

Town of Discovery Bay Old River Sanitary Outfall - Diffuser Section

Diver Inspection & Assessment

October 2022



Performed at Direction of:
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BACKGROUND

Underwater Resources Inc. (URI) conducted an underwater inspection and investigation along the exposed portions of the submerged and buried sanitary outfall diffuser section located in Old River ± 0.5 mile upstream and SW from the CA-4 Borden Highway bridge. The steel outfall transmission and HDPE diffuser discharge pipeline, constructed in 2004, had deficiencies reported from a previous UW inspection and condition assessment using divers in December 2017, there were concerns that multiple diffuser ports have become buried, broken and/or were missing.

URI and Herwit Engineers developed a plan to assess the operational condition of the diffuser pipe section and to make any necessary repairs using divers to comply with the Town of Discovery Bay (TofDB) RWQCB effluent discharge permit. URI proposed utilizing a qualified three-person diving crew comprised of a supervisor and two divers (3x2 crew) using a surface-supplied mode of air diving equipment with 2-way communications. The dive station with compressor, back-up air and radios were staged onshore along the west shoreline levee bank and divers would work alternately while conducting the initial investigation and any anticipated diffuser repairs.

BASELINE INSPECTION SCOPE

By using both the 2004 "design" DWGs for the original construction and 2017 report findings from that dive inspection URI would perform a condition assessment of the $\pm 110'$ long buried diffuser section along the river-bottom. Divers would investigate up to thirty-six (36) exposed diffuser risers and Red Valve port locations between STA 1+10 and 2+16 that were either exposed or buried. Based upon the NOAA tide chart (Borden Highway waypoint), water column height would also be recorded and be referenced by the date and time of day shown on the chart.

At locations where diffuser risers or ports were reported as being buried, broken and/or missing, divers were prepared to excavate down alongside the riser and remove individual riprap rock by hand. The height of each riser/check valve above the pipe crown was already known from the "as-built" shop DWGs so it would be an easy calculation to determine the extent of riprap cover. Likewise, adjacent diffuser riser spacing was also known so determining the accurate locations of any buried, broken, or missing diffuser ports would also be easy.

The results from this initial baseline diffuser section would yield enough information for the engineer to order enough HDPE diffuser pipe riser materials with flange adapters, backing rings/fasteners and Red Valves. Data collected from the dive survey would also document the following information: a) condition and height of each exposed diffuser port above the river bottom, b) record the strength and relative amount of flow through each Red Valve, c) document depth of water along river bottom at each diffuser location, d) determine exact locations of buried, broken and/or missing diffuser ports, and e) assess level of effort required by divers to relocate riprap and make repairs to damaged diffuser riser ports.

INSPECTION METHODOLOGY

URI mobilized a field crew of (3) personnel with dive and inspection equipment into a pickup truck and met O&M personnel and Greg Harris (Hervit Engineering) at WWTP #2 located @ 17501 Highway 4 at 0700 hours on Friday 10/14/22. The crew then drove eastward on Highway 4, turned onto a dirt road just before the bridge, and parked on the levee roadway adjacent to the pipeline. After a brief safety meeting and setting up the dive station, dive operations commenced @ 0905 hours.

Based upon anticipated strong peak river flows and a current, divers donned more weight than normal to facilitate staying close to the plane along the river bottom. Diver #1 located the nearshore exposed

diffuser port and established a travel line from the shoreline and then assessed the presence of armor rock, ease of locating visible diffusers and other conditions above the diffuser pipeline alignment. He swam and secured the end of a 150' long fiberglass tape weighted with a 1/8" Ø steel cable from the nearshore to last diffusers before removing all loose slack. The diver noted that portions of all 36 diffuser ports were visible above the river bottom. An UW digital still camera was also utilized to document conditions of diffuser ports both before and after a hand brush was used by the diver to remove aquatic algae and sediment from the exposed diffuser port/flange fasteners.

