

WEST BAY SANITARY DISTRICT



REQUEST FOR PROPOSALS

Project #1760.0

To Provide

Recycled Water Project – Sharon Heights
Design-Build (DB) Services and Short-Term Operations

Volume 3A of 3

Project Element Narratives

West Bay Sanitary District

WEST BAY SANITARY DISTRICT

RECYCLED WATER PROJECT – SHARON HEIGHTS DESIGN-BUILD (DB) SERVICES AND SHORT-TERM OPERATIONS

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Purpose of Volume 3A

The purpose of this document (Volume 3A – Project Element Narratives) is to provide descriptions of the Project Elements and associated design-build services of the Recycled Water Project – Sharon Heights. The DB Entity is responsible for providing the final design documents for the Project (sealed and signed by California professionally licensed engineers) in accordance with the Project Element Narratives and Volume 3B (Project Drawings). Where applicable, proposed modification to any of the technical approaches and design/performance criteria shall be addressed in accordance with Volume 1 (Request for Proposals), and shall only be allowed if approved by the District.

Additional information regarding the use of information and data contained in Volume 3 is located in Volume 1 (Request for Proposals).

Project Element 1: Influent Pump Station

1.1. Introduction

The purpose of this section is to stipulate the minimum requirements for the Influent Pump Station (Influent PS). Improvements generally consist of gravity inlet pipeline, manholes, gravity outlet pipeline, excavation for and installation of new wet well, installation of new valve pit, pumps, discharge piping and appurtenances, and electrical and instrumentation equipment. The DB Entity shall design the wet well and pumps to meet HI standards.

Design requirements and concept drawings have been developed for the Influent PS and are included herein. The pump station design presented herein is relatively prescriptive to provide the District with a pump station that is substantially similar to existing wastewater pump stations already in operation throughout the District. Consequently, the Influent PS requirements and concept drawings have been prepared in accordance with District pump station design standards. The DB Entity shall complete the pump station design, but not significantly deviate from the concept drawings. Furthermore, the DB Entity will be required to further coordinate the final location of pump station and pump station facilities with the City of Menlo Park.

The DB Entity shall provide a duplex sewage pumping system (2 pumps). The station shall be designed, installed and tested as required herein. The pumping system shall include quick disconnect submersible Flygt N-impeller pumps; a disconnect system which permits installation and removal of each pump without the need for personnel to enter the wet well, and electrical power and control system using bulb type liquid level sensors, and all appurtenances.

All components of the pumping system shall be UL listed and labeled for operation in Class 1, Group D, Division I location as defined in Section 501-8 of the National Electric Code.

1.2. Background

The Influent PS, located off-site from the recycled water treatment plant (RWTP) in a cul-de-sac adjacent to Sand Hill Road, is the most upstream component of the Project, and is needed to capture and convey flow from the West Bay Sanitary District sewershed to the recycled water plant. This sewershed primarily consists of flows from Portola Valley, and includes blowdown flow from the Stanford Linear Accelerator Laboratory (SLAC).

1.3. Operation

The Influent PS shall have variable frequency drives (VFD) and is anticipated to pump wastewater to the recycled water plant described in Element 3 – Recycled Water Treatment Plan. The Influent PS shall have a gravity bypass to act as an emergency overflow from the Influent PS wet well to the District's gravity collection system. The DB Entity will need to evaluate, design, and construct the Influent PS for each flow scenario to function as intended.

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The Influent PS shall be a duplex pump system designed so that a single pump can meet all operational needs while the other pump can be taken out of service.

Substantial odor is not expected be generated at the Influent PS or in the area downstream of the Influent PS. However, during the 6-month operating and training period, the District will monitor the gravity sewer downstream of the Influent PS for odors and solids accumulation. If odors and solids accumulation arise as a result of the Influent PS, the District will provide direction to the DB Entity on the frequency and duration of Influent PS turndown to flush downstream sewer.

1.4. Pump Sizing Criteria

The Influent PS shall be designed and constructed to handle all pumping conditions with one pump out of service (1 operational pump and 1 standby pump). The pumps shall be manufactured by Flygt (sole source) and equipped with VFDs. Conceptual design of the Influent PS, which is to be located on Sand Hill Road, includes identical duplex pumps. Conceptual design of the pumping system does not include raw influent pumps at the RWTP site.

1.5. Flow from Upstream Watershed

Flow from the upstream water shed is presented in Table 1.5-1, derived from flow meter data taken from mid-May to mid-June 2016. Flow monitoring data is provided in **Attachment C**.

Table 1.5-1: Average Upstream Watershed Flow Data during Metering Period

Scenario	Mon- Thurs	Friday	Saturday	Sunday
Average Dry Weather Flow	0.378	0.364	0.311	0.321
Peak Dry Weather Flow	0.692	0.721	0.576	0.531
Low Dry Weather Flow	0.082	0.066	0.071	0.071

Notes:

1. Flow data from 5/11/16 to 6/9/16.
2. Flows are instantaneous flow rates in million gallons per day (MGD).

Based on recent flow monitoring data after the flow monitoring period stated above, the average wastewater flow at Oak Avenue is between 0.30 and 0.35 MGD (208 and 243 gpm, respectively), which is less than the design pumping capacity of the Influent PS.

1.6. Pump Flow

Each pump within this duplex pump station shall be equipped with variable frequency drive (VFD) to provide flow to the RWTP at varied flow rates. At 48 Hz, a single pump shall deliver wastewater to the plant at a flow rate of 146 gpm (0.21 MGD). At 54 Hz, a single pump shall deliver wastewater to the plant at a flow rate of 382 gpm (0.55 MGD). At 60 Hz, a single pump shall deliver wastewater to the plant at a flow rate of 625 gpm (0.90 MGD).

1.7. System Curve and Hydraulic Profile

An approximate system curve with various pipeline roughness factors was developed during conceptual design and is presented as **Attachment A**. A system hydraulic profile was not developed during conceptual design. The DB Entity shall develop a system curve and system hydraulic profile as part of the final design.

1.8. Pump Efficiency

The DB Entity shall select pumps during final design. The DB Entity shall select the most efficient pumps that are appropriate for the Project's application and for the site conditions based on their design, manufacturer recommendations, and HI recommendations.

1.9. Discharge Piping Requirements

Pipeline from pumps through the valve pit shall be epoxy coated ductile iron.

1.10. Pump Requirements

Each pump shall be capable of delivering up to 625 GPM (0.90 MGD) at 60 Hz. Motors shall be designed for operation on 480 Volts, 60 hertz, 3-Phase power. The pumps shall be manufactured Flygt Corp, with Type 'N' impeller. Pumps will be controlled by variable frequency drives (VFDs).

Pump motors shall be squirrel-cage, induction, shell-type design, housed in an air-filled, watertight chamber, NEMA Design B type. The stator winding and stator leads shall be insulated with moisture resistant Class F insulation which will resist a temperature of 155 degrees C (311 degrees F). The stator shall be dipped and baked three times in Class F varnish. The motor shall be designed for continuous duty, capable of sustaining fifteen (15) evenly spaced starts per hour. The pump and motor shall be explosion-proof and shall be suitable for Class 1, Division 1, Group C and D hazardous locations.

Thermal sensors shall be used to monitor stator temperatures. The stator shall be equipped with three (3) thermal switches, embedded in the end coils of the stator winding (one switch in each stator phase). These shall be used in conjunction with and supplemental to external motor over protection and wired to the control panel.

Furnish factory connected portable cable from each motor to the motor control center. Leave 5 feet of slack cable within the control center.

The pump manufacturer shall warrant the units being supplied to the owner against defects in workmanship and material for a period of five (5) years or 10,000 hours, whichever occurs later. The warranty shall be in printed form and apply to all similar units.

The DB Entity shall provide all mechanical equipment with its proper supply of correct lubricant for starting, testing, and adjustment. All lubricants shall be as recommended by the equipment manufacturer and shall be products of the Owner's current lubricant supplier. The DB Entity shall limit the various types of lubricants by consolidating, with the equipment manufacturer's approval, into the least number of

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different types. In addition, not less than 30 days before the date shown in his construction schedule for starting, testing and adjusting equipment, the DB Entity shall provide the Owner with three copies of a list showing the proper lubricants, after consolidation, for each item of mechanical equipment and the estimated quantity of lubricant needed for a full year's operation, assuming all equipment to be operating continuously.

Cast iron pump discharge elbows shall be dry powder fusion epoxy coated. Provide pump appurtenances as follows:

- a. Lift Chain: Type 316, stainless steel. Size as recommended by pump manufacturer.
- b. Discharge Connection: As recommended by Flygt for the selected pump.
- c. Bolts and Nuts: All bolts and nuts in pump station shall be Type 316, stainless steel.
- d. Anchor Bolts: 3/4" diameter, 10" long, Type 316, stainless steel, heavy duty.
- e. Guide Bars: Two guide bars for each pump, 2 inch diameter, schedule 40, Type 316, stainless steel to match pump installed. Bars shall be one piece, continuous.
- f. Upper Guide Bar Bracket: Stainless steel, model to match cover and pump installed.
- g. Cable Holder: PVC coated, Type 316 stainless steel, supplied by pump manufacturer.
- h. Discharge Piping: Ductile Iron Discharge Piping and Fittings: AWWA C151, Class 50, flanged ductile iron, dry powder fusion bonded epoxy coated inside and outside installed per manufacturer's recommendations, 12 mil minimum thickness, typical for all discharge piping. Provide insulating gaskets where ductile iron discharge piping is in contact with dissimilar metals. Provide Type 316 stainless steel nuts and bolts.
- i. Pipe Support Beams: Type 316, stainless steel, cut to meet walls, drilled for anchor bolts and pipe clamps.
- j. Pipe Clamps: Type 316, stainless steel offset clamps, Carpenter and Patterson Fig. 179 or equal.
- k. Expansion Anchors: 3/4" Hilti Quick Bolt 11, Type 316 Stainless Steel.
- l. Flange Coupling Adaptors: Cast iron, Smith-Blair model 912, Dresser style 127, or equal, fusion bonded epoxy coated, 12 mil minimum thickness. Provide Type 316 stainless steel nuts and bolts.
- m. Pipe Supports (within Valve Vault); Pipe Supports: Shall be installed under all valves and tees in valve pits, and shall consist of an adjustable galvanized steel pipe support, Carpenter and Patterson Fig. 137 or equal set in 1 1/4' galvanized steel pipe embedded in concrete.
- n. Pump Station VFDs: Pump station VFDs shall be Eaton SVC 9000 or Allen Bradley Power Flex 755.

1.11. Power Supply and Electrical

The electrical design for the Influent PS shall be performed by a Professional Electrical Engineer who is registered with the State of California. Responsibilities of the Electrical Engineer include, but is not limited to, the design of power distribution, equipment layout, grounding, conduit and wire sizing in schedules, conduit routing, duct bank routing, motor controls, lighting, computer controls, communications, code compliance, installation details, and equipment specifications.

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A 3-phase, 480-volt, 300 amp, electrical service is anticipated for the Influent PS and is available at the intersection of Oak Avenue and Sand Hill Road. The DB Entity will be required to design all power supply and distribution improvements and coordinate improvements and service with PG&E. A single line diagram for the Influent PS based on loads for pumps for the approximate system curve is in Volume 3B. Further information regarding service with PG&E is included in **Attachment B**.

1.12. Major Electrical Equipment

Major electrical equipment shall include Influent PS Motor Control Center (MCC) and necessary PG&E facilities to serve the pump station. The MCC will include elements as shown in the drawings.

Service requirements are to be coordinated by the DB Entity with PG&E so that PG&E electric power is available when the facilities are otherwise ready for startup. PG&E system drawings are provided in **Attachment B**. DB Entity shall coordinate and construct service installation, in coordination with PG&E. The DB Entity will be responsible for securing electrical service for both the Influent PS and RWTP. The DB Entity will need to complete on-line PG&E applications for service, listing loads for PG&E to determine service size and service location. As part of this application, the DB Entity will need to produce and submit a single-line diagram to PG&E. All PG&E fees shall be paid by the DB Entity.

PG&E Engineering will produce drawings for the services. The DB Entity will have the option to install the facilities under the supervision of PG&E or have PG&E install facilities. This is to be determined and coordinated by the DB Entity.

It is anticipated that a 480volt, 3-phase, 300 amp service is needed from PG&E. PG&E, based on information provided by the DB Entity, will determine if a pad mount transformer will be needed adjacent to the MCC.

The Motor Control Center (MCC) shall be free standing front accessible, NEMA Class 1 Type B wiring as manufactured by Industrial Electric Manufacturing, General Switchgear, Cutler-Hammer/Westinghouse or Krug-Bixby-Long, Hayward. Centers shall be arranged with maximum of 6 size 1 starters in starters in vertical section. Enclosure; NEMA/gasketed innery structure and NEMA 3R outer structure.

Motor controls shall be combination “Mag Break” breaker, plug-in construction with ambient compensated overload relays in all load lines. All control center bussing shall be braced for 22,000 RMS amps asymmetrical short circuit current. Centers shall contain plug in combination molded case breakers, Type MCP. The circuit breakers/motor circuit protectors, motor starters and overload relays shall be manufactured by Cutler-Hammer/Westinghouse. The motor starter shall be Cutler-Hammer/Westinghouse model ESEA Solid State Reduced Voltage Starter with relay contacts, HOA switch and control item shown on the drawings.

Provide a 1/4” by 2” equipment ground bus full length of MCC with conductor lugs.

Provide a suitable split terminal strips of termination and interconnection of all control devices and power leads originating from starter cubicles.

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Circuit breakers shall be externally operable and interlocked with door to prevent opening when breaker or switch is closed. Breaker shall be capable of being locked in “open” position.

Provide laminated phenolic nameplates screwed on the door of each panel to identify unit controlled and control devices. Do not use abbreviations for equipment.

Provide a pilot light indication and hand-off-auto (HOA) selector switch for each starter unit. Pilot light shall light when the starter load terminals are energized.

Pilot light shall be transformer type intended for long-term usage.

Provide an hour meter for each starter and a number of start counter.

If both pumps are required after a power outage, the pumps shall be started sequentially.

Heat sensor thermostats in each pump motor shall be wired in series with the magnetic starter coil to protect the motor against excessive heat. Thermostats shall reset automatically when motor cools.

Provide space, minimum 20 inches wide by 36 inches high, for the alarm telemetry panel with hinged front door.

Design and provide all labor, materials, equipment and incidentals required for a complete grounding system for the electrical and instrumentation system as required and as stated herein.

1.13. Pump Control Requirements:

Pump control system shall be based on PLC. The PLC shall be Allen Bradley Compact Logix Programmable 1768 controllers.

Human Machine Interface (HMI) for the station shall be based on Allen Bradley PanelView Plus 6 1000 Graphic Terminals. It shall include:

- A 10.4 in. flat-panel color display with 640 x 480 resolution (minimum) and 18-bit graphics.
- Supports operator input via keypad (32 function keys), via touch screen or via keypad and touch screen.

Pump alarms shall be controlled by Flygt level control switches for high & low water alarm. An ultrasonic system shall control starting & stopping of the pumps and pump speed. Pump speeds shall be controlled by ultrasonic transmitter in the well and control panel in the motor control center in order to maintain a constant water elevation in the wet well.

Provide sequence of operation for pump motors as follows:

1. Lead pump should start when influent reaches pre-set level (lead pump On).
2. Lag pump should start when influent reaches pre-set level (lag pump On).
3. Either or both pumps should stop when Influent drops to pre-set level (Pump Off).

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4. On subsequent start, the Lead-Lag operation should alternate such that the lag-pump becomes the lead pumps and vice versa.
5. Low-Level alarm should activate when Influent reaches pre-set level (Low Alarm).
6. High-level alarm should activate when Influent reaches pre-set level (High Alarm).

Float level switches shall be direct acting float type which actuates when the longitudinal axis of the float is horizontal and deactivates when the liquid level falls 1 inch below the actuation level. The float housing shall be a chemical resistant, watertight casing of polypropylene. Each switch shall be supplied with sufficient cable to extend to the Motor Control Center. The level switches shall be Flygt ENM-10.

An alarm telemetry system will be provided by the DB Entity within the MCC. The telemetry panel is provided by Integrated Systems and Control. The contact person for providing the system is Larry DeShane, telephone no. (530) 878-9038. The telemetry panel is sole source. The telemetry panel will have discrete outputs to connect to the PLC if desired by the District at a later date, not a part of this contract. Provide the following telemetry system alarm points:

- a) Power Failure
- b) Telemetry Failure
- c) High Water Level
- d) Site Entry Alarm
- e) Low Water Level
- f) Pump #1 Malfunction
- g) Pump No1 Starts
- h) Pump No1 Run Time
- i) Pump No2 Starts
- j) Pump No2 Run Time
- k) Pump #2 Malfunction
- l) Spare

1.14. Instrumentation

DB Entity shall coordinate and implement an instrumentation labeling standard for the Influent PS that is consistent with the labeling standard used at the RWTP. Level transmitters shall be ultrasonic Siemens Hydro Ranger (6 relay), sole sourced.

1.15. Valves

Check valves shall be manufactured by Clow Corporation. Check valves shall be flanged, 150 psi working pressure, cast iron body, dry powder epoxy fusion coated inside and outside, non-slamming, horizontal swing type with outside stainless steel hinge and spring, Buna-N coated seat and seal ring manufactured.

Plug valves shall be manufactured by DeZurik. Plug valves shall be flanged, non-lubricated, eccentric type, rated 150 psi working pressure with eccentric port opening, dry powder epoxy fusion coated inside

and outside. Valve plug shall have resilient coating of Ethylene Propylene Tertolmer (EPT). Bearing surfaces at top and bottom of plug stem shall have EPT O-ring seals.

Equals will not be accepted.

1.16. Cathodic Protection

The DB Entity shall be responsible for determining the need for and designing cathodic protection for all metallic components of all pump station improvements. Soil corrosivity data for the RWTP site and the influent pump station site are included in the Geotechnical Report (BGG Engineers) included in as Attachment O. Additional testing of soils as required for cathodic protection design shall be the responsibility of the DB Entity.

1.17. Structural

All structural engineering shall be performed in accordance with this document and applicable codes, specifications, and standards, by the DB Entity's responsible structural engineer, licensed by the State of California.

A Geotechnical Report (report) has been prepared by Bagg Engineers (August 2016) and is provided as Attachment O. The report includes information pertaining to the Influent PS site. The DB Entity is responsible for reviewing the data and findings represented in this report and determining if these are sufficient to develop an independent Final Geotechnical Engineering Report (final report) and all design criteria for the project. The DB Entity shall be responsible for all interpretation of data contained in the final report, and no design recommendations made or implied in the Geotechnical Report shall be used in final design unless verified by the DB Entity's Geotechnical Engineer of Record. Additional borings, analysis and other investigations shall be made at the discretion of the DB Entity. The attached Geotechnical Report may not be used as the Final Geotechnical Report.

Project Element 2: Force Mains and Gravity Sewers

2.1. Introduction

New forcemain pipeline (forcemain) is required to convey wastewater to the Recycled Water Treatment Plant (RWTP). A gravity sewer is required to convey wasted sludge from the RWTP back into the District's gravity conveyance system (solids handling). Pipeline to convey wastewater from the Influent PS to the RWTP is anticipated to be placed in the westbound side of Sand Hill Road, between Oak Avenue and SHGCC. Waste from the treatment plant is anticipated to be conveyed in solids handling pipeline placed within the Sharon Heights Golf Course back into the District's conveyance system. Each pipe element is anticipated to be constructed by open cut construction. This section defines the minimum design criteria and construction requirements for pipeline.

2.2. Pipeline Alignment

A pipeline corridor has been established for environmental compliance. The DB Entity shall be responsible for selecting a final alignment, both horizontal and vertical, within the corridor shown on the drawings and within the constraints described below. The pipeline alignment must remain within the public right-of-way and permanent easements and generally follow the corridor alignment shown in Volume 3B. It is anticipated that the alignment will cross into SHGCC property. The DB Entity will be responsible for preparing plats, legal descriptions, and recordation of a 10' wide permanent sanitary sewer easement centered on the pipeline with the SHGCC property.

The DB Entity may propose enhancements to the alignment to reduce Project costs or improve the quality of the work. For example, a DB Entity could propose the alignment shift several feet to accommodate construction efficiencies, ease traffic control, or reduce pavement replacement costs. The District may also be open to trenchless construction provided that the overall goals of the Project are met and the City of Menlo Park is accepting of this approach.

2.3. Buried Utilities and Need to Perform Exploratory Excavations

Locations of buried utilities have not been field verified. The DB Entity shall perform its own exploratory excavations of buried utilities that will be crossed as they deem necessary for design, with sufficient lead time to incorporate into Final Design Documents and pipeline fabrication without causing revisions. These exploratory excavations (potholes) will determine the actual location, depth and dimensions of utilities shown on the Drawings or marked in the field that cross a proposed pipeline alignment.

Potholing within paved areas shall be performed using vacuum excavation equipment to ensure minimal disturbance. Excavated material shall be disposed of off-site by the DB Entity. Potholing with conventional excavation equipment is allowed outside of paved areas.

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The DB Entity shall be responsible for notifying Underground Service Alert (USA) for utility marking and shall also notify applicable utility owners in advance of potholing.

The DB Entity shall secure the required permits prior to potholing, including payment of permit fees and shall comply with the permit requirements. Right of Ways in which the DB Entity may choose to pothole are owned by the City of Menlo Park, SFPUC, and Caltrans.

The DB Entity shall provide required traffic control during potholing work in accordance with the requirements in Volume 3B – Project Drawings, and permitting agency requirements.

2.4. Geotechnical Information

A Geotechnical Report has been prepared by the District and is provided as **Attachment O**. Additional borings, analysis and other investigations shall be made at the discretion of the DB Entity for pipeline design. The attached Geotechnical Report may not be used as the Final Geotechnical Report.

2.5. Wastewater Pipeline Material

The pipeline materials requirements are described in this Section.

2.5.1. Forcemain

High density polyethylene and Polyvinyl Chloride pipe, as described below, are both acceptable materials for the forcemain.

2.5.1.1. High Density Polyethylene Pipe

High Density Polyethylene pipe and fittings shall be SDR 9 consisting of virgin high molecular weight polyethylene, specified under ASTM D3350 as having a cell classification of PE345434C. Pipe shall have a Manning “n” factor of 0.009.

Pipe shall be butt welded in accordance with ASTM D2657. The joints shall be leak-proof, thermal, butt joints. All fusing shall be done using tools recommended by the pipe supplier and approved by the District. Operators shall be certified by the pipe manufacturer. The fusing machine shall have hydraulic pressure control for fusing two pipe ends together. The ends of pipe shall be trimmed to form perpendicular faces before fusing. The heating plate on the fusing machine shall be electrically heated and thermostatically controlled and shall contain a temperature gauge for monitoring temperature. The heating plate shall be subject to periodic inspection, using a temperature stick, to assure even heating.

The tensile strength of yield of the butt fusion joints shall not be less than the pipe. A specimen of pipe cut across the butt fusion joints shall be tested in accordance with ASTM D638. Any material may be rejected for failure to meet any of the requirements of this specification. The acceptance of any deviation from these specifications shall be subject to the approval of the District.

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Joints between pipe sections shall be smooth on the inside and internal projection beads shall not be greater than 3/16 of an inch. The internal bead shall be removed during the fusing process with a tool specifically designed for that purpose.

Polyethylene pipe shall have a green stripe, or no stripe.

2.5.1.2. PVC Pipeline

PVC pipeline shall be fusible, restrained joint, or bell/spigot PVC C900 Class DR14. Piping should have restrained joints, as necessary, to withstand the operating pressure of the system. All piping shall be made from a PVC compound conforming to cell classification 12454 per ASTM D1784

2.5.2. Thrust Blocking

Thrust blocking shall be provided at all valves, bends, tees, crosses and reducers. Thrust block shall be constructed based on soils and pressure conditions. Ground against which the concrete is being placed shall be moistened (if needed) prior to placing so that it will not absorb excessive moisture from the fresh concrete. Forms where required shall be smooth and tight of sufficient strength to maintain their shape during placing of the concrete. Placing methods shall be such that the concrete will be placed in its final position without segregation. All concrete shall be rodded in place to insure smooth surfaces along form lines. Blocking shall be placed against undisturbed earth in such manner that pipe and fitting joints or valves will be accessible for repair. The relative area of thrust block required for various pressures and degrees of earth restraint are noted on the plans. Where poor soil and higher pressures are encountered, greater area of thrust block may be required.

2.5.3. Forcemain Appurtenances

Forcemain appurtenances shall be installed in locations that do not conflict with nearby property owners and allows for easy access in the future by maintenance staff. Appurtenances shall be designed and constructed in a manner that is protected from vandalism and inadvertent damage (such as being struck by an automobile or golf course equipment). Final siting of appurtenance locations is subject to District and City of Menlo Park approval.

2.5.3.1. Isolation Valves

Isolation valves are required at approximately 1,000 feet on center (O.C.) Isolation valves shall be resilient wedge gate valves conforming to the latest revision of ANSI/AWWA C509. The valves shall be suitable for a design working water pressure of at least 150 psig, with flanged or mechanical joint ends. Exposed valves shall have flanged ends, buried valves shall have mechanical joint ends. The valve body, bonnet and wedge shall be of cast iron or ductile iron and the wedge shall be fully EPDM rubber-encapsulated. The sealing rubber shall be permanently bonded to the wedge to meet ASTM D429 rubber metal bond testing. The wedge shall be symmetrical and shall seal equally well with flow in either direction. Body and bonnet wall thickness shall be equal to or greater than the minimum wall thickness as listed in Table 2 of ANSI/AWWA C509. The stem, stem nuts, glands, and bushings shall be of bronze, with the stem seal per ANSI/AWWA C509. Stems shall be sealed with three O-rings. The top two O-

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rings shall be replaceable with the valve full open and while subject to full rated working pressures. Valves shall be provided with non-rising stem and a 2-inch square operating nut.

Protective Coating: Interior and exterior body and bonnet surfaces shall be coated with fusion bonded epoxy complying with AWWA C550.

Each valve shall be permanently marked in accordance with MSS SP25 – Standard Marking Systems for Valves, Fittings, Flanges, and Unions.

Prior to shipment, each valve shall be hydrostatically tested to a pressure twice the specified working pressure.

Manufacturers shall be American Flow Control (Series 2500), Mueller Company (Series 2360), AVK (Series 25).

2.5.3.2. Air Release and Vacuum Valves

Combination air release valves are required at high points of forcemain alignment where air can be trapped.

Air release, air/vacuum, and combination air valves shall be located and sized in accordance with recommendations provided in AWWA Manual of Practice M51. Air valve sizing shall be evaluated and confirmed as part of design by the DB Entity. Air valves shall be equipped with slow-closing devices to minimize the effects of water hammer during pipeline filling.

Air valves shall be furnished with a stainless steel or polycarbonate floats, rubber seats, and brass or stainless steel internal mechanical components. Air valves shall be marked in raised letters on the outside of the body with the manufacturer's name or mark, model identification number, the valve's nominal size, and the pressure rating.

Air valves shall be rated to at least 150 psi and shall be flanged or threaded as required.

Combination air valves shall have a large venting orifice, which will allow large quantities of air to escape from the pipeline when the line is being filled. Once the pipeline is filled and under pressure, the valve shall automatically release small quantities of air which become trapped at the high points of the pipeline through a smaller auxiliary orifice. When the pipeline is being drained, these valves will allow large volumes of air to enter the pipeline to prevent excessive vacuum pressures and to facilitate the draining process.

Combination air valves shall be equipped with a controlled venting feature to facilitate slow valve closing and to prevent the valve large orifice from slamming closed.

The air release element of combination air valves shall automatically release small amounts of air that accumulate at high points along a pipeline. This automatic operation shall take place while the pipeline is in service and under pressure. Where lever mechanical elements are used, air release valves shall use a compound lever action.

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Prior to shipment, each valve shall be hydrostatically tested to a pressure twice the specified working pressure.

Manufacturers shall be DeZurik/APCO, Crispin Valve, Golden-Anderson or Val-Matic.

Locations of valves are to be coordinated with the West Bay Sanitary District, the City of Menlo Park, and/or the proper jurisdictional agency.

2.1.1.1 Pressure Testing

After backfilling, and prior to asphalt concrete pavement, pipelines shall be inspected for obstructions and shall be cleaned. All pipelines shall be cleaned using the sewer ball method or a high pressure hydroflusher. If the DB Entity elects to use the high-pressure hydroflusher, and if, in the opinion of the District, the lines are not cleaned sufficiently by hydroflushing, the DB Entity shall re-clean the lines using the sewer ball method at his own expense.

Additional costs for television inspection of the work after re-cleaning shall be borne by the DB Entity.

After completion of construction and cleaning of the forcemain pipeline and prior to asphalt concrete pavement the DB Entity shall inspect new sewer forcemain by a television camera. Any abnormalities are to be repaired at the DB Entity's expense. After completion of repairs, if any, the DB Entity shall again inspect the line by a television camera to the satisfaction of the District. The DB Entity shall pay for all costs associated with the testing and television inspection.

After cleaning and television inspection, the DB Entity shall pressure test the forcemain as described in Element 7 of this RFP.

2.5.4. Solids Handling Pipeline (Gravity Sewer)

2.5.4.1. PVC C900/C905

Gravity sewers shall be PVC pipeline and shall conform to the applicable requirements of AWWA C900 with a dimension ratio of 25 having elastomeric gasket joints with ends of pipe formed so that pipe will form a continuous line with a smooth interior surface when the pipes are laid together. Pipeline shall be designed to flow at 2ft/sec.

2.5.4.2. Manholes

Manholes and manhole frame and covers shall conform to West Bay Sanitary District Standards.

At each junction of the manhole, the DB Entity shall place a flexible joint located not more than one foot from the outside wall of the manhole. The DB Entity shall install such odd lengths as are necessary in laying the pipe to accomplish this result during the original installation.

All new and replacement manholes shall be tested in accordance with ASTM C1244-93, "Standard Test Method for Concrete Sewer Manholes by Negative Air Pressure (Vacuum) Test".

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Preparation of the manhole prior to testing shall include plugging all lift holes and temporarily plugging all pipes entering and exiting the manhole, taking care to securely brace the pipes and plugs to prevent them from being drawn into the manhole.

The test head shall be placed at the inside top of the cone section and the seal inflated in accordance with the manufacturer's recommendation. A vacuum of 10 inches of mercury shall be drawn and the vacuum pump shut off. With the valve closed, the time shall be measured for the vacuum to drop to 9 inches. The manhole shall pass if the time is greater than 60 seconds for a 48-inch diameter manhole, 75 seconds for 60-inch diameter, and 90 seconds for 72-inch diameter. If the manhole fails the initial test, necessary repairs shall be made with a non-shrink grout while the vacuum is still being drawn. Retesting shall proceed until a satisfactory test is obtained.

2.5.4.3. Pipeline Cleaning and Testing

After backfilling, and prior to asphalt concrete pavement, gravity pipelines shall be inspected for obstructions and shall be cleaned. All gravity pipelines shall be cleaned using the sewer ball method or a high pressure hydroflusher. If the DB Entity elects to use the high-pressure hydroflusher, and if, in the opinion of the District, the lines are not cleaned sufficiently by hydroflushing, the DB Entity shall re-clean the lines using the sewer ball method at his own expense.

Additional costs for television inspection of the work after re-cleaning shall be borne by the DB Entity.

After completion of construction and cleaning of the pipeline and prior to asphalt concrete pavement the DB Entity shall inspect new sewer forcemain by a television camera. Any abnormalities are to be repaired at the DB Entity's expense. After completion of repairs, if any, the DB Entity shall again inspect the line by a television camera to the satisfaction of the District. The DB Entity shall pay for all costs associated with the testing and television inspection.

2.5.5. Pipe Laying and Bedding

The DB Entity may proceed with the construction of the pipeline in either an upslope or downslope direction with pipe bells pointing in the direction of work. Each pipe length must be specifically checked for proper grade and the DB Entity must provide all requested material and labor to allow the District to verify the grade and slope of each pipe length. Each pipe length must be placed to a tolerance of $\pm 1/8$ -inch of the specified elevation.

Trenches shall be prepared and backfilled in accordance with sound bedding practices and with ASTM D2774 and D2321. All pipes shall be placed on a prepared subgrade of select material at least 4 inches deep below the barrel of the pipe. When additional material is required to stabilize a soft, wet or spongy foundation caused by the operations of the DB Entity, such material shall be provided at the DB Entity's expense. Adjustments of pipe to line and grade shall be made by scraping away or filling in and tamping approved material under the body of the pipe. No wedging or blocking to support the pipe will be permitted.

All pipes shall have minimum of four inches of bedding material below the barrel of the pipe. Bedding shall be placed and compacted as specified for initial trench backfill and shall be shaped around the barrel

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of the pipe. Bedding material shall be virgin, non-recycled, material per District Standards. The bedding shall extend up the sides of the pipe to the horizontal centerline. The size of gradation shall fall within the limits designated on the Plans. After the pipe has been properly laid and inspected, bedding material shall be placed from pipe horizontal centerline to a level not less than 12 inches over the pipe. The backfill material shall be placed in horizontal layers not exceeding eight inches in loose depth and compacted by power-operated tampers, rollers or vibratory equipment to a dry density equal to 90 percent of maximum. Each layer shall be compacted to the specified density prior to placing subsequent layers. Compaction by flooding or jetting methods will not be permitted. No further backfilling will be permitted until the District has accepted the initial backfill.

Backfill above bedding shall be virgin, non-recycled structural backfill material per District Standard Trench Detail, placed in horizontal layers not exceeding 12 inches in loose depth. Fill material shall have a moisture content such that the required degree of compaction may be obtained. Each layer shall be compacted by power-operated tampers, rollers, or other suitable equipment to a dry density equal to the surrounding material but not less than 90 percent relative compaction. Each layer shall be compacted to the specified density prior to placing subsequent layers. The 3-foot top layer of the subsequent backfill shall have a relative compaction of 95 percent. The finishing of the roadway (aggregate base and asphalt concrete) shall match the existing finishing or better and be constructed to the requirements of the jurisdiction. DB Entity shall arrange for inspection of roadway finish and provide District with written acceptance by the agencies involved.

2.5.6. Pipeline Restraint Requirements

All pipeline shall be provided with restrained joints where required to resist axial loading from static and dynamic thrust, Poisson's Effect and thermal stresses as applicable. Joint restraints shall be as required for the identified pipe materials and shall be designed in accordance with the design standards listed above

2.5.7. Recycled Water Pipeline

Recycled water pipeline shall Polyvinyl Chloride Pipe (PVC) for recycled water main shall conform to the applicable requirements of AWWA C900 with a dimension ratio of 18 having elastomeric gasket joints with ends of pipe formed so that pipe will form a continuous line with a smooth interior surface when the pipes are laid together. Pipe shall be purple in color.

Isolation valves shall be placed at tees and at locations that allow for future expansion without shutdown of the water system. Valves shall open left (counter-clock wise). All bolts shall be tightened to the manufacturer's specifications. Valves larger than 3 inches in size shall be Mueller Series A-2360, ductile iron bodies, non-rising stem with stainless steel trim, resilient seated wedge type with epoxy coating and bronze square nut top. All valves shall meet or exceed the requirements of AWWA C509. For working or static pressures above 250 psi, valves shall be as approved by the District.

The DB Entity shall provide and use proper implements, tools and facilities for the safe and proper handling and protection of the pipe, all as recommended by the manufacturer. Pipe shall be handled in such a manner as to avoid damage to the pipe material. Recycled water pipe shall be laid on a prepared virgin material bedding as recommended by the DB Entity based on soil conditions.

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Thrust blocking shall be provided at all valves, bends, tees, crosses and reducers. Ground against which the concrete is being placed shall be moistened (if needed) prior to placing so that it will not absorb excessive moisture from the fresh concrete. Forms where required shall be smooth and tight of sufficient strength to maintain their shape during placing of the concrete. Placing methods shall be such that the concrete will be placed in its final position without segregation. All concrete shall be rodded in place to insure smooth surfaces along form lines. Blocking shall be placed against undisturbed earth in such manner that pipe and fitting joints or valves will be accessible for repair. The relative area of thrust block required for various pressures and degrees of earth restraint are noted on the plans. Where poor soil and higher pressures are encountered, greater area of thrust block may be required.

Care shall be taken to keep the pipe clean at all times during the installation. Prior to testing the pipe shall be flushed so that the velocities of 5 feet per second are obtained sufficient to clean the entire length of pipe. Testing shall be performed on buried pipe after the trench has been completely backfilled. The DB Entity may, if field conditions permit, partially backfill the trench and leave the joints open for inspection and conduct an initial test. The acceptance test shall not, however, be conducted until all backfilling has been completed.

After the pipe has been laid and backfilled and final compaction has been obtained, the DB Entity shall test pressure pipe between each valve section or pipe run as described in Element 7 of this RFP.

All exposed pipe, fittings, valves and joints shall be examined during the test for seepage or other defects. Defects noted by this test shall be removed and replaced by the DB Entity with sound material. Afterwards, the test shall be repeated to the satisfaction of the District.

In addition, a leakage test shall be conducted after the pressure test has been satisfactorily completed. The duration of each leakage test shall be two hours and during the test the main shall be subjected to a pressure of 100 psi. Leakage shall not exceed that as shown in Table 3 of AWWA Standard C600-64 or not in excess of 10 gallons per day per inch diameter per mile, whichever is less.

If any test discloses leakage greater than specified, the DB Entity shall at his own expense locate and repair the defective joints until the leakage is within the specified allowance.

