NW Natural
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March 2, 2020

Mr. Randall Bailey
Oregon Department of Environmental Quality
Northwest Region
700 NE Multnomah St.
Suite 600
Portland, OR 97232

Subject: Annual Flow Meter and Outfall Inspections, NW Natural Source Control Groundwater Treatment Facility, 7900 NW St. Helens Road, Portland, NPDES Permit Number 103061 (permit renewal pending with DEQ)

Dear Mr. Bailey:

We have conducted an annual inspection of the NW Natural Groundwater Treatment System flow meters and outfall/diffuser. As per our past flow meter and outfall inspection reports, we are providing the following summary of the inspections, the results of those inspections, and the locations of the inspection reports.

Flow Meter Calibration

Flow meter calibration tests were performed to verify that the compliance effluent flow meter and other process flow meters in the plant are measuring flow accurately, within the limits of the flow meter technology. The tests were performed by Branom Instrument Co. on December 11-12, 2019.

Schedule F, Paragraph C2 of the NPDES permit requires that the flow meters read accurately within +/- 10% to ensure that the measurements of the volume of monitored discharges are accurate.

The complete flow meter calibration report is on file in the office at the Groundwater Treatment System (GTS) plant office. A summary of the data, along with specific process

streams measured, is included in Table 1. We note that the effluent compliance point flow meter (FM 600) measured **97.6%** accurate, based upon the difference in measured flow between the calibrated test flow meter and FM 600.

Table 1: Summary of December 2019 Flow Meter Calibration Testing

2019 NW Natural Flow Meter Test Summary				
Liquid				
Meter Number	**Date Tested**	**Description**	**Within 10% Accuracy?**	**Additional Information**
149	Dec. 11-12, 2019	Siltronic Pretreatment Effluent	Yes	
300	Dec. 11-12, 2019	NW Natural Pretreatment Effluent	Yes	
410	Dec. 11-12, 2019	Spent Backwash Return	NO	Possible air entrainment, or less-than-full pipe *(does not affect process stability or compliance)*
500	Dec. 11-12, 2019	Primary Bag Filter Influent	--	Unable to obtain reading due to possible scaling *(does not affect process stability or compliance)*
580	Dec. 11-12, 2019	GAC Backwash Flow Rate	Yes	
600	**Dec. 11-12, 2019**	**Plant Effluent (compliance point)**	**YES – 97.6%**	
700	Dec. 11-12, 2019	Sludge Feed to Gravity Thickeners	Yes	
720	Dec. 11-12, 2019	Thickened Sludge Feed to Filter Press	Yes	

One process flow meter (Spent Backwash Return Meter--FM 410) tested outside of the 10% window, likely due to entrained air or a less-than-full pipe. The FM 410 meter may not be reading as accurately as possible due to these conditions. The Bag Filter Influent Flow Meter (FM-500) could not be read, also perhaps due to coating on the inside of the pipe or a less-than-full pipe. We will attempt to clean this meter. Neither of these two process flow meters affects process stability or compliance.

A copy of the flow meter test report is attached.

Outfall Inspection Report

Table B2 of the NPDES permit requires that the condition of the GTS plant outfall and diffusers be inspected on an annual basis. On October 1, 2019, a dive team from

Advanced American Construction, Inc. (AAC) inspected the outfall and diffuser and provided us with a written report and video of the inspection. The inspectors found that, although marine growth was prevalent on the underwater portions of the outfall and diffuser, both the outfall and diffuser were in good condition and operating normally.

The dive team recommended replacement of some corroded flanges and the installation of a sacrificial anode on the diffuser to reduce future corrosion potential. Our consultants at Sevenson Environmental Services, Inc. (SES) are working with AAC to prepare a work plan for the divers to address these issues when the weather improves in May or June 2020, specifically:

1. To clean the complete surface of the outfall pipe and diffusers;
2. To check thickness of the pipe in the corroded and pitted areas to determine how much life is left in the structure;
3. To install the sacrificial anode.

In the meantime, SES is developing a cost estimate to construct a spare outfall structure that could quickly replace the existing structure should that prove necessary.

The outfall inspection summary report is attached. A video of the outfall and diffuser, safety protocols, and pre-dive procedures are on file in the GTS plant office.

Certification

I certify under penalty of law that this document and all documents were prepared under my direction or supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete.

I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violation.

If you have any questions about If this package, please contact Terry Driscoll at Aponowich,

Driscoll & Associates, Inc., at (404) 641-8107, tpdriscoll@mindspring.com.

Very truly yours,

Kathryn M. Williams

Kathryn Williams
Vice President of Public Affairs
NW Natural

Attachments:

- Letter from Industrial Systems Inc. dated January 31, 2020 re: Annual flow meter testing and verification for the GASCO water treatment facility
- 2019 Flow Meter Service Report & Data Table from Branom Instrument Co.
- Dive Inspection Report from Advanced American Construction, Inc. dated October 3, 2019

Industrial Systems Inc.

