SECTION 13.0

LIFT STATION CONSTRUCTION

13.0 LIFT STATION CONSTRUCTION

13.1 Construction of Lift Station

The work covered by this section of the specifications consists of furnishing and performing all operations, necessary and incidental to the construction and installation of a wet well, valve vault, instrumentation, control system, and appurtenances necessary for the operation and maintenance of the lift station to serve as part of the sanitary sewer system.

SCADA:	Supervisory Control and Data Acquisition
ANSI:	American National Standards Institute
ASTM:	American Standards for Testing Materials
IEEE:	Institute of Electrical and Electronics Engineers
ISA:	International Society of Automation
NEMA:	National Electrical Manufactures Association
UL:	Underwriters Laboratories, Inc.
NEC:	National Electric Code
CCWUED:	Columbia County Water Utility Engineering Department
CCWUMD:	Columbia County Water Utility Mechanical Department
GPC:	Georgia Power Company
O&M:	Operations and Maintenance Manual

All ANSI, ASTM, IEEE, ISA, NEMA, UL, and NEC specifications shall be made part of these specifications to cover the materials, installation, and testing for the final acceptance into the Columbia County Sanitary Sewer System. All references made to these specifications shall be in accordance with the latest revisions.

13.1.1 Pre-SCADA Survey

The developer, Engineer or Contractor is required to perform a pre-SCADA survey for the approximate area of the proposed lift station. The survey is required in order to determine SCADA service ability.

13.1.2 Lift Station Preconstruction

The installation of a lift station to serve sanitary sewer for a development requires a secondary preconstruction meeting to coordinate the design, construction and acceptance of the lift station. The developer's design engineer, contractor building the station, supplier, CCWUMD and the CCWU Inspector shall be present.

13.1.3 **Required Submittals**

13.1.3.1 **Power Verification**

The engineer shall contact the Georgia Power Company concerning power availability and submit Verification Letter to Columbia CCWUED before approval of lift station design.

13.1.3.2 **Shop Drawings**

The contractor is responsible for supplying all applicable shop drawings for each component for the erection of the lift station. Structures, piping details, valves, hardware, controls, instrumentation and appurtenances shall be detailed and submitted for approval through the CCWUED before delivering to the site for installation. Shop drawings without sufficient details shall be rejected and require a new submittal. Partial submittals shall be considered incomplete.

13.1.3.3 **Approved Equal**

The contractor or supplier for the project shall submit all appropriate information and details for materials that are requested to be "Approved Equal". Each item must be submitted and approved as equal by the CCWUED prior to delivery to the site for installation.

13.1.4 **Start Up and Service**

The SCADA system supplier and pump manufacturer shall provide a complete start up service upon completion of the lift station and control center. Each supplier shall provide factory trained representatives to check the completed installation, place the equipment in operation and instruct Columbia County Water Utility personnel in the proper use and maintenance of the equipment.

13.1.4.1 **Manuals**

Two notebook form copies and one compact disc (CD) of the Operation and Maintenance Manuals (O & M) for the equipment shall be furnished to Columbia County Water Utility at startup. A completed start up does not constitute final acceptance of the lift station.

13.1.4.2 **Spare Parts**

The pump manufacturer shall supply Columbia County Water Utility additional parts upon start up. One mechanical float, one mechanical seal set consisting of 1-upper and 1-lower seal.

13.1.5 **Warranty of Work**

The developer shall warranty all materials and workmanship for one year from the date of final acceptance by the B.O.C.

13.1.6 **Materials**

All materials shall be new and of first quality and free from any and all defects including but not limited to blemishes such as cracking, splitting,

spalling, damaged coatings, bending, dents and deformations of any type. Material shall be protected from damage at all times including during storage. The materials may be inspected at any time and deemed unsuitable or damaged. Where materials are deemed damaged, the materials shall either be satisfactorily repaired or removed from the job site. All repairs shall be in strict accordance with manufacturer's recommendations.

13.1.7 **Storage of Materials**

Pumps, pipe, fittings, controls and appurtenances shall be stored above the ground free from severe weather, foreign material exposure, and UV exposure per manufacturer's recommendations. The contractor has sole responsibility for the material and equipment's security on site.

13.1.8 **Pipe Specifications**

All piping inside the wet well and valve vault shall be flanged ductile iron pipe. Pipe specifications shall be in accordance with Section 12 of these specifications.

Yard piping of the force main shall be in accordance with Section 12 of these specifications.

13.2 Precast Wet Well and Valve Vault

All lift stations shall consist of a wet well and valve vault precast structure. The structures shall consist of a precast base section, precast riser sections, and a precast slab top. Each section shall be jointed to assure a uniform and water tight seal between sections. All damaged sections shall be removed and replaced as required. Venting is not required for the wet well.

