Appendix A

Clean Water Nashville Overflow Abatement Program

GUIDANCE FOR DESIGN

EQUALIZATION FACILITIES AND PUMP STATIONS

Version 3.0

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cleanwater NASHVILLE
OVERFLOW ABATEMENT PROGRAM

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Section 1

General Information

The Designer shall use these guidelines to design and prepare the plans and specifications for the wastewater equalization (EQ) facilities for the Clean Water Nashville Overflow Abatement Program (Program). These guidelines are applicable to normal situations as defined herein and can be modified for individual project site conditions. It is anticipated that projects involving multiple EQ tanks, additional tank(s) added to an existing EQ site, and large EQ tanks (greater than 10MG) may require variations from this guidelines to account for site-specific, operational, and hydraulic considerations.

These guidelines intend to establish the following:

- The limiting values for items upon which an evaluation of the plans and specifications will be conducted by the Program Management Team
- As far as practical, a uniform practice among the several EQ projects to be constructed under the Program

Users should also be cognizant of and follow Metro Water Services' (MWS) adopted water and sewer standards, Tennessee Department of Environment and Conservation's Design Criteria for Sewage Works, NFPA 820, International Building Code, and applicable federal requirements. Recommendations from the Designer regarding any proposed deviations or unforeseen issues shall be presented in the *Preliminary Engineering Report*.

Section 2

Equalization Tank Design Considerations

2.1 Equalization Tank Layout

2.1.1 Tank Numbers and Volumes

The Program will initially determine the number of EQ tanks and the required storage volumes for any given project and will provide this information to the Designer in the Project Summary and scope of work.

2.1.2 Tank Types

EQ tanks shall be designed and constructed as prestressed concrete tanks unless otherwise indicated in the Project Summary.

2.1.3 Prestressed Concrete Tank Suppliers

Crom Corp., Gainesville, FL, http://www.cromcorp.com/, has supplied prestressed concrete tanks on previous MWS projects. However, Precon Corp., Newberry, FL, http://www.precontanks.com/, and others can supply an equivalent product to obtain competitive tank prices.

2.1.4 Tank Diameter vs. Tank Height

The Project Summary provides the conceptual diameter and height developed in the *Corrective Action Plan/Engineering Report* (CAP/ER) and *Long Term Control Plan* (LTCP). For a given tank volume, the Designer shall consult with the tank suppliers and evaluate two or three tank diameter and height combinations to determine the most economical tank configuration. When recommending tank height, the Designer shall consider zoning setback and height regulations, energy use differences for the varying EQ pump discharge head, and site constraints.

The tank exterior wall height shall be based on the internal overflow pipe height plus the water depth over the top of the overflow pipe at the EQ pump station's peak pumped flow rate plus six inches for freeboard. See Section 2.1.9 for tank overflow piping requirements.

Where a tank is added to supplement an existing tank, the new tank shall match the existing tank's height where possible.

With the tank design recommendations, the Designer shall include an architectural concept type rendering to indicate the tank's relationship to neighboring features and buildings.

2.1.5 Tank Roof

The prestressed concrete tank design shall have a reinforced concrete dome roof with a 4-foot wide sidewalk around the dome perimeter. See Section 2.5.3 for dome sidewalk requirements.

2.1.6 Tank Floor Elevation

When evaluating tank floor elevations, the Designer shall consider:

- The maximum liquid level in the duty pump station to achieve proper tank drainage

- The sewer system elevations if a direct connection
- The design flood elevation

Where a tank is added to supplement an existing tank, the new tank floor elevation shall match the existing tank floor elevation where possible.

The Designer shall prepare a recommendation for the tank floor elevation.

2.1.7 Tank Floor Slope

The tank floor shall be sloped for drainage to a center drain pipe or sump. MWS prefers a three percent floor slope.

The Designer shall prepare a recommendation for the tank floor slope.

