



Addendum No. 1

EchoWater Project Tertiary Treatment Facilities (TTF) Project

Request for Equipment Supplier Prequalification Filter Influent Vertical Axial/Mixed Flow Pumps

SACRAMENTO REGIONAL COUNTY SANITATION DISTRICT
SACRAMENTO COUNTY, CALIFORNIA

**RECEIPT OF THIS ADDENDUM MUST BE ACKNOWLEDGED IN THE
SPACE PROVIDED ON THE REQUEST FOR PROPOSAL SUBMITTAL FORM**



December 13, 2017

Addendum No. 1 is hereby made part of the Regional San Request for Request for Equipment Supplier Prequalification Filter Influent Vertical Axial/Mixed Flow Pumps Dated November, 2017.

Addendum No. 1
to the Request for Equipment Supplier Prequalification Filter Influent
Vertical Axial/Mixed Flow Pumps
December 13, 2017

Bold indicates added or revised text and strikethroughs indicate deleted text.

Addendum Item	Section and Page or Drawing No.	Location and Description of Change
1.001	43 24 50.12	Remove existing Specification Section 43 24 50.12 (FILTER INFLUENT PUMPS) in its entirety and replace with attached Specification Section 43 24 50.12 (FILTER INFLUENT PUMPS)

Addendum No. 1 is hereby made part of the Regional San Request for Request for Equipment Supplier Prequalification Filter Influent Vertical Axial/Mixed Flow Pumps Dated November, 2017.

END OF ADDENDUM

SECTION 43 24 50.12

FILTER INFLUENT PUMPS

PART 1 -- GENERAL

1.01 GENERAL REQUIREMENTS

A. SCOPE:

1. Pump systems including vertical axial and mixed flow pumps, motors and variable frequency drives as specified and as scheduled.

- B. Tag numbers: P731002, P731005, P731003, P731006.

1.02 REFERENCES

- A. REFERENCE STANDARDS: The publications referred to hereinafter form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. The latest edition of the referenced publications in effect at the time of the bid shall govern. In case of conflict between the requirements of this section and the listed references, the requirements of this section shall prevail.

<u>Reference</u>	<u>Title</u>
AMBA 9	Load Ratings and Fatigue Life for Ball Bearings
AMBA 11	Load Ratings and Fatigue Life for Roller Bearings
ANSI S1.11	Standard Octave-Band and Fractional-Octave-and and Digital Filters
ASTM A36/A36M	Standard Specification for Carbon Structural Steel
ASTM A48/A48M	Standard Specification for Gray Iron Castings
ASTM A53	Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A120	Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated (Galvanized) Welded and Seamless for Ordinary Uses
ASTM A283	Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates
ASTM A395	Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures
ASTM A582	Standard Specification for Free-Machining Stainless Steel Bars
ASTM A743/A743M	Standard Specification for Castings, Iron-Chromium, Iron-Chromium Nickel, Corrosion Resistant, for General Application
ASTM D2240	Standard Test Method for Rubber Property – Durometer Hardness

<u>Reference</u>	<u>Title</u>
HI 9.8	Rotodynamic Pumps for Pump Intake Design
HI 14.6	Rotodynamic Pumps for Hydraulic Performance Acceptance Tests
OSHA 1910.212	General Requirements for All Machines

B. DEFINITIONS:

1. Pump head (total dynamic head, TDH), flow capacity, pump efficiency, net positive suction head available (NPSHA), and NPSH3: As defined in ANSI/HI Current Standards and as modified in the Specifications.
2. The pump head and efficiency are specified at the discharge flange and do not include the pump's internal losses. The internal pump losses from inlet bell to the discharge flange must be added and determined by the pump manufacturer.

