a water system to provide a fire flow at any node during maximum day demand while maintaining a residual pressure of at least 20 psi in all portions of the system. This analysis determines the available fire flow at selected nodes throughout the system. The fire flow contour map for the existing and future water system can be found in Appendix C.

7.1.3 Basis of Demand Projections

Demand projections are based on historical water use that were presented earlier.

7.2 Capacity of Waterworks System

7.2.1 Firm Supply Capacity

The firm pumping capacity of the HSPS is 19.9 mgd and the current WTP treatment/supply firm capacity is 19.7 mgd. The current maximum demand can be met by the firm supply capacity (19.7 mgd) of the WTP but the 20-year maximum daily demand will be approaching 80% of the firm supply capacity.

7.2.2 Finished Water Storage Capacity in Excess of the Normal Water System Requirements

The City is able to meet and exceed the water system's maximum day and peak hour demands with the firm capacity of its pumps and tanks. The capacity calculations in excess of normal water system requirements should also completed for each separate pressure district.

Based on the capacity of the system as described herein, the City's water supply system and each of its pressure districts individually, have the capacity to supplement peak hour demands, have available fire protection capacities during the maximum day and have finished water storage volumes in excess of normal water system requirements.

8 Recommended Water System Improvements

The City's water system has adequate capacity and conveyance capabilities to provide suitable supply and pressure to its customers during existing normal operating conditions, but the 20-year maximum daily demand will be approaching 80% of the firm supply capacity. Based on the Fire Flow Analysis, the City's water system has detected a few minor deficiencies in the area of fire protection. The following is a list of improvements that will improve the City's fire fighting capabilities, provide additional redundancy and looping and likely promote improved water quality.

8.1 Fire Flow Improvements

The following improvements would specifically improve fire-fighting capabilities in the City's water supply system. Certain improvements significantly enhance firefighting capabilities in specific areas. These improvements are important, but their system benefit is significantly less than the previous recommendations. There is no urgency to complete these within any specific period, but it is important to include these upgrades as street improvement projects are contemplated. These site-specific improvements, in no particular order, are as follows:

1. Complete Wayne Hill improvements to address pumping capacity and suction issues as described in 8.5.1.
2. Replace aging undersized water mains.

   As described in previous studies, the older 4-inch and 6-inch water mains vary in their capacity to convey the minimum required fire flow. The mains with limited fire flow are generally located in the older portions of the City within Pressure District PD-1 and can be serviced by multiple hydrants.

3. Replace older hydrants

   Approximately 80% of the City's hydrants are older cast iron Traverse City Iron Works (TCIW) hydrants. The seats for the hydrant foot valves penetrate the flow path to the channel and cause a higher head loss through the hydrant. Fire flows from these older hydrants are up to 10% less than other new hydrant models. The City should continue to implement its fire hydrant replacement program to increase fire flow capacity using newer higher flow hydrant models.

8.2 Redundancy and Reliability Improvements

The evaluation of the existing water system capacity concludes that redundancy and reliability improvements are recommended at:

1. Construct approximately 12,200 feet of 16-inch and 24-inch main on Webster Street, 8th Street, Lake Street, 7th Street and Spruce Street replacing the existing, older distribution main and providing redundancy of transmission to the west side of town.

2. Construction of a parallel 30-inch raw service water line from the LSPS to the WTP (see additional description in 8.5.3.1)

3. Construction of 16-inch water main on East Front Street from Park to Franklin Street

4. Construction of 12-inch water main on Hannah Avenue from Bates to Garfield

5. Construction of 12-inch water main on Veterans Drive from 14th Street to Georgetown

6. Construction of 12-inch water main on Front Street bridge between Pine and Hall Street with Bridge Project

7. Removal of the 12-inch water main across the Union Street Dam and replacing with a new 12-inch main under the Boardman River just east of Union Street bridge by directional drilling with the Fish Pass Construction Project.