For final cleaning, the DB Entity shall disinfect all water mains and interconnected piping after testing and before being placed into service to ensure their bacteriological safety. Disinfection shall be accomplished under the supervision of the DB Entity by a person skilled and experienced in the operation of water systems. Following disinfection and flushing, the DB Entity will take water samples for bacteriological analysis of the water. If the specified bacteriological requirements are not satisfied, the disinfection procedure must be repeated until the requirements are met.

- 1) Mains, Services, and related material:
 - a) Standard: AWWA C651 as amended herein.
 - b) Forms of Chlorine: Sodium hypochlorite or calcium hypochlorite.
 - c) Method: Continuous-Feed.

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- 2) Chlorine Residual Testing: AWWA C651, Appendix A, DPD Drop Dilution Method, except where otherwise specified.
- 3) Bacteriological Analyses of Water: After the completion of disinfecting procedure, including the final flushing as described heretofore, the Owner's Representative will obtain water samples from this system for bacteriological analyses. Requirements for satisfactory disinfection of water supply are that bacteriological analyses (Heterotrophic plate count) indicate that water samples are negative for coliformnerogenes organisms, and that total plate count is less than 100 bacteria per cubic centimeter. If bacteriological analyses do not satisfy the above requirements, then disinfection procedure must be repeated until these requirements are met.
- 4) Disposal of Disinfection Solution: Dechlorinate and dispose of disinfection solution in accordance with applicable regulations. Take special measures to prevent chlorinated water from entering the ground, surface water, or sanitary sewer and storm drainage systems. Dechlorinate chlorinated water prior to discharge.

2.5.8. Cover

The minimum pipeline cover is 4 feet in paved or unpaved public roadways or on the shoulder of public roadways.

2.5.9. Cathodic Protection

The DB Entity shall be responsible for determining the need for and designing cathodic protection for all metallic components of all pipelines included in the Project. Soil corrosivity data for the RWTP site and the influent pump station site are included in the Geotechnical Report (BGG Engineers) included in as Attachment O, but no such data has been gather for the pipeline alignments. Testing of soils as required for cathodic protection design shall be the responsibility of the DB Entity.

2.5.10. Roadway and Path Paving Requirements

Roadway and pathway paving shall be per City of Menlo Park requirements. Depth of existing AC shall be matched in the trench and the City of Menlo Park trenching details will be applied for the project. Permit terms and depth of AC have not yet been confirmed, but preliminary discussions with the City indicate that depth for trench paving ranges from 6 to 18 inches with portions being rubberized asphalt concrete pavement. Types of AC surfaces are the be confirmed by the DB Entity. The City also referenced a Cal Water project at the intersection of Sand Hill and Santa Cruz where up to 5 feet of AC thickness was encountered. The DB Entity should assume that up to 200 linear feet of pipe at this intersection will have this depth of AC.

Westbound lanes of Sand Hill Road will be slurry sealed by the DB Entity.

It is anticipated that final, finished, paving shall be installed every 1,000 feet of pipeline installed, after 1,000 feet of pipeline has passed pressure testing. This is to avoid having unfinished pavement along the entire length of the project area within Sand Hill Road.

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Any damage to pavement surfaces caused by the DB Entity are to be repaired or replaced to the satisfaction of the jurisdictional agency.

Plating for trenching within Sand Hill may be used on a short-term basis (a couple of days) and shall be recessed. Trenching within the bike lane is required to be backfilled and flush to grade. No cutback is permitted within Sand Hill Road.

2.5.11. Warning Tape and Tracer Wire

DB Entity shall provide a continuous strip of 6-inch wide warning tape with 1-inch black or white contrasting lettering with the words "Caution – Sanitary Sewer" or similar wording installed 1 foot above the center of the pipeline.

Locator wire shall also be within the trench and be solid #8 copper wire with protective coating. Locator wire shall be placed per trench detail shown in project plans, Volume 3B.

2.5.12. Traffic Control

Traffic control shall be provided to allow for safe passage of pedestrians, cyclists, and motorists through the work zone. Traffic control shall be in place at all times work is occurring that could impact traffic. A traffic control plan shall be developed in accordance with the California Manual on Uniform Traffic Control Devices, Caltrans, and approved by the City of Menlo Park and the West Bay Sanitary District.

2.5.13. Restoration

All areas shall be restored to pre-construction condition. Top soil in non-paved areas shall be removed, stored separated from other excavated material, and installed at the location it was removed.

2.5.14. Pipe and Manhole Abandonment

All abandoned sewer pipe shall be filled completely with sand or slurry and pipe ends plugged with 12" of concrete.

All abandoned manholes shall have the top three (3) feet of the structure removed, the base shall be broken up, the cone section shall be crushed, and the manhole shall be filled with sand or slurry. Existing manhole frames and covers shall be disposed of by the Contractor. All other removed materials shall be disposed of offsite by the Contractor in accordance with applicable regulations.

2.6. Work Restrictions and Constraints

2.6.1. SFPUC

The new sanitary sewer force main will cross SFPUC water lines near Sharon Park Drive. The DB Entity will coordinate work with the SFPUC and obtain any permits necessary to install the force main based on information to be provided to the DB Entity in an Addendum. This is further described in the Permit Fact Sheets (**Attachment P**).

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The San Francisco Public Utilities Commission (SFPUC) requires all projects that will disturb lands within the SFPUC rights of way to follow a two-step process prior to authorization. The first step is to attend an Initial Project review meeting with the SFPUC to obtain initial comments from their Natural Resources and Lands Management Division, Bureau of Environmental Management, Water Supply and Treatment Division, Real Estate Services, and the City and County of San Francisco's City Attorney. The committee members provided guidance at the meeting to the applicant regarding the next steps for securing written authorization to allow the applicant's proposed project with the SFPUC rights of way to proceed. This information will be provided to the DB Entity in an Addendum. The District attending this Initial Project meeting and notes are provided below:

- The committee stressed that the construction of the wastewater mains must comply with all applicable laws and plumbing codes.
- SFPUC-Water Supply and Treatment Division (WSTD) Land Engineering prefers that untreated wastewater pipelines cross below BDPLs Nos. 3 and 4 with a minimum of 24-inches of vertical clearance. However, if the pipeline cross above, then a minimum of 12-inches of vertical clearance is required.
- Potholing is required and SFPUC-WSTD-Land Engineering prefers that the DB Entity use the vacuum extraction method.
- SFPUC-Real Estate Services (RES) explained that ownership of the ROW parcels has changed over time with the widening of Sand Hill Road. SFPUC-RES explained that San Mateo County condemned various pieces of the SFPUC's ROW previously owned in fee. However, it is unclear at the moment whether the DB Entity's proposed alignment would be located within the SFPUC ROW or the public ROW, although conversations with SFPUC suggests that it may be in the City ROW. Depending on the order of condemnation and any reserved land right, this would affect how the SFPUC authorizes the project. For example, the DB Entity would need a revocable license if the proposed main alignment is within the SFPUC ROW parcel owned in fee; or the DB Entity would need a consent letter if the SFPUC holds an easement; or if the SFPUC has no ownership or easement over the parcel, then the SFPUC would only require review of engineering plans by SFPUC-WSTD Land Engineering. The DB Entity is encouraged to work with the City of Menlo Park to place the new pipeline within Menlo Park Right of Way to avoid needing a revocable license from the City of Menlo Park.
- The DB Entity will adhere to all laws and codes regarding the following: fused wastewater mains; and appropriate clearance and spacing between an untreated wastewater pipelines proximate to potable water supply pipelines.
- The DB Entity will obtain a consent letter from SFPUC-WSTD Land Engineering to perform potholing (contact Tracy Leung, Associate Engineer, at tleung@sfwater.org or (650) 871-3031). In addition, the DB Entity will provide the name of an authorized signatory that can sign and execute the consent letter.
- The DB Entity will submit revised engineering plans to SFPUC-WSTD Land Engineering for review and approval showing the following: SFPUC property boundary lines, all water supply pipelines and appurtenances, updated pipeline depths based on potholing data, typical cross-section, wastewater main crossing and material, and vertical clearance between pipelines (contact Tracy Leung, Associate Engineer, at tleung@sfwater.org or (650) 871-3031).

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- The DB Entity will continue to research and obtain a copy of the San Mateo County order of condemnation and/or deed to determine if the City of Menlo Park owns the ROW parcel at Sand Hill Road. The DB Entity will provide a copy of the order of condemnation and/or deed to SFPUC Real Estate Services (contact Chris Wong, Principal Administrative Analyst, at CJWong@sfwater.org or (415) 487-5211).
- Depending on the outcome of the San Mateo County order of condemnation and/or deed (or lack thereof) , Real Estate Service will authorize the work as follows:
 - If the ROW parcel is owned in fee by the SFPUC, then the work will be authorized through a revocable license (a discretionary action).
 - If the ROW parcel is owned in fee by the City of Menlo Park with an easement in favor of the SFPUC, then the work will be authorized through a consent letter (not a discretionary action).
 - If the ROW parcel is owned in fee by the City of Menlo Park and there is no easement in favor of the SFPUC, then this crossing is considered public ROW and the DB Entity only needs to have its plans reviewed and approved by the SFPUC. No authorization document will be provided.

If the DB Entity cannot provide evidence that the SFPUC no longer owns this ROW parcel in fee, then the DB Entity will work with SFPUC Real Estate Services to obtain a revocable license for the proposed project within the SFPUC ROW (contact Chris Wong, Principal Administrative Analyst, at CJWong@sfwater.org or (415) 487-5211)

- The DB Entity and/or its contractor will contact the SFPUC-WSTD Land Engineering Construction Inspector at least 48 hours prior to commencing construction work (contact Albert Hao, Construction Inspector, at ahao@sfwater.org or (650) 871-3015).
- The DB Entity and/or its contractor will contact SFPUC Millbrae Dispatch at (650) 872-5900 at least 24 hours prior to commencing work. In addition, the DB Entity and/or its contractors will notify Millbrae Dispatch when entering and leaving the SFPUC property.
- The DB Entity and/or its contractor will ensure that all construction debris is removed from SFPUC property and disposed of properly and legally. In addition, the DB Entity will restore the project site to pre-construction conditions upon completing its work on SFPUC property and arrange for a post-construction/restoration site inspection by SFPUC staff (contact Jane Herman, ROW Manager, at jherman@sfwater.org or (650) 652-3204).

SFPUC piping and Right of Way within Sand Hill can be found in **Attachment B**.

2.6.2. PG&E Gas Facilities

The new sanitary sewer force main will cross and be installed adjacent to large diameter gas mains. The DBE team will coordinate work with PG&E and construct pipeline in conformance with PG&E Requirements

2.6.3. City of Menlo Park Requirements/Work Hours

Work hours have not yet been established by the City of Menlo Park, however it is anticipated that any work that requires shutting down vehicular or bicycle travel lanes will be installed during the hours of 8:30 pm to 5:30 am. If work is limited to behind the curb with no vehicular or bicycle travel ways

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affected, normal construction hours of 8:00 to 4:00 pm unless otherwise approved by the City and the District.

Furthermore, if construction occurs in vehicular or bicycle travel ways that affect the paved surface of the roadway, the DB Entity will be required to replace the pavement from curb to median curb.

No vehicles are allowed to park in the City ROW overnight and vehicular parking and staging plan shall be reviewed and approved by the City Engineer.

2.6.4. DB Entity Plant and Equipment

The DB Entity alone shall at all times be responsible for the adequacy, efficiency and sufficiency of their plant and equipment.

The DB Entity shall at all times be responsible for the security of their plant and equipment. The District will not take any responsibility for missing or damaged equipment, tools or personal belongings.

The City of Menlo Park will not allow storage of materials on-site during non-work hours.

The DB Entity will be responsible to provide all water, power, lighting required for the project:

- Water - The DB Entity shall provide all water required for construction purposes.
- Power - The DB Entity shall provide power as required for the work.
- Lighting – The DB Entity shall provide all lighting required for night work. The District reserves the right to request additional lighting without further compensation to the DB Entity. All working areas utilized by the DB Entity to perform work during hours of darkness, shall be lighted to conform to the minimum illumination intensities established by California Division of occupational Safety and Health Construction Safety Orders (CAL OSHA) at no additional cost to the District. All lighting fixtures shall be mounted and directed in a manner precluding glare to approaching traffic.

The DB entity will be required to provide portable restroom facilities for use during construction.

2.6.5. Access to Local Businesses

The DB Entity is required to provide one lane of traffic, with traffic control, to businesses affected by pipeline construction in order to minimize impact to business owners.

Project Element 3: Satellite Recycled Water Treatment Plant

3.1. Introduction and Background

The Sharon Heights Satellite Recycled Water Treatment Plant (RWTP) consists of the infrastructure needed to produce recycled water (RW) for non-potable reuse at SHGCC and (in a later phase) the Stanford Linear Accelerator Center (SLAC). The infrastructure generally includes screenings, grit removal, equalization, biological reactors, and membrane bioreactors (MBR), disinfection, and associated piping and tankage. Instrumentation, controls and SCADA integration are needed to facilitate the operation of the RWTP, which is further described in Element 4 of this RFP.

The RWTP is located within the SHGCC property line, east of Junipero Serra Freeway (CA Highway 280) and north of Sand Hill Road. The site can be accessed through a public road near its closest physical address at 2950 Sand Hill Road, Menlo Park, CA 94025. After going through the entrance to the SHGCC, the road passes through a small parking lot and tennis facilities. The site is on the left of the two-way road, just south of the golf course fairway.

The RWTP receives raw municipal wastewater from the pump station and force main, as described in Element 1 and Element 2, respectively. The raw municipal wastewater includes residential dischargers within the WBSD service area, and includes blowdown from SLAC's cooling towers.

3.2. Wastewater Characteristics and Requirements

The objective of this section is to present the wastewater influent data and characteristics to be used as the basis of design. The treatment plant shall provide capacity to accommodate the anticipated flow and range of load conditions associated with production of up to 347 gpm (0.5 MGD) of recycled water. Although influent flow rates will vary seasonally and diurnally, the treatment plant shall be able to produce up to 347 gpm on a continuous basis, if sufficient influent flows become available. This section presents the flows and loadings criteria that apply to the process design for meeting these requirements.

3.2.1. Influent

The project requires diversion of wastewater flow from a 36-inch trunk line located in Oak Avenue and conveyance to the treatment facility. Based on recent flow monitoring data during dry weather months in 2016, the average wastewater flow at Oak Avenue is between 0.30 and 0.35 MGD (208 and 243 gpm, respectively), which is less than the design recycled water production rate of 347 gpm.

The District is considering construction of an additional pumping station to augment the available wastewater at the treatment plant in the future to be able to produce 347 gpm of RW flows. In order to maximize recycled water production from the current wastewater flows at Oak Avenue, the base project includes a 75,000-gallon flow equalization basin within the headworks process to facilitate equalization of diurnal influent flows. The District will consider alternative solutions, such as additional equalization basins or different process basin volumes, to maximizing recycled water production and equalize flow variations. Complete flow monitoring data associated with the Project at Manhole 66 in Oak Avenue are included in **Attachment C**.

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The basis of design for influent Water Quality for the proposal is shown in Table 3.2.1. The basis of design is based on the water quality sampling dataset at Sand Hill Road. The dataset was visually analyzed for outliers and atypical values, which were then removed from the dataset. The values presented in Table 3.2.1 are the 60th percentile of the remaining values of the dataset, with the exception of ammonia, where its median was selected.

Table 3.2-1: Influent Water Quality Basis of Design

Parameter	Units	Basis of Design Value
Peak Raw Influent Flow ¹	gpm	625
Ammonia as N	mg/L	58
BOD₅	mg/L	370
pH	Units	7.5
TSS	mg/L	550
VSS	mg/L	490
Alkalinity as CaCO₃	mg/L	240
TKN	mg/L	74
Nitrogen, Total	mg/L	74
TDS	mg/L	485
Sulfate as SO₄	mg/L	62
Phosphorus, Total	mg/L	10

Note:

1. Peak raw influent flow corresponds to the design capacity of the Influent PS. Design RW production rate shall be 347 gpm.

Sampling was conducted to characterize the influent in December 2014, April and May of 2015 and in March, April, and July of 2016. The complete set of water quality sampling data is included in **Attachment D**.

The DB Entity shall review the sampling data as a part of design prior to submitting the proposal.

3.2.2. Effluent Limits and Monitoring Requirements

The plant shall produce recycled water that meets all requirements of California Code of Regulations, Title 22 Disinfected Tertiary Recycled Water. In addition, effluent shall meet the total nitrogen and ammonia concentrations as shown in Table 3.2-2.

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Table 3.2-2: Recycled Water Quality and Monitoring Requirements

Parameter	Water Quality Limit	Units	Monitoring Requirements		Basis of Limit
			Frequency	Sample Type	
Turbidity	< 0.2 NTU more than 5% of any 24-hour period	NTU	Continuous	Online	Title 22 Regulation
	< 0.5 NTU at any time				
pH	Between 7.0 and 9 at all times		Daily	Discrete	Title 22 Regulation
Biochemical Oxygen Demand	10	mg/L	Weekly	24-hour Composite	Title 22 Regulation
Total Coliform Bacteria	2.2	MPN/100mL	Monthly	Discrete	Title 22 Regulation
Ammonia as NH₃-N¹	1 (max monthly average)	mg/L	Daily	24-hour Composite	SHGCC Storage Pond Limits
	5 (daily max)	mg/L	Daily	24-hour Composite	
Total Nitrogen (as N)¹	20	mg/L	Monthly	Discrete	SHGCC Storage Pond Limits
UV Dose²	-	-	Continuous	Online	Title 22 Regulation
EC/TDS³	610 (as TDS)	mg/L	Continuous	Online	SHGCC Irrigation Limit

Note:

1. DB Entity shall monitor various nitrogen constituents, including ammonia, nitrate, TKN, and Total Nitrogen to confirm Total Nitrogen levels meet the requirement.
2. UV dose shall be designed by DB Entity.

The maximum TDS observed from the influent water quality sampling data is 610 mg/L. While actual influent TDS may be lower, the RWTP shall be designed to produce RW with TDS concentrations that are not significantly higher than the influent TDS concentrations.

The effluent shall not cause discoloration or generate flotables, scum, or oils in the SHGCC storage ponds.

Samples and measurements shall be representative of the volume of the influent and effluent. Sampling shall be in accordance with the effluent limits and monitoring requirements summarized in Table 3.2-4. Samples shall be taken at the following locations:

2. Influent - downstream of influent pump station and upstream of plant return flows and first treatment process;
3. Effluent - downstream of the last treatment process (disinfection).

In addition, provide all necessary sampling, monitoring and reporting of the influent and the effluent to meet all regulatory and permitting requirements.

Continuously monitored (online) parameters shall be compared with grab sample results on a monthly basis to ensure that online meters are calibrated and accurate. In general, online readings should be within 5% of the grab sample result.

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Table 3.2-3: Treatment Plant Process Monitoring Requirements

Parameter	Plant Monitoring Location	Units	Monitoring Requirements	
			Frequency	Sample Type
Flow rate	All Flow Meters	<ul style="list-style-type: none"> • gpm • Daily Total 	Continuous	Online
Temperature	RW	°C	Continuous	Online
pH	RW		Continuous	Online
Dissolved Oxygen	MLSS (Aeration Basin)	mg/L	Continuous	Online
Biochemical Oxygen demand ²	Influent WW	mg/L	3X per week	24-hour Composite
Suspended Solids	Influent WW	mg/L	3X per week	24-hour Composite
Suspended Solids	MLSS (Aeration Basin)	mg/L	3X per week	Grab
Chlorine Residual	RW	mg/L	Continuous	Online
Settleable Solids	MLSS (Aeration Basin)	mL/L	Monthly	Grab
Oil & Grease (Recoverable)	Influent WW	mg/L	Monthly	Grab
Ammonia	Influent WW	mg/L	Monthly	24-hour Composite
Nitrite (as N)	Influent WW	mg/L	Monthly	24-hour Composite
Nitrate (as N)	Influent WW	mg/L	Monthly	24-hour Composite
Total Kjeldahl Nitrogen	Influent WW	mg/L	Monthly	24-hour Composite
Total Dissolved Solids ¹	RW	mg/L	Monthly	24-hour Composite
Sodium ¹	RW	mg/L	Monthly	24-hour Composite
Electrical Conductivity (ECw) ¹	RW	dS/m	Continuous	Online
Chloride ¹	RW	mg/L	Monthly	24-hour Composite
Boron ¹	RW	mg/L	Monthly	24-hour Composite
Bicarbonate Alkalinity as CaCO ₃	RW	mg/L	Monthly	24-hour Composite
Phosphorous, Total	RW	mg/L	Monthly	24-hour Composite
UV Transmittance	UV influent	Percent	Continuous	Online

Note:

1. High ECw is a possible indication of high sodium, chloride, and boron concentrations. If ECw, averaged over any 24-hour period, exceeds the limit shown in Table 3.2-2, collect sodium, chloride, and boron grab samples. If grab samples are higher than what is shown in Exhibit A of the DB agreement, SHGCC may request for influent recycled water to be wasted to prevent contamination of the storage ponds.

3.2.3. Monitoring Data Management

The monitoring data shall be organized and managed via database file format suitable for direct import to a structured query language (SQL) based relational database management system, without additional data

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manipulation. The data shall be formatted so it is easily searchable and printable using a database management system such as Microsoft Access. Provide all required work to set templates for printing and electronic reporting monitoring data for the District use and all regulatory and permitting agencies.

The monitoring data will be used for RWQCB reporting purposes, as well as, to assess the performance of the RWTP. The DB Entity is responsible for compiling the monitoring throughout the course of the initial operation period as part of the DB Entity's handover to the District for permanent operation.

3.3. Recycled Water Treatment Plant Design

The objective of this section is to provide guidelines and standards for design and construction of the recycled water treatment. The RWTP shall include at a minimum, the following principal elements:

1. Headworks
2. Equalization Basin
3. Membrane Bioreactor (MBR)
4. Chemical Systems
5. Disinfection
6. Blowers
7. Electrical Room
8. Sample Preparation Room and Office
9. Bathroom
10. All required safety facilities and system to meet local, State and national codes and standards including eyewash and emergency shower, and fire protection.
11. Odor Control

The primary purpose of the RWTP is to provide a source of recycled water that meets customer demands to the extent of available wastewater flow. As the customer demands are seasonal, the RWTP production flow rate shall be modified to meet daily demand targets. The DB Entity shall design the RWTP with turndown capabilities to facilitate energy savings during periods of lower RW demand. Turndown capabilities shall be demonstrated during the DB Entity's initial operation period.

Refer to Volume 3B for RWTP process flow schematic and a preliminary layout of the RWTP site that meets the requirements described in this section herein.

3.3.1. Design Codes and Standards

BioWIN model or approved equal model shall be used to design the treatment reactors to achieve the effluent requirements.

The biological reactors and MBR must be designed in two process trains to allow continuous operation at no less than fifty (50) percent of design flow of the RWTP when one treatment train is removed from service.

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The RWTP shall be designed to allow for continuous operation during wet weather flows, albeit at reduced flows, when the need for recycled water is limited and storage pond is at its maximum level.

The RWTP shall be capable of operating at full capacity for at least 95% of the days from March 1st through October 31st. The RWTP shall have at least 50% of its full capacity for at least 99% of the days during the same time period. Under no circumstances shall the RWTP be at less than 50% of its full capacity for more than 5 consecutive days. RWTP reliability shall be proven during the demonstrative operational period by the DB Entity.

Design storage pond levels shall be determined by the DB Entity in coordination with SHGCC.

3.3.2. Major Equipment Level of Quality and Performance

Manufacturers shown in Table 3.3-1 are approved manufacturers intended to define a level of quality and performance for equipment proposed for the RWTP. The DB Entity may include in the Proposal equipment that is “equal” to the approved equipment manufacturer for the District’s consideration and approval. Evidence of compliance with regards the equipment requirements, such as manufacturer’s data sheets, drawings, and installation list, shall be included with the Proposal. Approval is dependent on equipment’s compliance with Project and equipment requirements. Equipment manufacturer shall have unit responsibility of related equipment under the same service or process.

Table 3.3-1: Summary of Approved Equipment Manufacturers

Equipment	Approved Manufacturer(s)
Submersible Pumps for Wastewater	FLYGT, N-type Impellers, No Equal
Coarse Screens	WESTECH, PARKSON, HUBER, LAKESIDE, HYDRODYNE
Grit Removal Equipment	WESTECH, S&L, LAKESIDE, HUBER
Fine Screens	WESTECH, PARKSON, HUBER, LAKESIDE, HYDRODYNE
Mixers	FLYGT, ABS, WILO
Blowers	AERZEN, UNITED, KAESER, GARDNER DENVER
RAS/WAS Pumps	FLYGT, ABS, WILO
Diffusers	SANITAIRE, AEROSTRIP, EDI
Valves	DEZURIK, VALMATIC
Valve Actuators	HENRY PRATT, DEZURIK, ROTORK
MBR	GE, OVIVO, EVOQUA
UV Disinfection	TROJAN, WEDECO, ETS
PLC and Network	PLC: ALLEN BRADLEY CONTROLLOGIX ETHERNET SWITCHES: N-TRON, SISCO.

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3.3.2.1. Submersible Pumps

The District has standardized on Flygt pumps for all submersible pumps applications. For all submersible pumps applications, DB Entity shall provide Flygt pumps with N-type impellers.

3.3.2.2. Manufacturer Experience Requirements

The DB Entity is required to submit equipment installation lists associated with the following major equipment, which must include the following information:

- Location and owner of equipment
- Year installed
- Equipment size or capacity

The blower equipment shall meet the following minimum successful performance history requirements:

- Two (2) installations operating in California for at least three (3) years.
- Five (5) separate installations operating in the United States for at least five (5) years with a minimum eight blower units distributed between the five installations.
- Twenty (20) installations operating world-wide with a minimum fifty (50) blower units distributed between the twenty installations.

The MBR membranes shall meet the following minimum successful performance history requirements in municipal wastewater applications:

- Two (2) installations operating in California for at least three (3) years.
- Five (5) separate installations operating in the United States for at least three (3) years.
- Ten (10) installations operating world-wide.

The headworks equipment (i.e. course screen, grit removal and fine screen equipment) shall meet the following minimum successful performance history requirements:

- Two (2) installations operating in California for at least three (3) years.
- Five (5) separate installations operating in the United States for at least three (3) years.
- Ten (10) installations operating world-wide.

The pumps shall meet the following minimum successful performance history requirements

- Five (5) installations operating in California for at least three (3) years.
- Twenty (20) separate installations operating in the United States for at least three (3) years.
- Thirty (30) installations operating world-wide.

The mixers shall meet the following minimum successful performance history requirements

- Ten (10) installations operating in California for at least three (3) years.
- Twenty (20) separate installations operating in the United States for at least three (3) years.
- Thirty (30) installations operating world-wide.

3.3.3. Headworks

The headworks facility shall include the following:

- Coarse and fine screening
- Grit removal and handling
- Equalization storage
- Odor control ducting

Headworks equipment that is upstream of the equalization basin shall be sized to treat the maximum design flowrate from the Influent PS. Headworks equipment downstream of the equalization basin shall be sized adequately to support the design RW production rate (347 gpm).

3.3.3.1. Screening

Provide coarse and fine screening for the project. Coarse screening shall be provided to prevent ragging of downstream equipment and prevent clogging of grit pumps associated with the grit removal process. Fine screening is necessary to prevent material from blinding, fouling, or wrapping around the membranes and reducing their useful lives.

Both screening systems shall be sized to accommodate related peak flow. Each screen system will consist of the screening unit located inside an enclosed stainless housing, and a washer/compactor/screw conveyor that shall discharge screenings into a bagging device. Bagged screenings will be temporarily collected in a dumpster and then hauled away.

The washer/compactor/screw conveyor will have a water connection that on intermittent intervals washes the organics from the screened materials. Provide shutoff valves to allow isolation of water line from the washer/compactor. The coarse screen drum will have 6 mm perforations and the fine screen perforation size shall be no larger than 2 mm. Provide hose bib and adequate space to wash down, clean and remove bagged screenings material.

Screening aperture size requirements and screening equipment manufacturers shall be confirmed by the membrane equipment supplier. DB Entity shall provide written proof that the screening equipment is acceptable by the membrane equipment supplier.

Provide local control panel for each screen to allow local and remote, manual and automatic operation. Provide all required instrumentation to monitor the status of screening process and provide status and alarm locally and remotely. Install the screens to provide easy access to all screening system access panels for maintenance.

3.3.3.2. Grit Removal and Handling

Provide grit removal system to minimize grit accumulating in downstream pipes, channels, and tanks. The grit removal system will be enclosed in stainless housing or concrete chamber based on DB Entity final design. Grit is defined as particles larger than 0.008 inches (65 mesh) and with a specific gravity greater than 2.65. Grit removal system shall consist of the following components:

- Mechanical vortex grit chamber

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- Grit Pumping
- Grit washing and classifier equipment
- Collection of washed grit

Provide a mechanical vortex grit removal system sized to manage peak flow with a circular basin with a grit hopper and tangential inlets and outlets. Provide self-priming grit pumps to convey the collected grit from the hopper to washer. Grit conveyance pumping shall be accomplished by either a recessed impeller pump with a flooded suction, or an airlift pump. Design the grit system to minimize length of piping and complexity of pump and grit handling system.

Provide grit washing, classifying, and dewatering equipment to wash and dewater the collected grit. The captured grit shall be washed prior to disposal. The washed grit will be temporarily collected in a dumpster and then hauled away. The grit washer will have a water connection that on intermittent intervals washes the grit materials. Provide isolation valves to allow isolation of water line from the washer.

The grit removal and handing system shall meet the minimum requirements set forth in Table 3.3-2

Table 3.3-2: Grit Removal and Handling Sizing Criteria

Parameter	Units	Value	Comments
Grit Removal			
Type	-	Mechanical Vortex	
Number		1 duty	
Grit Capture Rate at Max Flow			
> 50 mesh		95%	
50 mesh < Grit < 70 mesh		85%	
70 mesh < Grit < 100 mesh		65%	
Grit Pumping			
Type		Self-priming	
Number		1 duty	
Grit Washing/Dewatering			
Number	-	1 duty	
Organics Removal	%	95	
Dry Solids Output	%	85	
Grit Capture	%	95	Capture of 0.2 mm grit

Provide local control panel for grit removal system to allow local and remote, manual and automatic operation. Provide all required instrumentation to monitor the status of de-gritting process and provide status and alarm

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locally and remotely. Install the grit system to provide easy access to all access panels, valves, pumps, etc. for maintenance. Adequate space shall be provided for handling and removal of grit dumpster.

3.3.3.3. Equalization

An equalization basin shall be provided with the storage volume shown in Table 3.3-3. The equalization basin is sized to store diurnal peak instantaneous flows from the pumping station and diminish the instantaneous peak flow rates conveyed to downstream treatment processes. Design the basin to provide sufficient mixing and minimize solids deposition. The District will consider the potential of resizing the equalization basin, if the DB Entity can demonstrate that equalization can be more effectively achieved with increase bioreactor volume, or a combination of increased bioreactor volume and separate equalization basin volume.

The basin shall have a floor sloping to the pumps that will also facilitate cleaning operations. The base project assumes a below-grade concrete tank with protective coating, although a stainless steel tank is permitted as well as long as all requirements stated in this section herein are met. Provide overflow piping and divert the overflow to sanitary sewer.

Provide local control panel for equalization basin to allow local and remote, manual and automatic operation. Provide all required instrumentation to monitor the status of the basin and pumping operation. Provide level sensor for the basin and set up levels alarms to provide high and over flow alarms and status. Provide status and alarm for the basin operations locally and remotely. The influent pump station operation shall be linked in with equalization basin level to minimize the overflow from equalization basin.

Install all related equipment to provide easy access from top of the basin. Provide basin drain piping with a mud valve or sump area to allow dewatering of the basin for cleaning. Provide access points including ladders or steps and several locations in the basin to allow man entry for inspection and cleaning. The basin shall be covered and the overhead shall be ducted to the odor control system (see Section 3.3.7 for odor control requirements).

The equalization basin shall meet the minimum requires set forth in Table 3.3-3.

Table 3.3-3: Equalization Basin Design Criteria

Parameter	Units	Value
Minimum Basin Volume	gallon	75,000
Number of Equalization Basin Pumps	-	1 duty + 1 standby

3.3.4. Membrane Bioreactors (MBR)

The MBR system process was selected as the technology for tertiary treatment due to its small footprint, which best fits the site constraints. The MBR system shall utilize the conventional activated sludge process with internal mixed liquor recycle for nitrification and denitrification. Provide two process trains. Each biological tank will be partitioned into zones with submersible mixers(s), fine bubble diffusers, and two membrane tanks that will house the membrane modules and air scour equipment.

The basin shall have a floor sloping to the pumps that will also facilitate cleaning operations. The base project assumes a below-grade concrete tank with protective coating, although a stainless steel tank is permitted as

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well as long as all requirements stated in this section herein are met. Provide level monitoring and controls necessary to prevent overflow of basin.

Mixed liquor in the membrane tanks will be pumped back or via gravity flows to the anoxic zone at an effective and adjustable rate to provide denitrification and maintain stable mixed liquor suspended solids concentrations across the process zones. The membrane process shall be designed to meeting the State of California Title 22 requirements and the plant effluent condition stated herein. Refer to Volume 3B for MBR flow schematic.

A portion of the solids and scum collected in the system shall be wasted to the gravity sewer tie-in.

The DB Entity shall evaluate the need for chemical addition and provide all required equipment for chemical addition if deemed necessary in the opinion of the DB Entity to meet the effluent performance requirements.

The membrane manufacturer shall have unit responsibility of the MBR system, and provide all associated blowers, pump, backflush systems and chemical storage and feed systems.

The MBR design criteria is summarized in Table 3.3-4.

Table 3.3-4: Membrane Bioreactors Sizing Criteria

Parameter	Units	Value
Membrane Type		Hollow Fiber, Flat Plate
Membrane Effective Pore Size	micron	0.04
Minimum Number of Trains	-	2
Allowable Peak Flux	gal/ft ² -day	12
Maximum MLSS Concentration for basin sizing	mg/l	8,000
Minimum MCRT	days	As required to meet effluent requirements described in Section 3.2.2.

Provide instrumentation to control and monitor operation and status of the biological and MBR system. Provide, install and integrate DO and or ORP meters, level sensor and all other required instrumentations throughout the treatment trains at various locations and zones to allow effective monitoring and control to process including control of blowers and pumps.

Provide local control panels for the blower and pumps designed to provide HAND/OFF/AUTO (HOA) selector switches and magnetic starters in conjunction with the related controls and instrumentation. The panel shall be designed to provide local and remote status of the blowers, pumps and associated alarm.

Provide control panel for operation of the MBR system. The controls shall provide local/remote and manual and automatic operations of the MBR system. The panel shall be designed to provide local and remote status of the MBR equipment and associated alarm.

All local control function shall be incorporated in the plant wide control system to allow control and monitoring of all equipment and processes remotely.

For open tanks, install all related equipment to provide easy access from top of the basins, including access bridges and walkway to allow full access to all equipment, piping, valves, gates and instrumentation.

Provide gates and valves to allow isolation of the each process train and MBR tankage. All gates and valves that are operated as a part of normal operation shall have electrical actuators. For all tanks provide drain piping with a mud valve or sump area to allow dewatering of the tanks for cleaning. Provide access points including ladders or steps at multiple locations in the tanks to allow man entry for inspection and cleaning.

Provide membrane laydown area adjacent to the MBR tanks to perform membrane cleaning and maintenance. Membrane laydown area shall be large enough so that a single membrane cassette can be comfortably accessed by operators on all sides. A bridge crane is not included in the base project; the District is equipped with boom trucks that can be used to remove membrane cassettes out of the tank. However, the DB Entity may incorporate a bridge crane as an added value to the design as long as all requirements of this section are met.

3.3.5. UV Disinfection

Provide ultraviolet (UV) disinfection of the tertiary effluent to meet Title 22 disinfected tertiary recycled water requirements. The UV facility shall consist of closed-vessel reactors with low-pressure, high-intensity output amalgam lamps.

The design for the UV System shall include two UV reactors with automatic mechanical sleeve wiping. A UV transmissivity analyzer shall be provided on the permeate piping upstream of the UV reactors to monitor and record UV transmissivity over time. Each UV reactor will have a UV intensity monitor to monitor and record UV intensity.

Design provisions to allow injection and residual monitoring of sodium hypochlorite feed and monitoring system downstream of the UV System in the future. Provide all required valves and accessories to allow isolation of each UV unit from the system.

Provide all required instrumentation and controls including flow metering prior to UV to allow efficient control of the UV system operation. Provide control panel for operation of the UV system. The controls shall provide local/remote and manual and automatic operations of the UV system. The panel shall be designed to provide local and remote status of the UV equipment and associated alarms.

3.3.6. Recycled Water Distribution

Following UV disinfection, the RW will be conveyed to the following systems:

- SHGCC storage pond tie-in
- Truck fill station
- Utility water for on-site use

3.3.6.1. SHGCC Storage Pond Tie-in

As part of Element 2 of the Project, a pressure pipeline will be constructed to connect the RWTP to the existing storage pond pipeline. The storage pond pipeline hydraulically connects the two SHGCC storage ponds; it is not a supply pipeline. It is the DB Entity's responsibility to confirm the location and depth of the tie-in location and the delivery pressure needed to fill the storage ponds. Design of the tie-in pipeline shall include backflow prevention measures to protect the RW pumps.

