CITY OF TORRANCE, CALIFORNIA

ADDENDUM NO. 1
Issued: October 24, 2016

TO

PROPOSAL, SPECIFICATIONS, BOND AND AFFIDAVIT FOR THE CONSTRUCTION OF

AMIE BASIN PUMP STATION UPGRADES, I-132
B2016-55

Please note the following changes and/or additions to the Bidder's Submittal, Plans and/or Specifications for the project indicated above. The bidder shall execute the Certification at the end of this addendum, and shall **attach this addendum to the Contract Documents submitted with the Bid**. In addition, the bidder shall complete and submit the "Acknowledgment of Addenda Received" Form provided in Section C of the Specifications.

1. **Refer to Section E, Special Provisions, Section 315, Page 49:**

Delete Section 315 – PUMP STATION in its entirety and replace with the following:

SECTION 315 - PUMP STATION

315-1 GENERAL.

315-1.1 Section Includes.

A. Site assembled:
   1. Pumps and mountings;
   2. Control panel;
   3. Miscellaneous Piping/Valves/Fittings integral to pumping station;
   4. Pumping station O&M manual and on-site training.

315-1.2 Action Submittals.

A. Name, Address, and Phone Number of Pump supplier as defined in Section 2.1 below;
B. Product Data: Provide manufacturer's technical data including pump capacities and operating characteristics;
C. Pump Performance Curves;
D. Shop Drawings: Show installation details in existing wet well and valve vault.

315-1.3 Closeout Submittals.

A. Field Reports: Provide quality-control test reports documenting each pumps operation performance;
B. Operation and Maintenance Manual: Include approved submittals and schedule for maintenance requirements. Six (6) hard copies in 3-ring binders and one electronic copy on a flash drive shall be provided.

315-1.4 Quality Assurance.

A. Manufacturer Qualifications: NPCA-certified plant, with experience and demonstrated capability to produce work specified in this Section;
B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

315-1.5 Warranty.

A. Manufacturer's Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components supplied and installed under this contract, that fail in materials or workmanship within specified warranty period;
   1. Failures include, but are not limited to, the following:
      a. Faulty operation of pumps, controls, or pumping and piping system accessories;
      b. Deterioration of metals, metal finishes, and other materials beyond normal use;
   2. Warranty Period for Pumps: One year from date of Substantial Completion;

   3. Warranty Period for Control Panel: One year from date of Substantial Completion.

315-1.6 Field Verification

A. Contractor shall de-water and clean the vaults and field verify all existing conditions and dimensions in the existing wet well and valve vault prior to preparing shop drawings.

315-2 PRODUCTS.

315.2.1 Manufacturer.

See paragraphs 315.2.51 and 315.2.5.2 below

The pump supplier must supply a complete pump system including all of the following:
1. A full submittal package including all parts;
2. A 1-year full system warranty for the entire system that supersedes all vendor warranties;
3. Day of start-up testing provided by an employee of the supplier;
4. A start-up report;
5. Operating and Maintenance manuals for the entire system (2 hard copies and 1 electronic copy);
6. Training on operation and maintenance of the system by an employee of the supplier;
7. All parts including pumps with auto-coupling system, piping within the wet well and the valve vault, valves, and control panel.

315.2.5 Wet-Well Accessories.

A. Guide Rail Assembly: Dual guide rail assembly, stainless steel, Type 304, with pump guide brackets configured to match requirements of selected pumps. Single guide rail assembly will not be accepted;
B. Flexible Resilient Pipe Connectors: Flexible connector, ASTM C 923;
Liners:
   1. A protective liner shall be used whenever the potential for corrosive attack to the concrete substrate exists;
   2. The liner shall be the Dura Plate 100 liner as manufactured by A-LOK® Products, Inc., Tullytown, PA or approved equal;
   3. The design of the liner shall provide a corrosion protective barrier permanently embedded to the inside well of the structure.
C. Provide all miscellaneous items and appurtenances for a complete and fully operational system.
D. All clamps, bolts and other miscellaneous metal items in both the wet well and valve vault shall be stainless steel.

315.2.5.1 Submersible Wastewater Non Clog Pump 1.

Scope:
Furnish - 1 ABS model XFP250M-CH2 PE1850 submersible non-clog wastewater pump or One (1) WILO model No. FA20.97Z+T42-4/51GEx 8" discharge submersible pump or pre-approved equal.

The ABS pump shall be supplied with a mating cast ten inch discharge connection and be capable of delivering 4,556 U.S. gallons per minute (gpm) at a total dynamic head (TDH) of 141.7-feet with a hydraulic efficiency of 75.4%. An additional point on the same curve shall be 4,338 U.S. gpm at a TDH of 147.6-feet. Shut off head shall be 215-feet (minimum). The Premium efficiency motor shall be an integral part of the pump unit. The motor shall be 248 HP connected for operation on a 460V, 3 phase, 60 Hertz electrical supply service.

The WILO pump shall be capable of delivering 4556 GPM at 141.7' TDH and complete with 50' of power/control cable plus wet pit base elbow. Motor to be air filled, 215 horsepower, 1745 RPM and operate on 480 Volts, 3 Phase, 60 Hertz power supply. The pump motor shall be Class H insulation; NEMA B design for wet pit installation, suitable for operation in a Class 1, Division 1, Groups C & D explosion proof environment and inverter duty capable

Pump is intended for wet pit installation and shall be supplied with a standard cast iron auto-installation guide rail system with an integrated ten-inch discharge elbow. Pump shall be fitted with a stainless steel lifting bail assembly, 15-feet long for lifting pump out of wet well for service or replacement. The working load rating of the lifting system shall be a minimum of 50% greater than the pump weight. Each pump motor shall be equipped with 49 feet of power and control cable sized in accordance with NEC and CSA standards.

