



State of West Virginia
 Department of Administration
 Purchasing Division
 2019 Washington Street East
 Post Office Box 50130
 Charleston, WV 25305-0130

Request for Quotation

RFQ NUMBER
DEP13905

PAGE
1

ADDRESS CORRESPONDENCE TO ATTENTION OF
CHUCK BOWMAN 304-558-2157

RFQ COPY
 TYPE NAME/ADDRESS HERE

VENDOR

SHIP TO

ENVIRONMENTAL PROTECTION
 DEPARTMENT OF
 OFFICE OF AML&R
 601 57TH STREET SE
 CHARLESTON, WV
 25304 304-926-0499

DATE PRINTED	TERMS OF SALE	SHIP VIA	F.O.B.	FREIGHT TERMS
06/04/2007				

BID OPENING DATE: 06/14/2007 BID OPENING TIME 01:30PM

LINE	QUANTITY	UOP	CAT NO	ITEM NUMBER	UNIT PRICE	AMOUNT
***** ADDENDUM NO. 4 *****						
ADDENDUM #4 ISSUED FOR GLEN ROGERS WATERLINE EXTENSION PROJECT TO DISTRIBUTE THE VENDOR QUESTIONS AND ENGINEER ANSWERS, SKETCHES, REVISED SPECIFICATIONS, AND BID SCHEDULE.						
THE BID OPENING DATE AND TIME REMAIN 06/14/07 AT 1:30 PM.						
***** NO OTHER CHANGES *****						
0001		JB		962-73		
RECLAMATION: RESTORATION OF LAND & OTHER PROPERTIES						

SEE REVERSE SIDE FOR TERMS AND CONDITIONS

SIGNATURE	TELEPHONE	DATE
TITLE	FEIN	ADDRESS CHANGES TO BE NOTED ABOVE

WHEN RESPONDING TO RFQ, INSERT NAME AND ADDRESS IN SPACE ABOVE LABELED 'VENDOR'

**GENERAL TERMS & CONDITIONS
REQUEST FOR QUOTATION (RFQ) AND REQUEST FOR PROPOSAL (RFP)**

1. Awards will be made in the best interest of the State of West Virginia.
2. The State may accept or reject in part, or in whole, any bid.
3. All quotations are governed by the *West Virginia Code* and the *Legislative Rules* of the Purchasing Division.
4. Prior to any award, the apparent successful vendor must be properly registered with the Purchasing Division and have paid the required \$125.00 registration fee.
5. All services performed or goods delivered under State Purchase Orders/Contracts are to be continued for the term of the Purchase Order/Contract, contingent upon funds being appropriated by the Legislature or otherwise being made available. In the event funds are not appropriated or otherwise available for these services or goods, this Purchase Order/Contract becomes void and of no effect after June 30.
6. Payment may only be made after the delivery and acceptance of goods or services.
7. Interest may be paid for late payment in accordance with the *West Virginia Code*.
8. Vendor preference will be granted upon written request in accordance with the *West Virginia Code*.
9. The State of West Virginia is exempt from federal and state taxes and will not pay or reimburse such taxes.
10. The Director of Purchasing may cancel any Purchase Order/Contract upon 30 days written notice to the seller.
11. The laws of the State of West Virginia and the *Legislative Rules* of the Purchasing Division shall govern all rights and duties under the Contract, including without limitation the validity of this Purchase Order/Contract.
12. Any reference to automatic renewal is hereby deleted. The Contract may be renewed only upon mutual written agreement of the parties.
13. **BANKRUPTCY:** In the event the vendor/contractor files for bankruptcy protection, this contract is automatically null and void, and is terminated without further order.
14. **HIPAA Business Associate Addendum** - The West Virginia State Government HIPAA Business Associate Addendum (BAA), approved by the Attorney General, and available online at the Purchasing Division's web site (<http://www.state.wv.us/admin/purchase/vrc/hipaa.htm>) is hereby made part of the agreement. Provided that, the Agency meets the definition of a Covered Entity (45 CFR §160.103) and will be disclosing Protected Health Information (45 CFR §160.103) to the vendor.

