Request for Bid
Lift Station Rehab Construction Group 3A Addendum No. 3 to
RFB No. 414882.71.0374
March 20, 2025

The following information encompasses Addendum No. 3 for the above referenced RFB. Bidders shall fully consider and acknowledge this Addendum in the preparation and submittal of its formal Bid. Failure to do so may result in the rejection of the Bid.

Section 1 – Additional Bidder Questions Received to Date

Section 2 – Updated Sections 11310 and 11311 of Specifications

All other conditions and requirements remain unchanged.

Section 1
Additional Bidder Questions Received to Date

Q1: For 47 West Van Huesen, you show an enclosed circuit breaker, a Trystar Docking Station, and a manual transfer switch as separate items. I can put a 100A breaker in the utility side of the MTS to make it service entrance. It will come with camlocks for temporary generator connection. No breaker on generator side because the generator normally has a breaker. You show as NEMA 4X which we provide as stainless steel. You also show the MTS as 100/3 but it is in front of the control panel so it should be 100/2 single phase. Looks like the voltage is 240V single phase. Is this correct?

SARP10: The MTS should be 100/2. Voltage is 240V single phase. NEMA 3R is suitable for this location.

Q2: For 360 North Highland, you show an enclosed circuit breaker, a Trystar Docking Station, and a manual transfer switch as separate items. I can put a 100A breaker in the utility side of the MTS to make it service entrance. It will come with camlocks for temporary generator connection. No breaker on generator side because the generator normally has a breaker. You show as NEMA 4X which we provide as stainless steel. You show this MTS as 100/2. Looks like the voltage is 240V single phase. Is this correct?

SARP10: The MTS should be 100/2. Voltage is 240V single phase. NEMA 3R is suitable for this location.

Q3: For 1217 Meadowlark, you show the utility side breaker in the utility meter cabinet and there is a dotted line around it so it makes me think it is existing. You also show an MTS with an Appleton connector for temporary generator in dotted lines in NEMA 3R. So, can I use an MTS with camlocks instead of the Appleton connector? Is the breaker really in the utility meter cabinet? Do you want NEMA 3R or 4X? Looks like voltage is 240V single phase. Is this correct?

SARP10: We can accept using the MTS with camlocks for this station as well for consistency. The MTS should be 100/2. Voltage is 240V single phase. NEMA 3R is suitable for this location. The dotted line around the utility meter does not mean existing on the one-line diagram, it represents the enclosure of the equipment.

Q4: In general, I will supply a breaker on the utility side of the MTS to make it service entrance on the locations where a breaker is not shown in the meter cabinet. I will not put a breaker on the generator side of the MTS because the generators usually have integrated breakers. Is this OK?

SARP10: Yes, that is acceptable.

Section 2
Updated Sections 11310 and 11311 of Specifications

SECTION 11310
DRY PIT SUBMERSIBLE PUMPS, VALVES, CONTROLS, & ACCESSORIES

PART 1 - GENERAL

1.01 SCOPE

A. This section includes equipment for one duplex submersible pump station to be supplied with integral electric motors, suction elbows, pump stand and electrical control panel assembly, and other miscellaneous installation accessories. All equipment shall be supplied by a single source supplier that adheres to the quality standards established and expressly named in this specification.

B. Acceptable manufacturers are those who meet this specification in its entirety and that can demonstrate compliance with these specifications through the submittal process outlined in section 2.04 such that no exceptions or deviations are noted (See Paragraph 2.04 Submittal). The System Supplier, for all equipment approved for this project shall meet or exceed all performance, material, service, and warranty requirements of this specification.

C. The Bidder shall be responsible for supplying the equipment specified herein to meet or exceed these specifications as obtained from the System Supplier for this project. The System Supplier shall be an Authorized Distributor of the proposed products and shall be capable of servicing the products with repair service and parts availability within 50 miles of the City of Memphis. The responsive System Supplier shall routinely stock complete pumps, controls and parts to repair those units in their own facility. All equipment approved for this project shall meet or exceed all performance, service, and warranty requirements of this

1.02 RELATED REQUIREMENTS

A. Bid Form

B. General Conditions

C. Shop Drawings

D. Painting

E. Electrical

1.03 GENERAL

A. The pumps shall be suitable for pumping raw sewage and shall be designed and fully guaranteed for this use. The fluid temperature range shall be from 40 degrees to 104 degrees F.

1.04 STANDARDS

A. The test code of the American Hydraulic Institute for testing pumps and sound engineering practice shall be used. Where required, all pump performance documentation, including flow/head curves, shall adhere to the Hydraulic Institute Standards and shall allow no negative tolerance on flow, head, hydraulic efficiency or any other criteria deemed by the Engineer to be necessary to evaluate pumping system performance.

1.05 ENVIRONMENTAL CONDITIONS

A. All equipment as specified herein shall be so supplied with respect to environmental conditions at the jobsite.

1.06 SUBMITTALS

A. Complete equipment and control submittals, complete assembly, foundation support, and installation drawings, together with detailed specifications and data covering pumps, motors, material used, parts, devices and other accessories forming a part of the equipment furnished shall be submitted for approval in accordance with the procedure set forth in the General Conditions.
   1. Data and specifications for the equipment shall include, but shall not be limited to the following:

B. Setting plans. Setting plans shall include:
   1. Anchor bolt layout
   2. Anchor bolt dimensions.
   3. Outline dimensions and weights of pumps, bases, motors, and control enclosures, etc.

C. Pumps. Data and drawings shall include:
   1. Manufacturer, type and model number.
   2. Assembly drawing, nomenclature and material list, O & M manual, and parts list.
   3. Type, manufacturer, model numbers, location and spacing of bearings.
   4. Impeller type, diameter, thru-let dimensions, sphere size, number of vanes and identification number.
   5. Complete motor performance data including: rating, voltage/phase/frequency; design type; service factor; insulation class; motor pole number; actual rotation speed when combined with the specified pumps; current, power factor and active input power (KW) as a continuous function of shaft power from no load to at least 115 percent load; start (max. Inrush) current; locked rotor current; NEC code letter; and motor torque as a continuous function through the motor start cycle from no rotation to synchronous speed.
   6. Complete performance test curve(s) showing full range (shutoff to run-out) head vs. Capacity, NPSHR, hydraulic efficiency, motor active (KW) input power, motor total (KVA) input power (based on measured current and voltage), and shaft power (BHP). See Sec. 3.01 Shop Tests.
   7. Location and description of Service Centers and spare parts stock.
   8. Warranty for the proposed equipment.

D. Controls. Complete Schematics and Documentation shall include:
   1. Panel layout drawings that show accurate dimensions, location of components, and proper connection of terminations with complete schematics of the proposed equipment.
   2. Cut sheets on all items to be provided.
   3. Operation manuals on VFDs or PLCs to be provided.

   The manufacturer shall indicate, by arrows to points on the Q/H curves, limits recommended for stable operation, between which the pumps are to be operated to prevent surging, cavitation, and vibration. The stable operating range shall be as large as possible, and shall be based on actual hydraulic and mechanical characteristics of the units and shall meet the hydraulic performance requirements of the proposed system.

1.07 SHOP TESTS

A. Pumps and Motors. Each pump and motor shall be performance tested as specified hereinafter; all pumps shall be tested with motor cables to be supplied with the pumps.

B. Each pump shall be tested for performance at the factory to determine the head vs. Capacity, motor total electrical power draw (KVA), and motor active electrical power draw (KW) for the full speed at which the pumps are specified and shown on a performance test curve. The motor and cable on each pump shall be tested for moisture content or insulation defects. After the test, the pump cable end shall be fitted with a shrink-fit rubber boot to protect it from moisture or water.

1.08 ACCEPTANCE TESTS

A. Acceptance tests shall be run to demonstrate that the pumping units, motors and control system meet the following requirements:

B. The pumping units operate as specified without excessive noise, cavitation, vibration, and without overheating of the bearings.

C. All automatic and manual controls function in accordance with the specified requirements.

D. All drive equipment operates without being overloaded.

PART 2 - PRODUCTS

2.01 SUBMERSIBLE PUMPS

A. Submersible Pumps shall meet the following performance requirements:

Item (Units)	4730 East Shore	1217 Meadowlark
Primary Duty Point (GPM/ft.)	595 GPM@ 71’ TDH	306 GPM@ 34’ TDH
Secondary Duty Point (GPM/ft.) Less than 60 Hz	1000 GPM@ 38’ TDH	237 GPM@ 21’ TDH
Minimum Shutoff Head (ft.)	124 Ft.	124 Ft.
Maximum Specific Energy at Primary Duty Point (KWHr/MG)	359 KWHr/MG	190 KWHr/MG
Max Motor Rating (HP) at 40 degrees C	20 HP @ 40° C	5 HP @ 40° C
Maximum NPSHre (ft) in Operation Range	14 Feet	15 Feet
Voltage/Cycle/Phase	230VAC/60Hz/ 3Phase	240VAC/60Hz/ 3Phase
Motor Design Type	NEMA Class B, NEMA MG1, Part 31	NEMA Class B, NEMA MG1, Part 31
Motor Service Factor	Greater than 1.15	Greater than 1.15
Minimum Motor Efficiency	87%	85%
Motor Insulation Rating	Class H	Class H
Maximum Rated Current (A)	52 Amps	12 Amps
Pump Suction x Discharge Size (inches)	6” x 4”	4” x 4”

2.02 PUMP DESIGN (DRY PIT SUBMERSIBLE)

A. The pumps shall be capable of handling raw, unscreened sewage. Pumps shall be supplied with a mating suction elbow and pump stand and be capable of delivering the flow specified in the table above. The pumps shall be capable of handling solids, fibrous materials, heavy sludge and other matter normally found in wastewater. The pump and motor shall be non-overloading at any point on the curve. The pump, with its appurtenances and cable, shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of sixty five (65) feet. No portion of the pump shall bear directly on the sump floor

2.03 PUMP CONSTRUCTION

A. Major pump components shall be of grey cast iron, ASTM A-48, Class 35B, with smooth surfaces devoid blow holes or other irregularities. All exposed nuts or bolts shall be AISI type 304 stainless steel. All metal surfaces coming into contact with the pumpage, other than stainless steel or brass shall be protected by a factory applied spray coating. All castings must be blasted before coating. All wet surfaces are to be coated with two-pack oxyrane ester Duasolid 50. The total layer thickness should be at least 120 microns. Zink dust primer shall not be used.

