Randolph Pump Station Improvements Project RFCSP
Solicitation Number: CO-00459
Job No.: 20-8611

ADDENDUM NO. 3

January 6, 2023

To Respondent of Record:

This addendum, applicable to work referenced above, is an amendment to the price proposal, plans and specifications and as such will be a part of and included in the Contract Documents. Acknowledge receipt of this addendum by entering the Addendum number and issue date on the space provided in submitted copies of the Respondent Questionnaire.

RESPONSES TO QUESTIONS

1. **Question: Section 44 42 56.02 - 1.02.B.3 – Nidec is listed as approved manufacturer, but is not called out on Schedule of Manufacturers for this section. Please add Nidec to this list for clarity.**
   Response: Schedule of Manufacturers and Suppliers for Major Equipment has been updated. Refer to Item No. 1 in the CHANGES TO THE SPECIFICATIONS section of this addendum.

2. **Question: Section 44 42 56.02 - 1.03.B.1.b – Please revise language and require the pump manufacturer to include all travel expenses for Owner witness testing in their proposal.**
   Response: Paragraph 1.03.B.1.b has been updated to specify the pump manufacturer (Supplier) is to be responsible for witness testing expenses. Refer to Item No. 8 in the CHANGES TO THE SPECIFICATIONS section of this addendum.

3. **Question: Section 44 42 56.02 - 1.03.B.2 – Confirm 'bowl' performance testing can be used with factory column/discharge head. Job motors would still be utilized.**
   Response: Paragraph 1.03.B.2 has been updated to specify that a factory column/discharge head can be utilized for 'bowl' performance testing. Job motors to still be utilized. Refer to Item No. 8 in the CHANGES TO THE SPECIFICATIONS section of this addendum.

4. **Question: Section 44 42 56.02 - 1.03.B.2.c – Remove NPSHR testing requirement at 1% head drop. Hydraulic Institute standard is for 3% drop. Additionally, please confirm NPSHA available for both pump applications.**
   Response: Requirement for NPSHR testing at 1% head drop has been removed. Refer to Item No. 8 in the CHANGES TO THE SPECIFICATIONS section of this addendum.

5. **Question: Section 44 42 56.02 - 1.03.B.2.f.3 – Remove this requirement. HI stipulates that test is acceptable if capacity curve passes through one tolerance band. Manufacturer will not guarantee curve passes through both tolerance bands.**
   Response: No changes are to be made to Section 44 42 56.02, Paragraph 1.03.B.2.f.

6. **Question: Section 44 42 56.02 - 1.03.C – Recommend removing language about pumps shipping disassembled. Pumps this size (under 20ft) should ship fully assembled to jobsite.**
   Response: Paragraph 1.03.C allows for the shipment of assembled or disassembled pumping units. Shipping disassembled pumping units will be allowed if requirements specified in Section 44 42 56.02 for shipment of disassembled equipment are adhered to. Shipping requirements for assembled pumping units

have been added in Paragraph 1.06.F. Refer to Item No. 8 in the CHANGES TO THE SPECIFICATIONS section of this addendum.

7. **Question: Section 44 42 56.02 - 1.03.E.1.c – Please add requirement for pump manufacturer to perform following services. It is critical for manufacturer to be present for these actions:**
   - **Barrel Plumb Inspection (2 days; 1 trip minimum)**
   - **Top Flange Level Inspection (2 days; 1 trip minimum)**
   - **Top Flange Weld Supervision (2 days; 1 trip minimum)**

   Response: No changes are to be made to Section 44 42 56.02, Paragraph 1.03.E.1.c.

8. **Question: Section 44 42 56.02 - 1.03.F – Section is titled 'Lateral and Critical Speed Analysis' but describes Forces and Moments analysis. Other than this section title, there is no lateral and critical speed analysis description in the specification. Please add description if these will be required.**
   Response: Dynamic analyses requirements have been added to Paragraph 1.03.F. Refer to Item No. 8 in the CHANGES TO THE SPECIFICATIONS section of this addendum.

9. **Question: Section 44 42 56.02 - 1.04.A.1.b – Please define parameters of lateral and critical speed analysis if this is required in submittal.**
   Response: See response to Question No. 8 of this addendum.

10. **Question: Section 44 42 56.02 - 1.06.D – Please remove 'anchor bolts' from this sentence. Contractor should be responsible for providing anchor bolts. Manufacturer can confirm minimum sizing.**
    Response: Paragraph 1.06.D has been updated to specify that the Contractor shall be responsible for providing anchor bolts. Refer to Item No. 8 in the CHANGES TO THE SPECIFICATIONS section of this addendum.

11. **Question: Section 44 42 56.02 - 1.07.A.2 – Please revise language. Pumps are not designed for operation against closed valve. Valve must open to limit discharge pressure to AOR range for pump within 1 minute of starting.**
    Response: Paragraph 1.07.A.2 has been updated to indicate that pumps shall operate against a partially closed valve. Refer to Item No. 8 in the CHANGES TO THE SPECIFICATIONS section of this addendum.

12. **Question: Section 44 42 56.02 - 1.07.A.4 – Please confirm that 125 psi is the maximum pressure expected in backflow condition.**
    Response: The check valve upstream of the pump control valve will not allow the pump to experience a backflow condition. References to backflow have been removed. Refer to Item No. 8 in the CHANGES TO THE SPECIFICATIONS section of this addendum.

13. **Question: Section 44 42 56.02 - 1.07.B.2 – Please confirm that max shutoff head is the maximum allowed, not a target for valve operation. Pre-approved PZ 930 selection has SOH value of 175' – please confirm this is still acceptable.**
    Response: Yes, maximum shutoff head listed in Pumping Conditions table is the maximum shutoff head allowed. A shutoff head of 175' is acceptable for the PZ 930 pumps, given the maximum allowable shutoff head specified for these pumps is 225'.

14. **Question: Section 44 42 56.02 - 1.07.B.2 – Please revise PZ 930 minimum operating head (specified at 60' TDH). This is not realistic per the PZ 930 system curve in Attachment 'C'. System curve implies minimum operating head of 67-68' TDH.**
    Response: Minimum operating head for PZ 930 pumps has been increased to 65' TDH. Refer to Item No. 8 in the CHANGES TO THE SPECIFICATIONS section of this addendum.

15. **Question: Section 44 42 56.02 - 1.07.B.2 – Please add row confirming minimum NPSHA expected for both PZ 930 and PZ 1060 applications.**
Response: NPSHA information has been added to Paragraph 1.07.B.2. Refer to Item No. 8 in the CHANGES TO THE SPECIFICATIONS section of this addendum.

16. **Question: Section 44 42 56.02 - 1.07.B.3 – Please revise minimum pump discharge diameter for PZ 930 application to 20" in order to match column diameter and other references throughout specification.**
Response: No changes are to be made to the minimum pump discharge diameter specifications.

17. **Question: Section 44 42 56.02 - 1.08.C – Please add "or 30 months after delivery, whichever occurs first" to warranty requirement.**
Response: No changes are to be made to Section 44 42 56.02, Paragraph 1.08.C.

18. **Question: Section 44 42 56.02 - 2.01.F.1 – Discharge of pumps will be tapped for gauge connection, but flow instrumentation should not be mounted in this area.**
Response: Requirement for flow switch connection at discharge head has been removed. Refer to Item No. 8 in the CHANGES TO THE SPECIFICATIONS section of this addendum.

19. **Question: Section 44 42 56.02 - 2.01.G – Remove this section, as it describes externally lubricated VTPs. These pumps are product lubricated and do not require enclosing tubes or tension tube assembly. Recommend revising this section to describe stuffing box/seal housing requirements, along with specification of either packing or mechanical split/cartridge seal.**
Response: Shaft seal requirements specified in Paragraph 2.01.G have been updated. Refer to Item No. 8 in the CHANGES TO THE SPECIFICATIONS section of this addendum.

20. **Question: Section 44 42 56.02 - 2.01.K.2 – Please remove 'turning vane' requirement from pump can description. Manufacturer should provide flow straightening vane from suction flange up to the inlet of pump can. Vertical flow vanes in barrel should be provided per HI and manufacturer recommendations.**
Response: No changes are to be made to Section 44 42 56.02, Paragraph 2.01.K.2.

21. **Question: Section 44 42 56.02 - 2.05.A –**
    1. **Remove shaft sleeve from required spare parts, or specify shaft sleeve through stuffing box area (if pumps will utilize packing instead of mechanical seals)**
    2. **Clarify (1) set of impeller AND bowl wear rings, per pump size**
    3. **Clarify if (1) set of bowl bearings, or also if (1) set of line-shaft/stuffing box bearings are also required.**
    4. **Remove pressure gauges – these are responsibility of Contractor**

    Response: Parts listed in Paragraph 2.05.A. have been updated and shall be provided either by pump manufacturer or Contractor. Contractor and manufacturer to coordinate to ensure all required spare parts are provided. Refer to Item No. 8 in the CHANGES TO THE SPECIFICATIONS section of this addendum.

22. **Question: Section 44 42 56.02 - 3.02 – Add requirements that:**
    1. **Barrels must be installed plumb within 0.015"/ft of length prior to encasement**
    2. **Top flanges must be leveled to within 0.002"/ft prior to field welding or grouting**
    3. **Top flanges must remain level within 0.002"/ft after grouting**

    Response: Pump barrel tolerance requirements have been updated in Paragraphs 2.01.K.1 and 3.02.B. Refer to Item No. 8 in the CHANGES TO THE SPECIFICATIONS section of this addendum.

23. **Question: Section 44 42 56.02 - 3.02.C – Remove this sentence. Pumps should ship fully assembled.**
Response: See response to Question No. 6 of this Addendum.

24. **Question: Section 44 42 56.02 - 3.03.A.3 – Require manufacturer to supply PIE 211 or equal RTD calibrator, which will be retained by Owner after acceptance testing.**
Response: Paragraph 3.03.A.3 has been updated to specify the manufacturer is to supply Altek RTD calibrator Model 211 or equal. Refer to Item No. 8 in the CHANGES TO THE SPECIFICATIONS section of this addendum.

25. **Question: Section 44 42 56.02 - 2.03.C – Remove requirement for testing in backspin scenario. This is not recommended. Attachments: Provide separate Attachment 'A' and 'B' documents for both PZ 930 and PZ 1060 applications in order to avoid confusion when filling out to include with Bid Submittal.**
Response: Backspin testing requirements have been removed. Regarding attachments, forms to be duplicated and modified as necessary to clearly provide pump and motor data for each size of pump and motor. Refer to Item No. 8 of the CHANGES TO THE SPECIFICATIONS section of this addendum.

26. **Question: SD-4 Detail 1 – Add flange to suction inlet. Drawing implies plain end pipe.**
Response: Detail 1/SD-4 is representative and not to scale (NTS). Pump suction inlet flanges are shown on Sheets PS-2 and PS-3.

