

LAKWOOD WATER DISTRICT

WHOLESALE TRANSMISSION MAIN EXTENSION SCHEDULE H – SPANAWAY INSTALLATION (Job #777)

ADDENDUM NO. 1

June 22, 2022

TO ALL PLANHOLDERS:

You are hereby notified of the following changes, deletions, additions, and corrections to the plans, specifications, and other documents comprising the contract documents for the Lakewood Water District Wholesale Transmission Main Extension, Schedule H – Spanaway Installation.

Refer to end of this addendum for a list of attachments. The following formatting has been used to note deletions (to the original text) and changes/additions to the Contract Documents.

- Deletions are formatted as stricken through (~~example~~) text.
- Changes/additions are formatted as bolded (**example**) text.

I. CLARIFICATIONS

- A. Lakewood Water District, on behalf of the Material Supply Contractor, will provide the
 - a. HDPE fittings and all necessary appurtenances for the installation of the fittings
 - b. Gaskets for ductile iron flanged pipe

II. INVITATION TO BID

- A. Revise the first and second paragraph as follows:

CURRENTLY READS:

Notice is hereby given that sealed bids for the **Wholesale Transmission Main Extension Schedule H – Spanaway Extension, Job #777**, will be received by **LAKWOOD WATER DISTRICT** until, but not after, ~~10:00 a.m.~~ Tuesday, June 28, 2022.

Bid proposals will be received by LAKWOOD WATER DISTRICT only by email addressed to Ian Black at Lakewood Water District at iblack@lakewoodwater.org no later than ~~10:00 a.m.~~, Tuesday, June 28, 2022. The bids will be opened, read, and publicly tabulated at ~~11:00 a.m.~~ The opening of Bids can be viewed and heard through a Microsoft Teams Live Event. To join the event, go to the District website at www.lakewoodwater.org and click on the red banner containing the project name at the top of the home page. The banner will not be placed on the website until the morning of the bid opening. Bids received after the time fixed for opening will not be accepted.

REVISED TO READ:

Notice is hereby given that sealed bids for the **Wholesale Transmission Main Extension Schedule H – Spanaway Extension, Job #777,** will be received by **LAKEWOOD WATER DISTRICT** until, but not after, **1:00 pm** Tuesday, June 28, 2022.

Bid proposals will be received by LAKEWOOD WATER DISTRICT only by email addressed to Ian Black at Lakewood Water District at iblack@lakewoodwater.org no later than **1:00 p.m.**, Tuesday, June 28, 2022. The bids will be opened, read, and publicly tabulated at **3:30 p.m.** The opening of Bids can be viewed and heard through a Microsoft Teams Live Event. To join the event, go to the District website at www.lakewoodwater.org and click on the red banner containing the project name at the top of the home page. The banner will not be placed on the website until the morning of the bid opening. Bids received after the time fixed for opening will not be accepted.

III. INSTRUCTIONS TO BIDDERS

A. Revise the Submission of Bids, Section 11.1 as follows:

CURRENTLY READS:

Proposals shall be only by email addressed to Ian Black at Lakewood Water District at iblack@lakewoodwater.org no later than ~~10:00 a.m.~~, June 28, 2022. The bids will be opened, read, and publicly tabulated at ~~11:00 a.m.~~ The opening of Bids can be viewed and heard through a Microsoft Teams Live Event. To join the event, go to the District website at www.lakewoodwater.org and click on the red banner containing the project name at the top of the home page. The banner will not be placed on the website until the morning of the bid opening. Bids received after the time fixed for opening will not be accepted.

REVISED TO READ:

Proposals shall be only by email addressed to Ian Black at Lakewood Water District at iblack@lakewoodwater.org no later than **1:00 p.m.**, June 28, 2022. The bids will be opened, read, and publicly tabulated at **3:30 p.m.** The opening of Bids can be viewed and heard through a Microsoft Teams Live Event. To join the event, go to the District website at www.lakewoodwater.org and click on the red banner containing the project name at the top of the home page. The banner will not be placed on the website until the morning of the bid opening. Bids received after the time fixed for opening will not be accepted.

IV. BID FORM

A. Revise the first paragraph on the Listing of Proposed Subcontractors page as follows:

CURRENTLY READS:

No later than ~~10:00 a.m.~~ on the date of bid opening as set forth in Section 00020, **BIDDERS SUBMITTING A BASE BID OF ONE MILLION DOLLARS OR MORE** shall deliver to the Owner's Superintendent the following list. The Bidder shall list as part of its bid either itself or the names of the subcontractors with whom the Bidder, if awarded the contract, will subcontract for performance of the work of heating, ventilation and air conditioning, plumbing as described in chapter 18.106 RCW, and electrical as described in chapter 19.28 RCW. The Bidder shall not list more than one subcontractor for each category of work identified, unless subcontractors vary with bid alternates, in which case the Bidder must indicate which subcontractor will be used for which alternate. Failure of the Bidder to submit as part of the bid the names of such subcontractors or to name itself to perform such work or the naming of two or more subcontractors to perform the same work shall render the Bidder's bid non-responsive and, therefore, void. The requirement of this section to name the Bidder's proposed heating, ventilation and air conditioning, plumbing, and electrical subcontractors applies only to proposed heating, ventilation and air conditioning, plumbing, and electrical subcontractors who will contract directly with the general contractor submitting the bid to the Owner.

REVISED TO READ:

No later than **1:00 p.m.** on the date of bid opening as set forth in Section 00020, **BIDDERS SUBMITTING A BASE BID OF ONE MILLION DOLLARS OR MORE** shall deliver to the Owner's Superintendent the following list. The Bidder shall list as part of its bid either itself or the names of the subcontractors with whom the Bidder, if awarded the contract, will subcontract for performance of the work of heating, ventilation and air conditioning, plumbing as described in chapter 18.106 RCW, and electrical as described in chapter 19.28 RCW. The Bidder shall not list more than one subcontractor for each category of work identified, unless subcontractors vary with bid alternates, in which case the Bidder must indicate which subcontractor will be used for which alternate. Failure of the Bidder to submit as part of the bid the names of such subcontractors or to name itself to perform such work or the naming of two or more subcontractors to perform the same work shall render the Bidder's bid non-responsive and, therefore, void. The requirement of this section to name the Bidder's proposed heating, ventilation and air conditioning, plumbing, and electrical subcontractors applies only to proposed heating, ventilation and air conditioning, plumbing, and electrical subcontractors who will contract directly with the general contractor submitting the bid to the Owner.

V. SUMMARY OF THE WORK

A. Revise the Summary of the Work, Section A as follows:

CURRENTLY READS:

The work to be performed under the Contract is furnishing all labor, materials, tools and equipment required for completion of the project. The Contractor shall work with the District and ~~a Material Supply Contractor~~ selected via a separate bid (Schedule G).

REVISED TO READ:

The work to be performed under the Contract is furnishing all labor, materials, tools and equipment required for completion of the project. The Contractor shall work with the District and **Consolidated Supply Company, referenced as Material Supply Contractor herein**, selected via a separate bid (Schedule G).

VI. TECHNICAL PROVISIONS

A. Revise Division 7, Section 7-13.3(3) Galvanic Anode Installation as follows:

CURRENTLY READS:

(c) Connection – ~~The anode lead wire shall be exothermically welded to the pipe. Alternatively, the anode shall be connected to a joint bonding wire by using a split bolt connection. Distances between anodes are nominal lengths and anode connections shall be made at pipe joints. Unless otherwise specified, for ductile iron water mains and steel pipe and casings, provide anodes as shown.~~

REVISED TO READ:

(c) Connection – **Provide anodes as shown.**

VII. MEASUREMENT AND PAYMENT

A. Revise Bid Item H.22 – Connection to Existing Spanaway Water System and 41st Avenue E as follows:

CURRENTLY READS:

The unit price shall cover the complete cost for providing all labor, materials, equipment for connections including excavation, haul disposal of waste, removal and disposal of the temporary pipe, pipe, fittings, joints, valves, shackle rods, couplings, cleaning, chlorinating, final connection, bedding material, replacement of bedding, backfill, compaction, installation of vaults and hatches, ladders, ladder extension systems, control valve, meter, pipe supports, rebar, concrete, anchors, gradings, topsoil, seeding, restoration, abandoning existing systems, and other items necessary to complete the connections to the existing water main per Contract Plans and Specifications. **Prices for connections shall include all pipe not called out with lengths and fittings not called out in the Plan/Profile View callouts and not provided by the District.** Payment shall be lump sum for each connection bid item.

REVISED TO READ:

The unit price shall cover the complete cost for providing all labor, materials, equipment for connections including excavation, haul disposal of waste, removal and disposal of the temporary pipe, pipe, fittings, joints, valves, shackle rods, couplings, cleaning, chlorinating, final connection, bedding material, replacement of bedding, backfill, compaction, installation of vaults and hatches, ladders, ladder extension systems, control valve, meter, pipe supports, rebar, concrete, anchors, gradings, topsoil, seeding, restoration, abandoning existing systems, **electrical and automatic control items as detailed in the Contract Plans and Specifications herein**, and other items necessary to complete the connections to the existing water main per Contract Plans and Specifications. **Prices for connections shall include all pipe not called out with lengths and fittings not called out in the Plan/Profile View callouts and not provided by the District.** Payment shall be lump sum for each connection bid item.

VIII. APPENDIX H – AUTOMATIC CONTROL SPECIFICATIONS

A. Add Appendix H – Automatic Control Specifications included as an attachment to this addendum.

IX. PLANS – SCHEDULE H

A. Revise Key Note No. 20 on Sheet 8 of the Schedule H Plans (DWG No. W04) as follows:

CURRENTLY READS:

Notify Olympic Pipe Line Company two working days prior to any construction within 25 feet of pipeline. Olympic ~~Pipeline~~ personnel shall be present during construction. 2' minimum clearance required between transmission main and pipeline. Construction shall conform to Olympic ~~Oil~~ requirements near pipeline. Trench shall be backfilled with CDF per specifications a minimum distance of 5 feet on either side of the pipeline.

REVISED TO READ:

Notify Olympic Pipe Line Company two working days prior to any construction within 25 feet of pipeline. Olympic **Pipe Line** personnel shall be present during construction. 2' minimum clearance required between transmission main **casing** and pipeline. Construction shall conform to Olympic **Pipe Line** ~~Oil~~ requirements near pipeline. Trench shall be backfilled with CDF per specifications a minimum distance of 5 feet on either side of the pipeline.