B. Pump Design
The heavy duty submersible wastewater pump shall be capable of handling raw unscreened stormwater without clogging. The pump shall be driven by a premium efficiency motor providing the highest levels of operational reliability and energy efficiency.

C. Guide Rail Base Assembly

There shall be no need for personnel to enter the wet well to remove or reinstall the pump(s). In a wet pit installation, the discharge base & elbow assembly shall be permanently installed in the wet well and connected to the discharge piping. In order to prevent binding or separation of the pump from the guide rail system, the pump(s) shall connect to the guide rail base automatically and firmly, guided by one 2 inch guide pipe (two 2 inch pipes are optional) extending from the base elbow to the top of the station. Systems using guide cable in lieu of rigid guide bars or pipes shall not be considered acceptable. The sliding guide bracket shall be a separate part of the pumping unit, capable of being attached to standard ANSI class 125 or metric DN250 pump flanges, so that the pump mounting is nonproprietary, and any pump with a standard discharge flange can be mounted on the base assembly. Base or bracket assemblies with proprietary or non-standard flange dimensions shall not be considered acceptable.

A field replaceable Nitrile (Buna-N) rubber profile gasket or O-ring shall accomplish positive sealing of the pump flange/guide rail bracket to the discharge elbow. Base assemblies which rely solely on metal to metal contact between the pump flange and discharge base elbow as a means of sealing are inherently leak prone, and shall not be considered equal. No portion of the pump shall bear directly on the floor of the sump. The guide rail system shall be available in an optional non-sparking version, approved by Factory Mutual for use in NEC Class 1, Division 1, Group C&D hazardous locations.

D. Pump Construction

Major pump components shall be of gray cast iron, EN-GJL-250 (ASTM A-48, Class 35B) with smooth surfaces devoid of porosity or other irregularities. All exposed fasteners shall be stainless steel 1.4401 (AISI type 316) construction. All metal surfaces coming into contact with the pumped media (other than the stainless steel components) shall be protected by a factory applied spray coating of high solids two part epoxy paint finish on the exterior of the pump. The pump shall be equipped with an open lifting hoop suitable for attachment of standard chain fittings, or for hooking from the wet well surface. The hoop shall ductile cast iron EN-GJS-400-18 (ASTM A536; 60-40-18) with an option of stainless steel 1.4462, and shall be rated to lift a minimum of four times the pump weight.

Sealing design for the pump/motor assembly shall incorporate machined surfaces fitted with Nitrile (Buna-N) rubber O-rings. Sealing will be the result of controlled compression of rubber O-rings in two planes of the sealing interface. Housing interfaces shall meet with metal to metal contact between machined surfaces, and sealing shall be accomplished without requiring a specific torque on the securing fasteners. Rectangular cross sectioned gaskets requiring specific torque limits to achieve compression shall not be considered equal. No secondary sealing compounds shall be required or used.

Impeller:

The channel impeller shall be of gray cast iron, EN-GJL-250 (ASTM A-48, Class 35B).

The impeller shall be of the double shrouded, non-clogging, two vane design, meeting the Ten State Standards requirement for minimum solids passage size of 3 inches. The impeller shall have a slip fit onto the motor shaft and drive key, and shall be securely fastened to the shaft by a stainless steel bolt which is mechanically prevented from loosening by a positively engaged ratcheting washer assembly. The head of the impeller bolt shall be effectively recessed within the impeller bore or supporting washer to prevent disruption of the flow stream and loss of hydraulic efficiency. The impeller shall be dynamically balanced to the ISO 10816 standard to provide smooth vibration free operation. Impeller designs which do not meet the Ten State Standards requirement for

3 inch solids passage size, those that rely on retractable impeller designs to pass 3 inch solids, or those that rely on fins or pins protruding into the suction path to assist in the handling of fibrous material shall not be considered equal.

Wear Ring System:
The ABS Wear Ring System shall have a replaceable wear ring of cast iron EN-GJL-300 (ASTM A48, Class 40) shall be securely fitted into the pump casing (volute). As an option, casing and impeller wear rings constructed of stainless steel shall be available. The optional casing wear ring shall be stainless steel 1.4581 (AISI 318), and the optional impeller wear ring shall be stainless steel 1.4571 (AISI 316Ti).

The WILO pump impeller shall be provided with an AISI 329 (1.4462) duplex stainless steel wear ring which is drive fitted to the suction eye of the impeller. The impeller wear ring shall be hardened to a Brinell hardness of 200-250. The casing shall be provided with an AISI 304 (1.4308) stainless steel wear ring which is drive fitted to the bottom suction inlet. The volute wear ring shall be hardened to a Brinell hardness of 275-325

Pump Volute:
The pump volute shall be single piece gray cast iron, EN-GJL-250 (ASTM A-48, Class 35B) non-concentric design with centerline discharge. Passages shall be smooth and large enough to pass any solids which may enter the impeller. Discharge size shall be as specified on the pump performance curve. The discharge flange design shall permit attachment to standard ANSI or metric flanges/appurtenances. The discharge flange shall be drilled to accept both 10 inch ANSI class 125 and metric DN250 (PN 10) metric flanged fittings. Proprietary or non-standard flange dimensions shall not be considered acceptable. The suction flange shall be integrated into the volute and its bolt holes shall be drilled and threaded to accept standard 10 inch ANSI class 125 flanged fittings. The minimum working pressure of the volute and pump assembly shall be 10 bar (145 psi).