27. **Question: SD-4 Detail 4 - Remove requirement on Detail 2 for pump manufacturer to provide anchor bolts. Anchor bolts should be responsibility of Contractor. Manufacturer will coordinate on minimum size.**
Response: Contractor shall be responsible for providing anchor bolts. Refer to Item No. 1 in the CHANGES TO THE PLANS section of this addendum.

28. **Question: Section 26 05 50 - 1.06.C – Remove this sentence. All motors should be new.**
Response: The referenced sentence is to remain in the Specifications. Motors manufactured more than twenty-four (24) months prior to the date of this Contract will not be accepted.

29. **Question: Section 26 05 50 - 2.04 – Confirm that random wound is acceptable. Confirm requirements for rotor bar construction (aluminum or copper) for PZ 930 and PZ 1060.**
Response: Random wound motors are acceptable. Rotor bar construction shall be copper. Refer to Item No. 4 in the CHANGES TO THE SPECIFICATIONS section of this addendum.

30. **Question: Section 26 05 50 - 2.04.N.2 – On previous projects, SAWS has revised 120-ohm nickel RTDs and changed to 100-ohm platinum RTDs as this is their standard. Please confirm if 120-ohm nickel RTDs are what SAWS wants for the PZ 930 and PZ 1060 motors.**
Response: Nickel, 120-ohm RTDs will be changed to platinum, 100-ohm RTDs. Refer to Item No. 5 in the CHANGES TO THE SPECIFICATIONS section of this addendum.

31. **Question: Section 26 05 50 - 2.04.P/Q – No vibration sensors are shown on PZ 930 or PZ 1060 plan drawings and are not included based on current iteration of project specifications.**
Response: Correct, vibration sensors are not required.

32. **Question: Section 26 05 50 - 2.05 – Recommend adding Complete motor testing requirement for PZ 930 and PZ 1060 motors prior to use in pump bowl witness performance testing.**
Response: Test procedures for motors, 600 volts and below shall be performed as currently specified in Section 26 05 50.

33. **Question: Section 26 05 51 - 2.03.F – Revise language. Motor manufacturers will not guarantee power factor.**
Response: Language has been revised. Refer to Item No. 7 in the CHANGES TO THE SPECIFICATIONS section of this addendum.

34. **Question: Section 26 05 51 - 3.02.C – Add requirement for pump manufacturer to provide baseline condition assessment of each well pump prior to removing existing motor. Any abnormal vibration or operating characteristics must be communicated to customer prior to replacing any equipment.**
Response: Per SC7 of the Special Conditions, the performance of the well pumps shall be tested at existing conditions and at completion of motor installation.

35. **Question: Section 26 05 51 - Please provide all O&M and technical data available on existing well pumps by addendum to help size compatible replacement motors.**
Response: O&M and technical data for the existing well pumps are not available. Photos of the motor nameplates for Well Pump No. 1 (WP-1) and Well Pump No. 2 (WP-2) are attached to this addendum. Motor name plate for Well Pump No. 3 can be accessed by the Contractor at the start of construction.

36. **Question: Section 26 05 51 - Require pump manufacturer to replace the existing 3-piece couplings.**
Response: The existing three-piece couplings will be replaced along with the existing well pump motors. Refer to Item No. 2 in the CHANGES TO THE SPECIFICATIONS section of this addendum for modifications to SC7 of the Special Conditions.

37. **Question: Section 26 05 51 - Require pump manufacturer to provide estimated above-grade reed frequency analysis on well pumps to ensure that no resonance conditions are introduced due to installing new motors with differing characteristics from old motors.**
Response: See response to Question No. 34 of this addendum.

38. **Question: Section 26 05 51 - Require pump manufacturer to provide motors with similar physical dimensions (mounting pattern, weight, RCF value, CG value) to reduce likelihood of introducing resonant vibration.**
Response: See response to Question No. 34 of this addendum.

39. **Question: Contract Drawing C-3, Key Note 4, requires Contractor to legally dispose of existing Hydrofluorosilcic Acid in Accordance with OSHA, TCEQ, and EPA Guidelines. Please provide a minimum volume for disposal that all bidders shall consider. Please also provide SDS Sheets for chemical.**
Response: Bidders to assume total capacity of existing HFA tank to be disposed. The total capacity of HFA tank is 3,000 gallons. Photo of HFA tank is attached to this addendum.

40. **Question: Contract Drawing C-3, Key Note 1, requires contractor to remove existing Chlorine Gas Building and Demolish Existing Building Foundation. Please provide Existing Drawings to determine the full extent of this work.**
Response: Record drawings of the existing chlorine gas building are not available. A photo of the interior of the existing chlorine gas building is attached to this addendum.

41. **Question: Contract Drawing C-3, Key Note 3, requires contractor to Demolish HFA Facility. Please provide Existing Drawings to determine the full extent of this work.**
Response: Record drawings of the existing HFA facility are not available. Photos of the interior of the existing fluoride building are attached to this addendum.

42. **Question: Contract Drawing CH-1 shows the Access Stair and Platform at the Brine Tank. Please confirm this shall be designed and supplied by OSHG Manufacturer.**
Response: Access stair and platform at the brine tank shall be designed and supplied by the tank manufacturer, as specified by Notes 6 and 7 on Sheet CH-2.

43. **Question: Contract Drawing CH-1 shows the Access Stair and Platform at the Sodium Hyochlorite Storage Tanks. Please confirm this should be designed and supplied by the FRP Tank Manufacturer.**
Response: Access stair and platform at the sodium hypo tanks shall be designed and supplied by the tank manufacturer, as specified by Notes 6 and 7 on Sheet CH-2.

44. **Question: Contract Drawing I-8, indicates that Pressure Gauges, PI 301A/B, 302A/B, and 303A/b are to be supplied by Division 44. Specification 44 42 56.02 Vertical Turbine Pumping Units doesn't provide any information on the Pressure Gauges to be supplied, nor does it specifically say that the pump manufacturer shall provide. Please confirm these shall be supplied by pump manufacturer, and provide details on what to provide.**
Response: Pressure gauges are specified in Section 40 73 00. Contractor and pump manufacturer are to coordinate pressure gauge responsibility.

45. **Question: Contract Drawing I-9, indicates that Pressure Gauges, PI 403A/B, 402A/B, and 401A/B are to be supplied by Division 44. Specification 44 42 56.02 Vertical Turbine Pumping Units doesn't provide any information on the Pressure Gauges to be supplied, nor does it specifically say that the pump manufacturer shall provide. Please confirm these shall be supplied by pump manufacturer, and provide details on what to provide.**
Response: Pressure gauges are specified in Section 40 73 00. Contractor and equipment manufacturer are to coordinate pressure gauge responsibility. Reference error on Sheet I-9 has been revised. See Item No. 2 in the CHANGES TO THE PLANS section of this addendum.

46. **Question: Contract Drawing I-12 shows PE/LIT 530 and PE/LIT 535 to be supplied by Division 44. However, Specification 40 70 02 Process Instrument Schedule, appears to indicate that these are to be supplied by Contractor. Please confirm these are to be supplied by Contractor and not Equipment Manufacturer.**
Response: Contractor and equipment manufacturer are to coordinate pressure gauge responsibility.

47. **Question: Contract Drawing CH-11, HFS-101 Tank Section, shows the Stainless Steel Fill Piping to be 2", per Key Note 8. However, P&ID Drawing I-14, shows the fill piping to be 3". Please confirm correct fill piping size.**
Response: Fill piping shall be 2" per Key Note 8. Call out error on Sheet I-14 has been revised. See Item No. 3 in the CHANGES TO THE PLANS section of this addendum.

48. **Question: Contract Drawing CH-11, Key Note 12 calls out the Vent Piping on the HFS Day Tank to be 6". Specification 44 42 76 confirms the size. However, the drawings scale it to be 4" CPVC piping. Please Advise.**
Response: Vent piping shall be 6" as specified by Key Note 12 and Section 44 42 76.

49. **Question: Confirm rated/maximum thrust values and operating speed for existing Well Pumps in order to properly size motors**
Response: The rated/maximum thrust information for the existing well pumps is not available. The operating speed of all three (3) motors is presumed to be 1190 rpm. However, this operating speed could only be confirmed for two (2) of the motors during design. See photos of the WP-1 and WP-2 motor nameplates attached to this addendum. Contractor is to verify the operating speed for all three (3) motors at the start of construction.

50. **Question: There are two Evaluation Criteria Form documents - one in a word file and one located within the RFCSP pdf document. Is there a preference as to which Evaluation Criteria Form should be used by respondents?**
Response: Evaluation Criteria Form documents in word and pdf format are the same documents. The Word file has been provided as a courtesy to potential Respondents to better assist them in responding and allowing them to type in the responses.

51. **Please extend the deadline for questions to after the new year. Preferably around 1/10. With the holiday subs and vendors need extra time to go through the bid documents and have an opportunity to ask.**
Response: See Addendum No. 1 for the changes in deadlines and the proposal opening date.

CHANGES TO THE SPECIFICATIONS

1. **Delete** Schedule of Manufacturers and Suppliers for Major Equipment in its entirety **and replace with** revised Schedule of Manufacturers and Suppliers for Major Equipment included in this addendum**.** Respondents shall use this version of the Schedule of Manufacturers and Suppliers for Major Equipment if submitting a proposal for this project.

2. **Special Conditions, SC7**
Delete: "Contractor to obtain the services of a Pump Specialist to furnish new motors for existing well pumps."
Replace with: "Contractor to obtain the services of a Pump Specialist to furnish new motors and three-piece couplings for existing well pumps."

3. **Section 26 05 50 NEMA Frame Induction Motors, 600 Volts and Below, Paragraph 2.04 MOTORS ½ HP AND LARGER**
Delete: "A. Motor voltage shall be 3 phase, single voltage, as shown on the Drawings, and in compliance with IEEE 841 (Mill & Chemical)."
Replace with: "A. Motor voltage shall be 3 phase, single voltage, random wound sized as shown on the Drawings, and in compliance with IEEE 841 (Mill & Chemical)."

4. **Section 26 05 50 NEMA Frame Induction Motors, 600 Volts and Below, Paragraph 2.04 MOTORS ½ HP AND LARGER**
Delete: "E. Motor rotors and assembly, shall be dynamically balanced."
Replace with: "E. Motor rotors and assembly, shall be dynamically balanced. Rotor bar construction shall be copper."

5. **Section 26 05 50 NEMA Frame Induction Motors, 600 Volts and Below, Paragraph 2.04.N Stator Temperature Detection**
Delete: "2. Where specified elsewhere or shown on the Drawings, winding temperature detectors of the resistance-type temperature detector type shall be provided for all motors 150 HP and larger. Each detector shall be of the 120-ohm nickel type. Each phase winding shall have two detectors for a total of six. Install the detectors between stator coils where the highest temperature will occur. Where motor protective relays are shown or specified, terminate and connect all six RTDs. Where other protective devices are shown or used, terminate the number of pairs as shown on the Drawings or specified."
Replace with: "2. Where specified elsewhere or shown on the Drawings, winding temperature detectors of the resistance-type temperature detector type shall be provided for all motors 150 HP and larger. Each detector shall be of the 100-ohm platinum type. Each phase winding shall have two detectors for a total of six. Install the detectors between stator coils where the highest temperature will occur. Where motor

protective relays are shown or specified, terminate and connect all six RTDs. Where other protective devices are shown or used, terminate the number of pairs as shown on the Drawings or specified."