Diver #1 exited the water at 1050 hours and Diver #2 entered the water at 1110 to conduct the actual physical, tactile, and video inspection of the exposed diffuser ports. The weighted tape allowed him to identify diffuser locations by inches and feet and, by referencing spacing gaps shown in the as-built DWGs, to determine locations where the buried diffuser pipeline reduced in pipe size. A helmet mounted UW closed circuit video camera (*Outland Technology Model 3310*) with lighting and LED monitor/DVR enabled topside personnel to observe the inspection in "real time", make comments and communicate with the diver. Video documentation also includes a "Time/Date" stamp overlay used to track the actual "clock" time and audio narration between the diver and topside observers.

The breathing umbilical was equipped with a hard-wire communication cable enabling continuous 2-way conversations between the diver and topside personnel. To be overlaid onto the video recording of the inspection. In addition, a 1/4" Ø hose enabled air to be blown from the diver supply manifold through the pneumofathometer and caisson gauge to document the depth of water to ±6" accuracy. By noting and recording the surface water elevation from the tide table, the height of the water column down to the base of each diffuser riser and port along the river bottom.

The underwater visibility along the bottom was particularly good (between 5' and 10') and the velocity of the river flows was negligible so did not adversely affect the progress of the inspection. Divers inserted a probe into the river bottom to measure thickness of softer sediment materials covering armor rock below and tape measured distances between diffuser ports were recorded to an accuracy of ±3-inches.

The entire inspection was performed and completed during a standard ST shift on Friday October 14th, 2022, between 0700 and 1400 hours with the diving occurring between 0900 and 1300 hours. The weather conditions were clear with a maximum in-water visibility reported at 10-feet. The height of each diffuser was then measured in reference to the mud line and this data was plotted on a sediment profile diagram. Lastly, the diver estimated the amount of riprap coverage at each diffuser location compared to the amount of sediment.

FINDINGS & MAINTENANCE

Divers conducted a tactile, visual, and narrated video inspection at all thirty-six (36) diffuser port locations to describe flows and above river bottom grade risers and ports. All were accounted for, in place and found to be in good condition and with no missing fasteners nor apparent damage to the Red Valve ports. At twelve (12) diffuser riser location the upper flange connections were visible and exposed (Diffuser #5 through #12, #20 through #22, and #28). All the fasteners and other visible hardware was tight and in good condition. Riprap was present above the entire diffuser section and around all diffusers. Sand levels exceeded the height of the riprap in locations with diffusers 14 through 18 protruding 4-inches or less from the sediment.

During the initial inspection Diffusers #30 through #32 only had minimal flow and Diffusers #33 through #36 had no flow. The diver used a folding rule to both probe and measure the depth of blockage and point of refusal from within the HDPE diffuser riser through each of these Red Valve rubber ports. After continuing the process of measuring with the folding rule it became apparent to the diver, he could dislodge the internal blockage by performing more rigorous and repeated probing at each location.

The process of probing allowed internal blockage of sediment and shells to be broken up and expelled from the clogged diffusers and, after repeated probing, Diffusers #30 through #36 were all cleaned of debris and had good flow. These efforts can be viewed in the videos titled "[221014 - 1217-1247hrs - Internal Cleaning of Diff. 36-31](#)" and "[221014 - 1247-1300hrs - Internal Cleaning of Diff. 36-31](#)".

Additional data can be found in *Table 1* on Page 4, the *Outfall Sediment Profile diagram* on Page 5, and the *Photo Log* on Page 6. All video files including those referenced above along with videos of the inspection can be viewed and downloaded on the following hyperlink below:

<https://www.dropbox.com/sh/yhe3nw45vig5bc4/AAAijPzVgTUwe7ddA0s2ZHG6a?dl=0>

n diffusers and from diffuser 1 are not exact and are for diver reference only.