The WILO pump has an 8 inch discharge flange, therefore the Discharge Base Elbow for a WILO pump shall be a custom 8 x 10 Discharge Base Elbow to fit discharge piping.

E. Premium Efficiency Motor
The Premium Efficiency motor shall meet efficiency standards in accordance with IEC 60034-30, level IE3 and NEMA Premium*. Motor rating tests shall be conducted in accordance with IEC 60034-2-1 requirements and shall be certified accurate and correct by a third party certifying agency. A certificate shall be available upon request.
* IE3 and NEMA Premium efficiency levels are equivalent, however the NEMA Premium standard is intended to cover dry installed motors only, not integrated submersible motors.

The Premium Efficiency motor shall be housed in a water tight gray cast iron, EN-GJL-250 (ASTM A-48, Class 35B) enclosure capable of continuous submerged operation underwater to a depth of 20 meters (65 feet), and shall have an IP68 protection rating. The motor shall be of the squirrel-cage induction design, NEMA type B, Premium Efficiency. The copper stator windings shall be insulated with moisture resistant Class H insulation material, rated for 180oC (356oF). The stator shall be press fitted into the stator housing. The use of bolts, pins or other fastening devices requiring penetration of the stator housing is unacceptable. The rotor bars and short circuit rings shall be made of cast aluminum.

The motor shall be designed for continuous duty. The maximum continuous temperature of the pumped liquid shall be 40oC (104oF), and intermittently up to 50oC (122oF). The motor shall be capable of handling up to 12 evenly spaced starts per hour without overheating. The service factor (as defined by the NEMA MG1 standard) shall be 1.1. The motor shall have a voltage tolerance of +/- 10% from nominal, and a phase to phase voltage imbalance tolerance of 1%. The motor shall have a NEMA Class A temperature rise, providing cool operation under all operating conditions. The Premium Efficiency Motor shall be FM and CSA approved for use in NEC Class I, Division I, Groups C & D hazardous locations. The surface temperature rating shall be T3C. The motor shall meet the requirements of NEMA MG1 Part 30 and 31 for operation on PWM type Variable Frequency Drives.

Cooling System:
The factory installed closed loop cooling system shall be adequately designed to allow the motor to run continuously under full load while in an unsubmerged (dry pit) or minimally submerged condition without the need for de-rating or reduced duty cycle.

The ABS pump shall have a cooling jacket shall surround the stator housing, and an environmentally safe non-toxic propylene glycol solution shall be circulated through the jacket by an axial flow circulating impeller attached to the main motor shaft. The coolant shall be pumped through an integrated heat exchanger in the base of the motor whenever the motor is running, allowing excess heat to be transferred to the process liquid.

The WILO pump motors supplied are all T model (air-filled) motors with no integrated cooling jacket thus need process fluid level in the wet pit to cool the motor.

Cooling systems that circulate a toxic cooling liquid shall not be acceptable. The use of external heat exchangers, fans, or the supply of supplemental cooling liquid shall not be required.

Thermal Protection:
Each phase of the motor shall contain a normally closed bi-metallic temperature monitor switch imbedded in the motor windings. These thermal switches shall be connected in series and set to open at 140oC +/- 5oC (284oF). They shall be connected to the control panel to provide a high stator temperature shutdown signal, and are used in conjunction with external motor overload protection. In addition, normally closed bi-metallic temperature switches shall be installed in the upper and lower bearing housings monitor the temperature of the bearings and provide high bearing temperature warning signals. As an option, RTD (PT100) type temperature measuring devices shall be available for the motor winding and bearings to provide actual temperature measurement at these locations. When the RTD option is supplied for the motor winding, bi-metallic switches shall also be supplied in the winding. The bi-metallic system must be connected to the control to provide positive shutdown of the motor in the event of an overheat condition. This is required in order to conform to FM and CSA rules for explosion proof equipment.

Mechanical Seals:
Each pump shall be equipped with a triple seal system consisting of tandem mechanical shaft seals, plus a radial lip seal; providing three complete levels of sealing between the pump wet end and the motor. The mechanical seal system shall consist of two totally independent seal assemblies operating in a lubricant reservoir that hydro-dynamically lubricates the lapped seal faces at a constant rate. The mechanical seals shall be of nonproprietary design, and shall be manufactured by a major independent manufacturer

specializing in the design and manufacture of mechanical seals. The lower, primary seal unit, located between the pump and the lubricant chamber, shall contain one stationary industrial duty solid silicon-carbide seal ring and one rotating industrial duty solid silicon-carbide seal ring. The stationary ring of the primary seal shall be installed in a seal holding plate of gray cast iron EN-GJL-250 (ASTM A-48, Class 35B). The seal holding plate shall be equipped with swirl disruption ribs to prevent abrasive material from prematurely wearing the seal plate. The upper, secondary seal unit, located between the lubricant chamber and the sensing chamber, shall contain one stationary industrial duty solid silicon-carbide seal ring, and one rotating one rotating industrial duty solid silicon-carbide seal ring. Each seal interface shall be held in contact by its own spring system. A radial lip seal shall be positioned above the sensing chamber, preventing any liquid which accumulates in the sensing chamber from entering the lower bearing and motor. The seals shall not require routine maintenance, or adjustment, and shall not be dependent on the direction of rotation for proper sealing. Each pump shall be provided with a lubricant chamber for the shaft sealing system which shall provide superior heat transfer and maximum seal cooling. The lubricant chamber shall be designed to prevent overfilling, and to provide lubricant expansion capacity. The drain and inspection plug shall have a positive anti-leak seal, and shall be easily accessible from the outside of the pump. The seal system shall not rely upon the pumped media for lubrication and shall not be damaged when the pump is run dry. Lubricant in the chamber shall be environmentally safe nontoxic material.

