CAVE BUTTES DAM POOL
FCDMC GAGE ID# 19517

STATION DESCRIPTION

LOCATION – The dam is located near what would be the intersection of Happy Valley Road and 16th Street. The gage is located on the east side of the main dam structure across Cave Creek Wash. Latitude 33° 43' 15" N, Longitude 112° 02' 43" W. Located in the NW1/4 SW1/4 SW1/4 S03 T4N R3E in the Union Hills 7.5-minute quadrangle.

ESTABLISHMENT – The gage was established on January 25, 1984.

DRAINAGE AREA – 195.7 mi^2

GAGE – The gage is a bubbler type orifice located near the outlet works in the dam pool. The orifice is at elevation 1.95 feet gage height, or 1,564.250 feet NAVD 1988, levels of November 14, 2017.

There are 24 staff gages located from the bottom of the pool area to the top of the dam. All staff gages display in feet gage height, in 5-foot increments. The staff gages alternate between beginning at 0 feet or 5 feet, i.e., 0-5, 5-10, 60-65, etcetera.

There are no crest gages at this location.

ZERO GAGE HEIGHT - Zero gage height is defined as the invert of the inlet of the outlet culvert. Elevation 1,562.300 feet NAVD 1988, levels of November 14, 2017. The NAVD88 elevations are based on three surveys, November 14, 2017, November 27, 2017, and December 11, 2017.

HISTORY – No history at this location prior to gage installation. Gaging was established at this location on January 25, 1984. The gage was a float and manometer type instrument. First rating was applied on January 1, 1990. The float type gage was replaced with a pressure transducer on November 1, 1993. Pressure transducer replaced on December 4, 1996. Pressure transducer moved out of CMP can on May 7, 1997 to its present location. A bubbler/non-submersible pressure transducer system was installed on February 12, 1998. Instrumentation replaced on April 1, 1998. A bubbler / gas purge system installed on February 17, 2000. Pool gage ID changed from 4904 to 4899. Pool gage ID changed to 4904 on February 21, 2008. The orifice line was relocated to the stilling well in June 2011. Elevation of orifice remains 1.90 feet gage height. A full survey of the inlet pool and outlet channel, instrumentation, staff gages, and reference marks was done on November 14, 2017.

REFERENCE MARKS –

The last significant survey of the dam and references occurred in January 1992. Previous references were not all surveyed in November 2017.

BM-1 is stamped SM-13 and is located on top of the dam at station 30+00. It is at elevation 120.149 feet gage height and 1,682.449 feet NAVD88, levels of November 14, 2017.

BM-2 is stamped SM-14 and is located on top of the dam nearest to the station house. It is at elevation 119.651 feet gage height and 1,681.951 feet NAVD 88, levels of November 14, 2017.

BM-3 is stamped RM-2 and is located on top of the dam. It is at elevation 119.372 feet gage height and 1,681.672 feet NAVD88, levels of November 14, 2017.

BM-4 is stamped RM-3 and is located on top of the dam. It is at elevation 119.250 feet gage height and 1,681.550 feet NAVD88, levels of November 14, 2017.

BM-6 is stamped CB-3 and is located on top of the dam. It is at elevation 119.421 feet gage height and 1,681.720 feet NAVD88, levels of November 14, 2017.

BM-6 is stamped CB-4 and is located on top of the dam. It is at elevation 119.282 feet gage height and 1,681.582 feet NAVD88, levels of November 14, 2017.

RM-1 is an aerial target nail located at where the downstream access ramp and the top of the dam intersect. It is stamped 'PP724'. It is at elevation 118.265 feet gage height and 1,680.565 feet NAVD88, levels of November 14, 2017.

RM-2 is a new rebar set at the toe of the outlet structure. It is at elevation -1.257 feet gage height and 1,561.043 feet NAVD88, levels of November 14, 2017.

RM-3 is a chiseled 'X' inside the outlet structure at the foot of the inlet pipe. It is at elevation -1.215 feet gage height and 1,561.085 feet NAVD88, levels of November 14, 2017.

RM-4 is a chiseled 'X' on the outside of the outlet structure on the concrete pad. It is at elevation -1.210 feet gage height and 1,561.090 feet NAVD88, levels of November 14, 2017.