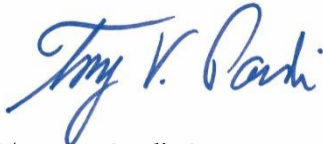
Attachments:

1. Appendix H – Automatic Control Specifications

End Revisions for Addendum No. 1

Addendum No. 1 is hereby made a part of these contract documents, and its terms and conditions are fully binding on the planholder and contractor. The contractor shall acknowledge receipt of this Addendum No. 1 by signing in the space provided below and attaching it to his/her proposal and fill out the Acknowledgement of Receipt of Addenda section on the Bid Forms. Failure to acknowledge this addendum may subject bidder to disqualification.

RH2 ENGINEERING, INC.



Tony V. Pardi, P.E.

Issued June 22, 2022

Received and acknowledged:

Contractor: _____

By: _____

Title: _____

Date: _____

APPENDIX H

Automatic Control Specifications

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DIVISION 17

SECTION 17000

CONTROL SYSTEM INTEGRATION

INSTRUMENTATION AND CONTROL (I&C)

PART 1 -- GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this Section:

1. International Society of Automation (ISA):
 - a. S5.1, Instrumentation Symbols and Identification.
 - b. S5.4, Standard Instrument Loop Diagrams.
 - c. S20, Specification Forms for Process Measurement and Control Instruments, Primary Elements and Control Valves.
 - d. S50.1, Compatibility of Analog Signals for Electronic Industrial Process Instruments.
2. National Electrical Manufacturers Association (NEMA):
 - a. 250, Enclosures for Electrical Equipment (1,000 Volts Maximum).
 - b. ICS 1, General Standards for Industrial Control and Systems.
3. National Institute of Standards and Technology (NIST).
4. Underwriters Laboratory, Inc. (UL): 508A, Standard for Safety, Industrial Control Panels.
5. National Electrical Code: NFPA 70.

1.02 SUMMARY

- A. This section covers all work necessary for adjusting, testing, documenting, and starting-up the Instrumentation and Control System.
- B. Supply Instrumentation and Field Devices. Major elements of this system include flow and pressure measurement. See complete list of devices required for this Section in paragraph section 2.
- C. Provide interconnect drawings for the electrical contractor to connect all devices identified by this section. Note that conduit and wiring between devices shall be provided and included as part of Appendix G – Electrical Specifications.
- D. Work includes furnishing, installing, calibrating, adjusting, testing, documenting, starting up, and Owner training for complete Instrumentation and Control (I&C). The system

integrator shall have unit responsibility of the implementation of the control system including end device programming and configuration in accordance with the design directives provided herein.

- E. Major parts are:
 - 1. Remote Telemetry Panel
 - 2. Primary elements, transmitters, and control devices.
 - 3. Networked Integration with equipment procured and delivered outside this Section.
- F. Installation of equipment supplied in this section shall be performed by the electrical and mechanical contractors as assigned by the General Contractor.

1.03 RELATED SECTIONS

- A. Electrical: See Appendix G and the specific responsibilities of the Control Systems Integrator.
- B. Control Panel with Application Software: See Section 17010 located in Appendix H – Automatic Control Specifications.

1.04 SPECIAL REQUIREMENTS

- A. The Contractor shall install components including those supplied, assembled and/or programmed by the System Integrator at the locations shown in the plans.
- B. The Contractor shall provide conduit, wiring and wire terminations per the project plan drawings. If the System Integrator determines the prescribed conduit schedule is inadequate for the construction of the control system, he shall submit a request for information (RFI) describing the concern.
- C. Contractor will provide conduit entry for a future communication service as identified by electrical sheets. A pull rope may be used in place of conductors for this future connection. Initial communication between this site and the master system shall be cellular based.
- D. Constrained within the scope of supply of equipment provided in this Section and related sections, the System Integrator shall provide instructions for wire and cable termination and energization of equipment included within this section's scope.
 - 1. The System Integrator shall provide instructions for the electrical contractor for termination of process field network (Profinet / Profibus) cabling in accordance with industry standards defined by the Profibus Organization. This will include the flowmeter. Slave address assignments in accordance with block diagram drawing set included as an attachment to the specifications.

2. The System Integrator shall provide a network diagram showing As Built wiring for network connected devices, indicating cable type, cable terminators and approximate conduit lengths for each segment.

1.05 DEFINITIONS

A. Abbreviations:

1. FCF: Flow Control Facility
2. FCV: Flow Control Valve
3. MCP: Main Control Panel.
4. I&C: Process Instrumentation and Control.
5. PLC: Programmable Logic Controller.
6. RTU: Remote Telemetry Unit
7. RIO: Remote I/O panels

B. Rising/Falling actions of discrete devices about their setpoints.

1. Rising contacts close when an increasing process variable rises through setpoint.
2. Falling contacts close when a decreasing process variable fall through setpoint.

C. Signal Types:

1. Analog Signals, Current Type:
 - a. 4 to 20 mA dc signals conforming to ISA S50.1.
 - b. Unless otherwise indicated for specific I&C Subsystem components, use the following ISA 50.1 options:
 - c. Transmitter Type: Number 2, two-wire.
 - d. Transmitter Load Resistance Capacity: Class L.
 - e. Fully isolated transmitters and receivers.
 - f. Analog Signals, Voltage Type: 1 to 5 volts dc within panels where a common high precision dropping resistor is used.
 - g. Discrete signals, two-state logic signals using dc or 120V ac sources as indicated.
2. Pulse Frequency Signals:
 - a. Direct current pulses whose repetition rate is linearly proportional to process variable.

- b. Pulses generated by contact closures or solid-state switches as indicated.
 - c. Power source less than 30V dc.
3. Network Communicated Signals: Process fieldbus data communicated over RS485 and Ethernet signal cables.

D. Instrument Tag Numbers:

1. A shorthand tag number notation is used in the Equipment Descriptions. For example: AI-2 [pH].

Notation	Explanation
PIT	ISA designator for Pressure Indicator Transmitter.
2	Loop number.
[A]	Same notation shown at 2 o'clock position on ISA circle symbol on P&ID. Refers to redundancy or detail in function.

1.06 SUBMITTALS

A. Action Submittals:

1. General:
- a. Shop Drawings, full-scaled details, wiring diagrams.
 - b. Identify proposed items and options. Identify installed spares and other provisions for future work (for example, reserved panel space; unused components, wiring, and terminals).
 - c. Legends and Abbreviation Lists:
 - d. Complete definition of symbols and abbreviations used on this Project (for example, engineering units, flow streams, instruments, structures, and other process items used in nameplates, legends, and data sheets).
2. Bill of Materials: List of required equipment.
- a. Group equipment items by enclosure and field, and within an enclosure, as follows:
 - b. I&C Components: By component identification code.
 - c. Other Equipment: By equipment type.
 - d. Data Included:
 - 1) Equipment tag number.
 - 2) Description.

- 3) Manufacturer, complete model number, and all options not defined by model number.
 - 4) Quantity supplied.
 - 5) Component identification code where applicable.
3. Field Instrument and Sensor Data: for
- a. I&C components supplied for installation by the mechanical and electrical contractors:
 - b. Catalog information, identifying proposed items and options.
 - c. Descriptive literature.
 - d. External power and signal connections.
 - e. Scaled drawings showing exterior dimensions and locations of electrical and mechanical interfaces.
4. Panel Construction Drawings:
- a. Scale Drawings:
 - b. Show dimensions and location of panel mounted devices, doors, louvers, and subpanels, internal and external.
 - c. Panel Legend:
 - d. List front of panel devices by tag numbers, nameplate inscriptions, service legends, and annunciator inscriptions.
 - e. Construction Details:
 - f. UL conformance, NEMA rating, materials, lifting lugs, mounting brackets, doorhinges and latches, and welding and other connection callouts and details.
 - g. Construction Notes:
 - h. Finishes, wire color schemes, wire ratings, wire and terminal block, numbering and labeling scheme.
5. Panel Control Diagrams: For discrete control and power circuits.
- a. Diagram Type: Ladder diagrams in format same as shown on Drawings. Include devices, related to discrete functions that are mounted in or on the panel and that require electrical connections.
 - b. Item Identification: Identify each item with attributes listed.
 - 6) Wires: Wire number and color. Cable number if part of multiconductor cable.
 - 7) Terminals: Location (enclosure number, terminal junction box number, or MCP number), terminal strip number, and terminal block number.
 - 8) Discrete Components:
 - 9) Tag number, terminal numbers, and location

- 10) Switching action (open or close on rising or falling process variable), setpoint value and units, and process variable description (for example, Sump Level High).
- 11) Relay Coils: Tag number and its function.
 - c. Ground wires, surge protectors, and connections.
 - d. Circuit Names: Show names corresponding to Circuit and Raceway Schedule for circuits entering and leaving a panel.
- 6. Panel Plumbing Diagrams:
 - a. For each panel containing piping and tubing. Show type and size for:
 - b. Pipes and Tubes: Thickness, pressure rating, and materials.
 - 12) Components: Valves, regulators, and filters.
 - 13) Connections to panel mounted devices.
 - 14) Panel interface connections.
- 7. Interconnecting Wiring Diagrams:
 - a. Diagrams, device designations, and symbols in accordance with NEMA ICS 1.
 - b. Show:
 - 15) Electrical connections between equipment, consoles, panels, terminal junction boxes, and field mounted components.
 - 16) Component and panel terminal board identification numbers, and external wire and cable numbers.
 - 17) Circuit names matching Circuit and Raceway Schedule.
- 8. Installation Details:
 - a. Include modifications or further details required to adequately define installation of I&C components.
- B. Informational Submittals:
 - 1. Per Section 01340 plus additional information requested below
 - 2. For I&C equipment, provide Manufacturer's Certificate of Proper Installation and readiness for operation.
 - 3. Owner Training Plan.
 - 4. Operation and Maintenance (O&M) Manual: Supply detailed O&M data on indexed and hyperlinked DVD.
 - a. Content and Format:
 - 18) DVD content hyperlinked from centralized index page.

