

Inspection Report

SAN JACINTO RIVER AUTHORITY



Inspection Report

APPENDIX A: Photographs and Diagrams

APPENDIX B: U/T Readings

APPENDIX C: Blueview Sonar Report
and Images

By: JODY IGUESS

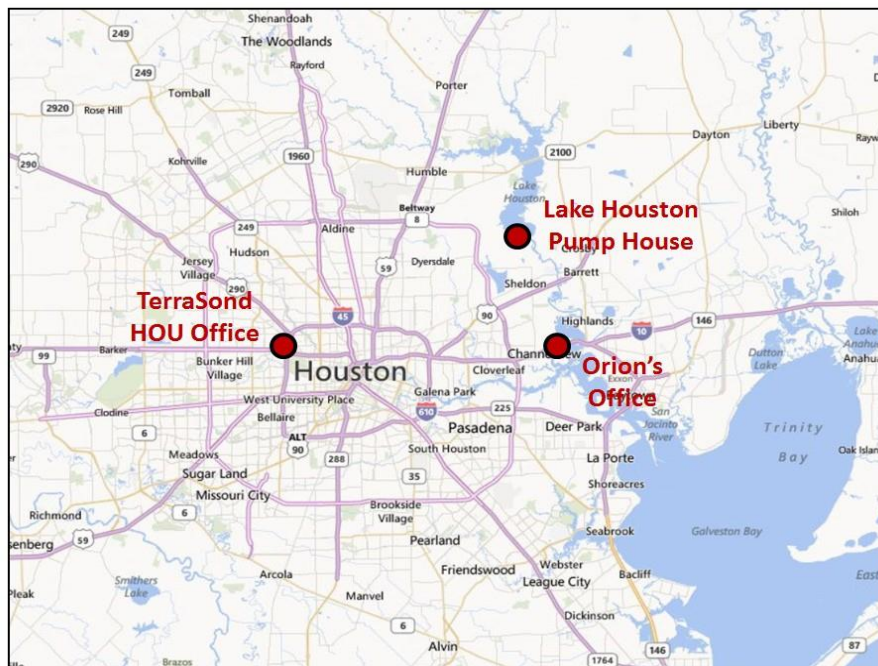
3/25/14

PUMP STATION AND LAKE INTAKE INSPECTION

EXECUTIVE SUMMARY

On March 12, 2014 Orion diving and salvage was requested to inspect the Pump Station Intake system located on Lake Houston.

The Inspection was carried out using surface supplied dive equipment from a 24 foot dive boat and a dive trailer. The boat inspected the bar rack out in the lake, and the dive trailer crew inspected the pump wet wells, screens and also penetrated the 4 – 8 foot by 7.5 foot concrete conduit pipes leading out to the lake. The inspection is to determine the condition of the bar rack, the concrete in the conduit pipe and in the wet well area and also the silt build up and the overall condition of the pump housings. The inspection also consisted of U/T readings on the pumps below water line as well as underwater scans using a blue view sonar imaging to give an overall picture. The lake water elevation at the time of the inspection was 42.60 feet. and all depths should be referenced using this elevation. Minor trash such as small logs were removed from under the bell housing. Photos of the concrete wall, pump shaft and trash rack (fencing) along with bar screen diagrams can be seen in **(Appendix A)**



Orion Construction LP contracted Terrsond to perform an inspection of the Lake Houston Pump House Station intake structures using an underwater 2D sonar scanner. The purpose of the data collection was to support Orion Construction LP (“Orion”) divers during their vision inspection of the structures. Scans were taken at two locations, at the bar screens in the lake and inside each pump bay capturing a 360 degree image of the pump shaft housing. The images were captured using the Blueview P900-2250 Sonar Scanning System. The documented images can be found in **(Appendix C)**.

Survey Equipment Utilized

- Teledyne BlueView P900-2250 2D Sonar Scanning System
- Including a Pan & Tilt Junction Box with tripod
- Laptop Dell Computer
- BlueView Technologies ProViewer 3.6 Software



CONDITION RATING

Member Condition: generally defines the geometric characteristics of the element. ODS classifies elements as **Good**, **Fair**, or **Poor**. A member classification in **Good** condition has little or no geometrical change due to deflection, deformation or impact and performs as originally intended. **Fair** indicates limited damage such as light splintering. Sufficient structural integrity exists, however, maintenance or repairs are sometime needed or recommended to extend the life of structure. **Poor** represents extensive damage. Elements in Poor condition require repair or replacement to perform as originally intended.

INSPECTION FINDINGS

#1 Pump, Wet Well, Screen and Conduit Pipe

Divers inspected pump and wet well 1 and found a concrete bottom at a water depth of 27 feet. Divers reported 2-4 inches of silt and small shell mixture on the entire bay floor, no other contained the shells. Directly under the bell housing of the intake pump they reported 1 inch of soft silt. Towards the trash screen that separates the pump basin from the intake bay where the intake pipe starts there was a buildup of mud 4-6 inches of mud. Divers inspected the concrete walls and found no visual damage such as spalling and reported that there was minor marine growth of 1-2 inches (algae) on the walls. The trash screen (fencing) that separates the bay from the intake pipe was inspected and found no visible damage to the screen with little marine growth on the screen. The bolts that secure the screen to the frame all appeared to be in good condition.

Divers visually inspected and took U/T readings on the pump shaft in 3 elevations with 4 readings at 12 clock, 6 clock, 3 clock, and 9 clock each location on the pipe, at water line, 12 feet and 24 feet on the intake shaft and bell housing located at the end of the pump near the bottom at 24 feet **(See Appendix B)**.

All flange bolts were in place and in good condition. The pump coating appeared to be in good condition with no visible deterioration to the coating and to the pump. The pump had minor marine growth of algae from 1-1.5 inches The U/T readings are on the chart provided in this report. (See APPENDIX B) The pump shaft has 3 flanges, and the first one is located at water line and then the next one is at 8 feet and the third one is at 18 feet and the pump bell housing is bolted to the last section of the pump, and all flanges had their bolts and nuts and were in good condition with no visible damage.

Divers also penetrated into the 84' long by 8 foot x 7.5 foot conduit pipe to the lakes bar rack, and reported 18 inches of mud at the opening of the pipe Entering 40 feet into the conduit pipe divers found 2.5 foot of mud and light marine growth on the walls of the pipe, divers reported that the walls felt in good condition with no visible damage or spalling. The

end of the pipe where the bar rack is located the diver reported to have 18 inches of mud build up at the opening.

Bar Screen Conduit 1

Bar Screen 1 is the southernmost bar screen and is the screen that pump 1 draws from. Divers took depth reading to identify the elevation of the top of the bar screen, the bottom of the bar screen and the top of the mud line. During the inspection of the bar screen the diver relayed that the bars appeared to be T shaped and have 5 bars per screen. It is unknown if this is the original shape of the bar or if they had original been H beam bars, if so the outer flange has deteriorated away on all of the bars. The existing bars have a flange bolted to the top and bottom of the conduit and a web that protrudes outward towards the lake. Due to the length of the bars and the lack of cross supports the bar have flexed to the north and the south slightly causing the spacing between bars to vary between 19 and 17 inches. (See diagram) The top of the bar screen is 18 feet below the water line. The bottom of the bar screen is 27 feet below the waterline and the mud line was 25feet below the waterline. Sediment depths averaged 12 to 24 inches and the diver located some small debris in front of the screen that he was able to move to the south away from the screens consisting of large limbs and branches.

The bar screens were found to be in very poor condition. The diver removed corrosion from some of the bar screens to identify the thickness of the heavily corroded metal. The diver attempted to find a section of bar screen that had minimal corrosion in order to define a base of material dimensions. The least corroded section of bar material was found in bar screen 4. The dimensions of the T bar that was used as a base had a flange width of 5 inches and a web width of 6 inches. The same section had a flange thickness of 3/8 inch and a web thickness of 1/4 inch. Since we were not provided with details of the bar this moderately corroded section of T bar is the only indication of what the original dimensions of the bar was. The average dimension of the T bar at Bar Screen 1 had a flange width of 2 inches, a web width of 2 inches a flange thickness of 1/4 inch and a web thickness of 1/8 inch. Due to the heavy corrosion in material Bar Screen 1 was giving rating of poor. Moving out from the bar screen 4 feet the mud bottom increases 3 to 5 foot in depth.

#2 Pump, Wet Well, Screen and Conduit Pipe

Divers inspected wet well Basin 2 and found that basin floors to be concrete and separated by a trash screen for the intake conduit. Divers reported 4- 9 inches of silt along the walls of the bay floor. Directly under the bell housing of the pump shaft they reported 1 inch of soft silt. Towards the trash screen that separates the pump basin from the conduit bay where the conduit pipe starts there was a buildup of 9 inches of mud. Divers inspected 3 the concrete walls and found no visual damage or spalling and reported that there was minor marine growth of 1-2 inches of (algae) on the walls.

The trash screen that separates the bay from the intake pipe was inspected and found no visible damage to the screen with little marine growth on the screen. The bolts that secure the screen to the frame all appeared to be in good condition with no damage.

Divers visually inspected and took U/T readings on the intake shaft in 3 locations with 4 readings at each location on the pump, at water line, 12 and 24 feet on the intake shaft and bell housing located at the end of the shaft near the bottom at 24 feet. The pump coating appeared to be in good condition with no visible deterioration to the coating and to the pump. The pump had minor marine growth of algae from 1 to 1.5 inches. The intake shaft has 3 flanges, the first one is located at water line, the second one is at 8 feet, the third one is at 18 feet and the intake bell housing is bolted to the last section of pump, all flanges had their bolts and nuts and were in good condition with no corrosion. The bell housing was in good condition and had no screen on the bottom of it; all 4 bell housings were the same configuration.

Divers penetrated the 84 foot long by 8 foot x 7.5 foot conduit pipe to the lakes bar rack, and reported 18 inches of mud at the opening of the pipe. Entering 40 foot into the conduit pipe divers found 30 inches of mud and light marine growth on the walls of the pipe, divers reported that the walls felt in good condition with no visible damage. The end of the pipe where the bar rack is located out in the lake was reported to have 12 inches of mud build up.

Divers visually inspected and took U/T readings on the pump shaft in 3 elevations with 4 readings at 12 clock, 6 clock, 3 clock, and 9 clock each location on the pipe, at water line, 12 and 24 feet on the intake shaft and bell housing located at the end of the pump near the bottom at 24 feet.

Bar Screen Conduit 2

Bar Screen 2 is the bar screen that pump 2 draws from. The top of the screen was 18 foot below the waterline the bottom of the screen was 26 foot below the water line and the mud line was 25 foot below the waterline. Sediment depths averaged 12 inches. Due to the length of the bars and the lack of cross supports the bar have flexed to the north and the south slightly causing the spacing between bars to vary between 19 and 17 inches. The average dimension of the T bar at BS2 had a flange width of 4 inches, a web width of 3 inches a flange thickness of $\frac{1}{4}$ inch and a web thickness of $\frac{1}{8}$ inch. Due to the heavy corrosion BS2 was giving rating of poor.

#3 Pump, Wet Well, Screen and Conduit Pipe

Wet well 3 depth is 27 foot, this depth is consistent with all bays. Silt build up was 1-9 inches along walls of the bay floor. Directly under the bell housing of the intake pump they reported 1 inch of soft silt. Towards the trash screen that separates the pump basin from the conduit bay where the conduit pipe starts there was a buildup of mud 1 inch of mud. Divers inspected the concrete walls and found no visual damage or spalling and reported that there was light marine growth of 1-2 inches of (algae) on the walls. The algae growth seems to be consistent threw out the bays on the walls.

The trash screen (fencing) that separates this bay from the conduit pipe was inspected and found to have no visible damage to the screen with little marine growth on the screen. All bolts and hardware that secure the screen to the frame all appeared to be in good condition.

Divers visually inspected and took U/T readings on the pump in 3 locations with 4 readings at each elevation on the pipe, at water line, -12 feet and 24 feet on the intake shaft an bell housing located at the end of the shaft near bottom at 24 feet. The pump coating appeared to be in good condition with no visible deterioration to the coating and to the pump. The pump had minor marine growth of algae from 1-2 inches. The pump has 3 flanges, and the first one is located at water line and then the next one is at 8 foot and the third one is at 18 foot and the intake bell housing is bolted to the last section of pump all flanges had their bolts and nuts and were in good condition with no corrosion. The bell housing was in good condition and had no screen on the bottom of it.

On Penetrating the 84 foot long by 8 foot by 7.5 foot conduit pipe to the lakes bar rack, divers reported 18 inches of mud at the opening of the pipe. Entering 40' into the pipe found 30 inches of mud and light marine growth on the walls of the pipe, divers reported that the walls felt in good condition with no visible damage. The end of the pipe where the trash rack is located out in the lake was reported to have 12 – 18 inches of mud build up. The mud appears to build up in the same locations about ½ ways down the conduit pipe.