Tide (ft)	Corrected Depth to MLLW (ft)	Diffuser Flow (pre-clean)	Diffuser Flow (post-clean)	Height (in) of Exposed Diffuser	Red Valve Diffuser Condition	Distance Reading on Tape Measure (ft)	Measured Distance From Diff. No. 1 (ft)	Measured Distance Between Diffusers (ft)	Flange Exposed Or Buried	RipRap Cover %	Sand Cover %	Notes
+2.3	18.7	Good	Good	6.5	Good	208.75	0.00	0.00	Buried	50	50	No damage to
+2.3	18.7	Good	Good	5	Good	205.75	3.00	3.00	Buried	50	50	No damage to
+2.3	18.7	Good	Good	10	Good	202.58	3.17	6.17	Buried	60	40	No damage to
+2.3	18.7	Good	Good	14	Good	199.50	3.08	9.25	Buried	80	20	No damage to
+2.3	18.7	Good	Good	25	Good	196.83	2.67	11.92	Exposed	40	60	No damage to
+2.3	18.7	Good	Good	30	Good	194.08	2.75	14.67	Exposed	50	50	No damage to
+2.3	19.7	Good	Good	32	Good	191.17	2.92	17.58	Exposed	60	40	No damage to
+2.3	19.7	Good	Good	35	Good	188.00	3.17	20.75	Exposed	50	50	No damage to
+2.3	19.7	Good	Good	31	Good	185.00	3.00	23.75	Exposed	90	10	No damage to
+2.3	20.7	Good	Good	27	Good	182.00	3.00	26.75	Exposed	90	10	No damage to
+2.3	19.7	Good	Good	26.5	Good	179.00	3.00	29.75	Exposed	80	20	No damage to
+2.3	18.7	Good	Good	20	Good	175.25	3.75	33.50	Exposed	75	25	No damage to
+2.3	18.7	Good	Good	13	Good	171.75	3.50	37.00	Buried	90	10	No damage to
+2.3	18.7	Good	Good	2.5	Good	168.33	3.42	40.42	Buried	10	90	Diffuser near c
+2.3	18.7	Good	Good	2	Good	166.00	2.33	42.75	Buried	50	50	Diffuser near c
+2.3	18.7	Good	Good	3.5	Good	163.08	2.92	45.67	Buried	10	90	Sand around d
+2.3	18.7	Good	Good	2	Good	159.75	3.33	49.00	Buried	10	90	Diffuser near c
+2.3	19.7	Good	Good	4	Good	156.75	3.00	52.00	Buried	10	90	No damage to
+2.3	20.7	Good	Good	11	Good	153.75	3.00	55.00	Buried	10	90	No damage to
+2.3	20.7	Good	Good	21	Good	148.00	5.75	60.75	Exposed	90	10	No damage to
+2.3	20.7	Good	Good	23	Good	145.00	3.00	63.75	Exposed	50	50	No damage to
+2.3	20.7	Good	Good	20	Good	142.75	2.25	66.00	Exposed	50	50	No damage to
+2.3	20.7	Good	Good	12	Good	139.50	3.25	69.25	Buried	90	10	No damage to
+2.3	20.7	Good	Good	10	Good	137.00	2.50	71.75	Buried	50	50	No damage to
+2.3	20.7	Good	Good	10	Good	133.67	3.33	75.08	Buried	50	50	No damage to
+2.3	20.7	Good	Good	10	Good	130.92	2.75	77.83	Buried	90	10	No damage to
+2.3	20.7	Good	Good	13	Good	127.92	3.00	80.83	Buried	80	20	No damage to
+2.3	20.7	Good	Good	17	Good	124.58	3.33	84.17	Exposed	90	10	No damage to
+2.3	20.7	Good	Good	14	Good	122.50	2.08	86.25	Buried	95	5	No damage to
+2.3	20.7	Minimal	Good	16	Good	120.00	2.50	88.75	Buried	95	5	Returned to gr
+2.3	20.7	Minimal	Good	13	Good	115.00	5.00	93.75	Buried	95	5	Returned to gr
+2.3	20.7	Minimal	Good	14	Good	112.00	3.00	96.75	Buried	90	10	Returned to gr
+2.3	20.7	None	Good	12	Good	109.42	2.58	99.33	Buried	95	5	Returned to gr
+2.3	19.7	None	Good	8	Good	106.17	3.25	102.58	Buried	70	30	Returned to gr
+2.3	20.7	None	Good	16	Good	103.25	2.92	105.50	Buried	95	5	Returned to gr
+2.3	20.7	None	Good	16	Good	100.00	3.25	108.75	Buried	50	50	Returned to gr

