



Flood Control and the Four Lakes

Four Lakes Dams: Built to Generate Hydroelectric Power

The four dams that make up the four lakes system – Secord, Smallwood, Edenville and Sanford dams – were built for the purpose of generating hydroelectricity.

The following language is copied from a July 19, 2019 report by Essex Consulting:

“The four hydro facilities were built nearly a 100 years ago. It was a time when large, centralized fossil generating stations were just beginning to be built. Transmission and distribution systems were in their infancy. In many rural areas of the country distributed hydroelectric stations such as these four facilities were the preferred, and perhaps only option, for electricity. As such, the projects could support large amounts of civil infrastructure to impound rivers and create head ponds. The advent of large, efficient generating stations and strong transmission - distribution systems diminished the value of small hydroelectric projects. Virtually no new dams are being built for small hydro and the projects that are being developed typically require only a minimum of infrastructure investment.”

The Federal Emergency Management Agency (FEMA), the U.S. Army Corps of Engineers (USACE), the Michigan Department of Environment, Great Lakes and Energy (EGLE), and the Federal Energy Regulatory Commission (FERC) have all dismissed the notion that the four dams were built for flood control. FLTF consultants and engineers, all of whom have decades of experience working with dams, dismiss the notion as well.

The takeaway is that these four large dams were built to make hydropower possible during the infancy of the electric industry. When these four dams were built in rural Michigan – hydropower was the only viable option.

Facts About Lake Levels

Consumers Power and Wolverine Energy in May 1923 signed a power purchase agreement to build four dams and sell the power to Consumers. The agreement is still in effect.

All four dams were most recently licensed by FERC in 1998. The licenses specify a normal summer water level and a normal winter level. The same is true for the Part 307 Lake Level Order issued to Four Lakes Task Force (FLTF) in 2019. The licenses and Lake Level Orders also specify that the lakes must be brought up to normal summer levels when the surface water temperature reaches 39 degrees F.

At either seasonal level, the FERC licenses and Lake Level Orders require the dam operator to keep the lake water level within an 8.4-inch range. If the water level exceeds the upper limit of the range, the dam operator is required to spill enough water through the dam to bring the lake level back down to within the license-mandated elevation range. This is not how flood control dams operate. It is, however, compatible with the development that has occurred around all four lakes over the past 95 years.

The September 1986, May 2014, June 2017 and May 19, 2020 floods all occurred when the lakes were at their normal summer levels. The concept that a winter drawdown could provide some flood control was irrelevant in each of these floods.

As most have observed, especially in this last flood, homes and roads flood when the normal lake level is exceeded. In the spring when the lake fills, there are times when the pace of increase is staged to avoid flooding properties on the lake. This may be called minor flood avoidance, but Normal Lake Levels are required to only move up and down by approximately 8 inches during the season, hardly enough to control a flood.

FACT: During the previous three historical floods in the greater Midland area, the dams were not a factor in controlling the floods.

What Is a Flood Control Dam?

A flood control dam is a dam near the base of a watershed that controls flooding downstream. Water levels on a flood control dam vary greatly and property owners along flood control reservoirs do not experience stable water levels like the four lakes historically have had. Flood control dams serve their function by holding flood water in the reservoir during a major rainstorm and runoff event, while releasing the water slowly enough to minimize flood damage to downstream properties.

The Natural Resource Conservation Service (NRCS) and other sources reference the first upstream flood control dam was built in 1948. This was the Cloud Creek Dam in Oklahoma (see image below). According to a definition provided by the Oklahoma Conservation Commission, which offers a clear explanation: *A dam is placed, and the water backs up and creates a flood pool, greater than the “permanent pool,” or lake level behind the dam to buffer the timing of the water going down stream.*

Many examples of such dams are operated by USACE. This type of flood control dam works best in areas like the Tennessee valley, where river valleys are deep, and the shoreline area is steep around the entire reservoir. The mid-Michigan area does not have the right topology for this type of flood control dam. The river valleys are relatively shallow, and the shorelines are too low and flat in many areas. The Four Lakes dams have relatively shallow basins and there is significant development around them not far above normal lake levels.

