**Request for Bid**
**Lift Station Rehab Construction Group 3B Addendum No. 3 to**
**RFB No. 414882.71.0423**
**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 (482 Jack Carley) and 11310 (5545 Elvis Presley Boulevard) of Specifications

All other conditions and requirements remain unchanged.

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## Section 1
## Additional Bidder Questions Received to Date

**Q1**: For 277 Windsor, 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 temp generator in dotted lines in NEMA 3R. So, can we supply an MTS with camlocks instead of the Appleton connector for consistency? Is the breaker really in the utility meter cabinet? Do you want NEMA 3R or 4X? Looks like the voltage is 240V three phase?

**SARP10**: Yes, this voltage is correct. We can accept using the MTS with camlocks for this station as well for consistency. 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.

**Q2**: For 482 Jack Carley, 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 temp generator in dotted lines in NEMA 3R. So, can we supply an MTS with camlocks instead of the Appleton connector for consistency? Is the breaker really in the utility meter cabinet? Do you want NEMA 3R or 4X? Looks like the voltage is 480V three phase?

**SARP10**: Yes, this voltage is correct. We can accept using the MTS with camlocks for this station as well for consistency. 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.

**Q3**: 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.

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**Section 2**
**Updated Sections 11310 (482 Jack Carley) and**
**11310 (5545 Elvis Presley Boulevard) of Specifications**

**SECTION 11310**
**WASTEWATER SUBMERSIBLE PUMPING STATION**

## PART 1 GENERAL

**1.01** SCOPE

A. This section covers guide rail-mounted, vertical, single stage, submersible, non-clog, dual-simplex, end suction centrifugal pumping units.

B. Each pumping unit shall be complete with a close coupled, submersible, electric motor, guide rails; discharge base elbow with adapter; controls, access hatch cover; and all other appurtenances specified or otherwise required for proper operation.

**1.02** REQUIREMENTS

A. Manufacturer's Qualifications

1. The pump manufacturer shall have a minimum of 25 units of similar type pumps installed and operating for no less than five (5) years in the United States.

2. All equipment approved for this project shall meet or exceed all performance, service, and warranty requirements of this specification.

3. 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 to 115 degrees F.

B. Quality Control

1. Because of the critical service of the pump and its expected long service life it is mandatory that certain quality control procedures be followed during the manufacturing process.

2. The pump manufacturer shall perform, as a minimum, the following procedures and shall provide certification, at the time of shipment, that these have been performed.

3. A motor and cable insulation test for moisture content or insulation defects shall be made.

4. Prior to submergence, the pump shall be run dry to establish correct rotation and mechanical integrity.

5. The pump shall be run for 30 minutes submerged, a minimum of 6 feet under water.

6. After the submerged operational test, the insulation test is to be performed again.

**1.03** RELATED SECTIONS

A. Section –02530 – Sewer Pipe Installation

**1.04** SUBMITTALS

A. Complete fabrication, assembly, foundation, and installation drawings, together with detailed specifications, and data covering materials used, parts, devices, and other accessories forming a part of the equipment furnished, shall be submitted in accordance with the submittals section. The data and specifications for each unit shall include, but shall not be limited to, the following:

1. Pumps
   a. Name of manufacturer.
   b. Type and model.
   c. Rotative speed.
   d. Size of discharge nozzle.
   e. Size of discharge elbow and adapter inlet and outlet.
   f. Type of bearings.
   g. Net weight of pump and motor only.
   h. Complete performance curves showing capacity versus head.
   i. NPSH required, efficiency, and KW input.
   j. Data on shop painting.

2. Motors
   a. Name of manufacturer.
   b. Type and model.
   c. Type of bearings and lubrication.
   d. Rated size of motor, hp.
   e. Temperature rating.
   f. Full load rotative speed.
   g. Net weight.
   h. Efficiency at full load and rated pump condition.
   i. Full load current.
   j. Locked rotor current.

3. Control Panel and Components
   a. Name of Manufacturer.
   b. Type and model.
   c. Dimensions and net weight of complete panel.
   d. Overcurrent characteristics and details of motor control.

**1.05** SITE POWER SUPPLY:

A. 120/208 volts, 3 phase, 60 hertz.

**PART 2 PRODUCTS**

**2.01** PUMPS

A. Manufacturers: NA

B. Equipment furnished and installed under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with drawings, specifications engineering data, instructions, and recommendations of the equipment manufacturer unless exceptions are noted by the Engineer. Definition of terms and other hydraulic considerations shall be as set forth in the Hydraulic Institute Standards.

C. Service Conditions: Each pumping unit shall be designed to handle raw sewage. Each pumping unit will be installed in an existing concrete wet well. Each pumping unit shall be capable

of operating under load in both a dry pit installation and a totally submerged environment, without damage. Motors shall be sufficiently cooled by the surrounding environment so that a cooling jacket is not required. Each pumping unit shall be designed for continuous duty handling pumped media of 40C and capable of handling a maximum of 15 evenly spaced starts per hour.

D. Performance and Design Requirements: Pumping units shall be designed for the following operating conditions and requirements:

| | | |
|---|---|---|
| 1. | Number of units: | 2 |
| 2. | Rated total head: | 45 feet |
| 3. | Capacity at rated: | 80 gpm |
| 4. | Operating head range: | 11-17 feet |
| 5. | Max pump operating speed: | 2300 rpm |
| 6. | Min motor hp rating: | 5.5 |
| 7. | Min discharge elbow outlet size: | 4 inches |
| 8. | Min hydrostatic test pressure: | 1.5 x shut-off head |
| 9. | Phase: | 3 |
| 10. | Hertz: | 60 |
| 11. | Voltage: | 230 |

E. Pump performance shall be stable and free from cavitation and noise throughout the specified operating head range at minimum suction submergences. The design running clearance between the impeller inlet and the casing wearing ring (if provided) shall be not less than 0.006 inch or one-half mil per inch of casing wearing ring diameter, whichever is greater.

