WASTEWATER

DESIGN AND CONSTRUCTION MANUAL

Vertical Municipal Infrastructure Standards

THE CORPORATION OF THE CITY OF BRANTFORD

REVISION TRACKING

EXISTING VERSION	VERSION NUMBER
March 2019	N: V1 - Original Final Submission
December 2020	V2
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2024 REVISION SUMMARY

SECTION	MODIFICATION & COMMENTARY
2.5.3 Flow Meter	Measure influent flow to the wet well, where possible
2.14 Instrumentation and Controls	inlet open-channel flowmeter, where installed H2S level sensor, where installed wet well infrared camera IP based power over Ethernet (POE), Class 1 Division 1 rated, where required Pressure monitor of local potable water supple line ability to monitor district pressure
2.15 Building and Access	Generators ~~must be located outside of the building~~ may be installed inside or outside the building depending on site conditions (refer to Common Elements for more information).
3.1 General Requirements	Electronic billing software
4.1 Plant Layout	Where additional space is required, removal of abandoned or unused processes shall be considered.
4.12 Automatic Sampling Stations	Automatic sampling stations are required for raw wastewater, final effluent and any other location as deemed necessary.

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1.0 INTRODUCTION

1.1 Scope

This section of the manual is intended to address design requirements related to the pumping, septage receiving, and treatment of municipal wastewater and municipal biosolids management within the City of Brantford.

Refer to the City's Linear Municipal Infrastructure Standards for sanitary collection system and forcemain design. This section should be read in conjunction with the General Preface and Common Elements sections of the Vertical Municipal Infrastructure Standards.

1.2 Description of the Wastewater Collection and Treatment System

The City of Brantford wastewater collection and treatment system is owned and operated by the Corporation of the City of Brantford. The wastewater collection and treatment system consists of a Class IV Wastewater Treatment Plant and a Class II Collection System. The City's wastewater vertical infrastructure generally consists of the following types of facilities:

- **Wastewater Pumping Stations (WWPS):** Facilities throughout the City that pump wastewater from a dedicated catchment to the gravity sewer network downstream to ultimately flow to the wastewater treatment plant.
- **Brantford Wastewater Treatment Plant (WWTP):** This facility is a Class IV conventional activated sludge treatment plant. Raw wastewater is lifted via the influent raw wastewater pumping station and flows through the plant by gravity. Preliminary treatment includes mechanically-raked bar screens and vortex grit separators. Flow is split between two parallel trains of conventional treatment and secondary clarification, after which the effluent is disinfected and dechlorinated. Final effluent is discharged to the Grand River.
- **Biosolids Management:** A biosolids storage and loading facility used to store and haul biosolids for seasonal land application.

2.0 WASTEWATER PUMPING STATIONS (WWPS)

2.1 General Design Considerations

WWPS configurations shall be designed to provide the most efficient layout of pumps, equipment, and piping with consideration for ease of access and maintenance. The design shall be aimed at minimizing or eliminating the need for confined space entry.

Facility design shall consider the following priorities:

- **Technical Feasibility:** Convey intended flows
- **Public Safety:** Limit risk to public health, the environment, and site security
- **Operator Safety:** Limit risk to operators
- **Adaptability:** Provide space for expansion, such as changes to future capacity or improvements in pumping efficiencies
- **Cost:** Maintain economics of design comparable to other systems on the market, in terms of life cycle costing (LCC) per unit of flow rate
- **Reliability of Operation:** Reduce frequency of plugging and maintenance requirements
- **Constructibility:** any proposed design changes must be able to be implemented into the existing site conditions. Where not possible, the standards can be amended to the City's approval.

2.2 Peak Flow

Peak flow is defined as the peak instantaneous inflow to the wastewater pumping station.

2.3 Firm Capacity

Firm capacity of a WWPS is defined as the pumping capacity of the facility when both the largest pump and the largest forcemain (where more than one forcemain exists) are out of service.

2.4 Wastewater Pumping Station Layout and Design

The most efficient layout of pumps and equipment for safe and cost-effective operation and maintenance of the facility shall be considered. Wet wells shall be designed and configured for safe and convenient operation with a self-cleaning configuration.

