



Lake Shannon Dam
Dam Identification No. 621 | Tyrone Township, Livingston
County, Michigan

NATIONAL DAM SAFETY PROGRAM INSPECTION REPORT

October 18, 2022



**LAKE SHANNON DAM
DAM IDENTIFICATION NO. 621
LIVINGSTON COUNTY, MICHIGAN**

**NATIONAL DAM SAFETY PROGRAM
INSPECTION REPORT**

Owner

**Lake Shannon Homeowners Association
Attn: Jeff Coates
7213 Driftwood Drive.
Fenton, MI 48430
(810) 516-5250 (cell)**

Hazard Potential Classification

Low

Prepared By:

**Wade Trim Associates, Inc.
25251 Northline Road
Taylor, MI 48180
(734) 947-9700**

Inspection Date

September 16,2022

This dam was inspected by, and report prepared by:



**Robert R.
Breen, PE**

Digitally signed by Robert R. Breen, PE
DN: cn=Robert R. Breen, PE, o=Wade
Trim Associates, ou=Transportation,
email=rbreen@wadetrim.com, c=US
Date: 2022.10.20 09:14:13 -04'00'

Robert R. Breen, PE
Michigan Registration No. 28033

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1. INTRODUCTION

The purpose of this inspection is to evaluate the structural condition and hydraulic capacity of this dam as required by Part 315, Dam Safety, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. The Michigan Department of Environment, Great Lakes, and Energy (EGLE) has classified this dam as having a low hazard potential. Wade Trim was requested by the Lake Shannon Homeowners Association to prepare this report for the Lake Shannon Dam. The report includes discussion of observations based on a visual only investigation of the dam and review of any previous inspection reports, plans, and data, which are available. The report also includes approximate hydraulic measurements from EGLE. This report should not be considered an in-depth engineering investigation, as there was no material testing done nor was there any geotechnical investigation of the embankment.

2. EXECUTIVE SUMMARY

The Lake Shannon Dam is comprised of a 1,500-foot-long earthen embankment, an auxiliary spillway, and a control structure. Overall, the dam is in generally fair to good condition overall. The embankment is in relatively good condition. It is well vegetated with heavy overgrowth and significant large tree growth along the embankment area, both upstream and downstream. Driftwood Drive, an asphalt secondary road traverses along the top of the embankment the entire length. Towards the south end of the embankment, the grades drop to form part of the auxiliary spillway. The upstream side of the embankment is lacking some rip rap along the shoreline. The upstream concrete drop structure is showing signs of deterioration around the top portion of the structure. The concrete is cracked and is disintegrating at a number of contact points with the steel grating. There is no safety handrail around the structure. The electrical and control cabinets need to be upgraded to meet current electrical standards. The following recommended actions are listed by priority. There appears to be no apparent significant changes in the condition of the structure since the inspection completed in 2017.

Following are conclusions and recommendations for repair/maintenance items outlined in this report.

1. Safety handrail should be attached to the perimeter of the control structure to prevent people from falling off the structure and into the water.
2. Trees should be removed from the upstream and downstream sides of the embankment. Strong winds could uproot the trees, causing damage to the

integrity of the embankment and potential failure to the embankment. Grass and lower lying overgrowth would be acceptable to maintain soil stability to the embankment and erosion protection.

3. The electrical cabinets need to be updated to meet current electrical standards. The use of plug-in extension cords within the cabinets is not in line with electric codes. Section 400.8(1) of the National Electric Code (NEC) does not permit flexible cords and cables to be used as a substitute for permanent wiring of a structure. Currently, the electric box on land has three extension cords plugged into a 4-outlet box. One extension cord extends through the buried conduit to the gate structure. At the gate structure control box, the extension cord is plugged into the electric cord for the power drive unit. The power drive should be plugged directly into a hard-wired outlet box, rated for minimum 15 amps (20 amps preferred).
4. Debris pile should be removed from auxiliary spillway on downstream side. A guardrail with gate should be placed along the length of the spillway to prevent access into the spillway resulting in the illegal dumping.
5. There are a number of trip hazards presenting themselves on the grating walkway that need to be eliminated.
6. Add rip rap to the upstream embankment shoreline from edge of water, up the embankment.
7. Add riprap on the downstream outlet slope around the 96-inch outlet.

Based upon observations at the time of the inspection, there are no visually apparent deficiencies that may lead to imminent failure. However, the second bullet above should be addressed as soon as possible to maintain the integrity of the embankment.

The low hazard potential rating for this dam remains appropriate. The dam location along the watercourse lends itself to the low hazard rating. There is one house immediately downstream and offset by approximately 250 feet from the edge of the downstream receiving waters of North Ore Creek. According to the latest FEMA maps this house is outside the Base Flood Elevation. Otherwise, the downstream reach of North Ore Creek is uninhabited, consisting of heavy overgrowth, and forested.

