

# RECLAMATION

*Managing Water in the West*

TR-2015-05

## Travel to McPhee and Nighthorse Reservoirs

Travel to perform sonar inspections and bathymetry surveys at McPhee and Nighthorse Reservoirs

Dates of Travel: September 8 – 10, 2015



U.S. Department of the Interior  
Bureau of Reclamation  
Technical Service Center  
Hydraulic Investigations and Laboratory Services Group  
Denver, Colorado

BUREAU OF RECLAMATION  
Technical Service Center  
Denver, Colorado

TRAVEL REPORT

Code: 85-856000

Date: November 5, 2015

To: Manager, Hydraulic Investigations and Laboratory Services Group

From: Tracy Vermeyen, Hydraulic Engineer

Subject: Travel to perform sonar inspections and bathymetry surveys at McPhee and Nighthorse Reservoirs

1. Travel period: September 8-10, 2015

2. Places or offices visited: Western Colorado Area Office – Durango, CO

3. Purpose of trip: Perform sonar inspections of river outlet works at McPhee Dam and to survey the bank line near a boat ramp at Lake Nighthorse.

4. Synopsis of trip: I arrived in Durango, CO on Tuesday, September 8, 2015 at 1:00 p.m. I went to the Western Colorado Area Office (WCAO) where I met with Tyler Artichoker and Casey Hall. Tyler requested I survey a short section of bank line at the Lake Nighthorse boat ramp to map a section of bank that contains fractured shale. Casey and I drove to Lake Nighthorse where we met Brett Griffin, boat operator. We prepared the boat for a sonar survey while Brett went over the job hazard analysis which we all signed. I tested the sonar equipment and everything was working normally. We spent about 2 hours surveying the area of interest and collected over 39,000 soundings. Figure 1 shows a 5-ft contour map of the boat ramp and bank line overlaid on an aerial photograph taken from Google Earth (image dated 6/27/2014). Note: this survey was performed with a differential GPS receiver and should not be considered a survey-grade map. The horizontal uncertainty in position is sub-meter and the vertical uncertainty for elevations is about 0.1 ft. Elevations were computed by subtracting the measured depth and instrument depth from the reservoir elevation at the time of the survey, El. 6881.16 ft.