2.1.8 Tank Roof/Overflow Vents

Prestressed concrete tanks shall be properly vented. The design shall include a center 50-inch diameter fiberglass reinforced plastic roof ventilator and sufficient 4-foot wide precast concrete roof vents, equally-spaced and placed around the roof perimeter, to also act as emergency tank overflows.

Calculate the number of overflow vents in each tank using a maximum 5-inch water depth through the emergency eyelid vents at the EQ pump station's peak pumped flow rate. *Note that this design condition assumes the tank overflow piping is plugged and the level control system is not functional.*

The Designer shall prepare a recommendation for the number and spacing of tank roof overflow vents.

2.1.9 Tank Overflow Piping

Prestressed concrete tanks shall have one or more internal overflow pipes per tank. Each overflow pipe shall have a flared inlet or weir box at a height corresponding to the depth at which the tank's maximum storage volume is calculated.

The maximum water level in any one tank shall be based on a maximum 3-inch head loss over the flare or weir box at the EQ pump station's firm peak pumped flow rate.

All above-ground tank piping shall be painted, flanged, ductile iron pipe with Protecto 401 ceramic epoxy lining. Flange bolts and nuts shall be Type 304 stainless steel.

The Designer shall prepare a recommendation for the number and diameter of overflow pipes with flares or weir boxes in each tank.

2.1.10 Tank Inlet/Transfer/Drain Piping

The tank inlet and transfer piping size shall be based on the EQ pump station's peak pumped flow rate. The tank inlet piping shall include a magnetic flow meter. No meter bypass will be required. MWS prefers a passive filing design over active controlled valving.

The tank inlet piping shall be discharged into the tank at approximately the mid-depth level to maximize the EQ pumps' efficiency during normal conditions. A ductile iron pipe drop assembly shall be provided at the discharge point.

Where a tank is added to supplement an existing tank, the tanks may be filled in series utilizing a transfer pipe. For sites with high pumping rates and large volumetric storage, the Designer may provide additional analysis and alternatives. The transfer pipe inlet elevation shall be at the mid-depth level. Once all tanks are half-full, the water levels will rise together until all tanks are full. The tank inlet piping shall also include provisions to use a manually-operated plug valve to take the first tank in series out of service and to route the pumped flow to the next tank in series. At sites with multiple tanks, piping and valving must allow any single tank to be out-of-service and the remaining tanks in sequence to be fillable/drainable.

Base the tank drain piping size on draining the tank over an 8- to 24-hour period. The drain piping for each tank may include a magnetic flow meter or a rate of tank level change monitored via SCADA. No meter bypass will be required. MWS prefers redundant motorized modulating plug valves in series modulated to the same position. Motor operators for new sites shall be installed 2 feet above the 500-year design flood elevation or the operators are for submersible service. See Section 2.6.1 for flood elevation requirements.

All above-ground tank piping shall be painted, flanged, ductile iron pipe with Protecto 401 lining. Flange bolts and nuts shall be Type 304 stainless steel.

All valve vaults shall meet NFPA 820 requirements.

The tank center drain pipe shall be provided with a stainless steel safety rail around the sump for personnel safety.

The Designer shall prepare a recommendation for sizing the tank inlet/transfer/drain piping including meters and valves.

2.1.11 Tank Access Manways

Prestressed concrete tanks shall have at least 2 manways with 1’5” x 4’4” stainless steel wall access per tank for tanks diameters less than 175 feet and four manways for tank diameters greater than or equal to 175 feet. Manway covers shall be bolted.

Some tank access manways may be covered by the finish grading and backfill at the site. It is preferred that they remain useable without excavation. All manways shall be installed at the same distance above the finished floor. If partially buried, a set four feet above finished grade shall be provided. If floor is at grade, manways be located between 24 to 36 inches above the tank floor to bottom of the door.

