

San Juan River Navajo Irrigation Projects Hogback-Cudei Irrigation Project A&B Pump Station Phase II

INSTALLATION SCOPE OF WORK & SPECIFICATIONS

Prepared for

Navajo Nation Department of Water Resources
Water Management Branch
P.O. 678
Ft. Defiance, AZ 86504

Prepared by

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PART 1. GENERAL

1.01 WORK INCLUDED

- A. This scope of work covers all material and workmanship required to install Phase II of the A&B Pump Station Project.
- B. General. The A&B Pump Station Project consists of two pumping schemes. The first pumping scheme, A-Lateral, serves approximately 292 acres. The second pump scheme, B-Lateral, serves approximately 570 acres. Both pumping schemes share the same facility and electrical supply infrastructure.
- C. Definition of Phase II of A&B Pump Station Project abandons the current pump station and replaces it with a new pump station from the turnout to the discharge outlet for each canal. Phase III (By others) of A&B Pump Station Project replaces both A-Lateral Canal with an underground pipeline and B-Lateral Canal with an underground pipeline.
- D. Scope. Work covered includes all demolition, disposal, design, earthwork, excavation, handling, installation, mechanical work, electrical work, concrete work, structural work, backfill, and final grading to complete the work as shown in the drawings and described in these specifications. All material, unless specified, are furnished by the Contractor.

1.02 GENERAL

- A. All materials, unless otherwise noted, shall be of new, first-quality manufacture, free from defects and suitable for the intended use. Where manufacture's names are used in the Specifications it is for the purpose of establishing the standard for quality and general configuration. Products of other manufacturers will be considered, provided they meet the same standards and the manufacture's name and product specifications are submitted to the Engineer for approval.
- B. The Contractor shall provide all permits, fees, materials, labor, and equipment necessary to complete the work.
- C. All workmanship shall be of the highest quality.
- D. All work shall be performed in strict accordance with these Specifications, and the applicable national, state and tribal law, codes and regulations. In addition, manufacturer's instructions for all materials shall be strictly followed. In the event of disagreement between national, state or tribal codes and these Specifications, the codes shall prevail. Such situations shall be discussed with the Engineer prior to proceeding with the work in question.
- E. In the event of conflicts between Specifications, Drawings and field conditions, the Engineer shall be consulted. No changes in the design or construction method shall occur without the review and approval of the Engineer. If changes in the Drawings or Specifications are deemed necessary by the Contractor, details of such changes shall be submitted to the Engineer for review as soon as practical to allow time for review before installation.
- F. Materials damaged in the course of installation shall be repaired or replaced at the option of the Engineer. The Contractor shall be liable for damage during handling or installation of all materials, whether provided as a part of this Contract or provided by

others, and shall repair or replace the material at the option of the Engineer at the Contractor's expense.

- G. Proper handling and storage of all materials and equipment prior to installation shall be the responsibility of the Contractor.
- H. Cost. The cost of all materials furnished by the Contractor and the cost of all work performed by the Contractor necessary to complete the project as described by the drawings and these specifications and the material specifications shall be included in the prices listed in the Bid Schedule.

1.03 WARRANTY

- A. Contractor shall warrant the work to be free from defects for a period of one year after completion of the project. Warranty shall cover all work performed by the Contractor and all materials provided by the Contractor.
- B. Manufacturer warranties. All manufacturer warranties for materials furnished by this scope of work shall be transferred to:
 - Shiprock Irrigation
 - Navajo Nation Department of Water Resources
 - P.O. Box 57
 - Shiprock, NM 87420
- C. Costs. All costs associated with warranting the scope of work as described in the drawings and specifications shall be included bid schedule for each item applicable to the warranty.

PART 2. SITE CONDITIONS, PREPARATION AND RESTORATION

2.01 GENERAL

- A. The pumping plant property shall be staked out and two elevation bench marks provided with the property site.
- B. All pipeline routes shall be staked every 100 ft. and at all point of intersections. Elevation benchmarks are provided every 500 ft.
- C. During construction, disturbance of the area shall be minimized. Construction activity shall be kept to the right-of-way at all times. Activity outside the construction boundary shall be by permission from Shiprock Irrigation only. Keep project area neat and orderly at all times, free of rubbish and excess construction materials.
- D. Prevent contamination of the project area. Do not dump waste oil, fuel, rubbish or other similar contaminants on the ground or in any streambed. The Contractor shall avoid contamination of the aquifer, soil or streams with any contaminant and shall be liable for containment and cleanup of any such contamination at his own expense.
- E. Fence Gates. Access to parts of the project may be through existing gates in existing fences. The Contractor is responsible for keeping these gates closed during the project.

2.02 ENVIRONMENTAL QUALITY PROTECTION

- A. Landscape Preservation. The Contractor shall be responsible for restoring any land disturbed by construction activities. This includes preserving the natural landscape by keeping construction impacts to a minimum, limiting all activity within the designated construction boundaries, cleaning the construction area during construction and after completion of the project, re-grading disturbed lands so natural contours are restored, and providing proper drainage to prevent erosion during and after construction. For agricultural fields, all ditches, furrows, and drainages shall be restored to original condition. The Contractor shall prepare a plan for remediating the disturbed lands and submit to the Engineer for approval.
- B. Vegetation Preservation. The Contractor shall preserve and protect existing vegetation which is not required to be removed by construction activity
- C. Water Quality Management. The Contractor shall be responsible for any sediment and erosion control, wastewater control, and storm water management for all land within the construction boundary and any drainage to and from the construction boundary during the duration of the project. All Federal, State, and Tribal requirements for maintaining water quality during construction activity shall be met. The Contractor shall prepare and submit a storm water pollution prevention plan and a Notice of Intent as required by the Clean Water Act section 402 permit 14 days prior to construction. The contractor shall submit a weekly inspection sheet of any measures implemented by the storm water pollution prevention plan.
- D. Air Quality Management. The Contractor shall comply with any applicable Federal, State, or Tribal regulations governing air quality for construction activity for the duration of the project. This includes all equipment emissions and dust abatement.

- E. Cultural Preservation. The Contractor shall protect any sites identified by the Navajo Nation as having any historical, religious, scientific, pre-historical, or archeological significance warranting preservation. No such areas are known to be within the construction boundaries. Should the Contractor discover any additional historical, religious, scientific, pre-historical, or archeological findings, all work involving that site shall cease until clearance is obtained. Expenses incurred by the delay shall be negotiated. Any excess disturbances by the Contractor or any individual associated with the Contractor as judged by the Navajo Nation shall be subject to the full extent of the law.
- F. Submittals. The Contractor shall submit to the Owner a copy of any required permit to complete the scope of work two days prior to any construction activity.
- G. Payment. All material and labor costs associated with preserving environmental quality and preparing the remediation plan shall be included in item number 2 of the bid schedule.

2.03 SAFETY

- A. General. The Contractor shall fully comply with all Federal, State and Tribal safety regulations.
- B. Safety Program. The Contractor shall establish and maintain a safety program during the duration of the project. The Contractor shall submit the safety program to the Owner for approval two days prior to any construction activity.
- C. US 64 Highway. The Contractor shall comply with all NMDOT safety requirements for traffic control while working within the right-of-way of US 64.
- D. Payment. The costs for establishing and maintaining a safety program shall be included in item 3 of the bid schedule. The costs for complying with all NMDOT safety requirements while working within the right-of-way of US 64 shall be completed in Item 24 of the bid schedule.

2.04 STAGING AND EQUIPMENT SERVICE AREA

- A. Shiprock Irrigation will designate a suitable equipment staging and service area for the Contractor within 1/4 mile of the project area. The staging and service area may be used for parking of equipment and storage of materials prior to installation. The Contractor shall be responsible for security at the staging area. Servicing of equipment and vehicles will be allowed only at the designated service area, except in cases where the repair must be performed on site before the equipment can be moved.
- B. Care shall be taken to avoid fuel and oil spills. All waste material, packaging and unused material shall be removed from the site upon completion of the Contract.
- C. The staging area shall be free of debris and re-graded to its original surface contour upon completion of the Contract.
- D. Payment. Costs associated with establishing and maintaining a staging area for the duration of the project shall be in item #4 of the bid schedule.

2.05 UTILITIES

- A. General. Existing utilities are located at the site. The Contractor shall identify all utilities, mark them during the duration of the project, and protect them from all construction activity. Any damage to existing utilities by the Contractor or their sub-contractors shall be repaired as directed by the utility owner at the Contractor's expense.
- B. NM One Call. The Contractor or any sub-contractor shall submit a confirmation number to the Owner at least two days prior to any excavation at the site. The Contractor shall maintain the confirmation number for the duration of the excavation.
- C. USBR Shiprock Municipal Pipeline. The United States Bureau of Reclamation has constructed the Shiprock Municipal Pipeline which is located on the project site. Any work associated with this pipeline must be coordinated with the Engineer to ensure compliance with the permit to cross this pipeline.
- D. NTUA. Navajo Tribal Utilities Authority (NTUA) has a municipal water line and power service poles on the project site. Any work associated with the utility must be coordinated with NTUA.
- E. Electricity. The Contractor is responsible for all required electrical requirements necessary to complete the project. The Contractor is welcome to utilize existing electrical infrastructure but must restore the power to at least original condition at the completion of the project.
- F. Water. The Contractor is responsible for all required water requirements necessary to complete the project. The Contractor may utilize the existing NTUA municipal water supply line but must restore the supply pipeline to at least original condition at the completion of the project.
- G. Payment. All costs associated with working existing site utilities shall be included with the applicable unit prices in the bid schedule.

PART 3. MATERIALS

3.01 GENERAL

- A. General. All materials, unless otherwise noted, shall be of new, first-quality manufacture, free from defects and suited for the intended use. Where manufacturer's names are used in the Specifications it is for the purpose of establishing the standard for quality and general configuration. Products of other manufacturers will be considered, provided they meet the same standards and the manufacture's name and product specifications are submitted to the Engineer for approval.
- B. Handling. Materials damaged in the course of transportation or installation shall be repaired or replaced at the option of the Engineer.
- C. Warranties. All material manufacture warranties shall be transferred to the Owner at the completion of the project.
- D. Storage and security. The Contractor is responsible for storing all material including the security of all material for the duration of the project. Any damage or loss shall be repaired or replaced by the Contractor at the Contractor's expense. This is to include any salvage material in the Contractor's care between the time of demolition and transport to the Owner.
- E. Payment. All costs associated with furnishing, handling, storing, and the security of all material furnished by this contract are to be included in the applicable cost in the bid schedule.

