

Preliminary Report on the Edenville Dam Failure, Response Efforts, and Program Reviews



August 31, 2020



EGLE Environmental Assistance Center
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Michigan.gov/EGLE

PREFACE

This report provides an update on the ongoing failure investigation of the Edenville Dam and the response actions of the Michigan Department of Environment, Great Lakes, and Energy (EGLE) and other agencies following the May 19, 2020, failures of the Edenville and Sanford Dams located in Midland and Gladwin Counties.

The report is respectfully submitted in response to Governor Gretchen Whitmer's May 27, 2020, letter to EGLE Director Liesl Eichler Clark, in which Governor Whitmer directed EGLE to:

"...lead an investigation into the causes of this disaster. Among other factors, I ask that you examine the storm event, the structural integrity of the dam, the dam owner's compliance, and the handoff of regulatory oversight from the federal to state government. In addition to investigating this incident, please review the larger issue of dam safety in Michigan and provide recommendations on policy, budgetary, legislative, and enforcement reforms that can prevent these harms from repeating elsewhere."

This report is the first in a series of reports. EGLE will receive future reports from an independent forensic investigation team, the Association of State Dam Safety Officials (ASDSO), and the Michigan Dam Safety Task Force. The independent forensic investigation team report will determine the contributing factors of the dam failures, and the ASDSO and task force reports will address overall improvement of dam safety in the State.

Below is a discussion of the immediate steps taken to protect public health related to the dam structure itself, as well as the various lines of investigation and an update on additional activities.

This report does not contain information regarding ongoing litigation related to the dam failures.

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INTRODUCTION

Over a 48-hour period, May 16-18, 2020, heavy rainfalls, ranging locally from 6-8 inches, hit mid-Michigan, concentrating in Arenac, Gladwin, Iosco, and Midland Counties. Subsequent rainfall from the evening of May 18, 2020, through the afternoon of May 19, 2020, placed additional stress on many dams located on the Tobacco River and Tittabawassee River systems, including the Chappel and Beaverton Dams (Tobacco River) and the Secord, Smallwood, Edenville, and Sanford Dams (Tittabawassee River). Due to this heavy rainfall combined with the already saturated state of the water system, the Tittabawassee River had surpassed flood stage in many areas.

Around 5:30 p.m. on May 19, 2020, a portion of the Edenville Dam's earthen embankment failed, causing an uncontrolled release of impounded water to rush downstream toward Edenville, Sanford Lake, and Sanford Dam. The level of Sanford Lake rose quickly over the next two hours, and around 7:45 p.m. the Sanford Dam was overtopped by floodwaters and failed. The combined failures sent a torrent of water rushing down the already swollen Tittabawassee River, through the village of Sanford, and toward the cities of Midland and Saginaw, where the Tittabawassee River joins the Saginaw River and ultimately outlets to Saginaw Bay. The Tittabawassee River crested in Midland midday on May 20, 2020, at 35 feet. Figures 1 and 2 are aerial photos taken on May 26, 2020, of the two failed dams.

EGLE assumed regulatory authority for the 96-year-old Edenville Dam in late 2018 after its license to generate hydropower was revoked by the Federal Energy Regulatory Commission (FERC). Four dams (Edenville, Sanford, Secord, and Smallwood) are privately controlled by Lee Mueller, who owns and operates them through a number of family trusts and LLC entities including Boyce Hydro Power, LLC (Boyce).

While more than 11,000 people were evacuated and 2,500 structures were damaged by the floods, no major injuries or fatalities were reported. Visual observations indicate that the flood wave generated by the failure of the two dams started around 20 feet high, dissipated to around 4 feet at the Midland United States Geological Survey gauge, and continued downstream. Preliminary damage estimates are more than \$250 million.

EGLE responded immediately during the flood event with floodplain and dam safety engineers and other staff travelling throughout the area to assess flood and dam safety risks. Dam Safety Program staff were on-site in the hours preceding, during, and following the dam failures to provide emergency personnel with technical assistance and information necessary to make decisions at the dam and protect the lives of downstream residents. In the days, weeks, and months following the flooding and dam failure events, EGLE staff continue to assist in recovery efforts and work with local, state, and federal agencies and others to perform additional assessments of public safety, transportation, and natural resources damages.

The following report was developed in response to Governor Whitmer's May 27, 2020, letter directing EGLE to lead an investigation into the cause(s) of the May 19, 2020, dam failures and also take a broader look at overall safety of dams in Michigan (Appendix A).



Figure 1: Aerial photograph of the failed Edenville Dam, looking south, taken on May 26, 2020.



Figure 2: Aerial photograph of the failed Sanford Dam, looking north, taken on May 26, 2020. On Tuesday, May 19, 2020, an estimated 200-year weather event caused local rivers to swell, especially in Arenac, Bay, Gladwin, Iosco, Midland, and Saginaw Counties. Flood waters caused additional stress on local dams and contributed to the failure of the Edenville and Sanford Dams and caused damage to the Chappel, Beaverton, Secord, Smallwood, and Forest Lake Dams. Failure of the two dams released a torrent of water, devastating the downstream communities of Edenville, Sanford, Midland, and Saginaw.

INVESTIGATIONS

Edenville Dam Engineering Analysis and Mitigation Efforts

Following the failure of the Edenville Dam, EGLE notified Boyce about safety and stability concerns associated with the remaining portions of the dam. These concerns included the stability of the Tobacco River side earthen embankments, the ongoing transportation challenges, and the natural resources impacts associated with the diversion of the Tobacco and Tittabawassee Rivers through the breach in the dam. EGLE directed Boyce to take action via two Dam Safety Orders and also obtained a temporary restraining order to compel Boyce to enlist the services of a qualified engineering consultant to perform an evaluation of the remaining dam and recommend any necessary actions to address ongoing concerns. Boyce hired TRC Engineers who submitted two reports in June and July. These reports were insufficient because they were too limited in scope, did not comply with the temporary restraining order, and did not adequately address EGLE's concerns. Despite continued efforts to compel Boyce to fully address these concerns, as of the date of this report, Boyce has not provided sufficient investigation and analysis to adequately assess the safety and stability of the dam or address the impacts to public safety and natural resources.

Given EGLE's ongoing concerns regarding the stability of the Tobacco River portion of the Edenville Dam, the shortcomings of the engineering reports, and lack of significant progress by Boyce, EGLE proceeded with completing the necessary investigations and analyses to ensure the safety of the public and address the ongoing impacts to natural resources. EGLE has the authority to take these actions under the emergency provisions of Part 315, Dam Safety, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA). EGLE is partnering with the Michigan Department of Transportation (MDOT) to address these issues and utilize existing emergency contracts with their engineering consultant, AECOM. This partnership will streamline the assessment and decision-making processes and ensure that a coordinated solution is identified and implemented in a timely manner.

AECOM has performed a preliminary safety evaluation and analyzed potential alternatives for mitigation measures which would address the above-mentioned concerns. These alternatives were scored based on various factors, including safety/stability, resource impacts, schedule, risk, monitoring and maintenance, and input from the public. Four viable alternatives were identified and evaluated further, including full breach of the dam through the spillway, modification and partial breach of the spillway, full breach of the dam through the earthen embankment, and stabilization of the spillway and embankment and maintaining the Tobacco River side impoundment in its current configuration. Each of these alternatives would restore either full or partial flow to the Tobacco River and restore the Tittabawassee River to its prefailure channel. Each alternative would also have varying impacts on the M-30 causeway bridge.

