



# EDENVILLE DAM RESTORATION

## Introduction

The Edenville Dam Restoration portion of the Four Lakes Level Project involves 5 phases, 3 of which have been completed. Phase IV (**Rebuilding of the Edenville embankments**) and Phase V (**Rebuilding the Spillways and Filling the Lake**) are suspended due to litigation challenging the capital improvement special assessment. Without financing, FLTF cannot move forward with these important final phases. It is our hope that the Heron Cove Association appeal and lawsuit will be resolved by the end of the year so we may commence construction in early 2025.

It is understandable that there is elevated emotion in connection with the suspension of construction on all four dams, and especially for Wixom Lake residents. Edenville has the most complex permitting paths of all the dams.

- Phase IV permitted construction and restoration of the embankments were suspended on Edenville in June, due to limited State of Michigan grant funds remaining and the Four Lakes Special Assessment District's inability to issue bonds due to the Heron Cove Association (HCA) appeal and lawsuits.
- There are issues to resolve before the final construction permit for Phase V is issued but will be resolved in accordance with the timeline projected. These issues are outlined at the end of this paper.
- The suspension of the Edenville Dam construction and permitting does not impact the timing for restoration at the other three dams. The other three dams are being suspended because of the inability to finance the final phase of the Lake Level Project because of the HCA appeal and lawsuits.

This paper provides background information in connection with the Edenville Dam Restoration portion of the Lake Level Project from pre-failure to August 2024.

## Before Edenville Dam Failure

In 1924, Wixom Lake was created by the impoundment of the Tittabawassee and Tabacco Rivers by the Edenville Dam. The Edenville Dam is an earthen embankment that was originally designed to generate hydroelectric power. The dam is located in Gladwin County, on and near the border of Midland County and is part of the Four Lakes and Dam system. The primary purpose of the dam prior to their failure was to produce hydroelectricity. In addition, over this same period of time, residential and commercial development occurred around Wixom Lake as the impoundment created an important recreational resource for boating and fishing.

In the 1990s, the Edenville Dam fell under the jurisdiction of the Federal Energy Regulatory Commission (FERC). In early 2018, FERC proposed revoking the dam owner's (Boyce Hydro Power, LLC, or "Boyce Hydro") hydropower license on Edenville, and did so in September of 2019, after years of non-compliance issues, including lack of spillway capacity. All four dams faced compliance and capacity issues, and losing the Edenville FERC license reduced approximately half of the electrical generation capacity of the combined total of the four dams<sup>1</sup>:

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<sup>1</sup> Essex Desktop Study Restoration of Hydroelectric Generation at Secord, Smallwood, Edenville and Sanford Dams



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Project Details

Project	Installed Capacity (MW)	% of Total MW	Drainage Area Sq. Miles	Head (ft) Summer Pond	Historic MWH	% of Total MWH
Secord	1.2	10%	190	46	4,323	13%
Smallwood	1.2	10%	308	28	3,137	9%
Edenville	4.8	47%	932	44	17,898	52%
Sanford	3.3	33%	968	26	8,750	26%
Totals	10.5	100%	-	-	34,108	100%

The loss of Edenville hydropower revenue created a threat to the long-term viability of Wixom, and all the lakes. Michigan common law does not require a private dam owner to maintain the existence of a dam or the artificial level of a lake. Specifically, Michigan law provides that ownership of a dam does not impose a duty on the dam owner to maintain the water at an artificial level created by operation of a dam. Meaning, without the incentive created by the production of hydropower revenue, Boyce Hydro could manipulate Wixom lake levels or eliminate the Wixom lake and the other three lakes altogether.

Looking for a solution to ensure the long-term viability of all the Four Lakes, in 2018 representatives from the lake associations began the process of transitioning the four hydroelectric dams and bottomlands from private ownership to public ownership. The counties of Midland and Gladwin established a citizen task force to explore the process of acquiring, financing, and managing the dams and lake levels per Part 307 “Inland Lake Levels” of the Michigan Natural Resources and Environmental Protection Act (“Part 307”).

In 2019, following the completion of a lake level study, the Counties filed a petition in the Midland Circuit Court pursuant to Part 307 requesting the Court establish the normal (legal) levels for all Four Lakes and to establish a special assessment district to defray the costs related to the maintenance of the lake levels. The special assessment process for lake level matters is consistent throughout Michigan, where properties with frontage and lake access are responsible for paying the cost to ensure the existence of an artificial lakes.

