02575 - WASTEWATER LIFT STATION

PART 1: GENERAL

1.1 SCOPE OF WORK

A. The Contractor shall furnish, install, test and place in operation the sewage pumping station shown on the approved drawings and specified hereinafter. All applicable sections of the ECUA Water and Sewer Standards shall be considered part of this work. All references to Industry Standards (ASTM, ANSI, etc.) shall be to the latest revision unless otherwise stated. Only those materials included in the ECUA Water and Sewer Standards Manual, (including, but not limited to, submersible pumps, VFD equipment and control panels), shall be installed. All materials shall be new unless specifically called for otherwise. All structures, pumps and panels shall require a complete shop drawing submittal for ECUA's review and approval.

1.2 SUBMITTALS

A. Actual catalog data, brochures and descriptive literature will be required for wet well, pumps, piping, valves, and rebar spacing at a minimum as specified herein. The wet well manufacturer shall provide up-lift calculations (signed and sealed by a Florida Registered Professional Engineer) for the wet well. Groundwater level shall be assumed to be at grade unless specific geotechnical exploration indicates the groundwater level should be assumed at a lower elevation. However, in no case shall the groundwater elevation be considered at lower than one-half the depth of the wet well.

B. Submit under provisions of the General Provisions.
   1. The Contractor installing all work shall review and approve all shop drawings prior to submittal to the Engineer for review. As part of the review, the contractor shall certify the following and include this statement on each submittal:
      a. I hereby certify that the equipment and devices shown and marked in this submittal are in compliance with the contract drawing and specifications, can be installed in the allocated space, will be stored in accordance with the manufacturer's recommendation and is submitted for approval.

Certified by: _____ Date: _____

C. Submit six (6) sets of shop drawings and product data grouped to include complete submittal of related systems, products, and accessories in a single submittal. No lift station work may be performed until shop drawings are approved. Submit Shop Drawings on the following systems as grouped below:

1. Wet Well
   a. Flotation Calculations (Signed and Sealed by Florida Registered P.E.)
   b. Base Thickness and Compaction Requirements
   c. Pipe Invert Elevations
   d. Pump Mounting Base
   e. Warranty Information
   f. Aluminum Hatches and Locations
   g. Safety Grating
   h. Orientation Diagram
2. Concrete Rebar Spacing Drawings
   a. Lift Station Base and Top Slabs
   b. Generator Slab
   c. SCADA Antenna Base
   d. Control Panel Base
   e. Concrete Pipe Supports
3. Submersible Pumps
   a. Pump Curve (Variable Speed and Fixed Speed)
   b. NPSH Curves
   c. Horsepower Curves
   d. Efficiency Curves
   e. Pump Efficiency (Pump and Motor Efficiency Provided Separately)\
   f. Pump Cables
   g. Pump Materials
   h. Base Elbow
   i. Guide Rail System
   j. Lifting Bales
4. Piping and Appurtenances
   a. Plug Valves
   b. Check Valves
   c. Backflow Prevention Device
   d. Stainless Steel Riser Piping and Fittings
   e. Pipe Bracing
   f. Float Hangar Rod Assembly
   g. Floats
   h. Level Transducer
   i. Flow Meter (if applicable)
   j. Pressure Transmitter
   k. Air Release Valves
   l. Pipe Supports and Location Schematic

5. Miscellaneous Mechanical Equipment
   a. Miscellaneous Mechanical Parts

D. Mark dimensions and values in units to match those specified.

1.3 RELATED REQUIREMENTS SPECIFIED ELSEWHERE

A. Excavation, Backfilling and Compaction: Section 02221
B. Water Distribution Lines/Service Lines: Section 02556
C. Gravity Sanitary Sewer: Section 02570
D. Sanitary Force Main: Section 02576
E. Fiberglass Wet Well: Section 02577
F. Fencing: Section 02830
G. Cast-in-Place Concrete: Section 03300
H. Electrical - Sections 16010-16050

1.4 QUALITY ASSURANCES

Comply with the latest published editions of AWWA and ASTM Standards

A. AWWA C515 - Gate Valves for Water & Sewerage Systems
B. AWWA C509 - Swing Check Valves for Waterworks
C. AWWA C151 - Ductile Iron Pipe
D. ASTM A746 - Ductile Iron Pipe
E. ASTM C478 - Concrete Pipe Manholes
F. ASTM D2241 - Poly Plastic Pipe
G. ASTM F477 - Elastomeric Seals for Plastic Pipe

PART 2 - WARRANTY

2.1 CONTRACTOR WARRANTY

A. The Contractor shall supply to ECUA a two (2) year unconditional warranty after final acceptance or any designated portion thereof. The warranty shall include materials and installation and shall constitute complete replacement and delivery to the site of materials and installation of same to replace defective materials or defective workmanship with new materials/workmanship conforming to the specifications.

