WASTEWATER
SUMMARY OF CHANGES

Authorization #1 - Amendments Effective March 31, 2012

Chapter Five (5)	Section Name	Amendment Description
Section 510	Part 5, B. 2 Drop Manhole	Clarified manhole drop as interior not exterior
Section 550-C: Approved Materials Checklist	Category 1 of 10: Valves and Accessories	Added JCM Series 432 for Tapping Sleeves (MJ on cast iron, DIP, PVC-900, etc.)
		Added Clow Series F-6114 for Tapping Valves (Resilient Seated Only)
	Category 2 of 10: Pipe Materials	Added Griffin Pipe Products to provider list for Ductile Iron Pipe for Valve Vaults
	Category 3 of 10: Pipe Fittings	Removed Freedom Plastics from Approved Manufacturer (Out of Business) for PVC Light Green 4" - 12" Pipe and 16" and larger Pipe
		Removed Freedom Plastics from Approved Manufacturer (Out of Business) for PVC Gravity Pipe - Mains and Services
		Added Plastic Trends for Fittings, Adapters and Plugs - Gravity PVC
	Category 5 of 10: Manholes and Accessories	Added Oldcastle Precast for Material - Concrete
Section 550-E:	Wastewater Pressure Test Form (PVC and DIP)	Updated/corrected maximum allowable leakage equation

Authorization #2 - Amendments Effective December 15, 2012

Chapter Five (5)	Section Name	Amendment Description
Section 511	Wastewater Force Main Standards - Part 4 Design - B. Velocity and Diameter	Updated Force Main Cleansing Velocities; County may authorize wastewater main size variations
Section 512	Wastewater Lift Station Standards and Specifications - Part 3 - Design Basis, E. Design Calculations	Clarified the Design Basis Calculation Criteria for Lift Stations (replaced 60% with 100% of all receiving system pumps…)
Section 550A	Part 4 - Design - F. Hydrostatic Leakage Testing 1. a. Procedure for Leakage Test	Updated/corrected maximum allowable leakage equation
Section 550D:	Wastewater Hydraulic Standards - Pump Station Design Criteria	Clarified the Design Basis Calculation Criteria for Lift Stations (replaced 60% with 100% of all receiving system pumps…)
Standard Drawing:	WW-16 Chain Link Fence (Typical)	Updated Chain Link Fence (Typical) Detailed Design Drawing

Authorization #3 - Amendments Effective May 22, 2013

Chapter Five (5)	Section Name	Amendment Description
Section 550C: Approved Materials Checklist	Category 5 of 10: Lift Station Materials and Accessories	Added Generator Fuel Tank provider (Modern Welding)
Section 519	Wastewater Treatment Facility SCADA Specifications	Added NEW Section 519 Wastewater Treatment Facilities SCADA Specifications and iFix schematics

WASTEWATER
SUMMARY OF CHANGES

Authorization #4 - Amendments Effective November 17, 2013

Chapter Five (5)	Section Name	Amendment Description
Section 512	Part 4 – Design, 2. a. i. - ii., v.	Clarified Single Wet Well Requirements
		8. a. - Clarified Single Wet Well Emergency Generator requirements due to flows from one/two/more lift station(s)
Section 550C: Approved Materials Checklist	Category 4 of 10: Manholes and Accessories	Added Manufacturers Atlantic TNG and Allied Precast to the Approved Materials Checklist
Standard Drawings	WW-01-1 Precast Concrete Manhole (Typical)	Corrected 5J typo error
	WW-05-1 Service Lateral (Standard)	Corrected double wye size
	WW-05-2 Sewer Service (Deep) Typical)	Updated minimum depth and note references
	WW-06-2 Force Main Manifold Connection (Typical)	Added NEW Force Main Manifold Connection (Typical)

Authorization #5 - Amendments Effective September 10, 2014

Chapter Five (5)	Section Name	Amendment Description
Section 510	Part 5, B. 2 - Drop Manhole	Clarified Lining of Drop Manholes consistent with Approved Materials
	Part 5, I - Coating or Lining	Clarified Coating or lining requirements of master, drop, or turbulent flow manholes consistent with Approved Materials
	Part 5, K- Pre-Case Concrete Sections, 9	Clarified Lining of Drop Manholes consistent with Approved Materials
	Part 5, M - Encapsulation	Clarified Encapsulation requirements subject to County approval
	Part 6 - Service Lateral Connections - C - Size and Length	Clarified Service lateral max length of 150'
Section 512	Part 4 Design, E. Major Component Requirements, Table 512-2	Table 512-2 (SCADA) updates and table formatting
	Part 4 Design E.2. Wet well requirements. (x)	Updated Buoyancy calculations - soil ring weight shall be 100% of total weight of soil ring…minimum safety of 1.1 shall be achieved.
	Part 4 Design e.7 - SCADA, 8.c. - Emergency Generator, 9 - Air Conditioned Motor Control Center, 10 - Variable Frequency Drive Motors, 12 - Level Control, F - Electrical Equipment, Power Supply and Power Cords, G - Controls	(Minor) SCADA related text edit
	Part 5 Construction, (FKA: 5.11, now 5.10) Fence Installation A. Post Setting	Clarified post core drill 2x post diameter
	Part 5 – (FKA 5.12, now 5.00) E. Doors	Clarified installation of Doors for Wet Well and Valve Vaults

WASTEWATER
SUMMARY OF CHANGES

Section 516	Wastewater Lift Station Electrical System Specifications	Extensive rewrite of Section 516; refocused from Lift Station Electrical Power and Control System Specifications to Electrical Specifications only.
Section 517	SCADA And Control Panel Specifications	Extensive rewrite of Section 517; refocused from SCADA RTU and Control Panel Specification to SCADA and Control Specifications only.
Section 518	Part 3.Plant Layout, H	Included reference to key switch and Approved Materials checklist
Section 550A	Testing and Inspection for Acceptance, Part-3. 3.02 Causes for Rejection of Gravity Mains - B.	Strike out portion of section under 3.02 B "Rejection of Gravity Mains" related to deflection tests, mandrel, and backfilling
	Testing of Wastewater Force Mains - Part 5 - A. Locating Wire System	Change "Tracer" to "Locating"
Section 550C: Approved Materials Checklist	Category 2 of 10: Pipe Materials	Change "Tracer" to "Locating"
	Category 4 of 10: Manholes and Accessories	Added "ALL" for exterior MH coatings; Added "Standard" (MH) to Interior Coatings, and "DROPPED" (MH) to Lining Systems (Cat 4)
	Category 5 of 10: Lift Station Materials and Accessories	Removed Tradeswind from FIXED Generator Suppliers
		Removed USF Fab Hatch Net System from Fall Protection System
		Added Electric Override Key Switch (Knox)
		Added Various SCADA related edits
Section: 550-K	SCADA Panel I/O Listing	Added (new) form for SCADA Panel I/O Listing
Standard Drawings	WW-12-2 Duplex Lift Station with Valve Vault Section View	Updated existing drawing associated with modified SCADA requirements
	WW-12-3 Duplex Lift Station Dimensions and Elevations Table	Updated existing drawing associated with modified SCADA requirements
	WW-12-4 Typical Float Type Level Switch Installation	Updated existing drawing associated with modified SCADA requirements
	WW-14-2 Duplex or Triplex Lift Station (Above Ground Piping) Section View	Updated existing drawing associated with modified SCADA requirements
	WW-14-3 Triplex Lift Station Dimensions and Elevations Table	Updated existing drawing associated with modified SCADA requirements
	WW-18 Lift Station Wash Down Assembly (Typical)	Updated existing drawing associated with modified SCADA requirements
	WW-20-1 Lift Station Control Panel Front View	Updated existing drawing associated with modified SCADA requirements
	WW-20-2 Lift Station Control Panel Rear View	Updated existing drawing associated with modified SCADA requirements
	WW-24 Duplex Control Panel Enclosure Dead Front Layout (Typical) , 25, 26-1, 27	Updated existing drawing associated with modified SCADA requirements
	WW-25 Lift Station TVSS Installation (Typical)	Delete Detail
	WW-26-1 Lift Station Grounding	Updated existing drawing associated with

WASTEWATER
SUMMARY OF CHANGES

	(Typical)	modified SCADA requirements
	WW-27 SCADA Pressure Sensor Water Service	Delete Detail

Authorization #6 - Amendments Effective October 3, 2015

Chapter Five (5)	Section Name	Amendment Description
Section 510	Part 2 - Location - 2.a.f.	Clarified easement size variation(s) authorization guidelines (easements adjacent to RoW must be for existing, NOT future use)
	Part 5 - Manholes - B. - Type 1. Standard Manhole; I. Coating or Lining; K. Pre-Cast Concrete Sections - 9.	Stated coating requirement for all standard manholes
Section 512	Part 2 - Location - B.	Clarified that written approval by PCU is needed for public, private and non PCU easements that cross a tract containing a PCU lift station
	Part 2 - Location - D.	Specified driveways to lift stations design parameters/dimensions and revised lift station layout dimensions
	Part 4 Design, E. Major Component Requirements, Table 512-2	Deleted reference to Valve Vault, inserted reference to Coating
	Part 4 Design E. Major Component Requirements - 2. Wet Well Requirements - 3. Piping Above Ground	Renamed this paragraph from Piping in Valve Vault or Above Ground to Piping Above Ground; deleted all reference to valve vault installations
	Part 4 Design E Major Component Requirements 13. Structural Bearing Design - a. - b.	Removed valve vaults references from description of structural bearing design for wet wells; valve vaults are obsolete for wet wells
	Part 5 – Construction 5.03 Valve Vault	Deleted 5.03 Valve Vault section
	Part 5 - Construction (New due to rev.) 5.03 Access Frames and Doors	Deleted valve vaults from descriptions, re-lettered specifications for access frames and doors
	Part 5 – Construction 5.04 Odor Control System - 5.05 Chain Link Fence - 5.06 Block Wall - 5.07 Gates, 5.08 Weed Control, 5.09 Stainless Steel Sluice Gates, 5.10 Fence Installation, 5.11 Wet Well Installation, 5.12 Cleaning, 5.13 Sluice Gate Installation and Testing, 5.14 Water Supply, 5.15 Wet Well Fall Protection System	Renumbered list; removed valve vault references
Section 513	Part 2 - Products 2.01 Pipe Materials	Specified PE 3408/**PE4710** code designation for HDPE pipe and related fittings

WASTEWATER
SUMMARY OF CHANGES

	Part 2 – Products 2.02 Joint Materials - E. Joints for Dissimilar Pipe	Removed reference to valve vault. Added wastewater pipes, valves and appurtenances material specifications for joints for dissimilar pipe
	Part 2 – Products 2.03 Fittings - C. HDPE Pressure Pipe	Provided cross reference to specification in section 2.04
	Part 2 – Products 2.04 Ductile Iron Pipe or HDPE Pipe and Fitting for Lift Stations - A and (NEW) 6, 7, 8	Removed reference to valve vault. Added new reference to include specifications for HDPE pipes, fittings and flanges
Section 550-A	Part 4 - Manhole Testing	Corrected title name for this section from Mainhole Testing to Manhole Testing
	Part 5 - Testing of Wastewater Force Mains - E.3 Hydrostatic Pressure Testing of Ductile Iron and PVC Pressure Pipe.	Changed Pressure testing for all pipe sections to hydrostatic pressure of 150 psi (was 100 psi)
Section 550-C: Approved Materials Checklist	Category 1 of 10: Valves and Accessories	Corrected Water Plus ARV Part No. to 131632
		Added Total Piping Solutions' Triple Tap Tapping Sleeves, DIP, PVC
		Added Team Industrial Products for Insertion Valve MJ/Ductile Iron RWGV (New valve type)
	Category 2 of 10: Pipe Materials	Updated JM Manufacturing name to JM-Eagle
	Category 3 of 10: Pipe Fittings	Updated Tyler Union Part Numbers and Comments for Restrained Joints, DIP, HDPE, and PVC
	Category 4 of 10: Manholes and Accessories	Delete US Foundry/USF 926; Add EJ Ergo and EJ Ergo XL Hinged cover and frame alternative
		Added Surface Coatings – Interior, Standard Manholes only; added Carboline Bitumastic 300M and Conseal CS-55
		Surface Coatings - Interior (Master/Drop/FM Receiving Manholes, Wet Wells, Valve Vaults); added IET's COREZYN's IET-Crete COR75-AZ-010
		Top Adjusting Rings: Added EJ's Riser Rings
	Categories 6-10 - Plants and Remote Facilities	Added Approved Facility Equipment: Categories 6-10 (New), Manufacturers, Part Numbers, Comments
Section 550-J	Wastewater System Schedule of Values - Page 4 of 4	Added Reviewer signature lines for Total Constructed Value $ Amount at the end of this section
Section 550-L	Gravity main Low-Pressure Air Test Form	Added (NEW) form for recording gravity air tests
Standard Drawings	WW-09 Lift Station Notes	Removed all references to valve vault(s)
	WW-10 Lift Station Notes (Continued)	Removed all references to valve vault(s)

WASTEWATER
SUMMARY OF CHANGES

	WW-11 Duplex Lift Station (Typical) Site Plan	Added new details to Figure for Duplex Lift Station (Typical Site Plan) including revised site dimensions, configuration (by LS Task Force)
	WW-12-1 Duplex Lift Station Plan View	Added new details to Figure for Duplex Lift Station Plan View; re-worked above ground configuration due to changes also represented in WW-11
	WW-12-2 - Duplex Lift Station Section View	Added new details to Figure for Duplex Lift Station Section View; re-worked configuration due to changes also represented in WW-11; clarified alarm levels due to recent SCADA changes
	WW-12-3 - Duplex Lift Station Dimensions and Elevations Table	Added new details to Figure for Duplex Lift Station Dimensions and Elevations Table; clarified alarm levels due to recent SCADA changes
	WW-12-5 - Typical Lift Station HDPE Pipe Bracing	(NEW) detail drawing for Typical Lift Station HDPE Pipe Bracing
	WW-14-2 - Triplex Lift Station (Above Ground Piping) Section View	Added new details to Figure for Triplex Lift Station (Above Ground Piping) Section View; clarified alarm levels due to recent SCADA changes
	WW-14-3 - Triplex Lift Station Dimensions and Elevations Table	Added new details to Figure for Triplex Lift Station Dimensions and Elevations Table; clarified alarm levels due to recent SCADA changes
	WW-20-2 - Lift Station Control Panel Rear View	Added note 5 regarding disconnect based on electric utility requirements.

Authorization #7 - Amendments Effective August 4, 2016

Chapter Five (5)	Section Name	Amendment Description
Section 510	Part 7 – Grease Traps, Interceptors, and Separators B, F, G, H, Table 510-4	Codified trap calculations and requirements
Section 516	Wastewater Lift Station Electrical Specifications	Additional SCADA related edits
Section 550C: Approved Materials Checklist	Category 3 of 10: Pipe Fittings	Added new vendor, SIP for fittings (C153 SSB/ C110 Flange, Restrained Joints (DIP, PVC)
	Category 5 of 10: Lift Station Materials and Accessories	Added Wilo-EMU pump to Submersible Pumps with Enclosed Impellers
Standard Drawing	WW-14-2 Triplex Lift Station (Above Ground Piping)	Replaced manual ARV with reference to GR-15-1 (Typical)

CHAPTER 5 WASTEWATER Section 510

Gravity Wastewater System Standards and Specifications

PART 1 - GENERAL

A. PCU will not approve PLANS for combined wastewater gravity systems. Gravity mains shall be designed to exclude infiltration/inflow.

B. Wastewater gravity system shall be designed for the estimated ultimate tributary population, as delineated in the approved PCU's MASTER PLAN (latest edition). When the DEVELOPER's MASTER PLAN is required, wastewater gravity mains shall be designed for the estimated ultimate build out of that DEVELOPMENT, as approved by PCU

PART 2 - LOCATION

A. Mains shall be located within dedicated public rights-of-way or Polk County Utilities Easements.

1. Public Rights-of-Way

When installed in rights-of-way, mains shall maintain a consistent alignment with respect to the centerline of the road. In all cases, mains shall be installed along one side of the road with crossings kept to a minimum.

2. Polk County Utilities Easements

If a main is to be constructed within an easement, the centerline of the pipe shall be located along the centerline of the easement.

a. When not adjacent to County or State rights of way, a minimum width of 20 feet shall be provided for mains with inverts located up to 5 feet below finish grade. For mains with inverts located deeper than 5 feet below finish grade, the minimum width shall be twice the invert depth of the main plus 10 feet. All widths shall be rounded up to the nearest even foot. Width of the easement shall be based on the deepest invert depth of each segment of the subject main.

b. Where multiple parallel mains are to be placed within a single easement, the FDEP required horizontal separation distance between the mains shall be added to the above minimum single main easement width and rounded up to the nearest even foot.

c. Have a maximum length of 150 linear feet if the easement terminates in a dead end or an obstruction. Longer easements may be authorized if adequate turnaround and work zone is provided as based on an AASHTO single unit vehicle. All locations and lengths of easements shall take in consideration the safety and accessibility of PCU vehicles and personnel.

d. Be free of any permanent structures, such as footers, foundations, walls, screen walls, buildings, air conditioner pads, transformer pads, sign supports, roof overhangs, stormwater structure, swimming pools, storage sheds, patios, etc.

e. Be accessible at all times and not subject to standing water nor under the side slope or bottom of a lake, pond or stormwater retention area, except that perpendicular crossings under swales, small ditches and canals may be authorized in writing by PCU.

f. As designated by PCU for existing use, a Polk County Utilities Easement of not less than 15 feet in width shall be provided parallel to and directly adjacent to all County, State, and Federal rights-of-way. Notwithstanding PCU's easement requirements stated above and herein, easements in typical subdivision construction including those adjacent to internal subdivision roads shall be sized and conveyed in accordance with the LAND DEVELOPMENT CODE. The ultimate width of easements may be based on the number, type, size and depth of the utility lines within the easement.

g. Landscape buffers may be allowed to co-exist with Polk County Utilities Easements as long as landscape berms are not utilized. Should PCU disturb or damage any landscaping or other installed improvements within the easement, PCU shall initiate repairs or install replacements in a timely manner at no cost to the property owner.

h. A triangular corner clip type of Polk County Utilities Easement, that has 20 foot long sides, shall be provided at all intersections of County, State, and Federal rights-of-way.

B. Mains within easements shall not be placed under septic tanks, storm water management facilities, buildings, retention ponds, athletic courts, swimming pools, fountains, patios, or other structures. Privacy walls and foundations shall not be placed parallel over mains or within the structure's zone of influence as based on a soil angle of repose of 45 degrees. Mains shall not be located along interior side or rear lot lines, unless approved in writing by PCU. Placement of mains along storm water retention pond berms may be allowed by PCU on a case by case basis when placed in a casing and if such a configuration results in efficient placement and utilization of the system. Service laterals, clean-outs, and other main related improvements shall not be placed along interior side or rear lot lines.

C. Mains may be accepted for maintenance if the private streets are designed with a urban design cross section in accordance with the LAND DEVELOPMENT CODE. Polk County Utilities Easements shall be dedicated over the entire private street rights-of-way. In addition, sufficient area must be available outside of paved areas to maintain PCU mains.

D. Offsite mains for all developments shall be extended along the entire frontage of each development. The minimum size of the main to be extended by the DEVELOPER shall be the same size that is the minimum main size required to serve the development. In the event that PCU desires to upsize the main, PCU shall reimburse the DEVELOPER in accordance with the provisions of the Utilities Code.

E. Mains with inverts located up to 4 feet below finish grade shall not be located closer than 10 feet from any structure that requires a Certificate of Occupancy. For mains with inverts located deeper than 4 feet below finish grade, the minimum distance of 10 feet shall be increased by one foot for each one foot of increased depth of the main's invert. All horizontal distances shall be rounded up to the nearest whole foot.

F. Unless specifically determined by PCU to be of benefit to its overall system, gravity wastewater infrastructure installed within a non-residential or multi-residential development shall not be subject to ownership, maintenance, or operation by PCU.

PART 3 - DESIGN BASIS

A. Average Daily Flow:

The gravity main design shall be based on ultimate development or projected flow. Average daily wastewater flow shall be calculated by the Equivalent Residential Connections (ERC) flow factors as outlined in the "Utilities Administration Manual".

B. Peak Design Flow:

1. Gravity mains shall be designed on the basis of ultimate development maximum rates of flow, which shall be the product of selected peak factors multiplied by the accumulative average daily flow as calculated above. The minimum peaking factor, provided in Table 510-1 shall be applicable for the range of average daily flow rates.

Table 510-1. Wastewater Peaking Factors.

Minimum Flow Range (gpd)	**Peak Factor**
Flows up to 100,000	4.0
100,001 to 250,000	3.5
250.000 to 500,000	3.2
500,000 to 1,000,000	3.0
Flows greater than 1,000,000	2.5

C. Design Calculations:

DEVELOPER's ENGINEER shall submit signed, sealed and dated design calculations with the PLANS for all sewer projects. Calculations shall show that gravity mains will have sufficient hydraulic capacity to transport all design flows.

PART 4 - DESIGN AND CONSTRUCTION

A. Minimum Size:

Gravity mains conveying wastewater shall be eight inches in diameter or greater.

B. Pipe Cover:

The minimum cover over gravity mains shall be no less than 36 inches below the finished grade unless approved otherwise by PCU. Gravity main invert depths shall not exceed 20 feet below finished grade. System design shall minimize pipe invert depths and the number of utility conflicts.

C. Slope:

1. Gravity mains shall be designed and constructed to provide minimum velocities, when flowing full, of no less than two feet per second, based on Manning's formula using an "n" value of 0.013. The minimum slopes as shown in Table 510-2 shall be provided; however, slopes greater than these are desirable.

2. Gravity mains shall have uniform slope between manholes.

Table 510-2. Minimum Design Slope Requirements of Gravity Mains.

Gravity Main Diameter (inches)	Percent Slope (%)
8	0.400
10	0.280
12	0.220
15	0.150
18	0.120
21	0.100

24	0.080
27	0.067
30	0.058
36	0.046
42	0.037

D. Size and Alignments:

Pipe size shall remain constant between manholes and pipe alignment must remain straight between manholes.

E. Additional Requirements:

Storm-water management and drain systems, air conditioner and refrigeration condensation lines, and water-to-water air conditioner lines shall not connect to the gravity main system. All gravity main extensions for future connections shall terminate at a manhole.

PART 5 - MANHOLES

A. Location:

Manholes shall be installed at the end of each gravity main, at all changes in grade, size, or alignment, at all gravity main intersections, and at distances not greater than 400 feet. Private gravity main systems eight inches or larger shall be separated from the PCU gravity main system by a manhole located within and adjacent to the right-of-way line.

B. Type:

1. Standard Manhole:

Where the difference in elevation between the incoming gravity main invert and the manhole invert is less than 24 inches, the manhole invert shall be filleted to prevent solids deposition. All standards manholes shall be coated in accordance with the appropriate “Approved Materials Checklist”.

2. Drop Manhole:

An interior drop pipe shall be provided for wastewater gravity main entering a manhole where the invert elevation is 24 inches or more above the manhole invert.

All drop manholes shall be lined or coated in accordance with the appropriate "Approved Materials Checklist".

3. Master Manhole:

   All gravity and force mains shall discharge their flows into a master manhole prior to the wet well of a wastewater lift station. Force mains intersecting gravity main systems shall discharge into a master manhole at a maximum angle of 45 degrees to the flow path in the manhole. All master manholes shall be lined or coated and have a minimum interior diameter in accordance with Table 510-3.

C. Personnel Access Opening:

Manhole covers and frames shall provide a 24 inch minimum access clearance through the frame opening.

D. Diameter:

Manholes shall have minimum interior diameters from the structure's base to the bottom of the top conical section as based on the main diameter in accordance with Table 510-3.

Table 510-3. Minimum Manhole Diameters.

Gravity Main Diameter (inches)	Minimum Inside Manhole Diameter (inches)
8 to 24	48 (60 for Master Manholes)
24 to 36	60
36 and larger	72

E. Flow Channel:

The flow channel through manholes shall be made to conform in shape and slope to that of the gravity mains. Flow direction changes in excess of 90 degrees shall not be included in gravity main alignments without written permission from PCU. Flow line elevation drop of 0.1 feet across manholes shall be provided. Benching shall have a minimum downward slope of 1/2 inch per foot from the wall of the manhole towards the rim of the flow channel. No bricks shall be used to construct channels.

F. Materials:

1. Manholes shall be constructed of precast units as specified in this Section. Brick or

cast-in-place manholes may be permitted on a case by case basis for retrofitting or repair purposes as approved by PCU.

2. Wastewater pipes, valves, and appurtenances shall be constructed of materials as specified in the Section entitled "Wastewater Pipes, Valves, and Appurtenances Specifications".

G. Castings:

All manhole frame and cover sets shall be in accordance with the STANDARD DRAWINGS and the appropriate "Approved Materials Checklist." Manholes that have 5 foot and larger inside diameters shall be provided with two piece covers in accordance with the STANDARD DRAWINGS. Bolt down covers shall be provided where manholes are located in areas outside of improved right-of-way and subject to ponding or flooding.

H. Vehicular Access:

A 12-foot wide access road shall be provided for all manholes that are located outside of State, COUNTY, or local roadways. The access road shall have a sub-base that is stabilized to a Florida Bearing value of 75 psi, and a base that is compacted to 98 percent of AASHTO T-180.

I. Coating or Lining:

A special coating or liner shall be provided for master manholes, drop manholes or any manhole that directly receives a discharge from a force main, as a minimum. A standard coating is required for other manholes. All coatings and liners shall be in accordance with the appropriate "Approved Materials Checklist".

J. Manhole Inserts:

All manhole cover and ring assemblies shall be furnished and installed complete with an insert. The purpose of the insert is to prevent intrusion of storm water, dirt, debris, and to help control emission of odors.

The manhole insert shall be manufactured from corrosion-proof material, such as HDPE, polypropylene, or stainless steel, suitable for atmospheres containing hydrogen sulfide and diluted sulfuric acid and other gases associated with wastewater collection systems. The minimum continuous uniform thickness of a polymer based insert, including all angles, shall be 1/8 inch.

The body of the HPDE insert shall be made of high density polyethylene co-polymer material that meets ASTM D1248, Class A, Category 5, Type 111, and have a minimum impact brittleness temperature of – 180º F. As a minimum, the material

used in the manufacture of the body of the stainless steel insert shall be 16 gage Type 304 stainless steel.

The insert shall be manufactured to the dimensions of the manhole opening to allow easy installation within the manhole frame. The manhole insert shall be manufactured to fit the manhole frame rim upon which the manhole cover rests.

The gasket shall be made of closed cell neoprene. The gasket shall have a pressure sensitive adhesive on one side and be placed under the weight-bearing surface of the insert by the manufacturer. The adhesive shall be compatible with the insert material so as to form a long-lasting bond in either wet or dry conditions.

A lift strap shall be attached to the rising edge of the bowl insert. The lift strap shall be made of 1" wide woven polypropylene web and shall be seared on all cut ends to prevent unraveling. The lift strap shall be attached to the insert by means of a stainless steel rivet. Location of the strap shall provide easy visual location.

Ventilation of the insert shall be by means of a vent hole located on the side wall of the dish ¾" below the lip. The hole thus placed allows a maximum release of 10 gallons per 24 hours and is not affected by debris that might collect in the bottom of the bowl.

The insert shall have proof of durability in traffic impact loads and shall have engineer certified proof of test passing a collapse load of 2200 pounds minimum applied to a 5.5" square area in the center of the insert.

The manhole frame shall be cleaned of all dirt and debris before placing the manhole insert on the rim. The manhole insert shall be fully seated around the manhole frame rim to retard water from seeping between the cover and the manhole frame rim.

K. Pre-Cast Concrete Sections:

1. Pre-cast manholes shall conform to specifications for ASTM C 478 "Pre-cast Reinforced Concrete Manhole Sections", except as otherwise specified below.

2. The minimum wall thickness shall be five inches. Pre-cast manholes shall be constructed with a pre-cast monolithic base structure as shown on the STANDARD DRAWINGS. The minimum base thickness shall be eight inches.

3. Concrete for manholes shall be Type II, 4000 psi at 28 days. Barrel, top and base sections shall have tongue and groove joints. All jointing material shall be a cold adhesive preformed plastic gasket, conforming to ASTM C 443 "Manhole Section Connections". Manholes shall be leak-free.

4. Sections shall be cured by an approved method as per ASTM C 478 for at least 28

days prior to coating and shall not be shipped until at least two days after having been coated.

5. Concrete surfaces shall have form oil, curing compounds, dust, dirt and other interfering materials removed by brush sand blasting and shall be fully cured prior to the application of any coatings.

6. The date of manufacture and the name or trademark of the manufacturer shall be clearly marked on each pre-cast section after coating on exterior surface.

7. Pre-cast concrete top slabs shall be used where cover over the top of the pipe is less than four feet.

8. Lift rings or non-penetrating lift holes shall be provided for handling pre-cast manhole sections.

9. With the exception of master manholes, drop manholes or manholes that have force mains directly discharging into them, the interior surfaces of all manholes shall have a protective bituminous epoxy or epoxy coating formulated to resist corrosion from a wastewater environment. The interior surfaces of master manholes, drop manholes, or manholes that have force mains directly discharging into them shall have a protective cementitious, polymer, high build epoxy, or elastomer based coating or lining in accordance with the appropriate "Approved Materials Checklist". All exterior surfaces of all manholes shall have a protective bituminous epoxy or epoxy coating capable of sealing out moisture. Coatings or liners shall be as specified in the appropriate "Approved Materials Checklist" and applied in strict accordance with the coating or liner manufacturer's recommendations. All coatings and liners shall a minimum of a one year manufacturer's warranty from the date of installation.

L. Liners and Coatings:

1. HDPE Liner:

   The light colored HDPE embedment sheeting shall be mechanically bonded to the concrete by integral studs. The liner shall be cast in place by the precast manufacturer and the CONTRACTOR shall field weld the joints. Minimum thickness of liner is 80 mils. All inserts and sleeves for piping shall be in accordance with the liner manufacturer's recommendations and shall result in complete coverage of all pre-cast sections and be capable of passing a spark test.

2. Coatings:

   Coatings shall be light in color. The receiving surface shall be prepared using a wet or dry sand blasting surface preparation process in accordance with the

manufacturer's recommendations. Coatings shall be applied in accordance with the manufacturer's recommendations. All coatings shall be selected in accordance with the appropriate "Approved Materials Checklist".

M. Encapsulation:

1. Where a structure is subject to a high ground water condition, is within the boundaries of a storm water management facility, or is subject to flooding, the cone, grade rings, joints, and iron frame shall be encapsulated with a heat shrink-wrap with a minimum final thickness of 100 mils unless otherwise approved by Polk County. The wrap shall have a cross-linked polyolefin backing coated with a protective heat activated adhesive. The wrap shall effectively bond to the substrate in order to provide corrosion and moisture protection. The PLANS shall specifically identify each structure that is designated to receive encapsulation.

N. Castings:

1. Gray iron castings for manhole frames, covers, adjustment rings and other items shall conform to the ASTM A 48, Class 30B. Castings shall be true to pattern in form and dimensions and free of pouring faults and other defects which would impair their strength or otherwise make them unfit for the service intended. The seating surfaces between frames and covers shall be machined to fit true. No plugging or filling will be allowed. Lifting or "pick" holes shall be provided, but shall not penetrate the cover. Casting patterns shall conform to those shown or indicated on the STANDARD DRAWINGS. All manhole frames and covers shall be traffic bearing to meet AASHTO H-20 loadings. Frames shall be suitable for the future addition of a cast iron ring for upward adjustment of top elevation.

O. Precast Concrete Manhole Installation:

1. Bedding, excavation, and backfill shall be in accordance with the Section entitled "Excavations, Backfill, Compaction, and Grading Specifications".

2. Placing Pre-Cast Sections:

a. The pre-cast base section shall be carefully placed on the prepared bedding so as to be fully and uniformly supported, in true alignment, and ensure that all pipes entering the structure shall be inserted to the proper grade.

b. Pre-cast manhole sections shall be handled by lift rings or non-penetrating lift holes. Such holes shall be filled with non-shrink grout after installation of the manhole and coated. Lifting of manhole sections shall be as per manufacturer's recommendation.

c. Sections shall be uniformly supported by the base structure, and shall not bear

directly on any of the pipes. Influent and effluent pipes shall be properly installed so as to form an integral watertight unit.

d. Sections shall be placed and aligned to provide vertical alignment with a 1/4-inch maximum tolerance per five feet of depth.

e. The completed manhole shall be rigid, true to dimensions, and watertight.

3. Placing Castings:

a. Casting shall be fully bedded in mortar with adjustment courses placed between the frame and manhole. Bricks shall be a minimum two and maximum four courses. Mortar shall conform to ASTM C 270, type M and the bricks shall be clay and conform to ASTM C 216, grade SW, size 3-1/2 inches wide by 8 inches long by 2-1/4 inches high. Adjustment by other approved materials shall be equal to a minimum of 4-1/2 inches and a maximum of 9 inches.

b. Top of manhole castings located in pavement, shouldered areas, and sidewalks shall be set flush with grade. Top of manhole castings located outside these areas shall be placed in accordance with the STANDARD DRAWINGS.

4. Channels:

Manhole flow channels shall be constructed with smooth and carefully shaped bottoms, built up sides and benching using cement and brick with no voids. Channels shall conform to the dimension of the adjacent pipe and provide changes in size, grade and alignment evenly. Cement shall be Portland Cement Type II only.

5. Pipe Connections:

Special care shall be taken to ensure that the openings through which pipes enter the structure are provided with watertight connections. Pipe connections shall conform to ASTM C 923, "Standard Specifications for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals".

P. Cleaning:

1. Newly constructed manholes shall be cleaned of any accumulation of silt, debris, or foreign matter of any kind and shall be free from such accumulations at the time of final inspection.

Q. Inspection for Acceptance:

1. The quality of materials, the process of manufacture and the finished sections shall be subject to inspection and approval by PCU. Such inspection may be made at the

place of manufacture, at the site after delivery or at both places and the sections shall be subject to rejection at any time due to failure to meet any of the specification requirements; even though sample sections may have been accepted as satisfactory at the place of manufacture. Sections rejected after delivery to the job shall be marked for identification and shall be removed from the job at once. Sections that have been damaged after delivery will be rejected and if already installed will be removed and replaced entirely at the CONTRACTOR's expense.

2. At the time of inspection, the sections will be carefully examined for compliance with the specified ASTM designation and with the approved manufacturer's drawings. Sections shall be inspected for general appearance, dimension, "scratch-strength" blisters, cracks, roughness, soundness, etc. The surface shall be dense and close-textured.

3. Manholes shall be inspected by PCU and defective manholes replaced by the CONTRACTOR. Pressure grouting of manholes for repair shall not be accepted.

PART 6 - SERVICE LATERAL CONNECTIONS

A. Service connections shall be as shown in the STANDARD DRAWINGS.

B. Service connections shall be permanently marked by cutting an "S" in the curb in direct alignment with the wye and the installation of a stake at the temporary plug to indicate the location of the service pipe as per the STANDARD DRAWINGS.

C. Size and Length:

Service laterals and fittings shall be a minimum of four inches in diameter for single services and six inches in diameter for double services. Service laterals shall be laid perpendicular to the receiving main, except in cul-de-sacs where service laterals may be connected to an upstream terminal manhole. Service laterals shall not exceed 150 feet. Service laterals shall terminate with a temporary plug at the right-of-way with individual cleanouts installed by the building's plumber in accordance with the STANDARD DRAWINGS.

D. Slope:

Service laterals shall have a minimum slope of one percent.

E. If a floor slab elevation is lower than the closest manhole top elevation, then a private prefabricated pump station with a check valve (for each occurrence) shall be required to pump wastewater to the lateral at the cleanout in the road right-of-way. The private pump station shall be operated and maintained by the property OWNER.

F. Connection:

Service laterals shall not be directly connected to sanitary manholes, except at terminal manholes. A maximum of three service laterals maybe connected directly to a terminal manhole. Incoming flows shall not be more than 90 degrees to the flow path in the manhole.

PART 7 - GREASE TRAPS, INTERCEPTORS, AND SEPARATORS

A. Grease interceptors shall be required for all commercial establishments where food will be processed or cooked in any way. The grease interceptor will be sized as defined below and will have a minimum volume of 750 gallons. All kitchen waste lines will be routed through the grease interceptor. However, no domestic waste will be allowed to enter the grease interceptor. All wastewater flow from the kitchen areas of these establishments shall flow through approved grease interceptors prior to entering the PCU system. In some cases, a grinder may be required for meat and fish processing plants.

B. Grease interceptors shall be located outside of buildings.

C. Sizing:

Refer to Table 510-4 for sizing requirements.

D. Grease interceptors shall be placed where the proposed food waste line will have adequate slope and be accessible for maintenance and inspection at all times.

E. Under-the-Counter Grease Traps:

1. Where location of an outside grease interceptor is determined not feasible by PCU, PCU may approve an under-the-counter grease trap on a case-by-case basis. A commercial establishment where food will be processed or handled will only be considered for an under-the-counter grease trap if it meets all of the following criteria:

    a. The building must be in existence at the time the under-the-counter grease trap is being proposed;

    b. The restaurant or food preparation establishment must have less than 600 gpd of wastewater flow;

    c. An under-the-counter grease trap must be installed on all drain fixtures in the food preparation areas; and

    d. ENGINEER shall consult with PCU personnel before finalizing the design.

Table 510-4. Sizing Requirements for Grease Traps, Interceptors, and Separators.

Type	Unit	Grease Interceptor/ Trap Capacity Single (gallons)	Grease Interceptor/ Trap Capacity In Series (gallons)	Grease, Oil, or Sand Separator Capacity (gallons)	Lint & Sand Separator Capacity (gallons)
Restaurant	seat	20	10		
Restaurant – Fast Food	seat	10	5		
Restaurant – 24-hour	seat	30	15		
Convention Center/ Manufacturing Cafeteria	meal	3	1.5		
Vehicle Repair, Maintenance, or Equipment Wash Facility	bay			200*	
Facility Using Commercial-Type Laundry Machines	machine				100*

* Minimum volume of 750 gallons.

PART 8 - SERVICE LOCATION AND IDENTIFICATION

A. The location of all service lines shall be as shown on the STANDARD DRAWINGS. On curbed streets, the exact location of each service shall be adequately and permanently identified using durable plastic green colored pavement markers that states “Wastewater Service” and “Call Before You Dig” as specified by the appropriate “Approved Materials Checklist”. Each marker shall be securely attached to the curb in accordance with the manufacturer’s guidelines approximately 6 inches from the top of the curb.

B. Where no curb exists, the exact location of each service shall be adequately and permanently identified using durable plastic green colored pavement markers that states “Wastewater Service” and “Call Before You Dig” as specified by the appropriate “Approved Materials Checklist”. Each marker shall be securely attached to the pavement in accordance with the manufacturer’s guidelines approximately 6 inches from the edge of pavement.

CHAPTER 5 WASTEWATER Section 510

Gravity Wastewater System Standards and Specifications

PART 1 - GENERAL

A. PCU will not approve PLANS for combined wastewater gravity systems. Gravity mains shall be designed to exclude infiltration/inflow.

B. Wastewater gravity system shall be designed for the estimated ultimate tributary population, as delineated in the approved PCU's MASTER PLAN (latest edition). When the DEVELOPER's MASTER PLAN is required, wastewater gravity mains shall be designed for the estimated ultimate build out of that DEVELOPMENT, as approved by PCU

PART 2 - LOCATION

A. Mains shall be located within dedicated public rights-of-way or Polk County Utilities Easements.

1. Public Rights-of-Way

When installed in rights-of-way, mains shall maintain a consistent alignment with respect to the centerline of the road. In all cases, mains shall be installed along one side of the road with crossings kept to a minimum.

2. Polk County Utilities Easements

If a main is to be constructed within an easement, the centerline of the pipe shall be located along the centerline of the easement.

a. When not adjacent to County or State rights of way, a minimum width of 20 feet shall be provided for mains with inverts located up to 5 feet below finish grade. For mains with inverts located deeper than 5 feet below finish grade, the minimum width shall be twice the invert depth of the main plus 10 feet. All widths shall be rounded up to the nearest even foot. Width of the easement shall be based on the deepest invert depth of each segment of the subject main.

b. Where multiple parallel mains are to be placed within a single easement, the FDEP required horizontal separation distance between the mains shall be added to the above minimum single main easement width and rounded up to the nearest even foot.

c. Have a maximum length of 150 linear feet if the easement terminates in a dead end or an obstruction. Longer easements may be authorized if adequate turnaround and work zone is provided as based on an AASHTO single unit vehicle. All locations and lengths of easements shall take in consideration the safety and accessibility of PCU vehicles and personnel.

d. Be free of any permanent structures, such as footers, foundations, walls, screen walls, buildings, air conditioner pads, transformer pads, sign supports, roof overhangs, stormwater structure, swimming pools, storage sheds, patios, etc.

e. Be accessible at all times and not subject to standing water nor under the side slope or bottom of a lake, pond or stormwater retention area, except that perpendicular crossings under swales, small ditches and canals may be authorized in writing by PCU.

f. As designated by PCU for existing use, a Polk County Utilities Easement of not less than 15 feet in width shall be provided parallel to and directly adjacent to all County, State, and Federal rights-of-way. Notwithstanding PCU's easement requirements stated above and herein, easements in typical subdivision construction including those adjacent to internal subdivision roads shall be sized and conveyed in accordance with the LAND DEVELOPMENT CODE. The ultimate width of easements may be based on the number, type, size and depth of the utility lines within the easement.

g. Landscape buffers may be allowed to co-exist with Polk County Utilities Easements as long as landscape berms are not utilized. Should PCU disturb or damage any landscaping or other installed improvements within the easement, PCU shall initiate repairs or install replacements in a timely manner at no cost to the property owner.

h. A triangular corner clip type of Polk County Utilities Easement, that has 20 foot long sides, shall be provided at all intersections of County, State, and Federal rights-of-way.

B. Mains within easements shall not be placed under septic tanks, storm water management facilities, buildings, retention ponds, athletic courts, swimming pools, fountains, patios, or other structures. Privacy walls and foundations shall not be placed parallel over mains or within the structure's zone of influence as based on a soil angle of repose of 45 degrees. Mains shall not be located along interior side or rear lot lines, unless approved in writing by PCU. Placement of mains along storm water retention pond berms may be allowed by PCU on a case by case basis when placed in a casing and if such a configuration results in efficient placement and utilization of the system. Service laterals, clean-outs, and other main related improvements shall not be placed along interior side or rear lot lines.

C. Mains may be accepted for maintenance if the private streets are designed with a urban design cross section in accordance with the LAND DEVELOPMENT CODE. Polk County Utilities Easements shall be dedicated over the entire private street rights-of-way. In addition, sufficient area must be available outside of paved areas to maintain PCU mains.

D. Offsite mains for all developments shall be extended along the entire frontage of each development. The minimum size of the main to be extended by the DEVELOPER shall be the same size that is the minimum main size required to serve the development. In the event that PCU desires to upsize the main, PCU shall reimburse the DEVELOPER in accordance with the provisions of the Utilities Code.

E. Mains with inverts located up to 4 feet below finish grade shall not be located closer than 10 feet from any structure that requires a Certificate of Occupancy. For mains with inverts located deeper than 4 feet below finish grade, the minimum distance of 10 feet shall be increased by one foot for each one foot of increased depth of the main's invert. All horizontal distances shall be rounded up to the nearest whole foot.

F. Unless specifically determined by PCU to be of benefit to its overall system, gravity wastewater infrastructure installed within a non-residential or multi-residential development shall not be subject to ownership, maintenance, or operation by PCU.

PART 3 - DESIGN BASIS

A. Average Daily Flow:

The gravity main design shall be based on ultimate development or projected flow. Average daily wastewater flow shall be calculated by the Equivalent Residential Connections (ERC) flow factors as outlined in the "Utilities Administration Manual".

B. Peak Design Flow:

1. Gravity mains shall be designed on the basis of ultimate development maximum rates of flow, which shall be the product of selected peak factors multiplied by the accumulative average daily flow as calculated above. The minimum peaking factor, provided in Table 510-1 shall be applicable for the range of average daily flow rates.

Table 510-1. Wastewater Peaking Factors.

Minimum Flow Range (gpd)	**Peak Factor**
Flows up to 100,000	4.0
100,001 to 250,000	3.5
250.000 to 500,000	3.2
500,000 to 1,000,000	3.0
Flows greater than 1,000,000	2.5

C. Design Calculations:

DEVELOPER's ENGINEER shall submit signed, sealed and dated design calculations with the PLANS for all sewer projects. Calculations shall show that gravity mains will have sufficient hydraulic capacity to transport all design flows.

PART 4 - DESIGN AND CONSTRUCTION

A. Minimum Size:

Gravity mains conveying wastewater shall be eight inches in diameter or greater.

B. Pipe Cover:

The minimum cover over gravity mains shall be no less than 36 inches below the finished grade unless approved otherwise by PCU. Gravity main invert depths shall not exceed 20 feet below finished grade. System design shall minimize pipe invert depths and the number of utility conflicts.

C. Slope:

1. Gravity mains shall be designed and constructed to provide minimum velocities, when flowing full, of no less than two feet per second, based on Manning's formula using an "n" value of 0.013. The minimum slopes as shown in Table 510-2 shall be provided; however, slopes greater than these are desirable.

2. Gravity mains shall have uniform slope between manholes.

Table 510-2. Minimum Design Slope Requirements of Gravity Mains.

Gravity Main Diameter (inches)	Percent Slope (%)
8	0.400
10	0.280
12	0.220
15	0.150
18	0.120
21	0.100

24	0.080
27	0.067
30	0.058
36	0.046
42	0.037

D. Size and Alignments:

Pipe size shall remain constant between manholes and pipe alignment must remain straight between manholes.

E. Additional Requirements:

Storm-water management and drain systems, air conditioner and refrigeration condensation lines, and water-to-water air conditioner lines shall not connect to the gravity main system. All gravity main extensions for future connections shall terminate at a manhole.

PART 5 - MANHOLES

A. Location:

Manholes shall be installed at the end of each gravity main, at all changes in grade, size, or alignment, at all gravity main intersections, and at distances not greater than 400 feet. Private gravity main systems eight inches or larger shall be separated from the PCU gravity main system by a manhole located within and adjacent to the right-of-way line.

B. Type:

1. Standard Manhole:

Where the difference in elevation between the incoming gravity main invert and the manhole invert is less than 24 inches, the manhole invert shall be filleted to prevent solids deposition. All standards manholes shall be coated in accordance with the appropriate “Approved Materials Checklist”.

2. Drop Manhole:

An interior drop pipe shall be provided for wastewater gravity main entering a manhole where the invert elevation is 24 inches or more above the manhole invert.

All drop manholes shall be lined or coated in accordance with the appropriate "Approved Materials Checklist".

3. Master Manhole:

All gravity and force mains shall discharge their flows into a master manhole prior to the wet well of a wastewater lift station. Force mains intersecting gravity main systems shall discharge into a master manhole at a maximum angle of 45 degrees to the flow path in the manhole. All master manholes shall be lined or coated and have a minimum interior diameter in accordance with Table 510-3.

C. Personnel Access Opening:

Manhole covers and frames shall provide a 24 inch minimum access clearance through the frame opening.

D. Diameter:

Manholes shall have minimum interior diameters from the structure's base to the bottom of the top conical section as based on the main diameter in accordance with Table 510-3.

Table 510-3. Minimum Manhole Diameters.

Gravity Main Diameter (inches)	Minimum Inside Manhole Diameter (inches)
8 to 24	48 (60 for Master Manholes)
24 to 36	60
36 and larger	72

E. Flow Channel:

The flow channel through manholes shall be made to conform in shape and slope to that of the gravity mains. Flow direction changes in excess of 90 degrees shall not be included in gravity main alignments without written permission from PCU. Flow line elevation drop of 0.1 feet across manholes shall be provided. Benching shall have a minimum downward slope of 1/2 inch per foot from the wall of the manhole towards the rim of the flow channel. No bricks shall be used to construct channels.

F. Materials:

1. Manholes shall be constructed of precast units as specified in this Section. Brick or

cast-in-place manholes may be permitted on a case by case basis for retrofitting or repair purposes as approved by PCU.

2. Wastewater pipes, valves, and appurtenances shall be constructed of materials as specified in the Section entitled "Wastewater Pipes, Valves, and Appurtenances Specifications".

G. Castings:

All manhole frame and cover sets shall be in accordance with the STANDARD DRAWINGS and the appropriate "Approved Materials Checklist." Manholes that have 5 foot and larger inside diameters shall be provided with two piece covers in accordance with the STANDARD DRAWINGS. Bolt down covers shall be provided where manholes are located in areas outside of improved right-of-way and subject to ponding or flooding.

H. Vehicular Access:

A 12-foot wide access road shall be provided for all manholes that are located outside of State, COUNTY, or local roadways. The access road shall have a sub-base that is stabilized to a Florida Bearing value of 75 psi, and a base that is compacted to 98 percent of AASHTO T-180.

I. Coating or Lining:

A special coating or liner shall be provided for master manholes, drop manholes or any manhole that directly receives a discharge from a force main, as a minimum. A standard coating is required for other manholes. All coatings and liners shall be in accordance with the appropriate "Approved Materials Checklist".

J. Manhole Inserts:

All manhole cover and ring assemblies shall be furnished and installed complete with an insert. The purpose of the insert is to prevent intrusion of storm water, dirt, debris, and to help control emission of odors.

The manhole insert shall be manufactured from corrosion-proof material, such as HDPE, polypropylene, or stainless steel, suitable for atmospheres containing hydrogen sulfide and diluted sulfuric acid and other gases associated with wastewater collection systems. The minimum continuous uniform thickness of a polymer based insert, including all angles, shall be 1/8 inch.

The body of the HPDE insert shall be made of high density polyethylene co-polymer material that meets ASTM D1248, Class A, Category 5, Type 111, and have a minimum impact brittleness temperature of – 180º F. As a minimum, the material

used in the manufacture of the body of the stainless steel insert shall be 16 gage Type 304 stainless steel.

The insert shall be manufactured to the dimensions of the manhole opening to allow easy installation within the manhole frame. The manhole insert shall be manufactured to fit the manhole frame rim upon which the manhole cover rests.

The gasket shall be made of closed cell neoprene. The gasket shall have a pressure sensitive adhesive on one side and be placed under the weight-bearing surface of the insert by the manufacturer. The adhesive shall be compatible with the insert material so as to form a long-lasting bond in either wet or dry conditions.

A lift strap shall be attached to the rising edge of the bowl insert. The lift strap shall be made of 1" wide woven polypropylene web and shall be seared on all cut ends to prevent unraveling. The lift strap shall be attached to the insert by means of a stainless steel rivet. Location of the strap shall provide easy visual location.

Ventilation of the insert shall be by means of a vent hole located on the side wall of the dish ¾" below the lip. The hole thus placed allows a maximum release of 10 gallons per 24 hours and is not affected by debris that might collect in the bottom of the bowl.

The insert shall have proof of durability in traffic impact loads and shall have engineer certified proof of test passing a collapse load of 2200 pounds minimum applied to a 5.5" square area in the center of the insert.

The manhole frame shall be cleaned of all dirt and debris before placing the manhole insert on the rim. The manhole insert shall be fully seated around the manhole frame rim to retard water from seeping between the cover and the manhole frame rim.

K. Pre-Cast Concrete Sections:

1. Pre-cast manholes shall conform to specifications for ASTM C 478 "Pre-cast Reinforced Concrete Manhole Sections", except as otherwise specified below.

2. The minimum wall thickness shall be five inches. Pre-cast manholes shall be constructed with a pre-cast monolithic base structure as shown on the STANDARD DRAWINGS. The minimum base thickness shall be eight inches.

3. Concrete for manholes shall be Type II, 4000 psi at 28 days. Barrel, top and base sections shall have tongue and groove joints. All jointing material shall be a cold adhesive preformed plastic gasket, conforming to ASTM C 443 "Manhole Section Connections". Manholes shall be leak-free.

4. Sections shall be cured by an approved method as per ASTM C 478 for at least 28

days prior to coating and shall not be shipped until at least two days after having been coated.

5. Concrete surfaces shall have form oil, curing compounds, dust, dirt and other interfering materials removed by brush sand blasting and shall be fully cured prior to the application of any coatings.

