

## 2017 BON Spillway Apron ROV Inspection Report

**Inspection date:** 11/8/2017;

**Inspection conducted for:** EC-HD & EC-HC;

**ROV Inspection by:** NWP Office of Dive/ ROV Operations and Safety;

**Inspection location:** Bonneville Dam, Cascade Locks, OR;

**Desired inspection targets:** Verification of rock debris in spillbays and structural defects;

### **ROV and Sonar description:**

The BON spillway and apron structures were inspected using a Deep Ocean Engineering Phantom XTL remotely operated vehicle (ROV). Visual inspection was conducted using the installed high-resolution camera and documenting on DVD. Sonar imaging was conducted utilizing a BlueView 2D multi-beam sonar as well as a Tritech SeaPrince Sector/ Polar Scanning sonar.

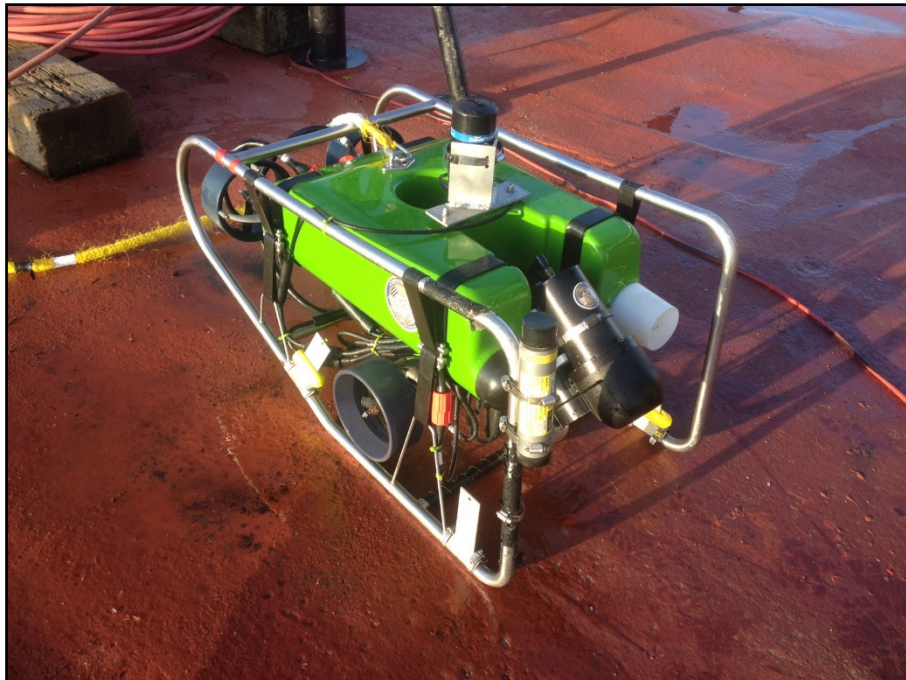


Figure 1 DOE Phantom XTL ROV and sonar



**Figure 2 BON Spillway. Red box indicates approximate area of inspection coverage.**

### **Project description and inspection findings:**

Spillbays, apron & baffle blocks- The spillway bays were inspected by BlueView sonar to determine the presence of rock debris as indicated by recent hydro-survey data. Once debris or structural defects were located by sonar, the ROV was piloted into the area of interest to gather video documentation. Sonar documentation was also captured of previous spillbay concrete repairs from 2012. Significant erosion and exposed reinforcing bar was found in some areas of the apron along both the upstream & downstream edge of the first row of baffle blocks. The baffle block trailing edges were found heavily eroded in these areas also.

Spillbay 17- As suspected from the hydro-survey data, SB 17 has a pile of rock that covers the entire area between the dividing piers. The rock pile is approximately 50ft by 26ft at the base of the ogee and ranges in depths from 15 to 24ft down the slope;

Spillbay 16- Another pile of rock was found in SB 16 and it is approximately 25ft by 13ft;

Spillbay 15- A small pile of rock was found in SB 15 and is approximately 15ft by 8ft;

Spillbay 14- SB 14 concrete surface was found to be rough and heavily eroded in areas above the previous concrete repair. Exposed reinforcing bar was also found in this area;

Spillbay 12- The previous concrete repair appears to be holding up and in good condition;

Spillbay 9- SB 9 concrete repair appears to be in good condition. Significant apron erosion and exposed reinforcing bar was found just upstream of the baffle blocks at SB 9, as well as between both rows of baffles and on the apron downstream of the second row of baffle blocks;

Spillbay 7- Areas of concrete surface erosion was found in SB 7;

Spillbay 6- Significant apron erosion and exposed reinforcing bar was found upstream of the baffle blocks at SB 6;

Spillbay 4- Significant apron erosion and exposed reinforcing bar was found upstream of the baffle blocks. The erosion and exposed rebar continued downstream and involved the majority of the upstream faces of multiple baffles;

Spillbay 2- A pile of small rock and debris was found in SB 2. It is approximately 9ft by 5ft and is composed of much smaller round river rock than what was found in the spillbays on the south end of the structure;

Video imagery below highlight areas of interest found during the inspection.



