STAMP Force Main, Main Pump Station, & Onsite Wastewater Treatment Facility

Basis of Design Report

For The

Genesee County Economic Development Center

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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 1.00 MGD. The onsite wastewater pump station involves a pump station and force main sewer that will collect and discharge pretreated 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 MGD 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).

Force Main and Main Pump Station

II. Project Information

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 MPS is shown in Figure 1, and the route of the new FM is shown in Figure 2.

B. Design Flows

The wastewater produced at the STAMP Site will increase incrementally as the STAMP Site is developed. Therefore, the MPS and wet well will be built in phases in response to these increasing flows up to the anticipated full-build flow rate of 6.0 MGD. The FM will be constructed to convey up to 6.0 MGD.

C. Effluent Discharge Location

Based on estimated construction costs, existing water quality, and input from the NYS DEC and all stakeholders, Oak Orchard Creek was determined to be the preferred body of water for discharge. The proposed discharge location is on the north side of the Hamlet of Shelby Center, along South Gravel Road (NYS Route 63). A map showing the selected route and discharge location is shown in Figure 2.

III. Proposed Project

The 2014 edition of the Recommended Standards for Wastewater Facilities, or Ten States Standards (10SS) and the 2011 Edition of the Guides for the Design of Wastewater Treatment Works, or TR-16, were used as references and guidance for the design of the proposed pump stations and force main.

A. Main Pump Station (MPS)

The treated onsite WWTF effluent and the tenant's treated process wastewater will be directed to the wet well of the MPS. The combined flow will be pumped to the outfall location through the FM. The proposed MPS will be constructed on the designated utility parcel located on the western side of Crosby Road, just south of the Main Access Road within the STAMP Site. The wet well and MPS building will be constructed to the east of the onsite WWTF. Figure 3 shows the utility parcel located on the overall STAMP site plan and Figure 4 shows the site plan of the WWTF and MPS within the utility parcel.

The MPS will utilize a rectangular concrete structure sized in accordance with Ten States Standards to handle flows from both the WWTF and the treated process water produced from the tenants at the STAMP Site. The full build-out wet well will have a storage volume of approximately 50,000 gallons. The storage will be provided by a 41'x15' tank, which will be separated by a divider wall in order to isolate flow to specific pumps. The operating range of the wet well will be approximately 10 feet vertically. Just outside of the wet well on the downstream side will be a precast concrete vault to house check valves and isolation valves for each pump.

Each section within the wet well will include two submersible pumps, with a total of 4 pumps. At full build out of the site and pump station, 3 submersible pumps will be in operation capable of pumping 6.0 MGD, with the 4th pump acting as a backup. Pumps will cycle in order to ensure equal wear on the pumps for maintenance purposes. The initial stage will include installation of 2 pumps with the ability to pump approximately 4.0 MGD, and new pumps will be added as flows onsite increase until full build out is reached.

The wet wells will include ventilation for both intake and exhaust of air using explosion proof equipment. In addition, a vault will be constructed to house a magnetic flow meter to measure flow pumped from the pump station. The ventilation of the full build-out wet well and dry well is designed to meet the requirements as outlined in Ten States Standards.

The controls for the submersible pumps will be housed in a metal sided enclosure. This enclosure will also house the utilities to the pump station including potable water and electric services.

B. Force Main

1. Location

The proposed force main is located between the MPS and the proposed discharge location. The route is along portions of Crosby Road and a proposed access roadway on the STAMP Site, north along Allegany Road (NYS Route 63) in the Town of Alabama, South Gravel Road in the Town of Shelby to the discharge point along Oak Orchard Creek. The discharge point is just north of the Hamlet of Shelby Center in Orleans County. The installation involves approximately 45,000 linear feet consisting of a combination of 24-inch DR-14 PVC, 20-inch diameter DR-11 HDPE, and 18-inch diameter DR-18 PVC sanitary force main, metering vaults, and maintenance manholes. The force main route is shown on Figure 2.

2. Design

The force main design considered effluent velocity, total dynamic head (TDH), and maximum rated working pressures for multiple diameters of PVC and HDPE sanitary force main. The system curve for the FM can be found in Appendix A at the end of this report.

A combination of pipe sizes and pressure ratings was selected to best accommodate the wide range of flow conditions and reduce pipe friction losses at the future higher flow. The force main was broken up into three conceptual sections, South of the Wildlife Refuge, inside the Wildlife Refuge, and north of the Wildlife Refuge. Given the anticipated soil conditions (moist peat and organics) and to reduce impacts, the force main within the Refuge will be installed by horizontal directional drilling (HDD) methods using fused high-density polyethylene pipe (HDPE). The wall thickness of HDPE pipe for the expected pressures is significantly greater than PVC pipe.

Pressures in the force main are expected to be highest within the southern section; in this area a 24" DR-14 PVC pipe was selected in order to ensure that the pipe could handle the higher expected head from the pump station. Inside of the refuge, the pipe size will be reduced to a 20" HDPE in order to accommodate the directional drilling methods required. On the north side of the refuge, the pipe will be further reduced since the anticipated pressure is lower. Outside of the refuge to the north, directional drilling methods will not be required, and therefore 18" DR-18 PVC pipe will be used.

To prevent settling of solids, the minimum flow required to maintain 2 ft/s in the 24" DR-14 PVC main (21.89" ID) is 2,346 gallons per minute (GPM). For the initial phases of the STAMP site, the temporary pump station will be operated to provide a flushing velocity through the main for an extended period of time. The temporary wet well has a volume of 0.50 MGD, this provides 3.6 hours of 2,346 gpm flow which will flush the entire length of FM to the outfall. It should also be noted that the proposed flow through the force main will be treated effluent and is not expected to have significant levels of solids or grit to settle in the pipe.

3. Profile

Overall, the force main route from the MPS to the discharge location is generally downhill with multiple high points along the route. The force main exits the MPS at 661.00' and the discharge structure invert in Oak Orchard Creek is approximately 616.00'. Therefore, the discharge elevation of the force main is approximately 45 vertical feet lower than the discharge elevation of pumps in the MPS.

The overall downhill alignment requires consideration of the effects of siphoning and gravity flow, especially for northern most section of the force main. An actuated control valve will be installed on the force main near the discharge point to prevent the force main from draining by gravity and to ensure the pipe remains full.

The PVC force main will be installed at a constant minimum slope of 0.5%, within the open cut areas and where the force main will be installed by HDD method, the HDPE pipe will be drilled at a minimum of 1.0% slope. The force main pipe is purposely installed sloping up and down along the route to provide designated high points for releasing air within the pipe. Air release valves will be installed within maintenance manholes at these high points.

4. Maintenance Manholes

Maintenance manholes will be installed at each high point along the route of the force main between the STAMP Site and the discharge location. Each manhole is a 6'-0" diameter precast concrete structure that contains an internal access ladder, a removable section of pipe, air release/vacuum breaker valve, and vent piping. Air-release/vacuum breaker valves are required to prevent air from becoming captured inside the force main pipe, which causes flow constrictions and results in poor pumping efficiencies. The removable fitting provides a means to access the force main for flushing, testing and bypass pumping purposes. The fitting consists of a 24" long straight section of ductile iron pipe that can easily be removed for the attachment of other fittings, testing equipment or bypass pumps. Each manhole will also have a 24" diameter cast iron manhole cover placed on top for access to the internal components. The cover will be installed so it is level with the finish grade will be placed over top of the pipe for access.

Since some of these maintenance manholes are in areas where the high-water level would be above the elevation of the air release/vacuum valve, the air release/vacuum breaker piping must extend above grade to ensure the air release valve vents the air properly. For these locations, a 2" diameter galvanized steel vent in the shape of a candy cane that extends approximately 2' above the high-water level will be required. The vent will contain a screen over the end of the pipe to prevent animals from entering the vent piping. The piping will be painted to blend in with the surroundings.

Main line valves will be installed approximately every 1,000 feet along the force main to provide a means to isolate sections of the force main for testing and maintenance purposes.

5. Sampling Metering

An 18” magnetic flow meter, located on the discharge piping within the new Main Pump Station building, will monitor the instantaneous and total flows exiting the STAMP Site. An automatic sample will collect a composite sample of the combined treated process wastewater and treated sanitary wastewater. Magnetic flow meters will also be installed at both the south and the north end of the Wildlife Refuge to monitor any unexpected loss within the Refuge limits.

6. Main Line Valves

The force main will require numerous main line valves along the route from the STAMP Site to the discharge location. Valves are located at each of the maintenance manholes and both of the metering manholes. The valves provide a means to isolate sections of the force main for testing and maintenance purposes. Each valve requires a cast iron valve box, installed to finish grade, for access to the valve’s operating nut. The top of the valve box is approximately 8” in diameter and installed level with the finish grade.

7. Force Main Markers

Fiberglass pipeline markers will be placed at periodic intervals along the entire force main route. Each marker is approximately 4” wide and extends 5’ above grade. The markers are used to help identify the location of the underground pipe, especially during the winter months and within heavily vegetated areas. A total of 14 markers will be installed within the Iroquois NWR area.

Onsite WWTF

IV. Project Information

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 full-build WWTF described in this report will be able to treat the expected full-build flow including 100,000 gallons per day (GPD) of treatment capacity allocated to the Town for future use. Therefore, the design average daily flow rate will be 1.0 MGD. The design flow rate is described in the table below.

DESIGN FLOW RATE

Average Daily Flow	1.0 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 B.

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.

V. Proposed Design

The WWTF will utilize a sequencing batch reactor (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 C. 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.

The SBR effluent would then be filtered through a disc filter to remove the 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*.

A. Headworks

The headworks will include the influent wet well and the influent channel which will include the bar screen and Parshall flume 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).

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. One 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 10’ 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 four (4) 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 steel staircase will be installed leading up to the catwalk. At the effluent end of the SBR tanks will be a 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. A butterfly valve located on the effluent piping will be installed to control effluent flow or isolate the SBR tanks for maintenance purposes.

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, and capacity will increase.

Sludge Holding Tanks

The SBR tanks will be further 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 and to provide for some aerobic digestion. 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.

D. Aeration Blowers (SBRs)

Aeration for the SBRs will be provided by positive displacement blowers installed within the headworks and controls building. The blowers will utilize premium efficiency motors and VFDs to control the amount of air flow 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. Filter Building

To achieve the required discharge limits of effluent phosphorus, disc filters will be installed following the SBRs. Phosphorus will be removed by adding alum to the SBR tanks. The phosphorus will precipitate and settle out of the wastewater and the disc filters will provide further removal of precipitated phosphorus and particles from the SBR decant. These disc filters will be installed within a concrete block building, as required by TR-16 Section 7.2.10.4. The filters will bring the total suspended solids levels below 10 mg/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 using a woven 316 stainless steel mesh as the filtration medium. As water passes across the rotating discs, solids accumulate on the disc surface, which creates head loss. This causes the water level between the pairs of discs 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.

F. Disinfection

Following the disc filters a UV disinfection system will be installed to inactivate any microorganisms still in the treated water to meet the effluent disinfection requirements. Upon exiting the disc filters, the effluent will flow through a meter, to measure the flow rate, and into the new ultraviolet disinfection structure. The 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.

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. The operator will utilize a concrete stairway to access the lower level of the 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.

G. 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 aerobically digested 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 dewater building will be designed for two screw press machines, each sized to handle the sludge generated from the 0.5 MGD SBR plants. The dewatered material will empty into a dump truck that will remove the material from the site for final disposal at a landfill.