3. PROJECT INFORMATION

A. Dam Description

The Lake Shannon Homeowners Association is the present owner of the dam control structure, embankment, and auxiliary spillway. The spillway is located approximately 1,500 feet south of the control structure. The dam is located in Tyrone Township, T04N, R06E, Section 19, Livingston County, Michigan. The dam is situated at the north end of Lake Shannon. The control structure consists of a multi-cell concrete box. The reinforced concrete structure is approximately 12 feet wide by 30 feet long. There is grating on the walking surface of the box structure. A fenced in enclosure surrounds the motorized sluice gate lift and the manually controlled stop logs. The motorized sluice gate is used as the primary control for the lake level. The two stop logs are used in cases where increased flows are required to maintain lake levels, especially after a storm event. The top rim of the concrete structure matches the lake operating level of El. 890 feet. Normal flow is over the rim. Additionally, the sluice gate is open as necessary to maintain the El 890 feet as flows increase into Lake Shannon.

The control structure outlets into 96-inch CMP pipe which runs approximately 140 feet north through the embankment and discharges into North Ore Creek. There are steel sheet pile wingwalls at the discharge pipe.

The earth embankment is approximately 1,500 feet in length and a height of approximately 8 feet. The crest of the spillway, at the east end, is approximately El. 891.50 feet with a low point at the spillway of El. 890.60 feet. .

B. Geology and Soils of the Area

A review of the Soil Survey of Livingston County Area, Michigan published in 2015 by the U.S. Department of Agriculture Soil Conservation Service through the web soil survey indicates soils in the area of the North Ore Creek at Lake Shannon Dam are predominately alluvial land, Fox-Boyer complex and Spinks-Oakville loamy sands. All consist of loamy over sandy to stratified sandy and gravelly glaciofluvial deposits.

C. Classification

There are two (2) classifications associated with dams under the National Dam Safety Criteria: Size Classification and Hazard Classification. The storage

capacity or the height of the dam, whichever provides the larger size category, establishes Size Classification (Table 1). Hazard Potential Classification (Table 2) refers to the potential loss of life and/or property damage in the area downstream of the dam, in the event of a dam failure. This classification does not reflect upon the structural integrity of the dam. Dams conforming to criteria for the Low Hazard Potential category generally are located in rural or agricultural areas where failure may damage farm buildings, limited agricultural land, township, or county roads. Significant Hazard Potential category structures are those located in predominantly rural or agricultural areas where failure may damage isolated homes, secondary highways or minor railroads or cause interruption of use or service of relatively important public utilities. Dams in the High Hazard Potential category are those located where failure may cause serious damage to homes, extensive agricultural, industrial, and commercial facilities, important public utilities, main highways, or railroads. The classifications for the Lake Shannon Dam is in accordance with the following table.

Table 1 Size Classification		
Impoundment		
<u>Category</u>	<u>Storage (Acre-Ft)</u>	<u>Height (feet)</u>
Small	<1,000 & ≥ 50	or <40 & ≥ 25
Intermediate	≥ 1,000 & < 50,000	or ≥ 40 & < 100
Large	≥ 50,000	or ≥ 100
Table 2 Hazard Potential Classification		
<u>Category</u>	<u>Loss of Life (Extent of Development)</u>	<u>Economic Loss (Extent of Development)</u>
Low	None expected (no Permanent structures for human habitation)	Minimal (Undeveloped occasional structures or agriculture)
Significant	Few (No urban development and no more than a small number of inhabitable structures)	Appreciable (Notable agriculture, industry or structures)
High	More than few	Excessive (Extensive Community, industry or agriculture)

Per the National Inventory of Dams (NID) the normal storage for Lake Shannon is 2,790 acre-feet and the dam height is 22 feet. Based on impoundment capacity, size of the dam, location of the dam, available technical information,

and engineering judgment, the Lake Shannon Dam has been classified in the Intermediate Size and Low Hazard Potential categories. Low Hazard is due to no potential of property damage since the vast majority of downstream land is undeveloped and extremely low probability of loss of life in the event of a failure of the dam. It is the judgment of this inspector that these classifications are correct.

The hazard potential rating is based upon the location and elevation of structures immediately downstream and does not reflect upon the structural integrity of the dam.

4. SITE INVESTIGATION

A. General

Wade Trim performed an inspection of the Lake Shannon Dam on September 16, 2022. The inspection was completed by senior structural engineer Robert Breen, PE, with assistance by Michael Hume. The inspection consisted of an evaluation of the embankment, control structure, auxiliary spillway, outlet culvert and the downstream streambanks. Findings from the site investigation are detailed below.

B. Embankment

The embankment is heavily vegetated with extreme overgrowth and extensive tall trees along each side of the embankment. What could be examined along the length of the embankment revealed no evidence of seepage or sloughing/settlement of soils due to seepage through the soils. No animal burrows were detected, although the areas of heavy overgrowth could not be examined extensively. The upstream shoreline along Lake Shannon could use additional rip rap to protect against wave action on the lake. Along the centerline of the embankment is Driftwood Drive. It is a 24-foot-wide asphalt paved road with two-foot gravel shoulders each side. As it traverses north to south along the embankment, it changes elevation to account for the emergency spillway across the road/embankment. The HMA surface is in good condition. There is no cracking of the asphalt surface which could indicate settlement or movement of the roadway and embankment.

