# STAMP Onsite Wastewater Treatment Facility

# Basis of Design Report

## For The

# Genesee County Economic Development Center


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## Acronyms

| | |
|---|---|
| 10SS | Ten States Standards |
| $BOD_5$ | 5-day biochemical oxygen demand |
| FM | Force main |
| GCEDC | Genesee County Economic Development Center |
| GEIS - | Generic Environmental Impact Statement |
| GPD - | Gallons per day |
| HDD - | Horizontal directional drilling |
| HDPE - | High-density polyethylene pipe |
| ICEAS - | Intermittent Cycle Extended Aeration |
| MGD - | Million gallons per day |
| MOU - | Memorandum of Understanding |
| MPS - | Main pump station |
| NYSDEC - | New York State Department of Environmental Conservation |
| PLC - | Programmable Logic Controller |
| SBR - | Sequential Batch Reactor |
| SEQR - | State Environmental Quality Review Act |
| SGIS - | Smart Growth Impact Statement |
| SHT - | Sludge holding tanks |
| SPDES - | State Pollutant Discharge Elimination System |
| STAMP - | Western New York Science & Technology Advanced Manufacturing Park |
| TDH - | Total dynamic head |
| TKN - | Kjeldahl nitrogen |
| TP - | Total phosphorus |
| TSS - | Total suspended solids |
| USFWS - | U.S. Fish and Wildlife Service |
| VFD - | Variable frequency drive |
| WWTF - | Wastewater Treatment Facility |

# I. General

## A. Background

The Genesee County Industrial Development Agency d/b/a/ the Genesee County Economic Development Center (GCEDC) and its affiliate, the Genesee Gateway Local Development Corporation (GGLDC), have been working for the last several years on the development of the Western New York Science & Technology Advanced Manufacturing Park (STAMP). The Site is planned as an advanced manufacturing campus on approximately 1,262 acres of land in the Town of Alabama, New York located along the west side of New York State Highway 77/63 (north of Judge Road) approximately five miles north of the I-90/New York State Thruway (STAMP Site).

At full build out, STAMP will be a high technology campus with the potential to accommodate over 6 million square feet of advanced technology manufacturing and related uses and to create up to 10,000 jobs. The GCEDC, as lead agency pursuant to the State Environmental Quality Review Act (SEQR), prepared a Generic Environmental Impact Statement (GEIS) and a Smart Growth Impact Statement ("SGIS") that analyzed the potential impacts of STAMP pursuant to the requirements of the SEQR and the State Smart Growth Public Information Policy Act.

In January 2012, the Final GEIS for STAMP was accepted as complete. The FGEIS identified alternatives for wastewater treatment for STAMP and assumed a maximum of 3 million gallons per day (MGD) of sanitary discharge would be needed. The preferred treatment alternative at that time included an onsite Wastewater Treatment Facility (WWTF) with a discharge to either Oak Orchard Creek, Whitney Creek or Tonawanda Creek. Based on feedback received during the GEIS process, several meetings with the neighboring Tonawanda Seneca Nation, and changes in the development of the STAMP Site to focus on the semiconductor industry, new alternatives for treatment were developed.

In August of 2013, a Conceptual Water and Wastewater Alternatives Analysis and Recommendations Report identified potential sanitary sewage conveyance and treatment options for the STAMP project, including 1.0 million gallons per day (MGD) of sanitary sewer effluent and 11.0 MGD of industrial process wastewater. Based on this report, the Village of Medina Wastewater Treatment Facility (Medina WWTF) was selected as the preferred sanitary sewer effluent treatment alternative.

The Tonawanda Seneca Nation voiced concerns with discharging effluent to Whitney Creek which flows into the Tonawanda Creek. The Tonawanda Creek flows through the Tonawanda Seneca Nation and it is an essential part of their cultural heritage. Another concern expressed by the New York State Department of Environmental Conservation (NYSDEC) was discharges to Whitney Creek and how that could affect the hydrology of the Tonawanda Wildlife Management Area. By utilizing the Medina WWTF and connecting to an established collection system, potential effects associated with discharging to Whitney Creek or directly to the Tonawanda Creek could be avoided.

A Memorandum of Understanding (MOU) was developed between the Village of Medina and the GCEDC which outlined the process of analyzing potential discharge routes through the Village, analyzing potential capacity upgrades at the Medina WWTF, and overall project implementation and ownership. However, in May 2017, the MOU with the Village expired so other means of wastewater disposal was deemed necessary. Additionally, by utilizing onsite recycling for the industrial process water, the overall potential total volume of wastewater has decreased significantly from 12 MGD to 6 MGD, causing a change in the proposed treatment methods and discharge location. More importantly, as noted in the 2013 Conceptual Water and Wastewater Alternatives Analysis and Recommendations Report, the need for a potential future large diameter force main “big sewer” for the disposal of process water is no longer needed.

With a reduced wastewater discharge maximum requirement of 6.0 MGD, onsite alternatives were once again considered feasible. Offsite effluent discharge locations were reviewed and analyzed as part of an ongoing effort to minimize environmental impacts and overall project costs for the overall wastewater solution. The review included input from the NYSDEC. Oak Orchard Creek near NYS Route 63, just north of the Iroquois Wildlife Refuge, was determined to be the preferred discharge location.

Several layout options were considered for an onsite WWTF, onsite pump station, and offsite discharge location. The preferred alternative involves an onsite Sequential Batch Reactor (SBR) sanitary sewer treatment facility that will discharge effluent to an onsite wastewater pump station. The WWTF will be designed to be easily expandable at treatment capacity levels of 0.25, 0.50, and 1.0 MGD.  The onsite wastewater pump station involves a pump station and force main sewer that will collect, and discharge treated manufacturing process wastewater effluent and treated effluent from the onsite WWTF. The pump station will be designed to be easily expandable at capacity levels of 3.0, 4.5, and 6.0 MGD. The STAMP team is currently working through the permit process with the U.S. Fish and Wildlife Service (USFWS) for the offsite force main and has begun design and permitting efforts for the onsite WWTF.

## B. Purpose

A new onsite wastewater treatment facility (WWTF) will be constructed to treat the sanitary wastewater generated by the manufacturing tenants. The process wastewater generated by the tenants will be treated at the tenants’ facilities. After treatment, the effluent flow from the onsite WWTF and the treated process wastewaters will be combined at the main pump station (MPS) wet well and then pumped to the discharge location in Oak Orchard Creek, north of Shelby Center in Orleans County through a force main (FM).

This report will outline the design of the FM, MPS, and the onsite WWTF, as well as describe the basis of design for the equipment and treatment processes. All work was designed within the accepted criteria of the Recommended Standards for Wastewater Facilities, 2004 Edition (commonly referred to as the “10 States Standards”) and TR-16 Guides for the Design of Wastewater Treatment Works (referred to as “TR-16).

# Onsite WWTF

## II. Project Information

To provide wastewater treatment for the STAMP site, an Onsite WWTF will be constructed. Several treatment options were considered, and the preferred alternative is a Sequential Batch Reactor (SBR) sanitary sewer treatment facility that will discharge effluent to an onsite wastewater pump station. The WWTF will be designed to be easily expandable.

The alternatives for the Onsite WWTF at the STAMP site were evaluated considering upfront capital costs, long term operation and maintenance (O&M) costs, and constructability. The chosen SBR technology is a continuous flow, intermittent cycle extended aeration system (ICEAS). This system is modular and suits the phasing needs of the STAMP site. The alternate treatment technologies considered include MBR technologies, fixed film technologies, and conventional activated sludge systems. The MBR technology proved to have a large maintenance expense associated with replacing the membranes at the end of their useful life. Additionally, the STAMP facility is meant to be operated with as little manpower as possible and an MBR system will require regular cleaning and backwashing tasks while the cycling operation of the SBR will be controlled by a programmable logic controller (PLC). Fixed film technologies were not ideal for the site because of the large footprint that they would need to meet the strict nutrient limit requirements. Fixed film technologies create sloughing of the biofilm which would need to be clarified and potentially filtered to meet the strict solids requirements of the site, the SBR technology does not require an additional clarifier because the biosolids are removed from the effluent within the treatment basin by the settling phase of operation. The closest technology to an SBR would be a conventional activated sludge system. These systems require both primary and secondary clarification and include recycling the biomaterials to the treatment basin. This alternative was not chosen because of the added infrastructure of the clarifiers and the hands-on operation that it would require.

The SBR plant consists of concrete tanks and associated treatment equipment including aeration blowers, pumps, submersible mixers, and process equipment. The infrastructure installed for the initial phases will be designed to be expandable to treat increasing wastewater flows. Therefore, the initial construction will avoid wasteful investments and will be necessary to provide treatment for the greater wastewater flows generated during the later phases of the park build-out.

### A. Site Location

The existing STAMP Site consists of agricultural land located within the Town of Alabama (Town). The location of the proposed STAMP Site including the location of the onsite WWTF is shown in Figure 1.

## B. Design Flows

The sanitary wastewater produced at the STAMP Site will increase incrementally as the STAMP Site is developed. Therefore, the WWTF will be built in phases in response to these increasing flows. The design flow average was determined from the expected occupancy of the STAMP site at full build. The STAMP site is expected to support approximately 10,000 employees. Considering a per capita usage rate of 35 gpd and a peaking factor of 2x for a new collection system, this would require a treatment capacity of 700,000 gpd. Including the 100,000 gallons per day (GPD) of treatment capacity allocated to the Town for future use and a factor of safety of 1.25 gives us the full build design average daily flow of 1 MGD. Additionally, a peaking factor of 2x is considered to arrive at a peak design flow. The full-build WWTF described in this report will be able to treat the expected design flow rates. The design flow rates are described in the table below.

**DESIGN FLOW RATE**

| | |
|---|---|
| Average Daily Flow | 1.0 MGD |
| Peak Flow | 2.0 MGD |

## C. Design Loadings

The sanitary wastewater produced at the STAMP Site is anticipated to have typical sanitary wastewater characteristics. The WWTF will be designed to treat the influent concentrations and loadings of contaminants. The table below summarizes these contaminants including 5-day biochemical oxygen demand ($BOD_5$), total suspended solids (TSS), total Kjeldahl nitrogen (TKN), ammonia, and total phosphorus (TP). The loadings were determined from the design average daily flow of 1.0 MGD.

**DESIGN INFLUENT CONTAMINANT CONCENTRATIONS AND LOADINGS**

| Contaminant | Concentration (mg/L) | Loading (lbs/d) |
|---|---|---|
| $BOD_5$ | 300 | 2502 |
| TSS | 250 | 2085 |
| TKN (as N) | 60 | 500 |
| Ammonia (as N) | 40 | 334 |
| TP (as P) | 4 | 33 |

## D. Design Water Quality Treatment Limits

The New York State Department of Environmental Conservation (NYSDEC) has provided draft State Pollutant Discharge Elimination System (SPDES) permit limits based on water quality in

Oak Orchard Creek near the proposed discharge location. The WWTF is designed to remove the influent contaminants to meet these discharge permit limits at the design flow rate. The table below summarizes some parameters from these limits. Complete draft SPDES permit limits are provided in Appendix C.

**SELECTED SPDES DRAFT PERMIT LIMITS**

| Parameter | Limit |
|---|---|
| Flow Rate | 1.0 MGD |
| pH | 6.0 - 9.0 S.U. |
| BOD5 | 5.0 mg/L |
| TSS | 10 mg/L |
| Ammonia (as N) | 1.2 mg/L, Summer |
| | 1.9 mg/L, Winter |
| TP (as P) | 0.20 mg/L |
| Fecal Coliform | 200 CFU/100mL |

These limits include very low phosphorus discharge limits and fecal coliform removal requirements. Therefore, the WWTF will include a disc filter to remove phosphorus and a UV system to provide effluent disinfection.

# III. Proposed Design

The WWTF will utilize a continuous flow ICEAS SBR process, as well as disc filters, and a UV disinfection system to treat sanitary wastewater. This biological treatment process is suited to accept sanitary wastewater and biological waste streams such as from food processing plants. The facility will also include a screw press to dewater solids for final landfill disposal. The process design calculations and proposed equipment are provided in Appendix D. The site plan and process flow diagram can be found in Figures 4 and 5, respectively.

The STAMP sewer collection system will flow by gravity to convey wastewater from the STAMP tenants to the WWTF. The STAMP gravity sewer will enter the WWTF site approximately 15 ft below grade. Therefore, the wastewater will need to be lifted to grade to flow through the treatment process. The STAMP gravity sewer would be extended to connect to the influent wet well where submersible pumps will lift the wastewater to grade allowing flow by gravity to occur through the remaining system. After the influent wet well, wastewater will flow through a mechanical bar screen, which will remove large particles and debris. It will then flow to a distribution box which will evenly distribute the flows to the SBR basins.

The SBRs operate in sequences of batch treatment cycles beginning with aeration, then settling, and decanting. During the aeration cycle, oxygen is added for bacteria to consume the contaminants within the wastewater. The air is then turned off to allow the bacteria to settle to the bottom of the tank. This allows treated effluent to be decanted from the end of the SBR basins.

To remove phosphorus a coagulating agent such as aluminum sulfate will be added to the SBR to precipitate out phosphorus. This chemical will be stored in a chemical bulk storage area located in the headworks and control building. The chemical bulk storage areas will include spill prevention measures including double containment equal to the largest storage volume per NYSDEC bulk storage requirements.

Additionally, following the SBR, effluent will enter a coagulation flocculation basin where coagulant and polymer will be added to aggregate the precipitated phosphorus into larger flocculent particles. The coagulation flocculation effluent would then be filtered through a disc filter to remove the precipitated and flocculated phosphorus to the required discharge levels. The clear effluent would then flow through a UV disinfection system before discharge to the MPS wet well on the STAMP site.

The biomass removed from the SBR basins will be pumped to the aerated sludge holding tanks (SHT). A dewatering building will be constructed to press the sludge to a higher solids concentration. This material can then be disposed of through solids hauling to a landfill.

The proposed designs are in accordance with the standards specified in 10 States Standards as well as *TR-16*. Automatic effluent sampling will occur in the effluent box after the UV system, prior to discharging to the MPS wet well. This sampling location was chosen because, after disinfection, the water will be treated to SPDES permit requirements. The disinfection requirement is seasonal. When disinfection is not required, the UV lamps will be turned off and the effluent at this location will still be treated to the permit requirements before final discharge to the MPS wet well.

## A. Headworks

The headworks will include the influent wet well and the influent channel which will include the bar screen and laser flow meter to measure the influent flow rate. The flow will then proceed to the distribution structure which will distribute flows evenly to the SBRs. The headworks equipment will be installed within the headworks and control building which will also include the chemical bulk storage facilities, see below, and the process equipment to operate the SBRs including the aeration blowers. The headworks and control building will also house the controls for the SBRs and will serve as the operations center of the facility.

***Influent Wet Well***

The influent pipe will connect to the 10-foot manhole wet wells which will house submersible pumps to lift the influent flows to the influent channel at grade. One manhole will be installed initially, and the pumps will be expandable in response to increasing wastewater flows as the STAMP Site is developed.

***Bar Screen***

A new bar screen will be installed within the concrete influent channel to remove large particles and debris. The bar screen is designed for flows of 2.0 MGD and includes 1/4" wide bars with 1/4" openings, set at a 30-degree angle as specified in Sections 61.121 and 61.122 of 10 State Standards. The bar screen is automatically cleaned by a rake conveyor operated by a ½ HP premium efficiency motor and variable frequency drive (VFD).

The influent channel is rectangular at 1' – 6" wide and 4' deep with a bottom slope of 1%. Therefore, the approach velocity within the channel at the average and peak design flows will be 2.6 ft/s and 3.4 ft/s. The velocity for the design peak flow is above the recommended 3 fps; however, the STAMP site will have a new collection system with little inflow and infiltration, so the peak design event is expected to occur infrequently and not for sustained periods of time. The corners of the channel include fillets to prevent solids accumulation.

***Washer Compactor***

The screenings will be emptied into a washer compactor. The washer compactor is designed to accept debris up to 4", including clothes, metal, wood, concrete and other harsh materials. Operating on a ¾ HP premium efficiency motor, the compactor will reduce the volume of trash and solids by more than 80% and will be run on variable speed drives (VFDs) to limit electric usage and operate more efficiently. The washer compactor will compact the screenings and will provide water to wash the screening to reduce odors.

## B. Distribution Structure

Following the headworks, wastewater will flow into a distribution structure which will include chambers that distribute the flows evenly to the SBR treatment tanks. The chambers will include slide gate valves to isolate the flows from the SBRs for maintenance.

## C. Treatment Tanks

***Sequential Batch Reactors***

The facilities will be constructed with two SBR plants, each treating 0.5 MGD. Each plant will consist of three rectangular concrete tanks. The SBRs will utilize the Intermittent Cycle Extended Aeration (ICEAS) process which is a continuous flow biological treatment method which combines multiple treatment processes into one tank. The process is automatic and combines the aeration system, blowers, pumps, mixers, effluent decanter and monitoring via one control system. The process does not require primary or secondary settlement tanks or return sludge pumping like traditional activated sludge facilities. Influent flow is distributed to all three SBR tanks where any flow or loading variations are evenly spread across the tanks.

The 30' wide by 86' long SBR tanks will have a side water depth of 15'. A 12" thick precast concrete pre-react wall, located 11' – 11" from the influent end of the tanks will be constructed within each SBR tank to create a pre-react zone. Each pre-react wall will contain seven (7) 18" square openings located at the bottom to allow flows to exit the pre-react zone to the treatment portion of the tank. PVC aeration piping containing fine bubble diffusers will be installed along the entire bottom of the tank. The fine bubble diffusers consist of 9" diameter EPDM discs. The tanks will be partially buried, utilizing catwalks along the top of the tank for access to the equipment and pumps in the tanks. A new aluminum staircase will be installed leading up to the catwalk. At the effluent end of the SBR tanks will be a mechanically driven stainless-steel decanter which consists of an adjustable weir to allow the upper portion of the settled wastewater to be removed while also keeping out any floatable materials.

The SBRs will be operated in batches. Wastewater will enter the pre-react zone where air will be continuously provided at a high rate to oxygenate the wastewater and provide for enhanced organics removal before proceeding to the treatment portion of the SBR tanks. During normal average daily flows, the SBRs will aerate for 2 hours where biological oxidation and reduction occurs. After this period, the air will be shut off to the SBR via an actuated valve, and the aeration and mixing process will cease for one hour which allows the solids to settle to the bottom of the tank. This occurs while influent wastewater continues to flow into each SBR. After an hour of settling time, the decanter weir is slowly lowered for treated wastewater to flow to the effluent piping.

After water has been drawn down to a specified level, based on capacity designs, the decanter rises, and the aeration and mixing process begins again. During periods of wet weather and high flows the control system automatically enters the storm mode where each decant cycle operates for 75% of the normal cycle time to increase treatment capacity.

***Sludge Holding Tanks***

The tanks will be sectioned at the influent end of the tanks for the sludge holding tanks (SHTs) Settled sludge will be removed from the SBR tanks using submersible solids handling pumps and discharged into the SHTs. The pumps will be mounted to rails on the side of each SBR tank and will operate for a pre-determined time and frequency based on the accumulated sludge level. The

SHTs will be aerated with fine bubble diffusers to prevent the sludge from becoming anaerobic. Sludge will be allowed to settle and thicken with the supernatant being removed from the SHTs and returned to the head of the plant. This thickened and digested sludge will then be removed from the SHTs using submersible solids handling pumps and sent to the screw press for dewatering.

The SHT calculations shown in Appendix D are for the biomass produced from both 3-basin SBR tanks. After approximately 30 days of storage, the expected sludge production from the full-build facility is 12,687 GPD which will be dewatered by the screw press.

## D. Aeration Blowers (SBRs)

Aeration for the SBRs will be provided by positive displacement blowers installed within the headworks and controls building. Six 30-HP blowers will aerate the SBRs while six 25-HP blowers will aerate the SHTs with two redundant SHT blowers. The blowers will utilize premium efficiency motors and VFDs to control the amount of airflow delivered to the SBRs under a wide range of flow conditions. Dissolved oxygen sensors located within each SBR and local control panels will monitor the dissolved oxygen content and be used to automatically adjust the amount of air delivered to each SBR using an actuated butterfly valve. Blowers will also be provided for the SHTs.

## E. Coagulation Flocculation Tank

Alum will be added in the SBRs to start the phosphorus precipitation process. Some phosphorus will be settled out of the wastewater, but further removal will be required to meet the proposed discharge limits. Following the SBRs the treated effluent will flow through a magnetic flow meter and into a segmented coagulation flocculation tank. Additional alum and polymer will be added in the rapid mix portion of the tank in proportion to the measured flow rate. The rapid mix tank will thoroughly mix the chemical into the water before flowing into the coagulation portion of the tank. The coagulation portion will be mixed at a slower speed with a paddle mixer to promote aggregation of the precipitated phosphorus particles into larger flocs. The final flocculation portion of the tank will be mixed at an even slower speed than the rapid mix and coagulation portions to promote larger floc formation. The segmented tanks are sized to provide a ½ minute, 5 minutes, and 5 minutes of contact time for the rapid, coagulation, and flocculation tanks, respectively, at the design flow rate.

## F. Filter Building

To achieve the required discharge limits of effluent phosphorus, disc filters will be installed following the coagulation flocculation tank. The disc filters will provide further removal of precipitated phosphorus and particles from the water. These disc filters will be installed within a concrete block building. The filters will bring the TSS levels below 10 mg/L and the total phosphorus levels below 0.20 mg-P/L. The design sheet in Appendix D shows the design parameters for one of the two filters. This demonstrates that the filters are capable of treating the design and peak flows from 1.0 mg-P/L, which is greater than the expected discharge from the SBRs, to the required 0.2 mg-P/L.

Inside the filters, influent water enters between a pair of discs and water passes outward across the discs. The filtered water then flows by gravity into a common collection well and exits the unit through the outlet pipe. The filtering discs are constructed of a woven polyester filter cloth as the filtration medium. As water passes across the discs, solids accumulate on the disc surface, which creates head loss. This causes the water level inside the unit to increase. When the water reaches a certain level, a level sensor activates an automatic spray wash cleaning sequence. The filter units will be expandable to allow for increasing numbers of discs to be installed in response to increasing wastewater flows as the tenants occupy the site.

Each disc has its own spray header to ensure efficient disc cleaning. The spray wash water (backwash reject) from each set of discs is collected in a common channel and then purged from the unit through a stainless-steel drain valve. The reject water will flow by gravity to a pump station which will pump the filter backwash back to the head of the plant.

## G. Disinfection

Following the disc filters a UV disinfection system will be installed to inactivate any microorganisms and viruses still in the treated water to meet the effluent disinfection requirements. The magnetic flow meter installed previous to the coagulation flocculation tank will communicate with the UV system for dose pacing. The UV structure will contain a concrete channel with a serpentine weir near the outlet of the structure. The weir is used to maintain a constant water level within the channel, guaranteeing that all UV bulbs are submerged at all times.

The main components of a UV disinfection system are the arc lamps, a reactor, and ballasts. The UV equipment will be installed within the channel. The system will include expandable modules which will allow installation of increasing amounts of UV lamps in response to increasing wastewater flows as the STAMP Site is developed.

The proposed system utilizes low pressure, high output lamp technology in accordance with energy efficiency best practices. This system will contain two banks of UV lamps to provide redundancy. The UV system will provide a UV dose of 30 $mJ/cm^2$ at the peak design flows per standards. The system is sized to treat the peak design flow considering a 65% UV transmittance with one bank out of service, providing 100% redundancy. This is accomplished with 64 lamps as detailed in Appendix D.

Due to grading of the site and the required slopes and depths of the effluent pipe system, the UV channel will be housed within a recessed concrete structure. All critical electrical panels will be placed at grade level, rather than in the vault to avoid potential damage in the event of a backup. A small davit crane will be installed to help lift the modules from the channel.

## H. Screw Press Dewatering

The screw press machines will be installed in the dewatering building. The screw press will be installed above a recessed sump with grated flooring and drain for wash down of the machine. The screw press will be fed from the submersible pumps in the SHTs. The motion of the screw will increase the pressure of the sludge against the screen to dewater the material. The screw press drive and the filtrate recycle pump will be operated on VFDs.

The screw press will be able to process the sludge and will be able to dewater to greater than 20% total solids with 95% solids capture. The system includes a filtrate recycle system to ensure solids capture. An emulsion polymer make-down unit will meter polymer to an injection device adding polymer to the sludge before the screw press.

During pressing, the exterior of the screen is continually washed and following pressing, the screen is washed down. The filtrate will exit the machine from the bottom and will flow through the drain in the sump to the dewater return line to the head of the plant. The dewatered material will empty into a container that will be hauled from the site for final disposal at a landfill.

The expected sludge production from the full-build facility is 12,687 GPD. The feed pump and screw press are capable of processing sludge at 44 gpm which would process the daily sludge production in less than 5 hours. The dewatered sludge will be hauled off site to be disposed of in a landfill.

## I. Site & General Facility

A new asphalt driveway will be installed around the WWTF Site to provide access to the buildings and tanks. The new driveway will connect to the access road to the north of the site. A new generator will be installed on site and connected to the facility in order to provide backup power.

## J. Odors

The treatment processes where odors are a concern are contained within buildings to mitigate odors. The only location where raw, untreated wastewater will be exposed to the atmosphere is enclosed within the headworks and control building. The SBR process and aerated sludge process will not produce strong odors. The dewatering process, where aerated sludge is dewatered, will be enclosed within the dewatering building and the material will be immediately removed from the site to the landfill for final disposal following dewatering.

## K. Chemical Storage

The chemicals stored on site will include alum for phosphorus precipitation and polymer for screw press dewatering. The alum will be stored in a chemical bulk storage area located in the headworks and control building. The polymer will be stored in a chemical bulk storage area in the dewatering building. The chemical bulk storage areas will include spill prevention measures including double containment equal to the largest storage volume per NYSDEC bulk storage requirements.

## IV. Phasing of Construction Discussion

The report primarily focuses on the full build 1 MGD treatment plant because this is the flow rate for the full build of the STAMP site. However, the wastewater treatment requirements for the site will increase incrementally as the STAMP site becomes occupied. There is a wide range of possibilities for the incremental increases in wastewater needs and phasing depending on the type and size of tenant.

Therefore, the design of the design of the SBR has been carefully thought out to provide flexibility to respond to incremental increases in wastewater flows. This section of the report has been added as an example of how this phasing might occur. This is not the planned phasing for the project, but it highlights the flexibility and modularity of the chosen SBR treatment technology and why it is suited for this application. At all phases, the treatment system will be capable of meeting the SPDES permit requirements.

As discussed, there is a wide range of possibilities for the pace and phases of wastewater needs as the park is occupied and the wastewater needs increase to the maximum design average daily flow of 1 MGD. The table below and the following discussion provides an example of the potential phasing of the project and the expected flows.

**STAMP WASTEWATER FLOWS AND PHASING**

| Phase | Wastewater Flow Rate (GPD) |
|---|---|
| 1 | 0 - 25,000 |
| 2A | 250,000 |
| 2B | 500,000 |
| 2C | 750,000 |
| 3 | 1,000,000 |

**Phase 1: 0 – 25,000 GPD**

Phase 1 will consist of installing a precast influent wet well tank and pouring a concrete channel and pad to install the mechanical course bar screen. The bar screen will be built to treat the Phase 3 wastewater flows. To accommodate the low wastewater flows during Phase 1, a temporary, removable steel baffle, will be inserted into the channel. The blowers and controls will be installed in a temporary enclosure that will serve as a portion of the future full-build controls building. The control panel installed for Phase 1 is designed for the full build programmable logic controller (PLC) to accommodate the future expansion and required inputs.

The SBR and sludge holding tank (SHT) for Phase 1 will involve constructing two concrete basins which will serve as future SHTs for Phases 2 and 3. The walls will serve as common walls for the future SBR tank construction.

The disc filter following the SBRs will be installed within a disc filter building that will be large enough for the full-build disc filters. Initially, one filter unit will be installed with one disc. Filter discs can be added to this unit as flows increase.

The UV disinfection system will be installed in a concrete channel poured within a concrete vault. Similar to the bar screen, a temporary steel baffle will be installed to accommodate low flows. A metal sided enclosure would be constructed on top of the vault. The UV lamps to treat Phase 1 flows will be installed initially, and the channel will be large enough to accommodate the UV system to treat full-build flows.

The equipment for Phase 1 is as follows:

SBR/SHT Equipment

(2) Positive displacement 20-HP SBR blowers (one duty, one standby used for future SHT)
(1) Positive displacement 20-HP SHT blower
(2) Fine bubble aeration grids (one per SBR and SHT)
(2) Decanters with single drive units (one per SBR and SHT)
(1) Automated air control valve
(1) 3-HP submersible waste sludge pump (SBR)
(1) 7.5-HP mixer (SBR)
(1) Control package, including the following features:
- 4-basin main control panel with HMI, motor starters and VFDs
- DO control
- Remote HMI accessibility

Additional Equipment

(2) 10-HP influent wet well pumps
(1) 1.5’ wide ¼” mechanical bar screen
(1) Disc filter unit. Initially installed with (1) disc. Polymer feed/coagulation system, backwash tank, and pumps sized for full-build
(1) UV disinfection system with (16) lamps installed

**Phase 2A – 2C: 250,000 – 750,000 GPD**

The Phase 2A through Phase 2C infrastructure will add on to the infrastructure built during Phase 1. For Phase 2A, this will include constructing two large concrete basins for the SBR tanks. The walls of these basins will be tied into the two tanks constructed during Phase 1, which will now serve as the SHTs. Additional tanks and equipment would be added as flows increase for Phases 2B and 2C.

The dewatering building will be constructed during Phase 2A and will house a screw press sized for full build biosolids production. The disc filter unit will be expanded to add up to six additional filter discs as needed to treat additional flows. The UV disinfection system will be expanded to treat additional flows by adding lamps. Additional lamps can be added up to the full build treatment capacity.

The equipment for the full-build of Phase 2C is as follows:

SBR/SHT Equipment

(2) Positive displacement 50-HP SBR blowers (one duty, one standby)
(2) Fine bubble aeration grids (one per SBR)
(2) Decanters with single drive unit (one per SBR)
(2) Automated air control valves
(2) 3-HP submersible waste sludge pumps (one per SBR)
(1) 7.5-HP mixer (mixer from Phase 1 SBR to be reused)
(2) 3-HP submersible digested sludge pumps (SHTs)
(1) Control package, including the following features:
- HMI, motor starters and VFDs for two basin expansion (PLC from Phase 1)
- DO Control
- Remote HMI Accessibility

Additional Equipment

(4) Influent wet well pumps
(1) 12-in screw press including polymer feed system
(6) Additional filter discs installed in Phase 1 disc filter unit
(16) Additional UV lamps
(1) Chemical feed system installed in control building

**Phase 3: 1,000,000 GPD (Full Build)**

Phase 3 will consist of constructing the additional concrete basins for the two SBR tanks and SHTs. These tanks can be constructed one at a time as wastewater flows increase. An additional disc filter unit with seven filter discs would be installed within the disc filter building to treat the full-build flows.

The equipment for Phase 3 is as follows:

SBR/SHT Equipment

(1) Positive displacement 50-HP SBR blowers
(2) Positive displacement 20-HP SHT blower
(4) Fine bubble aeration grids (one per SBR and SHT)
(4) Decanters with single drive unit (one per SBR and SHT)
(2) Automated air control valves
(2) 3-HP submersible waste sludge pumps (one per SBR)
(2) 7.5-HP mixer (one per SBR)
(2) 3-HP submersible digested sludge pumps (one per SHT)

(1) Control package, including the following features:
- HMI, motor starters and VFDs for two basin expansion (PLC from Phase 1)
- DO Control
- Remote HMI Accessibility

Additional Equipment

(1) Disc filter unit with seven filter discs

# V. Operations

## A. Facility Operations

The Town does not have a municipal sanitary sewer collection or conveyance system. Therefore, the GCEDC intends to form a sewer-works corporation to own and operate all STAMP sewer infrastructure including the WWTF.

## B. Emergency Response

The local emergency management services such as fire departments and medical services will be trained for emergency safety and response at this facility. Specific procedures such as emergency startup of the backup generator and shutdown of specific equipment will be outlined, and training will be provided by the operators of the facility. The emergency management services will be taught the hazards of the chemicals stored on site. Diesel will be stored in a tank on-site for the emergency backup generator. This tank will be clearly marked, and the concerns will be defined for the emergency management services.

## VI. Conclusion

The offsite sanitary sewer project is an integral and critical part of the necessary infrastructure for the STAMP Site. The project design avoids and minimizes potential environmental impacts. The GCEDC is committed to providing safe and reliable wastewater treatment at the onsite WWTF and developing a facility that will meet the current and future needs of water quality and treatment capacity at the STAMP Site. These specific projects will be imperative in achieving these goals.

