PROJECT DESCRIPTION (QUESTION 6)

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Project Background

The project includes work at two existing storm water lift stations along Interstate 94 in Fargo North Dakota. Lift Station Site One is the 25th Street interchange lift station. The work at Site 1 requires replacement of existing pumping equipment. The work at Site 2 requires total replacement of the existing storm water lift station due to inadequate pumping capacity.

Site 1: 25th Street Interchange Lift Station

Runoff from an approximately 3,500' length of the I-94 corridor, and a small portion of 25th St is collected in ditches adjacent to the roadway and conveyed toward the I-94 grade separated interchange at 25th St. Runoff is captured and temporarily stored within depressions in the gore areas in all four quadrants of the interchange. A series of culverts, inlets, and storm sewer convey the runoff to an existing lift station south of the on ramp in the SE quadrant of the interchange.

The lift station is a duplex system with an approximate total pumping capacity of 4,800 gallons per minute (gpm). The pumps are submersible style and discharge through individual forcemains to a discharge structure approximately 250' east of the wetwell. The discharge forcemains consist of 8" ductile iron pipe (DIP) in the vertical section within the wetwell before transitioning to 10" DIP and 10" polyvinyl chloride (PVC) outside of the wetwell. The discharge structure is the beginning of a gravity trunk storm sewer that conveys the pumped runoff from the 25th St interchange toward the Red River, collecting additional runoff through inlets in the south ditch as it is conveyed eastward. The contributing drainage area to the lift station at the 25th St interchange is approximately 47 acres.

An analysis was completed to evaluate the lift station's ability to meet design standards for roadway lane encroachments, and to provide recommendations for replacement of pumping and controls equipment. The pumps, discharge piping, and controls for the existing lift station were replaced as part of a 2009 improvement project. However, excessive damage was likely incurred to the pumping equipment from the introduction of gravel and other construction material into the system during the 25th St widening and eastbound (EB) I-94 on ramp construction project.

Site 2: University Drive Interchange Lift Station

The drainage area contributing to the I-94 grade separated interchange at University Dr is generally limited to the area inside of the entrance and exit ramps in the four quadrants of the interchange. Some additional runoff also bypasses on-grade inlets on University Dr north and south of the ramps and contributes to the underpass. Runoff tends to pond in the underpass sag, where it is eventually captured by a series of sag inlets and flanking inlets and conveyed toward the existing lift station within the gore area of the SE quadrant of the interchange. The lift station is a duplex system with an approximate total pumping capacity of 4,500 gpm. The pumps are submersible style and discharge through individual forcemains to a manhole approximately 50' SE of the wetwell. The discharge forcemains consist of 8" DIP. The manhole is a part of the gravity trunk storm sewer that begins at the 25th St lift station discharge structure and ends at the outfall at Red River.

Apart from the lift station discharge forcemains, the underpass stormwater facility is hydraulically disconnected from the I-94 gravity trunk storm sewer. The contributing drainage area to the lift station at the University Dr interchange is approximately 8 acres.

The interchange has a history of flooding during events less intense than the design recurrence event of 25-years. An analysis was completed to determine the pumping rate required to meet design standards for roadway lane encroachments, and to provide recommendations for a replacement lift station. The existing lift station was constructed in 1991. Through detailed drainage analysis the required pumping rate to meet current design standards was determined to be 13,600 GPM. The existing lift station was not large enough for the proposed pumping equipment. A completely new lift station and forcemain discharge lines are required. Additional improvements were required to provide adequate conveyance from the existing storm sewer system to the proposed lift station.

TECHNICAL SPECIFICATIONS (QUESTION 10)

Section 43 25 06
Submersible Solids-Handling Pumps

1.01 THE SUMMARY

A. Provide submersible solids-handling pumps and appurtenant Work, complete and operable, in accordance with the Contract Documents.

B. Examine the Site conditions, intended application, and operation of the pump system and recommend the pump that will best satisfy the indicated requirements.