Following notice and hearing, in May 2019, Midland Circuit Court Judge Stephan Carras approved and issued the Lake Level Order that established normal or legal lake levels for Wixom, Sanford, Smallwood, and Secord lakes and established the Four Lakes Special Assessment District (FLSAD). The Board of Commissioners from Gladwin and Midland counties appointed the Four Lakes Task Force (FLTF), as the Counties’ Delegated Authority to acquire, repair and then operate the four dams.

In December 2019, FLTF and Boyce Hydro entered into a purchase agreement for the acquisition of the dams and bottomlands. In anticipation of the acquisition, FLTF began its due diligence required for the purchase, which included evaluating and inventorying the facilities, equipment, and real property. However, before making the first installment and option payment, on May 19, 2020, the dam on Wixom Lake (Edenville Dam) failed, resulting in a surge of floodwaters causing the dam at Sanford Lake to fail; the upstream dams were also damaged. FERC ordered Secord and Smallwood dams be lowered for inspection and repair. Catastrophic flooding occurred throughout the region, destroying and damaging homes and businesses. The transaction to purchase the dams did not go forward.

It was later determined that the cause of the Edenville dam embankment was not because of the undersized spillway capacity, but a defect in the original materials used to construct the embankment. A



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FERC Forensic Report, consisting of nearly 500-pages, prepared by an independent team of engineers to study the dam's failure concluded that water seepage into the far eastern embankment caused "static liquefaction" (i.e., the sudden loss of soil strength) resulting in the failure of the embankment.)<sup>2</sup>.

Contrary to the misinformation circulating on social media, it is well-documented that the Edenville Dam and other dams were not constructed as "flood control dams". When constructed, the Edenville earthen embankments did not have any type of mechanism that made it possible to manage downstream flooding. The Edenville dam embankments were features of the landscape and the dam "gates" (which are located on top of the dam's embankments), could only lower the reservoir (i.e. Wixom Lake) by 6 or 7 feet, leaving nearly 40 feet of impoundment. This meant that Wixom Lake could not be drained entirely without a failure of its earthen embankment, and – as determined by about 1932, that storage provided by the dam was found to be inadequate to effectively manage downstream flooding.<sup>3</sup> The U.S. Army Corps of Engineers (USACE) concluded that the dam gates' ability to lower Wixom Lake to protect against downstream flooding was "negligible".<sup>4</sup> To put it succinctly, the gate design and reservoir capacity make it impossible for Edenville to provide downstream flood control.

### 2020-2022 Post Failure

Following the 2020 dam failures, FLTF immediately went to work to address the damage to the Four Lakes system. The State of Michigan, the counties, local municipalities and most importantly, the Four Lakes' community looked to FLTF to address immediate emergency concerns including dam stabilization, shoreline erosion, restoration, and debris removal.

One of the first steps immediately after the dam failures was the stabilization of the Edenville Dam. Because of FERC's termination of the Edenville Dam's hydropower permit in 2018, regulatory jurisdiction over the Edenville Dam defaulted to the Michigan Department of Environment, Great Lakes and Energy (EGLE). This allowed EGLE to use its emergency power to take control of the Edenville Dam and issued an emergency permit for the lowering Edenville Dam's impoundment remaining on the Tobacco side of the Dam<sup>5</sup>, and to stabilize the Tittabawassee side of the dam, while moving the river back to its original river channel and back to county-owned property. This work was Phase I and Phase II of the Edenville Dam Recovery and Restoration portion of the Lake Level Project ("Edenville Dam Stabilization").

Because the dams and bottomlands were privately owned, another major step was to acquire the properties and coordinate funding with federal and state agencies. To this end, the Board of Commissioners for Midland and Gladwin appointed FLTF to coordinate the acquisition of the dams and bottomlands (via condemnation), debris removal, shoreline restoration, dam stabilization, and funding needed to restore the Four Lakes. FLTF became a sponsor for matching grants with the United States Department of Agriculture (USDA) Natural Resources Conservation Services (NRCS).

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<sup>2</sup> Forensic Team Report (IFT), P S-4.

<sup>3</sup> IFT Report, F-2.

<sup>4</sup> *Id.* at F-2.

<sup>5</sup> The Tobacco Bottom Land is lower than the Tittabawassee Side. The two sides of the lake had equal depths at the dam. The issue was that the Tobacco River side retained a significant head of water after the dam failure and was drained for public safety.



