- With the structure operating at full capacity, the load on the foundation will be approximately 500 to 600 kips (neglecting buoyant effects).

- Net loading on the soil will approximately range from 100 to 200 kips.

- Site soil consists of over 20 feet of loose to medium dense non-engineered granular fill overlying a thin layer of organic silt

- Groundwater is anticipated to be approximately 3 to 6 feet below the ground surface.

- Depth required for over-excavation and replacement with structural fill would be in excess of 20 feet.

6.3.1 Seismic Activity

In accordance with the building code, a liquefaction analysis of the underlying site soils was conducted to determine the significance of liquefaction on the foundation system. Subsurface data collected at the site indicate portions of the underlying site soils may be susceptible to earthquake liquefaction. Considering the recommended foundation option will be a deep foundation extending below the potential zone for liquefaction, it is believed the structure will not be susceptible to impact due to liquefaction.

6.3.2 Excavation Support

Excavation support may be necessary in areas where the depth of the excavation is significant, or where the area disturbed by the excavation must be kept to a minimum. Recommendations addressing excavation support are provided below. Additional information on excavation support is available in Section 6.60 – Excavation Support, in the Geotechnical Report. Final recommendations regarding excavation support will be made during final design.

- All temporary excavated slopes in the underlying soils should be constructed not steeper than 1.5 horizontal to 1 vertical and in accordance with the requirements of the latest OSHA standards.

- Further excavation support will be required for steeper slopes.

- Significant dewatering will be required considering the proximity to the drainage channel. Sheet piling is recommended to facilitate the dewatering of the underlying soils during excavation for the foundation construction.

6.3.3 Dewatering

Significant dewatering and temporary diversion of the drainage channel is anticipated during construction of the structure. Primary recommendations to address dewatering are presented below.

- Based on the grain size analysis, it is recommended that dewatering of underlying soil should be handled by either drilled deep wells or wellpoints.
- Sheet piling and sandbags may be used in combination for temporary diversion of the drainage moat around the excavation area.

6.3.4 Vibration Induced Settlement, Preconstruction Survey, and Vibration Monitoring

The Easton Dam and Memorial Boulevard Bridge will be in close proximity to the site location for the UV disinfection system. Vibrations caused by installing Geopiers, driving piles, or installing sheeting in the vicinity of adjacent structures could result in densification of fill and associated settlement beneath those structures. Based on professional experience, the Geopier option has a lower potential for vibration-induced settlement than timber piles. Recommendations to address vibration concerns are presented below.

- Specifications should require a geotechnical engineer conduct a pre-construction survey of nearby structures prior to pile or pier installation.
- Vibrations should be monitored continuously by a seismograph during construction, specifically during all pile driving operations.
- Specifications should require establishment and monitoring of settlement control points adjacent to the proposed excavation and on nearby structures.

6.3.5 Subgrade Protection, Backfill, and Compaction

Significant amounts of over-excavation and subsequent backfilling below the structure is not likely to be required because a deep foundation system is recommended. Recommendations regarding subgrade protection and compaction are provided below.

- The contractor should be required to surface compact the subgrade around the Geopiers or piles and the entire footprint of the foundation prior to construction of the footing or pile cap.

- Compacted structural fill placed along sides of the structure to provide lateral resistance and frictional resistance against uplift.

- Compaction of fill in the structure footprint should be a minimum of 95 percent of the maximum dry density.

- Contractor should adjust lift thickness to meet required compaction.

- Soil should not be reused as structural fill intended for backfilling either below or around structures. Test soil samples do not contain adequate coarse gravel to meet recommended structural fill specifications.

- Soils not adequate for reuse as structural fill can be used in other areas not intended for support of structures or pavements.

- Soil analysis should be conducted on any soil considered for reuse.

6.4 Feasible Foundation Systems

Three feasible deep foundation systems were identified as feasible foundation types; rammed aggregate piers, timber piles and pressure injected footings. The following sections summarize each foundation system.

