Ultraviolet Light Disinfection Pilot Study Report

Easton Beach

Newport, RI

December 2007

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UV DISINFECTION PILOT STUDY REPORT
Easton Beach Newport, RI

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EXECUTIVE SUMMARY

From September to October 2007, Fuss & O'Neill operated a pilot ultraviolet (UV) disinfection system. This system was truck mounted and capable of treating up to 3 million gallons per day of water. The purpose of this testing was to confirm that UV disinfection could significantly reduce bacteria loadings being discharged from the moat as well as collect data that would be required for final design of a permanent UV disinfection system.

On-site pilot and off-site collimated beam testing results demonstrate UV disinfection as an effective method of inactivating pathogenic bacteria. Field conditions are characterized by wide variations in stormwater volume, UV transmittance (UV_T) and bacterial loads. On-site pilot results are in keeping with or better than the design parameters that were used to evaluate UV disinfection in the September 2007 Final Report for the Easton Pond Dam and Moat Study. Average on-site measurements on the Moat discharge for UV_T)and Total Suspended Solids (TSS) were both better in terms of treatment potential than what was assumed in the report (UV_T higher than 55% and TSS lower than 30 mg/L); therefore, the conceptual design appears to have been conservative in terms of evaluating treatment potential.

While stormwater flows in the Moat are variable to the degree that no one "typical" set of characteristics may be defined, the pilot plant achieved disinfection efficiencies below the beach closure standard of 104 *Enterococci* colonies per 100 mL. These efficiencies were observed even in storm water flows having significant amounts of total suspended solids (TSS) and correspondingly low UV_T. A precipitation event representative of these stormwater characteristics occurred on October 27, 2007. Pilot plant influent water quality was measured as: 17.6 ºC, pH 7.32 s.u., conductivity 9,000 µS/cm/ºC, Salinity 4.9 ppt, UV_T 65%, and TSS 11 mg/L. On October 27th, 2007, the pilot plant was operated at a load of 1,250 gallons per minute (63% of maximum hydraulic capacity), at a UV dose of 117 mW/cm², with the following results: *Enterococci* at inlet, 600 Col/100 ml, *Enterococci* at outlet, 1 Col/100 ml.

The only exception to the observed treatment effectiveness was an event on October 12, 2007, when significant wave action caused a significant amount of sand and floatables (e.g. seaweed) to enter into the pilot system. Because of this, a full-scale system needs to be designed to control sand and seaweed from entering the system.

1.0 INTRODUCTION

The September 2007 Final Report for the Easton Pond Dam and Moat Study identified ultra-violet (UV) disinfection of the moat discharge as having the best potential to improve surface water quality specifically related to bacteria loadings at Easton Beach. From September to October 2007, Fuss and O Neill operated a 3 million gallon per day (MGD) pilot ultraviolet (UV) disinfection system to treat wet-weather discharges from the Easton Pond Moat with two objectives. The first objective was to confirm that a UV system would actually be effective in reducing bacteria loads to a level that would significantly improve water quality at the beach. The second objective was to collect operational data that would be needed for final design of the system including UV transmittance and Total Suspended Solids of the moat discharge with related UV dose/sample response.

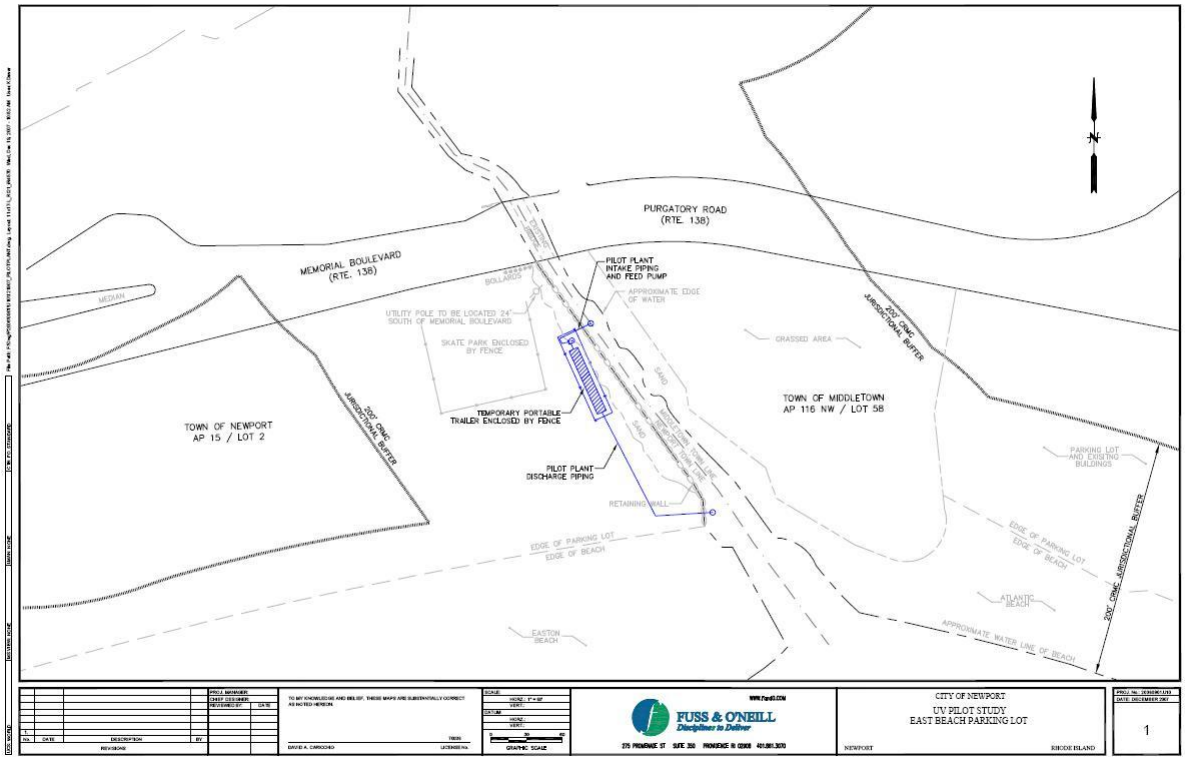
The September 2007 Final Report for the Easton Pond Dam and Moat Study, evaluated UV disinfection based on moat water quality of 30 mg/L TSS and a UV transmittance (UV_T) of 55%. Those figures were largely assumptions, based on limited knowledge of typical storm water runoff quality and only a single round of grab samples that were collected in March 2007.

The originally proposed one month study was extended from September through October due to lack of wet weather sampling events in September. Operation of the pilot plant allowed Fuss and O Neill to develop dose/response curves over a wide range of influent water quality conditions and UV system parameters.

2.0 DESCRIPTION OF PILOT PLANT EQUIPMENT

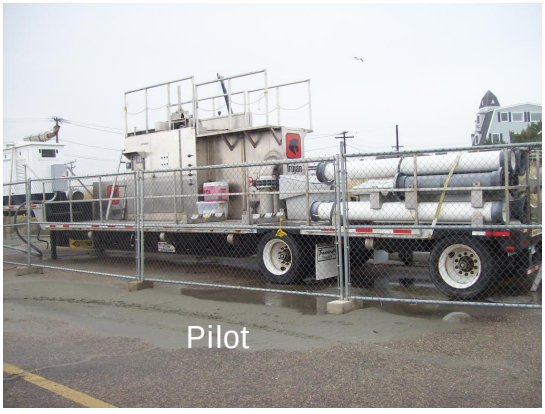
The pilot plant operated at the Easton Beach site consisted of three principal components: the UV treatment system, a feed pump and associated piping. Figure 1 is a site plan that indicates locations of the pilot plant, intake and outlet piping, and temporary electrical service.

Figure 1



2.1 UV Disinfection System

The pilot plant was mounted on a standard 48-foot flatbed trailer. Temporary fencing was erected to protect the equipment. The operational components of the plant consisted of stainless-steel influent and effluent tanks, a reactor containing two UV lamp banks each containing four medium-pressure ultraviolet lamps, an electrical control cabinet, and supporting mechanical and electrical apparatus. Other equipment mounted on the trailer included a 105-kW diesel generator, storage bins, and 12-inch piping.


Pilot

Power to the plant was provided by a standard 277/480-volt 3-phase utility service. The on-board generator was not operated. All operations of the

plant were controlled by a programmable logic controller (PLC) included in the pilot plant. Inputs to the PLC included operator commands from the keypad and instrumentation. System operating parameters displayed on the PLC included flow, UV dose, and UV_T from sensors incorporated in the pilot plant. Fuss & O Neill provided a standard data logger to record continuous UV_T values while connected to the pilot plant's PLC.

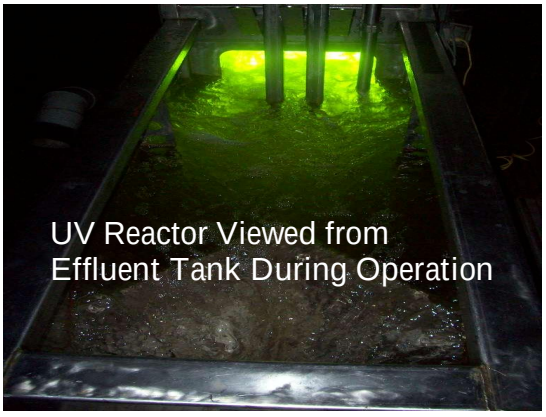

Influent Tank and Punch

Discharge was pumped from the Moat into the pilot plant through a 10-inch diameter feed pipe. A 1½ -inch stainless steel punch plate mounted in the inlet tank protected the lamps from large debris.

Water flowed from the inlet screen by gravity through the UV reactor and effluent tanks. The effluent then passed over an internal weir and into a discharge manifold and ultimately back to the Moat approximately 100 feet downstream of the pilot intake point.


Effluent

In the reactor, medium-pressure lamps generated polychromatic light in a band centered at the 254-nm wavelength, which is optimal for bacteriocidal effects. The light penetrated the cell wall of microorganisms and was absorbed by cellular components including RNA and DNA, inactivating them.


UV Reactor Viewed from Effluent Tank During Operation

Supporting equipment for the UV reactor consisted of liquid-cooled electronic ballasts (one per lamp) and hydraulically operated wiper rings mounted on each lamp. The wiper rings automatically cycled at operator-selected intervals. Cleaning of the lamp envelop maximized the light output.

2.2 Feed Pump and Discharge Piping

Storm water runoff was fed to the pilot plant from the Moat by an 8-inch diesel-driven, trailer-mounted, self-priming pump. The inlet of the pump drew water directly from the Moat through a submerged inlet screen and a combination of 8-inch flexible and rigid suction pipe. 8-inch flexible pipe connected the outlet of the pump to the inlet of the pilot plant.

Temporary discharge piping was assembled on-site using 12-inch flanged schedule-80 PVC pipe. The pipe discharged treated effluent from the pilot plant at the seawall at the south east corner of the Easton Beach parking lot.

Pilot Feed Pump

Pilot Discharge Manifold Piping

3.0 PILOT STUDY METHODOLOGY

3.1 Operation

The pilot UV treatment plant was operated under varying hydraulic loads and UV lamp intensities during wet weather events to determine on-site UV disinfection efficiency under field conditions. Monitoring events took place when runoff during storm events raised water levels in the Moat to levels sufficient to operate the feed pump. Hydraulic loads and lamp intensities were varied during the pilot testing in order to evaluate varying conditions. Pilot plant operation was conducted on the following dates:

EVENT	DATE
1	September 15, 2007
2	September 27-28, 2007
3	October 12, 2007
4	October 19-20, 2007
5	October 24, 2007
6	October 27, 2007
7	November 3, 2007

The following variations from the planned sampling protocol occurred:

- On October 15, 2007, plant operation was limited to the collection of two sets of samples when rainfall stopped and water level in the Moat became insufficient to operate the feed pump.

- On October 19, 2007 samples collected at 7:00 am and 7:15 am were excluded from this evaluation, as lab error was apparent in *Enterococci* counts reported.

- On October 12, 2007, proposed sampling could not be completed due to flow of ocean water up-gradient in Moat. Suspended sand in flow accumulated in influent tank and caused loss of UV_T readings.

3.2 Monitoring

Fuss & O'Neill collected UV system influent and effluent grab samples during monitoring events throughout the study. Originally, we anticipated a total of eight sampling events would occur over the one month course of the study. Because of lack of precipitation during September, 2007, the pilot study was continued through October and a portion of November, 2007. Our original sampling plan was amended to accommodate these conditions while producing valid plant performance data. A total of seven precipitation events having rainfall

sufficient to operate the pilot plant occurred in these months. Fuss & O Neill was on-site on four other occasions when predicted rainfall did not develop flow in the Moat sufficient to operate the pilot plant. Precipitation data for the study period is included in Appendix A. Field notes recorded during the operation of the pilot plant are included in Appendix B.

Grab samples were analyzed by New England Testing, Inc. (NET) of North Providence, Rhode Island, for total suspended solids (TSS) and *Enterococci*. NET maintains certification under the National Environmental Laboratory Approval Program (NELAP). The determinative method employed for *Enterococci* analysis was EPA 1600 and Enterolert™ . The determinative method employed for TSS analysis was EPA 2540D. Reports of results from NET are included in Appendix C. On-site dose-response results are presented in the discussion and conclusions sections of this report.

3.2.1 UV Transmittance

UV light transmittance (UV_T) is a measure of how much light of a given wavelength is absorbed by the influent, which is influenced by the type and amount of suspended matter present. The UV dose required is based upon UV_T and contact time. Therefore, higher solids concentrations require a higher UV dose to achieve a given level of disinfection. A HACH UVASsc UV absorbance/ % transmittance sensor and a SC100 controller were used to record real-time UV_T measurements of storm water flowing through the pilot plant. Data on the Hach UV transmittance sensor is included in Appendix E.

3.3 Collimated Beam Testing

A total of seven collimated beam (CB) analyses were conducted by Trojan Technologies of London, Ontario, Canada on split samples of the UV pilot plant influent over the course of the study. The purpose of the collimated beam testing was to provide detailed dose response data during laboratory testing in order to supplement the data that was collected in the field during the pilot testing. Results of CB dose-response data are incorporated in the discussion and conclusions sections of this report. Reports of results from collimated beam testing are included in Appendix D.

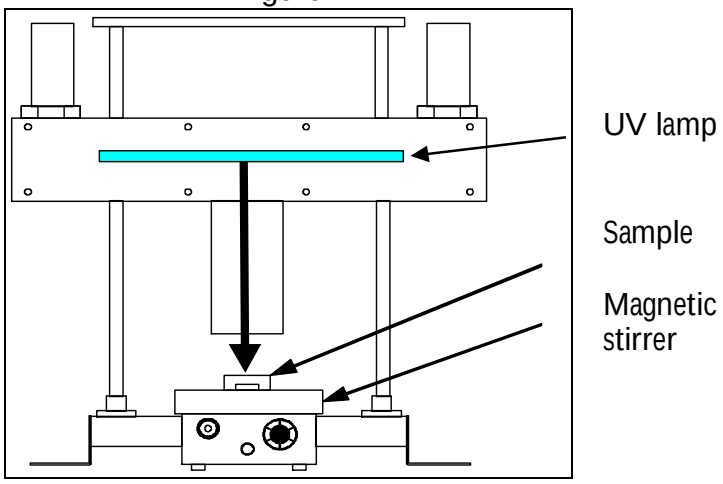
The sensitivity of specific microorganisms to UV light can be measured by the UV dose response test. A bench-scale collimated beam apparatus used for this study is shown schematically in Figure 2. Seven samples were collected from the moat and/or UV system intake during five sampling events. Two of these events occurred on July 5, 2007 and on November 15, 2007 before and after on-site pilot operations, respectively.

EVENT	DATE	On-Site Operation
1	July 5, 2007	Prior to on-site study
2	October 27, 2007 (Intake)	Concurrent with study
3	November 3, 2007 (Intake)	Concurrent with study
4	November 6, 2007 (upstream of bridge)	Concurrent with study
5	November 6, 2007 (Intake)	Concurrent with study
6	November 15, 2007 (upstream of bridge)	Following on-site study
7	November 15, 2007 (Intake)	Following on-site study

Where possible, collimated beam samples were taken during operation of the pilot plant to provide a direct comparison of treatment efficiencies. However, these samples required overnight shipment to Ontario, Canada, and could only be accepted by Trojan Technologies for analysis between the days of Monday and Thursday. This limited the number of samples suitable for analysis within the 72-hour holding time. A fraction of each sample shipped to Trojan Technologies was placed in the sample cell shown in Figure 2. Microbe inactivation is measured as a function of the UV dose received by the sample. The dose was calculated using accurate measurements of the intensity of UV light and exposure time. The formula is:

UV Dose = Intensity x Time (IT)
In units: mWattsec/cm^2 and seconds

Figure 2



Collimated beam testing apparatus[1]

3.4 UV Dose

The dose received by the influent was calculated using measurements of the intensity of UV light per unit area multiplied by the exposure (or contact) time. Again, the dose was calculated using accurate measurements of the intensity of UV light and exposure time. The formula is:

UV Dose = Intensity x Time (IT)
In units: mWattsec/cm^2 and seconds

UV intensity was measured by an internal photometer in the UV reactor. Exposure, or contact, time was derived from a flow meter in the inlet piping. These values were mathematically integrated in the pilot plant's PLC which displayed the UV dose values.

[1] Illustration courtesy of Trojan Technologies, Inc.

4.0 RESULTS AND DISCUSSION

4.1 Instantaneous UV_T

Instantaneous UV_T readings were collected as grab samples were taken from the influent and effluent of the reactor. These values represent a "snapshot" of the effluent characteristics as they existed at the moment of sampling. The maximum UV_T value recorded was 79%. The minimum UV_T value recorded was 51.7%.

4.2 Dose Response

The efficiency of UV disinfection is evaluated by comparing microbial counts before and after UV exposure. A dose-response curve is generated by plotting the number of survivors against the applied UV dose. Typically, microbial inactivation by UV exposure follows first-order kinetics, exhibiting an initial steep slope due to rapid inactivation of free microbes by low UV doses. A deviation from the straight line is often observed when suspended solids or clumps of microbes are present. This plateau or tailing region is a result of non-uniform absorption of UV light by microbes attached the particles.

All field data and laboratory data obtained during on-site piloting are summarized in Table 1. Data presented in Table 1 was used to generate on-site pilot dose-response curves shown in Figures 3 and 4 below. The dose-response curves represent the performance of the reactor operated under a range of UV doses and influent qualities.

Table 1: Field and NET Laboratory Data

	Sample ID	Time	Flow	Enterococci in	Enterococci out	Dose (mWs/cm2)	Lamp Intensity	TSS in	UVT
Sampling Event	03/04	2:50 am	1110	689	173	30.5	30%	2	56.00%
September 15, 2007	05/06	3:07 am	1950	794	210	30.5	30%	13	57.00%
	02/03	2:50 am	1100	189	11	30.5	30%	15	75.00%
Sampling Event	05/06	3:07 am	1100	488	7	126.6	75%	12.5	75.00%
September 27, 2007	08/09	3:23 am	1100	548	10	180	100%	16.5	76.50%
	02/03	6:30 am	1500	4840	408	27	30%	24	51.70%
Sampling Event	05/06	7:00 am	1500	437	264	Interference from TSS	75%	288	60.80%
October 12, 2007	08/09	7:15 am	<500	961	251	Interference from TSS[2]	100%	588	61.00%
	02/03	[3]7:00 am	2000	722	2420	180	100%	5.5	59.00%
	05/06	7:15 am	2000	2420	2420	155	90%	7	59.20%
Sampling Event	08/09	7:30 am	2000	2420	2	124	75%	3	59.00%
October 19, 2007	11/12	7:45 am	2000	2420	46	73	50%	4.5	59.00%
	14/15	8:00 am	2000	2420	387	32	30%	3.5	58.90%
	17/18	8:15 am	2000	2420	20	73	50%	6	58.80
	02/03	2:30 pm	2000	114	1	265	100%	11.5	73.00%
	05/06	2:45 pm	2000	436	1	265	100%	10	79.00%
Sampling Event	08/09	3:00 pm	2000	172	1	187	75%	12	72.40%
October 24, 2007	11/12	3:15 pm	2000	114	3	187	75%	18	72.30%
	14/15	3:30 pm	2000	73	1	106.7	50%	20.5	71.90%
	17/18	4:00 pm	2000	50	1	106.7	50%	13	71.40%
	20/21	4:15	2000	58	5	46.9	30%	14	71.00%
	23/24	4:30 pm	2000	104	9	46.9	30%	17.5	70.50%
	01/02	3:45 pm	2000	400	1	117	60%	8.5	66.50%
Sampling Event	04/05	4:15 pm	1750	300	10	117	60%	10.5	66.00
October 27, 2007	07/08	4:45 pm	1500	400	5	117	60%	7.5	65.70
	10/11	5:15 pm	1250	600	1	117	60%	11	65.30
	13/14	5:45 pm	1000	520	4	117	60%	9.5	64.70%
	02/03	9:41 am	2200	630	1	265	100%	9	71.40%
Sampling Event	05/06	10:00 am	1500	300	1	265	100%	8	72.40%
November 3, 2007	08/09	10:15 am	1100	630	1	265	100%	6	73.60%

[2] On October 12, 2007 tidal surges pushed debris and sand upstream, which was pumped through the pilot plant. Turbidity associated with that tidal surge interfered with pilot plant instruments, and the UV dose delivered was not reported. However, the pilot plant continued to disinfect water passing through the system.

[3] On October 19, 2007 samples collected at 7:00 am and 7:15 am were excluded from this evaluation, as *Enterococci* counts reported in pilot discharge were equal to or higher than those reported in the influent. Lab error or sample mislabeling is expected.

Figure 3 plots *Enterococci* concentration in the pilot plant effluent versus UV dose applied and summarizes this effect for all sampling events. Each sampling event is represented by a separate dose-response curve in Figure 3. Figure 3 also displays the design dose used during conceptual sizing of a full-scale UV disinfection system, and this piloting was conducted to determine veracity of that design.

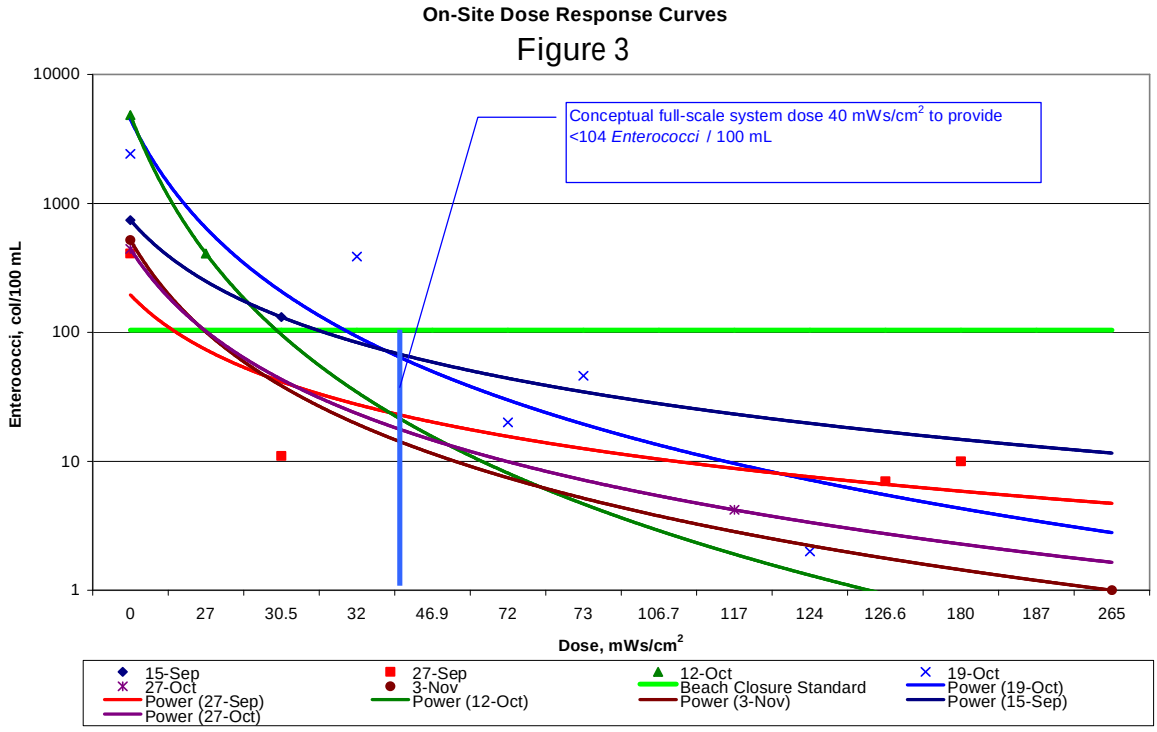


Figure 3

Figure 4 represents a compilation of on-site dose-response data. All *Enterococci* counts obtained throughout the study were averaged at each discrete UV dose. The dose-response curve is a best-fit of that averaged data. It can be observed that a dose on the order of 31 mWatt•sec/cm² consistently reduced *Enterococci* levels to below the 104 col./100ml. beach closure standard, which is represented by the red vertical line in Figure 4. Figure 4 also displays the design dose used during conceptual sizing of a full-scale UV disinfection system, and this piloting was conducted to determine veracity of that design.

