Appendix F: Outfall Evaluation Report

Outfall Evaluation

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DATE: November 25, 2018

TO: Pat Coxon and Larry Willman, City of Bremerton

FROM: Bill Fox, Cosmopolitan Marine Engineering

RE: West Plant Outfall Evaluation Report

This report documents the results of an inspection and evaluation of the City of Bremerton's West Plant treatment facility outfall 001 in Sinclair Inlet. An inspection dive and video were conducted on November 8, 2018, covering the outfall from the terminus of the diffuser to the inshore end where the pipeline disappears below mudline.

Outfall Drawing

The as-built drawing for the West Plant Outfall from 1971 is attached. The drawing shows a 36-inch diameter reinforced concrete pipe (RCP) outfall originating from a casing jacked under SR3 and the BNRR tracks, buried out to an elevation of approximately 82 feet city datum, then laid at a flat grade out to a 20-port diffuser. The drawing shows 30 inch high spalls to the springline of the pipe, with the crown 4 feet above native grade. The RCP outfall was constructed in 12-foot lengths, with gasketed bell-and-spigot joints. Joint restraint is by lugs at the springline drawn together by stainless steel all-thread rods and single backing nuts.

Video Record

Global Diving and Salvage vessel and personnel supported the inspection. The video record of the final dive is provided on thumb drives that are included in this report by reference. After finding and selectively cleaning marine growth from the outfall pipe and diffuser, Rhodamine WT fluorescent dye was injected into the effluent to aid in visualizing the discharge from the diffuser ports, and detection of leaks in the pipe.

Two video files are included:

1. The first video file is 21 minutes in duration. It begins at the terminus of the diffuser, just prior to arrival of the dye in the effluent. The effluent is first observed at the second diffuser port working shoreward. The video continues shoreward, showing all diffuser ports, pipe joints and restraints, and anchors. The first video concludes at the point where the pipe disappears below mudline at the shoreward end.

2. The second video file is three minutes in duration. It returns to the terminus of the diffuser, providing a complete video assessment of the end cap, restraints, and minor leakage at that location. It also shows the dyed effluent plume from port #1 that was missed in the first video file.

Outfall Evaluation

This evaluation is required by NPDES Permit No. WA0029289, Condition S13. Specific assessments required by the NPDES permit, and that are documented in this report include:

- Obtain GPS coordinates and confirm depths for beginning, midpoint and terminus of the diffuser.
- Determine the extent of sediment accumulation in the vicinity of the diffuser.
- Assess whether diffuser ports are free of obstructions and if they are flowing uniformly.
- Assess the physical condition of the outfall pipe, pipe joints, concrete anchors, diffuser section and end cap.

Diffuser Location and Depth. The dive team quickly found the end of the diffuser by descending a down line to temporary anchor deployed at previously recorded GPS coordinates. A downline was affixed to the diffuser end cap restraints and held tight in a vertical orientation. GPS coordinates were recorded over the vertical downline at the diffuser end, as were depths to the sea bottom and to the crown of the pipe.

GPS coordinates for midpoint were determined from the diffuser end based on known distance and bearing. Elevations of the bottom and crown of pipe have been adjusted to MLLW datum, based on published tide of +6 ft MLLW when the soundings were taken.

Depths and GPS locations of points of interest are tabulated below:

Location	Depth at Crown (MLLW datum)	Bottom Depth (MLLW datum)	Latitude (47° N)	Longitude (122° W)
Diffuser End	-28 ft	-42 ft	32’ 46.9”	40’ 11.0”
Diffuser Midpt	-28 ft	-41 ft	32’ 47.5”	40’ 11.3”
Diffuser Begin	-28 ft	-40 ft	32’ 48.0”	40’ 11.6”

Sediment Accumulation. Sediments graded from medium to coarse sand near the diffuser pipe, to fine grained silt (mud) a few feet away. The coarser particles adjacent to the pipe are presumably due to the induced currents that the effluent plume creates, or the biota that are present near the pipe and outlets. Sediments further shoreward after the diffuser ends graded to finer particles.