1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. The following standards are applicable in this Section:

HI 9.1-9.5	(2015) Pumps – General Guidelines for Type, Applications, Definitions, Sound Measurements and Documentation
HI 11.6	(2012) Submersible Pump Tests
HI 14.6	(2011) Rotodynamic Pumps for Hydraulic Performance Acceptance Test

1.03 EXTENDED PERIOD FOR CORRECTION OF DEFECTS

A. Furnish a warranty for the pumping system to be free of defects for a period of 5 years from the date of Substantial Completion. The warranty will be non-prorated. Correct defects in the pumping system upon notification from the Owner within 5 years from the date of Substantial Completion. Complete corrections within 5 Days after notification.

PART 2: GENERAL

2.01 GENERAL DESCRIPTION

A. Identification:

Pump Name	Submersible Pumps	Submersible Pumps
Location	LIFT STATION SITE 1 25th St	LIFT STATION SITE 2 University Drive
Quantity	2	2

B. Operating Conditions:

Location	Lift Station Site 1	Lift Station Site 2
Duty	Continuous	Continuous
Drive	Constant speed	Constant speed
Ambient environment	Submerged	Submerged
Ambient temperature, degrees F	35 to 108	35 to 108

Ambient relative humidity, percent	0 to 100	0 to 100
Fluid service	Storm water	Storm water
Fluid temperature, degrees F	33 to 70	33 to 70
Fluid pH range	6 to 8	6 to 8
Fluid specific gravity	1.0	1.0
Project site elevation, ft msl	900	900

C. Performance Requirements:

Location	SITE 1	SITE 2
Maximum shutoff head, ft	72	63
Design Flow Capacity, gpm	2,400	6,800
Design head TDH, ft	31	23
Design flow minimum efficiency, percent	65	70
Design flow minimum available NPSH, ft absolute	39	34
Maximum flow capacity at minimum static head, gpm	2,800	7,900
Maximum flow head TDH, ft, plus 5-feet, minus 2-feet	24	19
Maximum flow minimum efficiency, percent	60	64
Maximum flow minimum available NPSH, ft absolute	50	42
Maximum Pump Speed, RPM	1200	900
Maximum Motor size, hp	35	70

D. Pump Dimensions:

Location	SITE 1	SITE 2
Discharge pipe diameter*, in	8	18
Discharge flange rating ANSI, psi	150	150

*Provide DIP reducer if pump discharge diameter is different than discharge pipe diameter. Include all costs associated with furnishing and installing reducer in the bid price for "LIFT STATION – SITE X".

2.02 PUMP REQUIREMENTS

A. General

1. Provide pumps capable of continuous operation at full load with a water level of 60-inches above the invert of the wet pit, without cavitation or overheating of the motor.

2. Provide pumps, with their cables and appurtenances, able to withstand continuous submergence to a minimum depth of 65-feet, whether running or off, without leakage into the motor and / or control housing.

3. Provide pumps able to operate for short periods at zero static head without causing any damage to any part of the unit.

B. Construction: Conform to the following requirements:

Connections	Machined metal-to-metal quick disconnect type, for withdrawal of unit from above without disconnecting pipe. When lowered into place, the pumps automatically connect and lock into a specific discharge elbow support assembly provided by the pump manufacturer, allowing for zero leakage at all anticipated pump heads.
Pump Design	Single stage, centrifugal type, close-coupled to sealed or submersible electric motor, for operation in dry or wet pit, without external cooling.
Impeller	Maximum 3-port non-clog type with replaceable wear rings on impeller and in casing, to handle raw unscreened sewage, solids, and fibrous materials.
Bearings	Permanently lubricated, heavy duty axial and radial ball or roller bearings top and bottom, with a minimum L-10 life of 50,000 hours, at continuous, maximum load and speed, supported by detailed calculations, to be submitted with the Work Drawings.
Seals	Dual mechanical tandem, one stationary and one revolving shaft seals with individual springs, tungsten carbide or silicon carbide ring, each not requiring any maintenance, and capable of withstanding 1.5 times pump shutoff head. Oil lubricated seals, with moisture detector probes, alarm, and test circuits.
Oil Chamber	To supply oil for lubrication and cooling of the shaft seals.
Bottom Support	A specific cast duckfoot bend or discharge elbow with machined face support mounting system furnished by the pump manufacturer for each pump, anchored to sump floor, providing mounting support and zero leak connections for the pump and discharge piping.
Cables	Include necessary cables for power connection, moisture detection, and overload protection, sheathed, coded, and suitable for submersible pumps, and of sufficient length for direct connection to the terminal boxes indicated. Connect cables to the pumps and test at the factory. Provide anti-rodent stainless steel mesh on all pump cables.
Lifting Devices	Type 316 stainless steel guide rails with brackets and stainless-steel lifting system of sufficient operating length, or with a stainless-steel guide cable system with hooks and tension device, all rated at least 5 times the weight of the pump and motor.