13.2.8.1 **Precast Structures**

All precast concrete structures shall be manufactured in a plant that is certified through the National Precast Concrete Association (NPCA). All wet well and valve vault structures shall consist of prefabricated reinforced concrete sections designed for H20 Loading. These sections shall be fabricated in accordance with ASTM C478. No more than one influent line shall be installed in the wet well. All penetrations shall be machine cored and fitted for water tight connection. Chipping, hammering or saw cutting penetrations is not permitted.

13.2.8.2 **Sizing**

The wet well size shall be as determined by a professional engineer per application. However, the wet well shall be no smaller than 6'-0" square inside dimension. The depth shall be determined based upon storage requirement and required finished grade. The top of the wet well shall be 4'-0" above the established 100 year flood plain elevation regardless of what the existing elevation of the site.

13.2.8.3 **Steps**

The wet well shall not be fitted with steps. The valve vault shall be fitted with steps to facilitate safe ease of access. The steps may be installed by manufacturer or installed onsite by contractor. Steps shall be centered in side of vault between outlet piping. The first step shall be no more than 18" below the top slab and spaced a 16" o.c.

13.2.8.4 **Flotation**

The design of the wet well and valve vault shall include flotation calculations to prevent the flotation or pre-mature movement of the station during construction. Horizontal projections may be added to the precast base to develop the necessary weight to prevent flotation or movement.

13.2.8.5 **Jointing**

All joints for the precast sectioned structure shall utilize complimentary tongue and groove jointing to ensure an even and uniform joint closure. Each joint shall be sealed in the horizontal position around the perimeter of the joint along with an exterior vertical seal around the perimeter of the joint as specified for standard manholes. Interior joints inside the wet well or valve vault shall not be grouted. All joint sealer shall be trimmed off flush with the finished wall. No sealer shall be discarded into the wet well.

13.2.8.6 **Pipe Connections**

All connections to the wet well and valve vault shall be cored and utilize a water tight booted connection. The booted connection shall be as specified for standard manholes. Each booted connection shall be completely grouted exposing a smooth finish on the inside wall of the structure. The valve vault drain line shall have a flap valve inside the wet well to prevent gas or fluid from backing up into the valve vault.

13.2.8.7 **Control Connections**

All control and power connections coming into the structures shall be no more than 1'-6" from the top of the structure and completely sealed inside the wet well to prevent any gas or fluid from entering the conduits.

13.2.8.8 **Top Slab**

The top slab of the wet well and valve vault shall be precast from the manufacturer with H20 loading. Vents shall not be installed. The access hatch piping shall be installed and drain to daylight.

13.2.8.9 **Lifting Hooks**

All lifting hooks shall be stainless steel and recessed into the top slab to facilitate future removal if necessary.

13.2.8.10 **Access Hatch**

The access hatch shall be installed to facilitate equipment installation and removal and maintenance access into the structures. The access hatch shall be manufactured with a combination of stainless steel and aluminum. The hatch shall have a minimum live loading of 300 psi. All hinges and hardware shall be heavy duty design and made of a minimum of 316 stainless steel. The hatch shall be lockable and fitted with a Hinged Hatch Safety Grate (wet well) to provide fall in protection. The exterior walking plates shall be a minimum of ¼" diamond plate. Each door shall be equipped with a hold open arm that will lock in the 90 degree position.

13.2.8.10.1 Wet Well Hatch shall be a 2-door unit with Safety Grating. The hatch size shall be based on the minimum clearance necessary for pump removal. The minimum hatch opening size shall be 30" x 48". The wet well access hatch shall be a USF TPD model or approved equal.

13.2.8.10.2 Valve Vault Hatch shall be a single door unit with a minimum of a 3'-0" square opening. The hatch position shall be offset to one side to facilitate access to steps. The valve vault access hatch shall be a USF TPS model or approved equal.

13.2.8.11 **Lifting Hoist**

A slot shall be cast in the top slab of the wet well to receive a socket mount for the lifting hoist. The socket shall be cast in the correct position from the manufacturer. The lifting hoist shall be portable, socket insert type and consist of a mast pole, adjustable davit, static loop, winch assembly, pulleys and lifting cables and chains. All components of the hoist system shall be stainless steel. The complete design of all components of the hoist shall be sufficient to lift the pumps weight per application. The minimum loading shall be ½ ton lifting capacity. The hoist shall be Halliday Products "Series DB Portable Hoist" or approved equal.

13.2.8.12 **Hangers**

Guide Rail, Cable, Chain, Level Probe and Mechanical Float Hangers shall be securely fastened to the top slab using stainless steel expansion bolts per the manufacturer. The minimum number of expansion bolts shall be two per hanger. The minimum size expansion bolt shall be ½"diameter X 3" long with a minimum penetration of 2". A hanger shall be installed for each item. The chain hanger shall be sized to handle the correct weight of chain to be installed.

13.2.8.13 **Excavation and Backfill**

The excavation and backfill for the installation of the wet well and valve vault shall be in accordance with Section 12 of these specifications unless otherwise specified.