H. 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.

I. 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.

J. 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.

VI. 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.

VII. 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

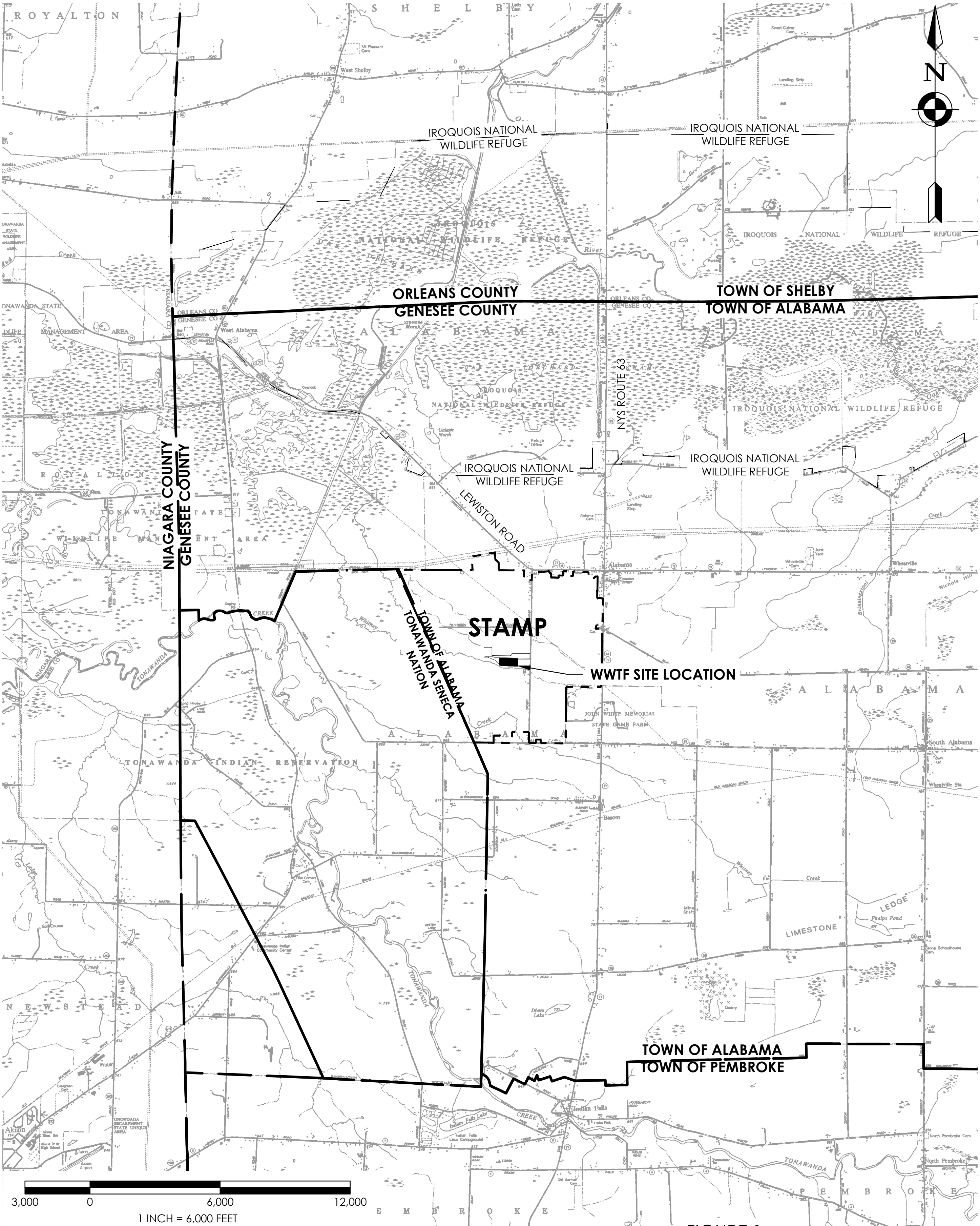


FIGURE 1

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

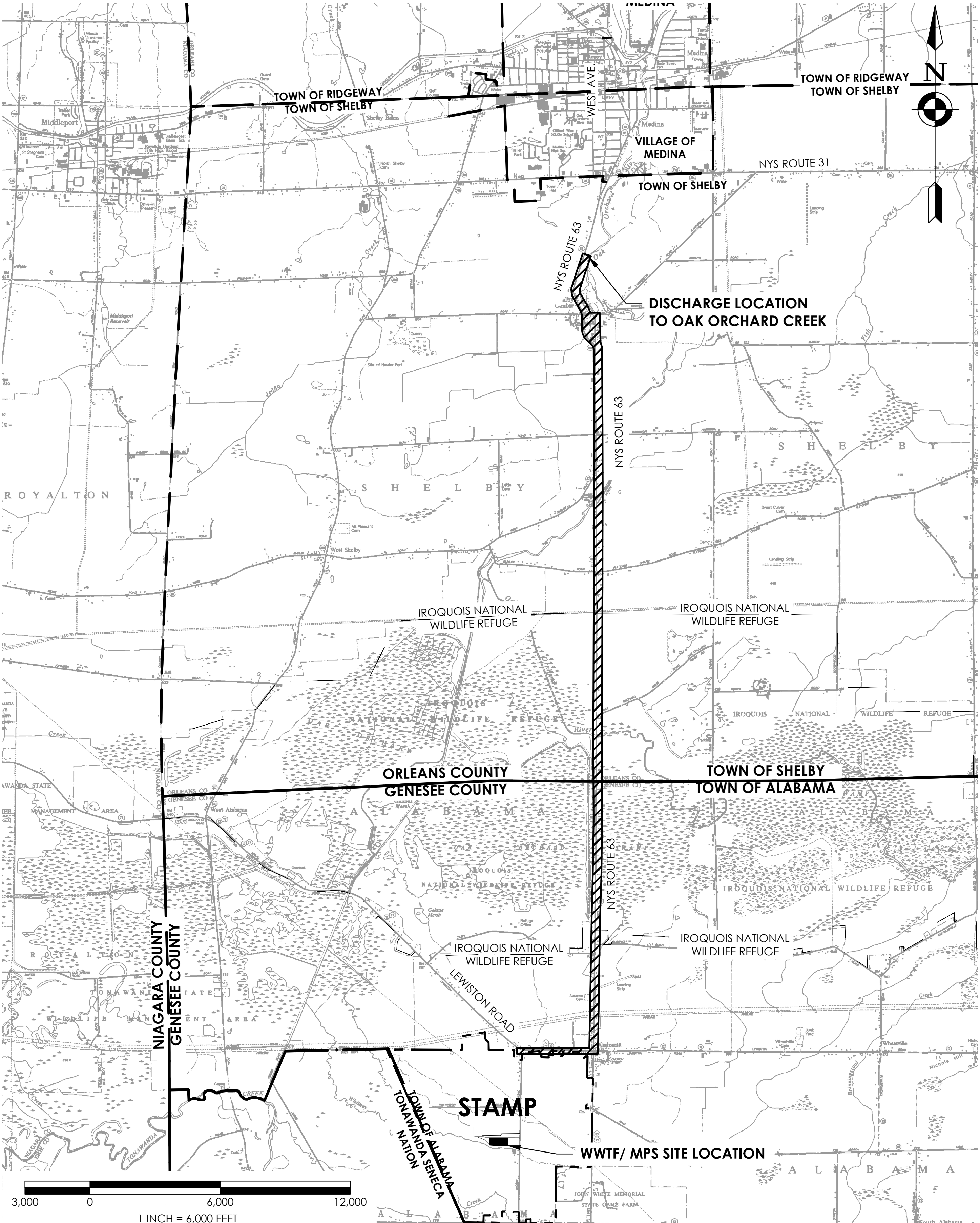


FIGURE 2

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

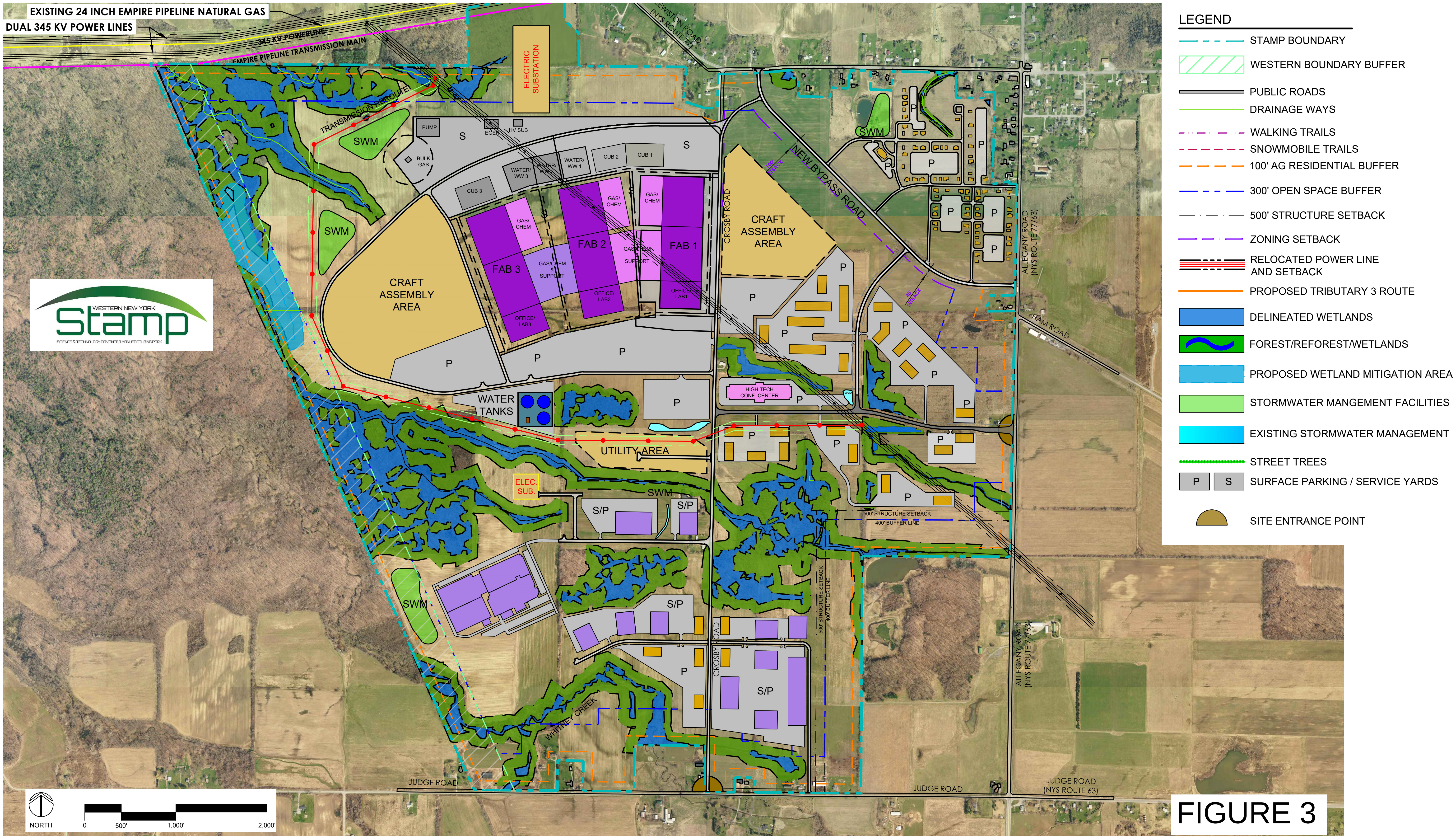
FORCE MAIN GENERAL LOCATION MAP

WNY STAMP OFFSITE SEWER

TOWN OF ALABAMA AND TOWN OF SHELBY, NEW YORK STATE

Figure 3

Overall STAMP Site Plan



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STAMP - MASTER BUILD OUT PLAN

WNY SCIENCE AND TECHNOLOGY ADVANCED MANUFACTURING PARK (STAMP)

JUNE 2020

NEW YORK STATE OF OPPORTUNITY

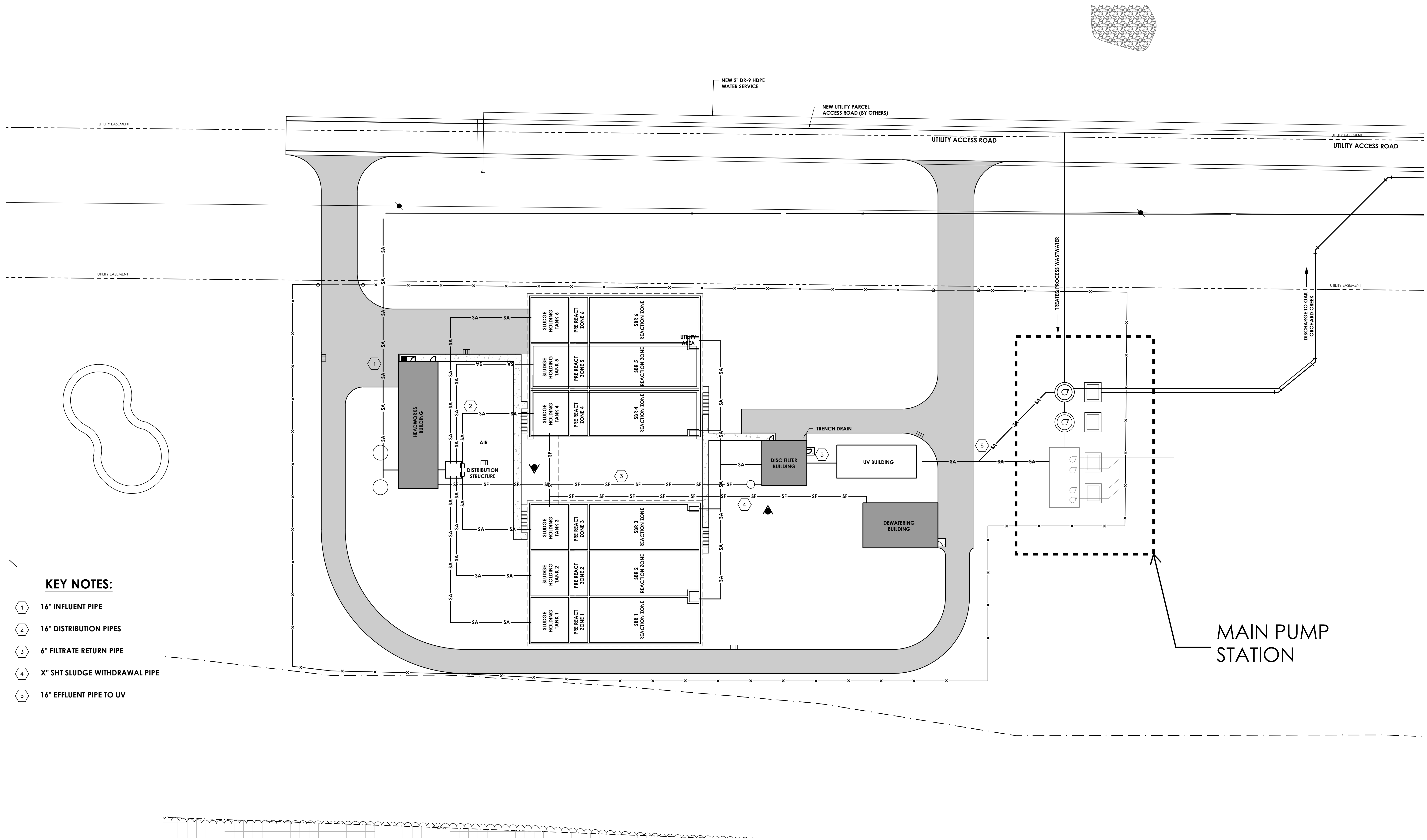
GREATER ROCHESTER ENTERPRISE

Power People Incentives — Genesee County Economic Development Center

INVEST BUFFALO NIAGARA

Figure 4

MPS and WWTF Site Plan



KEY NOTES:

1. 16" INFLUENT PIPE
2. 16" DISTRIBUTION PIPES
3. 6" FILTRATE RETURN PIPE
4. X" SHT SLUDGE WITHDRAWAL PIPE
5. 16" EFFLUENT PIPE TO UV

Referenced Drawings: None
Drawing Name: J:\PROJECTS\GCEDC\stamp onsite wwtf\D Design\ACAD\Civil\Site\Composite STAMP WWTF.dwg
Date last accessed: 6/9/2020 1:53 PM
Date last plotted: 6/9/2020 1:57 PM
Plotted By: Nick Bayer

REVISIONS				
NO.	DATE	BY	CHKED	DESCRIPTION

205 ST. PAUL STREET, SUITE 500
ROCHESTER, NEW YORK 14604
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FAX (585) 232-5836
CPLteam.com
ARCHITECTURE ▪ ENGINEERING ▪ PLANNING

GENESEE COUNTY ECONOMIC DEVELOPMENT CENTER

TOWN OF ALABAMA GENESEE COUNTY NEW YORK STATE

DATE: 04/27/2020
DRAWN: MCZ
DESIGNED: NAB
CHECKED: TAC
SCALE: 1"=60'

STAMP ONSITE WASTEWATER TREATMENT FACILITY

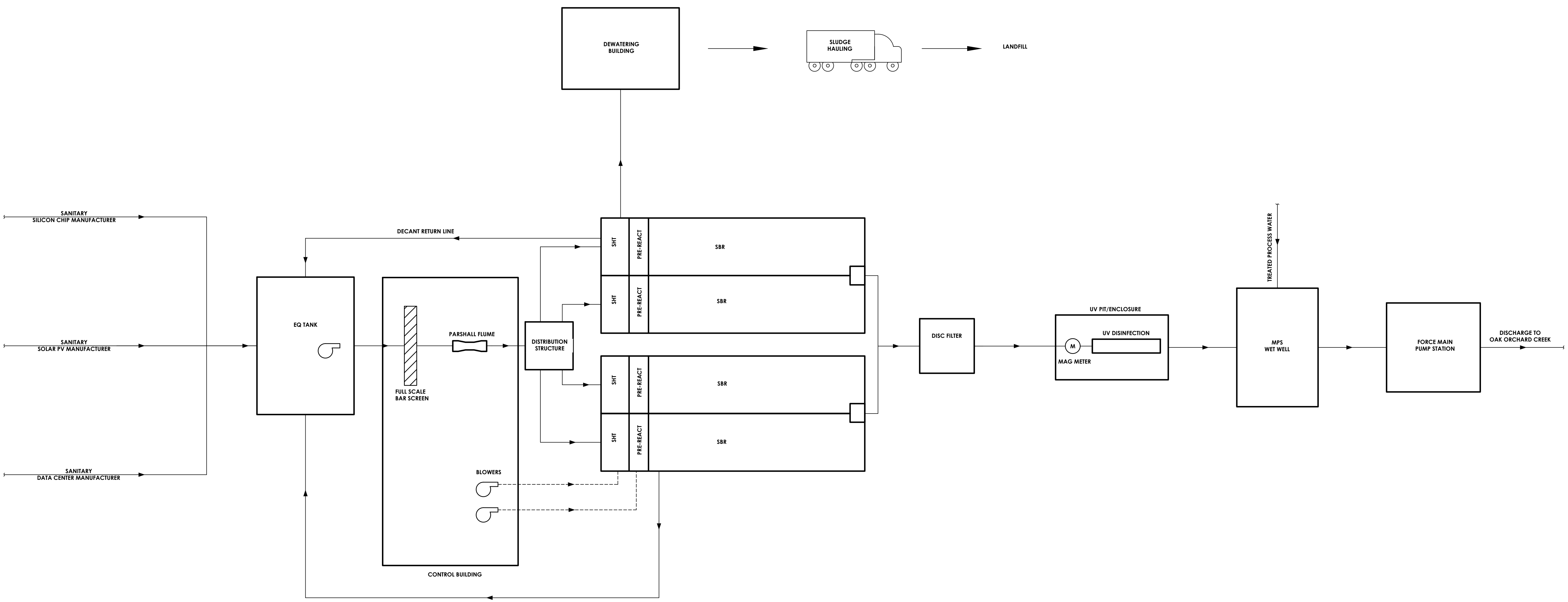
WWTF AND MPS SITE PLAN

PROJECT NUMBER 14822.00

DRAWING NUMBER FIGURE 4

Figure 5

WWTF Process Flow Diagram



REVISIONS				
NO.	DATE	BY	CHKED	DESCRIPTION

205 ST. PAUL STREET, SUITE 500
ROCHESTER, NEW YORK 14604
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CPLteam.com
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GENESEE COUNTY ECONOMIC DEVELOPMENT CENTER

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
FULL-BUILD SBR ALTERNATIVE

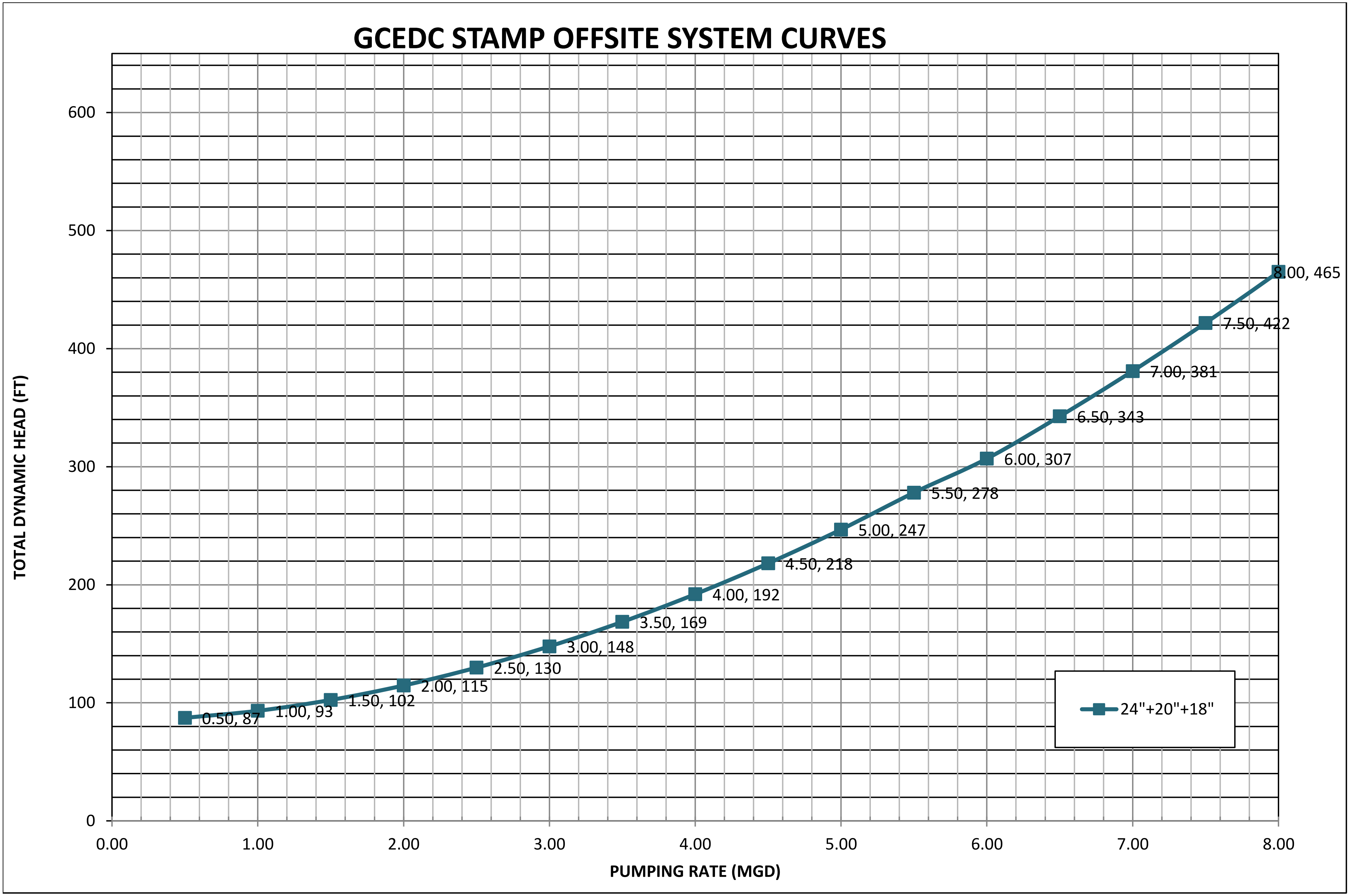
PROJECT NUMBER 14822.00

DRAWING NUMBER FIG 5

Plotted By: Nick Bayer
Date last plotted: 5/13/2020 4:19 PM
Date last accessed: 5/13/2020 3:00 PM
Drawing Name: J:\PROJECTS\GCEDC\stamp onsite wwtf\D Design\ACAD\Civil\General\G-02_STAMP WWTF_PROCESS FLOW DIAGRAM.dwg
Referenced Drawings: None

Appendix A

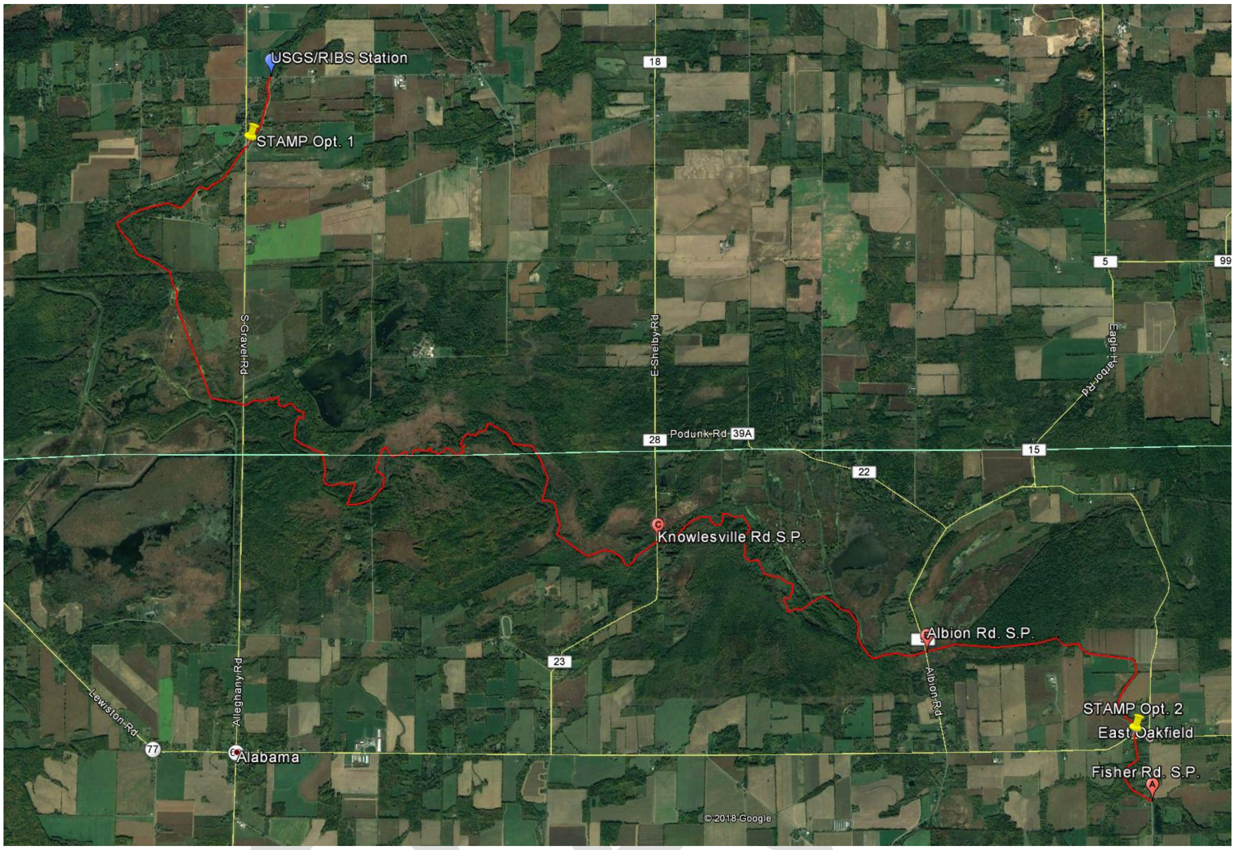
FM System Curve


GCEDC STAMP OFFSITE SYSTEM CURVES
TOTAL DYNAMIC HEAD (FT)
0
100
200
300
400
500
600
PUMPING RATE (MGD)
0.00
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
0.50, 87
1.00, 93
1.50, 102
2.00, 115
2.50, 130
3.00, 148
3.50, 169
4.00, 192
4.50, 218
5.00, 247
5.50, 278
6.00, 307
6.50, 343
7.00, 381
7.50, 422
8.00, 465
24"+20"+18"

Appendix B

WWTF Draft SPDES Permit Limits

Genesee County STAMP SPDES Permit Preliminary Limits Evalulation



OUTFALL OPTIONS

Option 1 – South Gravel Road Outfall

Lat/Long: 43° 09' 58", -78° 23' 25"
Receiving waterbody: Oak Orchard Creek (Class C)
Impairments: Non-point source phosphorus (agriculture), not on 303(d) list
7Q10: 0.46 MGD
Dilution ratio: 0.5:1

Option 2 – Lewiston Road Outfall

Lat/Long: 43° 05' 54", -78° 15' 00"
Receiving waterbody: Oak Orchard Creek (Class C)
Impairments: Non-point source phosphorus (agriculture), not on 303(d) list
7Q10: 0 MGD (ISEL as per TOGS 1.3.1)
Dilution ratio: 0:1

EFFLUENT CONDITIONS

Up to 1 MGD (by Phase 2) of industrial and sanitary wastewater, possibly covered under one or more ELG (433, 469, etc.). Treatment to consist of pH adjustment, MBRs, WQ tank, chemical precipitation, and filter press.

