

PROPOSED PUMP STATION AND CLARK STREET & INDUSTRIAL DRIVE SANITARY SEWER EXTENSION

PIONEER, OHIO

PRE-BID QUESTIONS AND RESPONSES

Number	Date	Bidder	Question	Response
1	11/1/2021	Bryan Excavating	Bid Form has 0 quantity for Fertilizer. Please advise?	Quantity shall be 0.23 ton as shown on Estimate. Revised Bid Form will be provided in Addendum 1 to follow.
2	11/2/2021	Helm and Sons	Do we need to purchase the plan set from Bell Engineer to submit a proposal?	Plans do not have to be purchased in order to submit a proposal. All plans and documents available online. Only charge if paper plans are desired.
3	11/2/2021	Helm and Sons	Plans show the gas main in close proximity of the excavation area for the pump station. Will this be relocated prior to start of construction?	Gas line will not be relocated prior to construction. Plans show 2-2.5' separation from the pump station to the gas line. Gas line was installed within the past 5 years and is a 4" steel line.
4	11/2/2021	Helm and Sons	A large shoring system will be required to dig out the area for the proposed pump station. Can we close that section of the road in order to haul in and install a shoring system without vehicles driving through? Will also need a crane to set the pump station.	Shutting down Clark Street and Coreway Avenue will be ok for short term closures. Contractor will be responsible for providing closure/detour signs. Detour from State Route 15 will be Baubice Street to Clark Avenue.
5	11/2/2021	Helm and Sons	Does the village have an area to haul and grade excess soils at?	Village does not currently have an area for excess spoils. Contractor responsible for hauling dirt off site.
6	11/2/2021	Helm and Sons	There will be substantial lead time on submittals and material order, can the date of substantial completion be waived as needed in order to accommodate material delays?	We understand that material delays may be unavoidable. The substantial completion date can be adjusted for any documented material delay. Contractors shall provide a tentative delivery schedule from supplier along with Bid Documents. Any delays beyond this schedule will be an approved extension on the substantial completion date. Our main goal is to provide a sanitary outlet for a current factory addition that is being constructed now and will be completed by the end of 2021. We want this completed as quickly as possible.
7	11/3/2021	Craun Liebing	Do you have any specifications for the package pump station?	Specification 11282 has been attached to this RFC.
8	11/4/2021		The Bid Book lists the Bid Date as Thursday November 15, 2021	So there is no confusion, the actual date is Monday, November 15, 2021 at 10:00a.m. Revised cover sheet added to this RFC
9	11/4/2021	Buckeye Pumps	Would Flygt pumps with our AGVV be an approved pump station supplier?	Yes, Buckeye Pumps package pump station is an approved supplier.
10	11/5/2021	Cummins Sales and Service	Would you allow Cummins to provide generator equipment for project?	Yes, Cummins is an approved generator supplier.

Questions as of 11/8/2021. No further questions will be accepted after Wednesday, November 10, 2021 at 1:00p.m.

Engineer's Official Bid Form - Pump Station and Clark Street & Industrial Drive Sanitary Sewer Extension

Item	ODOT CMS Item	Description	Unit	Quantity	Unit Price	Estimated Cost
SANITARY						
1	611	8" PVC SANITARY SEWER, TYPE B	LIN FT	400		
2	612	8" PVC SANITARY SEWER, TYPE C	LIN FT	972		
3	612	4" RJ-900 CERTA-LOK DR-18 SANITARY SEWER FORCE MAIN, DIRECTIONAL BORED	LIN FT	370		
4	611	SANITARY MANHOLE, 4' DIAMETER	EACH	4		
5	611	SANITARY PUMP STATION	EACH	1		
6		CHAIN LINK FENCE (INCLUDING GATE AND RAZOR WIRE)	LIN FT	100		
7		EMERGENCY GENERATOR (INCLUDING HOOKUP AND FOUNDATION)	EACH	1		
MISCELLANEOUS						
10	611	4" TO 15" CONDUIT (TILE) REPAIR-TO BE USED AS DIRECTED BY ENGINEER	LIN FT	300		
11	611	LARGER THAN 15" CONDUIT (TILE) REPAIR-TO BE USED AS DIRECTED BY ENGINEER	LIN FT	50		
12	614	MAINTENANCE OF TRAFFIC	LUMP	1		
13	623	CONSTRUCTION LAYOUT STAKING	LUMP	1		
14	624	MOBILIZATION	LUMP	1		
15	204	EXCAVATION AND EMBANKMENT	LUMP	1		
16	651	TOPSOIL STOCKPILED, AS PER PLAN	CU YD	260		
17	652	PLACING STOCKPILED TOPSOIL, AS PER PLAN	CU YD	260		
18	SPECIAL	CONCRETE DRIVE REMOVAL-INCLUDING SAW CUTTING	SQ FT	1937		
19	511	CONCRETE DRIVE REPAIR	SQ FT	2271		
20	SPECIAL	STONE DRIVE REPAIR	SQ FT	821		
21		ASPHALT ROAD REPAIR	SQ FT	100		
22		CURB REMOVAL AND REPAIR	SQ FT	10		
23		CURB CUT FOR DRIVEWAY	LIN FT	45		
EROSION CONTROL						
26	659	FERTILIZER	TON	0.23		
27	659	SEEDING AND MULCHING, CLASS 1 LAWN MIXTURE	SQ YD	2405		
28	659	TEMPORARY EROSION CONTROL SEED, CLASS 7 MIXTURE	SQ YD	100		
29	832	SILT FENCE, AS PER PLAN	LIN FT	1000		
TOTAL UNIT PRICE BID						

**OFFICE OF THE COUNTY COMMISSIONERS
VILLAGE OF PIONEER**

WILLIAMS COUNTY, OHIO

PROJECT MANUAL

**Pump Station and Clark Street & Industrial Drive
Sanitary Sewer Extension**

**CDBG GRANT
WILLIAMS COUNTY PROJECT # 5-2021**

COMMISSIONERS:

**Brian A. Davis, President
Terry N. Rummel, Vice-President
Lewis D. Hilkert**

VILLAGE ADMINISTRATOR:

Al Fiser

PROJECT MANGER

Dennis Miller, Executive Director MVPO

PROJECT ENGINEER:

Seth A. Coles, P.E.

Date of Letting: Monday, November 15, 2021 at 10:00 A.M. Local Time

ENGINEER'S ESTIMATE: \$ 664,087.05

Bell Engineering Limited, Inc.
05691A State Route 15, P.O. Box 565 Bryan, OH 43506

CONTRACTOR'S NAME AND ADDRESS:

Submitted by: _____

Address: _____

City: _____

State: _____ Zip Code: _____

Phone: _____ Fax: _____

Email: _____

11282 - ABOVE GROUND SUBMERSIBLE PUMP VALVE PACKAGE

1.01 SECTION INCLUDES

- A. Work under this section includes, but is not limited to, furnishing and installing a factory built duplex pump station as indicated on the project drawings, herein specified, as necessary for proper and complete performance.

1.02 REFERENCES

- A. Publications listed below form part of this specification to extent referenced in the text by basic designation only. Consult latest edition of publication unless otherwise noted.