2.2 FIBERGLASS WET WELL MANUFACTURER WARRANTY

A. The fiberglass wet well manufacturer shall warrant the wet well against defects for at least twenty (20) years after final acceptance of the lift station by

ECUA for operation and maintenance. Defects are defined as cracking, delamination or leaking. The warranty shall require the manufacturer to supply all necessary labor, materials, and equipment to repair defects to satisfaction of ECUA. The Contractor and/or manufacturer shall not make any exemption or exception to the above stated conditions or warranty.

2.3 PUMP MANUFACTURER WARRANTY

A. The manufacturer shall warrant to ECUA for permanent installation in municipal sewage service submersible pump and motor against defects in materials and workmanship including normal wear and tear to the following parts for a period of 5 years after final acceptance of the lift station, mechanical seals, bearings, shafts, motor electrical cables and motor stators.

B. The warranty shall include no less than 100% coverage for original equipment manufactured (OEM) parts and in-shop labor for pump/motor repairs for the full 5 years at NO COST to ECUA. This warranty shall not apply to parts that fail due to abuse, neglect, mishandling, or acts of God.

C. Verification of guarantees of performance and warranty certificate shall be indicated in the shop drawing submittal and in the operation and maintenance manuals and disks (Adobe Acrobat or Microsoft Word).

D. The pump distributor shall employ and make available proficient manufacturer-authorized service technicians to perform service calls to pumps supplied to ECUA. Service personnel shall adhere to all ECUA Safety Rules & Regulations and be trained and certified for confined space entries and carry liability and workers compensation insurance.

E. During the warranty period, the pump distributor shall, at no cost to ECUA, repair the subject pump. The location address, contact names, phone numbers, (including emergency, mobile, etc.) and fax numbers of the manufacturer-authorized warehouse and warranty service center shall be indicated in the shop drawing submittal and in the operation and maintenance manuals and disks (Adobe Acrobat or Microsoft Word).

PART 3 - GENERAL REQUIREMENTS

3.1 PROJECT SCHEDULE AND COOPERATION

A. The project schedule shall be established on the basis of working a normal work schedule including five days per week, single shift, eight hours per day or four days per week, single shift, ten hours per day, except for ECUA recognized holidays. Unless approved otherwise by ECUA, normal or general

items of work such as setting wet well, field pump test, density testing and final inspections, shall be scheduled during the normal work schedule. Due to operational and manpower limitations on the ECUA systems, ECUA may require the contractor to perform work outside of the normal work schedule. These operational and manpower limitations, including but not limited to, tie-in work (cut-in work or other work) and other phases of the work which may impact the continued (non-interruptible) service to existing ECUA customers. The contractor shall plan and anticipate the cost impact of these systems limitations and provide such work or services at no additional cost to ECUA. Unless approved otherwise, an ECUA representative shall be present to observe the excavated area prior to setting (installing) the wet well. The date and time for setting (installing) the pre-cast or fiberglass wet well shall be reviewed and approved by ECUA, prior to the actual work.

3.2 AS-BUILT DRAWINGS

A. As-built drawings are required on all sewer, force main and pump station projects, including projects for ECUA, City of Pensacola, Escambia County, DOT, private developments, and other Authorities, etc. As-built drawings shall be reviewed and approved by ECUA. The cost to provide as-built drawings shall be included as part of the related work requirements or general conditions for the utility work. **Contractor shall submit "As Built" drawings and operation and maintenance manuals before lift station start-up, no exceptions.**