13.2.8.13.1 Bedding for Precast Structures shall be bedded using select refill material. The wet well bedding shall be a minimum of 12" and the valve vault shall be a minimum of 8" beneath the structure. Where unsuitable material is encountered below the structure, see Section 12 of these specifications for removal and backfilling requirements.

13.3 Pumps Design / Construction

All pumps shall be capable of handling raw, unscreened sewage and as large as 3" solids. The pumping system shall be a duplex installation and designed by a professional engineer. Major pump components shall be a minimum of grey cast iron, ASTM A48, Class 30B, with smooth surfaces devoid of blow holes or other irregularities. All exposed nuts or bolts shall be ANSI type 304 stainless steel. Pumps shall be manufactured by Flygt or Hydromatic.

13.3.8 **Seals**

Sealing design shall incorporate metal to metal contact between machined surfaces. Critical mating surfaces where water tight seals are required shall be machined and fitted with BUNA-N or VITON rubber o-rings.

13.3.9 **Cable Seal**

The cable entry shall consist of a cylindrical elastomer grommet, flanked by washers having a zero tolerance against the cable outside diameter and the entry inside diameter and compressed by the body containing a strain relief function, separate from the function of sealing the cable. The cable entry junction chamber and motor shall be separated by a stator lead sealing gland or terminal board to isolate the interior from foreign material gaining access through the pump top. The cable entries shall have a water tight and submersible seal.

13.3.10 **Cooling**

Pumps shall be sufficiently cooled by the surrounding environment or pumped media.

13.3.11 **Bearings**

The pump shall rotate on two bearings. Motor bearings shall be permanently greased or oil lubricated. The upper bearing shall be a single deep groove ball bearing. The lower bearing shall be an angular contact bearing that compensates for axial thrust and radial forces.

13.3.12 **Mechanical Seal**

Each pump shall be provided with a tandem mechanical seal system consisting of two totally independent seal assemblies. The seals shall operate in a lubricant

reservoir that hydro dynamically lubricates the lapped seal faces at a constant rate. The seals shall not require any maintenance, adjustment, or depend on direction of rotation for sealing.

13.3.13 **Shaft**

Pump and motor shaft shall be the same unit. The pump shaft shall be an extension of the motor shaft. Couplings shall not be permitted. The shaft shall be stainless steel in accordance ASTM A479 S43100-T.

13.3.14 **Impeller**

The impeller shall be made of gray cast iron, class 35B or ASTM A536 ductile iron. The impeller shall be a non-clogging design capable of handling solids, fibrous material, heavy sludge and other matter found in normal sewage applications. The impeller shall be dynamically balanced. Static and dynamic balancing operations shall not deform or weaken the impeller. The impeller shall be slip fit to the shaft and key driven.

13.3.15 **Mix Flush Valve**

One pump shall be furnished with a mix flush valve integrally attached to the submersible pump for proper mixing of the waste fluid. A separately mounted mix flush valve may be installed in the wet well to mix waste fluid where specifically approved by CCWUED.

13.3.16 **Discharge Connection**

Each pump shall be designed to have a two part integral unit consisting of the volute casing with a machined discharge flange which automatically and firmly connects to the discharge connection. The discharge connection shall be manufactured from gray iron in accordance with ASTM A48, class 30B or better. All mating surfaces shall be completely devoid of blow holes or other irregularities. All nuts and bolts shall conform to ANSI type 304 stainless steel construction.

13.3.16.1 **Discharge Connection Installation**

Discharge connections shall be installed in the wet well in accordance with the manufacturer's placement diagrams. The contractor is responsible for the accuracy of the shop drawing submittals and verifying placement of the discharge connection and guide bars to top slab connection. The discharge connection shall utilize stainless steel bolting to the wet well floor as specified by the manufacturer. The minimum size of anchor bolts shall be ½" diameter x 4" long.

13.3.16.2 **Guide Rails**

All guide rails shall be a minimum of 2" diameter and integrally connected to the discharge connection. The guide bars shall be a minimum of stainless steel schedule 40 pipe. The length of the guide bars shall be sufficient to extend from the lower guide rail holder of the discharge

connection to the upper guide rail holder fastened to the top slab. The manufacturer shall supply intermediate guide bar brackets as required. Threaded guide bar ends are not permitted. Guide rail extensions shall be shop welded and maintain a true straight alignment free of bowing in any direction. All welds shall be ground smooth and maintain a true circle shape.

13.3.16.2.1**Guide Rail Installation**

The discharge connection shall be firmly installed in the wet well prior to guide rail installations. The guide bars shall be attached to the discharge connection and be vertically plumb the entire length.

13.3.16.3 **Hardware**

All brackets, holders, and fasteners shall be a minimum of 316 stainless steel. Each component shall be sufficient for the intended usage. All anchor bolts shall be a minimum of ½" diameter with a 3" penetration. All failed installations of anchor bolts shall be correctly filled per manufacturer's recommendations.