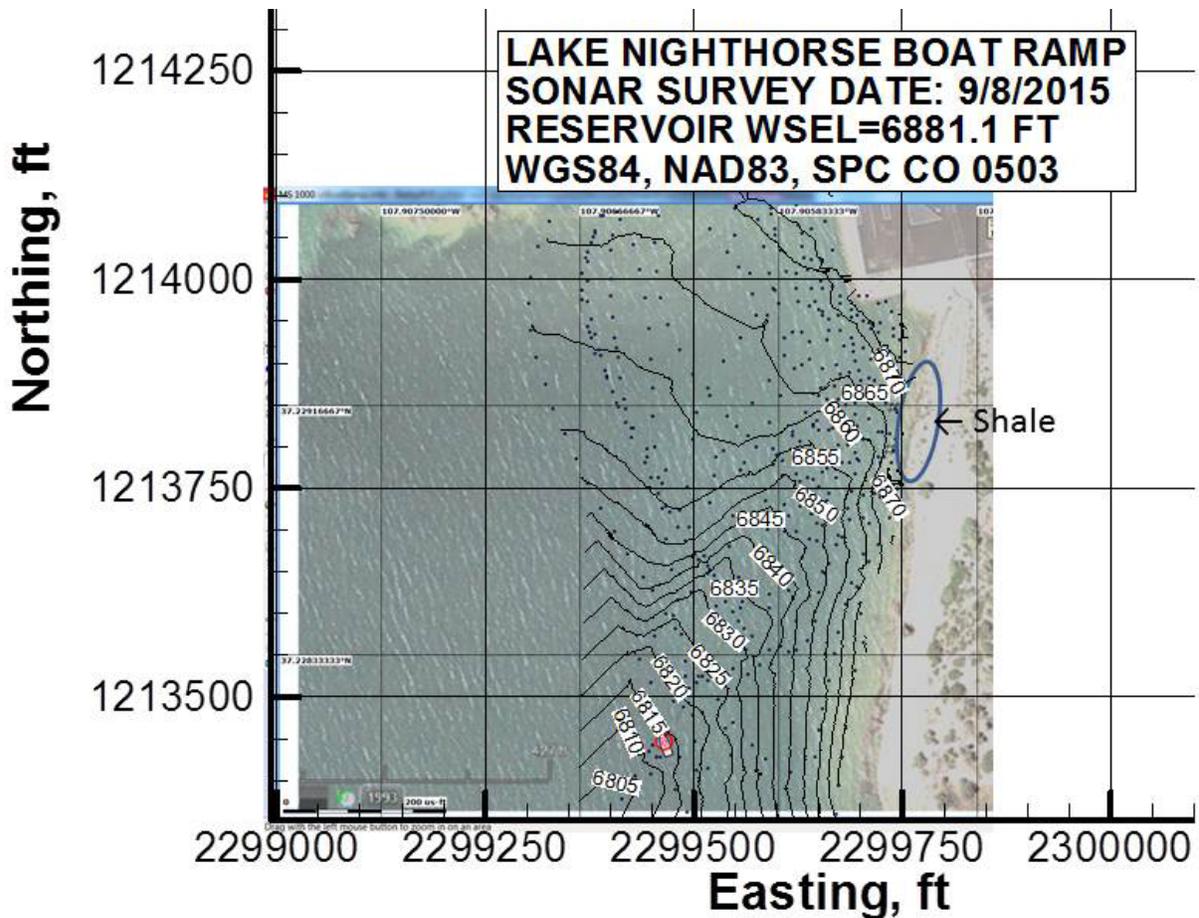
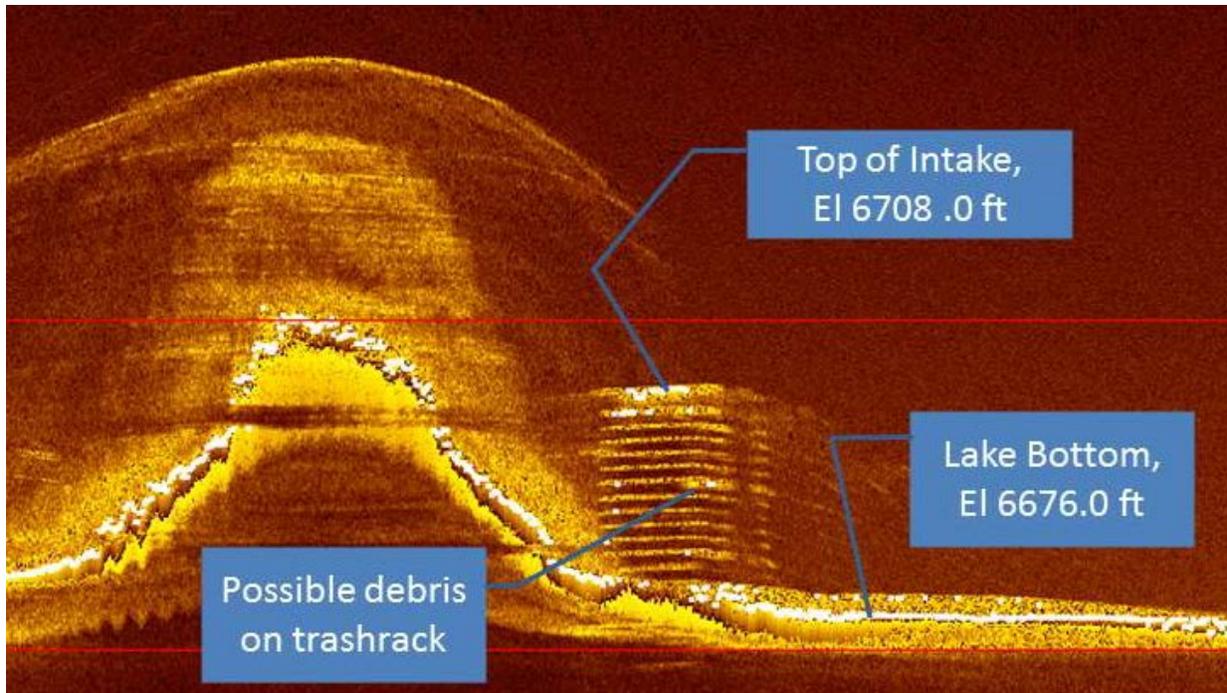


Figure 1. A 5-ft contour map of the shore line near the Lake Nighthorse boat ramp. The black dots represent the boat's path during the survey. The fractured shale area is denoted with the blue oval.