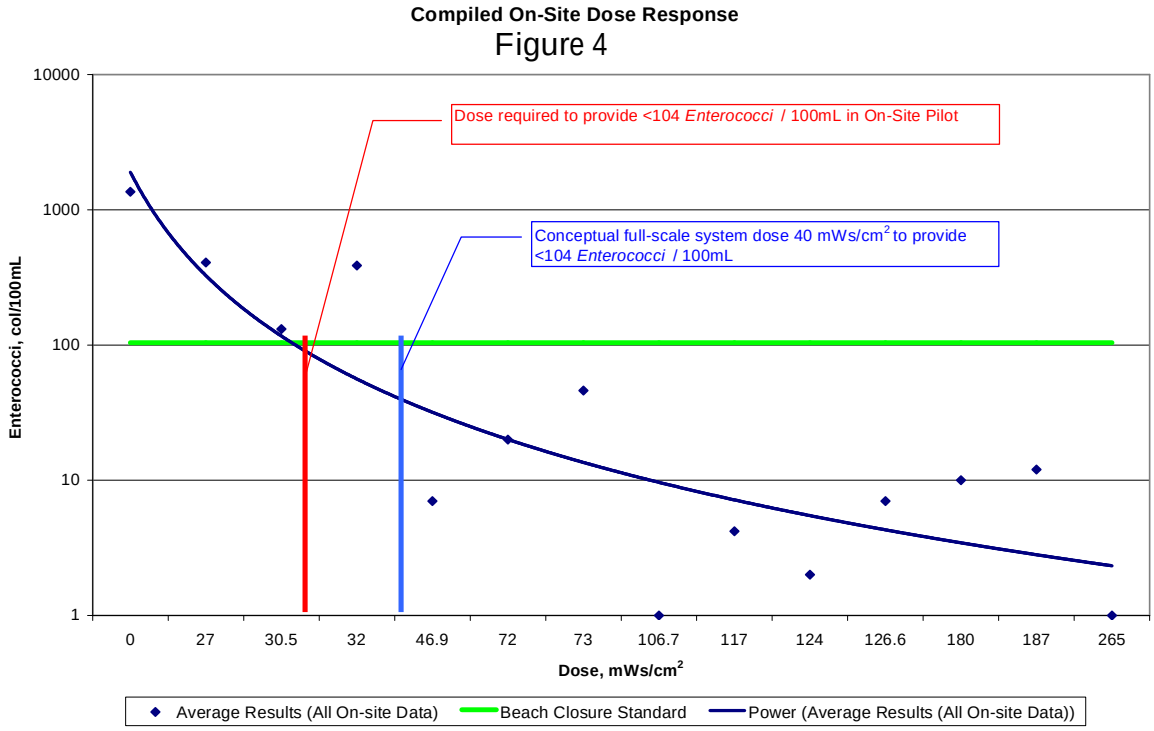
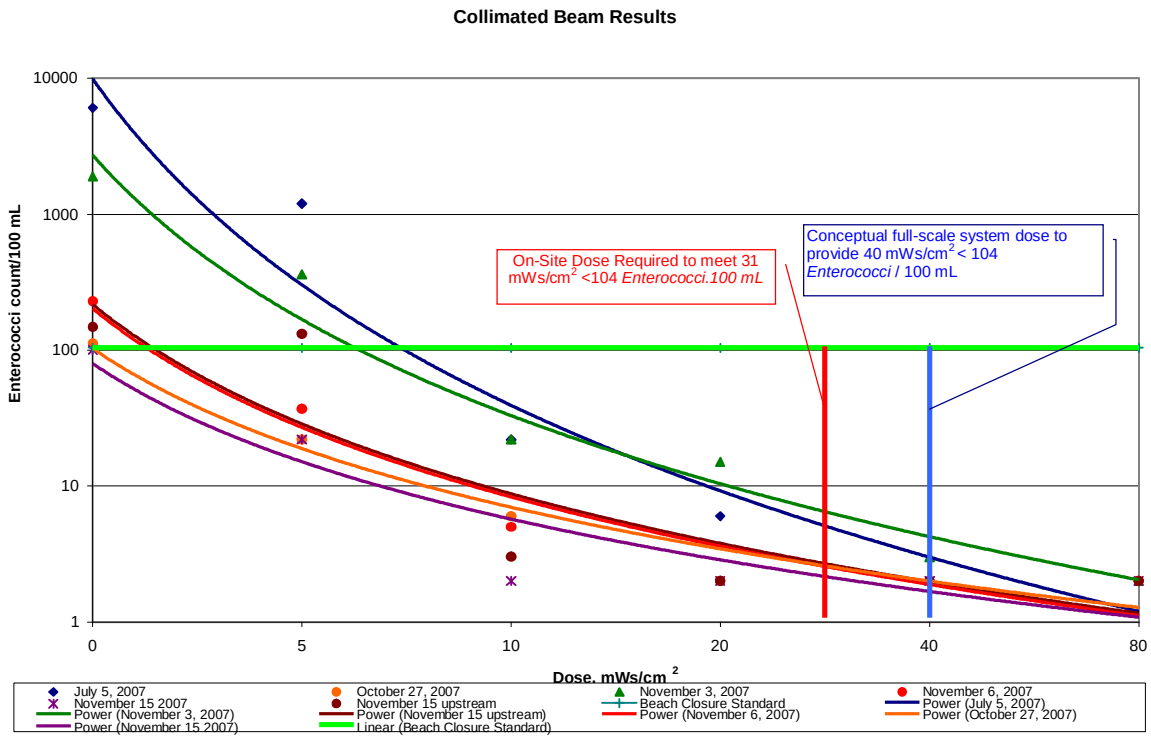


Figure 4

4.3 Collimated Beam Results

During selected rain events, grab samples for collimated beam testing were taken both upstream of the Memorial Boulevard bridge and from the inlet of the pilot plant. Figure 5 represents the dose response curves generated by plotting the number of surviving *Enterococci* before and after UV exposure against the UV dose.

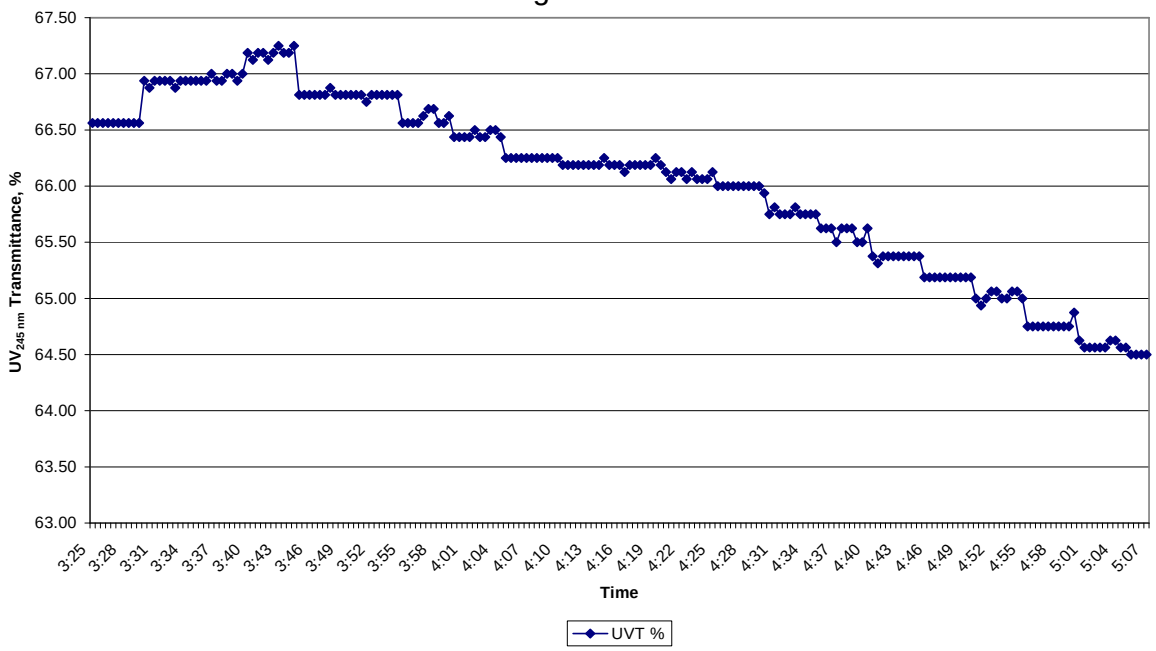
Collimated beam Dose-Response results show that a dose of 7 mWs/cm^2 reduced *Enterococci* levels to below the 104 col./100ml. beach closure standard in samples collected. The variation from on-site results is attributed to: interferences with UV light by debris pumped through the pilot plant out of the moat, lamp cleanliness or lack thereof in the pilot, and ideal laboratory conditions for CB tests (UV cell cleanliness and UV transmittance). Another factor is the unknown effect of sample aging and agitation during transport. Accordingly, while collimated beam testing provides useful benchmark data to evaluate pilot plant performance, it does not replace pilot plant operation as a means of acquiring full-scale plant design data.



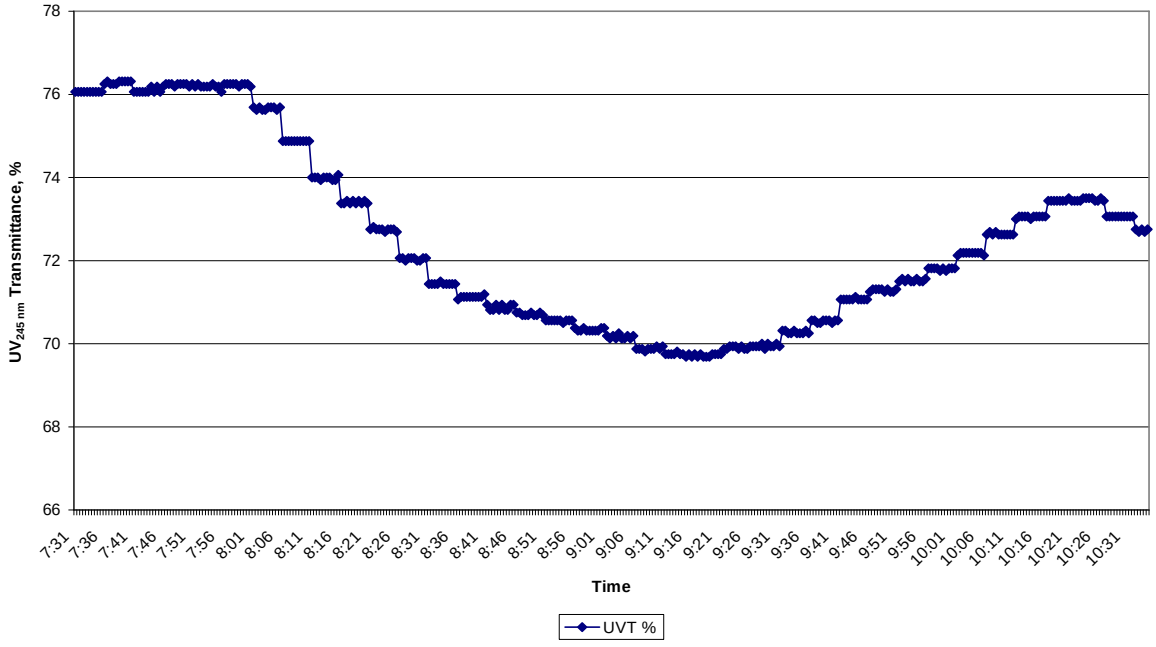
4.4 Continuous UV_T

Figures 6 through 8 provide plots of continuous UV_T values for water pumped from the Moat through the pilot plant during several rain events. The figures demonstrate how the water quality in the Moat changes during the course of a rain event, and demonstrate the fact that each rain event has its own characteristics. The UV_T values measured ranged from 57 to 77% as compared to 55% that was assumed during the conceptual design.

Online UVT - October 27, 2007 (3:45 - 5:07 pm)
Newport, RI Pilot Study
Figure 6



Online UVT - November 3, 2007 (7:22 am - 10:23 am)
Newport, RI Pilot Study
Figure 7



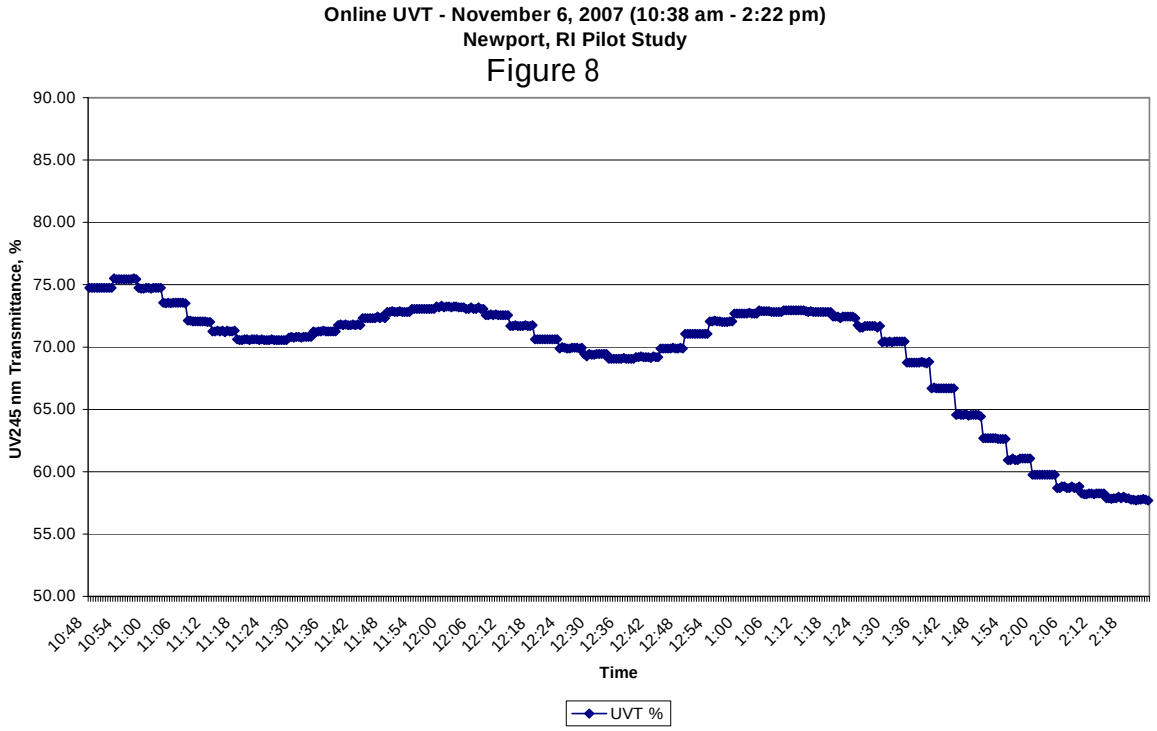


Figure 8

5.0 CONCLUSIONS

5.1 Effectiveness of Pilot Testing

Operations of the pilot plant combined with collimated beam testing demonstrate UV treatment as an effective method of disinfecting water discharging from the Moat. Under the observed water quality conditions and hydraulic loadings, the pilot plant was capable of delivering effluent meeting the beach closure standard of 104 col./100ml at a dose of 31 mW-sec/cm^2, with the exception of the October 12, 2007 event in which turbidity and TSS interfered with pilot plant instruments. At higher doses, the system provided virtually complete inactivation of *Enterococci.* The UV dose received by the influent equals the intensity of UV light per unit area multiplied by the exposure time. The effect of varying hydraulic load (which translates directly into influent contact time with the UV source) is captured in the equation. Therefore, data from the pilot plant is directly scalable to a full-scale plant.

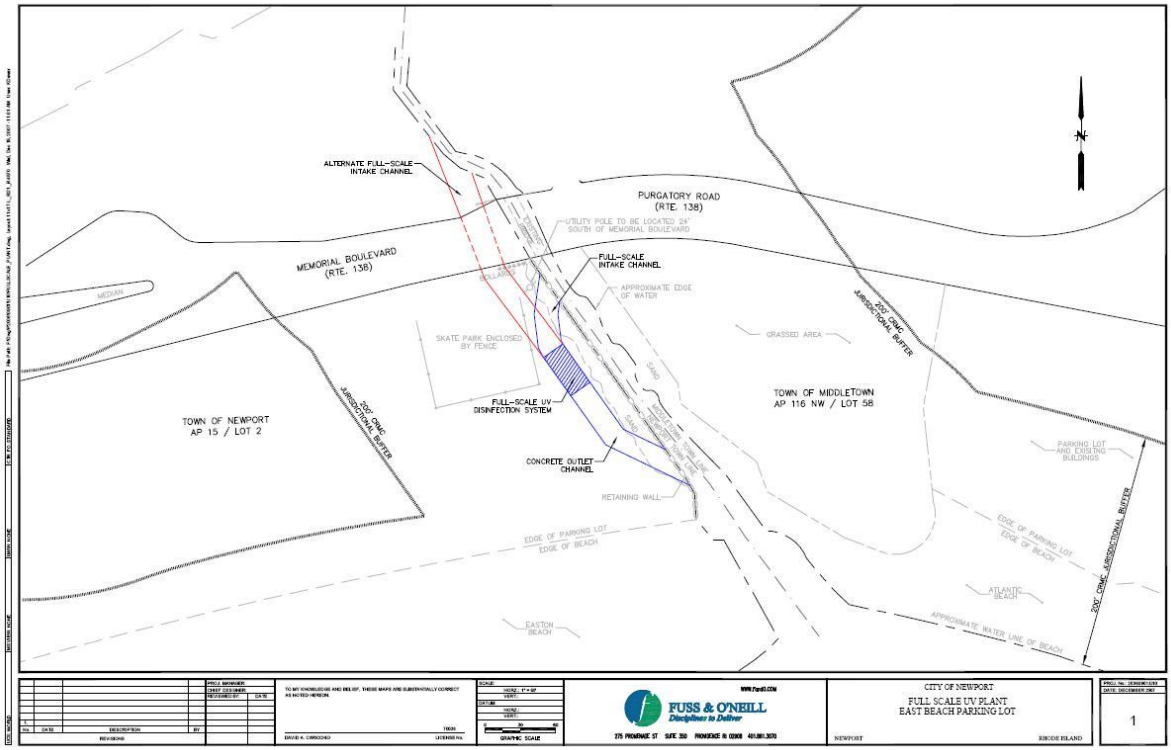
Pilot plant and collimated beam test results established the range of UV doses required for effective inactivation of *Enterococci* in the Moat discharge. The quality of the discharge from the moat is highly variable, as demonstrated by the wide range of UV_T and *Enterococci* values observed. Therefore, the delivered UV dose will need to vary in response to changing UV_T values upon full-scale implementation.

5.2 Other Operational Observations

Tidal action was expected to affect flow in the moat. Tidal action did not adversely affect UV disinfection; however, large debris and floatables caused blockages on the inlet screen, pump internals, and UV reactor screen throughout the study. The material was identified as natural material (sea grasses, seaweed) animal material (bivalves, a rat) and manmade material (textiles, plastics, shoes). These materials either flowed down the Moat from up-gradient areas or were pushed up the Moat from the Bay by tide and wind conditions. A screening device will be required to minimize the quantity of floatables that enter into the full-scale system.

Also, when high or storm tidal conditions reverse flow in the moat, sand and debris flow from the shore up-gradient in the moat. During one of the sampling events, significant quantities of sand were drawn into the pilot plant. The sand had a direct impact on sample TSS and caused interference with on-line instruments. An important aspect of final design of the full-scale system will be minimization of intake of sand and debris. One option could be to locate the inlet to the full-scale UV system as far upstream as possible in the moat. We have depicted relocation of the conceptual intake structure for the full-scale system in Figure 9. Relocation of the intake may also minimize impact from sea grasses and sea weed from entering into the system.

Figure 9



5.2 Comparison with Conceptual Design Assumptions

Data from this study confirms conceptual design for a full scale system was adequate and may have been somewhat conservative. The original conceptual design was based on an UV_T of 55% and Total Suspended Solids (TSS) concentration of 30 mg/l. It was also based on a dose of 40mWs/cm^2 to reduce bacteria levels to beach closure standard (104 cfu/100 ml. Measured UV_T was consistently above 55% with the exception of samples collected during an event on October 12, 2007. TSS concentrations were also typically below 30 mg/l with the exception of the October 12, 2007 event. Calculated dose response curves were also better (smaller dose) than what was assumed for the conceptual design.

The October 12th event had significant wave action that caused a significant amount of sand to be pushed up into the moat that resulted in sand being pumped into the pilot system. As stated above, final design of the full-scale UV disinfection system will need to address the issue of sand entering the system during storms with significant wave action.

At this stage in the project, the construction costs of $3.8 million (2007 dollars) and operation and maintenance costs of $267,000 per year (2007 dollars) appear to still be valid considering the remaining design issues that need to be addressed.

5.3 Remaining Design Issues

While pilot testing has confirmed that UV treatment is practical, several design issues still need to be resolved as summarized below:

- What system layout will minimize the impacts of this system on moat hydraulics? We need to design this system to minimize any impacts on flooding in the moat. This is now the most critical design issue that needs to be addressed and a detailed hydraulic study of the moat with the proposed UV system is now recommended.
- What is the pretreatment that will be required to keep floatables and sand out of the system, especially during storms with significant wave action? This is particularly important to minimize system maintenance.
- What are the subsurface conditions on this site and how will they impact structural design and dewatering during construction?
- What level of dilution is available at the beach and how does that impact costs if the City takes advantage of that?
- What improvements will be required to deliver adequate power to this site?
- Will Middletown and RIDOT participate in the implementation of this system?
- What will be the final system configuration and appropriate factor of safety/design storm for this system?

Once these questions are addressed, opinions-of-cost for construction and operation and maintenance of the system can be better defined.

6.0 RECOMMENDED NEXT STEPS

If the City decides to continue with the development of the UV system, we recommend that the City proceeds with preliminary design of the system to answer the critical design questions identified above and better define actual project costs. The City has a $60,000 grant (which will require a $60,000 match from the City) currently available from the State of Rhode Island. Preliminary design should be eligible for this funding. The following outlines preliminary design tasks in order of priority.

1. Detailed survey and wetlands flagging of the project area as required for future permitting, hydraulic analysis and design.
2. Hydraulic analysis of the moat and UV system to determine layout of system and impacts on moat flooding.

3. Process preliminary design which will include analysis of pretreatment requirements for sand and floatables as well as sizing evaluation and selection of design criteria based on cost benefit analysis.

4. Beach dilution study to better understand available dilution at beach and could also impact ultimate sizing and costs of the UV system if beach dilution is accounted for.
5. Geotechnical evaluation of the site and preliminary structural design based on that evaluation.

6. Electrical/controls preliminary design.

These tasks should also include outreach to the Town of Middletown and RIDOT to determine their future level of participation in this project.

APPENDIX A

PRECIPATION DATA

Appendix A

Rainfall data July 2007 to November 2007

Note: dates of sampling events are highlighted.

Newport, RI Actual Conditions for July 2007

Date	Actuals (°)			Normals (°)				Records (°)		Precip Amounts			Degree Days	
	High	Low	Avg	High	Low	Avg	Dpt	High/Year	Low/Year	Precip	Snow	Ground	Heating	Cooling
1	75	59	67	81	62	71	-4	97 / 1964	48 / 1988	0.15	-	-	0	2
2	76	54	65	81	62	72	-7	98 / 1941	51 / 1988*	0	-	-	0	0
3	79	54	66	81	62	72	-6	98 / 2002	50 / 1957	0	-	-	0	1
4	77	57	67	82	63	72	-5	101 / 1949	51 / 1986*	0.19	-	-	0	2
5	81	64	72	82	63	72	0	98 / 1999*	49 / 1979	0.59	-	-	0	7
6	85	66	76	82	63	72	4	97 / 1999*	50 / 1979	0.07	-	-	0	11
7	84	63	74	82	63	72	2	97 / 1993*	49 / 1965	0	-	-	0	9
8	91	65	78	82	63	73	5	99 / 1981	54 / 1969	0	-	-	0	13
9	81	66	74	82	64	73	1	99 / 1981	51 / 1909	0	-	-	0	9
10	86	66	76	83	64	73	3	100 / 1993	52 / 1953	0	-	-	0	11
11	81	72	76	83	64	73	3	97 / 1988*	53 / 1996*	0	-	-	0	11
12	84	65	74	83	64	73	1	96 / 1948	52 / 1945	0	-	-	0	9
13	87	59	73	83	64	73	0	94 / 1994*	52 / 1933	0	-	-	0	8
14	86	63	74	83	64	73	1	98 / 1995*	53 / 1999*	0	-	-	0	9
15	88	67	78	83	64	74	4	99 / 1995	54 / 1926	0.23	-	-	0	13
16	85	67	76	83	64	74	2	97 / 1983	52 / 1954	0.01	-	-	0	11
17	86	63	74	83	64	74	0	97 / 1999*	49 / 1954	0	-	-	0	9
18	73	65	69	83	65	74	-5	98 / 1999*	53 / 1956	0.72	-	-	0	4
19	83	69	76	83	65	74	2	100 / 1977	55 / 1956	0.29	-	-	0	11
20	84	65	74	83	65	74	0	101 / 1991	54 / 1939	0	-	-	0	9
21	81	62	72	83	65	74	-2	102 / 1991	51 / 1966	0	-	-	0	7
22	82	64	73	83	65	74	-1	101 / 1926	54 / 1937	0	-	-	0	8
23	71	63	67	83	65	74	-7	99 / 1952	54 / 1976	0.13	-	-	0	2
24	84	64	74	83	65	74	0	94 / 1933	52 / 1923	0	-	-	0	9
25	87	65	76	83	65	74	2	96 / 2001	53 / 1953	0	-	-	0	11
26	85	62	74	83	65	74	0	96 / 2005	51 / 1976	0	-	-	0	9
27	87	70	78	83	65	74	4	97 / 1940	53 / 2001	0	-	-	0	13
28	86	73	80	83	65	74	6	98 / 1949	53 / 1977	0.07	-	-	0	15
29	85	72	78	83	65	74	4	97 / 1949	53 / 1916	0	-	-	0	13
30	84	69	76	83	65	74	2	100 / 1949	53 / 1968	1.51	-	-	0	11
31	87	69	78	83	65	74	4	100 / 1917	51 / 1956	0	-	-	0	13

