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OAKLAND COUNTY
WATER RESOURCES COMMISSIONER

MEMORANDUM

TO: **Commissioner Helaine Zack, Chairperson, Finance and Infrastructure Committee**

FROM: **Mike McMahon PE, Ryan Woloszyk PE**

SUBJECT: **Resolution No. 20196 Lake Level Control Structures**

DATE: **11/24/2020**

On July 2, 2020, the Oakland County Board of Commissioners passed Resolution No. 20196 directing the Water Resources Commissioner (WRC) to ascertain and report on the status of all lake level control structures (dams) in Oakland County. The purpose of the resolution was to determine the condition, inspection status, and required maintenance of those structures. The attached report is in response to the Board's request and is based on information obtained from the Michigan Department of Environment, Great Lakes, and Energy (EGLE), as well as field work undertaken by the WRC staff.

After reviewing and compiling the available data, it can be said that the majority of dams in Oakland County are characterized as being in fair or better condition. Even among those that did not meet this threshold, there were no structures identified that appear to pose an immediate or significant threat to the environment or to the downstream property owners. WRC staff will make the effort to follow up with owners of lake level control structures that need a current inspection and/or repairs and will provide information to the State to update their database.

Enclosures

c: Dave Woodward, Chairperson, Oakland County Board of Commissioners
Chris Ward, Administrative Director

Oakland County Lake Level Control Structure Review

Prepared for:

Oakland County Board of Commissioners

November 2020

Executive Summary

On July 2, 2020, the Oakland County Board of Commissioners passed Resolution No. 20196 directing the Water Resources Commissioner (WRC) to ascertain and report on the status of all lake level control structures (dams) in Oakland County. The purpose of the resolution was to determine the condition, inspection status, and required maintenance of those structures. This report is based on information obtained from the Michigan Department of Environment, Great Lakes, and Energy (EGLE), as well as field work undertaken by the WRC staff.

After reviewing and compiling the available data, it can be said that the majority of dams in Oakland County are characterized as being in fair or better condition. Even among those that did not meet this threshold, there were no structures identified that appear to pose an immediate or significant threat to the environment or to the downstream property owners. WRC staff will make the effort to follow up with owners of lake level control structures that need a current inspection and/or repairs and will provide information to the State to update their database.

The State's inventory of dams in Oakland County included 149 structures. The data set pertinent to this report is included in Appendix A. It was determined that one structure, owned and operated by the WRC was missing from the database, and 12 structures have either been removed, decommissioned, or were never built and should be removed from the list. Therefore, this report will focus on the following information for the 138 documented lake level control structures in Oakland Country.

- Number of control structures
- EGLE (State of Michigan) ID
- Ownership
- Party responsible
- Hazard classification
- Condition rating
- Last inspection date
- Frequency of inspection
- Emergency Action Plan (EAP)

For the review process, WRC staff utilized data from the Michigan Department of Environment, Great Lakes, and Energy's (EGLE) geographical information system (GIS). This data set was then divided into three categories for review-

1) **Regulated structures not owned by WRC** - In total there are 60 structures in this category. Spicer Group was contracted to review 51 inspection reports that were on file with EGLE. Much of the information from Spicer's report has been incorporated into the body of this report. In addition, there are another 9 structures in this category that have no inspection report on file with EGLE that were visited by WRC staff.
2) **Regulated structures owned and maintained by WRC** - There are 32 structures in this category, and all have reports on file with EGLE. WRC staff reviewed the reports in this category.
3) **Unregulated or inventoried structures** - These structures do not have an inspection report on file since they are not regulated and, therefore, are not required to submit inspection reports. There is a total of 46 structures in this category. The review of the structures in this category was completed by WRC Staff through site visits and high-level visual inspection.

In summary then, there are 92 regulated and 46 unregulated dams resulting in a total of 138 known lake level control structures in Oakland County. The ownership of these structures is split between public and private ownership for both the regulated (66/26) and unregulated (14/32) dams.

Generally, the regulated dams have a much greater potential to cause downstream impact if they were to fail. Therefore, it is required that regulated dams be inspected on a specified interval and a report be submitted to the State.

Of the 83 regulated dams that have inspection reports on file, most are rated at satisfactory or fair condition. There are six dams that are in poor condition; one is privately owned and five are owned by a governmental agency. Five of the six structures are considered low hazard and have minimal risk downstream. The remaining structure is considered significant hazard. This structure does have some downstream flood capacity in the water course, limiting the potential risks downstream. However, a conversation with the governmental agency should be initiated to ensure repairs are made in a timely manner. All six of these structures should be reviewed over the next year to ensure that they are moving toward correction. There are no regulated structures rated as being in unsatisfactory condition.

As indicated previously, there are 9 regulated structures that do not have a report on file with EGLE. All these structures have a low hazard rating. There is one structure that, based on the WRC field visit, is considered in poor condition. Should it fail, this structure could affect the values of the homes on the waterbody it impounds. However, there is low risk downstream as there is flood capacity. It should also be noted that 14 dams with reports on file, are overdue for an inspection. These outstanding and overdue reports should be a priority moving forward to ensure the inspections are completed and any necessary repairs made to keep the dams in good operating condition. This is something the WRC will have to work with EGLE Staff on, as the WRC does not have jurisdiction or any mechanism to enforce compliance.

Regarding unregulated structures without inspection requirements, there are seven that are noteworthy and are discussed in some detail later in this report. There are three that are listed in EGLE's database as unsatisfactory**,** however, all three are decommissioned and are not holding water. Additionally, there are four that need repairs. They are all low risk as they detain a minimal amount of water.

General Information

Regulation

Of the 138 dams in Oakland County, 92 are regulated under Parts 307 (Inland Lake Levels) and/or 315 (Dam Safety) of Natural Resources and Environmental Protection Act (NREPA). Dam inspection reports are required at regular intervals for dams that are regulated under Part 307 and/or Part 315 of NREPA. Figure 1 below shows all the regulated and unregulated dams in Oakland County as inventoried by EGLE.

Dams are regulated by Part 307 when a circuit court issues an order establishing the water elevation (legal level) at which the lake is to be maintained. Dams regulated by Part 307 must be inspected every three (3) years. Dams within this category are all owned and operated by WRC.

Dams are regulated by Part 315 when they are over 6 feet in height and impound over 5 acres of water during the design flood (EGLE, 2020). Dams regulated by Part 307 and/or Part 315 that are classified as high, significant, or low hazard dams must be inspected every three (3), four (4) years, or five (5) years, respectively. EGLE does not have any inspection requirements for dams that are not regulated under Part 307 and/or Part 315.

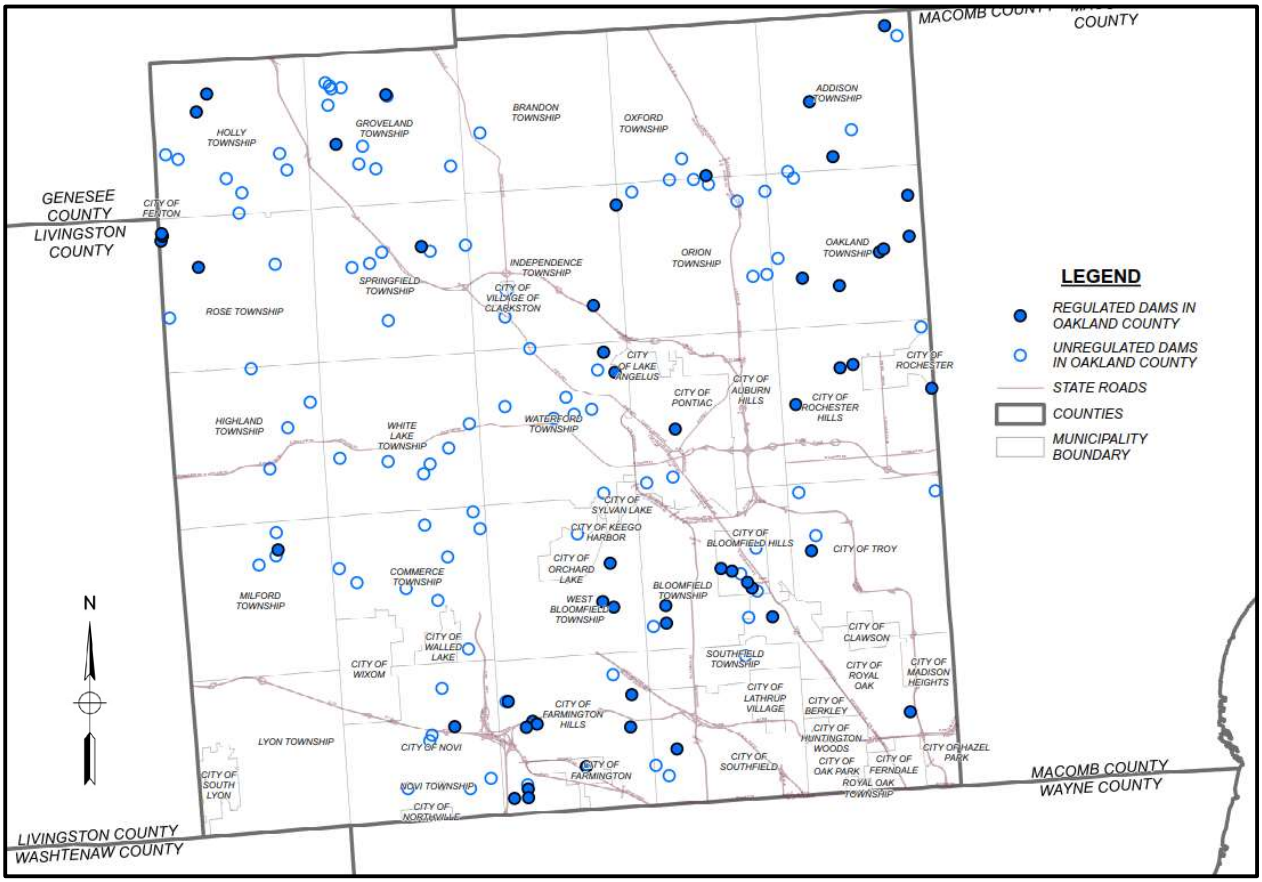

Figure 1: Dams Located in Oakland county

Ownership

Of the 138 dams within Oakland County, 58 is owned privately. The remaining 80 dams are owned by either Federal, State, or Local Agencies, according to EGLE data. This ownership distribution places a significant portion of required inspection and maintenance on private owners.

Ownership	Number of Dams	Percentage
Federal	3	2%
State	18	13%
Local Government	59	43%
Private	58	42%
Total	**138**	**100%**

Table 1 – Dam Ownership

Structure Age

Table 2 below shows the age distribution of the dams in Oakland County. The table is based upon the date when the dam was originally constructed. It does not consider if a dam has been reconstructed or reconfigured. There were 12 dams in Oakland County that are over 100 years old. Note, some dams have been reconstructed since they were originally built. For example,, the Davisburg Dam was originally constructed in 1835 but was reconstructed in the 1980s. The Ray Dam had an unknown original construction date; however, there was a partial breach in the 1980s and the dam was reconstructed between 2005 and 2006. 28% of the dams are between 51-75 years old.

Age of Dams	Number of Dams	Percentage
Over 100 years old	12	9%
76-100 years old	25	18%
51-75 years old	38	28%
26-50 years old	30	22%
0-25 years old	2	1%
Unlisted Age	31	22%
Total	**138**	**100%**

Table 2: Age Distribution

Hazard Classification

All regulated dams in Michigan are required to have a hazard classification assigned to them based on potential downstream impacts caused by failure of the dam. The hazard classification is NOT based upon the structural condition of the dam. The three (3) hazard potentials are:

- **Low**: no loss of life; minor impacts
- **Significant**: possible loss of life; significant impacts
- **High**: expected loss of life; severe impacts

Within Oakland County 77%, or 71 of the 92 regulated dams are classified as a low hazard potential. The remaining 23%, or 21 structures, with a significant or high hazard classification were reviewed in more detail and are listed in Table 3. The vast majority, 76% or 16, are under the ownership of some form of governmental agency. WRC owns and maintains 8 of these structures. This suggests that most of the structures with a high or significant hazard classification have a funding source for required repairs.