6. **Section 26 05 50 NEMA Frame Induction Motors, 600 Volts and Below, Paragraph 2.04.O Bearing Temperature Detection**
   Delete: "1. Where specified elsewhere or shown on the Drawings, bearing temperature detectors of the resistance-type temperature detector type (RTD) shall be provided in each pump or driven equipment motor bearing for all motors 150 HP and larger. For vertical motors, provide a detector in each thrust bearing and lower radial guide bearing. Each detector shall be of the 120-ohm nickel type."
   Replace with: "1. Where specified elsewhere or shown on the Drawings, bearing temperature detectors of the resistance-type temperature detector type (RTD) shall be provided in each pump or driven equipment motor bearing for all motors 150 HP and larger. For vertical motors, provide a detector in each thrust bearing and lower radial guide bearing. Each detector shall be of the 100-ohm platinum type."

7. **Section 26 05 51 NEMA Frame Induction Motors, 600 Volts and Below, Paragraph 2.03 RATINGS**
   Delete: "F. Power Factor: Minimum Power Factor at Full Load: 12 pole, at least 0.8; 10 pole or less, greater than 0.85. The motor manufacturer shall not utilize correction capacitors to achieve this power factor.
      1. The motor manufacturer shall size the correction capacitors in conjunction with the MCC supplier to achieve a 0.95 PF at 100% load."
   Replace with: "F. Power Factor: Minimum Power Factor at Full Load: 12 pole, at least 0.8; 10 pole or less, greater than 0.85.
      1. The motor manufacturer shall size the correction capacitors in conjunction with the MCC supplier to achieve a 0.95 PF at 100% load."

8. **Delete** Section 44 42 56.02 Vertical Turbine Pumping Units in its entirety **and replace with** revised Section 44 42 56.02 Vertical Turbine Pumping Units included in this addendum.

CHANGES TO THE PLANS

1. **Drawing SD-4 Standard Details IV, Detail 2**
   Delete: "1 ½" Ø STAINLESS STEEL ANCHOR BOLTS (VERIFY) SUPPLIED BY PUMP MANUFACTURER"
   Replace with: "1 ½" Ø STAINLESS STEEL ANCHOR BOLTS (PUMP MANUFACTURER TO VERIFY) SUPPLIED BY CONTRACTOR"

2. **Drawing I-9 PZ1060 Pump Station P&ID, Pressure Gauge Division References**
   Delete: "44"
   Replace with: "40"

3. **Drawing I-14 Fluoride Storage P&ID, Fill Line Diameter Callout**
   Delete: "3"
   Replace with: "2"

END OF ADDENDUM

This Addendum is forty (40) pages in its entirety, including attachments.

Attachments:

1) Schedule of Manufacturers and Suppliers for Major Equipment
2) Section 44 42 56.02 Vertical Turbine Pumping Units
3) Photo 1 – WP-1 Motor Nameplate
4) Photo 2 – WP-2 Motor Nameplate
5) Photo 3 – Existing Hydrofluorosilicic Acid Tank
6) Photo 4 – Interior of Existing Chlorine Gas Building
7) Photo 5 – Interior of Existing Fluoride Building

Estella Cota-Treviño, P.E.
Freese and Nichols, Inc.

SCHEDULE OF MANUFACTURERS AND SUPPLIERS FOR MAJOR EQUIPMENT

The Contract Documents are based upon the equipment or products available for the manufacturers/suppliers denoted as "1", "2", "3", etc., below. Respondent must indicate in the Proposal which manufacturer/supplier the Proposal was based upon and which Proposal is intended for use for each item of equipment listed below by circling one of the listed suppliers/manufacturers. If the Respondent circles more than one listed supplier, the Respondent must use the first supplier circled (unless an alternate is approved). If the Respondent does not circle one of the listed suppliers/manufacturers for an item of equipment, the Respondent must use the first listed supplier/manufacturer for that item.

Specification Number	Equipment	Manufacturer or Supplier
26 05 51	Large Induction Motors	1. ABB 2. Nidec (US Motors) 3. TECO – Westinghouse 4. General Electric
26 13 26	Medium Voltage Metal-Clad Switchgear	1. Eaton Cutler Hammer 2. Siemens 3. Square D 4. ABB
26 18 39	Medium Voltage Motor Control Center	1. Eaton Cutler Hammer 2. Siemens 3. Square D 4. ABB
26 24 13	Low Voltage Distribution Switchboards	1. Eaton / Cutler Hammer 2. Square D 3. ABB
26 24 19	Low Voltage Motor Control Centers	1. Eaton - Cutler Hammer 2. Square D 3. ABB 4. Allen-Bradley 5. Siemens

26 33 53	Single Phase Uninterruptible Power Supply (UPS)	1. Eaton Powerware Model Ferrups. 2. American Power Conversion Smart 3. Approved Equal
28 10 00	Integrated Security Systems	Cameras: 1. Axis Communications
33 11 13.13	Steel Pipe (AWWA C200)	1. Thompson Pipe Group 2. Northwest Pipe 3. Americal SpiralWeld
40 05 61	Gate Valves	1. American-Flow Control 2. Mueller Company 3. Clow Valve Company 4. U.S. Pipe and Foundry Company
40 05 65.29	Dual Disc Check Valves	1. Crane Duo-Chek II 2. APCO Series 9000 Double-Door Check 3. Tyco-Gulf Model MB 4. Val-Matic Series 8800 5. Approved Equal
40 92 13.14	Pump Control Ball Valves	1.Henry Pratt Company 2.Val-Matic Valve & Manufacturing Corporation 3.DeZurik, Inc. 4.GA Industries, LLC 5.No Approved Equals

40 05 78	Air Release and Air Vacuum Valves	Combination Air Release and Vacuum Valves: 1. APCO Model 140C 2. Val-Matic Model 200 3. Crispin Model C Air and Vacuum Valves for Vertical Turbine Pumps: 1. APCO Series 1900 2. Val-Matic Model 100 DWS-T 3. Crispin Model DL
40 63 00	Programmable Logic Controller	1. Rockwell Automation
40 75 00	Analytical Instruments	Free Chlorine Residual Analyzer: 1. Hach Fluoride Analyzer: 1. Hach
40 92 12.14	Pump Control Ball Valves	1. Henry Pratt 2. Val-Matic Valve & Manufacturing Corporation 3. DeZurik, Inc. 4. GA Industries, LLC
46 31 11	On-Site Sodium Hypochlorite Generation System	System: 1. Process Solutions, Inc. – Microclor Hydrogen Gas Detector: 1. Analytical Technologies Inc (ATI) Model B14 with Auto Test feature, 2. Conspec CN06 with Programmer/Calibrator and Calibration Kit 3. Approved Equal

46 33 44.01	Peristaltic Chemical Metering Pumps and Auxiliaries	For Sodium Hypochlorite System: 1. Bredel/Apex by Watson-Marlow 2. ProMinent Pumps by ProMinent Fluid Controls, Inc. 3. Keco (formerly Chemtube PPB), as manufactured by Ragazzini 4. Periflo For Hydrofluorosilicic Acid System: 1. Walchem EHE, Qdos Series by Watson-Marlow 2. Pulsafeeder Pulsatron Series
46 33 66	Hydrofluorosilicic Acid System	Transfer Pump: 1. Iwaki WMD-100FY 2. Approved Equal
46 41 17	Inline Static Mixers	1. Westfall Manufacturing Company 2. Kenic 3. Mixing Equipment Co. 4. Komax Systems. 5. KoFlo Corporation 6. Approved Equal
44 42 56.02	Vertical Turbine Pumping Units	Vertical Turbine Pumps: 1. Pentair Fairbanks Nijhuis 2. Flowserve 3. Peerless 4. Floway 5. ITT Goulds Vertical Turbine Motors: 1. ABB 2. TECO-Westinghouse 3. Nidec (US Motors) 4. General Electric

SECTION 44 42 56.02

VERTICAL TURBINE PUMPING UNITS

1.00 GENERAL

1.01 WORK INCLUDED

A. Furnish labor, materials, equipment and incidentals necessary to design, manufacture, fabricate, test, and deliver a total of six vertical line shaft pumping units to be used in the Owner's High-Service Pump Station. Six total units shall be furnished for the High-Service Pump Station. Three units shall be designated HSP 1-6, HSP 2-6, and HSP 3-6 for Pressure Zone 1060 and three units shall be designated HSP 1-4, HSP 2-4, and HSP 3-4 for Pressure Zone 930. All six pumps shall be of the same pump manufacturer. All six motors shall be of the same manufacturer. The pumping units shall be installed by the Contractor.

B. Pumping units shall include, but not necessarily be limited to, bowl and impeller assembly, line shaft, shaft bearings, column, above floor discharge, motor stand, motor, pump barrels (cans) for High-Service Pump Station pumps, anchor bolts, and flow conditioning basket. Accessories shall be furnished as required for a complete functioning pumping unit in accordance with the specified performance and installation conditions.

C. The Supplier shall be the Pump Manufacturer and shall be responsible for coordinating the design, testing and installation of the pumps and motors, as well as the adequacy and compatibility of the pumps and motors. The Motor Manufacturer shall act as a subcontractor of the Pump Manufacturer. The Motor Manufacturer shall provide a representative who is capable of coordinating the design, testing, and installation of the motors.

1.02 ACCEPTABLE MANUFACTURERS

A. Pumps:

1. Pentair Fairbanks Nijhuis
2. Flowserve
3. Peerless Pump
4. Floway
5. ITT Goulds

B. Motors:

1. ABB
2. TECO-Westinghouse
3. Nidec (US Motors)
4. General Electric

1.03 QUALITY ASSURANCE

A. Experience Requirements: Pumps and motors shall be the product of manufacturers who have had at least 10 years of successful experience in the design, manufacture and application of pumping units of the type, size, and performance capabilities as specified.

B. Factory Inspection and Tests:

1. General:

   a. Equipment furnished under these specifications shall be subject to inspection during manufacture by the Owner's and Engineer's representatives who shall be afforded proper facilities for determining compliance with the Specifications.

   b. The Supplier shall include in their proposal the cost for the Owner's and Engineer's representatives' airfare from San Antonio International, rental car, hotel, meals, and other expenses in accordance with the Federal Meals & Incidental Expenses Rate for the amount of time required for the representatives to witness the factory tests of the pumps and "job motors" for a maximum of two (2) trips. Two (2) representatives shall witness the required testing. All witnessed testing shall be conducted in North America. If tests are outside North America, the Supplier shall include in their proposal all witness costs for two (2) representatives. The Supplier shall also include any witness costs incurred if a test must be re-run due to failure in meeting the specified requirements.

   c. The Contractor shall provide written notice to the Engineer of testing schedule and test procedures at least 4 weeks prior to the scheduled test date.

   d. All six pumps shall be tested with the six "job motors" at maximum speed.