1. American National Std. Institute (ANSI) / American Water Works Assoc. (AWWA)
 - a. ANSI B16.1 Cast iron pipe flanges and flanged fittings.
 - b. ANSI/AWWA C115/A21.51 Cast/ductile iron pipe with threaded flanges.
 - c. ANSI 253.1 Safety Color Code for Marking Physical Hazards.
 - d. ANSI B40.1 Gauges, Pressure and Vacuum.
 - e. AWWA C508 Single Swing Check Valves.
 - f. AWWA C504 Plug Valves
2. American Society for Testing and Materials (ASTM)
 - a. ASTM A48 Gray Iron Castings.
 - b. ASTM A126 Valves, Flanges, and Pipe Fittings.
 - c. ASTM A307 Carbon Steel Bolts and Studs.
 - d. ASTM A36 Structural Steel.
3. Institute of Electrical and Electronics Engineers (IEEE)
 - a. ANSI/IEEE Std 100 Standard Dictionary of Electrical Terms.
 - b. ANSI/IEEE Std 112 Test Procedure for Polyphase Induction Motors.
 - c. IEEE Std 242 Protection of Industrial and Control Power Systems.
4. National Electric Code (NEC) / National Electrical Manufacturers Assoc. (NEMA)
 - a. NEC National Electric Code.
 - b. NEC 701 National Electric Code article 701.
 - c. NEMA Std MG1 Motors and Generators.
5. Miscellaneous References
 - a. Ten-State Standards Recommended Standards for Sewage Works.
 - b. Hydraulic Institute Std for Centrifugal, Rotary and Reciprocating Pumps.
 - c. NMTBA and JIC Std National Machine Tool Builders Association and Joint Industrial Council Standards
 - d. ISO 9001 International Organization for Standardization.

1.03 SYSTEM DESCRIPTION

- A. The contractor shall furnish and install one factory built automatically controlled above ground submersible pump valve package capable of handling raw unscreened sewage or similar liquids.
- B. The pumps and mechanical slide rail accessories shall be installed in the wet well as shown on the project plans. The pump control panel, liquid level control, valves and piping shall be installed within a factory built fiberglass or aluminum enclosure.
- C. Factory built pump station design, including materials of construction, pump features, valves and piping, and motor controls shall be in accordance with requirements listed under PART 2 - PRODUCTS of this section.

1.04 PERFORMANCE CRITERIA

- A. Each pump must be designed to handle raw, unscreened, domestic sanitary sewage. Pumps shall be furnished with a 4" discharge connection. Each pump shall be selected to deliver 150 GPM at a design dynamic discharge head of 40 ft. feet.
- B. Site power furnished to pump station shall be three phase, 60 hertz, 460 volts, 3 wire, maintained within industry standards. The available fault current provided at the pump station control panel is 10,000 kA rms symmetrical. Voltage tolerance shall be plus or minus 10 percent. Phase-to-phase unbalance shall not exceed 1% average voltage as set forth in NEMA standard MG-1. Control voltage shall not exceed 132 volts.

1.05 SUBMITTALS

A. Product Data

- 1. Prior to fabrication, pump station manufacturer shall submit an electronic copy of submittal data for review and approval.
- 2. Submittal shall include shop drawings, electrical ladder logic drawings, and support data as follows: Catalog cuts sheets reflecting characteristics for major items of equipment, materials of construction, major dimensions, motor data, pump characteristic curves showing the design duty point capacity (GPM), head (FT), and hydraulic brake horsepower (BHP). Electrical components used in the motor branch and liquid level control shall be fully described.
- 3. Shop drawings shall provide layout of mechanical equipment and anchor bolt locations for slide rail components. Pipe penetrations and station access clearances shall be dimensioned relative to the station centerline. The electrical ladder logic drawings shall illustrate motor branch and liquid level control circuits to extent necessary to validate function and integration of circuits to form a complete working system.

B. Operation & Maintenance Manuals

1. Installation shall be in accordance with written instructions provided by the pump station manufacturer. Comprehensive instructions supplied at time of shipment shall enable personnel to properly operate and maintain all equipment supplied. Content and instructions shall assume operating personnel are familiar with pumps, motors, piping and valves, but lack experience on exact equipment supplied.
2. Documentation shall be specific to the pump station supplied and collated in functional sections. Each section shall combine to form a complete system manual covering all aspects of equipment supplied by the station manufacturer. Support data for any equipment supplied by others, even if mounted or included in overall station design, shall be provided by those supplying the equipment. Instructions shall include the following as a minimum:
 - a. Functional description of each major component, complete with operating instructions.
 - b. Instructions for operating pumps and pump controls in all modes of operation.
 - c. Calibration and adjustment of equipment for initial start-up, replacement of level control components, or as required for routine maintenance.
 - d. Support data for commercially available components not produced by the station manufacturer, but supplied in accordance with the specifications, shall be supported by literature from the prime manufacturer and incorporated as appendices.
 - e. Electrical schematic diagram of the pump station circuits shall be in accordance with NFPA70. Schematics shall illustrate, to the extent of authorized repair, pump motor branch, control and alarm system circuits including interconnections. Wire numbers and legend symbols shall be shown. Schematic diagrams for individual components, not normally repairable by the station operator, need not be included. Details for such parts shall not be substituted for an overall system schematic. Partial schematics, block diagrams, and simplified schematics shall not be provided in lieu of an overall system diagram.
 - f. Mechanical layout drawing of the pump station and components, prepared in accordance with good commercial practice, shall provide installation dimensions and location of all pumps, valves and piping.
3. Operation and maintenance instructions which rely on vendor cut-sheets and literature which include general configurations, or require operating personnel to selectively read portions of the manual shall not be acceptable. Operation and maintenance instructions must be specific to equipment supplied in accordance with these specifications.

1.06 QUALITY ASSURANCE

- A. The pumps and pump station manufacturer must be ISO 9001:2008 revision certified, with scope of registration including design control and service after sales activities.
- B. The pumps and pump station manufacturer must be registered to the ISO 14001 Environmental Management System standard and as such is committed to minimizing the impact of its activities on the environment and promoting environmental sustainability by the use of best management practices, technological advances, promoting environmental awareness and continual improvement.
- C. Upon request from the **engineer or owner**, the pump station manufacturer shall prove financial stability and ability to produce the station within the specified delivery schedules. Evidence of facilities, equipment and expertise shall demonstrate the manufacturer's commitment to long term customer service and product support.
- D. All pump openings and passages shall be of adequate size to pass 3" diameter spheres (minimum) and any trash or stringy material which can pass through an average house collection system.
- E. Manufacturer must show proof of original product design and testing. Products violating intellectual property regulations shall not be allowed, as they may violate international law and expose the user or engineer to unintended liabilities. "Reverse-engineered" products fabricated to substantially duplicate the design of original product shall not be allowed, as they may contain substantial differences in tolerances and material applications addressed in the original design, which may contribute to product failure.
- F. The term "pump manufacturer" or "pump station manufacturer" shall be defined as the entity which designs, machines, assembles, hydraulically tests and warrants the final product. Any entity that does not meet this definition will not be considered a "pump manufacturer" or "pump station manufacturer" and is not an acceptable supplier. For quality control reasons and future pump and parts availability, pumps shall be designed and manufactured in the United States of America.
- G. The manufacturer's technical representative shall inspect the completed installation, correct or supervise the correction of any defect or malfunction, and instruct operating personnel in the proper operation and maintenance of the equipment as described in Part 3 of this section.
- H. Factory System Test
 - 1. All internal components including pumps, motors, valves, piping and controls shall be tested as a complete working system at the manufacturer's facility. Tests shall be conducted in accordance with Hydraulic Institute Standards at the specified head, capacity, rated speed and horsepower. Factory operational test shall simulate actual performance anticipated for the complete station.
 - 2. Upon request from the engineer, the operational test may be witnessed by the engineer, and/or representatives of his choice, at the manufacturer's facility.

G. Manufacturer's Start-up Services

1. The pump station manufacturer's authorized technical representative(s) shall inspect the completed installation, correct or supervise the correction of any defect or malfunction, and instruct operating personnel in the proper operation and maintenance of the equipment as described within this specification.

