

Hazen *Memorandum*

February 7, 2017

To: Erik McPeck, Delaware County Regional Sewer District

From: Scott Phipps, Project Manager
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cc: Mark Chandler, Delaware County Regional Sewer District
Tiffany Maag, Delaware County Regional Sewer District
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Re: Scioto Reserve Wastewater Treatment Plant Study

The Delaware County Regional Sewer District (DCRSD) owns and operates the Scioto Reserve Wastewater Treatment Plant (SRWWTP), which has a design permitted capacity of 0.4233 million gallons per day (mgd). The SRWWTP has a conventional liquid stream treatment configuration that includes raw influent pumping, screening, flow equalization, activated sludge process with secondary clarification, chlorination, and effluent pumping for land application at a nearby golf course.

This evaluation is intended to determine the overall capacity of the SRWWTP for future flows, loads, and regulatory conditions. This report discusses the initial understanding and assumptions, describes the detailed analysis undertaken, and identifies the results of the evaluation, including limiting process units that may potentially impact future capacity.

Background and Existing Conditions

DCRSD has a long-term agreement with the Scioto Reserve Country Club to provide SRWWTP treated effluent to their holding pond for irrigation. The holding pond and subsequent land application is the only permitted discharge for SRWWTP effluent. The Land Application Management Permit (LAMP) for SRWWTP has monthly discharge limits, as well as separate monitoring requirements using groundwater wells upstream and downstream of the application point. **Table 1** presents a summary of the monthly discharge limits in the LAMP and a comparison to historical performance.

Table 1. Summary of Permit Limits and Comparison to Performance

	Flow (MGD)	CBOD ₅ (mg/L)	TSS (mg/L)	TIN (mg/L)
Permit Conditions	0.4233	40 (monthly limit)	45 (monthly limit)	10 (monthly limit)
Historical Annual Average and Maximum Monthly (AA / MM) Effluent Values				
2012	0.236 / 0.258	8 / 12	14 / 20	16 / 23*
2013	0.300 / 0.607	7 / 10	12 / 20	12 / 17*
2014	0.257 / 0.289	4 / 11	7 / 11	9 / 15*
2015	0.267 / 0.286	9 / 15	7 / 20	6 / 10

*NOTE: TIN permit limits were effective October 1, 2014. 2014 MM value occurred prior to effective date.

50098-004

The data in **Table 1** shows a history of permit compliance and continuous improvement in nutrient removal to meet the relatively recent Total Inorganic Nitrogen (TIN) limit. Analysis of the available influent data also shows that the SRWWTP is likely receiving a more nitrogen-concentrated influent stream than assumed in the original design. **Table 2** presents a summary of the influent data from special sampling compared to the design values.

Table 2. Summary of Influent Data and Comparison to Design Assumptions

	BOD ₅ (mg/L)	TSS (mg/L)	NH ₃ -N (mg/L)
Design Values	200	220	30
2013 Special Sampling Averages	175	282	45

A summary of the major unit processes are presented in **Table 3** and shown schematically in **Figure 1**.

Table 3. Summary of SRWWTP Unit Processes

Unit Process	Quantity	Design Capacity	Notes
Influent Pumps	2	980 gpm at 40 ft TDH	Gorman Rupp Model T6A-B
Influent Screens	2	750 gpm	Andritz Hydrasieve (Model No. 554-1-72) Opening Size – 0.060 inches
Equalization Tanks	2	64,228 gallons (each)	
Aeration Basins	2	216,180 gallons (each)	14 ft side water depth (SWD) EDI Flexair Model 84P Fine Bubble Tube Diffusers
Secondary Clarifiers	2	63,415 gallons (each)	30 ft diameter 12 ft side water depth (SWD)
Return Activated Sludge (RAS) Pumps	4 (2 per RAS well)	270 gpm at 20-ft TDH	Gorman Rupp Model JSV3A60-E2.7
Disinfection	NA	NA	Hypochlorite feed
Effluent Pumps	2	380 gpm at 70-ft TDH	Gorman Rupp T4A-B
Blowers	7	Aeration: 538 cfm (Quantity 3) Sludge Holding: 406 cfm (Quantity 2) Equalization: 322 cfm (Quantity 1)	All Gardner Denver Lamson Aeration blowers are multistage centrifugal type, others are positive displacement type One additional filter scouring blower (out of service)

Figure 1 presents a layout of the unit processes and a process schematic for reference.

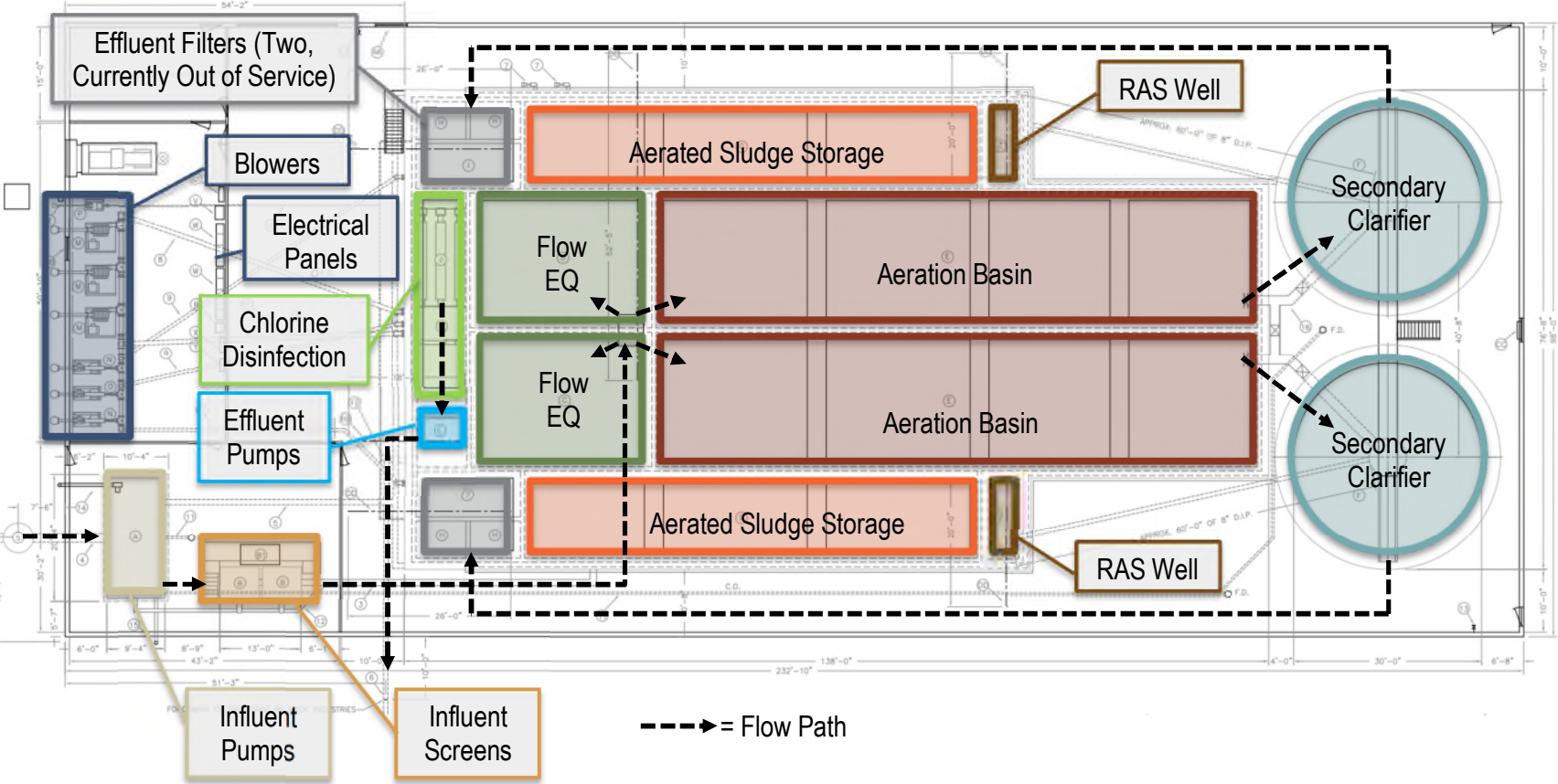


Figure 1. SRWWTP Facility Layout and Process Flow Diagram

Basis of Evaluation

The data provided by DCRSD, including historical data, equipment O&M manuals, and original design criteria and drawings, were used to evaluate the SRWWTP on the basis of the following:

1. Comparison to Ten States Standards Design Criteria
2. Aeration system analysis
3. Hydraulic analysis to identify hydraulic bottlenecks

Comparison to Ten State Standards

The SRWWTP existing unit processes were compared to Ten State Standards Criteria. Capacity was evaluated based on all units in service (installed capacity) and then with one unit out of service (firm capacity) at the most critical unit process.

Equalization Basins

Table 4 provides the standards for aeration requirements when using equalization basins. There are currently two equalization basins at SRWWTP, each with a volume of approximately 64,000 gallons. In order to meet the Ten State Standards minimum air requirements, approximately 160 cfm of air must be provided. The existing equalization blower is a positive displacement type rated for 322 scfm at full depth, which meets air requirements. The 406 scfm sludge holding tank blowers are connected to the same air header and could be used as standby blower capacity, in case the single equalization blower must be taken out of service.

Table 4. Equalization Basins – Aeration Requirements per Ten State Standards

Criteria	Minimum Dissolved Oxygen (mg/l)	Minimum Air Supply Rates (cfm/1000 gal)
Ten State Standards	1.00	1.25 (160 cfm total)
Installed Capacity	NA	322 cfm

Aeration Basins

The two existing aeration basins have a total volume of approximately 430,000 gallons. As seen in **Table 5**, the recommended organic loading limits SRWWTP to a firm capacity (one basin out of service) of 1.5 mgd. With both basins in service, the aeration basins are rated for 3.1 mgd. Additional details regarding the aeration system evaluation are presented later in this report.

Table 5. Aeration Basin Process Capacity Based on Ten State Standards

	Firm Capacity	Installed Capacity
Max Flow based on Organic Loading Rate of 40 lb CBOD ₅ /day/1000 ft ³	≤ 1.5 mgd	≤ 3.1 mgd
Max Flow based on F:M Ratio of 0.2 – 0.5	≤ 3.5 mgd	≤ 7.3 mgd

NOTE: Based on influent concentration of 178 mg/L CBOD₅ from 2013 special sampling

Secondary Clarifiers

The two existing 30-ft diameter secondary clarifiers have a side water depth (SWD) of 12 ft. Each has a surface area of approximately 700 sq ft and a weir length of 90 ft. **Table 6** shows the process capacity analysis for the two existing secondary clarifiers.

Table 6: Scioto Reserve WWTP Secondary Clarifiers Process Capacity Based on Ten State Standards

	Firm Capacity	Installed Capacity
Max Flow based on Surface Overflow Rate of 1,200 gpd/ft ²	≤ 0.85 mgd	≤ 1.70 mgd
Max Flow based on Weir Loading Rate of 30,000 gpd/ft	≤ 2.7 mgd	≤ 5.5 mgd
Max Flow based on Solids Loading Rate of 40 lb TSS/day/ft ²	≤ 0.7 mgd	≤ 1.4 mgd

Disinfection

Due to the land application function of the effluent, the SRWWTP uses chlorination through the existing 8-inch force main as the disinfection process and to meet the contact time requirement. To ensure disinfection standards, the residence time of the flow through the force main was calculated and confirmed to exceed the 15 minute minimum, as shown in **Table 7**. The maximum flow that the force main can handle while meeting the 15 minute minimum retention time is 1.58 mgd.

Table 7: Scioto Reserve WWTP Estimated Disinfection Residence Time

	Single Pump	Two Pumps Running in Parallel
Residence Time in Force Main	43 minutes	41 minutes

Aerated Sludge Holding

The SRWWTP currently stores sludge in aerated tanks before trucking it to another facility for dewatering. There are no numerical Ten State Standards for storage of sludge in tanks at a WWTP site, but there are guidelines for aerobic digestion. For reference, **Table 8** presents the guidelines designated by Ten State Standards for aerobic sludge digesters. The two aerated sludge holding tanks have a total storage volume of 212,000 gallons. In order to meet the minimum air requirements approximately 850 cfm of air must be provided.

Table 8: Scioto Reserve WWTP Aerobic Sludge Digestion Air Requirements

Criteria	Minimum Dissolved Oxygen (mg/l)	Minimum Air Supply Rates
Ten State Standards	1.00 – 2.00	30 cfm / 1000 ft ³ (total 850 cfm)
Installed Capacity	NA	812 cfm

Currently, there are two sludge aeration blowers, each providing 406 cfm, which does not meet the required air for the entire digestion volume. However, since the contents of the tanks are only intended for storage prior to digestion, this design criterion is not necessarily a limiting factor to the SRWWTP's overall capacity.

Aeration System Analysis

The existing aeration system at SRWWTP consists of the following components:

- Three Lamson Model 400 multistage centrifugal blowers rated for 538 cfm at 7.3 psi. One or two of these blowers are operated manually at full capacity under normal conditions. There are no VFDs, air flow control valves, or dissolved oxygen (DO) control to optimize oxygen delivery.
- Two 8-inch diameter air headers below the concrete floor between the blowers and the aeration basins
- Approximately 240 EDI FlexAir® Model 84P tube diffusers distributed throughout the basins. The most upstream zone on the west train of the aeration basins has been converted to an anoxic zone with a floating mixer and no diffusers to enhance denitrification.

Currently only the west train of the aeration basins is in operation under typical conditions. To fully consider the capacity and anticipated performance of the SRWWTP, the aeration system was evaluated for several different influent conditions, as summarized in **Table 9** below.

Table 9. Aeration System Influent Conditions

	Current Avg. Annual	Permit Capacity	Max Month	Max Week	Max Day
Flow (MGD)	0.26	0.42	0.61	0.72	0.84
Influent BOD ₅ (mg/L)	180	180	160	160	160
Influent TKN (mg/L)*	64	64	55	55	55

*NOTE: Influent TKN value estimated based on 2013 special sampling data for NH₃-N and typical ratio of 0.7 NH₃-N/TKN

The existing aeration system was evaluated under two different scenarios for all of the influent conditions listed in **Table 9**: one-basin operation (firm capacity) and two-basin operation (installed capacity). For system reliability, reserving one aeration basin for use only during maximum load conditions is recommended. The current system configuration (presented in **Figure 2**) is limited since the east train is incapable of providing the same level of treatment as the west train.

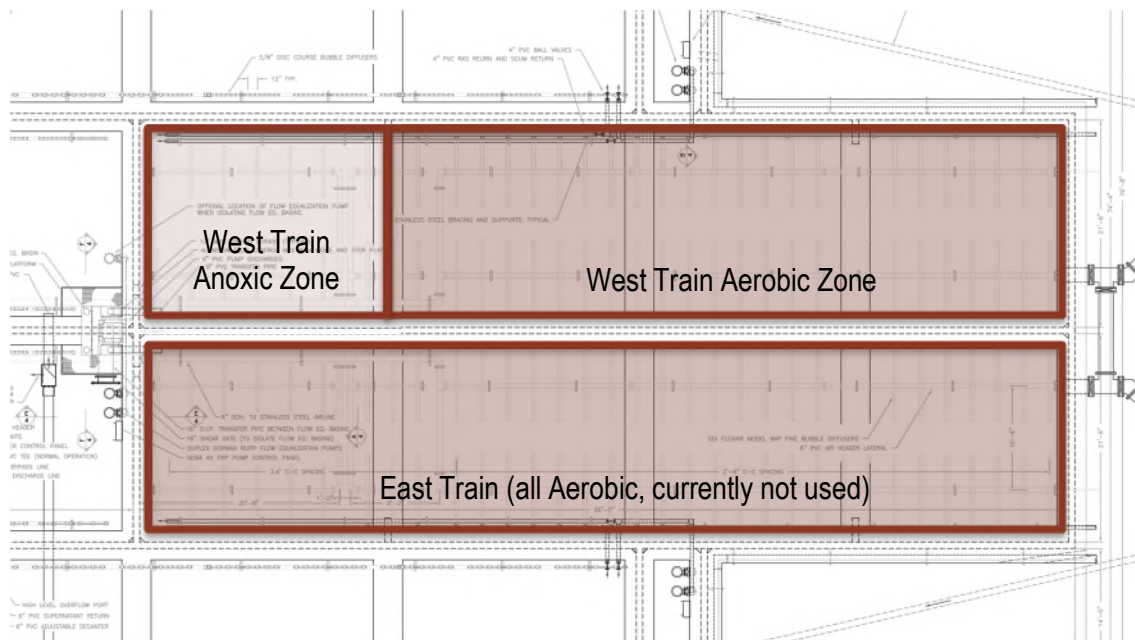


Figure 2: SRWWTP Aeration System Current Configuration

The current treatment scheme is also limited by the location of the anoxic zone. Although anoxic conditions in the most upstream zone is beneficial for settling performance, it provides limited benefits for denitrification since the prerequisite nitrification has not yet occurred on the influent flow. To compensate for this limitation, the SRWWTP staff turns off the air at times during the day and reroutes the RAS discharge to the midpoint of the tank to provide anoxic conditions for denitrification. This innovative strategy has been successful in meeting the TIN permit limit in recent years; however,

implementation must be closely monitored by experienced staff to be effective without compromising nitrification performance.

To further improve performance of the SRWWTP and simplify operation for TIN removal, the following alternatives were considered for upgrades to the aeration tanks:

1. Installation of internal baffle walls within each train to facilitate plug flow conditions (see **Figure 3**)
2. Installation of piping to convert existing tanks to plug flow in series (see **Figure 4**)
3. Installation of internal mixed liquor recycle (IMLR) pumps in both trains and addition of anoxic zone in east train (see **Figure 5**)

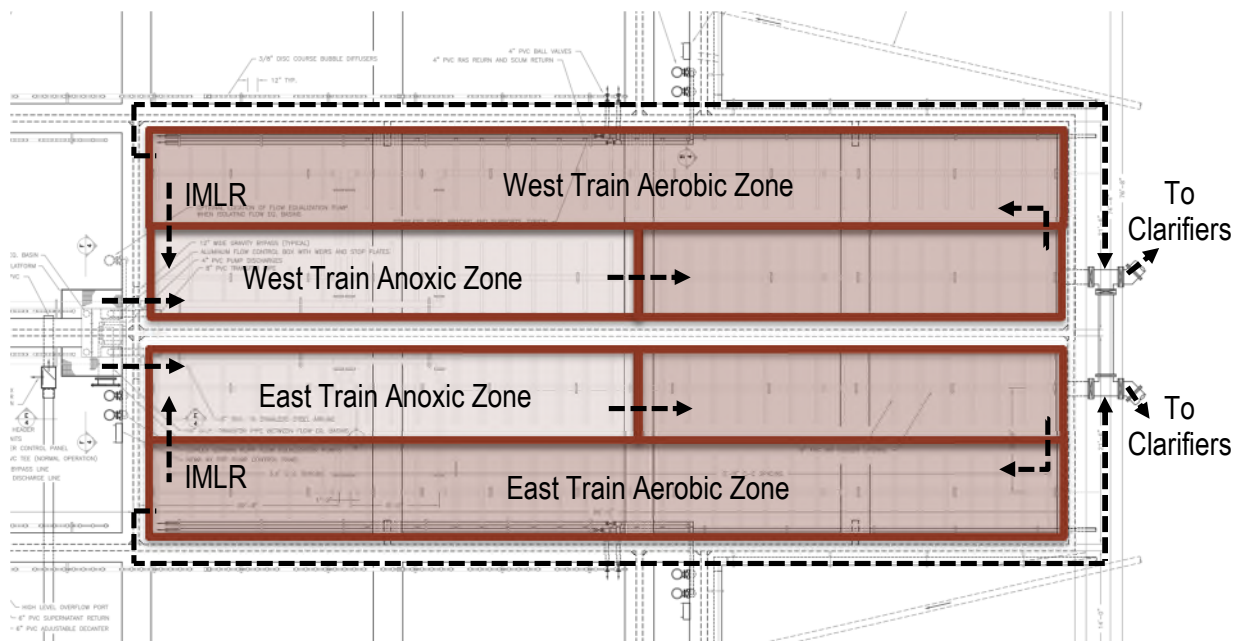


Figure 3: SRWWTP Aeration System – Internal Baffle Walls

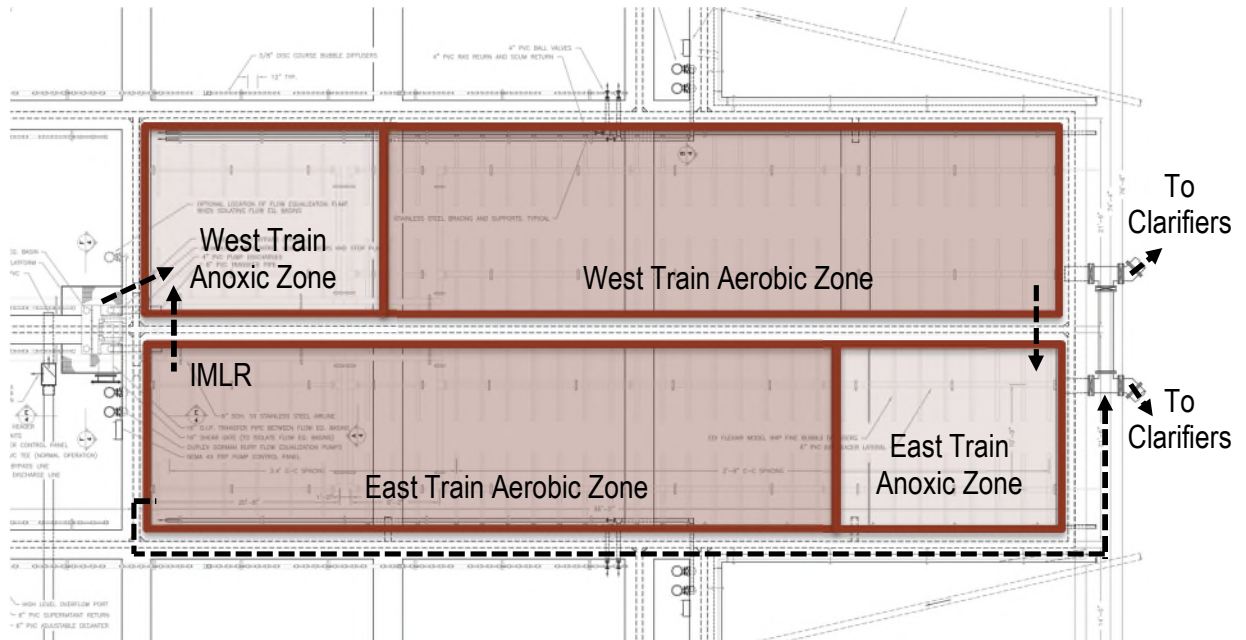


Figure 4: SRWWTP Aeration System – Two Tanks in Series

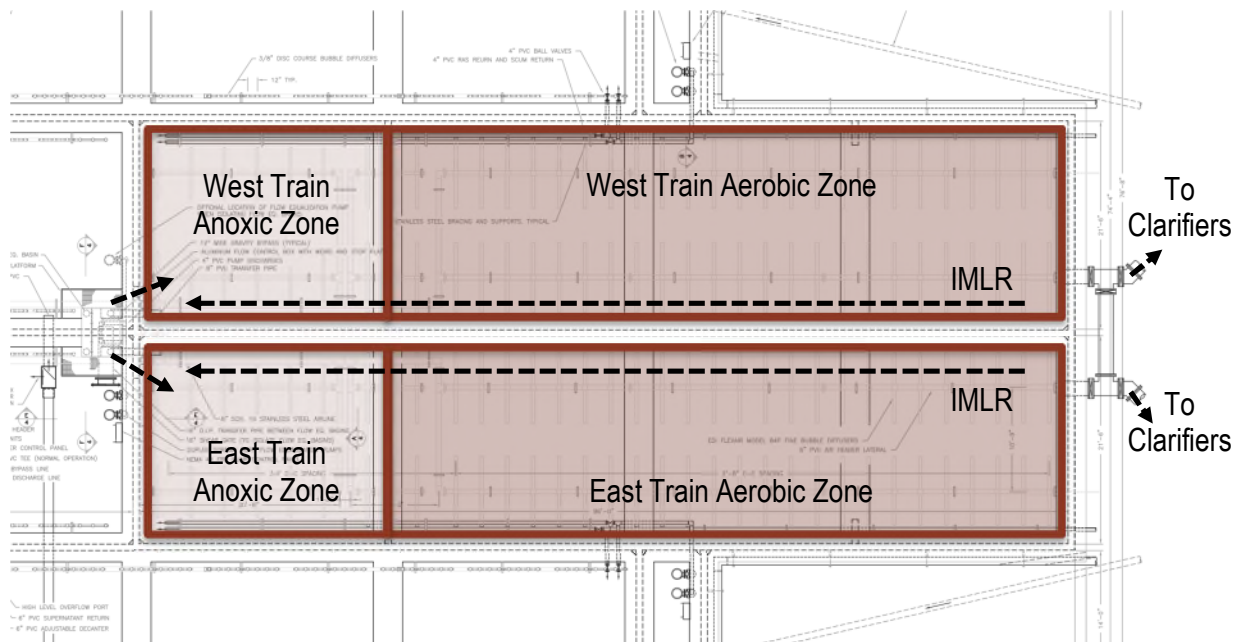


Figure 5: SRWWTP Aeration System – IMLR Pumps and East Anoxic Zone

Table 10: Summary of Aeration Basin Upgrade Alternatives

No.	Description	Advantages	Disadvantages
1	Internal Baffle Walls	<ul style="list-style-type: none"> Improved plug flow Internal recycle Redundancy 	<ul style="list-style-type: none"> Cost for piping and baffles Hydraulic limitation (effluent direction)
2	Two Tanks in Series	<ul style="list-style-type: none"> Improved plug flow Internal recycle 	<ul style="list-style-type: none"> No redundancy Hydraulic limitation (effluent direction)
3	IMLR Pumps and East Anoxic	<ul style="list-style-type: none"> Internal recycle Redundancy 	<ul style="list-style-type: none"> Mixed zones (no plug flow)

During a meeting to discuss the aeration basin upgrade alternatives on October 12, 2016, DCRSD and Hazen agreed that Alternative 3 was the most advantageous configuration based on lowest estimated capital cost and operational redundancy. The proposed improvements include an upgrade of approximately 1/4 of the aeration basin volume to anoxic conditions. The primary benefit of these upgrades is the ability to denitrify more reliably, and the associated reduction in effluent TIN. There are also a few ancillary benefits to denitrification that reduce the amount of oxygen that needs to be added to the process, including:

- Reduction of aeration demands as part of the denitrification biological process
- Consumption of BOD as carbon source for denitrification in the upstream anoxic zone

To demonstrate the above benefits of denitrification, a “future” scenario was defined with conditions identical to existing (see **Table 9**), except that the aeration demands are reduced to account for denitrification. The aeration demands were calculated for both the existing conditions and future conditions, and the comparison of the two conditions, as well as one tank versus two tank operation, is presented in **Figure 6**. The results show that the proposed improvements will not only improve treatment, but also reduce aeration demand and, accordingly, power consumption. In addition, two-tank operation will ultimately improve aeration efficiency by reducing the flux and headloss across the diffusers.

Additional improvements recommended for the aeration system are listed below:

- Replacement of original tube diffusers in the east train with new tube diffusers, similar to the relatively recent diffuser replacement in the west train.
- Relocation of blower inlet filters to outdoors. The current location inside the building may limit their ability to deliver oxygen to the process, particularly when all the doors are closed.
- Installation of inlet throttling valves on the three process blowers for improved air flow control.
- Installation of automatic DO control in the process tanks for control of the inlet throttling valves to modulate air delivery.
- Installation of new stainless steel air piping overhead. The current location of the air piping below the concrete pad between the blowers and aeration basins causes a low point, where condensate can collect and inhibit passage of air. In addition, the existing ductile iron piping has an increased risk of leaking due to deterioration of gaskets from exposure to high temperature.

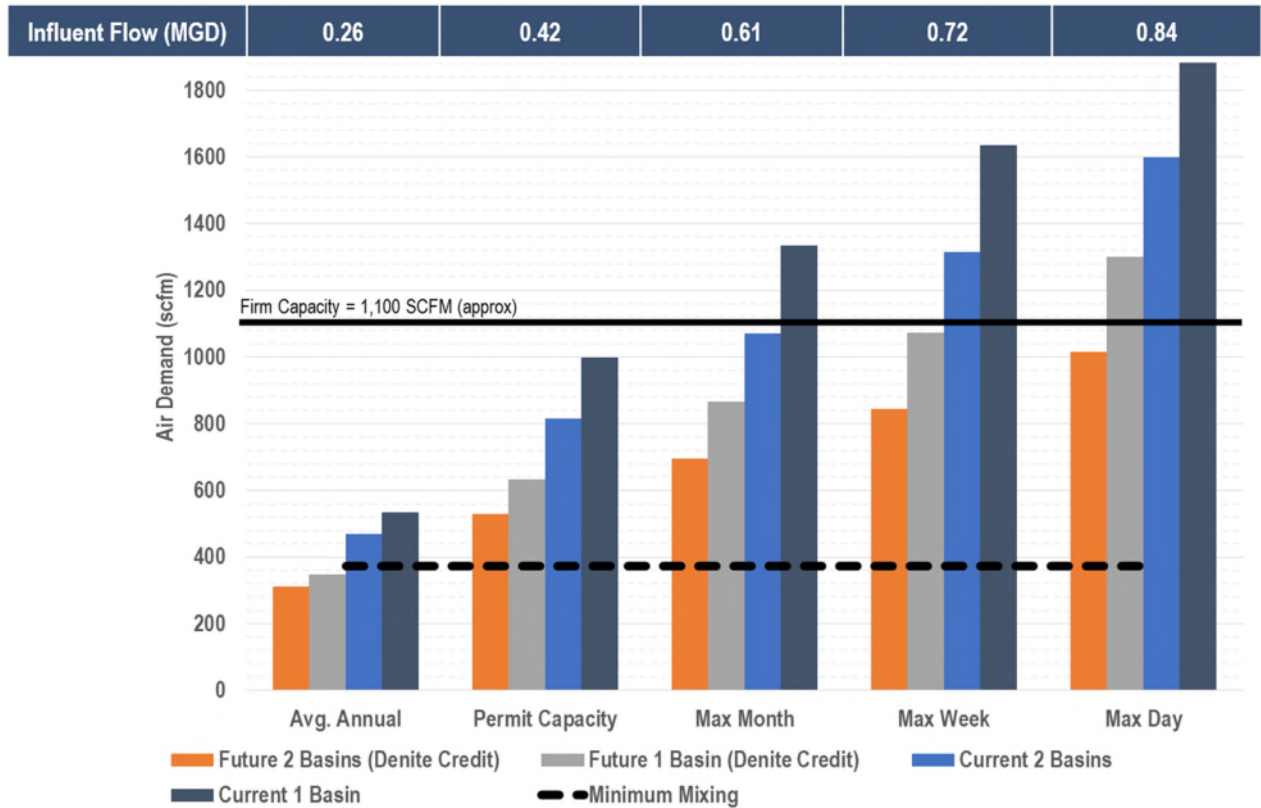


Figure 6: Aeration Demands – Current vs. Existing

Hydraulic Analysis

To evaluate the hydraulic design of the SRWWTP, a HazenPro Microsoft Excel-based hydraulic profile was developed based on the 1998 record drawings by Mack Industries, Inc. The hydraulic analysis included all flow elements from the diversion box upstream of the aeration tanks through the weir upstream of the effluent pump wet well, flowing by gravity throughout. No hydraulic limitations were identified when evaluated up to an influent flow of 1.5 mgd, plus RAS flow of 0.4233 mgd and IMLR flow up to 2.1 mgd.

Pumping Systems

Influent Pumps

The existing influent pumps are properly sized for the application and handle peak flows without issue. However, the pumps are constant speed and run intermittently at approximately 1.5 mgd, which causes operational complexity at downstream treatment units when average influent flows are only 0.3 mgd.

Figure 7 presents the pump and system curves, and highlights the operational gap between the typical influent flows and the operating point of the pumps.

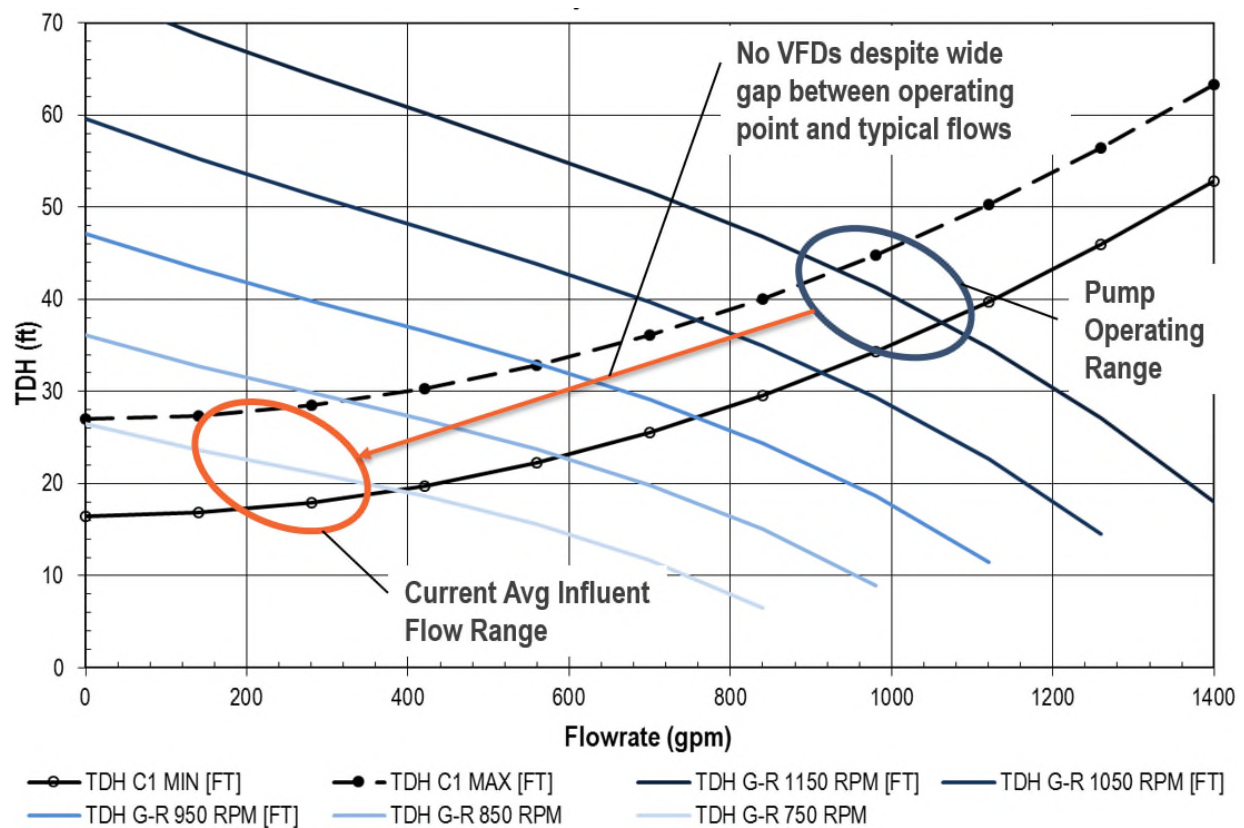


Figure 7: SRWWTP Influent Pumps – Operational Gap between Design Point and Influent Flow

To address this operational gap we have coordinated with the pump manufacturer’s representative and identified that the pumps can be retrofitted with variable frequency drives (VFDs) to adjust their speed. Due to the age of the pumps, the manufacturer recommended replacing the pumps in their entirety with new pumps and VFDs to ensure system reliability. Pump replacement should also be considered to provide a single point of responsibility for the pumps and VFDs. Costs for both options are presented later in this report.

Another challenge with the influent pump station that was identified by the operations staff is that grit tends to accumulate in the wet well, limiting the operational volume. As shown in **Figure 8**, there is a relatively large area of the wet well that allows for stagnation of flow and settling of material, particularly when the pumps sit idle during low flows. The addition of VFDs on the influent pumps may minimize this settling since stagnant periods will be reduced. To further simplify cleaning of the wet well, DCRSD could consider adding a connection from the influent pump force main header to recycle flow into the wet well and fluidize the settled material, as shown in **Figure 8**.