# Figure 1

# General Location Map

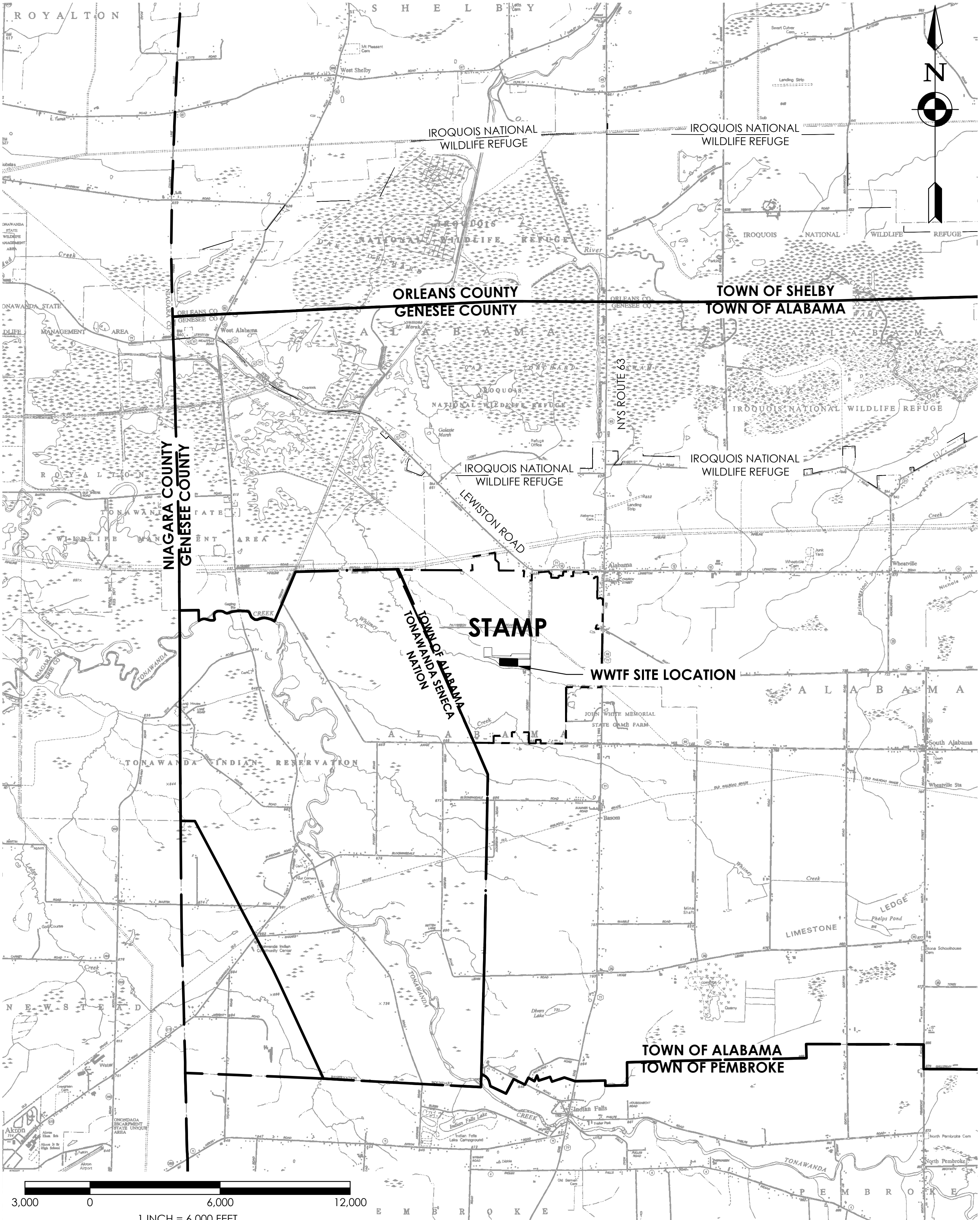


FIGURE 1

205 ST. PAUL STREET, SUITE 500
ROCHESTER, NEW YORK 14604
TEL (800) 274-9000
FAX (585) 232-5836

CPLteam.com

ARCHITECTURE ▪ ENGINEERING ▪ PLANNING

| | |
|---|---|
| DATE: | 4/27/20 |
| DRAWN: | ZLA |
| CHECKED: | ARK |
| SCALE: | AS NOTED |
| PROJ. #: | 14822.00 |

STAMP SITE GENERAL LOCATION MAP

WNY STAMP OFFSITE SEWER

TOWN OF ALABAMA AND TOWN OF SHELBY, NEW YORK STATE

Plotted By: Nick Bayer
Date last plotted: 5/21/2020 8:12 AM
Date last accessed: 5/18/2020 3:33 PM
Drawing Name: J:\PROJECTS\GCEDC\STAMP Offsite Sewer\D Design\ACAD\Civil\Figures\Location Map May 2020.dwg
Referenced Drawings: None

# Figure 2

# Proposed FM Route

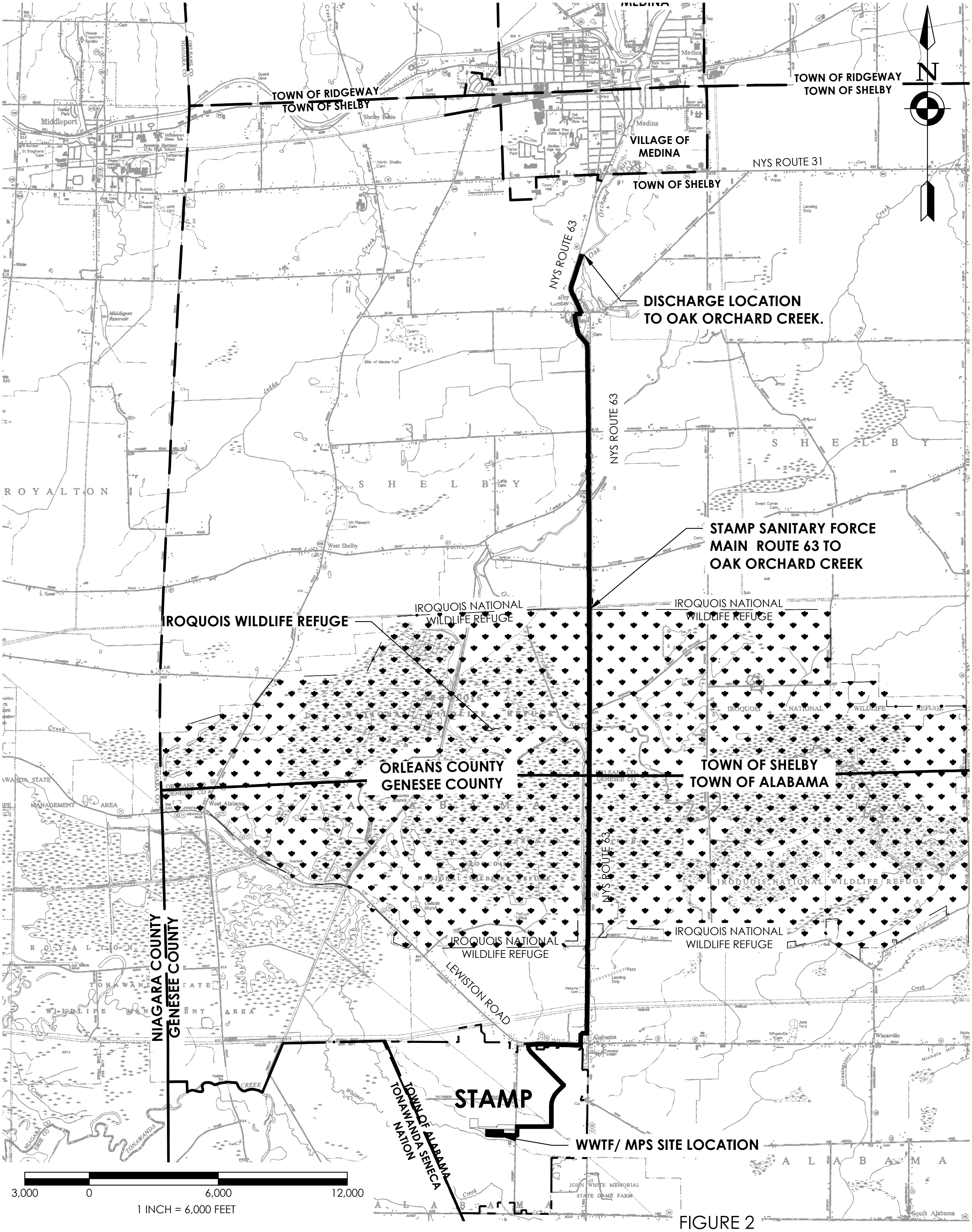


FIGURE 2

Plotted By: Andrew Kosa
Date last plotted: 12/7/2020 11:29 AM
Date last accessed: 9/9/2020 8:02 AM
Drawing Name: \\clarkpatterson.local\dfs\Projects2\PROJECTS\GCEDC\STAMP Offsite Sewer\D Design\ACAD\Civil\Figures\Location Map May 2020.dwg
Referenced Drawings: None

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| | |
|---|---|
| DATE: | 4/27/20 |
| DRAWN: | ZLA |
| CHECKED: | ARK |
| SCALE: | AS NOTED |
| PROJ. #: | 14822.00 |

FORCE MAIN GENERAL LOCATION MAP

WNY STAMP OFFSITE SEWER

TOWN OF ALABAMA AND TOWN OF SHELBY, NEW YORK STATE

# Figure 3

# Overall STAMP Site Plan

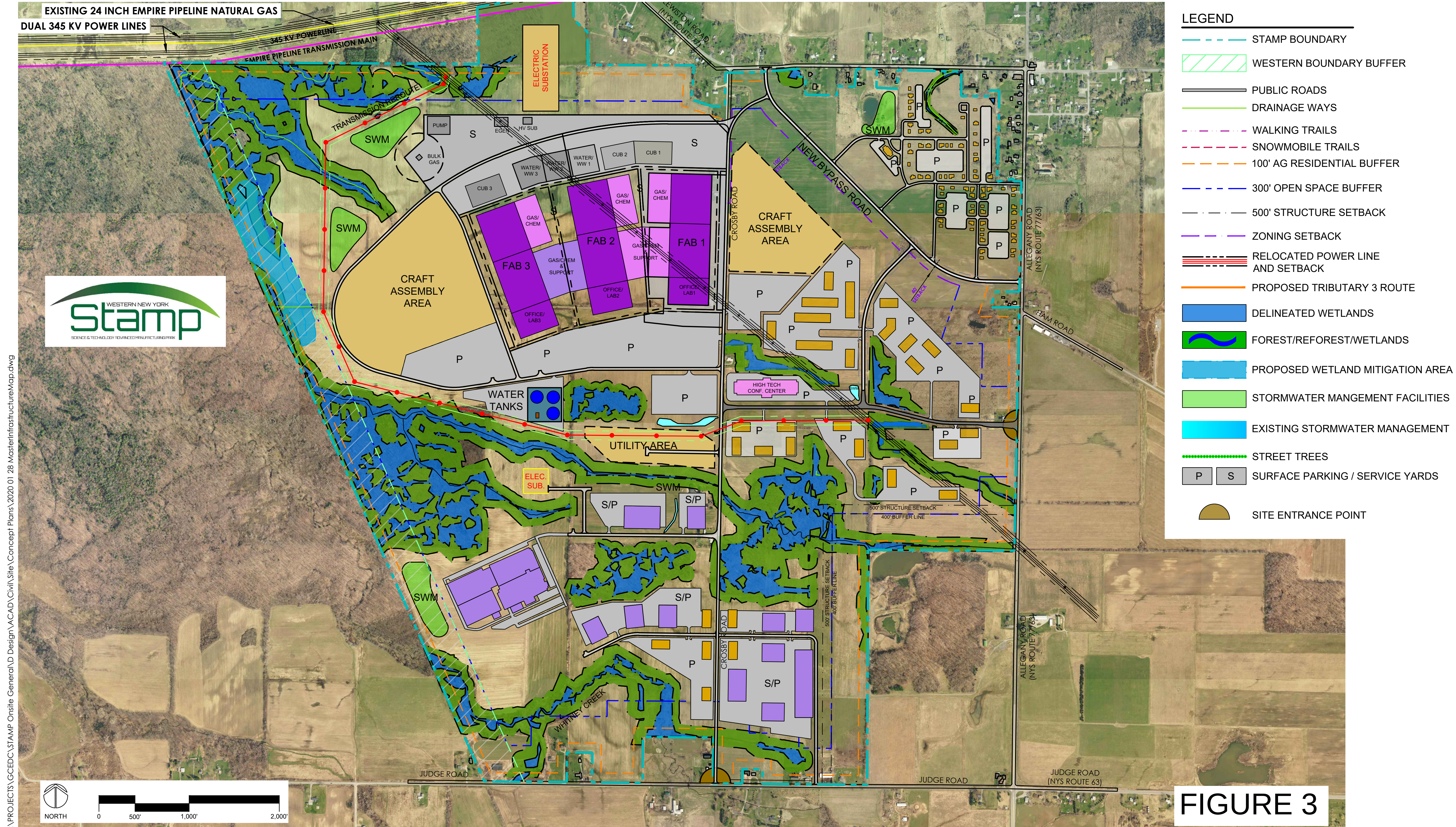



FIGURE 3

# STAMP - MASTER BUILD OUT PLAN

WNY SCIENCE AND TECHNOLOGY ADVANCED MANUFACTURING PARK (STAMP)

JUNE 2020

NEW YORK STATE OF OPPORTUNITY

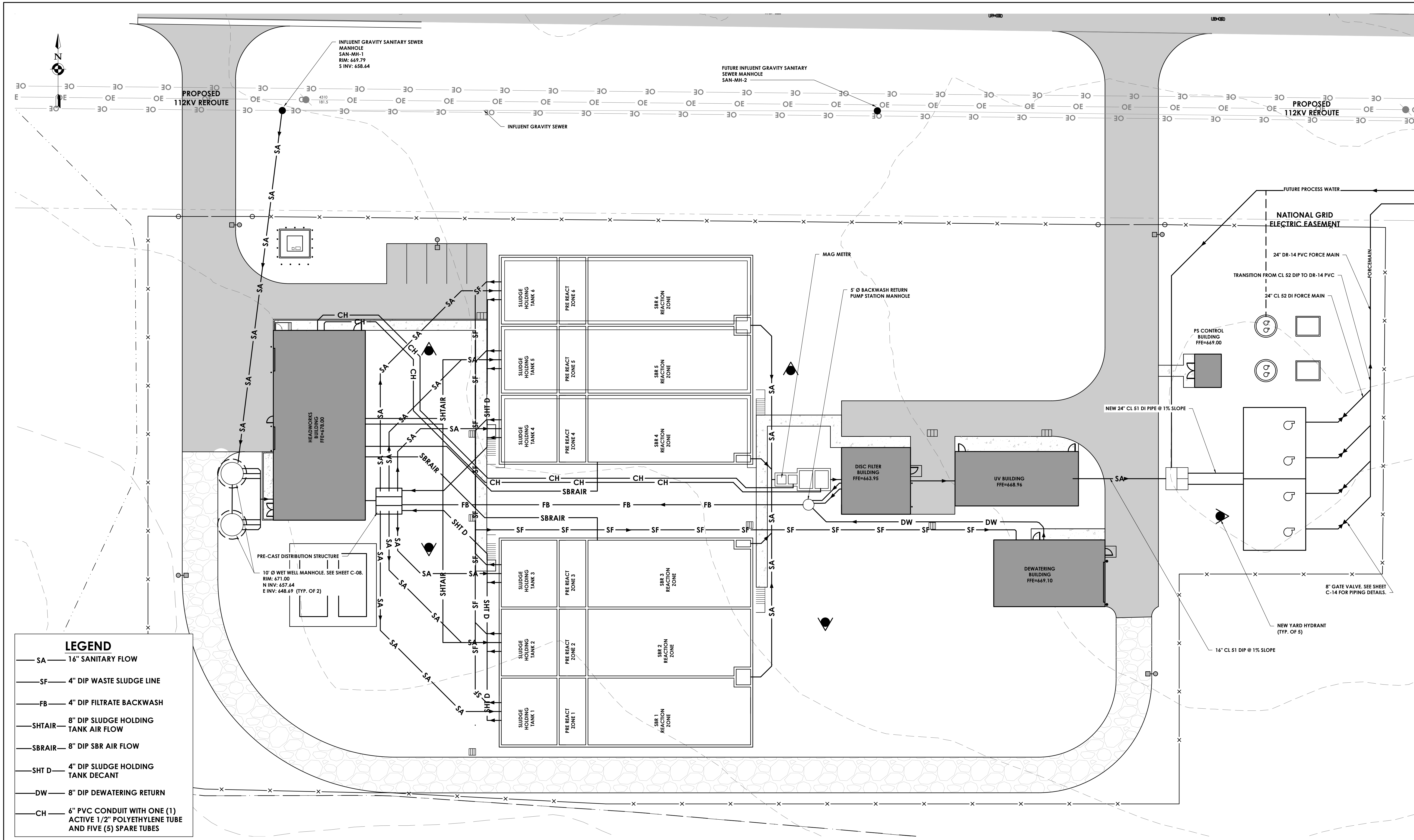
GREATER ROCHESTER ENTERPRISE

Power People Incentives — Genesee County Economic Development Center

INVEST BUFFALO NIAGARA

# Figure 4

# MPS and WWTF Site Plan




| REVISIONS | | | | |
|---|---|---|---|---|
| NO. | DATE | BY | CHKED | DESCRIPTION |

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STATE OF NEW YORK — PROFESSIONAL ENGINEER — 086962

# GENESEE COUNTY ECONOMIC DEVELOPMENT CENTER (AGENCY SET, NOT FOR CONSTRUCTION)

TOWN OF ALABAMA GENESEE COUNTY NEW YORK STATE

DATE: 04/27/2020
DRAWN: MCZ
DESIGNED: NAB
CHECKED: TAC
SCALE: 1"=20'

## STAMP ONSITE WASTEWATER TREATMENT FACILITY

## MPS AND WWTF SITE PLAN

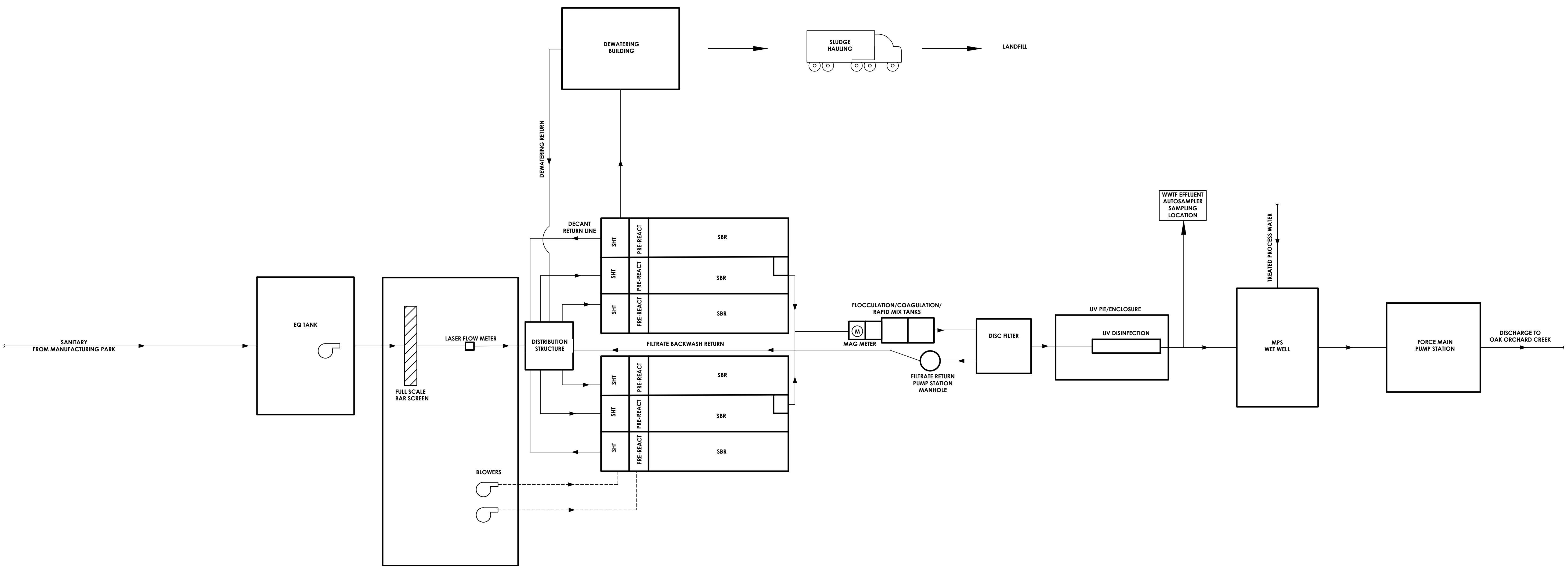
PROJECT NUMBER 14822.00

DRAWING NUMBER FIG.-4

Plotted By: Zach Anderson
Date last plotted: 10/15/2021 8:52 AM
Date last accessed: 10/15/2021 8:48 AM
Drawing Name: J:\PROJECTS\GCEDC\STAMP Onsite WWTF\D Design\ACAD\Civil\Site\Composite STAMP WWTF.dwg
Referenced Drawings: None

# Figure 5

# WWTF Process Flow Diagram




| REVISIONS | | | | |
|---|---|---|---|---|
| NO. | DATE | BY | CHKED | DESCRIPTION |
| | | | | |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STATE OF NEW YORK · ANDREW R. KO... · 086962 · LICENSED PROFESSIONAL ENGINEER

GENESEE COUNTY ECONOMIC DEVELOPMENT CENTER
(AGENCY SET, NOT FOR CONSTRUCTION)

TOWN OF ALABAMA GENESEE COUNTY NEW YORK STATE

DATE: 04/27/2020
DRAWN: MCZ
DESIGNED: NAB
CHECKED: ARK
SCALE: NTS

STAMP ONSITE WASTEWATER TREATMENT FACILITY

PROCESS FLOW DIAGRAM

PROJECT NUMBER 14822.00

DRAWING NUMBER FIG.-5

Referenced Drawings: None
Drawing Name: J:\PROJECTS\GCEDC\STAMP Onsite WWTF\D Design\ACAD\Civil\General\G-02_STAMP WWTF_PROCESS FLOW DIAGRAM.dwg
Date last accessed: 10/15/2021 8:52 AM
Date last plotted: 1/7/2022 5:16 PM
Plotted By: Nick Bayer

# Appendix A

# Wet Well Calculations

**Genesee County Economic Development Center**
**WNY Science, Technology & Advanced Manufactruing Park (STAMP)**
**Onsite Temporary Pump Station and Main Pump Station Wet Well Sizing**

**Temporary PS-Phase 1 (1 Pump Running, 1 Backup) 0.5 MGD**
**Up to 0.50 MGD**

| | | |
|---|---|---|
| Wet Well Diameter | 10 | ft |
| Wet Well Top | 669.5 | ft |
| Wet Well Bottom | 644 | ft |
| Top of Operating Range | 654 | ft |
| Bottom of Operating Range | 645 | ft |
| Wet Well Volume | 14981 | gal |
| Operating Volume | 5287 | gal |
| Influent Flow Rate | 347 | gpm |
| Pump Flow Rate | 900 | gpm |
| Wet Well Fill Time | 15.2 | min |
| Wet Well Empty Time | 9.6 | min |

**Temporary PS-Phase 2 (2 Pump Running, 1 Backup) 1 MGD**
**Up to 1.5 MGD**

| | | |
|---|---|---|
| Wet Well Diameter | 10 | ft |
| Wet Well Top | 669.5 | ft |
| Wet Well Bottom | 644 | ft |
| Top of Operating Range | 654 | ft |
| Bottom of Operating Range | 645 | ft |
| Wet Well Volume | 29961 | gal |
| Operating Volume | 10575 | gal |
| Influent Flow Rate | 694 | gpm |
| Pump Flow Rate | 1388 | gpm |
| Wet Well Fill Time | 15.2 | min |
| Wet Well Empty Time | 15.2 | min |

**Temporary PS-Phase 2a (3 Pump Running, 1 Backup) 1.5 MGD**
**Up to 2.0 MGD**

| | | |
|---|---|---|
| Wet Well Diameter | 10 | ft |
| Wet Well Top | 669.5 | ft |
| Wet Well Bottom | 644 | ft |
| Top of Operating Range | 654 | ft |
| Bottom of Operating Range | 645 | ft |
| Wet Well Volume | 29961 | gal |
| Operating Volume | 10575 | gal |
| Influent Flow Rate | 1041 | gpm |
| Pump Flow Rate | 1735 | gpm |
| Wet Well Fill Time | 10.2 | min |
| Wet Well Empty Time | 15.2 | min |

**Permanent PS-Phase 3 (1 Pump Running, 1 Backup) 3.0 MGD**
**Up to 4.0 MGD**

| | | |
|---|---|---|
| Wet Well Area | 2250 | ft |
| Wet Well Top | 669 | ft |
| Wet Well Bottom | 652 | ft |
| Top of Operating Range | 658 | ft |
| Bottom of Operating Range | 655.5 | ft |
| Wet Well Volume | 286110 | gal |
| Operating Volume | 42075 | gal |
| Influent Flow Rate | 2082 | gpm |
| Pump Flow Rate | 2500 | gpm |
| Wet Well Fill Time | 20.2 | min |
| Wet Well Empty Time | 100.7 | min |

**Permanent PS-Phase 4 (3 Pump Running, 1 Backup) 6.0 MGD**
**Up to 6.0 MGD**

| | | |
|---|---|---|
| Wet Well Area | 2250 | ft |
| Wet Well Top | 669 | ft |
| Wet Well Bottom | 652 | ft |
| Top of Operating Range | 658 | ft |
| Bottom of Operating Range | 655.5 | ft |
| Wet Well Volume | 572220 | gal |
| Operating Volume | 84150 | gal |
| Influent Flow Rate | 4164 | gpm |
| Pump Flow Rate | 4580 | gpm |
| Wet Well Fill Time | 20.2 | min |
| Wet Well Empty Time | 202.3 | min |

Note:

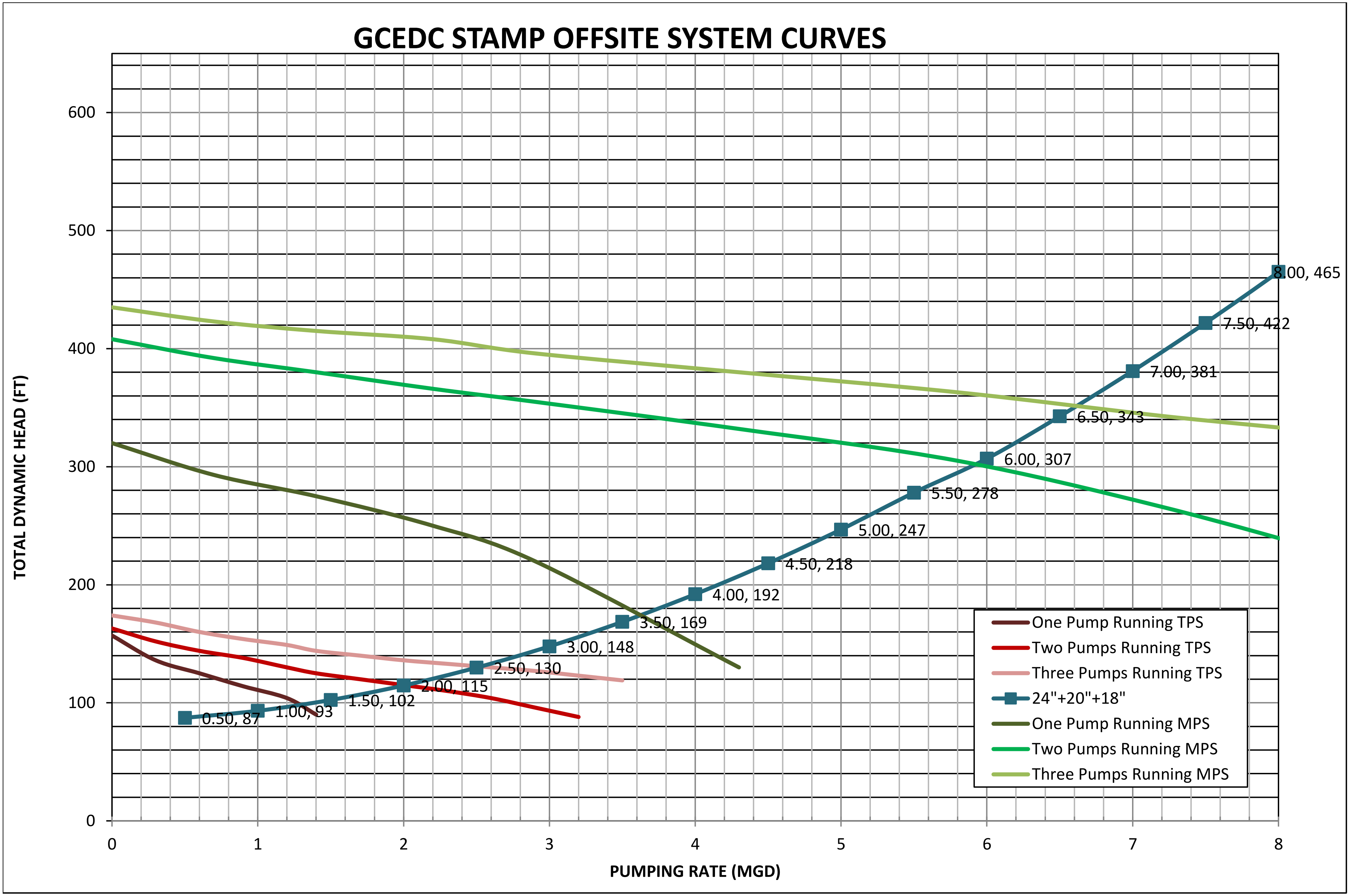
1. For the temporary pump station Phase 2 and Phase 3, each additional phase will be in addtion to the previous phases.
2. When the stanitary and process water flows exceed 2.0 MGD the permanent Main Pump Station will be needed.
3. When the Main Pump Station is needed, the temporary pump station will be decomissioned.

# Appendix B

# FM System Curve

GCEDC

STAMP OFFSITE SEWER



# Appendix c

# WWTF Draft SPDES Permit Limits

# PERMIT LIMITS, LEVELS AND MONITORING

| OUTFALL | LIMITATIONS APPLY | RECEIVING WATER | EFFECTIVE | EXPIRING |
|---|---|---|---|---|
| 001 | All Year otherwise stated | Oak Orchard Creek | See footnote (1) | ExDP |

| PARAMETER | EFFLUENT LIMITATION | | | | | MONITORING REQUIREMENTS | | | | FN |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Location | | |
| | Type | Limit | Units | Limit | Units | Sample Frequency | Sample Type | Inf. | Eff. | |
| Flow | Monthly Average | 1.0 | MGD | | | Continuous | Meter | | X | |
| Flow | Daily Maximum | Monitor | MGD | | | Continuous | Meter | | X | |
| pH | Range | 6.5 – 8.5 | SU | | | 2/Day | Grab | | X | |
| Temperature | Daily Maximum | 90 | º F | | | 2/Day | Grab | | X | |
| $CBOD_5$ | 7-Day Average | Monitor | mg/L | Monitor | lb/d | 1/Week | 24-hr. Comp. | | X | (2) |
| UOD | Daily Maximum | 30 | mg/L | 250 | lbs/d | 1/Week | Calculated | | X | (2,3) |
| Total Kjeldahl Nitrogen (TKN) (as N) | Daily Maximum | Monitor | mg/L | Monitor | lbs/d | 1/Week | 24-hr. Comp. | | X | |
| Total Suspended Solids (TSS) | 7-Day Average | 15 | mg/L | 130 | lb/d | 1/Week | 24-hr. Comp. | | X | |
| Settleable Solids | Daily Maximum | 0.1 | mL/L | | | 2/Day | Grab | | X | |
| Dissolved Oxygen | Daily Minimum | 5.0 | mg/L | | | 2/Day | Grab | | X | (2) |
| Ammonia (as N) (June 1 – October 31) | Monthly Average | 1.2 | mg/L | 10 | lb/d | 1/Week | 24-hr. Comp. | | X | (2) |
| Ammonia (as N) (Nov. 1 – May 31) | Monthly Average | 1.9 | mg/L | 16 | lb/d | 1/Week | 24-hr. Comp. | | X | (2) |
| TKN | Monthly Average | Monitor | mg/l | Monitor | lb/d | 1/Week | 24-hr. Comp. | | X | |
| Total Phosphorus (as P) | Monthly Average | 0.5 | mg/L | 4.2 | lb/d | 1/Week | 24-hr. Comp. | X | X | |
| Mercury, Low Level | Monthly Average | 0.7 | ng/L | - | | Quarterly | Grab | X | X | (4) |

| EFFLUENT DISINFECTION Required Seasonal from May 1st - October 31st | | Limit | Units | Limit | Units | Sample Frequency | Sample Type | Inf. | Eff. | FN |
|---|---|---|---|---|---|---|---|---|---|---|
| Coliform, Fecal | 30-Day Geometric Mean | 200 | No./ 100 mL | | | 1/Week | Grab | | X | |
| Coliform, Fecal | 7-Day Geometric Mean | 400 | No./ 100 mL | | | 1/Week | Grab | | X | |
| Chlorine, Total Residual | Daily Maximum | 0.03 | mg/L | | | 2/Day | Grab | | X | (5) |

| WHOLE EFFLUENT TOXICITY (WET) TESTING | | Limit | Units | Action Level | Units | Sample Frequency | Sample Type | Inf. | Eff. | FN |
|---|---|---|---|---|---|---|---|---|---|---|
| WET - Acute Invertebrate | See footnote | | | 0.30 | TUa | | See footnote | | X | (6) |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| WET - Acute Vertebrate | See footnote | | | 0.30 | TUa | | See footnote | | X | (6) |
| WET - Chronic Invertebrate | See footnote | | | 1.5 | TUc | | See footnote | | X | (6) |
| WET - Chronic Vertebrate | See footnote | | | 1.5 | TUc | | See footnote | | X | (6) |

**Footnotes Continued on Next Page**

**Footnotes:**

1. Upon construction completion, and submittal and acceptance by the DEC of the certificate of construction completion, **the** final effluent limitations shall be **effective upon DEC certification + 6 Months. The interim limits are monitor only until the final effluent limitations become effective** Both concentration and mass loading shall be reported for all parameters, except flow, settleable solids, pH, Temperature, DO and Fecal Coliform.

2. Limits may be reassessed upon a request to add new dischargers, either to the STAMP WWTP, or for a separate individual permit but whose discharge combines with the discharge of this permit and is discharged to outfall 001.

3. Ultimate Oxygen Demand (UOD) in mg/l shall be computed as follows: UOD = (1.5 × $CBOD_5$) + (4.5 × TKN).

4. The permittee must sample and analyze for mercury using USEPA Method 1631E.

5. If no chlorine is used in the treatment process, then no total residual chlorine monitoring is required.

6. **Whole Effluent Toxicity (WET) Testing:**

   Testing Requirements – Chronic WET testing is required, but report both the acute and chronic results. Testing shall be performed in accordance with 40 CFR Part 136 and TOGS 1.3.2 unless prior written approval has been obtained from the Department. The test species shall be Ceriodaphnia dubia (water flea - invertebrate) and Pimephales promelas (fathead minnow - vertebrate). Receiving water collected upstream from the discharge should be used for dilution. All tests conducted should be static-renewal (two 24-hr composite samples with one renewal for Acute tests and three 24-hr composite samples with two renewals for Chronic tests). The appropriate dilution series should be used to generate a definitive test endpoint, otherwise an immediate rerun of the test may be required. WET testing shall be coordinated with the monitoring of chemical and physical parameters limited by this permit so that the resulting analyses are also representative of the sample used for WET testing. The ratio of critical receiving water flow to discharge flow (i.e. dilution ratio) is 1.3:1 for acute, and 1.8:1 for chronic. Discharges which are disinfected using chlorine should be dechlorinated prior to WET testing or samples shall be taken immediately prior to the chlorination system.

   Monitoring Period - WET testing shall be performed quarterly (calendar quarters) one year after the commencement of wastewater discharge beginning in January and lasting for a period of one full year and then after every five year.

   Reporting - Toxicity Units shall be calculated and reported on the DMR as follows: TUa = (100)/(48-hr LC50) [note that Acute data is generated by both Acute and Chronic testing] and TUc = (100)/(7-day NOEC) or (100)/(7-day IC25) when Chronic testing has been performed or TUc = (TUa) x (10) when only Acute testing has been performed and is used to predict Chronic test results, where the 48-hr LC50, 7-day NOEC and/or IC25 are all expressed in % effluent. This must be done, including the Chronic prediction from the Acute data, for both species unless otherwise directed. For Chronic results, report the most sensitive endpoint (i.e. survival, growth and/or reproduction) corresponding to the lowest 7-day NOEC or IC25 and resulting highest TUc. For Acute results, report a TUa of 0.3 if there is no statistically significant mortality in 100% effluent as compared to the control. Report a TUa of 1.0 if there is statistically significant mortality in 100% effluent as compared to the control, but insufficient mortality to generate a 48-hr LC50. Also, in the absence of a 48-hr LC50, use 1.0 TUa for the Chronic prediction from the Acute data, and report a TUc of 10.0.

The complete test report including all bench sheets, statistical analyses, reference toxicity data, daily average flow at the time of sampling and other appropriate supporting documentation, shall be submitted within 60 days following the end of each test period with your WET DMR and to the WET@dec.ny.gov email address. A summary page of the test results for the invertebrate and vertebrate species indicating TUa, 48-hr LC50 for Acute tests and/or TUc, NOEC, IC25, and most sensitive endpoints for Chronic tests, should also be included at the beginning of the test report.

<u>WET Testing Action Level Exceedances</u> - If an action level is exceeded then the Department may require the permittee to conduct additional WET testing including Acute and/or Chronic tests. Additionally, the permittee may be required to perform a Toxicity Identification/Reduction Evaluation (TI/RE) in accordance with Department guidance. Enforceable WET limits may also apply. The permittee shall be notified in writing by their Regional DEC office of additional requirements. The written notification shall include the reason(s) why such testing, TI/RE and/or limits are required.

# Appendix D

# WWTF Basis of Design Equipment Selection

1. Mechanical Bar Screen, Washer Compactor
2. Influent Flow Meter
3. Sequential Batch Reactor (SBR) Design Calculations
4. Sludge Holding Tank (SHT) Design Calculations
5. SBR Aeration Blowers
6. SHT Aeration Blowers
7. Disc Filter Sizing and Equipment Selection
8. Coagulation and Flocculation Tank Design
9. UV Disinfection Sizing and Equipment Selection
10. Screw Press Sizing and Equipment Selection
11. Sanitary Sewer Pump Selection

# Mechanical Bar Screen, Washer Compactor

Duperon® ADAPTIVE TECHNOLOGY™
PRELIMINARY LIQUIDS/SOLIDS SEPARATION SYSTEMS

**Date:** June 12, 2019

**Project:** STAMP WWTP Medina NY **Proposal Number:** P10211

# BUDGET EQUIPMENT SCOPE

**To:** STAMP WWTP Medina NY


**From:** **Your Duperon® Team**
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Duperon® ADAPTIVE TECHNOLOGY™
PRELIMINARY LIQUIDS/SOLIDS SEPARATION SYSTEMS

**Date:** June 12, 2019

**Project:** STAMP WWTP Medina NY **Proposal Number:** P10211

# BUDGET EQUIPMENT SCOPE

**Thank you** for considering **Duperon®** system solutions for your project. We appreciate the opportunity to provide you with a **Budget Equipment Scope**. Please do not hesitate to contact your **Duperon® Team** with any questions as we work with you through the design process and ensure a successful project.

