

erosion is not recommended at this time. Further analysis to evaluate the TDG performance at higher tailwater elevations could change this recommendation.

10 Post-2020 Survey Summary and Analysis

Surveys were conducted of the stilling basin and other areas within the tailrace of all five dams between January and February 2021. The 2021 stilling basin surveys were compared to surveys conducted in 2017 to determine if there were changes in erosion or deposition over the 3 years of spill. In other areas of the tailrace there was not a direct comparison since the 2021 surveys were more extensive than the 2017 surveys. Appendix B – Post-2020 Stilling Basin Conditions shows both the current conditions as well as comparison to the 2017 surveys.

Lower Granite stilling basin shows significant movement of rock within the stilling basin since 2017 but similar total quantities accumulated within the stilling basin as 2017. The survey did not show much additional erosion of the concrete within the stilling basin although some could be hidden under additional deposition on the south side of the spillway. There appears to be movement of material just downstream of the endsill which will require additional comparison to historical surveys to determine if material has scoured beyond historical extents.

The Little Goose survey shows a significant increase in rock accumulated within the stilling basin with preliminary estimates about 30 thousand cubic yards (see Appendix B). There is little to no stilling basin floor visible in the 2021 survey and the condition of the concrete beneath the rock is unknown. Significant undermining of the jetty retaining wall downstream of the right side of the spillway exists as well as undermining of the powerhouse/spillway training wall. The undermining of these walls was seen in previous surveys. The high level assessment in 2018 was done in a memorandum for operations (USACE, 2018). This memo assessed undermining of the left and right training walls as high risk at that time but indicated more study was needed. There is likely some additional undermining of these walls since the 2017 survey, but the multi-beam surveys done in 2021 is not the correct type of survey to assess undermining.

The 2021 Lower Monumental survey shows some accumulation of rock within the stilling basin. There is no noticeable difference in erosion of the stilling basin from the 2017 survey, movement of material has occurred downstream of the end sill within the immediate tailrace.

The 2021 Ice Harbor survey shows very little rock accumulation within the stilling basin, and the comparison with the 2017 survey show some minor erosion of up to 0.4 ft. at the toe of the spillway below spill bays 2 and 8. The hydraulics of the end bays during 125% gas cap spill were more unstable fluctuating between plunging and skimming flow more often than the interior bays. Erosion downstream of the stilling basin does not seem extensive which is likely due to the high erosion resistance of the rock

downstream of the stilling basin. However, erosion of the coffer cells is still a concern. The 2021 survey indicates minor changes at the coffer cells since the 2017 surveys.