6.4.1 Rammed Aggregate Piers (Geopiers)

A Rammed Aggregate Pier (R.A.P.) foundation system is a proprietary system that may be feasible at this site. This is a shallow foundation system that transfers the foundation load to a deeper layer of soil if unsuitable soil is encountered at a shallow depth. The system does this by creating columns of compacted aggregate within the existing soil. Because there are no physical piles, or pile ends to engage, there is no need for a pile cap. The proposed structure can be designed as if it were being supported by competent soil.

6.4.1.1 Relative Costs for Rammed Aggregate Piers

Research into the cost for the installation of R.A.P. foundations has indicated that the current price varies from approximately $30/lf to $50/lf. It is anticipated that the size and type required for this project will likely cost approximately $35/lf because the number of piles is not governed by pile capacity, but rather by location. Assuming an average R.A.P. length of 35 feet, a typical R.A.P. will cost approximately $1225/each.

The use of R.A.P. foundations when appropriate often results in a 20% to 50% cost savings as compared to traditional deep foundation alternatives such as steel piles. In addition, the time required for the installation of R.A.P. foundations is often shorter than other traditional systems, reducing the overall time required for construction.

Using an assumed number of 75 piles for this project, the cost for the pile installation would be approximately $91,875. Adding an additional 25% to account for mobilization/de-mobilization, and required soil testing would bring the total cost for this foundation system to approximately $114,844.

6.4.2 Timber Piles

Timber piles derive their principal support from end-bearing in a competent layer of the soil strata. In this case, the glacial till encountered at depths of approximately 32 feet could be utilized for support of the anticipated compression loads. Timber piles, however, are not capable of providing significant resistance to tensile loads or uplift which will likely be a consideration during final design.

6.4.2.1 Relative Costs for Timber Piles

Timber piles are typically supplied in standard lengths to suit the needs of a specific project. For this project, it is anticipated that pile sections 35 to 40 feet in length can achieve the required capacity and are capable of meeting the requirements of the Geotechnical Engineer. This type of system is widely used in the area and supplies are readily available.

The current cost associated with supplying and installing timber piles of the anticipated length and capacity is approximately $35/lf. Assuming an average pile length of 35 feet, a typical timber pile would cost approximately $1225/each-in-place. Additional costs associated with the installation of timbers piles include mobilization / de-mobilization, and pre-drilling as needed to allow installation of the piles without damage. Using an assumed number of 75 piles for this project, and adding an additional 35% to account for mobilization / de-mobilization and pre-drilling would bring the total cost for this foundation system to approximately $124,031.

Not included in the cost provided above are load tests. Pile load tests are not a requirement of the building code when the pile capacity is less than 40 tons. Due to the method of installation and available capacity equations based on blow counts, it is anticipated that a pile load test will not be necessary.

6.4.3 Pressure Injected Footings

Pressure Injected Footings (PIFs) are shallow piles that are installed by driving casing to a desired depth, injecting a ball of low slump concrete out the bottom of the casing by pounding, and forming a pile shaft as the outer casing is withdrawn.

6.4.3.1 Relative Costs for Pressure Injected Footings (P.I.F.s)

For this project, it is anticipated that P.I.F. sections 35 to 40 feet in length can achieve the required capacity and are capable of meeting the requirements provided by the Geotechnical Engineer. This type of system is widely used in the area and supplies are readily available.

The cost associated with the installation of P.I.F.s varies depending on the size, depth, and capacity requirements for a particular project. For this project, the cost per liner foot of P.I.F. is expected to be approximately $45/lf, including mobilization / de-mobilization, and pre-drilling as needed to remove obstructions and allow installation. Assuming an average pile length of 35 feet, a P.I.F. would cost approximately $1575/each. Using an assumed number of 75 piles the total cost for this foundation system to approximately $118,125.

Not included in the cost provided above are load tests. Although load tests are not required by the building code for driven piles when the pile capacity is less than 40 tons, the only way to confirm the capacity of a P.I.F. is to conduct load tests. These tests will likely increase the cost associated with this system by an additional $20,000.

6.5 Construction Monitoring

Monitoring is recommended during construction of the chosen foundation system. Recommendations include, but are not limited to:

- A preconstruction survey of structures within 200 feet of pile driving or pier/PIF installation.
- Dynamic analysis of pile or driving system to develop driving criteria.
- Monitoring of vibrations during pile driving or Geopier installation.
- Monitoring of settlement control points.