Figure 3 Rock found in SB 17 on the downstream side of the pile.



Figure 4 Rock pile in SB 17 on the shallower upstream edge.



Figure 5 Rock in SB 16.





Figure 6 SB 15 rock.



Figure 7 Erosion found in SB 14 between the 2012 concrete repair and the 13/14 dividing pier.



Figure 8 Exposed rebar in SB 14.



Figure 9 Significant erosion found between baffle rows at SB 9.



Figure 10 Additional imagery of erosion on downstream side of baffle blocks at SB 9.



Figure 11 Erosion and rebar found upstream of baffles at SB 6.

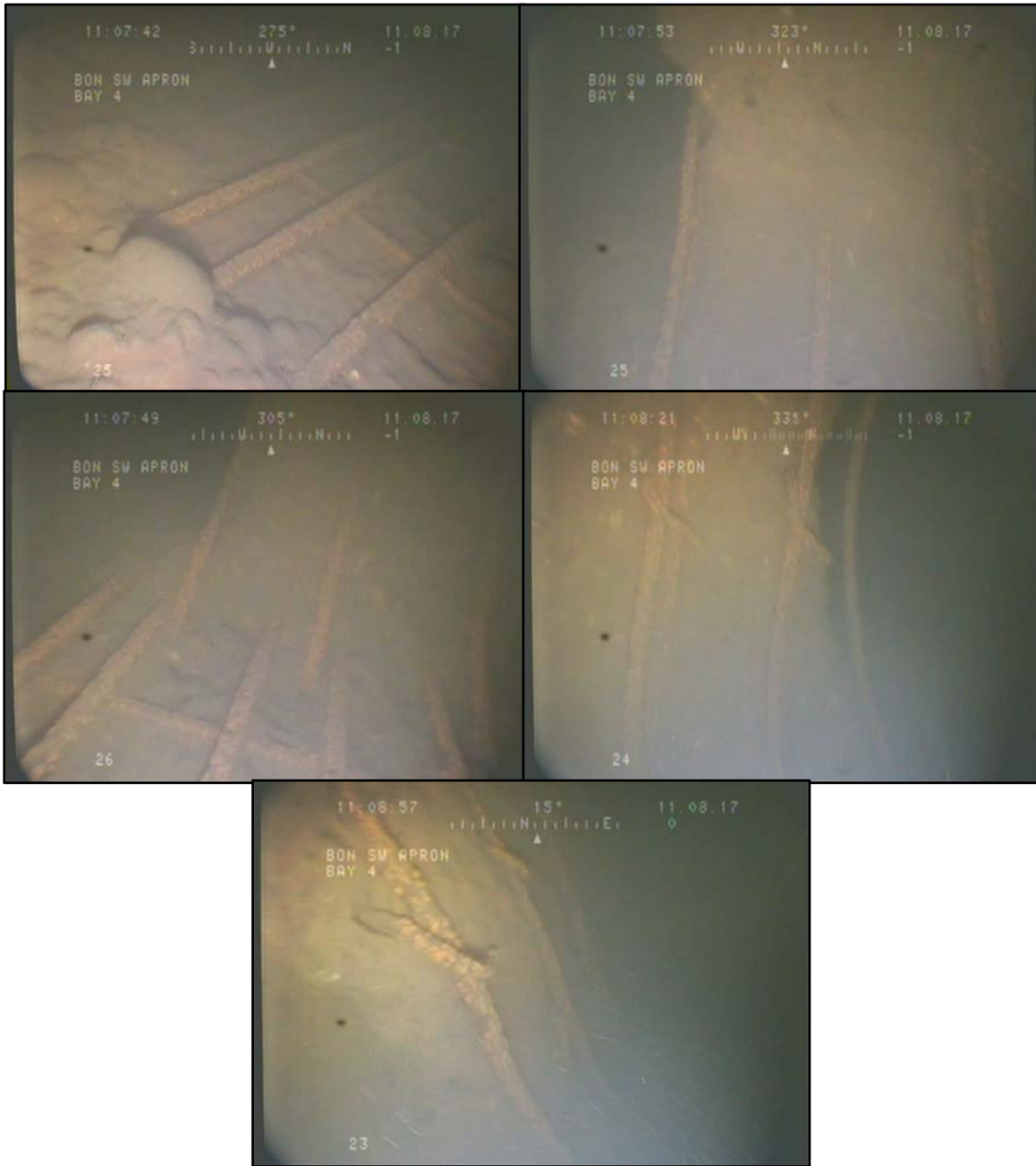


Figure 12 Images of erosion and exposed rebar of apron and baffles just downstream of SB 4.