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In July 2020, Boyce Hydro filed for bankruptcy protection which delayed the Counties' acquisition of the dams and bottomlands. In December 2020 the Counties acquired the dams and bottomlands from the bankruptcy trustee administering the Boyce Hydro bankruptcy estate. The acquisition of the former Boyce Hydro property allowed recovery to begin. EGLE subsequently transferred to FLTF the emergency recovery and restoration project (i.e., Phases I and II - Edenville Dam Stabilization), including the related permits and easements to work. The four dams, including Edenville, were stabilized. Additionally, over 5,000 points of debris were removed from the lake bottoms and 10,000 feet of shoreline were stabilized on Wixom and Sanford lakes under the USDA - NRCS program.

The ability to produce hydroelectric power on Edenville, and all the dams, was no longer viable due to a few factors, including:

1. The expiring licenses were legally toxic with attached legal liability associated with the dam failure.
2. Even under the Best-Case scenario, rehabilitating the existing facilities and assuming low FERC costs, revenues would have to increase on the order of two times for the projects to just break even over the 20-year study period<sup>6</sup>
3. The timing of receiving a license to rebuild and operate any of the dams for hydroelectric would be more expensive, slow, and uncertain.

### 2021 Feasibility Study, Permit Requirements, and Pre-Construction

At the time of the 2021 Feasibility Study the Restoration of Edenville was estimated at \$120.9 Million, with an estimated rebuild construction date of 2026. The study also highlighted that Edenville Dam would need, along with Sanford Dam, an Environmental Restoration Plan that included wetland and stream function mitigation.

Informed by updated Precipitation and Flood Study, Design Engineering occurred across all four dams for the 2021 Feasibility Study, Edenville and Sanford were staged after the final capacity of Secord and Smallwood were set. This was required to ensure each dam design could pass the flow of the upstream design. Engineer was completed to the points that bid packages for Edenville could be issued in 2023<sup>7</sup>.

FLTF initiated consultation with the Michigan Natural Features Inventory (MNFI) and the US Fish and Wildlife Service (USFWS). USFWS identified four potential threatened and/or endangered species present within the area. These species included the northern long-eared bat (threatened), eastern massasauga rattlesnake (threatened), snuffbox mussel (endangered) and the red knot bird (threatened). The Snuffbox Mussel was found only in Wixom and became a factor in construction timing on Edenville.

### The Snuffbox Mussel

FLTF engaged Central Michigan University<sup>8</sup> to undertake a study in connection with mussel habitat in all four lakes, and in 2022 two live Snuffbox mussel species were discovered in the upper reaches of the Tobacco River side of Wixom Lake. This prompted an engagement with USFWS to create a Habitat

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<sup>6</sup> Essex Desktop Study Restoration of Hydroelectric Generation at Secord, Smallwood, Edenville and Sanford Dams

<sup>7</sup> FLTF to go to bid with Sanford and Edenville, and had to reconfigure to packages to get competitive bids.

<sup>8</sup> <https://www.four-lakes-taskforce-mi.com/updates/2022-cmu-native-mussel-surveys-of-wixom-and-sanford-lakes>



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Conservation Plan (HCP) and Incidental Take Permit for the benefit of the Snuffbox mussel, which would be a requirement for filling Wixom Lake.

HCPs are planning documents required as part of an application for an incidental take permit. They describe the anticipated effects of the proposed taking; how those impacts will be minimized or mitigated; and how the HCP is to be funded<sup>9</sup>. FLTF has prepared the Edenville Dam Restoration Project HCP to cover the activities associated with refilling and maintaining a court-ordered legal lake limit for Wixom Lake, which describes the actions and measures that the applicant would implement to avoid, minimize, and mitigate incidental take of the snuffbox mussel, including monitoring and habitat improvement. It is NOT a permit to remove the mussels. The permit is still expected to be approved in 2024.

In its March 2024 Webinar, and April 17, 2024 News Flash, FLTF communicated that only State of Michigan funds can be used for Edenville Dam restoration until the U.S. Fish and Wildlife Service (USFWS) "Incidental Mussel Take Permit" is issued. This is because the funding source of the bond will be from revenue generated from the assessments. Without the USFWS permit, the Wixom level cannot be restored as revenue from Edenville assessments is required. This is not the case with the other dams.

### MDOT and Consumers

The Failure of Edenville Dam, also led to the failure of the M-30 Bridge. FLTF needed to coordinate the Edenville Dam construction activity with the Michigan Department of Transportation (MDOT) for the construction of the temporary and permanent bridges. FLTF also coordinated with Consumers Energy to reroute power lines, and the repair of a natural gas pipeline damaged by the flood.

