Communication to the City Commission

TO:	City Commission
COPY:	Frank Dituri, Director of Public Services
FROM:	Martin Colburn, City Manager
MEMO DATE:	July 8, 2021
SUBJECT:	Union Street Dam 2021 Inspection Report

EXECUTIVE SUMMARY:
Commissioner McGillivary has requested a brief discussion regarding the attached inspection report regarding the Union Street Dam prepared by the Michigan Department of Environment, Great Lakes and Energy.

GRETCHEN WHITMER
GOVERNOR

STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
LANSING

LIESL EICHLER CLARK
DIRECTOR

June 25, 2021

VIA E-MAIL

Mr. Frank Dituri
City of Traverse City, Public Services Department
625 Woodmere Avenue
Traverse City, Michigan 49686

Dear Mr. Dituri:

SUBJECT: Union Street Dam, Dam ID No. 511, Grand Traverse County

The enclosed Dam Safety Inspection Report for the Union Street Dam was prepared by Mr. Luke Trumble, P.E., Dam Safety Program, Water Resources Division, Department of Environment, Great Lakes, and Energy (EGLE). The visual inspection and report were completed at your request, as provided by Section 31518(4) of Part 315, Dam Safety (Part 315), of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA).

The purpose of this inspection was to evaluate the structural condition and hydraulic capacity of this dam, as required by Part 315 of the NREPA.

This dam is in fair to poor condition overall. The inspection report includes several recommendations for investigations and maintenance and repair of deficiencies that do not currently pose an immediate threat to the safety of the dam but should be completed within the timeframes indicated in the report.

If you have any questions regarding these recommendations, please contact me at 517-420-8923, or TrumbleL@Michigan.gov.

Sincerely,

Lucas Trumble, P.E., Supervisor
Dam Safety Unit
Water Resources Division
517-420-8923

Enclosure
cc: Mr. Gregg Bird, Grand Traverse County Emergency Management
File

DAM SAFETY INSPECTION REPORT
UNION STREET DAM – DAM ID NO. 511
BOARDMAN RIVER
GRAND TRAVERSE COUNTY – SECTION 3, T27N, R11W

OWNER/OPERATOR:

Public Services Department
City of Traverse City
625 Woodmere Avenue
Traverse City, Michigan 49686
231-922-4910

HAZARD POTENTIAL CLASSIFICATION:

High

INSPECTION DATE:

May 27, 2021

REPORT DATE:

June 18, 2021

INSPECTED AND PREPARED BY:

Lucas A. Trumble, P.E.
Hydrologic Studies and Dam Safety Unit
Water Resources Division
Department of Environment, Great Lakes, and Energy
P.O. Box 30458
Lansing, Michigan 48909
517-420-8923

INTRODUCTION

The purpose of this inspection was to evaluate the structural condition and hydraulic capacity of the Union Street Dam, as required by Part 315, Dam Safety (Part 315), of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. This inspection was conducted by the Department of Environment, Great Lakes, and Energy (EGLE) in response to a request by the owner of the dam, the City of Traverse City (City). The report is limited to a discussion of observations based on a visual investigation and review of any available previous inspection reports, plans, and data. This report should not be considered an in-depth engineering investigation. All references to "right" and "left" in this report are based on the observer facing downstream.

CONCLUSIONS AND RECOMMENDATIONS

The Union Street Dam is in fair to poor condition. Based upon observations at the time of the inspection, there were no apparent structural deficiencies that may lead to the dam's immediate failure. However, the age of the structure, coupled with observed deficiencies are indicators that the dam should be rehabilitated or replaced. Currently a permit has been issued for reconstruction of the dam. The City should press forward with these plans or, if prohibited, pursue further investigations and rehabilitation of the existing structure. The dam has adequate spillway capacity to safely pass the design flood. However, there are operational concerns that may impact spillway capacity during flood events. The following recommended actions are listed by priority:

1. Complete the planned reconstruction of the dam, as authorized under EGLE Permit No. WRP019834, as soon as practical.

Reconstruction of the dam in accordance with EGLE Permit No. WRP019834 will alleviate the necessity to perform the following recommended actions. If reconstruction of the dam is delayed significantly, the following recommended actions will become necessary:

2. Perform geotechnical investigations and analyses to ensure embankment meets current design standards for slope stability and seepage induced erosion.