Figure 13 Typical erosion and exposed rebar found at the downstream corners of all baffles in the first row.



Figure 14 Rock debris and pieces of rebar found in SB 2.

Sonar imagery below highlight areas of interest found during this inspection. Yellow arrows in sonar imagery indicate direction of water flow for image reference.

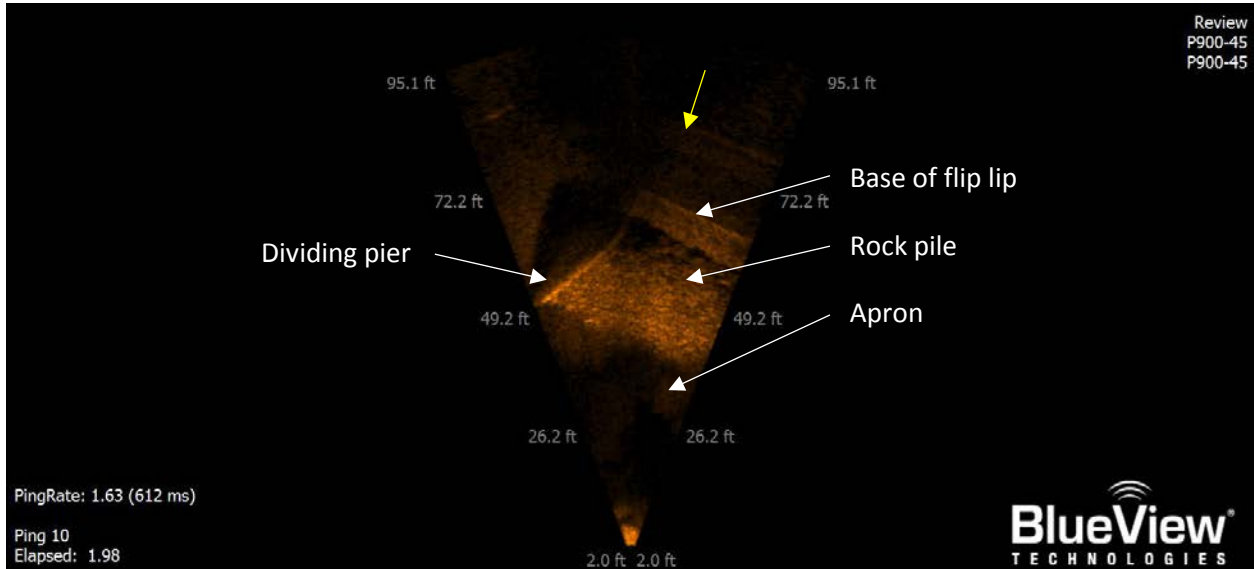


Figure 15 Sonar image of rock in SB 17.