3.02 STEEL PIPE

- A. General. All steel pipe is located in the discharge piping of the pumps. Drawing D116 shows details for all pre-fabricated steel fittings.
- B. Steel Pipe. All steel pipe shall be pre-fabricated galvanized steel pipe. All steel pipe shall be of the diameter shown on the drawings (IPS dimensions, nominal diameters shown) with a minimum wall thickness of 0.1345 inches (10 ga.). All steel pipe shall meet the requirements of AWWA-C200.
- C. Flanges. All steel flanges shall be ½-inch ring flanges with ANSI 150 drilling per AWWA C207 of the diameter shown on the drawings unless noted otherwise. All flanges shall be oriented as shown in the drawings.
- D. Steel Plate. All steel plate shall meet the requirements of ASTM-A568.
- E. Miters. Miter dimensions shall conform to AWWA C208.
- F. Welds. All steel-to-steel connections are welded unless otherwise noted. All welding to be in accordance with AWWA C206-97.
- G. Materials. All materials, fittings and accessories required in the fabrication of items listed in these specifications and on the drawings shall be provided by the fabricator.
- H. Coating. Following fabrication, all steel members, such as pipe, flanges and couplings, shall be hot-dipped galvanized to ASTM 123-73 specifications or approved equal. The thickness of galvanization shall not be less than 3.5 mils (0.0035 inches). Painting and other types of applied coatings will not be acceptable on these members.

- I. Transition Couplings. Steel to plastic pipe transition shall be completed by compression style ductile iron bolted transition couplings. The couplings shall be sized to fit the outside diameter of both pipes the coupling is to join. The transition coupling shall meet or exceed AWWA C219 and rated for 150 psi. The transition couplings used on HDPE pipe shall include inserts to prevent the compression coupler from crushing the pipe.
- J. Thrust Rings. Two thrust rings shall be installed on each end of a transition coupling to prevent the pipes from pulling apart. The thrust rings shall be configured as shown on the Drawings.
- K. Victaulic Ends. As shown on the drawings, a standard-wall grooved victaulic end shall be welded to the fittings. Victaulic 75 couplers shall be provided with rings and gaskets.
- L. Payment. Costs for furnishing steel pipe shall be included in Items 20 and 21 of the bid schedule.

3.03 HDPE PIPE

- A. Material Specifications Smooth Walled Pressurized Pipe. All HDPE pipe shall be manufactured with premium, highly engineered PE3408/3608 resin. Resin material shall conform to ASTM D3350 with the cell classification of 44557C and is listed with the Plastic Pipe Institute (PPI) TR4. It is formulated with carbon black and/ or ultraviolet stabilizer for maximum protection of against UV rays for added assurance. The pump sump supply lines and the pressure relief discharge line shall be DR26 HDPE pipe complying with AWWA C906 with IPS dimensions. The A-Lateral and B-Lateral pipe shall be DR 26 HDPE pipe with AWWA C906 with IPS dimensions.
- B. Fabricated Fittings. Fabricated fittings shall be made by heat fusion joining specially machined shapes cut from pipe, polyethylene sheet stock or molded fittings. Fabricated fittings shall be rated for internal pressure service at least equal to the full service pressure rating of the mating pipe. Fabricated fittings shall be tested in accordance with AWWA C906.
- C. Material Specification Corrugate Wall HDPE pipe. All corrugated HDPE pipe shall meet the ASTM F667 standards for pipe sized 8" to 24". For pipe and fittings sized 3" to 6" shall meet the ASTM F406 standards.
- D. Payment. Cost for the HDPE pipe for A-Lateral shall be included in item 22. Cost for the pipe for B-Lateral shall be included in item 23 and 24. Costs for furnishing HDPE pipe at canal turnout, and pond inlet shall be included in Items 9 and 13 of the bid schedule.

3.04 STEEL CASING FOR HIGHWAY CROSSING

- A. Material Specifications. The steel pipe shall be 30-inch O.D. 0.375-inch wall carbon steel pipe. The carbon steel pipe shall meet the requirements in ASTM 27/A27M.
- B. Payment. Costs for furnishing the steel pipe casing shall be included in Item 24 of the bid schedule.

3.05 VALVES

- A. General. All pipe valves shall be wafer style steel valves designed to be installed between two ½-inch steel flanges with 150 lb. bolt patterns. Each valve shall include the

required bolts, nuts, and washers to install the valve. All bolts, nuts, and washers shall be a minimum of grade 5 and zinc coated steel.

- B. Butterfly Valve. All butterfly valves shall be a wafer style valve. The valve shall have an epoxy coated cast iron body with locating lugs. The resilient seal shall consist of a stainless steel disc with Buna N liner. The shafts shall be fabricated from stainless steel. The bearings shall be bronze. The valve shall be gear operated with a hand wheel.
- C. Check Valve. All check valves shall have an epoxy coated cast iron body rated for 200 psi. The check valve shall be constructed with an aluminum bronze disc plate, an EPDM seat, stainless steel spring, and PTFE bearings. The check valves shall be a Watts ICV-125-2-2-T or approved equal.
- D. Pressure Relief Valve and Surge Anticipator Valve. The valve shall control high pressures and power failure surges by bypassing system pressure that exceeds the high pressure control setting and also by opening a preset amount when sensed pressure decreases below a preset minimum in anticipation of a surge.

The ductile iron valve body shall be hydraulically operated, single diaphragm-actuated and globe pattern. The valve shall consist of three major components: the body with seat installed, the cover with bearings installed and the diaphragm assembly. The diaphragm assembly shall be the only moving part and shall form a sealed chamber in the upper portion of the valve separating operating pressure from line pressure. Packing glands and/or stuffing boxes are not permitted and there shall be no pistons operating the main valve or pilot controls. The valve shall contain a resilient, synthetic rubber disc, with a rectangular cross-section contained on three and one-half sides by a disc retainer, forming a tight seal against a single removable seat insert.

The pressure relief pilot shall be an adjustable, spring-loaded, normally closed diaphragm control designed to permit flow when upstream pressure exceeds the control setting (70 psi). The low pressure pilot shall be an adjustable, spring loaded, normally open diaphragm control designed to open when the sensed pressure falls below the control setting (40 psi) and close when pressures are normal. The pilot system shall contain an adjustable hydraulic limiter to limit valve travel during low pressure opening without affecting high pressure relief valve travel. The contractor shall connect the sensing/pilot supply connection to the main header with minimum 3/4" pipe or tubing.

The valve shall be a Cla-Val Co. Model No. 52-03/652-03 Pressure Relief & Surge Anticipator Valve as manufactured by Cla-Val Co or approved equal.

- E. Air Vent. Air/vacuum relief valves shall be size as shown on the Drawings, designed to discharge air until the line is filled and open as pressure drops below atmospheric pressure. The valves shall be Waterman AV150 or approved equal.
- F. Gate Valve. The gate valve for the Pond Drain line shall be a double disk line gate valve capable of a 60 ft. head. The body shall be epoxy coated cast iron with iron seats that slip onto a CL 80 PIP PVC valve. The operator nut shall be a 2-inch operating nut on a non-rising bronze stem suitable for underground service. The valve shall come with a 4-inch PVC access tube, cap, and operating key.
- G. Payment. Costs for furnishing valves for the discharge piping shall be included in Items 20 and 21 of the bid schedule. Costs for furnishing valves for the pump intake piping shall be included in Bid Item 13. Payment for furnishing the pressure relief valve is included in Bid Item #28.

3.06 FLOW METER

- A. General. Flow meter shall be a brass insertion type electromagnetic meter with no moving parts, rated for 200 psi, and suitable for outdoor installation. Installation shall be through a 2-inch steel threaded and include a 2-inch full port brass ball valve. The electromagnetic flow meter shall be powered externally by a 12-24 Volt DC circuit. The meter shall have display the flow in gpm with a 1 percent accuracy for flows greater than ten percent of the design flow with a 4-20mA output. The valve shall be a Seametrics Ex100/200 electromagnetic flow meter or approved equally.
- B. Payment. Costs for furnishing flow meters shall be included in Items 20 and 21 of the bid schedule.

3.07 IRRIGATION PUMP

- A. General. Pumps shall be rated for continuous duty and will be operated at variable speeds. The pumps shall not overload the motors beyond the motor name plate power for any point on the performance characteristic curve. Within this wide range of flows (between 15%-150% of the individual pump design flow rates), the pumps must operate free of cavitation, and damaging vibration. The mass of the pumping unit and its distribution shall be such that resonance at normal operating speeds is avoided. Vibration shall be certified to be within the limits set by ANSI/HI 9.6.5 and ISO 10816 standards.

All parts of each pumping unit shall be designed to withstand the stresses that will be imposed upon them during handling, shipping, installation, and operation. The equipment, when assembled and operating, shall be free of noise and water leaks over the range of operation. All pumps shall be so constructed that dismantling and repairing can be accomplished without difficulty. All components shall be capable of operating at 100 psi pressure or higher.

The pumping unit shall be suitable for outdoor installation and shall be close-coupled, electric motor driven end-suction centrifugal. The pumps shall be supported on a concrete base as shown in the Drawings with the discharge flange pointing up.

- B. Centrifugal Pump. The pumps shall be end-suction centrifugal pumps with cast-iron volute cases. They shall be directly coupled to an electric motor with the impeller mounted on the motor shaft. They shall be supplied with bronze impellers and bronze wear rings. They shall be supplied with ANSI class 150 suction and discharge flanges. They shall be supplied with replaceable wear rings and shaft sleeves. They shall be provided with type 1 carbon ceramic mechanical seals suitable for operating with sediment concentrations up to 2,000 ppm.
- C. Performance Conditions. The pumps shall be operated with Variable Frequency Drives (VFD). They shall be selected such that the peak efficiency equals or exceeds 85% and meets the conditions in the table below. The 100% flow design point shall be selected near and, if possible, to the right of peak efficiency and shall be at 85% efficiency or greater.

The pumps must operate across the range of 55%- 100% of design flow at the required Total Dynamic Head (T.D.H.) shown below with efficiencies greater than 70% throughout this flow range when operating at a reduced speed with a VFD. This range shall be provided by a motor speed change of 10% or more.

The pumps shall also be able to operate at 30% of design flow with an efficiency of 50% or greater, and operate as low as 15% of design flow with VFD without damage to the pump.

The pumps shall have continuously rising characteristic curves.

Pump Station	Quantity	HP	Flow gpm	T.D.H. ft.	Min. Efficiency	Min. Head at 15% flow	Max. NPSH at design point - ft.
A	1	50	2280	67	85%	95	15
B	2	100	2500	128	89%	160	15

- D. Applicable Standards. AWWA E103-07 Standard for Horizontal and Vertical Line-Shaft Pumps
- E. Approved Equal. The pumps shall be Model 6YB, 50 hp, 1800 RPM Cornell Manufacturing and Model 6RB, 100 HP, 1800 RPM Cornell Manufacturing or approved equal.
- F. Replacement Parts. Each pump provided shall include one set of parts to replace wear rings, shaft sleeves, and mechanical seals.
- G. Payment. Payment for the A-Pump shall be included in Bid Item #14. Payment for the two B-Pumps shall be included in Bid Item #15.