B. Sealing design shall incorporate metal-to-metal contact between machined surfaces. Pump/Motor unit mating surfaces where watertight sealing is required shall be machined and fitted with Nitrile or Viton Rubber O-rings. Joint sealing will be the result of controlled compression of rubber O-rings in two planes and O-ring contact of four sides without the requirement of a specific bolt torque limit. Rectangular cross-sectioned gaskets that require specific torque limits to achieve compression shall not be considered as adequate or equal. No secondary sealing compounds, elliptical O-rings, grease or other devices shall be used in any part of the pump.

2.04 CABLE & CABLE SEAL

A. The cable entry shall be threaded and sealed by a field replaceable dual grommet system. A nylon clamp shall secure a strain relief function. Epoxies, silicones, or other secondary sealing systems shall not be considered acceptable.

B. The motor shall be equipped with 50 feet of shielded submersible cable. The shield within the cable shall allow for a control panel mounted interface component to communicate both ways with the integrally mounted control unit within the pump/motor housing. 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 any splices. The outer jacket of the cable shall be oil resistant chlorinated polyethylene rubber. The cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet or greater.

2.05 COOLING SYSTEM

A. Each unit shall be provided with an adequately designed cooling system that allows up to 10 motor starts per hour on a continuous basis and the ability to pump liquids of up to 104oF with no damage to motor windings, bearings, or drive shaft seals.

B. The motor shall be provided with an integral motor cooling system. A motor cooling jacket shall encircle the stator housing, providing for dissipation of motor heat regardless of the type of pump installation. An impeller, integral to the cooling system and driven by the pump shaft, shall provide the necessary circulation of the cooling liquid through the jacket. The cooling liquid shall pass about the stator housing in the closed loop system in turbulent flow providing for superior heat transfer. The cooling system shall have one fill port and one drain port integral to the cooling jacket. The cooling system shall provide for continuous pump operation in liquid or ambient temperatures of up to 104°F. (40°C.). Operational restrictions at temperatures below 104°F are not acceptable. Fans, blowers or auxiliary cooling systems that are mounted external to the pump motor are not acceptable.

2.06 MECHANICAL SEAL

A. Each pump shall be provided with a positively driven dual, tandem mechanical shaft seal system consisting of two seal sets, each having an independent spring. The lower primary seal, located between the pump and seal chamber, shall contain one stationary and one positively driven rotating corrosion resistant tungsten-carbide ring. The upper secondary seal, located between the seal chamber and the seal inspection chamber, shall contain one stationary and one positively driven rotating corrosion resistant tungsten-carbide seal ring. All seal rings shall be individual solid sintered rings. Each seal interface shall be held in place by its own spring system. The seals shall not depend upon direction of rotation for sealing. Mounting of the lower seal on the impeller hub is not acceptable. Shaft seals without positively driven rotating members or conventional double mechanical seals containing either a common single or double spring acting between the upper and lower seal faces are not acceptable. The seal springs shall be isolated from the pumped media to prevent materials from packing around them, limiting their performance.

B. Each pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and shall provide capacity for lubricant expansion. The seal lubricant chamber shall have one drain and one inspection plug that are accessible from the exterior of the motor unit. The seal system shall not rely upon the pumped media for lubrication

2.07 SHAFT

A. The pump and motor shaft shall be the same unit. The pump shaft shall be an extension of the motor shaft. Couplings shall not be acceptable. The shaft shall be AISI Type 431 stainless steel and shall be completely isolated from the pumped liquid. The use of Stainless steel sleeves shall not be considered equal to stainless steel shafts.

2.08 IMPELLER AND VOLUTE

A. The impeller shall be of Hard-IronTM (ASTM A-532 (Alloy III A) 25% chrome cast iron), dynamically balanced, semi-open, multi-vane, back swept, screw-shaped, non-clog design. The impeller leading edges shall be mechanically self-cleaned automatically upon each rotation as they pass across a spiral groove located on the volute suction. The leading edges of the impeller shall be hardened to Rc 60 and shall be capable of handling solids, fibrous materials, heavy sludge and other matter normally found in wastewater. The screw shape of the impeller inlet shall provide an inducing effect for the handling of up to 5% sludge and rag-laden wastewater. The impeller to volute clearance shall be readily adjustable by the means of a single trim screw. The impeller shall be locked to the shaft, held by an impeller bolt and shall be coated with alkyd resin primer.

B. The pump volute shall be a single piece gray cast iron, ASTM A-48, Class 35B, non-concentric design with smooth passages of sufficient size to pass any solids that may enter the impeller. Minimum inlet and discharge size shall be as specified. The volute shall have a replaceable suction cover insert ring in which are cast spiral-shaped, sharp-edged groove(s). The spiral groove(s) shall provide trash release pathways and sharp edge(s) across which each impeller vane leading edge shall cross during rotation so to remain unobstructed. Due to the likely presence or sand or grit the insert ring shall be cast of Hard-IronTM ASTM A-532 Alloy III A 25% chrome cast iron and provide effective sealing between the multi-vane semi-open impeller and the volute housing.

2.09 BEARINGS

A. The integral pump/motor shaft shall rotate on two bearings. The motor bearings shall be sealed and permanently grease lubricated with high temperature grease. The upper motor bearing shall be a single ball type bearing to handle radial loads. The lower bearing shall be a two row angular contact ball bearing to handle the thrust and radial forces. The minimum L10 bearing life shall be 50,000 hours at any usable portion of the pump curve.

2.10 MOTOR & PROTECTION DEVICES

A. The integrated control system shall continuously monitor the leakage sensor in the stator housing and the temperature of the motor. If the motor temperature is too high, the pump shall be capable of operating at a reduced speed until the high temperature conditions are normalized. The operator shall be able to modify the setting of the control system to decide if the active leakage signal shall stop or not stop the pump. External trips or overload devices for motor protection shall not be required.

2.11 SCOPE

A. The System Supplier shall provide a Duplex Pump Control system that shall control connected pumps in an energy conservation mode of operation. The system shall be capable of adapting to changing inflow conditions and shall automatically regulate pumped outflow based on inflow conditions and shall seek an optimal energy efficiency for the pump station. This shall be accomplished by either providing a Programmable Logic Controller (PLC) with Variable Frequency Drives (VFDs) to provide a station adaptable feature or Variable Frequency Drive with integral software designed for this purpose. Either supplied system shall be MONITORING SYSTEM ready for integration into the City of Memphis MONITORING SYSTEM system, if applicable. MONITORING SYSTEM ready specification means that the units are capable of MODBUS communication. Radios, cellular modems, antennas etc. are not included in this control panel. This system will incorporate the functionality as noted in the following sections.

2.12 ELECTRICAL CONTROL PANEL SPECIFICATIONS

A. The System Supplier shall furnish a NEMA 3R Painted (white) steel control panel enclosure that will house the equipment furnished as specified herein to provide integral liquid level control, moisture and thermal protection modules with either a PLC and VFD's or Advanced Integrated VFD. The enclosure shall be a definite purpose enclosure to maximize cooling of the installed equipment and will be provided with a minimum of the following:

1. Main Lugs for Incoming Power. The Control Panel shall incorporate Feeder Breakers of the appropriate size. The breakers shall be Heavy Duty NEMA rated and suitable for use with aluminum or copper conductors. Utility Meter and Fused Disconnect shall be located outside of the panel and be provided by an Electrical Contractor or shall be existing where applicable.
2. Each pump motor circuit shall be protected by a properly sized H frame molded case circuit breaker. Each pole of these breakers shall provide inverse time delay overload protection and instantaneous short circuit protection by means of a thermal magnetic element. The breaker shall be operated by a toggle type handle and shall have a Quick-make, Quick-break over center switching mechanism that is mechanically trip free from the handle so that the contacts cannot be held closed against short circuits and abnormal currents. Tripping due to overload or short circuit shall be clearly indicated by the handle automatically assuming a position midway between the manual "ON" and "OFF" position. The minimum interrupting rating of the breaker shall be 42,000 amps at 460 VAC. Pump motor circuit breaker toggle shall be operable through a cutout in the inner door.
3. Hand-Off-Automatic (external or integral to the VFD HMI) switches to select the operating mode for each pump installed on the control panel inner deadfront door.

4. Elapsed time meters and Run, Fail and Alarm Lights shall be provided for each pump motor with appropriate relays as required.
5. In the event either pump operation selector switch is in the “Off” position, the control system software shall automatically designate the operating pump motor as the “next pump motor to operate” after that pump motor is started.
6. The hinged inner door shall be provided and fabricated from, 5052-H32.080, marine alloy aluminum. The hinged inner door shall contain cutouts for all circuit breaker toggles. Control switches and indicators shall be labeled and mounted to the hinged inner door to keep operators from entering the live electrical compartment. A warning sign stating “DANGER -- Disconnect All Sources Of Power Before Opening Door” shall be installed on the inner door. The inner door shall be completely removable for ease of service and shall be held closed by at least (2) hand operated 1/4 turn fasteners. The following items shall be mounted on the inner door:
7. Hand-Off-Automatic – External or Integral to the VFD Operator Interface
8. Back-panel - The control system enclosure shall include a removable back-panel. The back-panel shall be painted white and fabricated from cold roll steel.
9. Components shall be fastened to the back-panel using stainless steel pinhead machine screws. All devices shall be clearly labeled in accordance with the schematic ladder diagram.
10. Transient Voltage Surge Suppressors on the 120VAC circuit
11. Loop Power Surge Suppressor
12. Dual Signal Splitters 9106 for a total of 3 Analog Outputs
13. Lightening Arrestor
14. Cooling Fan and Enclosure Light
15. Top Mounted Alarm Light

B. Energy Management Components furnished by the System Supplier
1. A Variable Frequency Drive with integral wastewater algorithms or a PLC with Variable Frequency Drive shall be provided for each pump in the system, sized for the appropriate voltage and power. The units(s) shall be supplied by the System Supplier and designed for wastewater pumping and with functionality pre-programmed for the specific pump model used. The VFD with Integral Control or PLC with VFD shall provide all level control functionality, hand/auto operation, pump alternation, pump over temperature monitoring, seal leakage monitoring, pump self-cleaning, sump cleaning and pipe cleaning algorithms. The supplied system shall also include capability to monitor station inflow, pump speed and energy consumption in order to automatically operate the pump station at optimal energy efficiency.
2. The system shall be tested and approved in accordance with national and international standards and comply with Directive 98/37/EC, Safety of Machinery and EN60204-1.
3. It shall conform to the relevant safety provisions of the Low Voltage Directive 2006/95/EC and the EMC Directive 2004/108/EC and has been designed and manufactured in accordance with the following harmonized European standards:

EN 61800-5-1: 2003	Adjustable speed electrical power drive systems. Safety requirements. Electrical, thermal and energy.
EN 61800-3 2nd Ed: 2004	Adjustable speed electrical power drive systems. EMC requirements and specific test methods
EN 55011: 2007	Limits and Methods of measurement of radio disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment (EMC)

EN60529 : 1992	Specifications for degrees of protection provided by enclosures

The variable frequency drive ampere rating shall be equal to or greater than the ampere rating listed on the motor being driven by the variable frequency drive.