The base project assumes that the MBR permeate pumps can supply enough pressure to the SHGCC storage pond pipeline and would not require additional intermediate pumping. The DB Entity shall review and analyze the use of MBR permeate pumps for this application and if necessary design, provide and install a system to deliver the water to the SHGCC storage ponds.

The approximate existing pond pipeline location is shown in Volume 3B (Project Drawings). The pipeline is 6-inch diameter, C900 PVC, with an approximate depth of 8 feet below the surface at the connection point (to be verified by the DB Entity). SHGCC has performed pressure testing of the existing storage pond pipeline to a pressure of 60 psi. DB Entity is not responsible for the integrity of the existing pipeline, only for connecting to it in such a way that the integrity is maintained. Testing of the final piping system (see Element 7) shall confirm that the new connecting pipe and existing pipe have the require pressure capacity. DB entity shall not be responsible for a failure in testing the existing portion of the pipeline unless the failure is a result of its construction activities.

3.3.6.2. Truck Fill Station

The RWTP will need to supply RW for the District's use in off-site applications. This will be achieved by filling water trucks so the RW can be used where needed. The truck fill station must be able to supply RW at a flow rate no less than 100 gpm. The discharge pressure shall be no less than 10 psi and no greater than 20 psi. A small in-line utility water pump (less than 5 HP) shall be install downstream of UV disinfection to provide sufficient flow and pressure to supply the truck fill station.

A hydrant or similar connection is desired, with the ability to lock the operating valve(s) to avoid unauthorized operation. The truck fill station should be located outside of the fenced RWTP area, near the parking lot in between the tennis courts. Refer to Volume 3B – Drawings, for approximate location. Location of truck fill station should accessible by a 2,000-gallon water truck.

3.3.6.3. Utility Water for On-site Uses

The RW shall be used for various uses on-site uses. On-site users include, but are not limited to the following depending on the final design:

- Headworks equipment
 - Coarse screen
 - Grit removal
 - Fine screen
- Biological reactor sprayers

- Odor control sprayers
- Site landscaping
- Site wash-down

The DB Entity shall design, provide and install RW water distribution system for onsite plant use. The system shall be designed to provide continuous supply of water for site usages identified above. The utility water system shall be able to provide RW at peak demands. Peak demand shall be calculated as the sum of all the on-site RW demands.

3.3.7. Odor Control

The odor control system shall be designed by the DB Entity to provide effective control of odor emissions from the RWTP facilities. The design of odor control system shall incorporate equipment and material that are suitable for use in a corrosive environment. The odor control system shall maintain odorous compound levels below perceptible thresholds at the boundary of RWTP work area.

The Project requires the submittal of an Authority to Construct/Permit to Operate application with the Bay Area Air Quality Management District (BAAQMD). Approval of this application is required to commence any construction or operation of the RWTP that is expected to generate adverse air emissions or odors. Due to the possible long lead-time of the preparing and having this application approved, the District will prepare and submit the application prior to the DB Entity's completion of final design. **Since the application requires information relating to the location of odor emission points and emission rates, the air permit application will rely on information provided in the Proposal of the selected DB Entity. The Proposal shall provide information relating to the location of odor emission points and abate facilities, such as process equipment, tanks, and odor control system(s).**

The District will make the air permit application available for the DB Entity to review and provide comments on prior to the District's submittal to the BAAQMD. The DB Entity shall provide comments within two (2) weeks of receiving the application.

In the event that the DB Entity recommends reassessment of the odor control requirements and alternative technology or technical approaches which require revisions to the air permit application, the DB Entity shall assume all cost, responsibility and risk associated with modifying the application, including associated schedule delays and all requirements imposed by the BAAQMD resulting from the revised application. These costs may include additional BAAQMD application fees. The DB Entity shall coordinate with the District throughout the project to ensure that the final design of the odor control system is reflected in the BAAQMD application and permit.

For purpose of determining odor control system spacing requirements, conservative assumptions were made relating to the expected air emissions and odor control system. The conceptual drawings shown in Volume 3B show air emitted from the headworks equipment and equalization basin will be ducted to an organic media bed. At a minimum, the odor control system shall be designed to convey and treat air emitted from the following processes:

- Headworks equipment

- Coarse screen
- Grit removal
- Fine screen
- Equalization basin (75,000 gallons storage capacity)
- Anoxic zones of biological reactors

3.3.8. Ancillary Systems

3.3.8.1. Plant Drainage

The site shall be designed with an integrated plant drainage system that will collect storm water runoff and wastewater that is generated on-site. The plant drainage system shall only be able to collect flows from the following areas:

- Storm water runoff
- Site drainage
- Wasted process wash water (e.g. water used for cleaning coarse screens)

The plant drainage system shall consist of a pumping station containing one duty and one standby submersible non-clog pumps. A single duty pump shall be able to convey all flows back to the front of headworks upstream of the coarse screens. The wet well shall be located in an area that is convenient to collect storm water runoff and site drainage through manhole(s).

Provide local control panel for pumping station to allow local and remote, manual and automatic operation. Provide all required instrumentation to monitor the status of the pumping operation. Provide level sensor and set up levels alarms at level to provide level, high and over flow alarms and status. Provide status and alarm for the basin operations locally and remotely.

Install pump station related equipment to provide easy access from top of the station. Provide access point including ladders or steps to allow man entry for inspection and cleaning.

3.3.9. Future Facilities

3.3.9.1. Reverse Osmosis Treatment System

The SHGCC and District may decide to implement a reverse osmosis (RO) treatment system in the future that will further purify the RW effluent. The RO treatment system is expected to consist of closed-conduit membranes, storage tanks, and electrical systems, among other supporting equipment.

The DB Entity shall designate a space on the site that is no less than 400 square feet that is to be reserved for the future RO treatment system. The space shall be approximately square and be accessible by operators from all sides and by heavy duty vehicles on at least 50% of its perimeter. The space shall be within the vicinity of its upstream and downstream processes to minimize the amount of additional yard piping needed. The DB Entity may propose an area that is currently in use by SHGCC; it is ultimately the decision of SHGCC to repurpose an area that is currently in use.

Reserve floor space in the RWTP's main motor control center to allow future installation of 0.25 MGD RO system.

3.3.9.2. Sodium Hypochlorite

Provide 100 square-foot area near the chemical storage area to allow installation of future sodium hypochlorite dosing system. Provide spare space in local power panel to allow future installation of the sodium hypochlorite pumping and control system.

3.3.9.3. Recycled Water Pump Station

A recycled water pump station is expected to be required to deliver recycled water to other industrial users as part of Phase 2 of the District's Recycled Water Project (not part of Project). The DB Entity shall designate a space on the site that is no less than 500 square feet that is to be reserved for a future recycled water pump station. The space shall be approximately square and accessible by operators from all sides and by heavy duty vehicles on at least 50% of its perimeter. The reserved space shall be within the vicinity of the disinfection system to minimize the amount of additional yard piping required. Volume 3B identifies a potential location for the recycled water pump station. If the DB Entity proposes an alternative location, it will be subject to review and approval, as the adjacent area is currently used by SHGCC for golf course operations and maintenance activities.

While the base project does not include pumps to pressurize the SHGCC storage pond pipeline, the DB Entity may decide to incorporate a pumping system that would boost pressures to the pond pipeline. If so, the pump system must be designed to allow expansion and installation of new pump so that future pumps for industrial users can be integrated into a common source of RW (i.e. clearwell or suction header).

3.4. Operation Standards

This section presents the operations requirements for the RWTP that can be met through a variety of technologies or design approaches.

3.4.1. Daily and Normal Operations Requirements

1. Daily operations requirements are the operational requirements that typically would occur on a daily and frequent basis:
 - a. Provide the ability to collect daily 24-hour, flow weighted composite samples of influent and effluent in accordance with the all regulatory permits and sampling requirements stated herein.
 - b. Provide the ability to collect representative RAS and WAS samples.
 - c. Provide the ability to easily collect daily grab sample at various treatment locations to allow for optimal control.
2. Normal operations requirements apply when the RWTP is operating at standard conditions. The District has identified "continuous" and "daily" normal operations requirements. The continuous normal operations requirements are the operational or functional characteristics that should occur in a well- functioning, smoothly operated facility on a continuous basis.
3. Automatic control of flows from the pumping station and equalization facilities shall be implemented to achieve the desired equalization and continuous operation of the plant.

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4. Equally divide the wastewater flow between all on-line process trains.
5. Prevent solids and scum stratification and foam accumulation in the reactor or facilities used to convey flow to and from process to process.
6. Continuously monitor dissolved oxygen levels and other key parameters (e.g. ammonia) to optimize performance and minimize operating costs.
7. Prevent oxygenated activated sludge in aerated zones from back-flowing into anoxic zones.
8. Provide air piping appurtenances to prevent wastewater from entering the air piping and aeration blowers.
9. Meter flow entering the biological reactors.
10. Meter in-plant recycled flows.
11. Automatically control internal mixed liquor recycle pumping rate at an operator established set-point that is established through a specific flow rate or percentage of mixed liquor flow.
12. Remove and discharge WAS from the membrane reactors to the gravity sewer based on the design RAS flow rate. Provide automatic and manual control for WAS disposal rate at an operator-established set point that is selectable to be a specific flow value and time. Provide flow meter to monitor WAS flow rate.
13. Automatically Control DO levels in the reactor.
14. Prevent algae growth on the any weirs without the need for routine manual cleaning.
15. Design of biological system shall include measures to dispose of scum/floating material from each reactor cell directly to gravity sewer. Provide effective control of filamentous bacteria growth in each reactor cell, such as a scum trough to collect scum and foam.
16. Continuously monitor turbidity and pH of the effluent and divert the flow to gravity sewer if it does not meet effluent requirements.
17. Protect composite sampling equipment from adverse conditions that could impact sample integrity.
18. Design pumping and conveyance to keep air or foam from entering the conveyance systems. Provide air release valves where necessary to prevent air binding of conveyance systems.
19. Use SCADA to continuously monitor and record information required for ongoing reliable plant operations and robust record keeping, including at least the following:
 - a. All metered or calculated flow data;
 - b. Biological reactor DO levels and other parameters monitored for process control;
 - c. All chemicals including polymer feed rates (wherever used in the process);
 - d. Turbidity levels from all online metering equipment;
 - e. pH levels from all online monitoring equipment;
 - f. UV delivered dose

g. Chlorine residual

20. Use SCADA to continuous monitor data as necessary for operation of odor control facility.
21. Use SCADA to report and record all continuous monitoring data necessary to readily determine compliance with all regulatory permits, including the effluent performance criteria listed herein.
22. Use SCADA to tabulate all metered or calculated plant flow data for each day, as 1-hour average values and daily totals, on a single reporting sheet. If more than one meter is used to measure a given flow report, tabulate individual flow meter values and combined flow meter values separately.

3.4.2. Operational Requirements

1. The Operational Demonstration (see Element 7) shall validate satisfactory operation of all equipment and systems in actual operation.
2. Training: See Element 7.

3.5. Project Technical Standards

3.5.1. General Design and Construction Quality Standards

This section describes the general design standards for the construction of the Project. If the following requirements overlap or conflict with requirements contained in other sections, or with governing codes, standards, or manufacturer's directions and instructions, the stricter interpretation or the District's directive shall govern.

The minimum design service lives of structures and equipment shall be as present below:

1. Electrical, Mechanical, and Instrumentation Process Equipment
 - a) Mechanical Components: 20 years
 - b) Continuous Duty Pumps: 15 years
 - c) Electrical Components: 15 years
 - d) Electrical Substations: 20 years
 - e) Electrical Motor Control Centers: 20 years
 - f) Instrumentation: 5 years
 - g) SCADA Hardware: 5 years
2. Heating, Ventilating, and Air Conditioning Equipment:
 - a) Heating: 20 years
 - b) Chillers and Air Handling Equipment: 20 years

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c) Appurtenant Systems: 15 years

3. Structures: 50 years

3.5.2. Facility Requirements

1. Vehicle access shall comply with the City of Menlo Park Fire Protection District requirements. The entire perimeter of the facility shall be accessible via Class 7 commercial trucks (GVWR 26,001 to 33,000 lbs.). All roads and access ramps shall be accessible by front-end loaders and dump trucks.
2. All wastewater facilities and open structures to convey/control flow to the facilities, shall operate with no less than a 2-foot freeboard at peak flow including all plant internal recycle flows.
3. Process tankage shall be capable of being isolated from other operating process units and provided with drains or easy accessible sump area to allow dewatering of tankage.
4. Enclosure of the plant site with a fence and signs designed to discourage the entrance of unauthorized persons.
5. Install hand rails and guards around tanks, trenches, pits, stairwells, and other hazardous structures with the tops of walls less than 42 inches above the surrounding ground level.
6. The facility shall be designed to limit operational noise level generated by the RWTP. The noise level at the plant boundary (fence line) must below 55 dBA or the noise level requirements established by SHGCC at the adjacent tennis courts or golf fairway, whichever is lower.
7. Provide an enclosed facility of no less than 150 square feet for the equipment and apparatus needed to perform basic operational analytical testing. At a minimum, provide all equipment and apparatus required for pH, temperature, biochemical oxygen demand, and suspended solids to allow making the necessary analytical determinations and operational control of the RWTP. The equipment and glassware shall be of types recommended by Standard Methods for the Examination of Water and Wastewater and the local regulatory authority. The area shall be provided with required utilities and facilities such as electricity, water, HVAC, sufficient storage space, a sink, a bench top, and a unisex bathroom. Equipment shall be arranged conveniently to allow operators to efficiently process samples and maintain a clean environment.
8. Maintain a safe and non-corrosive atmosphere for plant equipment, personnel around all process areas and equipment housing.
9. Adequate provision shall be made to effectively protect plant personnel and visitors from hazards.
10. All chemical feed equipment and storage facilities shall be constructed of materials resistant to chemical attack by all chemicals.
11. For chemical storage areas, provide spill containment such as dikes or curbs which will contain the stored volume until it can be safely transferred.
12. Provide sufficient storage for all chemicals on site to allow at least 30 days of continuous plant operations.
13. Provide all required safety equipment and apparatus required for operation and maintenance of an

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operating treatment plant to meet regulatory agency requirements, including but limited to emergency showers and eyewash stations.

14. Provide equipment and instrumentation identification and numbering for all equipment and instrumentation at the plant. All numbering shall be made up of equipment identification and unique tag numbers as described. Provide adequate access around all process and control equipment to allow maintenance repair, and replace of the equipment.

3.5.3. Equipment Redundancy and Standby Power Requirements

1. Standby power is not required for this project. However, the RWTP shall be equipped to receive power from a portable generator to sustain basic operations of the RWTP not related to the treatment processes, including:
 - a. SCADA
 - b. Lighting and site access
 - c. Sample preparation and office equipment
2. Provide equipment redundancy and summarized in Table 3.5-1. The DB Entities are encouraged to develop innovative redundancy and reliability

Table 3.5-1: Equipment Redundancy Requirements

Equipment type	Required Redundancy
Course Screens	No
Grit Removal	No
Fine Screens	No
Equalization pumping	Yes
Anoxic Zone Mixers	Provide an offline complete replacement unit to be stored by the District for each size mixer installed.
Blowers	Provide a complete replacement unit to be stored by the District for each size blower installed; size blowers to allow efficient operation of each process train.
MBR	No ¹
UV Disinfection	No ¹
Process pumps (ML, RAS, WAS and Permeate)	No (each train must have its own dedicated process pumps)
Plant Drain Pumps	Yes
Process Water Pump (if required by process equipment)	Provide an offline complete replacement unit to be stored by the District for each size pump installed

Note:

1. Membrane and disinfection system design shall comply with Title 22 reliability requirements, which allows for inclusion of disposal provisions as a reliability feature. The base project includes a

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process tank drainage piping that allows for the disposal of effluent that does not meet Title 22 standards.

3. All standby & offline complete replacement units must be tested and operational prior to plant testing and start up.
4. The standby units listed as offline complete replacement unit will be used to replace the operating units that require immediate maintenance or replacement. Therefore, the standby units listed as offline complete replacement units shall be ready to replace the operating unit without major modification.
5. For the equipment listed as requiring offline complete replacement unit as standby, provide easily accessible system dismantling points to allow efficient removal of the unit from the system.

3.5.4. Spare Parts Requirements

Spare parts are components of equipment, electrical and instrumentation that are expected to require replacement during the service life of the equipment or that must be immediately available on failure of critical equipment to allow continuous operation of the plant. The DB Entity shall provide adequate quantities of spare parts for all equipment and instrumentation systems based on reliability requirements, replacement lead time, manufacturer's recommendations, and the following requirements:

- Provide spare parts for components that are subjected to wear and which may be expected to require regular replacement under normal maintenance schedules, such as mechanical parts subject to continuous operation. Spare parts for these components shall be in quantities that can sustain operations for at least 1 year.
- Provide consumable spare parts for components with a life-expectancy of less than 1 year after initial 6-month operating period (see Element 9).
- Provide single spares for limited service items that normally require replacement after one use or function, such as fuses.
- Provide single spare parts for components that are not immediately available from distributors, such as for custom fabricated components.

Spare parts shall be identical to parts installed. Provide a complete inventory of all spare parts. The spare parts inventory shall include the following:

- Equipment number
- Equipment name
- Part name
- Vendor name
- Vendor part number
- Manufacturer
- Manufacturer part number
- Quantity supplied

3.6. Site and Civil Construction Requirements

This section describes the minimum requirements for design and construction of civil and site work. If the following requirements overlap or conflict with requirements contained in other sections or with governing codes, standards, or manufacturer's directions and instructions, the stricter interpretation or the District's directive shall govern.

3.6.1. Nearby Storage Pond

A storage pond, located directly west of the RWTP site, was formed when the area was excavated for ground cover for use at the golf course. The storage pond is used to store irrigation water, and is hydraulically connected to the other storage pond at SHGCC. The storage pond shall not be disturbed as a result of the construction and operation of the RWTP. Furthermore, all facilities shall adhere to the setback distances shown in Table 3.6-1.

Table 3.6-1: Minimum Setback Distance from Pond

Facilities	Minimum Setback Distance
Structures	20 feet
Roadways	10 feet
Fencing	10 feet
Temporary Construction Equipment and Staging	10 feet

Construction activity is not subject to minimum setback distance, although the DB Entity shall exercise caution when working near the pond. Temporary fencing, barriers, or other measures may be necessary as a safety precaution during construction. Refer to drawings for approximate delineating of storage pond, which is based on the top of the slope of the pond. No materials, tools or other debris shall at any time be allowed to fall into the existing pond, and DB Entity shall install such protection measures as necessary to prevent this from occurring.

3.6.2. Site Access

Site access during construction will be at 2950 Sand Hill Road, which is approximately 1,000 feet east of the RWTP site. The site access route will be through SHGCC property and will pass by the following areas:

- Tennis courts
- Golf courses and practice greens
- Maintenance yards
- Parking lots

The DB Entity is not allowed to park or temporarily store equipment in these areas, as this would cause disturbances in the daily operation of SHGCC. The DB Entity shall remain in the designated access route shown in the RFP drawings. Once within the SHGCC property, the DB Entity shall remain on course to the Contractor Staging Area or Work Area.

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Prior to any construction activity provide a layout of the required temporary construction facilities for review and approval. The layout shall include the following elements:

1. Limits of construction with special attention paid to areas identified in the Environmental documents or land owned by others.
2. Staging areas, field office areas, temporary utilities, construction access roads.
3. Construction equipment and truck access routing.

The existing access roads to plant site must be maintained and cleaned by the DB Entity at all times during construction period. Proper traffic control shall be exercised when transporting oversize or heavy loads through the access road. Coordination with SHGCC may be required if oversize or heavy loads will impede the flow of traffic.

3.6.3. Work Area Limits

The work area limits are shown in the RFP drawings. The DB Entity shall not conduct activity in, or store equipment, in areas that are not designated as either the work area limits, laydown area, or staging area.

Equipment may be stored overnight on the RWTP site; the DB Entity may provide temporary locks and site security system in order to protect stored items. Storage and construction shall remain within the site boundaries of the RWTP, including the boundaries set forth by the storage pond requirements.

The laydown area shown in the RFP drawings will be in close proximity of the area used by the maintenance staff of SHGCC. The DB Entity shall be accommodating of SHGCC operations and staff and not pose any obstructions during construction. The storage is allowed in the laydown area; however, stored items must be covered or screened so it cannot be seen from the golf course. Neither SHGCC nor the District is responsible for lost or missing items in the laydown area.

3.6.4. Earthwork

A project geotechnical report shall be prepared prior to completion of structural design and start of any earthwork.

Clear construction areas, vegetation, debris and other materials to expose undisturbed native soils or suitable existing fill and prepare the site for grading as recommended by the geotechnical engineer.

All material removed from the construction site shall be the property of the DB Entity.

Facility geotechnical and structural improvements shall be designed to limit settlement and prevent damage to structures and equipment.

1. Settlement of structures and differential settlement between connecting facilities and structures shall be limited to no more than 0.5-inch.
2. Concrete equipment pads, sidewalks and driveways, settlement is limited to no more than 0.25-inch.
3. All connections to structures or between structures shall be designed to accommodate this amount of settlement without damage or loss of function.

Settlement mitigation measures shall conform to the recommendations of an engineer specializing in soil mechanics and who is registered to practice in the State of California.

3.6.5. Finish Grade

1. Finished grade surface to be reasonably smooth and free of grade breaks, irregular surface changes, protrusions and other defects.
2. Un-improved areas shall be restored to pre-construction grades.
3. Grade surface to drain away from structures.
4. Direct drainage to collection points.
5. Provide smooth transitions to existing grades.
6. In no case shall a finished grade exceed a 1:2 (rise/run) slope or the limits set by the project geotechnical report, whichever represents the lesser slope.
7. All disturbed areas shall be provided with erosion control, either per the approved landscaping plan or through other physical means.
8. Slopes that will be landscaped with turf or other vegetation that requires mowing shall have finished grades of less than 1:4 (vertical:horizontal).
9. Do not leave low areas that will allow storm water to pond, with the exception of approved storm water detention or similar facilities.

3.6.6. Site Work

1. Provide adequate space for future expansion of facilities in accordance with the requirements listed herein.
2. Provide adequate space for pipes, pumps, and duct banks. Coordinate yard piping, including, but not limited to, potable water, recycle water and storm drainage with all process piping and utilities as to not create conflicts and to expedite access in the event of a failure or for the need to shut down a system.
3. Provide access roadway width and turnaround areas meeting the requirements of the Local code and fire department.
4. Allow adequate roadways, parking, and maneuvering areas on the Site to provide adequate, efficient, and safe access to staff, visitors and trucks. Ensure access for all vehicles (including tractor trailer trucks) to enter, maneuver and leave the area and access all the facilities. Access shall allow trucks to travel through the facility, past any buildings which will commonly receive deliveries, and exit the area without backing up or turning around. It is important to consider all types of trucks that will need access to each area. Provide crane access and necessary pavement width for crane outriggers for facilities which require a crane to remove equipment for maintenance.
5. Arrange structures to minimize hydraulic head losses wherever possible, and the need for pump stations and junction structures.
6. Access roads and parking areas shall be striped.
7. Asphalt pavement designed based on local and state requirements. The pavement structural sections shall base be prepared by a State of California registered geotechnical engineer based on R-value and Traffic Index (TI). The geotechnical engineer shall determine R-value using California Test Method

No. 301.

8. Reinforced concrete pavement shall be used in areas with high point loads such as truck loading areas and areas with wheeled waste containers.
9. Minimum pavement width for plant area 20 feet, or as required to comply with Menlo Park Fire Protection Department requirements.
10. Access roads shall allow adequate room for truck turning movements.
11. New pavement grades shall be between 1.5% and 4% with slopes to drainage.
12. The minimum vertical curve length allowable at the intersection of two grades shall be 50 feet. Vertical curves on all access road are not required where the algebraic difference is 2% or less.
13. Provide a minimum of four (4) standard parking spaces that are 10 feet wide by twenty (20) feet long.

3.6.7. Storm Water and Drainage

1. Direct surface drainage away from equipment, walkways and buildings.
2. Drainage collection system shall be able to convey the condition peak flow from the 10-year storm with the peak hydraulic grade line elevation to be at or below drain inlet grate elevation in the 10-year storm.
3. Site grading shall provide overland flow conveyance paths for runoff from storms greater than the 10-year event up to and including the 100-year event.
4. Ponding from the 100-year storm shall be one foot or more below adjacent building finished floor elevations and shall not enter treatment process facilities including subsurface facilities.
5. Storm water system must be designed to prevent storm water runoff leaving the site. Storm water shall be collected, detained and conveyed to the plant.
6. Storm water runoff that is returned to the treatment process shall be conveyed at less than the maximum treatment design flow.
7. If storm water detention is proposed as a part of overall draining system, the detention pond shall be sized to contain the 25-year, 4-day storm with two feet of freeboard.

3.6.8. Landscape

It is expected that some of the existing site landscaping will be removed in the process of constructing the RWTP. The DB Entity shall practice reasonable efforts to minimize the effects on site vegetation. The DB Entity shall make a reasonable efforts to salvage and replant vegetation that would lead to lower construction cost.

All vegetation that acts as a visual barrier between the RWTP site and the rest of the SHGCC facility shall be restored to its original height and density. The visual barrier will be intended to screen the RWTP from the rest of the surrounding area, including:

- Sand Hill Road
- Highway 280

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- SHGCC sporting facilities
- SHGCC maintenance yard

Vegetation over five (5) feet in height, including trees, shall be protected during construction and preserved in place with the site to the extent possible. Trees meeting the “heritage tree” definition of the City of Menlo Park’s Heritage Tree Ordinance shall be protected during construction and operation of the RWTP. Any heritage tree requiring removal or major pruning would require additional permitting from the City of Menlo Park at expense of the DB Entity.

All surfaces in the RWTP work area that are not paved shall be planted or covered with a low maintenance surface treatment such as rock. Landscape shall be low maintenance and water conserving while providing an attractive amenity that matches the golf course landscape and overall quality of the RWTP architecture design. At a minimum:

1. As specified in Element 5, the DB Entity is required to comply with environmental mitigation measures that provide visual screening of the plant utilizing landscaping and fencing. Design construction shall incorporate landscaping elements that effectively screen the plant from view, as required.
2. New landscaping shall include trees, shrubs, native grasses, groundcovers and minimal turf. Plant selection shall include materials that are drought tolerant, require low maintenance, require minimal levels of fertilization, and tolerate the levels of chlorine and salt content typical of irrigating with recycled water.
3. Plant layout and spacing shall consider mature plant size and growth habit to minimize pruning needs.
4. Provide aesthetically-pleasing vegetative landscaping around the plant entrance.
5. Planter widths shall be a minimum of eight feet (8’) inside dimension, to provide adequate space for healthy tree and root growth and to reduce potential pavement heave by roots.
6. Provide irrigation system for the landscaping within the plant site:
 - a. The Irrigation system should be automatically controlled evapotranspiration based sub-surface irrigation system.
 - b. Irrigation equipment shall be selected for durability and long life.
 - c. Irrigation system shall address the salt deposit build-up typical of Recycled water

3.6.9. Erosion and Sediment Control

Perform all planning, design, implementation, inspection and documentation to meet the requirements of Construction Activity Construction General Permit Order 2009-0009-DWQ and control erosion and sedimentation at the plant during and after construction.

1. Design and construct permanent erosion and sediment control planting and devices to prevent erosion at the completed plant.
2. Provide all required compliance activities and documents and pay all fines if a permit violation is issued.

3. Prepare a Storm Water Pollution Prevention Plan (SWPPP) including drawings showing temporary erosion control facilities during construction.

3.6.10. Fire Protection

Provide fire hydrants at the plant site conforming to local requirements and standards. Minimum allowable pressure in water mains serving fire hydrants shall be as approved by the Menlo Park Fire Protection District. All buildings shall incorporate provisions required by the Menlo Park Fire Protection District, such as sprinklers, hydrants, and extinguishers.

3.6.11. Fencing

Provide temporary fencing of the site during construction. New permanent fencing and with visual screening shall be designed as required by the mitigation measures included in Element 5.

Plant entrances shall be equipped with lockable slide gates. Entry gate shall be manual unlock and open.

3.6.12. Wildlife

Wildlife and their nesting areas may be encountered during construction. Preconstruction surveys of the site shall include an investigation of wildlife and potential impacts the Project may have on wildlife. As stated in the Project's *Mitigated Negative Declaration Report* (Attachment F), the Project can have potential impacts affecting the following species:

- California red-legged frog and California Tiger Salamander
- San Francisco garter snake
- Western pond turtle
- Nesting birds

The DB Entity is required to reduce potential impacts to wildlife to less than significant, as detailed in the Project's *Mitigated Negative Declaration Report* and Element 5. If wildlife is encountered, the DB may be required to perform recommended measures, including:

- Establishing avoidance buffers, specific to each species,
- Relocating animals through qualified biologist,
- Marking and flagging known nesting areas.

3.7. Architectural Design and Construction Requirements.

This section describes the architectural design and construction requirements for the project. If the following requirements overlap or conflict with requirements contained in other sections or with governing codes, standards, or manufacturer's directions and instructions, the more stringent interpretation or the District's directive shall govern.

3.7.1. Codes and Standards

The following codes and standards, latest editions, apply to this project:

- Local and County Ordinances
- California Building Code (CBC), 2013
- Accessible and Usable Buildings and Facilities (ICC/ANSI A117)
- State of California Occupational Safety and Health Administration (CAL/OSHA) General Industry Safety Orders
- California Code of Regulations (CCR)
- California Plumbing Code (CPC)
- California Fire Code (CFC)
- California Electrical Code (CEC)
- California Mechanical Code (CMC)
- California Energy Code
- California Green Building Standards Code
- National Fire Protection Association Codes and Standards
- Americans with Disabilities Act (ADA) The ADA Accessibility Guidelines for Buildings and Facilities
- Federal Occupational Safety and Health Administration (OSHA)

Architectural Design requirements include:

- A. All above-grade building walls shall be constructed of CMU, precast concrete walls, or pre-engineered steel. Above-grade buildings shall include sound attenuation, as needed, to reduce noise level as stated in this section.
- B. All building floors shall be made of concrete.
- C. Maximum height of all building or structures shall not exceed elevation 310 feet (NAVD 88 datum) and shall incorporate the architectural features of the building nearby as shown in Figure 3.7-1.
- D. The photo shown in Figure 3.7-1 is of existing maintenance structures adjacent to the site. The color pallet and overall aesthetic of new on-site structures shall be similar to adjacent maintenance structures. It is understood the CMU buildings or canopies may be part of the project; it is desired that new structures, including roofing and color scheme, compliment and coordinate with existing structures adjacent to the site. At a minimum, metal siding and roof decking shall be colored green, and the structure supports shall be painted dark red.

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Figure 3.7-1: Existing Metal Canopy



- E. The design shall be in accordance with this document and applicable codes, specifications, and standards, and the responsible architect, licensed by the State of California. The DB Entity architect shall work with the District to develop the final architectural features of the all buildings for this project.
- F. At a minimum the architectural design shall include:
 - 1. A 150 square feet enclosed facility for performing basic operational analytical testing. The facility shall include windows and/or skylights to provide adequate light during sunny days to the extent that additional lighting is not necessary. The facility shall also include a unisex bathroom containing a toilet and handwashing sink. See Section 3.5.2 for additional requirements of this enclosed facility.
 - 2. An electrical room to house the plant electrical and control gears including motor control center, plant wide control system and networking equipment.
- G. A metal canopy to cover all process tankage that are not inside buildings and are exposed to direct sun. To minimize and control the costs of long term maintenance, durable, low-maintenance materials, elements and finishes shall be designed for this project. When possible, the same kind of items shall be used throughout the facility. These elements include doors, door hardware, luminaries that require the same kind of lamps.
- H. Coordinate all lock systems and hardware with District and provide the required type.
- I. Fabricate and install trailing or handrail assembly to meet or exceed OSHA standards and meeting or exceeding the standards of quality stated herein.
- J. Provide buildings and enclosures for noisy equipment for dampening the noise to meet the criteria for noise abatement stated herein.

3.8. Structural Design and Construction Requirements.

This section describes the structural engineering design and construction Requirements for the structural design of the project. If the following requirements overlap or conflict with requirements

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contained in other sections or with governing codes, standards, or manufacturer's directions and instructions, the stricter interpretation or the District's directive shall govern.

3.8.1. Codes and Standards

1. Structural designs for this facility fall under the jurisdiction of the California Building Code (CBC) latest edition. All codes, standards, and specifications referenced in the CBC are applicable. In addition, latest editions of the following shall also be used:
 - a. All local and county ordinances and regulations.
 - b. Aluminum Design Manual" by the Aluminum Association.
 - c. Building Code Requirements for Masonry Structures (ACI 530/ASCE 5/TMS402).
 - d. Building Code Requirements for Structural Concrete (ACI 318).
 - e. Code Requirements for Environmental Engineering Concrete Structures by the American Concrete Institute (ACI 350). Design Considerations for Environmental Engineering Concrete Structures by the American Concrete Institute (ACI 350.4R).
 - f. Foundations for Dynamic Equipment by American Concrete Institute (ACI 351.3R).
 - g. Minimum Design Loads for Buildings and Other Structures. American National Standards Institute (ANSI)/American Society of Civil Engineers (ASCE) 7.
 - h. Seismic Design of Liquid-Containing Concrete Structures and Commentary (ACI 350.3) by the American Concrete Institute.
 - i. Steel Construction Manual, by the American Institute of Steel Construction (AISC).
 - j. U.S. Department of Commerce, National Technical Information Services, U.S. Atomic Energy Commission, Washington D.C., Nuclear Reactor and Earthquake, TID-7024, Chapter 6, Dynamic Pressure of Fluid Containers, August 1963.
 - k. Seismic Provisions for Structural Steel Buildings Construction, American Institute of Steel Construction (AISC-341).

3.8.2. General

1. All structural engineering shall be performed in accordance with this document and applicable codes, specifications, and standards, by the DB Entity's responsible structural engineer, licensed by the State of California.
2. For water containing structures, structural design shall be performed for "maximum" water levels indicated by process design requirements. Applicable load factors and durability coefficients from ACI 318 and 350 shall be applied to these loads. The structures shall be designed for any combination of empty and full conditions.
3. All equipment shall be mounted on concrete foundations or concrete supports adequately designed for dead and live loads and vibration. Vibration isolators or dampeners shall be installed wherever practical. Vibration design shall be accordance with ACI 351.3R-04.
4. For heavy equipment on ground-supported slabs, consideration must be given to an isolated equipment foundations design.
5. New tanks and below-grade structures exposed to soil shall be made of reinforced cast-in-place

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concrete, precast concrete or stainless steel construction.

6. All above-grade building walls shall be CMU or precast concrete.

7. All floors, shall be made of concrete.

8. Geotechnical Investigation

a. Before beginning structural design, the DB Entity shall retain a geotechnical engineer to review available geotechnical data and perform additional geotechnical investigation and prepare a geotechnical report. Criteria and recommendations of the geotechnical report shall be used for the design of all structures. The Project geotechnical report shall be prepared by a professional geotechnical engineer registered to practice in the State of California. At a minimum the geotechnical report shall include:

- 1) Field explorations and the results of laboratory testing
- 2) Site conditions including surface conditions, earth material and groundwater
- 3) Engineering seismology including nearby faults, liquefaction potential and seismic design criteria

b. Geotechnical design recommendation shall include:

- 1) Bearing capacity
- 2) Foundation type to meet criteria recommendation
- 3) Settlement estimate
- 4) Lateral earth pressures
- 5) Resistance to lateral loads
- 6) Concrete slabs-on-grade
- 7) Pipe support design
- 8) Pavement design
- 9) Corrosion potential
- 10) Measures to ensure structural integrity between existing and new portions of the buildings
- 11) Construction recommendations

b. A Geotechnical Report has been prepared by the District and is provided as **Attachment O**. The DB Entity is responsible for reviewing the data and findings represented in this report and determining if these are sufficient to develop a final Geotechnical Engineering Report and all design criteria for the project. The DB Entity shall be responsible for all interpretation of data contained in the Geotechnical Report, and no design recommendations made or implied in the Geotechnical Report shall be used in final design unless verified by the DB Entity's Geotechnical Engineer of Record. Additional borings, analysis and other investigations shall be made at the discretion of the DB Entity. The Geotechnical Report found in Attachment O (BAGG Engineers, August 2016) may not be used as the final

Geotechnical Report.

3.9. Mechanical Design and Construction Requirements.

This section describes the mechanical equipment and piping design, and construction Requirements for the RWTP work. If this section conflicts with governing codes and standards, or manufacturer's directions and instructions, the stricter interpretation or the District's interpretation shall be followed.

3.9.1. Codes and Standards

The mechanical and equipment systems shall be designed and built to the following codes and standards:

- American Gear Manufacturer's Association
- American Iron and Steel Institute Standards
- American National Standards Institute
- American Society for Testing and Materials
- American Society of Mechanical Engineers, Boiler and Pressure Vessel latest edition
- American Water Works Association
- ANSI/HI Pump Standards
- Anti-Friction Bearing Manufacturers Association
- California Building Code, latest edition,
- California Fire Code, latest edition
- California Mechanical Code, latest edition
- California Plumbing Code, latest edition
- Local and the County ordinances
- NFPA Codes and Standards
- U.S. Department of Labor Occupational Safety and Health Act
- Underwriters Laboratories Inc.

3.9.2. Mechanical Equipment

3.9.2.1. Standardization and System Responsibility

1. Equipment with similar functions shall be provided by the one manufacturer.
2. Equipment shall be assembled as a unit by the manufacturer who is responsible for the entire unit. The manufacturer shall provide a warranty covering the equipment system and all of its components.