2.1.12 Tank Water Level Sensors

Each prestressed concrete tank shall have one ultrasonic level sensor located on the tank roof to monitor the tank’s water level and stop the EQ pumps at a high liquid level. MWS prefers the Siemens HydroRanger 200 ultrasonic unit.

Each prestressed concrete tank shall also have one backup high-level float switch to stop the EQ pumps should the primary ultrasonic unit fail. MWS prefers the Flygt ENM-10 float switch.

2.1.13 Tank Coatings

No interior tank wall or floor coatings will be required.

Exterior tank walls shall be given a twice-rubbed "flash and slice" finish. Dependent upon the site, such as in a residential, mixed use or a sensitive location it may be followed by a paint coating above finish grade. Paint shall be Tnemec Series 156 Enviro-Crete Modified Waterborne Acrylate. The paint color shall match the existing tank(s), if applicable. At a new site, MWS will select the color during the final tank design.

2.1.14 Tank Mixing

No EQ tank mixing devices are required at the present time. However, the Designer shall incorporate facilities into the tank design to allow for future floor-mounted submersible propeller mixers in each tank. See Section 2.5.2 for dome hatch requirements.

Prestressed concrete tanks shall have provisions to add at least two equally-spaced mixers per tank for tank diameters less than 125 feet and four equally-spaced mixers per tank for tank diameters greater than or equal to 125 feet.

2.1.15 Tank Washdown

The EQ tanks will be cleaned using spray water hoses mounted on the tanks' roof dome. See Section 2.5.4 for dome-mounted hose reel requirements.

Each EQ tank shall be furnished with two or four equally-spaced, 1½-inch yard hydrants corresponding to the number of dome hatches. Hydrants shall be Murdock Model M-150 or equal. Additional information about these hydrants can be found at http://www.murdock-supersecur.com/large-volume-compression-hydrant-wheel-handle. The yard hydrants shall be located at grade and near the dome hatches to connect to the vertical washdown supply pipes. See Sections 2.2.4 and 2.5.2 for tank washdown piping and dome hatch requirements.

To facilitate tank washdown, radius concrete fillets shall be installed at the edge of the interior tank walls. However, radius fillets shall be excluded at tank manways for a flatter entrance walkway.

To facilitate tank washdown, two or four equally-spaced, 1½-inch, Type 304 stainless steel riser pipes shall be mounted on the exterior tank walls matching the number of dome hatches. The riser pipes shall be located adjacent to and corresponding to the number of yard hydrants. The riser pipes shall be furnished with quick-connect couplings and drains.

2.1.16 Tank Odor Control

MWS has determined from operational experience and existing EQ tank fluid characteristics that EQ tank odor control facilities <u>will not be required</u>.

2.2 Site Design Considerations

2.2.1 Setback Requirements

The Designer shall comply with Metro Zoning for horizontal setbacks. MWS prefers to exceed the setback requirements at the EQ tank site by a minimum of 25 percent including all protrusions and foundations.

2.2.2 Greenway Coordination

If not identified in the Project Summary, the Designer shall consult the Metro Parks Department to determine any present or future greenway requirements. If a future greenway is planned, the

Designer shall reserve such greenway corridor space on the site plan when developing the facilities layout.

2.2.3 Shotcrete Equipment Access

On the site design drawings, the Designer shall indicate a flat equipment access corridor around the tank perimeter to be used for the shotcrete scaffold for the application equipment during construction. The construction corridor shall be 20 feet wide as measured from the foundation slab's outside diameter.

2.2.4 Tank Washdown Piping

During tank washdown operations, the preferred minimum water pressure and flow at each hose on top of the EQ tank is 30 pounds per square inch (psi) at a flow of 20 gallons per minute (gpm). The Designer shall evaluate the existing site water piping, if any, and prepare a recommendation to upgrade the existing site water piping if necessary. The Designer shall provide backflow prevention devices for the washdown service water. Booster pumping for this service level is not anticipated or preferred, but the Designer shall evaluate and design if needed.