## Equipment Scope

**SCREENS:**

| QTY | UNIT | DESCRIPTION | | |
|---|---|---|---|---|
| **1** | **EA** | **Duperon® FlexRake® - Front Clean Front-Return** | | |
| | | Model: | LF - LowFlow | |
| Notes: | Based on 4ft channel height. Please note the Low Flow screen was not designed to manage septage. | Enclosure (& Material): | Fully Enclosed (304) | |
| | | Channel Width x Height: | 1.5 x 4 | Feet |
| | | Clear Opening Size: | 0.25 in | |
| | | Angle of Installation: | 30 | Deg. from Vertical |
| | | Material Construction: | 304 | SSTL |

**CONTROLS**

| QTY | UNIT | | |
|---|---|---|---|
| **1** | **EA** | **Main Control Panel:** | **1 - LF** |
| | | Power: | 480V/3ph/60hz |
| Notes: | Pre-engineered controls package included. Changes to scope will have cost impacts. | Panel Rating: | NEMA 4X |
| | | PLC/Relay Based: | Relay |
| | | Screen Instrumentation: | Dual Mechanical Float |
| | | Local Pushbutton Station(s): | Three Button (E-Stop/Run/Jog Rev) |

**TECH/FREIGHT**

| QTY | UNIT | DESCRIPTION | | |
|---|---|---|---|---|
| **1** | **LOT** | **On-Site Technical Assistance** | | |
| | | Number of Trips: | 1 | Trip(s) |
| | | Days On-Site per Trip: | 1 | 8-hour man-day(s) |
| **1** | **LOT** | **Freight** | | |
| | | FOB Factory, Full Freight Allowed | | |

Duperon ADAPTIVE TECHNOLOGY™
Let's Build a System that Works for You™

Date: May 17, 2019
Project: STAMP WWTP - Medina, NY
Number: P10211

# HYDRAULIC CALCULATIONS

## Notes: 3 MGD Phase 3 Peak Flow, 0.25" Bar Openings, 25% Blinding

**INPUT: Channel Physics**

| | | |
|---|---|---|
| Flow in MGD | 3.00 | MGD |
| Upstream water level | 2.50 | ft |
| Channel width | 1.50 | ft |
| Channel depth | 4.00 | ft |
| Degree of blinding | 25% | |

**INPUT: Screen Physics**

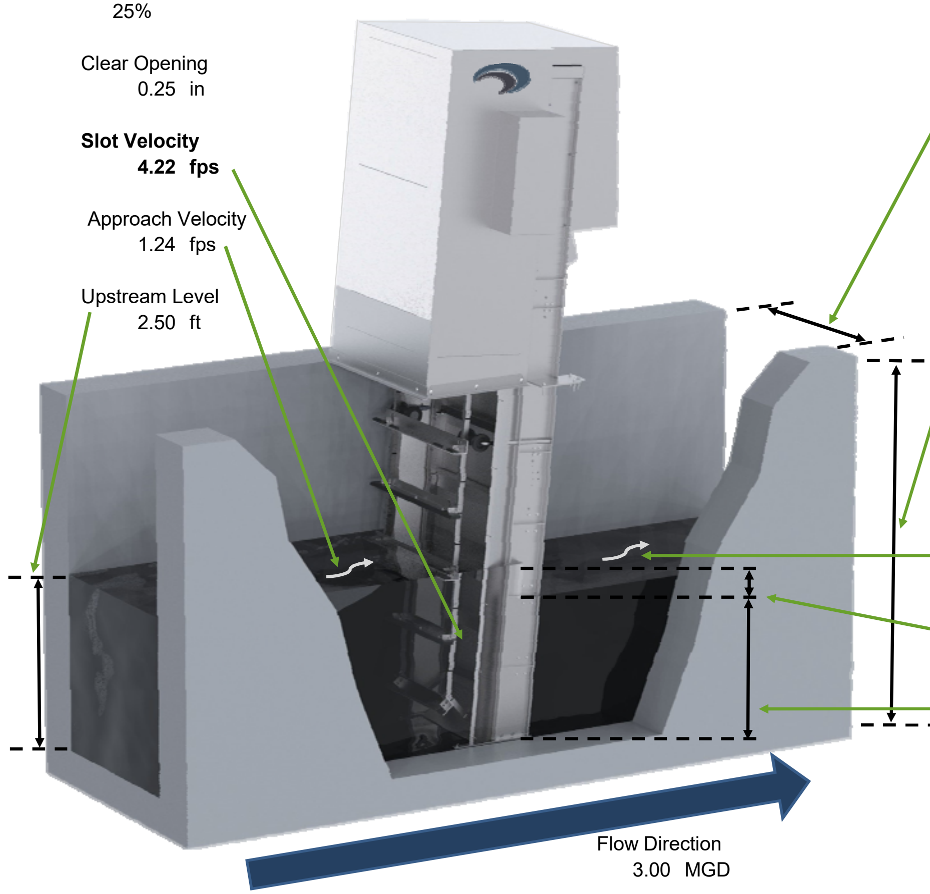
| | | |
|---|---|---|
| Clear Opening | 0.25 | in |
| Bar thickness | 0.25 | in |
| Thickness of side fab and closeout (2) | 0.33 | ft |

**Calculations**

| | | |
|---|---|---|
| Side fab & closeout area | 0.83 | sft |
| Flow area between side fab & closeouts | 2.93 | sft |
| Number of bars | 28.00 | ea |
| Flow area taken up by bars | 1.46 | sft |
| Total Channel flow without screen | 3.75 | sft |
| Flow area after screen area and blinding taken out | 1.10 | sft |
| Approach Velocity | 1.24 | fps |
| Slot Velocity | 4.22 | fps |
| Downstream Velocity | 1.45 | fps |
| Downstream Depth | 2.14 | ft |
| Head Loss | 4.34 | in |

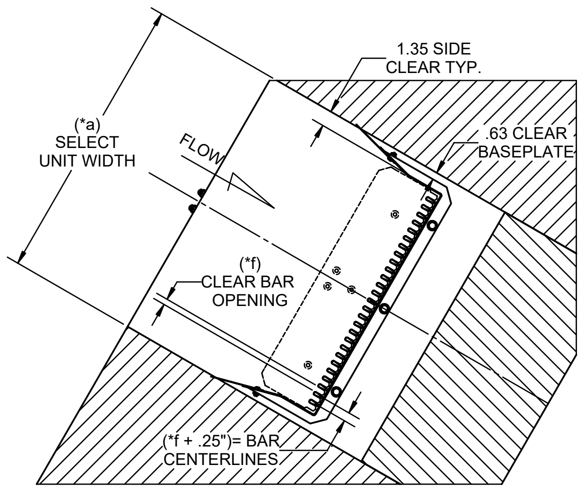
**Bernoulli Calculations**

| | | |
|---|---|---|
| Velocity thru bar screen | 4.22 | fps |
| Velocity upstream of bar screen | 1.24 | fps |
| Gravitational acceleration (constant) | 32.20 | $ft/s^2$ |
| Frictional coefficient (constant) | 1.43 | c |
| Headloss | 0.36 | ft |
| Headloss | 4.34 | inches |

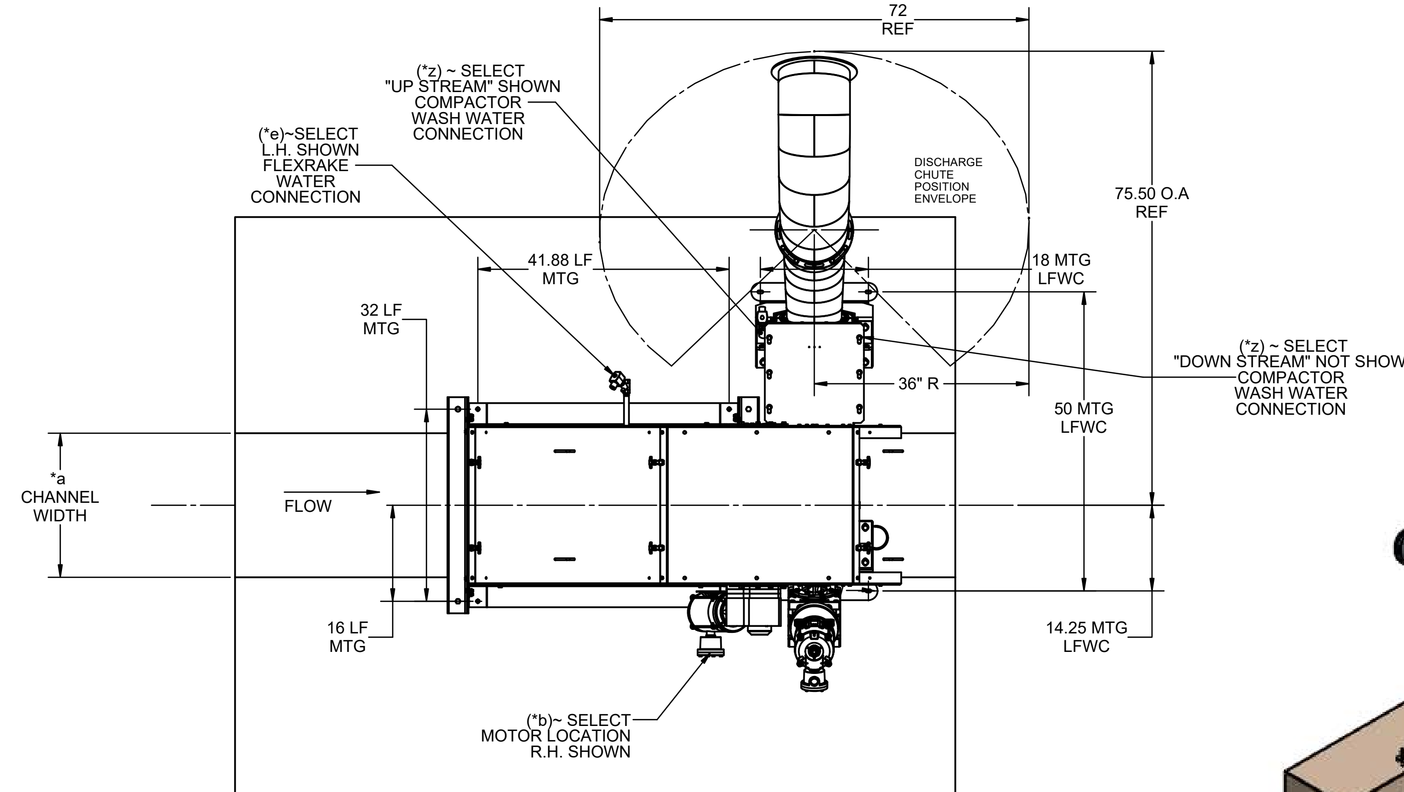


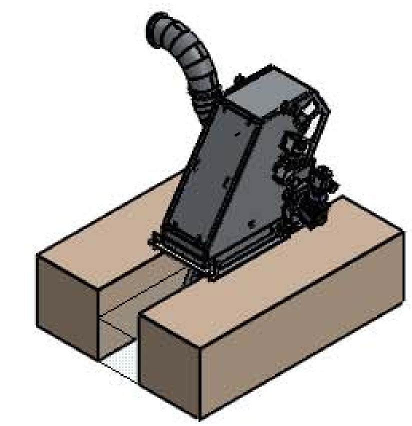

These calculations are an estimation based upon the information available. Flow channel hydraulics are highly dependent on water levels and the degree of blinding. The calculations above are a snapshot of only one condition. To fully analyze the hydraulics please contact your local Duperon representative.
Duperon recommends a minimum of 1.00 ft water depth when the unit is in operation to keep the SSTL FlexLinks lubricated and ensure an optimal amount of screening area.
Duperon recommends using Water Environment Federation (WEF) & "10 States" standards as design guidelines:
Approach velocity should be greater than 1.25 ft/s to prevent settling. Slot velocities should be less than 4 ft/s to prevent forcing material thru openings.

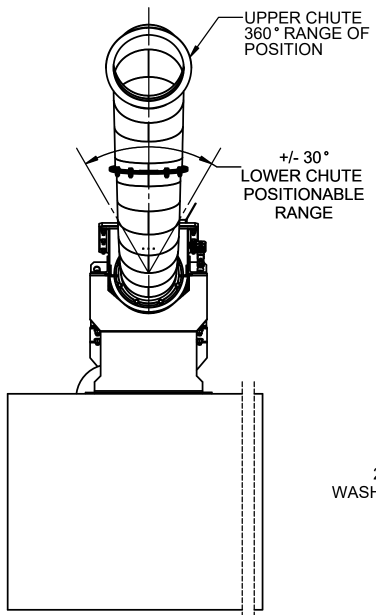

1200 Leon Scott Court | Saginaw, MI 48601 | P 989.754.8800 | F 989.754.2175 | TF 800.383.8479 | www.duperon.com

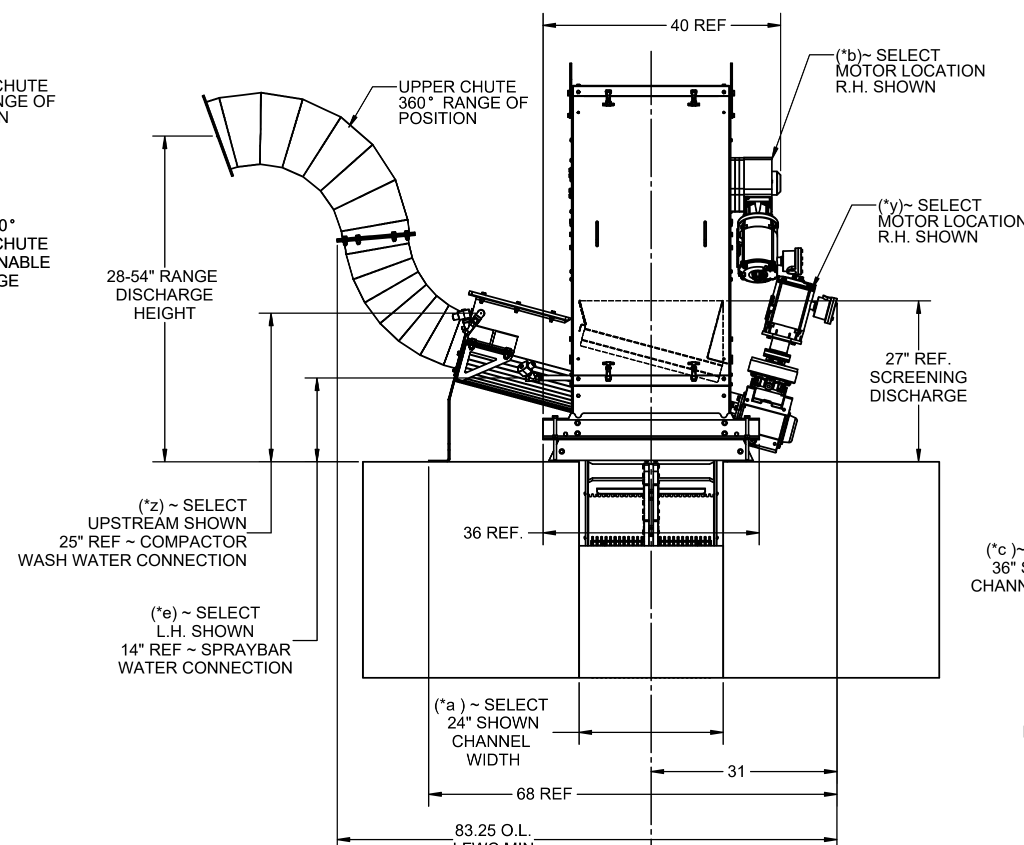


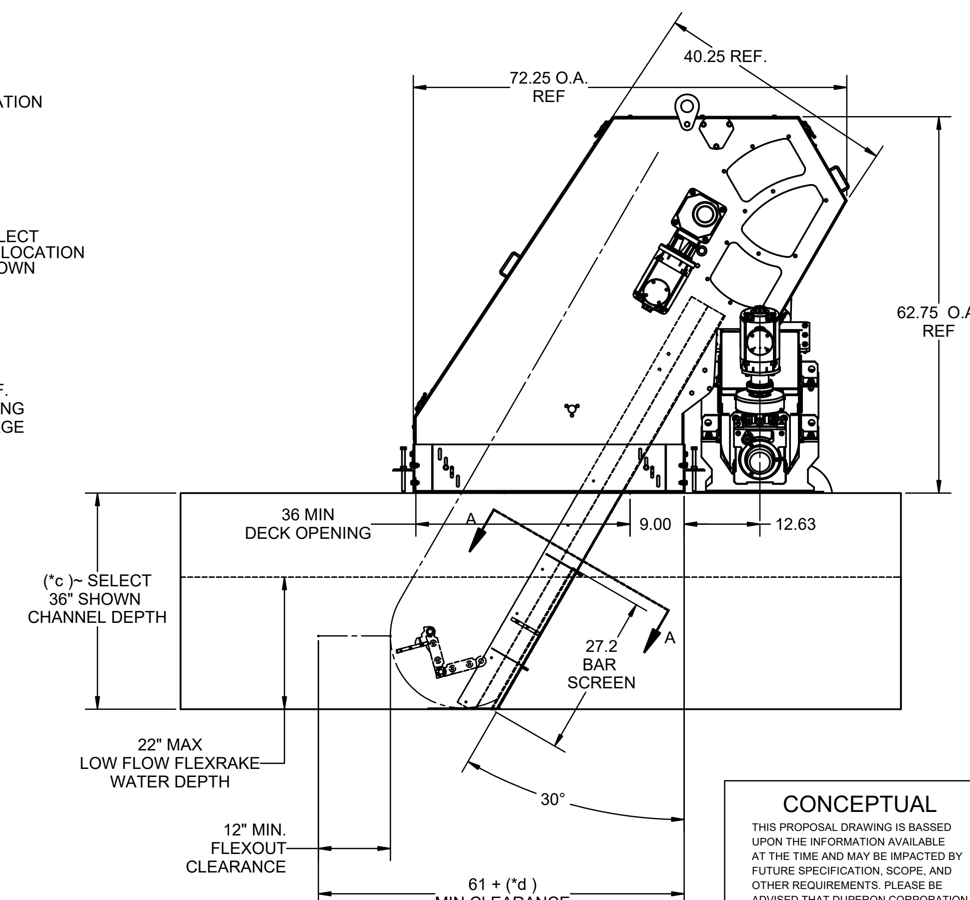

SECTION A-A
SCALE 1 : 8






SHOWN WITH STANDARD (2)-PIECE "POSITIONABLE" DISCHARGE CHUTES.
OTHER CHUTE CONFIGURATIONS AND LENGTHS AVALIABLE.
CONSULTE DUPERON PRODUCT ENGINEERING.

# VERIFICATION BLOCK

## WASHER COMPACTOR SELECTIONS

Please Circle One:

WATER SUPPLY CONNECTION:
(*z) = UPSTREAM or DOWNSTREAM

MOTOR LOCATION:
(*y) = RH or LH

DEBRIS BIN HEIGHT: ________

INDOOR OR OUTDOOR

FLOWS:
PEAK ________
AVERAGE ________

WATER LEVEL:
PEAK ________
AVERAGE ________

## FLEXRAKE SELECTIONS

Please Circle One:

UNIT WIDTH:
(*a) = 12" 18" 24"

MOTOR LOCATION:
(*b) = RH or LH

CHANNEL HIEGHT:
(*c) = 2'-0" 2'-6" 3'-0" 3'-6 4'-0" 4'-6" 5'-0" 5'-6" 6'-0"

CHANNEL DEPTH CLEARANCE:
MINIMIUM NEEDED AT 3FT DEEP.
(*d) =ADD 3.5" FOR EVERY 6" INCREASE OF DEPTH.

SUPPLY WATER CONNETION:
(*e) = RH or LH

CLEAR BAR OPENING:
(*f) = 1/4" 1/2" 3/4" 1"

## CONCEPTUAL

THIS PROPOSAL DRAWING IS BASSED UPON THE INFORMATION AVAILABLE AT THE TIME AND MAY BE IMPACTED BY FUTURE SPECIFICATION, SCOPE, AND OTHER REQUIREMENTS. PLEASE BE ADVISED THAT DUPERON CORPORATION RETAINS THE RIGHT TO REFUSE, WITHDRAW, OR NEGOTIATE THIS PROPOSAL AT ANY TIME PRIOR TO SIGNING MATERIAL CONTRACT

## PROPRIETARY



DIMENSIONING & TOLERANCING IN ACCORDANCE WITH ANSI Y14.5M-1982
TOLERANCES - UNLESS OTHERWISE SPECIFIED
.X =±0.13
.XX =±0.06
.XXX =±0.009
.XXXX =±0.0009
ANGULAR =±0.5°

| | | |
|---|---|---|
| DRAWN | WED | DATE 04/03/19 |
| CHECKED | CA | DATE ?/?/19 |
| APPROVED | - | DATE |
| APPROVED | - | DATE |

## -TEMPLATE-

Duperon®
Saginaw, Michigan 48601
TF 800.383.8479

SHEET TITLE
**DUPERON CORPORATION LOW FLOW SYSTEM LAYOUT**

PART NAME
**FLEXRAKE & LFWC SELECTIONS**

| SIZE | FSCM NO. | DWG. NO. | REV |
|---|---|---|---|
| D | | - | - |

SCALE 1:16 | SHEET 1 OF 1

# Influent Flow Meter

# LaserFlow® Ex

## Intrinsically Safe, Non-Contact Subsurface Velocity Sensor

The LaserFlow® Ex velocity sensor remotely measures flow in open channels with non-contact Laser Doppler Velocity technology and non-contact Ultrasonic Level technology. The sensor uses these advanced methods to measure velocity with a laser beam at single or multiple points below the surface of the wastewater stream. The sensor can be installed in hazardous areas defined as Class I, Div 1 or Zone 0.

*The only non-contact flow measurement device to read below the surface.*

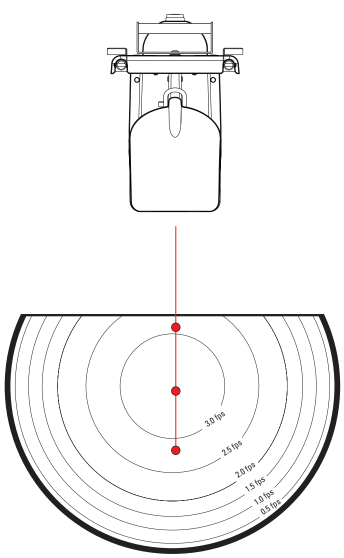
The sensor uses an ultrasonic level sensor to measure the level and determines a sub-surface point to measure velocity. The sensor then focuses its laser beam at this point and measures the velocity from the frequency shift (doppler shift) of the returned light.

The LaserFlow Ex is ideal for a broad range of wastewater monitoring applications. With Teledyne ISCO's TIENet™ Barrier, it is compatible with both the Teledyne ISCO Signature® Flowmeter and the 2160 LaserFlow Module, depending on the type of installation.

During submerged conditions, flow measurement continues without interruption with optional continuous wave Doppler Ultrasonic Area Velocity technology.

With its specially designed mounting bracket in place, the LaserFlow Ex can be deployed and removed from street level. This avoids the risk and expense of confined space entry. A variety of communication options enable programming and data retrieval from a remote location. Information about data quality can be recorded and transmitted with the flow data.

Additionally, built-in diagnostic tools simplify installation, maintenance, and advanced communication options reduce site visits.




*The LaserFlow device can be programmed to take velocity measurements at single or multiple points below the water's surface.*

LaserFlow®

## Applications:

- Hazardous Area Installations
- Flow measurement for CSO, SSO, I&I, SSEs, CMOM, and other sewer monitoring programs
- Wastewater treatment plant influent, process, and effluent flow measurement
- Industrial process and discharge flow measurement
- Shallow flow measurement in varying pipe sizes

## Standard Features:

- Intrinsically Safe Class I, Div 1, Zone 0
- Non-contact velocity and level measurement
- Single or multiple point measurement below the liquid surface
- Rugged, submersible enclosure with IP68 ingress protection
- Zero deadband from measurement point in non-contact level and velocity measurements
- Quality readings without manual profiling

## LaserFlow® Ex Sensor

| | |
|---|---|
| Size (H x W x D): | 18.0 x 9.5 x 23.5 in (45.7 x 24.1 x 59.7 cm) |
| Weight : | 24.8 lbs (11.25 kg) |
| Materials: | Conductive Carbon Filled ABS, SST, Conductive Kynar®[a], Anodized Aluminum, UV Rated PVC |
| Cable Lengths: | 32.8 or 75.5 ft (10 or 23 m)[b] |
| Enclosure: | IP68 |
| Certifications: | Class I, Division 1, Groups C-D, T4 Exia<br>Class I, Zone 0, AEx ia op is IIB T4 Ga<br>Ex II 1 G Ex ia op is IIB T4 Ga<br>IECEx ia op is IIB T4 Ga |
| Laser Class: | Class 3R |
| Temperature Range: | Operating: 14 to 140 °F (-10 to 60 °C)<br>Storage: -40 to 140 °F (-40 to 60 °C) |
| Power Required: | Input voltage: 8 to 26 VDC<br>16 VDC Nominal |
| Flow Accuracy: | ±4% of reading[c] |
| Communication Protocol: | TIENet™ |

### Velocity

| | |
|---|---|
| Technology: | Non-Contact, Subsurface Laser Doppler Velocity (patented) |
| Measurement Range: | 0 to 15 ft/s (0 to 4.6 m/s) |
| Maximum distance from liquid surface to bottom of sensor: | 10 ft (3 m) |
| Minimum depth: | 0.5 in (1.27 cm)[c] |
| Accuracy: | ±0.5% of reading 0.1 ft/s (±0.03 m/s) |
| Minimum Velocity: | 0.5 ft/s (0.15 m/s) |

### Level

| | |
|---|---|
| Technology: | Non-Contact Ultrasonic |
| Measurement Range: | 0 to 10 ft (0 to 3 m) from measurement point |
| Accuracy @ 72 °F (22 °C) | 0.02 ft (±0.006 m) at <1 ft level change<br>0.04 ft (±0.012 m) at <1 ft level change |
| Temperature Coefficient within compensated range: | ± 0.0002 x D (m) per degree C<br>± 0.00011 x D (ft) per degree F<br>(D = Distance from transducer to liquid surface) |
| Beam Angle: | 10° (5° from center line) |
| Ultrasonic Signal: | 50 KHz |
| Deadband: | Zero deadband from bottom of LaserFlow sensor[d] |

## Options and Accessories

- Redundant measurement with simultaneous Ultrasonic Level Sensing
- Permanent mounting hardware
- Sensor retrieval arm enables installation/removal without confined space entry
- Remote ultrasonic level sensor options for drop manhole and outfall applications

Optional Surcharge Measurement:

## TIENet™ 350 Ex Area Velocity Sensor

| | |
|---|---|
| Probe Size (H x W x L): | 0.75 x 1.3 x 6.0 in (19 x 33 x 152 mm) |
| Materials: | Sensor: Epoxy, chlorinated CPVC, SST<br>Cable: UV-Rated PVC |
| Certifications: | CE EN61326 |
| *(Pending)* | Class I, Division 1, Groups C-D, T4 Exia<br>Class I, Zone 0, AEx ia IIB T4 Ga<br>Ex II 1 G Ex ia IIB T4 Ga<br>Ex ia IIB T4 Ga IECEx |
| Temperature Range: | 32 to 158 °F (0 to 70 °C) |

### Velocity

| | |
|---|---|
| Technology: | Submerged Continuous Wave Doppler |
| Ultrasonic: | Measurement |
| Range: | -5 to 20 ft/s (-1.5 to 6.1 m/s) |
| Velocity Measurement: | Bidirectional |
| Accuracy: | ±0.1 ft/s (±0.03 m/s) from -5 to 5 ft/s<br>±2% of reading from 5 to 20 ft/s,<br>Uniform velocity profile |
| Minimum Depth: | 0.08 ft (25 mm) |
| Frequency: | 500 kHz |

### Level

| | |
|---|---|
| Technology: | Submerged Differential Linear Pressure Transducer |
| Measurement Range: | 0.033 to 10 ft (0.01 to 3.05 m) |
| Accuracy: | ± 0.10% of full scale |
| Maximum Depth: | 34 ft (10.5 m) |
| Stability: | ±0.023 ft/yr (±0.007 m/yr) |

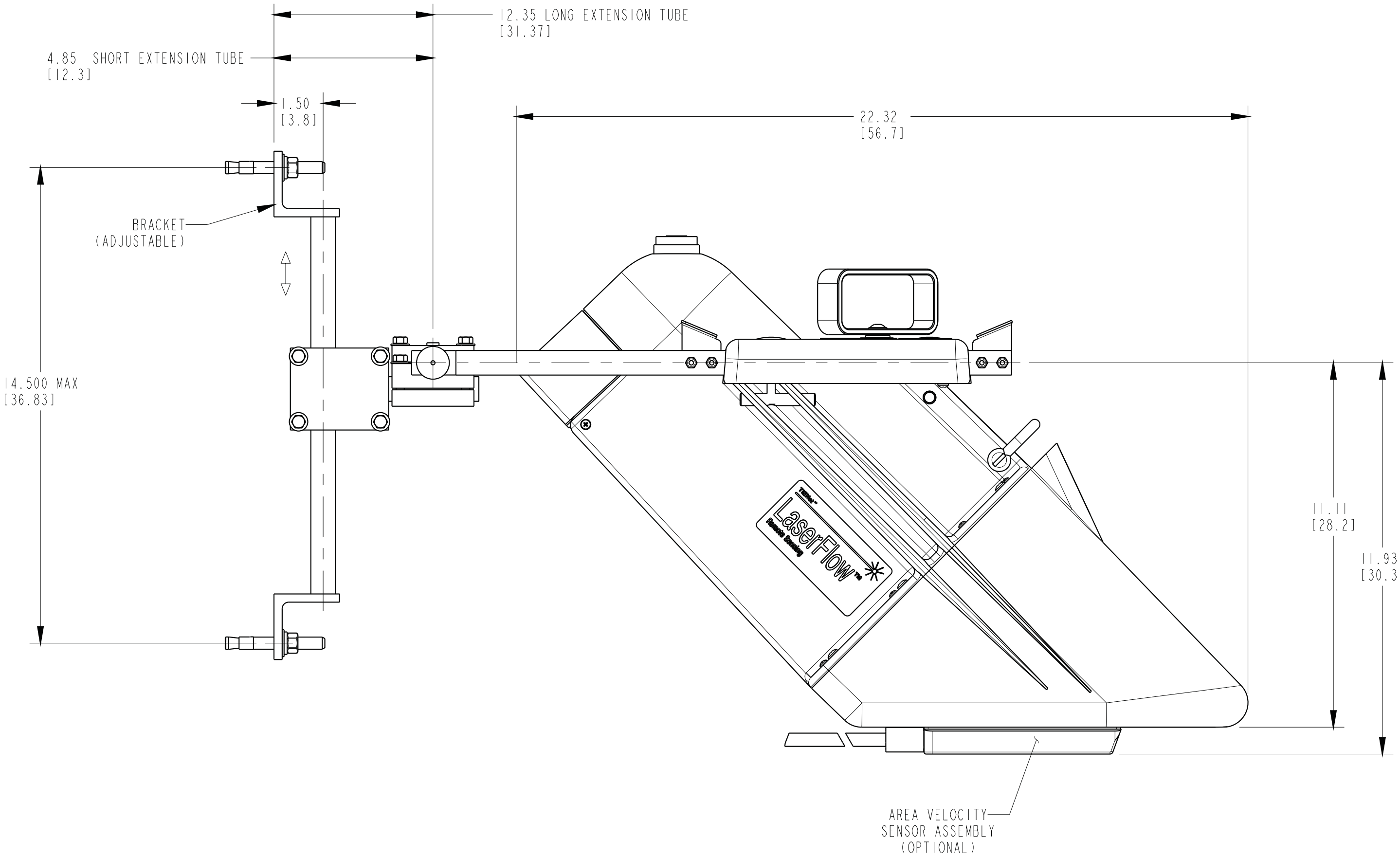
*TIENet™ Barrier device provides safe electrical connections that allow the sensor to be installed in Intrinsically Safe areas.*

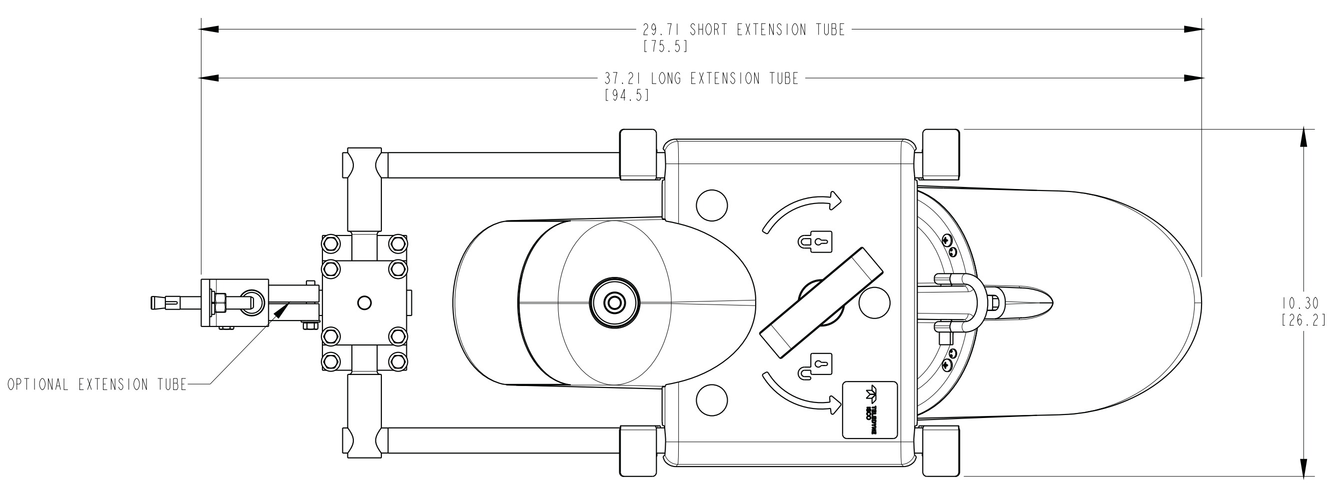

*IP66 enclosure for TIENet™ Barrier device.*


[a] *Kynar® is a registered trademark of Arkema, Inc.*
[b] *Custom cable lengths also available.*
[c] *Under normal flow conditions.*
[d] *Deadband for remote TIENet™ 310 ultrasonic level sensor varies, depending on the type of mounting hardware.*

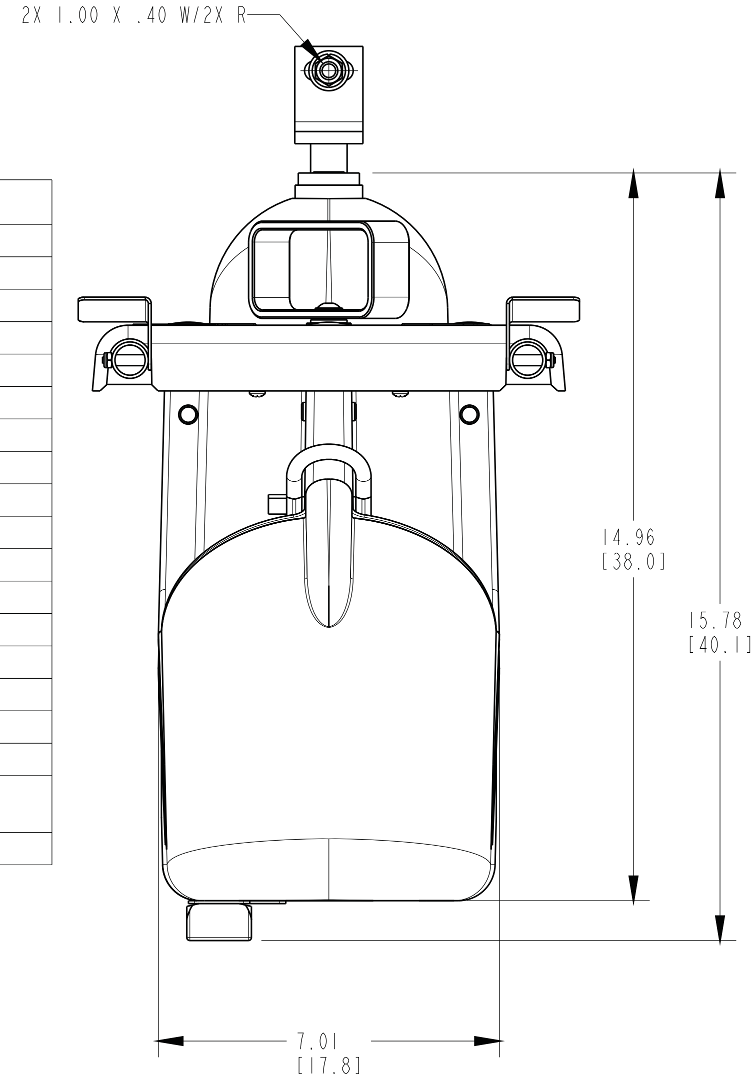
**Teledyne ISCO**
P.O. Box 82531, Lincoln, Nebraska, 68501 USA
Toll-free: (800) 228-4373 • Phone: (402) 464-0231 • Fax: (402) 465-3091
teledyneisco.com