3.9.2.2. Piping and Equipment Installation

1. Provide adequate space around piping to allow access for maintenance.
2. Pipes that are wall-supported should be mounted within four feet of the walls.
3. Pipes that are installed close to the walls, but not supported from the walls, shall have a minimum 6 inches of clearance between the pipe flange and the wall and or floor to facilitate disassembly.

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4. Maintain a minimum of 9'-0" feet clearance from the floor to the centerline for all piping that may impact equipment access.
5. Where personnel access to equipment or piping is required, provide a minimum of 7'-6" vertical clearance above the finished floor to lowest point of the piping and support.
6. Locate all equipment and associated panels and cabinets on reinforced concrete equipment pads which shall be a minimum of four inches high and extend two inches on all sides beyond the equipment base or mounting plate and be flush with panels and cabinets. All equipment pad shall have ¼" chamfer edge on all sides.
7. Provide stairs, catwalks, platforms and hatches for maintenance and operational access and equipment removal. Ladders shall not be used for this purpose where frequent access is required. Equipment that must be accessed annually or a more frequent basis shall not be installed in a Confined Space, as defined by OSHA and the California Code of Regulations.
8. Provide hoists, monorails, lifting eyes in the ceilings, or cranes where necessary for disassembling or removing all equipment in excess of 50 lbs.
9. Provide adequate headroom for removing all equipment without disassembly unless recommended the equipment manufacturer.
10. Allow ample space for maintenance and operational access to valve and gate operators. Provide adequate clearances for rising stem valves and gates in all positions. Include motorized operators, chain operators or access platforms for easy operation of all valves in elevated piping.
11. Minimum clearances shall be the most strict of the following:
 - a. Between adjacent items of equipment: 3 feet as measured from the edge of the concrete equipment pad.
 - b. Vertical (floor to overhead obstruction): 7.5 feet.
 - c. Manufacturer's recommended minimum maintenance clearances, plus 1 foot.
12. Clearances shall be actual to most outstanding dimension and not nominal.
13. Equipment shall be located to maintain the minimum clearances on at least three sides.
14. All equipment mounts, supports and anchorage shall be in accordance with the manufacturer's recommendations, the California amended International Building Code, Hydraulic Institute Standards, and industry standard requirements.
15. Equipment anchorage design shall be performed by a professional structural or civil engineer, registered to practice in the State of California.
16. All rotating or moving equipment shall be grouted into place with non-shrink grout.
17. Equipment anchor bolts shall be 304 or 316 stainless steel.
18. Pipe shall be anchored and supported so as not to transfer stresses from pipe to equipment.

3.9.2.3. Mechanical Equipment and Piping Design Requirements

1. Size drive equipment for the full load including losses in speed reducers and power transmission.
2. Nominal input horsepower rating of each gear or reducer shall at least be equal to nameplate horsepower of drive motor.
3. Provide drive units for 24 hour continuous operation.
4. Provide gear reducer totally enclosed and oil lubricated with antifriction bearings throughout.

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5. Provide worm gear reducers with service factor of at least 1.20 and helical and combination bevel-helical gear reducers with a service factor of at least 1.50.
6. Belts shall be capable of providing 150 percent of the rated driver horsepower.
7. Bushings shall be key seated to the drive shaft.
8. Sheaves shall be separately mounted on bushings by three pull-up grub or cap tightening screws.
9. Sheaves and bushings that operate at peripheral speeds equal to or less than 5,500 feet per minute shall be statically balanced. Sheaves and bushings that operate at peripheral speeds greater than 5,500 feet per minute shall be dynamically balanced.
10. Equipment bearings shall be oil or grease lubricated ball or roller type to accommodate all radial and axial thrust.
11. Oil lubricated bearings shall be equipped with either a pressure lubricating system or a separate oil reservoir type system.
12. L-10 bearing life: 100,000 hours as determined using the equipment's maximum operating speed or power output.
13. All mechanical seals shall be the nondestructive (nonfretting) split with type 316 or 316L stainless steel metal parts and Hastelloy C springs.
14. Rotary faces mechanical seals shall be tungsten carbide or silicon carbide. Stationary faces shall be ceramic, tungsten carbide or silicon carbide.
15. Where required to protect mechanical seals from grit, solids or chemicals in carrier fluid, drill and tap mechanical seal boxes for installation of clean water barrier supply piping.
16. Pumps
 - a. Pumps and pumping systems shall be designed in accordance with ANSI/HI Pump Standards, latest edition. Select and sequence pumps to operate within the manufacturer's allowable operating region with respect to flow, head and net positive suction head required (NPSHR).
 - b. Vibration levels of the pumping unit when installed on the structural foundation shall not exceed the limits recommended by the Hydraulic Institute.
 - c. Design pump intake structures in accordance with the requirements of the ANSI/HI Pump Standards, latest edition.
 - d. Centrifugal pump speeds shall generally not exceed 1,800 revolutions per minute (rpm) in water and waste pumping applications.
 - e. In general, rotary lobe pumps shall have a maximum speed of 300 rpm and progressive cavity pumps shall have a maximum speed of 200 rpm. Consult pump manufacturers for recommended maximum pump speeds for specific services.
 - f. Critical speed of all rotating members and the critical reed frequency of the head and motor structure shall be at least 25 percent above the maximum motor operating speed or 25 percent below the minimum operating speed.
 - g. Provide pressure taps on the suction and discharge sides of pumps and blowers.
 - h. The pump types shown in Table 3.9-1 will be acceptable for the services encountered:

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Table 3.9-1: Acceptable Pump Types for Specific Applications

Facilities	Minimum Setback Distance
Raw Sewage or Drainage	Non-Clog Centrifugal (Flygt N-Impeller only)
Grit	Recessed Impeller
MLSS	Propeller; Submersible, Non-Clog; or “through-the-wall” style pump
RAS and WAS	Progressing Cavity or Non-Clog Centrifugal
Liquid Chemical Metering	Diaphragm Metering or Peristaltic

17. Blowers

- a. Blower, driver, and accessories shall be provided through a single manufacturer.
- b. The blower system shall be capable of operating throughout the full design range without performance gaps and shall not exceed the nameplate motor rating over the entire range of operation
- c. Control panel(s) shall meet and be labeled pursuant to UL 508. Blowers shall be UL nameplate certified as a complete package, to the applicable UL standards.
- d. Blowers shall be capable of delivering their rated flow at its rated discharge pressure while operation within the range of environmental conditions specified herein.
- e. Blowers shall operate at least 5.0 psig from surge conditions at any operating point within the blower’s operating range. Blowers shall be capable of operating continuously and satisfactorily at any point between the minimum and maximum operating conditions without surge, vibration, hunting, overloading of motor, or excessive heating of the bearings.
- f. A blower shall not produce a sound level in excess of 90 dBA when measured 3 feet away from any part of the unit.

18. Electric Motors

- a. All electric motors shall be supplied by the driven equipment manufacturer.
- b. All electric motors shall have bearings rated for an L-10 life of 100,000 hours.
- c. Electric motors for use with variable frequency drives shall be totally enclosed, force ventilated, Class F insulation, inverter duty, with 1.15 service factor.
- d. Refer to Element 4 for additional requirements.

19. Equipment Vibration Testing

- a. Vibration testing shall be conducted on all installed rotating and/or reciprocating equipment having a driver of 50 HP or greater.
- b. Pumping equipment vibration shall not exceed HI criteria.
- c. Equipment other than pumps shall have vibrations that do not exceed ISO 1940-1 Balance Quality Grade G2.5 Criteria.

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20. Piping Systems

- a. Piping shall be located so that it is not a safety hazard, or a barrier to accessing equipment for maintenance and inspection
- b. Perform piping calculations using a coefficient for both a new pipe and an old pipe. Piping capacity should be calculated in conjunction with the RWTP hydraulic profile to ensure reasonable head loss allowances have been made in capacity determinations.
- c. Piping under structures shall be concrete encased with the encasement extending to a distance outside the structure determined by a 45 degree angle from the outside of the footing to the pipe.
- d. Gravity sewer pipe and any structure conveying raw influent, primary influent, or primary effluent shall be constructed of a material resistant to hydrogen sulfide corrosion or protected against such corrosion by other methods.
- e. Provide two couplings or flexible joints wherever piping 2 inches in diameter and larger passes from concrete to earth, to accommodate differential settlement of structures. The first coupling or joint shall be within 2 feet or one pipe diameter of the structure, whichever is greater.
- f. Joints on pressure pipelines, couplings and connections shall be restrained in accordance with applicable AWWA Standards. Concrete thrust blocks will not be allowed.
- g. Buried ferrous piping shall be corrosion protected by coating with cement mortar or other method as shown on the schedule of piping services and as recommended in the Corrosion Control Plan prepared for the Project
- h. Install a manual vent valve on the highest point and every local high point of every pipeline to be filled with liquid or to be tested hydrostatically. Indicate manual vents on plans and process and instrumentation Construction Document drawings.
- i. Install drip traps on piping and ducting systems containing air or gas that have potential for condensation collection.
- j. If piping reducers are required on the suction side of pumps, provide eccentric reducers with flat side on top.
- k. Pitch service-air and instrument-air mains downward in the direction of flow so both flow and gravity shall carry moisture to traps or water legs, which shall be placed at frequent intervals and all local low points.
- l. Gas piping shall not be concealed or located under building slabs or in crawl spaces.
- m. Do not run liquid-containing pipes over or in front of electrical rooms or equipment.
- n. Comply with the piping system requirements listed herein.

Table 3.9-2: Exposed Piping and Valve Material and Testing Requirements

Flow Stream ID	Flow Stream	Size (inches)	Pipe & Fittings	Valve Type	Test Pressure (psig)	Test Duration (min)
1W	No. 1 Water (Potable)	3" and smaller	Copper tube, ASTM B88, Type L Drawn. soldered joints with flange adapters for valves	Metallic Ball	150	60

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Flow Stream ID	Flow Stream	Size (inches)	Pipe & Fittings	Valve Type	Test Pressure (psig)	Test Duration (min)	
		3" and smaller	Galvanized Steel Pipe, ASTM A53 Schedule 40. Paint coat. Threaded joints.	Metallic Ball	150	60	
		4" - 12"	Copper tube, ASTM B88, Type L Drawn. Brazed joints with flanges for valves.	Butterfly	150	60	
			Copper Type K, DIP, C-151, CML		150		
		3" and smaller -12"+	Steel, ASTM A53		150		
AA	Aeration Air	3" and smaller	Type 304 Stainless Steel, SCH40S, ASTM A312, Threaded Joints	Globe Metallic Ball	30	120	
		4" and larger	Type 304 Stainless Steel, SCH10S, ASTM A312, Welded and Flanged Joints	Butterfly	30	120	
		3" and smaller -12"+	Steel, ASTM A53		50		
			Stainless Steel- 316 SCH10, Stainless Steel- 304 SCH10		50		
BP	Bypass	Same as process fluid					
CA	Citric Acid		PVC(1) SCH80, RPVC Tubing in PVC containment pipe type 100		100		
D	Drain		DIP, C-151, CML type 250		20		
		3" and smaller -12"+	Steel, ASTM A53		20		
	Process Drain	3" and smaller	Galvanized Steel, Schedule 40, ASTM A53, Galvanized Lining, Paint Coat, Threaded Joints	Eccentric Plug	30	120	
		4" and larger	Fabricated Steel, AWWA C200, CML, Paint Coat, Flanged and Welded Joint Or Ductile Iron, CL51, AWWA/ANSI C115/A21.15, CML, Paint Coat, Flanged Joints	Eccentric Plug	30	120	
	Pumped Drain	3" and smaller	Galvanized Steel, Schedule 40, ASTM A53, Galvanized Lining, Paint Coat, Threaded Joints	Eccentric Plug	50	120	
		4" and larger	Fabricated Steel, AWWA C200, CML, Paint Coated, Flanged and Welded Joints	Eccentric Plug	50	120	
	Tank Drain	3" and smaller	Galvanized Steel, Schedule 40, ASTM A53, Galvanized Lining, Paint Coat, Threaded Joints	Eccentric Plug	30	120	
		4" and larger	Fabricated Steel, AWWA C200, CML, Paint Coat, Flanged and Welded Joints	Eccentric Plug	30	120	
DFM	Drain Force Main		DIP, C-151, CML type 250		150		
		3" and smaller -12"+	Steel, ASTM A53		150		
			Stainless Steel -304 SCH10		150		

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Flow Stream ID	Flow Stream	Size (inches)	Pipe & Fittings	Valve Type	Test Pressure (psig)	Test Duration (min)
EFF	Effluent		PVC(1) SCH80		100	
	Primary Effluent	3" and smaller	Galvanized Steel, Schedule 40, ASTM A53, Galvanized Lining, Paint Coat, Threaded Joint	Eccentric Plug	30	120
		4" and larger	Fabricated Steel, AWWA C200, CML, Paint Coat, Flanged and Welded Joints	Eccentric Plug	30	120
	Secondary Effluent	3" and smaller	Galvanized Steel, Schedule 40, ASTM A53, Galvanized Lining, Paint Coat, Threaded Joints	Gate or Butterfly	30	120
		4" and larger	Fabricated Steel, AWWA C200, CML, Paint Coat, Flanged and Welded Joints	Gate or Butterfly	30	120
	Tertiary Filter Effluent	3" and smaller	Galvanized Steel, Schedule 40, ASTM A53, Galvanized Lining, Paint Coat, Threaded Joint	Metallic Ball	25	120
		4" – 42"	Fabricated Steel, AWWA C200, CML, Paint Coated Flanged and Welded Joints	Butterfly	25	120
	Final Effluent	3" and smaller	Galvanized Steel, Schedule 40, Galvanized Lining, Paint Coat, Threaded Joint	Metallic Ball	25	120
		4" and larger	Fabricated Steel, AWWA C200, CML, Paint Coat, Flanged and Welded Joint	Butterfly	25	120
	Thickener Effluent	3" and smaller	Galvanized Steel, Schedule 40, ASTM A53, Galvanized Lining, Paint Coat, Threaded Joints	Eccentric Plug	50	120
		4" and larger	Fabricated Steel, AWWA C200, CML, Paint Coat, Flanged and Welded Joints	Eccentric Plug	50	120
FA	Foul Air	3" – 12", 14"-30"	FRP, Halogenated Polyester with 5 percent Antimony Trioxide Fire Retardant. Add UV Inhibitor to Surface Coat. 20 mil, 90 percent Resin, Surface Mat. Min Wall 0.125 in thick to 20 in DIA: 0.187 in thick above 20 in DIA.	PVC Body Butterfly	5	60
			FRP Ducting		15	
FM	Forcemain	N/A				
GR	Grit		DIP C-151 Glass lined type 250, Steel ASTM A106 Glass lined SCH80		N/A	
MGH	Magnesium Hydroxide		PVC(1) SCH80, RPVC Tubing in PVC Containment pipe type 100		100	
MLR	Mixed Liquor Recycle		Stainless Steel-304 SCH10		50	
MLT	Mixed Liquor Transfer	4" and smaller	Fabricated Steel, AWWA C200, Fusion Bonded Epoxy Lined and Coated, Flanged and Welded Joints	Eccentric Plug	50	120

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Flow Stream ID	Flow Stream	Size (inches)	Pipe & Fittings	Valve Type	Test Pressure (psig)	Test Duration (min)
		6" and larger	Fabricated Steel, AWWA C200, CML, Paint Coated, Flanged and Welded Joints	Eccentric Plug	50	120
		3" and smaller -12"+	Steel, ASTM A53		50	
			Stainless Steel- 304 SCH10		50	
OF	Overflow	4" -12"	Fabricated Steel, AWWA C200, CML, Paint Coated, Flanged and Welded Joints	Butterfly	50	120
		14" and larger	Fabricated Steel, AWWA C200, CML, Paint Coated, Flanged and Welded Joints	Butterfly	50	120
		3" and smaller -12"+	Steel, ASTM A53		20	
			Stainless Steel- 304 SCH10		20	
PRM	Permeate	3" and smaller -12"+	Steel, ASTM A53		50	
RAS	Recycled Activated Sludge	4" and larger	Fabricated Steel, AWWA C200, CML, Paint Coated, Flanged and Welded Joints	Eccentric Plug	50	120
		3" and smaller -12"+	Steel, ASTM A53		50	
			Stainless Steel- 304 SCH10		50	
RW	Recycled Water	3" and smaller -12"+	Steel, ASTM A53		150	
	Chlorinated Recycled Water	3" and smaller	Galvanized Steel, Schedule 40, ASTM A53, Galvanized Lining, Paint Coat, Threaded Joints	Metallic Ball	200	120
		4" - 12"	Fabricated Steel, AWWA C200, CML. Paint coat. Flanged and welded joints or DIP, AWWA C151, CML, paint coat. Flanged fittings	Butterfly	200	120
SC	Screenings	3" and smaller -12"+	Steel, ASTM A53		20	
			Stainless Steel- 304 SCH10		20	
SCWW	Screened Wastewater	3 and smaller	Galvanized Steel, Schedule 40, ASTM A53, Galvanized Lining, Paint Coat, Threaded Joints	Eccentric Plug	100	120
		4 and larger	Ductile Iron, CL51, AWWA/ANSI C115/A21.15, CML, Paint Coat, Flanged Joints	Eccentric Plug	100	120
		3" and smaller -12"+	Steel, ASTM A53		20	
			Stainless Steel- 304 SCH10		20	
SCUM	Scum		DIP C-151 Glass lined type 250, Steel ASTM A106 Glass lined type SCH80		20	

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Flow Stream ID	Flow Stream	Size (inches)	Pipe & Fittings	Valve Type	Test Pressure (psig)	Test Duration (min)
	Primary Scum	3" – 12"	Steel, ERW, Grade B, Black, SCH 40, ASTM A53, Glass Lined, Paint Coat, Flanged Joint	Glass-lined Eccentric Plug	200	120
	Secondary Scum	4" – 12"	Steel, ERW, Grade B, Black, SCH 40, ASTM A53, Glass Lined, Paint Coat, Flanged Joint	Glass-lined Eccentric Plug	200	120
SD	Storm Drain	N/A				
SH	Sodium Hypochlorite		PVC (1) SCH80, RPVC Tubing in PVC containment pipe type 100		100	
		3" and smaller	PVC, ASTM D1784, Class 12454-B, ASTM D1785, SCH 80, Paint Coat, Solvent Welded joints	PVC, Vented Ball or Diaphragm	150	120
		4" and larger		Diaphragm	150	120
SM	Sample	3" and smaller	PVC, ASTM D1784, Class 12454-B, ASTM D1785, SCH 80, Paint Coat, Solvent Welded Joints	PVC Ball	200	120
		4" and larger		Diaphragm	200	120
			PVC (1) SCH 80		20	
SN	Supernatant	ALL	Ductile Iron, CL51, AWWA/ANSI C115/A21.15, Glass Lined, Paint Coat, Flanged Joints or Grooved Couplings	Glass-lined Eccentric Plug	100	120
SS	Sanitary Sewer	3" and less	Galvanized Steel, Schedule 40, ASTM A53, Galvanized Lining, Paint Coat, Threaded Joints	Not Used		
		4"-6"	No-hub cast iron soil pipe with standard duty stainless steel couplings	Not Used		
TS	Thickened Sludge	4" – 12"	Steel, ERW, Grade B, Black, SCH 40, ASTM A53, CML, Paint Coat, Flanged Joint Or Ductile Iron, CL51, AWWA/ANSI C115/A21.15, CML, Paint Coat, Flanged Joints	Eccentric Plug	200	120
			Stainless Steel-316 SCH10		20	
UW	Plant Utility Water	3" and smaller -12"+	Steel, ASTM A53		150	
			Brass, Stainless Steel-304 SCH10		150	
V	Vent	3 and smaller	Galvanized Steel, Schedule 40, ASTM A53, Galvanized Lining, Paint Coat, Threaded Joints	Not Used		
		3" and smaller -12"+	Steel, ASTM A53		20	

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Flow Stream ID	Flow Stream	Size (inches)	Pipe & Fittings	Valve Type	Test Pressure (psig)	Test Duration (min)
	Chemical Vent	3 and smaller	PVC, ASTM D1784, Class 12454-B, ASTM D1785, SCH 80, Paint Coat, Solvent Welded Joints	Not Used	200	120
WW	Wastewater		DIP C-151 CML		20	
		3" and smaller -12"+	Steel, ASTM A53		20	
		3" and smaller	Galvanized Steel, Schedule 40, ASTM A53, Galvanized Lining, Paint Coat, Threaded Joints	Eccentric Plug	100	120
		4" and larger	Ductile Iron, CL51, AWWA/ANSI C115/A21.15, CML, Paint Coat, Flanged Joints	Eccentric Plug	100	120
WWFM	Wastewater Forcemain	3" and smaller -12"+	Steel, ASTM A53		50	
			Stainless Steel -304 SCH10		50	
WAS	Waste Activated Sludge	3" and smaller	Galvanized Steel, Schedule 40, ASTM A53, Galvanized Lining, Paint Coat, Threaded Joint	Eccentric Plug	50	120
		4" and larger	Fabricated Steel, AWWA C200, CML, Paint Coat, Flanged and Welded Joints or Ductile Iron, CL51, AWWA/ANSI C151/A21.15, paint coat. Flanged fittings.	Eccentric Plug	50	120
		3" and smaller -12"+	Steel, ASTM A53		50	

Table 3.9-3: Buried Piping and Valve Material and Testing Requirements

Flow Stream ID	Flow Stream	Size (inches)	Pipe & Fittings	Valve Type	Test Pressure (psig)	Test Duration (min)
1W	No 1. Water (Potable)	4" and smaller	PVC, ASTM D1784, Class 12454-B, ASTM D1785, SCH 80. Solvent welded joints, flanges for valves.	Gate	150	60
		4" - 12"	Copper tube, ASTM B88, Type K. Brazed joints with flanges for valves.	Gate	150	60
			DIP, C-151, CML, PVC (1), HDPE, Solid Wall, C-906, Copper		150	
AA	Aeration Air	3" and smaller	Type304 Stainless Steel, SCH40S, ASTM A312, Threaded Joints	Not Used	30	120

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Flow Stream ID	Flow Stream	Size (inches)	Pipe & Fittings	Valve Type	Test Pressure (psig)	Test Duration (min)
		4" and larger	Type 304 Stainless Steel, SCH10S, ASTM A312, Welded and Flanged Joints	Not Used	30	120
			Stainless Steel-316 SCH10		50	
BP	Bypass	Same as process fluid				
CA	Citric Acid		RPVC Tubing in PVC containment pipe type 100		100	
D	Drain		PVC Gravity Sewer pipe SDR-35, HDPE profile wall RSC-63		20	
	Process Drain	3" and smaller	PVC Pipe, ASTM D3034, SDR 26, Rubber Gasket Joints	Not Used	30	120
		4" and larger	PVC Pipe, ASTM F679, PS46, Rubber Gasketed Joints	Eccentric Plug	30	120
	Pumped Drain	3" and smaller	PVC, ASTM D1784, Class 12454-B, ASTM D1785, SCH 80, Solvent Welded Joints	Eccentric Plug: 5.5.10.4	50	120
		4" and larger	Fabricated Steel, AWWA C200, CML, CMC, Welded Joints with Restrained Rubber Gasket or Dresser Joints as necessary	Eccentric Plug: 5.5.10.4	50	120
	Tank Drain	3" and smaller	PVC, ASTM D1784, Class 12454-B, ASTM D1785, SCH 80, Solvent Welded Joints	Eccentric Plug	30	120
		4" and larger	Fabricated Steel, AWWA C200, CML, CMC, Welded Joint with Restrained Rubber Gasket or Dresser Joints as necessary	Eccentric Plug	30	120
DFM	Drain Force Main		HDPE solid wall C-906 DR-11		150	
EFF	Effluent		PVC (1) SCH80, PVC C-900,905 DR-18, HDPE solid wall C-906 DR-11		100	
	Pond Effluent	All	Reinforced Concrete, ASTM C76, Minimum Class 3, Rubber Gasketed Joint, Manholes at Change in Direction	N/A	125	120

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Flow Stream ID	Flow Stream	Size (inches)	Pipe & Fittings	Valve Type	Test Pressure (psig)	Test Duration (min)
	Primary Effluent	3" and smaller	PVC, ASTM D1784, Class 12454-B, ASTM D1785, SCH 80, Solvent Welded Joints	Eccentric Plug	30	120
		4" and larger	Fabricated Steel, AWWA C200, CML, CMC, Welded Joints with Restrained Rubber Gasket or Dresser Joints where necessary	Eccentric Plug	30	120
	Secondary Effluent	3" and smaller	PVC, ASTM D1784, Class 12454-B, ASTM D1785, SCH 80, Solvent Welded Joints	Gate or Butterfly	30	120
		4" and larger	Fabricated Steel, AWWA C200, CML, CMC, Welded Joint with Restrained Rubber Gasket or Dresser Joints as necessary	Gate or Butterfly	30	120
	Tertiary Filter Effluent	3" and smaller	PVC, ASTM D1784, Class 12454-B, ASTM D1785, SCH 80, Solvent Welded Joints	Not Used	25	120
		4"-42"	Fabricated Steel, AWWA C200, CML, CMC, Welded Joints with restrained Rubber Gasket or Dresser Joint as needed	Butterfly	25	120
	Final Effluent	3" and smaller	PVC, ASTM D1784, Class 12454-B, ASTM D1785, SCH 80, Solvent Welded Joints	Gate or Butterfly	25	120
		4" and larger	Fabricated Steel, AWWA C200, CML, CMC, Welded Joints with restrained Rubber Gasket or Dresser Joint as needed	Gate or Butterfly	25	120
	Thickener Effluent	3" and smaller	PVC, ASTM D1784, Class 12454-B, ASTM D1785, SCH 80, Solvent Welded Joints	Eccentric Plug	50	120

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Flow Stream ID	Flow Stream	Size (inches)	Pipe & Fittings	Valve Type	Test Pressure (psig)	Test Duration (min)
		4" and larger	Fabricated Steel, AWWA C200, CML, CMC, Welded Joint with Restrained Rubber Gasket or Dresser Joints as necessary	Eccentric Plug	50	120
FA	Foul Air	3"-12"	PVC, ASTM D3034, SDR 35, Rubber Gasketed Joint	Not Used	5	60
		14"-30"	PVC, ASTM F679, SDR 35, Rubber Gasketed Joint	Not Used	5	60
			FRP Ducting, HDPE solid wall C-906 DR-17, HDPE Profile wall RSC-63		15	
FM	Forcemain		HDPE Solid wall C-906 DR-11		150	
GR	Grit	N/A				
IRR	Irrigation					
MC	Micro-C					
MGH	Magnesium Hydroxide		RPVC Tubing in PVC Containment Pipe type 100		100	
MLR	Mixed Liquor Recycle	N/A				
MLT	Mixed Liquor Transfer	6" and larger	Fabricated Steel, AWWA C200, CML, CMC, Welded Joints with Restrained Rubber Gasket, or Dresser Joints as necessary	Not Used	50	120
			PVC C-900,905 DR-18, HDPE solid wall C-906 DR-11		50	
OF	Overflow	4 -12	Ductile Iron, CL51, AWWA/ANSI C151/A21.15, CML, Polyethylene Bagged, Restrained Push-on or Mechanical Joints	Not Used	25	120
		14 and larger	Fabricated Steel, AWWA C200, CML, CMC, Welded Joints with Restrained Rubber Gasket or Dresser Joints where necessary	Not Used	25	120
			Steel AWWA C200 CML&C 1/4" wall, PVC C-900,905 DR-18		20	
PRM	Permeate		PVC Gravity Sewer pipe SDR-35, HDPE profile wall RSC-63		50	
RAS	Recycled Activated Sludge	4" and larger	Fabricated Steel, AWWA C200, CML, CMC, Welded Joints with Restrained Rubber Gasket or Dresser Joints where necessary	Eccentric Plug: 5.5.10.4	50	120
			PVC C-900,905 DR-18, HDPE solid wall C-906 DR-11		50	

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Flow Stream ID	Flow Stream	Size (inches)	Pipe & Fittings	Valve Type	Test Pressure (psig)	Test Duration (min)
RW	Recycled Water		PVC C-900,905 DR-18, HDPE solid wall C-906 DR-11		150	
	Chlorinated Recycled Water	4" and smaller	PVC, ASTM D1784, Class 12454-B, ASTM D1785, SCH 80. Solvent welded joints, flanges for valves.	Gate	200	120
		6" and larger	PVC, AWWA C900-07, Class 305. Restrained push-on joints, restrained mechanical joints at valves and fittings.	Gate	200	120
SC	Screenings	N/A				
SCWW	Screened Wastewater	3" and smaller	PVC, ASTM D1784, Class 12454-B, ASTM D1785, SCH 80, Solvent Welded Joints	Not Used	100	120
		4" and larger	Ductile Iron, CL51, AWWA/ANSI C151/A21.15, CML, Polyethylene Bagged, Restrained Push-on or Mechanical Joints	Eccentric Plug	100	120
			PVC C-900,905 DR018, PVC Gravity Sewer Pipe SDR-35		20	
SCUM	Scum		DIP C-151 Glass lined type 250, Steel ASTM A106 Glass lined type SCH80		20	
	Primary Scum	3" – 12"	Fabricated Steel, AWWA C200, Glass Lined, Tape Wrapped, Victaulic Coupling Joint	Glass-lined Eccentric Plug	200	120
	Secondary Scum	4" – 12"	Fabricated Steel, AWWA C200, Glass Lined, Tape Wrapped, Victaulic Coupling Joint	Glass-lined Eccentric Plug	200	120
SD	Storm Drain	All	Reinforced Concrete, ASTM C76, Class 3, Rubber Gasketed Joint	Not Used		
			PVC Gravity Sewer pipe SDR-35, HDPE profile wall RSC-63		20	
SH	Sodium Hypochlorite		RPVC Tubing in PVC containment pipe type 100		100	
		3" and smaller	PVC, ASTM D1784, Class 12454-B, ASTM D1785, SCH 80, Solvent Welded Joints, Double	Not Used	150	120
		4" and larger	Containment System			

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Flow Stream ID	Flow Stream	Size (inches)	Pipe & Fittings	Valve Type	Test Pressure (psig)	Test Duration (min)
SM	Sample	3" and smaller	PVC, ASTM D1784, Class 12454-B, ASTM	Not Used	200	120
		4" and larger	D1785, SCH 80, Solvent Welded Joints		200	120
			PVC (1) SCH 80		20	
SN	Supernatant	All	Ductile Iron, CL51, AWWA/ANSI C151/A21.15, Glass Lined, Polyethylene Bagged, Restrained Mechanical Joints	Glass-lined Eccentric Plug	100	120
			PVC Gravity Sewer pipe SDR-35		20	
SS	Sanitary Sewer	4"-6"	Beneath structures: No- hub cast iron soil pipe with standard duty stainless steel couplings			
		4"-6"	Yard: PVC Pipe, ASTM D3034, SDR 26, Rubber Gasketed Joints			
			HDPE, Profile wall RSC-63		20	
TS	thickened Sludge	4"-12"	Fabricated Steel, AWWA C200, CML, Tape Wrapped, Victaulic Coupling Joints	Eccentric Plug	200	120
			Stainless Steel-316 SCH10		20	
UW	Plant Utility Water		PVC (1) SCH 80, PVC C-900, 905 DR-18, HDPE Solid Wall C-906 DR-11		150	
V	Vent	N/A				
	Chemical Vent	3" and smaller	PVC, ASTM D1784, Class 12454-B, ASTM D1785, SCH 80, Solvent Welded Joints	Not Used	200	120
WW	Wastewater		PVC Gravity Sewer pipe SDR-35, HDPE solid wall C-906 Dr-11		20	
		3" and smaller	PVC, ASTM D1784, Class 12454-B, ASTM D1785, SCH 80, Solvent Welded Joints	Eccentric Plug	100	120
		4" and larger	Ductile Iron, CL51, AWWA/ANSI C151/A21.15, CML, Polyethylene Bagged, Restrained Push-on or Mechanical Joints	Eccentric Plug	100	120
WWFM	Wastewater Forcemain		PVC C-900,905 DR-18, HDPE solid wall C-906 DR-11		50	
WAS	Waste Activated Sludge	3" and smaller	PVC, ASTM D1784, Class 12454-B, ASTM D1785, SCH 80, Solvent Welded	Eccentric Plug	50	120

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Flow Stream ID	Flow Stream	Size (inches)	Pipe & Fittings	Valve Type	Test Pressure (psig)	Test Duration (min)
			Joints			
		4" and larger	Fabricated Steel, AWWA C200, CML, CMC, Welded Joints with Restrained Rubber Gasket or restrained Dresser Joints where necessary	Eccentric Plug	50	120
			PVC C-900,905 DR-18, HDPE solid wall C-906 DR-11		50	

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o. Yard Piping

- i) Shall comply with the Corrosion Control Design and Construction Standards.
- ii) Gravity pipelines four (4) inches and less in diameter shall have cleanouts to grade located at changes in direction, and at no less than 300-foot intervals in straight sections of pipe.
- iii) Gravity sewer and storm drain pipelines six (6) inches or greater in diameter shall have manholes located at changes in direction, and at no less than 300-foot intervals in straight sections of pipe. Manholes shall be constructed per District Standards.
- iv) Gravity pipelines shall be designed to provide a minimum velocity of 2 fps when flowing full.
- v) Minimize pressure piping with high and low points. When they are unavoidable, provide air and vacuum relief valves at high, and drains or blowoffs at low points.
- vi) Pipe bedding shall be suitable for pipe material, soil conditions and depth of cover as directed by manufacturer recommendations or applicable standards, whichever is more stringent.
- vii) Flexible pipe connection adaptors shall be provided at manholes and catch basins.
- viii) Provide backflow prevention for fire or service water pipelines.

p. Flanges and Pipe Threads

- i) Flanges shall conform in dimensions and drilling to ANSI B 16.1, Class 125.
- ii) Flange assembly bolts shall be heavy pattern, hexagonal head, carbon steel machine bolts with heavy pattern, hot-pressed, hexagonal nuts conforming to ANSI B18.2.1 and B18.2.2.
- iii) Pipe threads shall conform in dimension and limits of size to ANSI B 1.1, coarse thread series, Class 2 fit.
- iv) Threads shall be Uniform Screw Threads, Standard Coarse Thread Series, Class 2A and 2B, ANSI B1.1.

q. Piping Connections

- i) Connection of ferrous to nonferrous metal piping shall be with a dielectric flanged connection or union.
- ii) Where piping passes through walls, provide disassembly couplings within 1.5 feet of the wall.
- iii) Provide a screw union or flanged disassembly connection within 1.5 feet of each threaded end valve.
- iv) For pipelines 2½ inches in diameter and larger, provide a disassembly grooved-end, mechanical-type (Victaulic) coupling or screw union connection on each valve end.
- v) Provide flexible connections for assembly and disassembly of piping and for connections to designated non-thrust-accepting equipment such as pumps and

blowers. Provide adequate thrust restraint at each flexible coupling.

- vi) Install flexible pipe connections at the suction and discharge of all blowers to minimize pipe vibration and allow easier pipe removal for maintenance.
- vii) Provide stainless steel braided flexible tubing on air compressors.

r. Piping Identification

- i) Exposed piping (interior and exterior) and piping in pipe chases, shall be identified with plastic legend markers and directional arrows located at each side of the walls, floorings, and ceilings, at one side of each piece of equipment, at piping intersections, and at approximately 50-foot centers. Markers shall be securely attached to pipe by mechanical means (no adhesives). Markers shall be UV resistant plastic and printed with UV resistant ink. Markers shall comply with latest version of ANSI/ASME A13.1 with the addition of purple background and white letters for recycled water.
- ii) Buried piping shall be installed with tracer tape placed along the centerline and 24 inches below grade. Tracer tape colors shall comply with ANSI/ASME A13.1-2007 with the addition of purple background and white letters for recycled water. Tape shall be inert plastic suitable for direct burial. Tracer tape for plastic pipes shall be magnetic. Tracer tape.

s. Pipe Supports

- i) All piping and its components and appurtenances including bracing, supports and anchorages, shall be designed for wind and seismic forces per the CBC.
- ii) Provide seismic restraint and anchorage load calculations for each pipe system.
- iii) Piping support design, seismic and wind support calculations shall be performed by a professional structural or civil engineer, registered to practice in the State of California.

t. Piping Accessories

- i) Gauges
 - Pressure gauges, vacuum gauges, compound gauges, and temperature gauges shall be provided on equipment and piping to indicate the various conditions of the respective services. Temperature gauges shall be mounted in thermal wells.
 - Pressure gauges shall be installed on the suction and discharge of all pumps, blowers, and compressors; on air receiver tanks, surge tanks, and both sides of pressure reducing valves; and wherever required by process equipment.
 - All gauges shall be installed with the face in the vertical position, and in strict accordance with the manufacturer's recommendations. Care shall be taken to minimize the effect of water hammer or vibrations on the gauges.
 - Gauges shall be industrial quality type with Type 316 stainless steel internal parts and cases, and a 3½-inch-diameter face, minimum.
 - Gauges shall have an accuracy of ±1 percent and read to 150 percent of

the working pressure of the system or vessel to which they are connected.

- All pressure and vacuum gauges shall be isolated by separate shut-off valves and fitted with snubbers.
- Gauges attached to systems involving chemical solutions, corrosive fluids, sludge, sewage, or other liquids containing solids, shall be equipped with diaphragm seals.
- For sewage, sludge, and scum lines in sizes 4-inch through 24-inch, sleeved pressure gauges shall be used.

ii) Expansion Joints

- Provide expansion joints together with control rods and restraint, where required, to accommodate pipe movement due to temperature changes. Size control rods for the piping system pressure.
- Grooved-end, mechanical-type (Victaulic) couplings, where appropriate, may be used to relieve thermal stresses in piping systems.