C. Control Structure

The concrete portion of the control structure that was visible during the inspection is in good condition. The exposed portion of the concrete structure is exhibiting some very minor cracking in isolated areas of concrete. There is no handrail around the lower portion of the structure. There is a walkway grating supported by the concrete walls. The grating does not feel adequate as it deflects when walking across it. There are two areas where there are hinged floor openings that stick up above the adjacent walk surface. These present significant trip hazards. In addition, at the west side of the lower walkway, a 3-inch electrical conduit is approximately six inches above the walkway presenting yet another significant trip hazard.

From an operational standpoint, the center sluice gate is a motor operated vertical lift gate. This is operated manually (with any automatic controls) by way of a Rigid 700 power drive that is fed from an extension cord inside the control box on the structure. The power drive, which is removable, attaches to a square nut drive that in turn, raises and lowers the sluice gate located at the 60-inch inlet pipe. During the inspection, the power drive was engaged and raised and lowered the sluice gate an inch or so. This was to show the gate and motor drive operated. The two stop logs are manually operated. Each is raised or lowered via a dual hand crank with heavy duty nylon straps. The stop logs were not exercised during the inspection. However, it was noted that new nylon straps and new ratcheted manual lifts have replaced older lift equipment. It is the opinion of this inspector that repairs be made to the steel walkway grating to eliminate the trip hazards at the grating. Also, either the steel conduit be relocated to eliminate the trip hazard, or a level of grating be installed above it to create an intermediate landing.

D. Outlet Culvert

The 96-inch corrugated multi-plate (CMP) culvert that serves to convey downstream flow through the embankment is in relatively good condition. There is some minor rusting of the metal plates but does not appear to have threatened the integrity of the pipe. There are steel sheet piling wingwalls either side of the pipe that retain the slopes in behind the walls around the pipe. There is no indication of movement of these walls. There is some riprap in place at the invert outlet of the pipe. Outlet flow under normal flow is in general alignment with the downstream North Ore Creek.

E. Auxiliary Spillway

The spillway is located approximately 1,500 feet east of the control structure. The upstream side is a combination of some buried riprap and vegetation. Driftwood Drive forms the top surface of the spillway and is in relatively good condition with only minor asphalt cracking, normal for this type of pavement. The downstream spillway has an overall opening of approximately 100 feet (curb to curb) with an effective clear opening of approximately 70 feet. There is no barrier to prevent access down the spillway. Illegal dumping of cut brush and other debris sits within the spillway. The surface of the downstream spillway is concrete. Overflow water goes down the spillway and outlets into the Ore Creek floodplain to the north.

5. STRUCTURAL STABILITY

The general overall condition of the dam appears to be in generally good condition. There is no visual evidence of any structural instability of the dam. The gate structure requires some rehabilitation and possibly painting to maintain the structure and make it a safe environment for walking on. Overall, the embankment itself is in good condition. As noted, the downstream spillway needs to be cleaned of debris and a method employed to keep illegal dumping out of the spillway.

6. HYDROLOGY AND HYDRAULICS

A. Historical Data

The Lake Shannon Dam (Dam ID # 0621) is located in Tyrone Township, T04N, R06E, Section 19, Livingston County, Michigan. The dam is an earth embankment with a concrete drop structure. From prior information provided by the HOA, the control structure was constructed around 1960. The overflow spillway was reconstructed in 1975 after an earlier washout of a portion of the earthen embankment. Further enhancements to the control structure have been made in subsequent years.

B. Design Discharge

According to the Dam Safety Act, “low hazard potential dams shall be capable of passing the 100-year flood of record or 1.0% chance flood. In October 2022, EGLE-WRD provided the following flood discharge information for the North Ore Creek at Lake Shannon Dam. The estimated 100-year peak discharge (1.0% chance flood) is 1500 cubic feet per second, based on a drainage area of approximately 53.9 square miles. Based upon previous hydraulic evaluations, the current control structure is capable of passing approximately 1,000 to 1,100 cfs or 70% of the 100-year flow. The remaining 30% of the 100-year flow (+/-450 cfs) can be handled by the auxiliary spillway. Thus, the dam as a whole can handle the 100-year flow.

7. OPERATION AND MAINTENANCE

A. Dam Operation and Dam Maintenance

The homeowner’s association has developed an operation and maintenance procedure for the Lake Shannon Dam. Written instructions are located inside the operators control panel on the gate structure. The HOA actively maintains the dam structure in accordance with these procedures.

- Motorized sluice gate is exercised twice a year,
- Manual lift stop log gates are exercised regularly,
- Grease fittings are injected 2-3 times a year.