Design configuration of the pumping station is based on several factors including future flows, firm capacity, land availability, depth of wet well, flow variations, operations and maintenance considerations, construction capital costs, and life cycle costs.

Station layout shall ensure all rated and non-rated classified hazardous spaces are physically separated from each other (i.e. walls or other means).

Consider the general guidelines outlined in **Table 1** for pump station configurations based on the rated capacity. These are general guidelines only. Refer to the Standard Schematics in the Appendices of this Manual for a process schematic for each station type.

Table 1 Wastewater Pumping Station General Design Classification

Station Type	Rated Capacity	Specific Layout and Requirements for Station Type	No. of Pumps	No. of Forcemains	Wet Well Ventilation for Personnel Entry
I	< 75 L/s	A single cell, wet well submersible pumping station Bypass maintenance hole complete with an inlet isolation gate, located upstream within the site Electrical and control panel housed in a dedicated unclassified superstructure (prefabricated building may be considered) Below grade valve chamber housing valves and a discharge flowmeter	Two (one duty, one standby)	One sized for peak flow.	Portable ventilation system
II	76 L/s to 119 L/s	Wet well submersible pumping station with dual cells Inlet isolation gates to divert flows into each cell Inlet bypass chamber large enough to house the correct size portable bypass pumps for complete station rehabilitation, maintenance purposes, and/or complete station failure Wet well interconnection gate to isolate each cell for service Electrical and control panel housed in a dedicated unclassified superstructure (prefabricated building may be considered) Below grade valve chamber housing valves and a flowmeter for each forcemain	Up to three (at least one standby)	Two equally-sized forcemains, each sized for peak flow. Provide a motorized isolation valve for each forcemain connected to SCADA.	Ventilation duct with a permanent explosion-proof and corrosion-resistant ventilation fan
III	>120 L/s	Split wet well/dry well design with dry pit submersible pumps Inlet isolation gates to divert flows into each cell Inlet bypass chamber large enough to house the correct size portable bypass pumps for complete station rehabilitation, maintenance purposes, and/or complete station failure Wet well interconnection gate to isolate each cell for service Electrical and control panels housed in a dedicated superstructure that is unclassified Ventilated below-grade dry well housing valves and a flowmeter for each forcemain	To be determined by the Proponent based on anticipated range of flows	Two equally-sized forcemains, each sized for peak flow. Provide a motorized isolation valve for each forcemain connected to SCADA.	Ventilation duct with a permanent explosion-proof and corrosion-resistant ventilation fan

Notes:

- *All wet wells shall be equipped with a gooseneck ventilation duct.*
- *All station types shall be equipped with at least one standby pump.*
- *All station types shall provide stand-by power to meet the full load capacity of the facility. Must conform to* **Common Elements Section 11.0**.
- *All station types shall be equipped with an inlet open-channel flowmeter installed in an upstream maintenance hole within the site.*
- *The flowmeter shall be powered by the station and connection to SCADA for monitoring.*
- *Each forcemain shall be equipped with an inspection port and a forcemain bypass connection.*
- *The Proponent must consult with the City and the MECP regarding emergency overflow storage.*
- *The use of gravity outlet sewers in lieu of a forcemain may be considered where available adjacent to the station.*

2.5 Wet Well

2.5.1 Inlet Hydraulics

All inlet sewers should enter the wet well perpendicular to the structure. Inlet sewers shall be designed to minimize the free-falling of liquid to the maximum wet well operating level. Design the wet well to prevent excessive turbulence and air entrainment into the stored liquid to minimize the release of odorous and corrosive compounds.

2.5.2 Benching

Provide benching to limit solids build-up in the wet-well and to achieve a self-cleaning system on manual pump down. Benching and pump clearances in the wet well shall be designed in accordance with ANSI/HI 9.8. Ensure that benching design can accommodate the full working depth of the level transmitter and backup floats to operate properly. Concrete used for benching shall be of the same type and specifications as the concrete used for walls and slabs.

2.5.3 Flow Meters

Measure influent flow to the wet well, where possible, with an open-channel flow meter located in an upstream maintenance hole. Measure discharge flow for each forcemain with an in-line flowmeter. All flowmeters shall be connected to SCADA for monitoring. Provide straight pipe runs upstream and downstream of the flowmeters in accordance with the recommendations of the flowmeter manufacturers.