3.08 PUMP MOTOR

- A. General. All pump motors shall be continuous duty, totally enclosed fan cooled (TEFC), horizontal, squirrel cage inverter duty induction motors complying with NEMA MG-1 standards, with a service factor of 1.15. They shall be compatible with variable frequency drives and operate satisfactorily over a speed range of 25% to 100% of rated speed. They shall be selected and supplied by the pump manufacturer for compatibility with the pump they are designed to operate and shall operate at no more than 100% of their nameplate power over the normal operating range of the pump. They shall be sized as indicated in Section 1.1.3 of this specification.
- B. Efficiency. Motors shall operate at an efficiency of 92% or better at 100% speed.
- C. Voltage and Power. Motors shall be designed for 3-phase, 60 cycle, 480-volt power supply and be outdoor rated. They shall be supplied with an electrical connection box of cast metal with gaskets between the box and the housing and between the box and the cover. The connection box shall be provided with a grounding terminal inside the box.
- D. Motor Speed. Irrigation pump motors shall have a synchronous speed of 1800 rpm at 60 Hz.
- E. Pump Mating. The pump and motor are to be supplied as a unit, with properly matched shafts and base plates. They are to operate together, properly balanced without excessive vibration.
- F. Standards. All applicable ISO and IEC standards apply.
- G. Payment. Payment for furnishing and installing A-Motor shall be included in Bid Item #14. Payment for furnishing and installing B-Motors shall be included in Bid Item #15.

3.09 PUMP MOTOR CONTROL CENTER – IRRIGATION PUMP STATIONS

- A. General. The pump station shall have a floor-mounted motor control center with enclosure rated for indoor service installed as shown in the drawings within the pump building. It shall include the following equipment:
- Main fused disconnect sized appropriately for the expected load.
 - VFD controller for each pump.
 - Reduced voltage control circuit as required by control equipment manufacturer (120-volt AC or 24-volt DC).
 - Liquid level control to shut off pump(s) on low sump water level.
 - Climate control equipment as specified in the VFD standards.
 - Equipment not listed. Each motor control center shall include, in addition to the above listed items, all equipment required by the control center manufacturer and local and national codes for proper operation and safety.
- B. EMI/RFI filtering and Ground. This pump station, including motors and controls must operate without emitting interfering EMI/RFI signals that could disrupt the operation of Passive Integrated Transponder Antennae located in the vicinity to track endangered fish. The Contractor shall contact Biomark at 1-208-275-0011 to obtain information concerning the installed antennae and to arrange for testing of the facility after installation is completed. The Contractor must assure that EMI/RFI emissions are below the level that could disrupt the antennae operation.
- C. Standards. All equipment and workmanship shall meet the appropriate standards and conditions as listed in Section 4.09 Electrical.
- D. Payment. Payment for furnishing and installing pump motor control center for A-Pump shall be included in Bid Item #16. Payment for furnishing and installing pump motor control center for B-Pumps shall be included in Bid Item #17.

3.10 VARIABLE FREQUENCY DRIVE (PART OF PUMP MOTOR CONTROL CENTER)

- A. Standards. The drives and all components shall be designed, manufactured, and tested in accordance with the latest applicable standards of IEC, UL, CUL, and NEMA.
1. NEMA 250-2008 Enclosures for Electrical Equipment (1000 Volts Max.)
 2. MG1-1998 Motors and Generators
 3. IEC 61800 Adjustable speed electrical power drive systems.
- B. Warranty. Warranty shall be 2 years from the date of first successful start-up. The written warranty shall include all parts, labor, travel time, and expenses.
- C. Submittals. As part of the bid package, the following shall be submitted to the client in duplicate:
1. Dimensioned outline drawing and environmental requirements.
 2. Schematic drawings detailing all options specified.
 3. Product data sheets. Power and control connection diagram(s) including communications options and protocol. Drive (including all filters and accessories)

losses at full load and at 50% load, and cooling solution for the drive and auxiliary equipment.

4. Recommended spare parts.
5. Advantages and enhancements of specific products.
6. List and description of all Modbus registers mapped within the VFD unit including standard control, communications, protection, diagnostics and other manufacturer-specific Modbus registers.

Prior to starting the manufacturing process two copies of the following shall be submitted to the Client for approval:

1. Control schematics and connection diagrams.
2. Complete instruction manuals and installation instructions.
3. Interconnection wiring schematics and diagrams.
4. List of spare parts provided.
5. Configuration software if required.

Upon delivery of the VFD to the job site, the following shall be provided:

1. Two copies of Operation and Maintenance manuals must be provided with each VFD. They shall include the following:
 2. Spare parts listing source and current prices of replacement parts and supplies, including recommended spare parts to be pre-purchased by the client after the warranty ends.
 3. Recommended maintenance and repair procedures and intervals, including dimensioned as-built drawings
 4. Test and calibration procedures.
 5. Recommended cleaning methods
 6. Instructions for troubleshooting diagnostics
 7. Wiring diagrams
 8. Data sheets on major components including power electronics devices
 9. Full complement of user instruction materials.
- D. Operating Conditions. The VFD supplier is responsible for verifying that the drive will operate successfully in continuous operation with:
1. The Amperage and XIR for the 3 phase symmetrical fault current that are provided by the electrical utility (Navajo Tribal Utility Authority).
 2. The elevation and ambient temperatures that the VFD will be installed to work in (VFD panels will be installed together inside a Motor Control Center installed in the pump building as described elsewhere in these specifications).
- E. General Technical Specifications. The Variable Frequency Drives (VFDs) for 480 V 3 phase must have the following, at a minimum:
1. Microprocessor-based inverter logic isolated from power circuit.

2. Buffered Pulse Width Modulated (BPWM) output wave form using 4th generation Insulated Gate Bipolar Transistors (IGBT) technology.
3. Electronic thermal motor protection.
4. A guaranteed ability to provide continuous output amperage of 15% greater than the maximum amperage required by the project for the motor at a specified input voltage.
5. Resolution of output control frequency (0-65 Hz) of +/- 0.003 Hz.
6. DC link choke for the DC bus reactor.
7. Passive filter (line reactor and EMI/RFI filter) on the input side of the controller.
8. Ability to accept a variation of input voltage of +10% to - 15% (full rated motor voltage and torque must be deliverable with voltage dips down to 10% below the nominal AC line voltage).
9. Ability to withstand up to a 3% voltage imbalance between the line phases.
10. Ability to support a motor cable length of 150 ft. (minimum) or any greater length specified for this application without voltage reflection or other problems.
11. Temperature rating for 100% performance at 50 deg. Celsius ambient.
12. System response time less than or equal to 2 msec. 3% input line reactor on the input (if not built-in).
13. 6 pulses.
14. Testing by the manufacturer of the completely assembled package listed above.
15. Drive efficiency (including all associated filters) of 96.5% or better at full speed and full load.
16. Singularly, each VFD shall produce a maximum of 3% harmonic voltage distortion (THI) without additional external devices or external filters, and simultaneous operation of multiple VFD's shall not add more than 5% total harmonic voltage distortion back to the bus when measured at the point of common coupling without additional external devices or external filters.
17. Displacement power factor between 1.0 - 0.95 lagging at all speeds and loads.
18. The ability to automatically restart after an overcurrent, overvoltage, under voltage, or loss of input signal protective trip. The number of restart attempts, trial time, and time between reset attempts shall be programmable.
19. Faults due to three phase short circuit, phase-to-ground short circuits, and severe overloads shall occur without damage to the VFD.
20. 3-position Hand-Off-Auto (HOA) switch and speed potentiometer. When in "Hand", the VFD will be manually started, and the speed will be controlled from the speed potentiometer. When in "OFF", the VFD will be stopped. When in "Auto", the VFD will start via a signal from an internal PLC, and its speed will be controlled via PLC communications. For units with bypass capability, a 3-position Drive-Off-Bypass switch is required.
21. The VFD shall have input line fuses standard in the drive enclosure.

22. The VFD shall be optimized for a 2kHz carrier (switching) frequency. The carrier frequency shall be adjustable to a maximum of 8kHz. The carrier frequency shall be adjusted to the maximum frequency that eliminates audible "hums" in the motor and drive.
23. All EMI and RFI must be contained and controlled to meet IEC 61800-3-The drive must meet standard IEC 61800-5-1:2007 (2.3 times the line voltage for 1.3 msec) for transient protection as a minimum
24. The VFD shall provide volts per Hertz and "Sensorless Vector" operation. The operating mode shall be "Sensorless Vector" operation.

F. Payment. See 3.09 D of these Specifications.

3.11 PLC (PART OF PUMP CONTROL CENTER)

- A. Operating Information Displays. The following operating information displays shall be standard on the VFD digital display (5-line display, minimum):
 1. Motor speed (RPM, % or Engineering units)
 2. Output frequency, Hz - Motor current
 3. Output voltage
 4. Target water level, pressure, or flow rate
 5. Actual water level, pressure, or flow rate.
- B. Control. The VFDs will be controlled by PLCs that are supplied with the VFD controllers, and be standard factory installed units sold by the VFD manufacturer for that manufacturer's equipment. Because there will be two VFD controllers and pumps operating together at this location, one of the VFD controllers must include a "Cascade" feature that will be capable of staging the additional pump on Station B. Station A has just one pump. Initially, the pumps will be operated in "Manual" mode by locally setting the speed of each pump to achieve the desired flow, but must be configured and programmed to operate in automatic mode. Even when operated in "Manual" mode, the protective functions included in the following list shall be active.
- C. Each control PLC must have control logic that will automatically achieve the following:
 1. Dry pump protection, as indicated by a measured drop in power consumption. This will automatically shut down the pump.
 2. Slow, ramped startup. The ramp startup time must be a user-defined variable.
 3. Slow, ramped shutdown. The ramped shutdown time must be a user-defined variable.
 4. Ability to automatically control the pipeline pressure. Pressure transducers will provide 4-20 mA signals.
 5. Development of a simple 2-point (linear) calibration curve for the pressure sensors.
 6. Ability to read two pressure sensors (one is redundant), with the ability for the operator to manually select which of the two is the "primary" sensor. The PLC must be configured to automatically switch to the secondary sensor if the primary sensor value fails. Both pressure sensors must be provided and the PLC programmed accordingly.

7. Shut down the pump if a liquid level sensor in the pump sump falls below a certain level. Shut down within 10 seconds if the flow sensor (located between the pump discharge head and the check valve, for each pump) does not register flow.