Discovery Bay Outfall Sediment Profile

10/14/2022

MLLW

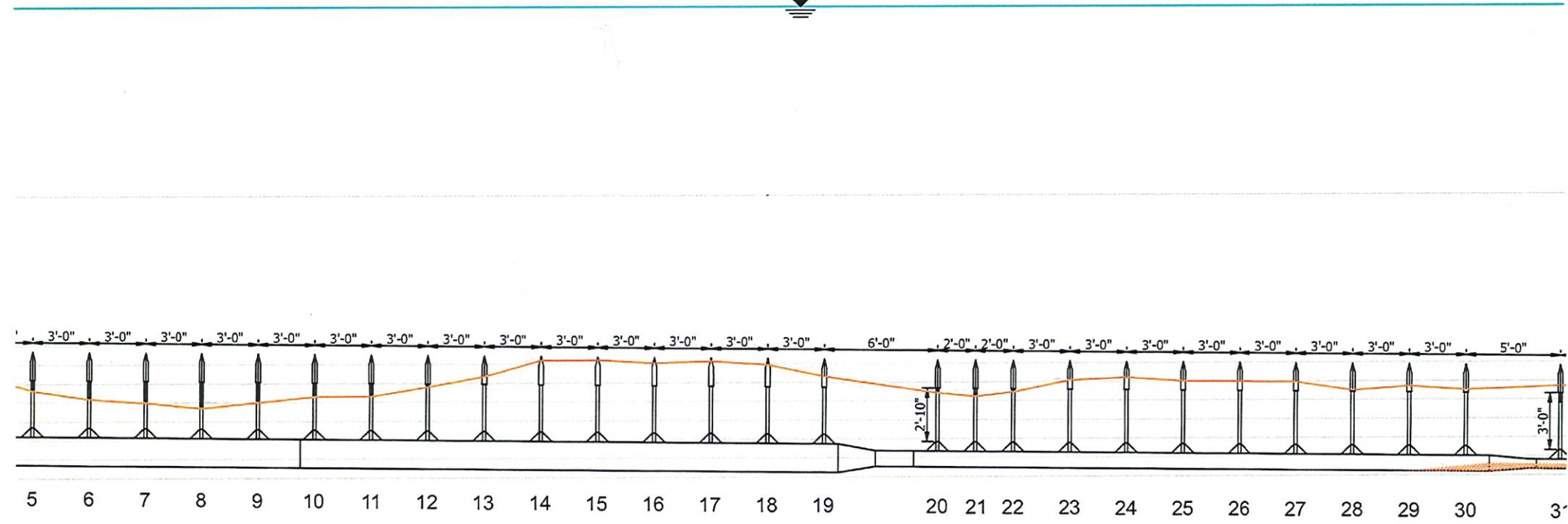


Photo Log



Photo 1 – Diffuser #1, Pre-Cleaning



Photo 2 – Diffuser #1, Post-Cleaning

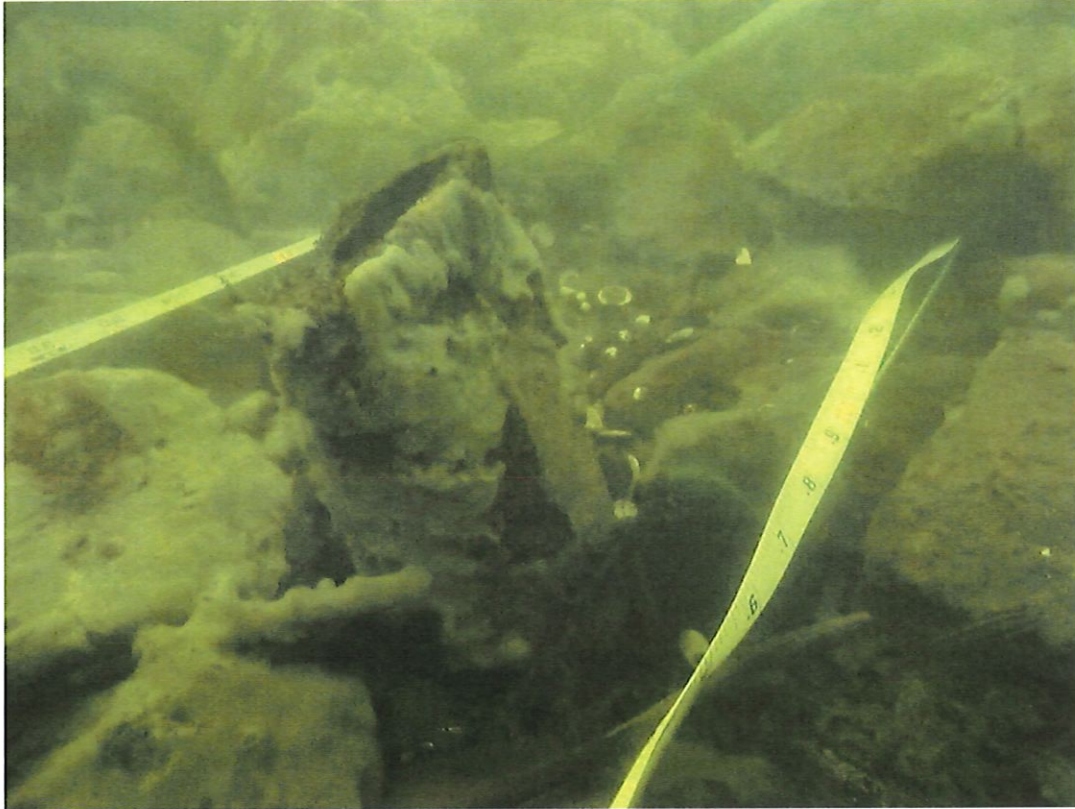


Photo 3 – Diffuser #2, Pre-Cleaning