2.5.4 Wet Well Sizing and Operating Depths

The depth and volume of the wet well shall be sufficient to ensure adequate control bands for each pump as well as not exceeding the maximum number of starts per hour for the selected pump motor. The following should be considered in determining the operating depth:

- The wet well low-level alarm elevation shall provide a sufficient net positive suction head (NPSH) margin in accordance with ANSI/HI 9.6.1;
- The minimum vertical separation between float elevations shall be no less than 100 mm;
- The wet well high-level alarm elevation shall be a minimum of 300 mm below the invert of the inlet sewer; and,
- The obvert of the inlet pipe shall be located below the wet well platform where possible.

2.5.5 Process Mechanical

All piping and hardware inside the wet well and valve chamber shall be Type 316L stainless steel. The design should always ensure that the material of all equipment in submerged and humid environments is selected to minimize corrosion.

2.5.6 Service Platform

Provide stainless steel 316L or FRP platforms to facilitate service access to equipment in the wet well with non-slip gratings.

2.5.7 Wet Well Ventilation Ducts

Provide stainless steel 316L or FRP ventilation ducts in the wet well with exterior access to permit connection of a portable ventilation fan for personnel access. For larger stations, ventilation fans shall be permanent and tied into SCADA for remote and manual operation. All mounting hardware shall be Type 316L stainless steel.

2.5.8 Wet Well Equipment and Personnel Entry Layout

The wet well shall be designed with confined space entry and third-party rescue entry in mind. Provide a paved surface that permits vehicles and trucks to be entirely off the main road. This paved surface must meet the requirements outlined in the Common Elements section of this Manual and be able to sustain the weight of a fully-loaded vacuum truck without damage. Provide an entry sketch for each hatch that shows ventilation, operator hazards, appropriate tie-off points, davits, hatch opening sequences, attendant safety, and non-entry rescue procedure to safeguard the personnel conducting maintenance and simplify retrieval.

2.5.9 Wet Well Cleaning

The wet well should be designed so that it can be easily cleaned from the outside without the need for confined space entry. Provide a permanent Type 316L stainless steel standpipe cleanout inside the wet well with an exterior camlock connection to facilitate vacuum cleaning for wet wells deeper than 6.0 m. Provide a reduced pressure zone (RPZ) separated water supply for wet well cleaning.

2.5.10 Dual-Purpose Bypass

Provide a dual-purpose forcemain bypass and wet well bypass connection to allow for the following:

- Pumping from the wet well through the discharge header to a tanker truck (bypassing the forcemain); and,
- Portable pumping from the inlet bypass maintenance hole to the forcemain (bypassing the wet well and pumps).

2.5.11 Wet Well Lighting

The wet well shall have adequate lighting for all wet well applications (equipment to match the classification area).

2.6 Dry Well and / or Valve Chamber

2.6.1 Piping Design

Provide minimum 50 mm taps and ball valves before and after each pump and after each check valve. In addition, provide hand access clean-out ports on the suction side of each pump. Provide anchorage and lateral supports for the vertical discharge pipe.

2.6.2 Valves and Gates

Pump laterals and forcemain valves shall not be installed inside the wet well. All process valves shall be installed within the dry well or a separate valve chamber. All valves and process mechanical equipment shall be material Type 316L stainless steel. Check valves shall be equipped with backflow actuators. For stations with more than one forcemain, provide motorized isolation valves controlled by SCADA on each forcemain. Remote-Automatic pumping operation shall alternate between the two forcemains at a pre-set frequency.

2.6.3 Sump Pumps

In dry well stations, install a duplex submersible sump pump system designed to pump drainage to the wet well. Pumps must be of the solids handling type and intended for wastewater service. In valve chambers, provide a sump with gravity drainage to the wet well complete with check valve. Size the sump so that a pump could be lowered into the sump and pump out the valve chamber if required.

2.6.4 Design for Dry Well Flooding

Pumping functionality must be maintained under flooded condition.

2.6.5 Surge Protection

When considering the design of a surge relief system:

- Evaluate the impact of hydraulic transients under normal and worst-case operation conditions.
- Protect the forcemain system from uncontrolled transient pressures.
- Do not rely solely on combination air valves to protect the system from high transient pressures.