D. Additional programming details include:

1. Incremental speed change shall be 0.2% of full speed or less.
2. First pump to start shall alternate at each pump start on Plant B to allow even wear on the pumps.
3. Display capability to show pressure, current flow rate, cumulative volume of water pumped, and operating hours for each pump and alarm conditions as a minimum.

The contractor must know the mechanism and be responsible for the supply and installation (if not already installed) of the necessary sensors for control.

Responsibility for installing and wiring the sensors into the VFD panel and programming the panel to the customer's control desire must be defined in advance and provided to the Owner for review.

Written and step-by-step instructions for the starting, monitoring, and troubleshooting of the control must be provided in duplicate. One copy for each pump must remain at each panel in a weatherproof condition; duplicate copies will be stored at the project office.

E. Speed Command Input. The speed command input shall be made by the following:

1. Keypad
2. Local Manual Potentiometer
3. 4-20 mA (dc) input from the pressure sensors.

F. Serial Communications.

1. The VFD shall have I/O communications for network communication with a PLC
2. The VFD shall have simple connectivity to the internet if it does not have an associated PLC. The protocol of the PLC will be Modbus, via RS-485 connection and be capable of being configured as a Modbus slave device with Modbus address of 1-254
3. RS-485 communication baud rate shall be 38.4 Kbaud or greater

G. Required Accessories All external interlocks and start/stop contacts shall remain fully functional whether the drive is in Hand, Auto or Bypass.

1. All wires to be individually numbered or labeled at both ends. A written wiring diagram with written detailed explanations of each wires (not just abbreviations) must be inserted next to each VFD controller.
2. The disconnect handle shall be thru-the-door type, and be lockable in the "Off" position using a padlock
3. Surge protection on the incoming power lines shall be provided for each VFD panel. The surge protectors must be placed outside the MCC panel, if there is a possibility that they will explode when activated.
4. Cooling of the interior of the VFD panel must be sufficient to remove the generated heat. No external air can be blown into the VFD panel. Additional cooling must be provided as needed for the surge protection, input line reactors, and other auxiliary

- equipment that generates heat. Two cooling methods are acceptable for the VFD panel: --Air conditioning. The air conditioning can be provided to individual panels, or to the larger MCC enclosure. In all cases there must be mechanism to move the heat to the outside of the individual VFD panels. Air conditioning must be sized for a calculated heat generation or 240 BTU/hr./ (input kW), whichever is greater. --A heat sink that draws the heat from the inside of the panel to outside fins that are mounted on the exterior of the MCC enclosure. The cooling fins on the outside of the panel must be shaded. This configuration will require a NEMA 4X enclosure so that it can be mounted in a cutout rectangular hole on the wall of the MCC enclosure.
5. US 508A listed and service entrance rating for the panel doors (10 kA SCCR). Panel doors are to be main fused disconnected. Stainless steel door nameplate.
 6. Space heater for winter to prevent condensation.
 7. Fluorescent light (external mounting).
 8. GFI receptacle (external mounting).
 9. The following 3 types of wires must be run in independent conduits: --Control circuit wiring (115 V or 24 V) for start/stop commands (note: 24 V is generally preferred) -- 4-20 mA or 0-5 VDC signals for speed control --Power wiring -In addition to the single-point grounding of the VFD, a grounding conductor must be brought back from the motor to the VFD's internal grounding terminal. Motor leads are to be VFD rated and shielded.
- H. Additional. The VFD must not be installed on an ungrounded Delta system. If that is the case, the electric utility should be asked to switch the transformer from a Delta to a Wye isolation transformer. If the utility will not do this, then an extra transformer must be installed. In this case, a 3 phase, electrostatically shielded Delta to Wye isolation transformer, should be installed before the VFD with the WYE grounded with an individual grounding rod.
- I. Contractor Obligations. The general obligations of the Contractor include setting and programming of all the systems in relation with the PLC. The Contractor shall provide:
1. Software specifications and licenses;
 2. A laptop for the Software (one laptop);
 3. Summary descriptions of the handled functions;
 4. Block diagram of the equipment;
 5. Summary descriptions of the operating modes;
 6. Complete PLC programming;
 7. Training systems;
 8. Technical architecture;
 9. Testing procedures;
 10. The description of user documentation.
- J. Testing. The Contractor will conduct a detailed functional analysis of automaticity, to confirm the list of inputs / outputs. The following parameters are considered:
1. Adjustable timing of changes in state of PLC inputs and storing of information;

2. Memorization of all defects;
 3. Grouping and fault management of power supply;
 4. Grouping and fault management of hydraulic;
 5. Grouping and fault management of auxiliaries.
- K. Payment. See 3.09 D of these Specifications.

3.12 SCADA

- A. General. SCADA shall report on both the pumping plant status and the trash screen status, transmit alarms, and transmit data to both the Shiprock Irrigation Office and Hogback Chapter office. The Contractor shall design, furnish, and install the system. The Contractor shall also train both Shiprock Irrigation and the delegated chapter official on the system.
- B. Inputs. SCADA inputs include: upstream pressure transducer, downstream pressure transducer, flow meter, pump on/off, pump manual/auto, Pump Motor Speed, Pump Output Frequency, Pump Output Voltage, and Trash screen on/off.
- C. Video Feed. A security video surveillance system shall be installed in the pump station oriented at an angle allowing visibility of the motor control center, front door, and irrigation pumps. The system shall include the following items: a camera to capture images day and night, a recorder to record the images, and a monitor to view the images. The camera shall have a minimum resolution of 720 horizontal lines and minimum lens speed of 30 frames per second. The camera shall be infrared LED to enhance night recording and be installed in a vandalism resistance enclosure. The recorder shall be digital with a 1 TB hard drive minimum, with a DVD burner or USB port to export files to a flash drive or DVD. The camera shall also be motion activated so that it records only when it detects motion. The DVR (recorder) shall be installed in the pumping control panel. Two monitors would be supplied and installed; one monitor at the Shiprock Irrigation office and the other at the Chapter House office. Monitors shall be at least 546mm 5ms widescreen LED backlight LCD monitor.
- D. Communications. Shiprock Irrigation currently has radio telemetry that transmits data from the nearby Fish Weir Structure. The Contractor shall utilize this existing system to establish communication for the Pump Station. The Contractor's work shall not diminish the functionality of the Fish Weir Structure communications.
- E. SCADA Host. Shiprock Irrigation currently hosts SCADA at their office. The Contractor shall add the Pump Station to this existing system. The Contractor shall also allow remote access (monitoring only) to the Hogback Chapter House. The Contractor's work shall not diminish the functionality of the current Fish Weir Structure host.
- F. Training. The Contractor shall train the Owner's designated representative on the operation and maintenance of the SCADA system.
- G. Payment. All costs associated with design, furnishing, and installation of the SCADA system for the pump house shall be included in Bid Item 26.

3.13 PRESSURE TRANSDUCERS

- A. General. Pressure measurement is required both upstream and downstream of the pump. The upstream pressure transducer is located on the inlet pipe and will

measure the depth of the settling pond. The downstream pressure transducer is located on the discharge pipe and is used to provide input to the PLC for managing flow.

- B. Pressure Transducer. The pressure transducer shall have a rugged all stainless steel construction with a ¼-inch mpt threaded end. The other end will have a PX 309 Cable Connection. All transducers shall have high stability and low drift.
- C. Upstream Transducer. The upstream transducer shall be able to have a range of 1-25 psi with a 0.25 percent static accuracy and a 2 percent error on this measurement band.
- D. Downstream Transducer. The upstream transducer shall be able to have a range of 1-50 psi with a 0.25 percent static accuracy and a 2 percent error on this measurement band.
- E. Payment. All costs associated with furnishing, installing, and calibrating the upstream pressure transducers are included in Bid Item 3. The costs for furnishing, installing, and calibrating the downstream pressure transducers are included in Bid Items 20, and 21.

3.14 TRASH SCREEN

- A. Traveling Screen. The trash screen shall meet the required flow of 16 cubic feet per second. The trash screen shall meet the dimensions of the concrete canal turnout structure as shown on Drawing D103. Electrical for pump spray and self-cleaning apparatus. Electrical power supply should be compatible with 480 volts 3-phase service.
- B. Screening Media. The screening media will be 24-20-14, 24 openings per foot vertical 20 openings per foot horizontal, made out of 14-gauge stainless steel 304 wire. The screening media rides on 5/16-inch rods on 6-inch centers which are driven by a C2060 chain. All chains, rods and belting are stainless steel 304.
- C. Bearings. Underwater non-lubricated sleeve and bushing Stellite brand bearings or approved equal.
- D. Spray Wash. Pump and filter for spray bar water. Submersible pump with a capacity of 45 gallons per minute @ 60 psi. Water supplied to the spray wash shall be obtained pumping downstream of the trash screen in the pump intake concrete structure. The spray wash should include filtration necessary to maintain the spray wash nozzles.
- E. Control Panel. Control panel to power the screen and the pump. Panel equipped with an adjustable timer which can be set to have the machine come on after a pre-set amount of time, and to shut off after a pre-set time.
- F. Spare Parts. The Contractor shall furnish spare parts that includes the submersible pump, spray nozzles, filter screen, and screen motor.
- G. Payment. All costs associated with furnishing the trash screen included in Bid Item 11

3.15 CANAL GATE

- A. The canal gate shall be a 36-inch diameter flat mounted C-10 canal gate as manufactured by Waterman USA or approved equal. The gate shall be constructed of grey iron with an all-bolted ¼-inch thick steel frame. The stem shall be a special leaded steel which resists corrosion. The stem is operated at the top by a heavy cast-bronze lift

nut and a cast iron wheel. The gate shall have a dependable seating closure that may be adjusted by cast iron wedge blocks. The frame shall be 15 ft. tall.

- B. The canal gate shall be a flatback for headwall mounted.
- C. Payment. Payment for the gate shall be included in Bid Item #7.

3.16 STOP LOGS

- A. Stop Logs shall be constructed out of pressure-treated 2-inch by 6-inch wood. All stop logs shall be chromated copper arsenate pressure treated wood.
- B. Payment. All costs associated with furnishing the trash screen included in Bid Item 11.