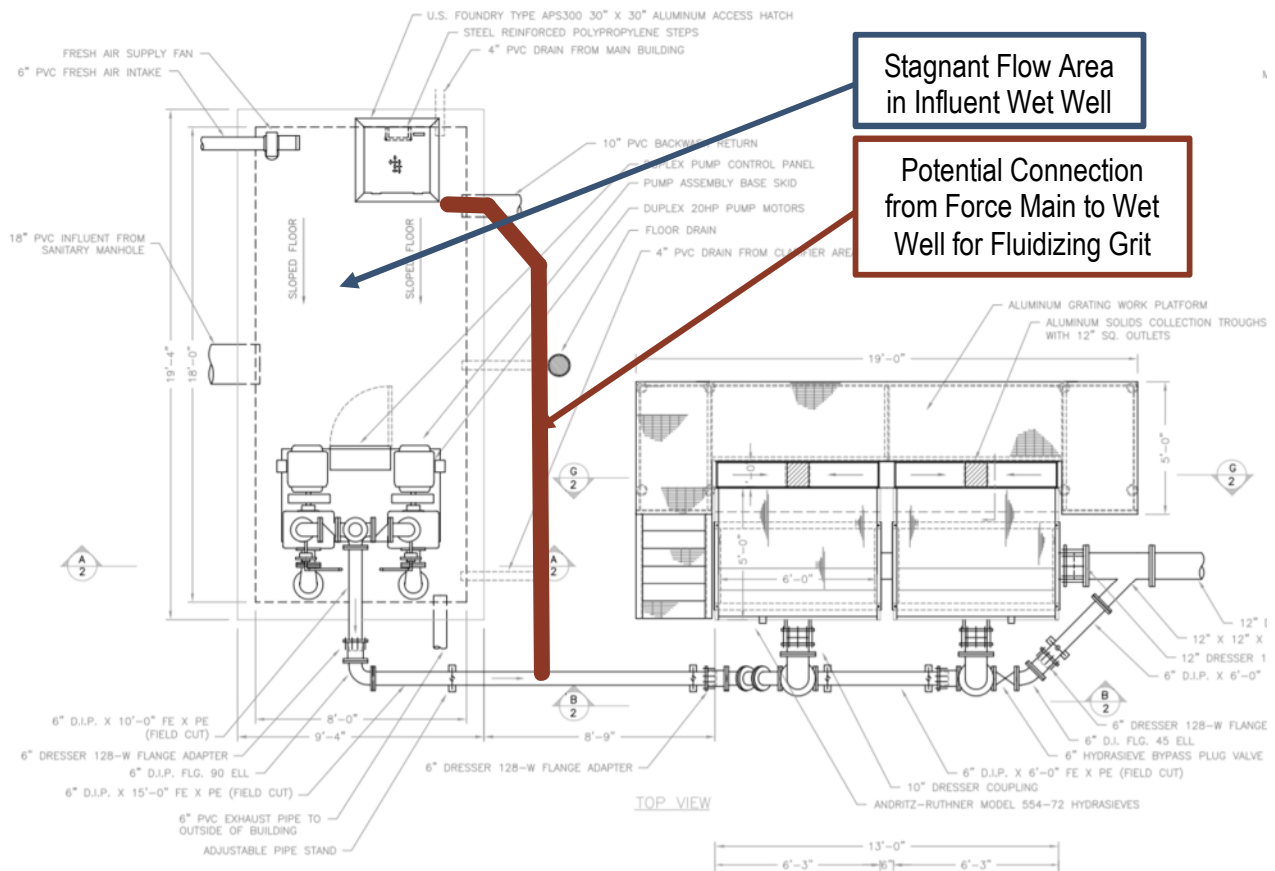


Figure 8: Influent Wet Well – Potential Modifications

The benefits of fluidizing the grit would only be realized if grit removal equipment was installed downstream. More information regarding proposed grit removal equipment is included later in this report.

Effluent Pumps

The existing effluent pumps convey final effluent to a holding pond to be used for golf course irrigation. The 8-inch diameter effluent force main is approximately 6,300 ft long, which results in a “steep” system curve, as shown in **Figure 9**. The length of the force main imparts a relatively high friction headloss on the pump system as flows increase. Due in part to the long force main, the effluent pump system has a firm capacity of approximately 0.5 mgd, making it the unit process that most significantly limits SRWWTP capacity.

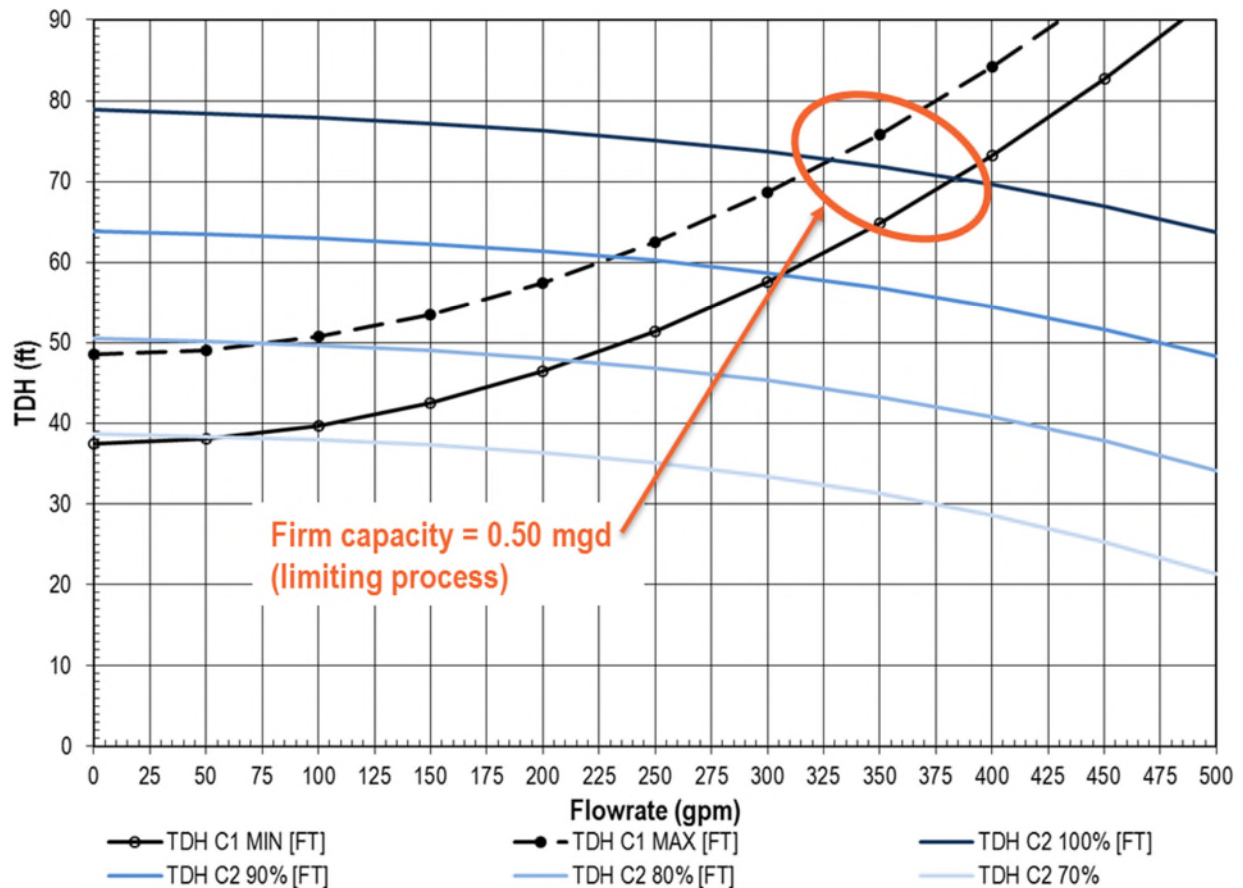


Figure 9: SRWWTP Effluent Pumps

To eliminate this hydraulic bottleneck, the effluent pumps are recommended to be replaced. Even at current flows the pumps are at risk of having insufficient capacity, especially if the influent equalization volume is full. Two scenarios for replacement pumps were considered: firm capacity of 1.5 mgd (one pump operating), and installed capacity of 1.5 mgd (two pumps operating). Because of the high head application, the manufacturer of the existing effluent pumps did not have a good selection for either scenario with increased capacity. Therefore submersible non-clog and vertical turbine centrifugal pumps were considered for replacement, with the design criteria presented in **Table 11**.

Table 11: Effluent Pump Station Design Criteria

Criteria	Value
Number of Pumps	2
Type	Centrifugal, Submersible Non-Clog or Vertical Turbine, VFD Driven
Sizing Alternative 1	1.5 MGD Firm Capacity (1 pump operating)
Sizing Alternative 2	1.5 MGD Installed Capacity (2 pumps operating)
Total Dynamic Head	270 ft
Max Speed	1800 RPM
Max HP	125
Control Panel	NEMA 4X duplex pump control panel
Electrical Requirements	460V, 3 Ph, 60 Hz

For this application, the equipment proposals received indicated lower capital costs for vertical turbine pumps, with a budgetary equipment price proposal of about \$40,000 per pump for sizing alternative 1. This budgetary price can be compared to nearly \$125,000 and \$75,000 per pump for submersible pumps in sizing alternatives 1 and 2, respectively. Accordingly, the cost estimate presented later in this report includes costs for vertical turbine pumps with 1.5 mgd firm capacity.

RAS Pumps

The existing return activated sludge (RAS) pumps are located in RAS wells adjacent to the sludge holding tanks, and pump to the influent of the aeration tanks. The RAS wells are fed by gravity from the secondary clarifiers, and the RAS flow rate is controlled by manual telescoping valves that connect to 8-inch diameter pipes from the secondary clarifiers. For more direct control of RAS rate, the RAS pumps are recommended to be replaced with dry pit vertical pumps on VFDs. This direct control is expected to improve the ability to optimize the process operation and allow for automatic control of RAS rates based on influent flow. The design criteria for the proposed new RAS pumps are presented in **Table 12**.

Table 12: RAS Pump Design Criteria

Criteria	Value
Number of Pumps	3
Type	Dry pit vertical
Capacity (each)	0.5 MGD
Total Dynamic Head	20 ft
Electrical	480V/3Ph/60Hz Class 1, Div 1, Group D Environment
Controls	New, standalone control panels with VFDs (in electrical room)

Performance and Operability

This section discusses the condition of existing unit processes based on observations and discussions with SRWWTP operations staff, as well as recommended improvements for enhanced treatment performance, efficiency, and operability.

Influent Screens

The existing influent screens are Andritz Hydrasieves with estimated 1/4-inch openings (see **Figure 10**). These screens are no longer marketed for influent wastewater screening, but are now emphasized for effluent screening applications due to their small opening sizes. One of the primary drawbacks of this equipment is that it is not self-cleaning. The influent flow comes over the top of the screen and travels through the screen by gravity, while debris is captured on the screen for manual removal. The operators must remove the debris on a routine basis to prevent excessive buildup and ensure performance of the screen. In addition, starting and stopping of the constant speed influent pumps cause sudden surges of flow on the screen, which creates an increased risk of exposure to raw wastewater by operators during screen cleaning.

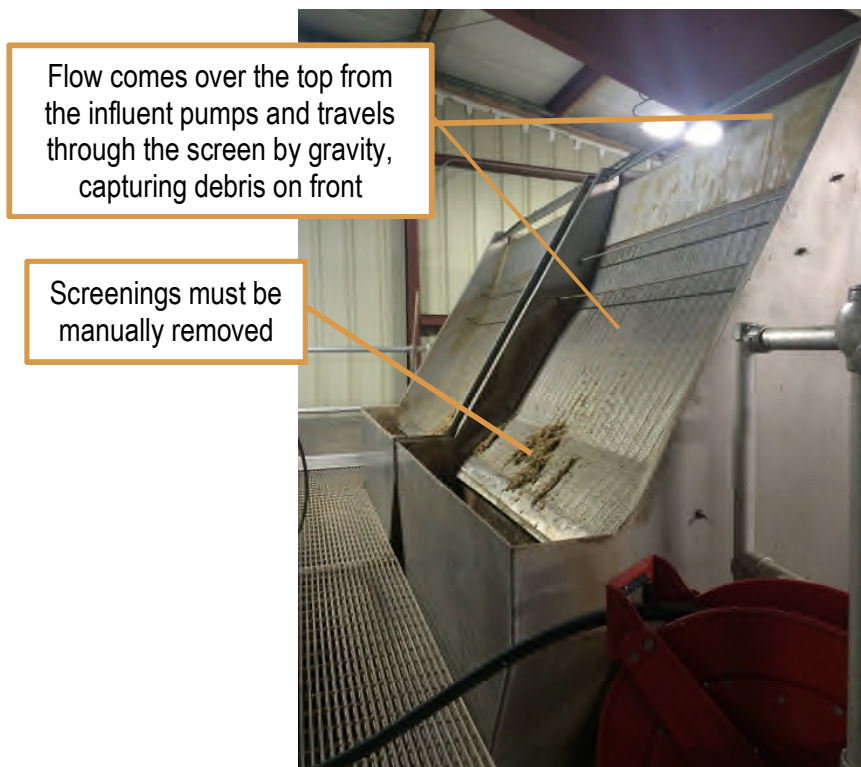


Figure 10: Influent Screens

Because the influent screens are obsolete and maintenance intensive, they are recommended to be replaced with modern equipment. The existing screens are located above grade in the SRWWTP building and are fed via the influent pump station force main. The screens were installed in this configuration reportedly because the bedrock in this area is shallow, and excavating below grade for gravity feed of the screens (for example, upstream of the influent pumps) was more costly than supporting them at a higher elevation. Accordingly, the proposed new screens were also assumed to be installed above grade in a standalone channel.

Two types of screens were considered:

1. Conventional multi-rake bar screen with separate washer/compactor equipment (e.g. Headworks, Inc. Bar Screen, see **Figure 11**)
2. Cylindrical bar screen with wash water cleaning and integral conveyor and screenings press (e.g. Lakeside Raptor Micro Strainer, see **Figure 12**)

Proposals were solicited for both types of screen with 1/4-inch openings and are attached for reference. Final selection of screening equipment has been deferred to detailed design.

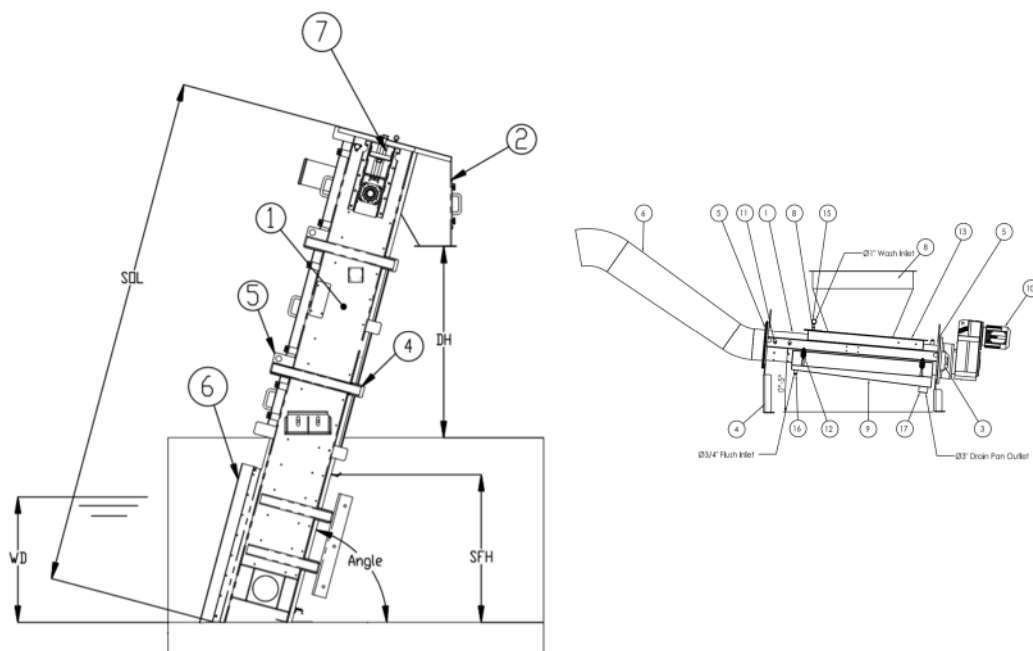


Figure 11: Conventional Multi-rake Bar Screen and Washer/Compactor (courtesy Headworks, Inc.)

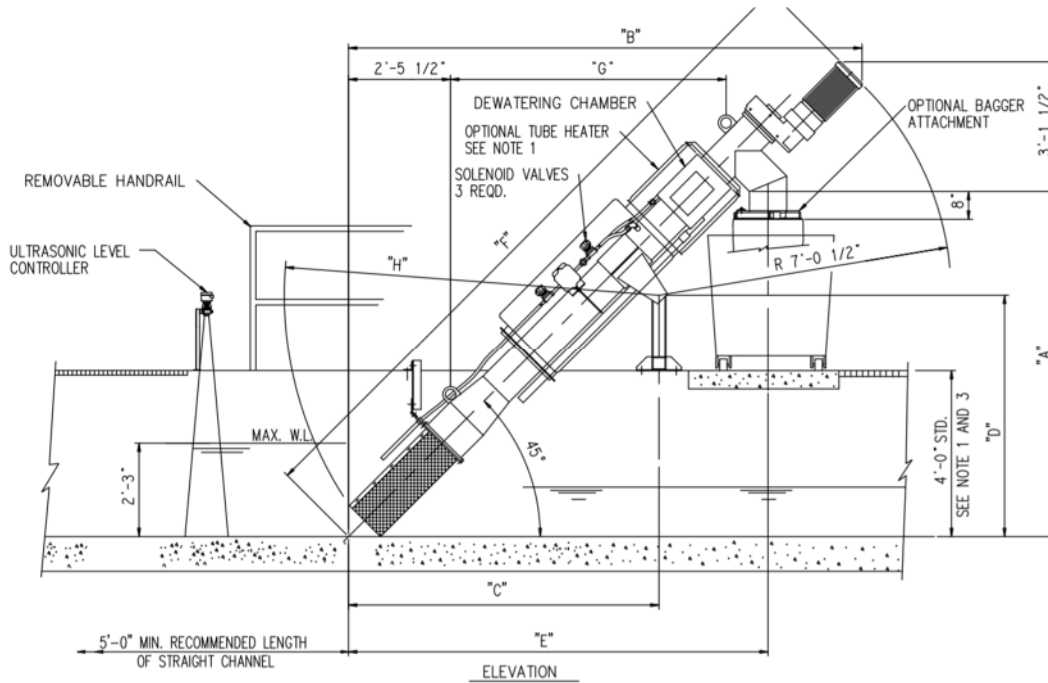


Figure 12: Cylindrical Bar Screen with Integral Conveyor (courtesy Lakeside Equipment Corp.)

Grit Removal

The existing SRWWTP does not have grit removal, but occasionally the influent wet well requires cleaning due to grit buildup as indicated previously. If the grit remains suspended and is transported downstream by the influent pumps, a stacked tray grit removal system could be considered for removal. As shown in **Figure 13**, the stacked tray grit removal system facilitates enhanced removal of grit (compared to conventional vortex grit removal). The grit is then pumped to washing and dewatering equipment.

The grit equipment would be located near the influent screens, preferably downstream of the screens to minimize buildup of rags and debris on the tray supports in the grit tank. Locating the grit removal next to the screening equipment could also allow for collection of grit and screenings in one dumpster for removal and disposal.

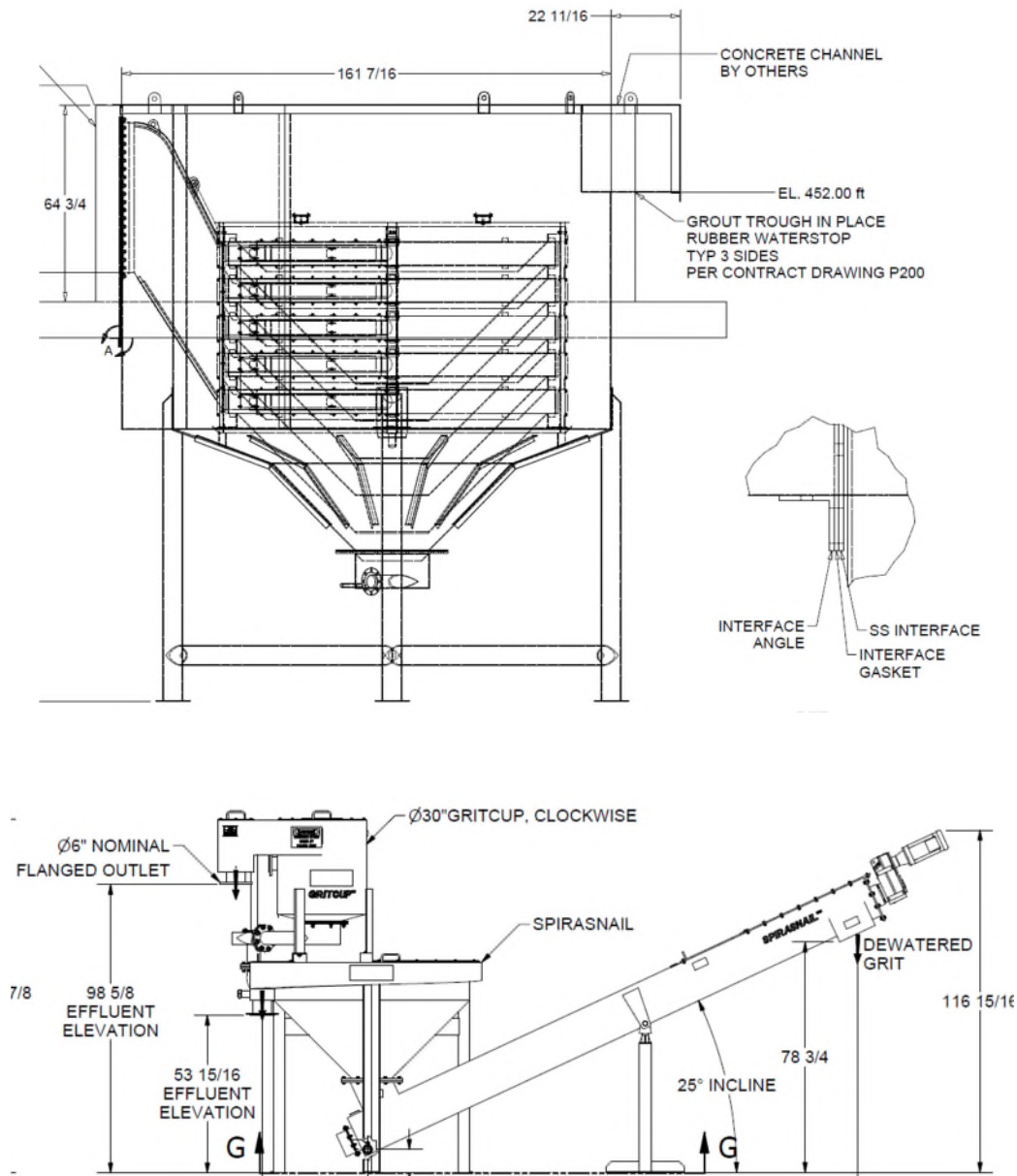


Figure 13: Stacked Tray Grit Removal, Washing, and Dewatering System (courtesy Hydro Intl.)

Secondary Clarifier Mechanisms

The existing secondary clarifiers include brushes on the bottom of the solids scrapers that do not touch the bottom of the clarifier, which severely limits the effectiveness of the clarifier mechanisms. The existing clarifiers also have potential to become a capacity-limiting unit process, as indicated in **Table 6**, if only one clarifier is operational. If both clarifiers are in continuous operation, the installed capacity is likely

sufficient for up to approximately 1.4 mgd. To resolve issues with solids removal and improve reliability of the clarifiers, the mechanisms are recommended to be upgraded with new equipment.

The cost estimate presented later in this report includes a retrofit of the clarifiers with new solids scrapers as a Priority No. 1 improvement. This modification is recommended at a minimum to improve treatment performance and solids handling, which is discussed later in this report.

Also listed as a Priority No. 2 improvement is complete replacement of the solids and scum removal mechanisms in the secondary clarifiers. The basis for the estimate is Evoqua Tow-Bro clarifier equipment (see example in **Figure 14**), which are typically well-suited for secondary clarifiers of this size. However, this equipment requires relatively flat bottom clarifiers to facilitate its direct pull of settled solids and distinct blanket control. Since the SRWWTP clarifiers have moderately sloped floors, some adjustment of the clarifiers or equipment may be necessary. Final equipment specifications are anticipated during detailed design.

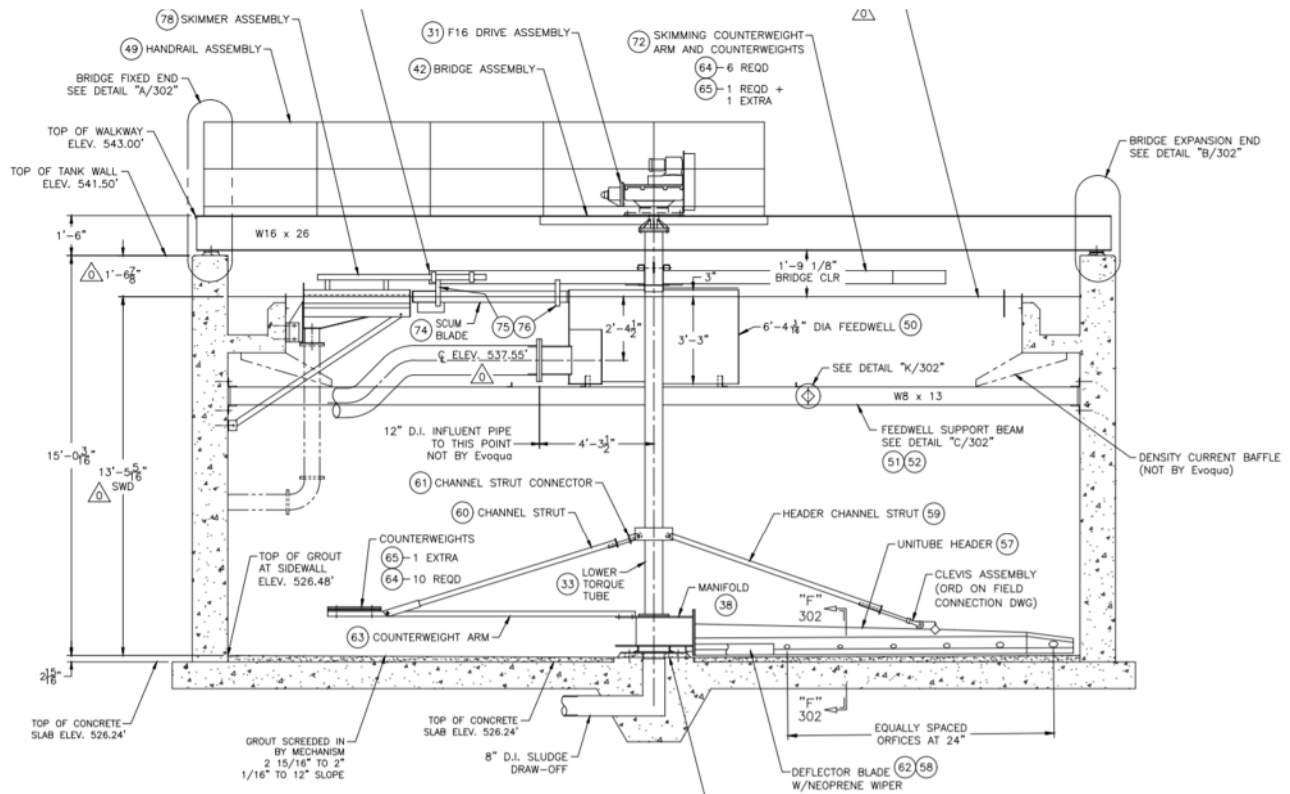


Figure 14: Example Secondary Clarifier Mechanism Replacement (courtesy Evoqua)

Location of Electrical Equipment

The configuration of the SRWWTP currently has electrical and control panels in an area adjacent to the blowers that is separate from the wastewater treatment system, but not physically isolated. As shown in **Figure 15**, there is not a ceiling on the electrical/blower room that prevents potentially flammable gases from the wastewater treatment system from contacting the electrical equipment. This lack of isolation of the electrical equipment is in conflict the National Fire Protection Association's (NFPA) Standard 820, and by association is in conflict with the local building code.



Figure 15: Electrical Equipment without Isolation from Wastewater Treatment System

In addition, because the blowers (without noise dampening enclosures) are located in the same area, the noise levels in the area of the control panels is excessive. Hearing protection is provided; however, physical isolation of both the blower room and the electrical equipment is recommended.

Chlorine Disinfection

The existing chlorine feed system does not have the ability to adjust feed rate based on forward flow, which means that sometimes chlorine is overfed, especially during low flow conditions. Adding the ability to pace the chlorine feed based on actual flow (and, therefore, actual demand) is recommended in the near future to reduce chemical costs and improve effluent quality.

Future Effluent Discharge and Disinfection

The golf course staff that receives SRWWTP effluent has previously reported to DCRSD that it may not need all of the effluent for irrigation. An increase in SRWWTP capacity (and, in turn, effluent flow) may push the current land application disposal method to its limit, so another effluent discharge location may be necessary. If a future discharge point is added to the NPDES Permit, especially a surface water discharge, it would have two major impacts on operation of the SRWWTP:

1. Lower effluent limits will likely be required for several parameters, including a significant reduction in total residual chlorine from the current 10 mg/L limit.
2. The discharge would likely be closer to the SRWWTP (e.g. the Scioto River across the street), and may not require effluent pumping. If effluent pumping is not used, the contact time available for chlorination will probably be reduced to the point of non-compliance with Ten States Standards (see **Table 7**).

To ensure more complete disinfection if chlorine contact time is limited, rapid mixing could be considered in the effluent wet well, as summarized in **Table 13** and shown in **Figure 16**. While chlorine contact time is an established convention, disinfection with chlorine is essentially an instantaneous process once the chlorine contacts a microorganism. Accordingly, effective mixing often optimizes chlorine disinfection, and could help the SRWWTP meet its current and future limits for both *E. coli* and total residual chlorine.

Table 13. Preliminary Specifications – Rapid Mixing Design Criteria

Item	Description
Location	Effluent Wet Well
Purpose	Rapid mixing of contents for chlorine disinfection efficacy
Configuration	Vertical Shaft
Shaft Length	15.5 ft (approx.)
Max Liquid Depth	7 ft (approx.)

Providing rapid mixing instead of conventional contact time would require OEPA to approve a variance from the Ten States Standards. Such a variance is uncommon, but may be worthwhile if DCRSD intends to defer a more comprehensive disinfection upgrade project to the future. Another potential disadvantage of rapid mixing is the risk of cavitation on the pumps with additional turbulence in the wet well.

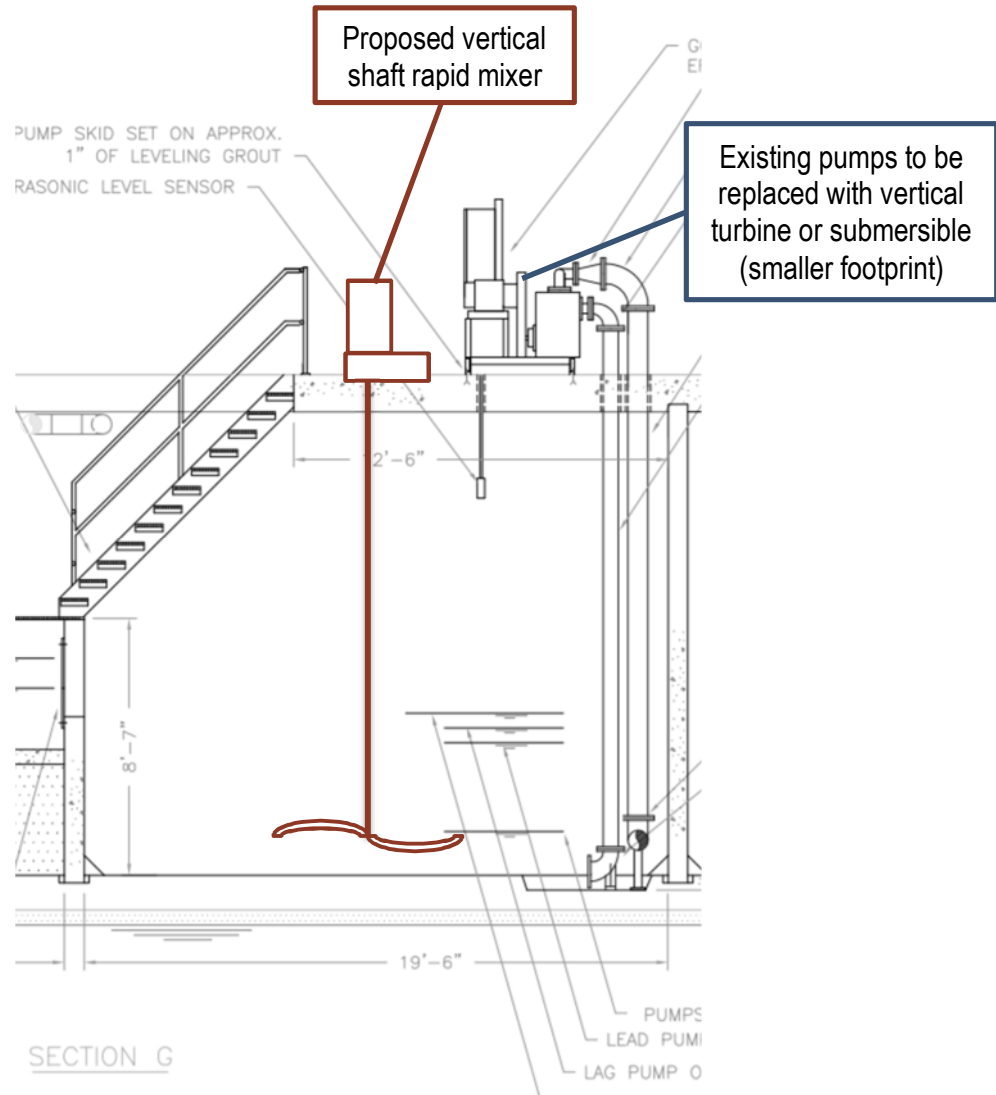


Figure 16. Vertical Shaft Rapid Mixer in Effluent Wet Well (Section View)

While flow pacing of chlorine feed and rapid mixing will optimize chlorine disinfection, future reductions in chlorine contact time and total residual chlorine effluent limits associated with a new discharge point may be difficult to maintain.

For future consideration, Hazen also evaluated retrofitting the existing disinfection channels with new UV disinfection equipment. Trojan provided a design proposal for three sets of their UV3000 PTP model, which would fit in the existing UV channels at the SRWWTP (see **Figure 17**). The cost for these systems are included as “Priority #3” improvements (i.e. for future consideration) later in this report.