### FEMA, Floodplains and Flood Control

Finally, for the Edenville Dam construction only, the Federal Emergency Management Agency (FEMA) required to complete a reassessment of the floodplain below Edenville Dam for national flood insurance purposes including completing a Conditional Letter of Map Revision (CLOMAR).

FEMA P-94 Federal Guidelines for Selecting and Accommodating Inflow Design Floods (IDF) for Dams<sup>10</sup> was used for the establishment of all four dams' spillway capacity. Selection of the IDF was the first step in ensuring that operation of the dams did not contribute to downstream flooding or pose an intolerable risk to public safety.

FEMA P-94 is not about Flood Control. As previously noted, Federal agencies, including FERC and USACE<sup>11</sup>, recognized gate functions and extremely limited capacity of the Four Lakes are inadequate to manage downstream flooding. Hydrographs have been presented at several public meetings, including EGLE Webinars on the new Dams and the Four Lakes System water flow discharge comparison below the

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<sup>9</sup> <https://www.fws.gov/sites/default/files/documents/habitat-conservation-plan-fact-sheet.pdf>

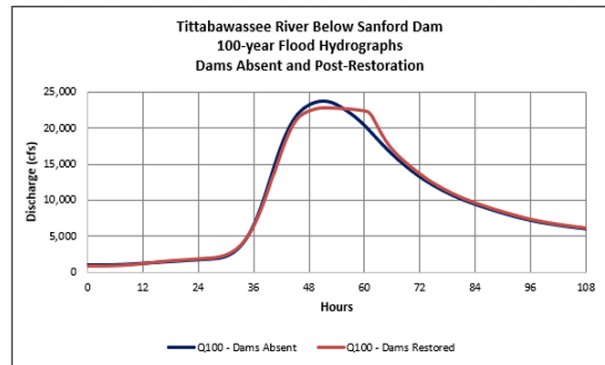
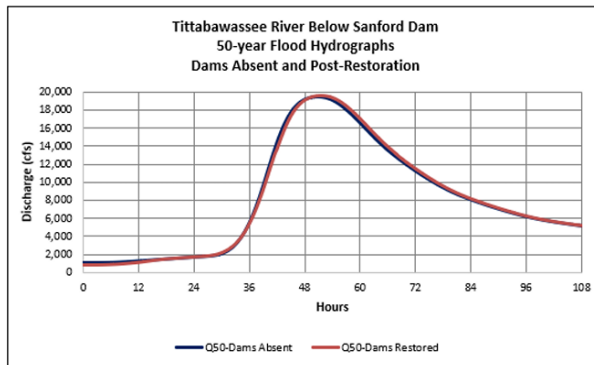
<sup>10</sup> [https://www.fema.gov/sites/default/files/2020-08/fema\\_dam-safety\\_inflow-designs\\_P-94.pdf](https://www.fema.gov/sites/default/files/2020-08/fema_dam-safety_inflow-designs_P-94.pdf)

<sup>11</sup> 1980 US Army Corp Report on Flood Control on the Tittabawassee River, FERC Order on rehearing and Amended License Order Sanford Dam October 1998



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Sanford Dam. With the new dams or without the dams, there is essentially no difference in discharge.



## The Restoration Plan Required to Permit

Extensive environmental permitting is required to rebuild the Edenville Dam, similar to the restoration of the construction of a new dam for permitting. The environmental permitting contemplates certain mitigation projects as a result of the construction and restoration of the dam. The mitigation projects proposed for Edenville Dam and under consideration by EGLE, include:

- **Road Culvert Replacements** on streams that feed into Wixom Lake
- **Shoreline Enhancement Projects** on public land, and private properties where owners are willing to participate. Projects around the Edenville Dam will likely include the upgrade and improvement of shorelines north of the Tobacco spillway and restoration of the stream function and erosion control directly south of the Edenville spillway.
- **Natural Vegetation Buffers**, the FLTF website will provide guidance for how private property owners can voluntarily create these buffers. No locations for natural buffer vegetation were identified on public properties around Wixom Lake.
- **Low Impact Design**, Practical low impact development (LID) techniques will provide water quality benefits to the restored lakes, as well as provide an offset to adverse impacts associated with the basin refill process and dam reconstruction.
- **Fish Habitat**, in addition to leaving standing trees in deeper water, shallow water habitat areas on Wixom Lake were for proposed with the potential to add additional habitat structure. This program must balance the creation of fish habitat for the benefit of anglers with the interests of all lake users. Locations for these habitat enhancement projects on Wixom Lake are being reviewed by EGLE and the MDNR.
- **Wetlands**: Wetland were dehydrated by the failure of the Edenville Dam, and new wetlands have emerged in parts of the lake bottom. FLTF will be monitoring to ensure there is a net increase in wetlands when the lake is refilled.