1.03 SUBMITTALS

A. The following information shall be submitted for review in accordance with SUBMITTAL PROCEDURES Section (01 33 00):

1. Certified shop and erection drawings. Contractor shall submit electronic files of the proposed equipment in the capacity, size, and arrangement as indicated and specified.
2. A copy of the contract mechanical process, electrical and instrumentation drawings, with addenda that are applicable to the equipment specified in this section, marked to show all changes necessary for the equipment proposed for this specification section. If no changes are required, mark all drawings with "No changes required" or provide a statement that no changes are required.
 - a. Failure to include all drawings or a statement applicable to the equipment specified in this section will result in submittal return without review until a complete package is submitted.
 - b. A copy of this specification section with addenda and all referenced specification sections with addenda, with each paragraph check-marked to indicate specification compliance or marked and indexed to indicate requested deviations and clarifications from the specified requirements.
 - c. If deviations and clarifications from the specifications are indicated, therefore requested by the Contractor, provide a detailed written justification for each deviation and clarification.
 - d. Failure to include a copy of the marked-up specification sections and or the detailed justifications for any requested deviation or clarification will result in

submittal return without review until marked up specifications and justifications are submitted in a complete package.

3. Submittals:

a. Data regarding pump characteristics and performance:

- 1) Prior to fabrication and testing, provide manufacturer's guaranteed performance curves based on actual factory tests of mechanically duplicate pumps, showing they meet indicated and specified requirements for head, capacity, horsepower, efficiency and NPSH3.
- 2) Provide curve for all internal pump losses
- 3) For units of same size and type, provide curves for a single unit only.
- 4) Submit curves for manufacturer's guaranteed performance on 8-1/2-inch by 11-inch sheets, one curve per sheet
- 5) Provide catalog performance curves at maximum pump speed indicated and specified for each service showing maximum and minimum impeller diameters available, allowable operating region (AOR) and preferred operating region (POR).
- 6) Shaft power loss
- 7) Thrust bearing power loss
- 8) Characteristic curves for variable speed pumps for maximum pump speed and for speeds required to obtain minimum pump flow and head conditions specified and indicated. Identify curves by speed and provide all curves on one sheet. Provide NPSH3 curve for each speed.

b. Certified setting plans, with tolerances, for anchor bolts.

c. Manufacturer's literature as needed to supplement certified data.

d. Operating and maintenance instructions and parts lists.

e. Listing of reference installations as specified with contact names and telephone numbers.

f. Torsional analysis: Submit as specified in COMMON WORK RESULTS FOR MECHANICAL EQUIPMENT Section (46 05 10) when scheduled.

g. Resonant frequency analysis.

h. Discharge head Finite Element Analysis (FEA).

- i. Shop drawing data for accessory items.
- j. Special tools.
- k. Manufacturer's product data, specifications and color charts for shop painting.
- l. The latest ISO 9001 series certification.
- m. Pump, Motor and Variable Frequency Motor Controller Coordination Certificate Form. Sample form provided at end of section.
- n. Qualifications of field service engineer.
- o. Factory Testing
 - 1) Factory and field testing procedures, pump and piping set up, equipment to be used and ANSI/HI testing tolerances to be followed.
 - 2) Results of factory performance tests as specified.
 - a) Submit curves for manufacturer's factory performance tests on 8-1/2-inch by 11-inch sheets, one curve per sheet.
 - 3) Certified results of hydrostatic testing as specified herein.
 - 4) Certified results of dynamic balancing per manufacture standard.
 - 5) Shop inspection reports.
 - a) Material QC checks
- r. Field Testing and Inspection
 - 1) Field testing plan
 - a) Provide performance and vibration testing procedures.
 - b) Completed Pre-Testing Checklist Form. Sample form provided at end of section.
 - c) Field inspection reports
 - d) Results of field testing
 - (1) Pump system performance testing results
 - 2) Results of field vibration test data including a vibration signature for each pump and drive assembly.

1.04 OPERATION AND MAINTENANCE INSTRUCTIONS

A. Submit operation and maintenance (O&M) instructions in accordance with the OPERATION AND MAINTENANCE DATA Section (01 78 23) by submitting a copy of the OPERATION AND MAINTENANCE DATA Section (01 78 23) with each paragraph check marked to show compliance. O&M instructions shall be submitted after all submittals specified above have been returned mark “No Exceptions Taken” or “Make Corrections Noted”. O&M instructions shall reflect the approved materials and equipment.