Divers visually inspected and took U/T readings on the pump shaft in 3 elevations with 4 readings at 12 clock, 6 clock, 3 clock, and 9 clock each location on the pipe, at water line, 12 feet and 24 feet on the intake shaft and bell housing located at the end of the pump near bottom at 24 feet.

Bar Screen Conduit 3

Bar Screen 3 is the bar screen that pump 3 draws from. The top of the screen was 18' below the waterline the bottom of the screen was 26 foot below the water line and the mud line was 24 foot below the waterline. Sediment depths averaged 24 inches. Due to the length of the bars and the lack of cross supports the bar have flexed to the north and the south slightly causing the spacing between bars to vary between 17 and 19 inches. The average dimension of the T bar at BS2 had a flange width of 2 inches, a web width of 2 inches a flange thickness of $\frac{1}{4}$ inch and a web thickness of $\frac{1}{8}$ inch. Due to the heavy corrosion BS3 was giving rating of poor.

#4 Pump, Wet Well, Screen and Conduit Pipe

Wet well 4 had the most mud build up on the bay floor with 3-4 feet of mud in the whole bay, and directly under the bell housing of the pump shaft divers reported 6 inches of mud. Divers inspected the concrete walls and found no visual damage or spalling and reported that there was light marine growth of 1-2 inches (algae) on the walls. Pictures were taken in this bay of the walls and screens as well as the pump shaft which are typical of all bays. The pump shaft has the same flange set up as the other 3 bays but the flanges sections are 2' deeper, all flanges are in good condition and have all bolts and mounting hardware that appear to be in good condition.

The trash screen (fencing) in bay 4 have light marine growth and appear to be in good shape with all the mounting hardware that secure the screen to the frame. The screens in all bays are the same configuration with no damage to the screens. Small debris was found in the bays but nothing to interfere with pump operations.

Divers penetrated into the conduit pipe# 4, - 84 feet long by 8 feet by 7.5 feet to the lakes bar rack, divers reported 23 inches of mud at the opening of the pipe. 40 feet into the pipe found 30 inches of mud and light marine growth on the walls of the pipe, divers reported that the walls felt in good condition with no visible damage or spalling. The end of the pipe where the bar rack is located out in the lake was reported to have 2 foot of mud build up.

There is a common bay that is between the trash screen (fencing) and the opening of the conduit pipe, divers were able to travel in this bay to each conduit pipe opening without getting out of one bay and into another the distance from the trash screen to the conduit pipe entrance is approximately 21 feet. The floor was concrete with a depth of 27 feet, and had 18 inches mud at the opening of the conduit pipe but then sloped to 1 foot towards the screen the entire length of the bay.

Divers visually inspected and took U/T readings on the pump shaft in 3 elevations with 4 readings at 12 clock, 6 clock, 3 clock, and 9 clock each location on the pipe, at water line, 12 feet and 24 feet on the intake shaft and bell housing located at the end of the pump near bottom at 24 feet.

Bar Screen Conduit 4

Bar Screen 4 is the bar screen that pump 4 draws from. The top of the screen was 18 foot below the waterline the bottom of the screen was 26 feet below the water line and the mud line was 23 foot below the waterline. Sediment depths averaged 3 inches. Due to the length of the bars and the lack of cross supports the bar have flexed to the north and the south slightly causing the spacing between bars to vary between 17 and 19 inches. The average dimension of the T bar at BS2 had a flange width of 4.5 inches, a web width of 4 inches, a flange thickness of $\frac{1}{4}$ inch and a web thickness of $\frac{1}{8}$ inch. The diver found the most north bar is broken in half and was unable to locate the top half. It is believed that the missing section is below the mud line. Due to the heavy corrosion and the broken screen bar BS4 was giving rating of poor.

Exterior Walls, Top of Conduit Structure at the Bar Screens

During the inspection of the north exterior wall the diver found the mud line at the north west corner to be at a water depth of 23 feet. As the diver made his way to the east (towards the pump house) he found that the mud line proceeded upward. Approximately 7 foot east of the corner, the mud line was at a water depth of 18 feet (The same as the top of the conduit structure). The diver reported that the mud line continued upward approximately to a 1 to 1 ratio as he moved towards the pump house. The diver did not locate any deficiencies in the concrete structure.

The inspection of the south exterior wall revealed very similar conditions that we found at the north wall. The diver found the mud line at the south west corner to be at a water depth of 25 feet. As the diver made his way to the east (towards the pump house) he found that the mud line proceeded upward. Approximately 7 feet east of the corner the mud line was at a water depth of 18 feet (The same as the top of the conduit structure). The diver reported that the mud line continued upward approximately to a 1 to 1 ratio as he moved towards the pump house. The diver did not locate any deficiencies in the concrete structure. During the inspection of exterior top of the structure the diver found a light dusting of sediment for the first seven feet from the west edge. After the seven foot mark the sediment began to escalate upward approximately in a 1 to 1 ratio. The diver did not locate any deficiencies in the concrete structure.

CONCLUSION

Wet Wells, Screens and Conduit Pipe

Upon inspection of the pump house wet well and conduit pipes and screens, the overall condition of the conduit pipes and pump bay walls appear in good condition with light to moderate mud build up and no visible damage or spalling to the concrete conduit walls.

The pump shaft and bell housings coating appears to be good and is intact with little to no scratches, lite marine growth and all mounting hardware still in place and in good condition. The screens (fencing) all seem to be good condition and in working order with no holes and no deformities as well as all the flange mounting hardware is in place. The screens (fencing) have light marine growth with no major debris build up. All bays except for Bay 4 seem to have light to moderate mud build up, and bay four has the most mud build up due to the pumps not running as much as the others. Sediment depths should be monitored for any increase in depth.

Divers felt inside the bell and found no debris and abnormal problems and did not fell the

impellers but did locate the pump vanes which were all in good condition.

The conditions of each wet well bay are A-typical with no visible damage and light to moderate mud in the bays and over all the pump house and all wall structure that make the intake structure appear to be in good working order.

Metal thickness reading were consistent on the pump shaft elevations at the water line and at the 12 feet elevations. Since we do not have a base line on the metal thickness we can assume that the wall thickness is approximately 3/8 inch of .375 inches at both elevations.

All bell housing metal thickness readings are different in range, starting at .506 (1/2") to 1.000 (1 inch). We cannot pinpoint why these readings differ but can assume that the higher readings are where the vanes may be cast into the housing or the flare (curvature) of the housing interfered with the actual reading, this is only an assumption. In our best opinion we do not think that the wall thickness has deteriorated or is in distress. This is based upon the good readings we received at the higher elevations and the condition of the coating.

Bar Screens

Mud removal doesn't appear to be necessary at the moment but should be monitored, especially in front of the bar screen, mud build up in front of the screen varies between 1-3 feet in depth. There's only a 4 foot area in front of the screen where the mud depth rises up to a mud level of 21 feet, leaving only a 3 foot difference from the top of the bar screen which is at 18 feet. There is also a 1 to 3 foot buildup of mud in front and inside of the screen at this time.

The Bar Screens are in a **severe** state of deterioration at all four locations with mud buildup 1' to 3 feet. Spacing between the bars are extreme approximately 18 inches, that leaves a wide opening for debris to possible get pulled into the bay. When debris gets pulled into the conduit it traps itself to the bottom and smaller debris starts to get entangled, now mud can start to build up and get trapped, creating a blockage or a restriction.

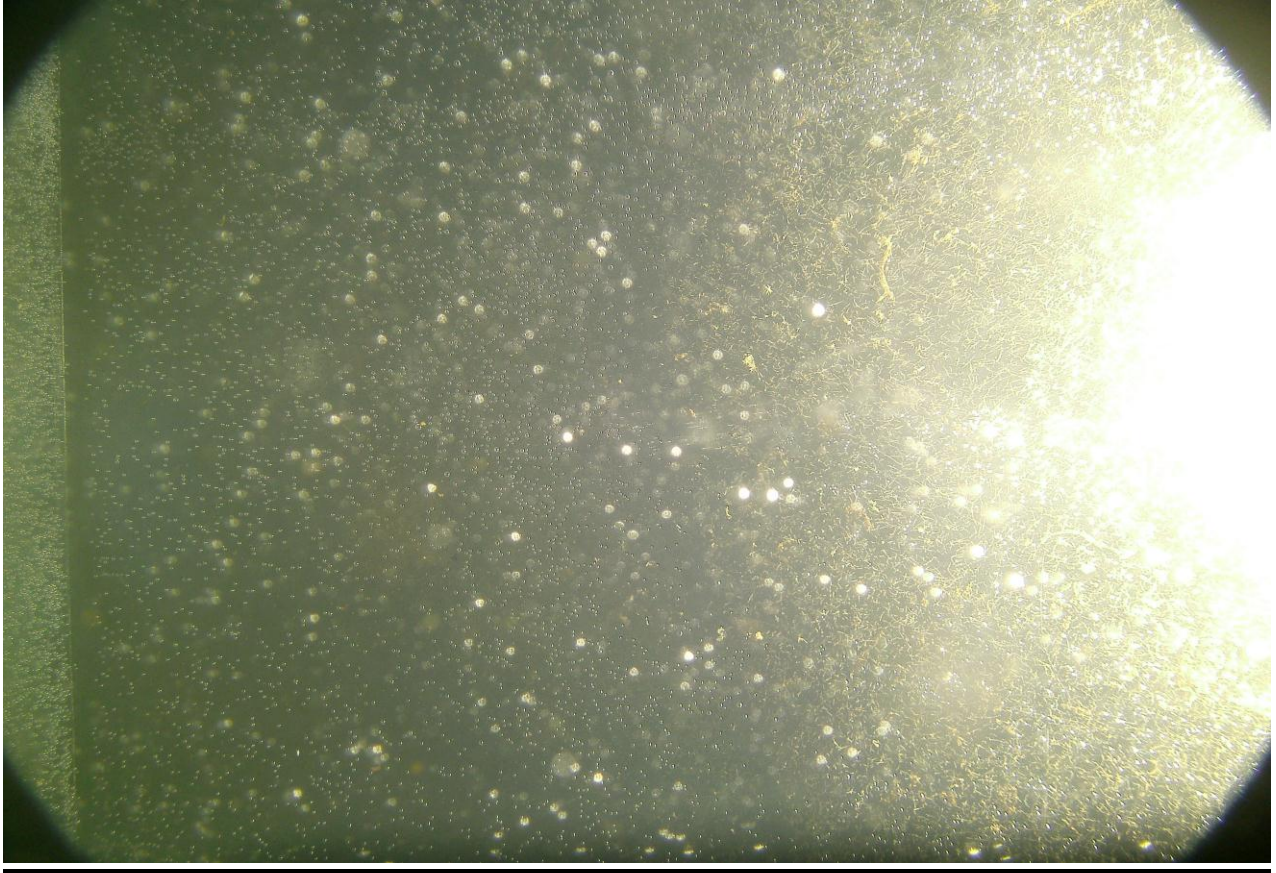
REPAIR RECOMMENDATIONS

Conduit bar screens are in **POOR CONDITION** showing extreme deterioration in the vertical bars and attaching hardware. Also bar screen spacing is about 18 inches on average which is extremely wide compared to others we have inspected. We recommend that new bar screens be fabricated and installed due to the extreme deterioration and wide spacing.

