An aerial photograph of a river system. A dam is visible in the lower right, with water cascading over it. To the right of the dam is a large commercial or industrial complex with several large buildings. A road with a bridge crosses the river in the middle. The left bank of the river is densely wooded. The overall scene is a mix of natural and developed land.

ALLEGAN DAM FEASIBILITY AND CONCEPTUAL DESIGN REPORT

June 24, 2019

AECOM

EXISTING DAM CONDITIONS

- ▶ Main spillway needs catwalk replaced and maintenance on south embankment, which is currently inaccessible. Embankment overtops in places at the design flow. Improvements recommended for stoplog installation and removal, minor repairs to concrete abutments.



Catwalk
conditions





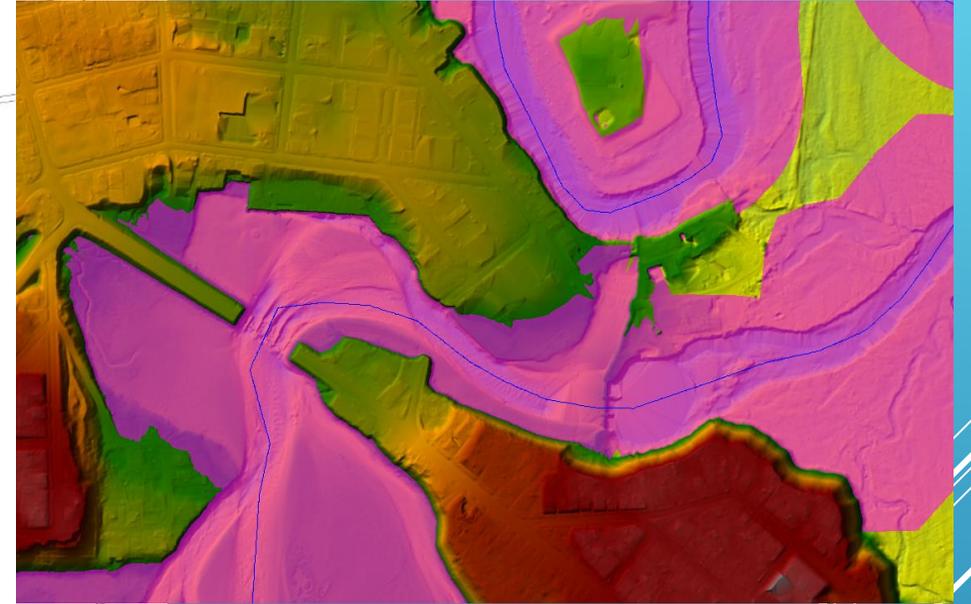
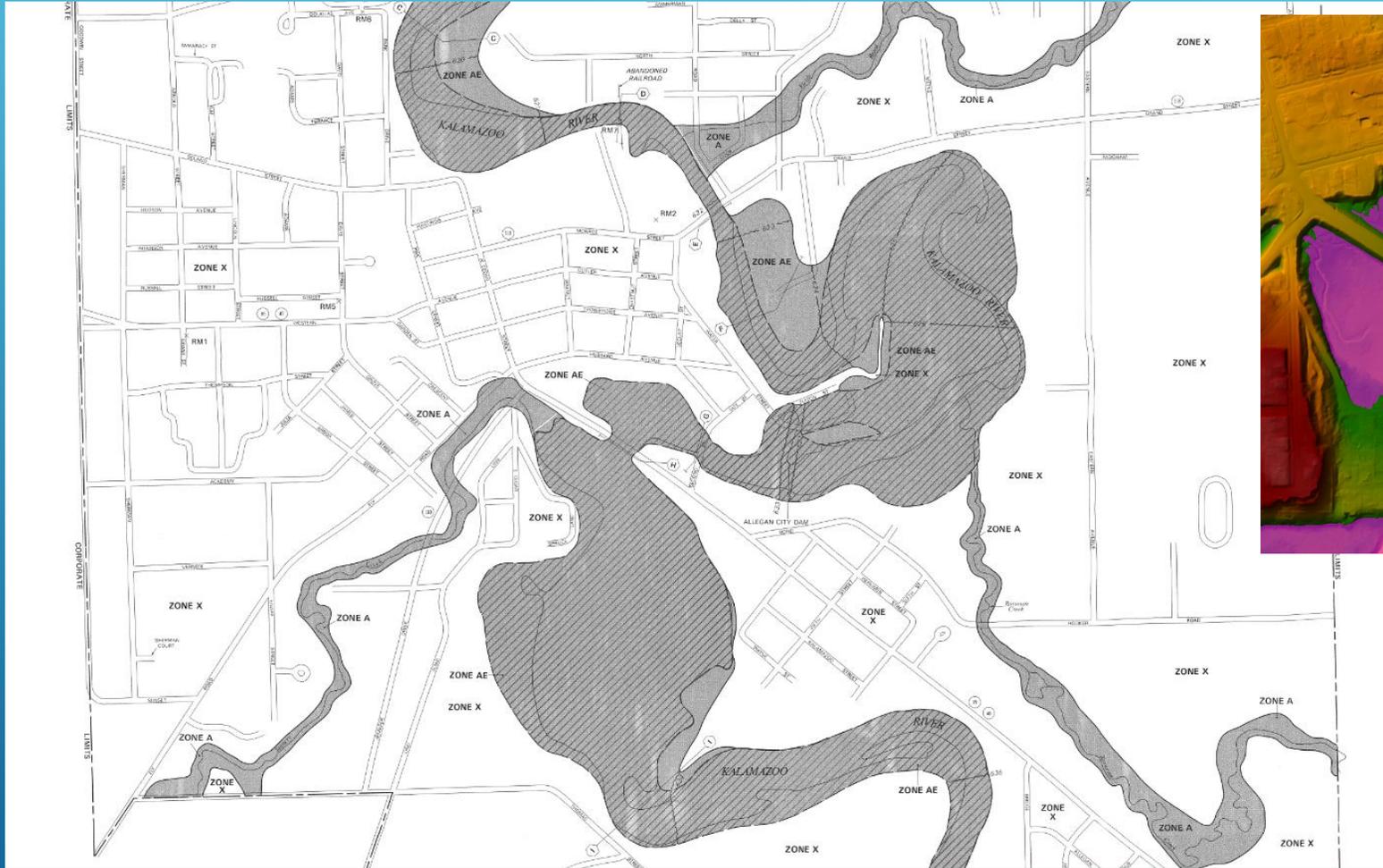
Powerhouse conditions