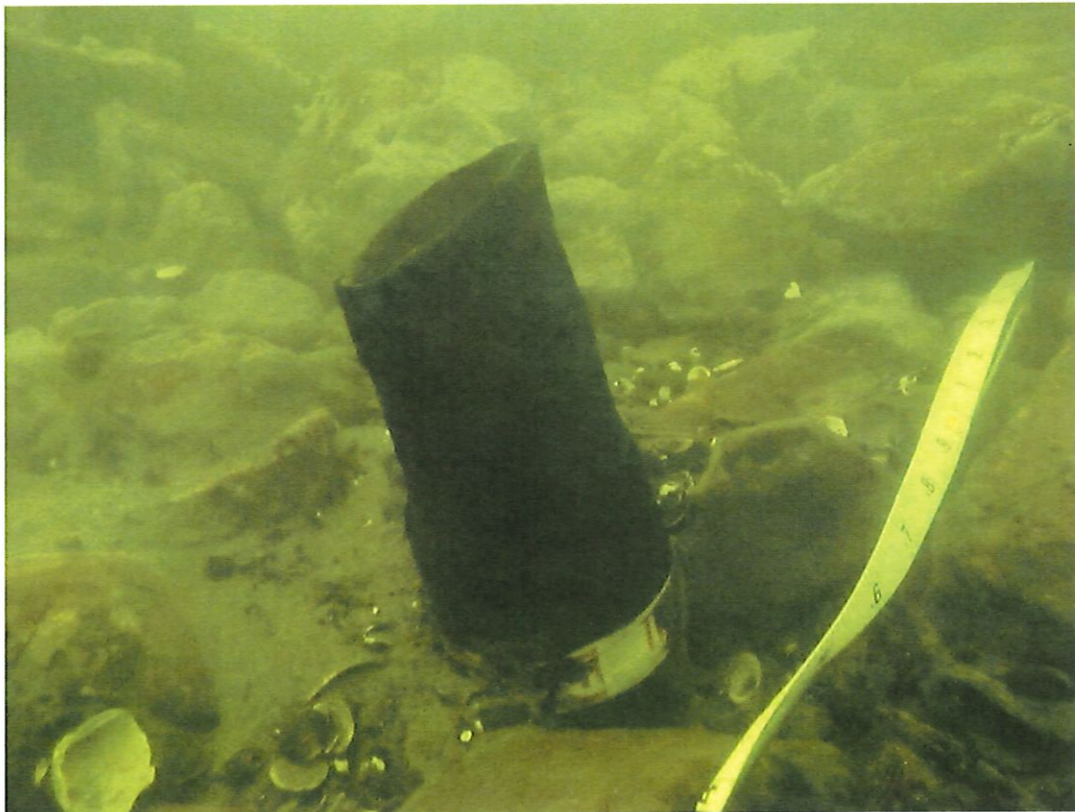


Photo 4 – Diffuser #2, Post-Cleaning

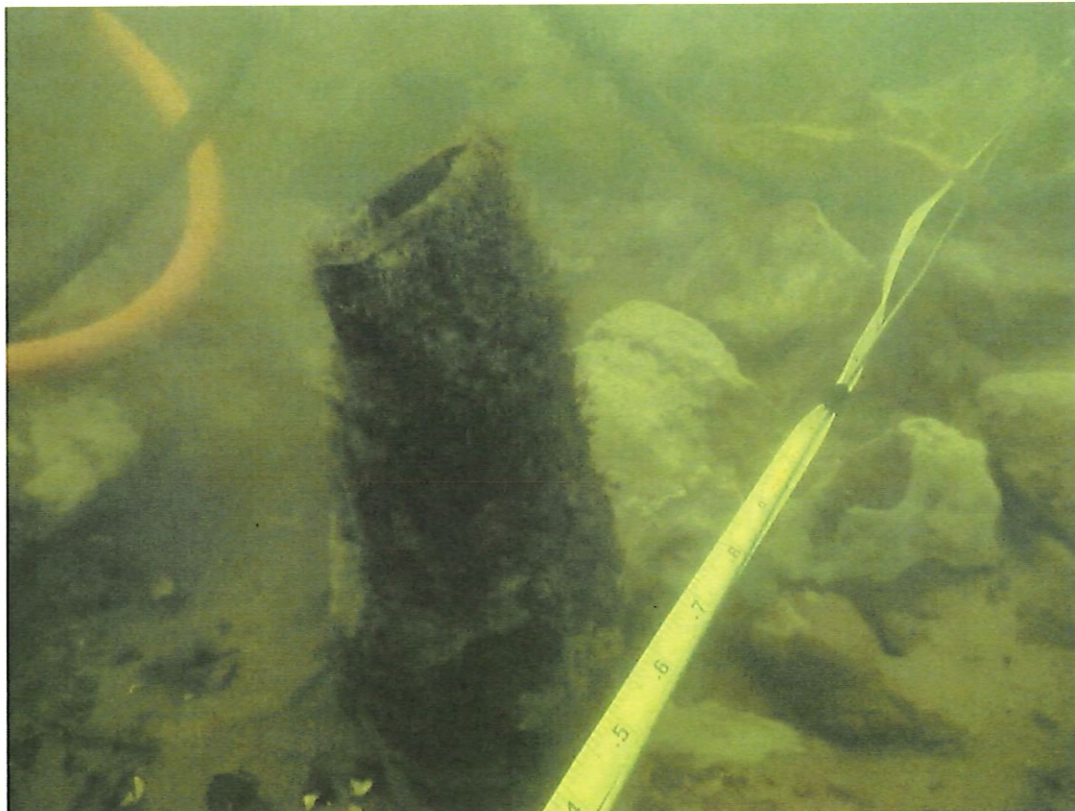


Photo 5 – Diffuser #3, Pre-Cleaning

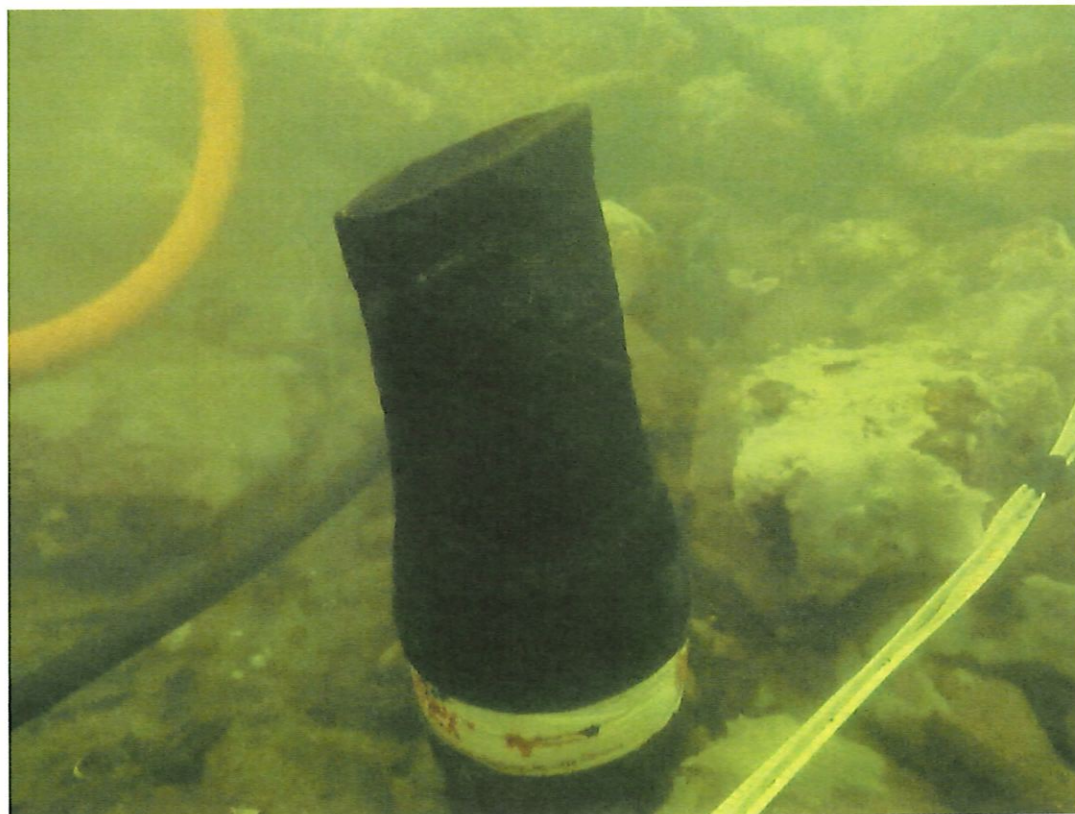


Photo 6 – Diffuser #3, Post-Cleaning

