

# SLWSD Water Supply and Treatment System Improvements Design Criteria Package

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HR Green Project No: 2504042

Prepared For:



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## Section 1. Project Overview

### 1-1. Purpose

This document establishes the design basis, requirements, and specifications for the St. Lucie West Services District (SLWSD) Reverse Osmosis Water Treatment Plant (ROWTP) expansion project. The expansion is intended to increase potable water supply capacity to 6.5 MGD firm and 8.2 MGD peak, while maintaining compliance with Florida Department of Environmental Protection (FDEP) drinking water standards and regulatory requirements outlined in the Florida Administrative Code (FAC). Subsequent sections provide a project overview with a flow diagram, followed by detailed technical specifications and performance requirements for Design-Build procurement.

### 1-2. Project Overview

The SLWSD requires an upgrade and expansion of its Water Supply and Treatment System to meet the growing development and overall service needs of the District's utility service area. SLWSD's evaluation of the ROWTP has identified necessary improvements to increase the finished water capacity to 5.4 MGD from the RO system, with corresponding raw water supply and treatment capacity to support the expanded system at 75-80% recovery.

The SLWSD ROWTP expansion is designed to achieve 6.5 MGD firm capacity through two integrated water sources: RO permeate (5.4 MGD) blended with pretreated surficial aquifer water (1.0 – 1.2 MGD). All major treatment components are sized to support this combined capacity with appropriate redundancy.

**Scope for Design-Build Procurement:** The expansion project encompasses upgrades to all major components of the treatment train: one additional Floridan Aquifer groundwater supply well, new raw water transmission infrastructure, micron cartridge filtration upgrades, two additional High-Pressure RO feed pumps, one additional RO treatment skid, one additional degasifier with blowers, two new biotrickling filter odor control systems, complete replacement of chemical feed systems, one new chlorine contact chamber, three additional transfer pumps, electrical MCC upgrades, and upgrade of one high-service pump.

**Surficial Aquifer Water Treatment System (Pilot Status):** The surficial aquifer water treatment component for LSI (Langelier Saturation Index) balancing and PFAS (Per- and Polyfluoroalkyl Substances) removal is based on preliminary pilot study results only. Additional data or documentation is anticipated to be required for FDEP permitting the surficial source as a new potable supply. It is the Design-Build Team's responsibility to evaluate the study results and finalize the design. Required permitting for this system is included in the scope of the Design-Build Team.

The following sections provide detailed information on each major component. System descriptions and Technical Criteria are based on the 2024-06-27\_FINAL\_SLWSD 2024 System Engineer Bond Report, field data collected during the August 13, 2025, site visit performed by ISS/HR Green, and input from the SLWSD operations team. Comprehensive water quality parameters for raw water (Floridan Aquifer) and finished water (FDEP drinking water standards) are included in Section 2-1. The Design-Build Team is required to examine these parameters and ensure all proposed treatment processes can effectively treat the raw water to meet or exceed regulatory requirements (FDEP, FAC, etc.).

For each expansion component, comprehensive Technical Criteria in the appendices establish specific performance requirements, dimensional constraints, material specifications, and integration parameters as minimum design standards. Each section outlines existing conditions, performance parameters, and expansion requirements with detailed equipment specifications, capacity ratings, dimensional data, and operational parameters necessary for proper design and implementation.

The Design-Build Team shall reference the appendices when developing detailed designs for each system component. Any discrepancies between the information provided and actual field conditions should be documented and addressed as part of the design process.

Specific Design Specifications for piping, instrumentation, and other related components are outlined in Section 2-15.

### **1-1.1 New Water Supply Well**

The existing ROWTP is supplied by three Floridan Aquifer groundwater wells, each equipped with well pumps rated at 1,400 gpm. The current firm capacity of the well system is 4.3 MGD. Standard operation includes rotating one or two wells to supply groundwater for the water treatment process, with Well No. 1, identified by SLWSD operations staff, being the most productive source in terms of yield.

The physical characteristics of the existing Floridan Aquifer groundwater wells are summarized in Section 2-1. To meet future capacity requirements and provide system redundancy, the project scope includes installing an additional supply well to increase the firm capacity of the groundwater supply to 6.5 MGD.

The new well is anticipated to be similar to existing wells in terms of depth, construction, water quality, and production. Introducing a fourth Floridan Aquifer groundwater well will necessitate modifying the current SFWMD Water Use Permit with FDEP to approve the increased water withdrawal from the Floridan Aquifer and to authorize the physical addition of the fourth well.

The Technical Criteria for this component of the project can be found in Section 2-2.

### **1-1.2 New Raw Water Transmission Main and Upgrades to Micron Cartridge Filtration**

The Design-Build Team shall design and construct a new raw water transmission main from the new well to the existing raw water main at the ROWTP. The transmission main shall be sized to convey the full capacity of the new well to the treatment plant.

Pipeline sizing shall be determined through hydraulic analysis during detailed design to maintain velocities between 3-5 fps at design flow and ensure the well/pump combination can deliver the required groundwater flow rate and pressure to the ROWTP. Pipeline material shall be appropriate for raw water quality, with preference for PVC C900 DR18, and will connect to the existing 16-inch raw water transmission main constructed primarily of PVC (C-900 specification). The design shall include appropriate appurtenances, including but not limited to air-release/vacuum valves at high points, thrust restraints, isolation valves, and tracer wire along the entire pipeline length.

The existing ROWTP micron cartridge filtration system consists of three vertical cartridge filters with capacities of 2.4 MGD, 1.5 MGD, and 1.5 MGD, respectively. These filters are 5-micron nominal rated and protect downstream RO membrane equipment from damage caused by sand or other fine particles.

To accommodate the increased treatment capacity, the Design-Build Team shall design and install upgrades to the micron cartridge filtration system to achieve a minimum capacity of 6.4 MGD with provisions for redundancy. The upgraded system shall provide additional cartridge filter vessels to meet the required capacity while maintaining a maximum loading rate of 3 gpm per 10-inch equivalent filter element. Filter vessels shall be constructed of 316L stainless steel, utilize nominal 5-micron filter

elements compatible with the existing system, and be NSF/ANSI 61 certified for drinking water use. The design shall allow for isolation of individual vessels for maintenance without interrupting system operation.

The Technical Criteria for Transmission Main and the Micron Cartridge Filter can be found in Sections 2-3 and 2-4 respectively.

### **1-1.3 Upgrades to High-Pressure Pumping Capacity**

The existing ROWTP utilizes vertical turbine-type reverse osmosis (RO) feed pumps in a duty-standby configuration. Currently, four pumps operate as duty units with one providing redundancy. Each 150 HP pump delivers 700 gpm at a total dynamic head (TDH) of 650 ft, with two units equipped with variable frequency drives (VFDs). The pumps feed a common header supplying the downstream RO treatment systems, typically with two pumps serving each treatment train. The current firm capacity, with four operational pumps, is 4.6 MGD.

To meet the expanded capacity requirements, two additional identical vertical turbine pumps (each rated at 785 gpm) will be designed and installed. This enhancement will increase the system's firm capacity to 6.85 MGD while maintaining the N+1 redundancy standard.

The expansion requires a reevaluation of the 316L stainless-steel high-pressure piping network between the pumps and the RO treatment system to ensure that hydraulic capacity meets future flow demands.

The Technical Criteria for the design of the High-Pressure Pumps can be found in Section 2-5.

### **1-1.4 New Reverse Osmosis Treatment System**

The existing ROWTP operates three RO treatment skids with two units online and one providing redundancy. Each skid features 29 first-stage and 13 second-stage pressure vessels with inter-stage pressure boosting, housing seven 40-inch Toray TMG20-440C membrane elements per vessel (430 sq ft surface area each).

According to manufacturer specifications (Toray), each skid is expected to produce 1.8 MGD (1,250 gpm) of permeate at 225 psi, with an average flux of 13.9 gfd (gallons per square foot per day) and 80% recovery, based on a groundwater TDS of 3,700 mg/L. SLWSD operations staff reported that actual performance is approximately 1.35 MGD per skid at 75% recovery.

The Design-Build Team shall design and install one additional RO treatment skid with a design capacity matching the existing skid (1.8 MGD), increasing the system firm capacity to 5.4 MGD while maintaining N+1 redundancy. The new skid shall match the existing configuration with average flux not exceeding 14 gfd and designed for 80% recovery.

Prior to detailed design, engineering analysis and performance testing is required to identify and address the factors limiting current skid performance below rated capacity.

The Technical Criteria for this component of the project can be found in Section 2-6.

### **1-1.5 Upgrades to Degasifier and Odor Control System**

The project scope includes designing and installing one additional degasifier and two new biotrickling filter odor control systems to increase treatment capacity and maintain system redundancy for the expanded ROWTP.

The facility currently operates two degasifiers that remove hydrogen sulfide and excess carbon dioxide from the RO permeate. Each existing unit is 8 ft in diameter and features 13 ft of polypropylene packing media, designed for a hydraulic loading rate of 30 gpm per square foot and a treatment capacity of 2 MGD. Each degasifier is served by a 10,000 SCFM forced-draft centrifugal blower, providing a current

firm capacity of 4 MGD with built-in redundancy. The new degasifier shall match existing unit specifications to increase firm capacity to 7.4 MGD. The tower shall be constructed of FRP with high-efficiency packing media designed for hydrogen sulfide removal and removal of excess carbon dioxide, positioned downstream of the calcite contactors. Two new blowers rated at 10,000 SCFM each shall be provided, and a new MCC building with VFDs shall be constructed to power the existing and new blowers, new chemical buildings, and accommodate transfer pumps.

For odor control, the plant currently uses a single FRP vertical packed tower chemical scrubber (6 ft diameter, 22.75 ft height) rated for 4 MGD to treat off-gases from degasifier operations. Two new biotrickling filter systems shall be installed to supplement and replace the existing chemical scrubber, increasing firm capacity to 8 MGD. The biotrickling filters shall provide a total treatment capacity of 8 MGD, with a minimum 99% hydrogen sulfide removal efficiency at inlet concentrations up to 50 ppm. The FRP vessels shall include high-efficiency engineered packing media designed for an empty-bed contact time of at least 15 seconds at peak airflow. Each system shall include automatic nutrient dosing, pH monitoring and control, recirculation systems with 100% pump redundancy, and media irrigation systems to maintain optimal biological conditions for handling variable airflow and hydrogen sulfide loading from multiple degasifiers operating simultaneously.

The Technical Criteria for the Degasifier and the Odor Control System are in Sections 2-7 and 2-8 respectively.

#### **1-1.6 Upgrades to Chemical Addition System**

The project scope includes the complete replacement of the anti-scalant, sulfuric acid, and caustic chemical feed systems to support the expanded treatment capacity of 5.4 MGD RO finished water. The Design-Build Team shall design and construct a new chemical feed building to house the replacement sulfuric acid and caustic soda systems with separate containment areas for incompatible chemicals. The building shall include appropriate ventilation, safety features such as emergency eyewash and shower stations, spill containment, chemical-resistant flooring, and adequate drainage.

The new chemical feed systems will connect to existing bulk storage tanks sized based on maximum dosages at design flows: anti-scalant at 6.5 MGD raw water flow (remaining in the existing water treatment plant), acid at 6.5 MGD raw water flow, and caustic at 5.4 MGD RO finished water flow. Each chemical system shall include one duty and two standby metering pumps (peristaltic pumps preferred) with automatic switchover capability, variable-speed drives for flow-proportional control, and a turndown ratio of at least 10:1. All pumps shall include back-pressure valves, pulsation dampeners, isolation valves, calibration columns, and appropriate instrumentation. The systems shall be fully integrated with the existing SCADA system for remote monitoring and control, with multiple control modes, including manual, flow-proportional, and closed-loop pH-based control, where applicable.

The Technical Criteria for the Chemical Addition System is in Section 2-9.

#### **1-1.7 Upgrades to the Clearwell/Chlorine Contact Chamber System**

The project scope includes designing and constructing one new Chlorine Contact Chamber (CCC) to supplement the existing chamber and increase the firm capacity of the disinfection system to 8.2 MGD. The existing CCC has an operating volume of ~85,300 gallons and provides a minimum 30-minute hydraulic retention time at a peak flow of 2,850 gpm (4.1 MGD).

The new CCC shall match the existing unit specifications, with an operating volume of 85,300 gallons, and shall be constructed of reinforced concrete, with an internal baffling system to ensure plug-flow conditions and a minimum baffling factor of 0.5. The design shall include flow control between chambers for balanced operation, as well as provisions for isolation and bypass for maintenance. The system shall

achieve a minimum 4-log virus inactivation and maintain a free chlorine residual of at least 0.2 mg/L at the outlet, in compliance with FAC/FDEP requirements<sup>1</sup>. The new chamber will be fully integrated with the existing SCADA system with instrumentation for flow measurement, chlorine residual monitoring, water level monitoring, and pH monitoring.

The Technical Criteria for this system can be found in Section 2-10.

### **1-1.8 Upgrades to Transfer Pumps**

The project scope includes installing three additional transfer pumps and upgrading existing pumps to increase the finished water transfer capacity to 5.7 MGD while maintaining N+1 redundancy. Currently, the facility uses three vertical turbine transfer pumps to move treated water from the Chlorine Contact Chamber to the ground storage tanks: two pumps rated at 1,200 gpm (51 ft TDH, 15 HP) and one at 1,400 gpm (30 ft TDH, 25 HP). The current firm capacity is 3.7 MGD.

The three new vertical turbine pumps shall each be rated at 1,400 gpm (2.0 MGD), with approximately 25 ft TDH and 25 HP motors. Pump materials shall include bronze impellers, stainless steel shafts, and cast-iron column and discharge heads. Two VFDs shall be provided for level control to ensure consistent flow through the basin, improving chemical pacing and chlorine dosing accuracy. Remaining pumps shall utilize cross-the-line soft starts based on water level. All pumps will be integrated with the existing SCADA system for automatic lead/lag operation and pump rotation.

The Technical Criteria for the pumps can be found in Section 2-11.

### **1-1.9 Upgrades to High-Service Pumps**

Currently, the system consists of 7 High-Service Pumps (HSP-1/2/3/4 Set A, and HSP-1/2/3 Set B). The project scope includes upgrading the existing 50 HP (700 gpm) High-Service Pump-1 (HSP-1) to a 100 HP (1,400 gpm) unit to increase the distribution system capacity. The ROWTP currently operates two sets of split-case centrifugal high-service pumps that deliver finished water to the community. Set A includes four pumps with varying capacities (one with 700 gpm, two at 1,400 gpm, and one at 3,000 gpm), while Set B includes three pumps (two at 1,400 gpm and one at 700 gpm). The current firm pumping capacity is 7,200 gpm, with the largest pump out of service, resulting in an effective firm capacity of 6.10 MGD and a peak-hour factor of 1.7.

The upgraded pump shall be a split-case centrifugal pump with a bronze impeller, a stainless steel shaft, and a cast iron casing. A VFD shall be provided for flow control. The upgrade will include all necessary modifications to the pump foundation, piping, electrical systems, and integration with the existing SCADA system. The enhanced system will increase firm pumping capacity to 7,900 gpm with the largest pump out of service, providing an effective firm capacity of 6.70 MGD with a 1.7 peak-hour factor.

The Technical Criteria for the pumps can be found in Section 2-12.

### **1-1.10 Raw Water Blend Filtration Systems**

Raw water pretreatment incorporating surficial aquifer blending is based on preliminary pilot study findings provided for reference. The Design-Build Team shall be solely responsible for:

- Conducting comprehensive engineering analysis and pilot testing validation;
- Establishing final design criteria, process configuration, equipment selection, and sizing;

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<sup>1</sup> Florida Administrative Code (FAC) Chapter 62-555, Drinking Water Standards, Monitoring, and Reporting. Specific disinfection requirements per FAC 62-555.320. The Design-Build Team shall verify current FDEP requirements and design the system to meet all applicable regulations in effect at the time of design.