7.0 ENVIRONMENTAL ASSESSMENT AND PERMITTING

Appendix R provides a detailed environmental assessment for this project and identifies permits that will be necessary for implementation of project. The environmental assessment discusses both the direct and indirect environmental effects of the proposed system on the surrounding project area. Water quality improvement alternatives previously identified for this site are also discussed. A no build alternative forecast indicates the site will remain in an existing conditions state and untreated discharge from the Moat will continue to Easton's Bay. Under the no build alternative forecast, bacteria levels will likely persist as will closures at Easton Beach.

Implementation of the project is anticipated to result in a reduction in bacterial loading into Easton's Bay and will have a positive environmental effect on water quality and pollutant discharge concerns. Additionally, direct impacts during construction are anticipated to be minimal on the following:

- Daily activities
- Cultural resources
- Ecological resources
- Erosion and sedimentation
- Displacement
- Noise and Visual Impacts

8.0 CONCLUSIONS

The following paragraphs summarize the major recommendations for the UV disinfection system proposed for the Moat discharge that were generated by the preliminary design.

Design Criteria

- The system should be designed for a peak flow of 96 cubic feet per second. This peak flow is consistent with the Water Quality Volume that is regulated by the Rhode Island Department of Environmental Management (RIDEM) for the existing watershed. This storm equals or exceeds 93% of all storm events in the Newport area. While this flow does not include runoff from the Esplanade, Esplanade flow can be accommodated by the UV disinfection system, provided the total peak flow does not exceed 105 cfs, which is the maximum capacity of the single-channel system. Flow from the existing Moat and Esplanade watersheds are not necessarily additive, and Middletown should evaluate whether hydrologic controls allow the Esplanade to be discharged to Moat within the peak 105 cfs criteria.

- Disinfection criteria for effluent from the UV system should have a 30-day geometric mean of 104 cfu/100 ml. While the beach closure standard is 104 cfu/100 ml, the geometric mean accounts for 30-50% dilution available within 300 feet of the Moat outfall and is a more reasonable performance standard for manufacturers to achieve, as opposed to an absolute numerical limit.

- Since Easton's Bay provides only 30 to 50% dilution within 300 feet of the Moat outfall, no significant dilution (5:1, 10:1 or 50:1 ratios of Easton's Bay to Moat discharge) is considered for process design purposes.

Hydraulics

- The hydraulic analysis of the Moat and UV disinfection system showed an increase water surface elevations in the moat during design storms by about 24 to 30-inches, which will exacerbate flooding conditions along the Moat. The system cannot operate by gravity alone. A pump system is therefore required to convey water from the Moat to the UV disinfection system channel.

- With a pump system, the hydraulics of the Moat may also accept the discharge from the Esplanade without any significant additional flooding in the Moat.

- Moat and UV System hydraulics must be designed to account for future sea level rise. An average sea level rise of 0.65 inches per year was used in preliminary design, which is consistent with the worst-case projections that are being offered by the Rhode Island Coastal Resources Management Council (CRMC). At this rate after 25 years, high tide would be about 16.3 inches higher than current levels. A 16.3-inch sea level rise was incorporated into the preliminary design.

Siting

- The open grassed area just north of Memorial Blvd bridge is the most appropriate location for installation of the UV disinfection system. This location protects the UV disinfection system from shoaling and storm surges compared to alternative locations south of the bridge. The recommended single-channel configuration also minimizes the need to relocate existing utilities to the west of the pump station. Other UV channel configurations or locations to the north of this site will require either relocating existing sanitary force mains or creating two UV systems to treat the eastern and western portions of the moat.

- The geotechnical analysis found that a deep foundation system will be required for this site. Timber piles were identified as the most conventional system, and one that can be completed by several local contractors.

UV System Design

- A wide range of alternative UV disinfection systems were evaluated during the preliminary design. Our study found that only conventional UV systems have been developed to the point where they have the capacity to reliably manage the flows that are expected for this system. After screening potential systems, we issued a Request for Information (RFI) to five vendors to provide detailed information on their systems. One vendor who was the primary supplier of microwave systems in the United States only responded with a letter stating that the microwave technology has not yet been developed to the scale that it could be employed on this project.