2.7 Pump Design

2.7.1 General Design Considerations

Pump selection shall be optimized to satisfy the peak design flow rate, the acceptable range of forcemain velocity, the wet well volume to facilitate pump cycling, and the life cycle costs.

Selection of pump type and size shall take into consideration the full range of anticipated flows (including low flows) within the planning horizon. Evaluate the fill time during low flow periods (particularly the first few years of a new development area) and consider the potential for odour generation due to long residence times in the wet well and/or forcemain.

After reviewing various demand scenarios, design pump operation to fall within the pump's preferred operating range (POR) under most flow scenarios.

Pumps should be designed to achieve maximum efficiency under normal operating conditions. Where more than one duty pump exists, avoid sizing the pumping system to achieve maximum efficiency under peak flow conditions if they rarely occur.

2.7.2 Submersible Wet Well Pumps

- Wet well submersible pump motors shall be rated for Class 1 Division 1 environments in accordance with NFPA 820.
- Pumps wet and wearing parts must be made from highly durable materials, such as High Chromium Iron or 420 Stainless Steel.
- Pumps shall be removable from the surface along guide rails. Provide a lifting system as described in the Common Elements section of the Manual.
- Pumps shall be of the solids-handling type and intended for wastewater service.

2.7.3 Dry Well Pumps

- Dry well submersible pump motors shall be rated for Class 1 Division 2 environments in accordance with NFPA 820.
- Pumps wet and wearing parts must be made from highly durable materials, such as High Chromium Iron or 420 Stainless Steel.
- Motors shall be designed to be cooled with a glycol jacket or equivalent. The use of process fluid for motor cooling is not acceptable.
- Pumps and sump pumps shall be of the solids-handling type and intended for wastewater service.
- Provide access ports to manually clean and unclog each pump without removing the pump.
- Evaluate the potential for vibrations and harmonic excitations.

2.8 Forcemain Design and Maintenance

Design the forcemain in accordance with the City's Linear Municipal Infrastructure Standards. Provide access points into each forcemain for bypass, swabbing, inspection, and investigations through insertion of analytical devices or closed-circuit television (CCTV) cameras. Provide at least one spare tap on each forcemain for pressure monitoring devices. The use of gravity outlet sewers in lieu of a forcemain may be considered where available adjacent to the station.

2.9 Emergency Overflow Storage

Provide water tight emergency overflow storage compatible with the City, Ministry of the Environment, Conservation and Parks (MECP), and local Conservation Authority requirements.

Emergency overflow storage capacity for new Municipally operated stations shall be at least one hour of retention time at peak wet weather flows. All emergency overflow storage structures shall be hydraulically connected to the collection system so that they fill by gravity without power or operator intervention, with monitoring to ensure the structure is normally empty, and alarming to indicate the fill level during an emergency. The emergency storage shall be full prior to any upstream flooding in the collection system. Automated pumps or drains shall be sized to empty the structure over 24hrs.

Alternatives to storage may be considered for existing Municipally operated stations due to space limitations on existing sites, with the understanding that future upgrades for growth should provide equivalent protection to the upstream catchment.

2.10 Access Hatches and Ladders

Provide an equipment access hatch directly above the inlet sewer into the wet well to allow for inspection and future installation of a grinder or screening if required by the City. All access hatches and ladders shall be material Type 316L stainless steel or FRP material. Provide dedicated equipment hatches for each pump and at least one personnel access hatch and ladder for wet wells and valve chambers. Refer to Common Elements for more information.