13.3.16.3.1**Upper Bracket Installation**

The upper bracket shall be mounted to the top slab using an anchor bolt. All bolts shall be cut flush with nuts to eliminate interference with pump sliding brackets. Where upper bracket chain hooks are not sufficient to hold the weight of the chain, an additional hook shall be added to adequately support the lifting chain.

13.3.16.3.2**Intermediate Brackets**

All intermediate brackets shall be installed per manufacturer's recommendations. Intermediate brackets shall be attached to the wet well wall or firmly attached to the discharge piping. All attachments shall be bolted connections to allow removal as necessary. The intermediate brackets shall not be used to correct bent guide bars.

13.3.16.3.3**Cable / Float / Chain / Probe Holders**

Holders shall be installed to attach power cable, backup float cables, probe and lifting chains. Each holder shall be sufficiently designed and installed to adequately support each item. Holders shall be installed per manufacturer's recommendations. A sufficient number of holders shall be installed to prevent cables from crossing the path of the pump installation and removal.

13.3.16.4 **Chains and Safety Hooks (Lifting)**

Each pump shall be supplied with a single length of chain with safety hooks cut to the correct length for pump removal and installation. Chain splicing is not permitted. All chains and safety hooks shall be made of type 316 stainless steel designed for the intended load to be lifted. The minimum chain and safety hook size shall be 3/16". Chains shall be attached to the pump hook and upper guide rail bracket.

13.4 Motor Design / Construction

All motors shall be NEMA B design, induction type with a squirrel cage rotor, shell type design and housed in an air filled watertight chamber. The stator windings shall be insulated with moisture resistant class H insulation rated for 180 degrees C. The motor and pump shall be produced by the same manufacturer.

13.4.8.1 **Voltage**

The combined service factor (combined effect of voltage, frequency and specific gravity) shall be a minimum of 1.15. The motor shall have a voltage tolerance of plus or minus 10%.

13.4.8.2 **Power Cable**

The power cable shall be sized according to the NEC and ICEA standards and shall be of sufficient length to reach the junction box without the need of splices**. The contractor shall order the correct length of cable necessary for the application. Power cables shall not be spliced.**

13.4.8.3 **Horsepower**

The motor horsepower shall be adequate so that the pump is non-overloading throughout the entire pump performance curve from shut-off through run-out.

13.4.8.4 **Power**

The power supplied to all motors shall be 3 phase power unless otherwise approved. Where 3 phase power does not exist, a variable frequency drive (VFD) must be installed to operate the motors.

13.4.8.4.1 Verification Letter is required from the Georgia Power Company in order to determine what power supply to site. The letter must be submitted to the CCWUED for review.

13.4.8.5 All Motors 20 HP or above must utilize 3 phase 480V power.

13.5 Lift Station Control Center

The lift station control center shall be designed to operate the required pumps specified and power characteristics shown on the design drawings. The lift station control center shall consist of a Main Power Disconnect (MPD), Manual Transfer Switch (MTS), Pump Control Panel (PCP) and SCADA Panel (SP). The combination of these individual units shall make up the Lift Station Control Center to facilitate an automatic operation of the lift station.

13.5.8 **Main Power Disconnect**

The MPD enclosure shall be NEMA 3R Rated. The MPD shall include all necessary components and be completely wired stranded copper conductors rated at 90 deg. C. All conductor terminations shall be as recommended by the device manufacturer.

13.5.8.1 Circuit Breakers shall be single A/3P main circuit breaker shall feed entire control panel based upon pump/motor design. All circuit breakers shall be heavy duty thermal magnetic or motor circuit protectors similar and equal to Square D type FAL. Each motor breaker shall be adequately sized to meet the pump motor operating characteristics. Circuit breakers shall be indicating type, "on-off-trip" positions of the operating handle. When the breaker is tripped automatically, the handle shall assume a middle position indicating "trip". Breakers shall be designed so that an overload on one pole automatically trips and opens all legs. Field installed handle ties shall not be permitted.

13.5.9 **Manual Transfer Switch**

The MTS shall be a 3 pole NEMA 3R enclosure rated for the design usage. The transfer switch shall be wired to an alternate power source plug for a portable generator. The plug shall be Russell Stoll Receptacle catalog # JPS 1044F-RCPT 100.

The Columbia County Water Utility Mechanical Department shall maintain a single portable generator for every three lift stations that do not include an on-site backup power source.

13.5.10 **Pump Control Panel**

The pump control panel shall provide for the operation of the pumps under normal conditions, and shall alternate the pumps on each pump down cycle to equalize the run time. In the event the incoming flow exceeds the capacity of the lead pump, subsequent pumps shall be automatically started to handle the increased flow. As the flow decreases the pump shall turn off at the elevations as shown on the plans.