3. Re-evaluate spillway capacity of the dam and its ability to safely convey the design flood event. This evaluation should consider the amount of time necessary to fully open the 10 principal spillway gates; any reduction in flow capacity resulting from the stoplogs in the principal spillway bays, clogging with debris, and closure of the fish ladder; and any other pertinent considerations that were not included in previous spillway capacity evaluations.

4. Remove all trees from dam embankments.

5. Close gap between upstream sheet pile and right wingwall of auxiliary spillway and back fill sinkhole behind wall.

6. Repair or replace deteriorated concrete surfaces at primary and auxiliary spillway outlets.

7. Perform dive/video inspection of culverts to assess progression of deterioration and determine if repairs or replacement are needed.

8. Repair erosion areas on embankments and protect with appropriate erosion control measures, such as riprap on shorelines and gravel or mulch on foot paths.

9. On an annual basis, lubricate and exercise all of the principal spillway gate operators through their entire range of motion.

10. Routinely inspect all trash racks and remove debris as necessary.

11. As part of routine maintenance, fill animal burrows and trap and remove animals to the extent practical.

12. By December 31, 2021, the City should review and update the existing operations and maintenance (O&M) plan, as necessary.

The dam's current high hazard potential rating remains appropriate.

PROJECT INFORMATION

The Union Street Dam consists of approximately 250 lineal feet of earth embankment. Within the embankment are two spillways and a fish ladder. The principal spillway consists of a concrete overflow section with five 10.5-foot wide bays. Each bay is connected to two 48-inch diameter corrugated metal pipe (CMP) outlet pipes (for a total of ten 48-inch CMPs) that extend through the embankment. Each pipe has a control gate and operator on the upstream end of the pipe. Immediately upstream of the outlet pipes are steel bar trash racks. Stoplogs in each of the five bays control the normal water surface in Boardman Lake.

The auxiliary spillway consists of a concrete inlet section and overflow structure, with two 11.0-foot wide stoplog bays. Downstream from the stoplog section are trash racks that are mounted on the concrete headwall. Two 48-inch diameter CMPs extend through the embankment and outlet into a separate channel connected to the Boardman River downstream.

A steel sheet pile wall connects the two spillways on the embankment's upstream face. The outlet structure for the principal spillway consists of a concrete headwall and concrete apron with a steel sheet pile cut-off wall. The outlet structure for the auxiliary spillway consists of concrete headwall and concrete slab erosion protection on the outlet channel's banks.

A six-foot wide concrete fish ladder connects to the inlet structure of the auxiliary spillway and outlets at the Boardman River to the left of the principal spillway. The fish ladder has several weir sections that step down from the lake elevation to the tailwater elevation in the river.

The dam's structural height, as measured from the invert of the principal spillway outlet

structure apron to the top of the embankment, is approximately 21 feet. The dam's height, as defined by Part 315, is the difference in elevation from the design flood elevation to the invert of the outlet stream. That height for the Union Street Dam is 20 feet. The head, or difference in upstream and downstream water elevations, was approximately ten feet on the inspection date. Normal freeboard is approximately five feet. Boardman Lake has a surface area of approximately 350 acres.

A National Dam Safety Program Inspection Report prepared by Donahue & Associates, dated May 1981, was used as a reference for this Project Information Section and this report. Donahue & Associates prepared that report for the Department of Natural Resources under the direction of the United States Army Corps of Engineers (USACE), Detroit District. Numerous previous inspection reports under the authority of Part 315 have been completed and were used as references for this report.