3.4 WORKMANSHIP

A. Materials: All work shall be constructed in accordance with the drawings and specifications. All defects disclosed by tests and inspections shall be remedied immediately by the Contractor with no additional compensation.
   1. All material shall be free from defects impairing strength and durability and be of the best commercial quality for the purpose specified.
   2. Unless indicated otherwise on the drawings, all metal components in the wet well, with the exception of pumps and motors shall be 316 stainless steel as specified herein or on the plans.
   3. The pumps, motors and guide rail system shall be supplied by the pump supplier to ensure unit compatibility.
   4. Station piping shall conform to ECUA Water and Sewer Standards. Specifically, station piping shall be as follows:
      a) Piping within the wet well shall be flanged schedule 10 316 stainless steel, (intermediate joints shall be welded). Fittings within the wet well shall be flanged 316 stainless steel. All nuts, bolts and accessories within the wet well shall be 316 stainless steel.

b) Pipe and fittings outside of the wet well and above ground shall be 316 stainless steel (flanged, schedule 10). All fabricated fittings shall be constructed to ANSI dimensions. If a spool piece is required, the length of the "run" or "through" dimension of a standard tee fitting of equal diameter to facilitate emergency replacement. Any variance shall be pre-approved by ECUA prior to installation. All bolts, washers and nuts shall be 316 stainless steel and shall be coated with "Never Seize" anit-sieze compound.

c) Force main piping below ground, outside of the wet well shall be in accordance with Section 02576 – Sanitary Sewer Force Mains of this standards manual.

d) Minimum wet well size shall be 8 foot diameter. A 12 foot diameter wet well (minimum) shall be utilized in cases where the pump discharge piping (in the wet well) is 10-inch diameter or larger.

3.5 REFERENCE POINTS AND LAYOUT

A. The Contractor shall be responsible for setting all grade stakes, lines and levels. The Contractor or Contractor's Surveyor will provide centerline of construction and will establish a bench mark. Any reference points, points of intersection, property corners, or bench marks, which are disturbed during construction, shall be restored by a Land Surveyor registered to practice in the State of Florida, and all costs thereof shall be borne by the Contractor. The Contractor shall assume all responsibility for the correctness of the grade and alignment stakes.

PART 4 - SUBMERSIBLE PUMPS

4.1 OPERATING CONDITIONS AND UNIT SIZES

A. Operating conditions and unit sizes shall be as shown on the drawings. The pump design operating conditions shall be within 10% +/- of the best efficiency point, unless otherwise approved by ECUA. When possible, the pump selection shall initially operate near and to the right of the best efficiency point (BEP).

4.2 SHOP DRAWINGS AND PUMP TAGS

A. Prior to commencing the pumping station installation and/or the furnishing of replacement pumps, the pump vendor shall submit for approval, detailed and dimensioned shop drawings for pumps including factory curves of identical model pumps provided to ECUA. The pump vendor shall furnish and deliver at the time of acceptance for use of the lift station and/or of the replacement pump(s) by ECUA, 3 compact disks (Adobe Acrobat, Microsoft Word or

Excel) and 6 manuals containing Operation & Maintenance data and motor and pump nameplate data (including serial numbers) for each pump supplied. The pump vendor shall provide a stainless steel or aluminum placard or tag which indicates all operating conditions of the pumps, including name plate data, impeller size and part number, design flow, TDH, and other pump related data. The tag shall be placed (with adhesive) inside the front panel of the pump control panel or as directed by ECUA.

4.3 PUMP EQUIPMENT:

A. Pumping equipment shall be premium quality submersible non-clog pumps for sewage service. Pumps shall be as listed in **Table 1: ECUA Pump Selection Chart** provided at the end of this section. Submersible pumps shall be complete with a submersible electric motor, floor-mounted discharge base and elbow, guide rails, motor electrical cable (minimum 50 feet in length) to connect at the control panel, disconnect, or junction box (no splicing allowed) and all other appurtenances specified or otherwise required for proper operation. Supplied pump cables are not to be trimmed without prior authorization and, if trimming is allowed, must be witnessed by ECUA Lift Station Maintenance Staff.

4.4 GENERAL

A. Equipment furnished and installed shall be fabricated, assembled, erected and placed in proper operating condition in full accordance with approved drawings, specifications, engineering data, instructions and recommendations of the equipment manufacturer, unless exceptions are noted and approved by ECUA. A letter from the pump manufacturer must be included in the submittal stating compliance to project specifications. Maximum motor horsepower shall be non-overloading over the entire length of the pump curve unless otherwise noted and approved.