ANTICIPATED SPDES PERMITS REQUIREMENTS

Option 1 – South Gravel Road Outfall

Parameter	Limit/Monitoring	Type	Notes
Flow Rate	1.0 MGD	Daily Max.	Design Q
pH	6.0-9.0 S.U.	Range	TBEL/ELG
Temperature	Monitor	Daily Max.	BPJ
BOD5	5.0 mg/L	Daily Max.	ISEL
UOD	Monitor	Calculation	BPJ
TDS	500 mg/L	Daily Max.	TBEL/WQBEL
TSS	10 mg/L	Daily Max.	ISEL
Settleable Solids	0.1 mL/L	Daily Max.	TBEL w/ filtration
Ammonia, Nitrogen (as N)	1.2 mg/L, summer 1.9 mg/L, winter	Monthly Avg.	WQBEL
Total Kjeldahl Nitrogen	Monitor	Monthly Avg.	BPJ
Phosphorus, Total	0.20 mg/L	Daily Max.	TOGS 1.3.6, DEC policy
Oil & Grease	15 mg/L	Daily Max.	ELG may be less stringent
Fecal Coliform	200/400 CFU/100mL	7-/30-day Geo. Mean	WQBEL
Dissolved Oxygen	5.0 mg/L	Avg. Minimum	Part 703
Chlorine, Total Residual	0.030 mg/L	Daily Max.	ML
Aluminum, Total	Monitor	Daily Max.	BPJ
Cadmium, Total	--	--	Applied according to ELG applicably
Chromium, Total	--	--	Applied according to ELG applicably
Copper, Total	Monitor	Daily Max.	BPJ
Fluoride, Total	--	--	Applied according to ELG applicably
Iron, Total	1.2 mg/L	Daily Max.	TBEL
Lead, Total	--	--	Applied according to ELG applicably
Mercury, Total	50 ng/L, MMP	Daily Max.	MDV
Nickel, Total	--	--	Applied according to ELG applicably
Thallium, Total	12 ug/L or Monitor	Daily Max.	WQBEL/BPJ
Silver, Total	--	--	Applied according to ELG applicably
Zinc, Total	0.40 mg/L	Daily Max.	TBEL
Cyanide, Total	--	--	Applied according to ELG applicably
Total Toxic Organics	--	--	Applied according to ELG applicably
WET Testing	0.3 TUa/1.0 TUc	Chronic Only	TOGS 1.3.2

Appendix C

WWTF Basis of Design Equipment Selection

1. Mechanical Bar Screen, Washer Compactor
2. Sequential Batch Reactor (SBR) Design Calculations
3. Disc Filter Sizing and Equipment Selection
4. UV Disinfection Sizing and Equipment Selection
5. Screw Press Sizing and Equipment Selection

Mechanical Bar Screen, Washer Compactor

Date: June 12, 2019

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

PRELIMINARY BUDGET EQUIPMENT SCOPE

To: STAMP WWTP Medina NY

From: **Your Duperon® Team**
Dan Satryano
Sales Project Manager
(989) 754-8800
dsatryano@duperon.com

Rep: Wayne Dodsworth
Sales Engineer
Koester Associates, Inc.
(315)6973800
wayned@koesterassociates.com

Lorene Bruns
National Sales Manager
(989) 754-8800
lbruns@duperon.com

Duperon® ADAPTIVE TECHNOLOGY™
PRELIMINARY LIQUIDS/SOLIDS SEPARATION SYSTEMS

Date: June 12, 2019

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

PRELIMINARY BUDGET EQUIPMENT SCOPE

Thank you for considering **Duperon®** system solutions for your project. We appreciate the opportunity to provide you with a **Preliminary 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		

Clarifications:

- This is not a fully designed project; preliminary pricing may be affected by scope change/project development
- Operational, structural, wind, or seismic calculations are not included
- Scope is based on models and assumptions widely utilized in the industry
- Scope does not convey an offer to sell; installation and taxes are not included
- **For reference only:** Standard Delivery Schedule: Submittals 4-6 week from PO - Delivery 8-12 weeks from approval

PRELIMINARY BUDGET PRICING: [redacted]

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

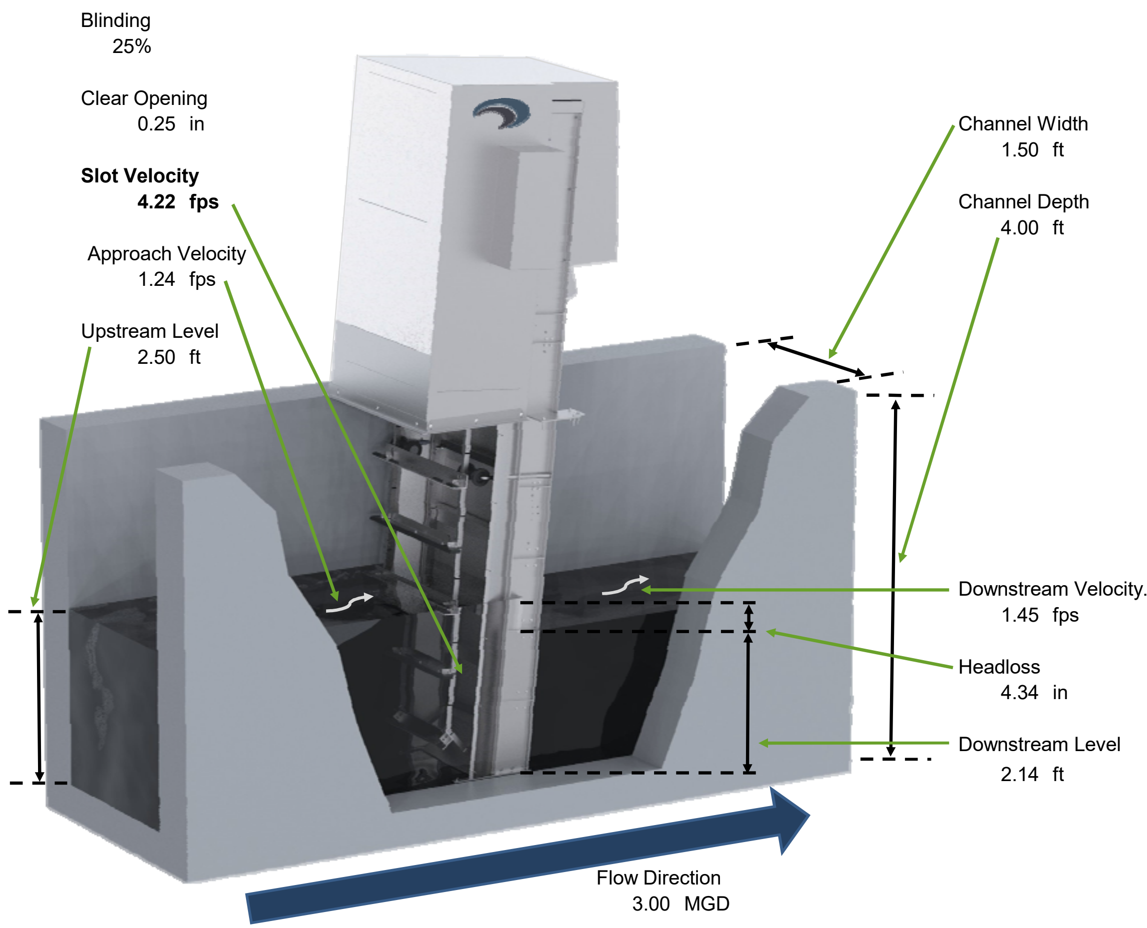
Clear Opening	0.25	in
Bar thickness	0.25	in
Thickness of side fab and closeout (2)	0.33	ft

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

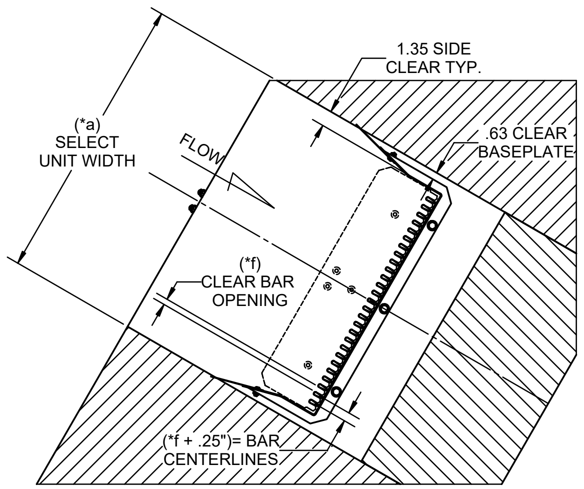
Bernoulli Calculations

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

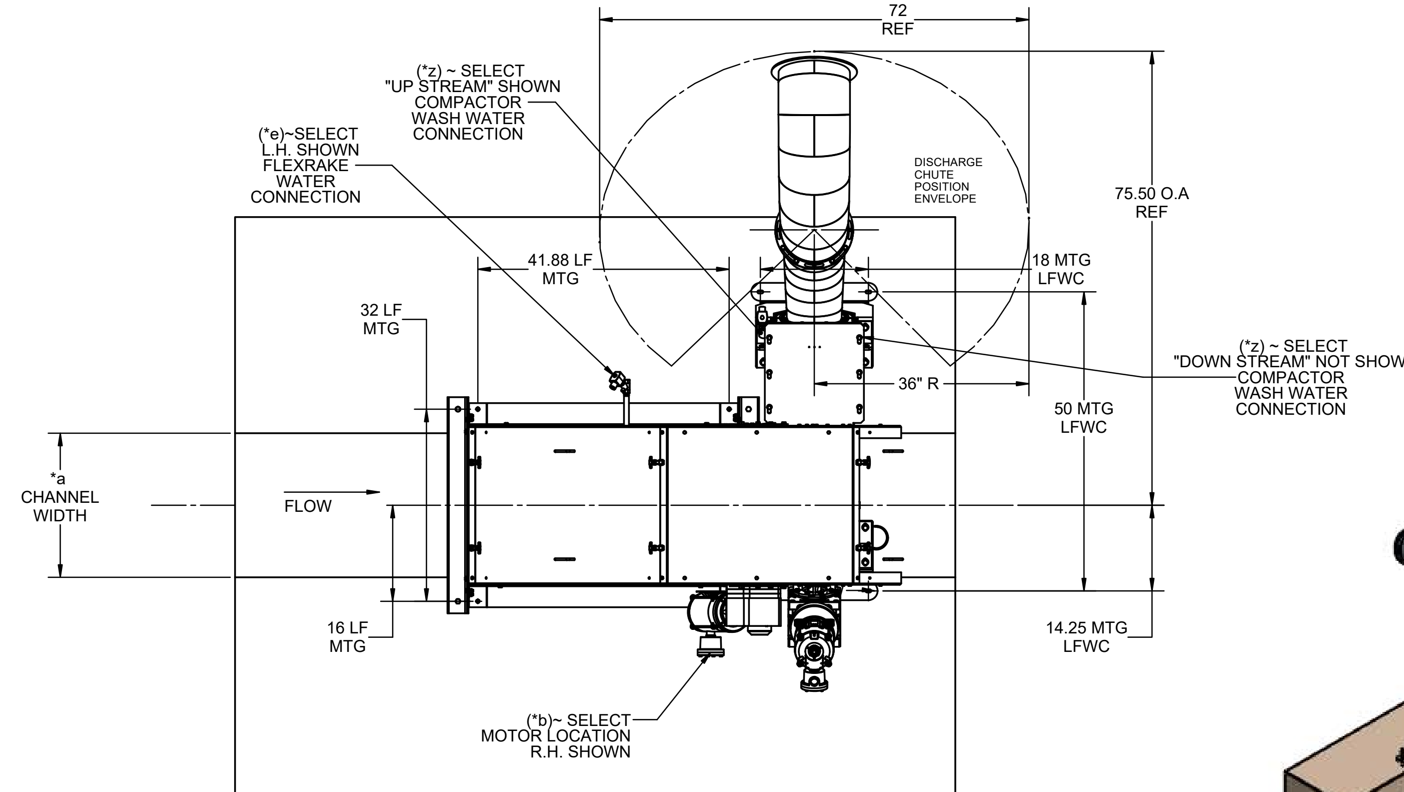


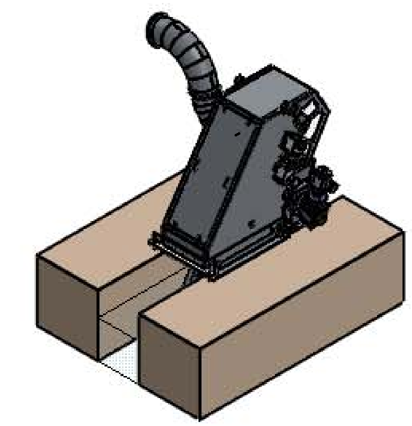
These calculations are an estimation based upon the information available. Flow channel hydraulics are highly dependent on water levels and the degree of blinding. The calculations above are a snapshot of only one condition. To fully analyze the hydraulics please contact your local Duperon representative.
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.