There is no observed accumulation or scour of sediments in the vicinity of the West Plant diffuser. The pipe has been in place for 47-years, and thus the local sediments have achieved an equilibrium with the outfall.

Diffuser Ports. The dyed effluent in the video clearly reveals that all diffuser ports were open and flowing freely. An abandoned fishing net covered several of the offshore ports, but were not visually impeding effluent flow.

Physical Condition. The following observations of the physical condition of the outfall pipe and diffuser are noted:

- During the initial dive pass there were points of interest cleaned for inspection and video recording. The points were in random order at multiple locations of hardware and diffusers. The outfall appeared to be in overall good condition based on this first pass.

- The most noteworthy finding may be that there are 22 ports, not the 20 ports shown on the drawings. Previous inspections had noted that there was a discrepancy, and this inspection definitively confirmed that there are 22 ports.

- The flush-wall diffusers on the outfall had moderate marine growth surrounding the outlet, consisting of anemones and tubeworms. Most of the growth was removed for the video, but was left in place for the nearshore ports to reveal that effluent flow was not impeded.

- An abandoned fishing net has been snared by the diffuser at the end. This has occurred since the previous inspection in 2009. There has been no damage caused to the pipe, or impact on effluent flow from any of the ports.

- There were no signs of cracking or damage to the pipe observed at any location. All joints were sealed in grout bands, and no leaking joints were observed.

- The joint harnesses consisted of lugs at the springline, on both sides of the pipe, that were drawn together by stainless steel all-thread rods and single nuts. Each joint harness was inspected closely, including several that had all marine growth removed by wire brush. The all-thread was intact and shiny. The nuts retained the hex heads, that could probably accept a hex wrench if there were a need to action the nuts.

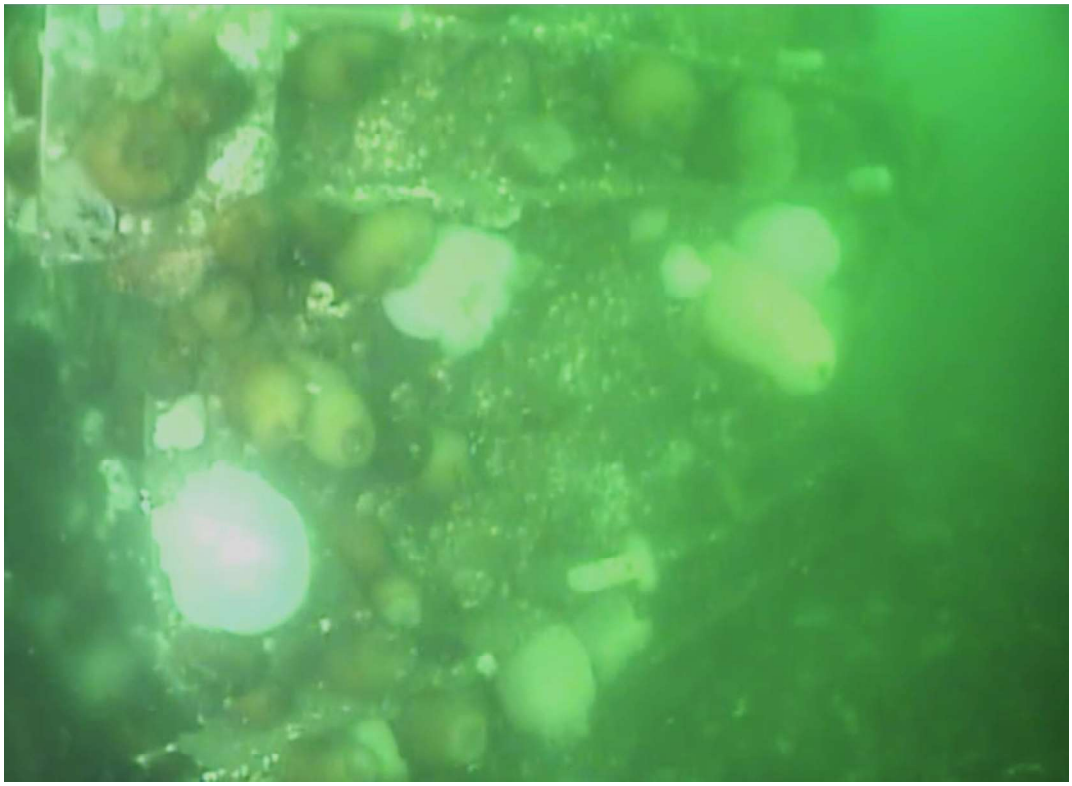
- The outfall was originally held in place with chain tying it to pipe support pads made of 4x12" creosote mats that are 6'-6" in width. The chain that ties the outfall to these mats has deteriorated and no longer provides restraint for the outfall. The restraints may have been installed only for construction purposes and were not intended to be permanent. Regardless, the 47-year-old pipe is stable without any other restraint than the joint harnesses.