The alternatives analysis, which included input from stakeholders, identified the modification and partial breach of the Tobacco River spillway as the preferred alternative. This will achieve the goals of restoring flow to the downstream Tobacco River, alleviate strain on the collapsed M-30 bridges, minimize upstream impacts, and address dam safety concerns. Figures 3 and 4, below, illustrate the proposed temporary mitigation measures. AECOM is now proceeding with the data collection and design phase for those measures. Upon completion of the design, EGLE will issue an emergency order to Boyce to complete the construction phase of the project this year.

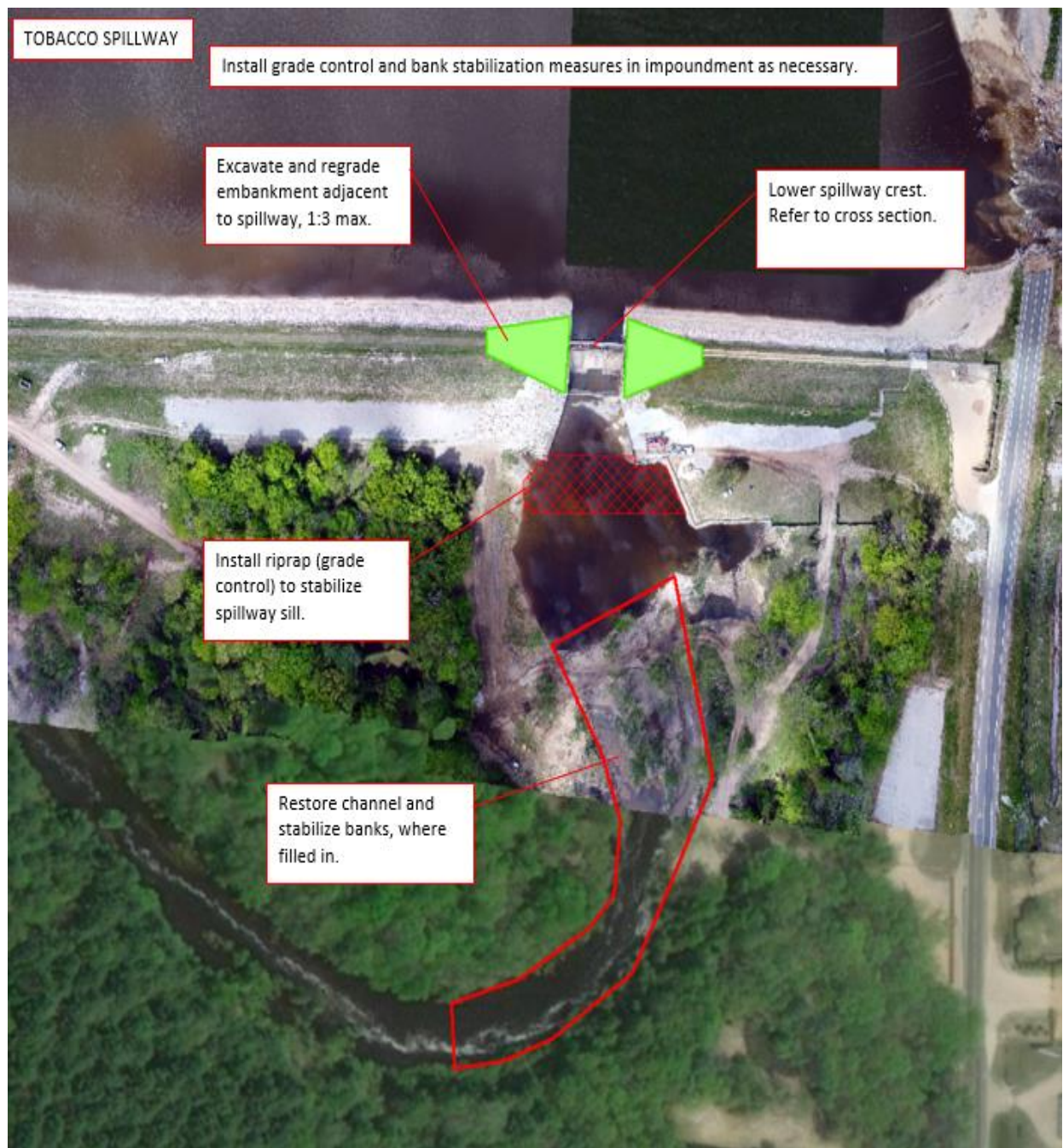


Figure 3: Proposed alternative for Tobacco River spillway.



Figure 4: Proposed alternative for Tittabawassee River spillway and breach.

In order to facilitate this work, EGLE is partnering with the Four Lakes Task Force (FLTF) to access Natural Resources Conservation Service (NRCS) Emergency Watershed Protection Grant funds. These funds may cover 75 percent of construction costs and up to 7.5 percent of engineering costs. The FLTF is a local sponsor for numerous NRCS restoration and stabilization projects in the affected area. The FLTF's involvement will help ensure the project complements other ongoing work and is consistent with long-range plans for the area.

Evaluation of Potential Downstream Chemical Impacts

Immediately after the dams failed, EGLE began coordinating an evaluation to determine if hazardous contaminants had been released from the Dow Chemical site in Midland, as well as the Tittabawassee River, Saginaw River, and Saginaw Bay Superfund Site. This work was done in partnership with the State Emergency Operations Center (SEOC), United States Environmental Protection Agency (USEPA), and others.

The Dow Midland Plant does not appear to have had a material impact on contamination in the overall river system because of the upstream dam failures. The results of 2020 postflood samples taken by EGLE at long-term trend monitoring stations were consistent with levels seen after non-2020 seasonal flooding events. Contingency planning provisions in place under EGLE's Part 111, Hazardous Waste Management, of the NREPA license for hazardous waste management, and management of legacy contamination under the existing Administrative Consent Order (ACO) between Dow, USEPA, and EGLE appear to have been successful and continue to function as designed.

EGLE staff continue to work with the USEPA and Dow on evaluations of the Superfund site under the ACO. Most of these evaluations are ongoing ACO monitoring requirements as the river floods seasonally and the implemented remedies require routine monitoring and maintenance. These evaluations include in-channel sediment cap monitoring, bank soil and stability monitoring, postflood response cleanups at riverside parks and residential areas, in-channel sediment composite sampling activities, postflood sediment deposit removal activities in parks and common areas, floodplain soil deposit monitoring, area(s) of concern monitoring, caged and native fish monitoring, and other EGLE independent monitoring activities. This data will be evaluated to further assess postflood conditions.

Dam Failure Forensic Investigation

The exact cause or causes of the Edenville and Sanford Dam failures will not be fully understood until the independent investigation of the failures is complete. The independent investigation will review factors that may have contributed to the dam failures, including known and unknown deficiencies with the dams, the hydrologic event that occurred May 16-21, 2020, the dam owner's compliance history, dam operations, regulatory oversight, and emergency notification and response during the event.

Because there were failures at both a federally-regulated dam and a state-regulated dam, and because one dam failure was likely impacted by the other, EGLE and FERC agreed to establish one investigation team to comprehensively review all contributing factors. In late May, FERC and EGLE directed the dams' owner, Boyce to assemble an investigation team and provide resumes to FERC and EGLE for review and acceptance. It is standard FERC protocol to require the dam owner to fund the dam failure investigation. However, the dam owner is not permitted to be involved in the investigative process.

Both agencies asserted that the investigative team must be comprised of qualified individuals with expertise in the various disciplines of dam safety engineering; given the ability to define their own scope of work and resources necessary to complete a thorough review; and completely independent with no direction taken from Boyce, FERC, EGLE, or any other outside agency. The investigation purpose is to determine the root physical cause(s) of the failures, identify other contributing factors to the failures (including human factors), and review the

effectiveness of Emergency Action Plans for the dams and the emergency response during and following the event.