- Securing all required permitting and regulatory compliance, including but not limited to: FDEP water use permit modifications for the new surficial aquifer source; effluent disposal permits for backwash and media rinse water; and, where applicable, EPA NPDES coverage for surface water discharge or Underground Injection Control authorization;
- Defining performance requirements and system integration; and
- Producing a detailed engineering report documenting all testing, analysis, design basis, regulatory coordination, and implementation strategy prior to construction.

Vendor references can be found in Section 2-13.

#### **1-1.11 Electrical MCC Improvements**

The project requires modifications to the facility's power distribution network to support expanded treatment capacity. Currently, the ROWTP draws electricity from Florida Power and Light through a distribution system that features a utility transformer, a 3,000-amp switchboard, and four motor control centers (MCC1, MCC2, MCC3, and MIPS IRR MCC). Emergency power is provided by two generators: a primary 1,250 kW unit serving the overall facility and a secondary 515 kW unit dedicated to MCC2. This electrical infrastructure currently serves water operations.

To accommodate the additional process equipment, the expansion will necessitate electrical upgrades designed by a professional electrical engineer licensed in the State of Florida. While specific improvements will be finalized during the detailed design phase, anticipated modifications include replacing the main switchboard assembly (encompassing the main breaker and transfer switch) and installing additional motor control sections.

The Design-Build Team shall verify the capacity and condition of the existing emergency generators to ensure reliable backup power given the increased electrical demand and the age of the equipment. The existing WTP and WWTP systems are "connected" via a conduit with two 4" conductors that allow the backup power supply to provide power to the WWTP and vice versa. This system is aging and in need of replacement.

The Technical Criteria can be found in Section 2-14.

#### **1-1.12 Instrumentation and Controls (I&C) System Upgrades**

The District maintains a services contract agreement with its chosen Control Systems Integrator, Integration Services, Inc. (ISI).

All process instrumentation and control system PLC I/O panels that are required to complete this project but are not included with or part of a required OEM supplied equipment package will be supplied by ISI. ISI will provide detailed instrumentation and control panel equipment submittals to the Design Build Team based on the submittal schedule defined in the project specification.

All the ISI supplied instruments, instrument panels and PLC I/O panels will be installed and wired by the Design Build Team.

All process connection tubing, fitting and hardware required to properly mount and/or install or bring process water to the process instruments will be the responsibility of the Design Build Team.

All stands, Unistrut and/or control panel mounting hardware will be the responsibility of the Design Build Team. All electrical conduit, wire and field termination of control wiring will be the responsibility of the Design Build Team.

The project includes the expansion of the existing facility's automation architecture to integrate new treatment components. The ROWTP currently operates through a distributed control system featuring a

central programmable logic controller (PLC) connected via Ethernet/IP to seven satellite PLCs positioned throughout the plant. The existing RO trains utilize extensive instrumentation for monitoring critical parameters, with sensors measuring pressure, flow, and conductivity across feed, permeate, and concentrate streams at each treatment stage.

Incorporating the fourth RO skid will require additional instrumentation and programming modifications to the plant-wide control platform designed by a licensed I&C engineer. While the skid manufacturer will supply the core control elements, these systems must be seamlessly integrated into the existing network infrastructure. Beyond the RO system, new instrumentation and controls will be implemented for all major equipment additions, ensuring monitoring and automated operation of the expanded facility.

#### 1-1.12.1 Tagging Standards

The design will be required to incorporate the existing equipment tagging standards established at the facility. The current standard uses the following structure:

AAA-BXX

Where:

AAA: ISA abbreviation of the device (i.e.: FIT, PIT, etc.)

B: Plant Area designation

2: Infeed Wells

3: Plant low pressure feed

4: R/O Skids

6: Clear Well

7: Concentrate disposal

8: High Service pump station A

9: High Service pump station B

XX: Unique alphanumeric identifier.

#### 1-1.13 Professional Engineering Certification Requirements

All design documents, calculations, and construction drawings shall be prepared under the responsible charge of, and bear the signature and seal of, a Professional Engineer licensed in the State of Florida in the appropriate discipline. This includes, but is not limited to:

- Civil/hydraulic engineering for pipelines, structures, and water systems.
- Structural engineering for concrete structures, foundations, and building elements.
- Electrical engineering for power distribution, motor controls, and electrical systems.
- Mechanical engineering for pumps, treatment equipment, and HVAC systems.

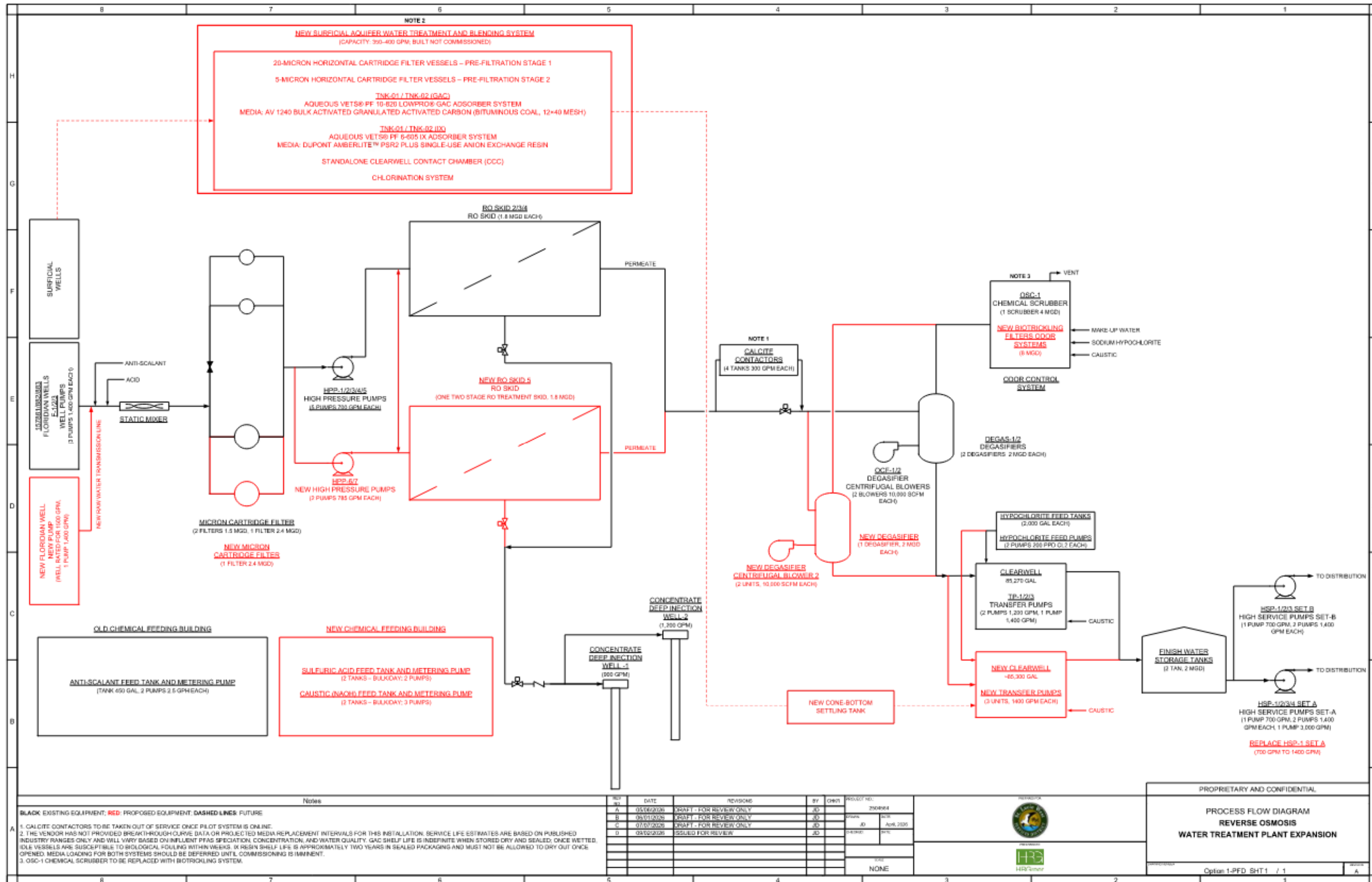
All drawings submitted for FDEP permitting shall bear appropriate professional seals as required by the FAC and FDEP regulations.

#### 1-1.14 Project Process Flow Diagram

Two Process Flow Diagrams (PFDs) are provided for the SLWSD ROWTP. Figure 1 illustrates the existing treatment system as it currently operates. Figure 2 illustrates the proposed expansion and shows the relationship between existing and proposed equipment. The diagrams identify the major treatment components, process flows, chemical injection points, and interconnections required for the new capacity objective. The PFDs serve as the primary reference for understanding the integrated system design and provide the basis for detailed engineering design and equipment coordination by the Design-Build Team.







## Section 2. Design Criteria

### 2-1. Water Quality Design Parameters

This section includes Floridan Aquifer raw water quality parameters for design basis and applicable FDEP drinking water quality standards.

#### Floridan Aquifer Raw Water Quality Parameters for Design Basis:

| Number of Wells                    | #    | 3      |        |        |
|------------------------------------|------|--------|--------|--------|
| Well ID                            |      | 157881 | 157882 | 157883 |
| Chemical Composition               |      |        |        |        |
| Fluoride                           | mg/L | 4.0    | 4.0    | 4.0    |
| Sodium                             | mg/L | 815    | 846    | 1050   |
| Calcium                            | mg/L | 147    | 154    | 174    |
| Chloride                           | mg/L | 18900  | 2070   | 2550   |
| Fluoride                           | mg/L | 4.0    | 4.0    | 4.0    |
| Iron                               | mg/L | 0.1    | 0.1    | 0.1    |
| Magnesium                          | mg/L | 127    | 132    | 161    |
| Sulfate                            | mg/L | 227    | 234    | 263    |
| Color                              | mg/L | 5.0    | 5.0    | 5.0    |
| TDS                                | mg/L | 3660   | 4050   | 4830   |
| Calcium Hardness CaCO <sub>3</sub> | mg/L | 366    | 385    | 434    |
| Total Alkalinity CaCO <sub>3</sub> | ppm  | 135    | 145    | 135    |

#### Surficial Aquifer Raw Water Quality Parameters for Design Basis:

| Number of Wells      | #    | 4 <sup>1</sup>     |         |          |          |
|----------------------|------|--------------------|---------|----------|----------|
| Well ID              |      | Well #8            | Well #9 | Well #14 | Well #15 |
| Chemical Composition |      |                    |         |          |          |
| Fluoride             | mg/L | 0.307              | 0.295   | 0.278    | TBD      |
| Sodium               | mg/L | 44.4               | 63.4    | 33.5     | TBD      |
| Calcium              | mg/L | 136 <sup>(1)</sup> | 101     | 135      | TBD      |
| Chloride             | mg/L | 64.3               | 50.0    | 42.9     | TBD      |
| Iron                 | mg/L | 2.75               | 21.9    | 1.48     | TBD      |
| Magnesium            | mg/L | 8.18               | 10.7    | 6.41     | TBD      |
| Sulfate              | mg/L | 48.5 <sup>2</sup>  | 28.8    | 41.6     | TBD      |

| Number of Wells                    | #    | 4 <sup>1</sup> |         |          |          |
|------------------------------------|------|----------------|---------|----------|----------|
| Well ID                            |      | Well #8        | Well #9 | Well #14 | Well #15 |
| Color                              | CU   | 20.0           | 30.0    | 40.0     | TBD      |
| TDS                                | mg/L | 552            | 484     | 494      | 530      |
| Calcium Hardness CaCO <sub>3</sub> | mg/L | 340            | 252     | 337      | 140      |
| Total Alkalinity CaCO <sub>3</sub> | mg/L | 296            | 296     | 302      | 300      |

<sup>1</sup> Source: Flowers Chemical Laboratories, Inc., Report and Invoice No. 468936; samples collected April 22, 2021; report revised May 6, 2021; Surficial Well RO Blend Pilot Study (Wells 8, 9, and 14). Well 15 has partial data in the Aqueous/VETS pilot: calcium, alkalinity, TDS, LSI, and PFAS, but not the iron and color that drive the surficial treatment basis. The Design-Build Team should confirm its water quality, particularly iron and color, before it feeds the blend.

<sup>2</sup> Denotes an estimated value for which one or more associated quality-control components exceeded laboratory control limits, per the laboratory report. Color is reported in color units (CU). Fluoride is no longer a monitored requirement per the District. Full parameter coverage and any additional constituents are to be confirmed against the complete signed and sealed laboratory report.

#### Florida Department of Environmental Protection (FDEP) Primary Drinking Water Quality Standards:

| Contaminant               | #    | Limit                     |
|---------------------------|------|---------------------------|
| Antimony                  | mg/L | 0.006                     |
| Arsenic                   | mg/L | 0.010                     |
| Asbestos                  | MFL  | 7 MFL                     |
| Barium                    | mg/L | 2                         |
| Beryllium                 | mg/L | 0.004                     |
| Cadmium                   | mg/L | 0.005                     |
| Chromium                  | mg/L | 0.1                       |
| Cyanide (as free Cyanide) | mg/L | 0.2                       |
| Fluoride                  | mg/L | 4.0                       |
| Lead                      | mg/L | 0.015                     |
| Mercury                   | mg/L | 0.002                     |
| Nickel                    | mg/L | 0.1                       |
| Nitrate                   | mg/L | 10 (as N)                 |
| Nitrite                   | mg/L | 1 (as N)                  |
| Total Nitrate and Nitrite | mg/L | 10 (as N)                 |
| Selenium                  | mg/L | 0.05                      |
| Sodium                    | mg/L | 160                       |
| Thallium                  | mg/L | 0.002                     |
| Chlorine                  | mg/L | 4.0 (as Cl <sub>2</sub> ) |

### Surficial Aquifer Raw Water Quality Parameters for Design Basis - PFAS:

| Compound |      | Prior to Treatment <sup>1</sup> |         |          |          | Federal Drinking Water Limit, MCL |
|----------|------|---------------------------------|---------|----------|----------|-----------------------------------|
|          |      | Well #8                         | Well #9 | Well #14 | Well #15 |                                   |
| PFOA     | ng/L | 8.3                             | 2.9     | 3.3      | 2.2      | 4.0                               |
| PFOS     | ng/L | 13                              | ND      | 1.1      | ND       | 4.0                               |
| PFHxS    | ng/L | 2.0                             | 1.4     | 1.7      | 1.3      | 2                                 |
| PFNA     | ng/L | 1.3                             | ND      | ND       | ND       | 2                                 |
| PFBS     | ng/L | 12                              | ND      | 1.7      | 4.6      | 2                                 |
| PFHxA    | ng/L | 9.7                             | 2.3     | 2.7      | 3.2      | -                                 |
| PFPeA    | ng/L | 17                              | 3.0     | 3.1      | 2.6      | -                                 |
| PFBA     | ng/L | 7.9                             | ND      | 4.1      | 4.4      | -                                 |
| PFHpA    | ng/L | 3.3                             | ND      | 1.4      | 1.5      | -                                 |

<sup>1</sup> Source: AqueousVETS St. Lucie Pilot Study Report (Project S-00077), PFAS influent sampling collected December 12, 2023. Values in nanograms per liter (ng/L). ND denotes non-detect. HFPO-DA (GenX) and remaining PFAS analytes were non-detect in all four surficial wells; the Floridan Aquifer source was non-detect for all PFAS analytes. PFAS data are from a separate sampling event and laboratory than the inorganic parameters above. These are raw source concentrations prior to treatment. PFOA and PFOS at Well 8, and PFOA at Wells 14 and 9, are at or above the 4 ng/L benchmark applied in the pilot study, which is the basis for the granular activated carbon and ion exchange treatment. The Design-Build Team confirms the treated source meets the applicable FDEP and federal PFAS limits at the time of permitting.

