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OFFICE OF WASTEWATER MANAGEMENT

WASHINGTON, D.C. 20460

SOLICITATION OF PUBLIC COMMENT FOR PROJECT-SPECIFIC BUILD AMERICA, BUY AMERICA NONAVAILABILITY WAIVER PROPOSAL

SUBJECT: UNDER EVALUATION: Project-Specific Nonavailability Waiver of Build America, Buy America Act Manufactured Products Requirements to the Great Lakes Water Authority in Detroit, Michigan, for Multiple Products

Intro: This solicitation of public comment by the U.S. Environmental Protection Agency (EPA) is to evaluate a Build America, Buy America (BABA) waiver request submitted by an assistance recipient based on nonavailability of a product for a single project.

This solicitation of public comment does not represent a final agency decision. The purpose of this proposal is to inquire whether potential alternative BABA-compliant products may be available that were not identified by the assistance recipient or through the EPA's product research efforts, and whether other factors should be considered in the evaluation of a waiver.

The EPA has completed its market research efforts and was unable to identify an alternative BABA-compliant product meeting the performance-based specifications in sufficient and reasonably available quantities and of a satisfactory quality. The EPA makes every effort to locate BABA-compliant alternative products through its waiver process and the public comment period provides an additional meaningful opportunity to augment the Agency's research. In the EPA's experience, a viable BABA-compliant product may be identified through public comment. Through this public comment period, commenters may provide information that indicates a compliant item is available. In that circumstance, EPA would not issue a final waiver.

Public comments are requested for 15 days (specific dates noted on the EPA's website). Please submit comments to BABA-OW@epa.gov. Please include information in the subject of the email identifying it as a public comment on this waiver request, such as "Waiver Comment: Great Lakes Water Authority" or similar. The proposed waiver will also be posted to the Made in America website.

Background

The Buy America Preference set forth in section 70914 of the BABA included in the Infrastructure Investment and Jobs Act (Pub. L. No. 117-58), requires all iron, steel, manufactured products, and construction materials used for infrastructure projects under Federal financial assistance awards be produced in the US.

Under section 70914(b), the EPA may waive the application of the Buy America Preference, in any case in which it finds that: applying the domestic content procurement preference would be inconsistent with the public interest; types of iron, steel, manufactured products, or construction materials are not produced in the US in sufficient and reasonably available quantities or of a satisfactory quality; or the inclusion of iron, steel, manufactured products, or construction materials produced in the U.S. will increase the cost of the overall project by more than 25 percent. All waivers must have a written explanation for the proposed determination; provide a period of not less than fifteen (15) calendar days for public comment on the proposed waiver; and submit the proposed waiver to the Office of Management and Budget's (OMB) Made in America Office for review to determine if the waiver is consistent with policy.

Summary

Proposed Waiver: The Environmental Protection Agency is soliciting comments regarding whether to issue a project waiver of the manufactured product requirements of section 70914 of the BABA included in the Infrastructure Investment and Jobs Act (Pub. L. No. 117-58), for doppler flow meters, magnetic flow meters, vertical side flow deflection mechanical bar screens, bar screen components, and remote input/output (I/O) cabinets and hardware used in an infrastructure project funded through the Clean Water State Revolving Fund.

Waiver Type: Nonavailability of multiple BABA-compliant products in sufficient and reasonably available quantities or of a satisfactory quality.

Waiver Level and Scope: Project level waiver for multiple products for a single project. No other project may utilize the waiver.

Proposed Waiver Description: Project-specific nonavailability waiver of BABA manufactured product requirements to the Great Lakes Water Authority (Applicant) in Michigan, for doppler flow meters, magnetic flow meters, vertical side flow deflection mechanical bar screens, bar screen components, and remote I/O cabinets and hardware for the Oakwood and Leib Combined Sewer Overflow (CSO) Improvements Project (project).

Project Summary: The project, which is located in Detroit, Michigan, is focused on improving facility treatment reliability, flexibility, operation, maintenance, and safety features to support planned increases in demand at the Applicant's Oakwood CSO Retention Treatment Basin and Pump Station and the Leib CSO Screening and Disinfection Facility. Improvements to the facilities are planned for the chemical feed systems, flushing systems, screening systems, disinfection processes, instrumentation, controls, and electrical systems. Additional site-specific improvements will be undertaken at both facilities.

Length of the waiver: From the effective date of the final waiver until project completion, estimated to be February 28, 2033. The waiver will be reviewed five years from the effective date of the final waiver to evaluate the continued need for the waiver.

Summary of Items Covered in the Proposed Waiver (including NAICS): The Applicant is seeking a waiver for the following BABA manufactured products:

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- Doppler Flow Meters:
 - NAICS – 334513
 - PSC – 6680
 - Specifications section – 407100
- Magnetic Flow Meters:
 - NAICS – 334513
 - PSC – 6680
 - Specifications section – 401700
- Vertical Side Flow Deflection Mechanical Bar Screens and Components:
 - NAICS – 333310
 - PSC – 4630
 - Specifications sections – 462100, 462150
- Remote I/O Cabinets and Hardware:
 - NAICS – 334513
 - PSC – 6110
 - Specifications section – 406300

No domestic alternative products were identified by the Applicant, or through the EPA’s market research completed in July 2025. For additional information on the project and products included in the waiver request, see the attached original waiver request from the assistance recipient and supporting documents, which includes the technical specifications.

Description of Efforts Made to Avoid the Need for a Waiver

The Applicant made a good faith effort to identify alternative compliant products that meet project specifications. They were unable to find other similar products that were BABA-compliant and would meet the technical specifications of the project.

The EPA also conducted market research in July 2025. The market research process included thorough review of the waiver request submission, examination of domestic manufacturer catalogs and other technical data and marketing materials, and communication with domestic manufacturers.

During market research, the EPA contacted ten (10) manufacturers and suppliers of doppler flow meters. No (zero) manufacturers indicated they could produce a BABA-compliant product that meets the technical specifications of the project. Based on the technical evaluation conducted, the claim that there are no BABA-compliant doppler flow meters available that meet the project’s specifications is supported.

The EPA also contacted ten (10) manufacturers and suppliers of magnetic flow meters. No (zero) manufacturers indicated they could produce BABA-compliant magnetic flow meters that meet the technical specifications of the project. Based on the technical evaluation conducted, the claim that there are no BABA-compliant magnetic flow meters available that meet the project’s specifications is supported.

The EPA also contacted ten (10) manufacturers and suppliers of vertical side flow deflection mechanical bar screens and screen components. One (1) manufacturer indicated they could produce BABA-compliant vertical side flow deflection mechanical bar screens and components, but additional

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information from the technical specifications for the project would be needed. During further communication between the Applicant and the manufacturer in July 2025, the manufacturer determined that they were unable to meet the technical specifications of the project due to the size of the screen that the Applicant requires. Based on the technical evaluation conducted and communication between the Applicant and the identified potential manufacturer, the claim that there are no BABA-compliant vertical side flow deflection mechanical bar screens and screen components available that meet the project's specifications is supported.

Finally, the EPA contacted ten (10) manufacturers and suppliers of remote I/O cabinets and hardware. No (zero) manufacturers indicated they could produce BABA-compliant remote I/O cabinets and hardware that meet the technical specifications of the project. Based on the technical evaluation conducted, the claim that there are no BABA-compliant remote I/O cabinets and hardware available that meet the project's specifications is supported.

Anticipated Impact if No Waiver is Issued

The Oakwood CSO and Leib CSO facilities discharge into the Rouge River and Detroit River, which are major waterways within Michigan. As a result of an anticipated increase in flow, these improvements will be needed to ensure adequate treatment.

Absent a waiver, the Applicant would be unable to complete this project, thus endangering public health and risking noncompliance with its discharge permits, as the affected systems would not function as intended. The products in this waiver request are critical components of the disinfection, storm pump discharge, CSO screening, and process control systems.

Description of Award

Recipient Name and/or Unique Entity Identifier (UEI): C11FW9DW7PG8

Federal Financial Assistance Listing Name: Clean Water State Revolving Fund

Federal Financial Assistance Listing Number: 66.458

Federal Financial Assistance Identification Number (FAIN): 02E03282

Agency CGAC: 068

Federal Financial Assistance Funding Amount: \$35,021,840.00

Total Cost of Infrastructure Expenditures: \$67,270,000.00

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May 27, 2025

Mr. Jonathan M. Berman
State Revolving Fund Compliance Specialist,
Finance Division I, Water Infrastructure Funding and Financing Section, Michigan
Department of Environment, Great Lakes, and Energy

Subject: Request for Project-Specific Non-Availability Waiver of Build America, Buy America Act Requirements to Great Lakes Water Authority, Wayne County for Oakwood and Leib CSO Improvements, Clean Water State Revolving Fund Project Number: 6001-01 Equivalency Funding cycle: Quarter 4 financing of Fiscal Year 2025.

Dear Mr. Berman:

The applicant, Great Lakes Water Authority (GLWA), is seeking a project-specific non-availability waivers pursuant to the domestic preference set forth in the Build America, Buy America (BABA) Act included in the Infrastructure Investment and Jobs Act. The waivers are being sought for the Oakwood and Leib Combine Sewer Overflow (CSO) Improvements project located in the City of Detroit, within Wayne County, Michigan. The project is focused on improving facility treatment reliability, flexibility, operation, maintenance, and safety features to support planned increases in utilization of both the Oakwood CSO Retention Treatment Basin (RTB) & Pump Station and Leib CSO Screening and Disinfection Facility (SDF). As a result of this additional flow, improvements will be needed to avoid potential water quality compliance issues. Disinfection systems will be improved at both facilities to provide adequate disinfection for the additional flow. Screening Improvements at the Leib facility and site improvements at both facilities are needed to improve facility or process reliability, flexibility, operation, maintenance, and/or access. The project is expected to be completed in February 2032.

The GLWA is seeking the approval of project-specific nonavailability waivers for some products required for completion of this project. The information supporting the non-availability waivers for Doppler flow meters, magnetic flow meters, vertical side flow deflection bar screens, and [REDACTED] remote I/O cabinets & hardware is attached. As indicated in the individual attached nonavailability waiver requests, based on research conducted during the study and design phases, there is no BABA-compliant option for Doppler and magnetic flow meters that meets the technical requirements of the project. Also, the [REDACTED] remote I/O cabinets and hardware, and vertical side flow deflection bar screens are required components for the rehabilitation of the CSO facilities, and to ensure compatibility with the existing distributed control system (DCS) and existing process configuration.

We sincerely appreciate your attention to and support in the evaluation and acquisition of the requested project-specific waiver. Should you require any further information or wish to discuss this matter in more detail, please do not hesitate to reach out. Thank you for your assistance.

Sincerely,

Vincent Genco

Vince Genco, PE
Manager – Wastewater Engineering
Wastewater Operating Services, Great Lakes Water Authority

cc:



SECTION 407100 – FLOW MEASUREMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections apply to this Section.

1.2 SCOPE.

- A. This section covers the furnishing of instrumentation equipment required in specification Section 40 61 96 – Process Control Description, as indicated on the drawings and as required.
- B. Principal components of the instrumentation systems shall be as indicated on the P&ID drawings; as indicated in the instrument device schedules in specification Section 40 61 91 – Instrument List, or as required.

1.3 GENERAL.

- A. Contractor shall select the equipment furnished under this section for its superior quality and the intended performance. An Installation Contractor will install equipment in accordance with the manufacturer's instructions. Equipment and materials used shall be subject to review and shall comply with the requirements specified in specification Section 40 70 00 – Instrumentation for Process Systems.

1.4 SUBMITTALS.

- A. Submittals shall be as required in Specification Section 40 61 15 – Process Control System Submittals.