1.07 MANUFACTURER'S WARRANTY

- A. The pump station manufacturer shall warrant all equipment to be of quality construction, free of defects in material and workmanship. A written warranty shall include specific details described below.
1. In addition to defects in material and workmanship, fiberglass reinforced polyester station or aluminum enclosures are warranted for a minimum of twenty-four (24) months to be resistant to rust, corrosion, corrosive soils, effects of airborne contamination or physical failures occurring in normal service for the period of the pump station warranty.
 2. All other equipment, apparatus, and parts furnished shall be warranted for minimum of twenty-four (24) months, excepting only those items that are normally consumed in service, such as light bulbs, oils, grease, packing, gaskets, O-rings, etc. The pump station manufacturer shall be solely responsible for warranty of the station and all components.
 3. All other equipment, apparatus, and parts furnished shall be warranted for twenty-four (24) months, excepting only those items that are normally consumed in service, such as light bulbs, oils, grease, packing, gaskets, O rings, etc. The pump station manufacturer shall be solely responsible for warranty of the station and all components.
 4. The concrete precast wet well shall have a 50-year design life and conform to ASTM C-478 and ASTM C-443.
- B. Components failing to perform as specified by the engineer, or as represented by the manufacturer, or as proven defective in service during the warranty period, shall be replaced, repaired, or satisfactorily modified by the manufacturer.
- C. It is not intended that the station manufacturer assume liability for consequential damages or contingent liabilities arising from failure of any vendor supplied product or part which fails to properly operate, however caused. Consequential damages resulting from defects in design, or delays in delivery are also beyond the manufacturer's scope of liability.
- D. Equipment supplied by others and incorporated into a pump station or enclosure is not covered by this limited warranty. Any warranty applicable to equipment selected or supplied by others will be limited solely to the warranty, if any, provided by the manufacturer of the equipment.

- E. This limited warranty shall be valid only when installation is made and use and maintenance is performed in accordance with manufacturer recommendations. A start-up report completed by an authorized manufacturer's representative must be received by manufacturer within thirty (30) days of the initial date the unit is placed into service. The warranty shall become effective on the date of acceptance by the purchaser or the purchaser's authorized agent, or sixty (60) days after installation, or ninety (90) days after shipment from the factory, whichever occurs first.
- F. A start-up report completed by an authorized manufacturer's representative must be received by an authorized representative of the owner within thirty (30) days of the initial date the unit is placed into service. The warranty shall become effective on the date of acceptance by the Owner.
- G. TRAINING
 - 1. Up to eight (8) hours of training shall be provided to the Owner's staff upon startup.

PART 2 - PRODUCTS

2.01 UNITARY RESPONSIBILITY

- A. In order to unify responsibility for proper operation of the complete pumping station, it is the intent of these Specifications that all system components be furnished by a single supplier (unitary source). The pumping station must be of standard catalog design, totally warranted by the manufacturer. Under no circumstances will a system consisting of parts compiled and assembled by a manufacturer's representative or distributor be accepted.

2.02 MANUFACTURER

- A. The pump station system integrator must be ISO 9001:2008 revision certified, with scope of registration including design control and service after sales activities.
- B. The specifications and project drawings depict equipment and materials which are deemed most suitable for the service anticipated. It is not intended, however, to eliminate other products of equal quality and performance. The contractor shall prepare his bid based on the specified equipment for purposes of determining low bid. Award of a contract shall constitute an obligation to furnish the specified equipment and materials.

2.03 STATION ENCLOSURE

- A. The station enclosure shall be above ground that contain and enclose all valves, and associated controls and shall be constructed to enhance serviceability by incorporating the following design characteristics:
 - 1. Two access panels per side of station shall be provided. Panels shall be sized and placed to permit routine maintenance operations through the panel openings of the enclosure. For these purposes, routine maintenance shall include frequently

- performed adjustments and inspections of the electrical components, controls and valves.
2. The access panels shall be provided with a hinge and latch. Hinge shall be the continuous type. Latch shall engage the enclosure at not less than three places, and shall be protected by a keyed lock.
 3. One enclosure side shall contain a screened vent to maximize air flow for enclosure ventilation.
 4. Station enclosure, less base, must be removable or able to be disassembled following the removal of reusable hardware.
 5. Removal or disassembly of the enclosure shall be accomplished by not more than two maintenance personnel without the use of lifting equipment.
- B. The station enclosure shall be manufactured of ASTM 6061-T6 aluminum or a molded reinforced orthophthalic polyester resins with a minimum of 30% fiberglass, and a maximum of 70% resin. Resin fillers or extenders shall not be used.
- C. If applicable glass fibers shall have a minimum average length of 1 1/4 inches. Major design considerations shall be given to structural stability, corrosion resistance, and watertight properties. The polyester laminates shall provide a balance of mechanical, chemical, and electrical properties to insure long life. They must be impervious to micro-organisms, mildew, mold, fungus, corrosive liquids, and gases which can reasonably be expected to be present in the environment surrounding the wet well.
- D. All interior surfaces of the housing shall provide:
1. Maintenance-free service
 2. Abrasion resistance
 3. Protection from sewage, greases, oils, gasoline, and other common chemicals
 4. The outside of the enclosure shall be coated with a suitable pigmented resin, compounded to insure long maintenance-free life.
- E. Outside surfaces of the enclosure aluminum enclosures shall have an aluminum ASTM 3003 mill finish. Additionally, a vinyl exterior finish is available with red brick look, tan brick look, rustic stone look or green pine tree look; resistant to UV, mild alkalis, mild acids and temperatures from -65F to 225F
- F. An exhaust blower shall be mounted on the side of the enclosure. Blower capacity shall be sufficient to change station air a minimum of once every two minutes. Blower motor shall be operated automatically and shall be turned on at approximately 70 degrees F and shall be turn off at 55 degrees F. Blower motor and control circuit shall be protected by a thermal-magnetic air circuit breaker to provide overcurrent and overload protection. Blower exhaust outlet shall be designed to prevent the entrance of rain, snow, rocks, and foreign material. Enclosure shall include bug-free ventilation covers and electric cooling fan(s) that is/are controlled by a thermostat, producing a minimum of 230 CFM

2.04 STATION BASE

- A. Station base shall be constructed of pre-cast, reinforced concrete bonded inside a fiberglass form covering top and sides, and shall be designed to insure adequate strength to resist deformation of the structure during shipping, lifting, or handling. The enclosure base shall function at the wet well top and incorporate a duplex access lid, sized for the installation and removal of the specified pumps, and shall be of sufficient size to permit access to the wet well. Color used shall de-emphasize the presence of dirt, grease, etc., and shall be provided with a non-skid surface.
- B. A static wet well vent shall be mounted in the station base, and be housed in the station enclosure. The station enclosure shall provide a transition area between the wet well and the vent outlet. The vent shall terminate through the station wall with a screened opening which shall be designed to prevent the entrance of rain, snow, rocks and foreign material.
- C. The station base shall incorporate a cable transition adapter for the pump cables, level controls, and associated wiring. The adapter shall provide for a vapor tight transition between the wet well and the lift station enclosure. The adapter shall incorporate cable grips for each cable and be provided with a gasket between the adapter and the station for a positive seal. Junction boxes shall not be considered for cable transition.
- D. The station base shall be furnished with elastomeric compression sealing devices for all piping penetrations to provide for a vapor tight transition between the wet well and lift station enclosure.
- E. Station Heater
 - 1. Pump station shall be provided with a 1300/1500 watt, 115 volt electric heater providing a minimum of 5000 BTU heat output per hour with cord, thermostat and grounding plug. Ungrounded heaters shall not be acceptable.
- F. Insulation Package
 - 1. The pump station shall be furnished with 1" thick spray foam insulation, which shall be applied to the roof, doors, and corner panels.
- G. Discharge Gauge Kit
 - 1. The pump station shall be equipped with a glycerin-filled pressure gauge to monitor discharge pressures. Gauge shall be a minimum of 4 inches in diameter, and shall be graduated in feet water column. Rated accuracy shall be 1 percent of full scale reading. Pressure gauge shall be graduated 0 to 70 feet water column minimum. Gauge kit shall be mounted and complete with all hoses and stainless steel fittings and shall include a shutoff valve installed in each connection to discharge piping and a three way valve to monitor either pump.
- H. Guide Rail Splice Kit
 - 1. Each pump shall be equipped with a welded 304 stainless steel assembly to provide guide rail splicing and support.
- I. Station Lighting

1. Enclosure shall be provided with six (6) high power LED waterproof light fixtures, installed in rigid aluminum housing which will adequately light the internal features of the station for maintenance and operational purposes.
- J. Station Lifting Hoist
1. Enclosure shall include a lifting hoist that is permanently mounted inside the enclosure for extracting the installed submersible pumps. The permanently mounted davit and house shall be mounted in a location that does not interfere with the discharge piping. Hoist shall be rated for pump weights but capable of lifting a minimum of 800 pounds.
- K. A duplex Ground Fault Circuit Interrupter (GFCI) receptacle providing 115 VAC, 60 Hz, single phase current, will be mounted in the pump station enclosure. Receptacle circuit shall be protected by a 15-ampere thermal-magnetic circuit breaker.