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Vancouver, WA 98682
Phone: (360) 718-7267
Fax: (360) 952-8958
e-mail:is@industrialsystems-inc.com
OR CCB #196597 WA #INDUSSI880K9 AK# 1018436

William "Chip" Byrd
Sevenson Environmental
7900 St Helens Road
Portland, OR 97210

January 31, 2020

Subject: Annual flow meter testing and verification for the GASCO water treatment facility

Dear Mr. Byrd,

Branom Instruments has completed their verification and testing of the flow meters at the subject facility for 2019. Their test report summary and data are enclosed.

Siemens Flow Meters

FIT-071, FIT-085, FIT-205

Branom uses a Siemens flow meter verification tool for the Siemens flow meters at this site. That unit provides verification of the flow meter as a unit and is very precise. It does not however, compare the flow meter reading to another known accurate flow measuring device. This could mean that installation problems or pipe fowling is impacting the flow meter reading without being detected.

The Siemens meters installed at this site include FIT-071, FIT-085 and FIT-205.
All Three Siemens flow meters passed the systems tests. Certificates are enclosed herewith.

ISOMAG Flow Meters

FIT-140, FIT-300, FIT-410, FIT-500, FIT-580, FIT-600, FIT-700, FIT-720

For testing of meters other than the Siemens brand, Branom uses a Siemens FUP-1010 clamp on ultra-sonic flow meter. The unit is clamped to the pipe near the meter being tested and flow readings it provides are compared to those provided by the installed meter. This flow meter is quite accurate but is subject to errors due to irregular surfaces on the pipe that can cause less than ideal surface contact. Scaling or buildup on the inside of the pipe can also cause inaccuracies in the meter's readings as this impacts the transit time of the ultra-sonic signal.

The test process for these meters included taking several manual readings from the installed meter and well as from the test meter. This was done over various flow ranges where possible.

The testing process went off much more smoothly this year than in some years past.

The test results for FIT – 410 indicate that the pipe may not be full of liquid and or there may be entrained air in the pipe. Repositioning the test meter yielded acceptable test results in the end.

FIT-500 verification was not successful and it is expected there may be build up inside the pipe or again, there may be a less than full pipe condition.

The remaining meters listed above produced satisfactory flow reading when compared to the clamp on meter.

Summary

Generally the flow meters at this site tested well.

In the future it may be worth considering replacing and or relocating FIT-410 and FIT-500

Branom, the company that completed this testing, is scheduled to do some sample flow meter testing using a different clamp on meter. The results of that sample testing will be provided when available.

If you have any questions or comments about this information please contact us.

Best Regards,

Troy B. Collison 1/31/2020

Troy B. Collison Date

Enclosures:
Branom Test Report
Branom Test Data
Siemens flow meter certificates

Technician: Rocky Desai
Branom Instrument Company
rdesai@branom.com
503-730-6104

Service Order: SO-04132
Service Dates: 12/10/19 – 12/11/19

Customer:
Industrial Systems Inc
12119 NE 99th Street, Suite #2090
Vancouver, WA 98682

Test Instruments:

Test Instrument	Serial Number	Calibration Date	Calibration Due
Fluke 744 Documenting Process Calibrator	8666002	11/18/2019	11/18/2020
Fluke 87 III True RMS Multimeter	75560598	7/18/2019	7/18/2020
Siemens FUP1010 Ultrasonic Flowmeter	35526	NA	NA
Siemens Verificator FDK-083F5061	N1E4300035	NA	2/6/2020
Simpson 372-3 Ohmmeter	NA	NA	NA

Siemens Magflo Magnetic Flowmeter Verifications:

See verification certificates for test parameters and data. Display replaced on FIT-071. Sunlid replaced on FIT-085.

TAG	603803 Result	Recommendation
FIT-071	Pass	None
FIT-085	Pass	None
FIT-205	Pass	None

See verification certificates for test parameters and data.

Clamp-On Comparison Testing of ISOIL Magnetic Flowmeters using Siemens FUP-1010:

Procedure:

Flow comparison tests were performed between the Isoil Magnetic Flowmeters and the Siemens FUP-1010 Ultrasonic Clamp-On Flowmeter. Numerous readings were observed and an average percent difference and percent difference of range (set in the ISOIL meter) was calculated for each meter.

The accuracy of the FUP-1010 is limited without known pipe wall thickness and fluid temperature. Fluid properties differing from pure water (suspended solids, viscosity, S.G., etc.) may also affect accuracy as well as deposits/corrosion on the inside or outside of the pipe. In addition, the best

accuracy is achieved under standard conditions defined by Siemens as "measurements taken on a straight run of 15 diameters upstream and 5 diameters downstream; flow rate above 1 fps; non-aerated Newtonian liquids flowing at Reynolds numbers <2000 or >10000".