13.5.10.1 **Enclosure**

The enclosure shall be a NEMA 4X, 304 stainless steel enclosure. The enclosure shall be a wall mount type with a minimum depth of 12" and sized to adequately house all the components. Double door enclosures shall be provided with 12" legs for pad mounting. The door gasket shall be rubber composition with a retainer to assure a positive weatherproof seal that does not create a memory in the material. The door shall open a minimum of 180 degrees.

13.5.10.1.1 A polished aluminum dead front shall be mounted on a continuous aircraft type hinge and shall contain cutouts for mounted equipment and provide protection of personnel from live internal wiring. Cutouts for breaker handles shall be provided to

allow operation of breakers without entering the compartment. All control switches, indicator pilot lights, elapsed time meters, duplex receptacle and other operational devices shall be mounted on the external surface of the dead front. The dead front shall open a minimum of 150 degrees to allow access to equipment for maintenance. A 3/4" break shall be formed around the perimeter of the dead front to provide rigidity.

13.5.10.1.2 The back plate shall be manufactured of 12-gauge sheet steel and be finished with a primer coat and two coats of baked on white enamel. All hardware shall be mounted to the sub panel with machine thread tapped holes. Sheet metal screws are not acceptable. All devices shall be permanently identified using engraved nameplates.

13.5.10.1.3 Motor starters shall be open frame, across the line, NEMA rated, with individual overload protection in each leg. Motor starter contact and coil shall be replaceable from the front of the starter without removing it from its mounted position. Overload heaters shall be block type, utilizing melting alloy spindles, and shall have visual trip indication. Overload shall be sized for the full load amperage draw of the pumps. Definite purpose contactors, fractional size starters, and horsepower rated contactors or relays shall not be acceptable. Motors over 20 HP shall be controlled via Square D Altavar soft starters of appropriate size. These shall be installed to the manufacturer's recommendations and may require run contactors.

13.5.10.1.4 Control Transformers and Power Supplies shall be provided for the 120 VAC and/or 24 VDC as necessary for control circuits. Transformers shall be fused on the primary and secondary circuits. The secondary shall be grounded.

13.5.10.1.5 A Lightning-Transient Protector shall be provided. The device shall be solid state with a response time of less than 5 nanoseconds and with a withstanding surge capacity of 6500 amperes. Unit shall be instant recovery, long life and have no holdover currents.

13.5.10.1.6 Phase Monitor A two line voltage rated, adjustable 12 pin plug-in phase monitor shall be installed to sense low voltage, loss of power, reversed phasing and loss of a phase per motor/pump. Control circuit shall de-energize upon sensing any of the faults and shall automatically restore service upon return to normal power.

13.5.10.1.7 Variable Frequency Drives (VFD) shall be equipped with a manual switch to bypass the VFD and run the motor/pump in manual control.

13.5.10.1.8 One Plug in Solid State Mini-Cas 120 Unit shall be supplied for each pump to monitor the pump for over-temp and leakage. The unit shall have an 11pin, round base to mate with a standard 11 pin socket. The unit shall also be flanged in order to allow dead front door mounting. The unit shall be powered by 24VAC, 24VDC, or 120VAC. LED indication shall be provided for power on, over-temp, and leakage conditions. An over-temp reset push-button shall be provided to allow reset of the unit.

13.5.10.1.9 The Sensor Input Circuitry is to contain both hardware and software filters to provide noise immunity, as well as sensor input short circuit protection. The Mini-Cas 120 unit shall be model 14-407129, as supplied by Flygt Corporation.

13.5.10.1.10 Remote Terminals shall be supplied for all alarm signals to be remotely transmitted. This shall include but not be limited to pump 1 failure, pump 2 failure, common alarm, high level alarm, and power failure. Terminals shall also be provided to allow the monitoring of pump run status, HOA in auto.

13.5.10.1.11 The HOA Switches shall be capable of operating the motor/pump regardless of the type of failure by the sensors with the exception of motor over-temp failure.

13.5.11 **Alarm System**

The alarm horn shall be mounted on the exterior of the cabinet. The alarm horn shall provide a signal of not less than 90db at 10 feet. An alarm silence switch shall deactivate the alarm horn but the alarm light will flash until the alarm condition ceases to exist. At that time the alarm-reset function will reset for normal operation. The alarm light shall be a weatherproof, shatterproof, red light fixture with a 40-watt bulb to indicate alarm conditions. The alarm level shall turn on the alarm light.

13.5.12 **Auxiliary Equipment**

13.5.12.1 The controller shall incorporate HOA switches, run lights and pump failure lights. All lights, switches and other control devices shall be rated NEMA 4X. A 50 watt condensation heater with adjustable thermostat shall be included in the control system.

13.5.12.2 The controller shall incorporate 3 spare 20A single pole breakers for the SCADA panel, site lighting and area GFI receptacles.

13.5.12.3 Where 480V power is to be supplied to operate the pumps an external transformer shall be supplied to provide 120/240 to the control panel.