2.2.5 Tank Overflow Piping

Overflow piping from the EQ tanks shall be routed back to the existing sewer system.

2.2.6 Site Piping Materials

Buried EQ tank inlet; overflow, transfer, and drain piping; and EQ pump station force mains shall be ductile iron pipe with Protecto 401 ceramic epoxy lining. Control and isolation valves shall be the plug type. No pinch valves are to be used.

All buried ductile iron pipe, valves, and fittings shall have restrained type joints.

2.2.7 Future Tanks

On the site design drawings the Designer shall indicate tees and stubouts with pipe plugs on buried piping for future EQ tanks, if applicable.

2.2.8 Water Quality and Erosion Control

The Designer shall follow MWS stormwater guidelines (latest version) when developing the project design. Use best management practices for all water quality and water control aspects. On the site design drawings the Designer shall indicate appropriate water quality and erosion control details. The Designer will consider a runoff/rain gravel infiltration ring around the EQ tank perimeter in unpaved areas. The designer should consider reinforced turf drives and gravel ring drives in appropriate locations for sustainable water quality design around the tank(s).

The Designer shall consider the minimization of stream buffer disturbances and delineate construction limits to control such; consider the limits of construction to reasonably define cost-effective, necessary primary and support construction operations; and designate logistically convenient and ample material "laydown" areas, access roadways, concrete washdown areas, and provide erosion control BMPs.

2.2.9 Access Drive Materials

On the site design drawings, the Designer shall indicate paved access roads and parking areas. Pervious concrete pavement is acceptable for infrequently-used driveways and parking areas, but it should not be specified for areas used by heavy maintenance vehicles with turning movement. Asphalt pavement shall be specified in areas used by maintenance vehicles. The Designer shall specify concrete pavement in areas around fueling points for generators. See Section 2.6.8 for standby power requirements.

2.2.10 Site Fence

On the site design drawings the Designer shall indicate perimeter fencing requirements. Unless directed otherwise for residential and mixed-use areas, the Designer shall use a decorative type security fence per Program details. Vinyl-coated chain-link type fence may be specified for industrial areas after concurrence by MWS.

2.2.11 Landscaping/Buffer

The Designer shall follow zoning site development requirements for landscaping and buffers. The Designer shall specify vegetative buffers in residential and mixed-use areas with 110% density of the Metro minimum. The scope and site may necessitate other special landscaping considerations.

2.3 Structural Design Considerations

2.3.1 Tank Design and Bidding Strategy

Prestressed concrete tanks, including the base slab and any necessary slab support systems such as piles or rock anchors, are intended to be bid as a lump sum. The construction contractor and his tank supplier shall be responsible for the final structural design for the prestressed concrete tank and its support/uplift structural system. Structural design drawings and calculations that have been stamped by a professional engineer registered in Tennessee shall be submitted along with the shop drawings.

In order for the tank supplier to prepare bidding quotations and the necessary construction drawings, the Designer shall provide in the design documents the required performance-type design criteria including enhancements for foundations concept and geotechnical information.

2.3.2 Soil Borings

The Designer shall locate soil borings on the site plan and obtain a preliminary *Geotechnical Report* from the Designer-retained geotechnical engineer. At a minimum or as identified in the Designer's Scope of Work, at least four soil/rock borings per tank and two borings per pump station to refusal and a minimum depth of 10 feet into solid rock shall be performed. Based on known site and soil characteristics, the Designer shall determine if additional borings are required and submit a recommendation. The *Geotechnical Report* will be included as an appendix to the bidding documents for information only.

2.3.3 Flood Elevation

The prestressed concrete tanks shall be protected from flotation during the design flood condition, assuming the tank is empty. The design flood for tanks at a given new site shall be the published Army Corps of Engineers or FEMA 100-year flood elevation. Existing EQ tank sites may conform to the existing tank flooding risk level, and the Designer will evaluate the cost of the new tank flooding risk level if higher.