The powerhouse structure has seen considerable deterioration and has been condemned. The structure needs to be replaced or removed in its entirety.

Any failure of the main spillway or powerhouse could result not only in damages downstream due to flooding and erosive forces, but also the potential downstream transport of contaminated sediments from within the impoundment.

Other safety concerns include the flooding potential of the low-lying mill district area and Perrigo Plant 1 facility at Water Street and State Street, which lie within the current FEMA delineated 100-yr floodplain, and have experienced repeated inundation events.



Conceptual Model 100-yr floodplain

FEMA 1989 FIS FLOOD-PRONE AREAS

- ▶ • Mitigate safety concerns associated with the deteriorating powerhouse and necessary dam repairs,
- ▶ • Improve the riverine ecosystem including fish passage and habitat quality,
- ▶ • Improve recreational opportunities, and
- ▶ • Manage contaminated sediments and waste within the project site.

PROJECT GOALS

- ▶ Remove powerhouse above-ground structures and fill the foundations. Fill the millrace or maintain as wetland or slackwater area (potential to bypass main spillway at flood flows).
- ▶ Replace catwalk and update main spillway.
- ▶ Provide fish passage (via fish ladder). Not preferred method, limited species passage. Long term maintenance and operation costs.
- ▶ Maintain current water levels in impoundment.
- ▶ Maintain main spillway dam in perpetuity. Continued maintenance, and long-term replacement cost for fish ladder and dam. Liability. Sediment management and continued deposition.

ALTERNATIVE: MAINTAIN CURRENT DAM

Trails & Lawn Areas

Overlook



- Park Land
- Trees & Vegetation
- Overlooks
- Trails
- Existing Walks
- River



Fish Ladder

- ▶ Reduce the height of the dam and remove above-water appurtenances.
- ▶ Create an area of rapids (rock ramp) that would be navigable by small crafts under a range of flow conditions, and
- ▶ accommodate volitional passage of desirable aquatic species. Not as effective as full removal, long term maintenance.
- ▶ Remove powerhouse above-ground structures and fill the foundations. Fill the millrace or maintain as wetland or slackwater area (potential to bypass main spillway at flood flows).
- ▶ Maintain lower water level, but still some level in the impoundment.
- ▶ Maintain lowered spillway dam in perpetuity. Continued maintenance, long-term replacement cost for dam and rock ramp. Liability. Sediment management and continued deposition.

ALTERNATIVE – PARTIAL REMOVAL

Trails & Lawn Along River



Step Down to River Edge / Water Feature Potential

Relocated Kayak Launch

Key Overlooks



- Park Land
- Wetlands
- Trees & Vegetation
- Boardwalks
- Overlooks
- Trails
- Existing Walks
- River



Wetlands, Trails, & Boardwalks



Full Width Rock Ramp Fishway

ALLEGAN CITY DAM - PARTIAL REMOVAL

- ▶ Remove powerhouse above-ground structures and fill the foundations. Fill the millrace.
- ▶ Remove main spillway dam and earthen embankments.
- ▶ Provides greatest level of aquatic organism passage, with no structure to maintain.
- ▶ Greatest reduction in upstream water levels.
- ▶ Greatest increase in park/recreation/habitat area.
- ▶ Greatest benefit to fisheries.
- ▶ Navigable by recreational boaters.
- ▶ No long-term operation or replacement costs.
- ▶ No liability for legacy contaminated sediments.