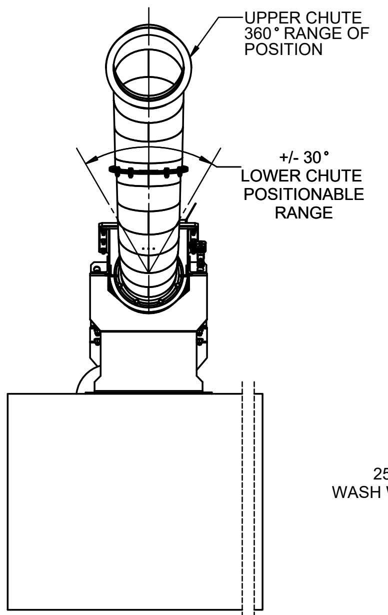
1200 Leon Scott Court | Saginaw, MI 48601 | P 989.754.8800 | F 989.754.2175 | TF 800.383.8479 | www.duperon.com

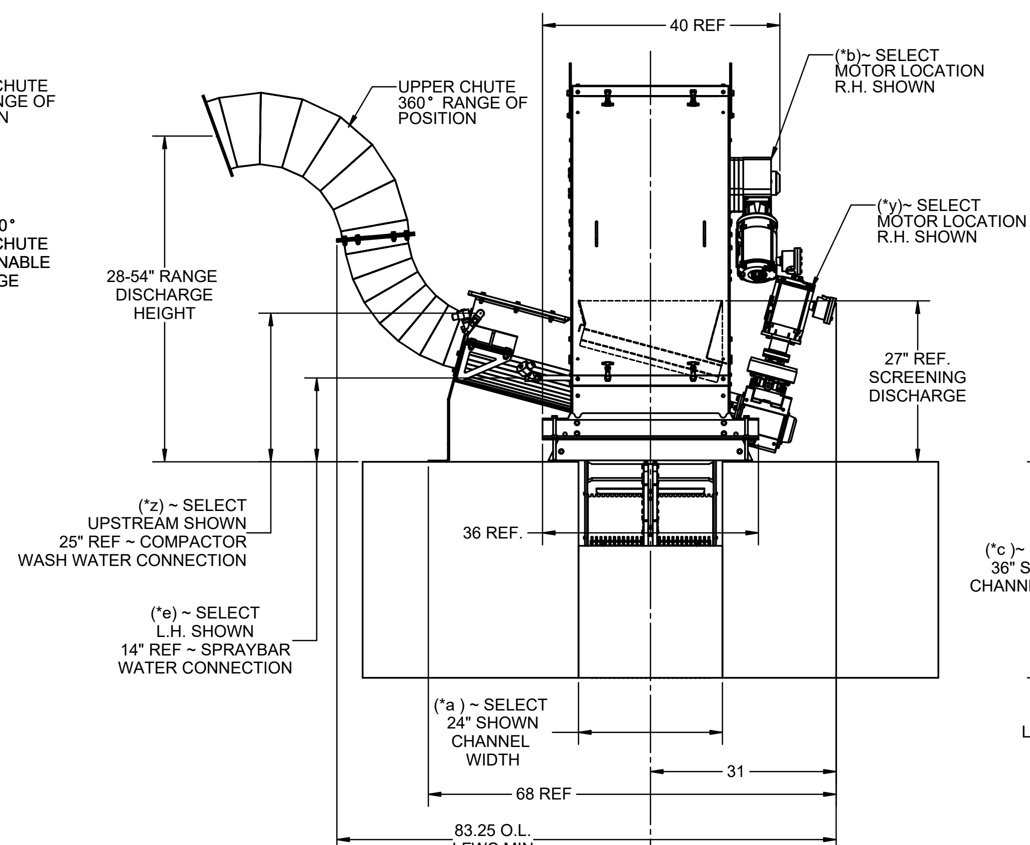


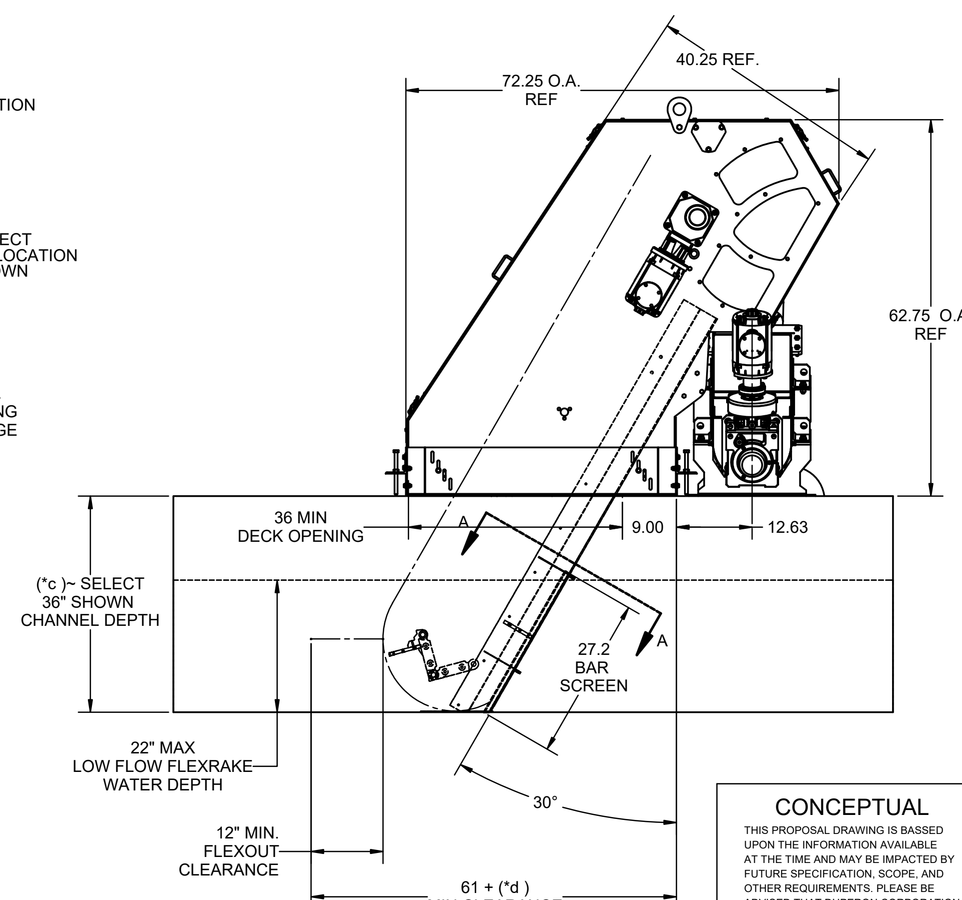
SECTION A-A
SCALE 1 : 8











VERIFICATION BLOCK

WASHER COMPACTOR SELECTIONS	FLEXRAKE SELECTIONS
Please Circle One:	Please Circle One:
WATER SUPPLY CONNECTION: (*z) = UPSTREAM or DOWNSTREAM	UNIT WIDTH: (*a) = 12" 18" 24"
MOTOR LOCATION: (*y) = RH or LH	MOTOR LOCATION: (*b) = RH or LH
DEBRIS BIN HEIGHT: ________	CHANNEL HIEGHT: (*c) = 2'-0" 2'-6" 3'-0" 3'-6 4'-0" 4'-6" 5'-0" 5'-6" 6'-0"
INDOOR OR OUTDOOR	CHANNEL DEPTH CLEARANCE: MINIMIUM NEEDED AT 3FT DEEP. (*d) =ADD 3.5" FOR EVERY 6" INCREASE OF DEPTH.
FLOWS: PEAK ________ AVERAGE ________	SUPPLY WATER CONNETION: (*e) = RH or LH
WATER LEVEL: PEAK ________ AVERAGE ________	CLEAR BAR OPENING: (*f) = 1/4" 1/2" 3/4" 1"

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

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

P:\Dept\R&D\RDL SYSTEM\2018_Projects\RDL78-2 WCSA Beta\WCSA Product Folders\LFWC DRAFT DOCs\Template DWG LF _LFWC\LF_LFWC Template

Sequential Batch Reactor (SBR) Design Calculations

DESIGN PROPOSAL

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)

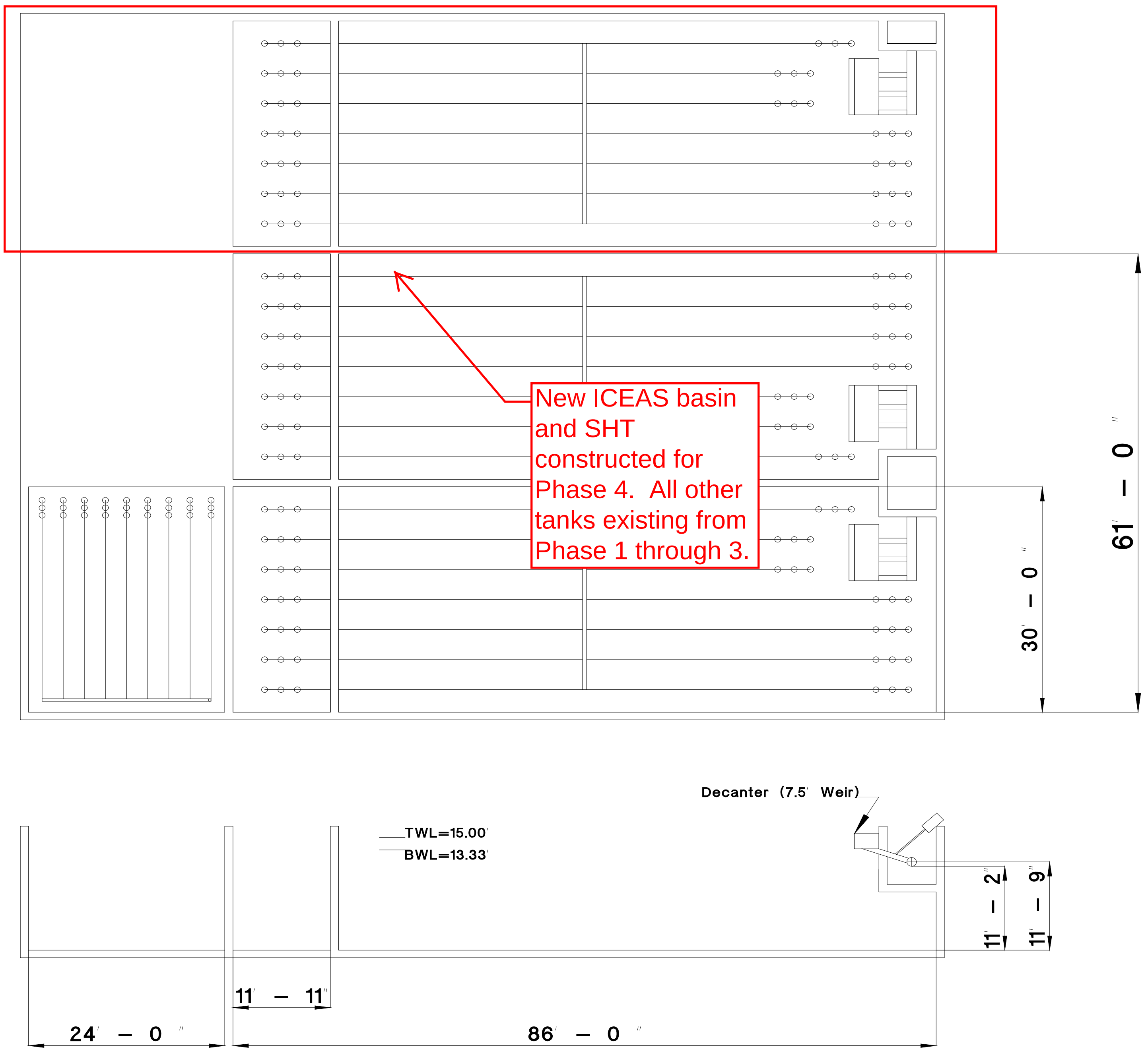
				Motor HP	No. Req.
Decanter Mechanism	7.5 ' Weir length				3
Decanter Drive Unit				1/4	3
ICEAS Blower	440 SCFM	7.3 PSIG		30	3
ICEAS Fine Bubble Aeration System	280 Disc Diffusers/Basin				3
Air Control Valve	6 "				3
Waste Sludge Pump	110 GPM			2.4	3
ICEAS Controls					1
SHT Blower	320 SCFM		7.5 PSIG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