2. Pumps:

   a. Pumps shall be factory tested and certified copies of test data and test curve shall be furnished to the Engineer. The efficiency, capacity, and horsepower requirements for field conditions shall be determined for not less than 10 points throughout the specified head range from shut-off to maximum specified operating capacity. Test procedures, interpretation, and conversion of data, shall conform to the latest requirements of the Test Code of the Hydraulic Institute standards, except as modified herein.

   b. During the factory performance tests, the Manufacturer shall make continuous measurements and record the maximum down-thrust and maximum up-thrust, for all conditions of its operation. Pumping unit shall be capable of withstanding all upthrust and downthrust conditions at any pump setting and/or pump operating condition, including momentary loads from start-up or shut-down.

   c. Conduct NPSHR tests in accordance with Hydraulic Institute Standards at 3% head drop conditions. Take at least four (4) points for NPSHR condition over the pump's Allowable Operating Range (A.O.R.). One point will be at each end of the A.O.R. One point will be at approximately rated point and minimum head point for continuous operation. An acceptable NPSHR test occurs if the pump required NPSH at 3% head drop is below the available NPSH.

   d. Pumps shall be tested using the "job motors" at maximum rated speed and with the complete pump bowl assembly, less the flow conditioning basket. A calibrated factory discharge head may be utilized for testing.

   e. The pump test results shall indicate that the performance of the pump from run-out head to shut-off head is similar to the pump curve submitted with the bid proposal. If the test results indicate that the pump performs substantially different from that indicated in the bid submittal, the Owner, at his option, may accept the unit at a reduced price, or may refuse to accept the unit.

f. Test results shall show no minus tolerance or margin with respect to capacity, total head or guaranteed efficiency at the specified conditions. Pumps shall have a continuous down slope in the head-capacity curve. Pumps shall be within the following plus tolerance, in accordance with HI 14.6, Grade 1U, except as modified below:

1). At rated head: 0 to +10 percent of rated capacity.

2). At rated capacity: 0 to +6 percent of rated head.

3). Pump head capacity curve must pass through both tolerance bands.

g. Following completion of factory tests, the Supplier shall furnish to the Engineer for review and approval four certified copies of all test data and test curves for each pump. Test curves shall also show calculated curves for expected performance at 100 percent speed for all pumps. The Engineer shall review test data and, upon determining that the pump meets contract requirements, authorization will be given for shipment. Shipment shall not be made without written approval of test data by the Engineer.

h. The Owner will visit the manufacturing site at the time of witness tests or prior to shipping for the purpose of inspecting and verifying the concentricity of the pump column sections as to the accurate machining of the shaft bearings and register fits of the column flanges. The Manufacturer shall make available to the Owner, the pump parts to be inspected, and such tools and facilities required to verify the alignment accuracies. It is not the intent to inspect all column sections, but at least three column sections for each pump, that are randomly selected by the Owner to verify concentricity and parallelism.

i. The Manufacturer or his representative shall make metallurgical analysis from coupons cast on the piece of each pour of metal going into the castings and shafting, and shall provide certified reports to the Owner, showing that the specified alloys are being furnished.

j. The Manufacturer shall perform a hydrostatic pressure test on the bowl assembly at 1.5 times the shut-off head or 150 psi, whichever is greater for a minimum of 30 minutes.

C. Assembly: It is anticipated that pump and motor may be shipped from separate points for assembly at the Site. All pumps can be disassembled for shipment. The Pump Manufacturer shall be responsible for coordination with the Motor Manufacturer to ensure that no undue difficulty in assembly will be occasioned when units are received at the Site. If the motor does not match properly, the defect shall be corrected to the satisfaction of the Owner. Any delays beyond the scheduled delivery time which are caused by these defects shall be subject to liquidated damages as provided for late delivery.

D. Marking: Pump and motor shall each have a standard manufacturer's nameplate securely affixed with tapping screws in a conspicuous place, showing the ratings, speed, rotation direction, serial number, model number, manufacturer, and other pertinent data. Pump Column sections and shafts shall be marked to indicate the installation sequence.

E. Service of Manufacturer's Representatives:

1. Pump Manufacturer's Representative:

a. The Pump Manufacturer shall furnish the services of a competent factory technician, who shall have had a minimum of 5 years' experience in the installation, adjustment,

and operation of the equipment which is being furnished under this Contract. This service is for the purpose of insuring proper installation and adjustment of the equipment; instructing operating personnel in proper operation, maintenance, and care of the equipment; for making operation tests of equipment and making recommendations for obtaining the most efficient use thereof.

b. The service representative shall be at the Site at any time the Contractor is assembling, setting, aligning, connecting or adjusting and testing the pump and motor assembly. He shall direct and assist the Contractor in the installation and certify in writing to the Owner that it has been properly installed and operates satisfactorily during acceptance tests.

c. The minimum time required to be on-site for 8 hours, not including travel time, is as follows:

Service	Min. Time
Pump and Motor Installation	6 days (2 trips minimum)
Pump Start-Up and Testing	6 days (2 trips minimum)
Troubleshooting	2 days (1 trips minimum)
Personnel Training	1 day (1 trip minimum)

2. Motor Manufacturer's Representative:

a. The Motor Manufacturer shall furnish the services of a competent factory technician, who shall have had a minimum of 5 years' experience in the installation, adjustment, and operation of the equipment which is being furnished under this Contract. This service is to ensure proper installation and adjustment of the motor, instruct personnel in proper operation, maintenance, and care of the equipment, for making operation tests of equipment, and recommendations for obtaining the most efficient use thereof.

b. The pump manufacturer's representative may also serve as the motor manufacturer's representative upon written notification of the motor manufacturer assigning that responsibility.

c. The service representative shall arrive at the Site after the motor installation but prior to testing and start-up. He shall verify the proper installation, alignment, wiring, lubrication, and connection of all appurtenances prior to start-up. He shall be present during testing and start-up and shall certify to the Owner in writing that the motors have been properly installed and operate satisfactorily.

d. The minimum time required to be on-site for 8 hours, not including travel time, is as follows:

Service	Min. Time
Check Motor Installation	6 days (2 trips minimum)
Pump Start-Up and Testing	6 days (1 trips minimum)
Troubleshooting	2 days (1 trips minimum)
Personnel Training	1 day (1 trip minimum)

F. Dynamic Analyses:

1. Level 1, Lateral Analysis: To determine the potential for a critical lateral frequency occurring within the normal operating speed range of the pump, and Level 1 lateral dynamic analysis shall be performed in accordance with ANSI/HI 9.6.8 Rotodynamic Pumps Guideline for Dynamics of Pumping Machinery, Table 9.6.8.4. Standard calculations using established equations shall be performed in accordance with Section 9.6.8.5.5 of the standard to calculate a value for the first transverse (lateral) critical speed of the rotor. The minimum frequency separation obtained by analysis shall be +/- 25 percent of any operating speed.

2. Level 1, Torsional Analysis: To determine the potential for a critical torsional frequency occurring within the normal operating speed range of the pump, a level 1 torsional dynamic analysis shall be performed in accordance with ANSI/HI 9.6.8 Rotodynamic Pumps Guideline for Dynamics of Pumping Machinery, Table 9.6.8.4. The angular or torsional case standard calculations shall be performed using established equations in accordance with Section 9.6.8.5.6 to calculate a value for the torsional critical speed of the pump/motor rotor system. The minimum frequency separation margin obtained by analysis shall be +/- 25 percent of any operating speed.

3. Level 1, Structural Analysis, Vertical Pump Structures: To determine the potential for a critical structural natural frequency occurring within the normal operating speed range of the pump, a Level 1 structural dynamic analysis shall be performed of the vertical pump structure in accordance with ANSI/HI 9.6.8 Rotodynamic Pumps Guideline for Dynamics of Pumping Machinery, Table 9.6.8.4. The structural reed critical frequency (RCF) calculation shall be performed in accordance with Section 9.6.8.5.7 and Appendix C. The minimum frequency separation margin obtained by analysis shall be +/- 25 percent of any operating speed.

4. Motor Reed Frequency Analysis:

   a. Prior to purchase, the expected reed critical frequency (RCF), mass, and location of the center of gravity of the motor shall be determined by the motor manufacturer and provided to the Equipment Manufacturer.

   b. The accuracy of this information shall be understood to be within +/- 10 percent of the values that would be obtained by verification methods. In the case of RCF, this would be an impact test in either of two perpendicular vertical planes when the motor is rigidly attached to a rigid foundation mass at least 10x as stiff and 10x as massive as the motor itself. The +/- 10 percent range of variance shall be used in the structural dynamic analysis, as applicable.

   c. After manufacture of the motor and before shipment, the motor RCF, mass, and center of gravity properties shall be verified at the motor manufacturer's facility. In the case of RCF, this involves an impact test in two perpendicular planes, to be denoted relative to the motor terminal box location.

   d. A report of the impact test results (as-built RCF) in both directions, the as-built mass of the motor, and the as-built center of gravity location shall be provided to the Equipment Manufacturer before shipment of the motor.

   e. If the as-built values of RCF, mass, or center of gravity location are outside of the allowed tolerances, then the motor manufacturer shall inform the Equipment Manufacturer and resolve any issues to the Equipment Manufacturer's satisfaction prior to shipment of the motor.

5. Reporting: Prepare reports of the dynamic analyses performed in accordance with ANSI/HI 9.6.8 Appendix G and submit to the Engineer.

6. Equipment Manufacturer shall advise the Contractor, Owner, and Owner's representative of the calculated resonant frequencies of the pumping unit and shall verify its accuracy when the unit is installed at the Project Site. If a resonant frequency problem exists for the installed unit, the Equipment Manufacturer shall be responsible for correcting the problem.

7. Forces and Moments Analysis:

   a. The pump manufacturer shall perform a Forces and Moments Analysis of the pump discharge head for the piping and harness arrangement shown on the Drawings to be assured that the pump discharge head is designed to properly withstand the forces and moments associated with a full speed closed valve startup, shutdown, and normal operation for this application. The discharge head shall be designed to accommodate maximum thrust conditions, with no detrimental impact to discharge head and rotating elements. Certified calculations shall be submitted to the Engineer.

   b. Equipment Manufacturer shall submit copies of all information and analysis to the Engineer.

1.04 SUBMITTALS

A. Submittals shall be in accordance with this Section, the General Requirements, Section 01 33 00 "Submittal Procedures" and shall include:

1. Shop Drawings:

   a. Drawings shall show complete physical description and performance capabilities of the pumping equipment, including, but not necessarily limited to dimensions, weights, materials, assemblies, sectional views, performance curves, power requirements and ratings, rated voltage and amperage, color charts and wiring diagrams as may be applicable.

   b. Submit general arrangement drawings for connecting parts for use to aid in future repairs and making field connections. Provide results of lateral and critical speed analysis.

   c. Submit drawings as a complete package of all equipment furnished. Partial drawings will not be reviewed, with the exception of the pump barrel drawings.

   d. Submit lab set-up sketches, test procedures, testing equipment, test equipment calibration certification, and sample calculations.