8. Installation of new generator and transfer switch at LSPS for the ability to provide temporary power for raw water pumping and treatment of maximum daily flows at the WTP

9. Replacement of the surface wash pump at the WTP

10. Rehabilitation of existing backwash pump at the WTP

8.3 Water Storage Improvements

The evaluation of the existing water system capacity concludes that the need for additional storage volumes in the system is unwarranted. Addressing the suction issues associated with Wayne Hill Booster Pump Station (described in 8.5.1) would increase the City's total storage capacity from 6.7 mgal to 7.4 mgal.

The City should continue to complete tank inspections and cleaning every five years.

8.4 Water Quality Improvements

The City has completed the preliminary Distribution System Materials Inventory (DSMI) and has submitted to EGLE. Continuing to implement complete DSMI is required by January 1, 2025.

8.5 Specific Project Recommendations

8.5.1 Wayne Hill Booster Station

Several changes in this Booster Pump Station operation could be considered to enable the Wayne Hill Booster Station to function more effectively and address some of the issues pointed out earlier and address the fire flow requirements. The remedies considered to address these problems are provided as follows.

As noted in Section 3, the City has experienced pressure drops during hydrant openings within the Booster Station service area. Increasing the pressure setpoints and ensuring the bladder tanks are charged to 90 psi has improved this issue. The bladder tanks have a total volume of 720 gallons and the effective usable volume is approximately 100 gallons each since the air cushion around the water expands as the water is drawn out of the tank thus reducing the pressure if no new water is being added. This provides about 10 seconds of response time per tank to allow the pumps to maintain. The installation of a third bladder tank will help and provide additional response to allow the pumps to pressurize the system during these high flows. The PRV WCV-1300 located within the booster station should also be replaced with a pressure sustaining valve to regulate the downstream pressure and maintain a residual upstream pressure above 95 psi so that 20 psi can be maintained at the highest elevations of PD-4 during fire demands.

In addition to improvements to the pumping infrastructure, the existing pump controls should be revised to provide for more continuous and longer pump operation between cycles. This can be accomplished through programming changes that would prevent the pump from running below a speed setting that would provide only minimal flow into the system so that the pump could remain on and respond more quickly to rapid changes in demand rather than having to be called to start up fairly frequently as is currently the case. If the minimum pump setting were set at 70%, that would produce very minimal flow into the system (possibly only enough to allow the downfeed through the small bypass PRV from WCV-1300 into PD-3 to occur or about 5 gpm). The controls could be revised to shut the lead pump down only when it has run at minimum speed for a certain time duration (say one hour) which would mean that there is very little if any system demand. To prevent one pump from running for too long, a second pump could be cycled in every 24 hours so that the wear on each pump can be evened out. A second (and a third) pump could be called for once the first (or both) pump is at maximum speed and if the pressure continues to drop for more than 3-5 seconds, which is similar to the current time frame for bringing on additional pumps during hydrant opening events. The above controls changes should occur regardless of which of the pump options below are selected.

Three options were considered to address the pumping capacity and suction issues at the booster station. These are:

Option 1 – Install Three New Booster Pumps on the Lower Level

This option includes the replacement of the three pumps with one pump sized with the capability of providing the MDD and 3 pumps used for fire flow conditions. The pumps would be located on the lower level and would take suction from the existing reservoir suction line with their discharge connecting to the existing 8-inch discharge header from the skid-mounted pumps.

Option 2 - Relocate Existing Booster Pumps to Lower Level and Provide an Elevated Storage Tank

This option includes relocating the existing booster pumps to the lower level and a new suction header from the low level reservoir suction line would be installed to connect to the pumps. One pump would provide the MDD and fire flow would be provided by the three pumps. Construction of a new elevated storage tank (150,000 gallons) in PD-3 would provide the required fire flows for the proposed commercial development in PD-3 as well as PD-2. Fire flow for PD-4 would continue to be provided solely by the pumps.