6. The date of manufacture and the name or trademark of the manufacturer shall be clearly marked on each pre-cast section after coating on exterior surface.

7. Pre-cast concrete top slabs shall be used where cover over the top of the pipe is less than four feet.

8. Lift rings or non-penetrating lift holes shall be provided for handling pre-cast manhole sections.

9. With the exception of master manholes, drop manholes or manholes that have force mains directly discharging into them, the interior surfaces of all manholes shall have a protective bituminous epoxy or epoxy coating formulated to resist corrosion from a wastewater environment. The interior surfaces of master manholes, drop manholes, or manholes that have force mains directly discharging into them shall have a protective cementitious, polymer, high build epoxy, or elastomer based coating or lining in accordance with the appropriate "Approved Materials Checklist". All exterior surfaces of all manholes shall have a protective bituminous epoxy or epoxy coating capable of sealing out moisture. Coatings or liners shall be as specified in the appropriate "Approved Materials Checklist" and applied in strict accordance with the coating or liner manufacturer's recommendations. All coatings and liners shall a minimum of a one year manufacturer's warranty from the date of installation.

L. Liners and Coatings:

1. HDPE Liner:

   The light colored HDPE embedment sheeting shall be mechanically bonded to the concrete by integral studs. The liner shall be cast in place by the precast manufacturer and the CONTRACTOR shall field weld the joints. Minimum thickness of liner is 80 mils. All inserts and sleeves for piping shall be in accordance with the liner manufacturer's recommendations and shall result in complete coverage of all pre-cast sections and be capable of passing a spark test.

2. Coatings:

   Coatings shall be light in color. The receiving surface shall be prepared using a wet or dry sand blasting surface preparation process in accordance with the

manufacturer's recommendations. Coatings shall be applied in accordance with the manufacturer's recommendations. All coatings shall be selected in accordance with the appropriate "Approved Materials Checklist".

M. Encapsulation:

1. Where a structure is subject to a high ground water condition, is within the boundaries of a storm water management facility, or is subject to flooding, the cone, grade rings, joints, and iron frame shall be encapsulated with a heat shrink-wrap with a minimum final thickness of 100 mils unless otherwise approved by Polk County. The wrap shall have a cross-linked polyolefin backing coated with a protective heat activated adhesive. The wrap shall effectively bond to the substrate in order to provide corrosion and moisture protection. The PLANS shall specifically identify each structure that is designated to receive encapsulation.

N. Castings:

1. Gray iron castings for manhole frames, covers, adjustment rings and other items shall conform to the ASTM A 48, Class 30B. Castings shall be true to pattern in form and dimensions and free of pouring faults and other defects which would impair their strength or otherwise make them unfit for the service intended. The seating surfaces between frames and covers shall be machined to fit true. No plugging or filling will be allowed. Lifting or "pick" holes shall be provided, but shall not penetrate the cover. Casting patterns shall conform to those shown or indicated on the STANDARD DRAWINGS. All manhole frames and covers shall be traffic bearing to meet AASHTO H-20 loadings. Frames shall be suitable for the future addition of a cast iron ring for upward adjustment of top elevation.

O. Precast Concrete Manhole Installation:

1. Bedding, excavation, and backfill shall be in accordance with the Section entitled "Excavations, Backfill, Compaction, and Grading Specifications".

2. Placing Pre-Cast Sections:

a. The pre-cast base section shall be carefully placed on the prepared bedding so as to be fully and uniformly supported, in true alignment, and ensure that all pipes entering the structure shall be inserted to the proper grade.

b. Pre-cast manhole sections shall be handled by lift rings or non-penetrating lift holes. Such holes shall be filled with non-shrink grout after installation of the manhole and coated. Lifting of manhole sections shall be as per manufacturer's recommendation.

c. Sections shall be uniformly supported by the base structure, and shall not bear

directly on any of the pipes. Influent and effluent pipes shall be properly installed so as to form an integral watertight unit.

d. Sections shall be placed and aligned to provide vertical alignment with a 1/4-inch maximum tolerance per five feet of depth.

e. The completed manhole shall be rigid, true to dimensions, and watertight.

3. Placing Castings:

a. Casting shall be fully bedded in mortar with adjustment courses placed between the frame and manhole. Bricks shall be a minimum two and maximum four courses. Mortar shall conform to ASTM C 270, type M and the bricks shall be clay and conform to ASTM C 216, grade SW, size 3-1/2 inches wide by 8 inches long by 2-1/4 inches high. Adjustment by other approved materials shall be equal to a minimum of 4-1/2 inches and a maximum of 9 inches.

b. Top of manhole castings located in pavement, shouldered areas, and sidewalks shall be set flush with grade. Top of manhole castings located outside these areas shall be placed in accordance with the STANDARD DRAWINGS.

4. Channels:

Manhole flow channels shall be constructed with smooth and carefully shaped bottoms, built up sides and benching using cement and brick with no voids. Channels shall conform to the dimension of the adjacent pipe and provide changes in size, grade and alignment evenly. Cement shall be Portland Cement Type II only.

5. Pipe Connections:

Special care shall be taken to ensure that the openings through which pipes enter the structure are provided with watertight connections. Pipe connections shall conform to ASTM C 923, "Standard Specifications for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals".

P. Cleaning:

1. Newly constructed manholes shall be cleaned of any accumulation of silt, debris, or foreign matter of any kind and shall be free from such accumulations at the time of final inspection.

Q. Inspection for Acceptance:

1. The quality of materials, the process of manufacture and the finished sections shall be subject to inspection and approval by PCU. Such inspection may be made at the

place of manufacture, at the site after delivery or at both places and the sections shall be subject to rejection at any time due to failure to meet any of the specification requirements; even though sample sections may have been accepted as satisfactory at the place of manufacture. Sections rejected after delivery to the job shall be marked for identification and shall be removed from the job at once. Sections that have been damaged after delivery will be rejected and if already installed, removed and replaced, entirely at the CONTRACTOR's expense.

2. At the time of inspection, the sections will be carefully examined for compliance with the specified ASTM designation and with the approved manufacturer's drawings. Sections shall be inspected for general appearance, dimension, "scratch-strength" blisters, cracks, roughness, soundness, etc. The surface shall be dense and close-textured.

3. Manholes shall be inspected by PCU and defective manholes replaced by the CONTRACTOR. Pressure grouting of manholes for repair shall not be accepted.

PART 6 - SERVICE LATERAL CONNECTIONS

A. Service connections shall be as shown in the STANDARD DRAWINGS.

B. Service connections shall be permanently marked by cutting an "S" in the curb in direct alignment with the wye and the installation of a stake at the temporary plug to indicate the location of the service pipe as per the STANDARD DRAWINGS.

C. Size and Length:

Service laterals and fittings shall be a minimum of four inches in diameter for single services and six inches in diameter for double services. Service laterals shall be laid perpendicular to the receiving main, except in cul-de-sacs where service laterals may be connected to an upstream terminal manhole. Service laterals shall not exceed 150 feet. Service laterals shall terminate with a temporary plug at the right-of-way with individual cleanouts installed by the building's plumber in accordance with the STANDARD DRAWINGS.

D. Slope:

Service laterals shall have a minimum slope of one percent.

E. If a floor slab elevation is lower than the closest manhole top elevation, then a private prefabricated pump station with a check valve (for each occurrence) shall be required to pump wastewater to the lateral at the cleanout in the road right-of-way. The private pump station shall be operated and maintained by the property OWNER.

F. Connection:

Service laterals shall not be directly connected to sanitary manholes, except at terminal manholes. A maximum of three service laterals maybe connected directly to a terminal manhole. Incoming flows shall not be more than 90 degrees to the flow path in the manhole.

PART 7 - GREASE TRAPS, INTERCEPTORS, AND SEPARATORS

A. Grease interceptors shall be required for all commercial establishments where food will be processed or cooked in any way. The grease interceptor will be sized as defined below and will have a minimum volume of 750 gallons. All kitchen waste lines will be routed through the grease interceptor. However, no domestic waste will be allowed to enter the grease interceptor. All wastewater flow from the kitchen areas of these establishments shall flow through approved grease interceptors prior to entering the PCU system. In some cases, a grinder may be required for meat and fish processing plants.

B. Grease interceptors shall be located outside of buildings where the proposed food waste line will have adequate slope and be accessible for maintenance and inspection at all times.

C. Sizing:

Refer to Table 510-4 for sizing requirements.

D. Grease interceptors shall be placed where the proposed food waste line will have adequate slope and be accessible for maintenance and inspection at all times.

E. Under-the-Counter Grease Traps:

1. Where location of an outside grease interceptor is determined not feasible by PCU, PCU may approve an under-the-counter grease trap on a case-by-case basis. A commercial establishment where food will be processed or handled will only be considered for an under-the-counter grease trap if it meets all of the following criteria:

    a. The building must be in existence at the time the under-the-counter grease trap is being proposed;

    b. The restaurant or food preparation establishment must have less than 600 gpd of wastewater flow;

    c. An under-the-counter grease trap must be installed on all drain fixtures in the food preparation areas; and

d. ENGINEER shall consult with PCU personnel before finalizing the design.

2. Refer to the following calculation to determine minimum grease trap sizing (flow through rating) requirements:

Minimum Grease Trap Capacity (GPM) = [Combined Sink*Storage Volume (*units in gallons*)]1 x 0.75

**Include all hand sinks and food/beverage prep sink interior bowl/basin volumes, but do not include the mop sink basin volume or floor drain flows in this calculation.

F. Lint Inteceptors/Traps: Lint interceptors/traps are required for all commercial laundry operations, laundry mats, hotels, and resorts having more than two residential sized laundry machines or one or more commercial laundry machine. Lint interceptrors/traps must be a minimum of 100 gallons in size, removable for cleaning, prevent passage into the drainage system of solids 0.5 inch or larger in size as well as, string, rags, buttons, or other materials detrimental to the public sewer system. Lint traps shall be sized based on number of washing machines, wastewater flow rate, wastewater retention time and storage factor. Refer to the following calculation to determine minimum lint interceptor/trap sizing requirements:

Minimum Lint Interceptor/Trap Size (in gallons) = (TGC)x(CPH)x(RT)x(ST)

Where:

TGC = Total gallons per standard wash cycle

CPH = Cycles per hour

RT = Retention time;

2.5 for institutional laundry

2.0 for standard commercial laundry

1.5 light commercial laundry

ST = Storage factor, based on hours of operation;

1.0 for 8 hours of operation

1.5 for 12 or more hours of operation

G. Oil and Water Separators:

1. Oil and water separators are required for all facilities where commercial vehicles or equipment are repaired, maintained or washed, including vehicle repair garages, car-washing facilities, factories, and all other facilities where

oily liquid wastes are produced.

2. Oil and water separators shall be individually designed and sized for each site- specific application but shall have a depth of no less than two feet below the invert of the discharge drain. The outlet opening of the separator shall have no less than an 18-inch water seal.

3. Where automobiles are serviced, greased, repaired or washed or where gasoline is dispensed, oil and water separators shall have a minimum capacity of 6 cubic feet for the first 100 square feet of area to be drained, plus 1 cubic foot for each additional 100 square feet of area to be drained into the separator.

4. All commercial vehicle-washing systems shall be equipped with a water recycling system that has no connection to the county sanitary sewer system. For the purposes of this Section, commercial vehicle washing systems shall include systems associated with businesses that sell or lease cars, trucks, boats, and other motorized vehicles. Hand-held hoses are exempt from this provision.

H. Sand and grit separators/traps: Sand and grit separators/traps are required for all commercial facilities discharging fine particles, floatables, or other debris that could cause clogs or blockages in the county collection system. Examples include sand, dust, metal shavings, rags, strings, feathers, glass, etc.. Sand and grit separators shall be individually designed and sized for each site-specific application and include ready access for cleaning and shall have a water seal of no less than six inches.

Table 510-4. Sizing Requirements for Grease Traps, Interceptors, and Separators.

Type	Unit	Grease Interceptor/ Trap Capacity Single (gallons)*	Grease Interceptor/ Trap Capacity In Series (gallons)*	Oil and Water Separator Capacity (gallons), minimum	Lint Interceptor/ Trap Capacity (gallons), minimum
Restaurant	seat	20	10		
Restaurant – Fast Food	seat	10	5		
Restaurant – 24-hour	seat	30	15		
Convention Center/	meal	3	1.5		

Manufacturing Cafeteria					
Vehicle Repair, Maintenance, or Equipment Wash Facility	bay			200*	
Facility Using Commercial-Type Laundry Machines	machine				100

* Minimum volume of 750 gallons.

PART 8 - SERVICE LOCATION AND IDENTIFICATION

A. The location of all service lines shall be as shown on the STANDARD DRAWINGS. On curbed streets, the exact location of each service shall be adequately and permanently identified using durable plastic green colored pavement markers that states “Wastewater Service” and “Call Before You Dig” as specified by the appropriate “Approved Materials Checklist”. Each marker shall be securely attached to the curb in accordance with the manufacturer’s guidelines approximately 6 inches from the top of the curb.

B. Where no curb exists, the exact location of each service shall be adequately and permanently identified using durable plastic green colored pavement markers that states “Wastewater Service” and “Call Before You Dig” as specified by the appropriate “Approved Materials Checklist”. Each marker shall be securely attached to the pavement in accordance with the manufacturer’s guidelines approximately 6 inches from the edge of pavement.

CHAPTER 5 WASTEWATER Section 511

Wastewater Force Main Standards

PART 1 - GENERAL

A. Force main systems shall be designed for the estimated tributary population, as delineated in the approved PCU's MASTER PLAN (latest edition) for the subject RUSA. When DEVELOPER's wastewater MASTER PLANs are required, force mains shall be designed for the estimated ultimate build out, as approved by PCU.

PART 2 – LOCATION

A. Refer to "Gravity Wastewater System Standards and Specifications".

PART 3 – DESIGN BASIS

A. Average Daily Flow and Peak Flows:

Average daily wastewater flow shall be calculated by referencing the equivalent residential unit flow factors as outlined in the "Utilities Administration Manual". Peak hourly wastewater flow rates shall be calculated by referencing the minimum peaking factors as specified in the Section entitled "Gravity Wastewater System Standards and Specifications".

B. Design Calculations:

The ENGINEER shall submit signed, sealed, and dated design calculations along with a compact disc copy of the SewerCad based model with the PLANS for all PCU projects. Calculations shall show that the mains will have sufficient hydraulic capacity for peak hourly flows while meeting the requirements of this Section. Minor head losses shall be incorporated in the calculations.

PART 4 - DESIGN

A. Pipe Cover:

A minimum cover of 36 inches shall be provided.

B. Velocity and Diameter:

At design pumping rates, a cleansing velocity of at least 2.0 feet per second shall be maintained. Polk County reserves the right to require velocities > 2.0 ft/sec in applications deemed appropriate. Maximum velocity at design pumping rates should not exceed six feet per second. The minimum force main diameter shall be four inches when connected to a single lift station and is internal of a single development. The ENGINEER shall also provide calculations showing that upsizing the proposed offsite force main has been considered in an effort to downsize the proposed lift station pumps. Only 4, 6, 8, 10, 12, 16, 20, 24, 30, 36, 42, 48, and 54-inch diameter force mains shall be permitted. Variations in main size may be authorized by the COUNTY when

deemed appropriate provided that the existing or proposed level of service is maintained and operational maintenance and responsibility is established to the benefit of the COUNTY. Using the PCU approved hydraulic modeling standards contained within this MANUAL, the ENGINEER shall determine on a case by case basis if it is necessary for all proposed HDPE pipe installations to be increased by one pipe size above all proposed or existing adjacent PVC and Ductile Iron Pipe installations.

C. Design Friction Losses:

Friction losses through mains shall be based on the Hazen-Williams or Darcy-Wiesbach formula. In the use of the Hazen-Williams formula, the value for "C" shall be 130.

D. Design Pressure and Restraint:

1. The main and fittings, including all restrained joint pipe fittings, shall be designed to withstand pump operating pressures and pressure surges, but not less than 150 psi. The restrained joint lengths shall be calculated consistent with the table format shown in the STANDARD DRAWINGS.

2. In the event that it is necessary to locate proposed mains or leave existing mains longitudinally under any part of a proposed roadway subject to regular non-residential traffic or with speed limits above 30 miles per hour, such mains shall have restrained joints.

E. Pigging Ports:

Provision for the installation of permanent access points into and egress points out of the piping system for pigging and cleaning purposes shall be incorporated into 8 inch and larger force mains. Wherever possible, pigging ports shall be located and incorporated within the lift station sites. Permanent and temporary access and egress points shall conform to the STANDARD DRAWINGS.

F. Mains shall be designed with uniform positive or negative slopes to avoid undulations and minimize high points and low points in the profile.

G. Offsite mains for all developments shall be extended along the entire frontage of each development. The minimum size of the main to be extended by the DEVELOPER shall be the same size that is the minimum main size required to serve the development. In the event that PCU desires to upsize the main, PCU shall reimburse the DEVELOPER in accordance with the provisions of the Utilities Code.

F. Mains with inverts located up to 5 feet below finish grade shall not be located closer than 10 feet from any structure that requires a Certificate of Occupancy. For mains with inverts located deeper than 5 feet below finish grade, the minimum distance of 10 feet shall be increased by one foot for each one foot of increased depth of the

main's invert. All horizontal distances shall be rounded up to the nearest whole foot.

G. Unless specifically determined by PCU to be of benefit to its overall system, wastewater force main infrastructure installed within a non-residential or multi-residential development shall not be subject to ownership, maintenance, or operation by PCU.

H. Materials:

1. Force mains shall be constructed of PVC pipe.

2. HDPE may be used in specific applications as specified in this MANUAL or as approved by PCU. Using the PCU approved hydraulic modeling standards contained within this MANUAL, the ENGINEER shall determine on a case by case basis if it is necessary for all proposed HDPE pipe installations to be increased by one pipe size above all proposed or existing adjacent PVC and Ductile Iron Pipe installations.

PART 5 – TERMINATION POINT

A. Force mains shall enter a gravity sewer system a maximum of one foot above the flow line of the receiving master manhole and be orientated no greater than 45 degrees to the flow path in the manhole. The interior surfaces of the receiving master manhole shall have a protective coating or lining. Force mains shall terminate directly into a wastewater master manhole or connect to another force main. Termination into gravity mains is not allowed.

PART 6 – AUTOMATIC AIR RELEASE VALVES

A. Automatic air release valves of appropriate size and number shall be provided to prevent air locking formation. Automatic combination air and vacuum release valves shall be utilized to prevent both air locking and vacuum formation. All such valves are required at the high points of the main or as specified by PCU. Valves shall be clearly delineated on the main profile in the STANDARD DRAWINGS. The ENGINEER shall submit calculations to PCU justifying the valve sizes and numbers as specified by AWWA M-51 "Air Release, Air/Vacuum, and Combination Air Valves".

PART 7 – VALVES

A. Valves shall be located on force main systems to facilitate effective isolation of the pipe system for repairs and maintenance. In accordance with the recommendations issued by valve manufacturers, gate valves shall not be installed on their side when used within a force main system. On straight runs of force mains, valve spacing shall not exceed 2,000 feet. Additional valves shall be provided where force mains intersect to facilitate isolation of pipe segments. Valves shall be installed on private forces and located adjacent to and within public rights-of-way lines or Polk County

Utilities Easement boundary lines in order to isolate private force mains and lift stations from the PCU system in case of the malfunction of such improvements.

PART 8 – FORCE MAIN VALVE LOCATION AND IDENTIFICATION

A. On curbed streets, the exact location of each force main valve shall be adequately and permanently identified using durable plastic green colored pavement markers that states “Force Main Valve” and “Call 811 Before You Dig” as specified by the appropriate “Approved Materials Checklist”. Each marker shall be securely attached to the curb in accordance with the manufacturer’s guidelines approximately 6 inches from the top of the curb.

B. Where no curb exists, the exact location of each force main valve shall be adequately and permanently identified using durable plastic green colored pavement markers that states “Force Main Valve” and “Call 811 Before You Dig” as specified by the appropriate “Approved Materials Checklist”. Each marker shall be securely attached to the pavement in accordance with the manufacturer’s guidelines approximately 6 inches from the edge of pavement.

CHAPTER 5 WASTEWATER Section 512

Wastewater Lift Station Standards and Specifications

PART 1 – GENERAL

A. The design standards outlined in this Section apply to all wastewater lift stations within the jurisdiction of this MANUAL. All stations shall be submersible type stations. The basis of design shall be reviewed and approved by PCU.

B. Lift stations shall be designed for the estimated ultimate tributary population, as delineated in one of the approved PCU MASTER PLANS (latest edition) for the subject RUSA. When a DEVELOPER's master plan is required, lift stations shall be designed for the estimated ultimate build out of that DEVELOPMENT, as approved by PCU.

C. Unless specifically determined by PCU to be of benefit to its overall system, wastewater lift stations installed within a non-residential or multi-residential development shall not be subject to ownership, maintenance, or operation by PCU.

D. Regional lift stations shall have wet wells designed and constructed to serve the lowest developable point on all adjacent vacant tracts of land surrounding a project by means of gravity flow only. The appropriate sized Polk County Utilities Easement(s) shall be provided by the DEVELOPER so that the gravity wastewater mains from all such vacant tracts of land can easily be connected to the wet well of the regional lift station.

E. All lift stations to be dedicated to and operated by PCU shall be of the municipal rated type.

PART 2 – LOCATION

A. With the exception of private lift stations serving single owner properties, all lift stations shall be located on fee simple tracts of land adjacent to rights-of-way and preferably sharing the same general location as storm-water management facilities. Private lift stations shall not be located directly adjacent to public thoroughfares. No part of a lift station, regardless of ownership, shall be located in a roadway median, in the middle of a cul-de-sac, within any portion of a public or private right-of-way, directly in front or behind of an occupied structure on the same side of the roadway, or less than 50 feet perpendicularly from the intersection of two or more rights-of-way. The actual location of all equipment within a lift station site shall be in accordance with the STANDARD DRAWINGS or as approved by PCU.

B. No public or private easement or non-PCU infrastructure of any kind shall be permitted to cross a tract containing a PCU lift station without written approval by PCU. Where conflicts are unavoidable in the opinion of PCU, the depth of the lift station tract shall be extended so that the required minimum dimensioned lift station site is located directly behind and adjacent to the conflicting easement or infrastructure.

C. Permanent and temporary vehicular access to a lift station shall freely accommodate the turning movements of a 40 foot long and 9 foot wide single unit truck vehicle with a 28 foot wheelbase as specified by the Institute of Transportation Engineers. Vehicular backup distance shall not exceed 60 linear feet. A T-shaped turn-around with the appropriate radii and pavement lengths may be considered as part of the access design. The design of the access driveway or roadway shall insure that the ramp break-over angle of a two wheel drive pickup truck with a standard wheelbase is accommodated along its entire length.

D. Driveways to lift stations along low traffic volume two lane residential roadways shall not be less than 23 feet in length from the lift station's gates to the adjacent roadway's edge of pavement or back of curb so as not to totally block both lanes of travel. The driveway length along all other roadways shall not be less than 45 feet so as to accommodate the entire length of the vehicle described above without impeding traffic in any travel lane. Driveway within PCU lift station tract shall be a minimum of 40 feet in length to accommodate the entire length of the vehicle described above within the tract.

PART 3 - DESIGN BASIS

A. Average Daily Flow:

The wastewater lift station design shall be based on ultimate development or projected flow. Average daily wastewater flow shall be calculated by the Equivalent Residential Unit flow factors as outlined in the "Utilities Administration Manual".

B. Peak Design Flow:

The design pumping capability of the station shall be based upon the peak design flow, which shall be calculated by multiplying the design average flow with the applicable minimum peaking factors as outlined in Table 510-1, "Wastewater Peaking Factors".

C. Number of Pumps:

Minimum number of pumps is determined by the peak design flow as shown in Table 512-1 below.

Table 512-1. Required Number of Pumps Based on Peak Design Flow.

Peak Design Flow (gpm)	Number of Pumps
Less than 1,000	2
1,000 to less than 2,500	3
2,500 to less than 4,000	4
4,000 or greater	5

D. Pump and Motor Selection:

The lift station shall be capable of pumping the peak design flow with the largest pumping unit out of service. Pumps shall be capable of meeting all system hydraulic conditions without overloading the motors.

E. Design Calculations:

The ENGINEER shall submit signed, sealed and dated design calculations for all wastewater lift stations. Calculations shall include high head and low head condition system curves plotted on the manufacturer's pump curve, hydraulic analysis of force main system including all friction and minor losses, operating cycles with wet well sizing, and buoyancy calculations. The design basis for all calculations shall provide for 100 percent of all receiving system pumps to be operating at the time that the proposed lift station is to be operating. System curves shall verify that the pumps are operating at peak efficiency in accordance with the manufacturer's specifications and are suitable for the design flow application. Pump and motor selection shall be designed based on the hydraulic grade line at the point of connection as based on PCU's MASTER PLAN model for the regional utility service area affected by the proposed development. Each component of the lift station shall be designed to accommodate the development's design flow at the prevailing system conditions at the time of build out, i.e., utilize impeller change-outs to adjust initial flow and head pressure to meet final conditions, etc.

PART 4 - DESIGN

A. Flooding:

1. When siting the lift station, the ENGINEER shall consider the potential for damage or interruption of operation because of flooding. Lift station structures, electrical equipment, and mechanical equipment shall be designed to be protected from physical damage by a 100-year 24-hour storm event. The bottom of all station

control and electrical boxes shall be no lower than the 100-year 24-hour Flood Elevation. In no case shall the top elevation of the control panel exceed the maximum distance from the lift station's concrete pad that is allowed by the NEC. In such cases, the elevation of the lift station's entire concrete pad shall be raised until the maximum distance allowed by the NEC is achieved.

2. Wastewater lift stations shall remain fully operational and accessible during a 25-year 24-hour storm event. The top elevation of the wet well shall be no lower than the 25-year 24-hour Flood Elevation. On a case-by-case basis, the top elevation of the wet well may be lower if it can be shown that no drainage runoff from the surrounding areas will flow to the lift station site at any time.

3. No occupied structures shall have a floor, which is connected by gravity flow to a PCU wastewater system, with a finish floor elevation below the top elevation of the lift station that serves it. Regulations of local, state and federal agencies regarding flood plains shall be considered.

4. The lift station site design shall insure positive storm water drainage radiates outward from the center of the wet well to the boundaries of the site and away from the lift station site. The access driveway or roadway shall not allow storm water to be conveyed onto the lift station site.

B. Accessibility:

The lift station shall be readily accessible by maintenance vehicles during all weather conditions including a 25-year 24-hour storm event. The lift station driveway shall be concrete onsite while the offsite portion may be either concrete or asphaltic concrete in accordance with the STANDARD DRAWINGS. In a phased development, a temporary 12 foot wide paved asphalt access road (1½ inch thick FDOT SP-9.5 Asphaltic Concrete, 6 inch thick LBR 40 Limerock Base, and 6 inch thick FBV 75 Sub-Base) within the appropriately sized Polk County Utilities Easement, shall be provided by the DEVELOPER and utilized by PCU until the temporary access is replaced with a platted roadway that complies with this MANUAL.

C. Boundary Survey:

A current BOUNDARY SURVEY shall be required at the lift station startup test and inspection. The DEVELOPER shall bear the entire expense of rectifying WORK improperly installed due to the construction of improvements not totally within the fee simple site to be dedicated to PCU. An electronic version and three copies of the certified BOUNDARY SURVEY shall be required.

D. Pump Requirements:

1. Pump rails and base elbows shall be capable of accepting a "Hydromatic" brand

pump by sliding a pump down the rails and accomplish a positive seal to the base elbow with no adapters. When other pump brands are considered as specified in the appropriate "Approved Materials Checklist", they shall be required to be adaptable to the above "Hydromatic" standards. Submersible pumps shall be readily removable and replaceable without dewatering the wet well or disconnecting any piping in the wet well.

2. Pumps shall be capable of handling raw sewage and passing solids of at least three inches in diameter. Pump suction and discharge openings shall be at least four inches in diameter. No pumps with less than five horsepower motors will be acceptable.

E. Major Component Requirements:

The major requirements for a lift station are specified in the following table.

Table 512-2. Lift Station Major Component Requirements.

COMPONENT		NUMBER OF PUMPS		
		2	3	4 or More
1	Site Plan	see #1 below	see #1 below	see #1 below
2	Number of Wet Wells	1	1	2
	Wet Well Structure Type	precast	precast	cast-in-place or precast
3	Piping (below or above ground)	below or above *	above	above
4	Site Enclosure	chain link	chain link or wall	wall
4a	Access Gate	swing	swing	swing

			or sliding	or sliding
5	Flow Meters	no	yes	yes
6	Odor Control System	*	*	*
7	SCADA and Control Panel	yes	yes	yes
8	Generator	*	yes	yes
9	A/C MCC	no	no	yes
10	VFD	no	*	*
11	Wet Well / Coating/ Liner	yes	yes	yes
12	Level Control	float ball and transducer	float ball and transducer	float ball and transducer
13	Automatic Gear Actuator	*	*	*
14	Wet Well Fall Protection System	yes	yes	yes

NOTE: Please refer below for component explanation.

** In accordance with MANUAL or as determined by PCU for proper system operation.*

1. Site Sizing, Tract, and Easement Requirements:

   Lift station sites shall be sized as delineated in the STANDARD DRAWINGS for the duplex, triplex, or more than three pumps per the lift station site plans. The DEVELOPER shall dedicate the lift station site and driveway by plat or separate instrument to PCU. Dedicated easements shall be shown as specified on the lift station site plans in the STANDARD DRAWINGS. All temporary access roads shall be improved to accommodate heavy truck traffic and dedicated to PCU, with a minimum 20 foot wide Polk County Utilities Easement that provides for ingress and egress to the lift station.

2. Wet Well Requirements:

   a. Single wet well:

      i. The wet well for a duplex lift station shall have a minimum six feet inside diameter. If the design requirements require 35 horsepower pumps or larger for a duplex lift station (less than 1000 gpm), a minimum 10-foot inside diameter wet well shall be required**.** Sufficient depth shall be provided to accommodate cycle time and motor submergence.

      ii. The wet well for a triplex lift station shall have a minimum 12-foot inside diameter. Sufficient depth shall be provided to accommodate cycle time and motor submergence.

      iii. In determining the cycle time, no consideration of volume shall be used for the volume below the top of the pump or the manufacturer's minimum submergence recommendation, whichever is greater.

      iv. Pumping levels shall be set to provide a minimum capacity between operational water levels sufficient to allow a minimum of ten minutes in one pumping cycle. The minimum time between successive starts of the same pump shall be ten minutes.

      v. For duplex lift stations (less than 1,000 GPM), the effective volume (from pump off elevation to the invert of the gravity pipe) shall be based on a fill time of 30 minutes at Average Daily Flow (ADF). For triplex lift stations, the fill time shall not exceed 10 minutes at ADF. The high liquid level in the wet well (storage capacity) shall not exceed the invert elevation of the lowest inflow pipe. When new development proposes connection to an existing lift station, vertical storage criteria within the wet well shall not be applied to the existing lift station without consideration of other factors including, but not limited to generator installation.

      vi. Pump-off water levels shall provide adequate submergence to preclude pump inlet cavitations. Design maximum water levels shall not exceed the invert elevation of the influent pipe.

      vii. The wet well floor shall have a minimum slope of one to one to the hopper bottom. The horizontal area of the hopper bottom shall be no greater than necessary for proper installation and function of the pump inlet.

      viii. Interior ladders shall not be permitted.

      ix. Only one inlet connection shall be permitted to a wet well.

      x. For buoyancy calculations, the soil ring weight (from the outer face of the

bottom slab to the outer edge of the wet well) shall be 100 percent of the total weight of the soil ring. The net density of the soil shall be used for calculating weight, i.e., soil density less the water density (62.4 pounds per cubic foot). A minimum safety factor of 1.1 shall be achieved.

b. Dual wet wells:

When required, dual wet wells shall be designed with the same criteria as a single wet well; except with master manhole and valving to separate either wet well. The influent slope of the wet well floor shall have a minimum slope one inch per foot to the hopper bottom.

3. Piping Above Ground:

Piping shall be installed above ground with a concrete slab.

4. Site Enclosures:

All lift station sites shall be enclosed. Duplex lift stations shall have six-foot high factory applied black vinyl security type chain link fencing with two offset six foot high chain link double swing gates or one single six foot high chain link rolling type gate as specified by PCU. PCU may require that lift stations with more than two pumps have eight-foot high concrete masonry unit perimeter walls and two offset eight-foot high minimum aluminum, double-hung swing gates instead of the required chain link fencing and gates. The use or substitution of chain link fencing slats, vinyl fencing, or wood fencing instead of or in addition to the black vinyl coated chain link fencing shall be prohibited. Three strands of barb wire shall be installed on top of the chain link fencing at the direction of PCU if it is determined to be necessary for site security.

Florida-Friendly Landscaping may be permitted along the outside perimeter fencing of the lift station site as long as the center of all trees are no closer than fifteen feet and the center of all other non-tree type plantings are no closer than five feet. Maintenance and irrigation of the landscaping shall be the responsibility of the installing entity and not PCU.

5. Flow Meters:

Indicating, totalizing, and recording flow measurement devices shall be provided at lift stations where required in Table 512-2. Bypass piping around the meter shall be provided for all stations with flow meters to facilitate meter maintenance.

6. Odor Control System:

Provide a complete system for the control of hydrogen sulfide gas and other wastewater odors as required and specified by PCU.

7. SCADA:

   a. Control Panel:

      Panel shall be of type to match lift station configuration (number of pumps, control features, etc) as determined by PCU. Refer to the Section 517 entitled "SCADA and Control Panel Specifications" for additional information.

8. Emergency Generator:

   a. Permanent stationary emergency generator sets shall be provided for all lift stations that utilize a 12 inch and larger force main, receive flows from one or more contributing lift stations, that receive flow from a generator equipped tributary lift station, pump more than 1000 gallons per minute, or as required by FDEP.

   b. The ENGINEER shall size the generator and fuel tank as required by PCU and submit the name of the manufacturer, burn rate specifications, and sizing calculations to PCU for review and approval. The generator and fuel tank manufacturer shall be as specified in the appropriate "Approved Materials Checklist".

   c. Lift stations shall be provided with manual transfer switches or emergency power receptacles, except for those lift stations with permanent stationary emergency generator sets, as specified in the Section 516 entitled "Wastewater Lift Station Electrical System Specifications".

9. Air Conditioned Motor Control Center:

   When a motor control center is required, a fully enclosed structure of concrete masonry unit construction with a stucco exterior on a concrete slab, prestressed concrete roof slab with built-up roofing, R-4 insulated or greater interior walls, and R-19 insulated suspended ceiling shall be provided. As specifically approved by PCU, low maintenance and long life prefabricated modular structures may be substituted for the above required concrete masonry unit based structures. A high temperature alarm with dry contact shall be provided for connection to the SCADA control panel.

10. Variable Frequency Drive Motors:

    Where variable frequency drives (VFDs) are installed, motors shall be rated for inverter duty operation and shall indicate inverter duty rated on the nameplate.

11. Wet Well Liner:

    Wet well liner to be provided as specified in the appropriate "Approved Materials

Checklist".

12. Level Control:

    Requirements in the Section entitled "Wastewater Lift Station Electrical System Specifications" shall apply.

13. Structural Bearing Design:

    a. All wet wellsand other such buried structure that are not subject to vehicular traffic, including their associated lids and covers, shall be designed utilizing a minimum 300 pound per square foot load bearing design.

    b. All wet wellsand other such buried structures that are subject to vehicular traffic, including their associated lids and covers, shall be designed utilizing a H-20 traffic load bearing design.

F. Electrical Equipment, Power Supply and Power Cords:

Requirements in the Sections entitled "Submersible Wastewater Pump Specifications" and "Wastewater Lift Station Electrical System Specifications" shall apply.

G. Controls:

Requirements in the Sections 516 and 517 entitled "Wastewater Lift Station Electrical System Specifications" and "SCADA and Control Panel Specifications" shall apply.

PART 5 - CONSTRUCTION

5.01 SCOPE OF WORK

A. This Section applies to the equipment, materials, site work, fences or walls, and appurtenances for the installation of wastewater lift stations.

B. Shop drawings for all components of a proposed lift station, not addressed in the appropriate "Approved Materials Checklist", shall be submitted to PCU for review and approval prior to construction.

C. All liners and coatings shall have a minimum of a one year warranty from the date of installation.

5.02 WET WELL

A. Wet Well Liners and Coatings:

1. HDPE Liner:

The light colored HDPE embedment sheeting shall be mechanically bonded to the concrete by integral studs. The liner shall be cast in place by the precast manufacturer and the CONTRACTOR shall field weld the joints. Minimum thickness of liner is 80 mils. All inserts and sleeves for piping shall be in accordance with the liner manufacturer's recommendations and shall result in complete coverage of all pre-cast sections and be capable of passing a spark test.

2. Coatings:

   Coatings shall be light in color, applied in accordance with the manufacturer's recommendations using dry sand blasting surface preparations, and in accordance with the appropriate "Approved Materials Checklist".

B. Pre-cast Concrete Sections:

1. Pre-cast wet wells shall conform to specifications for ASTM C 478 "Pre-cast Reinforced Concrete Manhole Sections", except as otherwise specified below.

2. The minimum wall thickness shall be eight inches. Pre-cast wet-wells shall be constructed with a pre-cast monolithic base structure as shown on the STANDARD DRAWINGS. The minimum base thickness shall be eight inches.

3. Concrete shall be Type II, 4000 psi at 28 days. All sections shall have tongue and groove joints except for top slab. All jointing material shall be a cold adhesive preformed plastic gasket, conforming to ASTM C 443 "Manhole Section Connections".

4. The date of manufacture and the name or trademark of the manufacturer shall be clearly marked on each pre-cast section.

5. Sections shall be cured by an approved method as per ASTM C 478 for at least 28 days prior to coating and shall not be shipped until at least two days after having been coated.

6. Pre-cast concrete top slabs shall be used.

7. Lift rings or non-penetrating lift holes shall be provided for handling pre-cast sections. Non-penetrating lift holes shall be filled with non-shrink grout after installation of the sections. The grout shall be coated after it as cured.

8. Concrete surfaces shall have form oil, curing compounds, dust, dirt and other interfering materials removed by brush and/or sand blasting and shall be fully cured prior to the application of any coatings.

9. Exterior surfaces shall have a protective coating, which shall be applied in strict accordance with the coating manufacturer's recommendations. All interior wall

and underside top surfaces shall have a protective liner as specified above.

C. Cast-in-Place Bases:

Cast-in-place bases shall be utilized only when specifically approved by PCU. Unless otherwise specified, cast-in-place bases shall be at least eight inches in thickness. Reinforcement and connection to the riser sections shall be designed by the ENGINEER and submitted to PCU for approval.

D. Pipe Penetration:

The void between the opening in the wet well structure and the exterior of the force main piping that penetrates the walls of the wet well shall be sealed by using compression type wall seals or non-shrink cement grout.

5.03 ACCESS FRAMES AND DOORS

A. The wet well shall be furnished with an access frame and door(s) along with an integrated fall protection system as specified in the appropriate "Approved Materials Checklist". Equipment furnished shall include the necessary aluminum access frames, complete with hinged and slide bar equipped doors, stainless steel upper guide holder, and level sensor cable holder. Doors shall be of aluminum diamond plate.

B. Wet well access doors shall be sized according to the pump manufacturer's recommendations. As a minimum, doors shall be sized to allow pumps to pass through the hatch opening with a 1 inch clearance between the back of the pump volute and the door. The front hatch frame shall have a minimum 8 inch clearance from the front of the pump volute. Double doors shall be used wherever possible.

C. Wet well hinges shall not be mounted on the same side as the guide rails and float/control ball rack.

D. The access frame and door(s) shall have stainless steel hardware.

E. Access doors that are not exposed to vehicular traffic shall have a load rating of 300 pounds per square foot. Access doors exposed to vehicular traffic shall have a H-20 traffic load rating. The support beam for load rating shall be mounted on the door.

5.04 ODOR CONTROL SYSTEM

A. In general, it shall be PCU's responsibility to furnish and install a complete system for the control of hydrogen sulfide gas and other sewer odors unless otherwise determined by PCU. Refer to the appropriate "Approved Materials Checklist".

5.05 CHAIN LINK FENCE

A. The CONTRACTOR shall furnish and erect a chain link fence as required in this Section.

B. Materials:

1. The fabric, posts, fastenings, fittings and other accessories for chain link fence shall meet the requirements of AASHTO M 181 with the following changes:

    a. The weight of coating of wire fabric shall be 1.2 ounces of zinc per square foot (Class B);

    b. The galvanizing of steel materials shall be hot-dipped galvanized; and

    c. The weight of coating on posts and braces shall be 1.8 ounces of zinc per square foot, both inside and outside to meet the requirements of AASHTO M 111.

2. The base metal of the fabric shall be a good commercial quality 9-gauge steel wire. The fabric shall be of uniform quality and shall be 6-foot high with a 2-inch mesh size

3. All posts and rails shall be in accordance with the following schedule:

    a. End, corner and pull posts – 2-3/8 inches OD, Schedule 40;

    b. Line posts and gate frames, as needed for support of gate size Schedule 40; and

    c. Gate Posts – 3-inch OD, Schedule 40

        i. Post braces and top rail – 1-5/8-inch OD, Schedule 20;

        ii. All gate openings shall be a minimum of 16 feet wide, double hung.

4. Tension wire shall be 0.177 inch coiled spring wire tensioned along the bottom of the fabric and shall be coated similarly to the wire fabric.

5. Miscellaneous fittings and hardware shall be zinc coated commercial quality or better steel or zinc coated cast or malleable iron as appropriate for the article.

6. All surfaces of the fabric, posts, fittings, and miscellaneous hardware shall have a factory applied black vinyl coating.

7. Post caps, designed to provide a drive fit over the top of the tubular post to exclude moisture, shall be provided.

8. All gates shall be capable of being secured by the use of a security type padlock with

a standard length shank. The gates shall be securely positioned in line with the adjacent fence sections by the use of an attached vertically sliding steel rod inserted in a slightly larger one inch deep drilled hole in the concrete driveway.

9. Where required by PCU, galvanized steel barbed wire shall be installed on top of the lift station perimeter fence, including the gates, to an additional height of 1 vertical foot utilizing 3 strands of wire evenly placed upon galvanized steel supports that angle outwardly 45 degrees. The supports on the gates shall be installed in the vertical position inline with the gate fabric.

5.06 BLOCK WALL

A. The CONTRACTOR shall furnish and erect a block wall as required in this Section.

B. Block wall shall be one-sided split face concrete masonry unit type construction and shall be painted with graffiti resistant material. Split face concrete masonry units shall conform to ASTM C90 normal weight Type 2, solid load bearing units. Units shall be 8-inch by 8-inch by 16-inch nominal size. Minimum compressive strength on the net area (average of three units) when tested in accordance with ASTM C140 shall be 2,000 psi on the net area. Minimum compressive strength of any individual unit shall be not less than 80 percent of the required three-unit average. Units shall be colored with integrally mixed, alkali-stable, lightfast and weather-resistant pigment. Color shall be maintained uniformly throughout the job within the normal manufacturing tolerances. Integral water repellant shall be a liquid polymer admixture resistant to water penetration with a Class E rating in accordance with ASTM E514-74. Top two courses of wall shall be poured and finished.

5.07 GATES

A. Chain Link Fencing Gates:

1. Swing gates shall be two, 8-foot wide double-hung gates as indicated on the STANDARD DRAWINGS and hinged to swing through 180 degrees from closed to open. Gates shall be complete with latches, locking device, stops keeper, hinges, fabric and braces. Gates shall be the same height as the fence and the gate fabric shall be the same as the fence fabric.

2. Gate leaves shall have truss rods or intermediate braces. Gate leaves eight feet or more in width shall have intermediate braces and diagonal truss rods or shall have tubular members as necessary to provide rigid construction, free from sag or twist.

B. Block Wall Gates:

When block walls are required, two, 8-foot wide ornamental aluminum double-hung gates shall be installed. The gates shall be the same height as the wall. The aluminum

gates shall be either black anodized or painted black. Gates shall swing through 180 degrees from closed to open and shall be complete with latches, locking device, stops keeper, hinges, fabric and braces.

5.08 WEED CONTROL

A. A 60 mil thick geo-fabric shall be installed under all graveled and rocked areas for weed control. The fabric shall be a heat bonded, non-woven, polypropylene, which is inert to biological degradation and resistant to naturally encountered chemicals, alkalis and acids. The fabric shall provide passage of air and liquids.

5.09 STAINLESS STEEL SLUICE GATES

A. When it is necessary to design wet wells with 3 pumps or more to allow for the isolation of individual pumps using chambers, stainless steel sluice gates shall be utilized. Each sluice gate shall be of the rising stem type, self-contained, and permit separate lifting.

1. Sluice gates, frames, guides, wedges, fasteners, and anchors shall be fabricated type 316 stainless steel construction with resilient seats. A de-seating system shall be incorporated into each gate.

2. Actuator pedestals shall be galvanized steel and stem guides shall be stainless steel with adjustable guide bushing.

3. Minimum material thickness shall be 3/8-inch. Frame member shall be 3/8-inch by 3-inch by 3-inch hot rolled angle.

4. The gate seat shall have a neoprene or hypalon seal around the perimeter.

5. Gates shall be supplied with accessories, including lift and lift stem, extension stem, stem guides, stem covers, wall thimbles, brackets and stop nuts. Gates shall be designed to meet seating and unseating heads.

6. Sluice gates and accessories shall operate satisfactory under the conditions of installation, including operating frequency ranging from twice daily to periods of prolonged idleness.

7. Opposing gate and frame mounted wedges shall be factory set to provide zero leakage at the design head pressures with factory certified test reports available.

B. Wedges:

1. Factory fixed to provide tight shutoff over an extended life and repeated use of the gate.

2. Stainless steel 316 (same material as the gate) welded into position on the gate at both the top and bottom.

3. Designed with intermediate wedges to eliminate any bowing or gate deflection when seated.

C. Seat:

1. The gate seat shall have a mechanically retained neoprene or hypalon seal around the entire perimeter of the gate opening.

2. The rubber seat to stainless steel combination shall be as specified in AWWA C-504.

3. The seat shall be raised away from the frame to allow a clearance area so that solids and debris can be pushed aside by the gate. The design of the seat shall be such that solids or debris does not get trapped on the seat and cause a leak path or damage.

4. The resilient seat is mechanically retained with stainless steel fasteners and field replaceable.

D. Wall Thimble:

1. Wall thimble shall be fabricated type 316 stainless steel or sufficient section to resist permanent distortion and shall be provided by the gate manufacturer.

2. Wall thimbles shall be of bent leg design or F-Type and of a depth equal to the thickness of the structure wall upon which the gate is mounted.

E. Stem and Couplings:

1. Operating stem shall be 316 stainless steel designed to transmit in compression at least two times the rated output of the operating manual mechanism with a 40-pound effort on the crank or hand-wheel.

2. The threaded portion of the stem shall have machined cut or rolled threads of the Acme type and shall have a surface finish of 32 microns or less.

3. When hydraulic, pneumatic or electric operators are used, including portable operators, stem design force shall not be less than 1.25 times the output thrust of the hydraulic or pneumatic cylinder with a pressure equal to the maximum working pressure of the supply, or 1.25 times the output thrust of the electric or hydraulic motor in the stalled condition. Sections of stem assemblies of diameter 1-3/4 inches and larger shall be joined together with solid couplings. The

couplings shall be grooved and keyed and shall be of greater strength than the stem.

4. Gates having widths equal to or greater than two times the height shall be provided with two lifting mechanisms connected by a tandem shaft.

5. Clear acrylic threaded stem cover with graduated markings to show the position of the gate.

F. Stem Guides:

1. Stem guides shall be fabricated from type 316L stainless steel and ultra high molecular weight polyethylene (UHMWPE) bushed where required by the manufacturer.

2. Guides shall be adjustable in two directions and shall be spaced in accordance with manufacturer's recommendation.

3. Stem guides shall not be located on the threaded portion of the stem.

G. Thrust Nut:

1. For rising stem arrangement, the thrust nut shall be located at the operator level.

5.10 FENCE INSTALLATION

A. Post Setting:

1. All posts shall be core drilled twice the diameter of the actual post and secured in place by high strength cement into the lift station site's concrete slab to a depth of three feet.

2. After the post has been set, aligned and plumbed, the hole shall be filled with 2,500 psi concrete. The concrete shall be thoroughly worked into the hole so as to leave no voids. The exposed surface of the concrete shall be crowned to shed water.

3. End, corner, pull and gate posts shall be braced to the nearest post with horizontal brace used as a compression member and a galvanized 3/8-inch steel truss rod and truss tightener used as a tension member. Corner posts and corner bracing shall be constructed at all changes of fence alignment of 30 degrees or more. All chain link fences shall be constructed with a top rail and bottom tension wire.

B. Placing Fabric:

1. The fabric shall not be placed until the posts have been permanently positioned and concrete foundations have attained adequate strength. The fabric shall be placed by

securing one end and applying sufficient tension to remove all slack before making permanent attachments at intermediate points.

2. The fabric shall be fastened to all corner, end and pull posts by substantial and approved means. Tension for stretching the fabric shall be applied by mechanical fence stretchers.

5.11 WET WELL INSTALLATION

A. Bedding:

The wet well shall be placed on bedding rock conforming to the requirements in the Section entitled "Excavations, Backfill, Compaction, and Grading Specifications". The bedding rock shall be firmly tamped and made smooth and level to assure uniform contact and support of the pre-cast element.

B. Pre-cast Sections:

1. The pre-cast base section shall be carefully placed on the prepared bedding so as to be fully and uniformly supported, in true alignment, and ensure that all pipes entering the structure shall be inserted to the proper grade.

2. Pre-cast sections shall be handled by lift rings or non-penetrating lift holes. Such holes shall be filled with non-shrink grout after installation of the wet well and coated. Lifting of sections shall be as per manufacturer's recommendation.

3. Sections shall be uniformly supported by the base structure, and shall not bear directly on any of the pipes. Influent and effluent pipes shall be properly installed so as to form an integral watertight unit.

4. Sections shall be placed and aligned to provide vertical alignment with a 1/4-inch maximum tolerance per five feet of depth.

5. The completed wet well shall be rigid, true to dimensions, and watertight.

6. Wherever practicable, all wet well excavations shall be dewatered and pre-cast sections installed in the dry.

C. Excavation and Backfilling:

Requirements of the Section entitled "Excavations, Backfill, Compaction, and Grading" Specifications" shall apply.

D. Pipe Connections:

Special care shall be taken to ensure that the openings through which pipes enter the

structure are provided with watertight connections. Pipe connections shall conform to ASTM C 923, "Standard Specifications for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals".

E. Doors:

Wet well frames shall be securely mounted and doors shall open above the pumps. Wet well hinges shall not be mounted on the same side as guide rails and cable rack.

F. Power Cable:

Each pump power cable shall be supported on a separate 3/8-inch Type 316 stainless steel hook located within six inches of guide rail bracket for each pump. Each pump power cable shall be run as not to restrict removal of pumps.

5.12 CLEANING

A. All newly constructed wet wells shall be cleaned of any accumulation of silt, debris, or foreign matter of any kind and shall be free from such accumulations at the time of final inspection.

5.13 SLUICE GATE INSTALLATION AND TESTING

A. The manufacturer shall guarantee the sluice gate, actuator, and appurtenance items for a period of three years covering the equipment and installation from the date of service.

B. After installation, all gates shall be tested for leakage. Each gate shall be operated through one complete cycle and then closed for testing, zero leakage tight shutoff as detailed in the manufacturer’s manual.

5.14 WATER SUPPLY

A. All wastewater lift stations shall be provided with a water system with adequate capacity and pressure for station wash down and other requirements. The water supply shall be supplied with a water meter and equipped with a PCU approved reduced pressure zone (RPZ) principle cross connection control assembly. The RPZ shall be installed and located inside the fenced area as described in the STANDARD DRAWINGS.

5.15 WET WELL FALL PROTECTION SYSTEM

A. A grate based wet well fall protection system shall be furnished and installed by the CONTRACTOR. A system shall be installed when the door(s) is fabricated or field installed on existing door(s). The system shall be installed in accordance with the manufacturer’s recommendations.