2. Operation and Maintenance Data: Manuals shall be prepared by the equipment Manufacturer per Section 01 33 04 "Operation and Maintenance Data" and shall incorporate storage and installation instructions and operation and maintenance procedures, appropriate final certified Shop Drawings, performance curves, and test data. Manuals may be Manufacturer's standard instructions, but shall be supplemented as necessary to cover any special feature not included in standard material. Submit preliminary manuals for review prior to delivery of the equipment.

3. Bid Submittal: In order to evaluate the bids, submit the following information.

   a. General: Furnish a complete description of all equipment offered under these specifications, including catalogs, cuts and pertinent engineering data. Where the

Bidder's product differs from the specified requirements and/or catalog description, each point of difference shall be clearly stated. This requirement is set forth to facilitate the review of bids and not to be construed by the Bidder as waiving any of the requirements of the Specifications.

b. Characteristic Curves: Characteristic curves for the pumps offered shall be submitted with the bid. Curves shall show the capacity, head, efficiency, required NPSH, and brake horsepower throughout the operating range of the pump from shut-off to maximum specified operating capacity. Characteristic curves shall have the capacity plotted as abscissa and the operating head, brake horsepower, efficiency and required NPSH plotted as ordinates. Torque-speed and pump inertia curves shall also be submitted. Torque-speed curves shall include curves for operating conditions with discharge valve fully open and fully closed.

c. Outline Drawings: Submit outline drawings of the pumps, motors and appurtenances, showing layout dimensions of the proposed equipment.

d. Data Sheet: Submit information requested on the Data Sheet included with the bid proposal forms.

e. Provide a list of at least three similar units in service supplied in the last 5 years and a name and telephone number for a reference for each of these installations.

4. Certified Test Reports: Submit Certified Test Reports for factory performance tests and metallurgical tests. Provide written certification that column pipe and discharge head were stress relieved prior to machining.

5. Equipment Installation Report: Submit Equipment Installation Reports from the Motor Manufacturer and Pump Manufacturer.

6. Field Testing Procedures to be submitted by an Independent Testing Agency to the Contractor for review by the Engineer/Owner, Pump, and Motor Manufacturer.

1.05 STANDARDS

A. The applicable provisions of the following standards shall apply as if written here in their entirety:

1. American Water Works Association (AWWA) Standards:

a. AWWA C210 - Liquid Epoxy Coating Systems.

b. AWWA E103 - Horizontal and Vertical Line-Shaft Pumps.

2. American National Standards Institute (ANSI).

3. American Standards for Testing and Materials (ASTM).

4. National Electrical Manufacturers Association (NEMA).

5. Test Code of the Hydraulic Institute Standards (HIS).

6. Institute of Electrical and Electronic Engineers (IEEE).

1.06 DELIVERY AND STORAGE

A. The Supplier shall be responsible for delivery of the pump, driver, and accessories, f.o.b. to the Site or to such storage site as may be designated by the Owner or Contractor, in good condition and undamaged.

B. Unloading and storage of the equipment shall be the responsibility of the Contractor who shall inspect the equipment for apparent damage. Equipment which is found to be damaged will not be accepted until properly repaired or replaced by the Supplier.

C. The pumps, motors, and accessories shall be stored indoors, and the motor space heaters shall be energized.

D. Furnish pump barrels as necessary to meet the Contractor's schedule. Contractor will be responsible for providing barrel anchor bolts.

E. Each component shall be packed in crates for long term storage and greased. The crates shall be clearly marked to indicate the appropriate pump serial number.

F. The pumping units (pumps, column, shafts, couplings, and head) may be assembled for shipment when the size allows for one unit to be shipped on one truck. The bowl assemblies (bowls, suction bell, impellers, pump shaft, and pump bearings) can be shipped assembled only if measures are taken to prevent any damage to the pump and components. Assembled pumps must be shipped with an accelerometer.

1.07 PERFORMANCE REQUIREMENTS AND SETTING

A. General:

1. Liquid to be pumped is treated groundwater water, treated with free chlorine and hydrofluorosilicic acid. The pumps for the High-Service Pump Station will pump from the proposed ground storage tank to the distribution system. The pumps at the High-Service Pump Station will pump from a closed suction barrel and be supported on the top flange of the suction barrel.

2. Pumps will be started and stopped against a partially closed pump control valve which will open and close very slowly to minimize transient pressure surges in the discharge pipeline, and the pump bowls, column and discharge shall be designed for these pressures. Control valve may be closed for up to 2 minutes with only minimal flow passing through the pump.

3. At the High-Service Pump Station, the suction barrels will be filled with water with submergence equal to the water elevation in the storage tank. The pumps shall have product lubricated shaft bearings.

4. The system curves (Figures 1 and 2) included in the Appendix show the system heads at the design conditions at which the pumps will operate, and the pumps will operate alone or in parallel with other pumps at the range of speeds specified.

5. The pumping heads tabulated below are total dynamic heads (TDH) under field conditions and are exclusive of all pump losses from suction bell to pump discharge. It is desired that the pump have its highest efficiency near the rated points, and this efficiency, as well as the pump’s efficiency at its minimum and maximum operating heads, will be used in evaluating the pumps.

B. High-Service Pump Station

1. Pump Selection - Listed below are the performance requirements for the High-Service Pump Station. HSP 1-6, HSP 2-6 and HSP 3-6 shall operate to individually pump a minimum of 6 MGD at 230 feet of head. HSP 1-4, HSP 2-4 and HSP 3-4 shall operate to individually pump a minimum of 12 MGD at 115 feet of head. The pumps must also meet the minimum flow requirements when operating by themselves. For each pump, the efficiencies at the rated heads will be averaged for the pump evaluation.

2. Pumping Conditions:

Pumping Conditions at Full Speed	HSP 1-6, HSP 2-6 & HSP 3-6	HSP 1-4, HSP 2-4 & HSP 3-4
Rated Capacity, MGD	6	12
Rated Head at Rated Flow, ft.	230	115
Maximum Shutoff Head, ft.	410	225
Maximum Operating Head, ft.	290	130
Minimum Operating Head, ft.	200	65
Maximum Rated Specific Speed	1800	1200
Minimum Overall Pump Efficiency at Rated Head, %	80	80
Maximum Rated Horsepower, HP	300	350
Net Positive Suction Head Available @ Minimum GST Water Elevation (10 feet), (ft)	55	55

3. Pumping Settings:

Pump Setting	HSP 1-6, HSP 2-6 & HSP 3-6	HSP 1-4, HSP 2-4 & HSP 3-4
Elev. of Suction Centerline	805.97'[1]	805.97'[1]
Elev. of Discharge Centerline	816.84'[1]	816.75'[1]
Elev. Operating Floor	813.89'[2]	813.89'[2]
Elev. Bottom of Suction Bowl	796.90'[1]	797.48'[1]
Elev. Bottom of Barrel (Can)	795.67'[1]	795.67'[1]
Suction Barrel Inlet Diameter (I.D.)	24"	36"
Barrel Diameter (O.D.)	30"	42"
Minimum Pump Discharge Diameter (I.D.)	14"	18"
Maximum Dimension Pump CL to Discharge Flange	16"	19"

Notes:

1. Elevations may vary based on the pumps selected. Contractor and Equipment Supplier to confirm elevations prior to manufacturing and installation of pumps, piping, and associated equipment.

2. Pump station slab (operating floor) elevation varies. Contractor to refer to project drawings.

1.08 EQUIPMENT WARRANTY

A. Supplier shall warrant the equipment furnished under this Section for a period of 2 years against defects in materials and workmanship and operational failure, as per the requirements in the General Conditions.

B. In the event of failure of any part or parts of the equipment during the first 2 years of service, provided that the equipment has been operated and maintained in accordance with good practice, the Supplier shall furnish, deliver and install a replacement for the defective part or parts at his own expense.

C. The first 2 years of service shall be interpreted as the 24-month period following the installation, adjusting and acceptance testing, and the start of actual operation of the equipment, as per the requirements in the General Conditions.

2.00 PRODUCTS

2.01 PUMPS

A. General:

1. Pumps shall be line shaft type, single or multi-stage vertical turbine pump with enclosed impellers, and above floor discharge.

2. Pumps shall be designed, manufactured, inspected and tested in accordance with the applicable requirements of AWWA E103, the Hydraulic Institute Standards and special requirements of this Section.3

3. The down-thrust load imposed on the impellers and line shaft will be carried by the upper thrust bearing of the motor, which shall be designed for the maximum load imposed. The impellers may be thrust balanced at the option of the Manufacturer to ensure the adequacy of the motor bearings to carry the load.

    a. If an up-thrust load occurs at any specified pumping condition, including pump start-up, the pumping unit shall be designed to withstand the worst case load without any damage to the unit. The Supplier shall make such measurements during the acceptance tests to determine that no damaging up-thrust condition exists, and shall be responsible for correcting such problems that may occur.

4. Pumps HSP 1-6, HSP 2-6, HSP 3-6, HSP 1-4, HSP 2-4, and HSP 3-4 at the High-Service Pump Station shall have water lubricated shaft bearings with an open line shaft.

5. Pumps shall be designed, manufactured, and installed to meet the “Acceptable Field Vibration Limits” as defined by the Hydraulic Institute.

6. The Supplier is not required to perform a pump sump physical model study, per 2018 Hydraulic Institute Standard 9.8.7.1. Engineer has incorporated pump sump physical model study considerations into pump station design.

B. Bowl Assembly:

1. Bowls:

    a. The suction bell and pump bowls shall be of cast iron, ASTM A48, Class 30, cast ductile iron, ASTM A536, or cast steel, free of blow holes, sand holes, or other detrimental defects, with smooth water passages.

b. The maximum bell/bowl diameter for HSP 1-6, HSP 2-6, and HSP 3-6 is to be 20 inches and the maximum bowl diameter for HSP 1-4, HSP 2-4, and HSP 3-4 is to be 30 inches.

c. The minimum distance between the bottom of the pump suction bell and the bottom of the barrel for HSP 1-6, HSP 2-6, and HSP 3-6 is to be 11 inches and the minimum distance between the bottom of the pump suction bell and the bottom of the barrel for HSP 1-4, HSP 2-4, and HSP 3-4 is to be 14 inches, as required for the installation of the pump flow conditioning baskets.

2. Bearings: The lower bowl shall have a suitable suction bell and a sealed permanently grease lubricated lower bearing. Bowl assembly shall have a shaft bearing above and below each impeller. Bearings shall be bronze, ASTM B505-932.

3. Wear Rings:

a. Bowls for enclosed impellers shall be fitted with renewable wear rings at the running joints between the impeller and bowl. Rings shall be securely attached or doweled to prevent rotation in their seats.

b. Wear ring material shall be nickel-aluminum-bronze, ASTM B148 UNS C958.