- The diffuser end cap consists of a steel end plate held fast by C-shape mild steel channels running horizontal across the cap from 2- to 10-o'clock position and 8- to 4-o'clock position. The C-channels are restrained by stainless tie rods to lugs on the diffuser pipe. Minor leakage of effluent was observed at the end cap restraints, but this is thought to be inconsequential because the volume is very minor, and the function of this portion of the outfall is to diffuser effluent anyway.

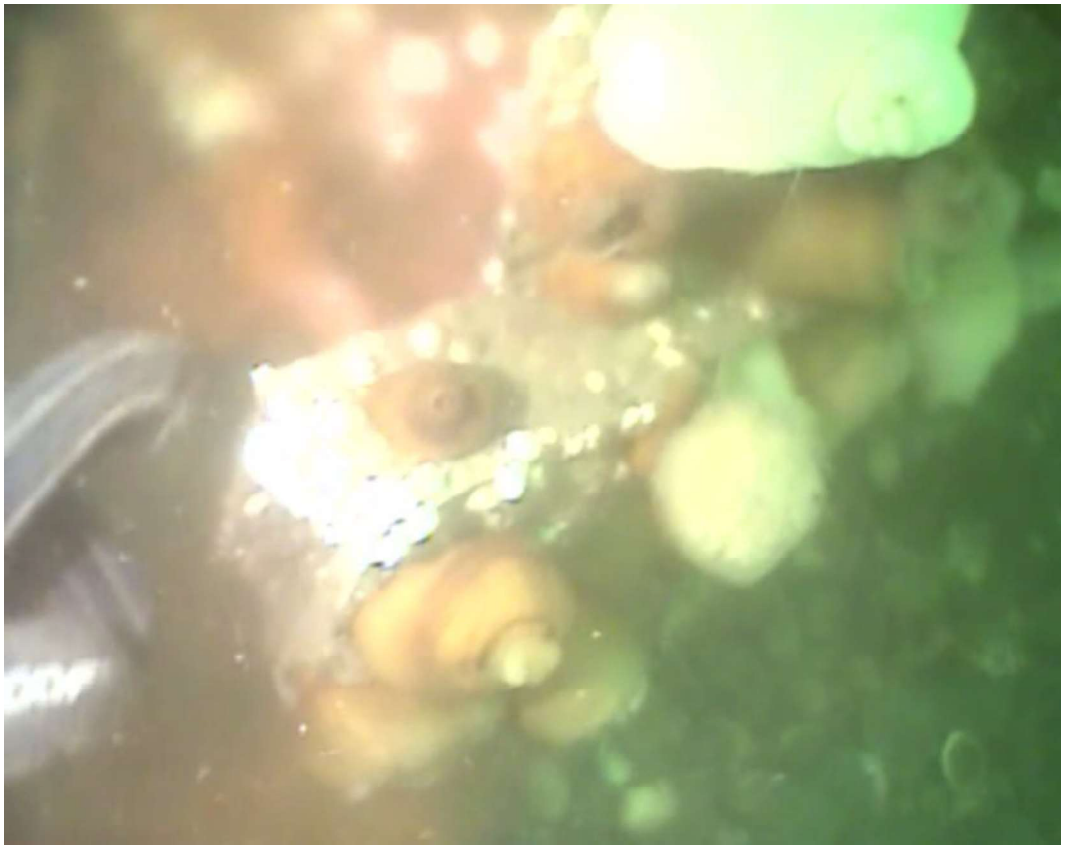
Summary

The RCP outfall and diffuser are in good condition and operating as intended. The presence of 22 diffuser ports rather than 20 shown on the drawings is confirmed.