- 19) Complete hardware information provided in pdf file format organized by manufacturer and item description.
 - 20) Sufficient detail to allow operation, removal, installation, adjustment, calibration, maintenance and purchasing replacements for each I&C component.
 - 21) Final versions of drawings reflecting installation As Built wiring.
- b. Include hard copy and digital copy:
- 22) Shop Drawings per the following items:
 - Bill of Materials.
 - Field Instrument Data Sheets.
 - Panel Plumbing Diagrams
 - Interconnecting Wiring Diagrams,
 - Application Software Operating Narrative
 - 23) Device O&M manuals indexed on DVD for components, electrical devices, and mechanical devices include:
 - Operations procedures.
 - Installation requirements and procedures.
 - Maintenance requirements and procedures.
 - Troubleshooting procedures.
 - Calibration procedures.
 - Internal schematic and wiring diagrams.
 - Component Calibration Sheets from field quality control calibrations.
5. Acceptance Tests:
- a. Test Procedure:
 - 24) Calibration confirmation of field instrument signals per Field Instrument Data Sheet specification.
 - 25) Paragraph by paragraph confirmation of project supplement attached control description.
 - b. Test Documentation: Copy of System Integrator signed off test procedures when tests are completed.

1.07 QUALITY ASSURANCE

- A. Calibration Instruments: Each instrument used for calibrating I&C equipment shall bear the seal of a reputable laboratory certifying that instrument has been calibrated within the previous 12 months to a standard endorsed by the NIST.
- B. Factory Calibration Records: Provide all factory instrument calibration record certifying instrument testing parameters. Instrument calibration from process measurement to local display and from local display to signal interface shall be demonstrated by either factory certified record or field testing and meet specified accuracy.

C. Coordination Meetings:

1. Location: Owner offices or jobsite by mutual agreement
2. Attended By: System Integrator, Electrical foreman, mechanical foreman, and General Contractor. Owner and/or Engineer may elect to attend meetings.
3. Notice: minimum five working day advance notice.
4. Meetings:
 - a. Pre-installation: within one week of delivery of equipment to jobsite to review installation requirements. Two to four hours are reserved for this purpose.
 - b. Pre-energization: System Integrator provides onsite review and approval of installed components and confirms wiring termination prior to energizing electrical circuits. Any devices not approved for energization are identified as exceptions to system integrator's installation certificate. Two to six hours are estimated for site review along with a one hour post review meeting.
 - c. Startup: System testing requirements are confirmed with General Contractor and electrical contractor. System Integrator will begin startup and acceptance testing following confirmation that all process equipment receive confirmation from the General Contractor that all process equipment is ready to begin
 - d. Minimum of one is required. Specific dates will be established in Progress Schedule.

1.08 DELIVERY, STORAGE, AND HANDLING

1. System Integrator will provide temperature-controlled warehouse storage for I&C equipment at its facility until Contractor requested delivery date.
2. Prior to installation at project location, store items in dry indoor locations. Provide heating in storage areas for items subject to corrosion under damp conditions.
3. Schedule delivery of electrical control panels and adjustable frequency drive units after interior painting is complete. Cover panels and other elements that are exposed to dusty construction environments.

1.09 ENVIRONMENTAL REQUIREMENTS

- A. Standard Environmental Requirements: Unless otherwise noted, design equipment for continuous operation in these environments:
1. Freestanding Panel and Consoles:
 - a. Inside, Air Conditioned: NEMA 1.
 - b. Inside: NEMA 12.
 - c. Outside: NEMA 4.

2. Wall Mounted Panels and Assemblies
 - a. Inside, Noncorrosive: NEMA 12.
 - b. All Other Locations: NEMA 4X.
 3. Field Elements:
 - a. Inside, Nema 12
 - b. Outside, Nema 4
 - c. Corrosive, Nema 4X
- B. Environmental Design Requirements: Following defines the types of environments referred to in the above.
1. Inside, Air Conditioned, Temperature:
 - a. Normal: 60 to 80 degrees F.
 - b. With Up to 4-Hour HVAC System Interruptions: 40 to 105 degrees F.
 2. Relative Humidity:
 - a. Normal: 10 percent (winter) to 70 percent (summer).
 - b. Up to 4-Hour HVAC System Interruption: 10 to 95 percent non-condensing
 3. Inside NEC Classification, nonhazardous.
 - a. Temperature: 20 to 104 degrees F.
 - b. Relative Humidity: 10 to 95 percent non-condensing.
 - c. NEC Classification: Nonhazardous.
 4. Inside, Corrosive:
 - a. Temperature: Minus 20 to 104 degrees F.
 - b. Relative Humidity: 10 to 95 percent non-condensing.
 - c. Corrosive Environment per drawing indication.
 - d. NEC Classification: Nonhazardous.
 5. Outside:
 - a. Temperature: Minus 20 to 104 degrees F.
 - b. Relative Humidity: 10 to 95 percent noncondensing, rain, snow, freezing rain.
 - c. NEC Classification: Nonhazardous.

1.10 SEQUENCING AND SCHEDULING

1. Activity Completion: The following is a list of key activities and their completion criteria:
 - a. Action Submittals: Reviewed and accepted.
 - b. Factory Test Complete: Hardware and Software is factory tested, packaged, and ready for shipment.
 - c. Modifications to existing SCADA Master System Complete
 - d. Acceptance Test: Completed and required test documentation accepted.

2. I&C Substantial Completion: When Owner issues Certificate of Substantial Completion.
 - a. Prerequisites:
 - 26) All I&C Submittals have been completed.
 - 27) System Integrator has successfully completed acceptance testing.
 - 28) Owner training plan is on schedule.
 - b. Finalization: When Engineer issues a written notice of Final Payment and Acceptance:
 - 29) Certificate of Substantial Completion issued for I&C.
 - 30) I&C Punch-list items completed.
 - 31) Final revisions to O&M manuals accepted.

3. Prerequisite Activities and Lead Times: Do not start the following key Project activities until the prerequisite activities and lead times listed below have been completed and satisfied:

<u>Activity</u>	<u>Prerequisites and Lead Times</u>
Submittal reviews by Engineer	Engineer acceptance of Submittal breakdown and schedule.
Hardware purchasing, fabrication, and assembly	Associated Shop Drawing Submittals completed.
Shipment	Completion of I&C Shop Drawing Submittals and preliminary O&M manuals.
Owner Training	Owner training plan completed
Acceptance Testing	Startup, Owner training, and test procedures completed

1.11 GUARANTEE

- B. The System Integrator shall repair or replace defective components, rectify malfunctions, correct faulty workmanship, all at no additional cost to the Owner during the warranty period.
- C. To fulfill this obligation, the System Integrator shall utilize qualified technical service personnel. Services shall be performed within five calendar days after notification by the Owner's Representative.

1.12 MEASUREMENT AND PAYMENT

- D. Payment for the work in this section shall be included as part of the lump-sum bid amount stated in the Proposal.

PART 2 -- MATERIALS

2.01 GENERAL

- 1. I&C functions as shown on Drawings and as required for each loop. Furnish equipment items as required and identified in this Section on the project drawings. Furnish all materials, equipment, and software, necessary to affect required system and loop performance.
- 2. Manufacturer: I&C design is based on Siemens equipment as preferred manufacturer for all automation and control equipment. Products have, therefore, been selected to be fully compatible and when possible, to match existing parts used throughout the Owner's control systems.
- 3. The District shall furnish field instruments and sensors for installation by the Contractor:

Equipment Item Letter	Tag (Blocks)	Loop Title	Instrument / Device Type
C	FE/FIT-1	Spanaway FCV Intertie: Station Flow meter	Magnetic Flowmeter
D	LSH-1	Spanaway Vault Flood Switch	Float Level Detection
E	PIT-1	Spanaway FCV Intertie: Lakewood zone Pressure	Gage Pressure
E	PIT-2	Spanaway FCV Intertie: Spanaway zone Pressure	Gage Pressure
F	ZS-1	Spanaway Vault Intrusion Switch	Limit Switch

- 4. The System Integrator shall furnish configuration for logic for the following sub-systems.
 - a. flowmeter – configure for slave address and data identified on block diagrams.

5. The System Integrator shall provide onsite services with support from electrical sub-contractor for a minimum of the time shown below. The System Integrator shall estimate time required for the skill set of the onsite technical staff that performs these tasks. Field staff who are unable to complete the required work may be rejected by Owner and require replacement with more qualified staff.
 - a. Pre-installation review with electrical and mechanical trade foreman. Provide four hours.
 - b. Pre-energization inspection and certificate of proper installation of I&C components. Provide one day.
 - c. Startup and Commissioning of supplied equipment. Provide one day at completion of station.
 - d. Acceptance Test and owner training. Provide six hours.

2.02 EQUIPMENT DESCRIPTIONS

- A. Instruments and field equipment supplied under this Section are identified on the drawings. Locations for mounting instruments and sensors may be shown on mechanical and electrical drawings.

2.03 NAMEPLATES AND TAGS

- A. Panel Nameplates: Enclosure identification located on the enclosure face.
 1. Location and Inscription: As shown.
 2. Materials: Laminated plastic attached to panel.
 3. Letters: 3/16-inch white on black background, unless otherwise noted.
- B. Component Nameplates—Back of Panel: Component identification located on or near component inside of enclosure.
 1. Inscription: Component tag number.
 2. Materials: Adhesive backed, laminated plastic.
 3. Letters: 3/16-inch white on black background, unless otherwise noted.
- C. Nametags: Component identification for field devices.
 1. Inscription: Component tag number.
 2. Materials: 16-gauge, Type 304 stainless steel, or adhesive backed laminated plastic.
 3. Letters: 3/16-inch.
 4. Mounting: Affix 304ss tags to component with 16- or 18-gauge stainless steel wire.

2.04 QUALITY CONTROL

- A. Scope: Inspect and test entire I&C to ensure it is ready for shipment, installation, and operation.
- B. Test: Exercise and test all functions.