F. Each pumping unit shall be designed so that reverse rotation at rated head will not cause damage to any component.

**2.02** MATERIALS

| | | |
|---|---|---|
| A. | Stator Housing, Oil Chamber Housing, and Sliding Bracket | Cast Iron, ASTM A48, Class 35B |
| B. | Casing Insert Ring & Impeller chrome cast iron) | Hard-Iron™ (ASTM A-532 (Alloy III A) 25% |
| | Shaft | Stainless Steel, AISI Type 431. |
| C. | All Wetted Assembly Fasteners | Stainless Steel, AISI Type 316 |
| D. | Mechanical Seals | 2 Tandem Type, oil lubricated. |
| 1. | Lower and Upper Seals points. | Corrosion Resistant Tungsten carbide at all |
| E. | Discharge Base | Cast iron ASTM A48, Class 35B |
| F. | Guide Rails | Stainless Steel pipe, AISI 304ss Schedule 40 |
| G. | Anchor Bolts, Nuts and Washers | Stainless Steel |

H. Epoxy Coating

1. Two Coats 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.

**2.03** PUMP CONSTRUCTION

A. All mating surfaces where watertight sealing is required shall be machined and fitted with nitrile rubber O-rings. Fitting shall be such that sealing is accomplished by metal-to-metal contact between machined surfaces. This will result in controlled compression of nitrile rubber O-rings without requirement of a specific torque limit. Rectangular cross sectioned gaskets requiring 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.

B. Impeller: The impeller blades shall be self-cleaning upon each rotation as they pass across a sharp relief groove in the Insert ring and shall keep the impeller blades clear of debris. The insert ring shall have a guide pin which moves fibers from the center of the impeller to the leading edges of the impeller. The impeller shall move axially upwards to allow larger debris to pass through and immediately return to normal operating position. The clearance between the insert ring and the impeller leading edges shall be adjustable. Due to the likely presence of sand and or grit the impeller and the cutting ring shall be made of ASTM A-532 Alloy III A with 25% chrome. Impellers that have surface hardening or coating will not be allowed.

C. Volute & Insert Ring: 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-Iron™ 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.

D. Motor: The pump shall be operated by a synchronous motor and an integrated control system and be capable to run at constant power at any point of the performance field without being overloaded. Motor shall utilize a permanent magnet rotor to maintain synchronous speed and maintain level IE-4 premium efficiency standards. The motor shall withstand at least 60 starts per hour. The stator shall be insulated by the trickle impregnation method using Class H monomer-free polyester resin resulting in a winding fill factor of at least 95%. The motor shall be inverter duty rated in accordance with NEMA MG1, Part 31. The stator shall be heat-shrink fitted into the cast iron stator housing. The use of multiple step dip and bake-type stator insulation process is not acceptable. The use of pins, bolts, screws or other fastening devices used to locate or hold the stator and that penetrate the stator housing are not acceptable. The motor shall be designed for continuous duty while handling pumped media of up to 104°F.

E. Integrated Control: An integrated pump control system installed in the pump/motor housing shall ramp up the speed at start-up of the pump to reduce the start-up current and secure that the direction of the impeller rotation is always correct. There shall be no need for any human intervention to ensure that the impeller is rotating in the correct direction within the volute. The control system that is integrated within the pump/motor housing shall be encapsulated to protect it against moisture ingress, and vibration. Motor, pump and control system shall be designed and produced by the same manufacturer. The integral control system mounted within the pump/motor housing shall be capable of adjusting the motor/impeller speed so that the pump can safely operate without overloading anywhere within the pumps' operating envelope. The pump shall incorporate a "pump-cleaning" function to remove debris from the impeller. The cleaning

function shall be initiated when the integral control system senses an increase in current draw due to debris in the pump. 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, the pump shall resume to automatic operation. If the pump impeller/volute does not clear itself after the programmed number of attempts, the control will initiate and alarm to notify that the pump inlet / volute is blocked by large debris.

F. Shaft & Bearings: The AISI 431 SS 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 row ball bearing to handle radial loads. The lower bearing shall be a double row angular contact ball bearing to handle the thrust and radial forces. Single row lower bearings are not acceptable. The minimum L10 bearing life shall be 50,000 hours at any usable portion of the pump performance field.

G. Oil Chamber Housing: The oil chamber shall contain a moisture sensor, inspection plug, drain plug and vent plug.

H. Mechanical Seals: 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 be a leakage-free seal. The upper seal shall contain one stationary and one positively driven rotating corrosion resistant tungsten-carbide seal ring. The rotating seal ring shall have small back-swept grooves laser inscribed upon its face to act as a pump as it rotates, returning any fluid that should enter the dry motor chamber back into the lubricant chamber. 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.

I. Sealing of Mating Surfaces: All mating surfaces of major components shall be machined and fitted with 0-rings where watertight sealing is required. Sealing shall be accomplished by O-ring contact on four surfaces and O-ring compression in two planes without reliance on a specific fastener torque or tension to obtain a watertight joint. The use of elliptical O-rings, gaskets, or seals requiring a specific fastener torque value to obtain and maintain gasket or seal compression and water tightness will not be acceptable. The use of secondary sealing compounds, gasket cement, grease, or other devices to obtain watertight joints will not be acceptable.

J. Discharge Base: A discharge base and discharge elbow shall be furnished by the pump manufacturer for each pumping unit. The base shall be sufficiently rigid to firmly support the guide rails, discharge piping, and pumping unit under all operating conditions. The base shall be provided with one or more integral support legs or pads suitable for bolting to the floor of the wetwell. The face of the discharge elbow inlet flange shall be perpendicular to the floor and make contact with the face of the pump discharge nozzle flange. The diameter and drilling of the elbow outlet flange shall conform to ANSI B16.1, Class 125.

1. The pump and motor assembly shall be automatically connected to and supported by the discharge base and guide rails such that the unit can be removed from the surge basin and replaced without the need for operating personnel to enter the surge basin.

K. Sliding Bracket: Each pumping unit shall be provided with an integral, self-aligning guide rail sliding bracket. The bracket shall be designed to obtain a wedging action between flange faces as final alignment of the pump occurs in the connected position. The bracket shall maintain proper contact and a suitably sealed connection between flange faces under all operating conditions.

L. Guide Rails: Each pumping unit shall be equipped with one or more guide rails constructed of stainless steel pipe. Guide rails shall be sized to fit the discharge base and the sliding bracket and shall extend upwards from the discharge base to the access hatch cover at the top of the surge basin. An upper guide rail bracket shall be provided and shall be stainless steel.

M. Lifting Cable or Chain: A cable or chain suitable for removing and installing each pump shall be selected and provided by the pump manufacturer. The cable or chain shall be 316 stainless steel. A suitable cable or chain hook shall be provided at the top of the surge basin.