2.11 Ventilation

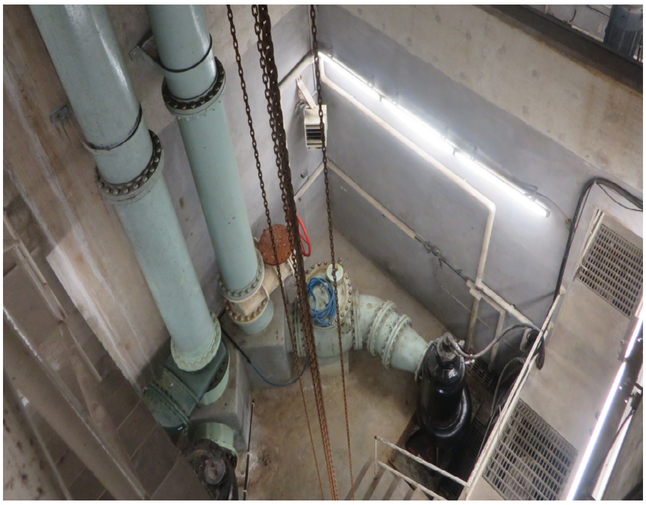
2.11.1 Wet Well Ventilation

All wet wells are to be equipped with a passive ventilation system to permit rising and falling liquid levels. Portable ventilation equipment is required for personnel entry into Type I stations. Permanent ventilation equipment is required for personnel entry into Type II and III pumping stations. Ventilation shall exceed required air exchanges per hour.

Wet well fans shall be controlled either by the PLC or timers to cycle at specific time intervals to control odour and minimize the build-up of gases and improve corrosion control.

2.11.2 Dry Well Ventilation

Dry wells shall be physically separated from all non-classified areas. Permanent ventilation fans and duct work is required for all dry well stations.



2.12 Odour Control

Designs shall provide solutions to reduce the potential for odour generation: avoid cascading wastewater flows into the wet well or discharge maintenance hole to reduce the potential for air entrainment and odour release. Evaluate various odour treatment technologies for pumping stations located:

- Near sensitive areas or residential dwellings, and
- Where the risk of odour generation is high despite minimizing retention time.

2.13 Electrical Design

For ease of service and operation, electrical equipment must be installed in unclassified areas where possible.

Provide a local junction box that is protected from flooding to enable removal and re-installation of pumps from wet well and dry pits without pulling cables from the motor starter.

Provide two 15 A ground fault interrupt (GFI) external electrical outlets located close to the wet well and valve chamber access point.

Exterior lighting should be considered for illuminating the wet well access area if site location permits.

2.14 Instrumentation and Controls

As a minimum, the following instruments shall be provided for wastewater pump stations and connected to SCADA for monitoring:

- Inlet open-channel flowmeter, where installed.
- Two wet well level indicating transmitters.
- A float system in conformance with the City's SCADA Standards.
- Discharge flowmeter and pressure transmitter for each forcemain.
- Flood floats in the dry well and/or valve chambers.
- H_2S Level sensor, where installed.
- Wet well infrared camera IP based, power over Ethernet (POE), Class 1 Division 1 rated, where required.
- Heat and smoke detectors .
- Security system.
- Primary pump control via PLC/ pressure probe set up (Station types 2&3 to be equipped with one per wet well with duty selection).
- Back-up pump control via transducer type level sensor completely independent from the PLC (Station types 2&3 to be equipped with one per wet well with duty selection).
- Process alarming is to be utilized through the City's current third party vendor (Alliance Security Systems) via an output from the PLC.
- There must also be a redundant form of alarming (back-up system) to notify on call O&M staff.
- Pressure monitor of local potable water supply line, ability to monitor district pressure.

All power and control wiring connections shall be delineated between the classified spaces by EYS seals and intrinsically safe relays, as applicable. Refer to City of Brantford SCADA Standards for more details.

2.15 Building and Access

Locate control panels, motor starters, electrical equipment inside the building. Generators may be installed inside or outside of the building depending on site conditions **(refer to Common Elements for more information).** All new building related appurtenances (i.e. stairs, ladders, doors, lighting, emergency lighting, etc.) must meet most current Building and Fire Codes/ Regulations.

Building and security alarming is to be utilized through the City's current third party vendor (Alliance Security Systems) via hard wired door switches, motion detectors etc. There must also be a redundant form of alarming (back-up system) to notify on call O&M staff.

Provide sufficient space for installation, maintenance and removal of all equipment. Provide permanent lifting systems for all major equipment. Ensure adequate separation of all classified areas.

3.0 SEPTAGE RECEIVING AND UNLOADING

3.1 General Requirements

The septage receiving station should be designed to receive hauled wastewater loads from a variety of truck sizes.

Septage receiving stations shall be laid out so that there is adequate room for septage hauling trucks to effectively maneuver and incorporate a spill containment pad. Spills will be confined to the area immediately surrounding the vehicle and hose connection and then drained to the sanitary sewer.