The FUP-1010 reports the velocity of sound measured through the fluid (Vs), the signal strength (ALC), and the level of aeration (AER) which may include suspended particles and turbulence. Layers of paint, corrosion, or coating on the inside or outside of the pipe affect the signal strength or pipe diameter. A Vs close to the estimated Vs indicates the physical installation and programmed parameters are likely correct. Low ALC and/or high AER may indicate that the accuracy is limited. Clamp-on comparison testing does not reference a known standard or determine how close the flow observed is to the actual flow. In practice, a difference of 5% or less indicate the meter is likely functioning correctly and reading flow accurately. Results higher than 5% may issues with the FUP-1010 installation or programming or may indicate issues with the pipe, fluid, or meter being tested. See recommendations for any suspected issues and corrective action.

Data and Discussion:

See document "SO-04132 Data" for data summary.

FIT-140:

The FUP-1010 installation was not successful during the first attempt due to low signal strength. The customer cleaned the pipe and the second installation was successful. The Vs, ALC, and AER were all excellent. The results support the conclusion that the meter is functioning accurately and as intended.

FIT-300:

The measured Vs indicated a good installation the FUP-1010. The low signal strength indicated the possibility of coating on the inside of the pipe. This could also be due to corrosion on the outside of the pipe. The AER was moderate indicating air, turbulence, or particulate matter in the fluid. Despite these issues the results were excellent and support the conclusion that the meter is functioning accurately and as intended.

FIT-410:

Installing the transducers on the upper half of the pipe was unsuccessful due to low signal strength. Installation on the lower half of the pipe was successful. The measured Vs was acceptable but not as close as desired, the signal strength was excellent, and the AER was high. The percent difference in flow was also higher than desired. A possible explanation for these observations would be a less than full pipe or entrained air in the fluid. Issues with the pipe and fluid would be the most likely explanation for the difference in flow observed. The meter may not be reading the flow as accurately as possible due to these suspected issues.

Branom Instrument Co.
Since 1947
BRANOM INSTRUMENTATION

FIT-500:

The FUP-1010 installation was not successful. Numerous attempts were made with different locations, transducers, and pump speeds. Coating on the inside of the pipe, a less than full pipe, or entrained air in the fluid are possible explanations. It is not possible to determine if the meter is recording flow accurately.

FIT-580:

The Vs, ALC, and AER were all excellent and the percent difference in flow observed was very low. The results support the conclusion that the meter is functioning accurately and as intended.

FIT-600:

The pipe was cleaned before testing. The Vs, ALC, and AER were all excellent and the percent difference in flow observed was very low. The results support the conclusion that the meter is functioning accurately and as intended.

FIT-700:

The meter is measuring the flow produced by diaphragm pumps. The routing of the piping was changed from last year and a new transmitter installed. The Vs was not as close as desired, the ALC was very good, and the AER was moderately higher than desired. The diaphragm pump could be producing turbulence or injecting air into the fluid. Despite this the results were acceptable indicating that the meter is likely functioning relatively accurately.

FIT-720:

The Vs was lower than desired, the ALC was very good, and the AER was moderately higher than desired. The ISOIL meter was also seen to fluctuate while the FUP-1010 remained steadier. These factors could indicate turbulence or air in the fluid. The percent difference in flow observed was acceptable indicating that the meter is likely functioning relatively accurately.

Rocky Desai
12/18/19

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SO-04123

Industrial Systems

12/10/19-12/11/19

TAG	Vs Est (m/s)	Vs (m/s)	ALC	AER	Range (GPM)	ISOIL (AVG GPM)	FUP1010 (AVG GPM)	AVG DIFFERENCE (GPM)	% Difference (GPM)	% Difference of Range (GPM)
FIT-140	1456	1452	53	5	300	68.4	73.7	5.3	7.4%	1.8%
FIT-300	1449	1455	11	12	2800	158.1	161.5	3.4	2.1%	0.12%
FIT410	1460	1433	27	15	250	36.6	32.4	4.2	12.2%	1.7%
FIT-580	1460	1461	38	7	2800	829.2	820	9.2	1.1%	0.33%
FIT-600	1468	1467	32	8	2800	158.8	155.1	3.7	2.4%	0.13%
FIT-700	1461	1421	29	9	300	41.3	44.5	3.2	7.5%	1.07%
FIT-720	1473	1437	35	9	299.6	7.9	7.4	0.5	7.0%	0.18%

MAGFLO® Verification Certificate

Customer:

Name	Industrial Systems Inc
Address	5835 NE 122nd Ave
	Portland, OR 97230
Phone	503-262-0367
Email	

MAGFLO® Identification:

TAG No./Name	0
Sensor Code No.	7ME634
Sensor Serial No.	208601U493
Transmitter Code No.	7ME69101AA101AA0
Transmitter Serial No.	IXFO1612292
Location	FIT-071

Results:

Verification file name or No.		SO-04132 FIT-071
Transmitter		Passed
Sensor	Insulation	Passed
	Magnetic Circuit	Passed