1.5 DELIVERY, STORAGE, AND SHIPPING.

- A. Delivery, storage and shipping shall be in accordance with the requirements of Division 1 specifications.

1.6 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 40 61 13 – Process Control System General Provisions
- B. Section 40 61 22 – Tools, Supplies, and Spare Parts, General
- C. Section 40 61 91 – Instrument List
- D. Section 40 70 00 – Instrumentation for Process System

PART 2 - PRODUCTS

2.1 MAGNETIC FLOWMETER

- A. Magnetic flow meter systems shall include a magnetic flow tube and a microprocessor-based "smart" transmitter that is capable of converting and transmitting a signal from the flow tube.

Magnetic flow meters shall utilize the characterized field principle of electromagnetic induction and shall produce DC signals directly proportional to the liquid flow rate.

- B. Each meter shall be furnished with a carbon steel metering tube and carbon steel flanges with a polyurethane, ceramic, neoprene, hard rubber, or [REDACTED] liner as required by the application and/or as specified herein. Liner shall have a minimum thickness of 0.125 inches. The inside diameter of the liner shall be within 0.125 inches of the inside diameter of the adjoining pipe. Liner protectors shall be provided on all flow tubes.
- C. The flow tube shall be provided with flush mounted electrodes.
- D. Grounding rings shall be provided for both ends of all meters.
- E. All materials of construction for metallic wetted parts (electrodes, grounding rings, etc.) shall be titanium or fully compatible with the process fluid for each meter in accordance with the recommendations of the manufacturer.
- F. Flow tube shall be rated for pressures up to 1.1 times the flange rating of adjacent piping. System shall be rated for ambient temperatures of -30 to +65°C. Meter and transmitter housings shall meet NEMA 4X/IP66 requirements as a minimum. When meter and transmitter are located in classified explosion hazard areas or where indicated, the meter and transmitter housings shall be selected with rating to meet the requirements for use in those areas. Where the flow tube is subject to submergence through installation in a meter vault or similar location, the flow tube assembly shall be rated NEMA 6P/IP68 and electronics shall be factory sealed against moisture intrusion. The use of field kits for modifying NEMA 4/4X/IP66 flow tubes to submergence duty shall not be acceptable. The associated transmitter shall be located in an area not subject to submergence.
- G. The transmitter shall provide pulsed DC coil drive current to the flow tube and shall convert the returning signal to a linear, isolated 4-20 mA DC signal. The transmitter shall utilize "smart" electronics and shall contain automatic, continuous zero correction, signal processing routines for noise rejection, and an integral LCD readout capable of displaying flow rate and totalized flow. The transmitter shall continuously run self-diagnostic routines and report errors via English language messages.
- H. The transmitter's preamplifier input impedance shall be a minimum of 109-1011 ohms which shall make the system suited for the amplification of low-level input signals and capable of operation with a material build up on the electrodes.
- I. The transmitter shall provide an automatic low flow cutoff below a user configurable low flow condition (0-10%). The transmitter's outputs shall also be capable of being forced to zero by an external contact operation.
- J. Each flow tube shall be factory calibrated and assigned a calibration constant or factor to be entered into the associated transmitter as part of the meter configuration parameters. Manual calibration of the flow meter shall not be required. Meter configuration parameters shall be stored in non-volatile memory in the transmitter. An output hold feature shall be provided to maintain a constant output during configuration changes.
- K. The transmitter shall be capable of communicating digitally with a remote configuration device via a frequency-shift-keyed, high frequency signal superimposed on the 4-20 mA output signal. The remote configuration device shall be capable of being placed anywhere in the 4-20 mA output loop. The remote configuration device shall be as specified under

Section 40 70 00 – Instrumentation for Process Systems. A password-based security lockout feature shall be provided to prevent unauthorized modification of configuration parameters.

- L. Accuracy shall be 0.30% of rate over the flow range. Repeatability shall be + 0.1% of rate; minimum turndown shall be 100:1. Minimum required liquid conductivity shall not be greater than 5 uS/cm. Maximum response time shall be adjustable between 1 and 100 seconds as a minimum. Transmitter ambient temperature operating limits shall be -10 to +50°C. Power supply shall be 115 VAC, 60 Hz.
- M. Flow tubes shall use wafer style end connections suitable for chemical applications. The cables for interconnecting the meter and transmitter shall be furnished by the manufacturer. Transmitter shall be mounted integrally on flow tube, wall, or 2-inch pipe mounted as shown in the Drawings and/or as specified.
- N. Meter shall be mounted on the process line as shown in the Drawings. Follow the manufacturer's requirements for upstream/downstream straight runs.
- O. Magnetic flow meter shall be [REDACTED], or engineer approved equal.

2.2 DOPPLER FLOWMETER

- A. Range-Gate Doppler flow meters rely on ultrasonic pulses and the Doppler effect to determine the velocity of certain particles in the stream of flow. An insertion probe, which is installed in the process pipe, is used to emit acoustic signals at a defined angle into the stream of flow, which are echoed back after coming in contact with free-floating particles. The velocity of these particles can then be determined by measuring the different frequencies between the emitted and returned signals (Doppler effect). Through range gating, or the practice of isolating echoes from different regions of the flow stream, velocity is measured in multiple different windows, or cells. This data is then used to observe the velocity in relation to the probe. An ultrasonic level and/or pressure sensor is installed along with the probe to determine the depth of flow in the same section of channel or pipe. Using the depth and velocity, the flow rate can be calculated.
- B. Flow rate measurement of slight to heavily polluted media in part filled and full pipes as well as varying canal profiles.
- C. Flow transmitter with integrated numeric discharge models for determination of the average flow velocity from up to 144 individual flow velocities. Connection options and calculation functions for up to 9 flow velocity sensors to determine the exact flow profile distribution in large or structured canals.
- D. Detection of spatially allocated flow velocity profiles using the correlation method and digital pattern detection. Calculation of the real 3D flow profile by integrating all measured local velocities covering the wetted cross section. Calculation of the flow rate from average flow velocity, filling level and canal shape considering medium temperature, flume shape, flume dimensions and degree of partial filling based on internal numeric discharge models.
- E. Storage, graphic representation and transmission of all relevant readings.
- F. Temperature compensation of all readings.

- G. Metal-encapsulated compact enclosure with easily accessible plug-in spring cage terminals on the front panel for quick tool-free installation and mounting. Large daylight TFT full color graphic display featuring 240 x 320 px and 65536 colors. Optimum display clarity even in direct sunlight thanks to 1:400 contrast ratio and up to 80° possible deviation from observation plane in any direction. Graphic 3D representation of the velocity distribution.
- H. Modern and intuitive one-hand operation using rotary pushbutton in context with high-resolution graphic color display. Programming with flat hierarchical structure, supported by colors and graphic elements, visual true-to-scale representation even of complex canal shapes and sensor positions in order to avoid errors during commissioning.
- I. Intelligent error and sensor diagnostics.
- J. Integrated recorder function with min. and max. memory. Storage of all individual velocities and according position heights, levels, average flow velocities, flow rates, medium and air temperature in internal high-capacity memory. Programming data and all saved readings as well as errors can be copied to standard USB stick via front-side USB interface.
- K. HART interface for direct connection of compatible sensors.
- L. Connection of the transmitter to following systems using HART, RS232/485, TCP-IP/Ethernet and ModBus TCP/RTU.
- M. Online access using Internet browser without the need to install additional software.
- N. Power supply shall be 120VAC. Provide a dedicated power supply for each meter.
- O. Meter shall be mounted in the process line as shown in the Drawings. Follow the manufacturer's requirements for upstream/downstream straight runs.
- P. Verification of installation and configuration shall follow specification 40 70 00 – 3.2.
- Q. Doppler flowmeter shall be by [REDACTED]. Approved equals and substitutions are not allowed.

2.3 LOCAL MECHANICAL FLOW INDICATOR

- A. Flow indicators shall have the following specifications
 1. Utilize variable area body housings.
 2. The internal volume of the housing enlarges from the inlet to the outlet.
 3. The primary element is a tempered alloy vane with one end affixed to the apex of the meter housing. As the flow rate changes, the vane is flexed in direct proportion.
 4. The unit shall be capable of operating within the following temperature limits: -23 to 85°C (-10 to 185°F)
 5. The unit shall be capable to handle up to 200 psig
 6. Housing material for the unit shall be made of brass
- B. Local mechanical flow indicators shall be [REDACTED] [REDACTED] by [REDACTED] [REDACTED], or as shown on the drawings.

2.4 FLOW SWITCH

- A. Each flow switch shall utilize a thermal dispersion type, Type 316 stainless steel sensing element (probe), unless otherwise indicated, installed in the process piping as indicated on the Drawings. Probe style shall be as determined by the manufacturer and based on the specific application.
- B. Unless otherwise indicated or recommended by the manufacturer, the element insertion length shall be approximately one-third to one-half of the pipe diameter plus allowance for mounting accessories. All mounting accessories shall be provided.
- C. The electronics shall be mounted to the sensor, unless otherwise indicated. Power supply to the unit shall be 120 VAC, 60 Hz. Where remote mounted, manufacturer shall furnish a continuous length of cable between the sensor and the electronics.
- D. The instrument shall be housed in a NEMA 4X (IP66) enclosure and shall be rated for a Class I, Division 1 or Division 2 environment, per the Area Classification Drawings, when located in a hazardous area.
- E. The unit shall have field configurable dual SPDT or single DPDT relay contacts rated 6 amps at 115 VAC for remote alarming.
- F. Flow repeatability shall be +/-1 percent of setpoint range.
- G. Flow response time shall be as low as 3 seconds.
- H. The flow switch shall be [REDACTED], [REDACTED], [REDACTED], or as shown on the drawings.

2.5 VARIABLE AREA FLOWMETER

- A. Variable area flow meter shall consist of a float chamber, tapered float, and a measuring ring.
- B. Shall include markings indicating desired operating range.
- C. Variable Area Flow Meters shall have the following specifications:
 - 1. Process Fluid Temperature: 32 to 140 degrees F
 - 2. Accuracy: +/- 2.0% of full scale
 - 3. Repeatability: 0.5% of full scale
 - 4. Max. Process Fluid Pressure: 500 psig at 140 degrees F
- D. The body material shall be Type 316 stainless steel. Wetted parts shall be as follows:
 - 1. Float: Type 316 stainless steel or compatible with process fluid
 - 2. Glass Tube: Borosilicate glass
 - 3. O-Rings: [REDACTED] minimum; or compatible with process fluid
 - 4. Others: Compatible with process fluid

- E. A graduated metal scale plate shall be provided for flow indication. A graduated metal scale plate shall be provided for flow indication. The indicator shall be large, easy to read, and calibrated in gallons per minute.
- F. Attachment to the pipe shall be by ANSI Class 125/150 stainless steel flanges conforming to ANSI B16.5.
- G. Variable Area Flowmeter shall have an integral needle or globe valve for adjustment of flow rate. Where the selected manufacturer does not provide this option, an externally mounted globe valve will be acceptable. For line sizes 1/2" and smaller, provide needle valve.
- H. Variable area flow meters shall be as manufactured by [REDACTED], [REDACTED], or as shown on the drawings.

PART 3 - EXECUTION

3.1 REQUIREMENTS

- A. All threaded connections between two stainless steel components shall be installed with process compatible anti-seize lubricant to prevent galling.
- B. Instrumentation installation requirements shall be as specified Specification Section 40 61 91 – Instrument List.
- C. Refer to Section 40 70 00 – Instrumentation for Process Systems, for additional information.

END OF SECTION 407100

SECTION 406300 – CONTROL SYSTEM HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections apply to this Section.