C. Rotating Assembly:

1. Impeller Shaft: The impeller shaft shall be stainless steel, ASTM A479 Type 410, Condition 1. Keyways in the shaft shall be provided with Type 304 stainless steel keys which shall properly space the impellers on the shaft and transfer thrust and torsion loads from impeller to shaft. Assemble using anti-seize compound on fasteners as necessary to prevent galling.

2. Impellers:

a. Impellers shall be of strong dense castings free of structural defects with uniform thickness of vanes and shrouds. They shall have smooth water passages for high efficiency and shall be statically and dynamically balanced.

b. Impellers shall be nickel-aluminum-bronze, ASTM B148 UNS C958.

3. Wear Rings:

a. Enclosed impellers shall be fitted with renewable wear rings at the running joints with the bowl. Rings shall be securely attached or doweled to prevent rotation in their seats.

b. Wear ring material shall match impeller material.

D. Line Shaft and Bearings:

1. Shaft: Line shaft and couplings shall be stainless steel, ASTM A479, Type 410 Condition 1, of size conforming to AWWA E103 and shall be furnished in interchangeable sections with lengths not greater than 5 feet. Shafts shall have butting faces, machined square to the axis of the shaft to ensure accurate alignment. The top line shaft section shall have a hardened chrome surface where it passes through the shaft seal and bushing. Assemble using anti-seize compound on fasteners to prevent galling.

2. Couplings: Shaft couplings shall be designed with a safety factor of 1-1/2 times the shaft design strength. Couplings may be threaded for shafts less than 2-1/2 inches in diameter. Couplings for shafts 2-1/2 inches and larger shall be keyed, lock type couplings to

prevent loosening from reverse torque of the shaft. All parts shall be stainless steel, and threaded parts shall be assembled using an anti-seize compound.

3. Bearings:

   a. Open line shaft bearings (HSP 1-6, HSP 2-6, HSP 3-6, HSP 1-4, HSP 2-4, and HSP 3-4) shall be bronze backed fluted rubber, Neoprene 65 shore. The rubber shall be of "low swell" material to prevent the rubber from seizing the line shaft and preventing rotation by hand. Bearings shall be lubricated with the liquid being pumped. All bearings shall be mounted securely in stainless steel 316L lined bearing retainers which are welded integrally to the pump column near each coupling. The retainer bore shall be machined concentric to the column flange aligning registers.

E. Pump Column:

1. The minimum column pipe nominal diameter shall be 14 inches for HSP 1-6, HSP 2-6, and HSP 3-6. The minimum column pipe nominal diameter shall be 20 inches for HSP 1-4, HSP 2-4, and HSP 3-4. Column pipe 24 inches in diameter and larger shall have a minimum wall thickness of 0.5-inches. Column pipe less than 24 inches in diameter shall have a minimum wall thickness of 0.375 inches. Column pipe diameter shall be such that friction loss does not exceed 5 feet per 100 feet of column pipe at the highest rated flow conditions. Column pipe shall be connected with flanged type connections using stainless steel bolts and nuts, and anti-seize compound. Maximum column pipe section length shall be 5 feet. Use anti-seize on flange faces. Column pipe shall be stress relieved with heat prior to machining of flanges and shaft retainers. The ends of each flanged section shall be faced parallel and machined accurately with a register fit, to ensure proper alignment when assembled. All flange registers shall be identical so that any section of column and shaft can be installed in any location in the column. Column pipe material shall conform to ASTM A53 or ASTM A120. Provide two lifting lugs and support brackets on all column sections and bowl assemblies.

F. Discharge Head Assembly:

1. The horizontal discharge shall be located above the pump base and shall terminate with a flange end, as shown in the Drawings. Coordinate with discharge piping. Discharge shall be drilled and tapped for a 1-inch pressure gauge connection. The 90-degree elbow shall be designed to minimize turbulence and pressure drop and shall consist of at least 3 mitre sections.

2. Pump base shall be designed to support the pump and driver and shall be rectangular of the size to bear on a pump supporting structure over the pump opening, or shall be round for mounting on the flange of a suction barrel, as appropriate. Provide stainless steel flange bolts and o-ring gasket to form a water-tight seal for suction barrel mounting.

G. Shaft Seal:

1. For open line shaft pumps, provide the discharge head with a renewable bronze bushing, ASTM B271, Alloy C93200, a replaceable stainless steel shaft sleeve keyed to the shaft with an O-ring seal between the shaft and the sleeve, and a shaft seal and ASTM A48 cast iron bleed-off style packing box with split stainless steel 316L packing gland and stainless steel gland bolts. Provide 5/8-inch minimum Rains-Flow Granulated, Flowable Metallic (GFM) tin based packing material or approved equal.

H. Motor Stand:

1. A motor stand shall be provided above the pump base to support the motor and it may be an integral part of the pump base or a separate stand bolted to the pump base. Motor stand shall be provided with openings with hinged stainless steel guard screens on opposite sides, to permit access to the shaft seal, lubrication connections and shaft coupling. Top of stand shall be machined square with the pump axis and shall have a register fit with the motor base. Provide stainless steel bolts for bolting motor to motor stand.

2. Provide connections for the motor bearings cooling systems (if required). Provide pressure regulating or flow control valves. Field piping will be furnished and installed by others.

3. Provide drain connection and facilities to completely drain all packing discharge and all water which collects in the motor stand. Motor base shall be adequately sloped to drains so the water does not pond.

I. Motor Coupling: Motor-to-pump coupling for solid shaft motors shall be three-piece rigid adjustable couplings for adjusting the impeller setting. Furnish all coupling bolts, nuts, washers and keys.

J. Pump Painting:

1. Grit blast to SSPC-SP-5, white metal blast, the outside of bowl assembly, inside and outside of the pump column, and inside and outside of discharge head/motor stand prior to coating. Inside of column pipe and discharge, and outside of bowls and column which is submerged or obscured from view, shall be coated with liquid epoxy, AWWA C210, to give a minimum total dry film thickness of 10 mils. Inside of bowls shall be coated with Plasite or other approved coating. Other exposed surfaces shall be cleaned, primed, and painted with two coats of the Manufacturer's standard exterior machinery enamel. Color shall be selected and approved by the Owner. Furnish extra touch-up paint for Installation Contractor's use.

2. All coatings that come into contact with pumped water shall be suitable for potable water services as approved by the National Sanitation Foundation (NSF) 61.

3. Holiday test all coatings using high voltage spark testing at a maximum voltage of 125 volts per mil. Wet sponge holiday testing will not be acceptable.

K. Suction Barrel:

1. Barrel: Suction barrels shall be welded steel construction with a flat bottom, cylindrical walls, inlet pipe and heavy flanged top. Top flange shall support the pump and motor and shall match the pump base. Furnish top o-ring gasket and stainless steel flange bolts, nuts and washers to anchor pump base and seal the connection. O ring shall be suitable for 50-psi pressure. Provide four lifting lugs below the floor level for setting barrels. The suction barrel's design and number of components shall be sufficient for handling and installation by the Contractor so that the installed barrel is plumb to within +/- 1/8 inch and the top flange is level to within 0.002 in/ft of diameter. The suction barrel mounting flange may be shipped loose for field leveling and welding. Provide sufficient instruction to the Contractor so that the leveling and welding process is accomplished without undue trouble.

2. Dimensions: Barrels for HSP 1-6, 2-6, and 3-6 shall be 30-inch outside diameter and of the length indicated in the pump setting schedule. Barrels for HSP 1-4, 2-4, and 3-4 shall

be 42-inch outside diameter. The length of the barrel will be verified by the Supplier prior to manufacturing. The bottom and wall of the barrel shall be 0.375-inch thick. Provide a turning vane at the junction of each pump barrel suction inlet and pump barrel, as dimensioned in the project Drawings . Turning vane shall be the same material and have the same coatings as the pump barrel. Provide anchor rings on the outside of the barrel to anchor into the concrete encasement of the barrel. Provide leveling legs at the bottom the barrel. Barrels for future pumps shall be furnished with an O-ring gasketed flange cover with lifting lugs. Provide o-ring gasket and stainless steel flange bolts, nuts and washers.

3. Painting:

   a. Grit blast to SSPC-SP-5, white metal blast, the inside and outside of pump suction barrel prior to coating. The outside of the barrel shall receive a coat of rust preventative primer and interior shall be coated with liquid epoxy, AWWA C210, to produce a minimum dry film thickness of 12 mils. Furnish extra touch up paint for Contractor's use.

   b. All coatings that come into contact with pumped water shall be suitable for potable water services as approved by the National Sanitation Foundation (NSF) 61.

   c. Holiday test all coatings using high voltage spark testing at a maximum voltage of 125 volts per mil. Wet sponge holiday testing will not be acceptable.

2.02 600-VOLT AND BELOW MOTORS

A. General:

1. Refer to Section 26 05 50 "NEMA Frame Induction Motors, 600V and Below" for requirements.

2.03 SPECIAL TOOLS

A. Furnish with the equipment, one set of any special tools or devices required for the assembly, operation, and maintenance of all equipment furnished.

2.04 LUBRICANT

A. Furnish with the equipment, oil of the recommended type and grade, in sufficient quantity for initial filling and for operation during acceptance tests and installation. Advise Owner of type and available sources of lubricants. In addition, provide Owner with a sufficient quantity of lubricant for required service during the first 12 months after start-up. Pump lubrication oil shall be food grade.

2.05 SPARE PARTS

A. Furnish the recommended spare parts, properly boxed and labeled for each size and type of pump provided for the Project, as a minimum, the following:

1. One (1) complete set of line shaft bearings.
2. One (1) complete set of bowl bearings.
3. One (1) complete set of bowl wear rings.
4. One (1) complete set of impeller wear rings.
5. One (1) shaft sleeve.

6. One (1) set of pressure gauges.
7. One (1) complete set of gaskets and O-rings.
8. One (1) complete stuffing box assembly.
9. Three sets of packing for the pump stuffing box.
10. Additional spare parts shall be provided for 1 full year of operation in accordance with manufacturer's recommendation.

3.00 EXECUTION

3.01 GENERAL

A. The Manufacturer's Representative has responsibilities in the installation and field testing of the equipment as described in this Section. Installation of equipment shall be performed by the Construction Contractor who shall be required to assemble the equipment, if required, and install it in accordance with Installation, Operation and Maintenance instructions which shall be furnished by the Supplier or Manufacturer, the installation drawings for this Project and applicable Installation Instructions of the Hydraulic Institute Standards.