A comprehensive rehabilitation project for the Union Street Dam, is currently underway. The FishPass project will fully reconstruct the Union Street Dam. This will include the construction of an arced labyrinth weir with a sharp crested low-flow weir for the primary spillway that discharges to a nature-like channel. Parallel to the nature-like channel will be a 400-foot long, 30-foot wide concrete flume, which can facilitate multiple research activities on upstream and downstream fish passage and blockage. The concrete flume will include a headworks on the upstream end, with multiple weir and sliding gates, and tilting gates on the downstream end to control flow within the flume. Downstream of the two channels will be an entrance pad that provides uniform flow conditions between the channels and facilitates anchoring of research equipment. The project will also include relocation of the existing watermain, construction of a pedestrian bridge across both channels, construction of a research building with public restrooms, kayak portage facilities, and various park amenity improvements.

This project was planned to start in 2021 but is currently delayed due to a Grand Traverse County Circuit Court order.

SITE INVESTIGATION

The following discussion of the physical condition of the dam and appurtenances is based on observations and photographs obtained on the date of the inspection. Recommended actions related the existing dam and appurtenant structures are only required if reconstruction of the dam is significantly delayed.

Embankment

The dam embankment is in fair to poor condition. Most of the embankment is well vegetated with a healthy growth of grass that is well maintained. However, there are numerous trees of considerable size along the embankment. These trees present several risks to the dam, such as piping routes along the root systems and loss of embankment section in the event of a tree fall. All trees should be removed from the embankments to the abutments.

A gap was observed between the upstream sheet pile wall and the right wingwall for the auxiliary spillway, as can be seen in Photograph 20. There appears to be material loss in the area of the gap with settlement observed on the embankment. If the dam isn't replaced, this gap should be closed, and the embankment restored.

There is extensive seepage along the downstream toe of embankment in the vicinity of the primary outlet. This seepage, coupled with recent high water, appears to have induced some erosion and sloughing at the toe as can be seen in Photographs 46 through 48. The concrete walkway along the headwall of the primary spillway outlet is uneven and broken (Photographs 39 through 45) which is indicative of settlement typically associated with seepage and freeze/thaw effects. Given the extent of seepage on the dam and the age of the structure, geotechnical investigations and analyses should be performed on the embankment to ensure acceptable stability and seepage factors of safety under normal and extreme loading conditions, if the dam isn't replaced.

There are also numerous locations along the upstream and downstream slopes that are experiencing surface erosion due to foot traffic and to a lesser degree shoreline scour. These areas should be restored as necessary and protected with appropriate erosion control measures such as riprap or mulch.

Last, a water main traverses the entire length of the embankment crest, as shown in several of the photographs at the end of this report. The water main is buried as near the right abutment of the dam and as is traverses the principal spillway but is exposed as is traverses the fish ladder and auxiliary spillway near the left abutment of the dam. City staff have indicated that the water main has burst in past but did not significantly impact the dam. Depending on the location and severity, a water main burst could cause significant erosion of the embankment, potentially impacting stability of the dam. Though no remedial action is required at this time, proper observation and maintenance of the water main is imperative to dam safety. The permitted dam construction project would move the spillway upstream of its current location, eliminating risk of damage to the dam during a water main burst.

Primary Spillway

The primary spillway appears to be in fair condition based on visual observation. The observable concrete components appear to be in fair condition with minor cracking and efflorescence. Spalling and deterioration at the top of the outlet headwall can be seen in Photograph 42 and 45. This should be repaired to prevent further deterioration.

The outlet culverts were submerged and not observable on the day of the inspection. Given the duration since the last dive inspection and previous recommendations and repairs, the City should plan for another dive inspection and, if necessary, repairs. Given the age and material of the culverts, the City should plan for replacement of the culverts in the near future.

Based on reports from the operator, the gates have all been operated and lubricated routinely. It was noted that manual operation of the gates is inherently slow. Therefore, adjustment of gates in response to changing flow conditions is sometimes prolonged. Additionally, buildup of debris on the trash racks can impact the upstream water levels. Debris is routinely removed from the trash racks. This good maintenance practice should continue.