The following seal types shall not be considered equal: Seal systems with less than three complete levels of sealing between the pump wet end and the motor. Seals of proprietary design, or seals manufactured by other than major independent seal manufacturing companies. Seals requiring set screws, pins, or other mechanical locking devices to hold the seal in place, conventional double mechanical seals containing either a common single or double spring acting between the upper and lower seal faces, any system requiring a pressure differential to seat the seal and ensure sealing.

Mechanical Seal Protection System:
The primary mechanical seal shall be protected from interference by particles in the waste water, including fibrous materials, by an active Seal Protection System integrated into the impeller. The back side of the impeller shall be equipped with a sinusoidal cutting ring, forming a close clearance cutting system with the lower submersible motor housing or seal plate. This sinusoidal cutting ring shall spin with the pump impeller providing a minimum of 75 shearing actions per pump revolution. Large particles or fibrous material which attempt to lodge behind the impeller or wrap around the mechanical seal, shall be effectively sheared by the active cutting system into particles small enough the prevent interference with the mechanical seal. The Seal Protection System shall operate whenever the pump operates, and shall not require adjustment or maintenance in order to function. Submersible pump designs which do not incorporate an active cutting system to protect the primary mechanical seal shall not be considered acceptable for wastewater service.

Seal Failure Early Warning System:
The integrity of the mechanical seal system shall be continuously monitored during pump operation and standby time. An electrical probe shall be provided in a sensing chamber positioned above the mechanical seals for detecting the presence of water contamination within the chamber. The sensing chamber shall be air filled, and shall have a drain / inspection plug with a positive anti-leak seal which is easily accessible from the outside of the pump. A solid-state relay mounted in the pump control panel or in a separate enclosure shall send a low voltage, low amperage signal to the probe, continuously monitoring the conductivity of the liquid in the sensing chamber. If

sufficient water enters the sensing chamber through the mechanical seal system, the probe shall sense the increase in conductivity and signal the solid state relay in the control panel. The relay shall then energize a warning light on the control panel, or optionally, cause the pump shut down. This system shall provide an early warning of mechanical seal leakage, thereby preventing damage to the submersible pump, and allowing scheduled rather than emergency maintenance. Systems utilizing float switches or any other monitoring devices located in the stator housing rather than in a sensing chamber above the mechanical seals are not considered to be early warning systems, and shall not be considered equal or acceptable.

In addition, two additional moisture sensing probes, one in the electrical connection chamber, and one in the motor chamber shall be provided. These probes shall send separate signals to the control panel as described above, so that maintenance personnel are given an early warning of the presence of moisture in the respective sensing chambers.

Shaft:
The pump shaft and motor shaft shall be an integral, one piece unit adequately designed to meet the maximum torque required at any normal start-up condition or operating point in the system. The shaft shall have a full shutoff head design safety factor of 1.7, and the maximum shaft deflection shall not exceed .05 mm (.002 inch) at the lower seal during normal pump operation. Each shaft shall be stainless steel 1.4021 (AISI 420) material, and shall have a polished finish with accurately machined shoulders to accommodate bearings, seals and impeller. As an option, the shaft shall be available in stainless steel 1.4462 (UNS S31803). Carbon steel, chrome plated, or multi piece welded shafts shall not be considered adequate or equal.

Bearings:
Each pump shaft shall rotate on high quality permanently lubricated, greased bearings. The upper bearing shall be a cylindrical roller bearing which is electrically isolated from the bearing housing to prevent bearing damage from circulating currents when the pump is operated on a variable frequency drive. The lower bearings shall be a matched set of at least three heavy duty bearings, two angular contact ball bearings and one cylindrical roller bearing. All three lower bearings shall have identical outer race diameters to provide maximum bearing load capacity. Designs which utilize a roller bearing with a smaller outer diameter than the other bearings in the assembly do not provide maximum load capacity and shall not be considered equal. Bearings shall be of sufficient size and properly spaced to transfer all radial and axial loads to the pump housing and minimize shaft deflection. L-10 bearing life shall be a minimum of 100,000 hours at flows ranging from ½ of BEP flow to 1½ times BEP flow (BEP is best efficiency point). The bearings shall be manufactured by a major internationally known manufacturer of high quality bearings, and shall be stamped with the manufacturer's name and size designation on the race. Generic or unbranded bearings from other than major bearing manufacturers shall not be considered acceptable.

Power Cable:
The power cables shall be sized according to NEC and CSA standards and shall be of sufficient length to reach the junction box without requiring splices. The outer jacket of the cable shall be oil, water, and UV resistant, and shall be capable of continuous submerged operation underwater to a depth of 65 feet. Note the first junction box is located at the top of the embankment on the concrete block wall, approximately 150'.

Cable Entry/Junction Chamber:
The cable entry design shall not require a specific torque to insure a watertight seal. The cable entry shall consist of cylindrical elastomer grommets, flanked by stainless steel washers. A cable cap incorporating a strain relief and bend radius limiter shall mount to the cable entry boss, compressing the grommet ID to the cable while the grommet OD seals against the bore of the cable entry. The junction chamber shall be isolated and sealed from the motor by means of sealing glands. Electrical connections between the power cables and motor leads shall be made via a compression or post type terminal board, allowing for easy disconnection and maintenance. An access port shall be located in the center of the motor lid to allow easy access to the electrical connections without the need to remove the entire motor lid.