In the following weeks, Boyce submitted resumes for six very qualified team members, which were unanimously accepted by FERC and EGLE. However, after an initial kickoff meeting on June 17, 2020, with the team, FERC, and EGLE, Boyce failed to finalize contracts with the team members to commence the investigation. After several attempts to compel Boyce to do so, FERC, in consultation with EGLE, took over the investigation team contracts and pressed forward with the investigation. On August 13, 2020, the team was directed to define their own scope and not take direction from EGLE, FERC, or Boyce. The team accepted this charge and FERC and EGLE immediately began transferring data to the investigation team at their direction. The team expects that the investigation will take approximately 12-18 months.

The team consists of five members:

1. John France, P.E., team lead and expert in Geotechnical Engineering and Emergency Action Planning
2. Irfan Alvi, P.E., expert in Structural Engineering and Human Factors
3. Jennifer Williams, P.E., expert in Geotechnical Engineering
4. Steve Higinbotham, P.E., expert in Hydraulic Structures
5. Arthur Miller, PhD, P.E., expert in Hydraulic Engineering, Hydrology, and Reservoir Operations

Dam Safety Program Review

EGLE has enlisted the services of the ASDSO Peer Review Committee to perform a thorough evaluation of Michigan's Dam Safety Program. ASDSO is a national nonprofit organization serving state dam safety programs and the broader dam safety community. Since 1989, the ASDSO has conducted more than 70 program reviews across the nation, uniquely positioning the organization to compare EGLE's program to national benchmarks.

The ASDSO members conducting the program review are:

- Bob Dalton, P.E., Veenstra & Kimm, Inc., Consultant (former Illinois Dam Safety Manager, ASDSO President, and National Dam Safety Review Board member)
- Bill Bingham, P.E., Retired Dam Practice Leader, Gannett Fleming (former United States Society on Dams President and National Dam Safety Review Board member)
- Ken Smith, P.E., Assistant Director, Division of Water, Indiana Department of Natural Resources (former ASDSO President and National Dam Safety Review Board member)
- Denny Dickey, P.E., Consultant (former Pennsylvania Dam Safety Manager; California Department of Water Resources, Division of Safety of Dams' audit team lead; and United States Department of Homeland Security's Dams Sector Government Coordinating Council member)

The Dam Safety Program evaluation, which was launched in early August 2020, is looking at the program's mission and goals, budget and staffing levels, organizational structure, and strength of existing State laws and procedures. ASDSO has already reviewed Michigan's Dam Safety Program statutes and regulations, as well as the program's protocols, examples of past dam safety inspection reports, and associated agency records. ASDSO has also spent a

significant amount of time conducting online interviews of EGLE Dam Safety Program leaders to assess their expertise and ask questions about the program's implementation.

A final report from the Peer Review Committee is expected in September 2020. The final report prepared by ASDSO is expected to identify best practices that should be continued or adopted by the program and highlight deficiencies that need to be corrected. The report will also include ASDSO recommendations to improve the effectiveness of the Dam Safety Program. This report will be provided to the newly formed Michigan Dam Safety Task Force for consideration in its review and recommendations.

Michigan Dam Safety Task Force

In her May 27, 2020, letter to EGLE, Governor Whitmer directed EGLE to review the larger issue of dam safety in Michigan and provide recommendations on policy, budgetary, legislative, and enforcement reforms that limit risks going forward. In response, EGLE has created a Michigan Dam Safety Task Force of key dam safety stakeholders to share their experience and expertise to improve dam safety in Michigan. The Michigan Dam Safety Task Force includes:

- Representatives of local units of government, including municipal dam owners, emergency management officials, and drain commissioners.
- Private stakeholders, such as dam owners and environmental and transportation consultants with dam expertise.
- Academic experts from the civil engineering and natural resources fields.
- Leaders of Michigan's tribal, conservation, and environmental communities.
- Officials from the State of Michigan departments most directly involved in dam safety: EGLE, Department of Natural Resources (DNR), MDOT, and the Michigan Public Service Commission.

The newly formed Michigan Dam Safety Task Force's review will include an evaluation of the EGLE Dam Safety Program's statutory structure, budget and program design, the adequacy of Michigan's dam safety standards, overall State of Michigan approach to dam management, and the degree of investment needed in Michigan's dam infrastructure.

The Michigan Dam Safety Task Force ultimately will report to the Governor and State Legislature on its findings and recommendations for regulatory, financial, and programmatic improvements to help ensure Michigan dams are appropriately maintained, operated, and overseen to protect Michigan's citizens and aquatic resources. With its kickoff scheduled for September 8, 2020, the Michigan Dam Safety Task Force is expected to meet monthly with its final report anticipated in early 2021.

COMMUNICATIONS

EGLE staff has been assisting individuals and community officials in all five counties affected by flooding, as well as working with other State agencies, federal agencies, the media, and legislators. Outreach to the community has included:

- Creating an Edenville Dam Failure Web site at Michigan.gov/EdenvilleDamFailure, which includes information on the flooding and dam failure events, an interactive online map of State-regulated dams and statistics, and links to other resources. The online map showing location, condition, downstream hazard potential, and other pertinent information for State-regulated dams is available at: <https://egle.maps.arcgis.com/apps/webappviewer/index.html?id=f8c0637f34864bcbabb9c794fd8e452b>.
- Running coordinated EGLE-Federal Emergency Management Agency (FEMA) outreach efforts to ensure communities are rebuilding safely.
- Hosting an EGLE online Public Informational Meeting on July 8, 2020, with presentations on recovery services and activities by EGLE, MDOT, Michigan State Police (MSP), FEMA, and local emergency management offices.
- Hosting a second Public Informational Meeting on July 15, 2020, focused on permitting requirements and the process for obtaining disaster assistance funding under the current Federal Disaster Declaration (presenters included EGLE, FEMA, and local building officials).
- Holding biweekly community updates with local legislators and local officials.
- Attending the Saginaw-Tittabawassee Rivers Contamination Community Advisory Group virtual meeting on July 14, 2020 (participants included representatives from EGLE, USEPA, Dow, local environmental groups, and interested citizens).

EGLE staff has also participated in interviews with numerous state, local, and national media outlets. Interview topics have included the recent dam failures, the broader inventory and state of dams in Michigan, dam issues specific to local media markets, and Dow Superfund sampling numbers and historic monitoring trends.

In cooperation with other State agencies and in an effort to inform the public through the media as part of a communication strategy, EGLE has issued 18 press releases on the State's flooding response and follow-up actions, which are available at Michigan.gov/EdenvilleDamFailure. They include the following:

- Governor Whitmer Directs EGLE to Investigate Failures of Edenville, Sanford Dams (May 27, 2020)
- In Midland disaster's aftermath, Michigan EGLE deploys staff to assist in cleanup, investigation, testing and risk assessment (June 3, 2020)
- State Announces Lawsuit Seeking Compensation, Restoration of Damages Caused by Boyce Hydro (June 9, 2020)
- EGLE to hire third dam inspector, appoint task force that will evaluate dam safety in Michigan (July 30, 2020)
- August 10, 2020: State investigators to assess concerns at remaining portion of Edenville Dam (August 10, 2020)
- August 11, 2020: Forensic investigation of flooding, breaches at Michigan dams moves forward (August 11, 2020)

Finally, EGLE has responded to numerous legislative inquiries and participated in Senate and House Appropriations Subcommittee hearings related to the recent dam failures and EGLE's Dam Safety Program. In response to a request from Senators Dan Lauwers and Rick Outman, EGLE also sent a letter and associated background information (Appendix B). A letter was also sent in response to a request from the United States House of Representatives' Committee on Energy and Commerce (Appendix C).