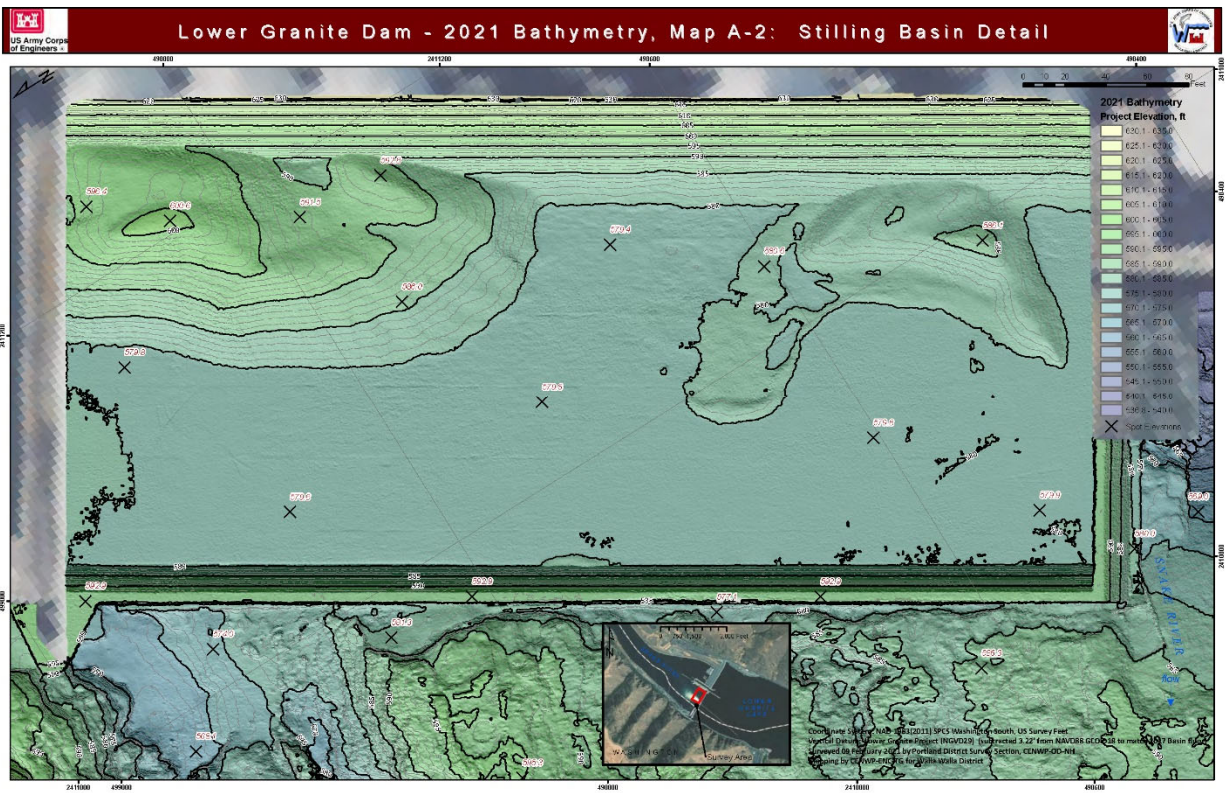
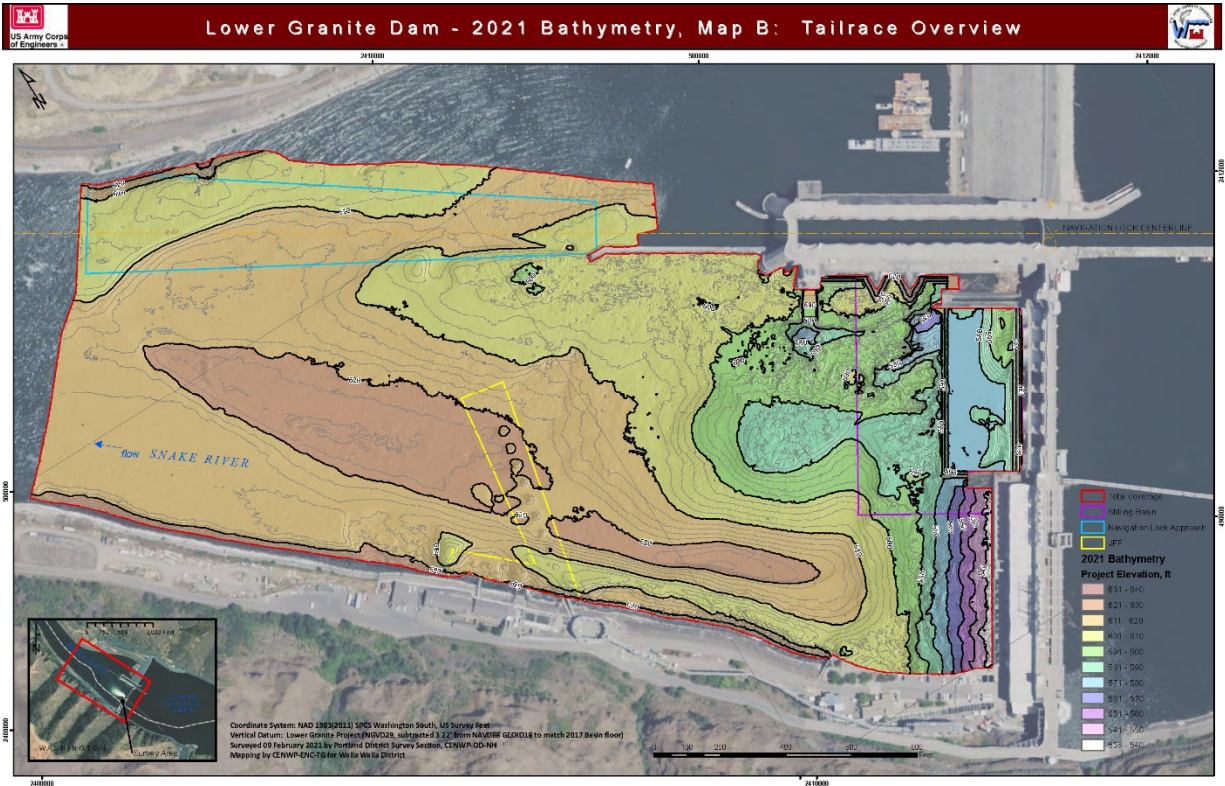
The 2021 McNary survey shows little rock in the stilling basin. The survey did not show much erosion from 2017 to 2021 however there is a one foot deep hole at the base of spillbay 3. This area was covered by a debris pile in 2017 so it is unclear if the erosion occurred recently or over time. There is significant undermining of the endsill which has occurred over time, with little to no indication of significant scour or deposition occurring over the past three years.