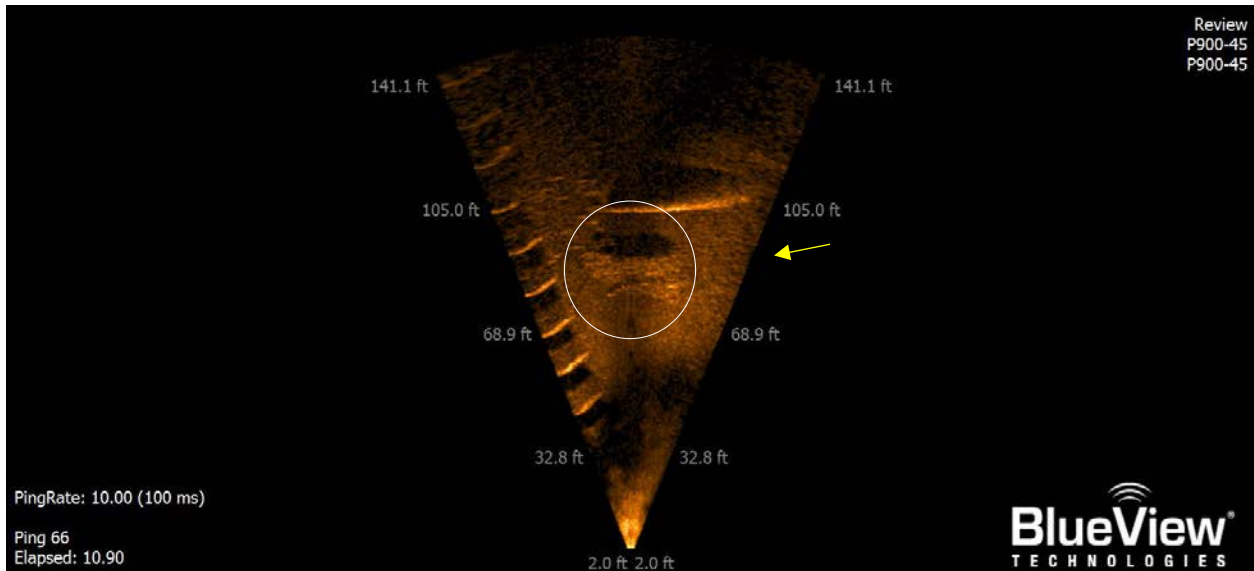


Figure 16 Circle indicates rock pile in SB 16.

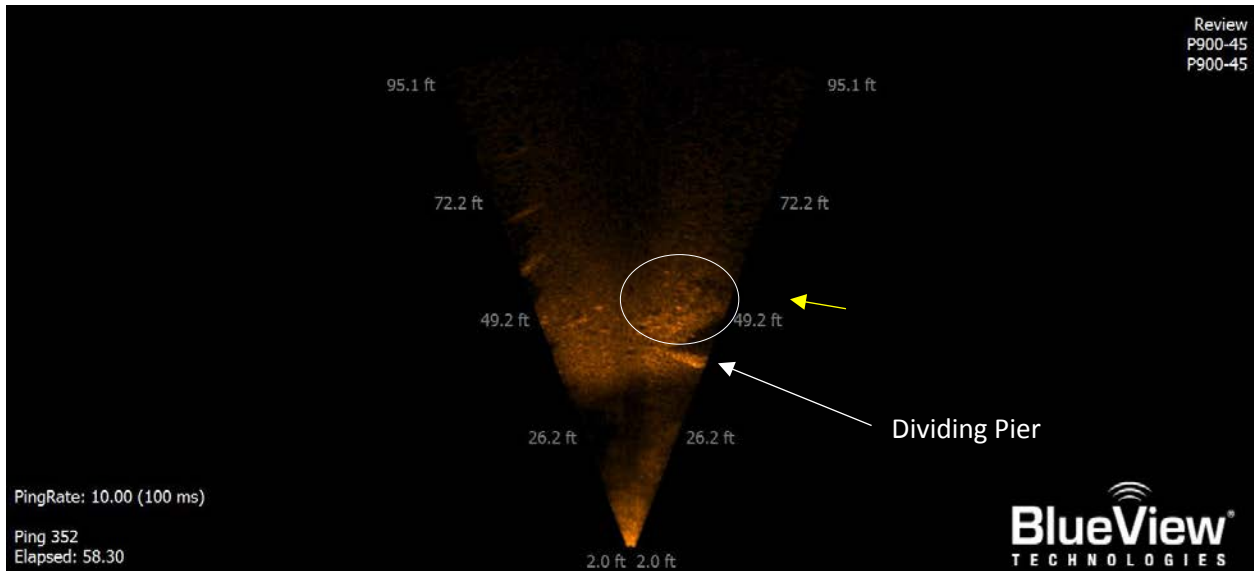


Figure 17 Rock pile in SB 15.

