SECTION 13450

PLANT CONTROL AND SCADA SYSTEMS

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GENERAL

1.01 SUMMARY

A. This section specifies the supply, installation, programming, and integration of a Programmable Logic Controller (PLC)-based plant control system that shall communicate with all automated devices and field instruments located at the Plant, and shall automate the control of waste water treatment as an integrated system. The SCADA is an existing system to be modified to add the monitor signals of E.C.

transmitter, DO transmitter, Ammonia transmitter, and RAS/WAS flow transmitters process variables from the instrument PLC.

B. This section also specifies the supply, installation, programming, and integration of a supervisory control and data acquisition (SCADA) system that shall provide a Human/Machine Interface (HMI) into the PLC-based plant control system. The SCADA system shall allow process data to be monitored, displayed, and stored. It shall also allow the control of automated equipment in accordance with operational state and user-authorization requirements.

C. The PLC-based plant control system shall be capable of fully operating all automatic equipment with or without the SCADA system being in operation.

D. Work includes all required programming of programmable logic controllers (PLCs), master and slave network devices, network interfaces, a SCADA workstation, human-machine interface / supervisory control and data acquisition (HMI/SCADA) software, autodialer software, and other required hardware and software components to yield a complete and operational system.

E. The control logic descriptions contained in this Section describe key operational features and requirements. These descriptions do not, however, describe all logical relationships and constraints, time delay criteria, sequences of operation, and other program features that will be required to yield a functional, real-time system.

1.02 RELATED SECTIONS

A. Section 11070 Instruments

1.03 SUBMITTALS

A. Qualifications statement of system integrator, including the number of years experience in work similar to this Project and a list of at least five similar projects that have been performed recently. The project list should give preference to projects that reflect similar conditions and circumstances, and state the human-machine interface (HMI) software package and version used.

B. Make submittals for all materials, hardware, and software to be provided under this Section, whether as specified or substitutions, in accordance with these Specifications.

C. Submit a preliminary description of the SCADA workstation display screens to be provided, including a preliminary description or listing of the contents of each. Include a diagram or map that depicts the hierarchical relationship between the display

screens, and an indication of how the operator may navigate from one screen to the next. Submit a hardcopy printout of two representative graphical display screens.

1.04 CLOSE-OUT SUBMITTALS

A. A User's Guide or Operator's Manual describing the intended use of the site-specific programming specified herein.

B. Documentation and electronic program backup copies of all site-specific programming provided under this Section for all PLCs and SCADA systems, including "as-built" control logic descriptions, annotated program listings, and ladder-logic diagrams.

C. A system configuration diagram showing all PLCs and their identification tags, local and remote I/O and the logical addresses associated with each physical device, network devices and interfaces, and the description of all interconnecting cables including connectors and pin-outs.

D. A piping & instrumentation diagram (P&ID) showing the functional relationships and piping between all controlled equipment, instrumentation, and other devices, and the I/O communicated to each device.

E. A site plan showing the general physical location and identification of all pumps, valves, flow meters, instrumentation, and equipment, with each device labeled with the identifiers used in I/O and software documentation. The site plan need not be to scale.

F. I/O schematics depicting the signal and control connections of all controlled devices and instruments.

G. Equipment controlled by PLCs not programmed under this Section may represented by blocks, provided that all physical I/O and data variables communicated between devices is represented.

H. Upon request, the Engineer will provide electronic media copies of contract documents to facilitate the preparation of these closeout submittals.

1.05 QUALITY ASSURANCE

A. SCADA programming and integration performed under this Section shall be by an integrator who has been regularly engaged in control integration of waste water treatment plants.

B. All equipment furnished or modified under this Section shall be of a manufacturer who has been regularly engaged in the design and manufacture of the equipment.

C. The integrator's trained field representative shall have the following experience requirements:

1. Have overseen the integration of control systems for not less than five filtration water treatment plants.

2. Have overseen the programming of at least five control systems using the same human-machine interface (HMI) software supplied for this Project, in the same or earlier versions of the software.

1.06 SCHEDULING

A. Scheduling and coordination of Work under this section shall as required to maintain treatment plant availability.

1.07 WARRANTY

A. The manufacturer shall provide a one-year labor and parts warranty on the system. Warranties shall start on the date of filing of the "Notice of Completion."

1.08 MAINTENANCE

A. Contractor shall provide twenty (20) hours of telephone-based and eight (8) hours of on-site support and maintenance during the first year of service after the "Notice of Completion." Additional support and maintenance required shall be available at the Contractor's standard rates.