PART 3 -- INSTRUMENTS AND FIELD SENSORS

3.01 FLOW ELEMENT AND TRANSMITTER, ELECTROMAGNETIC

- A. General:
 - 1. Function: Measure, indicate, and transmit the flow of a conductive process liquid in a full pipe.
 - 2. Type: Electromagnetic flowmeter, with operation based on Faraday's Law, utilizing the pulsed dc type coil excitation principle with high impedance electrodes. Full bore meter with magnetic field traversing entire flow-tube cross section.
- B. Components: Flow element, transmitter, mounting hardware.
- C. Application: potable water flow, suitable for liquids with a minimum conductivity of 5 microS/cm
- D. Operating Process Flow Temperature: 32 to 100 degrees F, typical
- E. Transmitter Operating Temperature: -5 to 140 degrees F
- F. Accuracy: Plus or minus 0.2 percent of rate for pipe velocities of 1 to 30 feet per second.
- G. Other features:
 - 1. No obstructions to flow.
 - 2. Very low pressure loss.
 - 3. Measures bi-directional flow.
- H. Process Connection:
 - 1. Meter Size (diameter inches): As noted.
 - 2. Connection Type: 150-pound ANSI raised-face flanges;
 - 3. AWWA C207, Table 2 Class D
 - 4. Flange Material: Carbon steel

- I. Power (Transmitter): 24vdc, unless otherwise noted.
- J. Element:
 - 1. Meter Tube Material and coating: Carbon Steel flanged ASTM A 105, 150 μm coating, unless otherwise noted.
 - 2. Liner Material: Ebonite Hard Rubber
 - 3. Electrode Material: Hastelloy
 - 4. Grounding: internal electrode
 - 5. Cable Glands / Terminal Box: $\frac{1}{2}$ " NPT / Fiberglass reinforced polyamide NEMA 4X/6
- K. Transmitter:
 - 1. Mounting: integral to meter, ability for remote mount without modification to transmitter unit.
 - 2. Digital LCD display, indicating flow rate and total.
 - 3. Bi-directional Flow Display: Required, unless otherwise noted.
 - 4. Forward and reverse flow rate.
 - 5. Forward, reverse and net totalization.
 - 6. Parameter Adjustments: By keypad or non-intrusive means.
 - 7. Enclosure: NEMA 4X, minimum, unless otherwise noted.
 - 8. Empty Pipe Detection: display and outputs to zero when empty pipe detected.
 - 9. Profibus network connection
 - 10. Signal Interface: 4-20mA, totalizer pulse, fault contact closure.
 - a. Built-in Diagnostic System:
 - 1) Field programmable electronics.
 - 2) Self-diagnostics with troubleshooting codes.
 - 3) Ability to program electronics with full scale flow, engineering units, meter size, zero flow cutoff, desired signal damping, totalizer unit digit value, etc.
 - b. Initial flow tube calibration and subsequent calibration checks.
 - 4) Factory Calibration:

- 5) Calibrated in an ISO 9001 and NIST certified factory.
- 6) Factory flow calibration system must be certified by volume

L. Manufacturer Data:

1. Siemens Industry, Process Division
 - a. Sensor (sizes 1" to 48" 150lb flange): 8" 7ME6580-4PJ14-2AA2
 - b. Transmitter: 7ME6920-1AA30-1AA0
 - c. Wall Mount Junction Box: FDK-085U1053
 - d. Profibus DP communication board, Profile 3: FDK: 085U0237
 - e. Lightning Protection, Coil & Electrode: FDK:085U0237 (Qty 2)
 - f. Submersible Kit: FDK-085U0220
 - g. Cables: A5E02296464 (49' each standard cable and special cable)

3.02 GAGE PRESSURE TRANSMITTER

A. General:

1. Function: Indicate the rise or fall of a liquid in a reservoir, tank, vault; increase or decrease of pressure in a pipeline, tank or vessel.

B. Type:

1. Body: Die Cast Aluminum
2. Diaphragm Fill Material: Silicone
3. Process Connection: 1/2"
4. Power: 24VDC
5. Display: Integral type, digital reading
6. Manufacturers and Products:
 - a. Siemens 7MF0300
7. Measuring:
 - a. Accuracy: 0.06% minimum
 - b. Range: Field Programmable
 - c. Units: Field Programmable
 - d. Span: provide model with largest percentage of available span
 - e. Output: 4-20mA + HART

- C. Protection:
 - 1. Lighting Protection: Provide surge suppressor for lighting protection
- D. Installation
 - 1. See Installation Details on Drawings
 - 2. Use ½” Process Connections unless otherwise noted
 - 3. Provide with steel wall mounting bracket
- E. Manufacturer Data:
 - 1. Siemens Industry, Process Division
 - a. Transmitter: 7MF0300-1QE01-5AM2-Z E01+E84+H01
 - b. Block and Bleed: 7MF90114FA
 - c. Transient Surge Unit: 16346-9112 or equivalent.

3.03 FLOAT SWITCH

- A. General:
 - 1. Function: Indicate the rise or fall of a liquid in a reservoir, tank or vault
- B. Type:
 - 1. Body: stainless stem, buna float housing
 - 2. Switch: SPST snap action type with a minimum 20VA rating
 - 3. Action: magnetic field, rising sensor, can be inverted for reverse logic
 - 4. Deadband: minimum of 0.25” differential between “On” and “Off position of switch
 - 5. Mercury Free construction
 - 6. Manufacturers and Products:
 - a. Pro Sense, type FLS-VL-400
- C. Mounting
 - 1. ¼” NPT male thread fitting
 - 2. Adapt to conduit with end fitting with ¼” NPT female threads.
 - 3. Set actuation limit by use of conduit clamp

- a. Set reservoir actuation at 4" under overflow
- b. Set pipe gallery actuation at 6" above floor

3.04 MECHANICAL SYSTEMS

A. Pressure Gauge: For other than process variable measurement.

1. Dial Size: Nominal 4.5-inch dial size.
2. Accuracy: 2 percent of span.
3. Scale Range: Such that normal operating pressure lies between 50 and 80 percent of scale range.
4. Connection: 1/4-inch NPT through bottom, unless otherwise noted.
5. Manufacturers and Products:
 - a. Ashcroft .
 - b. Marsh
 - c. Wika

B. Valve, Needle:

1. Materials: Brass body with 0.020-inch orifice.
2. Manufacturers and Products:
 - a. Whitey; Model 21RF2.
 - b. Hoke; 3700 Series.

C. ON/OFF Valves:

1. Type: Ball valve.
2. Materials: Brass.
3. Manufacturers and Products:
 - a. Whitey; Series 41 through Series 43.
 - b. Hoke; Flomite 7100 Series.

D. Tubing and Fittings:

1. Tubing: Copper
2. Fittings: Brass compression

3.05 DOOR/HATCH AJAR SENSORS (INDUSTRIAL LIMIT SWITCHES)

A. General:

1. Function: Indicate the opening of a door or hatch

B. Type:

1. Rating: Switches located inside the reservoir shall be rated NEMA type 6P, switches located in vaults shall be rated NEMA type 6P, limit switches located in pump stations shall be rated NEMA type 4
2. Switch Contacts: Provide a Form C contact position switch for industrial application use
3. Action: Limit switch shall have roller lever with snap action return. Actuation lever length shall be as required to accommodate installation but shall be no less than 3-inches
4. Temperature Rating: Switches shall be rated for use in temperatures ranging from 0°F to 104°F
5. Manufacturers and Products:
 - a. Switch: Siemens, 3SE03-AR16P(NEMA 4)
 - b. Roller Arm: Siemens, 3SX03-KL142

PART 4 -- EXECUTION

4.01 EXAMINATION

- A. For equipment not provided by I&C, but that directly interfaces with the I&C, verify the following conditions. If any devices fail to meet interface requirements, provide written notification to Contractor.
 1. Proper installation.
 2. Calibration and adjustment of positioners and transducers.
 3. Correct control action.
 4. Switch settings and dead bands.
 5. Opening and closing speeds and travel stops.
 6. Input and output signals.

4.02 INSTALLATION

- A. Material and Equipment Installation: Retain a copy of manufacturers' instructions at jobsite, available for review at all times.
- B. Electrical Wiring: As specified in Division 16, Electrical.
- C. Mechanical Systems:
 - 1. Drawings for I&C Mechanical Systems are diagrammatic and not intended to specifically define element locations or piping and tubing run lengths. Base materials and installations on field measurements.
 - 2. Plastic Tubing Supports: Except as shown on Drawings, provide continuous support in conduits or by aluminum tubing raceway system.
 - 3. Install tubing conduit for plastic tubing and tubing raceways parallel with, or at right angles to, structural members of buildings. Make vertical runs straight and plumb.
 - 4. Install conduits to I&C enclosures within areas permitted by manufacturer drawings. Top entry of conduits shall be avoided and if required, shall not be located in drip line of panel mounted equipment.
 - 5. Enclosure Lifting Rings: Remove rings following installation and plug holes.

4.03 PROTECTION

- A. Protect enclosures and other equipment containing electrical, instrumentation and control devices, including spare parts, from corrosion and moisture.
- B. During jobsite construction, protect I&C enclosures from exterior damage using cardboard, foam and similar temporary construction materials. Protect internal components from exposure to metal shavings and other construction debris by use of plastic wrap and tape.

4.04 CLEANING/ADJUSTING

- A. Repair affected surfaces to conform to type, quality, and finish of surrounding surface.
- B. Cleaning:
 - 1. Prior to startup of system using tubing, clear tubing of interior moisture and debris.
 - 2. Upon completion of Work, remove materials, scraps, and debris from interior and exterior of equipment.

4.05 FIELD QUALITY CONTROL

- A. Startup and Testing Team:

1. Thoroughly inspect installation, termination, and adjustment for components and systems.
 2. Complete onsite tests.
 3. Complete onsite training.
 4. Provide startup assistance.
- B. Operational Readiness Inspections and Calibrations: Prior to startup, inspect and test to ensure that entire I&C is ready for operation.
1. Loop/Component Inspections and Calibrations:
 - a. Check I&C for proper installation, calibration, and adjustment on a loop-by-loop and component-by-component basis.
 - b. Prepare component calibration sheet for each instrument.
 - 1) Project name.
 - 2) Loop number.
 - 3) Component tag number.
 - 4) Manufacturer for elements.
 - 5) Model number/serial number.
 - 6) Summary of functional requirements, for example:
 - 7) Transmitters/converters, input and output ranges.
 - 8) Calibrations, for example:
 - Analog Devices: Actual inputs and outputs at 0, 10, 50, and 100 percent of span, rising and falling.
 - Discrete Devices: Actual trip points and reset points.
 - Controllers: Mode settings (PID).
 - 9) Space for comments.
- C. Acceptance Tests: These are the activities performed by the Contractor and assisted by the System Integrator with respect to automatic control verification.
1. General:
 - a. Test all I&C elements to demonstrate that I&C satisfies all requirements.
 - b. Procedures, Forms, and Checklists:
 - 1) Conduct tests in accordance with, and documented on, Engineer accepted procedures, forms, and checklists.
 - 2) Sign-off after each test item after satisfactory completion.
 - c. Conducting Tests:

- 1) Provide special testing materials, equipment, and software.
 - 2) Wherever possible, perform tests using actual process variables, equipment, and data.
 - 3) If it is not practical to test with real process variables, equipment, and data, provide suitable means of simulation.
 - 4) Define simulation techniques in test procedures.
- d. Coordinate I&C testing with Owner and affected Subcontractors.
- 1) Excessive Test Witnessing: Refer to Supplementary Conditions.
2. Test Requirements:
- a. Perform local and manual tests for each loop before proceeding to remote and automatic modes. Where possible, verify test results using visual confirmation of process equipment and actual process variable. Unless otherwise directed, exercise and observe devices supplied by others, as needed to verify correct signals to and from such devices and to confirm overall system functionality.
 - b. Provide digital copy of startup/ acceptance testing manual and provide to Owner following each jobsite test period.