3.17 CONCRETE

- A. Cement. The cement to be used shall conform to the "Standard Specification for Portland Cement" designation C.150 of the American Society for Testing Materials (ASTM). The recommended cement is Type II Normal Portland Cement. Any request to deviate from this will be subject to approval by the Engineer. No rapid hardening (Type III) cement types will be allowed.
- B. Water. Water to be used for concrete mixing shall be potable water.
- C. Aggregate. Aggregate proposed for concrete shall be subject to inspection and approval by the Engineer. The dust content, measured as the percentage of material passing a 75µm sieve shall not exceed 5% in the case of fine aggregate and 1.5% in the case of coarse aggregate. The fineness modulus shall fall in the range of 1.6 to 3.5 (inclusive). The chloride content of the aggregates shall not exceed 0.03% by mass and the aggregate shall be free of organic materials.
- D. Admixtures. The use of accelerating admixtures will not be allowed. The use of water reducing admixtures is encouraged in order to lower the water/cement ratio.
- E. Mixture Design. The mix shall be designed to conform to the following parameters:
 - 1. 28-day minimum compressive strength $f'_c = 4000$ psi
 - 2. Maximum water/cement ration = 0.45 (by weight)
 - 3. Total entrained air = 5% (-1% to +1%)
 - 4. Maximum size of aggregate = 3/4-inch
 - 5. Minimum slump = 2-inch and maximum slump = 4-inch
- F. Mixing, Transporting and Placing. All work shall be conducted in accordance with ACI 212.2, "Guide for Use of Admixtures in Concrete," ACI 211.1, "Recommended Practice for Selecting Proportions for Normal and Heavyweight Concrete," ACI 304. "Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete."
- G. Curing. Minimum times for stripping formwork shall be 48 hours. No concrete shall be backfilled until after a 48-hour curing period. Should cement other than Type I be used, formwork/backfilling times shall be subject to review by the Engineer.
- H. Reinforcement. Reinforcement shall conform to ASTM 615 or ASTM 616 or A617. The minimum characteristic yield strength $f_y = 60$ ksi unless noted otherwise. All reinforcement bars shall be #4 deformed placed on 12-inch centers each way unless

noted otherwise. Footings shall have two rows of #4 rebar. Dowel pins 12-inch on center extending at least 12 inches into the vertical walls shall be placed in all footings or slabs used as footings and tied to the reinforcement steel of the walls. Where required, transition bars between walls and the footings shall be bent to conform to the shape of the structure. All reinforcement plans shall be submitted to the Engineer for approval 15 days prior to forming any structures. Ties for reinforcement shall be black annealed wire not less than 1/16-inch in diameter.

- I. Cover. The minimum cover to any reinforcing bar shall be two inches for 6-inch thick slabs and walls and three inches for 8-inch or greater slabs and walls.
- J. Embedded Items. All items to be embedded in the concrete shall be securely fastened to the reinforcement in the correct positions. No concrete shall be placed before the Engineer has inspected the reinforcement, built-in items and formwork and certified them as ready for concrete placement. Such inspection and certification shall in no way relieve the Contractor of any liabilities due to errors and/or omissions of any part of the construction.

K. Tolerances.

Compressive Strengths. No more than 5% of the random samples collected shall yield strengths less than the specified strength and no individual test shall yield a strength more than 10% below the specified strength.

Dimensional Tolerances. Variation in cross sectional sizes, positions of built-in items, plan dimensions, levels and any linear structural dimensions shall be -1/4 inches to +1/2 inches.

- L. Quality Control. All concrete and reinforced concrete work will be subject to inspection and testing according to the provisions of the applicable ASTM standards as listed under Section 1, Volume 01.04, "Steel-Structural, Reinforcing, Pressure Vessel, Railway" and Section 4, Volumes 04.01 "Cement; Lime; Gypsum" and 04.02, "Concrete and Aggregates," without compromising the requirements of other standards and specifications as mentioned elsewhere within this document.
 - i. The frequency of casting test cylinders for concrete compressive strength tests will be determined by the Engineer. Generally, one set of three will be taken per pour over 5 cubic yards and a minimum of one set per 30 cubic yards placed.
 - ii. No backfill on top of reinforced concrete shall commence before the concrete has reached a minimum of 70% of its design compressive strength.
 - iii. Inspection by the Engineer will be required before re-commencing work after completion of each of the following concreting stages:
 - 1. Placing rebar and built-in items
 - 2. Erecting formwork
 - 3. Placing concrete
 - 4. Stripping formwork
 - 5. Backfilling against the structure
- M. Payment. All costs associated with furnishing concrete included in the applicable bid item that requires the contractor to furnish and install concrete.

3.18 STEEL BUILDING

- A. General. The building shall be a pre-manufactured steel building designed, furnished, and installed by the contractor. All structural steel sections and welded plate members shall be designed in accordance with the AISC 360, Specifications for Structural Buildings.
- B. Design. Steel Building frame and structural components shall be designed by a licensed structural engineer licensed in the state of New Mexico. The design shall be submitted to the client's representative for review and approval prior to construction.
- C. Frame. Frame shall be clear span rigid frame able to span the building dimensions. Material shall meet at minimum ASTM A-570 or ASTM A-572 or ASTM A-529 with a minimum yield point of 55,000 psi. All framing members shall be built-up or wide flange sections with a minimum web thickness of 1/8-inch and a minimum flange thickness of 1/4-inch. All welding shall be in accordance with AWS D 1.1-85. Structural connections shall be shop welded butt-plates which are punched or drilled for field bolted assembly. The building shall be anchored to concrete pier footings with the required A-307 quality or better anchor bolts. Structural members supporting the jib crane shall be up-sized to accommodate the additional load of the crane plus crane capacity. Ceiling height shall be sized to allow a minimum of 24" of clear space from any part of the top of the crane to the nearest ceiling structure and fixtures.
- D. Frame Finishes. All structural members shall have acrylic primer applied at a thickness of 1.5 mils. Paint with compatible topcoat of 3.0 mils thickness, colored ivory.
- E. Exterior Wall and Roof Panels. All exterior panels shall be a minimum 26-gauge prefinished steel colored ivory.
- F. Electrical. All electrical service for the building shall be designed, furnished, and installed by the contractor complying with the 2014 National Electric Code. The design shall include circuits adequate for pumps, pump controls and pump fixtures; and (2) 120-volt 20-amp circuits for the two 1/4 hp submersible pumps, with NEMA 5-20R outlets located on the south pit wall 48" above the floor, centered above the sump pit; and (1) 120-volt 20-amp wall outlets circuit with easily accessible NEMA 5-20R outlets on either end of the control room; and (1) 120-volt 20-amp wall outlet circuit in the pit with (1) NEMA 5-20R outlet centered on each pit walls 48" above the floor; and (1) Circuit sized for the 1-ton jib crane, and (1) 240 volt 50 Amp Circuit with (1) NEMA 6-50R outlet located on the south wall between the doors; and interior light circuit(s) adequate for providing 10-foot candles on all exposed floor surfaces for interior lighting; and exterior lighting circuit(s) adequate for providing 5-foot candles for exterior flood lighting on the ground in front of each pump-house doors.
- G. Safety Railings. All railings, railing openings, gates, and barriers shall comply with OSHA Standard Number 1910.23 "Guarding floor and wall openings and holes." Railings shall be steel with a minimum wall thickness of 14 ga. Handrails and gates shall be primed to a thickness of 1.5 mils and painted to a thickness of 3.0 mils.
- H. Stairs and Grating. All stairs and ladders shall comply with OSHA Standard Number 1926.1052 "Stairways." Stair treads shall be galvanized steel non-slip diamond safety grating.
- I. Translucent Panels. Three 4-ft by 4-ft opaque translucent window panels and three roof opaque translucent panels shall be furnished and installed as shown on Drawing

- D111. The translucent panels shall allow 70 percent emission to provide a soft white light.
- J. Man Door. One 36-inch by 82-inch commercial grade steel 12-gauge man door with steel frame. Door shall include stainless grade-1, 6-pin dead bolt and matching doorknob. Door and frame shall be primed and painted.
 - K. Security Door. One 36-inch by 82-inch steel bar and screen security door shall be installed on the man door. Door shall have Stainless knob with latch, and stainless grade-1, 6-pin deadbolt. Door and frame shall be primed and painted ivory.
 - L. Garage Door. 14'high by 12 wide externally mounted rollup garage door with power operators. Door operation controls shall be mounted inside the building. Include security lock mechanism.
 - M. Garage Door Frame. Contractor shall design a frame for the garage door suitable for the additional load of the garage door.
 - N. Jib Crane. One wall mounted 16-ft long steel I-beam cantilever motorized jib crane capable of lifting one ton (2000 lbs capacity). The building structure shall be designed to accommodate the attachment of jib crane plus the cranes rated capacity. The jib crane shall be mounted at the maximum height that still allows the crane boom arm to swing freely underneath the fully opened garage door header. Jib crane shall be Gorbel WC200-B1-16-12 wall cantilever jib crane or equally approved.
 - O. Payment. All costs associated with the design, furnishing, and installation of the building shall be included in Bid Item Number 25.

3.19 ELECTRICAL

- A. General. A permanent power supply is required to operate the automated trash screen, the spray bar, pump motors, and building. A XXX KVA transformer exists to run the existing pumping station. This transformer will be used to provide power for the new pump station. The Contractor will design, furnish, and install all power service between the existing transformer and the electrical demands.
- B. Design. All electrical work shall be designed by a licensed engineer in the state of New Mexico. The design shall be submitted to the Engineer for review and approval prior to construction.
- C. Power Service. An existing 480-volt three phase power service to the site and an electric meter shall be provided by NTUA through a service contract with the Owner.
- D. Distribution. A distribution panel with a main breaker, a circuit breaker to power the trash screen, a circuit breaker to power the building, and a GFCI receptacle for miscellaneous use, are required.
- E. Electrical Work. System is to be designed, furnished, and built by the contractor. All work is to be completed by a licensed electrician. Supply cables, fittings, grounding and distribution equipment are installed and connected in accordance with current regulations and standards. The work site is left free of installation waste and excess materials in accordance with industry practice.
- F. Wire. Wire shall be rated for outdoor/hazardous service and sized by a licensed electrician to meet demand requirements.

- G. Disconnect Boxes. The disconnect boxes shall be 30 amp 600-volt heavy duty fused disconnects enclosed within a vertically hinged NEMA 3R enclosure. Three 600 V fuses appropriately sized by a licensed electrician that fit the disconnect block shall be provided with each box. One 1-1/4-inch steel hub suitable for installing onto the disconnect box shall be provided with each box.
- H. Junction Box. The junction box shall be a NEMA 3R powder coated carbon steel enclosure rated for 30 amps and 600 Volts. The junction box shall be a screw cover wall mounted enclosure. Each junction box shall come with four 1/4-inch springnuts and four 1/4-inch bolts to mount the box to 1-5/8-inch by 7/8-inch 12 gauge galvanized Uni-Strut Channel.
- I. Conduit. Conduit shall be rigid Schedule 80 PVC grey conduit sized appropriately to house the wires assigned to the conduit
- J. Ground Rods. Ground rods shall be 1/2-inch diameter 8 ft. long copper-bonded, pointed ground rods. Each ground rod shall be provided with a ground clamp connector for securing the ground wire.
- K. Payment. All costs associated with furnishing the power supply from the transformer shall be included in Bid Items 18.