4.5 SERVICE CONDITIONS:

A. Pump performance shall be stable and free from cavitations and excessive vibration and noise throughout the specified operating head range at minimum suction submergence. Pump shall be designed so that reverse rotation at rated head will not cause damage to any component. Pump manufacturer shall supply a registered engineer to witness the pump tests and sign and seal the Certified Hydraulic Institute test reports.

4.6 MATERIALS

A. Major pump components shall be of gray cast iron unless otherwise noted. The Contractor/Developer shall furnish a spare pump impeller, volute, wear rings, wear plate, seals, and all other necessary maintenance parts for each installed pump specified. The spare pump impeller shall not be trimmed. The spare parts shall be delivered to ECUA in a storage box made with pressure treated wood and marked with the lift station number and applicable pump model on all visible sides. As an alternate, the Contractor/Developer may supply a complete single spare pump in lieu of the various spare parts listed above.

4.7 SOLIDS HANDLING PUMP CONSTRUCTION

A. Impeller: The impeller casing shall have well-rounded water passages and smooth interior surfaces free from cracks, porosity, blowholes, or other irregularities. The impeller shall be a semi-open or enclosed one-piece casting and must pass a minimum 3-inch solid sphere. Vortex impellers may be used with prior authorization from ECUA staff on a case-by-case basis. The interior water passages shall have uniform sections and smooth surfaces and shall be free from cracks and porosity. The impeller shall be dynamically balanced and securely locked to the shaft by means of a key and self-locking bolt or nut. All interior surfaces of the wet end (impeller, volute and back plate) shall be coated with Belzona 1321 Ceramic S-metal or preapproved equal. Hardened metallurgy may be required in sewer collection areas that are known to have a high grit content. Coatings shall be applied in accordance with coating manufacturer's recommendations.

B. Mechanical Seals (Upper and Lower Seals): Pumps shall have mechanical seals, which shall require neither maintenance nor adjustment and shall be readily accessible for inspection and replacement. The seals shall not rely upon the pumped media for lubrication and shall not be damaged if the pump is run un-submerged for extended periods while pumping under load. Mechanical seals shall be solid hard faced, (not laminated type). The bottom and top seals shall be silicon carbide.

C. Mating Surfaces: All mating surfaces (pump assembly), of major components shall be machined and fitted with o-rings where watertight sealing is required.

D. Wear Rings: Impeller and volute must have stainless steel wear ring system (except vortex impellers). Impeller wear ring shall be 300 series Brinnell hardness, minimum, and volute wear ring shall be 400 series Brinnell hardness, minimum. Wear rings may not be required if hardened metallurgy components are utilized.

E. Discharge Base and Elbow: The pump manufacturer shall furnish a discharge base and discharge elbow for the pump supplied. The base shall be sufficiently rigid to firmly support the guide rails, discharge piping and pump under all operating conditions. The base shall be suitable for bolting to the floor, (bolting to the pump mounting bracket, see details on drawings), of the wet well. All bolts shall be supplied with a fender and lock washer. The face of the discharge elbow inlet flange shall make contact with the face of the pump discharge nozzle flange. The pump and motor assembly shall be a "quick disconnect" type connected to and supported by the discharge base and guide rails allowing the pump to be removed from the wet well and replaced without the need for unbolting any flange or requiring personnel to enter the wet well. Pump shall be provided with a sealing flange and guide rail sliding bracket. The bracket shall be designed to obtain a leak proof seal between flange faces as final alignment of the pump occurs in the connected position. The bracket shall maintain proper contact and a suitably sealed connection between flange faces under all operating conditions. Metal to metal mating surfaces are unacceptable.