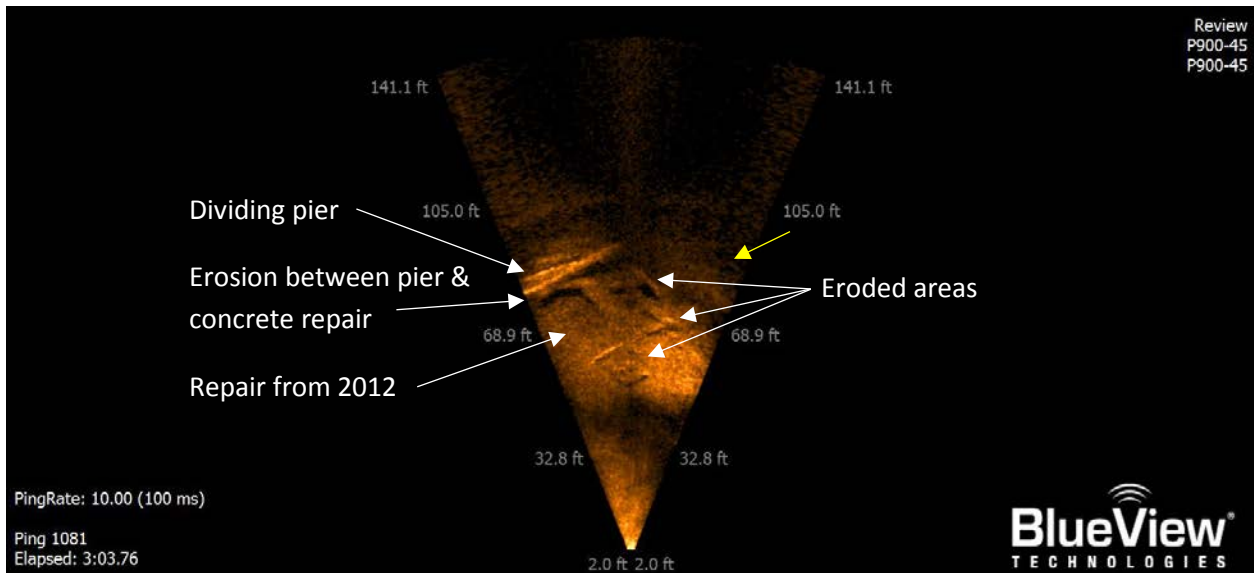


Figure 18 Areas of erosion in SB 14.

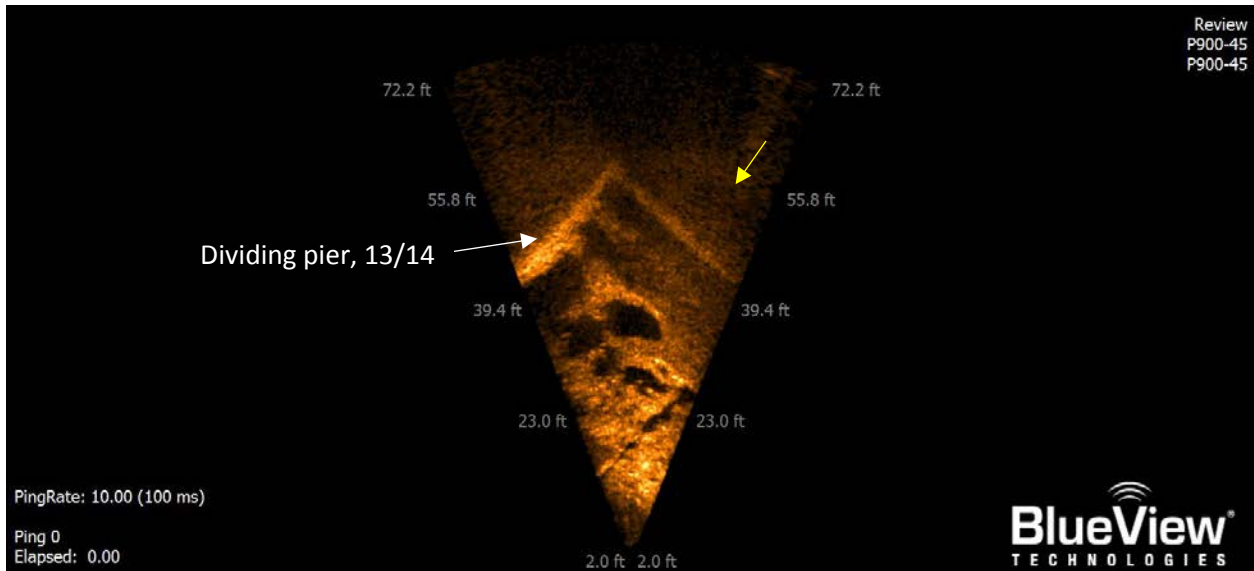


Figure 19 Close up sonar image of eroded areas of SB 14. Dark shadows in image represent eroded concrete surface.