13.5.12.4 Pump Control Panel Compartment Lighting shall be a minimum of a 15W fluorescent light to trouble shoot components. The light shall be equipped with a manual on/off switch.

13.6 Primary Control System

13.6.8 APP 521 System

The pump controller shall consist of all the components, hardware and software to provide a trouble-free pumping station. The system shall be designed and specifically produced for the control of the pump station. The RTU shall control the pumps as a stand alone unit in the event of a communications loss. A UPS shall be supplied to back up the control voltage. The controller shall be an Automatic Pump Pilot (APP-521) as manufactured by ITT Flygt or pre-approved equal. The pump controller shall include an RS-232 communications port. The port shall be available for use as communication interface to dial-up modem, leased line modem, GPRS cellular modem, or radio. The pump controller shall be UL listed.

13.6.9 Operation

The pump controller shall operate the pumps in accordance with operator programmed set points. The controller shall also be capable of remote start-stop functions via network. The following information shall be observed on the front panel display:

13.6.9.1 Start-stop pump levels

13.6.9.2 Pump elapsed run time (each pump)

13.6.9.3 Number of pump starts (each pump)

13.6.9.4 Pump status (running, stopped or alarm)

13.6.9.5 Pump current draw (amps)

13.6.9.6 Overflow accumulated time

13.6.9.7 Overflow number of events

13.6.9.8 Alarm delays

13.6.9.9 Input status

13.6.10 Pump Controller Display

The pump controller shall provide for local display, acknowledgement and remote notification of alarm conditions. The controller shall log up to 100 alarm events. Alarm capabilities shall include:

13.6.10.1 Wet Well High Level

13.6.10.2 Wet Well Low Level

13.6.10.3 Wet Well Overflow

13.6.10.4 Pump Over Current

13.6.10.5 Pump Undercurrent

13.6.10.6 Pump Fail to Start

13.6.10.7 Pump Over Temperature

13.6.10.8 Pump Seal Fail

13.6.10.9 Power Failure

13.6.10.10 Intrusion Alarm

13.6.10.11 Personnel Alarm (adjustable time-delay alarm)

13.6.10.12 Test Alarm (periodic test alarm for communications)

13.7 Primary Level Sensor

The lift station shall have a primary level sensor in order to control pump on/off, lag time and flush valve operation. The primary level sensor shall be a programmable flow indicating transmitter or submersible probe.

13.7.8 Flow Indicating Transducer

The flow indicating transducer shall consist of a controller and ultrasonic transducer. The controller shall be mounted within an enclosure in the pump control panel and the transducer shall be securely mounted within the wet well. The transducer shall be LS100 as manufactured by ITT Flygt or pre-approved equal.

13.7.8.1.1 The controller shall be a solid state and generate the necessary signal to drive the transducer, detect the return echo and process and interpret the elapsed time. The controller shall contain level to flow linearizor which will convert the level reading into a flow function.

13.7.8.1.2 The controller installation shall be housed in a double enclosure of nonferrous construction conforming to NEMA 4. The enclosure shall contain an analog meter which will produce a 4 to 40ma. output and suitable for operation on 120V 60 Hz power. The enclosure shall also have a heater for moisture prevention.

13.7.9 Submersible Probe and MIO201

The submersible probe shall be a conductance probe manufactured of Avesta 254 SMO with high grade stainless steel alloy electrodes. The Probe casing material shall be PVC. The unit shall be capable of operating in liquids ranging from +32 to +140 degrees F. The submersible probe shall be a conductance probe as manufactured by ITT Flygt or pre-approved equal. The probe shall interface with the APP via an MIO201 module. The Probe shall be 10’ in length with 10 points of control.

13.7.10 Intrinsic Requirements

Level sensors will be operated at the voltage required for operation. A maximum of 24VAC will be applied.

13.8 Backup Level Sensor

13.8.8 Floats

Two float switches shall be provided for backup level control in event of transducer failure. The float switches shall consist of a mechanically activated SPDT micro switch encased in a polypropylene float. Mercury activated switches shall not be allowed. The interrupting capacity of the switch shall be 250VAC 10A resistive load, 250VAC 3A inductive load, or 30VDC 5A. The plastic components shall be screwed or welded together. Plastic casings joined by adhesives shall not be allowed. The cable shall consist of 3 conductors in a PVC sheath. The float switch shall operate in media temperatures of 0 to +60 degrees C, and in media densities of 0.65 to 1.5 g/cm3. The float switch shall be ENM-10 by ITT Flygt or pre-approved equal.

13.8.9 Intrinsic Requirements

The float system shall be intrinsically safe. Intrinsically safe relays shall be plug-in style with LED indicating float switch has activated the relay. Intrinsic relay shall be rated for use in Class I, Groups A, B, C, D, Class II Groups E, F, G and Class III Hazardous Locations. The relay shall be UL listed 73VL, UL 913.