EGLE ID	Name	Hazard Classification	Ownership
240	Clarkston Dam	High	Private
241	Clintonville Dam	Significant	WRC
245	Loon Lake Dam	Significant	WRC
248	Ford Dam #3 (Hubbell Pond)	Significant	CVT
253	Holly Dam	Significant	CVT
255	Lake Louise Dam	High	WRC
259	Lake Orion Dam	Significant	CVT
263	Oxbow Dam	High	WRC
265	Pontiac Lake Dam	High	WRC
267	Quarton Dam	Significant	CVT
275	Waterford Multi-Lakes Level Control	Significant	WRC
276	Wildwood Lake Dam	High	State
277	Winkler Pond Dam	Significant	Private
614	Lake Neva Dam	High	Private
615	Lake Sherwood Dam	Significant	Private
684	Endicott Lake Dam	Significant	Private
692	Heron Dam	High	State
693	Davisburg Trout Pond Dam	Significant	State
718	Dawson Millpond Dam	High	WRC
777	Wolverine Lake Dam	Significant	CVT
1675	Wau-Me-Gah Lake Dam	Significant	WRC

Table 3 – High and Significant Hazard Dams

Emergency Action Plans

An Emergency Action Plan (EAP) is required for dams that have a hazard classification of either significant or high. The EAPs are required to be submitted to the State for approval and should be updated at the same interval as the inspections. Of the 21 dams that are required to have EAPs, it was verified that all 21 dams had EAPs in place, based upon information included in the EGLE GIS layer and the inspection reports provided. The EAPs were not evaluated as part of this review process.

Condition Assessment

All regulated dams are required to have an overall condition assessment assigned as part of the inspection process. Condition assessments are assigned in accordance with the following four categories:

- **Satisfactory:** No existing or potential dam safety deficiencies are recognized. Acceptable performance is expected under all conditions in accordance with the applicable regulatory criteria. Minor maintenance items may be required.
- **Fair:** Acceptable performance is expected under all conditions in accordance with the applicable dam safety regulatory criteria. Minor deficiencies may exist that require remedial action and/or secondary studies or investigations.
- **Poor:** A dam safety deficiency is recognized for any condition in accordance with the applicable dam safety regulatory criteria. Remedial action is necessary. Poor also applies when further critical studies or investigations are needed to identify any potential dam safety deficiencies.
- **Unsatisfactory:** Considered unsafe. A dam safety deficiency is recognized that requires immediate or emergency remedial action for problem resolution. Reservoir restrictions may be necessary.

Approximately 52%, or 48 of all dams, and 81% or 17, of the high and significant hazard dams in Oakland County, were in satisfactory condition. It should be noted that unregulated dams are not required to have a condition assessment completed.

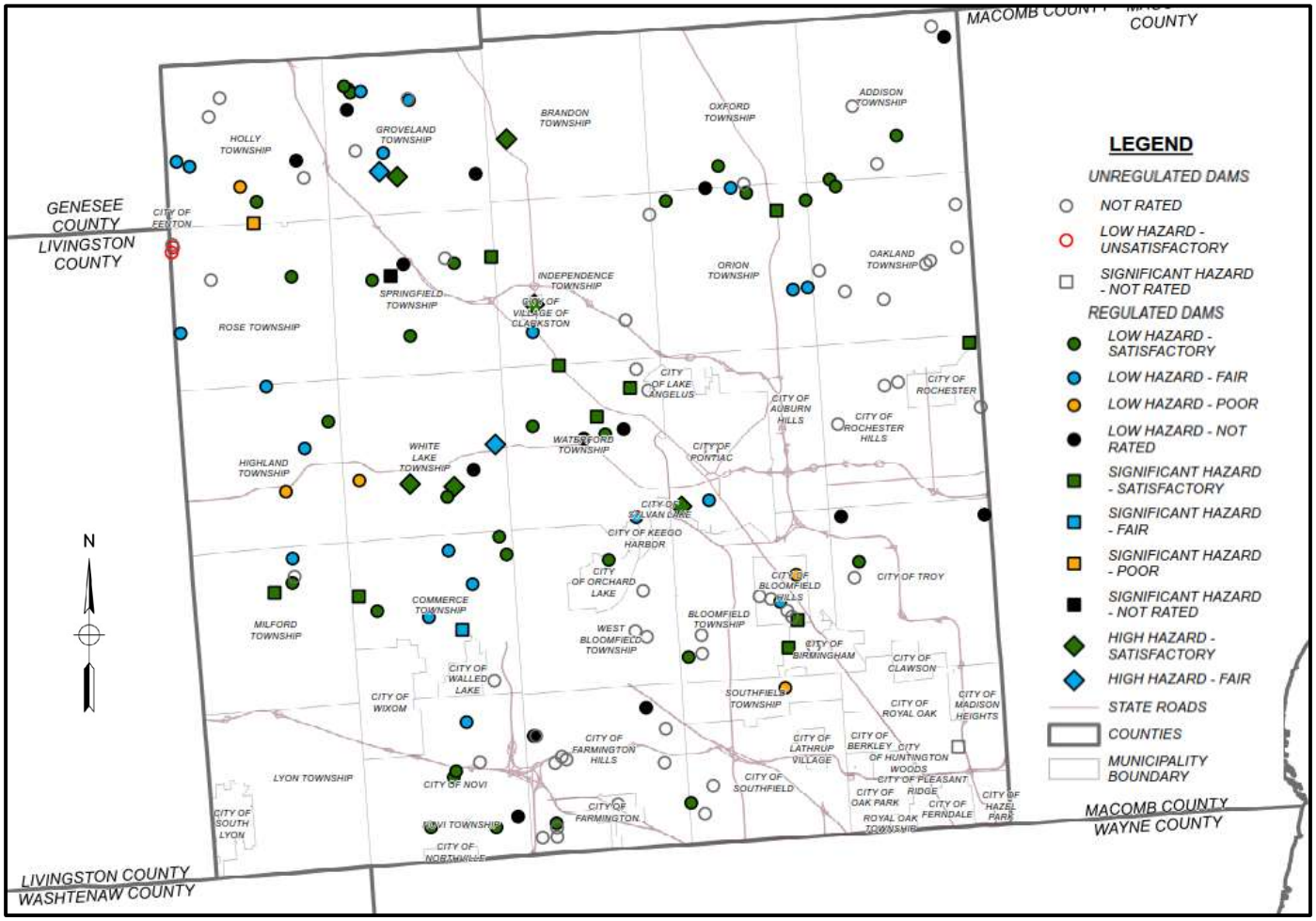

Figure 2: Hazard Classification and Condition Assessment assigned to each dam

NUMBER OF REGULATED DAMS IN OAKLAND COUNTY (92)

(Shown by Ownership with Hazard Rating & Condition)

WRC (32)

- 0 Missing Reports
- 0 Overdue Reports
- 0 Missing EAPs

Low (24)	Significant (4)	High (4)
13 Satisfactory	4 Satisfactory	3 Satisfactory
10 Fair	0 Fair	1 Fair
1 Poor	0 Poor	0 Poor
0 Unsatisfactory	0 Unsatisfactory	0 Unsatisfactory
0 Not Rated	0 Not Rated	0 Not Rated

Private (26)

- 7 Missing Reports
- 9 Overdue Reports
- 0 Missing EAPs

Low (21)	Significant (3)	High (2)
6 Satisfactory	3 Satisfactory	2 Satisfactory
3 Fair	0 Fair	0 Fair
1 Poor	0 Poor	0 Poor
0 Unsatisfactory	0 Unsatisfactory	0 Unsatisfactory
11 Not Rated	0 Not Rated	0 Not Rated

Other Government (34)

- 2 Missing Reports
- 5 Overdue Reports
- 0 Missing EAPs

Low (26)	Significant (6)	High (2)
12 Satisfactory	4 Satisfactory	1 Satisfactory
9 Fair	1 Fair	1 Fair
3 Poor	1 Poor	0 Poor
0 Unsatisfactory	0 Unsatisfactory	0 Unsatisfactory
2 Not Rated	0 Not Rated	0 Not Rated

Regulated Dams Not Owned By WRC

Of the 92 regulated dams, 60 are not owned by WRC. Some are owned by other government agencies and some are privately owned. Nine of the 60 structures do not have an inspection report on file with the State. Spicer Group received inspection reports on 51 dams to review and report back to WRC. The dam inspection reports were the most recent inspection reports on file with the State. Based on the 51 reports and the information contained within the EGLE GIS layer, Spicer Group created a report from which most of the information in this section is drawn from.,

General Recommendations

Based upon the inspection reports and information provided by EGLE, 23 of the 60 regulated dams not owned by Oakland County either had no inspection report on file or were overdue for inspection. The owners should be contacted, inspections completed, and reports submitted to the State.

Structures with No Reports or Past Due Reports

EGLE ID	Name	Hazard Classification	Ownership	Date of last Inspection
240	Clarkston Dam	High	Private	03-Aug-11
247	Erity Dam	Low	CVT	25-Sep-12
259	Lake Orion Dam	Significant	CVT	29-Jul-16
264	Perrysville Dam	Low	Private	01-May-96
273	Spring Lake Dam	Low	Private	
277	Winkler Pond Dam	Significant	Private	09-Sep-16
448	Seven Lakes Addition Dam	Low	State	07-May-15
684	Endicott Lake Dam	Significant	Private	15-Apr-08*
758	Renchik Dam	Low	Private	
968	Petrauskas Pond Dam	Low	Private	
1667	Cranbrook Lake Dam	Low	Private	05-Dec-96
1669	Farmington Venture Detention Pond Dam	Low	Private	04-Dec-97
1674	Heather Lake Dam	Low	Private	22-Jul-78
1676	Lake Charnwood Dam	Low	Private	01-Nov-12
1679	Lower Hatchery Dams	Low	CVT	16-Aug-89
1686	Meadow Lake Dam	Low	Private	06-Sep-00
1707	Secord Lake Dam	Low	Private	

1710	Lake Araho Dam	Low	Private	
1717	Tull Lake Dam	Low	Private	
1971	Pettibone Pond Dam	Low	State	13-Sep-00
2120	Proud Lake Dam	Low	State	13-Sep-00
2472	Troy Lakes Estates Dam	Low	Private	
2580	Pebble Creek Detention Basin Dam	Low	CVT	

* Note Endicott Lake Dam was rebuilt in 2019.

The nine structures listed below are regulated by Part 315 and need to have an inspection completed, as there is no inspection report on file with EGLE.

- Spring Lake Dam, 273
- Renchik Dam, 758
- Petrauskas Pond Dam, 968 (Outlet Failed Poor Condition)
- Lower Hatchery Dams, 1679 (WRC Spoke with CVT and will be inspected)
- Secord Lake Dam, 1707
- Lake Araho Dam, 1717 (WRC Spoke with owner and will be inspected Poor Condition)
- Tull Lake Dam, 1717
- Troy Lake Estates Dam, 2472
- Pebble Creek Detention Basin Dam, 2580

As a courtesy, WRC Staff performed a visual inspection of these 9 structures. At least three appear to need significant repairs – Petrauskas Pond Dam, the Secord Lake Dam and the Lake Araho Dam (see recommendations below). While all 9 dams are rated low hazard, it is important that they be inspected as soon as possible and be put on a regular inspection schedule.

Table 4 shows common recommendations found in the 51 inspection reports reviewed and the number of dams that received the recommendation. Most of the dams received multiple recommendations in an inspection report. Please note, this list is an overview and does not include all recommendations given in an inspection report.