1.2 THE REQUIREMENT

- A. The Contractor, through the use of the System Integrator and qualified electrical installers, shall provide the [REDACTED]/PLC-based Process Control System (PCS) complete and operable, in accordance with the Contract Documents.
- B. PCS Configuration: The PCS system would consist of PLCs, communication modules, [REDACTED], I/O modules, and WRRF HMI/Workstations and required equipment and peripherals as shown on the Contract Drawings and as described in these specifications, and as required to meet the functional intent of the specifications.
- C. The System Integrator shall be responsible for the interface to systems furnished by others and for the interface to existing equipment as shown on the Contract Drawings.

1.3 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01 33 00 – Submittal Procedures
- B. Section 40 61 13 – Process Control System General Provisions
- C. Section 40 61 21– Process Control System Testing

1.4 SUBMITTALS.

- A. Submittals shall be as required in Specification Section 40 61 15 – Process Control System Submittals.
- B. Provide Informational Submittals on any new Control System Hardware being provided.

1.5 DELIVERY, STORAGE, AND SHIPPING.

- A. Delivery, storage and shipping shall be in accordance with the requirements of Division 1 specifications.

PART 2 - PRODUCTS

2.1 INDIVIDUAL DEVICE SPECIFICATIONS.

- A. Individual instruments and related devices shall be provided as specified herein, and as required.

2.01 [REDACTED] SYSTEM COMPONENTS

- A. [REDACTED] System Central Processor Unit (CPU) – [REDACTED]

1. CPU shall provide communications with other control systems and man-machine interfaces as specified.
 2. Diagnostics:
 - a. Standard, self-diagnostic routines shall be provided to determine proper hardware and software operation.
 3. Communications: The [REDACTED] processor shall be equipped with on-board communications ports for the following:
 - a. USB port
 - b. Ethernet port
 4. Instruction Set:
 - a. The [REDACTED] shall be equipped with the following instructions as a minimum:
 - 1) Relay-type logic functions including normally open contacts, normally closed contacts, and output coils
 - 2) Timers: On delay, off delay, and retentive
 - 3) Counters: Up, down
 - 4) Math functions including integer and floating point, add, subtract, multiply, divide, and square root
 - 5) Data transfer instructions
 - 6) Logical AND, NOT, OR, XOR instructions
 - 7) Compare Instructions: Equal to, greater than, less than
 - 8) Proportional - Integral - Derivative (PID) control algorithm
 - b. The [REDACTED] shall support branching functions to allow any combination of series or parallel instructions.
 - c. The [REDACTED] programming shall support the use of subroutines.
 5. Support on-line programming including run-time editing
 6. Manufacturer and Model:
 - a. Existing [REDACTED]
 7. Programming software: Existing [REDACTED]
- B. Network Communications:
1. In addition to the communication ports available on the processor, select communication modules for the following networks, as required:
 - a. Ethernet/IP
 - b. Modbus, latest version.
- C. Power Supplies:
1. Chassis Power: Each existing [REDACTED] processor and includes a power supply. The Co power supply shall be sized, at a minimum, to accommodate spare and future I/O. The power supply shall be mounted on the left end of the I/O chassis and plug directly into the backplane. If the addition of I/O to an existing chassis requires a larger power supply, then that power supply shall be supplied by the D/B Contractor or responsible entity.
 - a. Input Voltage: 120 VAC, 60 Hz
 - b. Output Current: 13 A at 5 VDC, minimum
 - c. Provide cabling as required
 - d. Manufacturer and Model: Per Existing
- D. I/O Modules:
1. Available Types: The types of I/O modules available for use with the [REDACTED] system shall be as required. interposing terminations and Relays. Wire size range from #22 AWG to #12 AWG. The following types of manufacturer standard I/O modules shall be available:
 - a. Individually isolated discrete input modules which accept an input of 120VAC, 60 Hz.

- b. Individually isolated discrete input modules which accept an input of 48 VDC, sink or source.
 - c. Isolated output modules. Each output point shall be independently fused and individual blown-fuse indication for each point. Isolated outputs shall have a current capacity of 2 amps at 120 VAC.
 - d. Isolated discrete output modules @ 48 VDC, sink or source with each output fused with individual blown-fuse indication AND Interposing Relay where required.
 - e. Isolated relay output modules with an output current capability of 2A at 120 VAC per point.
 - f. Isolated analog input modules (16-bit minimum resolution) which accept an input of 4-20 mA DC and read the HART signal.
 - g. Isolated analog output modules (15-bit minimum resolution) which produce an output of 4-20 mA DC and read the HART signal. Analog output modules shall allow selectable output response to faults of minimum, maximum, or last output value.
2. Required Features: The I/O modules and system hardware supplied shall incorporate the following design and construction features and comply with the following requirements:
- a. Noise immunity and filtering
 - b. IEEE surge-withstand rating to IEEE 472
 - c. Optical isolation for inputs and outputs to provide controller logic protection
 - d. Any card, any slot, plug-in packaging. Mechanical keying of I/O module to its removable terminal block (RTB) to ensure module is placed in correct slot after removal. Electronic keying between I/O module and processor ensures correct module type and revision. Modules shall be replaceable under power
 - e. Software configuration of modules (no jumpers or switches)
 - f. 600 volt I/O wiring terminal arms sized to accommodate up to #14 AWG wires. Wiring design shall allow I/O module removal and replacement without disturbing I/O wiring connections
 - g. Front-of-module LED Status indicators for each individual input and output point are to indicate when power is applied at I/O terminals
 - h. Fused output circuits for output modules with blown fuse indication
 - i. Where required and recommended by the manufacturer, external transient suppressor shall be provided for installation across the output loads
 - j. Scaling to engineering units for analog modules
 - k. Provide required connectors with each I/O module
3. Provide minimum 25% spare installed I/O for each type of I/O installed in every branch.
4. I/O, including spares, shall be wired to terminal blocks prior to interconnection with other devices.
5. Manufacturer: [REDACTED]

2.02 PLC SYSTEM COMPONENTS

- A. PLC System Central Processor Unit (CPU) – [REDACTED]
- 1. CPU shall provide communications with other control systems and man-machine interfaces as specified.
 - 2. Diagnostics:
 - a. Standard, self-diagnostic routines shall be provided to determine proper hardware and software operation.
 - 3. Communications: The PLC processor shall be equipped with on-board communications ports for the following:
 - a. USB port



- b. Ethernet port
 - 4. Instruction Set:
 - a. The PLC shall be equipped with the following instructions as a minimum:
 - 1) Relay-type logic functions including normally open contacts, normally closed contacts, and output coils
 - 2) Timers: On delay, off delay, and retentive
 - 3) Counters: Up, down
 - 4) Math functions including integer and floating point, add, subtract, multiply, divide, and square root
 - 5) Data transfer instructions
 - 6) Logical AND, NOT, OR, XOR instructions
 - 7) Compare Instructions: Equal to, greater than, less than
 - 8) Proportional - Integral - Derivative (PID) control algorithm
 - b. The OCS shall support branching functions to allow any combination of series or parallel instructions.
 - c. The PLC programming shall support the use of subroutines.
 - d. The PLC shall include the [REDACTED] of process objects.
 - 5. Support on-line programming including run-time editing
 - 6. Manufacturer and Model:
 - a. Contractor shall provide the latest models available from the manufacturer at the time of installation.
 - b. Large Systems:
 - 1) [REDACTED]
 - c. Midsize Systems:
 - 1) [REDACTED] [REDACTED] [REDACTED] or [REDACTED] [REDACTED]
 - 7. Programming software: [REDACTED]
- B. Network Communications:
- 1. In addition to the communication ports available on the processor, select communication modules for the following networks, as required:
 - a. Ethernet/IP
 - b. [REDACTED] or [REDACTED], latest version by [REDACTED].
- C. Power Supplies:
- 1. Chassis Power: Each PLC system shall include a power supply sized, at a minimum, to accommodate spare and future I/O. If the addition of I/O to an existing chassis requires a larger power supply, then that power supply shall be supplied by the Contractor or responsible entity.
 - a. Input Voltage: 120 VAC, 60 Hz
 - b. Output Current: 13 A at 5 VDC, minimum
 - c. Provide cabling as required
 - d. Manufacturer and Model: [REDACTED], [REDACTED]
- D. I/O Modules:
- 1. Available Types: The types of I/O modules available for use with the [REDACTED] system shall be as required. Wire size range from #22 AWG to #12 AWG. The following types of manufacturer standard I/O modules shall be available:

- a. Individually isolated discrete input modules which accept an input of 120VAC, 60 Hz.
 - b. Individually isolated discrete input modules which accept an input of 48 VDC, sink or source.
 - c. Isolated output modules. Each output point shall be independently fused and individual blown-fuse indication for each point. Isolated outputs shall have a current capacity of 2 amps at 120 VAC.
 - d. Isolated discrete output modules @ 48 VDC, sink or source with each output fused with individual blown-fuse indication AND Interposing Relay where required.
 - e. Isolated relay output modules with an output current capability of 2A at 120 VAC per point.
 - f. Isolated analog input modules (16-bit minimum resolution) which accept an input of 4-20 mA DC and read the HART signal.
 - g. Isolated analog output modules (15-bit minimum resolution) which produce an output of 4-20 mA DC and read the HART signal. Analog output modules shall allow selectable output response to faults of minimum, maximum, or last output value.
2. Required Features: The I/O modules and system hardware supplied shall incorporate the following design and construction features and comply with the following requirements:
 - a. Noise immunity and filtering
 - b. IEEE surge-withstand rating to IEEE 472
 - c. Optical isolation for inputs and outputs to provide controller logic protection
 - d. Any card, any slot, plug-in packaging. Mechanical keying of I/O module to its removable terminal block (RTB) to ensure module is placed in correct slot after removal. Electronic keying between I/O module and processor ensures correct module type and revision. Modules shall be replaceable under power
 - e. Software configuration of modules (no jumpers or switches)
 - f. 600 volt I/O wiring terminal arms sized to accommodate up to #14 AWG wires. Wiring design shall allow I/O module removal and replacement without disturbing I/O wiring connections
 - g. Front-of-module LED Status indicators for each individual input and output point are to indicate when power is applied at I/O terminals
 - h. Fused output circuits for output modules with blown fuse indication
 - i. Where required and recommended by the manufacturer, external transient suppressor shall be provided for installation across the output loads
 - j. Scaling to engineering units for analog modules
 - k. Provide required connectors with each I/O module
 3. Provide minimum 25% spare installed I/O for each type of I/O installed in every chassis.
 4. I/O, including spares, shall be wired to terminal blocks prior to interconnection with other devices.
 5. Manufacturer: [REDACTED]

2.03 NETWORK SWITCHES AND ROUTERS

- A. All network equipment must be designed for continuous operation in IT and industrial applications.
- B. Network switches and routers shall be managed, running the full version of [REDACTED] latest [REDACTED].
- C. Network equipment shall support Gigabit speeds on all ports.

- D. All uplink or expansion ports shall be SFP. Provide SFP modules as required to accommodate the connections. Unused ports shall be provided with dust covers.
- E. Switches shall support [REDACTED] and [REDACTED] network topologies/technologies.
- F. Switches shall support [REDACTED] and [REDACTED] uplinks.
- G. Switches shall support dual uplink connections and automatic failover.
- H. Switches and routers shall include the [REDACTED] and [REDACTED] feature set.
- I. Furnish a 3-year [REDACTED] [REDACTED] agreement registered to GLWA.
- J. Network switch models shall be selected based on their location.
 - 1. Rack Mounted
 - a. 19” Rack-mount capable
 - b. Support dual power feeds at 120VAC
 - c. [REDACTED], or latest [REDACTED] validated model, no equal
 - 2. Control Panel Mounted
 - a. DIN-rail capable
 - b. Screw terminals for power connections
 - c. Support dual power feeds at 24VDC
 - d. Suitable for industrial locations with an extended temperature rating.
 - e. [REDACTED], [REDACTED], or latest [REDACTED] validated model, no equal
- K. Network router model shall be:
 - 1. 19” Rack-mount capable
 - 2. Support dual power feeds at 120VAC
 - 3. [REDACTED], or latest [REDACTED] validated model, no equal
- L. Security Appliance model shall be:
 - 1. 19” Rack-mount capable
 - 2. Support dual power feeds at 120VAC
 - 3. [REDACTED] or [REDACTED] at Owner’s discretion, no equal.