Option 3 – Supplemental Booster Pumps on Lower Level

It is also possible to address the current low NPSH problem by providing a booster pump at the elevation of the suction line from the reservoir. This booster pump would operate when the reservoir level at or below elevation 732'. This booster pump should be located so that the pump volute elevation is at or below the lowest water surface in the reservoir at all times. Adding a supplemental booster pump to push water against the existing prefabricated booster pump skid would enable the existing pumps on the skid to operate adequately under any condition of reservoir elevation and thus allow the full reservoir to be utilized during fires or other high demand periods. This pump would be sized to provide enough capacity for all three of the skid-mounted pumps to be utilized, if desired The increased head would increase the capacity of the three existing pumps and provide sufficient fire flow.

8.5.2 Grand Traverse Commons

Several improvements to the water system at Grand Traverse Commons were evaluated to address low pressure issues occurring at these locations. This includes the replacement of the 10-inch cast-iron water mains in the Commons area with 10-inch and 12-inch ductile iron water mains. Additionally, establishing a higher pressure district (PD-9) through the connection of a portion of Commons Water System located within PD-1 to the adjacent Garfield Township pressure district which operates at a higher HGL than PD-1. The scope of this work includes:

- Replacement of approximately 2,400 feet of 10-inch CIP water mains in Cottage View Drive to 300 feet south of Brown Drive

- Create a new pressure district (PD-9) by the:

    - Construction of a new 8-inch PRV (Option 1) at the location of the Red Drive Booster Station to downfeed from the Garfield Township Munson Pressure District (HGL 975 feet) to PD-9 (HGL = 825 feet) The estimated water age in this proposed district would increase due to the long travel times from the City's system to Garfield Township and the eventual backfeed into PD-9 and then to the City. or

    - Rehabilitation of the Red Drive Booster Station for use by the City (Option 2). This station owned by Garfield Township is currently under plans to be abandoned but could be acquired by the City for use in the new station. This option would require evaluation and installation of new pumps as well as the construction of a new discharge water main to the Commons system.

- Installation of approximately four check valves at:

    - 12-inch DIP water main on Silver Drive South of the Commons

    - 6-inch CIP water main on Cottageview Drive south of Medical Campus Drive

    - 12-inch DIP water main and 10-inch CIP water main at in Brook Street at the intersection of Medical Campus Drive

This new pressure district (PD-9) would be maintained at an HGL of 825 feet and would increase the pressures under maximum day conditions from 33 psi to 60 psi.

Looping of this district could also be completed with the connection to the existing 8-inch water mains from Orange Drive to Franke Road within the Garfield Township system. This installation would require a second 8-inch PRV to be installed near the intersection of Silver Drive and Silver Lake Road. The cost of this looping was not included in the project cost estimate.

8.5.3 Water Treatment Plant

8.5.3.1 Low Service Pump Station

The Low Service Pump Station capacity represents the limiting factor to the City's water supply capacity. HRC evaluated the installation of a secondary 30-inch water line parallel to the existing 30-inch water line from the LSPS to the raw water flow meter. The second raw water line would also provide a redundant raw water supply to the WTP. Replacement of all four pumps is anticipated over the next 5-10 years. Replacing pumps number 1 and 2 with higher

capacity pump and operating on VFDs would provide additional capacity while allowing the pumps to vary the raw water flow rate for lower demand conditions.

New emergency power generation at the LSPS would provide the WTP the ability to increase the treatment capacity during power outages.

8.5.3.2 Raw Water Supply

Replacing the emergency access point on the 36-inch intake pipe would enable the City to supply the WTP with raw water in the event of an emergency or if the intake structure is damaged or needs repair.