C. Materials

Pump, volute, oil casing, sliding bracket, motor frame, bottom support	Cast iron
Impeller	Cast iron, statically and dynamically balanced
Pump shaft	Type 420 stainless steel, or 1045 carbon steel with Type 420 stainless steel sleeve
Exposed bolts, nuts, washers	Type 316 stainless steel
Mechanical seals	Independently operating tandem tungsten-carbide or silicon carbide and carbon rings with stainless steel springs
Wear rings	Type 304 or 416 stainless steel and nitrile rubber with steel insert, with a Brinnell hardness of 300 on impeller and 350 on case

2.03 MOTOR

A. Approval: Pumping system, including the motor, and wiring, approved by a nationally approved testing agency for explosion-proof service. Rated Class I, Division 1, Group C and D service as determined by the National Electric Code and approved by a nationally recognized testing agency (UL or FM) at the time of opening Bids. Include in the Bid a copy of the certificate of approval.

B. Insulation: Pump motors designed for continuous duty in hazardous locations. Moisture-resistant stator and stator-leads, triple varnished and insulated according to Class F, capable of withstanding a temperature rise of up to 155 degrees C. Allowable temperature rise of the motor at full load condition not to exceed 80 degrees C.

C. Stator: Mount the motor stator in an air-filled, watertight casing, not fixed in place by externally mounted screws which may cause leakage in the motor.

D. Motor Rating: Provide motors with service factors of 1.10 or greater.

E. Junction Box: Motor junction box capable of being sealed completely from the stator casing to prevent leakage through the junction box into the stator housing should a motor cable be damaged or have some other means to prevent leakage into the junction box under any condition.

F. Cable Entry: Cable entry water seal designed such that it precludes specific torque requirements to ensure a watertight and submersible seal. Permit no entry of water into any high voltage area even if the cable is severed below the water level.

G. Cooling System: Provide pumps with adequately designed cooling systems using a wastewater jacket and thermal radiator integrally cast with the stator casing. Non-clogging cooling medium channels and ports by virtue of their dimensions. Wastewater

jackets are not required for motors that are designed to operate continuously at full load with ambient cooling.

H. Motor Protection: Integral thermal sensors in the motors, one for each phase, to monitor stator temperatures. Sensors used in conjunction with and supplemented by external motor over-current protection located at the control panel.

I. Leak Detection

1. Lower seal failure alarm: Provide leakage sensor in the oil chamber to activate an alarm when water concentration exceeds 30%.

2. Stator Leakage Sensor: Activate an alarm and stop the motor when any water is detected.

J. Motor Protection Module: Provide protection relay to monitor the motor thermal and leakage sensors and provide alarm contacts for each. Alarm contacts to be used in the pump starter controls. Provide relay to be installed by others in the RVSS starters. Module provided by the pump manufacturer and compatible with the supplied pumps.

2.04 PROTECTIVE COATING

A. Protect all metal surfaces coming into contact with the pumped media with a rust inhibitive primer followed by a high solids epoxy paint finish.

2.05 PUMP CONTROLS

A. Pumps shall be controlled in accordance with Section 26 29 99 Lift Station Controls.

2.06 SPARE PARTS

A. Furnish spare parts for each pump as indicated

1. One set of bearings

2. One impeller

2.07 FACTORY TESTING AND SHIPMENT

A. Include the following procedures with the factory test prior to shipment, in addition to the factory tests in Section 43 20 00:

1. Verification of cavitation-free service and absence of motor overheating during conditions simulating the actual operating conditions after installation, whether submerged, semi-submerged, or dry.