F. Motors: The pump shall be driven by a totally submersible electric motor rated for service utilizing an adjustable-speed drive (VFD). Pump motor shall be of sufficient horsepower as to be non-overloading over the entire length of the pump curve. The stator housing shall be a watertight casing. Motor insulation shall be moisture resistant, Class H, at a minimum. Motor shall be NEMA Design B for continuous duty at 40 degree C ambient temperature and designed for at least 10 starts per hour. All motors shall be 3 phase unless preapproved by ECUA. Motor bearings shall be anti-friction, permanently lubricated type. Motor shall be oil-cooled and designed to operate in a totally or partially submerged condition without damage to the motor. Pump cable assembly shall bear a permanently embossed code or legend indicating the cable is suitable for submerged and hazardous duty use. Cable sizing shall conform to NEC requirements. The cable shall enter the pump(s) through a heavy-duty stainless steel assembly with grommet. An epoxy seal system shall be provided to this cable entrance assembly to achieve water tightness. The system used shall ensure a watertight submersible seal. Cable shall terminate in a junction chamber. Junction chamber shall be sealed from the motor by a compression seal and epoxy dam system. All motors shall be explosion proof. Provide motors that are FM or UL listed for use in Class I Division 1 Groups C&D hazardous locations as defined by the National Electric Code.

G. Balance: All rotating parts shall be accurately machined and shall be in as nearly perfect rotational balance as possible. Excessive vibration shall be sufficient cause for rejection of the equipment. The pump impellers shall be re-balanced after being trimmed and coated.

4.8 GUIDE RAILS

A. Pump shall be equipped with two guide rails (no cable wire assembly). Guide rails shall be schedule 40 pipe, minimum, a minimum of 2-inches in diameter and sized to fit the discharge base and the sliding bracket and shall extend upwards from the discharge base to the access hatch cover at the top of the wet well. Intermediate rail braces shall be provided and evenly spaced for wet wells greater than 15 feet in depth. Braces secured to the discharge piping shall not be accepted. Guide rails and brackets shall be 316 stainless steel, no exceptions.

B. Pump removal shall be facilitated by a lifting bale only, no chains or cables are allowed unless specifically noted by ECUA. Lifting bales shall be stainless steel and shall be easily "hooked" from the top of the wet well. Lifting bale shall be designed for the full weight of the pump with a safety factor of 1.6.

4.10 INSTALLATION

A. Pump discharge base shall be leveled, plumbed and aligned into position to fit connecting piping. The discharge base shall be solidly secured to the wet well floor using the pump mounting plate and appropriately sized 316 stainless steel anchors. This work shall be inspected by ECUA prior to any liquid being allowed into the wet well. After final alignment and bolting, pump discharge base and all connections shall be inspected. If any movement or opening of any joints is observed, any and all piping, including pump discharge base, shall be corrected.

PART 5 - FRAME AND COVERS

A. Access frame and covers shall be suitable size for pumping units furnished and shall be constructed of skid-proof aluminum with a minimum load rating of 300 lbs. /sq. ft. or H-20 traffic loading when called for on the drawings. Frame and covers shall be furnished complete with stainless steel staple assembly (not recessed) for the locking mechanism, hold-open device, upper guide holder and cable holder. Access covers shall be hinged to open as indicated on the drawings. Hatches shall be sized to provide a 4-inch minimum clearance between hatch and pump volute (measured from all sides and includes the pump and rail system). Hatches shall be gasketed to minimize water intrusion and odors, with drain piping.

B. All hinges, fasteners and miscellaneous hardware shall be 316 stainless steel. For tamper proof and security purposes, the hinges shall be bolted to the door(s) with stainless steel carriage bolts and nuts. The nuts shall be welded to

the bolts on both the door(s) and frame. ECUA will provide pad locks, as required. Locks shall be easily accessed, no slam-lock-type locking mechanisms will be allowed.

PART 6 - VALVES

6.1. GENERAL

A. The contractor shall furnish and install check valves, plug valves, and appurtenances as shown on the drawings and as specified in the ECUA Water and Sewer Standards Manual.

B. The coating system for the valves and appurtenances (as needed) shall be manufactured by Sherman Williams. Surface Preparation shall be based on the guidelines set forth by the Society for Protective Coatings (SSPC) as follows: 1.) ***New Materials*** - SP6, Commercial Blast, or 2.) ***Refurbishing Existing Piping, Valves, and Appurtenances*** - SP6, Commercial Blast or SP10, Near White Metal depending on level of corrosion and paint damage.

Level	**Paint**	**Dry Film Thickness (Microns)**
Primer	Macropoxy 646	6-9
Intermediate	Macropoxy 646	6-9
Top	Acrolon 218	2-4

In addition, the surface preparation requirements shall be field verified by ECUA Maintenance or Engineering Representatives.