Table 4: Overview of Typical Recommendations

Recommendation	Number of Dams
Televised Inspection	12
Clear trees/brush off embankment and mow	35
Monitor and remove debris from spillway	11
Fill animal burrows	9
Lubricate machinery	5
Monitor seepage	13
Install flow monitoring	1
Complete structural analysis	1
Repair railings	3
Update O&M Plan	34
Concrete Repairs	20

Specific Recommended Repairs

This section focuses on specific dams, that included recommended repairs in the inspection reports on file with the State. In addition, recommendations are given for specific dams without inspection reports, based on observations made during the visual inspection conducted by WRC staff.

Erity Dam (EGLE ID 247)

The inspection report for the Erity Dam was from October 2012. The dam had a hazard classification of **Low** and a condition assessment of **Poor**. The east structure of the Erity Dam is owned by the Village of Beverly Hills and the west structures ownership is unknown. The report stated that DEQ staff were attempting to determine the ownership of the West structure. Please note, the Erity Dam has been inspected by DEQ staff since 1992 and is overdue for an inspection and report. The report noted that the dam did not have adequate spillway capacity to pass the design flood. Additionally, both structures needed vegetation removal and management around the structures.

Regarding the west structure with unknown ownership, the report included a recommendation to enlist a qualified engineer to evaluate the spillway condition. The spillway was observed to have deficiencies and was in poor condition with trees growing along the spillway abutments, causing deflection of the concrete walls. It was recommended that the left and right upstream abutment

walls should be repaired as soon as possible. Additionally, the report recommended preparing a plan to address the structural deficiencies and implementing it as soon as possible as the west spillway had continued to deteriorate from previous reports.

Regarding the east structure owned by Village of Beverly Hills, the report recommended completing an in-depth analysis of the spillway within the next 15 years, though it was in fair condition. The left abutment wall had a tree growing adjacent to the wall, which caused the wall to crack and rotate. There was a void behind the right abutment wall that was creating an unstable condition. The report stated there was not an immediate threat with the East spillway; however, this had been a noted problem in past inspection reports.

Holly Dam (EGLE ID 253)

The inspection report for the Holly Dam was from November 2017. The dam had a hazard classification of **Significant** and a condition assessment of **Poor**. The Holly Dam is owned by the Village of Holly. According to the 2017 report, the deterioration of the principal spillway could be a threat to the stability of the dam. The dam was noted as having insufficient freeboard; however, it had adequate spillway capacity. It was observed that the concrete of the principal spillway had cracked and spalled. The powerhouse spillway structure was observed to have structural deficiencies; however, this was deemed not a direct threat to the stability or operation of the dam. The concern with the powerhouse was for public safety, unauthorized entry, and vandalism. The report recommended the owner of the dam to submit a plan and schedule to address deficiencies with the principal spillway and left earthen embankment of the diversion dam by February 1, 2018.

Haven Hill Lake Dam (EGLE ID 696)

The inspection report for the Haven Hill Lake Dam was from May 2015. The dam had a hazard classification of **Low** and a condition assessment of **Poor**. The Haven Hill Lake Dam is owned by the Michigan Department of Natural Resources (MDNR) Parks and Recreation. The report noted that there was deterioration of the concrete principal spillway. It was also stated that the dam had adequate spillway capacity to pass the design flood but with insufficient freeboard. The 2015 report recommended repair or replacement of both concrete principal spillway abutment walls due to exposed stone masonry and reinforcing steel. The 2015 inspection report stated that this was a repeated recommendation from past reports.

Duck Lake Dam (EGLE ID 698)

Spicer Group reviewed the Duck Lake Dam inspection report from October 2016. The dam had a hazard classification of **Low** and a condition assessment of **Fair**. The Duck Lake Dam is owned by the Charter Township of Orion. The report recommended restoring the function of the dam's three (3) drawdown gates. The report speculated that the conduits near the drawdown gates had become damaged or separated. It also noted that stabilization measures should be implemented in the eroded areas adjacent to the bridge/spillway abutment wall. It was noted that major improvements were completed in 2014 which included removing trees along the embankment, regrading and installing gabion baskets, rehabilitation of the concrete abutment walls, and replacement of the Nakomis Road bridge. Additionally, monitoring was recommended for the seepage area, also known as a boil, located immediately downstream of the drawdown structure.

Vhay Lake Dam (EGLE ID 783)

Spicer Group reviewed the Vhay Lake Dam inspection report from April 2017. The dam had a hazard classification of **Low** and a condition assessment of **Poor**. The Vhay Lake Dam is owned by the Vhay Lake Property Owner's Association (POA). The report noted that the concrete spillway was in poor condition and the hydraulic capacity was less than the 100-year design flood event. According to the 2017 report, the dam was only capable of conveying approximately half of the 100-year flood discharge. It was recommended that significant work be completed on the dam to increase the hydraulic capacity.

Additionally, the report recommended repair or replacement of the left and right upstream wingwalls and the right and left downstream abutment due to loss of concrete and exposed rebar. These were both recommended to take place within the next five (5) years from the report date. The report also recommended replacing the weir crest. The report noted that the weir crest should be replaced with a new concrete weir or adjustable stop log system. It specifically mentioned the weir should NOT be replaced in kind. The report also noted that there were areas of seepage observed on the downstream face and toe of the embankment slope. It was recommended that the seepage should be monitored and if the condition worsens, a French Drain or toe blanket drain should be installed.

Petrauskas Pond (EGLE ID 968)

The Petrauskas Pond Dam was visited on September 8, 2020 by WRC Staff. The dam has a hazard classification of **Low** with no condition assessment. As part of the visit it was noted that the primary outlet should be inspected due to failure. Additionally, this structure is regulated under Part 315 and is need of a full inspection. WRC Staff spoke with the owners and will continue to follow up to have the structure inspected in 2021. Additional, WRC note, there is minimal downstream risk due to available floodway and minimal impoundment of water.

Cranbrook Lake Dam (EGLE ID 1667)

The inspection report for the Cranbrook Lake Dam was from December 1996. Please note, the Cranbrook Lake Dam is overdue for an inspection and report. The Cranbrook Lake Dam is owned by the Cranbrook Educational Community. The dam had a hazard classification of **Low** and a condition assessment of **Fair**. According to the 1996 report, the spillway capacity was inadequate to pass peak flood flows. Key recommendations in the report include the following:

- Lower the lake level by removal of the single timber stop log (approximately four (4) inches) in each spillway
- Construct a new gate in Upper Spillway No. 2 and two (2) gates in the Lower Spillway
- Consider raising the dam by approximately two (2) feet to provide adequate freeboard and/or consider creation of an emergency spillway immediately north of the Lower Spillway (at the location of previous overtopping)

The Upper No. 2 spillway was observed to have weakened embankment and spillway abutment walls from tree roots. The Upper No. 1 spillway was observed to have dry-laid field stone walls which were in poor condition. The report stated that the combined capacity of the three spillways in the dam was inadequate to pass the required design flow.

Lower Hatchery Dams (EGLE ID 1679)

The Lower Hatchery Dam was visited on September 22, 2020 by WRC Staff. The dam had a hazard classification of **Low** with no condition assessment. The Lower hatchery Dam is in the Drayton Plains Nature Center in Waterford. As part of the visit it was noted that the center support should be inspected due to spalling concrete. Additionally, this structure is regulated under Part 315 and is need of a full inspection. WRC Staff spoke with representatives from the city and they plan to have the structure inspected in 2020. Additionally, WRC noted, there is minimal downstream risk due to available floodway and minimal impoundment of water.

Secord Lake Dam (EGLE ID 1707)

The Secord Lake Dam was visited on September 10, 2020 by WRC Staff. The dam had a hazard classification of **Low** with a condition assessment of **Fair**. As part of the visit it was noted that the pipe from the lake appears to be collapsing. Additional WRC note, there is minimal downstream risk due to available floodway. However, there are 7 homes on the impoundment that may lose value if the structure failed.

Lake Araho Dam (EGLE ID 1710)

The Lake Araho Dam was visited on September 1, 2020 by WRC Staff. The dam had a hazard classification of **Low** with no condition assessment. As part of the visit it was noted that the primary outlet should be inspected due to failing concrete. Additionally, this structure is regulated under Part 315 and is need of a full inspection. WRC Staff spoke with the owners and they plan to have the structure inspected in 2020. Additional, WRC note, there is minimal downstream risk due to available floodway and minimal impoundment of water. However, there are 26 homes on the impoundment that may lose value if the structure failed.

Pettibone Pond Dam (EGLE ID 1971)

Spicer Group reviewed the inspection report for the Pettibone Pond Dam from September 2000. The dam had a hazard classification of **Low** and a condition assessment of **Poor**. The Pettibone Pond Dam is owned by MDNR Parks and Recreation. Please note, the Pettibone Pond Dam is overdue for an inspection and report. According to the 2000 report, the dam did not have sufficient capacity to pass the design flood. Key recommendations in the report include the following:

- Remove a minimum of one foot of stoplogs from the spillway to provide adequate spillway capacity during design flood conditions
- Install toe drain on the right embankment by October 1, 2001
- Develop a plan to address repairs to the concrete spillway by 2005
- Monitor settlement and seepage at the embankment toe on a quarterly basis.

The concrete spillway was observed to have deterioration in several locations; however, they did not require immediate repair. There was also observation of cracks at the junction of the right abutment wall and right downstream wingwall. These cracks were also observed in the 1992 report. Please note, this recommendation is from 2000 and Spicer Group is unaware of the current condition of the dam.

Hartman & Tyner Mitigation Pond 1 (EGLE ID 2641)

Spicer Group reviewed the inspection report for the Hartman & Tyner Mitigation Pond 1 Dam inspection report from November 2019. The dam had a hazard classification of **Low** and a condition assessment of **Fair**. The Hartman & Tyner Mitigation Pond 1 is owned by MDNR Wildlife. The report recommended urgent work on portions of the dam. Key recommendations in the report included the following:

- Remove or replace both failing principal spillway outlet pipe end sections as soon as practical
- Backfill, compact, and seed the eroded segment of the embankment to the right of the left spillway outlet pipe as soon as practical
- Monitor the erosion occurring adjacent to the left concrete spillway structure monthly

The principal spillway outlet was recommended for removal or replacement due to previous inspection reports indicating the pipes had signs of sag and misalignment. Both pipes were in a state of partial collapse.

Regulated Dams Owned by WRC

Of the 92 regulated dams, 32 are owned and maintained by WRC. Dam inspections were completed by WRC staff for all dams in 2019 as part of our scheduled triennial inspection process and reports are on file with the State. Key information from those reports related to existing conditions and recommended repairs are summarized here.

General Recommendations

Of the 32 structures owned and operated by WRC, 31 are rated at Satisfactory or Fair condition. Most of the repairs recommended through the inspection process have been completed by WRC staff. For outstanding repairs, WRC is either working internally or working with a contractor to complete the repairs.

Currently the only general recommendation is to update EAP maps to better reflect dam break flood mapping. WRC staff has started this process utilizing a consultant.

Specific Recommended Repairs

This section focuses on specific dams, that included recommended repairs from the inspection reports, or existing condition. Additionally, any structure with a poor or unsatisfactory condition and a hazard classification of Significant or High is included here.

Clintonville Dam {Oakland-Woodhull} (EGLE ID 241)

The Oakland-Woodhull Lake Dam was inspected in 2019. The dam had a hazard classification of **Significant** and a condition assessment of **Satisfactory**. In the report there are notes of minor repairs for fencing and vegetation. This work will be handled internally.

Loon Lake Dam (EGLE ID 245)

The Loon Lake Dam was inspected in 2019. The dam had a hazard classification of **Significant** and a condition assessment of **Satisfactory**. In the report there are notes of minor repairs for low flow valves and additional consideration for the operation of Loon #1. WRC is working with a contractor to complete the repairs noted.

Lake Louise Dam (EGLE ID 255)

The Lake Louise Dam was inspected in 2019. The dam had a hazard classification of **High** and a condition assessment of **Satisfactory**. In the report there are notes of minor repairs for low flow valves and vegetation removal. WRC is working with a contractor to complete the repairs noted.