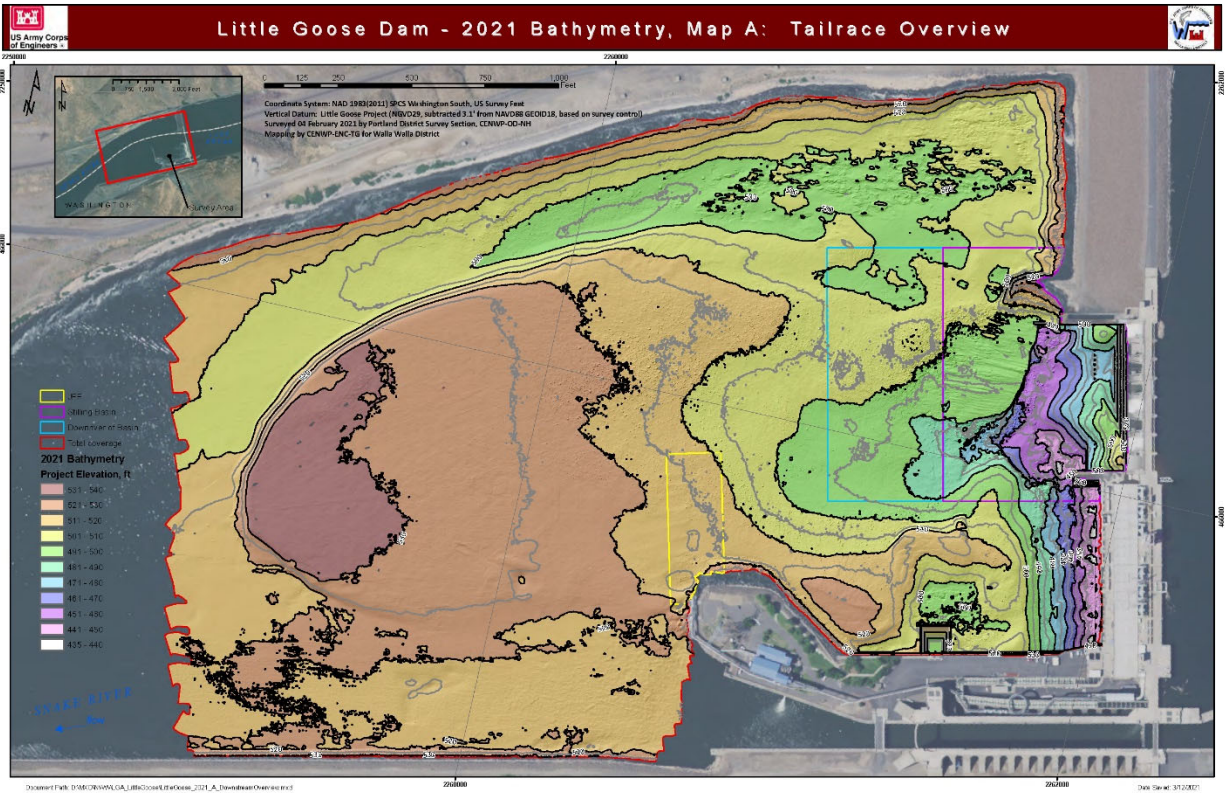
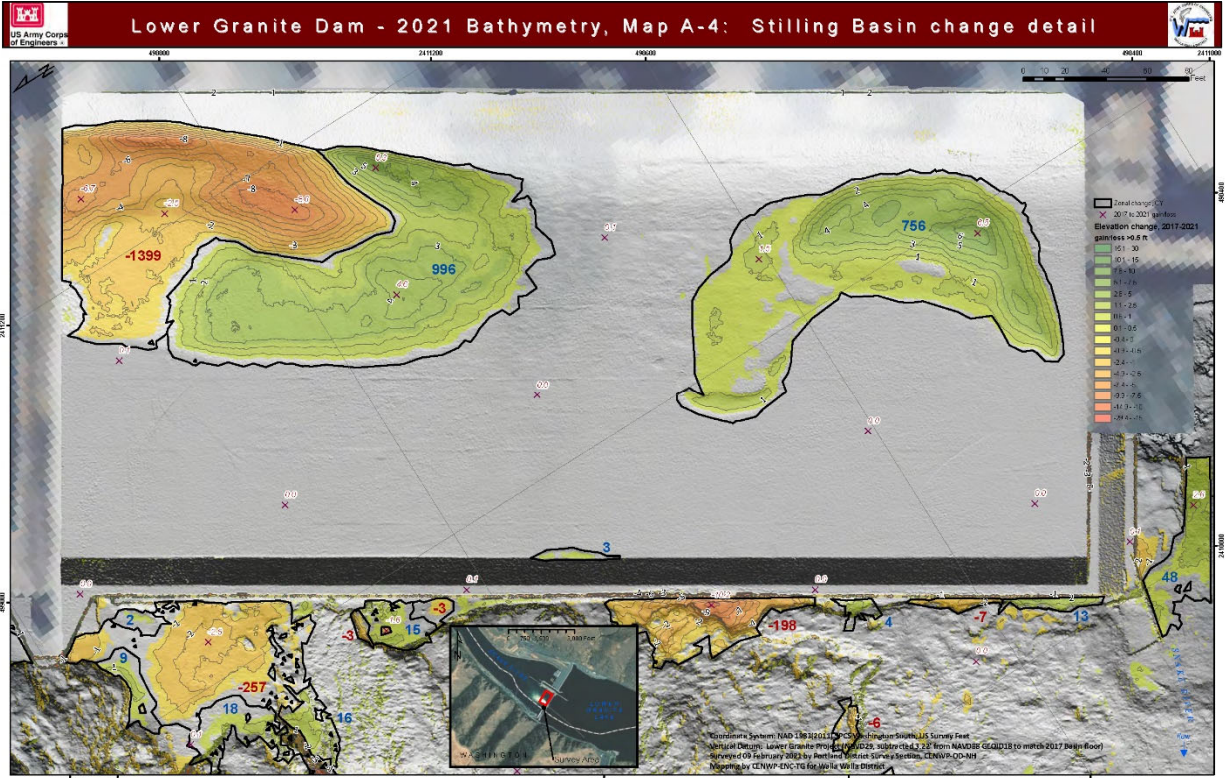
Rock and debris in the stilling basin increases the likelihood of ball milling erosion; the rock should be removed to minimize the potential for erosion and to fully assess the erosion that has occurred. The rock accumulated within the stilling basin was estimated for each of the dams and is summarized in Table 10-1. Prior