C. Unless otherwise noted, painting system shall be applied in accordance with manufacturers recommendations.

Color selection shall be in accordance with ECUA Standards. Any variance from these standards must be approved by ECUA Engineering staff prior to application.

6.2. CHECK VALVES (LEVER & WEIGHT STYLE)

A. Check valves shall conform to the requirements of AWWA C508. Check valves larger than 2-inch nominal size shall be iron body with stainless steel bolts and nuts, flanged ends, 316 stainless steel shaft connected to a steel outside lever and weight, swing-type with straight-away passageway of full pipe area. The valve shall have renewable bronze seat ring and rubber-faced disc. Check valves shall be 150 psi working pressure. All interior and exterior ferrous surfaces shall be coated with fusion bonded epoxy in accordance with AWWA Standard C-550.

6.3 PLUG VALVES (ABOVE GROUND ONLY)

A. Plug valves shall be of the non-lubricated, 100 percent port eccentric type with resilient faced plugs with flanged ends, furnished with all necessary joint materials. Valves are to be rated for 150 psi (non-shock working pressure), cast-iron body, nickel seat, and hard rubber Hycar coated plug with a flushing port. Valves shall be installed with the seat on the downstream side of the flow path, to provide a positive seal when closed. Valve shall include hand-wheels for operation. Valves shall be as manufactured by Dezurik or approved equal. Unless otherwise approved by ECUA, plug valves will not be allowed in direct bury applications. Direct bury valves shall be resilient seated gate valves as specified in Section 02576 – Sanitary Sewer Force Mains of the specifications. All interior and exterior ferrous surfaces shall be coated with fusion bonded epoxy in accordance with AWWA Standard C-550.

PART 7 - TESTING

7.1 PUMP FACTORY TESTS

A. The pump manufacturer shall perform the following tests on each pump prior to shipment. Pump test report must be provided to Engineer prior to pump installation.

1. Megger the pump motor and cable for insulation breaks or moisture intrusion.
2. Prior to submergence, run pump dry "bump" and check for correct rotation.
3. Pump shall be run continuously for 30 minutes in a submerged condition, with a minimum submergence of 10 feet.
4. Vibration shall not exceed 10 mm/s (RMS) when measured at the main bearing nearest to the impeller.
5. Pump shall be removed from test tank, meggered immediately for moisture and all seals checked for water intrusion.
6. Pumps shall be operated at a minimum of 6 points to establish the hydraulic curve. Variable speed pumps shall be reduced in speed in increments of 200 rpm down to the minimum speed and operated at a minimum of 6 points to establish the hydraulic curves for each of the speeds. KW input shall be monitored and recorded. One test point shall be performed with discharge valve closed. Pumps shall develop appropriate capacity and head within Hydraulic Institute Standards without excessive noise or cavitations.

7. For pumps less than 100 HP, the pump supplier shall submit copies of certified Hydraulic Institute test reports including factory pump curves for each pump (s) provided to ECUA.
8. For pumps 100 HP and greater, the above certified pump performance test (at a minimum) must be completed on each actual pump supplied. An ECUA representative(s) may be required to witness the certified test (ECUA's travel expenses by ECUA).

7.2. FIELD ACCEPTANCE TESTING

A. Pre-Final Inspection: Prior to final inspection, the Contractor shall conduct a pre-final site inspection (including energizing each pump), in the presence of an ECUA representative. Any deficiencies noted at this time shall be corrected prior to scheduling of the final inspection.

B. Final Inspection:

1. The Contractor shall be responsible for conducting the following field acceptance tests and start-up procedures in the presence of a ECUA representative. The Contractor shall notify ECUA, the Engineer and the pump manufacturer's representative 48 hours prior to the proposed start-up. The time and date of this final inspection shall be scheduled by ECUA. The Contractor shall furnish all labor, piping, equipment, water and materials required to perform the acceptance testing. The Contractor shall ensure the force main is full of water prior to the pump test. The pumps shall not be field tested by recirculating water through the wet well.