The following factors should be considered in the design of the septage receiving system:

- Card reader system or equivalent
- Raw wastewater grinder and/or screening complete with washer compactor
- Grit and rock separation
- Flow metering
- Heat tracing (where applicable)
- Flushing connections (effluent water or water service complete with RPZ)
- Connectivity to the SCADA system
- Odour control system (where applicable)
- Wet well with pumps and sampling access or gravity connection to the collection system (where applicable)
- Consideration for sampling and refrigeration provided in consultation with the City
- Electronic billing system.

4.0 WASTEWATER TREATMENT

The design of the Wastewater Treatment Plant and its components shall be in accordance with the latest version of the Ontario Design Guidelines for Sewage Works.

4.1 Plant Layout

Maximize the site's ultimate capacity in planning the plant layout. Design of expansion works should be carried out to permit the orderly and economical construction of the facility with minimal disruption of the existing facility. Future expansion shall be considered during design of the overall layout. Where additional space is required, removal of abandoned or unused processes shall be considered.

4.2 Process Laboratory

The plant must have a centrally located on-site laboratory. The laboratory must be designed by lab design specialists. The laboratory must have an entrance on the ground floor.

4.3 General Structural Requirements for Wastewater Applications

Concrete structures handling wastewater shall have a protective coating system to suit process conditions. Open process tanks shall be equipped with adequate walkways, catwalks, and railings to facilitate operator access.

4.4 Raw Wastewater Pumping Station

The design of raw wastewater pumping stations shall comply with the design guidelines for wastewater pumping stations outlined in the Wastewater Pumping Stations section of this Manual.

4.5 Preliminary Treatment

Preliminary treatment shall be housed in a building with automated screening and grit removal systems and designed for ease of operation for the removal of grit and screening bins, clean-up of the facility, and redundancy for grit removal, screening, and washer-compactor system reliability.

Sources and characteristics of raw wastewater and septage to the plant should be considered in the design of the grit removal and screening system.

The hydraulic design of the headworks channels shall be such that solids and grit settling and buildup within channels are avoided. Adequate valving should be included to permit isolation of individual channels for bypass and maintenance.

Electrical panels shall be housed in a separate unclassified area in the Headworks building. At a minimum, the Start, Stop, and General Fault alarm signals shall be communicated to plant SCADA.

4.6 Primary Clarifiers

Primary clarifiers shall be sized to handle the largest of the surface overflow rates under either average or peak design flow.

All channels conveying wastewater from preliminary treatment to the primary clarifiers shall be designed to avoid solids deposition. Associated sludge and scum removal systems shall be designed to suit site conditions.

4.7 Aeration Systems

Aeration tanks shall be sized to meet the required hydraulic retention time. The design of the aeration tank depth shall consider maximizing the oxygen transfer rate supplied by the aeration diffusion system. The aeration tanks should be designed with an automated step-feed system. Aeration systems shall utilize high efficiency blowers with fine bubble-diffused air that is capable of achieving a minimum dissolved oxygen (DO) concentration of 2.0 mg/L at any time.

Aeration systems shall provide sufficient mixing to maintain all mixed liquor solids in suspension for treatment process purposes. The addition of other means of mixing shall be evaluated if the aeration mixing demand exceeds aeration process demand significantly.

The air flow rate shall be monitored in SCADA. Isolation valves shall be provided on the main header and all sub-headers. The blower power draw shall be monitored in SCADA. Adequate dissolved oxygen metering devices shall be provided at the end of each pass of each tank and shall be tied to a fully automated DO control system.

LCC analysis shall be completed on aeration network design. Blower selection (count, capacity, operation range, etc.) shall be based on providing turn-down capacity to match low diurnal loadings and minimum mixing requirements during each season while still maintaining good overall efficiency. For multiple aeration tanks, the influent chamber and mixed-liquor suspended solids (MLSS) chamber shall be designed to provide uniform distribution of flow and capability of isolating each tank using weirs and gates.

4.8 Secondary Clarifiers

Secondary clarifiers shall be sized to handle the largest of the surface overflow rates under either average or peak design flow. Secondary clarifiers shall be designed for flow-paced return activated sludge (RAS) control to facilitate a continuous wasting process.