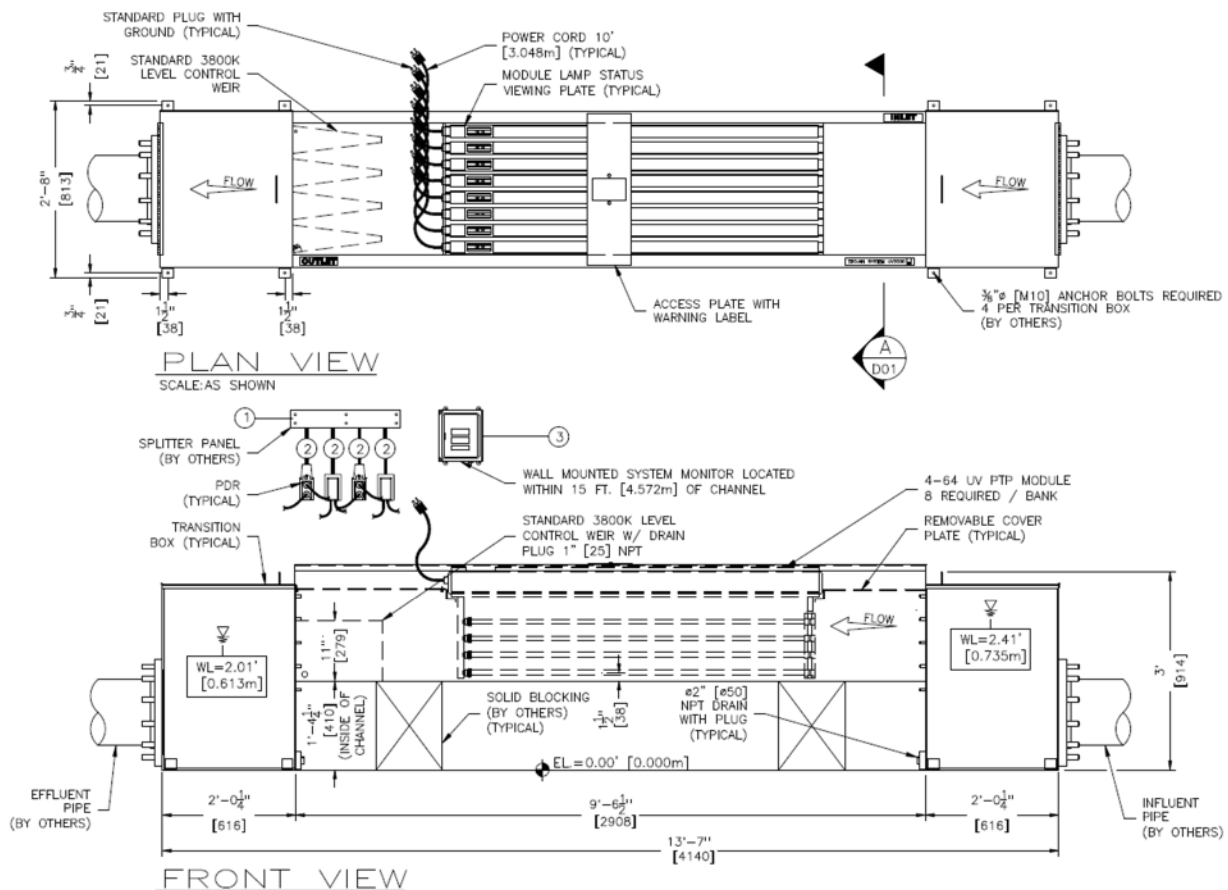


Figure 17: Trojan UV System for SRWWTP

Solids Storage and Transport

The SRWWTP was designed for aerated sludge storage, but was never intended to accommodate full aerobic digestion of its waste solids (see **Table 8**), either in aeration capacity or retention time. The waste solids from the SRWWTP are currently transported to the Olentangy Environmental Control Center (OECC) for aerobic digestion and dewatering. Operation of the SRWWTP aerated storage tanks was described by DCRSD personnel as summarized in **Table 14** below. Based on the information in **Table 14**, an estimated solids yield of 1.0 lb TS per lb influent BOD₅ was calculated as shown in **Figure 18**.

Table 14. SRWWTP Solids Storage and Handling

Parameter	Value
Aerated Storage Volume	212,000 gallons
Truck Volume	4,200 gallons
Settled Solids Concentration	0.8%-1.0%
Truck Frequency to OECC	15-18 per week
Operating Schedule:	
Aerated	8 am – 12 am (16 hrs)
Settle	12 am – 7 am (7 hrs)
Decant	7 am – 8 am (1 hr)

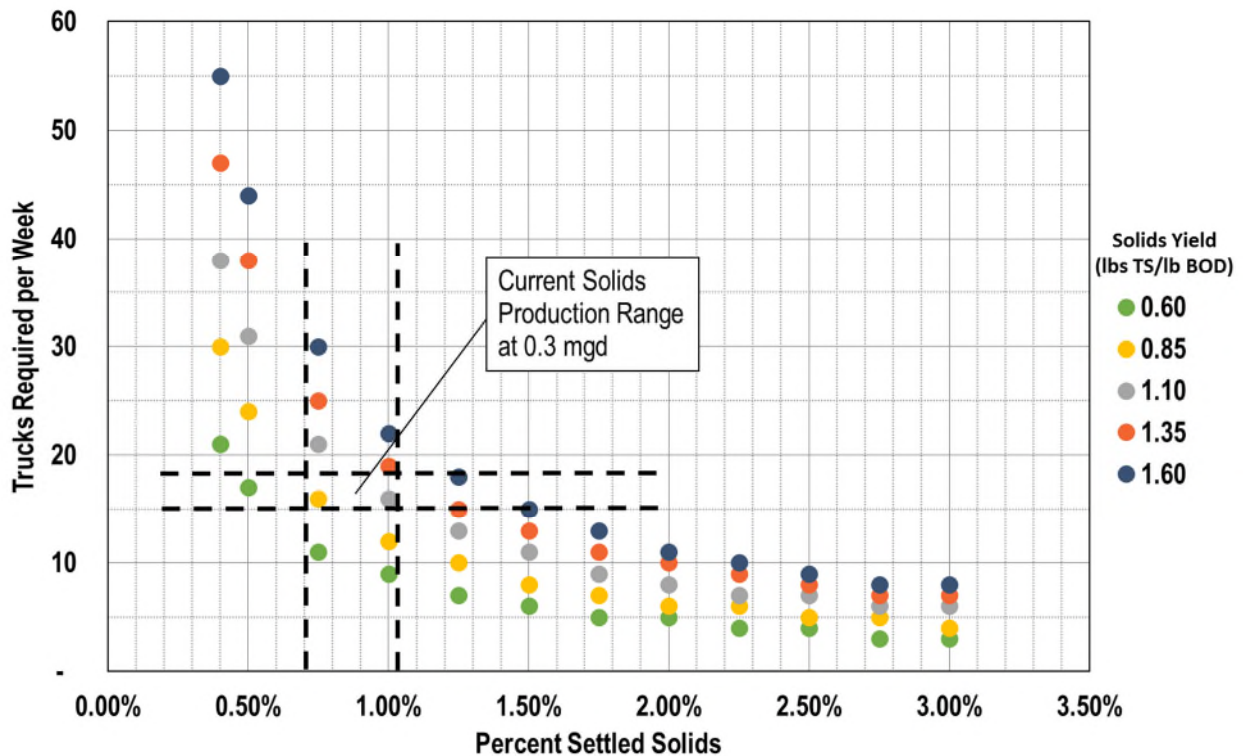


Figure 18: Current Estimated Solids Production at SRWWTP

There are several factors currently having an impact on solids production and settling in the sludge storage tanks:

1. The existing brushes for solids removal in the secondary clarifiers appear to leave several inches of solids on the bottom of the clarifiers, as described previously in this report. This solids removal operation is selectively removing a lighter floc, which is transferred to the sludge storage tanks along with its limited settling characteristics.

2. The current solids yield is greater than typical for a conventional activated sludge plant, and will likely be reduced once anoxic zone mixing and internal recycle pumping is added. Optimization of the aeration system should also help with reducing the solids yield.
3. According the DCRSD staff, the density of the settled sludge is typically less than 1.0%, which means that the trucks are transporting a significant volume of water to OECC. Polymer feed may help increase the density of the floc in the storage tanks and reduce truck frequency.

With improvements to sludge removal in the clarifiers, yield, and settled solids density, the solids production and truck frequency could be reduced even at future flows. **Figure 19** presents the anticipated solids production and truck frequency at a future annual average flow of 0.5 mgd.

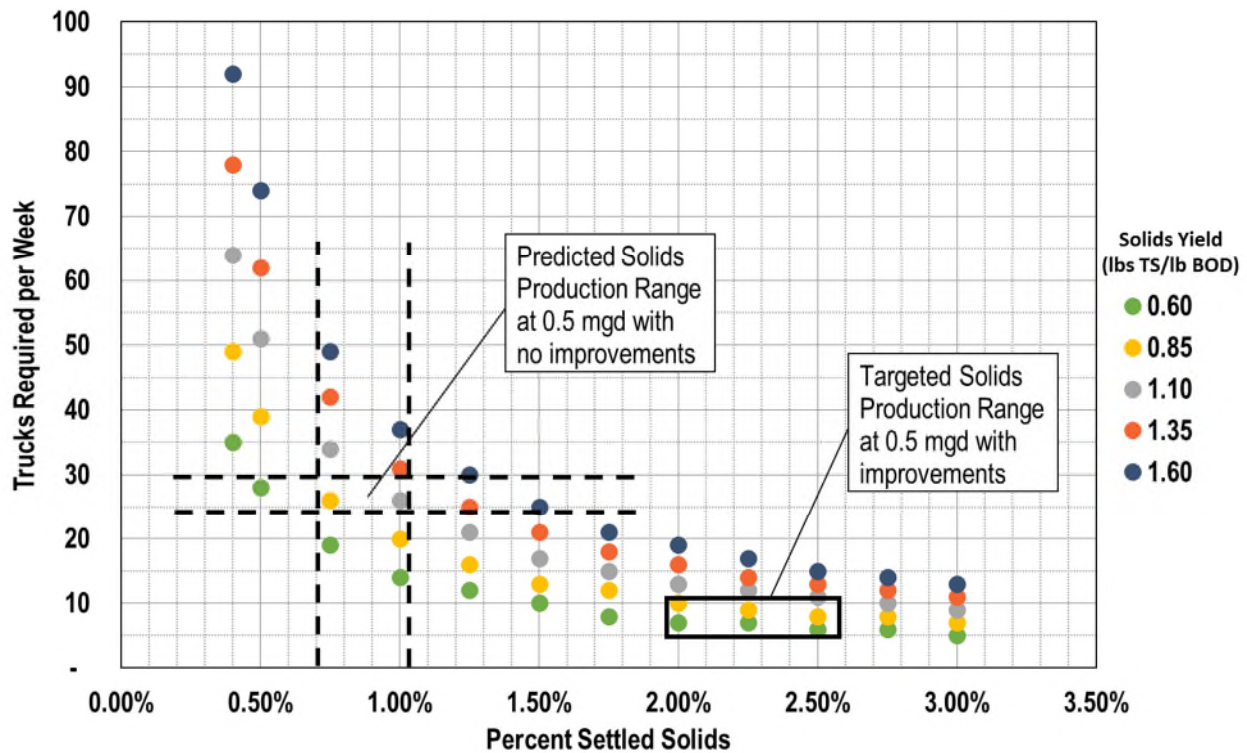


Figure 19: Future Estimated Solids Production at 0.5 mgd

Conclusions and Recommendations

This section summarizes the recommended improvements for the SRWWTP and presents a cost estimate for DCRSD's consideration.

Figure 20 shows the recommended improvements.

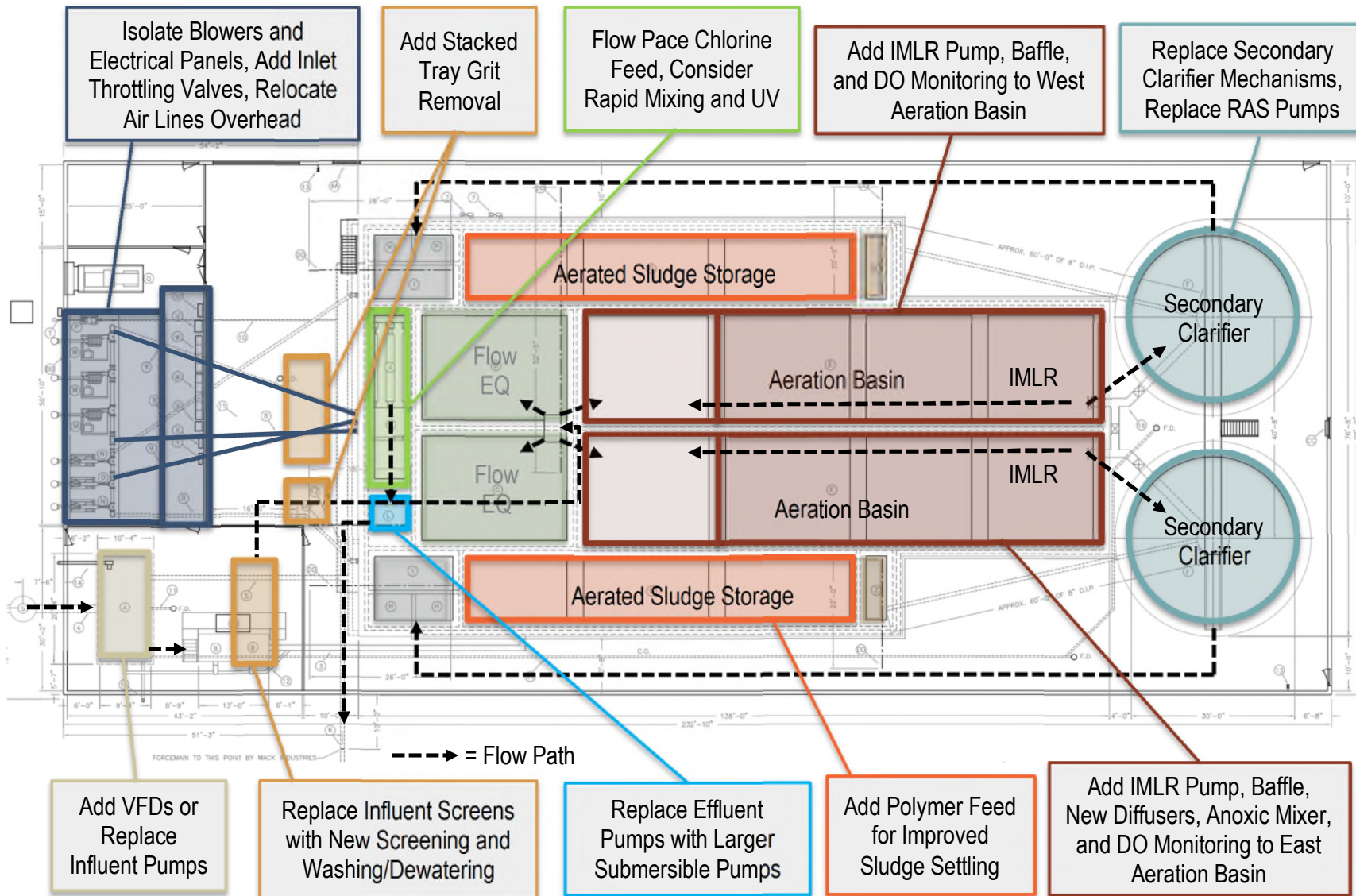


Figure 20. Summary of Proposed SRWWTP Improvements

Opinion of Probable Project Costs

The preliminary cost estimate is presented in **Table 15**, and is arranged with relative prioritization of each improvement.

Table 15: Preliminary Opinion of Probable Project Costs

Improvement		Priority #1	Priority #2	Priority #3
Aeration Tank Improvements		\$264,000		
Effluent Pumps ¹		\$106,000		
Influent Pump VFDs ²		\$65,000		
Chlorine Feed Controls		\$15,000		
NFPA 820 Improvements		\$165,000		
Influent Screening Equipment		\$269,000		
Secondary Clarifier Mechanisms		\$20,000	\$349,000	
Aeration Piping			\$109,000	
Polymer Feed Systems			\$47,000	
Grit Removal Equipment				\$296,000
Rapid Mixing in Effluent Wet Well				\$39,000
UV Disinfection Equipment				\$218,000
A – Subtotal Base Construction Cost		\$904,000	\$505,000	\$553,000
Contractor Overhead and Profit	15% of A	\$136,000	\$76,000	\$83,000
Estimating Level Contingency	20% of A	\$181,000	\$101,000	\$111,000
Mobilization	5.0% of A	\$45,000	\$25,000	\$28,000
B – Subtotal Construction Cost		\$1,266,000	\$707,000	\$775,000
Construction Contingency	10% of B	\$126,000	\$71,000	\$78,000
C – OPINION OF PROBABLE CONSTRUCTION COST		\$1,392,000	\$778,000	\$853,000
Engineering Services	15% of C	\$209,000	\$117,000	\$128,000
Insurance	3.0% of C	\$42,000	\$23,000	\$26,000
Bonding	3.0% of C	\$42,000	\$23,000	\$26,000
Permitting	0.5% of C	\$7,000	\$4,000	\$4,000
Escalation to Midpoint of Construction (3% per Year)	6% of C	\$83,000	\$47,000	\$51,000
D – ESCALATED OPINION OF PROBABLE PROJECT COST		\$1,775,000	\$992,000	\$1,088,000

NOTES:

1. Price shown is for vertical turbine pumps with firm capacity of 1.5 mgd (1 pump running, 1 on standby).
2. Add \$10,000 for all new influent pumps (self-priming centrifugal)

Appendix A: Detailed Opinion of Probable Construction Costs

Delaware County Regional Sewer District
CSI Section Cost Estimate Report

Engineer: Hazen and Sawyer _____ Date: 07-Feb-17
 Project: Scioto Reserve WWTP Upgrade _____ Estimator: MDS
 Submittal: Revised Study _____ Checker: SDP
 Work Task: _____ Cost Index: _____

Division Summary	Total	Percentage
Division 1 - General Requirements	\$94,500	4.9%
Division 2 - Site Construction	\$8,000	0.4%
Division 3 - Concrete	\$0	0.0%
Division 4 - Masonry	\$8,250	0.4%
Division 5 - Metals	\$39,250	2.0%
Division 6 - Wood & Plastics	\$7,000	0.4%
Division 7 - Thermal & Moisture Protection	\$10,500	0.5%
Division 8 - Doors & Windows	\$9,000	0.5%
Division 9 - Finishes	\$4,000	0.2%
Division 10 - Specialties	\$720	0.0%
Division 11 - Equipment	\$1,211,760	62.6%
Division 12 - Furnishings	\$0	0.0%
Division 13 - Special Construction	\$0	0.0%
Division 14 - Conveying Systems	\$3,120	0.2%
Division 15 - Mechanical	\$182,200	9.4%
Division 16 - Electrical	\$223,000	11.5%
Division 17 - Instrumentation and Control	\$134,000	6.9%
Division 1 - 17 SubTotal		100.0%
Mobilization @ 5.0%		\$96,765
Overhead @ 8%		\$162,565
Profit @ 7%		\$153,624
Bonds and Insurance @ 3.0%		\$70,448
Total		\$2,418,702
Design Contingency 20.0%		\$483,740
PROBABLE CONSTRUCTION COST		\$2,902,442
(February 2017)		
ESCALATION TO MIDPOINT OF CONSTRUCTION ⁽¹⁾		\$3,063,767
(December 2018)		
(1) Escalation based on a compound present to future basis of 1.0556 (1.83 years @ 3 percent)		
Project Costs 5.6%		\$161,325

Accuracy Range	
- 30%	+ 20%
\$ 2,031,710	\$ 3,482,931

**Delaware County Regional Sewer District
CSI Section Cost Estimate Report**

Engineer: Hazen and Sawyer	Date: 07-Feb-17
Project: Scioto Reserve WWTP Upgrade	Estimator: MDS
Submittal: Revised Study	Checker: SDP
Work Task:	Cost Index:

Specification Section	Unit	Quantity	Material Cost	Labor/ Equipment Cost	Installation Factor	Total
Division 1 - General Requirements						
Protection of Existing Facilities	LS	1	\$0	\$1,000		\$1,000
Sanitation Facilities	LS	1	\$0	\$1,000		\$1,000
Survey	LS	1	\$0	\$2,500		\$2,500
Temporary Facilities	LS	1	\$0	\$5,000		\$5,000
Final Cleanup	LS	1	\$0	\$5,000		\$5,000
Contractor's Project Manager	LS	1	\$0	\$80,000		\$80,000
Division 1 Total						\$94,500
Division 2 - Site Construction						
02050 Demolition	LS	1	\$0	\$2,000	1	\$2,000
02999 Temporary Handling of Sewage Flow	LS	1	\$4,000	\$2,000	1.5	\$6,000
Division 2 Total						\$8,000
Division 3 - Concrete						
Division 3 Total						\$0.00
Division 4 - Masonry						
04220 Concrete Masonry Units						
Concrete Block (8"X8"X16")	SF	500	\$11.00	\$5.50	1.5	\$8,250
Division 4 Total						\$8,250
Division 5 - Metals						
05500 Miscellaneous Metalwork						
Fabricated Grating and Supports for New Screen	SF	600	\$30	\$30	2	\$36,000
05520 Handrails and Railings						
Aluminum Handrails with kick plate	LF	50	\$50	\$15	1.3	\$3,250
Division 5 Total						\$39,250
Division 6 - Wood & Plastics						
06620 FRP Baffle Wall	SF	200	\$25	\$10	1.3	\$7,000

**Delaware County Regional Sewer District
CSI Section Cost Estimate Report**

Engineer: Hazen and Sawyer	Date: 07-Feb-17
Project: Scioto Reserve WWTP Upgrade	Estimator: MDS
Submittal: Revised Study	Checker: SDP
Work Task:	Cost Index:

Specification Section	Unit	Quantity	Material Cost	Labor/ Equipment Cost	Installation Factor	Total	
Division 6 Total						\$7,000	
Division 7 - Thermal & Moisture Protection							
07411	Interior Ceiling Panels	SF	600	\$10	\$5	1.5	\$9,000
07900	Joint Sealants						
	Caulking, Sealant and Misc. Items	LS	1	\$1,000	\$500	1.5	\$1,500
Division 7 Total						\$10,500	
Division 8 - Doors & Windows							
08120	Fiberglass Reinforced Door and Door Frame System						
	Hollow Metal Doors (Single) w/ hardware & glass	EA	1	\$1,500	\$300	1.2	\$1,800
	Hollow Metal Doors (Double) w/ hardware & glass	EA	2	\$3,000	\$600	1.2	\$7,200
Division 8 Total						\$9,000	
Division 9 - Finishes							
09900	Painting	LS	1	\$2,000	\$2,000	2	\$4,000
Division 9 Total						\$4,000	
Division 10 - Specialties							
10400	Identifying Devices						
	Self-Luminous Exit Signs	EA	2	\$140	\$70	1.5	\$420
10522	Portable Fire Protection Equipment						
	FE Type 'A'	EA	1	\$250	\$50	1.2	\$300
Division 10 Total						\$720	
Division 11 - Equipment							
11100	Pumps, General						
11115	Horizontal Self-Priming Centrifugal Pumps						
	Influent Pumps	EA	2	\$22,000	\$2,200	1.1	\$48,400
	Effluent Pumps	EA	2	\$40,000	\$4,000	1.1	\$88,000
11215	Dry Pit Vertical Pumps						
	RAS Pumps	EA	3	\$18,000	\$5,400	1.3	\$70,200
11220	Low Head Axial Flow Pumps	EA	2	\$30,000	\$9,000	1.3	\$78,000

**Delaware County Regional Sewer District
CSI Section Cost Estimate Report**

Engineer: Hazen and Sawyer	Date: 07-Feb-17
Project: Scioto Reserve WWTP Upgrade	Estimator: MDS
Submittal: Revised Study	Checker: SDP
Work Task:	Cost Index:

Specification	Section	Unit	Quantity	Material Cost	Labor/ Equipment Cost	Installation Factor	Total
11241	Floating Mixers	EA	1	\$20,000	\$6,000	1.3	\$26,000
11420	Mechanical Screens and Screenings Compactors Mechanically-cleaned screens	EA	1	\$100,000	\$30,000	1.3	\$130,000
11441	Fine Bubble Diffused Aeration Equipment	LS	1	\$35,000	\$10,500	1.3	\$45,500
11460	Secondary Clarifier Equipment	EA	2	\$85,000	\$25,500	1.3	\$221,000
11511	Liquid Polymer Preparation Systems	EA	2	\$15,000	\$4,500	1.3	\$39,000
Division 11 Total							\$746,100
11430	OPTION: Grit Removal Equipment (Hydro Intl Headcell)	LS	1	\$190,000	\$57,000	1.3	\$247,000
11600	OPTION: Rapid Mixer	LS	1	\$28,200	\$8,460	1.3	\$36,660
11610	OPTION: UV Equipment (Trojan UV 3000 PTP)	LS	1	\$140,000	\$42,000	1.3	\$182,000
Division 12 - Furnishings							
Division 12 Total							\$0.00
Division 13 - Special Construction							
Division 13 Total							\$0.00
Division 14 - Conveying Systems							
14600	Davit Cranes - IMLR Pumps	EA	2	\$1,200	\$360	1.3	\$3,120
Division 14 Total							\$3,120
Division 15 - Mechanical							
15006	Ductile Iron Pipe Flanged D.I. Pipe - 12"	LF	100	\$200.00	\$200.00	2	\$40,000
15012	Stainless Steel Air Piping 12" Process Air Piping	LF	300	\$75	\$75	2	\$45,000
	8" Process Air Piping	LF	100	\$60	\$60	2	\$12,000
15020	Pipe Supports	LS	1	\$10,000	\$5,000	1.5	\$15,000
15101	Butterfly Valves (Air Service) 12"	EA	2	\$1,500	\$300	1.2	\$3,600
	12" w/ Electric Modulating Actuator	EA	3	\$7,500	\$1,500	1.2	\$27,000
	4"	EA	6	\$500	\$100	1.2	\$3,600

**Delaware County Regional Sewer District
CSI Section Cost Estimate Report**

Engineer: Hazen and Sawyer	Date: 07-Feb-17
Project: Scioto Reserve WWTP Upgrade	Estimator: MDS
Submittal: Revised Study	Checker: SDP
Work Task:	Cost Index:

Specification Section	Unit	Quantity	Material Cost	Labor/ Equipment Cost	Installation Factor	Total
15500 HVAC Work						
Air Handling Unit - New Electrical Room	EA	1	\$30,000	\$6,000	1.2	\$36,000
Division 15 Total						\$182,200
Division 16 - Electrical						
Division 16 Total (15% of Div 02-15)						\$223,000
Division 17 - Instrumentation and Control						
DO Monitoring and Control of Blower Inlet Valves	LS	1	\$10,000	\$5,000	1.5	\$15,000
Plant-wide Programmable Logic Controller (PLC)	EA	1	\$30,000	\$15,000	1.5	\$45,000
Allowance - 5% of Div 02-15	LS					\$74,000
Division 17 Total (5% of Div 02-15)						\$134,000
Division 1 - 17 SubTotal						\$1,716,640

Appendix B: Manufacturer's Data Sheets and Budgetary Proposals



The Gorman-Rupp Company
600 South Airport Road
Mansfield, OH 44903
Phone: (419) 755-1011

PROPOSAL/CONTRACT

Purchaser:

For: Delaware County, Ohio

Bidding Contractors

Scioto Reserve WWTP

Influent Pumping System

Re: Existing G-R Station 99-1639-LE

Engr.: Hazen & Sawyer - Columbus, Ohio

Note: *Our Contract includes the provisions set forth below and the Terms and Conditions on the final page hereof, including without limitation the reservation of security interest and warranty liability and price escalation clause. The information or data contained in the Proposal/Contract is proprietary to The Gorman-Rupp Company and should not be copied, reproduced, duplicated, or disclosed to any third party, in whole or in part, without the prior written consent of The Gorman-Rupp Company. The Gorman-Rupp Company will not be bound by any Terms and Conditions other than those identified in this Proposal/Contract, nor shall The Gorman-Rupp Company be liable for any liquidated damages or be a party to or bound by the terms and conditions of any other contract documents.*

One (1) - Replacement of Gorman-Rupp duplex self-priming pumps, motors and accessories, as well as an automatic variable speed pump control panel with primary and backup level control systems.

Station retrofit to include:

Pumps, Motors and Accessories

- Two Model T6A3S-B (Size 6" x 6") Super T-Series self-priming pumps
- V-belt drives including replacement sheaves and belts selected to operate pumps at approximately 1180 RPM.
- Pumps and motors to be installed on the original Gorman-Rupp steel base plate and motor stands.
- OSHA belt guards to be reused.
- Design Condition Point: 979 GPM @ 40' TDH.*
- 20 horsepower, 1750 RPM, ODP, 254T frame, 3/60/480 volt, inverter duty, premium efficient motors.
- Pump spare parts kit for pumps, includes one mechanical seal and o-rings.
- High pump temperature shutdown sensors (field mounted and wired by others).
- Automatic air release valves with stainless steel fittings (one for each T6 pump).
- Isolation ball valves for the AARV's.
- Pump drain kits with stainless steel fittings.
- Suction/discharge gauge packages with stainless steel fittings.
- Stainless steel isolation ball valves supplied for pump gauge packages.

* Duplicates the original hydraulic design. Hydraulic performance cannot be guaranteed if original T6 pumps are reused.

Electrical Control Components

- Controls manufactured by a UL panel builder and labeled "Enclosed Industrial Control Panel"
- Controls supplied in NEMA 1 stainless steel control panel.
- Panel will be three phase, 60 hertz, 480 volt, 4 wire electrical service.
- Panel to be field mounted and wired on the pump skid base.

Motor Branch Components

A NEMA 1 stainless steel enclosure (field mounted on existing station base/panel support rack by others) and will house the following components, as well as the level control system:

- Panel to be 36" H x 30" W x 14" D.
- Main terminal block and ground bar.
- Circuit breakers.
- Allen Bradley PowerFlex VFD's.
- Drives supplied with HIM modules mounted on the panel door.
- Dry contacts wired to a terminal strip within the pump control panel for:
 - High water alarm
 - Low water alarm
 - Pump fault #1, #2 (includes high pump temperature shutdown and VFD fault)
 - Low enclosure temperature
 - Three phase low voltage monitor
 - Backup float control enabled.
- Control circuit.
- Pump mode selector (Integrinex).
- Alternator relay (Integrinex).
- Pump run indicators (Integrinex).
- Elapsed time meters (Integrinex).
- Sequence selector switch (Integrinex).
- 3 kVA control circuit transformer (480/120) shipped loose and field installed remote of pump control panel, by others.
- Duplex ground fault receptacle.
- Three phase voltage monitor with auto reset.
- Transient voltage surge suppressor.
- Panel strip heater with thermostat.
- Wiring inside panel.
- Alarm silence (Integrinex).

Primary Level Control System

- Gorman-Rupp "Integrinex Standard" solid state level control system.
- Ultrasonic transducer level sensor by others.
- Independent lag pump.
- High water alarm.
- Low water alarm.
- Spare parts kit.
- Automatic pump alternation.
- Pump/motor variable speed control.
- Analog signal based on wet well level provided for wet well pacing.

Backup Level Control System

- Intrinsically safe float switch control system
- Float switch control to include two (2) floats with 50 ft. cables
- Lead pump and lag pump started independently
- PVC Chain with weight for securing of floats.

Note: Backup float switch control to activate the lead and lag pumps separately (by use of a time delay relay), in the event of a primary level control failure. One low float to turn both pumps off.

Also includes

- Certified pump reprime performance tests.
- Operation and maintenance manuals.
- Startup services with start-up report.
- Equipment warranty (five years).

TOTAL SELLING PRICE, delivered to Delaware County, Ohio, is:

- **Gorman-Rupp Control Panel price:\$26,920.00.**
- **Gorman-Rupp Super T6 pumps, motors and accessories:\$16,730.00.**

Federal, State or Local taxes, which may apply will be added to the above price.
 Price includes start-up supervision and operator training [one 8-hour day].

Some of the remaining stations items not included are:

- Existing Gorman-Rupp pump skid to be reused including the motor support stands.
- Field mounting of the new pump control panel onto the existing panel support rack is by others.
- Installation of the new Gorman-Rupp Super T6 pumps is by others.
- All suction and discharge piping including valves to be reused.
- Conduit and wiring from Gorman-Rupp panel to remote ultrasonic level controller (controller by others).
- Electric service to control panel or hook up of same.
- Electrical disconnect switch or hook up of same.
- Any required wiring from the Gorman-Rupp panel to the new pump motors and high pump temperature shutdown sensors.
- Any required telemetry equipment or installation of same.
- Any required field wiring to interface the telemetry system with the Gorman-Rupp panel.
- Padlocks.
- Water for testing.
- Any required painting or concrete coatings.
- Taxes, permits or any items not addressed.

Terms: Net 45 days from date of invoice, subject to credit approval. These terms are independent of, and are not contingent upon, the time or manner in which purchaser may receive payment from others.

Estimated time for submittal drawings: 4 to 5 weeks after receipt of order.


Estimated shipment: 7 to 8 weeks after receipt in our office of complete approved submittal data.

This quotation includes only equipment specifically mentioned herein and does not include, or infer inclusion of, any additional equipment, piping, valves, wiring, installation or services etc., regardless of its relation to the quoted equipment.

LEProT6 - Delaware County Sioto Reserve Influent PS.doc

If you wish to purchase this equipment, please sign this Proposal/Contract form and return it to:
The Craun-Liebing Company, 11801 Clifton Boulevard, Cleveland, Ohio 44107.

To purchase this equipment at the price offered herein, please sign two original Proposal/Contracts and return both originals to the aforementioned address. Upon acceptance of this Proposal/Contract, The Gorman-Rupp Company will execute this Contract and return one fully executed original for your records. Any use by the Purchaser of the price offered herein shall be deemed acceptance by the Purchaser of this Proposal/Contract including all of it Terms and Conditions.

Accepted this ___ day of _____, 2016 Purchaser: _____ Company Name By: _____ Authorized Signature Print Name: _____ Title: _____	Submitted this <u>29th</u> day of <u>November</u> 2016 Authorized Distributor of the Gorman-Rupp Company: <u>The Craun-Liebing Company</u>  By: Authorized Signature Print Name: <u>A. Randall Keefe</u> Title: <u>President (216) 228-7900 Ext. 104</u>
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The Gorman-Rupp Company

TERMS AND CONDITIONS

PROPOSAL DRAWING and bulletin illustrations are submitted to show general arrangement and approximate dimensions. The Company reserves the right to make such changes in details of design, construction or arrangement of equipment as in its judgment constitute as improvement. Engineering, dimensional and instruction data shall be furnished to the purchaser promptly after acceptance of the proposal for approval. Changes in layout design requested by purchaser after acceptance of proposal will be made at purchaser's expense and may result in a potential change in estimated submittal and/or lead time quoted.

The Gorman-Rupp Company will supply the products as described in this Proposal/Contract (hereinafter the "Scope of Supply"). The products supplied will conform to the Scope of Supply and any modifications thereto as contained in the submittals approved by the project engineer and as received by The Gorman-Rupp Company.

The equipment, apparatus and parts furnished are WARRANTED against defects in materials and workmanship. Specific applicable warranty is available at www.grpumps.com/warranty.

NO OTHER WARRANTY, EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY OR MERCHANTABILITY OR FITNESS, SHALL EXIST AS TO ANY EQUIPMENT OR GOODS COVERED HEREBY, ALL SUCH WARRANTIES BEING EXPRESSLY WAIVED BY THE PURCHASER.

The Company will, at its option, repair or replace any equipment or part which proves defective under its warranty provided that the purchaser notifies the Company in writing of such defect within the applicable warranty period and provided further that after start-up service has been performed, the labor to replace accessory items, such as sump pumps, dehumidifiers, relays or alternators, etc., shall be the responsibility of the owner's maintenance personnel. The foregoing states the purchaser's sole remedy for any breach of warranty by the Company.

PRICE ESCALATION CLAUSE:

Quoted prices are firm for sixty (60) days subject to an escalation not to exceed 5% for the following sixty (60) days and 1-1/2% per month thereafter.

Orders accepted by The Gorman-Rupp Company will be held firm if the orders are approved and released for production within sixty (60) days provided shipment is accepted by the customer immediately following completion of production.

Orders accepted by The Gorman-Rupp Company where production release or shipment is delayed by the customer beyond (60) days following acceptance of order by The Gorman-Rupp Company, prices will be subject to an escalation not exceed 1-1/2% per month until again released.

Price escalation will not exceed Federal guidelines.

THE AMOUNT OF ANY APPLICABLE TAX or other Government charge upon the production, sales, shipment and/or use of the equipment covered by this quotation shall be added to the price and shall be paid by the purchaser.

ALL ORDERS SHALL BE MADE OUT to The Gorman-Rupp Company; 600 South Airport Road; Mansfield, Ohio and shall be subject to acceptance by the Company. ORDER MAY BE CANCELED ONLY with the Company's written consent and ON TERMS that will indemnify the Company against loss. Cancellation fees shall be assessed in an amount equal to 50% of the Proposal/Contract amount after acceptance of the proposal for approval and/or purchaser receives submittal information; 100% of the Proposal/Contract amount after acceptance of the proposal for approval and/or verbal written approval release for production.

Performance of any contract by the Company shall be contingent upon credit approval, strikes, fires, accidents, war reduced supply of fuel or raw materials, or other restraints affecting shipments or curtailments in manufacturing or due to delays unavoidable or beyond the control of the Company.

THE COMPANY SHALL NOT, in any event, be liable for indirect, special, consequential or liquidated damages or penalties, whether based upon contract, warranty, tort or negligence.