2.05 PUMP DESIGN

- A. The manufacturer of the pumps must be certified to ISO 9001 by an accredited certification agency.
- B. Hydraulic Components and Solids Handling:
1. The pump casing shall be of gray iron, ASTM A-48, Class 30, or ductile iron, Class 65-45-12, with a 125# Flange. Casing shall be easily removable from the motor for full inspection of impeller.
 2. All pump openings and passages shall be of adequate size to pass 3.0" diameter spheres (minimum) and any trash or stringy material which can pass through an average house collection system.
 3. The impeller shall be a multi-vane vortex type with integral stagger-step winglets on each vane. The winglet shall form a stagger-stepped L-shaped cross section at the face of the vane for improved hydrodynamic efficiency. Impeller shall be of ductile iron and precision balanced. Balancing shall not deform or weaken the impeller. The impeller shall be recessed into the pump casing and shall not require flow of liquid through the impeller. The impeller and seal housing shall incorporate auxiliary vanes to hydraulically reduce pressure on the primary seal and force fibrous materials and solids away from the close axial clearance on the backside of the impeller. The impeller shall be driven by means of a key slotted into the shaft. Impeller fasteners shall be non-corroding. No impeller clearance adjustment or wear rings shall be required.
 4. A hoisting bail shall provide for proper balance of pump while it is being lifted.
 5. All other major pump components such as motor housing, seal housing, and bearing brackets shall be of gray iron, ASTM A-48, Class 30. All external surfaces coming into contact with pumped media shall be protected by water-based epoxy primer and a waterborne enamel top coat with a minimum 8 mil thickness. All exposed fasteners and lock washers shall be of 300 series stainless steel.
- C. Shaft Seal

1. Two separate mechanical seals shall be provided, arranged in tandem. The upper seal shall have a carbon rotating face and ni-resist stationary face. The lower seal shall incorporate silicon carbide on both the rotating and stationary faces. Cage and springs shall be of stainless steel and elastomers of Viton or Buna-N.
2. The rotating seal faces shall be lubricated from an oil filled reservoir between pump and motor; the oil serving as both lubricating and a cooling media. The reservoir shall have two oil fill and drain plugs to insure accuracy when measuring lubricant level and for ease of maintenance.
3. Seal shall require no special maintenance or routine adjustment; however, shall be easily inspected or replaced. No seal damage shall result from operating the pump for short periods of time without liquid.
4. A seal failure electric probe sensor shall be installed in the seal chamber. The sensor shall be capable of sensing leakage into the seal chamber and the sensitivity level shall be set in the control panel.

D. Pump Motor

1. Motor Description

- a. The motor and pump must be connected to form an integral unit. Motor shall be a squirrel-cage, induction type in an air-filled water tight enclosure, oil-filled motors shall not be acceptable. The motor shall conform to NEMA design standards, and incorporate Class H insulation materials to withstand a continuous operating temperature of 180°C (356°F). The pump and motor shall be capable of handling liquids with a maximum temperature of 40°C (104°F). The motor shall be explosion proof, Class 1, Division 1 Group C & D, 480V, 3 phase, 60 HZ submersible motor operating at no higher than 1800 RPM.
- b. Motor shall be capable of sustaining a minimum of 10 starts per hour and shall be inverter duty rated in accordance with NEMA MG1. The motor shall not require a cooling jacket or any other means of auxiliary cooling during normal continuous operation.
- c. Motor housing shall be of cast iron. The stator shall consist of copper windings with copper connectors applied to high grade electrical steel laminations. The stator shall be held securely in place by a heat-shrink fit into the motor housing. Any other means of securing the stator which would require penetration of the motor housing shall not be considered acceptable.
- d. Combined rotor and shaft assembly shall be dynamically balanced for vibration-free operation. Rotor end bars and short circuit rings shall be of aluminum. The pump shaft shall be of 17-4 PH series stainless steel. The shaft shall be machined with shoulders or snap ring grooves for positive placement of bearings.
- e. The upper and lower bearing shall be of heavy duty design, capable of supporting the shaft and rotor while under maximum radial and thrust loads. The bearings shall be permanently grease lubricated and sealed at the time of

installation. The minimum B-10 bearing life shall be 50,000 hours over the normal operating range of the curve.

2. Watertight Integrity

- a. All static seals at watertight mating surfaces shall be of Buna-N or Viton rubber O-ring type. Use of auxiliary sealing compounds shall not be required.
- b. The power and control cables shall enter the motor through a terminal housing. The entrance shall be sealed with a rubber grommet and clamp set which when compressed longitudinally causes a radial watertight seal. The individual leads of the power and control cables shall be separated by a compressible grommet, which shall provide protection from wicking through the cable. Any other cable entrance design requiring use of epoxies, silicones, or similar caulking materials shall be considered unacceptable.
- c. The motor and sensor leads shall be mated to the cable leads through a group of quick-connect, color-coded cable connectors.
- d. The pump and electrical cables shall be capable of continuous submergence without loss of waterproof integrity to a depth of 65 feet.
- e. The watertight integrity of the motor housing and shaft seal shall be tested during manufacture by vacuum testing the completed pump assembly.

3. Motor Protection

- a. The motor shall be protected from thermal damage by a group of three separate thermostatic switches embedded into the stator windings, one per stator phase. Each switch shall open independently and terminate motor operation if temperature of the protected winding reaches the high temperature set point of 160°C (320°F) and shall automatically reset upon cooling of the winding. The thermal sensing device shall be connected to the pump control panel by the contractor.

The pump shall utilize a single probe to monitor both the motor and seal chambers for moisture intrusion. The detection of moisture in either chamber shall send a signal to the control panel which shall be used to notify the user of the need for an inspection.

2.06 AUTOMATIC DISCHARGE CONNECTION

- A. Each pump shall be furnished with a submersible discharge connection system to permit removal and installation of the pump without the necessity of an operator entering the wet well. The design must insure an automatic and firm connection of the pump to the discharge piping when lowered into place.
- B. A gray iron or fabricated steel base plate with integral guide rail pilots shall be provided along with all hardware and anchor bolts required for permanent installation to the wet well floor. The base plate shall be designed with an integral 90° elbow, or adapt to a commercially available elbow for connection to the vertical discharge piping utilizing standard ANSI 125 lbs. flanges. The base plate shall be coated with an epoxy coating

for corrosion resistance. The manufacturer shall provide all necessary drawings to insure proper installation and alignment of baseplate within the sump.