4. The drive units shall be modularly constructed. Printed circuit boards shall be connected in such manner that they are easily removed from the unit. Power components shall be readily accessible and be connected in such manner that they are easily removed from the unit. The pump drive shall be freestanding for wall mounting or cabinet installation construction, for 230-480V, 60HZ 3Phase supply and shall be rated for IP55 and IP66 isolation class.

C. System Operation – VFD with Integral Control or PLC and VFD Functionality
   1. High/Low Level Sump Control:
      a. The system shall provide automatic level control via means of a submersible pressure transducer (4-20mADC) and one (1) non-mercury liquid level float switch. A user-programmable Start Level shall indicate the point at which the pump will start. Upon activation the pump shall run at maximum speed for a pre-determined period, then ramp down to an energy efficient optimal speed, calculated by the system. When the water level reaches the Stop Level, the pump shall stop. The Optimal Speed shall either be calculated by the system or manually entered by the user.
      b. In case of high inflow, the system shall increase pump speed until the water level begins to decrease. When the water level reaches the Stop Level, the pump shall stop.
      c. In case of very high inflow, when a pump or pumps are unable to overcome the inflow conditions even at maximum speed, additional pumps shall be activated and run at maximum speed until the stop Level is reached. If water levels continue to rise, a High Level Alarm shall be activated.
      d. The system shall incorporate a Minimum Speed function that prevents the pump from operating at speeds too low to move water based on the pump curve.
   2. Run Time Averaging:
      a. The system shall provide capability to balance run times for even wear among available operable pumps. This shall be a function of the control system and not require external devices, such as an Alternating Relay. The function shall operate by determining a “random” start level based on the Start Level setting. The system shall determine a random start level independent of each other. The system shall determine new random start levels every 24 hours. The pump with the lowest random start level shall be first to start on any given pump cycle. Other pumps shall remain in Standby capacity in case the lead and/or lag pump shall not be able to lower the water level as described in the section above. By recalculating the random start levels every 24 hours, balanced run times are accomplished.
   3. Pump Cleaning Function:
      a. The system shall incorporate a “self-cleaning” function to remove debris from the pumps. The cleaning shall be triggered by three circumstances:
         1) Soft Clogging: When motor current equals 20% or greater above rated motor current , in the drive, for a period of 7 seconds
         2) Hard Clogging: When motor current equals 80% or greater above rated current for a period of 0.01 seconds
         3) Schedule Cleaning: The system is pre-programmed to perform cleaning regularly
         4) The cleaning function shall consist of forced stopping, reversal and forward runs timed to allow for debris to fall from the impeller. After cleaning cycle is complete, drive shall resume to automatic operation.

4. Sump Cleaning Function:
   a. The system shall incorporate a sump cleaning function to ensure surface solids and grease is regularly removed from the sump. The sump cleaning function shall perform regularly when enabled by the operator. Sump cleaning shall consist of the following functions
      1) Sump cleaning is triggered when internal timer expires and during a normal pump down cycle
      2) Pump is automatically ramped to maximum speed
      3) Pump runs at maximum speed for designated time or until the pump are snoring."
      4) When Sump Cleaning is over, the pump is shut off and resumes normal operation.
5. Pipe Cleaning Function:
   a. The system shall incorporate a pipe cleaning function to avoid discharge pipe sedimentation and clogging due to reduced pump speed. This shall be an automatic feature that initiates with every pump cycle. Upon reaching Pump Start Level, the system shall operate the pump at 100% speed for a determined time before ramping down to the most energy efficient speed for the duration of the cycle.
6. Energy Efficiency Speed Finder:
   a. The system shall provide a function that automatically calculates the most energy efficient speed for the pump based on station inflow characteristics. An algorithm calculates the optimal speed whereby the most water is pumped using the least amount of energy, the optimal speed is constantly adjusted to account for changes inflow without requiring operator adjustment, multiple setpoints, etc.
   b. The energy efficient function prevents the drive from running off of the system curve for the pump. This will ensure maximum hydraulic efficiency as well as electrical efficiency is maintained.
7. Alarms & Monitoring:
   a. The system shall provide alarms and monitoring for the system, pump and sump. Alarms shall be presented on the display, via a Summary Alarm relay and via Modbus registers. All alarms, when occurring, shall remain active until reset. Alarms shall have a built-in 4 second delay to prevent nuisance tripping. Alarms shall be as follows:
      1) Pump Monitoring:
         (a) Pump Over Temperature (thermal contacts in motor stator)
         (b) Pump Seal Leak (Seal leakage sensor)
      2) Sump Monitoring:
         (a) High Sump Level (via level float switch or submersible transducer)
         (b) Submersible transducer Sensor Error (Submersible transducer is not connected, reports faulty values or the wrong start level is used)
      3) Pump drive Monitoring (includes, but not limited to):
         (a) Drive Overcurrent
         (b) Drive Overload Trip
         (c) Drive Overvoltage
         (d) Drive Undervoltage
         (e) Drive Overtemperature (internal)
         (f) Drive Overtemperature (ambient)
         (g) Drive Undertemperature (ambient)
         (h) Input Phase Loss
         (i) Drive Output Max Torque Exceeded

D. Submersible Pressure Transducer:

1. The liquid level of the wet well shall be sensed by a submersible level transducer. The transducer shall be a 2-wire type to operate from the level controller's regulated loop power supply and produce an instrumentation signal (4-20mA) in direct proportion to the measured level excursion over a factory-calibrated range of zero to (30) feet of water. The unit shall be set to operate at 16.4 Feet for this application.
2. The transducer shall be of the ceramic capacitive, relative pressure sensing type, suitable for continuous submergence and operation and shall be installed in accordance with manufacturer's instructions. The bottom diaphragm face of the sensor shall be installed approximately 6 inches above the wet well floor. The sensor shall be hung in the wet well using a cable bracket including two sliding cable locking jaws in a location in the wet well and as shown on the job plans.
3. The transducer housing shall be fabricated of PPS (polyphenylene sulfide) with a ceramic bottom diaphragm.
4. The transducer element shall incorporate high over-pressure protection and be designed to withstand intermittent overpressures (10) times the full-scale range being sensed. Metallic diaphragms shall not be acceptable in that they are subject to damage or distortion. Sensing principles employing LVDTs, resistive or pneumatic elements shall not be acceptable.
5. The internal pressure of the lower transducer assembly shall be relieved to atmospheric pressure through a heavy-duty urethane jacketed hose/cable assembly and a slack PVC bellows mounted in the control panel. The sealed breather system shall compensate for variations in barometric pressure and expansion and contraction of air due to temperature changes and altitude as well as prevent fouling from moisture and other corrosive elements.
6. The transducer assembly shall be installed where directed by the Engineer and connected with other system elements and placed in successful operation
7. The transducer shall have a programming feature using a standard USB interface and a laptop computer, the servicing transmitter can be programmed on-the-fly to the required measuring range. The design without sharp edges prevents particles, textiles and paper from sticking to the housing or the diaphragm. The transducer shall be surge resistant.
8. The transducer power cable shall be steel reinforced PUR cable with high tensile strength (2,000 lb).

2.13 PUMP STATION VALVES

A. The system supplier shall furnish 2 check valves, 2 knife gate valves and the number of air vacuum/air release valves as shown on the plans. These items shall be shipped loose for installation in the pump station valve vault and along the force main as required. Piping, fittings, bolts, gaskets in the valve vault and along the force main shall be supplied by the contractor.

2.14 PUMP STATION VALVES – SUPPLY AS SHOWN ON THE PLANS

A. Plug valves shall be of the non-lubricating, eccentric type and shall be designed for a working pressure of 175 psi for valves 12" and smaller, 150 psi for valves 14" and larger. Valves shall provide tight shut-off at rated pressure. Valve shall be manufactured by Henry Pratt. Valves 20" and smaller shall have round port design. Minimum port area for all valves shall be 80% of corresponding pipe area.

B. The plug valve body shall be cast iron ASTM A126 Class B with welded-in overlay of 90% nickel alloy content on all surfaces contacting the face of the plug. Sprayed, plated, nickel welded rings or seats screwed into the body are not acceptable. The valve plug shall be cast iron ASTM A126 Class B, with Buna N resilient seating surface to mate with the body seat. Valve flanges shall be in strict accordance with ANSI B16.1, Class 125.

C. Plug valve shall be furnished with permanently lubricated sleeve type bearings conforming to AWWA C504. Bearings shall be of sintered, oil impregnated type 316 stainless steel ASTM A-743 Grade CF-8M or bronze ASTM B-127. Valves shaft seals shall be of the “U” cup type, in accordance with AWWA C504. Seals shall be self adjusting and repackable without moving the bonnet from the valve. 6” and smaller exposed valves shall be provided with wrench actuators. 8” and larger exposed valves shall be provided with worm gear type manual actuators. All buried valves shall be provided with worm and gear actuators suited for the intended service.