1. The Contractor shall furnish all labor, tools, equipment and machinery necessary to receive, inspect, unload, store, protect, and install completely, in proper operating condition, the equipment. Contractor shall protect and store the motors indoors and as recommended by the Manufacturer, keeping bearings lubricated and the motor space heaters energized during storage and until they are put into service.
2. Contractor shall also furnish such incidental items not supplied with the equipment, but which may or may not be described in the Drawings and Specifications, for complete installation, such as welding, drain lines, gaskets, flange bolts, connecting piping, wiring, conduit, ducts, mounting brackets, anchors and other appurtenances as necessary.
3. Certain items of equipment due to its size or character will be disassembled for shipping, and shall be assembled by the Contractor as it is installed. It is the Contractor's responsibility, in establishing his costs for installation, to determine the degree of disassembly that the equipment will be shipped in.

B. The Contractor shall schedule the service of the Manufacturer to assist in the assembly, installation, lubrication, adjustment, and acceptance test of the equipment.

3.02 INSTALLATION

A. Install six vertical line shaft pumping units at the High-Service Pump Station.

B. At the High-Service Pump Station, install six pump barrels to the required tolerances. Equipment Manufacturer shall inspect and determine that the pump barrel mounting flange has been installed correctly and to the recommended tolerance prior to installation of the pump. The recommended tolerance is that the discharge head connection nozzle is in alignment with the piping to within +/- 1/16-inch and that the mounting flange is level to within 0.002 in/ft of span. This determination shall be made prior to grouting with the mounting flange properly shimmed. Before placing the grout scarify the adjoining concrete and pour a non-shrink epoxy grout. After properly curing, remove the temporary wedges or shims and hand pack voids with grout. Then torque the anchor bolts to the appropriate values. A second inspection shall be made after the mounting flange has been completely

grouted in place, but prior to installation of the pump. Installation includes leveling and grouting the pump barrel.

C. Assemble the flow conditioning basket, bowl assembly, column, line shaft and discharge head and anchor to pump barrel flange.

D. Set and align motor, assemble shaft coupling and adjust impeller setting. After running the pumping unit, readjust impeller.

E. Furnish and install drain lines.

F. Install the motor lubricating oil furnished by the Supplier to the proper level.

G. Furnish and install wiring, conductors, conduits, cable trays, and connections for motor leads, control wiring, etc.

H. Conduct acceptance tests and submit an installation report as required in Paragraph 3.03.

3.03 FIELD QUALITY CONTROL

A. Acceptance Test:

1. Upon completion of installation of equipment, the Contractor will have an independent testing laboratory conduct an acceptance test to verify the satisfactory installation and operation of the equipment. The test shall be conducted in a manner approved by and in the presence of the Contractor, Engineer Owner, and Manufacturer's Representative. Equipment shall be checked for excessive noise, alignment, vibration, and lateral deflection, general performance, etc. Vibration of the unit when measured at the top motor bearing shall not exceed the "Acceptable Field Vibration Limits" of the Hydraulic Institute Standards for Centrifugal Pumps. The unit must perform in a manner acceptable to the Engineer before final acceptance will be made by the Owner. A minimum of 30 days of satisfactory operation will be required prior to final acceptance. Testing equipment shall be provided by the independent testing laboratory.

2. A field "bump" test of the installed pump and motor shall be made under the supervision of the Service Representative to confirm that the Reed Frequency is not within 25 percent of any operational exciting frequency.

3. The Motor Manufacturer shall provide a testing apparatus to check the proper installation and calibration of RTDs, prior to final acceptance. The apparatus shall be Altek RTD calibrator Model 211 or equal and shall be retained by Owner after acceptance testing.

B. Field Testing Procedures: At least 30 days prior to the tests, the independent testing laboratory will submit its test procedures for review and comment by both the Engineer/Owner and Manufacturer.

C. Test Data: The pumping units shall be operated throughout their full range of operating heads, recording pump discharge pressure, water level, flow, motor voltage and current, vibrations, noise, deflection, and motor bearing temperatures, as applicable.

D. Equipment Installation Report: The pump and motor representatives shall each submit a written report certifying the equipment is properly installed, lubricated, is in accurate alignment, is free from undue stress from connecting appurtenances, that it has been operated under all operating conditions and that it is operating satisfactorily.

3.04 PAINTING

A. Touch-up all damage of painting of the pumping unit with extra paint furnished by the manufacturer.

3.05 PRELIMINARY OPERATIONAL TEST AND SYSTEM OPERATIONAL TEST

A. The Contractor shall perform two separate preliminary operational tests over a period of not less than two 10-hour tests or one 24-hour test for each pressure zone pump station (PZ 1060 pumps and PZ 930 pumps). Data shall be recorded, such as reservoir levels, pump discharge pressure, pump speed, flow rates, vibration, and pump and motor bearing temperatures, power information, etc.

B. The Supplier shall be responsible for operating the equipment and recording and submitting the necessary data from this test. The Contractor shall assist in the performance testing.

C. The cost of power required for performing all tests will be borne by the Owner. Testing will begin only after the pipeline and reservoirs are filled to their design levels. The Contractor shall coordinate filling procedures with the Engineer.

D. After the preliminary operational test is completed, and when all pump stations and pipeline construction is complete and prior to final acceptance of the pump stations, the Contractor shall cooperate in performing an overall 30 day system operational test. The Owner will be responsible for operating the equipment and recording data during this test. The Contractor and his Suppliers will be responsible for trouble-shooting and adjustments to equipment. This 30-day system operational test is not required as part of Substantial Completion. The purpose of the test is to demonstrate or check the ability of the system to pump continuously with various pump combinations and speeds.

E. It is anticipated that the 30-day system operational testing may begin after Work is completed by others as indicated in Section 01 11 00 “Summary of Work”. However, no guarantee is made by the Engineer or Owner as to the date for starting testing. If testing cannot begin as a sole result of delays in completion of work by other contractors, the Contractor will be granted an extension of time. No additional compensation will be provided to the Contractor as a result of delays in completion due to postponement of testing.

END OF SECTION

ATTACHMENT A
PUMP DATA SHEET – VERTICAL TURBINE PUMPING UNITS

Equipment Manufacturer: _____

Submit the following data for each size of Pumping Unit:

Pumps: _____

Pump Data

1. Make and Type Design _____
2. Full Speed _____
3. Speed at Rated Head _____
5. Impeller Diameter and Material _____
6. Max. Impeller Diameter for Casing _____
7. Shutoff Head _____
8. Suction/Discharge Flange Sizes _____
9. Impeller Specific Speed _____
10. Maximum Backspin Speed _____
11. Suction Specific Speed _____
12. Maximum Brake Horsepower _____
13. NPSH Required at Rated Head _____
14. NPSH Required at Minimum Head _____
15. Wire-to-Water Efficiency at Rated Point _____
16. Wire-to-Water Efficiency at Minimum Capacity _____
17. Rotor polar moment of inertia WR^2 or equivalent WR^2, as viewed from the pump end for the driver, coupling, pump and enclosed fluid as applicable. _____

Weights (indicate dry and wet)

1. Pump _____
2. Pump and Motor Base _____
3. Motor _____
4. Complete Unit (including Base Plate) _____

Miscellaneous Information

1. Motor Factory Test Location (City, State, Country) _____
2. Pump Factory Test Location (City, State, Country) _____
3. Pump Factory Test Requires Job AFD (Yes or No)* _____

THIS FORM MUST BE RETURNED WITH YOUR BID

ATTACHMENT B
MOTOR DATA SHEET –VERTICAL TURBINE PUMPING UNITS

Submit the following data for each size of Pumping Unit:

Motor Data

Manufacturer		Motor HP	
Frame		Enclosure	
Type		RPM	
Voltage		Phase	
Starting Method		Hertz	
Shaft Size		Rotor WK2 (lb-ft2)	
Insulation Class		Duty	
Full Load Amps		No Load Amps	
Locked Rotor Amps		Locked Rotor Torque	
Locked Rotor Torque		% Breakdown Torque	
Locked Rotor KVA/HP			

NEMA Design _____

Service Factor _____

Inrush Current (% of Full Load) _____

Max Safe Stalled Time (seconds) _____

Number of Safe Starts Per Day _____

Number of Consecutive Starts _____

*Full Load Temp Rise, in Degree Celsius over 50 Celsius Ambient (at 1.0 S.F.) _____

*Service Factor Temp Rise, in Degree Celsius over 50 Celsius Ambient (at 1.15 S.F.) _____

*Limiting Temperature Rise

Resistance (at 25° C): _____

Bearings: Type/Size _____ Life _____ Lubrication: _____

Exhaust Air (CFM): _____ Exhaust Air Temp Rise (°F): ____

	Efficiency	Power Factor	Current
1.15 S.F. Load			
4/4 Load			
3/4 Load			
1/2 Load			
1/4 Load			