Newport, RI Actual Conditions for August 2007

Date	Actuals (°)			Normals (°)				Records (°)		Precip Amounts			Degree Days	
	High	Low	Avg	High	Low	Avg	Dpt	High/Year	Low/Year	Precip	Snow	Ground	Heating	Cooling
1	89	68	78	83	65	74	4	97 / 2006	53 / 1953	0	-	-	0	13
2	93	67	80	83	65	74	6	104 / 1975	54 / 1985*	0	-	-	0	15
3	93	71	82	83	65	74	8	98 / 2006	51 / 1953	0	-	-	0	17
4	92	73	82	83	65	74	8	98 / 1944	52 / 1959	0	-	-	0	17
5	84	67	76	83	64	74	2	100 / 1944	51 / 1972	0	-	-	0	11
6	82	66	74	83	64	73	1	96 / 1918	50 / 1934	0.02	-	-	0	9
7	86	71	78	82	64	73	5	95 / 2001*	52 / 1994*	0	-	-	0	13
8	91	72	82	82	64	73	9	95 / 1909	51 / 1957	0.05	-	-	0	17
9	80	66	73	82	64	73	0	100 / 2001*	51 / 1964	0	-	-	0	8
10	67	54	60	82	64	73	-13	100 / 1949	47 / 1964	0.85	-	-	5	0
11	83	54	68	82	64	73	-5	100 / 1944	50 / 1974	0	-	-	0	3
12	87	64	76	82	64	73	3	101 / 1944	50 / 1968	0	-	-	0	11
13	87	67	77	82	64	73	4	100 / 2005	50 / 1957	0.07	-	-	0	12
14	81	57	69	81	64	73	-4	98 / 2002	47 / 1964	0	-	-	0	4
15	83	58	70	81	63	72	-2	97 / 1947	51 / 1909	0	-	-	0	5
16	85	67	76	81	63	72	4	97 / 1944	49 / 1964	0	-	-	0	11
17	80	64	72	81	63	72	0	97 / 1944	50 / 1981*	0.03	-	-	0	7
18	76	57	66	81	63	72	-6	92 / 1987*	50 / 1923	0.05	-	-	0	1
19	75	51	63	81	63	72	-9	94 / 2002	48 / 1918	0	-	-	2	0
20	75	56	66	80	62	71	-5	97 / 1937	47 / 1981	0.01	-	-	0	1
21	69	56	62	80	62	71	-9	95 / 1937	49 / 1981*	0	-	-	3	0
22	75	59	67	80	62	71	-4	97 / 1976	46 / 1969	0	-	-	0	2
23	76	63	70	80	62	71	-1	91 / 1947	45 / 1957	0	-	-	0	5
24	88	67	78	80	61	71	7	94 / 1947	46 / 1957	0	-	-	0	13
25	92	70	81	79	61	70	11	96 / 1948	44 / 1940	0	-	-	0	16
26	87	70	78	79	61	70	8	102 / 1948	41 / 1981	0	-	-	0	13
27	84	65	74	79	61	70	4	101 / 1948	49 / 1954	0	-	-	0	9
28	85	61	73	79	61	70	3	100 / 1948	47 / 1968	0	-	-	0	8
29	83	58	70	78	60	69	1	95 / 1948	44 / 1986	0	-	-	0	5
30	85	60	72	78	60	69	3	95 / 1953	45 / 1965	0	-	-	0	7
31	86	61	74	78	60	69	5	96 / 1953	40 / 1965	0	-	-	0	9

Newport, RI Actual Conditions for September 2007

Date	Actuals (°)			Normals (°)				Records (°)		Precip Amounts			Degree Days	
	High	Low	Avg	High	Low	Avg	Dpt	High/Year	Low/Year	Precip	Snow	Ground	Heating	Cooling
1	81	62	72	78	59	69	3	93 / 1969	43 / 1975	0	-	-	0	7
2	77	55	66	77	59	68	-2	99 / 1953	47 / 1991*	0	-	-	0	1
3	84	58	71	77	59	68	3	95 / 1929	45 / 1967	0	-	-	0	6
4	85	61	73	77	59	68	5	92 / 1937	47 / 1976	0	-	-	0	8
5	80	52	66	77	58	67	-1	92 / 1983	45 / 1906	0	-	-	0	1
6	74	56	65	76	58	67	-2	95 / 1983	45 / 1909	0	-	-	0	0
7	89	65	77	76	58	67	10	96 / 1983*	43 / 1984*	0	-	-	0	12
8	92	69	80	76	57	67	13	96 / 1945	46 / 1952	0	-	-	0	15
9	80	62	71	76	57	66	5	91 / 1971	42 / 1980	0	-	-	0	6
10	72	61	66	75	57	66	0	94 / 1983	41 / 1917	0.34	-	-	0	1
11	74	63	68	75	56	66	2	100 / 1983	38 / 1917	1.77	-	-	0	3
12	76	56	66	75	56	65	1	91 / 2005	42 / 1917	0	-	-	0	1
13	74	52	63	74	56	65	-2	91 / 1957	44 / 1970	0	-	-	2	0
14	74	53	64	74	55	65	-1	90 / 1931	38 / 1911	0	-	-	1	0
15	68	53	60	74	55	64	-4	90 / 1915	38 / 1975	0.38	-	-	5	0
16	67	48	58	73	54	64	-6	92 / 1941	41 / 1964	0	-	-	7	0
17	68	47	58	73	54	64	-6	90 / 1941	37 / 1960	0	-	-	7	0
18	70	45	58	73	54	63	-5	89 / 1906	39 / 1990*	0	-	-	7	0
19	69	48	58	72	53	63	-5	92 / 1906	37 / 1956	0	-	-	7	0
20	81	57	69	72	53	63	6	93 / 1983	38 / 1979	0	-	-	0	4
21	80	58	69	72	53	62	7	89 / 1914	35 / 1956	0	-	-	0	4
22	79	62	70	71	52	62	8	93 / 1980	34 / 1962	0	-	-	0	5
23	80	62	71	71	52	61	10	92 / 1970	38 / 1974	0	-	-	0	6
24	81	53	67	71	51	61	6	87 / 1959	34 / 1974	0	-	-	0	2
25	86	57	72	70	51	61	11	89 / 1920	36 / 1950	0	-	-	0	7
26	89	67	78	70	51	60	18	89 / 2007	37 / 1967	0	-	-	0	13
27	81	65	73	70	50	60	13	86 / 1998	35 / 1980	0.06	-	-	0	8
28	80	61	70	69	50	60	10	84 / 1943	33 / 1980	0	-	-	0	5
29	76	54	65	69	49	59	6	88 / 1952	33 / 1914	0	-	-	0	0
30	70	51	60	69	49	59	1	85 / 1986	35 / 1951	0	-	-	5	0

Newport, RI Actual Conditions for October 2007

Date	Actuals (°)			Normals (°)				Records (°)		Precip Amounts			Degree Days	
	High	Low	Avg	High	Low	Avg	Dpt	High/Year	Low/Year	Precip	Snow	Ground	Heating	Cooling
1	66	47	56	68	48	58	-2	88 / 1950	35 / 1974	0	-	-	9	0
2	73	47	60	68	48	58	2	87 / 1927	36 / 1992*	0	-	-	5	0
3	72	64	68	68	48	58	10	83 / 1919	35 / 1908	0	-	-	0	3
4	82	64	73	67	47	57	16	85 / 1959	32 / 1945	0	-	-	0	8
5	83	61	72	67	47	57	15	87 / 1922	31 / 1965	0	-	-	0	7
6	84	63	74	66	46	56	18	88 / 1946	29 / 1984*	0	-	-	0	9
7	73	53	63	66	46	56	7	86 / 1963	30 / 1984	0	-	-	2	0
8	75	53	64	66	46	56	8	82 / 1931	27 / 1954	0.01	-	-	1	0
9	65	54	60	65	45	55	5	84 / 1943	30 / 1953	0.24	-	-	5	0
10	60	55	58	65	45	55	3	90 / 1949	26 / 1980	0.12	-	-	7	0
11	63	58	60	65	44	55	5	84 / 1949	27 / 1956	0.16	-	-	5	0
12	63	42	52	64	44	54	-2	87 / 1928	27 / 1956	0.01	-	-	13	0
13	62	38	50	64	44	54	-4	85 / 1954	22 / 1981	0	-	-	15	0
14	63	43	53	64	43	53	0	81 / 1990*	28 / 1953	0	-	-	12	0
15	65	39	52	63	43	53	-1	82 / 1975	30 / 1981	0	-	-	13	0
16	66	45	56	63	43	53	3	83 / 1963	28 / 1978	0	-	-	9	0
17	70	40	55	63	42	52	3	88 / 1947	30 / 1978	0	-	-	10	0
18	77	62	70	62	42	52	18	85 / 1908	28 / 1978	0	-	-	0	5
19	71	64	68	62	42	52	16	81 / 1945	24 / 1974	0.72	-	-	0	3
20	73	53	63	61	42	52	11	80 / 1947	23 / 1970	0.13	-	-	2	0
21	75	51	63	61	41	51	12	81 / 1920	23 / 1972	0	-	-	2	0
22	81	53	67	61	41	51	16	86 / 1979	27 / 1974	0	-	-	0	2
23	77	62	70	60	41	51	19	85 / 1947	24 / 1969	0	-	-	0	5
24	72	54	63	60	41	50	13	74 / 1963	21 / 1969	0.03	-	-	2	0
25	57	42	50	60	40	50	0	75 / 1998*	27 / 2003	0.07	-	-	15	0
26	62	41	52	59	40	50	2	78 / 1963	27 / 1976	0.03	-	-	13	0
27	71	54	62	59	40	49	13	82 / 1947	20 / 1976	0.29	-	-	3	0
28	59	41	50	59	40	49	1	80 / 1919	24 / 1976	0	-	-	15	0
29	52	34	43	58	39	49	-6	78 / 1984	26 / 1980	0	-	-	22	0
30	63	36	50	58	39	49	1	79 / 1946	24 / 1980	0	-	-	15	0
31	66	39	52	58	39	48	4	83 / 1946	24 / 1966	0	-	-	13	0

Newport, RI Actual Conditions for November 2007

Date	Actuals (°)			Normals (°)				Records (°)		Precip Amounts			Degree Days	
	High	Low	Avg	High	Low	Avg	Dpt	High/Year	Low/Year	Precip	Snow	Ground	Heating	Cooling
1	69	47	58	57	39	48	10	78 / 1974	26 / 1925	0	-	-	7	0
2	54	41	48	57	39	48	0	82 / 1950	21 / 1976	0	-	-	17	0
3	49	44	46	57	38	48	-2	78 / 1990	23 / 1980	0.74	-	-	19	0
4	58	40	49	56	38	47	2	77 / 1987	26 / 1912	0	-	-	16	0
5	56	36	46	56	38	47	-1	75 / 1994	22 / 1908	0	-	-	19	0
6	57	37	47	56	38	47	0	72 / 1994*	25 / 1951	0.65	-	-	18	0
7	51	35	43	55	38	47	-4	74 / 1938	26 / 1931	0	-	-	22	0
8	46	27	36	55	37	46	-10	73 / 1945	22 / 1931	0	-	-	29	0
9	48	33	40	55	37	46	-6	74 / 1945	18 / 1976	0	-	-	25	0
10	43	32	38	54	37	46	-8	73 / 1999	22 / 1995*	0	-	-	27	0
11	46	27	36	54	37	45	-9	68 / 1966	16 / 1956	0	-	-	29	0
12	48	26	37	54	36	45	-8	75 / 1909	21 / 1926	0.03	-	-	28	0
13	60	36	48	53	36	45	3	70 / 1964	20 / 2001	0.22	-	-	17	0
14	59	32	46	53	36	44	2	75 / 1993	16 / 1905	0	-	-	19	0
15	65	43	54	53	35	44	10	78 / 1993	18 / 1905	0.39	-	-	11	0
16	49	33	41	52	35	44	-3	72 / 1990	14 / 1933	0.08	-	-	24	0
17	44	31	38	52	35	43	-5	73 / 1928	14 / 1924	0	-	-	27	0
18	46	32	39	52	35	43	-4	73 / 1953	15 / 1936	0	-	-	26	0
19	44	33	38	51	34	43	-5	72 / 1941	14 / 1936	0	-	-	27	0
20	44	26	35	51	34	43	-8	72 / 1991*	17 / 1986	0.09	-	-	30	0
21	52	35	44	51	34	42	2	71 / 1931	16 / 1987	0	-	-	21	0
22	67	42	54	50	33	42	12	70 / 1931	16 / 1987*	0.02	-	-	11	0
23	41	28	34	50	33	41	-7	72 / 1979	14 / 1972	0	-	-	31	0
24	36	21	28	49	33	41	-13	73 / 1979	6 / 1989	0	-	-	37	0
25	51	26	38	49	32	41	-3	71 / 1979	12 / 1938	0	-	-	27	0
26	M	M	M	49	32	40	M	67 / 2001	10 / 1938	0.34	-	M	M	M
27	M	M	M	48	32	40	M	66 / 1946	9 / 1932	M	M	M	M	M
28	M	M	M	48	31	40	M	72 / 1990	13 / 1904	M	M	M	M	M
29	M	M	M	48	31	39	M	64 / 1990*	12 / 1904	M	M	M	M	M
30	M	M	M	47	31	39	M	68 / 1933	13 / 1929	M	M	M	M	M

APPENDIX B

FIELD NOTES

FUSS & O'NEILL
Disciplines to Deliver

PREPARED BY	DATE	CHECKED BY	DATE	PROJECT NO.
WBM	9-15			20071147.A10

NEWPORT UV PILOT - SAT. 9/15/07 - FIELD NOTES

SHEET NO. 1 of 2

1305: ON SITE - CREEK LOW, BUT FLOWING - HIGH TIDE
CLOUDY, LIGHT DRIZZLE, 70° WIND S GUSTS TO 30

REARRANGE PUMP INLET IN CREEK
START PUMP & UV REACTOR

1400: PUMP @ 920 RPM GOOD SUCTION

FLOW 1110 GPM, FIRST TANK AT ABOUT 50% (CONSTANT) BUT FOAMING.

LAMP POWER @ 30% UV INT. = 30.5 mW/CM^2

UVT = 56%

BOTH BANKS ON (8 TUBES) SYSTEM POWER 8660 VA

1415: SAMPLE 1 (TROJAN, 1-L PLASTIC)

091507008850-01 INLET
091507008850-02 OUTLET

NET:

091507008850-03 INLET
091507008850-04 OUTLET

1421: PUMP TO 1480 RPM. - GOOD SUCTION

1433: CREEK LOW, BUT FLOWING
RAIN STOPPED PARTLY CLOUDY

FLOW: 1950 GPM FIRST TANK AT 100%

LAMP POWER @ 30% UV INT = 30.5 mW/CM^2

UVT = 57%

8 TUBES ON 8614 VA DRAW

FUSS & O'NEILL
Disciplines to Deliver

PREPARED BY	DATE	CHECKED BY	DATE	PROJECT NO.

SHEET NO. 2 of 2

1445: SAMPLE 2

091507008S0-05 INLET
091507008S0-06 OUTLET

1455: SHUT DOWN UV REACTOR

1530: OFF SITE - PILOT PLANT SECURED.

FUSS & O'NEILL
Disciplines to Deliver

PREPARED BY	DATE	CHECKED BY	DATE	PROJECT NO.
WSM	9/27			20069901.010

NEWPORT UV PILOT - FIELD NOTES

SHEET NO. 1 of 4

7:30 PM ON SITE - STARTING SYSTEM. NO RAIN. ABOUT 60° CLOUDY WIND S GUST TO 30KTS

8:00 PM RUNNING AT 1360 GPM - WATER: DARK BROWN COLOR. NO RAIN. UVT: 53.8%
22° pH: 7.02 10.79 mS/°C 6 ppt

BANK 1A TRIPPED ON GROUND FAULT - BANK OFF

9:00 - 9:30 PM LIGHT RAIN BEGINS - NO FLOW IN CREEK. WATER: DARK BROWN COLOR. UVT: 58%
1133 GPM
22° pH: 7.00 8 mS/°C 5 ppt

BANK 1A: 81% BANK 1B: 30%

10:30 PM S. WIND INCREASING - BANDS OF SPRINKLES NO FLOW IN CREEK.

11:30 PM WIND LESS - STILL S - WARM SCATTERED SHOWERS MOVING THRU
CREEK NOT FLOWING. PUMPING @ 1148 GPM
UVT: 75% BOTH BANKS @ 30%
FLOW & UV DOSE STABLE.
21.4° pH: 6.69 6.73 mS/°C 3.6 ppt.

11:47 PM GIANT RAT OR MUSKRAT? SWIMMING DOWNSTREAM FROM N TO S.

12:00 PM ABOUT LOW TIDE - VERY SLUGGISH MOVEMENT IN STREAM - WATER RECIRCULATING FROM OUTLET TO INLET.

1100 GPM UVT: 73% 21.4° 3.1 ppt 6.47 pH 5.66 mS/°C RAIN STOPPED

12:30 PM MOON VISIBLE THROUGH THIN CLOUDS & FOG - WIND CALM - WARM

2:50 AM NO RAIN - MOON OUT - CREEK FLOWING

COND 4100 mS/°C 21.2° 2.2 ppt pH: 6.88
UVT: 75% (WATER CLEAR) BOTH BANKS @ 30%

SAMPLE 01: TSS INLET 2:50 AM
SAMPLE 02 BAC. INLET ? 2:50 AM
SAMPLE 03 BAC. OUTLET 2:50 AM
} @ 1100 GPM

BANKS TO 75% AT 2:55 AM

3:07 AM pH: 6.83 21.1° 2.1 ppt 3837 mS/°C
UVT: 75% 1111 GPM

FUSS & O'NEILL
Disciplines to Deliver

PREPARED BY	DATE	CHECKED BY	DATE	PROJECT NO.

SHEET NO. 3 of 4

SAMPLE 04 - TSS @ INLET 3:07 AM
SAMPLE 05 - BAC. @ INLET 3:07 AM
SAMPLE 06 - BAC. @ OUTLET 3:07 AM

3:10 AM BANKS TO 100%

3:23 AM 3940 mS/°C 21.0° 2.1 ppt pH: 6.90
1100 GPM UVT: 76.5%

SAMPLE - 07 TSS INLET 3:23 AM
SAMPLE - 08 BAC. INLET 3:23 AM
SAMPLE - 09 BAC. OUTLET 3:23 AM

DUPLICATE:

SAMPLE - 10 TSS INLET 3:23 AM
SAMPLE - 11 BAC. INLET 3:23 AM
SAMPLE - 12 BAC. OUTLET 3:23 AM

3:30 AM MOON & STARS OUT - CALM & WARM
CREEK BARELY FLOWING - WATER CLEAR

5:00 AM SECURE SYSTEM - CALL LAB

7:00 AM SAMPLES (12 BOTTLES) TO N.E.T.

FUSS & O'NEILL
Disciplines to Deliver

PREPARED BY	DATE	CHECKED BY	DATE	PROJECT NO.

SHEET NO. 4 of 4

8:30 AM SECURE SITE, HIGH TIDE. SUNNY.

CREEK:

9.8 mS/°C 20.9° ~~8.1 pH~~ 8.1 ppt pH: 6.73

SEA WATER:

22.4 mS/°C 20.7° 13.6 ppt pH: 6.77

END OF RECORD

Walter S. Mahoney F&O

FUSS & O'NEILL
Disciplines to Deliver

PREPARED BY	DATE	CHECKED BY	DATE	PROJECT NO.
WSM	10/12			

NEWPORT UV PILOT FIELD NOTES 10/12/07

SHEET NO. 1 of 2

0300: CALL TO LAURA - DECISION TO SAMPLE.

0500: ON SITE AT NEWPORT. RAIN N. OF BRIDGE, BUT PARTLY CLOUDY AT BEACH.

0530: WEATHER: ABOUT 60° STEADY SW WIND AT ABOUT 25 KTS. NO FLOW IN CREEK.

SP. COND. 1160 uS/CM² 16° 0.6 ppt pH 7.8 UVT 54% WATER IN CREEK LOW - PUMA AT 500 GPM FLOW STEADY.

0630 CALL TO LAURA AT 6:20: FLOW STARTED IN CREEK. ESTIMATE AT ABOUT 2 FT/MIN AT BRIDGE. TIDE RISING - HEAVY SURF BREAKING ON BEACH - WIND DEAD OFFSHORE AT 30 KTS.

PUMP TO 1530 RPM PRIMARY TANK AT 2/3 FULL FLOW ≈ 1,500 GPM BOTH BANKS TO 30% UV DOSE 27 mW/CM²

SAMPLE 1: SP. COND. 1540 uS/CM² 16.1° 0.8 ppt pH: 8.0 UVT: 51.7% BANKS @ 30%

0635: PLANT SHUTS DOWN ON LOW FLOW FAULT. PUMP LABORING - INLET SCREEN MAY BE BLOCKED. MUCH SEAWEED IN PRIMARY TANK.

0655 SUN COMING UP. INLET SCREEN CLEARED OF SEAWEED. FLOW AT 1,500 GPM BANKS AT 75%

RISING TIDE IS FORCING WATER NORTH UP THE CREEK. SALINITY AT 8.0 RISING RAPIDLY.

0700 SAMPLE 2: SP. COND. 45 mS/CM² 16.8° 25 ppt (RISING) pH 8.9 UVT: 60.8% BANKS @ 75%

0715 FLOW REVERSED WITH VERY STRONG CURRENT. EST. FLOW AT 10 FT/MIN. MUCH SEAWEED & FLOTSAM BEING CARRIED UP STREAM.

FUSS & O'NEILL
Disciplines to Deliver

PREPARED BY	DATE	CHECKED BY	DATE	PROJECT NO.
WSM	10/12			

SHEET NO. 2 of 2

0715, CONTINUED: SAMPLE 3 AT ABOUT 7:15
PUMP CLOGGING FLOW < 500 GPM - PUMP LABORING

SP. COND. 49 mS/CM² 16.5° 32 ppt pH 9.17 UVT: 61%
BANKS AT 100 %

0730 COND. 49 mS/CM² 16° 32 ppt (STABLE)
THIS IS LIKELY UNDILUTED SEAWATER. CALL TO LAURA - SAMPLING STOPPED.

0800 SALINITY CONSTANT AT 32 ppt. FLOW REVERSED WITH VERY STRONG CURRENT. HIGH TIDE - WATER IS AT SEAWALL S. OF PARKING LOT. SURF 3-5 FEET, BREAKING HEAVILY ON BEACH. CALL TO LAURA.

SP. COND. 49 mS/CM² 16.5° 32 ppt pH 9.0 UVT 60%
WATER VERY TURBID. DARK CLOUDS OVERHEAD. THUNDER TO S AND W. ABOUT 75% CLOUD COVER. SPRINKLES.

0820: BRIEF SHOWER. FLOW REVERSED. CURRENT IS SLOWING.

0845 FLOW GOING BACK & FORTH. SP. COND. 56 mS/CM² 32 ppt UVT 63%. LAMPS AT 100% BUT INLET SCREEN CLOGGED. FLOW < 500 GPM.

0930 SECURE PLANT. SAMPLES 1-3 TO THE CUSTODY OF L. MARCOLINI (F&O). WILL BE OFF SITE SHORTLY.

0930 END OF RECORD.

Walter S. Mahoney, F&O
10/12/2007

FUSS & O'NEILL
Disciplines to Deliver

PREPARED BY	DATE	CHECKED BY	DATE	PROJECT NO.
ADSM	10/19			J006901.010

NEWPORT UV PILOT FIELD NOTES

SHEET NO. 1 of 4

1:00 PM, FRIDAY 10/19: ON SITE. TEMP. ABOUT 72°
SUN THRU HIGH CLOUDS - NO FLOW IN CREEK. LOW TIDE.
INSTRUMENT: RENTAL YSI 650 D.O. METER.
CREEK: 18° 206 uS/CM/°C pH 6.6
SEA WATER: 18° 2,7000 uS/CM/°C pH: 7.6

6:18 PM NO FLOW IN CREEK. SCATTERED SHOWERS
TIDE RISING. MOSTLY CLOUDY, WIND SE 25-30
KTS STEADY - HEAVY SURF BREAKING ON BEACH.

9:00 - 10:00 HEAVY RAIN BANDS. WIND INCREASING TO
60-70 KNOTS W. HIGHER GUSTS. TIDE NEAR HIGH -
HEAVY SURF BREAKING AT SEAWALL. SALT SPRAY AT
PLANT. WAVES TRAVELING UPSTREAM IN CREEK.

10:00 PM - 2:00 AM (SATURDAY) SCATTERED LIGHT
SHOWERS - FLOW REVERSED IN CREEK.
SP. COND. 16,550 uS/CM/°C UVT: 57.8%

3:00 AM FLOW REVERSED. LT. RAIN SHOWERS.
SP. COND. 20,500 uS/CM/°C UVT 64.2% 18°
pH: 7.3

3:30 AM DIMINISHING WIND @ 30-40 KTS SE
FLOW UPSTREAM SLOWING AND STOPPING AT TIMES.
SP. COND. ± 25,000 uS UVT 65° INLET BLOCKED.

FUSS & O'NEILL
Disciplines to Deliver

PREPARED BY	DATE	CHECKED BY	DATE	PROJECT NO.
WSM	10/20			

SHEET NO. 3 of 4

4:00 AM WIND DIMINISHING TO 20 KTS SE
FLOW: DOWNSTREAM TIDE GOING OUT - HEAVY SURF BREAKING ON BEACH. SP. COND. ≈ 25,000 uS.