D. Swing check valves are of self-contained free swinging disc style. Valves conform to all standards set forth in AWWA C508. Valve hinge pins are Stainless Steel and conform to the industry standards set forth for cushion valves. Manufacturer should have a minimum of ten years experience supplying AWWA C508 valves. Valves shall conform to ANSI B16.1: Cast Iron Pipe Flanges and Flanged Fittings Class 25,125,250 and 800 and AWWA C508: Swing Check Valves for Waterworks Service, 2” through 24” NPS. Valves are rated for 200 p.s.i. water working pressure. All testing is done in accordance with AWWA C508. Valves have integrally cast flat face flanges in accordance with ANSI BI6.1 Class 125. All cast iron used conforms to ASTM A126 CLB. Valve Hanger and Disc are of cast iron conforming to ASTM A126 CLB. Hinge Pins conform to ASTM A276 GR304. Seat Rings are of Low Zinc Bronze conforming to ASTM B62 or of Stainless Steel conforming to ASTM A276 GR316. Internal and external coatings are high build two component epoxy conforming to AWWA C550. All valves meet the standards of AWWA C508 All valves utilize a single disc mounted to a clevis hinge which prevents the disc from tipping. The valve disc swings open once the pump starts and allows for full flow. When closed the valve offers a tight shut-off. Valve body and cover are of Cast Iron, valve hinge is of Cast Iron. Disc seating surface is either Bronze, Stainless Steel or of Buna-n depending on application. Valve seat rings are of Bronze or Stainless Steel. The valve body has a bolted cover design and flanges are integral to body casting –not wafer style. Valve body and disc are designed in such a way as to minimize turbulence. Spring systems are externally mounted on the side of the body and do not come into contact with main line media. Markings on the valves are in accordance with AWWA C508, and include the name of manufacturer, the year of manufacture, maximum working pressure and size of valve. All valves are built for horizontal installation. However, all valves operate equally well in the vertical installations.

E. Knife Gate Valves shall be of the Bonneted type, rated for 150 PSI CWP. Flanges shall be drilled and tapped to ANSI B16.5, Class150 pound standard with raised faces. Flange raised face shall be machined using serrated-spiral or serrated-concentric grooves with a 125-250 RMS finish. Valve bodies shall be cast CF8 or CF8M stainless steel (304ss).The valve bonnet shall be fabricated with 304stainless steel liner, packing box and bonnet flange raised face. Bonnet flange and stiffeners shall be 304 stainless steel. A gate wiper shall be used between the bonnet flange and the body top flanges. The wiper material shall be UHMWPE. Valve shall have 304 gate and integral cast stainless steel seat in the valve body. Gate shall be of design and thickness to withstand full 150 PSI rated pressure without permanent deflection to the gate. Gate shall have a rounded, beveled bottom. Seat and gate shall have a fully machined finish for one way shutoff. Minimum of two gate wedges shall be provided to assist seating of the gate against the seat in the lower half of the valve body. Gate guides shall be provided in the upper half of the valve body. Packing gland shall be cast stainless steel (CF8/CF8M). Packing shall be Teflon lubricated synthetic packing with a minimum of 4 rows of packing. Packing gland bolts, studs and nuts shall be 304 Stainless steel. Valve yoke shall be cast CF8 (304) stainless steel. Yoke shall be the flat top design to allow bolt-on field installation or conversion of actuators without welding or machining. Valve stem shall be 304 stainless steel (same material grade as bonnet liner) with full ACME threads. Stem nut shall be bronze. Stem nut shall be enclosed by the use of a cast stainless steel retainer. Manually actuated valves shall be hand wheel operated for all sizes. Bevel gear operators are recommended for valves 16” and above where frequent operation is required and/or where used in applications above 75 PSI. Valves shall be designed, manufactured and tested to MSS SP-81 standard or AWWA C520 standard.

F. Air and Vacuum Valves, where required, shall have the following functions: continuous discharge of dis-entrained pressurized air/gas, unrestricted vacuum break, and pipeline surge protection in a single chamber. Valves shall be anti-surge and anti-shock air release and vacuum break valves. The small orifice shall release air accumulations after the pipeline is filled, under pressure and in operation. The valve shall be equipped with an integral surge alleviation mechanism that automatically dampens surge pressures due to rapid air discharge or the subsequent rejoining of separated water columns. The valves shall be designed with the following features and materials of construction:
   1. The intake/discharge orifice area is equal to the nominal size of the valve, i.e., an 8" valve shall have 8" full flow inlet and 8" outlet.
   2. Nozzle and Anti-Shock floats shall be solid unbreakable HDPE that will not deform under twice the design working pressure.
   3. Manufacturer shall have ISO 9001, and third party vacuum testing to certify sizing and performance. CFD, FEA or other types of theoretical modeling are not acceptable.
   4. Valve shall have a 10 year in-service warranty for all internal components.
   5. 304 Stainless Steel Body, Flange, Top Cover and Fasteners
   6. 316 Stainless Steel Nozzle & Lower Float Assembly
   7. Integral High Density Polyethylene Anti-Shock and Nozzle Floats
   8. EPDM Seats and Seals
   9. Tangential top and bottom Flushing Ports.

PART 3 - EXECUTION

3.01 INSPECTION

A. Inspect all equipment upon arrival at job site and prior to installation. Notify manufacturer of any damage and/or shortage.

B. Inspect concrete mounting pads and anchor bolts for correct size and alignment prior to installation.

3.02 PREPARATION

A. Make corrections and/or repairs as required for items inspected and found to be deficient.

3.03 INSTALLATION

A. Install pumps and accessories in strict accordance with the manufacturer's instructions.

3.04 FIELD QUALITY CONTROL

A. The manufacturer's field engineer or representative shall inspect and check the installation after erection and be on hand for initial start-up of the equipment for a period of at least three (3) days. He shall also instruct operating personnel in the operation and maintenance of the system.

3.05 ADJUSTING AND CLEANING

A. Adjust equipment as required and within limits of manufacturer's instructions for proper alignment.

B. Apply proper type and quantity of lubricants for short term storage or start-up operation as applicable.

C. Clean equipment of any foreign matter or substances.

D. Field paint all components to be painted in accordance with manufacturers recommendations.

3.06 PROTECTION

A. After installation and painting protect the equipment from any damage by work of other trades. Repair any damage that nevertheless may occur.

3.07 SERVICE

A. The pump manufacturer shall have an authorized factory service center capable of completely servicing the proposed pumps within 100 miles of the project site. The pump manufacturer shall have a factory direct service center/stocking facility capable of completely servicing, and which stocks identical complete drive units, and spare parts for, the proposed pumps within 100 miles of the project site.

3.08 PUMP WARRANTY

A. The pump manufacturer shall provide prorated warranty for the units supplied to the Owner against defects in material and workmanship for a period of at least five (5) years or 10,000 operating hours in writing under the operating conditions presented by this project. Pump manufacturer shall demonstrate ability to support claimed warranty coverage by meeting all requirements of Section 4.01 of this specification.

B. The manufacturer guarantees the installation to be free from clogging when pumping sewage and wastewater containing solids and debris normally found in domestic wastewater. This guarantee is extended to the original owner for a period of 24 - months from the date of start - up of the equipment by the local authorized distributor. Should the pump impeller clog with typical solids and/or debris normally found in domestic wastewater during this period, the manufacturer shall reimburse the owner for reasonable cost to remove the pump, clear the obstruction and reinstall the affected pump unit . The manufacturer reserves the right to inspect the pump station, pump units and possibly modify the pump unit, if deemed necessary, to mitigate any further occurrence of pump clogging at no cost to the owner.

3.09 SUBSTANTIAL COMPLETION

A. Substantial Completion for each individual lift station within a lift station rehabilitation project will be achieved when the pumps and control system are functioning automatically, as intended in the design, and without the intervention of any means of bypass pumping for three (3) days. In addition, a startup report (if new pumps were installed) from the pump supplier must be submitted through the Subcontractor to the Purchaser with the Substantial Completion documentation.

B. Subcontractor shall notify Purchaser in writing when Subcontractor believes the Work meets the requirements for Substantial Completion. Purchaser will inspect the work within ten calendar days after Purchaser’s receipt of Subcontractor’s notice. If Purchaser identifies any defective or non-conforming Work, Subcontractor shall correct that Work in accordance with Article 00572.10. Purchaser will issue a notice that Substantial Completion has been achieved when the Work meets the requirements for Substantial Completion. Purchaser’s issuance of the notice of Substantial Completion does not relieve Subcontractor of its obligations under this Subcontract.

3.10 LIFT STATION SEQUENCING AND PROGRESS

A. Subcontractor is responsible for its own means and methods to execute the Work on time. However, in an effort to minimize the amount of time spent on bypass pumping and to reduce the likelihood of an SSO, the following sequencing is suggested based on past lift station contract performance and information provided by suppliers. This is intended to augment the Subcontractor’s obligations set forth under Article 00370.8, Schedule of Submittals.
   1. Notice to Proceed is issued.
   2. It is advised that the Subcontractor begin coordination efforts with MLG&W for electrical improvements as early as possible in the contract period.
   3. Within two weeks, forward major equipment submittals to Purchaser.
   4. Purchaser will review equipment submittals and, barring any major deficiencies, will return submittals within ten (10) days.

5. Typical lead time for pumping, controls, and electrical equipment is twelve to thirty (12-30) weeks. During this time, preparatory work which does not interfere with the existing lift station's functionality should be completed.
6. Once and physical work begins on the station, its force main, its controls, or its electrical system, Subcontractor assumes operation and maintenance responsibility for the lift station.
7. Just prior to work beginning on the major pumping, controls and electrical equipment, bypass pumping system (if a part of the rehabilitation) should be installed and tested. Once operational, demolition of existing pumping components can begin.
8. Each contract of lift station rehabilitation will include multiple lift stations. Ideally, based on the number of crews the Subcontractor can employ, Work will be sequenced to minimize the number of stations on bypass at any time.
9. Substantial Completion is achieved, per station.
10. Within 30 days of Substantial Completion, Final Completion is achieved, per station. The Final Completion letter from the Purchaser is issued.
11. Contract Final Completion will occur when all lift stations in the contract have achieved Final Completion.