- C. Each pump shall be provided with a replaceable ductile iron slide rail guide shoe attached to pump discharge flange. A replaceable neoprene seal shall be provided as an integral part of the guide shoe to form a seal with the base plate connection and eliminate the possibility of leakage and erosive wear during operation. The seal shall contact mating faces in a static position and shall have adequate flexibility to flex under pumping pressure to increase seal efficiency. Metal-to-metal contact at the discharge connection shall not be acceptable.
- D. The contractor shall provide two lengths of 2", schedule 40 stainless steel guide rail pipe for each pump.
- E. Upper guide rail pilots, and a lifting cable shall be furnished for each pump. Bottom pilots shall be an integral part of the baseplate for ease of installation and proper alignment.
- F. The guide shoe shall direct the pump down two vertical guide rails and onto the discharge connection in a simple lineal movement. The buildup of sludge and grease on guide rails shall not present problems during the lifting operation. The guide shoe shall be designed with integral hooks at the top to transmit full weight of the pump to the base plate flange. No portion of the pump shall be supported directly on the bottom of the wet well, guide rails, or lifting cable.
- G. Lifting cable shall consist of a 316 stainless steel braided wire cable attached to the pump lifting bail. A crimped ball end shall be provided at the upper end of this cable for attaching to the wet well access frame.
- H. All bolts, machine screws, nuts, washers, and lockwashers for complete assembly of access cover, guide rails, and discharge elbow shall be stainless steel.

2.07 WET WELL ACCESS

- A. The wet well access shall be fabricated from welded aluminum sections. A hinged aluminum door shall be provided for each pump. The hinged door shall be fabricated from 1/4" thick aluminum with non-skid diamond tread on upper surface. All hardware on access assembly shall be stainless steel with a flush upper surface without protrusions. For safety, the door shall have a 300 lbs/sq.ft. rating and be fitted with a recessed staple for padlock. Door shall be furnished with a flush aluminum drop handle and automatic hold open arm.

2.08 VALVES AND PIPING

- A. Check Valve: Each pump shall be equipped with a full flow type check valve capable of passing a 3" spherical solid. Valve shall be constructed with flanged ends and fitted with an external lever and torsional spring. Valve seat shall be constructed of stainless steel, secured to the body to ensure concentricity, sealed by an O-ring, and shall be replaceable. The valve body shall be cast iron incorporating a clean-out port large enough to allow removal and/or replacement of the valve clapper without removing valve or piping from the line. Valve clapper shall have a molded neoprene seating surface

incorporating low pressure sealing rings. Valve hinge pin and internal hinge arm shall be stainless steel supported on each end in brass bushings. Shaft nut shall have double O-rings which shall be easily replaceable without requiring access to interior of valve body. All internal hardware shall be stainless steel. Valve shall be rated at 175 PSI water working pressure, 350 PSI hydrostatic test pressure. Valves other than full flow type or valves mounted in such a manner that prevents the passage of a 3" spherical solid shall not be acceptable.

- B. Each discharge line shall be equipped with a 2-way plug valve to permit isolation of the pumps from the common discharge header. The plug valve shall be non-lubricated type. Valve body shall be cast iron with flanged end connections drilled to 125 pound standard. Valve shall be furnished with a drip-tight shutoff plug mounted in stainless steel or Teflon over phenolic bearings and shall have a resilient facing bonded to the sealing surface. Valves shall have ports designed to pass 3" spherical solids.

C. Discharge Bypass Piping

1. The station header pipe shall incorporate a 2-way plug valve to permit emergency access to the pump station force main after isolation of the pumps. The plug valve shall be non-lubricated, tapered type. Valve body shall be cast iron with flanged end connections drilled to 125 pound standard. Valve shall be furnished with a drip-tight shutoff plug mounted in stainless steel or teflon over phenolic bearings, and shall have a resilient facing bonded to the sealing surface.
2. The header pipe shall penetrate the station side wall and terminate with a male OPW type quick connect fitting.

D. Suction Bypass Piping

1. The station shall incorporate piping to permit emergency access to the pump station wet well.
2. The pipe shall penetrate the station side wall and terminate with a male OPW type quick connect fitting.

E. Piping

1. Flanged header pipe shall be centrifugally cast, ductile iron, complying with ANSI/AWWA A21.51/C115 standards for sanitary sewage services and class 53 thickness.
2. Flanges shall be cast iron class 125 and Comply with ANSI B16.1.
3. Pipe and flanges shall be threaded and suitable thread sealant applied before assembling flange to pipe.
4. Bolt holes shall be in angular alignment within $1/2^{\circ}$ between flanges. Flanges shall be faced and a gasket finish applied.
5. All pipes connected to the pump station shall be supported according to good commercial practice.

F. Vacuum Break / Air Release Valves

1. The header piping shall be equipped with ball type check valves on the discharge side of each pump to allow a vacuum break to occur, as well as assist purging air from the system in the event that there is insufficient atmospheric pressure available to support the resultant water column. A ball valve and PVC line extending through the pump station base for drainage back to the wet well shall be installed in each pump discharge line.

2.09 ELECTRICAL CONTROL COMPONENTS

- A. The pump station control panel will be tested as an integral unit by the pump station manufacturer.

B. Panel Enclosure

1. The electrical control equipment shall be mounted within a 36"x30"x14" Nema 1 stainless steel, dead front type control enclosure. The enclosure door shall be hinged and sealed with a neoprene gasket. It shall include a removable plated steel back panel on which control components shall be mounted. Back panel shall be secured to enclosure with collar studs. Operator controls shall be mounted on the enclosure door. The enclosure shall be mounted within the fiberglass or aluminum valve enclosure. The control panel shall be equipped with vapor emission type corrosion inhibitors.
2. All control components shall be securely fastened to a removable back panel with screws and lock washers. Switches, indicators and instruments shall be mounted through the control panel door. All control devices and instruments shall be secured to the sub-plate with machine screws and lockwashers. Mounting holes shall be drilled and tapped; Self-tapping screws shall not be used to mount any components. All connections from the back panel to door mounted or remote devices shall be made through terminal blocks. All control devices shall be clearly labeled to indicate function.
3. A main terminal block and ground bar shall be furnished for field connection of the electrical supply. The connections shall be designed to accept copper conductors of sufficient size to serve the pump station loads. The main terminal block shall be mounted to allow incoming wire bending space in accordance with Article 373 of the National Electrical Code (NEC).

C. UL Label Requirement:

1. Pump station controls shall conform to third party safety certification. The panel shall bear a serialized UL label listed for "Enclosed Industrial Control Panels". The enclosure, and all components mounted on the sub-panel or control cover shall conform to UL descriptions and procedures.

D. Transient Voltage Surge Suppressor

1. The control panel shall be equipped with a modular surge arrestor to minimize damage to the pump motors and control from transient voltage surges. The suppressor shall utilize thermally protected by heavy duty zinc-oxide varistors encapsulated in a non-conductive housing. Mechanical indicators shall be provided on each phase to indicate protection has been lost. The suppressor shall have a short circuit current rating of 200,000 Amps and a Maximum Discharge current rating [I_{max}] of 40,000 Amperes. Nominal discharge current [I_n] is 20,000 Amperes. Surge arrester according to UL 1449 3rd Edition, Type 2 component assembly.

E. Station Enclosure Low Temperature Alarm:

1. Pump station shall be supplied with a thermostat which shall monitor interior station temperature. The control shall incorporate an unpowered dry contact wired to terminal blocks for field connection to a remote alarm device. The contact will close in the event that the temperature within the enclosure falls below approximately 35 degrees F. Low temperature alarm should be connected to SCADA system.

F. Motor Branch Components

1. A properly sized heavy duty air circuit breaker shall be furnished for each pump motor, and shall have a symmetrical RMS interrupting rating of 60 amperes at 208 volts. All circuit breakers shall be sealed by the manufacturer after calibration to prevent tampering.
2. A padlocking operating mechanism shall be installed on each motor circuit breaker. Operator handles for the mechanisms shall be located on the door, with interlocks which permit the door to be opened only when circuit breakers are in the "OFF" position. An additional mechanism(s) shall be provided on the circuit breaker permitting the breaker to be operated and/or locked with the control panel door in the open position.
3. Motor Starter
 - a. An open frame, across-the-line, NEMA rated magnetic motor starter shall be furnished for each pump motor. Starters of NEMA size 1 and above shall be designed for addition of at least two auxiliary contacts. Starters rated "O", "OO", or fractional size shall not be acceptable. Power contacts shall be double-break and made of cadmium oxide silver. Coils shall be epoxy molded for protection from moisture and corrosive atmospheres. The starter assembly shall be equipped with a metal mounting plate for durability. All motor starters shall be equipped to provide under-voltage release and overload protection on all three phases. Motor starter contacts and coils shall be easily replaceable without removing the motor starter from its mounted position.
 - b. Overload relays shall be solid-state block type, having visual trip indication with trip-free operation. Electrically resetting the overload will cause one (1) normally open and one (1) normally closed isolated alarm/control contact to reset, thus re-establishing a control circuit. Trip setting shall be governed by solid-state circuitry and adjustable current setting. Trip classes shall be 10, 15 and 20. Additional features to include phase loss protection, selectable jam/stall protection and selectable ground fault protection.