Oxbow Lake Dam (EGLE ID 263)

The Oxbow Lake Dam was inspected in 2019. The dam had a hazard classification of **High** and a condition assessment of **Satisfactory**. In the report a missing downstream bar screen is noted. WRC is working with a contractor to complete the repair.

Pontiac Lake Dam (EGLE ID 265)

The Pontiac Lake Dam was inspected in 2019. The dam had a hazard classification of **High** and a condition assessment of **Fair**. In the report there are notes of the following-

- Non-Functional Gate – WRC, worked through a contractor and completed gate repairs
- Wingwall Cracks – WRC, through a consultant, is monitoring the wingwalls for movement. This has been deemed a nonstructural concern at this time
- Spalling of concrete in spillway – WRC Field Staff are monitoring the spillway for additional cracks.
- South of Dike No. 1 Saturation – WRC is working with a consultant to determine if this poses any risk to the structure. This work is scheduled to be complete in 2021.

WRC is in the long-range planning phase for a major reconstruction project on this dam in the next 10-years.

Waterford Multi-Lake Level Control (EGLE ID 275)

The Waterford Multi-Lake Dam was inspected in 2019. The dam had a hazard classification of **Significant** and a condition assessment of **Satisfactory**. In the report there are notes of changes to the O & M plan for the gates. WRC is working internally to make the O & M changes noted.

Dawson Millpond Dam (EGLE ID 718)

The Dawson Millpond Dam was inspected in 2019. The dam had a hazard classification of **High** and a condition assessment of **Satisfactory**. In the report there are notes to repair the damaged sluice gate and remove vegetation from the dam. This work was completed by a contractor this year.

Bevins Lake Dam (EGLE ID 1661)

The Bevins Lake Dam was inspected in 2019. The dam had a hazard classification of **Low** and a condition assessment of **Poor**. This structure poses no risk to downstream residents in its current condition. The Bevins Lake Dam is a sheet pile structure that has failed and currently is not functioning. The WRC is in the design process for a new dam at this location.

Wau-Me-Gah Lake Dam (EGLE ID 1675)

The Wau-Me-Gah Lake Dam was inspected in 2019. The dam had a hazard classification of **Significant** and a condition assessment of **Satisfactory**. In the report there are notes of minor grout work in the downstream culvert. WRC is working internally to make the repairs noted.

Unregulated or Inventoried Structures

There are 46 structures that are not regulated under any act and are considered inventory dams. They do not require inspection by the State and therefore, no report has been submitted. WRC staff conducted site visits for most of the dams in this category to confirm their existence and determine the general condition of these structures. WRC was unable to locate several of the structures. Additional effort will be required to verify the information for these dams.

It should be noted that inventory structures in this section are not regulated by any authority. As such there is limited action that can be taken to ensure the structure is maintained.

General Recommendations

Regarding the data within EGLE's GIS, it is recommended the information be updated, based on the findings of this report. There are several structures that no longer exist and should be removed or noted as such. Additional structures may need to be added to their inventory list.

The following structures have been removed, failed or are no longer in service (these are the same structures mentioned in the first paragraph of this report). As such they should be removed from the EGLE Database-

- Gehrke Dam, 250
- Crystal Lake Dam, 776
- Pontiac Motor Division Detention Basin, 1367
- Eggleston Dam, 1673
- Paint Creek Cider Mill Dam, 1700
- Rochester City Park Dam, 1702
- Shoup Pond, 1709
- Woodcreek Hills Dam, 1718
- Misuaraca Dam, 2286
- Mill Pond Dam, 2287
- Outwood Sub Dam, 2289

Specific Recommended Repairs

This section focuses on specific unregulated inventory dams that have no report on file and have noted deficiencies. Recommendations are given based on observations made during the visual inspection conducted by WRC staff.

Fenton Dam #1 (EGLE ID 1670)

The Fenton Dam #1 is unregulated but has a condition assessment of "unsatisfactory". The Fenton Dam #1 is owned by Rose Township Parks. The township has removed all boards from this structure, and it is abandoned. There is only natural flow and impoundment.

Fenton Dam #2 (EGLE ID 1671)

The Fenton Dam #2 is unregulated but had a condition assessment of “unsatisfactory”. The Fenton Dam #2 is owned by Rose Township Parks. The township has removed all boards from this structure, and it is abandoned. There is only natural flow and impoundment.

Fenton Dam #3 (EGLE ID 1672)

The Fenton Dam #3 is owned by Rose Township Parks the last in a chain of three structures. The township has removed all boards from this structure, and it is abandoned. There is only natural flow and impoundment.

Lake Genesareth Dam (EGLE ID 1677)

The Lake Genesareth Dam was visited on September 28, 2020 by WRC Staff. The Lake Genesareth Dam is in Farmington Hills. As part of the visit it was noted that the weir needs repair due to spalling concrete. Additional WRC note, there is minimal downstream risk due to available floodway and minimal impoundment of water.

Franklin Drain Dam (EGLE ID 1689)

The Franklin Drain Dam was visited on September 28, 2020 by WRC Staff. The Franklin Drain Dam is in West Bloomfield Township. As part of the visit it was noted that the weir needs repair. Additional WRC note, there is minimal downstream risk due to available floodway, culvert restriction, and minimal impoundment of water. However, there are 7 homes on the impoundment that may lose value if the structure failed.

Franklin Drain Dam (EGLE ID 1695)

The Franklin Drain Dam was visited on September 28, 2020 by WRC Staff. The Franklin Drain Dam is in West Bloomfield Township. As part of the visit it was noted that the sheet pile wall needs repair. Additional WRC note, there is minimal downstream risk due to available floodway and minimal impoundment of water.

Franklin Drain #2 Dam (EGLE ID 1696)

The Franklin Drain Dam #2 was visited on September 28, 2020 by WRC Staff. The Franklin Drain #2 Dam is in West Bloomfield Township. As part of the visit it was noted that the sheet pile wall needs repair. Additional WRC note, there is minimal downstream risk due to available floodway and minimal impoundment of water.

Appendix A

Summary of Pertinent Information from EGLE Database

Note: the recommendations for each structure are located on pages 10 - 18.

Summary of Data for Dams In Oakland County

DamID	WRC provided Report	Dam Name	Owner Type	Owner Name	Downstream Hazard Potential	Condition Assessment	Year Constructed	Age	Last Inspection Date	Frequency of Inspection
237		Oxford Multi-lakes Control Structure	Private	Oakland County Drain Commissioner	Low	Satisfactory	1975	45	25-Jul-19	3
239		Bunny Run Dam	Private	Oakland County WRC	Low	Satisfactory	1926	94	31-Oct-19	3
240	Yes	Clarkston Dam	Private	Lehman Investment Company	High	Satisfactory	1900	120	03-Aug-11	3
241		Clintonville Dam	Private	Oakland County Drain Commissioner	Significant	Satisfactory	1915	105	01-Nov-19	3
242		Commerce Dam	Private	Oakland County Drain Commissioner	Low	Fair	1915	105	16-Aug-19	3
244	Yes	Davisburg Dam	Local Government	Oakland County Parks and Recreation (County)	Low	Satisfactory	1835	185	16-Jul-18	5
245		Loon Lake Dam	Private	Oakland County Drain Commissioner	Significant	Satisfactory	1936	84	19-Aug-19	3
247	Yes	Erity Dam	Local Government	Village of Beverly Hills	Low	Poor	1913	107	25-Sep-12	5
248	Yes	Ford Dam #3 (Hubbell Pond)	Local Government	Village of Milford	Significant	Satisfactory	1939	81	25-Apr-17	4
250		Gehrke Dam	Private	Anmar Inc.	Significant	Not Rated	1913	107	01-Jan-01	
253	Yes	Holly Dam	Local Government	Village of Holly	Significant	Poor	1840	180	31-Jul-17	4
255		Lake Louise Dam	Private	Oakland County Drain Commissioner	High	Satisfactory	1925	95	31-Jul-19	3

DamID	WRC provided Report	Dam Name	Owner Type	Owner Name	Downstream Hazard Potential	Condition Assessment	Year Constructed	Age	Last Inspection Date	Frequency of Inspection
256		Lakeville Lake Dam	Private	Oakland County Drain Commissioner	Low	Satisfactory	1913	107	31-Jul-19	3
259	Yes	Lake Orion Dam	Local Government	Village of Lake Orion	Significant	Satisfactory	1829	191	29-Jul-16	4
263		Oxbow Dam	Private	Oakland County Drain Commissioner	High	Satisfactory	1964	56	30-Aug-19	3
264	Yes	Perrysville Dam	Private	Dennis Karas, Karas Industrial Sales, Inc.	Low	Not Rated	1890	130	01-May-96	5
265		Pontiac Lake Dam	Private	Oakland County Drain Commissioner	High	Fair	1920	100	05-Nov-19	3
266	Yes	Pungs Dam	Private	Jay and Bernadett Gagen	Low	Satisfactory	1923	97	07-Apr-16	5
267	Yes	Quarton Dam	Local Government	City of Birmingham	Significant	Satisfactory	1921	99	20-Jun-17	4
272		Bald Mountain Pond Dam	State	MDNR Fisheries	Low	Not Rated	1946	74	03-Sep-92	
273		Spring Lake Dam	Private	Great Lakes Lot Owners Association	Low	Not Rated	1938	82	01-Jan-01	5
275		Waterford Multi-Lakes Level Control	Private	Oakland County Drain Commissioner	Significant	Satisfactory	1973	47	12-Jun-19	3
276	Yes	Wildwood Lake Dam	State	MDNR Parks & Recreation	High	Satisfactory	1961	59	17-Oct-18	3
277	Yes	Winkler Pond Dam	Private	Nathaniel L. & Bryn Brock	Significant	Satisfactory	1917	103	13-May-20	4
314	Yes	Phipps Lake Dam	Private	UJF Otronville	Low	Fair	1930	90	12-Nov-16	5
315		Dixie Lake Dam	Private		Low	Not Rated	1940	80	01-Jan-01	
432	Yes	Big Seven Lake Dam	State	MDNR Parks & Recreation	Low	Fair	1967	53	28-Oct-19	5

DamID	WRC provided Report	Dam Name	Owner Type	Owner Name	Downstream Hazard Potential	Condition Assessment	Year Constructed	Age	Last Inspection Date	Frequency of Inspection
448	Yes	Seven Lakes Addition Dam	State	MDNR Parks & Recreation	Low	Fair	1970	50	07-May-15	5
614	Yes	Lake Neva Dam	Private	Lakewood Village Improvement Assoc	High	Satisfactory	1955	65	17-Dec-15	3
615	Yes	Lake Sherwood Dam	Private	Lake Sherwood Association	Significant	Satisfactory	1957	63	13-Oct-17	4
679		Addison Oaks Dam	Local Government	Oakland County Parks	Low	Not Rated	1976	44	14-Sep-77	
681		Twelve Oaks Mall Dam	Private	The Taubman Company, Inc.	Low	Not Rated	1976	44	14-Jul-77	
682	Yes	Upper Trout Lake Dam	State	MDNR Parks & Recreation	Low	Fair	1963	57	16-Sep-15	5
683	Yes	Lower Trout Lake Dam	State	MDNR Parks & Recreation	Low	Fair	1963	57	16-Sep-15	5
684	Yes	Endicott Lake Dam	Private	Linda Goldman	Significant	Satisfactory	1913	107	15-Apr-08	4
687	Yes	Indian Lake Dam	Private	Indian Lake Dam Association	Low	Satisfactory	1928	92	06-Sep-18	5