B. The System shall be:

1. Designed to support a 300 PSF live load.
2. Highly visible in color.
3. Capable of locking in the fully open position.
4. Provided with lift assistance for ease of operation.
5. UV and corrosion resistant.
6. Lockable to prevent unauthorized opening.
7. Supported with a load bearing bar(s) that provide continuous support.
8. Made of aluminum or one piece fiberglass.

C. Lift Assistance: A torsion rod shall be incorporated into the grating panel design to provide lift assistance when opening the grating panel.

D. Hold Open Feature: A hold open arm shall be provided to lock the cover in a fully open 90 degree position. A release handle shall be provided to allow the grating panel to be closed.

E. Hardware: All hardware (mounting brackets, hinges, torsion rod, hold open arm, padlock loop, and fasteners) shall be Type 316 stainless steel.

CHAPTER 5 WASTEWATER Section 513

Wastewater Pipes, Valves, and Appurtenances Specifications

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. These specifications cover wastewater pipes, valves, and appurtenances used for the wastewater collection systems and lift stations.

B. The CONTRACTOR shall be responsible for all stored material furnished for the project. The CONTRACTOR shall, if requested by PCU, furnish certificates, affidavits of compliance, test reports or samples for any of the materials specified herein. All materials delivered to project site for installation are subject to random testing for compliance with the designated specifications.

C. Wastewater mains, service lateral piping, and connections shall be installed as indicated in the STANDARD DRAWINGS.

PART 2 - PRODUCTS

2.01 PIPE MATERIALS

A. PVC Gravity Pipe:

1. PVC gravity pipe shall conform to ASTM F679 with a SDR of 26. Uniform minimum “pipe stiffness” at five percent deflection shall be 46 psi. The joints shall be integral bell elastomeric gasket joints manufactured in accordance with ASTM D3212 and ASTM F477. The applicable UNI-Bell Plastic Pipe Association standard is UNI-B-7.

B. PVC Pressure Pipe:

All PVC pipe shall bear the NSF-DW seal. The minimum standard length of pipe shall be 13 feet.

1. All PVC pipe shall be manufactured in accordance with AWWA Standard C900. Pipe that is 4 to 12 inches in diameter shall be C900 and have a dimension ratio of 18. Pipe larger than 12 inches in diameter shall be C905 or C909 and have a dimension ratio of 25. Pipe shall be the same outside diameter as ductile iron pipe.

C. HDPE Pressure Pipe:

Materials used for the manufacture of high-density polyethylene pipe and fittings shall comply with all requirements of ASTM D1248 and Plastic Pipe Institute (PPI) designation PE3408/PE4710. Manufacturer shall be a member in good standing of the Plastic Pipe Institute. HDPE pipe and fittings shall comply or exceed AWWA Standards C901/C906, ASTM D2513, ASTM D3035 and ASTM F714. The

manufacturer shall supply a letter of certification stating compliance to all the above standards prior to shipping any material to project site. The HDPE material shall have ultraviolet inhibitors to resist degradation by direct and prolong sunlight. The design of HDPE materials shall be based on the hydrostatic design basis (HDB) of 1,600 psi at 73.4 degrees Fahrenheit. Pipe shall be designed and produced to ductile iron diameters and to a maximum dimension ratio of 11. In the event that HDPE pipe with 42 inch and larger diameters are not available due to general industry limitations, PCU may consider the use of outside diameters based on iron pipe sizes.

D. Ductile Iron Pressure Pipe:

The use of DI pipe for new wastewater applications shall be restricted to onsite use inside the limits of wastewater lift stations and treatment facilities. Unless otherwise stated, all DI pipe and fittings shall comply with the material requirements contained within Section 2.04 (A) below.

2.02 JOINT MATERIALS

A. PVC Gravity Pipe:

PVC gravity pipe joints shall have push on type joints with flexible elastomeric seals per ASTM D 3212.

B. PVC Pressure Pipe:

1. PVC pressure pipe shall have integral bell push on type joints conforming to ASTM D3139.

2. Fusible PVC pressure pipe lengths shall be assembled in the field with butt fused joints. The CONTRACTOR shall follow the pipe supplier's written guidelines for this procedure. All fusion joints shall be completed as specified by the pipe supplier and this MANUAL.

C. HDPE Pressure Pipe:

HDPE joints shall conform to AWWA C906.

D. Restrained Joints:

Restrained joint devices shall be made specifically for PVC pipe and meet or exceed the requirements in ASTM F-1674.

E. Joints for Dissimilar Pipe:

Joining of dissimilar pipe and pipe between lift station wet well shall conform to Table 513-1 below.

Table 513-1. Joints for Dissimilar Pipe.

Type of Line	Material	Material	Use
Gravity	C-900	SDR-26	PVC Adapter
Force Main	PVC	Ductile Iron	Restrained MJ Sleeve
Force Main	PVC	HDPE	Restrained MJ Sleeve to Fused PVC Adapter
Force Main	PVC	AC	Coupler
Lift Station Wet Well	HDPE	Ductile Iron	Electrofusion and Restrained MJ Sleeve to Fused MJ DIP Adapter
Lift Station Wet Well	Ductile Iron	Ductile Iron	MJ Sleeve

F. Pipe Markings:

Pipes shall have the manufacturer's home-mark on the spigot. On field cut pipe, the CONTRACTOR shall provide home-mark on the spigot in accordance with the manufacturer's recommendations.

2.03 FITTINGS

A. PVC Gravity Pipe**:**

1. Branches:

Unless otherwise specified, wye branches shall be provided in the gravity main for service lateral connections. Wyes shall be sized in accordance with the STANDARD DRAWINGS. All fittings shall be of the same material as the pipe.

2. Plugs:

Plugs for stub outs shall be of the same material as the pipe, and gasketed with the same gasket material as the pipe joint, or be of material approved by PCU. The

plug shall be secured to withstand specified test pressures.

B. PVC Pressure Pipe:

Fittings shall be restrained mechanical joint compact ductile iron fittings that conform to ANSI/AWWA A21.53/C153. Interior and exterior coatings of ductile iron pipe fittings shall be as specified in the appropriate "Approved Materials Checklist".

C. HDPE Pressure Pipe:

Fittings used with HDPE pipe shall be mechanical joint ductile iron compact fittings in accordance with ANSI/AWWA A21.53/C153 unless otherwise specifically approved by PCU. HDPE fittings in wet well shall be in accordance with section 2.04 below.

2.04 DUCTILE IRON PIPE OR HDPE PIPE AND FITTINGS FOR LIFT STATIONS

A. All lift station pipe and fittings from the pump discharge to the first pipe fitting outside of the lift station wet well shall be either all ductile iron with ductile iron flanges in accordance with AWWA C115 or all HDPE piping and HDPE fittings and flanges in accordance with AWWA C906 and C207. All other lift station piping and fittings shall be ductile iron with ductile iron flanges.

1. Ductile Iron Pipe:

   Ductile iron pipe of nominal diameter 4 through 64 inches shall conform to ANSI/AWWA A21.51/C151. A minimum of CL 53 pipe shall be supplied for all sizes of pipe unless a higher-class pipe is specifically called out in the PLANS or required by PCU.

2. Fittings:

   Fittings shall be mechanical joint ductile iron compact fittings in accordance with ANSI/AWWA A21.53/C153.

3. Joints:

   Joints shall be flanged conforming to ANSI/AWWA A21.11/C111, unless otherwise called for on the PLANS. Restrained or flanged joints shall be provided where called for on the PLANS. Flanged joints shall conform to AWWA C115.

4. Exterior Coatings:

   Ductile iron pipe and fittings shall be coated as specified in the appropriate "Approved Materials Checklist". Primer and field coats shall be compatible and shall be applied in accordance with the manufacturer's recommendations. Final

field coat color shall be green for wastewater.

5. Interior Coatings and Linings:

   Ductile iron pipe and fittings shall have an interior protective coating or lining as specified in the appropriate "Approved Materials Checklist".

6. HDPE Pipe:

   HDPE pipe of nominal diameter 4 through 63 inches shall conform to ANSI/AWWA C906 with dimensions conforming to ANSI/AWWA C110/A21.10. A minimum diameter ratio of DR 11 pipe shall be supplied for all sizes of pipe unless a higher-class pipe is specifically called out in the PLANS or required by PCU. Vertical piping must be supported at a minimum of 8 feet on center. Spacing may be less if recommended by material manufacturer.

7. HDPE Fittings:

   Fittings shall be butt-weld joint HDPE fittings in accordance with ANSI/AWWA C906 and ASTM D3261.

8. HDPE Joints:

   Joints with flanges shall be conforming to ANSI/AWWA C207 and ANSI B16.5, unless otherwise called for on the PLANS. Restrained or flanged joints shall be provided where called for on the PLANS. Flanged joints shall be fabricated to mate with ductile iron fittings in accordance with AWWA C115. All flanged joints shall have a backup ring of materials identified in PLANS, either stainless steel or ductile iron. Dimension of ring shall conform to C906 and ANSI B16.5.

2.05 AUTOMATIC AIR RELEASE VALVES

A. General:

Wastewater force mains shall be equipped with automatic air release or automatic combination air and vacuum release valves, located as shown on the PLANS, and as specified in the Section entitled "Wastewater Force Main Standards. Valves shall be located in above ground enclosures as detailed on the STANDARD DRAWINGS.

B. Valve:

The valve body shall be conical in shape and shall be either fusion bonded epoxy coated steel (inside and out) or stainless steel with a funnel shape lower body to automatically drain sewage back into the system. All internal parts shall be corrosion resistant stainless steel or non-metallic plastic materials.

2.06 VALVES

A. General:

In general, plug valves shall not be installed within a force main system, except at wastewater lift stations. Gate valves shall be placed in a vertical position at all other locations within a force main system.

B. Gate Valves:

Refer to the Section entitled “Potable Water System Standards and Specifications”.

C. Plug Valves:

When it is proven by the ENGINEER that it is necessary to install a plug valve within the wastewater transmission system, the following criteria shall apply.

1. Plug valves shall be either eccentric or ballcentric.

2. Plug valves shall be installed complete with operating hand wheels, extension stems, operator, operating nuts or wrenches as required for normal operation.

3. Valves shall have the name of the manufacturer and the size of the valve cast or molded onto the valve body. A permanent plate shall be attached to the valve or operator indicating serial number, order number, accessories, operator model and manufacturer, etc.

4. Eccentric plug valves shall be of the non-lubricated type with 80 percent port areas. The port area for valves 4 to 20 inches shall have a minimum 80 percent nominal pipe diameter. Valves 24 inches and larger shall have a minimum port area of 70 percent of nominal pipe diameter.

5. Minimum pressure rating of valves 4 to 12 inches shall be 175 psi; valves 14 to 72 inches shall be 150 psi. Valve bodies shall be cast iron ASTM A 126, Class B. Valve ends shall be screwed, flanged or mechanical joint as indicated on the drawings. Plugs shall be cast iron or ductile iron with neoprene facing and shall be of the single piece design. The plug shall be of the same configuration for all valves and shall require no stiffening member opposite the plug for balance or support. Valve body seats shall have a welded in overlay of not less than 90 percent nickel. Packing shall be adjustable and safely replaceable. Brushing shall be Type 316 stainless steel in both upper and lower journals. The valve should be capable of drip tight shut off with flow in either direction at the full pressure of the valve. All exposed nuts, bolts, springs and washers on buried service valves shall be stainless steel.

6. Face to face dimensions shall be in conformance to ASME B16.10 and the following dimensions from Table 513-2 below:

Table 513-2. Lift Station Plug Valve Flange Face to Face Dimensions.

Valve Size (inches)	Face to Face (inches)
4	9.0
6	10.5
8	11.5
12	14.0
16	17.75
20	23.5
24	42.0

D. Valve Testing:

Plug valves shall be tested in accordance with AWWA C504. Each valve shall meet the performance, leakage, and hydrostatic tests described in AWWA C504. The leakage test shall be applied to the face of the plug tending to unseat the valve. The manufacturer shall furnish certified copies of reports covering proof of design testing as described in AWWA C504.

E. Actuators:

Manual valves shall have lever or gear actuators and tee wrenches, extension stems, floor stands, etc. as indicated on the PLANS. All valves 6-inch and larger shall be equipped with gear actuators. All gearing shall be enclosed in a semi-steel housing and be suitable for running in a lubricant with seals provided on all shafts to prevent entry of dirt and water into the actuator. All actuator shafts shall be supported on permanently lubricated bronze bearings. Actuators shall clearly indicate valve position and an adjustable stop shall be provided to set closing torque. All exposed nuts, bolts and washers shall be zinc or cadmium plated. Valve packing adjustment shall be accessible without disassembly of the actuator.

2.07 VALVE BOXES

A. Standard Three-Piece Cast Iron Valve Box:

Three-piece valve boxes are required for mains less than six feet below finished grade as indicated in the STANDARD DRAWINGS. Valve boxes shall be provided with suitable heavy duty ductile or cast iron bonnets and shall extend to such elevation at or slightly above the finished grade surface as directed by PCU. The barrel shall be screw type only and have a 5-1/4-inch shaft. The upper section shall have a flange at the bottom having sufficient bearing area to prevent settling and shall be complete with cast iron covers. Covers shall have "SEWER" cast into the top for all mains.

B. Valve Box Assembly:

Valve box assemblies, as indicated in the STANDARD DRAWINGS, are required for any size main whenever the top of the valve nut is six feet or deeper below the finished surface elevation that is directly above the valve location. Valve boxes shall be one complete assembled unit composed of the ductile or cast iron valve box with a 5-1/4 inch barrel shaft and steel extension stem that attaches to the valve body. All moving parts of the extension stem shall be enclosed in a housing to prevent contact with the soil. Valve box assembly shall be adjustable to accommodate variable depths.

C. The stem assembly shall be of a telescoping design that allows for variable adjustment length. The material shall be galvanized square steel tubing. The stem assembly shall have a built-in device that prevents the stem assembly from disengaging at its fully extended length. The extension stem must be capable of surviving a torque test to 1,000 ft-lb without failure.

D. Valve boxes, located in roadways with speed limits above 30 miles per hour or on mains that are 16 inches in diameter or larger, shall have locking lids utilizing a five sided nut with a special wrench needed to open. Valve lids to be made as shown in the STANDARD DRAWINGS.

E. A test station box shall be installed into the valve pad for the placement of the locating wire as shown in the STANDARD DRAWINGS. The test station box shall be as specified in the appropriate "Approved Materials Checklist".

F. Locating wire shall be 14-gauge single strand solid core copper wire with insulation. The color of the insulation shall be the same color as the color code for the pipe being installed.

G. Each valve marker shall be made of bronze with each specific valve's information clearly imprinted on its top surface, provided with a hanger pin, and installed in each valve collar as shown in the STANDARD DRAWINGS.

2.08 PRESSURE GAUGES

A. Pressure gauges shall be installed on each lift station discharge pipe as indicated on the STANDARD DRAWINGS. Each pressure gauge shall be direct mounted, diaphragm (type) gauge, stainless steel case, stainless steel sensing element, liquid (oil) filled, with a 4-1/2-inch diameter dial, and furnished with a clear glass crystal window, 1/4-inch shut-off (isolation) valve. Gauges shall be weatherproofed. The face dial shall be white finished aluminum with jet-black graduations and figures. The face dial shall indicate the units of pressure measured in psi, with a zero to 150 psi range.

PART 3 - CONSTRUCTION

3.01 MATERIAL IDENTIFICATION AND TESTING

A. Pipe Identification and Location:

1. Each length of pipe shall bear the name or trademark of the manufacturer, the location of the manufacturing plant and the class or strength classification of the pipe. The markings shall be plainly visible on the pipe barrel. Pipe, which is not clearly marked, is subject to rejection. The CONTRACTOR shall remove all rejected pipe from the project site within five NORMAL WORKING DAYS.

2. All PVC pipe and other pipe that is factory color-coded on the outside surface of the pipe shall be identified and locatable as specified in the STANDARD DRAWINGS. All Ductile Iron Pipe, and other pipe not factory color-coded on the outside surface of the pipe, shall be identified and locatable as specified in the STANDARD DRAWINGS. Where the above type of identification method is not considered to be practical by PCU, the pipe shall have a field applied three inch wide permanent blue paint stripe down the top outside center of the pipe along its entire length.

B. Material Testing Requirements:

1. If requested by PCU, a sample of pipe to be tested shall be selected at random by PCU or the testing laboratory hired by PCU.

2. When the samples tested conform to applicable standards, all pipe represented by such samples shall be considered acceptable based on the test parameters measured. Copies of test reports shall be available before the pipe is installed on the project.

3. In the event that any of the test samples fail to meet the applicable standards, all pipe represented by such tests shall be subjected to rejection. The CONTRACTOR may furnish two additional test samples from the same shipment or delivery, for each sample that failed and the pipe will be considered acceptable if all of these additional samples meet the requirements of the applicable standards. All such retesting shall be at the CONTRACTOR's expense.

4. Pipe that has been rejected by PCU shall be removed from the site of the work by the CONTRACTOR and replaced with pipe that meets these specifications.

3.02 SEPARATION OF MAINS

A. Separation of all mains shall be in accordance with the STANDARD DRAWINGS.

3.03 INSTALLATION OF VALVES

A. All valves shall be inspected upon delivery in the field to insure proper working order before installation. They shall be set and jointed to the pipe in the manner as set forth in the AWWA Standards for the type of connection ends furnished. All valves and appurtenances shall be installed true to alignment and rigidly supported. Any damage to the above items shall be repaired to the satisfaction of PCU before they are installed.

3.04 NOTIFICATION OF CONNECTION TO EXISTING MAINS

A. PCU shall be notified at least five NORMAL WORKING DAYS in advance to schedule main connections and valve operations. All existing valves are to be operated only by PCU. All valves installed are to remain closed during construction.

The CONTRACTOR shall exercise extreme caution when excavating in proximity of PCU mains. PCU main locations shown on plans are not exact or guaranteed. The CONTRACTOR is responsible for field verifying existing utility locations. PCU dispatch operator shall be notified immediately in the event of a force main, water main, or reclaimed water main break or damage. The CONTRACTOR shall immediately repair all damage to PCU mains, at the CONTRACTOR's expense. If the repair is not made in a timely manner, as determined by the PCU Inspector, PCU may perform repairs and the CONTRACTOR will be charged for repairs.

CHAPTER 5 WASTEWATER Section 514

Wastewater System Bypass Specifications

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. The WORK covered by this Section consists of providing all temporary bypassing to perform all operations in connection with the flow of wastewater around pipe segment(s) or lift stations. The purpose of bypassing is to prevent wastewater overflows and provide continuous service to all wastewater customers. The CONTRACTOR shall maintain wastewater flow in the construction area in order to prevent backup and/or overflow and provide reliable wastewater service to the users of the wastewater system at all times.

B. When not a low flow scenario or the bypass origination and discharge points are not adjacent to each other, the pipe utilized during the WORK shall be restrained joint DI pipe, restrained joint PVC pipe, fusible PVC pipe with butt welded joints, or HDPE pipe with butt welded joints. Lay flat rolled types hoses may be used when there is a low flow scenario and the bypass origination and discharge points are adjacent to each other. All pipes shall be sufficiently supported in order to restrict horizontal or vertical movement.

PART 2 - PRODUCTS

2.01 GENERAL

A. The CONTRACTOR shall provide and maintain adequate equipment, piping, tankers and other necessary appurtenances in order to maintain continuous and reliable wastewater service in all wastewater lines as required for construction. The CONTRACTOR shall have tankers, backup pump(s), piping and appurtenances ready to deploy immediately.

PART 3 - EXECUTION

3.01 GENERAL

A. The CONTRACTOR shall have all materials, equipment and labor necessary to complete the repair, replacement or rehabilitation on the job site prior to isolating the gravity main segment, manhole, or lift station. The CONTRACTOR shall demonstrate that the pumping system is in good working order and is sufficiently sized to successfully handle flows by performing a test run for a period of 24 hours prior to beginning the WORK.

3.02 TRAFFIC CONSIDERATIONS

A. The CONTRACTOR shall locate bypass pumping suction and discharge lines so as to not cause undue interference with the use of streets, private driveways and alleys to include the possible temporary trenching of piping at critical intersections. Ingress and egress to adjacent properties shall be maintained at all times. Ramps, steel plates or others methods shall be deployed by the CONTRACTOR to facilitate traffic over surface piping. High traffic commercial properties may require alternate methods.

3.03 BYPASS PLAN

A. The CONTRACTOR shall submit a sufficiently detailed drawing or comprehensive written plan to PCU for approval and acceptance that describes the intended bypass for the maintenance of flows during construction. The CONTRACTOR shall also provide a sketch with the written plan showing the location of bypass pumping equipment for each lift station or line segment(s) around which flows are being bypassed. The plan shall include any proposed tanker(s), pump(s), bypass piping, backup plan, and equipment, work schedule, monitoring log for bypass pumping, monitoring plan of the bypass pumping operation and maintenance of traffic plan. The CONTRACTOR shall cease bypass operations and return flows to the new and/or existing sewer when directed by PCU. All bypass piping shall be designed to withstand at least twice the maximum system pressure or a minimum of 50 psi, whichever is greater. During bypassing, no wastewater shall be leaked, dumped, or spilled in or onto, any area outside of the existing wastewater system. When bypass operations are complete, all bypass piping shall be drained into the wastewater system prior to disassembly.

3.04 BYPASS OPERATION

A. PCU must approve of and accept the bypass plan for planned bypasses prior to implementation of the bypass. The CONTRACTOR shall plug off and pump down the sewer manhole or line segment in the immediate WORK area and shall maintain the wastewater system so that surcharging does not occur. Emergency bypasses shall be as directed by PCU.

B. Where WORK requires the line to be blocked beyond NORMAL WORKING HOURS and bypass pumping is being utilized, the CONTRACTOR shall be responsible for monitoring the bypass operation 24 hours per day, 7 days per week. If accepted in the bypass plan by PCU, any electronic monitoring in lieu of on-site monitoring must be detailed in the written plan and approved by PCU.

C. The CONTRACTOR shall ensure that no damage will be caused to private property as a result of bypass pumping operations. The CONTRACTOR shall complete the WORK as quickly as possible and satisfactorily pass all tests, inspections and repair all deficiencies prior to discontinuing bypassing operations and returning flow to the sewer manhole or line segment.

D. The CONTRACTOR shall immediately notify PCU should a sanitary sewer overflow occur and take the necessary action to clean up and disinfect the spillage to the satisfaction of PCU and/or other governmental agency. If sewage is spilled onto public or private property, the CONTRACTOR shall wash down, clean up and disinfect the spillage to the satisfaction of PCU and/or other governmental agency. When bypassing a lift station, one back-up pump equal to the primary unit shall be required. Bypass pumps shall have a maximum rating of 65 decibels for sound attenuation next to residential developments, 70 decibels next to commercial

businesses, and 80 decibels next to industrial areas or in accordance with the LAND DEVELOPMENT CODE.

3.05 CONTRACTOR LIABILITY

A. The CONTRACTOR shall be responsible for all required pumping, equipment, piping and appurtenances to accomplish the bypass and for any and all damage that results directly or indirectly from the bypass pumping equipment, piping and/or appurtenances. The CONTRACTOR shall also be liable for all COUNTY personnel and equipment costs, penalties, and fines resulting from sanitary sewer overflows. It is the intent of these specifications to require the CONTRACTOR to establish adequate bypass pumping as required regardless of the flow condition.

Submersible Wastewater Pumps Specifications

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. The specifications within this Section are for equipment that is intended to be standard pumping equipment of proven ability as manufactured by a reputable firm having at least five years experience in the production of such equipment. The equipment furnished shall be designed, constructed and installed in accordance with the best practices and methods and shall operate satisfactorily when installed as shown on the PLANS.

B. All parts shall be so designed and proportioned as to have liberal strength and stiffness and to be especially adapted for the WORK to be done. Ample space shall be provided for inspection, repairs and adjustment. All necessary foundation bolts, plates, nuts, and washers shall be furnished by the equipment manufacturer and shall be of Type 316 stainless steel. Brass or stainless steel nameplates identifying the name of the manufacturer, voltage, phase, rated horsepower, speed and any other pertinent data shall be attached to each pump. The nameplate rating of the motors shall not be exceeded.

C. The pumps shall be capable of handling raw unscreened domestic wastewater and minimum 3-inch diameter solid spheres. Pumps shall be mounted in the wet well as shown in the STANDARD DRAWINGS. Refer to the appropriate "Approved Materials Checklist".

1.03 QUALITY ASSURANCE

A. Warranty/Service Center shall be located in Orange, Lake, Hillsborough, Polk, or Osceola Counties and service response shall be within two hours during NORMAL WORKING HOURS, and provide emergency service 24 hours, 7 days a week.

B. Vendor shall have an exchange program in place with ability to exchange out-of-service pumps that require shop work for pump in vendor stock until repairs are complete or serviceable pump is available.

PART 2 - PRODUCTS

2.01 PUMP CONSTRUCTION DETAILS

A. Shaft:

The pump shaft shall be of Series 300 or 400 stainless steel or carbon steel. When a carbon steel shaft is provided, the manufacturer shall demonstrate that any part of the shaft which will normally come in contact with the wastewater has proven to be corrosion resistant in this application. The shaft and bearings shall be adequately designed to meet the maximum torque required for any start-up or operating condition and to minimize vibration and shaft deflection. As a minimum, the pump shaft shall rotate on two permanently lubricated bearings. The upper bearing shall be a single row ball bearing. The lower bearing shall be a two row angular contact ball bearing, if required to minimize vibration and provide maximum bearing life. Bearings shall be

designed to provide a minimum life of 50,000 hours.

B. Impeller:

The impeller shall be constructed of bronze or gray cast iron, ASTM A-48, class 30. All external bolts and nuts shall be of Type 316 stainless steel. Each pump shall be provided with a replaceable metallic wear ring system to maintain pump efficiency. As a minimum one stationary wear ring provided in the pump volute and one rotating wear ring provided on the pump impeller shall be required. A two-part system is acceptable. The closed type can be single or double vaned. The open type shall be single vane with a self-cleaning, adjustable cast iron wear plate. All impellers shall be non-clogging and dynamically balanced.

C. Mechanical Seal:

Each pump shall be provided with a tandem double mechanical seal or dual mechanical seals running in an oil reservoir, composed of two separate lapped face seals, each consisting of one stationary and one rotating tungsten carbide ring with each pair held in contact by a separate spring, so that the outside pressure assists spring compression in preventing the seal faces from opening. The compression spring shall be protected against exposure to the pumped liquid. Silicone carbide may be used in place of tungsten carbide for the lower seal. The pumped liquid shall be sealed from the oil reservoir by one face seal and the oil reservoir from the air-filled motor chamber by the other. The seals shall require neither maintenance nor adjustment, and shall be easily replaced. Seal shall be held in place by locking ring. Conventional double mechanical seals with a single spring between the rotating faces, requiring constant differential pressure to effect sealing and subject to openings and penetration by pumping forces, shall not be considered equal to tandem seal specified and required. Cartridge seal shall be acceptable.

D. Guides:

A sliding guide bracket shall be an integral part of the pump casing and shall have a machined connecting flange to connect with the cast iron discharge connection (pump base elbow), which shall be bolted to the floor of the wet well with stainless steel anchor bolts and so designed as to receive the pump discharge flange without the need of any bolts or nuts. The pump base elbow design shall be interchangeable such that it will provide a watertight connection for any of the specified or otherwise accepted pumps without requiring any special tools, gaskets or adapters. Sealing of the pumps to the discharge connection shall be accomplished by a simple linear downward motion of the pump with the entire weight of the pumping unit guided by two Type 316 seamless tubular stainless steel guides which will press it tightly against the discharge connection. No brackets for guide rail system will be mounted to discharge piping. No portion of the pump shall bear directly on the floor of the wet well and no rotary motion of the pump shall be required for sealing. Sealing at the discharge connection by means of a diaphragm or similar method of sealing will not be accepted as an equal to a metal to metal contact of the pump discharge and mating discharge connection specified and required. Approved pump manufacturers, if necessary to meet the above specification,

shall provide a sliding guide bracket adapter. No reducing brackets or adapters shall be placed on or between the base elbow seating surface and pump volute. The design shall be such that the pumps shall be automatically connected to the discharge piping when lowered into place on the discharge connection. The pumps shall be easily removable for inspection or service, requiring no bolts, nuts or fastenings to be removed for this purpose and no need for personnel to enter the wet well.

2.02 MOTORS

A. General Requirements:

All motors shall be built in accordance with latest NEMA, IEEE, ANSI and AFBMA standards where applicable. Pump motors shall be housed in an air-filled, watertight casing and shall have Class F insulated windings which shall be moisture resistant. Motors shall be NEMA Design B, rated 155 degrees C maximum. Pump motors shall have cooling characteristics suitable to permit continuous operation, in a totally, partially or non-submerged condition. The pump shall be capable of running continuously in a non-submerged condition under full load without damage, for extended periods. The motor shall be capable of a minimum of 10 starts per hour. A field running test demonstrating this ability, with 24 hours of continuous operation under the above conditions, shall be performed for all pumps being supplied before final acceptance, as required by PCU. Pump motors shall be non-overloading over entire pump range.

1) Motors 25 horsepower and below shall be rated 230/460-volt, 3-phase.

2) Motors greater than 25 horsepower shall be rated 460-volt, 3-phase.

B. Heat and Moisture Sensors:

Each motor shall incorporate a minimum of one ambient temperature compensated overheat sensing device and one moisture sensing device. These protective devices shall be wired into the pump controls in such a way that if excessive temperature is detected the pump will shut down. If moisture is detected, a fault will be sent to SCADA and activate a seal failure alarm light on the dead front door without affecting pump operation. These devices shall be self-resetting.

C. Cables:

Cables shall be designed specifically for submersible pump applications and shall be properly sealed. A type CGB watertight connector with a neoprene gland shall be furnished with each pump to seal the cable entry at the top of the pump. The pump cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall be comprised of a single cylindrical elastomer grommet, flanked by washers and/or a compression gland, all having a close tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the entry body containing a strain relief function, separate from the

function of sealing the cable. The assembly shall bear against a shoulder in the pump top. The cable entry junction chamber and motor shall be separated by a stator lead sealing gland, epoxy barrier, or terminal board, which shall isolate the motor interior from foreign material gaining access through the pump top. Secondary sealing systems utilizing epoxy potting compounds may be used. The manufacturers shall supply a cable cap as part of the spare parts for each pump when this type of sealing system is used. All cables shall be continuous, without splices from the motor to the control panel, junction box terminal strip, unless otherwise approved by PCU. The junction chamber, containing the terminal board, shall be perfectly leak proof.

2.03 PUMP CONTROL SYSTEM

A. Refer to the Section entitled "Wastewater Lift Station Electrical and Control System Specifications".

PART 3 - EXECUTION

3.01 SHOP PAINTING

A. Before exposure to weather and prior to shop painting, all surfaces shall be thoroughly cleaned, dry and free from all mill-scale, rust, grease, dirt and other foreign matter. All pumps and motors shall be shop coated with a corrosion resistant paint proven to withstand an environment of raw wastewater. All nameplates shall be properly protected during painting.

B. Gears, bearing surfaces, and other similar surfaces obviously not to be painted shall be given a heavy shop coat of grease or other suitable rust-resistant coating. This coating shall be maintained as necessary to prevent corrosion during periods of storage and erection and shall be satisfactory to PCU up to the time of the final acceptance test.

3.02 HANDLING

A. All parts and equipment shall be properly protected so that no damage or deterioration will occur during a prolonged delay from the time of shipment until installation is completed and the units and equipment are ready for operation. Finished surfaces of all exposed pump openings shall be protected by wooded planks, strongly built and securely bolted thereto. Finished iron or steel surfaces not painted shall be properly protected to prevent rust and corrosion.

3.03 WARRANTY

A. The pump manufacturer shall warrant the units being supplied to PCU against defects in workmanship and material for a period of five years from installation or 10,000 hours from installation, whichever comes first.

3.04 TOOLS AND SPARE PARTS

A. No tools or spare parts shall be required.

Wastewater Lift Station Electrical System Specifications

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. This Section specifies the electrical system requirements for wastewater lift stations. These requirements apply to standard lift stations and also include general requirements applying to stations with Variable Frequency Drives (VFDs) and Motor Control Centers (MCCs). Provide all work necessary for a complete and operational lift station installation.

B. All work shall be performed in accordance with the current revision of the National Fire Protection Association (NFPA) 70, National Electrical Code (NEC) and OSHA regulations and guidelines. Provide equipment labeled or listed by a nationally recognized testing laboratory or other organization as a basis for approval under the NEC.

C. Pump Operation shall be controlled automatically by means of hydrostatic pressure transducer level sensors with a float ball backup system for pump control and level alarms. VFD pump operation shall be PID-controlled to maintain a level set point in the wet well. VFD driven pumps shall start and stop based on specific level set points.

D. Lift station control panel(s) shall be provided for each wastewater lift station. Refer to Section 517, SCADA and Control Panel Specifications for requirements related to lift station control and monitoring and control panel construction and materials.

1.02 DESIGN REQUIREMENTS

A. Unless otherwise noted, the latest version of the following codes and standards shall be used for the design and construction of County Utility Lift Stations.

1. Institute of Electrical and Electronics Engineers (IEEE).

    a. Standards as applicable for design and implementation.

2. National Electrical Manufacturers Association (NEMA).

    b. Standards as applicable for design and implementation.

3. National Fire Protection Association (NFPA):

    a. 70 – National Electrical Code.

    b. 70E - Standard for Electrical Safety in the Workplace.

    c. 820 – Standard for Fire Protection in Wastewater Treatment and Collection Facilities.

4. Telecommunications Industry Association (TIA); Electronics Industry Association (EIA):

    a. 607, Commercial Building Grounding and Bonding Requirements for Telecommunications.

5. Underwriters Laboratory, Inc.

    a. 508, Standards for Safety, Industrial Control Equipment.

    b. Component specific standards as applicable.

B. All lift station designs shall comply with the requirements of the Florida Administrative Code and Florida Administrative Register Rule Chapter 61G15-33, Responsibility Rules of Professional Engineers Concerning the Design of Electrical Systems.

C. All lift station electrical designs shall be signed and sealed by an Electrical Engineer registered in the State of FL.

D. The following documents shall be provided for each lift station design and construction project at a minimum:

1. Power Distribution riser or single line diagram with available utility short circuit current and equipment short circuit current interrupt ratings and all breaker and wire ratings and sizes.

2. Conductor gauges and insulation type and conduit size and type.

3. Location and type of surge protective devices.

4. Location and sizes of all electrical equipment and control devices. Equipment rack layouts.

5. Load calculations.

6. Grounding and bonding layouts and details including type and location of grounding rods, conductor type and size, and bonding requirements.

7. Control and instrumentation wiring risers or diagrams.

8. Electrical Legends.

9. Design specifications noting all equipment, workmanship, installation, and testing requirements

10. Construction Submittals for all components.

11. As-built construction drawings.

12. Testing documentation.

13. Lift station electrical O&M manuals.

PART 2 - PRODUCTS

2.01 GENERAL

A. Provide products and materials as specified in the appropriate "Approved Materials Checklist" and as specified herein. Provide products of the same or similar type of one manufacturer in order to achieve standardization.

B. Equipment and devices installed outdoors shall be capable of continuous operation within a minimum ambient temperature range of minus 22 degrees F to 144 degrees F unless noted otherwise.

C. Provide manufacturer's standard finish except where specific color or finish is indicated.

2.02 POWER SUPPLY AND MAIN DISCONNECT

A. Coordinate installation of all new and modified power services with the local utility and obtain all required permits.

B. Power supply to the control panel shall be 240-volt, 3-phase, 4-wire (Delta) or 480-volt, 3-phase, 4-wire (Wye). Service shall be designed for the station full load amperes including the loading of any planned future equipment plus a minimum 50% spare capacity. Single-phase power is not permitted.

C. The power supply cables to the control panel from the off-site source shall be installed underground within a minimum 3-inch diameter schedule 80 PVC electrical conduit and in accordance with the NEC.

D. For systems having a permanently mounted standby generator, refer to Section 516 Part 2.07 "Standby Power Generator System" for generator and transfer switch requirements.

E. Systems requiring a portable generator connection shall meet the following requirements:

1. Coordinate requirements with control panel supplier .

2. Provide a breaker based UL1008 listed and service entrance rated transfer switch

with generator cam-lock connectors to be used as the service entrance equipment and terminate utility feed to this device. Refer to Manual Transfer Switch (MTS) specification for requirements.

F. Manual Transfer Switch:

1. Provide service entrance rated UL 1008 listed manual transfer switch for lift stations requiring portable generator systems.

2. Transfer switch shall be molded case breaker-based with safety interlocked door and interior dead-front panel construction. Transfer switch enclosure shall be NEMA 3R powder coated galvanneal steel construction.

3. Switches shall be 240V or 480V AC 3-phase, 4-wire based on available site voltage and rated for a minimum of 100A. Provide with color coded cam-lock style connectors as required for the site specific amperage having a minimum 400A rating.

4. Manufacturer: ESL Power Systems Stormswitch or approved equal.

G. Where required by the local electrical utility, an additional UL listed, NEMA 3R, lockable, non-fused, safety type switch utility service disconnect shall be installed ahead of the utility meter in accordance with local utility requirements. The disconnect shall be rated for the maximum available fault current from the utility serving the lift station.

H. Provide 3-phase surge suppression on the downstream side of the transfer switch to provide surge protection on both utility and generator power. A Surge Protective Device (SPD) shall be included and wired to protect motors and control equipment from induced line surges. All SPD's shall be UL listed and installed in accordance with the respective power company requirements and manufacturer's specifications. SPD's shall be attached to the load side of the main transfer switch and mounted in a separate NEMA 4X enclosure directly attached to the transfer switch enclosure. Where a manual transfer switch is not supplied, SPD's shall be installed downstream of the control panel main and generator breakers and mounted external to the control panel. SPD's shall meet the following minimum requirements:

1. The SPD unit shall be UL listed and labeled as per UL 1449 latest edition and have a UL 1283 listing for active sine wave tracking.

2. The unit shall meet "Testing Requirements" of IEEE 62.41 and 62.45.

3. Minimum 10-year replacement warranty.

4. Provide with Disconnect Only option.

5. Provide status indicator lights and contact relay output indicating suppressor fault.

6. Manufacturer:

   a. Eaton, SPD series.

   b. Eaton/Innovative Technology Protector, PTE series.

   c. Approved Equal.

2.03 BOXES

A. Outlet and Device Boxes:

1. General: Outlet and device boxes shall be cast aluminum with a powder coat finish and threaded outlets. The boxes shall be gasketed, weatherproof, and UL listed for wet locations. Provide with matching gasketed weatherproof covers selected for the appropriate application.

2. All receptacles and switches shall be industrial grade as manufactured by Eaton/Cooper, Hubbell, or Leviton.

3. For wet location receptacles, provide die-cast powder coated aluminum impact-resistant, single-gang outlet cover with a NEMA 3R rating while in-use.

4. For wet location switches, provide gasketed powder coated aluminum covers with hinge.

5. Manufacturers (boxes):

   a. Crouse-Hinds, Cast Aluminum Weatherproof FS/FD Boxes.

   b. Thomas and Betts, Cast Aluminum Weatherproof FS/FD Boxes.

   c. Appleton, Cast Aluminum Weatherproof FS/FD Boxes.

B. Terminal Junction Boxes (Hazardous Locations):

1. Terminal junction boxes for hazardous locations shall be provided for all junction boxes having a direct connection to the lift station wet well where there is not an appropriate listed conduit seal-off or air gap in between.

2. Provide an ATEX or equivalently approved Type Ex e Class I Zone 1 terminal junction box having UL Listed NEMA 4X Type 304 stainless steel construction for termination of wet well power and control wiring. Power and control wiring shall be separated by a minimum of 12-inches. Separate power and control wiring

junction boxes may be provided. The box shall be provided with corrosion resistant terminal strips to accommodate instrumentation and power conductors from the wet well. Seal conduits entering the junction box from the wet well with duct seal, or equivalent, and provide a minimum Class I Division 2 poured conduit seal between the junction box and control panel.

3. Junction Box: Hoffman Zonex ATEX certified Type 4X, or approved equal.

4. Terminal Block: Eaton XB series, Phoenix Contact UT series, or approved equal Ex e labeled corrosion resistant screw type terminal block.

C. Terminal Junction Boxes (Non-Hazardous Locations):

1. General: Provide terminal junction boxes as required.

2. Terminal junction boxes shall be NEMA 4X Type 304 Stainless Steel with hinged cover and white enamel painted interior mounting panel.

3. Manufacturers:

a. Hoffman

b. Rittal

c. Schaefer

D. Concrete electrical box:

1. General: Provide concrete electrical boxes as required for underground electrical circuits.

2. Concrete electrical boxes shall be sized as required, have H/20 loading capacity and shall be reinforced concrete with extension and open bottom with openings in each end for conduit entry. Covers shall be galvanized steel diamond plate with integral handle with appropriate label/marking and locking bolts.

3. Manufacturer: Oldcastle/Christy B series or approved equal.

2.04 CONDUIT AND FITTINGS

A. Rigid Aluminum Conduit:

1. Provide rigid aluminum conduit above grade and where conduit sealing fittings are used. Provide aluminum sealing fittings to prevent galvanic corrosion and seizing of threaded connections. Use with stainless steel Myers hub for connections to enclosures. Provide PVC-coated conduit or coat aluminum with

bitumastic where in contact with concrete.

2. Rigid aluminum conduit shall meet requirements of NEMA C80.5 and UL6A and be of Type 6063 copper-free aluminum alloy.

B. PVC Schedule 80 Conduit:

1. Provide PVC Schedule 80 conduit below grade. PVC conduit may be extended from below to above grade where conduit sealing fittings are not required such as from the wet well to the terminal junction box.

2. PVC Schedule 80 conduit shall meet the requirements of NEMA TC-2 and UL 651 and shall be furnished without factory formed bell.

C. Flexible Metal Liquid-tight Conduit:

1. Provide flexible metal liquid-tight conduit where necessary to provide flexible connections for instrument and equipment connections.

2. Flexible metal liquid-tight conduit shall meet the requirements of UL 360 and be constructed of galvanized steel with an extruded PVC jacket.

D. Fittings:

1. Rigid aluminum fittings shall meet the requirement of UL 514B and be of copper-free construction.

2. PVC fittings shall meet the requirements of NEMA TC-3.

3. Manufacturers:

a. Crouse-Hinds

b. Thomas and Betts

c. OZ-Gedney

2.05 ALARM LIGHT, HIGH LEVEL

A. A vapor proof and vandal proof screw-on type red alarm light shall be mounted on top of a separate 1½ inch minimum diameter Schedule 40 aluminum riser pole located behind and connected to the bottom of the panel by a 1½ inch minimum diameter water tight flexible electrical conduit. The riser pole shall be secured to the horizontal cross member struts, not the panel, with the bottom of the light being no less than 12 inches but not more than 18 inches above the top of the enclosure.

B. Alarm Light Specification:

1. Type: Rotating reflector or flashing bulb.
2. Dome: Polycarbonate.
3. Color: Red.
4. Enclosure: NEMA 4X with ½-inch threaded pipe fitting.
5. UL Listed.
6. Power: 24Vdc.
7. Manufacturer:
   a. Federal Signal, 225XST.
   b. Edwards Signaling.
   c. Approved equal.

2.06 ELECTRICAL EQUIPMENT RACK

A. The main support beams shall be minimum 6-inch structural aluminum I-Beams or H-Beams with a minimum web thickness of 0.210 inches. Two coats of bitumastic coating shall be applied where aluminum will be in contact with concrete or the ground.

B. Horizontal cross member struts shall be 12-gauge stainless steel U-channels with a minimum nominal dimension of 1-1/2” inch by 1-inch. The ENGINEER shall review the structure’s wind loading requirements and make any size increases to the main support posts as needed. All other electrical equipment support brackets and hardware shall be 316-stainless steel. Hardware shall include, as a minimum, brackets, nuts, bolts, washers, toggle bolts, clamps, straps, etc.

C. An outdoor rated weatherproof GFCI receptacle, UL listed for wet locations, shall be mounted on the electrical equipment rack with NEMA 3R while-in-use aluminum cover. The receptacle shall be fed from a dedicated circuit.

2.07 STANDBY POWER GENERATOR SYSTEM

A. General:

1. A stationary standby power generator system including the diesel engine generator and automatic transfer switch shall be installed at lift stations, as

required by Section 512 entitled "Wastewater Lift Station Standards and Specifications".

2. The generator shall be sized to carry the full lift station load with all pumps operating. Operating voltage shall match of the lift station utility source.

3. Generator configuration shall be diesel engine in a weatherproof sound attenuated enclosure with a diesel fuel tank(s) and separately mounted automatic transfer switch.

4. Manufacturers:

   a. Caterpillar

   b. Cummins

   c. Kohler

B. Generator Set:

1. Generator Set shall be a UL 2200 listed package.

2. The generator set shall consist of a diesel engine directly coupled to an electric generator, together with the necessary controls and accessories to provide continuous electric power to the lift station for a minimum duration of 48-hour failure of the normal power supply. The main fuel tank shall have at least 133 percent of the amount of fuel required for the class rating (Class 48), as defined in NFPA 110. The generator set shall be sized to operate continually for the minimum run time of 48 hours under a full load condition.

3. A complete engine generator system shall be furnished and installed with fuel transfer pump, fuel tank, day tank with rupture basin (where required), battery, battery charger, muffler, radiator, control panel, remotely mounted automatic transfer switch, and all other accessories required for an operational system. All materials and parts of the generator set shall be new and unused. Each component shall be of current manufacture from a firm regularly engaged in the production of such equipment. The set shall be of a standard model in regular production at the manufacturer's place of business.

C. Requirements:

1. The emergency generator set and accessories shall be of a type that complies with the latest edition of the NEC and all applicable state and local building codes.

2. The material and workmanship used in the manufacture of this equipment shall be of the highest quality consistent with the current standards for like equipment, and

the equipment shall be manufactured in such a manner so as to conform to the latest applicable IEEE, ANSI, ISA, and NEMA standards.

D. Engine:

1. The engine shall be water-cooled, four-stroke cycle, compression ignition diesel. The engine shall be equipped with a fuel filter with a replaceable spin-on canister, lube oil and intake air filters, lube oil and fuel coolers, a fuel transfer pump, fuel priming pump, and a jacket water cooling system consisting of jacket water pump, fan assembly, fan guard, and duct flange outlet.

2. The engine and generator shall be torsionally compatible to prevent damage to either engine or generator. An engine instrument panel shall be installed on the generator set in an approved location. The panel shall include oil and fuel pressure and water temperature gauges. A mechanically driven engine hour meter shall also be provided.

3. The engine governor shall be of the isochronous electronic type. Frequency regulation shall not exceed plus/minus 0.25 percent under steady state conditions. The engine shall start and assume its rated load within 10 seconds, including transfer time.

E. Generator:

1. The generator shall be a three-phase, 60-hertz, single bearing, synchronous type, built to NEMA Standards. Epoxy impregnated Class F insulation shall be used on the stator and the rotor.

2. The excitation system shall employ a generator-mounted volt per hertz type regulator. Voltage regulation shall be plus/minus two percent from no load to full load. Readily accessible voltage drop, voltage level and voltage gain controls shall be provided. Voltage level adjustment shall be a minimum of plus/minus five percent.

F. Engine Generator Control Panel:

Control panel shall be mounted inside generator enclosure. Panel shall contain, but not be limited to, the following equipment:

1. Control Equipment:

Control equipment shall consist of all necessary exciter control equipment, generator voltage regulators, voltage-adjusting rheostat, and speed control equipment and automatic starting controls, as required to satisfactorily control the engine/generator set. In addition an automatic safety shut down shall be provided for low oil pressure and/or high temperature conditions in the engine. An

emergency shut down lever switch shall be provided on the air intake. Provide the following I/O for interface with the control panel PLC via a Modbus or an Ethernet Modbus TCP interface:

a. System Not in Auto.
b. Engine ON.
c. Engine Fault.
d. Engine Control Panel Fault.
e. Low Battery.
f. Low-Oil Pressure.
g. Low-Coolant Temperature.
h. High-Coolant Temperature.
i. Over Crank Fault.
j. Over Speed.

2. Metering Equipment:

Metering equipment shall include 3-1/2-inch meters (dial or digital type frequency meter, two percent accuracy voltmeter, and ammeter and ammeter-voltmeter phase selector switch). The control panel shall also include the engine water temperature, lube oil pressure and hour meter.

3. Fault Indicators:

Individual press-to-test fault indicator lights for low oil pressure, high water temperature, low water level, over speed, and over crank shall be provided.

4. Function Switch:

A four-position function switch marked “Auto”, “Manual”, “Off/Reset”, and “Stop” shall be provided.

G. Battery Charger:

The battery charger shall be UL 1236 listed and designed that it shall not be damaged and shall not trip its circuit protective device during engine cranking or it shall be automatically disconnected from battery during cranking period. The charger shall be mounted inside the emergency generator enclosure. The charger shall have a 7-day/24-hour timer control. The charger shall include an ammeter and voltmeter, Power ON pilot light, AC failure relay and light, and a low and high DC voltage alarm and relay.

H. Battery:

The battery shall be lead-acid type with sufficient capacity to provide 90 seconds total cranking time without recharging. The battery shall be adequately rated for the

specific generator set. The battery shall be encased in hard rubber or plastic, shall be housed in an acid resistant frame, and shall be furnished with proper cables and connectors, together with rack and standard maintenance accessories.

I. Base Mounting:

A suitable number of spring-type vibration isolators with a noise isolation pad shall be provided to support the set and its liquids. Isolators shall be bolted to concrete generator pad.

J. Electrical Connections:

All connections to the generator set shall be underground.

K. Cooling System:

The generator set shall be equipped with an engine-mounted radiator sized to maintain safe operation at 110 degrees Fahrenheit maximum ambient temperature. A blower type fan shall be used directing the airflow from the engine through the radiator. The motor shall be equipped with a crankcase heater. The entire cooling system shall be filled with 50 percent glycol-water solution.

L. Fuel System:

1. Regulated Tanks - a fuel tank that has a capacity greater than 550 gallons.

   Regulated tanks are subject to F.A.C. 62.762 and must have registration submitted and insurance in place. Both registration and monthly visual inspection reports shall be kept on site and readily available for review by the Federal Department of Environmental Protection (FDEP) and/or the Florida Department of Health (DOH). Any tank installation that is greater than 1320 gallons shall have a Spill Prevention, Control, and Countermeasure Plan (SPCC) completed by the Engineer of Record prior to installation and registration as per the COUNTY and Title 40 Code of Federal Regulations (CFR), Part 112. Tanks shall have a 1993 sticker and content “diesel” label located in a conspicuous location that can be seen by anyone approaching the tank for inspection or fueling.

2. Non-Regulated Tanks - a fuel tank that has a capacity of less than 550 gallons.

   Non-regulated tanks do not require registration or insurance and will be visually inspected quarterly and shall have a 1993, “Less than 550 Gallons” sticker and a content “diesel” label applied to the tank in a conspicuous location that can be seen by anyone approaching the tank for inspection or fueling.

3. All fuel tanks that are to be incorporated into a design drawing shall be reviewed and signed off by COUNTY staff prior to 100 percent plans for CIP projects

being submitted for review or Level 2 approval for private development projects involving such infrastructure to be dedicated to PCU. Prior to ordering any fuel tank, the following will take place. Five signatures will be collected from the appropriate COUNTY staff that acknowledges a proposed delivery and installation of a fuel tank. Those signatures will come from the offices of Purchasing, PCU, Risk (insurance), Risk (regulatory) and Fleet Management. The PCU Environmental Staff shall be notified thirty (30) days prior to delivery to a COUNTY facility.