M. POWER SUPPLIES

1. Provide separate power sources to feed each switch. One feed shall be from a local UPS, second feed shall be conditioned utility power off of a different circuit than the input to the UPS.
2. For devices with only single power inputs, source power shall be connected from an Automatic Transfer Switch that is connected to dual feeds as specified above. Automatic Transfer Switch shall revert to Utility power upon power restoration after a utility outage.
3. 24VDC powered switches shall have separate power supplies for each feed. Each power supply shall be connected to a separate source following the requirements in part A.

PART 3 - EXECUTION

3.1 REQUIREMENTS

- A. The destination of all network data cables (both copper and fiber) leaving an enclosure, patch panel, or building shall be labeled at each end using wire markers. Refer to Specification Section 26 05 19 – Low Voltage Conductors and Cables for wire marker details.
- B. Refer to Section 40 61 13 – Process Control System General Provisions, Part 3 of the Specifications for additional requirements.
- C. All patch panels shall be labeled with destination/function of each port. Provide printed directory mounted to or adjacent to patch panel with this information where sufficient space is not available.
- D. The Contractor shall utilize personnel to accomplish, or supervise the physical installation of elements, components, accessories, or assemblies which it provides. The Contractor shall employ installers who are skilled and experienced in the installation and connection of elements, components, accessories, and assemblies it provides.
- E. Components of the PCS including communication cabling shall be the installation responsibility of the Contractor unless specifically noted otherwise. Installation shall be per the contract documents and the equipment manufacturer's requirements. Grounding shall be shown on submittal drawings. After installation of the PCS is completed, the installation shall be inspected jointly by the Contractor and the Equipment Manufacturer's representatives. Problems shall be corrected, and when both are satisfied with the installation, a written certification of the installation shall be delivered to the Engineer.
- F. The certification shall state that [REDACTED] communication and I/O modules, system grounds, communication network, and other components of the PCS system have been inspected and are installed in accordance with the manufacturer's guidelines.
- G. The [REDACTED] and I/O racks shall be installed such that LED indicators and switches are readily visible with the panel door open and such that repair or replacement of any [REDACTED] component can be accomplished without disconnecting wiring or removing other components.

END OF SECTION 406300

SECTION 462100 – VERTICAL SIDE FLOW DEFLECTION MECHANICAL BAR SCREENS

PART 1 - GENERAL

- A. Drawings and general provisions of the Contract, including General and Supplemental Conditions and Division 01 Specification Sections apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Four vertical mount deflection screens.
2. Each screen consists of a screen frame, bar rack assembly, cleaning carriage assemblies, overflow weir, discharge weir, hydraulic power pack, external supports and controls, and other appurtenances required or shown on Drawings.

B. Related Requirements:

1. Section 099000 “Paintings and Coatings.”
2. Various Sections in Division 40 for Mechanical piping and appurtenances, valves, pipe hangers and supports.
3. Section 400593.23 “Low-Voltage Motor Requirements for Process Equipment.”
4. Section 406122 “Tools, Supplies, and Spare Parts.”
5. Section 406196 “Process Control Descriptions.”
6. Section 406300 “Control System Hardware.”
7. Section 406700 “Control System Equipment Panels & Racks.”

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct virtual conference minimum one week prior to commencing Work of this Section.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for vertical mount deflection screens, hydraulic power packs, and control panels.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings:

1. Include plans, elevations, sections, and mounting details showing all important details of construction, dimensions and anchor bolt sizes and locations.

2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Detail fabrication and assembly of vertical side-flow deflection screens, hydraulic power packs, and control panels.
4. Include diagrams for power, signal, and control wiring.
5. A complete total bill of materials for all equipment.
6. A list of manufacturers recommended spare parts to be supplied in addition to those specified in Paragraph 1.9 below with the manufacturer's current price for each item.
7. Recommended grade of lubricants along with alternative references to equal products of other manufacturers.
8. Complete motor and drive data as specified in Section 400593.23.
9. Complete description of surface preparation, shop prime and finish painting.

1.5 DELEGATED DESIGN SUBMITTALS

- A. Delegated-Design Submittal: For screen support bracing; Including Calculations and drawings prepared by a licensed structural engineer showing the external screen supports, including connection details, size, number, and location.
- B. Qualifications Statement: Submit qualifications for licensed professional.

1.6 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Manufacturer's Installation Drawings and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 1. Screen configuration.
 2. Anchor bolt locations.
 3. Hydraulic tubing connections between the screens and stainless steel hydraulic piping
 4. Hydraulic power pack configuration and drip pans.
 5. Control panels.
- B. Qualification Data: For Installer, manufacturer, and factory-authorized service representative.
- C. Welding certificates.
- D. Source quality control reports, including results of factory tests.
- E. Field quality control reports, including results of operating and acceptability tests at the site.
- F. Sample Warranty: For manufacturer's warranty.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For vertical side flow deflection screens, hydraulic power packs, and control panels to include in maintenance manuals.

- B. Operation and Maintenance Data: For vertical side flow deflection screens, hydraulic power packs, and control panels. The instructions shall be prepared specifically for this installation and shall include all required catalog cuts, drawings, equipment lists, and descriptions necessary to instruct operating and maintenance personnel unfamiliar with such equipment. Installation drawings, wiring diagrams, and maintenance requirements shall all be included.
- C. Software and Firmware Operational Documentation:
 - 1. Software operating and upgrade manuals.
 - 2. Program Software Backup: On magnetic media or compact disk, complete with data files of PLC program and I/O listings.
 - 3. Device address list.
 - 4. Printout of software application and graphic screens.
- D. Warranty Documentation.

1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Provide the following spare parts for each screen:
 - 1. One Cleaning Tine Sections (Standard).
 - 2. One Cleaning Tine Section (End).
 - 3. Two oil filters.
 - 4. One complete set of hydraulic hoses for connection between stainless steel tubing and screens and hydraulic power packs.
 - 5. One complete set of hydraulic hoses for each hose on the hydraulic power pack assembly.
 - 6. One pressure sensor and gauge for each hydraulic power pack.

1.9 QUALITY ASSURANCE

- A. Delegated Design Engineer: Licensed professional engineer experienced in design of specified Work and licensed in the jurisdiction of the project location.
- B. Include in this article prerequisites, standards, limitations, and criteria that establish an overall level of quality for products and workmanship. Include only those quality-assurance provisions that affect all Work of this Section rather than those that apply only to Part 2 - Products or Part 3 - Execution.
- C. Manufacturer Qualifications: Equipment specified shall be manufactured and furnished by a single manufacturer who is fully experienced, reputable, and qualified in the manufacture of deflection screen equipment and who shall have a minimum of 5 years' experience and a minimum of ten screens of similar type and size in successful operation for a minimum of past five years each. Manufacturer shall have successful experience in the manufacture and servicing of equipment of the type, size, and performance of equipment specified. Manufacturer shall maintain a permanent service organization and supply of spare parts in the U. S. Mechanically cleaned screen shall be suitable for satisfactory operation within the water levels of the chamber in which it is installed and as indicated below.

- D. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer or an authorized representative who is trained and approved by manufacturer.
- E. Services of Manufacturer's Representative
 - 1. Provide services of a manufacturer's representative, specifically trained on type of equipment specified. Submit qualifications of representative for approval. Man-day requirements listed below are exclusive of travel time and do not relieve Contractor of obligation to provide sufficient service to place equipment in satisfactory operation. The following man-day requirements shall be provided for each screen.
 - a. Concrete Inspection: Manufacturer shall supply one (1) 8-hour day to inspect the concrete to assure the concrete is level and square.
 - b. Installation: Assist in locating anchor bolts, setting, leveling, aligning, etc, for installation and in coordinating electrical and miscellaneous utility connections: Two 8-hour days.
 - c. Start up and acceptance testing: One 8-hour day.
 - d. Operation and Maintenance training: Two 8-hour days.
 - 2. This instruction period shall be scheduled at least 10 days in advance with Owner and shall take place prior to plant start up and acceptance by Owner. The final copies of operation and maintenance manuals must have been delivered to Owner prior to scheduling the instruction period with Owner.
 - 3. If there are difficulties in operation of the equipment due to the manufacturer's design or fabrication, additional service shall be provided at no additional cost to the Owner.
- F. Welding Qualifications: Qualify procedures and personnel according to AWS D1.6 Structural Welding Code – Stainless Steel and AWS D9.1 Sheet Metal Code

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Ship in as few parts as possible, requiring minimum onsite assembly.
- B. Provide lifting eyes or lugs on the equipment to allow easy installation of the units into the channels.

1.11 FIELD CONDITIONS

- A. The influent stream to be screened will be introduced to the screen during wet weather event. Solids will be removed from combined sewage and conveyed from the screenings inlet channel to the screenings collection channel and carried away with the wastewater to a downstream treatment facility. Screened overflow will be discharged to the Disinfection Chamber and then to the CSO outfall.
- B. Deflection screen equipment shall be as follows:

- 1. Number of Units:
- 2. Type:

- 4. Vertical Side-flow Deflection Screen.

- | | |
|--|----------------------------------|
| 3. Location: | Screen Channels No. 2 and No. 4. |
| 4. Hydraulic capacity: | 158 CFS (each). |
| 5. Total Unobstructed open screen area: | 29 square feet. |
| 6. Screen Length: | 29 feet (max). |
| 7. Screening Height: | 4 feet. |
| 8. Maximum Velocity through Open Area at Peak Flow: | 4.7 ft/s. |

1.12 WARRANTY

- A. All equipment supplied under this Section shall be warranted for a time period, and commence on a date as outlined in the General Conditions and Division 01
- B. Refer to General Conditions and Division 01 for warranty requirements.
- C. Provide a special warranty for products supplied as part of this Section for a period of 1 year in addition to the warranty required by the General Conditions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide the following:
- B. [REDACTED] / 4.Manufacturers: Subject to compliance with requirements, provide products as shown on the drawings by the following
 - 1. [REDACTED] screens and associated equipment as supplied by [REDACTED], [REDACTED] Approved Equals' and substitutions are not allowed.