## 360 LaserFlow Velocity Sensor and Wall Mounting Hardware

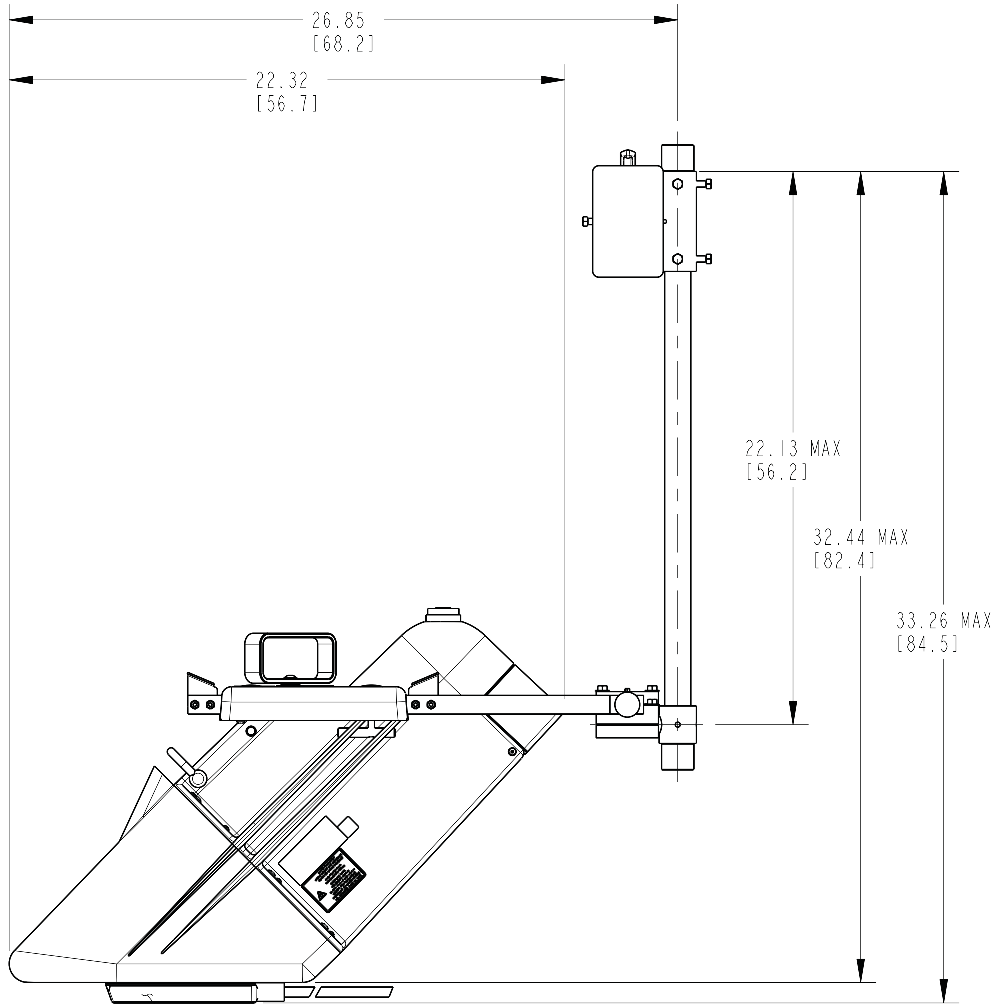


| LaserFlow SENSOR SPECIFICATIONS | |
|---|---|
| | |
| **WEIGHT** | |
| MOUNT | 11.5 LBS [5.2 KG] |
| LaserFLow SENSOR 10M | 19.2 LBS [8.7 KG] |
| LaserFlow SNSR + AREA VELOCITY | 20 LBS [9 KG] |
| | |
| **ENCLOSURE MATERIAL** | |
| HOUSING LaserFlow | CONDUCTIVE CARBON FILLED ABS |
| HOUSING ULTRASONIC | ANNODIZED ALUMINUM 6061 |
| ULTRASONIC SENSOR | Kynar 340 RESIN PVDF GRADE |
| MOUNTING HARDWARE | STAINLESS STEEL |
| ALL OTHER EXTERIOR METAL PARTS | STAINLESS STEEL |
| | |
| **ELECTRICAL** | |
| POWER SUPPLY | TIENet BUS POWERED 8-26 VDC |
| | |
| **ELECTRICAL CONNECTIONS** | |
| TIENet DEVICE | SREW TERMINAL CONNECTION<br>OR TIENet PLUG |
| LASER CLASS | CLASS 3R |



## 360 LaserFlow Velocity Sensor ~~and Temporary Mounting Hardware~~




NOTES:

1. SECONDARY DIMENSIONS IN BRACKETS ARE IN CENTIMETERS [CM], UNLESS OTHERWISE SPECIFIED.

| LaserFlow SENSOR SPECIFICATIONS | |
|---|---|
| | |
| **WEIGHT** | |
| CARGO BAR 48"-55" [122-140] | 6.0 LBS [2.7 KG] |
| CARGO BAR 54"-66" [137-168] | 6.5 LBS [2.9 KG] |
| CARGO BAR 63"-84" [160-213] | 7.4 LBS [3.4 KG] |
| CARGO BAR 83"-114" [211-290] (SHOWN) | 9.0 LBS [4.1 KG] |
| MOUNT | 11.7 LBS [5.3 KG] |
| LaserFLow SENSOR 10M | 19.2 LBS [8.7 KG] |
| LaserFlow SNSR + AREA VELOCITY | 20 LBS [9 KG] |
| | |
| **FORCES** | |
| TOTAL FORCE | 350 LBS [158.8 KG] |
| MAX LOAD | 45 LBS [20.4 KG] |
| | |
| **ENCLOSURE MATERIAL** | |
| CARGO BAR | ALUMINUM |
| HANDLE & HYDRAULIC HOUSING | NYLON |
| FOOT | RUBBER |
| HOUSING LaserFlow | CONDUCTIVE CARBON FILLED ABS |
| HOUSING ULTRASONIC | ANNODIZED ALUMINUM 6061 |
| ULTRASONIC SENSOR | Kynar 340 RESIN PVDF GRADE |
| MOUNTING HARDWARE | STAINLESS STEEL |
| ALL OTHER EXTERIOR METAL PARTS | STAINLESS STEEL |

# Sequential Batch Reactor (SBR) Design Calculations

**DESIGN**

Stamp, NY Sanitaire #a29193-18

| | | | |
|---|---|---|---|
| Max Month* | MGD | 0.510 | |
| Max 4.0hr Cycle Flow | MGD | 0.765 | |
| Max 3.0hr Cycle Flow | MGD | 1.020 | |
| | | mg/l | lb/day |
| $BOD_5$ (20°C) | | 300 | 1276 |
| Suspended Solids | | 250 | 1063 |
| TKN(Assume 1.5 (NH3-N) = TKN) | | 60 | 255 |
| NH3-N | | 40 | 170 |
| Total Phosphorus | | 4 | 17 |
| Max Wastewater Temperature | °C | 20 | |
| Min Wastewater Temperature | °C | 6 | |
| Ambient Air Temperature | °F | 20 - 90 | |
| Site Elevation | ft | 500 | |

*** - Maximum 30 day period mass flow**

## Table B: ICEAS® EFFLUENT QUALITY (MONTHLY AVERAGE)

| | | |
|---|---|---|
| $BOD_5$ (20°C) | mg/l | 10.0 |
| Suspended Solids | mg/l | 10.0 |
| $NH_3$-N | mg/l | 1.2 |
| Total Phosphorus | mg/l | 0.8 |

*Requires chemical precipitation

## Table C: ICEAS PROCESS DESIGN CRITERIA

| | | |
|---|---|---|
| Operating Basins | | 3 |
| Operating Top Water Level | ft | 15.00 |
| F / M | BOD5/DAY/MLSS | 0.039 |
| SVI (after 30 minutes settling) | ml/g | 150 |
| MLSS at Bottom Water Level | mg/l | 5,080 |
| Waste Sludge Produced (Approx.) | lb/day | 969 |
| Volume of Sludge Produced (Approx., 0.85% solids) | GPD | 13,700 |
| Normal Decant Rate | GPM | 708 |
| Peak Decant Rate | GPM | 944 |
| Hydraulic Retention Time | Days | 1.62 |
| Sludge Age | Days | 32.0 |
| Alkalinity | mg/l | 295 |
| Chemical Dosage (as Alum) | mg/l | 42 |

***Bold, italicized text indicate assumptions made by Sanitaire***

**Cycle Timing**

| | | Max Month* | |
|---|---|---|---|
| | | Normal | Min |
| Air-On | min | 120 | 90 |
| Settle | min | 60 | 45 |
| Decant | min | 60 | 45 |
| Total | min | 240 | 180 |

## Table D: KEY ICEAS DESIGN DETAILS

| | | |
|---|---|---|
| Top Water Level | ft | 15.00 |
| Basin Width (Inside) | ft | 30.0 |
| Basin Length (Inside) | ft | 86.0 |
| Bottom Water Level | ft | 13.33 |
| No. of Sludge Holding Tanks | | 3 |
| SHT Top Water Level | ft | 15.0 |
| SHT Width | ft | 25.0 |
| SHT Length | ft | 30.0 |
| Sludge Storage Time | days | 10 |

## ICEAS EQUIPMENT(Base Design)

| | | | | | Motor HP | No. Req. |
|---|---|---|---|---|---|---|
| Decanter Mechanism | 7.5 | ' Weir length | | | | 3 |
| Decanter Drive Unit | | | | | 1/4 | 3 |
| ICEAS Blower | 440 | SCFM | 7.3 PSIG | | 30 | 3 |
| ICEAS Fine Bubble Aeration System | 280 | Disc Diffusers/Basin | | | | 3 |
| Air Control Valve | 6 | " | | | | 3 |
| Waste Sludge Pump | 110 | GPM | | | 2.4 | 3 |
| ICEAS Controls | | | | | | 1 |
| SHT Blower | 320 | SCFM | | 7.5 PSIG | 25 | 4 |
| SHT Aeration System | 225 | Disc Diffusers/Basin | | | | 3 |

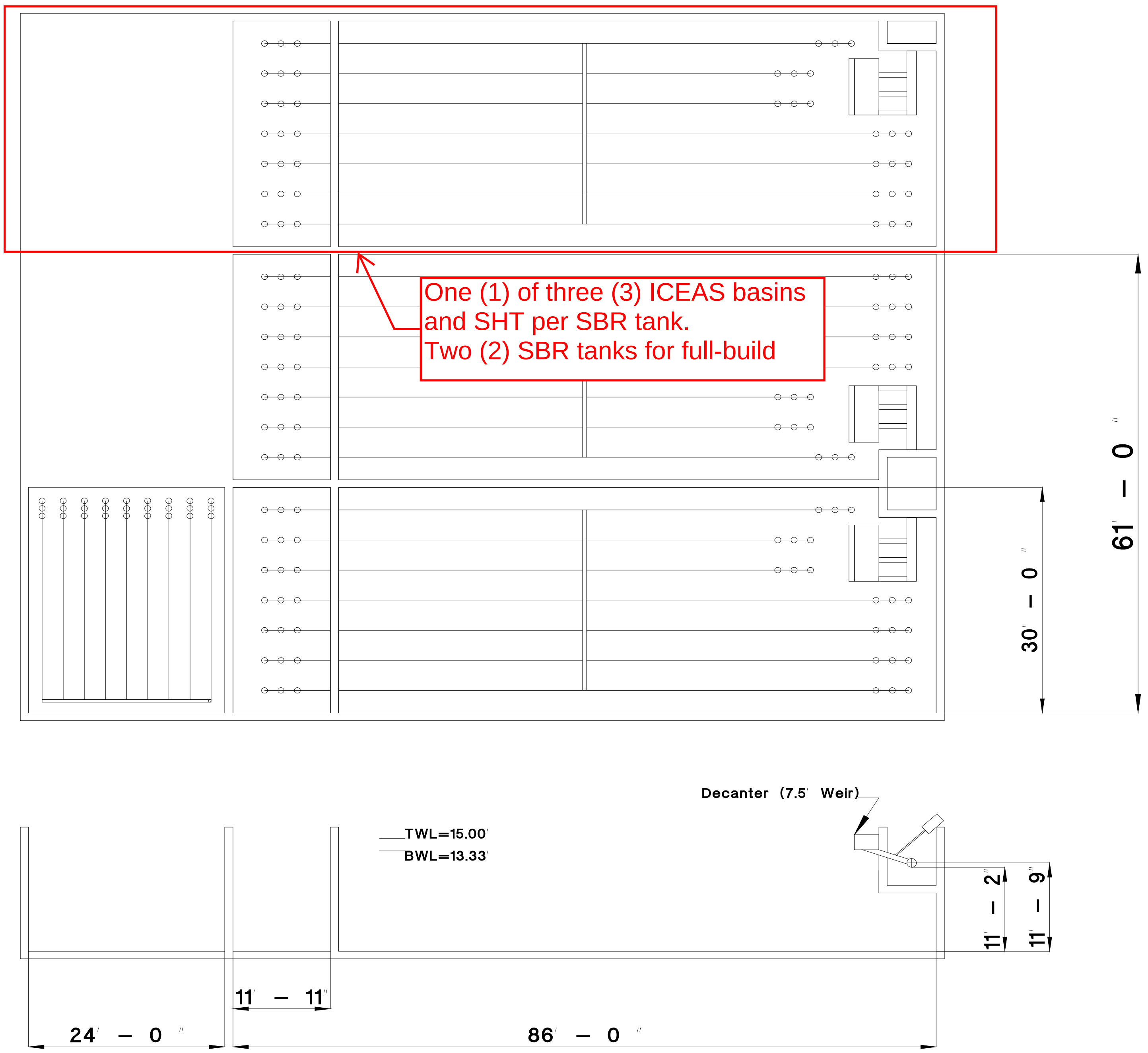
## ICEAS POWER REQUIREMENTS Max Month

**(At Average Aeration Depth)**

| | | | | | | | | | Kwh/Day |
|---|---|---|---|---|---|---|---|---|---|
| Decant Drive Unit | 0.2 | BHP | 3 | run | @ | | 6 | Hrs/day | 2.7 |
| ICEAS Air Blowers | 22.6 | BHP | 1 | run* | @ | | 24 | Hrs/day | 404.6 |
| ICEAS Air Blowers | 22.6 | BHP | 1 | run** | @ | | 12 | Hrs/day | 202.3 |
| Waste Sludge Pump | 1.9 | BHP | 3 | run | @ | | 0.7 | Hrs/day | 3.0 |
| | | | | | | | KWH/DAY | | 612.6 |
| | | | | | AVERAGE | | KWH/HR | | 25.53 |

* Shared ICEAS Blowers
** Dedicated ICEAS Blowers

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| SHT Blower | 19.3 | BHP | 3 | run | @ | | 18 | Hrs/day | 775.60 |
| | | | | | | | KWH/DAY | | 1,388.20 |
| | | | | | AVERAGE | | KWH/HR | | 57.84 |




PRELIMINARY - THIS DRAWING IS NOT INTENDED FOR CONTRACT DOCUMENTS, SUBMITTALS, OR CONSTRUCTION

| | | | | | | |
|---|---|---|---|---|---|---|
| Sanitaire a xylem brand BROWN DEER, WISCONSIN 53223 | CUST NO. / DWG NO. | THIS DRAWING IS THE PROPERTY OF XYLEM AND IS SUBMITTED IN CONFIDENCE. IT IS NOT TO BE DISCLOSED, USED OR DUPLICATED WITHOUT PERMISSION OF XYLEM. | Stamp, NY PRELIMINARY LAYOUT ICEAS System | DRAWN BY TDB / CHKD BY / APPVD BY | DATE 4/30/20 / DATE / DATE | JOB a29193-18 / SHEET |

***SANITAIRE ICEAS Detailed Design Calculations***
***BOD Removal and Nitrification Process***

***SANITAIRE Project #a29193-18***
***Stamp, NY***

## Design Parameters

**A. Flow**

| | | |
|---|---|---|
| Max Month | 510,000 | GPD |
| Max 4.0hr Cycle Flow | 765,000 | GPD |
| Max 3.0hr Cycle Flow | 1,020,000 | GPD |

**B. Treatment**

| | Influent Quality | Effluent Requirement |
|---|---|---|
| $BOD_5$ (20°C), mg/l | 300 | 10 |
| Suspended Solids, mg/l | 250 | 10 |
| TKN, mg/l | 60 | |
| $NH_3$-N, mg/l | | 1 |
| TN, mg/l | | |
| Phosphorus | 4 | 0.8 |

**C. Environment**

| | | |
|---|---|---|
| Alkalinity (Minimum Requirement) | 300 | mg/l |
| Max Wastewater Temperature | 20 | °C |
| Min Wastewater Temperature | 6 | °C |
| Ambient Air Temperature | 20 - 90 | °F |
| Site Elevation | 500 | ft |

**D. ICEAS Process Design Criteria**

| | | |
|---|---|---|
| F / M | 0.047 | $BOD_5$ / MLSS / day |
| SVI (after 30 minutes settling) | 150 | ml/g |
| Number of ICEAS Basins | 3 | |
| Top Water Level | 15 | ft |

**E. Cycle Timing**

| | | Normal | Storm |
|---|---|---|---|
| Air-On | min | 120 | 90 |
| Air-Off | min | | |
| Settle | min | 60 | 45 |
| Decant | min | 60 | 45 |
| Total | hrs | 4 | 3 |

SANITAIRE
a xylem brand

**F. Detailed Calculations**

## Mass of BOD

$$BODL = \frac{Q \ x \ BODin \ x \ 8.34}{1{,}000{,}000} = \frac{170{,}000 \ x \ 300 \ x \ 8.34}{1{,}000{,}000} = \mathbf{425 \ lb/day/basin}$$

where: BODL = BOD Load (lb/day/basin)
Q = Average Dry Weather Flow per basin (gal/day)
BODin = Influent BOD concentration (mg/l)
1,000,000 = Conversion (l/mg)
8.34 = Conversion (lb/gal)

## Mass of Biomass

$$BMOB = \frac{BOD_L}{F / M} = \frac{425}{0.0395} = \mathbf{10{,}778 \ lb/basin}$$

where: BMOB = Mass of Biochemicalmass (lb/day/basin)
F / M = Food to Microorganism ratio ($day^{-1}$)

## Volume of Biomass

$$Vbio = BMOB \ x \ SVI = 10{,}778 \ x \ 2.4 = \mathbf{25{,}867 \ ft^3/basin}$$

where: Vbio = Volume of Biochemicalmass ($ft^3$/basin)
SVI = Sludge Volume Index ($ft^3$/lb)

## Maximum Volume Above Bottom Water Level

**Peak Dry Weather Flow:**

$$Vbwld = \frac{PDWF \times (NCT - NDT)}{24 \times 7.48} = \frac{255{,}000 \times (4.0 - 1.00)}{24 \times 7.48} = \mathbf{4{,}261\ ft^3/basin}$$

where: Vbwld = Maximum Volume Above BWL at Peak Dry Weather Flow ($ft^3$/basin)
PDWF = Peak Dry Weather Flow (gal/day)
NCT = Normal Cycle Time (hr/cycle)
NDT = Decant Time (hr/cycle)
7.48 = Conversion (gal/$ft^3$)
24 = Conversion (hours/day)

**Peak Wet Weather Flow:**

$$Vbwls = \frac{PWWF \times (SCT - SDT)}{24 \times 7.48} = \frac{340{,}000 \times (3.0 - 0.75)}{24 \times 7.48} = \mathbf{4{,}261\ ft^3/basin}$$

where: Vbwls = Maximum Volume Above BWL at Peak Wet Weather (Storm) Flow ($ft^3$/basin)
PWWF = Peak Wet Weather Flow (gal/day)
SCT = Storm Cycle Time (hr/cycle)
SDT = Storm Decant Time (hr/cycle)

MVAB (Maximum Volume Above Bottom Water Level) is larger of Peak Dry Weather and Peak Wet Weather Calculation

$$MVAB = \mathbf{4{,}261\ ft^3/basin}$$

## Decant Rates

**Peak Dry Weather Flow:**

$$PDR = \frac{MVAB \times 7.48}{NDT} + \frac{PDWF}{1{,}440} = \frac{4{,}261 \times 7.48}{60.0} + \frac{255{,}000}{1{,}440} = \mathbf{708\ gal/min}$$

where: PDR = Normal Decant Rate (gal/min)
NDT = Normal Decant Time (min/cycle)
1440 = Conversion (min/day)

**Peak Wet Weather Flow:**

$$PWR = \frac{MVAB \times 7.48}{SDT} + \frac{PWWF}{1{,}440} = \frac{4{,}261 \times 7.48}{45.0} + \frac{340{,}000}{1{,}440} = \mathbf{944\ gal/min}$$

where: PWR = Peak Decant Rate (gal/min)
SDT = Storm Decant Time (min/cycle)

## Decanter Sizing

**Peak Dry Weather Flow:**

$$DLa = \frac{PDR}{\text{Weir Loading Rate} \times 7.48} = \frac{708}{20 \times 7.48} = \mathbf{4.73\ ft}$$

where: DLa = Decanter Length for Average Dry Weather Flow (ft)
20 = Weir Loading Rate ($ft^3$/min/ft of decanter weir)

**Peak Wet Weather Flow:**

$$DLp = \frac{PWR}{\text{Weir Loading Rate} \times 7.48} = \frac{944}{25 \times 7.48} = \mathbf{5.05\ ft}$$

where: DLp = Decanter Length for Peak Wet Weather (Storm) Flow (ft)
25 = Weir Loading Rate ($ft^3$/min/ft of decanter weir)

Design Decanter Length = **7.5 ft**

## Basin Working Volume

$$BWV = MVAB + Vbio = 4{,}261 + 25{,}867 = \mathbf{30{,}128\ ft^3/basin}$$

where: BWV = Basin Working Volume ($ft^3$/basin)
Vc = Volume of chemical sludge due to Phosphorus removal ($ft^3$/basin)
(Please refer to phosphorus removal calculation.)

## Basin Area

$$BA = \frac{BWV}{TWL - BZ} = \frac{30{,}128}{15.0 - 3.2} = \mathbf{2{,}550\ ft^2/basin}$$

where: BA = Basin Area ($ft^2$)
TWL = Top Water Level (ft)
BZ = Buffer Zone (ft) (Safety Factor)

## Sludge Depth

$$SD = \frac{Vbio}{BA} = \frac{25{,}867}{2{,}550} = \mathbf{10.14\ ft}$$

where: SD = Sludge Depth (ft)

## Decanter Draw Down

$$DD = \frac{MVAB}{BA} = \frac{4,261}{2,550} = \mathbf{1.67\ ft}$$

where: DD = Draw Down (ft)

## Bottom Water Level

$$BWL = SD + BZ + Vd = 10.14 + 3.19 + 0.05 = \mathbf{13.33\ ft}$$

where: BWL = Bottom Water Level (ft)
Vd = Depth of Chemical Sludge for Phosporus precipitation (ft)

## Top Water Level

$$TWL = BWL + DD = 13.33 + 1.67 = \mathbf{15.00\ ft}$$

where: TWL = Top Water Level (ft)

## Hydraulic Retention Time

$$HRT = \frac{BA \times MAFD \times 7.48}{QT}$$

where: HRT = Hydraulic Retention Time (days)
MAFD = Maximum Average Flow Depth (ft)
QT = Fill Rate at Average Dry Weather Flow (gal/day)

$$MAFD = \frac{Q \times [(NCT \times 60) - NDT]}{BA \times 1,440 \times 7.48} + BWL = \frac{170,000 \times [(4.0 \times 60) - 60.0]}{2,550 \times 1,440 \times 7.48} + 13.33 = \mathbf{14.44\ ft}$$

$$HRT = \frac{2,550 \times 14.44 \times 7.48}{170,000} = \mathbf{1.62\ days}$$

## MLSS Concentration at Bottom Water Level

$$MLSS = \frac{Mbio \times 1{,}000{,}000}{BWL \times BA \times 62.42} = \frac{10{,}778 \times 1{,}000{,}000}{13.33 \times 2{,}550 \times 62.42} = \mathbf{5{,}080\ mg/l}$$

where: MLSS = Mixed Liquor Suspended Solids concentration at Bottom Water Level (mg/l)
62.42/1E+06 = Conversion (lb/mg x l/ft³)
CA = Area Increment due to chemical sludge (ft²/basin)

## Mass of Sludge Produced

$$\Delta M = \left( \frac{Y \times (BOD_{in} - BOD_{out})}{1 + (B \times \theta^{(T-20)} \times SRT)} + Zio + Zno \right) \times \frac{Q \times 8.34}{1{,}000{,}000} + Csludge$$

$$\Delta M = \left( \frac{0.6 \times (300 - 10.0)}{1 + (0.07 \times 1.02^{(6-20)} \times 32.0)} + 50.0 + 75.0 \right) \times \frac{1.7E{+}05 \times 8.34}{1{,}000{,}000} + 51 = \mathbf{323\ lb/day/basin}$$

(Lawrence-McCarty Equation as presented in WEF MOP/8 4th Edition, pg 11-11, Eqn. 11.7)

where: ΔM = Mass of Sludge Produced (lb/day/basin)
Y = Volatile cell yield (VSS/BOD removed)
q = Arrhenius Temperature Correction Factor
B = Decay Rate (day$^{-1}$)
$BOD_{out}$ = Anticipated Effluent BOD (mg/l)
SRT = Solids Retention Time (days)
Zio = Nonvolatile Influent suspended solids (mg/l)
Zno = Volatile Non-Biodegradable solids (mg/l)
T = Minimum Wastewater Temperature (°C)

## Volume of Sludge Produced

$$V_{ws} = \frac{\Delta M}{SFws \times 8.34} = \frac{323}{0.0085 \times 8.34} = \mathbf{4{,}555\ gal/day/basin}$$

where:
- Vws = Volume of Waste Sludge (gal/day/basin)
- SFws = Solids Fraction in Waste Sludge
- 8.34 = Density (lb/gal)

## Observed Yield Factor

$$Yobs = \frac{\Delta M}{BOD_L} = \frac{323}{425} = \mathbf{0.759}\ \frac{\mathbf{MLSS}}{\mathbf{BOD}}$$

Observed Yield Factor (lb/day MLSS/lb/day BODremoved)

## Mean Cell Residence Time

$$MCRT = \frac{Mbio}{\Delta M + ((Q - Vws) \times TESS \times 8.34 / 1E{+}06)}$$

$$MCRT = \frac{10{,}778}{323 + ((170{,}000 - 4{,}555) \times 10.0 \times 8.34 / 1{,}000{,}000)} = \mathbf{32.0\ days}$$

where:
- MCRT = Mean Cell Residence Time (days)
- TESS = Anticipated Effluent Total Suspended Solids (mg/l)
- 8.34E-06 = Conversion (lb/mg x l/gal)

## Sludge Age for Nitrification

Refer to Metcalf and Eddy, Edition IV pages 614 and 705

Constants and Temperature Corrections:

| Coefficient | Base Value | Theta | Temperature Corrected | Symbol |
|---|---|---|---|---|
| Maximum Specific Growth Rate of Nitrifying bacteria, g VSS/g VSS.day | 0.75 | 1.07 | 0.291 | $\mu_{nm}(T)$ |
| Half-Velocity constant for nitrifiers | 0.74 | 1.053 | 0.359 | Kn(T) |
| Nitrifier decay rate | 0.08 | 1.04 | 0.046 | Kdn(T) |
| Dissolved Oxygen, mg/l | 2 | | 2 | DO |
| Half-Velocity Constant for Dissolved Oxygen, mg/l | 0.5 | | 0.5 | Ko |
| Minimum Water Temperature, °C | 6 | | 6 | T |
| Safety Factor | 2.0 | | 2.0 | SF |

Calculations:

$$\mu_n = \left( \mu_{nm}(T) \times \frac{TENH_3}{TENH_3 + Kn(T)} \times \frac{DO}{DO + Ko} \right) - Kdn(T)$$

$$\mu_n = \left( 0.291 \times \frac{1.0}{1.0 + 0.359} \times \frac{2.0}{2.0 + 0.5} \right) - 0.046 = \mathbf{0.125\ days^{-1}}$$

$$SRTmin = \frac{1}{\mu_n} = \frac{1}{0.125} = \mathbf{8.0\ days}$$

$$SRTaerobic = SRTmin \times SF = 8.0 \times 2.0 = \mathbf{16.0\ days}$$

$$SRToverall = \frac{SRTaerobic \times 24}{TA} = \frac{16.0 \times 24}{12.0} = \mathbf{32.0\ days}$$

**Design sludge age adequate for nitrification.**

where: $\mu nm(T)$ = Maximum Temperature Corrected Nitrifier Growth Rate ($days^{-1}$)

$\mu_n$ = Specific Nitrifier Growth Rate at Temperature, DO, and Effluent $NH_3$ (g/g-days)

SRTmin = Minimum Sludge age required for Nitrification (days)

SRTaerobic = Design Aerobic Sludge Age (days)

SF = Safety Factor

SRToverall = Sludge Age accounting for entire ICEAS cycle (days)

TA = Aeration Time (hrs/day)

$TENH_3$ = Anticipated Effluent Ammonia (mg/l)

## Waste Sludge Pump Capacity

$$WSP = \frac{Vws \times NCT}{24 \times SPT} = \frac{4{,}555 \times 4.0}{24 \times 6.90} = \mathbf{110\ gal/min}$$

where: WSP = Waste Sludge Pump Capacity(gal/min)
SPT = Sludge Pumping Time (min/cycle)

## Biological Phosphorus Removal

$$TPb = TPi - TPe - [\,Yobs \times (BODin - BODout)] \times TPps \times VSS/TSS = 4.0 - 0.80 - [0.759 \times (300 - 10.0) \times 0.000 \times 0.622] = \mathbf{3.20\ mg/l}$$

where: TPb = Concentration of the Soluble Phosphorus to be removed (mg/l)
TPi = Concentration of the Total Phosphorus in the Influent (mg/l)
TPps = Percent of Total Phosphorus in VSS in WAS

## Chemical Dosing

$$CD = MolR \times TPb \div Ion \times MWRatio$$

where: CD= Required Ferric Chloride dosing rate, mg/l
MolR= Mole Ratio (Actual Dose required vs. Stoichiometric Dose)
Ion= Fraction Metal Ion in Ferric Chloride
MWRatio= Ratio of Molecular Weights, Fe:P

Mole Ratio for Metal Salt Dosage Based on effluent Phosphorus concentration.
Mole ratio based on curves in Activated Sludge and Nutrient Removal, WEF OM-9, 3rd edition, 2018

$$CD = 2.51 \times 3.20 \div 0.348 \times 1.81 = \mathbf{42\ mg/l}$$

## Mass of Chemical Sludge

$$Csludge = \frac{Q \times TPb \times 11.25 \times 8.34}{1{,}000{,}000} = \frac{170{,}000 \times 3.20 \times 11.25 \times 8.34}{1{,}000{,}000} = \mathbf{51\ lb/day/basin}$$

where: 11.25= Mass of Precipitate formed per Mass of P removed

## Volume of Chemical Sludge

$$Vcs = Csludge \times SVI \times SA = 51 \times 2.4 \text{ X } 32.0 = \mathbf{3{,}936\ ft^3/basin}$$

where: Vcs = Volume of Chemical Sludge ($ft^3$/basin)

*SANITAIRE ICEAS Aeration Design Calculations*

*BOD Removal and Nitrification Process*

*SANITAIRE Project #a29193-18*

*Stamp, NY*

## Carbonaceous Oxygen Demand

$$AOR1 = A \times \frac{Q \times BODin}{1{,}000{,}000} \times 8.34 = 1.20 \times \frac{170{,}000 \times 300}{1{,}000{,}000} \times 8.34 = \textbf{510 lb/day/basin}$$

where AOR1 = Actual Oxygen Required for BOD oxidation (lb/day/basin)
A = O2 / BOD
Q = Average flow (gal/day/basin)
BODin = Influent BOD received (mg/l)
1,000,000 = Conversion (g x mg)
8.34 = Conversion (lb x gal)

## Nitrification Oxygen Demand

$$AOR2 = TKNox \times 4.60 = 61.3 \times 4.60 = \textbf{282 lb/day/basin}$$

where AOR2 = Actual Oxygen required for Ammonia Oxidation (lb/day/basin)
TKNox = Nitrogen available for oxidation(lb/day/basin)

Constants

| Coefficient | Value | Symbol |
|---|---|---|
| VSS/TSS | 0.6222 | |
| Sludge N | 0.1 | Ns |
| Effluent Dissolved Organic Nitrogen, mg/l | 1 | EDON |
| Expected Effluent Ammonium concentration | 1 | $TENH_3$ |

$$TKN_{ox} = (TKN - EDON - TENH_3 - N_{assim} - N_{part}) \times Q \times 8.34 \div 1{,}000{,}000$$

$$TKN_{ox} = (60 - 1 - 1 - 14.17 - 0.62) \times 170{,}000 \times 8.34 \div 1{,}000{,}000 = \textbf{61.3 lb/day/basin}$$

where $N_{assim}$ = Nitrogen assimilated into biomass, (mg/l)

$$N_{assim} = BOD_{in} \times N_s \times Y_{obs} = 300 \times 0.1 \times 0.759 = \textbf{14.17 mg/l}$$

where $Y_{obs}$ = Observed Sludge Yield, (MLSS produced / BOD removed)

$$N_{part} = TESS \times N_S \times VSS/TSS = 10 \times 0.1 \times 0.62 = \textbf{0.62 mg/l}$$

where $N_{part}$ = Nitrogen bound to VSS portion of effluent TSS (mg/l)
TESS = Anticipated Effluent Total Suspended Solids (mg/l)

## Denitrification Oxygen Credit

$$O_{2denit} = 2.9 \times NO3\text{-}Ndenit = 2.9 \times 42 = \textbf{122 lb/day/basin}$$

where $O_{2denit}$ = Oxygen mass credit from denitrification (lb/day/basin)

NO3-Ndenit = Mass of NO3-N denitrified (lb/day/basin)

$$NO_3\text{-}N_{denit} = \mu_{DN} \times VSS/TSS \times BMOB \times ART = 0.00075 \times 0.62 \times 10{,}778 \times 8.31 = \textbf{42 lb/day/basin}$$

where $\mu_{DN}$ = Denitrification rate at 6°C (NO3/MLVSS/hr)

BMOB = Basin biomass (lb/basin)

ART = Anoxic Retention Time, (hrs/day)

## Total Actual Oxygen Transfer

$$AOR = AOR1 + AOR2 - O_{2denit} = 510 + 282 - 122 = \textbf{671 lb/day/basin}$$

where AOR = Total Actual Oxygen Required (lb/day/basin)

## Total Standard Oxygen Transfer

$$SOR = \frac{AOR}{AOR / SOR} = \frac{671}{0.4820} = \textbf{1,393 lb/day/basin}$$

$$\frac{AOR}{SOR} = \frac{\alpha \times \theta^{(TSite - 20)} \times (\beta \times C^{*}sat_{20} \times Psite / Pstd \times Csurf_{T} / Csurf_{20} - D.O.)}{C^{*}sat_{20}}$$

$$\frac{AOR}{SOR} = \frac{0.65 \times 1.024^{(20 - 20)} \times (0.95 \times 10.37 \times 14.46 / 14.70 \times 9.07 / 9.07 - 2.0)}{10.37} = \textbf{0.4820}$$

where SOR = Standard Condition Oxygen Requirement (lb/day/basin)

$\alpha$ = Alpha factor

$\theta$ = Temperature coefficient

Tsite = Water temperature (°C)

$\beta$ = Beta factor

Psite = Site Atmospheric Pressure

Pstd = Standard atmospheric pressure (psig)

$C^{*}sat_{20}$ = Dissolved oxygen solubility at standard conditions (mg/l)

$Csurf_{T}$ = Dissolved oxygen solubility at site water temperature (mg/l)

$Csurf_{20}$ = Dissolved oxygen solubility at 20°C (mg/l)

D.O. = Residual dissolved oxygen concentration (mg/l)

## Aeration System Standard Oxygen Transfer Rate

$$SOTR = \frac{SOR}{TA} = \frac{1{,}393}{12} = \mathbf{116\ lb/hr/basin}$$

where SOTR = Standard oxygen transfer rate (lb/hr/basin)
TA = Aeration Time, (hrs/day)

## Aeration Depth

Average Aeration Depth

$$AADad = \frac{Q \times [(NCT \times 60) - (NDT + NST)]}{2 \times 1{,}440 \times 7.48 \times BA} + BWL$$

$$AADad = \frac{170{,}000 \times [(4.0 \times 60) - (60 + 60)]}{2 \times 1{,}440 \times 7.48 \times 2{,}550} + 13.33 = \mathbf{13.70\ ft}$$

where AADad = Average Aeration Depth at Average Dry Weather Flow (gpd)
Q = Average Dry Weather Flow (gpd/basin)
NCT = Normal Cycle Time (hr)
NDT = Normal Decant Time (min)
NST = Normal Settling Time (min)
BA = Basin Area ($ft^2$)
1440 = Conversion (min/day)
2 = Calculate Aeration Depth at Middle of Normal Reaction Phase (NCT - NST - NDT)
7.48 = Conversion ($gal/ft^3$)