315.2.5.2 Submersible Wastewater Non Clog Pump 2 & 3.

A. SCOPE

Furnish - 2 ABS Model XFP 150J-CH2 PE 1040/4 submersible non-clog wastewater pump or 2 WILO Model No. FA15.77Z+T30-4/55KEx 6" discharge submersible or approved equal.

The ABS pump shall be supplied with a mating cast iron six inch discharge connection and be capable of delivering 2087 U.S. GPM at a total dynamic head of 144.4 feet at a hydraulic efficiency of 75.3%. An additional point on the same curve shall be 1945 U.S. GPM at a total dynamic head of 151.3 feet. Shut off head shall be 208 feet (minimum). The Premium Efficiency motor shall be an integral part of the pump unit. The motor shall be 139 HP connected for operation on a 460 volt, 3 phase, 60 hertz electrical supply service.

The WILO pump shall discharge submersible pump for the M2/M3 applications to deliver 2087 GPM at 144.4' TDH and complete with power/control cable plus wet pit base elbow. Motor to be air filled, 114 horsepower, 1760 RPM and operate on 480 Volts, 3 Phase, 60 Hertz power supply. The pump motor shall be Class H insulation; NEMA B design for wet pit installation, suitable for operation in a Class 1, Division 1, Groups C & D explosion proof environment and inverter duty capable

Pumps intended for wet pit installation shall be supplied with a standard cast iron guide rail system with an integrated six inch discharge elbow. Pumps intended for dry pit installation shall be supplied with a steel mounting frame. Each pump unit shall be fitted with a stainless steel lifting bail or chain assembly, 15 feet long for lifting the pump. The working load rating of the lifting system shall be a minimum of 50% greater than the pump weight. Each pump motor shall be equipped with 49 feet of power and control cable sized in accordance with NEC and CSA standards.

B. PUMP DESIGN

The heavy duty submersible wastewater pump(s) shall be capable of handling raw unscreened sewage, storm water, and other similar solids-laden fluids without clogging. The pump shall be driven by a Premium Efficiency motor, providing the highest levels of operational reliability and energy efficiency.

C. GUIDE RAIL BASE ASSEMBLY (wet pit installation)

There shall be no need for personnel to enter the wet well to remove or reinstall the pump(s). In a wet pit installation, the discharge base & elbow assembly shall be permanently installed in the wet well and connected to the discharge piping. In order to prevent binding or separation of the pump from the guide rail system, the pump(s) shall

connect to the guide rail base automatically and firmly, guided by one 2 inch guide pipe (two 2 inch pipes optional) extending from the base elbow to the top of the station. Systems using guide cable in lieu of rigid guide bars or pipes shall not be considered acceptable. The sliding guide bracket shall be a separate part of the pumping unit, capable of being attached to standard 6 inch ANSI class 125 or metric DN150 pump flanges, so that the pump mounting is nonproprietary, and any pump with a standard discharge flange can be mounted on the base assembly. Base or bracket assemblies with proprietary or non-standard flange dimensions shall not be considered acceptable.

A field replaceable Nitrile (Buna-N) rubber profile gasket or O-ring shall accomplish positive sealing of the pump flange/guide rail bracket to the discharge elbow. Base assemblies which rely solely on metal to metal contact between the pump flange and discharge base elbow as a means of sealing are inherently leak prone, and shall not be considered equal. No portion of the pump shall bear directly on the floor of the sump. The guide rail system shall be available in an optional non-sparking version, approved by Factory Mutual for use in NEC Class 1, Division 1, Group C&D hazardous locations.

D. PUMP CONSTRUCTION

Major pump components shall be of gray cast iron, EN-GJL-250 (ASTM A-48, Class 35B) with smooth surfaces devoid of porosity or other irregularities. All exposed fasteners shall be stainless steel 1.4401 (AISI type 316) construction. All metal surfaces coming into contact with the pumped media (other than the stainless steel components) shall be protected by a factory applied spray coating of high solids two part epoxy paint finish on the exterior of the pump. The pump shall be equipped with an open lifting hoop suitable for attachment of standard chain fittings, or for hooking from the wet well surface. The hoop shall ductile cast iron EN-GJS-400-18 (ASTM A536; 60-40-18) with an option of stainless steel 1.4462, and shall be rated to lift a minimum of four times the pump weight.

Sealing design for the pump/motor assembly shall incorporate machined surfaces fitted with Nitrile (Buna-N) rubber O-rings. Sealing will be the result of controlled compression of rubber O-rings in two planes of the sealing interface. Housing interfaces shall meet with metal to metal contact between machined surfaces, and sealing shall be accomplished without requiring a specific torque on the securing fasteners. Rectangular cross sectioned gaskets requiring specific torque limits to achieve compression shall not be considered equal. No secondary sealing compounds shall be required or used.

Impeller:
The channel impeller shall be of gray cast iron, EN-GJL-250 (ASTM A-48, Class 35B).