MULTIAGENCY COORDINATION

Natural Resource Assessment

In the days after the Edenville Dam failure, EGLE and DNR deployed teams on and along the bottomlands to assess the extent of environmental resource damages. This effort was essential to identify areas of erosion that could impact private property, collect data vital to bridge and road repairs, and gather evidence that could be used in potential future enforcement actions.

EGLE and DNR staff assessed the extent of high water flooding, stream stability and erosion issues, habitat loss, and mussel and fish impacts. These efforts included collecting and/or assessing data on:

- Postflood event high water marks across the affected areas. This data was provided to MDOT for final survey data collection. Additionally, EGLE created a Geographic Information System (GIS) data layer to better summarize, store, and display the data.
- Fifty-six tributaries around the Wixom Lake and Sanford Lake impoundment areas and the main channels within the impoundments (as shown in Figures 5 and 6 below) using GIS. This included 165 channel observation points, 62 channel blockage points, and 116 head cut observation points, as well as information on 62 existing road culverts. In addition to location information, staff also collected culvert data (e.g., type, dimension, and condition), stream condition and dimensions, erosion, flood impacts, photos, and an assessment of the severity and future risk of the impacts.

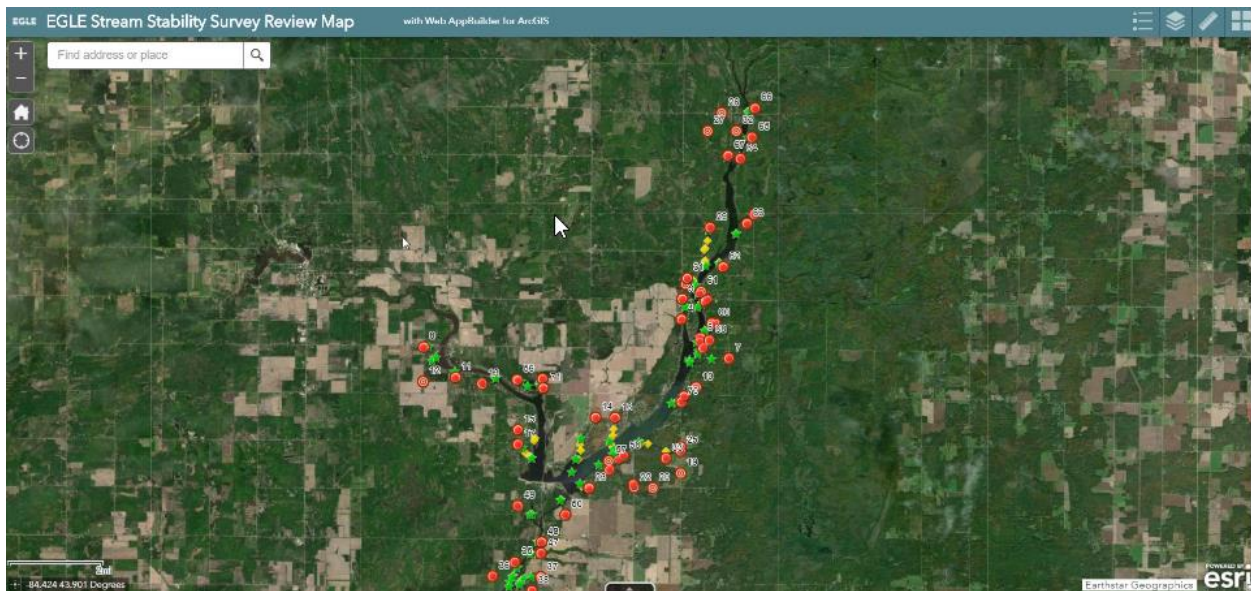


Figure 5: Observation points surrounding Wixom Lake.

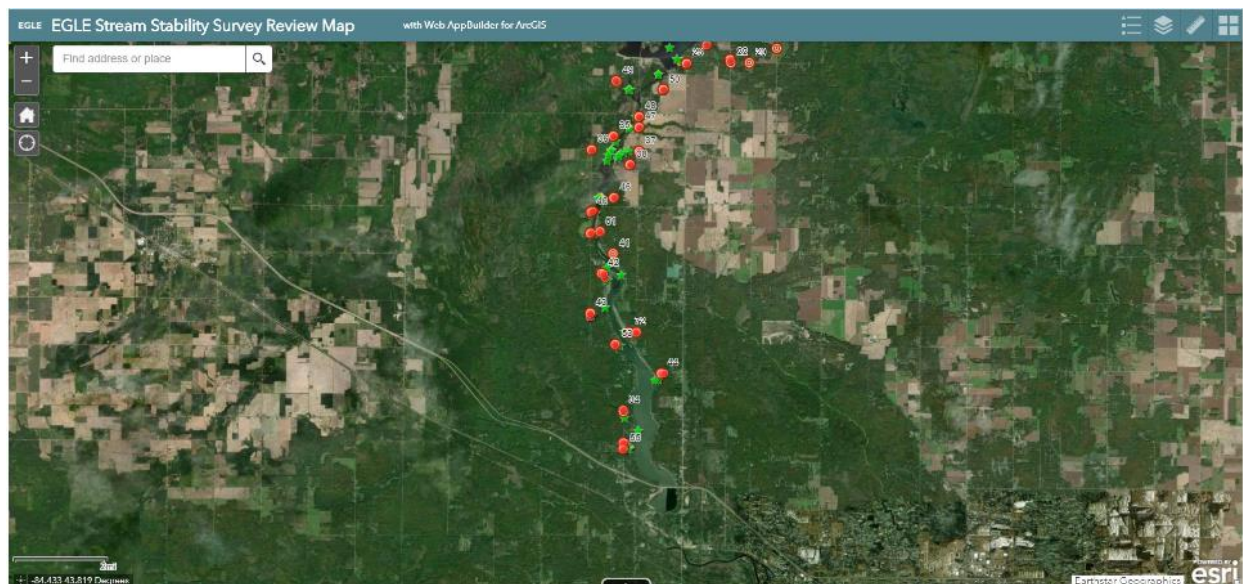


Figure 6: Observation points surrounding Sanford Lake.

- Negative impacts to eight wetland systems across the Wixom Lake and Sanford Lake basins. Data collected included information on wetland type, vegetation composition, hydrology, soils, and an initial assessment of ecological function and values for each site. This data has been compiled and placed in a GIS layer.
- Negative impacts resulting from the dam failures at 12 representative sites within the Wixom Lake and Sanford Lake basins. Data collection was focused on potential mortality of both mussel and fish populations and the initial assessment of future negative outcomes to the fisheries and aquatic systems in the Tittabawassee River as a result of the dam failures, including the loss of recreational opportunities.

Recovery Operations and Financial Assistance

The dam breaches resulted in the equivalent of a 500-year flood through Sanford, Midland, and Saginaw. Evacuations had been conducted prior to the onset of flooding. There were no fatalities, and damage assessment for the impacted area occurred in July. This report does not encompass the scope and breadth of activities by first responders and emergency personnel by local, state, and federal partners.

On June 12, 2020, the SEOC concluded incident response operations and transitioned to recovery activities, which have involved significant engagement by EGLE and other State agencies. Since a Federal Stafford Act Major Disaster Declaration was issued on July 9, 2020, federal officials have been working on recovery efforts with their state and local counterparts.

Currently, the MSP's Emergency Management and Homeland Security Division, EGLE, DNR, MDOT, and Michigan Department of Agriculture and Rural Development are involved in recovery efforts to: remove debris, monitor erosion and natural resource impacts, work with FEMA on individual and public financial assistance, and complete debris removal to help return the impacted area as close as possible to predisaster conditions.