<sup>2</sup> Federal Maximum Contaminant Levels for PFOA and PFOS are 4.0 ng/L under the April 2024 National Primary Drinking Water Regulation; compliance is based on a running annual average at the sampling point, and EPA has proposed extending the compliance deadline to 2031. Federal limits for PFHxS, PFNA, HFPO-DA, and the Hazard Index mixture were proposed for rescission in 2026 and are not fixed at this time. PFHxA, PFPeA, PFBA, and PFHpA have no federal drinking-water limit. State (FDEP) limits may differ and can be more stringent. The Design-Build Team confirms the treated source meets the applicable FDEP and federal PFAS limits in effect at the time of permitting.

MCL stands for Maximum Contaminant Level.

## 2-2. Water Supply Well

### A. Existing System Information

The following tables provide detailed information on the existing water supply wells and pumping equipment as documented in the 2024-06-27\_FINAL\_SLWSD 2024 System Engineer Bond Report and/or verified during the August 13, 2025, site visit.

Existing Groundwater Well characteristics:

| Number of Units | #   | 3                                   |                                     |                                     |
|-----------------|-----|-------------------------------------|-------------------------------------|-------------------------------------|
| Well ID         |     | 157,881                             | 157,882                             | 157,883                             |
| Unit Capacity   | gpm | 1,500                               | 1,500                               | 1,500                               |
| Well Diameter   | in  | 8                                   | 10                                  | 10                                  |
| Well Depth      | ft  | 1,321                               | 1,657                               | 1,895                               |
| Casing Diameter | in  | 16                                  | 18                                  | 18                                  |
| Casing Depth    | ft  | 908                                 | 885                                 | 865                                 |
| Year Drilled    |     | 2004                                | 2004                                | 2004                                |
| Piping Diameter | in  | 12                                  | 12                                  | 12                                  |
| Piping Length   | ft  | 1,153                               | 330                                 | 589                                 |
| Pipe Material   |     | SSTL Above Grade<br>PVC Below Grade | SSTL Above Grade<br>PVC Below Grade | SSTL Above Grade<br>PVC Below Grade |

Existing Well Pump Characteristics:

| Number of Units | #      | 3                            |                |                |
|-----------------|--------|------------------------------|----------------|----------------|
| Unit ID         |        | F-1                          | F-2            | F-3            |
| Unit Capacity   | gpm    | 1,400 @ 45 psi               | 1,400 @ 45 psi | 1,400 @ 45 psi |
| Horsepower      | HP     | 60                           | 60             | 60             |
| T.D.H.          | ft     | 130                          | 130            | 130            |
| Speed           | R.P.M. | 1,785                        | 1,785          | 1,785          |
| Manufacturer    |        | Afton/U.S. Electrical Motors |                |                |
| Model           |        | 10x12 GSV                    |                |                |
| Type            |        | Vertical Turbine             |                |                |
| Year Installed  |        | 2004                         | 2004           | 2004           |

### B. General Requirements

- B-1 Design Basis and Verification Requirements: The specifications in this section are based on SLWSD requirements, existing system data, and operational parameters. The Design-Build Team shall verify all stated capacities, dimensions, materials, and performance parameters through independent engineering calculations and analyses prior to equipment selection and

procurement. The Design-Build Team shall ensure that all equipment and systems meet the stated performance objectives and shall document any required adjustments with supporting engineering justification for Engineer review and approval.

- B-2 The Design-Build Team shall design and construct one new Floridan Aquifer production well to supplement the existing three wells currently supplying the ROWTP.
- B-3 The new well shall increase the firm capacity of the groundwater supply system to 6.5 MGD.
- B-4 All design and construction shall comply with Florida Department of Environmental Protection (FDEP) regulations, AWWA standards, and SLWSD standards and specifications.
- B-5 The Design-Build Team shall coordinate with SFWMD for modification of the existing Water Use Permit to accommodate the increased withdrawal and additional well.
- B-6 All well design and construction documents shall be prepared under the responsible charge of a Professional Engineer licensed in the State of Florida and experienced in water well design.

#### **C. Well Location and Site Development**

- C-1 Proposed well location shall be determined based on hydrogeological investigation to maximize yield while maintaining appropriate setbacks from existing wells to prevent interference.
- C-2 Well site should include adequate access for maintenance vehicles, appropriate drainage, security fencing, and lighting.
- C-3 Design-Build Team shall prepare and submit all required environmental permits for well site clearing and development.

#### **D. Well Construction**

- D-1 Well should be designed to match or exceed the production capacity of existing wells (1,500 gpm).
- D-2 Well depth shall be determined based on hydrogeological investigation and recommendations to access productive zones of the Floridan Aquifer. Depth is anticipated to be comparable to existing wells (1,321 to 1,895 feet) but shall be confirmed by the project hydrogeologist.
- D-3 Well construction shall include:
  - Surface casing: Minimum 24-inch diameter PVC extending to competent confining layer
  - Production casing: Minimum 16-inch diameter constructed of corrosion-resistant materials suitable for groundwater quality
  - Open hole section: Minimum 12-inch diameter
  - Grout seal: Neat cement grout from the bottom of the casing to the surface
- D-4 Well development shall achieve sand-free production with turbidity < 1 NTU (Nephelometric Turbidity Units) after 24 hours of continuous pumping.
- D-5 The Design-Build Team shall coordinate with a qualified hydrogeologist to identify optimal production zones and design appropriate screening and open-hole sections.

#### **E. Pump and Motor**

- E-1 Vertical turbine pump with the following specifications:
  - Capacity: 1,500 gpm

- Total Dynamic Head (TDH): To be determined based on well testing, but sufficient to deliver water to the ROWTP raw water system
- Motor: Premium efficiency, vertical hollow shaft, 480V, 3-phase, appropriately sized for required capacity

E-2 Pump materials should be corrosion-resistant and suitable for raw water quality conditions.

E-3 The Pump column pipe shall be made of 316L stainless steel with flanged connections.

#### **F. Electrical and Controls**

F-1 Provide electrical service from the WTP MCC Room.

F-2 Instrumentation shall include:

- Flow meter with 4-20mA output
- Pressure transducer with 4-20mA output

F-3 SCADA integration to enable remote monitoring and control of well operation from the ROWTP control system.

#### **G. Well Site Improvements**

Site improvements shall include:

- Access road suitable for maintenance vehicles
- Security fencing with a locked gate
- Site lighting
- Drainage to prevent flooding

#### **H. Raw Water Transmission Line**

H-1 Design and install a raw water transmission line from the new well to the ROWTP with an appropriate size to maintain velocities between 3-5 fps at design flow.

H-2 Transmission line materials shall be suitable for raw water quality, with a preference for SSTL above grade, transitioning to PVC C900 below grade.

H-3 Provide isolation valves, air release valves, and other appurtenances as required.

#### **I. Testing and Commissioning**

I-1 Conduct step-drawdown test and 72-hour constant rate pumping test to determine well yield and efficiency.

I-2 Water quality testing shall include all parameters required by FDEP and parameters critical to RO treatment:

- Total Dissolved Solids (TDS)
- Conductivity
- pH
- Alkalinity
- Hardness

- Iron
- Manganese
- Hydrogen Sulfide
- Sulfate
- Chloride
- Silica
- Langelier Saturation Index (LSI)

I-3 Prepare a well completion report with all construction details, lithologic logs, and testing results.

## **J. Regulatory Requirements**

J-1 Obtain all necessary permits, including:

- SFWMD Water Use Permit modification
- FDEP well construction permit
- Local construction permits

J-2 Coordinate with SLWSD for submission of FDEP PWS component construction permit application.

J-3 Prepare and submit all documentation required for regulatory approval.

## **K. Documentation and Deliverables**

K-1 Provide complete design documentation, including:

- Engineering calculations
- Detailed drawings (signed and sealed)
- Well construction details
- Pump curves and specifications

K-2 Furnish O&M manuals for all equipment and systems.

K-3 Provide warranty documentation and manufacturer support information.

K-4 Submit as-built drawings in AutoCAD format and GIS-compatible format.

## 2-3. Raw Water Transmission

### A. Existing System Information

The Design-Build Team shall design and construct a new raw water transmission main from the new well to the ROWTP.

The new raw water well will connect to the existing raw water transmission main, transporting groundwater to the existing raw water main. These new watermain will connect to the existing 16-inch water pipe constructed of either primarily PVC (C-900 specification)

### B. General Requirements

- B-1 Design Basis and Verification Requirements: The specifications in this section are based on SLWSD requirements, existing system data, and operational parameters. The Design-Build Team shall verify all stated capacities, dimensions, materials, and performance parameters through independent engineering calculations and analyses prior to equipment selection and procurement. The Design-Build Team shall ensure that all equipment and systems meet the stated performance objectives and shall document any required adjustments with supporting engineering justification for Engineer review and approval.
- B-2 The Design-Build Team shall design and construct a new raw water transmission main from the new well to the existing raw water main.
- B-3 The transmission main shall be sized to convey the full capacity of the new well (1,500 gpm) to the ROWTP.
- B-4 All design and construction shall comply with Florida Department of Environmental Protection (FDEP) regulations, AWWA standards, and SLWSD standards and specifications.
- B-5 The Design-Build Team shall coordinate with appropriate authorities for all required right-of-way permits and utility crossing approvals.
- B-6 All pipeline design documents, including hydraulic calculations and structural designs, shall be prepared, signed, and sealed by a Professional Engineer licensed in the State of Florida.

### C. Pipeline Design

- C-1 Pipeline size shall be determined through hydraulic analysis to maintain velocities between 3-5 fps at design flow.
- C-2 Pipeline material shall be appropriate for raw water quality, with preference for PVC C900 DR18.
- C-3 Design pressure rating shall be a minimum of 150 psi or 1.5 times the maximum operating pressure, whichever is greater.
- C-4 Pipeline profiles shall maintain a minimum cover of 36 inches below grade and appropriate clearances from other utilities.
- C-5 Pipeline alignment shall follow the most direct route practical while minimizing environmental impacts and utility conflicts.

### D. Appurtenances

- D-1 Install air release/vacuum valves at all high points.
- D-2 Provide thrust restraint at all changes in direction, tees, and termination points.
- D-3 Install tracer wire along the entire pipeline length for future location.

### **E. Connection to Existing System**

- E-1 Design connection to the existing raw water system at the existing raw water main with appropriate isolation valves to allow for future maintenance.
- E-2 Connections shall be designed to minimize disruption to plant operations during construction.
- E-3 Provide flow control capability to balance production between all wells.

### **F. Testing and Commissioning**

- F-1 Conduct pressure testing of entire pipeline at 1.5 times the working pressure for a minimum of 2 hours.
- F-2 Perform disinfection and bacteriological testing in accordance with AWWA C651 prior to placing in service.
- F-3 Complete flow testing to verify hydraulic capacity meets design requirements.

### **G. Documentation and Deliverables**

- G-1 Provide complete design documentation including:
  - Engineering calculations
  - Detailed drawings (signed and sealed)
  - Material specifications (signed and sealed)
- G-2 Submit as-built drawings in AutoCAD format and GIS-compatible format.
- G-3 Provide warranty documentation for all materials and installation.

## 2-4. Micron Cartridge Filtration

### A. Existing System Information

The following table provides detailed information on the existing Micron Cartridge Filtration equipment as documented in the 2024-06-27\_FINAL\_SLWSD 2024 System Engineer Bond Report and/or verified during the August 13, 2025, site visit.

Existing Micron Cartridge Filtration System characteristics:

|                       |     |                   |      |      |
|-----------------------|-----|-------------------|------|------|
| Number of Units       | #   | 3                 |      |      |
| Unit ID               |     | TBD               | TBD  | TBD  |
| Unit Capacity         | MGD | 2.4               | 1.5  | 1.5  |
| Configuration         |     | Vertical          |      |      |
| Inlet/Outlet Diameter | in  | 10                | 10   | 10   |
| Cartridge Diameter    | in  | 32                | 30   | 30   |
| Number of Cartridges  | #   | TBD               | TBD  | TBD  |
| Cartridge Length      | in  | 40                |      |      |
| Manufacturer          |     | Parker Filtration |      |      |
| Model                 |     | Fulflo Filter     | TBD  | TBD  |
| Type                  |     | 5 Micron Vertical |      |      |
| Year Installed        |     | 2004              | 2013 | 2013 |

### B. General Requirements

- B-1 Design Basis and Verification Requirements: The specifications in this section are based on SLWSD requirements, existing system data, and operational parameters. The Design-Build Team shall verify all stated capacities, dimensions, materials, and performance parameters through independent engineering calculations and analyses prior to equipment selection and procurement. The Design-Build Team shall ensure that all equipment and systems meet the stated performance objectives and shall document any required adjustments with supporting engineering justification for Engineer review and approval.
- B-2 The Design-Build Team shall design and install upgrades to the existing micron cartridge filtration system to accommodate the increased flow capacity of the ROWTP.
- B-3 The upgraded system shall have a minimum capacity of 6.4 MGD with provisions for redundancy.
- B-4 All design and construction shall comply with Florida Department of Environmental Protection (FDEP) regulations, AWWA standards, NSF/ANSI 61 for drinking water system components, and SLWSD standards and specifications.
- B-5 The Design-Build Team shall coordinate with SLWSD operations staff to ensure minimal disruption to existing plant operations during construction and implementation.

### C. System Design

- C-1 Provide additional cartridge filter vessels to achieve the required capacity while maintaining a maximum loading rate of 3 gpm per 10-inch equivalent filter element.

- C-2 Filter vessels shall be constructed of 316L stainless steel with a minimum pressure rating of 150 psi.
- C-3 Design shall allow for isolation of individual vessels for maintenance without interrupting system operation.
- C-4 Filter elements shall be nominal 5-micron rating, compatible with the existing system, and NSF/ANSI 61 certified for drinking water use.
- C-5 Filter vessel design shall facilitate easy cartridge replacement and maintenance.

#### **D. Piping and Valving**

- D-1 All piping shall be 316L stainless steel with a minimum pressure rating of 150 psi.
- D-2 Provide isolation valves for each filter vessel on both the inlet and the outlet.
- D-3 Include pressure differential monitoring across each vessel and across the entire system.
- D-4 Design piping to ensure even flow distribution to all filter vessels.
- D-5 Provide drain connections with appropriate valving for each vessel.

#### **E. Instrumentation and Controls**

- E-1 Install pressure transmitters on the inlet and outlet of each filter vessel with 4-20mA output.
- E-2 Install flow measurement on the combined system inlet.
- E-3 Integrate all instrumentation with the existing SCADA system.

#### **F. Ancillary Systems**

- F-1 Design and install appropriate supports and platforms for access to all components.
- F-2 Provide adequate clearance around filter vessels for maintenance activities.
- F-3 Include sampling ports before and after the filtration system.
- F-4 Design drainage system to sized for the discharge during filter changeout and cleaning operations.

#### **G. Testing and Commissioning**

- G-1 Conduct pressure testing of all piping and vessels at 1.5 times the working pressure for a minimum of 2 hours.
- G-2 Perform clean water flow testing to verify hydraulic capacity meets design requirements.
- G-3 Complete full system functional testing, including instrumentation and controls.
- G-4 Provide startup services, including operator training on system operation and maintenance.

#### **H. Documentation and Deliverables**

- H-1 Provide complete design documentation, including:
  - Engineering calculations
  - Detailed drawings (signed and sealed)
  - Material specifications (signed and sealed)
  - Filter loading calculations



- H-2     Furnish O&M manuals for all equipment and systems.
- H-3     Provide warranty documentation for all equipment and installation.
- H-4     Submit filter element specifications, including replacement procedures and recommended maintenance schedule.
- H-5     Provide spare filter elements equal to one complete system replacement.

## 2-5. High-Pressure Pumping System

### A. Existing System Information

The following table provides detailed information on the existing equipment as documented in the 2024-06-27\_FINAL\_SLWSD 2024 System Engineer Bond Report and/or verified during the August 13, 2025, site visit.