Velocity	Current Output			Frequency Output		
Theoretical	Theoretical	Actual	Deviation	Theoretical	Actual	Deviation
0.5m/s	4.800mA	4.801mA	0.16%	0.500kHz	0.500kHz	-0.03%
1.0m/s	5.600mA	5.602mA	0.15%	1.000kHz	1.001kHz	0.08%
3.0m/s	8.800mA	8.801mA	0.03%	3.000kHz	3.002kHz	0.06%
	Current Output 4-20mA			Frequency Output 0-10kHz		

Transmitter Settings:

Basic	Qmax.	154.000 US G /min
	Flow Direction	Positive
	Low flow Cut-off	1.50%
	Empty Pipe	ON
Output	Current Output	ON (4-20mA)
	Time Constant	1.0 Sec.
	Relay Output	Error Level
	Digital Output	Pulse
	Frequency Range	N/A
	Time Constant	N/A
	Volume/pulse	0.99999953 US G/p
	Pulse width	0.066 sec.
	Pulse polarity	Positiv
Totalizer 1 value before test		26511322.74527123 US G
Totalizer 1 value after test		26511326.87295955 US G
Totalizer 2 value before test		7250.4775177 US G
Totalizer 2 value after test		7250.47852684 US G
Operating time in days		1404

Sensor Details:

Size	DN 50 2 IN
Cal. Factor	2.07868266
Correction Factor	1.0
Excitation Freq.	15.0Hz

Verificator Details (083F5061)

Serial No.	N1E4300035
Device No.	140017
Software Version	1.40
PC-Software Version	5.01
Cal. date	2019.02.06
ReCal. date	2020.02.06

Comments

Meter passed all tests.

These tests verify that the flowmeter is functioning within 2% deviation of the original test parameters.

Verification is traceable to National and International Standards.

Date and signature

2019.12.10 Rocky Desai

NWN-PCI0778254

MAGFLO® Verification Certificate

Customer:

Name	Industrial Systems Inc
Address	5835 NE 122nd Ave
	Portland, OR 97230
Phone	503-262-0367
Email	

MAGFLO® Identification:

TAG No./Name	0
Sensor Code No.	7ME634
Sensor Serial No.	PBD-J2250001
Transmitter Code No.	7ME691
Transmitter Serial No.	N1H8250178
Location	FIT-085

Results:

Verification file name or No.		SO-04132 FIT-085
Transmitter		Passed
Sensor	Insulation	Passed
	Magnetic Circuit	Passed

Velocity	Current Output			Frequency Output		
Theoretical	Theoretical	Actual	Deviation	Theoretical	Actual	Deviation
0.5m/s	4.800mA	4.800mA	0.03%	0.500kHz	0.500kHz	-0.06%
1.0m/s	5.600mA	5.603mA	0.17%	1.000kHz	1.002kHz	0.15%
3.0m/s	8.800mA	8.800mA	0.00%	3.000kHz	3.002kHz	0.05%
	Current Output 4-20mA			Frequency Output 0-10kHz		

Transmitter Settings:

Basic	Qmax.	300.000 US G /min
	Flow Direction	Positive
	Low flow Cut-off	1.50%
	Empty Pipe	OFF
Output	Current Output	ON (4-20mA)
	Time Constant	5.0 Sec.
	Relay Output	Error Level
	Digital Output	Pulse
	Frequency Range	N/A
	Time Constant	N/A
	Volume/pulse	0.99999953 US G/p
	Pulse width	0.066 sec.
	Pulse polarity	Positiv
Totalizer 1 value before test		91.81721538 US MG
Totalizer 1 value after test		91.81721538 US MG
Totalizer 2 value before test		0.01637474 US MG
Totalizer 2 value after test		0.01637523 US MG
Operating time in days		1007

Sensor Details:

Size	DN 100 4 IN
Cal. Factor	8.09920597
Correction Factor	1.0
Excitation Freq.	7.5Hz

Verificator Details (083F5061)

Serial No.	N1E4300035
Device No.	140017
Software Version	1.40
PC-Software Version	5.01
Cal. date	2019.02.06
ReCal. date	2020.02.06

Comments

Meter passed all tests.

These tests verify that the flowmeter is functioning within 2% deviation of the original test parameters.

Verification is traceable to National and International Standards.

Date and signature

2019.12.10 Rocky Desai

MAGFLO® Verification Certificate

Customer:

Name	Industrial Systems Inc
Address	5835 NE 122nd Ave
	Portland, OR 97230
Phone	503-262-0367
Email	

MAGFLO® Identification:

TAG No./Name	0
Sensor Code No.	7ME634
Sensor Serial No.	208701U493
Transmitter Code No.	7ME691
Transmitter Serial No.	231230U463
Location	FIT-205

Results:

Verification file name or No.		SO-04132 FIT-205
Transmitter		Passed
Sensor	Insulation	Passed
	Magnetic Circuit	Passed

