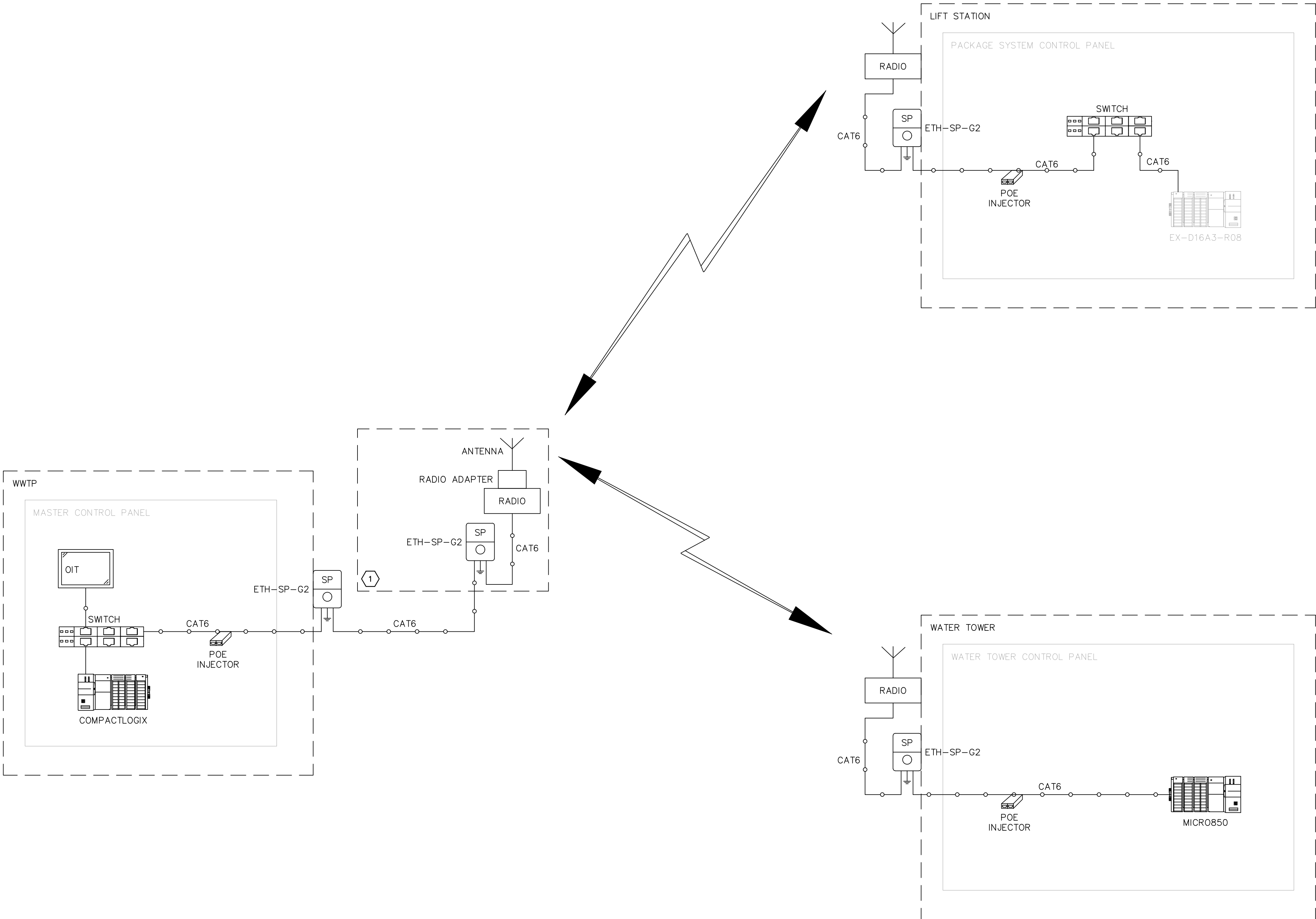




## SHEET KEYNOTES

1. INSTALLED ON TOWER/MAST.

NETWORK ARCHITECTURE

SCADA SERVICES

BENNETT, NEBRASKA

2024

REVISIONS

drawn by: LIT  
checked by: RAA  
approved by: RAA  
QA/QC by: NJC  
project no.: 024-00902  
drawing no.:  
date: 07/03/2024