to the 2021 survey Lower Granite had the most rock accumulated in the stilling basin, but Little Goose now has significantly higher rock accumulated than any other stilling basin.

Table 10-1 – Approximate Stilling Basin Rock Accumulation

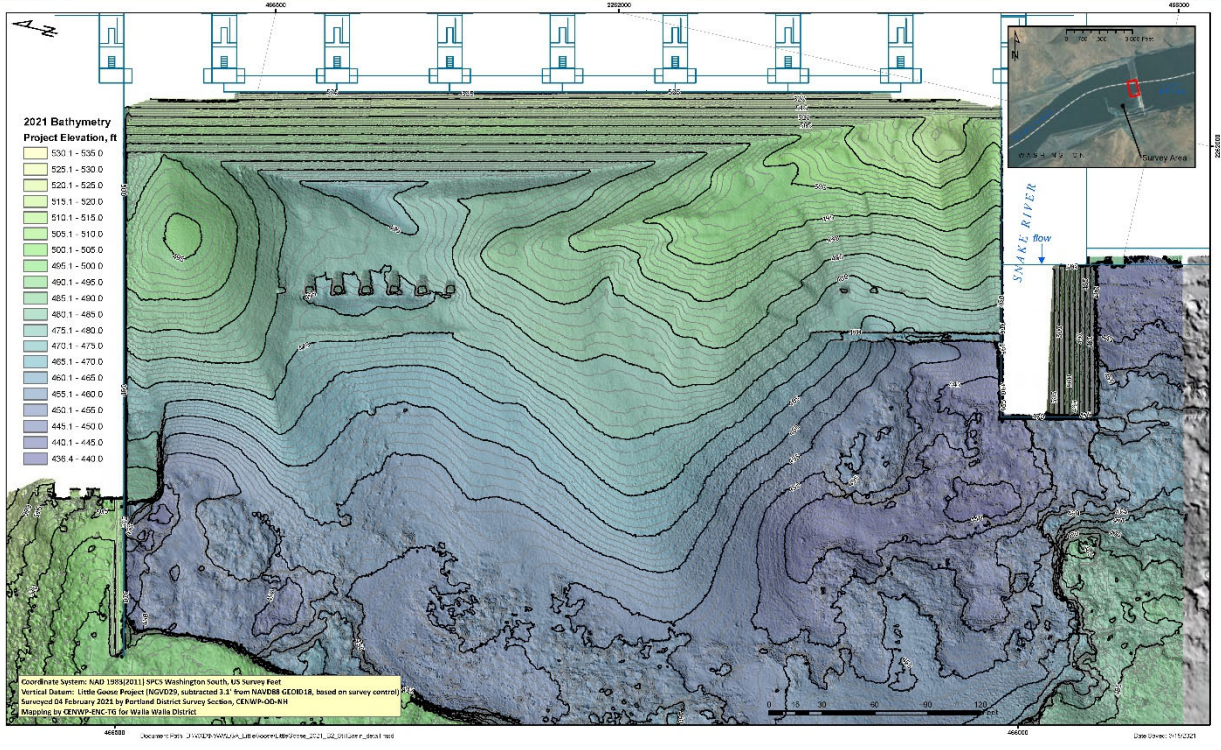
Project	Debris Accumulation (cy)
Lower Granite	5,500
Little Goose	30,000
Lower Monumental	500
Ice Harbor	N/A
McNary	N/A