- Based on evaluation of each UV vendor's response to our RFI, Trojan UV received the highest point total for the qualitative analysis. Wedeco, Aquionics and Calgon also submitted responses. The proposed Trojan UV system has the lowest estimated opinion of construction cost and 20-Year

Life Cycle Cost. Trojan UV was the only vendor to offer a life time guarantee to meet the 104 *Enterococci* colonies/100 ml RIDOH beach standard (30-day geometric mean). The UV disinfection system proposed by Trojan UV was the only single channel design, which results in the smallest foot print for construction and site disturbance. Given their small construction foot print, there is no apparent need for sewer line relocation under the selected Alternative location #2.

- All UV system vendors indicated their system designs are sensitive to flow. Significant increases in design flows will increase project footprint and costs. For example, the Trojan UV system with a single channel configuration as proposed could manage a peak flow with desired treatment results of up to 105 cfs. Peak design flow greater than 105 cfs will require adding another channel, in effect doubling UV channel footprint and increasing equipment costs.

- Pretreatment systems for large solids/particulate removal were reviewed and incorporated in preliminary design to minimize potential damage to the pump and downstream UV disinfection equipment. RFI's were provided to four vendors, and three responded. Lakeside Equipment Corporation appeared to have the best suited equipment for this project largely because its bar screen has no moving parts below the Moat water surface.

- In summary, this system will consist of a by-pass weir that will be automatically closed with rainfall and opened after the storm event passes. The pump and UV system will be activated and deactivated in conjunction with closing and opening the weir, respectively. Water diverted from the Moat by the by-pass weir will drain through the bar screen to a pump(s) that will convey the water up to the UV system. UV lamp intensity (i.e. UV dose) will be controlled using a UV transmittance sensor that will provide process feedback so that automated system adjustments provide the required UV dose.

- We have developed an opinion-of-construction cost of $5.377 million and a 20-year life-cycle cost of $21.624 million through preliminary design, which is based on current electricity costs to Newport and based on the premise of operating the UV lamps at 100% intensity for 48-hours during each of fifty four (54) rain events annually. Life cycle costs are conservative. These projections are higher than what was developed as part of the conceptual design. There are several reasons for this including:

- RIDOT and Middletown pump station outfalls must be relocated to discharge upstream of the Moat diversion weir.
- A pump station is required to prevent exacerbation of flooding along the Moat.
- An influent screen to remove large particulate matter and debris carried by the Moat.
- National Grid will need to invest in some capital improvements in order to deliver the required power to this system. Preliminarily, National Grid has reported that $150,000 to $200,000 of capital improvements may be required to bring necessary service to the UV disinfection system. These costs may be shared with the City.
- Deep foundations are required for this site.
- The area of influence within the Moat at the UV system intake and discharge will require reinforced construction using cable concrete along the Moat bottom.
- A building to house the new electrical service is required due to its size.

TABLES

TABLE 16
SUMMARY OF RESPONSES FOR UV DISINFECTION RFI
UV DISINFECTION SYSTEM FOR STORMWATER TREATMENT
Newport, RI
September 2008

	Aquionics Inc.	Trojan Technologies	Calgon Carbon Corp[1]	WEDECO UV Technologies, Inc
What is the name of the unit proposed for UV Disinfection?	Inline 18000+	Trojan UV4000Plus	C^3500^{TM}	Wedeco TAK55
What was the proposed capital cost? (Only 104 *Enterococci*/100 ml design basis shown)	At 96 cfs: $1,992,000 At 116 cfs: $2,316,000	At 96 cfs: $1,650,000: At 116 cfs: $3,084000	At 96 cfs: $3,054,100 (updated price)	At 96 cfs: $3,200,000 At 116 cfs: $3,700,000
Was a list provided of UV installations of the same magnitude for similar systems?	Yes.	Yes.	No.	Yes.
What was the relative design flow?	183 total installations <10 MGD: 164 10 to 50 MGD: 17 >50 MGD: 2	286 total installations <10 MGD: 105 10 to 50 MGD: 153 >50 MGD: 28	35 total installations <10 MGD: 33 10 to 50 MGD: 2 >50 MGD: 0	251 total installations <10 MGD: 186 10 to 50 MGD: 54 >50 MGD: 11
What kind of water stream was treated (stream, wastewater, stormwater, etc)?	Municipal Wastewater and Municipal Drinking Water	Combined Sewer Overflow & Sanitary Sewer Overflow	Water and Wastewater	Sanitary wastewater