2.2 GENERAL DESIGN

- A. Materials of Construction: All wetted parts shall be constructed from high strength plastic or stainless steel. Electrical devices, motor and power packs shall be of the manufacturer's standard materials.
- B. Shop Surface Preparation/Coating: All welds shall be cleaned and passivated to remove weld spatter, slag, and discoloration in accordance with ASTM A380. Electrical devices, motor and power packs with drip pans shall be provided with the manufacturer's standard coating system.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 FINE SCREEN ASSEMBLY

- A. Frame: Screen frame shall be a rectangular support structure that provides stability for the screen, the required mounting surface for the bar rack assembly, and the guiding surfaces for the traveling cleaning carriages.
1. Design unit frame to be anchored at the base and sides of the screen. The frame will be a welded construction, fabricated of formed stainless sheet and plate from Type 316L stainless steel.
 2. One side member will be drilled and tapped for mounting of the stationary end of the bar rack assembly.
 3. A machined mounting block will be welded to the opposite side member for mounting of the tensioning end of the bar rack assembly.
- B. Discharge (Control) Weir:
1. Fasten control weir to the discharge side of the screen to provide the desired water elevation and flow velocity through the screen.
 2. Construct weir of Type 316L stainless steel.
- C. Bar Screen (Rack) Assembly: Consist of parallel stainless steel bars secured to the screen frame with specially designed end blocks. Spacing between each bar will be 4 mm (0.16 inch).
1. Each bar will be made of minimum 4 mm (0.16 inch) Type 316L stainless steel and will be continuous from one end of the screen to the other. Designs without continuous bars will not be allowed.
 2. Design end sections of each bar to facilitate the removal of solids from the bar rack. A hole will be drilled at both ends of each bar to allow the bars to be secured to the end blocks.
 3. Modular end blocks will be made from Type 316L stainless steel. Each end block will be machined to secure a set of bars to the screen frame. Bars will be fastened to each end block with a stainless steel pin connection. Modular end blocks will be stacked to provide the necessary screen height.
 4. Stationary end blocks will be provided at the fixed end of the bar rack assembly. These end blocks will be fastened directly to the screen frame.
 5. Tensioning end blocks will be provided at the opposite end of the bar rack assembly. Tensioning end blocks will be a floating-type connection to be tensioned after securing the frame to the concrete structure. As torque is increased on the bolts, the tension end blocks will be pulled, creating the required pre-tension on the bars.
 6. Designs which do not incorporate a bar tensioning feature are specifically excluded.
- D. Cleaning Carriage Assembly:
1. Cleaning carriage will consist of sets of cleaning tines mounted on a traveling carriage assembly. Travel of the carriage assembly will be provided by a hydraulic cylinder. Each set of cleaning tines will travel forward and backward across a section of the screen length. The travel distance of each set of cleaning tines will overlap the travel distance of the adjoining set. The shape of the tines will be designed to move accumulated solids forward during forward travel of the carriage, and to allow accumulated solids to pass

over during backward travel of the carriage assembly. The travel distance overlap and tine shape will allow solids to be transported to the end of the screen.

2. Carriage assembly will consist of tine support members fastened together by cross-member angles. Slide blocks mounted on the carriage assembly will guide the travel of the carriage.
3. Each tine support member will be fabricated of Type 316L stainless steel angles welded to each side of a type 316L stainless steel structural tube. The flanking angles will provide a mounting surface for the cleaning tines. Mounting tabs will be welded to the tube for attachment of the cross-member angles.
4. Cross-member angles shall be structural angles made of Type 316L stainless steel. Both cross-member angles shall be fastened to the top and bottom of all tine support members to provide an integral carriage assembly. A mounting bracket will be welded to the top cross-member to provide a clevis-type mount for the rod end of the hydraulic cylinder.
5. Slide blocks made of UHMW polyethylene will be fastened to the top and bottom cross-member angles.

E. Cleaning Combs (Tines):

1. Cleaning tines will be provided in replaceable sections. The standard cleaning tine section will be machined from a block of UHMW polyethylene.
2. The end cleaning tine sections consist of individual tines fastened to a UHMW PE mounting block. Each individual tine will be made of bronze alloy. The extended shape of the end tine will push accumulated solids past the end of the bars.

F. Overflow Weir:

1. A stainless steel overflow weir will be fastened to the top of the screen frame. It will provide protection of the hydraulic cylinder and ensure that emergency overflow water flows smoothly over the top of the screen into the outfall channel.
2. Overflow weir, fabricated of Type 316L stainless steel, will extend the length of the screen. In the width direction, the shroud will extend beyond the cleaning carriage assembly.

G. Hydraulic Cylinder:

1. A stainless steel hydraulic cylinder will be mounted above the carriage assembly. The housing of the cylinder will be secured to the screen frame, while the rod end will be pinned to the clevis bracket on the top cross-member of the carriage assembly.
2. The piston rod will be made of hard chrome plated carbon steel. The rod end will be supplied with an eye bolt fitted with a bronze bushing. The rod end will be connected to the clevis bracket with a stainless steel pin, secured by two cotter pins.

H. Hydraulic Hoses:

1. Four 18 inch long hydraulic hose pigtails will provided by the screen manufacturer for each screen.
2. Rate hose for 4,250 psi, made from synthetic rubber tube with double braid wire reinforcement and synthetic rubber cover.
3. Nominal inside diameter shall be 0.45 inch and the end fittings will be #8 (FJIC) female swivel, stainless steel.

I. Hydraulic Tubing:

1. Provide 5/8-inch diameter stainless steel tubing with burst pressure no less than 3,000 psi for connection to the screen and to the hydraulic power pack, including all connectors and anchors required to support the hydraulic lines. The tubing as well as its support system will be made of Type 316 stainless steel. Tube connections shall be JIC type fittings or equal.

J. Hydraulic Power Pack:

1. Hydraulic cylinder will be driven by a remote- mounted hydraulic power pack. The hydraulic power pack will be mounted indoors and protected from freezing and the weather. One power pack will be provided for each screen. The hydraulic power pack will include the following:
 - a. Hydraulic gear pump.
 - b. Replaceable suction filter.
 - c. 5 HP, 1800 RPM, 230/460 volt, 3 Phase, 60 Hz, TEFC, severe duty electric motor.
 - d. 10 gallon capacity oil reservoir.
 - e. 0-3000 psi pressure gauge.
 - f. Pressure transducer, 4-20 mA, NEMA 4 enclosure.
 - g. Pressure limiting/relief valve.
 - h. Directional control valves, 4 way. 3 position, double solenoid, spring return to all ports, seals, 120 VAC coils, 1/2" NPT conduit box rated NEMA 4.
 - i. Replaceable oil filter.
 - j. Filler/breather cap with strainer.
 - k. Temperature switch, SPDT, snap action switching element, NEMA 4 enclosure.
 - l. Oil Level switch.
 - m. The hydraulic pressure of the cleaning carriage cylinder will be monitored by a pressure transducer which will produce an analog signal that will be sent to the PLC in the control panel.
 - n. The oil reservoir will be constructed of welded carbon steel and provided with a gasket bolt-on lid.
 - o. Hydraulic fluid shall be biodegradable and non-hazardous, supplied and as recommended by the screening manufacturer.
 - p. Viscosity at 40°C shall be no less than 26.9 centistokes.
 - q. Viscosity at -40°C shall be no less than 85.0 centistokes.
 - r. Hydraulic hoses provided for connections within the power pack assembly will comply with hose manufacturer bend radius criteria to avoid sharp bends and stress that could cause leaks at either end of the hose.
2. Each power pack will be supplied with an individual drip pan as shown on Drawings and constructed of welded 11 gauge carbon steel. The power pack will be attached to the drip pan by factory welding mounting tabs to the drip tray that bolt to the power pack reservoir. The assembled drip tray will be primed and painted by the same coating as the reservoir.

K. External Supports:

1. External supports will be furnished by the equipment supplier to provide structural stability for the screen.
2. Supports will be made from Type 316L stainless steel structural tubing. Support locations, lengths and means of attachment shall be as per the manufacturer's recommendations.

L. Anchors and Fasteners:

1. Anchor Bolts: Furnish anchor bolts and nuts of ample size and strength for the purpose intended, sized by the equipment manufacturer. Anchor bolt materials shall be Type 316 stainless steel conforming to the requirements of Section 051200, Structural Steel Framing. The equipment supplier shall furnish all anchor bolts, nuts, and washers required for the equipment. Adhesive anchors shall be provided. Expansion anchors will not be accepted.
2. Fasteners: Type 316 stainless steel. Equipment supplier shall furnish fasteners required for the assembly of the equipment.

2.4 CONTROLS

- A. Control Devices: Controls necessary for the fully automatic operation of the screen shall be provided. Equipment supplier shall furnish electrical items specifically called for in this specification section. Contractor shall supply other electrical items, and interconnecting wiring of proper size, including all conduit and supports required to place the equipment into service. Level sensors for indication of screen channel levels and operation of screens will be the existing level sensors as shown on the drawings.
- B. Control Panel: A 480 volt primary control panel shall be provided in a NEMA 12 type painted carbon steel enclosure suitable for wall mounting with the following components to provide proper operation of four screens within one panel:
 1. A 480 volt main disconnect switch with through door interlock handle.
 2. Non-reversing motor starter.
 3. A 480 to 120 volt step down transformer
 4. Programmable Logic Controller, [REDACTED], [REDACTED] type with Operator Interface Unit with minimum 4" display.
 5. Ethernet Port for network communication: Per Section 406300 for Control System Hardware
 6. Elapsed time meter for each hydraulic power pack motor
 7. The panel will contain the following logic devices for proper operation of the equipment:
 - a. Indicating Lights, push-to-test LED type:
 - 1) High Oil Temperature FAULT.
 - 2) Low Oil Level FAULT.
 - 3) Screen RUNNING.
 - 4) Cleaning Carriage Stroke Reduced FAULT.
 - 5) Cleaning Carriage Blocked FAULT.
 - 6) Loss of Pressure Signal FAULT.
 - 7) Hydraulic Pump Motor Overload FAULT.
 - 8) High Influent Channel Level FAULT.

- b. Selector switches: Hand-Off-Remote-Auto
- c. Pushbuttons:
 - 1) EMERGENCY STOP.
 - 2) FAULT RESET.
- d. Discrete status outputs for connection to [REDACTED] via Ethernet:
 - 1) Hand switch Auto mode selected.
 - 2) Hand switch Remote mode selected.
 - 3) Motor running.
 - 4) Motor overload.
 - 5) High oil temperature.
 - 6) Low oil level.
 - 7) E-stop.
 - 8) Cleaning Carriage stroke reduced.
 - 9) Cleaning carriage blocked.
 - 10) Loss of pressure signal.
 - 11) Screen PLC Set Points (visible in [REDACTED], adjustable only at PLC):
 - a) Intermittent mode start level.
 - b) Intermittent mode stop level.
 - c) Intermittent mode repeat cycle off time.
 - d) Intermittent mode repeat cycle on time.
 - e) Continuous mode start level.
 - f) Continuous mode stop level.
 - g) Screen Repeat (automated exercise) cycle on time.
 - h) Screen Repeat (automated exercise) cycle off time.
 - i) Upstream high level on.
 - j) Upstream high level off.
 - k) Upstream Level 1 (Influent Channel) -4 mA Scale.
 - l) Upstream Level 1 (Influent Channel) -20 mA Scale.
 - m) Upstream Level 2 (Mt. Elliot Sewer) -4 mA Scale.
 - n) Upstream Level 2 (Mt. Elliot Sewer) -20 mA Scale.

C. Local Control Station (LCS): A two-hole, NEMA 7, Type 316 stainless steel, local control station for installation on the operating level near each screen. Each LCS will include:

- 1. Hand-Off-Auto with spring return to off selector switch.
- 2. Emergency stop push button.

D. Sequence of Operation:

- 1. Screen Hand Operation: When the screen selector switch is in the Hand position, the screen will run continuously forward and backward. Turning the screen selector switch to Off will return to home position and stop the unit.
- 2. Screen Automatic Operation: When the screen selector switch is in the Auto position, the screen will cycle on demand by the level signal from the Influent Channel Level Sensor analog signal or repeat cycle timer. After the level sensor condition has cleared, the screen shall return to its home position.

- a. Influent Channel level signal initiates travel of assembly at an adjustable water surface elevation (WSEL). Refer to Section 406196 “Process Control Descriptions” for the initial WSELs for starting intermittent and continuous modes of automatic operation.
 - b. Assembly travels continuously until the WSEL drops below an adjustable level set point.
 - c. Table 46100-1 provides the proposed initial project-specific settings for select PLC setpoints. The selected settings are preliminary and are intended to be coordinated during shop drawing review and finalized during installation and startup.
3. Emergency Stop: The unit will stop immediately if any of the Emergency Stop pushbuttons associated with the specific screen are pressed. When the E-stops are closed (reset) the unit may cycle immediately.