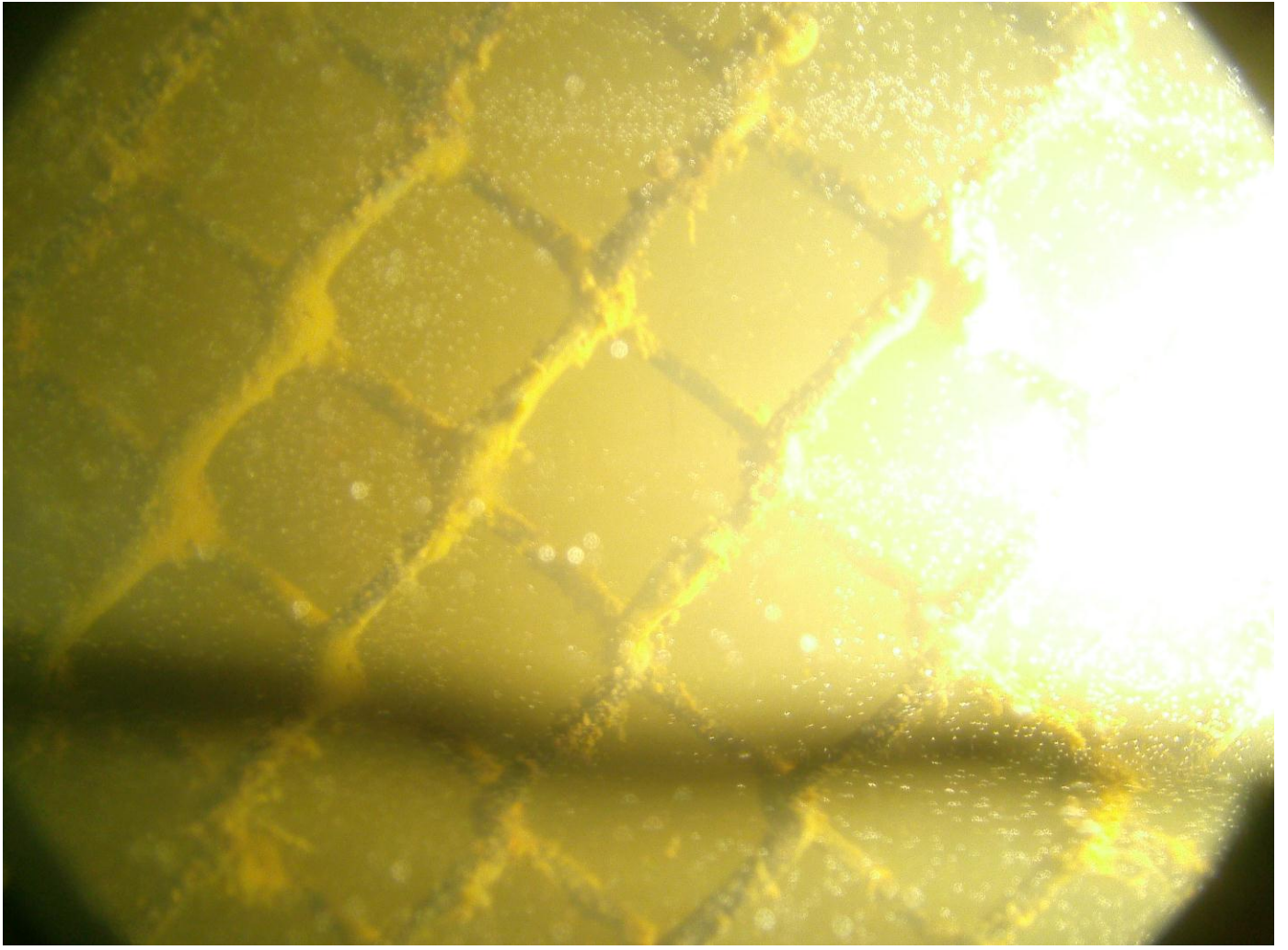
If there are no drawings for the bar screens, divers need to mobilize to take detailed measurements for bar screen fabrication and to identify the means of attaching the new screens to the conduit. Mud would have to be removed in front and inside of the conduit 3 feet to create a mud free area for the demo and installation of the new screens.

Mud would be removed using a Holland 6 inch Hydraulic Submersible Pump. This pump works as an underwater vacuum moving mud from one location to another. The hydraulic pump would be suspended in to the water, attached to the suction end of the pump will be a 6 inch non collapsible hose with cam lock connections. Attached to the discharge end of the pump is a 6 inch discharge hose that would be stretched and secured along the bottom of the lake, approximately 75 feet from the intake structure bar screens. Once all the mud is removed, diver could proceed with the bar screen repairs.

APPENDIX A
PHOTOGRAPHS
AND
DIAGRAMS



#4 PUMP SHAFT - LIGHT MARINE GROWTH
SHOWING NO CORROSION & GOOD COATING
TYPICAL OF ALL PUMP SHAFTS



#4 WET WELL SCREEN - WITH LIGHT MARINE GROWTH

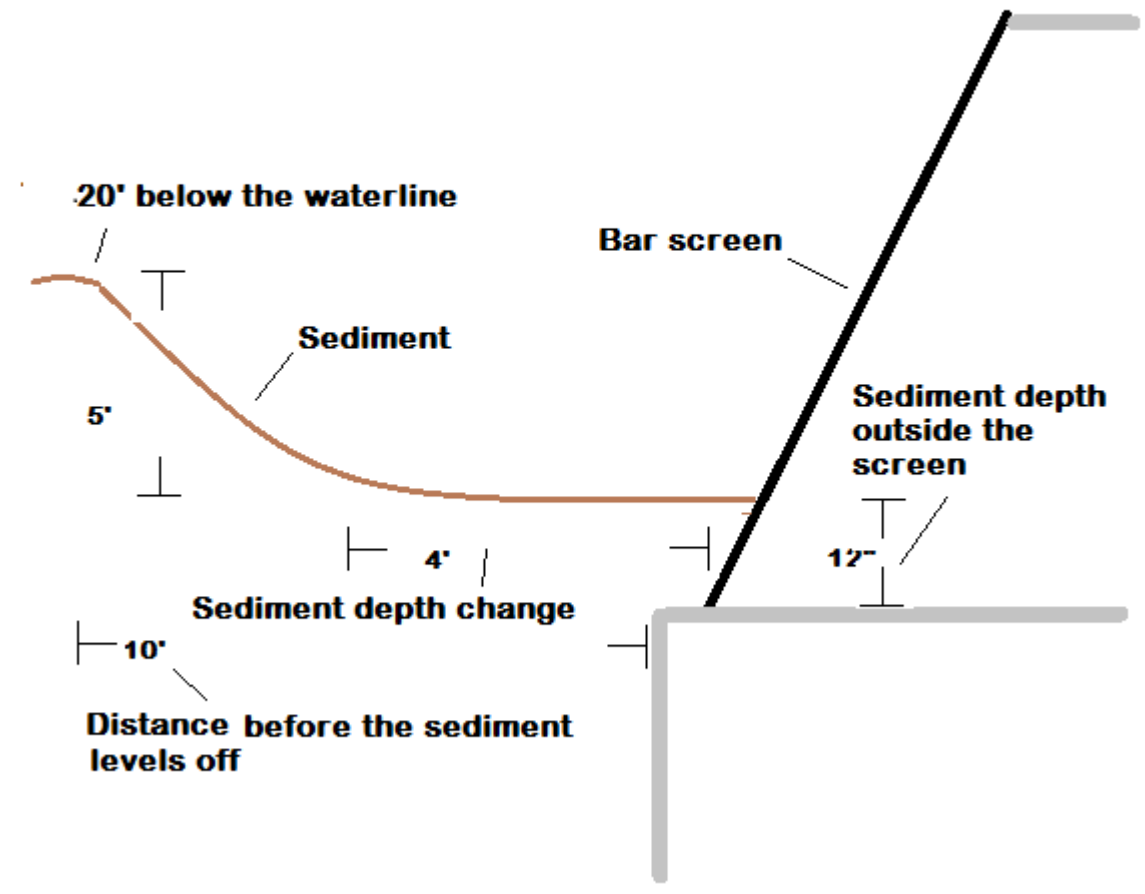
TYPICAL OF ALL TRASH SCREENS (FENCING)