3.20 SECURITY FENCING

- A. General. A commercial grade chain link fence shall be installed for security and safety purposes.
- B. Round Steel Pipe. The pipe shall be Schedule 40 standard weight pipe, in accordance with ASTM F1083.
- C. Fence Fabric. The material shall be manufactured from galvanized steel wire. The size of the steel wire core shall be 9 gauge.
- D. Fittings. The fittings shall meet the requirements for ASTM F626.
- E. Gates. The swing gates shall meet the requirement of ASTM F900.
- F. Payment. All costs associated with furnishing the power supply included in Bid Item 27.

3.21 HANDRAILS

- A. General. All handrails shall be installed per drawings. All handrails shall meet the OSHA standards.
- B. Steel Tubing. All handrails shall be 1.5-inch galvanized steel pipe. All pipe shall be welded 14 gauge. All handrails shall withstand a minimum requirement of 200 pounds.
- C. Payment. All cost for the handrail for the canal turnout shall be included in Bid Item 7. All cost for the handrails for the pond outlet shall be included in Item 11. All handrails for the concrete sump structure inside the building shall be included in Bid Item 12.

3.22 SAND

- A. General. A layer of sand is required for the pond let structure (D102).
- B. Sand. Sand shall be washed and clean. The sand must have less than 10% fine sands.

- C. Payment. All cost associated with sand at the pond inlet shall be include in Item 8.

3.23 STEEL PLATE

- A. General. A galvanized steel plate is used as a filler between the concrete wall and the trash screen at the pond outlet.
- B. Steel Plate. The steel plate shall be 3/16" galvanized steel. The galvanized steel plate shall meet the ASTM A123/A123M standards.
- C. Payment. All cost shall be included in Item 11.

3.24 STEEL GRATE

- A. General. The steel grate shall be used for the walkway, conduit chase and sump box as shown in the drawings.
- B. Steel Grating. All steel grate shall be welded galvanized steel 1-1/2-inch by 3/16-inch fastened over 2-inch by 2-inch by 1/4-inch steel galvanized angle placed on 16-inch centers. All galvanized steel shall meet the ASTM A123/A123M standards.
- C. Payment. All costs associated with the canal turnout shall be included in Bid Item 7. All cost associated with pond outlet shall be included in Item 11. All cost for the pump sump shall be included Item 12.

PART 4. WORKMANSHIP

4.01 GENERAL

- A. Specifications. See "Material Specifications – Hogback A&B Pump Station Phase II".
- B. Payment. All costs for furnishing material as specified in "Material Specifications – Hogback A&B Pump Station Phase II" shall be included in the applicable bid item.

4.02 ABANDONMENT

- A. General. The existing infrastructure requires abandonment. This includes the pumps, inlet structure and the electrical controls.
- B. Powers disconnect. All electrical service must be safely disconnected from the transformer to the existing power supply and safely terminated.
- C. Mechanical. Mechanical infrastructure shall be carefully dismantled and given to the Owner for salvaging.
- D. NTUA water line for pump lubrication. The plumbing to the pump lubrication outlet shall be disconnected from the NTUA isolation valve.
- E. Payment. Payment for cleaning, demolishing, and disposing of the building per these Specifications and Drawings shall be included in the Bid Item 5.

4.03 SITE PREP

- A. General. The location and configuration of site features shall be as shown in the Drawings and Specifications. During construction, disturbance of the area outside the

construction area is not allowed unless noted. Keep project area neat and orderly at all times, free of rubbish and excess construction materials.

- B. Earthwork grade. All earthwork shall be completed using survey control. Final elevation shall be within 0.1 ft. of design elevation as shown on the Drawings.
- C. Cut. Areas for cut shall be brought to within five percent of the optimum moisture content to achieve a compaction of 95% of standard proctor prior to any excavation. Moisture content of cut areas shall be tested on a daily basis to ensure compliance.
- D. Fill. All fill shall be obtained from areas of cut. All fill shall be compacted to 95% of standard proctor in maximum 6-inch lifts. Compaction of fill shall be tested on a daily basis to ensure compliance.
- E. Grading. Finished grade shall be contoured to match original ground using a maximum slope of 3:1.
- F. Driveway. The sub-grade moisture content shall be scarified to a depth of 6-inches and to within five percent of the optimum moisture content. The sub-grade shall then be compacted to 95% of standard proctor in 6-inch minimum lifts prior to any road base placement. A 6-inch road base material meeting a gradation that 40 to 65 percent passes a # 4 sieve shall be placed on top of the subgrade and compacted to 95% of standard proctor. The top of the road base layer shall be within 0.1 ft. of design elevation.
- G. Payment. All costs associated with completing site preparation as described in the Specifications and Drawings are included in Bid Item Number 6.

4.04 PIPELINE EXCAVATION

- A. General. The Contractor shall complete excavation of pipe trenches.
- B. Permitting. The Contractor shall be responsible for obtaining a one-call confirmation number from NM one call prior to any excavation.
- C. Survey. All pipeline point of intersections and the center line every 100 ft. shall be staked by others. Elevation bench marks every 500 ft. shall be set by others. Building corners shall be staked by others. All other survey requirements are furnished by the Contractor.
- D. Grade. Grade shall be controlled such that when the pipe is installed the invert elevation shall not deviate from that shown on the Drawings by more than 0.1 ft. For slopes greater than 0.002 ft./ft., there shall be no reverse grades allowed. For slopes less than 0.002 ft./ft., there shall be no reverse grades greater than 0.1 ft. (maximum deviation between high and low point).
- E. Trench Bottom Preparation. The bottom of the trench shall be clean and free from protruding stones larger than ½ inch in diameter, hard lumps, angular stones, or abrasive material, to allow the pipe to lie directly on earth in the bottom of the trench.
- F. Trench Width. The trench shall have a minimum width of the pipe diameter plus 8 inches on each side with the pipe centered in the trench. Up to the top of the pipe, the trench shall not be wider than the diameter of the pipe plus 12 inches on each side.
- G. Trench Depth. Unless specified, all pipe shall have a minimum cover depth of 3 feet. Over-excavation of a minimum of 2 inches may be required to prevent damage to the pipe by allowing room for bedding material.

- H. Bell Holes. Bell holes shall be excavated at each joint to prevent excess stress on the bell and to provide for proper joint alignment. The length of these bell holes shall be limited to that necessary to provide joint assembly.
- I. Safety. All appropriate and applicable safety precautions and regulations shall be followed during excavation, including trench shoring or sloped trench walls for protection of workers where required.
- J. Open trenches shall be clearly marked with appropriate barricades when close to public access. All national, state and tribal safety regulations shall be followed.
- K. Payment. All costs associated with excavation per the Specifications and the Drawings shall be included in bid items 3, 4 and 5.

4.05 HDPE PIPELINE INSTALLATION

- A. During installation, pipe shall be handled carefully to avoid any damage. Any damaged pipe during trenching and installation shall be replaced by the Contractor at the expense of the Contractor. Any debris in the pipe shall be removed prior to installation. During assembly, pipe ends shall not be left open when installation is not active at the open end. Keep the pipe ends blocked to prevent entry of foreign matter that might clog the system when flushing.
- B. Heat Fusion Joining. Joints between plain end pipes and fittings shall be made by butt fusion. The butt fusion procedures used shall be procedures that are recommended by the pipe and fitting Manufacturer. The Contractor shall have a minimum of one-year experience installing large diameter HDPE pipe and shall ensure that persons making heat fusion joints have received training in the Manufacturer's recommended procedure. The Contractor shall maintain records of trained personnel, and shall certify that training was received not more than 12 months before commencing construction. External and internal beads shall not be removed.
- C. Butt Fusion of Unlike Wall Thickness. Butt fusion shall be performed between pipe ends, or pipe ends and fitting outlets that have the same outside diameter and are not different in wall thickness by more than one Standard DR, for example, SDR 13.5 to SDR 17, or SDR 11 to SDR 13.5. Transitions between unlike wall thickness greater than one SDR shall be made with a transition nipple (a short length of the heavier wall pipe with one end machined to the lighter wall). SDR's for polyethylene pipe are 7.3, 9, 11, 13.5, 17, 21, 26, 32.5 and 41.
- D. Field Cutting. Pipe ends should be squarely cut to $90^{\circ} \pm 5^{\circ}$. Do not use bar chain lubrication if cutting pipe with a chainsaw.
- E. Pipe Joining. The joining of the pipe shall be accomplished according to the manufacturer's specifications. Assemble the joints in as straight an alignment as possible. The manufacturer's recommended maximum joint deflection shall not be exceeded at any time. ASTM standards say that fusion is generally not recommended below -4°F without special provisions. Follow all guidelines set forth in ASTM F2620.
- F. Pipe Repair. Damaged portions of the HDPE pipe may be repaired using electrofusion repair saddles, or if the damage is sufficiently extensive a section of pipe may be cut out and removed.
- G. Fittings. Not more than one plain-end connection of 16" IPS and larger fabricated directional fittings (elbows, tees, etc.) shall be butt fused to the end of a pipe length

before placing the assembly into the trench. The remaining fitting connections shall be made in the trench using butt fusion. Handling, lifting, moving or lowering a 16" IPS or larger fabricated fitting that is connected to more than one pipe length is prohibited. The installing contractor at his expense shall correct fitting damage caused by such improper handling.

- H. Thrust Blocks. Thrust blocks are required for all horizontal tees, elbows, and termination ends. Concrete used for thrust blocks shall be a minimum 3,000 psi mix. The thrust block shall be poured so that the bearing area specified in the Drawings is achieved. A minimum distance of 1 ft. between the pipe and the undisturbed trench wall shall be maintained. Thrust blocks shall not be backfilled until 24 hours after they have been poured.
- I. Payment. All costs associated with pipe installation per the Specifications and Drawings shall be included in bid items 7, 9, 22, and 23.

4.06 PIPELINE BACKFILL

- A. General. Backfill shall follow shortly after the installation of the HDPE Pipe. The material placed within the haunches of the pipe and at least 12 inches above the top of the pipe shall be free from stones larger than $\frac{3}{4}$ inch in diameter, angular stones, abrasive or frozen material, and free of debris or other organic materials. The backfill material shall be placed in a manner that minimizes voids throughout the trench but particularly around the pipe. Backfill below the haunches shall be compacted in 6-inch lifts to a density equal to 95 percent of a standard proctor. The final backfill (from at least 12" above the crown of the pipe to the top of the trench) shall be free from stones larger than 4 inches in diameter, clumps of frozen soil, rubble or other such material. In most cases, the material that was originally excavated can be used for final backfill. Following backfill of the trench, the surface shall be re-graded to the original ground surface with the trenched area mounded to allow for backfill settlement.
- B. Payment. The cost for backfilling the trench surface re-grading shall be included in bid items 22, and 23.