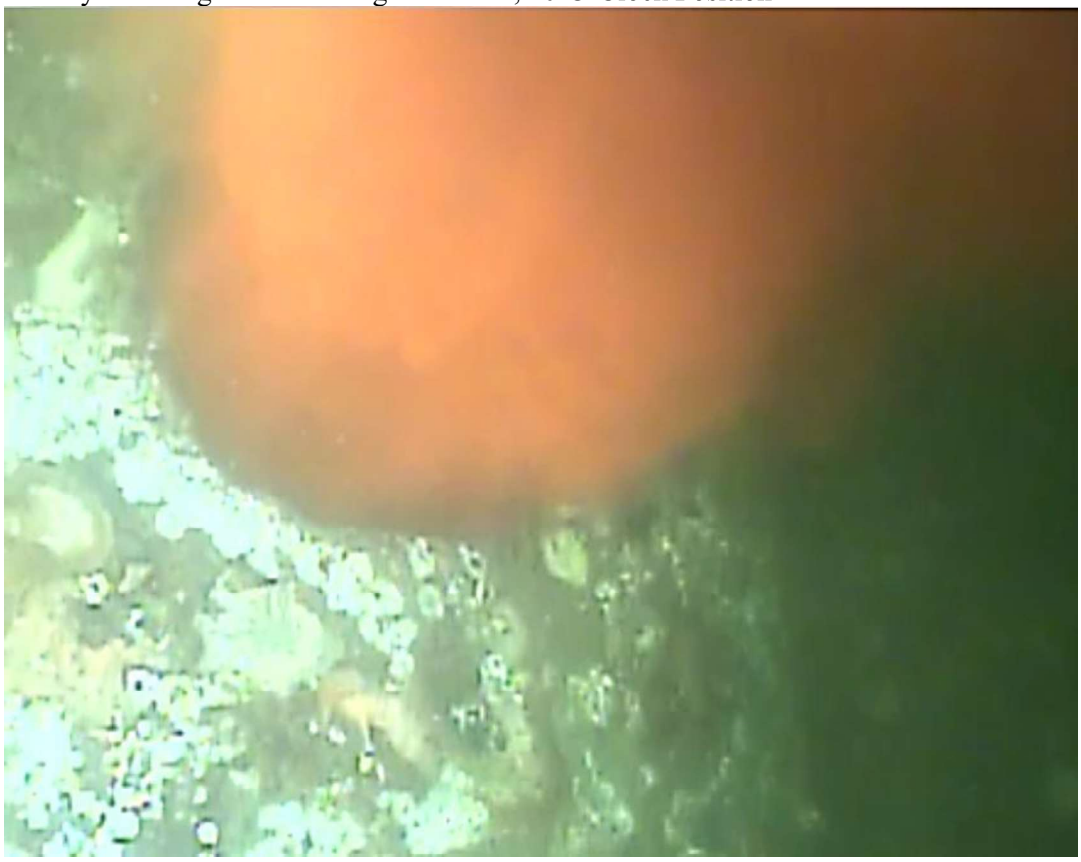
Photos



Blind Flange, Offshore End of Outfall Showing C-Channel Restraints



Red Dye Leaking at Blind Flange Restraint, 10-O'Clock Position



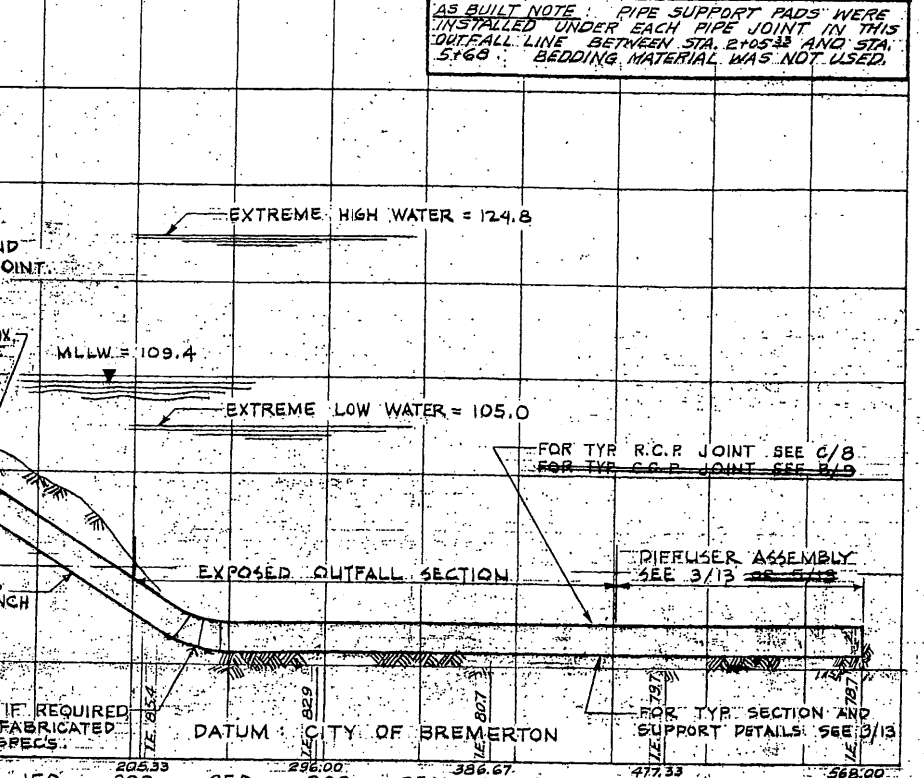
Typical Diffuser Port with Red Dye Discharge

Typical Joint Grout Injection Band