4. Fuel Storage Tank:

   a. All fuel tanks shall be double wall steel or steel and concrete tanks with an interstitial annular space.

   b. Provide fuel tanks sized as required for 48 hours of continuous runtime.

   c. Two fuels tanks in series is the maximum allowed at any one facility.

   d. Fuel tanks requiring a day tank for the generator shall include a rupture basin for the day tank.

   e. All fuel lines shall be installed above ground with a concrete pad separating the piping from the ground. The piping will be secured to the concrete every five feet to avoid vibration. The pipe shall be black iron with threaded ends. Pipe dope shall be used at all connections. No thread tape shall be used. Underground piping is prohibited for the fuel delivery system.

   f. All external tanks (non-belly tanks) shall have hurricane tie downs.

   g. Provide audible alarm when liquid level in tank reaches 90 percent of the capacity.

   h. Non-regulated tanks may have visual leak detection.

   i. Regulated tanks shall be equipped with the following fuel monitoring system:

      a) Fuel tank level control panel for tank gauging, leak sensing, and audible/visual alarm annunciation. Panel shall be NEMA 4X construction.

      b) Provide 4-20mA output proportional to tank level and dry contact outputs for leak indication, and high-high, low, and low-low levels suitable for connection to SCADA control panel. Signals may be transmitted via Modbus or Ethernet Modbus TCP.

      c) Provide audible alarm for high and low levels and leak detection.

d) Provide visual indication of tank level.

e) If two tanks of 500 gallons, or greater, are installed at one site, both tanks shall follow the "regulated" installation procedures, meaning both tanks shall be equipped with the Pneumercator system.

f) Provide Pneumercator type TMS-1000D or TMS-2000 console with MP55xS level probe and LS-600 series leak sensor.

5. Paint:

   The fuel piping shall be painted red. The spill bucket, handrails, and front of stair tread shall be painted yellow. Vent pipes and all other appurtenances shall be painted black.

6. Fueling:

   No fuel will be delivered to any tank prior to pressure testing and inspection by COUNTY staff. This includes but is not limited to testing of the generator. Fuel for testing and the first delivery to fill the tanks shall be at the CONTRACTOR's expense.

7. Inspection and Testing:

   Inspection of the fuel tank and piping shall be completed by a member of the PCU Environmental staff. Inspection by anyone other than a member of the PCU Environmental staff will not relieve the CONTRACTOR or ENGINEER of responsibility or be accepted. Pressure testing of the fuel lines shall be conducted with a member of PCU Environmental staff present. The test will be conducted for two (2) hours at 5 PSI.

8. Violations:

   All violations of the rules set forth by the Polk County Environmental Regulatory Committee shall be punishable as set forth by the Florida Department Environmental Protection. Any and all fines charged to the COUNTY as a result of regulatory violations on the part of a contractor will be paid by the contractor. All violations incurred by the CONTRACTOR will be reported to the Polk County Purchasing Division.

N. Exhaust System:

1. The generator set supplier shall provide a residential grade critical-type silencer, with flexible exhaust fittings, properly sized and installed, according to the manufacturer's recommendation. The silencer shall be mounted so that the engine does not support its weight.

2. Exhaust pipe size shall be sufficient to ensure that measured exhaust backpressure does not exceed the maximum limitations specified by the generator set manufacturer. The exhaust system shall be stainless steel and include a flexible, seamless, stainless steel connection between the engine exhaust outlet and the muffler. The exhaust system shall be a part of generator enclosure. A stainless steel weatherproof rain cap shall be installed over the exhaust pipe.

O. Weatherproof Enclosure:

1. Enclosure and all other items shall be designed and built by engine manufacturer as an integral part of the entire generator set in accordance with UL 2200 and shall be designed to perform without overheating in the ambient temperature specified.

2. Enclosure shall be constructed of 14 or 16-gauge sheet aluminum suitably reinforced to be vibration free in the operating mode. Enclosure shall have a rating of 75 db at the perimeter of the lift station site. Enclosure hardware shall be stainless steel.

3. Four hinged doors shall be provided to allow complete access without their removal. Doors shall be pad lockable on handles.

4. Each door shall have at least two latch-bearing points.

5. Panels shall be completely and simply removable for major service access. Additional doors in front of the radiator shall be supplied for easy removal of radiator assembly.

6. Enclosure shall be waterproof and the roof shall be peaked to allow drainage of rainwater.

7. Baked enamel finish with primer and finish coat shall be painted before assembly. All fasteners shall be stainless steel.

8. Unit shall have sufficient guards to prevent entrance by small animals.

   a. Batteries shall be designed to fit inside enclosure and alongside the engine and shall be easily removable for service. Batteries under the generator are not acceptable.

   b. Unit shall have coolant and oil drains outside the unit to facilitate maintenance. Each drain line shall have a high quality valve located near the fluid source.

   c. Fuel filter shall be inside the base perimeter and located so spilled fuel cannot fall on hot parts of engine or generator. A cleanable primary fuel strainer

shall be used to collect water and sediment between tank and main engine fuel filter.

d. Crankcase fumes disposal shall terminate in front of the radiator to prevent oil from collecting on the radiator core and reducing cooling capacity.

P. Automatic Transfer Switch:

1. The automatic transfer switch shall be the product of a single manufacturer and housed in a NEMA 3R Type 304-stainless steel enclosure with drip shield and door gasket. There shall be permanently affixed to the interior side of the enclosure door both a data-plate that includes generator kVA/kWkW, fuel tank capacity, rated fuel consumption, serial and model number of generator set, and a 10-inch x 12-inch pocket for log sheet storage.

2. The transfer switch shall be provided with the following features:

a. Complete protection, close differential voltage sensing relays monitoring all three phases (pick-up set for 95 percent of nominal voltage, dropout set for 85 percent nominal voltage).

b. Voltage sensing relay on emergency source (pick-up set for 95 percent of nominal frequency).

c. Time delay on engine starting-adjustable from 1 second to 300 seconds (factory set at three second)

d. Time delay normal to emergency transfer-adjustable from zero second to 300 seconds (factory set at one second). The CONTRACTOR shall request time delay settings in accordance with the priority rating or their respective loads.

e. Time delay emergency to normal transfer-adjustable 30 seconds to 30 minutes (factory set at five minutes), and time delay bypass switch shall be provided on door of the switch cabinet.

f. Unload running time delay for emergency engine generator cooling down-adjustable from zero to five minutes (factory set at five minutes) unless the engine generator control panel includes the cool down timer.

g. A dual time on neutral position shall be present from emergency power to regular utility power upon generator exercise routine.

h. Provisions shall be adequate for monitoring the condition of the generator under the SCADA system. Provide dry contacts for monitoring of the following status signals. Signals may be communicated via Modbus or Ethernet Modbus TCP:

a) Switch in Auto.
b) Switch in Utility Position.
c) Switch in Generator Position.
d) Utility Power Available.
e) Generator Power Available.
f) Fault.

3. Manufacturers:

   a. Emerson/ASCO

   b. Cummins

   c. Russelectric

   d. Eaton/Cutler-Hammer

2.08 INSTRUMENTATION

A. Provide instrumentation as shown on the PLANS and as required by Section 512 entitled "Wastewater Lift Station Standards and Specifications". Wire all analog instrumentation to the SCADA control panel for local and remote monitoring.

B. Level Element/Transmitter, Hydrostatic, Wastewater:

1. General: Measure and transmit signal proportional to water level. Provide cable length and level range as required for lift station.

2. Type: Hydrostatic.

3. Wetted materials may be stainless steel, titanium, Teflon, or Kynar.

4. Provide with sintered metal filter or desiccant vent to prevent water intrusion into the vent tube.

5. Loop-powered 4-20mA transmitter with integral lightning protection.

6. Provide with all necessary installation materials. Provide strain relief cord for cable hanging.

7. The element/transmitter shall be specifically designed for wastewater application.

8. Manufacturer:

   a. Endress and Hauser, Waterpilot FMX 21 with 42mm heavy duty construction.

   b. Keller America, Level Rat.

c. Blue Ribbon, BC001 Birdcage type.

C. Large Float Level Switches:

1. General: Actuate contact at set liquid level.

2. Type: Teflon coated stainless steel float with mercury switch.

3. 6.5-inch maximum actuation differential.

4. Provide switches with stainless steel mounting cable kit including 15-pound anchor and stainless steel cable clamps.

5. Manufacturer:

a. Anchor Scientific, Roto-Float.

b. Siemens, 9G.

c. Contegra, FS 96.

D. Pressure Gauges:

1. General: Pressure indication with range 0 – 60 psi.

2. Type: Bourdon tube with glycerin fill.

3. Phenolic case with 4-1/2” diameter dial and glass window.

4. Connection size: 1/2” lower connection.

5. Manufacturer:

a. Ashcroft, 1279 series.

b. Ametek, 1980 series.

c. Wika, XSEL series.

E. Pressure Transmitter:

1. General: Measure and transmit signal proportional to pressure.

2. Provide with 0-150 psi range.

3. Loop-powered with 4-20mA output with HART.

4. Silicone filled with 1/2" NPT connection.

5. NEMA 4X coated aluminum housing.

6. Provide installation brackets, stand, and block and bleed valves.

7. Manufacturer:

   a. Rosemount; Model 2051.

   b. Siemens; Sitrans P.

   c. Endress and Hauser; Cerebar S.

F. Electromagnetic Flow Meter and Transmitter:

1. General: Measure, indicate, and transmit the flow of a conductive process liquid in a full pipe.

2. Type: The magnetic flow meter shall be of the low frequency electromagnetic induction type and shall produce a DC-pulsed signal directly proportional and linear to the liquid flow rate..

3. Provide flow range as required with a minimum 10:1 turndown ratio.

4. Features:

   a. Zero stability feature.

   b. Empty pipe detection.

   c. Measure bi-directional flow.

5. Metering Tube: The metering tubes shall be constructed of stainless steel with carbon steel flanges. All magnetic flow meters shall be designed to mount directly in the pipe between ANSI Class 150 flanges and shall consist of a flanged pipe spool piece with laying length of at least 1-1/2 times the meter diameter.

6. Enclosure: NEMA 6P continuous submergence.

7. Liner: Hard rubber or polyurethane.

8. Electrodes: Type 316 Stainless Steel or Hastelloy C.

9. Grounding rings: Provide two (2) type 316 stainless steel, if required.

10. The length of the section of straight pipe before and after the meter shall be a

minimum of five (5) times the outside diameter of the pipe or as otherwise recommended by the manufacturer.

11. Transmitter:

    a. NEMA 4X construction remote mounted.

    b. Power 120Vac, 60Hz.

    c. Digital LCD display with configuration menu and keypad.

    d. 4-20mA output proportional to flow with HART.

    e. Mount transmitter on separate stand with sunshield and face north.

12. Calibrated in an ISO 9001 or NIST certified factory.

13. Manufacturer:

    a. Foxboro; 9100A with IMT25.

    b. Siemens; Sitrans F M Mag 5100 W with F M MAG 5000.

    c. ABB; WaterMaster.

G. Outdoor Instrument Surge Suppression:

1. General: Provide surge suppression for all 2, 3, and 4-wire instrumentation. Ground surge suppressor in accordance with manufacturer's instructions.

2. NEMA 4X enclosure.

3. UL 1449 Listed.

4. LED indication where available.

5. Manufacturers: Phoenix Contact, Weidmuller, Emerson/Edco.

2.09 ELECTRICAL GROUNDING SYSTEM

A. Lift stations shall be grounded in accordance with the NEC and IEEE 142-2007, Recommended Practice for Grounding for Industrial and Commercial Power Systems. All grounding systems shall be tested by the 3-point fall of potential test in accordance with ANSI/IEEE Standard 81, or approved equivalent testing. Documentation shall include all test apparatus information and results in both tabular and graphical formats, where applicable.

B. General: Provide 5/8-inch diameter copper clad steel ground rods 10-feet in length, minimum.

   a. Provide ground rods around the concrete wet well pad perimeter at all four corners. Provide additional ground rods as required to ensure ground rods have a separation of approximately 20-feet.

   b. Provide ground rod box for most accessible ground rod to allow for access for testing purposes. Ground rod box shall be Christy No. G5, Lightning and Grounding Systems Inc. I-R series, Alltec Corp. TW-FL8T, or approved equal.

C. Connectors:

   a. Below grade connectors and connections to reinforcing steel shall be exothermic weld type, Erico Cadweld or Cadweld Exolon.

   b. All other connectors shall be mechanical type copper alloy as manufactured by Erico, Burndy, or Thomas and Betts.

D. Conductors:

   a. Provide grounding ring connecting all system ground rods. Ground ring conductor shall be minimum #2/0 tinned stranded copper. Install ground ring approximately 30 inches below grade and 30 inches away from the wet well.

   b. Provide #2/0 tinned stranded copper wire to equipment and structures as noted below.

   c. Provide minimum #6 AWG green XHHW insulated copper stranded ground wire to instrumentation and equipment as noted below.

E. The following outlines minimum grounding requirements:

   a. Bond wet well cover to wet well structural steel using #2/0 tinned copper wire.

   b. Bond metallic valve vault covers to ground system using #2/0 tinned copper ground wire.

   c. Bond control panel ground bus to grounding system using minimum #6 insulated copper ground.

   d. Bond generator frame and neutral to grounding system with #2/0 tinned copper ground wire in accordance with the NEC.

   e. Bond utility system neutral to grounding system with #2/0 tinned copper ground wire in accordance with the NEC.

f. Bond metallic enclosures to grounding system with minimum #6 insulated copper ground wire.

g. Bond chain link fencing to nearest ground rod using #2/0 tinned copper ground wire.

h. Ground all surge suppression and instrumentation in accordance with manufacturer's instructions using minimum #6 insulated copper ground wire.

i. Ground electromagnetic flow meter grounding rings with #6 insulated copper ground wire.

j. Ground all analog instrumentation shielded cables at one end at the control panel ground bus.

k. Bond together system neutrals, service equipment enclosures, exposed noncurrent-carrying metal parts of electrical equipment, metal raceways, ground conductor in raceways and cables, receptacle ground connections, and metal piping systems.

l. Bond all metallic railing, supports, and cable racks with minimum #2/0 tinned copper ground wire.

2.13 VALVE ACTUATORS

A. The actuators shall be suitable for use on a nominal 460-volt or 220-volt three-phase 60-hertz power supply and are to incorporate motor, integral reversing starter, local control facilities, and terminals for remote control and indication connections. It shall be possible to carry out the setting of the torque, turns, and configuration of the indication contacts without the necessity to remove any electrical compartment covers.

B. The electric motor shall be Class F insulated with a time rating of at least 15 minutes at 104 degrees Fahrenheit (40 degrees Celsius) or twice the valve stroking time, whichever is the longer, at an average load of at least 33 percent of maximum valve torque. Electrical and mechanical disconnection of the motor should be possible without draining the lubricant from the actuator gear case. Plugs and sockets are not acceptable as a means of electrical connection for the motor.

C. Motor Protection:

1. Protection shall be provided for the motor as follows:

a. The motor shall be de-energized in the event of stall when attempting to unseat a jammed valve.

b. A thermostat to protect against overheating shall sense motor temperature.

D. Gearing:

The actuator gearing shall be totally enclosed in an oil-filled gear case suitable for operation at any angle. All main drive gearing must be of metal construction. Where the actuator operates gate valves or large diameter ball or plug valves, the drive shall incorporate a lost-motion hammer blow feature. For rising spindle valves, the output shaft shall be hollow to accept a rising stem and incorporate thrust bearings of the ball or roller type at the base of the actuator, and the design should be such as to permit the gear case to be opened for inspection or disassembled without releasing the stem thrust or taking the valve out of service. Standard SAE80EP gear oil shall be used to lubricate the gear case.

E. Hand Operation:

1. A hand wheel shall be provided for emergency operation and engaged when the motor is declutched by a lever or similar means. The hand/auto selection lever should be pad lockable in both “hand” and “auto” positions. It should be possible to select hand operation while the actuator is running or start the actuator motor while the hand/auto selection lever is locked in "Hand" without damage to the drive train.

2. The hand wheel drive must be mechanically independent of the motor drive, and any gearing should be such as to permit emergency manual operation in a reasonable time. Clockwise operation of the hand wheel shall give closing movement of the valve unless otherwise stated in the job specification. For safety purposes, it shall be possible to disengage the electric drive with the declutch lever. This disengagement and any subsequent reengagement shall not cause any damage to the valve or operator, even with the motor running.

F. Drive Bushing:

1. The actuator shall be furnished with a drive bushing easily detachable for machining to suit the valve stem or gearbox input shaft. Normally, the drive bush shall be positioned in a detachable base of the actuator. Thrust bearings, when housed in a separate thrust base, should be of the sealed-for-life type.

G. Torque and Turns Limitations:

1. Torque and turns limitation to be adjustable as follows:

a. Position setting range: 2.5 to 100,000 turns, with resolution to 7.5 degrees of actuator output. Torque setting: 40 to 100 percent rated torque. Torque sensing must be affected directly electrically or electronically. Extrapolating torque from mechanically measured motor speed is not acceptable due to

response time. Torque measurement shall be independent of variations in frequency, voltage, or temperature.

b. “Latching" to be provided for the torque sensing system to inhibit torque off during unseating or during starting in mid-travel against high inertia loads.

c. The electric circuit diagram of the actuator should not vary with valve type remaining identical regardless of whether the valve is to open or close on torque or position limit. An inexpensive setting tool is required for non-intrusive calibration and interrogation of the actuator. This setting tool will provide speedy interrogation capabilities as well as security in a non-intrusive intrinsically safe watertight casing.

H. Remote Valve Position and Actuator Status Indication:

1. In the event of a (main) power (supply) loss or failure, the position contacts must continue to be able to supply remote position feedback and maintain interlock capabilities. If batteries are required to maintain contact functionality, then the actuator vendor shall provide a supply sufficient for 30 continuous days of unpowered operation with one complete valve cycle every hour. A backup power source must be provided in the actuator to ensure correct remote indication should the actuator be moved manually when the power supply is interrupted. Four contacts shall be provided which can be selected to indicate any position of the valve with each contact externally selectable as normally open or normally closed. The contacts shall be rated at 5-ampere, 250-VAC, 30-VDC.

2. At a minimum, the following contact outputs shall be provided for each open/close service valve actuator:

   a. Open.

   b. Closed.

   c. Remote Selected.

   d. Fault.

3. At a minimum, the following signals shall be accepted from the control panel for open/close service valve actuator control:

   a. Open Command.

   b. Close Command.

4. At a minimum, the following status signals shall be provided for each modulating valve actuator:

a. Position Feedback, analog 4-20mA.

b. Fault, discrete contact.

c. Remote, discrete contact.

5. At a minimum, the following signals shall be accepted from the control panel for modulating service valve actuator control:

a. Position Command, analog 4-20mA.

I. Local Position Indication:

The actuator must provide a local display of the position of the valve, even when the power supply is not present. The display shall be able to be rotated in 90-degree increments so as to provide easy viewing regardless of mounting position. The actuator shall include a digital position indicator with a display from fully open to fully closed in one percent increments. Green and red lights corresponding to open (green) and closed (red) positions shall be included on the actuator with both lights on indicating mid-travel position

J. Integral Starter and Transformer:

1. The reversing starter, control transformer, and local controls shall be integral with the valve actuator, suitably housed to prevent breathing and condensation buildup. For "On/Off" service, this starter shall be an electromechanical-type suitable for 60 starts per hour and of rating appropriate to motor size. For modulating duty, the starter shall be suitable for up to a maximum of 1,200 starts per hour. The controls supply transformer shall be fed from two of the incoming three phases. It shall have the necessary tapings and be adequately rated to provide power for the following functions:

a. 120-VAC energization of the contactor coils;

b. 24-VDC output where required for remote controls; and

c. Supply for all the internal electrical circuits.

2. Easily replaceable fuses shall protect the primary and secondary windings.

K. Integral Push Buttons and Selector:

1. Integral to the actuator shall be local controls for open, close, and stop, and a local/remote selector switch, pad lockable in any one of the following three positions:

a. Local Control Only;

b. Off (No Electrical Operation); and

c. Remote Control plus Local Stop Only.

2. It shall be possible to select maintained or non-maintained local control. The local controls shall be arranged so that the direction of valve travel can be reversed without the necessity of stopping the actuator.

L. Wiring and Terminals:

1. Internal wiring shall be of tropical grade PVC insulated stranded cable of appropriate size for the control and three- phase power. Each wire shall be clearly identified at each end. The terminals shall be embedded in a terminal block of high tracking resistance compound. The terminal compartment shall be separated from the inner electrical components of the actuator by means of a watertight seal.

2. The terminal compartment of the actuator shall be provided with a minimum of three threaded cable entries. When required, a forth cable entry shall be provided. All wiring supplied as part of the actuator to be contained within the main enclosure for physical and environmental protection. External conduit connections between components are not acceptable. Control logic circuit boards and relay boards must be mounted on plastic mounts to comply with double insulated standards. No more than a single primary size fuse shall be provided to minimize the need to remove single covers for replacement. A durable terminal identification card showing plan of terminals shall be provided attached to the inside of the terminal box cover indicating:

a. Serial Number;

b. External Voltage Values;

c. Wiring Diagram Number; and

d. Terminal Layout.

3. This must be suitable for the contractor to inscribe cable core identification beside terminal numbers.

M. Enclosure:

1. Actuators shall be O-ring sealed and listed IP68 and NEMA 4X/6 for submergence to 7 meters for 72 hours. Actuators shall have an inner watertight and dustproof O-ring seal between the terminal compartment and the internal electrical elements of the actuator that fully protects the motor and all other

internal electrical elements of the actuator from ingress of moisture and dust when the terminal cover is removed on site for cabling. Enclosure protection of NEMA 6, IP68, shall be guaranteed without the need of suitable cable glands. The enclosure shall allow for temporary site storage without the need for an electrical supply connection.

2. All external fasteners shall be stainless steel.

3. Actuators for explosion/hazardous applications shall be certified flameproof for Zones 1 and 2 (Divisions 1 and 2) Group A, B, C, and D gases.

N. Startup Kit: Each actuator shall be supplied with a startup kit comprised of installation instructions, electrical wiring diagrams, and spare cover screws and seals.

O. Manufacturer:

1. Auma.

2. Rotork.

3. Beck.

2.14 LED Lighting

A. Provide LED lighting for each liftstation.

B. Master Lift Station Lighting Features:

1. Two Light Engines, 40 LEDs minimum.

2. Color Temperature: 40K.

3. Distribution: Medium of appropriate type.

4. Power: 120Vac.

5. Provide with motion control and photocell. Wire to On/Off/Motion handswitch.

6. Mounting: Pole Mounted. Mount to 140MPH rated light pole.

7. Finish, dark bronze to match light pole.

C. Residential Lift Station Lighting Features:

1. Two adjustable LED heads.

2. High performance 5000K CCT LEDs with 1222 lumen output.

3. Dual array motion sensor wired to On/Off/Motion handswitch.

4. Power: 120Vac.

5. Rugged aluminum housing.

6. Mounting: Pole Mounted in accordance with manufacturer instructions.

7. Finish: Bronze.

8. UL listed for wet locations.

D. Manufacturer:

1. Master Lift station: Lithonia; DSX1 series.

2. Residential Lift Station: Lithonia OFLR 6LC 120 MO BZ

3. Approved equal.

PART 3 - EXECUTION – TESTING, SERVICE, AND WARRANTY

3.01 GENERAL

A. All installed work shall comply with NECA installation standards.

B. Provide arc flash labeling for all electrical enclosures in accordance with the NEC and NFPA 70E.

C. Face all transmitters and displays north where feasible.

D. The CONTRACTOR shall provide conduit and wire from all signal instruments to the control panel:

1. Analog signals and other DC voltage signals shall be run in a separate conduit from AC voltage wiring to minimize interference.

2. Ground all shielded conductor shields at one end only.

3.02 TESTING

A. Provide lift station startup as specified in the Section 550-B entitled “Testing and Inspection for Acceptance (Lift Stations).

B. The grounding system shall be tested to less than five ohms of resistance. Testing results by a certified testing agency using 3-point fall of potential testing as described by ANSI/IEEE Standard 81, or approved equivalent testing, and documented as

described by NETA (International Electrical Testing Association), shall be provided to PCU during lift station startup.

C. Generator and Transfer Switch Testing:

1. Equipment shall be completely assembled and tested at the factory prior to shipment. Certified copies of the data obtained during these tests shall be submitted to PCU.

2. Final tests shall be conducted at the site, after installation has been completed, in the presence of a PCU representative. The emergency generator manufacturer shall furnish a service representative to operate the engine during the tests, to check all details of the installation and to instruct PCU representatives in proper equipment operation.

3. Field tests shall include operating the diesel generating set for carrying normal lift station loads. A full load bank test shall be required unless otherwise noted by PCU. The CONTRACTOR shall fill the main fuel tank at the completion of the tests to 90 percent of tank capacity.

4. The rating of the generator shall be as required to meet the specifications. The generator rating must be substantiated by the manufacturer's standard published curves. Special ratings shall not be acceptable. The set shall be capable of supplying the specified usable kilowatts for the specified duration, including the power required for the pump start-up, without exceeding its safe operating temperature. The generator shall be sized to run all pumps.

5. Transfer switches shall be tested for proper switching operation with the installed generator or with a PCU supplied portable generator in the case of manual transfer switches and breakers.

E. Actuator Testing:

1. Actuator testing shall be performance tested and individual test certificates shall be supplied free-of-charge. The test equipment should simulate a typical valve load and the following parameters should be recorded:

   a. Current at Maximum Torque Setting.

   b. Torque at Maximum Torque Setting.

   c. Flash Test Voltage.

   d. Actuator Output Speed or Operating Time.

2. In addition, the test certificate should record details of specification, such as gear

ratios for both manual and automatic drive, closing direction, and wiring diagram code number.

3.03 SERVICE

A. Generator service:

1. Warranty and service center for the generator shall be located in Orange, Lake, Polk, Hillsborough, or Osceola Counties and service response shall be within two hours during normal working hours, and provide emergency service 24 hours 7 days a week.

2. The CONTRACTOR shall submit a written one-year manufacturer's standard service contract for the diesel engine generator and essential support systems, commencing on the date of acceptance of the unit to PCU at the time of acceptance of the unit(s). Contract shall include one preventative maintenance inspection of the installation prior to expiration of the warranty period to assure the safe and dependable operation of the system.

C. Provide one set of all special tools that are required for the normal operation and maintenance of the engine driven generator unit.

3.04 WARRANTY

A. General:

Equipment installed under this Section shall have a minimum one calendar year warranty against defects in materials and workmanship covering parts and labor from the date of PCU acceptance unless otherwise noted below.

B. Generator:

The generator manufacturer shall provide a 36 calendar month non-prorated certified written warranty cover materials, labor, and workmanship.

C. Generator Batteries:

The generator batteries shall be provided with a 48 calendar month warranty for the replacement of the battery if found to be defective.

D. Actuators shall be warranted for 24 calendar months from date of lift station acceptance.

SCADA and Control Panel Specifications

PART 1 - GENERAL

1.01 SUMMARY

A. This section provides minimum requirements for the design and construction of County lift station and reclaim water site control panels and related SCADA system requirements. The purpose of this section is to establish conventions and standards used in the selection of instrumentation, hardware, programming, and configuration of lift station control systems to ensure uniformity across all County lift station SCADA and control systems. The County reserves the right to approve changes based on site specific design requirements to ensure consistency with these standards.

B. Unless otherwise noted, the latest version of the following standards shall be used for the design and construction of County SCADA and control systems.

1. Institute of Electrical and Electronics Engineers (IEEE).
    i. Standards as applicable for design and implementation.

2. International Society of Automation (ISA):
    i. S5.1, Instrumentation Symbols and Identification.
    ii. S5.4, Instrument Loop Diagrams.
    iii. S50.1, Compatibility of Analog Signals for Electronic Industrial Process Instruments.
    iv. TR20.00.01, Specification Forms for Process Measurement and Control Instruments.
    v. IEC62443 (ISA-99), Industrial Automation and Control System Security.

3. National Electrical Manufacturers Association (NEMA).
    i. Standards as applicable for design and implementation.

4. National Fire Protection Association (NFPA):
    i. 70 – National Electrical Code.
    ii. 70E - Standard for Electrical Safety in the Workplace.
    iii. 820 – Standard for Fire Protection in Wastewater Treatment and Collection Facilities.

5. National Institute of Standards and Technology:
    i. SP-800 series.

6. Underwriters Laboratory, Inc.
    i. 508, Standards for Safety, Industrial Control Equipment.
    ii. 698, Industrial Control Equipment for Use in Hazardous (Classified) Locations.
    iii. Component specific standards as applicable.

C. The CONTRACTOR shall provide and install a control panel and integrate this unit into the County SCADA system as described within this Section. Lift station SCADA monitoring and control components shall consist of a Programmable Automation Controller (PAC), local Operator Interface Terminal (OIT), Ethernet-based radio or digital cellular modem, and central Human-Machine Interface (HMI) graphic screens.

D. At a minimum, the following documents shall be provided for each facility design and construction project:

1. Piping and Instrumentation Diagrams (P&IDs) or detailed control panel shop drawings containing the following:
    i. Process piping and valves, as appropriate.
    ii. Instrumentation.
    iii. Motors and motor control equipment.
    iv. All I/O shall be clearly labeled on the P&IDs and/or wiring diagrams noting whether each point is a Discrete or Analog input or output. All termination locations shall be shown. For Fieldbus or Ethernet I/O, appropriate tables shall be used to list minimum I/O exchange requirements.
    v. Equipment and instrument voltages.
    vi. Equipment and instrument tag numbers.

2. Network block diagrams.

3. Loop specifications and control descriptions outlining all major process control functions and PLC / HMI programming requirements.

4. Design specifications noting all equipment, workmanship, installation, and testing requirements.

5. Construction submittals for all components.

6. As-built construction drawings.

7. Testing documentation.

E. SCADA Panel Types:

1. Type 1 Control Panels provide monitoring and control of reclaimed water sites.

2. Type 2 Control Panels are integrated SCADA RTU and pump control panels providing monitoring, control, and power distribution for lift stations with integrally mounted motor controllers.

3. Type 3 Control Panels are SCADA RTU control panels providing monitoring and control of lift stations having separately mounted motor controllers.

4. See Attachment "A" for typical I/O requirements for Type 1, Type 2 and Type 3 Control Panels with constant speed and variable speed motor controllers.

F. The CONTRACTOR shall integrate lift station monitoring and control into the County's existing central Trihedral VTScada HMI system.

1.02 APPROVED SUPPLIERS

A. The SCADA and control panel supplier shall be one the following approved suppliers (listed alphabetically):

1. Curry Controls Company
2. DCR Engineering
3. Revere Control Systems
4. Rocha Controls
5. Unitron Controls

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Provide equipment compatible with the County's existing central SCADA system to ensure proper communications and data transfer. Components listed in this section are based on the latest manufacturer's models and specifications at the time the standard was developed. Provide the manufacturer's equivalent state of the art model at the time of construction for each item specified.

B. Equipment shall be in conformance with the appropriate "Approved Materials Checklist" found in Section 550-C. Equipment suppliers shall provide a minimum one year system warranty for all control panel components.

C. Use products of a single manufacturer of the same series device to achieve standardization.

D. Provide nameplates and service legends for all panels and components and provide stainless steel tags for all field devices.

E. All components used shall be UL listed or recognized for their intended use and bear the appropriate UL mark.

F. Number and tag each wire with machine printed heat shrink wire tags. Numbers shall match panel drawings and include field device tag number where applicable.

G. Grounding:

1. Ground all devices and instrumentation in accordance with manufacturer's instructions, the National Electrical Code, and IEEE 142-2007 Recommended Practice for Grounding of Industrial and Commercial Power Systems.
2. Furnish separate copper bus bars for signal and shield ground connections.
3. Furnish and install door grounding kit for enclosures.
4. Ground all DIN Rail.
5. Ground surge suppressors with the shortest possible ground conductor length.
6. Ground bus bars at a single ground point.

2.02 PANEL CONSTRUCTION

A. This section outlines general panel construction requirements for Type 1, 2, and 3 Control Panels.

B. Design and fabricate all control panels in accordance with UL 508A and UL 698A as appropriate for the installation. All panels shall bear the UL listing mark for enclosures stating "Listed Enclosed Industrial Control Panel" per UL 508A or UL 698A.

C. The control panel shall be manufactured using quality workmanship and components, and upon completion shall be completely factory tested using the three phase line voltage source for which the panel is intended. All control and alarm operations shall be performed using external, simulated signals to ensure proper operation.

D. Control panels shall be designed to be similar to other County control panels designed to the requirements specified herein. The intent of this standard and specification is to provide consistent design and construction of lift station and reclaim water control panels. Components provided and control panel layouts and wiring shall closely match existing County control panels of similar type.

E. All wiring in panels shall be in duct type wireway or a flexible protective sleeve where a wireway is not practical. All wire shall be terminated to the terminal block. The use of wire nuts or similar connections is prohibited.

F. Provide white powder-coated mild steel back panel. All components shall be mounted on the plane of the back panel with backup power and UPS batteries mounted near the bottom of the panel enclosure on a separate shelf with a plug-in wiring harness for easy removal.

G. All panel components shall be rated for the maximum expected temperature of the control enclosure including solar heat gains.

H. At a minimum, all outdoor panel enclosures shall be NEMA 4X white painted 304 Stainless Steel with a top mounted white painted solar shield. All indoor panel enclosures shall be NEMA 12 painted steel.

   a. Outdoor enclosures shall be provided with all control interface components, including displays and hand switches accessible from behind the front door of the panel on a dead-front to allow operation without exposure to live circuits of any voltage and to prevent outdoor exposure to these components. All adjustments shall be accommodated from the dead-front of the panel including breaker operation to de-energize the enclosure, individual pumps, and control sections. Aluminum dead-front construction shall be either powder coated black with laser etched tagging or unfinished brushed aluminum with phenolic nameplates.

   b. Indoor enclosures shall be provided with all control interface components, including displays and hand switches accessible from outside of the front door. Indoor enclosures shall be provided with separately mounted motor control equipment. Dead-front construction is not required for these control panels.

   c. Size enclosures to adequately house all components with sufficient space to allow for maintenance. All panels shall be provided with the appropriate quantity of corrosion-inhibiting vapor capsules.

I. Nameplates: All equipment enclosures, circuit breakers, control switches, indicator pilot lights and other control devices shall be identified with laser etched naming on dead-fronts or permanently affixed legend plates and phenolic-type engraved nameplates.

J. Provide outdoor mounted enclosures with breather and drain as manufactured by:
   a. Hoffman, H2Omit.
   b. Cooper Crouse-Hinds, ECD Type 4X Drain and Breather.
   c. Approved equal.

K. Lighting: Door switched fluorescent or LED lighting with protective lighting cover.

L. Receptacles: DIN Rail mounted as manufactured by Allen-Bradley, Weidmuller, or Phoenix Contact.

M. All enclosures shall be equipped with a lockable 3-point latching system that maintains enclosure NEMA rating without the use of clamps.

N. All exterior hardware and hinges shall be stainless steel.

O. There shall be permanently affixed to the interior side of the enclosure door both a nameplate and a 10-inch by 12-inch pocket for log sheet storage. The nameplate shall contain the following information: voltage, phase, rated horsepower, rpm, date manufactured, pump and control panel manufacturer's name, pump data, including impeller data, operating point and head, kilowatt input, amperes at the operating point and at least two other points on the pump curve, and pump serial numbers. There shall be a permanently affixed document pocket in the interior side of the exterior enclosure door to include a laminated wiring diagram and bill of materials.

P. Control panel enclosure manufacturers:
   a. Hoffman.
   b. Rittal.
   c. Schaefer.

Q. Type 1 and 3 Control Panels without Integral Motor Controllers:

   a. Type 1 and 3 control panels are powered by 120Vac circuits and do not require panel mounted generator receptacles. Power these control panels from a source having generator backup power.
   b. Control panels shall include PAC, OIT, communication, and control components only.
   c. Furnish main circuit breaker for 120Vac power feed and a circuit breaker on each individual 120Vac branch circuit distributed from the power panel. Provide a fused disconnect type terminal block for all 24Vdc power distribution.
   d. Provide outdoor enclosures with dead-front construction with access to HMI, control switches and indicators from behind the front door.

R. Type 2 Control Panels with Integral Motor Controllers:

   a. Control panels shall include both SCADA controls and pump motor controls in the same enclosure with higher voltage pump power distribution and lower voltage SCADA controls fully separated by a full and continuous metal barrier. SCADA control sections and pump power distribution sections shall have separate dead-fronts to allow work on isolated sections of the enclosure.
   b. Provide enclosures with dead-front construction with access to HMI, control switches and indicators from behind the front door as well as all major breakers for main panel feed, control power, and individual pump breakers.
   c. Provide multi-lug power distribution block assemblies for parallel tapped 3-phase power distribution.

d. Circuit Breakers:

   i. Main power feed and each pump motor shall be protected by a 3-pole molded case circuit breaker in accordance with the "Approved Materials Checklist".
   ii. Coordinate required breakers with provision of manual transfer switch to determine if only a main breaker or main and generator breakers with mechanical interlock are required.
   iii. Provide breakers in accordance with NEMA AB 1.
   iv. Provide breakers with minimum 22,000-ampere RMS symmetrical rating, minimum at 480 volts, unless otherwise required.
   v. Tripping: Indicate with operator handle position.

e. Power Control Transformer:

   i. On 480-volt control panels, provide a control power transformer with a minimum size of 2.0KVA to supply 120 Vac power for starter coils, 20 ampere duplex receptacle, indicator pilot lights, alarm horn, alarm light, PAC, OIT, etc.
   ii. The primary side shall have both legs fused. The secondary side shall have one leg fused and the other grounded.
   iii. Provide transformer with sufficient capacity to power connected load.

f. Motor Control Components:

   i. The panel shall contain a motor starter for each motor. The motor starter shall be an across the line non reversing magnetic starter with individual solid state smart overload protection. Provide a solid-state soft-start motor starter with a shorting contactor for motors greater than 25 horsepower. Local power company regulations shall govern.
   ii. Selector switches shall be installed on the face of the inner dead front door unit. Selector switches shall be a heavy-duty oil tight "Hand-Off-Auto" three-position switch to control the operation mode of each pump motor starter.
   iii. Magnetic Starters:
      1. NEMA Type Open Enclosure motor starter.
      2. Starter Type: Non-reversing.
      3. NEMA Size: As required, size 1 minimum.
      4. Manufacturer: Schneider Electric/Square D.
   iv. Solid State Smart Overload:
      1. Provide solid state overloads for use with across the line magnetic motor starters.

2. Monitors, controls, and protects pump motors.

3. Communication:
    a. Ethernet Modbus TCP.
    b. Built in webserver.
    c. All I/O available via Ethernet.
    d. Coordinate IP addressing with the County.

4. Modules: Main controller and expansion module for voltage and power monitoring.

5. Provide the following hardwired I/O for each motor:
    a. Run Command.
    b. On Status.
    c. Remote Status.
    d. Fail Status.

6. Protection Functions:
    a. Thermal overload.
    b. Phase imbalance and overload.
    c. Phase reversal.
    d. Ground fault.
    e. Stalling.
    f. High and low power, voltage, and amps.
    g. Coordinate all protection functions with pump and motor supplier. Adjust parameters based on actual running conditions to prevent nuisance tripping.

7. Metering Functions:
    a. Current, all phases.
    b. Voltage, all phases.
    c. Motor temperature.
    d. Frequency.
    e. Power.
    f. Power factor.

8. Manufacturer: Schneider Electric, TeSys T.

v. Solid State Reduced Voltage Soft Starter

1. Provide solid state reduced voltage soft starter for all motors 25HP and larger.

2. Enclosure: NEMA 1.

3. UL 508 Listed.

4. Sized as required for motor FLA plus service factor.

5. Adjust starting parameters based on soft starter and pump supplier recommendations and requirements to ensure smooth starting and stopping and to meet generator starting requirements.

6. Provides integral motor protection.

7. Provide feeder breaker with shunt trip or isolation contactor as required by manufacturer for positive power shutoff during a starter fault condition.

8. Communication:
    a. Ethernet Modbus TCP.
    b. Built in webserver.
    c. All I/O available via Ethernet.
    d. Coordinate IP addressing with the County.

9. Provide the following hardwired I/O (at a minimum):
    a. Run Command.
    b. On Status.
    c. Remote Status.
    d. Fail Status.

10. Provide the following additional I/O via the Ethernet interface (at a minimum):
    a. Current, all phases.
    b. Voltage, all phases.
    c. Motor temperature.
    d. Frequency.
    e. Power.
    f. Power factor.
    g. Fault condition.

11. Manufacturer: Schneider Electric, Altistart 48.

vi. Variable Frequency Drives (VFD's):
    1. Provide VFD's where required by the County or the design ENGINEER.

    2. Enclosure: NEMA 1.

3. UL 508 Listed.

4. Sized as required for motor FLA plus service factor.

5. Adjust starting parameters and minimum speed based on VFD and pump supplier recommendations and requirements to ensure smooth starting and stopping.

6. Provides integral motor protection.

7. Provide VFD inverter technology and required filters to meet IEEE 519 harmonic distortion requirements and pump motor protection requirements.

8. Communication:
    a. Ethernet Modbus TCP.
    b. Built in webserver.
    c. All I/O available via Ethernet.
    d. Coordinate IP addressing with the County.

9. Provide the following hardwired I/O (at a minimum):
    a. Run Command.
    b. On Status.
    c. Remote Status.
    d. Fail Status.
    e. Speed Command.
    f. Speed Feedback.

10. Provide the following additional I/O via the Ethernet interface (at a minimum):
    a. Current, all phases.
    b. Voltage, all phases.
    c. Motor temperature.
    d. Frequency.
    e. Power.
    f. Power factor.
    g. Fault condition.
    h. Torque.

11. Manufacturer: Schneider Electric, Altivar 61/71.

vii. Temperature and Seal Fail Relays:

1. Provide relay module for submersible pumps to monitor

high motor temperature and seal failure/moisture detection.

2. Provide dry relay contact outputs, rated 8 Amps at 120Vac, for thermal overload and seal leakage conditions.
3. Selectable automatic and manual reset for temperature condition.
4. Local indication of overtemp or seal leakage.
5. Mount accessible through dead-front or panel front for non-dead-front construction.
6. Operating Temperature: -20 to +55 degrees C.
7. Manufacturers:
    a. MPE, Pump Monitor Relay.
    b. Xylem/Flygt, Mini-CAS.
    c. ATC Diversified Electronics.

S. Control Panel General Equipment (select all exact component types as required for application):

a. Wiring:
    i. All power wires shall be THW or THWN 75 degree Celsius insulated stranded copper conductors and shall be appropriately sized for the given load application. All control circuit wire shall be type THW/THWN stranded. All wiring within the enclosure shall be neatly routed by the use of slotted type wiring duct with snap on type covers.
    ii. Interior wiring shall be neatly bundled with nylon ties and include sufficient looping across the hinges to prevent wire damage, with each end of conductor marked (ID'd) and color coded in accordance with UL Standard 508A.
    iii. All wiring shall be numbered and tagged so that each wire corresponds with the lift station's electrical schematic. Terminal points of all terminal strips shall be permanently identified. All terminal numbers and identifying nomenclature shall correspond to and be shown on electrical diagrams. All wiring shall be permanently identified with heat shrink preprinted labels or permanent clip-on labels and be shown on electrical schematic diagrams.
    iv. Surge suppressor leads to be as short as practical.
    v. Control wiring shall be no smaller than #14 AWG.

b. Control Circuit Breakers:

    i. UL 489 listed.
    ii. DIN rail mounting.
    iii. Manufacturers:

1. Schneider Electric/Square D; Multi 9 Series.
2. Allen-Bradley; 1489-A series.
3. Weidmuller.
4. Phoenix Contact.

c. Terminal Block:

i. Screw compression clamp.
ii. Single level.
iii. Provide 20 percent spare installed terminal block.
iv. Rated for minus 55 to 110 degree C.
v. DIN rail mounting.
vi. Label all terminal block with appropriate numbers.
vii. Rated 600Vac.
viii. Manufacturers:
1. Schneider Electric/Square D.
2. Allen-Bradley.
3. Weidmuller.
4. Phoenix Contact.

d. Control Relays:

i. Plug-in socket type.
ii. Rail mounted.
iii. LED indicator.
iv. Push-to-test type.
v. Rated for minus 25 to 40 degree C.
vi. Provide hold-down clips.
vii. Manufacturers:
1. Schneider Electric/Square D.
2. Allen-Bradley.
3. Weidmuller.
4. Phoenix Contact.

e. Pilot Lights and Hand switches:

i. Indicating Lights, Watertight:
1. Heavy-duty, push-to-test type, NEMA 250, Type 4X watertight, industrial type with integral transformer for 120Vac applications and corrosion-resistant service.
2. Screwed on prismatic lenses and factory engraved legend plates for service legend.
3. Manufacturers and products:
a. Square D; Type SK.

b. Allen-Bradley; Type 800H.
c. Approved equal.

ii. Pushbutton, Momentary, Watertight:

1. Heavy-duty, NEMA 250, Type 4X watertight, industrial type with momentary contacts rated for 120Vac service at 10 amperes continuous and corrosion-resistant service.
2. Standard size, black field, legend plates with white markings for service legend.
3. Manufacturers and products:
    a. Square D; Type SK.
    b. Allen-Bradley; Type 800H.
    c. Approved equal.

iii. Selector Switch, Watertight:

1. Heavy-duty, NEMA 250, Type 4X watertight, industrial type with contacts rated for 120Vac service at 10 amperes continuous and corrosion-resistant service.
2. Standard size, black field, legend plates with white markings, for service legend.
3. Operators: Black knob type.
4. Single-hole mounting, accommodating panel thicknesses from 1/16 to 1/4 inch.
5. Manufacturer and Products:
    a. Square D; Class 9001, Type SK.
    b. Allen-Bradley; Type 800H.
    c. Approved equal.

f. Alarm Horn (enclosure mounted):

i. Provide a vapor proof horn mounted on the side of the control panel for local high-level alarm annunciation.
ii. Provide an alarm silence pushbutton on the exterior of the control panel enclosure which will silence the horn without turning off the alarm light. Automatically reset the circuit when the alarm condition resets to normal.
iii. Function: Audible alarm. Produces sound by electro-mechanical vibration of a diaphragm.
iv. Sound Output Level: 99 dB nominal at 10 feet, adjustable.
v. Enclosure: Cast aluminum, NEMA 4X with panel mount gasket.
vi. Power: 24Vdc.
vii. UL Listed.
viii. Manufacturer:

1. Federal Signal, 450 Vibratone Horn.
2. Approved Equal.

g. Enclosure Surge Suppression:
   i. IP 20 DIN rail mounted.
   ii. Pluggable surge device with base socket.
   iii. Grounded via DIN rail.
   iv. LED indication where available.
   v. UL 1449 listed.
   vi. Provide surge suppression for the following external connections:
      1. Incoming power connections.
      2. Analog signal lines.
      3. Communication signal lines.
   vii. Manufacturers:
      1. Phoenix Contact.
      2. Emerson/Edco.
      3. Citel.

h. Power Supplies:
   i. IP20 DIN rail mounted.
   ii. Provide separate power supplies to power panel components and field devices.
   iii. UL 508 listed.
   iv. Manufacturers:
      1. Allen-Bradley.
      2. Weidmuller.
      3. Phoenix Contact.
      4. IDEC.

i. Uninterruptible Power Supply (UPS):
   i. 24Vdc Input/Output UPS with separately mounted batteries.
   ii. UL508 listed.
   iii. Minimum backup runtime: 30 minutes.
   iv. DIN rail mounted.
   v. Manufacturers:
      1. UPS: Transtronics BVUPS or approved equal.
      2. Batteries: Werker or approved equal.

2.03 PAC, I/O, AND OIT REQUIREMENTS

A. Provide equipment compatible with the County's existing central SCADA system to ensure proper communications and data transfer. Remote PAC's shall communicate to the central VTScada server via Ethernet DNP3 communications utilizing poll by exception and general polling loop controlled by the VTScada

system. DNP3 communications shall be configured to locally store variables with date and time stamp to allow backfilling of data to the central VTScada system in the case of communication failure.

B. Local lift station control system communications shall be via Modbus TCP to equipment and I/O devices. Configure PAC NOE modules to store and restore smart overload, soft starter, and VFD configuration settings.
C. Configure OITs to store major analog process variables and pump start/stop change of states and trend.

D. Provide all PAC system components, cables, and additional ancillary equipment required for a completely functional PAC system.

E. PAC systems shall be based on the following:
    a. Scheider Electric Modicon M340 PACs.

F. PAC I/O

    a. Provide PAC I/O layout similar to other County lift station control panels for similarity between I/O wiring and PAC I/O addressing in the PAC program.
    b. Provide each PAC with a minimum of 20 percent (minimum 2 points) installed spare I/O, of each I/O type, including the necessary terminal block, interposing relays, and surge protection. Pre-wire all I/O to field terminal blocks. Spare I/O is in addition to I/O provided for planned future additions such as planned future pumps or odor control.
    c. Provide at least 20% and a minimum of 2 spare slots in each PAC chassis to accommodate future I/O cards. If the number of spare slots required exceeds the PAC chassis capacity, provide subpanel space and wireway to accommodate a future chassis. Provide empty DIN rail space required to accommodate the future terminal block to support the spare slots.
    d. Use separate I/O modules for parallel controlled equipment such as multiple pumps where feasible. Pumps should be split across multiple I/O cards such that the failure of a single I/O card does not impact the operation of all pumps.
    e. Provide interposing relays for all discrete outputs.

G. PAC Requirements:
    a. Provide complete microprocessor-based programmable device plug-in power supply, communications, and I/O modules for process control and monitoring. Provide all components as necessary for a complete system.

    b. Chassis:
        i. Type: Modicon M340, BMX series.

ii. Number of Slots: Sufficient for the number of modules required, including spares, plus the required number of empty slots, minimum of 8. Provide expansion bases as required.
iii. Provide cover on empty slots.

c. Processor Modules (CPU):
   i. Type: Modicon M340, BMXP342020.
   ii. Supports 1024 discrete and 256 analog I/O.
   iii. Supports up to 4 racks.
   iv. USB and Modbus communication ports, minimum.
   v. Memory: 2 Mbyte internal RAM with supplied compact flash memory card for backup of programs, minimum.

d. Power Supply Modules:
   i. Type: Modicon M340, BMXCPS2010.
   ii. Input Voltage: 24V dc.
   iii. Quantity: One for each processor chassis and one for each expansion I/O chassis. Include sufficient capacity to power future expansion of all spare (empty) chassis slots.

e. Network Communications Modules:
   i. Type: Ethernet and Fast Ethernet, 100 Mbps.
   ii. Communications Module: Modicon M340, BMXNOE100.
      1. Memory: Supplied Flash Memory Card.
      2. Configure to scan motor controller I/O and backup motor controller and overload device settings.

   iii. RTU Module: Modicon M340, BMXNOR0200H.
      1. Memory: 128MB Flash Card.
      2. DNP3 over Ethernet.
      3. Modbus TCP.

f. Discrete Input, ac (DI):
   i. Voltage: 24Vdc.
   ii. Points per Modules: 16, isolated.
   iii. Modicon M340, BMXDDI1602.

g. Discrete Output (DO):
   i. Relay Output, 2A.
   ii. Points per Module: 8.
   iii. Modicon M340, BMXDRA0805.

h. Analog Input (AI):
   i. Signal: 4 to 20 mA at 24V dc.

ii. Analog Input Points per Module: 4 or 8, isolated.
iii. Modicon M340, BMXAMI0410 or BMXAMI0810.

i. Analog Output (AO):
   i. Signal: 4 to 20 mA at 24V dc.
   ii. Analog Output Points per Module: 4, isolated.
   iii. Modicon M340, BMXAMO0410.

j. Software: Compatible with Modicon Unity Pro.

H. Operator Interface Touchscreen:

a. Provide industrial touchscreen mounted to front or deadfront of control panel as required. At a minimum, the following shall be displayed on touchscreens:

   i. Wetwell Level (Trended) and appropriate alarms.
   ii. Wetwell Setpoint operation.
   iii. Wetwell Level switch status and appropriate alarms.
   iv. Pump Running (Trended), Fault, and Remote status.
   v. Pump Amps (Trended).
   vi. Pump Runtime Counter.
   vii. Pump Phase Monitor Alarm.
   viii. Flow (Trended), if required.
   ix. Flow totalized; Current Day, Previous Day.
   x. Pressure (Trended), if required.
   xi. Alarm Silence Pushbutton.

b. Memory: Minimum 512kB RAM internal with 1GB or larger compact flash or SD card installed for data logging.

c. Ports: USB and Ethernet TCP/IP.

d. Power: 24Vdc

e. Software: Compatible with Vijeo Designer.

f. Resolution: 320 x 240 pixels (minimum).

g. Display: 5.7-inch (minimum).

h. Manufacturers:

   i. Modicon Magelis.