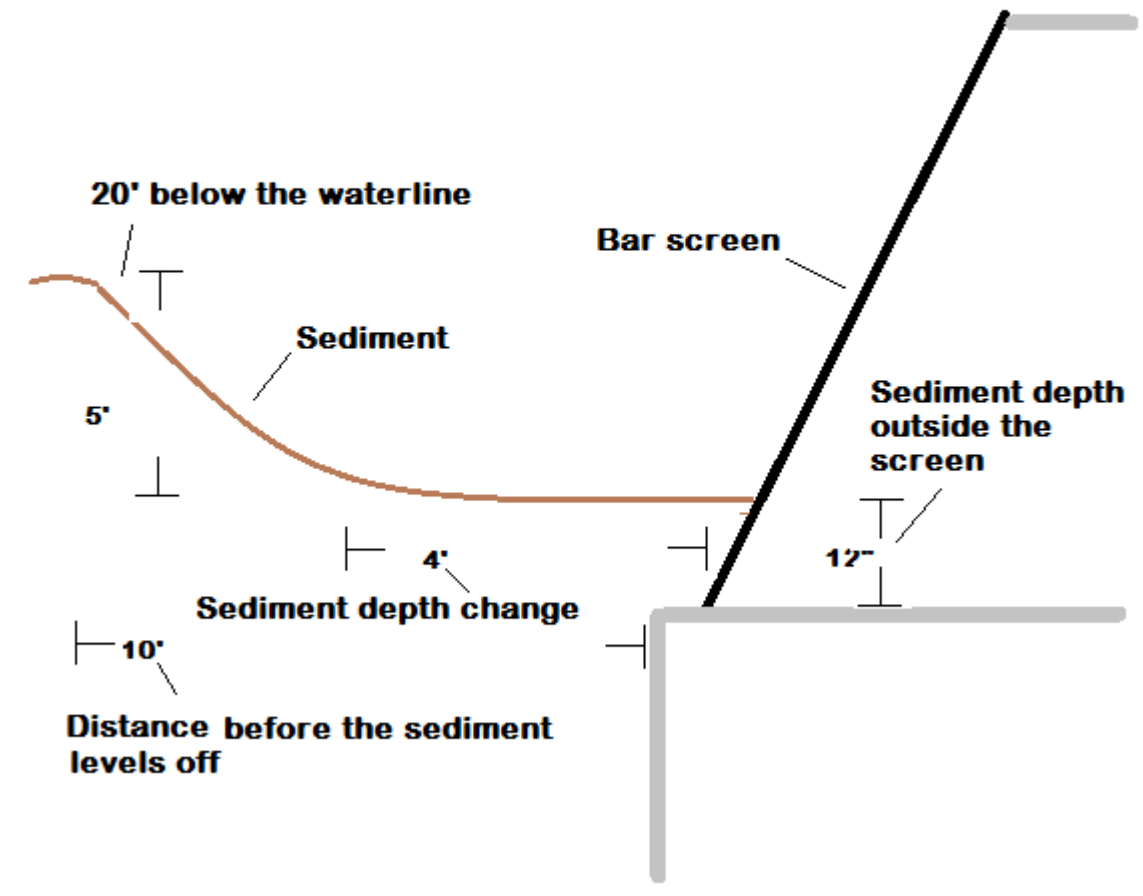
#4 WET WELL - WALL ABOVE THE SCREEN - LIGHT MARINE GROWTH

TYPICAL OF ALL CONCRETE & CONDUIT WALLS

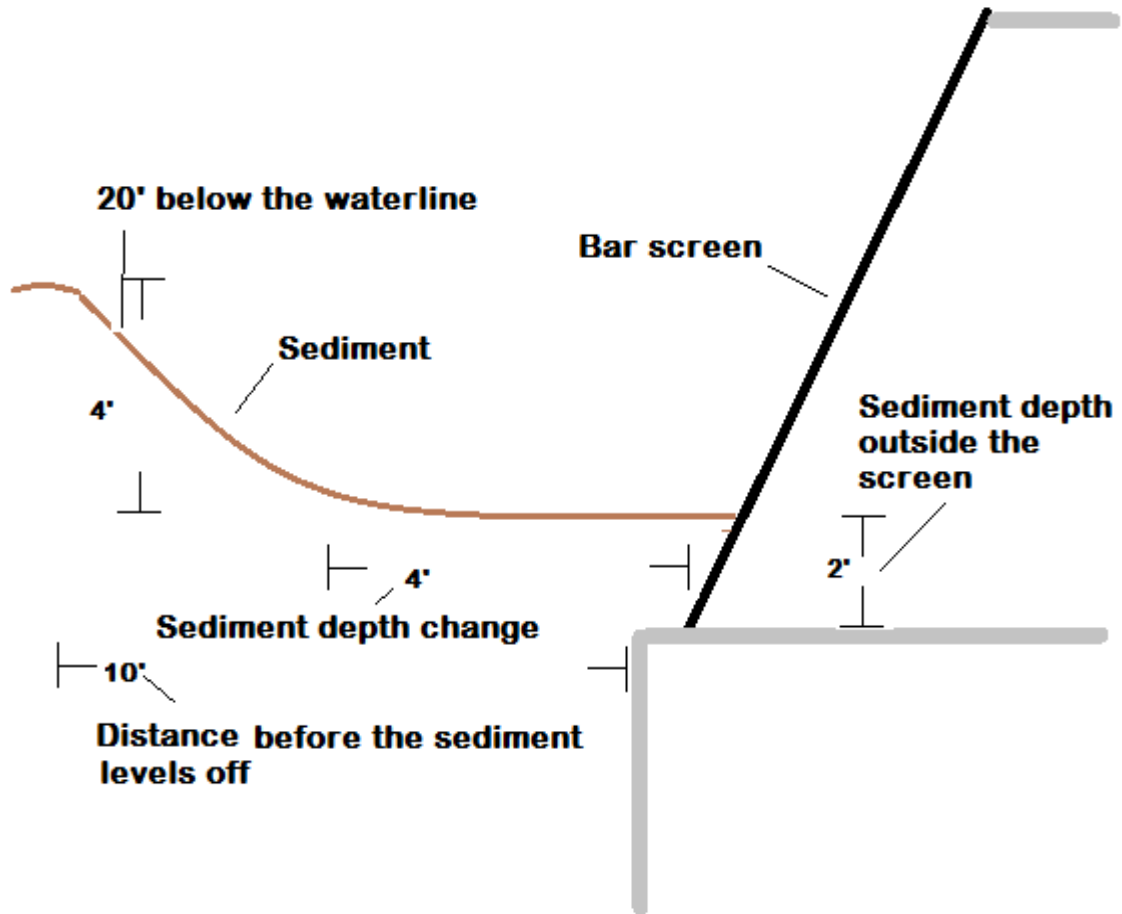
Bar Screen 1



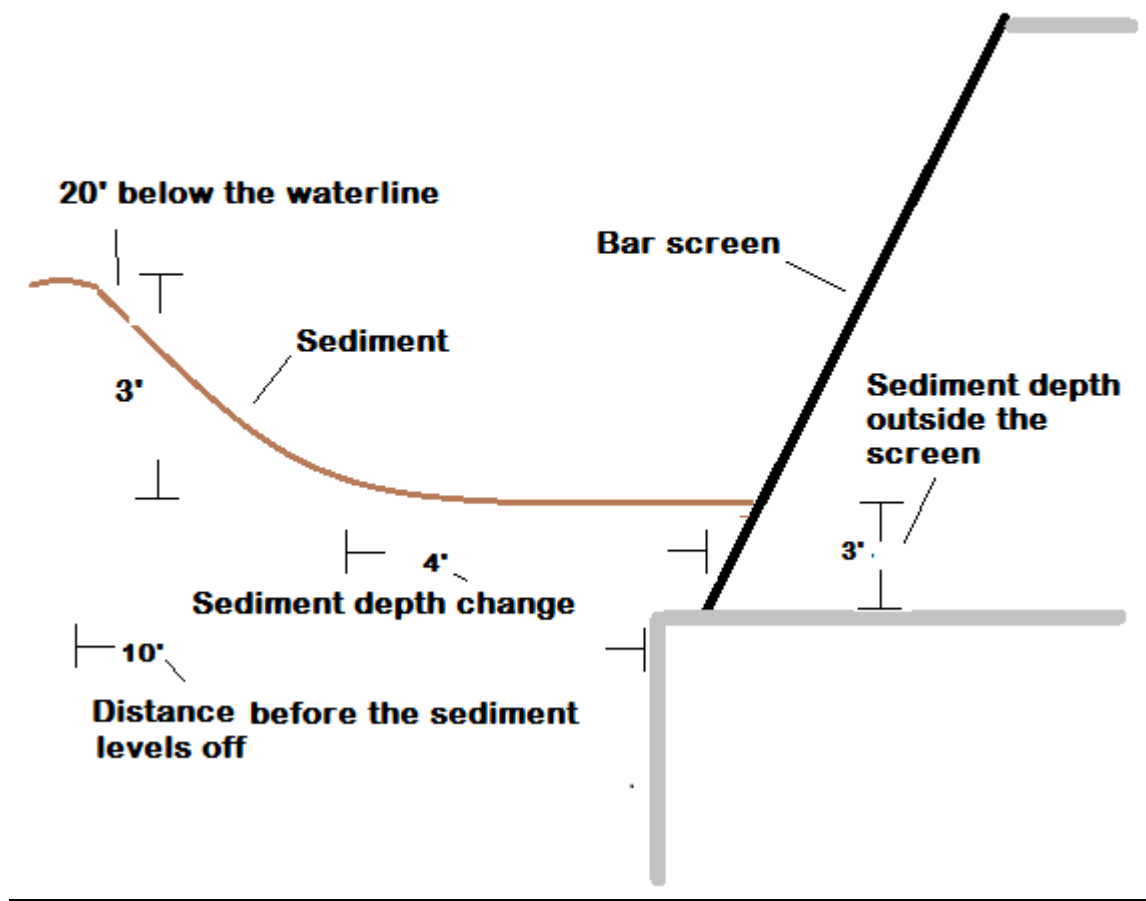
Bar Screen 2



Bar Screen 3



Bar Screen 4



APPENDIX B
PUMP IN WET WELL
U/T Readings

PUMP SHAFT U/T Readings

| PUMP 1 | 12 CLOCK | 6 CLOCK | 3 CLOCK | 9 CLOCK |
|-------------------|-----------------|----------------|----------------|----------------|
| w/L | .396 | .394 | .396 | .396 |
| 12' | .398 | .398 | .400 | .398 |
| 24'(BELL) | .930 | 1.000 | .876 | .916 |
| PUMP 2 | | | | |
| W/L | .338 | .340 | .326 | .338 |
| 12' | .368 | .372 | .370 | .368 |
| 24' (BELL) | .740 | .595 | .598 | .558 |
| PUMP 3 | | | | |
| W/L | .322 | .230 | .320 | .250 |
| 12' | .368 | .518 | .368 | .366 |
| 24' (BELL) | .506 | .758 | .808 | .750 |
| PUMP 4 | | | | |
| W/L | .366 | .356 | .358 | .366 |
| 12' | .358 | .364 | .368 | .368 |
| 24' (BELL) | .700 | .932 | .812 | .786 |

***NOTE: 12 CLOCK POSITION IS THE WEST DIRECTION IN THE BAY
FACING THE GATE**

APPENDIX C
BLUEVIEW SONAR
REPORT AND IMAGES

Blueview Data

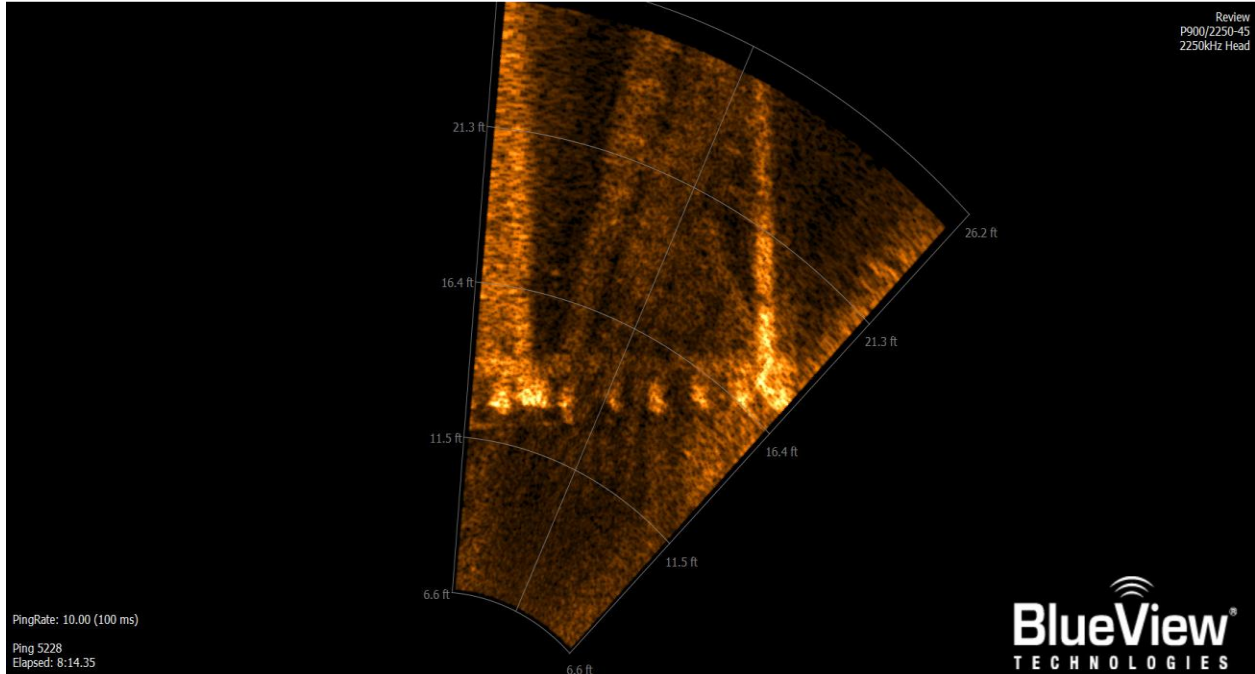
Data collection started on the vessel at the intake structure. The system was setup to collect data at a frequency of 2.25 MHz to achieve the highest resolution possible. In order to ensure the intake structure would be scanned entirely, the BlueView tripod was positioned initially about 13ft outward from the structure, between pumps 1 and 2 (the two southerly pumps). TerraSond personnel began recording BlueView sonar imagery, making sure to pan and tilt to include the entire structure within range. Upon completion of intakes 1 and 2, the diver was notified to reposition the tripod in front of intakes 3 and 4 (the two northerly pumps), also at a distance of approximately 13ft outward from the structure. Again, the TerraSond personnel recorded BlueView sonar imagery, being careful to include the entire structure within range.

After the survey of the exterior of the pump house intake valves was completed, the system was brought back on board and broken down for transport to land. The Orion dive team then moved to a nearby dock to offload equipment and crew to begin the inspection of the valve pump compartments.

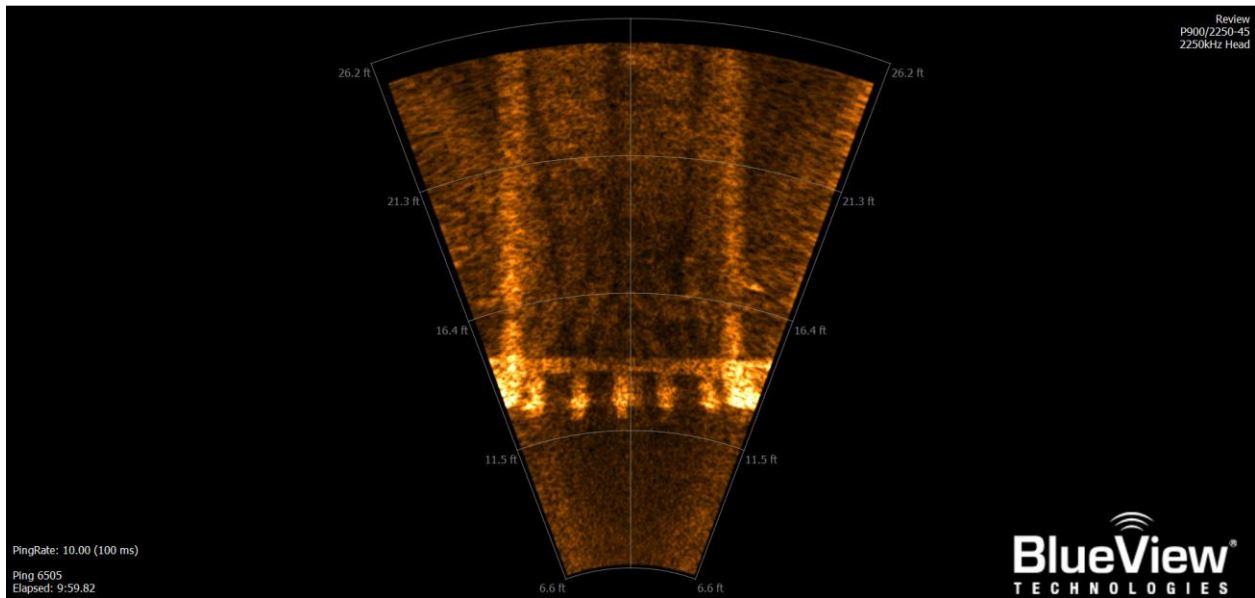
Once the equipment was lowered down below the main level of the pump house, it was set up again to begin the second part of the day's surveying. Each intake valve compartment was surveyed from all four corners to ensure 360-degrees of sonar coverage. Acquisition began in Pump Bay #1 compartment, followed by #2, #3, and finally #4 (south to north). Each compartment was surveyed in a clockwise direction, beginning with the northwest corner, followed by the northeast corner, the southeast corner, and finally the southwest corner. Though the BlueView tripod was moved within each valve compartment, data was recorded for the entire duration it was in the water in each compartment. This allowed TerraSond to acquire the maximum amount of imagery possible. Each valve compartment was surveyed from each corner, utilizing pan and tilt to allow for the fullest coverage possible. The Orion dive team assisted with the launch and recovery of the BlueView tripod each time, and maintained open lines of communication to ensure TerraSond personnel could acquire the highest quality data.

Data collected while aboard the Orion dive boat as well as while inside the pump house was acquired with no issues, and with the highest quality. High resolution images from all four pump intakes externally, as well as from all four corners of all four valve compartments internally, were obtained successfully, as well as some interesting images of various features.