E. Fault Conditions:

1. Excessive motor current will trip the starter overload relays, immediately stop the power pack motor, and illuminate the alarm indicating light. This fault must be reset by depressing the motor starter overload reset internal to the control panel.
2. Momentary motor over or under current will trip the current monitor, immediately stop the drive motor, and illuminate the alarm indicating light. Pushing the reset pushbutton will reset this fault.
3. High Oil Temperature. If the oil temperature exceeds 140° F, the high temperature will close, the screen will shut down and illuminate the High Oil Temperature fault light. When the oil temperature cools below 140° F, the screen starts again. The high temperature fault light remains illuminated until acknowledged.
4. Low Oil Level. If the oil level in the reservoir drops below the low level switch, the switch will close, the screen will shut down and illuminate the Low Oil Level fault light.
5. Carriage Stroke Reduced Fault. The pressure transducer mounted on the hydraulic power pack will continuously monitor the operating pressure of the unit. The pressure transducer will output a 4-20 mA signal. If the pressure spikes five times in 10 second (adjustable) period, the screen will shut down and illuminate the Carriage Stroke Reduced Fault light.
6. Carriage Blocked Fault. If the preset maximum pressure measured by the pressure transducer is maintained for longer than 30 seconds, the screen will shut down and illuminate the Carriage Blocked Fault light.
7. Loss of Pressure Signal Fault. If the control panel does not receive a 4-20 mA signal from the pressure transducer for 2 minutes the screen will shut down and illuminate the Loss of Pressure Signal Fault.
8. High Influent Channel Level Fault. If the influent level is above a specific level a warning light will illuminate. Refer to initial set points in Table 46100-1 and Paragraph 2.4.F.3 for screen operation during high influent channel level.
9. Faults shall reset by pressing the FAULT RESET push button after the cause of the fault is corrected.

Table 462100-1 proposed initial project -specific settings for select PLC setpoints.

| Description | Initial (Project) Setting | Range | Setting Visible in [REDACTED] ¹ |
|---|---------------------------|----------------|--|
| INTERMITTENT MODE START LEVEL SET-POINT | 106.2 FT | 1-999 FT | Yes |
| INTERMITTENT MODE STOP LEVEL SET-POINT | 106.0 FT | 1-999 FT | Yes |
| INTERMITTENT MODE REPEAT CYCLE ON TIME | 3 MIN. | 1-999 MIN. | Yes |
| INTERMITTENT MODE REPEAT CYCLE OFF TIME | 3 MIN. | 1-999 MIN. | Yes |
| CONTINUOUS MODE START LEVEL SET-POINT | 109.5 FT | 1-999 FT | Yes |
| CONTINUOUS MODE STOP LEVEL SET-POINT | 109.4 FT | 1-999 FT | Yes |
| SCREEN REPEAT (AUTOMATED EXERCISE) CYCLE ON TIME ² | 0 MIN. | 1-999 MIN. | Yes |
| SCREEN REPEAT (AUTOMATED EXERCISE) CYCLE OFF TIME | 168 HRS. | 1-999 HRS. | Yes |
| SCREEN DWELL TIMER | 1 SEC. | 1-999 SEC. | |
| SCREEN PARK AT HOME TIMER | 2 SEC. | 1-999 SEC. | |
| MAX PRESSURE SETPOINT (EXTEND) | 1750 PSI (field set) | 1-9999 PSI | |
| MAX PRESSURE SETPOINT (RETRACT) | 1750 PSI (field set) | 1-9999 PSI | |
| MAX PRESSURE ON-DELAY TIMER | 1 SEC. | 0.01-9.99 SEC. | |
| SCREEN START FAULT DELAY TIMER | 5 SEC. | 1-999 SEC. | |
| HIGH LEVEL MODE ENABLE/DISABLE ³ | ENABLE | | Yes |
| USPSTREAM HIGH LEVEL ON SET-POINT ³ | 111.64 FT | 1-999 IN. | Yes |
| UPSTREAM HIGH LEVEL OFF SET-POINT | 111.64 FT | 1-999 IN. | |
| AUTOMATIC RESTART ENABLE/DISABLE | ENABLE | | |
| SCREEN SHORT STROKE COUNTER | 5 | 1-999 | |
| SCREEN SHORT STROKE TIMER | 10 SEC. | 1-999 SEC. | |
| CARRIAGE BLOCKED FAULT DELAY TIMER | 30 SEC. | 1-999 SEC. | |
| LOSS OF PRESSURE SIGNAL FAULT DELAY | 2 MIN. | 0-999 MIN. | |
| PRESSURE 4 MA REFERENCE | 0 PSI | 0-9999 PSI | |
| PRESSURE 20 MA REFERENCE | 3000 PSI | 0-9999 PSI | |
| UPSTREAM LEVEL1 (INFLUENT CHANNEL) - 4 MA SCALE ⁴ | TBD FT | 0-999.9 FT | Yes |
| UPSTREAM LEVEL 1 (INFLUENT CHANNEL) - 20 MA SCALE | TBD FT | 0-999.9 FT | Yes |
| UPSTREAM LEVEL2 (MT ELLIOT SEWER)- 4 MA SCALE ⁴ | TBD FT | 0-999.9 FT | Yes |
| UPSTREAM LEVEL 2 (MT ELLIOT SEWER)- 20 MA SCALE | TBD FT | 0-999.9 FT | Yes |

1. [REDACTED] system shall monitor the Screen systems operational setpoints through Ethernet output. Modification of the setpoints is available at the Screen Control Panel only.
2. Owner will run the screens manually to exercise every 7 days.

3. Refer to Section 406169 Process Control Descriptions. Screens will continue to run when level is above overflow weir. Enable indicates that screen will remain ON above High Level Set Point. Depth indicated is the elevation of overflow weir which is when the Influent Channel Level High indicator light should illuminate. To be confirmed during shop drawing review.
4. Level scale will be determined during shop drawing review and confirmed during startup based on existing level sensor scale and converting depth to elevations. Mt. Elliot Sewer Level 4-20 mA will be adjusted to account for offset between Influent channel level and Mt. Elliot Sewer level after calibration completed under a separate contract.

2.5 SOURCE QUALITY CONTROL

- A. Factory Tests: Screen will be fully assembled and shop tested to confirm fit and function of the screen. A certificate of the shop test shall be supplied with the shipping documents.
- B. Screen will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.
- D. Screen will be shipped to the site fully assembled, some ancillary components may be removed to prevent damage during shipment.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine finished concrete wall openings with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Contractor shall coordinate with the screen manufacturer to provide the dimensions of the screen openings required for proper installation within the tolerances indicated by the manufacturer.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Equipment Installation: Installation shall be in strict accordance with the respective manufacturer's instructions and recommendations in the locations shown on Drawings. Installation shall include furnishing the required oil and grease for initial operation. The grades of oil and grease shall be in accordance with the manufacturer's recommendations. Anchor bolts shall be furnished by Screen manufacturer and set in accordance with the manufacturer's recommendations and setting drawings. Use non-shrink grout to fill gap between screen and upstream end of wall after screen aligned and anchored.
- B. Install materials and equipment in accordance with approved shop drawings and Contractor's other submittals approved by Project Construction Management Lead, the Contract Documents,

and manufacturer's installation instructions. When manufacturer's installation instructions conflict with the Contract Documents, obtain interpretation or clarification from Project Construction Management Lead before proceeding.

- C. Manufacturer's installation instructions include manufacturer's written instructions; drawings; illustrative, wiring and schematic diagrams; diagrams identifying external connections, terminal block numbers and internal wiring; and other such information pertaining to installation of materials and equipment. Included are all of manufacturer's printed installation instructions, including those that may be attached to equipment upon delivery.
- D. Prior to installing materials and equipment, complete preparation of surfaces on which materials and equipment are to be installed.
- E. During installation, maintain materials and equipment in neutral position and do not exert undue stress on materials and equipment.
- F. Comply with requirements for pipe hangers and supports specified in Section 400507 "Hangers and Supports for Process Piping."
- G. Hydraulic Tubing Installation:
 - 1. Make turns with long radius bends and not 90 degrees. Tube connections shall be JIC fittings.
 - 2. Do not use [REDACTED] Tape on any connection for hydraulic piping. Use only pipe dope suitable for use with hydraulic oil.
 - 3. Provide a continuous fall in tubing from the power pack to the screen. No high spots in the tubing are allowed, which can trap air. If high spots are unavoidable, provide air bleed devices at each high point in the line.
 - 4. Secure tubing and hoses to prevent movement.
 - 5. Flush hydraulic lines to prevent dirt and metal shavings from fouling the hydraulic system. Cap ends to prevent dirt from contaminating tubing lines. Upon completion of all field tubing, but before connection to control components, clean the tubing system by circulating oil continuously at a rate of not less than 12 fps. Filter the hydraulic oil through a 2 micron filter for a period of not less than 24 hours until the filter fails to retain any particulate material during a filter run of not less than 1 hour duration, whichever is the greater period of time.
 - 6. Take proper precautions to avoid contamination of hydraulic lines and equipment during storage and installation.

3.3 FIELD QUALITY CONTROL (AND SYSTEM STARTUP)

- A. Manufacturer's representative shall check and approve the installation prior to operation. Manufacturer's representative shall field test and calibrate the equipment to assure that the system operates to the Owner's satisfaction.
- B. Manufacturer's Field Service: Manufacturer shall furnish the services of a factory representative, as provided under Paragraph 1.10.D above, who has complete knowledge of proper operation and maintenance. The manufacturer's representative will be present for concrete inspection, installation supervision, start-up and test services and operation and maintenance personnel training services. The representative shall make a minimum of three

visits to the Site for a minimum of six 8-hour days for each screen installation. The first visit shall be to inspect the concrete prior to equipment installation. The second visit shall be for assistance in the installation of equipment. Subsequent visits shall be for checking the completed installation, start-up, and training of the system. Manufacturer's representative shall test operate the system in the presence of Engineer and verify that the equipment conforms to the requirements. Manufacturer representative will revisit the Site as often as necessary until trouble is corrected and the installation is entirely satisfactory.

C. Performance Acceptance Testing (PAT): Perform the following tests and inspections with the assistance of a factory-authorized service representative and in the presence of Engineer:

1. Mechanical bar screen shall have a dry test run to demonstrate the correct alignment, smooth operation, proper and equal spacing of screen bars, freedom from vibration, excessive noise and overheating of the parts and bearings. Observe that cleaning carriage assemblies properly and smoothly engage the screen bars.
2. An overload test shall be conducted to test the overload device to operate the jam clearing sequence and/or stop the drive at a loading condition to protect the drive unit and mechanism from damage.
3. Make necessary adjustments and settings to the overload device at this time to ensure that the mechanically cleaned screen will stop and switch off the drive motor and sound an alarm when a predetermined overload condition occurs on the screen bars.
4. Perform a wet test utilizing plant flow to test the ability of the screen to operate automatically or manually to remove screenings. Test shall continue for not less than 8 hours of actual run time (which may take several days to accumulate) prior to final acceptance. Test is dependent on wet weather and will not require the presence of the manufacturer representative if this is not feasible based on inability to predict when a wet weather event will provide sufficient flow for facility operation. However, remote interaction and support during the wet test is required.
5. Defects recorded during the above field tests and all defects and failures occurring within the first year of operation shall be corrected.
6. Tests shall be conducted in the presence of Engineer.
7. In the event the mechanism fails to meet the above test, make necessary changes and retest mechanism. If mechanism remains unable to meet the test requirements to the satisfaction of Engineer, it shall be removed and replaced with a satisfactory mechanism at Contractor's expense.