1. Recommendations for short and long-term storage.

1.05 UNIT RESPONSIBILITY

A. A single pump manufacturer shall be responsible for furnishing the pumps, motors, variable frequency drives and for coordination of design, assembly, testing, and installation, complete and operable as specified herein. Each pump shall be produced, assembled and performance tested by the pump manufacturer at a facility owned or operated by the pump manufacturer and under the direct supervision and control of the pump manufacturer.

1.06 SYSTEM DESCRIPTION

A. Components: Pump, , motors, and drive arrangements as specified or as scheduled with shafts, columns, intermediate bearings, discharge heads, seals, couplings, base plates, guards, supports, anchor bolts, taps, lifting eyes, , and other items as required for a complete and operational system.

B. Design requirements:

1. Pump performance characteristics:

- a. As specified in the Pump Schedule.
- b. Performance tolerances shall be the same as the test tolerances specified in COMMISSIONING Section (01 91 00).
- c. Pump curve shall be continuously rising throughout the design conditions listed in the pump schedule.

2. Motor characteristics: As specified in the Pump Schedule.

C. Product requirements as specified in PRODUCT DELIVERY REQUIREMENTS Section (01 65 00) and COMMON WORK RESULTS FOR MECHANICAL EQUIPMENT Section (46 05 10).

1.07 PUMP INTAKE DESIGN

- A. Northwest Hydraulic Consultants Inc. has performed a physical hydraulic model test of the facility including drum screens, wet well and pump intake design as indicated.
- B. The physical modeling has verified that the pump intake design satisfies the acceptance criteria as specified by Hydraulic Institute Standards, ANSI/HI 9.8-2012.
- C. The pump manufacturer shall review the pump installation with particular attention to the pump suction wet well and pump intake confined wet well design.
- D. The pump suction bell outside diameters:
 - 1. Pumps P731002 and P731005: 90-inch.
 - 2. Pumps P731003 and P731006: 72-inch.
- E. Suction bells with outside diameters less than or greater than specified and indicated on the drawings, may be submitted and acceptable only if a physical hydraulic modeling test plan is submitted to the District for review and acceptance and subsequently a physical hydraulic model is conducted by the pump manufacturer to demonstrate that the pump manufacturer's proposed suction bell outside diameter and wet well and intake modifications satisfies all acceptance criteria specified by ANSI/HI 9.8-2012 for all specified pump performance requirements and conditions of service specified and indicated.
- F. Physical hydraulic model testing shall incorporate all dimensional modifications to the wet well and pump intake bay design configuration associated with the proposed pump suction bell design and performed at no additional cost to the District.
- G. Submit physical hydraulic model test reports to the District for review and acceptance.
- H. Submit all modifications associated with the wet well and intake bay design by the Contractor for review and acceptance.
- I. All work associated with any changes in bell diameters shall be at no additional cost to the District.
- J. The pump suction specific speed shall not exceed 10,900.

1.08 WARRANTY

- A. As specified in OPERATION AND MAINTENANCE DATA Section (01 78 23).

PART 2 -- PRODUCTS

2.01 MANUFACTURERS

- A. To be determined by prequalification selection.

2.02 VANED BASKETS

- A. Provide vaned baskets as indicated and as detailed. Vaned baskets will be floor mounted type.
- B. Material: Type 316L stainless steel.

2.03 SUCTION BELL

- A. Provide with flared inlet and a minimum of three (3) guide vanes.
- B. Provide inlet diameter as specified and indicated on the drawings.
 - 1. ASTM A48 Class 30 cast iron if separate from bowl assembly. If integral with bowl assembly, provide same material as specified for bowl assembly.
 - 2. Epoxy ceramic lining as specified herein.
- C. Suction Bell Bearing:
 - 1. Provide suction bell with a water-lubricated Thordon or B584-932 tin bronze bearing and a bronze sand collar of a design that has been used in similar applications for a minimum of five (5) years.

2.04 BOWL ASSEMBLY

- A. Pump Bowls: Free from blow-holes, sand holes and all other defects and faults based on pump manufacturers QC program.
 - 1. Cast stainless steel A743 CF3M.
 - a. Fabricated bowls are not acceptable.
 - b. Cast Iron bowls with stainless steel liners are not acceptable.
 - 2. Provide flanged bowls with Type 316 stainless steel hardware.
- B. Pump Shaft: ASTM A582, Type 416 Stainless Steel.
- C. Impellers:
 - 1. Type: Axial or mixed flow.