Many of the communities in the disaster area participate in the National Flood Insurance Program (NFIP). The NFIP is managed through FEMA with the assistance of the NFIP coordinator and floodplain engineers in EGLE. The NFIP provides flood insurance for communities who agree to adopt and enforce floodplain management regulations. EGLE has provided, and continues to provide, assistance directly to residents impacted by the flooding, local officials, and county officials and has coordinated with FEMA and other State agencies on the response efforts.

The topics EGLE has provided assistance on include flood insurance information, increased cost of compliance (ICC) coverage, substantial damage (which is a FEMA and building code requirement), floodplain requirements for rebuilding, repair of structures, and State floodplain permit requirements. EGLE and FEMA are in the process of contacting all NFIP communities in the declared area to review basic NFIP related information and answer any questions local officials may have. There are seven communities in the disaster area that are sanctioned from the NFIP (meaning no flood insurance is available in those communities). FEMA contacted all seven to inform them of their status and the fact that they can get back in the NFIP if they chose. EGLE's NFIP coordinator will assist those communities with that process.

Tables 1-3, below, contain the most up-to-date flood insurance claims and disaster assistance data for the disaster area.

Table 1: NFIP claims status in designated counties; date of loss - May 16-22, 2020.

NFIP Claim Payments	\$26,328,548
Average Claim	\$ 61,643
Claims Filed	464
Claims Remaining Open	30
ICC Claims	2

Table 2: NFIP claims distribution in designated counties by occupancy type.

Occupancy Type	Number of Claims Closed Without Payment	Number of Claims Submitted
1 – Single Family	356	398
2 – Two- to Four-Family	6	6
3 – Other Residential	36	38
4 – Other Nonresidential	5	7
6 – Nonresidential - Business	10	15
Grand Total	413	464

Table 3: Disaster declaration financial assistance (individual assistance).

Individual Assistance Applications Approved	1,776
Total Individual and Households Program Dollars Approved	\$20,288,752.89
Total Housing Assistance (HA) - Dollars Approved	\$19,638,300.85
Total Other Needs Assistance (ONA) - Dollars Approved	\$ 650,452.04
Hazard Mitigation Grant Program (HMGP) - Dollars Obligated	\$ 0.00

Transportation Infrastructure

EGLE is providing postflood recovery assistance to ongoing efforts to reopen roads damaged from the flood event that occurred May 17-20, 2020. EGLE's assistance includes conducting joint field inspections with the public transportation agencies and providing technical assistance on replacement structure sizing and geometry to minimize environmental resource impacts and improve resiliency for future flood events. EGLE's assistance also includes expediting permit application processing to facilitate road reopenings, which allow emergency services to resume and minimize public travel inconvenience. When necessary, EGLE also partners with FEMA to support local public transportation agencies in maximizing project reimbursement under the Flood Disaster Declaration.

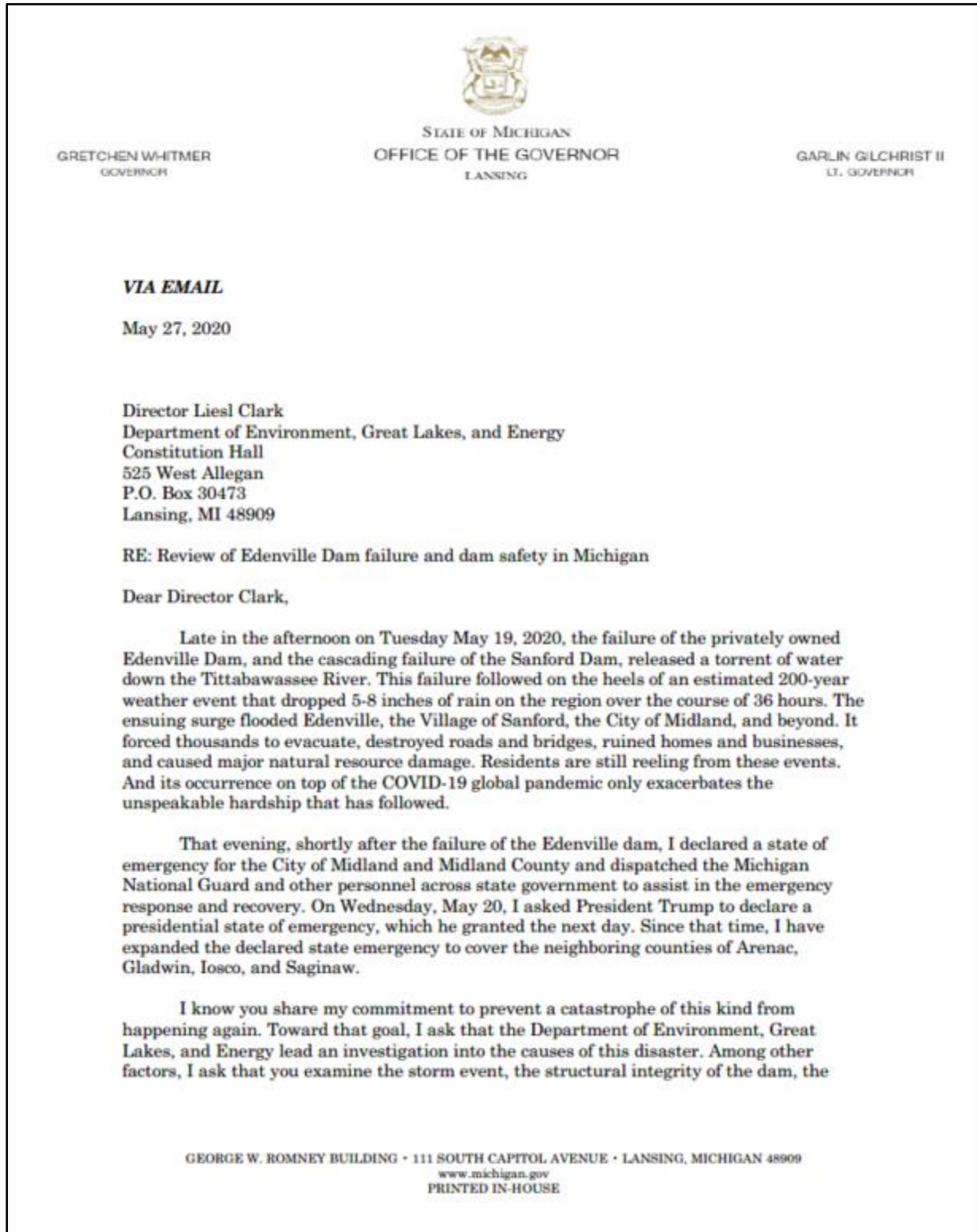
To date, EGLE has provided assistance to MDOT, county road commissions, and local municipalities with 43 road/stream crossings that sustained damaged from flood waters. Flood damage was sustained in six counties in western mid-Michigan. Specifically, Arenac (9 sites), Gladwin (8 sites), Iosco (4 sites), Midland (11 sites), Ogemaw (2 sites), and Saginaw (8 sites) Counties sustained damage to public roads. The extent of road damages varies from scour damage to complete structural failure. As of August 21, 2020, EGLE has issued permits for repairs/replacements at 14 of the above sites. Other sites have not been submitted for permits as funding and design work is still ongoing.

EGLE also continues to assist MDOT and the Midland County Road Commission in repairing and replacing structures directly damaged by the dam failures and flooding. Damaged roadways directly resulting from the dam failures include M-30 over Wixom Lake, M-30 over Tittabawassee River, Curtis Road, and US-10 over Sanford Lake.