Even when lowered to river levels, it is unlikely that the Four Lakes dams would make a significant difference downstream. While the Four Lakes dams can be built to be safe in the event for future floods, they do not have the basin volume to have a significant impact on alleviating a flood. Visit the [Oklahoma Conservation Commission](#) for more information on this type of dam.

The red line on the photo below indicates the extent that water can back up in the flood pool upstream.



When there is more water than the lake can store and the principal spillway can release, water will flow through the auxiliary spillway.

FACT: The dams of the Four Lakes only control about 40% of the water going to Midland. The Salt, Pine and Chippewa rivers all connect to the Tittabawassee *downstream* of the Sanford Dam.



FACT: There is not enough capacity in the basins to hold enough water to make a significant difference in flooding when there is historic rain. Clearly an investment in our dams will not be based on significant downstream flood reduction.

Why has USACE said three of the four dams are primarily for flood control?

There is an error in the USACE National Inventory of Dams (NID) database. FLTF was aware of this issue, but since it was not relevant to any decisions, did not pursue it. We have since asked FERC to clarify the purpose of the dams. In a letter to FLTF's Dave Kepler dated December 8, 2020, FERC Regional Engineer John Zygaj stated:

"The flood control benefits of the late-winter drawdown[s] are negligible in true flood situations. However, some benefits are provided, mostly to shoreline residents, by minor reductions in the extent and magnitude of spring runoff flows ... The USACE is investigating an apparent problem in the way the database accepts and displays submitted data and will take any necessary corrective action." (See attached)

Can we do something about flooding?

Yes, we can, and we are. The flood of 2020 was caused by another historic flood after the 2017 flood, when the Edenville Dam and the cascading failure of Sanford Dam occurred. The dams should have been improved so they would not fail.

- 1) **Flooding in the Four Lakes.** We are re-doing flood studies, recalibrating data from the 2020 flood; and making sure that data goes into our dam reconstruction so the dams can withstand flooding significantly greater than the last three historical floods. In addition, we must minimize flooding when the lakes get above their normal level and still are contained by the dams. This is a key principle going forward in our design.
- 2) **Flood Management Downstream: *This is where USACE is helping.*** As we reviewed in our [September 2020 Recovery and Restoration Plan](#), the dams, once they are safely built and repaired to maintain and withstand these storms, will not have a significant impact positively or negatively on future large rain events. The water flowing from these four dams equals about 40% of the water that comes from the watersheds north of the City of Midland. The County of Midland, with FLTF support, has engaged with USACE to do Flood Plain Management Services (FPMS) to understand downstream flooding and identify risk reduction projects or actions that will reduce flood impact.

Flood improvement approaches fall into two categories—structural and nonstructural. Structural activities lessen harm by using landscaping, floodwalls, elevation or diversion. Nonstructural measures reduce damage through zoning, subdivisions and building codes. USACE could help with its Planning Assistance Program and/or Capital Assistance Program.



Could the dams be used for flood control?

It would be a challenge for a few reasons. One solution being discussed, BUT NOT YET STUDIED, is to divert some of the water away from the four lakes and Midland. This is something some stakeholders in Midland would like to consider, and FLTF would support its investigation. It is important to note that this would be independent of the dam decision. Our focus is on building dams that will withstand historic periods of rain and floods, for the support of recreational lakes that are not a factor to downstream flooding. We are studying these factors in our Flood Studies.

Could USACE still help pay for our dams?

Based on USACE criteria, the four lakes are not eligible for funding. This has been reviewed, researched by FLTF, and discussed with USACE. Out of the more than 90,000 dams in the NID, USACE operates only 700. USACE has “Study Authority and Project Authority to Assist in Construction” and bases its decision on “Benefit for Value.” In other words, the investment in a dam must offset the cost of future property loss. It was determined in consultation and discussion that the study phase to determine if USACE could help with the dams would be a few years, and that funding would be unlikely. Therefore, FLTF pursued funding from the State of Michigan.

FACT: Other federal funding is available, including perhaps other funding from USACE programs. However, we have a higher probability of receiving federal funding if we have demonstrated a commitment with local and state financing; and have a clear engineered plan. This is the path we are pursuing.