The following images represent each structure from each location where the BlueView sonar tripod was setup, beginning with the exterior of the intake bays, continuing to the individual intake pump compartments' corners.

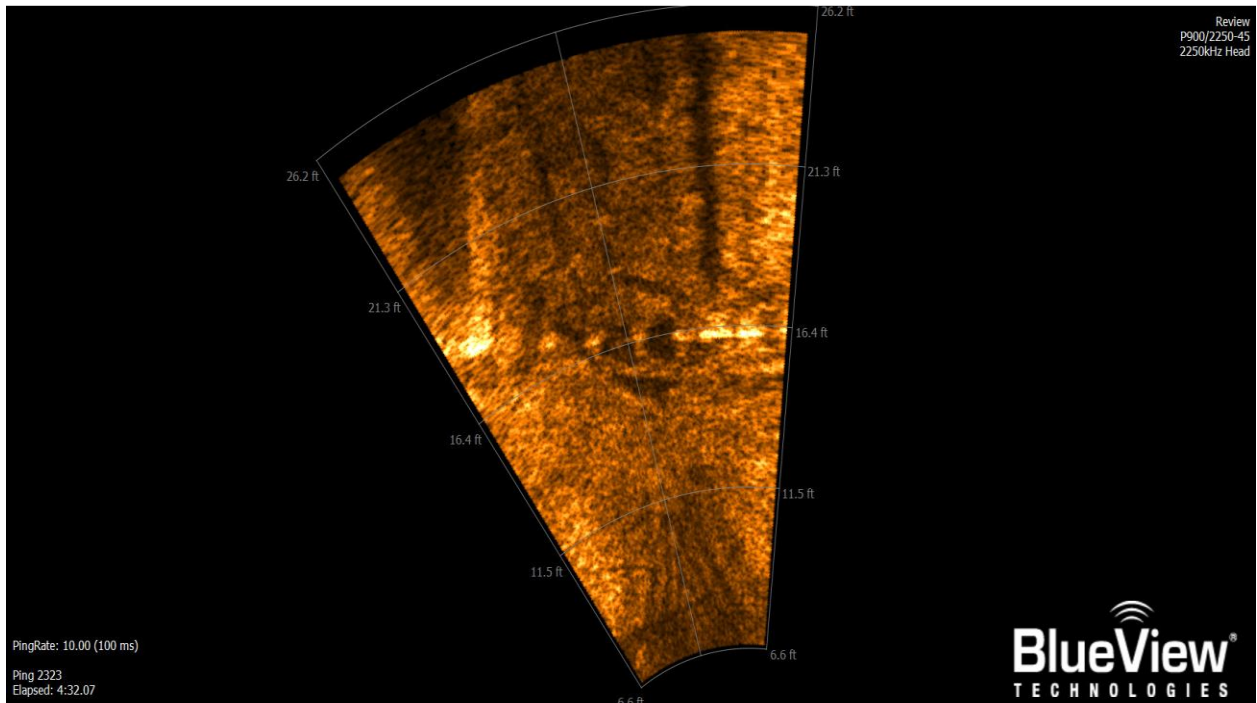


Intake Structure #1
Bar Screen and
conduit

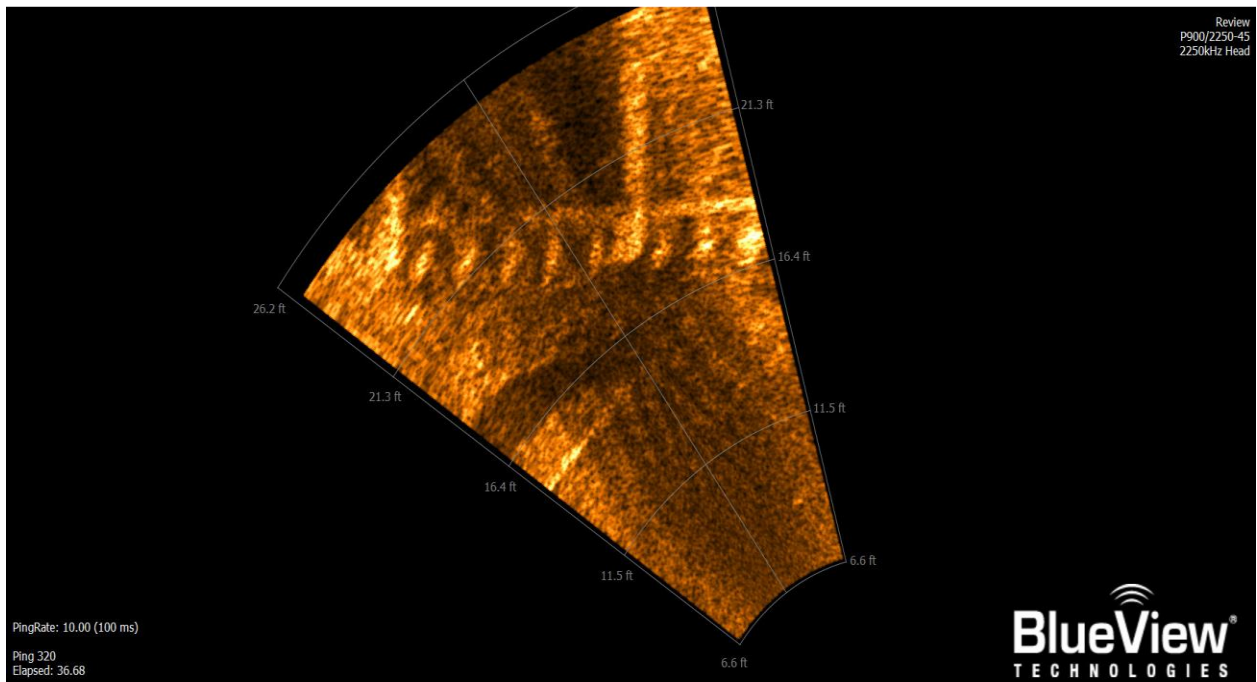


Intake Structure #2 Bar
Screen and conduit

Images are looking down at the bar screens and showing the tops of the conduit pipe. This is due to the mud build up in front of all the screens. The Blueview Tri-pod was at the mud depth of 20 feet and the base of the bar screen is at 27 feet. This condition applies to all (4) Bar Screen locations. The sonar distance from the bar screen is approximately 13 feet. A direct head on shot was not able to taken due to the mud build up in front of the bar screen.