Fish Ladder

The fish ladder was closed off on the upstream end and drained on the day of the inspection. The condition of the ladder and concrete surfaces appears to be fair, with minor cracks and efflorescence present.

Auxiliary Spillway

The auxiliary spillway is in fair to poor condition. In order to prevent fish passage at the dam, fencing has been applied to the upstream weir. It is reported that debris buildup on this fencing is frequent and requires increased maintenance effort. During high flow conditions, debris removal could be challenging and limit the efficacy of the spillway. Frequent inspection of the auxiliary spillway is required to keep it free of debris.

The bank protection at the outlet of the auxiliary spillway appear to be compromised with the concrete slabs being undermined and displaced. These banks should be restored and protected with riprap or other erosion protection measures.

Similar to the primary spillway, the culverts of the auxiliary spillway are aged beyond their design life. These culverts should be inspected via video or dive inspection and repaired as necessary. The City should plan for replacement of the culverts in the near future.

STRUCTURAL STABILITY

Based upon observations during the inspection, there were no indicators of any conditions that represent an immediate threat to the dam's stability. However, due to the prevalence of seepage, numerous trees and isolated areas of settlement, the City should pursue further investigations into the stability of the structure if it is not replaced soon.

HYDROLOGY AND HYDRAULICS

The contributing drainage area of the Boardman River at the Union Street Dam is approximately 151 square miles. The design discharge for this high hazard potential dam is the 0.5 percent chance (200-year) flood discharge, which is estimated to be 2,200 cubic feet per second (cfs).

According to previous inspection reports that were reviewed and accepted for this dam, the existing spillway capacity is estimated to be approximately 2,250 cfs, with 1.0 foot of freeboard; therefore, the dam is considered to have adequate spillway capacity. Copies of the hydraulic calculations used to make this determination are on file with the Dam Safety Program.

During the inspection it was observed that debris can frequently buildup on the trash racks of the primary spillway and the fencing on auxiliary spillway. Routine inspection and maintenance are necessary to ensure debris is removed and adequate flow capacity is maintained. Additionally, the fish ladder was closed off at the direction of the Michigan Dept. of Natural Resources in response to concerns with allowing jumping fish species to access sections of the river now open following upstream dam removals. This closure will slightly limit the dam's ability to pass flood flows. Finally, City staff indicated that fully opening the 10 principal spillway gates during a flood can take

upwards of 5 hours. As such, a more detailed evaluation of the dam's hydraulic capacity is warranted, unless the dam is replaced soon. This evaluation should consider all factors described above and any other factors that might limit the hydraulic capacity of the dam that were not considered in previous evaluations.

The planned reconstruction of the dam includes construction of a fixed crest labyrinth spillway capable of safely conveying the design flood without operation of spillway gates. Passive management of a principal spillway is preferred as it does not require human intervention, or special maintenance in order to convey flood flows.

OPERATION AND MAINTENANCE

Operation of the dam is the responsibility of the owner or their designee. A written Operations and Maintenance Plan (O&M Plan) has been prepared and is on file with the Dam Safety Program.

The owner performs weekly operation and maintenance inspections. These inspections and other maintenance practices are included in the O&M Plan.