2. Material: Cast stainless steel ASTM A743 CA6MN. Fabricated impellers are not acceptable.
3. Provide the propellers secured to the shaft with a thrust collar and key arrangement.
4. Statically and dynamically balance propellers. Required balance: As specified in COMMON WORK RESULTS FOR MECHANICAL EQUIPMENT Section (46 05 10) to meet vibration criteria as specified in COMMISSIONING Section (01 91 00).

D. Discharge Diffuser:

1. Provide a flanged discharge diffuser of ASTM A48 Class 30 cast iron with a seven (7) diffuser vane arrangement.
 - a. Epoxy ceramic lining as specified herein.

2.05 COLUMN AND LINE SHAFT

A. Type: Flanged with Open Line shaft and Type 316 stainless steel bolts and nuts.

1. Size: As indicated in the Pump Schedule.

B. Material: Steel ASTM A36.

1. Provide section lengths as indicated, but no longer than 10 ft-0 inches.
2. Provide lifting lugs with lifting eyes 180 degrees apart below each column flanged connection for pump removal.
3. Epoxy ceramic lining as specified herein.
4. Provide standard wall pipe thickness in accordance with ANSI, minimum 3/8" wall thickness.

C. Line shaft and couplings: 17-4 pH stainless steel.

1. Provide the shaft diameter sized for the total axial thrust plus the weight of all rotating parts supported by it and the horsepower transmitted. The maximum combined shear stress shall not exceed 30 percent of the elastic limit in tension or be more than 18 percent of the ultimate tensile strength of the shafting material.
2. Connections: Bolted and keyed
3. Bearing Spider: ASTM A36.
4. Bearing:
 - a. Bronze backed Neoprene.

- b. Thordon XSL.
- 5. Line shaft sleeve at bearings: Type 316 stainless steel.
- D. Hardware: Type 316 stainless steel.

2.06 DISCHARGE HEAD

- A. Type: Above ground.
 - 1. Provide a discharge elbow with minimum three (3) piece mitered 90 degree bend.
 - 2. Provide size as indicated in the Pump Schedule.
- B. Material:
 - 1. ASTM A120, A53 and A283 Grade D steel.
 - a. Epoxy ceramic lining as specified herein.
 - b. Provide a minimum of four (4) supports at maximum of 90 degree spacing from baseplate to motor flange for variable speed application.
- C. Provide integral flange for bolting to column flange.
- D. Provide a sole plate of fabricated steel ASTM A36, minimum 2-in thick. Coordinate bolt size and bolt pattern with discharge head.
- E. Connection: Flanged:
- F. FEA of discharge head, soleplate and supports which shall be designed to withstand all thrust conditions imposed by the pump and driver during operation at the specified and indicated conditions and at future conditions specified and indicated.
- G. Provide neoprene gasket between top column flange and discharge head.
- H. Provide Type 316 stainless steel guard and hardware conforming to OSHA requirements.

2.07 COUPLING

- A. Provide a flanged adjustable coupling for vertical solid shaft motors.
- B. Spacer type, John Crane CPAT Style 2 or equal.

2.08 SEALS

A. Type: Split Mechanical.

1. Manufacturer:

a. Chesterton Style 442.

b. Or Equal.

B. Materials:

1. Gland: Type 316 stainless steel.

2. Rotary Holder: Type 316 stainless steel.

3. Hardware: Type 316 stainless steel.

4. Springs: Hastelloy C or Elgiloy.

5. Rotating Faces: Silicon Carbide.

6. Stationary Faces: Silicon Carbide.

7. Elastomers: Viton.

C. Restriction Bushing: Split type, glass filled Teflon.

2.09 LINING

A. Manufacturer:

1. Belzona Supermetalgilde.

2. Devcon Brushable Ceramic Blue. Type: Ceramic filled epoxy.

C. Percent Solids by Volume: 100 percent.

D. Provide two coats 8 to 15 mils (200 to 380 microns) thick with total minimum DFT of 20 mils (500 microns).

E. Cured Hardness: 90D in accordance with ASTM D2240.

F. Surface preparation, mixing and application and safety requirements shall be in accordance with the lining manufacturer's printed instructions and as specified.