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## Pull Ahead Projects

Given the need for stabilization of the dams, some construction required for restoring the Edenville dam that improved dam safety received permitting and could be completed. However, the final construction permit will not be issued until certain environmental issues are addressed. Below are the phases of the Edenville Restoration portion of the Four Lakes Level Project, which were divided into four phases of projects pulled ahead of the final fifth phase. The first three phases have been completed:

- **Phase I – Tobacco Spillway demolished to lower the impounded water behind Tobacco Side of the Dam and dam stabilization of the remaining dam.**

This phase was an emergency permit. Construction started in late 2020 under EGLE's project management and then turned over the permits and project to FLTF project once the counties had ownership of the dams.

- **Phase II – Edenville Spillway and embankment breach stabilized, downstream property flood debris removal, and erosion stabilized.**

This phase also had an emergency permit, and easements obtained by EGLE. FLTF assumed the permit and contracted the construction.

- **Phase III – Implementation of the Cutoff wall throughout the embankment**

The cutoff wall was a requirement for stabilization of the embankment, and one of the Dam Safety Design features. Since the M30 bridge sits on the Edenville Dam, cutoff wall installation had to be completed prior to the construction start for the new permanent M-30 bridge.

- **Phase IV – the rebuilding of the Edenville embankments**

This phase was to rebuild the embankments to meet Dam Safety standards, including new drainage, slope changes and enhancements. This was to be completed by the end of 2024. However, given the available funds, the project was suspended, at a stable stopping point in June 2024. It will be restarted in the spring of 2025, if funds are available.

- **Phase V – Rebuilding the Spillways and Filling the Lake**

This phase includes installation of the Auxiliary Spillway and the primary spillways on both rivers and the final lake fill. This phase is delayed until appeal is settled, and construction financing is available and the USFWS permit is received.



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## Phase V requirements to start construction.

The requirements to begin construction of phase V, the final phase of construction at Edenville is:

### FINANCING

1. The Heron Cove appeal and lawsuits must be resolved, before municipal financing (i.e., issuing bonds) can be approved. Without a revenue source to pay the principal and interest on the bonds required to finance the final phase of the Four Lakes Level Project, construction cannot proceed.
2. The USFWS Snuffbox Mussel Habit Conservation Assessment (HCA) must be completed and incidental Take Permit Issued. This is not an EGLE permit requirement, but it is a lake fill requirement. The Edenville Dam cannot use financing from the \$80 Million Bond financing until there is certainty of the Take Permit. *The other dams can use the Bond financing as soon as it is available.*

### EGLE PERMIT

1. Final sign-off on Part 315 Dam Safety, Part 31 related to floodplains, and part 303 related to wetland monitoring. There are no key issues to acquire currently.
2. The Restoration Mitigation Plan is still under discussion with EGLE, MDNR and EPA, and we expect the projects defined and monitoring requirements to be done by the end of the year. There will be minor permitting and potential private property easements required for this work.
3. There will be permanent easements and temporary access easements needed to construct the dam.

FLTF is engaged in resolving all of these issues by the end of the year. This will allow FLTF to finish construction in 2025 on Phase IV and begin construction on Phase V in early 2025.

### Current Estimates

If financing can be put in place by the end of 2024, with the above conditions expected to be addressed by then, construction can restart on the Edenville Dam in early 2025. The date estimate for completion of construction estimate would then be August 27, 2027 (+/- 6 months), one year later than the 2021 Feasibility Study Estimate.

The Edenville Restoration Project costs (Phase III through IV) are estimated at \$125 million, the estimate of the 2021 study of \$121 million. It should be noted that costs were reduced through value engineering, were overcome with the inflation that occurred in 2022 and 2023.

## Conclusion

Immediately after the Edenville Dam's failure, there was little belief by state and federal agencies that Wixom Lake could be restored. There is now an accepted design, contracts prepared and final issues in connection with the permits to be resolved. The environmental restoration plan is in its final steps for approval by state and federal agencies.