SECTION 17300

REMOTE TERMINAL UNIT (RTU/TCP)

# GENERAL

## DESCRIPTION

### This section identifies requirements for materials, testing, and installation of the RTU/TCP. The Telemetry Control Panels (TCP), Applications Software and the SCADA control of the facility/plant is provided by the District’s PCIS supplier and installed by the Contractor.

## RELATED WORK SPECIFIED ELSEWHERE

### Section 01810 – Start-Up, Testing and Commissioning

### Section 16480 – Low-Voltage Motor Control

### Section 17000 – General Requirements for I&C System

### Section 17100 – Input/Output Signals List

### Section 17400 – Control Narrative

[Note to Engineer – Adjust the above related sections as appropriate to the specific project sections.]

## SUBMITTALS

### Submit shop drawings in accordance with the General Conditions.

### Submit manufacturer’s data for all materials and equipment.

### Conform to submittal requirement of Section 01300 and Section 17000.

### Submit a copy of the programming software to develop the application plus a copy of the complete configuration and application. Deliver final versions (backups) to the District prior to acceptance of the work.

## SPARE PARTS

### Provide the following spare parts to the District in the manufacturer’s original containers labeled to describe the contents and the equipment for which it is furnished.

#### Provide 1 24 VDC With a minimum of 26.8 volts maximum output, 10 A Power supply.

#### PLC Input/Output Modules: One of each type provided.

## MEASUREMENT AND PAYMENT

### Payment for the work in this section shall be included as part of the lump-sum bid amount for PCIS supplier’s products and services.

# MATERIALS

## MANUFACTURERS

### The RTU/TCP shall be an model 5447-2 Telemetry System as manufactured by Systems Integrated, San Diego, CA (the Process Control and Instrumentation System (PCIS) supplier) and shall provide TCP control functionality and a solid state PC based Operator Interface Terminal (OIT). The RTU/TCP components shall be compatible with and will directly connect to the District's existing SCADA System. The RTU/TCP shall be furnished with all required Ethernet modules to connect with all of the equipment at the site associated with the control system. The RTU/TCP shall provide all of the necessary radio and/or communication equipment as needed.

## GENERAL

### The RTU/TCP shall consist of integrated radio telemetry and local processing and control electronics, operator interface, radio equipment, power supply, and enclosure.

## OPERATOR INTERFACE TERMINAL (OIT)

### Provide, program, test, fully configure, and place into operation OIT as indicated herein. The contractor shall utilize EVMWD designated system programmer for all required programming to meet EVMWD programming standards.

#### The OIT shall be a panel-mounted PC that allows bi-directional communication with the RTU/TCP. The OIT shall be a SightView node model#: SI-SVH-6001 with standard SightView software.

#### The OIT shall have a minimum of 23-inch diagonal, color LCD display. The OIT shall also have an industrial keyboard.

#### Screens shall be configured using DataView software. All screens are to use existing templates for the standard site types. New screen objects are to be reviewed and approved by the District’s SCADA group and Operations Staff (Ops).

#### The OIT shall be capable of displaying text messages that can be triggered by the status or values of bits or numeric variables in the Programmable Logic Controller. In addition, the unit shall accept and display text messages that are stored in the TCP as ASCII strings.

#### **Graphics:** The graphic displays shall allow the District’s Operations Staff to monitor and control the system using a number of preconfigured graphic displays, which represent the particular equipment and processes being controlled. Screens shall be programmed as detailed on the project drawings. Graphic displays shall be provided illustrating a process flow using symbols to represent equipment with process flow direction lines connecting the symbols. Symbols shall be used for pumps, motors, valves, and primary elements. Adjacent to each discrete graphic symbol, a description shall be included. Adjacent to each analog graphic symbol, the point description, current value, and engineering units shall be displayed. Alarm messages shall flash. All process lines, structures, and equipment shall be identified with the proper nomenclature.