N. Access Hatch Cover: Each access hatch cover shall be provided by the pump manufacturer. Each cover all be of all aluminum construction and suitable for a live load of 150 pounds per square foot. The cover shall be a double leaf type constructed of structural shapes and reinforced diamond pattern checkered plate. Structural shapes and plates shall have a thickness of not less than 1/4 inch. Each leaf shall be provided with two hinges, torsion bars or other device to assist opening, an automatic hold open arm, retractable handle, and a padlock hasp. The frame shall be provided with either strap anchors bolted or welded to the exterior, or a continuous anchor flange. All aluminum surfaces to be in contact with concrete or mortar shall be given a heavy coat of coal tar paint.

1. Each cover shall be provided with a lifting cable or chain hook, a guide rail support bracket, and a support bracket for the level control float cables.

**2.04** CONTROLS

A. Liquid Level Sensor: The sump shall be equipped with a Multi-Stage Level Sensing Device or a Level transmitter designed to detect level of the waste water for pump control and liquid level display. The Multi-Stage Level Sensing Device shall be PVC injected to seal the unit and prevent any moisture from entering any of the sensor units. Each sensor on the probe shall be rotated 90 degrees horizontally from the previous sensor along the probe length to eliminate tracking between sensors. Level sensing probes shall be pressure injected with an epoxy resin at final assembly to encapsulate all internal components and connections, thereby creating a rigid, sealed, homogeneous unit. Two wires shall be included within the length of the probe and shall be connected to each other at the bottom of the probe. When the wires are connected to the Pump station Controller, the connection shall provide fail-safe monitoring of the probe cable and the probe assembly.The flexible cable used for the Level Sensing Probe shall be comprised of PVC/PVC multi-conductor construction with a common oversheath that is water and oil resistant. The multi-conductor cable shall be identified with numbering and text along the entire length of the outer sheath at required intervals. The Level transmitter shall measure the relative pressure with a ceramic diaphragm and be approved acc. EN

61000-6-2, EN 61000-6-3, EN 61326-1. It shall be insulated > 100 MΩ at 500 V DC and the sensor body shall be made of Ryton PPS. All sensors installed in the sump shall be approved for explosive areas according UL Class 1, 2 and 3 Division 1 Group A-D T4/T5/T6. Cables shall be secured to the top of probe bodies by synthetic rubber compression fittings for strain relief. The cable shall be rated to physically support the combined weight of the sensor and long enough to reach to reach the cable connection box. The mounting bracket shall be by stainless steel and include a wiper device that allows maintenance personnel to clean the level sensing probe when necessary.

B. Pump Controls: Pumps No. 1 and No. 2 shall operate in an automatic dual-simplex mode alternating lead pump and lag pump. Standby pump shall start and lead pump shall stop if liquid level rises to standby pump on elevation. All controls shall be mounted in a NEMA 4X enclosure mounted on Unitstrut metal channel framing adjacent to the pump station. Float switch operation shall provide the following functions during rising and falling levels in wetwell:

1. Low level shut-off and alarm shutdown of all pumps.
2. Normal low-level pump off. (Pumps No. 1 and No. 2.)
3. Lead pump start.
4. Lag pump start at high level. (Pumps No. 1 and No. 2)
5. High liquid level alarm.

C. Operation: Systems design shall provide that pumps No. 1 and No. 2 shall alternate as lead and lag pumps at normal low-level pump off elevation. When pump failure should occur, operation shall automatically start the opposite pump immediately and at the same speed as the failed pump. The lag pump shall operate as lead pump until failed pump has been repaired and placed back in service. Failure of either pump shall be indicated by a light on the control panel indicating the problem and energizing the flashing alarm.

1. Branch Circuit Disconnects:
    a. Disconnect Switches: A thermal magnetic air circuit breaker for each pump motor shall be adequately sized to meet the pump motor operating conditions and sealed by the manufacturer after calibration to prevent tampering. A mechanical disconnect mechanism shall be installed on each circuit breaker as a means of disconnecting power to the pump motors. The disconnect mechanism operator handles shall be lockable, located on the exterior of the control enclosure and permit the door to open only when the circuit breakers are in the "OFF" position.
2. Station Optimization: The following station optimization features shall be pre-configured:
    a. Fat buildup minimization feature that uses a random lead pump start delay timer. The timer shall be initially set to 60 seconds.
    b. A sump and pipe cleaning function that will run the CPS to the snore point based on an operator configurable number of pump cycles. The number of cycles shall be initially set to 11.
    c. The system shall automatically detect a blockage and automatically clear the blockage. The station controller shall monitor the status and annunciate an alarm should the blockage not be cleared.
    d. The station controller shall have an energy minimizer function that minimizes the amount of energy used per pumping cycle.
    e. Integrated data logger with:
        i. Capacity for recording up to 4,000 events and ability to download events to a USB storage device

f. Faults on the controller shall be configurable for:
   i. Acknowledgement Required
   ii. Three (3) levels of priority
   iii. Automatically resetting fault

3. Overload Protection: The system shall monitor motor current and shall trip in the event that the motor current at the rated voltage exceeds the setpoint. The System shall monitor temperature of the motor, power level, and speed.

4. Pump Motor Protection: The pump control panel shall be equipped to terminate pump operation due to high motor winding temperature or moisture in the motor housing and shall utilize the contacts in the pump motor. If either event should occur, the motor cease to operate and an indicator, visible on the inner door and pilot light visible on the outer door, shall indicate the pump motor has been shut down due to thermal overload or moisture. The pump motor shall automatically reset when the condition has been corrected. Manual reset shall be required on Critical Faults.

5. Phase Monitor: The control panel shall be equipped to monitor the incoming power and shut down the pump when required to protect the motor(s) from damage caused by phase reversal, phase loss, voltage unbalance greater than 5% or voltage less than 83% of nominal. A time delay shall be provided to minimize nuisance trips. The motor(s) shall automatically restart when power conditions return to normal.