PART 4 - MEASUREMENT

4.01 PUMPING STATIONS

A. Measurement: Complete in Place.

PART 5 - PAYMENT

5.01 PUMPING STATIONS

A. At the contract lump sum price including but not limited to all costs for furnishing all materials, equipment, supplies, all construction equipment, tools and the performance of all necessary labor, supervision, and services: and the installation complete of the pumping station in conformance the Contract Documents. This includes all excavation and backfill, pumps, control panel, electrical improvements, conduit, supports generator docking station, transfer switch, level transducer, backup float switches, discharge piping, pipe bracing, guide rails, lift chains, demolition, and restoration, and all Work required by the Contract Documents or otherwise necessary for a complete and operational pumping station.

B. Upon providing proof of ordering the station from the supplier, the Subcontractor may be compensated for the cost of ordering the materials on its next payment request. If approved, this will be paid as a percentage of the lump sum line item, rounded up to the nearest whole percent, to cover the invoice. A detailed copy of the station's invoice must be provided with the payment request documentation.

C. Upon providing proof of ordering the station from the supplier, the Subcontractor may be compensated for the cost of ordering the materials on its next payment request. If approved, this will be paid as a percentage of the lump sum line item, rounded up to the nearest whole percent, to cover the invoice. A detailed copy of the station's invoice must be provided with the payment request documentation.

D. Upon providing proof of ordering the station from the supplier, the Subcontractor may be compensated for the cost of ordering the materials on its next payment request. If approved, this will be paid as a percentage of the lump sum line item, rounded up to the nearest whole percent, to cover the invoice. A detailed copy of the station's invoice must be provided with the payment request documentation.

END OF SECTION

SECTION 11311
DRY PIT SUBMERSIBLE PUMPS, VALVES, CONTROLS, & ACCESSORIES

PART 1 - GENERAL DESCRIPTION

1.01 SCOPE

A. This section includes equipment for one duplex submersible pump station to be supplied with integral electric motors, suction elbows, pump stand and electrical control panel assembly, and other miscellaneous installation accessories. All equipment shall be supplied by a single source supplier that adheres to the quality standards established and expressly named in this specification.

B. Acceptable manufacturers are those who meet this specification in its entirety and that can demonstrate compliance with these specifications through the submittal process outlined in section 2.04 such that no exceptions or deviations are noted (See Paragraph 2.04 Submittal). The System Supplier, for all equipment approved for this project shall meet or exceed all performance, material, service, and warranty requirements of this specification.

C. The Bidder shall be responsible for supplying the equipment specified herein to meet or exceed these specifications as obtained from the System Supplier for this project. The System Supplier shall be an Authorized Distributor of the proposed products and shall be capable of servicing the products with repair service and parts availability within 50 miles of the City of Memphis. The responsive System Supplier shall routinely stock complete pumps, controls and parts to repair those units in their own facility. All equipment approved for this project shall meet or exceed all performance, service, and warranty requirements of this

1.02 RELATED REQUIREMENTS

A. Bid Form

B. General Conditions

C. Shop Drawings

D. Painting

E. Electrical

1.03 GENERAL

A. The pumps shall be suitable for pumping raw sewage and shall be designed and fully guaranteed for this use. The fluid temperature range shall be from 40 degrees to 104 degrees F.

1.04 STANDARDS

A. The test code of the American Hydraulic Institute for testing pumps and sound engineering practice shall be used. Where required, all pump performance documentation, including flow/head curves, shall adhere to the Hydraulic Institute Standards and shall allow no negative tolerance on flow, head, hydraulic efficiency or any other criteria deemed by the Engineer to be necessary to evaluate pumping system performance.

1.05 ENVIRONMENTAL CONDITIONS

A. All equipment as specified herein shall be so supplied with respect to environmental conditions at the jobsite.

1.06 SUBMITTALS

Complete equipment and control submittals, complete assembly, foundation support, and installation drawings, together with detailed specifications and data covering pumps, motors, material used, parts, devices and other accessories forming a part of the equipment furnished shall be submitted for approval in accordance with the procedure set forth in the General Conditions.

Data and specifications for the equipment shall include, but shall not be limited to the following:

A. Setting plans. Setting plans shall include:
   1. Anchor bolt layout
   2. Anchor bolt dimensions.
   3. Outline dimensions and weights of pumps, bases, motors, and control enclosures, etc.

B. Pumps. Data and drawings shall include:
   1. Manufacturer, type and model number.
   2. Assembly drawing, nomenclature and material list, O & M manual, and parts list.
   3. Type, manufacturer, model numbers, location and spacing of bearings.
   4. Impeller type, diameter, thru-let dimensions, sphere size, number of vanes and identification number.
   5. Complete motor performance data including: rating, voltage/phase/frequency; design type; service factor; insulation class; motor pole number; actual rotation speed when combined with the specified pumps; current, power factor and active input power (KW) as a continuous function of shaft power from no load to at least 115 percent load; start (max. Inrush) current; locked rotor current; NEC code letter; and motor torque as a continuous function through the motor start cycle from no rotation to synchronous speed.
   6. Complete performance test curve(s) showing full range (shutoff to run-out) head vs. Capacity, NPSHR, hydraulic efficiency, motor active (KW) input power, motor total (KVA) input power (based on measured current and voltage), and shaft power (BHP). See Sec. 3.01 Shop Tests.
   7. Location and description of Service Centers and spare parts stock.
   8. Warranty for the proposed equipment.

C. Controls. Complete Schematics and Documentation shall include:
   1. Panel layout drawings that show accurate dimensions, location of components, and proper connection of terminations with complete schematics of the proposed equipment.
   2. Cut sheets on all items to be provided.
   3. Operation manuals on VFDs or PLCs to be provided.

The manufacturer shall indicate, by arrows to points on the Q/H curves, limits recommended for stable operation, between which the pumps are to be operated to prevent surging, cavitation, and vibration. The stable operating range shall be as large as possible, and shall be based on actual hydraulic and mechanical characteristics of the units and shall meet the hydraulic performance requirements of the proposed system.

1.07 SHOP TESTS

A. Pumps and Motors. Each pump and motor shall be performance tested as specified hereinafter; all pumps shall be tested with motor cables to be supplied with the pumps.

B. Each pump shall be tested for performance at the factory to determine the head vs. Capacity, motor total electrical power draw (KVA), and motor active electrical power draw (KW) for the full speed at which the pumps are specified and shown on a performance test curve. The motor and cable on each pump shall be tested for moisture content or insulation defects. After the test, the pump cable end shall be fitted with a shrink-fit rubber boot to protect it from moisture or water.

1.08 ACCEPTANCE TESTS

Acceptance tests shall be run to demonstrate that the pumping units, motors and control system meet the following requirements:

A. The pumping units operate as specified without excessive noise, cavitation, vibration, and without overheating of the bearings.

B. All automatic and manual controls function in accordance with the specified requirements.

C. All drive equipment operates without being overloaded.

PART 2 - PRODUCTS

2.01 SUBMERSIBLE PUMPS

Submersible pumps shall meet the following performance requirements:

Item (Units)	**360 North Highland**	**47 West Van Heusen**
Primary Duty Point (GPM/ft.)	515 GPM@ 36’ TDH	100 GPM@ 46’ TDH
Secondary Duty Point (GPM/ft.) Less than 60 Hz	800 GPM@ 25’ TDH	200 GPM@ 30’TDH
Minimum Shutoff Head (ft.)	60 Ft.	54 Ft.
Maximum Specific Energy at Primary Duty Point (KWHr/MG)	190 KWHr/MG	360 KWHr/MG
Max Motor Rating (HP) at 40 degrees C	7.5 HP @ 40° C	6.4 HP @ 40° C
Maximum NPSHre (ft) in Operation Range	14 Feet	5 Feet
Voltage/Cycle/Phase	230VAC/60Hz/ 3Phase	230VAC/60Hz/ 3Phase
Motor Design Type	NEMA Class B, NEMA MG1, Part 31	NEMA Class B, NEMA MG1, Part 31
Motor Service Factor	Greater than 1.15	Greater than 1.15
Minimum Motor Efficiency	85%	87%
Motor Insulation Rating	Class H	Class H
Maximum Rated Current (A)	21 Amps	17 Amps
Pump Suction x Discharge Size (inches)	6” x 4”	4” x 3”

2.02 PUMP DESIGN (DRY PIT SUBMERSIBLE)

A. The pumps shall be capable of handling raw, unscreened sewage. Pumps shall be supplied with a mating suction elbow and pump stand and be capable of delivering the flow specified in the table above. The pumps shall be capable of handling solids, fibrous materials, heavy sludge and other matter normally found in wastewater. The pump and motor shall be non-overloading at any point on the curve. The pump, with its appurtenances and cable, shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of sixty five (65) feet. No portion of the pump shall bear directly on the sump floor

2.03 PUMP CONSTRUCTION

A. Major pump components shall be of gray cast iron, ASTM A-48, Class 35B, with smooth surfaces devoid of blow holes or other casting irregularities. Higher density cast irons (Class 40 and above) with reduced vibration dampening, will not be acceptable for pump driver castings, such as stator and bearing housings. All exposed nuts or bolts shall be AISI type 316 stainless steel. All metal surfaces coming into contact with the pumped media, other than stainless steel and/or brass, shall be protected by a factory-applied coating system suitable for sewerage pumping applications.

B. Sealing design shall incorporate metal-to-metal contact between machined surfaces. Pump/Motor unit mating surfaces where watertight sealing is required shall be machined and fitted with Nitrile or Viton Rubber O-rings. Joint sealing will be the result of controlled compression of rubber O-rings in two planes and O-ring contact of four sides without the requirement of a specific bolt torque limit.

C. Rectangular cross-sectioned gaskets that require specific torque limits to achieve compression shall not be considered as adequate or equal. No secondary sealing compounds, elliptical O-rings, grease or other devices shall be used in any part of the pump.

2.04 CABLE & CABLE SEAL

A. The cable entry shall be threaded and sealed by a field replaceable grommet. A nylon clamp shall secure a strain relief function. Epoxies, silicones, or other secondary sealing systems shall not be considered acceptable.

B. The motor shall be equipped with 50 feet of shielded submersible cable. The shield within the cable shall allow for a control panel mounted interface component to communicate both ways with the integrally mounted control unit within the pump/motor housing. 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 any splices. The outer jacket of the cable shall be oil resistant chlorinated polyethylene rubber. The cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet or greater.