Pipe Joint Restraining Rod

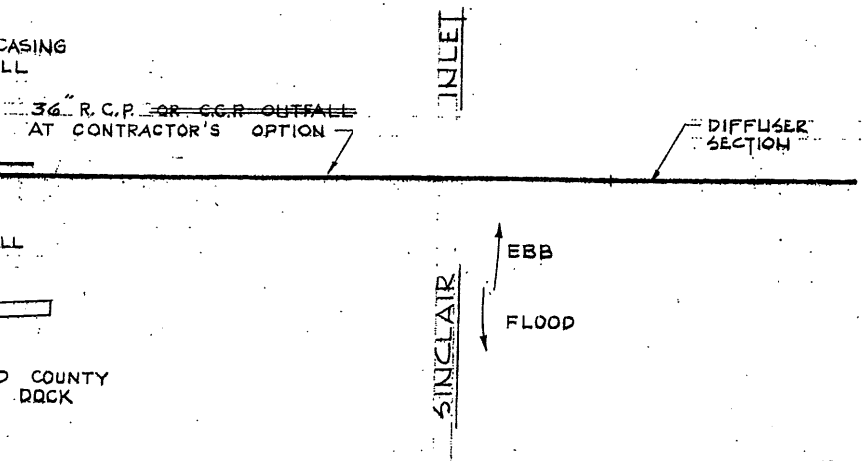
Joint Restraining Lug Attached to RCP Pipe

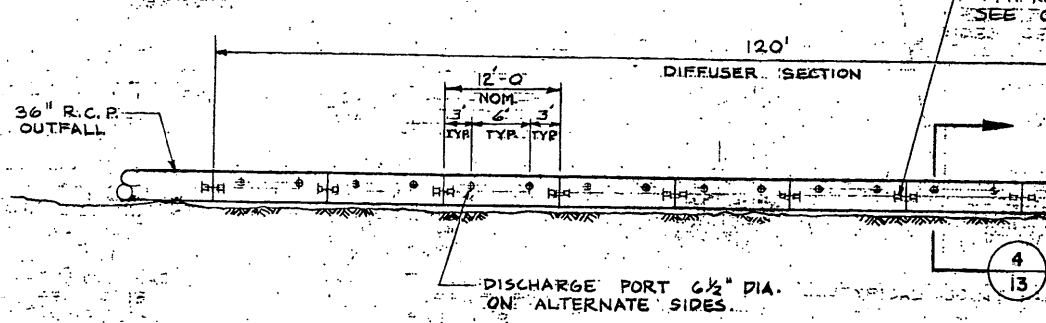
AS BUILT NOTE: PIPE SUPPORT PADS WERE INSTALLED UNDER EACH PIPE JOINT IN THIS OUTFALL LINE BETWEEN STA. 2+05.33 AND STA. 5+68. BEDDING MATERIAL WAS NOT USED.