Existing High-Pressure Pumping System characteristics:

| Number of Units | #      | 5                |       |       |       |       |
|-----------------|--------|------------------|-------|-------|-------|-------|
| Unit ID         |        | HPP-1            | HPP-2 | HPP-3 | HPP-4 | HPP-5 |
| Unit Capacity   | gpm    | 700              | 700   | 700   | 700   | 700   |
| Horsepower      | HP     | 150              | 150   | 150   | 150   | 150   |
| T.D.H.          | ft     | 650              | 650   | 650   | 650   | 650   |
| Speed           | R.P.M. | 3600             | 3600  | 3600  | 3600  | 3600  |
| Manufacturer    |        | Afton            |       |       |       |       |
| Model           |        | MPV              |       |       |       |       |
| Type            |        | Vertical Turbine |       |       |       |       |
| Year Installed  |        | 2004             | 2004  | 2004  | 2004  | 2004  |

### B. General Requirements

- B-1 Design Basis and Verification Requirements: The specifications in this section are based on SLWSD requirements, existing system data, and operational parameters. The Design-Build Team shall verify all stated capacities, dimensions, materials, and performance parameters through independent engineering calculations and analyses prior to selecting and procuring equipment. The Design-Build Team shall ensure that all equipment and systems meet the stated performance objectives and shall document any required adjustments with supporting engineering justification for Engineer review and approval.
- B-2 The Design-Build Team shall design and install one additional Reverse Osmosis (RO) treatment skid to supplement the existing three operational skids at the ROWTP.
- B-3 The Design-Build Team shall design and install two additional high-pressure RO feed pumps to supplement the existing five (5) pumps currently at the ROWTP.
- B-4 The new high-pressure pumps shall increase the firm capacity of the pumping system to 6.85 MGD with N+1 redundancy (seven pumps operating, one spare). This capacity accommodates the 5.4 MGD RO system design flow plus margin for future system expansion and operational flexibility. The RO treatment system has a limiting design flow of 5.4 MGD at firm capacity; excess high-pressure pump capacity provides operational flexibility and future expansion capability.
- B-5 All design and construction shall comply with Florida Department of Environmental Protection (FDEP) regulations, AWWA standards, NSF/ANSI 61 for drinking water system components, and SLWSD standards and specifications.
- B-6 The Design-Build Team shall coordinate with SLWSD operations staff to ensure minimal disruption to existing plant operations during construction and implementation.

### **C. Pump Specifications**

- C-1 Each new pump shall be a vertical turbine type with the following specifications:
- Capacity: 785 gpm
  - Total Dynamic Head (TDH): 650 ft
  - Motor: 150 HP, premium efficiency, TEFC, inverter duty rated
  - Materials: 316L stainless steel wetted parts
  - Speed: 1,800 rpm nominal
- C-2 Pumps shall be designed to match the hydraulic performance curve of existing units.
- C-3 Pump materials shall be compatible with feed water chemistry and suitable for continuous operation.
- C-4 One of the new pumps shall be equipped with a VFD to match the existing system configuration, which currently includes two VFDs. Remaining new pumps shall utilize cross-the-line soft start.
- C-5 Pump efficiency shall meet or exceed 75% at the design point.
- C-6 Pumps shall match the performance characteristics of existing units (reference: Afton MPV or approved equal). Specific manufacturer references are provided for compatibility with existing equipment; however, the Design-Build Team may propose equivalent equipment from alternative manufacturers that meet or exceed the stated performance specifications and are compatible with existing system components.

### **D. Pump Installation and Mounting**

- D-1 Provide a concrete foundation and mounting for each pump according to the manufacturer's recommendations.
- D-2 Design installation to minimize vibration and ensure proper alignment.
- D-3 Provide appropriate clearance around pumps for maintenance access.
- D-4 Include vibration monitoring mounts on each pump.
- D-5 Design installation to allow for future pump removal and replacement without affecting adjacent equipment.

### **E. Suction and Discharge Piping**

- E-1 Perform hydraulic analysis of the existing high-pressure piping system and upgrade as necessary to accommodate increased flow.
- E-2 All high-pressure piping shall be 316L stainless steel with a minimum pressure rating of 300 psi.
- E-3 Design piping to maintain velocities between 3 and 7 fps at design flow.
- E-4 Provide isolation valves on the suction and discharge of each pump.
- E-5 Include check valves on the discharge of each pump to prevent backflow.
- E-6 Provide pressure gauges and transmitters on the suction and discharge of each pump.
- E-7 Include provisions for pump priming and air release.

### **F. Variable Frequency Drives (VFDs)**

- F-1 Provide VFDs for each pump.
- F-2 VFD shall be sized for a 150 HP motor with 25% additional capacity.
- F-3 VFD shall include the following features:
- Line and load reactors
  - Harmonic filters
  - Manual bypass
  - Human-machine interface (HMI) panel
  - Communication capability compatible with the existing SCADA system
- F-4 VFD enclosure shall be NEMA 12 minimum, suitable for indoor installation.

### **G. Electrical Requirements**

- G-1 Provide a complete electrical system including:
- Replacement of existing Siemens MCC 3 with 1200A Square D MCC for powering high pressure pumps and multiple existing transformers. The new MCC may be installed in the existing workshop space, but the existing HVAC system will likely need to be upgraded. Overhead busway is allowable for feeder from main gear to MCC.
  - Replacement of the existing main Siemens 3200A switchboard and transfer equipment with 4000A Square D switchboard and two (2) transfer switches for both standby generator sets. Transfer switches shall be from Square D or Lakeshore. Provide a manual tie 800A breaker with keys to WWTP for the event of both generators failing.
  - New 4000A Square D switchboard shall have circuit breakers to back feed the existing MCC 1, 2, and 3. There should also be a circuit breaker for the new MCC installed in clearwell building.
  - Motor starters for constant speed pumps
  - Overcurrent protection
  - Ground fault protection
  - Lightning and surge protection
  - Replace existing Safe/Tronic VFDs with Square D VFDs sized as required.
- G-2 All electrical components shall be rated for the environment and service conditions.
- G-3 Design electrical system to comply with NEC, local electrical codes, and IEEE 519.
- G-4 Provide emergency power connections compatible with the plant standby generator system.

### **H. Instrumentation and Controls**

- H-1 Provide the following instrumentation at minimum:
- Pressure switches on the suction and discharge of each pump
  - Flow meter on combined discharge header
  - Motor winding temperature sensors
  - Vibration monitoring

- H-2 All analog instrumentation shall provide 4-20mA output signals for integration with SCADA. Discrete devices (switches, status contacts) shall provide dry contact signals.
- H-3 Integrate pump controls with the existing SCADA system to allow for remote monitoring and control.
- H-4 Integrate pump controls with the existing skid-based control strategy, in which each RO skid operates independently and the operator selects the lead skid at daily startup. Centralized lead/lag control of the high-pressure feed pumps is not part of this scope.
- H-5 Provide automatic shutdown protection for low suction pressure, high discharge pressure, high motor temperature, and other critical parameters.

### **I. Testing and Commissioning**

- I-1 Conduct factory performance testing of pumps prior to shipment.
- I-2 Perform field testing including:
  - Hydrostatic testing of piping at 1.5 times the working pressure
  - Pump performance testing to verify flow, head, and efficiency
  - Motor insulation resistance testing
  - VFD functional testing
- I-3 Conduct vibration analysis during pump operation.
- I-4 Verify proper pump alignment before and after operational testing.
- I-5 Perform system integration testing with SCADA.
- I-6 Conduct a 24-hour continuous operation test.

### **J. Documentation and Deliverables**

- J-1 Provide complete design documentation, including:
  - Engineering calculations
  - Detailed drawings (signed and sealed)
  - Material specifications (signed and sealed)
  - Pump curves and specifications
  - Hydraulic analysis of high-pressure piping system
- J-2 Furnish O&M manuals for all equipment and systems.
- J-3 Provide warranty documentation for all equipment and installation.
- J-4 Submit the recommended spare parts list.
- J-5 Provide vibration baseline measurements for future reference.

## 2-6. Reverse Osmosis Treatment System

### A. Existing System Information

The following table provides detailed information on the existing equipment as documented in the 2024-06-27\_FINAL\_SLWSD 2024 System Engineer Bond Report and/or verified during the August 13, 2025, site visit.

Existing RO System characteristics:

| Number of Units                 | #   | 3          |            |            |
|---------------------------------|-----|------------|------------|------------|
| Unit ID                         |     | SKID NO. 2 | SKID NO. 3 | SKID NO. 4 |
| Rated Unit Capacity             | MGD | 1.8        | 1.8        | 1.8        |
| Actual Unit Capacity            | MGD | 1.35       | 1.35       | 1.35       |
| Number of First Stage Vessels   | #   | 29         | 29         | 29         |
| Number of Second Stage Vessels  | #   | 13         | 13         | 13         |
| Flux Rate                       | gpd | 13.91      | 13.91      | 13.91      |
| System Recovery "Y"             | %   | 80%        |            |            |
| Permeate Flow Rate per Array    | gpm | 1,250      |            |            |
| Concentrate Flow Rate per Array | gpm | 313        |            |            |
| Feed Flow Rate                  | gpm | 1,563      |            |            |
| Manufacturer                    |     | Toray      |            |            |
| Model                           |     | TMG20-440C |            |            |
| Year Installed                  |     | 2013       | 2004       | 2004       |
| Year of Last Maintenance        |     | -          | 2013       | 2013       |

### B. General Requirements

- B-1 Design Basis and Verification Requirements: The specifications in this section are based on SLWSD requirements, existing system data, and operational parameters. The Design-Build Team shall verify all stated capacities, dimensions, materials, and performance parameters through independent engineering calculations and analyses prior to selecting and procuring equipment. The Design-Build Team shall ensure that all equipment and systems meet the stated performance objectives and shall document any required adjustments with supporting engineering justification for Engineer review and approval.
- B-2 The Design-Build Team shall design and install one additional Reverse Osmosis (RO) treatment skid to supplement the existing three operational skids at the ROWTP.
- B-3 The new RO skid shall match the design capacity of the existing skids (1.8 MGD) to increase the firm capacity of the RO system to 5.4 MGD of finished water.
- B-4 All design and construction shall comply with Florida Department of Environmental Protection (FDEP) regulations, AWWA standards, NSF/ANSI 61 for drinking water system components, and SLWSD standards and specifications.

- B-5 The Design-Build Team shall coordinate with SLWSD operations staff to ensure minimal disruption to existing plant operations during construction and implementation.
- B-6 Prior to detailed design, the Design-Build Team shall evaluate the performance of existing RO skids to identify and address any operational limitations in the new skid design.

### **C. RO Skid Configuration**

- C-1 The RO skid shall be configured to match existing skids with 29 first-stage pressure vessels and 13 second-stage pressure vessels with inter-stage pressure boost.
- C-2 Each pressure vessel shall have an 8-inch diameter and accommodate seven (7) 40-inch-long membrane elements with a total surface area of 430 sq ft.
- C-3 The RO skid shall be designed for a permeate capacity of 1.8 MGD (1,250 gpm) operating at approximately 225 psi.
- C-4 The system shall be designed to operate at 80% recovery based on the existing raw water quality parameters.
- C-5 The average flux shall not exceed 14 gfd under design conditions.
- C-6 The skid shall be designed with appropriate provisions for cleaning connections, sample points, and gauge ports.

### **D. Membrane Elements**

- D-1 All piping shall be 316L stainless steel with a minimum pressure rating of 150 psi.
- D-2 Provide isolation valves for each filter vessel on both the inlet and the outlet.
- D-3 Include pressure differential monitoring across each vessel and across the entire system.
- D-4 Design piping to ensure even flow distribution to all filter vessels.
- D-5 Provide drain connections with appropriate valving for each vessel.
- D-6 Membrane elements shall provide performance equivalent to or exceeding Toray TMG20-440C. Reference to existing Toray equipment is provided for compatibility and performance comparison

### **E. Skid Materials and Construction**

- E-1 All wetted parts, including piping, valves, and fittings, shall be constructed of 316L stainless steel.
- E-2 Pressure vessels shall be fiberglass reinforced plastic (FRP) with a minimum pressure rating of 300 psi.
- E-3 Skid frame shall be constructed of 304 stainless steel or approved equal with appropriate structural supports. Alternative framing materials, including fiberglass reinforced plastic (FRP), may be proposed by the Design-Build Team with supporting justification during technical submittals..
- E-4 All seals and gaskets shall be EPDM or other materials compatible with the feed water chemistry.
- E-5 The skid shall be designed for easy access to all components for maintenance.

### **F. Instrumentation and Controls**

- F-1 Provide the following instrumentation at minimum:
  - Flow meters for feed, permeate, and concentrate streams

- Pressure transmitters for feed, interstage, permeate, and concentrate
- Conductivity analyzers for feed, permeate, and concentrate
- pH analyzers for feed and permeate
- Temperature sensor for feed water
- Replace existing turbidity analyzers at the infeed section and high-pressure feed. Turbidity analyzers are not required on individual RO skids.

F-2 All instrumentation shall provide 4-20mA output signals for integration with SCADA.

F-3 Provide a local control panel with a programmable logic controller (PLC) and remote I/O compatible with the existing Allen-Bradley ControlLogix EthernetIP based plant control system. Include automatic shutdown protection for high/low pressure, high/low pH, high conductivity, and other critical parameters.

F-4 Design a control system to allow both manual and automatic operation of the RO skid.

#### **G. Chemical Feed Systems**

G-1 Evaluate and expand existing chemical feed systems as needed to accommodate the additional RO skid. Provide dedicated chemical feed pumps for each RO skid (one pump per skid per chemical type) with individual selection capability in the control program. Chemical systems include:

- Scale inhibitor
- Sulfuric Acid
- Sodium hydroxide (pH adjustment)
- Sodium hypochlorite (disinfection)

Detailed chemical feed system specifications are provided in Section 2-9.

G-2 Chemical feed rates shall be flow-paced and automatically adjusted based on flow conditions.

G-3 Chemical feed systems shall include appropriate calibration columns, pulsation dampeners, and back pressure valves.

G-4 All chemical feed components shall be compatible with the chemicals being used.

#### **H. Membrane Cleaning System**

H-1 The new RO skid shall be designed to connect to the existing Clean-In-Place (CIP) system.

H-2 Evaluate the capacity of the existing CIP system and upgrade if necessary to accommodate the additional skid.

H-3 Provide all necessary connections, valves, and piping for cleaning operations.

H-4 Design cleaning connections to minimize cross-contamination potential between cleaning chemicals and product water.

#### **I. Piping and Valving**

I-1 All high-pressure piping shall be 316L stainless steel with a minimum pressure rating of 300 psi.

I-2 Low-pressure piping (permeate) may be PVC Schedule 80 or other appropriate material.

- I-3 Provide isolation valves for each pressure vessel and at all major pipe branches.
- I-4 Include sample ports at feed, permeate (each pressure vessel), and concentrate streams.
- I-5 Provide pressure relief valves on the feed and interstage piping set at 10% above maximum operating pressure.
- I-6 Design piping to ensure even flow distribution to all pressure vessels.

#### **J. Energy Efficiency**

- J-1 Design system to optimize energy consumption with target specific energy usage < 8.0 kWh/1,000 gallons of permeate produced.
- J-2 Evaluate potential for energy recovery from the concentrate stream if economically feasible.
- J-3 Design for efficient operation across varying flow conditions.

#### **K. Testing and Commissioning**

- K-1 Conduct a factory acceptance testing of the complete skid prior to shipment.
- K-2 Perform pressure testing of all piping and vessels at 1.5 times the working pressure for a minimum of 2 hours.
- K-3 Conduct performance testing, including:
  - Membrane performance (flux, salt rejection)
  - System recovery
  - Energy consumption
  - Water quality parameters
- K-4 Provide the manufacturer's representative for startup and commissioning services.
- K-5 Conduct a 7-day performance demonstration test to verify compliance with design criteria.

#### **L. Operator Training and Support**

- L-1 Provide minimum 16 hours of operator training on system operation, maintenance, and troubleshooting.
- L-2 Furnish detailed membrane cleaning procedures and frequency recommendations.
- L-3 Provide technical support for a period of one year following system acceptance.

#### **M. Documentation and Deliverables**

- M-1 Provide complete design documentation, including:
  - Engineering calculations
  - Detailed drawings (signed and sealed)
  - Material specifications (signed and sealed)
  - Membrane projection models
  - Hydraulic calculations
- M-2 Furnish O&M manuals for all equipment and systems.