	Aquionics Inc.	Trojan Technologies	Calgon Carbon Corp[1]	WEDECO UV Technologies, Inc
What operating data such as bacterial counts per 100 mL, Total Suspended Solids, daily flow rate, transmissivity, etc were provided?	Peak flow, Total Suspended Solids, Ultraviolet transmissibility, 3-log reduction counts	Peak design flow, TSS, Ultraviolet transmissibility, Disinfection limit, Design dose, Fouling factor	Peak Design Flow	Peak design flow, TSS, Ultraviolet transmissibility, Disinfection limit, Design dose
What was down time as a function of total operating time?	Not discussed in vendor response.	Information not provided to Manufacturer by clients	Not discussed in vendor response.	Not discussed in vendor response.
What is the provided electrical cost?	Not discussed in vendor response.	At 96 cfs: $207,336 At 116 cfs: $189,136 (based on 40, 48-hour long events and $0.10/kWH)	Not discussed in vendor updated response.	Not discussed in vendor response.
What is the electrical load at 100% lamp power? (Only 104 *Enterococci*/100 ml design basis shown)	At 96 cfs: 1361 kW (Total system)	At 96 cfs: 1,408 kW (Total System)	At 96 cfs: 768 kW (Lamps and Ballast only)	At 96 cfs: 700 kW (Lamps & Ballasts only)
What was projected Operation and Maintenance Cost?	Not discussed in vendor response.	Not discussed in vendor response.	Not discussed in vendors updated response.	Not discussed in vendor response.
What Environmental Standards needed to be met for the installation?	Not discussed in vendor response.	Not discussed in vendor response.	Not discussed in vendor response.	Not discussed in vendor response.

	Aquionics Inc.	Trojan Technologies	Calgon Carbon Corp[1]	WEDECO UV Technologies, Inc
Was a sample equipment specification included for the proposed system?	Yes.	Yes.	Yes.	Yes.
What system performance guarantee is offered?	To perform as specified for one year in service.	To perform as specified for the life of the system.	A process warranty for the system could be offered; typically issued for 10 years.	"Shall guarantee the specified doses for this application."
What are the standard equipment warranty periods (ballasts, lamps, controls, etc.)?	Lamps have a pro-rated warranty. All other equipment is warranted from 18 months from ship date or from 12 months in service, whichever is sooner.	Lamps have a 5,000 hour warranty, pro-rated after 3,000 hours. Ballasts are fully warranted for one year of service. All other equipment is warranted from 18 months from ship date or from 12 months in service, whichever is sooner.	Not discussed in vendor response.	General: 18 months from shipment, or 12 months after being placed into service, whichever comes first. Ballasts: 5 years, prorated after the first year. Quartz sleeve: 20 years, prorated after the first 5 years. Lamps: 12,000 hours, prorated after 1,000 hours.