RM-5 is a chiseled 'X' on the SW corner of the stilling well pad. It is at elevation 1.909 feet gage height and 1,564.209 feet NAVD88, levels of November 14, 2017.

RM-6 is a new rebar set just uphill from the uppermost staff gage. It is at elevation 115.651 feet gage height and 1,677.951 feet NAVD88, levels of November 14, 2017.

RM-7 is a chiseled 'X' at the center of the upstream headwall at the principal outlet. It is at elevation 12.715 feet gage height and 1,575.015 feet NAVD88, levels of November 14, 2017.

RP-1 is the most downstream bolt securing the top plate onto the stilling well. It is at elevation 6.184 feet gage height and 1,568.484 feet NAVD88, levels of November 14, 2017.

CHANNEL AND CONTROL – The primary outlet from the dam is a 45-inch diameter concrete culvert 548 feet in length. The emergency spillway for the dam is located to the west of the main dam.

PRINCIPAL OUTLET / EMERGENCY SPILLWAY –

The principal outlet is a 45-inch diameter concrete culvert. The invert of the inlet is at 0.000 feet gage height, or 1,562.300 feet NAVD88. The invert of the outlet is at –2.770 feet gage height, or 1,559.530 feet NAVD88. The culvert length is 548 feet. Flow begins through the culvert at 0.00 feet gage height. There is some sediment storage inside the outlet structure, as the bottom of the structure is at elevation -1.21 feet gage height.

The emergency spillway is located to the west of the gage and main dam. The spillway is blasted into the mountain and spills into the valley below. The bottom width of the spillway is 510 feet. The spillway crest is at 97.10 feet gage height, or 1,659.40 feet NAVD88.

The top of the dam elevation is approximately 119.1 feet gage height, or 1,681.4 feet NAVD88.

RATINGS – The current discharge rating is Rating #7 (applied 10/01/2015) which is a revision of Rating #6, adjusting the spillway flows using a weir coefficient of 2.8 rather than 2.9. Rating #6 is a revision of Rating #5 to account for movement of the pressure transducer out of the orifice. Rating #3 is the basis for all ratings following it. Ratings 4 (applied 10/1/94) and 5 (applied 10/1/96) are revisions of Rating #3 to account for discrepancies from the discharge at the gage at the outlet channel. R. W. Cruff developed rating #3 (applied 3/2/92) in March 1992 using the HY-8 culvert analysis for the primary outlet and the weir equation for the auxiliary spillway. Rating #2 (applied 1/1/90) was taken from the structure data book. Rating #1 (applied 1/25/84) was from the original COE design.

The capacity rating was modified to account for the new mapping for stages above the emergency spillway, and is based on the same topo used in the 2011 study. Previously,

the volumes were only determined up to the spillway elevation. Volumes above the spillway elevation were estimated from extending the plot of the given values. The rating will be current for Water Year 2011. The previous capacity rating is Rating #4 (applied 5/7/97). Rating #4 is merely Rating #3 accounting for movement of the level sensor. Rating #3 (applied 10/1/96) is a revision of Rating #2 to account for more surface area. Rating #2 (applied 10/1/95) is a refinement of the design COE gross capacity curve. Rating #1 (applied 1/25/84) is the COE design capacity rating.

DISCHARGE MEASUREMENTS – Discharge measurements are made at the outlet channel to refine the rating for that gage. No other discharge measurements at the primary outlet would be possible.

POINT OF ZERO FLOW – Flow begins through the principal outlet at 0.00 feet gage height. Flow begins through the emergency spillway at approximately 97.10 feet gage height.

FLOODS / SIGNIFICANT IMPOUNDMENTS –

The largest impoundment occurred on January 8, 1993 at 75.89 feet gage height, and 17,592 acre-feet and 38.2 percent full. The second largest event occurred on January 23, 2010 at 67.20 feet, 8,696 acre-feet, and 18.6 percent full.

REGULATION – Cave Creek dam approximately 1/2 mile upstream regulates flows into Cave Buttes Dam. Both dams regulate natural flows on Cave Creek Wash.

DIVERSIONS – None known

ACCURACY – Fair

JUSTIFICATION – Monitor water levels behind Cave Buttes Dam for public safety.

UPDATE – October 25, 2023
ES Thomas