21. Valves & Gates

- a. Valve types shall be as designated in the Piping and Valve Material and Testing tables herein. Valves of the same size and service shall be provided by a single valve manufacturer.
- b. Plug valves and butterfly valves shall include position indicators.
- c. Provide adequate clearances for rising stem valves and gates. Stems shall be provided with clear covers that are resistant to UV degradation (yellowing, cloudiness, loss of plasticity).
- d. Provide each valve with 1.5-inch diameter .025-inch thick Type 304 stainless steel Identification tags with valve number engraved with ¼-inch high numbers/letters. Attach to valve with type 304 stainless steel chain.

22. Metallic Ball Valves

- a. Ball valves 2 inches and smaller shall be threaded, full bore, shall have bronze, brass, or stainless steel bodies, balls and stems, and Teflon seats at both ends. Valves shall be rated at 300 psi and shall be so constructed as to make positive shutoff with flow in either direction.
- b. Ball valves larger than 2 inches shall be flanged, full bore, shall have carbon steel or ductile iron bodies, balls and stems, and Teflon seats at both ends. Valves shall be rated at 275 psi and shall be so constructed as to make positive shutoff with flow in either direction.

23. Plastic Ball Valves

- a. Materials - body, stem, ball, handle, end connectors: PVC ASTM D1784-1245B; ball seat: Teflon; O-rings: Viton. Provide vented ball for sodium hypochlorite service.
- b. Design: true union
- c. Rating: 150 psi at 75 degrees F

24. Ball Valves in Instrument Air Service

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- a. Body, stem, ball, and support rings: 316 stainless steel
 - b. Seats: 316 stainless steel (hard) or Teflon or Delrin (soft). Only use soft seats on applications where manufacturer's temperature and pressure ratings exceed process design conditions.
 - c. Body wall thickness shall be sufficient for process design conditions per ASME B31.1.
25. Butterfly Valves for Water Service
- a. Butterfly valves shall comply with AWWA C504.
 - b. Body: Cast Iron, ASTM A126, Grade B or ductile iron, ASTM A536
 - c. Butterfly valve shafts shall be stainless steel, ASTM A276, Type 304 or ASTM A582, Type 416. Seat mating surfaces shall be stainless steel, ASTM A276, Type 18-
 - d. 8. Seat sealing surface shall be neoprene or Buna-N.
 - e. Discs shall be ductile iron, ASTM A536 or cast iron, ASTM A48, Class 40 or ASTM A126, Class B, or stainless steel Type 316, ASTM A276.
 - f. Butterfly valves shall be used for isolating service on water, air, and gas service applications.
26. Butterfly Valves for Foul Air Service
- a. Butterfly valves shall be of the through-shaft design and comply with AWWA C504.
 - b. Shaft: Stainless steel, ASTM A276, Type 304
 - c. Body: rigid PVC
 - d. Seat: EPDM
 - e. Disc: polypropylene with encapsulated metal reinforcing insert
27. Eccentric Plug Valves
- a. Plug valves shall comply with AWWA C517.
 - b. Eccentric plug valves shall be full-flow, non-lubricated, resilient plug type suitable for drip-tight, bi-directional shutoff.
 - c. Valve upper and lower journal bearings shall be replaceable, sleeve-type, corrosion-resistant, and permanently lubricated.
 - d. Eccentric plug valves larger than 3 inches shall be flanged with welded in nickel overlay seats.
 - e. Eccentric plug valves shall be used for all piping services in which the wastewater or wastewater solids.
28. Gate Valves
- a. Gate valves shall be resilient wedge gate valves complying with AWWA C509 or AWWA C515, including hydrostatic testing requirements.
 - b. All exposed gate valves shall be rising stem type.
 - c. All buried or submerged valves shall be non-rising stem type.

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29. Diaphragm Valves

- a. All diaphragm valves shall be weir type, 150 psi rated with flanged end connection.
- b. Materials
 - a. Body: PVC with reinforcing ribs at end connections
 - b. Diaphragm: Teflon with EPDM backing.
 - c. Bonnet and hand wheel: reinforced polypropylene
 - d. Stem: stainless steel with adjustable stainless steel travel stop nut

30. Swing Check Valves

- a. Comply with AWWA C508.
- b. Clear opening shall be equal to or greater than connecting piping.
- c. Materials
 - i) Body and cover: Cast iron, ASTM A126, Class B
 - ii) Disc: Cast iron, ASTM A126, Class B
 - iii) Seat rings: Bronze, AWWA C508
 - iv) Hinge shafts and hinge pins: Stainless steel, ASTM 276, Type 304
 - v) Shaft bushings: Bronze, AWWA C50

31. Slide Gates

- a. Comply with AWWA C561.
- b. All gates shall be rising stem.
- c. Slide plate, plate reinforcement and frames: apply a safety factor of 5.0 with regard to ultimate tensile, compressive and shear strength.
- d. Materials:
 - i) Frame, slide plate, rails and yoke: ASTM A240 or ASTM A276, Type 316L stainless steel. Minimum thickness: 1/4 IN.
 - ii) Lifting nut and thrust nut: ASTM B584 bronze
 - iii) Top and slide seals: Neoprene J-seals per ASTM D2000 or UHMWPE per ASTM D4020 (with compression cord).
 - iv) Bottom seal: Neoprene per ASTM D2000, Grade 2 BC-510 or Grade 2 BC-625.
 - v) Stems, stem guides, stem couplers, bolts, studs, fasteners and anchor bolts: ASTM A276 Type 316 stainless steel.
 - vi) Stem cover: Polycarbonate per ASTM D3935.

32. Manual Valve and Gate Actuators

- a. All manual valves and gates shall be provided with manual operators.
- b. Manual actuators shall require a maximum pull of 80 lbs. at the maximum pressure

- rating of the valve.
- c. All exposed valves with centerlines more than 7 feet 6 inches above the floor shall be provided with chain wheels and operating chains.
 - d. Wrench nuts shall be provided on all buried valves, on all valves that are to be operated through floor boxes, and where otherwise required.
33. Valve and Gate Actuators
- a. All powered actuators shall be from the same manufacturer.
 - b. Control power: Provide by an integral 120 volts AC, single-phase control transformer unless a separate power source is shown on the electrical Contract Drawings. Size transformer to operate at not more than 80% of rating with the connected load shown and include protective secondary fusing.
 - c. Provide actuators with an integral control station.
 - d. Include "Local –Stop-Remote" selector switch and "Open-Close" selector switch.
 - e. Momentary operation of the "OPEN" or "CLOSE" switch shall causes the actuator to drive the valve or gate to the appropriate limit. Software configuration shall allow push-to-run operation where desirable.
 - f. Momentary operation of the "STOP" pushbutton shall causes the operator to stop.
 - g. Provide terminals for remote "OPEN" and "CLOSE" pushbuttons.

3.10. HVAC & Plumbing Design and Construction Requirements.

This Section describes the heating, ventilation, and air conditioning (HVAC) design and construction Requirements for the structural design of the project. If the following requirements overlap or conflict with requirements contained in other sections or with governing codes, standards, or manufacturer's directions and instructions, the stricter interpretation or the District's directive shall govern.

3.10.1. Codes and Standards

The following codes and standards, latest editions, apply to this project:

1. California Mechanical Code (CMC), latest edition.
2. California Building Code (CBC), latest edition.
3. California Energy Code (CEC), latest edition.
4. California Plumbing Code (CPC), latest edition.
5. American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) Standard 90.1. Energy Standard for Buildings Except Low Rise Residential Buildings.
6. ASHRAE Standard 62.1. Ventilation for Acceptable Indoor Air Quality.
7. ASHRAE, HVAC Applications Handbook.
8. National Fire Protection Association (NFPA) Standard 90A, "Installation of Air Conditioning and Ventilation Systems."
9. American Conference of Governmental Industrial Hygienists (ACGIH), Industrial Ventilation:

Handbook of Recommended Practice.

10. American Industrial Hygiene Association (AIHA) ANSI/AIHA Standard Z9.5-93, Laboratory Ventilation.
11. California Code of Regulations (CCR) Title 24 Energy Efficiency Standards.
12. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) Duct Construction Standards- Metal and Flexible.
13. U.S. Department of Labor Occupational Safety and Health Act (OSHA).
14. NFPA Standard 820, Standard for Fire Protection in Wastewater Treatment and Collection Facilities.
15. SMACNA- Thermostat FRP Duct Construction Manual.

3.10.2. HVAC System Design

1. The HVAC system shall be designed based on three (3) work space type designation:
 - a. Work Space Type 1: This is for areas where no heating is required to prevent freezing or extreme temperatures or where work is done on an intermittent or short-term basis.
 - b. Work Space Type 2: This is for area with minimal comfort. Type 2 areas shall have a design inside heating temperature of 68 °F and a design inside cooling temperature of 85 °F.
 - c. Work Space Type 3: Type 3 provides comfort heating and cooling under all anticipated ambient conditions for normally occupied office/laboratory/work areas. Type 3 space shall have a design inside heating temperature of 68 °F and a design inside cooling temperature of 75 °F.
2. Ventilation: Ventilation systems shall be designed using the minimum ventilation criteria as shown below or the applicable local code, whichever is more stringent:
 - a. Covered or enclosed wet wells, sumps, channels, and process tankage: Per NFPA 820, latest edition.
 - b. Chemical storage and process areas: 10 air changes per hour, 100 percent outside air, per occupancies as determined by CBC, or to control heat gain (no greater than 10° above ambient).
 - c. Mechanical rooms: 6 air changes per hour, 100 percent outside air, or to control heat gain, or as required to maintain space temperature at 10 °F above ambient.
 - d. Office areas, minimum: Per ASHRAE 62.1. Work Space Type 3.
 - e. Sample preparation areas, minimum: Per Industrial Ventilation Handbook of Recommended Practice. Work Space Type 3.
 - f. Electrical rooms: Per ASHRAE 62.1. Work Space Type 2.
 - g. Process areas: To meet NFPA 820 requirements.

- h. Higher ventilation rates are sometimes required to control corrosion, improve odor collection, or improve the space for occupancy safety or comfort. Designs shall consider practices to reduce higher ventilation rates, which result in higher operating costs and higher capital cost
3. Clean spaces shall be designed to have positive pressure relative to potentially odorous or hazardous spaces. Clean spaces include laboratories area, electrical rooms, office areas, equipment rooms without gas handling equipment, or equipment rooms not exposed to wastewater. Positive pressure shall be achieved by supplying more air than exhausting.
4. All NFPA 820 classified spaces are required to have a negative pressure of 0.1 inch WC. For exhaust only systems, design the intake system for a 0.1 inch WC pressure drop. For systems using supply and exhaust fans, design the exhaust system with slightly greater static pressure than required. Indicate the desired space positive or negative pressure on the drawings.
5. All HVAC floor mounted equipment shall be installed on concrete equipment pad.
6. Curb mounted equipment, including rooftop ventilating equipment shall be mounted on vibration isolation bases that fit over the curb and under the isolated equipment.

3.11. SCADA Design and Construction Requirements

SCADA design of the RWTP shall be coordinated with the design of the Influent PS and force mains. Refer to Element 4 for SCADA requirements.

3.12. Electrical Design and Construction Requirements

The purpose of this section is to stipulate design and construction standards relating to the electrical equipment at the RWTP. Electrical design of the other Project Elements shall be per Project Element 4 requirements. If the following requirements overlap or conflict with requirements contained in other sections or with governing codes, standards, or manufacturer's directions and instructions, the stricter interpretation or the District's directive shall govern.

3.12.1. Electrical Distribution

The DB Entity will be responsible for securing electrical service for both the treatment plant site and the pump station site. For each site, the DB Entity will need to complete on-line PG&E applications for service, listing loads for PG&E to determine service size and service location. As part of this application, the DB Entity will need to produce and submit single line diagrams to PG&E. System maps for PG&E encompassing the pump station and treatment plant sites can be found in Attachment B. All PG&E fees will be paid by the DB Entity.

PG&E Engineering will produce drawings for the services. The DB Entity will have the option to install the facilities under the supervision of PG&E or have PG&E install facilities. This is to be determined and coordinated by the DB Entity.

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For the treatment plant site, it is anticipated that the service will come from a 12-kV distribution line at the T-intersection of Sand Hill Road, near the Sharon Heights Golf club house. A transformer will be required to step down to the service required for the treatment plant. It is anticipated the transformer and other PG&E hardware will be pad mounted and placed in close proximity of the treatment plant. The electrical service is anticipated to be a 1,000 amp service.

Securing PG&E service is a lengthy and time consuming process which the DB Entity is highly encouraged to start as soon as electrical loads are determined, and single line diagrams completed, for each site.

3.12.2. Codes and Standards:

All electrical work shall be performed in the accordance with the most current version of the following:

- All work shall be performed in accordance with the Local, State, County standards, and local Pacific Gas and Electric (PG&E) codes
- California Building Code (CBC)
- California Code of Regulations (CCR)
- California Electrical Code (CEC)
- American National Standard Institute (ANSI)
- International Society of Automation (ISA) Standards (formerly The Instrumentation, Systems, and Automation Society and Instrument Society of America)
- National Fire Protection Association (NFPA) and National Electrical Code (NEC)
- Design to comply with requirements for NFPA 820-2012 edition and NFPA 70- 2011 Edition
- National Electrical Manufacturers Association (NEMA)
- Occupational Safety and Health Administration Standards (OSHA)
- Underwriters Laboratories, Inc.

3.12.3. Area Electrical Classifications:

Conditioned or Dry Locations: Materials, equipment, and incidentals in areas considered as conditioned/dry space shall meet NEC and NEMA requirements for dusty locations. All conditioned space areas shall be considered dry locations. Enclosures installed in conditioned space locations shall meet NEMA 12 requirements.

Hazardous Locations: Materials, equipment, and incidentals in areas designated as hazardous shall meet NEC and NEMA requirements for the Class, Group, and Division designated.

Wet Locations: Materials, equipment, and incidentals in areas considered as wet, or can potentially be wet or damp, shall meet NEC and NEMA requirements for wet locations. Enclosures installed in wet locations shall meet NEMA 4X requirements, and shall be Type 316 stainless steel.

Corrosive Locations: Materials, equipment, and incidentals in areas considered as corrosive shall meet NEC and NEMA requirements for corrosive locations. Enclosures installed in corrosive locations shall meet NEMA 4X Type 316 stainless steel.

3.12.4. General

The electrical design for this Project shall be performed by a Professional Electrical Engineer who is registered and in good standing with the State of California. Responsibilities of the Electrical Engineer include, but are not limited to, the design of power distribution, equipment layout, grounding, conduit and wire sizing in schedules, conduit routing, duct bank routing, motor controls, lighting, computer controls, communications, code compliance, installation details, and equipment specifications. The Electrical Engineer shall be regularly engaged in the design of municipal water and wastewater facilities.

- Electrical power system shall be required to safely distribute power for the highest projected electrical demand at the facility, as determined by the equipment included in the final design of the Project.
- All equipment and materials shall be new and supplied by reputable manufacturers with adequate experience in manufacturing, installing, and operating the equipment and materials in similar applications. All equipment shall be designed for the intended service.
- Components of electrical subsystems must be procured from a single manufacturer. Provide the manufacturer's latest design conforming to the standards and requirements included herein.
- All components and devices installed shall be standard items of industrial grade, and shall be of sturdy and durable construction suitable for long-term, dependable service. Light-duty, fragile, or competitive grade devices are not acceptable.
- Provide lightning protection system for all buildings and structures as required by NFPA 820 in accordance with NFPA 780. Lightning protection system shall be certified and shall be designed and provided by Lightning Protection Institute (LPI) registered/certified organization.
- Provide fire alarm(s) and detection system(s) for a buildings and process areas as required by NFPA 820, in accordance with NFPA 72, and by the Menlo Park Fire Protection District. Fire alarm(s) and detection system(s) shall be designed by a registered fire protection engineer or organization.
- Provide combustible gas detection for buildings and process areas as required by NFPA 820.
- Electrical design shall incorporate measures to reduce the potential for arc-flash and reduce Personal Protective Equipment requirements.

- The Contractor responsible for the installation of electrical equipment shall have successfully performed work of similar or greater complexity on at least five (5) previous projects and shall have a current C10 Electrical Contractor's License issued by the State of California Department of Consumer Affairs.
- The Contractor responsible for the installation of electrical equipment shall be familiar with and understand codes and requirements from NFPA70, NFPA110, NFPA820 and all other local codes as required for work scope as stated herein.

3.12.5. Design Guidelines

- Power shall be acquired from the PG&E with capacity necessary to power the new facilities. Refer to Element 4 for additional details and requirements.
- Provide a minimum of 20 percent extra space in each switchgear, switchboard, motor control center and panelboard.
- Provide a minimum of 25 percent spare loading on transformers.
- Locate equipment with capability of expansion with adjacent free space where possible. Provide 25 percent free space for expansion.
- Switchgear, switchboards, MCCs, low-voltage transformers and panelboards shall be located indoors. Medium-voltage service entrance gear and medium-voltage transformers shall be located outdoors.
- Provide service entrance rated metal-clad switchgear to accept power from PG&E. Service entrance switchgear and service equipment from PG&E shall be in strict conformance with PG&E requirements for incoming cables, metering.,
- Provide step down transformer to 480V with one central transformer then distribute 480V throughout the facility.
- Provide 480-VAC, 3-phase, 60Hz for all motors 1 HP to 200 HP.
- Provide 120/208 VAC for controls, receptacles, and lighting circuits. 480V lighting circuits may be used for outdoor lighting.
- Perform calculations as part of electrical system analysis and design work. Perform voltage drop calculation to confirm available voltage at equipment during motor start and run conditions. Calculations shall be done for conductor runs over 300 feet.
- Maintain voltage regulation to ± 3 percent under normal conditions.
- Limit starting voltage drop to less than 10 percent.

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- Limit running voltage drop to less than 3 percent for branch circuitry, and not exceeding 5 percent for total at subject operating voltage.
- Provide surge protective device at all switchboards, medium voltage transformers, panelboards, medium voltage switchgear and PG&E entrance equipment on the line side of the main circuit breaker.
- All surge protection devices shall be UL Listed with class or category ratings as required to meet the Lightning Protection Institute certifications.
- Provide circuit breaker with conductors sized in accordance with the equipment associated with the surge protective device. Locate surge protective device so that the indicating lights are viewable without removing panels.
- Provide power factor correction for all motors as required. Power factor shall be corrected to the maximum value permitted by the motor manufacturer. Power factor shall meet or exceed PG&E's requirement. DB Contractor shall coordinate requirement with PG&E and shall implement power factor correction as required.
- PG&E power shall be continuously monitored by power monitoring instrument and networked to the SCADA system. Metering shall be provided at the service entrance switchgear, at the main breakers of all new 480V motor control centers and at all 480V switchboards.
- Provide uninterruptable power (with maintenance bypass switch to allow transfer to PG&E power in the event of a UPS fail) for all PLC panels and vendor supplied panels. UPS runtime shall be a minimum of 30 minutes.
- All stanchions shall be manufactured from stainless steel double Unistrut, or equal, and stainless steel hardware. Mounting base shall be 1/4-inch minimum stainless steel plate.
- All indicating lights, pushbuttons and switches shall be NEMA 4/4X/13 corrosion resistant and watertight rated in non-hazardous locations. Indicating lights shall be 30.5 mm in diameter and use LED bulbs. Lockout stops shall be pushbutton with red cap and padlocking mechanism. Provide NEMA 7 / UL Listed for Class 1 Division 1 or Class 1 Division 2 locations as applicable.
- Provide lighting for all indoor and outdoor spaces meeting the Foot Candles level stated in Section 3.12.12.

3.12.6. Electrical Systems Analysis

As a part of this project conduct and submit all required electrical system analysis studies for all switchgear, switchboards, MCCs, and generators including power transformers starting at PG&E's service point.

Studies shall be prepared, stamped and signed by a Professional Electrical Engineer registered in the State of California. All analysis studies shall be updated prior to final completion of the project utilizing

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characteristics of as-installed equipment, materials and incorporate all modifications to the power system that occurs construction phase.

Studies shall be performed using computer based software utilizing field verified data. Documents program name and version in report. Prepare multiple 11" x 17" drawings showing the complete one-line drawing of the network modeled.

At a minimum, provide:

- Arc Flash Study:
 - Follow guidelines outlined in the NFPA 70E-2011 and IEEE 1584.
 - Arc flash protection boundary and incident energy shall be calculated for every switchboard, motor control center, pump control panel, panelboard, vendor panel, busway, etc. where maintenance work is may be needed on energized equipment.
 - Arc flash computations shall include both line and load side of main breaker calculations, where necessary.
 - Provide arc-flash labels for MCCs, 480V and applicable 208V panelboards, switchboard, switchgears, and control panels.
- Short Circuit Study:
 - Determine the short circuit current available. Perform a load flow study to verify the electrical power system is adequately designed.
 - Short Circuit interrupting duties shall be calculated for an assumed three-phase bolted fault and line-to-ground fault at each of the following locations:
- Load Flow Study
- Harmonic Analysis
- Coordination Study:
 - Determine the settings, ratings and types of the overcurrent protective devices provided to develop recommended settings for relay including CT values and Circuit Breakers adjustments

All electrical equipment and accessories shall be secured in accordance with the seismic standards of the CBC for the appropriate facility designation. Provide seismic calculations for bolt down anchorage per CBC requirements. Calculations shall be stamped and signed by a professional structural or civil engineer currently licensed to practice in the State of California.

3.12.7. Underground Conduits and Ductbank Requirements

- All equipment and instrumentation located below grade shall have conduit drain boxes. Conduit interiors shall be plugged with sealant to keep water from traveling down conduits into equipment and instrumentation.
- Underground conduits outside of structures, excluding PG&E conduits, shall have a minimum cover of 24 inches. PG&E power and telephone conduits shall have as required by PG&E.
- Communications, power, and control conduits may be located in the same ductbank, with separation.
- Bury warning tapes approximately 12 inches above all underground concrete-encased duct banks and other conduit runs over 100 feet in length. Use red tape for “Electric” service and orange tape for “Communication” service.
- Provide labels for all pullboxes and at end of runs and tees.
- Provide a minimum of 20% spare conduits in main ductbanks between process areas for each voltage class provided on the project.
- Underground conduits shall be encased in reinforced concrete and shall be adequately separated from the earth or water by at least 3 inches of concrete. Maintain a minimum of two inches of clearance between conduits and any reinforcement bars. Conduits in ductbanks shall be rigidly supported in their proper positions with conduit spacers while concrete is being placed. Ductbank concrete shall conform to ASTM C150, with 28 day compressive strength of 2500 PSI (Class B) and minimum cement content of 55 percent. Add red color additive for identification purposes.

3.12.8. Voltage Separation Requirements

- 480 VAC power and 120 VAC control conductors may be in common raceways if cable sizes are compatible for pulling and the insulation rating is equal to or greater than the highest voltage present.
- 24 VDC signal conductors shall be in separate raceways from 60 VAC and greater power/control conductors. Provide minimum of 12 inches conduit separation, materials, wire types, etc., to minimize interference.
- Medium voltage power shall be routed in dedicated ductbanks or raceways and shall be separated from all other electrical ductbanks by a minimum of 24 inches.

3.12.9. Local Disconnects Requirements

- Provide local disconnects for all motors rated 50HP or less. The local disconnect shall be installed in accordance with the National Electrical Code.

- All disconnect switches shall be lockable with a padlock in the OFF position.
- Disconnect switches shall be designed for motors as required by the NEC to permit safe operation under load (load break).
- Provide fused switches for all mechanical HVAC units.
- Provide a 120VAC weatherproof GFI service receptacle at each HVAC equipment disconnect.

3.12.10. Grounding Requirements

Design and provide all labor, materials, equipment and incidentals required for a complete grounding system for the electrical and instrumentation system as required. At a minimum, provide:

- #4/0 bare copper ground ring surrounding all buildings and structures.
- 10-foot long, 3/4-inch diameter ground rods. The rods shall be placed at 20-foot intervals along the ground ring perimeter. Ground rod boxes shall be placed over all ground rods. The ground ring shall be tied into the plant's overall ground grid. Bond building steel frame and metal water pipe located within of pipe entrance to building to ground ring.

3.12.11. Electrical Room Requirements

The electrical room shall be arranged to house all electrical and control equipment that is required to be inside the building. The electrical room shall conform to the following requirements:

- Provide floor and wall space for future expansion of electrical equipment; a minimum of 20 percent of the total wall space shall be unused. Provide minimum 6-foot clear working space in front of electrical equipment. See Section 3.12.5 for further requirements.
- Rooms shall be climate controlled for efficient cooling and heating for equipment.
- Provide housekeeping pads for all pad mounted equipment. Housekeeping pads shall be 3-1/2 inches above surrounding finished floor and shall be a minimum of 4 inches larger in width on all sides of equipment. The concrete shall be precisely leveled so that equipment set in place will not require shimming.
- Provide the following for rooms containing motor control centers or control panels with starters:
 - Means of egress in accordance with NFPA 70.
 - 9-foot minimum door height (removable transoms will be allowed).
 - 10-foot minimum clear working space / ceiling height.
 - Smoke alarms and fire extinguishers.

- Doors with panic hardware which open outwards from electrical rooms.
- Convenience receptacles

3.12.12. Project Lighting Requirements

Area lighting for process area shall be from LED or metal halide pole mounted lamps with 120 VAC weatherproof GFI receptacles in each pole. Lighting fixtures shall minimize up-light and illuminate only the subject area. Provide battery pack type emergency lighting for personnel safety.

Indoor areas shall be provided with switchable circuits with a minimum number of non-switched lighting fixtures for personnel safety. For indoor areas where there is process equipment requiring routine inspection, maintenance or adjustment, lighting shall be by local switched overhead light source.

The lighting requirements at RWTP areas are summarized in Table 3.12-1.

Table 3.12-1: Lighting Requirements

Location	Foot Candles (FC) Level
Indoor process areas	40
Outdoor process areas	5
Electrical rooms	50
Mechanical rooms	30
Control area	60
Access road lighting	2
Substation areas	2
Maintenance areas	60
Lab	60
Storage area	30

The following presents location-specific lighting requirements.

- Site Lighting:
 - Area lighting fixtures shall be metal halide type or LED.
 - Base, pole, and fixture assembly shall meet applicable seismic design requirements.
- Area Lighting:
 - Fixtures in Class 1, Div 1/2 areas shall be LED or metal halide type.

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- Outdoor high-bay fixtures shall be LED type.
- Indoor Lighting:
 - Architecturally finished areas shall be provided with standard recessed fluorescent 3x6 cell troffers.
 - Provide emergency lighting adequate for safe movement shall be provided in all interior areas. Self-contained battery packs with PAR type lamps are required.
 - Provide self-illuminating type exit lights.
 - Fluorescent lighting located in chemical storage areas, process rooms, electrical rooms shall be wraparound type, enclosed, gasketed and UL Listed for Wet areas.

Non-process indoor areas shall have occupancy sensor activated lighting with automatic timer shutoffs. Outdoor lights shall be controlled automatically and manually via bypass (Off/Photocell) hand switch. “Off” will turn off the lights. In “Photocell”, outdoor lighting shall be controlled based on photocell. Provide local switched lights where directed by the District.

3.12.13.Low Voltage Switchgear and Switchboards Requirements

- Conform to IEEE, ICEA, NEC, ANSI, UL and NEMA standards.
- Heavy gauge steel with NEMA 1 rating for indoor locations and NEMA 3R for outdoor locations with tin plated copper buses.
- Power bus shall have a continuous amperage rating at least equal to the main circuit breaker or the power source and shall be braced to withstand stresses resulting from the maximum short-circuit current available.
- Neutral bus shall have a minimum of 50 percent of the capacity of the main bus.
- Ground bus shall be rated per NEC relative to the power bus amperage rating.
- Main circuit breakers shall be 100% rated and indicating type with adjustable ground fault (G), Long (L), Short (S) and Instantaneous (I) trip functions. Specify digital trip units on all circuit breakers with L/S, L/S/I, or L/S/I/G trip functions.
- Switchgear and switchboards shall have infrared window access for bus connections and main cable connections to perform infra-red camera testing.
- Where access is needed for maintenance, provide swing-type door in place of removable panels.

- A remote racking device shall be provided to allow racking of draw out breakers from 25 feet away. Motorized racking device shall be mobile and easily to align. Remote racking device shall be of the same manufacturer and be compatible with the equipment supplied.
- Provide flat, smooth, rubber mats in front of each switchgear / switchboard. Mat shall extend the full length of the equipment. Mat shall have a minimum width of 36 inches extending out from in front of the equipment. The mat supplied shall be specifically made for isolation application. Provide for indoor locations only.

3.12.14. Motor Control Centers (MCC) Requirements

- Motor Control Centers shall conform to the standards for NEMA Class II, Type B diagrams and wiring.
- Provide UL 845, 600V, 65,000 amperes interrupting current (AIC) minimum unless deemed too low by results of power system study and available fault current from PG&E.
- Provide circuit breaker operator extensions for all breakers over 70-inches in height.
- MCC shall be designed to minimize fault propagation between and in front of MCC sections.
- MCC shall be “intelligent” type with integral networking of all motor controllers and metering devices to permit a single Ethernet communication point of connection to the PLC system.
- Provide all power supplies and modules, necessary for communications. Communication system shall be the MCC manufacturer’s factory based system.
- MCCs shall be located in climate controlled rooms or buildings.
- MCC cubicle breaker shall disengage all power to the bucket, including foreign voltage through a relay.

3.12.15. Variable Frequency Drives (VFD) Requirements

- Provide active front end or 18-pulse VFDs for all motors 50-hp and greater.
- VFD shall constantly monitor the load current with an electronic thermal overload relay and trip the drive on motor overload. The electronic overload relay shall be adjustable and compensate for the reduced cooling of the motor at reduced speeds.
- Transient and surge voltage power line input and output protection shall be provided for each VFD through use of metal oxide varistors (MOVs), phase-to-ground filter capacitors, or other approved equal methods.
- VFDs shall be located in climate controlled rooms or buildings. Small amperage units may be installed in motor control centers.

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- VFDs shall be configured to be re-enabled automatically after a power fail for automatic operation by the.
- Provide VFDs with a door mounted alpha-numeric human interface module (HIM) digital display with keypad to view and adjust the setpoints, parameters, diagnostic, and status indicators.
- All VFDs shall be able to operate locally (in manual) independent of the PLC system.
- All VFD controls, settable parameters and instantaneous operational registers shall be accessible from the Ethernet communications port. Provide all VFDs with factory installed Ethernet communication for full integration into the plant control system. Provide local disconnect switch auxiliary contact shutdown for VFD controls when a local disconnect switch is required.
- Provide VFDs with the following protection:
 - Inrush current limit.
 - Ground fault.
 - Over-temperature heatsink thermal switch to protect against excessive ambient temperature or loss of cooling.
 - DC bus protection.
 - Under voltage.
 - Over frequency.
 - Phase loss (input & output).
- VFDs shall comply with the latest edition of IEEE 519 for total harmonic voltage, current distortion calculation, and measurement.
- Voltage Harmonics: Operation of the VFD shall not add more than 3 percent total harmonic voltage distortion while operating from the PG&E source, or more than 5 percent while operating from standby generator.
- Current Harmonics: Maximum allowable total harmonic current distortion limits for each VFD shall not exceed 5 percent as calculated and measured at the point of common coupling.
- Maximum allowable audible noise from the VFD system shall be 85 A-weighted decibels (dBA) at a distance of one 3.3 feet at any speed or load condition.
- The harmonic power correction system shall be designed to produce an electronically injectable harmonic current to cancel the load-produced harmonic current such that the upstream power harmonic current and voltage are reduced to below 5 percent Total Demand Distortion and 5 percent Total Harmonic Distortion.

3.12.16. Full Speed Motor Controllers Requirements

For motors that require more than four (4) starts per hour, provide Reduced Voltage Solid State (RVSS) motor controllers designed with adjustable time interval soft start and soft stop features.

For motors below 30 HP requiring less than four (4) starts per hour provide full voltage non-reversing starters. The started shall be rated for a minimum of 65KA RMS symmetrical amperes or as deemed necessary as the results of the power system study.

3.12.17. Panelboards Requirements

Panelboards shall comply with the applicable sections of UL, NEC, and NEMA and be manufactured by the same manufacturer for all panelboards.

Panelboard shall have bolt-on devices with a hinged door over all circuit breaker handles. A copper ground and neutral bus bar shall be included in panelboards with terminal screws.

Provide panelboard breakers with individual padlock hasps (lockable in off position) when feeding a motor.

3.12.18. Electrical Enclosures Requirements

All enclosures shall be NEMA rated for installed locations with fast access door latches. Enclosure construction shall be 14-gauge minimum with continuously welded seams. Outer door shall have provisions for locking enclosure with standard padlock.

Provide enclosures with accessories consisting of breaker to disconnect incoming power and lockable disconnect for breakers used in circuits above 120VAC, deadfront door, heater, fan, removable metal filters, louvers, and thermostats.

All enclosure shall be provided with engraved phenolic nameplate.

3.12.19. Wiring Requirements

- **Low Voltage Conductors:** Conductors shall be copper with 600 V minimum rated insulation with type THHN / THWN, rated 90 degrees C in dry locations and 75 degrees C in wet locations, oil resistant for #4 AWG and smaller. XHHW-2 for larger than #4 AWG.
- **VFD Conductors:** All VFD load side power wiring shall have rated blended composite semiconductive, UL type TC 90°C insulation and 100% shielding with foil tape & tinned copper braid.
- **Instrument Wiring:** All wiring shall conform to UL 2250, UL 1581 and NFPA 70 Type ITC. Field instrument cables shall be 600 V insulation 100 percent foil shield coverage, twisted pair #16 conductors with drain wire. Non-Field instrument cables shall have 300 V rated insulation and individual foil shielded twisted pair #18 conductors with drain wire.

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- **Data Network Cable (Indoor):** Cable shall consist of 4 pair unshielded twisted pair #24 AWG solid conductors. The cable shall be rated by IEEE for service intended – plenum and dry.
- **Data Network Cable (Outdoor):** Cable shall consist of 4 pair shielded twisted pair #24 AWG solid conductors. The cable shall be rated by IEEE for service intended - plenum, conduit, wet or dry.
- **Fiber Optic Cable:** Cable shall be loose tube, 62.5/125 um, multimode, with jacket made of polyethylene, corrugated steel armor, and dielectric layers. Cable maximum attenuation shall be no more than 3.5 dB per kilometer with a minimum light emitting diode (LED) bandwidth of 200 MHz per 500 kilometers. Connectors shall not require epoxy or polishing and incorporate a fiber stub that can be bonded to the incoming fiber in the ferrule. Connector shall be compatible with ANSI/TIA/EIA -568-B-3.

All medium-voltage cables shall be single copper with compact Class B stranding, MV-105, 15kV EPR, 133 percent insulation, with insulation shielding. Provide fire protective tape on all medium-voltage conductors in manholes. Label all cables by means of fiber, laminated plastic, or nonferrous metal tags indicating the cable type, conductor size, circuit number, circuit voltage, cable destination, and phase identification. Provide DC high potential, shield continuity and phase rotation testing on all new primary conductors prior to energizing the cables.

All wires shall be symmetrically labelled at the minimum near the termination. Coordinate labeling requirements with the District.

3.12.20.Raceways and Conduit Requirements

Conduit types shall be designed per area designations and use:

- **Class I Hazardous Areas:** Galvanized Rigid Steel (GRS) and Galvanized Rigid Steel. Polyvinyl Coated (GRS-PVC) when required in other designated areas
- **Conduits in Dry Environments:** Galvanized Rigid Steel (GRS)
- **Conduits in Wet or Corrosive Environments:** Galvanized Rigid Steel, Polyvinyl Coated (GRS-PVC).
- **Conduits Above Acoustical Tile Ceilings in Finished Rooms:** Electrical Metallic Tubing (EMT)
- **Conduits Embedded in Concrete:** Polyvinyl Chloride (PVC-40), Polyvinyl Coated (GRS-PVC).
- **Conduits Below Slab-On-Grade:** provide Polyvinyl Chloride (PVC-40)
- **Direct Buried Conduits and Ductbanks:** Polyvinyl Chloride (PVC-80)
- **Conduits for Data Conductors:** GRS-PVC

Provide 10 percent spare conduits of all types in duct banks between MCCs, switchboards, switchgear, control panels and electrical rooms.

Flexible conduit shall only be installed in exposed or accessible locations and shall be less than 3 feet. Flex connectors shall be PVC coated when connected to GRS-PVC conduits.

For all conduit in transition, the transition shall be made below grade before the transitioning to exposed conduit. Conduit transition has conformed to NFPA 70 requirements in classified areas. All grounding bushings shall be tied to the grounding system with properly sized bonding conductors per the NEC Code.

Conduits connected to boxes, cabinets, exposed to weather or in areas subject to moisture shall be fitted with watertight sealing hubs with sealing ring and insulated throat.

All raceways for lighting, HVAC and receptacle circuits shall be surface mounted. At a minimum, support rigid conduits at 8 feet intervals and PVC conduits at 4 feet intervals. Provide support for all conduits within 1 foot of boxes or changes in direction. Conduits installed outdoor or in corrosive area above grade shall be braced in place with stainless steel Unistrut stanchions and PVC coated clamps with backplates.

