**EDENVILLE DAM FAILURE**

The Edenville Dam, located on the Tittabawassee River failed Tuesday night after the region received about 4 to 7 inches of rain. Flow at the time of the dam failure occurred was about 30,000 cubic feet per second at the downstream US Geological Survey gauge at Midland, Michigan (USGS gauge #04156000) and water level was about 31 feet. This is slightly below the 1986 record flood which reached 33.9 feet. The flood peaked at just over 50,000 cfs and a water level of about 35 feet which is below the projected crest of 38 feet.

Edenville Dam was a 6600 foot long earthen dam. This is important because once an earthen dam overtops it is subject to catastrophic failure because the water flowing over the dam may erode the earthen materials it encounters. Wixom Lake, which is formed by Edenville Dam, has a storage capacity of 66,000 acre-feet, or the equivalent of about 33,000 cfs for one day. Once the dam failed, flows downstream increased rapidly from the dam, peaking at the Midland gauge around noon on Wednesday, May 20, 2020.

WHY DID THE DAM FAIL?

According to a study conducted in 1994 by engineering firm Mead and Hunt, Inc. the spillway capacity of the dam was 26,200 cfs. Once flows exceeded the spillway capacity, water levels in Wixom Lake increased until they overtopped the dam, rapidly eroding the dam and causing the catastrophic failure. (There are multiple videos of the dam failing.) The project’s spillway lacked the capacity to fully pass the water coming into Wixom Lake during the significant precipitation event. Although not verified by American Dams, others have stated that the flood had a 500-year recurrence interval and was greater than the flood of 1986.

WHY DIDN’T EDENVILLE DAM HAVE SUFFICIENT SPILLWAY CAPACITY TO PASS THE 500-YEAR FLOOD?

The dam’s owner retained Mead and Hunt, Inc. to prepare an Inflow Design Flood study for the project in August 1994. That study determined that the Probable Maximum Flood (PMF) was 74,340 cfs. Because failure of Edenville dam has the potential to cause loss of life downstream or significant economic damage, dam regulators require such dams to provide sufficient spillway capacity to safely pass the PMF. Since the PMF is 74,340 cfs and the spillway capacity is 26,200, the current spillway was inadequate to pass the PMF or even the 500-year flood. Since increasing the spillway capacity to 74,340 cfs would be costly, the spillway expansion has been an ongoing issue with regulators and the dam owners since 1994.

WHY DIDN’T THE DAM FAIL IN 1986 WHEN THE PEAK STREAMFLOW WAS 38,000 CFS AND THE SPILLWAY CAPACITY IS 26,200 CFS?

American Dams has not researched this question, but it is likely that the post failure analysis will look at operations in 1986 and in 2020 to see if there were differences and if the failure could have been prevented, despite not having the required spillway capacity. Several other key questions will need to be addressed in the coming weeks. It will be important to assess if the lake levels drawn down before the 1986 flood and able to absorb some of the inflow? Although the downstream flow rate at the USGS gauge was greater than the spillway capacity, was the actual inflow into Lake Wixom less than the combined outflow capacity of the spillway and powerhouse? How much did the drainage area downstream of the dam contribute to flows at the USGS gauge? Since the Federal Energy Regulatory Commission (FERC) required the dam owner to cease generation in late 2018, was the project operating at the time of failure, and if not, could that have helped lessen the potential for failure by having some of the flows move through the powerhouse rather than over the spillway?

HOW MUCH DID THE FAILURE OF THE DAM CONTRIBUTE TO DOWNSTREAM FLOODING?

The answer to this question has not been determined. FERC and the Michigan Department of the Environment Dam Safety Division is likely to have this issue studied to determine the contribution to the downstream flooding. Since the water level downstream was 31 feet prior to the dam failure and the peak flood elevation was 35 feet, the dam failure could have contributed a significant portion of this differential. The final number will depend upon how fast the 66,000 acre-feet behind the dam was released.

WHY DID FERC ISSUE AN ORDER TO CEASE GENERATION ON NOVEMBER 17, 2017?

The project owner and its predecessors have been in dispute with FERC for decades, and especially over the past 20 years since even before FERC issued the project license on October 16, 1998. Jurisdictional considerations and a failure to comply with the FERC license have been at the heart of the dispute. The owner had made some progress on designing spillway improvements, but that was insufficient for FERC. FERC subsequently denied the owner’s request for rehearing in the winter of 2018.

CAN AMERICAN DAMS ASSIST OTHER DAM OWNERS WHOSE DAMS MAY HAVE INSUFFICIENT SPILWAY CAPACITY?

Yes. American Dams is a non-profit organization dedicated to educating the public on the benefits of dams, and providing information to small dam owners on regulatory and operational matters, and in safely operating dams for the public’s benefit. American Dams does this as a free service. American Dams does not provide engineering consulting or legal services. However, American Dams can provide recommendations to small dam owners if they have a need for such services. Contact American Dams at Americandams.org,