The design flood elevation shall be identified and listed in the prestressed concrete tank specification. The Designer shall further consider grade and potential saturated groundwater elevations if the flood elevation is lower than finished grade and design for the greater uplift forces.

2.3.4 Uplift/Pile Design

For water depths less than 40 feet, the minimum floor thickness for prestressed concrete tanks shall be six inches. For water depths equal to or greater than 40 feet, the minimum thickness shall be eight inches. For sites with improved foundations and fill such as shot-rock, the minimum thickness shall be 12 inches. For sites with uplift piles and/or bearing pile design, the minimum thickness shall be 24 inches. The Designer shall assume that the tank foundation is a thick, rigid, reinforced concrete slab. The Designer shall estimate the slab thickness and show it on the design drawings for bidding purposes.

If required by site conditions the Designer shall prepare conceptual pile and/or rock anchor layout drawings for bidding purposes and other foundation improvement methodologies such as overcut and refill with shot-rock. The construction contractor and his tank supplier will prepare the final foundation improvement pile and/or rock anchor design.

2.3.5 Seismic Design

The Designer shall base the prestressed concrete tank on appropriate seismic design elements per the Metro building code and include the seismic design criteria in the prestressed concrete tank specification.

2.3.6 Concrete Strength

The design compressive strength of the concrete used in constructing the floor, walls, and roof shall be at least 4,500 psi. The Designer shall include concrete design criteria in the prestressed concrete tank specification.

2.3.7 Concrete-encased Pipes

All ductile iron pipe installed below tank floor slabs shall be encased in concrete. Reinforcing for the encasement may be required due to pipe sizes, and the Designer shall determine such. See Section 2.2.6 for site piping materials requirements.

2.4 Multiple Equalization Tank Operations

2.4.1 Tank Filling

Multiple EQ tanks at one site shall typically be filled in series using gravity overflow/transfer pipes to fill to the tank's mid-point, and then the tanks are filled in parallel if hydraulically designed in that manner to maintain maximum pumping rates. See Section 2.1.10 for tank inlet/transfer/drain piping requirements.

2.4.2 Tank Drainage

Multiple EQ tanks at one site shall be fully drained one at a time by opening the motorized modulating plug valves on each individual tank's drain line(s). See Section 2.1.10 for tank inlet/transfer/drain piping requirements.

2.5 Equalization Tank Maintenance Personnel Considerations

2.5.1 Dome Access

Maintenance personnel shall be able to access the tank dome and hatches by climbing an exterior affixed spiral or corkscrew stair. Stair landings shall be provided per applicable code(s).

Security gates and concrete landing/support pads shall be provided at the bottom of the stairs.

No interior tank ladders will be required.

2.5.2 Dome Hatches

Maintenance personnel shall be able to primarily vertically access the tank interior for washdown or maintenance purposes or, for future submersible mixers installation, through dome hatches.

For tank diameters less than 125 feet, the Designer shall specify two aluminum hinged, 6-foot x 6-foot Bilco-type floor hatches per tank. For tank diameters greater than or equal to 125 feet, the Designer shall specify four hatches per tank. The hatches shall be equally spaced with safety guardrails. The roof hatches shall be located near the yard hydrants. See Section 2.1.15 for tank washdown requirements.

One additional FRP, 8 foot x 8 foot floor type hatch shall be provided for heavy maintenance to lower a bobcat or similar sized equipment items into the tank.

2.5.3 Dome Sidewalk

Maintenance personnel shall be able to access the roof dome hatches by walking on a 4-foot wide sidewalk along the dome perimeter.

On the exterior side of the walk, the sidewalk shall have an aluminum guardrail with 4-inch toe boards. Electrical conduits and water lines crossing in the sidewalk area only shall be embedded to avoid tripping hazards.

2.5.4 Dome-Mounted Hoses and Hose Reels

Specifications shall include two or four dome-mounted, equally-spaced hose reels to be located near the dome hatches.