15 Appendix B – Post-2020 Stilling Basin Conditions

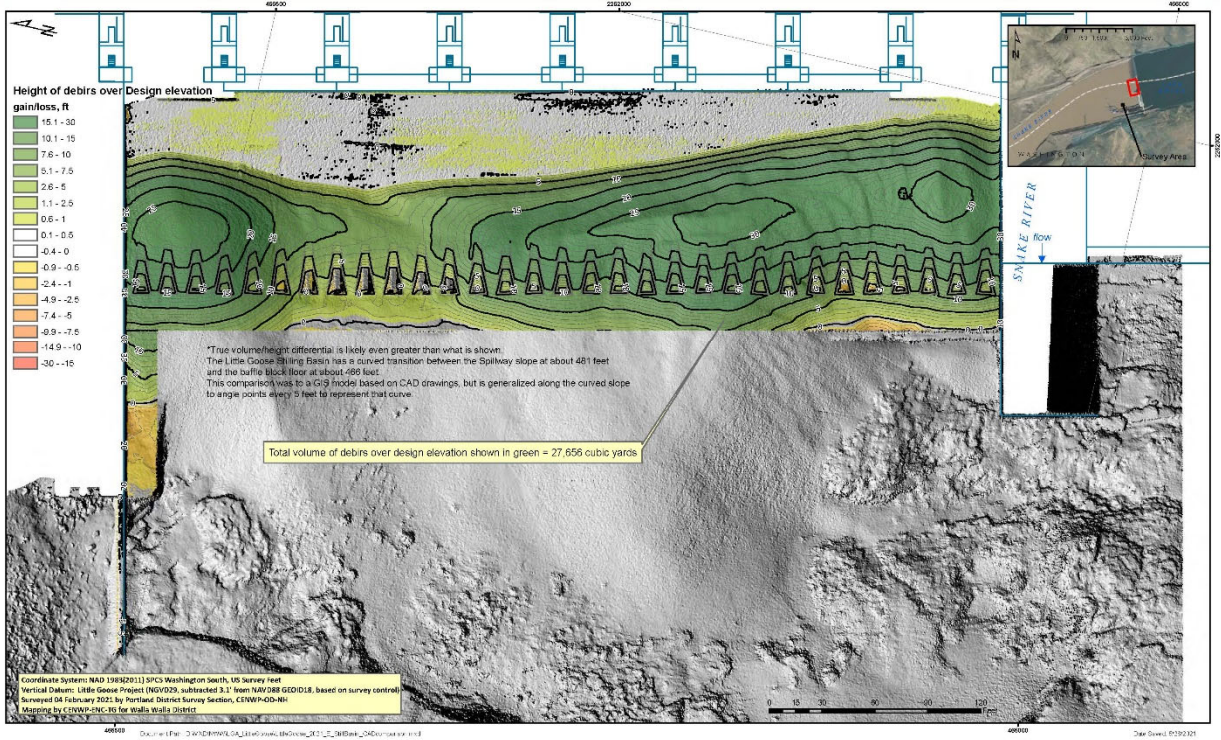




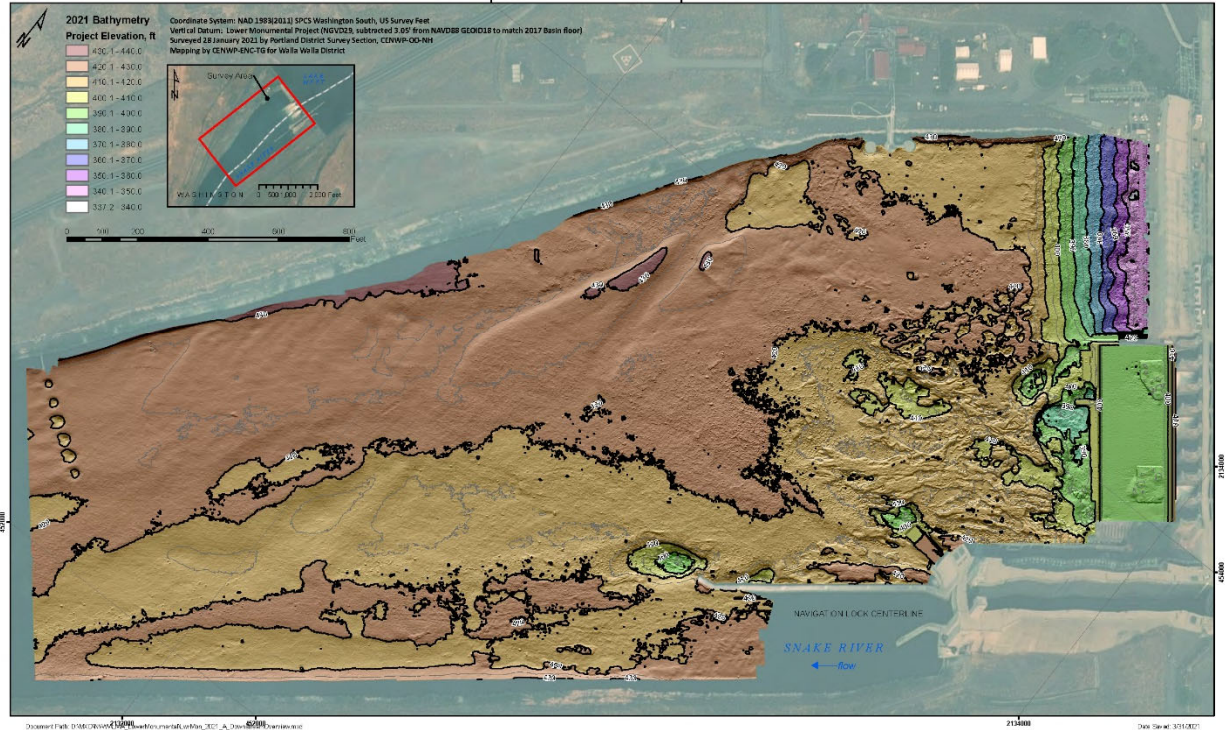
US Army Corps of Engineers **Little Goose Dam - 2021 Bathymetry, Map B-2: Stilling Basin detail** 



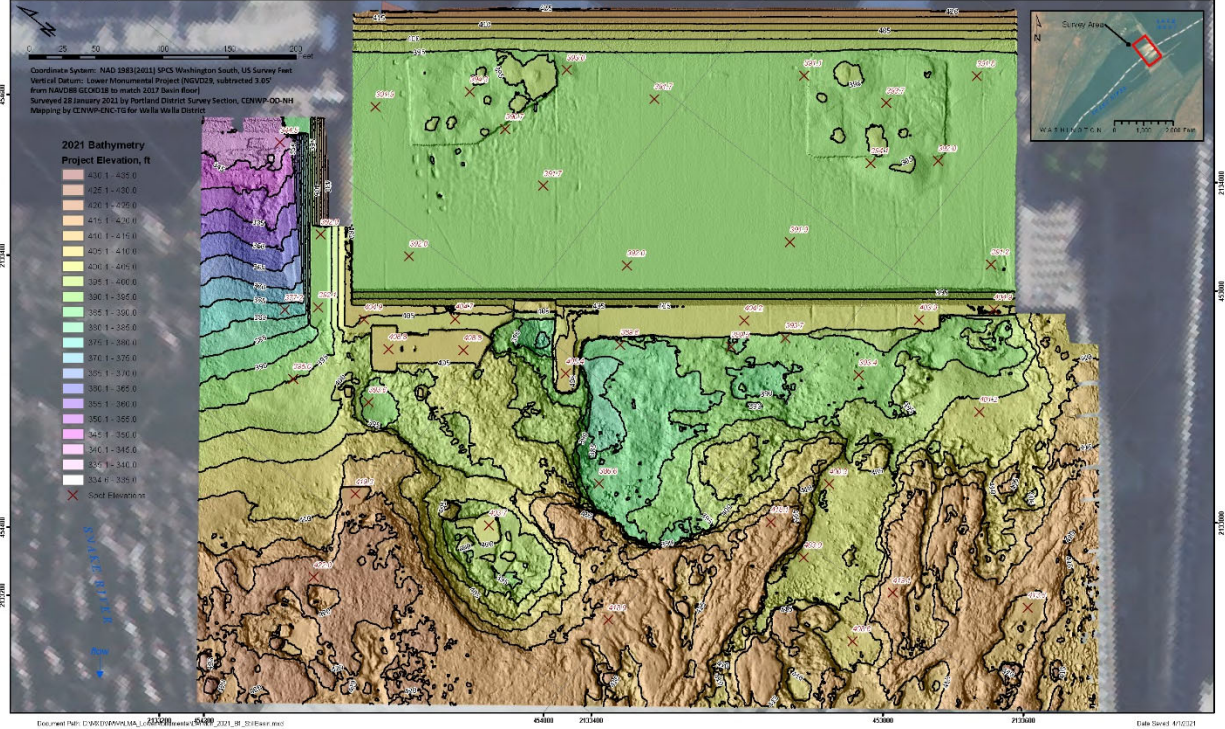
US Army Corps of Engineers **Little Goose Dam - 2021 Bathymetry, Map E-3: Stilling Basin debris height*** 