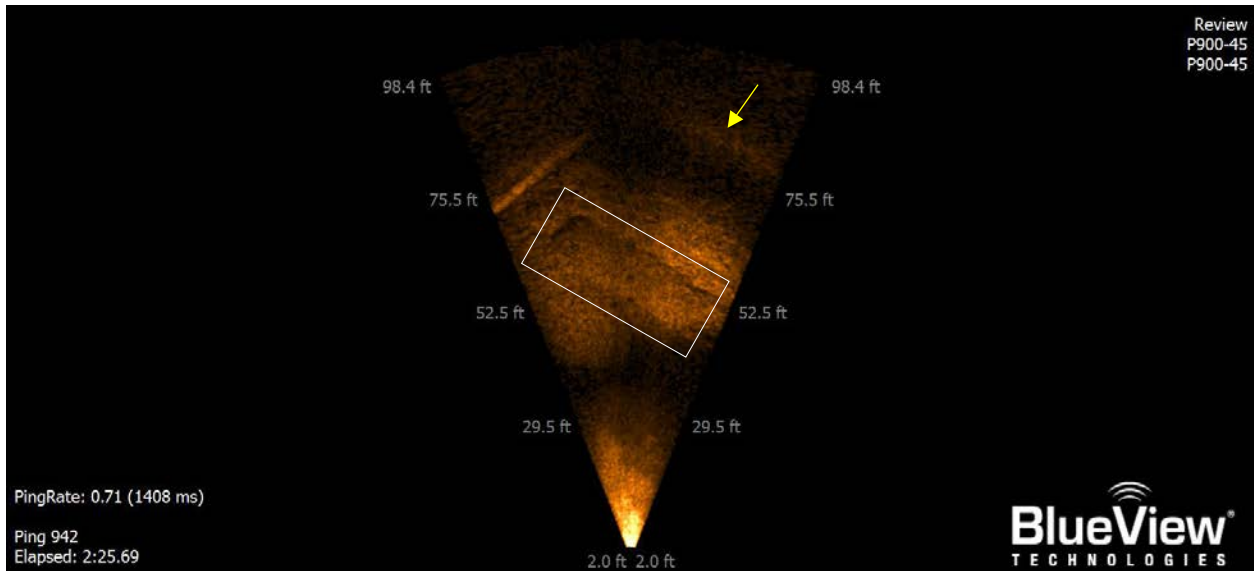


Figure 20 Imagery of SB 12 concrete repair from 2012.



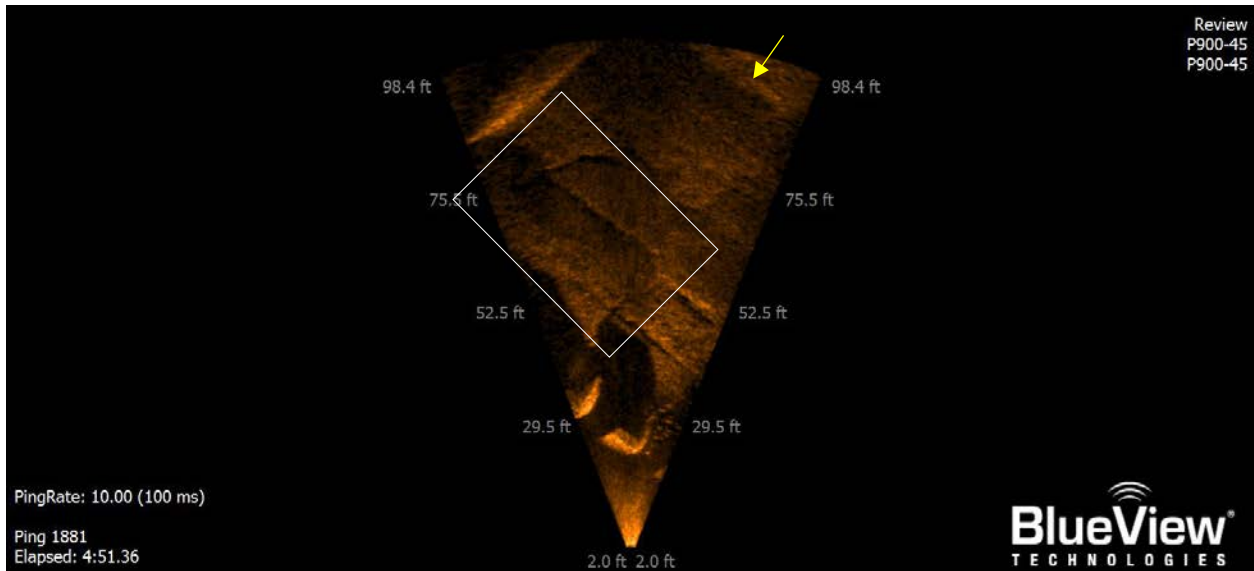


Figure 21 Imagery of SB 9 concrete repair.