## RADIO TELEMETRY SYSTEM

### Radio telemetry system shall consist of integrated very high throughput point-to multipoint microwave radios with integral panel antennas. The supplier shall coordinate radio frequency requirements with the District and District’s PCIS supplier (Systems Integrated).

### Radio/Antenna System:

#### Provide a point-to-multipoint radio system that delivers 867 Mbps data rate. The integrated 2x2 MIMO 22dBi dual polarized 1 foot panel antenna will cover distances up to three miles. The radio will operate in unlicensed bands from 5.150 to 5.925 GHz. Incoming power will be 36 to 57 VDC via an Ethernet port (Power over Ethernet).

#### Radio shall be provided by the District’s PCIS supplier.

#### The RTU/TCP housing door shall be equipped with a tamper switch connected to send a signal when the door is opened.

#### The RTU/TCP shall be enclosed in a Hoffman, or equal, NEMA 4 enclosure with stainless-steel fasteners with a continuously hinged single door. The Contractor is to assure that conduits do not enter the top of the enclosures. Provide heavy-duty three point lockable handle.

#### The RTU/TCP shall include two 12-volt 100 Amp Hour batteries.

### Antenna Tower:

#### Location of the tower with respect to the motor control center and/or the TCP panel shall be as defined within the Contract documents.

#### The radio/antenna combination unit shall be mounted on top of the tower pointed at the appropriate direction as determined by the radio propagation study.

#### The antenna mast shall be Aluma 903716 - 50-foot Antenna Tower (no or equal).

### Antenna:

#### Frequency: 4.9 GHz to 5.9 GHz.

#### Wind Rating Without Ice: 100 mph (200 km/hr).

### Radio Frequency Propagation Analysis:

#### The Contractor shall review the radio frequency analysis provided as part of the Contract documents and coordinate/determine the final installation location of the antenna mast on the site with the Owner/Owner’s Representative and the Process Control and Instrumentation System (PCIS) supplier. The Contractor shall ensure that the installation of the mast will allow the mast to be “laid down” for maintenance without interference.

[Note to Engineer: Confirm if a radio study will be provided as part of the Contract documents to identify radio mast location, mast height, antenna height, and antenna direction/azimuth & then adjust the above paragraph as appropriate.]

## LIGHTNING PROTECTION

### There shall be a lightning arrester mounted and electrically grounded. The arrestor shall be installed in the TCP and be provided as part of the TCP.

### Power Circuits: Telemetry, radio, and computing equipment shall be supplied power from a completely separate circuit from the panelboard. No additional outlets are to be permitted on this circuit. The convenience outlet within the TCP shall be used for supporting portable laptops and test equipment. There shall be a circuit breaker with a rating of not more than 8 amps protecting the convenience outlet.

# EXECUTION

## COMBINATION RADIO/ANTENNA SYSTEM MOUNTING

### One conduit shall be installed between the Telemetry Control Panel (TCP) enclosure and the antenna mast/tower base. The conduit shall be a minimum of 1 ½ inches in diameter and is to be used for the radio cables (CAT 5), provided as part of the radio equipment assembly. The conduit shall be routed from the base of the antenna mast to the Telemetry (TCP) enclosure in a manor to ensure that any water entering the conduit will not flow into the Telemetry Enclosure. A radio ground wire (#6XHHW Green wire) shall be installed in the same conduit as the radio cable and this ground wire shall be terminated in the TCP. Contractor to install a 1 ½ inch conduit from the base of mast and route to the pivot point of the mast. At that point, a rain head shall be attached to the conduit. The communications cable and the #6 ground wire shall be routed out of the conduit, attached to the lowest portion of the antenna mast, tie wrapped to the bottom section of the antenna mast. Care shall be taken to ensure that the rotation of the mast is not impeded by the antenna cable, conduit, weather head or the ground cable. Install using the cable mounting brackets provided with the antenna mast and using tie wraps to bind the ground wire to the antenna cable every foot. Provide enough cable to reach the top of the antenna mast plus an addition 10 feet.