The impeller shall be of the double shrouded, non-clogging, two vane design, meeting the Ten State Standards requirement for minimum solids passage size of 3 inches. The impeller shall have a slip fit onto the motor shaft and drive key, and shall be securely fastened to the shaft by a stainless steel bolt which is mechanically prevented from loosening by a positively engaged ratcheting washer assembly. The head of the impeller bolt shall be effectively recessed within the impeller bore or supporting washer to prevent disruption of the flow stream and loss of hydraulic efficiency. The impeller shall be dynamically balanced to the ISO 10816 standard to provide smooth vibration free operation. Impeller designs which do not meet the Ten State Standards requirement for 3 inch solids passage size, those that rely on retractable impeller designs to pass 3 inch solids, or those that rely on fins or pins protruding into the suction path to assist in the handling of fibrous material shall not be considered equal.

Wear Ring System:
The ABS wear ring system shall be replaceable wear ring of cast iron EN-GJL-300 (ASTM A48, Class 40) shall be securely fitted into the pump casing (volute). As an option, casing and impeller wear rings constructed of stainless steel shall be available. The optional casing wear ring shall be stainless steel 1.4581 (AISI 318), and the optional impeller wear ring shall be stainless steel 1.4571 (AISI 316Ti).

The WILO wear ring system shall be provided with an AISI 329 (1.4462) duplex stainless steel wear ring which is drive fitted to the suction eye of the impeller. The impeller wear ring shall be hardened to a Brinell hardness of 200-250. The casing shall be provided with an AISI 304 (1.4308) stainless steel wear ring which is drive fitted to the bottom suction inlet. The volute wear ring shall be hardened to a Brinell hardness of 275-325

Pump Volute:
The pump volute shall be single piece gray cast iron, EN-GJL-250 (ASTM A-48, Class 35B) non-concentric design with centerline discharge. Passages shall be smooth and large enough to pass any solids which may enter the impeller. Discharge size shall be as specified on the pump performance curve. The discharge flange design shall permit attachment to standard ANSI or metric flanges/appurtenances. The discharge flange shall be drilled to accept both 6 inch ANSI class 125 and metric DN150 (PN 10) metric flanged fittings. Proprietary or non-standard flange dimensions shall not be considered acceptable. The suction flange shall be integrated into the volute and its bolt holes shall be drilled and threaded to accept standard 6 inch ANSI class 125 flanged fittings. The minimum working pressure of the volute and pump assembly shall be 10 bar (145 psi).

E. PREMIUM EFFICIENCY MOTOR
The Premium Efficiency motor shall meet efficiency standards in accordance with IEC 60034-30, level IE3 and NEMA Premium*. Motor rating tests shall be conducted in accordance with IEC 60034-2-1 requirements and shall be certified accurate and correct by a third party certifying agency. A certificate shall be available upon request.
* IE3 and NEMA Premium efficiency levels are equivalent, however the NEMA Premium standard is intended to cover dry installed motors only, not integrated submersible motors.

The Premium Efficiency motor shall be housed in a water tight gray cast iron, EN-GJL-250 (ASTM A-48, Class 35B) enclosure capable of continuous submerged operation underwater to a depth of 20 meters (65 feet), and shall have an IP68 protection rating. The motor shall be of the squirrel-cage induction design, NEMA type B, Premium Efficiency. The copper stator windings shall be insulated with moisture resistant Class H insulation material, rated for 180oC (356oF). The stator shall be press fitted into the stator housing. The use of bolts, pins or other fastening devices requiring penetration of the stator housing is unacceptable. The rotor bars and short circuit rings shall be made of cast aluminum.

The motor shall be designed for continuous duty. The maximum continuous temperature of the pumped liquid shall be 40oC (104oF), and intermittently up to 50oC (122oF). The motor shall be capable of handling up to 15 evenly spaced starts per hour without overheating. The service factor (as defined by the NEMA MG1 standard) shall be 1.1. The motor shall have a voltage tolerance of +/- 10% from nominal, and a phase to phase voltage imbalance tolerance of 1%. The motor shall have a NEMA Class A temperature rise, providing cool operation under all operating conditions. The Premium Efficiency Motor shall be FM and CSA approved for use in NEC Class I, Division I, Groups C & D hazardous locations. The surface temperature rating shall be T3C. The

motor shall meet the requirements of NEMA MG1 Part 30 and 31 for operation on PWM type Variable Frequency Drives.

The motor shall be capable of operating, completely submerged, partially submerged, or unsubmerged. For submerged (wet pit) applications, the motor shall be self-cooling via the process fluid surrounding the motor. For unsubmerged (dry pit) applications, an optional integrated glycol based cooling system shall be utilized to enhance heat transfer, and allow the motor to operate at full rated power continuously without the need for de-rating or reduced duty cycle.

Cooling System:
The ABS pump shall have a factory installed closed loop cooling system shall be adequately designed to allow the motor to run continuously under full load while in an unsubmerged or minimally submerged condition. A cooling jacket shall surround the stator housing, and an environmentally safe non-toxic propylene glycol solution shall be circulated through the jacket by an axial flow circulating impeller attached to the main motor shaft. The coolant shall be pumped through an integrated heat exchanger in the base of the motor whenever the motor is running, allowing excess heat to be transferred to the process liquid.

The WILO pump motors supplied are all T model (air-filled) motors with no integrated cooling jacket thus need process fluid level in the wet pit to cool the motor.

Cooling systems that circulate the pumped medium through the cooling jacket, or those that use a toxic cooling liquid shall not be acceptable. The use of external heat exchangers, fans, or the supply of supplemental cooling liquid shall not be required.