- c. A reset pushbutton, mounted through the control panel door, shall permit resetting the overload relays without opening the door.
4. All motor branch and power circuit components shall be of highest industrial quality. The short circuit current rating of all power circuit devices shall be a tested combination or evaluated per the National Electrical Code Article 409. The lowest rated power circuit component shall be the overall control panel short circuit rating and shall not be less than the fault current available. The minimum control panel rating shall not be less than 10 kA, rms symmetrical. Control assemblies operating at 120 volts nominal or less may be provided with transformers which limit the fault current and may be rated less than the minimum required short circuit rating

G. Other Control Components

1. The pump control panel shall be equipped to terminate pump operation due to high motor winding temperature or moisture in the motor housing or seal cavity, utilizing contacts in the pump motor housing and seal cavity. If a moisture or thermal event should occur, the motor starter will drop out and a visible indicator on the door shall indicate the pump motor has been shut down. If shutdown is due to high motor temperature, motor power will automatically be restored when the temperature returns to normal range. If the shutdown occurs due to moisture, a manual reset will be required before motor power is restored. Dry contacts, wired to terminal blocks, shall be furnished for each pump for thermal/moisture shutdown.
2. The control circuit shall be protected by a normal duty thermal- magnetic air circuit breaker which shall be connected in such a manner as to allow control power to be disconnected from all control circuits.
3. Pump mode selector switches shall be connected to permit manual start and manual stop for each pump individually, and to select automatic operation of each pump under control of the liquid level control system. Manual operation shall override the liquid level control system. Selector switches shall be heavy duty, oil-tight design, with contacts rated NEMA A300 minimum.
4. Pump alternation shall be integral to the liquid level controller. Provisions for automatic alternation or manual selection shall also be integral to the liquid level controller.
5. Control panel shall be equipped with one oil-tight pilot light for each pump motor. Light shall be wired in parallel with the related pump motor starter to indicate that the motor is on or should be running.
6. Six digit elapsed time meter shall be displayed on the Integrinex™ Standard operator interface to indicate total running time of each pump in "hours" and "tenths of hours". Pump runtime shall be adjustable and password protected.
7. A switch shall be provided to permit the station operator to select automatic alternation of the pumps, to select pump number one to be the lead pump for each pumping cycle or to select pump number two to be the lead pump for each pumping

cycle. Selector switch shall be oil-tight design, with contacts rated NEMA A300 minimum.

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

9. Auxiliary Power Transformer

- a. The lift station shall be equipped with a 3 KVA stepdown transformer to supply 115 volt, AC, single phase for the control and auxiliary equipment. The primary and secondary side of the transformer to be protected by a thermal magnetic circuit breaker, sized to meet the power requirements of the transformer. An operating mechanism shall penetrate the control panel door. and a padlockable operator handle shall be secured on the exterior surface. Interlocks must prevent opening the door until circuit breakers are in "OFF" position. An additional mechanism(s) shall be provided on the circuit breaker permitting the breaker to be operated and/or locked with the control panel door in the open position.

10. Three-Phase Voltage Montior

- a. The control panel shall be equipped to monitor the incoming power and shut down the pump motors when required to protect the motor(s) from damage caused by phase reversal, phase loss, voltage unbalance, high voltage, and low voltage. An adjustable time delay shall be provided to minimize nuisance trips. The motor(s) shall automatically restart, following an adjustable time delay, when power conditions return to normal.

11. Pump Start Delay

- a. The control circuit for pump #2 shall be equipped with a time delay to prevent simultaneous motor starts.

12. Panel Heater

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

H. Wiring

1. The control panel, as furnished by the manufacturer, shall be completely wired. The contractor shall field connect the power feeder lines to the main terminal block, final connections to the remote alarm devices, and the connections between the pump and the pump motor control. All wiring, workmanship, and schematic wiring diagrams shall be in compliance with applicable standards and specifications set forth by the National Electric Code (NEC).
2. All user serviceable wiring shall be type MTW or THW, 600 volts, and shall be color coded as follows:

- a. Line and load circuits, AC or DC power.....Black
 - b. AC control circuit less than line voltage.....Red
 - c. DC control circuit.....Blue
 - d. Interlock control circuit, from external source.....Yellow
 - e. Equipment grounding conductor.....Green
 - f. Current carrying ground.....White
 - g. Hot with circuit breaker open.....Orange
3. Control circuit wiring inside the panel, with the exception of internal wiring of individual components, shall be of 16 gauge minimum, type MTW or THW, 600 volts. Power wiring shall be 14 gauge minimum.
 4. Motor branch and other power conductors shall not be loaded above the temperature rating of the connected termination. Wires shall be clearly numbered at each end in accordance with the electrical diagrams. All wires on the sub-plate shall be bundled and tied.
 5. Wires connected to components mounted on the enclosure door shall be bundled and tied in accordance with good commercial practice. Bundles shall be made flexible at the hinged side of the enclosure. Adequate length and flex shall be provided to allow the door to swing to its full open position without undue stress or abrasion on the wire or insulation. Bundles shall be held in place on each side of the hinge by mechanical fastening devices.
- I. Conduit requirements are as follows
1. All conduit and fittings shall be UL listed.
 2. Liquid tight flexible metal conduit shall be constructed of smooth, flexible galvanized steel core with smooth abrasion resistant, liquid tight, polyvinyl chloride cover.
 3. Conduit shall be supported in accordance with articles 346, 347, and 350 of the National Electric Code.
 4. Conduit shall be sized according to the National Electric Code.
- J. Grounding
1. The pump control manufacturer shall provide a common ground bar mounted on the enclosure back plate. The mounting surface of the ground bar shall have any paint removed before making final connections.
 2. The contractor shall make the field connections to the main ground lug and each pump motor in accordance with the National Electric Code.
- K. Identification
1. A permanent corrosion resistant name plate(s) shall be attached to the control and include the following information:
 - a. Equipment serial number

- b. Control panel short circuit rating
 - c. Supply voltage, phase and frequency
 - d. Current rating of the minimum main conductor
 - e. Electrical wiring diagram number
 - f. Motor horsepower and full load current
 - g. Motor overload heater element
 - h. Motor circuit breaker trip current rating
 - i. Name and location of equipment manufacturer
2. Control components shall be permanently marked using the same identification shown on the electrical diagram. Identification label shall be mounted adjacent to the device.
 3. Switches, indicators, and instruments shall be plainly marked to indicate function, position, etc. Marking shall be mounted adjacent to and above the device.

2.10 LIQUID LEVEL CONTROL

- A. The manufacturer of the liquid level control system must be ISO 9001:2000 revision certified, with scope of registration including design control and service after sales activities.
- B. The level control system shall start and stop the pump motors in response to changes in wet well level, as set forth herein.
- C. The level control system shall be capable of operating as either an air bubbler type level control system, submersible transducer type system, or ultrasonic transmitter type system.
- D. The level control system shall utilize alternation to select first one pump, then the second pump, then the third pump (if required), to run as lead pump for a pumping cycle. Alternation shall occur at the end of a pumping cycle, or in the event of excessive run time.
- E. The level control system shall utilize an electronic pressure switch which shall continuously monitor the wet well level, permitting the operator to read wet well level at any time. Upon operator selection of automatic operation, the electronic pressure switch shall start the motor for one pump when the liquid level in the wet well rises to the "lead pump start level". When the liquid is lowered to the "lead pump stop level", the electronic pressure switch shall stop this pump. These actions shall constitute one pumping cycle. Should the wet well level continue to rise, the electronic pressure switch shall start the second and/or third pump (if required) when the liquid reaches the "lag pump start level", or "standby pump start level" so that all pumps are operating. These levels shall be adjustable as described below.
 1. The electronic pressure switch shall include integral components to perform all pressure sensing, signal conditioning, EMI and RFI suppression, DC power supply and 120 volt outputs. Comparators shall be solid state, and shall be integrated with other components to perform as described below.