	Aquionics Inc.	Trojan Technologies	Calgon Carbon Corp[1]	WEDECO UV Technologies, Inc
How should removal of grit and solids prior to your UV disinfection system be handled? It is important to note that the stormwater discharge carries debris and solids like tree limbs, shoes, and trash. The discharge is tidally influenced so sand/grit and seaweed may be carried back into the UV system channel.	Screening recommended both upstream & downstream of the unit AQUIONICS does not provide screening/grit separation	Screening and grit removal recommended both upstream & downstream of the unit TROJAN does not provide screening/grit separation	Not discussed in vendor response.	Protective baffle plate ahead of the first lamp bank included which is a 1" punch plate. WEDECO recommends screening & grit removal to 30µ with a maximum TSS of 30 mg/L WEDECO does not provide screening/grit separation
What is the headloss across the UV disinfection system in inches of water for the specified flow rates? (Only 104 *Enterococci*/100 ml design basis shown)	12" per unit (12 units recommended operated in parallel)	At 96 cfs: 16.78 inches (1 channels required)	At 96 cfs: 28.21 inches (5 channels required)	At 96 cfs: 18.9 inches At 116 cfs: 23.4 inches (4 to 5 channels required)
Provide detail information on the type of monitoring and control systems used to operate the system.	PLC controlled (data provided) and included in system cost.	PLC controlled (data provided) and included in system cost.	PLC controlled (data gleamed from specification and included in system cost.	PLC controlled (data provided) and included in system cost.
What level of experience do operators typically need to use equipment?	Basic knowledge of wastewater equipment; equipment-specific training provided.	Basic knowledge of wastewater equipment; equipment-specific training provided.	Basic knowledge of wastewater equipment; equipment-specific training provided.	3-5 days training by factory rep, basic computer skills.
Can the system be hooked up to a communication line for remote operation/alarm signaling?	Yes, supervisory control and data acquisition (SCADA) interface provided.	Yes, supervisory control and data acquisition (SCADA) interface provided.	Yes, supervisory control and data acquisition (SCADA) interface provided.	Yes, supervisory control and data acquisition (SCADA) interface provided.

	Aquionics Inc.	Trojan Technologies	Calgon Carbon Corp[1]	WEDECO UV Technologies, Inc
How much attention does the system require? Will the system need to be continuously attended during operation?	Routine inspection & maintenance. System may be operated unattended	Routine inspection & maintenance. System may be operated unattended. Weekly inspection recommended regardless of if equipment is used or not.	Routine inspection & maintenance. System may be operated unattended.	System may be operated unattended. System has remote alarm capability (telephone line required).
How readily available are system replacement components? Are they off the shelf parts that can be ordered for rush delivery in 24 hours? Please provide a list of suppliers capable of supplying all system components.	All components available from upstate NY office.	On-site service available locally from MAHER in Massachusetts, who is a factory-authorized field service provider.	Parts are readably available out of their Pittsburg PA office.	Replacement parts shipped 24-48 hours after receipt of payment or purchase order, location not indicated in vendor response.
Does the system require any chemical cleaning or chemicals for normal operations?	Yes, a small quantity of lamp cleaning solution. (The composition and exact volume of the solution is not stated).	Yes, a small quantity of lamp cleaning solution. (The composition and exact volume of the solution is not stated, but is food grade based).	No. (System utilizes Teflon wiper blades to clean lamp sleeves and does not require chemicals)	No (System utilizes Teflon wiper blades to clean lamp sleeves and does not require chemicals).
Is an automatic means of cleaning the lamps provided?	Yes.	Yes.	Yes.	Yes.

	Aquionics Inc.	Trojan Technologies	Calgon Carbon Corp[1]	WEDECO UV Technologies, Inc
How often are UV lamps changed out under normal operating conditions (e.g. hours of operation)?	4,000 to 8,000 hours Lamp replacement cost is $500 each	~ 5,000 hours Lamp replacement cost is $300 each	~12,000 hours Lamp replacement cost is $250 each	~ 12,000 hours Lamp replacement cost is $199 each
What is the normal cycling on/off time for UV lamps and will prolonged shutdown followed by startup adversely impact the UV lamps?	Up to 6 on/off cycles per day Manufacturer recommends a minimum of monthly startup of lamps.	Up to 4 on/off cycles per day Prolonged shutdown does not affect lamp life.	Not discussed in vendor response.	4 on/off cycles per 24-hr. period.
How is the system mounted in the treatment channel?	No channel mounting provided (UV lamps are mounted in provided pipe)	Cast-in-place concrete around a factory-fabricated steel insert	Mounts in a cast-in-place concrete channel	Mounts in a cast-in-place concrete channel
Can the system be configured for varying water elevations or must the lamps be fully submerged at all times?	A "dogleg" loop at the outlet of the system is recommended. Lamps must be submerged during operation.	An adjustable weir plate is provided. Lamps must be submerged during operation.	An adjustable weir gate is provided. Lamps must be submerged during operation.	An adjustable weir plate is provided. Lamps must be submerged during operation.
Will the ballast of the lamps need to be replaced if submerged? If so, provide a description of required equipment replacement and budgetary costs.	System does not utilize ballast, but different technology, which is not designed for submergence. Ballast replacement cost is Not available	Yes, ballasts are not designed for submergence. Ballast replacement cost is $970 each	Yes, ballasts are not designed for submergence. Ballast replacement cost is $400 each	Yes, ballasts are not designed for submergence. Ballast replacement cost is $350 each