A secondary raw water intake pipe and connection was also considered as part of this evaluation. This option could include installing a secondary direct intake or a buried intake structure into East Bay at the LSPS. The secondary direct intake option would require an approximate 4,000 feet of 36-inch offshore at a different location than the current intake. The buried intake would require two approximately 225' x 225' intake structures (each rated for 12 mgd each) located closer to shore (less than 1,000 feet). The structures would be equipped with perforated piping installed in deep bed filter sand media capped with native sand. The structure would be equipped with the ability for backwashing. These options would need to be considered if water demands begin to routinely exceed the current intake capacity or if water quality or other problems develop with the current intake crib and pipe.

8.5.3.3 Filter Backwash Recycle

The USEPA and EGLE typically permit the recycling of the decant water from the filter backwash and sludge lagoon through the Filter Backwash Recycling Rule given:

1. The water is treated through the processes of the existing direct filtration system and;

2. The total volume recycled is less than 10% of the influent flow. The WTP maximum discharge is 180,000 gallons per day from the WTP lagoons. At the minimum daily flow observed in the past five years, this represents less than 5% of the total raw water flow.

Because recycling backwash water may concentrate biological contaminants such as *Cryptosporidium* and *Giardia*, it is recommended to periodically monitor and/or disinfect this water before recycling in the treatment process. Disinfection by ultraviolet light is one of the most effective methods of deactivating these microorganisms and can be accomplished at lower doses and contact times (C*t) than other disinfection methods, such as chlorine.

Two options exist for implementation of UV disinfection of the recycled flow as follows:

Options 1 – UV Disinfection Only

The first option includes the installation of 12-inch discharge piping and yard valves to discharge the plant drain pump effluent pipe to the 24-inch raw water main in the yard north of the WTP. A 12-inch diameter inline medium-pressure UV equipment module rated for up to 1 mgd (instantaneous) and 0.5 mgd (daily) flow could be installed for this purpose. Monitoring of the recycle flow rate could be completed using a new magnetic flow meter installed on the recycle pipe.

Options 2 – UV Disinfection and Backwash Tank

A second option to also replace one of the open sludge and backwash lagoons with a covered concrete storage tank. Although not required, this would ensure that all recycled water is essentially isolated from exposure to the environment. This tank would provide for the reclamation of backwash water and would consist of a covered below-grade cast-in-place concrete holding tank constructed within the footprint of one of the existing backwash lagoons. The backwash supernatant would be drained and pumped back to the WTP and treated and the settled sludge would be pumped to the remaining sludge lagoon. The tank would be constructed with two cells, each sized for 200,000 gallons, to hold the volume of two backwashes plus some additional volume per cell for freeboard and extended backwash times. The backwash supernatant would be withdrawn using piping or a decanting device and recycled to the WTP raw water using a recycle pump station with an integral wet well. Solids would be drained using a sloped base slab to a collection zone and then pumped from the tank using a separate sludge pump station or submersible pumps to the remaining sludge lagoon. This option would also include the UV disinfection and flow metering as described above as well as piping, earthwork (assumed to be 30% of the tank cost) instrumentation and controls. The decant from the sludge lagoons would continue to be discharged to surface water via the plant drain pump station.

8.5.4 Increased Filter Capacity

The existing filters have a design filtration rate of 4 gpm per sf which is the maximum rate approved by EGLE. Increasing the filtration rate to 5 gpm per sf has been previously discussed and could be allowed with EGLE approval. An EGLE approved pilot study would be required to demonstrate the filtration capacity prior to conversion to high rate filtration. This would increase the filtration capacity to 25 mgd. Increasing the filtration rate would increase the headloss and reduce the filter run times but would allow the WTP to use the existing five filters to achieve treatment capacity without constructing new filters.

The estimated cost of the pilot studies can be up to $80,000 and the associated implementation costs would be $100,000 for the increased instrumentation and filter modifications.

8.6 Summary of Recommended Capital Improvements

Table 8-1 summarizes the recommended capital improvements and the estimated completion year. Cost estimates are provided in Appendix F along with a Figure F-1 depicting the locations of the recommended capital improvements. Costs are based on similar projects completed in the City and budget estimates from equipment suppliers. For the purpose of this study, project costs less than $50,000 were not included as capital improvements. The recommended improvement options for Wayne Hill Booster Station are shown in Figure F-2 and F-3.