Velocity	Current Output			Frequency Output		
Theoretical	Theoretical	Actual	Deviation	Theoretical	Actual	Deviation
0.5m/s	4.800mA	4.799mA	-0.13%	0.500kHz	0.500kHz	0.06%
1.0m/s	5.600mA	5.597mA	-0.16%	1.000kHz	1.000kHz	-0.02%
3.0m/s	8.800mA	8.797mA	-0.06%	3.000kHz	3.002kHz	0.06%
	Current Output 4-20mA			Frequency Output 0-10kHz		

Transmitter Settings:

Basic	Qmax.	500.000 US G /min
	Flow Direction	Positive
	Low flow Cut-off	1.50%
	Empty Pipe	ON
Output	Current Output	ON (4-20mA)
	Time Constant	5.0 Sec.
	Relay Output	Error Level
	Digital Output	Pulse
	Frequency Range	N/A
	Time Constant	N/A
	Volume/pulse	0.99999953 US G/p
	Pulse width	0.066 sec.
	Pulse polarity	Positiv
Totalizer 1 value before test		464.89763916 US MG
Totalizer 1 value after test		464.89767218 US MG
Totalizer 2 value before test		0.31484491 US MG
Totalizer 2 value after test		0.31484517 US MG
Operating time in days		2162

Sensor Details:

Size	----------
Cal. Factor	17.97178841
Correction Factor	1.0
Excitation Freq.	3.75Hz

Verificator Details (083F5061)

Serial No.	N1E4300035
Device No.	140017
Software Version	1.40
PC-Software Version	5.01
Cal. date	2019.02.06
ReCal. date	2020.02.06

Comments

Meter passed all tests.

These tests verify that the flowmeter is functioning within 2% deviation of the original test parameters.

Verification is traceable to National and International Standards.

Date and signature

2019.12.16 Rocky Desai

Advanced American Construction

Advanced-American.com

DIVE INSPECTION REPORT

NW Natural - Gasco Willamette River Outfall Diffuser Inspection

Sevenson Environmental Services, Inc

REPORT DATE: **October 3, 2019**

PREPARED FOR: **William "Chip" Byrd**

PREPARED BY: **Trevin Belveal**
Advanced American Construction

AAC Job Number: 1119-057/01110

Advanced American Construction, Inc.
Post Office Box 83599 • Portland, Oregon 97283
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Website: www.callaac.com • CCB# 167886

October 3, 2019

William "Chip" Byrd
Sevenson Environmental Services, Inc
2749 Lockport Rd
Niagara Falls, NY 14305

Phone: 503-286-1785
Email : wbyrd@sevenson.com

Diving Inspection Report

NW Natural Gasco Willamette River Outfall Diffuser Inspection

Inspection Date: October 1, 2019

Job Location: 7900 NW Saint Helens Rd, Portland, OR / Willamette RM 6

On October 1st, 2019, Advanced American Construction, Inc. (AAC) supplied a three-man dive crew for inspection at the NW Natural Gasco Willamette River Outfall Diffuser. The dive team was equipped with a surface supplied air dive system, underwater video and topside communication. The crew was staged from a 26' dive boat and secured to the dock. Crew launched the dive boat at AAC's shop and traveled to the site.

Background: The outfall consists of an 8'' diameter steel pipe that extends downward into the water. A flange connection then directs the pipe 90 degrees to the horizontal direction inshore. Four - 2" diffuser ports are attached to the crown of the main outfall pipe and have a 24'' spacing, extending 22" vertically with a 45-degree bend at the top pointing downstream. At the end of the outfall pipe is a blind flange bolted to the pipe. The main pipe is welded to a horizontal member above surface for support. Additionally, a piece of vertical channel extends down into the water and is welded to the main outfall pipe between diffusers #3 and #4. See figure 1 for outfall details.

Scope of Work:

AAC dive crew performed an inspection of the outfall piping to determine current conditions and functionality

- Main 8" outfall pipe condition
- All flange connections and hardware conditions
- Diffusers #'s 1, 2, 3, and 4 conditions
- Welded supports conditions
- GPM flow test performed in conjunction with onsite representative

Conditions Found

Main 8" outfall pipe:

- Pipe had both minor corrosion and marine growth build up present. Pitting was also present on pipe after it was cleaned off.
- Overall integrity of the pipe was determined to be good with no discrepancies noted.
- Pipe was securely hanging in water column with very little movement when checked by the diver.

Flange connections:

- Both the vertical flange that was installed prior to the 8" main pipe turns horizontal in water and the blind flange had all hardware present and tight. Hardware and flange highly corroded and marine growth build-up present (see Figures 3,4, and 5)
- During GPM flow testing no flow was detected leaking from the flanges.

