Hydrographic Survey of Little Robber Lake

Field Collection

Transportation of the collection equipment and crew occurred on 8/27 and 8/28 of 2001. The field collection was conducted by Kent Collins and Ron Ferrari of the Sedimentation and River Hydraulics Group. The underwater collection was started on the afternoon of 8/27/2001. The collection was conducted using a real-time kinematic global positioning system (RTK GPS), single beam depth sounder, and field collection computer. All equipment was mounted on a pontoon raft.

To be able to merge the collected data with previous collected data, the RTK GPS base was set over a previous established point called "rebar". The point "rebar" was established using a single GPS receiver. The point should be classified as a project datum. The assigned coordinates to the point "rebar" are in the NAD83 Wyoming West Central state plane coordinate system:

N 252,840.460
E 2,251,806.890
Elevation 6544.412

The underwater collection was completed on the evening of 8/27/2001. The water surface elevation during the time of collection was around 6,482.9 feet. On the morning of 8/28/2001 some above water topography points were collected using the RTK GPS system. Due to time restraints and the rocky cliff topography in the upper portion of the lake, only about half of the reservoir was walked for the above water collection. The ground survey data determined the top of the dam to be around elevation 6496.5 and a previous high water level of the lake to be around elevation 6490. This high water line was estimated using undercuts along the shoreline of the lake.

Analysis

The underwater depth data was edited and converted to elevations using the water surface elevation 6,482.9. This x,y,z data set was merged with all available x,y,z above water data points and used to develop the lake topography needed to compute the area and capacity. The lake topography was developed using the software program ARC/INFO. To be able to compute the upper lake areas a boundary or clip around all of the data that represented the lake had to be completed. This was accomplished by digitizing the contours labeled 6493 and 6500 from the USGS quad map of the lake. Using all above information and some engineering judgment, the 6493 contour was edited to enclose all lake data points and was assigned an elevation of 6490. The 6500 contour was also edited and assigned an elevation of 6496. The area computed for elevation 6496 is a very crude estimate of the maximum water surface.

Contours for the lake below elevation 6490 were computed from the data set using the triangular irregular network (TIN) surface modeling package within ARC/INFO. The resulting contours are presented on the attached map. All mapping features such as the roads were from the USGS quad. The circular contours just upstream of the dam are an inlet structure which the survey vessels just happen to cross on the last profile line. Once it was located, additional data was collected to better represent the inlet.

The surface areas for Little Robber were computed at 0.5 foot increments from elevation 6,462.0 to 6,490.0. These surface areas were determined using ARC/INFO from the developed TIN. The storage-elevation relationships based on the measured surface areas were developed using an area-capacity computer program called ACAP85. The surface area for elevation 6496 was used to estimate the capacity at top of dam.

Summary

The 2001 survey determined the lake has a total storage capacity of 402 acre-feet and a surface area of 33 acres at elevation 6490. Since the 2001 underwater survey was conducted near lake elevation 6482.9 and a complete above water lake survey was not conducted, these upper elevation results must be considered an estimate. As summarized, the contour for elevation 6490 and 6496 were projected using available information from the USGS topography and the available above water survey data. The values for elevations below the water surface elevation 6482.9 are more accurate since depths as shallow as 2-feet were collected along the shoreline and upper reaches of the lake. Additional above water data would need to be collected to better clarify the upper lake topography. As a word of caution, the very upper lake bottom was a very soft delta and would have to be measured after the lake drops further and dries out or freezes.

The data around the dam and inlet should be of some interest. The bottom was very flat with depths around 13 feet. The small diameter inlet structure was found to have a maximum depth of around 22 feet. Using the single beam depth sounder the inlet was hard to locate, but it appears to be just a small circular opening as presented on the attached map.

Note of caution. The 1999 Formal Seed Examination Report titled “Little Robber Detention Dam” has the maximum operating level of the reservoir being 6490 or 10-feet below the dam crest. This was determined as the invert elevation of the service spillway inlet. The report states the emergency spillway on the left abutment has a crest elevation of 6495, but no values for crest of dam were located. There are several statements in the report that the dam crest is various distances above different features or events which would make the crest elevation around 6500 feet. The USGS quad of the lake shows the crest lower than 6500 feet. As stated previously, all elevations for the August 2001 lake survey were tied to the point “rebar”. As a check, the upstream crest of the inlet to the service spillway was measured as elevation of 6487.1. This compared well with previous measurements of this inlet when using the point “rebar” as the datum, but appears to be around 3 feet lower than what is stated in the 1999 Seed report. If in the future it is determined that a shift is necessary it can easily be accomplished since all collected data for this study was tied to the point “rebar.”