### At the base of the antenna mast, a 10 foot copper ground rod shall be installed with a #2 copper ground wire being interconnected between the ground rod and the base of the antenna mast. This antenna copper ground shall be used to ground the antenna mast by CAD welding the copper cable to the 9 foot mounting pole above the ground and then inserting the ground wire into the interconnecting conduit or seal tight flexible conduit that interconnects the rigid conduit underground conduit to the conduit being used to route the communications cable and ground cable going to the TCP enclosure. The local ground cable shall be bonded to the ground cable coming from the TCP at local ground entry point into the 1 ½ conduit.

### The Cat 5 communication cable shall be terminated to the RJ45 weather tight connectors provided with the radio assembly equipment. Additionally, a #6 green ground wire shall be installed in the conduit, through the weather head and shall be terminated on the radio antenna enclosure on the grounding screw provided with the radio equipment. The radio antenna cables and grounding wire shall be pulled from the Telemetry (TCP) enclosure to the weather head, through the termination enclosure and shall not be cut or spliced. The Cat 5 cables will be terminated and tested by the PCIS supplier.

### A 10 foot grounding rod shall be installed at the base of the antenna mast and a minimum #2 bare copper wire shall be used to terminate the grounding rod to the antenna mast.

## PUMP STATION RTU PROGRAMMING

[Note to Engineer: Adjust 3.02 header description above as appropriate for project type.]

### Remote Auto Control:

#### Individual pump on/off level set points will be transmitted from SCADA Central as described above.

#### Lead and lag pumps shall turn on and off at the on/off level set points based on the reservoir level.

[Note to Engineer – Pump On/OFF setpoint description above is to be adjusted as appropriate for the project specific control requirements as identified in the project’s Control Narrative.]

#### If a pump fails to run within a set time of a run command, the next pump in the sequence shall run in its place.

#### Refer to Section 17400 for additional information regarding Control Narrative.

### Additional Programming:

#### Provide pump thermal fail detection for each pump and transmit to SCADA Central. A pump has failed if the motor thermal switch opens. Activate associated local “thermal fail” alarm and shut down the motor until manually reset at the OI panel.

#### Provide pump fail detection for each pump and transmit alarm to SCADA Central. A pump has failed if a run contact is not received within an adjustable time delay after a start contact was sent (Pump Fail-To-Start). Activate associated local “pump fail” alarm and de- energize motor until manually reset at the OI panel.

#### An intrusion signal shall be generated if any of the limit switches on the exterior MCC/meter pedestal, panel, cabinet, gates, or vault hatches are activated and the intrusion override key switch is not activated by an operator within one minute (adjustable).

#### For stations with automatic transfer switches, prevent motors from starting simultaneously following a power failure. Provide 30 seconds (adjustable) between starts.

#### Information transmitted to/from SCADA Central shall be as shown on the P&ID drawings.

## TEST, INSPECTION, AND TRAINING

### **General:** The TCP may be viewed and tested at the PCIS factory by the Contractor and/or EVMWD or its Representative. After installation has been completed, Contractor shall conduct an operating test to demonstrate that equipment operates in accordance with specification requirements.

### For those PCIS sites that have a Siteview node, the PCIS supplier shall provide a built in test function designed for rapid analysis of the TCP functionality

### **Inspection:** After final installation, the Contractor shall perform the required testing on the TCP to ensure that the field wiring terminations are correctly labeled and match the project documents, with all installed interconnecting wires and terminals identified. Verify that various components within the TCP are properly labeled. The Stat-Up Team (GC, EC, Commissioning Coordinator, Contractor’s PICI, District’s PCIS supplier, and Owner/Owner’s Representative) shall observe operational features specified. Any PCIS deficiencies indicated shall be repaired by the PCIS supplier at the PCIS supplier’s expense.

### **Training:** Project-Specific operator training will be provided by the PCIS supplier. The training is to be conducted via a video conference call or on site at the facility. The training duration is to be approximately 1.5 hours.

END OF SECTION