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## Maximum Aeration Depth

$$MADpw = \frac{PWWF \times [(SCT \times 60) - (SDT + SST)]}{1{,}440 \times 7.48 \times BA} + BWL$$

$$MADpw = \frac{340{,}000 \times [(3.0 \times 60) - (45 + 45)]}{1{,}440 \times 7.48 \times 2{,}550} + 13.33 = \mathbf{14.44\ ft}$$

where MADpw = Maximum Aeration Depth at Peak Wet Weather Flow (gpd)
PWWF Peak Wet Weather Flow (gpd/basin)
SCT = Storm Cycle Time (hr)
SDT = Storm Decant Time (min)
SST = Storm Settle time (min)
MAD = Maximum Aeration Depth (ft)

MAD is larger of MADad and MADpw

$$MAD = \mathbf{14.44\ ft}$$

## Air Flow Requirement

$$Process\ Air = \frac{SOTR \times 10{,}000}{\rho \times SOTE \times Opw \times 60} = \frac{116 \times 10{,}000}{0.075 \times 25.59 \times 23.2 \times 60} = \mathbf{434\ scfm}$$

where Process Air = Process air flow requirement (scfm)
$\rho$ = Air density (0.075 lb/day/ft³)
SOTE = Standard Oxygen Transfer Efficiency @ Submergence of 12.70 ft
Opw = Fraction of Oxygen in air by Weight
10,000 = Conversion (100% * 100%)
60 = Conversion (min/hr)

$$Mixing\ Air = MI \times BA = 0.13 \times 2{,}550 = \mathbf{319\ scfm}$$

where Mixing Air = Mixing air flow requirement (scfm)
MI = recommended air flow per unit area of basin (scfm/ft²)

## Blower Unit Capacity

Blower unit capacity (BUC) is the larger of the process air requirement and the mixing air requirement.

| | |
|---|---|
| Process Air | 434 scfm |
| Mixing Air | 319 scfm |

Use 1 blower per tank

BUC = **440 scfm**

## Blower Pressure

psig = MAD x 0.432 + $H_L$ = 14.44 x 0.432 + 1.00 = **7.3 psig**

where psig = blower pressure (rounded to next psig)
0.432 = water density (psi/ft)
$H_L$ = Cumulative piping and diffuser headloss (psig)

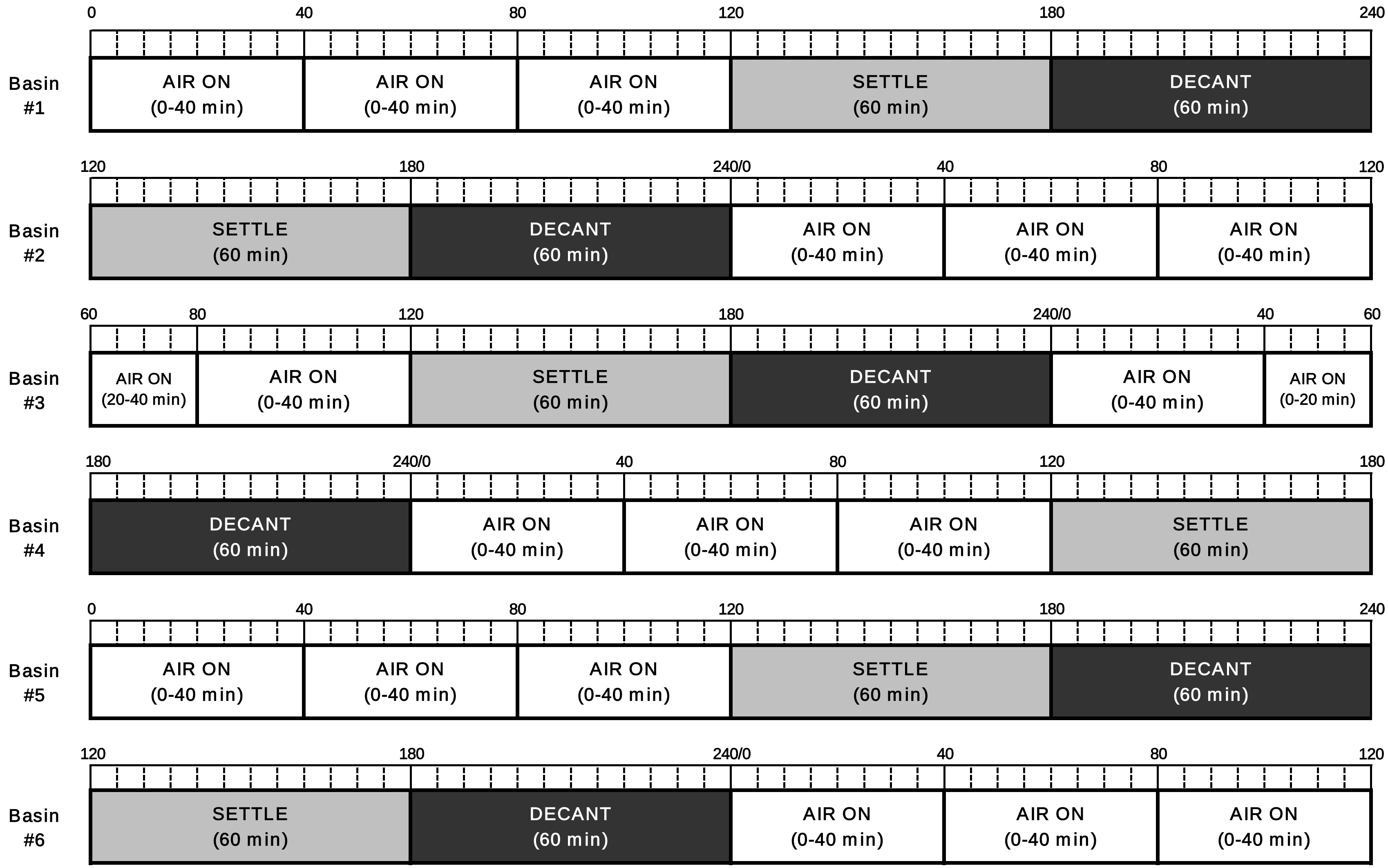
## Average Blower Power

Blower power based on vendor curves, BUC, and Average Aeration Depth (12.70 ft)

$Power_{avg}$ = **22.6 bhp**

**Project Name:** STAMP
**Sanitaire Number:** A29193-17

## ICEAS 6-Basin NIT Normal Cycle 240 mins (4 hours)

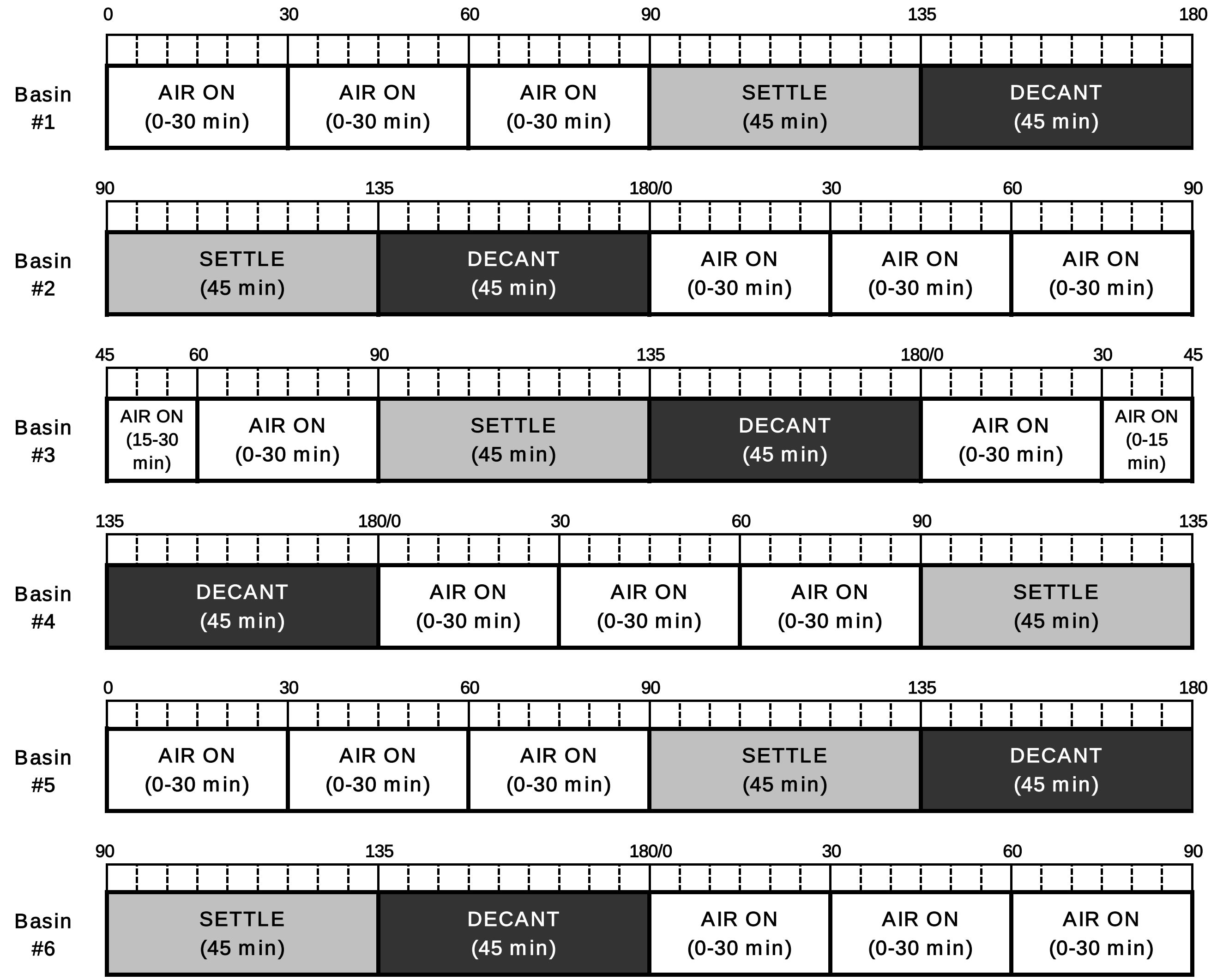



Notes:
Each basin fills continuously over entire cycle. Basins #1 and #2, #3 and #4, #5 and #6 share blowers.
"Air On" periods in the react phase are programmable from 0 to 40 minutes.
Sludge wasting occurs during the decant phase, pump run time is programmable.
During the storm cycle, the time segments are reduced by 25% to accommodate additional flow.

I:\ABJ\Cycle Charts\ICEAS\NIT\60 Min Decant\12 Hrs Aeration per Day\Single Storm.xls
10/15/2020

**Project Name:** STAMP
**Sanitaire Number:** A29193-17

**ICEAS 6-Basin NIT High Flow Mode 180 mins (3 hours)**




Notes:
Each basin fills continuously over entire cycle. Basins #1 and #2, #3 and #4, #5 and #6 share blowers.
"Air On" periods in the react phase are programmable from 0 to 30 minutes.
Sludge wasting occurs during the decant phase, pump run time is programmable.
During the storm cycle, the time segments are reduced by 25% to accommodate additional flow.

# Sludge Holding Tank (SHT) Design Calculations

***SANITAIRE Detailed Design Calculations***

# Sludge Holding Tank

***SANITAIRE Project #A29193-20***
***STAMP, NY***

## Design Parameters

### A. Sludge Characteristics

| | | | | |
|---|---|---|---|---|
| $Q_I$ | Daily Flow to Digester | | 27 332 | GPD |
| $TSS_I$ | TSS Concentration to Digester | | 0.85% | w/w |
| $TSS_E$ | TSS Concentration in Digester | (after decanting) | 1.60% | w/w |
| $VSS_I$ | VSS Concentration to Digester | | 62.2% | w/w |

### B. Site Characteristics

| | | | |
|---|---|---|---|
| $T_{max}$ | Max Wastewater Temperature | 30 | °C |
| $T_{min}$ | Min Wastewater Temperature | 6 | °C |
| $T_a$ | Ambient Air Temperature | 20 - 90 | °F |
| E | Site Elevation | 310 | ft |
| $SRT_2$ | Aerobic SRT of Upstream Secondary Process | 16 | days |

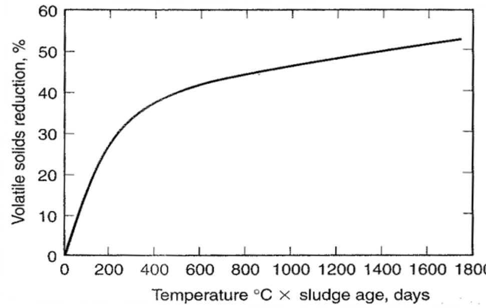
### C. Aerobic Digester Basin Dimensions

| | | | |
|---|---|---|---|
| | Process | Vorelodos Energy Saving with Decanter | |
| | Baffle | No | |
| | Configuration | Parallel | |
| | Digester Type | Rectangular | |
| N | Number of Digesters | 6 | |
| $V_{TWL}$ | Volume/Digester at TWL | 10 800 | ft³ |
| L | Digester Length | 30 | ft³ |
| W | Digester Width | 24 | ft |
| $A_d$ | Digester Area | 720 | ft²/AD |
| TWL | Digester Depth at TWL | 15.00 | ft |

### D. Cycle Times

| | | | |
|---|---|---|---|
| $C_A$ | React - anaerobic/anoxic (air off) | | h |
| $C_O$ | React - aerobic (air on) | 21.0 | h |
| $C_S$ | Settle | 2.8 | h |
| $C_D$ | Decant | 0.3 | h |
| $C_T$ | Total | 24.0 | h |
| $C_W$ | Desludge | 60.0 | min |

## Operation (Iterative Solution - values confirmed below)




| | | | |
|---|---|---|---|
| $SRT_T$ | Digester Total Solids Retention Time | 37.1 | days |
| HRT | Digester Hydraulic Retention Time (HRT) | 17.2 | days |
| $VSS_d$ | Predicted VSS Destruction in digester | 20.3% | VSSd |
| | (relative to VSS concentration in WAS from 2ndary process) | | |

**E. Confirm Aerobic Digester VSS Destruction, $VSS_d$ (based on Digester Total SRT listed above)**

| | | Upstream 2ndary Process | Aerobic Digester | Total | |
|---|---|---|---|---|---|
| $SRT_A$ | Aerobic SRT | 16.0 | 32.4 | 48.4 | days |
| | Degree-Days at $T_{min}$ | 96 | 195 | 291 | degree-days |
| | VSS Destruction (relative to 2ndary Process Influent) | 15% | 17% | 32% | |

Where: SRTA for Aerobic Digester = 37.1 days total SRT x 21.0 hr/d air / 24 hr/d = 32.4 days

VSS destruction in upstream 2ndary process and digester based on Fig 13-35 in Metcalf & Eddy, 5th edition and degree-days in each part of process

To understand this, compare Fig 13-35 in Metcalf & Eddy, 5$^{th}$ edition with Equation 8-20 M+E 5$^{th}$ edition or 8-15 M+E 4$^{th}$ edition.
Equation 8-20 calculates the VSS sludge production related to SRT for a WWTP. Aerobic digestion SRT is just an extension of the upstream 2ndary process, but in another tank, so the shape of the Eq 8-20 secondary treatment VSSd curve is the same as Fig 13-35 aerobic digester VSSd curve. Figure 13-35 was based on data from non-nitrifying plants with relatively low aerobic SRT values, so to accurately prtedict the VSS destruction in an aerobic digester, the VSS destruction in the upstream 2ndary process must also be taken into account.

| VSSd = 1 - [(1 - VSST) / (1 - VSS2)] = 1- (1 - 32%) / (1- 15%) = 20.3% |
|---|

Where: $VSS_T$ = Total VSS destruction in upstream 2ndary process and aerobic digester combined, relative to VSS concentration in 2ndary process influent
$VSS_T$ = VSS destruction in aerobic digester, relative to VSS concentration in 2ndary process influent

**F. Calculate Volume of Supernate and Digester Sludge, Digester BWL, and confirm assumed SRT at BWL**

Calculate mass of digested sludge using VSS destruction listed above

| | Biosolids to Digester | Biosolids from Digester | |
|---|---|---|---|
| Inerts | 733 | 733 | lbTSS/d |
| $Mass_{VSS}$ | 1205 | 960 | lbTSS/d |
| $Mass_{TSS}$ | 1938 | 1693 | lbTSS/d |

Where: Digested MassVSS = QI x 8.34 x TSSI / 1,000,000 x VSSI x (1 - VSSd) = 27 332 x 8.34 x 0.85% / 1,000,000 x 62.2% x (100% - 20.3%) = 960 lbTSS/d

Calculate volume of digested sludge using mass of digested sludge listed above

$Q_S$ Digested Sludge Flow = MassTSS / 8.34 / TSSE x 1,000,000 = 1 693 / 8.34 / 1.60% x 1,000,000 = 12 687 GPD
F Decant Frequency = Once Every 1 Days
$Q_D$ Daily Decant Flow = (QI - QS)*F = (27 332 - 12 687)*1=14 645
BWL Digester Depth at BWL = [N x Ad x TWL - (QD/7.48)] / Ad / N = [6 x 720 x 15 - (14 645 / 7.48)] / 720 / 6 = 14.5 ft
$Mass_{BWL}$ Digester TSS Mass at BWL = [N x Ad x BWL x 7.48) / 1,000,000 x 8.34 x TSSE = (6 x 720 x 14.5 x 7.48) / 1,000,000 x 8.34 x 16 000 = 62 725 lb
Confirm SRT Assumed Above:

| Digester Total SRT = MassBWL / 1,000,000 x 8.34 x TSSE = 37.0 days |
|---|

**G. Calculate Digester AOR, based on VSS Destruction Calculated Above**

Assume unit mass of O2 required per unit mass of VSS destroyed as: 2.3 lbO2/lbVSSd
$AOR_D$ AOR per Digester = (MassVSSin - MassVSSout) x 2.3 lbO2/lbVSSd / N * 24 / Co = (1 205 - 960) x 2.3 / 6 x 24 / 21.0 = 4.5 lbO2/h

## Sludge Holding Tank Design Proposal

STAMP, NY Sanitaire #A29193-20

### Table A: SLUDGE CHARACTERISTICS AND SITE CONDITIONS

| | | | |
|---|---|---|---|
| Daily Flow to Digester | | 27 332 | GPD |
| Daily Decant Flow | | 14 645 | GPD |
| Daily Desludge Flow | | 12 687 | GPD |
| TSS Concentration to Digester | | 0.85% | w/w |
| TSS Concentration in Digester | (after decanting) | 1.60% | w/w |
| Max Wastewater Temperature | | 30 | °C |
| Min Wastewater Temperature | | 6 | °C |
| Ambient Air Temperature | | 20 - 90 | °F |
| Site Elevation | | 310 | ft |

### Table B: DESIGN CRITERIA

| | | |
|---|---|---|
| Process | Vorelodos Energy Saving with Decanter | |
| Baffle | No | |
| Configuration | Parallel | |
| Digester Type | Rectangular | |
| Digester Solids Retention Time (SRT) | 37.1 | days |
| Digester Hydraulic Retention Time (HRT) | 17.2 | days |
| Predicted VSS Destruction | 20% | VSSd |

### Table C: DESIGN DETAILS

| | | |
|---|---|---|
| Number of Digesters | 6 | |
| Volume/Digester at TWL | 10 800 | $ft^3$ |
| Volume/Digester average | 10 538 | $ft^3$ |
| Digester Length | 30.0 | ft |
| Digester Width | 24.0 | ft |
| Digester Depth at TWL | 15.00 | ft |
| Digester Depth average | 14.64 | ft |
| Minimum Digester Depth with Mixer Operating | 4.85 | ft |
| Maximum Downstream Water Level | 11.23 | ft |

## : PROCESS EQUIPMENT

| | | |
|---|---|---|
| Fine Bubble Aeration Diffuser Quantity / Digester | 32 | |
| Number of Aerated Zones / Digester | 1 | |
| Blower Flowrate for Process / Digester | 74 | scfm |
| Blower Flowrate for Mixing 30scfm/kft³ / Digester * | 324 | scfm |
| Blower Flowrate Proposed / Digester | 74 | scfm |
| Blowers (PD type) Quantity / Digester (Duty) | 1 | |
| Blowers (PD type) Quantity Total (Duty / Standby) | 6 / 1 | |
| Blowers (PD type) Motor Rating each | 8 | Hp |
| Mixer Quantity / Digester | 1 | |
| Mixer Motor Rating each | 3 | Hp |
| Desludge Pump Quantity / Digester (Duty / Standby) | 1 / 1 | |
| Desludge Pump Flowrate | 235 | GPM |
| Desludge Pump Motor Rating each | 5.0 | Hp |
| Decanter Quantity / Digester | 1 | |
| Decanter Flowrate | 162.7 | GPM |
| Decanter Motor Rating each | 0.25 | Hp |
| OSCAR Controls and DO and ORP Instrumentation | | |

* May require a waiver for States that require 10scfm/1000ft³

## AERATION/MIXING POWER REQUIREMENTS (TOTAL FOR ALL TRAINS)

| | | |
|---|---|---|
| Operating Power / Blower | 5 | Hp |
| Operating Power / Mixer | 2.8 | Hp |
| Operating Power / Decanter | 0.3 | Hp |
| Total Operating Power | 745 | kWh/d |

# SBR Aeration Blowers

KAESER COMPRESSORS®

**POSITIVE DISPLACEMENT BLOWER**

***PACKAGE RECOMMENDATIONS***

Date: 10-08-2020
Page: 1

Customer: Alabama, NY

Prepared by: K. Ballew

## Design data:

| | | | |
|---|---|---|---|
| Operating mode: | Gauge pressure | Flow medium: | Air |
| Inlet pressure: | 14.3 psia | Pressure differential: | 8.4 psig |
| Inlet temperature: | 100 °F | Discharge pressure: | 22.7 psia |
| Air Humidity: | 50% | Operation with FC (VFD): | Yes |

## Technical data:

| | | | |
|---|---|---|---|
| Package type: | **Com-paK** | Maximum pressure differential: | 8.7 psig |
| Package: | **DB 166 C** | Blower speed (60 Hz): | 4535 rpm |
| Blower: | Omega 42P | % of blower's maximum speed: | 94% |
| Drive motor: | 30.0 hp | Inlet flexible connector: | Piped- 4" Sleeve |
| Drive motor power: | 460V / 3 / 60Hz | Discharge flexible connector: | Piped- 4" Sleeve |
| Ventilation fan power: | 115V / 1 / 60Hz | | |

## Performance data:

| | **Min Frequency** | **Design Point** | **Max Frequency** |
|---|---|---|---|
| Frequency | 18 Hz | 58.9 Hz | 60 Hz |
| Speed | 1361 rpm | 4454 rpm | 4535 rpm |
| Inlet flow Q1*: | 108 cfm | 491 cfm | 501 cfm |
| Air flow Q1 (standard):<br>standard conditions:14.7 psia, 68°F, 36% RH | 96 scfm | 440 scfm | 449 scfm |
| Discharge temperature: | 275 °F | 228 °F | 228 °F |
| Blower shaft power: | 7.3 hp | 24.6 hp | 25.1 hp |

| | |
|---|---|
| Sound pressure level**: | 72 dB(A) |
| Sound power level**: | 88 dB(A) |
| Estimated weight: | 1140 lb |
| Dimensions (W x L x H) | 44.0 x 46.0 x 51.0 inches |

*** Performance data to DIN ISO 1217- Annex C**
****Measured to DIN EN ISO 2151, figures ± 3 dB(A), with isolated pipework**

**POSITIVE DISPLACEMENT BLOWER**

***PACKAGE RECOMMENDATIONS***



Customer: Alabama, NY

Prepared by: K. Ballew

## Equipment Scope:

Inlet silencer w/ filter (grade G4)
Blower Block w/ Input Shaft Lip Seal
Oil drains with ball valves
V-Belt drive w/ automatic belt tensioner
IP 55 TEFC Inverter rated drive motor (NPE)
Discharge silencer
Pressure relief valve
Vibration isolators
Sound enclosure with vent fan
Flexible connectors on inlet and discharge
Flap style check valve (plate)

| Standard instrumentation: | Supplied |
|---|---|
| Discharge temperature gauge with switch | yes |
| Discharge pressure gauge | yes |
| Inlet filter differential pressure gauge | yes |

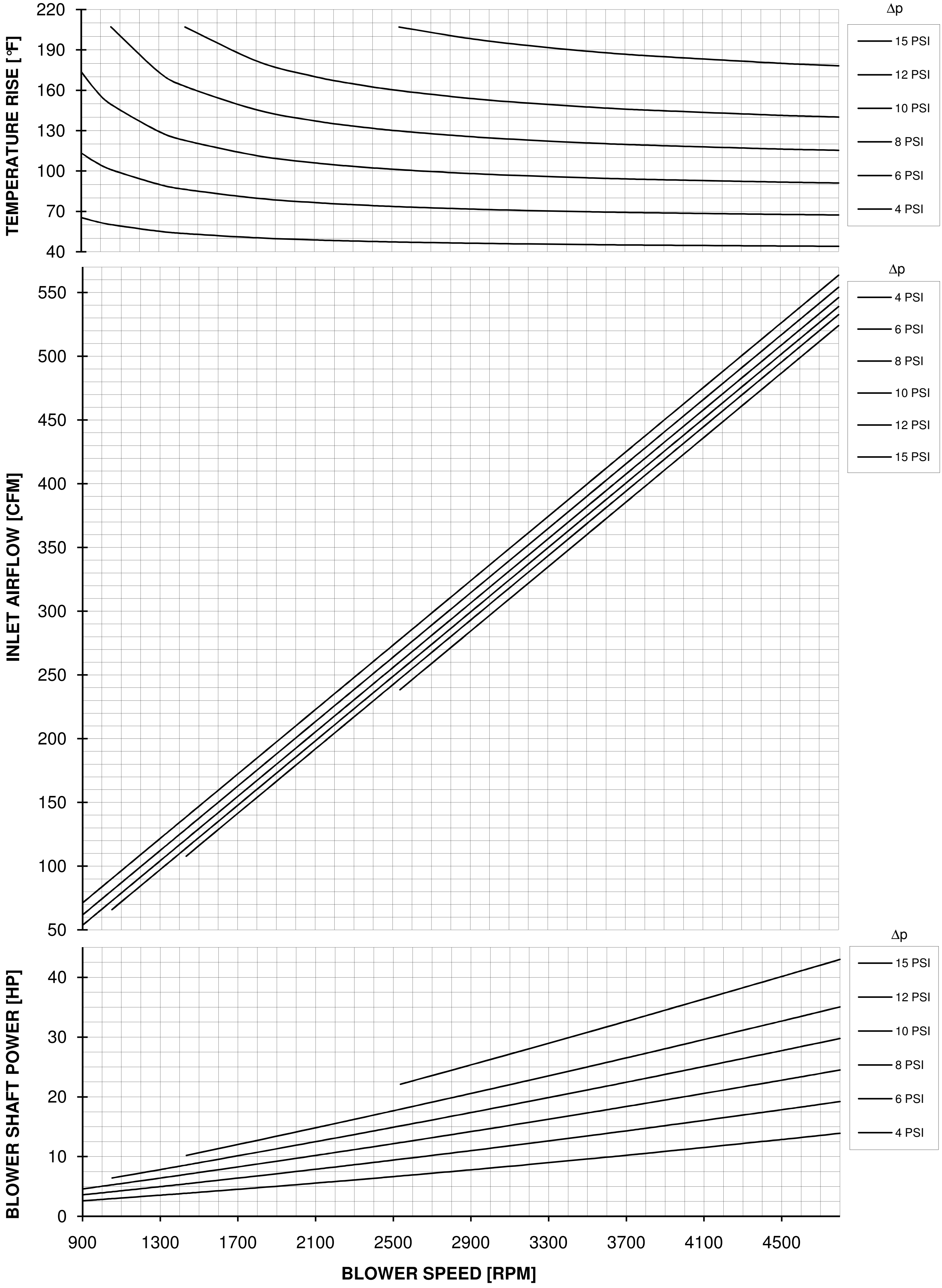
| Optional accessories: | Supplied |
|---|---|
| Unloaded Start valve | no |
| Inlet filter differential pressure switch | no |
| Discharge pressure switch | no |
| Discharge pressure sensor (output 4-20mA) | no |
| Enclosure safety temperature switch (thermostat) | no |
| Enclosure heater,115v (auxiliary heater) | no |
| Outdoor designed sound enclosure | no |

Comments/ Customer requirements:

**Notes:**
**a. Blower package requires blower controls.**
**b. Motors, silencers, instrumentation and supplied accessories shown above are all factory mounted.**

# OMEGA 42PLUS

PRESSURE PERFORMANCE
14,7 PSIA and 68°F



# SHT Aeration Blowers

KAESER COMPRESSORS®

**POSITIVE DISPLACEMENT BLOWER**

***PACKAGE RECOMMENDATIONS***



Customer: Alabama, NY

Prepared by: K. Ballew

## Design data:

| | | | |
|---|---|---|---|
| Operating mode: | Gauge pressure | Flow medium: | Air |
| Inlet pressure: | 14.3 psia | Pressure differential: | 8.5 psig |
| Inlet temperature: | 100 °F | Discharge pressure: | 22.8 psia |
| Air Humidity: | 50% | Operation with FC (VFD): | Yes |

## Technical data:

| | | | |
|---|---|---|---|
| Package type: | **Com-paK** | Maximum pressure differential: | 10.1 psig |
| Package: | **CB 131 C** | Blower speed (60 Hz): | 4535 rpm |
| Blower: | Omega 41P | % of blower's maximum speed: | 91% |
| Drive motor: | 25.0 hp | Inlet flexible connector: | Piped- 3" Sleeve |
| Drive motor power: | 460V / 3 / 60Hz | Discharge flexible connector: | Piped- 3" Sleeve |
| Ventilation fan power: | 115V / 1 / 60Hz | | |

## Performance data:

| | **Min Frequency** | **Design Point** | **Max Frequency** |
|---|---|---|---|
| Frequency | 18 Hz | 59.1 Hz | 60 Hz |
| Speed | 1361 rpm | 4471 rpm | 4535 rpm |
| Inlet flow Q1*: | 78 cfm | 368 cfm | 374 cfm |
| Air flow Q1 (standard):<br>standard conditions:14.7 psia, 68°F, 36% RH | 70 scfm | 330 scfm | 335 scfm |
| Discharge temperature: | 287 °F | 230 °F | 230 °F |
| Blower shaft power: | 5.7 hp | 18.7 hp | 19.0 hp |

| | |
|---|---|
| Sound pressure level**: | 72 dB(A) |
| Sound power level**: | 87 dB(A) |
| Estimated weight: | 979 lb |
| Dimensions (W x L x H) | 39.0 x 45.0 x 51.0 inches |

*** Performance data to DIN ISO 1217- Annex C**
****Measured to DIN EN ISO 2151, figures ± 3 dB(A), with isolated pipework**

Customer: Alabama, NY

Prepared by: K. Ballew

## Equipment Scope:

Inlet silencer w/ filter (grade G4)
Blower Block w/ Input Shaft Lip Seal
Oil drains with ball valves
V-Belt drive w/ automatic belt tensioner
IP 55 TEFC Inverter rated drive motor (NPE)
Discharge silencer
Pressure relief valve
Vibration isolators
Sound enclosure with vent fan
Flexible connectors on inlet and discharge
Flap style check valve (plate)

| Standard instrumentation: | Supplied |
|---|---|
| Discharge temperature gauge with switch | yes |
| Discharge pressure gauge | yes |
| Inlet filter differential pressure gauge | yes |

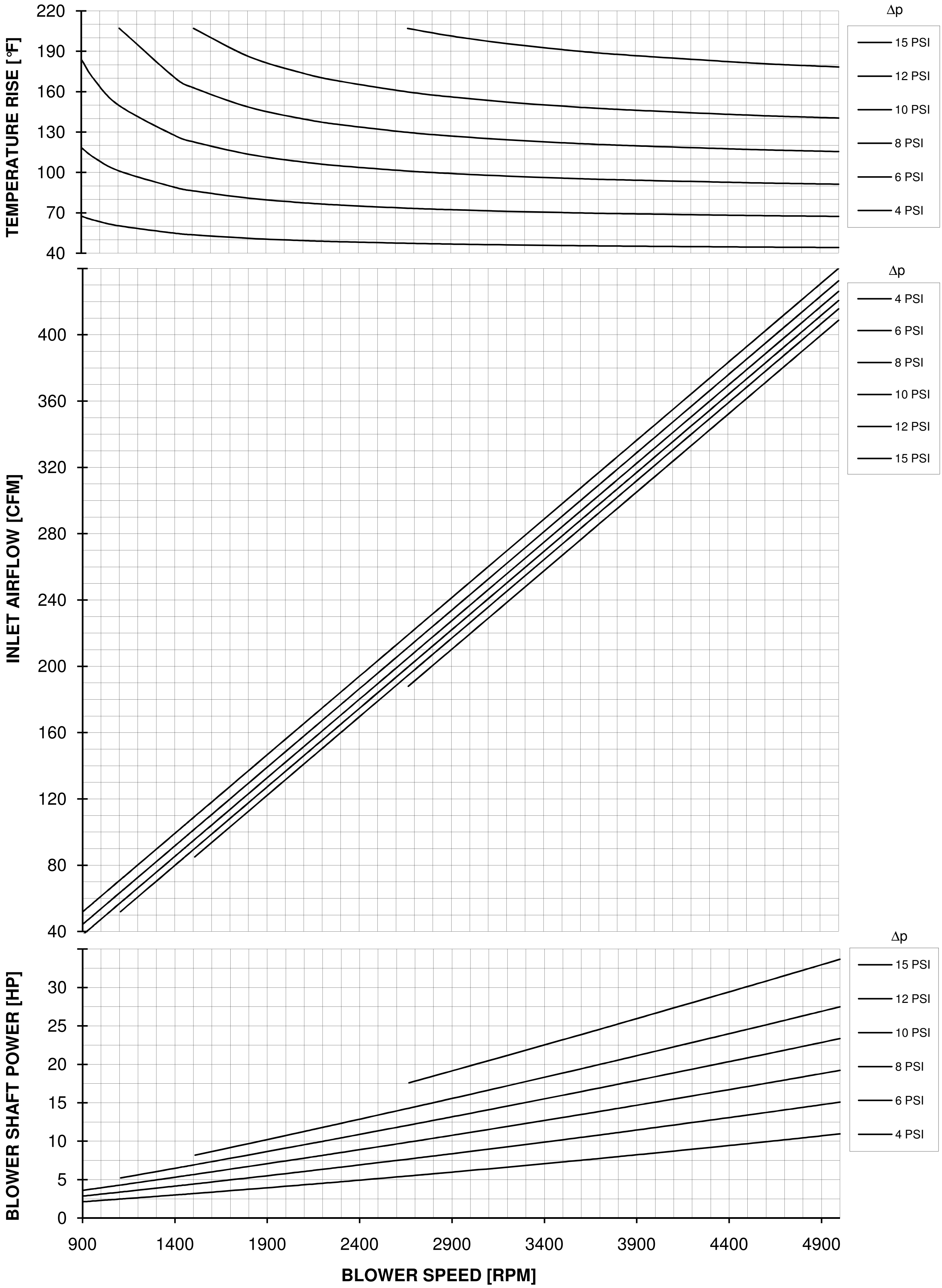
| Optional accessories: | Supplied |
|---|---|
| Unloaded Start valve | no |
| Inlet filter differential pressure switch | no |
| Discharge pressure switch | no |
| Discharge pressure sensor (output 4-20mA) | no |
| Enclosure safety temperature switch (thermostat) | no |
| Enclosure heater,115v (auxiliary heater) | no |
| Outdoor designed sound enclosure | no |

Comments/ Customer requirements:

**Notes:**
**a. Blower package requires blower controls.**
**b. Motors, silencers, instrumentation and supplied accessories shown above are all factory mounted.**

# OMEGA 41PLUS

PRESSURE PERFORMANCE
14,7 PSIA and 68°F



# Disc Filter Sizing and Equipment Selection

Hydrotech Discfilter

Project: Alabama DFS
Client:
Date: 5700132909 9/24/2020

RSM Contact: Wayne Emery
Phone: (412) 414-5061
Representative Contact:



Kruger is pleased to propose the Hydrotech Discfilter system for this project. The system design is based on the information listed in the following tables and will be supplied according to Kruger design standards:

| **Design Parameters** | | |
|---|---|---|
| Influent Source | Effluent from SBR | |
| Peak Hour Flow | 1.36 (944) | MGD (gpm) |
| Average Day Flow | 1.02 (709) | MGD (gpm) |
| [1]Peak Influent TSS | 35 | mg/L |
| [1]Average Influent TSS | 20 | mg/L |
| [2]Peak Influent TP | 1.00 | mg/L |
| [2]Influent soluble non-reactive P | 0.02 | mg/L |
| Monthly Average Effluent TSS | 10 | mg/L |
| [2]Monthly Average Effluent TP | 0.200 | mg/L |

[1]Peak TSS includes 15 mg/L solids generated from chemical addition and Average TSS includes 10 mg/L solids generated from chemical addition.