G. All ferrous surfaces not specified to have a ceramic epoxy lining shall have a factory applied high solids epoxy prime and finish paint as specified in PAINTING AND COATING Section (09 90 00).

2.10 DRIVERS

- A. Horsepower:
 - 1. As scheduled.
- B. Motors: Provide motors as specified in MEDIUM VOLTAGE MOTORS Section (26 05 10), as applicable, and as specified in this Section:
 - 1. RPM: As scheduled:
 - 2. Enclosure: As scheduled.
 - 3. Electrical characteristics: As scheduled.
 - 4. Efficiency, service factor, insulation, and other motor characteristics: As specified in MEDIUM VOLTAGE MOTORS Section (26 05 10) as applicable.
 - 5. Motor accessories: As specified in MEDIUM VOLTAGE MOTORS Section (26 05 10) as applicable and in this Section.
 - 6. Coordinate motors with the variable frequency drive manufacturer to ensure compatibility between the motor and variable frequency drive.

2.11 SUPPORTS

- A. Strength: Design pump discharge head and driver (motor) supports to withstand a minimum of 1.5 times the maximum imposed operating loads or the imposed seismic loads, whichever is greater.
- B. Resonant frequency: Design discharge head and motor supports in conjunction with the pump, shafting, drivers, bearings, and other components to avoid natural resonant frequencies, either torsional, radial, or axial as specified in COMMISSIONING Section (01 91 00).
- C. Coordinate pump and drive system supports with the foundation designs as indicated on the Drawings.
- D. Anchor bolts: As specified in ANCHORAGE IN CONCRETE AND MASONRY Section (03 15 20).

2.12 SOURCE TESTING:

- A. Provide motor factory testing in accordance with ACCEPTANCE TESTING OF ELECTRICAL SYSTEMS Section (26 08 10).
- B. Pump Tests:

1. Hydrostatic testing in accordance with ANSI/HI 14.6. Test pump bowls, column and discharge head under a hydrostatic head of at least 75 psi or 150 percent of rated shutoff head, whichever is greater.
2. Provide witnessed performance tests as specified herein for all pumps.
3. Witnessed Performance testing.
 - a. Test pumps assembled with a nominal 10 feet of column.
 - b. Run pump at full speed rating point for 60 minutes prior to start of any testing.
 - c. Full speed tests:
 - 1) Test pumps at the conditions specified and indicated and take not less than seven operating points between shut-off and run out. Test points must be at the conditions specified and indicated.
 - 2) Take readings to determine flow, differential pressure, rpm, horsepower, pump and wire to water efficiency.
 - 3) Operate each pump for not less than one hour and take readings to determine that the pump will operate as specified and indicated without cavitation at the specified minimum head condition with not more than the specified NPSH available. Test with the job submergence as indicated.
4. Variable speed tests:
 - a. Conduct tests as specified above for full speed at reduced speeds except that tests for cavitation at run out are not required.
 - b. Run one speed test at speed required to discharge the minimum rating point specified and indicated with one point of test at the minimum rating point.
 - c. Run a second test at a speed approximately midway between full and minimum speed.
 - d. Run addition tests for each reduced speed operating condition specified and indicated.
5. Factory tests on pumps:
 - a. String test complete job motor, job variable frequency motor controller, discharge head, bowl and a minimum of 10 feet of column or as many sections as is practical for the manufacturer's test pit.
 - 1) For each pump size, use one job motor shipped to the pump testing facility for use in these pump tests.