6. Secondary Surge Arrester: 480VAC three phase surge suppression device shall be installed in line with the supply voltage with the following features:
   a. Each input shall have a nominal AC operating voltage of 240V for 240V supply or 277V for 480V supply
   b. Meet UL 1449 4$^{th}$ edition requirements
   c. Meet IEC 61643-11 requirements
   d. Response time <1ms
   e. Nominal discharge current: 20kA 8/20 µs
   f. Maximum discharge current: 50kA 8/20 µs
   g. Maximum surge capacity: 60kA 8/20 µs
   h. Voltage protection rating: 1000V (240V) or 1500V (480V)
   i. Voltage protection level: 1300V (240V) or 1700V (480V)
   j. Residual voltage at 10kA (8/20 µs): 1395V
   k. Operating frequency range: 0-500Hz
   l. Operating temperature: -40ºC to +85ºC

7. Pump Start Delay: The control circuit for one of the pumps shall be equipped with a time delay to prevent simultaneous motor starts following a power outage. The time delay shall be a solid state fixed 5 second on-delay device.

8. High Liquid Level Alarm and Silencer: In the event the high liquid alarm level in the wetwell is reached, a signal relay equipped with one set of normally open (N.O.) contacts shall be energized, the N.O. controls shall then close and complete a 115 volt AC circuit for the external alarm signal devices. The signal relay shall include an indicator visible on the front of the control enclosure and shall maintain the alarm signal until manually reset. The external signal devices shall be silenced by a momentary actuation of the alarm silence switch which shall energize an alarm silence relay. After lowering the high liquid level and manually resetting the signal relay, the alarm silence relay shall drop out, requiring no further attention by the operator.

9. Low Liquid Level Alarm and Silencer: In the event the liquid level in the wetwell is reduced to a minimum depth of 12 inches, a low liquid level alarm shall be activated. Upon activation, a signal relay equipped with one set of normally open (N.O.) contacts shall be energized, the N.O. controls shall then close and complete a 115 volt AC circuit for the external alarm signal devices. The signal relay shall include an indicator visible on the front of the control enclosure and shall maintain the alarm signal until manually reset. The external signal devices shall be silenced by a momentary actuation of the alarm silence switch which shall energize an alarm silence relay. After raising the low liquid level and manually resetting the signal relay, the alarm silence relay shall drop out, requiring no further attention by the operator. The alarm shall not actuate on the $10^{th}$ cycle intentional pump down of the wet well.

10. Pump Run Lights: Each pump motor shall have a pilot light located in the front of the control enclosure which shall illuminate when the motor is running.

11. Elapsed Time Meters: An elapsed time meter for each pump motor shall be mounted in the front of the control enclosure and wired to each motor starter to record total running time of each pump motor in hours and tenths of hours. The elapsed time meter shall be 6-digit, nonresettable.

12. Pump Sequence Selector: A 3-position toggle switch shall be provided which shall override the automatic alternator and provide manual selection of either pump No. 1 or No. 2 as the "lead" pump.

13. Pump Mode Selector: The pump mode selector switch shall be a three (3) position "HAND-OFF-AUTO" type for each pump. In the "AUTO" mode the pump is operated automatically by the controls. In the "OFF" mode the pump will not operate, and in the "HAND" mode the pump will operate continuously without regard to automatic controls.

14. Enclosures: All controls shall be mounted in a NEMA 4X watertight enclosure.

    a. Receptacle: A duplex ground fault indicating utility receptacle providing 115 VAC, 60 Hertz, single phase current, shall be mounted through the inner swing panel of the control enclosure. Receptacle circuit shall be protected by a 15 ampere thermal-magnetic circuit breaker.

    b. Panel Heater: The control panel shall be equipped with a panel heater to minimize the effects of humidity and condensation. The heater shall include a thermostat.

    c. Auxiliary Power Transformer: The pump control panel shall be equipped with a 500 KV stepdown transformer to supply 115 volt, AC, single phase for the control and auxiliary. The primary side of the transformer shall be protected by a thermal magnetic air circuit breaker, specifically sized to meet the power requirements of the transformer. A mechanical operating mechanism shall be installed on the circuit breaker to provide a means of disconnecting power to the transformer. The operator handle for the mechanism shall be located on the exterior of the control panel, with interlocks which permit the door to be opened only when the circuit breaker is in the “OFF” position.

15. Alarm Light: The alarm light shall be 115 volt AC, 100 watt, vaportight type with a red

globe, guard and mounting hardware. The alarm light shall be located and wired as shown on the drawings. The alarm light circuit shall be equipped with a repeat cycle timer causing the alarm light to flash at approximately 1 second cycles (½ second on and off).

**2.05** BALANCE

A. All rotating parts shall be accurately machined and shall be in as nearly perfect rotational balance as practicable. Excessive vibration shall be sufficient cause for rejection of the equipment. The mass of the unit and its distribution shall be such that resonance at normal operating speeds is avoided. In any case, the vibration displacement (peak-to-peak) as measured at any point on the machine shall not exceed 4.0 mils.

B. At any operating speed, the ratio of rotative speed to the critical speed of a unit or components thereof shall be less than 0.8 or more than 1.3.

**2.06** ELECTRIC MOTORS

A. The motor and the pump control system shall receive sufficient cooling from the pumped liquid to operate the pump at continuous duty in a liquid with a temperature with 104°F. Operational restrictions on the liquid temperature below 104°F or the demand of auxiliary cooling systems like fans or blowers are not acceptable. The Stator shall be inverter duty rated in accordance with NEMA MG1, Part 31 and be insulated according class H (356°F).

B. Motor, pump and control system shall be designed and supplied by the pump manufacturer.

C. The control system shall continuously monitor the leakage sensor in the stator housing and the temperature of the motor. It shall be impossible to overload the motor. If the motor temperature is too high, the pump shall continue to operate at reduced power until conditions are normalized. External trips or overload devices for motor protection shall not be required.

D. 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.

E. The pump shall incorporate a “pump-cleaning” function to remove debris from the impeller. The cleaning function shall be initiated when the integral control system senses an increase in current draw due to debris in the pump. 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, the pump shall resume to automatic operation. If the pump impeller/volute does not clear itself after the programmed number of attempts, the control shall initiate and alarm to notify that the pump inlet / volute is blocked by large debris.

F. It shall be possible to access and adjust the pump system with a Human Machine Interface (HMI) ranging from basic monochrome displays to full-color touch screen units and smartphone or tablet. It shall enable the operator to view and control entire pump system and logged operational data like number of starts, avoided clogging instances, pump run-time, motor power, motor current, power factor, temperature, pump leakage etc.

A. Each pump motor shall be provided with a shielded cable suitable for submersible pump applications; this shall be indicated by a code or legend permanently embossed on the cable. The cable shall be not less than 50 feet in length. Cable sizing shall conform to NEC requirements.