6:00 AM MODERATE RAINSTORM - INLET SCREEN CLEARED - FLOW STARTING IN CREEK. SP. COND. 910 uS 18° pH: 6.48 UVT 59.5% PLANT RE-STARTED. BANKS: 100%

0700 AM BEGIN SAMPLING AT SAMPLE 4

SAMPLE # 10200785O - XX

-01 SALINITY
-02 INLET
-03 OUTLET
-04 TSS

819 uS 18° pH 6.5
UVT: 59% DOSE: 180 mW/cm²

7:05 BANKS TO 90%

0715 SAMPLE 5

-05 INLET
-06 OUTLET
-07 TSS

830 uS 18° pH 6.48
UVT: 59.2% DOSE: 155 mW/cm²

0720 BANKS TO 75%

FUSS & O'NEILL
Disciplines to Deliver

PREPARED BY	DATE	CHECKED BY	DATE	PROJECT NO.
WSM	10/20			

SHEET NO. 3 of 4

0730 SAMPLE 6

-08 INLET
-09 OUTLET
-10 TSS

786 uS 18° pH 6.49
UVT: 59% DOSE 124 MW/CM²

0735 BANKS TO 50%

0745 SAMPLE 7

-11 INLET
-12 OUTLET
-13 TSS

709 uS 18° pH 6.49
UVT: 59% DOSE 73 MW/CM²

0750 BANKS TO 30%

0800 SAMPLE 8

-14 INLET
-15 OUTLET
-16 TSS

799 uS 18° pH 6.47
UVT: 58.9% DOSE 32 MW/CM²

0805 BANKS TO 50%

0815 SAMPLE 5

-17 INLET
-18 OUTLET
-19 TSS

759 uS/CM/°C 18° pH 6.47
UVT: 58.8% DOSE 73 MW/CM²

FUSS & O'NEILL
Disciplines to Deliver

PREPARED BY	DATE	CHECKED BY	DATE	PROJECT NO.
WSM	10/20			

SHEET NO. 4 of 4

0900 PLANT SECURED & OFF SITE

10:40 SAMPLES TO CUSTODY OF NET

END OF RECORD

Walter S. Mahoney F.O. 10/20/2007

FUSS & O'NEILL
Disciplines to Deliver

PREPARED BY	DATE	CHECKED BY	DATE	PROJECT NO.
MBM	10/24			7006 901.010

NEWPORT UV PILOT FIELD NOTES

SHEET NO. 1 of 4

0700 ON SITE. ABOUT 60°, LIGHT NW WIND TIDE ABOUT ½ WAY DOWN THE BEACH - LT. SURF. DRY GROUND, BUT SLOW FLOW IN CREEK 2 to 3 FT/MIN. CREEK WATER CHARACTERISTICS: 14 ppt SALINITY 23 mS/CM/°C UVT 71% pH 6 (PAPER), 18°, SANITARY SEWAGE SMELL.

0800 COLLIMATED BEAM SAMPLE 1 - UPSTREAM OF BRIDGE & FLAP VALVE AT LIFT STATION.

0815 COLLIMATED BEAM SAMPLE 2 FROM INLET TANK. WATER CHARACTERISTICS UNCHANGED. SAMPLE 1 & 2 FIXED WITH 1.0 ml CLOROX BLEACH. PLANT SECURED & OFF SITE BY 0830.

1415: BACK ON SITE - LIGHT RAIN - FLOW IN CREEK 3 TO 4 FT/MIN (ESTIMATE). PLANT STARTED AT 2,000 GPM.

COLLIMATED BEAM SAMPLE #3 TAKEN UPSTREAM AS ABOVE. COLLIMATED BEAM SAMPLE # 4 FROM INLET TANK.

1430: SAL. 6.3 ppt 18° 11 mS/CM/°C pH: 6 (PAPER) UVT @ 73% BANKS: 100% @ 2000 GPM, 265 mW/cm²

SAMPLES TO NET: 10240785O-XX

SAMPLE 1: UPSTREAM BACTERIA TAKEN WITH COLLIMATED BEAM SAMPLE.

-02 INLET
-03 OUTLET
-04 TSS @ INLET

1445 SAMPLE 2 BANKS 100 % 2,000 GPM

-05 INLET
-06 OUTLET
-07 TSS @ INLET

SAL. 6.2 ppt 18° 10.87 mS/CM/°C UVT @ 79 %
UV DOSE: 265 mW/CM².

1450 BANKS TO 75%

1500 SAMPLE 3 BANKS 75% 2,000 GPM

-08 INLET
-09 - OUTLET
-10 TSS @ INLET

SAL. 6.1 ppt 18° 9.3 mS/CM/°C UVT @ 72.4 %
UV DOSE 181 mW/CM² pH: 6 (PAPER)

1515 SAMPLE ~~3~~ 4 BANKS 75% 2,000 GPM

-11 INLET
-12 OUTLET
-13 TSS @ INLET

SALINITY 5.9 ppt 18° 10.39 mS/CM/°C UVT: 72.3%
UV DOSE 187 mW/CM² pH: 6 (PAPER)

1520 BANKS TO 50 %

1530 SAMPLE 5 BANKS @ 50 % 2,000 GPM

-14 INLET
-15 OUTLET
-16 TSS @ INLET

SALINITY 5.7 ppt 18° 10.30 mS/CM/°C UVT: 71.9%
UV DOSE 106.7 mW/CM² pH: 6 (PAPER)

1545: PUMP STOPPED TO CLEAR BRANCH & LEAVES FROM INLET SCREEN.

1600 SAMPLE 6 BANKS @ 50% 2000 GPM
- -17 INLET
- -18 OUTLET
- -19 TSS @ INLET

SALINITY 5.7 ppt 18° 9.92 mS/CM/°C UVT: 71.4%
UV DOSE 106.7 MW/CM²

1610 BANKS TO 30% FLOW 2000 GPM

1615 SAMPLE 7 BANKS AT 30% 2000 GPM
- -20 INLET
- -21 OUTLET
- -22 TSS @ INLET

SALINITY 5.4 ppt 18° 9.57 mS/CM/°C UVT: 71.0%
UV DOSE 46.9 mW/CM² pH: 6 (PAPER)

1630 SAMPLE 8 BANKS AT 30% ~~UVT~~ 2,000 GPM
- -23 INLET
- -24 OUTLET
- -25 TSS @ INLET

SALINITY 5.4 ppt 18° 9.59 mS/CM/°C UVT: 70.5%
DOSE: 46.9 MW/CM² pH: 6 (PAPER)

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Disciplines to Deliver

PREPARED BY	DATE	CHECKED BY	DATE	PROJECT NO.
WSM	10/24			3006 901.010

SHEET NO. 4 of 4

1700 PLANT SECURED & OFF SITE

1800 SAMPLES TO CUSTODY OF JOE, NET.

END OF RECORD.

Walter S. Mahoney P.E.

FUSS & O'NEILL
Disciplines to Deliver

PREPARED BY	DATE	CHECKED BY	DATE	PROJECT NO.
WSM	10/27			2006 901.010

NEWPORT UV PILOT - FIELD NOTES 10/27/07

SHEET NO. 1 of 2

THE INTENT OF THIS RUN IS TO SET THE LAMP BANKS TO 60% POWER AND VARY THE HYDRAULIC LOAD FROM 1000 TO 2000 GPM.

1530 COLLIMATED BEAM SAMPLE 3 TAKEN FROM STREAM ABOVE BRIDGE, UPSTREAM OF THE "FLAP VALVE".

17.4° pH 7.24 1550 uS/°C 0.8 ppt.

1535 COLLIMATED BEAM SAMPLE 4 - INLET TANK

17.4° pH 7.24 9560 uS/°C 5.5 ppt

1545 BANKS AT 60% UV DOSE: 117 mW/CM² UVT: 66.5%

FLOW: ≈ 2,000 GPM (INLET TANK FULL)

SAMPLE 1 102707850-XX

-01 INLET

-02 OUTLET

-03 TSS INLET

17.5° pH 7.29 9290 uS/°C 5.3 ppt UVT: 66.5%

1615 SAMPLE 2 - FLOW ≈ 1750 GPM±

-04 INLET

-05 OUTLET

-06 TSS INLET

17.5° pH 7.30 8890 uS/°C 5.0 ppt UVT: 66%

FUSS & O'NEILL
Disciplines to Deliver

PREPARED BY	DATE	CHECKED BY	DATE	PROJECT NO.
MSM	10/27			

SHEET NO. 2 of 2

1645 SAMPLE 3 - FLOW ≈ 1500 GPM ±

-07 INLET

-08 OUTLET

-09 TSS INLET

17.6° pH 7.29 8500 µS/°C 4.8 ppt UVT 65.7%

1715 SAMPLE 4 - FLOW ≈ 1250 GPM ±

-10 INLET

-11 OUTLET

-12 TSS INLET

17.6° pH 7.32 9000 µS/°C 4.9 ppt UVT: 65.3%

1745 SAMPLE 5 - FLOW 1000 GPM ±

(WATER LEVEL DROPPING IN CREEK)

-13 INLET

-14 OUTLET

-15 TSS INLET

17.5° pH 7.25 7840 µS/°C 4.3 ppt UVT: 64.7%

LAMPS WERE AT 60% POWER, ALL 5 SAMPLES.

WEATHER: LT. RAIN, PASSING HEAVY SHOWERS, 70°, WINDY.

MSMahoney, F&O

FUSS & O'NEILL
Disciplines to Deliver

PREPARED BY	DATE	CHECKED BY	DATE	PROJECT NO.
JWBM	10/27			3006 901.V10

SHEET NO. 1 of 1

COLLIMATED BEAM SAMPLE CHARACTERISTICS

FIRST FLUSH - ABOUT 15 MINUTES AFTER FLOW STARTED

SAMPLE 1 - UPSTREAM OF BRIDGE 10/27, 00:00 HRS

13.5° pH: 7.55 1098 uS/CM/°C 0.5 ppt

SAMPLE 2 - INLET

14.1° pH: 7.46 1850 uS/CM/°C 1.1 ppt

FOLLOWING ABOUT 4 HRS (TOTAL) OF ON-AND-OFF RAIN, CREEK HAD BEEN FLOWING FOR 4-5 HOURS (ESTIMATE)

SAMPLE 3 - UPSTREAM OF BRIDGE 10/27, 1530 HRS

17.4° pH: 7.10 1550 uS/CM/°C 0.8 ppt

SAMPLE 4 - INLET

17.9° pH 7.24 9560 uS/CM/°C 5.5 ppt

(HEAVY RAIN SHOWER)

ALL 4 SAMPLES HELD IN ICE BATH

FUSS & O'NEILL
Disciplines to Deliver

PREPARED BY	DATE	CHECKED BY	DATE	PROJECT NO.
JWSM	11/3			2007H213.V10

NEWPORT UV PILOT FIELD NOTES NOV 3 2007

SHEET NO. 1 of 3

0500 ON SITE. WEATHER: ANTICIPATING THE ARRIVAL OF T.S. NOEL. WEATHER: CLOUDY, ABOUT 50°, N-E WIND TO ABOUT 30 KTS, LOW TIDE, HEAVY SURF BREAKING ON BEACH. NO FLOW IN CREEK.

9.6°C 4682 µS pH 7.23 SALINITY 2.5 ppt UVT: 78.5%

0600 PLANT STARTED AT MIN FLOW LAMPS @ 100 %

UV DOSE 293 mW/CM² – NO FLOW IN CREEK.

0700 LIGHT PASSING SHOWERS - WIND N-E, INCREASING TO 60 KNT GUSTS. NO FLOW IN CREEK.

0800 BANDS OF HEAVIER RAIN - NO FLOW IN CREEK. TIDE (OR STORM SWELL) RISING - SURF TO 6' BREAKING ON BEACH.

0845 FLOW IN CREEK? - HEAVY BANDS OF RAIN.

10° 3818 µS/cm/°C pH 7.25 UVT 70.9 2.1 ppt

0850 COND. 3540 µS, FALLING. NO FLOW AT BRIDGE.

0900 10° 2860 µS/cm/°C pH 7.26 UVT 70.1 1.5 ppt

NO FLOW IN CREEK – RAIN STOPPED AT ABOUT 0850

0920 HEAVY RAIN – NO FLOW – WIND GUSTS TO 70 KTS.

0930 FLOW IN CREEK – COLLIMATED BEAM SAMPLE 1 TAKEN UPSTREAM OF BRIDGE. NET SAMPLE TAKEN AT THIS SAME TIME & PLACE – 110307850-01

9.4° 442 uS/CM/°C pH 7.30 0.3 ppt

0936 COLLIMATED BEAM SAMPLE 2 FROM INLET

9.9° 2401 uS/CM/°C pH 7.22 1.2 ppt UVT 71.2 %

0941 FLOW ↑ TO 2,200 GPM BANKS @ 100 %

9.8° 2111 uS/CM/°C pH 7.29 1.1 ppt UVT 71.4 %

11030785O -02 INLET
-03 OUTLET
-04 TSS @ INLET

1000 FLOW ↓ TO 1,550 GPM BANKS @ 100 %

9.8° 2069 uS/CM/°C pH 7.23 1.1 ppt UVT 72.4 %

-05 INLET
-06 OUTLET
-07 TSS @ INLET

1015 FLOW ↓ TO 1,100 GPM BANKS @ 100 %

9.7°C 1676 uS/CM/°C pH: 7.21 0.9 ppt UVT 73.6 %

-08 INLET
-09 OUTLET
-10 TSS @ INLET

1030 VERY HEAVY RAIN & WIND - COLLIMATED BEAM SAMPLE # 3 UPSTREAM OF BRIDGE. A.C. POWER "BLINKED" & LAMP BANKS TRIPPED OFF. HEAVY

FUSS & O'NEILL
Disciplines to Deliver

PREPARED BY	DATE	CHECKED BY	DATE	PROJECT NO.
WSM	11/3			

SHEET NO. 3 of 3

SURF BREAKING ON SANDBAR. RAIN BLOWING HORIZONTALLY.

9.5°C 1322 uS/CM/°C pH 7.21 0.7 ppt SALINITY

1036 COLLIMATED BEAM SAMPLE 4 TAKEN FROM INLET TANK. RISING WATER IN CREEK MAKES SAMPLING FROM LADDER DANGEROUS.

9.6° 1809 uS/CM/°C pH: 7.13 0.9 ppt UVT: 73.2%

1045 WAVES COMING UPSTREAM - SHUTTING DOWN PUMP. TROPICAL STORM CONDITIONS.

1100 OFF SITE & END OF RECORD.

Walter S. Mahoney F&O

FUSS & O'NEILL
Disciplines to Deliver

PREPARED BY	DATE	CHECKED BY	DATE	PROJECT NO.
WSM	11/03			2007 1213.010

COLLIMATED BEAM SAMPLE CHARACTERISTICS

SHEET NO. 1 of 1

SAMPLE 1 0930, UPSTREAM OF THE BRIDGE

9.4°C 442 uS/CM/°C pH 7.30 0.3 ppt SALINITY

SAMPLE 2 0936, AT THE PUMP INLET

9.9°C 2401 uS/CM/°C pH 7.22 1.2 ppt SALINITY

SAMPLE 3 1030, UPSTREAM OF BRIDGE

9.5°C 1322 uS/CM/°C pH 7.21 0.7 ppt SALINITY

SAMPLE 4 1036, AT THE PUMP INLET

9.6°C 1809 uS/CM/°C pH 7.13 0.9 ppt SALINITY

NOTES:

SAMPLES 1 & 2 REPRESENT A FIRST FLUSH CONDITION

SAMPLES 3 & 4 TAKEN DURING HEAVY FLOW CONDITION

WEATHER: ABOUT 50°, HEAVY RAIN, WIND NE TO 60 KNTS, HEAVY SURF BREAKING ON BEACH, TIDE RISING

Walter S. Mahoney, F&O

FUSS & O'NEILL
Disciplines to Deliver

PREPARED BY	DATE	CHECKED BY	DATE	PROJECT NO.
WSM	11/6			2007 1213.010

SHEET NO. 1 of 1

COLLIMATED BEAM SAMPLE CHARACTERISTICS

SAMPLE 1 1040, UPSTREAM OF BRIDGE

13.2°C 1220 µS/CM/°C pH 6.38 0.6 ppt SALINITY

SAMPLE 2 1050, AT PUMP INLET

11.9°C 10.97 mS/CM/°C pH 6.75 6.3 ppt SALINITY
UVT 75%

NOTES:

1. SAMPLES 1 & 2 TAKEN AT FIRST FLUSH.
2. WATER HAD STRONG SULFIDE SMELL.
3. LARGE AMOUNTS OF STIFF, DIRTY-WHITE FOAM WERE FORMED IN THE INLET TANK.
4. WEATHER: ABOUT 50°, PASSING BANDS OF HEAVY RAIN, DIMINISHING WIND. LOW TIDE WITH HEAVY SURF BREAKING ON BEACH.

FUSS & O'NEILL
Disciplines to Deliver

PREPARED BY	DATE	CHECKED BY	DATE	PROJECT NO.
MSM	11/15			2006901.010

NEWPORT UV PILOT COLLIMATED BEAM SAMPLES

SHEET NO. 1 of 1

SAMPLE 1 - UPSTREAM OF BRIDGE

3:30 PM 58° pH 8.2 451 uS/CM/°C
12.65 MG/L D.O.

SAMPLE 2 - DOWNSTREAM OF BRIDGE

3:43 PM 58° pH 7.76 1844 uS/CM/°C
13.97 MG/L D.O.

WEATHER: HEAVY RAIN TO N AND W
WIND NW TO 30 KTS AIR: 50°
MODERATE FLOW IN CREEK

APPENDIX C

NET LAB RESULTS

REPORT OF ANALYTICAL RESULTS

NETLAB Case Number S0917-01

Prepared for:

Fuss & O'Neill
275 Promenade Street, Suite 350
Providence, RI 02908
Attn: Walter Mahoney

Report Date: September 20, 2007

Reviewed by:

Richard Warila
Laboratory Director

Lab # RI010

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Total # of Pages: 8

STATEMENTS/CERTIFICATIONS REQUIRED BY THE NATIONAL ENVIRONMENTAL LABORATORY APPROVAL CONFERENCE (NELAC)

New England Testing Laboratory is certified under the National Environmental Laboratory Approval Program (NELAP). This certification requires the following statements and certifications be included in our report.

This report shall not be reproduced, except in full, without written approval of the laboratory.

New England Testing certifies that the test results contained within this report meet all NELAC requirements except as detailed in the Case Narrative section of this report.

SAMPLES SUBMITTED and REQUEST FOR ANALYSIS:

The samples listed in Table I were submitted to New England Testing Laboratory on September 17, 2007. The group of samples appearing in this report was assigned an internal identification number (case number) for laboratory information management purposes. The client's designations for the individual samples, along with our case numbers, are used to identify the samples in this report. The case number for this sample submission is S0917-01.

Project: Newport UV Pilot

TABLE I, Samples Submitted

Sample ID	Date Sampled	Matrix	Analysis Requested
09150700850-03	9/15/07	Wastewater	Table II
09150700850-04	9/15/07	Wastewater	Table II
09150700850-05	9/15/07	Wastewater	Table II
09150700850-06	9/15/07	Wastewater	Table II

TABLE II, Analysis and Methods

ANALYSIS	DETERMINATIVE METHOD
Enterococci	EPA 1600 and Enterolert
Total Suspended Solids	160.2

These methods are documented in:

Standard Methods for the Examination of Water and Wastewater, 20th Edition, 1998, APHA, AWWA-WPCF.

Manual of Methods for Chemical Analysis of Water and Water Wastes, EPA-600/4-79-020 (Revised 1983), USEPA/EMSL.

40 CFR 136, *Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act*, Office of Federal Register National Archives and Records Administration.

CASE NARRATIVE

All samples were found to be properly preserved and received at 1 deg C. The samples had been collected just prior to delivery to the lab. All analyses were performed within EPA designated holding-times. Procedure/calibration checks required by the designated protocols were within control limits.

Sample Results

09150700850-03

Parameter	Result	Reporting Limit	Date Analyzed
Enterococci, Col/100mL	689	1	9/17/07 @ 11:00
Total Suspended Solids, mg/l	2.0	2.0	9/18/07

09150700850-04

Parameter	Result	Reporting Limit	Date Analyzed
Enterococci, Col/100mL	173	1	9/17/07 @ 11:00
Total Suspended Solids, mg/l	4.5	2.0	9/18/07

09150700850-05

Parameter	Result	Reporting Limit	Date Analyzed
Enterococci, Col/100mL	794	1	9/17/07 @ 11:00
Total Suspended Solids, mg/l	13.0	2.0	9/18/07

09150700850-06

Parameter	Result	Reporting Limit	Date Analyzed
Enterococci, Col/100mL	210	1	9/17/07 @ 11:00
Total Suspended Solids, mg/l	8.0	2.0	9/18/07

CUSTODY RECORDS

FUSS & O'NEILL
Discipline to Deliver
(860) 646-2469 • www.FandO.com

☐ 146 Hartford Road, Manchester, CT 06040
☐ 56 Quarry Road, Trumbull, CT 06611
☐ 1419 Richland Street, Columbia, SC 29201
☐ 78 Interstate Drive, West Springfield, MA 01089
☐ 610 Lynndale Court, Suite E, Greenville, NC 27858
☐ 24 Madison Avenue Extension, Albany, NY 12203
☒ 275 Promenade Street, Suite 350, Providence, RI 02908
☐ 80 Washington Street, Suite 301, Poughkeepsie, NY 12601
☐ Other _____

CHAIN-OF-CUSTODY RECORD 12904

Turnaround
☐ 1 Day* ☐ 3 Days* ☐ Other _____ (days)
☐ 2 Days* ☒ Standard (____ days) *Surcharge Applies

PROJECT NAME	PROJECT LOCATION	PROJECT NUMBER	LABORATORY
NEWPORT UV PILOT	NEWPORT RI	20091147.A10	NET

REPORT TO: WALTER MAHONEY
INVOICE TO: WALTER MAHONEY
P.O. NO.: 20091147.A10-00850
Sampler's Signature: Walter Mahoney Date: 9/15/09

Source Codes:
MW=Monitoring Well PW=Potable Water S=Soil W=Waste
SW=Surface Water T=Treatment Facility B=Bottom Sediment A=Air
X=Other STORMWATER

Analysis Request: ENTEROCOCCI T35

Containers: Soil VOA Vial, [ ] methanol [ ] sodium bisulfate; Glass Soil Container ( ) oz; Glass Soil Container ( ) oz; Other; Other; Water VOA Vial [ ] As is [ ] HCl; Glass Amber ( ) mL [ ] As is [ ] H2SO4; Plastic - As is; Plastic - H2SO4 250 ml [ ] As is [ ] 500 [ ] 1000 ml; Plastic - HNO3 250 ml [ ] 250 ml [ ] 500 ml; Plastic - NaOH, 250 ml [ ] Filtered; Bacteria Bottle; Comments

Item No.	Transfer Check 1	2	3	4	Sample Number	Source Code	Date Sampled	Time Sampled	ENTEROCOCCI	T35	Bacteria Bottle	Comments
1					091507008 50-03	X	9-15	1415	X	X		
2					09150700850-04	X	↓	1415	X	X		
3					09150700850-05	X	↓	1445	X	X		
4					09150700850-06	X	↓	1445	X	X		

Transfer Number	Relinquished By	Accepted By	Date	Time
1	Walter Mahoney	[illegible]	9-17	8:35
2				
3				
4				

Reporting and Detection Limit Requirements:

Additional Comments:
ACTUAL COUNT REQ'D FOR ENTEROCOCCI - DILUTE IF NECESSARY.

REPORT OF ANALYTICAL RESULTS

NETLAB Case Number S0928-03

Prepared for:

Fuss & O'Neill
275 Promenade Street, Suite 350
Providence, RI 02908
Attn: Walter Mahoney

Report Date: October 3, 2007

Reviewed by:

Richard Warila

Richard Warila
Laboratory Director

Lab # RI010

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New England Testing certifies that the test results contained within this report meet all NELAC requirements except as detailed in the Case Narrative section of this report.

SAMPLES SUBMITTED and REQUEST FOR ANALYSIS:

The samples listed in Table I were submitted to New England Testing Laboratory on September 28, 2007. The group of samples appearing in this report was assigned an internal identification number (case number) for laboratory information management purposes. The client's designations for the individual samples, along with our case numbers, are used to identify the samples in this report. The case number for this sample submission is S0928-03.

Project: Newport UV Pilot

TABLE I, Samples Submitted

Sample ID	Date Sampled	Matrix	Analysis Requested
092707850-01	9/28/07	Waste	Table II
092707850-02	9/28/07	Waste	Table III
092707850-03	9/28/07	Waste	Table III
092707850-04	9/28/07	Waste	Table II
092707850-05	9/28/07	Waste	Table III
092707850-06	9/28/07	Waste	Table III
092707850-07	9/28/07	Waste	Table II
092707850-08	9/28/07	Waste	Table III
092707850-09	9/28/07	Waste	Table III
092707850-10	9/28/07	Waste	Table II
092707850-11	9/28/07	Waste	Table III
092707850-12	9/28/07	Waste	Table III

TABLE II, Analysis and Methods

ANALYSIS	DETERMINATIVE METHOD
Total Suspended Solids	160.2

TABLE III, Analysis and Methods

ANALYSIS	DETERMINATIVE METHOD
Enterococci	EPA 1600 and Enterolert

These methods are documented in:

40 CFR 136, *Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act*, Office of Federal Register National Archives and Records Administration.

CASE NARRATIVE

All samples were found to be properly preserved and cooled. The samples had been collected just prior to delivery to the lab. All analyses were performed within EPA designated holding-times. Procedure/calibration checks required by the designated protocols were within control limits.