2. The Contractor shall demonstrate that the pump mounting and guide rail systems are fully operational. The Contractor shall remove and reinstall the pumps in the presence of the ECUA representative, prior to conducting the performance test.

a. Prior to acceptance, as part of the final inspection, and prior to placing the station in operation, the Contractor shall conduct a pump performance test. Pumps shall operate according to the operating conditions indicated on the drawings without excessive vibration or overheating. Testing shall be performed using clean water. The Contractor shall supply water at its own expense to perform the required testing. Pumping rates shall be determined by pumping a calculated volume of water in a specified time interval. Head and flow conditions shall be measured and recorded. Water levels during testing shall fall within the pump control levels shown on the drawings. Amperage draws shall be

monitored to determine effectiveness and efficiency of equipment. The test shall be repeated until satisfactory results are obtained. The test results shall be recorded on the Pump Test Report sheet included in the appendix section herein. Test reports shall include a minimum of three (3) points on the factory curve provided in the field at start-up. Pump test data will include the factory curve and the start-up curve. If the Contractor is unable to demonstrate to ECUA that the pumping unit performs satisfactorily, the unit shall be rejected. The Contractor shall then remove and replace the defective unit at its own expense. Satisfactory performance includes, but is not limited to, the following:

b. Pumps shall deliver rated GPM at rated TDH.
c. Running amperage shall be noted and recorded on each leg of power cord while pump is operating under full load.
d. All self test trip relays shall demonstrate ability to simulate a fault condition. All test results shall be recorded on the pump test report and be submitted to the Engineer.
e. Unless otherwise allowed by ECUA, pumps shall operate within 5 % of the approved, certified, head-capacity curve.
f. Following performance testing, pumps shall be meggered for pump-moisture intrusion.

PART 8 - WASHDOWN STATION

8.1. WATER SERVICE PIPING

A. Water service piping shall be 2-inch diameter (minimum). Water meter, shall be 1 1/2-inch diameter (minimum) and will be supplied and set by ECUA unless otherwise noted. Materials and installation shall meet ECUA's standards for typical water service construction unless otherwise noted or water service provided by a utility other than ECUA.

8.2. BACKFLOW PREVENTOR

A. The Contractor shall furnish and install a 2-inch diameter (minimum) reduced pressure backflow preventer which meets the requirements of ECUA's Cross Connection Control Policy (see details on drawings).

8.3. WATER SERVICE & METER

A. The Contractor shall secure the water meter by filling out an ECUA water meter application. There is no fee for a water service for an ECUA Standard Lift station. The Contractor shall install the meter box and service in accordance with all applicable ECUA Standard Details and Specifications and

ECUA will install the meter. If ECUA is not the provider of water service, the Contractor/Developer shall be responsible for all installation fees, including but not limited to permitting and tap fees. The Contractor shall be responsible for the cost of all water used during construction and testing. The water service will then be transferred to ECUA upon final acceptance of the pump station.

PART 9 - PERMITS

A. The Contractor shall secure and pay for all plumbing, electrical, right-of-way and other required permits and make application for electric and water meter. The Contractor shall be responsible for all costs associated with utilities used during construction and testing of the lift station.

PART 10 - OPERATION AND MAINTENANCE MANUALS

10.1 GENERAL

A. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to this Section.

B. Summary: This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory.
2. Operation manuals for systems, subsystems, and equipment.
3. Maintenance manuals for the care and maintenance of products, materials, finishes and systems and equipment.

C. Submittals:

1. Initial Submittal: Submit 1 draft copies of each manual at least 15 days before requesting inspection for Substantial Completion. Include a complete operation and maintenance directory. Engineer will return one copy of draft and mark whether general scope and content of manual are acceptable.
2. Final Submittal: Submit three copies of each manual in final form at least 15 days before final inspection. Engineer will return copy with comments within 15 days after final inspection.
   a. Correct or modify each manual to comply with Engineer's comments. Submit six (6) copies of each

corrected manual within 15 days of receipt of Engineer's comments.

D. Coordination: Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

10.2 PRODUCTS

A. Operation and Maintenance Documentation Directory

1. Organization: Include a section in the directory for each of the following:
   a) List of documents.
   b) List of systems.
   c) List of equipment.
   d) Table of contents.

2. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
3. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
4. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.
5. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

B. MANUALS, GENERAL

1. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
   a) Title page.
   b) Table of contents.
   c) Manual contents.

2. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:
   a) Subject matter included in manual.
   b) Name and address of Project.
   c) Name and address of Owner.
   d) Date of submittal.
   e) Name, address, and telephone number of Contractor.
   f) Name and address of Engineer.
   g) Cross-reference to related systems in other operation and maintenance manuals.

3. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
   a) If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

4. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

   a) Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch(215-by-280-mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets. Maximum binder size shall be 3-inches in thickness.
   b) Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
   c) Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
   d) Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
   e) If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
   f) If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual.

g) At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

5. Descriptions: Include the following:
   a) Product name and model number.
   b) Manufacturer's name.
   c) Equipment identification with serial number of each component.
   d) Equipment function.
   e) Operating characteristics.
   f) Limiting conditions.
   g) Performance curves.
   h) Engineering data and tests.
   i) Complete nomenclature and number of replacement parts.
   j) Copy of pump data plate.

6. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
7. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
   a) Include procedures to follow and required notifications for warranty claims.

10.3 EXECUTION

A. Manual Preparation: Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.

B. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

C. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
   1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.

2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

D. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

E. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.

EMERALD COAST UTILITIES AUTHORITY
SUBMERSIBLE SEWAGE PUMP SELECTION CHART

REV. 5/30/2013 by SNH

Horsepower	15 HP and Below	16-40 HP	41 HP and Above
RPM	1200 or 1800	1200 or 1800	900, 1200, or 1800[4]
Pump Type	Submersible Centrifugal Non-clog or Vortex[1]	Submersible Centrifugal Non-clog or Vortex[1]	Submersible Centrifugal Non-clog or Vortex[1]
Power Control	FVNR Starters	FVNR Starters (<20HP) VFD/Soft Start (≥ 20HP)	VFD
Pump Manufacturer Warranty (100%)	5 year, See Spec.	5 year, See Spec.	5 year, See Spec.
Minimum Pump Efficiency	60%[2]	60%[2]	60%[2]
Motor Insulation Class	Class H	Class H	Class H
Mechanical Seal Type - Pump Side	Silicon Carbide/Silicon Carbide	Silicon Carbide/Silicon Carbide	Silicon Carbide/Silicon Carbide
Mechanical Seal Type - Bearing Side	Carbon/Silicon Carbide	Carbon/Silicon Carbide	Carbon/Silicon Carbide
Bearings	40,000 hours min.	40,000 hours min.	40,000 hours min.
Impeller Wear Ring[3]	Stainless Steel/ 300 Series Brinnell Hardness	Stainless Steel/ 300 Series Brinnell Hardness	Stainless Steel/ 300 Series Brinnell Hardness
Volute Wear Ring[3]	Stainless Steel/ 400 Series Brinnell Hardness	Stainless Steel/ 400 Series Brinnell Hardness	Stainless Steel/ 400 Series Brinnell Hardness
Removal Method/ Material	2-inch Guide Rails Sch. 40, 316 S.S.	2-inch Guide Rails Sch. 40, 316 S.S.	Based on Pump Size 2-inch, Sch. 40 min., 316 S.S.
Seal Availability	2 Business Days	5 Business Days	TBD Based on Size of Pump
Impeller Availability	2 Business Days	5 Business Days	TBD Based on Size of Pump
Shaft	440 Stainless Steel	440 Stainless Steel	440 Stainless Steel
Approved Manufacturer[5]	**EMU**	**EMU**	**EMU**
	Fairbanks Morse	**Fairbanks Morse**	**Fairbanks Morse**
	Hydromatic	**Hydromatic**	**KSB**
	KSB	**KSB**	

1 - Pump selection shall be determined at ECUA's discretion depending on application.

2 - Minimum pump efficiency requirement is for non-clog pumps and may be waived by ECUA on a case by case basis. ECUA project specific requirements shall be shown on Contract Drawings or in Section 02575 of the Contract Specifications

3 - Hardened metalurgy may be required in some locations, primarily where high grit is anticipated (i.e. Pensacola Beach and Perdido Key)

4 - 1800 rpm allowed on pump motors less than 61 horsepower only.

5 - Engineer shall evaluate each approved pump manufacturer and provide ECUA with his/her selection for each. If a pump selection is not available for a manufacturer, Engineer shall provide documentation from pump vendor. Engineer shall obtain ECUA's concurrence prior to final pump selection and power control options during review of permit application or review of construction drawings. A pre-submittal meeting with ECUA is mandatory.