B. The cable entry water seal design shall be such that a specific fastener torque is not required to ensure a watertight and submersible seal. The use of epoxies, silicones, or other secondary sealing systems will not be acceptable. The cable entry junction box and motor shall be separated by a stator lead sealing gland or terminal board. The junction box shall isolate the motor interior from moisture gaining access through the top of the stator housing or a separate moisture sensing device shall be provided in the stator housing.

**2.07** SPARE PARTS -

A. A complete set of seals, O-rings, gaskets, and one spare mechanical seal set, consisting of an upper and lower seal, shall be furnished for each pump.

B. Stipulations, with labels indicating the contents of each package. Spare parts shall be delivered to the Owner as directed.

**2.08** PAINTING

A. 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. Stainless Steel parts shall not require coatings.

**PART 3** EXECUTION

**3.01** INSTALLATION

A. Each discharge base shall be leveled, plumbed, aligned, and wedged into position to fit connecting piping. Installation procedures shall be as recommended by the pump manufacturer and the Hydraulic Institute Standards. Grouting shall be as specified in the grouting section.

B. Anchor bolts shall be accurately located and centered in pipe sleeves having an inside diameter approximately 2-1/2 times the bolt diameter and with a length approximately 8 times the bolt diameter.

**3.02** 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.

**3.03** 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.

- Notice to Proceed is issued.
- It is advised that the Subcontractor begin coordination efforts with MLG&W for electrical improvements as early as possible in the contract period.
- Within two weeks, forward major equipment submittals to Purchaser.
- Purchaser will review equipment submittals and, barring any major deficiencies, will return submittals within ten (10) days.
- 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.
- 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.
- 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.
- 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.
- Substantial Completion is achieved, per station.
- Within 30 days of Substantial Completion, Final Completion is achieved, per station. The Final Completion letter from the Purchaser is issued.

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 Station

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 with the Contract Documents. This includes all excavation and backfill, pumps, control panel, concrete pad, sidewalk improvements, electrical improvements, conduit, supports, generator docking station, transfer switch, level transducer, back up float switches, suction elbow assembly with floor stand, sump pump, dry pit piping, valve replacement, 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. At Substantial Completion, the Subcontractor may claim 85% of the value of the lump sum line item on its next payment request, under the condition that all requirements of Substantial Completion are met.

D. At Final Completion, the Subcontractor may claim 100% of the value of the lump sum line item on its next payment request, under the condition that all requirements of Final Completion are met.

**END OF SECTION**

**SECTION 11310**
**RAW WASTEWATER PUMPS**

## PART 1 - GENERAL

### 1.01. DESCRIPTION

The General Contractor shall furnish, install, test and place in satisfactory operation, as shown on the Plans and specified, wet-pit submersible pump(s) complete with all appurtenances, accessories, and spare parts as will be required to produce a complete and workable installation.

### 1.02. RELATED WORK SPECIFIED ELSEWHERE

NA

### 1.03. SUBMITTALS

A. Data to be submitted

A. The Contractor shall submit pump curves for the units which he proposes to supply, showing Total Dynamic Head, Pump Efficiency, Brake Horsepower, Power Input to Electric Drive Motor of Pumping Unit for the various conditions under which the units are to operate along with descriptive data and specifications describing in detail the construction of the complete units.

B. The manufacturer shall have a minimum of five installations of similar size pump and motor combinations to those being furnished for this project. Installations must be in operation for a minimum of five years.

B. Dimensional Data

The successful bidder shall submit to the Engineer for approval, shop drawings, showing all weights and dimensions necessary for the installation of foundations, anchor bolts, piping and valve connections.

## PART 2 - MATERIALS

### 2.01. MANUFACTURERS

A. Manufacturer

Sewage pumps shall be manufactured by Wilo USA LLC or pre-approved equal.

Any pump manufacturer, other than specified, proposing to offer the following equipment must submit sufficient information to the Engineer to determine that the equipment complies with the requirements of the Contract Documents. This information must be received by the Engineer not less than 14 days prior to the Bid Date. The Engineer will issue an addendum prior to the bid date that lists any pre-approved equipment. Contractors and manufacturers are advised that a manufacturer named as an approved supplier is not excused from meeting all technical and performance requirements of this specification. The pre-bid qualification package shall include complete pump performance data, evidence of compliance with the installation experience requirements of this Section and a letter from an officer of the company of the pump manufacturer listing all exceptions to the specifications.

B. Pump Performance:

Each pump shall be capable of the following performance:

| | |
|---|---|
| **Model** | Wilo FA |
| **Service** | EMU FA10.51E; FK17.1-4/16K-Ex |
| **Quantity** | 2 |
| **Duty Point Flow**, gallons per minute | 275 |
| **Duty Point Total Dynamic Head**, feet | 40 |
| **Minimum Hydraulic Efficiency at Duty Point**, % | |
| **Maximum NPSH-R at Duty Point**, feet | |
| **Maximum Rated Motor Power**, horsepower | 10.2 |
| **Maximum Motor Speed**, revolutions per minute | 1730 |
| **Motor voltage**, volts | 230 / 3 Phase |
| **Minimum Shut-off Pressure**, feet | |
| **Secondary Rating Point Flow, gallons per minute** | |
| **Secondary Rating Point Total Dynamic Head, feet** | |
| **Minimum Hydraulic Efficiency at Secondary Rating Point, %** | |
| **Minimum Discharge Size,** inches | 4 |
| **Minimum Pump Base Suction Intake Size**, inches | 4 |

## 2.02. PUMP CONSTRUCTION

A. General

The sewage pumping units shall be vertical, non-clogging, centrifugal sewage pumps with bottom inlet and side discharge. The pumps shall be direct driven by integral squirrel cage, electric induction motors. Each pump shall include quick removal system, anchor bolts and all accessories specified herein.

B. Volute

A. The volute shall be constructed of ASTM A48 Class 35B (GG25) or higher cast iron capable of prolonged resistance to raw sewage.

B. Suction and discharge flanges shall be 125# and meet ANSI standard B16.1.

C. All nuts, bolts, washers, and other fastening devices supplied with the pumps shall be stainless steel.

D. All mating surfaces requiring a watertight seal shall be machined and fitted with FPM (Viton) O-rings. Paper gaskets are not acceptable.

C. Impeller

A. Pump impellers shall be of the solids handling non-clog type. The impeller vane shall be smooth, finished throughout, and shall be free from sharp edges.