Sample Results

Total Suspended Solids

Sample ID	Result, mg/l	Reporting Limit	Date Analyzed
092707850-01	15.0	2.0	10/2/07
092707850-04	12.5	2.0	10/2/07
092707850-07	16.5	2.0	10/2/07
092707850-10	15.0	2.0	10/2/07

Enterococci

Sample ID	Result, Col/100ml	Reporting Limit	Date Analyzed
092707850-02	189	1	9/28/07 @ 7:30
092707850-03	11	1	9/28/07 @ 7:30
092707850-05	488	1	9/28/07 @ 7:30
092707850-06	7	1	9/28/07 @ 7:30
092707850-08	548	1	9/28/07 @ 7:30
092707850-09	10	1	9/28/07 @ 7:30
092707850-11	387	1	9/28/07 @ 7:30
092707850-12	3	1	9/28/07 @ 7:30

CUSTODY RECORDS

S0928-03

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☐ Other _____

CHAIN-OF-CUSTODY RECORD 12953

Turnaround
☐ 1 Day* ☐ 3 Days* ☐ Other _____ (days)
☐ 2 Days* ☒ Standard (____ days) *Surcharge Applies

PROJECT NAME	PROJECT LOCATION	PROJECT NUMBER	LABORATORY
NEWPORT UV PILOT	NEWPORT RI	2006901.010	NET

REPORT TO: WALTER MAHONEY
INVOICE TO: WALTER MAHONEY
P.O. NO.: 850
Sampler's Signature: WSMahoney Date: 9/28/07

Source Codes:
MW=Monitoring Well PW=Potable Water S=Soil W=Waste
SW=Surface Water T=Treatment Facility B=Bottom Sediment A=Air
X=Other _____

Analysis Request / Containers

Item No.	Transfer Check 1	2	3	4	Sample Number	Source Code	Date Sampled	Time Sampled	EMTBTEX co Cl	TSS	Soil VOA Vial, [ ] methanol	Glass Soil Container ( ) oz	Glass Soil Container ( ) oz	Other:	Other:	Water VOA Vial, [ ] As is [ ] HCl	Glass Amber ( ) mL [ ] As is [ ] As is [ ] H_2SO_4	Plastic - As is, [ ] 250 ml [ ] 500 ml 1000 ml	Plastic - H_2SO_4, [ ] 250 ml [ ] 500 ml	Plastic - HNO_3, 250 ml [ ] Filtered	Plastic - NaOH, 250 ml	Bacteria Bottle	Comments
					092707850 -01	W	9-28	0250		X	X												
					-02			0250	X														
					-03			0250	X														
					-04			0307		X													
					-05			0307	X														
					-06			0307	X														
					-07			0323		X													
					-08			0323	X														
					-09			0323	X														
					-10			0323		X													

Transfer Number	Relinquished By	Accepted By	Date	Time
1	WSMahoney		9/28	7:00
2				
3				
4				

Reporting and Detection Limit Requirements:

Additional Comments:

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☐ 80 Washington Street, Suite 301, Poughkeepsie, NY 12601
☐ Other _____

CHAIN-OF-CUSTODY RECORD 12954

Turnaround
☐ 1 Day* ☐ 3 Days* ☐ Other _____ (days)
☐ 2 Days* ☒ Standard (____ days) *Surcharge Applies

PROJECT NAME	PROJECT LOCATION	PROJECT NUMBER	LABORATORY
NEWPORT UV PILOT	NEWPORT RI	2006901-010	NET

REPORT TO: WALTER MAHONEY
INVOICE TO: WALTER MAHONEY
P.O. NO.: 850
Sampler's Signature: WSMahoney Date: 9/28/07

Source Codes:
MW=Monitoring Well PW=Potable Water S=Soil W=Waste
SW=Surface Water T=Treatment Facility B=Bottom Sediment A=Air
X=Other _____

Analysis Request / Containers

Item No.	Transfer Check 1 2 3 4	Sample Number	Source Code	Date Sampled	Time Sampled	Entero coli	TSS	Soil VOA Vial, [ ] methanol [ ] sodium bisulfate	Glass Soil Container ( ) oz	Glass Soil Container ( ) oz	Other:	Other:	Water VOA Vial, [ ] As is [ ] HCl	Glass Amber ( ) ml, [ ] As is [ ] HCl	Plastic - As is, [ ] 250 ml [ ] As is [ ] H_2SO_4	Plastic - H_2SO_4, [ ] 250 ml [ ] 500 [ ] 1000 ml	Plastic - HNO_3, 250 ml [ ] 250 ml [ ] 500 ml	Plastic - NaOH, 250 ml [ ] Filtered	Bacteria Bottle	Comments
		092707850-11	W	9/28	0323	X														
		092707850-12	W	9/28	0323	X														

Transfer Number	Relinquished By	Accepted By	Date	Time
1	WS Mahoney		9/27	7:00
2				
3				
4				

Reporting and Detection Limit Requirements:

Additional Comments:

REPORT OF ANALYTICAL RESULTS

NETLAB Case Number S1012-01

Prepared for:

Fuss & O'Neill
275 Promenade Street, Suite 350
Providence, RI 02908
Attn: Walter Mahoney

Report Date: October 17, 2007

Reviewed by:

Richard Warila

Richard Warila
Laboratory Director

Lab # RI010

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New England Testing certifies that the test results contained within this report meet all NELAC requirements except as detailed in the Case Narrative section of this report.

SAMPLES SUBMITTED and REQUEST FOR ANALYSIS:

The samples listed in Table I were submitted to New England Testing Laboratory on October 12, 2007. The group of samples appearing in this report was assigned an internal identification number (case number) for laboratory information management purposes. The client's designations for the individual samples, along with our case numbers, are used to identify the samples in this report. The case number for this sample submission is S1012-01.

Project: Newport UV Pilot

TABLE I, Samples Submitted

Sample ID	Date Sampled	Matrix	Analysis Requested
101207850-01	10/12/07	Wastewater	Table II
101207850-02	10/12/07	Wastewater	Table II
101207850-03	10/12/07	Wastewater	Table III
101207850-04	10/12/07	Wastewater	Table II
101207850-05	10/12/07	Wastewater	Table II
101207850-06	10/12/07	Wastewater	Table III
101207850-07	10/12/07	Wastewater	Table II
101207850-08	10/12/07	Wastewater	Table II
101207850-09	10/12/07	Wastewater	Table III

TABLE II, Analysis and Methods

ANALYSIS	DETERMINATIVE METHOD
Enterococci	EPA 1600 and Enterolert

TABLE III, Analysis and Methods

ANALYSIS	DETERMINATIVE METHOD
Total Suspended Solids	2540D

These methods are documented in:

40 CFR 136, *Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act*, Office of Federal Register National Archives and Records Administration.

CASE NARRATIVE

All samples were found to be properly preserved and cooled. The samples had been collected just prior to delivery to the lab. All analyses were performed within EPA designated holding-times. Procedure/calibration checks required by the designated protocols were within control limits.

Sample Results

Total Suspended Solids

Sample ID	Result, mg/l	Reporting Limit	Date Analyzed
101207850-03	24	8	10/16/07
101207850-06	288	16	10/16/07
101207850-09	588	16	10/16/07

Enterococci

Sample ID	Result, Col/100ml	Reporting Limit	Date Analyzed
101207850-01	>4840	1	10/12/07 @ 10:30
101207850-02	408	1	10/12/07 @ 10:30
101207850-04	437	1	10/12/07 @ 10:30
101207850-05	264	1	10/12/07 @ 10:30
101207850-07	961	1	10/12/07 @ 10:30
101207850-08	251	1	10/12/07 @ 10:30

CUSTODY RECORDS

8102-01

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☐ Other ______

CHAIN-OF-CUSTODY RECORD 12956

Turnaround
☐ 1 Day* ☐ 2 Days* ☐ 3 Days* ☑ Standard (____ days) ☐ Other ______ (days) *Surcharge Applies

PROJECT NAME	PROJECT LOCATION	PROJECT NUMBER	LABORATORY
NEWPORT UV PILOT	NEWPORT RI	20071147.A10	NET

REPORT TO: WALTER MAHONEY
INVOICE TO: WALTER MAHONEY
P.O. NO.: 20071147.A10-00350
Sampler's Signature: W. S. Mahoney Date: 10/11/07

Source Codes:
MW=Monitoring Well PW=Potable Water S=Soil W=Waste
SW=Surface Water T=Treatment Facility B=Bottom Sediment A=Air
X=Other ______

Analysis Request: ENTEROCOCCI, TSS

Containers: Soil VOA Vial [ ] methanol [ ] sodium bisulfate; Glass Soil Container ( ) oz; Glass Soil Container ( ) oz; Other; Other; Water VOA Vial [ ] As is [ ] HCl; Glass Amber ( ) ml [ ] As is [ ] H₂SO₄; Plastic - As is, [ ] 250 ml [ ] 500 [ ] 1000 ml; Plastic - H₂SO₄ [ ] 250 ml [ ] 500 ml; Plastic - HNO₃ 250 ml [ ] Filtered; Plastic - NaOH, 250 ml; Bacteria Bottle

Item No.	Transfer Check 1	2	3	4	Sample Number	Source Code	Date Sampled	Time Sampled	ENTEROCOCCI	TSS	Comments
					101207850-01	WW	10/12	0630	X		
					-02	↓	↓	0630	X		
					-03	↓	↓	0630		X	
					-04	↓	↓	0700	X		
					-05	↓	↓	0700	X		
					-06	↓	↓	0700		X	
					-07	↓	↓	0715	X		
					-08	↓	↓	0715	X		
					-09	↓	↓	0715		X	

Transfer Number	Relinquished By	Accepted By	Date	Time
1	W S Mahoney	A R Mahoney	10/12	09:45
2	[signature]	[signature]	10/12	11:10
3				
4				

Reporting and Detection Limit Requirements:

Additional Comments: SAMPLE 1 AT 0.8 FTT
SAMPLE 2 AT 29.0 FTT
SAMPLE 3 AT 32.0 FTT

REPORT OF ANALYTICAL RESULTS

NETLAB Case Number S1019-14

Revised Report

Prepared for:

Fuss & O'Neill
275 Promenade Street, Suite 350
Providence, RI 02908
Attn: Walter Mahoney

Report Date: October 30, 2007

Reviewed by:

Richard Warila
Laboratory Director

Lab # RI010

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STATEMENTS/CERTIFICATIONS REQUIRED BY THE NATIONAL ENVIRONMENTAL LABORATORY APPROVAL CONFERENCE (NELAC)

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New England Testing certifies that the test results contained within this report meet all NELAC requirements except as detailed in the Case Narrative section of this report.

SAMPLES SUBMITTED and REQUEST FOR ANALYSIS:

The samples listed in Table I were submitted to New England Testing Laboratory on October 19, 2007. The group of samples appearing in this report was assigned an internal identification number (case number) for laboratory information management purposes. The client's designations for the individual samples, along with our case numbers, are used to identify the samples in this report. The case number for this sample submission is S1019-14.

Project: Newport UV Pilot

TABLE I, Samples Submitted

Sample ID	Date Sampled	Matrix	Analysis Requested
102007850-01	10/20/07	Waste	Table II
102007850-02	10/20/07	Waste	Table III
102007850-03	10/20/07	Waste	Table III
102007850-04	10/20/07	Waste	Table III, IV
102007850-05	10/20/07	Waste	Table III
102007850-06	10/20/07	Waste	Table III
102007850-07	10/20/07	Waste	Table III, IV
102007850-08	10/20/07	Waste	Table III
102007850-09	10/20/07	Waste	Table III
102007850-10	10/20/07	Waste	Table III, IV
102007850-11	10/20/07	Waste	Table III
102007850-12	10/20/07	Waste	Table III
102007850-13	10/20/07	Waste	Table III, IV
102007850-14	10/20/07	Waste	Table III
102007850-15	10/20/07	Waste	Table III
102007850-16	10/20/07	Waste	Table IV
102007850-17	10/20/07	Waste	Table III
102007850-18	10/20/07	Waste	Table III
102007850-19	10/20/07	Waste	Table III, IV

TABLE II, Analysis and Methods

ANALYSIS	DETERMINATIVE METHOD
Salinity	2520 B

TABLE III, Analysis and Methods

ANALYSIS	DETERMINATIVE METHOD
Enterococci	EPA 1600 and Enterolert

TABLE IV, Analysis and Methods

ANALYSIS	DETERMINATIVE METHOD
Total Suspended Solids	2540D

These methods are documented in:

Standard Methods for the Examination of Water and Wastewater, 20th Edition, 1998, APHA, AWWA-WPCF.

Manual of Methods for Chemical Analysis of Water and Water Wastes, EPA-600/4-79-020 (Revised 1983), USEPA/EMSL.

40 CFR 136, *Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act*, Office of Federal Register National Archives and Records Administration.

CASE NARRATIVE

All samples were found to be properly preserved and received at 1 deg C. All analyses were performed within EPA designated holding-times. Procedure/calibration checks required by the designated protocols were within control limits.

Note: An Enterococci analysis was performed on samples 102007850-04, 07, 10, 13 and 19 on October 25, 2007 as per the client's request.

Sample Results

Salinity

Sample ID	Result, ppt	Reporting Limit	Date Analyzed
102007850-01	0.2	NA	10/23/07

Enterococci

Sample ID	Result, Col/100ml	Reporting Limit	Date Analyzed
102007850-02	722	1	10/20/07 @ 10:00
102007850-03	>2420	1	10/20/07 @ 10:00
102007850-05	>2420	1	10/20/07 @ 10:00
102007850-06	>2420	1	10/20/07 @ 10:00
102007850-08	>2420	1	10/20/07 @ 10:00
102007850-09	2	1	10/20/07 @ 10:00
102007850-11	>2420	1	10/20/07 @ 10:00
102007850-12	46	1	10/20/07 @ 10:00
102007850-14	2420	1	10/20/07 @ 10:00
102007850-15	387	1	10/20/07 @ 10:00
102007850-17	>2420	1	10/20/07 @ 10:00
102007850-18	20	1	10/20/07 @ 10:00
102007850-04	190	1	10/25/07 @ 17:00
102007850-07	95	1	10/25/07 @ 17:00
102007850-10	185	1	10/25/07 @ 17:00
102007850-13	110	1	10/25/07 @ 17:00
102007850-19	62	1	10/25/07 @ 17:00

Total Suspended Solids

Sample ID	Result, mg/l	Reporting Limit	Date Analyzed
102007850-04	5.5	2.0	10/22/07
102007850-07	7.0	2.0	10/22/07
102007850-10	3.0	2.0	10/22/07
102007850-13	4.5	2.0	10/22/07
102007850-16	3.5	2.0	10/22/07
102007850-19	6.0	2.0	10/22/07

CUSTODY RECORDS

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❑ 80 Washington Street, Suite 301, Poughkeepsie, NY 12601
❑ Other _____

CHAIN-OF-CUSTODY RECORD 14701

Turnaround
❑ 1 Day* ❑ 3 Days* ❑ Other _____ (days)
❑ 2 Days* ☒ Standard (____ days) *Surcharge Applies

PROJECT NAME: NEWPORT UV PILOT
PROJECT LOCATION: NEWPORT RI
PROJECT NUMBER:
LABORATORY: NET

REPORT TO: WALTER MAHONEY
INVOICE TO: WALTER MAHONEY
P.O. NO.: 850
Sampler's Signature: Walter Mahoney Date: 10/20/07

Source Codes:
MW=Monitoring Well PW=Potable Water S=Soil W=Waste
SW=Surface Water T=Treatment Facility B=Sediment A=Air
X=Other _____

Analysis Request / Containers

Item No.	Transfer Check 1 2 3 4	Sample Number	Source Code	Date Sampled	Time Sampled	SALINITY	ENTEROCOCCI	TSS	Soil VOA Vial [ ]	Soil VOA Vial [ ] methanol	Glass Soil Container [ ] water [ ]	Glass Soil Container [ ] oz.	Other: [ ] Na(SO)₂	Water VOA Vial [ ]	Glass Amber [ ] As is [ ] HCl	Plastic - As is [ ] ml, [ ] As is [ ] HCl	Plastic - H₂SO₄ [ ] 250 ml [ ] As is [ ] H₂SO₄	Plastic - H₂SO₄ [ ] 250 ml [ ] 500 ml	Plastic - HNO₃ 250 ml [ ] Filtered [ ] 1000 ml	Plastic - NaOH 250 ml [ ] Unfiltered	Comments
		10200785O-01	W	10/20	0700	X															
		-02			0700		X														
		-03			0700		X														
		-04			0700			X													
		-05			0715		X														
		-06			0715		X														
		-07			0715			X													
		-08			0730		X														
		-09			0730		X														
		-10			0730			X													

Transfer Number	Relinquished By	Accepted By	Date	Time
1	Walter Mahoney	NET COOLER	10/20	1840
2				
3				
4				

Reporting and Detection Limit Requirements:
Additional Comments: PAGE 1 OF 2

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☒ 275 Promenade Street, Suite 350, Providence, RI 02908
❑ 80 Washington Street, Suite 301, Poughkeepsie, NY 12601
❑ Other _____

CHAIN-OF-CUSTODY RECORD 14702

❑ 1 Day* ❑ 3 Days* ❑ Other _____ (days)
❑ 2 Days* ☒ Standard (____ days) *Surcharge Applies

PROJECT NAME: NEWPORT UV PILOT
PROJECT LOCATION: NEWPORT RI
PROJECT NUMBER:
LABORATORY: NET

REPORT TO: WALTER MAHONEY
INVOICE TO: WALTER MAHONEY
P.O. NO.: 850

Sampler's Signature: Walter Mahoney Date: 10/20/07

Source Codes:
MW=Monitoring Well PW=Potable Water S=Soil W=Waste
SW=Surface Water T=Treatment Facility B=Sediment A=Air
X=Other _____

Analysis Request / Containers

Item No.	Transfer Check 1 2 3 4	Sample Number	Source Code	Date Sampled	Time Sampled	ENTEROCOCCI	TSS	Soil VOA Vial, [ ] methanol	Soil VOA Vial, [ ] water	Glass Soil Container ( ) oz [ ] $Na(SO_3)_2$	Glass Soil Container ( ) oz	Other:	Water VOA Vial, [ ] As is [ ] HCl	Glass Amber ( ) mL [ ] As is [ ] H_2SO_4	Plastic - As is, [ ] 250 ml [ ] 500 [ ] 1000 ml	Plastic - H_2SO_4, [ ] 250 ml [ ] 500 ml	Plastic - HNO_3, 250 ml [ ] Filtered [ ] Unfiltered	Plastic - NaOH, 250 ml	Comments
		-11	W	10/20	0745	X													
		-12			0745	X													
		-13			0745		X												
		-14			0800	X													
		-15			0800	X													
		-16			0800		X												
		-17			0815	X													
		-18			0815	X													
		-19			0815		X												

Transfer Number	Relinquished By	Accepted By	Date	Time
1	Walter Mahoney	NET COOLER	10/20	1040
2				
3				
4				

Reporting and Detection Limit Requirements:

Additional Comments: PAGE 2 OF 2

REPORT OF ANALYTICAL RESULTS

NETLAB Case Number S1024-27

Prepared for:

Fuss & O'Neill
275 Promenade Street, Suite 350
Providence, RI 02908
Attn: Walter Mahoney

Report Date: October 30, 2007

Reviewed by:

Richard Warila
Laboratory Director

Lab # RI010

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New England Testing certifies that the test results contained within this report meet all NELAC requirements except as detailed in the Case Narrative section of this report.

SAMPLES SUBMITTED and REQUEST FOR ANALYSIS:

The samples listed in Table I were submitted to New England Testing Laboratory on October 24, 2007. The group of samples appearing in this report was assigned an internal identification number (case number) for laboratory information management purposes. The client's designations for the individual samples, along with our case numbers, are used to identify the samples in this report. The case number for this sample submission is S1024-27.

Project: Newport UV Pilot

TABLE I, Samples Submitted

Sample ID	Date Sampled	Matrix	Analysis Requested
102407850-01	10/24/07	Wastewater	Table II
102407850-02	10/24/07	Wastewater	Table II
102407850-03	10/24/07	Wastewater	Table II
102407850-04	10/24/07	Wastewater	Table III
102407850-05	10/24/07	Wastewater	Table II
102407850-06	10/24/07	Wastewater	Table II
102407850-07	10/24/07	Wastewater	Table III
102407850-08	10/24/07	Wastewater	Table II
102407850-09	10/24/07	Wastewater	Table II
102407850-10	10/24/07	Wastewater	Table III
102407850-11	10/24/07	Wastewater	Table II
102407850-12	10/24/07	Wastewater	Table II
102407850-13	10/24/07	Wastewater	Table III
102407850-14	10/24/07	Wastewater	Table II
102407850-15	10/24/07	Wastewater	Table II
102407850-16	10/24/07	Wastewater	Table III
102407850-17	10/24/07	Wastewater	Table II
102407850-18	10/24/07	Wastewater	Table II
102407850-19	10/24/07	Wastewater	Table III
102407850-20	10/24/07	Wastewater	Table II
102407850-21	10/24/07	Wastewater	Table II
102407850-22	10/24/07	Wastewater	Table III
102407850-23	10/24/07	Wastewater	Table II
102407850-24	10/24/07	Wastewater	Table II
102407850-25	10/24/07	Wastewater	Table III

TABLE II, Analysis and Methods

ANALYSIS	DETERMINATIVE METHOD
Enterococci	EPA 1600 and Enterolert

TABLE III, Analysis and Methods

ANALYSIS	DETERMINATIVE METHOD
Total Suspended Solids	2540D

These methods are documented in:

~~*Standard Methods for the Examination of Water and Wastewater*, 20th Edition, 1998, APHA, AWWA-WPCF.~~

40 CFR 136, *Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act*, Office of Federal Register National Archives and Records Administration.

CASE NARRATIVE

All samples were found to be properly preserved and received at 1 deg C. All analyses were performed within EPA designated holding-times. Procedure/calibration checks required by the designated protocols were within control limits.

Sample Results

Enterococci

Sample ID	Result, Col/100ml	Reporting Limit	Date Analyzed
102407850-01	30	1	10/24/07 @ 18:00
102407850-02	114	1	10/24/07 @ 18:00
102407850-03	1	1	10/24/07 @ 18:00
102407850-05	436	1	10/24/07 @ 18:00
102407850-06	1	1	10/24/07 @ 18:00
102407850-08	172	1	10/24/07 @ 18:00
102407850-09	<1	1	10/24/07 @ 18:00
102407850-11	114	1	10/24/07 @ 18:00
102407850-12	3	1	10/24/07 @ 18:00
102407850-14	73	1	10/24/07 @ 18:00
102407850-15	1	1	10/24/07 @ 18:00
102407850-17	50	1	10/24/07 @ 18:00
102407850-18	1	1	10/24/07 @ 18:00
102407850-20	58	1	10/24/07 @ 18:00
102407850-21	5	1	10/24/07 @ 18:00
102407850-23	104	1	10/24/07 @ 18:00
102407850-24	9	1	10/24/07 @ 18:00

Total Suspended Solids

Sample ID	Result, mg/l	Reporting Limit	Date Analyzed
102407850-04	11.5	2.0	10/25/07
102407850-07	10.0	2.0	10/25/07
102407850-10	12.0	2.0	10/25/07
102407850-13	18.0	2.0	10/25/07
102407850-16	20.5	2.0	10/25/07
102407850-19	13.0	2.0	10/25/07
102407850-22	14.0	2.0	10/25/07
102407850-25	17.5	2.0	10/25/07

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- ☐ 24 Madison Avenue Extension, Albany, NY 12203
- ☐ 275 Promenade Street, Suite 350, Providence, RI 02908
- ☐ 80 Washington Street, Suite 301, Poughkeepsie, NY 12601
- ☐ Other _____

CHAIN-OF-CUSTODY RECORD 12936

Turnaround
☐ 1 Day* ☐ 3 Days* ☐ Other _____ (days)
☐ 2 Days* ☐ Standard (____ days) *Surcharge Applies

PROJECT NAME	PROJECT LOCATION	PROJECT NUMBER	LABORATORY
NEWPORT UV PILOT	NEWPORT	2006901.U10	NET

REPORT TO: WALTER MAHONEY
INVOICE TO: WALTER MAHONEY
P.O. No.: 2006901.U10-850
Sampler's Signature: WSM Mahoney Date:

Source Codes:
MW=Monitoring Well PW=Potable Water S=Soil W=Waste
SW=Surface Water T=Treatment Facility B=Bottom Sediment A=Air
X=Other _____

Item No.	Transfer Check 1	2	3	4	Sample Number	Source Code	Date Sampled	Time Sampled	Analysis Request: ENTEROCOCCI	TSS	Containers: Soil VOA Vial, [ ] methanol [ ] sodium bisulfate	Glass Soil Container ( ) oz	Glass Soil Container ( ) oz	Other:	Other:	Water VOA Vial, [ ] As is [ ] HCl	Glass Amber ( ) ml, [ ] As is [ ] H_2SO_4	Plastic - As is, [ ] 250 ml [ ] 500 [ ] 1000 ml	Plastic - H_2SO_4, [ ] 250 ml [ ] 500 ml	Plastic - HNO_3, 250 ml [ ] Filtered	Plastic - NaOH, 250 ml	Bacteria Bottle	Comments
					102407850-01	W	10/24	1430	X														
					-02			1430	X														
					-03			1430	X														
					-04			1430		X													
					-05			1445	X														
					-06			1445	X														
					-07			1445		X													
					-08			1500	X														
					-09			1500	X														
					-10			1500		X													

Transfer Number	Relinquished By	Accepted By	Date	Time
1	WSM Mahoney	RDW SD	10/24	1800
2				
3				

Reporting and Detection Limit Requirements:

Additional Comments: PAGE 1 OF 3

4027 01

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- ☐ 24 Madison Avenue Extension, Albany, NY 12203
- ☐ 275 Promenade Street, Suite 350, Providence, RI 02908
- ☐ 80 Washington Street, Suite 301, Poughkeepsie, NY 12601
- ☐ Other _____

CHAIN-OF-CUSTODY RECORD 12935

Turnaround
☐ 1 Day* ☐ 3 Days* ☐ Other _____ (days)
☐ 2 Days* ☐ Standard (____ days) *Surcharge Applies

PROJECT NAME | PROJECT LOCATION | PROJECT NUMBER | LABORATORY

REPORT TO:
INVOICE TO:
P.O. NO.:
Sampler's Signature: Date:

Source Codes:
MW=Monitoring Well PW=Potable Water S=Soil W=Waste
SW=Surface Water T=Treatment Facility B=Bottom Sediment A=Air
X=Other _____

Analysis Request / Containers

Item No.	Transfer Check 1	2	3	4	Sample Number	Source Code	Date Sampled	Time Sampled	Enterococci	TSS	Soil VOA Vial [ ] methanol [ ] sodium bisulfate	Glass Soil Container ( ) oz	Glass Soil Container ( ) oz	Other:	Other:	Water VOA Vial [ ] As is [ ] HCl	Glass Amber ( ) mL [ ] As is [ ] HCl	Plastic - As is, [ ] 250 ml [ ] As is [ ] H_2SO_4	Plastic - H_2SO_4 [ ] 250 ml [ ] 500 [ ] 1000 ml	Plastic - HNO_3 250 ml [ ] 500 ml	Plastic - NaOH, 250 ml [ ] Filtered	Bacteria Bottle	Comments
					102407850 - 11	W	10/24	1515	X														
					-12			1515	X														
					-13			1515		X													
					-14			1530	X														
					-15			1530	X														
					-16			1530		X													
					-17			1600	X														
					-18			1600	X														
					-19			1600		X													
					-20			1615	X														

Transfer Number	Relinquished By	Accepted By	Date	Time
1	[signature]	RDWCO	10/24	1800
2				
3				

Reporting and Detection Limit Requirements:

Additional Comments: PAGE 2 OF 3

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- ☐ 275 Promenade Street, Suite 350, Providence, RI 02908
- ☐ 80 Washington Street, Suite 301, Poughkeepsie, NY 12601
- ☐ Other _____

CHAIN-OF-CUSTODY RECORD 12905

Turnaround
☐ 1 Day* ☐ 3 Days* ☐ Other _____ (days)
☐ 2 Days* ☐ Standard (____ days) *Surcharge Applies

PROJECT NAME | PROJECT LOCATION | PROJECT NUMBER | LABORATORY

REPORT TO:
INVOICE TO:
P.O. NO.:
Sampler's Signature: Date:

Source Codes:
MW=Monitoring Well PW=Potable Water S=Soil W=Waste
SW=Surface Water T=Treatment Facility B=Bottom Sediment A=Air
X=Other _____

Analysis Request / Containers

Item No.	Transfer Check 1	2	3	4	Sample Number	Source Code	Date Sampled	Time Sampled	Enterococci	TSS	Soil VOA Vial, [ ] methanol [ ] sodium bisulfate	Glass Soil Container ( ) oz	Glass Soil Container ( ) oz	Other:	Other:	Water VOA Vial, [ ] As is [ ] HCl	Glass Amber ( ) ml, [ ] As is [ ] As is [ ] H_2SO_4	Plastic - As is, [ ] 250 ml [ ] 500 [ ] 1000 ml	Plastic - H_2SO_4, [ ] 250 ml [ ] 500 ml	Plastic - HNO_3, 250 ml [ ] Filtered	Plastic - NaOH, 250 ml	Bacteria Bottle	Comments
					102407850-21	W	10/24	1615	X														
					-22	↓	↓	1615		X													
					-23			1630	X														
					-24			1630	X														
					-25	↓	↓	1630		X													

Transfer Number	Relinquished By	Accepted By	Date	Time
1	[signature]	RDW&O	10/24	1800
2				
3				

Reporting and Detection Limit Requirements:

Additional Comments: PAGE 3 OF 3

REPORT OF ANALYTICAL RESULTS

NETLAB Case Number S1029-18

Prepared for:

Fuss & O'Neill
275 Promenade Street, Suite 350
Providence, RI 02908
Attn: Walter Mahoney

Report Date: November 2, 2007

Reviewed by:

Richard Warila
Laboratory Director

Lab # RI010

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STATEMENTS/CERTIFICATIONS REQUIRED BY THE NATIONAL ENVIRONMENTAL LABORATORY APPROVAL CONFERENCE (NELAC)

New England Testing Laboratory is certified under the National Environmental Laboratory Approval Program (NELAP). This certification requires the following statements and certifications be included in our report.