Several of the recommended improvements are reflected in the total capital improvements cost including Wayne Hill Booster Station Option 3 – Supplemental Booster Pumps and Filter Backwash Recycle Option 1 – Existing Storage Lagoons.

Table 8-1: Recommended Water System Capital Improvements

PROJECT	DESCRIPTION	PROJECT/OPTION AMOUNT	TOTAL SELECTED	TIME FRAME
	WTP Projects			
W1	WTP and Low Service PS New Electrical Gear and VFDs	$1,204,000	$1,204,000	2020-2025
W2	Replace Sodium Hypochlorite Tanks	$405,000	$405,000	2020-2025
W3	Replace Surface Wash Pump	$47,000	$47,000	2020-2025
W4	Rehab Backwash Pump	$50,000	$50,000	2020-2025
W5	Replace HSPS Control Valves	$402,000	$402,000	2020-2025
W6	New Raw Water Main from LSPS to WTP	$770,000	$770,000	2025-2030
W7	Install New Generator at LSPS	$450,000	$450,000	2025-2030
W8	LSPS Pump Replacement	$1,347,000	$1,347,000	2030-2040
W9	HSPS Pump Replacement	$1,401,000	$1,401,000	2030-2040
W10A	Backwash Recycle	$453,000	$453,000	2030-2040
W10B	Backwash Recycle and Backwash Tank	$2,928,000		2030-2040
		WTP IMPROVEMENTS PROJECTS	$6,529,000	
	Distribution System Projects			
D1	8th Street Bridge Project, 20-inch and 24-inch from Boardman to Lake Ave (Phase 1)	$284,000	$284,000	2020-2025
D2	24-inch on Lake Avenue from Cass to Union, (Phase 3B)	$388,000	$388,000	2020-2025
D3	24-inch on 7th from Union to Wadsworth, (Phase 4)	$636,000	$636,000	2020-2025
D4	Front Street Bridge Project, 12-inch Front/Pine to Front/Hall	$200,000	$200,000	2020-2025
D5	16-inch on East Front from Franklin to Park St.	$850,000	$850,000	2020-2025
D6	24-inch from Webster/Rose to 8th/Railroad, (Phase 5B)	$1,285,000	$1,285,000	2020-2025
D7	US-31 MDOT, 16-inch from US-31/Union to US-31/Bay; 12-inch from US-31/Railroad to US-31/Garfield	$1,584,000	$1,584,000	2020-2025
D8	24-inch from Garfield/Washington to Webster/Rose, (Phase 5A)	$1,176,000	$1,176,000	2020-2025
D9A	Wayne Hill Improvements Option 1 - New Booster Pumps on Lower Level	$447,000		2020-2025
D9B	Wayne Hill Improvements Option 2 - Ex. Booster Pumps to Lower Level, New Tower	$1,603,000		2020-2025
D9C	Wayne Hill Improvements Option 3 - New Supplemental Booster Pumps on Lower Level	$432,000	$432,000	2020-2025
D10	12-inch on Hannh Avnue from Bates to Garfield	$770,000	$770,000	2025-2030
D11	Downtown, 12-inch Boardman/8th to Boardman/State; Washington/Boardman to Cass/State	$975,000	$975,000	2025-2030
D12	24-inch on 7th from Wadsworth and Spruce (Phase 6)	$1,475,000	$1,475,000	2025-2030
D13	16-inch on Spruce from 7th to Wayne St. (Phase 7)	$1,272,000	$1,272,000	2025-2030
D14	12-inch on Veterans Drive from Georgetown to 14th Street	$798,000	$798,000	2025-2030
D15A	Grand Traverse Commons Improvements Option 1 - PRV	$908,000		2030-2040
D15B	Grand Traverse Commons Improvements Option 2 - Pump Station	$1,258,000	$1,258,000	2030-2040
		DISTRIBUTION SYSTEM IMPROVEMENTS PROJECTS	$13,383,000	
		TOTAL ESTIMATED COST OF PROJECTS	**$19,912,000**	

Notes:

1. W = WTP Projects, D = Distribution System Projects
2. All pricing in 2020 dollars.
3. Pricing includes 20% contingency and 20% engineering, legal, and administrative.