4.9 Sludge Pumps

Sludge pumps, RAS pumps, and waste activated sludge (WAS) pumps must be suitable for handling sludge and gritty material with a solids concentration of up to 5%. The pumps should be selected to efficiently cover the anticipated range of flows, not just the peak flow rate.

Both RAS and WAS flow shall be measured through SCADA using dedicated flowmeters. The RAS discharge point or chamber shall be designed to ensure good mixing, sampling, and minimal turbulence with secondary influent flow.

4.10 Effluent Disinfection and Dechlorination

Design of chlorine contact tank shall provide sufficient residence time to achieve the desired disinfection level. Online monitoring of the effluent chlorination and dechlorination processes must be considered when selecting monitoring equipment. The instruments shall be connected through SCADA for monitoring.

4.11 Alternative Technologies

Where a change in the treatment technology is suggested/required, a LCC analysis and efficiency comparison between the existing and proposed technology must be completed to determine if it is an applicable replacement.

4.12 Automatic Sampling Stations

Automatic sampling stations are required for raw wastewater, final effluent and any other location as deemed necessary. Provide automatic sampling stations to perform discrete or composite flow proportional and time proportional sampling. The sampler enclosure shall be weatherproof, corrosion resistant, insulated, and complete with forced air heater and thermostat, locking door, and bolt down base. The refrigerated sample compartment must be lockable. The controller must be programmable with an LCD display and connected to SCADA for monitoring.

In the event of a power failure, program settings and stored information shall be maintained by an internal lithium battery. The installation of samplers in classified environments is to be avoided whenever possible. Sampling stations shall collect a sample from a well-mixed area with continuous flow to provide representative samples. Automatic sampling stations are required for raw wastewater and final effluent.

4.13 Accessibility for Manual Sampling

Design sampling locations to allow operators to safely and conveniently obtain grab samples.

Provide dedicated sampling points throughout the plant to allow for obtaining grab samples for raw wastewater, raw sludge, digested sludge, RAS, WAS, secondary effluent, and final effluent. Provide flushing ability at every location where an online instrument exists.

4.14 High-Pressure Effluent Water System

A high-pressure, plant-wide, effluent water system shall consist of a minimum of two duty pumps, one standby pump, and a hydropneumatic tank to maintain system pressure when the pumps are not running.

The system shall be fully automatic with the pumps delivering the required flow and pressure at the farthest yard hydrant of the system. Yard hydrants for effluent water service shall be self-draining and non-freezing. Provide a visible nameplate on or near every new and existing hydrant warning against the consumption of non-potable water

5.0 BIOSOLIDS MANAGEMENT

5.1 Digesters

Primary anaerobic digesters shall be equipped with at least one sidewall access bulkhead into the digester for inspection and cleaning.

Provide mechanical mixing equipment for digester mixing. The digester system shall be equipped with recirculation pumps that force sludge through a heat exchanger to maintain the operating temperature.

Secondary anaerobic digesters shall be equipped with at least one sidewall access bulkhead into the digester for inspection and cleaning. The secondary digester should be equipped with a decant system for a maximum range of sludge depths. Each digester shall be equipped with an emergency overflow line to protect the structure.

5.2 Digester Bio-Gas

Digester generated bio-gas shall be utilized for generation of hot water or heat generated electricity. A dedicated gas meter shall be provided to measure total gas flow of the generated biogas. Generated biogas shall be treated to remove impurities. All exterior piping shall be fully insulated and heat traced. Any unused generated bio-gas shall be flared to atmosphere

5.3 Sludge Heat Exchanger

Heat exchangers used for sludge heating shall be tube-in-tube type complete with a minimum of two recirculation pumps, one duty and one standby.

5.4 Biosolids Storage and Loading Facility

Digested sludge (biosolids) is transferred in liquid form to Biosolids Storage Tanks (BST). BSTs shall be adequately sized to store biosolids over the winter period of Dec. 1st to Mar. 31st while accounting for poor weather conditions. Each storage tank shall be equipped with level measurement, mechanical mixers and decant system. The tanks shall have one access hatch for entry.

The sludge loading station shall be designed for minimum interference to the operation of the plant during sludge loading operation. Access to the sludge loading station shall be designed to permit trucks to enter and leave the station directly with an appropriate tracking system to measure the volumes hauled offsite.