- 2) Use a single job variable frequency motor controller shipped to the pump testing facility for use in these pump tests.
 - 3) Provide performance curves adjusted for any column length that is not included in the factory testing.
 - 4) At a minimum, all motors shall be at the factory to confirm all components are compatible.
6. Provide a minimum of 30 days written notice prior to factory testing.
- C. Run all tests in accordance with the latest standards of the Hydraulic Institute and as specified.
- D. Testing Acceptance Grade and Tolerances:
1. ANSI/HI 14.6 Acceptance Grade: 1U.
 2. Efficiency Tolerance: -0 percent.
 3. If pumps do not meet the tolerances specified, trim the impeller and retest until the specified results are obtained.
- E. Tests of variable frequency motor controllers specified in ACCEPTANCE TESTING OF ELECTRICAL SYSTEMS Section (26 08 10).
- F. In the event that specified tests indicate that pump, motor, or variable frequency drive will not meet specifications, District Representative has the right to require additional complete witnessed tests for all pumps, motors, and variable frequency drives at no additional cost to the District.
- G. Repeat tests until specified results are obtained.
- H. Correct or replace promptly all defects or defective equipment revealed by or noted during tests at no additional cost to the District.
- I. Provide all travel expenses including roundtrip airfare and lodging for witness performance testing for three (3) people.

2.13 SPARE PARTS

- A. Provide list of spare parts inventory in accordance with SPARE PARTS Section (01 78 43).
- B. Special tools: None, except for as required by the Contractor for installation. Special tools shall be removed from the site by the Contractor after commissioning of the equipment is completed.

- C. Spare parts: None, except for as required by the Contractor during Start-up and Commissioning.

PART 3 -- EXECUTION

3.01 GENERAL (NOT USED)

3.02 INSTALLATION

- A. Install items in accordance with shop drawings, manufacturer's printed instructions and as specified in COMMON WORK RESULTS FOR MECHANICAL EQUIPMENT Section (46 05 10).
- B. Install pumping units on a concrete pad and align thereon.
- C. Set base on metal shims placed directly under the part of the base carrying the greatest weight and spaced close enough to provide uniform support.
- D. After alignment is correct, grout using high grade non-shrink grout.
- E. Do not embed leveling nuts in grout.

3.03 TESTING

- A. Factory Acceptance Testing:
 - 1. Pumps:
 - a. Test witnessing: Factory Acceptance Tests shall be witnessed by the District Representative or District when scheduled; provide advanced notice of source testing as specified in the QUALITY CONTROL Section (01 45 00).
 - b. Pump performance test: Test level to ANSI/HI 14.6 1U Acceptance Grade; test as specified in the COMMISSIONING Section (01 91 00).
 - c. Vibration test: Test level as described in this Section; Test as specified in the COMMISSIONING Section (01 91 00).
 - d. Noise test: Test as specified in the COMMISSIONING Section (01 91 00).
 - e. Hydrostatic pressure tests: As specified for components in this Section.
 - f. Factory performance tests shall be completed using the actual pump bowls and impellers, but may use the manufacturer's test head and motor.
 - 2. Motor: Test as specified in the ACCEPTANCE TESTING OF ELECTRICAL SYSTEMS Section (26 08 10).

B. Field Testing:

1. Test piping connections to prove the pump nozzles are installed with the pipe in a free supported state and without need to apply vertical or horizontal pressure to align piping with pump nozzles. This must be performed and the piping acceptable prior to any field performance testing.
2. Field testing will not be conducted without calibration certificates for all testing equipment, gauges and flow meters and a completed and signed pretesting check list.
3. After installation of pumping equipment, and after inspection, operation, testing and adjustment have been completed by the manufacturer's field service technician, conduct running test for each pump in presence of the District's representative to determine its ability to operate within the vibration and temperature limits specified, and to deliver its rated capacity under specified conditions.
4. Test pumps on secondary effluent only. Contractor is responsible for coordinating with the District's plant operations for delivery and disposal of secondary effluent used for testing.
5. All calibrations must be within 30 days of the field testing.
6. The testing will not be started and will not be accepted until the calibrated testing equipment stated above is operational and all certifications have been submitted.
7. During tests, observe and record head, capacity, pump bearing housings and motor bearing temperature, noise and vibration and motor inputs.
 - a. Provide vibration signature test data for each pump and drive assembly.
 - 1) Limit: 50 percent of ANSI/HI allowable limits.
 - b. Bearing Temperature: Bearing temperature not to exceed 180 degrees F (82 degrees C).
 - c. Test Duration: Determined by the District's Representative but not less than three hours of continuous operation at each condition specified and indicated.
8. Run each pump for minimum four hours prior to taking temperature readings of the pumps, motors, and shafting.
9. Immediately correct or replace all defects or defective equipment revealed by or noted during tests at no additional cost to the District.
10. Repeat tests until specified results are obtained.