Seal all conduits to prevent water traveling through conduits into junction boxes, underground facilities, electrical enclosures, panels, instruments or buildings. As required, install conduit drain boxes and plug conduit to keep out water traveling into equipment located below grade. Seal all conduit entering from below grade into the panels and all other electrical enclosures with plugging compound sealant. Top entry of conduits into all enclosures located outdoors or in other wet locations is not acceptable.

Spare conduits for future use shall have a pull rope installed and shall be labeled and capped.

3.12.21. Panel and Equipment Identification Requirements

Provide caution, warning, and danger nameplates for all panels and equipment as required. The nameplate shall be red with white lettering. The nameplate material shall be rigid laminated with white lettering.

- Nameplates for outdoor equipment and panels shall be aluminum and be fastened with screws
- For interior devices such as relay, module, power supply, fuse, or terminal block, provide a nameplate located above the device.

3.12.22. Wire and Conduit Identification Requirements

All wires shall be identified with wire labels on both ends of each wire. Wire labels shall be machine printed with on white heat shrinkable tubing. Wire labels for lighting and receptacle circuits shall consist of the panel board and circuit number and a unique node number

Wiring shall be color coded as follows:

- 120/208 V, 3-phase, phase legs:

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- Phase A: black
- Phase B: red
- Phase C: blue
- 120/208 V, 3-phase neutrals: white
- 277/480 V, 3-phase, phase legs:
 - Phase A: brown
 - Phase B: purple
 - Phase C: yellow
- 277/480 V, 3-phase neutrals: gray
- 120 V, 1-phase AC Control: red
- 120 V, 1-phase AC Power: black
- Equipment Ground: green
- DC Power: blue
- DC Signal:
 - Positive: red or clear
 - Negative: black
 - Ground: green with yellow stripes
- Control Panels:
 - Interlock-control-wire circuits from external power sources:
 - Ungrounded Conductors: orange
 - Grounded (current-carrying) AC circuit conductor which remains energized when the main supply circuit disconnecting means is in the off position (per NFPA 79): white with orange stripe.

All conduits shall have unique conduit names, including spare conduits. Provide conduit prefixes to identify type of function followed by a unique number that is best associated with the equipment tag reference. Where there is more than one conduit to an equipment, a letter suffix can be added to distinguish the conduit. At a minimum, conduit shall have conduit tags at both ends of each conduit run and where it enters and leaves, junction boxes, terminal boxes and pullboxes.

3.12.23. Testing Requirements

Conduct all required testing to operational readiness of all equipment. At a minimum provide:

- **Pre-energization tests:**
 - Perform visual inspection and recording of motor nameplate data.
 - Conduct torque connections testing.
 - Perform wire insulation and continuity tests.
 - Perform grounding system tests to assure that system is complete and effective
- **Networking cable and fiber Testing:** Every fiber optic cabling link in the installation shall be tested in accordance with the field test specifications defined in ANSI/TIA- 568-C.2 “Commercial Balanced Twisted-Pair Telecommunications Cabling and Components Standard”. Each networking cable link shall be tested.
- **Pre-startup tests:**
 - Conduct breaker tests.
 - Perform phase rotation tests on all equipment.

3.12.24. Electrical Training Requirements

Provide training for District for any electrical equipment requiring set up and maintenance incorporated into the project such as Soft Starter VFD setups and operating and maintenance procedures.

In addition, the DB Entity shall provide training for the District personnel of the potential arc-flash hazards associated with working on energized equipment. Training shall include Lock-Out/Tag-Out (LOTO) procedures and proper use of Personal Protective Equipment (PPE).

Project Element 4: Supervisory Control and Data Acquisition (SCADA)

4.1. Introduction

Supervisory Control and Data Acquisition (SCADA) improvements generally consist of Programmable Logic Controllers (PLCs), Human Machine Interface (HMI), SCADA Screens, SCADA software, Radio, and conduit connecting the treatment plant to the Influent PS.

4.2. Background

Communication between the Influent PS, the treatment plant, and District Offices shall be as follows:

- The treatment plant will be wired to the Influent PS (SCADA). If any issues should arise at the plant (shutdown), signal will be sent to the Influent PS to shut down.
- The treatment plant will send signal to the District Offices at 500 Laurel Street, Menlo Park by Radio (SCADA).
- The Influent PS will send signal to the District Offices by telemetry.
- The PLC at the Influent PS and the telemetry panel will not be connected as part of this project however both the telemetry panel and PLC will be fitted with discrete outputs to allow for interconnection at a later time.

It is anticipated that the SCADA system will be used for monitoring and not controlling the treatment plant and the Influent PS from remote locations.

4.3. Drawings

A single line diagram for the Influent PS and a schematic communication block diagram are included in Volume 3B. It is the intent that a single line diagram will be prepared by the DB Entity based on their design and a detailed communication block diagram will be prepared by the DB Entity.

4.4. Electrical Distribution

The DB Entity will be responsible for securing electrical service for both the treatment plant site and the pump station site. For each site, the DB Entity will need to complete on-line PG&E applications for service, listing loads for PG&E to determine service size and service location. As part of this application, the DB Entity will need to produce and submit single line diagrams to PG&E. System maps for PG&E encompassing the pump station and treatment plant sites can be found in Attachment B. All PG&E fees will be paid by the DB Entity.

PG&E Engineering will produce drawings for the services. The DB Entity will have the option to install the facilities under the supervision of PG&E or have PG&E install facilities. This is to be determined and coordinated by the DB Entity.

For the pump station site, it is anticipated that the service will come from a 12-kV distribution line at the intersection of Oak Avenue and Sand Hill Road. A transformer will be required to step down to 480Volt, 3 phase power needed for the pump station. It is anticipated the transformer and any other PG&E hardware will be pad mounted and adjacent to the pump station MCC. The PG&E meter will be placed within the MCC. The electrical service is anticipated to be a 300 amp service.

For the treatment plant site, it is anticipated that the service will come from a 12-kV distribution line at the T-intersection of Sand Hill Road, near the Sharon Heights Golf club house. A transformer will be required to step down to the service required for the treatment plant. It is anticipated the transformer and other PG&E hardware will be pad mounted and placed in close proximity of the treatment plant. The electrical service is anticipated to be a 1,000 amp service.

Securing PG&E service is a lengthy and time consuming process which the DB Entity is highly encouraged to start as soon as electrical loads are determined, and single line diagrams completed, for each site.

4.5. Supervisory Control and Data Acquisition (SCADA)

4.5.1. Radio Survey Required

The DB Entity shall perform a radio survey and siting evaluation for the SCADA system. The SCADA system will provide communication between the plant and the influent pump station, and the plant and the District Offices at 500 Laurel Street, Menlo Park.

4.5.2. Drawings Included in RFP

A schematic Communication Block diagram between the plant and the Influent PS can be found in Volume 3B however the DB Entity will be required to prepare a detailed Communication Block diagram based on their design.

4.5.3. SCADA Backbone

The backbone of the SCADA system to be provided by the DB Entity shall consist of the components described below. A more detailed description of the SCADA and instrumentation requirements for the RWTP is located in Section 4.6.

4.5.3.1. Communication Conduit

Two 2-inch communication conduits will be installed along the length of the sewer forcemain between the Influent PS MCC and the treatment plant. Conduits shall have the following characteristics:

- Conduit shall be PVC or HDPE Schedule 80.

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- All bends, sweeps and elbows shall be 24-inch minimum radius.
- Conduits shall enter boxes, vaults and manholes through drilled knockout holes. Openings shall be sealed with non-shrink grout to produce a water-tight seal.
- Conduits shall be cut flush with the inside edge of the substructure, and sanded.
- Upon the completion of conduit installation, Contractor shall be required to proof each conduit to verify continuity/integrity of the conduit system and also to ensure smooth cable pulling. All conduits must be proofed after backfilling, but prior to final paving.
- Proofing shall be accomplished by pulling a solid aluminum or steel mandrel or by blowing a pressure-sealed type metal test mandrel. For the pull-through type mandrel, the outside diameter of the mandrel shall be a minimum of eighty percent (80%) of the inside diameter of the conduit and four inches (4") long. The mandrel shall be approved by the District prior to use.
- A 1/4-inch continuous nylon pull rope (200 pounds minimum tensile strength) shall be installed in each conduit run and secured at each end, except where an alternative material is required by specific Trench Occupants.
- All conduit terminations shall be plugged using approved removable plastic caps.

4.5.3.2. Communication Cable

Fiber optics cable shall be run through one of the 2" conduits. Cables shall be spliced as recommended by manufacturer. Communication cable will terminate in fiber optics modules at both the Influent PS and the plant.

4.5.3.3. Communication Conduit Appurtenance Requirements

Prefabricated pull boxes (minimum size 17" x 30") shall be installed maximum 400 feet on center. Pull boxes shall be installed outside of vehicle travel ways and be rated for incidental traffic. Pull boxes shall have the following characteristics:

- Pull box shall be sized to accommodate splicing of fiber optics cable.
- Pull Rope will be run through pull boxes to facilitate installation of fiber optic cable.
- Pull box covers shall be labeled "Sewer".
- Provide 12" deep crushed rock in the bottom of all pull boxes, vaults and manholes except those pull boxes used for street lighting, unless otherwise indicated or noted.

4.5.3.4. Control Room and PLC

A new work station shall be mounted in a control room on the treatment plant site. The control room shall also include the PCM (PLCs) and FO communication panel. Added air conditioning is required for this room.

4.5.3.5. Programmable Logic Controller (PLC) at Plant

Allen Bradley Control Logix Programmable 1756 controllers are required sole sourced. A schematic Communication Block Diagram can be found in Volume 3B. The DB Entity shall provide necessary communication cards to meet the schematic diagram.

4.5.3.6. PLC at the Influent PS

Allen Bradley CompactLogix Programmable 1768 controllers are required sole sourced. A schematic Communication Block Diagram can be found in Volume 3B. The DB Entity shall provide necessary communication cards to meet goals of the schematic communication block diagram.

A Human Machine Interface (HMI) will be required at the pump station. The HMI shall be Allen Bradley PanelView Plus 6 1000 Graphic Terminals sole sourced. The HMI will include:

- A 10.4 in. flat-panel color display with 640 x 480 resolution (minimum) and 18-bit graphics.
- Supports operator input via keypad (32 function keys), via touch screen or via keypad and touch screen.

4.5.3.7. Networking

The PLCs shall be networked utilizing Allen Bradley Control Network. Interface to the pump station is a fiber optic cable feed.

4.5.3.8. SCADA Screens

SCADA Screens (PCs with monitors) shall be set up at both the treatment and the District Offices. Software used shall be Wonderware, sole sourced. DB Entity will provide PCs and software. All PC, monitors, software, programming, networking and required accessories to provide fully function local and remote (District Offices) control shall be provided, constructed and installed by the DB Entity.

4.5.3.9. Instrumentation

Level transmitters for the Influent PS shall be ultra-sonic Siemens Hydro Ranger (6 relay) sole sourced.

4.5.3.10. Control System Workshops

The DB Entity shall organize three (3) workshops at 30 percent, 60 percent, and 90 percent stages of control system development to review control system approach, HMI and reporting development and incorporate District's feedback into the control system configurations.

4.6. RWTP Instrumentation and Controls Design and Construction Requirements

This section describes the minimum requirements for design and construction of instrumentation and control systems at the RWTP including plant wide supervisory control and data acquisition (SCADA) system, and expands upon the basic description of SCADA requirements presented in Section 4.5. If the following requirements overlap or conflict with requirements contained in other sections or with governing codes, standards, or manufacturer's directions and instructions, the stricter interpretation or the District's directive shall govern.

4.6.1. Design

1. DB Entity shall design and provide instrumentation and control system that is automated, efficient, and reliable. The plant normal operation shall be fully automated without manual operator intervention.
2. The DB Entity shall provide all instruments that are necessary to fulfill the project equipment. Each instrument's wetted materials shall be compatible with the measured fluid temperature and corrosively
3. The Plant Wide Control Supervisory Control and Data Acquisition (WP-SCADA) and Human Machine Interface (HMI) systems shall be commercial off-the-shelf types. The selected system must have local support (within 50 miles) for future modification.
4. The PW-SCADA shall have an I/O and historical database server. All software packages shall be provided with the latest development license, client licenses for all workstations, I/O communication driver/software, historian, SQL software and report generation software.
5. PLC hardware and software shall be commercial off-the-shelf types and shall be provided with the latest required licenses.
6. All software packages shall use the most recent licensed versions that are compatible with all related software packages.
7. Provide operator workstations that meet the requirements of the manufacturer requirements of the selected software.
8. All process control parameters such as flow, level, temperature, pressure and other water quality measurements shall be measured/regulated/controlled by instrumentation and control equipment.
9. All products described in this section shall be provided by a single Systems Integrator (SI). The DB Entity shall provide the services of a Systems Integrator whose responsibility shall be to furnish, construct, supervise installation, calibrate, test, and place into operation all transmitters, instruments, PLCs, control panels, power distribution equipment, motor control centers, alarm equipment, and accessories. The SI shall provide both HMI configuration and PLC programming services. At a minimum, the SI shall meet the following qualifications:
 - a. Experienced in implementation of system integration of similar type projects and

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successfully completed work of similar or greater complexity and on similar facilities on at least 10 previous projects.

- b. SI responsible engineer shall have five (5) years prior experience on similar sized projects.
 - c. Have a permanent, service facility within 250 miles of the project site.
10. At a minimum provide two levels of controls Local Control and Central Control for all equipment.
 11. At local control level provide all required function to allow manual control of individual equipment. At the Central Level provide plant wide monitoring and control of the RWTP and individual equipment in manual and automated modes.
 12. Provide all required hardwired, software and work to set up a monitoring station at the District office to allow continues monitoring of the plant operations and alarms remotely.
 13. The control system architecture for the project shall incorporate PLC and PW-SCADA operations workstations (computers and color touch screen displays), instrumentation, and hardware and control devices.
 14. The PLC processors and I/O shall be distributed throughout the plant and interconnected to all I/O points.
 15. All workstations shall have the same program and display the same data.
 16. All computer workstations shall be provided with a mouse with USB connection, keyboard with USB connection, and monitor. The screen size of the computer monitor shall be a minimum of 24 inches, measured diagonally.
 17. Enclosures for the control panels shall be NEMA rated with appropriate NEMA rating for the environment in which they are installed.
 18. Control panels shall be cooled/heated with closed loop type conditioning systems to include air conditioners, internal panel circulation fans and resistive heaters as required to maintain environmental controls to protect internal components of the control panel.
 19. Environmental controls, including air conditioners, exhaust fans, heaters and circulation fans, shall maintain interior panel temperatures within ratings of all internal equipment given the intended installation location.
 20. Design environmental control systems to prevent premature failure of panel internal components. If necessary cooled/heated panels to maintain environmental controls to protect internal components of the control panel.
 21. Provide processor of sufficient memory size to allow for 20 percent spare capacity.
 22. Provide UPS with circuit breaker distribution to PLC, I/O, and associated instrumentation. At a minimum, the UPS shall maintain control system and instrument power during a power outage for 60 minutes.

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23. All PLC digital outputs shall be via interfacing relays.
24. All PLC, SCADA workstation(s), and SCADA server(s) shall be powered by a UPS system which shall maintain power for a minimum of 60 minutes after a power interruption.
25. All signal transmission from field instrumentation shall be 4-20 mA, sourced by a 24 VDC supply from a 24 VDC power supply located in the local control panel that is monitoring the instrument. Instruments that require 120VAC power shall be powered from the UPS located in the local control panel.
26. Power to instruments and instrument loops shall be from a single source, if possible, in order to provide the highest integrity: e.g., from the loop primary receiving instrument/module, or from a UPS when so specified. A loop shall not be dependent on a diversity of multiple power sources.
27. Non-standard equipment outputs shall be converted to defined standard signals for monitoring by a PAC.
28. All equipment shall be designed and constructed so that in the event of a power interruption, the equipment will transfer to a safe mode of operation when power is restored.
29. All field instrument shall be tagged with tag numbers and a functional description. The instrument numbering system shall be coordinated with the District. Instrumentation identification shall consist of a two to four letter prefix identifying the instrument's function, followed by a unique instrument number. Instrumentation prefixes shall follow ANSI/ISA 5.1 Standard instrument identification lettering.

4.6.2. Installation

1. Only shielded twisted pair, shielded triad, or manufacturer supplied cables shall be used for analog signals and communications signals.
2. Provide terminal blocks all junctions and all wires shall be labeled and identified at such junctions.
3. Install waterproof seals on all conduits to outdoor instruments located below grade. Installation shall be such that liquid shall not enter instrument or enclosure to which the conduit is connected.
4. Provide 10% spare I/O and all spare I/O shall be landed on terminal blocks and labeled.
5. Provide local disconnects for all instruments' power.
6. Provide relays, signal converters, isolators, boosters, power conditioners, circuit cards, and other miscellaneous devices as required for a compatible and functional interface.
7. Provide analog loop isolators where required.
8. Instrumentation wiring shall be run between instruments, terminal boxes, or panels without splices.
9. The instrumentation and accessory equipment shall be installed in accordance with the manufacturer's instructions.
10. Instruments with displays units located outside shall be mounted inside a 316 stainless steel

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NEMA 4X enclosure, to protect it from the damaging effects of the sun. Provide instrument sun shield stainless steel enclosure over field electronic instruments exposed to direct sunlight with hinged door/rubber flap to view indicators.

11. Mount instruments where they will be accessible from fixed stairs, platforms, or grade.
12. Mount all instruments with indicators and controls facing forward toward the normal operating area, within reading distance, and in the line of sight.
13. All instruments not directly mounted to the pipe shall be provided with floor stands or stainless steel wall brackets. Instruments shall not be mounted directly to walls.

Project Element 5: Regulatory and Permitting

5.1. Introduction

Responsibility for preparing applications for permits and for compliance with regulatory and permitting requirements to construct the project is shared by the District and the DB Entity. Division of responsibilities is summarized below, with details provided in the permit fact sheets in Attachment P.

5.2. Permits

Permits being secured by the District are as follows (agency issuing permit is included in parenthesis):

- General Order for Recycled Water for use area and treatment plant (one order -combined), a Title 22 Report and Notice of Intent for coverage are needed for both elements –District to develop the T22 Report for the Use Area and the Notice of Intent for both the Use Area and the Treatment Plant, see below - DB to develop T22 Report for the plant (SFBRWQCB)
- Discharge permit for solids disposal to West Bay Sanitary District sewer (WBSD)
- Authority to Construct/Permit to Operate for treatment plant operational air emissions (BAAQMD)

Permits to be secured by the DB Entity and for which DB entity shall be responsible for all applicable permit applications and fees:

- City of Menlo Park Encroachment Permit (Menlo Park)
- Title 22 Report for the RWTP – see above General Order (SFBRWQCB)
- Clean Water Act, Section 402 Notice of Intent for coverage under Statewide Construction Stormwater Permit, “SWPPP” (SFBRWQCB)
- Permit to cross Hetch-Hetchy aqueduct (SFPUC)
- Applications for electrical service from Pacific Gas and Electric (PG&E)
- Caltrans Encroachment Permit – Encroachment permit applied for by the District with a preliminary design. The DB Entity will coordinate design revisions and construction with Caltrans.
- SFPUC- Defined in Element 2 of this Document.
- Analysis during the Mitigated Negative Declaration found no properties included on a list of hazardous material sites compiled pursuant to Government Code Section 65962, therefore the DB entity should assume no contamination at the site. If contaminated groundwater is found at the site during dewatering activities, a “VOC and Fuel General Permit” would be needed through the SFBRWQCB prior to discharge.

Current status of each permit and permit application materials are included in **Attachment P**.

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5.3. Mitigation, Monitoring, and Reporting Plan (MMRP) and Responsibilities

As part of the environmental documentation process, the District adopted a Mitigation, Monitoring, and Reporting Plan (MMRP) in November 2015. The MMRP is a commitment made by the District and must be complied with by the District and by its contractors. The complete MMRP is included as an attachment to this section. Table 5.3-1 summarizes the MMRP measures and the agencies which would provide review and approval, as necessary, for implementing or monitoring and reporting compliance with the measure.

Table 5.3-1: Summary of Mitigation Measures and Responsibilities

Impact Statement Number(s)	Mitigation Measure Number/Title ⁽¹⁾	DB Entity Responsibilities	District Responsibilities
3.1-1 3.1-2 3.10-1	AES-1 Design, Vegetation, and Screening of Project Facilities	DB Entity responsible for implementing measure activities	District, in collaboration with City of Menlo Park, responsible for monitoring and reporting actions
3.3-1 3.3-2 3.3-3 3.3-4	AIR-1 BAAQMD Air Pollution Control Technologies	DB Entity responsible for implementing air emissions mitigating measures that comply with air permit application requirements. DB Entity to coordinate with District on technology design for implementation.	District to prepare and submit BAAQMD air permit application. District responsible for monitoring and reporting actions.
3.4-1	BIO-1 Protection of Special Status Animals	DB Entity responsible for attending applicable WEAP trainings and implementing measure activities	District, in consultation with CDFW and USFWS, responsible for monitoring and reporting actions
3.4-1	BIO-2 Protection of Nesting Birds	DB Entity responsible for implementing measure activities	District, in consultation with CDFW and USFWS, responsible for monitoring and reporting actions
3.4-2	BIO-3 Preservation of Protected Trees	DB Entity responsible for implementing measure activities	District, in collaboration with City of Menlo Park, responsible for monitoring and reporting activities
3.5-1 3.5-2	CUL-1 Archeological and Native American Monitoring	DB Entity responsible for implementing measure activities	District responsible for monitoring and reporting activities
3.5-1 3.5-2	CUL-2 Archeological Resource Finds	DB Entity responsible for implementing measure activities	District, in consultation with Caltrans Office of Cultural Resources Studies and the State Historic Preservation Office, responsible for monitoring and reporting

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			activities
3.5-3	CUL-3 Develop and Implement Paleontological Mitigation Plan	DB Entity responsible for implementing measure activities	District, in consultation with Caltrans Office of Cultural Resources Studies and the State Historic Preservation Office, responsible for monitoring and reporting activities
3.8-1 3.8-2 3.8-3	HAZ-1 Hazardous Materials Management Spill Prevention and Control Plan	DB Entity responsible for implementing measure activities	District responsible for monitoring and reporting activities
3.8-5	HAZ-2 Implement Fire Safety Construction Practices	DB Entity responsible for implementing measure activities	District responsible for monitoring and reporting activities
3.12-1 3.12-2 3.12-3 3.12-4	NOI-1 Implement Noise Control Measures During Construction	DB Entity responsible for implementing measure activities	District, in collaboration with City of Menlo Park, responsible for monitoring and reporting activities
3.8-4 3.16-1 3.16-2 3.16-3 3.16-4	TRA-1 Develop and Implement Traffic Control Plan	DB Entity responsible for implementing measure activities	District, in collaboration with Caltrans and City of Menlo Park, responsible for monitoring and reporting activities

Note:

1. Exact text for each measure is included in the Attachment Q.

Project Element 6: Funding Requirements

6.1. INTRODUCTION

WBSD may fund the project with a Clean Water State Revolving Fund (CWSRF) grant/loan, U.S. Bureau of Reclamation grant, and/or Integrated Regional Water Management (IRWM) Grant. Thus, the District, bidders, and D-B Entity must comply with funding-related requirements as summarized in Table 6.1-1 and detailed in the following sections. Table 6.1-1 is not meant to be an exhaustive summary; rather, the table focuses on the Disadvantaged Business Enterprise (DBE) requirements, Davis Bacon federal wage provisions, and American Iron and Steel requirements.

Table 6.1-1: Funding Requirements Summary

Requirement	Description	Responsibility	Timing
<i>Disadvantaged Business Enterprise (DBE)¹</i>			
Fair Share Objectives	SWRCB does not have specific goals or percentages of DBE contractors to use, but the WBSD might. If so, ensure compliance.	WBSD	During RFP solicitation period
DBE Certification	Contractor to submit forms as part of bid package.	Bidders	During RFP solicitation period
	Certify contractors and subcontractors as DBEs.	WBSD	At bid opening
Six Good Faith Efforts (GFEs)	Contractor must demonstrate compliance with six GFEs to solicit and incorporate DBE participation as applicable and reasonable. All bids must include documentation to demonstrate implementation of the GFEs (prior to bid opening) in order to be deemed in compliance.	Bidders	<u>Prior to bid opening</u>
	Complete forms and submit with proposal: DBE Sub-Contractor Participation Form (EPA 6100-2) (only in the event of the dispute), DBE Sub-Contractor Performance Form (EPA 6100-3), DBE Sub-Contractor Utilization Form (EPA 6100-4).		
	Review bidder's documents closely to determine that the GFEs were performed.	WBSD	<u>Prior to bid opening</u>

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	Use the services and assistance of the SBA and/or Minority Business Development Agency (MBDA) of the U.S. Department of Commerce.	WBSD	Prior to and during RFP solicitation period
Contract Administration Requirements	Conduct pre-bid conference to explain DBE requirements.	WBSD	During RFP solicitation period
	Conduct bid solicitation period for minimum of 30 calendar days before bid opening date. The 30 day solicitation period for DBEs has to be done by the general contractor for all sub-agreements for equipment, supplies, construction and services as well (e.g., drillers going after the well contract have to solicit for DBEs providing ancillary services like water treatment or waste hauling).	WBSD and Bidders (for subcontractors)	During RFP solicitation period
	Submit all DBE forms and Bidders List from selected contractor to SWRCB with final Budget Approval Package.	WBSD	After D-B Entity selection
	Require entities receiving funds to create and maintain a Bidders List that includes all firms that bid or quote on prime contracts, or bid or quote on subcontracts, including both DBEs and non-DBEs.	WBSD	Until WBSD is no longer receiving funding from SWRCB
	Require prime contractor to pay its subcontractor for satisfactory performance no more than 30 days from the prime contractor's receipt of payment from the WBSD.	WBSD	During D-B contracting period
	Provide written notification prior to any termination of a DBE subcontractor by the prime contractor to the WBSD.	D-B Entity	During D-B contracting period, if necessary
	If a DBE subcontractor fails to complete work under the subcontract for any reason, WBSD must require the prime contractor to employ the six GFEs if soliciting a replacement subcontractor. Require the prime contractor to employ the six GFEs even if the prime contractor has achieved its fair share objectives.	WBSD and D-B Entity	During D-B contracting period, if necessary

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DBE Reporting	CWSRF recipient must report DBE utilization to SWRCB on the DBE Utilization Report (SWRCB Form DBE UR334 included in Appendix J of the Policy) within 10 calendar days of the end of the annual reporting period (October 10) until the “Notice of Completion” is issued.	WBSD	Before October 1 st every year throughout construction
Davis-Bacon Federal Wage Provisions			
General Provisions	Determine federal wage determinations (http://www.wdol.gov/) and include the wage determinations in the RFP.	WBSD	Prior to RFP solicitation
	Monitor www.wdol.gov weekly to ensure that the wage determination contained in the solicitation/RFP remains current. If DOL issues a modification more than 10 days prior to the closing date, WBSD shall amend the solicitation. If DOL modifies or supersedes applicable wage determinations less than 10 days prior to closing date, WBSD should consult with SWRCB.	WBSD	Weekly during RFP solicitation period
	Include appropriate wage determinations and required clauses in bids/RFPs, contracts, and subcontracts (including provision requiring subcontractors follow the wage determinations incorporated into the prime contract).	WBSD, D-B Entity, and subcontractors	During contract negotiations and execution
	Verify registration in approved U.S. Department of Labor Apprenticeship Programs	D-B Entity	During construction
	Conduct employee wage rate interviews using Labor Standards Interview Form (Standard Form 1445).	WBSD	During construction
	Submit weekly payroll and compliance statements to WBSD.	D-B Entity	During construction
	Review weekly payrolls and compare to wage determinations to ensure wages and fringes are being paid.	WBSD	During construction
	Post, in a conspicuous location, applicable wage determinations	D-B Entity	At start of construction

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	and D-B posters at construction site		
	Include a copy of the applicable federal wage determinations and Davis Bacon language in the bid/contract documents.	WBSD	During development of the RFP
	Be prepared to make available any Davis Bacon documentation to SWRCB, EPA, DOL, or other auditing authorities.	WBSD and D-B Entity	During construction and at least 3 years after completion of construction
	Keep certified payrolls and interview forms on file.	WBSD	For at least 3 years after completion of construction
	Include Davis Bacon Language in all contracts and subcontracts. See full language in Attachment I.	WBSD, D-B Entity, and subcontractors	During contract negotiations and execution
American Iron and Steel (AIS)			
General Requirement	Unless a waiver has been received from the USEPA, ensure all iron and steel products for the project were made in the U.S. by applying the step certification process in which certifications from each supplier, fabricator, and manufacturer of iron and steel products certifying the process was domestically performed are provided. Appendix 5 of the AIS Guidance includes example certifications. Alternatively, the final manufacturer that delivers the iron and steel product to the worksite, vendor, or contractor may provide a certification asserting all manufacturing processes occurred in the U.S.	D-B Entity	Prior to and during construction
Labor Compliance Program			
General Requirement	Adopt and enforce a Department of Industrial Relations-certified Labor Compliance Program in order to meet the requirements of the California Labor Code section 1771.5.	WBSD	Prior to construction
Trafficking Victims Protection Act of 2000			
Contracting Requirement	Include Trafficking in Persons-related provision from WBSD SRF financing agreement in all	WBSD, D-B Entity, and subcontractors	During contract negotiations and execution

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	contracts and subcontracts. See full language below.		
Executive Order 11246			
Contracting Requirement	Include Executive Order 11246-related provision from WBSD SRF financing agreement in all contracts and subcontracts. See full language below.	WBSD, D-B Entity, and subcontractors	During contract negotiations and execution
Non-Discrimination			
Contracting Requirements	Include nondiscrimination and compliance provisions from WBSD SRF financing agreement in all contracts and subcontracts. See full language below.	WBSD, D-B Entity, and subcontractors	During contract negotiations and execution

Note:

1. All documentation of DBE compliance will need to be submitted to SWRCB including relevant faxes, emails, and newspaper ads showing the RFP was advertised in a multitude of ways.

6.2. CWSRF Loan / Grant

The DB Entity shall abide by the requirements included in this section herein as to not prevent the Project from being eligible for CWSRF funding.

6.2.1. Administering Agency

The State Water Resources Control Board (SWRCB) is responsible for overseeing the CWSRF loan/grant funding process.

6.2.2. Requirements

- A portion of the CWSRF program is funded by the U.S. Environmental Protection Agency (USEPA) and is therefore, subject to certain federal cross-cutters for environmental documentation (i.e. CEQA-Plus) and federal contracting requirements must be complied with and reflected in design specifications and/or bid-related documents by WBSD. All of the requirements are listed in the Financing Agreement (yet to be executed). When WBSD signs the agreement they are self-certifying that they comply.
- SWRCB requires all projects be bid in accordance with current State laws and federal cross-cutters.
- SWRCB developed its *Policy for Implementing the Clean Water State Revolving Fund* (the Policy), most recently amended February 17, 2015. Per Section XI. Construction / Implementation Financing Agreement and the CWSRF website: (http://www.waterboards.ca.gov/water_issues/programs/grants_loans/srf/srf_templates.shtml):
 - Disbursement of funds is contingent on execution of a financing agreement and the SWRCB will not disburse funds until after that agreement has been executed.
 - The financing agreement includes the recipient's certification that it has complied (or will comply with) a non-exclusive list of federal and state laws as well as other applicable federal and state laws.

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6.2.2.1. Disadvantaged Business Enterprise (DBE) program

- The DBE program is a federal program designed to increase the participation of DBEs. WBSD is required to seek and is encouraged to use DBEs for its procurement needs. It should award a “fair share” of subagreements to DBEs. This applies to all subagreements for equipment, supplies, construction, and services.
- Key components of DBE Program include the following.
 - Fair share objectives
 - Goal for qualified and certified Minority Business Enterprises (MBEs) and Woman Business Enterprises (WBEs) to receive a “fair share” of procurement opportunities. Procurement opportunities include construction, equipment, professional services, and supplies.
 - Fair share objective is not a quota. The District cannot be penalized for not meeting its fair share objectives.
 - DBE certification
 - Six Good Faith Efforts
 1. Ensure DBEs are made aware of contracting opportunities to the fullest extent practical through outreach and recruitment activities. For Tribal, State and Local Government Recipients, this will include placing DBEs on solicitation lists and soliciting them whenever they are potential sources.
 2. Make information on forthcoming opportunities available to DBEs. Posting solicitations for bids or proposals for a minimum of 30 calendar days before the bid opening date.
 3. Consider in the contracting process whether firms competing for large contracts could subcontract with DBEs.
 4. Encourage contracting with a group of DBEs when a contract is too large for one firm to handle individually.
 5. Use the services and assistance of the Small Business Administration (SBA) and/or Minority Business Development Agency (MBDA) of the U.S. Department of Commerce.
 6. If the prime contractor awards subcontracts, require the prime contractor to take the above steps.
 - Contract administration requirements
 - DBE reporting
- Various forms must be submitted by the contractor as part of bid package. These forms and the DBE compliance guidelines are included as **Attachment G**.
- Solicitations for bids or proposals must be posted for a minimum of 30 calendar days before the bid opening date. All bidders **must demonstrate compliance** with the six Good Faith Efforts (GFEs) to solicit and incorporate DBE participation as applicable and reasonable. All bids must include documentation to demonstrate implementation of the GFEs (prior to bid opening) in order to be deemed in compliance. The 30 day solicitation period for DBEs has to be done by the general contractor for subs as well (e.g., drillers going after the well contract have to solicit for DBEs providing ancillary services like water treatment or waste hauling).
- SWRCB strongly encourages a pre-bid conference to explain the DBE requirement.
- WBSD must submit all DBE forms from the selected contractor to SWRCB with the final budget approval package. If the selected contractor has not taken acceptable “Good Faith Efforts”, the Division of Financial Assistance cannot accept the award of the construction contract. The

CWSRF recipient may select the next low, responsive and responsible bidder. Alternatively, it may rebid the contract. It must choose one of these options in order to receive CWSRF assistance. Consistent with the results of the Division's financial security review, the Division will amend the financing agreement to reflect the costs of selecting the next low, responsive and responsible bidder or the low, responsive, and responsible bidder after rebidding the project. A flowchart showing the DBE process for two design-build scenarios is included as **Attachment H**.

- WBSD shall review the bidder's documents closely to determine that the GFEs were performed **prior to bid or proposal opening date**. Failure to complete the GFE and to substantiate completion of the GFE before the bid opening date could jeopardize CWSRF financing for the project.
- Failure of the apparent low bidder to perform the GFE prior to bid opening constitutes a non-responsive bid. The construction contract may then be awarded to the next low, responsive, and responsible bidder that meets the requirements or the Recipient may re-advertise the project.
- During construction, the recipient must report DBE utilization to the Division on the DBE Utilization Report (SWRCB Form DBE UR334 included in Appendix J of the Policy) within 10 calendar days of the end of the annual reporting period (October 10) until the "Notice of Completion" is issued.
- There is no specified DBE target (i.e. percentage) that must be met.

6.2.2.2. Davis-Bacon Federal Wage Provisions

- All CWSRF construction financing or refinancing agreements must contain federal Davis-Bacon provisions.
- In order to comply with these provisions, it is the responsibility of WBSD to ensure that all contractors and subcontractors:
 - Include appropriate wage determinations and required clauses in bids and contracts
 - Verify registration in approved U.S. Department of Labor Apprenticeship Programs
 - Conduct employee wage rate interviews
 - Collect/review weekly payroll and compliance statements
 - Post, in a conspicuous location, applicable wage determinations and Davis-Bacon posters at construction site
- WBSD is required to include the following in the bid/RFP, contract, and subcontract documents:
 - A copy of the applicable federal wage determination(s) which can be found at: <http://www.wdol.gov/>.
 - Davis Bacon language, included as **Attachment I**.
- During construction:
 - Davis-Bacon poster (**Attachment J**) and wage determinations (federal and state) must be posted in a conspicuous place at the project construction site.
 - Contractors and subcontractors must submit weekly certified payrolls to recipient. An optional payroll form for the contractor to use and instructions are included as **Attachment K**.
 - Recipient or authorized representative compare payrolls to wage determinations to ensure wages and fringes are being paid.
 - Recipient or authorized representative conduct employee interviews using Labor Standards Interview Form (Standard Form 1445) (**Attachment L**).

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- The recipient, contractors/subcontractors shall be prepared to make available any Davis-Bacon documentation to State Water Board, EPA, DOL, and other auditing authorities.
- After construction:
 - Certified payrolls and interview forms must be kept for three years.
 - Davis-Bacon documentation must remain available for review by State Water Board, EPA, DOL and other auditing authorities for a period of at least three years after completion of construction.

6.2.2.3. American Iron and Steel (AIS)

- Absent an exclusion or waiver from the U.S. Environmental Protection Agency (USEPA), recipients must use iron and steel products that are produced in the U.S. for projects.
- Sample certifications and sample contract language is included in the AIS Guidance (**Attachment M**).
- Waivers or exclusions can be applied for.
- More detailed information available at:
 - <http://www.epa.gov/cwsrf/state-revolving-fund-american-iron-and-steel-ais-requirement>
 - <http://www.epa.gov/cwsrf/american-iron-and-steel-requirement-guidance-and-questions-and-answers>

6.2.2.4. Force Account, Land Purchase and Other Non-Bid Projects

- Force account, land purchase and other non-bid projects that do not require public contracting or procurement to establish the final budget and scope of work in the financing agreement do not need to go through the processes of executing an amended financing agreement.