SHEET  
1 OF 1



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## **INSTRUMENTATION AND CONTROL SYSTEM SCOPE OF SERVICES**

### **A. GENERAL OVERVIEW:**

1. Related Documents:
  - a. Drawings and Request for Proposal Documentation apply to this Section.
2. Definitions:
  - a. SCADA: Supervisory Control and Data Acquisition System
  - b. PLC: Programmable Logic Controller
  - c. OIT: Operator Interface Terminal
  - d. RTU: Remote Terminal Unit
  - e. LAN: Local Area Network
  - f. WAN: Wide Area Network
  - g. WLAN: Wireless Local Area Network
  - h. HMI: Human-Machine Interface
  - i. I/O: Input/Output
  - j. FAT: Factory Acceptance Test
  - k. VFC: Variable Frequency Controller
  - l. RFP: Request for Proposal
3. Contractor shall submit shop drawings of proposed hardware to Engineer for review and approval.
  - a. Engineer must approve hardware shop drawing submittals prior to equipment procurement and installation.
  - b. Engineer shall have two (2) weeks to review and approve all equipment shop drawing submittals.
4. Contractor shall provide control panel as-built drawings upon completion of the project.
  - a. Contractor shall submit as-built drawings to Engineer, for review and approval.
  - b. As-built documentation shall detail control panel layout and bill of material, power distribution wiring, I/O wiring, and communication wiring.
  - c. Engineer shall have two (2) weeks to review and approve as-built documentation.
5. Contractor shall remove existing control system equipment. No equipment or cabling shall be abandoned in place. Contractor shall provide removed equipment to the Owner.
  - a. WWTP: Remove existing AB SLC 500 series processors and I/O modules.
  - b. Water tower: Remove AB Micro Logix1200 processors and I/O modules.

### **B. INSTRUMENTATION AND HARDWARE PROCUREMENT AND INSTALLATION:**

1. *Contractor shall provide all control system equipment and instrumentation with all appurtenances required for a fully functional system.*
2. *Unless otherwise noted, all instrumentation and control system equipment shall be installed per manufacturer recommended installation procedures.*
3. *All control panel equipment shall be adequately spaced to allow for proper heat dissipation.*
4. *Contractor shall procure, install, and terminate all cable and conduit for a fully functional system in accordance with the Scope of Work and Drawing Package.*
5. *Contractor shall be responsible for coordination of work and schedule of all work related activities. Contractor shall work with the Owner to establish the schedule of work and associated equipment downtimes.*

6. *Existing control panel wiring shall be replaced, or an intermediary terminal block installed, if wire length is too short to reach the new field terminal block location. Splices shall not be allowed. Conductors shall be replaced with equivalent cable type and size.*
7. *The Contractor shall utilize the wire management system on the back panels for all wire runways.*
8. *Contractor shall provide the following:*
  - a. *Wastewater Treatment Plant:*
    - i. *Contractor shall provide, install, and terminate new Ubiquiti LTU-Rocket BaseStation Radio, Ubiquiti UISP Horn Antenna, Ethernet surge protectors and CAT6 ethernet cable.*
      1. *Contractor shall install Radio/antenna; Radio/antenna to be tower/mast mounted with clear line of sight to water tower radio and lift station radio.*
      2. *Contractor shall provide site survey to ensure proper communication with radios at both water tower and lift station.*
      3. *Contractor shall install Ethernet surge protectors in accordance with manufactures recommended requirements.*
      4. *Contractor shall provide, install, and terminate new Ubiquiti PoE injector adequately sized for the radio application.*
      5. *Existing building penetrations shall be used where possible for exterior radio/antenna to be coordinated with the owner prior to installation.*
    - ii. *Contractor shall provide, install, and terminate the following PLC components:*
      1. *PLC Processor: Allen-Bradley CompactLogix 5069-L320ER PLC and associated power supply, backplane, communication modules, and I/O modules to meet functionality of existing SLC 5/03.*
    - iii. *Contractor shall provide, install, and terminate new Allen-Bradley PanelView Plus 7, 9" minimum.*
    - iv. *Contractor shall provide Modbus TCP/IP to EtherNet/IP gateway for communication between Lift Station PLC and CompactLogix PLC.*
    - v. *Contractor shall provide, install, and terminate an industrial Ethernet switch to include a minimum of the following:*
      1. *4 copper ports (RJ-45, female)*
      2. *LED indication of the link activity for each port.*
      3. *Environmental: Suitable for installation in industrial environments. Operating Temperature Range: -40° to 75° C.*
      4. *The Contractor shall provide all cabling between SCADA equipment and Ethernet switches as indicated on the drawings.*
      5. *Auto-negotiating 10/100BaseTX RJ-45 ports.*
  - a. *Water Tower*
    - i. *Contractor shall provide, install, and terminate new Ubiquiti LTU-XR Radio, Ethernet surge protector and CAT6 ethernet cable.*
      1. *Contractor shall install Radio; Contractor to provide radio mounting hardware, radio to be mounted with clear line of sight to wastewater treatment plant radio, mounting location to be coordinated with the owner prior to installation.*

2. Contractor shall provide site survey to ensure proper communication with base station at the Wastewater Treatment Plant.
  3. Contractor shall install Ethernet surge protectors in accordance with manufactures recommended requirements.
  4. Contractor shall provide, install, and terminate new Ubiquiti PoE injector adequately sized for the radio application.
  5. Existing building penetrations shall be used where possible for exterior radio/antenna to be coordinated with the owner prior to installation.
- ii. Contractor shall provide, install, and terminate new Allen-Bradley Micro850 Series PLC to match existing Micro 1200 functionality.