11. Contractor to provide all labor, piping, equipment, and test gauges for conducting tests.
 - a. Contractor shall provide calibrated test gauges for all permanently installed gauges.
12. Make all adjustments necessary to place equipment in specified working order at time of above tests.
13. Remove and replace equipment at no additional cost to the District with equipment that will meet all requirements specified and indicated if unable to demonstrate to the satisfaction of the District's Representative that equipment will perform the service specified, indicated and as submitted.

C. Pre-Operational Testing:

1. Witnessing: All field-testing shall be witnessed by the District Representative; provide advanced notice of field-testing as specified in the COMMISSIONING Section (01 91 00).
2. Pre-Commissioning: As specified in the COMMISSIONING Section (01 91 00).
3. Pump performance test: Test level to ANSI/HI 14.6 1U Acceptance Grade; Test as specified in the COMMISSIONING Section (01 91 00).
4. Vibration test: Test level as described in this Section. Test as specified in the COMMISSIONING Section (01 91 00).
5. Noise test: Test as specified in the COMMISSIONING Section (01 91 00).
6. Motor: Test as specified in the ACCEPTANCE TESTING OF ELECTRICAL SYSTEMS Section (26 08 10).

D. Operational Testing:

1. As specified in the COMMISSIONING Section (01 91 00).

3.04 TRAINING

- A. Training shall conform to TRAINING Section (01 79 10). The number of training session and hours for each craft shall conform to the requirements of TRAINING Section (01 79 10).

3.05 COMMISSIONING

- A. Manufacturer to inspect system before initial start-up and certify that system has been correctly installed and prepared for start-up as specified in COMMISSIONING Section (01 91 00) and this Section.

B. Manufacturer services:

1. Provide certificates as specified in COMMISSIONING Section (01 91 00).
2. Manufacturer's Representative onsite requirements:
 - a. Installation: 3 trips, 5 day minimum.
 - b. Functional Testing: 4 trips, 5 day minimum each.
3. Process operational period:
 - a. Manufacturer's Representative shall be onsite the first five (5) days of Reliability Acceptance Testing (RAT). Additional onsite requirements shall be based on pump performance and RAT shutdowns.

3.06 PUMP SCHEDULE

TAG NUMBERS	P-731002, P-731005	P-731003, P-731006
<u>General Characteristics:</u>		
Application	Secondary Effluent	
Service	Filter Influent Pumps	
Quantity	2	2
Torsional Analysis	Required	
Fluid Maximum Temperature , deg F	81.3	
Site Altitude, ft above MSL	16	
<u>Pump Characteristics:</u>		
Number of Stages	1	1
Impeller Type	Axial or Mixed Flow	
Line Shaft Type	Open	
Line Shaft Bearing Spacing, Feet	10	10
Line Shaft Lubrication	Product Lubricated	
Seal Type	Split Mechanical	
Column Connection Type	Flanged	
Column Size, inches	60	48
Maximum Column Section Lengths, Feet	10	
Discharge Arrangement	Above Grade, Flanged	
Discharge Size, in	60	48

TAG NUMBERS	P-731002, P-731005	P-731003, P-731006
Coupling Type	Spacer	
Speed Control	Variable Frequency Drive	
Maximum Pump rpm @ 100% Speed	450	585
Minimum Pump rpm @ 100% Speed	395	507
<u>Rated Design Point (at Maximum Revolutions per Minute):</u>		
Flow, gpm	107,000	65,600
Head, Feet	33	33
Minimum Efficiency, Percent	77	78
NPSH3, ft	36	36
<u>Required Condition 2 (at Maximum Revolutions per Minute):</u>		
Flow, gpm	115,000	70,000
Head Range, Feet	20-23	20-23
Minimum Efficiency, Percent	70	70
NPSH3, ft	44	40
<u>Required Condition 3 (at Minimum Speed):</u>		
Flow, gpm	60,000	35,000
Head, Feet	22	22
Minimum Efficiency, Percent	82	79
NPSH3, ft	28	30
<u>Driver Characteristics:</u>		
Driver Type	Electric Motor	
Drive Arrangement	Vertical Coupled	
Motor Configuration	VSS	
Non-Reverse Ratchets	No	
Driver Horsepower	1250	800
Maximum Driver rpm	400 or 450	514 or 600
Inverter Duty Rated	Yes	