Thermal Protection:
Each phase of the motor shall contain a normally closed bi-metallic temperature monitor switch imbedded in the motor windings. These thermal switches shall be connected in series and set to open at 140oC +/- 5oC (284oF). They shall be connected to the control panel to provide a high stator temperature shutdown signal, and are used in conjunction with external motor overload protection. As an option, bi-metallic temperature switches shall be available for the upper and lower bearings to provide high bearing temperature warning signals. As an alternate option, RTD (PT100) type temperature measuring devices shall be available for the motor winding and bearings to provide actual temperature measurement at these locations. When the RTD option is supplied for the motor winding, bi-metallic switches shall also be supplied in the winding. The bi-metallic system must be connected to the control to provide positive shutdown of the motor in the event of an overheat condition. This is required in order to conform to FM and CSA rules for explosion proof equipment.

Mechanical Seals:
Each pump shall be equipped with a triple seal system consisting of tandem mechanical shaft seals, plus a radial lip seal; providing three complete levels of sealing between the pump wet end and the motor. The mechanical seal system shall consist of two totally independent seal assemblies operating in a lubricant reservoir that hydro-dynamically lubricates the lapped seal faces at a constant rate. The mechanical seals shall be of nonproprietary design, and shall be manufactured by a major independent manufacturer specializing in the design and manufacture of mechanical seals. The lower, primary seal unit, located between the pump and the lubricant chamber, shall contain one stationary industrial duty solid silicon-carbide seal ring and one rotating industrial duty solid silicon-carbide seal ring. The stationary ring of the primary seal shall be installed in a seal holding plate of gray cast iron EN-GJL-250 (ASTM A-48, Class 35B). The seal holding

plate shall be equipped with swirl disruption ribs to prevent abrasive material from prematurely wearing the seal plate. The upper, secondary seal unit, located between the lubricant chamber and the sensing chamber, shall contain one stationary industrial duty solid silicon-carbide seal ring, and one rotating one rotating industrial duty solid silicon-carbide seal ring. Each seal interface shall be held in contact by its own spring system. A radial lip seal shall be positioned above the sensing chamber, preventing any liquid which accumulates in the sensing chamber from entering the lower bearing and motor. The seals shall not require routine maintenance, or adjustment, and shall not be dependent on the direction of rotation for proper sealing. Each pump shall be provided with a lubricant chamber for the shaft sealing system which shall provide superior heat transfer and maximum seal cooling. The lubricant chamber shall be designed to prevent overfilling, and to provide lubricant expansion capacity. The drain and inspection plug shall have a positive anti-leak seal, and shall be easily accessible from the outside of the pump. The seal system shall not rely upon the pumped media for lubrication and shall not be damaged when the pump is run dry. Lubricant in the chamber shall be environmentally safe nontoxic material.

The following seal types shall not be considered equal: Seal systems with less than three complete levels of sealing between the pump wet end and the motor. Seals of proprietary design, or seals manufactured by other than major independent seal manufacturing companies. Seals requiring set screws, pins, or other mechanical locking devices to hold the seal in place, conventional double mechanical seals containing either a common single or double spring acting between the upper and lower seal faces, any system requiring a pressure differential to seat the seal and ensure sealing.

Mechanical Seal Protection System:
The primary mechanical seal shall be protected from interference by particles in the waste water, including fibrous materials, by an active Seal Protection System integrated into the impeller. The back side of the impeller shall be equipped with a sinusoidal cutting ring, forming a close clearance cutting system with the lower submersible motor housing or seal plate. This sinusoidal cutting ring shall spin with the pump impeller providing a minimum of 75 shearing actions per pump revolution. Large particles or fibrous material which attempt to lodge behind the impeller or wrap around the mechanical seal, shall be effectively sheared by the active cutting system into particles small enough the prevent interference with the mechanical seal. The Seal Protection System shall operate whenever the pump operates, and shall not require adjustment or maintenance in order to function. Submersible pump designs which do not incorporate an active cutting system to protect the primary mechanical seal shall not be considered acceptable for wastewater service.

Seal Failure Early Warning System:
The integrity of the mechanical seal system shall be continuously monitored during pump operation and standby time. An electrical probe shall be provided in a sensing chamber positioned above the mechanical seals for detecting the presence of water contamination within the chamber. The sensing chamber shall be air filled, and shall have a drain / inspection plug with a positive anti-leak seal which is easily accessible from the outside of the pump. A solid-state relay mounted in the pump control panel or in a separate enclosure shall send a low voltage, low amperage signal to the probe, continuously monitoring the conductivity of the liquid in the sensing chamber. If sufficient water enters the sensing chamber through the mechanical seal system, the probe shall sense the increase in conductivity and signal the solid state relay in the control panel. The relay shall then energize a warning light on the control panel, or optionally, cause the pump shut down. This system shall provide an early warning of mechanical seal leakage, thereby preventing damage to the submersible pump, and

allowing scheduled rather than emergency maintenance. Systems utilizing float switches or any other monitoring devices located in the stator housing rather than in a sensing chamber between the mechanical seals are not considered to be early warning systems, and shall not be considered equal or acceptable.

Shaft:
The pump shaft and motor shaft shall be an integral, one piece unit adequately designed to meet the maximum torque required at any normal start-up condition or operating point in the system. The shaft shall have a full shutoff head design safety factor of 1.7, and the maximum shaft deflection shall not exceed .05 mm (.002 inch) at the lower seal during normal pump operation. Each shaft shall be stainless steel 1.4021 (AISI 420) material, and shall have a polished finish with accurately machined shoulders to accommodate bearings, seals and impeller. As an option, the shaft shall be available in stainless steel 1.4462 (UNS S31803). Carbon steel, chrome plated, or multi piece welded shafts shall not be considered adequate or equal.