B. Pump impellers shall be manufactured from ASTM A48 Class 35B (GG25) or higher cast iron.

C. Impellers shall be key driven and securely held to the shaft by a streamlined impeller washer and bolt assembly specifically designed to reduce friction in the suction eye of the impeller. The arrangement shall be such that the impeller cannot unscrew or be loosened by torque

from either forward or reverse rotation. Designs based on threaded connection between pump shaft and impeller will not be considered.

D. The impeller shall be capable of passing a 3-inch solid non-deformable sphere. Designs that cannot pass a sphere through the impeller or rely on deforming, cutting, or chopping solid materials shall not be acceptable.

D. Wear Rings

A. The impeller shall be provided with an AISI 329 (1.4462) duplex stainless steel wear ring that is drive fitted to the suction eye of the impeller.

B. The casing shall be provided with an AISI 304 (1.4308) stainless steel wear ring that is drive fitted to the bottom suction inlet.

**2.03. MOTORS**

A. Submersible Motors

A. Each pump shall be furnished with a squirrel cage, induction motor enclosed in a watertight housing suitable for use and compatible with all variable frequency drive systems.

B. The motor shall be suitable for dry pit or wet pit installation under full load conditions. Motors shall be certified for variable frequency drive systems without de-rating the motor output power. The motors shall be capable of installation in either the wet pit or dry pit installation without adding or removing any items to the motor's interior or exterior.

C. The motor shall be oil-filled and constructed with moisture resistant NEMA Class H insulation and Class H slot liners and constructed to NEMA B design standards. The copper wound stator shall be dipped in epoxy enamel and hardened to withstand a temperature of 180 °C for Class H as defined in NEMA Standard MG-1. Each winding phase or layer shall be laced with Class H glass lined paper. The use of cable ties to restrain windings shall not be allowed. The rotor shall be statically and dynamically balanced after fabrication. The rotor shall utilize aluminum amortisseur bars and short circuit rings. The motor shall be certified for continuous duty with a service factor of 1.10 and shall be non-overloading over the entire allowable operating range of the impeller.

D. The motor shall be capable of sustaining 15 starts per hour (unlimited starts with VFD) at a minimum ambient temperature of 40°C.

E. The motor shall be capable of uninterrupted operation with a voltage drop of 10%.

F. The power cables entering the motor housing shall connect to individual terminal pins, which separates the incoming service from the pump motor.

G. The motor shall be cooled via the internally circulated oil by means of a pump/motor shaft mounted oil circulation impeller. The oil/coolant impeller shall be mounted above the upper mechanical seal. Systems that utilize a coolant impeller mounted between the upper and lower mechanical seals shall not be acceptable. The motor/pump oil circulation impeller shall cause the oil to move through and around the stator windings and motor rotor from which it picks up heat. This heat is then directed into the motor heat exchanger that transfers the heat to the pumped liquid. The heat exchanger shall be located below the sealing chamber. It shall be provided with a labyrinth design channel system such that a minimum of 85% of the heat generated by the motor must be conducted through the heat exchanger to the pumped liquid. Cooling systems requiring a separate, clean water source or that circulates

the pumped sewage through a cooling jacket will not be accepted.

H. The motor shall bear the Factory Mutual (FM) explosion-proof label certifying its use in a Class 1, Division 1, Groups C & D hazardous location.

I. Thermal switches shall be furnished to monitor stator temperatures. The stator shall be equipped with two (2) thermal switches. Thermal switches shall automatically de-energize the motor when its temperature exceeds a preset limit as recommended by the manufacturer.

J. The pump manufacturer's nameplates shall be engraved, laser etched, or stamped on stainless steel and fastened to the motor casing.

B. Shafts

A. All shafts shall be dynamically balanced and shall be constructed of AISI 420 (1.4021) stainless steel. Carbon steel shafts or shafts with sleeves of any type are not acceptable. The shaft shall be one-piece construction without joints or stubs attached.

B. Multiple row lower bearings for axial thrust and a single row upper bearing for radial thrust shall support the motor/pump shafts. Thrust bearings shall be restrained from thrust in both directions. Designs that do not protect the pump/motor from thrust in reverse directions shall not be acceptable.

C. Bearings shall be sealed and grease lubricated.

D. Minimum shaft diameter shall be 1.375-in at the lowest bearing.

E. Shaft stiffness ratio $L^3/D^4$ shall not exceed 10.

C. Mechanical Seals

A. Each pump shall be provided with double mechanical seals with the seal housing constructed of AISI 420 series (1.4028) stainless steel and the spring system constructed of AISI 301 series (1.4310) stainless steel. The block seal housing shall be constructed such that it can be dismantled allowing the seal faces and springs to be renewed and the seal system to be placed back into service. Cartridge seals constructed such that they cannot be repaired or renewed shall not be acceptable. Both upper and lower seal faces shall be silicon carbide versus silicon carbide.

B. The seal shall be mounted in a separate and isolated seal chamber. The seal chamber shall be filled with non-conductive lubricating oil as recommended by the manufacturer.

C. A moisture sensor shall be furnished to sense moisture intrusion for each pump. This sensor shall be wired to the Pump Control Panel (specified in Division ___) and shall activate an alarm light upon moisture intrusion. The sensor probe shall be mounted in the seal chamber and shall be of the conductive type, sensing moisture intrusion above the lower seal, but below the upper seal. Designs that sense moisture intrusion above the upper seal using a float switch are not acceptable.

D. Power and Control Cables

A. Power and control cables shall be furnished in lengths to run un-spliced from the pump to the pump control panel as shown on the Contract Drawings and as specified herein (40-ft). Cables shall terminate with conductor sleeves that bundle the entire group of strands of each phase to improve termination at the pump control panel. The sleeves shall be provided to

confirm that all strands of each conductor are terminated properly. Termination shall be coordinated with the connection to the Pump Control Panel.

B. Cables shall be of the "NSSHOU" type and shall be approved by the MSHA for use in hazardous locations and shall conform to industry standards for loads, resistance under submersion against sewage, and be of stranded construction. The cables shall enter the pump through a heavy-duty galvanized cast iron entry assembly that shall be provided with an external clamp assembly to protect against tension once secured providing a strain relief function as part of standard construction.