- M-3 Provide warranty documentation for all equipment and installation.
- M-4 Submit membrane monitoring program including recommended testing parameters and frequency.
- M-5 Provide recommended spare parts list.

## 2-7. Degasifier System

### A. Existing System Information

The following table provides detailed information on the existing equipment as documented in the 2024-06-27\_FINAL\_SLWSD 2024 System Engineer Bond Report and/or verified during the August 13, 2025, site visit.

Existing Degasifier characteristics:

|                        |      |                                |         |
|------------------------|------|--------------------------------|---------|
| Number of Units        | #    | 2                              |         |
| Unit ID                |      | DEGAS-1                        | DEGAS-2 |
| Liquid Flowrate        | gpm  | 1,250                          | 1,250   |
| Diameter               | ft   | 8.0                            | 8.0     |
| Height                 | ft   | 25.5                           | 25.5    |
| Packing Media Height   | ft   | 13.0                           | 13.0    |
| Packing Media Material |      | Polypropylene                  |         |
| Air Requirement        | SCFM | 5,000                          | 5,000   |
| Manufacturer           |      | Indusco Environmental Services |         |
| Type                   |      | Forced Draft                   |         |
| Material               |      | Reichold Dion VER 9102         |         |
| Year Installed         |      | 2005                           | 2005    |

Existing Degasifier Blowers characteristics:

|                 |        |             |        |
|-----------------|--------|-------------|--------|
| Number of Units | #      | 2           |        |
| Unit ID         |        | OCF-1       | OCF-2  |
| Unit Capacity   | SCFM   | 10,000      | 10,000 |
| Horsepower      | HP     | 30          | 30     |
| Speed           | R.P.M. | 1,765       | 1,765  |
| Manufacturer    |        | Hoffman     |        |
| Model           |        | AEHEUW      |        |
| Type            |        | Centrifugal |        |
| Year Installed  |        | 2005        |        |

### B. General Requirements

- B-1 Design Basis and Verification Requirements: The specifications in this section are based on SLWSD requirements, existing system data, and operational parameters. The Design-Build Team shall verify all stated capacities, dimensions, materials, and performance parameters through independent engineering calculations and analyses prior to selecting and procuring equipment. The Design-Build Team shall ensure that all equipment and systems meet the stated performance objectives and shall document any required adjustments with supporting engineering justification for Engineer review and approval.
- B-2 The Design-Build Team shall design and install one additional degasifier to supplement the existing units at the ROWTP.
- B-3 The new degasifier shall increase the firm capacity of the degasification system to 7.4 MGD.
- B-4 All design and construction shall comply with Florida Department of Environmental Protection (FDEP) regulations, AWWA standards, NSF/ANSI 61 for drinking water system components, and SLWSD standards and specifications.
- B-5 The Design-Build Team shall coordinate with SLWSD operations staff to ensure minimal disruption to existing plant operations during construction and implementation.

### **C. Degasifier Design**

- C-1 The new degasifier shall match existing units with the following specifications:
- Diameter: 8 ft
  - Packing media depth: 13 ft
  - Hydraulic loading rate: 30 gpm per square foot
  - Treatment capacity: 2 MGD
- C-2 Degasifier tower shall be constructed of FRP suitable for the water quality and environmental conditions.
- C-3 Packing media shall be high-efficiency type designed for hydrogen sulfide and carbon dioxide removal, equivalent to existing units.
- C-4 Design shall include an appropriate water distribution system at the top of the tower to ensure even flow across the media.
- C-5 Provide a mist eliminator at the top of the tower to prevent water carryover.
- C-6 Include access platforms, ladders, and hatches for inspection and maintenance.

### **D. Degasifier Blowers**

- D-1 The new blower shall have the following specifications:
- Capacity: 10,000 SCFM
  - Static pressure: Sufficient for the tower design
  - Motor: Premium efficiency, TEFC, appropriately sized for the required capacity
- D-2 Blower shall be a direct-drive centrifugal type with an inlet filter and silencer.
- D-3 Provide new MCC building with VFD's for 2 existing and 2 new blowers. MCC will also power new chemical buildings, any branch circuits, or outbuildings, and accommodate new and existing Transfer Pumps.

- D-4 Blower materials shall be suitable for humid, hydrogen sulfide-laden air.
- D-5 Include vibration isolation mounts and flexible connections.
- D-6 The new blowers shall be installed indoors, similar to the existing ones.

#### **E. Piping and Ductwork**

- E-1 Water piping to and from the degasifier shall be appropriately sized FRP, PVC Schedule 80 or other suitable material.
- E-2 Air ductwork shall be FRP or other hydrogen sulfide-resistant material.
- E-3 Design ductwork for a maximum velocity of 3,000 fpm and a minimum pressure drop.
- E-4 Provide isolation dampers for the degasifier air inlet and outlet.
- E-5 Include access ports and drains at appropriate locations in ductwork.
- E-6 Design ductwork configuration to connect with the new or existing odor control system.

#### **F. Instrumentation and Controls**

- F-1 Provide the following instrumentation at a minimum:
  - Flow meter for water inlet to degasifiers
  - Pressure differential indicators across packing media
  - Dissolved oxygen analyzer on degasifiers effluent
  - Airflow measurement for blower
- F-2 All instrumentation shall provide 4-20mA output signals for integration with SCADA.
- F-3 Integrate controls with the existing SCADA system to allow for remote monitoring and control. This system is usually provided by an OEM with its own PLC. The OEM should supply an A/B PLC with an Ethernet port for connecting to the plant SCADA network. The SCADA system can read and write data to the OEM system for control monitoring.
- F-4 Design control system to provide automatic operation based on plant flow and water quality parameters.
- F-5 Include low-flow and high-level alarm switches to protect equipment.

#### **G. Safety Features**

- G-1 Provide a hydrogen sulfide detection system in the vicinity of the degasifiers.
- G-2 Design appropriate ventilation for enclosed spaces if applicable.
- G-3 Provide non-slip surfaces on all platforms and walkways.
- G-4 Include appropriate guardrails and fall protection.
- G-5 Provide confined space entry provisions where required.

#### **H. Testing and Commissioning**

- H-1 Conduct pressure testing of all water piping at 1.5 times the working pressure for a minimum of 2 hours.
- H-2 Perform leak testing of all air ductwork.

- H-3 Conduct performance testing, including:
- Degasifier hydrogen sulfide and carbon dioxide removal efficiency
  - Dissolved oxygen levels in effluent
  - Blower performance verification
  - System hydraulic capacity verification
- H-4 Provide manufacturer's representative for startup and commissioning services.
- H-5 Conduct a 7-day performance demonstration test to verify compliance with design criteria.

#### **I. Documentation and Deliverables**

- I-1 Provide complete design documentation, including:
- Engineering calculations
  - Detailed drawings (signed and sealed)
  - Material specifications (signed and sealed)
  - Equipment selection calculations
- I-2 Provide complete O&M manuals for all equipment and systems. s.
- I-3 Provide warranty documentation for all equipment and installation.
- I-4 Submit recommended maintenance schedule and procedures.
- I-5 Provide recommended spare parts list.

## 2-8. Odor Control System

### A. Existing System Information

The following table provides detailed information on the existing equipment as documented in the 2024-06-27\_FINAL\_SLWSD 2024 System Engineer Bond Report and/or verified during the August 13, 2025, site visit.

Existing Chemical Scrubber characteristics:

|                 |                                        |       |
|-----------------|----------------------------------------|-------|
| Number of Units | #                                      | 1     |
| Unit ID         | OCS-1                                  |       |
| Unit Capacity   | MGD                                    | 4.0   |
| Diameter        | ft                                     | 6     |
| Height          | ft                                     | 22.75 |
| Manufacturer    | Indusco Environmental Services         |       |
| Type            | FRP Vertical Packed Tower Air Scrubber |       |
| Material        | Hetron 922 Vinyl Ester Resin           |       |
| Year Installed  | 2005                                   |       |

### B. General Requirements

- B-1 Design Basis and Verification Requirements: The specifications in this section are based on SLWSD requirements, existing system data, and operational parameters. The Design-Build Team shall verify all stated capacities, dimensions, materials, and performance parameters through independent engineering calculations and analyses prior to equipment selection and procurement. The Design-Build Team shall ensure that all equipment and systems meet the stated performance objectives and shall document any required adjustments with supporting engineering justification for Engineer review and approval.
- B-2 The Design-Build Team shall design and install a new biotrickling filter odor control system to supplement the existing system and replace the existing system at the ROWTP.
- B-3 The new odor control systems shall increase the firm capacity to 8 MGD.
- B-4 All design and construction shall comply with Florida Department of Environmental Protection (FDEP) regulations, AWWA standards, and SLWSD standards and specifications.
- B-5 The Design-Build Team shall coordinate with SLWSD operations staff to ensure minimal disruption to existing plant operations during construction and implementation.

### C. Biotrickling Filter Design

- C-1 Provide a biotrickling filter system with 8 MGD treatment capacity.
- C-2 System shall be designed and sized for airflow from multiple degasifiers operating simultaneously.
- C-3 Design for a minimum 99% hydrogen sulfide removal efficiency at inlet concentrations up to 50 ppm.
- C-4 Vessel shall be constructed of corrosion-resistant material (FRP or equivalent) suitable for outdoor installation.

- C-5 Include high-efficiency engineered packing media with appropriate surface area for biological growth.
- C-6 Design for empty bed contact time of minimum 15 seconds at peak airflow.
- C-7 System shall be designed and sized for variable airflow and hydrogen sulfide loading conditions.
- C-8 Provide appropriate support structure and foundation per manufacturer's recommendations.

#### **D. Nutrient and Water Systems**

- D-1 Provide a nutrient addition system with automatic dosing based on airflow and/or hydrogen sulfide loading. Use onsite Reuse Water for makeup water source if possible.
- D-2 Nutrient storage shall be sized for a minimum 30-day supply at design conditions.
- D-3 Include secondary containment for nutrient storage.
- D-4 Design recirculation system with appropriate pump sizing and 100% redundancy.
- D-5 Include an irrigation system to maintain media moisture content with uniform distribution.
- D-6 Provide means for controlling recirculation water pH through nutrient dosing or supplemental chemicals or reuse water from the wastewater plant effluent process water supply
- D-7 Design a water distribution system to prevent dry areas in the media bed.
- D-8 Include provisions for periodic media washing to control excess biomass.

#### **E. System Controls**

- E-1 Provide an automatic control system to maintain optimal biological conditions.
- E-2 Include pH monitoring and control with appropriate setpoints for biological activity.
- E-3 Provide controls for nutrient addition based on operating conditions.
- E-4 Include programmable timers for irrigation cycles and media washing.
- E-5 Design control system to adjust to varying hydrogen sulfide loading conditions.
- E-6 Provide interlocks with degasifier operation to ensure proper airflow management.
- E-7 Integrate controls with the existing SCADA system for remote monitoring and control. This system is typically provided by an OEM with its own standalone PLC. The OEM shall supply an Allen-Bradley PLC with an available Ethernet port to connect to the existing plant SCADA network, enabling the plant SCADA system to read and write data for remote system monitoring and control.

#### **F. Ductwork and Connections**

- F-1 Air ductwork shall be FRP or other hydrogen sulfide-resistant material.
- F-2 Design ductwork for a maximum velocity of 3,000 fpm and a minimum pressure drop.
- F-3 Provide isolation dampers for connections to each degasifier.
- F-4 Include access ports for sampling and inspection.
- F-5 Design ductwork configuration to allow for the operation of any combination of degasifiers.
- F-6 Provide appropriate stack design for treated air discharge with a minimum 10 ft height above adjacent structures.

F-7 Include condensate collection and drainage systems for ductwork.

### **G. Instrumentation and Monitoring**

G-1 Provide the following instrumentation at a minimum:

- Hydrogen sulfide analyzers before and after odor control system
- pH monitors for recirculation water
- Pressure differential indicators across media
- Flow measurement for the recirculation system
- Level sensors for nutrient storage tank
- Temperature sensors for inlet air and media bed
- Airflow measurement

G-2 All instrumentation shall provide 4-20mA output signals for integration with SCADA.

G-3 Include sampling ports before and after treatment for manual verification.

G-4 Replace the existing local control panel for the existing equipment and provide a new local control panel with an HMI display showing critical parameters for the new system.

G-5 Include data logging capability for performance monitoring and reporting.

### **H. Biomass Control Features**

H-1 Design system to control excessive biomass accumulation.

H-2 Include provisions for periodic backwashing or air scouring of media.

H-3 Provide a drain system for the removal of excess biomass and wash water.

H-4 Design recirculation system to control biomass sloughing.

H-5 Include provisions for media inspection and replacement if necessary.

### **I. Safety Features**

I-1 Provide hydrogen sulfide detection system in the vicinity of the biotrickling filter.

I-2 Include an emergency eyewash station near the nutrient handling area.

I-3 Provide non-slip surfaces on all platforms and walkways.

I-4 Include appropriate guardrails and fall protection.

I-5 Provide confined space entry provisions where required.

I-6 Include appropriate signage for nutrient storage and handling areas.

### **J. Testing and Commissioning**

J-1 Perform leak testing of all ductwork and vessels.

J-2 Conduct pressure testing of all liquid piping at 1.5 times the working pressure.

J-3 Develop and implement biological startup protocol, including seeding if necessary.

J-4 Conduct performance testing, including:

- Hydrogen sulfide removal efficiency at varying concentrations
- System pressure drop verification
- Nutrient consumption rates
- Control system functionality

J-5 Provide manufacturer's representative for startup and commissioning services.

J-6 Conduct a 30-day performance demonstration test to verify compliance with design criteria, allowing for a biological acclimation period.

#### **K. Documentation and Deliverables**

K-1 Provide complete design documentation, including:

- Engineering calculations
- Detailed drawings (signed and sealed)
- Material specifications (signed and sealed)
- Media selection calculations
- Biological design parameters

K-2 Furnish O&M manuals for all equipment and systems.

K-3 Provide warranty documentation for all equipment and installation.

K-4 Submit recommended maintenance schedule and procedures.

K-5 Provide recommended spare parts list.

K-6 Include safety data sheets for all nutrients and chemicals used in the system.

K-7 Provide biological startup and maintenance procedures specific to the installed system.

## 2-9. Chemical Addition System

### A. Existing System Information

The following table provides detailed information on the existing equipment as documented in the 2024-06-27\_FINAL\_SLWSD 2024 System Engineer Bond Report and/or verified during the August 13, 2025, site visit.