DamID	WRC provided Report	Dam Name	Owner Type	Owner Name	Downstream Hazard Potential	Condition Assessment	Year Constructed	Age	Last Inspection Date	Frequency of Inspection
688	Yes	Prince Lake Dam	State	MDNR Parks & Recreation	Low	Satisfactory	1963	57	28-Jul-17	5
689	Yes	Pettibone Creek Dam #1	Local Government	Village of Milford	Low	Satisfactory	1938	82	25-Apr-17	5
690		Pettibone Creek Dam No 2	Private	Tom Callan	Low	Not Rated	1938	82	01-Jan-01	
691	Yes	Moore Lake Dam	State	MDNR Parks & Recreation	Low	Fair	1938	82	28-Jul-17	5
692	Yes	Heron Dam	State	MDNR Parks & Recreation	High	Fair	1969	51	17-Oct-18	3
693	Yes	Davisburg Trout Pond Dam	State	MDNR Wildlife	Significant	Satisfactory	1951	69	28-Jul-17	4
694	Yes	Braemar Lake Dam	Private	Braemar Lake POA	Low	Satisfactory	1960	60	19-Oct-18	5
695	Yes	Knoblock Lake Dam	Private	Knobby Hill Farms Association	Low	Fair	1935	85	18-Jul-17	5
696	Yes	Haven Hill Lake Dam	State	MDNR Parks & Recreation	Low	Poor	1924	96	07-May-15	5
698	Yes	Duck Lake Dam	Local Government	Charter Township of Orion	Low	Fair	1920	100	29-Jul-16	5

Summary of Data for Dams In Oakland County

DamID	WRC provided Report	Dam Name	Owner Type	Owner Name	Downstream Hazard Potential	Condition Assessment	Year Constructed	Age	Last Inspection Date	Frequency of Inspection
699		Indianwood Lake Dam	Private	Oakland County Drain Commissioner	Low	Satisfactory	1920	100	22-Jul-19	3
718		Dawson Millpond Dam	Private	Oakland County Drain Commissioner	High	Satisfactory	1915	105	12-Sep-19	3
758		Renchik Dam	Private	Christopher & Elizabeth Smither	Low	Not Rated	1957	63	01-Jan-01	5
776		Crystal Lake Dam	State	MDNR Parks & Recreation	Low	Not Rated	1924	96	19-Aug-92	
777	Yes	Wolverine Lake Dam	Government	Village of Wolverine Lake	Significant	Fair	1925	95	17-Nov-16	4
783	Yes	Vhay Lake Dam	Private	Vhay Lake POA	Low	Poor	1966	54	24-Mar-17	5
819		Duck Lake Dam	Private	Oakland County Drain Commissioner	Low	Fair	1953	67	01-Oct-19	3
850	Yes	Susin Lake Dam	Private	Susin Lake Improvement Board	Low	Satisfactory	1945	75	06-Oct-17	5
862	Yes	Crystal Lake Dam	Private	City of Pontiac	Low	Fair	1989	31	16-Aug-19	3
916		Union Lake Level Control Structure	Private	Oakland County Drain Commissioner	Low	Satisfactory	1964	56	30-Aug-19	3
917		Walled and Shawood Lakes Dam	Private	Oakland County Drain Commissioner	Low	Fair	1985	35	16-Aug-19	3
918		Watkins Lake Dam	Private	Oakland County Drain Commissioner	Low	Satisfactory	1960	60	29-Aug-19	3
919		Williams Lake Control Structure	Private	Oakland County Drain Commissioner	Low	Satisfactory	1972	48	18-Sep-19	3
968		Petrauskas Pond Dam	Private	Raymond Petrauskas	Low	Not Rated	1988	32		5
969	Yes	Leavenworth Detention Pond Dam	Local Government	City of Novi	Low	Satisfactory	1995	25	05-Jun-18	5
1151		Sisters of Mercy Dam	Private	Sisters of Mercy	Low	Not Rated	0		01-Jan-01	

DamID	WRC provided Report	Dam Name	Owner Type	Owner Name	Downstream Hazard Potential	Condition Assessment	Year Constructed	Age	Last Inspection Date	Frequency of Inspection
1367		Pontiac Motor Division Detention Basin	Private	Pontiac Motor Division	Significant	Not Rated	1982	38	13-Jun-82	
1661		Bevins Lake Dam	Private	Oakland County Drain Commissioner	Low	Poor	1966	54	31-Oct-19	3
1662		Buell Road Dam	Private	Ralph Zakerski	Low	Not Rated	0		01-Jul-82	
1663	Yes	Bush Lake Dam	Private	Village of Holly	Low	Satisfactory	2011	9	09-Nov-19	3
1664		Cass Lake Control Structures 1 and 2	Private	Oakland County WRC	Low	Fair	1968	52	29-Jun-19	3
1665		Cedar Island Dam	Private	Oakland County Drain Commissioner	Low	Satisfactory	1965	55	16-Aug-19	3
1667	Yes	Cranbrook Lake Dam	Private	Cranbrook Educational Community	Low	Fair	0		05-Dec-96	5
1669	Yes	Farmington Venture Detention Pond Dam	Private	Farmington Brook Sub Ha	Low	Not Rated	1979	41	04-Dec-97	5
1670		Fenton Dam #1	Local Government	Rose Township	Low	Unsatisfactory	1937	83	10-Sep-92	
1671		Fenton Dam #2	Local Government	Rose Township	Low	Unsatisfactory	1937	83	10-Sep-92	
1672		Fenton Dam #3	Private	Private Wm Wilson	Low	Not Rated	1937	83	04-May-89	
1673		Eggleston Dam	Private	W. B. Eggleston	Low	Not Rated	1953	67	01-Jan-01	
1674	Yes	Heather Lake Dam	Private	Village Oaks Common Areas Assn	Low	Not Rated	1978	42	22-Jul-78	5
1675		Wau-Me-Gah Lake Dam	Private	Oakland County Drain Commissioner	Significant	Satisfactory	1930	90	18-Sep-19	3
1676	Yes	Lake Charnwood Dam	Private	Lake Charnwood Property Owners Asso	Low	Not Rated	1963	57	01-Nov-12	5
1677		Lake Genesareth Dam	Private	Holy Sepulchre Cemetary	Low	Not Rated	0		01-Jan-01	
1678		Lovett Dam	Private	J. L. Lovett Jr	Low	Not Rated	0		01-Jan-01	
1679		Lower Hatchery Dams	Private	Drayton Plains Nature Center	Low	Not Rated	0		16-Aug-89	5
1680		Manito Lake Dam	Government	Oakland County	Low	Not Rated	1950	70	01-Jan-01	
1681	Yes	McGinnis Lake Dam	State	MDNR Parks & Recreation	Low	Fair	1978	42	07-May-15	5
1682		Meadowbrook Retention Dam	Private	Trinity Land Limited	Low	Not Rated	1979	41	05-Sep-80	

DamID	WRC provided Report	Dam Name	Owner Type	Owner Name	Downstream Hazard Potential	Condition Assessment	Year Constructed	Age	Last Inspection Date	Frequency of Inspection
1683	Yes	Meadowglen Sub Storm Ret Pond Dam	Private	Meadowglen HOA	Low	Satisfactory	1977	43	26-Oct-18	5
1684		Meadowhills Est Retention Pond North	Private		Low	Not Rated	1978	42	01-Jan-01	
1685		Meadowhills Estates Retention Pond South	Private		Low	Not Rated	1978	42	18-Sep-79	
1686	Yes	Meadow Lake Dam	Private	Meadow Lake Farm Association	Low	Satisfactory	1950	70	06-Sep-00	5
1689		Franklin Drain Dam	Private	Unknown	Low	Not Rated	0		01-Jan-01	
1690		Stony Creek Dam	Private	Unknown	Low	Not Rated	0		01-Jan-01	
1691		River Rouge Dam #1	Private	Unknown	Low	Not Rated	0		01-Jan-01	
1692		River Rouge Dam #2	Private	Unknown	Low	Not Rated	0		01-Jan-01	
1693		Baldwin Pond Dam	Private	Donald Barlow	Low	Not Rated	0		01-Jan-01	
1694		Cranbrook Foundation Dam	Private	Cranbrook Foundation	Low	Not Rated	0		01-Jan-01	
1695		Franklin Drain Dam	Private	Unknown	Low	Not Rated	0		01-Jan-01	
1696		Franklin Drain #2 Dam	Private	Unknown	Low	Not Rated	0		01-Jan-01	
1697		Northbrook Gardeners Dam	Private	Northbrook Gardeners	Low	Not Rated	0		01-Jan-01	
1698	Yes	Northfield Hills Dam	Private	City of Troy	Low	Satisfactory	1971	49	02-May-19	5
1699		Old Hamestead	Private	Unknown	Low	Not Rated	0		01-Jan-01	
1700		Paint Creek Cider Mill Dam	Private	Oakland Township	Low	Not Rated	0		01-Jan-01	
1702		Rochester City Park Dam	Local Government	City of Rochester	Low	Not Rated	1934	86	01-Jan-01	
1704		Hillview Lake Dam	Private	Mitchell Balcerzak	Low	Not Rated	0		01-Jan-01	
1705		San Marino Golf Club Dam	Private	San Marina Golf Club	Low	Not Rated	1967	53	01-Jan-01	
1706		Sashabaw Creek Dam	Private	R. J. Clark	Low	Not Rated	0		01-Jan-01	
1707		Secord Lake Dam	Private	Alan & Charmaine Paulson	Low	Not Rated	0		01-Jan-01	5
1708		Sargent Creek Dam	Private	Carraher Adele	Low	Not Rated	0		01-Jan-01	
1709		Shoup Pond	Local Government	Oakland County	Low	Not Rated	0		01-Jan-01	
1710		Lake Araho Dam	Private	Paint Creek Group, Inc.	Low	Not Rated	0		01-Jan-01	5
1711		Smith Dam	Private	Fresh Air Society	Low	Not Rated	1938	82	01-Jan-01	
1713		Stewart Lake Dam	Local Government	Oakland County Parks	Low	Not Rated	0		01-Jan-01	
1714		Taylor Lake Dam	Private	Green & Les	Low	Not Rated	0		01-Jan-01	
1715		Traxler Dam	Private	Traxler	Low	Not Rated	0		01-Jan-01	
1716		Waldon Pond Dam	Private	Unknown	Low	Not Rated	0		01-Jan-01	
1717		Tull Lake Dam	Private	Twin Lakes Improvement Association	Low	Not Rated	0			5

Summary of Data for Dams In Oakland County

DamID	WRC provided Report	Dam Name	Owner Type	Owner Name	Downstream Hazard Potential	Condition Assessment	Year Constructed	Age	Last Inspection Date	Frequency of Inspection
1718		Woodcreek Hills Dam	Private	Woodcreek Hills Development	Low	Not Rated	0		01-Jan-01	5
1719		Yates Mill Dam	Private	Yates Cider Mill	Low	Not Rated	0		01-Jan-01	
1971	Yes	Pettibone Pond Dam	State	MDNR Parks & Recreation	Low	Poor	1940	80	13-Sep-00	5
1998		Lake Angelus Level Control Structure	Local Government	Village of Lake Angelus	Low	Not Rated	1979	41	15-Aug-90	
1999		Big Lake Dam	Private	Oakland County Drain Commissioner	Low	Satisfactory	1969	51	08-Nov-19	3
2000		Eagle Lake Dam	Local Government	Oakland County	Low	Not Rated	1978	42	01-Jan-01	
2001		Fox Lake Dam	Private	Oakland County Drain Commissioner	Low	Fair	1965	55	12-Sep-19	3
2002		Middle & Lower Straits Dam	Private	Oakland County Water	Low	Fair	1965	55	25-Oct-19	3
2004		Storm Retention Pond Dam	Local Government	West Bloomfield Township	Low	Not Rated	1975	45	12-Sep-95	
2005		Tipsico Lake Dam	Private	Oakland County Drain Commissioner	Low	Fair	1954	66	01-Oct-19	3
2120	Yes	Proud Lake Dam	State	MDNR Parks & Recreation	Low	Satisfactory	1962	58	13-Sep-00	5
2172		Cemetary & Dollar Lake Dam	Private	Oakland County Drain Commissioner	Low	Fair	1973	47	12-Jun-19	3
2197	Yes	Taft Road Regional Detention Basin	Local Government	City of Novi	Low	Satisfactory	1990	30	05-Jun-18	5
2198	Yes	Thornton District Detention Basin	Local Government	City of Novi	Low	Satisfactory	1985	35	05-Jun-18	5
2199	Yes	Meadowbrook Lake Dam	Local Government	City of Novi	Low	Satisfactory	1984	36	05-Jun-18	5
2286		Misuaraca Dam	Private	Josephine Misuraca	Low	Not Rated	0		01-Jan-01	
2287		Mill Pond Dam	Private	C S Harding Mott Jr	Low	Not Rated	0		01-Jan-01	
2288	Yes	Ray Dam	Local Government	City of Southfield	Low	Satisfactory	0		20-Jun-17	5
2289		Outwood Sub Dam	Private	Unknown	Low	Not Rated	0		01-Jan-01	
2290		Warstler Dam	Private	Floyd Warstler	Low	Not Rated	0		01-Jan-01	
2413		Galloway Creek USGS Control	Federal	DOI USGS	Low	Not Rated	1960	60	01-Jan-01	