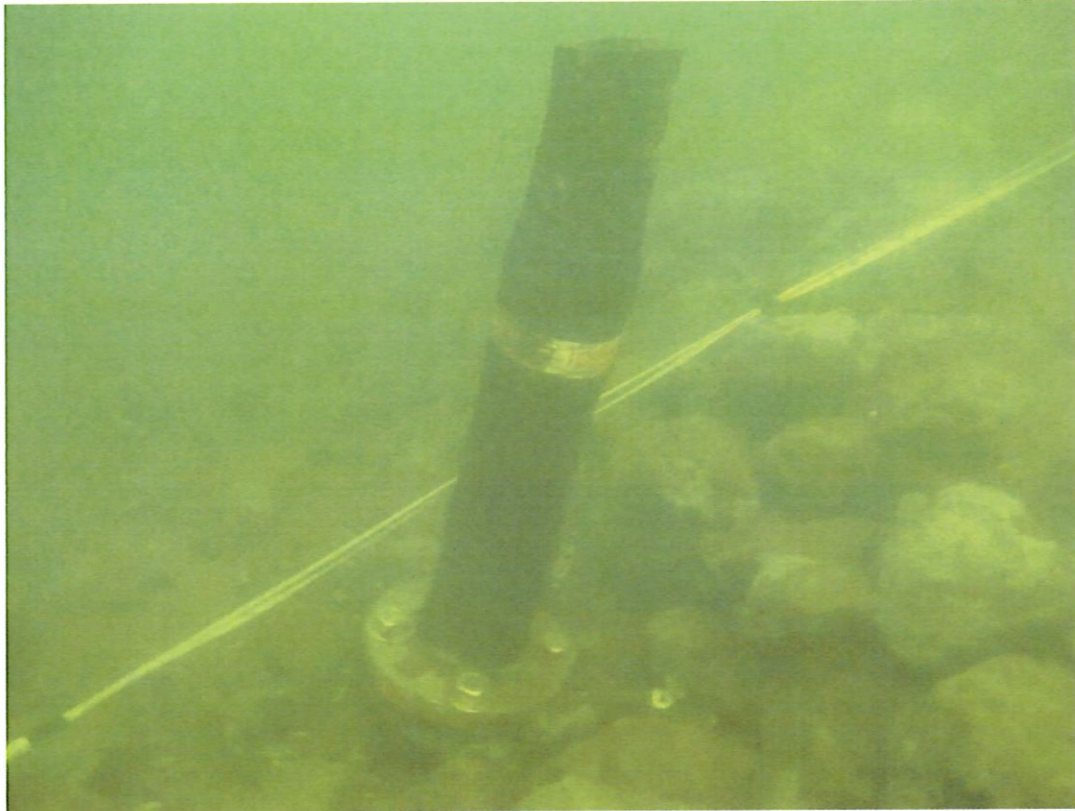


Photo 7 – Diffuser #12, Post-Cleaning



Photo 8 – Diffuser #16, Post-Cleaning



Photo 9 – Diffuser #19, Post-Cleaning

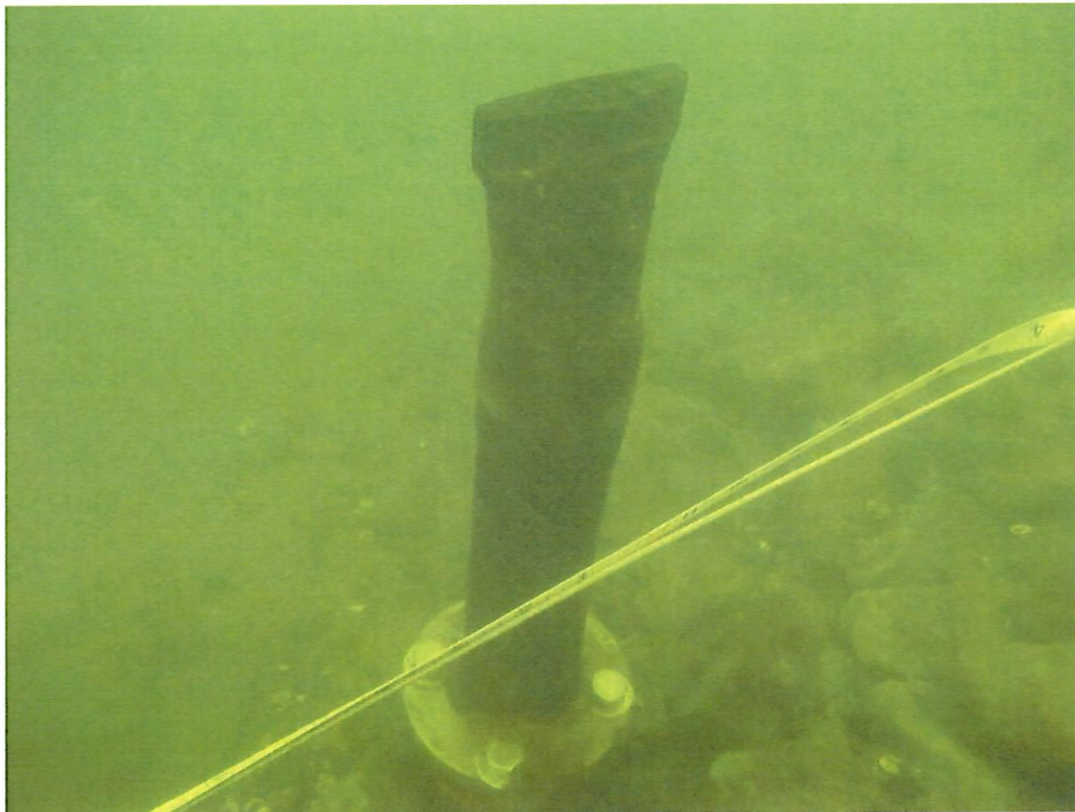


Photo 10 – Diffuser #22, Post-Cleaning



Photo 11 – Diffuser #25, Post-Cleaning



Photo 12 – Diffuser #28, Post-Cleaning



Photo 13 – Diffuser #31, Post-Cleaning



Photo 14 – Diffuser #35, Post-Cleaning

Tide Chart - Old River Borden Highway Bridge

Tides: Borden Highway Bridge, Old River

based on Port Chicago, Suisun Bay, Calif. (NOAA)
37° 53 24 N 121° 34 12 W

Average Tides
Mean Range: 2.3 ft
MHHW: 3.2 ft
Mean Tide: 1.6 ft

Daily Highs & Lows
4:47a 0.0 ft Low
11:21a 2.3 ft High
3:57p 1.2 ft Low
9:31p 3.1 ft High

Friday, October 14, 2022