2.04 COMMUNICATION

A. General:

a. Provide both local and remote communications for lift stations. External communications from lift station to County SCADA system Wide Area Network (WAN) shall be Ethernet-based communications via either digital cellular or 900MHz digital radio systems. Coordinate with County for communications connection between facility and the County WAN. Coordinate with the County to determine radio communications infrastructure necessary to establish reliable communications for each facility. Consult the County on required components for each specific site. Coordinate and test all communications with County Utilities SCADA and Public Safety Radio Shop groups.

b. Provide local Ethernet and digital communications between controllers, OITs, and smart field components (such as intelligent MCCs, generators, automatic transfer switches, and packaged control systems) via Ethernet Modbus TCP.

c. Design networks for fault tolerance and for management utilizing SNMP. All general networks shall be a 10/100BASE-TX and Fast Ethernet Fiber where required. Configure all ports to match speed and negotiation of connected equipment.

d. Design of network systems shall include IP address and VLAN assignments coordinated with the County and existing County infrastructure. VPN tunnels and TCP/IP port based security shall be determined to ensure proper communications and security between facilities.

e. Network components specified shall be the state of the art at the time of design and construction. Contractor shall provide the latest state of the art hardware available during the submittal process, and shall upgrade features as necessary to meet functional requirements. Network components listed shall outline minimum requirements for each component.

f. Provide surge suppression for network connected equipment located in vulnerable locations such as connections between buildings or near AC power lines. Provide adequate separation or shielding between communications cabling and other types of cable systems that could interfere with communications.

B. Ethernet Network Hardware Components:

a. Select network components to meet requirements for each facility for proper communications and security in accordance with Industry Standards. The following general components shall be used within the SCADA system.

b. Industrial Network Layer 2 Switch, Ethernet, DIN Rail:
   i. Function: Network communications between PLCs, Ethernet connected field components, and HMI's within a lift station.
   ii. Minimum of 8 RJ-45 ports. Provide and select switches with SFP modules as required for fiber connections. Provide ports as required for each site including a minimum of 2 spare ports.
   iii. Support 10/100BASE-TX and Fast Ethernet fiber where required.
   iv. Layer 2 software.
   v. Supports SNMP, IEEE 802.1D, IEEE 802.1Q, Multicast IGMP, IEEE 802.3x.
   vi. Power: 24Vdc.
   vii. IP 20 enclosure.
   viii. Temperature rating: 0 to 60 degrees C.
   ix. UL 508 Listed.
   x. DIN rail mounted.
   xi. Manufacturers:
      1. N-Tron 700 Series.
      2. Hirschmann RS20 series.
      3. Moxa EDS series.

C. Remote Wireless Communications:

a. Coordinate with County on type of remote communication solution to provide. Remote communications shall be via Verizon Digital Cellular or 900MHz digital radio system as directed by the County.

b. Digital Cellular Requirements:

   i. Where directed by the County, provide CalAmp Vanguard 3000 Multi-Carrier 3G Cellular Broadband Router Model 140-7230-000.
   ii. Provide multi-band high gain Omni antenna Wilson Electronics Model 301202 and connect with outdoor rated 50-ohm LMR-400 cable with appropriate connectors. Locate and mount antenna to lift station equipment rack or on outside of building in a location to maximize received signal strength.
   iii. Provide PolyPhaser DSXL RF surge protector.

c. 900MHz digital Ethernet Radio Requirements:

i. Where directed by the County, provide a Cambium PMP 100 Canopy Connectorized Subscriber Module 9000SMCDD with a KP Performance 900MHz 36-inch yagi antenna Model YA14KPPD mounted approximately 25-feet above grade or as directed by the County and connected with outdoor rated 50-ohm LMR-400 cable with appropriate connectors.
ii. Provide PolyPhaser inline gas surge protection GT-NFM-AL.
iii. Antenna mast shall be aluminum construction and rated for Florida Building Code wind speed with the attached load. Provide bitumastic or manufacturer recommended coating where aluminum will be in contact with the earth or concrete.

2.05 CONTROL FUNCTIONS

A. Provide the following general control and display functions for PAC's and VTScada HMI interface for all control panels:

1. Configure remote PAC for DNP3 communications to allow store and forward of all data with date and time stamp to ensure all data is communicated if communications are lost and restored. Configure DNP3 for poll by exception to send data to the central HMI when there is a change in state. Configure change of state for all variables.

2. Refer to I/O lists following this section for a listing of all hardwired I/O generally associated with each type of control panel. Modify I/O as required when automatic transfer switches are provided and other special equipment to ensure all equipment is monitored and controlled appropriately. Coordinate all items and I/O not specifically listed with the County.

3. Coordinate remote notification of all alarms with the County.

4. Provide UPS backup of I/O where practical.

5. Display all discrete and all analog variables. Display all variables on appropriate HMI displays. Display status for discrete variables such as ON/OFF/FAIL status for motors and OPEN/CLOSE/FAIL status for valves. Display value and totalizer value when appropriate for analog variables such as process variables, set points, drive speeds, and valve positions. To prevent clutter and to ease operation, some displayed variables will not normally appear on displays but will be accessible through easily identifiable point-and-click targets. Runtime and totalizer counters are an example of variables that might not normally appear on the HMI display.

6. Sound the alarm tone, indicate the alarm condition on appropriate HMI displays, and add to the HMI alarm summary display. Upon acknowledgement, silence the alarm tone and indicate the alarm condition on appropriate HMI displays and the alarm summary display. Remove acknowledged alarms from the alarm summary once they are cleared. Log alarm occurrence, acknowledgement, and clearance in the alarm log file. Coordinate with County as to which alarms will receive remote signaling via autodialer function of the SCADA system.

7. Provide Pump Fail to Run logic and alarms and Valve Fail to Open/Close logic and alarms.

8. Calculate Elapsed Run Time for all motors in the PAC and display on local OIT and HMI.

9. Totalize all flows, in the PAC, for Current Day, Previous Day, Month, and Year and display on local OIT and HMI.

10. Display Daily Max, Min, and Average for all analog process variables.

11. Provide cycle counters for all motors and valves. One cycle is defined as transition from OFF to ON. For valves, one cycle is defined as transition from CLOSED to OPEN.

12. Provide bumpless transfer for all manual to auto and auto to manual PLC modes of operation.

13. Power outage and utility/generator power transitions:
    a. Suppress all nuisance alarms during power outages.
    b. Reset all equipment so that it is available after a power transition.
    c. Provide delays before restarting pumps to ensure pumps do not block load generator or utility.
    d. Monitor power status and transfer switch positions.

14. Provide nuisance alarm suppression to suppress alarms such as low flow when a pump is not running.

15. Coordinate user level security access groups and adjustable parameters with the County.

16. Provide analyzer fail alarm when the analyzer 4-20mA signal is out of range.

17. Provide a communication alarm between the PAC and HMI when communications are lost. To prevent nuisance alarming, the preset delay shall be at least three times the nominal update or polling period of the specific device. For PLC controlled equipment operating under HMI manual control, maintain equipment in the last

state following a loss of communications. For PLC controlled equipment under automatic PLC control, maintain automatic equipment control and sequencing during a loss of communications.

18. Provide automatic alternation of lead and lag pumps for lift stations. Auto alternate when all pumps are off. For pumps that normally operate continuously, provide alternation on a daily basis starting at 8 a.m. and provide a manual forced alternate button.

19. Provide high and low alarms for all analog transmitters. Provide high-high, high, and low-low alarms for all level transmitters.

20. A fail-safe input shall be provided indicating intrusion into the control panel. Upon loss of this signal, or a series of devices providing this signal, the RTU shall report an alarm to the central HMI's.

21. Pump Fault hardwired contacts shall include pump leak and temperature alarms from submersible pump monitoring relays.

22. Provide odor control system monitoring, where required.

23. Provide power monitoring, via Ethernet communications, of each smart overload device, solid state soft starter and variable frequency drive to monitor the following parameters:

    a. Fault Status (Alarm).
    b. Loss of Phase (Alarm).
    c. Phase Reversal (Alarm).
    d. Phase Unbalance (Alarm).
    e. Phase A, B, C current in Amps.
    f. Phase-to-Phase Voltage in Volts.
    g. Power in kVA.
    h. Power in kW.
    i. Power Factor.
    j. Monitor or generate alarms for Amps and Voltage out of typical range.

24. Tag Numbering:

    SCADA tag numbering shall be as follows for either analog or digital functions:

    FAC_ TAG_X_Y_ BFN
    e.g., LS123_LIT_001_02_LAHH

    FAC Facility/Lift Station Identifier (6 characters/digits max): Obtain facility identifier from the County for each facility.

TAG Instrument Tag (4 characters max): This is the instrument or control loop tag as indicated on the P&ID's or Field Tag. Follow ISA designation from Table 1 in ISA Standard 5.1.

X Loop Number (3 digits max): This is the loop number indicated on the P&ID's and field device tag.

Y Unit Number (2 digits max): Where applicable, use where multiple sets of units is provided for the same control loop.

BFN Block Function or Clarifying Abbreviation (4 characters max): In some cases a block function is required to further identify the block or I/O point, e.g. the tag for a level transmitter high-high alarm would be FAC_ TAG_X_Y_ LAHH. Coordinate abbreviations with the County.

B. Type 1 Control Panel Requirements:

1. A Type 1 SCADA Control Panel shall be used for reclaimed water sites without pumps, such as remote metering sites for irrigation and ground water recharge. The panel shall accommodate both monitoring and control functions.

2. These sites require analog signal monitoring of flow and pressure. Some stations may require motorized valve control to modulate flow through the site.

3. Design, furnish and install a solar power pack when a 120 VAC, 8-amp power supply is not readily available.

4. Refer to Attachments for Type 1 Control Panel Typical I/O.

5. Where required, provide control of reclaim water stations as follows:

   a. Manual Operation of Flow Control Valve: If local switch at the valve is in LOCAL position, then the valve can be opened and closed using local open and close pushbuttons. If local switch at the valve is in OFF position, then the valve will stay in current position. Show the current position of the valve and show the valve as LOCAL and UNAVAILABLE at the HMI/OIT.
   b. Manual Operation from HMI/OIT: If local switch at the Flow Control Valve is in REMOTE position, and the soft switch at the HMI/OIT is in MANUAL, then the valve can be opened to an operator entered percent position using the soft switches at the HMI/OIT. Show the valve as REMOTE and AVAILABLE.
   c. Automatic Operation from HMI/OIT: If local switch at the Flow Control Valve is in REMOTE position, and the soft switch at the HMI/OIT is in AUTOMATIC, then provide proportional and integral action control of valve position as follows to maintain an operator input flow rate:

i. Process variable is Reclaim Water Flow.
ii. Set Point is operator entered flow rate in GPM.
iii. Controlled device is Flow Control Valve Position.
iv. Provide set point deviation alarm if flow cannot be maintained within +/- 10 percent of set point.

C. Type 2 and 3 Control Panels with Constant Speed Pumps:

1. This section outlines control requirements for Type 2 and 3 control panels for constant speed lift station pumps.

2. Provide all general control and monitoring functions as specified in the general requirements of Control Functions and to meet the functional intent of lift station operation as outlined by all lift station specifications.

3. Pumps having MCC (non-panel mounted) motor starters shall have hand switches located at the MCC in lieu of switches mounted at the control panel. However, the same functional requirements apply to both integral and non-integral motor starter installations.

4. Refer to Attachments for Type 2 and 3 control panels with constant speed pumps Typical I/O. Pump solid state smart overloads and solid state reduced voltage soft starters shall have hardwired and Ethernet I/O as shown in the attached Typical I/O list.

5. Provide float type level switches for low-low level, high level, and high-high level annunciation and associated control. Coordinate switch actuation heights with default level set points to prevent interferences.

6. Local, remote, and automatic controls are required for Type 2 and 3 control panels with constant speed pumps. The following outlines general control requirements:

   a. Manual operation of each constant speed pump: If local dead-front mounted hand switch is in HAND then the pump will start and run continuously. Show the pump as LOCAL and UNAVAILABLE at the HMI/OIT.

   b. Manual operation from HMI/OIT: If local hand switch on the dead-front is in REMOTE position, and the soft switch at the HMI/OIT is in MANUAL, then the pump can be started or stopped using the soft switch at the HMI/OIT. Show the pump as REMOTE and AVAILABLE.

   c. Automatic operation of constant speed pump: If local hand switch on the dead-front is in REMOTE position, and the soft switch at the HMI/OIT is in AUTOMATIC, then provide automatic operation as follows:

i. Provide primary control using the wet well level transmitter.
ii. Operator enters the following set points:
    i) Low-Low level Alarm.
    ii) Low level shutoff.
    iii) Lead pump start.
    iv) Lag pump start.
    v) Lag-lag pump start etc. dependent on number of pumps.
    vi) High-High level Alarm.
iii. Pumps start when their associated set point is exceeded. Provide 30 second delay between starting pumps if more than one pump is called to start at the same time.
iv. All pumps stop when the level falls below the Low Level Shutoff set point.
v. Alarm on High-High Level transmitter level. Provide remote alarm notification on this alarm.
vi. Provide pump alternation when all pumps are off.
vii. Provide the following overrides:
    i) Start all pumps via the PAC with a 30 second delay between pump starts when the High Level float switch is activated. This alarm level should be alarmed and provide remote alarm notification.
    ii) Start all pumps via hardwired logic with a 30 second delay between pump starts when the High-High level float switch is activated. This operation overrides PAC control. Provide notification of this alarm via SCADA, remote alarm notification, and actuate local alarm horn and light. Allow for remote silencing of alarm horn via SCADA HMI/OIT and provide a local hardwired silence switch on the exterior of the control panel. Pump alternation strategies do not apply when on level float controls.
    iii) Stop all pumps when the low level float switch is activated. Provide notification of this alarm via SCADA and remote alarm notification.
    iv) Provide alarm at SCADA and remote alarm notification when there are level sensor and float mismatches. For example, provide an alarm when the low level float switch is actuated but the level transmitter is reading high level.

d. Configure all smart overloads (SO) and soft starters (SS) to have configuration settings backed up by PLC NOE cards. Give each motor control device a unique name identified as LSXXX_SO_YY (Lift Station Number Smart Overload Local unit number). For example, Lift Station No. 127 Pump 1 would read LS127_SO_01.

e. Monitor generator and related systems where provided. Ensure that the appropriate delays are provided to prevent multiple pumps from starting at the

same time under generator power. This includes high level situations where multiple pumps may be called during a switchover from utility to generator power. Provide the required delays in the PAC and for hardwired control overrides. Pump alternation strategies do not apply when on generator power.

D. Type 2 and 3 Control Panels with Variable Speed Pumps

1. This section outlines control requirements for Type 2 and 3 control panels for variable speed lift station pumps.

2. Provide all general control and monitoring functions as specified in the general requirements of Control Functions and to meet the functional intent of lift station operation as outlined by this USSM.

3. Pumps having MCC (non-panel mounted) VFD's shall have hand switches located at the MCC in lieu of switches mounted at the control panel. However, the same functional requirements apply to both integral and non-integral motor starter installations.

4. Refer to Attachments for Type 2 and 3 control panels with variable speed pumps Typical I/O. Pump VFD's shall have hardwired and Ethernet I/O as shown in the attached Typical I/O list.

5. Provide float type level switches for low-low level, high level, and high-high level annunciation and associated control. Coordinate switch actuation heights with default level set points to prevent interferences.

6. Local, remote, and automatic controls are required for Type 2 and 3 Control Panels with VFD's. The following outlines general control requirements:

   a. Manual operation of each variable speed pump: If local dead-front mounted hand switch is in HAND, and then the pump will start and run continuously. Speed shall be adjusted via local potentiometer. Show the pump as LOCAL and UNAVAILABLE at the HMI/OIT.

   b. Manual operation from HMI/OIT: If local hand switch on the dead-front is in REMOTE position, and the soft switch at the HMI/OIT is in MANUAL, then the pump can be started or stopped using the soft switch at the HMI/OIT and speed adjusted via an operator entered speed at the HMI/OIT. Show the pump as REMOTE and AVAILABLE.

   c. Automatic operation of constant speed pump: If local hand switch on the dead-front is in REMOTE position, and the soft switch at the HMI/OIT is in AUTOMATIC, then provide automatic operation as follows:

i. Provide primary control using the wet well level transmitter.
ii. Operator enters the following set points:
  i) Low-Low level alarm
  ii) Low level shutoff
  iii) Pump Start Level
  iv) Pump Control Level set point
  v) High-High level alarm
iii. The lead pump starts when the level is above the Pump Start Level.
iv. The running pump(s) modulates speed to maintain the Pump Control Level set point via PID control algorithm. PID controller shall be properly tuned for smooth control.
v. If the running pumps reach 100% speed for an adjustable delay initially set at 2 minutes, then the next lag pump shall start. Adjust the speed of all running pumps together to maintain the level set point.
vi. If all running pumps reach a minimum operating speed for an adjustable delay initially set at 1 minute, then shut off the last pump started. Determine minimum pump run speed during startup based on pump operation and pump operational curves to ensure pumps run on their published curves of operation.
vii. When only one pump is running at its minimum speed and the level is below the level set point, then continue to run this pump until the low level shutoff is reached. Stop all running pumps when the low level shutoff is reached.
viii. Alternate pump operation on a 24-hour basis or when all pumps are off.
ix. Alarm on High-High Level Transmitter level. Provide remote alarm notification on this alarm.
x. Provide the following overrides:
  i) Start all pumps at 100% speed via the PAC with a 30 second delay between pump starts when the High Level float switch is activated. This alarm level should be alarmed and provide remote alarm notification.
  ii) Start all pumps at 100% speed via hardwired logic with a 30 second delay between pump starts when the High-High Level float switch is activated. This operation overrides PAC control. Provide notification of this alarm via SCADA, remote alarm notification, and actuate local alarm horn and light. Allow for remote silencing of alarm horn via SCADA HMI/OIT and provide a local hardwired silence switch on the control panel dead-front. Pumps do not alternate when on hardwired controls.
  iii) Stop all pumps when the low level float switch is activated. Provide notification of this alarm via SCADA and remote alarm notification.
  iv) Provide alarm at SCADA and remote alarm notification when there are level sensor and float mismatches. For example provide

an alarm when the low level float switch is actuated but the level transmitter is reading high level.

d. Configure all Variable Frequency Drives (VFD's) to have configuration settings backed up by PAC NOE cards. Give each motor control device a unique name identified as LSXXX_VFD_YY (Lift Station Number Variable Frequency Drive unit number). For example, Lift Station No. 127 Pump 1 would read LS127_VFD_01.

e. Monitor generator and related systems where provided. Ensure that the appropriate delays are provided to prevent multiple pumps from starting at the same time under generator power. This includes high level situations where multiple pumps may be called during a switchover from utility to generator power. Provide the required delays in the PAC and for hardwired control overrides. Pump alternation strategies do not apply when on generator power.

PART 3 - EXECUTION

3.01 FACTORY TESTING

A. Assemble and test all controls panels at the supplier's factory. Notify County of factory testing a minimum of 2 weeks in advance (in County) and 4 weeks in advance (outside County) to allow County personnel the opportunity to witness testing. The County reserves the right to witness factory testing of all control panels.

B. Control panel supplier shall completely factory test control panels prior to shipment to ensure it is operational and ready for field installation. At a minimum, the following shall be verified:

1. Construction matches approved drawings and County standards.
2. Test all I/O. Simulate all I/O external to control panels and verify PLC and HMI receives I/O.
3. Correct deficiencies prior to shipping control panel.

3.02 INSTALLATION OF CONTROL PANEL

A. It shall be the responsibility of the Contractor to mount the control panel. All required hardware and software components necessary for a complete and functional SCADA and control panel system shall be provided. A Florida certified electrical Contractor shall perform the installation. All work shall be in accordance with the current edition of the NEC and UL Standards.

B. Protect enclosures and other equipment containing electrical, instrumentation and control devices, including spare parts, from corrosion through the use of corrosion-inhibiting vapor capsules.

3.03 GENERAL INSTALLATION

A. Provide all required installation and work for a completely functional lift station control and monitoring system including power and signal wiring for all field instrumentation and between the control panel and all remotely mounted I/O interfaces including motor controllers and packaged control systems.

B. Install all equipment in accordance with manufacturer's instructions.

C. All enclosures, ground busses, antenna masts and surge arrestors shall be grounded and bonded to the lift station ground system in accordance with national standards and manufacturer's instructions.

D. All hardware and brackets used to mount the control panel shall be stainless steel.

E. Provide a radio survey to verify required antenna height for reliable radio communication.

F. Upon completion of work, thoroughly clean the work area and interior of the control panel. Ensure fresh corrosion inhibiting vapor capsules have been provided.

3.04 FIELD TESTING, STARTUP, AND ACCEPTANCE

A. Notify County of field testing and startup schedule a minimum of 2 weeks in advance. The County reserves the right to witness all field testing and County acceptance is required before any lift station is considered complete. Refer to Section entitled "Testing and Inspection for Acceptance of Lift Stations" for additional requirements.

B. At a minimum, the following tests shall be completed:

1. Test all I/O between field devices and lift station PAC controller. Where possible, real process variables and operations shall be used. When real operation is not feasible, I/O points shall be simulated to show proper operation.

2. Test all field and in-panel communications via Ethernet and serial communications as applicable.

3. Demonstrate all control functions operate properly under all operating scenarios. Where feasible, operation shall be tested under actual operating conditions.

4. Test all monitoring, logging, and control functions from the local OIT.

5. Communication between the control panel and remote SCADA server(s) shall be tested and communication signal strength documented.

6. Test all monitoring, logging, and control functions from the central VTScada system. All change of state and polling functions shall be verified and adjusted as required. I/O exchange after loss of communication shall be tested to ensure all data is correctly logged and time stamped after communications are restored.

7. Test operation of all starting/stopping scenarios for pumps for all control modes on utility and generator power sources. Test generator switching functions in conjunction with pump operation.

C. All field testing shall be documented on PCU approved test forms and signed by the Contractor and control panel supplier.

3.05 SERVICE

A. The SCADA and control panel system supplier shall have four or more factory trained support personnel available within four hours. The system supplier shall have the capability to supply replacement parts and equipment within six business hours of notification from PCU. PCU shall have 24-hour per day access to service personnel by a cell phone or pager. The SCADA and control panel supplier shall maintain a 24-hour answering service that can direct emergency calls to the appropriate service technician. Service representatives who are not specifically trained in the service of PCU's SCADA system are unacceptable.

3.06 DOCUMENTATION

A. The following documents shall be provided prior to acceptance of the lift station by PCU:

1. Complete schematic and wiring diagram, in the latest version of AutoCAD, and bill of materials on compact disc or similar electronic media.

2. Two (2) maintenance manuals with above drawings and manufacturer's maintenance literature bound in three-ring binders;

3. A laminated copy of the schematic and wiring diagram shall be permanently affixed to the interior side of the exterior enclosure door or in control panel door pocket.

4. Documented PAC controller, OIT, and HMI application programs suitable for programming updates to the control system and reuse for standardization of the lift station control system.

3.07 WARRANTY

A. The control panel, including all applications programming, shall have a one calendar year warranty against defects in materials and workmanship covering parts and labor from the date of PCU acceptance. The control panel supplier shall provide all material and labor to repair or replace failed components at no cost to PCU.

B. Warranty service shall be completed within the following period of time:

1. Major issues rendering the control panel non-functional shall have on site response with qualified personnel within one business day.

2. Minor issues involving a failure of the control panel or any of its components shall have on site response within qualified personnel within two business days.

3. PCU will have the option to proclaim any hardware or software failure an emergency if in the opinion of PCU the failure could result in a public health or safety concern.

CHAPTER 5 WASTEWATER Section 518

Wastewater Treatment Facilities Standards

PART 1 - GENERAL

A. This Section shall be applicable to the design of wastewater treatment facilities proposed as part of any development to be constructed in compliance with the LAND DEVELOPMENT CODE, the COMPREHENSIVE PLAN, and as part of the PCU Community Investment Program, when applicable.

B. Design, Construction, and Plan Review:

The design and construction of wastewater treatment facilities associated with COUNTY approved developments shall be in compliance with Chapter 4, 5, and 6 of this MANUAL. PLANS will be reviewed and approved by PCU as part of the subdivision or commercial site plan review process as specified by the LAND DEVELOPMENT CODE.

C. Compliance with Other Regulatory Requirements:

It shall be the responsibility of the DEVELOPER/CONTRACTOR to obtain and comply with all applicable federal, state, and local regulatory permits.

D. The DEVELOPER shall be financially responsible for any proposed designs that require modification to or may adversely affect any portion of PCU's wastewater infrastructure.

PART 2 - DESIGN

A. The design of the wastewater treatment facility shall be designed for the maximum day demand of the design year, as a minimum. Requirements of the FDEP, LAND DEVELOPMENT CODE, and COMPREHENSIVE PLAN, whichever is more restrictive, shall govern. Consideration shall be given to the design requirements of other federal and state regulatory agencies regarding safety requirements, special designs for the handicapped, plumbing, and electrical codes. No part of the plant shall be constructed below the 100 year flood prone elevation as established by FEMA.

B. The wastewater treatment facility shall be sited on a fee simple parcel of land that measures not less than one acre in size.

PART 3 - PLANT LAYOUT

A. The ENGINEER shall consider the functional aspects of the plant layout, provisions for future plant expansion, provisions for expansion of the plant waste treatment and disposal facilities, access roadways, site grading, site drainage, walkways, driveways, and delivery of chemicals.

B. Onsite buildings shall be provided with adequate ventilation, adequate lighting, lightning protection, adequate heating, adequate drainage, accessibility of equipment for operation, servicing, and removal, flexibility of operation, operator safety,

convenience of operation, and the placement of chemical storage and feed equipment in a separate room to reduce hazards and dust problems. Main electrical control equipment shall be located above grade and above the 100 year flood prone elevation. Adequate facilities shall be included for shop space and storage consistent with the needs of the designed facilities.

C. All buildings shall be of concrete masonry unit construction with either engineered trusses and coated metal roof systems or hollow core concrete slab based roofs. All structures shall be painted with colors in accordance with PCU standards, unless otherwise approved by PCU. All exterior doors shall be of steel construction and interior doors shall be of wood or steel construction.

D. A permanently mounted standby power generator system of sufficient size shall be required so that potable water may be treated and/or pumped to the distribution system during power outages to meet the average day demand.

E. Adequate monitoring equipment, sample taps, flow meters, and pipe color coding shall be provided.

F. An operation and maintenance manual including a parts list and parts order form, operator safety procedures, and operational trouble shooting section shall be supplied for any proprietary unit installed in the facility.

G. Consideration shall be given to the safety of plant personnel and visitors. The design must comply with all applicable safety codes and regulations that may include the Florida Building Code. Uniform Fire Code, National Fire Protection Association Standards, and OSHA standards.

H. Security measures shall be installed and instituted in accordance with this MANUAL. Appropriate design measures to help ensure the security of water system facilities shall be incorporated. Such measures, as a minimum, shall include heavy duty type locks for exterior doorways, windows, gates, and other entrances to sources, treatment, and water storage facilities, signage, intrusion alarms, motion sensitive flood lighting, and 6 foot high security type fencing topped with 3 strands of barb wire. Facilities secured with electrically operated gates shall include key switches in accordance with the appropriate “Approved Materials Checklist” (See Wastewater Checklist). Other measures may include close circuit monitoring and real time water quality monitoring.

I. Electrical supply to the facility shall be placed underground onsite of the plant property.

J. Other than pipes, conduits, foundations, and footings, the wastewater treatment facility shall be constructed above ground.

K. Lightning protection systems shall be installed and certified in accordance with all applicable sections of UL 96A, "Installation Requirements for Lightning Protection Systems" as published by the Underwriters Laboratories, Inc. A Master Label Certificate of Inspection for Lightning Protection Systems shall be provided to the COUNTY for each such installation.

PART 4 - MATERIALS

A. All materials used in the construction of a wastewater treatment facility shall be in accordance with this MANUAL.

PART 1 – GENERAL WASTEWATER PLANT SCADA STANDARDS

1.01 SUMMARY OF SYSTEM

A. These standards represent minimum requirements for County projects at the time the standards were adopted. The County reserves the right to approve changes based on site specific design requirements

B. Wastewater treatment facilities shall be able to be monitored and controlled remotely. The CONTRACTOR shall provide a Human Machine Interface (HMI) / Supervisory Control and Data Acquisition (SCADA) system, Programmable Logic Controller (PLC), and decentralized Historian for wastewater treatment facility control as identified in this Section.

C. The SCADA process data shall be organized by unit process (UP) as identified below:

Unit Process Number	Process Name
5	Relocated Headworks
10	Influent Pump Station
15	Return Pump Station
20	Headworks/Preliminary Treatment
25	Biological Nutrient Reactor
30	Aeration/Oxidation Ditch
35	Aeration Blowers
37	Intermediate Pump Station
40	Clarifiers
50	Return Activated Sludge/Waste Activated Sludge
60	Tertiary Filtration
70	Disinfection/Chlorine Contact Chamber
80	Chemical Storage and Feed
90	Reclaimed/Reject Storage and Transfer Pumping
100	Reclaimed High Service Pumping
105	Reclaimed Augmentation
110	Sludge Holding/Digestion
115	Sludge Dewatering
120	Operations Electrical Building
130	Maintenance Building

140	Electrical Building
150	Unused
160	Unused
170	Unused
180	Vacuum Truck Receiving Area

D. SCADA tag numbering shall be as follows:
   1. Facility = SW
   2. Unit Process = 10
   3. Function of Device = Level Indicating Transmitter
   4. Quantity/Discrete Identifier = 1
      i. E.g. SW_010_LIT_001

1.02 EQUIPMENT TO BE MONITORED AND CONTROLLED

i. The following typical elements at standard unit processes must be monitored and controlled at the various unit processes with alarms as defined:

a. UP 5/20 Headworks

i. Influent Flow Meter
Monitored Data
1. Instantaneous Flow
2. Totalized Daily Flow, Current and Previous Day

Alarms
1. Out of Range
2. No Signal

ii. Mechanical Bar Screen/Level Operated
Monitored Data
1. Motor Status
2. Level in Channel
3. Screw Conveyor Motor Status

Alarms
1. Screen Over-Torque
2. Screen Fail
3. Channel Level High
4. Screw Wash/Press Over-Torque
5. Screw Wash/Press Fail

iii. Grit Removal
Monitored Data
1. Grit Air Lift Motor Status
2. Grit Classifier Motor Status

3. Screw Wash/Press Motor Status

Alarms

1. Grit Air Lift Failure
2. Grit Classifier Failure
3. Screw Wash/Press Over-Torque
4. Screw Wash/Press Fail

b. UP 10 Influent Pump Station

i. Influent Flow Meter (may be same as UP 5/20)

Monitored Data

1. Instantaneous Flow
2. Totalized Daily Flow, Current and Previous Day

Alarms

1. Out of Range
2. No Signal

ii. Pumps

Monitored Data

1. Pump Motor Status
2. Level in Pump Station

Alarms

1. Pump Over-Torque
2. Pump Fail
3. High Level Alarm
4. High-High Level Alarm
5. Low Level Alarm

c. UP 15 Return Pump Station

i. Flow Meter

Monitored Data

1. Instantaneous Flow
2. Totalized Daily Flow, Current and Previous Day

Alarms

1. Out of Range
2. No Signal

ii. Pumps

Monitored Data

1. Pump Motor Status
2. Level in Pump Station

Alarms

1. Pump Over-Torque
2. Pump Fail
3. High Level Alarm
4. High-High Level Alarm
5. Low Level Alarm

d. UP 20 Headworks – See UP 5

e. UP 30 Aeration/Oxidation Ditch
   i. Mechanical Aerator
      Monitored Data
      1. Aerator Motor Status
      2. VFD Speed
      3. Dissolved Oxygen (DO)
      4. Oxidation Reduction Potential (ORP)

      Alarms
      1. Aerator Motor Fail
      2. Aerator Motor Over-Torque
      3. High DO/ORP
      4. Low DO/ORP
      5. Aerator Oil Pressure Low
   ii. Anoxic Mixer
      Monitored Data
      1. Anoxic Mixer Motor Status

      Alarms
      1. Anoxic Mixer Over-Torque
      2. Anoxic Mixer Fail

f. UP 40 Clarifiers
   i. Clarifier Rake
      Monitored Data
      1. Clarifier Motor Status

      Alarms
      1. Clarifier Motor Fail
      2. Clarifier Motor Over-Torque
   ii. Scum Pumps
      Monitored Data
      1. Scum Pump Motor Status

      Alarms
      1. Scum Pump Over-Torque
      2. Scum Pump Fail
      3. Scum Pump Over Pressure

g. UP 50 Return Activated Sludge/Waste Activated Sludge
   i. Flow Meters
      Monitored Data
      1. Instantaneous Flow (Both)
      2. Totalized Daily Flow, Current and Previous Day (RAS)
      3. Set to Waste, Current and Previous Day (WAS)
      4. Total Wasted, Current and Previous Day (WAS)
      5. Valve Status (if common pump station)

Alarms

1. Out of Range
2. Valve Failure
3. No Signal

ii. Pumps

Monitored Data

1. Pump Motor Status
2. VFD Speed
3. Level in Pump Station

Alarms

1. Pump Over-Torque
2. Pump Fail
3. High Level Alarm
4. High-High Level Alarm
5. Low Level Alarm

h. UP 60 Tertiary Filtration

i. Backwash Filters/Deep Bed Filters

Monitored Data

1. Backwash Pump and Wash Unit Motor Status
2. Level in Filter
3. Valve Status (if using deep bed)
4. Total Suspended Solids and/or Nephelometric Turbidity Units
5. Flow Rate

Alarms

1. Pump/Wash Unit Motor Fail
2. Valve Fail
3. High Level
4. Low Level
5. Flow Rate Out of Range

i. UP 70 Disinfection/Chlorine Contact Chamber

i. Instrumentation

Monitored Data

1. Chlorine Dosage Measurement
2. Chlorine Residual Measurement
3. Final pH
4. Flow Rate
5. Valve Position for Reject/Storage

Alarms

1. Low Chlorine Residual
2. High Chlorine Residual
3. Effluent pH Out of Range
4. Flow Rate Out of Range

5. Valve Fail

j. UP 80 Chemical Storage and Feed
   i. Chemical Feed and Monitoring
      Monitored Data
      1. Sodium Hypochlorite Level/Volume
      2. Alum Level/Volume
      3. Sodium Hypochlorite Pump Status
      4. Sodium Hypochlorite Pump Stroke
      5. Sodium Hypochlorite Pump Speed
      6. Alum Pump Status
      7. Exhaust Fan Status
      8. Eye Wash Status

      Alarms
      1. Sodium Hypochlorite Pump Failure
      2. Alum Pump Failure
      3. Exhaust Fan Failure
      4. Eyewash In Use or Failure
      5. High Alum Level
      6. Low Alum Level
      7. High Sodium Hypochlorite Level
      8. Low Sodium Hypochlorite Level

k. UP 90 Reclaimed/Reject Storage and Transfer Pumping
   i. Levels/Valves
      Monitored Data
      1. Ground Storage Tank Levels
      2. Calculated Ground Storage Tank Volumes
      3. Calculated Rate of Change (gpm) in Storage
      4. Reject Storage Tank Levels
      5. Calculated Reject Storage Tank Volumes
      6. Calculated Rate of Change (gpm) in Reject
      7. Transfer Pump Wet Well Level
      8. Fill Valve Status
      9. In/Eff Valves for Tanks Status

      Alarms
      1. High Ground Storage Level
      2. Low Ground Storage Level
      3. High Reject Storage Level
      4. Low Reject Storage Level
      5. High Wet Well Level
      6. Low Wet Well Level
      7. Valve Failure
   ii. Pumps
      Monitored Data

1. Pump Motor Status
2. VFD Speed

Alarms

1. Pump Over-Torque
2. Pump Fail

l. UP 100 Reclaimed High Service Pumping

i. Pumps

Monitored Data

1. Pump Motor Status
2. VFD Speed
3. Pressure
4. Flow Rate

Alarms

1. Pump Over-Torque
2. Pump Fail
3. Flow Out of Range
4. High Pressure
5. Low Pressure

m. UP 105 Reclaimed Augmentation

i. Pumps

Monitored Data

1. Pump Motor Status
2. Pressure
3. Flow Rate
4. Well Level

Alarms

1. Pump Over-Torque
2. Pump Fail
3. Flow Out of Range
4. High Pressure
5. Low Pressure
6. Well Below Desired Liquid Level Set point

n. UP 110 Sludge Digestion

i. Blowers

Monitored Data

1. Blower Motor Status
2. VFD Speed
3. Air Flow Rate

Alarms

1. Blower Fail
2. Flow Out of Range
3. High Pressure

ii. Sludge Transfer Pumps
Monitored Data
1. Pump Motor Status
2. VFD Speed
3. Flow Rate
Alarms
1. Pump Fail
2. Flow Out of Range
3. High Pressure

iii. Instrumentation
Monitored Data
1. DO or ORP
2. Liquid Level
3. Calculated Volume In Digester
4. Rate of Change (gpm in/out)
Alarms
1. High DO/ORP
2. Low DO/ORP
3. High Liquid Level
4. Low Liquid Level

o. UP 120 Operations Electrical Building
i. Electrical Line Power
Monitored Data
1. Phase Voltage Difference
2. Phase Amperage
3. Tie-Breaker Status
4. Main Breaker Status
Alarms
1. Low Voltage
2. High Voltage
3. Loss of Power

ii. Generator Power
Monitored Data
1. Generator Status
2. Phase Voltage Difference
3. Phase Amperage
4. Transfer Switch Status
Alarms
1. Low Voltage
2. High Voltage
3. Generator Failure
4. Transfer Switch Failure

p. UP 130 Maintenance Building
(Not typically utilized)

q. UP 140 Electrical Building
   i. Electrical Line Power
   Monitored Data
      1. Phase Voltage Difference
      2. Phase Amperage
      3. Tie-Breaker Status
      4. Main Breaker Status
   Alarms
      1. Low Voltage
      2. High Voltage
      3. Loss of Power
   ii. Generator Power
   Monitored Data
      1. Generator Status
      2. Phase Voltage Difference
      3. Phase Amperage
      4. Transfer Switch Status
   Alarms
      1. Low Voltage
      2. High Voltage
      3. Generator Failure
      4. Transfer Switch Failure

1.03 DATA TO BE STORED IN HISTORIAN

A. The following typical data at standard and alarm at unit processes. Historical data shall be stored at a minimum rate of one point every ten seconds, or a change greater than a set dead-band, and shall be stored as defined:

a. UP 5/20 Headworks
   i. Influent Flow Meter
   Monitored Data
      1. Instantaneous Flow
      2. Totalized Daily Flow, Current and Previous Day
   ii. Mechanical Bar Screen/Level Operated
   Monitored Data
      1. Screen Motor Status
      2. Screw Wash/Press Motor Status
      3. Level in Channel
   Alarms
      1. Screen Fail
      2. Screw Wash/Press Fail

iii. Grit Removal
Alarms
1. Grit Air Lift Failure
2. Grit Classifier Failure
3. Screw Wash/Press Fail

b. UP 10 Influent Pump Station
i. Influent Flow Meter (may be same as UP 5/20)
Monitored Data
1. Instantaneous Flow
2. Totalized Daily Flow, Current and Previous Day
Pumps
Monitored Data
1. Pump Motor Status
2. Level in Pump Station
Alarms
1. Pump Fail

c. UP 15 Return Pump Station
i. Flow Meter
Monitored Data
1. Instantaneous Flow
2. Totalized Daily Flow, Current and Previous Day
ii. Pumps
Monitored Data
1. Pump Motor Status
2. Level in Pump Station
Alarms
1. Pump Fail

d. UP 20 Headworks – See UP 5

e. UP 30 Aeration/Oxidation Ditch
i. Mechanical Aerator
Monitored Data
1. VFD Speed
2. Dissolved Oxygen (DO)
3. Oxidation Reduction Potential (ORP)
Alarms
1. Aerator Motor Fail
ii. Anoxic Mixer
Monitored Data
1. Anoxic Mixer Motor Status
Alarms
1. Anoxic Mixer Fail

f. UP 40 Clarifiers
    i. Clarifier Rake
        Monitored Data
            1. Clarifier Motor Status
        Alarms
            1. Clarifier Motor Fail
    ii. Scum Pumps
        Monitored Data
            1. Scum Pump Motor Status
        Alarms
            1. Scum Pump Fail
            2. Scum Pump Over Pressure

g. UP 50 Return Activated Sludge/Waste Activated Sludge
    i. Flow Meters
        Monitored Data
            1. Instantaneous Flow (Both)
            2. Totalized Daily Flow, Current and Previous Day (RAS)
            3. Set to Waste, Current and Previous Day (WAS)
            4. Total Wasted, Current and Previous Day (WAS)
            5. Valve Status (if common pump station)
        Alarms
            1. Valve Failure
    ii. Pumps
        Monitored Data
            1. Pump Motor Status
            2. VFD Speed
            3. Level in Pump Station
        Alarms
            1. Pump Over-Torque
            2. Pump Fail

h. UP 60 Tertiary Filtration
    i. Backwash Filters/Deep Bed Filters
        Monitored Data
            1. Backwash Pump and Wash Unit Motor Status
            2. Level in Filter
            3. Valve Status (if using deep bed)
            4. Total Suspended Solids and/or Nephelometric Turbidity Units
            5. Flow Rate
        Alarms
            1. Pump/Wash Unit Motor Fail
            2. Valve Fail

i. UP 70 Disinfection/Chlorine Contact Chamber
    i. Instrumentation
    Monitored Data
        1. Chlorine Dosage Measurement
        2. Chlorine Residual Measurement
        3. Final pH
        4. Flow Rate
        5. Valve Position for Reject/Storage
    Alarms
        1. Valve Fail

j. UP 80 Chemical Storage and Feed
    i. Chemical Feed and Monitoring
    Monitored Data
        1. Sodium Hypochlorite Level/Volume
        2. Alum Level/Volume
        3. Sodium Hypochlorite Pump Status
        4. Sodium Hypochlorite Pump Stroke
        5. Sodium Hypochlorite Pump Speed
        6. Alum Pump Status
        7. Exhaust Fan Status
        8. Eye Wash Status
    Alarms
        1. Sodium Hypochlorite Pump Failure
        2. Alum Pump Failure
        3. Exhaust Fan Failure
        4. Eyewash In Use or Failure

k. UP 90 Storage Transfer Pumping, Ground Storage and Reject Storage
    i. Levels/Valves
    Monitored Data
        1. Ground Storage Tank Levels
        2. Calculated Ground Storage Tank Volumes
        3. Reject Storage Tank Levels
        4. Calculated Reject Storage Tank Volumes
        5. Transfer Pump Wet Well Level
        6. Fill Valve Status
        7. In/Eff Valves for Tanks Status
    Alarms
        1. Valve Failure
    ii. Pumps
    Monitored Data
        1. Pump Motor Status
        2. VFD Speed
    Alarms

1. Pump Fail

l. UP 100 Reclaimed High Service Pumping
   i. Pumps
      Monitored Data
      1. Pump Motor Status
      2. VFD Speed
      3. Pressure
      4. Flow Rate
      Alarms
      1. Pump Fail

m. UP 110 Sludge Digestion
   i. Blowers
      Monitored Data
      1. Blower Motor Status
      2. VFD Speed
      3. Air Flow Rate
      Alarms
      1. Blower Fail
   ii. Sludge Transfer Pumps
      Monitored Data
      1. Pump Motor Status
      2. VFD Speed
      3. Flow Rate
      Alarms
      1. Pump Fail
      2. High Pressure
   iii. Instrumentation
      Monitored Data
      1. DO or ORP
      2. Liquid Level
      3. Calculated Volume In Digester

n. UP 120 Operations Electrical Building
   i. Electrical Line Power
      Monitored Data
      1. Phase Voltage Difference
      2. Phase Amperage
      3. Tie-Breaker Status
      4. Main Breaker Status
      Alarms
      1. Low Voltage
      2. High Voltage
      3. Loss of Power

ii. Generator Power
Monitored Data
1. Generator Status
2. Phase Voltage Difference
3. Phase Amperage
4. Transfer Switch Status

Alarms
1. Low Voltage
2. High Voltage
3. Generator Failure
4. Transfer Switch Failure

PART 2 – COMPONENTS AND INTEGRATION

2.01 SOFTWARE, PLC, COMPUTERS, and NETWORK COMPONENTS

A. The CONTRACTOR shall purchase and install equipment compatible with the PCU existing SCADA central station equipment.

1. Wastewater treatment facility control systems must utilize GE PAC RX3i PLC components.

2. Wastewater treatment facility SCADA controls must be integrated utilizing iFix with the licenses for the latest version supplied as part of the construction effort. CONTRACTOR must verify and utilize the iFix version currently in use by PCU prior to integrating PLC/SCADA.

3. CONTRACTOR shall provide local servers and historian, including a license for GE Historian, latest version, as part of the construction effort.

4. iFix and Historian licenses must be provided with sufficient tags for at least 30% spare tags.

5. Servers provided will be mapped to PCU network by Owner. Hardware to be provided to Owner at a time scheduled at least two (2) weeks in advance for mapping purposes.

B. SCADA Computer Server equipment shall be as follows:

1. Primary SCADA server
   i. Dell R710 or approved equivalent
   ii. Two Pentium Xeon Hex-Core Processors, 3.0 Ghz min, 12 Mb L3 Cache
   iii. 24 Gb of DDR3 RAM, 1333 MHz, expandable to 128 Mb
   iv. Hard Drives: (2) RAID 1 configuration HD, SAS, SCSI, 15,000 rpm,

Hot-Swappable. Size of each drive shall be at least 200% of capacity required for current system implementation.
v. Multi-use optical drive, 24x, CD-RW/DVD-RW
vi. Multimedia cards: manufacturer's standard
vii. Dual Hot-Swappable Power Supplies
viii. Two IEEE 802.3 network card, dual redundant, 1 GbE
ix. External 56k modem, V.90 PCI, USB interface, voice and data modem, as manufactured by US Robotics.
x. Windows Server 2008 R2 Standard Operating System, 5 Client Access Licenses
xi. Keyboard, Video, Mouse module
xii. Proficy iFix Software Run License, Latest Version
xiii. 3-Years Onsite Warranty

2. Backup SCADA server
   i. Dell or approved equivalent
   ii. Pentium Quad-Core Processor, 3.6 Ghz min, 12 Mb L2 Cache
   iii. 16 Gb of DDR3 RAM, 1333 MHz
   iv. Hard Drives: (2) RAID 1 configuration HD, SATA, 7,200 rpm. Size of each drive shall be at least 200% of capacity required for current system implementation.
   v. Multi-use optical drive, 24x, CD-RW/DVD-RW
   vi. Audio Card: manufacturer's standard
   vii. Video Card: capable of running two monitors and software noted
      1. Dual Channel VGA color graphics, 16X transfer rate
      2. 512 Mb DDR3, min
      3. NVIDIA Quadro NVS 300
   viii. Single Power Supply, 500 kW min
   ix. 101-key Enhanced Keyboard
   x. Mouse: two button with thumb wheel, min
   xi. IEEE 802.3 network card, dual redundant, 1 GbE
   xii. Windows Server 2008 R2 Standard Operating System, 5 Client Access Licenses
   xiii. Proficy iFix Development License, Latest Version
   xiv. (2)-47-inch Flat Panel Displays
   xv. 3-Years Onsite Warranty

3. Historian SCADA server
   i. Link with all Historian tags sent to Base One Master Historian
   ii. Dell R710 or approved equivalent
   iii. Dual Pentium Xeon Hex-Core Processor, 3.0 Ghz min, 12 Mb L3 Cache
   iv. 24 Gb of DDR3 RAM, 1333 MHz, expandable to 128 Mb
   v. Hard Drives: (4) RAID 5 configuration HD, SAS, SCSI, 15,000 rpm, Hot-Swappable. Size of drive array shall be at least 200% of capacity

required for current system implementation with 5 years of data stored.
vi. Multi-use optical drive, 24x, CD-RW/DVD-RW
vii. Multimedia cards: manufacturer's standard
viii. Dual Hot-Swappable Power Supplies
ix. IEEE 802.3 network card, dual redundant, 1 GbE
x. External 56k modem, V.90 PCI, USB interface, voice and data modem, as manufactured by US Robotics.
xi. Windows Server 2008 R2 Standard Operating System, 5 Client Access Licenses
xii. Keyboard, Video, Mouse module
xiii. Proficy iFix Historian, Latest Version
xiv. Proficy Web Server, Latest Version
xv. 3-Years Onsite Warranty

4. Additional Equipment
   i. Cisco 1 GbE Network Switch
      1. 24 ports, 4 Dual Ports
      2. 4 Dual Port Uplinks Support 1 GbE Upload and Download
      3. Catalyst 2960S series
   ii. 1 KVM Module, Tripplite B040-008-19
   iii. Tripplite 6 kVA UPS
   iv. Network Rack, 42 RU min
   v. Cable Management Unit for Network Rack
   vi. 24" Monitor, ViewSonic VG2436wm or Equal

C. New plants shall have integrated WiFi throughout the facility in accordance with IEEE 802.11. WiFi shall be able to be utilized for remote SCADA access at any unit process in the plant.
   1. Radio propagation studies shall be performed during design and construction of WiFi networks to ensure WiFi is functional at all unit processes.

D. New unit processes shall have decentralized I/O to limit long runs of buried copper communication. Localized OLMs shall be designed and installed with a fiber connection to carry the information to a point local to the PLC. There the data can be converted back into a readable signal for the PLC.

E. CONTRACTOR to perform testing on integrated systems at key stages in the process. At a minimum, Operational Readiness Testing (ORT) and Performance Acceptance Testing (PAT) shall be performed. Factory Testing and Staging Testing may be added at COUNTY or ENGINEER discretion. Minimum testing requirements shall be as follows:

   1. Operational Readiness Test (ORT): Prior to startup test period and PAT, inspect, test, and document that entire Process Instrumentation and Control System (PICS) is ready for operation.

i. Loop/Component Inspections and Tests:
    1. Check PICS for proper installation, calibration, and adjustment on a loop-by-loop and component-by-component basis.
    2. Provide space on forms for signoff by PICS subcontractor.
    3. Use loop status report to organize and track inspection, adjustment, and calibration of each loop and include the following:
        a. Project name.
        b. Loop number.
        c. Tag number for each component.
        d. Checkoffs/Signoffs for Each Component:
            i. Tag/identification.
            ii. Installation.
            iii. Termination wiring.
            iv. Calibration/adjustment
        e. Checkoffs/Signoffs for the Loop
            i. Field Device Signals Transmitted to the PLCs are Operational: Received/sent, processed, adjusted.
    4. Component calibration sheet for each active field component (except simple hand switches, lights, gauges, and similar items) include the following:
        a. Project name.
        b. Loop number.
        c. Component tag number or PLC register address.
        d. Component code number for field device elements.
        e. Manufacturer for field device elements.
        f. Model number/serial number for field device elements.
        g. Summary of Functional Requirements, for Example:
            i. Indicators and recorders, scale and chart ranges.
            ii. Transmitters/converters, input and output ranges.
            iii. Computing elements' function.
            iv. Controllers, action(direct/reverse) and control modes (P&ID).
            v. Switching elements, unit range, differential (fixed/adjustable), reset (auto/manual).
        h. Calibrations, for Example, but not Limited to:
            i. Analog Devices: Actual inputs and outputs at 0,10, 50, and 100 percent of span, rising and falling.
            ii. Other Field Devices: Actual trip points and reset points.
            iii. Controllers: Mode settings (P&ID).
            iv. Actual inputs or outputs of 0, 10, 50, and 100 percent of span, rising and falling.

v. Space for comments.

i. Maintain loop status reports, valve adjustment sheets, and component calibration sheets at site and make them available to Engineer at all times.

j. Test and calibrate all fiber optic data links. Document that the dB links are within specified limits and the data communication is error free at specified baud rates.

k. These inspections and tests will be spot checked by Engineer.

l. Engineer reviews loop status sheets and component calibration sheets and spot-check their entries periodically, and upon completion of ORT. Correct deficiencies found.