When purchaser asks that equipment be warehoused or held for a stated or indefinite period after the equipment is ready for shipment, it is expressly understood and agreed that billing will be accepted as of the date when the equipment is ready for shipment and that STORAGE CHARGES (NOT TO EXCEED 1-1/2% PER MONTH) will apply thirty (30) days from that date.

Unless otherwise specified, DELIVERIES QUOTED are figured from the date of release to production. Statements as to expected shipment dates from the factory represent the Company's best judgment. Purchaser hereby waives all claim to damage caused by delay in shipment or delivery.

Unless otherwise specified, TERMS are Net 45 days from date of invoice, F.O.B., Mansfield, Ohio with freight allowed to the job site or first destination, whichever is applicable. All terms of credit are subject to the Company's approval and are independent of and not contingent upon the time and manner in which the purchaser may receive payment from others. Purchaser shall be notified of any changes in credit terms prior to acceptance of order.

ANY INDEBTEDNESS OWING TO THE COMPANY for a period longer than (30) days shall BEAR INTEREST until paid at the current prime rate. If the Company finds it necessary to place any indebtedness hereunder in the hands of an attorney for collection, purchaser shall pay all expenses and costs of collection, including reasonable attorney's fees.

THE PROVISIONS on the face hereof and these Terms and conditions constitute the entire agreement among the parties and supersede the provisions of any purchase order, other communication between the parties or any statement or representation not included herein. This Agreement may not be modified or amended except in writing signed by the parties intended to be bound thereby.

This Agreement shall be governed by the laws of the State of Ohio.

Budgetary Proposal

October 31, 2016



John Olson
630/837-5640, ext. 229
jo@lakeside-equipment.com

TO	PROJECT
Mark Strahota Hazen & Sawyer 150 E. Campus View Blvd Columbus, OH 43235	Delaware County Scioto Reserve WWTP

EQUIPMENT	UNIT	QTY	TOTAL
Lakeside Raptor[®] Micro Strainer Model 16MS - 0.25 - 100	\$ 68,000	1	\$68,000

Due to the current volatility of stainless steel prices, budgetary cost of equipment may be subject to change.

SPECIFICATION				
Unit Capacity:	1.94	mgd	Maximum Headloss:	16 inches
Inclination:	45	degrees	Maximum Upstream Level:	27 inches
Hole Diameter:	0.25	inches (6 mm)	Nominal Basket Diameter:	13 inches
Water Requirements:	15	gpm at 60 psi	Transport Screw Diameter:	10 inches

SCREEN	CONTROL PANEL
AISI 304 stainless steel construction	Explosion proof design
Standard length screen	NEMA 4X - 304 stainless steel main control panel
Perforated plate basket	No local control station
2 hp drive unit	Fusible disconnect switch with door handle
3-Zone wash system with solenoid valves	Control power transformer
Ultrasonic level sensor	Allen-Bradley MicroLogix 1100 PLC
Spare parts	Variable frequency drive with line reactor
	Selector switches
	Indicator lights

EXCLUSIONS	
Grating across channel	Discharge chute
Handrail around perimeter of channel	Slide gates
Screenings collection containers	Manual bar screen
Piping, valves or fittings, unless noted otherwise	Special tools
Interconnecting conduit or wiring	

OPTIONAL ITEMS	UNIT PRICE
Extra screen transport tube length (per foot of extra vertical height)	\$800
Weather protection system package	\$9,700
Screenings bagger - individual or continuous type	\$800

NOTES			
FOB:	Chariton, Iowa	Approvals:	6 to 8 weeks
Freight:	Freight allowed to jobsite	Shipment after Approval:	18 to 20 weeks
Start-Up Service:	2 days in 1 trips	Weight per Screen:	1,500 lbs
Warranty:	One (1) year	Installation Time per Screen:	32 hours



Prepared for:
Delaware County, Ohio
Scioto Reserve WWTP

Submitted by:
Headworks® Inc.

November 4, 2016



Headworks Inc. is a nationally certified
WBENC Women's Business Enterprise

THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND NEITHER THIS DOCUMENT NOR SAID PROPRIETARY INFORMATION SHALL BE PUBLISHED, REPRODUCED, COPIED, DISCLOSED, OR USED FOR ANY PURPOSE OTHER THAN CONSIDERATION OF THIS PROPOSAL, WITHOUT THE WRITTEN APPROVAL OF HEADWORKS INC.



Project Name:	Delaware County OH
State/Country:	Ohio
Rep. Company:	BL Anderson
Offer:	16-11-03 DEL Rev. 0
Date Offer:	4-Nov-16
	V3.4

Budget Offer # 16-11-03 DEL Rev. 0 Delaware County OH

Thank you for your request for a screen and screenings handling package proposal. Headworks is pleased to offer you the Headworks MS Series Bar Screen Model MS1 and the Headworks Screwpacker Shafted Spiral Compactor for this project.

The Headworks[®] Bar Screen Model MS1 design offers the following features:

- Stainless Steel Construction - for corrosion resistance
- Low Profile - requires less than 8 feet of head space
- Low Headloss - even with 1/4 inch openings
- High Hydraulic Capacity - about 2 MGD per ft² of screen area
- Electronically Controlled Automatic Reverse - to remove obstructions



The Headworks[®] Screwpacker[™] design offers the following features:

- Stainless Steel Construction - for corrosion resistance
- High Performance Shafted Spiral, Carbon Steel
- Flexible Discharge Point
- Screenings Wash Zone



Enclosed are our Design Specifications, Budget Offer, Scope of Supply, and General Terms and Conditions, which complete the offer. If you have any questions or comments, please do not hesitate to contact our local Sales Representative, or our office.

Yours Sincerely,

Madelene Brock
Headworks Inc.
Sales Engineer



Headworks Inc. is a nationally certified
WBENC Women's Business Enterprise



Project Name: Delaware County OH
 State/Country: Ohio
 Rep. Company: BL Anderson
 Offer: 16-11-03 DEL Rev. 0
 Date Offer: 4-Nov-16
 V3.4

Sales Representative:

Matthew Boone
 BL Anderson Company, Inc.
 8887 Eagle Ridge Court
 West Chester, OH 45069
 Ph: 513-889-4746

Project Summary:

Equipment Per Drawing

Equipment	Item	Units	US \$
Bar Screen MS1: Option 1	1	1	233,505
SW W220	3	1	56,172
TOTAL PROJECT COSTS			289,677

HW Recommended Equipment

Equipment	Item	Units	US \$
Bar Screen MS1: Option 2	2	1	225,966
SW W220	3	1	56,172
TOTAL PROJECT COSTS			282,138



Project Name:
 State/Country:
 Rep. Company:
 Offer:
 Date Offer:

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 Delaware County OH
 Ohio
 BL Anderson
 16-11-03 DEL Rev. 0
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Item:	1
Type of Product	Bar Screen MS1

Project Name:	Delaware County OH	
Offer Number	16-11-03 DEL Rev. 0	
Item Number:	1	
No. of Screens	1	
Screen Data	Feet	Meter
SOL Screen Overall Length (approx.)	37.44	11.41
OF Operating Floor to Channel Invert	28.00	8.53
CD Channel Depth	5.33	1.62
CW Channel Width	2.50	0.76
SW Screen Total Width (approx.)	2.34	0.71
SFW Screen Field Width (approx.)	1.52	0.46
WD Water Depth	0.55	0.17
DH Discharge Height	5.00	1.52
SFH Screen Field Height	1.21	0.37
BS Bar spacing	0.25 inch	6.35 mm
Wall Recess	NO	
Floor Recess	NO	
Screen grouted when in recess	NO	
# of Sections/Pieces	1	
Material	SS 304	
Chain Roller Type	Stainless	
Top Enclosed	Yes	
Installation Angle (Degree)	75 deg	
Weight (per screen)	5121 lb	2323 kg
Pull Out Type	Yes	
Pivot Type	NO	
Q max. Specified	1.50 mgd	0.07 m3/s
Q max. (v-Ch. = 0.9m/sec or 3'/s)	1.79 mgd	0.08 m3/s
Q max. (v-Ch. = 0.6m/sec or 2'/s)	1.19 mgd	0.05 m3/s
Headloss at 2'/sec channel velocity	8.98 inch	22.81 cm
Headloss at 3'/sec channel velocity	10.21 inch	25.92 cm

Screen Scope of Supply	Supplied
Headworks Bar Screen MS1	YES
Spare Parts	NO
Control Panel (Main NEMA 4X & Local NEMA 7)	YES
Ultrasonic Level Sensor	YES
Interconnecting Wiring	NO
Training (O&M)	YES



Project Name:
 State/Country:
 Rep.Company:
 Offer:
 Date Offer:

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 BL Anderson
 16-11-03 DEL Rev. 0
 4-Nov-16
 V3.4

Item:	2
Type of Product	Bar Screen MS1

Project Name:	Delaware County OH	
Offer Number	16-11-03 DEL Rev. 0	
Screen Name	Option 2	
Item Number:	2	
No. of Screens	1	
Screen Data	Feet	Meter
SOL Screen Overall Length (approx.)	37.94	11.56
OF Operating Floor to Channel Invert	28.00	8.53
CD Channel Depth	5.33	1.62
CW Channel Width	2.00	0.61
SW Screen Total Width (approx.)	1.84	0.56
SFW Screen Field Width (approx.)	1.02	0.31
WD Water Depth	0.90	0.27
DH Discharge Height	5.00	1.52
SFH Screen Field Height	1.56	0.47
BS Bar spacing in Inch/mm	0.25 inch	6.35 mm
Wall Recess	NO	
Floor Recess	YES	
Screen grouted when in recess	NO	
# of sections/pieces	1	
Material	SS 304	
Chain Roller Type	Stainless	
Top Enclosed	Yes	
Installation Angle (Degree)	75 deg	
Weight [lb,kg] (per screen)	4824 lb	2188 kg
Pull Out Type	Yes	
Pivot Type	NO	
Q max. Specified	1.50 mgd	0.07 m3/s
Q max. (v-Ch. = 3'/s) [mgd,m3/s]	1.89 mgd	0.08 m3/s
Q max. (v-Ch. = 2'/s) [mgd,m3/s]	1.26 mgd	0.06 m3/s
Headloss at 2'/sec channel velocity	12.98 inch	32.97 cm
Headloss at 3'/sec channel velocity	14.21 inch	36.08 cm

Screen Scope of Supply	Supplied
Headworks Bar Screen MS1	YES
Spare Parts	NO
Control Panel (Main NEMA 4X & Local NEMA 7)	YES
Ultrasonic Level Sensor	YES
Interconnecting Wiring	NO
Training (O&M)	YES



Project Name:
 State/Country:
 Rep. Company:
 Offer:
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 16-11-03 DEL Rev. 0
 4-Nov-16
 V3.4

Item:	3
Type of Product	Screwfactor™

Type Quoted:	SW W220
System Components	Supplied
Inlet Hopper	YES
Discharge Tube	YES
Motor	YES
Continuous Bagging Unit	NO
Gear Reducer	YES
Solenoid Valves	YES
Material	304SS

Screwfactor Scope of Supply	Supplied
Item	SW W220
Spare Parts	NO
Control Panel (Main included with Screen & Loca	NO
Continuous Bagging Unit	NO
Training (O&M)	YES



Project Name: Delaware County OH
State/Country: Ohio
Rep. Company: BL Anderson
Offer: 16-11-03 DEL Rev. 0
Date Offer: 4-Nov-16
V3.4

GENERAL TERMS AND CONDITIONS

Applicable Terms

These terms govern the purchase and sale of the equipment and related services. If any (collectively, "Equipment") referred to in Seller's quotation, proposal or acknowledgement, as the case may be (Seller's "Documentation"). Whether these terms are included in an offer or an acceptance by Seller, such offer or acceptance is conditioned on Buyer's assent to these terms. Seller rejects all additional or different terms in any of Buyer's forms documents.

Pricing

The price of the Equipment is based upon the following conditions:

20% Upon Approval of Submittals

75% due net 30 days from date of equipment shipment

5% Retainage due net 30 days from date of Start-Up, but no later than 180 days from shipment

Pricing is based on receipt of a Purchase Order within 60 days from the date of this Offer and shipment of the equipment not later than 12 months from the date of this Offer. In the event Buyer cannot take the equipment within the stipulated time, the price will escalate 0.5% per month thereafter. All storage costs are for the account of the Buyer.

These terms are independent of and not contingent upon the time and manner in which the purchaser receives payment from the site owner or any other person. Acceptance of order subject to credit approval. All monies not paid when due shall bear interest from the due date to the date paid either (i) at the fluctuating rate of 3% above the Prime Rate as defined below or (ii) the highest rate allowed by law, whichever is lesser. "Prime Rate" is the prime rate in effect on the first business day of the month in which a change occurs, as published in the Wall Street Journal on the next business day.

Validity of Quotation

60 days from date of offer.

Bonds

Unless specifically stated in our Offer, No Performance Bonds, Payment Bonds, Supply Bonds, Maintenance or any other type of Bonds and any related expenses are included. Any acceptance to provide Bonds will only be considered prior to the Offer.

Ownership of Material

All devises, designs (including drawings, plans and specifications), estimates, prices, notes, electronic data and other documents or information prepared or disclosed by Seller, and all related intellectual property rights, shall remain Seller's properties. Seller grants Buyer a non-exclusive, non transferable license to use any such material solely for Buyer's use of the equipment. Buyer shall not disclose any such material to third parties without Seller's prior written consent.

Changes

Seller shall not implement any changes in the scope of work described in Seller's documentation unless Buyer and Seller agree in writing to the details of the changes and any resulting price, schedule, or contractual modifications. This includes any changes necessitated by a change in applicable law occurring after the effective date of any contract including these terms.



Project Name: Delaware County OH
State/Country: Ohio
Rep. Company: BL Anderson
Offer: 16-11-03 DEL Rev. 0
Date Offer: 4-Nov-16
V3.4

Stainless Steel Price Increases

All Orders accepted, are subject to the following terms:

Headworks® Inc. reserves the right to adjust the price of the equipment based on increases in the price of stainless steel. This increase would be based on stainless steel price increases (including surcharges) as published monthly in the U.S. with the base price being that price (including surcharges, if any) published on the date of this offer. Such price increase only affects the cost of the stainless steel material portion of the affected equipment.

Force Majeure

“Force Majeure” shall mean any act or event which is outside the reasonable control of a party including, without prejudice to the foregoing generality, Acts of God, epidemics, tidal waves, explosions, lightning, earthquakes, hurricanes, wars (whether declared or not), riots, strikes and industrial actions (other than among the employees of party seeking to rely on such event, or its subcontractor), civil and military disturbances and unrest, acts of the public enemy, action or inaction of the government or governmental authorities or of representatives thereof. If Headworks is prevented from or delayed in performing its obligations as a result of Force Majeure, such prevention or delay shall not be considered a breach of the Agreement, but shall for the duration of such event relieve Headworks of its respective obligations thereunder. Should the Force Majeure suspension period last for more than one (1) month, Headworks may terminate this quote or agreement.

Freight Terms

Equipment is sold FOB point of manufacture with freight included in the above price to the nearest specified destination, provided suitable access roads exist for the delivery carrier(s).

Shipment Schedule

16 - 20 weeks ex works after receipt of approved submittal drawings.

Start-Up and Operator Training

1 trip of up to 3 consecutive days included, per Screen.

Submittals

Technical submittal drawings for review, authority examination and approval shall be furnished to the buyer within 3 - 4 weeks of order acceptance. The buyer shall approve the submittals within 4 weeks from receipt, otherwise the Stainless Steel Price Increases clause described above will become applicable.

Taxes

Federal, state and local taxes, if any, are not included in the above prices. All applicable taxes are for the purchaser's account.

Patent Protection

Various Headworks equipment contain proprietary information covered by a number of patents and patents pending in the USA and in many international countries. For a full list of the approved patents, please contact Headworks Inc. Legal department in Houston, Texas.



Project Name: Delaware County OH
State/Country: Ohio
Rep. Company: BL Anderson
Offer: 16-11-03 DEL Rev. 0
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Headworks® Bar Screen Warranty

The seller warrants all equipment of its own manufacture to be free of defects caused by faulty material or workmanship for a period of five (5) years from date of local delivery. Headworks will replace or repair any part or parts which upon examination shall show to have failed under normal use and service by the original user within the warranty period. In the event that defects develop during the warranty period, under normal and proper use, Headworks is to be notified promptly and with their consent the products are to be returned to Headworks F.O.B. Headworks factory at buyers cost. In the case of components purchased by Headworks and incorporated into the equipment, such as Electrical Controls, Instrumentation, Electrical Motors, Gear Reducers and related items, Headworks warranty is limited to the individual manufacturer's warranty for that component, usually one year. This warranty does not apply to equipment or parts thereof which have been altered or repaired other than by a representative of Headworks, or damaged by improper installation, application, erosion or corrosion of any sort, or subjected to misuse, abuse, neglect or accident.

THIS WARRANTY, INCLUDING THE STATED REMEDIES, IS EXPRESSLY MADE BY HEADWORKS AND ACCEPTED BY PURCHASER IN LIEU OF ALL OTHER WARRANTIES, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, WHETHER WRITTEN, ORAL, EXPRESS, IMPLIED, OR STATUTORY. HEADWORKS NEITHER ASSUMES NOR AUTHORIZES ANY OTHER PERSON TO ASSUME FOR IT ANY OTHER LIABILITIES WITH RESPECT TO ITS EQUIPMENT. HEADWORKS SHALL NOT BE LIABLE FOR NORMAL WEAR AND TEAR, NOR FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGE DUE TO INOPERABILITY OF ITS EQUIPMENT FOR ANY REASON NOR ANY CLAIM THAT ITS EQUIPMENT WAS NEGLIGENTLY DESIGNED OR MANUFACTURED.

Screwfactor™ Warranty

The seller warrants all equipment of its own manufacture to be free of defects caused by faulty material or workmanship for a period of eighteen (18) months from date of shipment or twelve (12) months from date of start-up, whichever first occurs. Headworks will replace or repair any part or parts which upon examination shall show to have failed under normal use and service by the original user within the warranty period. This warranty does not apply to equipment or parts thereof which have been altered or repaired other than by a representative of Headworks, or damaged by improper installation, application, erosion or corrosion of any sort, or subjected to misuse, abuse, neglect or accident.

THIS WARRANTY, INCLUDING THE STATED REMEDIES, IS EXPRESSLY MADE BY HEADWORKS AND ACCEPTED BY PURCHASER IN LIEU OF ALL OTHER WARRANTIES, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, WHETHER WRITTEN, ORAL, EXPRESS, IMPLIED, OR STATUTORY. HEADWORKS NEITHER ASSUMES NOR AUTHORIZES ANY OTHER PERSON TO ASSUME FOR IT ANY OTHER LIABILITIES WITH RESPECT TO ITS EQUIPMENT. HEADWORKS SHALL NOT BE LIABLE FOR NORMAL WEAR AND TEAR, NOR FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGE DUE TO INOPERABILITY OF ITS EQUIPMENT FOR ANY REASON NOR ANY CLAIM THAT ITS EQUIPMENT WAS NEGLIGENTLY DESIGNED OR MANUFACTURED.



Project Name: 10 of 10
State/Country: Delaware County OH
Rep. Company: BL Anderson
Offer: 16-11-03 DEL Rev. 0
Date Offer: 4-Nov-16
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Termination

Buyer may at any time terminate this order or any part hereof for its sole convenience. In the event of such termination, Seller shall immediately stop all work hereunder, and shall immediately cause any of its suppliers or subcontractors to cease such work. Seller shall be paid a reasonable termination charge consisting of a percentage of the order price reflecting the percentage of the work performed prior to the notice of termination, including without limitations any and all engineering work completed in submittal preparation, plus actual direct costs resulting from termination. Seller shall not be paid for any work done after receipt of the notice of termination, nor for any costs incurred by the Seller's suppliers or subcontractors which Seller could reasonably have avoided. Buyer will make no payments for finished work, work in process, or raw material fabricated or procured by the Seller in excess of any order or release.

Presence of High Grit Levels, Stones and Rocks

The presence of high levels of Grit, Stones and/or Rocks that can impair the normal operation of Headworks' products, develop premature wear and/or cause damage to its products is not covered under the Headworks Inc. Standard Warranties unless strictly expressed in writing. This policy is in effect for the Bar Screen, Perforator™, Eliminator™, Spiralman™, Transporter™, Transpactor™, & Screwpactor™.

Limitation of Liability

In no event shall Seller be liable for anticipated profits or for incidental or consequential damages. Seller's liability on any claim of any kind for any loss or damage arising out of or in connection with or resulting from this contract or from the performance or breach thereof shall in no case exceed the price allocable to the goods or services which gives rise to the claim. Seller shall not be liable for penalties of any description. Any action resulting from any breach on the part of Seller as to the goods or services delivered hereunder must be commenced within one (1) year after the cause of action has accrued.

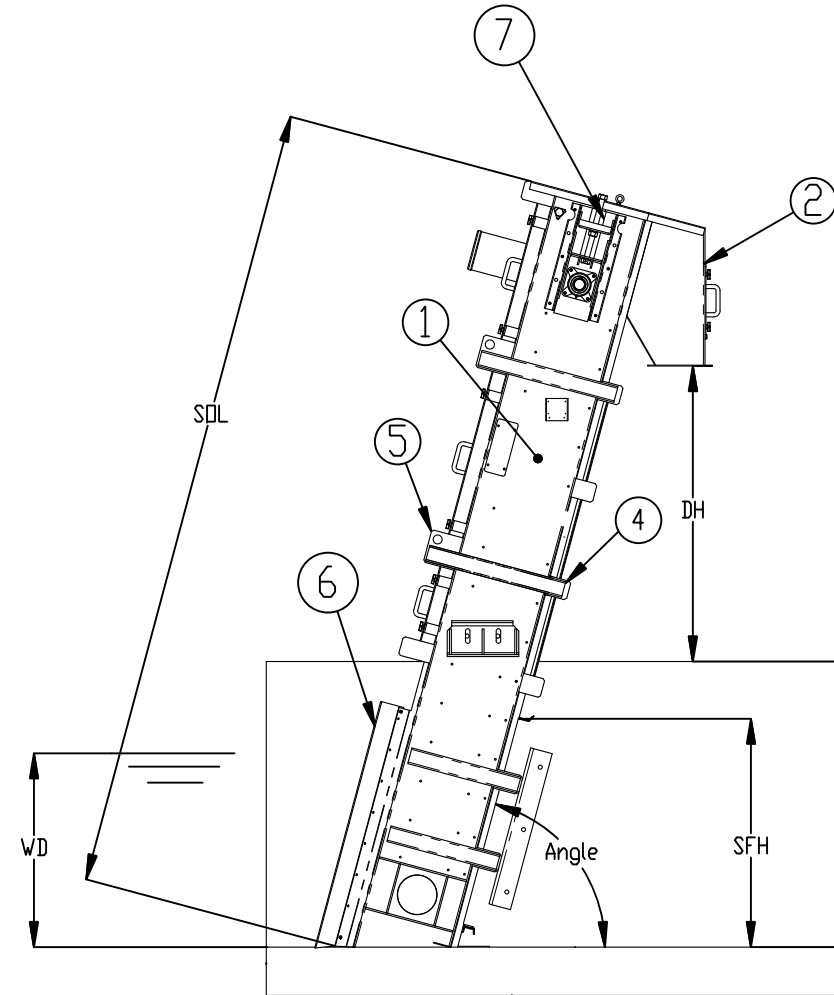
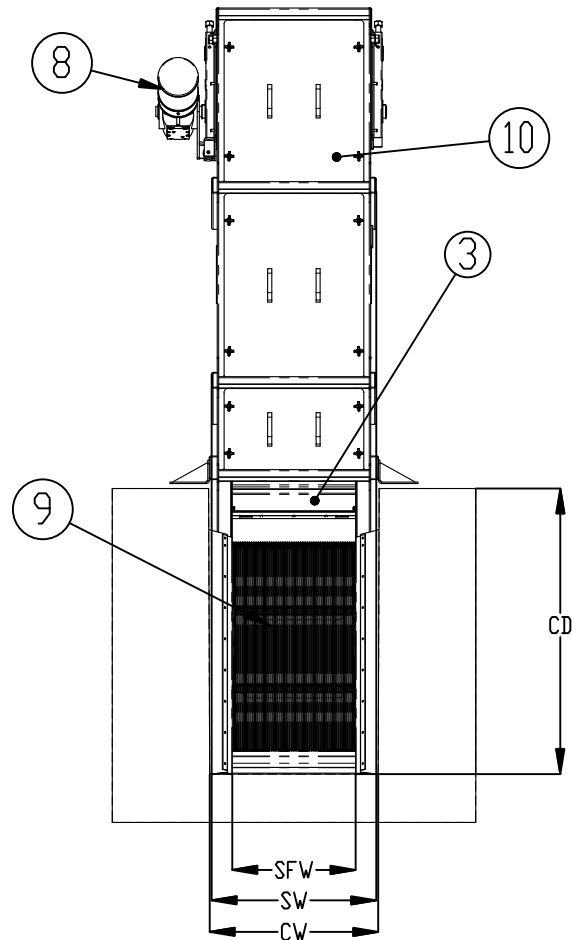
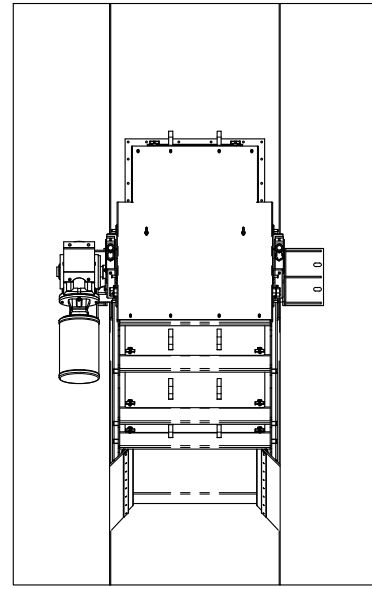
Dispute Clause

Any claim, dispute or other matter in question between Supplier and Owner, arising out of or relating to either's obligations to the other under this Contract, shall, if possible, be resolved by negotiation between Supplier's and Owner's designated representatives for the applicable Purchase Order. Supplier and Owner each commit to seeking resolution of such matters in an amicable, professional and expeditious manner so as to avoid unnecessary losses, delays and disruptions to the Work. If a matter cannot be resolved by the parties' designated representatives for the applicable Purchase Order, no later than thirty (30) days after the designated representatives fail to reach agreement, representatives from executive management of Supplier and Owner shall attempt to resolve the matter.


If resolution cannot be reached by the parties' executive managers, no later than thirty (30) days after the executive managers fail to reach agreement, the parties shall submit the dispute to non-binding mediation. The parties shall select a mediator and a mediation location that are mutually acceptable.

If resolution cannot be reached by the parties through mediation, within thirty (30) days after the mediation has concluded, either party may file suit in a court of competent jurisdiction in the county of the state in which the Work Site is located. If a Purchase Order required Work to be performed at more than one Work Site in more than one state, the exclusive venue for suit shall be a court of competent jurisdiction.

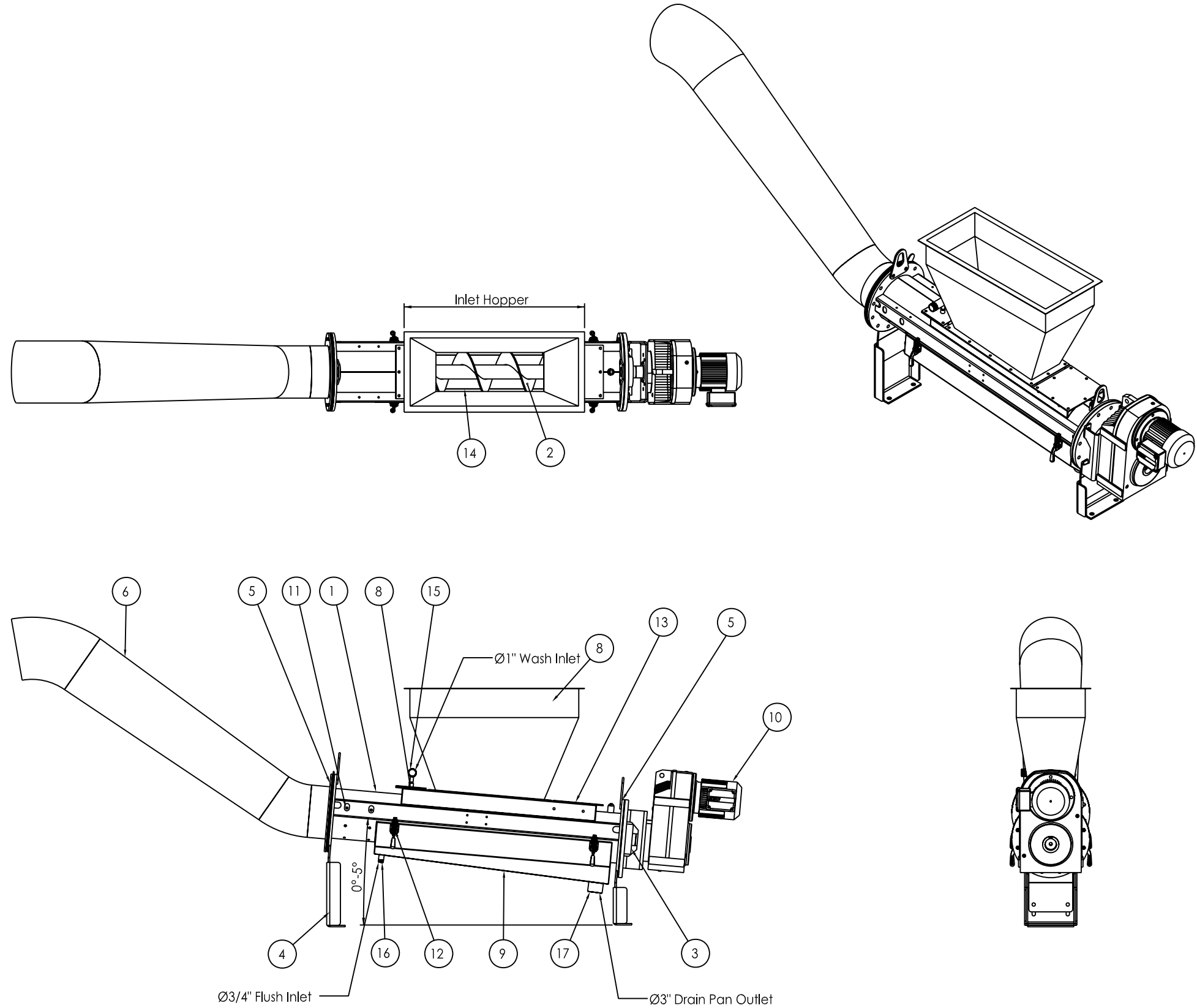
Item No.	Part	Material
1	SIDE FRAME	304/316 SS
2	DISCHARGE CHUTE	304/316 SS
3	DEBRIS PLATE	304/316 SS
4	SIDE STIFFNER	304/316 SS
5	LIFTING PAD	304/316 SS
6	SEAL	BUNA N
7	CHAIN ADJUSTER	304/316 SS
8	GEARMOTOR	CAST IRON
9	TAPER BAR	304/316 SS
10	SCREEN COVERS	POLYCARBONATE/SS



Screenfield WidthSFW
 Screen Frame Width.....SW
 Channel Depth.....CD
 Channel Width.....CW
 Discharge Height.....DH
 Screenfield Height.....SFH
 Screen Overall Length.....SOL
 Water Depth.....WD

SCALE: 1:48	CHECKED BY:	DATE:	DATE:
PROJ. NO:	DRAWN BY:	DATE:	DATE:
PLANT:	LOCATION:	Rev: 0	Sht: 1 of 1
MS SERIES BAR SCREEN MODEL MS1 TEMPLATE DRAWING		No: 12	Yr: 14
 Headworks Inc. 1100 Jettmore Park Dr. Houston, Texas 77041			

Item no	Part	Material
1	Body	Stainless Steel
2	Shafted Spiral	Carbon Steel
3	Bearing Assy.	MFG Std.
4	Supports	Stainless Steel
5	End Flanges	Stainless Steel
6	Discharge Tube	Stainless Steel
7	Inlet Hopper	Stainless Steel
8	Spray Nozzles	Brass
9	Drain Pan	Stainless Steel
10	Gear-Reducer Motor	MFG Std.
11	Wear Bars	Carbon Steel
12	Quick Release Clamps	Stainless Steel
13	Access Cover	Stainless Steel
14	Sieve Area	Stainless Steel
15	Wash Water Inlet	-
16	Flush Water Inlet	-
17	Drain-Pan Outlet	-



APPROVED BY:	DATE:	APPROVED BY:	DATE:
CHECKED BY:	DATE:	CHECKED BY:	DATE:
DRAWN BY:	DATE:	DRAWN BY:	DATE:
CDS	03/16/06	CDS	03/16/06
Rev	0	Rev	0
For Information		DESCRIPTION	

SCALE:	1:24
ORDER NO:	
REFERENCE DWG:	
JOB NO:	
PLANT:	CDS
LOCATION:	03/16/06

Screwpacktor SW		Mo:	03	Yr:	06	Rev:	0	Sht:	1	of	1
Template Drawing		SW220 and SW320									





Budget Pricing

Project Name: Delaware County, OH Scioto Reserve WWTP Date Prepared: October 31, 2016
 Project Number: 16_11_0240-A Engineer: Hazen and Sawyer

Equipment	Quantity	Price
Primary Grit Removal 1.5 mgd/unit		
4 ft. 5 Tray 150 micron HeadCell® Grit Removal unit	1	
HeadCell® inlet flow distribution header, 316 Stainless Steel	1	
Grit slurry underflow collector, 316 Stainless Steel	1	<u>\$85,000.00</u>
Grit Classifying and Washing		
24" TeaCup®: 304 Stainless Steel,	1	
Valves, gauges, plumbing, and single-point water connection	1	
Grit Dewatering		
1.5 yd ³ Decanter: Galvanized steel, Front or Rear Loader/Self Dumping	1	<u>\$104,000.00</u>
Control Panel		
NEMA 4X, 304 Stainless Steel Enclosure, 480 VAC, Three Phase, VFD Programmable Relay	1	included
Grit Pump		
Dry Pit, Recessed Impeller, horizontal mount, 150 gpm grit pump, 30 ft TDH	1	included
Freight		
Freight to Jobsite	1	included
Start-up		
One (1) factory representative for two (2) trips for a total of four (4) days	1	included
Total Proposal Budget Price:		<u>\$189,000.00</u>

Budget Adder Summary

1 Year Service & Maintenance Contract		
One (1) factory representative for two (2) trips for a total of two (2) days (Parts Allowance \$1,000)	1	<u>\$7,300.00</u>
Alternate Grit Dewatering		
GS0660 Grit Snail®: 304 Stainless Steel, up to 1.0 yd ³ /hr 6" Belt, 60" Clarifier	1	<u>\$93,000.00</u>

Terms & Conditions: As defined by Hydro International standard Terms & Conditions.