Notes:

1. Responses for vendor based on a follow up phone conversation and revised quote. Original quote was based on killing *fecal coli form* bacteria, not *Enterococci*

TABLE 17
UV DISINECTION SYSTEM QUALITATIVE ANALYSIS
UV DISINFECTION SYSTEM FOR STORMWATER TREATMENT
96 cfs (62 MGD) Design Flow
Newport, RI
September 2008

equested	Point Value Assigned to Each Requested Item	Aquionics		Trojan UV		Wedeco		Calgon	
		Response to Question	Resulting Numeric Value	Response to Question	Resulting Numeric Value	Response to Question	Resulting Numeric Value	Response to Question	Resulting Numeric Value
fection Experience at	10 pts for a Yes	Yes	10 pts	Yes	10 pts	Yes	10 pts	No	0 pts
of ongoing UV	15 pts for a Yes	Yes	15 pts	Yes	15 pts	No	0 pts	No	0 pts
g data for its list of	10 pts for a Yes	Yes	10 pts	Yes	10 pts	Yes	10 pts	Yes	10 pts
engineering?	5 pts for a Yes	Yes	5 pts	Yes	5 pts	Yes	5 pts	No	0 pts
s guarantee meeting standard?	15 pts for a Yes	Yes	15 pts	Yes	15 pts	No	0 pts	No	0 pts
rantee?	10 pts for a Yes	Yes	10 pts	Yes	10 pts	Yes	10 pts	No	0 pts
were provided?	Number of Points equals the number of installations in a given size range, divided by the total number of installations, times 20	183	2 pts	286	10 pts	251	5 pts	35	5 pts
han or equal to 10		164	18 pts	105	7 pts	186	15 pts	33	19 pts
een 10 and 50 MGD		17	2 pts	153	11 pts	54	4 pts	2	1 pts
ations greater than or ded?		2	0 pts	28	2 pts	11	1 pts	0	0 pts
lloss (inches) for the	-0.2 pt for each inch of headloss	12.0 inches	-2 pts	16.78 inches	-3 pts	18.90 inches	-4 pts	28.21 inches	-6 pts
to operate the lamps	-0.1 pt for each 100 kw	1,361 kw	-1 pts	1,075 kw	-1 pts	700 kw	-1 pts	786 kw	-1 pts
e the treatment	-10 pts for a Yes	Yes	-10 pts	No	0 pts	Yes	-10 pts	Yes	-10 pts
d/or drawings	5 pts for a Yes	Yes	5 pts	Yes	5 pts	Yes	5 pts	Yes	5 pts
for normal system	-5 pts for a Yes	Yes	-5 pts	Yes	-5 pts	No	0 pts	No	0 pts
for the operating life d	10 points for the highest, 5 points for the next highest, and 2 points	8,000 hours	5 pts	5,000 hours	2 pts	12,000 hours	10 pts	12,000 hours	10 pts
re needed for 4 col/100ml?		(12 units - 35"L x 42" W each)		(1 Channel - 96"W x 39'L x		(4 Channels)		(5 Channels - 44'Wx38'Lx78"D)	
d for treatment at 62		216 Lamps		336 Lamps		1944 Lamps		1360 Lamps	
cost?	-1 pt for each $1,000,000	$ 24,005,762.29	-24 pts	$ 21,624,080.28	-22 pts	$ 22,245,207.13	-22 pts	$ 22,802,615.63	-23 pts
			54.2 pts		92.6 pts		60.5 pts		33.6 pts

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