6.2.2.5. Trafficking Victims Protection Act of 2000

- The Recipient, its employees, contractors and subcontractors and their employees may not engage in severe forms of trafficking in persons during the term of this Agreement, procure a commercial sex act during the term of this Agreement, or use forced labor in the performance of this Agreement. The Recipient must include this provision in its contracts and subcontracts under this Agreement. The Recipient must inform the State Water Board immediately of any information regarding a violation of the foregoing. The Recipient understands that failure to comply with this provision may subject the State Water Board to loss of federal funds. The Recipient agrees to compensate the State Water Board for any such funds lost due to its failure to comply with this condition, or the failure of its contractors or subcontractors to comply with this condition. The State Water Board may unilaterally terminate this Agreement if the Recipient that is a private entity is determined to have violated the foregoing.

6.2.2.6. Executive Order No. 11246

- The Recipient shall include in its contracts and subcontracts related to the Project the following provisions:
 - "During the performance of this contract, the contractor agrees as follows:
 - "(a) The contractor will not discriminate against any employee or applicant for employment because of race, creed, color, or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, creed, color, or national origin. Such action shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including

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- apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the contracting officer setting forth the provisions of this nondiscrimination clause.
- "(b) The contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to race, creed, color, or national origin.
 - "(c) The contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice, to be provided by the agency contracting officer, advising the labor union or workers' representative of the contractor's commitments under Section 202 of Executive Order No. 11246 of September 24, 1965, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.
 - "(d) The contractor will comply with all provisions of Executive Order No. 11246 of Sept. 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.
 - "(e) The contractor will furnish all information and reports required by Executive Order No. 11246 of September 24, 1965, and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the contracting agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.
 - "(f) In the event of the contractor's noncompliance with the nondiscrimination clauses of this contract or with any of such rules, regulations, or orders, this contract may be cancelled, terminated or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts in accordance with procedures authorized in Executive Order No. 11246 of Sept 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order No. 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.
 - "(g) The contractor will include the provisions of Paragraphs (1) through (7) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order No. 11246 of Sept. 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as the contracting agency may direct as a means of enforcing such provisions including sanctions for noncompliance: Provided, however, That in the event the contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the contracting agency, the contractor may request the United States to enter into such litigation to protect the interests of the United States."

6.2.2.7. Non-Discrimination

- The Recipient shall include in its contracts and subcontracts related to the Project the following provisions:
 - (a) During the performance of this Agreement, Recipient and its contractors and subcontractors shall not unlawfully discriminate, harass, or allow harassment against any employee or applicant for employment because of sex, race, color, ancestry, religious creed, national origin, sexual orientation, physical disability (including HIV and AIDS), mental disability, medical condition (cancer), age (over 40), marital status, denial of family care leave, or genetic information, gender, gender identity, gender expression, or military and veteran status.

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- (b) The Recipient, its contractors, and subcontractors shall ensure that the evaluation and treatment of their employees and applicants for employment are free from such discrimination and harassment.
- (c) The Recipient, its contractors, and subcontractors shall comply with the provisions of the Fair Employment and Housing Act and the applicable regulations promulgated thereunder. (Gov. Code, §12990, subds. (a)-(f) et seq.; Cal. Code Regs., tit. 2, § 7285 et seq.) Such regulations are incorporated into this Agreement by reference and made a part hereof as if set forth in full.
- (d) The Recipient, its contractors, and subcontractors shall give written notice of their obligations under this clause to labor organizations with which they have a collective bargaining or other agreement.
- (e) The Recipient shall include the nondiscrimination and compliance provisions of this clause in all subcontracts to perform work under the Agreement.

6.2.2.8. Other Requirements

- For work which requires procurement, the recipient must submit a final budget approval package after receiving bids. This will be evaluated by the SWRCB for consistency with the approved financing, the likelihood of meeting limits or objectives established by the RWQCB and compliance with CWSRF program requirements including federal cross-cutters.
- The SWRCB will use the bids, proposals, and purchase orders accepted by the recipient, along with the requested contingency amount, to determine the eligible amended financing agreement amount.
- Recipient must certify that it complies with all **public contracting requirements**.
- Recipient may start construction prior to effective date of the financing agreement but will not receive reimbursement of construction costs incurred prior to the effective date and are not guaranteed financing approval and an executed financing agreement.
- While not stated explicitly in the Policy, WBSD must comply with **federal anti-lobbying requirements**. SWRCB does not provide non-lobbying forms, but requires compliance and self-certification through execution of the financing agreement.
- Recipient, contractors and subcontractors must comply with all applicable federal and state laws, rules, guidelines, regulations, and requirements as described in the WBSD financing agreement with SWRCB.

6.2.2.9. Signage

- During construction, WBSD and DB Entity must comply with **signage requirements** to enhance public awareness of SRF assistance. Multiple options for signage summarized here:
- http://www.waterboards.ca.gov/water_issues/programs/grants_loans/srf/docs/signage_guidance.pdf.
- Logos for use on the signs are available here:
http://www.waterboards.ca.gov/drinking_water/services/funding/dwsrf_templates.shtml.

6.3. IRWM Grant

The DB Entity shall abide by the requirements included in this section herein as to not prevent the Project from being eligible for IRWM grant funding.

6.3.1. Administering agency

The California Department of Water Resources (DWR) is responsible for overseeing the IRWM grant funding process.

6.3.2. Requirements

- A grant agreement would include applicable requirements, many of which are described in the Standard Conditions of a grant agreement. These include, but are not limited to:
 - Comply with all applicable California laws and regulations and implement the project in accordance with applicable provisions of the law.
 - Complete the project as described in the Work Plan, Budget, and Schedule, included in the grant agreement.
 - The following will need to be provided to DWR upon completion:
 - Final plans and specs
 - Environmental permits
 - CEQA documents
 - Project monitoring plan
 - WBSD must comply with California Labor Code requirements by independently or through a third party, adopting and enforcing a Department of Industrial Relations-certified Labor Compliance Program (LCP) meeting the requirements of Labor Code section 1771.5.
 - **Americans with Disabilities Act (ADA)** - WBSD must comply with ADA of 1990 which prohibits the discrimination on the basis of disability, and associated regulations.
 - **Child Support Compliance Act** – WBSD must fully comply with all applicable state and federal laws related to child and family support enforcement including disclosure of information and compliance with earnings assignment orders. It must comply with earnings assignment orders of all employees and provide the names of all new employees to the New Hire Registry maintained by the California Employment Development Department.
 - **Competitive Bidding and Procurement** – WBSD shall comply with all applicable laws and regulations regarding securing competitive bids and undertaking competitive negotiations for contracts with other entities and acquisition of goods and service and construction of the project.
 - **Drug-Free Workplace Certification** – WBSD, its contractors, and subcontractors must comply with the Drug-Free Workplace Act of 1990.
 - **Final Inspection and Certification of Registered Professional** – Upon project completion, a final inspection and certification must be conducted by a California Registered Civil Engineer that the project was completed in accordance with submitted final plans and specs. WBSD must then notify the State’s project manager of the inspection date at least 14 calendar days prior to the inspection in order to provide the State the opportunity to participate.
 - **Indemnification** – WBSD must require its contractors and subcontractors to name the State, its officers, agents, and employees as additional insured on their liability insurance for project implementation.
 - **Inspections of Project by State** – Contractors and subcontractors must include provisions in contracts to ensuring the State has access to inspect the work being performed at any and all reasonable times during the term of the Grant Agreement.

- **Nondiscrimination** – WBSD and its contractors and subcontractors shall not unlawfully discriminate, harass, or allow harassment against any employee or applicant for employee because of gender, sexual orientation, race, color, ancestry, religion, creed, national origin (including language use restriction), pregnancy, physical disability, mental disability, medical condition, age (over 40), marital status, and denial of medical and family care leave or pregnancy disability leave. WBSD, contractors, and subcontractors shall comply with the provisions of the Fair Employment and Housing Act and associated regulations.
- **Workers' Compensation** – WBSD must make contractors and subcontractors aware of Section 3700 of the California Labor Code which requires employers to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of the code.

6.4. Reclamation Grant Programs

6.4.1. Administering agency

The U.S. Bureau of Reclamation (Reclamation) is responsible for overseeing Reclamation grant funding programs.

6.4.2. Requirements

Because Reclamation is a federal entity, requirements would be expected to be similar to the CWSRF program. The District would be required to comply with federal financial assistance regulations regarding procurement under financial assistance awards, and any contract document would need to conform to these standards.

Project Element 7: Quality Management

The purpose of this Element is to stipulate the quality management minimum requirements for the project. DB Entity's Quality Management Plan, including Quality Assurance and Quality Control (QA/QC) procedures that shall be implemented during the work.

Quality Assurance shall include documentation of inspections, certifications, test results, batch tickets, certified factory inspections, and other reports to confirm that quality control procedures are being followed and implemented throughout the course of the design development and during construction. Quality Control shall include inspection, sampling and testing, and other requirements.

7.1. Quality Management Requirements

The DB Entity shall be responsible for controlling the quality of work associated with the design and the construction of this project, including:

- Confirm that the permitting, design, and construction of the project are consistent with the all requirements.
- Develop systems and procedures to allow discovery of problems early and enable resolution in a timely manner.
- Safeguard implementation of QA/QC activities through the use of documented procedures and process that can be readily audited by the DB Entity and District.
- Minimize the life-cycle costs of the District's infrastructure and facilities.
- Allow for independent oversight of the work by the District.

There shall be full oversight of the construction under the direction of the DB Entity. The DB Entity shall be required to certify that the construction of the project is in compliance with the DB Entity's Construction Documents. QA/QC staff must function independently and be empowered to enforce quality requirements, define quality expectations, independently verify quality, proactively identify any potential causes of unacceptable quality of work and oversee all corrective actions. All requirements of the Quality Management Program shall apply to all subcontractors and subconsultants.

The DB Entity shall identify a Quality Management Plan Manager (QC Manager), subject to approval by the District, who has performed similar functions on projects of similar size for a minimum of 5 years. The DB Entity QC Plan Manager shall be on-site as often as necessary, but not less than the daily working hours specified in the Contract Documents to remedy and demonstrate that Work is being performed properly and to make multiple observations of Work in progress. Additionally, The DB Entity is to furnish personnel with assigned QC functions reporting to the QC Manager. Persons performing QC functions shall have sufficient qualifications, authority, and organizational freedom to identify quality problems and to initiate and recommend solutions.

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Construction Documents shall clearly show detailed quality requirements such as: construction tolerances, material requirements, standards which are to be followed during construction, equipment model numbers, ASTM requirements, field testing, and any test reports or certifications required from the manufacturers and suppliers. DB Entity shall develop measures to ensure that design documents are not released to construction until authorized and approved by the District, as applicable.

7.2. Quality Management Plan

The DB Entity shall develop and provide a Quality Management Plan (QMP) describing the policies and procedures for achieving the District's quality requirements. The Quality Management Plan shall integrate the permitting, design, construction, testing and commissioning phases of the work and shall include QA/QC forms or templates that will be used for the project.

The DB Entity's Quality Management Plan shall be provided to the District for approval no more than four (4) weeks following the Notice to Proceed. The District shall review and respond to the DB Entity's initial Quality Management Plan submittal within three (3) weeks of receipt. The DB Entity shall update and resubmit the Quality Management Plan as required to obtain approval from the District.

After District's approval of the plan, revisions and updates to the Quality Management Plan may be proposed by the DB Entity as the work progresses. Changes to the approved Quality Management Plan shall be approved by the District.

At the minimum, the Quality Management Plan shall include:

- A description of the DB Entity's overall quality management approach, including its QA/QC approach for all phases of the project including permitting, design, construction, testing and commissioning activities.
- Organization charts and minimum staffing requirements for QA/QC activities for each phase of project including description of responsibilities and authorities each QA/QC team members.
- Plans and procedures to confirm that all permits and approvals are properly obtained and that permit requirements are met throughout Project execution. Include roles and responsibilities and procedures for obtaining approvals for all required permits.
- Procedures necessary to ensure that design quality is maintained during the design development, review and approval processes.
- Procedures to ensure that the design and construction quality standards are incorporated into Construction Documents.
- Process for implementation of changes in design during construction as well as District review and approval of changes.
- Description of QA/QC audit procedures to confirm that all aspects of the Quality Management Plan are being implemented.

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- Development of templates for various elements of the work including request for information (RFI), RFI logs, meeting minutes, progress payment applications, shop drawing logs, field inspection reports, testing and commissioning forms and any other templates necessary for the work.
- Overall inspection, sampling, and testing procedures.
- Establishment of the construction daily field reporting form and forms for documentation of field testing and test results.
- Processes and procedures to identify unacceptable and deficient work proactively.
- Procedures to address and manage deficient or rejected Work during design and construction phase.
- Procedures to ensure that procured products and services conform to the requirements of the specifications.
- Description of quality assurance documentation and reporting requirements.
- The Plan shall detail the QA/QC submittals for construction for all materials and equipment and clearly define submittal review process and procedures during construction.

The DB Entity shall perform all testing and inspections required by the Construction Documents, codes, regulations, and standards.

7.3. Inspection of Work Requirements

General requirements for Inspection of Work are as follows:

- All inspectors shall be qualified, trained, and proficient in performing inspections to which they are assigned.
- All Work performed by the DB Entity shall be inspected by the DB Entity. All materials shall be inspected and when necessary tested prior to incorporation into the work. All materials shall be available for inspection by the District.
- The DB Entity shall inspect materials or equipment upon the arrival on the jobsite and prior to installation. The DB Entity shall remove defective items from the site.
- The DB Entity shall permit the District to witness the DB Entity's inspections or perform independent inspections at any time. The DB Entity shall assist the District with performing any independent inspections.
- The DB Entity shall verify measurements and dimensions of the Design-Build work as a first step of starting each installation.

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- Work shall not be backfilled, buried or covered, until it has been inspected. Any work covered in the absence of inspection shall be subject to uncovering and inspection.
- All nonconforming work area shall be noted, reported and promptly corrected.

The DB Entity shall give the District at least five (5) Working Days advance notice of tests or inspections to allow optional attendance by the District. The Work shall be performed under the periodic observation of the District and is subject to inspection and audit by the District to ensure strict compliance with the all requirements and standards. The District shall be permitted access to all parts of the work, including locations where materials or equipment are manufactured, fabricated or stored.

The DB Entity shall be responsible for scheduling and coordinating all inspections including the special inspections, as needed. Structural tests and special inspections shall comply with the California Building Code.

7.4. Notice of Covering Work

The DB Entity shall give the District notice of its upcoming schedule with respect to covering of work and completion of any Work, at least five (5) work days before such covering and completion. Such notice may be provided in the construction meeting minutes. The District shall give the DB Entity notice a minimum of 48 hours of any intended inspection or testing of such work in progress prior to its covering or completion.

7.5. Right of Rejection Deficient Work

The District shall have the right to reject any work or materials to be furnished for the project which fail to meet the requirements of the Construction Documents and project standards at any time.

The DB Entity shall remove from the Site of the Work and replace rejected work or materials promptly after notification of rejection. All costs of removal and replacement of rejected articles or materials shall be borne by the DB Entity.

7.6. Documentation Control / Quality Records

The DB Entity shall establish methods for control and distribution of Construction Documents to the construction team with the most current drawings, specifications and information to construct and complete the Work.

The DB Entity shall maintain information containing equipment manufacturers' installation, operation, and maintenance instruction manuals, and certifications of proper installation that will be available in the field during testing and related activities.

The DB Entity shall maintain evidence of activities affecting quality. At a minimum, this shall include:

- Field testing and sampling report and log

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- Operational reports and logs,
- QA/QC Audit reports
- Records of inspections and tests including daily logs and photographs,
- Reports of materials tests and analyses and certifications
- Equipment and system tests results and certifications
- Daily Inspection Reports, including (at a minimum):
 - Inspection of specific work.
 - Quality characteristics in compliance.
 - Quality characteristics not in compliance.
 - Corrective/remedial actions taken.
 - Statement of certification.
 - QC Manager's signature.
 - Information provided on the daily report shall not constitute notice of delay or any other notice required by the Contract Documents.

Quality Records shall be written with sufficient clarity to allow the District to verify that the quality management is thorough, complete, and can be verified during each phase of the Work, and all Work is properly inspected and all deficiencies are being identified and resolved. Quality Records shall be kept current and be maintained on-site to demonstrate compliance with the technical specifications and the DB Entity's Construction Documents.

The DB Entity shall maintain information containing equipment manufacturers' installation, operation, and maintenance instruction manuals, and certifications of proper installation that will be available in the field during testing and related activities.

Quality Records shall be maintained in a manner that provides for timely recovery. Quality Records shall be protected from deterioration, damage, or destruction. All Quality Records shall be subject to periodic audit reviews performed by the District to assure compliance with the requirements.

The DB Entity shall develop a written procedure for how of inspection of all material and equipment will be conducted to ensure that it meets all Technical Specifications and the DB Entity's Construction Documents. These inspection reports shall have sufficient detail to enable the District to identify inspections which have been performed and review the results of these inspections.

All required field, factory and laboratory quality control tests and engineering data must be documented and transmitted to the design staff for review and approval of materials used in the Work. Documentation

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shall be prepared by the design staff certifying that the test and engineering data records have been reviewed and approved.

The results of all field, factory and laboratory quality control tests and engineering data furnished for the design staff's review shall be submitted with 24-hours after completion of the tests. The DB Entity shall furnish at copy of each test result to the District. One (1) copy of each test report shall be transmitted directly to the District within five (5) Working Days after each test is completed.

The District will furnish the DB Entity with a copy of each field and laboratory quality assurance test report for tests conducted by the District.

7.7. District Review of Quality Records

The Quality Records will be periodically audited by the District to confirm that the quality control program is implemented and maintained throughout the course of construction. The District shall have access to all DB Entity Quality Records.

The DB Entity shall secure and deliver to the District promptly all required certificates of inspection, test reports and work logs.

7.8. General Testing Requirements

7.8.1. District Directed Testing

District retains the right, but not the obligation, to direct the location and timing of additional testing to be performed at the DB Entity's expense. Additional testing shall be performed as a quality control test, recorded as District-Directed Testing (DDT) and such testing shall be in addition of that required by the quality assurance schedules provided by the DB Entity.

- DDT shall be performed with an allowance of \$25,000 (see Volume 1 of RFP)
- DDT shall not be used by the DB Entity to meet the minimum frequencies required by the QMP or other Contract documents
- DDT shall not be delayed unreasonably after direction by the District
- DDT shall be included in the DB Entity's quality evaluation and acceptance of the work
- If DB Entity performs work after District request for a DDT, any required removal and subsequent replacement of work to allow for testing where directed shall be solely at the DB Entity's expense.

7.8.2. District Verification Testing

Independent District Verification Testing (DVT) may be performed by the District. The QMP Manager shall monitor the progress of the placement of materials and inform, in advance, the District about

upcoming opportunities for a DVT consistent with the DVT schedule to be provided at the beginning of the field construction of the Project. The District reserves the right to perform DVT at any time.

7.8.3. District's Right to Test

In addition to any other inspection or quality assurance provisions stated herein, the District shall have the right to independently select, test, and analyze, at the expense of the District, additional test specimens of any or all of the materials to be used. Results of such tests and analyses shall be considered along with the tests or analyses made by the DB Entity to determine compliance with the applicable specifications for the materials so tested or analyzed.

Testing services provided by the District, if any, are for the sole benefit of the District; however, test results shall be made available to the DB Entity.

7.8.4. Overall Testing Requirements

The DB Entity is responsible for coordinating, managing, and performing all testing and developing all required testing documentation. The DB Entity shall provide all the resources needed to perform all testing activities associated with the Improvements. All construction testing shall be performed by individuals who are qualified and experienced in providing these testing services. Equipment used to perform tests shall be calibrated according to requirements in the testing procedure. Offsite laboratory tests shall be conducted using a certified testing laboratory that is authorized to operate in the State of California.

7.8.5. Materials Testing Requirements

The DB Entity shall provide all materials testing services needed to assure quality of all aspects of the Work. At a minimum provide the following:

- Concrete materials, aggregate and mix designs.
- Masonry units, grout, mortar materials and design mixtures.
- Asphaltic concrete materials and design mixtures.
- Fill and backfill materials.
- In-place field density of fills and backfill.
- All import soil and aggregate materials.
- Controlled density fill material strength tests.
- Moisture-density and relative-density of embankment, fill, and backfill materials.
- Joint sealant and caulking.
- Precast concrete.

- Holiday testing of pipeline coatings and other high performance coatings.
- Concrete strength.
- Welding inspection of all field-welded steel pipe joints.

7.8.6. Installation Testing Requirements

The DB Entity shall be responsible verifying that all equipment and facilities have been properly installed and constructed by completing installation testing. At the minimum the installation testing includes:

- Hydraulic structure leak testing.
- Pipeline pressure and leak testing
- Testing of all gates, valves and actuators;
- Steel pipe coating tests
- Dielectric testing
- Corrosion control/cathodic protection testing
- Vibration testing.
- Electrical testing, including testing of power distribution, switchgear, motor control equipment, and surge protection equipment.
- All other installation testing needed to satisfy the requirements of the project.

7.8.7. Equipment and Systems Requirements

The DB Entity shall perform testing to verify that the installed equipment and the complete systems have been properly installed and are operating in accordance with all requirements and standards. At a minimum equipment and systems testing includes:

- Dry and clean water testing of reactors, tanks, piping, pumping equipment, screens, grit removal, blowers, MBR system and all other process and control equipment.
- Perform functional and performance testing to demonstrate the proper installation and operation of individual treatment equipment and control systems.
- Perform all equipment manufacturers' recommended tests and procedures.
- Representatives of the District shall be notified to allow for witnessing of all equipment and systems testing, as defined above.
- A Qualified representative of the equipment manufacturer shall attend all related equipment start-up and testing

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The DB Entity shall prepare and submit a Testing Plan at least six (6) weeks prior to any testing activities. The District will provide comments on the on Testing Plan within three (3) weeks of receipt. If necessary, the DB Entity shall prepare and resubmit updates of the Testing Plan until the plan is approved by the District.

The Testing Plan shall describe the coordinated set of activities to allow a timely, efficient, and successful testing of the treatment equipment and systems. The plan shall include detailed test checklists and forms for each item of equipment, and each system/subsystem. At a minimum, the Testing Plan shall include:

- Schedule for all testing and identification of all key pretest and posttest activities and work.
- Detailed plan testing procedure for all equipment and system to be tested.
- Manufacturer's equipment inspection and certification procedures.
- Procedure for cleaning and flushing pipelines, tanks and equipment prior to testing and start up.
- Documentation requirements during equipment check-out and testing, including sign-off responsibilities by installer, equipment manufacturer's representative and the DB Entity.

Equipment shall be considered ready for test when:

- Water containing structures have passed a water tightness test.
- Equipment, piping, electrical wiring, and instrumentation have been installed.
- Project-related construction submittals including wiring diagrams and O&M manuals for equipment have been completed by the DB Entity and approved by the District.
- Safety devices and equipment are installed, adjusted, tested and fully functional.
- Equipment and instrumentation tagging, panel identification, and wiring identification have been completed to the extent necessary to identify items being tested.
- Instruments and controls have been calibrated through their full range.
- Manufacturer's representatives have inspected major equipment installations and certified that equipment is installed properly.

The testing may start after the District has approved the Testing Plan. The DB Entity shall provide notice of at least one (1) week notice prior to the start of testing.

Equipment may be tested as it is installed and made ready for testing. A portion of the plant may be tested as they are completed and made ready for testing. Testing of individual equipment and subsystems within a system shall be satisfactorily completed prior to commencing testing of the system as a whole.

The DB Entity shall provide all required personnel to conduct all testing activities. All necessary personnel of the various construction trades such as electricians, plumbers, etc., and field service

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personnel of the major equipment suppliers as required for equipment testing activities shall be available during testing.

Equipment and Systems Testing Requirements: Equipment and systems testing shall, at a minimum, include all tests and procedures recommended by the equipment manufacturer and all specified testing requirements in the Construction Documents. All items of equipment shall be tested as part of a system to the maximum extent possible. The systems that shall be successfully tested include, but are not limited to, the following:

- All treatment equipment and related systems;
- All pumping and conveyance equipment and related systems;
- All storm water and drain systems;
- All chemical storage and feed systems;
- Plant wide control and alarm systems;
- Uninterruptible power supply systems;
- All utility water systems; communications, SCADA, instrumentation and control, alarm, and telemetry systems;
- Lighting and emergency lighting systems;
- Irrigation System;
- All electrical and related distribution systems.

Water used in equipment and systems testing shall be provided by the DB Entity.

Testing Reporting Requirements: The DB Entity shall be responsible for documenting satisfactory achievement of all testing requirements. The documentation shall be compiled and provided in an Equipment and Systems Testing Personnel.

7.8.8. Pipe Testing

DB Entity shall provide in the QMP all testing and frequency that will be completed for the pipeline. The minimum shall be completed.

7.8.9. Weld Testing

Liquid penetrant testing: As soon as practicable after welding of each joint, test all field-welded joints by the liquid penetrant inspection procedure in accordance with ASTM E 165 under Method “B” and “Leak Testing.” Conduct 10 tests per 1,000 feet of pipe.

Magnetic particle weld testing: As soon as practicable after welding of each joint, test all field-welded joints by the DB Entity using the magnetic particle examination procedure in accordance with ASTM E 709. Conduct 5 tests per 1,000 feet of pipe.

7.8.10. Hydrostatic Pressure Testing

DB Entity shall provide their own hydrostatic test plan in the QMP. The following are minimum requirements for testing:

- Test pressure shall be 1.50 times the normal operating valves pressure of the pipeline.
- Test connections, valves, blowoffs, Air release, and closure pieces with the piping.
- Do not test against closed valves. Provide blind flanges, dished heads, or other means to isolate test sections.
- Do not include valves, equipment, or piping specialties in test sections if test pressure exceeds the valve, equipment, or piping specialty safe test pressure allowed by the item's manufacturer.
- During the performance of the tests, test pressure shall not vary more than plus or minus 5 pounds per square inch gauge with respect to the specified test pressure.
- Select the limits of testing to sections of piping. Select sections that have the same piping material and test pressure.
- When test results indicate failure of selected sections, limit tests to piping less than 500 feet long and test piping for minimum 2 hours for visible leaks and minimum 2 hours for the pressure test with maximum leakage allowance.
- Testing procedures:
 - Before pressurizing for the tests, retain water in piping under slight pressure for a water absorption period of minimum 24 hours.
 - Fill piping section under test slowly with water while venting air:
 - Raise pressure to the specified test pressure and inspect piping visually for leaks:
 - Consider visible leakage testing complete when no visible leaks are observed.
 - Pressure test with maximum leakage allowance:
 - Leakage allowance is zero for piping systems using flanged, National Pipe Thread threaded and welded joints.
 - For piping systems using joint designs other than flanged, threaded, or welded joints, accurately measure the makeup water necessary to maintain the pressure in the piping section under test during the pressure test period:

- Consider the pressure test to be complete when makeup water added is less than the allowable leakage and no damage to piping and appurtenances has occurred.
- Successful completion of the pressure test with maximum leakage allowance shall have been achieved when the observed leakage during the test period is equal or less than the allowable leakage and no damage to piping and appurtenances have occurred.
- When leakage is allowed, calculate the allowable leakage by the following formula:
 - $L = S \times D \times P^{1/2} \times 148,000^{-1}$

Wherein the terms shall mean:

- L = Allowable leakage in gallons per hour.
- S = Length of the test section in feet.
- D = Nominal diameter of the piping in inches.
- P = Average observed test pressure in pounds per square inches gauge, at the lowest point of the test section, corrected for elevation of the pressure gauge.
- x = The multiplication symbol.

7.9. Cathodic Protection Testing

Provide cathodic protection testing. Testing procedure shall be submitted with the corrosion protection plan. Depending on system, testing may vary but should be in similar nature to the following. Testing procedure shall be provided by corrosion protection engineer.

7.9.1. Testing During Construction

Furnish all necessary equipment and materials and make all electrical connections to the pipe as required to test the electrical continuity of bonded pipe joints. Conduct a continuity test on each pipe joint that is required to be bonded. Test the electrical continuity of each pipe joint before bonding and after the bonds have been installed, but before backfilling of the pipe.

The test procedure shall be as follows:

- Measure the resistance of each pipe joint before and after bonding, using the low resistance ohmmeter in accordance with the manufacturer's written instructions.
- Use helical hand spikes to contact the pipe on each side of the joint. When taking measurements after the pipe joint bonding cables have been installed, do not touch the exothermic weld or the bonding cables.
- Clean the contact area to bright metal by filing or grinding, with all surface rusting or oxidation removed.

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- Take measurements both forward and reversed to ensure no DC interference.
- Record the measured pipe joint resistances on a permanent record and submit 3 copies to the District.
- Repair any damaged pipe coating in accordance with the specifications, using only compatible and accepted materials.
- Joint bond acceptance:
 - Resistances of bonded pipe joints shall be less than or equal to the maximum allowable bond resistance values shown in Table 7.9-1.

Table 7.9-1: Allowable Bond Resistance

Joint Type	Maximum Allowable Resistance
Push On Mechanical	0.000162 ohm
Flexible Coupling	0.000175 ohm
Joint Bond	0.000081 ohm

- Replace any joint bonds which exceed the allowable resistance. Retest replacement joint bonds for compliance with the specified bond resistance.
- Test Records:
 - Replace any joint bonds which exceed the allowable resistance. Retest replacement joint bonds for compliance with the specified bond resistance.
 - Replace any joint bonds which exceed the allowable resistance. Retest replacement joint bonds for compliance with the specified bond resistance.
 - The test records shall include:
 - The location (pipeline station number) and a brief description of the joint type, fitting.
 - The date of the test and the status of the joint (before or after bonding).
 - The resistance measured.
 - Any comments.
 - Notify the District at least 24 hours before pipe joint resistance testing is to be conducted, in order that the testing may be witnessed by the District.

7.9.2. Testing After Construction

Perform electrical continuity testing on the entire bonded pipeline system or specified bonded sections of the pipeline system installed as part of Project to ascertain and ensure that all pipe joint bonding has been properly installed and is functioning as designed. Complete the continuity testing after the pipe joint bonding and installation of the corrosion monitoring test stations have been completed.

At least 3 weeks before continuity testing is to be accomplished, submit a testing plan and schedule to the District. This plan and schedule shall include a list of the equipment that will be used for the testing, including power supply, auxiliary (temporary) ground, reference electrodes, voltmeters.

Testing procedure:

- Conduct the continuity tests by measuring the response of the potential of the piping to the application of a simulated cathodic protection test current in the following manner:
 - Install an auxiliary (temporary) ground at a minimum distance of 10 feet from the pipeline near or adjacent to a corrosion monitoring test station.
 - Connect the auxiliary ground to the positive DC output terminal of a portable cathodic protection rectifier unit or "steady source" DC power supply, as accepted by the District.
 - Connect the negative DC output terminal of the rectifier or DC power supply to the pipeline by means of the test cables in the corrosion monitoring test station.
 - Adjust the DC output of the rectifier or power supply to provide a pipeline potential no more negative than minus 2.00 volts with respect to a standard copper/copper-sulfate (Cu/CuSO₄) reference electrode in contact with the earth directly over the pipeline at the test station location.
 - Record the DC voltage and current output of the rectifier or power supply, along with the pipeline-to-Cu/CuSO₄ potential measured at or near the auxiliary ground.
 - With the DC test current turned on and off on a cycling basis (by means of a current interrupter installed in the test circuit), "on" and "off" pipe-to-Cu/CuSO₄ potential measurements shall be taken at each corrosion monitoring test station in both directions away from the auxiliary ground and power source.
 - Pipe-to-Cu/CuSO₄ potential measurements of "foreign" lines and/or casings located at test stations shall also be taken with the simulated cathodic protection current "on" and "off."
- When the pipe-to-CU/CuSO₄ potential change from "off" to "on" becomes less than 300 millivolts, move the auxiliary ground and the power supply to a new location, with the testing procedure as described in Items a through g repeated until the entire bonded pipeline or bonded pipeline sections have been tested.

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- Take all pipe-to-Cu/CuSO₄ potential measurements utilizing a Digital Multimeter and the copper/copper-sulfate reference electrodes.
- Accomplish all continuity testing in the presence of the District.

7.9.3. Inspection

- Upon completion of all work, the corrosion control facilities installed under this Contract will be inspected and tested by the District to ensure complete conformance with the Contract Documents.
- Any unapproved deviations or changes from the design made by the DB Entity during the installation of these facilities shall be corrected.
- Any or all deficiencies in the facilities found through the final testing shall be corrected to meet the requirements of the Contract Documents.

7.10. Pump and Pump Station Testing

- Factory and field testing are required.
- Test 8 hours minimum for flow and head; begin tests at or near the rated condition; for factory and field-testing, test with furnished motor at full speed.
- Test each specified flow and head condition at the rated speed and test at minimum as well as maximum specified speeds; operate at each test condition for a minimum of 20 minutes or longer as necessary to measure required performance, vibration, and noise data at each test condition.
- Record measured shaft revolutions per minute, flow, section pressure or wet well level, discharge pressure; record measured bearing temperatures (bearing housing exterior surface temperatures may be recorded when bearing temperature devices not required by the equipment section) and record observations on noise levels.
- Bearing temperatures: During maximum speed or capacity, measure and record the exterior surface temperature of each bearing versus time.
- Perform efficiency and/or Net Positive Suction Head Required (NPSHr) and/or priming time tests when specified in the equipment section in accordance with the appropriate HI standard and as follows:
 - Perform NPSHr testing at maximum rated design speed, head and flow with test fluids at ambient conditions; at maximum rated speed, test at 15 percent above rated design flow, and 25 percent below rated design flow.
 - Perform efficiency testing with test fluids at maximum rated speed.
 - Perform priming time testing with test fluids at maximum rated speed.

7.10.1. Variable Speed Equipment Tests

At a minimum, perform priming time testing with test fluids at:

- Maximum rated speed.
- The speed corresponding to the rated maximum capacity.
- The speed corresponding to the minimum capacity.
- The speed corresponding to the average operating conditions.

7.10.2. Tolerance

Tolerances shall be in accordance with appropriate HI Standards, except the following modified tolerances apply:

- From 0 to plus 5 percent of head at the specified flows.
- From 0 to plus 5 percent of flow at the rated design point head.
- No negative tolerance for the efficiency at the specified flows.
- No positive tolerance for vibration limits. Vibration limits and test methods in HI Standards do not apply, use limits and methods specified in this or other Sections of the Specifications.

7.11. Electrical and Instrumentation Testing

Provide testing protocol for electrical and instrumentation in the QMP. Plan shall be approved by District. The following is the minimum requirements and shall meet all InterNational Electrical Testing Association (NETA) and IEEE requirements.

- Manufacturer's Field Tests:
 - Completed per manufacturer's published requirements.
- Pre-energization Tests:
 - Perform visual inspection and recording of motor nameplate data.
 - Conduct torque connections testing.
 - Perform wire insulation and continuity tests.
 - Perform grounding system tests to assure that system is complete and effective
- Pre-startup Tests:
 - Conduct breaker tests.

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- Perform phase rotation tests on all equipment.

Project Element 8: Testing, Commissioning, Operational Demonstration, Final Acceptance and Operation and Training Period

8.1. Introduction

This section describes the requirements for Project Acceptance, includes testing, commissioning and operational demonstration. It also includes Project Closeout documents including Operation and Maintenance Manuals. The DB Entity shall prepare and submit a full testing plan with final submittal requirements for District approval. Finally, this section describes the Operation and Training Period that follow Final Acceptance.

Completion of the testing, validation of performance, and final acceptance shall, at a minimum, involve the following steps:

1. Functional Testing: Equipment, mechanical, electrical, instrumentation and control system testing
2. Process Commissioning Period (As needed)
3. Substantial Completion
4. Operational Demonstration (30 days)
5. Final Acceptance

8.2. Functional Testing

The functional stage of testing shall involve the completion of testing forms by the DB Entity which include all possible operating scenarios, alarm conditions, prohibitive interlocks, and indication functions. The DB Entity shall perform a test run for all functional tests to ensure that systems are functioning properly prior to witnessing by the District and/or their authorized representatives. After the test run is successfully completed, the DB Entity shall notify the District at least 72-hours in advance of the scheduled functional testing. Upon successfully completing functional testing, the District and/or their authorized representatives will sign applicable functional testing forms.

Functional testing of all process equipment shall take place with available water suitable for the intended equipment. The DB Entity is responsible for the installation and removal of any temporary piping, valves, pumps, etc. to deliver the test water to the process area and to dispose of the test water at a location and rate approved by the District. In systems where equipment cannot be operated without sewage/sludge the Functional Testing shall be performed to the extent possible, as long as it is communicated to and approved by the District.

The DB Entity is responsible for all costs of the functional testing, including the supply of materials and chemicals necessary for the performance of the tests. The DB Entity is responsible for functional testing for all project equipment and systems in all modes of operation. The DB Entity shall demonstrate proper

operation of each instrument loop function including alarms, local and remote controls, instrumentation and other equipment functions. For each equipment and process system, simulate actual process conditions as needed to test each loop, each mode of control, sequences, alarms, and other functions. Verify control system response, displays, and logs at all applicable devices. Verify and record scaling and setpoints.

Modify system parameters, pump and equipment control, and process treatment operations to confirm all operating parameters during this test. If any equipment or system does not meet all of the parameters defined in the Functional Test Plan, the DB Entity shall correct the problem and shall repeat the test until it is successful.