Hose reels shall be sized for 1½-inch Hosecraft USA Model 922-23-24B hoses or equal. For additional information, see http://www.hosecraftusa.com/accessory/Hose_Reels_1.

Hose reels shall be stainless steel. For additional information, see http://www.hosecraftusa.com/accessory/Hose_Reels_Stainless.

Each hose reel shall have minimum 25 feet of 1½-inch hose.

2.5.5 Dome-Mounted Davit Crane

To facilitate raising and lowering tools, etc., one dome-mounted davit crane with a 115 VAC electric powered winch shall be provided and located near the top of the staircase and co-located with a dome hatch. The davit crane shall have a 1,000-pound lift capacity, a 35- to 42-inch reach, and a lift range of the tank height plus five feet. Davit crane and hoist materials shall be stainless steel. Davit cranes shall be Thern Model M5110E4SS, or equal. For additional information, see http://www.thern.com/wp-content/uploads/5110_Portable_DavitCrane.pdf.

2.6 Electrical Design Considerations

2.6.1 Flood Elevations

The floor elevation for new electrical/control buildings shall be above the 500-year flood elevation or flood of record, whichever is greater.

All new site electrical equipment such as switchgear, electrical panels, VFDs, and non-submersible motor operators shall be installed two feet above the 500-year flood elevation or flood of record, whichever is greater. Existing site additions or modifications shall consider this level of protection in design.

2.6.2 Electrical Panel Protection

All electrical distribution panels, pump drives, and control panels shall be installed in a weatherproof building that is not of the IPA form. Designer shall document NFPA 820 requirements for any areas needing to be classified spaces.

2.6.3 Tank Roof Convenience Outlets

Four roof-mounted, 120V, 20amp convenience outlets on two circuits shall be equally spaced and located near the roof hatches.

2.6.4 Tank Roof Lightning Protection

No lightning protection for the EQ tank's roof will be required.

2.6.5 Tank Lighting

No permanently installed lights on the roof or inside the EQ tanks will be required.

Outdoor lighting shall be provided at the tank site for security purposes only. Consider solar powered fixtures for sustainable design.

2.6.6 Future Tank Mixers

Empty electrical conduits shall be provided for the future tank mixers. Conduit shall be encased in the concrete dome sidewalk crossing and extend vertically down the outside tank wall and to the distribution panel. See Section 2.1.14 for tank mixing requirements.

2.6.7 Instrumentation

Instruments tied to SCADA such as level sensors, floats, and flowmeters shall output to a terminal panel and split to controls and telemetry.

Provide the following alarm outputs to SCADA:

- High EQ tank level for each tank
- High EQ pump station level
- EQ pump fail
- High LEL at pump station

The Contractor will provide and install telemetry and SCADA panels for new installations. Existing SCADA panel modification and screen modifications will be performed by MWS.

Section 3

Equalization Pump Station Design Considerations

3.1 Pump Station Layout

The best alternative design for pump stations and EQ tanks allows them to be constructed and completed concurrently with working clearance for both efforts. Considerations shall include the electrical building location and foundation so as to have the electrical building finish concurrently with the pumping station structure. The electrical building layout shall provide a line of sight using a window or open door to the equipment area.

3.2 Pump Type

If a new EQ pump station is required to pump wastewater into the EQ tanks, the pump station shall be constructed with poured-in-place reinforced concrete vault type construction with wet-pit submersible pumps. If a new duty pump station is required in the Project Summary such as in a pump station replacement, consideration shall be given to new dual wet wells, a common dry well with submersible pumps in dry-pit application, common building and a common electrical room for both equalization and duty pumps. Pumps shall be Flygt for MWS standardization. For additional information, see http://www.flygtus.com/109914.asp

Pump layout for pump station capacities greater than 3,200 gpm shall be based on the Hydraulic Institute Standards and the Flygt brochure *Design Recommendations for Pump Stations with Large Centrifugal Pumps*. See Section 3.3 for pump numbers and capacity requirements.