Proposal Package

Grit Removal System

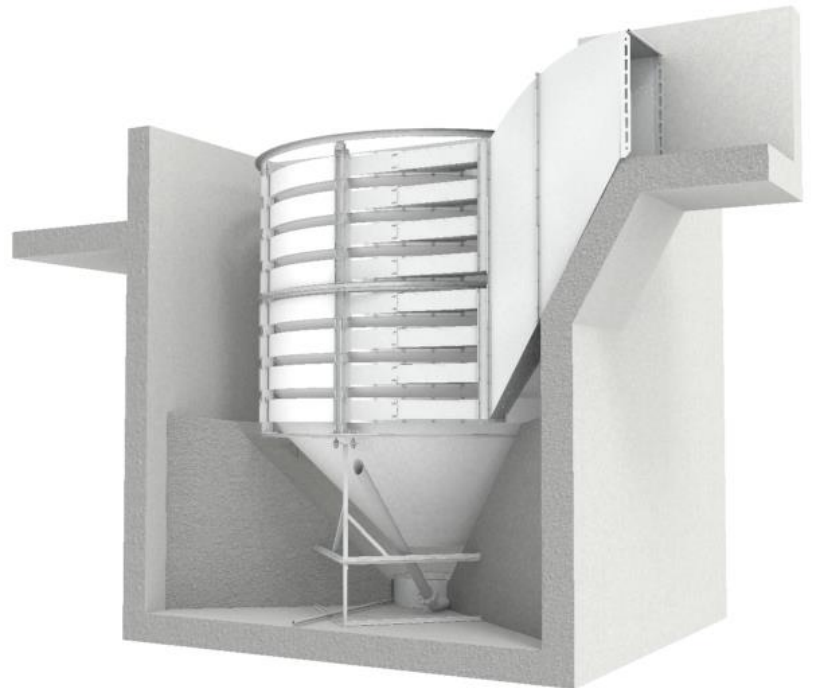
Delaware County, OH
Scioto Reserve WWTP

Engineer: Hazen and Sawyer

Representative: Henry P. Thompson

Manufacturer: Hydro International

2925 NW Aloclek Suite 140 · Hillsboro, OR 97124
(503) 615-8130 ph · (503) 615-2906 fax · www.hydro-int.com



Water & Wastewater Solutions
Grit Removal at its Finest...[®]

October 31, 2016

Mr. Mark Strahota
Hazen and Sawyer
150 E Campus View Blvd, Suite 133
Columbus, OH 43235

RE: Headworks Grit Control & Dewatering System
Delaware County, OH – Scioto Reserve WWTP
File #16_11_0240-A

Dear Mr. Strahota:

Thank you for your interest in Hydro International. We are pleased to present our proposal for a HeadCell® Grit Removal, Classification, Washing, and Dewatering System. Hydro International is dedicated to providing innovative, high performance grit removal equipment through superior engineering, high-quality products and unmatched customer service. Our extensive experience includes thousands of installations throughout the world.

Grit is continually introduced into collection systems, but is not uniformly carried to treatment facilities. As flows increase, the grit load entering the plant elevates. Once in the treatment plant, where velocities are slower than in the collection system, grit will deposit in processes, disrupting systems, decreasing equipment longevity, and increasing maintenance costs. The HeadCell® Grit Removal System offers many benefits over conventional grit removal systems including:

- Removing fine grit protects equipment and processes from abrasive wear and sedimentation
- All-hydraulic design with no moving parts, minimizing operating and maintenance costs
- Small footprint system capable of high efficiency solids capture and removal
- Robust design allowing long component life with minimal wear
- Complete grit system with no weak link through capture to washing/classification to dewatering
- Minimal headloss at peak flows fits most existing flow profiles
- Structured flow ensures maximum utilization of tray surface area and equal surface loading rates throughout the system
- Large surface area with short settling distances ensures higher performance in a smaller footprint
- Compact, yet expandable design capable of high efficiency solids capture and removal
- Continuous boundary layer flow over hydrophobic surfaces prevents grease build-up

We sincerely appreciate your interest in our equipment and look forward to working with you on this project. As you progress with the design, we can quickly generate CAD drawings, budget updates, and specifications as well as review equipment layouts and specifications for your particular application. Reference lists are available through your local representative. If you have any questions or concerns, do not hesitate to contact us.

Regards,
Hydro International



Lindsey Schweitzer
Sr. Applications Engineer

Performance Objective

Hydro International is pleased to propose the following HeadCell® grit removal, washing, and dewatering system to be installed in an existing plant which has flows of 0.4 mgd average and 1.5 mgd peak. Each component of the grit removal system is designed to remove 95% of all grit 150 micron or better at the component flows listed below.

Proposed Equipment Summary

HeadCell® Grit Concentrator

The HeadCell® is an all-hydraulic grit concentrator, which uses vortex flow and a stacked tray design to efficiently capture and settle fine grit via large surface area and short settling distances. The unit can be installed into the process flow, downstream of screening, in any system where limited head is available. The unit requires no external power source, has no internal moving parts, is self-cleaning, and has a compact modular construction. Wide turndown ratios can be accommodated in the HeadCell® when it is combined with Hydro's high performance washing system.

Quantity:	1
Size:	4' diameter
Number of Trays per Unit:	5
Surface Area/Unit:	63 ft ²
Loading rate at Peak Flow:	16.6 gpm/ft ²
Performance:	95% removal of all grit (specific gravity 2.65) ≥ 150 microns @ peak flow
Performance:	95% removal of all grit (specific gravity 2.65) ≥ 75 microns @ average flow
Peak Flow/Unit:	1.5 mgd with 12" headloss
Average Flow/Unit:	0.4 mgd with no more than 1" headloss
Discharge:	Weir
Underflow Connection:	4"
NPW Connection:	1" NPT
NPW Requirement/Unit:	Continuous 6 gpm @ 50 psig (contact Hydro for alternative options)
Materials of Construction:	316 SS Support Structure/Duct/Underflow Low Density Polyethylene Trays
Weight Dry (approximate):	800 lbs

TeaCup® Grit Removal Washing/Classification Unit

The TeaCup® is a all hydraulic, high efficiency vortex separator designed to remove grit, sediment and sand from wastewater, raw water and other liquids using vortex motion and boundary layer effects to aid in organics removal. The TeaCup® provides improved removal performance as flow rate increases. The TeaCup® discharges a clean (low organic) grit slurry, which emits fewer odors and requires only dewatering to meet stringent disposal regulations.

Quantity:	1
Size:	24" diameter
Performance:	95% removal of all grit (specific gravity 2.6) ≥ 75 microns @ design flow

Design Flow/Unit: 150 gpm with 39" headloss
 Minimum/Average Flow/Unit: 83 gpm with 12" headloss
 Peak Flow/Unit: 250 gpm with 108" headloss
 Influent solids concentration: ≤1%
 Influent Connection: 3" flanged pipe
 Effluent Connection: 4" flanged pipe
 Underflow Connection: 3" flanged pipe
 NPW Connection: 1.5" NPT
 NPW Requirement/Unit (for 30-120 sec. every 1–2 hrs.): Intermittent 30 gpm @ 50 psig
 Material of Construction: 304 SS
 Weight Dry/Wet (approximate): 650/750 lbs
 Operation Time: Continuous or a minimum of 10-15 minutes

Decanter Dewatering Unit

The Decanter dewateres grit by quiescently settling high-density solids to retain all grit and abrasives. The Decanter is an economical option for smaller plants that require performance dewatering. The Decanter comes in three basic configurations to match local disposal trucks or equipment configurations: front-loading, rear-loading, and self-dumping.

Quantity: 1
 Size: 1.5 cy
 Overflow Connection: 3" NPT
 Drain Connection: 2" NPT
 Drain Screen: 0.10" 304 SS wedgewire
 Material of Construction: Galvanized Steel
 Weight Dry/Wet (approximate): Configuration TBD
 Performance: ≥60% (wt) total solids and ≤25% volatile solids

Grit Pump

The grit pump shall be designed to convey grit slurry from the HeadCell® to the TeaCup® equipment. The grit pump shall be a recessed impeller, vortex-type unit, specifically designed to pump slurries of grit, debris and organic solids without clogging. The parts exposed to abrasive wear (case, impeller and wearplate) shall have a minimum 650 Brinell hardness for maximum wear resistance.

Quantity: 1
 Style: Dry - Pit
 Nominal Size: TBD
 Design Flow Rate: 150 gpm
 Design TDH: 30'
 Power Supply: 480V/3-phase
 Horsepower: TBD

Control Panel

The panel shall contain all timers, VFDs, switches, and indicator lights to operate one (1) TeaCup® unit and one (1) Grit Pump in either fully automated or manual mode.

Quantity:	1
Enclosure Material:	304 SS
Enclosure Type:	NEMA 4X
Power Supply:	480V/3-phase
Control Logic:	Programmable Relay
Grit Pump Control:	VFD

System Hydraulics

System hydraulics is the responsibility of the design engineer. Hydro International can provide information on HeadCell® hydraulics, TeaCup® flow vs. headloss curves and pumping and piping FAQ's to assist the engineer in determining system hydraulics and pump requirements, upon request.

Design Recommendations

- 1/2" or finer screening prior to the grit removal system
- Velocity through bar screen openings/slots/apertures should not exceed 4 ft/s at peak flow as recommended by industry design manuals.
- Estimated grit load a peak flow 0.08 yd³/hr
- All piping connected to Hydro equipment must be supported by other means than the Hydro equipment
- 2 – 3 ft/s channel velocities at peak flow as recommended by industry design manuals
- 4 – 7 ft/s grit slurry pipe velocities as recommended by industry design manuals
- Incorporate a drain line, piped to a floor drain, in the grit dumpster to allow for further dewatering prior to disposal
- A minimum 18" of access clearance around all equipment and minimum 3' of access clearance above equipment
- Operators find that it is useful to locate a spray hose adjacent to the equipment so that they can spray all equipment down during an inspection
- Incorporate a minimal access platform to facilitate inspection access to the top of the equipment
- Intermittent operation of grit pump/TeaCup® system may be an option. Contact Hydro for further information.
- Grit pumps may require NPW for seal flushing. Requirements for flushing are dependent on the make, model, and seal type of the pump specified by the engineer.

Start-up

One (1) factory trained representative, two (2) trips, for start-up and instruction services as required totaling four (4) days.

Quote Validity: 30 days

Exclusions

Any item(s) not specifically described above are excluded and are not to be supplied by Hydro International including but not limited to the following:

- | | |
|---|--|
| • Field assembly, erection and installation | • instrumentation of any kind not expressly stated above |
| • Anchor bolts | • Wiring and conduit |
| • Interconnecting piping and valving not expressly stated above | • Field or touch-up paint, painting, blasting and touch-up of surface finish |
| • Pipe connections and fittings not expressly stated above | • Spare parts not specifically stated above |
| • All pipe supports, hangers and braces | • Unloading, hauling and storage charge |
| • Controls, switches, control panels and | • Lubricating oil and greases |

- Grit study, field performance testing, laboratory testing and sample collection and analysis
- All concrete and grouting work
- Insulation and heat tracing of any kind
- Seismic analysis
- Performance and/or supply bond(s)
- Grit dumpsters
- Translation services

Options

Quotes will be provided upon request for the following optional features:

- Stainless steel valve bodies
- Additional field days for startup or training
- PLC-based control panel
- Upgrade 304 to 316 stainless steel
- Seismic certification
- Additional decanters
- Extended warranty
- Field performance testing, laboratory testing and sample collection and analysis
- Service & maintenance contract
-

Warranty

Hydro International's Standard Warranty shall apply per the Terms and Conditions of Sale.

Delivery

Please allow 4 to 6 weeks after receipt of purchase order for approval drawings. Shipment is typically a maximum of 16 weeks after receipt of "Approved" or "Approved As Noted, Resubmittal Not Required" submittal package. Price includes truck freight to jobsite, but does not include any state or local taxes if required.

Terms & Conditions

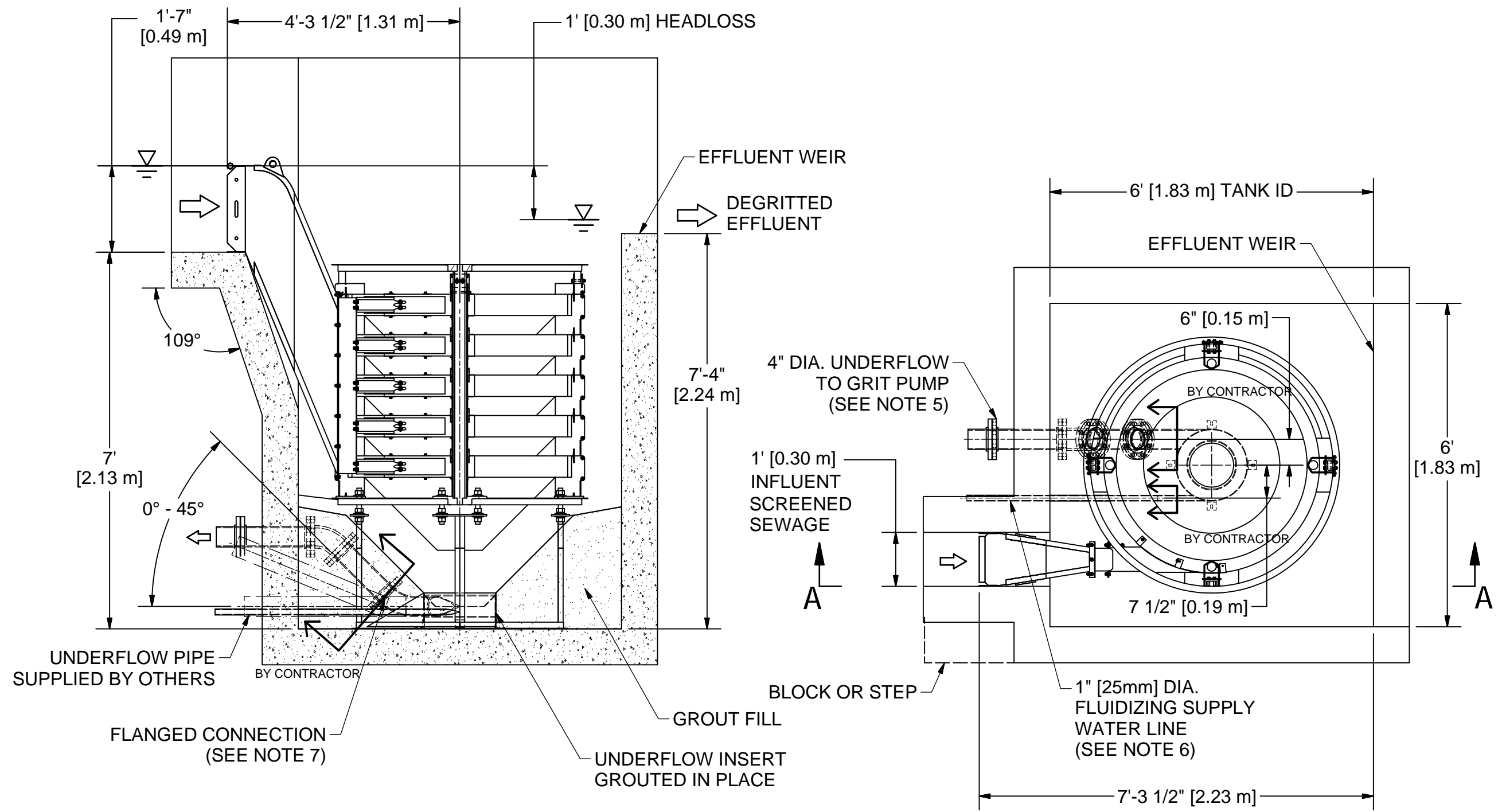
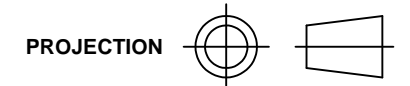
This proposal is made pursuant to Hydro International's standard Terms & Conditions of Sale, attached hereto and made a part hereof.

Contacts

Local Representative:

Mr. Timothy Shaw
 Henry P. Thompson
 101 Main Street, Suite 300
 Milford, OH 45150
 Ph: (513) 248-3229
 Fax: (513) 248-3201
 tshaw@hpthompson.com

DO NOT CHANGE DUCT LAYOUT OR PIPE ORIENTATION WITHOUT CONSULTING HYDRO INTERNATIONAL



1. ALLOW GRIT PUMP TO FULLY DRAIN HEADCELL TANK.
2. PLANT FLOW BYPASS RECOMMENDED TO ALLOW THE HEADCELL TO BE TAKEN OUT OF SERVICE IF MAINTENANCE IS REQUIRED.
3. CLOCKWISE & COUNTERCLOCKWISE UNITS ARE AVAILABLE.
4. ALTERNATE EFFLUENT CONFIGURATIONS ARE AVAILABLE.
5. THE GRIT PUMP SUCTION LINE SHOULD BE DESIGNED FOR A 4-7 ft/s [1.2-2.2 m/s] LINE VELOCITY.
6. FLUIDIZING WATER REQUIREMENTS
11 gpm [0.7 l/s] FOR 4', 6', AND 9' HEADCELL
20 gpm [1.3 l/s] FOR 12' HEADCELL
7. UNDERFLOW PIPE CONNECTION CAN BE SUPPLIED AT 0°, 22.5°, OR 45° ANGLE.

REV	BY	DATE	DESCRIPTION
-	SR	9/20/2010	FIRST RELEASE

REVISION HISTORY

Date	Scale	
9/20/2010	1/2" = 1'0"	
Drawn By	Checked By	Approved By
SR		

Title
**EUTEK HEADCELL
 PROPOSAL DRAWING**

4' DIAMETER
 5 TRAY
 150 MICRON



2925 NW Aloclek Drive
 Suite 140
 Hillsboro, OR 97124
 Tel: (503) 615-8130
 Fax: (503) 615-2906
 email: sales@eutek.com

SECTION A-A

ANY WARRANTY GIVEN BY HYDRO INTERNATIONAL WILL APPLY ONLY TO THOSE ITEMS SUPPLIED BY IT. ACCORDINGLY HYDRO INTERNATIONAL CANNOT ACCEPT ANY RESPONSIBILITY FOR ANY STRUCTURE, PLANT, OR EQUIPMENT, (OR THE PERFORMANCE THERE OF) DESIGNED, BUILT, MANUFACTURED, OR SUPPLIED BY ANY THIRD PARTY. HYDRO INTERNATIONAL HAVE A POLICY OF CONTINUOUS DEVELOPMENT AND RESERVE THE RIGHT TO AMEND THE SPECIFICATION. HYDRO INTERNATIONAL CANNOT ACCEPT LIABILITY FOR PERFORMANCE OF ITS EQUIPMENT, (OR ANY PART THEREOF), IF THE EQUIPMENT IS SUBJECT TO CONDITIONS OUTSIDE ANY DESIGN SPECIFICATION. HYDRO INTERNATIONAL OWNS THE COPYRIGHT OF THIS DRAWING, WHICH IS SUPPLIED IN CONFIDENCE. IT MUST NOT BE USED FOR ANY PURPOSE OTHER THAN THAT FOR WHICH IT IS SUPPLIED AND MUST NOT BE REPRODUCED, IN WHOLE OR IN PART, WITHOUT PRIOR PERMISSION IN WRITING FROM HYDRO INTERNATIONAL.
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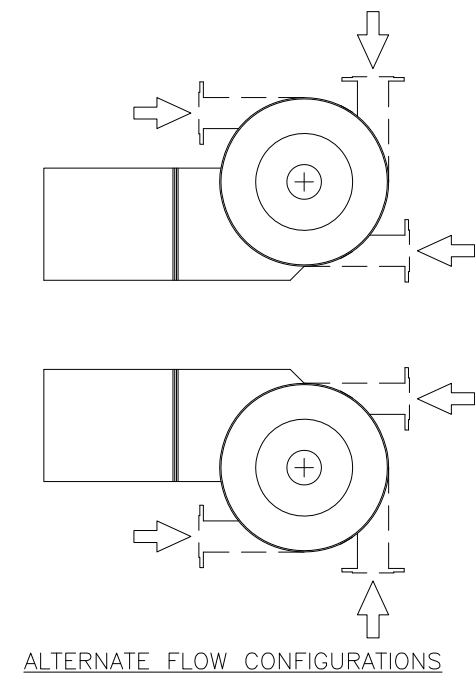
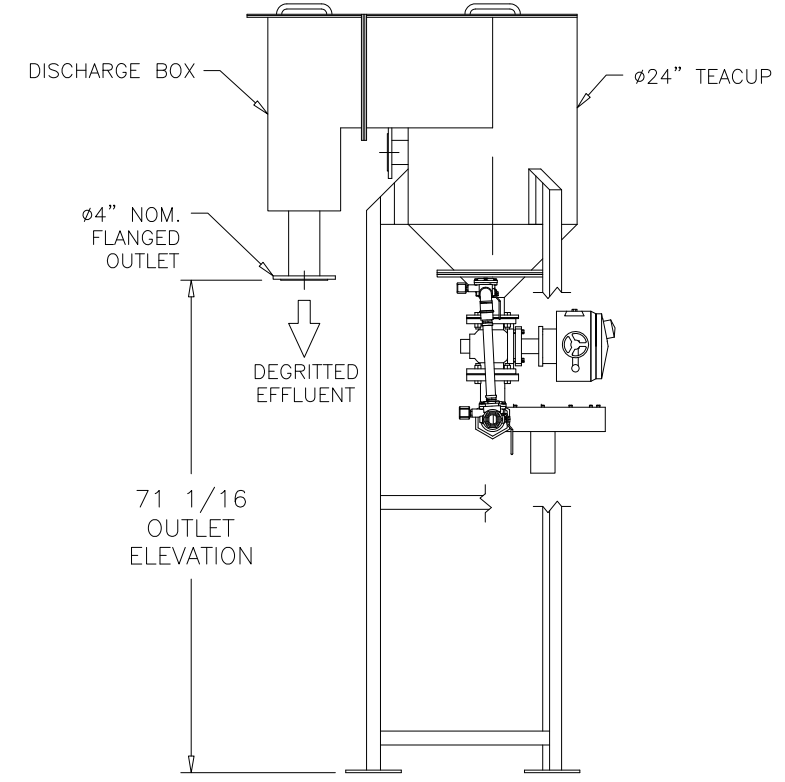
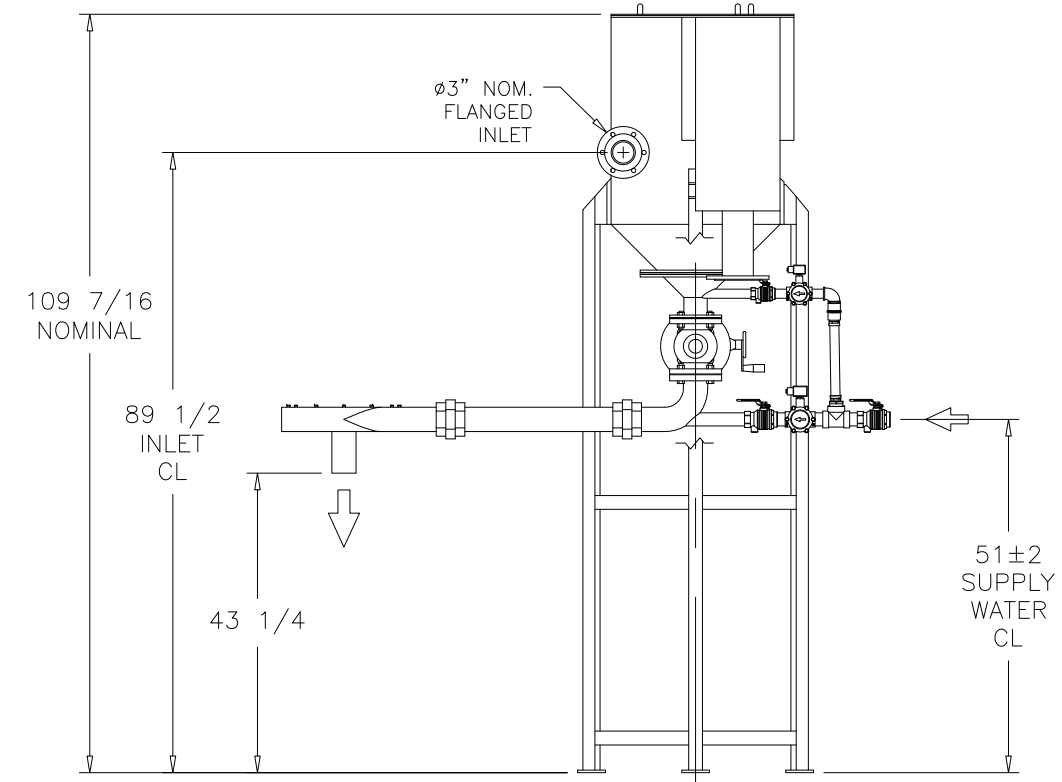
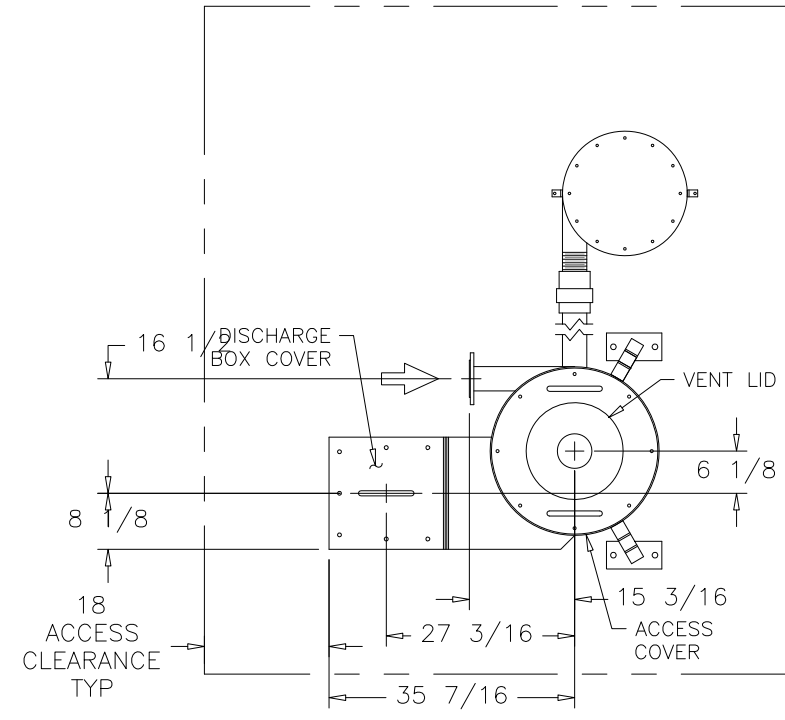
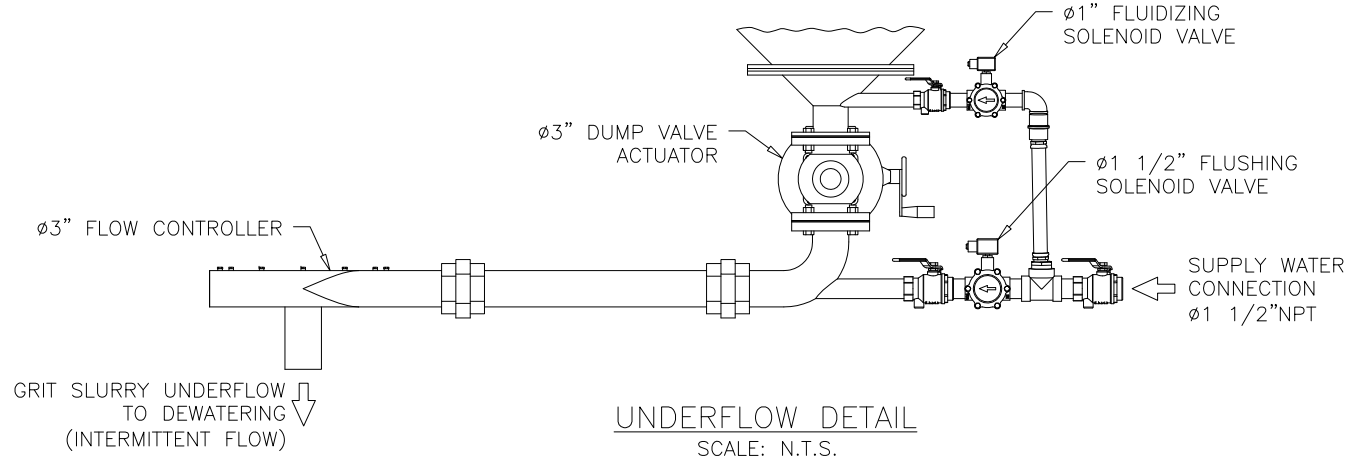
DO NOT SCALE DRAWING

UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN INCHES. TOLERANCES ARE:

FRACTIONS ± 1/4
 DECIMALS ± 0.25
 ANGLES ± 1'

Approximate Weight:	800 LBS
Finish:	Next Assembly: -
Treatment:	Ref. No. PROPOSAL
Sheet Size: B	Sheet: 1 OF 1
Drawing No. 4' 5 Tray 150 HC	Rev: -

1. TEACUPS ARE AVAILABLE IN CLOCKWISE AND COUNTER-CLOCKWISE ORIENTATION.
2. PLUMBING WILL BE LAYED OUT AND INSTALLED ON EQUIPMENT DURING FABRICATION TO INSURE PROPER FIT AND CORRECTNESS.
3. CONTRACTOR WILL BE REQUIRED TO MAKE A SINGLE WATER CONNECTION FOR EACH TEACUP.
4. EQUIPMENT WEIGHTS:
EACH TEACUP: DRY: 650 LBS.; WET: 950 LBS.
5. PROVIDE ADEQUATE CLEARANCE AROUND EQUIPMENT FOR OPERATIONS AND MAINTENANCE.
6. TEACUP HEIGHT VARIES WITH HEIGHT OF DEWATERING EQUIPMENT.



REV	BY	DATE	DESCRIPTION
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REVISION HISTORY

Date: 09/03/2013 Scale: 3/8" = 1' 0"

Drawn By: DR Checked By: LS Approved By: -

Title: EUTEK TEACUP 24 INCH - 75 MICRON

PROPOSAL DRAWING



2925 NW Aloclek Drive
Suite 140
Hillsboro, OR 97124
Tel: (503) 615-8130
Fax: (503) 615-2906
email: sales@eutek.com

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DO NOT SCALE DRAWING
UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN INCHES. TOLERANCES ARE:
FRACTIONS ± 1/16
DECIMALS ± .06
ANGLES ± 1'


Approximate Weight:
SEE NOTE 4
Finish: -
Treatment: -
Sheet Size: B
Sheet: 1 OF 1

Next Assembly: -
Ref. No.: PROPOSAL
Drawing No.: TC24-75DB
Rev: B

1. 3" NPT OVERFLOW CONNECTION AND 2" NPT DRAIN CONNECTION IS SHOWN ON THE LEFT SIDE (SEE PLAN VIEW). PLEASE NOTE THAT THESE COMPONENTS CAN ALSO BE LOCATED ON THE RIGHT SIDE.

2. EQUIPMENT WEIGHT (LBS):
 DRY: 800; WET: 4,800

3. SCREENINGS ARE NOT TO BE DUMPED INTO THE DECANTER.

 CONTRACTOR TO DIRECT FLOW TO AN OPEN DRAIN.

D	AP	121311	UPDATED SD
C	LS	10/10/11	PIPING & NOTES ADDED
B	SR	01/05/10	RE-ISSUE NEW BORDER
REV	BY	DATE	DESCRIPTION

REVISION HISTORY

Date	Scale
03/08/01	NTS

Drawn By	Checked By	Approved By
SAJ/MA	AN	

Title
 1.5 cy DECANTERS

PROPOSAL DRAWING

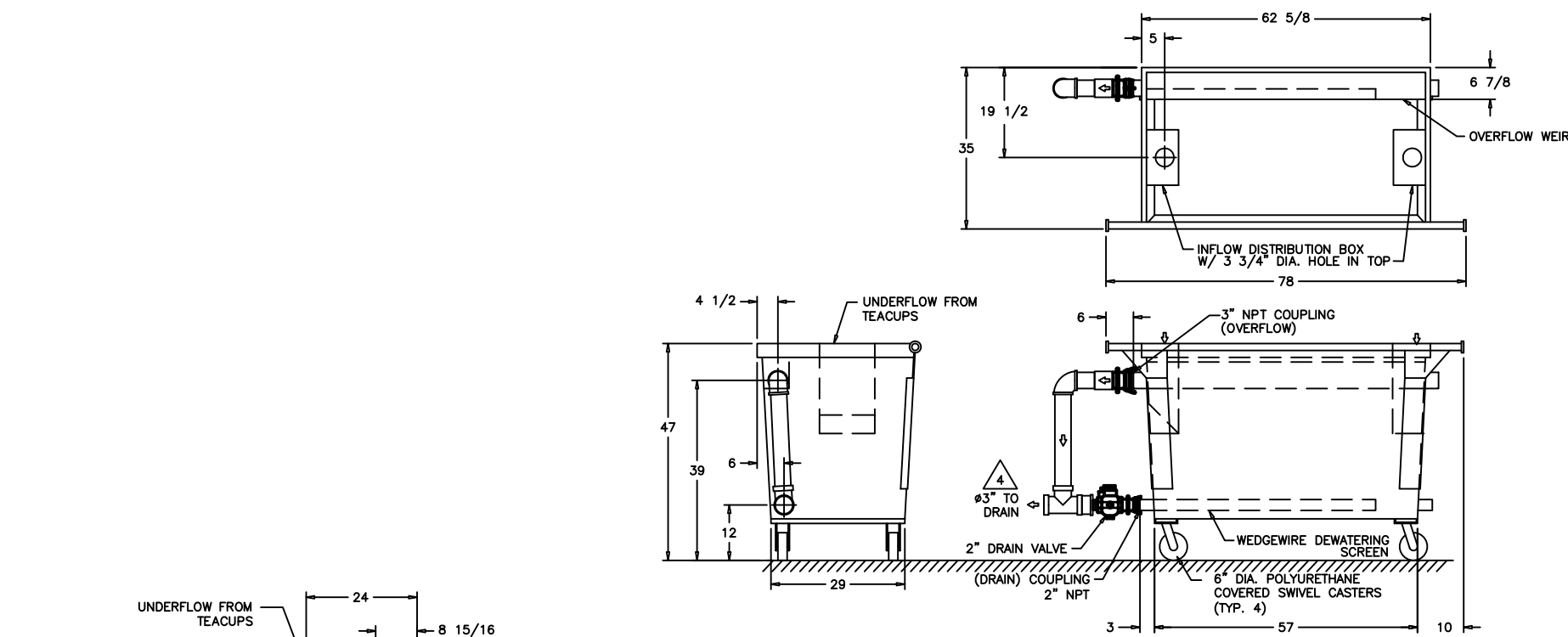


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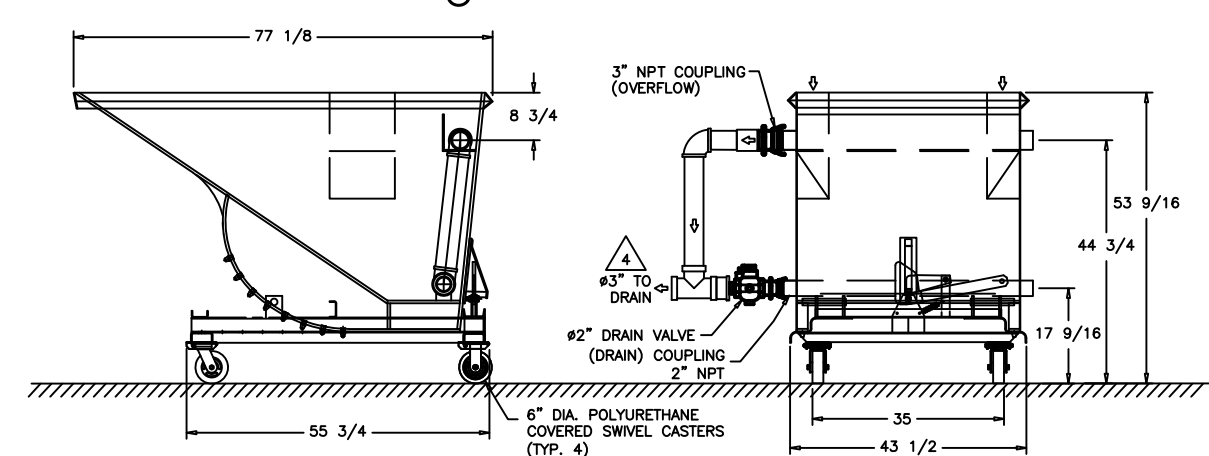
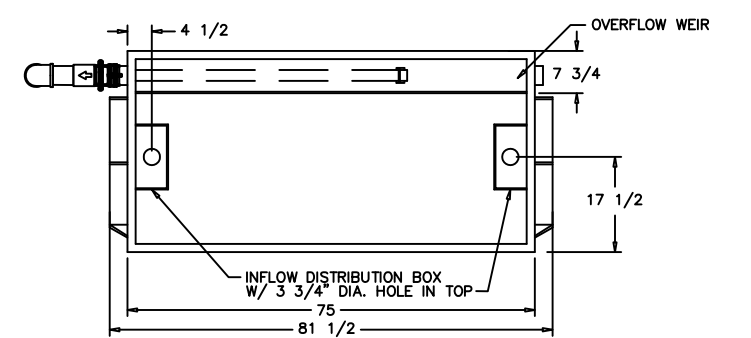
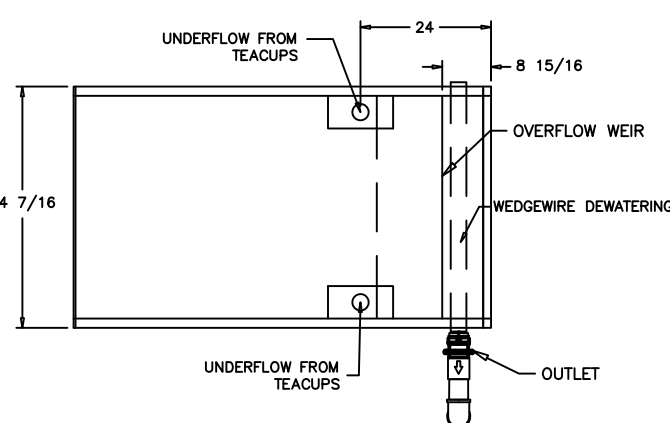
Next Assembly: N/A

Ref. No. PROPOSAL

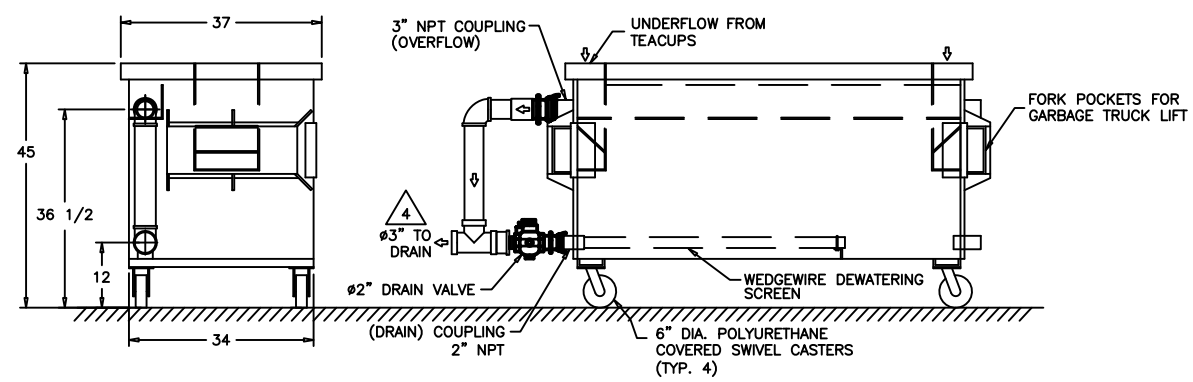
Drawing No. S00006-002 Rev D



REAR LOADING DECANTER



SELF-DUMPING DECANTER



FRONT LOADING DECANTER

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FRACTIONS ± 1/16
 DECIMALS ± .06
 ANGLES ± 1'

Approximate Weight:
SEE TABLE

Finish:
Treatment:
Sheet Size: B
Sheet: 1 OF 1

North American Grit Gradations

Hydro International is pleased to announce the availability of national and regional grit gradation data. This data, which has been compiled from over 120 tests across North America, contains average physical size data as well as settling velocity (SES) data, making it the most comprehensive information available on grit and its behavior.