1.09 GENERAL CONTROL LOGIC REQUIREMENTS

A. Alarms

1. Operational alarms generated during operation of the water system shall be classified as follows:

a. Level 1 Alarm—Dialer Notification. Plant operator shall be notified via the alarm dialer. Processes and systems associated with the alarm condition shall be allowed to continue. HMI software shall display an alarm notice that will remain until cleared by the operator.

b. Level 2 Alarm—Screen Notification. HMI software shall display an alarm notice that will remain until cleared by the operator.

c. Level 3 Alarm—Alarm Log Only.

2. Alarm log.

a. All alarm events shall be logged. Alarm log entries shall include as a minimum: date-time stamp, status (triggered or cleared), description of alarm, and identification of device generating the alarm.

B. Security

1. The commercial HMI/SCADA software and site-specific control programs shall provide a minimum of four levels of security, as follows. Except as noted, all security levels require a username and password in order to log onto and access the system.

   a. Level 1 Security—Programmer. Provides full access to all control programs, control objects, databases, and all other development resources in addition to the privileges of Level 2.

   b. Level 2 Security—Supervisor. In addition to the privileges of Level 3, Supervisor access allows modification of allowable set point ranges, and can establish equipment and operational state locks that cannot be modified at less secure levels. Supervisor access is required to create new or modify existing reports.

   c. Level 3 Security—Operator. This security level represents the level of operational and data control routinely used in day-to-day operation. All data can be reviewed, equipment operational states changed, set points redefined within allowable ranges, and reports and be requested and printed.

   d. Level 4 Security—Observer. This is the default security level, and requires no username or password. Provides view- and read-only access to displays and operational state data. No changes in operational state of equipment, set points, or other operational or software properties are allowed.

1.10 SCADA WORKSTATION DISPLAY SCREENS

A. General

1. As used in this topic, the term "display screen" refers to graphical and alphanumeric displays of data presented on the SCADA workstation monitor. Display screens are generated and controlled by the human-machine interface software.

2. As used in this topic, the term "interactive display screen" refers to a display screen that includes controls, on-screen function keys, icons, or other features that allow the operator to interact with the data and change the operational status of displayed information, equipment, and controlled devices.

3. Interactive display screens shall be provided to communicate and control the status of all equipment, systems, and devices controlled by or in communication with the plant SCADA system. Display screens shall also be provided for all alarms, alarm logs, and operator set points. Data trend displays shall be available for time series data.

4. Interactive display screens that report operational status information about physical equipment or systems shall be graphical in nature. Each item of equipment, including pumps, valves, tanks, etc., shall be shown in a symbolic manner. Piping that is significant to the function of the device or system shall also be shown. The operational state of each device (open, closed, on, auto, hand, off, alarm condition, malfunction, etc.) shall be displayed through use of color, differences in the symbol used, annotation, or other visual manner. Analog data such as tank levels shall be shown Numeric readouts of analog data shall also be provided where appropriate.

5. Status logs, alarm logs, time series data, and other tabular data may be presented in alphanumeric displays. Such displays may be provided to present greater quantities of information than can conveniently be displayed in a schematic graphical representation, or to permit the information to be sorted or filtered according to operator established criteria.

6. Information shall be presented in a hierarchical manner, with initial screens displaying broad, summary information, and more detailed and more closely focused information displayed in subsequent screens. The operator shall be able to navigate between screens using Forward and Back controls, querying display objects visible on the screen, accessing a display screen index, or some combination of these methods. Navigation between screens shall be fully managed within the HMI software environment, requiring no operating-system level commands or actions.

B. System Overview Display.

1. A system overview screen shall be interactive and shall show:

   a. Storage and distribution information including water levels, treatment information, and discharge rates.

   b. Treatment plant information including waste water inflow rate, operational status, and individual flow rates.

MONITORING AND CONTROL FUNCTIONS

The SCADA system will be used to monitor equipment installed at the plant, and shall generate alarms or corrective signals when necessary. The device with monitor the following equipment:

Equipment, device, or installation	**Monitor/ Control Function** (See footnotes)
E.C., DO, Ammonia, SFM 2,4 Flow	Process variables, alarm setpoints

Monitor and reporting- footnotes:

1. Monitor equipment status, local failure alarm

2. Monitor equipment status, local failure alarm, initiate dialer failure alarm

C. Treatment Plant Displays.

1. Provide the operational status of all controlled devices and systems at the treatment plant in one or more interactive display screens.

2. Provide levels, flow rates, and other field instrument readings.

3. Provide displays or interactive displays for all alarms, alarm logs, time sequence trends, and other tabular data acquired in the control and operation of the Plant.

1.11 OPERATOR INTERFACE DEVICE DISPLAYS

A. General.

1. Operator interface devices shall be provided and programmed to provide data access to and control of each of the devices, systems, processes, and set points under automated control at the site where it is located.