The Designer shall prepare a recommendation for the EQ or common pump station dimensions, layout, and elevations and submit it in the *Preliminary Engineering Report* with full exhibits.

3.3 Pump Numbers and Capacity

The peak pumped flow into the EQ tanks will be determined in the Project Summary and given to the Designer in the scope of work. The Project Summary provides the conceptual ratings and number in the CAP/ER and LTCP developed for planning. The Designer shall use this information to determine the pump numbers and capacity to be provided with his detailed design development from explicit site data developed in the *Preliminary Engineering Report*. See Section 3.4 for pump speed requirements.

At least two pumps shall be provided to meet the required firm/rated capacity. An additional standby pump for EQ pump stations discharging to sanitary sewer overflow EQ tanks shall be evaluated for pump station layout/size, hydraulic impacts, electrical impacts, and total cost impacts. No standby pump or review will be required for EQ pump stations discharging to combined sewer overflow EQ tanks. This information will be submitted in the *Preliminary Engineering Report* with cost differentials for MWS to make a benefit/risk/cost decision.

The Designer shall prepare a recommendation for the number and rated capacity for each pump.

3.4 Standby Power Requirements

Provide a standby power generator for EQ pump stations that discharges to sanitary sewer overflow EQ tanks. Provide sufficient information and a cost analysis in the PER for MWS to make a benefit/risk/cost decision. Base the generator sizing information on one pump running continuously and extrapolate the generator sizing/costs based on multiple pumps running continuously.

No standby power generator for EQ pump stations that discharge to combined sewer overflow EQ tanks will be required.

3.5 Pump Speed

Pump speeds can vary from 900 to 1,800 revolutions per minute; however, preference shall be given to pumps with lower speeds.

3.6 Pump Weight

In general, individual submersible pumps shall weigh less than 5,000 lbs. If pumps greater than 5,000 lbs. are needed, the Designer shall consult the Design Management team.

3.7 Pump Drives

In general, all EQ pumps shall be driven by variable frequency drives. Submersible pump motors shall be inverter duty type.

3.8 Pump Level Controls

The EQ pump station shall have 1 ultrasonic level sensor for monitoring the wet well water level and controlling the EQ pumps. MWS prefers the Siemens HydroRanger 200 ultrasonic unit.

The pump station shall also have 1 backup high-level float switch to alarm the EQ pumps should the primary ultrasonic unit fail. MWS prefers the Flygt ENM-10 float switch.

3.9 Pipe Materials

Discharge piping and fittings from the EQ pump station shall be ductile iron pipe with Protecto 401 ceramic epoxy lining with restrained joints in buried applications and flanged joints in exposed applications. Flange bolts and nuts shall be type 304 stainless steel.

Section 4

Equalization Tank/Pump Control Strategy

4.1 Diversion Structure

A diversion structure with an overflow weir that discharges to the EQ pump station shall be provided on the inlet sewer. The maximum water depth over the weir at the peak pumped flow shall be one foot. The Designer shall prepare a recommendation for the overflow weir's length and elevation. Pump/ variable frequency drive control will be governed by system liquid levels until the tank's upper elevation indicates that the tank is full and stops the pumps.

An inclined to the influent-flow, manually-cleaned (or self-cleaning by gravity post event) pump protection bar rack shall be provided above the weir. The stainless steel bar rack shall have 3-inch openings. The Designer shall consider the vertical height and required span for the design event.

4.2 Equalization Tank Drain Valves

The EQ tank's motorized drain valve(s) shall have automatic controls. In general, the EQ drain valve(s) shall open when the water level in the sewer system or duty pump station has receded. Multiple tanks will drain to the midpoint as a unit through the transfer pipe and the lead tank draining. Then each tank will drain consecutively beginning with the lead tank from the mid-point.