This report shall not be reproduced, except in full, without written approval of the laboratory.

New England Testing certifies that the test results contained within this report meet all NELAC requirements except as detailed in the Case Narrative section of this report.

SAMPLES SUBMITTED and REQUEST FOR ANALYSIS:

The samples listed in Table I were submitted to New England Testing Laboratory on October 27, 2007. The group of samples appearing in this report was assigned an internal identification number (case number) for laboratory information management purposes. The client's designations for the individual samples, along with our case numbers, are used to identify the samples in this report. The case number for this sample submission is S1029-18.

Project: Newport UV Pilot

TABLE I, Samples Submitted

Sample ID	Date Sampled	Matrix	Analysis Requested
102707850-01	10/27/07	Waste	Table II
102707850-02	10/27/07	Waste	Table II
102707850-03	10/27/07	Waste	Table III
102707850-04	10/27/07	Waste	Table II
102707850-05	10/27/07	Waste	Table II
102707850-06	10/27/07	Waste	Table III
102707850-07	10/27/07	Waste	Table II
102707850-08	10/27/07	Waste	Table II
102707850-09	10/27/07	Waste	Table III
102707850-10	10/27/07	Waste	Table II
102707850-11	10/27/07	Waste	Table II
102707850-12	10/27/07	Waste	Table III
102707850-13	10/27/07	Waste	Table II
102707850-14	10/27/07	Waste	Table II
102707850-15	10/27/07	Waste	Table III

TABLE II, Analysis and Methods

ANALYSIS	DETERMINATIVE METHOD
Enterococci	EPA 1600 and Enterolert

TABLE III, Analysis and Methods

ANALYSIS	DETERMINATIVE METHOD
Total Suspended Solids	2540D

These methods are documented in:

Standard Methods for the Examination of Water and Wastewater, 20th Edition, 1998, APHA, AWWA-WPCF.

40 CFR 136, *Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act*, Office of Federal Register National Archives and Records Administration.

CASE NARRATIVE

All samples were found to be properly preserved and received at 1 deg C. All analyses were performed within EPA designated holding-times. Procedure/calibration checks required by the designated protocols were within control limits.

Sample Results

Enterococci

Sample ID	Result, Col/100ml	Reporting Limit	Date Analyzed
102707850-01	400	100	10/27/07 @ 22:50
102707850-02	<1	1	10/27/07 @ 22:45
102707850-04	300	100	10/27/07 @ 22:57
102707850-05	10	1	10/27/07 @ 22:45
102707850-07	400	100	10/27/07 @ 22:58
102707850-08	5	1	10/27/07 @ 22:48
102707850-10	600	100	10/27/07 @ 23:00
102707850-11	1	1	10/27/07 @ 22:48
102707850-13	520	100	10/27/07 @ 23:01
102707850-14	4	1	10/27/07 @ 22:50

Total Suspended Solids

Sample ID	Result, mg/l	Reporting Limit	Date Analyzed
102707850-03	8.5	2.0	10/30/07
102707850-06	10.5	2.0	10/30/07
102707850-09	7.5	2.0	10/30/07
102707850-12	11.0	2.0	10/30/07
102707850-15	9.5	2.0	10/30/07

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X 275 Promenade Street, Suite 350, Providence, RI 02908
❑ 80 Washington Street, Suite 301, Poughkeepsie, NY 12601
❑ Other _____

CHAIN-OF-CUSTODY RECORD 14703

Turnaround
❑ 1 Day* ❑ 3 Days* ❑ Other ____ (days)
❑ 2 Days* X Standard (____ days) *Surcharge Applies

PROJECT NAME: NEWPORT UV PILOT
PROJECT LOCATION: NEWPORT
PROJECT NUMBER: 2006901.010
LABORATORY: NET

REPORT TO: WALTER MAHONEY
INVOICE TO: WALTER MAHONEY
P.O. NO.: 2006901.010
Sampler's Signature: W SMahoney Date: 10/27

Source Codes:
MW=Monitoring Well PW=Potable Water S=Soil W=Waste
SW=Surface Water T=Treatment Facility B=Sediment A=Air
X=Other _____

Analysis Request / Containers

Item No.	Transfer Check 1	2	3	4	Sample Number	Source Code	Date Sampled	Time Sampled	Enterococci	TSS	Comments
					102707850-01	W	10/27	1545	X		100-200k
					-02			1545	X		1-2k
					-03			1545		X	
					-04			1615	X		100-200k
					-05			1615	X		1-2k
					-06			1615		X	
					-07			1645	X		100-200k
					-08			1645	X		1-2k
					-09			1645		X	
					-10			1715	X		100-200K

Containers: Soil VOA Vial, [ ] methanol; Soil VOA Vial, [ ] water [ ] $Na(SO_3)_2$; Glass Soil Container ( ) oz; Glass Soil Container ( ) oz; Other:; Water VOA Vial, [ ] As is [ ] HCl; Glass Amber ( ) mL, [ ] As is [ ] H_2SO_4; Plastic - As is, [ ] 250 mL [ ] 500 [ ] 1000 mL; Plastic - H_2SO_4, [ ] 250 mL [ ] 500 mL; Plastic - HNO_3, 250 mL [ ] Filtered [ ] Unfiltered; Plastic - NaOH, 250 mL

Transfer Number	Relinquished By	Accepted By	Date	Time
1	W SMahoney	RD WD	10/27	
2				
3				
4				

Reporting and Detection Limit Requirements:

Additional Comments:
PAGE 1 OF 2

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- ☐ 275 Promenade Street, Suite 350, Providence, RI 02908
- ☐ 80 Washington Street, Suite 301, Poughkeepsie, NY 12601
- ☐ Other _____

CHAIN-OF-CUSTODY RECORD 12952

Turnaround
☐ 1 Day* ☐ 2 Days* ☐ 3 Days* ☐ Standard (____ days) ☐ Other _____ (days)
*Surcharge Applies

PROJECT NAME | PROJECT LOCATION | PROJECT NUMBER | LABORATORY

REPORT TO:
INVOICE TO:
P.O. NO.:
Sampler's Signature: Date:

Source Codes:
MW=Monitoring Well PW=Potable Water S=Soil W=Waste
SW=Surface Water T=Treatment Facility B=Bottom Sediment A=Air
X=Other _____

Analysis Request

Containers

Item No.	Transfer Check 1 2 3 4	Sample Number	Source Code	Date Sampled	Time Sampled	Enterococci	TSS	Soil VOA Vial [ ] methanol [ ] sodium bisulfate	Glass Soil Container ( ) oz	Glass Soil Container ( ) oz	Other:	Other:	Water VOA Vial [ ] As is [ ] HCl	Glass Amber ( ) ml [ ] As is [ ] H_2SO_4	Plastic - As is, [ ] 250 ml [ ] 500 [ ] 1000 ml	Plastic - H_2SO_4, [ ] 250 ml [ ] 500 ml	Plastic - HNO_3, 250 ml [ ] Filtered	Plastic - NaOH, 250 ml	Bacteria Bottle	Comments
		102707850-11	W	10/27	1715	X													1-2K	
		-12			1715		X													
		-13			1745	X													100-200K	
		-14			1745	X													1-2K	
		-15			1745		X													

Transfer Number	Relinquished By	Accepted By	Date	Time
1	[signature]	[signature]	10/27	
2				
3				

Reporting and Detection Limit Requirements:

Additional Comments:
PAGE 2 OF 2

REPORT OF ANALYTICAL RESULTS

NETLAB Case Number S1105-23

Prepared for:

Fuss & O'Neill
275 Promenade Street, Suite 350
Providence, RI 02908
Attn: Walter Mahoney

Report Date: November 8, 2007

Reviewed by:

Richard Warila
Laboratory Director

Lab # RI010

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STATEMENTS/CERTIFICATIONS REQUIRED BY THE NATIONAL ENVIRONMENTAL LABORATORY APPROVAL CONFERENCE (NELAC)

New England Testing Laboratory is certified under the National Environmental Laboratory Approval Program (NELAP). This certification requires the following statements and certifications be included in our report.

This report shall not be reproduced, except in full, without written approval of the laboratory.

New England Testing certifies that the test results contained within this report meet all NELAC requirements except as detailed in the Case Narrative section of this report.

SAMPLES SUBMITTED and REQUEST FOR ANALYSIS:

The samples listed in Table I were submitted to New England Testing Laboratory on November 3, 2007. The group of samples appearing in this report was assigned an internal identification number (case number) for laboratory information management purposes. The client's designations for the individual samples, along with our case numbers, are used to identify the samples in this report. The case number for this sample submission is S1105-23.

Project: Newport UV Pilot

TABLE I, Samples Submitted

Sample ID	Date Sampled	Matrix	Analysis Requested
110307850-01	11/03/07	Waste	Table II
110307850-02	11/03/07	Waste	Table II
110307850-03	11/03/07	Waste	Table II
110307850-04	11/03/07	Waste	Table III
110307850-05	11/03/07	Waste	Table II
110307850-06	11/03/07	Waste	Table II
110307850-07	11/03/07	Waste	Table III
110307850-08	11/03/07	Waste	Table II
110307850-09	11/03/07	Waste	Table II
110307850-10	11/03/07	Waste	Table III

TABLE II, Analysis and Methods

ANALYSIS	DETERMINATIVE METHOD
Enterococci	EPA 1600 and Enterolert

TABLE III, Analysis and Methods

ANALYSIS	DETERMINATIVE METHOD
Total Suspended Solids	2540D

These methods are documented in:

Standard Methods for the Examination of Water and Wastewater, 20th Edition, 1998, APHA, AWWA-WPCF.

40 CFR 136, *Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act*, Office of Federal Register National Archives and Records Administration.

CASE NARRATIVE

All samples were found to be properly preserved and received at 1 deg C. All analyses were performed within EPA designated holding-times. Procedure/calibration checks required by the designated protocols were within control limits.

Sample Results

Enterococci

Sample ID	Result, Col/100ml	Reporting Limit	Date Analyzed
110307850-01	100	100	11/3/07 @ 13:00
110307850-02	630	100	11/3/07 @ 13:00
110307850-03	<1	1	11/3/07 @ 13:00
110307850-05	300	100	11/3/07 @ 13:00
110307850-06	<1	1	11/3/07 @ 13:00
110307850-08	630	100	11/3/07 @ 13:00
110307850-09	1	1	11/3/07 @ 13:00

Total Suspended Solids

Sample ID	Result, mg/l	Reporting Limit	Date Analyzed
110307850-04	9	2	11/6/07
110307850-07	8	2	11/6/07
110307850-10	6	2	11/6/07

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❑ 24 Madison Avenue Extension, Albany, NY 12203
☒ 275 Promenade Street, Suite 350, Providence, RI 02908
❑ 80 Washington Street, Suite 301, Poughkeepsie, NY 12601
❑ Other _____

CHAIN-OF-CUSTODY RECORD 14724

Turnaround:
❑ 1 Day* ❑ 3 Days* ❑ Other _____ (days)
❑ 2 Days* ☒ Standard (____ days) *Surcharge Applies

PROJECT NAME: NEWPORT UV PILOT
PROJECT LOCATION: NEWPORT RI
PROJECT NUMBER: tg 20071213.U10
LABORATORY: NET

REPORT TO: WALTER MAHONEY
INVOICE TO: WALTER MAHONEY
P.O. NO.: 20071213-U10-850
Sampler's Signature: Walter Mahoney Date: 11/03/07

Source Codes:
MW=Monitoring Well PW=Potable Water S=Soil W=Waste
SW=Surface Water T=Treatment Facility B=Sediment A=Air
X=Other _____

Analysis Request / Containers

Item No.	Transfer Check 1 2 3 4	Sample Number	Source Code	Date Sampled	Time Sampled	ENTEROCOCCI	TSS	Soil VOA Vial, [ ] methanol	Soil VOA Vial, [ ] water	Glass Soil Container ( ) oz	Glass Soil Container ( ) oz	Other:	Water VOA Vial, [ ] As is [ ] HCl	Glass Amber ( ) ml, [ ] As is [ ] H_2SO_4	Plastic - As is, [ ] 250 ml [ ] 500 [ ] 1000 ml	Plastic - H_2SO_4, [ ] 250 ml [ ] 500 ml	Plastic - HNO_3, 250 ml [ ] Filtered [ ] Unfiltered	Plastic - NaOH, 250 ml	Comments
		110307850 - 01	W	11/03	0930	X													200 K
		- 02			0941	X													200 K
		- 03			0941	X													
		- 04			0941		X												
		- 05			1000	X													200 K
		- 06			1000	X													
		- 07			1000		X												
		- 08			1015	X													200 K
		- 09			1015	X													
		- 10			1015		X												

Transfer Number	Relinquished By	Accepted By	Date	Time
1	[signature]	NET Cooler	11/03	1200
2	[signature]	"	11/03	13:20
3				
4				

Reporting and Detection Limit Requirements:

Additional Comments: SALINITY < 1 ppt

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Disciplines to Deliver
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❑ 146 Hartford Road, Manchester, CT 06040
❑ 56 Quarry Road, Trumbull, CT 06611
❑ 1419 Richland Street, Columbia, SC 29201
❑ 78 Interstate Drive, West Springfield, MA 01089
❑ 610 Lynndale Court, Suite E, Greenville, NC 27858
❑ 24 Madison Avenue Extension, Albany, NY 12203
❑ 275 Promenade Street, Suite 350, Providence, RI 02908
❑ 80 Washington Street, Suite 301, Poughkeepsie, NY 12601
❑ Other _____

CHAIN-OF-CUSTODY RECORD 14733

Turnaround
❑ 1 Day* ❑ 3 Days* ❑ Other _____ (days)
❑ 2 Days* ❑ Standard (____ days) *Surcharge Applies

PROJECT NAME: NEWPORT UV PILOT
PROJECT LOCATION: NEWPORT RI USA
PROJECT NUMBER: 2006901.010
LABORATORY: TRUSTAL

REPORT TO: WALTER MAHONEY
INVOICE TO: WALTER MAHONEY
P.O. No.: 2006901.010-850

Sampler's Signature: WS Mahoney Date: 11/15/07

Source Codes:
MW=Monitoring Well PW=Potable Water S=Soil W=Waste
SW=Surface Water T=Treatment Facility B=Sediment A=Air
X=Other _____

Analysis Request / Containers

Item No.	Transfer Check 1	2	3	4	Sample Number	Source Code	Date Sampled	Time Sampled	Comments
1					SAMPLE 1	W	11/15	1530	
2					SAMPLE 2	W	11/15	1543	

Transfer Number	Relinquished By	Accepted By	Date	Time
1	WS Mahoney	FEDEX	11/15	
2				
3				
4				

Reporting and Detection Limit Requirements:

Additional Comments:
PRESERVED BY REFRIGERATION ONLY

APPENDIX D

COLLIMATED BEAM RESULTS

TROJANUV
WATER CONFIDENCE

CERTIFICATE OF ANALYSIS
Final Report

Project Name:	**Easton Beach WWTP, RI**	**Trojan Sales:**	Cathy Robson
Client Contact:	Amy Hunt	**Local Rep:**	---
Client Address:	275 Promenade St. Suite350 Providence, RI 02908	**Sample #:**	07-0574 to 07-0577
Telephone:	**(401) 861-3070**		
Email:	---		

Received Date:	March 20, 2007 15:30	**Treatment Process:**	---
Analysis Date:	March 20, 2007	**Weather Conditions:**	---
Release Date:	March 22, 2007		

LAB SAMPLE NO.	SAMPLE IDENTIFICATION	SAMPLE DATE/TIME (M/D/Y)	%T	%T FILT.	TSS (PPM)
07-0574	Collimated Beam Sample (#86207031601)	03/16/07 16:30	79	84	11
07-0575	PSA Sample (#862070316-02)	03/16/07 16:32	--	--	--
07-0576	TSS Sample (#862070316-03)	03/16/07 16:35	79	84	11
07-0577	TSS Sample (#862070316-04)	03/16/07 17:00	79	84	8

DESCRIPTION OF ANALYSES

%T (Percent Transmittance)
The percentage of germicidal UV light that is able to penetrate through a sample of water. The higher the %T measure, the more effective a UV system will be. %T can be reduced by iron, organic dyes, tannins, humic acids.

%T Filtered (Percent Transmittance) - The percentage of germicidal UV light that is able to penetrate through a sample ofwater after it has passed through a 1.2µm Glass Fiber Filter.

Total Suspended Solids (TSS) - The weight measurement of all suspended matter larger than 1.2µm for a predetermined volume of water.

For more information on these water quality parameters and/or pre-filtration technologies please contact your local Trojan Representative at: 1-800-265-5774.

Comments: Collimated Beam Sample was beyond 48 hour holding time for biological analysis.

Certified by Wayne Lem, P.Eng.
Validation and Research Services Manager

TROJAN UV
WATER CONFIDENCE

CERTIFICATE OF ANALYSIS
Final Report

Project Name: Newport Easton Beach, RI
Client Contact: Amy Hunt
Client Address: 275 Promenade St., Suite 350
Providence, RI 02908

Telephone: (401) 861-3070
Email: ---

Trojan Sales: Cathy Robson
Local Trojan Rep: ---
Engineering Firm: ---

Sample #: 07-2278 & 07-2279

Received Date/Time: July 6, 2007 14:30
Analysis Date: July 6, 2007
Release Date: July 9, 2007

Treatment Process: ---
Weather Conditions: Rain
Disinfection Limit: 104 Enterococci per 30 Day Geomean

LAB SAMPLE NO.	SAMPLE IDENTIFICATION	SAMPLE DATE/TIME (M/D/Y)	RECEIVED TEMP. (°C)	%T	%T FILTERED	TSS (PPM)	MEAN PARTICLE SIZE (MICRONS)	% PARTICLE >31 MICRONS
07-2278	Collimated Beam Sample	07/05/07 13:00	7	63	67	6	19.01	16.48
07-2279	PSA Sample	07/05/07 13:00	7	-	-	-	15.64	10.00

COLLIMATED BEAM RESULTS

Dose (mWs/cm2)	07-2278 Enterococci/100mL
0	6100
5	1200
10	22
20	6
40	<2
80	<2

DESCRIPTION OF ANALYSES

%T (Percent Transmittance)
The percentage of germicidal UV light that is able to penetrate through 1cm of water sample. The higher the %T measure, the more effective a UV system will be. %T can be reduced by iron, organic dyes, tannins, humic acids.
%T Filtered (Percent Transmittance) - The percentage of germicidal UV light that is able to penetrate through a sample of water after it has passed through a 1.2µm Glass Fiber Filter.
Total Suspended Solids (TSS) - The weight measurement of all suspended matter larger than 1.2µm for a predetermined volume of water.
Particle Size Analysis (PSA) - The measure of mean particle size distribution within a sample using the Lasentec M100C Par-Tec Analyzer.
Collimated Beam - Determines the UV dose necessary to disinfect wastewater effluent to legislated permit levels or lower for specified target microorganisms.

Comments:

Gordon King for A. Royce Aug 9/07

Certified by Alan Royce, P.Eng.
Senior Research Engineer

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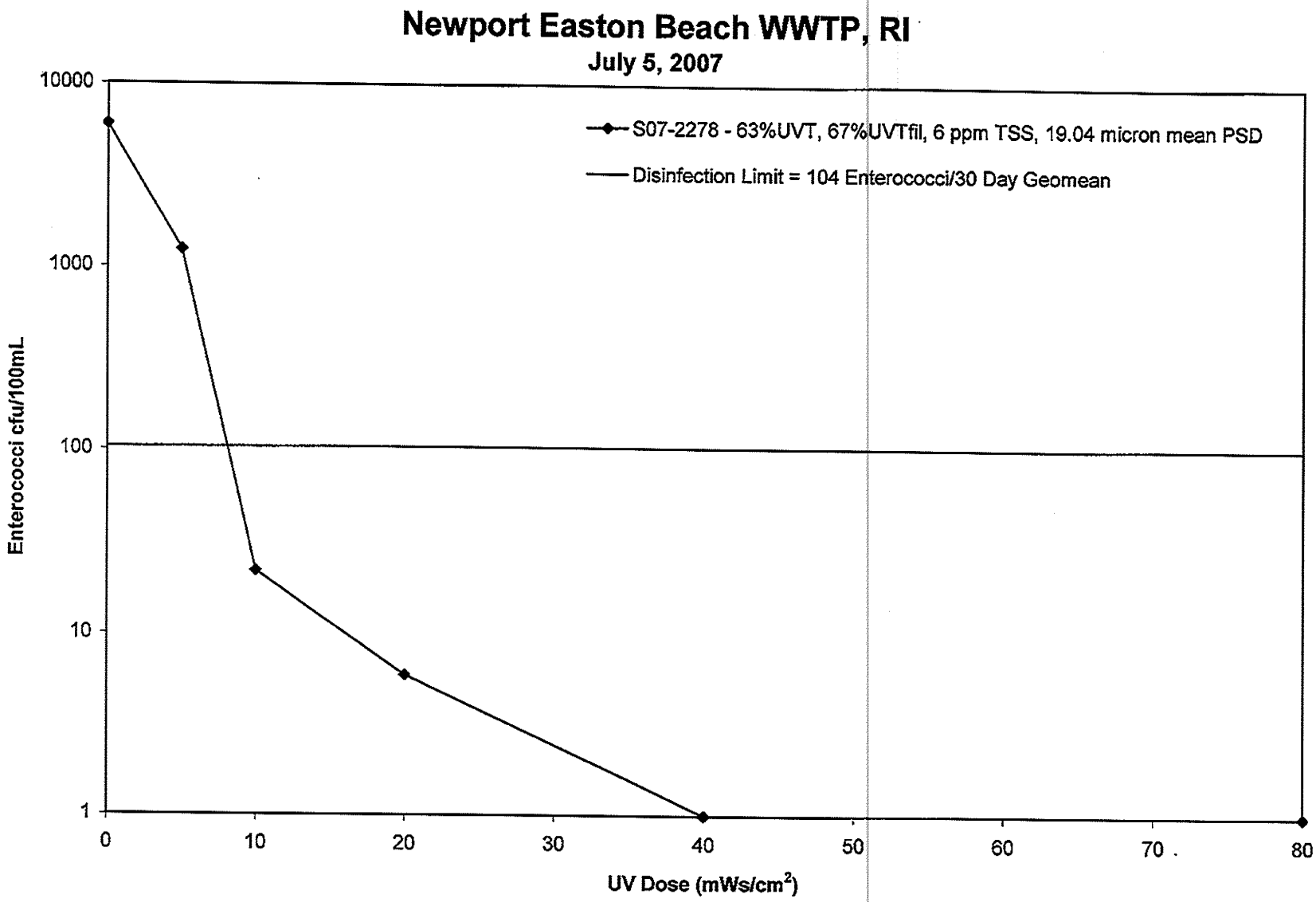
Newport Easton Beach WWTP, RI
July 5, 2007
S07-2278 - 63%UVT, 67%UVTfil, 6 ppm TSS, 19.04 micron mean PSD
Disinfection Limit = 104 Enterococci/30 Day Geomean
Enterococci cfu/100mL
10000
1000
100
10
1
0
10
20
30
40
50
60
70
80
UV Dose (mWs/cm2)

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CERTIFICATE OF ANALYSIS
Final Report

Project Name:	**Newport Easton Beach, RI**	**Trojan Sales:**	Cathy Robson
Client Contact:	**Amy Pacifico**	**Local Trojan Rep:**	---
Client Address:	**275 Promenade St., Suite 350** Providence, RI 02908	**Engineering Firm:**	Fuss & O'Neil, Inc.
		Sample #:	07-3747 to 07-3750
Telephone:	(401) 861-3070		
Email:	---		

Received Date/Time:	November 5, 2007 14:00	**Treatment Process:**	---
Analysis Date:	**November 5, 2007**	**Weather Conditions:**	Rain
Release Date:	**November 5, 2007**	**Disinfection Limit:**	104 Enterococci per 30 Day Geomean

LAB SAMPLE NO.	SAMPLE IDENTIFICATION	SAMPLE DATE/TIME (M/D/Y)	RECEIVED TEMP. (°C)	%T	%T FILTERED	TSS (PPM)
07-3747	Sample 1 Upstream	11/03/07	8	71	74	7
07-3748	Sample 2 Inlet [1] (Collimated Beam sample)	11/03/07	8	66	74	25
07-3749	Sample 3 Upstream	11/03/07	8	68	74	13
07-3749	Sample 4 Inlet	11/03/07	8	68	74	13

COLLIMATED BEAM RESULTS

Dose (mWs/cm2)	07-3748[2] Enterococci/100mL
0	1900
5	360
10	22
20	15
40	3
80	2

DESCRIPTION OF ANALYSES

%T (Percent Transmittance) - The percentage of germicidal UV light that is able to penetrate through 1cm of water sample. The higher the %T measure, the more effective a UV system will be. %T can be reduced by iron, organic dyes, tannins, humic acids.