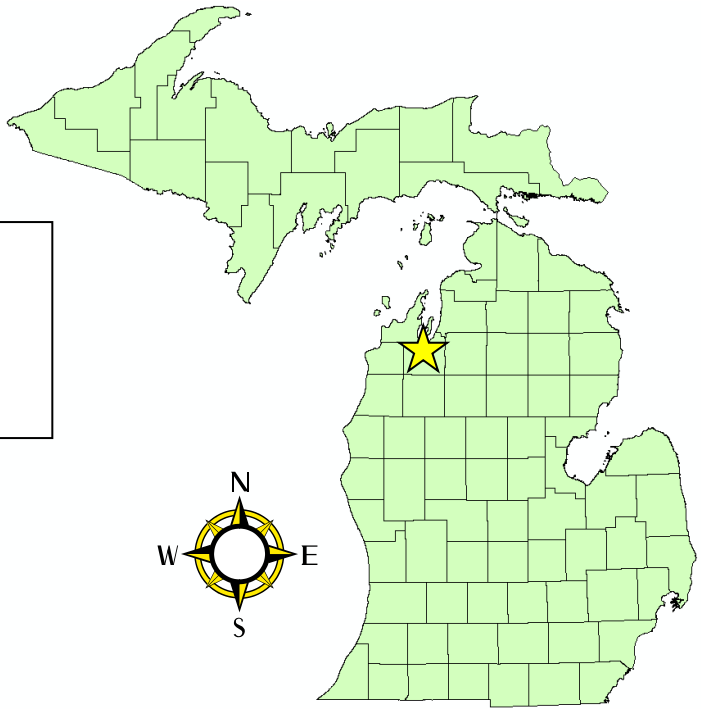
EMERGENCY ACTION PLAN (EAP)

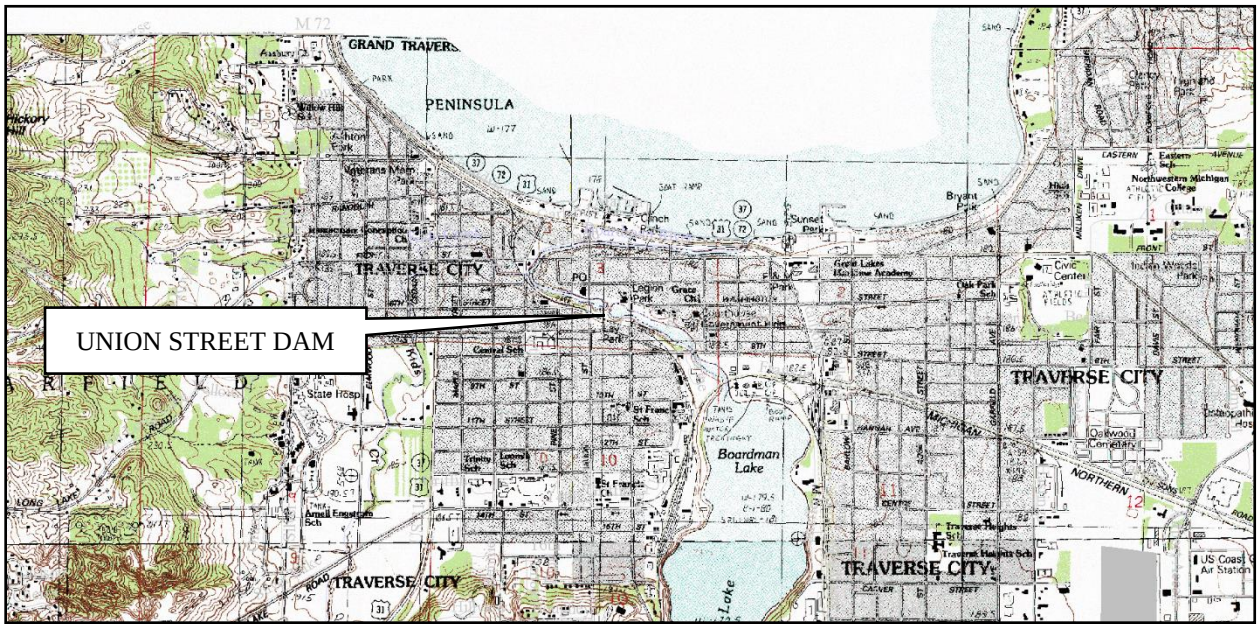
The Union Street Dam has a high hazard potential rating. An EAP is therefore required per the provisions of Part 315, Dam Safety, of the NREPA. An EAP, last updated on February 4, 2021, is on file with the Dam Safety Program. This fulfills your periodic EAP review and update requirements for this inspection cycle.