Diffusers:

- Diffuser #1 – Welded connection to crown of main 8" pipe was in good condition with no cracks. Pipe had both rust corrosion and marine growth build up present. Pitting was present on pipe. Diffuser was not obstructed, and no cover or screen was present.
- Diffuser #2 - Welded connection to crown of main 8" pipe was in good condition with no cracks. Pipe had both rust corrosion and marine growth build up present. Pitting was present on pipe. Diffuser was not obstructed, and no cover or screen was present.
- Diffuser #3 - Welded connection to crown of main 8" pipe was in good condition with no cracks. Pipe had both rust corrosion and marine growth build up present. Pitting was present on pipe. Diffuser was not obstructed, and no cover or screen was present.
- Diffuser #4 - Welded connection to crown of main 8" pipe was in good condition with no cracks. Pipe had both rust corrosion and marine growth build up present. Pitting was present on pipe. Diffuser was not obstructed, and no cover or screen was present.

Welded metal supports:

- Above surface horizontal support welded to 8" outfall pipe was in good working order with no broken welds present. (Figure 10)
- Below water vertical channel that is welded to 8" outfall pipe was in good working order with no broken welds present. Below water section was heavily corroded with marine growth and minor pitting is present. (Figures 11 and 12)

GPM flow test: In conjunction with site rep flow was brought up to 305 and 800GPM.

- Diver noted that diffuser #1 had the strongest flow and it began tapering down as he moved down to each diffuser with #4 being the weakest.
- During the flow test diver inspected all components of the submerged section of the outfall and no leaks were present.

Table 1

Diffuser Reference	305 GPM Flow Test	800 GPM Flow Test
1	Heavy bubbles	Heavy bubbles
2	Moderate bubbles	Moderate bubbles
3	Light bubbles & effluent	Light bubbles & effluent
4	effluent	effluent

Recommended Correction Action:

- Consider replacing the corroded flange hardware.
- Weld an anode to the 8" outfall pipe to provide corrosion protection.
- Perform annual inspections to monitor condition of outfall components.

A link for the final inspection video will be provided by email.

Thank you for the opportunity to work with you on this project. If you have questions, please contact me directly at 503-445-9000.

Sincerely,

Scott Miller
Advanced American Construction, Inc.

DIAGRAMS & PICTURES

Figure 1- Sevenson Environmental Services, Inc Outfall Pipe Details. Dwg. No. OF-2 Section A 6
Figure 2 – 8" Outfall pipe marine growth and rust scale build-up, middle area is cleaned are that exposes pitting 7
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Figure 11- Below water vertical support with marine growth, rust build up and clean area exposing pitting 11
Figure 12- Above water view of vertical channel support welded into horizontal support 12