Existing Anti-Scalant Feed System characteristics:

|                               |                            |      |
|-------------------------------|----------------------------|------|
| Anti-Scalant Solution         |                            |      |
| Concentration                 |                            | 37%  |
| Anti-Scalant Specific Gravity |                            | 1.1  |
| Existing Design Dosage        | mg/L                       | 4    |
| Existing Usage                | gpd                        | 7    |
| Storage Requirement           | days                       | 30   |
| Anti-Scalant Feed Tank        |                            |      |
| Number of Units               | #                          | 1    |
| Unit Capacity                 | gal                        | 515  |
| Manufacturer                  | Belco                      |      |
| Material                      | Polyester Resin            |      |
| Anti-Scalant Feed Pump        |                            |      |
| Number of Units               | #                          | 2    |
| Rated Capacity                | gph                        | 0.35 |
| Maximum Capacity              | gph                        | 0.35 |
| Rated Pressure                | psig                       | 175  |
| Required Pressure             | psig                       | 150  |
| Horsepower                    | HP                         | 0.5  |
| Speed                         | R.P.M                      | 1750 |
| Manufacturer                  | Milton Roy                 |      |
| Model                         | Macroy D Model D22X2PM4NNN |      |
| Year Installed                | TBD                        |      |

Existing Acid Feed System characteristics:

|                                |      |      |
|--------------------------------|------|------|
| <b>Sulfuric Acid Solution</b>  |      |      |
| <b>Concentration</b>           |      | 98%  |
| Sulfuric Acid Specific Gravity |      | 1.84 |
| Existing Design Dosage         | mg/L | 45   |

|                                   |         |                            |     |
|-----------------------------------|---------|----------------------------|-----|
| Sulfuric Acid Solution            |         |                            |     |
| Existing Usage                    | gpd     | 88                         |     |
| Storage Requirement               | days    | 30                         |     |
| Existing Sulfuric Acid Feed Tanks |         |                            |     |
| Number of Units                   | #       | 2                          |     |
| Unit Capacity                     |         | Bulk                       | Day |
|                                   | gal     | 5,000                      | -   |
|                                   | gal-day | -                          | 750 |
| Existing Sulfuric Acid Feed Pumps |         |                            |     |
| Number of Units                   | #       | 2                          |     |
| Rated Capacity                    | gph     | 8.5                        |     |
| Maximum Capacity                  | gph     | 12                         |     |
| Rated Pressure                    | psig    | 150                        |     |
| Horsepower                        | HP      | 0.5                        |     |
| Speed                             | R.P.M   | 1750                       |     |
| Manufacturer                      |         | Milton Roy                 |     |
| Model                             |         | Macroy D Model D46X2PM4NNN |     |
| Year Installed                    |         | -                          |     |

Existing Caustic Feed System characteristics:

|                             |         |       |     |
|-----------------------------|---------|-------|-----|
| Caustic Solution            |         |       |     |
| Concentration               |         | 50%   |     |
| Caustic Specific Gravity    |         | 1.52  |     |
| Existing Design Dosage      | mg/L    | 4     |     |
| Existing Usage              | gpd     | 94    |     |
| Storage Requirement         | days    | 30    |     |
| Existing Caustic Feed Tanks |         |       |     |
| Number of Units             | #       | 2     |     |
| Unit Capacity               |         | Bulk  | Day |
|                             | gal     | 4,500 | -   |
|                             | gal-day | -     | 750 |
| Existing Caustic Feed Pumps |         |       |     |
| Number of Units             | #       | 3     |     |
| Rated Capacity              | gph     | 25    |     |

|                |       |                            |
|----------------|-------|----------------------------|
| Rated Pressure | psig  | 100                        |
| Horsepower     | HP    | 0.5                        |
| Speed          | R.P.M | 1750                       |
| Manufacturer   |       | Milton Roy                 |
| Model          |       | Macroy D Model D72X8PM4NNN |
| Year Installed |       | -                          |

## B. General Requirements

- B-1 Design Basis and Verification Requirements: The specifications in this section are based on SLWSD requirements, existing system data, and operational parameters. The Design-Build Team shall verify all stated capacities, dimensions, materials, and performance parameters through independent engineering calculations and analyses prior to equipment selection and procurement. The Design-Build Team shall ensure that all equipment and systems meet the stated performance objectives and shall document any required adjustments with supporting engineering justification for Engineer review and approval.
- B-2 The Design-Build Team shall design and install complete replacements for the anti-scalant, acid, and caustic chemical feed systems at the ROWTP.
- B-3 The new chemical systems shall be sized to support the expanded treatment capacity of 5.4 MGD RO finished water.
- B-4 Design-Build Team shall design and construct a new chemical feed building to house the replacement sulfuric acid and caustic soda systems.
- B-5 All design and construction shall comply with Florida Department of Environmental Protection (FDEP) regulations, AWWA standards, NSF/ANSI 61 for drinking water system components, and SLWSD standards and specifications.
- B-6 The Design-Build Team shall coordinate with SLWSD operations staff to ensure minimal disruption to existing plant operations during construction and implementation.

## C. Chemical Feed Building

- C-1 Design and construct a new chemical feed building appropriately sized to house the sulfuric acid and caustic (sodium hydroxide) feed systems relocated from the existing chemical building. The existing chemical building is not fully decommissioned; the anti-scalant feed system remains in its current location within the existing chemical building.
- C-2 Building shall include separate containment areas for incompatible chemicals.
- C-3 Provide an appropriate ventilation system meeting applicable codes for chemical storage areas.
- C-4 Include safety features such as emergency eyewash and shower stations, spill containment, and appropriate signage.
- C-5 Design flooring with a chemical-resistant coating and adequate drainage.
- C-6 Provide sufficient space for maintenance activities and chemical deliveries.
- C-7 Include appropriate electrical, lighting, and climate control systems.

## D. Bulk Storage Systems

- D-1 Connect new chemical building feed lines to existing bulk storage tanks for each chemical.
- Anti-scalant: Sized based on maximum dosage at 6.4 MGD raw water flow. Shall remain in its current location within the existing chemical building and is not relocated to the new chemical feed building.
  - Acid (sulfuric): Sized based on maximum dosage at 6.4 MGD raw water flow. Relocated to the new chemical feed building.
  - Caustic (sodium hydroxide): Sized based on maximum dosage at 5.4 MGD finished water flow from the RO system. Relocated to the new chemical feed building.
- D-2 Provide separate secondary containment for each chemical feed pump system.

### **E. Chemical Feed Pumps**

- E-1 Provide chemical feed skids with a minimum of five metering pumps for each chemical type (anti-scalant, sulfuric acid, and sodium hydroxide). Each pump shall be sized for one treatment train, with pumps selectable in the SCADA system for assignment to specific treatment trains during operation.
- E-2 Metering pumps shall be peristaltic type and sized to deliver the maximum required chemical dose for one treatment train at maximum flow with a minimum turndown ratio of 10:1.
- E-3 Pump materials shall be compatible with the respective chemicals.
- E-4 Each pump shall include the following:
- Automatic switchover capability between duty and standby units
  - Back pressure valves
  - Pressure relief valves
  - Pulsation dampeners
  - Isolation valves
  - Pressure gauges
  - Calibration columns
- E-5 Provide dual control (speed and stroke) for all metering pumps as follows:
- Speed control: Flow-paced, adjusting automatically based on treatment train feed flow
  - Stroke control: PID-based control responding to measured parameter feedback (e.g., pH for acid/caustic)
  - Exception: anti-scalant pumps require speed control only (flow-paced)
- E-6 Design feed systems with appropriate check valves and injection quills at chemical injection points.

### **F. Chemical-Specific Requirements**

- F-1 Anti-scalant system:
- Injection points shall be located upstream of cartridge filters / RO membranes
  - Design for accurate dosing proportional to RO feed flow

- Include provisions for dilution if required by the manufacturer

**F-2 Acid & Caustic Systems:**

- Provide pH monitoring at the acid injection point and downstream
- Design for accurate pH control of RO feed water
- Provide pH monitoring at the caustic injection point and downstream
- Design for accurate pH control of RO permeate
- Include a dilution system if required for proper mixing
- Design for precise alkalinity adjustment

**G. Instrumentation and Controls**

**G-1 Provide the following instrumentation at a minimum:**

- Flow switch for each chemical feed line
- Tank level sensors for all storage tanks and day tanks
- pH analyzers where applicable
- Pressure sensors on chemical feed lines

**G-2 All instrumentation shall provide 4-20mA output signals for integration with SCADA.**

**G-3 Integrate chemical feed controls with the existing SCADA system to allow for remote monitoring and control.**

**G-4 Design control system to provide the following control modes:**

- Manual control
- Flow-proportional control
- Closed-loop control based on pH or other parameters where applicable
- Automatic switchover between duty and standby pumps

**G-5 Include appropriate alarms for critical parameters and system failures.**

**H. Chemical Delivery and Handling**

**H-1 Design chemical fill stations with adequate containment and safety features.**

**H-2 Provide truck unloading pads with containment and drainage.**

**H-3 Include lockable fill connections with appropriate compatibility measures to prevent cross-contamination.**

**H-4 Design the delivery area to allow safe and efficient chemical deliveries, including an adequate turning radius for delivery vehicles.**

**H-5 Provide appropriate transfer pumps or pressurized unloading systems as required.**

**I. Safety Features**

**I-1 Provide emergency eyewash and shower stations at appropriate locations near chemical handling areas.**

- I-2 Include appropriate signage and labeling for all chemical systems.
- I-3 Design ventilation systems to maintain safe atmospheric conditions in chemical storage areas.
- I-4 Provide personal protective equipment storage at entrances to chemical areas.
- I-5 Include appropriate fire protection systems.
- I-6 Design for safe maintenance access to all equipment.

#### **J. Testing and Commissioning**

- J-1 Conduct pressure testing of all chemical piping at 1.5 times the working pressure.
- J-2 Perform calibration of all metering pumps across the full operating range.
- J-3 Conduct performance testing, including:
  - Chemical feed accuracy verification
  - Control system functionality
  - Alarm system verification
  - Automatic switchover testing
- J-4 Provide manufacturer's representative for startup and commissioning services.
- J-5 Verify proper integration with SCADA system.

#### **K. Documentation and Deliverables**

- K-1 Provide complete design documentation, including:
  - Engineering calculations
  - Detailed drawings (signed and sealed)
  - Material specifications (signed and sealed)
  - Chemical dose calculations
  - Hydraulic calculations for chemical feed systems
- K-2 Provide complete O&M manuals for all equipment and systems.
- K-3 Submit warranty documentation for all equipment and installation.
- K-4 Submit safety procedures for chemical handling and emergency response protocols.
- K-5 Offer a recommended list of spare parts.
- K-6 Include safety data sheets for all chemicals used in the system.

## 2-10. Clearwell/Chlorine Contact Chamber System

### A. Existing System Information

The following table provides detailed information on the existing equipment as documented in the 2024-06-27\_FINAL\_SLWSD 2024 System Engineer Bond Report and/or verified during the August 13, 2025, site visit.

Existing Clearwell/ CCC System characteristics:

|                 |     |        |
|-----------------|-----|--------|
| Number of Units | #   | 1      |
| Unit ID         |     | CCC-1  |
| Unit Capacity   | gal | 85,270 |
|                 | gpm | 2,850  |
| Length          | ft  | 52     |
| Width           | ft  | 24     |
| Depth           | ft  | 9.5    |

Existing Chloride Addition System:

|                                |         |           |
|--------------------------------|---------|-----------|
| Existing Dosage                | mg/L    | 5         |
| Existing Usage                 | gph     | 2         |
| <b>Hypochlorite Feed Tanks</b> |         |           |
| Number of Units                | #       | 2         |
| Unit Capacity                  | gal/day | 2,000     |
| <b>Hypochlorite Feed Pumps</b> |         |           |
| Number of Units                | #       | 2         |
| Unit Capacity                  | ppd     | 200       |
| Horsepower                     | HP      | TBD       |
| T.D.H.                         | ft      | TBD       |
| Speed                          | R.P.M.  | TBD       |
| Manufacturer                   |         | Prominent |
| Model                          |         | Sigma I   |
| Year Installed                 |         | 2008      |

### B. General Requirements

B-1 Design Basis and Verification Requirements: The specifications in this section are based on SLWSD requirements, existing system data, and operational parameters. The Design-Build Team

shall verify all stated capacities, dimensions, materials, and performance parameters through independent engineering calculations and analyses prior to equipment selection and procurement. The Design-Build Team shall ensure that all equipment and systems meet the stated performance objectives and shall document any required adjustments with supporting engineering justification for Engineer review and approval.

- B-2 The Design-Build Team shall design and construct one new Chlorine Contact Chamber (CCC) to supplement the existing chamber at the ROWTP.
- B-3 The new CCC shall increase the firm capacity of the disinfection system to 8.2 MGD.
- B-4 All design and construction shall comply with Florida Department of Environmental Protection (FDEP) regulations, AWWA standards, and SLWSD standards and specifications.
- B-5 The Design-Build Team shall coordinate with SLWSD operations staff to ensure minimal disruption to existing plant operations during construction and implementation.

### **C. Design and Configuration**

- C-1 The new CCC shall match the existing unit with an operating volume of 85,300 gallons.
- C-2 Design shall provide a minimum hydraulic retention time of 30 minutes at a peak flow rate of 2,850 gpm (4.1 MGD).
- C-3 CCC shall be constructed of reinforced concrete with appropriate structural design for below-grade installation.
- C-4 Include an internal baffling system to ensure plug flow conditions with a minimum baffling factor of 0.5.
- C-5 Design shall minimize short-circuiting and dead zones to maximize disinfection efficiency.
- C-6 Include provisions for draining and cleaning the chamber.
- C-7 Provide appropriate access hatches and safety features for maintenance.

### **D. Hydraulic Design**

- D-1 Design inlet and outlet structures to ensure even flow distribution.
- D-2 Provide flow control between existing and new CCCs to allow for balanced operation.
- D-3 Include provisions for isolation and bypass of each chamber for maintenance.
- D-4 Design the hydraulic profile to allow gravity flow through the system where possible.
- D-5 Include high water level alarms and overflow protection.
- D-6 Provide sample ports at strategic locations to monitor disinfection performance.

### **E. Chemical Feed Integration**

- E-1 Design appropriate chemical(s) injection points with proper mixing.
- E-2 Provide chemical feed piping with appropriate materials compatible with chemical(s) used for injection.
- E-3 Include multiple injection points if needed for optimal distribution.
- E-4 Design a chemical feed system to allow for automated control based on flow and residual measurements.

E-5 Coordinate chemical feed design with the chemical addition systems upgrades.

## **F. Instrumentation and Controls**

F-1 Provide the following instrumentation at a minimum:

- Flow measurement at inlet and outlet (for chemical feed pacing)
- Chlorine residual analyzers at the inlet and outlet of the system (for chemical feed stroke control)
- Water level monitoring (for transfer pump control)
- pH monitoring

F-2 All instrumentation shall provide 4-20mA output signals for integration with SCADA.

F-3 Integrate controls with the existing SCADA system to enable remote monitoring and control.

F-4 Design the control system to provide automatic operation based on flow and water quality parameters.

F-5 Include appropriate alarms for critical parameters.

## **G. Disinfection Performance**

G-1 Design the system to achieve a minimum 4-log virus inactivation, in compliance with FDEP requirements.

G-2 Ensure a minimum free chlorine residual of 0.2 mg/L at the outlet.

G-3 Designed to minimize disinfection byproduct formation.

G-4 Include provisions for calculating and reporting CT (concentration × time).

G-5 Design for operational flexibility to adjust disinfection parameters based on water quality changes.

## **H. Site Integration**

H-1 Locate new CCC adjacent to existing chamber where feasible per survey data

H-2 (ideally to mirror existing CCC along transfer pump wall).

H-3 Design appropriate yard piping to connect with existing treatment processes.

H-4 Include site restoration and drainage considerations.

H-5 Provide access for maintenance vehicles and equipment.

H-6 Coordinate with other plant expansion components to ensure integrated operation.

## **I. Testing and Commissioning**

I-1 Perform hydraulic testing to confirm retention time and flow distribution.

I-2 Perform leak testing on the completed structure. e.

I-3 Perform tracer studies to confirm hydraulic efficiency and baffling factor.

I-4 Perform disinfection of the new chamber prior to placing it in service.

I-5 Conduct water quality testing to verify disinfection performance.

I-6 Verify proper integration with the SCADA system and chemical feed systems.

## **J. Documentation and Deliverables**

- J-1 Provide complete design documentation, including:
- J-2 Engineering calculations
- J-3 Detailed structural and hydraulic drawings (signed and sealed)
- J-4 Material specifications (signed and sealed)
- J-5 CT calculations
- J-6 Hydraulic profile analysis
- J-7 Provide detailed O&M manuals for all equipment and systems.
- J-8 Provide warranty documentation for all equipment and installation.
- J-9 Submit recommended maintenance schedule and procedures.
- J-10 Provide as-built drawings in AutoCAD format and GIS-compatible format.

## 2-11. Transfer Pumps

### A. Existing System Information

The following table provides detailed information on the existing equipment as documented in the 2024-06-27\_FINAL\_SLWSD 2024 System Engineer Bond Report and/or verified during the August 13, 2025, site visit.