APPENDICES

A location map and inspection photographs are attached.

Union Street Dam
Dam ID No. 511
Section 3, T 27N, R 11W
Grand Traverse County





UNION STREET DAM
GRAND TRAVERSE COUNTY
DAM ID NO. 511

Photograph 1 – Upstream slope at left abutment viewed from auxiliary spillway. Note trees on embankment.

Photograph 2 – Upstream slope left of auxiliary spillway. Note erosion, trees and vegetation.

UNION STREET DAM
GRAND TRAVERSE COUNTY
DAM ID NO. 511

Photograph 3 – Erosion and tree growth adjacent to left upstream auxiliary spillway wing wall.

Photograph 4 – Right auxiliary spillway wing wall. Note minor cracking and efflorescence.

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Photograph 5 – Upstream face of auxiliary spillway and fish ladder. Note fencing on spillway and fish ladder to prevent fish passage.

Photograph 6 – Inlet to auxiliary spillway culverts with trash racks.

UNION STREET DAM
GRAND TRAVERSE COUNTY
DAM ID NO. 511

Photograph 7 – Left auxiliary spillway culvert inlet.

Photograph 8 – Right auxiliary spillway culvert inlet.

Photograph 9 – Crest of embankment over auxiliary spillway.

Photograph 10 – Stoplogs closing upstream end of fish ladder.

UNION STREET DAM
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Photograph 11 – Looking downstream at fish ladder from upstream entrance. Note fencing to block fish passage.

Photograph 12 – Looking at upstream fish ladder entrance from pedestrian bridge.

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DAM ID NO. 511

Photograph 13 – Left wall of fish ladder, looking upstream.

Photograph 14 – Looking downstream fish ladder from pedestrian bridge.

UNION STREET DAM
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DAM ID NO. 511

Photograph 15 – Downstream slope of embankment viewed from fish ladder. Note trees and foot traffic erosion.

Photograph 16 – Crest of embankment viewed from fish ladder.

UNION STREET DAM
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Photograph 17 – Downstream slope of embankment viewed from fish ladder.

Photograph 18 – Upstream face of auxiliary spillway viewed from right wingwall.

UNION STREET DAM
GRAND TRAVERSE COUNTY
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Photograph 19 – Impoundment upstream of dam.

Photograph 20 – Separation between upstream sheet pile and right auxiliary wingwall.

Photograph 21 – Left auxiliary spillway wingwall viewed from right wingwall.

Photograph 22 – Upstream face of embankment and primary spillway. Note recently removed debris.

UNION STREET DAM
GRAND TRAVERSE COUNTY
DAM ID NO. 511

Photograph 23 – Typical gate operator.

UNION STREET DAM
GRAND TRAVERSE COUNTY
DAM ID NO. 511

Photograph 24 – Looking upstream at left most bay of primary spillway intake.

Photograph 25 – Upstream face of embankment and primary spillway.

Photograph 26 – Looking upstream at third bay from left of primary spillway intake.

Photograph 27 – Left center bay of primary spillway intake.

Photograph 28 – Right center bay of primary spillway intake.

Photograph 29 – Upstream right abutment. Note trees and vegetation.

Photograph 30 – Upstream right abutment. Note submerged steps and walkway.

Photograph 31 – Right wingwall of primary spillway intake.

UNION STREET DAM
GRAND TRAVERSE COUNTY
DAM ID NO. 511

Photograph 32 – Looking at upstream right bank from right abutment.

Photograph 33 – Upstream slope viewed from right abutment.

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Photograph 34 – Crest viewed from right abutment.

Photograph 35 – Downstream slope from right abutment. Note trees.

Photograph 36 – Looking at right abutment and downstream bank from crest.

Photograph 37 – Animal burrow on downstream slope near right abutment.