Furthermore, EGLE is assisting transportation agencies with indirect impacts from dam failures to road crossings of the Tobacco River, Tittabawassee River, and upstream tributary streams. While these roads are currently open to traffic, road crossings upstream from dam failures may be at a higher risk of failure during future storms. As the riverine systems adjust to new conditions, an overall lowering of the stream channel is expected upstream throughout the river system (often called a head-cut). The head-cutting will cause culverts to become "perched" (i.e., the downstream end of the culvert will be suspended above the newly established downstream elevation of the channel). Bridge footings may also become exposed making them vulnerable to scour and structural failure. Perched culverts also impact fish in the river system because fish can no longer pass from downstream to upstream through these structures. EGLE consults with the DNR on fishery concerns, and the agencies partner to ensure road work does not negatively impact mussel populations.

APPENDICES

Appendix A: Governor Whitmer Letter



dam owner's compliance, and the handoff of regulatory oversight from the federal to state government. In addition to investigating this incident, please review the larger issue of dam safety in Michigan and provide recommendations on policy, budgetary, legislative, and enforcement reforms that can prevent these harms from repeating elsewhere. The department can issue its findings and recommendations in one or more reports, but please update me regularly on the progress of the investigation. Regarding the Edenville Dam failure, I request you provide me a preliminary account of what happened no later than August 31, 2020, with the results of the forensic investigation to follow as soon as possible thereafter.

Understand you have the full resources of my administration available to ensure this review is accurate, timely, and thorough. Please call on other departments and outside experts to assist in your review as needed. Thank you for your commitment to this important work that lies ahead.

Sincerely,



Gretchen Whitmer
Governor

Appendix B: EGLE Response to Michigan Senate Request



GRETCHEN WHITMER
GOVERNOR

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

LANSING

EGLE

LIESL EICHLER CLARK
DIRECTOR

July 27, 2020

VIA E-MAIL

The Honorable Dan Lauwers
State Senator
State Capitol
P.O. Box 30036
Lansing, Michigan 48909-7536

The Honorable Rick Outman
State Senator
State Capitol
P.O. Box 30036
Lansing, Michigan 48909-7536

Dear Senator Lauwers and Senator Outman:

SUBJECT: Edenville Dam Failure

Thank you for your letter of July 17, 2020, regarding the Edenville Dam failure, the internal department events and inspections that preceded it, and new ways to improve how dams are monitored and maintained. We share your interest in taking actions that will help prevent similar events in the future.

The Department of Environment, Great Lakes, and Energy (EGLE) has compiled the information you have requested. Please note that some of the correspondence references documents that are protected as Critical Energy Infrastructure Information (CEII) and cannot be shared by EGLE staff. Those documents can be requested from the Federal Energy Regulatory Commission (FERC) through their CEII Freedom of Information Act (FOIA) process or directly from the dam owner, Boyce Hydro Power, LLC. Please let us know if you have questions regarding this information or would like to set up a time to discuss it.

In follow up to our interest in preventing similar events in the future and in response to a directive from Governor Gretchen Whitmer, EGLE is taking several actions:

- In cooperation with the FERC, an independent third-party team comprised of dam safety experts has been assembled to investigate and produce a report on all contributing factors of the Edenville Dam failure and emergency response efforts during and immediately following the event. The investigation will be consistent with FERC dam failure investigation procedures along with the Dam

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Senator Rick Outman
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Failure Investigation Guideline produced by the Association of State Dam Safety Officials' (ASDSO) Dam Failure Investigation Committee.

- EGLE has requested the ASDSO to do an independent review of Michigan's Dam Safety Program to provide professional guidance to improve the performance and management of the program and to evaluate the mission, objectives, and policies and procedures of the program.
- The administration is establishing a Michigan Dam Safety Task Force comprised of state and federal agencies, local governments, and affected stakeholders to review dam safety issues in Michigan and provide recommendations on policy, budgetary, legislative, and enforcement reforms that can help prevent failures in the future. The task force will develop a report summarizing their observations and proposing recommendations to the Governor for program improvements (regulatory, financial, and programmatic) that would help ensure that Michigan dams are appropriately maintained, operated, and overseen to ensure the safety of Michigan's citizens and aquatic resources.
- EGLE was able to obtain an exception to the current hiring freeze to hire an additional staff engineer in our Dam Safety Program. As you are aware, the program is currently functioning with two engineers and a supervisor. As mentioned above, further recommendations on adequate staffing for the program will be included in the program review and task force initiatives.

If you need further information or assistance, please contact Ms. Teresa Seidel, Director, Water Resources Division, at 517-284-5470; SeidelT@Michigan.gov; or EGLE, P.O. Box 30458, Lansing, Michigan 48909-7958; or you may contact me.

Sincerely,



Liesl Eichler Clark
Director
517-284-6700

cc: Senator Ed McBroom
Mr. Aaron B. Keatley, Chief Deputy Director, EGLE
Ms. Sarah M. Howes, Legislative Liaison, EGLE
Ms. Teresa Seidel, EGLE

Appendix C: EGLE Response to United States House of Representatives Request



GRETCHEN WHITMER
GOVERNOR

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

EGLE

LIESL EICHLER CLARK
DIRECTOR

June 15, 2020

VIA E-MAIL

United States House of Representatives
Committee on Energy and Commerce
2125 Rayburn House Office Building
Washington, DC 20515-6115

Dear Committee Members:

SUBJECT: Edenville Dam, Dam ID No. 549, Gladwin County, Michigan

Thank you for your June 1, 2020, letter requesting additional information about the actions the State of Michigan has taken in overseeing the Edenville Dam. Below are your questions and our corresponding responses.

1. *As you are aware, Michigan inspected the Edenville dam on October 8, 2018 [please note the inspection was on October 4, 2018], and found the facility in "fair structural condition," despite FERC's finding only one month prior that resulted in the revocation of the project's hydropower license. Please detail what assessment was performed to reach that finding.*

The Federal Energy Regulatory Commission (FERC) and the State of Michigan do not coregulate licensed hydropower dams in Michigan, meaning that when a dam is licensed by FERC to generate hydroelectricity, that dam is exempt from regulation under Michigan's dam safety statute, Part 315, Dam Safety, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA); MCL 324.31501 *et seq.* This being the case, when FERC revoked the license to generate hydroelectricity at the Edenville Dam in September 2018, Michigan's Dam Safety Program assumed jurisdiction over the dam on the date the order became effective. Virtually all technical information related to FERC-regulated hydropower dams is protected as Critical Energy Infrastructure Information (CEII) and is not publicly disseminated. As such, Michigan's Dam Safety Program staff did not possess much documentation on the dam and lacked vital knowledge of the dam's history and past engineering assessments. The October 4, 2018, inspection of the dam was not intended to be an in-depth engineering analysis of the dam, but rather to provide a chance to meet with the owner, gain familiarity with the site, identify any critical structural deficiencies that might put the dam at risk of immediate failure, and to request past documentation needed to understand the overall safety of the dam and compliance with State statute. The October 4, 2018, inspection included only a surface inspection of the visible portions of the dam and did not include an analysis of hydraulic capacity, embankment stability, or operational adequacy. No critical structural issues were observed during that inspection warranting a "fair"

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assessment of structural condition, per the report. An evaluation of hydraulic capacity, embankment stability, and operational adequacy was to be performed at a later date after the State of Michigan had received additional information from FERC and the owner as necessary to complete that evaluation.

It should be noted that though many of the FERC dam safety requirements are similar to those of Michigan, one major difference exists. FERC requires that high hazard potential dams are able to safely convey the full Probable Maximum Flood (PMF), while Part 315 requires high hazard potential dams over 40 feet high are able to safely convey the one-half PMF. While it was well-documented by FERC that the dam could not pass PMF flows, no analysis of its ability to pass the one-half PMF had been completed prior to revocation of the license. A full assessment of the dam's overall condition would include both structural integrity and hydraulic adequacy components. Additional data collection and analyses were being coordinated by the owner's consultant group and Michigan's Dam Safety Program staff throughout 2019, with a final consultant's report expected in March 2020.