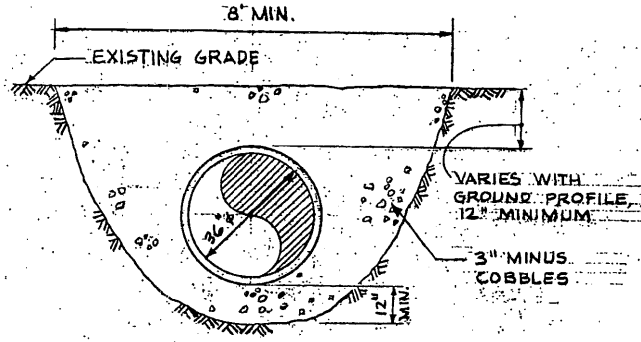
OUTFALL PROFILE (2/13)
SCALE: HORIZ. 1" = 50', VERT. 1" = 10'

NOTE: ALL EXCAVATED MATERIAL, EXCESS CONCRETE, & CONSTRUCTION DEBRIS SHALL BE DISPOSED OF ON LAND.

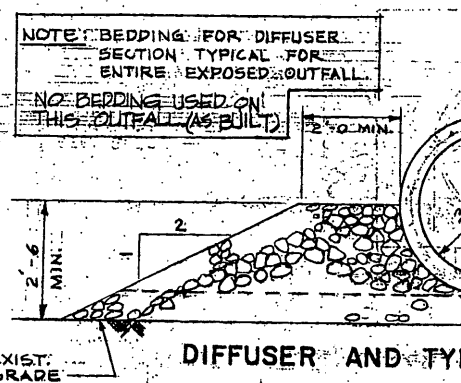




R.C.P. DIFFUSER SECTION PLANT NO. 2 (3/13)
SCALE: 1" = 10'



TYPICAL TRENCH SECTION FOR BURIED PIPE (6/13)
NO SCALE



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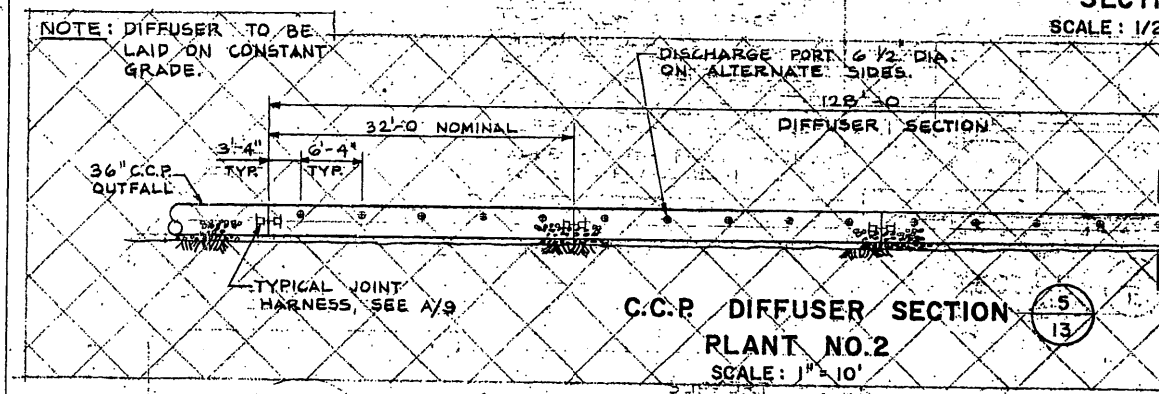
SCALE: 1/2...



C.C.P. DIFFUSER SECTION PLANT NO. 2 (5/13)
SCALE: 1" = 10'