2.05 COOLING SYSTEM

A. The cooling system shall provide sufficient cooling to run the pump at continuous pump duty in an ambient temperature of up to 104°F. Operational restrictions at temperatures below 104°F or the demand of auxiliary cooling systems like fans or blowers are not acceptable.

B. Each pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and shall provide capacity for lubricant expansion. The seal lubricant chamber shall have one drain and one inspection plug that are accessible from the exterior of the motor unit. The seal system shall not rely upon the pumped media for lubrication. The cooling system shall be a radiant heat sink type system integral to the stator housing.

2.06 MECHANICAL SEAL

A. Each pump shall be provided with dual tandem mechanical shaft seal system comprising two totally independent seal assemblies. The seals shall operate in a seal lubricant buffer chamber that hydro-dynamically lubricates the lapped seal faces at a constant rate. The inner seal, located between the lubricant buffer chamber and the stator housing, shall contain one stationary and one positively driven rotating ring, functioning as an independent secondary barrier between the pumped liquid and the stator housing. Both inner seal faces shall be corrosion resistant Tungsten Carbide. The outer of the tandem set of seals function as the primary barrier between the pumped liquid and the stator housing. This set shall consist of a stationary ring and a positively driven rotating ring, both of which shall be corrosion resistant.

B. Each interface shall be held in contact by its own spring system supplemented by external liquid pressures. The seals shall require neither maintenance nor adjustment, but shall be easily inspected and replaceable. The lower (outer) seal shall not bear on the impeller and shall remain fixed upon impeller removal.

C. Shaft seals without positively driven rotating members, or conventional double mechanical seals with a common single or double spring acting between the upper and lower units requiring a substantial pressure differential to offset external pressure and effect sealing, shall not be considered acceptable nor equal to the dual independent seal system specified. Cartridge-type seals comprising a single rotating element sandwiched between dual stationary elements will not be considered a dual tandem seal system and will not be accepted. Seals shall not be of the uni-directional type, but capable of dual rotation with no damage. The shaft sealing system shall be capable of withstanding volute pressures up to 1.5 times pump shutoff head. No seal damage shall result from operating the pumping unit in its liquid environment, from running pump dry, or from reverse pump operation. The drain and inspection plug, with positive anti-leak seal, shall be easily accessible from the outside.

2.07 SHAFT

A. The pump and motor shaft shall be the same unit. The pump shaft shall be an extension of the motor shaft. Couplings shall not be acceptable. The shaft shall be AISI Type 431 stainless steel and shall be completely isolated from the pumped liquid. The use of Stainless steel sleeves shall not be considered equal to stainless steel shafts.

2.08 IMPELLER AND VOLUTE

A. The impeller shall be of Hard-IronTM (ASTM A-532 (Alloy III A) 25% chrome cast iron), dynamically balanced, semi-open, multi-vane, back swept, screw-shaped, non-clog design. The impeller leading edges shall be mechanically self-cleaned automatically upon each rotation as they pass across a spiral groove located on the volute suction. The leading edges of the impeller shall be hardened to Rc 60 and shall be capable of handling solids, fibrous materials, heavy sludge and other matter normally found in wastewater. The screw shape of the impeller inlet shall provide an inducing effect for the handling of up to 5% sludge and rag-laden wastewater. The impeller to volute clearance shall be readily adjustable by the means of a single trim screw. The impeller shall move axially upwards on its shaft to allow larger debris to pass through and immediately return to normal operating position. The impeller shall be locked to the shaft, held by an impeller bolt and shall be coated with alkyd resin primer.

B. The pump volute shall be a single piece gray cast iron, ASTM A-48, Class 35B, non-concentric design with smooth passages of sufficient size to pass any solids that may enter the impeller. Minimum inlet and discharge size shall be as specified. The volute shall have a replaceable suction cover insert ring in which are cast spiral-shaped, sharp-edged groove(s). The spiral groove(s) shall provide trash release pathways and sharp edge(s) across which each impeller vane leading edge shall cross during rotation so to remain unobstructed. Due to the likely presence or sand or grit the insert ring shall be cast of Hard-IronTM ASTM A-532 Alloy III A 25% chrome cast iron and provide effective sealing between the multi-vane semi-open impeller and the volute housing.

2.09 BEARINGS

A. The integral pump/motor shaft shall rotate on two bearings. The motor bearings shall be sealed and permanently grease lubricated with high temperature grease. The upper motor bearing shall be a single ball type bearing to handle radial loads. The lower bearing shall be a two row angular contact ball bearing to handle the thrust and radial forces. The minimum L10 bearing life shall be 50,000 hours at any usable portion of the pump curve.

2.10 MOTOR & PROTECTION DEVICES

A. The integrated control system shall continuously monitor the leakage sensor in the stator housing and the temperature of the motor. If the motor temperature is too high, the pump shall be capable of operating at a reduced speed until the high temperature conditions are normalized. The operator shall be able to modify the setting of the control system to decide if the active leakage signal shall stop or not stop the pump. External trips or overload devices for motor protection shall not be required.

2.11 SCOPE

A. The System Supplier shall provide a Duplex Pump Control system that shall control connected pumps in an energy conservation mode of operation. The system shall be capable of adapting to changing inflow conditions and shall automatically regulate pumped outflow based on inflow conditions and shall seek an optimal energy efficiency for the pump station. This shall be accomplished by either providing a Programmable Logic Controller (PLC) with Variable Frequency Drives (VFDs) to provide a station adaptable feature or Variable Frequency Drive with integral software designed for this purpose. Either supplied system shall be MONITORING SYSTEM ready for integration into the City of Memphis MONITORING SYSTEM system, if applicable. MONITORING SYSTEM ready specification means that the units are capable of MODBUS communication. Radios, cellular modems, antennas etc. are not included in this control panel. This system will incorporate the functionality as noted in the following sections.

2.12 ELECTRICAL CONTROL PANEL SPECIFICATIONS

A. The System Supplier shall furnish a NEMA 3R Painted (white) steel control panel enclosure that will house the equipment furnished as specified herein to provide integral liquid level control, moisture and thermal protection modules with either a PLC and VFD's or Advanced Integrated VFD. The enclosure shall be a definite purpose enclosure to maximize cooling of the installed equipment and will be provided with a minimum of the following:

1. Main Lugs for Incoming Power. The Control Panel shall incorporate Feeder Breakers of the appropriate size. The breakers shall be Heavy Duty NEMA rated and suitable for use with aluminum or copper conductors. Utility Meter and Fused Disconnect shall be located outside of the panel and be provided by an Electrical Contractor or shall be existing where applicable.
2. Each pump motor circuit shall be protected by a properly sized H frame molded case circuit breaker. Each pole of these breakers shall provide inverse time delay overload protection and instantaneous short circuit protection by means of a thermal magnetic element. The breaker shall be operated by a toggle type handle and shall have a Quick-make, Quick-break over center switching mechanism that is mechanically trip free from the handle so that the contacts cannot be held closed against short circuits and abnormal currents. Tripping due to overload or short circuit shall be clearly indicated by the handle automatically assuming a position midway between the manual "ON" and "OFF" position. The minimum interrupting rating of the breaker shall be 42,000 amps at 460 VAC. Pump motor circuit breaker toggle shall be operable through a cutout in the inner door.
3. Hand-Off-Automatic (external or integral to the VFD HMI) switches to select the operating mode for each pump installed on the control panel inner deadfront door.
4. Elapsed time meters and Run, Fail and Alarm Lights shall be provided for each pump motor with appropriate relays as required.
5. In the event either pump operation selector switch is in the "Off" position, the control system software shall automatically designate the operating pump motor as the "next pump motor to operate" after that pump motor is started.

6. The hinged inner door shall be provided and fabricated from, 5052-H32.080, marine alloy aluminum. The hinged inner door shall contain cutouts for all circuit breaker toggles. Control switches and indicators shall be labeled and mounted to the hinged inner door to keep operators from entering the live electrical compartment. A warning sign stating "DANGER -- Disconnect All Sources Of Power Before Opening Door" shall be installed on the inner door. The inner door shall be completely removable for ease of service and shall be held closed by at least (2) hand operated 1/4 turn fasteners. The following items shall be mounted on the inner door:
7. Hand-Off-Automatic – External or Integral to the VFD Operator Interface
8. Back-panel - The control system enclosure shall include a removable back-panel. The back-panel shall be painted white and fabricated from cold roll steel.
9. Components shall be fastened to the back-panel using stainless steel pinhead machine screws. All devices shall be clearly labeled in accordance with the schematic ladder diagram.
10. Transient Voltage Surge Suppressors on the 120VAC circuit
11. Loop Power Surge Suppressor
12. Dual Signal Splitters 9106 for a total of 3 Analog Outputs
13. Lightening Arrestor
14. Cooling Fan and Enclosure Light
15. Top Mounted Alarm Light

B. Energy Management Components furnished by the System Supplier
   1. A Variable Frequency Drive with integral wastewater algorithms or a PLC with Variable Frequency Drive shall be provided for each pump in the system, sized for the appropriate voltage and power. The units(s) shall be supplied by the System Supplier and designed for wastewater pumping and with functionality pre-programmed for the specific pump model used. The VFD with Integral Control or PLC with VFD shall provide all level control functionality, hand/auto operation, pump alternation, pump over temperature monitoring, seal leakage monitoring, pump self-cleaning, sump cleaning and pipe cleaning algorithms. The supplied system shall also include capability to monitor station inflow, pump speed and energy consumption in order to automatically operate the pump station at optimal energy efficiency.
      a. The system shall be tested and approved in accordance with national and international standards and comply with Directive 98/37/EC, Safety of Machinery and EN60204-1.
      b. It shall conform to the relevant safety provisions of the Low Voltage Directive 2006/95/EC and the EMC Directive 2004/108/EC and has been designed and manufactured in accordance with the following harmonized European standards:

EN 61800-5-1: 2003	Adjustable speed electrical power drive systems. Safety requirements. Electrical, thermal and energy.
EN 61800-3 2nd Ed: 2004	Adjustable speed electrical power drive systems. EMC requirements and specific test methods
EN 55011: 2007	Limits and Methods of measurement of radio disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment (EMC)
EN60529 : 1992	Specifications for degrees of protection provided by enclosures

The variable frequency drive ampere rating shall be equal to or greater than the ampere rating listed on the motor being driven by the variable frequency drive.