13.8.10 Level Float Switches

The float switches shall consist of a mechanically activated SPDT micro switch encased in a polypropylene float. Mercury activated switches shall not be allowed. The interrupting capacity of the switch shall be 250VAC 10A resistive load, 250VAC 3A inductive load, or 30VDC 5A. The plastic components shall be screwed or welded together. Plastic casings joined by adhesives shall not be allowed. The cable shall consist of three conductors in a PVC sheath. The float switch shall operate in media temperatures of 0 to +60 degrees C, and in media densities of 0.65 to 1.5 g/cm3. The float switch shall be ENM-10 by ITT Flygt or pre-approved equal.

13.8.11 Operation of Redundant Float Back Up

The redundant float backup system shall operate independently of the APP controller in the case of controller failure. This system shall be initiated on a controller failure output. The high level float shall be shared by the controller and the redundant system through relay logic to allow the APP's use of the high level float as redundancy for its analog input device. When in redundant mode and not controlled by the APP, high float shall turn on both pumps with a 15 second interval between the starting of the two pumps. Low level float shall shut down both pumps.

The manufacturer shall be listed as a certified National Recognized Testing Laboratory producing to UL 508 requirements for industrial control systems and shall provide evidence of such by attaching a serialized label on the cabinet door.

13.9 As Built Drawings and Diagrams

A final as built drawing encapsulated in Mylar shall be attached to the inside of the front door. Schematics shall be done in ladder logic with wire numbers and line numbers. Real time cross referencing of relay contact to line numbers shall be given as well as a written description of component function on each circuit of the drawings. Terminal strip layouts shall be provided for ease of connecting external devices. Electrical drawings and bill of materials shall be provided in Auto Cad 2004 electrical.

13.9.8.1 All component parts in the control panel shall be permanently identified with engraved legend plates as designated on the drawings. A list of all legends shall be available in Excel format and attached with the schematics on the panel door.

13.9.8.2 All equipment shall be tested to the operational requirements. All equipment shall be guaranteed for a period of three years from the date of installation. The guarantee is effective against all defects in workmanship and/or defective component. The warranty is limited to replacement of or repair of the defective equipment.

13.10 Instrumentation and Control

13.10.8 **Standards**

All work shall conform to applicable standards of ANSI, IEEE, ISA, NEMA, UL, and NEC.

13.10.9 **Qualifications**

Attention is directed to the fact that the instrumentation and control system specified herein is part of an integrated system. As such it shall be furnished by a single system vendor where possible. The Contractor is responsible for coordinating the compatibility of equipment furnished by various manufacturers. The Contractor shall be responsible for the satisfactory operation of the entire system.

13.10.10 **SCADA**

The Contractor shall furnish and install a SCADA System for the monitoring and control of the pumping station consisting of an RTU panel, radio antenna, and appurtenances. The SCADA system will utilize the 928-952 - MHz frequency license already acquired by Columbia County. The SCADA system shall be fully compatible with the existing SCADA system. The County's existing SCADA system was installed by Whitaker Electric, Harlem, Georgia. Because of the specialized nature of the system, this specification has been prepared around the Bristol System.

13.10.11 **Radio Survey**

A radio survey shall be performed to determine the feasibility of utilizing radio signal from this site to communicate with the County's main system at the Point Comfort Road Water Treatment Plant.

13.10.12 **RTU Panel**

The RTU shall be mounted in a separate enclosure, back mounted adjacent to the pumping station. The RTU panel shall consist of a Bristol 3305 DPC, duplex receptacle, surge protector, battery backup, lightning protection, and an MDS radio, all mounted in a Hoffman NEMA 4X fiberglass enclosure. A label plate shall be mounted on the outside of the RTU cabinet with the RTU number and site name on a black background with white lettering. Complete wiring schematics shall be mounted inside the cabinet. **All wiring terminals shall be numbered to correspond with the wiring diagram.**

13.10.13 **Radio Antenna and Enclosure**

The radio antenna and associated cable shall be mounted near the pumping station. The exact height and direction of the antenna is to be determined by the radio survey.

13.10.14 **Control and Monitoring**

The RTU panel shall monitor the following items. The parameters listed below represent minimum communication requirements and do not relieve the contractor of providing a complete communication and control system with adequate room for expansion. The RTU shall have the capability of providing control in the future.

I/O Type	Description
DI	*Pump 1 Running*
DI	*Pump 2 Running*
DI	*Pump 1 Auto Mode*
DI	*Pump 2 Auto Mode*
DI	*Wet Well High Level*
DI	*Pump Station Flood Alarm*
DI	*AC Power Failure*
DI	*RTU Low Battery*
DI	*Intrusion Alarm*

13.10.14.1 **Installation**

The Contractor will be responsible for mounting the RTU panel, installing the antenna and connecting to all items to be monitored.