4.07 UTILITY CROSSINGS

- A. General. All of the pump supply lines and B-Lateral Pipeline cross the Shiprock Municipal Pipeline which is currently owned by the Bureau of Reclamation. The Contractor shall notify the Engineer one week in advance when the crossing will take place so that Reclamation may be on site when their pipeline is crossed.
- B. Excavation. All excavation within 10 ft. of the centerline crossing shall employ a vacuum suction to probe the depth of the excavation prior to any excavation. Spoils of any vacuum suction shall be disposed of along the other trench spoils in an area that has been contained by earthen berms. All other excavation may be completed by a hydraulic shovel provided that the excavation does not go below the depth of the probe.
- C. Damage. Any damage to the Shiprock Municipal Pipeline incurred during construction shall be repaired at the expense of the Contractor as directed by the Engineer in consultation with Reclamation.
- D. Payment. All costs associated with crossing utilities shall be included in Bid Item Number 13 for the pump inlet piping. All costs associated with crossing utilities shall be included in Bid Item 23 for B-Lateral Pipeline.

4.08 US-64 CROSSING

- A. General. B-Lateral Pipeline crosses US-64 as shown on Drawing P103. All workmanship and materials shall conform to the New Mexico Department of Transportation standards. The crossing shall be accomplished by direct boring the road to grades and elevations shown in the plan and profile drawings. Pipe that is damaged during unloading, handling or installation shall be replaced as directed by the Engineer at the expense of the Contractor.
- B. Traffic Control. The Contractor shall comply with the New Mexico Department of Transportation traffic control requirements during the entire duration of the crossing installation.
- C. Bore Installation. The 30-inch steel 3/8-inch wall pipe shall be installed to the proper alignment and grade as shown in the Drawings by direct boring. No open cut installation will be allowed within the highway right-of-way. The steel pipe shall be installed such that there is no annular space between the pipe and the ground through which the pipe is installed.
- D. HDPE Pipe Installation. Once the 30-inch steel casing has been installed, the Contractor shall insert the 22-inch DR 26 HDPE pipe through the steel casing. All fused joints shall be completed and visually inspected to ensure the joint has been fused prior to installation.
- E. Utility Markers. 60-inch long by 3.75-inch fiberglass purple posts (for irrigation) shall be placed on the edge of the highway right-of-way marking the location of the pipeline once the pipeline has been backfilled and graded.
- F. Payment. All costs associated with installation of the road crossing per the Specifications and Drawings shall be included in Bid Item 24.

4.09 MECHANICAL

- A. General. All mechanical pumps and trash screens shall be installed following the directions of the manufacturer as required to comply with the manufacturer warranty. The installation shall be completed under the direction of a qualified pump mechanic with at least one-year experience of installing similar pumps. The installation of the trash screen shall be completed under the direction of a qualified technician with at least one-year experience for installing similar screens.
- B. Pump Installation. The pump shall be placed on the cement pump support as shown on the drawings. The pump shall be level and secured on the support. The pump shall be checked to ensure that it can rotate freely. Pump rotational directions shall be checked by very quickly energizing the pump with a VERY SHORT on/off power pulse. Check to ensure that all belts and shaft couplings are properly adjusted, aligned, and guards in place.
- C. Pump plumbing. All plumb piping must be clean and free of debris and obstructions prior to installation. Pipe joints are to be checked and verified that all gaskets are in place and fasteners tight. Pipe threads shall have a fast-dry, flexible set thread sealant applied that is designed for high vibration environments. The pipes shall be installed in alignment with the pump so that the piping does not introduce torque onto the pump assembly.

- D. Air vents. All air vents shall remain open once installed to safeguard the pump and plumbing.
- E. Trash Screen. Trash screen installation shall follow manufacturer directions
- F. Payment. All costs associated with installing mechanical features shall be included in the applicable bid item.

4.10 ELECTRICAL

- A. General. All electrical shall be installed under the direction of a licensed electrician. All electrical work shall comply with applicable codes. All work shall not be hazardous or dangerous to any personnel working on the site or to the public accessing the site in the future.
- B. Handling. Proper loading, handling, and transportation are important to the integrity of all electrical material. The material shall be handled at all times so as to avoid any damage. Damage to any material from any cause during the loading, handling, and transportation shall be replaced or repaired.
- C. Storage. All electrical components shall be stored in a manner with to prevent contaminants from entering. The best method for accomplishing this is to keep electrical parts in packaging until installation. If the packaging has been breached or does not exist, the part should be protected by repackaging as required.
- D. Underground Wire. Trench depths for direct burial underground wire shall have a minimum depth of 24-inches. Wire installation shall follow trenching as soon as possible to ensure the placement of the wire on the bottom of the trench. Any damage to the insulation of the wire during installation shall be repaired or replaced. Backfill of the trench shall follow installation as close as possible. Where splices are required, the splice shall be completed by a licensed electrician. Splice kits used shall be 3M low voltage kits suitable for direct burial or equivalent. The splice area shall only be backfilled after inspection and the location documented.
- E. Outdoor Steel Framing. All framing shall be fabricated from galvanized 12 gauge uni-strut channel or equivalent. Vertical posts shall be 1-5/8" x 1-5/8" channel and cross bracing shall be 1-5/8" x 7/8" channel. Vertical posts shall be inserted 18-inches into the ground and anchored with concrete post mix. Boxes and components shall be secured to the channel by spring nuts. Boxes shall be mounted so the bottom of the disconnect box is 44-inches above the ground.
- F. Cleaning. All electrical parts shall be clean, free of dust and debris prior to installation.
- G. Switches, Outlets, and Miscellaneous Part Installation. All switches, outlets, control boxes, and other access boxes shall be installed at a height or location that allows for easy access.
- H. Unused Openings. All unused openings in any electrical part shall be safely covered to prevent contamination.
- I. Inspection. All electrical work requires inspection by a licensed electrician prior to covering.
- J. Testing. All electrical work shall be tested for proper function prior to commissioning the facility.

- K. Payment. The cost for the electrical and the electrical components for supply to A-Lateral shall be included in Bid Item 18. The cost for the electrical requirements to supply B-Lateral shall be included in Bid Item 19. The cost for the electrical requirements for the trash screen shall be included in item 11.

4.11 TESTING

- A. General. All mechanical systems shall be tested by the Contractor until all components are operating as designed and to manufacturer capabilities. Once all testing has been completed, the Contractor shall operate and maintain the pumping plant for one week (7 days) to ensure proper operation of the facility.
- B. Standards. Testing of all equipment shall be conducted in accordance with all specified standards and procedures specified by the equipment manufacturer. The Engineer shall witness all field testing. Copies of all test certificates and performance curves shall be supplied to the Engineer once testing is complete.
- C. Pump testing prior to construction. Each pump and motor shall be tested at the factory to certify that it meets the design conditions including the pressure-discharge performance curve with efficiency and power demand, vibration, electrical input, and motor temperature rise. All pump testing shall meet the requirements of the Hydraulic Institute Standards for Rotodynamic Pumps (ANSI/HI 14.6).
- D. Field Pump testing. The Contractor shall provide pump testing results to demonstrate that the pumps are performing as specified. These results shall include flow and pressure measurements immediately downstream of each pump. In the event of inadequate pump performance, the Contractor shall be responsible for additional pump and motor testing to determine the cause of the problem. After repairs have been made, the Contractor shall re-test the pumping plant and, if needed, provide additional measures until the pumping plant meets the design specifications. The Contractor shall be fully responsible for any and all work required to correct all pumping deficiencies.
- E. Valve test. All valves shall be operated over their entire operating range to ensure proper function.
- F. Pipeline test. All pipelines shall be filled, operated, and visually inspected for any leaks for 24 hours. The pipeline shall operate without any leaks for at least one week prior to transferring the system to the Owner.
- G. Payment. All costs associated with testing the completed works shall be included in the applicable bid item.

4.12 TRAINING

- A. General. The Contractor shall train the Owner on the operation and maintenance of the pumping plant during the week the Contractor is operating and maintaining the plant.
- B. Warranties. The Contractor shall inform the Owner of each manufacturer warranty and go over the literature with the Contractor.
- C. Field Training. The Contractor shall provide one-day training with the Owner on all pumping plant feature. The training shall include an overview of manufacturer literature, hands on instructions for operating system components, and a review of maintenance requirements.

- D. Payment. All costs associated with training the Owner on the pumping plant shall be included in Bid Item 19.

4.13 HOGBACK CANAL TURNOUT

- A. General. A new turnout structure to the pumping plant shall be installed on Hogback Canal as shown on Drawing D101. The structure includes earthwork, concrete work, installation of a canal gate, and a HDPE corrugated pipe.
- B. Backfill. All structural backfill shall be completed with native material free of organic material, sticks, and rocks and compacted to 95 percent of standard proctor in 6-inch lifts. All pipe backfill shall be compacted to 85 percent of standard proctor in 12-inch lifts.
- C. Gravel Foundation. The foundation material under the structure shall be a 12-inch depth of 1.5-inch washed gravel.
- D. Pipe Installation. The 36-inch corrugated HDPE pipe shall be cast-into the concrete structure.
- E. Safety Railings. All safety railing shall be installed based on OSHA standards. Railings shall be galvanized 1.5-inch diameter welded 14-gauge galvanized steel. All fittings shall be galvanized steel that clamp onto the railing pipe with a case hardened set screw with corrosion resistant coating.
- F. Payment. All cost required to install the Hogback Canal Structure shall be included in Bid Item 7.

4.14 POND INLET

- A. General. The 36-inch corrugated pipe shall terminate at a stem wall with riprap apron located at the settling pond as shown on Drawing D102.
- B. Backfill. All structural backfill shall be compacted to 95 percent of standard proctor in 6-inch lifts.
- C. Gravel Foundation. The foundation material under the structure shall be a 12-inch depth of 1.5-inch washed gravel.
- D. Riprap Apron. Riprap apron shall have a 12-inch layer of sand foundation. A 18-inch layer of riprap is applied on top of the sand to the dimensions shown on D102. Gradation shall be Dmax equal to 18-inches, D50 equal to 8-inches.
- E. Payment. All costs required to install the Pond Inlet Structure shall be included in Bid Item 8.

4.15 SETTLING POND

- A. General. A settling pond shall be excavated as shown on Drawings L102 and L103.
- B. Cleaning. The existing vegetation and debris shall be removed from the pond area and disposed of at the San Juan County Landfill.
- C. Excavation. The pond shall be excavated to the width and length as shown on the Drawings. Spoils shall be placed between the canal and the settling pond in a long pile.

that is graded. The pond invert shall slope from pond inlet (elevation 4991) to the outlet (elevation 4990.75). Side slopes of the pond shall be 2:1.