2. The drive units shall be modularly constructed. Printed circuit boards shall be connected in such manner that they are easily removed from the unit. Power components shall be readily accessible and be connected in such manner that they are easily removed from the unit. The pump drive shall be freestanding for wall mounting or cabinet installation construction, for 230-480V, 60HZ 3Phase supply and shall be rated for IP55 and IP66 isolation class.

C. System Operation – VFD with Integral Control or PLC and VFD Functionality
   1. High/Low Level Sump Control:
      a. The system shall provide automatic level control via means of a submersible pressure transducer (4-20mADC) and one (1) non-mercury liquid level float switch. A user-programmable Start Level shall indicate the point at which the pump will start. Upon activation the pump shall run at maximum speed for a pre-determined period, then ramp down to an energy efficient optimal speed, calculated by the system. When the water level reaches the Stop Level, the pump shall stop. The Optimal Speed shall either be calculated by the system or manually entered by the user.
      b. In case of high inflow, the system shall increase pump speed until the water level begins to decrease. When the water level reaches the Stop Level, the pump shall stop.
      c. In case of very high inflow, when a pump or pumps are unable to overcome the inflow conditions even at maximum speed, additional pumps shall be activated and run at maximum speed until the stop Level is reached. If water levels continue to rise, a High Level Alarm shall be activated.
      d. The system shall incorporate a Minimum Speed function that prevents the pump from operating at speeds too low to move water based on the pump curve.
   2. Run Time Averaging:
      a. The system shall provide capability to balance run times for even wear among available operable pumps. This shall be a function of the control system and not require external devices, such as an Alternating Relay. The function shall operate by determining a “random” start level based on the Start Level setting. The system shall determine a random start level independent of each other. The system shall determine new random start levels every 24 hours. The pump with the lowest random start level shall be first to start on any given pump cycle. Other pumps shall remain in Standby capacity in case the lead and/or lag pump shall not be able to lower the water level as described in the section above. By recalculating the random start levels every 24 hours, balanced run times are accomplished.
   3. Pump Cleaning Function:
      a. The system shall incorporate a “self-cleaning” function to remove debris from the pumps. The cleaning shall be triggered by three circumstances:
         1) Soft Clogging: When motor current equals 20% or greater above rated motor current , in the drive, for a period of 7 seconds
         2) Hard Clogging: When motor current equals 80% or greater above rated current for a period of 0.01 seconds
         3) Schedule Cleaning: The system is pre-programmed to perform cleaning regularly
         4) The cleaning function shall consist of forced stopping, reversal and forward runs timed to allow for debris to fall from the impeller. After cleaning cycle is complete, drive shall resume to automatic operation.
      b. Sump Cleaning Function:

1) The system shall incorporate a sump cleaning function to ensure surface solids and grease is regularly removed from the sump. The sump cleaning function shall perform regularly when enabled by the operator. Sump cleaning shall consist of the following functions
2) Sump cleaning is triggered when internal timer expires and during a normal pump down cycle
3) Pump is automatically ramped to maximum speed
4) Pump runs at maximum speed for designated time or until the pump are snoring."
5) When Sump Cleaning is over, the pump is shut off and resumes normal operation.

c. Pipe Cleaning Function:
1) The system shall incorporate a pipe cleaning function to avoid discharge pipe sedimentation and clogging due to reduced pump speed. This shall be an automatic feature that initiates with every pump cycle. Upon reaching Pump Start Level, the system shall operate the pump at 100% speed for a determined time before ramping down to the most energy efficient speed for the duration of the cycle.

d. Energy Efficiency Speed Finder:
1) The system shall provide a function that automatically calculates the most energy efficient speed for the pump based on station inflow characteristics. An algorithm calculates the optimal speed whereby the most water is pumped using the least amount of energy, the optimal speed is constantly adjusted to account for changes inflow without requiring operator adjustment, multiple setpoints, etc.
2)

e. Alarms & Monitoring:
The system shall provide alarms and monitoring for the system, pump and sump. Alarms shall be presented on the display, via a Summary Alarm relay and via Modbus registers. All alarms, when occurring, shall remain active until reset. Alarms shall have a built-in 4 second delay to prevent nuisance tripping. Alarms shall be as follows:
1) Pump Monitoring:
(a) Pump Over Temperature (thermal contacts in motor stator)
(b) Pump Seal Leak (Seal leakage sensor)
2) Sump Monitoring:
(a) High Sump Level (via level float switch or submersible transducer)
(b) Submersible transducer Sensor Error (Submersible transducer is not connected, reports faulty values or the wrong start level is used)
3) Pump drive Monitoring (includes, but not limited to):
(a) Drive Overcurrent
(b) Drive Overload Trip
(c) Drive Overvoltage
(d) Drive Undervoltage
(e) Drive Overtemperature (internal)
(f) Drive Overtemperature (ambient)
(g) Drive Undertemperature (ambient)
(h) Input Phase Loss
(i) Drive Output Max Torque Exceeded

D. Submersible Pressure Transducer:

1. The liquid level of the wet well shall be sensed by a submersible level transducer. The transducer shall be a 2-wire type to operate from the level controller's regulated loop power supply and produce an instrumentation signal (4-20mA) in direct proportion to the measured level excursion over a factory-calibrated range of zero to (30) feet of water. The unit shall be set to operate at 16.4 Feet for this application.
2. The transducer shall be of the ceramic capacitive, relative pressure sensing type, suitable for continuous submergence and operation and shall be installed in accordance with manufacturer's instructions. The bottom diaphragm face of the sensor shall be installed approximately 6 inches above the wet well floor. The sensor shall be hung in the wet well using a cable bracket including two sliding cable locking jaws in a location in the wet well and as shown on the job plans.
3. The transducer housing shall be fabricated of PPS (polyphenylene sulfide) with a ceramic bottom diaphragm.
4. The transducer element shall incorporate high over-pressure protection and be designed to withstand intermittent overpressures (10) times the full-scale range being sensed. Metallic diaphragms shall not be acceptable in that they are subject to damage or distortion. Sensing principles employing LVDTs, resistive or pneumatic elements shall not be acceptable.
5. The internal pressure of the lower transducer assembly shall be relieved to atmospheric pressure through a heavy-duty urethane jacketed hose/cable assembly and a slack PVC bellows mounted in the control panel. The sealed breather system shall compensate for variations in barometric pressure and expansion and contraction of air due to temperature changes and altitude as well as prevent fouling from moisture and other corrosive elements.
6. The transducer assembly shall be installed where directed by the Engineer and connected with other system elements and placed in successful operation
7. The transducer shall have a programming feature using a standard USB interface and a laptop computer, the servicing transmitter can be programmed on-the-fly to the required measuring range. The design without sharp edges prevents particles, textiles and paper from sticking to the housing or the diaphragm. The transducer shall be surge resistant.
8. The transducer power cable shall be steel reinforced PUR cable with high tensile strength (2,000 lb).

2.13 PUMP STATION VALVES

A. The system supplier shall furnish 2 check valves, 2 knife gate valves and the number of air vacuum/air release valves as shown on the plans. These items shall be shipped loose for installation in the pump station valve vault and along the force main as required. Piping, fittings, bolts, gaskets in the valve vault and along the force main shall be supplied by the contractor.

2.14 PUMP STATION VALVES – SUPPLY AS SHOWN ON THE PLANS

A. Plug valves shall be of the non-lubricating, eccentric type and shall be designed for a working pressure of 175 psi for valves 12" and smaller, 150 psi for valves 14" and larger. Valves shall provide tight shut-off at rated pressure. Valve shall be manufactured by Henry Pratt. Valves 20" and smaller shall have round port design. Minimum port area for all valves shall be 80% of corresponding pipe area.

B. The plug valve body shall be cast iron ASTM A126 Class B with welded-in overlay of 90% nickel alloy content on all surfaces contacting the face of the plug. Sprayed, plated, nickel welded rings or seats screwed into the body are not acceptable. The valve plug shall be cast iron ASTM A126 Class B, with Buna N resilient seating surface to mate with the body seat. Valve flanges shall be in strict accordance with ANSI B16.1, Class 125.

C. Plug valve shall be furnished with permanently lubricated sleeve type bearings conforming to AWWA C504. Bearings shall be of sintered, oil impregnated type 316 stainless steel ASTM A-743 Grade CF-8M or bronze ASTM B-127. Valves shaft seals shall be of the “U” cup type, in accordance with AWWA C504. Seals shall be self adjusting and repackable without moving the bonnet from the valve. 6” and smaller exposed valves shall be provided with wrench actuators. 8” and larger exposed valves shall be provided with worm gear type manual actuators. All buried valves shall be provided with worm and gear actuators suited for the intended service.

D. Swing check valves are of self-contained free swinging disc style. Valves conform to all standards set forth in AWWA C508. Valve hinge pins are Stainless Steel and conform to the industry standards set forth for cushion valves. Manufacturer should have a minimum of ten years experience supplying AWWA C508 valves. Valves shall conform to ANSI B16.1: Cast Iron Pipe Flanges and Flanged Fittings Class 25,125,250 and 800 and AWWA C508: Swing Check Valves for Waterworks Service, 2” through 24” NPS. Valves are rated for 200 p.s.i. water working pressure. All testing is done in accordance with AWWA C508. Valves have integrally cast flat face flanges in accordance with ANSI BI6.1 Class 125. All cast iron used conforms to ASTM A126 CLB. Valve Hanger and Disc are of cast iron conforming to ASTM A126 CLB. Hinge Pins conform to ASTM A276 GR304. Seat Rings are of Low Zinc Bronze conforming to ASTM B62 or of Stainless Steel conforming to ASTM A276 GR316. Internal and external coatings are high build two component epoxy conforming to AWWA C550. All valves meet the standards of AWWA C508 All valves utilize a single disc mounted to a clevis hinge which prevents the disc from tipping. The valve disc swings open once the pump starts and allows for full flow. When closed the valve offers a tight shut-off. Valve body and cover are of Cast Iron, valve hinge is of Cast Iron. Disc seating surface is either Bronze, Stainless Steel or of Buna-n depending on application. Valve seat rings are of Bronze or Stainless Steel. The valve body has a bolted cover design and flanges are integral to body casting –not wafer style. Valve body and disc are designed in such a way as to minimize turbulence. Spring systems are externally mounted on the side of the body and do not come into contact with main line media. Markings on the valves are in accordance with AWWA C508, and include the name of manufacturer, the year of manufacture, maximum working pressure and size of valve. All valves are built for horizontal installation. However, all valves operate equally well in the vertical installations.