4.06 MANUFACTURER'S SERVICES

- A. Specialty Equipment: Provide the services of a qualified manufacturer's representative during installation, startup, and demonstration testing and Owner training.

4.07 TRAINING

A. General:

1. Provide an integrated training program to meet specific needs of Owner's personnel.
2. Include training sessions, for operators and maintenance personnel.
3. Provide instruction on one working shift as needed to accommodate the Owner's personnel schedule.
4. Owner reserves the right to make and reuse video of training sessions.

B. Operations and Maintenance Training:

1. Include a review of O&M manuals and survey of spares, expendables, and test equipment.
2. Use equipment similar to that provided or currently owned by Owner.

3. Provide training suitable for instrument technicians with at least a 2-year associate engineering or technical degree, or equivalent education and experience in electronics or instrumentation.

C. Operations Training:

1. Training Session Duration: 4-hour instructor day.
2. Number of Training Sessions: One.
3. Location: Jobsite.
4. Content: Conduct training on equipment type basis.
 - a. Operation: For example, AUTO/MANUAL control transfer, AUTO and MANUAL.

END OF SECTION

DIVISION 17

SECTION 17010

**PLC BASED CONTROL PANEL WITH APPLICATION SOFTWARE
(DISTRICT SUPPLIED)**

PART 1 -- GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this Section:

1. International Society of Automation (ISA):
 - a. S5.1, Instrumentation Symbols and Identification.
 - b. S5.4, Standard Instrument Loop Diagrams.
 - c. S20, Specification Forms for Process Measurement and Control Instruments, Primary Elements and Control Valves.
 - d. S50.1, Compatibility of Analog Signals for Electronic Industrial Process Instruments.
2. National Electrical Manufacturers Association (NEMA):
 - a. 250, Enclosures for Electrical Equipment (1,000 Volts Maximum).
 - b. ICS 1, General Standards for Industrial Control and Systems.
3. National Institute of Standards and Technology (NIST).
4. Underwriters Laboratory, Inc. (UL): 508A, Standard for Safety, Industrial Control Panels.
5. National Electrical Code: NFPA 70.

1.02 SUMMARY

A. This Section describes equipment, software and services supplied by the District to the Contractor for installation and integration into the overall control system. The Control and Telemetry System provided as part of this contract is an addition and modification to Lakewood Water District's existing system, which has been designed and furnished by S&B Inc.

B. The District will supply one PLC based control panel with application software, programmed to provide control of electrical equipment and monitor instruments as defined in the specifications. The Main FCF panel (RTU) is provided for installation at the Spanaway intertie. The control panel is UL508A listed and include application software as described in the project drawings. The PLC control panel dimensions are listed in section 2.01 3 a and provided on the block diagrams. The software functionality of the

equipment is described on the block diagram drawings included as an attachment to the specifications.

- C. The District will supply application software, SCADA screens, off-duty callout alarms and automation training for operators related to the use of the software programming. The Contractor is not required to perform work at the District Shops location and does not provide support services for Verizon Wireless communication.
- D. This Section is distinct and separate from Contractor provided equipment, installation and services as defined in Appendix G – Electrical Specifications and Section 17000 located in Appendix H – Automatic Control Specifications. Conduit and wiring between devices shall be provided and included as part of Appendix G.
- E. System Integration work to test the control system and field instruments is provided as part of Section 17000 System Integration.
- F. Control Panel features:
 - 1. Programmable Logic Controller (PLC) based station control panel.
 - 2. Application software development for PLC, HMI and SCADA systems.
 - 3. Connections for primary elements, transmitters, and control devices.
 - 4. Communication Module for TCP/IP connectivity
 - 5. Profibus master for Flowmeters
- G. The control panel provided as part of this Contract is an addition and modification to the Owner’s existing SCADA system, which was designed and furnished by S&B, Inc. For compatibility with their comprehensive system, design and software are provided by S&B, Inc.
- H. Installation of equipment supplied in this section shall be performed by the electrical and mechanical contractors as assigned by the General Contractor with interconnections defined by the System Integrator.

1.03 SPECIAL REQUIREMENTS

- A. The Contractor shall install the PLC control panels, test operation with equipment provided under separate sections and provide overall functional acceptance testing.
- B. The Contractor shall provide a schedule to receive the control panels from the District at the project site or a mutually agreeable alternate location. The Contractor shall protect equipment from adverse conditions including environmental, mechanical and electrical while in its possession. The contractor may request delivery of the control panels up to six months before scheduled start up.

- C. The Contractor shall supply configuration files for network connected equipment that is not provided by the System Integrator prior to completing submittal approval. The Contractor shall provide general station description (GSD) files and compliance certificates for the following type of equipment but not exclusively for flowmeters to demonstrate that the devices are certified by the Profibus organization (Profibus.org).

1.04 DEFINITIONS

A. Abbreviations:

1. FCF: Flow Control Facility
2. FCV: Flow Control Valve
3. MCP: Main Control Panel.
4. I&C: Process Instrumentation and Control.
5. PLC: Programmable Logic Controller.
6. RTU: Remote Telemetry Unit
7. RIO: Remote I/O panels

B. Rising/Falling actions of discrete devices about their setpoints.

1. Rising contacts close when an increasing process variable rises through setpoint.
2. Falling contacts close when a decreasing process variable falls through setpoint.

C. Signal Types:

1. Analog Signals, Current Type:
 - a. 4 to 20 mA dc signals conforming to ISA S50.1.
 - b. Unless otherwise indicated for specific I&C Subsystem components, use the following ISA 50.1 options:
 - c. Transmitter Type: Number 2, two-wire.
 - d. Transmitter Load Resistance CapaDistrict: Class L.
 - e. Fully isolated transmitters and receivers.
 - f. Analog Signals, Voltage Type: 1 to 5 volts dc within panels where a common high precision dropping resistor is used.
 - g. Discrete signals, two-state logic signals using dc or 120V ac sources as indicated.
2. Pulse Frequency Signals:

- a. Direct current pulses whose repetition rate is linearly proportional to process variable.
 - b. Pulses generated by contact closures or solid state switches as indicated.
 - c. Power source less than 30V dc.
3. Network Communicated Signals: Process fieldbus data communicated over RS485 and Ethernet signal cables.

D. Instrument Tag Numbers:

1. A shorthand tag number notation is used in the Equipment Descriptions. For example: AI-2 [pH].

Notation	Explanation
PIT	ISA designator for Pressure Indicator Transmitter.
2	Loop number.
[A]	Same notation shown at 2 o'clock position on ISA circle symbol on P&ID. Refers to redundancy or detail in function.

1.05 SUBMITTALS

A. Submittals supplied to the Contractor:

- 1. General:
 - a. Shop Drawings, full-scaled details, wiring diagrams.
 - b. Identify proposed items and options. Identify installed spares and other provisions for future work (for example, reserved panel space; unused components, wiring, and terminals).
 - c. Legends and Abbreviation Lists:
 - d. Complete definition of symbols and abbreviations used on this Project (for example, engineering units, flow streams, instruments, structures, and other process items used in nameplates, legends, and data sheets).
- 2. Panel Construction Drawings:
 - a. Scale Drawings:
 - 1) Show dimensions and location of panel mounted devices, doors, louvers, and subpanels, internal and external.
 - b. Panel Legend:
 - 1) List front of panel devices by tag numbers, nameplate inscriptions, service legends, and annunciator inscriptions.
 - c. Construction Details:

- 1) UL conformance, NEMA rating, materials, lifting lugs, mounting brackets, doorhinges and latches, and welding and other connection callouts and details.
- d. Construction Notes:
 - 1) Finishes, wire color schemes, wire ratings, wire and terminal block, numbering and labeling scheme.
3. Panel Control Diagrams: For discrete control and power circuits.
 - a. Diagram Type: Ladder diagrams in format same as shown on Drawings. Include devices, related to discrete functions, that are mounted in or on the panel and that require electrical connections.
 - b. Item Identification: Identify each item with attributes listed.
 - 1) Wires: Wire number and color. Cable number if part of multiconductor cable.
 - 2) Terminals: Location (enclosure number, terminal junction box number, or MCC number), terminal strip number, and terminal block number.
 - c. Discrete Components:
 - 1) Tag number, terminal numbers, and location
 - 2) Switching action (open or close on rising or falling process variable), setpoint value and units, and process variable description (for example, Sump Level High).
 - 3) Relay Coils: Tag number and its function.
 - d. Ground wires, surge protectors, and connections.
 - e. Circuit Names: Show names corresponding to Circuit and Raceway Schedule for circuits entering and leaving a panel.
- B. Informational Submittals:
 1. Operation and Maintenance (O&M) Manual: O&M data on indexed and hyperlinked DVD per District SCADA standard. DVD and paper copies of drawings and operating narrative.
 - a. Content and Format:
 - 1) DVD content hyperlinked from centralized index page.
 - 2) Complete hardware information provided in pdf file format organized by manufacturer and item description.
 - 3) Sufficient detail to allow operation, removal, installation, adjustment, calibration, maintenance and purchasing replacements for each I&C component.
 - 4) Final versions of drawings reflecting installation As Built wiring.

- 5) Final version of operating narrative to include any additional requirements determined during performance acceptance testing.
- b. Include hard copy and digital copy:
 - 1) Shop Drawings per the following items:
 - Bill of Materials.
 - Panel Control Diagrams.
 - Panel Wiring Diagrams
 - Application Software Operating Narrative
 - 2) Device O&M manuals indexed on DVD for components include:
 - Operations procedures.
 - Installation requirements and procedures.
 - Maintenance requirements and procedures.
 - Troubleshooting procedures.
 - Internal schematic and wiring diagrams.
2. Acceptance Tests:
 - a. Test Procedure:
 - 1) Section paragraph confirmation of Operating Narrative.