Existing Transfer Pumps System characteristics:

| Number of Units | #      | 3                 |       |       |
|-----------------|--------|-------------------|-------|-------|
| Unit ID         |        | TP-1              | TP-2  | TP-3  |
| Unit Capacity   | gpm    | 1,400             | 700   | 700   |
| Horsepower      | HP     | 25                | 15    | 15    |
| T.D.H.          | ft     | 30                | 51    | 51    |
| Speed           | R.P.M. | 1,191             | 1,785 | 1,770 |
| Manufacturer    |        | Peerless Pump Co. |       |       |
| Model           |        | 25BM-2            | M12MB | M12MB |
| Year Installed  |        | 1987              | 2005  | 2005  |

### B. General Requirements

- B-1 Design Basis and Verification Requirements: The specifications in this section are based on SLWSD requirements, existing system data, and operational parameters. The Design-Build Team shall verify all stated capacities, dimensions, materials, and performance parameters through independent engineering calculations and analyses prior to equipment selection and procurement. The Design-Build Team shall ensure that all equipment and systems meet the stated performance objectives and shall document any required adjustments with supporting engineering justification for Engineer review and approval.
- B-2 The Design-Build Team shall design and install three additional transfer pumps to supplement the existing three pumps currently at the ROWTP.
- B-3 Upgrade existing pumps to meet the 5.7 MGD
- B-4 The new transfer pumps shall increase the firm capacity of the pumping system to 5.7 MGD while maintaining N+1 redundancy.
- B-5 All design and construction shall comply with Florida Department of Environmental Protection (FDEP) regulations, AWWA standards, and SLWSD standards and specifications.
- B-6 The Design-Build Team shall coordinate with SLWSD operations staff to ensure minimal disruption to existing plant operations during construction and implementation.

### C. Pump Specifications

- C-1 The new pumps shall be a vertical turbine type with the following specifications:
  - Capacity: 1,400 gpm (2.0 MGD)
  - Total Dynamic Head (TDH): To match existing 1,400 gpm pumps (approximately 25 ft)

- Motor: Premium efficiency, appropriately sized (approximately 25 HP)
- Materials: Bronze impeller, stainless steel shaft, and cast-iron column and discharge head
- C-2 Pumps shall be designed to match the hydraulic performance curve of the existing 1,400 gpm pumps.
- C-3 Pump materials shall be compatible with finished drinking water and suitable for continuous operation.
- C-4 Provide two variable frequency drives (VFDs) for level control. VFD-based level control provides consistent flow through the basin, improving chemical pacing and chlorine dioxide dosing accuracy. Remaining pumps shall utilize cross-the-line soft starts based on water level.
- C-5 Pump efficiency shall meet or exceed 75% at the design point.

#### **D. Pump Installation and Mounting**

- D-1 Provide a concrete foundation and mounting for the pump according to the manufacturer's recommendations.
- D-2 Design installation to minimize vibration and ensure proper alignment.
- D-3 Provide appropriate clearance around the pumps for maintenance access.
- D-4 Include vibration monitoring mounts.
- D-5 Design installation to allow for future pumps removal and replacement without affecting adjacent equipment.

#### **E. Suction and Discharge Piping**

- E-1 Perform hydraulic analysis of the existing piping system and upgrade as necessary to accommodate increased flow.
- E-2 Suction and discharge piping shall be ductile iron or PVC Schedule 80 with an appropriate pressure rating.
- E-3 Design piping to maintain velocities between 3-7 fps at design flow.
- E-4 Provide isolation valves on suction and discharge.
- E-5 Include a check valve on the discharge to prevent backflow.
- E-6 Provide pressure gauges on suction and discharge.
- E-7 Include provisions for pumps priming and air release.

#### **F. Variable Frequency Drive**

- F-1 Provide VFD for necessary transfer pumps.
- F-2 VFD shall be sized for the motor with 25% additional capacity.
- F-3 VFD shall include the following features:
  - Line and load reactors
  - Harmonic filters
  - Manual bypass
  - Communication capability compatible with the existing SCADA system

- F-4 VFD enclosure shall be NEMA 12 minimum, suitable for indoor installation.
- F-5 VFD shall be programmed to provide soft start capability and adjustable acceleration/deceleration rates.

## **G. Electrical Requirements**

- G-1 Provide a complete electrical system, including:
- Power supply to motors and VFDs (two VFDs for level control)
  - Motor starters with cross-the-line soft starts for remaining pumps
  - Overcurrent protection
  - Ground fault protection
  - Lightning and surge protection
- G-2 All electrical components shall be rated for the environment and service conditions.
- G-3 Design electrical system to comply with NEC, local electrical codes, and IEEE 519.
- G-4 Provide emergency power connections compatible with the plant standby generator system.

## **H. Instrumentation and Controls**

- H-1 Provide the following instrumentation at minimum:
- Pressure switches on suction and discharge
  - Flow switch on discharge
  - Motor winding temperature sensors
  - Vibration monitoring
- H-2 All instrumentation shall provide 4-20mA output signals for integration with SCADA.
- H-3 Integrate pump controls with the existing SCADA system to allow for remote monitoring and control.
- H-4 Design control system to provide automatic lead/lag operation and pump rotation with existing pumps.
- H-5 Provide automatic shutdown protection for low suction pressure, high discharge pressure, high motor temperature, and other critical parameters.
- H-6 Design control logic to maintain balanced flow distribution between operating pumps.

## **I. Testing and Commissioning**

- I-1 Conduct factory performance testing of the pump prior to shipment.
- I-2 Perform field testing, including:
- Hydrostatic testing of piping at 1.5 times the working pressure
  - Pump performance testing to verify flow, head, and efficiency
  - Motor insulation resistance testing
  - VFD functional testing

- I-3 Conduct vibration analysis during pump operation.
- I-4 Verify proper pump alignment before and after operational testing.
- I-5 Perform system integration testing with SCADA.
- I-6 Conduct a 24-hour continuous operation test.

## **J. Documentation and Deliverables**

- J-1 Provide complete design documentation, including:
  - Engineering calculations
  - Detailed drawings (signed and sealed)
  - Material specifications (signed and sealed)
  - Pump curves and specifications
  - Hydraulic analysis of the transfer system
- J-2 Provide O&M manuals for all equipment and systems. s.
- J-3 Submit warranty documentation for all equipment and installation.
- J-4 Submit the recommended spare parts list.
- J-5 Provide vibration baseline measurements for future reference.

## 2-12. High-Service Pumping

### A. Existing System Information

The following table provides detailed information on the existing equipment as documented in the 2024-06-27\_FINAL\_SLWSD 2024 System Engineer Bond Report and/or verified during the August 13, 2025, site visit.

Existing Transfer Pumps System characteristics:

| Existing High Service Pumps - Set A |        |                        |        |       |         |
|-------------------------------------|--------|------------------------|--------|-------|---------|
| Number of Units                     | #      | 4                      |        |       |         |
| Unit ID                             |        | HSP-1                  | HSP-2  | HSP-3 | HSP-4   |
| Unit Capacity                       | gpm    | 700                    | 1,400  | 3,000 | 3,000   |
| Horsepower                          | HP     | 50                     | 100    | 100   | 150     |
| T.D.H.                              | ft     | TBD                    | TBD    | TBD   | TBD     |
| Speed                               | R.P.M. | 3,550                  | 1,785  | TBD   | 1,728   |
| Manufacturer                        |        | Peerless               |        |       |         |
| Type                                |        | Split Case Centrifugal |        |       |         |
| Model                               |        | 3AE9                   | 6AE14G | TBD   | 8AEF17Q |
| Year Installed                      |        | 1987                   | 1987   | 1987  | 2020    |

| Existing High Service Pumps - Set B |        |                        |        |        |
|-------------------------------------|--------|------------------------|--------|--------|
| Number of Units                     | #      | 3                      |        |        |
| Unit ID                             |        | HSP-5                  | HSP-6  | HSP-7  |
| Unit Capacity                       | gpm    | 1,400                  | 1,400  | 700    |
| Horsepower                          | HP     | 100                    | 100    | 50     |
| T.D.H.                              | ft     | 195                    | 195    | 160    |
| Speed                               | R.P.M. | 1775                   | 1775   | 1770   |
| Min. Efficiency                     |        | 93.6%                  | 93.6%  | TBD    |
| Manufacturer                        |        | Aurora                 |        |        |
| Type                                |        | Split Case Centrifugal |        |        |
| Model                               |        | AEHEUW                 | AEHEUW | AEHH8B |
| Year Installed                      |        | 2016                   | 2016   | 2016   |

### B. General Requirements

B-1 Design Basis and Verification Requirements: The specifications in this section are based on SLWSD requirements, existing system data, and operational parameters. The Design-Build Team shall verify all stated capacities, dimensions, materials, and performance parameters through

independent engineering calculations and analyses prior to equipment selection and procurement. The Design-Build Team shall ensure that all equipment and systems meet the stated performance objectives and shall document any required adjustments with supporting engineering justification for Engineer review and approval.

- B-2 The Design-Build Team shall upgrade the existing 50 HP (700 gpm) High-Service -1 (HSP-1) in Set A pump to a 100 HP (1,400 gpm) pump at the ROWTP.
- B-3 The upgraded pump shall increase the firm capacity of the high-service pumping system to 7,900 gpm with the largest pump out of service, providing an effective firm capacity of 6.70 MGD with a peak hour factor of 1.7.
- B-4 All design and construction shall comply with Florida Department of Environmental Protection (FDEP) regulations, AWWA standards, and SLWSD standards and specifications.
- B-5 The Design-Build Team shall coordinate with SLWSD operations staff to ensure minimal disruption to existing water distribution system operations during construction and implementation.

### **C. Pump Specifications**

- C-1 The upgraded pump shall be a split case centrifugal type with the following specifications:
  - Capacity: 1,400 gpm
  - Total Dynamic Head (TDH): To match existing 1,400 gpm pumps in the system
  - Motor: 100 HP, premium efficiency, TEFC
  - Materials: Bronze impeller, stainless steel shaft, and cast-iron casing
- C-2 Pump shall be designed to match the hydraulic performance curve of the existing 1,400 gpm pumps.
- C-3 Pump materials shall be compatible with finished drinking water and suitable for continuous operation.
- C-4 Provide a VFD for the upgraded pump to allow flow control.
- C-5 Pump efficiency shall meet or exceed 80% at the design point.

### **D. Pump Installation and Modifications**

- D-1 Evaluate the existing pump foundation and modify it as necessary to accommodate the larger pump.
- D-2 Design installation to minimize vibration and ensure proper alignment.
- D-3 Provide appropriate clearance around the pump for maintenance access.
- D-4 Include vibration isolation pads if required.
- D-5 Design installation to allow for future pump removal and replacement without affecting adjacent equipment.

### **E. Suction and Discharge Piping**

- E-1 Perform hydraulic analysis of the existing piping system and upgrade as necessary to accommodate increased flow.

- E-2 Modify suction and discharge piping as required, using ductile iron with appropriate pressure rating.
- E-3 Design piping to maintain velocities between 3-7 fps at design flow.
- E-4 Provide new isolation valves on suction and discharge if existing valves are not adequately sized.
- E-5 Include a new check valve on the discharge sized appropriately for the increased flow.
- E-6 Provide pressure gauges on suction and discharge. D-7 Evaluate and modify pump station header piping, as necessary.

#### **F. Variable Frequency Drive**

- F-1 Provide VFD for the upgraded high-service pump.
- F-2 VFD shall be sized for a 100 HP motor with 25% additional capacity.
- F-3 VFD shall include the following features:
  - Line and load reactors
  - Harmonic filters
  - Manual bypass
  - Human-machine interface (HMI) panel
  - Communication capability compatible with the existing SCADA system
- F-4 VFD enclosure shall be NEMA 12 minimum, suitable for indoor installation.
- F-5 VFD shall be programmed to provide soft start capability and adjustable acceleration/deceleration rates.

#### **G. Electrical System Upgrades**

- G-1 Evaluate existing electrical service and upgrade as necessary to accommodate the increased motor horsepower.
- G-2 Provide complete electrical system modifications, including:
  - Power supply to motor and VFD
  - Motor control center modifications
  - Overcurrent protection
  - Ground fault protection
  - Lightning and surge protection
- G-3 All electrical components shall be rated for the environment and service conditions.
- G-4 Design electrical system modifications to comply with NEC, local electrical codes, and IEEE 519.
- G-5 Evaluate standby generator capacity and make recommendations for any required upgrades.

#### **H. Instrumentation and Controls**

- H-1 Provide the following instrumentation at minimum:
  - Pressure transmitters on suction and discharge

- Flow meter on discharge (if not already present)
  - Motor winding temperature sensors
  - Vibration monitoring
- H-2 All instrumentation shall provide 4-20mA output signals for integration with SCADA.
- H-3 Integrate pump controls with the existing SCADA system to allow for remote monitoring and control.
- H-4 Integrate the upgraded pump into the existing high-service pump control strategy. The District has stated that the high-service pumps do not operate on a lead/lag basis, and the existing documented control strategy is not to be changed.
- H-5 Provide automatic shutdown protection for low suction pressure, high discharge pressure, high motor temperature, and other critical parameters.
- H-6 Update control logic to maintain balanced flow distribution between operating pumps.

#### **I. System Hydraulics Analysis**

- I-1 Perform a detailed hydraulic analysis of the entire high-service pumping system with the upgraded pump.
- I-2 Evaluate system curves at varying demand conditions.
- I-3 Verify adequate net positive suction head (NPSH) available for all pumping conditions.
- I-4 Analyze potential for water hammer and recommend mitigation measures if necessary.
- I-5 Verify that distribution system pressures remain within acceptable ranges under all operating conditions.

#### **J. Testing and Commissioning**

- J-1 Conduct factory performance testing of the pump prior to shipment.
- J-2 Perform field testing, including:
- Hydrostatic testing of modified piping at 1.5 times the working pressure
  - Pump performance testing to verify flow, head, and efficiency
  - Motor insulation resistance testing
  - VFD functional testing
- J-3 Conduct vibration analysis during pump operation.
- J-4 Verify proper pump alignment before and after operational testing.
- J-5 Perform system integration testing with SCADA.
- J-6 Conduct a 24-hour continuous operation test.
- J-7 Verify distribution system pressures at critical points during testing.

#### **K. Documentation and Deliverables**

- K-1 Provide complete design documentation, including:
- Engineering calculations

- Detailed drawings (signed and sealed)
- Material specifications (signed and sealed)
- Pump curves and specifications
- Hydraulic analysis of high-service pumping system
- Electrical load calculations

- K-2 Furnish O&M manuals for all equipment and systems.
- K-3 Provide warranty documentation for all equipment and installation.
- K-4 Submit the recommended spare parts list.
- K-5 Provide vibration baseline measurements for future reference.
- K-6 Update the system hydraulic model to reflect the upgraded pump configuration.

## 2-13. Surficial Aquifer Water Treatment and Blending System

### DISCLAIMER

No Technical Specifications are provided in this Design Criteria Package for the Surficial Aquifer Water Treatment and Blending System.

The references provided for the surficial aquifer water treatment components are based on preliminary pilot study results only.

The Design-Build Team is solely responsible for establishing final design criteria, process configuration, equipment selection, sizing, permitting, performance requirements, and integration. Based on the existing pilot study data, the Design-Build Team is also responsible for determining whether additional water quality data or analyses are needed to satisfy FDEP permitting for the surficial aquifer source prior to placing the blend in potable service.

### A. Pilot Study Consideration

The District's primary driver is reducing the use of corrosion-control chemicals (calcite media, ortho polyphosphate, and caustic soda) and the associated cost, which the District estimates at nearly \$300,000 per year. PFAS reduction is a secondary benefit. Both objectives are retained as co-equal pass/fail criteria for this validation because the blend cannot be certified without demonstrating both corrosion-control performance and PFAS compliance:

1. **Corrosion-Control Chemical Reduction:** Blending treated surficial water (25%) with reverse osmosis (RO) permeate (75%) is intended to achieve a positive Langelier Saturation Index (LSI > 0) and reduce or discontinue reliance on calcite contactors and corrosion-control chemical feed, subject to validation and FDEP approval.
2. **PFAS Control:** Per- and polyfluoroalkyl substances (PFAS) removal via granular activated carbon (GAC) and ion exchange (IX) treatment is intended to meet FDEP regulatory limits.