C. The cables for each pump shall pass through the galvanized cast iron strain relief component and then through a series of stainless steel disks and Buna-n grommet that is sandwiched between the disks to control compression of the grommet. These components shall work to compress the cable jacket by the inner diameter of the grommet while the outer diameter of the grommet seals against the inside surface of the cable entry chamber in the top of the motor.

**2.04. CONTROLS**

A. Controls

The Control system shall be an Adgo Inc. Pump control panel or pre-approved equal. Pump supplier shall supply the control system (including Variable Frequency Drives as required). The Pump control system shall consist of pressure transducer, PLC controlled system, a minimum 7” HMI, with float backups as shown on contract drawings.

The control package shall have the ability to measure level via 4-20mA level sensor and very the speed of the pumps based upon operator adjustable setpoints. In addition to the level control settings the pumps shall alternate via an operator selectable method of time, each start/stop, or via the least runtime.

The pump control system shall operate off of a float backup system in the event of a failure of the PLC, HMI, or level sensor.

B. PLC

The PLC shall be and Allen Bradley - CompactLogix, Programmable Automation Controller with the appropriate amount of I/O as indicated on the drawings.

A. The programmable automation controller (PAC) shall be an embedded I/O design, with expansion capability. The available expansion shall be local I/O modules or distributed (remote) I/O connected through a network.
   1. A single local chassis shall house CPU, memory, embedded digital I/O, communications interface options and power supply.
   2. The PAC shall be DIN rail or panel mounted.
   3. All system modules, and local and remote chassis shall be designed to operate in:
      a) An industrial environment with an ambient temperature of 0° to 60°C (32° to 140°F), and with a relative humidity range of 5% to 95%, non-condensing.
      b) A free airflow environment (convection cooling only, no fans or other air moving devices shall be required).
      c) Conformal coating of the PAC shall be offered as an option for use in corrosive/hazardous applications.
   4. All system modules, and local and remote chassis shall be designed and tested to operate in high electrical noise environments.

B. The system shall support up to 4 local expansion modules.
   1. Local expansion modules shall be installed to the right of the embedded I/O modules.
   2. The local expansion modules shall mechanically lock together by means of a tongue and groove design and have an integrated communication bus that is connected from module to module by a movable bus connector.
   3. Each module shall have a built-in removable terminal block behind a door at the front of the module with a finger-safe cover. I/O wiring shall be routed from beneath the module to I/O sensors and actuators.
   4. The manufacturer shall have available a variety of I/O modules, including AC digital, DC digital, contact output, analog, RTD, thermocouple and high-speed counter.

C. The CPU shall be a self-contained unit, and will be capable of providing control program execution, supporting remote and local programming, controlling all I/O scanning and inter-controller and peripheral communication and diagnostic functions.
   1. 32 tasks (100 programs per task):
      a) Continuous – 1 allowed.
      b) Periodic – Run via an interrupt at a user-defined interval in 1 µs increments from 1 ms to 2000 s.
      c) Event – Triggered by consumed tag or EVENT instruction.
   2. 256 controller connections
   3. Network connections:
      a) 256 EtherNet/IP
      b) 120 TCP

D. The PAC shall organize user applications as tasks, which can be specified as continuous, periodic or event based. Tasks can be triggered by input point or instruction.

E. Programming instructions shall include the following:
   1. Relay-Type (bit)
   2. High-Speed Counter
   3. Counter and Timer
   4. Data Comparison (for example: Equal, Greater than or Equal, Less than or Equal)
   5. Data Manipulation (for example: Copy, Move)
   6. Logical (for example: And, Not, Or)
   7. Integer and Floating Point Math (for example: Add, Subtract, Multiply, Log 10)
   8. Advanced Math and Trigonometric Functions (for example Sine, Cosine, Tangent)
   9. Statistical
   10. Matrix and Array (for example: COP, CSP, FIFO)
   11. BCD Conversion
   12. Program Flow Control (for example: Jump, Subroutine)
   13. Application Specific (for example: Sequencer)
   14. Diagnostic
   15. Communication
   16. Recipe
   17. Proportional Integral and Derivative (PID)
   18. Block Read and Write
   19. Immediate I/O and Communication Update

F. The system must be capable of storing the following data:
   1. External Output Status
   2. External Input Status
   3. Timer Values
   4. Counter Values
   5. Boolean Values (0 or 1)
   6. Short Integer Numbers (-128 to 127)

7. Integer Numbers (-32,768 to 32,767)
8. Double Integer Numbers (-2,147,483,648 to 2,147,483,647)
9. Floating Point Numbers to 8 significant digits (for 8+ digits, conversion to exponential form from ±1.1754944 E -38 to ±3.402823 E +38)
10. Long Integer Numbers (-9,223,372,036,854,775,808 to 9,223,372,036,854,775,807)
11. Internal Processor Status Information
12. Data shall be distinguishable to the CPU by address and sub-element mnemonic.
13. Management of the data into memory subsections shall be an automatic function of the CPU operating system.
14. Data can be displayed in ASCII, Binary, Octal, Hexadecimal or Decimal.
15. Function-specific data such as PID, Axis, Axis Group or Message shall have dedicated displays available that annotate the meaning of specific control bits and words within them and allow for selective control where appropriate.

G. The front of the CPU shall have a USB port.

H. The front of the CPU shall have an integrated latching mechanism for securing the Secure Digital (SD) memory card. The PAC shall operate with the memory card removed.

I. The CPU shall have a Real Time Clock.

J. The processor module shall have green, red and yellow LED indicators with sequences for OK (module status), Force, Run, SD, I/O (I/O status), NS (network status), Link 1 and Link 2 (EtherNet/IP port status).

K. The processor module shall have mode switch positions for Remote, Program and Run.

C. HMI

The HMI Shall be an Allen-Bradley, Model 2715P Panelview 5510 minimum of 7”

A. The operator interface terminal shall combine the display, logic communication, and power into one base unit in a fixed hardware configuration.

B. The operator interface terminal shall be designed to be mounted in space required for similar PanelView models with 7-inch to 19-inch display sizes.

C. The operator interface terminal shall be designed for the following environmental parameters:
1. Operating temperature range of 0 to 55 °C (32 to 131 °F) [19-inch models to 50 °C (122 °F)].
2. Non-operating temperature range of -25 to +70 °C (-13 to 158 °F).
3. Humidity range of 5 to 95% non-condensing.