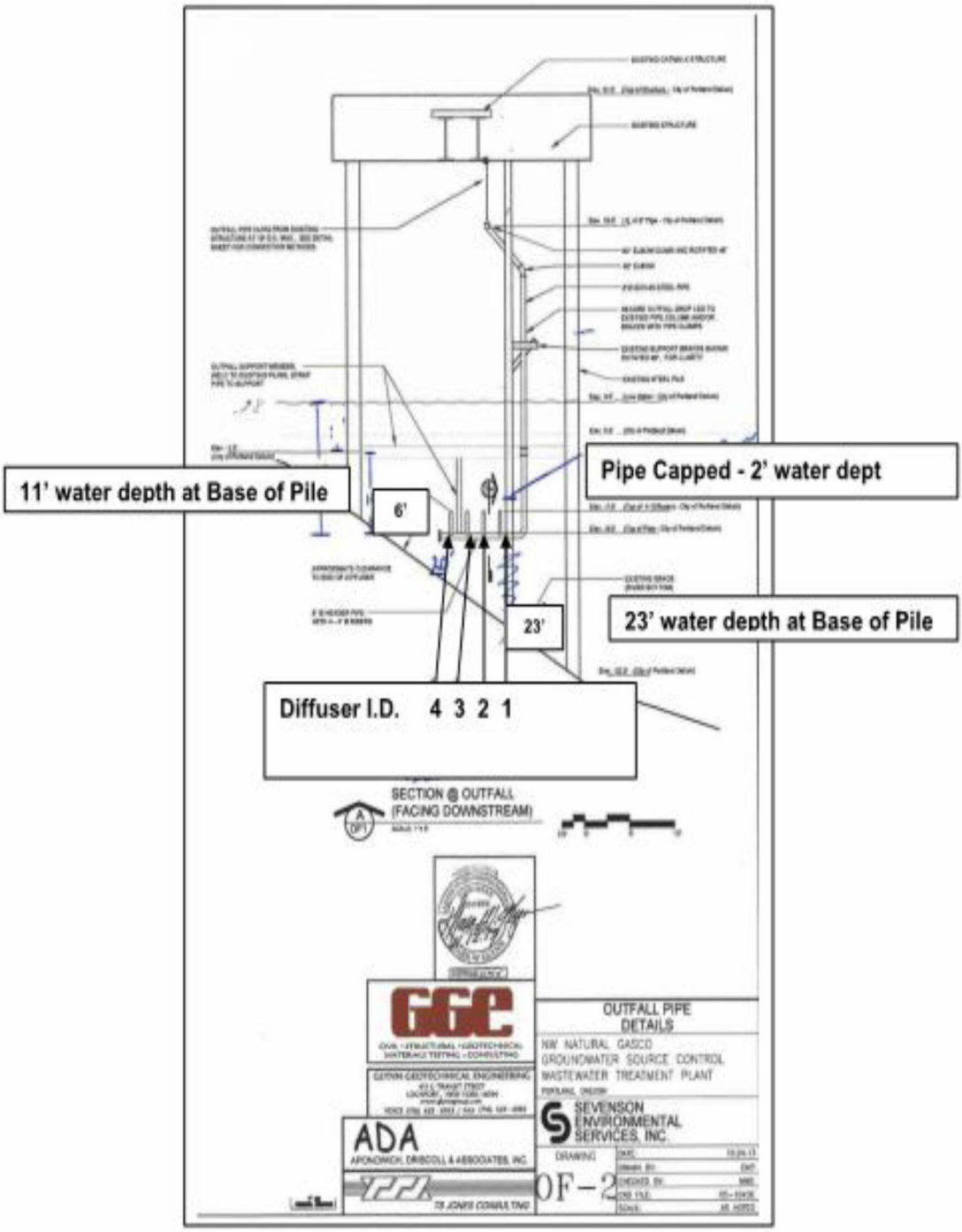

Figure 1- Sevenson Environmental Services, Inc Outfall Pipe Details. Dwg. No. OF-2 Section A

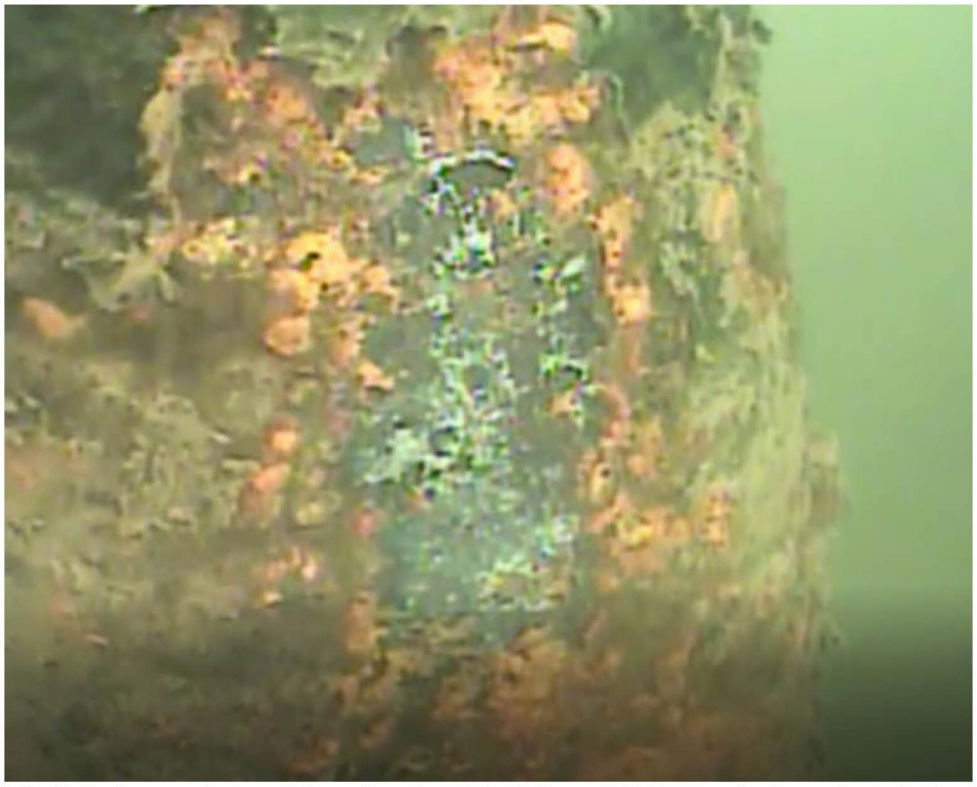

Figure 2 – 8" Outfall pipe marine growth and rust scale build-up, middle area is cleaned are that exposes pitting