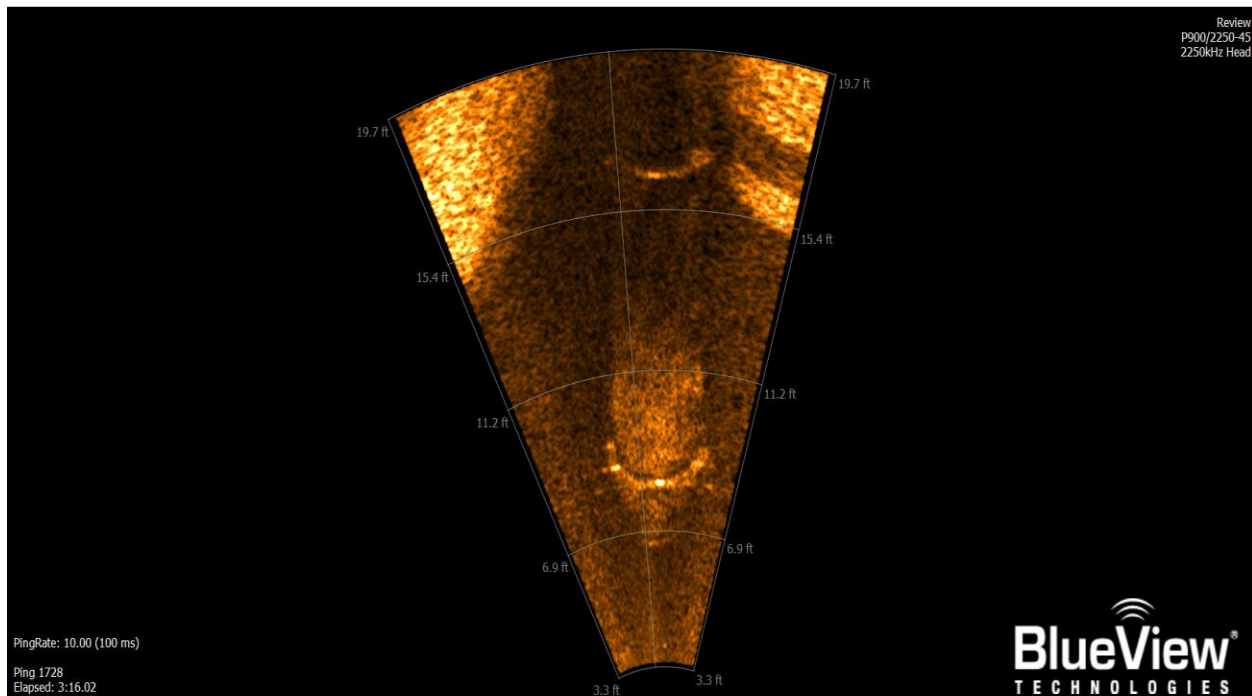


Intake Structure #3

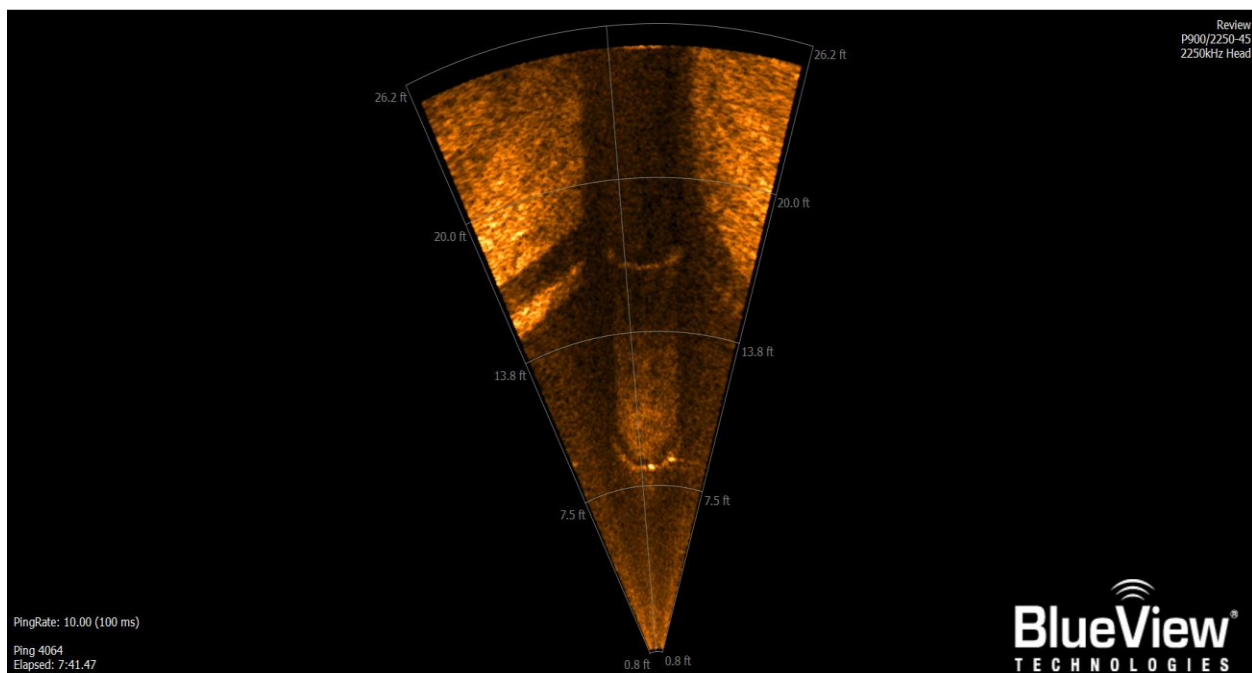


Intake Structure #4
Bar Screen and
conduit

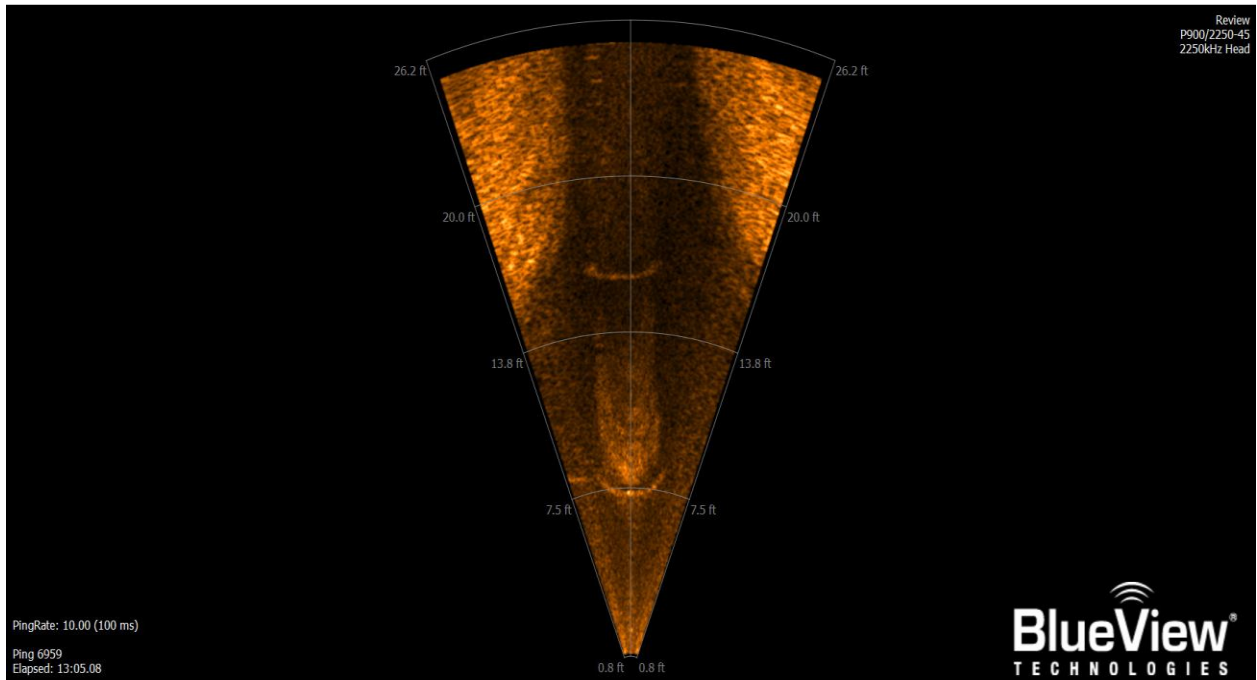
PUMP BAY 1



Pump Shaft #1, N

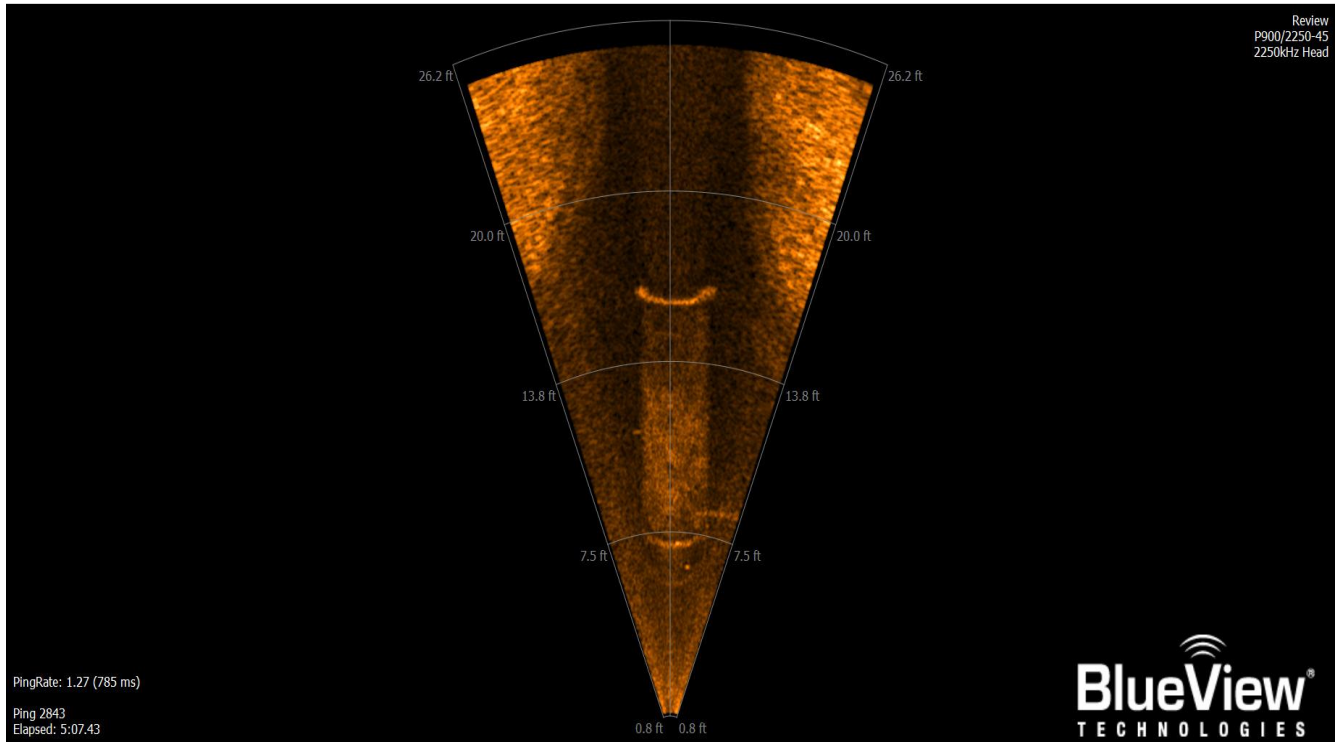


Pump Shaft #1, SE

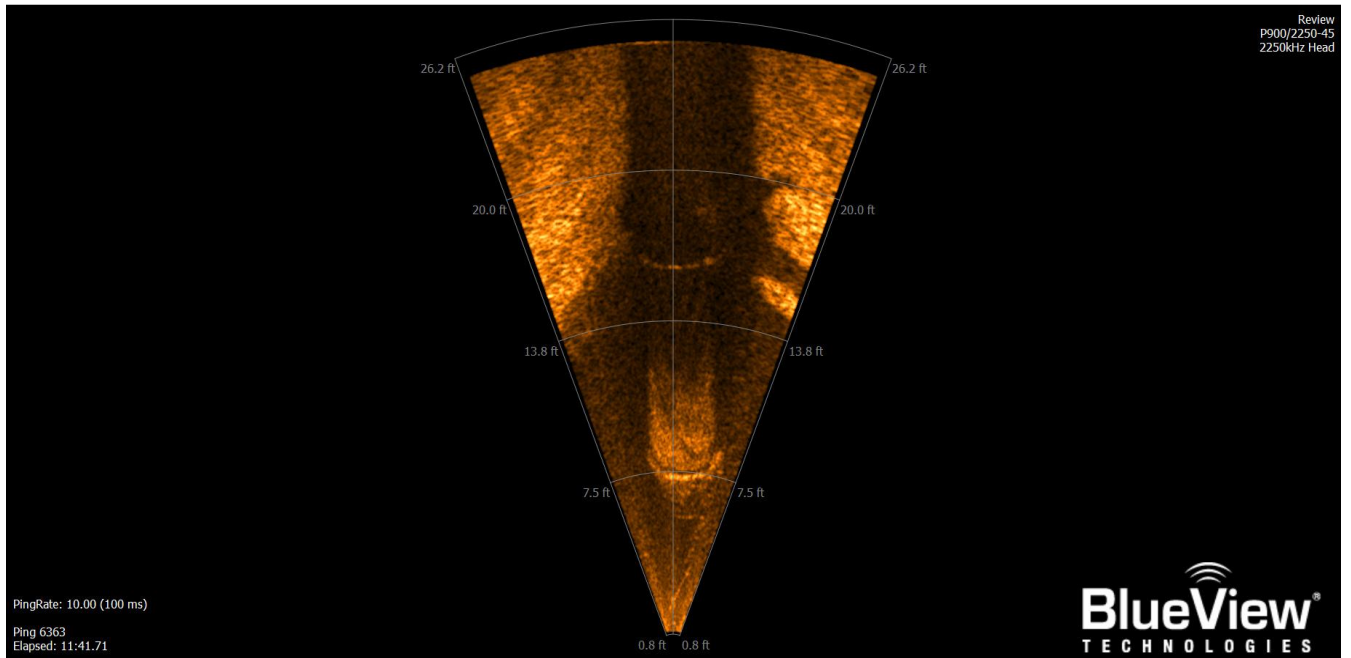


Pump Shaft #1, SW

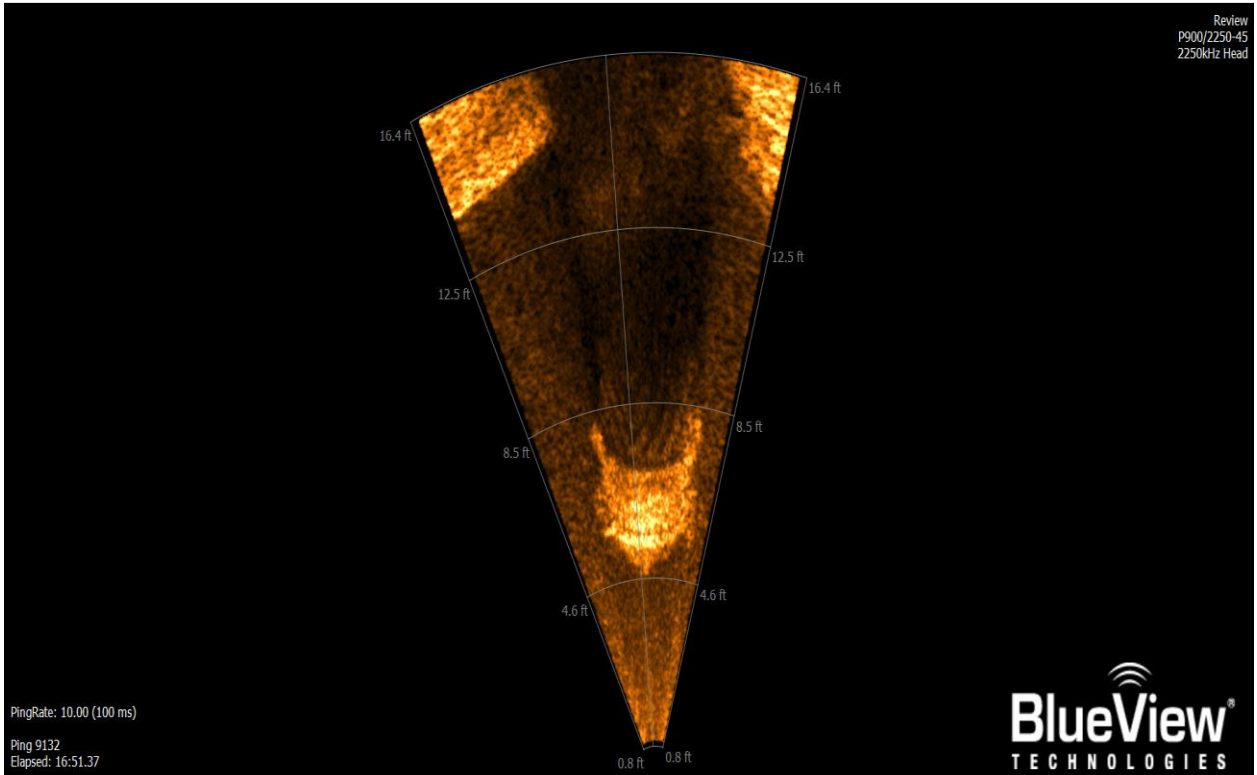
PUMP BAY 2



Pump Shaft #2, NW