2. Performance Acceptance Tests (PAT):

i. Once ORT has been completed and facility has been started up, perform a witnessed PAT on complete PICS to demonstrate that it is operating as required by the Contract Documents. Demonstrate each required function on a paragraph-by-paragraph, loop-by-loop, and site-by-site basis.

ii. Loop-specific and non-loop-specific tests same as required for Factory Testing except that entire installed PICS tested using actual process variables and all functions demonstrated.

iii. Perform local and manual tests for each loop before proceeding to remote and automatic modes.

iv. Where possible, verify test results using visual confirmation of process equipment and actual process variable. Unless otherwise directed, exercise and observe devices supplied by others, as needed to verify correct signals to and from such devices and to confirm overall system functionality. Test verification by means of disconnecting wires or measuring signal levels is acceptable only where direct operation of plant equipment is not possible.

v. Provide updated versions of the following documentation available to Engineer at site, both before and during tests.
   1. One copy of submittals applicable to the equipment to be tested.
   2. One copy of the Drawings and Specifications together with addenda and applicable change orders.
   3. Make one copy of all O&M manuals.

vi. Specialty Equipment: For certain components or systems provided

under this section but not manufactured by PICS Subcontractor, provide services of qualified manufacturer's representative during installation, startup, demonstration testing, and County training. Refer to Article Onsite Services in PICS Subsystems for specific requirements.

vii. Instruments shall be tested at 0 percent, 25 percent, 50 percent, 75 percent, and 100 percent of scale through wired and wireless communications to the PLC and to the HMI insofar as is practical and not to put effluent quality at risk.

2.02 INSTRUMENTATION

A. The CONTRACTOR shall purchase and install instrumentation equipment as standardized below. The equipment aligns with what Polk County Utilities currently utilizes. Exact models shall be determined during design:

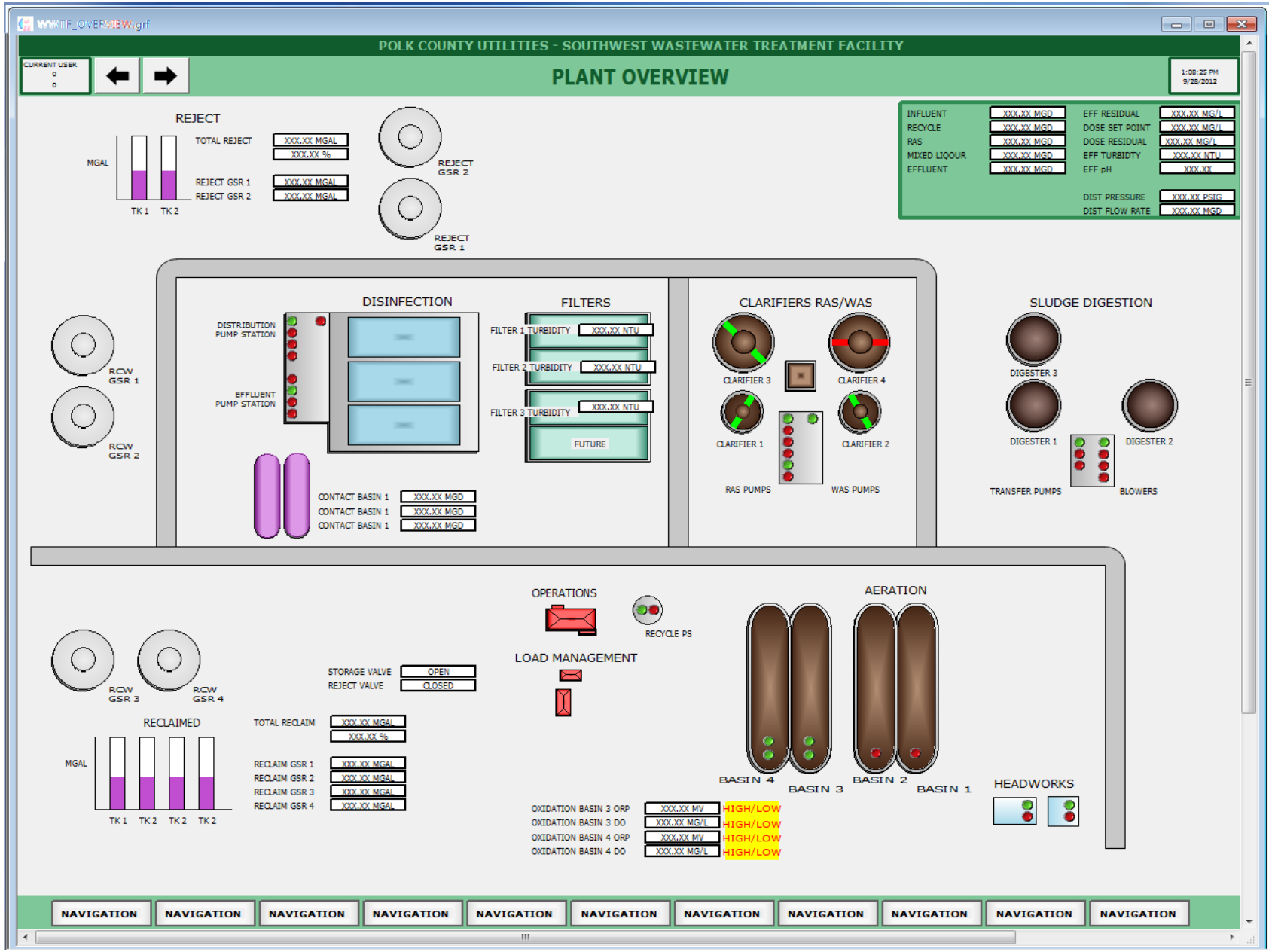
1. Liquid Level
    i. Pressure – Rosemount 3051
    ii. Ultrasonic – Endress Hauser FMU95 or Siemens SITRAN LU
    iii. Approved Equal
2. Pressure Indicating and Differential Transmitters
    i. Rosemount 3051
    ii. Approved Equal
3. Pressure Switches
    i. Ashcroft B-Series
    ii. Approved Equal
4. Pressure Gauges
    i. Ashcroft
    ii. Approved Equal
5. Flow Meters
    i. Electromagnetic – Foxboro
6. Chemical Metering Pumps
    i. Prominent
7. Chlorine Analyzers
    i. Prominent
8. Hach Transmitters
    i. Hach SC200 or SC1000 depending on number of elements
9. pH Element
    i. Prominent – pH sensor
10. Dissolved Oxygen
    i. Hach LDO
    ii. Approved Equal
11. Oxidation Reduction Potential
    i. Hach pHD – ORP sensor

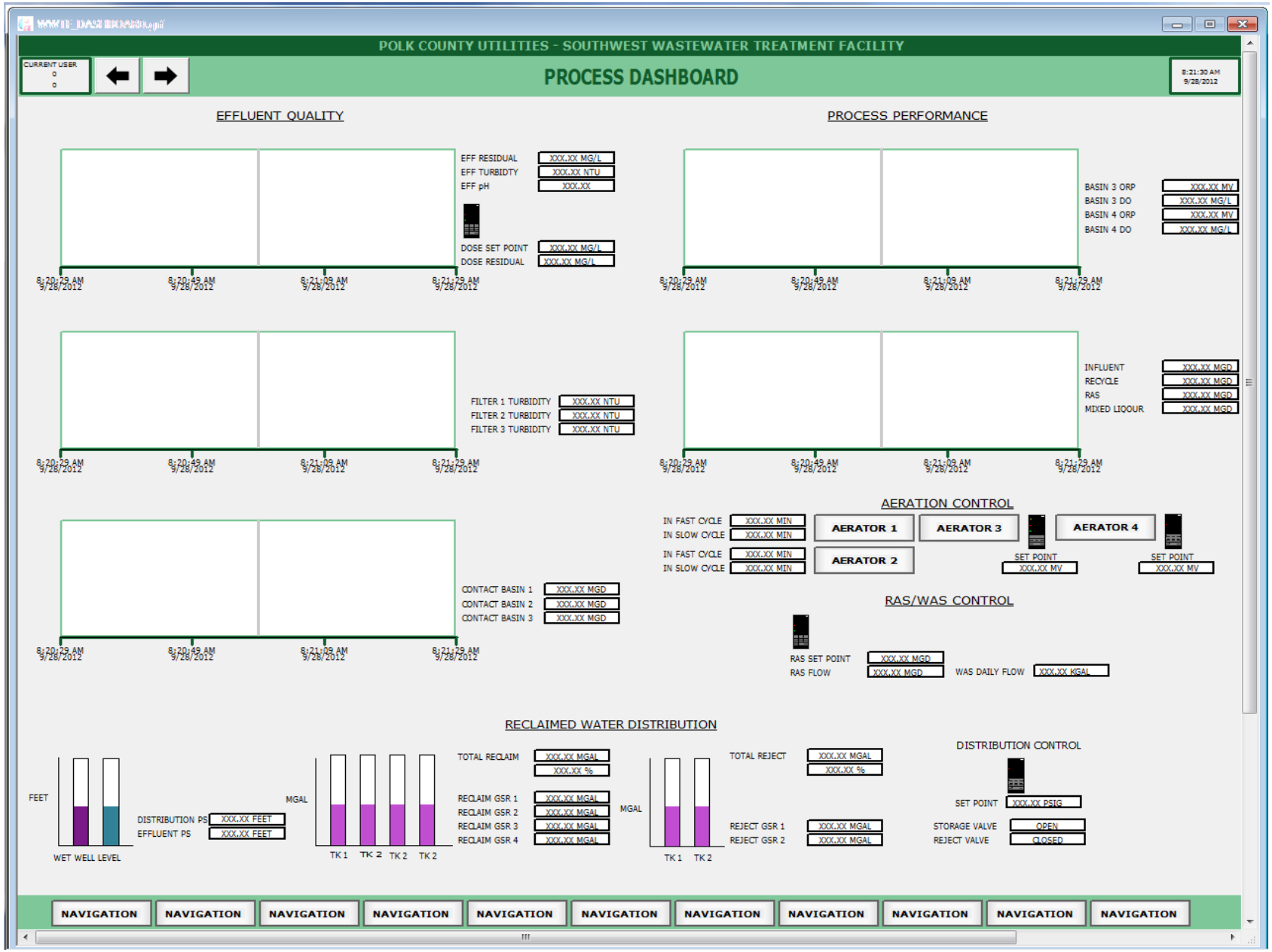
ii. Approved Equal

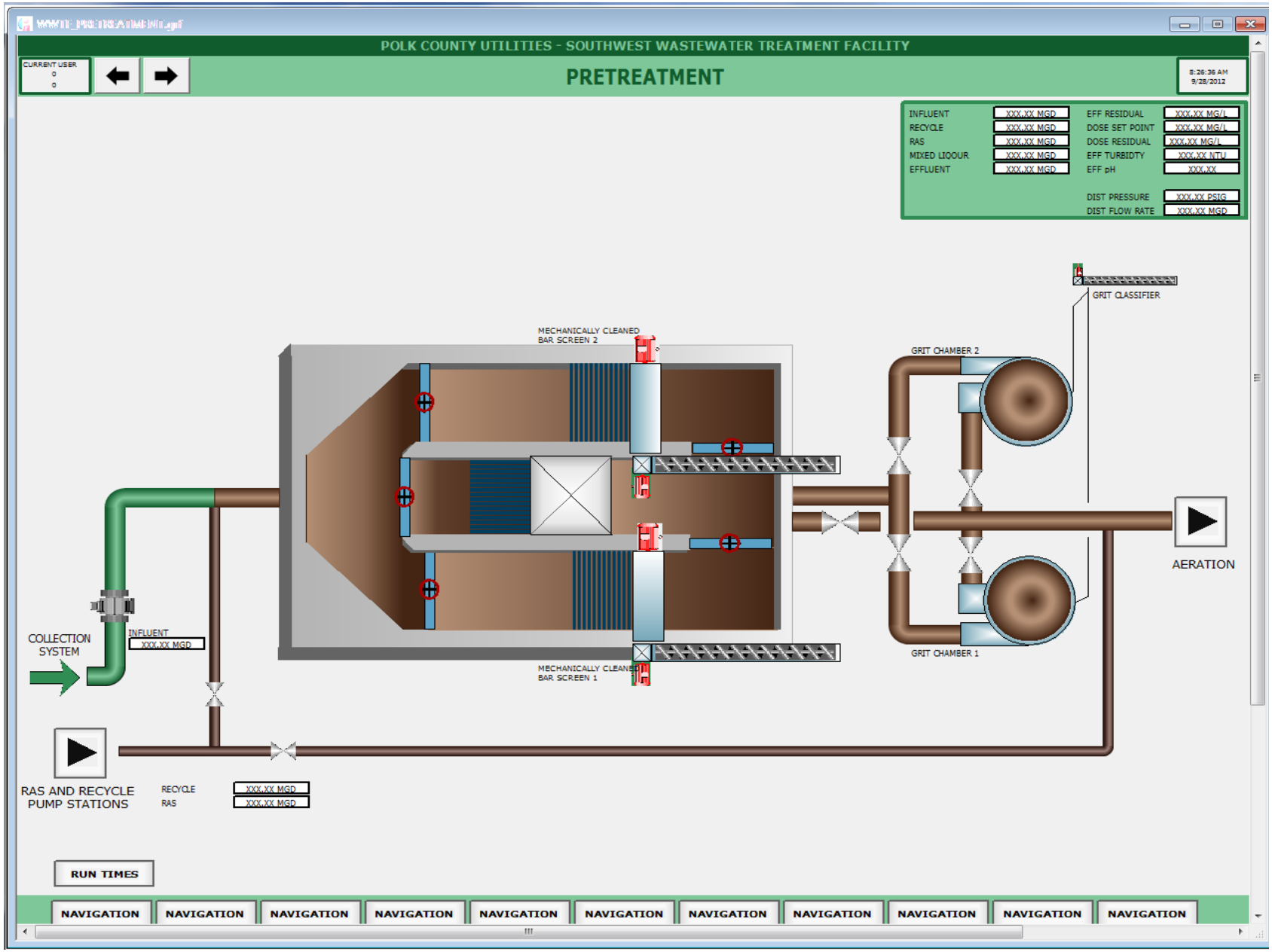
12. Turbidity Sensor
    i. HF Scientific – Microtol2
    ii. Approved Equal
13. Motor Operated Valves
    i. Limitorque or Auma Actuators, Valve per Polk County Standards
    ii. Approved Equal
14. Total Suspended Solids (High and Low) and NTU
    i. Hach Solitax
    ii. Approved Equal
15. Sludge Blanket Monitor
    i. Cerlic CAT microP
    ii. Approved Equal

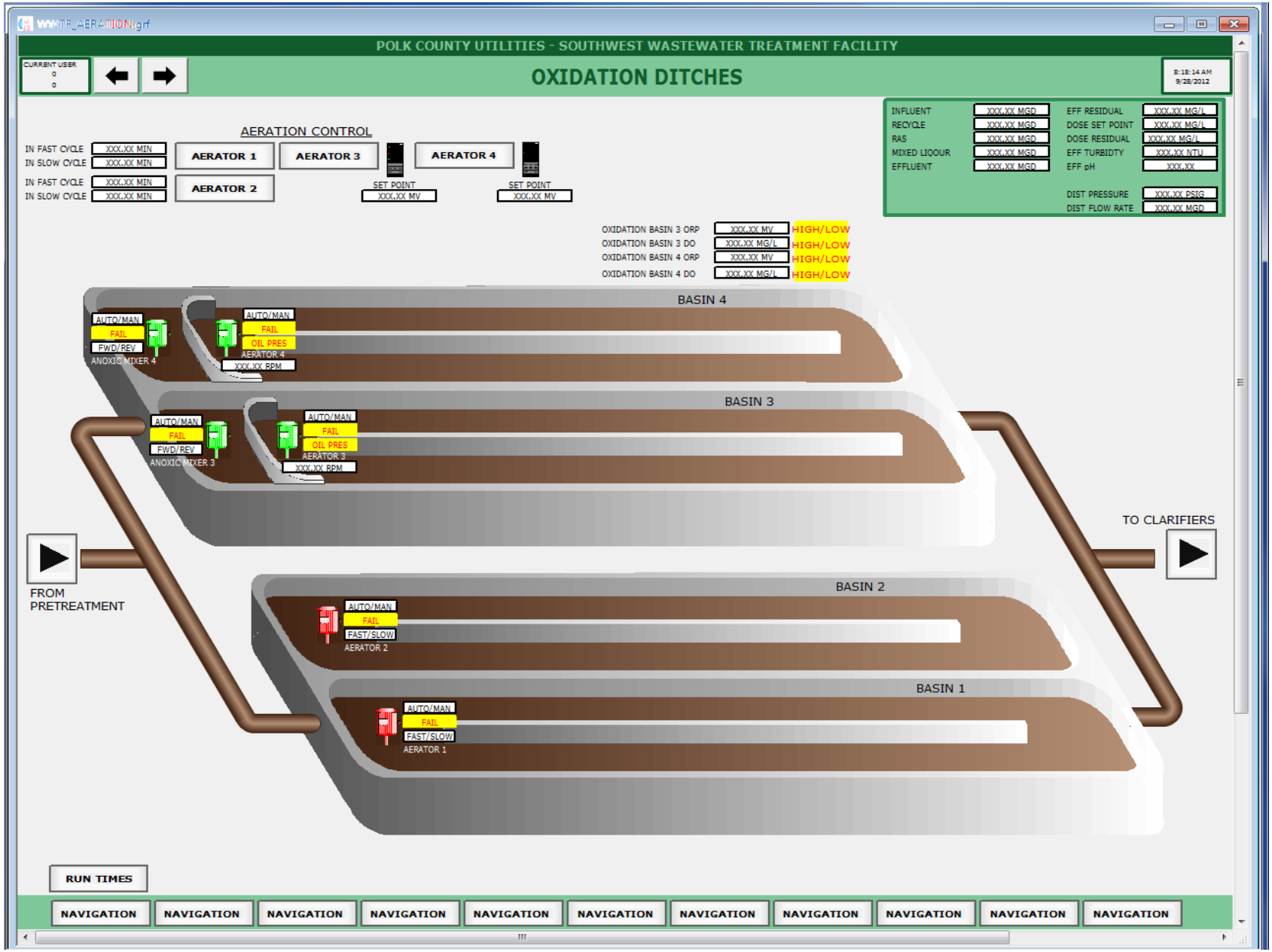
2.03 STANDARD SCREENS

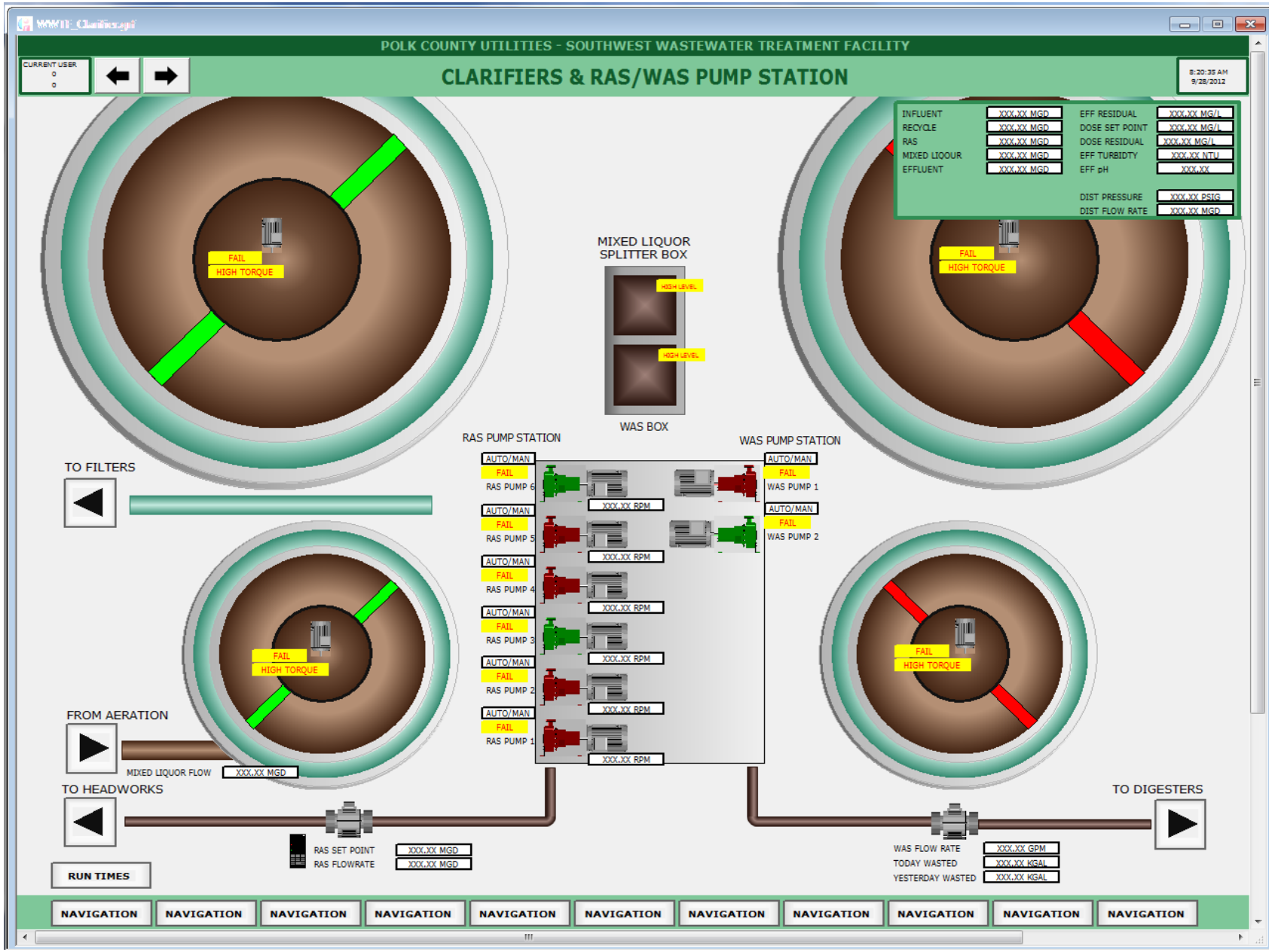
A. The following pages are intended to be standard screens as a basis for creating wastewater treatment facility SCADA pages. The screens shall be used as a basis by both designers and integrators.

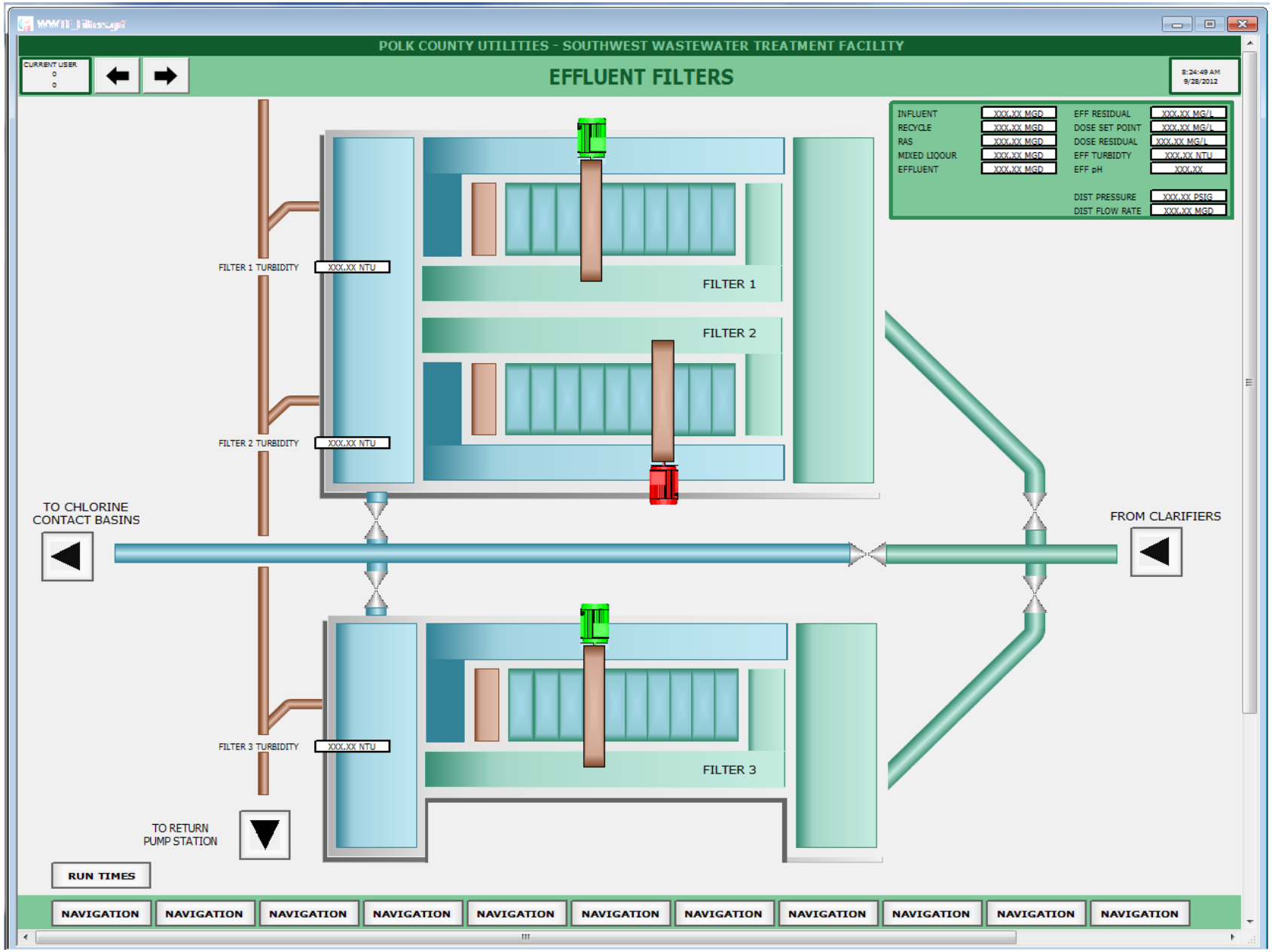

WWTF_OVERVIEW.grf
POLK COUNTY UTILITIES - SOUTHWEST WASTEWATER TREATMENT FACILITY
CURRENT USER
PLANT OVERVIEW
1:08:25 PM
9/28/2012
REJECT
MGAL
TK 1
TK 2
TOTAL REJECT
XXX.XX MGAL
XXX.XX %
REJECT GSR 1
XXX.XX MGAL
REJECT GSR 2
XXX.XX MGAL
REJECT GSR 2
REJECT GSR 1
INFLUENT
XXX.XX MGD
RECYCLE
XXX.XX MGD
RAS
XXX.XX MGD
MIXED LIQOUR
XXX.XX MGD
EFFLUENT
XXX.XX MGD
EFF RESIDUAL
XXX.XX MG/L
DOSE SET POINT
XXX.XX MG/L
DOSE RESIDUAL
XXX.XX MG/L
EFF TURBIDTY
XXX.XX NTU
EFF pH
XXX.XX
DIST PRESSURE
XXX.XX PSIG
DIST FLOW RATE
XXX.XX MGD
DISINFECTION
DISTRIBUTION PUMP STATION
EFFLUENT PUMP STATION
FILTERS
FILTER 1 TURBIDITY
XXX.XX NTU
FILTER 2 TURBIDITY
XXX.XX NTU
FILTER 3 TURBIDITY
XXX.XX NTU
FUTURE
CLARIFIERS RAS/WAS
CLARIFIER 3
CLARIFIER 4
CLARIFIER 1
CLARIFIER 2
RAS PUMPS
WAS PUMPS
SLUDGE DIGESTION
DIGESTER 3
DIGESTER 1
DIGESTER 2
TRANSFER PUMPS
BLOWERS
RCW GSR 1
RCW GSR 2
CONTACT BASIN 1
XXX.XX MGD
CONTACT BASIN 1
XXX.XX MGD
CONTACT BASIN 1
XXX.XX MGD
RCW GSR 3
RCW GSR 4
STORAGE VALVE
OPEN
REJECT VALVE
CLOSED
OPERATIONS
RECYCLE PS
LOAD MANAGEMENT
AERATION
BASIN 4
BASIN 3
BASIN 2
BASIN 1
HEADWORKS
RECLAIMED
MGAL
TK 1
TK 2
TK 2
TK 2
TOTAL RECLAIM
XXX.XX MGAL
XXX.XX %
RECLAIM GSR 1
XXX.XX MGAL
RECLAIM GSR 2
XXX.XX MGAL
RECLAIM GSR 3
XXX.XX MGAL
RECLAIM GSR 4
XXX.XX MGAL
OXIDATION BASIN 3 ORP
XXX.XX MV
HIGH/LOW
OXIDATION BASIN 3 DO
XXX.XX MG/L
HIGH/LOW
OXIDATION BASIN 4 ORP
XXX.XX MV
HIGH/LOW
OXIDATION BASIN 4 DO
XXX.XX MG/L
HIGH/LOW
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION

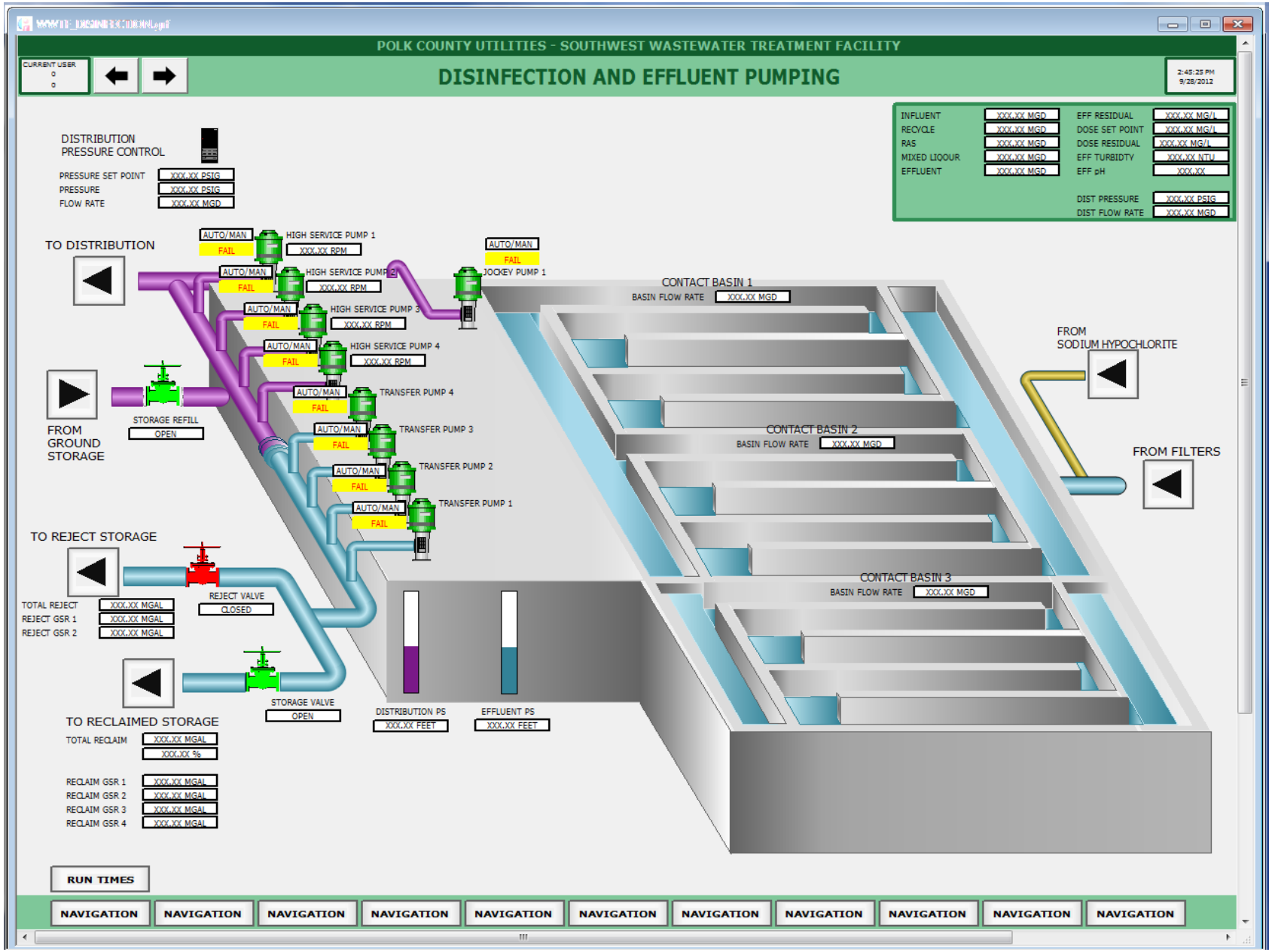

POLK COUNTY UTILITIES - SOUTHWEST WASTEWATER TREATMENT FACILITY
CURRENT USER
PROCESS DASHBOARD
8:21:30 AM
9/28/2012
EFFLUENT QUALITY
EFF RESIDUAL
XXX.XX MG/L
EFF TURBIDTY
XXX.XX NTU
EFF pH
XXX.XX
DOSE SET POINT
XXX.XX MG/L
DOSE RESIDUAL
XXX.XX MG/L
PROCESS PERFORMANCE
BASIN 3 ORP
XXX.XX MV
BASIN 3 DO
XXX.XX MG/L
BASIN 4 ORP
XXX.XX MV
BASIN 4 DO
XXX.XX MG/L
8:20:29 AM 9/28/2012
8:20:49 AM 9/28/2012
8:21:08 AM 9/28/2012
8:21:29 AM 9/28/2012
FILTER 1 TURBIDITY
XXX.XX NTU
FILTER 2 TURBIDITY
XXX.XX NTU
FILTER 3 TURBIDITY
XXX.XX NTU
INFLUENT
XXX.XX MGD
RECYCLE
XXX.XX MGD
RAS
XXX.XX MGD
MIXED LIQOUR
XXX.XX MGD
AERATION CONTROL
IN FAST CYCLE
XXX.XX MIN
IN SLOW CYCLE
XXX.XX MIN
AERATOR 1
AERATOR 3
AERATOR 4
IN FAST CYCLE
XXX.XX MIN
IN SLOW CYCLE
XXX.XX MIN
AERATOR 2
SET POINT
XXX.XX MV
SET POINT
XXX.XX MV
CONTACT BASIN 1
XXX.XX MGD
CONTACT BASIN 2
XXX.XX MGD
CONTACT BASIN 3
XXX.XX MGD
RAS/WAS CONTROL
RAS SET POINT
XXX.XX MGD
RAS FLOW
XXX.XX MGD
WAS DAILY FLOW
XXX.XX KGAL
RECLAIMED WATER DISTRIBUTION
FEET
WET WELL LEVEL
DISTRIBUTION PS
XXX.XX FEET
EFFLUENT PS
XXX.XX FEET
MGAL
TK 1
TK 2
TK 2
TK 2
TOTAL RECLAIM
XXX.XX MGAL
XXX.XX %
RECLAIM GSR 1
XXX.XX MGAL
RECLAIM GSR 2
XXX.XX MGAL
RECLAIM GSR 3
XXX.XX MGAL
RECLAIM GSR 4
XXX.XX MGAL
MGAL
TK 1
TK 2
TOTAL REJECT
XXX.XX MGAL
XXX.XX %
REJECT GSR 1
XXX.XX MGAL
REJECT GSR 2
XXX.XX MGAL
DISTRIBUTION CONTROL
SET POINT
XXX.XX PSIG
STORAGE VALVE
OPEN
REJECT VALVE
CLOSED
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION

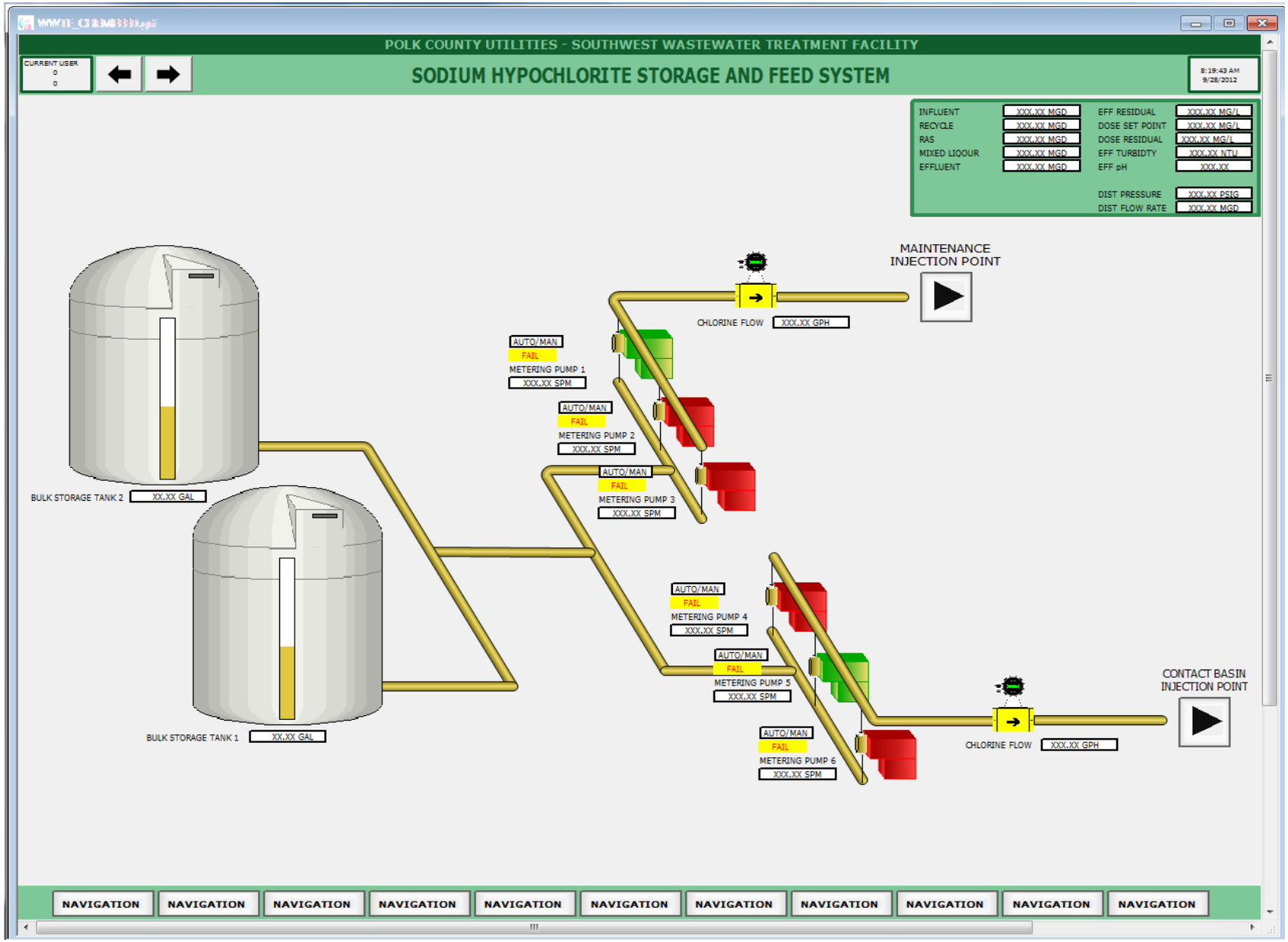

POLK COUNTY UTILITIES - SOUTHWEST WASTEWATER TREATMENT FACILITY
CURRENT USER
0
0
PRETREATMENT
8:26:36 AM
9/28/2012
INFLUENT XXX.XX MGD
RECYCLE XXX.XX MGD
RAS XXX.XX MGD
MIXED LIQOUR XXX.XX MGD
EFFLUENT XXX.XX MGD
EFF RESIDUAL XXX.XX MG/L
DOSE SET POINT XXX.XX MG/L
DOSE RESIDUAL XXX.XX MG/L
EFF TURBIDTY XXX.XX NTU
EFF pH XXX.XX
DIST PRESSURE XXX.XX PSIG
DIST FLOW RATE XXX.XX MGD
GRIT CLASSIFIER
MECHANICALLY CLEANED BAR SCREEN 2
GRIT CHAMBER 2
AERATION
COLLECTION SYSTEM
INFLUENT XXX.XX MGD
MECHANICALLY CLEANED BAR SCREEN 1
GRIT CHAMBER 1
RAS AND RECYCLE PUMP STATIONS
RECYCLE XXX.XX MGD
RAS XXX.XX MGD
RUN TIMES
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION

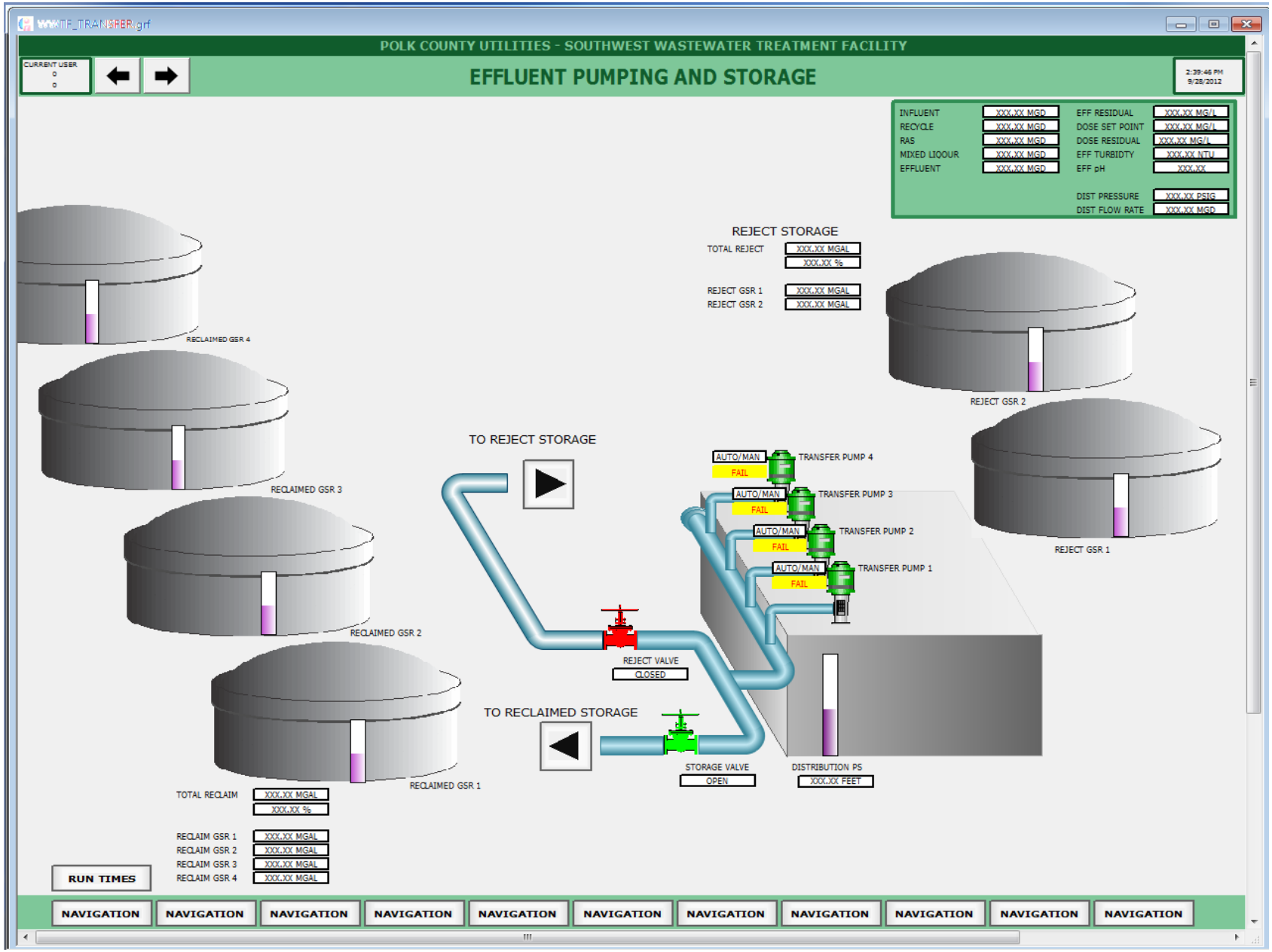

WWTF_AERATION.grf
POLK COUNTY UTILITIES - SOUTHWEST WASTEWATER TREATMENT FACILITY
CURRENT USER
OXIDATION DITCHES
8:18:14 AM
9/28/2012
AERATION CONTROL
IN FAST CYCLE
IN SLOW CYCLE
XXX.XX MIN
AERATOR 1
AERATOR 3
AERATOR 4
AERATOR 2
SET POINT
XXX.XX MV
INFLUENT
RECYCLE
RAS
MIXED LIQOUR
EFFLUENT
XXX.XX MGD
EFF RESIDUAL
DOSE SET POINT
DOSE RESIDUAL
EFF TURBIDTY
EFF pH
XXX.XX MG/L
XXX.XX NTU
XXX.XX
DIST PRESSURE
XXX.XX PSIG
DIST FLOW RATE
OXIDATION BASIN 3 ORP
OXIDATION BASIN 3 DO
OXIDATION BASIN 4 ORP
OXIDATION BASIN 4 DO
HIGH/LOW
BASIN 4
BASIN 3
BASIN 2
BASIN 1
AUTO/MAN
FAIL
FWD/REV
ANOXIC MIXER 4
OIL PRES
AERATOR 4
XXX.XX RPM
ANOXIC MIXER 3
AERATOR 3
FAST/SLOW
AERATOR 2
AERATOR 1
FROM
PRETREATMENT
TO CLARIFIERS
RUN TIMES
NAVIGATION

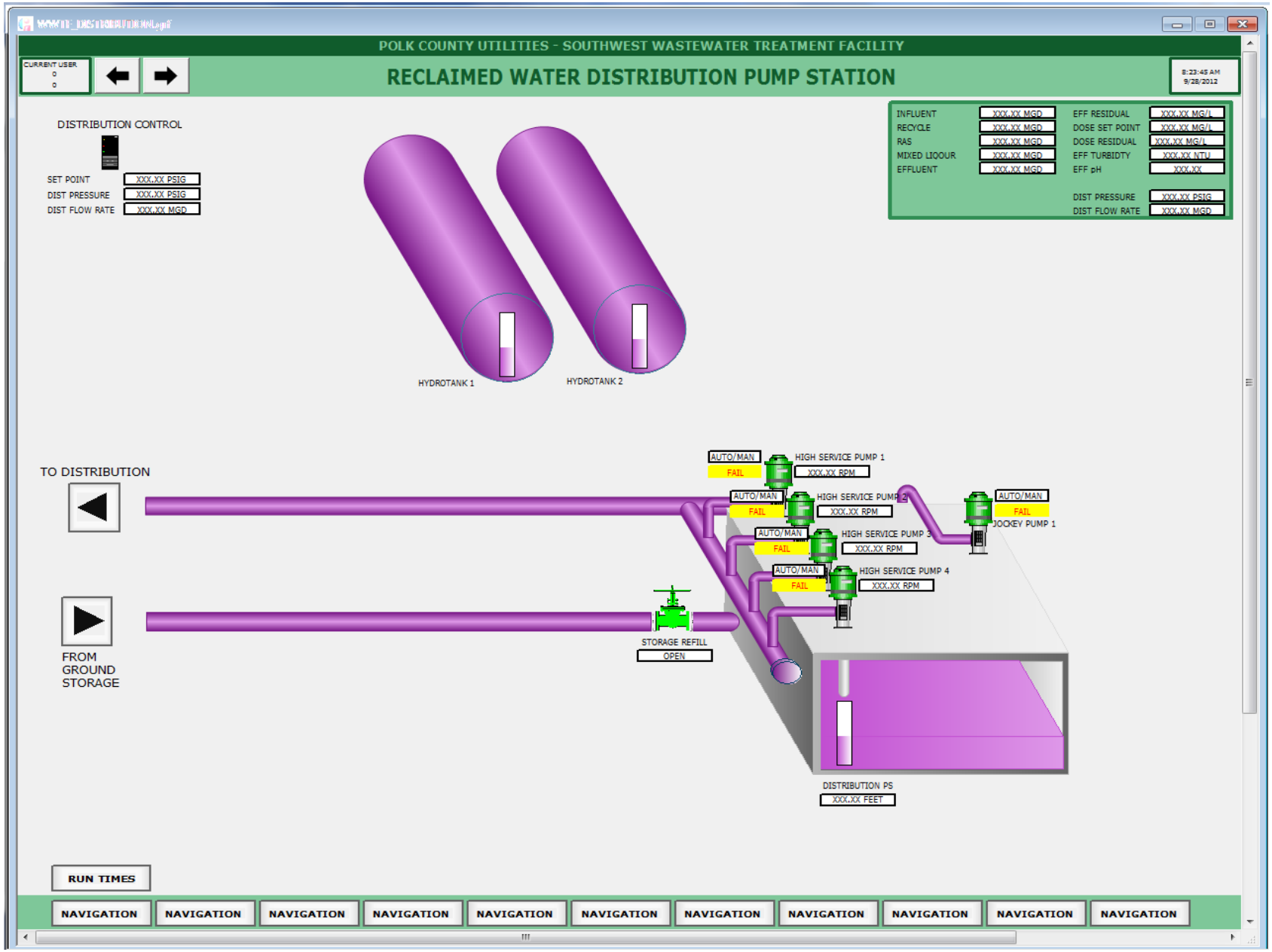

POLK COUNTY UTILITIES - SOUTHWEST WASTEWATER TREATMENT FACILITY
CLARIFIERS & RAS/WAS PUMP STATION
CURRENT USER
INFLUENT XXX.XX MGD
RECYCLE XXX.XX MGD
RAS XXX.XX MGD
MIXED LIQOUR XXX.XX MGD
EFFLUENT XXX.XX MGD
EFF RESIDUAL XXX.XX MG/L
DOSE SET POINT XXX.XX MG/L
DOSE RESIDUAL XXX.XX MG/L
EFF TURBIDTY XXX.XX NTU
EFF pH XXX.XX
DIST PRESSURE XXX.XX PSIG
DIST FLOW RATE XXX.XX MGD
FAIL
HIGH TORQUE
MIXED LIQUOR SPLITTER BOX
HIGH LEVEL
WAS BOX
RAS PUMP STATION
WAS PUMP STATION
AUTO/MAN
FAIL
RAS PUMP 6
RAS PUMP 5
RAS PUMP 4
RAS PUMP 3
RAS PUMP 2
RAS PUMP 1
WAS PUMP 1
WAS PUMP 2
XXX.XX RPM
TO FILTERS
FROM AERATION
MIXED LIQUOR FLOW XXX.XX MGD
TO HEADWORKS
RAS SET POINT XXX.XX MGD
RAS FLOWRATE XXX.XX MGD
TO DIGESTERS
WAS FLOW RATE XXX.XX GPM
TODAY WASTED XXX.XX KGAL
YESTERDAY WASTED XXX.XX KGAL
RUN TIMES
NAVIGATION