D. Prepare test and inspection reports.

1. Manufacturer shall certify in writing that screens have been properly installed and are operating correctly.

E. System Acceptance Test (SAT) – Demonstrate the following in the presence of Engineer and Owner

1. Starting/stopping screens in Auto by simulating a level input signal.
2. Starting/stopping the screens in Remote.
3. Energizing/de-energizing electrical disconnect switches.
4. Automatic stopping of the screens in Auto by simulating a high oil pressure signal and confirm signal to [REDACTED].
5. Confirm signals to [REDACTED] when screen in Auto, Remote, E-stop activated.

6. Taking measurements and recording data and observed issues (deviations from the design documents).
7. Defects recorded during the above field tests and all defects and failures occurring within the first year of operation shall be corrected.

END OF SECTION 462100

SECTION 462150 – VERTICAL SIDE FLOW DEFLECTION MECHANICAL BAR SCREENS
REHABILITATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Rehabilitation of four vertical mount deflection screens.
2. Each screen consists of a screen frame, bar rack assembly, cleaning carriage assemblies, overflow weir, discharge weir, hydraulic power pack, external supports and controls, and other appurtenances required or shown on Drawings.
3. Existing [REDACTED] screen assembly and support bracing will be removed from the Leib CSO Screening and Disinfection Facility Screen Channels No. 1 and 3, rehabilitated, and reinstalled.
 - a. Rehabilitation screen assembly includes cleaning and adjustment of the frame, bar rack (bar screen) assembly, cleaning carriage assembly, combs to manufacturer recommended tolerances and condition.
 - b. Replace or rebuild of hydraulic cylinder which operates cleaning carriage.
 - c. Replacement of control weir and overflow weir attached to screen assembly and modifying weirs to accommodate existing support bracing.
 - d. Replacement of hydraulic hoses, hydraulic power packs, control panels, and local control stations.

B. Related Requirements:

1. Section 099000 "Paintings and Coatings."
2. Various Sections in Division 26 for electrical work, except as specified in this Section.
3. Various Sections in Division 40 for Mechanical piping and appurtenances, valves, pipe hangers and supports.
4. Section 400593.23 "Low-Voltage Motor Requirements for Process Equipment."
5. Section 406122 "Tools, Supplies, and Spare Parts."
6. Section 406196 "Process Control Descriptions."
7. Section 406300 "Control System Hardware."
8. Section 406700 "Control System Equipment Panels & Racks."

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct virtual conference minimum one week prior to commencing Work of this Section at Leib CSO Screening and Disinfection Facility (SDF).

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for vertical mount deflection screens, hydraulic power packs, and control panels.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings:

1. Include plans, elevations, sections, and mounting details showing all important details of construction, dimensions and anchor bolt sizes and locations.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Detail fabrication and assembly of vertical side-flow deflection screens, hydraulic power packs, and control panels.
4. Include diagrams for power, signal, and control wiring.
5. A complete total bill of materials for all equipment.
6. A list of manufacturers recommended spare parts to be supplied in addition to those specified in Paragraph 1.9 below with the manufacturer's current price for each item.
7. Recommended grade of lubricants along with alternative references to equal products of other manufacturers.
8. Complete motor and drive data as specified in Section 400593.23.
9. Complete description of surface preparation, shop prime and finish painting.

1.4 DELEGATED DESIGN SUBMITTALS

- A. Delegated-Design Submittal: For screen support bracing; Including Calculations and drawings prepared by a licensed structural engineer showing the external screen supports, including connection details, size, number, and location.
- B. Qualifications Statement: Submit qualifications for licensed professional.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Manufacturer's Installation Drawings and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 1. Screen configuration.
 2. Anchor bolt locations.
 3. Hydraulic tubing connections between the screens and stainless steel hydraulic piping.
 4. Hydraulic power pack configuration and drip pans.
 5. Control panels.
- B. Qualification Data: For Installer, manufacturer, and factory-authorized service representative.
- C. Welding certificates.
- D. Source quality control reports, including results of factory tests.

- E. Field quality control reports, including results of operating and acceptability tests at the site.
- F. Sample Warranty: For manufacturer's warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For vertical side flow deflection screens, hydraulic power packs, and control panels to include in maintenance manuals.
- B. Operation and Maintenance Data: For vertical side flow deflection screens, hydraulic power packs, and control panels. The instructions shall be prepared specifically for this installation and shall include all required catalog cuts, drawings, equipment lists, and descriptions necessary to instruct operating and maintenance personnel unfamiliar with such equipment. Installation drawings, wiring diagrams, and maintenance requirements shall all be included.
- C. Software and Firmware Operational Documentation:
 - 1. Software operating and upgrade manuals.
 - 2. Program Software Backup: On magnetic media or compact disk, complete with data files of PLC program and I/O listings.
 - 3. Device address list.
 - 4. Printout of software application and graphic screens.
- D. Warranty Documentation

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Provide the following spare parts for each screen:
 - 1. One Cleaning Tine Sections (Standard).
 - 2. One Cleaning Tine Section (End).
 - 3. Two oil filters.
 - 4. One complete set of hydraulic hoses for connection between stainless steel tubing and screens and hydraulic power packs.
 - 5. One complete set of hydraulic hoses for each hose on the hydraulic power pack assembly.
 - 6. One pressure sensor and gauge for each hydraulic power pack.

1.8 QUALITY ASSURANCE

- A. Delegated Design Engineer: Licensed professional engineer experienced in design of specified Work and licensed in the jurisdiction of the project location.
- B. Manufacturer Qualifications: equipment specified shall be manufactured and furnished by a single manufacturer who is fully experienced, reputable, and qualified in the manufacture of deflection screen equipment and who shall have a minimum of 5 years' experience and a minimum of ten screens of similar type and size in successful operation for a minimum of past

five years each. Manufacturer shall have successful experience in the manufacture and servicing of equipment of the type, size, and performance of equipment specified. Manufacturer shall maintain a permanent service organization and supply of spare parts in the U. S. Mechanically cleaned screen shall be suitable for satisfactory operation within the water levels of the chamber in which it is installed and as indicated below.

- C. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer or an authorized representative who is trained and approved by manufacturer.
- D. Replacement equipment furnished under this Specification shall be new and unused. Use new materials of high grade, and with properties best suited to the work required.
- E. Furnish upgraded screening equipment complete with accessories required and meeting the detailed requirements of the Specifications.
- F. Screen upgrade equipment including new hydraulic power packs, control panels, and accessories shall be furnished by manufacturer. Screen replacement parts including hydraulic cylinder rebuild components, such as seals, control weir, overflow weir, and hardware shall be manufactured by the original equipment manufacturer.
- G. Services of Manufacturer's Representative:
 - 1. Provide services of a manufacturer's representative, specifically trained on type of equipment specified. Submit qualifications of representative for approval. Man-day requirements listed below are exclusive of travel time and do not relieve Contractor of obligation to provide sufficient service to place equipment in satisfactory operation. The following man-day requirements shall be provided for each screen.
 - a. Concrete Inspection: Manufacturer shall supply one 8-hour day to inspect the concrete to assure the concrete is level and square.
 - b. Installation: Assist in locating anchor bolts, setting, leveling, aligning, etc, for installation and in coordinating electrical and miscellaneous utility connections: Two 8-hour days.
 - c. Start up and acceptance testing: One 8-hour day.
 - d. Operation and Maintenance training: Two 8-hour days.
 - 2. This instruction period shall be scheduled at least 10 days in advance with Owner and shall take place prior to plant start up and acceptance by Owner. The final copies of operation and maintenance manuals must have been delivered to Owner prior to scheduling the instruction period with Owner.
 - 3. If there are difficulties in operation of the equipment due to the manufacturer's design or fabrication, additional service shall be provided at no additional cost to the Owner.
- H. Welding Qualifications: Qualify procedures and personnel according to AWS D1.6 Structural Welding Code – Stainless Steel and AWS D9.1 Sheet Metal Code

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Ship in as few parts as possible, requiring minimum onsite assembly.
- B. Provide lifting eyes or lugs on the equipment to allow easy installation of the units into the channels.

1.10 FIELD CONDITIONS

- A. The influent stream to be screened will be introduced to the screen during wet weather event. Solids will be removed from combined sewage and conveyed from the screenings inlet channel to the screenings collection channel and carried away with the wastewater to a downstream treatment facility. Screened overflow will be discharged to the Disinfection Chamber and then to the CSO outfall.
- B. The deflection screen equipment shall be as follows:
 - 1. Number of Units: 4 (Existing, to be rehabbed).
 - 2. Type: Vertical Side-flow Deflection Screen.
 - 3. Location: Screen Channels No. 2 and No. 4.
 - 4. Hydraulic capacity: 158 CFS (each).
 - 5. Total Unobstructed open screen area: 29 square feet.
 - 6. Screen Length: 29 ft (max).
 - 7. Screening Height: 4 feet.
 - 8. Maximum Velocity through Open Area at Peak Flow: 4.7 ft/s.

1.11 WARRANTY

- A. All equipment supplied under this Section shall be warranted for a time period, and commence on a date as outlined in the General Conditions and Division 01
- B. Refer to General Conditions and Division 01 for warranty requirements.
- C. Provide a special warranty for products supplied as part of this Section for a period of 1 year in addition to the warranty required by the General Conditions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide rehabilitation of the following:
 - 1. [REDACTED].
 - 2. Approved Equals' and substitutions are not allowed.
- B. Manufacturers: Subject to compliance with requirements, provide products as shown on the drawings by the following

1. [REDACTED] screens and associated equipment as supplied by [REDACTED]
2. Should equipment which differs from this section be offered and determined to be equal to that specified and shown in drawings such equipment shall be acceptable only on the basis that any revisions in the design and/or construction of affected areas, including materials and labor for structures, piping, appurtenant equipment, electric, etc., required to accommodate such a substitution be made at no additional cost to Owner and be approved by Engineer.
3. Manufacturer and manufacturer's field representative shall be consistent between the work performed under this specification and Section 462100.

2.2 GENERAL DESIGN

- A. **Materials of Construction:** All wetted parts shall be constructed from high strength plastic or stainless steel. Electrical devices, motor and power packs shall be of the manufacturer's standard materials.
- B. **Shop Surface Preparation/Coating:** All welds shall be cleaned and passivated to remove weld spatter, slag, and discoloration. Electrical devices, motor and power packs with drip pans shall be provided with the manufacturer's standard coating system.
- C. **Electrical Components, Devices, and Accessories:** Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 FINE SCREEN ASSEMBLY

- A. Existing fine screens and support bracing will be removed from the screen channels to allow for modifications to the screen channel concrete walls. Existing screen components will be rebuilt and reused as indicated on Drawings and specified.
- B. Thoroughly clean surfaces to remove grease, dirt, and other foreign matter.
- C. Once removed from the channel, protect screens from outdoor elements.
- D. **Frame:** Screen frame shall be a rectangular support structure that provides stability for the screen, the required mounting surface for the bar rack assembly, and the guiding surfaces for the traveling cleaning carriages.
 1. Perform necessary repairs or adjustments to return the frame to a condition that is square and suitable for mounting within the channel wall when reinstalled.
- E. **Discharge (Control) Weir:**
 1. Replace control weir with a new weir fastened to the discharge side of the screen to provide the desired water elevation and flow velocity through the screen.
 2. Construct weir of Type 316L stainless steel.
 3. Modify discharge weir to cut out a section to go around the existing support bracing specified in Paragraph 2.3, M. Reinforce weir plate for three inches on each side of the cut-out or according to manufacturer recommendations.