- D. Compaction of pond invert. When grade has been achieved, the pond invert shall be wheel rolled with a sheep's foot compactor five times under optimal moisture as defined by a moisture-density curve taken at the site before the compaction.
- E. Payment. All costs required to construct the settling pond shall be included in Bid Item 10.

4.16 POND OUTLET

- A. General. A concrete headwall structure with a stop log weir and a traveling trash screen is placed at the outlet of the pond as shown in Drawing D103. The concrete headwall structure is the manifold to three pipe inlets that supply a pump.
- B. Backfill. All structural backfill shall be compacted to 95% of standard proctor in 6-inch lifts. All pipe backfill shall be compacted to 85% of standard proctor in 12-inch lifts. All backfills shall have no rocks, sticks or sharp objects.
- C. Gravel Foundation. The foundation material under the structure shall be a 12-inch depth of 1.5-inch washed gravel.
- D. Steel Grating. 1-1/2-inch by 3/16-inch welded galvanized steel grating fastened over 2-inch by 2-inch by 1/4-inch steel galvanized angle placed on 16-inch centers.
- E. Safety Railings. All safety railing shall be installed based on OSHA standards. Railings shall be galvanized 1.5-inch diameter welded 14-gauge galvanized steel. All fittings shall be galvanized steel that clamp onto the railing pipe with a case hardened set screw with corrosion resistant coating.
- F. Stop logs. Stop log tracks shall be 2" by 2" by 1/4" galvanized channel bolted onto the concrete slot as shown on the Drawings. Stop logs shall be 63-inch long per the specifications.
- G. Trash Screen. The trash screen shall be configured per these Specifications and Drawings. Galvanized steel plate, 3/16-inch thick, shall be placed between the trash screen and the concrete wall to fill in the annular space. The plate shall be field fitted and fastened to the frame of the trash screen. The trash screen submersible pump shall be placed between the screen and the pipe inlets. The top of the screen shall be configured so that the debris from the trash screen drops onto a 6-inch concrete trash collection clean-off pad. The 6-inch concrete pad is 10-ft by 15.3-ft and sloped back to the pond to allow for drainage. The electrical junction box shall be located off of the clean-off pad. Conduit from the junction box to the trash screen shall be placed along the wall of the concrete structure.
- H. Drain. A 8-inch CL 80 PIP PVC pipe shall be cast into the bottom floor of the concrete structure as shown on the Drawings. The pipe will serve as a drain for the pond. A 8-inch gate valve per these specifications shall be installed on the bank outside of the pond as shown on Drawing L102. The 8-inch drain line shall discharge to the canal.
- I. Payment. All costs associated with furnishing and constructing the pond outlet structure and trash screen shall be included in Bid Item 11.

4.17 STEEL BUILDING

- A. General. A steel building shall be placed over the pump sump as shown on Drawing D111 and per these Specifications. The steel building shall be placed on a concrete pier and footing so that the building is secure with no gaps or spacing between the building and the ground.
- B. Pier and Footings. Pier and footings shall be installed as required building manufacturer. Northeast corner shall be set on basement wall. The minimum depth of 1-1/2" washed gravel under all footings shall be 12-inch.
- C. Concrete slabs. All concrete slab shall be 6-inch thick. Concrete slabs shall have a number 4 rebar on 12-inch center reinforcement. The floor shall be sloped 2% toward sump pit from all directions.
- D. Roof. The roof shall be one-side slope to the pitch as shown on the Drawings. Translucent roof panels shall be installed as shown on the Drawing D111.
- E. Electrical. The Contractor shall design, furnish, and install electrical service to the building suitable for the pump service, ventilation, lighting, jib-crane, submersible pumps, and incidental electrical service.
- F. Payment. All costs to design, furnish, and to construct the steel building shall be included in Bid Item 25.

4.18 PUMP SUMP

- A. General. A concrete pump sump shall be constructed as shown in Drawings D104 through D106 and per these Specifications.
- B. Concrete. The concrete slab shall be 6-inch. All concrete slab shall have #4 rebar with 12 inch by 12-inch grid. All concrete walls shall be 12-inch thick. The walls shall have #5 rebar placed in 6-inch by 6-inch grid. All openings shall be grouted. The slab shall be place with saw-cut control joint as shown in D104. The floor shall be sloped 1% towards the sump box which will house the submersible pumps.
- C. Footings. The perimeter footing on sump wall shall be 12-inches thick. All footings in the sump shall two layers of #5 rebar placed on a 12-inch by 12-inch grid.
- D. Gravel Foundation. The foundation material under the structure shall be a 12-inch depth of 1.5-inch washed gravel.
- E. Pump Platforms. All concrete pump platforms shall be 32-inch x 24-inch by the height required by the pump to fit the piping. The concrete pump platforms shall have Number 4 rebar reinforcement on 8-inch by 8-inch centers.
- F. Sump Box, Submersible Pumps, and Drain. The sump box that houses the submersible pumps and drain discharge piping shall be configured as shown on Drawing D104, D105, and D106. Two submersible pumps shall be configured and plumbed to a 4-inch Schedule 40 PVC drain line that discharges to the canal. The pumps shall be capable of discharging 30 gpm at an overall head of 22 ft. The pumps shall be able to pump with a minimum water level of 3/8-inch. The pumps shall be automated to switch on when water enters into the sump box. The pumps are to be 115 V PSC motor, made of corrosion resistant thermoplastic, and able to handle solids up to 1/8-inch diameter.
- G. Electrical trench. An 8-inch in-floor trench shall be configured as shown in the floor of the sump to house all electrical conduit.

- H. Steel Grating. 1-1/2-inch by 3/16-inch welded galvanized steel grating fastened over 2-inch by 2-inch by 1/4-inch steel galvanized angle placed on 16-inch centers.
- I. Steel Deck. A 24-inch by 36-inch steel deck will be installed above the sump box. The welded galvanized steel grating shall be 1-1/2-inch by 3/16-inch fastened over 2-inch by 2-inch by 1/4-inch steel galvanized angle placed on 16-inch centers.
- J. Safety Railings. All safety railing shall be installed based on OSHA standards. Railings shall be galvanized 1.5-inch diameter welded 14-gauge galvanized steel. All fittings shall be galvanized steel that clamp onto the railing pipe with a case hardened set screw with corrosion resistant coating.
- K. Stairs. The Contractor shall design the stairs into the sump for a minimum 40 psi load. Stairs shall be constructed with MC10x6.5 9-gauge C channel stair stringers as shown on Drawing D112. The steps shall be 24½-inch by 2-inch by 9/14-inch steel width with 3 Diamond Grip Strut Tread. A concrete landing shall be configured to terminate the stairs onto the sump concrete slab.
- L. Payment. All costs to construct the sump per the drawings and specifications shall be included in Bid Item 12.

4.19 LATERAL PIPE DISCHARGE

- A. General. The discharge into both A Lateral and B Lateral is a cast-in-place headwall as shown on D122.
- B. Backfill. All structural backfill shall be completed with native material free of organic material, sticks, and rocks and compacted to 95 percent of standard proctor in 6-inch lifts. All pipe backfill shall be compacted to 85 percent of standard proctor in 12-inch lifts.
- C. Gravel Foundation. The foundation material under the structure shall be a 12-inch depth of 1.5-inch washed gravel.
- D. Pipe Installation. The HDPE pipe shall be cast-into the concrete structure.
- E. Payment. All costs to install the Lateral A discharge shall be included in Item 22. All cost to install the headwall the Lateral B discharge shall be included in item 23.

END OF SECTION

BID SCHEDULE

No.	Description	Quantity	Unit Cost	Extension
1	Mobilization and Demobilization.	1 ea.		
2	Environmental compliance as described in the drawings and specifications.	1 ea.		
3	Safety Program as described in the drawings and specifications.	1 ea.		
4	Establish and maintain a staging area as described in the drawings and specifications.	1 ea.		
5	Abandonment of existing infrastructure as described in the drawings and specifications	1 ea.		
6	Site Preparation of new pump yard as described in the drawings and specifications	1 ea.		
7	Furnish and install canal turnout concrete structure as described in the drawings and specifications	1 ea.		
8	Furnish and install canal inlet concrete structure as described in the drawings and specifications	1 ea.		
9	Furnish and install canal inlet piping from canal turnout structure to pond inlet as described in the drawings and specifications	62 ft.		
10	Settling pond excavation and grading as described in the drawings and specifications	1 ea.		
11	Furnish and install pond outlet concrete structure and trash screen as described in the drawings and specifications	1 ea.		
12	Furnish and install pump sump concrete structure as described in the drawings and specifications	1 ea.		
13	Furnish and install pond outlet piping between the pond outlet and the pump sump as described in the drawings and specifications	69 ft.		
14	Furnish and install pump and motor for A-Lateral as described in the drawings and specifications	1 ea.		
15	Furnish and install pump and motor for B-Lateral as described in the drawings and specifications.	2 ea.		
16	Furnish and install pump controls, VFD, and PLC for A-Lateral Motor as described in the drawings and specifications.	1 ea.		
17	Furnish and install pump controls, VFD, and PLC for B-Lateral Motor as described in the drawings and specifications.	2 ea.		

No.	Description	Quantity	Unit Cost	Extension
18	Design, furnish and install all electrical requirements to supply pump motors, building, and trash screen from the existing transformer to the electrical demands as described in the drawings and specifications.	1 ea.		
19	Training the Owner on manufacturer warranties, operation, and maintenance review as described in the drawings and specifications	1 ea.		
20	Furnish and install all supply and discharge steel pipe, valves, and fittings to A-Lateral as described in the drawings and specifications	1 ea.		
21	Furnish and install all supply and discharge steel pipe, valves, and fittings to B-Lateral as described in the drawings and specifications	2 ea.		
22	Furnish and install A-Lateral Pipeline from steel discharge pipe to A-Lateral Canal as described in the drawings and specifications	295 ft.		
23	Furnish and install B-Lateral Pipeline from steel discharge pipe to B-Lateral Canal as described in the drawings and specifications (does not include US 64 crossing)	1,210 ft.		
24	Furnish and install B-Lateral Pipeline US 64 crossing as described in the drawings and specifications	217 ft.		
25	Design, furnish and install pumps steel building as described in the drawings and specifications	1 ea.		
26	Design, furnish and install a SCADA system for the pump station as described in the drawings and specifications	1 ea.		
27	Furnish and install perimeter fencing around pump station as described in the drawings and specifications	311 ft.		
28	Furnish and install pressure relief and surge anticipator valve and discharge piping as described in the drawings and specifications.	1 ea.		
Total				
Navajo Nation Business Activity Tax (5%)				
Grand Total				