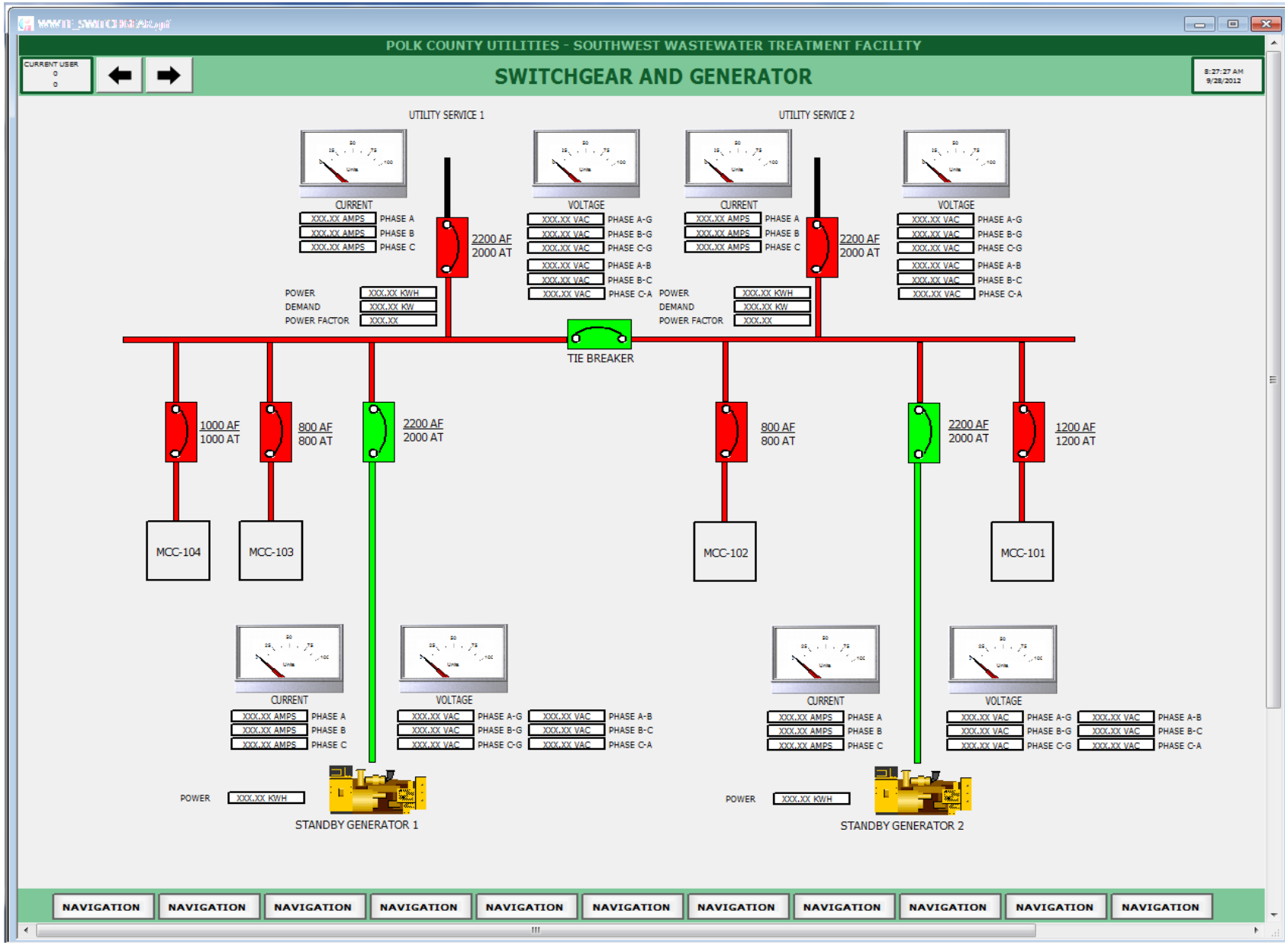

POLK COUNTY UTILITIES - SOUTHWEST WASTEWATER TREATMENT FACILITY
CURRENT USER
EFFLUENT FILTERS
8:24:49 AM
9/28/2012
INFLUENT
XXX.XX MGD
RECYCLE
XXX.XX MGD
RAS
XXX.XX MGD
MIXED LIQOUR
XXX.XX MGD
EFFLUENT
XXX.XX MGD
EFF RESIDUAL
XXX.XX MG/L
DOSE SET POINT
XXX.XX MG/L
DOSE RESIDUAL
XXX.XX MG/L
EFF TURBIDTY
XXX.XX NTU
EFF pH
XXX.XX
DIST PRESSURE
XXX.XX PSIG
DIST FLOW RATE
XXX.XX MGD
FILTER 1 TURBIDITY
XXX.XX NTU
FILTER 2 TURBIDITY
XXX.XX NTU
FILTER 3 TURBIDITY
XXX.XX NTU
FILTER 1
FILTER 2
FILTER 3
TO CHLORINE CONTACT BASINS
FROM CLARIFIERS
TO RETURN PUMP STATION
RUN TIMES
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION

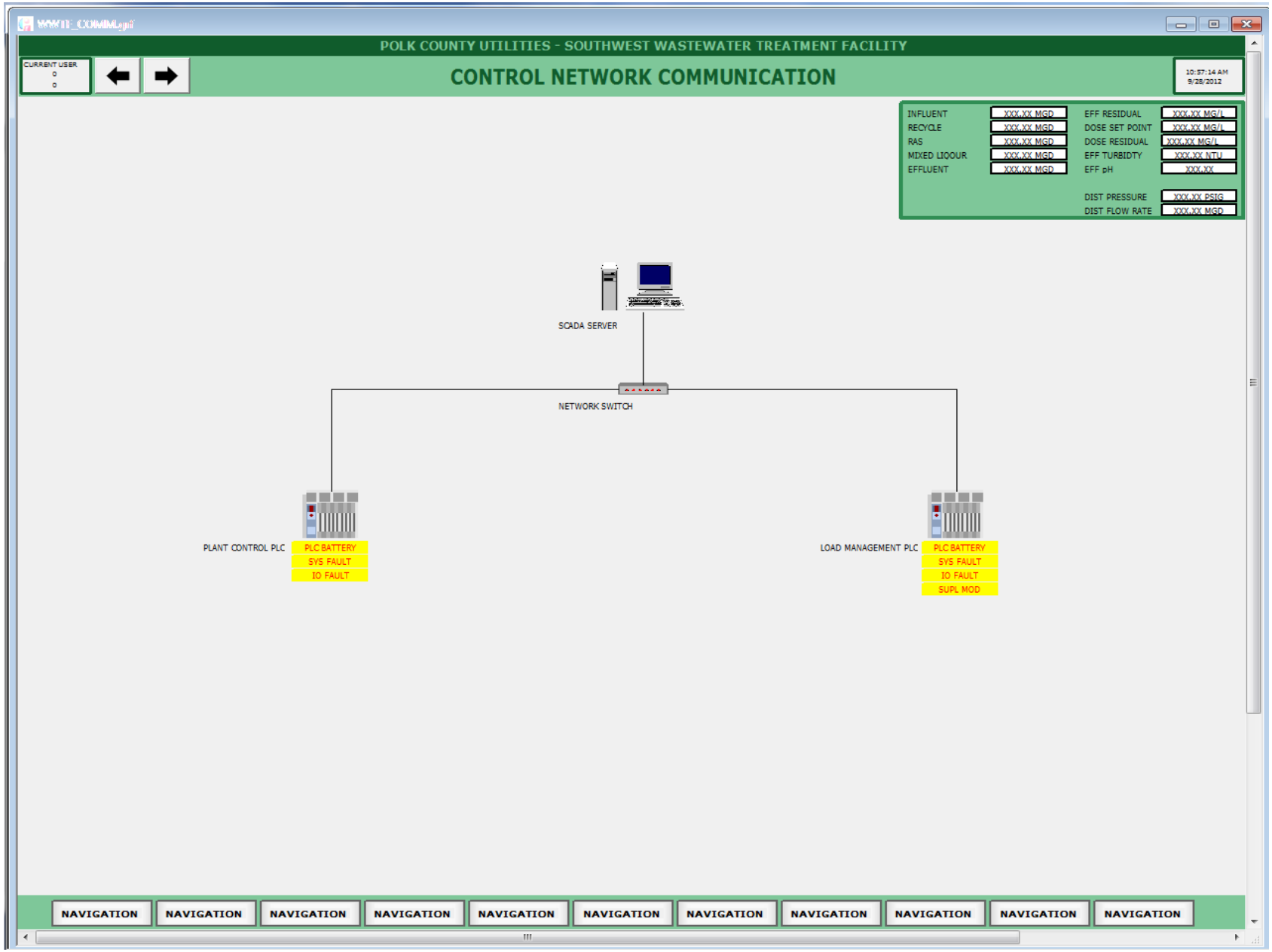

POLK COUNTY UTILITIES - SOUTHWEST WASTEWATER TREATMENT FACILITY
DISINFECTION AND EFFLUENT PUMPING
CURRENT USER
2:45:25 PM
9/28/2012
DISTRIBUTION PRESSURE CONTROL
PRESSURE SET POINT
PRESSURE
FLOW RATE
INFLUENT
RECYCLE
RAS
MIXED LIQOUR
EFFLUENT
EFF RESIDUAL
DOSE SET POINT
DOSE RESIDUAL
EFF TURBIDTY
EFF pH
DIST PRESSURE
DIST FLOW RATE
TO DISTRIBUTION
HIGH SERVICE PUMP 1
HIGH SERVICE PUMP 2
HIGH SERVICE PUMP 3
HIGH SERVICE PUMP 4
JOCKEY PUMP 1
TRANSFER PUMP 4
TRANSFER PUMP 3
TRANSFER PUMP 2
TRANSFER PUMP 1
AUTO/MAN
FAIL
FROM GROUND STORAGE
STORAGE REFILL
OPEN
CONTACT BASIN 1
BASIN FLOW RATE
CONTACT BASIN 2
CONTACT BASIN 3
FROM SODIUM HYPOCHLORITE
FROM FILTERS
TO REJECT STORAGE
TOTAL REJECT
REJECT GSR 1
REJECT GSR 2
REJECT VALVE
CLOSED
STORAGE VALVE
TO RECLAIMED STORAGE
TOTAL RECLAIM
RECLAIM GSR 1
RECLAIM GSR 2
RECLAIM GSR 3
RECLAIM GSR 4
DISTRIBUTION PS
EFFLUENT PS
RUN TIMES
NAVIGATION


POLK COUNTY UTILITIES - SOUTHWEST WASTEWATER TREATMENT FACILITY
CURRENT USER
SODIUM HYPOCHLORITE STORAGE AND FEED SYSTEM
8:19:43 AM
9/28/2012
INFLUENT XXX.XX MGD
RECYCLE XXX.XX MGD
RAS XXX.XX MGD
MIXED LIQOUR XXX.XX MGD
EFFLUENT XXX.XX MGD
EFF RESIDUAL XXX.XX MG/L
DOSE SET POINT XXX.XX MG/L
DOSE RESIDUAL XXX.XX MG/L
EFF TURBIDTY XXX.XX NTU
EFF pH XXX.XX
DIST PRESSURE XXX.XX PSIG
DIST FLOW RATE XXX.XX MGD
MAINTENANCE INJECTION POINT
CHLORINE FLOW XXX.XX GPH
AUTO/MAN
FAIL
METERING PUMP 1
XXX.XX SPM
METERING PUMP 2
METERING PUMP 3
METERING PUMP 4
METERING PUMP 5
METERING PUMP 6
BULK STORAGE TANK 2 XX.XX GAL
BULK STORAGE TANK 1 XX.XX GAL
CONTACT BASIN INJECTION POINT
NAVIGATION


WWTF_TRANSFER.grf
POLK COUNTY UTILITIES - SOUTHWEST WASTEWATER TREATMENT FACILITY
CURRENT USER
0
0
EFFLUENT PUMPING AND STORAGE
2:39:46 PM
9/28/2012
INFLUENT XXX.XX MGD
RECYCLE XXX.XX MGD
RAS XXX.XX MGD
MIXED LIQOUR XXX.XX MGD
EFFLUENT XXX.XX MGD
EFF RESIDUAL XXX.XX MG/L
DOSE SET POINT XXX.XX MG/L
DOSE RESIDUAL XXX.XX MG/L
EFF TURBIDTY XXX.XX NTU
EFF pH XXX.XX
DIST PRESSURE XXX.XX PSIG
DIST FLOW RATE XXX.XX MGD
REJECT STORAGE
TOTAL REJECT XXX.XX MGAL
XXX.XX %
REJECT GSR 1 XXX.XX MGAL
REJECT GSR 2 XXX.XX MGAL
RECLAIMED GSR 4
RECLAIMED GSR 3
RECLAIMED GSR 2
RECLAIMED GSR 1
REJECT GSR 2
REJECT GSR 1
TO REJECT STORAGE
AUTO/MAN
FAIL
TRANSFER PUMP 4
TRANSFER PUMP 3
TRANSFER PUMP 2
TRANSFER PUMP 1
REJECT VALVE
CLOSED
TO RECLAIMED STORAGE
STORAGE VALVE
OPEN
DISTRIBUTION PS
XXX.XX FEET
TOTAL RECLAIM XXX.XX MGAL
XXX.XX %
RECLAIM GSR 1 XXX.XX MGAL
RECLAIM GSR 2 XXX.XX MGAL
RECLAIM GSR 3 XXX.XX MGAL
RECLAIM GSR 4 XXX.XX MGAL
RUN TIMES
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION


POLK COUNTY UTILITIES - SOUTHWEST WASTEWATER TREATMENT FACILITY
CURRENT USER
0
0
RECLAIMED WATER DISTRIBUTION PUMP STATION
8:23:45 AM
9/28/2012
DISTRIBUTION CONTROL
SET POINT
XXX.XX PSIG
DIST PRESSURE
XXX.XX PSIG
DIST FLOW RATE
XXX.XX MGD
INFLUENT
XXX.XX MGD
RECYCLE
XXX.XX MGD
RAS
XXX.XX MGD
MIXED LIQOUR
XXX.XX MGD
EFFLUENT
XXX.XX MGD
EFF RESIDUAL
XXX.XX MG/L
DOSE SET POINT
XXX.XX MG/L
DOSE RESIDUAL
XXX.XX MG/L
EFF TURBIDTY
XXX.XX NTU
EFF pH
XXX.XX
DIST PRESSURE
XXX.XX PSIG
DIST FLOW RATE
XXX.XX MGD
HYDROTANK 1
HYDROTANK 2
TO DISTRIBUTION
FROM GROUND STORAGE
AUTO/MAN
FAIL
HIGH SERVICE PUMP 1
XXX.XX RPM
HIGH SERVICE PUMP 2
HIGH SERVICE PUMP 3
HIGH SERVICE PUMP 4
JOCKEY PUMP 1
STORAGE REFILL
OPEN
DISTRIBUTION PS
XXX.XX FEET
RUN TIMES
NAVIGATION


POLK COUNTY UTILITIES - SOUTHWEST WASTEWATER TREATMENT FACILITY
CURRENT USER
0
0
SWITCHGEAR AND GENERATOR
8:27:27 AM
9/28/2012
UTILITY SERVICE 1
UTILITY SERVICE 2
CURRENT
VOLTAGE
XXX.XX AMPS
PHASE A
PHASE B
PHASE C
XXX.XX VAC
PHASE A-G
PHASE B-G
PHASE C-G
PHASE A-B
PHASE B-C
PHASE C-A
2200 AF
2000 AT
POWER
DEMAND
POWER FACTOR
XXX.XX KWH
XXX.XX KW
XXX.XX
TIE BREAKER
1000 AF
1000 AT
800 AF
800 AT
2200 AF
2000 AT
1200 AF
1200 AT
MCC-104
MCC-103
MCC-102
MCC-101
STANDBY GENERATOR 1
STANDBY GENERATOR 2
NAVIGATION


POLK COUNTY UTILITIES - SOUTHWEST WASTEWATER TREATMENT FACILITY
CURRENT USER
0
0
CONTROL NETWORK COMMUNICATION
10:57:14 AM
9/28/2012
INFLUENT
XXX.XX MGD
RECYCLE
XXX.XX MGD
RAS
XXX.XX MGD
MIXED LIQOUR
XXX.XX MGD
EFFLUENT
XXX.XX MGD
EFF RESIDUAL
XXX.XX MG/L
DOSE SET POINT
XXX.XX MG/L
DOSE RESIDUAL
XXX.XX MG/L
EFF TURBIDTY
XXX.XX NTU
EFF pH
XXX.XX
DIST PRESSURE
XXX.XX PSIG
DIST FLOW RATE
XXX.XX MGD
SCADA SERVER
NETWORK SWITCH
PLANT CONTROL PLC
PLC BATTERY
SYS FAULT
IO FAULT
LOAD MANAGEMENT PLC
PLC BATTERY
SYS FAULT
IO FAULT
SUPL MOD
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION

CHAPTER 5 **WASTEWATER** **Section 550**

STANDARD DRAWINGS

WW-01-1 Precast Concrete Manhole (Typical)
WW-01-2 Doghouse Concrete Manhole Connection
WW-02 Manhole Connection
WW-03-1 Standard Manhole Frame and Cover Set
WW-03-2 Large Manhole Frame and Cover Set
WW-04 Manhole in Non-Paved Area
WW-05-1 Service Lateral (Standard) (Typical)
WW-05-2 Service Lateral (Deep) (Typical)
WW-06-1 Force Main to Gravity Sewer Manhole Connection (Typical)
WW-06-2 Force Main Manifold Connection (Typical)
WW-07 Grease Interceptor (Typical)
WW-08 Lint / Hair Trap Interceptor (Typical)
WW-09 Lift Station Notes
WW-10 Lift Station Notes (Continued)
WW-11 Duplex Lift Station (Typical) - Site Plan
WW-12-1 Duplex Lift Station with Valve Vault - Plan View
WW-12-2 Duplex Lift Station with Valve Vault - Section View
WW-12-3 Triplex Lift Station - Dimensions and Elevations Table
WW-13 Triplex Lift Station (Typical) - Site Plan
WW-14-1 Triplex Lift Station - Plan View
WW-14-2 Duplex or Triplex Lift Station (Above Ground Piping) - Section View
WW-14-3 Triplex Lift Station - Dimensions and Elevations Table
WW-15 Pipe Support and Gauge/Diaphragm Assembly (Typical)
WW-16 Chain Link Fence (Typical)
WW-17-1 Lift Station Wall (Typical) - Section View
WW-17-2 Cantilever Swing Gate (Typical)
WW-18 Lift Station Wash Down Assembly (Typical)
WW-19 THIS PAGE IS INTENTIONALLY BLANK
WW-20-1 Lift Station Control Panel - Front View
WW-20-2 Lift Station Control Panel - Rear View
WW-21 THIS PAGE IS INTENTIONALLY BLANK
WW-22 Electrical Legend
WW-23 Duplex Pump Control Schematic (240V/480V)
WW-24 Duplex Pump Control Panel Enclosure - Dead Front Layout (Typical)
WW-25 Lift Station TVSS Installation (Typical)
WW-26-1 Lift Station Grounding (Typical)
WW-26-2 Lift Station Cover and Door Grounding (Typical)
WW-26-3 Lift Station Ground Test Well
WW-26-4 Lift Station Fence Post Grounding (Typical)
WW-27 SCADA Pressure Sensor - Water Service

CHAPTER 5 WASTEWATER Section 550-A

Testing & Inspection for Acceptance

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. These specifications cover the testing and inspection for acceptance of wastewater collection and transmission systems.

B. Requests for testing and acceptance of wastewater collection and transmission systems shall be executed in accordance with the Section entitled “Field Testing and Inspection Procedures”.

C. Gravity Mains:

Mains shall be inspected with CCTV for alignment, grade variations, separated pipes, leaks, deflections, cracks, brakes, or otherwise defective pipe to ensure overall pipe integrity. The CCTV inspection contractor shall perform the CCTV inspection(s) at the CONTRACTOR’s sole expense and submit the report(s) to PCU for review and consideration for approval**.** Should PCU so determine, all or part of the CCTV inspection shall be repeated at the sole expense of the CONTRACTOR.

D. Pressure Mains:

Hydrostatic tests shall be conducted for pressure pipes, joints and valves for allowable limits of pressure and leakage. Air testing of pressure pipes will not be permitted under any circumstance. All pressure mains shall be hydraulically cleaned with a polypropylene swab (pig) to remove dirt, sand, and debris from the main prior to hydrostatic testing.

PART 2 - GRAVITY MAIN CCTV INSPECTION

2.01 STANDARDS

A. Gravity mains shall be televised from manhole to manhole utilizing a 360-degree pan and tilt color camera. The camera shall be of the self-propelled tractor type with a measuring device mounted to the front capable of being read as the tractor moves and capable of accurately measuring depth of standing water up to, and including, three inches.

B. Closed Circuit Television (CCTV) data shall be recorded and submitted in digital format.

C. CCTV operators inputting the CCTV data shall be certified users who have successfully completed the Pipeline Assessment and Certification Program (PACP) user course from the National Association Sewer Service Companies (NASSCO).

D. CCTV operators shall be able to demonstrate proficiency in televising and recording

using PACP codes, as required by PCU.

E. CCTV inspections shall use unique identification numbers established and provided by PCU in pipe segment reference, upstream manhole number and the downstream manhole number fields

F. Reports generated by the computer software shall be consistent with PACP requirements, observation report with still images; and CCTV inspection results with a pipe run graph.

2.02 PREPARATION

A. All manhole channels shall be constructed and coated (if applicable) prior to CCTV inspection.

B. The CONTRACTOR shall clean gravity mains to remove debris and remove stains prior to televising. Flushing water or debris will not be allowed to enter pump station wet wells. Water will be pumped from the sewer system during flushing to an acceptable discharge location. A visual inspection shall be made and all obstructions removed.

C. Mains that are dirty (dirty walls and/or debris in the inverts) shall be re-flushed and cleaned before rescheduling a CCTV inspection. If necessary, swabbing may be required of specific sections of pipe.

D. Dewatering system shall not be operated within 48 hours prior to CCTV inspection.

E. Backfill from the gravity main to the subgrade shall be compacted and stabilized for inspection and cleaning vehicle access prior to CCTV.

F. Inverts will be constructed in manholes prior to televising.

2.03 EXECUTION

A. Wherever possible, gravity mains shall be televised in the downstream direction.

B. Sufficient water shall be run through each section of main until water runs through each downstream manhole no more than 48 hours prior to televising. Lines that are dry or that enough water has not run through to reach the end of each section shall not be televised.

C. The sewer line shall be inspected manhole to manhole with a crawler and pan and tilt camera driven through at a moderate rate of speed.

D. Lighting should be set to allow for clear visibility without excessive reflection and should allow realistic colors to be visible.

E. The iris of the camera should be adjusted to allow for a sharp focused image and the lens should be kept clean and free of obstructions.

F. The operator should follow the manufacturer's instructions to achieve the proper color correction.

G. All notes or coded references shall have footages recorded with them

H. The camera should be centered within the pipe.

I. The distance between manhole centers shall be accurate within 1 percent.

J. The camera shall be stopped at all laterals adjusted for a clear picture and an orbital scan of the lateral taken pausing at the invert at the service lateral to detect dirt or infiltration.

K. The camera shall also be stopped at any suspected or confirmed defects, the focus properly adjusted and a clear digital video taken.

L. Areas suspected of leaking shall be paused long enough to determine if a leak exists currently or if deposits have occurred.

M. A digital photo shall be taken of all areas noted on the report including laterals and any confirmed or suspected defects.

N. Manholes shall be measured from rim to invert and the depth recorded on the inspection header.

O. Manhole material and defects shall be noted.

PART 3 - GRAVITY MAIN TESTING

3.01 LEAKAGE TESTING

A. The CONTRACTOR, with PCU representation present, shall perform leakage testing. The CONTRACTOR shall be responsible for furnishing all necessary labor and equipment to conduct such testing.

Leakage tests shall be by the low-pressure air test. Each test section shall not exceed 400 feet in length and shall be tested between adjacent manholes. Leakage testing shall be conducted in accordance with the procedure for "Recommended Practice for Low Pressure Air Testing of Installed Sewer Pipe" as established by the Uni-Bell PVC Pipe Association. The pipe shall pass the current most stringent UNI-B-6 Uni-Bell standards for testing gravity sewers and shall have no evidence of leaks in the pipe or connections.

Low-pressure Air Test Procedure:

1. Isolate each section of the gravity wastewater main to be tested between manholes using inflatable air plugs that are securely placed at the ends of the section of the main to be tested.

2. Introduce air pressure slowly to approximately 4 psig.

3. Determine groundwater elevation above the spring line of the pipe. For every foot of groundwater above the spring line of the pipe, increase the starting air test pressure by 0.43 psig. Do not increase the pressure above 10 psig.

4. Allow the pressure to stabilize for at least five minutes. Adjust the pressure to 3.5 psig or increase the test pressure as determined above when groundwater is present.

5. Start the test.

6. Determine the test duration for each sewer section with a single pipe size from the following table. Do not make allowance for laterals.

Table 550-A-1. Allowable Leakage - Low Pressure Air Test

Nominal Pipe Size (inches)	Minimum Test Time (min/ 100 feet)
8	1.2
10	1.5
12	1.8
15	2.1
18	2.4
21	3.0
24	3.6
27	4.2
30	4.8
36	6.0

7. Record the drop in pressure during the test period. If the air pressure has dropped more than 1.0 psig during the test period, the section of main being tested has failed. Otherwise, the section of main being tested has passed.

8. When a section of main fails the test, the CONTRACTOR shall determine the source of the air leakage, make the appropriate corrections, and retest. If necessary, testing shall be conducted incrementally by individual pipe sections until all leaks are isolated. After all leaks are repaired, the CONTRACTOR shall retest the entire section of the main between manholes.

9. All testing results, including the quantity of acceptable leakage, shall be documented and certified using the PCU approved Low Pressure Air Test Form.

3.02 CAUSES FOR REJECTION OF GRAVITY MAINS

A. The CONTRACTOR shall be required to replace the pipeline if the acceptance or bond CCTV inspection reveals cracked, broken, or defective pipe, and/or in the case of PVC pipe a ring deflection in excess of five percent.

B. After backfilling of trenches, all PVC sewer pipe shall be tested by the CONTRACTOR for initial diametric deflections by the use of a Go-No-Go type mandrel which is acceptable to PCU. The initial diametric deflection shall not exceed five percent (5%) of the base inside diameter as defined by ASTM D-3034.

C. Joint separation shall be no greater than two inch between the spigot and bell of the pipe.

D. No evidence of leakage will be acceptable for private gravity mains connecting to the PCU collection system.

E. The following NASSCO PACP codes or notes shall be cause for rejection of gravity sewer systems

1. PACP coding of “Line” (L) shall be accompanied by a measurement of the line, grade or angular deviation. Variance of established line and grade at any point along the length of the pipe shall not be greater than 1-1/2 inches, provided such variation does not result in a level or reverse sloping invert. An approved method shall be used to determine this deviation. A PACP coding of MWLS with a percentage of pipe greater than 18.75% on 8-inch sewer, 15% on 10-inch sewer etc. will be corrected by excavation and repair.

2. PACP coding of “Infiltration” (I) for pipe joints shall be replaced or the pipe joint shall be reseated at the joint. Grouting shall not be considered a method of repair and will not be accepted. Replace the leaking gravity main segment if there is visible infiltration at any point other than the pipe joint.

3. Any PACP coding in the category of “Structural Family”.

4. PVC pipe having ID tears will be rejected.

5. PACP condition grading of “OB” (obstruction) in pipe shall be rejected, the obstruction shall be removed and the line cleaned and re-televised.

3.03 ACCEPTANCE OF GRAVITY MAINS

A. Successful passage of both the leakage test and CCTV inspection is required before acceptance by PCU.

B. Prior to repair or replacement of failed sewer pipe, the method of repair or

replacement shall be submitted to PCU for review and consideration for approval. Pressure grouting of pipe or manholes shall not be considered as an acceptable method of repair.

PART 4 - MANHOLE TESTING

4.01 TESTING AND INSPECTION OF MANHOLES

A. Leakage Test:

There shall be no visible leakage through the walls or pipe connections.

B. Vacuum Test:

All manholes shall be required to meet the requirements of the vacuum test as per the current ASTM C 1244 “Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test” prior to acceptance.

ASTM C1244 states that a vacuum test is intended to be used as a preliminary test to enable the installer to demonstrate the condition of the concrete manhole prior to backfill.

ASTM C1244 requires that a vacuum of 10 inches Hg to be drawn on the manhole after all lift holes are plugged and pipes entering the manhole are temporarily plugged and securely braced. The time is measured for the vacuum to drop to 9 inches Hg. The manhole is accepted if the measured time meets or exceeds the values presented in Table 550-A-2 below or Table 1 of ASTM C1244, whichever is more restrictive. If the manhole fails the initial test, it may be repaired by an approved method until a satisfactory test is obtained.

Table 550-A-2. Minimum Duration – Manhole Vacuum Test

Manhole Diameter (Feet)	Test Period (Seconds)
4	60
5	75
6	90

Vacuum testing after backfilling should be performed only after a successful non-backfill test has been completed in accordance with ASTM C1244.

Vacuum testing backfilled manhole systems is not recommended, especially in the presence of ground water as the hydrostatic pressure may exceed the design limits of critical flexible connectors leading to a system failure.

All testing shall be documented and certified using the PCU approved Vacuum Test Form.

C. Manhole Inspections:

1. The quality of all materials, the process of manufacture, and the finished sections shall be subject to inspection and approval by PCU. Such inspection may be made at the place of manufacture and/or at the site after delivery, or at both places. The sections shall be subject to rejection at any time on account of failure to meet any of the specification requirements; even though sample sections may have been accepted as satisfactory at the place of manufacture. Sections rejected after delivery to the job shall be marked for identification and shall be immediately removed from the job. All sections, which have been damaged, will be rejected. If already installed, rejected section shall be removed and replaced entirely at the CONTRACTOR's expense.

2. At the time of inspection, the sections will be carefully examined for compliance with the specified ASTM designation, and with the approved manufacturer's drawings. All sections shall be inspected for general appearance, dimension, "scratch-strength" blisters, cracks, roughness, soundness, etc. The surface shall be dense and close-textured. Installed manholes shall be inspected for proper filling and coating of the lifting holes and proper installation of any liner, coating or shrink-wrap.

PART 5 TESTING OF WASTEWATER FORCE MAINS

A. Locating Wire System:

All wastewater force mains shall be installed with a continuous green insulated copper locating wire. Locating wire shall be installed in accordance with the STANDARD DRAWINGS and pass a continuity check with an approved tracing system before acceptance by PCU.

B. Inspection of Automatic Combination Air and Vacuum Release Valves:

After completion of the pressure test the ARV shutoff valve shall be opened and PCU shall test the ARV for proper connection and operation.

C. Inspection of Valves and Valve Boxes:

Valves shall be opened wide and then tightly closed, and the various nut and bolts shall be tested for tightness. Any valve that does not operate correctly shall be replaced. Buried valves shall have an operating nut within two feet of finished grade. Valve boxes shall be properly marked and checked for installation in accordance with the STANDARD DRAWINGS. Operating nuts, extensions, and upper guides shall not interfere with valve operation. Before acceptance by PCU valve boxes shall be adjusted to finished grade with the operating nut properly centered and shall have a "V" notched in the curb or street in the absence of a curb directly opposite the valve box.

D. Swabbing:

1. All mains shall be hydraulically cleaned with a polypropylene swabbing (also known as pigging) device to remove dirt, sand, and debris from main.

2. If swabbing access and egress points are not provided in the design drawings, it will be the responsibility of the CONTRACTOR to provide and remove temporary access and egress points for the cleaning, as required.

3. Passage of cleaning poly swabs through the system shall be constantly monitored, controlled, and all poly swabs entered into the system shall be individually marked and identified so that the exiting of the poly swabs from the system can be confirmed.

4. Cleaning of the system shall be done in conjunction with the initial filling of the system for its hydrostatic test.

5. The line to be cleaned shall only be connected to the existing distribution system at a single connection point.

6. The CONTRACTOR shall locate and open all new in-line valves beyond the point of connection on the pipeline to be cleaned during the swabbing operation.

7. At the receiver or exit point for the poly swab, the CONTRACTOR is responsible for creating a safe environment for collection of debris, water, and the swab. The CONTRACTOR shall provide for the protection of surrounding personnel and property and the safe retrieval of the swab.

8. Only PCU personnel shall operate the supply valve from the existing distribution system. Cleaning and flushing shall be accomplished by propelling the swab down the pipeline to the exit point with potable water. Flushing shall continue until the water is completely clear and swab is retrieved.

    i. Re-apply a series of individual swabs in varying diameters and/or densities as required, to attain proper cleanliness of pipeline.

    ii. Swabbing speed shall range between two and five feet per second.

9. After the swabbing process, pressure testing and disinfection of the pipe shall be completed in accordance with this MANUAL.

E. Hydrostatic Pressure Testing of Ductile Iron and PVC Pressure Pipe:

1. Hydrostatic tests shall consist of pressure and leakage tests for non-butt welded jointed pipes. Air testing of pressure pipes will not be permitted under any circumstance. Testing shall be performed from in-line valve to in-line valve with a depressurized section behind each valve, whenever possible. Testing shall be performed from in-line valve to in-line valve with a depressurized section behind each valve, whenever possible.

2. The CONTRACTOR shall furnish all necessary testing material and equipment. PCU will monitor and approve a satisfactory test.

3. All pipe sections to be pressure tested shall be subjected to a hydrostatic pressure of 150 psi. The duration of each pressure test shall be for a period of two hours. If during the test, the integrity of the tested line is in question, PCU may require a 6-hour pressure test. The basic provisions of AWWA C600 shall be applicable.

4. Procedure for Pressure Test:

   Each section of pipe to be tested, as determined by PCU, shall be slowly filled with water and the specified test pressure shall be applied by means of a pump connected to the pipe in a satisfactory manner. Before applying the specified test pressure, all air shall be expelled from the pipe. To accomplish this, taps shall be made and appropriate valves installed to ensure bleeding of all air from the main. If defective pipes, fittings or valves are discovered during this pressure test, all such items shall be removed and replaced by the CONTRACTOR with sound material and the test shall be repeated until satisfactory results are obtained. Provisions of the current AWWA C600, where applicable, shall apply.

F. Hydrostatic Pressure Testing of HDPE and Fusible PVC Pressure Pipe:

1. After installation, the butt welded jointed pipe shall be tested in accordance with this MANUAL with the following modifications:

   a. Test Duration: The total test time including initial pressurization, initial expansion, and time at test pressure, shall not exceed five hours. If the test is not completed due to leakage, equipment failure, etc., the test section shall be depressurized and allowed to “relax” for a minimum of eight hours before it is brought back up to test pressure. The test procedure consists of initial expansion phase and leakage test phase.

   b. Prior to Hydrostatic Pressure Testing Procedure:

1) Hydraulically clean the main to be tested with a polypropylene swab (pig) to remove dirt, sand, and debris from the main prior to hydrostatic testing.

2) Insure that main to be tested is restrained against horizontal and vertical movement. Exposing joints only is allowed.

c. Hydrostatic Pressure Testing Procedure:

1) Fill main slowly with water to remove air.

2) Pressurize up to 1.5 times the Pressure Class of the pipe used at the lowest point of the main being tested.

3) Maintain for 4 hours while adding water as needed in non-monitored amounts as pipe will expand while until pressure.

4) Reduce pressure by 10 psi and monitor for 1 hour.

5) Main passes if there are no leaks within 5 percent of the remaining pressure after reduction.

F. Hydrostatic Leakage Testing:

1. Procedure for Leakage Test:

After completion of the pressure test, a leakage test shall be conducted to determine the quantity of water lost by leakage under the specified test pressure. Applicable provisions of AWWA C600 shall apply.

a. Allowable leakage in gallons per hour for pipeline shall not be greater than that determined by the formula:

$$L = \frac{ND(P)^{1/2}}{7{,}400}$$

Note:

L - Allowable leakage in gallons per hour.
N - Number of joints in the tested line.
D - Nominal diameter of the pipe in inches.
P - Average test pressure during leakage test in pounds per square inch gauge.

b. Leakage is defined as the quantity of water to be supplied in the installed pipe or any valve section under test, which is necessary to maintain the specified leakage test pressure after the pipe has been filled with water and the air

expelled. Should any test of pipe installed disclose leakage greater than that allowed, the CONTRACTOR shall locate and replace or repair the defective joints, pipe or valve until subsequent testing is within the specified leakage allowance.

F. All testing and the quantity of acceptable leakage shall be documented and certified using the PCU approved Pressure Test Form.

CHAPTER 5 WASTEWATER Section 550-B

Testing and Inspection for Acceptance (Lift Stations)

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. This Section covers the testing and inspection for acceptance of wastewater lift stations.

B. Requests for testing and acceptance of wastewater lift stations shall be executed in accordance with the Section entitled “Field Testing and Inspection Procedures”.

C. The final startup and final inspection shall demonstrate and ensure to PCU that the complete lift station system is fully operational in accordance with this MANUAL.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 PREPARATION FOR TESTING

A. The CONTRACTOR shall install sufficient monitoring wells in the representative areas of the gravity system, acceptable to PCU, to determine the groundwater elevations. Monitoring wells shall be installed a minimum 24 hours prior to Section 3.02 testing.

3.02 TESTING AND INSPECTION OF WETWELLS

A. Leakage Test:

There shall be no visible leakage through the walls or pipe connections.

B. Wet Well Liner/Coating Testing:

All wet well surfaces with linings or coatings shall be tested with an acceptable electrical Holiday or flaw detector, if applicable, after installation and any imperfections discovered shall be repaired by a method approved by PCU. The CONTRACTOR shall provide all necessary equipment and material for testing. Liners and coatings requiring spark testing will be spark tested in accordance with NACE Standard RP-02-74. Test voltage equals 1250 multiplied by the square root of the coating thickness in mils (0.001 inch), or test voltage equals 250 multiplied by the square root of the coating material in microns (0.001 mm) this formula’s results shall not exceed the dielectric strength of the material being tested.

3.03 FINAL LIFT STATION START-UP

A. The following shall occur prior to the Final Lift Station Start Up being conducted:

1. A successful Informal Lift Station Start Up of the lift station, its site, and improvements;
2. All wire checks completed;
3. Wastewater Collection System CCTV inspections has been successfully completed and reviewed by PCU;
4. FDEP Water Clearance received by PCU;
5. FDEP placard for fuel tank, if applicable, has been received and properly located

on the tank;

6. A "Lift Station Start-Up Form", as contained in this MANUAL, has been completed by the CONTRACTOR and received by PCU;
7. Liner and coatings tests have been successfully completed and documentation received by PCU;
8. All compaction tests, as required by the Section entitled "Excavations, Backfill, Compaction, and Grading Specifications", have been successfully completed by the CONTRACTOR and reviewed by PCU.
9. Two printed copies and one electronic copy in Acrobat "pdf" format of the Operation and Maintenance Manual for the lift station has been received by PCU.

B. Prior to the formal acceptance of the lift station by the PCU, a PCU acceptable BOUNDARY SURVEY that includes all improvements within the lift station site and out to the centerline of the adjacent roadway shall be submitted to PCU, in accordance with the Section entitled "Development Coordination". The CONTRACTOR and DEVELOPER shall bear the entire expense of rectifying all WORK improperly installed due to the construction of improvements not totally within the site dedicated to PCU. An electronic version and three copies of the certified BOUNDARY SURVEY shall be required.

C. The intent of the Formal Lift Station Start Up is for the CONTRACTOR to successfully demonstrate to PCU that the WORK will function as a complete and operable system under normal as well as emergency operating conditions and the lift station is ready for acceptance. All testing and inspection activities shall demonstrate that all applicable items of this MANUAL and the approved construction documents have been met.

D. The CONTRACTOR shall furnish all labor, fuel, energy, lubrication, water and all other materials, equipment, tools, and instruments necessary for the Formal Lift Station Up along with all other testing and inspection activities. Prior to the Formal Lift Station Start Up, the CONTRACTOR shall conduct preliminary testing of all equipment and make all changes, adjustments, and replacements required. All materials used shall be in accordance with the appropriate "Approved Materials Checklist".

Listed below is a partial checklist of requirements to be met.

1. The CONTRACTOR shall coordinate the Informal and Formal Lift Station Start Up activities with PCU, the manufacturer's representatives, and subcontractors. A factory representative knowledgeable in the mechanical and electrical equipment furnished shall inspect and supervise the operation of their respective equipment during the Formal Lift Station Start Up. Upon satisfactory completion of the equipment testing and inspection, the factory representative(s) shall issue the required manufacturer's warranty certificates.
2. The CONTRACTOR shall initiate startup of each system in accordance with the lift station's Operation and Maintenance Manual. The CONTRACTOR shall

demonstrate that all of the components of each system are operating under their own controls as designated without overheating or overloading any parts and without objectionable vibration as determined by PCU.

3. The CONTRACTOR shall observe the system operation and make adjustments as necessary to optimize the system performance. The CONTRACTOR shall coordinate with PCU for any adjustments desired or operational problems requiring debugging.
4. All functions of the lift station mechanical and electrical equipment shall be tested and inspected for operation and workmanship by the CONTRACTOR. All equipment shall be properly installed and meet the design performance requirements.
5. The pumps shall be flow tested at the lift station startup to verify their performance meets the design requirements and the manufacturer's pump curve.
6. A Lift Station Start-Up Report, as contained in this MANUAL, shall be completed by PCU.
7. The DEVELOPER shall bear the entire expense of rectifying WORK installed outside the lift station property.
8. No generator shall be used to power any portion of the lift station during the Final Lift Station Start-Up.

E. Re-testing:

If the results of the Formal Lift Start Up do not meet the requirements of this MANUAL, the deficiencies shall be corrected and the Formal Lift Start Up shall be rescheduled in accordance with the Section entitled "Field Testing and Inspection Procedures".

F. Fuel Tanks:

The CONTRACTOR, ENGINEER, and the DEVELOPER shall be fully responsible for complying with all COUNTY and FDEP (F.A.C. 62.762) storage tank installation protocols. The installation of any storage tank that is subject to the above standards shall be properly registered, insured, installed, and inspected accordingly. The CONTRACTOR shall provide a minimum 5 NORMAL WORKING DAYS advance notice of any storage tank installation to and receive written confirmation from the Utilities Director, the Purchasing Director, the Risk Management Insurance Section Manager, the Risk Management Regulatory Section Manager, and the Fleet Management Director. No fuel shall be placed within a fuel tank without the approval of PCU.

1. Fuel tanks, with a capacity of less than 550 gallons, do not require registration by FDEP. However, "Less than 550" and "1993" stickers are to be obtained from PCU and properly applied to the tanks prior to the Formal Lift Station Start Up.
2. Fuel tanks, with a capacity of 550 but less than 1320 gallons, shall have a properly completed "Storage Tank Facility Registration Form" reviewed and approved by PCU prior to it being submitted by the CONTRACTOR to the FDEP Fuel Tank

Division, with all applicable fees. The original FDEP Storage Tank Registration Placard shall be provided to PCU prior to the Formal Lift Station Start Up. A "1993" sticker and a laminated copy of the FDEP Storage Tank Registration Placard shall be properly applied to the tanks prior to the Formal Lift Station Start Up.

3. Fuel tanks, with a capacity of 1320 or more gallons, shall be required to have a "Spill Prevention, Control, and Countermeasure Plan (SPCC), that complies with Title 40, Code of Federal Regulations, Part 112, in addition to the requirements specified in the Section above.

F. Acceptance:

PCU shall recommend the lift station for formal acceptance by the COUNTY once the lift station functions as a complete and operable system under normal as well as emergency operating conditions, has been certified by the ENGINEER that it complies with all applicable specifications of this MANUAL and the approved construction documents, and all observed deficiencies have been corrected to PCU's satisfaction.

CHAPTER 5 **WASTEWATER** **Section 550-C**

Approved Materials Checklist

PLEASE TYPE OR PRINT CLEARLY IN BLACK INK

Project Name: _____

PCU Project File Number: _____

Contractor's Name: _____

Contractor's Address: _____

Contractor's Signature: _____

Engineer's Name: _____

Engineer's Address: _____

PCU Reviewer: _____ Date: _____

Approved: ____ Denied/Resubmit: ____

Comments:

_____
_____
_____
_____
_____
_____

With the submission of this document, the CONTRACTOR understands that the use of the following selected items, as individually indicated by the use of an "X", is mandatory.

Substitutions using other items contained within this Checklist shall be initiated by the CONTRACTOR submitting a revised Checklist to PCU for its review and approval at least 10 calendar days in advance of need.

It is also understood by the CONTRACTOR that PCU shall reject materials and products not in accordance with this document and the MANUAL. Any material or product not contained within this Checklist shall be approved in advance by the Utilities Code Committee in accordance with the provisions of the Utilities Code.

Shop drawings shall be required for all structures and similar items not contained within this checklist, such as manholes, wet wells, and other castings.

CHAPTER 5 **WASTEWATER** **Section 550-C**

Approved Materials Checklist

Four (4) sets of the CONTRACTOR's and ENGINEER's executed APPROVED MATERIALS CHECKLIST and any necessary shop drawings shall be submitted to PCU for its use and approval, plus the number of sets needed for the CONTRACTOR use. Ordering materials and products without specific written approval from PCU of the submitted list and shop drawings is NOT recommended and is done at the CONTRACTOR's sole expense and responsibility.

NOTE: The latest changes approved by the Utilities Code Committee are indicated by "<u>underlining</u>" and deleted items by "~~strikethroughs~~".

Wastewater Category 1 of 10: VALVES AND ACCESSORIES			
ITEM TO BE USED	**Manufacturer**	**Part Number**	**Comments**
Automatic Air Release Valves:			
	Val-Matic	48ABW	Epoxy Lined
	ARI	S-020-T02	FBE Coated
	ARI	S-020-SST02	Stainless Steel
Automatic Combination Air / Vacuum Release Valves:			
	Val-Matic	802ABW	Epoxy Lined
	ARI	D-025-PT02	Reinforced Nylon
	ARI	D-025-SST02	Stainless Steel
Air / Vacuum Release Valve Enclosures (Horizontal Venting and Medium Green):			
	Water Plus	131632	
	Channell	BPH 1730	
	Hydro-Guard	Safety-Guard 15100 Low Profile or 02100	
Air / Vacuum Release Valve and Large Diameter Manholes Frame and Cover:			
	US Foundry	USF 679-BK-M	
	CertainTeed	Pamrex 36"	Alternative – <u>Not to be used in paved roadways</u>.
Air / Vacuum Release Valve Service Saddles (Epoxy With Stainless Steel Straps):			
	Ford	Series FC202	
	JCM	406	
	Mueller	DR2S	
	Cascade	CNS 2	
Plug Valves – MJ & Flanged (8mil Fusion Bonded Epoxy Lined With Stainless Steel Bolts, Gear Operator To Be Sized For Rated Pressure Of The Valve, And For Use Only Within A Lift Station):			
	Dezurik	Series – PEC	

Approved Materials Checklist

	Pratt	Ballcentric	
Gate Valves 16-inch Through 48-inch (Resilient Seated Only):			
	American Flow Control	Series 2500	
	Clow	Series F-6100	
	Mueller	Series A-2361	
	U.S. Pipe	Series 5460	
	Kennedy	Series 4571	
	M & H	Series 4067	
Gate Valves 12-inch And Smaller (Resilient Seated Only):			
	American Flow Control	Series 2500	
	American R/D	Series 2000	
	AVK	Series 25	
	Clow	Series F-6100	
	Kennedy	Series 4571	
	M & H	Series 4067	
	Mueller	Series A-2360	
	U.S. Pipe	Metroseal 250	
	Waterous	Series 500	
Tapping Sleeve (Fabricated Steel Mechanical Joint (Fusion Bonded)):			
	JCM	Series 414	
Tapping Sleeve (For All Taps On IPS O.D. PVC Pipe, Including Size On Size (18-8 Type 304 Stainless Steel Body, Flange, And Bolts), Flange To Accept Standard Tapping Valves.):			
	Ford	Series FTSS	
	JCM	Model 432	
	Mueller	Series H-304 S/S	
	Cascade	CFT-EX	
	Total Piping Solutions	Triple Tap	
Tapping Sleeve (Mechanical Joint For Cast Iron, Ductile Iron, PVC C-900 & AC Pipe; All Taps Including Size On Size.)			
	Mueller	H615 / H616 / H619	
	American Flow Control	2800	
	JCM	Model 432	
	Total Piping Solutions	Triple Tap	
Tapping Valves - MJ/Ductile Iron			
	M & H	Series 4751	
	American Flow Control	Series 2500	
	Mueller	T-2360 & T-2361	
	Clow	Series F-6114	
Insertion Valves - MJ/Ductile Iron RWGV (In Place of Line Stop/Tapping Sleeve)			

	Team Industrial Products	InsertValve	Available 4" through 12"
Locate Wire Access Box For Buried Valves			
	Bingham/Taylor	P 200NFG TEST 2T	
Valve Box With Lids (5¼ -Inch, ASTM A48 30B Cast or Ductile Iron, With "SEWER" cast into the lid top):			
	Bingham/Taylor Foundry	4905-X, 4905, 4904-L	
	American Flow Control*	Trench Adapter	* For mains with valve nuts that are 6 feet or deeper.
	Sigma	VB261, VB262, VB264, VB4650W	
	Star		Heavy Duty Screw or Slip Type
	Mueller	MVB	Use w/ AJBV-4" Locking Bolt

Wastewater Category 2 of 10: PIPE MATERIALS			
ITEM TO BE USED	**Manufacturer**	**Part Number**	**Comments**
Casing Spacers (All Sizes) Stainless Steel With Vinyl Runners Centering			
	Cascade	Series CCS / CCPS / AZ	
	PSI	C-G-2 Series	
	RACI	S/T, F/G, P/Q, M/N, E/H	
	PSI-Ranger	Ranger II	
	CCI	CSS8, CSS12	
	Advance Systems		
Ductile Iron Pipe For Valve Vaults (4-inch To 12-inch = PC 350, 16-inch To 20-inch = PC 250, 24-inch = PC200, 30-inch To 64-inch = PC 150) (DI Flanges, AWWA C115):			
	American Ductile Iron Pipe	Protecto 401	Wasser Ferro Clad Primer
	Griffin Pipe Products	Protecto 401	
	US Ductile Iron Pipe	Protecto 401	
Ductile Iron Pipe Coatings, Linings, and Wrappings (For Use In Lift Station Wet Wells)			
	Superior Environmental Products	Interior – SP 2000 Exterior – SC 3300 with Wrapidseal applied	
	Wrapidseal	Interior – Protecto 401 Exterior – Permite with Wrapidseal	

Approved Materials Checklist

HDPE Pipe DR11 (Green Striped) (Use For Directional Bores Is Prohibited Except With Specific PCU Approval)			
	Chevron/Phillips	Performance Pipe / ISCO Pipe	
	CSR	Polypipe/Charter Plastics	
	ARNCO		
	JM-Eagle		
	National Pipe		
Painting Finish Aerial Piping, Fittings, and Valves (Field Primer)			
	Porter/International	286 U-Primer	
	Tnemec	37-77H Chem-Primer	
	Glidden	Alkyd Industrial Enamel	
	Colorwheel	635 Red Primer	
Painting Finish (Exterior)			
	Porter/International	2749 Light Base	
	Tnemec	Tnemec-Gloss 2H	
	Glidden	Alkyd Industrial Enamel	
	Colorwheel	600 Exterior Finish	
PVC (Light Green) 4-inch Through 12-inch Pipe (AWWA C-900, DR18) and 16-inch and larger pipe (AWWA C-905 or C-909, DR 25):			
	Bristolpipe		
	Certainteed	Certa-Lok	
	JM-Eagle		
	Ipex		
	Diamond Plastics		
	National Pipe		
	NAPCO	North American Pipe Company	
	Uponor ETI	Ultra-Blue C909 (green)	
	Underground Solutions	Fusible PVC	For Pressure Main Use Only
PVC Gravity Pipe – Mains and Services (SDR 26, Light Green In Color)			
	Certainteed		
	Can-Tex		
	JM-Eagle		
	Diamond Plastics		
	Bristolpipe		
	National Pipe		
	Vassallo		
	NAPCO	North American Pipe Company	

Approved Materials Checklist

Pipe Lining Material – Gravity Mains (Must Meet ASTM F1216 And Be Equal To Materials Listed Below)			
	Insituform	CIP Liner	
	National Liner	CIP Liner	
	LMK Enterprises	Performance Liner	
	Steven's Technologies	CIP Liner 2 part 100% epoxy	
	Inner Cure Technologies	Reichhold/DION CIP Liner	
	Lanzo Lining	Lanzo CIP Lining System	
	Reynolds Inliner	Reichold/Intech	
	FirstLiner	FirstLiner CIP Lining System	
	Premier Pipe	Premier Pipe CIP Lining System	
Force Main Identification Tape (Light Green, 6-Inches Wide, 2-inches High Black Lettering, Adhesive Backed):			
Buried Force Main Warning Tape (Light Green, 3-inches Wide, 1-Inch High Black Lettering, Non-Adhesive Backed):			
Force Main Locating Wire (Single Strand 14-Gauge Solid Copper Wire with Light Green Colored Insulated Covering):			
	Copperhead	Reinforced Locating Wire	Alternative
Locating Marker Systems (Force Main) (Green In Color):			
	3M	Scotch Mark EMSII Electronic Marker Locator #1265	
	3M	Scotch Marker Electronic Ball Marker #1404	
Curb and Pavement Markers (Green in Color, Imprinted With The Words "POLK COUNTY UTILITIES" And "CALL 811 BEFORE YOU DIG" With "SANITARY SEWER SERVICE" or "FORCE MAIN VALVE" As Applicable):			