Figure 3- Blind Flange and hardware

Figure 4- Blind flange and hardware from backside

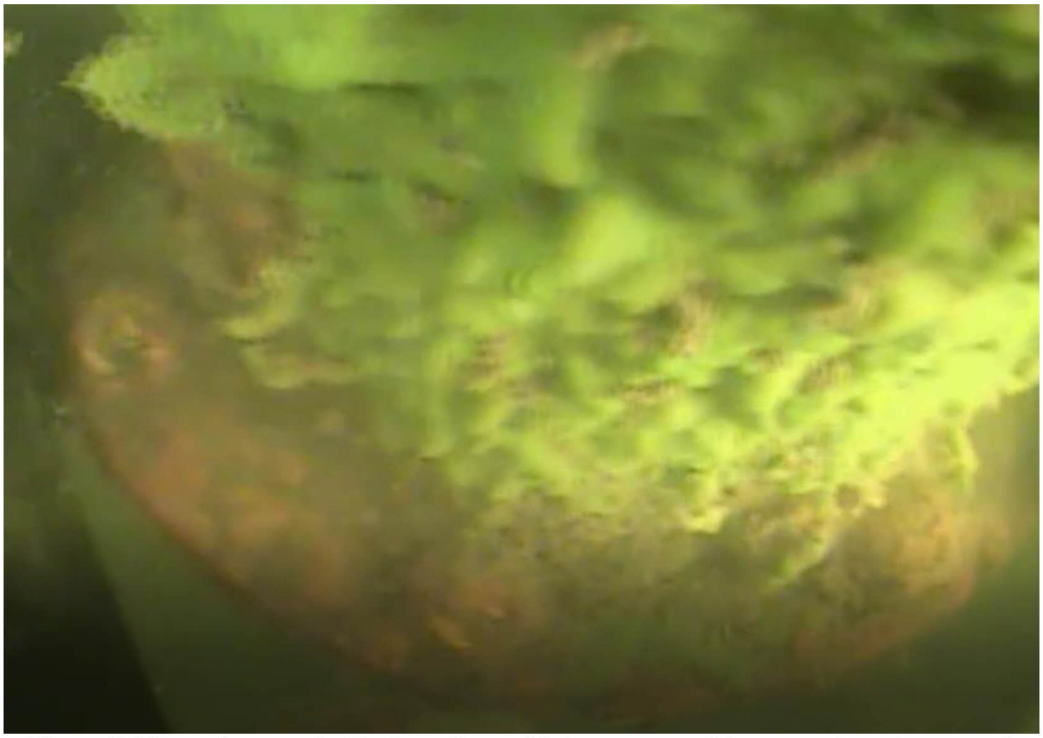

Figure 5- Flange from main 8" pipe prior to 90 degree turn with rust and marine growth

Figure 6- Diffuser #1 during flow test

Figure 7- Diffuser #2 during flow test

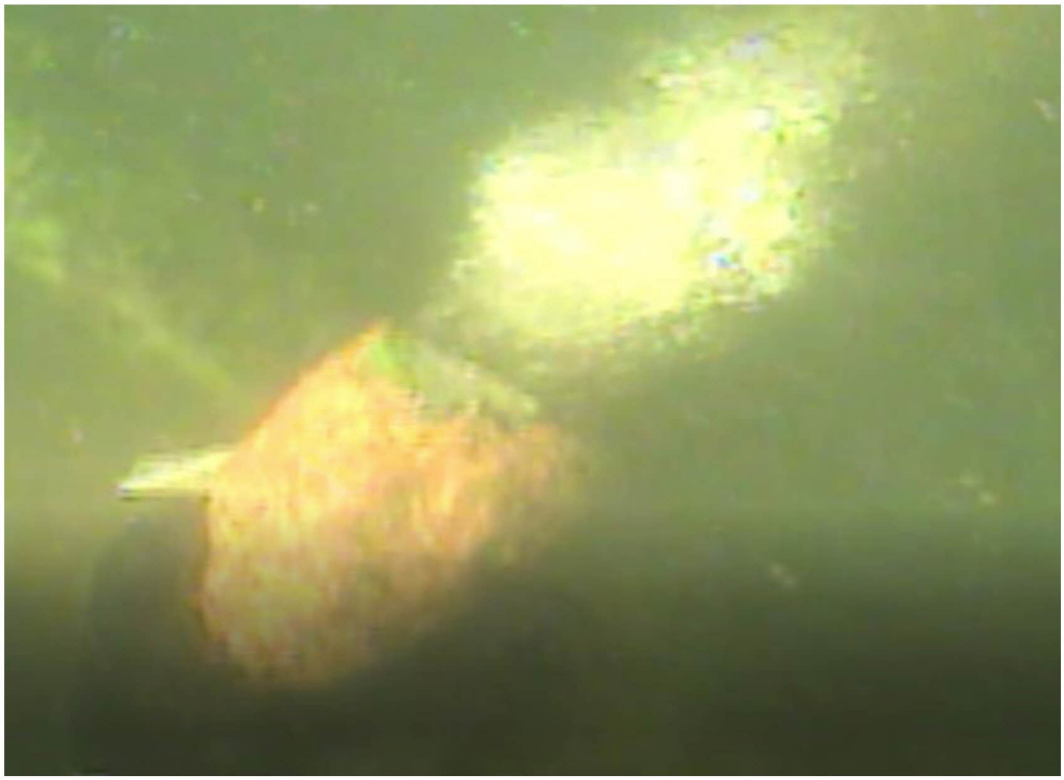

Figure 8- Diffuser #3 during flow test

Figure 9- Diffuser #4 during flow test

Figure 10- Above water of 8" pipe welded to horizontal support

Figure 11- Below water vertical support with marine growth, rust build up and clean area exposing pitting

Figure 12- Above water view of vertical channel support welded into horizontal support