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

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

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

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

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

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

Observed Yield Factor

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

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

Mean Cell Residence Time

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

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

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 ($days^{-1}$)

μ_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

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

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

Biological Phosphorus Removal

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

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

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

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

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

Mass of Chemical Sludge

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

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

Volume of Chemical Sludge

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

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

SANITAIRE a xylem brand

SANITAIRE ICEAS Aeration Design Calculations

BOD Removal and Nitrification Process

SANITAIRE Project #a29193-18

Stamp, NY

Carbonaceous Oxygen Demand

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

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 x 4.60 = 61.3 x 4.60 = **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	$TENH_3$

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

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

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

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

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

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

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

Denitrification Oxygen Credit

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

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

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

$$NO3\text{-}N_{denit} = \mu_{DN} \times VSS/TSS \times BMOB \times ART = 0.00075 \times 0.62 \times 10{,}778 \times 8.31 = \mathbf{42\ lb/day/basin}$$

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

BMOB = Basin biomass (lb/basin)

ART = Anoxic Retention Time, (hrs/day)

Total Actual Oxygen Transfer

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

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

Total Standard Oxygen Transfer

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

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

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

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

α = Alpha factor

θ = Temperature coefficient

Tsite = Water temperature (°C)

β = 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)

SANITAIRE
a xylem brand

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)

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 = **14.44 ft**

Air Flow Requirement

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

where Process Air = Process air flow requirement (scfm)
ρ = 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 x BA = 0.13 x 2,550 = **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**

Disc Filter Sizing and Equipment Selection

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1. Design Summary and Scope of Supply

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 Criteria

Design Parameters		
Influent Source	Effluent from SBR	
Peak Hour Flow Phase 2	1.36 (944)	MGD (gpm)
Peak Hour Flow Phase 1	0.20 (139)	MGD (gpm)
Peak Influent TSS	20	mg/L
Average Influent TSS	15	mg/L
[1]Monthly Average Effluent TSS	10	mg/L

1) The influent to the Filtration System must contain particles of sufficient size and strength to allow retention on the specified 10 um media surface in order for the performance criteria to be met.

Equipment Supply

Discfilter Design	Phase 1	Phase 2	
Discfilter Model Number	HSF2206/2-1C	HSF2206-1C	
Total Units (duty/standby)	1 (1/0)	1 (1/0)	
Total Filter Area Per Unit	121	362	ft^2
Submerged Filter Area Per Unit	78	235	ft^2
Disc Diameter	2.2	2.2	m
Peak Hydraulic Loading Rate	1.77	4.02	gpm/ft^2
Number of Discs Per Unit	2	6	
Media Pore Size	10	10	µm
Chassis Material	304 SS	304 SS	
Cover Material	GRP	GRP	
Self-Enclosed Tank Material	304 SS	304 SS	
SEW Drive Motor	1.5	1.5	HP
Backwash Water Pump	2	7.5	HP
Backwash Pump Rated Flow	14	41	gpm
Influent Flange	ANSI 12"	ANSI 12”	

Effluent Flange	ANSI 10"	ANSI 10"	
Mobile Automated Cleaning System	Optional	Optional	
Controls System	Allen Bradley	Allen Bradley	
Unit Control Panel Enclosure Type	NEMA 4X	NEMA 4X	
Instrumentation - Level Sensors	One (1) lot	One (1) lot	

An instrumentation and control system will be included with the Kruger equipment. The control system will be designed and supplied according to Kruger standards. It will include the following:

- NEMA4X local control panel for each Discfilter unit

Process and Design Engineering

Kruger provides process engineering and design support for the system as follows:

- Equipment specifications for equipment supplied by Kruger
- Technical instructions for operation and start-up of the system
- Equipment location drawings and installation plans
- Project specific O&M manuals

Field Services

Kruger will furnish a Service Engineer as specified at the time of start-up to inspect the installation of the completed system, place the system in initial operation, and to instruct operating personnel on the proper use of the equipment. Specifically, Kruger will provide:

- Field Service Engineer/Technician – Four (4) days on site in not more than two (2) site visits to assist with inspection check-out, start-up, optimization, and operator training.
- I&C Field Service Engineer/Technician – Four (4) days on site in not more than one (1) site visit to assist with inspection and I/O check-out, start-up, and operator training.

Installation Requirements

The following items will be installed by the Contractor/Others:

- Control panel(s)
- Interconnecting wiring and/or conduit between the supplied control panel(s) and Discfilter equipment
- Any junction or pull boxes or any other like device needed to supply the interconnecting wiring
- All field connections/terminations to the supplied control panels, the Discfilter equipment and between the Discfilter and supplied control panels
- All supports and anchoring required to install the Discfilter unit
- Plumbing/interconnecting piping, electrical connections, access platforms, grating & handrails

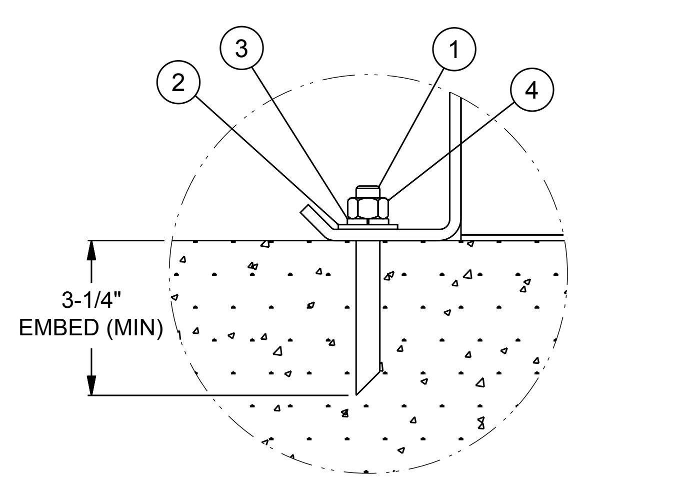
2. Pricing

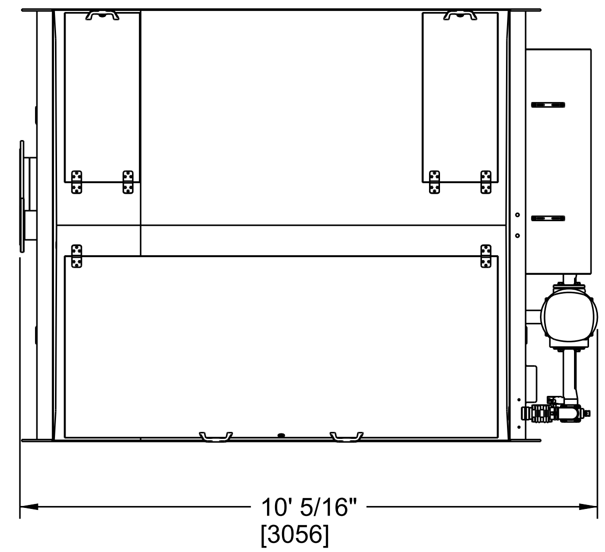
The pricing for the Discfilter system, as defined herein, including process and design engineering, field services, and equipment supply is as follows:

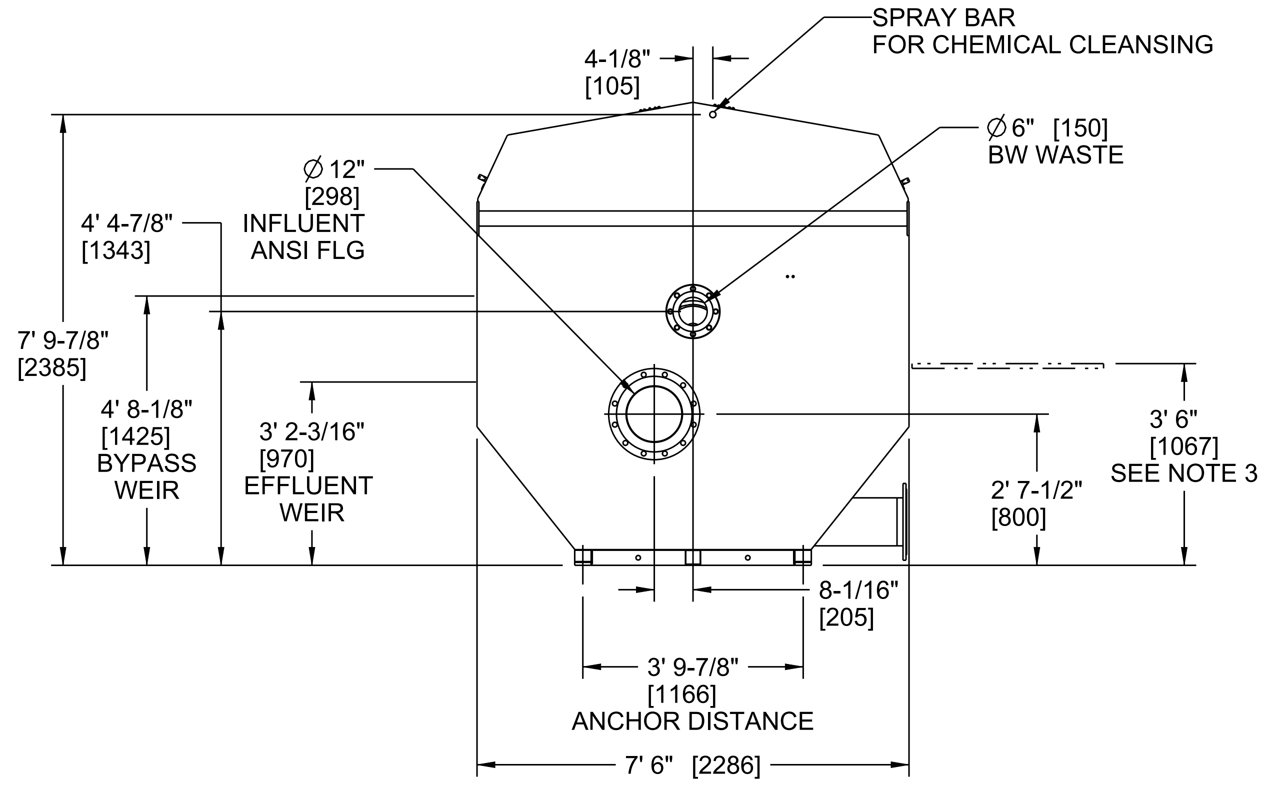
TBD

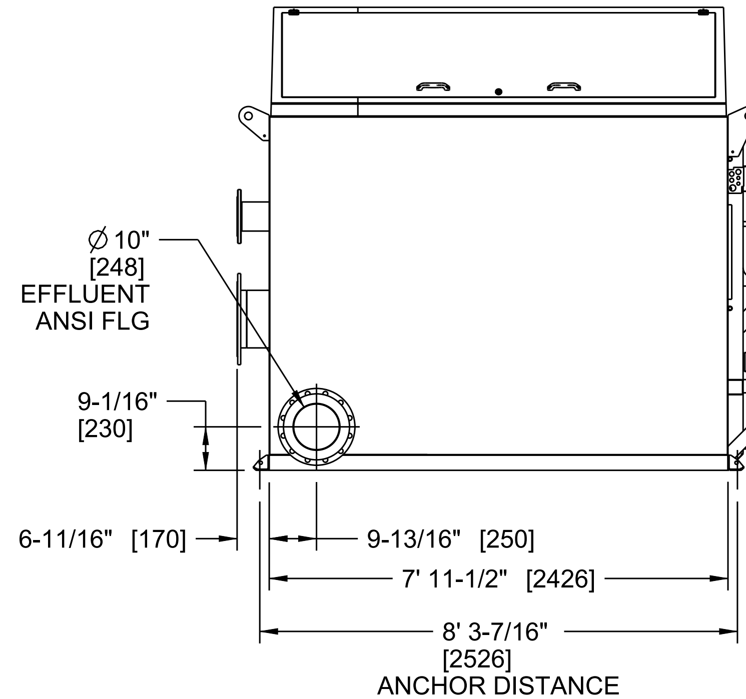
Adder for four (4) discs for Phase 2 and upgraded BW Pump: TBD