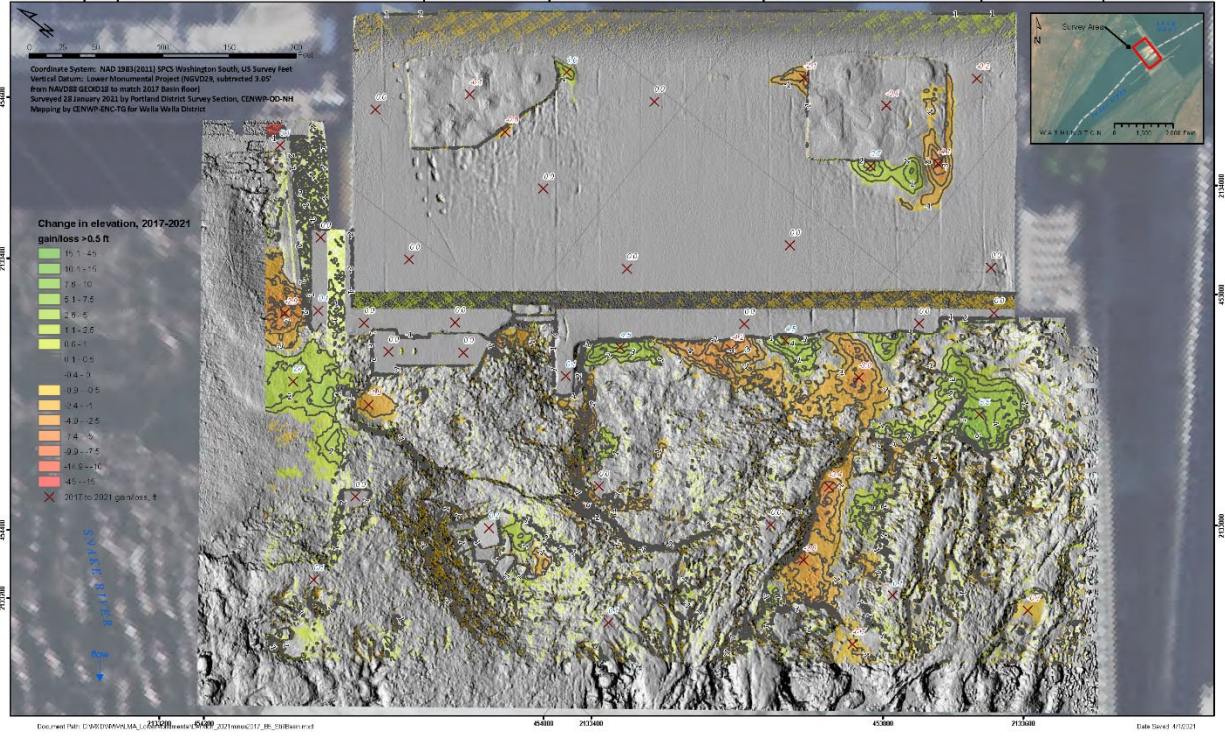
US Army Corps of Engineers **Lower Monumental Dam - 2021 Bathymetry, Map A-2: Tailrace** 



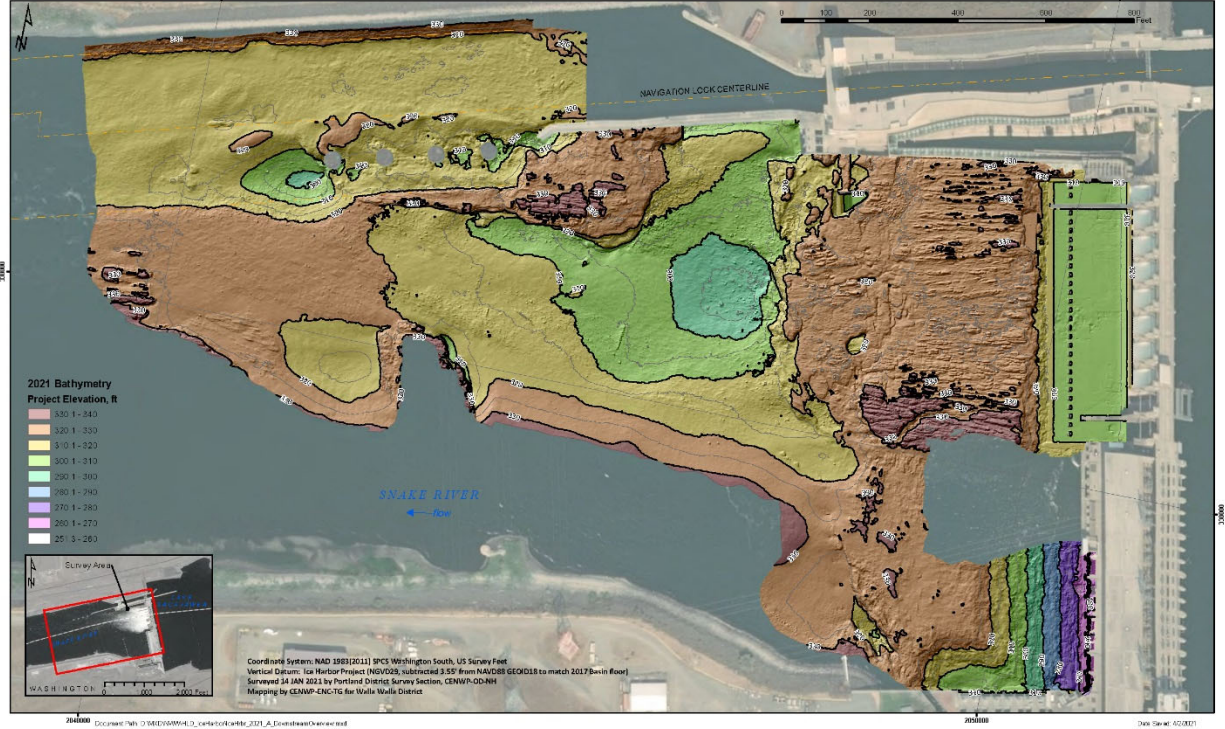
US Army Corps of Engineers **Lower Monumental Dam - 2021 Bathymetry, Map B: Stilling Basin** 