D. The operator interface terminal shall operate on power input of 18 to 30 VDC.

E. The operator interface terminal shall be provided with clamps for installing the display in the enclosure’s cutout. The clamps shall compress the bezel gasket to form a permanent seal against the panel.

F. The operator interface terminal shall be designed to provide free air flow convection cooling without a fan.

G. At a minimum the HMI shall have the following screens: Overview of Pump/Lift Station, Maintenance, Setpoint screen, VFD configuration screens. Manual pump operation, and Elapsed Time Meters.

D. Level Sensor

The level sensor shall be a Submersible level transducer. The sensor shall be suitable for Water and Wastewater applications. The level transducer shall be manufactured by KPSI, Endress Hauser, Rosemount, or engineer approved equal.

E. GENERATOR AND TRANSFER SWITCH

The control panel shall be equipped with a generator docking station with integrated transfer switch, Trystar TMTS or equal with male cam-lock connectors. Generator connection box shall be provided with engraved identification plaque (red with white letters) with voltage and phase configuration of station as indicated. Letters to be 3" in height. Nameplate screwed to box using stainless steel screws.

**2.05. REMOVAL SYSTEM**

A. General Description

The removal system shall consist of a discharge base elbow that mounts in the bottom of the wet pit, a replaceable pump coupling, guide pipes and supports and hardware as required for a complete and operational system. Connections to piping shall be standard ANSI flanges.

B. Discharge Base Elbow

The ASTM A48 Class 30B or higher cast iron discharge base elbow shall be provided to support the full weight of the submersible pump in the installation and provide a leak proof connection in which the pump coupling mates using a conformed Buna-N seal that is held in place by the combined weight of the cantilevered pump and motor. The hydraulic pressure generated while the pump is in operation also aids the sealing. The discharge base elbow shall be provided guide pipe retention lugs.

C. Pump Coupling

The pump coupling shall be close-grained gray cast iron construction. The coupling shall be located between the pump discharge flange and the vertical face of the discharge base. The purpose of the coupling shall be to allow use of a standard ANSI drilled pump-casing flange on the pump. The coupling acts as the intermediate part between the pump and the discharge base. The coupling vertical face is designed to seal against the vertical face of the discharge base using a replaceable Buna-N elastomeric compressible one-piece seal that acts as both the discharge face seal and the gasket between the coupling and the pump flange. Wet pit installation designs that utilize the flat face of the pump flange to seal against the discharge base are not allowed.

D. Guide Rails

AISI 304 stainless steel guide rails supported by upper (and intermediate, if required) brackets of AISI 316 stainless steel shall guide each pump. The guide rails shall consist of standard dimension Schedule 10S piping with a minimum diameter of 1.25-in. The guide rails shall be supported by an AISI 316 SS upper guide rail bracket that will be mounted in the opening of the access cover to support and guide the pump/motor into and out of the wet well. Intermediate guide rail brackets shall be provided for all installations deeper than 20-ft.

E. Lifting Device

A lifting chain of 20-ft AISI 316 stainless steel shall be provided for each pump. Additional lifting devices, if required, shall be provided by the supplier of the hoist/crane. The responsibility to

determine compatibility of the lifting chain with the hoist/crane is by the supplier of the hoist/crane.

A lifting chain of 20-ft AISI 316 stainless Steel shall be provided for each pump by the supplier of the hoist/crane.

**2.06. SHOP PAINTING**

A. Primer and Finish Paint - Shop apply to all exterior ferrous surfaces of the pump and motor a single coat (6 – 8 mils DFT) of two-component epoxy. Coating shall be resistant to sewage of normal pH and contain no more than 3.5 pounds per gallon of VOCs.

B. Surface Preparation - Prepare all surfaces to receive coating system. Surfaces must be free from dust, grease, rust, scale, and other coatings.

## PART 3 - EXECUTION

**3.01. WARRANTY**

Municipal-use pumps and motors shall be covered by a limited five (5) year warranty that shall comprise the following terms: The initial year from start-up of the equipment shall be covered 100% for parts and labor. The following years 2 through 5 shall be covered 100% for parts. This warranty shall not be limited by hours of running time or operation from variable speed drives.

**3.02. FIELD QUALITY CONTROL**

A. Field Testing

A. After the installation of the pumps, controls and all appurtenances, and when construction of other units of the pump station will permit, each complete pumping unit will be subject to field tests as specified herein under actual operating conditions.

B. The field tests shall be made by the Contractor under the direct supervision of a qualified factory-trained engineer or manufacturer's representative, and in the presence of, and as directed by the Engineer. The Contractor shall provide, calibrate and install all temporary gauges and meters, shall make necessary tapped holes in the pipes, and install all temporary piping and wiring required for the field tests.

C. The field tests shall determine the head, discharge flow and overall efficiency characteristics of each pumping unit and in addition, shall demonstrate that under all conditions of operation each unit:

Has not been damaged by transportation or installation.
Has been properly installed.
Has no mechanical defect.
Is in proper alignment.
Has been properly connected.
Is free of overheating of any parts.
Is free of all-objectionable vibration and noise.
Is free of overloading of any parts.

### 3.03. SPARE PARTS*

A. The manufacturer shall furnish one set of the following spare parts for each pump model number:

   A. TBD by design engineer

### 3.04. 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.

### 3.05. 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.

- Notice to Proceed is issued.
- It is advised that the Subcontractor begin coordination efforts with MLG&W for electrical improvements as early as possible in the contract period.
- Within two weeks, forward major equipment submittals to Purchaser.
- Purchaser will review equipment submittals and, barring any major deficiencies, will return submittals within ten (10) days.
- 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.
- 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.
- 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.
- 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.
- Substantial Completion is achieved, per station.
- Within 30 days of Substantial Completion, Final Completion is achieved, per station. The Final Completion letter from the Purchaser is issued.

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 STATION

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 with the Contract Documents. This includes all excavation and backfill, pumps, control panel, concrete pad, sidewalk improvements, electrical improvements, conduit, supports, generator docking station, transfer switch, level transducer, back up float switches, suction elbow assembly with floor stand, sump pump, dry pit piping, valve replacement, 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. At Substantial Completion, the Subcontractor may claim 85% of the value of the lump sum line item on its next payment request, under the condition that all requirements of Substantial Completion are met.

D. At Final Completion, the Subcontractor may claim 100% of the value of the lump sum line item on its next payment request, under the condition that all requirements of Final Completion are met.

**END OF SECTION**