Approved Materials Checklist

Wastewater Category 3 of 10: PIPE FITTINGS			
ITEM TO BE USED	**Manufacturer**	**Part Number**	**Comments**
Expansion Joints			
	EBAA Iron Inc.		
	Fernco		
	Star Pipe	Star Flex 5000, 5100, & 5200	
Fittings – Ductile Iron (C153 SSB/C110 FLG) (Cement Mortar Lined and Coated In Accordance With AWWA C104) (Outside Surfaces Shall Be Prime Coated Only If Located Aboveground And Painted):			
	Union/Tyler		
	US Pipe		
	American		
	Serampore Industries (SIP)		
	Sigma		
	Star Pipe		
Fittings, Adapters, And Plugs - Gravity PVC (SDR 26, Light Green in Color):			
	Harco		
	JM-Eagle		
	Multi-Fittings		
	Plastic Trends		
Clean-Outs With Caps – PVC (White in Color, Exterior Nut):			
	USSI	Clean-Out Smart Plug with Plug Seat	For Use On PCU Operated Infrastructure As Required By PCU
Restrained Joints (Ductile Iron Pipe):			
	EBAA Iron Inc.	Mega-lug 1100 (3-inch to 48-inch) Mega-lug 1100HD (10-inch to 48-inch) Mega-lug 2100 (3-inch to 12-inch) Series RS 3800 Restrainer	RS 3800 Includes Sleeve
	American	Fast Grip Gaskets Flex Ring Field Flex Ring Lok Ring	

	Ford	Series 1400-D	
	Serampore Industries (SIP)	EZ Grip	For DI Pipe
	Sigma	One LOK SLD	
	Sigma	LOK Series PVP and PVPF	
	Star Pipe	Stargrip Series 3000, 3000S, 3000OS, 3100P, & 3100S Flange Adapter Series 200 & 400 Retainer Gland Series 600 Restrainer Series 1000, 1100, & 1200 Flange Adapter Series 3200 Series 4000 & 4100P Series 3200 & 4200	
	Tyler/Union	Tuf Grip TLD Series 1000, 1000S Tuf Grip Dual Wedge Restraint Series 1500	For DI Pipe Use For PVC, DIP, HDPE pipe use
Restrained Joints (PVC Pipe):			
	EBAA Iron Inc.	Mega-lug 2000 PV (4-inch to 36-inch) F/IPS, DR25, DR18, DR14 & DR41 Mega-lug 2000 SV (4-inch to 12-inch) Mega-lug 2100 Flange Adapter (3-inch to 12-inch) Mega-lug 1500 Bell Restraint (4-inch to 12-inch) Mega-lug 1600 Bell Restraint (4-inch to 12-inch) F/PVC C-900 Bell Restraint 2800 Series (14-inch to 42-inch) F/PVC C-905 Bell Restraint	

Approved Materials Checklist

	Uni-Flange/Ford	1350 Bell Restrainer (2-inch to 12-inch) 1350 Bell Restrainer (2-inch to 8-inch) (14-inch to 24-inch) 1390 Bell Restrainer (4-inch to 12-inch) (12-inch to 24-inch) 900 Adapter Flange (4-inch to 12-inch) 1500 Series "CIRCLE LOCK" 1300 Fitting Restrainer (14-inch to 24-inch)	
	JCM	610 Sur-Grip Bell Joint Restrainer (14-inch to 24-inch) 621 Sur-Grip Bell Joint Restrainer (14-inch to 24-inch) 610 Fitting Restrainer (4-inch to 30-inch) 620 Bell Restrainer (4-inch to 12-inch) 621 Bell Restrainer (14-inch to 30-inch)	
	Serampore Industries (SIP)	EZ Grip	For PVC Pipe
	Sigma	One LOK SLC	
	Sigma	PV LOK Series PVP and PVPF	
	Star	Stargrip PVC Series 4000 Series 1100 PVC Harness Series 1200 PVC Harness Series 4000 & 4100P Series 3200 & 4200 Restrainer Series 1000, 1100, & 1200 Flange Series 3200 & 4200 Adapter Flange Series 200 & 400	
	Tyler/Union	Tuf Grip TLP Series 2000, 2000S Tuf Grip Dual Wedge Restraint Series 1500 Bell Joint Restraints Series 3000: 32U, 33U, 34U, 35U	For PVC Pipe Use For PVC, DIP, HDPE pipe use For PVC Pipe Use

Approved Materials Checklist

Wastewater Category 4 of 10: MANHOLES AND ACCESSORIES			
ITEM TO BE USED	**Manufacturer**	**Part Number**	**Comments**
Encapsulation and Joint Seal (12 inch minimum width):			
	Canusa	Wrapid Seal / Wrapid Tape	
	Cretex	Wrap External Joint Seal	
	PSI	Boa Tape	
Frame and Cover (With "POLK COUNTY", "SANITARY", "FLORIDA" cast into the top of the cover):			
	US Foundry	USF 225-AS	Regular (4' Inside Dia.) Manholes
	EJ	Ergo	Hinged Cover and Frame Alternative for Regular Dia. Manholes – Not for use in paved roadways.
	CertainTeed	Pamrex 24"	Hinged Cover and Frame Alternative for Regular Dia. Manholes – Not for use in paved roadways.
	US Foundry	USF 667-CR-XB	Large (5' and Larger Inside Dia.) Manholes
	CertainTeed	Pamrex 36"	Hinged Cover and Frame Alternative for Large Dia. Manholes – Not for use in paved roadways.
	EJ	Ergo XL	Hinged Cover and Frame Alternative for Large Dia. Manholes – Not for use in paved roadways.
Manhole Insert (No Ventilation Hole)			

Approved Materials Checklist

	Bay Area Plastics	Tight Seal Insert - Black	Polypropylene with 1/8" Minimum Continuous Polymer Thickness.
	USSI-USA	Inflow Defender - Black	HDPE with 1/8" Minimum Continuous Polymer Thickness.
	Inflow Systems	Inflow Shield	16 Gage Type 304 SS
Jointing Material			
	K.T. Snyder Co, Inc.	Ram-Nek	
Material – Concrete			
	Mack Precast		Precast
	Standard Precast		Precast
	Hanson Pipe & Product		Precast
	Oldcastle Precast		Precast
	Atlantic TNG		Precast
	Allied Precast		Precast
Pipe Seals, Force Main Entering Wet Well And/Or Valve Box			
	Link Seal	Model S-316 Link Seal Modular Seal	
Pipe Seals, Manhole – Gravity Less Than 12-inch			
	Atlantic Concrete	A-Lok (cast-in-place)	
	NPC	Kor-N-Seal Model WS	
Pipe Seals, Manhole – Gravity Greater Than Or Equal To 12-inch			
	Atlantic Concrete	A-Lok (cast-in-place)	
Surface Coatings – Exterior (Manholes, Wet Wells, and Valve Vaults)			
	Carboline	Bitumastic 300M	
	Conseal	CS-55	
Surface Coatings – Interior (Standard Manholes only)			
	Carboline	Bitumastic 300M	
	Conseal	CS-55	
Surface Coatings – Interior (Light Colors) (Master/Drop/FM Receiving Manholes, Wet Wells, and Valve Vaults)			
	Sauereisen	SewerGuard 210	
	Sauereisen	F-170	
	I.E.T., Inc. / IET Systems/CoREZYN	IET-Crete COR75-AQ-010	Two-Part Resin, 10-Year Warranty
	Kerneos Aluminates Technologies	Sewpercoat	

	CCI Spectrum, Inc.	Spectrashield	
	Strong Company	Strong-Seal Systems	
	Sherwin-Williams	Cor-Cote SC	Sewer Cote Epoxy
	Sherwin-Williams	Sherflex	Polyurethane Elastomer
	Raven Lining	Raven 404	
	Raven Lining	Raven 405	
Top Adjusting Rings (Use Must Be Approved In Advance By FDOT Or Polk County Transportation):			
	Ladtech, Inc.		HDPE
	Cretex	Pro-Ring	Expanded Polypropylene (EPP)
			Reinforced Concrete
	EJ	Riser Rings	
Lining Systems (Light Colors) (Master/Drop/FM Receiving Manholes, Wet Wells, and Valve Vaults)			
	AGRU Liner	HDPE Liner	Factory Installed
	GSE Studliner	HDPE Liner	Factory Installed
	GU Liner	Polypropylene (PP) Liner	Factory Installed

Wastewater Category 5 of 10: LIFT STATION MATERIALS AND ACCESSORIES			
ITEM TO BE USED	**Manufacturer**	**Part Number**	**Comments**
Odor Control System and Equipment:			
	Premier Chemicals	Thioguard	
Alarm Horn (AH)			
	Federal Signal	450 series	
	Edwards	871P-G1	
Alarm Light (AL)			
	Federal Signal	225 XST	
	Edwards		
Block Walls - Anti-Graffiti Paint			
	American Building	Polyshield Restoration	
	Richard's Paint	Professional Water Seal & Graffiti	
	Environmental Products	Graffiti-Proof	
Control Panels (CP)			
	Curry Controls Company		

Approved Materials Checklist

	DCR Engineering		
	Revere Control Systems		
	Rocha Controls		
	Unitron Controls		
Control Panel - Control Circuit Breaker			
	Square D	QOU120 or Multi-9 series	
Control Panel - Control Circuit Transformer			
	Square D	EO-18	
Control Panel - Electric Box Mounts			
	Unistrut	P1110T	
Control Panel - Emergency Circuit Breaker (ECB)			
	Square D		Required where transfer switch is not provided.
Control Panel – Enclosure (with the appropriate Arc Flash Label on Panel Door)			
	Hoffman		
	Rittal		
	Schaefer		
Control Panel - Explosion-Proof Seal- Off			
	Crouse-Hinds		
	OZ/Gedney		
Control Panel - Float Regulator (FR)			
	Anchor Scientific	Roto-Float	Mount floats to stainless steel cable with 15 lbs. anchor using stainless steel cable ties/clamps.
	Siemens	9G	
	Contegra	FS 96	
Control Panel - Fuses (F)			
	Bussmann		
Control Panel - Hand-Auto-Off Selector (HOA)			
	Square D	9001-SKS	
Control Panel - Horn Silence Button (HSS)			
	Square D	9001-SKR-IU	
Control Panel – Moisture and Temperature Failure Relays			
	MPE	PMR	
	Flygt	Mini-CAS	
	ATC Diversified	SPM	

Approved Materials Checklist

Control Panel - Motor Circuit Breaker (MB)			
	Square D		
Control Panel - Motor Starter (MS)			
	Square D		
Control Panel - Solid State Overload			
	Square D	TeSysT	
Control Panel - Supplemental Protector Breaker – 3-pole, 1-amp			
	Square D	MG24532	
Control Panel - Surge Protector (UL 1449, Latest Edition Listed And Labeled), , Voltage, and Phase To Match Service, Rated 80,000-amps Per Mode (Minimum 10-Year Warranty).			
	Eaton	SPD	
	Innovative Technologies	PTE	
Control Panel - Terminal Strip (TS)			
	Square D	9070GR6	
Flow Meters With Replaceable Sensors (Pipe Length Before And After Meter Is To Be 5 Times The Diameter Of The Pipe.)			
	Foxboro		
	Siemens		
	ABB		
Generator Circuit Breaker			
	Square D		
Generator Fuel Tanks (Double Walled And For Fixed Generator Systems Only)			
	Convault		
	Modern Welding		
	Phoenix		
Generator Systems, Fixed			
	Caterpillar		
	Cummins		
	Kohler		
Generator Systems, Portable			
	Caterpillar		
	Cummins		
	Kohler		
Generator Receptacle (GR)			

	Russelstoll	JRSB 1044 FR (100 amp)	For ≤ 25 Hp Pumps. Required when transfer switch not provided.
	Russelstoll	JRSB 2044 (200 amp)	For 25 Hp > Pumps. Required when transfer switch not provided.
Generator Automatic Transfer Switch			
	Emerson/ASCO.		
	Cummins.		
	Russelectric.		
	Eaton/Cutler-Hammer		
Generator Manual Transfer Switch			
	ESL Power Systems	Stormswitch	Replaces service entrance breaker and generator breaker and receptacle.
Human Machine Interface (HMI)			
	Schneider Electric	Magelis	
Main Service Disconnect Breaker			
	Square D		
Main Circuit Breaker (MCB)			
	Square D		
Main Circuit Transformer (MCT)			
	Square D	500SV43F	
Odor Control Monitoring Instrument			
	Precision Control	Model SRC-1	
Pressure Gauges:			
	Ashcroft	1279	0-60 PSI
	Ametek	1980	
	Wika	XSEL	
Pressure Gauges (Diaphragm Seals)			
	Ashcroft	Type 201	
Level Hydrostatic Pressure Transducers- 0 To 15 psi Range			
	Endress Hauser	FMX 21	42mm Heavy Duty version.
	Keller America	LevelRat	

Approved Materials Checklist

	Blue Ribbon Ind.	Birdcage Pressure Transducer	
Sluice Gate For Wet Well			
	BNW	Model 77	316 ss
	Fontaine	Model 20	316 ss
Submersible Pumps With Enclosed Impellers			
	Hydromatic		
	Flygt		
	Wilo-EMU		
Check Valves 4-inch And Larger (8 mil Epoxy Lined)			
	M & H	159	
	Mueller	Series 2600 (Up to 12 inches)	
	Mueller	Series 8001 (16” and Larger)	
	American Flow Control	Series 600 or 50 line	
Cushion Check Valves (Oil Filled)			
	GA		
	APCO		
	CCNE		
Variable Frequency Drives			
	Schneider-Electric Square D	Altivar	
Variable Frequency Motors			
	U.S. Motors	Rated for inverter duty only	
	Baldor	Rated for inverter duty only	
	Reliance	Rated for inverter duty only	
Wet Well and Valve Vault Access Frames and Covers (A minimum non-traffic bearing load rating of 300 PSF or, if subject to vehicular traffic, a H-20 traffic bearing load rating)			
	Halliday Products		
	Bilco Company		
	USF Fabrication, Inc.		
Lift Station Wet Well Fall Protection System			
	Halliday Products	Retro Grate Fall Thru Protection System	
	Bilco	Fall Protection Grating System	
	USF Fabrication, Inc.	Hinged Hatch Safety Grate	
Pad Locks			

	Videx CyberLock	PL-01KR, PL-02KR, PL-03KR (Key Retaining)	CL-6P3WR (Installed in Schlage Pad Lock w/ 1" or 2" or 3" SS Shackle, as appropriate for each application)
	Videx CyberLock	PL-01, PL-02, PL-03 (Non-Key Retaining)	CL-6P3WR (Installed in Schlage Pad Lock w/ 1" or 2" or 3" SS Shackle, as appropriate for each application)
Uninterruptable Power Supply (UPS)			
	Transtronics	BVUPS	Provide with (2) werker batteries or equal
Electric Override Key Switch			
	Knox Key Switch	3500 Series	For Use with Facilities with Electrically Operated Gated Access

Wastewater Category 6 of 10: VALVES AND ACCESSORIES (PLANTS AND REMOTE FACILITIES)			
ITEM TO BE USED	**Manufacturer**	**Part Number**	**Comments**
Automatic Combination Air / Vacuum Release Valves:			
	Val-Matic	VM-38	Air Release Only – Plant, Facility Use Only
	Val-Matic	VM-45	Air Release Only – Plant, Facility Use Only
	Val-Matic	VM-200C	Combination – Plant, Facility Use Only
Gate Valves, Plug Valves			
	DeZurik	PEF Series Plug Valve	According to Application.
	DeZurik	Knife Gate Valves	According to Application
	Val-Matic		According to Application.
Valve Actuators			

	Beck	Model 11	Remote Indication or Position Display According to Application
	Auma	SA	Remote Indication or AumaMatic, According to Application
Hydraulically Operated Control Valves (Pressure Reducing/Sustaining Valves):			
	Cla-Val		Model or Series based on field application.
	OCV		Model or Series based on field application.
	Watts/Ames		Model or Series based on field application.

Wastewater Category 7 of 10: PUMPS, CHEMICAL FEED SYSTEMS			
ITEM TO BE USED	**Manufacturer**	**Part Number**	**Comments**
Vertical Turbine			
	Goulds		
	Flowserve	VIC, VIT, SMVT, or DWT	based on application.
	Deming		(AKA: Process Systems, Inc.)
	National		
Centrifugal/Split Case/Submersible/End Suction			
	Aurora		
	Flowserve		
	Flygt	N or C Series submersible	
	Goulds		
Chemical Pumps			
	Prominent		Appropriate series based on flow rate. Degassing heads for NaOCl.
Skid, Shelf Mounted Feed Systems			
	Blue Planet		Utilize “Polk County” junction box with hour meter/operating indication.

Chemical Tanks			
	Snyder	Captor/Dual Containment	HDLPE with NaOCl Resin
	Poly Processing Co.	Saf-T tank	XLPE with OR 1000 Inner Coating
Sludge Transfer Pumps – Rotary Lobe			
	Boerger	Model PL, CL, or FL, typical.	Sized Based on Application.

Wastewater Category 8 of 10: TANKS and GENERATORS			
ITEM TO BE USED	**Manufacturer**	**Part Number**	**Comments**
Pre-stressed Concrete Tanks			
	Crom		
	Pre-con		
Standby Power Generators			
	Kohler		3-Ph, 480V Diesel
	Caterpillar		3-Ph, 480V Diesel
	Cummins		3-Ph, 480V Diesel
Fuel Tanks (Stand-alone)			
	Convault		Pneumercator level/leak detection systems also required. LC 1000 w/ LS600 and LS610.
	Modern Welding		Pneumercator level/leak detection systems also required. LC 1000 w/ LS600 and LS610.
	Phoenix		Pneumercator level/leak detection systems also required. LC 1000 w/ LS600 and LS610.

Approved Materials Checklist

Wastewater Category 9 of 10: FLOW METERS			
ITEM TO BE USED	**Manufacturer**	**Part Number**	**Comments**
Flow Meters (Electro-magnetic)			
	Siemens	Sitrans FM Mag, 5000 series unless using bussed network.	
	ABB	WaterMaster Series	
	Foxboro	9100A w/ IMT 25	

Wastewater Category 10 of 10: ELECTRICAL			
ITEM TO BE USED	**Manufacturer**	**Part Number**	**Comments**
VFDs, Relays, Breakers			
	Schneider-Electric	Square D	
Security/Surveillance System			
	Axis		Camera/Equipment
	Bosch		Camera/Equipment
	Pelco		Camera/Equipment
	Exaqvision		Software

Wastewater Hydraulic Standards

Force Main Design Criteria		
Minimum Velocity	2 fps	
Maximum Velocity	6 fps	
Maximum Transmission Pressure	40 psi	
Hazen Williams Friction Coefficient (C) New	130	All existing and future pipe materials (Nominal ID)
Pump Station Design Criteria		
Maximum Pump TDH	150 feet	From both pumps off
Minimum (run out) pump TDH		Based on lag pump on
For Pump Station Evaluation: Insure Peaking Factors comply with Ten State Standards for Pump Station Evaluations The design pumping capacity of the station is estimated by multiplying the AADF with the applicable peaking factors as follows:	Annual Average Daily Flow (AADF Flows to 100,000 GPD 100,000 to 250,000 GPD 250,000 to 500,000 GPD 500,000 to 1,000,000 GPD Flows Greater Than 1,000,000 GPD	Peak Factor 4.0 3.5 3.2 3.0 2.5
For Transmission System Evaluation: The design pumping capacity of the station is estimated by multiplying the AADF with the applicable countywide peaking factor as follows:	Peak Factor 4.0	
	All calculations shall provide for 100 percent of all receiving system pumps to be operating at the same time that the proposed lift station(s) will be operating.	

CHAPTER 5 **WASTEWATER** **Section 550-E**

Wastewater Force Main Pressure Test Form
(PVC and Ductile Iron Pipe)

Project: _____

PCU Project No.: _____

Procedures for conducting this test shall be in strict conformance with AWWA standard C600, latest revision. Maximum allowable leakage shall be: $L = \frac{ND(P)^{1/2}}{7,400}$

Where:
L = maximum allowable leakage, measured in gallons per hour
N = number of joints in the tested line (where a pipe joins a pipe or a pipe joins a fitting)
D = nominal diameter of pipe, measured in inches
P = test gauge pressure, measured in pounds per square inch (minimally 150 psi)
(For a 2-hour test at 150 psi, equation simplifies to: L = ND x 0.00331)

TESTING PARAMETERS & SYSTEM INFORMATION

Test Pressure (minimally 150 psi):			psi
Beginning Test Pressure:	psi	Ending Test Pressure:	psi
Test Duration (minimally 2 hours):		Hours:	
Date of Test:			
Time at Start of Test:		Time at End of Test:	
Test Segment Location:			

Pipe Type	Diameter, inches	Length, feet	Number of Joints	Max. Leakage for 2 Hour Test, gallons
Total Maximum Allowable Leakage, gallons:				
Total Actual Leakage, gallons:				

CONTRACTOR & INSPECTOR PERSONNEL INFORMATION

	Contractor	Inspector
Signature:		
Printed Name:		
Company Name:		
Phone Number:		
Date:		

CHAPTER 5 **WASTEWATER** **Section 550-F**

Wastewater Force Main Pressure Test Form (HDPE Pipe)

Project: _____

PCU Project No.: _____

Procedures for conducting this test shall be in accordance with ASTM F 2164 and AWWA Standard C600, latest revision, where applicable. Pneumatic Testing is strictly prohibited.

Prior to Hydrostatic Pressure Testing Procedure:

1) Flush main with a minimum velocity of 3 fps to clear foreign materials.
2) Insure that main to be tested is restrained against horizontal and vertical movement. Exposing joints only is allowed.

Hydrostatic Pressure Testing Procedure:

1) Fill main slowly with water to remove air.
2) Pressurize up to 1.5 times the Pressure Class of the pipe used at the lowest point of the main being tested.
3) Maintain for 4 hours while adding water as needed in non-monitored amounts as pipe will expand while until pressure.
4) Reduce pressure by 10 psi and monitor for 1 hour.
5) Main passes if there are no leaks within 5 percent of the remaining pressure after reduction.

TESTING PARAMETERS & SYSTEM INFORMATION

Calculated Test Pressure:			psi
Beginning Test Pressure:	psi	Ending Test Pressure:	psi
Test Duration (minimally 5 hours):		Hours:	
Date of Test:			
Time at Start of Test:		Time at End of Test:	

Diameter, inches	Length, feet	Pressure Class, psi	Test Segment Location

CONTRACTOR & INSPECTOR PERSONNEL INFORMATION

	Contractor	Inspector
Signature:		
Printed Name:		
Company Name:		
Phone Number:		

Wastewater System CCTV and Mandrel Inspection Report

Project: _____

PCU Project No.: _____

Test Date:		Street Name:	
Pipe Size:		Pipe Type & Pipe Specification:	
Start MH #:		Start MH Depth:	
End MH #:		End MH Depth:	
5% Mandrel Pulled With or Against Flow Path?			
Camera Pulled With or Against Flow Path?			

Tape Counter	Actual Footage	Clock Reference	Comment/Description

CONTRACTOR & INSPECTOR PERSONNEL INFORMATION

	Contractor	Inspector
Signature:		
Printed Name:		
Company Name:		
Phone Number:		
Date:		

CHAPTER 5 WASTEWATER Section 550-H

Wastewater Force Main Pigging (Swabbing) Report Form

Project: _____

PCU Project No.: _____

Procedures for pigging (swabbing) the system shall be in strict conformance with the Polk County Utilities Standards and Specifications Manual.

PIGGING (SWABBING) PARAMETERS & SYSTEM INFORMATION

Date:			
Time at Start:		Time at End:	
Segment Location:			
Pig Outside Diameter:		Pig's Maximum % Compression of Full Size:	
Pig Exterior Material Composition:		Pig Interior Material Composition:	
Pig Manufacturer:			

Pipe Type	Diameter, inches	Length, feet	Number of Times	Estimated Amount of Water Used, gallons
Total Estimated Amount of Water Used, gallons:				
Total Actual Amount of Water Used, gallons:				

CONTRACTOR & INSPECTOR PERSONNEL INFORMATION

	Contractor	Inspector
Signature:		
Printed Name:		
Company Name:		
Phone Number:		
Date:		

CHAPTER 5 WASTEWATER Section 550-I

Formal Lift Station Start Up Completion Form

Prior to the pump station start-up, the DEVELOPER/CONTRACTOR shall submit this completed form to PCU with the following items successfully completed prior to the Formal Lift Station Start Up.

- ❑ Locate Wire has been successfully checked;
- ❑ All Force Main Valves have been located;
- ❑ CCTV Video Inspections have been successfully completed;
- ❑ FDEP Water Clearance has been received by PCU;
- ❑ FDEP Fuel Storage Tank Placard has been properly placed, if applicable;
- ❑ Copy of latest Power Company Billing Statement has been submitted to PCU.

Transfer of utility billing shall be requested by PCU after final acceptance of the entire wastewater system by the Polk County Board of County Commissioners.

GENERAL INFORMATION

Project Name: _____

PCU Project #: _____

Scheduled Formal Start-Up Date: _____ Informal Start-Up Date: _____

Station Name: _____ PCU Lift Station #: _____

Address: _____ Subdivision: _____

Power Company: _____ Meter Number: _____

Water Company: _____ Meter Number: _____

START-UP ATTENDEES

Contractor: _____ Phone Number: _____

Consulting Engineer: _____ Phone Number: _____

Developer: _____ Phone Number: _____

Utilities Inspector: _____ Phone Number: _____

CONTROL PANEL

Control Panel Rep: _____ Phone Number: _____

Control Panel Name: _____ Serial Number: _____

Formal Lift Station Start Up Completion Form

SCADA PANEL

SCADA Panel Rep: _____ Phone Number: _____

SCADA Panel Name: _____ Serial Number: _____

ELECTRICAL EQUIPMENT

Main Service Voltage: _____ Amperage: _____

Main Breaker Name: _____ Amperage: _____

Pump Breaker Name: _____ Amperage: _____

Control Breaker Name: _____ Amperage: _____

Main Disconnect: _____ Amperage: _____

Is Disconnect Lockable? YES NO

TVSS Type:

Transformer: _____ Primary: _____ Secondary: _____ KVA: _____

Alternator Name: _____

Phase Monitor Name: _____ Type: _____

Starter Name: Size: Heater Size: _____

Voltage: _____ Phase: _____ Amps: _____ Horse Power: _____

Pressure Transducer
Manufacturer:

Main Service SCA (Available Short Circuit Amperage): _____

Main Breaker AIC (Short Circuit Amps Capacity): _____

PUMP EQUIPMENT

Pump Manufacturer: _____ Model #: _____

Impeller Size: _____ Number: _____

Pump #1 Serial #: _____ Pump #2 Serial #: _____

Pump #3 Serial #: _____ Pump #4 Serial #: _____

Pump #5 Serial #: _____

FLOAT BALLS

Float Ball Manufacturer: _____

Formal Lift Station Start Up Completion Form

Off Level Depth: _____ Lead Start Depth: _____

Lag 1 Start Depth: _____ Lag 2 Start Depth: _____

High Level Depth: _____

MECHANICAL

Valve Vault Size: _____ Wet Well Diameter: _____ Wet Well Depth: _____

Base Elbow Size: _____ Riser Pipe Size: _____

Plug Valve Manufacturer: _____

DESIGN CRITERIA

Point 1 GPM: _____ At TDH: _____

Point 2 GPM: _____ At TDH: _____

Point 3 GPM: _____ At TDH: _____

GENERATOR

Generator Manufacturer: _____ KVA _____ KW _____

Fuel Tank Manufacturer: _____ Fuel Tank Capacity: _____

Generator Plug Manufacturer: _____

Transfer Switch Manufacturer: _____

Generator Serial Number: _____ Generator Model Number: _____

Day Tank Capacity: Year of Manufacture:

Engine Manufacture: _____ Engine Model Number: _____

Engine Serial Number: _____ Tire Size, if Portable: _____

CROSS CONNECTION CONTROL

Cross Connection Control Assembly Manufacturer: _____ Model #: _____

FLOW METER

Flow Meter Manufacturer: _____ Flow Meter Model #: _____

Formal Lift Station Start Up Completion Form

ODOR CONTROL SYSTEM

Manufacturer: _____ Additive Type: _____

For PCU Use Only

PUMPING CAPACITY					
	PS# 1	**PS# 2**	**PS# 3**	**PS# 4**	**PS# 5**
GPM at Startup:					
TDH at Startup:					
PSI at Startup:					

ELECTRICAL						
	Phase A:		**Phase B:**		**Phase C:**	
# 1 Pump Amps at Startup						
# 2 Pump Amps at Startup						
# 3 Pump Amps at Startup						
# 4 Pump Amps at Startup						
# 5 Pump Amps at Startup						
Pump Megs	Pump # 1:		Pump # 2:		Pump # 3:	
	Pump # 4:		Pump # 5:			
Incoming Service Voltage	A to B:		A to C:		B to C:	
	A to GND:		B to GND:		C to GND:	

MECHANICAL

Plug Valve Size: _____ Plug Valve Length _____

Check Valve Manufacturer: _____

Check Valve Size: _____ Type: _____

Check Valve Lay Length: _____

Oil Filled Gauges: _____ Manufacturer: _____

By-Pass Size: _____ Female Cam-Lock: _____

Pipe Size(s) Entering Wet-Well: _____

Formal Lift Station Start Up Completion Form

Station Pumps To: _____

O & M Manual Digital Copy Provided?	YES	NO
Property Survey Report Provided?	YES	NO
FDEP Fuel Tank Placard, if applicable	YES	NO
Certification of ARC Testing for Liner Provided?	YES	NO

Comments:

List Deficiencies/Discrepancies:

CHAPTER 5 **WASTEWATER** **Section 550-J**

Wastewater System Schedule of Valves

Date: _____

Contractor: _____

Project: _____

PCU Project No.: _____

Item No.	Item Description	Qty.	Unit	Unit Cost ($)	Extended Cost ($)
1	Single Service, Long				
2	Single Service, Short				
3	Double Service, Long				
4	Double Service, Short				
5	8” PVC, SDR-26, 0’-6’ deep				
6	8” PVC, SDR-26, 6’-8’ deep				
7	8” PVC, SDR-26, 8’-10’ deep				
8	8” PVC, SDR-26, 10’-12’ deep				
9	8” PVC, SDR-26, 12’-14’ deep				
10	8” PVC, SDR-26, 14’-16’ deep				
11	10” PVC, SDR-26, 0’-6’ deep				
12	10” PVC, SDR-26, 6’-8’ deep				
13	10” PVC, SDR-26, 8’-10’ deep				
14	10” PVC, SDR-26, 10’-12’ deep				
15	10” PVC, SDR-26, 12’-14’ deep				
16	10” PVC, SDR-26, 14’-16’ deep				
17	12” PVC, SDR-26, 0’-6’ deep				
18	12” PVC, SDR-26, 6’-8’ deep				
19	12” PVC, SDR-26, 8’-10’ deep				
20	12” PVC, SDR-26, 10’-12’ deep				
21	12” PVC, SDR-26, 12’-14’ deep				
22	12” PVC, SDR-26, 14’-16’ deep				
23	15” PVC, SDR-26, 0’-6’ deep				
24	15” PVC, SDR-26, 6’-8’ deep				
25	15” PVC, SDR-26, 8’-10’ deep				
26	15” PVC, SDR-26, 10’-12’ deep				
27	15” PVC, SDR-26, 12’-14’ deep				
28	15” PVC, SDR-26, 14’-16’ deep				
29	Standard Precast Manhole with Ring and Cover, 0’-6’ deep				

Wastewater System Schedule of Valves

30	Standard Precast Manhole with Ring and Cover, 6'-8' deep				
31	Standard Precast Manhole with Ring and Cover, 8'-10' deep				
32	Standard Precast Manhole with Ring and Cover, 10'-12' deep				
33	Standard Precast Manhole with Ring and Cover, 12'-14' deep				
34	Standard Precast Manhole with Ring and Cover, 14'-16' deep				
35	Pump Station, Duplex Complete				
36	Pump Station, Triplex Complete				
37	Standby Generator Set				
38	Odor Control System				
39					
40					
41	4" PVC, AWWA C-900, DR 18, Green				
42	4' DIP, Pressure Class 350, Epoxy-Lined, Bituminous Coated				
43	4" Gate Valve Assembly, Complete				
44	4" 11 ¼ Degree Bend, DI, C153, Epoxy-Lined, Bituminous Coated				
45	4" 22 ½ Degree Bend, DI, C153, Epoxy-Lined, Bituminous Coated				
46	4" 45 Degree Bend, DI, C153, Epoxy-Lined, Bituminous Coated				
47	4" 90 Degree Bend, DI, C153, Epoxy-Lined, Bituminous Coated				
48	4" Tee, DI, C153, Epoxy-Lined, Bituminous Coated				
49	4" Cross, DI, C153, Epoxy-Lined, Bituminous Coated				
50					
51	4" HDPE				
52					
53	6" PVC, AWWA C-900, DR 18, Green				
54	6" DIP, Pressure Class 350, Epoxy-Lined, Bituminous Coated				
55	6" Gate Valve Assembly, Complete				

Wastewater System Schedule of Valves

56	6” 11 ¼ Degree Bend, DI, C153, Epoxy-Lined, Bituminous Coated				
57	6” 22 ½ Degree Bend, DI, C153, Epoxy-Lined, Bituminous Coated				
58	6” 45 Degree Bend, DI, C153 Epoxy-Lined, Bituminous Coated				
59	6” 90 Degree Bend, DI, C153, Epoxy-Lined, Bituminous Coated				
60	6” Tee, DI, C153, Epoxy-Lined, Bituminous Coated				
61	6” Cross, DI, C153, Epoxy-Lined, Bituminous Coated				
62					
63	6” HDPE				
64					
65	8” PVC, AWWA C-900, DR 18, Green				
66	8” DIP, Pressure Class 350 Epoxy-Lined, Bituminous Coated				
67	8” Gate Valve Assembly, Complete				
68	8” 11 ¼ Degree Bend, DI, C153, Epoxy-Lined, Bituminous Coated				
69	8” 22 ½ Degree Bend, DI, C153, Epoxy-Lined, Bituminous Coated				
70	8” 45 Degree Bend, DI, C153, Epoxy-Lined, Bituminous Coated				
71	8” 90 Degree Bend, DI, C153, Epoxy-Lined, Bituminous Coated				
72	8” Tee, DI, C153, Epoxy-Lined, Bituminous Coated				
73	8” Cross, DI, C153, Epoxy-Lined, Bituminous Coated				
74					
75	8” HDPE				
76					
77	10” PVC, AWWA C-900, DR 18, Green				
78	10” DIP, Pressure Class 350 Epoxy-Lined, Bituminous Coated				
79	10” Gate Valve Assembly, Complete				
80	10” 11 ¼ Degree Bend, DI, C153,				

Wastewater System Schedule of Valves

	Epoxy-Lined, Bituminous Coated				
81	10” 22 ½ Degree Bend, DI, C153, Epoxy-Lined, Bituminous Coated				
82	10” 45 Degree Bend, DI, C153, Epoxy-Lined, Bituminous Coated				
83	10” 90 Degree Bend, DI, C153, Epoxy-Lined, Bituminous Coated				
84	10” Tee, DI, C153, Epoxy-Lined, Bituminous Coated				
85	10” Cross, DI, C153, Epoxy-Lined, Bituminous Coated				
86					
87	10” HDPE				
88					
89	12” PVC, AWWA C-900, DR 18, Green				
90	12” DIP, Pressure Class 350 Epoxy-Lined, Bituminous Coated				
91	12” Gate Valve Assembly, Complete				
92	12” 11 ¼ Degree Bend, DI, C153, Epoxy-Lined, Bituminous Coated				
93	12” 22 ½ Degree Bend, DI, C153, Epoxy-Lined, Bituminous Coated				
94	12” 45 Degree Bend, DI, C153, Epoxy-Lined, Bituminous Coated				
95	12” 90 Degree Bend, DI, C153, Epoxy-Lined, Bituminous Coated				
96	12” Tee, DI, C153, Epoxy-Lined, Bituminous Coated				
97	12” Cross, DI, C153, Epoxy-Lined, Bituminous Coated				
98					
99	12” HDPE				

Total Constructed Value: _____

Reviewer:_____ Date:_____

Comments_____

CHAPTER 5 **WASTEWATER** **Section 550-J**

Wastewater System Schedule of Valves

Date: _____

Contractor: _____

Project: _____

PCU Project No.: _____

Item No.	Item Description	Qty.	Unit	Unit Cost ($)	Extended Cost ($)
1	Single Service, Long				
2	Single Service, Short				
3	Double Service, Long				
4	Double Service, Short				
5	8” PVC, SDR-26, 0’-6’ deep				
6	8” PVC, SDR-26, 6’-8’ deep				
7	8” PVC, SDR-26, 8’-10’ deep				
8	8” PVC, SDR-26, 10’-12’ deep				
9	8” PVC, SDR-26, 12’-14’ deep				
10	8” PVC, SDR-26, 14’-16’ deep				
11	10” PVC, SDR-26, 0’-6’ deep				
12	10” PVC, SDR-26, 6’-8’ deep				
13	10” PVC, SDR-26, 8’-10’ deep				
14	10” PVC, SDR-26, 10’-12’ deep				
15	10” PVC, SDR-26, 12’-14’ deep				
16	10” PVC, SDR-26, 14’-16’ deep				
17	12” PVC, SDR-26, 0’-6’ deep				
18	12” PVC, SDR-26, 6’-8’ deep				
19	12” PVC, SDR-26, 8’-10’ deep				
20	12” PVC, SDR-26, 10’-12’ deep				
21	12” PVC, SDR-26, 12’-14’ deep				
22	12” PVC, SDR-26, 14’-16’ deep				
23	15” PVC, SDR-26, 0’-6’ deep				
24	15” PVC, SDR-26, 6’-8’ deep				
25	15” PVC, SDR-26, 8’-10’ deep				
26	15” PVC, SDR-26, 10’-12’ deep				
27	15” PVC, SDR-26, 12’-14’ deep				
28	15” PVC, SDR-26, 14’-16’ deep				
29	Standard Precast Manhole with Ring and Cover, 0’-6’ deep				

Wastewater System Schedule of Valves

30	Standard Precast Manhole with Ring and Cover, 6'-8' deep				
31	Standard Precast Manhole with Ring and Cover, 8'-10' deep				
32	Standard Precast Manhole with Ring and Cover, 10'-12' deep				
33	Standard Precast Manhole with Ring and Cover, 12'-14' deep				
34	Standard Precast Manhole with Ring and Cover, 14'-16' deep				
35	Pump Station, Duplex Complete				
36	Pump Station, Triplex Complete				
37	Standby Generator Set				
38	Odor Control System				
39					
40					
41	4" PVC, AWWA C-900, DR 18, Green				
42	4' DIP, Pressure Class 350, Epoxy-Lined, Bituminous Coated				
43	4" Gate Valve Assembly, Complete				
44	4" 11 ¼ Degree Bend, DI, C153, Epoxy-Lined, Bituminous Coated				
45	4" 22 ½ Degree Bend, DI, C153, Epoxy-Lined, Bituminous Coated				
46	4" 45 Degree Bend, DI, C153, Epoxy-Lined, Bituminous Coated				
47	4" 90 Degree Bend, DI, C153, Epoxy-Lined, Bituminous Coated				
48	4" Tee, DI, C153, Epoxy-Lined, Bituminous Coated				
49	4" Cross, DI, C153, Epoxy-Lined, Bituminous Coated				
50					
51	4" HDPE				
52					
53	6" PVC, AWWA C-900, DR 18, Green				
54	6" DIP, Pressure Class 350, Epoxy-Lined, Bituminous Coated				
55	6" Gate Valve Assembly, Complete				

Wastewater System Schedule of Valves

56	6” 11 ¼ Degree Bend, DI, C153, Epoxy-Lined, Bituminous Coated				
57	6” 22 ½ Degree Bend, DI, C153, Epoxy-Lined, Bituminous Coated				
58	6” 45 Degree Bend, DI, C153 Epoxy-Lined, Bituminous Coated				
59	6” 90 Degree Bend, DI, C153, Epoxy-Lined, Bituminous Coated				
60	6” Tee, DI, C153, Epoxy-Lined, Bituminous Coated				
61	6” Cross, DI, C153, Epoxy-Lined, Bituminous Coated				
62					
63	6” HDPE				
64					
65	8” PVC, AWWA C-900, DR 18, Green				
66	8” DIP, Pressure Class 350 Epoxy-Lined, Bituminous Coated				
67	8” Gate Valve Assembly, Complete				
68	8” 11 ¼ Degree Bend, DI, C153, Epoxy-Lined, Bituminous Coated				
69	8” 22 ½ Degree Bend, DI, C153, Epoxy-Lined, Bituminous Coated				
70	8” 45 Degree Bend, DI, C153, Epoxy-Lined, Bituminous Coated				
71	8” 90 Degree Bend, DI, C153, Epoxy-Lined, Bituminous Coated				
72	8” Tee, DI, C153, Epoxy-Lined, Bituminous Coated				
73	8” Cross, DI, C153, Epoxy-Lined, Bituminous Coated				
74					
75	8” HDPE				
76					
77	10” PVC, AWWA C-900, DR 18, Green				
78	10” DIP, Pressure Class 350 Epoxy-Lined, Bituminous Coated				
79	10” Gate Valve Assembly, Complete				
80	10” 11 ¼ Degree Bend, DI, C153,				

Wastewater System Schedule of Valves

	Epoxy-Lined, Bituminous Coated				
81	10” 22 ½ Degree Bend, DI, C153, Epoxy-Lined, Bituminous Coated				
82	10” 45 Degree Bend, DI, C153, Epoxy-Lined, Bituminous Coated				
83	10” 90 Degree Bend, DI, C153, Epoxy-Lined, Bituminous Coated				
84	10” Tee, DI, C153, Epoxy-Lined, Bituminous Coated				
85	10” Cross, DI, C153, Epoxy-Lined, Bituminous Coated				
86					
87	10” HDPE				
88					
89	12” PVC, AWWA C-900, DR 18, Green				
90	12” DIP, Pressure Class 350 Epoxy-Lined, Bituminous Coated				
91	12” Gate Valve Assembly, Complete				
92	12” 11 ¼ Degree Bend, DI, C153, Epoxy-Lined, Bituminous Coated				
93	12” 22 ½ Degree Bend, DI, C153, Epoxy-Lined, Bituminous Coated				
94	12” 45 Degree Bend, DI, C153, Epoxy-Lined, Bituminous Coated				
95	12” 90 Degree Bend, DI, C153, Epoxy-Lined, Bituminous Coated				
96	12” Tee, DI, C153, Epoxy-Lined, Bituminous Coated				
97	12” Cross, DI, C153, Epoxy-Lined, Bituminous Coated				
98					
99	12” HDPE				

Total Constructed Value: _____

Reviewer:_____ Date:_____

Comments_____

SCADA Panel I/O Listing

Type 1 Control Panel				
Typical Hardwired I/O Description	**Digital Inputs**	**Digital Outputs**	**Analog Inputs**	**Analog Outputs**
Control Power Alarm	1			
Control Valve Closed	1			
Control Valve Open	1			
Station Power Alarm	1			
Intrusion Alarm	1			
Main Surge Suppressor Fail	1			
Control Panel Surge Suppressor Fail	1			
UPS Fail	1			
Flow			1	
Pressure Influent			1	
Pressure Effluent			1	
Control Valve Position Feedback			1	
Control Valve Position Command				1
Used I/O	**8**	**0**	**4**	**1**
Estimated Spare I/O	**8**	**0**	**4**	**3**
TOTAL HARDWIRED I/O	**16**	**0**	**8**	**4**

SCADA Panel I/O Listing

Type 2 Control Panel: Constant Speed Pump Lift Station

Typical Hardwired I/O Description	Digital Inputs	Digital Outputs	Analog Inputs	Analog Outputs
Control Power Alarm	1			
Low-Low Level, All Pumps Off (ball float)	1			
High Level Alarm, All Pump Start PLC (ball float)	1			
High-High Level Alarm, All Pump Start Hardwired Override (ball float)	1			
Station Power Alarm	1			
Intrusion Alarm	1			
Main Surge Suppressor Fail	1			
Control Panel Surge Suppressor Fail	1			
UPS Fail	1			
Pump 1 Run Status	1			
Pump 2 Run Status	1			
Pump 3 Run Status, etc.	1			
Pump 1 Fault Status	1			
Pump 2 Fault Status	1			
Pump 3 Fault Status, etc.	1			
Pump 1 Remote Status	1			
Pump 2 Remote Status	1			
Pump 3 Remote Status, etc.	1			
Manual Transfer Switch Utility Power Available, Where Available*	1			
Generator Running Status, Where available*	1			
Generator Fault, Where Available*	1			
Fuel Tank Low-Low Level*	1			
Fuel Tank High-High Level*	1			
Fuel Transmitter Fault*	1			
Pump 1 Run Command		1		
Pump 2 Run Command		1		
Pump 3 Run Command, etc.		1		
Alarm Horn Silence		1		
Wet Well Level			1	
Generator Fuel Tank Level*			1	
Flow, Where Required			1	
Pressure, Where Required			1	

SCADA Panel I/O Listing

Used I/O	**24**	**4**	**4**	**0**
Estimated Spare I/O	**8**	**12**	**0**	**0**
TOTAL HARDWIRED I/O	**32**	**16**	**4**	**0**

Notes:
* Provide additional generator, transfer switch, and fuel system monitoring where available and as specified in other Utility Code Sections such as generator oil, temperature and cranking faults, and transfer switch position status and fail alarms. At the option of the Contractor, these signals may be communicated via digital communications such as Ethernet or serial Modbus.
1. Provide specific I/O as required for each individual site and modify total quantities as necessary.

SCADA Panel I/O Listing

Type 2 Control Panel: Constant Speed Pump Lift Station				
Typical Ethernet I/O Description	**Digital Inputs**	**Digital Outputs**	**Analog Inputs**	**Analog Outputs**
Power Phase Monitor Alarm Pump 1	1			
Power Phase Monitor Alarm Pump 2	1			
Power Phase Monitor Alarm Pump 3, etc.	1			
Motor Controller General Fail Pump 1	1			
Motor Controller General Fail Pump 2	1			
Motor Controller General Fail Pump 3, etc.	1			
Motor Controller Reset Pump 1		1		
Motor Controller Reset Pump 2		1		
Motor Controller Reset Pump 3, etc.		1		
Amps Pump 1			1	
Amps Pump 2			1	
Amps Pump 3, etc.			1	
Power Pump 1, Where Available			1	
Power Pump 2, Where Available			1	
Power Pump 3, etc., Where Available			1	
TOTAL ETHERNET I/O	**6**	**3**	**6**	**0**

Notes:
1. Provide Generator related I/O in this category where I/O is communicated via digital communications.
2. Motor controller resets are automatic for the first failure and manual for all other occurrences as required.

SCADA Panel I/O Listing

Type 3 Control Panel: Variable Speed Pump Lift Station				
Typical Hardwired I/O Description	**Digital Inputs**	**Digital Outputs**	**Analog Inputs**	**Analog Outputs**
Control Power Alarm	1			
Low-Low Level, All Pumps Off (ball float)	1			
High Level Alarm, All Pump Start PLC (ball float)	1			
High-High Level Alarm, All Pump Start Hardwired Override (ball float)	1			
Station Power Alarm	1			
Intrusion Alarm	1			
Main Surge Suppressor Fail	1			
Control Panel Surge Suppressor Fail	1			
UPS Fail	1			
Pump 1 Run Status	1			
Pump 2 Run Status	1			
Pump 3 Run Status, etc.	1			
Pump 1 Fault Status	1			
Pump 2 Fault Status	1			
Pump 3 Fault Status, etc.	1			
Pump 1 Remote Status	1			
Pump 2 Remote Status	1			
Pump 3 Remote Status, etc.	1			
Manual Transfer Switch Utility Power Available, where available*	1			
Generator Running Status, Where Available*	1			
Generator Fault, Where Available*	1			
Fuel Tank Low-Low Level*	1			
Fuel Tank High-High Level*	1			
Fuel Transmitter Fault*	1			
Pump 1 Run Command		1		
Pump 2 Run Command		1		
Pump 3 Run Command, etc.		1		
Alarm Horn Silence		1		
Wet Well Level			1	
Generator Fuel Tank Level*			1	
Flow, Where Required			1	
Pressure, Where Required			1	
Pump 1 Speed Command				1

SCADA Panel I/O Listing

Pump 2 Speed Command				1
Pump 3 Speed Command, etc.				1
Used I/O	**24**	**4**	**4**	**3**
Estimated Spare I/O	**8**	**12**	**1**	**1**
TOTAL HARDWIRED I/O	**32**	**16**	**5**	**4**

Notes:
* Provide additional generator, transfer switch, and fuel system monitoring where available and as specified in other Utility Code Sections such as generator oil, temperature and cranking faults, and transfer switch position status and fail alarms. At the option of the Contractor, these signals may be communicated via digital communications such as Ethernet or serial Modbus.
1. Provide specific I/O as required for each individual site and modify total quantities as necessary.

SCADA Panel I/O Listing

Type 3 Control Panel: Variable Speed Pump Lift Station				
Typical Ethernet I/O Description	**Digital Inputs**	**Digital Outputs**	**Analog Inputs**	**Analog Outputs**
Power Phase Monitor Alarm Pump 1	1			
Power Phase Monitor Alarm Pump 2	1			
Power Phase Monitor Alarm Pump 3, etc.	1			
Motor Controller General Fail Pump 1	1			
Motor Controller General Fail Pump 2	1			
Motor Controller General Fail Pump 3, etc.	1			
Motor Controller Reset Pump 1		1		
Motor Controller Reset Pump 2		1		
Motor Controller Reset Pump 3, etc.		1		
Pump 1 Speed Feedback			1	
Pump 2 Speed Feedback			1	
Pump 3 Speed Feedback, etc.			1	
Amps Pump 1			1	
Amps Pump 2			1	
Amps Pump 3, etc.			1	
Power Pump 1			1	
Power Pump 2			1	
Power Pump 3, etc.			1	
Torque Pump 1			1	
Torque Pump 2			1	
Torque Pump 3, etc.			1	
Total Ethernet I/O	**6**	**3**	**12**	**0**

Notes:
1. Provide Generator related I/O in this category where I/O is communicated via digital communications.
2. Motor controller resets are automatic for the first failure and manual for all other occurrences as required.

CHAPTER 5 **WASTEWATER** **Section 550-L**

Gravity Main Low-Pressure Air Test Form
(PVC and Ductile Iron Pipe)

Project: _____

PCU Project No.: _____

Procedures for conducting this test shall be in strict conformance with UNI-B-6 Uni-Bell standards for testing gravity sewer main lines.

Date:_____ Specified Maximum Pressure Drop:_____psig

TESTING PARAMETERS & SYSTEM INFORMATION

Specified Maximum Pressure Drop
Date of Test
Identification of Pipe Material Installed

Pipe Under Test				Spec Time	Field Test Operations Data					
Upstream MH #	Downstream MH #	Dia D (in.)	Length L (ft.)	Refer to UNI-B-6 (min:sec)	Pressure Initially Raised to (psig)	Time Allowed for Pressure to Stabilize	Start Test Pressure (psig)	Stop Test Pressure (psig)	Elapsed Time (min:sec)	Pass or Fail (P or F)

CONTRACTOR & INSPECTOR PERSONNEL INFORMATION

	Contractor	Inspector
Signature:		
Printed Name:		
Company Name:		
Phone Number:		
Date:		

This test form was derived from UNI-B-6-98, Appendix 2, Air Test Data Sheet. The purpose of this form is to assist in obtaining information from field testing of wastewater pipes as well as to assist in evaluating acceptability of construction.

Leakage testing shall be conducted in accordance with the procedure for “Recommended Practice for Low Pressure Air Testing of Installed Sewer Pipe” as established by the Uni-Bell PVC Pipe Association. The pipe shall pass the current most stringent UNI-B-6 Uni-Bell standards for testing gravity sewers and shall have no evidence of leaks in the pipe or connections.