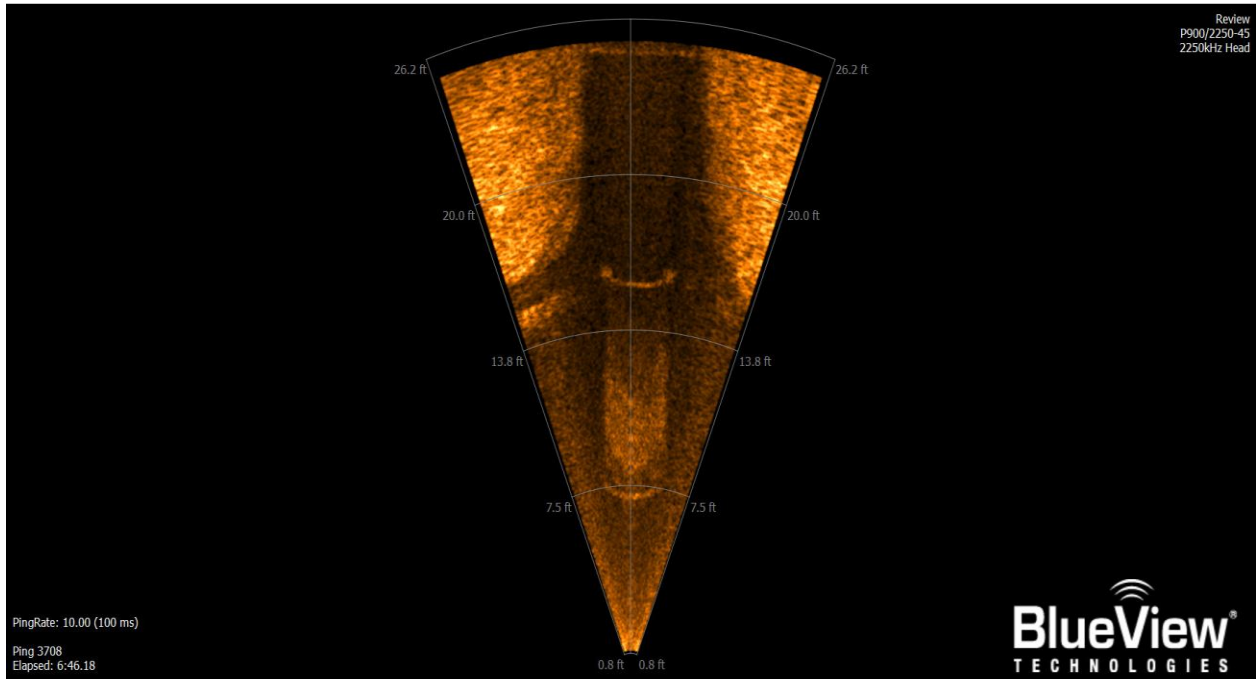


Pump Shaft #2, NE

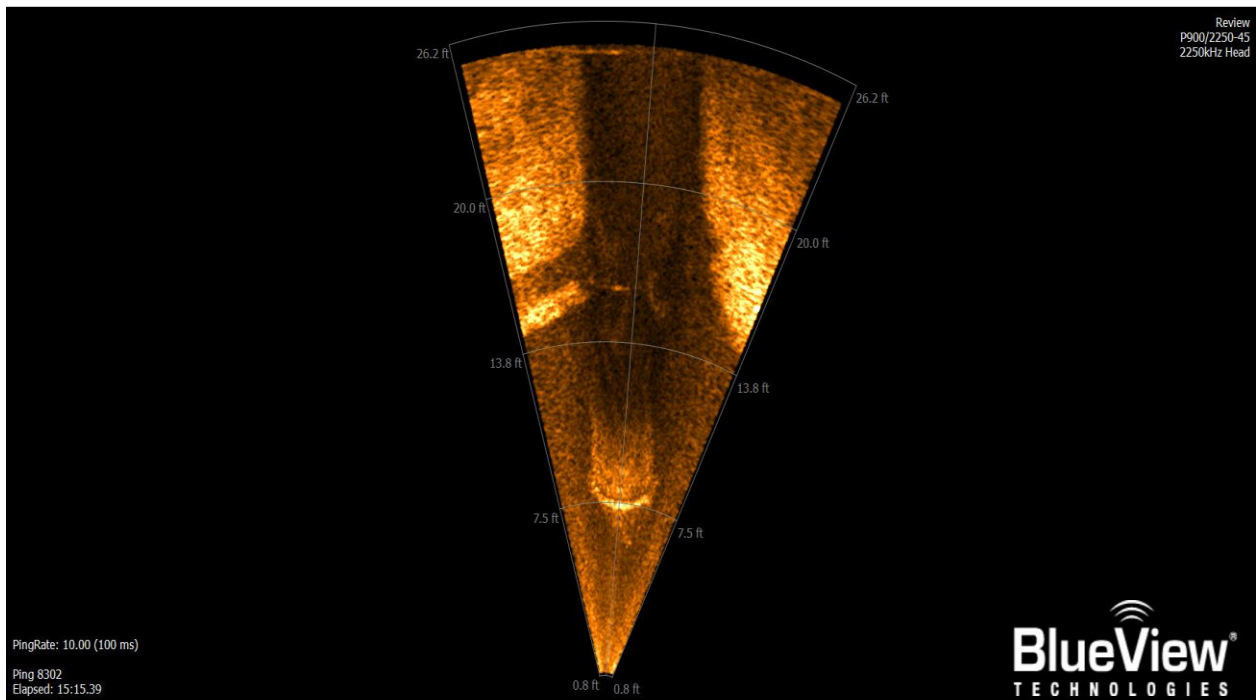


Pump Shaft #2, SE

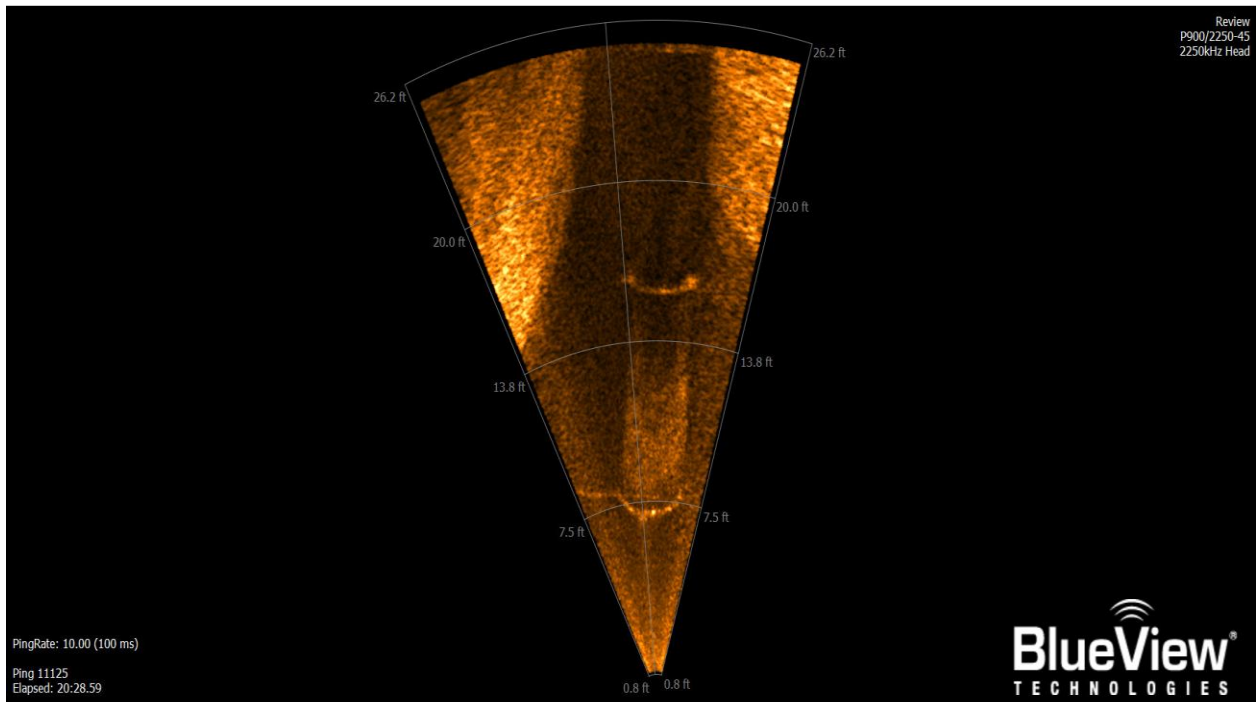
PUMP BAY 3



Pump Shaft #3, NE

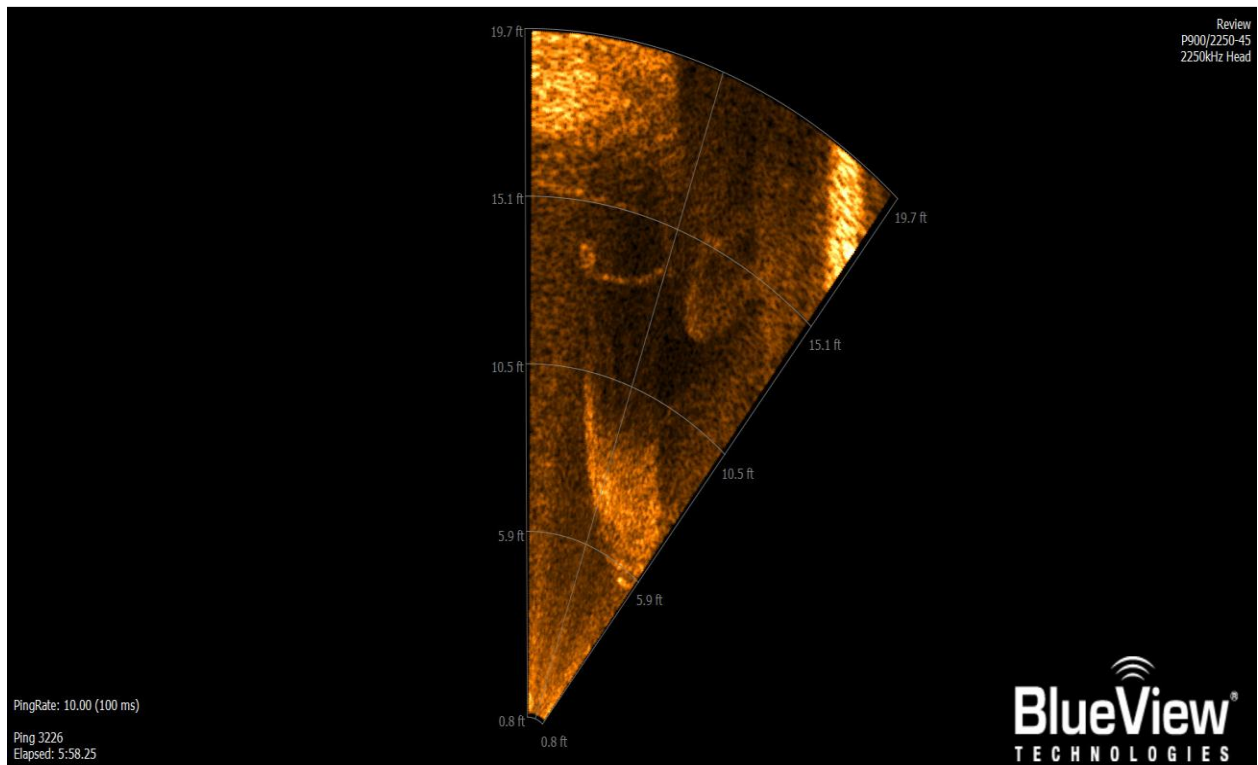


Pump Shaft #3, SE

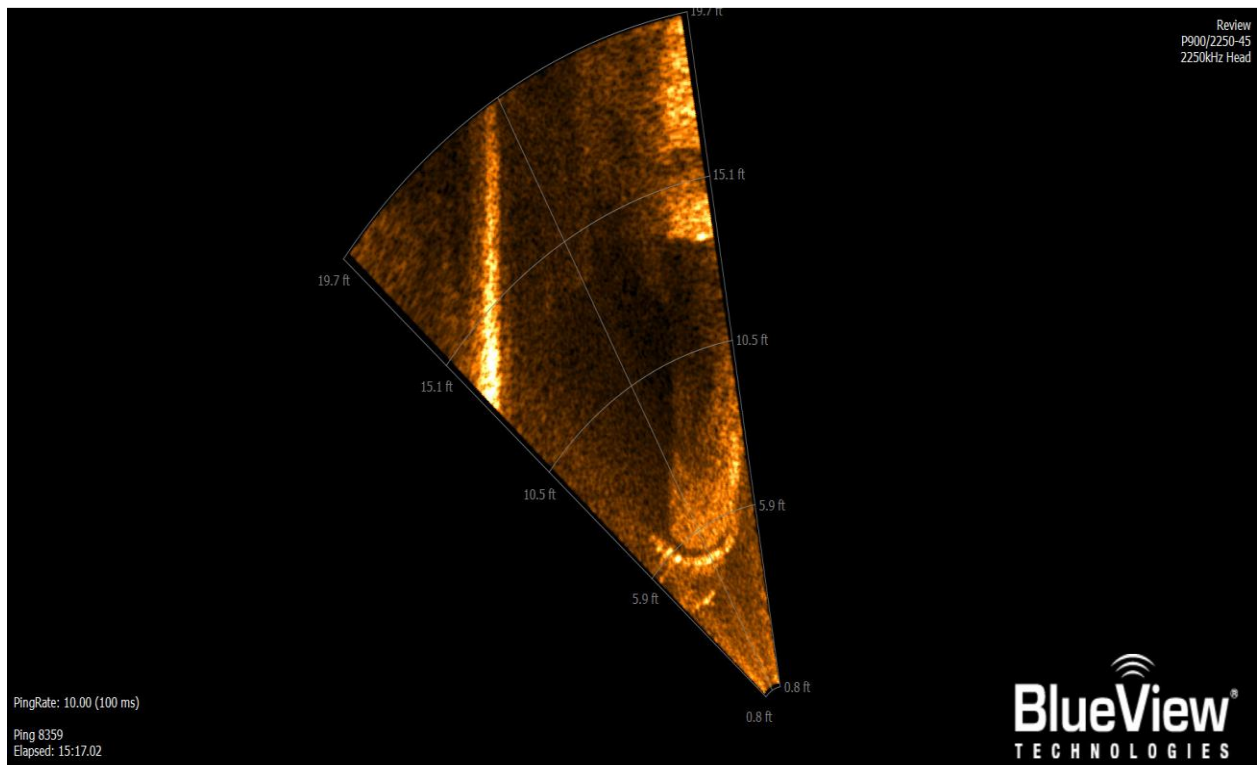


Pump Shaft #3, SW

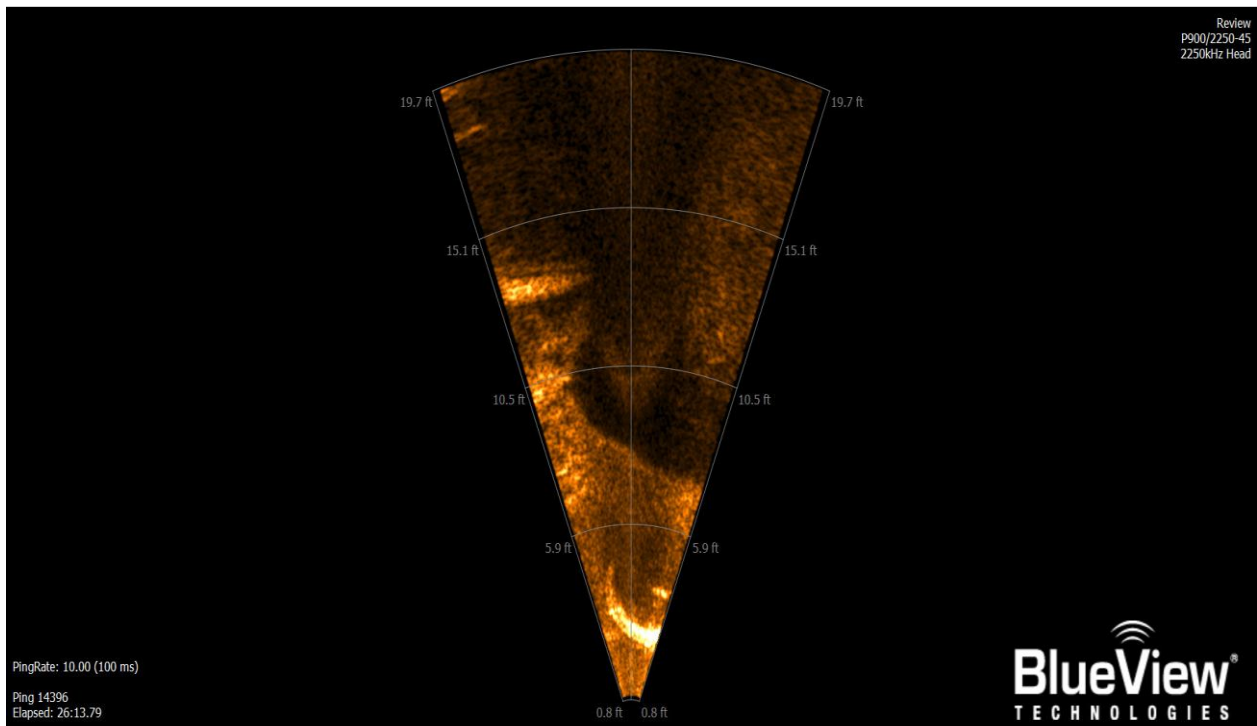
PUMP BAY 4



Pump Shaft #4, NW

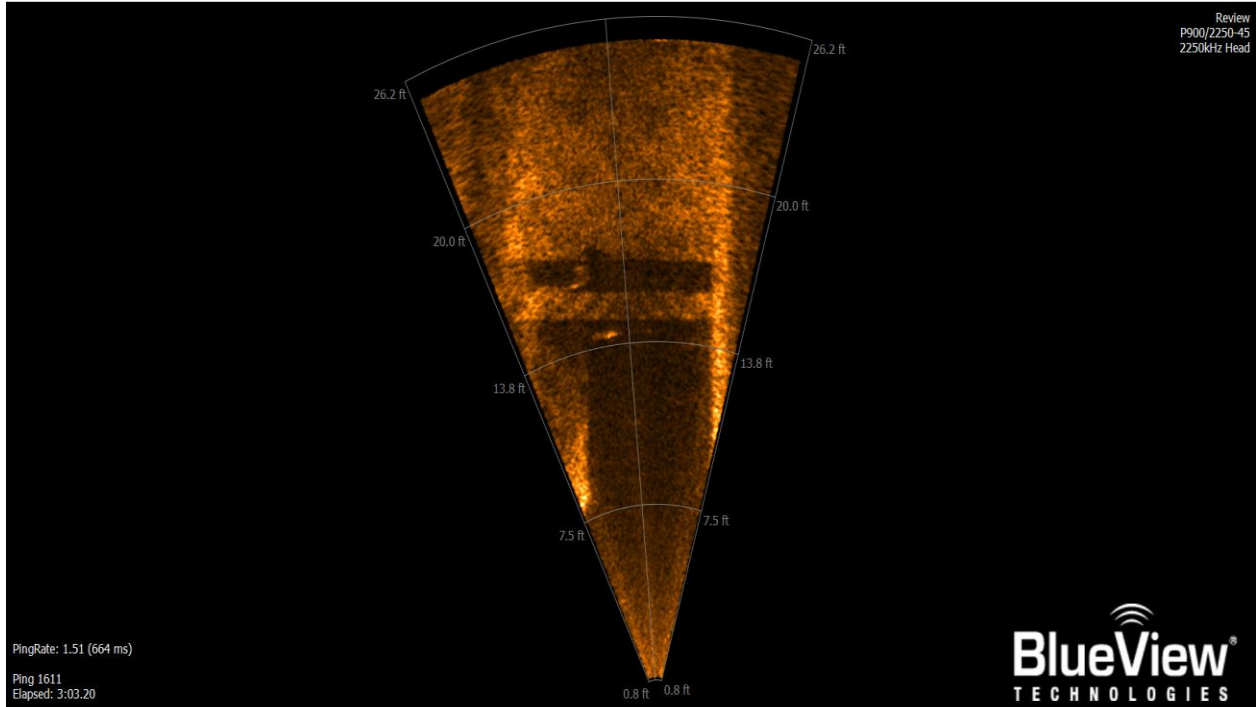