9 General Plan Requirements

The purpose of this Section is to satisfy the requirements of the EGLE SWDA Rules promulgated according to the Act P.A. 399 of 1976, as amended. Part 16 of the Rules indicate that certain suppliers of water shall submit and maintain an up to date waterworks system General Plan. The principal elements of the General Plan, which are provided to satisfy these requirements, include the following:

1. General Layout of the Entire Waterworks System

    a. The City uses their GIS database to map the entire water works system including the treatment system and distribution system including valves, hydrants, storage tanks, water mains, and booster stations. Refer to Appendix A for maps of the City's Water System.

2. Pressure Contours under Peak Demands

    a. A hydraulic analysis of the distribution system was completed as part of this Reliability Study. Appendix C displays the existing conditions model pressure contours under peak demand conditions.

3. Identification of Service Area

    a. Refer to Appendix A which displays the service area for the City's Water Supply System.

4. Rated Capacity of Waterworks System

    a. Refer to Section 7 for a detailed analysis of the rated capacity of the City's Waterworks System.

5. Inventory of Water Mains

    a. Appendix F contains a complete inventory of the water mains by pipe diameter, pipe material and estimated installation year.

6. Capital Improvements

    a. This Water System Reliability Study concludes that the water supply system has adequate capacity and conveyance capabilities to provide suitable supply and pressure to its customers during existing normal operating conditions, but the 20-year maximum daily demand will be approaching 80% of

the firm supply capacity. The Fire Flow Analysis performed as part of the Reliability Study revealed minor deficiencies in the City distribution system. These fire flow deficiencies should be addressed as required to support development as needed. Section 8 identifies system improvements to upgrade the water distribution system and provides recommendations to enhance the reliability and redundancy in the existing water supply system.

7. To accommodate the anticipated expansion for the 5-year and 20-year planning periods, a Future Water System Analysis was performed. This analysis is provided in Section 6. Improvements to accommodate future system growth were identified in Section 8. Requests for system extension should continue to be reviewed on case-by-case basis as projected distribution system sizing may need to be modified based on the specific requests.

8. The City has completed an Asset Management Program which has been approved by EGLE.

9. The City has completed preliminary distribution system materials inventory by January 1, 2020 and is implementing the complete distribution system materials inventory by January 1, 2015.

10 Water Shortage Response and Interruption of Service

10.1 Electrical Power System

The City has enough emergency power generation from the 700 kW generator to operate pumping and treatment at 8.0 to 11.0 mgd should a complete power outage occur. The City recently completed the installation of a new automatic transfer switch (ATS) at the WTP in 2020 which provides reliable transfer to standby power and back to line power when service is restored. The LSPS is provided with backup power capability through the WTP 700 kW generator. The installation of a new generator at the LSPS would allow the WTP to convey and treat a higher firm capacity. The Wayne Hill Booster Station has sufficient generator capacity to power the current loads to this station.

10.2 Interruption of Water Service

The City's current Emergency Response Plan addresses the issues surrounding the process and procedures for supplying customers with potable water should water service be interrupted. Furthermore, the water supply system has been constructed with sufficient redundancy so that each pressure district can be supplied from several different sources. However, if an interruption in water service to the distribution system occurs and forces system pressures to drop below the recommended minimum levels, the water would be disinfected in a manner approved by EGLE and compliance with state drinking water standards would be demonstrated by additional bacteriological testing. In addition, the City has 6.7 million gallons of gravity supply between the three storage tank sites that can be isolated and made available for emergency use only, if necessary.