2. The electronic pressure switch shall be capable of operating on a supply voltage of 12-24Vdc in an ambient temperature range of -10 degrees C (14 degrees F) through 55 degrees C (131 degrees F). Ingress Protection of IP56 for indoor use with closed cell neoprene blend gasket material. Evaluated by Underwriters Laboratories for Pollution Degree 2 device for U.L. and cU.L. Control range shall be 0 to 33.3 feet of water with an overall repeat accuracy of (plus/minus) 0.1 feet of water. Memory shall be non-volatile. A Battery backed real time clock shall be standard.
3. Eleven optically isolated, user defined digital inputs for pump and alarm status. Rated at 10mA at 24Vdc. Eight digital output relays (mechanical contacts), configurable for pump start/stop or alarms. Three relays rated at 12 Amp @ 28Vdc and 120Vac, five relays rated at 3 Amp @ 30Vdc and 120Vac. The electronic pressure switch shall consist of the following integral components: pressure, display, electronic comparators, digital inputs and digital output relays.
 - a. The internal pressure sensor shall be a strain gauge transducer and shall receive an input pressure from the air bubbler system. The transducer shall convert the input to a proportional electrical signal for distribution to the display and electronic comparators. The transducer output shall be filtered to prevent control response to level pulsations or surges. The transducer range shall be 0-14.5 PSI, temperature compensated from -40 degrees C (-40 degrees F) through 85 degrees C (185 degrees F), with a repeat accuracy of (plus/minus) 2.5% full scale about a fixed temperature. Transducer overpressure rating shall be 3 times full scale.
 - b. The electronic pressure switch shall incorporate a digital back lighted LCD panel display which, upon operator selection, shall indicate liquid level in the wet well, and pump status indication for up to 3 pumps. The display shall include a 128 x 64 bit resolution LCD to read out directly in feet of water, accurate to within one-tenth foot (0.1 foot), with a full scale indication of not less than 12 feet. The display shall be easily convertible to indicate English or metric units.
 - c. Level adjustments shall be electronic comparator set-points to control the levels at which the lead, lag and standby pumps start and stop. Each of the level settings shall be easily adjustable with the use of membrane type switches, and accessible to the operator without opening any cover panel on the electronic pressure switch. Controls shall be provided to permit the operator to read the selected levels on the display. Such adjustments shall not require hard wiring, the use of electronic test equipment, artificial level simulation or introduction of pressure to the electronic pressure switch.
 - d. Each digital input can be programmed as pump run, pump HOA, pump high temp, pump moisture/thermal, starter failure (FVNR, RVSS, VFD), and phase failure. Inputs are used for status and alarm indication.
 - e. Each output relay in the electronic pressure switch shall be hard contact mechanical style. Each relay input shall be optically isolated from its output and shall incorporate zero crossover switching to provide high immunity to electrical noise. Each output relay shall have an inductive load rating equivalent to one NEMA size 3 contactor. A pilot relay shall be incorporated for loads greater than a size 3 contactor.

4. The electronic pressure switch shall be equipped with alarm banners with time and date history for displaying alarm input notification. Alarm history will retain a 16 of the most recent alarm events.
5. The electronic pressure switch shall be equipped with pump start/stop and alarm input delay(s) that have an adjustable delay set points.
6. An Antiseptic function with a built in timer shall be incorporated in the electronic pressure switch to prevent the well from becoming septic.
7. The electronic pressure switch shall be capable of jumping to next available pump if current pump is out of service due to pump failure or manual selection. Circuit design in which application of power to the lag pump motor starter is contingent upon completion of the lead pump circuit shall not be acceptable.
8. The electronic pressure switch shall be equipped with a simulator system capable of performing system cycle testing functions.
9. The electronic pressure switch shall be capable of calculating and displaying pump elapse run time. The elapse run time is resettable and adjustable.
10. The electronic pressure switch shall have internal capability of providing automatic simplex, duplex, and triplex alternation, manual selection of pump sequence operation, and alternation in the event of 1-24 hours of excessive run time.
11. The electronic pressure switch shall be equipped with a security access code to prevent accidental set-up changes and provide liquid level set-point lock-out. The supervisor access code is adjustable.
12. The electronic pressure switch shall be equipped with one (1) 0-33 ft. W.C. input, one (1) scalable analog input of either 0-5Vdc, or 4-20mA, and one (1) scalable analog output of either 0-5Vdc, 0-10Vdc or 4-20mA. Output is powered by 10-24Vdc supply. Load resistance for 4-20mA output shall be 100-1000 ohms.
13. The electronic pressure switch shall include a DC power supply to convert 120Vac control power to 12 or 24Vdc power. The power supply shall be 500 mA (6W) minimum and be UL listed Class II power limited power supply.
14. The electronic pressure switch shall be equipped with an electronic comparator and mechanical output relay to alert maintenance personnel to a high liquid level in the wet well. An alarm banner, visible on the front of the controller, shall indicate that a high wet well level exists. The alarm signal shall be maintained until the wet well level has been lowered and the circuit has been manually reset. High water alarm shall be furnished with a dry contact wired to terminal blocks.
15. The electronic pressure switch shall be equipped with an electronic comparator and mechanical output relay to alert maintenance personnel to a low liquid level in the wet well. An alarm banner, visible on the front of the controller, shall indicate that a low wet well level exists. The alarm signal shall be maintained until the cause for the low wet well level has been corrected and the circuit has been manually reset. A low

liquid level condition shall disable all pump motors. When the wet well rises above the low level point, all pump motors shall be automatically enabled. Low water alarm shall be furnished with a dry contact wired to terminal blocks.

F. An alarm silence pushbutton and relay shall be provided to permit maintenance personnel to de-energize the audible alarm device while corrective actions are under way. After silencing the alarm device, manual reset of the alarm condition shall clear the alarm silence relay automatically. The pushbutton shall be a membrane style button integral to the Integrix Standard level controller.

G. Air Bubbler System

1. The level control system shall be the air bubbler type, containing air bubbler piping which extends into the wet well. A pressure sensor contained within the electronic pressure switch shall sense the air pressure in this piping to provide wet well level signals for the remainder of the level control system.
2. Two vibrating reed, industrial rated, air pumps shall be furnished to deliver free air at a rate of approximately 5 cubic feet per hour and a pressure not to exceed 7 psi. Liquid level control systems utilizing air compressors delivering greater quantities of air at higher pressures, requiring pressure reducing valves, air storage reservoirs, and other maintenance nuisance items will not be acceptable. A selector switch shall be furnished to provide manual alternation of the air pumps. The switch shall be connected in such a manner that either pump may be selected to operate continuously. The selector switch shall be oil-tight design with contacts rated NEMA A300 minimum.
3. An air bell constructed of PVC 3 inches in diameter shall be provided for installation at the outlet of the air bubbler line in the wet well. The air bell shall have a 3/8" NPT tapped fitting for connection to the bubbler line.
4. An air flow indicator gauge shall be provided and connected to the air bubbler piping to provide a visual indication of rate of flow in standard cubic feet per hour.