%T Filtered (Percent Transmittance) - The percentage of germicidal UV light that is able to penetrate through a sample of water after it has passed through a 1.2µm Glass Fiber Filter.

Total Suspended Solids (TSS) - The weight measurement of all suspended matter larger than 1.2µm for a predetermined volume of water.

Collimated Beam - Determines the UV dose necessary to disinfect wastewater effluent to legislated permit levels or lower for specified target microorganisms.

Comments:

[1]Bacteriological analysis results are unreliable due to the age of this sample. Holding time exceeding 48 hours will produce an unrepresentative sample and therefore should not be used for sizing purposes.

Certified by Alan Royce, P.Eng.
Senior Research Engineer

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TROJAN UV
WATER CONFIDENCE™

CERTIFICATE OF ANALYSIS
Final Report

Project Name: Newport Easton Beach, RI
Client Contact: Amy Pacifico
Client Address: 275 Promenade St., Suite 350
Providence, RI 02908

Telephone: (401) 861-3070
Email: ---

Trojan Sales: Cathy Robson
Local Trojan Rep: ---
Engineering Firm: Fuss & O'Neil, Inc.

Sample #: 07-3795 and 07-3796

Received Date/Time: November 7, 2007 16:00
Analysis Date: November 7, 2007
Release Date: November 12, 2007

Treatment Process: ---
Weather Conditions: Rain
Disinfection Limit: 104 Enterococci per 30 Day Geomean

LAB SAMPLE NO.	SAMPLE IDENTIFICATION	SAMPLE DATE/TIME (M/D/Y)	RECEIVED TEMP. (°C)	%T	%T FILT. (1.2µm)	TSS (PPM)
07-3795	Sample 1 Upstream	11/06/07	8	72	76	12
07-3796	Sample 2 Inlet	11/06/07	8	73	(1)	(1)

COLLIMATED BEAM RESULTS

Dose (mWs/cm2)	07-3795 Enterococci/100mL	07-3796(1) Enterococci/100mL
0	230	360
5	37	35
10	5	<2
20	<2	<2
40	<2	---
80	<2	---

DESCRIPTION OF ANALYSES

%T (Percent Transmittance) - The percentage of germicidal UV light that is able to penetrate through 1cm of water sample. The higher the %T measure, the more effective a UV system will be. %T can be reduced by iron, organic dyes, tannins, humic acids.

%T Filtered (Percent Transmittance) - The percentage of germicidal UV light that is able to penetrate through a sample of water after it has passed through a 1.2µm Glass Fiber Filter.

Total Suspended Solids (TSS) - The weight measurement of all suspended matter larger than 1.2µm for a predetermined volume of water.

Collimated Beam - Determines the UV dose necessary to disinfect wastewater effluent to legislated permit levels or lower for specified target microorganisms.

Comments:
(1)Sample bottle damaged during shipment, insufficient volume to perform %T filtered, TSS and higher doses for CB analysis.

WALT, THIS INFO IS ON "ALL DATA" WORKBOOK NOW. PLOTS ARE UP-TO-DATE. LRM

Certified by Alan Royce, P.Eng.
Senior Research Engineer

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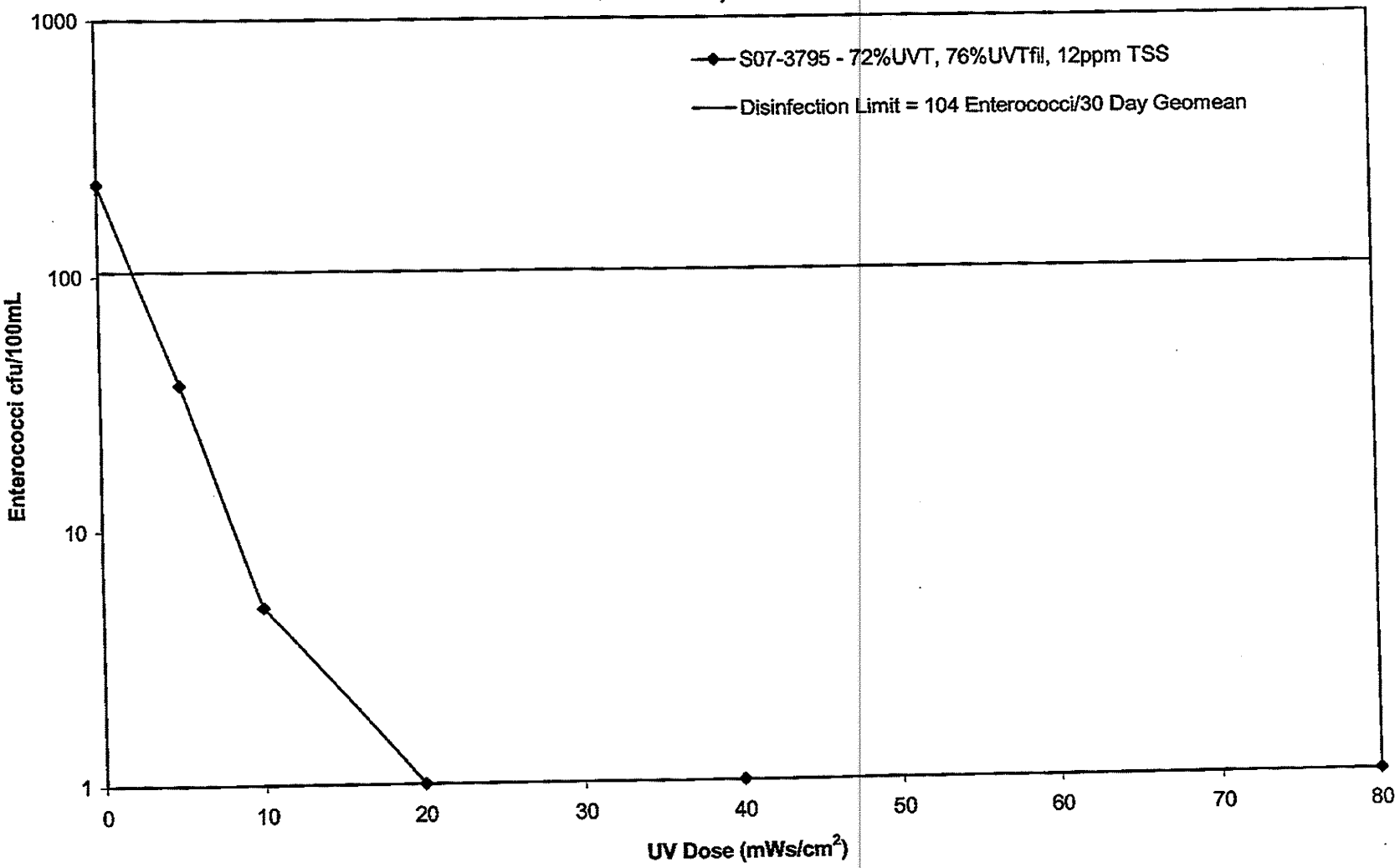
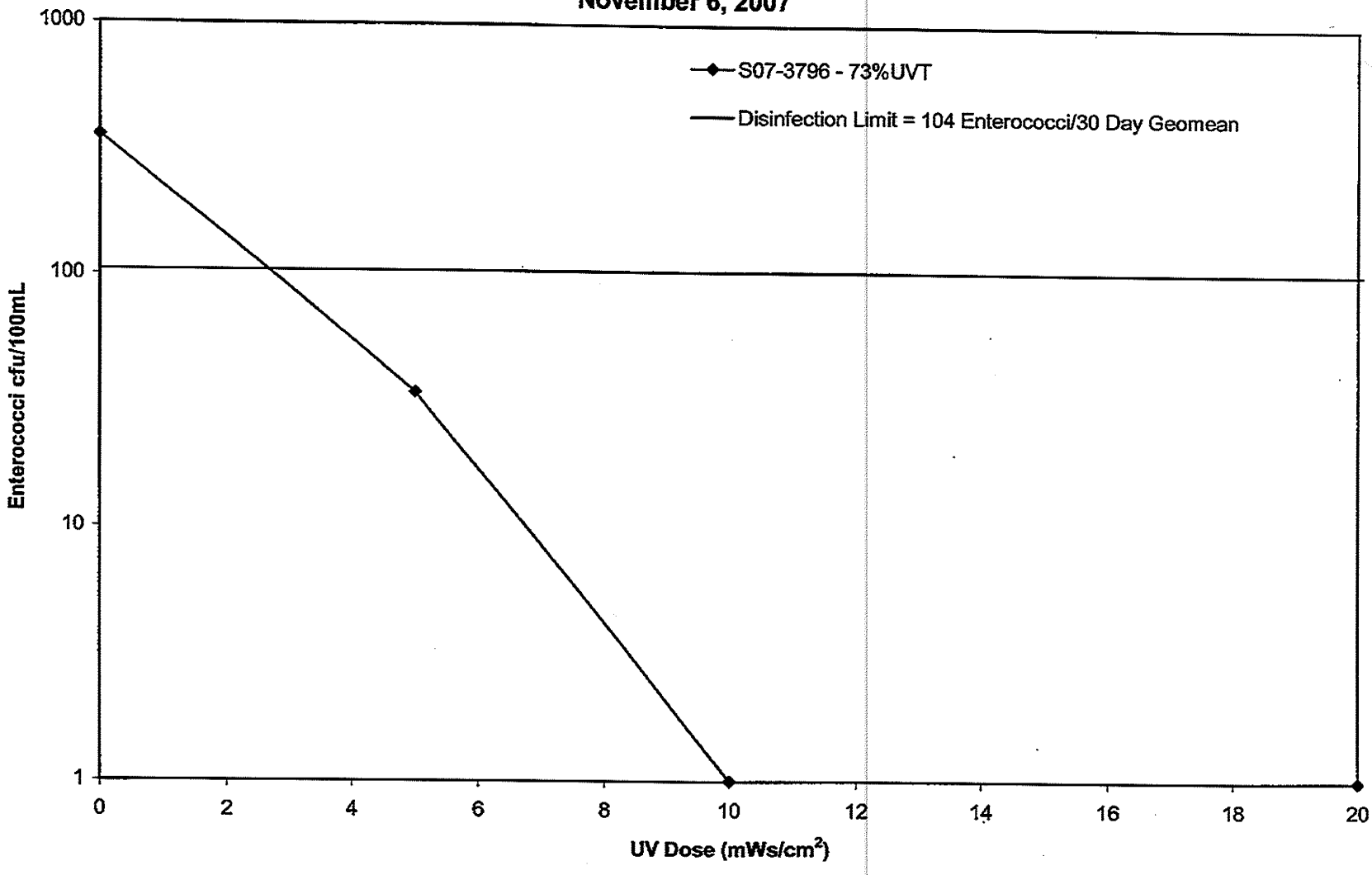
Newport Easton Beach WWTP, RI

November 6, 2007



Newport Easton Beach WWTP, RI

November 6, 2007



TROJAN UV
WATER CONFIDENCE

CERTIFICATE OF ANALYSIS
Final Report

Project Name: Newport Easton Beach, RI
Client Contact: Amy Pacifico
Client Address: 275 Promenade St., Suite 350
Providence, RI 02908

Telephone: (401) 861-3070
Email: ---

Trojan Sales: Cathy Robson
Local Trojan Rep: ---
Engineering Firm: Fuss & O'Neil, Inc.

Sample #: 07-3836 and 07-3837

Received Date/Time: November 16, 2007 14:00
Analysis Date: November 16, 2007
Release Date: November 19, 2007

Treatment Process: ---
Weather Conditions: Rain
Disinfection Limit: 104 Enterococci per 30 Day Geomean

LAB SAMPLE NO.	SAMPLE IDENTIFICATION	SAMPLE DATE/TIME (M/D/Y)	RECEIVED TEMP. (°C)	%T	%T FILT. (1.2µm)	TSS (PPM)
07-3836	Sample 1 Upstream (first flush)	11/15/07	7	76	81	12
07-3837	Sample 2 Inlet (first flush)	11/15/07	7	76	81	12

COLLIMATED BEAM RESULTS

Dose (mWs/cm2)	07-3836 Enterococci/100mL	07-3837 Enterococci/100mL
0	101	148
5	22	32
10	2	3
20	<2	<2
40	<2	<2
80	<2	<2

DESCRIPTION OF ANALYSES

%T (Percent Transmittance) - The percentage of germicidal UV light that is able to penetrate through 1cm of water sample. The higher the %T measure, the more effective a UV system will be. %T can be reduced by iron, organic dyes, tannins, humic acids.

%T Filtered (Percent Transmittance) - The percentage of germicidal UV light that is able to penetrate through a sample of water after it has passed through a 1.2µm Glass Fiber Filter.

Total Suspended Solids (TSS) - The weight measurement of all suspended matter larger than 1.2µm for a predetermined volume of water.

Collimated Beam - Determines the UV dose necessary to disinfect wastewater effluent to legislated permit levels or lower for specified target microorganisms.

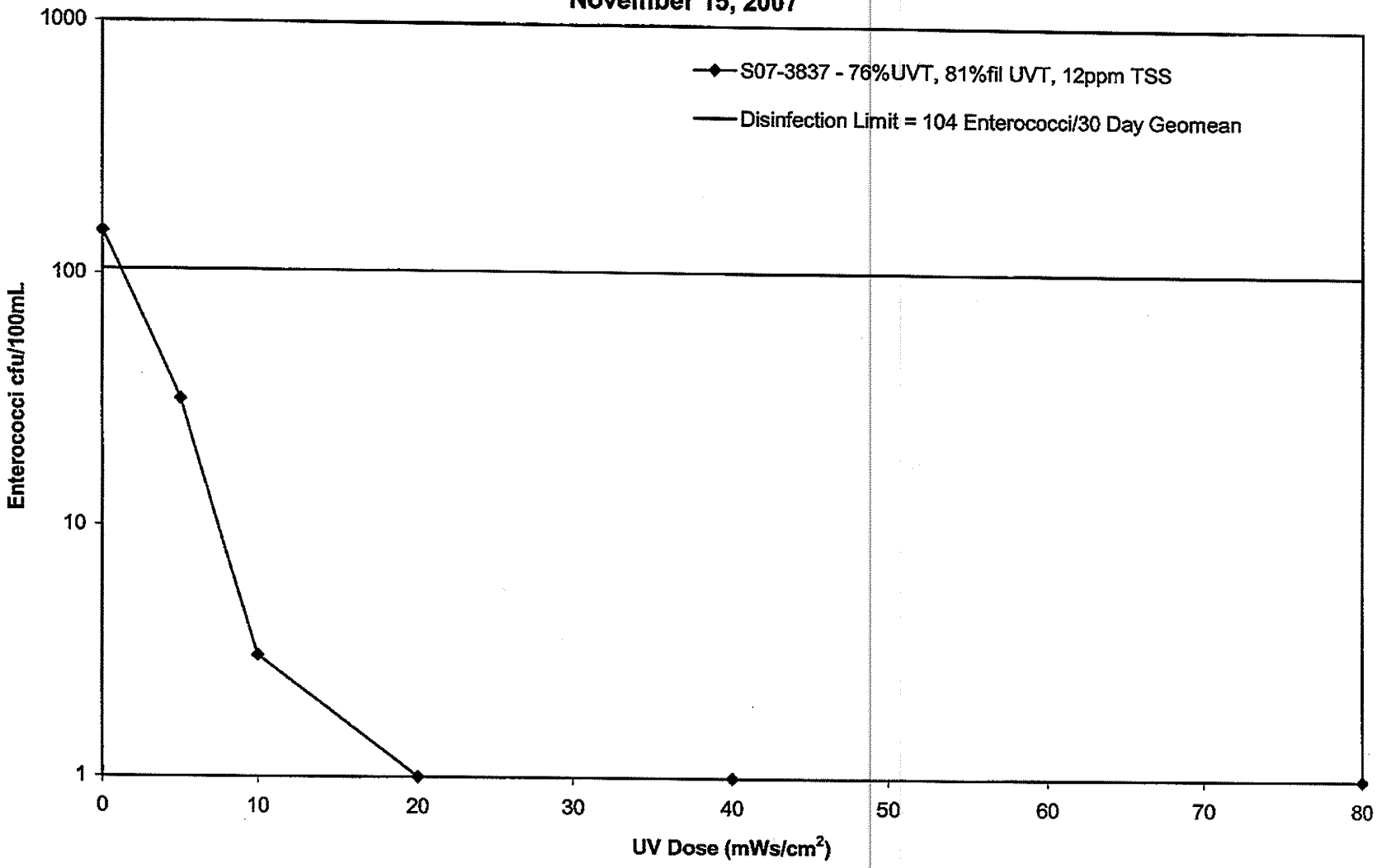
Comments:

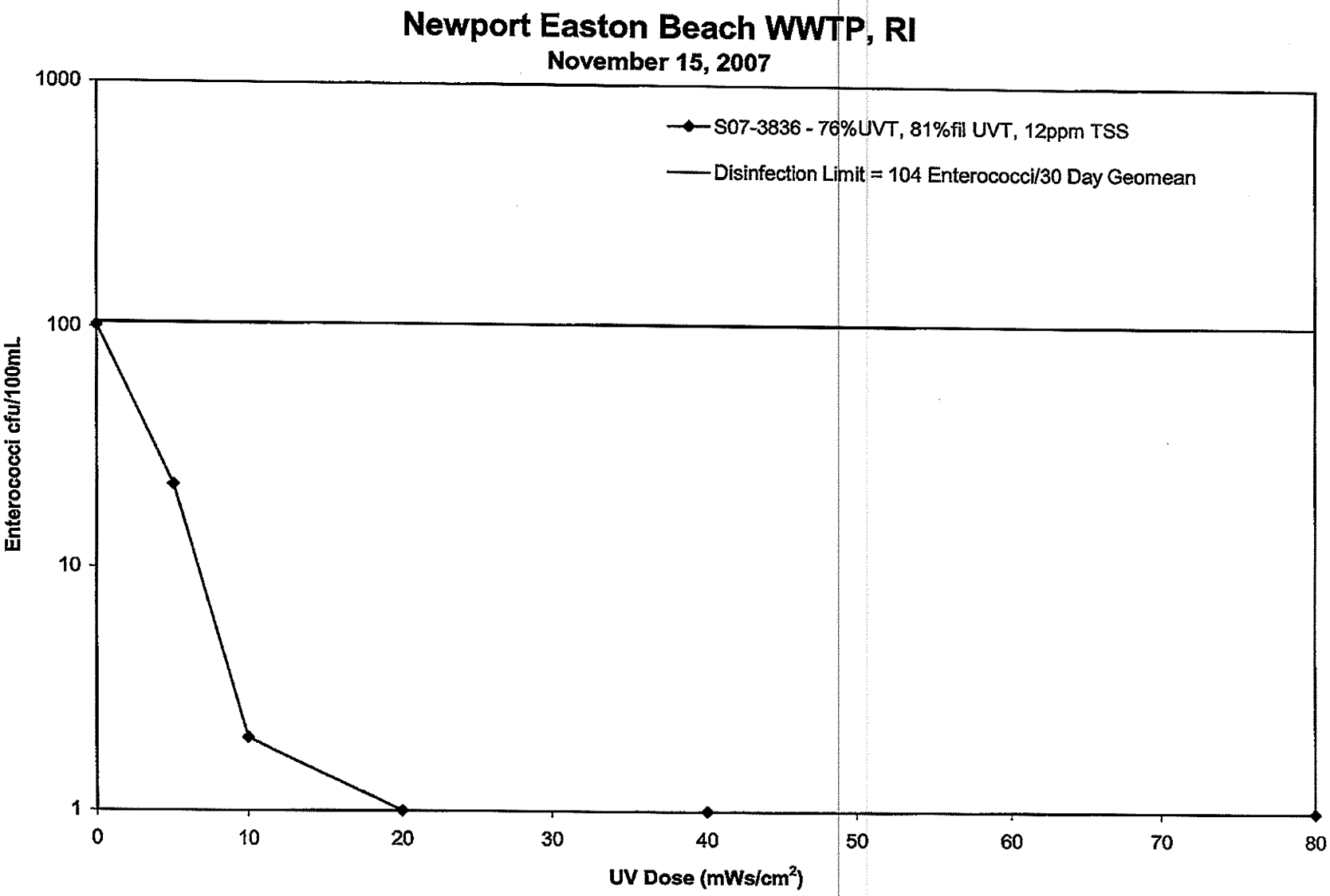
Certified by Alan Royce, P.Eng.
Senior Research Engineer

TROJAN TECHNOLOGIES INC.
3020 GORE ROAD, LONDON, ONTARIO, CANADA N5V 4T7 T 519.457.3400 F 519.457.3030 WWW.TROJANUV.COM

Newport Easton Beach WWTP, RI

November 15, 2007

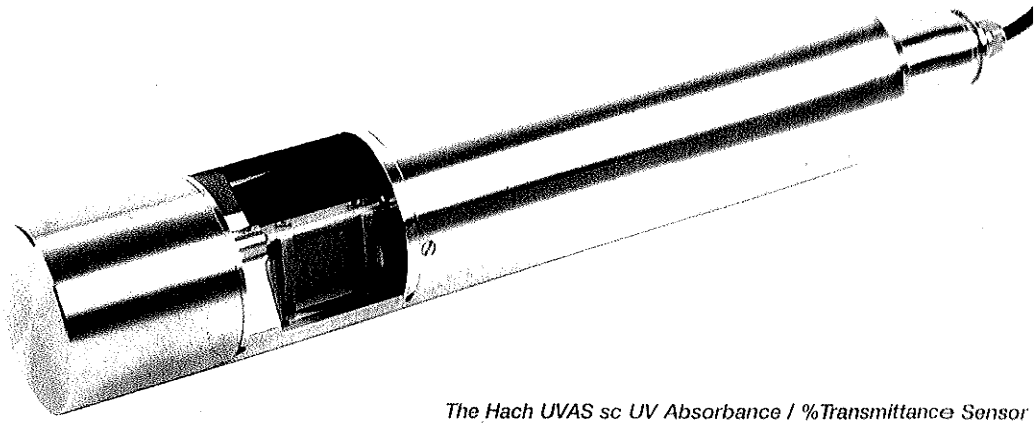



Newport Easton Beach WWTP, RI
November 15, 2007
S07-3836 - 76%UVT, 81%fil UVT, 12ppm TSS
Disinfection Limit = 104 Enterococci/30 Day Geomean
Enterococci cfu/100mL
1000
100
10
1
0
10
20
30
40
50
60
70
80
UV Dose (mWs/cm2)

APPENDIX E

UV TRANSMITTANCE SENSOR DATA

UVAS sc
UV Absorbance / %Transmittance Sensor



The Hach UVAS sc UV Absorbance / %Transmittance Sensor determines the Spectral Absorption Coefficient (SAC) at a wavelength of 254 nm. Measurements can be expressed in absorption units (m–1), mE, AU, %T, %T/cm, mg/L, or ppm.

DW WW IW

Features and Benefits

Continuous, Automatic Early Warning Systems

Use the Hach UVAS sc UV Absorbance/Transmittance Sensor to continuously protect plant treatment processes from high influent organic loads. Operators can use the continuous readings of UV absorbance or transmission to watch for sudden changes in organic load that would require alternate treatment procedures.

Control Activated Sludge Processes

Activated sludge processes require precise balancing of organic load, aeration, and nutrients. Continuous trending of the organics in the system with the UVAS sc sensor can help operators know how to balance other factors resulting in cost and time savings.

Self-cleaning Wiper System

With the UVAS sc sensor submerged in the sample stream, the detector windows are automatically cleaned by a built-in wiper that eliminates surface films or particles that can diminish accuracy.

Monitor Efficiency of UV Disinfection Process

UV light transmittance (UVT) is critical in the delivery of dose in a UV reactor. The delivered dose is determined by, among other things, the UVT of the source water, the intensity of the UV lamps, and the flow rate of the water source. UVT can be affected by many factors, from a simple change in the seasons to storm events.

Potential changes in UVT should be considered in a UV disinfection system for optimized dose delivery. Hach's UVAS sc is designed to provide continuous UVT measurement of pre-disinfected source water. Operational costs related to sampling for UVT may be reduced with continuous on-line measurement. Data can immediately be incorporated into the operation in real time.