[2]Co-precipitation may be necessary upstream to achieve listed influent P concentrations. The chemical addition must be both flow paced and optimized to limit residual reactive chemical.

| **Discfilter Design** | | |
|---|---|---|
| Discfilter Model Number | HSF2206-1C | |
| Total Units (duty/standby) | 2 (1/1) | |
| Total Filter Area Per Unit | 362 | $ft^2$ |
| Submerged Filter Area Per Unit | 235 | $ft^2$ |
| Disc Diameter | 2.2 | m |
| Peak Hydraulic Loading Rate | 4.02 | $gpm/ft^2$ |
| Number of Discs Per Unit | 6 | |
| Media Pore Size | 10 | µm |
| Chassis Material | 304 SS | |
| Cover Material | GRP | |
| Self-Enclosed Tank Material | 304 SS | |
| SEW Drive Motor | 1.5 | HP |
| Backwash Water Pump | 7.5 | HP |
| Backwash Pump Rated Flow | 41 | gpm |
| Influent Flange | ANSI 12" | |
| Effluent Flange | ANSI 10" | |
| Mobile Automated Cleaning System | Included | |
| Controls System | Allen Bradley | |
| Unit Control Panel Enclosure Type | NEMA 4X | |
| Instrumentation - Level Sensors | One (1) lot | |

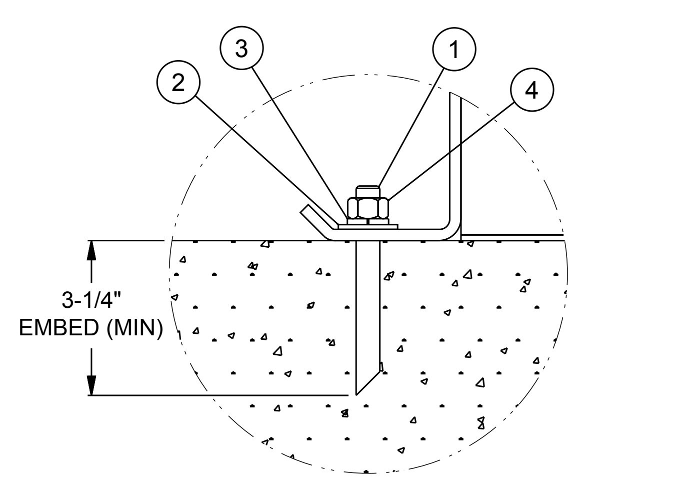
* Hydraulic loading rate does not include standby unit.

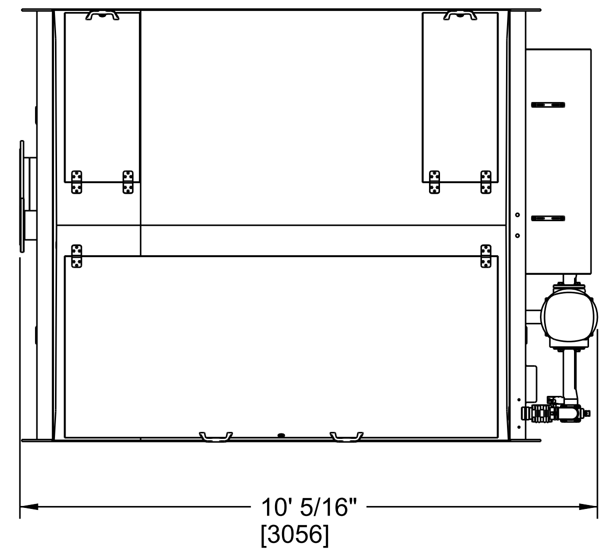
| **Tertiary Coagulation/Flocculation Design** | | |
|---|---|---|
| Concrete Tankage | By Others | |
| **Coagulation/Flocculation Mixing Details** | | |
| **Zone** | **HP** | **HRT (min)** |
| Rapid Mixing Tank | 5.0 | 0.6 |
| Coagulation Mixing Tank | 2.0 | 5.0 |
| Flocculation Mixing Tank | 0.5 | 5.0 |
| **Chemical Feed Equipment** | | |
| Polymer Prep + Polymer Feed System | Included | |
| Coagulant Feed System | Included | |

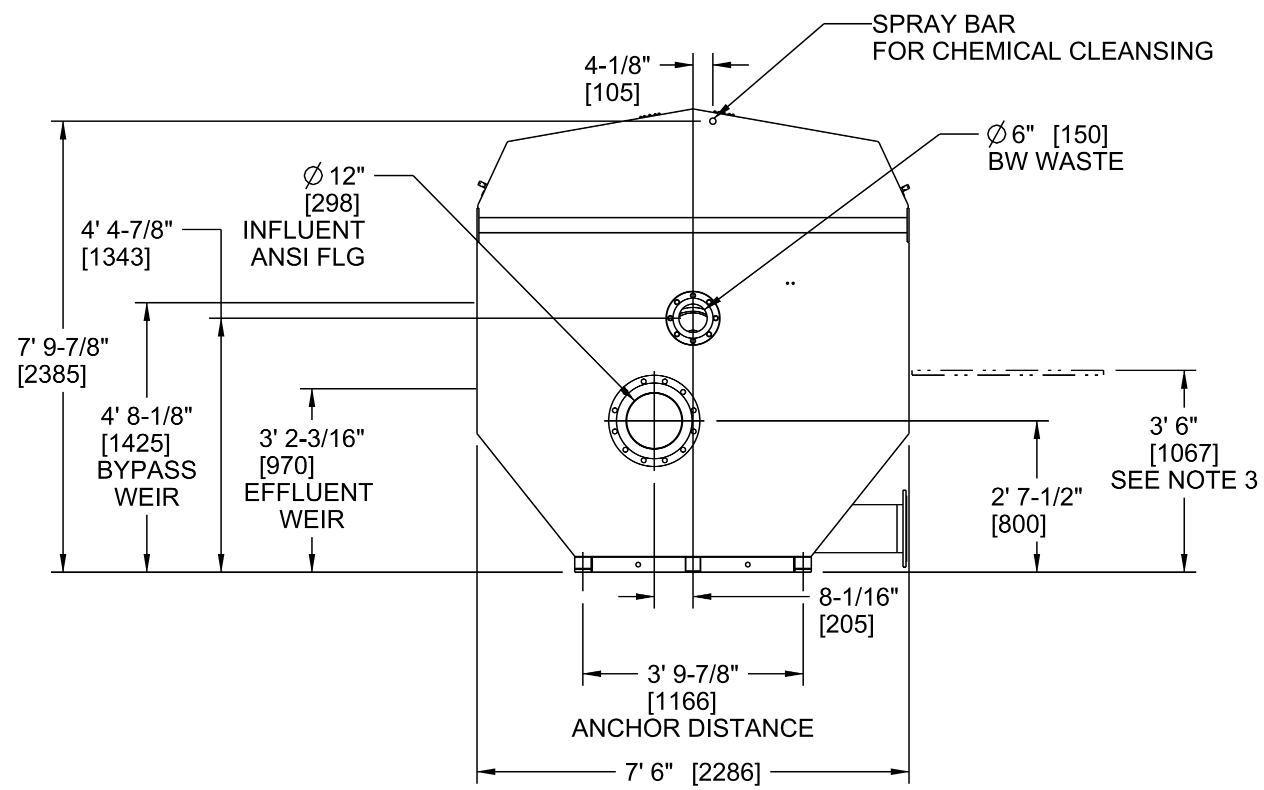
* Coag/Floc HRT based on 1.36 MGD Peak Flow

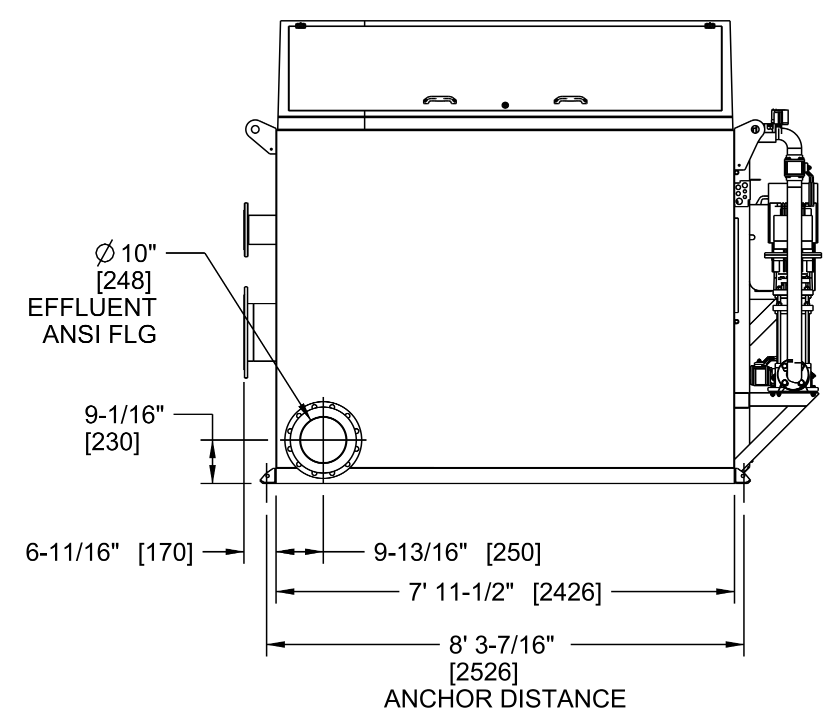
A mobile Automated Cleaning System (ACS) is included as part of the equipment supply. The mobile ACS consists of a polyethylene tank, mag drive centrifugal pump, and chemical resistant hose mounted on movable trolley unit. The ACS unit is designed to connect via hose to the chemical spray header within a Discfilter unit, and the ACS connects via 480V receptacle to the control system. The control system will allow for operator initiation of the chemical clean process. Once initiated, the control system provides automatic operation and control of the cleaning process.

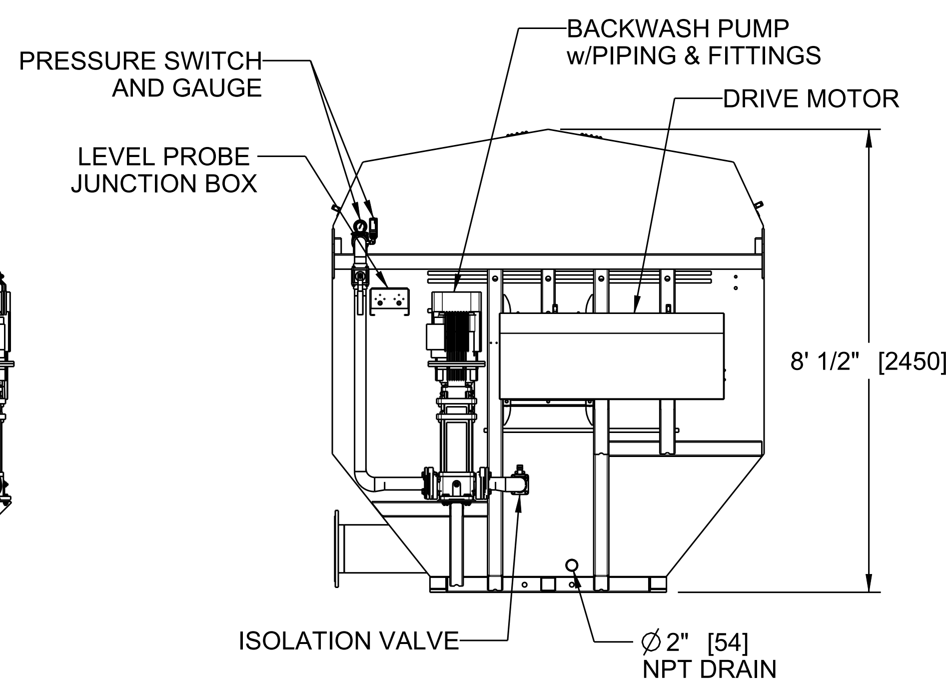
| | |
|---|---|
| 1 | 1/2" THREADED ROD: ASTM F593 W/ B1.1 UNC THDS |
| 2 | 1/2" FLAT WASHER: ASTM A240 304 SS. PLATE |
| 3 | 1/2" LOCK WASHER |
| 4 | 1/2" HEX NUT: ASTM F594 W/ B1.1 UNC THREADS |




NOTES :

1. ALL FLANGE CONNECTIONS:BOLT PATTERN ANSI B16.5. PLATE FLANGE: GALVANIZED, STUB END: AISI 304
2. DIMENSIONS IN [ ] ARE MM
3. RECOMMENDED PLATFORM ELEVATION. WORK PLATFORM TO BE SELF SUPPORTING. PLATFORMS MAY NOT BE ATTACHED TO THE FILTER AND LOADS MAY NOT BE TRANSFERRED TO FILTER. PLATFORMS DESIGNED/PROVIDED BY OTHERS.
4. RECOMMEND 24" MINIMUM MAINTENANCE ACCESS AROUND ENTIRE PERIMETER OF DISCFILTER.
5. FOLLOW ANCHOR MANUFACTURERS GUIDELINES FOR SPECIFIC INSTALLATION REQUIREMENTS INCLUDING ANCHOR EMBEDMENT AND EDGE DISTANCE. SEISMIC CODE REQUIREMENTS MAY AFFECT ANCHOR DETAIL SHOWN.
6. ALL ANCHORS AND FASTENERS TO BE STAINLESS STEEL. APPLY ANTI-SEIZE TO ALL CONNECTIONS.

| REV | DESCRIPTION | DRAWN | APPR | DATE |
|---|---|---|---|---|
| | | | | |
| | | | | |
| B | REVISED NAME | HJH | - | 11.15.18 |
| A | | CDP | JCC | 03.29.18 |



VEOLIA
KRUGER INC.
4001 WESTON PKWY CARY, NC 27513 | (919) 677-8310

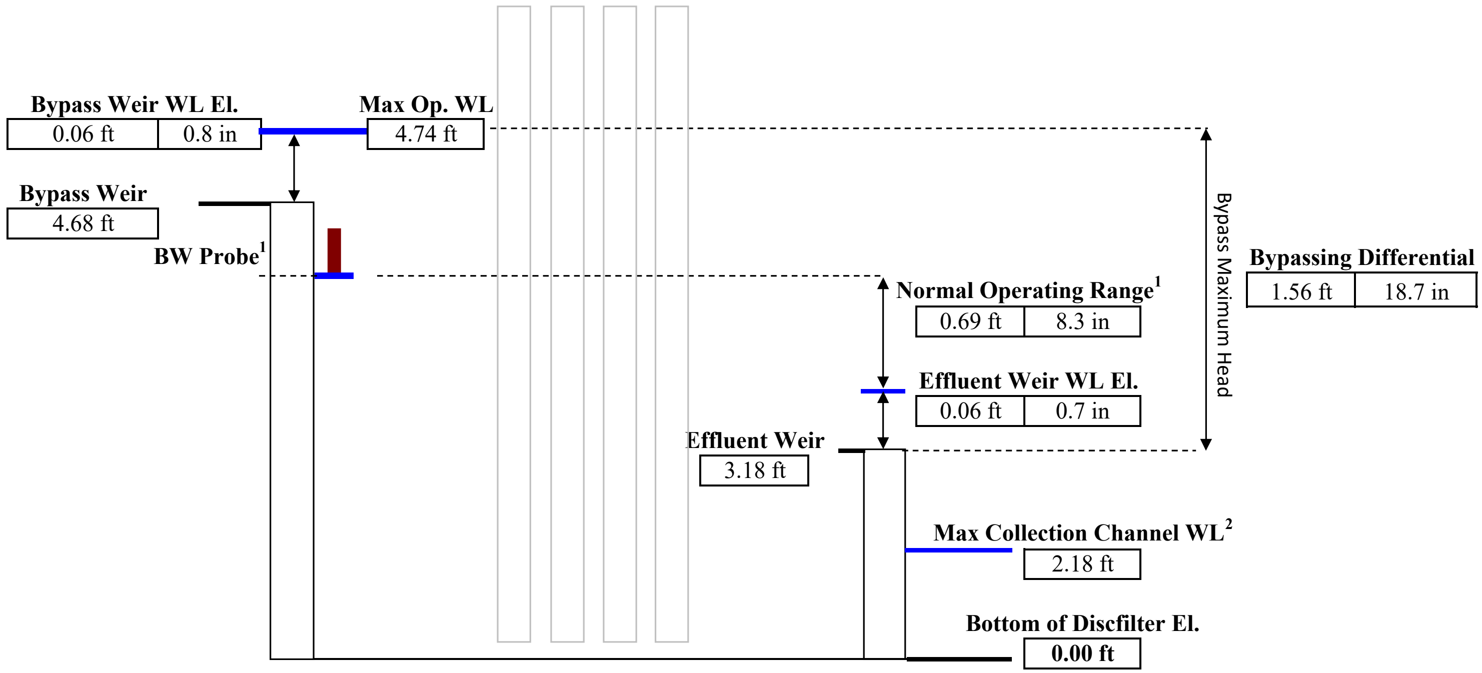
DISCFILTER
HSF2206-1C, UNIT DRAWING
MIXING BYPASS

-
STANDARD PRODUCT

| SCALE | DRAWING NO | SHEET | REV |
|---|---|---|---|
| 1:40 | 1C.2206.M.12.10 | 1 of 1 | B |

VEOLIA

| | |
|---|---|
| **Date:** | 5/4/2020 |
| **Project City:** | Alabama |
| **Project State:** | NY |
| **Project Number:** | 5700132909 |
| **Model:** | HSF2206/2-1C |
| **Total Flow:** | 0.20 MGD |
| **Units in Service:** | 1 |
| **Flow per unit:** | 0.20 MGD |




| | mm | ft | in | elevation |
|---|---|---|---|---|
| Inlet Bypass Water Elevation | 1,444 mm | 4.74 ft | 56.9 in | 4.74 ft |
| Bypass Weir | 1,425 mm | 4.68 ft | 56.1 in | 4.68 ft |
| Effluent Water Elevation | 988 mm | 3.24 ft | 38.9 in | 3.24 ft |
| Effluent Weir | 970 mm | 3.18 ft | 38.2 in | 3.18 ft |
| Bottom of Unit | 0 mm | 0.00 ft | 0.0 in | **0.00 ft** |

NOTE: The above diagram is indicative of hydraulic profile only and should not be interepreted as a display of treatment flow path.

[1] - The exact placement of the backwash probe is based on operating observations during installation and startup.

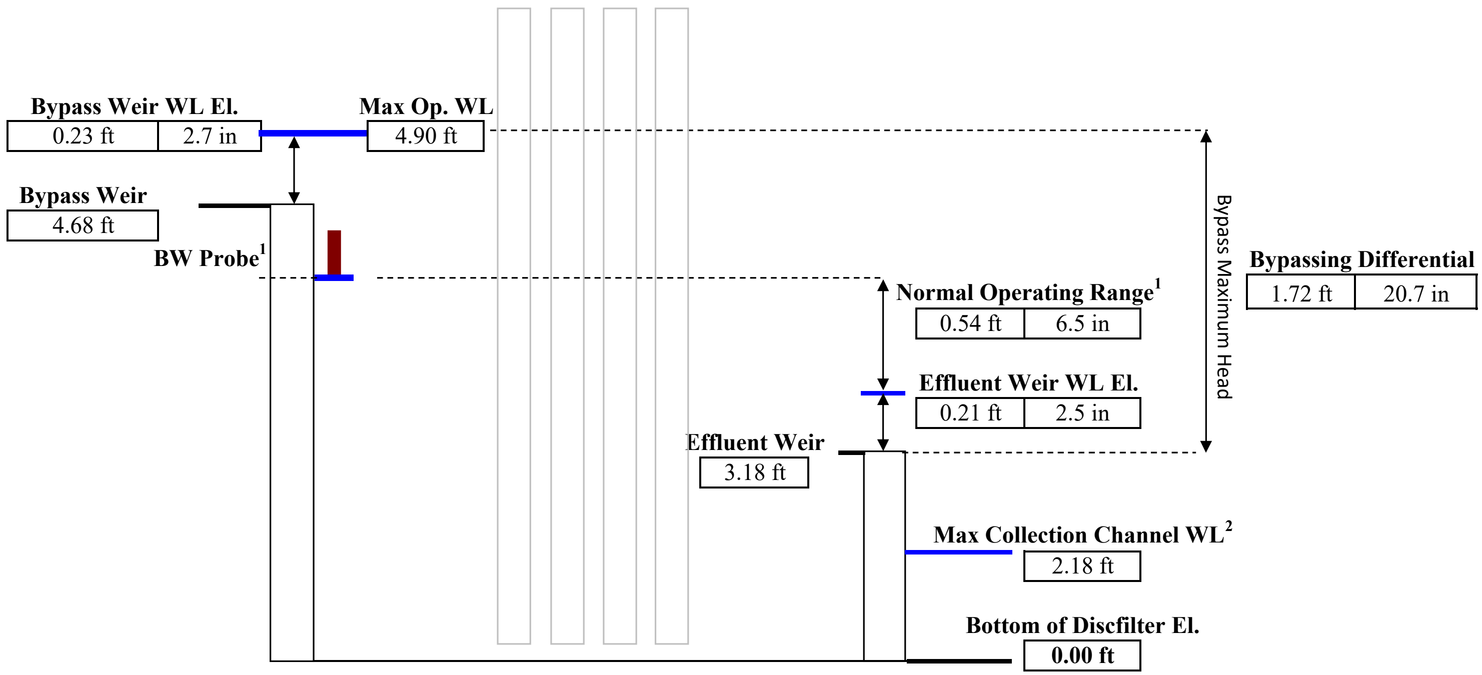
[2] - Please contact Kruger if downstream hydraulic conditions are such that the water level in the effluent collection channel exceeds levels indicated.

Veolia Water Technologies, Inc.
dba Kruger
4001 Weston Parkway
Cary, NC 27513
Tel: (919) 677-8310
www.veoliawatertech.com

*Water Technologies*

VEOLIA

| | |
|---|---|
| **Date:** | 5/4/2020 |
| **Project City:** | Alabama |
| **Project State:** | NY |
| **Project Number:** | 5700132909 |
| **Model:** | HSF2206-1C |
| **Total Flow:** | 1.36 MGD |
| **Units in Service:** | 1 |
| **Flow per unit:** | 1.36 MGD |




| | mm | ft | in | elevation |
|---|---|---|---|---|
| Inlet Bypass Water Elevation | 1,495 mm | 4.90 ft | 58.8 in | 4.90 ft |
| Bypass Weir | 1,425 mm | 4.68 ft | 56.1 in | 4.68 ft |
| Effluent Water Elevation | 1,033 mm | 3.39 ft | 40.7 in | 3.39 ft |
| Effluent Weir | 970 mm | 3.18 ft | 38.2 in | 3.18 ft |
| Bottom of Unit | 0 mm | 0.00 ft | 0.0 in | **0.00 ft** |

NOTE: The above diagram is indicative of hydraulic profile only and should not be interepreted as a display of treatment flow path.

[1] - The exact placement of the backwash probe is based on operating observations during installation and startup.

[2] - Please contact Kruger if downstream hydraulic conditions are such that the water level in the effluent collection channel exceeds levels indicated.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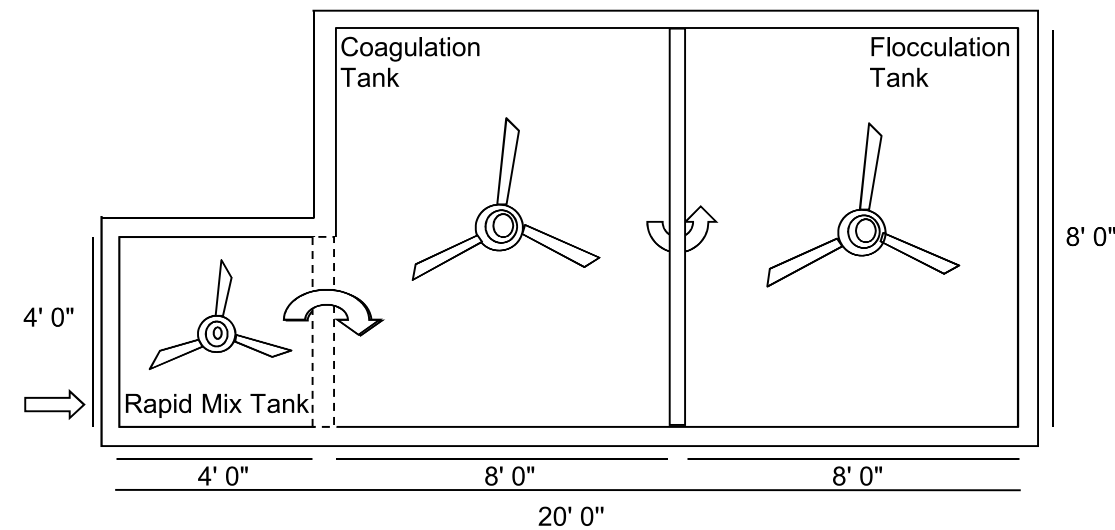
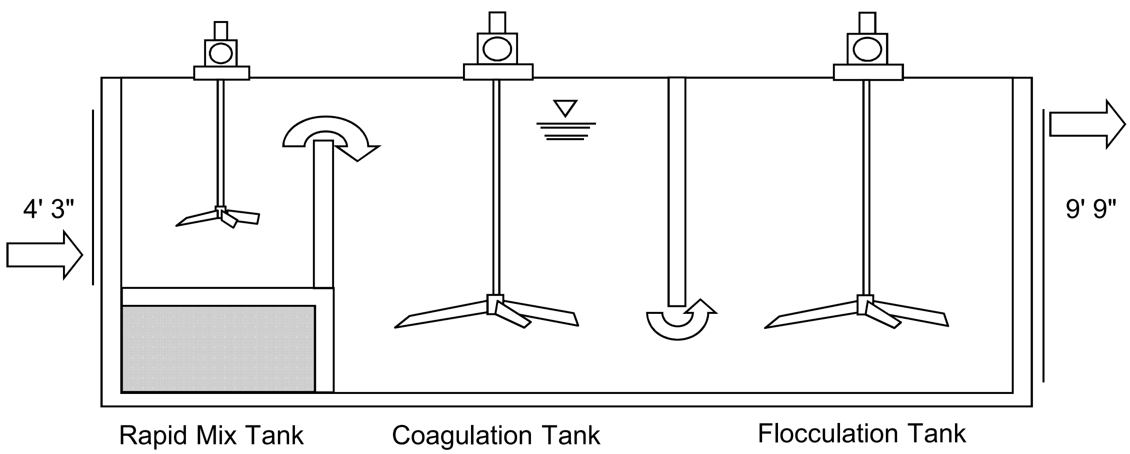
Cary, NC 27513
Tel: (919) 677-8310
www.veoliawatertech.com


*Water Technologies*

# Coagulation and Flocculation Tank Design

# Coag/Floc Single Train Layout
# Alabama, NY
# Total Capacity = 1.36 MGD
# Capacity Per Train = 1 x 1.36 MGD

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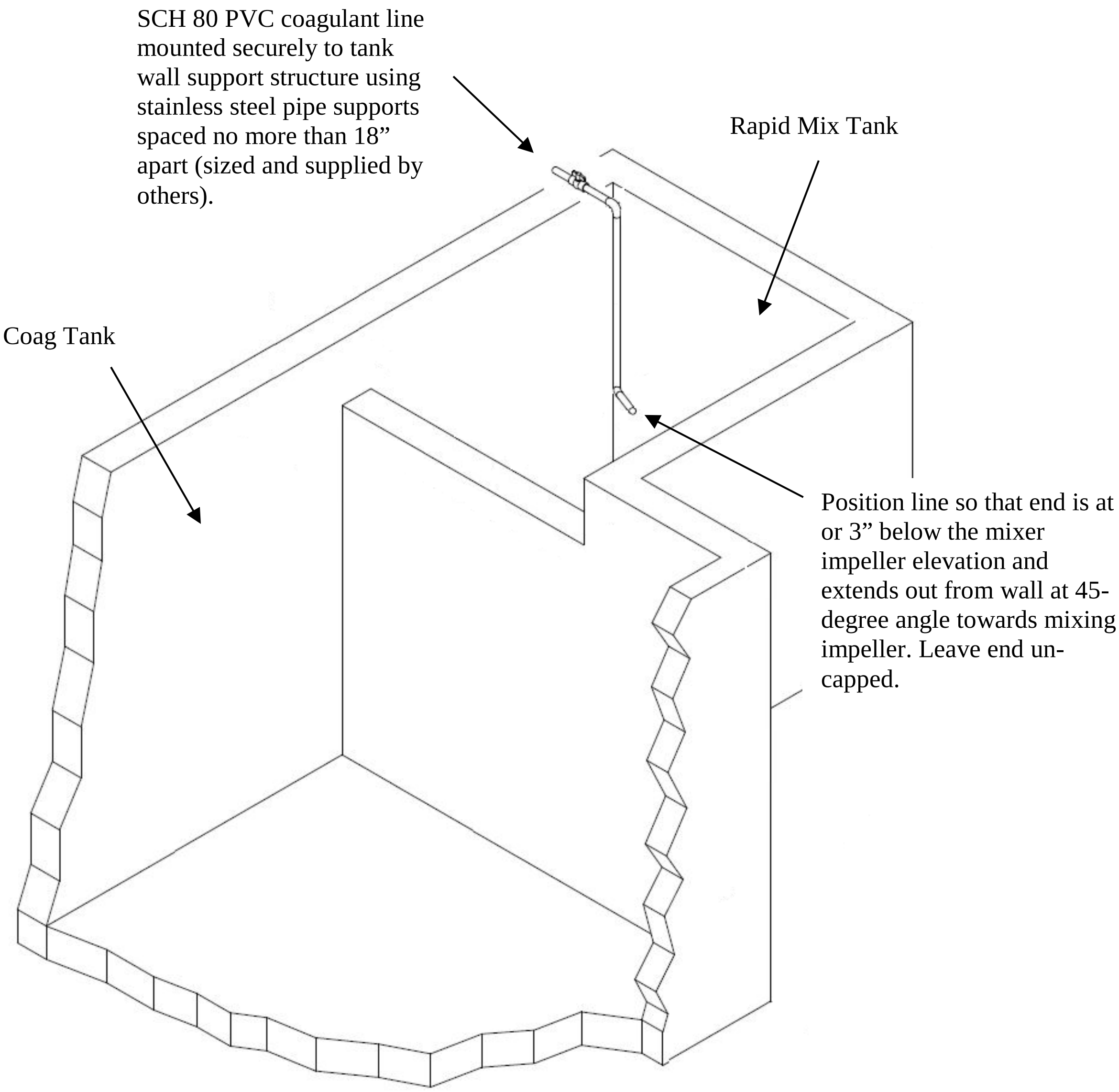
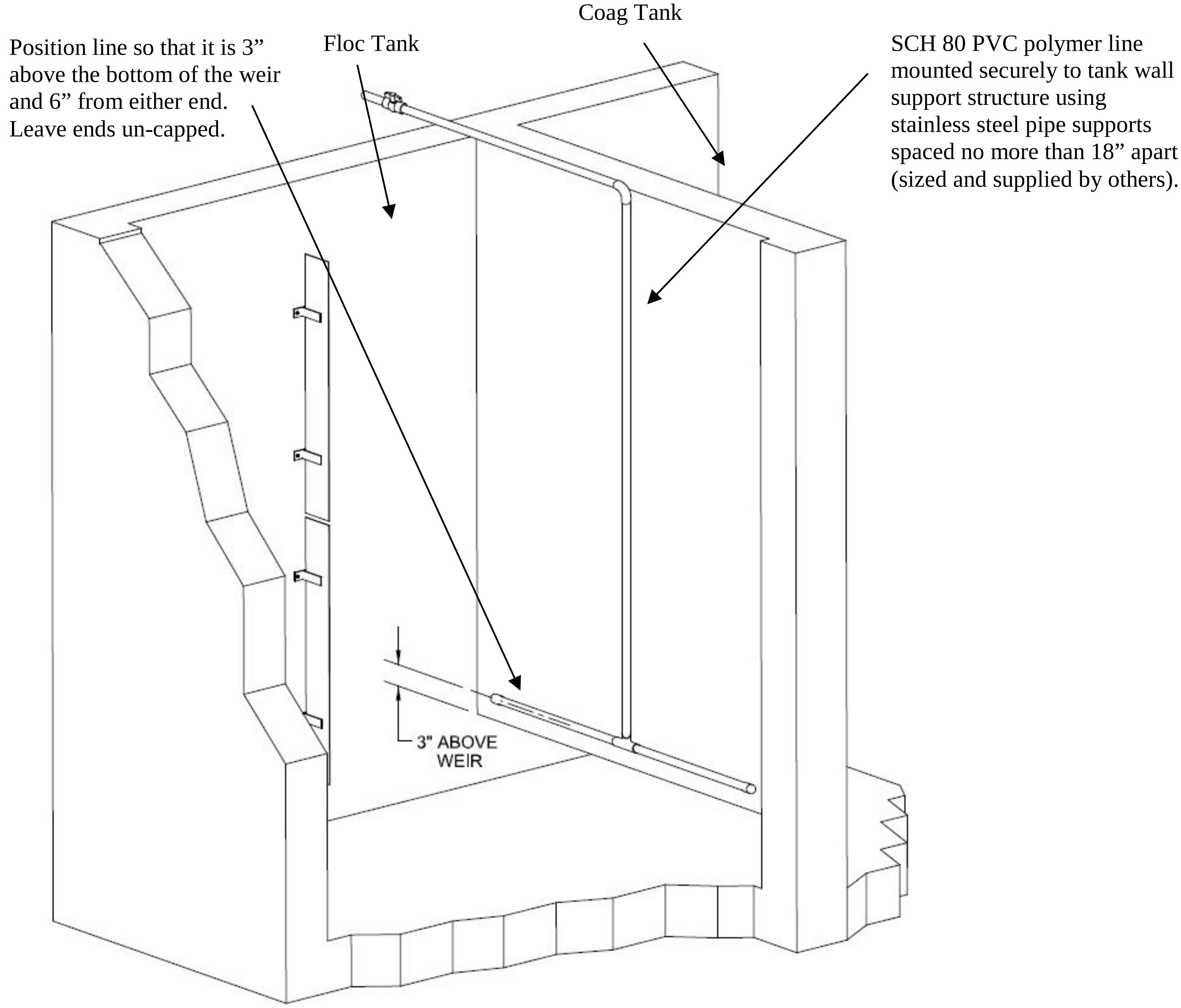
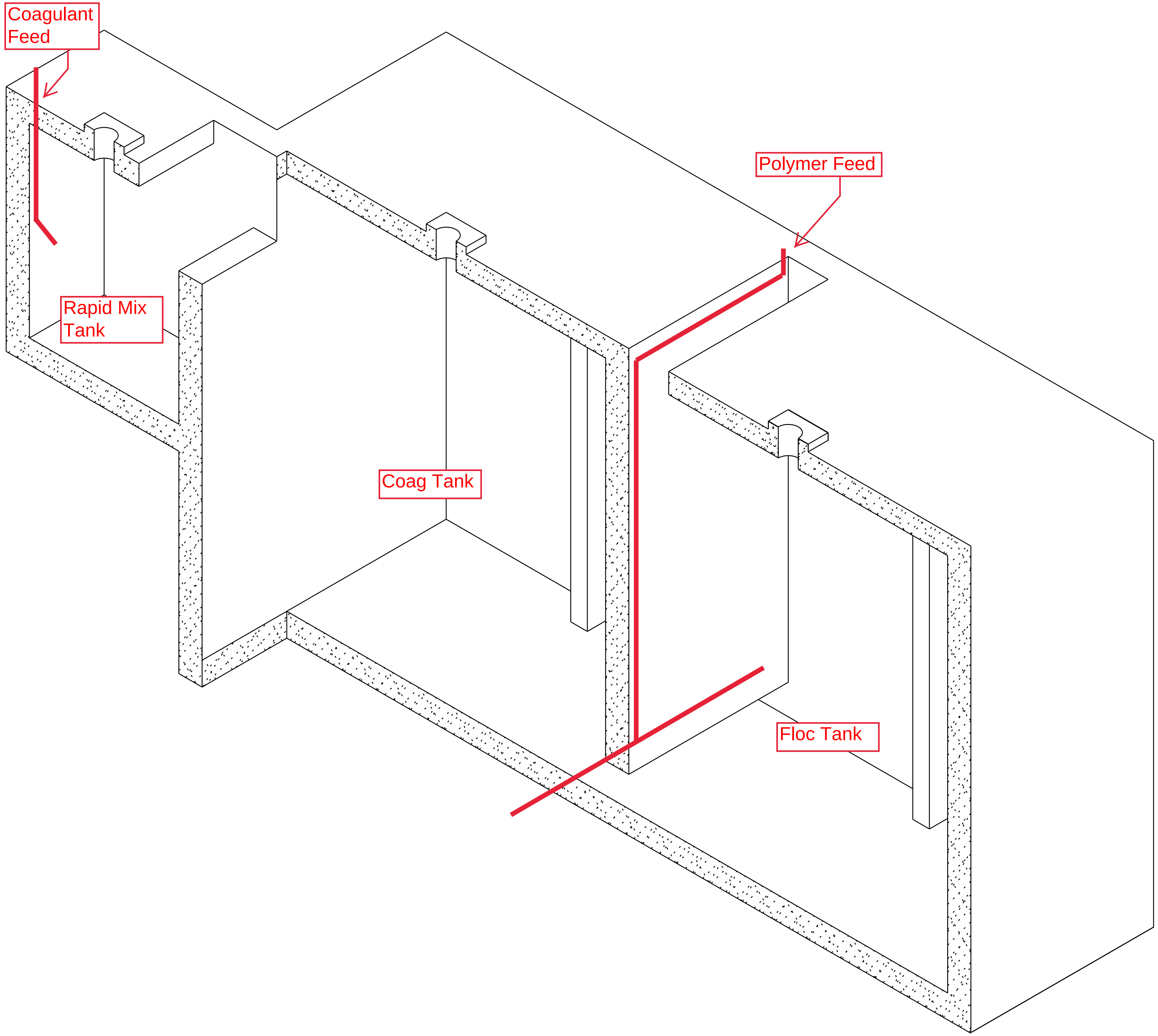
dba Kruger
4001 Weston Parkway
Cary, NC 27513
Tel: (919) 677-8310