1.06 DELIVERY, STORAGE, AND HANDLING

1. Contractor will provide temperature controlled environment for storage of Control Panels prior to installation.
2. Prior to installation at project location, store items in dry indoor locations. Provide heating in storage areas for items subject to corrosion under damp conditions.
3. Schedule delivery of control panel after interior painting is complete. Cover panels and other elements that are exposed to dusty construction environments.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Standard Environmental Requirements: Unless otherwise noted, design equipment for continuous operation in these environments:
 1. Freestanding Panels and Assemblies
 - a. Inside, Noncorrosive: NEMA 12.
 - b. Outside, Noncorrosive: NEMA 4.
- B. Environmental Design Requirements: Following defines the types of environments referred to in the above.
 1. Relative Humidity:
 - a. Normal: 10 percent (winter) to 70 percent (summer).

- b. Up to 4-Hour HVAC System Interruption: 10 to 95 percent non-condensing
- 2. Inside NEC Classification, nonhazardous.
 - a. Temperature: 20 to 104 degrees F.
 - b. Relative Humidity: 10 to 95 percent non-condensing.
 - c. NEC Classification: Nonhazardous.

PART 2 -- MATERIALS

2.01 GENERAL

- 1. Manufacturer: Control Panel design is based on Siemens equipment as preferred manufacturer for all automation and control equipment. Products have, therefore, been selected to be fully compatible and when possible, to match existing parts used throughout the Owner’s control systems.
- 2. The instrumentation and control and telemetry system are designed to function as an integral part of the Owner’s comprehensive water telemetry, control, and reporting system in place at other facilities. This system is designed to allow new facilities to be constructed or existing facilities to be modified and then to be fully integrated as part of this overall system. The master telemetry unit and graphical user interface shall be modified to accommodate the new facilities specified and indicated on Drawings.
- 3. The District shall furnish control panels for installation by the Contractor.
 - a. Control Panels – Spanaway Intertie

The following control panels are covered by this Section:

Equipment Item Letter	Panel No.	Service	Mounting	NEMA	Dimensions H" x W" x D"	Location
	FVF (RTU)	Flow Control Facility (FCF) Panel Remote Telemetry Unit	Freestanding	3R (Outdoor)	72 x 36 x 36	Spanaway Intertie, near FCV vault
G	MB-1	Utility Meter Base and Disconnect Eleclosure	Wall mount	4 SS (Outdoor)		To side of RTU

- 4. The District shall furnish application software for logic and graphic display units for the following sub-systems.
 - a. Programmable Logic Controller (PLC) - application software for logic processing of automatic operation. Deliverable product in Siemens TIA Portal. Software loaded and factory tested in Siemens S7 PLC.
 - b. Human Machine Interface (HMI) – application software for graphic depiction of process signals and setpoint entries. Deliverable will include screen development for operation of pumps, and valve control systems. Deployment

will load to Siemens Unified Series color touch screens using TIA Portal software.

- c. Supervisory Control and Data Acquisition (SCADA), screen modification for the new Flow Control Stations to existing Siemens WinCC application at the District Shops location.
5. The District's Consultant (S&B) shall provide onsite services with support for electrical sub-contractor.
 - a. Pre-installation review with system integrator, electrical and mechanical trade foreman. Provide two hours.
 - b. Startup and Commissioning of control panel and SCADA link to master system. Provide two days at completion of construction.
 - c. Acceptance Test and owner training. Provide one day.

2.02 SYSTEM DESCRIPTION

A. General:

1. The Instrumentation, Control and SCADA system is designed to provide overall control for the Wholesale pumping system and Flow Control Stations using locally sensed pressure, flow, status conditions, and feedback from remote sensors.
2. The block diagrams illustrate electrical interconnection requirements between the I&C system and field equipment and sensors. The loop descriptions briefly describe each of the instrument loops and the major instrument components involved. The System Integrator shall be responsible for the design of the system and developing all software for the PLCs, Flow Control and GUI Systems
3. Any equipment or devices shown on Drawings as future are shown for information purposes. No future hardware shall be included as part of this Contract, "by others" hardware identifies materials supplied as part of the overall project and specified in sections outside of 17000 and 17010.
4. This specification section includes application software for the PLC units in the Wholesales Booster Stations, Spanaway Intertie Flow Control, District Shops panel and the SCADA master computer. At the RTU Panels, the PLC shall be programmed to provide local automatic as well as supervisory control of the station provided by the MTU PLC via the communications system. All alarm and control functions are monitored locally on the HMI as well as transmitted to the Master Telemetry Unit (MTU). Fail-safe features shall be included for all operations.
5. The District supplied Master PLC software provides the remote control and monitoring as shown on the Project Drawings. The GUI computer system monitors the station and provides instructions for the Master PLC to control the system.

2.03 CONTROL PANEL ELECTRICAL SPECIFICATION

- A. Control Panel Electrical Components, Terminals, Wires, and Enclosures: UL recognized, or UL listed.
- B. Wires within Enclosures:
 - 1. AC Circuits:
 - a. Type: 300-volt, Type MTW stranded copper.
 - b. Size: For current to be carried, but not less than 18 AWG.
 - 2. Analog Signal Circuits:
 - a. Type: 300-volt stranded copper, twisted shielded pairs.
 - b. Size: 20 AWG, minimum.
 - 3. Other dc Circuits.
 - a. Type: 300-volt, Type MTW stranded copper.
 - b. Size: For current carried, but not less than 18 AWG.
 - 4. Special Signal Circuits: Use manufacturer's standard cables.
 - 5. Wire Identification: Numbered and tagged at each termination.
 - a. Wire Tags: Machine printed, heat shrink.
 - b. Manufacturers: Brady PermaSleeve or Tyco Electronics.
- C. Wires entering or leaving enclosures, terminate and identify as follows:
 - 1. Analog and discrete signal, terminate at numbered terminal blocks.
 - 2. Special signals, terminated using manufacturer's standard connectors.
 - 3. Identify wiring in accordance with Section 16, Conductors.
- D. Terminal Blocks for Enclosures:
 - 1. Quantity:
 - a. Accommodate present and spare indicated needs.
 - b. Wire spare PLC I/O points to terminal blocks.
 - c. One wire per terminal for field wires entering enclosures.
 - d. Maximum of two wires per terminal for 18-WG wire for internal enclosure wiring.
 - e. Spare Terminals: 20 percent of all connected terminals, but not less than 5 per terminal block.

2. General:
 - a. Connection Type: Screw compression clamp.
 - b. Compression Clamp:
 - 1) Complies with DIN-VDE 0611.
 - 2) Hardened steel clamp with transversal groves that penetrate wire strands providing a vibration-proof connection.
 - 3) Guides strands of wire into terminal.
 - 4) Screws: Hardened steel, captive and self-locking.
 - 5) Current Bar: Copper or treated brass.
 - 6) Insulation:
Thermoplastic rated for minus 55 to plus 110 degree C.
Two funneled shaped inputs to facilitate wire entry.
 - 7) Mounting:
Standard DIN rail.
Terminal block can be extracted from an assembly without displacing adjacent blocks.
End Stops: Minimum of one at each end of rail.
 - 8) Wire preparation: Stripping only permitted.
 - 9) Jumpers:
Allow jumper installation without loss of space on terminal or rail.
 - 10) Marking System:
Terminal number shown on both sides of terminal block
Allow use of preprinted and field marked tags.
Terminal strip numbers shown on end stops.
Mark terminal block and terminal strip numbers as shown on Panel Control Diagrams and Loop Diagrams.
Fuse Marking for Fused Terminal Blocks: Fuse voltage and amperage rating shown on top of terminal block.
3. Terminal Block, General-Purpose:
 - a. Rated Voltage: 600V ac.
 - b. Rated Current: 30 amp.
 - c. Wire Size: 22 AWG to 10 AWG.
 - d. Rated Wire Size: 10 AWG.
 - e. Color: Beige body.
 - f. Spacing: 0.25 inch, maximum.
 - g. Test Sockets: One screw test socket 2.3 mm diameter.
 - h. Manufacturer and Product: Siemens; 8WA1011.

4. Terminal Block, Ground:
 - a. Wire Size: 22 AWG to 12 AWG.
 - b. Rated Wire Size: 12 AWG.
 - c. Color: Green and yellow body.
 - d. Spacing: 0.25 inch, maximum.
 - e. Grounding: Ground terminal blocks electrically grounded to the mounting rail.
 - f. Manufacturer and Product: Siemens; 8WA1011-1PH00.

5. Terminal Block, Fused, 24V dc:
 - a. Rated Voltage: 600V dc.
 - b. Rated Current: 16-amp.
 - c. Wire Size: 22 AWG to 10 AWG.
 - d. Rated Wire Size: 10 AWG.
 - e. Color: Grey body.
 - f. Fuse: 0.25 inch by 1.25 inches.
 - g. Indication: LED diode 24V dc.
 - h. Spacing: 0.512 inch, maximum.
 - i. Manufacturer and Product: Siemens; 8WA1011-1SF31.

6. Terminal Block, Fused, 120V ac:
 - a. Rated Voltage: 600V ac.
 - b. Rated Current: 16-amp.
 - c. Wire Size: 22 AWG to 10 AWG.
 - d. Rated Wire Size: 10 AWG.
 - e. Color: Grey body.
 - f. Fuse: 0.25 inch by 1.25 inches.
 - g. Indication: Neon Lamp 110V ac.
 - h. Leakage Current: 1.8 mA, maximum.
 - i. Spacing: 0.512 inch, maximum
 - j. Manufacturer and Product: Siemens; 8WA1011-1SF32.

E. Grounding of Enclosures:

1. Furnish isolated copper grounding bus for signal and shield ground connections.

2. Ground bus grounded at a common signal ground point in accordance with National Electrical Code requirements.
3. Single Point Ground for Each Analog Loop:
 - a. Locate at dc power supply for loop.
 - b. Use to ground wire shields for loop.
4. Ground terminal block rails to ground bus.