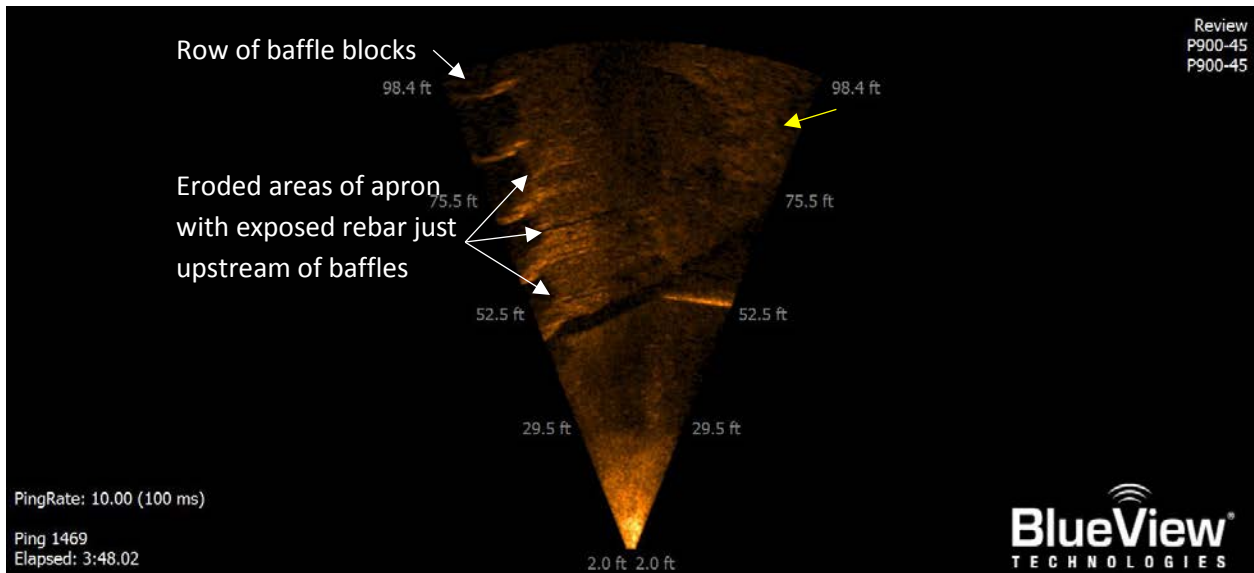


Figure 22 Imagery of apron, baffle block erosion & exposed rebar at SB 9.

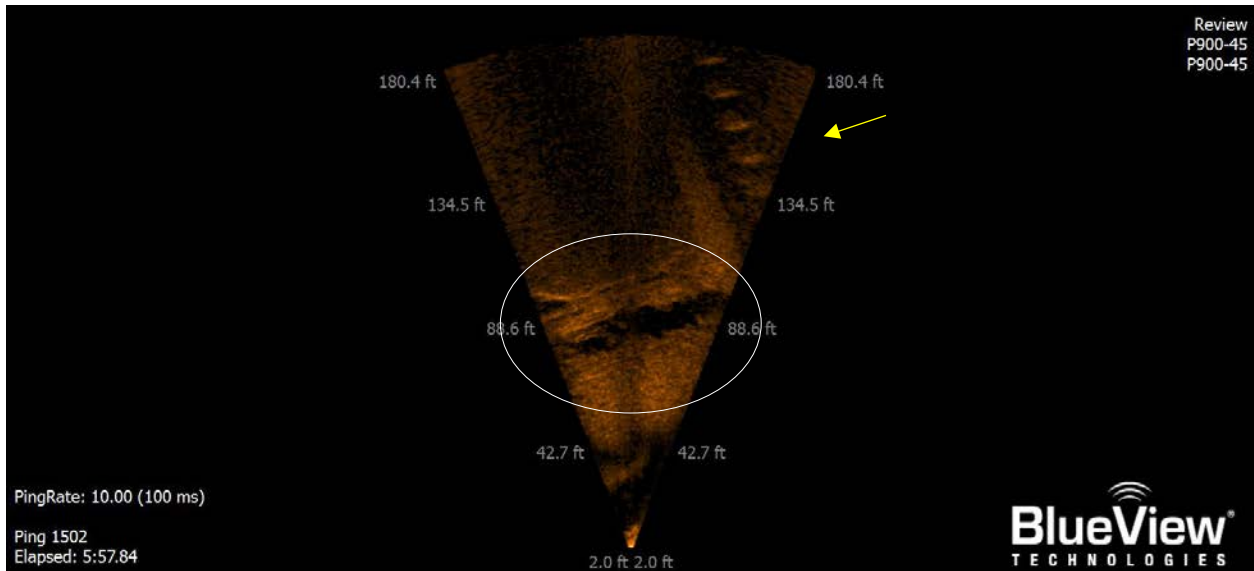


Figure 23 Area of significant erosion and exposed rebar on the apron surface downstream of SB 9 and both baffle rows.