**Wednesday, September 9, 2015** – At 7:30 a.m. I met with Brett Griffin at the WCAO where we loaded the sonar equipment on the WCAO's Parker boat. We transported the sonar equipment to the McPhee Reservoir near Dolores, CO where we met Rob Walker with the Dolores Water Conservancy District who was going to assist us for the day. We prepared the boat for a sonar survey while Brett went over the job hazard analysis which we all signed. We started the day collecting sonar images near McPhee Dam to locate the submerged river outlet works structure. We surveyed the area for about 20 minutes until we located the intake. We made several passes over the intake structure to collect sonar images and determined the intake's location. The GPS coordinates for the intake structure are 37.57740489°N, 108.568492°W.

Figure 2 is a typical sonar image of the submerged intake and the surrounding topography. Based on observations of several sonar images there appears to be some debris accumulated on the trashracks and appropriate precautions should be taken when performing the upcoming ROV inspection.



**Figure 2. Typical sonar image (side view) of the river outlet works intake tower. The horizontal lines represent the trashrack support beams. The white dots represent the strongest acoustic reflection. The lake bottom appears to have 4 to 5 ft of sediment accumulation from the as-built intake channel elevation, El. 6671.0 ft obtained from drawing 71-D-116.**

After the intake was located, we made a few survey passes across the forebay to survey the dam embankment. This partial survey did not reveal any concerns regarding the condition of the embankment. Maps were not produced because during data collection the motion reference unit (MRU) stopped working which compromised the survey data because boat pitch and roll motion could not be corrected for in the echosounder measurements.

Next we went to the Great Cut Dike on McPhee Reservoir to survey an area where Casey Hall observed a small landslide on the intake channel's right bank near GPS coordinates 37.5101°N, 108.5847°W. We made several survey transects along the bank line to map the bathymetry. Figure 3 shows the contour lines produced from the bathymetry data. Note: these contours were produced using differential GPS position data and are not considered survey-grade. The landslide area did not contain any major deformations, but there is some gulley erosion and deposition near GPS coordinates 37.50969°N, 108.58389°W as shown on figure 4. Further down the right bank there is deposition of material near the toe of the slope.

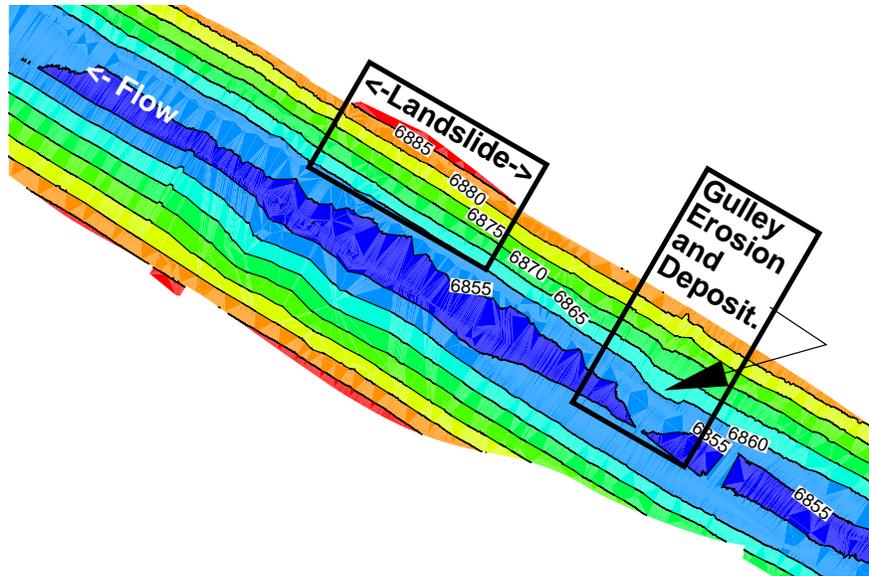


Figure 3. Contour map of bathymetry data collected on September 9, 2015 near the Great Cut Dike. Data collected near the landslide location did not indicate any significant changes in the bank. However, there is some gulley erosion and deposition near GPS coordinates 37.50969°N, 108.58389°W.