Virtually all conventional grit removal processes rely on gravity sedimentation to achieve the separation of grit from wastewater. Most conventional grit removal processes are designed based on the assumption that grit is spherical and has a specific gravity 2.65. However, not all grit maintains a specific gravity of 2.65 and other factors such as shape and encapsulation by fats, oils and grease significantly impact its settling velocity. Therefore, the best means to analyze grit is to determine the settling velocity for given particle size ranges. Settling velocity data can be correlated to the measured settling velocity of a clean sand sphere. The settling velocity is expressed as the Sand Equivalent Size (SES), which is the sand particle size having the same settling velocity as the more buoyant grit particle. The correlated particle size, or Sand Equivalent Size can then be used for design of the grit removal process.

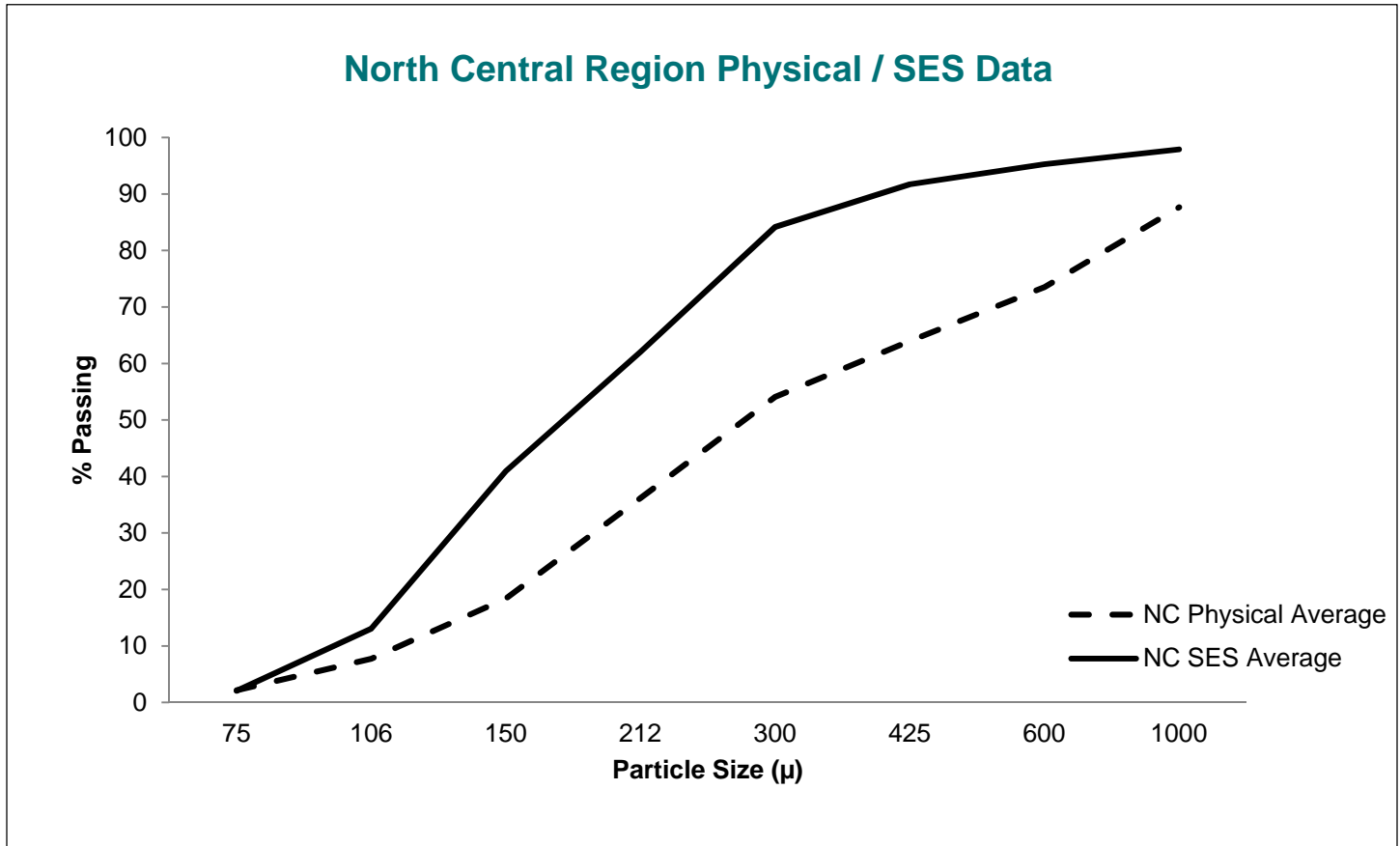
When settling velocity is considered in the design actual removal efficiency of grit particles can be estimated more realistically.

Data is available for the following regions:

Region	States / Provinces Included
Northeast	ME, VT, NH, MA, RI, NY, CT
Mid-Atlantic	PA, NJ, MD, DE, DC, VA, WV
Southeast	NC, SC, GA, AL, FL, MS
North Central	MO, KS, KY, IN, OH, IL, MI, WI, IA, MN, ND, SD, NE
South Central	TN, AR, OK, TX, LA
West	WA, OR, CA, AK, HI, AZ, NV, NM, CO, ID, MT, UT, WY
Western Canada	AB, MB, SK
Ontario Canada	ON

State data is available for individual states where more than 5 data points are available; those states currently include: Georgia, Texas, Florida, California, and Virginia.

North Central Regional Gradation



Micron	% Passing								
	75	106	150	212	300	425	600	1000	
NC Physical Average	2.2	7.8	18.4	36.2	54.1	64.0	73.5	87.7	<i>Physical</i>
NC SES Average	2.0	13.0	41.0	62.0	84.2	91.7	95.3	97.9	<i>SES</i>

The above table shows the % of grit passing through various sieve sizes based on physical size (unshaded) and Sand Equivalent Size (SES) (shaded). SES provides the settling velocity distribution of the grit particles.

Standard Terms and Conditions of Sale

- 1. DEFINITIONS.** "Hydro" is Hydro International with an address of 2925 NW Aloclek Drive #140 in Hillsboro, Oregon. "Buyer" is the party purchasing the goods from Hydro.
- 2. ENTIRE AGREEMENT.** Hydro's agreement is based on these terms and conditions of sale. This document, together with any additional writings signed by Hydro, represents a final, complete, and exclusive statement of the agreement between the parties and may not be modified, supplemented, explained, or waived by parol evidence, Buyer's purchase order, any course of dealing, Buyer's payment or acceptance, or in any other way except in writing signed by Hydro through its authorized representative. These terms and conditions are intended to cover all activity of Hydro and Buyer hereunder, including sales and use of products, parts, and work, and all related matters (references to products include parts and references to work include construction and installation). Hydro's obligations hereunder are expressly conditioned on Buyer's assent to these terms and conditions. Hydro objects to any terms that are different from, or additional to, these terms and conditions. Any applicable detail drawings and specifications are hereby incorporated and made a part of these Terms and Conditions of Sale insofar as they apply to the material supplied hereunder.
- 3. SPECIFICATIONS.** Products are supplied in accordance with information received by Hydro, or its duly authorized agent, from Buyer. Hydro shall have no responsibility for products created or sold based upon inaccurate and/or incomplete information supplied to it. Buyer shall ensure that Hydro receives all relevant information in time to enable it to supply the appropriate products.
- 4. INSTALLATION AND APPLICATION OF PRODUCTS.** Products supplied hereunder shall be installed and used only in the particular application for which they were specifically designed. Buyer should not presume that any products supplied by Hydro may be utilized for any applications other than those specified; nor shall Hydro's obligations, including, without limitation, any warranty obligations, survive Buyer's transfer of products supplied hereunder to third parties unless the products are transferred with Hydro's consent. In addition, Buyer shall not use any product supplied hereunder at any location other than at the location for which Hydro has previously received notice from Buyer. Any breach of any of the foregoing restrictions may amount to an infringement of the patent for the products in question and will in any event void all express or implied warranties relating to the products supplied hereunder.
- 5. PURCHASE PRICE AND PAYMENT TERMS.** All prices are in U.S. dollars and all payments shall be made in U.S. dollars. Payment terms are as follows:

	Incremental Payment	Cumulative Payment
Upon Approval of Shop Drawings	10%	10%
Upon Delivery of Equipment to Site	80%	90%
Upon Final Acceptance or 45 days following completion of equipment start up	10%	100%

If payments are not made in conformance with the terms stated herein, any unpaid balance shall be subject to interest at a rate 1½% per month, but not to exceed the maximum amount permitted by law. If shipment is delayed by Buyer, the previously agreed date of readiness for shipment shall be deemed to be the date of shipment for payment purposes. If manufacture is delayed by Buyer, a payment shall be made based on purchase price and percentage of completion, with the balance payable in accordance with the terms as stated. If at any time in Hydro's judgment Buyer may be or may become unable or unwilling to meet the terms specified, Hydro may require satisfactory assurance or full or partial payment as a condition to commencing, or continuing manufacture, or in advance of shipment.

Until payment in full has been received by Hydro, this Standard Terms and Conditions of Sale shall constitute a security agreement and Buyer hereby grants Hydro a purchase money security interest in and to the products produced by Hydro hereunder, and any products or proceeds thereof. In particular:

- (i) Hydro will retain an express purchase money security interest in and to the products and all proceeds thereof.
 - (ii) Until full payment for the products is received by Hydro, Hydro reserves the right to retake possession of the products at any time and for this purpose Buyer authorizes Hydro or its duly authorized agent to enter upon land or premises where it believes the product may be.
 - (iii) Proceeds of any disposal of the products shall be held in trust for Hydro pursuant to the terms of the Maine Uniform Commercial Code.
 - (iv) Buyer grants Hydro a power of attorney for the purpose of filing a UCC-1 financing statement in the name of Buyer to evidence Hydro's security interest in the products.
- 6. BACKCHARGES.** In the event that Buyer is required to make repairs, corrections or modifications to the goods supplied by Hydro, it shall only do so upon written approval from Hydro. Backcharges shall be limited to the costs directly associated in making the repairs, corrections or modifications to the goods supplied by Hydro. The costs of such backcharges shall be subject to approval by Hydro and shall be limited to: (1) directly related labor and material costs, (2) directly related equipment and tool rental at prevailing rates in the project location and (3) Buyer's overhead & supervision costs to make repairs, corrections or modifications to the goods supplied by Hydro. Buyer shall submit complete documentation to Hydro's satisfaction including but not limited to labor time sheets, material lists, and rental fees detailing the nature of the back charges. Backcharges shall be in the form

of an adjustment to the contract price or reduction in retained payments and not a direct payment. No incidental or consequential backcharges shall be allowed.

7. **DELIVERY.** The goods are sold F.O.B. manufacturing site, freight prepaid to Buyer at job site. Except as outlined in Paragraph 8 below, the risk of loss passes to Buyer after Hydro delivers the goods to the carrier. Hydro reserves the right to select the method of shipment and carrier. Delivery dates are approximate only and are not a guarantee of delivery on a particular day. Hydro is not liable for failure or delays in deliveries of any cause whatsoever beyond the control of Hydro.
8. **TITLE & INSURANCE:** Title to the product(s) and risk of loss or damage shall pass to Buyer upon delivery to a carrier as outlined in Paragraph 7 above, or, in the event Buyer delays shipment, by the previously agreed date of readiness for shipment, except that a security interest in the product(s) or any replacement shall remain in Hydro's name, regardless of the mode of attachment to realty or other property, until the full price has been paid in cash. Buyer agrees to protect Hydro's interest by adequately insuring the product(s) against loss or damage from any external cause with Hydro named as insured or co-insured.
9. **ERECTION:** Unless otherwise stated in writing, the goods provided hereunder shall be assembled and erected by and at the expense of Buyer.
10. **CANCELLATION & BREACH:** Orders placed cannot be canceled, nor shipments of goods made up, or in process, be deferred beyond the original shipment dates specified, except with Hydro's written consent and upon terms which shall indemnify Hydro against all loss. In the event of cancellation or the substantial breach of Buyer's obligations, as by failing to make any of the payments when due, the parties agree that Hydro will suffer a serious and substantial damage that will be difficult, if not impossible, to measure, both as of the time of entering into this purchase agreement and as of the time of such cancellation or breach. Therefore, the parties agree that, upon such cancellation or breach, Buyer shall pay to Hydro the sums set forth herein below, which sums the parties do hereby agree shall constitute agreed and liquidated damages in such event:
 - If cancellation or breach shall occur after the acceptance of the purchase order but prior to mailing of submittal documents by Hydro to Buyer, liquidated damages shall be 10% of the selling price.
 - If cancellation or breach shall occur within thirty (30) days from the mailing of submittal documents by Hydro to Buyer, the liquidated damages shall be 20% of the selling price.
 - If the cancellation or breach occurs after thirty (30) days from the mailing of submittal documents by Hydro to Buyer, but prior to notification that the order is ready for shipment, the liquidated damages shall be the total of 30% of the selling price plus the expenses incurred, cost of material, and reasonable value of the work expended to fill the order involved herein by Hydro's engineers and other employees, agents and representatives after the mailing of general arrangement drawings by Hydro to Buyer, said sums to be determined at the sole reasonable discretion of Hydro; provided, however, that the total liquidated damages under this provision shall not exceed the total selling price.
 - If cancellation or breach shall occur after Hydro has notified Buyer that the order is ready for shipment, then the liquidated damages shall be the total selling price, less costs associated with startup or field testing.
11. **MATERIALS OF CONSTRUCTION, PAINTS AND COATINGS:** Buyer is responsible for determining the suitability of, and for giving final approval of, the materials of construction, paints, coatings, etc. to be used by Hydro.
12. **WARRANTY:** Any product that proves defective in material, workmanship or design within twelve (12) months after delivery (or entry into storage) will be, at the discretion of HYDRO, modified, repaired or replaced, or Buyer's payment for the products will be refunded. This shall be Buyer's sole remedy. HYDRO EXPRESSLY EXCLUDES AND DISCLAIMS ANY WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR OTHER WARRANTIES, EXPRESS OR IMPLIED.

This warranty does not cover any defects or costs caused by: (1) normal wear and tear of equipment from designed operation. (2) modification, alteration, repair or service of the goods by anyone other than Hydro; (3) physical abuse to, or misuse of, the goods, or operation thereof in a manner contrary to Hydro's instructions; (4) any use of the goods other than that for which they were intended; (5) chemicals or components which were not disclosed to Hydro; (6) storage contrary to Hydro's instructions; or (7) failure to maintain the goods in accordance with Hydro's instructions.

This warranty does not apply to component parts of the goods that were not both originally designed and manufactured by Hydro, including, but not limited to, valves and controls. These component parts do not carry any warranties by Hydro, and only carry the warranties, if any, of their manufacturers.

In order for Buyer to make a claim under this warranty, Buyer must promptly, and within the warranty period, notify Hydro in writing of any defect(s) in the goods covered by this warranty. If any defect(s) in the goods covered by this warranty are visible at the time of delivery, Buyer must notify Hydro of the defect(s) in writing within five working days. To make any claim under this warranty, Buyer must also fully comply with written authorization and return instructions from Hydro.

13. **FIELD SERVICE:** Startup/Field Service will only be scheduled upon written request. Buyer shall notify Hydro of schedule requirements at least ten (10) working days in advance, or additional charges may be added to cover late-scheduled travel costs. Additional costs will be limited to those arising out of late-scheduled costs. Should Buyer have outstanding balances due Hydro, no startup / field service will be scheduled until such payments are received by Hydro. Hydro will send documents to Buyer defining the service or startup requirements. Buyer assumes all responsibility for the readiness of the system when it requests startup service. Should Hydro's Field Service Engineer arrive at the jobsite and determine that the system cannot be started up within a reasonable time, Hydro shall have the option to bring the Field Service Engineer home and bill Buyer for time, travel and living expenses. Additional field service is available from Hydro at the prevailing per-diem rate at the time of the request for service plus all travel and living expenses, portal-to-portal. A purchase order or change order will be required prior to scheduling this additional service.
14. **LIMITATION OF HYDRO'S LIABILITY.** Hydro assumes no liability or responsibility for the misuse of its products by Buyer, Buyer's employees, agents or assigns, or other use inconsistent with the use appropriate to the performance specification requirements submitted to Hydro, and Buyer agrees to indemnify and hold harmless Hydro for any loss, costs, expense or liability that it may incur or be put to as a result of misuse or inconsistent use of the products. In addition, Hydro shall have no liability to Buyer for any consequential or incidental damages incurred by Buyer in connection with the contract documents or the products purchased by Buyer. Hydro shall not be liable for any loss which results from delay in delivery caused by any

reason beyond its control, including, but not limited to, acts of God, casualty, civil disturbance, labor disputes, strikes, transportation or inability to obtain materials or services, any interruption of its facilities, or act of any governmental authority. The time for delivery shall be extended during the continuance of such conditions. The total liability of Hydro to Buyer in the form of liquidated damages for any loss, indemnity, damage or delay of any kind will not under any circumstances exceed 25% of the Contract Sum.

- 15. INTELLECTUAL PROPERTY.** Hydro shall retain sole ownership of all of its intellectual property used or produced in connection with the Project, including but not limited to all drawings, specifications, software, written materials, manuals, marks, business methods, and all other property that is capable of protection by a patent, copyright or trademark (whether or not such protection has actually been sought). Buyer shall not use such intellectual property except for the purpose of confirming the quality of design and/or manufacturing of the products and services set forth in the Proposal. Buyer shall not photocopy, duplicate or in any way copy such intellectual property except for the Buyer's internal purposes only (but not for rendering services or selling products to third persons). Buyer shall not sell, license, assign or transfer the intellectual property protected by this paragraph to anyone. Buyer shall ensure that Owner is in possession of valid licenses for all third-party software (not provided by Hydro) used for the Project, and shall indemnify and hold harmless Hydro against all claims by licensors of such software. Hydro makes no warranty regarding the effect of such third-party software on the performance of the software to be developed by Hydro for the Project and Hydro shall be released from any warranties given to Buyer to the extent that such software causes or contributes to problems. Following acceptance and final payment to Hydro, Hydro will grant to the Owner a non-transferable, non-exclusive license to use the software for the Owner's internal purposes only in the form of the license agreement attached as Exhibit A.
- 16. TAXES.** Prices stated herein do not include any tax, excise, duty or levy now or hereafter enacted or imposed, by any governmental authority on the manufacture, sale, delivery and/or use of any item delivered. An additional charge will be made therefore and paid by Buyer unless Hydro is furnished with a proper exemption certificate relieving Hydro of paying or collecting the tax, excise, duty or levy in question.
- 17. INTERPRETATION OF CONTRACT.** This contract shall be construed according to the laws of the State of Maine.
- 18. CHOICE OF FORUM.** Buyer and Hydro hereby consent and agree that the United States District Court for the District of Maine or the District Court or Superior Court located in the City of Portland, County of Cumberland, Maine will have exclusive jurisdiction over any legal action or proceeding arising out of or relating to the contract documents, and each party consents to the personal jurisdiction of such Courts for the purpose of any such action or proceeding. Buyer and Hydro further hereby consent and agree that the exclusive venue for any legal action or proceeding arising out of or relating to the contract documents will be in the County of Cumberland, Maine. Each party hereby waives all rights it has or which may hereafter arise to contest such exclusive jurisdiction and venue.
- 19. ATTORNEYS' FEES.** If any judicial or non-judicial proceeding is initiated for the purpose of enforcing a provision of this contract, the prevailing party shall be awarded reasonable attorneys' fees in addition to all other costs associated with the proceeding, whether or not the proceeding advances to judgment.
- 20. SEVERABILITY.** If any provisions of this contract are held invalid by a court of competent jurisdiction, the remainder of this contract shall not be rendered invalid, and such invalid provisions shall be modified, in keeping with the letter and spirit of this contract, to the extent permitted by applicable law so as to be rendered valid.
- 21. ANTI-BRIBERY.** Hydro International will not engage in any form of bribery or corruption. The offering, giving or receiving of bribes is contrary to Hydro International's values and can play no part in the way in which it carries out its business. Hydro requires you to support our approach and implement provisions consistent with our policy through your own organization and your supply chain. Please find a copy of our Anti-Bribery and Corruption Policy on our website at <http://plc.hydro-intl.com/content/view/296/247/>



eVOQUA
WATER TECHNOLOGIES

Preliminary Proposal

Scioto Reserve WWTP
Delaware County, OH

Version: 1

Date: 11/8/2016

Prepared By: Matthew Roegner



SUMMARY:

We are pleased to present our proposal for Two (2) Tow-Bro Mechanisms in existing 30' X 12' concrete tanks at the Scioto Reserve WWTP.

EQUIPMENT & DESCRIPTION:

PRICE

(2) Envirex Tow-Bro Mechanisms

- Hot dip galvanized construction
- Drive mechanism complete with:
 - Reducer, motor, micro switch overload device, shear pin
- Access bridge, center platform, hand railing toe plate
- Torque tube
- Unitube suction header
- Associated attachment and anchor bolts

\$170,000

ATTACHED DOCUMENTS

This proposal includes the following documents:

- Drive specification sheet
- General arrangement drawing (not project specific)

A few key advantages of our process are:

- *Longevity:* All mechanisms are designed and constructed for a life expectancy of at least 20 years
- *Ease of Maintenance:* Our drive assemblies offer a split gear design, allowing for ease of access and removal of structural components is not required.
- *Flexibility:* Our dedicated teams of Engineers and Designers consider all factors and requirements for optimal clarification performance.
- *Standards:* We offer all designs to meet Ten-States-Standards and our drive components adhere to AGMA standards, ensuring optimal performance while adhering to established regulation



Side-Feed Tow Bro Clarifier - Scope of Supply

Project: Scioto Reserve
Engineer: Hazen and Sawyer

Date: November 8, 2016
Designer: MSR

Clarifier Mechanisms: (2) 30'- 0" Diameter x 12'- 0" SWD

Items INCLUDED

- F16LT Drive Assembly; 0.50HP, 230/460 V, 60 Hz, 3 Phase Motor
 - Rotational Speed: 0.05 RPM
 - Tip Speed: 4.71 ft/min
 - Torque Rating of Selected Drive: 4,700 ft-lbs
- Influent Feed Well
- Center Torque Tube
- Tow Bro Header
- Full Span Bridge with Half Span Walkway and Center Platform
- 1-1/2-in Double-rail Handrail
- 1 1/4" Grating for Walkway and Center Platform Decking
- (1) Conventional Skimming Assemblies per Tank with Flushing Device
- (1) Scum trough
- Evoqua Standard Service Manuals
- 316 SS Anchor Bolts
- Freight
- Engineering
- Field Service consisting of Two (2) Trips and Four (4) Days

Materials of Construction

- Submerged Equipment: Primed A36 Carbon Steel
- Non-Submerged Equipment: Primed A36 Carbon Steel
- Handrail: Aluminum
- Walkway Decking: Aluminum
- Weirs and Baffles: FRP (Not by Evoqua)

Items NOT INCLUDED

- Electrical Controls, except as noted
- Weirs, Baffles and Associated Supports
- Current Density Baffles
- Concrete Tank
- Effluent Troughs
- Finish Paint

General Items

- Compliance permitting and approval (Federal, State and/or local).
- Detail shop fabrication drawings.
- Electrical, hydraulic, or pneumatic controls unless specifically noted.
- Engineering and supervision of all equipment and labor for civil works.
- Laboratory, shop, or field testing other than supervision of start-up testing.
- Taxes, bonds, fees, permits, lien waivers, licenses, etc.

- Tools or spare parts.
- Unloading of equipment and protected storage of equipment at jobsite.
- Utilities connections.

Civil Works and Mechanical Items

- Adhesives, adhesive dispensers, grout, mastic & anti-seize compounds.
- Anchor bolts and/or expansion anchors unless otherwise noted.
- Base slabs, equipment mounting pads, or shims.
- Concrete work of any sort, grout, mastic, sealing compounds, shims.
- Demolition, removal, or transfer of anything that is existing.
- Engineering, permitting, and surveying.
- Equipment lifting hoists, cranes, or other lifting devices.
- Field surface preparation and/or painting.
- Floor grating, stairways, ladders, platforms, handrailing unless noted.
- Installation of equipment.
- Interconnecting materials external to enclosures such as cable, pressure taps, tubing, etc.
- Labor for field testing.
- Lubricants, grease piping, grease guns.
- Modifications to existing equipment or structures.
- Pipe supports and hangers for piping.
- Piping, pumps, valves, wall sleeves, gates, drains, weirs, baffles not mentioned.
- Plumbing associated with waste disposal, floor drains, and/or emergency and safety wash stations.
- PVC solvent weld materials.

Electrical Items

- Conduit or wiring in the field.
- Cable trays, fittings, and supports.
- Influent instrumentation including, but not limited to flowmeters, pH analyzers, temperature transmitters and/or pressure transducers.
- Instrumentation required for post treatment monitoring.
- Power to Evoqua supplied equipment.
- Motor control centers.
- Plant lighting.
- Supply and installation of building power, lighting, main service disconnects and control panels.
- Supply, installation and control of a remote telemetry system (SCADA) to monitor and control the operation of the system and overall plant operation other than mentioned Evoqua controls.
- Underwriters Laboratory inspection of electrical controls.
- Variable frequency drives unless specifically noted.

Budget Price

(2) Clarifier Mechanisms

\$170,000

The scope of supply and pricing are based on Evoqua's standard equipment selection, standard terms of sale and warranty terms. Any variations from these standards may affect this budgetary quotation. Additionally, please note that this budgetary quotation is for review and informational purposes only and does not constitute an offer for acceptance.

Sheet:
F16-2LT

F-Type Drive Data Sheet



Rev: 0 Date: 2/8/10

F16-LT SPECIFICATIONS

PRIMARY REDUCTION

PARALLEL HELICAL GEAR MOTOR, 1.25 MIN SERVICE FACTOR. CASE IS CAST IRON MOUNTED ON AN ADJUSTABLE STEEL BASE FOR CHAIN TENSION ADJUSTMENT.

MOTOR

SEVERE DUTY, 1/2 HORSEPOWER, 1800 RPM, TEFC, 230/460 VOLT, 3 PHASE, 60 HERTZ, NEMA DESIGN B, CLASS "F" INSULATION, 40 DEG C AMBIENT TEMPERATURE, 1.15 SERVICE FACTOR, BALL BEARING TYPE MOTOR.

SECONDARY REDUCTION

SPROCKETS	: FABRICATED STEEL
CHAIN	: #80L "REDI-LUBE" STEEL ROLLER, SELF LUBRICATING
GUARD	: OSHA STYLE, COMPLETELY ENCLOSED, MOLDED POLYETHYLENE WITH ALUMINUM BACK PLATE

FINAL REDUCTION

HOUSING	: GREY IRON, CLASS 40B, ASTM A48
SHAFTING	: H.R. STEEL, AISI 4142 HEAT TREATED
WORM	: AISI 8620 HARDENED TEETH
WORM GEAR	: DUCTILE IRON ASTM A536
BEARINGS	: ANTI-FRICTION TYPE
LUBRICATION	: OIL BATH AND GREASE WITH OIL SEALS ON SHAFTING. HOUSING IS PROVIDED WITH OIL FILL/DRAIN PIPES AND OIL LEVEL SIGHT GLASS.
STEADY BEARING	: THE HOUSING SHALL BE PROVIDED WITH A ROLLING ELEMENT TYPE TORQUE TUBE STEADY BEARING TO PREVENT TIPPING OF THE GEAR.

OVERLOAD DEVICE:

MICRO SWITCHES (SEE TORQUE OVERLOAD DEVICE DATA SHEET) PLUS SHEAR PIN.

DESIGN STANDARDS

FINAL REDUCTION GEARING

AGMA 6034-B92 (SUPERSEDES 6034-A87) SINGLE AND DOUBLE REDUCTION OF CYLINDRICAL WORM AND HELICAL REDUCERS.

BEARINGS

MINIMUM B-10 LIFE 200,000 HOURS

FINAL OUTPUT SPEEDS : 0.04 / 0.06 RPM

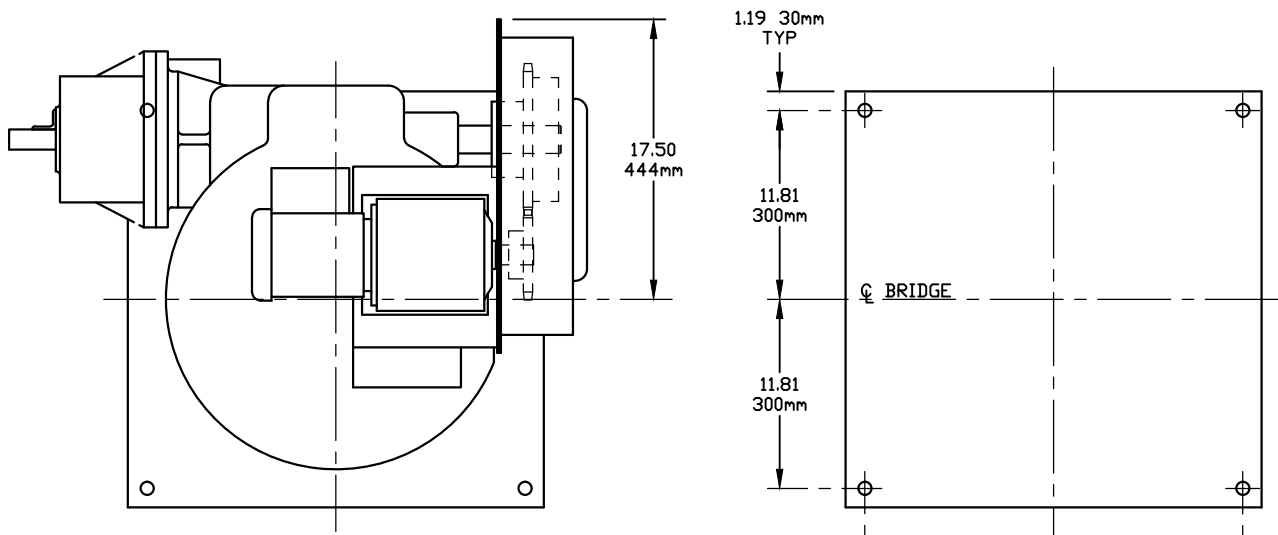
DRIVE MECHANISM TORQUE RATINGS

RATED TORQUE PER AGMA STANDARD	: 4600 ft-lbs	6238 N-m
ALARM TORQUE (100% AGMA)	: 4600 ft-lbs	6238 N-m
MOTOR SHUT OFF TORQUE (120% AGMA)	: 5520 ft-lbs	7485 N-m
SHEAR PIN TORQUE (130% AGMA)	: 5980 ft-lbs	8109 N-m
SHEAR PIN PART NO	: 103-81624-2L	
SHEAR PIN VALUE	: 1225 lbs	556 kg

Sheet:
F16-1
Rev: 0
Date: 2/8/10

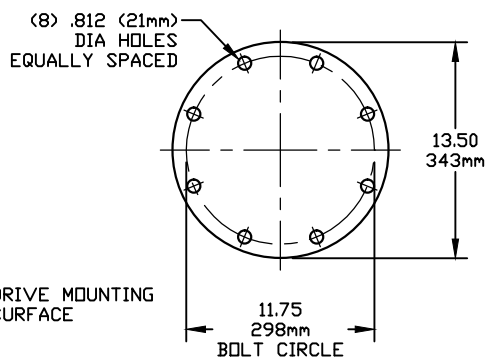
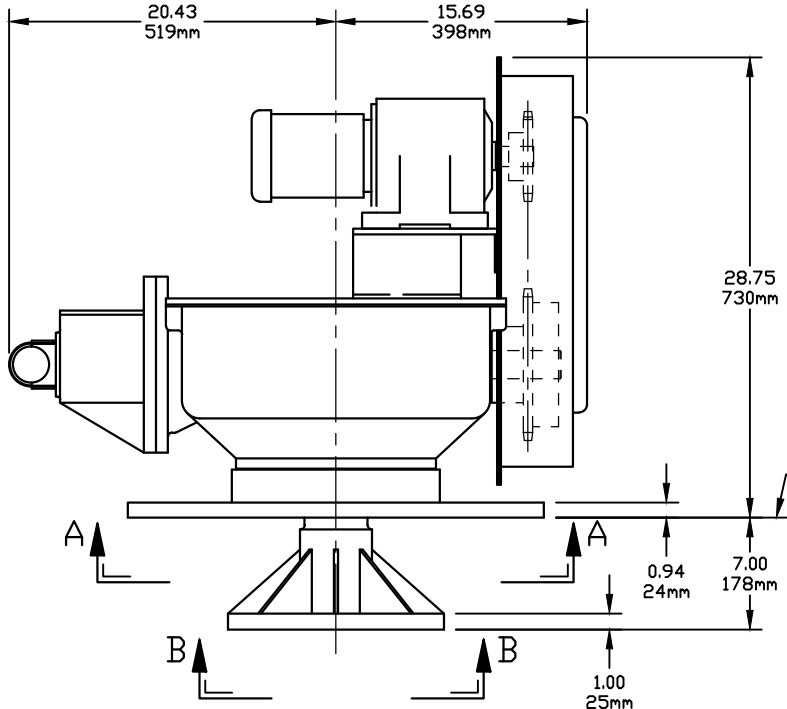
F-Type Drive Data Sheet

F16 LT & HT



(4) .81 (21mm) DIA MOUNTING HOLES

VIEW "A-A"
MOUNTING BOLT PATTERN



VIEW "B-B"
TORQUE TUBE MOUNTING PATTERN

TORQUE RATINGS				
DRIVE	AGMA & ALARM TORQUE		SHUT-OFF TORQUE	SHEAR-PIN TORQUE
F16-LT	4600 ft-lbs	6238 N-m	5520 ft-lbs 7485 N-m	5980 ft-lbs 8109 N-m
F16-HT	6700 ft-lbs	9085 N-m	8040 ft-lbs 10902 N-m	8710 ft-lbs 11811 N-m