2. *What communications did Michigan have with FERC regarding the Edenville dam prior to and during the noncompliance and revocation proceedings?*

FERC provided Michigan's Dam Safety Program with copies of a compliance order and cease generation order dated June 15, 2017, and November 20, 2017, respectively. Those orders instructed the owner, Boyce Hydro, LLC (Boyce), to first enact a plan to come into compliance with federal regulations and later to stop producing electricity until the dam was brought into compliance. These were the only direct communications from FERC to the State of Michigan. Later, the State of Michigan was made aware of an order proposing revocation issued by FERC on February 15, 2018, and the order revoking license issued by FERC on September 10, 2018, and effective 15 days later on September 25, 2018. No formal consultation regarding the revocation and transition to state jurisdiction occurred.

Following revocation, Michigan's Dam Safety Program staff reached out to FERC in an effort to build a better understanding of the compliance history, obtain technical documents not publicly available, and discuss the likelihood that the owner's appeals would be granted and the FERC license would be reinstated. The main takeaways from those conversations were: FERC would not be reconsidering the license revocation so the dam would remain under State of Michigan jurisdiction until such a time that the owner was granted a new license; and all nonpublic information related to the Edenville Dam provided to the State of Michigan would need to come via FERC's CEII Freedom of Information Act (FOIA) process or be provided by the owner, at their discretion.

It should be noted that FERC has indicated they cannot broadcast legal actions related to the revocation of a license prior to ordering the revocation. This, coupled

with the difficulties in sharing information related to CEII, has inhibited the transition of regulatory authority over the Edenville Dam from FERC to the State of Michigan.

3. *What did Michigan view as its authorities and obligations with respect to the Edenville dam prior to FERC's revocation of the hydroelectric license for the dam in September 2018?*

Dams regulated by FERC are expressly exempt from regulation under Part 315. As such, the State of Michigan had no regulatory oversight of the safety of the dam prior to the license revocation. The State of Michigan does regulate work at/around the dam under other statutes, including any work within regulated inland lakes and streams, floodplains, and wetlands.

4. *What did Michigan view as its authorities and obligations with respect to the Edenville dam after FERC's revocation of the hydroelectric license for the dam?*

Upon revocation of the FERC license, the State of Michigan assumed regulatory authority over the safety of the dam under Part 315. Under Part 315, the State of Michigan can direct the owner to perform engineering evaluations of the dam to include assessment of structural integrity, hydraulic capacity, embankment stability, and operational adequacy. Part 315 also requires that a dam be maintained in a safe condition and that it can safely convey the regulatory design flood, in this case, one-half PMF. If a deficiency exists that could endanger a dam, the general course of action is to work with the owner to resolve issues prior to becoming a dam safety emergency. If the owner is unable or unwilling to remedy a deficiency, the State of Michigan can pursue elevated enforcement action, including providing notice of the violation, instilling penalties, and issuing orders to the owner to compel compliance. Additionally, local jurisdictions obtained legal lake level orders for Wixom Lake in May 2019 from the local circuit courts under Part 307, Inland Lake Levels, of the NREPA; MCL 324.30701 *et seq.* The Part 307 orders authorized the local jurisdictions to require the owners to maintain a certain lake level, purchase the dam, and collect assessments from property owners to help maintain the dam once purchased. The Part 307 orders also triggered the requirement that the local jurisdictions ensure that comprehensive inspections of the dam be performed on a regular basis and submitted to the State of Michigan for review.

5. *What actions did Michigan take with respect to Edenville dam after FERC's revocation of the hydroelectric license for the dam?*

Upon revocation of the license, the State of Michigan's first action was to reach out to FERC in order to gain a better understanding of the appeal process, as the revocation was being appealed by the owner. Once it was determined that the order was final and that the dam would remain under state jurisdiction until such a time that the owner applied for and received a new license to generate hydroelectricity,

the State of Michigan established communications with the owner and set up an initial site visit, which was the October 4, 2018, visual inspection of the dam. Since there were no apparent structural deficiencies observed during the October 4, 2018, inspection that would be expected to cause immediate failure of the dam, the State of Michigan requested all available technical documents related to the dam from both FERC and the owner. The request included past inspection reports and supporting documentation, engineering analyses, and hydraulic evaluations.

The majority of the requested documents were provided by the dam owner, while some documents were eventually provided by FERC after navigating the CEII FOIA process. Additionally, a summary hydraulic analysis from the owner's consultant, dated January 4, 2019, was provided to the State of Michigan. This analysis indicated that the dam did have adequate capacity to safely convey the design flood (one-half PMF) per state requirements. The analysis provided did not contain enough detail for the state to verify the calculations, so additional details were requested starting on February 8, 2019.

At about the same time, there was an effort by Gladwin and Midland Counties, through their delegated authority, Four Lakes Task Force (FLTF), to purchase all four Boyce-owned dams along the Tittabawassee River and establish legal lake levels on all four lakes: Secord Lake, Smallwood Lake, Wixom Lake, and Sanford Lake. That was why the local jurisdictions obtained the Part 307 orders. As the counties' delegated authority, FLTF was to take over all operation and maintenance of the dams, though the transfer of ownership from Boyce to the counties was to take several years. Michigan's Dam Safety Program staff communicated directly to the FLTF's consultant, Spicer Group, Incorporated (Spicer), as funding to make improvements to the dams would come via fundraising by FLTF, as well as a special tax assessment of the lakefront and lake access property owners. In other words, FLTF and Spicer would be designing and implementing any necessary repairs and modifications to the dam to ensure compliance with applicable state and federal regulations.

The State of Michigan communicated concerns over the hydraulic analysis provided by Boyce and the dam's ability to safely convey the one-half PMF per state requirements and set up a call with Boyce's consultant, Purkeypile Consulting, LLC, for March 16, 2019. During that call, the consultant indicated that additional data collection and analysis would be required to verify previous hydraulic calculations. This included gate tests to determine the maximum opening height and a review of flood operations of the dam by dam personnel, among other things. These were scheduled for June 2019, with the results provided to the State of Michigan in August 2019. It was communicated at that time by Spicer to the State of Michigan that the assumptions made by Boyce's consultant were not appropriate and that the dam did not likely have adequate capacity to convey the one-half PMF, though Spicer did not submit a signed and sealed finding to that effect to the State of

Michigan. Later in 2019, Michigan's Dam Safety Program compiled all information available, including the new data collected that summer, and performed a preliminary hydraulic analysis of the Edenville Dam's two spillways, based on current conditions at that time. In early 2020, those preliminary results were communicated to Spicer, who indicated that their analysis yielded similar results and that the dam did not appear to have enough spillway capacity to pass the one-half PMF. Spicer also indicated that they were working on compiling a full inspection report, as required under Part 315, which would identify all known deficiencies of the dam, including spillway capacity, and which would be provided to the State of Michigan in March 2020. The intent of the state was to respond to that inspection report when received and instruct the owner to provide a plan and schedule for addressing all deficiencies that could endanger the dam. Spicer performed the evaluation between June 2019 and March 2020, but submittal of that report was apparently delayed due to COVID-19 work-from-home precautions by Spicer, so the expected submittal date was pushed back to May 2020. The dam failed on May 19, 2020, before a final report was submitted to the State of Michigan. Spicer submitted the report on June 4, 2020.