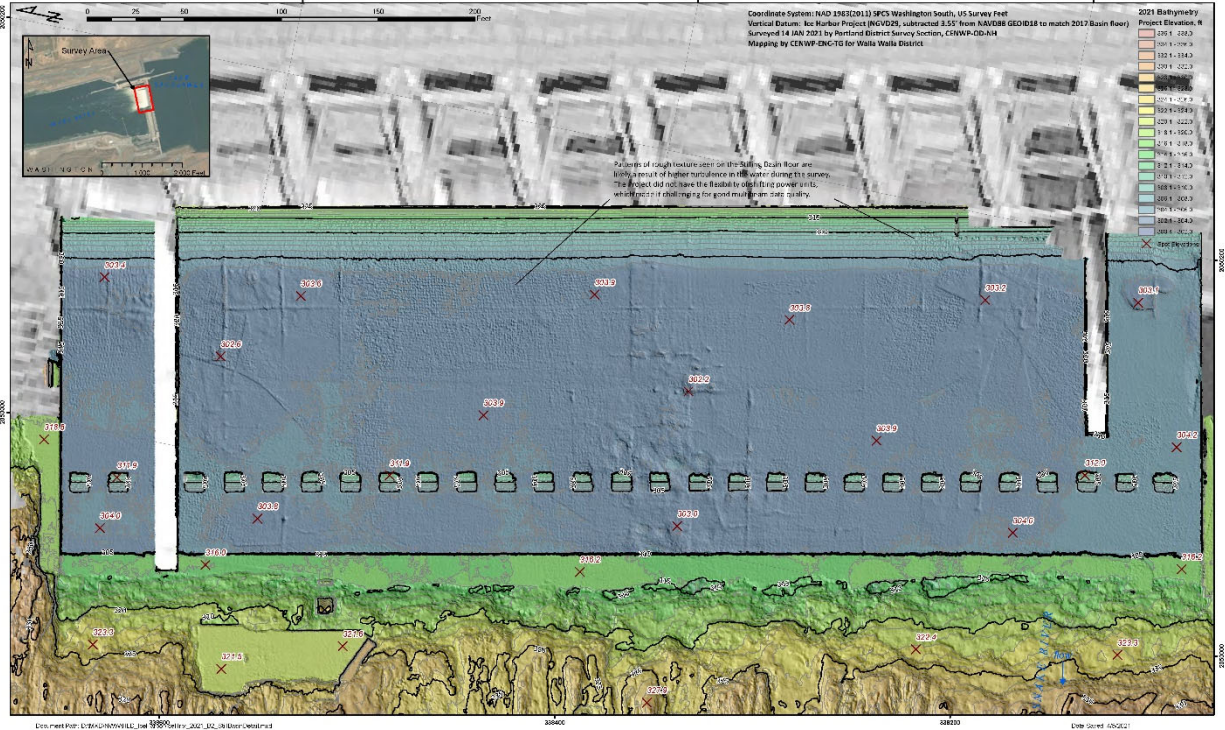
US Army Corps of Engineers **Lower Monumental Dam - 2021 Bathymetry, Map B-5: Stilling Basin change** WMA



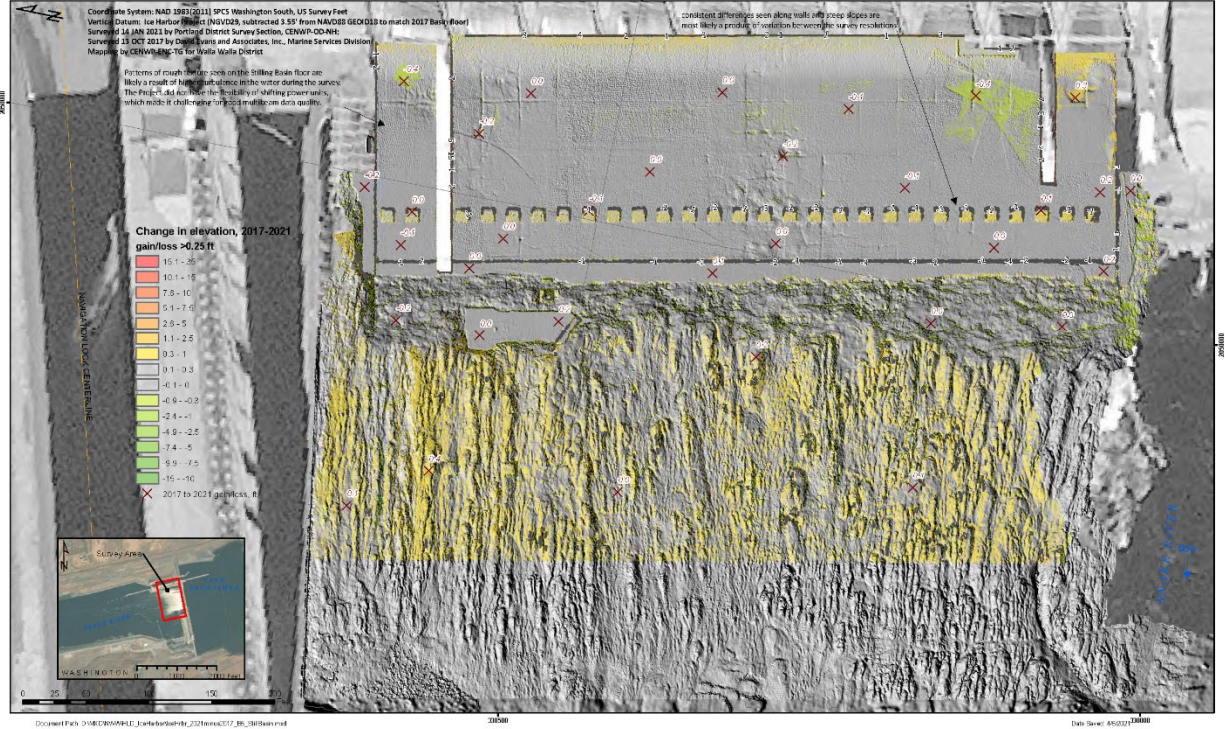
US Army Corps of Engineers **Ice Harbor Dam - 2021 Bathymetry, Map A-2: Tailrace** WMA