FINAL OUTPUT RPM/INPUT HP				TOTAL WEIGHT
DRIVE	0.04 RPM	0.06 RPM	---	
F16-LT	0.50 HP/0.37 KW	0.50 HP/0.37 KW		1058#/480kg
F16-HT	0.50 HP/0.37 KW	0.50 HP/0.37 KW		1058#/480kg



B.L. Anderson Company, Inc.
8887 Eagle Ridge Court
West Chester, OH 45069
513.889.4746 Voice
513.889.5333 Fax
matt@blanderson.com
www.blanderson.com

Company: Hazen and Sawyer

Date: 12/2/2016

Attn: Mark Strahota

Quote # Budget #2

Subject: Delaware County Scioto Reserve WWTP - IMLR and RAS

Quantity	Description	Price
1	RAS Pump System Pricing	\$ 54,517.00
1	IMLR Pump System Pricing	\$ 59,463.00
1	Effluent PS Pricing - Option 1	\$ 248,966.00
1	Effluent PS Pricing - Option 2	\$ 147,356.00
	TOTAL	

Net 30 days

Signature:

**Delaware County Scioto Reserve
RAS Pump Pricing**

Part No	Description	Qty	Unit Price	Extended Price
3102.095-0023	Flygt Model NT-3102.095 4" volute Submersible pump equipped with a 460 Volt / 3 phase / 60 Hz 3.7 HP 1750 RPM motor, 465 impeller, 1 x 50 Ft. length of SUBCAB 4G4+2x1,5 submersible cable, FLS leakage detector, volute is prepared for Flush Valve	3	\$7,486.00	\$22,458.00
14-69 00 09	START UP CHARGE FLYGT 1-TP MODELS: 3000,7000,8000	1	\$1,115.00	\$1,115.00
719 03 01	CONNECTION,DISC PP 316 ANSI+ PIPE MOUNT 4630/40	1	\$2,617.00	\$2,617.00
719 02 01	FLANGE UNIT	1	\$943.00	\$943.00
613 68 04	BRACKET,GUIDE BAR UPPER 2" 316	1	\$181.00	\$181.00
83 09 38	PLUG,PROTECTIVE PE	1	\$17.00	\$17.00
693 24 01	SHIELD,VORTEX COMPLETE 316	1	\$897.00	\$897.00
14-49 01 03	TS3162 FEET 2"GUIDE RAIL 316SS	40	\$33.00	\$1,320.00
84-80 00 84	MULTISMART MSM 3MP2+ 3 PUMP W/MTR PROT NO SOFT	1	\$5,661.00	\$5,661.00
14-69 97 61C	MT-ENABLE,DNP3/MODBUS	1	\$1,720.00	\$1,720.00
14-69 97 61D	MT-ENABLE + FLOW CALCULATIONS FUNCTION	1	\$578.00	\$578.00
	Flygt Freight	1	\$900.00	\$900.00
PRIMEX	NEMA 4X Triplex Control Panel	1	\$11,000.00	\$11,000.00
ACQ550-U1-08A8-4	ABB ACQ550 5HP Wall Mounted. 480 VAC. 8.8A ND, 6.9A HD. NEMA 1 UL Type 1	3	\$1,170.00	\$3,510.00
BLA	System Startup and Training	1	\$1,600.00	\$1,600.00
TOTAL PRICE				\$54,517.00

**Delaware County Scioto Reserve
IMLR Pump Pricing**

Part No	Description	Qty	Unit Price	Extended Price
4630.492-0013	Flygt Model PP-4630 Submersible propeller pump, Stainless steel (ASTM 304), equipped with a 460 Volt / 3 phase / 60 Hz 2.5 HP 855 RPM motor, Prop 5°, 50 Ft. length of SUBCAB 4G2,5+2x1,5 submersible cable, C/W FLS leakage detector	2	\$15,287.00	\$30,574.00
14-69 00 09	START UP CHARGE FLYGT 1-TP MODELS: 3000,7000,8000	1	\$1,115.00	\$1,115.00
719 03 01	CONNECTION,DISC PP 316 ANSI+ PIPE MOUNT 4630/40	1	\$2,617.00	\$2,617.00
719 02 01	FLANGE UNIT	1	\$943.00	\$943.00
613 68 04	BRACKET,GUIDE BAR UPPER 2" 316	1	\$181.00	\$181.00
83 09 38	PLUG,PROTECTIVE PE	1	\$17.00	\$17.00
693 24 01	SHIELD,VORTEX COMPLETE 316	1	\$897.00	\$897.00
14-49 01 03	TS3162 FEET 2"GUIDE RAIL 316SS	40	\$33.00	\$1,320.00
84-80 00 84	MULTISMART MSM 3MP2+ 3 PUMP W/MTR PROT NO SOFT	1	\$5,661.00	\$5,661.00
14-69 97 61C	MT-ENABLE,DNP3/MODBUS	1	\$1,720.00	\$1,720.00
14-69 97 61D	MT-ENABLE + FLOW CALCULATIONS FUNCTION	1	\$578.00	\$578.00
	Flygt Freight	1	\$900.00	\$900.00
PRIMEX	NEMA 4X Duplex Control Panel	1	\$9,000.00	\$9,000.00
ACQ550-U1-08A8-4	ABB ACQ550 5HP Wall Mounted. 480 VAC. 8.8A ND, 6.9A HD. NEMA 1 UL Type 1	2	\$1,170.00	\$2,340.00
BLA	System Startup and Training	1	\$1,600.00	\$1,600.00
TOTAL PRICE				\$59,463.00

**Delaware County Scioto Reserve
Effluent Pump Pricing - Option 1**

Part No	Description	Qty	Unit Price	Extended Price
3315.095-YYYY	Flygt Model NP-3315.095 6" volute Submersible pump equipped with a 460 Volt / 3 phase / 60 Hz 160 HP 1780 RPM motor, 455 impeller, 2 x 50 Ft. length of SUBCAB 3x50+2G35/2+S(2x0,5) submersible cable, FLS leakage detector, volute is prepared for Flush Valve	2	\$79,316.00	\$158,632.00
14-69 00 09	START UP CHARGE FLYGT 1-TP MODELS: 3000,7000,8000	2	\$1,115.00	\$2,230.00
604 56 06	CONNECTION,DISCH 6X6" CI	2	\$1,255.00	\$2,510.00
14-59 00 00	KIT,HARDWARE 3/8IN SS (2X)	2	\$47.00	\$94.00
14-48 82 00	BOLT,ANCHOR HD 3/4 X 12IN	2	\$396.00	\$792.00
255 47 01	SLEEVE,NBR	4	\$17.00	\$68.00
661 54 01	BRACKET,GUIDE BAR U. 3" 316SS	2	\$254.00	\$508.00
14-48 71 04	CHAIN,7/16" HI-TEST GALVANIZED	50	\$52.00	\$2,600.00
14-58 91 10	HOOK,SAFETY ASSEMBLY	2	\$58.00	\$116.00
14-58 72 07	KIT,CHAIN FITTINGS FSWL 7150#	1	\$211.00	\$211.00
14-48 94 00	HOLDER,CABLE HEAVY DUTY 316SS	1	\$126.00	\$126.00
14-49 01 01	TS3163 FEET 3"GUIDE RAIL 316SS	80	\$66.00	\$5,280.00
84-80 00 84	MULTISMART MSM 3MP2+ 3 PUMP W/MTR PROT NO SOFT	1	\$5,661.00	\$5,661.00
14-60 30 09	SUPPLY,BATTERY POWER, 55W, 12V TRICKLE CHARGE,DIN RAIL KIT	1	\$194.00	\$194.00
14-69 97 61C	MT-ENABLE,DNP3/MODBUS	1	\$1,720.00	\$1,720.00
14-69 97 61D	MT-ENABLE + FLOW CALCULATIONS FUNCTION	1	\$578.00	\$578.00
84-80 00 24	PROBE,FS,10 SENSORS+ 9'7" LONG, 33' CABLE	1	\$905.00	\$905.00
14-40 71 29	MINI-CASII/FUS 120/24VAC,24VDC	2	\$469.00	\$938.00
14-40 71 30	SOCKET,11-PIN BACK MOUNTING	2	\$74.00	\$148.00
582 88 30	SENSOR,ENM-10 0.95-1.1 40'	3	\$323.00	\$969.00
	Flygt Freight	1	\$3,000.00	\$3,000.00
PRIMEX	NEMA 4X Duplex Control Panel	1	\$28,000.00	\$28,000.00
ACQ550-U1-08A8-4	ABB ACQ550 200 HP Wall Mounted. 480 VAC. 246A ND, 192A HD. NEMA 1 UL Type 1	2	\$16,043.00	\$32,086.00
BLA	System Startup and Training	1	\$1,600.00	\$1,600.00

\$248,966.00

**Delaware County Scioto Reserve
Effluent Pump Pricing - Option 2**

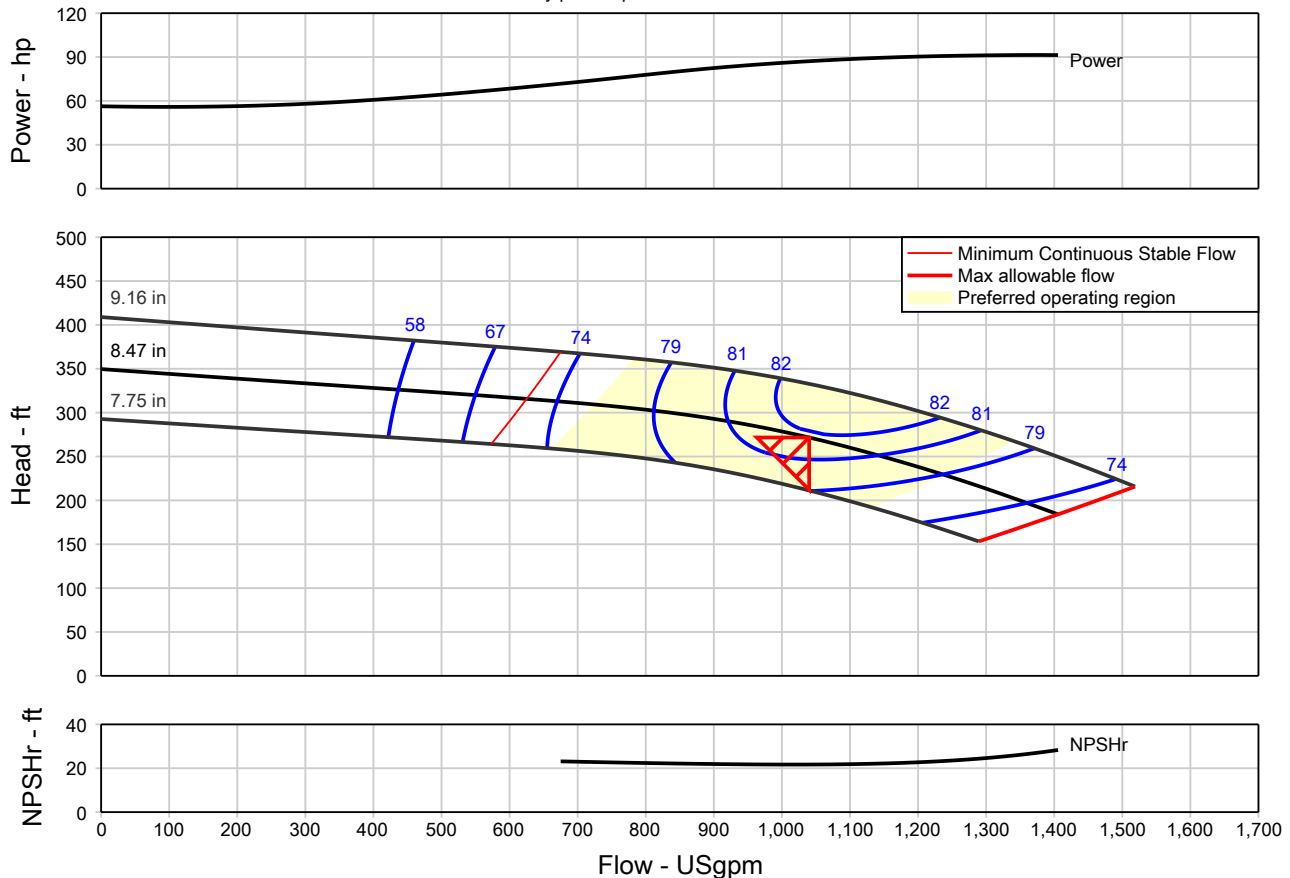
Part No	Description	Qty	Unit Price	Extended Price
3202.095-0183	Flygt Model NP-3202.095 4" volute Submersible pump equipped with a 460 Volt / 3 phase / 60 Hz 72 HP 3550 RPM motor, 273 impeller, 1 x 50 Ft. length of SUBCAB 3x50+2G35/2+S(2x0,5) submersible cable, FLS leakage detector	2	\$43,425.00	\$86,850.00
14-69 00 09	START UP CHARGE FLYGT 1-TP MODELS: 3000,7000,8000	1	\$1,115.00	\$1,115.00
540 13 05	CONNECTION,DISCH 4X4" CI	2	\$769.00	\$1,538.00
661 54 00	BRACKET,GUIDE BAR U. 3" GALV	2	\$158.00	\$316.00
255 47 01	SLEEVE,NBR	4	\$17.00	\$68.00
14-48 71 14	CHAIN,3/8" PROOF COIL GALV	50	\$25.00	\$1,250.00
14-58 72 06	KIT,CHAIN FITTING GA 3170-3202	2	\$117.00	\$234.00
14-58 91 05	HOOK,SAFETY ASSEMBLY	2	\$32.00	\$64.00
14-58 95 20	HARDWARE,DISC CONN ASSY	2	\$111.00	\$222.00
14-59 00 00	KIT,HARDWARE 3/8IN SS (2X)	2	\$47.00	\$94.00
582 88 30	SENSOR,ENM-10 0.95-1.1 40'	2	\$323.00	\$646.00
14-40 71 29	MINI-CASII/FUS 120/24VAC,24VDC	2	\$469.00	\$938.00
14-40 71 30	SOCKET,11-PIN BACK MOUNTING	2	\$74.00	\$148.00
14-48 94 00	HOLDER,CABLE HEAVY DUTY 316SS	1	\$126.00	\$126.00
14-49 01 01	TS3163 FEET 3"GUIDE RAIL 316SS	80	\$66.00	\$5,280.00
84-80 00 84	MULTISMART MSM 3MP2+ 3 PUMP W/MTR PROT NO SOFT	1	\$5,661.00	\$5,661.00
14-60 30 09	SUPPLY,BATTERY POWER, 55W, 12V TRICKLE CHARGE,DIN RAIL KIT	1	\$194.00	\$194.00
14-69 97 61C	MT-ENABLE,DNP3/MODBUS	1	\$1,720.00	\$1,720.00
14-69 97 61D	MT-ENABLE + FLOW CALCULATIONS FUNCTION	1	\$578.00	\$578.00
84-80 00 24	PROBE,FS,10 SENSORS+ 9'7" LONG, 33' CABLE	1	\$905.00	\$905.00
582 88 30	SENSOR,ENM-10 0.95-1.1 40'	3	\$323.00	\$969.00
	Flygt Freight	1	\$3,000.00	\$3,000.00
PRIMEX	NEMA 4X Duplex Control Panel	1	\$19,000.00	\$19,000.00
ACQ550-U1-08A8-4	ABB ACQ550 75HP Wall Mounted. 480 VAC. 97A ND, 77A HD. NEMA 1 UL Type 1	2	\$7,420.00	\$14,840.00
BLA	System Startup and Training	1	\$1,600.00	\$1,600.00

\$147,356.00

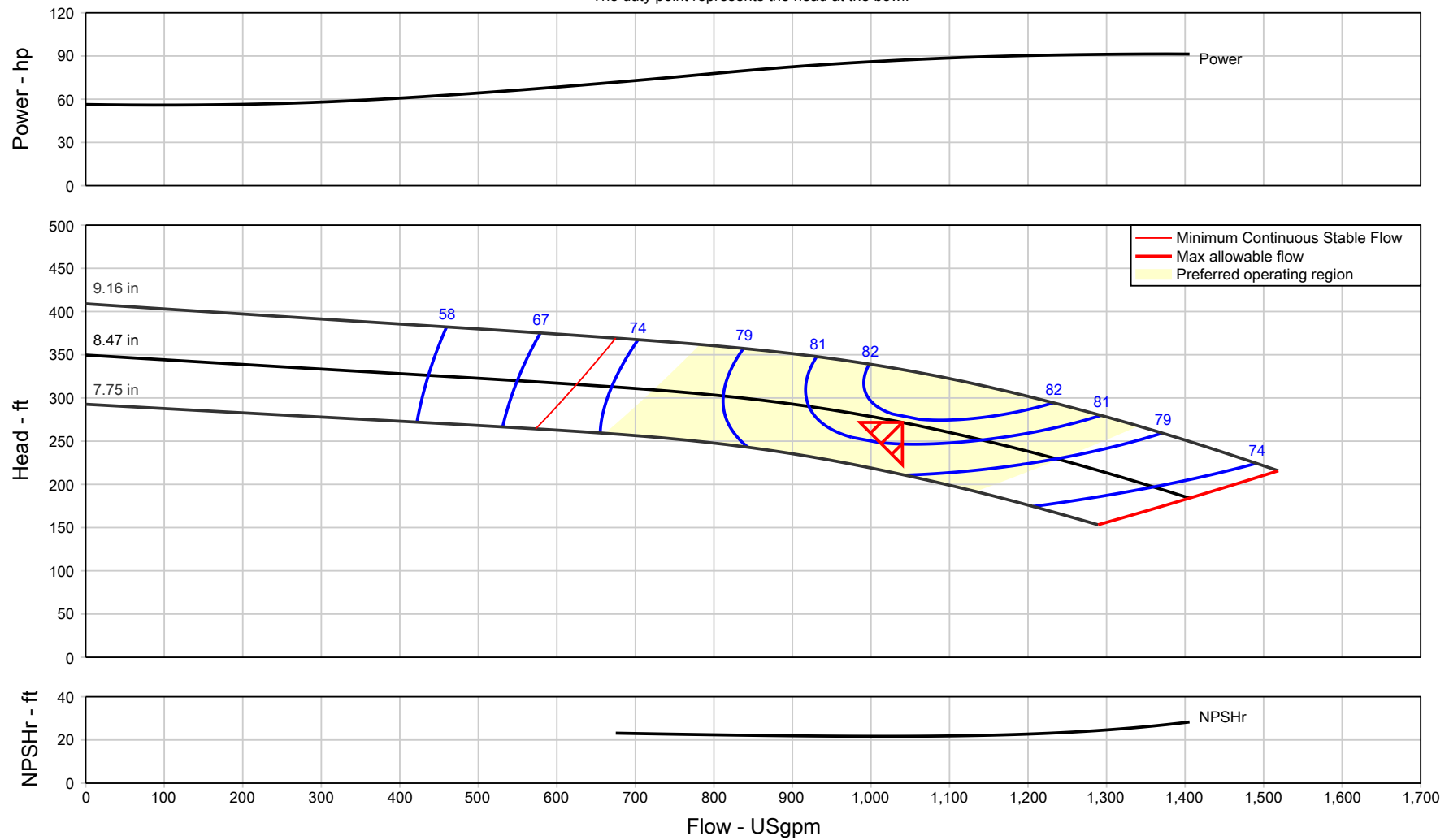
Item number	: 010	Size	: 12M-SS
Service	:	Stages	: 4
Quantity	: 1	Based on curve number	: 12_TURB_2160_1800_SS
Quote number	: 572207	Date last saved	: 01 Dec 2016 2:20 PM

Operating Conditions		Liquid	
Flow, rated	: 1,040.0 USgpm	Liquid type	: Water
Differential head / pressure, rated (requested)	: 270.0 ft	Additional liquid description	:
Differential head / pressure, rated (actual)	: 270.0 ft	Solids diameter, max	: 0.00 in
Suction pressure, rated / max	: 0.00 / 0.00 psi.g	Solids concentration, by volume	: 0.00 %
NPSH available, rated	: Ample	Temperature, max	: 68.00 deg F
Frequency	: 60 Hz	Fluid density, rated / max	: 1.000 / 1.000 SG
Performance		Viscosity, rated	: 1.00 cP
Speed, rated	: 1770 rpm	Vapor pressure, rated	: 0.34 psi.a
Impeller diameter, rated	: 8.47 in	Material	
Impeller diameter, maximum	: 9.16 in	Material selected	: Cast iron bowl - Standard impeller material
Impeller diameter, minimum	: 7.75 in	Pressure Data	
Efficiency (bowl / pump)	: 81.84 / 81.23 %	Maximum working pressure	: See the Additional Data page
NPSH required / margin required	: 21.70 / 0.00 ft	Maximum allowable working pressure	: See the Additional Data page
nq (imp. eye flow) / S (imp. eye flow)	: 43 / 113 Metric units	Maximum allowable suction pressure	: N/A
Minimum Continuous Stable Flow	: 625.1 USgpm	Hydrostatic test pressure	: See the Additional Data page
Head, maximum, rated diameter	: 349.7 ft	Driver & Power Data	
Head rise to shutoff (bowl / pump)	: 28.69 / 29.10 %	Driver sizing specification	: Maximum power
Flow, best eff. point (bowl / pump)	: 1,033.7 / 1,029.7 USgpm	Margin over specification	: 0.00 %
Flow ratio, rated / BEP (bowl / pump)	: 100.61 / 101.00 %	Service factor	: 1.00
Diameter ratio (rated / max)	: 92.47 %	Power, hydraulic	: 71.33 hp
Head ratio (rated dia / max dia)	: 81.63 %	Power (bowl / pump)	: 87.16 / 87.54 hp
Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010]	: 1.00 / 1.00 / 1.00 / 1.00	Power, maximum, rated diameter	: 91.80 hp
Selection status	: Acceptable	Minimum recommended motor rating	: 100 hp / 74.57 kW

Bowl performance. Adjusted for construction and viscosity.
 The duty point represents the head at the bowl.

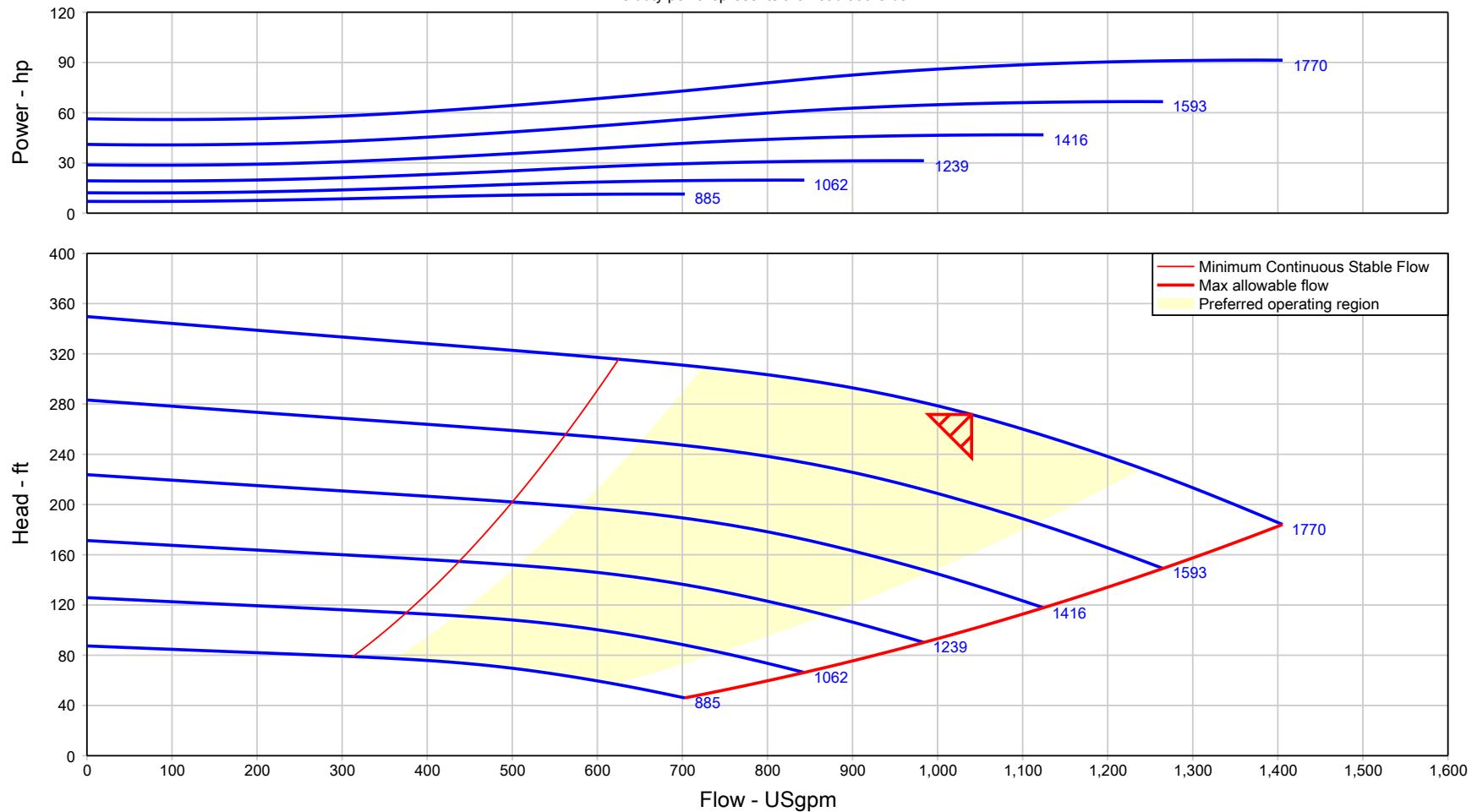


Bowl performance. Adjusted for construction and viscosity.
The duty point represents the head at the bowl.



Item number	: 010	Size	: 12M-SS	Flow, rated	: 1,040.0 USgpm
Service	:	Stages	: 4	Differential head / pressure, rated	: 270.0 ft
Quantity	: 1	Speed, rated	: 1770 rpm	NPSH required	: 21.70 ft
Quote number	: 572207	Based on curve number	: 12_TURB_2160_1800_SS	Fluid density, rated / max	: 1.000 / 1.000 SG
Date last saved	: 01 Dec 2016 2:20 PM	Efficiency (bowl / pump)	: 81.84 / 81.23 %	Viscosity	: 1.00 cP
		Power (bowl / pump)	: 87.16 / 87.54 hp	Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010]	: 1.00 / 1.00 / 1.00 / 1.00

Bowl performance. Adjusted for construction and viscosity.
The duty point represents the head at the bowl.



Item number	: 010	Size	: 12M-SS	Flow, rated	: 1,040.0 USgpm
Service	:	Stages	: 4	Differential head / pressure, rated	: 270.0 ft
Quantity	: 1	Speed, rated	: 1770 rpm	NPSH required	: 21.70 ft
Quote number	: 572207	Based on curve number	: 12_TURB_2160_1800_SS	Fluid density, rated / max	: 1.000 / 1.000 SG
Date last saved	: 01 Dec 2016 2:20 PM	Efficiency (bowl / pump)	: 81.84 / 81.23 %	Viscosity	: 1.00 cP
		Power (bowl / pump)	: 87.16 / 87.54 hp	Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010]	: 1.00 / 1.00 / 1.00 / 1.00
				Impeller diameter, rated	: 8.47 in

Item number	: 010	Size	: 12M-SS
Service	:	Stages	: 4
Quantity	: 1	Speed, rated	: 1770 rpm
Quote number	: 572207	Frame size	:
		Date last saved	: 01 Dec 2016 2:20 PM

Performance Data	Stage, Speed and Solids Limits		
Head, maximum diameter, rated flow	: 332.8 ft	Stages, maximum	: 8
Head, minimum diameter, rated flow	: 211.3 ft	Stages, minimum	: 1
Head, maximum, rated diameter	: 349.7 ft	Pump speed limit, maximum	: 1800 rpm
Efficiency adjustment factor, total	: 1.00	Pump speed limit, minimum	: 901 rpm
Power adjustment, total	: 0.00 hp	Curve speed limit, maximum	: 1900 rpm
Head adjustment factor, total	: 1.00	Curve speed limit, minimum	: 901 rpm
Flow adjustment factor, total	: 1.00	Variable speed limit, minimum	: 450 rpm
NPSHR adjustment factor, total	: 1.00	Solids diameter limit	: 0.94 in
NPSH margin dictated by pump supplier	: 0.00 ft	Typical Driver Data	
NPSH margin dictated by user	: 0.00 ft	Driver speed, full load	: 1780 rpm
NPSH margin used (added to 'required' values)	: 0.00 ft	Driver speed, rated load	: 1782 rpm

Mechanical Limits	Typical Driver Data		
Torque, rated power, rated speed	: 4.95 hp/100 rpm	Driver efficiency, 100% load	: N/A
Torque, maximum power, rated speed	: 5.19 hp/100 rpm	Driver efficiency, 75% load	: N/A
Torque, driver power, full load speed	: 5.62 hp/100 rpm	Driver efficiency, 50% load	: N/A
Torque, driver power, rated speed	: 5.65 hp/100 rpm		
Torque, pump shaft limit	: 19.56 hp/100 rpm		
Radial load, worst case	: -		
Radial load limit	: -		
Impeller peripheral speed, rated	: -		
Impeller peripheral speed limit	: -		

Various Performance Data	Flow (USgpm)	Head (ft)	Efficiency (%)	NPSHr (ft)	Power (hp)
Shutoff, rated diameter	0.00	349.7	-	-	56.33
Shutoff, maximum diameter	0.00	408.9	-	-	69.37
Minimum Continuous Stable Flow	625.1	315.7	71.68	23.51	69.50
Rated flow, minimum diameter	1,040.0	211.3	79.05	-	70.18
Rated flow, maximum diameter	1,040.0	332.8	82.46	-	106
BEP flow, rated diameter	1,033.7	272.8	81.85	21.69	86.99
120% rated flow, rated diameter	1,248.0	226.7	78.66	23.48	90.82
End of curve, rated diameter	1,405.6	184.1	71.52	28.32	91.34
End of curve, minimum diameter	1,289.3	153.3	69.28	24.37	72.01
End of curve, maximum diameter	1,518.8	215.8	72.59	34.90	114
Maximum value, rated diameter	-	349.7	81.85	-	91.80
Maximum value, maximum diameter	-	-	82.83	-	114

System differential pressure	@ Density, rated	@ Density, max
Differential pressure, rated flow, rated diameter (psi)	117.6	117.6
Differential pressure, shutoff, rated diameter (psi)	151.3	151.3
Differential pressure, shutoff, maximum diameter (psi)	177.0	177.0

Discharge pressure	@ Suction pressure, rated	@ Suction pressure, max	@ Suction pressure, rated	@ Suction pressure, max
Discharge pressure, rated flow, rated diameter (psi.g)	117.6	117.6	117.6	117.6
Discharge pressure, shutoff, rated diameter (psi.g)	151.3	151.3	151.3	151.3
Discharge pressure, shutoff, maximum diameter (psi.g)	177.0	177.0	177.0	177.0

Ratios	Maximum flow / rated flow, rated diameter	Head rated diameter / head minimum diameter, rated flow
	: 135.16 %	: 128.57 %

Head and Power Losses

Friction loss rate, column	: 2.62 %
Friction loss, column	: 0.32 ft
Friction loss, discharge head	: 0.53 ft
Friction loss, can/barrel	: -
Friction loss, suction bell and strainer	: 0.00 ft
Friction loss, bowl/column adaptor	: 0.01 ft
Friction loss, total	: 0.86 ft
Power loss, lineshaft bearings	: 0.12 hp
Power loss, thrust bearing	: 0.26 hp
Power loss, total	: 0.38 hp

Dimensions

Minimum clearance below suction bell lip/case	: 3.25 in
Minimum well diameter	: 13.00 in
Suction nozzle centerline height	: -
Bowl assembly length, first stage	: 15.93 in
Bowl assembly length, upper stage	: 10.75 in
Bowl assembly length, total	: 48.18 in
Suction bearing hub length	: 6.13 in
Strainer length	: 7.00 in
Bowl to column adaptor length	: 5.30 in
Discharge head stick-down	: -2.00 in
Submersible motor adaptor length	: -

Bowl vs. Pump Performance

Head (bowl / pump)	: 271.7 ft / 270.0 ft
Efficiency (bowl / pump)	: 81.84 % / 81.23 %
Power (bowl / pump)	: 87.16 hp / 87.54 hp
NPSH required at first stage impeller eye	: 21.70 ft

Submersible motor length	: -
Column length	: 12.13 ft
Total pump length	: 17.00 ft
Can / barrel length	: -
Stuffing box sleeve diameter	: 1.44 in

Weights and Down Thrust

Weight, lineshaft	: 60.53 lb
Weight, bowl assembly rotating element	: 118.0 lb
Thrust factor	: 6.33 lb/ft
Thrust, hydraulic (rated / max)	: 1,716.9 / 2,209.5 lbf
Thrust, bowl shaft end (rated / max)	: -0.00 / -0.00 lbf
Thrust, shaft step (rated / max)	: 113.4 / 113.4 lbf
Thrust, stuffing box sleeve (rated / max)	: -46.25 / -46.25 lbf
Thrust, total (rated / max)	: 1,962.5 / 2,455.2 lbf
Thrust bearing capacity	: -

Suction bell diameter	: 11.50 in
Minimum submergence to prevent vortexing	: 33.00 in
Discharge head height	: 22.94 in
Discharge nozzle centerline height	: 10.00 in
Min distance discharge nozzle centerline to suction bell	: 0.00

Lineshaft length	: 14.48 ft
Bowl shaft diameter	: 1.69 in
Bowl diameter, outside	: 12.26 in
Bowl diameter, exit	: 9.00 in
Column diameter, inside	: 8.07 in
Column internal obstruction diameter	: 1.25 in
Can/barrel diameter, inside	: -
Can/barrel obstruction diameter	: -

Pressure Data

	Maximum working pressure (psi.g)	Maximum allowable working pressure (psi.g)	Hydrostatic test pressure (psi.g)
Bowl	151.3	380.0	570.0
Column	151.3	400.0	N/A
Discharge head	151.3	175.0	N/A
Can/Barrel	-	-	-

NPSH

NPSH at bowl (available / required)	: Ample / 21.70 ft
NPSH at low liquid level (available / required)	: Ample / 5.68 ft
NPSH at suction flange (available / required)	: - / -

Torque Limits

Torque, lineshaft limit	: 6.60 hp/100 rpm
-------------------------	-------------------

Liquid Velocities

Column liquid velocity	: 6.68 ft/s
Can liquid velocity	: -
Suction nozzle liquid velocity	: -

Potable water

Is this for potable water service?	: No
------------------------------------	------

Product line options

Pump type	: Wet pit	Low liquid level (Bottom of baseplate/soleplate to minimum submergence level)	: ft
Head measured at	: Disch. nozzle centerline	NPSHa measured at	: Bowl
Length Strategy	: Pump length with soleplate and with	Discharge nozzle location from mounting surface	: Auto in

	strainer(from bottom of soleplate to strainer)		
Length	: 17.00 ft	Column liquid velocity limit	: 16.40 ft/s
Product line options - additional			
Pump Shaft Material	: Standard	Suction strainer	: Basket, clip-on / bolt-on
Bowl to column conn.	: Discharge case threaded	Column construction	: Threaded
Motor shaft type	: Hollow shaft	Column type	: AWWA Standard Wall
Flanged adjustable coupling	: None	Column diameter	: 8 inch
Flange rating	: 125#	Lineshaft type	: Threaded lineshaft
Soleplate	: Yes	Lineshaft lubrication	: Open lineshaft, product lube
Discharge head conn.	: Flanged	Lineshaft diameter	: 1 1/4 inches
Discharge head design and material	: Type CT-Cast Iron	Lineshaft material	: Carbon steel (AISO-C1045)
Discharge head size	: 16.5 or 20 BD x 8		
Suction type	: Bell		

Strahota, Mark

From: Timothy Shaw <tshaw@HPThompson.com>
Sent: Tuesday, December 06, 2016 4:31 PM
To: Strahota, Mark
Subject: FW: Delaware County Information Request - Scioto Reserve WWTP Effluent Pumps
Attachments: 12 SS.PDF

Mark,

Please see the following pump selection as requested for the Fairbanks Vertical Turbine pump.