6. *According to press reports, a January 31, 2020 communication from an engineer employed by your department to consultants indicated that the dam did not meet safety standards. What additional assessment or action undertaken by Michigan during the period between October 2018 when the dam was found to be in "fair" condition and January 2020 led to the conclusion that the dam did not meet safety standards?*

Please refer to the response to question 5, above. In short, the October 4, 2018, inspection by Dam Safety Program staff was intended to be a visual inspection to identify any deficiencies that would place the dam at imminent risk of failure, requiring immediate action. That report found the dam to be in "fair" structural condition but did not include an evaluation of hydraulic capacity of the dam as that information was not available at the time. Throughout 2019 and early 2020, Dam Safety Program staff continued to work with the owner group and their consultants to receive all necessary information to complete an evaluation of spillway capacity of the dam. By early 2020, Dam Safety Program staff suspected that the dam did not have adequate spillway capacity to safely convey the design flood (one-half PMF) event per Part 315 requirements. This deficiency would have warranted a "poor" overall condition assessment for the dam. Dam Safety Program staff expected the report to be provided by Spicer in March 2020, which was provided on June 4, 2020, would confirm their analysis.

7. *In May 2020, Michigan sued Boyce Hydro for alleged counts of environmental violations, public nuisance, and conversion, based upon Boyce Hydro's lowering of Lake Wixom's water levels in the winters of 2018 and 2019. What legal and regulatory actions, if any, has Michigan taken against Boyce Hydro with respect to*

the Edenville dam? Please provide a list of all legal and regulatory actions taken by Michigan against Boyce Hydro between September 2018 and today.

The following legal and/or regulatory actions have been taken by the State of Michigan between September 2018 and June 9, 2020:

- October 2018: Boyce lowered Wixom Lake far below FERC-mandated levels to inspect the dam but did not return the lake to FERC-mandated levels as FERC's September 19, 2018, order authorizing the drawdown had required. This exposed large areas of bottomland for many months.
- November 2, 9, and 14, 2018: Site inspections of Wixom Lake by Michigan Department of Natural Resources (DNR) and Michigan Department of Environment, Great Lakes, and Energy (EGLE) staff to evaluate natural resource damages following a citizen's complaint regarding drawdown of Wixom Lake.
- May 16, 2019: Permit WRP016343 v.1 issued to Boyce Hydro, LLC, at Boyce's request to refill Wixom Lake back to normal summer pool elevation.
- November 25, 2019: Boyce had applied for a permit to drawdown Wixom Lake temporarily over the winter months by approximately eight feet and then return the lake to normal summer pool elevation in spring 2020. EGLE denied the permit application because Boyce's desire not to spend money for ice management over the winter, as other dam owners throughout Michigan do, did not outweigh the natural resource damages an extended drawdown would cause.
- December 2019: Boyce performed the temporary winter drawdown despite the denial of its permit application.
- December 5, 2019: Consent Judgement entered by Gladwin County Circuit Court resolving a previous June 2016 lawsuit unrelated to dam safety. Boyce had violated the State of Michigan's water quality, floodplains, inland lakes and streams, wetlands, and soil erosion statutes. The Consent Judgement required Boyce to obtain a soil erosion and sedimentation control permit and notice of coverage, restore impacted wetland and stream areas, conduct floodplain compensation, obtain an after-the-fact permit, and pay \$161,000 of enforcement costs and charges.
- December 12, 2019: Enforcement Notice issued to Boyce for drawdown of Wixom Lake without authorization under Part 301, Inland Lakes and Streams; Part 303, Wetlands Protection; and Part 307 of the NREPA.
- December 13, 20, and 23, 2019: Site inspections of Wixom Lake by DNR and EGLE staff to evaluate natural resource damages.
- January 2, 2020: Boyce Trusts and FLTF signed a purchase agreement for FLTF to acquire Wixom, Sanford, Secord, and Smallwood Dams and lake bottoms over the course of two years, closing in January 2022.
- February 6, 2020: Preapplication meeting with FLTF consultants regarding Edenville Dam to discuss repairs, permitting, and next steps.

- February 14, 2020: Permit WRP020435 v.1 issued to Boyce to conduct spillway repairs on the Edenville Dam.
 - March 16, 2020: Another preapplication meeting with FLTF consultants to discuss repairs, permitting, and next steps for the Edenville Dam.
 - April 9, 2020: Permit WRP021788 v.1 issued to Boyce at its request to refill Wixom Lake to normal summer pool elevation as required by the Part 307 orders.
 - May 1, 2020: Complaint was filed in Ingham Circuit Court against Boyce to recover natural resource damages for the harm caused by the unauthorized, yet temporary, winter 2018 and 2019 drawdowns. The complaint had nothing to do with the lake level. It did not seek to require Boyce to maintain a certain lake level; the Part 307 orders obtained by the local jurisdictions already did that. Nor did it seek to require Boyce to raise the lake to its normal summer pool level; Boyce had already done that. It was solely to recover damages for the past temporary drawdowns and to require Boyce to obtain permits before performing any drastic temporary drawdowns in the future.
 - May 22, 2020: After the Tittabawassee River side of the Edenville Dam failed on May 19, 2020, the Tobacco River side remained intact but showed signs of weakness. An Emergency Inspection Order was issued to Boyce requiring an engineer to evaluate the remainder of the dam and report findings to Michigan's Dam Safety Program no later than May 24, 2020. Boyce did not comply.
 - May 28, 2020: Notice sent to Boyce directing them to form an Independent Forensic Investigation Team to complete a detailed investigation of the condition and structural integrity of Edenville Dam.
 - June 9, 2020: Complaint was filed in Ingham County Circuit Court against Boyce because of its failure to maintain the Edenville Dam despite using it for years to earn profits from the use of Michigan's natural resources. The complaint seeks damages, civil fines, and an order requiring Boyce to repair the damage the failure of its dam has caused.
 - June 9, 2020: A motion for a temporary restraining order was filed to require Boyce to immediately comply with the May 22, 2020, dam Emergency Inspection Order.
8. *What resources, including financial and personnel, does Michigan dedicate to the state's dam safety program?*

Michigan's Dam Safety Program consists of two full-time dam safety engineers, a supervisor, and one part-time administrative support. Total budget for the program is less than \$350,000 annually. The funding is comprised of approximately \$87,000 in federal funding, \$112,000 from the DNR for inspection of DNR dams, \$74,000 in permit fees, and \$74,000 in state general funds.

9. *What communications has Michigan had with FERC regarding the safety of the Edenville dam since FERC's revocation of the hydroelectric license for the dam?*

Please refer to the response to question 5, above. There was little communication post-revocation between FERC and EGLE other than EGLE's request for past CEIL-protected technical documents related to the dam, which were provided in December 2018.

Dam Safety Program staff met with a FERC engineer immediately following the failure of the Edenville and Sanford Dams to perform site inspections of both failed dams as well as the Secord and Smallwood Dams (both FERC-regulated) in order to determine additional flooding risks and stability of the dams. In addition, Dam Safety Program staff has had weekly calls with several FERC representatives to plan and coordinate the forensic investigations of both the Edenville and Sanford Dams, preferably as a joint effort by one independent investigation team.

Please let us know if there are any additional questions or concerns or if clarification of these responses is needed. We look forward to continuing these discussions related to the Edenville Dam and Michigan's Dam Safety Program.

Sincerely,



Liesl Eichler Clark
Director
517-284-6712

cc: Ms. Dana Sherry, Governor's Washington D.C. Office
Mr. Aaron B. Keatley, Chief Deputy Director, EGLE
Ms. Amy Epkey, Senior Deputy Director, EGLE
Ms. Sarah M. Howes, Legislative Liaison, EGLE
Ms. Teresa Seidel, EGLE
Mr. Mario Fusco, Jr., EGLE
Mr. Dan DeVaun, EGLE
Mr. Luke Trumble, EGLE