**Rapid Mix Tank Coagulant Piping**



**Flocculation Tank Polymer Piping**

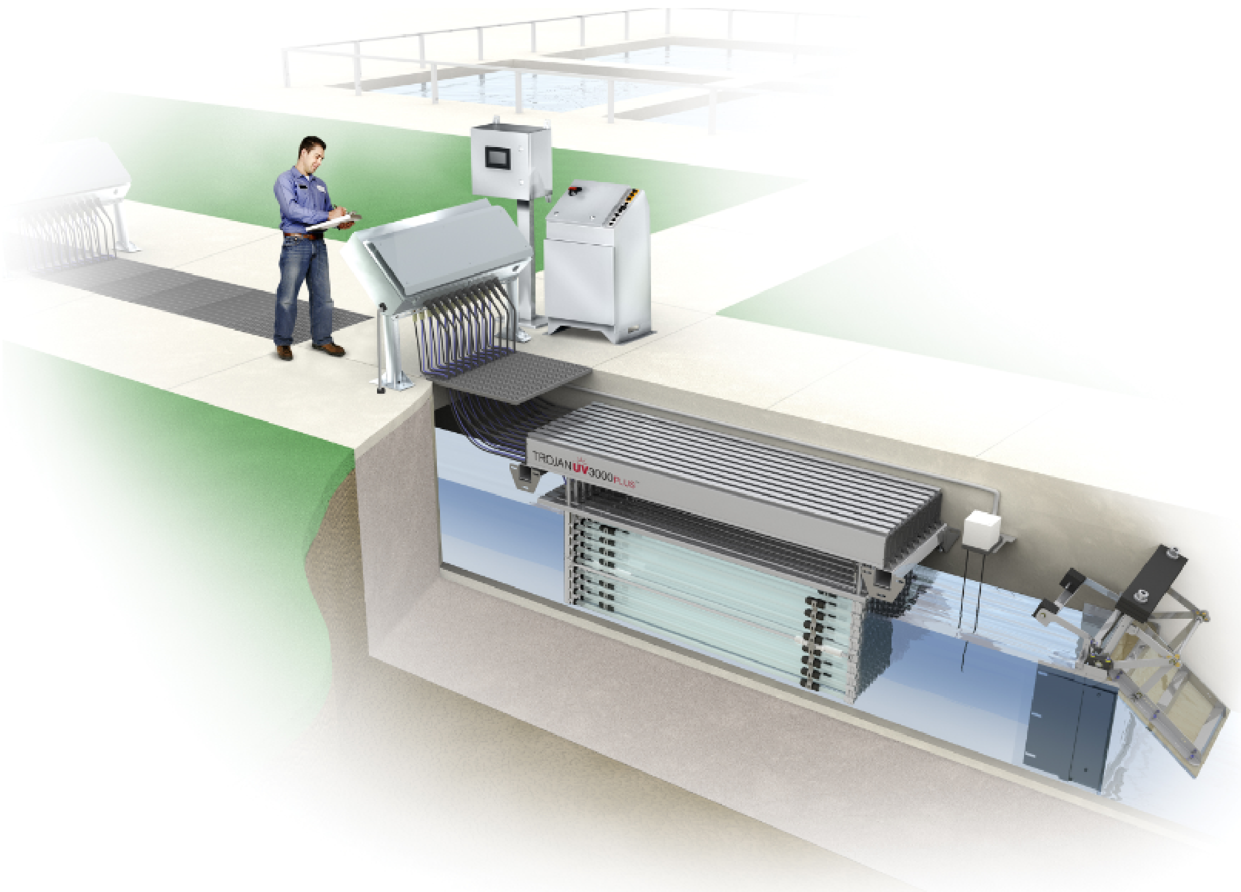



Coagulant Feed
Polymer Feed
Rapid Mix Tank
Coag Tank
Floc Tank

# UV Disinfection Sizing and Equipment Selection

TROJANUV3000PLUS™

PROPOSAL FOR STAMP - ALABAMA, NY
QUOTE: 226539
September 17, 2020




The TrojanUV3000Plus™ is operating in **over 2000** municipal wastewater plants around the world. Disinfecting **over 17 billion** gallons a day, the TrojanUV3000Plus™ has become the reference standard in the industry.

September 17, 2020

CPL
205 St Paul St Suite 500
Rochester, NY  14604
US

Attention: Nick Bayer

In response to your request, we are pleased to provide the following TrojanUV3000Plus™ proposal for the STAMP - ALABAMA project.

The TrojanUV3000Plus™ has been shown in over 2000 installations to provide dependable performance, simplified maintenance, and superior electrical efficiency. As explained in this proposal, the system incorporates innovative features to reduce O&M costs, including variable output electronic ballasts to provide dimming capability and Trojan's revolutionary ActiClean-WW™ system – the industry's only online chemical and mechanical quartz sleeve cleaning system.  All Trojan installations are supported by a global network of certified Service Representatives providing local service and support.

Please do not hesitate to call us if you have any questions regarding this proposal. Thank you for the opportunity to quote the TrojanUV3000Plus™ and we look forward to working with you on this project.

With best regards,

*Fiona Crawford*

Fiona Crawford
3020 Gore Road
London, Ontario  N5V 4T7
Canada
(519) 457 – 3400 ext. 2194
fcrawford@trojanuv.com

**Local Representative:**

Mike Ademovic
Koester Associates, Inc.
3101 Seneca Turnpike
Canastota, NY
US
315-967-3800

# DESIGN CRITERIA

**STAMP - ALABAMA**

| | |
|---|---|
| Peak Design Flow: | **1.36 MGD (current) 2.72 MGD (future)** |
| UV Transmittance: | **65 %** (minimum) |
| Total Suspended Solids: | **20 mg/l** (30 Day Average, grab sample) |
| Disinfection Limit: | **200 Fecal Coliform per 100 ml** (30 day Geomean, grab sample) |
| Design Dose: | **30 mJ/cm$^2$ (**bioassay validated) |
| Validation Factors: | **0.98** end of lamp life factor (Low-Pressure Amalgam Lamps)<br>**0.95** fouling factor (ActiClean-WW™ Chemical / Mechanical Cleaning System) |

TROJANUV3000PLUS™

## DESIGN SUMMARY

**QUOTE: 226539**

Based on the above design criteria, the TrojanUV3000Plus™ proposed consists of:

| | |
|---|---|
| **CHANNEL** (Please reference Trojan layout drawings for details.) | |
| Number of Channels: | **1** |
| Approximate Channel Length Required: | **30 ft** |
| Channel Width Based on Number of UV Modules: | **16 in (flared to 48 in at level controller)** |
| Channel Depth Recommended for UV Module Access: | **62 in** |
| **UV MODULES** | |
| Total Number of Banks: | **2 (1 duty, 1 standby)** |
| Number of Modules per Bank: | **4 (2 installed for current conditions, 2 stored modules for future 2.72 MGD)** |
| Number of Lamps per Module: | **8** |
| Total Number of UV Lamps: | **64 (Including Redundancy)** |
| Maximum Power Draw: | **16 kW** |
| **UV PANELS** | |
| Power Distribution Center Quantity: | **2** |
| System Control Center Quantity: | **1 (Touch Smart Controller)** |
| **MISCELLANEOUS EQUIPMENT** | |
| Level Controller Quantity: | **1** |
| Type of Level Controller: | **Serpentine Weir (384 in effective crest length)** |
| Automatic Chemical / Mechanical Cleaning: | **Trojan ActiClean-WW™** |
| UV Module Lifting Device: | **UV Module Lifting Sling** |
| Standard Spare Parts / Safety Equipment: | **Included – 4 lamps, 2 Sleeves, 4 Lampholder Seals, 1 set Wiper Seals, 1 Ballast , 1 Operator's Kit** |
| Other: | **2 – 304 SST Channel Reduction Baffles, 8 in. wide** |
| **ELECTRICAL REQUIREMENTS** | |

**1.** Each Power Distribution Center requires an electrical supply of one (1) 480/277V, 3-phase, 3-wire + GND, 60 Hz, 8.2 kVA, 14.7 Amps.
**2.** The Hydraulic System Center requires an electrical supply of one (1) 480V, 3-phase, 3-wire + GND, 60 Hz, 2.5 kVA.
**3.** The System Control Center requires an electrical supply of one (1) 120V, 1-phase, 2-wire + GND, 60 Hz, 1.8 kVA, 15 Amps.
**4.** Electrical disconnects required per local code are not included in this proposal.

# Screw Press Sizing and Equipment Selection

354 State Route 29, Greenwich, New York 12834
Phone No 518-695-6851
E-mail: dan@bdpindustries.com

**Date: Wednesday, July 8, 2020** 

**To: Clark Patterson Lee**
**205 Saint Paul Street**
**Rochester, NY 14604**

**Attn: Nick Bayer**
**585-324-0448**
**NBayer@CPLteam.com**

**Re: STAMP Project**
**Budget Proposal: One (1) BDP DSP 18 Screw Press skid mounted**
**BDP Proposal #: 070820-1508**

BDP Industries, Inc. is pleased to offer our quotation for One (1) BDP Screw Press and accessories, skid mounted. The screw press system includes the press, a control panel, polymer system, sludge pump, filtrate recycle system, and wash water pump, all mounted on a stainless steel skid as a complete dewatering system. A discharge conveyor, separate from the skid, is also included in this proposal. Below is a summary description and scope of our proposal.

## EQUIPMENT DESCRIPTION

The Screw Press equipment package includes a complete press and appurtenant equipment, skid mounted and described as follows:

1. One (1) 316L stainless steel polymer injection and polymer/sludge mixing system consisting of an injection ring, variable vortex mixer, and reducing fittings.

2. One (1) Screw Press, 18” diameter, with the following design features:

   a.) 304 stainless steel frame.
   b.) 304 stainless steel wetted parts.
   c.) 304 stainless steel hardware.
   d.) Replaceable wear flights.
   e.) Automatic, intermittent oscillating screen shower.
   f.) Filtrate recycle system.
   g.) Pneumatically adjustable discharge cone.
   h.) TEFC IP65 severe duty variable speed motors.
   i.) PVC conduit.
   j.) NEMA 4X pre-wired junction box.

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3. One (1) complete electrical control panel for all Screw Press control functions, drives, and interlocks for the screw press dewatering system. The panel will include an:
   a) Allen Bradley Compact Logix PLC
   b) Allen Bradley 12" Panelview plus OIT
   c) Allen Bradley Powerflex 525 variable frequency drives.
   d) IEC starter.
   e) 480/3/60
   f) UL 508
   g) NEMA 4X
   h) 304 stainless steel

4. One (1) Equipment Skid constructed of 304 stainless steel with integral filtrate collection sump and grating for walk-ways. All equipment in this proposal except for the discharge conveyor will be mounted and affixed to the equipment skid and will be pre-wired and pre-plumbed at the BDP factory.

5. One (1) Seepex, Netzsch or MXQ Progressive Cavity sludge feed pump with 5 HP TEFC drive motor capable of pumping 75 GPM at 300 RPM and 50 psi of head pressure

6. One (1) UGSI Automatic emulsion polymer blending unit with 5 GPH progressive cavity neat polymer pump, motorized mixing chamber and 1,200 GPH dilution water capability.

7. One (1) 3" Diameter Siemens Magnetic Flow Meter.

8. One (1) Washwater Booster Pump.

9. One (1) Filtrate Recycle System with Moyno 34401 pump and pressure transducer for automatic level control.

10. One (1) Ingersoll Rand Air Compressor and Air Drier.

11. One (1) 3 HP 304 stainless steel inclined u-trough screw conveyor, 18 ft in length, capable of 110 CFH. Conveyor supports included.

12. One-year warranty.

13. Six (6) days of on-site start-up spread over two trips for start up, mechanical checkout and operator training.

14. Freight to the jobsite.

354 State Route 29, Greenwich, New York 12834
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E-mail: dan@bdpindustries.com

15. *Optional for Future Addition:* One (1) 36" diameter Rotary Drum Thickener with a variable speed drive motor.
    a) 304 stainless steel frame
    b) 304 stainless steel wetted parts.
    c) 304 stainless steel hardware.
    d) TEFC IP65 severe duty variable speed motors.
    e) PVVC conduit.
    f) NEMA 4X pre-wired Junction box.

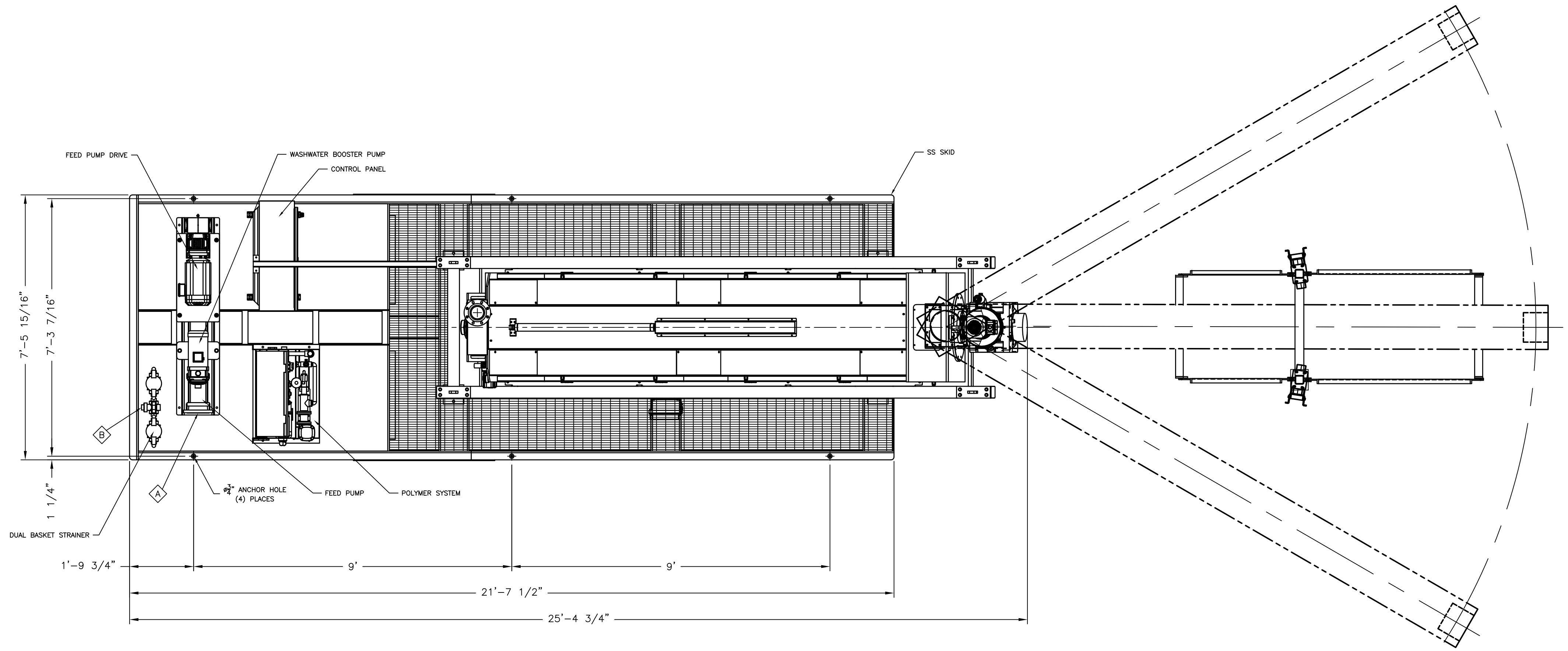
The Screw Press will come completely factory-assembled, tested and will be shipped in one piece. The polymer injection devices, polymer make down unit, electrical control panel and all ancillary equipment will be skid-mounted, except for the screw conveyor. This quotation is for furnishing equipment only and does not include any other installation labor or field services other than checkout and start up services as listed above. The price does not include any applicable taxes or installation. BDP is not responsible for obtaining installation or operating permits, if required, or any additional permit fees.

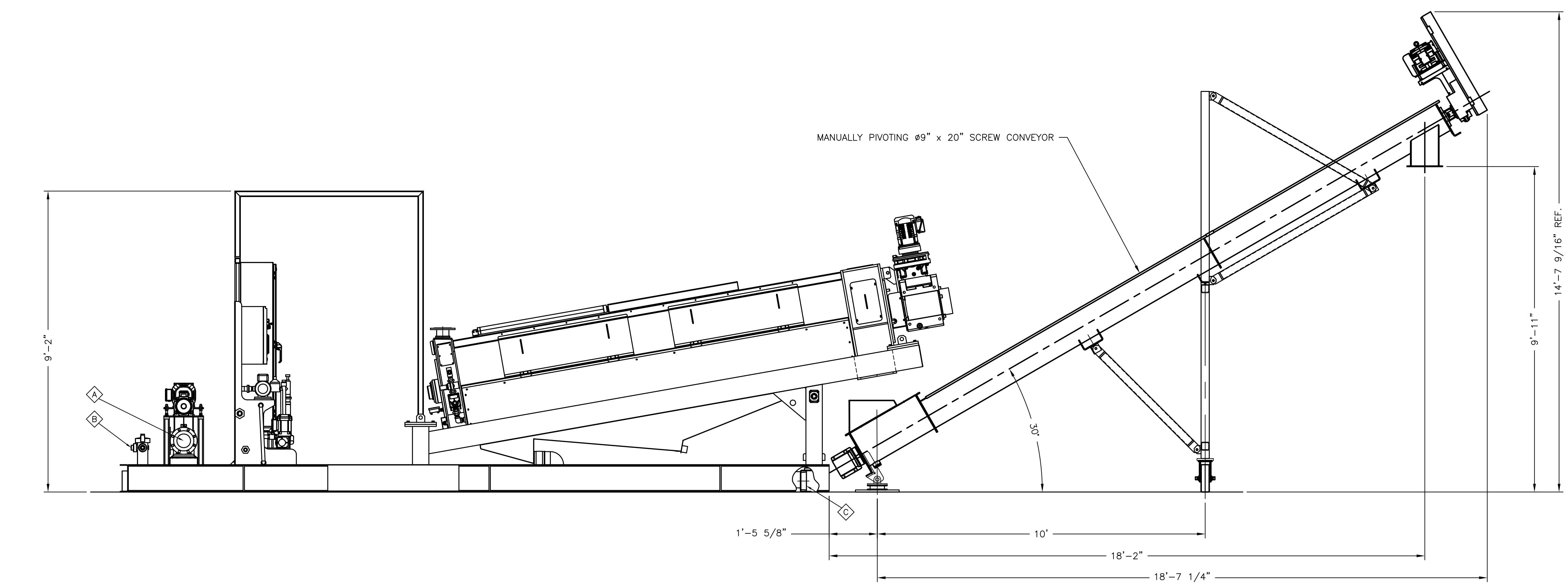
## SHIPMENT

Approximate shipping weight of the unit is 13,500 pounds. Estimated shipping time is 20 to 26 weeks after receipt of purchase order.

## FIELD SERVICE

Startup services shall include six (6) days over two trips of on-site start-up, mechanical checkout and operator training.




CONNECTION LEGEND:

- (A) 5" 150# FLANGED FEED INLET
- (B) 1-1/2" NPT WASHWATER INLET
- (C) 6" NPT MAIN COLLECTION PAN OUTLET

PLUMBING BEYOND THESE POINTS NOT SUPPORTED BY BDP

| QTY. | DESCRIPTION | MAT. | ITEM | REMARKS |
|---|---|---|---|---|

**BDP INDUSTRIES, INC.**
**GREENWICH, N.Y. 12834**

| | | | | |
|---|---|---|---|---|
| CUSTOMER: STAMP, NY | MACHINE: DSP 18x12 | | DWG TITLE GENERAL ARRANGEMENT SKIDDED DSP 18x12 SCREW PRESS | |
| BDP JOB NO. PROPOSAL | DWN BY: SKD | DATE: 9/18/20 | | |
| APP'D BY: | SCALE: | SHT. 1 OF 1 | DWG NO. 1-800-227 | REV. 1 |

| REV. | DESCRIPTION | BY | DATE |
|---|---|---|---|

# Sanitary Sewer Pump Selection

# Data sheet

Customer item no.:Temporary PS
Communication dated: 10/06/2020
Doc. no.: Rochester, NY
Quantity: 4

Number: ES 8000472153
Item no.: 100
Date: 10/06/2020


**KRTE 100-317/374XEG-S**

Version no.: 1

## Operating data

| | | | |
|---|---|---|---|
| Requested flow rate | 584.00 US GPM | Actual flow rate | 601.38 US GPM |
| Requested developed head | 130.00 ft | Actual developed head | 137.85 ft |
| Pumped medium | Wastewater, municipal biologically treated Not containing chemical and mechanical substances which affect the materials | Efficiency | 67.4 % |
| | | Power absorbed | 31.02 HP |
| | | Pump speed of rotation | 1776 rpm |
| | | Max. power on curve | 42.59 HP |
| | | Shutoff head | 184.50 ft |
| Max. ambient air temperature | 68.0 °F | Design | Single system 1 x 100 % |
| Min. ambient air temperature | 68.0 °F | | |
| Fluid temperature | 104.0 °F | | |
| Fluid density | 62.303144 lb/ft³ | Performance test | Yes |
| Fluid viscosity | 0.0010 in²/s | | |
| Ex-Request acc.to Atex | II T3 | | |

## Design

| | | | |
|---|---|---|---|
| Design | Close-coupled submersible | Impeller type | Single vane, radial flow (E) |
| Orientation | Vertical | Wear ring | Casing wear ring |
| Suction flange pump drilled according to(DN1) | unmachined | Impeller diameter | 12.40 in |
| | | Free passage size | 2.99 in |
| Discharge flange pump drilled according to(DN2) | EN 1092-2 / DN 100 / PN 10 | Direction of rotation from drive | Clockwise |
| | | Ex protection | Explosion protection to NEC Class1, Div 1, Gr.C, D T3 |
| Shaft seal | 2 mech. seals in tandem arrangement with oil reservoir | Color | Ultramarine blue (RAL 5002) KSB-blue |
| Manufacturer | KSB | | |
| Type | MG | | |
| Material code | SIC/SIC/NBR | | |

## Driver, accessories

| | | | |
|---|---|---|---|
| Driver type | Electric motor | Motor service factor | 1.15 |
| Model (make) | KSB | Temperature sensor | Bimetal switch / PTC |
| Motor const. type | KSB Sub. motor | Motor winding | 460 V |
| NEMA code letter | G | Number of poles | 4 |
| Frequency | 60 Hz | Starting mode | Direct-on-line starting |
| Rated voltage | 460 V | Connection mode | Delta |
| Rated power P2 | 49.99 HP | Motor cooling method | Surface cooling |
| Available reserve | 61.14 % | Motor version | X |
| Rated current | 60.3 A | Cable design | Rubber hose |
| Starting current ratio | 6.4 | Cable entry | Sealed along entire length |
| Insulation class | H according IEC 34-1 | Power cable | AWG 7-7+15-5 |
| Type of protection | XP/I/1/CD | Number of power cables | 1 |
| Motor enclosure | IP68 | Moisture sensor | With |
| Cos phi at 4/4 load | 0.84 | Cable length | 32.81 ft |
| Motor efficiency at 4/4 load | 92.4 % | | |

## Materials G

| | | | |
|---|---|---|---|
| Pump casing (101) | Cast iron A 48 Class 35 B | O-Ring (412) | Nitrile rubber NBR |
| Discharge cover (163) | Cast iron A 48 Class 35 B | Casing wear ring (502.1) | Cast iron A 48 Class 35 B |
| Shaft (210) | Chrome steel ASTM A276 Type 420 T | Motor housing (811) | Cast iron A 48 Class 35 B |
| | | Motor cable (824) | Chloroprene rubber |
| Impeller (230) | Cast iron A 48 Class 35 B | Screw (900) | Stainless steel A 193 B8M |
| Bearing bracket (330) | Cast iron A 48 Class 35 B | | |

## Data sheet

Customer item no.:Temporary PS
Communication dated: 10/06/2020
Doc. no.: Rochester, NY
Quantity: 4



**KRTE 100-317/374XEG-S**

Version no.: 1

### Nameplates

| | | | |
|---|---|---|---|
| Nameplates language | International | Duplicate nameplate | With |

### Certifications

| | | | |
|---|---|---|---|
| **Hydraulic performance test** | | Test participation | Non-witnessed |
| Acceptance standard | ISO 9906 & ANSI HI Class 2B | Quantity, non-witnessed | 4 |
| Quantity meas. points Q-H | 5 | Quantity, witnessed | 0 |
| Certificate | Inspection cert. 3.1 to EN 10204 | | |

### Installation parts

| | | | |
|---|---|---|---|
| Installation type | stationary 2 guide rail | Mounting type | Composite anchor bolts |
| Scope of supply | Pump with installation parts For guide rail arrangements, the guide rails are not included in KSB's scope of supply. | Foundation rail | Without |
| | | **Claw** | |
| | | Design | Straight |
| | | Size | DN 100 |
| Installation depth | 14.76 ft | **Lifting chain / -rope** | Without |
| Material concept | G | Lifting Bail | With |

**Duckfoot bend**

| | |
|---|---|
| Size | DN 100 |
| Flange design | ASME |
| Duckfoot bend size (DN2 / DN3) | DN 100 Drilled according to ASME |
| Material | Cast iron A 48 Class 35 B |

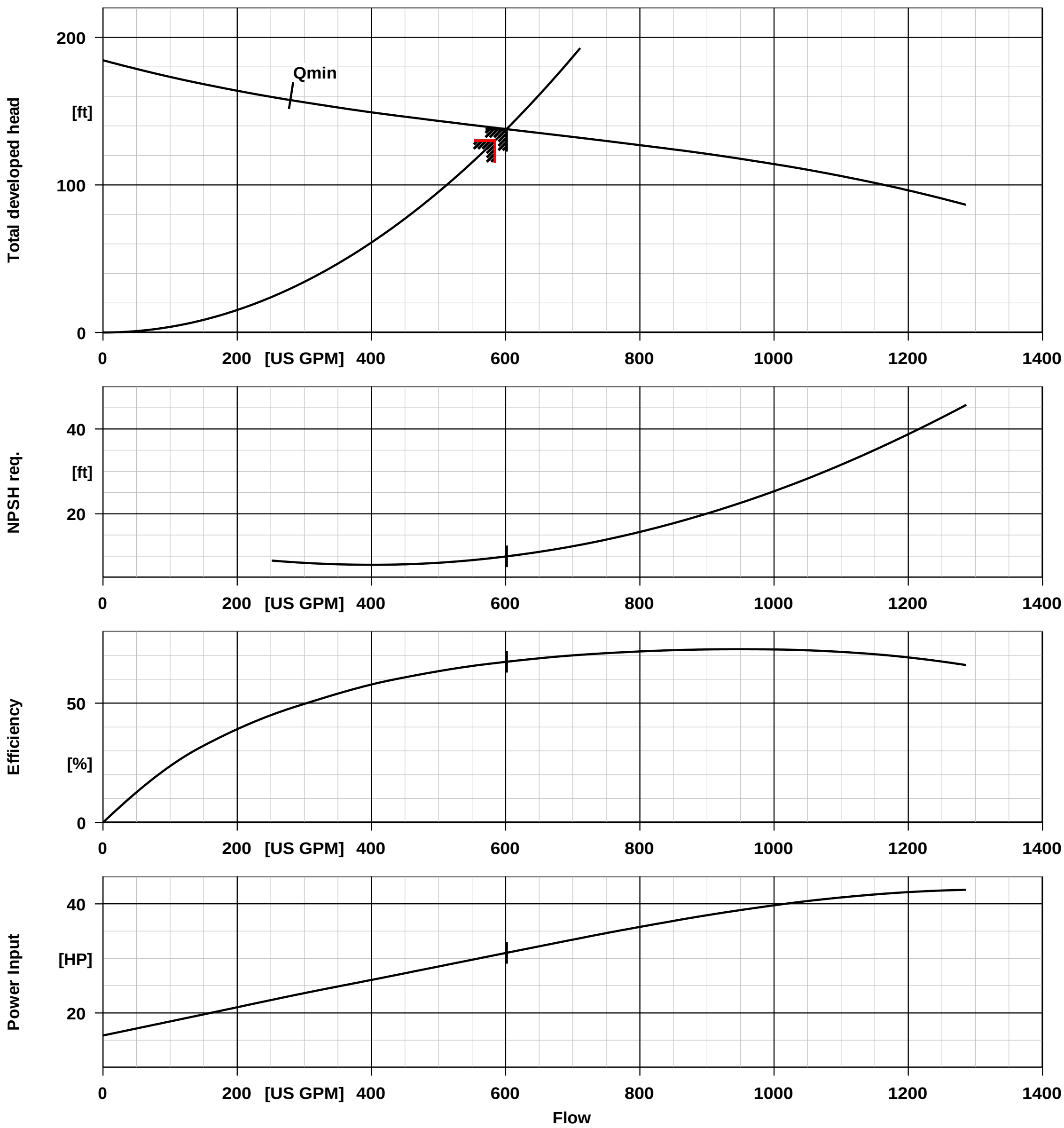
## Performance curve

Customer item no.:Temporary PS
Communication dated: 10/06/2020
Doc. no.: Rochester, NY
Quantity: 4

Number: ES 8000472153
Item no.:100
Date: 10/06/2020
Page: 3 / 21

Version no.: 1

**KRTE 100-317/374XEG-S**




### Curve data

| | | | |
|---|---|---|---|
| Speed of rotation | 1776 rpm | Efficiency | 67.4 % |
| Fluid density | 62.303144 lb/ft³ | Power absorbed | 31.02 HP |
| Viscosity | 0.0010 in²/s | NPSH req. 3% | 9.97 ft |
| Flow rate | 601.38 US GPM | Curve number | K43480 |
| Requested flow rate | 584.00 US GPM | Effective impeller diameter | 12.40 in |
| Total developed head | 137.85 ft | Acceptance standard | ISO 9906 & ANSI HI Class 2B |
| Requested developed head | 130.00 ft | | |

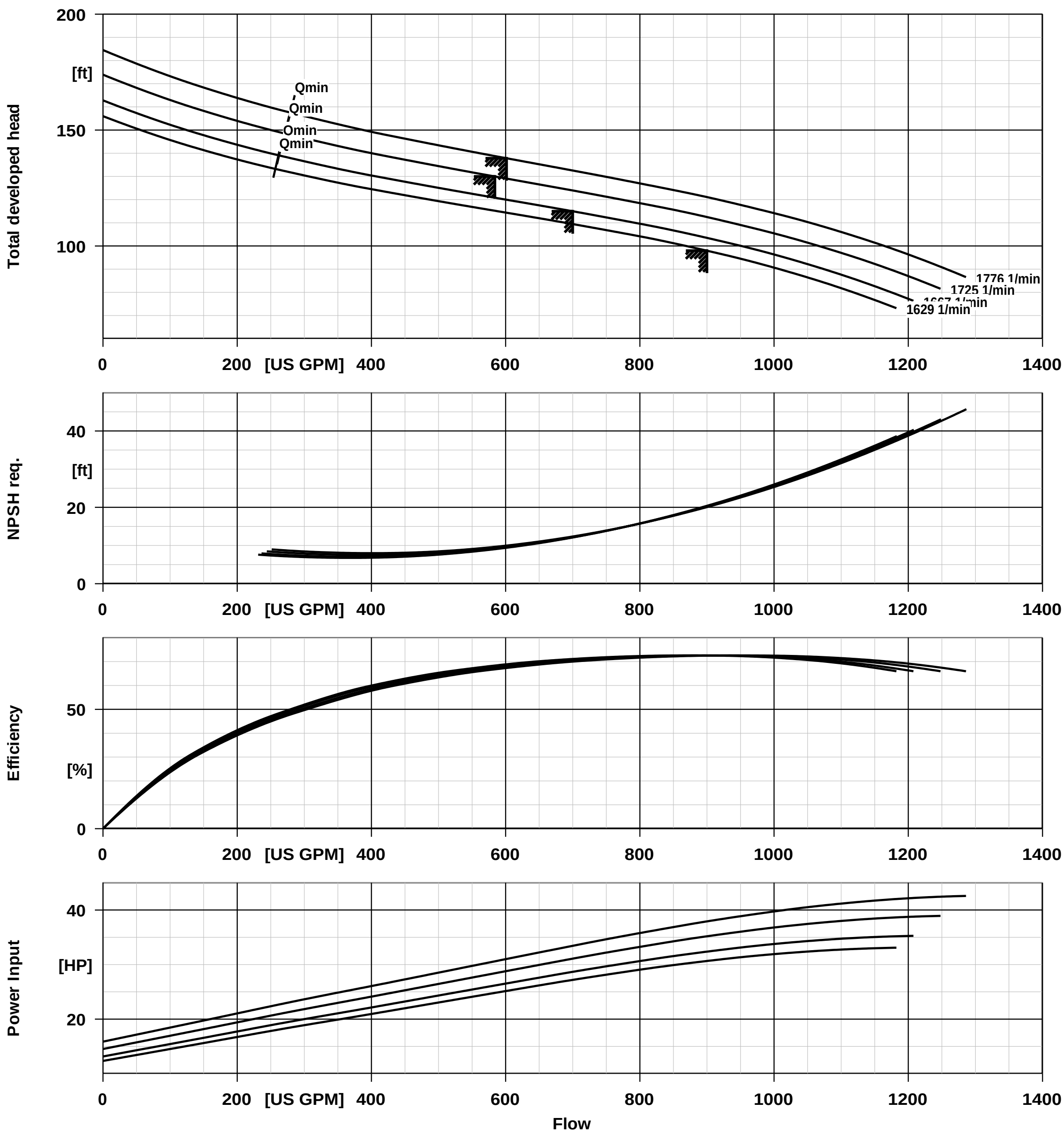
# Speed curve

Customer item no.:Temporary PS
Communication dated: 10/06/2020
Doc. no.: Rochester, NY
Quantity: 4

Number: ES 8000472153
Item no.:100
Date: 10/06/2020
Page: 4 / 21

**KRTE 100-317/374XEG-S**

Version no.: 1




## Curve data

| | | | |
|---|---|---|---|
| Fluid density | 62.303144 lb/ft³ | Total developed head | 137.85 ft |
| Viscosity | 0.0010 in²/s | Requested developed head | 130.00 ft |
| Flow rate | 601.38 US GPM | Effective impeller diameter | 12.40 in |
| Requested flow rate | 584.00 US GPM | | |

# Motor data sheet

Customer item no.:Temporary PS
Communication dated: 10/06/2020
Doc. no.: Rochester, NY
Quantity: 4