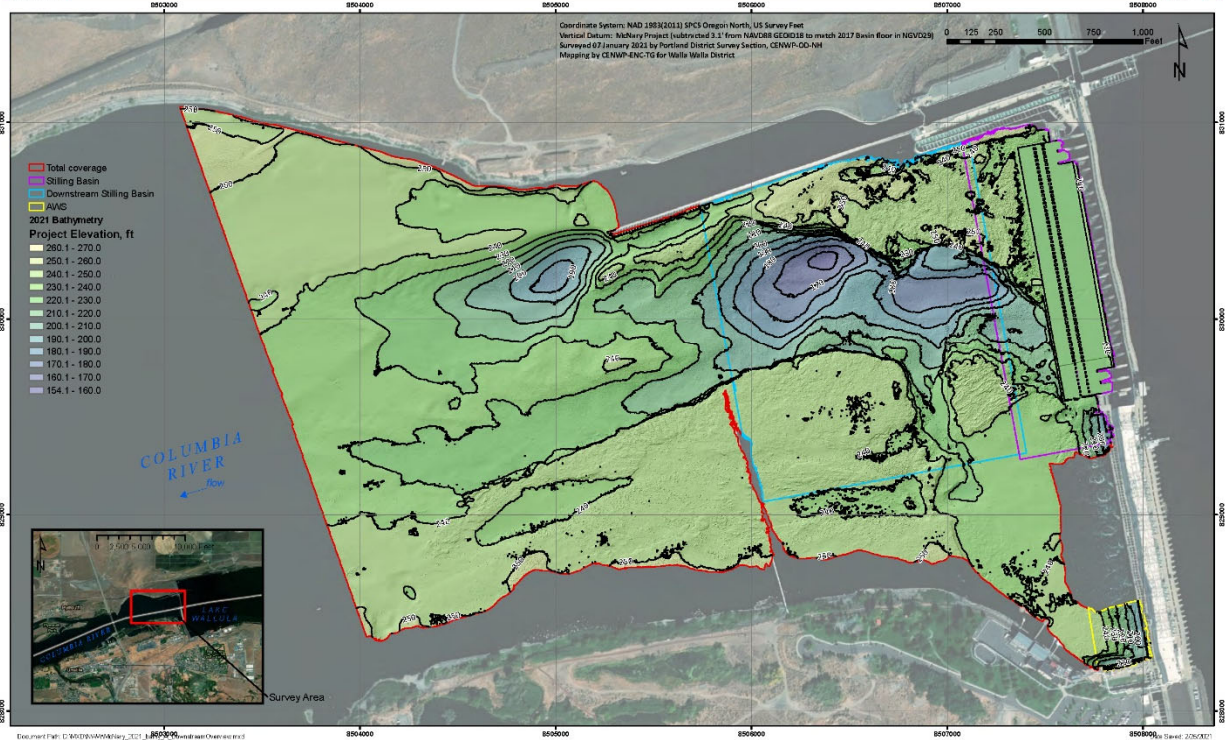
Ice Harbor Dam - 2021 Bathymetry, Map B-2: Stilling Basin detail



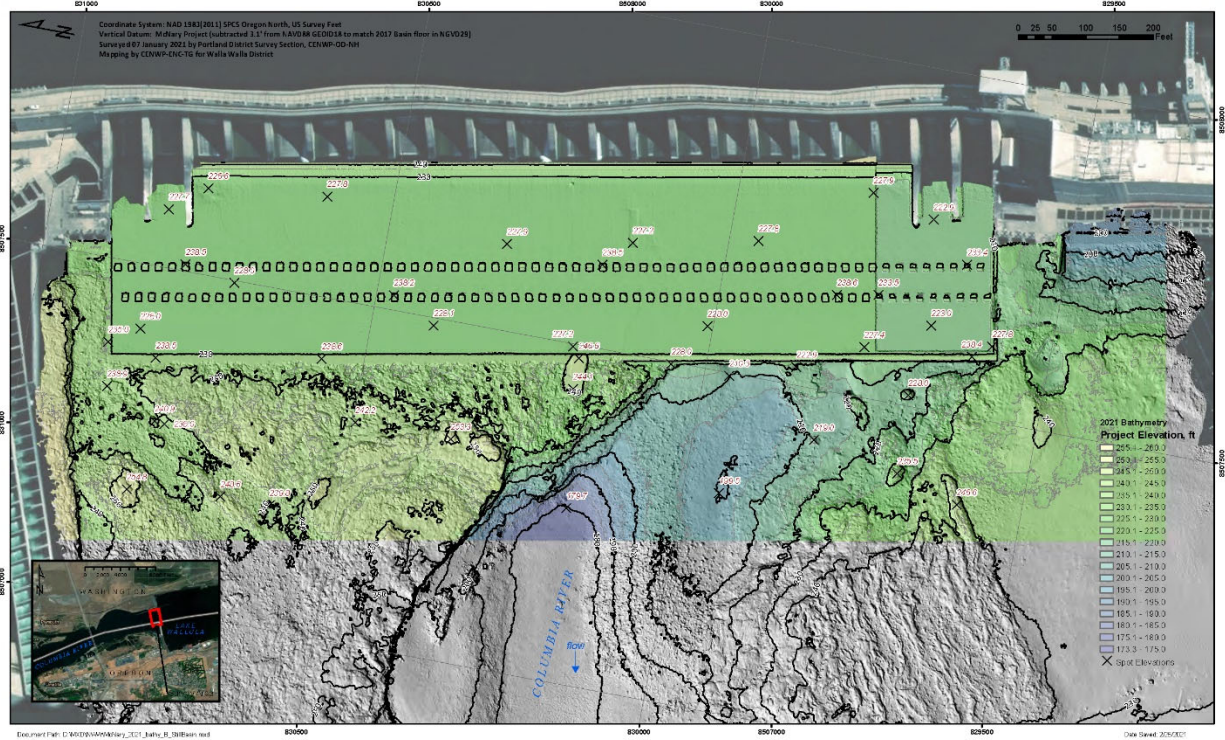
Ice Harbor Dam - 2021 Bathymetry, Map B-5: Stilling Basin change



US Army Corps of Engineers **McNary Dam - 2021 Bathymetry, Map A: Tailrace Overview** 



US Army Corps of Engineers **McNary Dam - 2021 Bathymetry, Map B: Stilling Basin** 





McNary Dam - 2021 Bathymetry, Map B-3: Stilling Basin change from 2017