H. Submersible Transducer System (**Optional**)

1. The level control system shall utilize a submersible transducer. It shall be a strain gauge transducer with a pressure sensor housed in a 316 SST or Titanium case designed to extend into the wet well. The pressure transducer shall provide a proportional signal for distribution to the display and electronic comparators of the electronic pressure switch, and remainder of the level control system. Sensor range shall be 0-12 ft. W.C. minimum with an over-pressure rating 3 times full scale. The transducer shall have output capability of 0-5Vdc or 4-20mA. The transducer's polyurethane jacketed shielded cable shall be of suitable length for proper installation into the wet well without splicing.
2. Intrinsically Safe Barrier (to be used with submersible transducer)
 - a. An intrinsically safe repeater shall be supplied in the control enclosure. Repeater must be recognized and listed as intrinsically safe by a nationally recognized testing laboratory. Station manufacturer shall make all connections from repeater

to feeder lines and motor controls. Installing contractor shall make connections from repeater to transducer.

3. Submersible transducer transient voltage surge suppression

- a. Submersible transducer will be furnished with transient voltage surge suppression to protect related equipment from an induced voltage spike from lighting.

I. Alarm Light

1. Station manufacturer will supply one 115 volt AC alarm light fixture with vapor-tight red globe, guard, conduit box, and mounting base. The design must prevent rain water from collecting in the gasketed area of the fixture, between the base and globe. The alarm light shall be mounted on the station enclosure.

J. Alarm Flasher

1. The alarm light circuit shall be equipped with a repeat cycle timer causing the alarm light to flash. Flash rate shall be approximately 1 second. (1/2 second on and off).

2.11 BACKUP LIQUID LEVEL CONTROL (Intrinsically Safe Mercury Float Switch Type)

- A. A backup level control system shall be provided to operate the pumps, in the event of a failure of the primary solid state air bubbler level control system. This backup level control will allow for a redundant pump off switch, located at a wet well setting that is above the submersible pump motor housings, to turn the pump motors off in the event of a primary level control failure.
- B. The backup level control system shall start and stop pump motors in response to changes in wet well level. It shall be the mercury float switch type, incorporating intrinsically safe relays. Rising and falling liquid level in the wet well causes switches within the floats to open and close, providing start and stop signals to the remainder of the level control system.
- C. The backup level control system shall start and stop the pumps in accordance to the wet well level. The pump start and stop float switches shall be set above and below the normal pump start and stop level settings utilized for the primary air bubbler level control. Upon operator selection of automatic operation, a float switch shall start one pump motor when water rises to the "pump start level", then after a preset time delay, the second pump motor will also start. When the water is lowered to the "pump stop level", the system shall stop both pumps. These actions shall constitute one pumping cycle.
- D. Two float switches shall be supplied for installation by the Contractor. Each float shall contain a mercury switch sealed in a polypropylene housing, with 50 feet of power cord. Float switches shall wire direct to the control panel. A stainless-steel chain with weight shall be furnished to secure the switches in the wet well.
- E. Two intrinsically safe relays shall be supplied in a separate level control enclosure. Relays must be recognized and listed as intrinsically safe by a nationally recognized

testing laboratory. Installing contractor shall make all connections from relays to motor controls.

- F. The back-up level control system for use with Gorman-Rupp pump systems shall be a Intrinsically Safe Mercury Float Switch Type.

2.12 CONCRETE PRECAST WET WELL

The pump and motor assembly shall be field installed within a precast wet well designed for wastewater applications. The wet well shall be fitted out with rails, inlet pipe openings at the proper elevation per the drawings, 4" outlet pipe exiting as the proper elevation, pipe supports, and hardware for a complete installation. Before shipping, the pump station components shall be assembled, and the operation thoroughly tested. The project engineer shall have been notified 10 days in advance of this testing, and the engineer or designee(s), shall be invited to observe the testing at the factory.

A. Materials and Construction Features

1. Material: Precast Concrete, 5,000 PSI @ 28 Days Min, Conform to ASTM C-478, includes Xypex additive and coal-tar epoxy coating to wet well interior to combat corrosion.
2. Dimensions: 10.0' Dia. x 30.0' Deep, as shown on the Plans (measured from top of wet well slab to wet well inside floor) x (measured from inside to inside)
3. Rail Assembly: Field-plumbed for pump and motor installation and removal by staff from the surface, with no "confined space" entry required. Slide rails, support brackets, and pipe/pump connection hardware shall be fabricated of stainless steel suitable for resisting sanitary sewage corrosive
4. ity.
5. Inlet Pipe Opening: Elevation and direction as shown on the plans. Opening fitted with watertight seal to prevent infiltration.
6. Outlet Pipe Opening: Elevation and direction as shown on the plans.
7. Access Hatch Cover & Safety Grate: Aluminum Channel-Frame Access Cover with lockable dual hatch doors, 300 PSF load rated, stainless-steel hinges and hardware; includes Aluminum "I" bar construction safety grate with safety orange powder-coated finish.
8. Cable / Wire Trough: Aluminum wire trough with slip-resistant removeable cover, designed to contain all power cables, level control cables and serve as the wet well vent.

PART 3 – EXECUTION

3.01 GENERAL

A. The Contractor shall install the factory-built pump station including the necessary site work (grading, concrete, soil compaction, and restoration); wet well and enclosures; pump and motors; valves, piping and motor control equipment; conduit and wiring; instruments; generator; supports, hardware and all other necessary equipment and appurtenances for a complete and operable installation.

3.02 EXAMINATION

- A. Contractor shall off-load equipment at installation site using equipment of sufficient size and design to prevent injury or damage. Station manufacturer shall provide written instruction for proper handling. Immediately after off-loading, contractor shall inspect complete pump station and appurtenances for shipping damage or missing parts. Any damage or discrepancy shall be noted in written claim with shipper prior to accepting delivery. Validate all station serial numbers and parts lists with shipping documentation. Notify the manufacturer's representative of any unacceptable conditions noted with shipper.

3.03 INSTALLATION

- A. Install, level, align, and lubricate pump station as indicated on project drawings. Installation must be in accordance with written instructions supplied by the manufacturer at time of delivery.
- B. Backfill around the wet well with ODOT #304 structural backfill from wet well base to bottom of concrete pad. Compact in 12" lifts.
- C. Check motor and control data plates for compatibility to site voltage. Install and test the station ground prior to connecting line voltage to station control panel.
- D. Prior to applying electrical power to any motors or control equipment, check all wiring for tight connection. Verify that protective devices (fuses and circuit breakers) conform to project design documents. Manually operate circuit breakers and switches to ensure operation without binding. Open all circuit breakers and disconnects before connecting utility power. Verify line voltage, phase sequence and ground before actual start-up.

3.04 FIELD QUALITY CONTROL

A. Operational Test

1. Prior to acceptance by owner, an operational test of all pumps, and control systems shall be conducted to determine if the installed equipment meets the purpose and intent of the specifications. Tests shall demonstrate that all equipment is electrically, mechanically, structurally, and otherwise acceptable; it is safe and in optimum working condition; and conforms to the specified operating characteristics.
2. After construction debris and foreign material has been removed from the wet well, contractor shall supply clear water volume adequate to operate station through several pumping cycles. Observe and record operation of pumps, suction and discharge gage readings, ampere draw, pump controls, and liquid level controls. Check calibration of all instrumentation equipment, test manual control devices, and

automatic control systems. Be alert to any undue noise, vibration or other operational problems.

B. Manufacturer's Start-up Services

1. Coordinate station start-up with manufacturer's technical representative. The representative or factory service technician will inspect the completed installation. Calibrate and adjust instrumentation, correct or supervise correction of defects or malfunctions, and instruct operating personnel in proper operation and maintenance procedures.

3.05 CLEANING

- A. Prior to acceptance, inspect interior and exterior of pump station for dirt, splashed material or damaged paint. Clean or repair accordingly. Remove from the job site all tools, surplus materials, scrap and debris.

3.06 PROTECTION

- A. The pump station should be placed into service immediately. If operation is delayed, station is to be stored and maintained per manufacturer's written instructions.

END OF SECTION