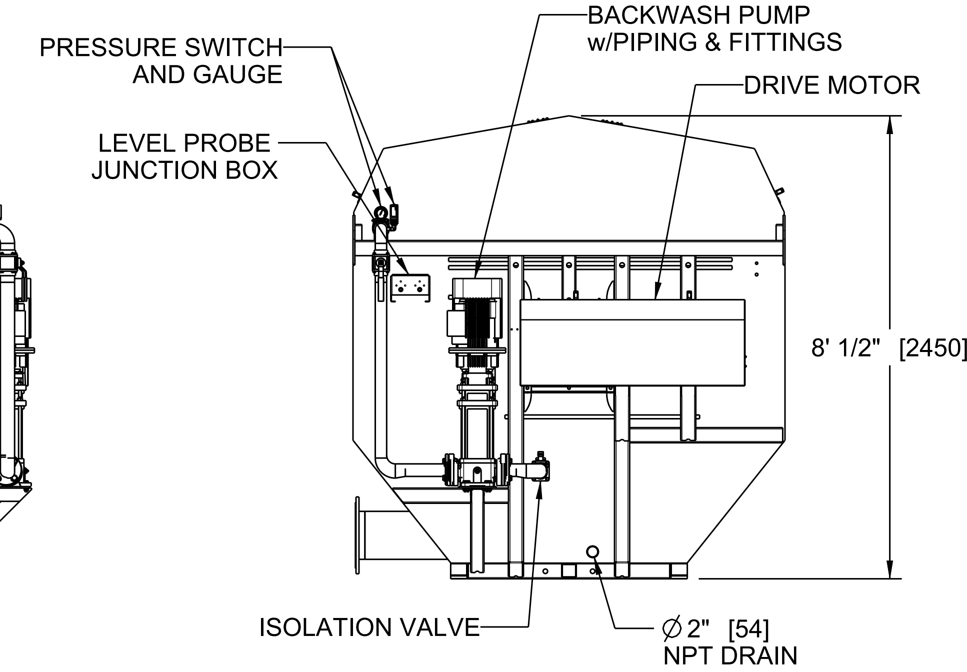
1	1/2" THREADED ROD: ASTM F593 W/ B1.1 UNC THDS
2	1/2" FLAT WASHER: ASTM A240 304 SS. PLATE
3	1/2" LOCK WASHER
4	1/2" HEX NUT: ASTM F594 W/ B1.1 UNC THREADS











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	PRELIMINARY RELEASE	CDP	JCC	03.29.18

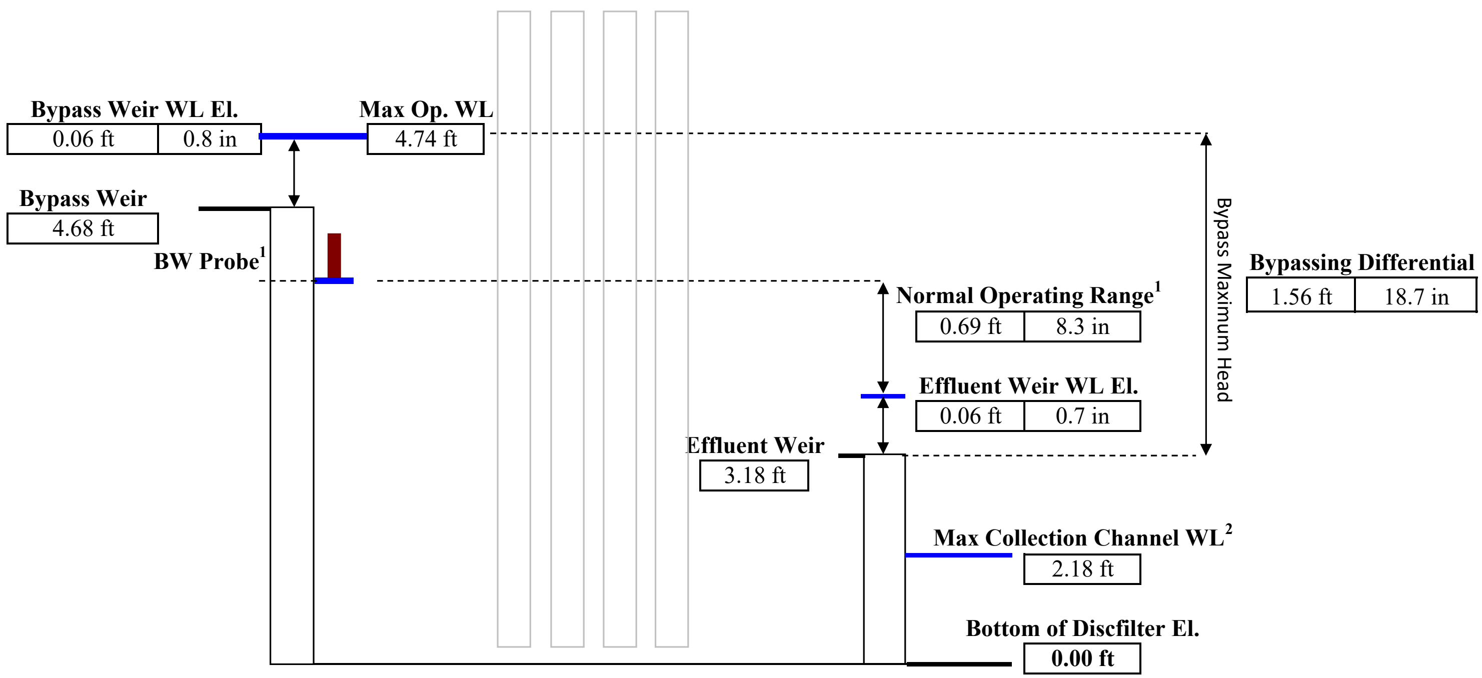
VEOLIA
KRUGER INC.
4001 WESTON PKWY CARY, NC 27513 | (919) 677-8310

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

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.

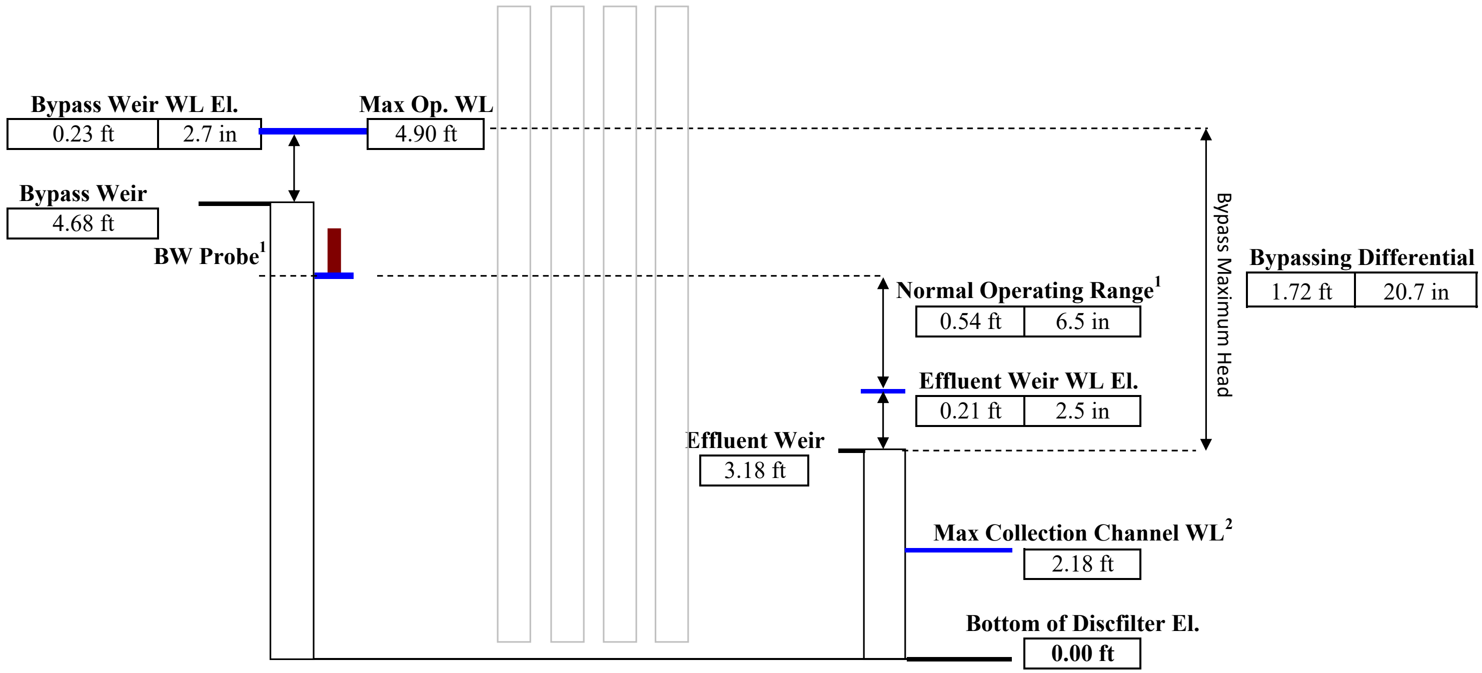
[2] - Please contact Kruger if downstream hydraulic conditions are such that the water level in the effluent collection channel exceeds levels indicated.

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.

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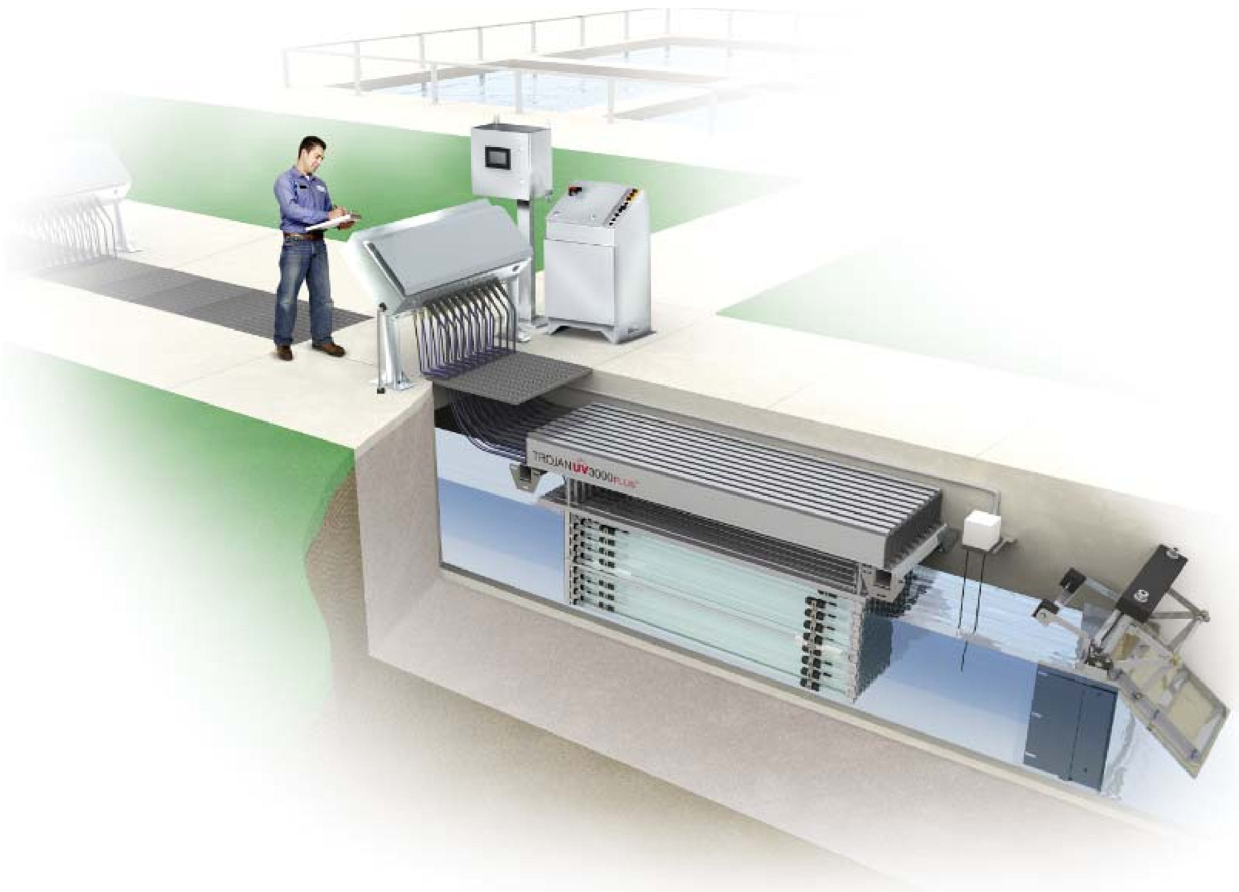
Water Technologies

UV Disinfection Sizing and Equipment Selection

TROJANUV3000PLUS™

PROPOSAL FOR STAMP - ALABAMA, NY
QUOTE: 224597
May 4, 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.