DamID	WRC provided Report	Dam Name	Owner Type	Owner Name	Downstream Hazard Potential	Condition Assessment	Year Constructed	Age	Last Inspection Date	Frequency of Inspection
2415		River Rouge USGS Control	Private	DOI USGS	Low	Not Rated	1962	58	01-Jan-01	
2416		Upper River Rouge USGS Control	Private	DOI USGS	Low	Not Rated	1959	61	01-Jan-01	
2470		Applebrook Detention Basin #1	Private	Biltmore Properties	Low	Not Rated	1981	39	01-Jan-01	
2471		Oak River Sub #2 Dam	Private	Biltmore Properties	Low	Not Rated	1981	39	29-Jan-88	
2472		Troy Lakes Estates Dam	Private	Chris Nelson & Son Inc	Low	Not Rated	1993	27	01-Jan-01	5
2496	Yes	Waterfowler's Impoundment Dam	State	MDNR Wildlife	Low	Fair	1985	35	28-Oct-19	5
2497	Yes	Thread Creek Impoundment Dam	State	MDNR Wildlife	Low	Satisfactory	1969	51	28-Oct-19	5
2570		Orchard Lake Dam	Private	Oakland County Drain Commissioner	Low	Satisfactory	1968	52	26-Nov-19	3
2580		Pebble Creek Detention Basin Dam	Local Government	City of Farmington Hills	Low	Not Rated	0			5
2641	Yes	Hartman & Tyner Mitigation Pond 1	State	MDNR Wildlife	Low	Fair	1993	27	28-Oct-19	5
2642	Yes	Hartman & Tyner Mitigation Pond 2	State	MDNR Wildlife	Low	Satisfactory	1993	27	28-Oct-19	5
2643		Commerce Township Park Dam	Local Government		Low	Not Rated	0			
4002		Long Lake Dam	Private	Oakland County Drain Commissioner	Low	Satisfactory	1965	55	25-Oct-19	3
4003		Scott Lake Control Structure	Private	Oakland County Drain Commissioner	Low	Not Rated	0			3
4004		White Lake Dam	Private	Oakland County Drain Commissioner	Low	Satisfactory	1948	72	29-Aug-19	3

DamID	Recommendations
237	
239	
240	Repairs performed in 2006 and 2008 addressed current maintenance concerns. Banks and vegetation should be maintained at their present condition. The headwall of the outlet structure has spalling on its concrete face. An epoxy mortar overlay on sound concrete should be placed in the near future. The headwall railing is in need of repair at the same time.
241	
242	
244	The Davisburg Dam is in satisfactory overall 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. The principal spillway does not have adequate capacity to convey the design flood; however, the embankment has been armored for protection from overtopping flows. Therefore, the dam is considered to have adequate spillway capacity to safely convey the design flood. The following recommended actions are listed by priority: 1. Continue to monitor the condition of the principal spillway gate and outlet pipe monthly. 2. Perform a follow-up televised camera inspection of the interior of the principal spillway gate and outlet pipe within five years. Implement repairs or replacement as recommended in the inspection report. 3. Remove woody debris from the upstream slope and continue to mow the entire earthen embankment a minimum of two times per year to prevent further establishment of woody vegetation and facilitate visual inspection. 4. Continue to monitor the grouted riprap overtopping protection for damage during overtopping events. Repair as necessary. 5. Continue to lubricate and operate the principal spillway gate a minimum of two times per year to ensure its proper operability. 6. Prepare, and keep up-to-date an Operation and Maintenance (O&M) Plan for the dam. Provide updated copies to the Dam Safety Program. The dam's current low hazard potential rating remains appropriate.
245	
247	The Erity Dam is in poor condition. The dam does not have adequate spillway capacity to safely pass the design flood. Based upon observations at the time of the inspection, there were, however, no other apparent structural deficiencies that may lead to the immediate failure of the dam. The following recommended actions should be completed by the owner of the right spillway. 1. Enlist the services of a qualified engineer to further evaluate the right spillway's condition and develop a long-term plan to address its deficiencies. Implement the plan for major repair, replacement, or removal of the structure as soon as reasonably possible. 2. Develop a plan to address the spillway capacity deficiency as soon as reasonably possible. This should be done in accordance with the repair, replacement, or removal of the spillway. 3. Remove all trees and brush from the embankments as soon as reasonably possible. 4. Backfill, compact, and seed the eroded areas adjacent to both downstream abutment walls as soon as possible. 5. Monitor quarterly the seepage collection pipe located along the left downstream channel wall. Report any changes in the flow rate, color, or sediment transport to the Dam Safety Program. 3 The following recommended actions should be completed by the Village of Beverly Hills on the left spillway. 1. Repair the left upstream and right downstream abutment walls as soon as possible. 2. Remove all trees and brush from both embankments as soon as reasonably possible. 3. Within 15 years, perform an in-depth analysis of the left spillway's concrete structure. 4. Prepare an Operation and Maintenance Plan (O&M Plan), providing a copy to the Dam Safety Program. The low hazard potential rating for this dam remains appropriate.
248	1. Within the next year, remove trees at the toe of the right earth embankment downstream slope to a point approximately 8-feet away from the toe of slope. 2. Continue to monitor by either observation or collection of the seepage flow in both earth embankments. Note any increase in flow or movement of soil particles. 3. Use the Operation and Maintenance (O&M) Plan outlined both the office notebook and items covered in this Operation and Maintenance Section of this Report. 4. Update the Emergency Action Plan contacts. Provide information to the Oakland County Emergency Services Coordinator for acceptance then provide EAP documentation to the MDEQ.
250	
253	The Holly Dam is in overall poor condition. Continued deterioration of the principal spillway and powerhouse structure will pose a threat to the stability of the dam in the mid to long-term. The dam has adequate spillway capacity to convey the design flood, but with less than recommended freeboard. The following recommended actions are listed by priority: 1. Remove all trees and brush from both earthen embankments. This recommendation is repeated from the 2009 inspection report, and should be completed as soon as possible. After clearing, both embankments should be mowed or treated with herbicide a minimum of two times per year to prevent further establishment of woody vegetation and to facilitate visual inspection. 2. Submit a plan and schedule to address deficiencies with the principal spillway and left earthen embankment of the diversion dam by February 1, 2018. Plans could include repair, replacement, or removal of the structures. 3. Implement a program to remove all burrowing animals and beavers from the vicinity of the dam. Backfill existing burrows and remove debris from both spillway structures as necessary. 4. Review, and update as necessary, the Emergency Action Plan (EAP) for this dam in coordination with Oakland County Homeland Security. Provide the results of this review, and any updates, to the Dam Safety Program by December 31, 2017. 5. Review and update the Operation and Maintenance (O&M) Plan periodically. Provide updated copies to the Dam Safety Program. The dam's current significant hazard potential rating remains appropriate.
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DamID	Recommendations
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259	The Lake Orion Dam is in satisfactory overall 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. The dam has adequate spillway capacity to safely convey the design flood. The following recommended actions are listed by priority: 1. Repair cracks and spalling on the downstream face of the principal spillway. This recommendation is repeated from previous inspection reports and should be completed as soon as reasonably possible. 2. Remove all trees and brush from the earthen embankment. This recommendation is repeated from previous inspection reports and should be completed as soon as reasonably possible. After clearing, the entire earthen embankment should be mowed or treated with herbicide a minimum of two times per year to prevent further establishment of woody vegetation and to facilitate visual inspection. 3. Provide Dam Safety Program staff access to the auxiliary spillway head gate and powerhouse structures during the 2020 inspection of the dam or have a consulting engineering firm inspect these structures before that inspection. 4. 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. This action was due on December 31, 2008. 5. Prepare and keep up to date an Operation and Maintenance Plan (O&M Plan) for the dam. Provide updated copies to the Dam Safety Program. The dam's current significant hazard potential rating remains appropriate.
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264	Mortared joints in the spillway tunnel should be inspected occassionally and repointed as is necessary to ensure the walls stay in good repair. Rip rap should be replaced if losta long the north and south banks of the spillway tunnels outflow to ensure good protection of the slopes.
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266	Recommended all trees and stumps be removed from the entire embankment and to 10 feet beyond the toe of embankment at a time when the lake has been drawn down. Keep embankment free of trees and brush in the future. Steps should be taken to provide for frequent monitoring during any flood situation and to provide a sure, effective method for removing an adequate number of stop logs during a flood situation. Plans should be made for replacement of the upstream wingwalls and downstream upper retaining walls. Other unsound concrete should be chipped away and be armored with a 6" layer of new concrete, anchored to the old concrete. This work should be completed prior to the next required inspection in five years. Burrowing animals should be removed from the area. It is recommended that a simple operation and maintenance plan be established for this dam.
267	1. Continue to monitor the seepage along the downstream right abutment of the principal spillway and downstream left abutment of the auxiliary spillway outlet structures on a quarterly basis. Report any changes in seepage flow rate, color, or sediment deposition to the Dam Safety Program. 2. Remove all trees and brush from the upstream face of the left earthen embankment. This recommendation is repeated from the 2013 inspection report and should be completed as soon as possible. After clearing, both embankments should be mowed a minimum of two times per year to prevent further establishment of woody vegetation and to facilitate visual inspection. 3. Backfill and seed the small eroded area along the upstream face of the left earthen embankment by November 1, 2018. 4. Continue to operate the auxiliary spillway gates through their entire range of motion a minimum of two times per year to ensure their proper operability. 5. Prepare, and keep up-to-date, an Operation and Maintenance Plan (O&M Plan) for the dam. Provide copies, and any updates, to the Dam Safety Program.
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276	1. Perform a televised camera inspection of the interior of the principal spillway outlet pipe. This recommendation is repeated from previous inspection reports and should be completed as soon as reasonably possible. 2. Monitor the foot traffic erosion along the upstream slope of the earthen embankment on an annual basis. If the condition worsens, implement erosion control measures as necessary. 3. Review, and update as necessary, the dam's Emergency Action Plan (EAP) in coordination with Oakland County Emergency Management. Submit the results of this review, and any updates to the Dam Safety Program. This action was due on December 31, 2012. 4. Periodically review and update the dam's Operation and Maintenance Plan (O&M Plan). Provide updated copies to the Dam Safety Program.
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314	1. Monitor seepage on the back left slope (as facing downstream) and report any flow change or sedimentation accumulation. 2. Backfill animal burrown on the embankment side of the left buttress. 3. Locate, mark and monitor the toe drains. 4. Repair spalling concrete in the spillway structure.
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DamID	Recommendations
448	1. Perform repairs to the drawdowsn gate and restore the normal impoundment level, as authorized by DEQ Permit No. 15-63-0023-P. Replace the missing access hatch upon completion of these repairs, as it is a potential safety hazard and is susceptible to unauthorized entry and/or vandalism. 2. Remove all remaining trees and brush from the earthen embankment and principal spillway inlet. THis condition is repeated from previous inspection reports and should be completed as soon as possible. After clearing, the entire embankment should be mowed a minimum of two times per year to prevent further establishment of woody vegetation and facilitate visual inspection. 3. Remove all burrowing animals from the vicinity of teh dam by June 1, 2016. Backfill, compact, and seed all existing burrows once the animals are removed. 4. Monitor the historical depression at the downstream face of the earthen embankment on an annual basis for changes in size or erosion. If the condition worsens, the depression should be backfilled, compacted, and seeded. 5. Commission a televised camera inspection of teh interior of the principal spillway outlet pipe within 10 to 15 years. Implement repairs or replacement of the pipe as recommended in that inspection report. 6. Review and update the Operation and Maintenance Plan (O&M Plan) annually. Provide any updates to the Dam Safety Program.
614	1)Some minor bare spots and mole “tracks/tunnels” were found in several areas over the length of the earthen dam on the east side of Biscayne Street. These have very little impact on the integrity of the dam, as long as they are repaired and controlled. To repair, anyholes should be filled and compacted with clay material and the “tracks”compacted level the vegetative surface. Eliminating or controlling the moles is essential to prevent major future maintenance requirements. The bare spots should be seeded with a field grass such as perennial rye or wild flowers. 2)Depressions and eroded areas along the shoreline of Brendel Lake at the outlet pipes. The gabion baskets installed with the reconstruction of the outlet structure are still in good condition, but the shoreline on each side of baskets is eroding. There is no major urgency but these areas need to be watched for continued erosion. 3)Debris in the overflow pipe. The flared end section and the bar grate have collected sticks and leaves that should be cleaned out. This overflow pipe is an important safety devise to control the maximum high water elevation of Lake Neva and control the hydrostatic pressure on the earthen dam of which Biscayne Avenue is built. 4)Lake Neva Shoreline Erosion. There is some shoreline erosion along the west side of Biscayne Street, but, it is very minor and just needs to be monitored.
615	1. Monitor all cracks in the principal spillway drop structure for changes in crack size.2. Monitor the upstream sheet piling retaining wall for continued deterioration. The wall has gaps and is tipping.3. Monitor seepage areas located in the roadside ditch and adjacent to the outlet culvert. 4. Monitor minor stoplog leakage. Minor leakage is normal for wood stoplogs, but should be monitored for any increases in flow.5. The existing trash rack is old, but is still functioning. When the trash rack is replaced, we recommend upgrading to a self-cleaning design trash rack.6. Develop a written Operation & Maintenance (O&M) Plan for the dam, which wasoutlined in the Operation and Maintenance Section of previous Inspection Reports andrepeated herein.7. Update the Emergency Action Plan contacts with the Oakland CountyEmergency Services Coordinator and notify MDEQ of status upon submittal ofthis Report.
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682	1. Complete a televised camera inspection of the interior of the corrugated metal pipe (CMP) outlet pipe as soon as reasonably possible. Implement repairs or replacement as recommended in that inspection. 2. Remove all trees and brush from the earthen embankment and auxillary spillway channel by November 1, 2016. Once cleared, the entire embankment and channel should be mowed and/or treated with herbicide a minimum of two times per year to prevent futher establishment of woody vegetation and facilitate visual inspection. 3. Review the Operation and Maintenance Plan (O&M Plan) annually and update as necessary. Provide updated copies to the Dam Safety Program.
683	1. Complete a televised camera inspection of the interior of the corrugated metal pipe (CMP) outlet pipe as soon as reasonably possible. Implement repairs or replacement as recommended in that inspection report. 2. Repair the crack in the principal spillway inlet riser headwall as soon as reasonably possible. 3. Remove all trees and brush from the earthen embankment and auxillary spillway channel by November 1, 2016. Once cleared, the entire embankment and channel should be mowed and/or treated with herbicide a minimum of two times per year to prevent further establishment of woody vegetation and facilitate visual inspection. 4. Continue to monitor seepage at the downstream toe of the earthen embankment slope on a quarterly basis. Report any changes in seepage conditions to the Dam Safety Program. 5. Review and update the Operation and Maintenance Plan (O&M Plan) annually. Provide updated copies to the Dam Safety Program.
684	Evaluate strength of existing concrete and stability of structure. Repair concrete piers and wingwalls at principal outlet. Repair concrete channel of secondary outlet. Remove trees and brush from earthen embankments. Grub embankments and remove roots and animal burrows. Inspect dam on an annual basis prior to and after embankment improvements. Evaluate options/alternatives for increasing spillway capacity. Increase spillway capacity.
687	Install filter fabric and plain riprap in these areas to prevent further erosion from strom events. Divert storm water runoff from two-track leading to the dam to the upstream side of the road with an angled diversion channel as discussed during the inspection. Remove existing vegetation from concrete and monitor twice a year to keep the concrete clear of vegetation in the future. The few remaining trees and brush should be removed from the downstream toe of slope. Paint the metal safety railings and replace corroding sections with holes in them. Also, plan to either fully repair or replace all metal safety railings in the next ten years if possible.