Photograph 38 – Trees and foot traffic erosion on downstream slope near right abutment.

Photograph 39 – Concrete walkway over primary spillway outlet. Note broken concrete and seepage.

UNION STREET DAM
GRAND TRAVERSE COUNTY
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Photograph 40 – River channel downstream of primary spillway.

Photograph 41 – Downstream right bank. Note extensive vegetation.

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Photograph 42 – Concrete walkway over primary spillway. Note broken concrete and seepage.

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Photograph 43 – Concrete walkway and boardwalk along downstream toe of embankment. Note seepage and broken concrete.

Photograph 44 – Downstream slope of embankment to right of primary spillway. Note foot traffic erosion, trees and vegetation.

UNION STREET DAM
GRAND TRAVERSE COUNTY
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Photograph 45 – Concrete walkway over primary spillway outlet. Note seepage and erosion along toe of embankment.

Photograph 46 – Toe of embankment between primary spillway and fish ladder.

UNION STREET DAM
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Photograph 47 – Erosion along toe of embankment between primary spillway and fish ladder.

Photograph 48 – Seepage and erosion along toe of embankment between primary spillway and fish ladder.

UNION STREET DAM
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Photograph 49 – Downstream entrance to fish ladder.

Photograph 50 – Looking upstream at fish ladder from downstream entrance.

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Photograph 51 – Looking upstream at middle section of fish ladder.

Photograph 52 – Looking downstream at fish ladder entrance.

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Photograph 53 – Left bank of downstream river channel with boardwalk.

Photograph 54 – Auxiliary spillway outlet viewed from right wingwall.

Photograph 55 – Erosion behind auxiliary spillway right wingwall.

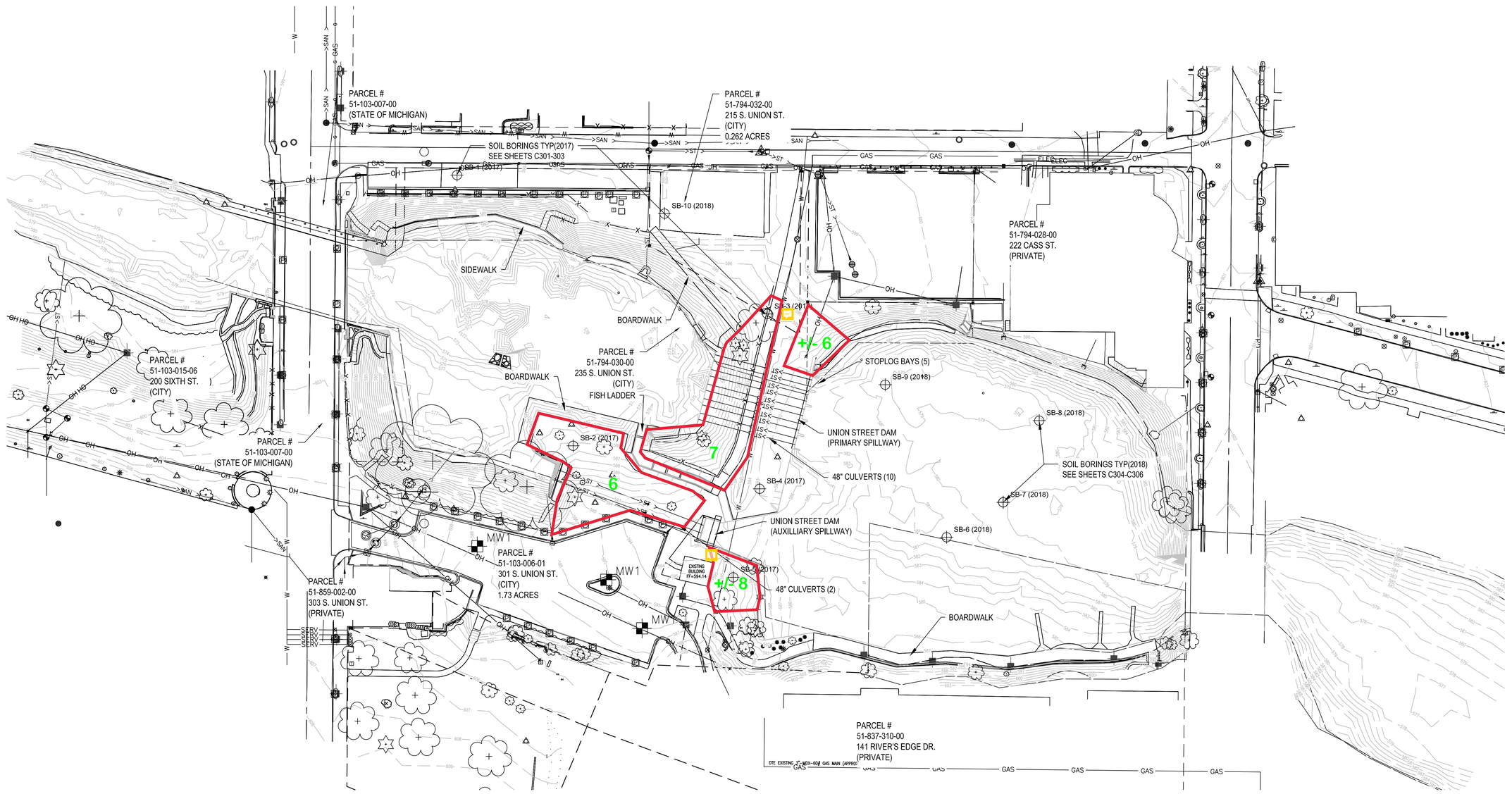
Photograph 56 – Left bank/wingwall of auxiliary spillway outlet.