Number: ES 8000472153
Item no.:100
Date: 10/06/2020


**KRTE 100-317/374XEG-S**

Version no.: 1

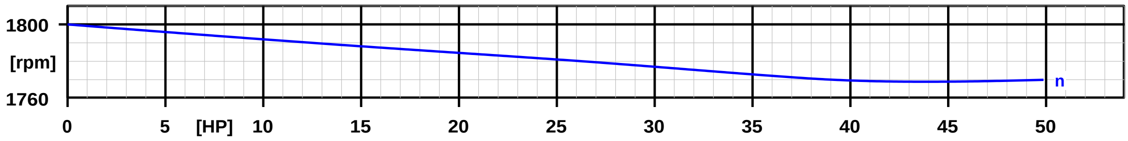
## Motor data

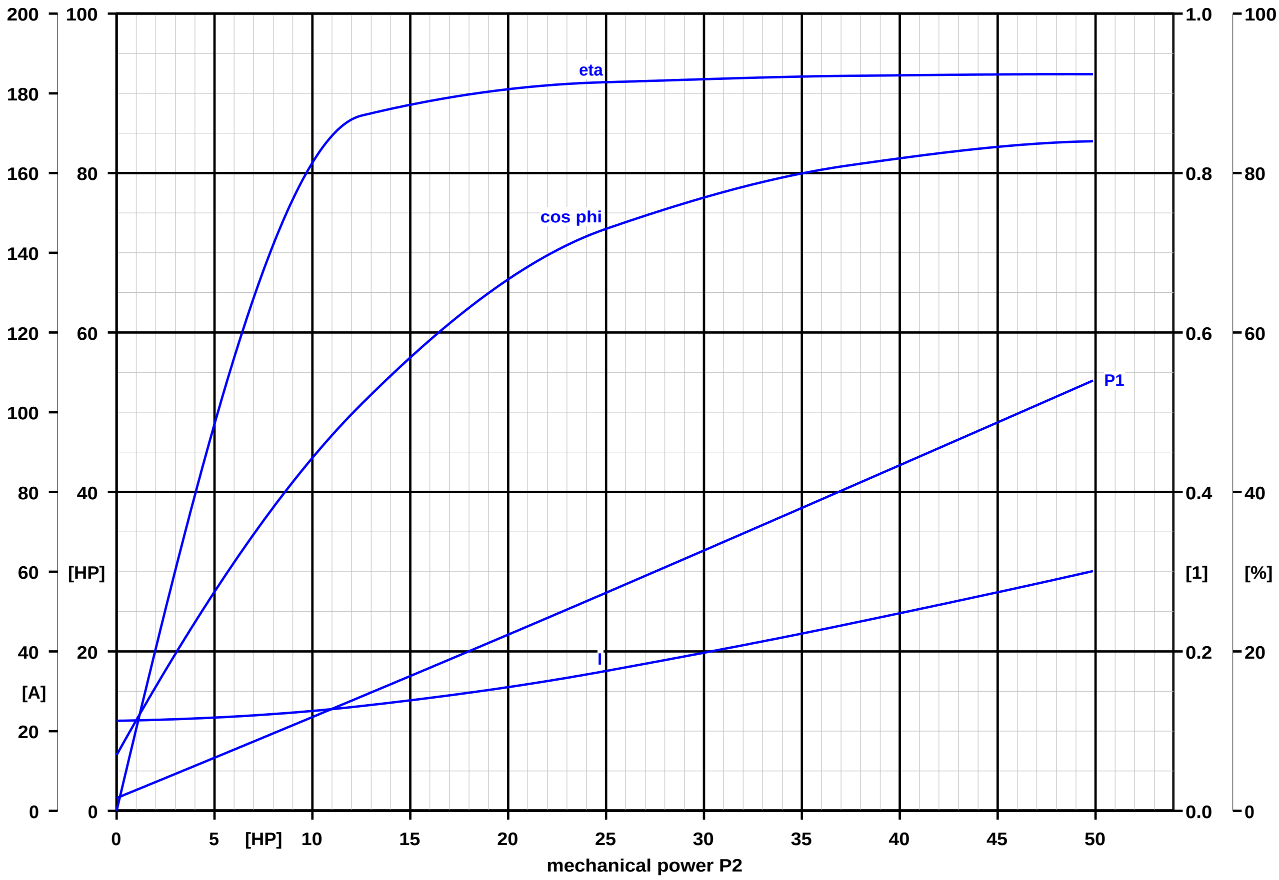
| | | | |
|---|---|---|---|
| Motor manufacturer | KSB | Rated speed | 1770 rpm |
| Motor size | 37E | Starting current ratio | 6.4 |
| Motor construction type | KSB Sub. motor | Starting mode | Direct-on-line starting |
| Motor material | Grey cast iron EN-GJL-250 | Power cable | AWG 7-7+15-5 |
| Efficiency class | not classified | Number of power cables | 1 |
| Rated voltage | 460 V | Power cable Ø min. | 0.96 in |
| Frequency | 60 Hz | Power cable Ø max. | 1.08 in |
| Motor power | 49.99 HP | Cable standard | NEC |
| Rated current | 60.3 A | Switching frequency | 10.00 1/h |

**Curve data**

The no-load point is not a guarantee point within the meaning of IEC 60034

| | | | | | |
|---|---|---|---|---|---|
| Load | 0.0 % | 25.0 % | 50.0 % | 75.0 % | 100.0 % |
| P2 | 0.00 HP | 12.50 HP | 25.00 HP | 37.49 HP | 49.99 HP |
| n | 1800 rpm | 1790 rpm | 1781 rpm | 1771 rpm | 1770 rpm |
| P1 | 1.61 HP | 14.34 HP | 27.36 HP | 40.67 HP | 54.11 HP |
| I | 22.6 A | 26.3 A | 35.1 A | 47.0 A | 60.3 A |
| Eta | 0.0 % | 87.2 % | 91.4 % | 92.2 % | 92.4 % |
| cos phi | 0.07 | 0.51 | 0.73 | 0.81 | 0.84 |



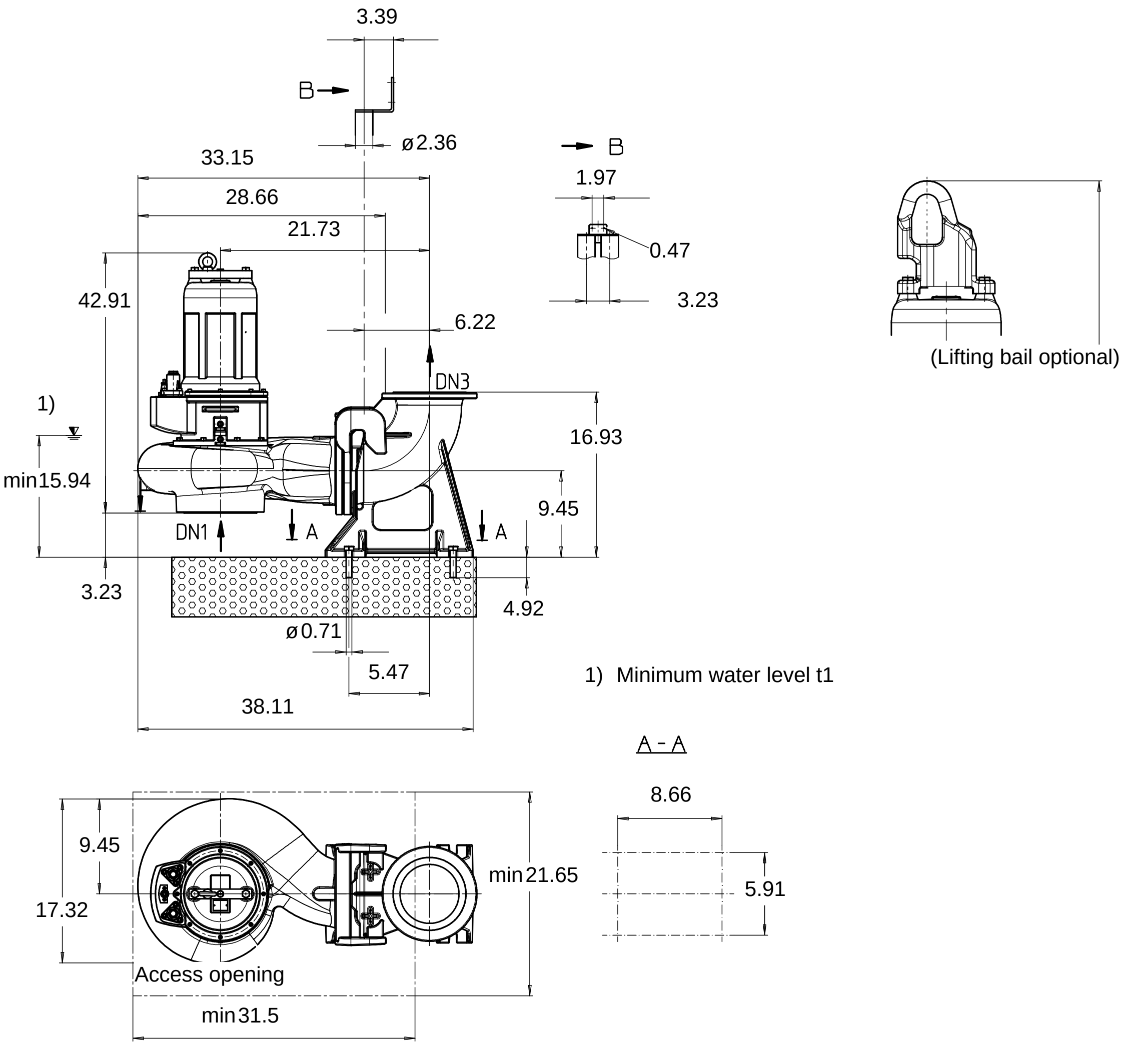
# Installation plan

Customer item no.:Temporary PS
Communication dated: 10/06/2020
Doc. no.: Rochester, NY
Quantity: 4

Number: ES 8000472153
Item no.:100
Date: 10/06/2020


**KRTE 100-317/374XEG-S**

Version no.: 1




*Drawing is not to scale*

*Dimensions in in*

# Installation plan

Customer item no.:Temporary PS
Communication dated: 10/06/2020
Doc. no.: Rochester, NY
Quantity: 4

Number: ES 8000472153
Item no.:100
Date: 10/06/2020


**KRTE 100-317/374XEG-S**

Version no.: 1

**Motor**

| | |
|---|---|
| Motor manufacturer | KSB |
| Motor size | 37E |
| Motor power | 49.99 HP |
| Number of poles | 4 |
| Speed of rotation | 1770 rpm |
| Motor enclosure | IP68 |

**Connections**

| | |
|---|---|
| Suction flange pump drilled according to(DN1) | unmachined |
| Duckfoot bend size (DN2 / DN3) | DN 100 Drilled according to ASME |

**Weight net**

| | |
|---|---|
| Pump, Motor, Cable | 952 lbm |
| Claw / Foot | 32 lbm |
| Total | 984 lbm |

**Connect pipes without stress or strain!**

Dimensional tolerances for shaft axis height: DIN 747

| | |
|---|---|
| Dimensions without tolerances, middle tolerances to: | ISO 2768-m |
| Connection dimensions for pumps: | EN735 |
| Dimensions without tolerances - welded parts: | ISO 13920-B |
| Dimensions without tolerances - gray cast iron parts: | ISO 8062-CT11 |
| Dimensions without tolerances - stainless steel parts: | ISO 8062-CT12 |

**For auxiliary connections see separate drawing.**

# Data sheet

Customer item no.:Permanent PS
Communication dated: 10/06/2020
Doc. no.: Rochester, NY
Quantity: 4

Number: ES 8000472153
Item no.: 300
Date: 10/06/2020


**KRTK 150-503/1554XNG-S**

Version no.: 1

## Operating data

| | | | |
|---|---|---|---|
| Requested flow rate | 1533.00 US GPM | Actual flow rate | 1533.17 US GPM |
| Requested developed head | 354.00 ft | Actual developed head | 354.08 ft |
| Pumped medium | Wastewater, municipal biologically treated Not containing chemical and mechanical substances which affect the materials | Efficiency | 71.9 % |
| | | Power absorbed | 190.08 HP |
| | | Pump speed of rotation | 1781 rpm |
| | | Max. power on curve | 269.36 HP |
| | | Shutoff head | 434.30 ft |
| Max. ambient air temperature | 68.0 °F | Design | Single system 1 x 100 % |
| Min. ambient air temperature | 68.0 °F | | |
| Fluid temperature | 104.0 °F | | |
| Fluid density | 62.303144 lb/ft³ | Performance test | Yes |
| Fluid viscosity | 0.0010 in²/s | | |
| Ex-Request acc.to Atex | II T3 | | |

## Design

| | | | |
|---|---|---|---|
| Design | Close-coupled submersible | Impeller type | Multivane radial flow impeller (K-max) |
| Orientation | Vertical | | |
| Suction flange pump drilled according to(DN1) | unmachined | Wear ring | Casing wear ring |
| | | Impeller diameter | 18.78 in |
| Discharge flange pump drilled according to(DN2) | EN 1092-2 / DN 150 / PN 10 | Free passage size | 2.99 in |
| | | Direction of rotation from drive | Clockwise |
| Shaft seal | 2 mech. seals in tandem arrangement with oil reservoir | Ex protection | Explosion protection to NEC Class1, Div 1, Gr.C, D T3 |
| Manufacturer | KSB | Temperature sensor PT100 inboard | With |
| Type | MG | | |
| Material code | SIC/SIC/NBR | Color | Ultramarine blue (RAL 5002) KSB-blue |

## Driver, accessories

| | | | |
|---|---|---|---|
| Driver type | Electric motor | Temperature sensor | Bimetal switch / PTC |
| Model (make) | KSB | Motor winding | 460 V |
| Motor const. type | KSB Sub. motor | Number of poles | 4 |
| NEMA code letter | F | Starting mode | Direct-on-line starting |
| Frequency | 60 Hz | Connection mode | Delta |
| Rated voltage | 460 V | Motor cooling method | Surface cooling |
| Rated power P2 | 208.01 HP | Motor version | X |
| Available reserve | 9.43 % | Cable design | Rubber hose |
| Rated current | 232.0 A | Cable entry | Sealed along entire length |
| Starting current ratio | 6.1 | Power cable | AWG 1/0-4 |
| Insulation class | H according IEC 34-1 | Number of power cables | 2 |
| Type of protection | XP/I/1/CD | Control cable | AWG 15-10 |
| Motor enclosure | IP68 | Number of control cables | 1 |
| Cos phi at 4/4 load | 0.90 | Moisture sensor | With |
| Motor efficiency at 4/4 load | 93.3 % | Cable length | 32.81 ft |
| Motor service factor | 1.15 | | |

## Data sheet

KSB

Customer item no.:Permanent PS
Communication dated: 10/06/2020
Doc. no.: Rochester, NY
Quantity: 4

Number: ES 8000472153
Item no.: 300
Date: 10/06/2020


**KRTK 150-503/1554XNG-S**

Version no.: 1

### Materials G

| | | | |
|---|---|---|---|
| Pump casing (101) | Cast iron A 48 Class 35 B | Casing wear ring (502.1) | Cast iron A 48 Class 35 B |
| Discharge cover (163) | Cast iron A 48 Class 35 B | Shaft protecting sleeve (524) | Chrome steel A 276 Type 420 |
| Shaft (210) | Chrome steel ASTM A276 Type 420 T | Motor housing (811) | Cast iron A 48 Class 35 B |
| | | Motor cable (824) | Chloroprene rubber |
| Impeller (230) | Cast iron A 48 Class 35 B | Screw (900) | Stainless steel A 193 B8M |
| Bearing bracket (330) | Cast iron A 48 Class 35 B | | |
| O-Ring (412) | Nitrile rubber NBR | | |

### Nameplates

| | | | |
|---|---|---|---|
| Nameplates language | International | Duplicate nameplate | With |

### Certifications

| | | | |
|---|---|---|---|
| | | Test participation | Non-witnessed |
| **Hydraulic performance test** | | Quantity, non-witnessed | 4 |
| Acceptance standard | ISO 9906 & ANSI HI Class 2B | Quantity, witnessed | 0 |
| Quantity meas. points Q-H | 5 | | |
| Certificate | Inspection cert. 3.1 to EN 10204 | | |

### Installation parts

| | | | |
|---|---|---|---|
| Installation type | stationary 2 guide rail | Mounting type | Composite anchor bolts |
| Scope of supply | Pump with installation parts For guide rail arrangements, the guide rails are not included in KSB's scope of supply. | Foundation rail | Without |
| | | **Claw** | |
| | | Design | Straight |
| | | Size | DN 150 |
| Installation depth | 14.76 ft | | |
| Material concept | G | **Lifting chain / -rope** | Without |
| | | Lifting Bail | With |

**Duckfoot bend**

| | |
|---|---|
| Size | DN 150 |
| Flange design | ASME |
| Duckfoot bend size (DN2 / DN3) | DN 150 Drilled according to ASME |
| Material | Cast iron A 48 Class 35 B |

# Performance curve

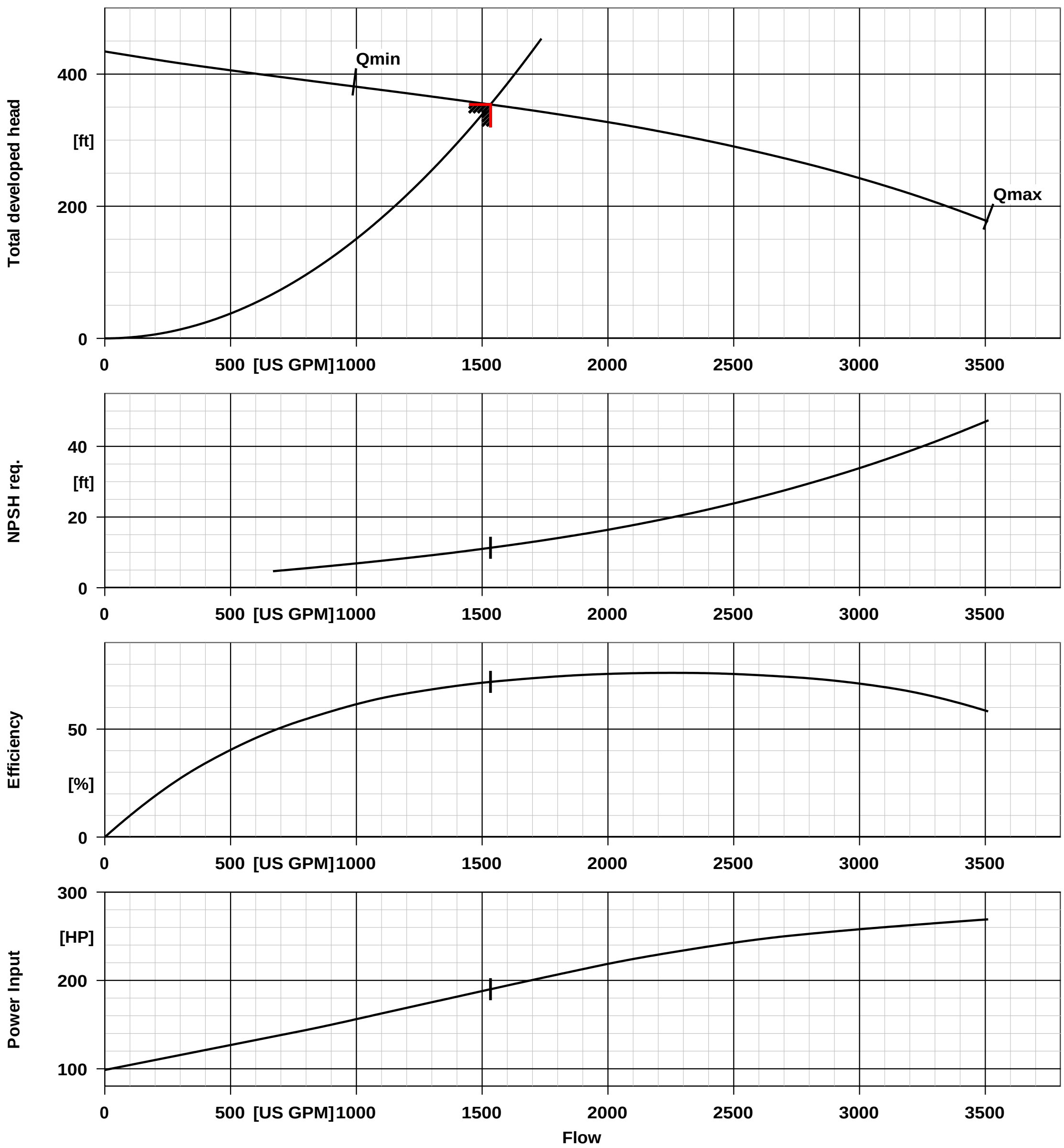
KSB

Customer item no.:Permanent PS
Communication dated: 10/06/2020
Doc. no.: Rochester, NY
Quantity: 4

Number: ES 8000472153
Item no.:300
Date: 10/06/2020


**KRTK 150-503/1554XNG-S**

Version no.: 1




## Curve data

| | | | |
|---|---|---|---|
| Speed of rotation | 1781 rpm | Efficiency | 71.9 % |
| Fluid density | 62.303144 lb/ft³ | Power absorbed | 190.08 HP |
| Viscosity | 0.0010 in²/s | NPSH req. 3% | 11.32 ft |
| Flow rate | 1533.17 US GPM | Curve number | K43629/0 |
| Requested flow rate | 1533.00 US GPM | Effective impeller diameter | 18.78 in |
| Total developed head | 354.08 ft | Acceptance standard | ISO 9906 & ANSI HI Class 2B |
| Requested developed head | 354.00 ft | | |

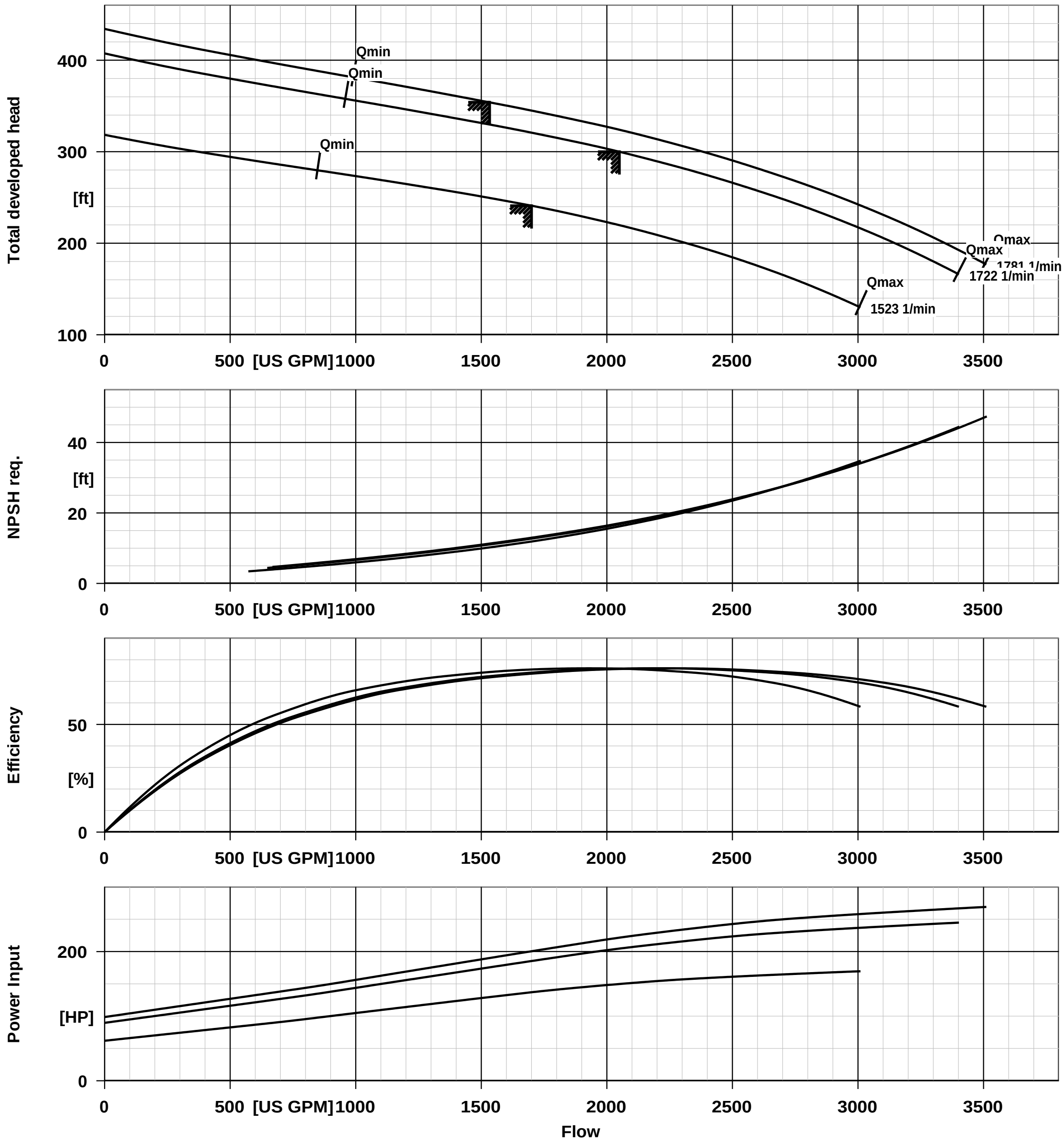
# Speed curve

Customer item no.:Permanent PS
Communication dated: 10/06/2020
Doc. no.: Rochester, NY
Quantity: 4

Number: ES 8000472153
Item no.:300
Date: 10/06/2020


**KRTK 150-503/1554XNG-S**

Version no.: 1




## Curve data

| | | | |
|---|---|---|---|
| Fluid density | 62.303144 lb/ft³ | Total developed head | 354.00 ft |
| Viscosity | 0.0010 in²/s | Requested developed head | 354.00 ft |
| Flow rate | 1533.00 US GPM | Effective impeller diameter | 18.78 in |
| Requested flow rate | 1533.00 US GPM | | |

# Motor data sheet

Customer item no.:Permanent PS
Communication dated: 10/06/2020
Doc. no.: Rochester, NY
Quantity: 4

Number: ES 8000472153
Item no.:300
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**KRTK 150-503/1554XNG-S**

Version no.: 1

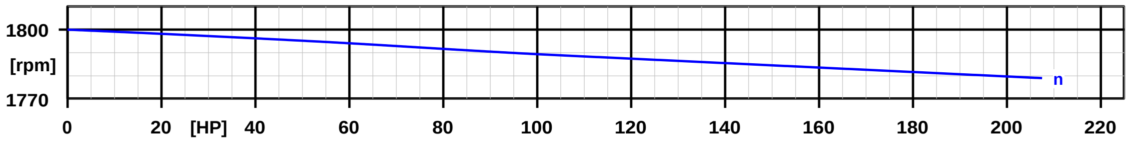
## Motor data

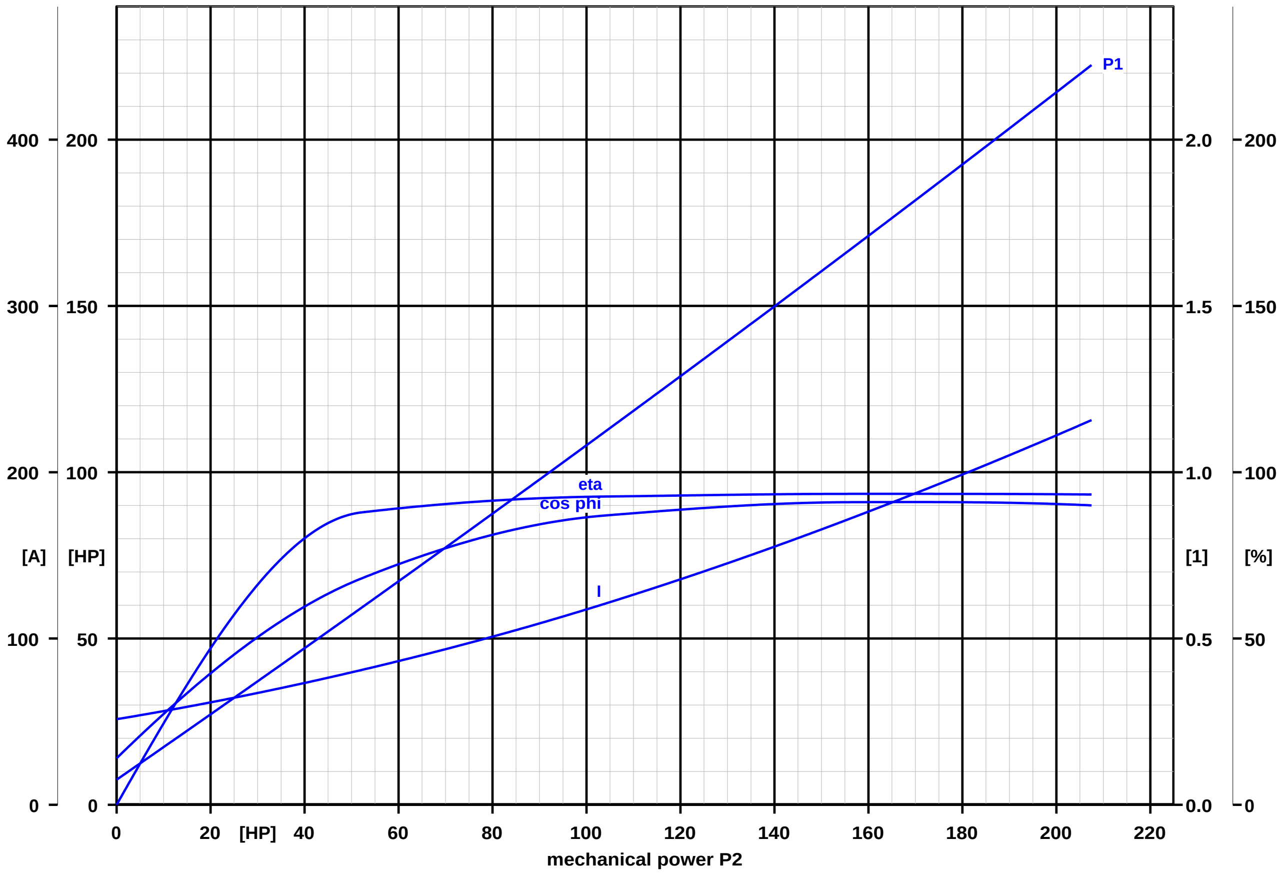
| | | | |
|---|---|---|---|
| Motor manufacturer | KSB | Starting mode | Direct-on-line starting |
| Motor size | 155N | Power cable | AWG 1/0-4 |
| Motor construction type | KSB Sub. motor | Number of power cables | 2 |
| Motor material | Grey cast iron EN-GJL-250 | Power cable Ø min. | 1.37 in |
| Efficiency class | not classified | Power cable Ø max. | 1.45 in |
| Rated voltage | 460 V | Control cable | AWG 15-10 |
| Frequency | 60 Hz | Number of control cables | 1 |
| Motor power | 208.01 HP | Ctrl. cable diameter, min. | 0.63 in |
| Rated current | 232.0 A | Ctrl. cable diameter, max. | 0.67 in |
| Rated speed | 1779 rpm | Cable standard | NEC |
| Starting current ratio | 6.1 | Switching frequency | 10.00 1/h |

**Curve data**

The no-load point is not a guarantee point within the meaning of IEC 60034

| | | | | | |
|---|---|---|---|---|---|
| Load | 0.0 % | 25.0 % | 50.0 % | 75.0 % | 100.0 % |
| P2 | 0.00 HP | 52.00 HP | 104.00 HP | 156.00 HP | 208.01 HP |
| n | 1800 rpm | 1795 rpm | 1789 rpm | 1784 rpm | 1779 rpm |
| P1 | 7.55 HP | 59.14 HP | 112.24 HP | 166.82 HP | 223.01 HP |
| I | 51.5 A | 81.0 A | 121.0 A | 172.0 A | 232.0 A |
| Eta | 0.0 % | 87.9 % | 92.7 % | 93.5 % | 93.3 % |
| cos phi | 0.14 | 0.68 | 0.87 | 0.91 | 0.90 |



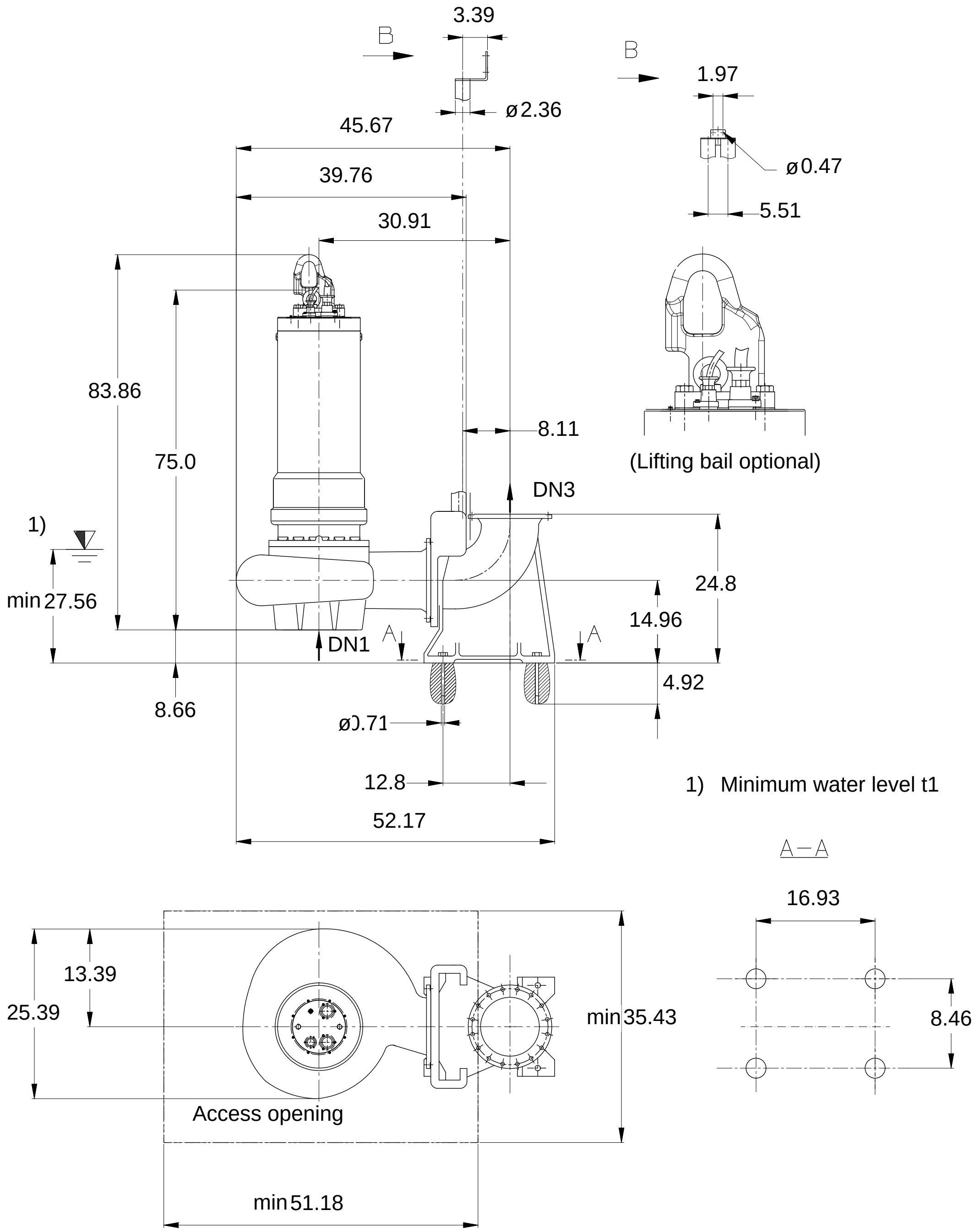
# Installation plan

Customer item no.:Permanent PS
Communication dated: 10/06/2020
Doc. no.: Rochester, NY
Quantity: 4

Number: ES 8000472153
Item no.:300
Date: 10/06/2020
Page: 20 / 21

**KRTK 150-503/1554XNG-S**

Version no.: 1




*Drawing is not to scale*

*Dimensions in in*

# Installation plan

Customer item no.:Permanent PS
Communication dated: 10/06/2020
Doc. no.: Rochester, NY
Quantity: 4

Number: ES 8000472153
Item no.:300
Date: 10/06/2020


**KRTK 150-503/1554XNG-S**

Version no.: 1

**Motor**

| | |
|---|---|
| Motor manufacturer | KSB |
| Motor size | 155N |
| Motor power | 208.01 HP |
| Number of poles | 4 |
| Speed of rotation | 1779 rpm |
| Motor enclosure | IP68 |

**Connections**

| | |
|---|---|
| Suction flange pump drilled according to(DN1) | unmachined |
| Duckfoot bend size (DN2 / DN3) | DN 150  Drilled according to ASME |

**Weight net**

| | |
|---|---|
| Pump, Motor, Cable | 3532 lbm |
| Claw / Foot | 49 lbm |
| Total | 3580 lbm |

**Connect pipes without stress or strain!**

Dimensional tolerances for shaft axis height: DIN 747

| | |
|---|---|
| Dimensions without tolerances, middle tolerances to: | ISO 2768-m |
| Connection dimensions for pumps: | EN735 |
| Dimensions without tolerances - welded parts: | ISO 13920-B |
| Dimensions without tolerances - gray cast iron parts: | ISO 8062-CT11 |
| Dimensions without tolerances - stainless steel parts: | ISO 8062-CT12 |

**For auxiliary connections see separate drawing.**