*b. Lift Station*

- i. Contractor shall provide, install, and terminate new Ubiquiti LTU Lite Radio, Ethernet surge protector and CAT6 ethernet cable.
1. Contractor shall install Radio; Contractor to provide radio mounting hardware, radio to mounted with clear line of sight to wastewater treatment plant radio, mounting location to be coordinated with the owner prior to installation.
  2. Contractor shall provide site survey to ensure proper communication with base station at the Wastewater Treatment Plant.
  3. Contractor shall provide, install, and terminate new Ubiquiti PoE injector adequately sized for the radio application.
  4. Contractor shall install Ethernet surge protectors in accordance with manufactures recommended requirements.
  5. Existing building penetrations shall be used where possible for exterior radio/antenna to be coordinated with the owner prior to installation.
- ii. Contractor shall provide, install, and terminate an industrial Ethernet switch to include a minimum of the following:
1. 4 copper ports (RJ-45, female)
  2. LED indication of the link activity for each port.
  3. Environmental: Suitable for installation in industrial environments. Operating Temperature Range: -40° to 75° C.
  4. The Contractor shall provide all cabling between SCADA equipment and Ethernet switches as indicated on the drawings.
  5. Auto-negotiating 10/100BaseTX RJ-45 ports.

**C. INSTRUMENTATION AND CONTROL SYSTEM CONFIGURATION**

1. The Contractor shall configure all new control system equipment to match the functionality of the existing equipment. It is the sole responsibility of the Contractor to coordinate with the Owner to become aware of, and adhere to, the existing control system standards.
2. The control system shall embody a Point-to-Multipoint topology where the WWTP CompactLogix PLC will serve as the Master PLC. Both the Water Tower and Lift Station PLCs shall communicate with the Master PLC and OIT.
3. Contractor shall provide all configuration files to the Owner upon completion of the project. If password protected, all credentials shall be provided to the Owner for full access.

- a. *Wastewater Treatment Plant*
  - i. *Contractor shall configure 9" PanelView Plus 7 OIT. All existing functionality on existing OIT shall be replicated on the new OIT with updated, modern, graphics. Lift station graphic screen shall be reconfigured to function with the Electric Pump Lift Station PLC/HMI.*
  - ii. *Contractor shall configure Ubiquiti radio and antenna away from site installation. Once radio link is connected, deploy devices on site. Program radio in PtMP BaseStation mode.*
  - iii. *Contractor shall provide the configuration of the Modbus TCP/IP to EtherNet/IP gateway for communication between Lift Station PLC and CompactLogix PLC. Refer to Lift Station section below for specific data required from the Lift Station PLC.*
  - iv. *Configure existing Sensaphone 400 notification system to communicate with new PLC and match existing system functionality.*
- b. *Water Tower*
  - i. *Contractor shall integrate and configure Micro850 Series PLC data with WWTP CompactLogix PLC and OIT via radio link.*
    - 1. *Match existing logic & control functionality.*
  - ii. *Contractor shall configure Ubiquiti radio and antenna away from site installation. Once radio link is connected, deploy devices on site. Program radio in PtMP CPE mode.*
- c. *Lift Station*
  - i. *Contractor shall configure existing Ultronics V570-57-T20B PLC/HMI to communicate via the Modbus TCP/IP protocol to the Wastewater Treatment Plant Supervisory PLC. The following communication shall be provided at a minimum:*
    - 1. *Pump1 Run Command*
    - 2. *Pump 2 Run Command*
    - 3. *Pump 1 Alarm*
    - 4. *Pump 2 Alarm*
    - 5. *Pump 1 Running*
    - 6. *Pump 2 Running*
    - 7. *System Alarm*
    - 8. *Level Alarm*
  - ii. *Contractor shall configure Ubiquiti radio and antenna away from site installation. Once radio link is connected, deploy devices on site. Program radio in PtMP CPE mode.*
  - iii. *Contractor shall integrate Ubiquiti radio and antenna with existing Packaged Control System PLC, EX-D16A3. Establish communication and power to the PLC through the PoE injector and Ethernet switch.*

**D. ADDITIONAL BID ITEMS (Outside Base Bid)**

- a. *Contractor to provide additional pricing for the following scope of work, outside of the base bid cost:*
  - i. *Replace existing Sensaphone 400 callout notification system with a SCADA HMI package and Workstation PC.*
    - 1. *SCADA PC operating system to be Windows 10 Professional.*
    - 2. *SCADA PC to have a minimum of 1 TB hard drive.*
    - 3. *SCADA PC to have a minimum of 16 GB RAM.*
    - 4. *SCADA PC to be provided with a 27" monitor, keyboard, and mouse.*

- a. *Password Protected Access with administrative credentials provided to owner.*
  - b. *Alarming and Alarm Log*
    - i. *Three (3) Alarm Designation Levels*
  - c. *Operator Voice Call Out Notification System*
  - d. *SCADA HMI to be VT SCADA, Inductive Automation Ignition, Tatsoft FrameworX or approved equal.*
- ii. *Provide, configure, and commission VPN for remote access to the SCADA network.*
  - 1. *VPN to have two factor authentication (2FA).*
  - 2. *VPN to be IXON, or approved equal.*



**SCADA SERVICES  
BENNET, NEBRASKA – 2024**

**JULY 2024**

**Olsson Project No. 024-00902**