ALTERNATIVE – FULL DAM REMOVAL

Wetlands & Potential Stormwater Storage



Hillside Step Down



Hillside Water Feature



Key Overlooks



Boat Launch

- Park Land
- Wetlands
- Trees & Vegetation
- Riparian Vegetation
- Pedestrian Bridges
- Boardwalks
- Overlooks
- Trails
- Existing Walks
- River



Kayak Rail Portage

Relocated Kayak Launch



Wetlands, Trails, & Boardwalks



Pedestrian Bridge
Trail Loop Connection



Fish Habitat /
Wetland Fringe



Main Overlook



Bench Swings

CONCEPTUAL LEVEL COST ESTIMATES

Estimated Project Costs	Dam Repair	Partial Removal	Full Removal
Cost to City	\$3.7M	\$8.2M	\$8.1M
Cost to Superfund	-	\$21.9M	\$35.5M
Total Construction Cost	\$3.7M	\$30.1M	\$43.5M
Net Present Value O&M (100 yr)	\$6.9M	\$1.4M	\$289,000
Total To City	\$10.6M	\$9.6M	\$8.4M

	Dam Repair and Maintenance	Partial Dam Removal	Full Dam Removal
Dam Safety	Safety addressed, but long-term risks remain	Long-term risk significantly reduced, but sediment containment and dam risks remain	Dam removed, no long term maintenance or liability
Flood Management	Flood issues upstream and erosion issue downstream remain unchanged	Flood levels upstream are lowered	Flood levels upstream are lowered, sediment transport can occur downstream to alleviate some erosion
Maintenance Cost	Dam costs remain, additional cost to implement fish ladder	Some work to maintain rock ramp, boat passage,	No dam or fish passage maintenance costs
Improved Recreation Opportunities	Least change to current condition	Increased boat passage , habitat, open space	Largest increase in boater access, habitat, and open space
Improved Fish Passage	Fish ladder provides passage to some fish	Rock ramp provides passage to numerous fish species	Restored channel approaches natural conditions, provides best conditions for passage for greatest number of species
Improved Fish Habitat	No change from current condition	Some increase in running-water habitat	Significant increase in running-water habitat
Contaminated Sediment Mgmt	Sediment likely to be capped in place, lesser amount removed, becomes responsibility of the City	Medium amount of sediment to manage/dispose of, however, it is removed from project site/ecosystem	Largest amount of sediment to manage/dispose of, however, it is removed from project site/ecosystem
Construction Cost Estimate	\$3,302,031.61	\$28,410,486.45	\$39,503,345.54
Construction Cost without Sediment Remediation Cost	\$3,302,031.61	\$12,055,286.45	\$8,932,145.54
Long Term Operation and Maintance Cost Estimates	\$3,492,441.51	\$748,633.51	\$288,693.29
Potential Funding	MDNR/EGLE/NRD will not assist with cost of repairs/maintenance for existing structure. Fish ladder assistance from MDNR is also uncertain. Sediment capping/remediation would be carried out by EGLE/EPA.	May be able to find grants to support some portions of the partial removal, such as the rock ramp for fish passage. Sediment remediation would be carried out by EGLE/EPA.	Full removal will have the most opportunity for obtaining grants. MDNR would likely assist with full removal and restoration of fish passage and habitat. Sediment remediation would be carried out by EGLE/EPA. The City would potentially bear the lowest cost responsibility under this scenario.
Permitting	This alternative would involve addressing known concerns with the dam and powerhouse and continuing to operate/inspect the existing spillway.	The rock ramp would be a new structure and therefore would likely have the greatest permitting effort/challenges.	Considerable permitting effort would be required for erosion control, structure removal, flow management, and changes to the channel. However, the state stakeholder departments would have the greatest support for the dam removal alternative.
Ecological Benefit	No ecological benefit seen from this alternative beyond Superfund basic remediation/capping of sediments.	Some ecological benefit from increased running-water habitat, increased fish passage, sediment capping and soil remediation, which would benefit ecosystem health.	Greatest ecological benefit. Natural flow and sediment transport. Return to pre-dam condition as well as practicable, passage for most native fish and other aquatic organisms, return to running-water habitat throughout project area, potential for restored native mussel habitat, greatest sediment removal and soil remediation, greatest benefit to ecosystem health from contaminant remediation/removal.



ALLEGAN CITY DAM - Existing Conditions Looking Upstream

JUNE 5, 2019





ALLEGAN CITY DAM - Full Dam Removal Looking Upstream

JUNE 5, 2019

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ALLEGAN CITY DAM - Existing Conditions View of Downtown Waterfront

JUNE 5, 2019

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ALLEGAN CITY DAM - Full Dam Removal View of Downtown Waterfront

JUNE 5, 2019

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QUESTIONS?