E. Knife Gate Valves shall be of the Bonneted type, rated for 150 PSI CWP. Flanges shall be drilled and tapped to ANSI B16.5, Class150 pound standard with raised faces. Flange raised face shall be machined using serrated-spiral or serrated-concentric grooves with a 125-250 RMS finish. Valve bodies shall be cast CF8 or CF8M stainless steel (304ss).The valve bonnet shall be fabricated with 304stainless steel liner, packing box and bonnet flange raised face. Bonnet flange and stiffeners shall be 304 stainless steel. A gate wiper shall be used between the bonnet flange and the body top flanges. The wiper material shall be UHMWPE. Valve shall have 304 gate and integral cast stainless steel seat in the valve body. Gate shall be of design and thickness to withstand full 150 PSI rated pressure without permanent deflection to the gate. Gate shall have a rounded, beveled bottom. Seat and gate shall have a fully machined finish for one way shutoff. Minimum of two gate wedges shall be provided to assist seating of the gate against the seat in the lower half of the valve body. Gate guides shall be provided in the upper half of the valve body. Packing gland shall be cast stainless steel (CF8/CF8M). Packing shall be Teflon lubricated synthetic packing with a minimum of 4 rows of packing. Packing gland bolts, studs and nuts shall be 304 Stainless steel. Valve yoke shall be cast CF8 (304) stainless steel. Yoke shall be the flat top design to allow bolt-on field installation or conversion of actuators without welding or machining. Valve stem shall be 304 stainless steel (same material grade as bonnet liner) with full ACME threads. Stem nut shall be bronze. Stem nut shall be enclosed by the use of a cast stainless steel retainer. Manually actuated valves shall be hand wheel operated for all sizes. Bevel gear operators are recommended for valves 16” and above where frequent operation is required and/or where used in applications above 75 PSI. Valves shall be designed, manufactured and tested to MSS SP-81 standard or AWWA C520 standard.

F. Air and Vacuum Valves, where required, shall have the following functions: continuous discharge of dis-entrained pressurized air/gas, unrestricted vacuum break, and pipeline surge protection in a single chamber. Valves shall be anti-surge and anti-shock air release and vacuum break valves. The small orifice shall release air accumulations after the pipeline is filled, under pressure and in operation. The valve shall be equipped with an integral surge alleviation mechanism that automatically dampens surge pressures due to rapid air discharge or the subsequent rejoining of separated water columns. The valves shall be designed with the following features and materials of construction:
   1. The intake/discharge orifice area is equal to the nominal size of the valve, i.e., an 8" valve shall have 8" full flow inlet and 8" outlet.
   2. Nozzle and Anti-Shock floats shall be solid unbreakable HDPE that will not deform under twice the design working pressure.
   3. Manufacturer shall have ISO 9001, and third party vacuum testing to certify sizing and performance. CFD, FEA or other types of theoretical modeling are not acceptable.
   4. Valve shall have a 10 year in-service warranty for all internal components.
   5. 304 Stainless Steel Body, Flange, Top Cover and Fasteners
   6. 316 Stainless Steel Nozzle & Lower Float Assembly
   7. Integral High Density Polyethylene Anti-Shock and Nozzle Floats
   8. EPDM Seats and Seals
   9. Tangential top and bottom Flushing Ports.

PART 3 - EXECUTION

3.01 INSPECTION

A. Inspect all equipment upon arrival at job site and prior to installation. Notify manufacturer of any damage and/or shortage.

B. Inspect concrete mounting pads and anchor bolts for correct size and alignment prior to installation.

3.02 PREPARATION

A. Make corrections and/or repairs as required for items inspected and found to be deficient.

3.03 INSTALLATION

A. Install pumps and accessories in strict accordance with the manufacturer's instructions.

3.04 FIELD QUALITY CONTROL

A. The manufacturer's field engineer or representative shall inspect and check the installation after erection and be on hand for initial start-up of the equipment for a period of at least three (3) days. He shall also instruct operating personnel in the operation and maintenance of the system.

3.05 ADJUSTING AND CLEANING

A. Adjust equipment as required and within limits of manufacturer's instructions for proper alignment.

B. Apply proper type and quantity of lubricants for short term storage or start-up operation as applicable.

C. Clean equipment of any foreign matter or substances.

D. Field paint all components to be painted in accordance with manufacturers recommendations.

3.06 PROTECTION

A. After installation and painting protect the equipment from any damage by work of other trades. Repair any damage that nevertheless may occur.

3.07 SERVICE

A. The pump manufacturer shall have an authorized factory service center capable of completely servicing the proposed pumps within 100 miles of the project site. The pump manufacturer shall have a factory direct service center/stocking facility capable of completely servicing, and which stocks identical complete drive units, and spare parts for, the proposed pumps within 100 miles of the project site.

3.08 PUMP WARRANTY

A. The pump manufacturer shall provide prorated warranty for the units supplied to the Owner against defects in material and workmanship for a period of at least five (5) years or 10,000 operating hours in writing under the operating conditions presented by this project. Pump manufacturer shall demonstrate ability to support claimed warranty coverage by meeting all requirements of Section 4.01 of this specification.

B. The manufacturer guarantees the installation to be free from clogging when pumping sewage and wastewater containing solids and debris normally found in domestic wastewater. This guarantee is extended to the original owner for a period of 24 - months from the date of start - up of the equipment by the local authorized distributor. Should the pump impeller clog with typical solids and/or debris normally found in domestic wastewater during this period, the manufacturer shall reimburse the owner for reasonable cost to remove the pump, clear the obstruction and reinstall the affected pump unit . The manufacturer reserves the right to inspect the pump station, pump units and possibly modify the pump unit, if deemed necessary, to mitigate any further occurrence of pump clogging at no cost to the owner.

3.09 SUBSTANTIAL COMPLETION

A. Substantial Completion for each individual lift station within a lift station rehabilitation project will be achieved when the pumps and control system are functioning automatically, as intended in the design, and without the intervention of any means of bypass pumping for three (3) days. In addition, a startup report (if new pumps were installed) from the pump supplier must be submitted through the Subcontractor to the Purchaser with the Substantial Completion documentation.

B. Subcontractor shall notify Purchaser in writing when Subcontractor believes the Work meets the requirements for Substantial Completion. Purchaser will inspect the work within ten calendar days after Purchaser’s receipt of Subcontractor’s notice. If Purchaser identifies any defective or non-conforming Work, Subcontractor shall correct that Work in accordance with Article 00572.10. Purchaser will issue a notice that Substantial Completion has been achieved when the Work meets the requirements for Substantial Completion. Purchaser’s issuance of the notice of Substantial Completion does not relieve Subcontractor of its obligations under this Subcontract.

3.10 LIFT STATION SEQUENCING AND PROGRESS

A. Subcontractor is responsible for its own means and methods to execute the Work on time. However, in an effort to minimize the amount of time spent on bypass pumping and to reduce the likelihood of an SSO, the following sequencing is suggested based on past lift station contract performance and information provided by suppliers. This is intended to augment the Subcontractor’s obligations set forth under Article 00370.8, Schedule of Submittals.
   1. Notice to Proceed is issued.
   2. It is advised that the Subcontractor begin coordination efforts with MLG&W for electrical improvements as early as possible in the contract period.
   3. Within two weeks, forward major equipment submittals to Purchaser.
   4. Purchaser will review equipment submittals and, barring any major deficiencies, will return submittals within ten (10) days.

5. Typical lead time for pumping, controls, and electrical equipment is twelve to thirty (12-30) weeks. During this time, preparatory work which does not interfere with the existing lift station's functionality should be completed.
6. Once and physical work begins on the station, its force main, its controls, or its electrical system, Subcontractor assumes operation and maintenance responsibility for the lift station.
7. Just prior to work beginning on the major pumping, controls and electrical equipment, bypass pumping system (if a part of the rehabilitation) should be installed and tested. Once operational, demolition of existing pumping components can begin.
8. Each contract of lift station rehabilitation will include multiple lift stations. Ideally, based on the number of crews the Subcontractor can employ, Work will be sequenced to minimize the number of stations on bypass at any time.
9. Substantial Completion is achieved, per station.
10. Within 30 days of Substantial Completion, Final Completion is achieved, per station. The Final Completion letter from the Purchaser is issued.
11. Contract Final Completion will occur when all lift stations in the contract have achieved Final Completion.

PART 4 - MEASUREMENT

4.01 PUMPING STATIONS

A. Measurement: Complete in Place

PART 5 - PAYMENT

5.01 PUMPING STATIONS

A. At the contract lump sum price including but not limited to all costs for furnishing all materials, equipment, supplies, all construction equipment, tools and the performance of all necessary labor, supervision, and services: and the installation complete of the pumping station in conformance the Contract Documents. This includes all excavation and backfill, pumps, control panel, electrical improvements, conduit, supports generator docking station, transfer switch, level transducer, backup float switches, discharge piping, pipe bracing, guide rails, lift chains, demolition, and restoration, and all Work required by the Contract Documents or otherwise necessary for a complete and operational pumping station.

B. Upon providing proof of ordering the station from the supplier, the Subcontractor may be compensated for the cost of ordering the materials on its next payment request. If approved, this will be paid as a percentage of the lump sum line item, rounded up to the nearest whole percent, to cover the invoice. A detailed copy of the station's invoice must be provided with the payment request documentation.

C. Upon providing proof of ordering the station from the supplier, the Subcontractor may be compensated for the cost of ordering the materials on its next payment request. If approved, this will be paid as a percentage of the lump sum line item, rounded up to the nearest whole percent, to cover the invoice. A detailed copy of the station's invoice must be provided with the payment request documentation.

D. Upon providing proof of ordering the station from the supplier, the Subcontractor may be compensated for the cost of ordering the materials on its next payment request. If approved, this will be paid as a percentage of the lump sum line item, rounded up to the nearest whole percent, to cover the invoice. A detailed copy of the station's invoice must be provided with the payment request documentation.

END OF SECTION