Bearings:
Each pump shaft shall rotate on high quality permanently lubricated, greased bearings. The upper bearing shall be a cylindrical roller bearing and the lower bearings shall be a matched set of at least three heavy duty bearings, two angular contact ball bearings and one cylindrical roller bearing. All three lower bearings shall have identical outer race diameters to provide maximum bearing load capacity. Designs which utilize a roller bearing with a smaller outer diameter than the other bearings in the assembly do not provide maximum load capacity and shall not be considered equal. Bearings shall be of sufficient size and properly spaced to transfer all radial and axial loads to the pump housing and minimize shaft deflection. L-10 bearing life shall be a minimum of 100,000 hours at flows ranging from ½ of BEP flow to 1½ times BEP flow (BEP is best efficiency point). The bearings shall be manufactured by a major internationally known manufacturer of high quality bearings, and shall be stamped with the manufacturer's name and size designation on the race. Generic or unbranded bearings from other than major bearing manufacturers shall not be considered acceptable.

Power Cable:
The power cables shall be sized according to NEC and CSA standards and shall be of sufficient length to reach the junction box without requiring splices. The outer jacket of the cable shall be oil, water, and UV resistant, and shall be capable of continuous submerged operation underwater to a depth of 65 feet.

Cable Entry/Junction Chamber:
The cable entry design shall not require a specific torque to insure a watertight seal. The cable entry shall consist of cylindrical elastomer grommets, flanked by stainless steel washers. A cable cap incorporating a strain relief and bend radius limiter shall mount to the cable entry boss, compressing the grommet ID to the cable while the grommet OD seals against the bore of the cable entry. The junction chamber shall be isolated and sealed from the motor by means of sealing glands. Electrical connections between the power cables and motor leads shall be made via a compression or post type terminal board, allowing for easy disconnection and maintenance.

315.2.6 Pump Station Controls.

A. Control Sequence of Operation
The system shall use three alternating VFDs. The Orenco LS Controller shall monitor and control the pumps using a pressure transducer and one back-up float switches. A local color touchscreen interface is provided for system status, data and parameter adjustment.

B. Control Panel
Complying with UL 698A, with weatherproof enclosure, covered compartments sized to accommodate controllers, circuit breakers, transformers, alternators, and programmable logic controller. Basis of Design Product: Orenco Systems, Inc., OLS Custom Panel;
1. NEMA 3R Steel Enclosure w/Cooling Fan & Heater;
2. Orenco LS Controller;
3. Color Touchscreen HMI;
4. 460VAC Variable Frequency Drive For Each Pump;
5. Motor Circuit Breaker For Each Pump;
6. Main Circuit Breaker;
7. Control Transformer With Primary Fusing;
8. Controls Circuit Breaker;
9. HOA Switches (one per pump);
10. Temperature Sensor Input Terminals;
11. Seal Fail Sensors (one per pump);
12. 80db Audible Alarm with Push-to-Silence;
13. Flashing Alarm Beacon Light;
14. Control Relay For Remote Alarm Dry Contact;
15. Terminal Blocks as required;
16. UL698a Listed.

C. Level Control System
Shall be a pressure transducer with back up floats. The pressure transducer shall be Keller America Level Rat or Pre-approved Equal. The back-up float shall be an internally weighted non-mercury spdt float.

315.2.7 Piping And Valves.

A. Ductile-Iron, Mechanical-Joint Pipe and Fittings
1. Ductile-Iron Pipe: AWWA C151/A21.51, with mechanical-joint bell and plain spigot end unless flanged ends are indicated;
   a. Provide flanged ends within well and vault. All flanged fittings are to have stainless steel hardware;
2. Ductile-Iron Fittings: AWWA C110/A21.10, mechanical-joint, ductile- or gray-iron standard pattern or AWWA C153/A21.53, ductile-iron compact pattern;
3. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and stainless steel bolts;
4. Application: Buried service between well and vault.

B. Swing Check Valves
The valve body and cover shall be constructed of ASTM A536 Grade 65-45-12 ductile iron VAL-MATIC SWINGFLEX CHECK VALVE or Pre-approved Equal.

C. Eccentric Plug Valves
The valve body and cover shall be constructed of ASTM A126 Class B cast iron for working pressures up to 175 psig Direct and 100 Reverse. The words "SEAT END" shall be cast on the exterior of the body seat end. VAL-MATIC CAM-CENTRIC PLUG VALVE w/ Handwheel or pre-approved equal.

315- 3 EXECUTION.

315.3.2 Field Quality Control.

Perform tests and inspections and prepare test reports;
Manufacturer's Field Service: Engage a pump manufacturer's authorized service representative to assist in testing and startup;
Tests and Inspections:
Test completed piping systems according to requirements of authorities having jurisdiction.
Submit reports;
After installing wastewater pumps and after electrical circuitry has been energized, test pumps and controls for compliance with requirements;
After electrical circuitry has been energized, start units to confirm the station can run at pre-specified design parameters;
Test piping for leaks and defects;
Test and adjust controls and safeties;
Remove and replace components of the wastewater pumping stations that do not pass tests and inspections'

By Order of the City Engineer

CRAIG BILEZERIAN
City Engineer

BIDDER'S CERTIFICATION

I acknowledge receipt of the foregoing Addendum No. 1 and accept all conditions contained therein.

_____
Bidder

_____ _____
By Date

******* Submit this executed form with the bid *******

Please fill out and submit the
"Acknowledgment of Addenda Received" form
Provided in Section C of the Specifications