Both objectives are met for the design to be validated. Failure of either objective requires design modifications. The Existing Pilot Study Report shall be considered and reviewed by the Design Build Team to determine if the study is sufficient to move forward with the blend design.

The treatment train flows: surficial supply wells → pre-filtration (20-micron + 5-micron cartridge filters) → dual GAC systems → dual IX systems → standalone chlorine contact chamber → cone-bottom settling tank with periodic blowdown → valve-controlled connection to the clearwell for blend-ratio adjustment. Sodium hypochlorite is dosed ahead of the contact chamber. Together, the contact chamber and cone-bottom settling tank provide a minimum of 10 minutes of detention (District's minimum reference basis) at the 350 to 400 gpm design flow, corresponding to a working volume of about 3,500 to 4,000 gallons. That detention gives the hypochlorite time to oxidize the dissolved iron and provides disinfection contact, and the resulting floc settles and is removed by periodic blowdown in the cone-bottom tank ahead of the clearwell. Removing the iron is also what corrects the iron-related color. Final vessel configuration and sizing are set by the design-build team, carrying the 10-minute minimum as the design basis. The surficial stream bypasses the degasifier and odor control system because the surficial water is an iron-only concern with no sulfides. Chlorine contact provides disinfection, and iron and color settle out in the cone-bottom tank ahead of the clearwell. The surficial system is isolated and can be shut off or bypassed to drain if it does not meet spec, without affecting the existing treatment train. The calcite contactors remain

in service throughout the pilot period; their removal is not part of this project scope and is not anticipated for at least one to two years of successful blended operation, subject to FDEP approval. Equipment is sized for a 350 to 400 gpm design capacity.

Three water streams should be monitored: RO Permeate (75% of blend), Treated Surficial Water (25% of blend), and Blended Finished Water (the primary focus for LSI validation).

#### A-1 Corrosion Control Verification

The finished water pH should remain between 6.5 and 8.5 per FDEP requirements and should be monitored continuously. Daily trending of alkalinity and hardness should confirm that surficial water provides the minerals needed to maintain LSI stability without calcite addition. Because the surficial blend changes the finished water chemistry entering the distribution system, corrosion control verification for the pilot includes confirmation that the blended water does not increase lead or copper solubility relative to the current finished water. Lead and copper tap results are reviewed against the applicable FDEP action levels, currently 0.015 mg/L for lead and 1.3 mg/L for copper, with the lead action level lowering to 0.010 mg/L on November 1, 2027 under the EPA Lead and Copper Rule Improvements (LCRI). Routine Lead and Copper Rule tap monitoring continues under the utility's existing compliance program and is not altered by this pilot.

The Design-Build Team is assigned to interpret the corrosion control data and confirm that the blended finished water maintains corrosion control during design. HR Green is not determining that the existing pilot is sufficient for corrosion control performance.

#### A-2 PFAS Removal Performance

Per- and polyfluoroalkyl substances (PFAS) removal is not the primary objective of this evaluation. The primary objective is a positive LSI through blending. PFAS appears as a factor within the Aqueous/Vets reports supporting the preliminary evaluation of this project, so the pilot retains PFAS monitoring as a confirmation item rather than as a performance target the surficial system is being designed to meet.

The pilot should monitor PFAS concentrations in the pre-blend (post-GAC/IX) and post-blend water streams with sampling locations and frequency set by the Design-Build Team. Design-Build Team direction. Media breakthrough curves should be established to determine GAC and IX media breakthrough curves are developed to track media saturation rates and inform change-out frequency during the pilot period. The pilot criterion for PFAS is that blended finished water remains below the applicable FDEP limits through the pilot period. Confirmation that the existing pilot data satisfies this criterion is assigned to the Design-Build Team during design. HR Green is not determining that the existing pilot is sufficient for PFAS performance.

### B. Blending Point Monitoring and Validation Protocol

The specific instrumentation, monitoring frequency, and validation approach should be refined by the equipment vendor and Design-Build Team based on source water characteristics, system configuration, and operational feasibility. This section is a foundation for protocol development during design and commissioning, not a final specification. PFAS is monitored by periodic laboratory sampling of the treated surficial stream and the blended finished water, at a frequency set during design and consistent with the media change-out schedule.

**Required Instrumentation:** The blending system should be equipped with minimum online instrumentation: pH analyzer, conductivity analyzer, temperature sensor, and free chlorine analyzer. All

analyzers should transmit data continuously to a data logger or Programmable Logic Controller (PLC) with alarm capability. Alarm setpoints on the key parameters are defined during design.

**Daily Laboratory Confirmation:** Daily laboratory analysis should confirm online analyzer accuracy by measuring alkalinity, hardness, calcium. These parameters should be combined with online data to calculate LSI daily. Laboratory results should be compared to online readings to verify analyzer calibration and performance.

**LSI Validation Protocol:** The demonstration verifies that the blending system maintains LSI greater than 0 under operating conditions. If LSI drops below 0 on any day, the Design-Build Team is to take the following steps:

- Confirm the result with laboratory analysis;
- Investigate the cause (analyzer malfunction, source water quality change, blend ratio drift, or system upset);
- Document the event and corrective action taken;
- Report findings within 48 hours.

**PFAS Validation Protocol:** The treated surficial source meets FDEP and federal PFAS limits for finished water before blending and during operation. Media change-out is based on breakthrough monitoring to keep PFAS within limits. Exceeding limits necessitates corrective measures like media replacement or treatment adjustments before resuming potable service.

**Validation Criteria:** The blend demonstration is evaluated by the Design-Build Team on LSI and PFAS performance over the pilot period. Indicators of a favorable demonstration include:

- A positive LSI held through the pilot period, with any negative LSI excursion explained and corrected;
- Analyzer calibration held within the acceptable limits set during design;
- Seasonal variation in source water is managed through blend-ratio adjustment (target 25:75 RO permeate to treated surficial water).
- Finished-water PFAS held within the applicable FDEP and federal limits across the demonstration.

Indicators that the blend alone does not meet the LSI target include a positive LSI held only with continued calcite contribution or a negative LSI held despite blend-ratio adjustment, recurring negative LSI excursions that trace to insufficient surficial water mineral content, and source water quality changes that make blend-ratio control unreliable. Finished-water PFAS above the applicable limits, or media breakthrough that is not manageable within the change-out schedule, is also an unfavorable indicator.

The calcite contactors stay in operation during the pilot period and supplement the blend as needed to maintain a positive LSI. If the blend alone doesn't achieve the LSI target, it doesn't mean system failure; it indicates the calcite's contribution. Removing them is outside this project's scope and isn't expected until the blend shows consistent corrosion-control effectiveness acceptable to FDEP. The Design-Build Team will analyze validation data to determine if reduced calcite operation is justified, subject to FDEP approval. HR Green is not assessing whether the current pilot data is adequate.

### C. Supporting Objectives

Media performance should be tracked through differential pressure development, saturation rates, and optimal replacement frequency for both GAC and IX systems. System operation should be verified through daily dual system alternation, automation reliability, and backwash water quality assessment.

Blend ratio achievement should be verified continuously at 25:75. If LSI targets are not met at this ratio, the Design-Build Team should adjust proportions (e.g., 30:70) and document findings.

#### **D. Data Management**

All treatment equipment should include flow meters on all streams and differential pressure transmitters on GAC and IX vessels. Online analyzers should measure pH, conductivity, temperature, and free chlorine at the blending point. A Programmable Logic Controller (PLC) should log data at 15-minute intervals with alarm functionality

reports should track LSI trending, seasonal analysis, media performance, and cost data. The final pilot report should document the LSI trending and the Design-Build Team's evaluation.

#### **E. References**

The AqueousVETS pilot study for PFAS removal concluded in May 2026 and provides preliminary data supporting the surficial aquifer treatment approach. However, the Design-Build Team may evaluate equipment from multiple vendors to compare to AqueousVETS technology. Alternative GAC and IX systems meeting NSF/ANSI 61 standards and performance criteria may be substituted based on cost, availability, and operational feasibility.

Additional references include FDEP Corrosion Control Treatment Technique Rules, American Water Works Association (AWWA) Corrosion Control Guidance, and the City of Houston East WTP Design Criteria (pilot framework reference).

- AV Project S-00077 St Lucie Pilot Study Report PDF Document - Josh Miller - TJ Bayer - 3-14-26
- 4965\_001 Pilot Skid Presentation

## 2-14. Electrical MCC Improvements

### A. Existing System Information

The following table provides detailed information on the existing equipment as documented in the 2024-06-27\_FINAL\_SLWSD 2024 System Engineer Bond Report and/or verified during the August 13, 2025, site visit.

Existing MCC characteristics:

| <b>MCC 1</b>    |        |                        |           |       |         |
|-----------------|--------|------------------------|-----------|-------|---------|
| Number of Units | #      | 4                      |           |       |         |
| Unit ID         |        | HSP-1                  | HSP-2     | HSP-3 | HSP-4   |
| Unit Capacity   | gpm    | 700                    | 1,400     | 1,400 | 3,000   |
| Horsepower      | HP     | 50                     | 100       | 100   | 150     |
| T.D.H.          | ft     | TBD                    | TBD       | TBD   | TBD     |
| Speed           | R.P.M. | 3550                   | 1785      | TBD   | 1728    |
| Manufacturer    |        | Leeson                 | US Motors | TBD   | Lincoln |
| Type            |        | Split Case Centrifugal |           |       |         |
| Model           |        | TBD                    | 6212-2Z-J | TBD   | TBD     |
| Year Installed  |        | -                      | -         | -     | -       |

| <b>MCC 2</b>    |        |                        |        |        |
|-----------------|--------|------------------------|--------|--------|
| Number of Units | #      | 3                      |        |        |
| Unit ID         |        | TBD                    | TBD    | TBD    |
| Unit Capacity   | gpm    | 1,400                  | 1,400  | 700    |
| Horsepower      | HP     | 100                    | 100    | 50     |
| T.D.H.          | ft     | TBD                    | TBD    | TBD    |
| Speed           | R.P.M. | 1775                   | 1775   | 1770   |
| Min. Efficiency |        | 93.6%                  | 93.6%  |        |
| nav             |        |                        |        |        |
| Manufacturer    |        | TBD                    | TBD    | TBD    |
| Type            |        | Split Case Centrifugal |        |        |
| Model           |        | AEHEUW                 | AEHEUW | AEHH8B |
| Year Installed  |        | -                      | -      | 2015   |

## **B. General Requirements**

- B-1 Design Basis and Verification Requirements: The specifications in this section are based on SLWSD requirements, existing system data, and operational parameters. The Design-Build Team shall verify all stated capacities, dimensions, materials, and performance parameters through independent engineering calculations and analyses prior to equipment selection and procurement. The Design-Build Team shall ensure that all equipment and systems meet the stated performance objectives and shall document any required adjustments with supporting engineering justification for Engineer review and approval.
- B-2 The Design-Build Team shall upgrade one existing MCC.
- B-3 Movement of MCC's incorporating the WTP Workshop/VFD Room
- B-4 Replacement of Existing Switchgear
- B-5 Incorporation of WWTF Electrical System Tie in
- B-6 All design and construction shall comply with Florida Department of Environmental Protection (FDEP) regulations, AWWA standards, and SLWSD standards and specifications.
- B-7 The Design-Build Team shall coordinate with SLWSD operations staff to ensure minimal disruption to existing water distribution system operations during construction and implementation.
- B-8 All electrical designs, including MCC modifications, switchgear replacement, and power distribution upgrades, shall be prepared under the responsible charge of a Professional Engineer licensed in the State of Florida with expertise in electrical engineering.

## **C. MCC Specifications**

- C-1 Upgrades shall be Square D

## **D. Variable Frequency Drive**

- D-1 Provide VFD for the upgraded high-service pump and HPP pump.
- D-2 VFD shall be sized accordingly for each motor with 25% additional capacity.
- D-3 VFD shall include the following features:
  - Line and load reactors
  - Harmonic filters
  - Manual bypass
  - Human-machine interface (HMI) panel
  - Communication capability compatible with the existing SCADA system
- D-4 VFD enclosure shall be NEMA 12 minimum, suitable for indoor installation.
- D-5 VFD shall be programmed to provide soft start capability and adjustable acceleration/deceleration rates.

## **E. Electrical System Upgrades**

- E-1 Evaluate existing electrical service and upgrade as necessary to accommodate the increased motor horsepower.

- E-2 The existing WTP and WWTP systems are “connected” via a conduit with two 4” conductors that allow the backup power supply to provide power to the WWTP and vice versa. This system is aging and in need of replacement.
- E-2.1 Existing 800 Amp manual switch at the WTP MCC room and the WWTP MCC room shall be demolished.
- E-2.2 Install new conduits and conductors to replace the existing and install terminal blocks in the MCC rooms at the two facilities. in-ground splices are not allowed.
- E-3 Provide complete electrical system modifications, including:
- Power supply to motor and VFD
  - Motor control center modifications
  - Overcurrent protection
  - Ground fault protection
  - Lightning and surge protection
- E-4 All electrical components shall be rated for the environment and service conditions.
- E-5 Design electrical system modifications to comply with NEC, local electrical codes, and IEEE 519.
- E-6 Evaluate standby generator capacity and make recommendations for any required upgrades.

#### **F. Instrumentation and Controls**

- F-1 Provide the following instrumentation at minimum:
- Pressure transmitters on suction and discharge
  - Flow meter on discharge (if not already present)
  - Motor winding temperature sensors
  - Vibration monitoring
- F-2 All instrumentation shall provide 4-20mA output signals for integration with SCADA. Instruments shall be Devicenet based to be compatible with existing systems at the District.
- F-3 Integrate pump controls with the existing SCADA system to allow for remote monitoring and control.
- F-4 Integrate the upgraded pump into the existing high-service pump control strategy. The District has stated the high-service pumps do not operate on a lead/lag basis, and the existing documented control strategy is not to be changed.
- F-5 Provide automatic shutdown protection for low suction pressure, high discharge pressure, high motor temperature, and other critical parameters.
- F-6 Update control logic to maintain balanced flow distribution between operating pumps.

#### **G. Testing and Commissioning**

- G-1 Conduct factory performance testing of the pump prior to shipment.
- G-2 Perform field testing, including:
- Hydrostatic testing of modified piping at 1.5 times the working pressure

- Pump performance testing to verify flow, head, and efficiency
  - Motor insulation resistance testing
  - VFD functional testing
- G-3 Conduct vibration analysis during pump operation.
- G-4 Verify proper pump alignment before and after operational testing.
- G-5 Perform system integration testing with SCADA.
- G-6 Conduct a 24-hour continuous operation test.
- G-7 Verify distribution system pressures at critical points during testing.

#### **H. Documentation and Deliverables**

- H-1 Provide complete design documentation, including:
- Engineering calculations
  - Detailed drawings (signed and sealed)
  - Material specifications (signed and sealed)
  - Pump curves and specifications
  - Hydraulic analysis of high-service pumping system
  - Electrical load calculations
- H-2 Furnish O&M manuals for all equipment and systems.
- H-3 Provide warranty documentation for all equipment and installation.
- H-4 Submit the recommended spare parts list.
- H-5 Provide vibration baseline measurements for future reference.
- H-6 Update the system hydraulic model to reflect the upgraded pump configuration.

## 2-15. Design Specifications for Piping, Instrumentation, and Other Related Components

- A. SLWSD adopted standard general engineering standards that are to be referenced for any work within the District.
- B. The District's standards are available to the public on their website. Following are the details for general engineering and water related documents.
  - a. General Engineering Documents: <https://www.slwsd.org/Customer-Service/Other-Resources/Services-Engineering-Documents/General-Engineering-Documents>
  - b. Water Engineering Documents: <https://www.slwsd.org/Customer-Service/Other-Resources/Services-Engineering-Documents/Water-Engineering-Documents>

## Appendices

### Appendix A: Signed and Sealed Survey

## Appendix B: Geotechnical Report