Vibration Alarm and Trip Set Point _____

RTD Types and Mounting _____

RTD Alarm and Trip Set Point _____

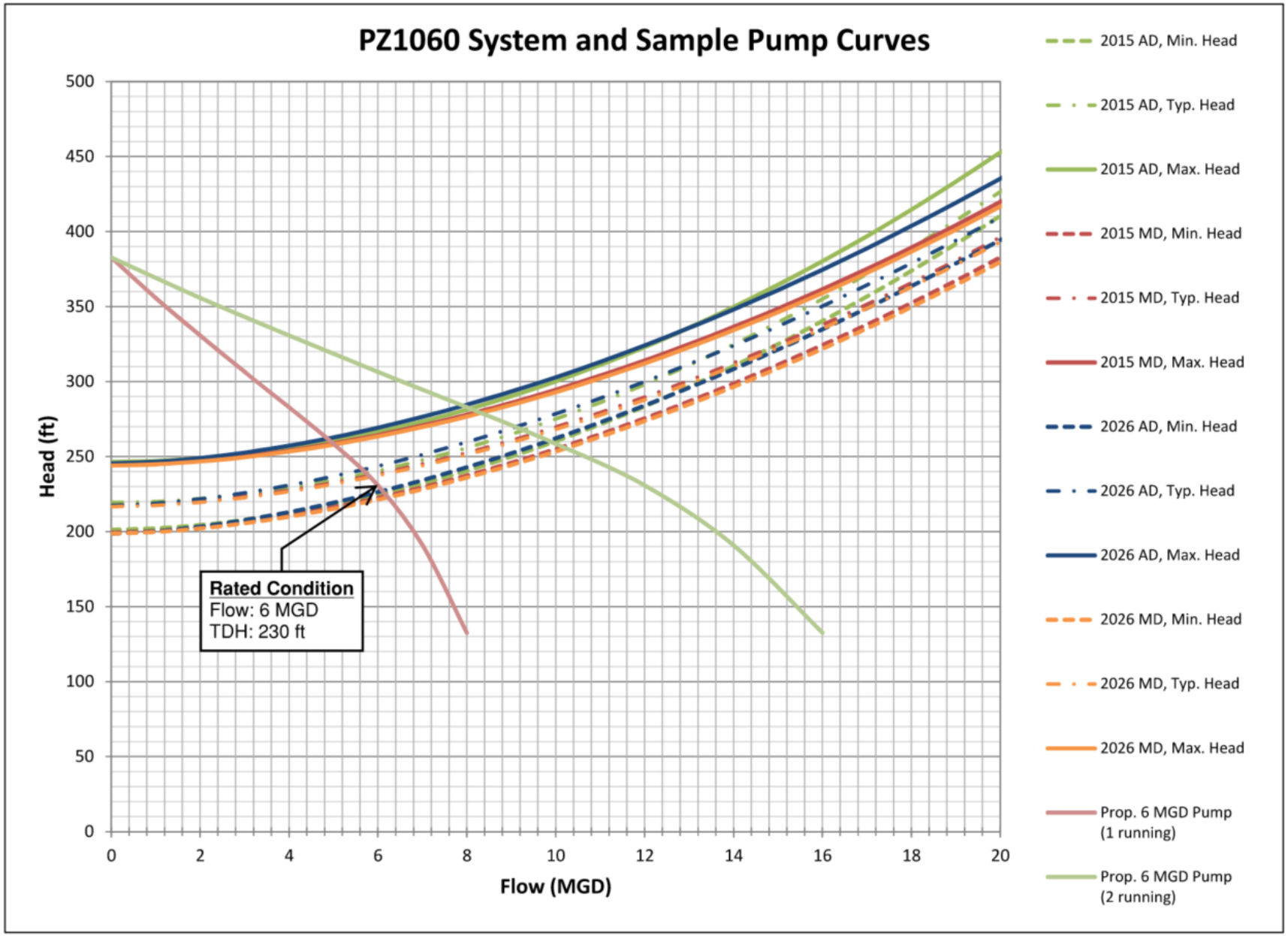
Motor Sound Power Level _____

Motor Recommended Power Factor without overexciting the motor _____

Space Heater Voltage _____ Wattage _____

THIS FORM MUST BE RETURNED WITH YOUR BID

ATTACHMENT C
SYSTEM AND PUMP CURVES


PZ1060 System and Sample Pump Curves
Head (ft)
Flow (MGD)
0
50
100
150
200
250
300
350
400
450
500
0
2
4
6
8
10
12
14
16
18
20
Rated Condition
Flow: 6 MGD
TDH: 230 ft
2015 AD, Min. Head
2015 AD, Typ. Head
2015 AD, Max. Head
2015 MD, Min. Head
2015 MD, Typ. Head
2015 MD, Max. Head
2026 AD, Min. Head
2026 AD, Typ. Head
2026 AD, Max. Head
2026 MD, Min. Head
2026 MD, Typ. Head
2026 MD, Max. Head
Prop. 6 MGD Pump (1 running)
Prop. 6 MGD Pump (2 running)

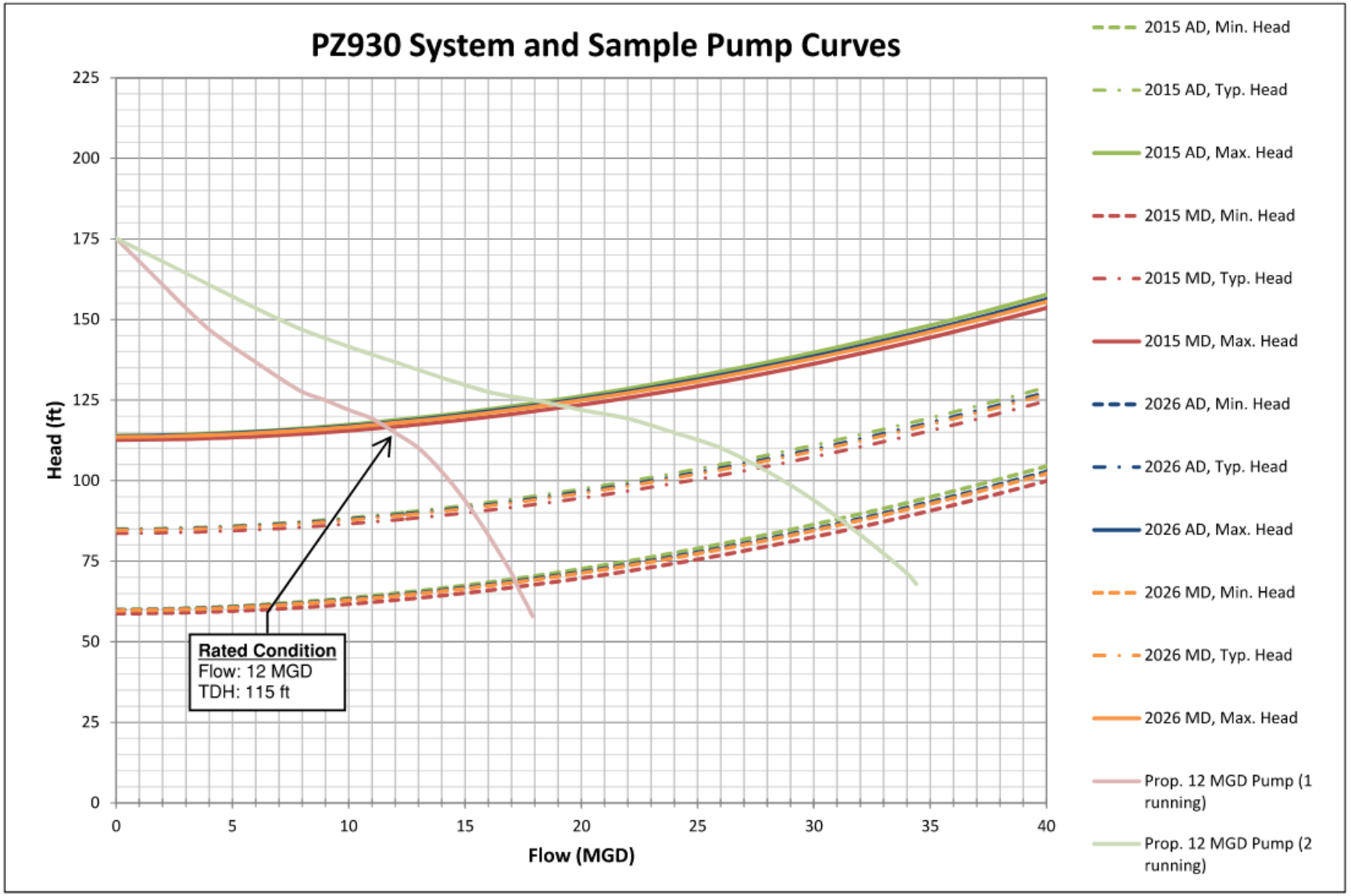

PZ930 System and Sample Pump Curves
Head (ft)
Flow (MGD)
0
25
50
75
100
125
150
175
200
225
0
5
10
15
20
25
30
35
40
Rated Condition
Flow: 12 MGD
TDH: 115 ft
2015 AD, Min. Head
2015 AD, Typ. Head
2015 AD, Max. Head
2015 MD, Min. Head
2015 MD, Typ. Head
2015 MD, Max. Head
2026 AD, Min. Head
2026 AD, Typ. Head
2026 AD, Max. Head
2026 MD, Min. Head
2026 MD, Typ. Head
2026 MD, Max. Head
Prop. 12 MGD Pump (1 running)
Prop. 12 MGD Pump (2 running)

Photo 1 - WP-1 Motor Nameplate

EVANS ENTERPRISES, INC.
SINCE 1954
www.goevans.com

ORG. BRAND & SIZE | SHAFT | OPP
REPAIR ORD# | MECHANIC | DATE

NJV806P FRAME S H21161
700 RPM 1180 PHASE 3 ~ 60
4000 VOLTS B
87 AMPS 40 SERVICE
1.15 CONT. AMBIENT 90
NEWARK, N.J. CODE

LUBRICATING INSTRUCTIONS FOR
CONTINENTAL POSITIVE FEED OIL LUBRICATED
BALL BEARING VERTICAL MOTORS

INSTALLATION

THE MOTOR MUST OPERATE ON A LEVEL BASE AND [illegible] MUST BE LEVEL. CHECK OIL SETTING BY MEASURING FROM [illegible] OF FRAME TO BOTTOM EDGE OF CAP. IF NECESSARY, ADJUST PROPER LEVEL. BOTTLE IS REMOVED FROM CAP BY TWISTING UNSCREW. USE ONLY TURBINE OIL LIGHT WITH A VISCOSITY 40-45 SSU AT 210° F. FOR ALL CLIMATES. REFILL BOTTLES AND SCREW INTO CAP UNTIL BEARINGS WILL TAKE NO MORE OIL.

CAUTION

ALLOW AT LEAST 20 MINUTES FOR OIL TO ENTER CHAMBER BEFORE STARTING THE MOTOR. UNUSUAL CONSUMPTION OF OIL INDICATES A LEAK, INVESTIGATE. CHECK OIL PIPE CONNECTIONS. ALWAYS KEEP VISIBLE SUPPLY OF OIL IN THE BOTTLE. IF MOTOR IS KEPT IDLE, OPERATE MOTOR A FEW SECONDS EVERY MONTH TO DISTRIBUTE OIL IN BEARINGS

BEARING NO.

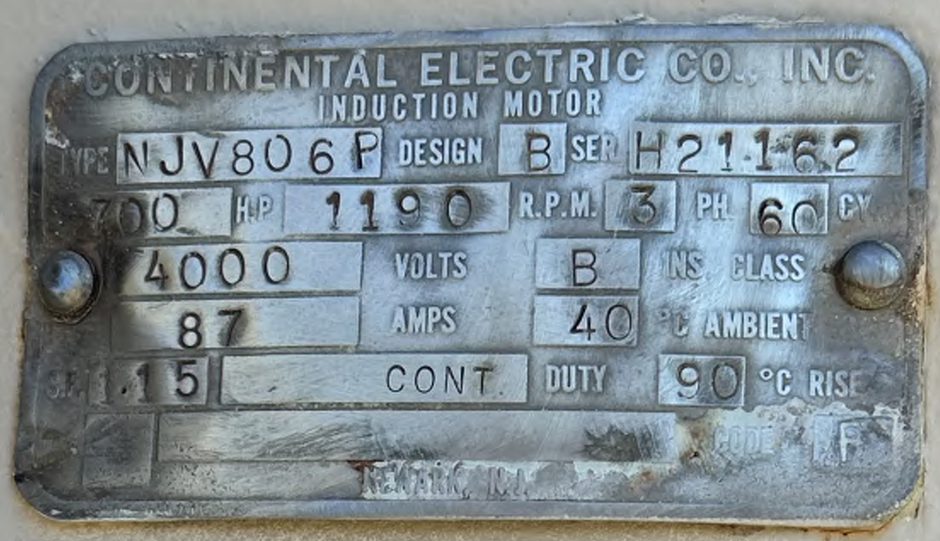
EDGE OF FRAME

3205
BEARING NO.

SERIAL NO. H21161

CONTINENTAL ELECTRIC CO., INC., NEWARK, N.J.

Photo 2 - WP-2 Motor Nameplate



WP-2

Photo 3 - Existing Hydrofluorosilicic Acid Tank

Photo 4 - Interior of Existing Chlorine Gas Building

Photo 5 - Interior of Existing Fluoride Building