F. Power Distribution within Panels:

1. Feeder Circuits:
 - a. One or more 120V ac, 60-Hz feeder circuits as shown on Drawings.
 - b. Provisions for feeder circuit conduit entry.
 - c. Furnish terminal board for termination of wires.
2. Power Panel: Furnish main circuit breaker and a circuit breaker on each individual branch circuit distributed from power panel.
 - a. Locate to provide clear view of and access to breakers when door is open.
 - b. Breaker sizes: Coordinate such that fault in branch circuit will blow only branch breaker but not trip the main breaker.
 - c. Branch Circuit Breaker: UL489 type breaker, 250V ac, DIN rail mounting.
 - d. Breaker Manufacturer and Product: Siemens; 5SJ4.
3. Circuit Wiring: P&IDs and Control Diagrams on Drawings show function only. Use following rules for actual circuit wiring:
 - a. Devices on Single Circuit: 20, maximum.
 - b. Multiple Units Performing Parallel Operations: To prevent failure of any single branch circuit from shutting down entire operation, do not group all units on same branch circuit.
 - c. Branch Circuit Loading: 12 amperes continuous, maximum.
 - d. Panel Lighting and Service Outlets: Put on separate 15-amp, 120V ac branch circuit.
 - e. Provide 120Vac plug mold for panel components with line cords.

G. Signal Distribution:

1. Within Panels: 4 to 20 mA dc signals may be distributed as 1 to 5V dc.
2. Outside Panels: Isolated 4 to 20 mA dc only.
3. All signal wiring twisted in shielded pairs.

H. Signal Switching:

1. Use dry circuit type relays or switches.
2. No interruption of 4 to 20 mA loops during switching.
3. Switching transients in associated signal circuit:
 - a. 4 to 20 mA dc Signals: 0.2 mA, maximum.
 - b. 1 to 5V dc Signals: 0.05V, maximum.

I. Relays:

1. General:
 - a. Relay Mounting: Plug-in type socket.
 - b. Relay Enclosure: Furnish dust cover.
 - c. Socket Type: Screw terminal interface with wiring.
 - d. Socket Mounting: Rail.
 - e. Provide holddown clips.
2. Signal Switching Relay:
 - a. Type: Dry circuit.
 - b. Contact Arrangement: 2 Form C contacts.
 - c. Contact Rating: 0 to 5 amps at 28V dc or 120V ac.
 - d. Contact Material: Gold or silver.
 - e. Coil Voltage: As noted or shown.
 - f. Coil Power: 0.9 watts (dc), 1.2VA (ac).
 - g. Expected Mechanical Life: 10,000,000 operations.
 - h. Expected Electrical Life at Rated Load: 100,000 operations.
 - i. Indication Type: Neon or LED indicator lamp.
 - j. Seal Type: Hermetically sealed case.
 - k. Manufacturer and Product: Siemens; 3TX7111.
3. Control Circuit Switching Relay, Nonlatching:
 - a. Type: Compact general-purpose plug-in.
 - b. Contact Arrangement: Form C contacts.
 - c. Contact Rating: 10A at 28V dc or 240V ac.
 - d. Contact Material: Silver cadmium oxide alloy.

- e. Coil Voltage: As noted or shown.
- f. Coil Power: 1.8 watts (dc), 2.7VA (ac).
- g. Expected Mechanical Life: 10,000,000 operations.
- h. Expected Electrical Life at Rated Load: 100,000 operations.
- i. Indication Type: Neon or LED indicator lamp.
- j. Push to test button.
- k. Manufacturer and Product: Siemens; 3TX7111.

J. Power Supplies:

- 1. Furnish to power instruments requiring external dc power, including two-wire transmitters and dc relays.
- 2. Convert 120V ac, 60-Hz power to dc power of appropriate voltage(s) with sufficient voltage regulation and ripple control to assure that instruments being supplied can operate within their required tolerances.
- 3. Provide output over voltage and over current protective devices to:
- 4. Protect instruments from damage due to power supply failure.
- 5. Protect power supply from damage due to external failure.
- 6. Enclosures: NEMA 1 in accordance with NEMA 250.
- 7. Mount such that dissipated heat does not adversely affect other components.
- 8. Fuses: For each dc supply line to each individual two-wire transmitter.
 - a. Type: Indicating.
 - b. Mount so fuses can be easily seen and replaced.

K. Service Outlets for Freestanding Panels:

- 1. Type: Three-wire, 120-volt, 15-ampere, GFCI duplex receptacles.
- 2. Quantity:
 - a. For panels 4 feet wide and smaller: One.
 - b. For panels wider than 4 feet: One for every 4 feet of panel width, two minimum per panel.

2.04 SPARE PARTS

Description	Percent of Each Type and Size Used	No Less Than
Fuses	20	5
Relays	20	2

2.05 FABRICATION

1. General:
 - a. Panels with external dimensions and instruments arrangement as shown on Drawings.
 - b. Panel Construction and Interior Wiring: In accordance with the National Electrical Code, state and local codes, NEMA, ANSI, UL, and ICECA.
 - c. Factory Assembly: Assemble panels at the manufacturer's factory. No fabrication other than correction of minor defects or minor transit damage shall be done on panels at jobsite.
 - d. UL Listing Mark for Enclosures: Mark stating "Listed Enclosed Industrial Control Panel" per UL 508A.
2. Wiring Within I&C Panels:
 - a. Restrain by plastic ties or ducts or metal raceways.
 - b. Hinge Wiring: Secure at each end so that bending or twisting will be around longitudinal axis of wire. Protect bend area with sleeve.
 - c. Arrange wiring neatly, cut to proper length, and remove surplus wire.
 - d. Abrasion protection for wire bundles which pass through holes or across edges of sheet metal.
 - e. Connections to Screw Type Terminals:
 - 1) Locking-fork-tongue or ring-tongue lugs.
 - 2) Use manufacturer's recommended tool with required sized anvil to make crimp lug terminations.
 - 3) Wires terminated in a crimp lug, maximum of one.
 - 4) Lugs installed on a screw terminal, maximum of two.
 - f. Connections to Compression Clamp Type Terminals:
 - 1) Strip, prepare, and install wires in accordance with terminal manufacturer's recommendations.
 - 2) Wires installed in a compression screw and clamp, maximum of one for field wires entering enclosure, otherwise maximum of two.

- g. Splicing and tapping of wires, allowed only at device terminals or terminal blocks.
 - h. Terminate 24V dc and analog signal circuits on separate terminal block from ac circuit terminal blocks.
 - i. Separate analog and dc circuits by at least 6 inches from ac power and control wiring, except at unavoidable crossover points and at device terminations.
 - j. Arrange wiring to allow access for testing, removal, and maintenance of circuits and components.
 - k. Plastic Wire Ducts Fill: Do not exceed manufacturer's recommendation.
3. Temperature Control:
- a. Nonventilated Panels: Size to adequately dissipate heat from equipment mounted inside panel or on panel.
4. Freestanding Panel Construction:
- a. Materials: Sheet steel, unless otherwise shown on Drawings with minimum thickness of 10-gauge, unless otherwise noted.
 - b. Panel Fronts:
 - 1) Fabricated from a single piece of sheet steel, unless otherwise shown on Drawings.
 - 2) No seams or bolt heads visible when viewed from front.
 - 3) Panel Cutouts: Smoothly finished with rounded edges.
 - 4) Stiffeners: Steel angle or plate stiffeners or both on back of panel face to prevent panel deflection under instrument loading or operation.
 - c. Internal Framework:
 - 1) Structural steel for instrument support and panel bracing.
 - 2) Permit panel lifting without racking or distortion.
 - d. Lifting rings to allow simple, safe rigging and lifting of panel during installation.
 - e. Adjacent Panels: Securely bolted together so front faces are parallel.
 - f. Doors: Full height, fully gasketed access doors where shown on Drawings.
 - 1) Latches: Three-point, Southco Type 44.
 - 2) Handles: "D" ring, foldable type.
 - 3) Hinges: Steel hinges with stainless steel pins.
 - 4) Rear Access Doors: Extend no further than 24 inches beyond panel when opened to 90-degree position.
 - 5) Front and Side Access Doors: As shown on Drawings.

5. Non-freestanding Panel Construction:
 - a. Based on environmental design requirements required and referenced in Article Environmental Requirements, provide the following:
 - b. For panels listed as inside, air conditioned:
 - 1) Enclosure Type: NEMA 12 in accordance with NEMA 250.
 - 2) Materials: Steel.
 - c. Metal Thickness: 14-gauge, minimum.
 - d. Doors:
 - 1) Rubber-gasketed with continuous hinge.
 - 2) Stainless steel lockable quick-release clamps.
6. Factory Finishing:
 - a. Enclosures:
 - 1) Stainless Steel and Aluminum: Not painted.
 - 2) Nonmetallic Panels: Not painted.
 - 3) Steel Panels:

Sand panel and remove mill scale, rust, grease, and oil.
Fill imperfections and sand smooth.
Paint panel interior and exterior with one coat of epoxy coating metal primer, two finish coats of two-component type epoxy enamel.
Sand surfaces lightly between coats.
Dry Film Thickness: 3 mils, minimum.
Manufacturer's standard finish color:
 Inside: Powder Coat RAL 5015 Blue
 Outside: Powder Coat White

2.06 QUALITY CONTROL

- A. Scope: Tested by manufacturer to meet project specification.
- B. Location: Manufacturer's factory or Owner approved staging Site.
- C. Test: Exercise and test all functions.

2.07 PROTECTION

- A. Protect enclosures and other equipment containing electrical, instrumentation and control devices, including spare parts, from corrosion and moisture.

- B. During jobsite construction, protect I&C enclosures from exterior damage using cardboard, foam and similar temporary construction materials. Protect internal components from exposure to metal shavings and other construction debris by use of plastic wrap and tape.

2.08 FIELD QUALITY CONTROL

A. Startup and Testing Team:

1. Thoroughly inspect installation, termination, and adjustment for components and systems.
2. Complete onsite tests.
3. Complete onsite training.
4. Provide startup assistance.

B. Operational Readiness Inspections and Calibrations: Prior to startup, inspect and test to ensure that entire I&C is ready for operation.

1. Loop/Component Inspections and Calibrations:
 - a. Check software for proper response with logic, timing and tuning parameters as necessary to achieve the requirements identified in the project drawings and control strategy narratives. Adjust on a loop-by-loop basis.

C. Acceptance Tests: These are the activities performed by the Contractor and assisted by the System Integrator with respect to automatic control verification.