TROJANUV3000PLUS™

May 4, 2020

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

We are pleased to provide the following TrojanUV3000Plus™ proposal for the **STAMP – Alabama, NY** 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

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

Local Representative:

Wayne Dodsworth
Koester Associates Inc.
(315) 697-3800
Wayned@koesterassociates.com

TROJANUV3000PLUS™

DESIGN CRITERIA

Peak Design Flow:	**0.17 MGD** (expandable to future 2.72 MGD)
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 SUMMARY

QUOTE: 224597

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:	**54 in**
Number of SST Channel Reduction Baffles:	**2**
UV MODULES	
Total Number of Banks:	**2**
Number of Modules per Bank:	**2 (expandable to 4 for future 2.72 MGD)**
Number of Lamps per Module:	**4**
Total Number of UV Lamps:	**16 (expandable to 32 for future 2.72 MGD)**
Maximum Power Draw:	**8 kW**
UV PANELS	
Power Distribution Center Quantity:	**2 (4 Module Wide PDC for Expansion)**
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:	**Module Lifting Sling**
Standard Spare Parts / Safety Equipment:	**Included**
Other Equipment:	**2 - 8 in W 304SST Channel Reduction Baffles**

ELECTRICAL REQUIREMENTS	
1.	Each Power Distribution Center requires an electrical supply of one (1) 208V, 3-phase, 3-wire + GND, 60 Hz, 4.1 kVA.
2.	The Hydraulic System Center requires an electrical supply of one (1), 208V, 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.
4.	Electrical disconnects required per local code are not included in this proposal.

COMMERCIAL INFORMATION

Total Capital Cost:

This price excludes any taxes or duties that may be applicable.
Standard equipment warrantees and start up by Trojan-certified technicians are included.

EQUIPMENT WARRANTEES

1. Trojan Technologies warrants all components of the system (excluding UV lamps) against faulty workmanship and materials for a period of 12 months from date of start-up or 18 months after shipment, whichever comes first.

2. UV lamps purchased are warranted for 12,000 hours of operation or 3 years from shipment, whichever comes first. The warranty is pro-rated after 9,000 hours of operation. This means that if a lamp fails prior to 9,000 hours of use, a new lamp is provided at no charge.

3. Electronic ballasts are warranted for 5 years, pro-rated after 1 year.

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, June 5, 2019

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

Attn: Nick Bayer
Phone: 585-324-0448
E-mail: NBayer@CPLteam.com

Re: STAMP Project
Budget Proposal: One (1) BDP 3012 Screw Press skid mounted
BDP Proposal #: 060519-0839

BDP Industries, Inc. is pleased to offer our quotation for One (1) BDP Screw Press and accessories, skid mounted. The Screw Press is designed to achieve high discharge solids with a system that is simple to operate and maintain. The screw press unit includes a pre-thickening drum, 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) 304 stainless steel 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.

3. One (1) Screw Press, 12” diameter, with the following design features:

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

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.

4. 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 525 variable frequency drives.
   d) IEC starter.
   e) 480/3/60
   f) UL 508
   g) NEMA 4X
   h) 304 stainless steel

5. 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.

6. One (1) 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

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

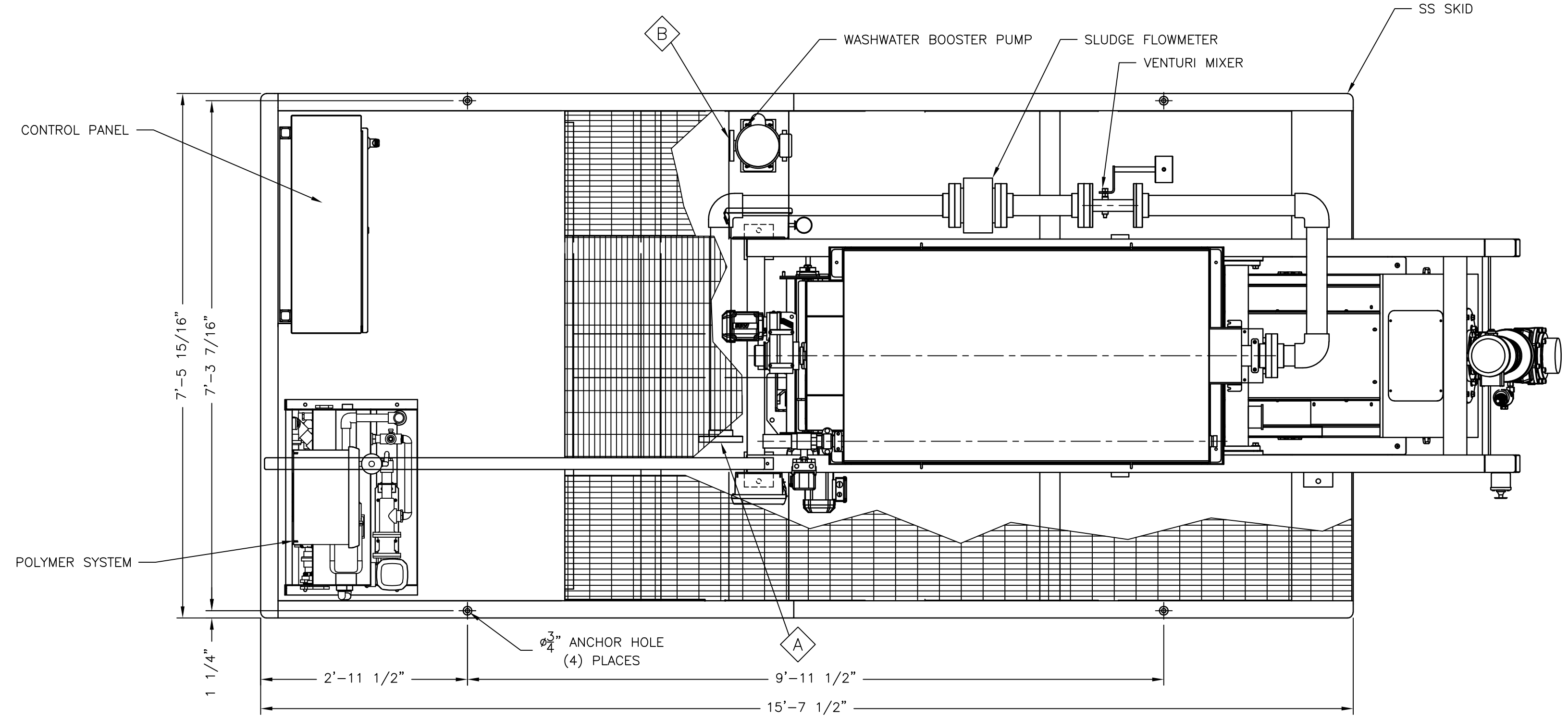
8. One (1) 3" Diameter Siemens Magnetic Flow Meter.

9. One (1) Washwater Booster Pump.

10. One (1) Filtrate Recycle System with Moyno 34401 pump.

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

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



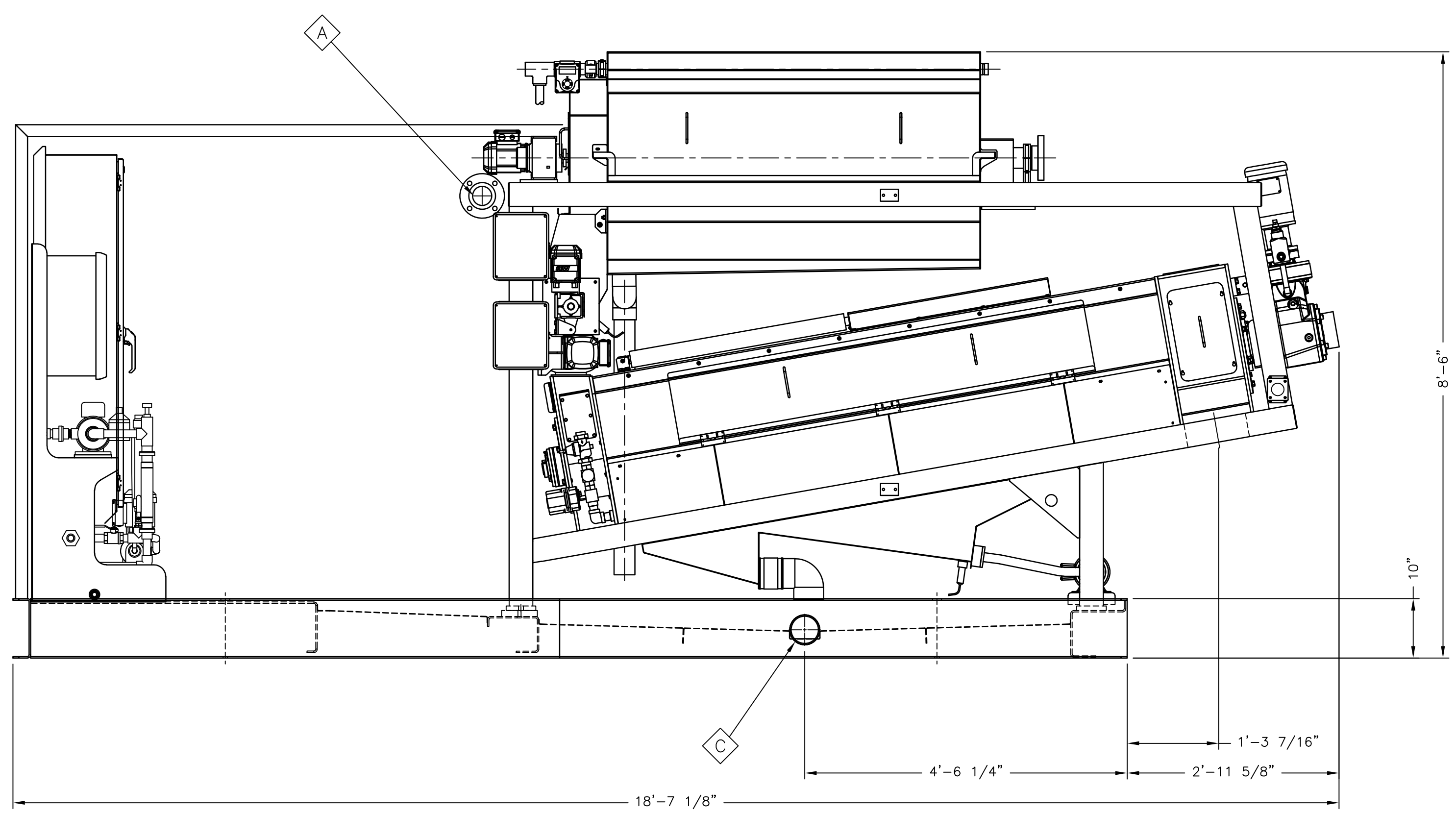
CONNECTION LEGEND:

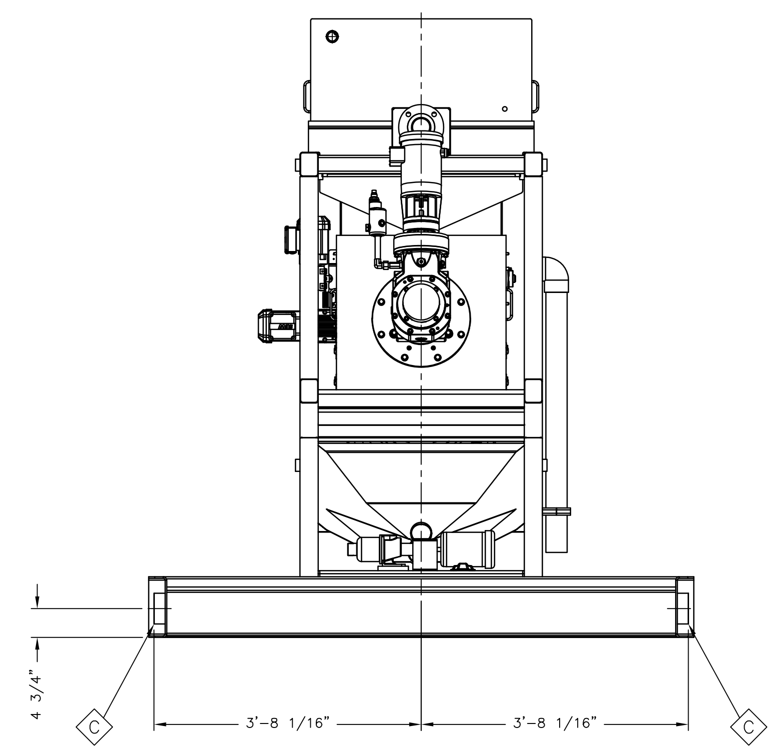
- A 3" 150# FLANGED FEED INLET
- B 1-1/4" 150# WASHWATER INLET
- C (2) 4" FEMALE NPT MAIN COLLECTION PAN OUTLETS

PLUMBING BEYOND THESE POINTS NOT SUPPORTED BY BDP

APPROXIMATE WEIGHT:

- 6,500 LB. SHIPPING
- 7,500 LB. OPERATING





QTY.	DESCRIPTION	MAT.	ITEM	REMARKS

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

CUSTOMER:	MACHINE:	DWG TITLE
HASTINGS, NY	SCREW PRESS	SKID MOUNTED MODEL 3012 DSP SCREW PRESS

BDP JOB NO.	DWN BY:	DATE:
1415	MJG	8/18/16

APP'D BY:	SCALE:	SHT.	OF	DWG NO.	REV.
		1	1	1-1415-2	3

REV.	DESCRIPTION	BY	DATE
3	ADD SHIPPING AND OPERATING WEIGHTS	SKD	11/14/16
2	REDESIGN SKID FOR SIDE FILTRATE OUTLETS	SKD	10/4/16