2. Pump seals designed for complete water tightness at 65-feet submergence for 30 minutes and data on factory testing and quality control shall be submitted with the Work Drawings.

3. Parts properly lubricated and protected so that no damage or deterioration will occur even during a prolonged delay from the time of shipment until installation is completed and the pumps are ready for operation.

4. Properly protect finished ferrous surfaces not painted to prevent rust and corrosion.

5. Protect the finished surfaces of exposed flanges by strong wooden blind flanges.

6. Properly crate each pump to protect against damage during shipment.

2.08 MANUFACTURERS, OR APPROVED EQUAL

A. Flygt Corporation

B. Sulzer

PART 3: EXECUTION

3.01 INSTALLATION

A. Field test the submersible pump guide rail system in the presence of the Engineer and Owner by removing and reinstalling each submersible pump three times. Correct, with no additional cost to the Owner, any deficiencies observed with either the mounting rails or seating to the discharge elbow.

3.02 SERVICES OF MANUFACTURER

A. Inspection, Startup, and Field Adjustment: Presence of the service representative of the manufacturer is required continuously at the Site to furnish the services required by Section 43 20 00 – Pumps, General

B. Instruction of Owner's Personnel: Presence of the training representative of the manufacturer is required at the Site for 1 Day to furnish the services required by Section 43 20 00 – Pumps, General.

C. A Day is defined as an 8-hour period at the Site, excluding travel time.

D. The Engineer may require that the inspection, startup, and field adjustment services above be furnished in 3 separate trips.

END OF SECTION 43 25 06

MANUFACTURER SUMMARY (QUESTION 11.1.1)

11.1.1 Pump Manufacturer Summary Table

Manufacturer	Manufacturer/ Supplier able to provide BABA Compliance	Meets Technical Requirements	Distributer	Contact	Comments
Flygt	No	Yes	Electric Pump	Steve Forsythe	Pumps were submitted and approved for the project application.
Goulds	No	N/A	Electric Pump	Steve Forsythe	No pumps were submitted for review.
Crane Pumps & Systems	No	N/A	Electric Pump	Steve Forsythe	No pumps were submitted for review.
godwin	No	N/A	Electric Pump	Steve Forsythe	No pumps were submitted for review.
flojet	No	N/A	Electric Pump	Steve Forsythe	No pumps were submitted for review.
Lowara	No	N/A	Electric Pump	Steve Forsythe	No pumps were submitted for review.
KSB	No	Yes	Quality Flow Systems	Pat Malay	Pumps were submitted and approved for the project application.
SimFLO	No	No	Quality Flow Systems	Pat Malay	Does not provide close coupled submersible pumps.
HCP	No	N/A	Quality Flow Systems	Pat Malay	No pumps were submitted for review.
Pentair (Fairbanks Nijhuis)	No	N/A	Dakota Pump & Control	Dave Redlin	No pumps were submitted for review.
Wilo	No	N/A	Dakota Pump & Control	Dave Redlin	No pumps were submitted for review.
MWI Pumps	Possible	No	MWI Pumps	Bill Miller	No official response to this inquiry, but MWI has indicated on past projects that they provide BABA compliant pumps. However, MWI does not provide close coupled submersible pumps.
Keen Pumps	No	N/A	Keen Pumps	Jody Barr	No pumps were submitted for review.
GPM-Eliminator	Possible	No	GPM Inc.	Blake Kolquist	No pumps were submitted for review. Possible to make compliant with exceptions to some of the technical specifications.
Tsurumi Pumps	No	N/A	GPM Inc.	Blake Kolquist	No pumps were submitted for review.
Ebara Pumps	Pending Response	N/A	GPM Inc.	Blake Kolquist	No pumps were submitted for review.
Gorman-Rupp	Pending Response	N/A	GPM Inc.	Blake Kolquist	Contacted via email and phone, no response as of 12/1/23
Precision Powered Products	Pending Response	N/A	Precision Powered Products	Itamar Vandelli	Contacted via email and phone, no response as of 12/1/23