DamID	Recommendations
688	1. Remove all woody vegetation, weeds, and cattails from both embankments and in the immediate vicinity of the principal spillway inlet structure. This recommendation is repeated from the 2012 inspection report and should be completed as soon as reasonably possible. Once cleared, both embankments should be mowed or treated with herbicide a minimum of two times per year to prevent further establishment of woody vegetation and to facilitate visual inspection. 2. Perform a televised camera inspection of the principal spillway drop inlet and outlet pipe within five years. Implement repairs or replacement as recommended in that report. 3. Continue to monitor the principal spillway for debris build-up monthly and after major rainfall events. Remove the debris as necessary. 4. Monitor the principal spillway for additional erosion. Install erosion control measures as necessary. 5. Review and update the Operation and Maintenance Plan (O&M Plan) regularly. Provide updates to the Dam Safety Program.
689	It is recommended that all brush and young trees be removed from the area surrounding the open channel spillway and from the shoreline surrounding the spillway intakes to maintain the integrity of the spillways. Regular observations of the spillway and embankment slopes (at least monthly and during/after heavy rains) and the periodic maintenance mentioned in the Operation and Maintenance section below should be continued.
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691	1. Spillway repairs were previously permitted by the DEQ in 1999 under DEQ Permit No. 99-10-0609-P, but were never implemented. Subsequent dam safety inspection reports have recommended that these repairs be completed as soon as possible. Parks and Recreation Division (PRD) should respond to this report in writing by January 20, 2018 with a plan and schedule for addressing these deficiencies. 2. Remove all brush from both earthen embankments. This recommendation is repeated from the 2012 inspection report and should be completed as soon as reasonably possible. Once clear, both embankments should be mowed or treated with herbicide a minimum of two times per year to prevent further establishment of woody vegetation and to facilitate visual inspection. 3. Review and update the Operation and Maintenance Plan (O&M Plan) regularly. Provide any updates to the Dam Safety Program.
692	1. Reconstruct the sandbag ring adjacent to the principal spillway outlett. Continue to monitor seepage conditions monthly. Report any changes in seepage flow rate, color, or sediment deposition to the Dam Safety Program. 2. Complete a televised camera inspection of the interior of the principal spillway outlet pipe by the end of 2022. 3. Remove all trees and brush from the earthen embankment. This recommendation is repeated from previous inspection reports and should be completed as soon as practical. Once cleared, the entire embankments should be mowed a minimum of two times per year to prevent further establishment of woody vegetation and to facilitate visual inspection. 4. Backfill, compact, and stablize the eroded areas along the upstream slope of the earthen embankment. This recommendation is repeated from previous inspection reports and should be completed as soon as practical. 5. Consider repairing and restoring operability to the drawdown gate and operator. 6. Review and update as necessary the dam's 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. This action was due on December 31, 2012. 7. Review and update the Operation and Maintenance Plan (O&M Plan) periodically. Provide updated copies to the Dam Safety Program.
693	1. Continue to monitor the principal spillway for buildup of debris monthly and during heavy rainfall events. Remove debris as needed. 2. Continue current efforts to remove beavers from the vicinity of the dam. 3. Continue to mow both embankments a minimum of two times per year to prevent further establishment of woody vegetation and to facilitate visual inspection. 4. Repair the minor spalling at the right principal spillway abutment wall, adjacent to the catwalk safety railing connection, within 5 to 10 years. 5. Continue to monitor the seepage and condition of the concrete at the right downstream headwall on an annual basis. Implement repairs as needed. 6. In coordination with Oakland County Homeland Security, review, and update as necessary, the Emergency Action Plan (EAP) for the dam by December 31, 2017. Provide any updates to the Dam Safety Program. 7. Review and update the Operation and Maintenance Plan (O&M Plan) regularly. Provide any updates to the Dam Safety Program.
694	Clear brush before the next inspection. Monitor the cracks for displacement and widening. Also watch for spalling of the concrete in areas around the cracks. Recommends continued semi-annual operations of the sluice gate. Recommned that the gear box have annual grease applications using the grease zert on the structure.
695	All brush and trees should be removed. Replace and compact soils in loose areas, add additional fill to downstream slope to increase slope to a 4H: 1V slope. Properly seed with grass to prevent tree and brush growth. Fill burrows and sinkholes as they are discovered. Annually walk crest of earthen dam to inspect for animal activity. Investigate the routing and determine if it is necessary to increase the spillway capacity or just provide an overflow channel to route additional flows. Monitor cracks for widening and displacement. It should be noted these cracks were documented in the past two reports, therefore may not be a major issue, but still should be monitored.
696	1. Repair or replace both concrete principal spillway abutment walls. This recommendation is repeated from previous inspection reports and should be completed as soon as reasonably possible. 2. Remove all trees and brush from the upstream face of the right earthen embankment and both downstream principal spillway abutment walls by June 1, 2016. Mow the entire embankment a minimum of two times per year to prevent further establishment of woody vegetation and facilitate visual inspection. 3. Continue to monitor seepage at the toe of the earthen embankment on a quarterly basis. 4. Monitor the bare foot path along the embankment crest on an annual basis. Implement erosion control measures as necessary. 5. Review and update the Operation and Maintenance Plan (O&M Plan) annually. Provide any updates to the Dam Safety Program.
698	Monitor the boiling water area immediately downstream of the principal spillway on a monthly basis. Report any changes in flow rate, color, scour or sediment deposition, or movement of the spillway structure to OHM and the Dam Safety Program. Continue efforts to remove all trees from the upstream slopes of the earthen embankments. This recommendation is repeated from the 2012 inspection report and should be completed as soon as reasonably possible. Once cleared, both embankments should be mowed or treated with herbicide a minimum of two times per year to prevent further establishment of woody vegetation and to facilitate visual inspection. Implement stabilization measures in the eroded areas adjacent to the bridge/spillway abutment wall by November 1, 2017. Restore function to the dam's three drawdown gates. Lubricate and operate the gates a minimum of two times per year. Prepare and keep up to date an Operations and Maintenance (O&M) Plan for the dam. Provide updated copies to the Dam Safety Program.