12M-SS, 4 Stage 100 HP, 1780 RPM, w/ Stainless Steel Impeller, 8" threaded column assembly in max 5 ft. sections, Flanged bowl Assembly, 19' estimated overall length (bowl/column assembly), Type CT Cast Iron 16 1/2" x 8" discharge head with 442 Mechanical seal, and Steady Bushing. Includes U.S. Motor, Premium Eff, TEFC drive motor. Vertical Hollow Shaft VHS, 100 HP, 1800 RPM. Performance and Hydro testing.

Price: \$38,950 each plus freight and startup.

Thanks,
Tim

From: Timothy Shaw
Sent: Thursday, December 01, 2016 5:11 PM
To: 'Strahota, Mark'
Subject: RE: Delaware County Information Request - Scioto Reserve WWTP Effluent Pumps

Mark,

We are unable to provide a selection for a submersible pump to meet the design conditions due to the high head requirements. Attached is a selection for a Vertical Turbine which is relatively common for plant effluent. Let me know if you will consider vertical turbine pumps for this application.

Thanks,
Tim

Timothy B. Shaw, PE | The Henry P. Thompson Company

Providing Clean Water Solutions.....Since 1910

101 Main Street, Suite 300 | Milford, OH 45150-1183 | www.hpthompson.com

TShaw@HPThompson.com | Office: (513) 248-3229 | Cell: (513) 807-7256 | Fax: (513) 248-3201

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From: Strahota, Mark [<mailto:mstrahota@hazenandsawyer.com>]
Sent: Monday, November 28, 2016 9:58 AM

To: Timothy Shaw

Subject: Delaware County Information Request - Scioto Reserve WWTP Effluent Pumps

Hi Tim,

See attached an additional request for information for DCRSD Scioto Reserve. Apologies for the short notice, but if you can provide the requested information this week, that would be greatly appreciated.

Please let me know if you have any questions. Thank you

Mark Strahota, PE

Associate | Hazen and Sawyer

150 E. Campus View Blvd, Suite 133, Columbus, OH 43235

614-781-9655 (office main) | 614-396-8826 (direct) | 512-507-9546 (cell)

mstrahota@hazenandsawyer.com | hazenandsawyer.com



3020 Gore Road
 London, Ontario N5V 4T7
 1-888- 220-6118
 Tel: (519) 457-3400 / Fax: (519) 457-3030
 www.trojanuv.com

**Trojan System UV3000™PTP
 Municipal Wastewater Disinfection Equipment**

Project Name: Scioto Reserve - Delaware Co.,OH

Quote Number: PCP1366

Date: 1/17/2017

Prepared For:	Mark Strahota	Phone:	614-396-8826
Company:	Hazen and Sawyer	Fax:	
		Email:	mstrahota@hazenandsawyer.com

UV System Design Parameters		Guaranteed Performance	
Peak Design	1,500,000 Gpd	Validated UV Dose	>35,000 uWs/cm2
UV Transmittance	65% (minimum)	Disinfection Limit	<200fecal coliform /100 ml
TSS Concentration	30 mg/l, 30-day average		30 day geometric mean

EQUIPMENT DETAILS 3800KPTP – Three units in parallel – 50% redundancy

- Complete UV system supplied with three Type 304 Stainless Steel Channels, Module Support Racks, Level Control Weirs, Transition Boxes, Monitoring Systems, Spare Parts Package and Operators Kit.
- 24 Type 316 Stainless Steel Modules supplied, containing 4 UV lamps each – Total of 32 UV lamps per bank
- Each UV module weighs 38 pounds and is easily handled by one person
- Each UV module has a standard 120V plug and 10 foot weatherproof cable for connection to GFI receptacle
- 12 outdoor-rated GFI Power Distribution Receptacles supplied (one for 2 modules)
- Each lamp consumes 87.5 Watts – Total system power requirement of 2,800 Watts per bank (5,600 Watts duty)
- Lamp on/off status indicated on each UV module using LED indicators
- Monitoring System provided for local indication of UV intensity, lamp age and alarms
- Remote indication of UV intensity and low UV intensity alarm available
- Each monitoring System requires 120V, single phase, 2 wire, 5 amp power supply
- Please refer to the enclosed drawings and specifications for full design details and requirements

COMMERCIAL DETAILS

- Comprehensive Lamp Warranty: Full replacement (non pro-rated) up to 12,000 hours
- System Warranty: 12 months after start-up or 18 months after shipment, whichever occurs first
- 3 Copies of Shop Drawings and O&M Manuals will be supplied
- Equipment Delivered 3-5 weeks after release for fabrication (approved shop drawings)
- Prices do not include any duties or taxes that may be applicable
- Prices are FOB factory, freight paid to jobsite
- Start-up and Training provided by Trojan-certified local service provider

SELLING PRICE \$ 139,200.00

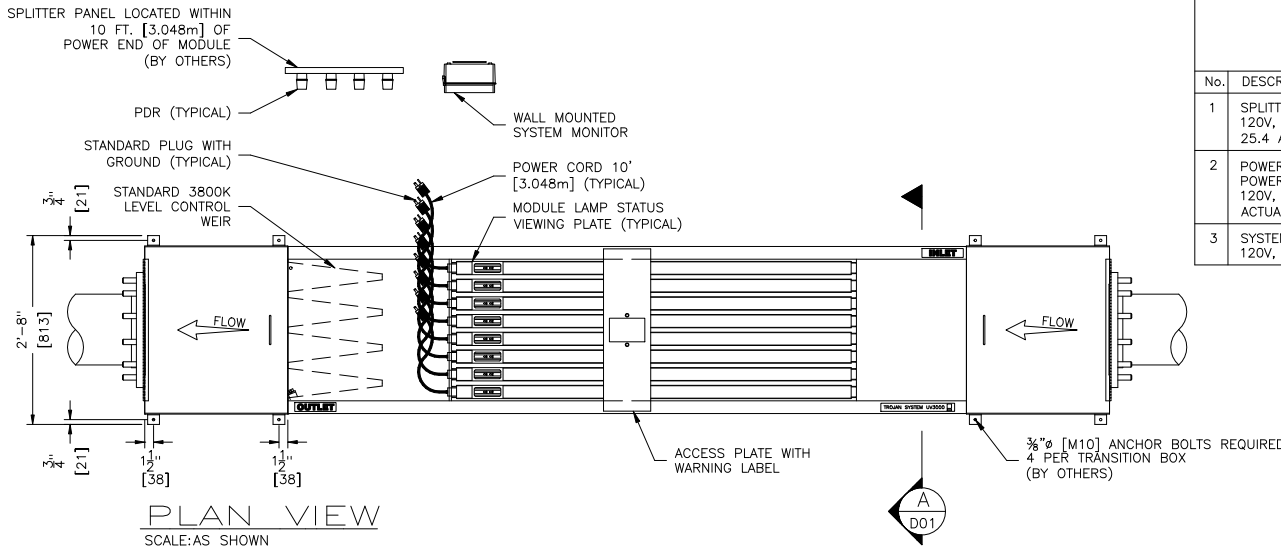
Please contact me if you have any questions about this design. I look forward to working with you on this project.

Rep Name:	Timothy B. Shaw, PE	Phone:	513-248-3200
Rep Company:	The Henry P. Thompson Co.	Fax:	513-248-3200
Email:	tshaw@hpthompson.com		

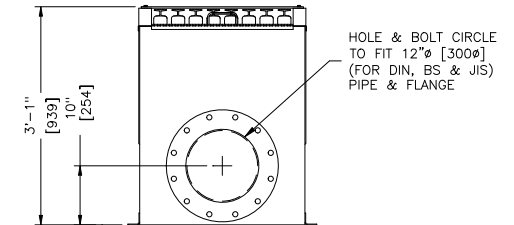
TROJAN UV3000™ PTP

EQUIPMENT INTERCONNECTIONS

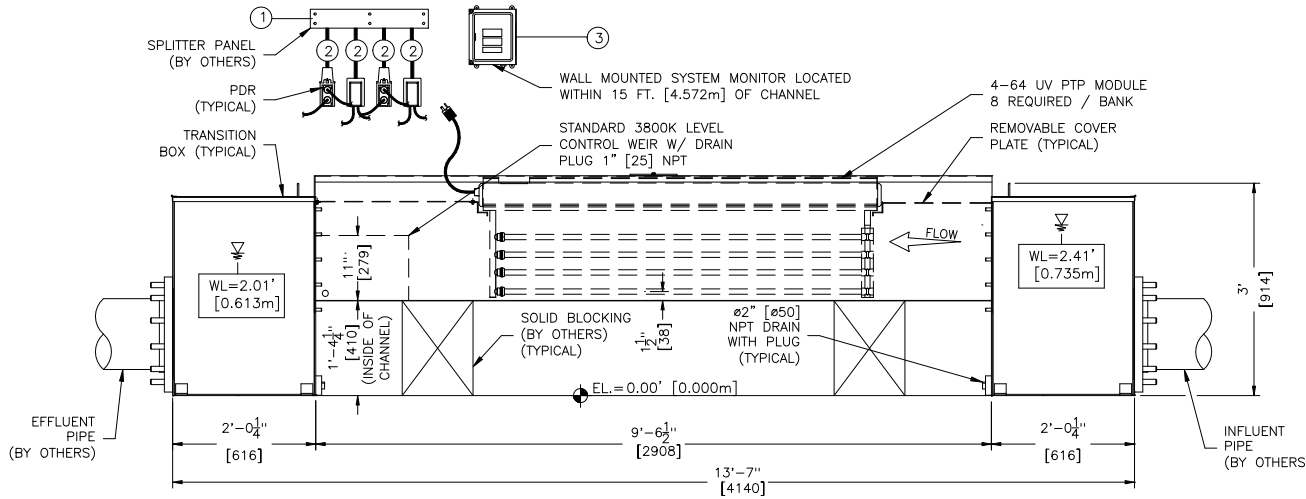
No.	DESCRIPTION	FROM	TO
1	SPLITTER PANEL POWER SUPPLY 120V, 1 PHASE, 2 WIRE, ACTUAL DRAW 25.4 AMPS / SPLITTER PANEL	DISTRIBUTION PANEL (DP) (NOT SHOWN) (BY OTHERS)	SPLITTER PANEL (BY OTHERS)
2	POWER DISTRIBUTION RECEPTACLE (PDR) POWER SUPPLY 120V, 1 PHASE, 2 WIRE, ACTUAL DRAW 6.3 AMPS / PDR	SPLITTER PANEL (BY OTHERS)	PDR
3	SYSTEM MONITOR POWER SUPPLY 120V, 1 PHASE, 2 WIRE, 5 AMPS	DP (NOT SHOWN) (BY OTHERS)	SYSTEM MONITOR



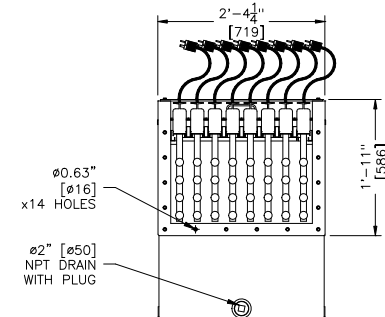
PLAN VIEW
SCALE: AS SHOWN



END VIEW (TYPICAL)
SCALE: AS SHOWN



FRONT VIEW
SCALE: AS SHOWN



A SECTION
SCALE: AS SHOWN
NOTE: PDR, SPLITTER PANEL (BY OTHERS) AND SYSTEM MONITOR NOT SHOWN FOR CLARITY

NOTES:

- : DO NOT slope channel floor.
- : CHANNEL WIDTH & DEPTH MUST BE KEPT WITHIN A TOLERANCE OF + OR - 1/4" [6].
- : ANCHOR BOLTS ARE NOT SUPPLIED BY TROJAN TECHNOLOGIES.
- : BOLTS, WASHERS & NUTS FOR CONNECTION OF CHANNEL TO TRANSITION BOXES ARE PROVIDED BY TROJAN TECHNOLOGIES.
- : SYSTEM CONDUIT, WIRING, DISTRIBUTION PANELS & INTERCONNECTIONS BY OTHERS.
- : ELECTRICAL REQUIREMENTS SHOWN ARE TO SUPPLY TROJAN UV EQUIPMENT ONLY. ELECTRICAL INRUSH FACTOR TO BE ADDED AS PER LOCAL CODE.
- : ANY EXTRA OUTLETS NOT BEING USED BY TROJAN EQUIPMENT HAVE NOT BEEN INCLUDED IN THE INTERCONNECT AMPERAGE.
- : CONTRACTOR TO REVIEW ALL TROJAN TECHNOLOGIES INSTALLATION INSTRUCTIONS PRIOR TO EQUIPMENT INSTALLATION.
- : ACCESS IS REQUIRED FOR MODULE REMOVAL - NOTE THE CHANNEL WIDTH AND ENSURE ADEQUATE ACCESS IS PROVIDED TO ALL MODULES.
- : DO NOT ENCASE THE STEEL CHANNEL IN CONCRETE.
- : [] INDICATES MILLIMETERS UNLESS OTHERWISE SPECIFIED.

MULTIPLE CHANNELS IN PARALLEL (OPTION):

- : ADDITIONAL UNITS CAN BE INSTALLED PARALLEL TO THE UNIT SHOWN.
- : ACCESS BETWEEN EVERY 2 PARALLEL CHANNELS IS REQUIRED FOR MODULE REMOVAL - NOTE THE CHANNEL WIDTH AND ENSURE ADEQUATE ACCESS IS PROVIDED BETWEEN TRANSITION BOXES AND CHANNELS.
- : ACCESS BETWEEN A MAXIMUM OF 2 CHANNELS IS NOT REQUIRED FOR MODULE REMOVAL. TRANSITION BOXES CAN BE INSTALLED ADJACENT TO EACH OTHER.

TROJAN UV

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DESCRIPTION: LAYOUT, UV3000PTP-UV3800K 1 CHANNEL 1 BANK 4 LAMPS WEIR		STANDARD DRAWING NO. 3M0520	
DRAWN BY : LZ/JM/SPM	DATE : 12JN21	REFERENCE NO. N/A	
CHECKED BY : SAH	DATE : 12JN22	DWG NO.	REV.
APPROVED BY : CAP	DATE : 12JN22	D01	D
SCALE (8 1/2 x 11) : NOT TO SCALE		LOG NUMBER : N/A	

Q67051
Revision -



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 Q67051- Rapid Mixer- PMSLMixerCalc



Introduction

January 26, 2017

Mark Strahota, PE
Hazen and Sawyer
150 E. Campus View Blvd
Suite 133
Columbus, OH 43235

Quotation Number: Q67051 **Revision:** -
Reference: DCRSD Scioto Reserve Disinfection
Subject: Rapid Mixer

Dear Mark,

Philadelphia Mixing Solutions Ltd. (PMSL) is a global leader in supplying mixing equipment and process technology; with more than 50 years of fluid mixing experience. We are capable of providing the highest levels of expertise and experience for your mechanical and process mixing solutions.

- ✓ To ensure long design life, Philadelphia Mixing Solutions, Ltd. Designs its own gear drives, shafts, and impellers that are specifically designed to accommodate the stresses common with mixing/agitation applications.
- ✓ **ISO-9001:2008 Certified**
- ✓ PMSL is equipped to perform a variety of laboratory tests and computer modeling at our Palmyra, Pennsylvania facility including CFD, FEA, PIV laser, and many mixer configurations

Thanks again for giving us this opportunity. We greatly appreciate your business and look forward to working with your team.

Your contacts at Philadelphia Mixing Solutions:

Regional Sales Manager

Christopher Knecht
+1 (717) 269-8929
cknecht@philamixers.com

Application Engineer

Audrey O'Neal
+1 (717) 832-8838
aoneal@philamixers.com

Manufacturer's Representative

Tim Shaw
Henry P. Thompson Company
+1 (513) 807-7256
tshaw@HPTHompson.com

PMSL Offering

PHILADELPHIA MIXING SOLUTIONS STANDARD OFFERING

<u>Tank Tag</u>	<u>Mixer Description</u>	<u>Motor Power</u>	<u>Wetted End MOC</u>	<u>Tank Mounting</u>	<u>Qty.</u>	<u>Price Each</u>	<u>Currency</u>
Rapid Mixer	Raven 3800 Series	5 HP	316 SS	Drivestand - PTOS	3	\$28,200	USD
Total:						\$84,600	USD

SPECIAL REQUIREMENTS

<u>Description</u>	<u>Mixer Description</u>	<u>Price Adder per Unit</u>

Commercial Offering

LEAD TIME

Approval drawings will be issued 4 weeks after receipt of order and acceptance by PMSL.

Shipment will be 12-14 weeks after receipt of approved outline drawings and release to manufacture.

The standard lead time mentioned above is based upon current shop load and inventory. It may be possible to accelerate delivery upon request. Actual lead time is to be confirmed at receipt of order and release for manufacture, subject to current shop load.

FREIGHT (INCOTERM 2010)

EXW (Ex Works) Factory, Palmyra, PA

Unless otherwise stated, crating is not included in freight costs.

PAYMENT TERMS

To be determined.

Pricing does not include any taxes or tariffs. All orders will be billed on a pro rata basis for approved partial shipments.

PRICING VALIDITY

Budgetary

SPECIFICATIONS

No specifications were reviewed at this time.

STANDARD DOCUMENTATION

Documentation will be our standard documentation package comprising:

- GA drawing with mixer dimensions, weights, nozzle loads
- Motor dimensional drawing
- Motor wiring diagram
- Motor data sheets (manufacturers standard)
- Installation, Operation and Maintenance Manual

FACTORY SERVICE

Startup, training, and installation assistance are not included in the price as quoted. If field service is desired, it may be purchased directly from Philadelphia Mixing Solutions per our standard Field Service Rates (available upon request).

WARRANTY

Our mechanical warranty for this equipment will be 12 months after start-up, not to exceed 18 months after shipment. We agree to repair or replace any mixer component supplied by PMSL that, during the warranty period, fails because of defects in materials or defects caused by factory workmanship. This warranty is based upon proper storage, installation according to instructions, and proper maintenance after start-up. Our service manuals will detail the procedure to be used. Extended warranties are available on request.

RAW MATERIALS ADDER

As PMSL is dependent on other suppliers for raw material, we are subject to unforeseeable and uncontrollable fluctuations in pricing levels for such products. For this reason, PMSL must adjust its prices to reflect our increased costs should the order be placed outside the quoted pricing validity period.

CANCELLATION POLICY

Cancellation in whole, or in part, after release to manufacture may result in cancellation charges for materials purchased, work performed, and/or services provided up to and including date of cancellation.

Milestone Schedule of Cancellation charges would be:

- 20% of Order Value at Approval Drawing submission (only applicable for approval orders)
- 45% of Order Value at Release to Fabricate
- 90% of Order Value at Receipt of Motors / Seals, etc.
- 100% of Order Value from Completed Assembly stage

TERMS & CONDITIONS

This quotation is subject to the Standard Terms and Conditions of Sale, as outlined on the attached. This quotation will become a part of any Purchase Order Agreement between PMSL and the successful Buyer or Contractor.

Clarifications/Exceptions

Document	Rev.	Section No.	Comment/Exception
General	-	N/A	The following items are NOT included in our pricing or scope of supply: tanks, baffles, mixer support bridges or structures, sub-base plates, platforms, walkways; structural steel beam or channel supports; handrails; grating; lubricants; motor controls or starters; wiring; conduit or other electrical components; hold down hardware; bridge or platform designs or recommendations; installation, field service, state or local taxes; field or finish painting; and rubber field patch kits.
			Agitator design is based upon meeting a G-value of 498 s^{-1} in an 8ft by 8ft area as the flow is moving through the channel.

Standard Terms and Conditions of Sale

PHILADELPHIA MIXING SOLUTIONS, LTD. STANDARD TERMS AND CONDITIONS OF SALE

GOVERNING TERMS

These terms and conditions and those stated in Seller's proposal or quotation shall exclusively govern the transaction of sale of goods between Customer and Philadelphia Mixing Solutions, Ltd., a Pennsylvania Corporation, ("Seller"), described on the front side of this form, provided that any terms set forth on the front side hereof or in Seller's quotation which differ from, conflict with or add to the terms set forth below shall govern. Seller hereby objects to any additional, conflicting or different terms or conditions proposed by Customer prior or subsequent to the date hereof, including any such terms or conditions contained in the Customer's order or other Customer document. Acceptance of Seller's offer or counteroffer by acknowledgement is expressly limited to these Terms, which may not be modified except in writing, executed by the President or a Vice President of Seller.

GENERAL

Stenographic and clerical errors are subject to correction. All price lists and discount schedules of Seller are subject to change without notice. Further, unless otherwise stated on the front side of this form, if the delivery date of a product sold hereunder is more than three months after the order date, Seller may assess an additional fee to compensate Seller for any increase in raw material costs incurred between the date of order and date of delivery.

PROPRIETARY MATERIAL

All specifications, drawings, technical data and engineering information supplied to Customer by Seller constitute Seller's proprietary intellectual property, shall be used solely in connection with this order, shall not be disclosed to others without Seller's written consent and shall be returned upon request.

DISPUTES

All disputes, claims or controversies arising out of or in any way relating to the sale of products by Seller to Customer shall be governed by Pennsylvania law without regard to conflicts of law principles. If a dispute arises out of or relates to this contract or the breach thereof, and if the dispute cannot be settled through negotiation, the parties agree first to try in good faith to settle the dispute by mediation administered by the American Arbitration Association under its Commercial Mediation Procedures before resorting to litigation. If a party fails to respond to a written request for mediation within 30 days after service, or fails to participate in any scheduled mediation conference, that party shall be deemed to have waived its right to mediate the issue in dispute. Mediation shall take place via audio or video conference, unless the parties agree to an in-person location.

The parties hereby consent that venue for any litigation concerning this Agreement shall lie in either the U.S. District Court for the Middle District of Pennsylvania, or the Court of Common Pleas of Lebanon County, Pennsylvania and hereby submit to the exclusive jurisdiction of said courts. Interpretation of this Agreement shall be governed in all respects in accordance with the laws of the Commonwealth of Pennsylvania, without regard to its conflicts of laws provisions, and the parties hereby waive any right to a jury trial.

STANDARDS

The standards of the American Gear Manufacturers Association will be used and shall govern, where applicable, in the manufacture of gears and gear drive assemblies, unless Seller expressly agrees otherwise in writing.

LIMITED WARRANTY

Subject to the qualifications set forth below, Seller warrants that for a period of twelve (12) months from start-up, not to exceed eighteen (18) months from date of shipment to Customer, the products sold to Customer will: (i) conform with and meet all specifications (ii) be free from defects in materials and workmanship; and (iii) be delivered free from all liens and encumbrances created by or arising through Seller. Seller is not responsible for the accuracy or reliability of any specifications, design conditions or other data furnished by or on behalf of Customer or the ultimate user.

Materials exposed to process are not warranted against corrosion or other deterioration due to exposure to vessel contents. Customer is solely responsible to determine the integrity of such materials. Seller warrants only that (i) in the case of materials selected by Customer, the materials used will conform to Customer specifications of such materials and (ii) in the case of materials not specified by Customer, the materials shall be Seller's standard materials of construction for out-of-tank components.

Seller shall not be responsible for any defects in any components (such as gears, shafts, bearings, or motors) furnished by others at the request of Customer, and Customer shall look solely to the manufacturer or supplier of such component for its exclusive remedy with respect thereto.

Seller's warranties shall be void if the product is not used strictly in accordance with all instructions as to storage, handling, maintenance, lubrication, installation, startup, operation and safety set forth in the manuals and instruction sheets furnished by Seller.

At Seller's sole discretion, Seller may authorize repair services to be performed by others. Seller shall have no responsibility for repairs made outside Seller's plant unless such repairs are effected in accordance with Seller's written authorization and shipped to such other repair facility strictly in accordance with Seller's instructions.

This limited warranty is exclusive and is in lieu of all other warranties whatsoever express and implied, including but not limited to implied warranties of merchantability or fitness for a particular purpose. Any sample that may be provided by Seller shall not constitute a warranty that the products will conform to the sample. There are no oral statements, promises, representations or other warranties collateral to or affecting this limited warranty.

LIMITATIONS OF REMEDIES AND LIABILITIES

Seller's sole liability and obligation for a breach of the warranty or any other provision of these terms shall be to repair or replace the specific nonconforming products (or part) discovered during the stated warranty period or to credit or refund the purchase price actually paid for such nonconforming products (or part), as Seller may elect.

Such product (or part) shall be shipped to Seller as specified below under "Items Shipped to Seller." Without limiting the foregoing, under no circumstances shall Seller be liable for any expenses for removal of allegedly defective product (or part) for inspection, replacement or repair or for installation costs of repaired or replaced product (or part).

Seller's liability on any claim, whether grounded in contract, tort (including negligence), any theory of strict liability or otherwise, of any kind for any loss or damage arising out of or in connection with or resulting from the sale of the products hereunder or the performance or breach hereof or the products or their performance or use is limited solely and exclusively to the remedies provided above and no other right or remedy will be available to Customer or to any person or entity. Seller will in no event be liable to any person or entity for any indirect, special, incidental, consequential, liquidated or punitive damages, any fines or penalties of any kind, any loss of profits or any other economic loss, whether or not foreseeable, to any person, property or entity, in connection with or arising out of the furnishing, performance or use of the products, whether grounded in contract, tort (including negligence), any theory of strict liability or otherwise.

All claims for breach of any of Seller's warranties shall be barred unless Customer notifies Seller of such breach in writing within 30 days of discovery of the breach.

INSPECTIONS AND REJECTIONS

Customer shall promptly inspect all shipments of material upon delivery for physical defects, conformity to specifications and completeness including all components necessary for installation and shall notify Seller in writing of all defects, non-conformities or missing items within 15 days of delivery. Thereafter, the shipment shall be deemed accepted and assumed to be complete and Seller shall have the right to impose additional charges for allegedly missing items later requested by Customer. Defects not impairing satisfactory operation of the equipment shall not be a ground for rejection. Seller reserves the right to inspect allegedly defective goods at point of delivery or ship them to a destination of its choice. No material shall be refunded without Seller's written permission.

MATERIAL FURNISHED BY CUSTOMER

Materials which Customer furnished for incorporation into any order shall be shipped as specified below under "Items Shipped to Seller". If material defects are found by Seller in materials furnished by Customer, Seller may notify Customer and charge it for all expenses incurred by Seller through the date of discovery of the defect. If minor defects can be repaired by Seller, Customer shall pay extra charges as are necessary to cover repair work. Shipment dates for orders where Customer furnishes material are predicated on timely receipt of such material free from defects. If any material furnished by Customer is damaged by Seller, Seller's responsibility shall be limited to the replacement cost of the material and Seller shall not be liable for any consequential or incidental damages.

CANCELLATIONS

Orders placed by Customer may not be cancelled without Seller's written consent. If an order is cancelled by Customer, Customer will indemnify Seller against all loss, damage or expense incurred due to cancellation, including but not limited to the cost of special materials, non-resalable goods completed or in process, labor, engineering time, overhead, profit and reasonable attorneys' fees incurred to collect such losses from Customer.

SHIPMENT

Unless otherwise quoted, shipments are F.O.B. Seller's plant. Seller's responsibility ceases upon delivery to the carrier. Delivery to destination is not guaranteed by Seller. Claims for loss or damage in transit must be made by Customer against the carrier. In the absence of shipping instructions, Seller reserves the right to ship all material upon completion by the common carrier of its choice.

Shipping dates are approximate and are based upon all information necessary to commence manufacture. Completion and shipment may be subject to delays due to causes beyond the reasonable control of Seller or its suppliers, including, without limitation, labor disruptions, labor strikes, accidents, unusually severe weather, fires or other casualties or acts of God or government.

DEFERRED SHIPMENTS

Shipments may not be deferred beyond the specified shipment date without Seller's written consent. When shipping is deferred for Customer's convenience or due to lack of shipping instructions, failure to complete credit arrangements satisfactory to Seller, late delivery of customer supplied material or other cause attributable to Customer, Customer shall pay storage charges, interest and any other expenses incurred by Seller due to the delay. Orders on which delivery is deferred shall be invoiced upon completion of manufacture and are subject to a finance charge of at the rate of 18% per annum from time of invoice.

ITEMS SHIPPED TO SELLER

All items shipped to Seller (including, without limitation, items being shipped for warranty work, returns of rejected materials, items being shipped to Seller for inspect and repair work and materials furnished by Customer for incorporation into any order) shall be shipped to Seller F.O.B. Seller's plant or F.O.B. at such other location as may be designated by Seller, freight prepaid by Customer. Without limiting the foregoing, Customer is responsible for insuring that all such items are securely and appropriately packed and in no event shall Seller be responsible for any loss or damage incurred in shipping any such item.

TAXES

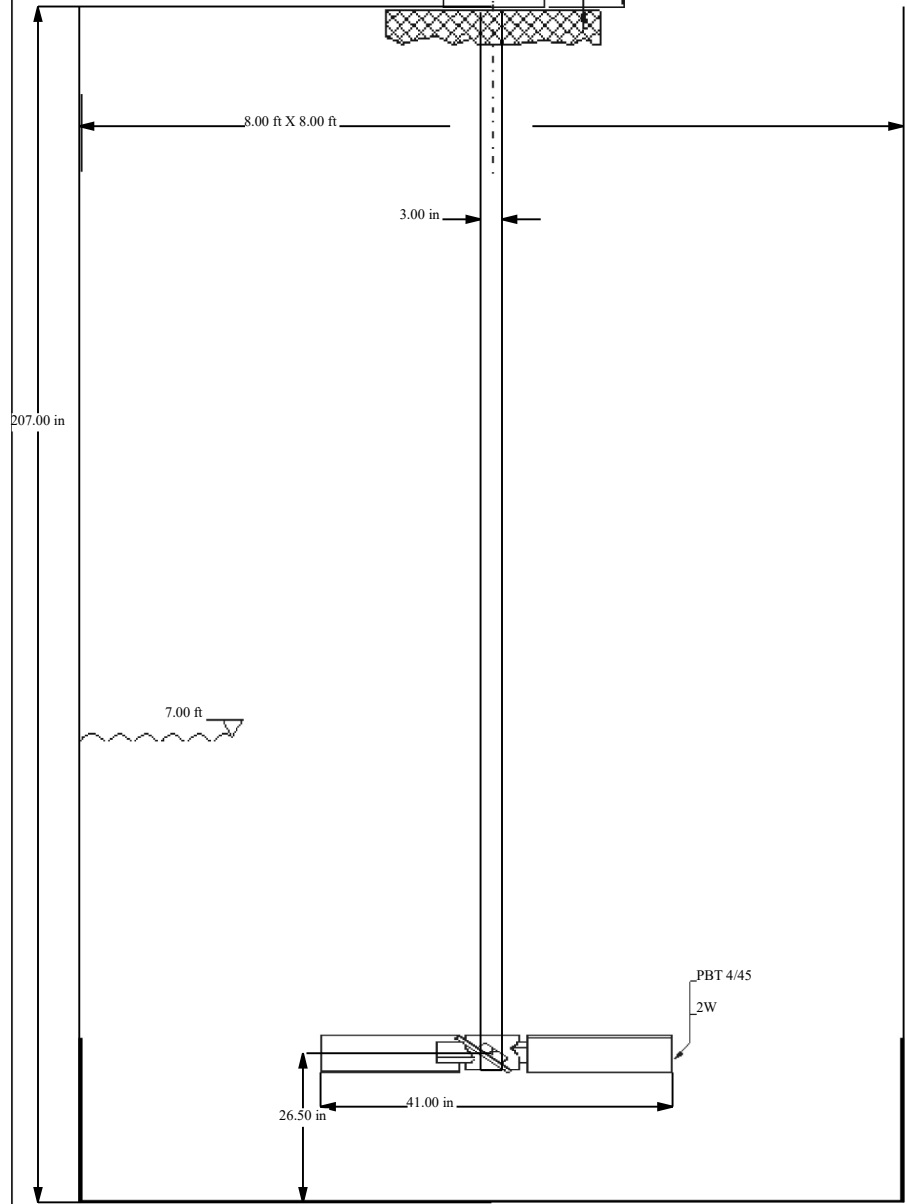
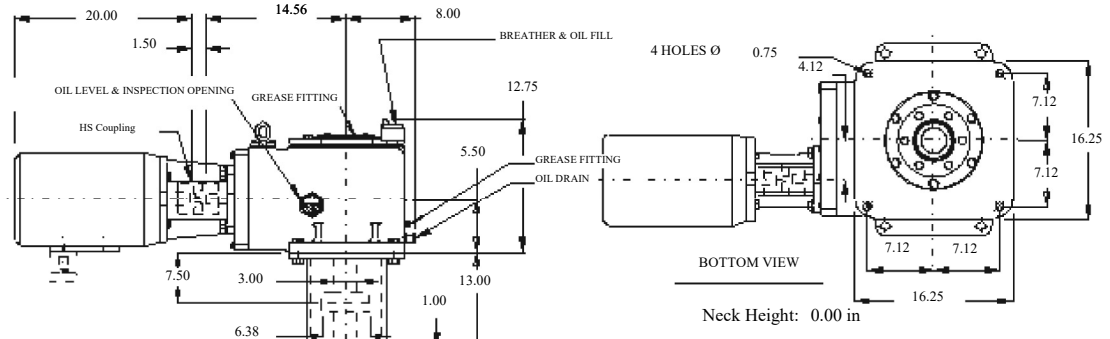
If prices are not stated on the front side hereof to include sales, use, excise or other taxes, then when required by law, taxes will be billed and collectible as a separate item at time of shipment unless proof of a valid exemption satisfactory to the taxing authority is provided to Seller.

TERMS OF PAYMENT

Unless otherwise agreed, payment terms are net 30 days from the date of invoice. Invoices are dated upon shipment or, if shipment is delayed by Customer, as of the completion of manufacture. If payment is not made when due, Customer shall pay Seller a finance charge of 1.5% per month. No retainages shall be deductible from or withheld by Customer from payments due Seller. Under no circumstances shall Customer have the right to delay payment until its receipt of payment.



Serial Number: _____ Drawing Number: _____ Equipment Number: Rapid Mixer Rev.: _____



THE MIXER SUPPORT STRUCTURE MUST BE LEVEL WITHIN 0.12" AND IS TO BE DESIGNED SUCH THAT THE DYNAMIC ANGULAR DEFLECTION OF THE DRIVE IS LIMITED TO 0.12" IN ANY DIRECTION.

TANK, BAFFLES, MIXER SUPPORT AND MOUNTING HARDWARE BY OTHERS

Caution
 1. All dimensions are in inches (unless stated otherwise)
 2. Mounting hardware provided by others
 3. Mixer design loads include suitable service factor
 4. This drawing is not to scale

Customer Information			
Customer Name			
Q67051- DCRSD Scioto Reserve Disinfection Project Name			
Customer PO No.		Customer Inquiry No.	
Order No.		PMSL Inquiry No.	
Drive & Motor			
3853M-S	17.10 :1	PTOS 3.0 Instand	
Drive Type	Gear Ratio	Mount Type	
70.2	CW	2.00(200000hrs)	
Nominal RPM	Spn	Service Factor	Bearing Life
5.00 HP	1200	215TC	
Motor HP	RPM	Frame	
TEFC	NEMA MILL/CHEM	Premium	
Enclosure	Duty	Efficiency	
Tank & Environment			
Open Tank			Flat
Top Head			Bottom Head
Flat	4	14.11 in	207.00 in
Baffles Type	Baffles No.	Width	Length
3351.27 gal	1.00 S.G.	1.00 cP	
Liquid Volume	Density	Viscosity	
14.70 PSI	68.00 °F	0.00	
Process Pressure	Temperature	Solids Conc.	
Wetted Parts			
S/S 316		S/S 316	
Wetted Parts Material		Hardware Material	
Impeller Manufacture Method		Hub Mounting Method	
Mixer Design Loads			
1957 lb		10557 lb·in	
Static Weight		Weight Moment	
15506 lb·in		9249 lb·in	
Dynamic Moment		Dynamic Torque	
86 lbs			
Dynamic Shear			
Weight			
615 lb		215 lb	
Gearbox		Motor	
475 lb		1305 lb	
Wetted Parts		Total	

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Approved (Initial) _____ Date _____ Page 1