- F. Bar Screen (Rack) Assembly: Consists of parallel stainless steel bars secured to the screen frame with specially designed end blocks. Rehab and repair any bent or misaligned bars such that spacing between each bar will be 4 mm (0.16 inch). If replacement of any bar is considered necessary, then bars and screen assembly will comply with requirements listed in PART 2 of Section 462100.
- G. Cleaning Carriage Assembly:
1. Cleaning carriage consists of sets of cleaning tines mounted on a traveling carriage assembly. Travel of the carriage assembly is provided by a hydraulic cylinder. Each set of cleaning tines travel forward and backward across a section of the screen length. The travel distance of each set of cleaning tines overlap the travel distance of the adjoining set. The shape of the tines is designed to move accumulated solids forward during forward travel of the carriage, and to allow accumulated solids to pass over during backward travel of the carriage assembly. The travel distance overlap and tine shape will allow solids to be transported to the end of the screen. Refer to PART 2 of Section 462100 for further description of the cleaning carriage.
 2. Replace the slide blocks made of UHMW polyethylene, fastened to the top and bottom cross-member angles, during screen rehabilitation.
 3. Perform repairs or adjustments required for smooth operation of the cleaning carriage to meet manufacturer required tolerances and performance.
- H. Cleaning Combs (Tines):
1. Cleaning tines are provided in replaceable sections. The standard cleaning tine section is machined from a block of UHMW polyethylene. Replace sections with worn or broken cleaning tines from existing spares provided by owner. Provide spare parts as indicated in Paragraph 1.9 upon completion of screen rehab in addition to remaining existing spare parts.
 2. The end cleaning tine sections consist of individual tines fastened to a UHMW PE mounting block. Each individual tine will be made of bronze alloy. The extended shape of the end tine will push accumulated solids past the end of the bars.
- I. Overflow Weir:
1. A new stainless steel overflow weir will be fastened to the top of the screen frame. It will provide protection of the hydraulic cylinder and ensure that emergency overflow water flows smoothly over the top of the screen into the outfall channel.
 2. Overflow weir, fabricated of Type 316L stainless steel, will extend the length of the screen. In the width direction, the shroud will extend beyond the cleaning carriage assembly and discharge (control) weir.
 3. Modify overflow weir to cut out a section to go around the existing support bracing specified in Paragraph 2.3, M. Reinforce weir plate for three inches on each side of the cut-out or according to manufacturer recommendations.
- J. Hydraulic Cylinder:
1. A stainless steel hydraulic cylinder is mounted above the carriage assembly. The housing of the cylinder is secured to the screen frame, while the rod end is pinned to the clevis bracket on the top cross-member of the carriage assembly.

2. The piston rod will be made of hard chrome plated carbon steel. The rod end will be supplied with an eye bolt fitted with a bronze bushing. The rod end will be connected to the clevis bracket with a stainless steel pin, secured by two cotter pins.
3. Screen rehabilitation includes replacing the hydraulic cylinders.

K. Hydraulic Hoses:

1. Four 18 inch long hydraulic hose pigtails will be provided by the screen manufacturer for each screen.
2. Rate hose for 4,250 psi, made from synthetic rubber tube with double braid wire reinforcement and synthetic rubber cover.
3. Nominal inside diameter shall be 0.45 inch and the end fittings will be #8 (FJIC) female swivel, stainless steel.

L. Hydraulic Tubing:

1. Provide 5/8-inch diameter stainless steel tubing with burst pressure no less than 3,000 psi for connection to the screen and to the hydraulic power pack, including all connectors and anchors required to support the hydraulic lines. The tubing as well as its support system will be made of Type 316 stainless steel. Tube connections shall be JIC type fittings or equal.

M. Hydraulic Power Pack:

1. Hydraulic cylinder will be driven by a remote- mounted hydraulic power pack. Each Rehabilitated screen will be provided with a new hydraulic power pack and an individual drip pan as shown on the drawings. Refer to PART 2 of Section 462100 for hydraulic power pack requirements.

N. External Supports:

1. Existing external supports will be reinstalled with the rehabilitated screens.
2. Support locations, lengths and means of attachment shall be as per the manufacturer's recommendations. Locations will be coordinated with the modifications to the discharge weir and overflow weir as indicated in Paragraphs 2.3, D and 2.3, H.

O. Anchors and Fasteners:

1. Anchor Bolts: Furnish anchor bolts and nuts of ample size and strength for the purpose intended, sized by the equipment manufacturer. Anchor bolt materials shall be Type 316L stainless steel conforming to the requirements of Section 051200, Structural Steel Framing. The equipment supplier shall furnish all anchor bolts, nuts, and washers required for the equipment. Adhesive anchors shall be provided. Expansion anchors will not be accepted.
2. Fasteners: Type 316L stainless steel. The equipment supplier shall furnish all fasteners required for the assembly of the equipment.

2.4 CONTROLS

- A. Control Devices: Controls necessary for the fully automatic operation of the screen shall be provided. Equipment supplier shall furnish electrical items specifically called for in Section 462100. Contractor shall supply other electrical items, and interconnecting wiring of proper size, including all conduit and supports required to place the equipment into service. Level sensors for indication of screen channel levels and operation of screens will be the existing level sensors as shown on the drawings.
- B. Control Panel: Equipment supplier shall furnish the control panel and components to provide proper operation of four screens within one panel as specified in Section 462100.
- C. Sequence of Operation: Refer to Section 462100.
- D. Fault Conditions: Refer to Section 462100.

2.5 SOURCE QUALITY CONTROL

- A. Factory Tests: The screen will be fully assembled and shop tested to confirm fit and function of the screen. A certificate of the shop test shall be supplied with the shipping documents.
- B. Screen will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.
- D. Screen will be shipped to the site fully assembled, some ancillary components may be removed to prevent damage during shipment.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine finished concrete wall openings with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Contractor shall coordinate with the screen manufacturer to provide the dimensions of the screen openings required for proper installation within the tolerances indicated by the manufacturer.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Equipment Installation: Installation shall be in strict accordance with the respective manufacturer's instructions and recommendations in the locations shown on the Drawings. Installation shall include furnishing the required oil and grease for initial operation. The grades of oil and grease shall be in accordance with the manufacturer's recommendations. Anchor bolts shall be furnished by screen manufacturer and set in accordance with the manufacturer's

recommendations and setting drawings. Use non-shrink grout to fill gap between screen and upstream end of wall after screen aligned and anchored.

- B. Install materials and equipment in accordance with approved shop drawings and Contractor's other submittals approved by Project Construction Management Lead, the Contract Documents, and manufacturer's installation instructions. When manufacturer's installation instructions conflict with the Contract Documents, obtain interpretation or clarification from Project Construction Management Lead before proceeding.
- C. Manufacturer's installation instructions include manufacturer's written instructions; drawings; illustrative, wiring and schematic diagrams; diagrams identifying external connections, terminal block numbers and internal wiring; and other such information pertaining to installation of materials and equipment. Included are all of manufacturer's printed installation instructions, including those that may be attached to equipment upon delivery.
- D. Prior to installing materials and equipment, complete preparation of surfaces on which materials and equipment are to be installed.
- E. Comply with requirements for pipe hangers and supports specified in Section 400507 "Hangers and Supports for Process Piping."
- F. Hydraulic Tubing Installation:
 - 1. Make turns with long radius bends and not 90 degrees. Tube connections shall be JIC fittings.
 - 2. Do not use [REDACTED] Tape on any connection for hydraulic piping. Use only pipe dope suitable for use with hydraulic oil.
 - 3. Provide a continuous fall in tubing from the power pack to the screen. No high spots in the tubing are allowed, which can trap air. If high spots are unavoidable, provide air bleed devices at each high point in the line.
 - 4. Secure tubing and hoses to prevent movement.
 - 5. Flush hydraulic lines to prevent dirt and metal shavings from fouling the hydraulic system. Cap ends to prevent dirt from contaminating tubing lines. Upon completion of all field tubing, but before connection to control components, clean the tubing system by circulating oil continuously at a rate of not less than 12 fps. Filter the hydraulic oil through a 2 micron filter for a period of not less than 24 hours until the filter fails to retain any particulate material during a filter run of not less than 1 hour duration, whichever is the greater period of time.
 - 6. Take proper precautions to avoid contamination of hydraulic lines and equipment during storage and installation.

3.3 FIELD QUALITY CONTROL

- A. Manufacturer's representative shall check and approve the installation prior to operation. Manufacturer's representative shall field test and calibrate the equipment to assure that the system operates to the OWNER'S satisfaction.

- B. **Manufacturer's Field Service:** The manufacturer shall furnish the services of a factory representative, as provided under Paragraph 1.10.D above, who has complete knowledge of proper operation and maintenance. The manufacturer's representative will be present for concrete inspection, installation supervision, start-up and test services and operation and maintenance personnel training services. The representative shall make a minimum of three visits to the Site for a minimum of six 8-hour days for each screen installation. The first visit shall be to inspect the concrete prior to equipment installation. The second visit shall be for assistance in the installation of equipment. Subsequent visits shall be for checking the completed installation, start-up, and training of the system. Manufacturer's representative shall test operate the system in the presence of Engineer and verify that the equipment conforms to the requirements. Manufacturer representative will revisit the Site as often as necessary until trouble is corrected and the installation is entirely satisfactory.
- C. **Performance Acceptance Testing (PAT):** Perform the following tests and inspections with the assistance of a factory-authorized service representative and in the presence of Engineer:
1. Mechanical bar screen shall have a dry test run to demonstrate the correct alignment, smooth operation, proper and equal spacing of screen bars, freedom from vibration, excessive noise and overheating of the parts and bearings. Observe that cleaning carriage assemblies properly and smoothly engage the screen bars.
 2. An overload test shall be conducted to test the overload device to operate the jam clearing sequence and/or stop the drive at a loading condition to protect the drive unit and mechanism from damage.
 3. Make necessary adjustments and settings to the overload device at this time to ensure that the mechanically cleaned screen will stop and switch off the drive motor and sound an alarm when a predetermined overload condition occurs on the screen bars.
 4. Perform a wet test utilizing plant flow to test the ability of the screen to operate automatically or manually to remove screenings. Test shall continue for not less than 8 hours of actual run time (which may take several days to accumulate) prior to final acceptance. Test is dependent on wet weather and will not require the presence of the manufacturer representative if this is not feasible based on inability to predict when a wet weather event will provide sufficient flow for facility operation. However, remote interaction and support during the wet test is required.
 5. Defects recorded during the above field tests and all defects and failures occurring within the first year of operation shall be corrected.
 6. Tests shall be conducted in the presence of Engineer.
 7. In the event the mechanism fails to meet the above test, make necessary changes and retest mechanism. If mechanism remains unable to meet the test requirements to the satisfaction of Engineer, it shall be removed and replaced with a satisfactory mechanism at Contractor's expense.
- D. **Prepare test and inspection reports.**
1. Manufacturer shall certify in writing that screens have been properly installed and are operating correctly.
- E. **System Acceptance Test (SAT) – Demonstrate the following in the presence of Engineer and Owner**
1. Starting/stopping screens in Auto by simulating a level input signal.
 2. Starting/stopping the screens in Remote.

3. Energizing/de-energizing electrical disconnect switches.
4. Automatic stopping of the screens in Auto by simulating a high oil pressure signal and confirm signal to [REDACTED].
5. Confirm signals to [REDACTED] when screen in Auto, Remote, E-stop activated.
6. Taking measurements and recording data and observed issues (deviations from the design documents).
7. Defects recorded during the above field tests and all defects and failures occurring within the first year of operation shall be corrected.

END OF SECTION 462150