8.2.1. Certificate of Proper Installation:

At completion of Functional Testing and prior to Operational Demonstration, furnish written report(s) prepared and signed by manufacturer's authorized representative, certifying that the manufacturer's equipment:

1. Has been properly installed, adjusted, aligned, and lubricated, where applicable.
2. Is free of any stresses imposed by connecting piping or anchor bolts.
3. Is suitable for satisfactory full-time operation under full load conditions.
4. Operates within the allowable limits for vibration.
5. Controls, protective devices, instrumentation, and control panels furnished as part of the equipment package are properly installed, calibrated, and functioning.
6. Control logic for start-up, shutdown, sequencing, interlocks, and emergency shutdown have been tested and are properly functioning.

Furnish written report prepared and signed by the electrical and/or instrumentation subcontractor, certifying:

1. Control logic that resides in motor control centers, control panels, and circuit boards furnished by the electrical and/or instrumentation subcontractor has been calibrated and tested and is properly operating.
2. Control logic for equipment start-up, shutdown, sequencing, interlocks and emergency shutdown has been tested and is properly operating.
3. Co-sign the reports along with the manufacturer's representative and subcontractors.

8.3. Biological Process Optimization Period (As Needed)

Following completion of Operational Demonstration, the process commissioning period shall commence. The purpose of the biological process optimization period is to start up the biological process (activated

sludge) and achieve a stable and healthy activated sludge conditions which reliably meeting the Project's water quality requirements. Daily mixed liquor concentrations shall be measured and manageable foam and scum conditions (i.e. less than one hour of operations effort) shall be logged to determine activated sludge health and stability. The biological process optimization period shall be considered complete when water quality requirements and a stable and healthy activated sludge are observed over 14 consecutive days.

The DB Entity shall provide District staff the opportunity to observe and participate in the optimization process. The District and/or their authorized representatives shall notify the DB entity upon concurrence of the completion of the biological process optimization period. This period must be completed before commencement of the Operational Demonstration period (Section 8.5)

8.4. Substantial Completion

The DB Entity shall notify the District, in writing, when the DB Entity believes that the Work has reached Substantial Completion. Upon receipt of the notification, the District and/or their authorized representatives will make inspection, to determine if the Work and administrative requirements are sufficiently complete in accordance with the Project Requirements so the facility is ready for its intended use. If items are found which prevent such use or occupancy, the District will notify the DB Entity, in writing, of such items by issuing a Corrective Work Item List.

Upon the completion of such corrective work, the DB Entity shall so notify the District in writing. The District shall inspect the Work to determine its acceptability for Substantial Completion and for determination of other items which do not meet the requirements of the Project. Upon verification that the Work is substantially complete, the District shall prepare a Certificate and the Punch List, with input from the DB Team design engineer and construction team. The Certificate shall establish the date of Substantial Completion and the responsibilities of the District and DB Entity for security, maintenance, heat, utilities, damage to the Work and insurance, commencement of warranties required by the Project requirements. The Certificate shall establish the date, not to exceed 60 days after the issuance of the Certificate, in which the DB entity shall finish all items on the Punch List or remaining work or administrative requirements accompanying the Certificate. When the preceding provisions have been approved by both the District and the DB Entity, both parties shall sign the Certificate to acknowledge their written acceptance of the responsibilities assigned to them in such Certificate.

Substantial Completion requires completion of the following Work:

- Completion of the work as required by the Project requirements to allow the District to occupy and use the Project for its intended purpose.
- Completion of the Corrective Work Item List (as defined above)
- Process Commissioning completed.
- All process equipment shall be installed and operational.

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- All instrumentation and control systems shall be installed and operational to allow automatic operation.
- All alarms are fully functional, tested and demonstrated to properly associate locally, remotely and in the SCADA system.
- All items related to health and safety of District operations and maintenance staff, including warning signs, guardrails, and safety equipment shall be complete.
- All record drawings have been submitted, updated, reviewed and approved.

Portions of the Work not essential to the system operation, which can be completed without interruption of system operations, may be completed after the Work is substantially complete, and may include the following items:

- Final Site Clean-Up
- Completion of the Final Punch List
- Training of District Operations Staff (see Operations and Training Period, below)

8.5. Operational Demonstration (30 days)

Operational Demonstration shall begin after Substantial Completion has been reached and documented. The purpose of Operational Demonstration is to confirm and prove reliable operation of the facilities under actual wastewater loading and recycled water production conditions. During this operational period, the DB Entity shall be fully responsible for providing operational staff, equipment, supplies, and chemicals, and for the costs of all utilities required to operate the plant.

1. During Operational Demonstration, period the DB Contactor shall replicate actual operating conditions to the greatest extent possible; including operating of all controls and programming associated with the system.
2. The DB Entity shall immediately correct defects in material, workmanship, or equipment which become evident during Operational Demonstration.
3. The DB Entity shall monitor performance of all equipment and system during the Operational Demonstration period and conduct water quality monitoring and daily testing to demonstrate compliance with whole system effluent performance criteria.
4. Repeat Operational Demonstration when malfunctions or deficiencies cause shutdown or partial operation of the RWTP or results in performance that is less than specified herein.

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5. When demonstrating compliance with effluent water quality requirement, the plant must operate in influent flow and water quality stress mode for a minimum of 168 consecutive hours. Stress test is defined as operating each process or equipment to its rated capacity. Any water quality stress testing that requires minimum water temperatures must be conducted during January and/or February. If it is not possible to exactly replicate the applicable water quality conditions for the entire test period, the DB Entity shall detail the specific approaches that will be used to demonstrate achievement of the water quality requirements. Acceptable approaches include, but are not necessarily limited to:
 - a. Routing plant effluent back to the head of the plant or other location to recirculate back through the treatment processes.
 - b. Where parallel process trains are included in the design, one train process units shall be "turned off", so that the remaining process unit(s) receive higher flows and loads which will more closely replicate design conditions
6. Failure of any major process unit during the 30 day Operational Demonstration period will result in the abandonment of the Operational Demonstration work and the 30 day Operational Demonstration shall be restarted from the beginning.
7. DB Entity shall provide a chronological record of the status of the system and equipment during the Operational Demonstration to the District. All changes in status or system parameters, adjustments, and results of tests shall be included in the record. Entries shall be made, noting the date and time, at the occurrence of each event.
8. Once the Operation Demonstration has been accepted by the District, the RWTP is deemed acceptable for online operation to begin producing RW for use at SHGCC. The DB Entity's operational phase shall commence once the RWTP begins delivering RW to the SHGCC storage ponds. The DB Entity shall establish and document standards of practice for each process area during the operational phase so operations can be easily transitioned to the District when the operational phase is completed. Furthermore, the DB Entity shall document, at a minimum, the following operational characteristics:
 - a. Consumables consumption rate and cost (e.g. chemical usage, odor control media),
 - b. Potable water consumption rate,
 - c. Power cost,
 - d. Labor hours, organized by personnel and title,
 - e. Process monitoring, as detailed in Section 3.2.

8.6. Final Acceptance

Following completion of Operational Demonstration and when the DB Entity considers the Work is complete, the DB entity shall notify the District or their authorized representatives in writing and request final acceptance. The District will review the submitted information, including the Operational

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Demonstration Report, by the DB Team to determine if the Work and administrative requirements are complete in accordance with the Contract Documents.

Submit following Closeout Submittals before final acceptance of the Work:

1. Completed Punch list of items requiring correction from Substantial Completion.
2. Evidence of Compliance with Requirements of Governing Authorities.
3. Project Record Documents.
4. Approved Operation and Maintenance Manuals.
5. Approved Warranties and Bonds.
6. Keys and Keying Schedule.
7. Completed Operational Demonstration Report.

8.7. Operation and Training Period (6 Months)

The DB Entity shall provide all labor (including properly licensed, on-site personnel), equipment, materials, chemicals and other items required to properly and fully operate the satellite treatment facility for a period of 6 months from the date of Project acceptance. During this period, the DB Entity shall be responsible for arranging for chemical delivery to the site, replacing worn or broken parts and equipment, ordering new parts and consumables, performing routine and major maintenance of equipment and facilities, monitoring plant operation and water quality testing and all other activities associated with full operation of the plant.

All odor-related issues should be addressed by the DB Entity during the initial operating period. Odor resulting for equipment or construction defects shall be addressed by the DB Entity through the duration of the warranty period. DB Entity shall establish a system to log and respond to odor complaints, which can be transitioned to the District after the operation and training period.

The DB Entity will pay all electrical utility costs during the initial operation and maintenance period. The District will provide utility bills to the DB Entity for reimbursement. The DB Entity may assume an average utility rate of \$0.13/kWh for proposal purposes. If utility rates are higher, the District will pay the difference based on the rate difference but not based on assumed energy consumption. It is the DB Entity's responsibility to accurately project energy usage based on the final design and proposed equipment. As detailed in Volume 1 of this Request for Proposal, the DB Entity shall be accountable for inaccurate energy and chemical consumption estimates submitted in the Respondent's proposal.

The DB Entity shall complete monitoring and data management per Section 0. Operations data and information shall be made available to District upon request.

Should any spare parts be consumed in the initial operation and maintenance period, they shall be replaced in kind by the DB Entity such that the District obtains a complete inventory of recommended

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spare parts at the conclusion of the period. In addition, the initial operation and maintenance period shall conclude with all chemical storage full, all equipment operational and functioning correctly, all routine and required maintenance complete and with no ongoing operational problems at the plant. The District reserves the right to extend the operating period beyond six (6) months at no additional cost to the District until these requirements are met.

At the end of the 6-month operational demonstration period, the DB team shall develop an Operational Demonstration Summary Report providing a summary of the following:

- Operations information and data for the 6-month period
- Equipment issues and outage
- Process issues and outages
- Documentation of consumables used
- Energy use by month
- Chemical use by month
- Daily recycled water delivered; daily, monthly and annual totals

8.8. Training

During the Operational Demonstration period, the DB Entity shall provide operations training to the District staff. Training shall include, but is not limited to, facility inspections, equipment calibration, and modification of operating setpoints, control system review, equipment maintenance, water quality sampling, regulatory report development, process data analysis review, and other facility operational requirements.

- DB Entity is responsible for providing all training of the District staff on the care, maintenance and proper operation of the equipment such that the Owner is capable of fully and independently operating the facilities.
- DB Entity shall involve Owner's staff from the early stages of the project so that they become familiar with the plant during the construction process to better understand how the key equipment is installed and started up on a functional level.
- DB Entity shall develop a formal training plan consisting of both class room and hands-on field training. The initial phase of the training plan shall include vendor training that focuses specific training sessions for all equipment. The Vendor Training will detail the maintenance requirements, troubleshooting and repair guidelines of the equipment.
- DB Entity shall provide classroom and hands-on field system training for the following:

- Process Training: This training will provide an overview of the treatment processes and details on the facility control and monitoring system. The overview training will include required action to troubleshoot biological systems upsets.
 - Operations Training: This training will provide hands-on and classroom training for day to day operation of the facilities. The training will include Start and Stop processes for all equipment, lock out/tag out procedures, general health & safety procedures, sampling requirements and procedures, and required action during operational emergencies.
 - Electrical & Control Systems Training: This training will include maintenance and safety training for major electrical equipment, such as the electrical switch gear, transformers, power monitors and MCC's. In addition it will provide training for the control system, hands on training and calibrating and maintaining instruments such as flow meters, analyzers and critical reporting instruments.
- Operation and maintenance training of personnel shall be provided for all equipment provided as a part of this project.
 - Vendor training shall be conducted by competent representatives who are certified by the manufacturer to be thoroughly familiar with the subject matter, as well as instructional methods.
 - Four (4) weeks prior to any training session the DB Entity shall provide a lesson plan to the owner. A lesson plan shall contain instructional objectives of the training, a training outline, and credentials of the instructor.

8.9. Operation and Maintenance Manuals

The DB Entity shall provide a plant-wide Operations and Maintenance (O&M) Manual for all treatment systems. The (O&M) Manual shall be specific to this facility.

The manual shall provide technical guidance in the operation and management of the treatment processes and equipment. The manual is intended for use by plant staff as the primary reference for the training of staff, control, standard operation, emergency operation, start-up, shutdown, and alarm troubleshooting of the treatment processes and their related equipment.

8.9.1. Operation Manual

The operations section of the manual must be written in easily understandable English and shall include a table of contents, a brief plant process summary including headworks, biological treatment, MBR and disinfection, organized from the influent to the discharge. Include section on electrical power supply and distribution, PLC system and controls and SCADA system.

The O&M manual shall describe operation of the individual systems and treatment processes. Operation information for each system or process shall include system description, operating procedures monitoring requirements.

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For each system or process provide a description of each equipment, valve and instrument, provide quantity, related equipment or instrument numbers, manufacturer and model and rating or size. Include screenshots, if needed, of process control SCADA and photos to fully present each process.

Provide a detailed description of the operation and control of each unit process including the following:

- Normal range for each operational parameter.
- All automatic controls and the procedures to change the set points.
- Potential operating problems, procedures minimize them to recognize them and step by step actions to follow if they occur.
- Operating procedures for each unit process shall include:
 - Startup procedures
 - Normal shutdown procedures
 - Emergency shutdown procedures
 - Standby power procedures

Provide a detailed description of each alarm and the required response. Arrange all alarms by process area and include alarm number, related equipment or instrumentation tag, and all required procedure for responding to alarms.

Include a section in the operations manual to present all monitoring and sampling requirements for process control, and provide a schedule for the monitoring and sampling. Discuss the importance of the parameters that are monitored. The manual shall also include:

- List of all required laboratory analysis methods and procedures.
- List of equipment, supplies and chemicals required for the laboratory analysis.
- Procedures for storage and handling of laboratory chemicals.
- Sample record-keeping logs and procedure.

Include all process design parameters, equipment and tankage sizes and construction drawings for the facility as a part of appendices.

8.9.2. Maintenance Manual

The Maintenance section also must be written in easily understandable English and provide an overview of the maintenance schedule, preventative maintenance, and record keeping for major equipment items. Include all equipment and instrumentation manufacturer O&M Manuals as a part of appendices.

In addition, provide a list of potential emergencies and develop procedures to be followed in case of an emergency. Present safe operation and maintenance of the facilities including:

- Potential hazards along with methods and procedures to manage the risks
- Proper housekeeping for a safe working environment
- Discuss plant process chemical handling procedures, the hazards associated with each chemical.

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Provide two (2) hard copies and two (2) electronic copies (searchable PDF format) of the O&M manual to the District.

Project Element 9: Design Build Warranty

The DB Entity, at its own expense, shall make all repairs or replacements necessitated by defects in materials or workmanship, supplied in the Project, and pay for any damage to other works resulting from such defects, which becomes evident within one (1) year after the date of Substantial Completion date, whichever is applicable or within such longer period of time as may be prescribed by law or by the terms of any applicable special guarantee required by the Contract Documents. Defects in materials or workmanship also includes all work and materials provided by subcontractors or manufacturers of packaged equipment components. The DB Entity also agrees to indemnify, defend, and hold the District and SHGCC harmless from liability of any kind arising from damage due to said defects.

The DB Entity shall execute and submit a completed Warranty Form in the format acceptable to the Owner. The Warranty Form shall be submitted prior to the Substantial Completion. In addition, the DB Entity shall submit the other specified additional warranties, guarantees, and bonds from manufacturers and suppliers.

The DB Entity shall, upon the receipt of notice in writing from the District, promptly make all repairs arising out of defective materials, workmanship, or equipment. The District is hereby authorized to make such repairs, and the DB Entity and its Surety shall be liable for the cost thereof, if ten (10) days after giving of such notice to the DB Entity, the DB Entity has failed to make or undertake the repairs with due diligence. In case of emergency, where in the opinion of the District, delay could cause serious loss or damage, repairs may be made without notice being sent to the DB Entity, and the expense in connection therewith shall be charged to the DB Entity, and its Surety shall be liable for the cost thereof.

Prior to the expiration of the Warranty period, the District reserves the right to hold meeting(s) which will require the attendance of the DB Entity. The purpose of the meeting(s) are to review warranties, bonds and maintenance requirements and determine required repair or replacement of defective items.

Acceptance of the Work or a portion of the Work by the District, shall not extinguish any covenant or agreement on the part of the DB Entity to be performed or fulfilled under this DB Entity which has not been performed or fulfilled at the time of such acceptance. All covenants and agreements shall continue to be binding on the DB Entity until they have been fulfilled.

The District and the DB Entity agree that warranty on the parts of the work possessed and used by the District shall commence on the date that the District takes possession of such work and so notifies the DB Entity in writing. The District and the DB Entity further agree that such possession, and use of the work shall not be deemed as Substantial Completion or acceptance of any other part of the Work.

If, after installation, the operation or use of the materials or equipment furnished in this Project proves to be unsatisfactory to the District, the District shall have the right to operate and use such materials or equipment until it can, without damage to the District, be taken out of service for correction or replacement. Such period of use of the defective materials or equipment pending correction or replacement shall in no way decrease the guarantee period required for the acceptable corrected or replaced items of materials or equipment.

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Nothing in this Element shall be construed to limit, relieve or release the DB Entity's, subcontractor's and equipment supplier's liability to the District for damages sustained as the result of latent defects in the equipment furnished caused by the negligence of the supplier's agents, employees or subcontractors. Stated in another manner, the warranty requirements contained in this Element shall not amount to nor shall it be deemed to be a waiver by the District of any rights or remedies (or time limits in which to enforce such rights or remedies) it may have against the supplier of the equipment to be furnished under these Specifications for defective workmanship or defective materials under the laws of this State pertaining to acts of negligence.

9.1. Membranes Warranty

In addition to the warranty above, the membrane equipment supplier shall provide a guaranteed membrane replacement or additional purchase price, as a cost per module and as a cost for the total system. The membrane equipment supplier shall provide warranty duration for membranes for a minimum of 5 years, with the initial 2 years carrying a warranty for full replacement (including labor and materials) and the remaining years of the warranty prorated. All warranty and support shall be provided directly by the membrane equipment supplier and not the local representative.

The membrane equipment supplier shall warrant membrane modules under the following terms:

1. The membrane equipment supplier shall repair, replace, or add at no cost to the District, any membrane modules that fail before the end of the warranty period which shall commence with Substantial Completion certification. Failure is defined as any defect in the membrane manufacturing that causes any of the following:
 - a. Inability to meet production capacity requirements as specified.
 - b. Inability to meet performance requirements after a cleaning as specified.
 - c. Inability to meet membrane permeate quality requirements as specified.
 - d. The membrane equipment supplier shall further warranty any valves or equipment that are started or actuated more than once per hour, for a minimum period of 3 years.
2. If membrane equipment supplier is unable to modify the system through addition of membranes or other elements, and cannot satisfy requirements of testing, commissioning, or Operational Demonstration, or the system fails to meet specified performance criteria during the warranty period following the date of Substantial Completion certification, then membrane equipment supplier shall be responsible for complete removal of nonconforming system and subsequent installation of membrane products that are capable of meeting specified performance conditions.
3. The membrane equipment supplier shall guarantee that for components manufactured by the membrane equipment supplier, replacement parts shall continue to be available to the District for a minimum of 20 years from date of successful completion of Substantial Completion certification. The membrane equipment supplier shall guarantee that, if the membrane equipment

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Supplier's or Supplier's product line is sold, Supplier shall make provisions such that all guarantees, warranties, and bonds will remain in effect and that replacement parts and operational support continue to be available to the District for the time period specified above.

Project Element 10: Coordination and Review Requirements

The purpose of this Element is to present the procedures for coordination and review of all work associated with this project to verify that it been designed and constructed in accordance with the requirements listed herein.

10.1. Submittal Management Manual

The DB Entity shall submit a Project Submittal Management Manual (Manual) to the District for consideration and approval. The Manual shall identify the submittal packages and associated schedule of submission, and shall identify the frequency of the design progress/coordination meetings during various phases of the design. The Manual shall include the schedule to obtain local, state, and federal permits as required for the Project. Each submittal package shall contain a minimum of one (1) electronic (PDF) copy and four (4) hardcopies. At a minimum, the Project Submittal Management Manual shall include the following:

- Design and construction schedule
- Design package submittals as defined herein
- Design-build quality management plan submittal
- Warranties, certifications, and other data by manufacturers
- Operation and maintenance (O&M) manuals
- Schedule of progress meetings
- Schedule for securing permits

The DB Entity shall maintain a computerized document control system to monitor the generation, status, and filing of documents. Documents such as the Contract Documents, Construction Documents, Request for Information, Design Clarifications, Meeting Minutes, Applications for Payment, reports and transmittal letters shall be managed using the computerized system.

10.2. Design and Construction Documents

10.2.1. Design Phase Documents

Design package submittals shall be defined by the DB Entity in the Project Submittal Management Manual. The submittals shall be organized to meet the project requirements for design and permitting work. It is anticipated that the DB Entity will phase design submittals over the course of the project to support the proposal construction schedule. The District understands that the DB Entity will likely schedule construction of some project components to proceed while design of other elements is still ongoing. This is acceptable, and the DB Entity's design submittal schedule shall reflect the requirement that construction shall not start on any component shall not proceed until that component has reached 100

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percent design, will approval from the District and all agencies having jurisdiction, including permitting agencies. At a minimum, provide:

- Project schedule
- Design submittals (Construction Documents) for all design disciplines at the following design stages.
 - 50 percent
 - 90 percent
 - 100 percent (final)
 - As-builts (Record Documents). See Section 10.2.4 for further requirements.
- Request for change to the project requirements, including changes agreed upon during the proposal phase of the Project.
- Review meetings material, including coordination meeting minutes
- Permitting
 - Application submittals to local, state, and federal for permits.
 - Design documents (Construction Documents) required for local, state, and federal permits.
 - Local, state, and federal permit agency review and comments.

The DB Entity shall provide the following for each design submittal for the District's review and approval:

- Project Schedule.
- Design criteria for all design disciplines included in the design submittal
- Basis of Design Reports covering all design work included in the design submittal
- Piping and Valve schedules.
- Electrical loads.
- Equipment schedules for process, mechanical, HVAC, electrical, instrumentation and control, and all supporting systems.
- Specifications for major equipment.

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- Narrative description for controls (including control loop descriptions), remote monitoring and operating capability, voice and data communications.
- Specifications including civil, structural, architectural, equipment, specialties, mechanical, electrical, instrumentation, and controls sections.

10.2.2. Construction Phase Documents

Construction Documents shall be consistent with interim design documentation that are to be modified during the District's review process. The DB Entity shall submit the final Construction Documents after addressing the District's comments on the 90 percent design submittals. The 90 percent design submittal shall include completion of design analyses and documents while also incorporating review comments from the 50 percent design submittal. DB Entity shall fully develop and finalize the design details.

The final Construction Documents shall include all corrections and changes agreed to be made as a result of the comments received from District and the permitting agencies. The Construction Documents shall be in the form that is issued for construction.

Construction work shall not vary from the final Construction Documents submitted to the District except where such variations are allowed, subject to review and approval, as provided for herein. Adherence to the final Construction Documents will be one factor used by the Districts in its review and approval of applications for payment during construction.

The DB Entity shall prepare and provide a complete set of Construction Documents. At a minimum the following Construction Documents shall be prepared and provided for the project:

- Construction Specifications
 - Include Civil, structural, architectural, equipment, specialties, mechanical, electrical, instrumentation, and controls sections. Construction Document specifications shall be prepared with Microsoft Word. The specification shall be provided in a format consistent with the Construction Specifications Institute (CSI) standards.
- General Drawings
 - Cover sheet with location maps
 - Drawing index
 - Standard abbreviations and symbols
 - Equipment, piping and valve schedules
 - Hydraulic profile
 - General plan
 - Process flow diagrams

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- Civil Drawings
 - Scaled site plan(s)
 - Scaled paving, grading, and drainage plans with corresponding sections
 - Scaled piping plan and profile for water lines, force mains, recycle water piping and gravity sewers
 - Scaled yard piping plans with sections
 - Landscaping and irrigation plan
 - Typical details
- Process Mechanical Drawings
 - Scaled Influent PS mechanical plans and sections
 - Scaled RWTP mechanical plans and sections
 - Scaled RWTP equipment layout and sections for each process area
 - Typical Details
- Architectural Drawings
 - Scaled building floor and roof plans
 - Scaled building exterior elevations and sections
 - Building finish, door, and hardware schedules
 - Typical details
- Structural Drawings
 - Scaled Influent PS foundation, plans and sections.
 - Scaled building foundation, roof plans and sections.
 - Scaled process structure foundation, plans and sections.
 - Typical details
- Heating, Ventilation, and Air Conditioning (HVAC) and Plumbing Drawings
 - HVAC plans and sections with dimensioning
 - Building plumbing plans and sections with dimensioning

- Typical details
- Corrosion Control Construction Document Drawings
 - Corrosion control plan
 - Typical details
- Piping and Instrumentation Drawings
 - Piping and instrumentation diagrams (P&IDs) for each process area
 - Instrumentation Loop Diagrams
 - Typical details
- Electrical Drawings
 - Scaled electrical site plan(s)
 - Power distribution one-line diagram
 - Motor Control Centers (MCC) one-line diagrams and elevations
 - Panel board and schedules
 - SCADA system architecture
 - Panel and wiring riser diagram

Construction Document drawings shall be prepared with AutoCAD. Construction Document drawings shall be prepared in accordance with the United States National CAD Standard and District standards.

10.2.3. Project Photographs and Video

The DB Entity shall provide photographs and video of the existing condition of entire site including each area of Work prior to the start of Work. Areas to be photographed and videoed shall include the site of the Work and all existing facilities, either on or adjoining the Project site, including all facilities access roads etc, which could be damaged as a result of the DB Entity's Work. Video and pictures of the entire County right-of-way shall be provided and submitted to the County as part of the encroachment permit.

The DB Entity shall provide photographs and videos of construction in each area of Work throughout progress of Work including a key plan designating where each photograph was taken. Take site and interior photographs and videos from differing directions pre-excitation, footing excavation, soil testing, utility crossings, concrete work, building construction, , electrical work, and instrumentation and other applicable activities indicating relative progress of the work.

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The DB Entity shall provide post-construction photographs and videos of construction in each area to document the finished condition of all work. Take photos and video from same points in same direction as pre-construction photos and videos.

The DB Entity shall maintain a comprehensive log of all photographs and shall organize the log and the photographs by date and by subject area. The DB Entity shall include for each photograph in the photograph log, the photograph number, photograph date and a description of the photograph, including indication of direction of the photo.

The photographs and the log shall become the property of the District at the completion of the Work.

10.2.4. Project Record Documents

The DB Entity shall maintain record design and construction documents (Project Record Documents), including engineering analysis, calculations, design reports, Record Drawings, technical specifications, approved shop drawings, photographs, design change notices, test records, survey data, DB Entity's field orders, and all other documents pertinent to the Work, including locations (northings and eastings) for all buried features. Project Record Documents shall note all changes made to the design drawings during construction. These documents shall be updated regularly and shall never be more than two (2) weeks behind the current state of the Work.

The DB Entity shall submit to the District the Project Record Documents. The final submittal shall include a set of final design documents, calculations, engineering analyses, and design reports; an electronic set of construction technical specifications in Microsoft Word, an electronic set of Record Drawings in AutoCAD format and four sets of prints Record Drawings shall be designated in as "Record Drawings" and shall be signed and sealed by the engineer(s) in responsible charge of the design work, along with a certification both signed and sealed by the DB Entity's responsible design and construction representatives.

Construction phase submittals shall be outlined in details in the Project Submittal Management Manual. At a minimum, the DB Entity shall provide the following:

- Requests for information and clarification between the DB Entity's construction and the design staff.
- Equipment and material supplier submittals.
- Inspection reports.
- Material testing reports.
- Equipment supplier installation test and certifications reports.
- Electrical system test reports.
- Instrumentation and control test reports.

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- Redesign or design clarifications needed during construction.
- Field orders and field changes.
- Photos and videos of pre-construction, construction and post construction phases.
- Project Record Documents.

10.3. Design Phase Review:

The District's input to the design process shall be on an ongoing basis as the work is being performed. To assist design review process, the DB Entity shall schedule design progress meetings with the District as needed, at a minimum of monthly throughout the design phase. The purpose of these meetings will be to discuss overall design progress, the conformance of the design to the project requirements, and to address outstanding issues arising from the review and response and issues related to permitting. Early construction activities may also be included as agenda items for each design progress meeting. All meetings will be held in the District's offices.

Special meetings may be held as required by the DB Entity to discuss special project issues such as project schedule, startup planning, etc.

The DB Entity shall prepare and issue draft meeting minutes within three (3) working days of each design progress/review meeting. The meeting minutes shall document all decisions made and approved deviations from the project requirements. The DB Entity shall issue final meeting minutes within three (3) working days of receiving comments on the draft meeting minutes from the District.

The District will review the design documents for compliance and consistency with the project requirements, including a detailed review of the equipment, material specifications and construction standards. In addition, District will provide input on issues such as selection of finishes, architectural concept, site access, equipment layout/access and landscaping.

All DB Entity's requests for changes to the project requirements must be submitted in writing and clearly identified in the submittals. The changes must be fully documented with clear justification and its benefits to the District.

The District will complete its review of each submittal in no more than three (3) weeks. For each submittal, the District will provide written comments indicating concerns, problems, or non-compliance. The DB Entity shall provide a written response to the comments within five (5) working days. If necessary meetings shall be scheduled to address the comments to facilitate timely completion of the submittal review process.

10.4. Construction Phase Review

The District will periodically review construction activities and participate in construction progress meetings on a biweekly basis, or more frequently if required to verify compliance with the requirements. In addition, the District will monitor the progress of construction to review and verify all applications for

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payment covering all related construction work performed. DB Entity will schedule and administer meetings throughout progress of the work and prepare and distribute meeting agenda, draft and final meeting minutes. In general, construction progress meeting will be held every other week at the District's offices with the following minimum agenda:

- Minutes from previous meeting – comments
- Actions resulting from previous meeting
- Project schedule
- Submittal status and schedule
- Design clarifications and changes
- Work completed to date
- Daily field reports
- Construction Deficiency Report/List
- Inspection/Test Reports
- Partial payment request
- 2-week/4-week look ahead
- District's comments, issues
- Design Entity's comments, issues
- Major Equipment/Material Delivery & Expediting
- Reports of representatives of the manufacturer
- Staff training, including ongoing training and schedule of future training
- Safety
- Startup/commissioning Activities
- Action items
- Next scheduled meeting

To the maximum extent possible, the DB entity shall advise the District at least 24 hours in advance of the construction progress meeting regarding all items to be added to the agenda.

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The District's review and involvement in construction activities is intended to be a part of the District's independent quality assurance process, and it shall not be viewed as a part of the DB Entity quality management plan.

Prior to initiation of construction, the DB Entity shall prepare and submit to the District a preliminary listing of all shop drawings and other submittals to be prepared by the DB Entity. The DB Entity shall update the list of submittals periodically throughout the construction period. The DB Entity shall submit copies of all submittals, including review comments included in final approved submittals to the district for record purposes.

In addition the DB Entity shall meet and inspect the work with the District 11 months after project completion. At the minimum the DB Entity shall:

- Arrange the inspection date with the District at least 7 days before the meeting.
- Meet in District's office or other mutually agreed upon place.
- Inspect the Work and draft list of items to be completed or corrected.
- Review service and maintenance contracts, and take appropriate corrective action when necessary.
- Complete or correct defective work and extend correction period accordingly.
- Require attendance of DB Entity, Project Manager, or Superintendent, appropriate manufacturers and installers of major units of constructions, and affected subcontractors

10.5. Project Schedule Requirements

Detailed Project Network (DPN): Immediately upon receipt of the Notice to Proceed, the DB Entity shall commence the preparation of its DPN. The DPN shall be a computer-generated and computer-drawn schedule analysis, developed using Primavera Project Planner, Primavera Systems, Inc., in analyzing the project schedules. The DB Entity shall assemble and determine, with the assistance of its engineers, designers, subcontractors, vendors, and suppliers, information regarding the Work that includes, but is not limited to:

- A Detailed Project Network that represents the DB Entity's best judgment of how it shall prosecute and complete the work in compliance with the project requirements stated herein.
- The identity and duration of all activities to be included in the Work. Activities shall meet the following criteria:
 - Activities shall be numbered, and their descriptions shall be clear and concise. The beginning and end of each Activity shall be readily verifiable.
 - Activities shall be coded with sufficient detail to allow identification of the Activity as to type of work, work responsibility, requirement for design, permitting, and any other coding necessary to accurately describe the work Activity. All Activities associated with

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- the preparation, submittal and approval of information required by the District shall be coded so they may be readily identified.
- The quantity and cost component for each Activity shall be provided. The sum of the Activity cost components shall equal the Contract Price. If the Contract calls for pay items, the Activity shall also be coded to allow identification with its respective pay item(s). Fabrication of materials and/or equipment shall be described in a separate Activity. The cost component of any fabrication Activity shall be zero.
 - Activity duration should be sufficiently short to allow each Activity to be identified as a discreet item of work. For most Activities, the duration should not exceed 30 days. However, if the Activity duration must exceed 30 days, quantification of the Activity must be included to aid in updating the Activity's progress.
 - The identity of long lead activities for items permitting and delivery dates of all major pieces of equipment or materials.
 - The identity of any potential problems or constraints related to the implementation of the overall work plan.
- The DB Entity, within 60 calendar days following Notice to Proceed shall submit the DPN to the District for review and approval. The DB Entity shall revise the DPN according to the comments received from the District and submit the revised schedule within 10 calendar days after receipt. The reviewed schedule will then be considered the "Approved Baseline Project Schedule". At a minimum the submittal shall include:
 - Show the interdependencies of the work Activities and the major points of interface or interrelation with the activities of others, including Specific Dates for completion of design, permitting and construction.
 - The start and completion dates of all items of Work including design, survey, permitting and construction work.
 - The dates of submittals, procurement, delivery, installation and completion of each item of equipment and material requirement.
 - The lead time required for testing, inspection and other procedures required prior to completion of the Work.
 - The activities shall be grouped by phase, internal milestone dates, project area, trade and subconsultant to provide logical summary activities.
 - All activities of for permitting.
 - All permanent and temporary coordination and tie-in activities for utilities.
 - Include the description and quantity of work, by Activity.
 - Allow for the time required for engineering, permitting, preparation, submission and approval of submittals (including Maintenance & Operating Instructions), manufacturing, delivery, and installation.

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- Delineate the Critical Path (or Paths).
- Indicate all erection and installation Activities.
- Indicate all testing of equipment and materials.
- Indicate startup, operational demonstration, and commissioning Activities.
- All Activity durations shall be given in calendar days. The Network shall also indicate each of the following:
 - Interfaces with the work of outside entities, e.g., utilities, power
 - Description of Activity including Activity numbers
 - Estimated duration for each Activity
 - Early start date for each Activity
 - Late start date for each Activity
 - Early finish date for each Activity
 - Late finish date for each Activity
 - Float available for each path of Activities
 - Actual start date for each Activity begun
 - Actual finish date for each Activity completed
 - The Critical Path for the project, with said path of Activities being clearly and easily recognizable on the time-scaled network diagram. The relationship between all non-critical Activities and Activities on the Critical Path shall be clearly shown on the plot of the Detailed Project Network by symbol.
 - The dollar value and quantity of work for each Activity, corresponding with the Schedule of Values
 - The percentage complete for each Activity in progress or completed
 - Relationships shall not contain positive or negative lags other than “0”.
 - Zero Total Float constraints shall not be acceptable in the network.
 - Open-ended Activities (other than the first and last Activity) shall not be acceptable.
 - Mandatory Start and Mandatory Finish dates shall not be used in place of logic relationships.

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- The link between the remaining duration and percent complete must be disabled since the schedule will be cost and resource loaded. Prior approval from the District must be acquired should the DB Entity elect to use the “schedule percent complete” method in lieu of a resource driven schedule.

10.5.1. Detailed Project Network Updates

Approximately monthly during the project, and not less than 5 calendar days prior to the date of each Application for Progress Payment, the DB Entity shall update the DPN based on actual progress, and submit to District for review and approval. The DB Entity shall also submit a narrative report with the updated computer-generated Cost and Schedule Reports which shall include, but not be limited to, a description of problem areas, current and anticipated delaying factors and their impact, an explanation of corrective action taken, any newly planned Activities, and any proposed logic revisions. Section). The narrative shall also include:

- A description of actual work accomplished during the reporting period.
- A summary per week the Work during the reporting period.
- Summary of amounts due each Subcontractor for each period, indicating total contract amount, amount paid to date, and amount due this period.
- Summary of amounts due each major equipment supplier for each period, indicating total contract amount, amount paid to date, and amount due this period.
- Changed or additions to DB Entity’s supervisory personnel since the preceding progress report.
- Update and status of submittals and the Submittal Management Manual updates

10.5.2. Recovery Schedule

Should Substantial Completion or Final Completion not be accomplished on schedule, that the most current progress schedule indicates 14 or more days behind to the extent that any of the mandatory specific or milestone or completion dates are in jeopardy, the DB Entity shall prepare and submit to the District a supplementary Recovery Schedule. The Recovery Schedule shall be submitted in a form and detail appropriate to the need, which explains and displays how the DB Entity intends to reschedule those Activities, in order to regain compliance with project schedule.

Within 5 calendar days, the DB Entity shall participate in a meeting with the District to review and evaluate the Recovery Schedule. Any revisions necessary as a result of this review shall be resubmitted by the District for approval within 2 calendar days of the conference. The approved Recovery Schedule shall then become the schedule which the Db Entity shall use in planning, coordinating, and executing the Work to regain compliance with project schedule.