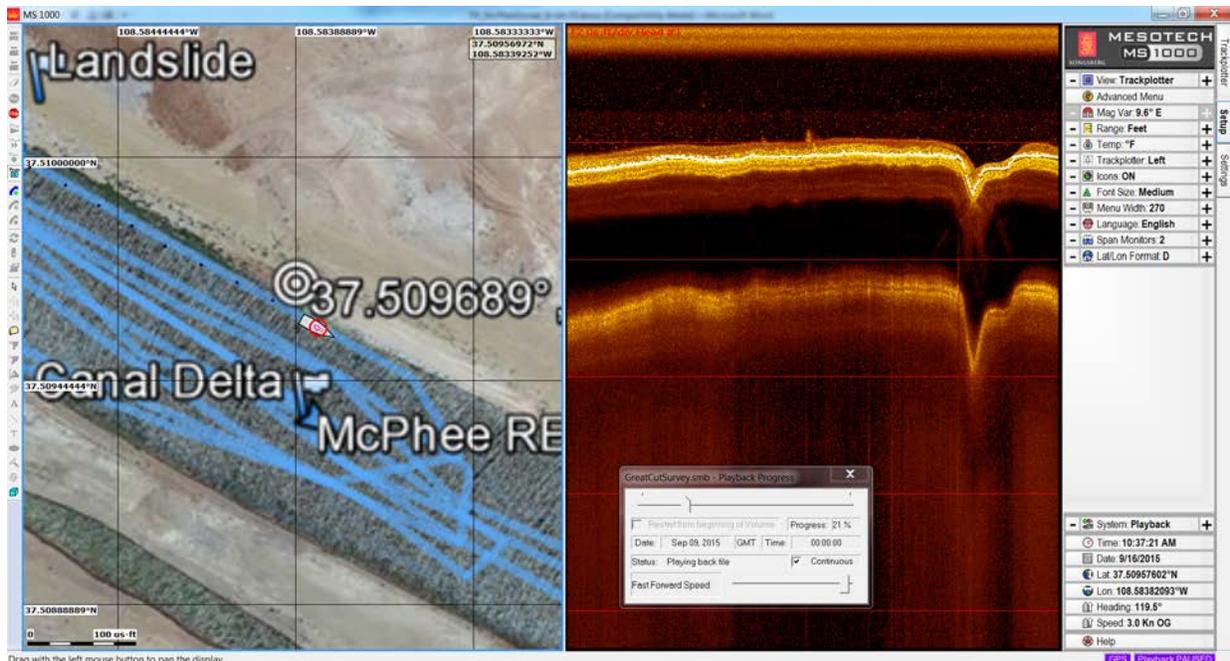


Figure 4. Screen capture from sonar software package showing the location of the sonar (left panel) and the gulley erosion that was measured to extend about 4 ft deep from a depth sounding taken along the right bank (right panel).

We completed our sonar survey activities at 2:00 p.m. We packed up our equipment, loaded the boat, and returned to Durango at 4:00 p.m. Brett and I delivered the sonar equipment for shipment back to the Denver Federal Center.

**Thursday, September 10, 2015** – I left Durango, CO at 8:00 a.m. and returned to Denver.

5. Conclusions: A sonar survey successfully located the river outlet works in McPhee reservoir. Based on observations of several sonar images there appears to be some debris accumulated on the trashracks and appropriate precautions should be taken when performing the upcoming ROV inspection. Bathymetry data were collected to develop contour maps for the boat ramp area at Lake Nighthorse, and along the Great Cut Dike intake channel. The sonar system performed as expected for all applications, however, the Motion Reference Unit (MRU) sensor malfunctioned during portions of the bathymetry data collection which compromised some of the data collected. The MRU sensor and communication interface box will need to be repaired.

6. Action correspondence initiated or required: None

7. Client feedback received: N/A

cc:

Tyler Artichoker (WCAO)

Casey Hall (WCAO)

Brett Griffin (WCAO)

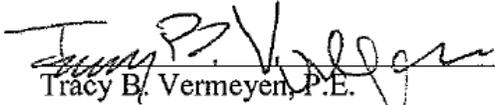
**SIGNATURES AND SURNAMES FOR:**

**Travel to:** Travel to Durango, CO, Western Colorado Area Office, McPhee and Nighthorse Reservoirs.

**Dates of Travel:** September 8-10, 2015

**Names and Codes of Travelers:** Tracy Vermeyen, 85-856000

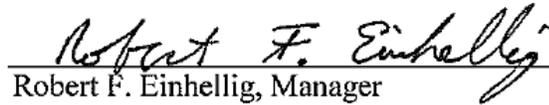
**Traveler:**

  
Tracy B. Vermeyen, P.E. 11/4/15  
Hydraulic Investigations and Laboratory Services Group Date

**Reviewed:**

  
Kent Walker, P.E. 11/4/15  
Hydraulic Investigations and Laboratory Services Group Date

**Noted and Dated by:**

  
Robert F. Einhellig, Manager 11/4/15  
Hydraulic Investigations and Laboratory Services Group Date