13.10.15 **Software**

Columbia County's SCADA system utilizes the Intellution FIX32 Version 7.0 software running in a Windows 2000 environment. The SCADA system supplier shall be responsible for modifying the existing Bristol Netview ACCOL software to accept and recognize the new RTU. A copy of the existing programming will be

provided by Columbia County for modification by the SCADA supplier. The SCADA supplier will provide all software required to provide a complete operating system, including HMI screens at the Point Comfort Road SCADA server.

13.10.16 **Start-up and Service**

The SCADA System Supplier shall provide the services of a factory-trained representative to check the completed installation, place the equipment in operation and instruct the Owner's personnel in the proper use and maintenance of the equipment. All control equipment shall be guaranteed against defects of material and workmanship for a period of one (1) year from date of acceptance.

13.11 Lift Station Control Center Framework

13.11.8 All enclosures shall be securely mounted to a galvanized and/or a stainless steel fabricated frame work.

13.11.9 There shall be a minimum of two posts. All posts shall be a minimum of 2 ½" diameter galvanized rigid post. Each post shall have a top cap and shall extend a minimum of 2'-0" below ground and be embedded in concrete.

13.11.10 There shall be a minimum of two horizontal supports consisting of galvanized 1 5/8" unistrut bolted to the posts.

13.11.11 All conduits shall be galvanized rigid steel. All pump power and control wires shall be installed in conduits. There must be a minimum of three 2" conduits to support a duplex lift station. All conduits shall be sealed off to prevent liquid or gas from entering the conduit.

13.11.12 All exterior receptacles shall be installed in weatherproof boxes.

13.11.13 Site lighting shall consist of a 25' class 3 treated pole with an aluminum cap, and with a 175W mercury vapor light fixture with a weatherproof on/off light switch mounted on the pole.

13.12 Lift Station Access Road

13.12.8 All access roads shall be a minimum of 12' wide. Where required, a turn out shall be constructed to permit turn around and access into the fenced site. All access roads shall be constructed with roadway ditches to control runoff. The ditches shall flow water away from the station yard and prevent road failure.

13.12.9 All access roads less than 5% slope shall be constructed with a minimum of 6" compacted crusher run.

13.12.10 All access roads with greater than 5% slope shall be paved. Paved access roads with less than 15% slope shall be asphalt. The access road shall be a minimum of 6" compacted crusher run with a compacted 2" course of asphalt.

13.12.11 All access roads with a slope 15% or greater shall be a minimum of 6" concrete. The concrete shall be a minimum of 3000 psi.

13.12.12 All paved access roads with heavy cross drainage shall utilize a paved curbing to control water flow across the roadway.

13.13 Lift Station Site

13.13.8 All lift station sites shall be a minimum of 4'-0" above the 100 year flood plain regardless of the existing ground elevation.

13.13.9 The site shall be graded to shed all water away from the wet well and valve vault. Additional swales or surface matting may be required to control erosion and force all water shed away from the site.

13.13.10 The lift station yard shall be a minimum of 6" compacted GAB over a filter fabric. The stone shall be no more than 6" below the top of the wet well and valve vault.

13.13.11 The lift station yard shall be completely fenced.

13.13.12 A 2" water service shall be installed to serve the site. The water service shall consist of a 2" meter, 2" service line, 2" RPZ, 2" gate valve, and yard hydrant. See Section 14 of these specifications for water service materials and installation.

13.13.13 The site must be capable of emergency bypass pumping during complete pump failure through the use of an isolation valve and blind flange hook up. The positioning of the pumping hook up shall have a minimum of a 5' wide clear zone in order to connect temporary bypass piping.

13.14 Fencing

13.14.8 The fence shall be a 6' high with three strands of barbed wire. All fence posts and railing shall be a minimum of schedule 40. All wire shall be a minimum of 9 gauge galvanized. The corner and gate posts shall be a minimum of 2 ½" diameter and concreted in the ground with a minimum of 2'-0" bury.

13.14.9 A minimum of a 16' wide gate (2-8' leafs) shall be provided to permit the access of a mobile crane truck and mobile pump and generator set up. The gate shall be capable of opening 180 degrees. Gates shall be fitted with latches and locks for compete security of the site.

13.15 Miscellaneous Equipment

13.15.8 Plug, Check, Air Release Valves

All plug, check, and air release valves shall be in accordance with Section 12.20 of these specifications.

13.15.9 Pressure Gauges

All pressure gauges shall be liquid filled and rated per specific design pressures. The minimum rated pressure shall be 0-50 psi.

13.15.9.1 Installation of pressure gauges shall be installed immediately downstream of the check valve and plug within the valve vault or pit. Pressure gauges shall be connected to the force main piping using a standard service tap connection or directly tapped from the pipe supplier. Each pressure gauge shall also have an isolation valve in the riser stem for installation and maintenance.

13.15.10 **Signage**

There shall be a “No Trespassing” sign attached to all sides of the fencing around the lift station site. The sign shall be a minimum of 12” square and be firmly attached to the fencing at 5’ above the ground.