As part of the notification process between the Lake Shannon dam and adjacent dams, as-needed communication occurs with the Parishville dam in Livingston County and Lobdell Lake dam in Genesee County when any or all of the dams are altering their flows through their respective control structures.

B. Emergency Action Plan

Since the Lake Shannon Dam is rated as a Low Hazard dam, an Emergency Action Plan (EAP) is not required.

APPENDICES

APPENDIX A.1: LOCATION MAP

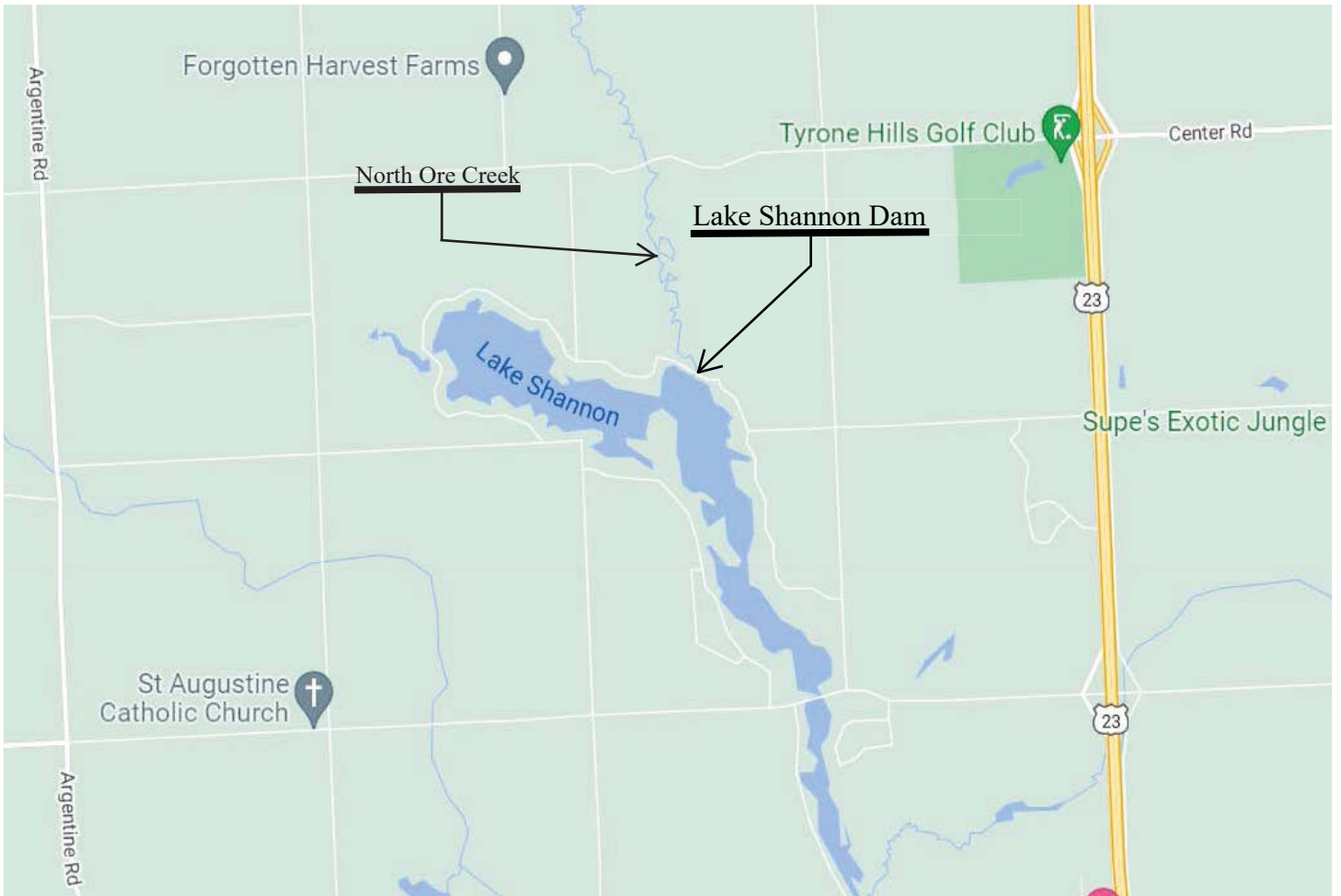
APPENDIX A.2: DAM STRUCTURE DRAWINGS

APPENDIX A.3: EGLE 100-YEAR PEAK DISCHARGE DATA

APPENDIX A.4: INSPECTION PHOTOGRAPHS

APPENDIX A.1
LOCATION MAP

T04N, R06E, Section 19, Tyrone Township,
Livingston County, Michigan



APPENDIX A.2
DAM STRUCTURE DRAWINGS

ENCLOSURE AROUND
OPERATING CABINET

Water Flow into Structure over
Logs and over Wall

Normal Water
Level
El. 890'

8' pipe to
Creek below Dam

POWER OPERATED
SLUICE GATE

Extra Grooves inside
Walls

6' Pipe from
Lake

Stop Logs
(MANUALLY OPERATED)

SECTION A

PLAN

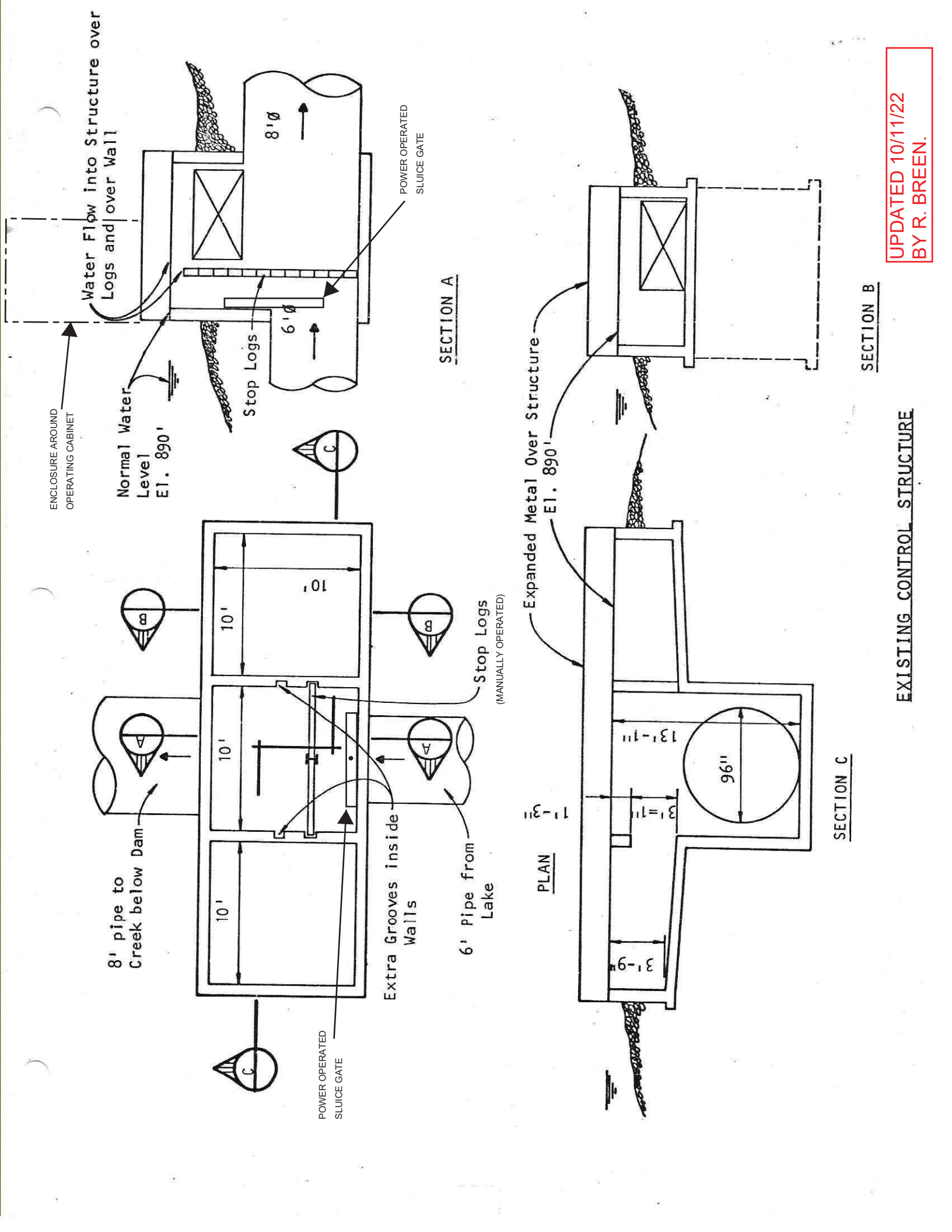
Expanded Metal Over Structure
El. 890'

SECTION C

SECTION B

EXISTING CONTROL STRUCTURE

UPDATED 10/11/22
BY R. BREEN.



APPENDIX A.3
EGLE 100 -YEAR PEAK
DISCHARGE DATA

From: [Hume, Michael](#)
To: [Breen, Robert](#)
Subject: FW: Flood or Low Flow Discharge Request Lake Shannon Dam
Date: Thursday, October 13, 2022 10:56:02 AM

-----Original Message-----

From: EGLE-wrd-qreq <EGLE-wrd-qreq@michigan.gov>
Sent: Thursday, October 6, 2022 8:24 PM
To: Hume, Michael <mhume@wadetrim.com>
Subject: RE: Flood or Low Flow Discharge Request

This message originated from outside of Wade Trim

We have processed the discharge request submitted by email on September 20, 2022 (Process No. 20220602), as follows:

North Ore Creek at Shannon Lake Dam, Dam ID 621, Section 19, T4N, R6E, Tyrone Township, Livingston County, has a total drainage area of 53.9 square miles and a contributing drainage area of 53 square miles. The design discharge for this dam is the 1% chance (100-year) flood. The 50%, 20%, 10%, 4%, 2%, 1%, 0.5%, and 0.2% chance peak flows are estimated to be 480 cubic feet per second (cfs), 700 cfs, 900 cfs, 1100 cfs, 1300 cfs, 1500 cfs, 1700 cfs, and 2000 cfs, respectively. (Watershed Basin No. 32C Shiawassee).

Please include a copy of this letter with your inspection report or any subsequent application for permit. These estimates should be confirmed by our office if an application is not submitted within one year. If you have any questions concerning the discharge estimates, please contact Ms. Susan Greiner, Hydrologic Studies and Floodplain Management Unit, at 517-927-3838, or by email at: GreinerS@michigan.gov. If you have any questions concerning the hydraulics or the requirements for the dam safety inspection report, please contact Mr. Luke Trumble of our Dam Safety Unit at 517-420-8923, or by email at: TrumbleL@michigan.gov.

Low flows are provided in a separate email.

-----Original Message-----

From: EGLE-Automated <EGLE-Automated@michigan.gov>
Sent: Tuesday, September 20, 2022 4:52 PM
To: EGLE-wrd-qreq <EGLE-wrd-qreq@michigan.gov>
Subject: Flood or Low Flow Discharge Request

Requestor: Michael Hume
Company: Wade Trim, Inc.
Address: 25251 Northline Road
City/State: Taylor, MI
ZIP Code: 48180
Phone: 7349472679
Date: 09/20/2022

50 percent
20 percent
10 percent
4 percent
2 percent
1 percent
0.5 percent
0.2 percent

Monthly 95 percent exceedance

Monthly 50 percent exceedance

Monthly Mean

90 Day, 10 year (90Q10)

Lowest monthly 95 percent exceedance

Lowest monthly 50 percent exceedance

Contact Agency:

Contact Person:

Watercourse: North Ore Creek

Local Name: Lake Shannon

County: Livingston

City/Township: Tyrone Township

Section: 19

Town: T4N

Range: R6E

Location: Tyrone Township, MI, approximately 3500 feet west of Linden Road, on Driftwood Drive North.

FFR1: Dam

Email: mhume@wadetrim.com

APPENDIX A.4
INSPECTION PHOTOGRAPHS

2022 Lake Shannon Dam, Dam Inspection

PHOTO 1



LOOKING EAST TOWARDS DAM CONTROL STRUCTURE

PHOTO 2



LOOKING SOUTH TOWARDS DAM CONTROL STRUCTURE

2022 Lake Shannon Dam, Dam Inspection

PHOTO 3



LOOKING WEST TOWARDS DAM CONTROL STRUCTURE

PHOTO 4



LOOKING NORTH TOWARD DAM CONTROL STRUCTURE

2022 Lake Shannon Dam, Dam Inspection

PHOTO 5



LOOKING SOUTH TOWARD LAKE FROM DAM CONTROL STRUCTURE

PHOTO 6



ROADWAY NORTH OF DAM CONTROL STRUCTURE LOOKING NORTH TOWARDS NORTH EMBANKMENT

2022 Lake Shannon Dam, Dam Inspection

PHOTO 7



NORTH EMBANKMENT NORTH OF ROADWAY

PHOTO 8



ROADWAY LOOKING EAST, NORTH OF DAM CONTROL STRUCTURE

2022 Lake Shannon Dam, Dam Inspection

PHOTO 9



ROADWAY LOOKING WEST, NORTH OF DAM CONTROL STRUCTURE

PHOTO 10



RIPRAP NORTH OF DAM CONTROL STRUCTURE, ALONG EMBANKMENT

2022 Lake Shannon Dam, Dam Inspection

PHOTO 11



ELECTRICAL CONDUIT- ELECTRICAL BOX TO THE DAM CONTROL STRUCTURE

PHOTO 12



CLOSE UP OF ELECTRICAL CONDUIT AS TRIP HAZARD

2022 Lake Shannon Dam, Dam Inspection

PHOTO 13



TYPICAL PULLEY SYSTEM TO OPEN STOP LOGS (TYP 2 LOCATIONS)

PHOTO 14



TRIP HAZARD ON DAM CONTROL STRUCTURE

2022 Lake Shannon Dam, Dam Inspection

PHOTO 15



SEDIMENT BUILDUP, SOUTH SIDE OF DAM CONTROL STRUCTURE

PHOTO 16



RUSTING & DETERIORATION ON STEEL SURFACES OF DAM CONTROL STRUCTURE

2022 Lake Shannon Dam, Dam Inspection

PHOTO 17



TRIP HAZARD ON DAM CONTROL STRUCTURE

PHOTO 18



TYPICAL GRATING AND SUPPORT SYSTEM @ CONTROL STRUCTURE

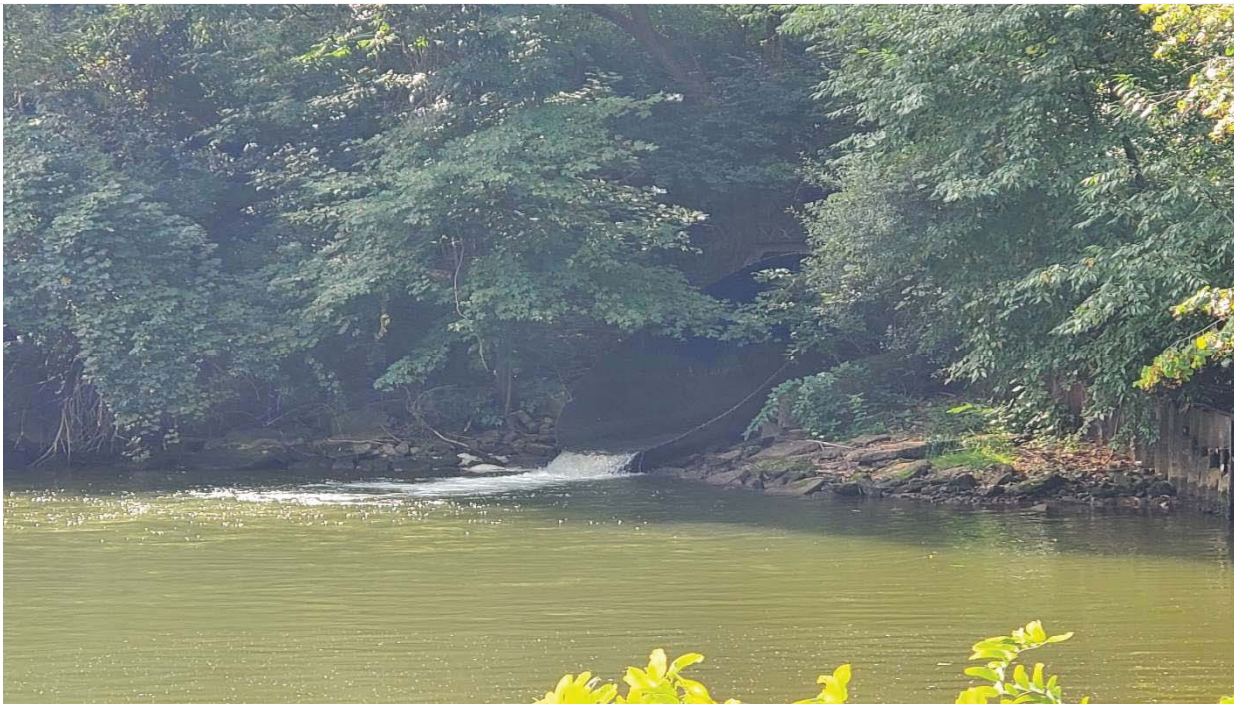
2022 Lake Shannon Dam, Dam Inspection

PHOTO 19



DOWNSTREAM CORRUGATED METAL PIPE OUTFLOW DISCHARGE

PHOTO 20



DOWNSTREAM LOOKING SOUTH TOWARD 96 IN CORRUGATED METAL PIPE DISCHARGE INTO NORTH ORE CREEK

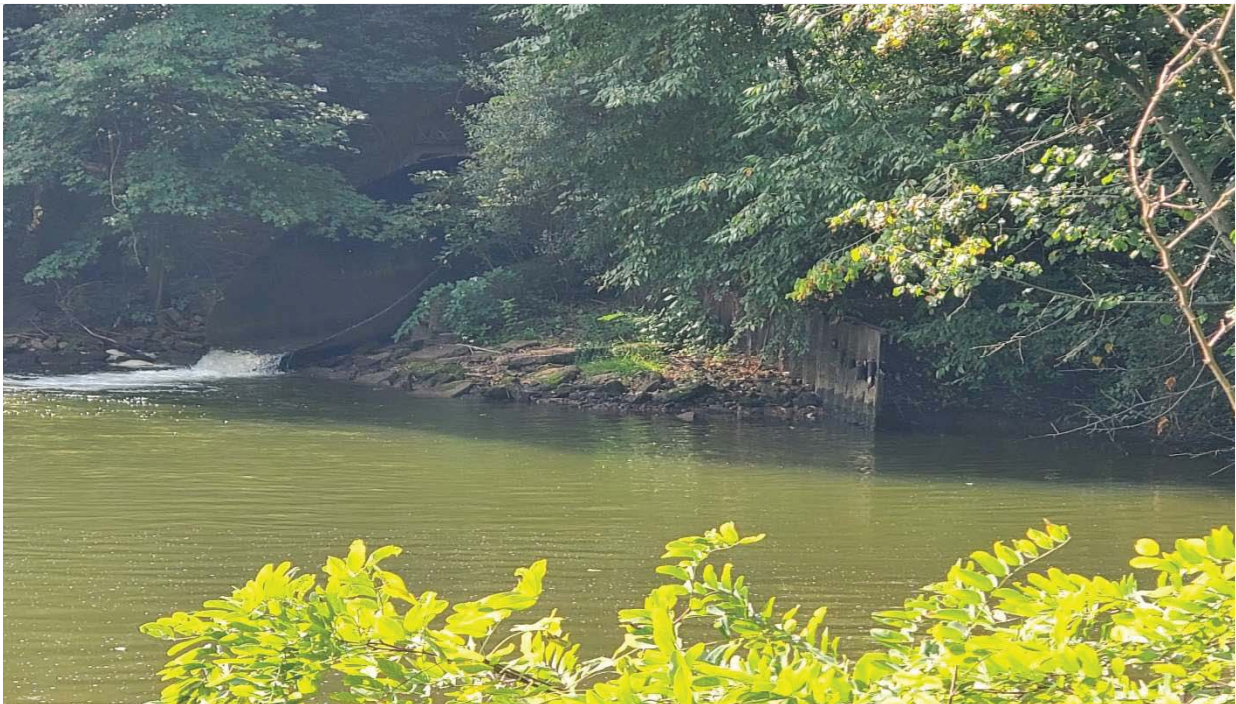
2022 Lake Shannon Dam, Dam Inspection

PHOTO 21



DOWNSTREAM OUTFLOW RIVER AREA LOOKING SOUTH

PHOTO 22



SHEET PILING TO WEST OF OUTFLOW DISCHARGE PIPE

2022 Lake Shannon Dam, Dam Inspection

PHOTO 23



EMERGENCY SPILLWAY LOOKING EAST

PHOTO 24



SOUTH EMBANKMENT OF EMERGENCY SPILLWAY LOOKING SOUTH TOWARD LAKE

2022 Lake Shannon Dam, Dam Inspection

PHOTO 25



NORTH EMBANKMENT OF EMERGENCY SPILLWAY LOOKING NORTH, DEBRIS PILE BUILDUP IN MIDDLE OF CONCRETE SLOPING SURFACES

PHOTO 26



NORTH EMBANKMENT OF EMERGENCY SPILLWAY LOOKING EAST, DEBRIS PILE IN MIDDLE OF CONCRETE SLOPING SURFACES

2022 Lake Shannon Dam, Dam Inspection

PHOTO 27



EMERGENCY DRY HYDRANT VALVE

PHOTO 28



TYPICAL SOUTH EMBANKMENT OF LAKE SHANNON NEAR EMERGENCY SPILLWAY

2022 Lake Shannon Dam, Dam Inspection

PHOTO 29



EMERGENCY SPILLWAY LOOKING WEST

PHOTO 30



TYPICAL TREE AND BRUSH GROWTH BUILDUP ON THE SOUTH EMBANKMENT

2022 Lake Shannon Dam, Dam Inspection

PHOTO 31



NORTH OF ROADWAY EMBANKMENT, WITH TYPICAL TREE AND BRUSH GROWTH THROUGHOUT

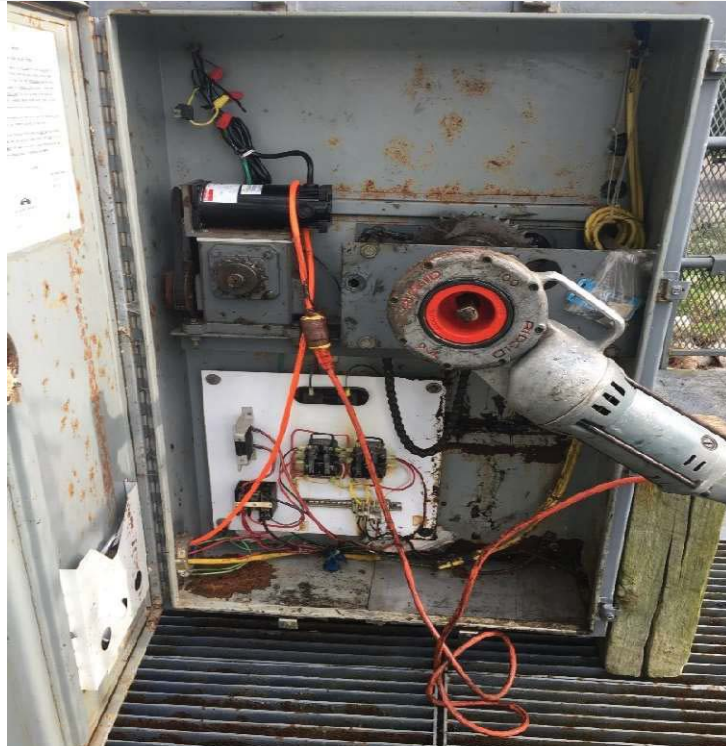
PHOTO 32



WATER LEVEL CONTROL ELECTRICAL BOX OFF DAM CONTROL STRUCTURE

2022 Lake Shannon Dam, Dam Inspection

PHOTO 33



WATER LEVEL CONTROL BOX ON DAM CONTROL STRUCTURE