Self Diagnostics and Easy Maintenance

Diagnostic routines built into the UVAS sc sensor reduce the need for extensive calibration and maintenance. Only semi-yearly inspection and replacement of the wiper and seals is needed.

Specifications*

	UVAS sc Tank Sensors	UVAS sc Bypass Sensors
Measurement Technique	UV absorption measurement (2-beam technique), reagent-free	
Measurement Method	SAC 254 in accordance with DIN 38404 C3	
Measurement Path Length	1, 2, 5 and 50 mm	2, 5, and 50 mm
Measurement Range	Choice of: 0.01 to 60 m^{-1} at 50 mm 0.1 to 600 m^{-1} at 5 mm 0 to 1500 m^{-1} at 2 mm 2 to 3000 m^{-1} at 1 mm	Choice of: 0.01 to 60 m^{-1} at 50 mm 0.1 to 600 m^{-1} at 5 mm 0 to 1500 m^{-1} at 2 mm
Compensation	550 nm	
Measurement Interval (>= min)	= 1 minute	
Sample Temperature	2 to 40 °C (35.6 to 104 °F)	
Sample pH	4.5 to 9 pH	
Probe Pressure Limit at Inlet	0.5 bar (7.25 psi) maximum	n/a
Sample Flow Rate	n/a	0.5 L/hour minimum
Sample Connection	n/a	4 mm ID/6 mm OD hose
Cable Length	10 to 120 m (32.8 to 393.7 ft.)	
Control Function	PID, time control, 2-point controller (with sc100)	
Inspection Interval	6 months	
User Maintenance	1 h / month, typical	
Dimensions	70 x 333 mm (2.75 x 13.11 in.) approximate	
Weight	3.6 kg (7.9 lb.) approximate	

**Specifications subject to change without notice.*

NOTE

The UVAS sc probes cannot be used in sea water.

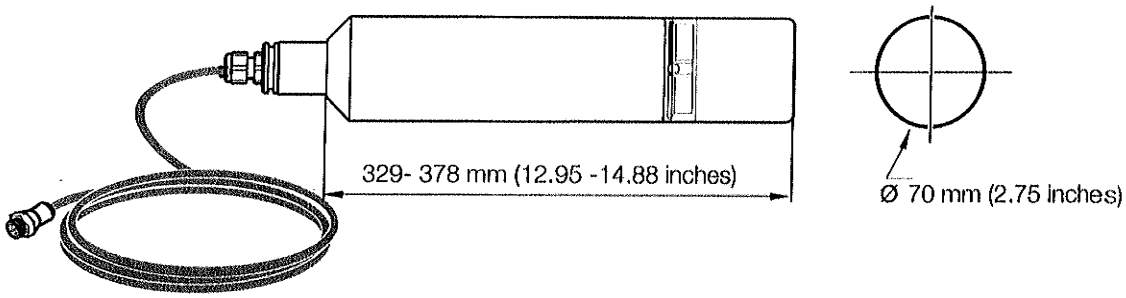
Engineering Specifications

1. The UV absorbance/transmittance sensor shall be a continuous-reading sensor that utilizes a 2-beam ultra-violet absorption technology with a 1, 2, 5, or 50 mm path length.
2. The measurement range shall be 0 to 3000 absorption units (m-1), depending on model and path length.
3. The measurement interval shall be user-selectable.
4. The sensor shall provide reagent-free operation without the requirements of sample conditioning.
5. The sensor shall be self-cleaning via a wiper and retain a life-long factory calibration.
6. The sensor shall be warranted for one full year against defects in material and workmanship.
7. The sensor shall be the UVAS sc tank or bypass sensor for UV absorbance/transmittance measurement, manufactured by Hach Company.

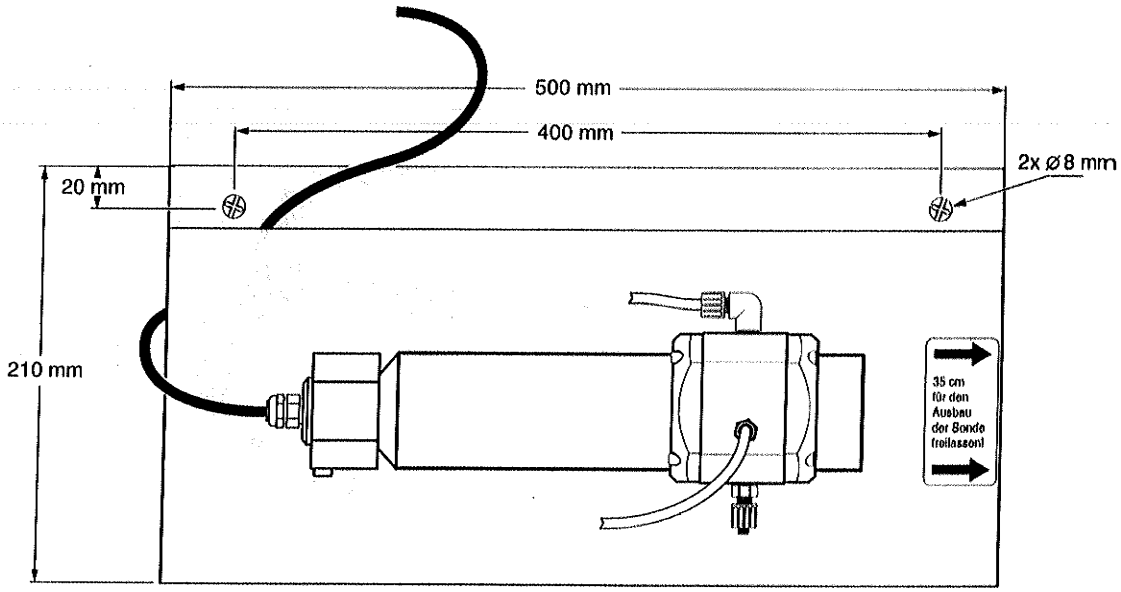
Dimensions

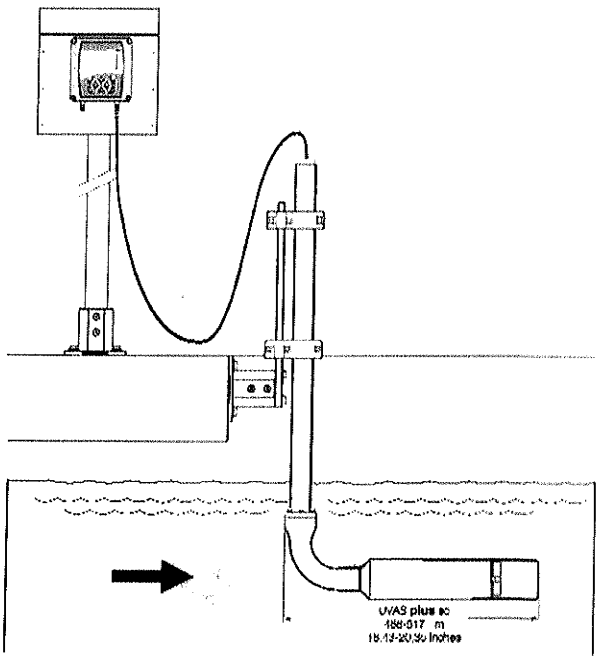
Hach UVAS sc UV Absorbance / %Transmittance Sensors can be installed using a fixed-point installation kit as shown in the bottom illustration. The bypass panel below can be used for non-immersion applications. With the cable supplied, the sensor can be used in a sample stream within 10 meters (32.8 feet) of the controller.

UVAS sc tank sensor



UVAS sc bypass sensor





Installation for mounting the Hach UVAS sc UV Absorbance / %Transmittance Sensor for immersion in open tanks.

Ordering Information

The following sensors include the Hach sc100 Multi-parameter Controller (see literature #2463 for complete details)

69450-00	1 mm UVAS sc sensor
69451-00	2 mm UVAS sc sensor
69452-00	5 mm UVAS sc sensor
69453-00	50 mm UVAS sc sensor

UVAS sc sensor only

LXV418.99.10002	1 mm UVAS sc sensor only
LXV418.99.20002	2 mm UVAS sc sensor only
LXV418.99.50002	5 mm UVAS sc sensor only
LXV418.99.90002	50 mm UVAS sc sensor only

Bypass panel

LZX868	Bypass Panel for 50 mm sensor
LZX867	Bypass Panel for 5 mm sensor
LZX869	Bypass Panel for 2 mm sensor

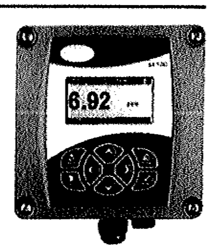
Mounting hardware

LZX414.00.10000	Mounting Hardware with 90 degree adapter

To complete your Absorbance / %Transmittance measurement system, choose from these Hach controllers...

Model sc100 Controller

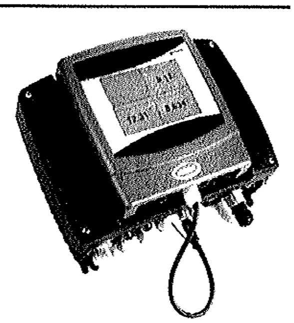
(see Lit. #2463)



The Model sc100 Controller receives data from one or two sensors. Its "plug and play", mix-and-match operation lets it fit into any facility or workflow. Digital communication with any Hach digital sensor or probe is simple and reliable.

Model sc1000 Controller

(see Lit. #2403)



Get the same great features as the sc100 Controller above—"plug and play", all digital operation and communication—but with the Hach sc1000 Controller, up to eight Hach sensors can be used with one controller in any combination. The sc1000 Controller is also expandable and upgradeable to easily adapt to you needs.

Lit. No. 2465
XXX Printed in U.S.A.

In the interest of improving and updating its equipment, Hach Company reserves the right to alter specifications to equipment at any time.

[illegible] It's more than ensuring the quality of water—it's about ensuring the quality of life. When it comes to the things that touch our lives...

Keep it pure.

Make it simple.

Be right.

For current price information, technical support, and ordering assistance, contact the Hach office or distributor serving your area.

In the United States, contact:

HACH COMPANY World Headquarters
P.O. Box 389
Loveland, Colorado 80539-0389
U.S.A.
Telephone: 800-227-4224
Fax: 970-669-2932
E-mail: orders@hach.com
www.hach.com

U.S. exporters and customers in Canada, Latin America, sub-Saharan Africa, Asia, and Australia/New Zealand, contact:

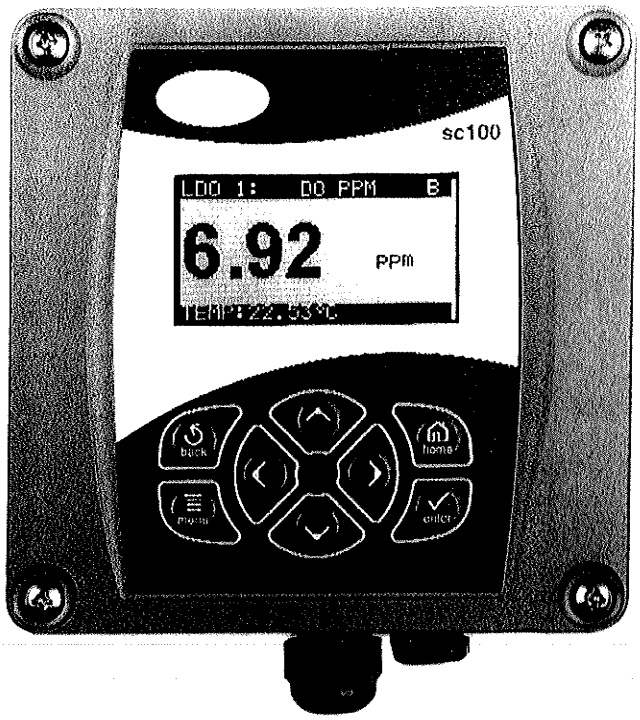
HACH COMPANY World Headquarters
P.O. Box 389
Loveland, Colorado 80539-0389
U.S.A.
Telephone: 970-669-3050
Fax: 970-461-3939
E-mail: intl@hach.com
www.hach.com

In Europe, the Middle East, and Mediterranean Africa, contact:

HACH + LANGE Europe
Dr. Bruno Lange GmbH & Co. KG
Willstätterstraße 11
D-40549 Düsseldorf
GERMANY
Tel: +49 (0) 211 5288-0
Fax: +49 (0) 211 5288-143
E-mail: info@hach-lange.de
www.hach-lange.com

HACH

Be Right™



The Model sc100 Controller receives data from one or two sensors. Its plug-and-play, mix-and-match operation lets it fit into any facility or workflow. Digital communication with any Hach digital sensor or probe is simple and reliable.

Features and Benefits

One Controller for One or Two Sensors

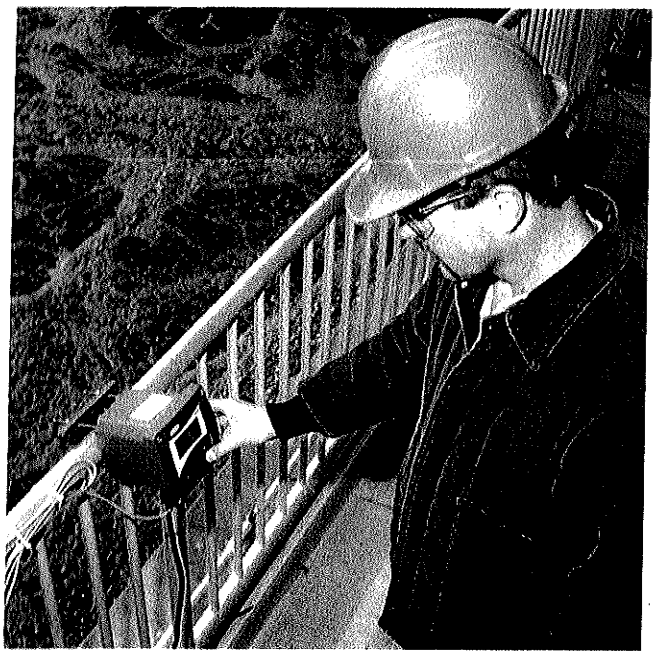
The Hach sc100 Controller receives data from up to two sensors. Use any of Hach's line of digital sensors for pH/ORP, conductivity, dissolved oxygen, or turbidity.

One Controller for One or Two Parameters

Not only can the sc100 controller be used for up to two sensors, but the sensors need not be the same. Mix and match any combination of parameters.

One Controller for Many Options

Communications using RS485/MODBUS® or RS232/MODBUS® protocols or the wireless infrared port are available. (Contact your Hach representative for other communication protocols.) Multiple control functions include built-in PID, control contacts, and alarm functions.



"Plug and Play" Operation

There's no complicated wiring or set up procedures with the sc100 controller. Just plug the sensor in and it's ready for use without special ordering or software configuration.

Simple, Reliable Data Collection

A built-in data logger collects measurement at user selectable intervals (1 to 15 minutes), together with calibration and verification points, alarm history, and instrument setup changes for up to 6 months. With a two-year warranty, the Hach sc100 Controller is built to last.

DW WW PW IW

DW = drinking water WW = wastewater municipal PW = pure water / power
IW = industrial water E = environmental C = collections FB = food and beverage

HACH®

Be Right™

Specifications*

Ambient Conditions

Operation

With less than 7 W sensor load:
-20 to 60° C (-4 to 140° F); 0 to 95% relative humidity, non-condensing

With less than 25 W sensor load:
-20 to 40° C (-4 to 104° F); 0 to 95% relative humidity, non-condensing

Storage

-20 to 70° C (-4 to 158° F); 0 to 95% relative humidity, non-condensing

Power Requirements

100 to 230 Vac, 50/60 Hz; Power: 11W with 7W sensor load; 35W with 25W sensor load

Display

Graphic dot matrix LCD, 128 x 64 pixels with LED backlighting

Relays

Three SPDT, user-configurable contacts rated 100 to 230 Vac, 5 Amp resistive maximum

Outputs

Two analog 4-20 mA, maximum impedance 500 Ohms, optional digital network connection

Control

PID, High/low phasing, setpoint, deadband, overfeed timer, off delay, and on delay

Alarms

Low alarm point, low alarm point deadband, high alarm point, high alarm point deadband, off delay, and on delay

Communication (Optional)

RS-232 (MODBUS®): Configure and retrieve measured data for one analyzer using IBM-compatible PC

RS-485 (MODBUS®): Advanced communications/networking with PLC or SCADA system directly from analyzer.

Memory Backup

All user settings are retained indefinitely in memory (non-volatile) (EEPROM)

Mounting Configurations

Surface, panel, and pipe (horizontal and vertical)

Enclosure

NEMA 4X/IP66; metal enclosure with corrosion-resistant finish

Dimensions

1/2 DIN; 144 x 144 x 150 mm (5.7 x 5.7 x 5.9 in.)

Weight

1.6 kg (3.5 lbs.)

Certifications

ETL to UL 61010A-1 and CSA C22.2 No. 1010.1

**Specifications subject to change without notice.*

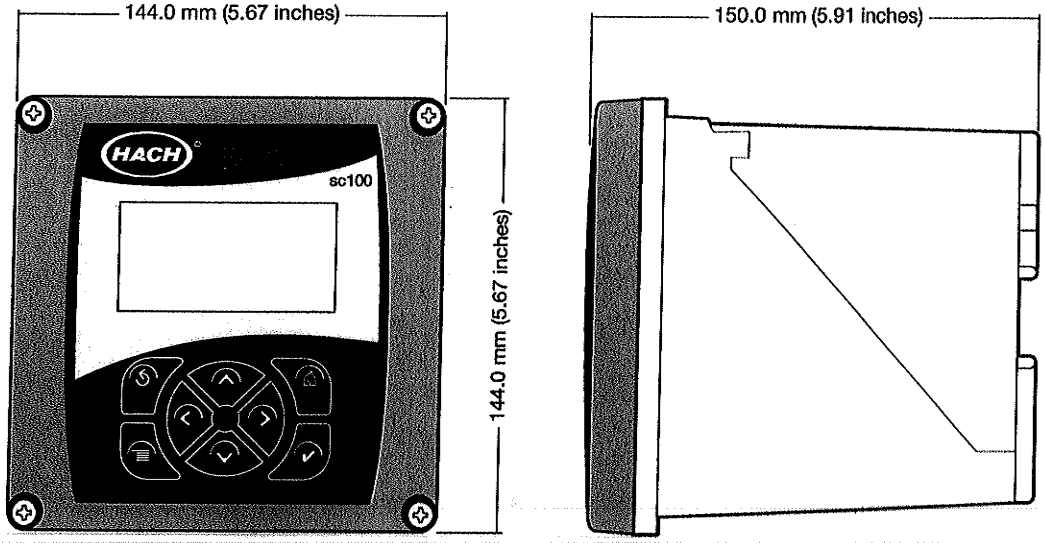
Engineering Specifications

1. The controller shall be a microprocessor-based instrument.
2. Connections between the sensors and the controller shall be "plug and play."
3. The controller shall have the option for RS232/MODBUS® or RS485/MODBUS® serial input/output capability for two-way communication to a computer and have wireless downloading capability through an IR Port located on the interface unit to download and print realtime data, calibration history, and current set points in a CSV format.
4. The Interface unit shall allow operators to control sensor and interface functions with menu-driven software.
5. The interface unit shall have a built-in data logger with the capacity to store data on 15-minute intervals for up to 6 months with two sensors per controller.
5. The interface unit shall include two analog 4-20 mA outputs and 3 unpowered SPDT form 'C' alarm contacts.
7. The interface unit shall include two independent PID control functions.
8. The interface unit shall be housed in a NEMA-4X/IP66 metal enclosure with corrosion-resistant finish.
9. The controller shall be mounted horizontal or vertical on surface, panel, or pipe.
10. The AC power supply shall be housed in the interface unit and automatically accept input in the range of 100 to 230 Vac, 50/60 Hz.
11. All system components shall be certified by ETL to UL 61010A-1, CSA C22.2 No. 1010.1.
12. The controller shall be warranted for two full years against defects in material and workmanship.
13. The controller shall be Hach Company Model sc100 Controller.

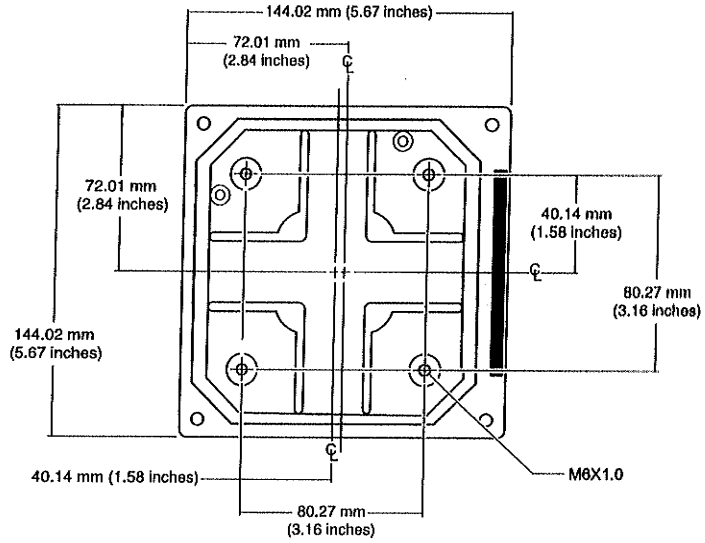
Dimensions

The sc100 controller unit can be installed on a surface, panel, or pipe (horizontally or vertically). No tools are needed to connect the controller unit to any Hach digital sensor.

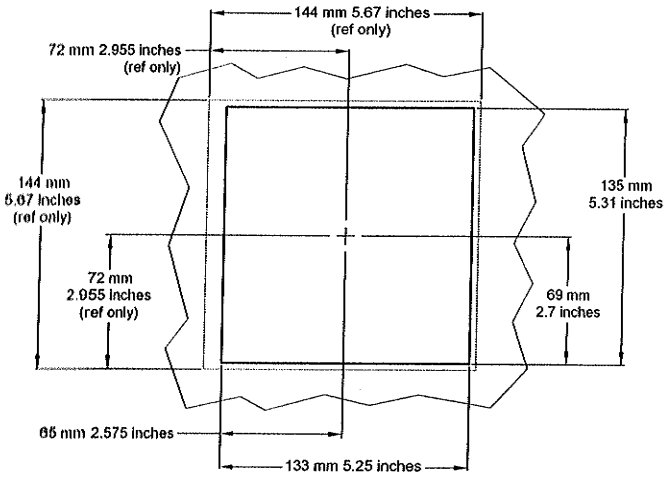
Front and Side Views



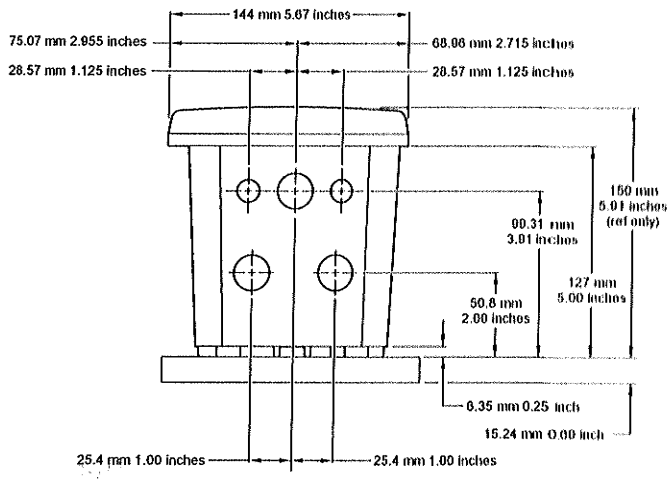
Back View



Panel Mount Cut-Out Dimensions



Conduit Hole Dimensions



Ordering Information

LXV401.52.00002 sc100 Controller Standard

LXV401.52.01002 sc100 Controller with RS-232 (MODBUS®)

LXV401.52.02002 sc100 Controller with RS-485 (MODBUS®)

Note: Power cords must be ordered separately.

Note: Other communication options are available. Please contact Hach Technical Support or your Hach representative.

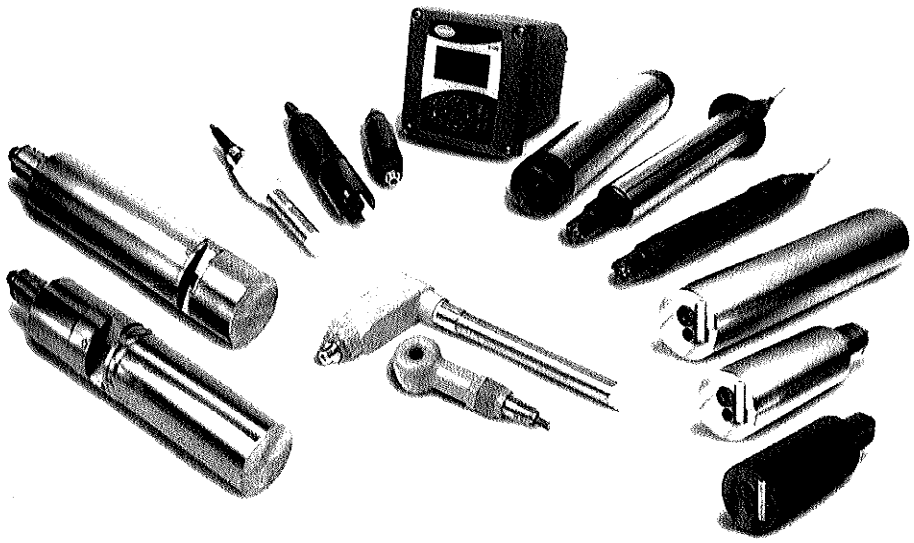
Power Cords

54488-00	Power Cord with strain relief, 125 Vac
54489-00	Power Cord with strain relief, 230 Vac, European-style plug

Accessories

58690-00	Sun Shield, for controller

To complete your digital measurement system, choose from Hach's family of digital products...



Keep it pure.

Make it simple.

Be right.

For current price information, technical support, and ordering assistance, contact the Hach office or distributor serving your area.

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Lit. No. 2463
B53 Printed in U.S.A.

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