2. Each operator interface shall be able to operate autonomously, communicating with and controlling the associated PLC without benefit of the SCADA workstation located in the Office Building or modem communications between the treatment plant and other sites.

3. Information shall be presented in a hierarchical manner, with initial displays providing summary data and subsequent displays providing more detailed and more closely focused data. The operator shall be able to navigate between displays using function keys or other means.

1.12 REQUIRED REPORTS

A. General.

1. The information management portion of the plant control software shall provide the capability to generate predefined and ad hoc reports based on accumulated operational data. The software shall provide the capability to query and filter the data on multiple criteria, including filtering for the sampling frequency of data.

2. Software shall include the necessary tools for creation of new reports, and documentation on the use of these tools by the owner.

B. Monthly Treatment Plant Report

1. The Monthly Treatment Plant report is a tabular report with columns of data, with a row of data for each calendar day. Summary totals, averages, maximum, and minimum values shall be provided where indicated.

2. Two additional reports of similar scope and complexity shall be provided at the direction of the Engineer.

REPORT GENERATION

The SCADA system shall collect data from the various flowmeters and monitoring equipment, and shall allow manual input of data received from testing laboratories , plant staff, and similar. Using the collected information, the SCADA system shall be programmed to provide, at a minimum, the following reports:

Report	Notes
Operations trend chart generation	Using data collected and stored, generate a trend chart for each of the following parameters: plant flow; influent and effluent BOD, Influent and effluent Suspended solids, MLSS and dissolved Oxygen
Monthly operating report	Format to satisfy Regional Water Quality Control Board
Annual operations summary	Compile data from 12 monthly reports each year, summarize. Format to satisfy RWQCB.
Weekly and monthly alarms summary	

PART 2 PRODUCTS

2.01 PROGRAMMABLE LOGIC CONTROLLERS (PLCs)

A. The programmable controllers are to be Allen- Bradley Compactlogix with Ethernet communication. Any exception shall be system wide and subject to owner approval.

2.02 SCADA WORKSTATION

1. Workstation is existing.

2.03 SCADALARM

A. All instrument alarms will be added to the SCADAlarm dialer software call out list.

B. The most recent version of SCADAlarm shall be purchased by the Contractor on behalf of the District and installed within the existing Workstation. The District owns a version of SCADAlarm that is no longer compatible with the Intouch software presently installed. The SCADAlarm shall be installed and configured to include notification of the operators for the existing alarm conditions (15 alarms including – power loss, generator running, generator fail, common alarm – air blower tripped, common alarm – effluent pumps, common alarm – high torque FSD 1 & 2, blower discharge low pressure and overload) and an additional 10 alarm conditions (high/low pH, Ec, Chlorine Residual, turbidity, UV alarms) for the instrumentation associated with the UV disinfection system. The system will be required to confirm alarm recognition and call-out capability.

2.04 SCADA SOFTWWARE

A. SCADA software is existing Wonderware Intouch runtime. The integrator shall provide the programming version of Wonderware licensed owned by the integrator.

B. The Contractor shall examine and correct the ladder logic program and Wonderware Intouch, including involvement with RTU #2 and #3 for the following errors: a) influent flowrates, b) screw pump hour run meters, c) Blower 2 shows overloaded when it is not, d) blower 3 shows running when it is not, e) Kw meter for the blowers is not displaying correctly, f) blower hour meters are not reading correctly.

2.05 SOFTWARE OWNERSHIP

A. SCADA Source Code shall be provided to and owned by Malaga in an electronic backup media format.

B. PLC Logic code and program listings shall be provided to and owned by Malaga in an electronic backup media format.

C. All software licenses for SCADA programming, PLC programming shall be provided to and owned by Malaga.

PART 3 EXECUTION

3.01 INSTALLATION

A. A complete functional factory test of all status and control functions will be scheduled with the owner and owners representative with two weeks prior notice. This test will include complete testing of the Ethernet communication link between the instrument PLC equipment and the SCADA.

B. Installation of programmable logic controllers, I/O components, network devices, and other hardware specified in this section shall be installed in accordance with manufacturer's instructions.

C. Contractor shall provide all equipment, connections, and appurtenances for a complete and operational system.

3.02 FIELD QUALITY CONTROL

A. Contractor's field service.

1. The Contractor shall provide the service of a qualified representative to provide instructions on the proper installation of the equipment, inspect the completed installation, participate in the startup of equipment controlled by the PLC-based control system, participate in the field testing of the plant control and SCADA systems and make any necessary adjustments and program changes, conduct training of the Owner's personnel as described below, and place the plant control and SCADA systems in trouble-free operation. The contract price paid for the plant control and SCADA systems shall include the cost of these services.

B. Installation supervision shall include forty (40) hours of inspection and field adjustments.

C. Training shall include ten (10) hours of instruction.

END OF SECTION