DamID	Recommendations
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777	Several areas along the berm hae settled. Depressions along the concrete wing walls of the dam. Eroded areas along the seawall. The overall berm must be brough back up to elevation 920.50 NAVD 88.
783	Remove brush and trees from the upstream and downstream slopes including trees around plunge pool and 10' beyond the toe of slope. Remove stumps and immediately fill any void space with engineer approved fill. Observe and monitor for continued erosion. If erosion progresses, install riprap toe of slope protection. Monitor seepage rates and the extents of the seepage area to determine if the rates are increasing or the seepage area is growing in size. If this condition is worsening, then install a French or toe blanket drain system on the right downstream toe of slope to reduce seepage. Widening of the embankment or flattening the slope will also reduce the potential of seepage reaching the surface. The wingwalls should be repaired or replaced within the next 5 years. Repair or replace the abutments within a 5-year period. Replace the weir crest with a new concrete weir or adjustable stop log system if the weir continues to degrade and there is loss in lake level. Replacing in kind is not recommended given the overall structural deficiencies. Continue to inspect the area of concern in future inspections. The 1993 report recommended removal or relocation of the 3 underspill pipes, yet two remain in place. We recommend removal of these underspill pipes. If it is recommended that the pipes must remain in place, we recommned they be installed through the upper portions of teh embankment and discharge to the existing plunge pool. Valves could be installed to control and maintain these structures. Repair or replace the safety fencing along the dam spillway deck. Open the sanitary manhole and verify the pipe is not connected to the manhole. The city will need to remove this cover since it is bolted in place. Monitor the groundwater seepage through the outlet. If seepage rates increase, remove the concrete pipe and install a toe drain or toe blanket system as recommended in Item No 2. An Emergency Action Plan is not required for this dam as it is a low hazard dam. However, we do recommend preparation of an Operation, Monitoring, and Maintenance plan given the existing condition of the dam. This plan should remain in place until repair or replacement has been completed and a new Operation and Maintenance Plan can be enacted. The Vhay Lake property owners have taken the responsibility of having the dam inspected and are acting as the operator for the dam. Actual ownership of the dam is likely the adjacent landowners. Therefore, we recommend that the Vhay Lake Property Owners Association acquire easements for access, operation, and maintenance of the dam from the adjacent landowners. Based on our determination, the dam has enough capacity to convey the 294 cfs at the crest of the embankment. HOwever, the Flood Insurance Study indicates a significant backwater effect on the Amy Drain for storms larger than a 10-year design storm which indicates that the hydraulics of the dam may not impact the flood elevation on Vhay Lake. HOwever, we recommend with any significant work done on the dam to include increasing the hydraulic capacity of the structure to meet MDEQ's hydraulic requirements of safely passing the 100-year flood.
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850	Remove brush and trees from the downstream slopes including trees up to 10' beyond the toe of slope. Remove stumps and immediately fill any void space with engineer approved fill. I recommend implementing a tree removal program to systematically clear over a period of time. One example would be to start by clearing all trees and woody vegetation smaller than 4 inches in diameter one year then progress to larger diameter trees. Place topsoil, seed, and mulch to establish grass growth. FIll with dirt, seed and mulch.
862	1) Perform spot welding for sheet pile for spillway weir (occassional pinholes and leaking - rerplace as necessary). 2) Repair missing fencing section west of Oaks Drain. 3) Add sight glasses for the two 66-inch sluice gates. 4) Fill animal burrow at sheet pile.
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969	Continue to monitor the pine trees growing along the downstream face of the earthen embankment on a quarterly basis. If signs of distress or seepage are observed, the trees and roots should be removed, and voids filled with engineered fill. Repair the damaged concrete at the overflow structure of the principal spillway by the end of 2018. Continue to monitor the principal spillway inlets for debris buildup monthly and after high-flow events. Remove the debris as necessary. Prepare, and keep up-to-date, a written Operation and Maintenance Plan (O&M Plan) for the dam. Provide updated copies to the Dam Safety Program.
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DamID	Recommendations
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1663	List work needed, how to be done, by whom, estimated cost, source of funds, recommended completion date. If emergency, to what extent. ADDITIONAL COMMENTS.
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1667	1. Request the Michigan Department of Environmental Quality to conduct further hydrologic and hydraulic analysis to assess spillway needs. 2. Lower the lake level by removal of the single timber stop log (approximately 4 inches) in each spillway. 3. Remove debris from all spillways and perform detailed inspection of all spillway walls and foundations. Repair cracks and/or wall joints with injection grouting. 4. Construct a new gate in Upper Spillway No. 2 and two gates in teh Lower Spillway. 5. Consider raising the dam by approximately 2 feet to provide adequate freeboard and/or consider creation of an emergency spillway immediately north of the Lower Spillway (at the location of previous overtopping). 6. Develop a written Operation and Maintenance (O&M) Plan. The plan should address operation of the spillway gates based on pond levels, both under normal and emergency conditions.
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1681	1. Remove all trees and brush from the earthen embankment. This recommendation is repeated from previous inspection reports and should be completed as soon as reasonably possible. After clearing, the entire embankment should be mowed a minimum of two times per year to prevent further establishment of woody vegetation. 2. Remove all burrowing animals from the vicinity of the dam and backfill, compact, and seed any burrows found along the earthen embankment by June 1, 2016. 3. Continue to mointor the depression along the upstream face of the earthen embankment on an annual basis. Report any significant increases in the depression size to the Dam Safety Program immediately. 4. Consider increasing the safety of the dam by removing a number of the stop logs from the principal spillway, thereby increasing its flow capacity during flood conditions. 5. Perform a televised camera inspection of the interior of the principal spillway outlet pipe within 10 to 15 years. Implement repairs or replacement of the pipe as reommended in that inspection report. 6. Review the Operation and Maintenance Plan (O&M Plan) for the dam and update as necessary. Provide any updated copies to the Dam Safety Program.
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DamID	Recommendations
1683	1. The 21-inch CMP inlet pipe appears to be partially plugged by debris. This debris should be removed as soon as possible. 2. It is recommended that an improved trash rack be installed at the upstream entrance to the 21-inch CMP inlet pipe to minimize debris entering the pipe. 3. The concrete stormwater pipe that outlets downstream of the dams twin 48-inch CMP outlet pipes has several joint separations and should be repaired. 4. Continue to remove all weeds, brush and trees from the earthen embankment. This work should be completed annually. 5. The flared end sections on the downstream end of the twin 48-inch CMP outlet pipes are showing signs of deterioration. The condition of these end sections should be monitored on a quarterly basis. As they degrade, they will eventually need to be replaced. 6. The dam and its appurtenances should be monitored on a regular basis and a journal of regular maintenance, repair and observances kept.
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1686	The existing maintenance program is excellent and should be continued. The only item that should be added to the maintenance program is the removal of brush from the downstream slope of the embankment. This work should be completed within the next three years. No repairs are recommended at this time. No alterations to the dam are recommended. Since there are no operating gates at this facility, there are no recommendations for operation.
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1698	1. Remove all brush and trees from the upstream and downstream embankments. This work should be completed annually. 2. The dam and its appurtenances should be monitored on a semi-annual basis and a journal of regular maintenance, repair, and observances kept. This should include observances of water level, looking for changes in structures condition, looking for unwanted animal activity, and erosion or seepage.
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DamID	Recommendations
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1971	1. Remove a minimum of one foot of stoplogs from the spillway to provide adequate spillway capacity during design flood conditions. The drawdown will require a permit under Part 301, Inland Lakes and Streams, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. 2. Install toe drain on the right embankment by October 1, 2001. 3. Clear brushy growth and trees from teh embankment by May 1, 2001. 4. Develop a plan to address repairs to the concrete spillway by 2005. 5. Monitor settlement and seepage at the embankment toe on a quarterly basis. 6. Develop an Operation and Maintenance (O&M) Plan for the dam.
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2120	An Operation and Maintenance (O&M) Plan should be prepared for this structure.
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2197	1. Remove all trees and brush from the downstream slope of the earthen embankment. Mow and/or treat the entire embankment with herbicide at least two timies per year to prevent further establishment of woody vegetation and to facilitate visual inspection. Avoid planting of additional trees along the earthen embankment slopes. 2. Perform an inspection of the interior of both 78-inch diameter corrugated metal outlet pipes by December 31, 2023. 3. Prepare and keep up-to-date a written Operation and Maintenance Plan (O&M Plan) for the dam. Provide updated copies to the Dam Safety Program.
2198	1. Remove all trees and brush from the earthen embankment by July 1, 2020. Mow and/or treat the entire embankment a minimum of two times per year to prevent further establishment of woody vegetation and to facilitate visual inspection. 2. Lubricate and operate the low-level inlet gate through its full range of motion a minimum of two times per year to ensure its proper operability. 3. Perform a televised camera inspection of the interior of corrugated metal pipe (CMP) outlet within 5 years. 4. Prepare and keep up-to-date, an Operation and Maintenance Plan (O&M plan) for the dam. Provide updated copies to the Dam Safety Program.
2199	1. Remove all trees and brush from both earthen embankments by July 1, 2020. After clearing, mow and/or treat both embankments a minimum of two times per year to prevent further establishment of woody vegetation and to facilitate visual inspection. 2. Within the next five years, backfill and stablize the upstream face of the left embankment where wave action erosion is occuring. 3. Prepare, and keep up-to-date, an Operation and Maintenance Plan (O&M Plan) for the dam. Provide updated copies to the Dam Safety Program.
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2288	1. Remove all trees and brush from both earthen embankments by November 1, 2018. After clearing, both embankments should be mowed a minimum of two times per year to prevent further establishment of woody vegetation and to facilitate visual inspection. 2. Continue to monitor the low flow notch in the principal spillway for debris buildup on a quarterly basis. Remove debris as necessary. 3. Continue to lubricate and operate the drawdown gate a minimum of two times per year in order to ensure its proper functioning. 4. Develop an Operation and Maintenance Plan (O&M Plan) for the dam and update as necessary. Provide a copy of the O&M Plan to the Dam Safety Program.
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DamID	Recommendations
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2496	1. Remove all trees and brush from the earthen embankment and auxillary spillway. This recommendation is repeated from past inspection reports and should be completed as soon as practical. After clearing, mow and/or treat the entire embankment and auxillary spillway channel a minimum of two times per year to prevent further establishment of woody vegetation and facilitate visual inspection. 2. Perform a televised camera inspection of teh interiors of the inlet and outlet pipes of the principal spillway within five years. 3. Confirm that repairs were completed or make repairs to the wooden inline riser structure of the principal spillway as necessary. 4. Review the Operation and Maintenance (O&M) Plan and update as necessary. Provide any updates to the Dam Safety Program.
2497	1. Remove cattail buildup from primary spillway inlet as soon as practical. Continue to monitor inlet on a quarterly basis and remove debris as necessary. 2. Remove all trees and brush from the earthen embankments and auxillary spillway. This recommendation is repeated from past inspection reports and should be completed as soon as reasonably possible. Mow both embankments a minimum of two times per year to prevent further establishment of woody vegetation and facilitate visual inspection. 3. Perform a televised inspection of the interior of the primary spillway structure within five years. 4. Review and update the Operation and Maintenance (O&M) Plan annually. Provide updated copies to the Dam Safety Program.
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2641	1. Remove or replace both failing principal spillway outlet pipe end sections as soon as practical. 2 Backfill, compact, and seed the eroded segment to the right of the left spillway outlet pipe as soon as practical. Monitor this segment and report any changes in the conditions to the Dam Safety Program. 3. Continue efforts to remove all trees and brush from the earthen embankments and auxillary spillway. After clearing, mow both embankments a minimum of two times per year to prevent further establishment of woody vegetation and facilitate visual inspection. 4. Monitor the erosion occuring adjacent to the left concrete spillway structure on a monthly basis. Implement repairs as necessary to prevent further erosion. 5. Continue to regularly monitor the spillway inlet structures for debris buildup and remove the debris as necessary. 6. Continue to monitor the outlet pipes for additional movement or deflection on a quarterly basis. 7. Prepare an Operation and Maintenance Plan (O&M Plan) and update as necessary. Provide updated copies to the Dam Safety Program.
2642	1. Remove all trees and brush from the earthen embankments and auxillary spillway. This recommendation is repeated from past inspectio nreports and should be completed as soon as reasonably possible. Mow both embankments a minimum of two times per year to prevent further establishment of woody vegetation and facilitate visual inspection. 2. Continue efforts to remove burrowing animals from the dam's vicinity. Backfill, compact, and seed all existing burrows as soon as possible. 3. Continue to monitor the spillway for inlet debris buildup on a quarterly basis and remove debris as necessary. 4. Prepare an Operation and Maintenance Plan (O&M Plan) and update as necessary. Provide updated copies to the Dam Safety Program.
2643	
4002	
4003	
4004	