Pump Shaft #4, NE

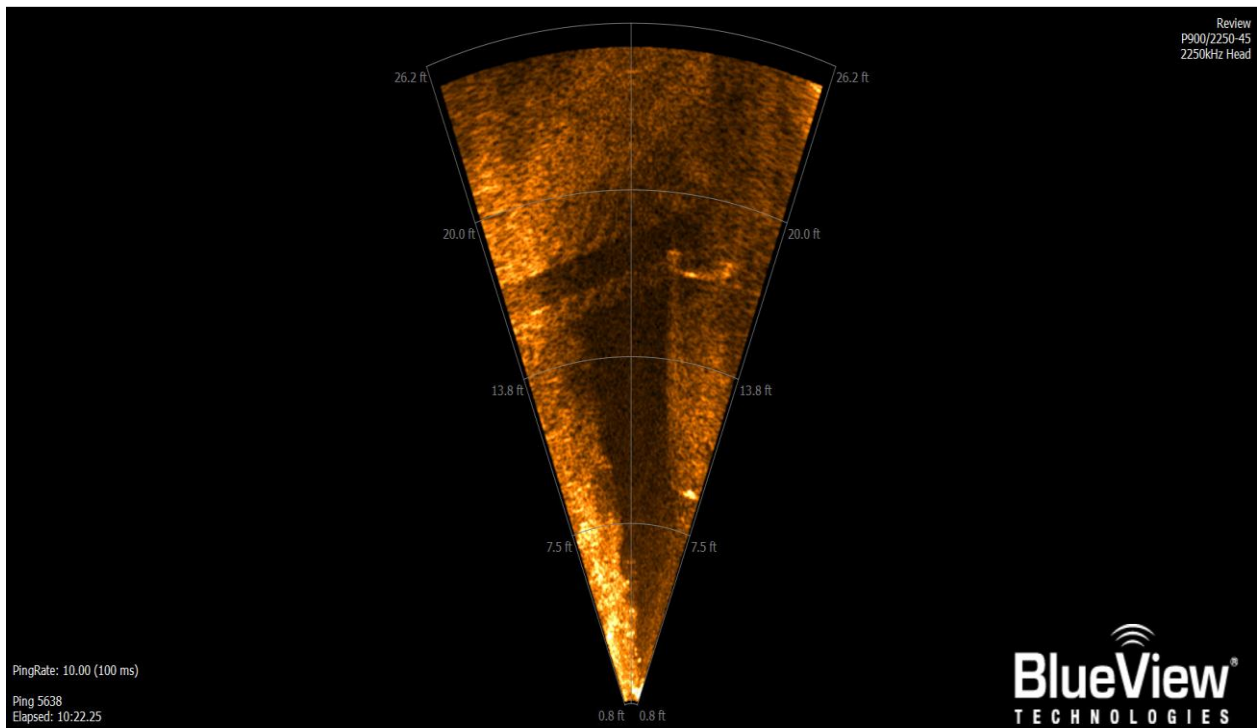


Pump Shaft #4, SW

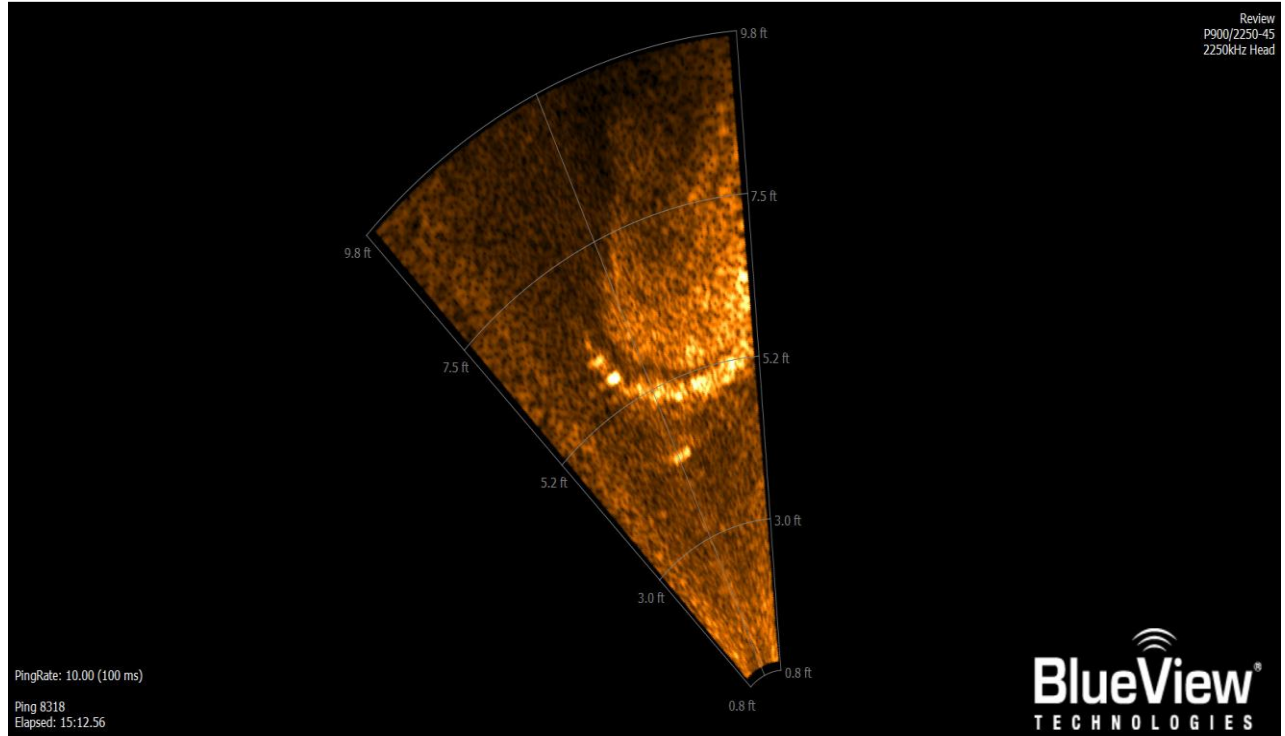
The following sonar images capture some interesting features or exhibit areas of interest:



Conduit bay access opening inside Bay #1 intake pump compartment



Diver bubbles and compartment access opening behind Pump Shaft #3 intake pump



Flanges on Pump Shaft #4 intake pump