Photograph 57 – Left auxiliary spillway culvert outlet.

Photograph 58 – Right auxiliary spillway culvert outlet

UNION STREET DAM
GRAND TRAVERSE COUNTY
DAM ID NO. 511

Photograph 59 – Looking upstream at Union Street Dam from Union Street Bridge.



LEGEND

- PROPERTY LINE
- ROW
- PAVEMENT BOUNDARY
- OVERHEAD ELECTRIC — OH
- EXISTING MAJOR CONTOUR LINE — 900
- EXISTING MINOR CONTOUR LINE
- WATER SURFACE ELEVATION
- WATER MAIN — W
- STORM SEWER — >ST<
- GAS MAIN — GAS
- FOUND PROPERTY CORNER
- SIGN
- GAS BOX
- WATER VALVE
- FIRE HYDRANT
- WATER MANHOLE (W)
- MONITORING WELL (MW1)
- STORM MANHOLE (ST)
- CATCH BASIN
- ROUND/BEEHIVE GRATE CATCH BASIN
- SB-X (YEAR) SOIL BORING - EXISTING
- SHRUB
- DECIDUOUS TREE
- CONIFEROUS TREE
- PED LIGHT POLE
- ELECTRIC RISER
- TELEPHONE RISER/BOX
- UTILITY POLE
- GUY WIRE
- PARKING METER

NORTH

0 40' 80'

US Army Corps of Engineers
Detroit District

Mark	Description	Date	Appr.
	AS-AWARDED	10/13/2020	

File Name: C000 - GENERAL PLAN OF THE SITE.dwg
Plot Scale:
Plot Date: February 25, 2020
PROJECT NO. 60554424
Zero Accidents Zero Tolerance

DESIGN BY: J. MCDERMOTT
DRAWN BY: J. MCDERMOTT
REVIEWED BY: T. NAPIERALA

TRAVERSE CITY, MI
10850 TRAVERSE CITY HIGHWAY
SUITE 950
ph (231) 932-7582
AECOM

FISHPASS PROJECT AT UNION STREET DAM TRAVERSE CITY, MICHIGAN

GENERAL PLAN OF THE SITE

SHEET
C000

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