

Bolivar Dam General History



Aerial view of Bolivar Dam

General History

Bolivar Dam is one of a system of dams designed to provide flood control and water conservation in the Muskingum Watershed in Southeastern Ohio. It is located on Sandy Creek of the Tuscarawas River, a tributary of the Muskingum River, 183.4 miles upstream of the confluence of the Muskingum with the Ohio River. Bolivar Dam is located near the town of Bolivar Village, Ohio, in Stark and Tuscarawas Counties. The Bolivar Dam is one of a series of sixteen U.S. Army Corps' of Engineers flood control dams in the Muskingum River basin. The dam is a two-zoned, rolled earthfill embankment with an impervious core and pervious upstream and downstream shells. The total crest length is 6,300 feet with approximately 1,300 feet at a height of 87 feet and 5,000 feet of a lower level dike from 20 feet to 50 feet high. The foundation of the dam is glacial outwash material and the depth to bedrock is up to 230 feet below the crest of the dam. The outlet works at the left abutment of the main embankment consists of twin concrete lined tunnels, an intake tower, walls, and stilling basin founded on rock. The intake structure consists of a reinforced concrete substructure and a brick superstructure. Six caterpillar gates, each 7.0 feet wide by 15.0 feet tall are contained in the intake structure. The invert of each gate opening is at elevation 895.0 feet. The outlet conduits consist of twin, 16-foot-diameter horseshoe-shaped, concrete-lined tunnels. The tunnels are connected to the intake structure through transition sections and extend 814 feet through the south abutment to the stilling basin. The stilling basin is a reinforced concrete structure of conventional hydraulic jump design with baffle blocks and an end sill for

energy dissipation. The floor slab is anchored to rock and drain holes four feet into rock are provided to relieve uplift pressure. The top of dam elevation has been raised from elevation 982 feet to elevation 985.5 feet by construction of a 3.5-foot high parapet wall along the upstream face of the dam. The dam was raised to correct a spillway deficiency created by up-to-date design criteria. It is a "dry dam" and does not retain a permanent pool during any season of the year. The outlet works normally pass the entire flow of Sandy Creek, except during periods of flood retention.

The emergency spillway is a trapezoidal cut through the left abutment approximately 300 feet west of the outlet works. The spillway base width varies from 540 feet at the crest at elevation 962.0 feet to 140 feet at the downstream end. The spillway crest is founded on rock but the downstream channel is concrete lined for 220 feet below the crest. The overall length of the spillway is approximately 1200 feet. The design discharge is 61,700 cfs with a surcharge of 18 feet and a freeboard of 2 feet.

Bolivar Dam has a history of excessive downstream seepage and the potential of through-seepage, under-seepage, and slope instability at design pools. The Sandy Creek valley is a broad, deeply filled pre-glacial valley consisting of sorted glacial outwash materials with possible lenses of open work gravels. The glacial deposits, upon which the dam is founded are composed of pervious, fine to coarse gravelly sands, generally about 150 feet thick. Based on a review of the subsurface and instrumentation data and based on observed performance during the pool of record in 2005, it is believed that several areas of the embankment and/or foundation would become unstable due to piping at some pool less than the spillway crest level. This instability would threaten the integrity of the dam and could lead to a complete dam failure.