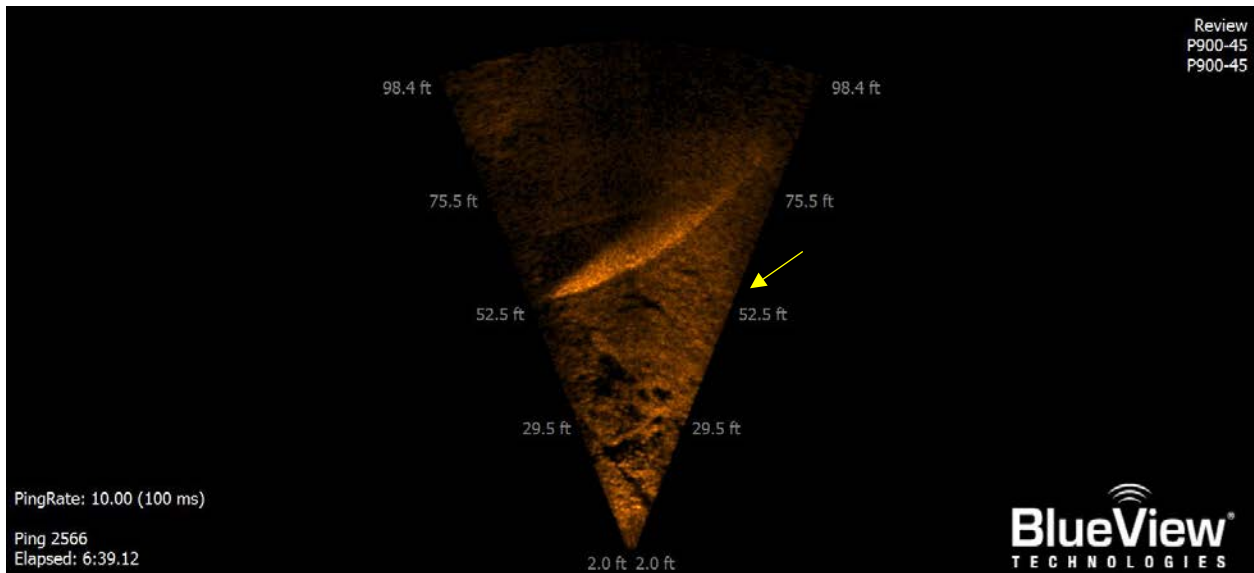


Figure 24 Imagery from SB 7. Dark shadows indicate concrete surface erosion.

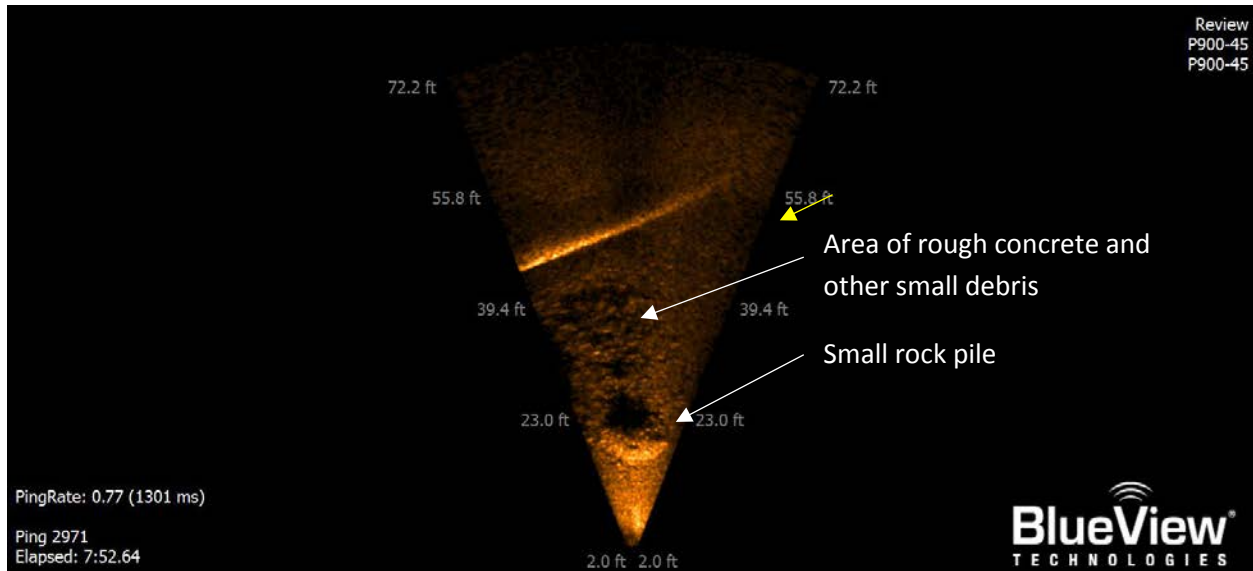


Figure 25 Imagery of small rock pile at SB 2.

**Point of contact for inspection results and report:**

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