1. General:
 - a. Test all I&C elements to demonstrate that I&C satisfies all requirements.
 - b. Procedures, Forms, and Checklists:
 - 1) Conduct tests in accordance with, and documented on, Engineer accepted procedures, forms, and checklists.
 - 2) Sign-off after each test item after satisfactory completion.
 - c. Conducting Tests:
 - 1) Provide special testing materials, equipment, and software.
 - 2) Wherever possible, perform tests using actual process variables, equipment, and data.
 - 3) If it is not practical to test with real process variables, equipment, and data, provide suitable means of simulation.
 - 4) Define simulation techniques in test procedures.
 - d. Coordinate I&C testing with Owner and affected Subcontractors.
 - 1) Excessive Test Witnessing: Refer to Supplementary Conditions.

2. Test Requirements:

- a. Once facility has been started up and is operating, perform a witnessed Acceptance Test on complete I&C to demonstrate that it is operating as required. Demonstrate each required function on a paragraph-by-paragraph and loop-by-loop basis.
- b. Perform local and manual tests for each loop before proceeding to remote and automatic modes. Where possible, verify test results using visual confirmation of process equipment and actual process variable. Unless otherwise directed, exercise and observe devices supplied by others, as needed to verify correct signals to and from such devices and to confirm overall system functionality.
- c. Update operating narrative documentation as required to align with settings and conditions observed during Acceptance Testing.
- d. Provide digital copy of startup/ acceptance testing manual and provide to Owner following each jobsite test period.

2.09 MANUFACTURER'S SERVICES

- A. Specialty Equipment: Provide the services of a qualified manufacturer's representative during installation, startup, and demonstration testing and Owner training.

2.10 TRAINING

A. General:

1. Provide an integrated training program to meet specific needs of Owner's personnel.
2. Include training sessions, for operators and maintenance personnel.
3. Provide instruction on one working shift as needed to accommodate the Owner's personnel schedule.
4. Owner reserves the right to make and reuse video tapes of training sessions.

B. Operations and Maintenance Training:

1. Include a review of O&M manuals and survey of spares, expendables, and test equipment.
2. Use equipment similar to that provided or currently owned by Owner.
3. Provide training suitable for instrument technicians with at least a 2-year associate engineering or technical degree, or equivalent education and experience in electronics or instrumentation.

C. Operations Training:

1. Training Session Duration: 4-hour instructor day.

2. Number of Training Sessions: One.
3. Location: Jobsite.
4. Content: Conduct training on loop-by-loop basis.
 - a. Loop Functions: Understanding of loop functions, including interlocks for each loop.
 - b. Loop Operation: For example, adjusting process variable setpoints, AUTO/MANUAL control transfer, AUTO and MANUAL control, annunciator acknowledgement and resetting.

PART 3 -- CONTROL STRATEGIES

3.01 INTERTIE FLOW CONTROL FACILITY (FCF) CONTROL STRATEGIES

- A. The SCADA system provides remote supervisory control of the flow control valve. The valve is in the full open position unless it is being exercised for maintenance purposes or when two or more interties are in operation.
- B. The SCADA RTU controls interface with the flowmeter using Profibus communication. The Profibus communication connects the PLC, providing all information pertinent about flow rate and flow total. This information is used to track water usage.
- C. Fail-safe logic shall include protection against high flow and broken pipe conditions.
- D. Supervisory control is provided by the GUI to override any automatic controls.
- E. Data Exchange: Flow Control Facility RTU is capable of the following communication protocols. Profibus, Profinet, Modbus TCP, Ethernet /IP (using the HMI as a whiteboard), and Modbus RTU.
- F. System Integrator will coordinate with Partners for Datapass communication protocol. All analog and setpoints are scaled values. The following whiteboard example defines the datapass area between the FCF RTU and the Partner RTU / system:

FCF RTU (Lakewood)	RTU (Partner)	#	Value	Definition
DB3xx.DBW46	40001.00	#		Lakewood to Partner Commands #1
DB3xx.DBX47.0	40001.00	0	1	MTU handshake
DB3xx.DBX47.1	40001.01	1	2	Wholesale Pump 1 Called
DB3xx.DBX47.2	40001.02	2	4	Wholesale Pump 1 Running
DB3xx.DBX47.3	40001.03	3	8	Wholesale Pump 2 Called
DB3xx.DBX47.4	40001.04	4	16	Wholesale Pump 2 Running
DB3xx.DBX47.5	40001.05	5	32	Wholesale Pump 3 Called
DB3xx.DBX47.6	40001.06	6	64	Wholesale Pump 3 Running
DB3xx.DBX47.7	40001.07	7	128	Wholesale Pump 4 Called
DB3xx.DBX46.0	40001.08	8	256	Wholesale Pump 4 Running
DB3xx.DBX46.1	40001.09	9	512	
DB3xx.DBX46.2	40001.10	10	1024	

DB3xx.DBX46.3	40001.11	11	2048	
DB3xx.DBX46.4	40001.12	12	4096	
DB3xx.DBX46.5	40001.13	13	8192	
DB3xx.DBX46.6	40001.14	14	16384	New Setpoint Received
DB3xx.DBX46.7	40001.15	15	32768	Setpoint Completed
DB3xx.DBW48 40002.00				Lakewood to Partner Commands #2
DB3xx.DBX49.0	40002.00	0	1	Wholesale Site communication Link Down
DB3xx.DBX49.1	40002.01	1	2	District Communication Link Down
DB3xx.DBX49.2	40002.02	2	4	
DB3xx.DBX49.3	40002.03	3	8	
DB3xx.DBX49.4	40002.04	4	16	
DB3xx.DBX49.5	40002.05	5	32	
DB3xx.DBX49.6	40002.06	6	64	
DB3xx.DBX49.7	40002.07	7	128	
DB3xx.DBX48.0	40002.08	8	256	
DB3xx.DBX48.1	40002.09	9	512	
DB3xx.DBX48.2	40002.10	10	1024	
DB3xx.DBX48.3	40002.11	11	2048	
DB3xx.DBX48.4	40002.12	12	4096	
DB3xx.DBX48.5	40002.13	13	8192	
DB3xx.DBX48.6	40002.14	14	16384	Shutdown Requested
DB3xx.DBX48.7	40002.15	15	32768	Shutdown Complete
				Lakewood to Partner Setpoints
DB3xx.DBW50	40003	1		Wholesale Pump Station Flow Rate
DB3xx.DBW52	40004	2		Networked (Profibus) Flow Rate (xxxx gpm)
DB3xx.DBW54	40005	3		Flow Total Today (x.xxx MG)
DB3xx.DBW56	40006	4		Flow Total Yesterday (x.xxx MG)
DB3xx.DBW58	40007	5		Minimum Flow Setpoint
DB3xx.DBW60	40008	6		Maximum Flow Setpoint
DB3xx.DBW62	40009	7		Wholesale Station Zone HGL (xxx.x ft.)
DB3xx.DBW64	40010	8		At Intertie Local Pipeline Zone HGL (xxx.x ft.)
DB3xx.DBW66	40011	9		At Intertie Partner Side Zone HGL (xxx.x ft.)
DB3xx.DBW68	40012	10		
DB3xx.DBW70	40013	11		
DB3xx.DBW72	40014	12		
DB3xx.DBW74	40015	13		
DB3xx.DBW76	40016	14		
DB3xx.DBW78	40017	15		
DB3xx.DBW80	40018	16		
DB3xx.DBW82	40019	17		
DB3xx.DBW84	40020	18		
DB3xx.DBW100 40021.00				Partner to Lakewood Digital Events 1
DB3xx.DBX101.0	40021.01	0	1	RTU Handshake
DB3xx.DBX101.1	40021.02	1	2	New Flow SP requested
DB3xx.DBX101.2	40021.03	2	4	
DB3xx.DBX101.3	40021.04	3	8	

DB3xx.DBX101.4	40021.05	4	16
DB3xx.DBX101.5	40021.06	5	32
DB3xx.DBX101.6	40021.07	6	64
DB3xx.DBX101.7	40021.08	7	128
DB3xx.DBX100.0	40021.09	8	256
DB3xx.DBX100.1	40021.10	9	512
DB3xx.DBX100.2	40021.11	10	1024
DB3xx.DBX100.3	40021.12	11	2048
DB3xx.DBX100.4	40021.13	12	4096
DB3xx.DBX100.5	40021.14	13	8192
DB3xx.DBX100.6	40021.15	14	16384
DB3xx.DBX100.7	40021.16	15	32768

DB3xx.DBW102 40022.00

DB3xx.DBX103.0	40022.01	0	1
DB3xx.DBX103.1	40022.02	1	2
DB3xx.DBX103.2	40022.03	2	4
DB3xx.DBX103.3	40022.04	3	8
DB3xx.DBX103.4	40022.05	4	16
DB3xx.DBX103.5	40022.06	5	32
DB3xx.DBX103.6	40022.07	6	64
DB3xx.DBX103.7	40022.08	7	128
DB3xx.DBX102.0	40022.09	8	256
DB3xx.DBX102.1	40022.10	9	512
DB3xx.DBX102.2	40022.11	10	1024
DB3xx.DBX102.3	40022.12	11	2048
DB3xx.DBX102.4	40022.13	12	4096
DB3xx.DBX102.5	40022.14	13	8192
DB3xx.DBX102.6	40022.15	14	16384
DB3xx.DBX102.7	40022.16	15	32768

Partner to Lakewood Digital Events 2

Partner Communication Link Down

Request Shutdown
Shutdown Complete

Partner to Lakewood Analog

DB3xx.DBW104	40023	1
DB3xx.DBW106	40024	2
DB3xx.DBW108	40025	3
DB3xx.DBW110	40026	4
DB3xx.DBW112	40027	5
DB3xx.DBW114	40028	6
DB3xx.DBW116	40029	7
DB3xx.DBW118	40030	8
DB3xx.DBW120	40031	9
DB3xx.DBW122	40032	10
DB3xx.DBW124	40033	11
DB3xx.DBW126	40034	12
DB3xx.DBW128	40035	13
DB3xx.DBW130	40036	14
DB3xx.DBW132	40037	15
DB3xx.DBW134	40038	16
DB3xx.DBW136	40039	17

Requested Flow Setpoint (xxxx gpm)
Water Quality Chlorine Residual (x.xxx ppm)
Water Quality pH (xx.xx)

END OF SECTION