INSTRUCTIONS TO BIDDERS

1. Use the quotation forms provided by the Purchasing Division.
2. **SPECIFICATIONS:** Items offered must be in compliance with the specifications. Any deviation from the specifications must be clearly indicated by the bidder. Alternates offered by the bidder as **EQUAL** to the specifications must be clearly defined. A bidder offering an alternate should attach complete specifications and literature to the bid. The Purchasing Division may waive minor deviations to specifications.
3. Complete all sections of the quotation form.
4. Unit prices shall prevail in cases of discrepancy.
5. All quotations are considered F.O.B. destination unless alternate shipping terms are clearly identified in the quotation.
6. **BID SUBMISSION:** All quotations must be delivered by the bidder to the office listed below prior to the date and time of the bid opening. Failure of the bidder to deliver the quotations on time will result in bid disqualifications.

SIGNED BID TO:

Department of Administration
Purchasing Division
2019 Washington Street East
Post Office Box 50130
Charleston, WV 25305-0130

Questions received by Division of Administration regarding WVDEP RFQ# 13905
Received Fax Copy of Questions 05/23/07

- Q. Bid Item 2230.2- Can Restrained Joint Ductile Iron Pipe be used for the 6" Stream Crossing?
- A. Yes, Restrained Joint Ductile Iron Pipe can be used for this bid item.
- Q. Bid Item 13050.1- Is the stone for the roadway under this item paid for under Bid Item 2610.2 or is the stone for the roadway to be part of Bid Item 13050.1.
- A. The stone for the roadway is to be included in Item 13050.1 and paid for under this item for each Lineal Foot of Tank Roadway Restoration.
- Q. Bid Item 15030- Would you please detail this bid item? Where and how this tests and repair of existing 6" water line to take place? Explain what we are supposed to do. The specification is very vague.
- A. The section of existing 6" Waterline to be tested extends from the proposed tie in near the proposed Booster Pump Station and at the point where the new line is to be tied in. The purpose of this portion of the contract is to find and eliminate any significant leaks in the existing waterline which is to be used in the contract. The methods to pressure tests this section of line will be similar to testing a new line. The service lines to each of the existing residences will be turned off at the meter. The system will be pressurized using standard air testing equipment. Any fire hydrant on the line will be isolated with the isolation valve located in front of the hydrant. Upon pressurizing the system monitoring of the air pressure will be performed. If a drop in pressure occurs which exceed the allowable values listed in the Table included in the specifications the contractor will employ standard leak testing methods, using sound detection equipment etc. to find the leaking section of the pipe. When the section of pipe is repaired a second leak tests will be performed and the process will be repeated. The contractor will be reimbursed for all piping, valves, etc. that are required to repair the leak at the contract unit rates for each of these items. Testing and finding each leak as well as all excavation costs to find the leak will be included in the bid item 15030 for the specific tasks of pressure testing the line. The contractor will be paid at the contracted amount for the pressure testing and repair. The pressure tests will be repeated and if the line is still found to be leaking and additional repairs must be made the contractor will be paid at the contract amount for each leak repaired.
- Q. Bid item 15230.1&15230.2- Is the contractor to hook up the customer's existing service line to the new meter setting? Is the contractor to remove the old meter setting or abandon the old meter setting in place? Please explain how and/or what is to be done with the old meter setting.

- A. The contractor is required to hook up the existing customer service line to the meter.

The contractor is to remove the old meter, meter pit, and service setter. The disturbed area is to be filled in and re-seeded.

The old meter, meter pit, and setter will become the property of the contractor.

1. Q. There are no electrical specifications or details for the service at the Booster Pump Station. Would you please provide spec and details of the service?
 - A. The contractor shall mount a meter base and 3 pole 100 AMP Disconnect on a treated wood support system. Conduit for the supply from the power company will extend 1 foot outside the fenced enclosure and extend to the meter base. Conduit shall be run from the meter to the disconnect and then to the pump station. All buried conduit shall be buried a minimum of 3 feet below the finished ground surface. All conduit shall be PVC Schedule 40 and will be 4 inches in diameter. A detail of the proposed electrical service mounting board is included in this addendum.

2. Q. Is electrical service/ and or telephone service required at the tank site? If so how is this service to be installed? On Poles? Direct Burial? Please provide specs and details for the service required.
 - A. See attached specification for Solar Powered Radio Telemetry System to be substituted for the EFI supplied Telemetry Equipment. The telemetry system is no longer part of the pay item for the booster pump station. A pay item has been included on the revised bid schedule for a separate solar powered telemetry system. The pump station shall be supplied telemetry ready. The telemetry equipment at the tank site shall be mounted on a service mounting board similar to that described above. A detail of this mounting board is included in this addendum.

3. Q. Who is responsible for the Power/ Telephone Service Charges required at the tank site? If so how is this service to be installed? On pole? Direct Burial? Please provide specs and details for this service if required.
 - A. Since the telemetry system has been changed by this addendum to solar power, no power service or telephone service will be required at the Tank Site.

4. Q. Is a fence required at the tank site? Is so, please provide a detail.
 - A. A fence is required at the tank site. The fence detail is shown on a detail sheet included in the drawings. The specification for the fence is included in section 2830 of the specifications.

5. Q. Can the Spoil from the tank site be wasted on site?
 - A. Yes. All areas disturbed and waste areas must be vegetated in accordance with the specifications.



the Challenge. the Choice.™

5088 Washington Street, West • Charleston, WV 25313
304-776-7473 • Fax 776-6426

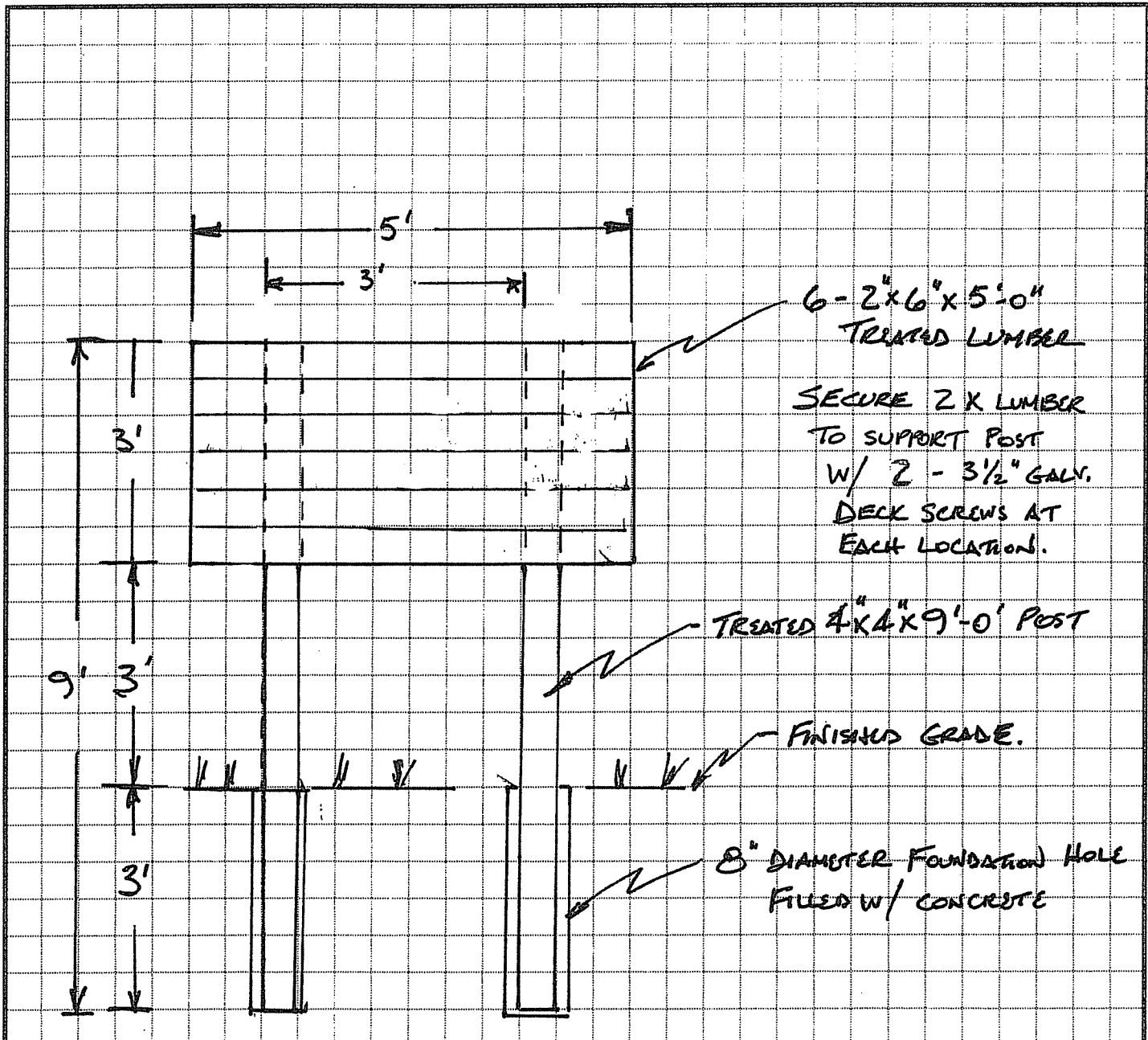
JOB GLEN ROGERS

SHEET NO. _____ OF _____

CALCULATED BY _____ DATE _____

CHECKED BY _____ DATE _____

SCALE _____



TYPICAL ELECTRICAL MOUNTING BOARD

TO BE INSTALLED AT TANK SITE AND

AT BOOSTER PUMP STATION

**GLEN ROGERS PSD
WATER DISTRIBUTION SYSTEM
CONTRACT**

006

SECTION 11248 – PUMP CONTROLS AND TELEMETRY EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions apply to work of this section.
- B. Division-16 Basic Electrical Materials and Methods sections apply to work specified in this section.

1.2 SUMMARY:

- A. Extent of instrumentation and control equipment work is indicated by drawings and schematics, and is hereby defined to include, but not by way of limitation, control panels, flow measurement, recorders, transmitters, etc.
- B. Types of instrumentation and control equipment specified in this section include the following:
 - 1. Glen Rogers Water Booster Station Master Transceiver Unit (MTU)
 - 2. Glen Rogers Storage Tank Remote Terminal Unit (RTU)
 - 3. Tank Level Chart Recorder
 - 4. Tank Level Transducer
 - 5. Solar Power Equipment
 - 6. Spare Parts
- C. Refer to other Division-16 sections for wires/cables, electrical boxes and fittings, and wiring devices which are required in conjunction with instrumentation and control equipment work; not work of this section.
- D. The Electrical Contractor shall have the responsibility for the installation of instrumentation and control wiring conduits and cables and interfacing the MTU with the Booster Station Control Panel per the I/O table specified within. This work to be part of the electrical work specified elsewhere under Division 11 and 16. Such electrical work must be installed in accordance with the requirements of the Instrumentation and Controls System supplier.
- E. Refer to Division-3 sections for concrete bases for the plant metering equipment, install anchor bolts and other items to be embedded in concrete according to manufacturer's instructions and recommendations and as specified in Division 3.

1.3 SUBMITTALS:

- A. Hardware Submittals:

Before any components are fabricated, and/or integrated into assemblies or shipped to the job site, furnish to the Engineer for their review six (6) copies of submittal documents. Submittals shall include full details, shop drawings, catalog cuts and such other descriptive matter and documentation as may be required to fully describe the equipment and to demonstrate its conformity to these specifications.

Specifically, the Contractor shall submit the following materials:

1. Block diagram and operational description of the system showing all major components and their interconnections and interrelationships. Label each diagram and specify all external power and communications interfaces. All diagrams shall be in an 11 by 17 format. Required documentation sets shall be furnished in bound hardcopy and final documentation shall also be provided in electronic format on CD.
2. Drawings of equipment to be supplied shall include, as a minimum: overall dimension details for each panel, console, etc., including internal and external arrangements and door mounted operator devices with nameplate designations. Wiring diagrams of equipment including field device connections shall be included and specific installation/wiring requirements identified.
3. Operational Description shall include the principal functions/capabilities of the PLC's as provided and configured /programmed. Included shall be a description of system communications.
4. Provide a detailed Bill of Materials along with descriptive literature identifying component name, manufacturer, model number, and quantity supplied.

B. Software Submittals:

1. Provide complete user manuals for all supplier configured software and firmware. For ancillary software such as operating systems, spreadsheets, etc. being supplied under this contract, only a listing of the manuals which will be included with the Operations and Maintenance documentation is required.
2. Sample communication and control database programs for project in hardcopy form. As a minimum, hardcopy form shall be fully documented, including code, comments, addressing data and cross-references, etc. Every line or section of code shall be accompanied by a comment describing its function.
3. Provide initial graphic display and report format layouts as described later in this specification. List and briefly describe all operator interface functions provided at the PC, including: alarm annunciation and acknowledgment, status displays, control capabilities, report generation, event logging, charting and trending, etc.

C. Test Outlines and Procedures Submittals

Test descriptions shall be in sufficient detail to fully describe the specific tests to be conducted to demonstrate conformance with this specification.

D. Spares and Expendable Recommendations

The Contractor shall provide the spare parts listed at the end of this section.

1.4 SYSTEM RESPONSIBILITY

- A. The Contractor shall be responsible for and shall provide for the design, supply, delivery, installation, certification, calibration and adjustment, software configuration, testing and startup, owner training,

**GLEN ROGERS PSD
WATER DISTRIBUTION SYSTEM
CONTRACT**

008

warranty and routine future field services, of a complete coordinated system which shall perform the specified functions and interface with the Booster Station control panel.

- B. The Owner and the Engineer will review system technical information as submitted by the Contractor for software; operating system, database, control strategies and the graphical user interface, i.e. report and log formats, graphics, trends, alarming, etc. for complete compliance with these specifications.
- C. The Contractor shall provide the Owner with all services and hardware to ensure that proper communications are established with off-site remote locations which are to be monitored and controlled. This work shall include, but not be limited to:
 - 1. System communications shall be based on the use of VHF radio transceivers. System supplier shall perform a radio propagation path analysis based on the use of this frequency to determine suitability for use, required antenna heights, and use and location of repeater units. The radio system shall be designed for 98% or better reliability for each station.
 - 2. If FCC radio licensing is required by frequency selection, the system supplier shall be responsible to contact and coordinate with the appropriate FCC authorized Frequency Coordinator for radio communications in the project area. This includes but not limited to: Assist in the preparation and submittal of FCC main form 600 and necessary related schedules for application of licensing of assigned radio frequencies. If radio telemetry system design mandates, assist owner in preparation of any FAA forms or schedules required to gain FCC and FAA approvals.
 - 3. All coordination and license application fees required for licensing shall be included in the bid price. The Owner will execute the necessary FCC documents at such times as needed during the licensing process.
 - 4. Provide and install all radio, antenna, antenna supports, antenna grounding, antenna cable, surge arrestors and other hardware necessary for the radio system.

1.5 ON SITE SUPERVISION

- A. The Contractor shall provide experienced personnel to supervise, perform, and coordinate the installation, adjustment, testing, and startup of the control system. The personnel shall be present on-site as required to effect a complete and operating system.

1.6 TESTING AND STARTUP

- A. All elements of the control/telemetry system shall be tested to demonstrate that the total system satisfies all of the requirements of this Specification. The Contractor shall provide all special testing materials and equipment. The Contractor shall coordinate and schedule all of his testing and startup work with the Owner. As a minimum, the testing shall include both a factory test and a field test. Testing requirements are as follows:

1. Factory Tests

The PLC's and all other associated hardware shall be tested at the factory, prior to shipment, so as to demonstrate that each component is operational and meets the requirements of these specifications. Test results shall be certified, with written documentation provided to the Owner upon test completion. The Owner or Engineer will not witness factory testing.

2. Field Tests

All system components shall be checked to verify that they have been installed properly and that all terminations have been made correctly. Witnessed field tests shall be performed on the complete system. Each function shall be demonstrated to the satisfaction of the Owner and Engineer on a paragraph-by-paragraph basis.

Each test shall be witnessed and signed off by the Contractor and the Engineer upon satisfactory completion. The Contractor shall notify the Owner at least one (1) week prior to the commencement date of the field tests.

1.7 TRAINING

- A. The training program shall educate operators, maintenance, engineering, and management personnel with the required levels of system familiarity to provide a common working knowledge concerning all significant aspects of the system being supplied. The training program shall consist of one 8-hour days. Both classroom-type and field site sessions shall be provided. At least two weeks prior to the requested start of the program, the proposed dates of training shall be submitted to the Owner and the Engineer for approval.
- B. The supplier shall provide all instructional course material, equipment and manuals to conduct the training program. Owner shall provide facilities for the training.

1.8 OPERATION AND MAINTENANCE MANUALS

- A. The Contractor shall provide (6) complete sets of hard-covered ring bound loose-leaf O&M manuals. In addition to "as-built" system drawings, the manuals shall include internal wiring diagrams and operating and maintenance literature for all components provided under this section.
- B. The submitted literature shall be in sufficient detail to facilitate the operation, removal, installation, programming and configuration, adjustment, calibration, testing and maintenance of each component and/or instrument.
- C. Operation and Maintenance manuals shall include copies of all PLC programs written to accomplish the monitoring and control functions specified. Programs shall be updated after startup is complete, with the program(s) provided to the Owner on compact disk (CD). Two (2) copies to be provided.
- D. The contents of the O&M manuals shall be generally organized as follows:
 - 1. System Hardware/Installation
 - 2. System Software
 - 3. Operation
 - 4. Maintenance and Troubleshooting
- E. A separate section containing all data pertinent to the radio system shall be provided. This section shall include:
 - 1. Radio system block diagram.

2. Computer generated radio path signal strength calculations and their associated support materials.
3. Licensing information where applicable. Owner shall provide a photocopy of the FCC license for incorporation into the manuals.

1.9 DEFINITION OF ACCEPTANCE

- A. System acceptance shall be defined as that point in time when the following requirements have been fulfilled:
1. All O&M documentation has been submitted, reviewed and approved.
 2. The complete control/telemetry system and instrumentation have successfully completed all testing requirements specified herein and have successfully been started up.
 3. All Owner's staff personnel training programs have been completed.
 4. Owner/Engineer sign a document indicating telemetry system has formally been accepted.

PART 2 - PRODUCTS

2.1 SUPPLIERS:

- A. Available Suppliers: Subject to compliance with requirements, suppliers offering products which may be incorporated in the work include, but are not limited to the following:
1. The C. I. Thornburg Co., Inc., Huntington, West Virginia representing Siemens Water Technologies (formerly US Filter Control Systems of Vadnais Heights, MN)
 2. Another manufacturer who can supply Instrumentation and Controls System that has equivalent qualities complying to specifications. The Engineer shall evaluate this product to determine compliance to specifications.

2.2 PROJECT SCOPE

- A. The control and monitoring system of the water Booster Station and Storage Tank shall consist of one centralized main control panel located at the Booster Station, communicating with the Storage Tank RTU via VHF radio communication. The central control panel shall monitor all system information, monitoring of alarms, equipment status and process variables. The Booster Station shall consist of a Microprocessor-based Master Transceiver Unit (MTU) as described elsewhere in these specifications. The MTU shall provide communications with the remote sites, local I/O capability, remote tank level control and alarm annunciation.
- B. The telemetry system shall consist of the following:

Unit A – Glen Rogers Water Booster Station Master Transceiver Unit (MTU)

(1) Microcomputer-based Control/Monitoring unit with keypad/controller as described within a wall mounted Nema 1 gasketed enclosure, with communication to the Unit B Storage Tank RTU via radio communication and local analog and digital input/output as described in the I/O table shown elsewhere in these specifications. The panel will also transmit local analog signals to a wall mounted chart recorder. The MTU shall provide automatic booster pump control based on tank level, pump alternation, and level

**GLEN ROGERS PSD
WATER DISTRIBUTION SYSTEM
CONTRACT**

alarms, and be interfaced with the Booster Station Control Panel specified elsewhere. The panel shall be powered by local 120 vac incoming service w/ battery backup.

Unit B – Glen Rogers Storage Tank Level Transceiver Panel RTU-1

(1) Ground Water Storage Tank remote transceiver units to transmit tank level to the MTU via radio communication, mounted within a Nema 4X fiberglass enclosure. The Tank RTU shall be powered by 12 volt DC Unit E solar powered unit.

Unit C – Tank Level Pressure Transducer

(1) Water Tank Level Pressure transducer panel. Each transducer shall be powered from the tank RTU with 12 volt dc input, and transmit a 1 to 5 volt output level signal to the RTU. The transducer, along with pressure gauge, shutoff and bleed valves, shall be mounted within a Nema 4X fiberglass enclosure.

Unit D – Tank Level Circular Chart Recorders

(1) Circular Chart Recorder shall be furnished and mounted at the Booster Station location adjacent to the MTU panel. The recorder shall chart history of the tank level.

2.3 SYSTEM REQUIREMENTS

A. WATER BOOSTER STATION MASTER CONTROLLER/TRANSCEIVER TELEMETRY UNIT

1. The central control panel MTU shall be supplied as a complete package including all hardware and software necessary to provide a completely functional system. The system shall be factory tested, debugged and ready for installation.
2. The MTU shall be furnished in a NEMA 1 enclosure suitable for floor or wall mounting and shall include a circuit breaker, electrical surge protection and power supplies. The MTU shall be front panel mounted to permit operator access for viewing system status and alarm acknowledgment functions. The MTU will continue to communicate with the RTU and display system status/alarm information including alarm horn and silence capability in the event of incoming alarms. The MTU's display shall be capable of showing all discrete and analog points in their proper state and engineering units, and contain booster pump hand-off-auto switches in the Operator Interface panel for remote operation. The MTU shall be battery backed (via UPS) to maintain telemetry functions, process status and alarm display as necessary during power outages.
3. The MTU shall be capable of utilizing FM VHF/UHF radio communication to communicate with the various water distribution system RTU's. The MTU shall have local I/O capabilities for any locally monitored equipment and processes. The MTU shall allow on-line user configuration of alarms and event information and permit logical grouping of alarms. The MTU as a minimum shall perform the above functions and as described elsewhere in these specifications.

B. STORAGE TANK RTU

1. The Storage Tank RTU shall be furnished in a 4X fiberglass enclosure as herein described suitable for wall mounting and shall include a remote tank level/ pressure transducers, circuit breaker, electrical surge protection, battery backed power supplies,

**GLEN ROGERS PSD
WATER DISTRIBUTION SYSTEM
CONTRACT**

thermostatically controlled condensation protection and all other features as described herein and elsewhere in these specifications. The RTU shall utilize data radios to communicate to and from the MTU.

2. The Microprocessor-based controllers described elsewhere in these specifications shall be mounted within the enclosure inner door (tanks and well pumps) or outer door (boosters) with all required input/output capability to meet the job requirements with not less than 10% spare capacity for future expansion. The controllers shall be battery backed to maintain telemetry functions during power outages.
3. Each RTU shall be provided with the designated NEMA type enclosure and input/output (I/O) configuration as shown in the tables at the end of this specification section. Note that the table lists current configuration of the inputs and outputs. Each RTU shall be provided with the total I/O capacity as described under the Microprocessor-based controller Section later in these specifications.

2.4 PRODUCT SPECIFICATIONS

A. REMOTE TRANSCEIVER UNITS / MASTER TRANSCEIVER UNITS

1. The main site and each remote location shown on the plan drawings and as described herein shall be of the PLC type with adequate memory and instruction sets required to make the unit perform all of the functions required by this specification. Units shall communicate with the Master PLC over the previously specified telemetry medium. Systems using a PC for master communications shall not be acceptable.
2. All control signals, status signals, alarm and process variable data shall be transmitted and received between the central location and the remote sites via the SCADA system. The system shall convert commands, alarms and variable analog data to digital blocks and transmit this information between the Central and the multiple remote locations. The master and remote PLCs shall be capable of stand-alone control to maintain programmed logic.
3. Units shall be furnished completely configured and tested providing the specified communication, monitoring, display, input/output, annunciation, computational and other requirements for operation of the SCADA system. Any additional components required for operation, whether specifically referenced herein or not, shall be provided.
4. The PLC system shall be based on a scalable modular multi-use open architecture platform that can be efficiently applied to perform the necessary functions at each location. Each controller/telemetry unit shall be a modular hardware style PLC consisting of a CPU with adequate memory and instructions, power supply, local and remote input/output modules, communications ports, and all other components required to make the unit perform all of the functions required in this specification.
5. It is required that the same model PLC device be used throughout the SCADA system including; RTU, MTU and IRTU (repeaters) sites providing a complete solution with one common technology. This is to insure complete system continuity, compatibility between like devices, enhancing overall system efficiency by the reduced need to learn, maintain, support and carry spare parts for multiple technologies.
6. The PLC system shall support true system open architecture allowing use of specialized for water and wastewater hardware and software and full integration of other third party

generic hardware/software devices. The architecture shall meet the requirements as herein defined and allow economical expansion of function and features based on new and evolving technologies. Systems using non-scalable and/or closed proprietary architectures shall not be acceptable.

7. The PLC system shall be based on a robust, field proven, current technology hardware platform allowing utilization of the latest advances in technology and permitting the most open programming and communication architectures. The PLC system shall be modular and scalable to be efficiently applied at each of the specified sites within the system.
8. The PLC system shall include a real time of day time clock w/battery back up for time stamping of data log records and scheduling of periodic time of day based events. Clock shall not require reset after a site power failure has occurred.
9. The PLC shall store system parameters including, logic configuration, setpoints, time delays, alarm and event data, counters and totalizers, etc.. in field programmable (FLASH) non-volatile memory. Sufficient non-volatile memory must be provided to protect at least 8,000 variables. The PLC shall also provide enough protected memory for time stamped data logging of up to 200,000 process values. This data shall be unaffected by power interruptions.
10. The PLC shall have enough processing power and working (DRAM) memory to enable high level programs such as Internet Web Servers to operate efficiently without affecting other simultaneous multitasking operations.
11. The PLC shall be furnished with a minimum of 6 communication ports with true multitasking and allow simultaneous support of all ports. Ports can be configured for local I/O, Operator Interface/display support, LAN/WAN, etc..
12. The PLC processor shall meet the following as a minimum:
 - CPU - True 32 Bit running at 50 MHz.
 - 16 MB – 32 bit Dynamic RAM
 - 8 MB FLASH
 - 512 KB Static RAM
 - 1 (One) