STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
WATER RESOURCES DIVISION

GRETCHEN WHITMER
GOVERNOR

PHILLIP D. ROOS
DIRECTOR

November 27, 2024

VIA E-MAIL

Wesley Sanchez, Director of Public Works
Village of Lake Orion
21 East Church Street
Lake Orion, Michigan 48362

Dear Wesley Sanchez:

SUBJECT: Lake Orion Dam, Dam ID No. 259, Oakland County

The enclosed Dam Safety Inspection Report for the Lake Orion Dam was prepared by Allyson Hartz and Lucas Trumble, P.E., both of the Dam Safety Unit, 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, 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 the dam, as required by Part 315 of the NREPA.

The Lake Orion Dam is in satisfactory condition. The following recommended actions are listed by priority:

1. Review, and update as necessary, the dam's current Emergency Action Plan (EAP) in coordination with Oakland County Emergency Management. Provide the results of this review, and any updates, to the Dam Safety Program as soon as possible. **This action has been overdue since December 31, 2008.**

2. **Trees and Brush (Action: Maintenance):** Continue efforts to remove all trees and brush from the earthen embankment. Flush cut and/or grind stumps and remove clearing debris from the embankment. The stumps should be cut a maximum of one (1) foot above ground. Establish appropriate vegetation if stump is to be ground. We do not recommend uprooting trees for removal. Tree roots can lead to piping failure by cultivating flow paths in the embankment especially when the tree dies. Trees can also cause extensive damage and/or failure when they are uprooted from a storm. Complete action by December 31, 2026.

   a. Embankment - Upstream Slope, Downstream Slope

3. **Deteriorating Material (Action: Monitor, Maintenance):** Inspect locations of concrete deterioration, a minimum of twice per year, to ensure the deterioration is not increasing in size. Consider concrete repairs in the next five (5) years to prevent structural concerns.

a. Auxiliary Spillway - Headwall, Outlet Conduit

b. Embankment - Downstream Slope

i. Monitor deterioration of concrete retaining wall at drain outlet

4. **Ground Cover (Action: Monitor, Maintenance):** A large area of bare ground with exposed soil was observed on the right downstream embankment slope, specifically adjacent to the principal spillway wall. Continue efforts to establish appropriate vegetation cover to stabilize the slope. Monitor this area for loss of earth material.

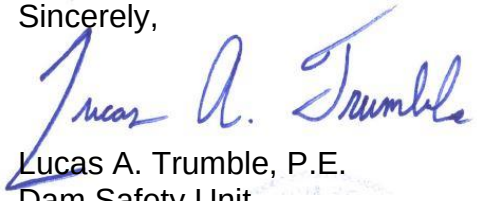
a. Embankment - Downstream Slope

5. Gates should be maintained according to the manufacture's recommendations and operated through their entire range of motion a minimum of once a year to ensure they are working properly.

6. Create an operation and maintenance plan. A proper operation and maintenance plan will increase the dam's service life and maintain the dam's hydraulic and structural condition.

If you have any questions regarding these recommendations, please contact Allyson Hartz at 517-331-5687, or HartzA1@Michigan.gov, or you may contact me.

Sincerely,



Lucas A. Trumble, P.E.
Dam Safety Unit
Water Resources Division
Department of Environment, Great Lakes, and Energy
517-420-8923

Enclosure

cc: Lori Swanson, Michigan Department of Transportation
Rob Seeley, Oakland County Emergency Management Coordinator
Allyson Hartz, EGLE
File

DAM SAFETY INSPECTION REPORT
LAKE ORION DAM – DAM ID NO. 259
PAINT CREEK
OAKLAND COUNTY – SECTION 2, T04N, R10E

OWNER(S)/OPERATOR(S):

Wes Sanchez, Director of Public Works
Village of Lake Orion
21 East Church Street
Lake Orion, Michigan 48362

Lori Swanson, Manager
Oakland TSC, Michigan Department of Transportation
800 Vanguard Drive
Pontiac, Michigan 48341

HAZARD POTENTIAL CLASSIFICATION: Significant

INSPECTION DATE: October 24, 2024

REPORT DATE: November 27, 2024

PREPARED AND INSPECTED BY:

Allyson Hartz
Dam Safety Unit
Water Resources Division
Department of Environment, Great Lakes, and Energy
P.O. Box 30458
Lansing, Michigan 48909-7958
517-331-5687

Lucas A. Trumble, P.E.
Registration Number: 58295
Dam Safety Unit
Water Resources Division
Department of Environment, Great Lakes, and Energy
P.O. Box 30458
Lansing, Michigan 48909-7958
517-231-8594

INTRODUCTION

The purpose of this inspection was to evaluate the structural condition and hydraulic capacity of the Lake Orion Dam, as required by 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 Village of Lake Orion.

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 Lake Orion Dam is in satisfactory condition.

The following recommended actions are listed by priority:

1. Review, and update as necessary, the dam's current Emergency Action Plan (EAP) in coordination with Oakland County Emergency Management. Provide the results of this review, and any updates, to the Dam Safety Unit as soon as possible. **This action has been overdue since December 31, 2008.**

2. **Trees and Brush (Action: Maintenance):** Continue efforts to remove all trees and brush from the earthen embankment. Flush cut and/or grind stumps and remove clearing debris from the embankment. The stumps should be cut a maximum of one (1) foot above ground. Establish appropriate vegetation if stump is to be ground. We do not recommend uprooting trees for removal. Tree roots can lead to piping failure by cultivating flow paths in the embankment especially when the tree dies. Trees can also cause extensive damage and/or failure when they are uprooted from a storm. Complete action by December 31, 2026.

    a. Embankment - Upstream Slope, Downstream Slope

3. **Deteriorating Material (Action: Monitor, Maintenance):** Inspect locations of concrete deterioration, a minimum of twice per year, to ensure the deterioration is not increasing in size. Consider concrete repairs in the next five (5) years to prevent structural concerns.

    a. Auxiliary Spillway - Headwall, Outlet Conduit

    b. Embankment - Downstream Slope

        i. Monitor deterioration of concrete retaining wall at drain outlet

4. **Ground Cover (Action: Monitor, Maintenance):** A large area of bare ground with exposed soil was observed on the right downstream embankment slope, specifically adjacent to the principal spillway wall. Continue efforts to establish appropriate vegetation cover to stabilize the slope. Monitor this area for loss of earth material.

    a. Embankment - Downstream Slope

5. Gates should be maintained according to the manufacture's recommendations and operated through their entire range of motion a minimum of once a year to ensure they are working properly.

6. Create an operation and maintenance plan. A proper operation and maintenance plan will increase the dam's service life and maintain the dam's hydraulic and structural condition.

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

PROJECT INFORMATION

The original Lake Orion Dam was reportedly constructed around 1829 to power a mill. That dam failed in the late 1830s and was later rebuilt. The dam structure then went through several iterations in the years following, including retrofitting of the dam with hydroelectric generation equipment by the Detroit Edison Company. Mill and hydroelectric operations have long since been abandoned. The most recent modification to the dam occurred in 1987, including the widening of M-24 over the dam, removal of an abandoned railroad bridge, removal of a fish ladder, reconstruction of the concrete abutment walls, and relocation of the weir portion of the concrete principal spillway, as authorized by Department of Natural Resources (DNR) Permit No. 87-14-487. The dam, located on Paint Creek and jointly owned, operated, and maintained by the Village of Lake Orion (Village) and the Michigan Department of Transportation (MDOT), currently maintains an impoundment used for recreational purposes.

The dam consists of a 760-foot long earthen embankment, a 25-foot wide concrete gravity principal spillway structure, and a concrete head gate auxiliary spillway. The earthen embankment serves as the roadbed for M-24 and has a crest width of approximately 76 feet, and upstream and downstream slopes of approximately 2 horizontal to 1 vertical (2H:1V).

The principal spillway structure, located near the centerline of the dam, consists of a single 25-foot wide spillway bay containing a broad crest weir fitted with removable concrete block stoplogs. Flows from the spillway discharge through a stilling basin to Paint Creek. Lake levels are controlled via the concrete block stoplogs.

The auxiliary spillway structure, located near the right abutment of the earthen embankment, consists of a concrete head gate structure that discharges under M-24 and Broadway Street through two 30-inch diameter penstocks, an abandoned powerhouse structure, and a short tailrace channel before rejoining Paint Creek. Drawdown of the impoundment is achieved by opening the gates and passing all flow through the former powerhouse.

Additionally, the DNR constructed a cold water discharge structure at the dam in 1991. The cold water discharge structure, located within the left abutment of the earthen embankment, consists of 980 feet of 18-inch diameter corrugated high density polyethylene (HDPE) pipe with an inlet located 60 feet below the surface of Lake Orion. The cold water discharge pipe is located just downstream of the left spillway abutment

wall. The control structure is located within a manhole in the park immediately north of the dam.

The dam has a structural height of 18 feet, a hydraulic height of 16.4 feet, and maintains approximately 13 feet of head with 5.2 feet of freeboard, creating a 470-acre impoundment under normal flow conditions.

Major repairs were made to the dam in 2017, under EGLE Emergency Conditional Permit No. WRP008299, following the discovery of a large sinkhole upstream of the principal spillway structure and large volumes of water seeping under the spillway structure. Repairs included pressure grouting of the opening in the spillway, installation of steel sheet pile cutoff, and concrete lining of the approach channel under the M-24 bridge.

The dam was originally inspected under Part 315 by MDOT staff in 1994 and has been subsequently inspected by Dam Safety Unit staff in 1998, 2002, 2008, 2012, 2016, and 2020. Copies of these reports are on file with the Dam Safety Unit. Original construction plans for the dam were not available at the time of this inspection.

SITE INVESTIGATION

The following discussion of the dam's physical condition and appurtenances is based on observations and photographs obtained on the inspection date.

In addition to the specific findings listed below, it is important to continue good maintenance practices. These practices include regular inspection of the dam embankments and hydraulic structures for any deficiencies. Some of the more common issues that are found include growth of trees and brush, development of erosion areas, and animal burrows.

The following data was collected on the date of the inspection and includes deficiencies observed during the inspection and necessary actions for remediation of the observed deficiencies.

Embankment	
Upstream Slope	
Issues Present	*Trees and Brush*
Trees and Brush	
Describe Issue	*Trees, brush, and woody vegetation were observed on the upstream embankment slope.*
Photo(s)	*28, 29, 30*
Action Required	*Maintenance*
Describe Action Required	*Continue efforts to remove all trees and brush from the earthen embankments. Trees should be removed to 10 feet beyond the downstream toe of slope. Once cleared, embankments should be mowed or treated with herbicide a minimum of two (2) times per year to prevent further establishment of woody vegetation and to facilitate visual inspection.*

Crest	
Issues Present	*None*
Downstream Slope	
Issues Present	*Trees and Brush, Ground Cover, Deteriorating Material*
Trees and Brush	
Describe Issue	*Trees, brush, and woody vegetation were observed on the downstream embankment slope.*
Photo(s)	*35, 36, 37, 38, 39*
Action Required	*Maintenance*
Describe Action Required	*Continue efforts to remove all trees and brush from the earthen embankments. Trees should be removed to 10 feet beyond the downstream toe of slope. Once cleared, embankments should be mowed or treated with herbicide a minimum of two (2) times per year to prevent further establishment of woody vegetation and to facilitate visual inspection.*
Ground Cover	
Describe Issue	*A large area of bare ground with exposed soil was observed on the right downstream embankment slope, specifically adjacent to the principal spillway wall.*
Photo(s)	*35*
Action Required	*Monitor, Maintenance*
Describe Action Required	*Continue efforts to establish appropriate vegetation cover to stabilize the slope. Monitor this area for loss of earth material.*
Deteriorating Material	
Describe Issue	*The concrete block retaining wall at the drain outlet on the right downstream embankment slope has deteriorated over time.*
Photo(s)	*33, 34*
Action Required	*Monitor, Maintenance*
Describe Action Required	*Monitor this area to ensure deterioration is not accelerating. Consider replacement of the concrete block retaining wall.*

Principal Spillway	
Issues Present	*None*

Auxiliary Spillway		
Issues Present	*Deteriorating Material*	
Deteriorating Material		
Describe Issue	*Significant spalling and deterioration were observed at the concrete retaining wall at the outlet, and the concrete headwall and upstream columns of the auxiliary spillway.*	
Component	*Outlet Conduit*	*Headwall*
Photo(s)	*15*	*21, 22, 23, 24*
Action Required	*Monitor, Maintenance*	

Describe Action Required	*Inspect locations of concrete deterioration, a minimum of twice per year, to ensure the deterioration is not increasing in size. Consider concrete repairs in the next five (5) years to prevent concerns.*

The above monitoring and maintenance items should be addressed in accordance with the Conclusions and Recommendations section of this report.

General notes about the issues observed are shown below:

Ground Cover

Ground cover protects surfaces from erosive forces (water, wind, animals etc.).

Deteriorating Material

All materials deteriorate over time, but proper maintenance can extend the service life of the material and reduce the life cycle cost of maintenance and operation of the dam.

Trees, Brush, and Woody Vegetation

If woody vegetation is allowed to mature, it could develop an extensive root system. These root systems can lead to piping failure or if the brush and trees are uprooted in a storm, can cause extensive deterioration of the embankment. In addition, woody vegetation invites animal activity, impedes the visual inspection of the dam, and can kill other vegetation that helps stabilize the soil. Embankments should be clear of woody vegetation and mowed 10 feet past the toe of the embankment.

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. No remedial action is required at this time.

HYDROLOGY AND HYDRAULICS

The contributing drainage area to the Paint Creek at the Lake Orion Dam is approximately 37.9 square miles. The design discharge for this significant hazard potential dam is the 0.5 percent annual chance (200-year) flood discharge which is estimated to be 600 cubic feet per second (cfs). The principal spillway can pass 600 cfs with a rise in the impoundment level of approximately 4.0 feet above normal pool elevation and 1.7 feet of freeboard at the earthen embankments. Therefore, the dam is considered to have adequate capacity to safely convey the design flood.

Copies of the hydraulic calculations used to make this determination are on file with the Dam Safety Unit. Estimated flood flows are shown in Appendix C.

OPERATION AND MAINTENANCE

Our records indicate that no written Operation and Maintenance (O&M) Plan, outlining both the normal and emergency procedures for the dam upkeep and operation, has been prepared for this dam. It is recommended that an O&M Plan is developed and kept current. A copy should be provided to the Dam Safety Unit.

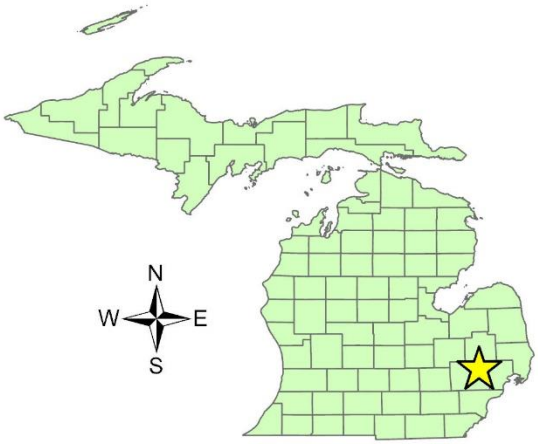
EMERGENCY ACTION PLAN

An Emergency Action Plan (EAP) is required under Part 315 (Section 31523) for high or significant hazard potential dams. The owner is required to review and update the EAP for the dam, in coordination with Oakland County Emergency Management. **Provide a copy of the updated EAP to the Dam Safety Unit by December 31, 2024. This action has been overdue since December 31, 2008.**

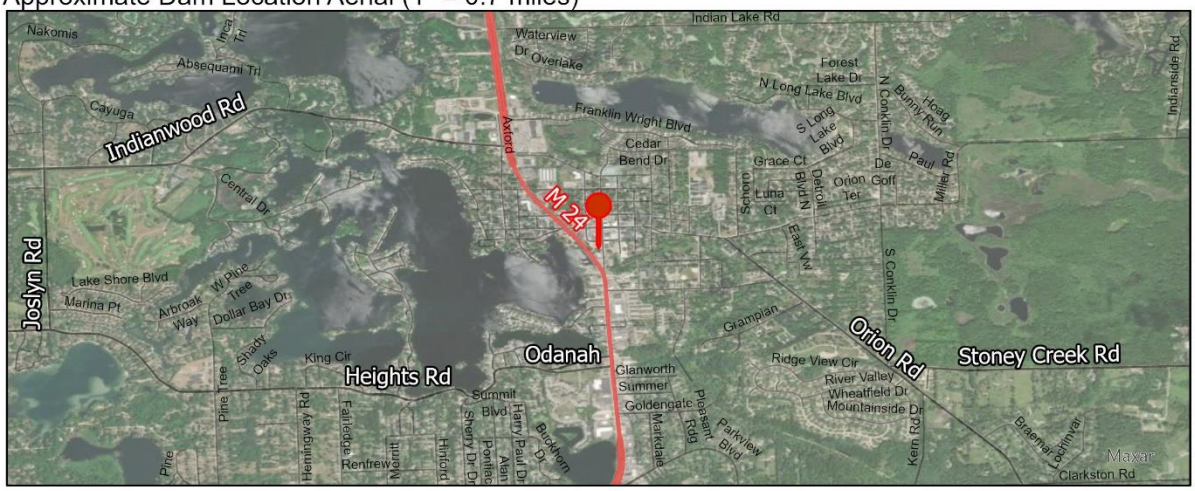
APPENDICES

Appendix A - Location Map
Appendix B - Inspection Photographs
Appendix C - Hydraulic Data

Lake Orion Dam
Dam ID No. 259
Section 2
T 04N
R 10E
Oakland County



Approximate Dam Location Aerial (1" = 0.7 miles)



Approximate Dam Location Topography, 5' Contours (1" = 0.7 miles)

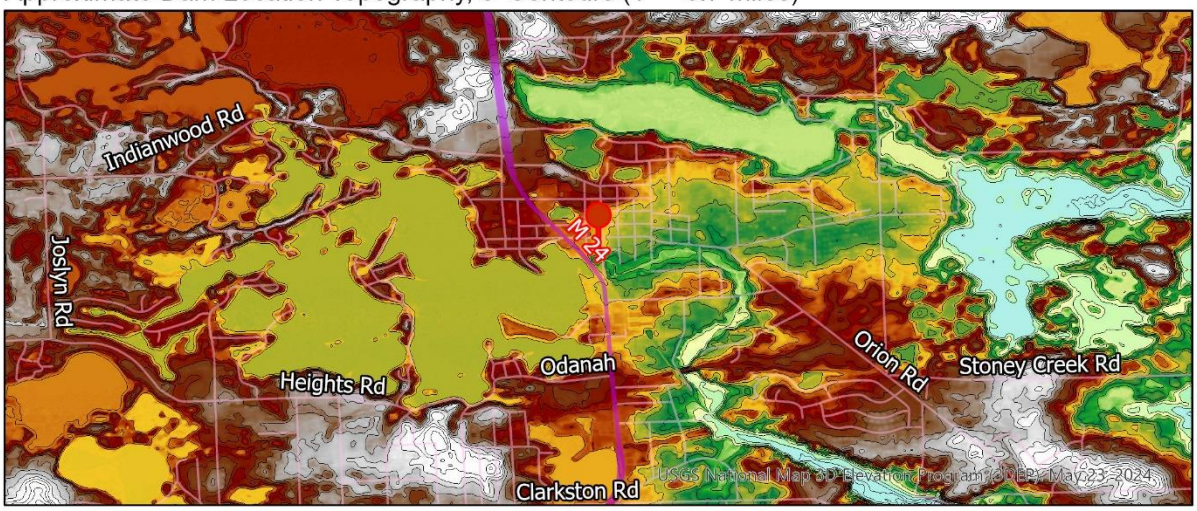


Photo #1: Principal Spillway Weir Wall. Concrete block stoplogs shown.

Photo #2: Principal Spillway Weir Wall.

Photo #3: Principal Spillway Weir Wall.

Photo #4: Principal Spillway Inlet.

Photo #5: Principal Spillway Inlet.

Photo #6: Principal Spillway Inlet.

Photo #7: Principal Spillway Inlet.

Photo #8: Principal Spillway Abutment Left Wall.

Photo #9: Principal Spillway Abutment Left Wall.

Photo #10: Principal Spillway Abutment Right Wall.

Photo #11: Principal Spillway Abutment Right Wall.

Photo #12: Principal Spillway Apron. Receiving channel.

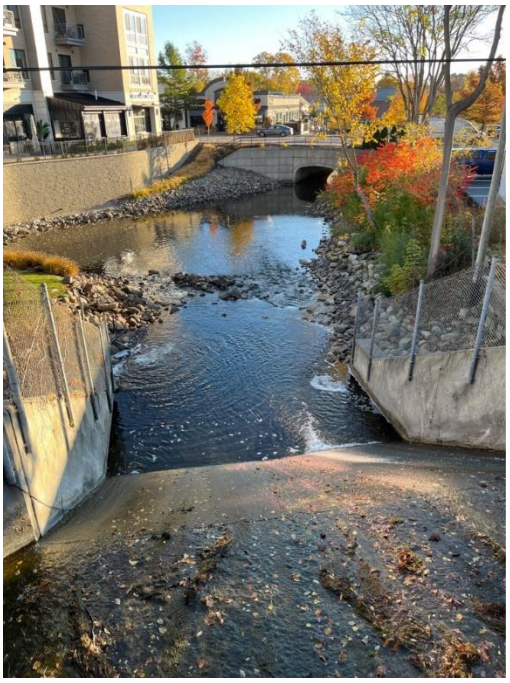


Photo #13: Principal Spillway Chute.

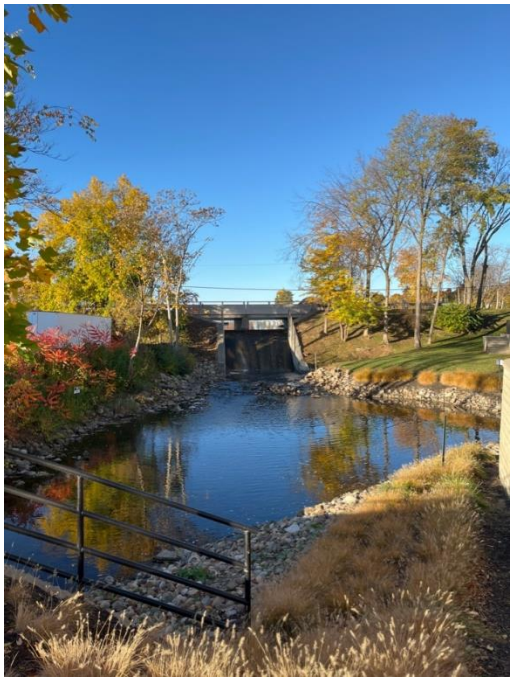


Photo #14: Principal Spillway Chute.

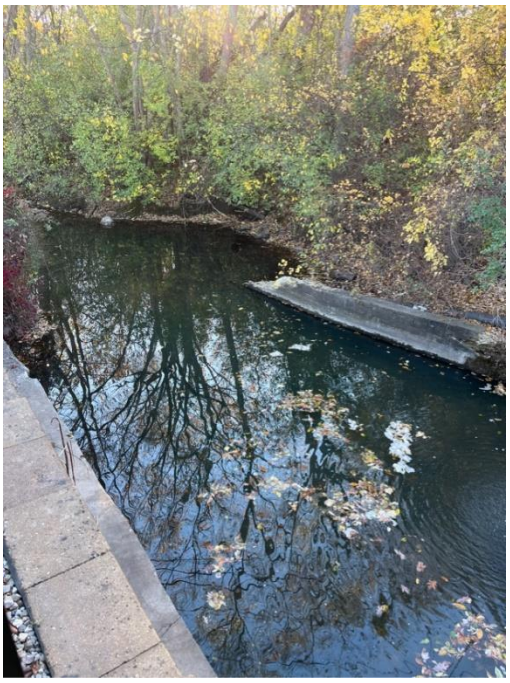


Photo #15: Auxiliary Spillway Outlet Conduit. Note spalling and deterioration of retaining wall on right side.

Issue: Deteriorating Material, Action: Monitor, Maintenance

Photo #16: Auxiliary Spillway Outlet Conduit.

Photo #17: Auxiliary Spillway Outlet Conduit. Principal spillway receiving channel (shown on left side of photo) and auxiliary spillway channel rejoin to Paint Creek.

Photo #18: Auxiliary Spillway Gate.

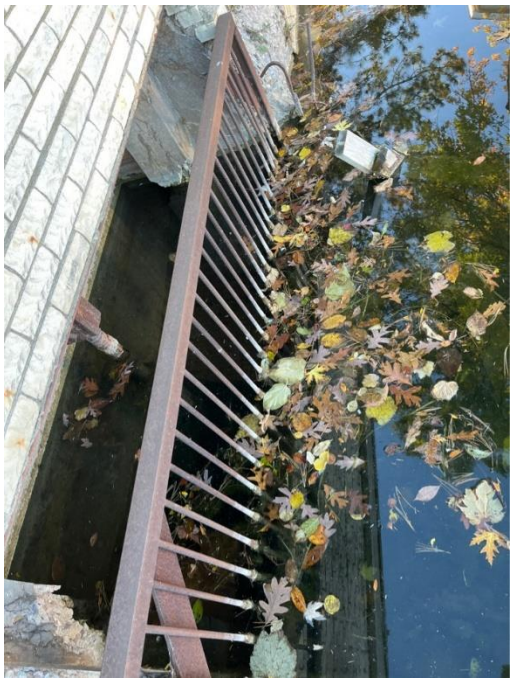


Photo #19: Auxiliary Spillway Gate. Upstream face.

Photo #20: Auxiliary Spillway Gate.

Photo #21: Auxiliary Spillway Headwall.
Issue: Deteriorating Material, Action: Monitor, Maintenance

Photo #22: Auxiliary Spillway Headwall.
Issue: Deteriorating Material, Action: Monitor, Maintenance

Photo #23: Auxiliary Spillway Headwall. Note deteriorating concrete column.
Issue: Deteriorating Material, Action: Monitor, Maintenance

Photo #24: Auxiliary Spillway Headwall. Note deteriorating concrete column.
Issue: Deteriorating Material, Action: Monitor, Maintenance

Photo #25: Embankment Upstream Slope. Cold water inlet at the park immediately north of the dam.

Photo #26: Embankment Upstream Slope. Cold water inlet at the park immediately north of the dam.

Photo #27: Impoundment. Note cold water inlet pipe.

Photo #28: Embankment Upstream Slope. Left slope shown.
Issue: Trees and Brush, Action: Maintenance

Photo #29: Embankment Upstream Slope. Right slope shown.
Issue: Trees and Brush, Action: Maintenance

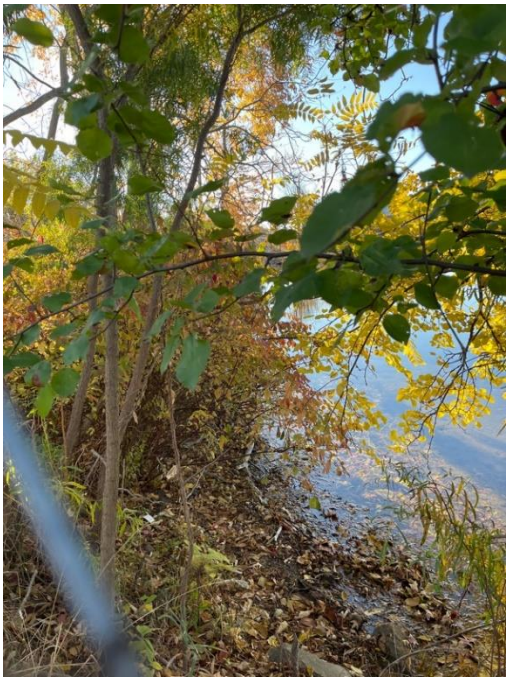


Photo #30: Embankment Upstream Slope. Left slope shown.
Issue: Trees and Brush, Action: Maintenance

Photo #31: Embankment Crest. Crest is M-24, Viewed from right.

Photo #32: Embankment Crest. Crest is M-24, viewed from right.

Photo #33: Embankment Downstream Slope. Deteriorating concrete block retaining wall shown with drain outlet on right downstream slope.
Issue: Deteriorating Material, Action: Monitor, Maintenance

Photo #34: Embankment Downstream Slope. Deteriorating concrete block retaining wall shown with drain outlet on right downstream slope.
Issue: Deteriorating Material, Action: Monitor, Maintenance

Photo #35: Embankment Downstream Slope. Right slope shown.
Issue: Trees and Brush, Ground Cover, Action: Monitor, Maintenance

Photo #36: Embankment Downstream Slope. Left slope shown.
Issue: Trees and Brush, Action: Maintenance

Photo #37: Embankment Downstream Slope. Left slope shown.
Issue: Trees and Brush, Action: Maintenance

Photo #38: Embankment Downstream Slope. Right slope shown.
Issue: Trees and Brush, Action: Maintenance

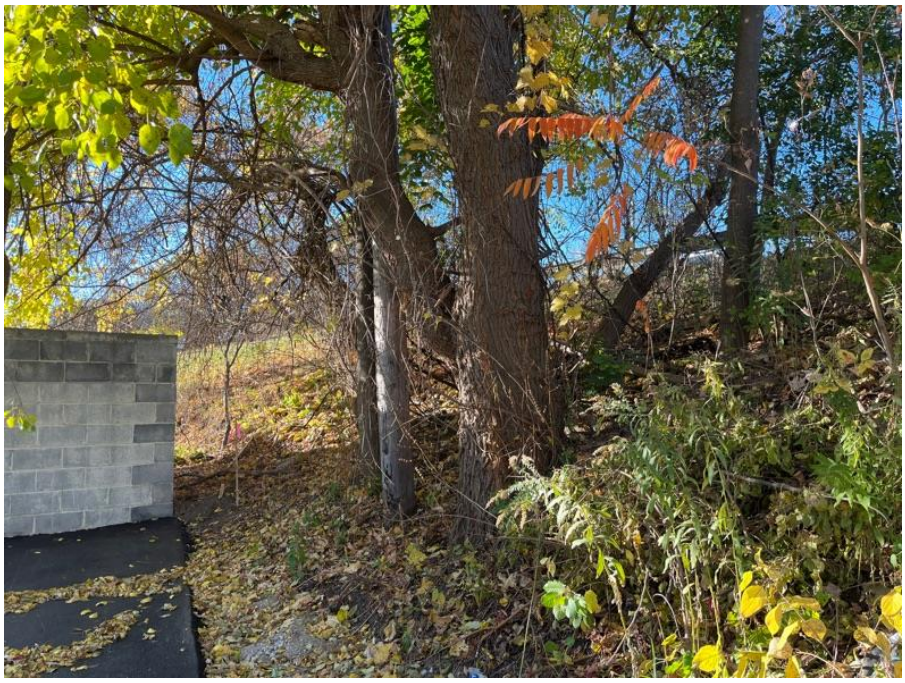


Photo #39: Embankment Downstream Slope. Right slope shown.
Issue: Trees and Brush, Action: Maintenance

Photo #40: Embankment Downstream Slope. Right slope shown.

Photo #41 Impoundment.

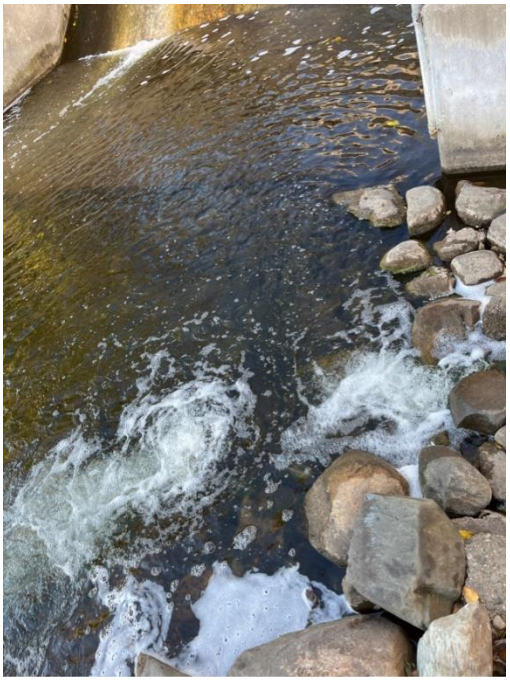


Photo #42. Cold water outlet pipe appears to have compromised joints. Water was observed bubbling up to the surface along the pipe.

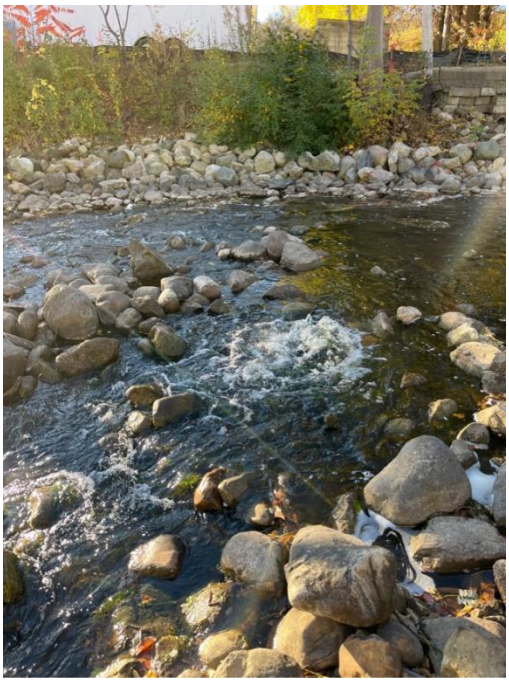


Photo #43. End of cold water outlet pipe.

From: EGLE-wrd-qreq <EGLE-wrd-qreq@michigan.gov>
Sent: Thursday, November 14, 2024 4:55 PM
To: Hartz, Allyson (EGLE) <HartzA1@michigan.gov>
Subject: RE: Flood or Low Flow Discharge Request

We have processed the discharge request submitted by email on October 25, 2024 (Process No. 20240604), as follows:

Paint Creek at Lake Orion Dam, Dam ID 259, Section 2, T4N, R10E, Village of Lake Orion, Oakland County, has a total drainage area of 39.9 square miles and a contributing drainage area of 37.9 square miles. The design discharge for this dam is the 0.5% chance (200-year) flood. The 50%, 20%, 10%, 4%, 2%, 1%, 0.5%, and 0.2% chance peak flows are estimated to be 260 cubic feet per second (cfs), 340 cfs, 390 cfs, 450 cfs, 500 cfs, 540 cfs, 600 cfs, and 720 cfs, respectively. (Watershed Basin No. 12 Clinton).

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.

From: EGLE-Automated <EGLE-Automated@michigan.gov>
Sent: Friday, October 25, 2024 9:13 AM
To: EGLE-wrd-qreq <EGLE-wrd-qreq@michigan.gov>
Subject: Flood or Low Flow Discharge Request

Requestor: Allyson Hartz
Company: MI EGLE
Address: 27700 Donald Ct
City/State: Warren, MI
ZIP Code: 48092
Phone: 5173315687
Date: 10/25/2024
1 percent
2 percent
0.5 percent
50 percent
20 percent
10 percent
4 percent
0.2 percent
Flood Discharge Request Type: Dam
Other Description (if request type "Other" selected):
Dam Hazard Potential (if request type "Dam" selected): Significant

LAKE ORION DAM
OAKLAND COUNTY
DAM ID NO. 259

Dam ID (if request type "Dam" selected): 259
Low Flow Project Description:
Contact Person:
Watercourse: Paint Creek
Local Name:
County: Oakland
City/Township: Lake Orion
Section: 2
Town: 04N
Range: 10E
Location: Lake Orion Dam, dam ID 259
Email: hartza1@michigan.gov