TAG NUMBERS	P-731002, P-731005	P-731003, P-731006
Motor Voltage/Phases/Hertz	4160/3/60	
Enclosure Type	WPII	
Bearing Temperature Sensors	Yes	
Vibration Sensors	Yes	

****END OF SECTION****

PRE-TESTING CHECKLIST			
Project:			
Equipment/System to be Tested:			
Testing Date:			
PROCEDURE	YES	NO	REMARKS/PROBLEMS NOTED
Is there Electric Power to the site?			
Has all equipment been installed?			
Have all controls and panels been wired up?			
Have pumps and other equipment been certified and checked out physically and functionally by the service technician and Contractor prior to day of testing?			All equipment should be tested and certified by service techs prior to day of testing and checkout by the District Representative. It is in the Contractors best interest to run a test
Has the piping been pressure tested?			If the system has not been Pressure tested, then no testing shall be performed. This is a matter of safety and protection of the equipment installed at the station.
Is there water or product for testing?			
Is there a place to pump water for extended periods of time during the testing?			If there is no place to send the water, the Contractor must provide temporary recirculation piping and valves so that a performance test can be performed. This should be setup and tested prior to the day of the testing and checkout by the District Representative.
Have all functions/IO's/Alarms			This should be completed prior to the day of the check and testing by the District Representative.

PRE-TESTING CHECKLIST			
Project:			
Equipment/System to be Tested:			
Testing Date:			
PROCEDURE	YES	NO	REMARKS/PROBLEMS NOTED
been tested? Auto/Manual Modes			
Are there Motor Operated Valves? Have they been tested?			
Are there pressure gauges?			Contractor must provide calibrated gauges
Test gauges?			Use Calibrated Test Gauge, To be Furnished by the Contractor, to verify installed gauges are calibrated.
Is there a flow meter?			Provide a portable flow meter or temporary installed flow meter for testing. Meter must be calibrated.
Are there transmitters on the project?			
Are they reporting properly?			
Are there VFD's or soft starts on the Project?			
Have the settings been set?			
Have the drives been calibrated?			
Is there vibration signature testing required?			Contractor must provide all equipment required for this test.

PRE-TESTING CHECKLIST			
Project:			
Equipment/System to be Tested:			
Testing Date:			
PROCEDURE	YES	NO	REMARKS/PROBLEMS NOTED
Is all testing equipment scheduled for day of testing?			
Temperature Guns?			
Flow Meters?			
Volt/Amp/PF Meter?			
Vibration Equipment?			
Pressure Gauges?			
Strobe/Tachometers?			
Contractor's Representative			Date
Manufacturer's Field Service Technician			Date
Resident Representative			Date

PUMP, MOTOR & VFD CERTIFICATE FORM

Project Name:

Contact Number:

Client:

Pump Service and Tag Numbers:

Date:

1. Pump Specification Section Name and Number:

- a. Pump Manufacturer & Model Number:

- b. Pump Speed, rpm:

- c. Motor hp (kW):

- d. Motor Speed, rpm:

2. Motor Specification Section and Number:

- a. Motor manufacturer and Model Number:

- b. Motor Type:

- c. Full Load Speed, rpm:

- d. Motor hp (kW):

- e. Electrical Service:

- f. FLA:

- g. Service factor:

- h. Motor Enclosure:

3. VFD:

- a. Manufacturer and Model:

b. Type:

c. Amp rating:

Signing below signifies that the parties have reviewed all the data for the pumps, motors and VFD's for the service indicated and all are compatible and coordinated and will function as specified and indicated:

Pump Manufacturer _____ Date: _____

Motor Manufacturer _____ Date: _____

VFD Manufacturer _____ Date: _____

Contractor _____ Date: _____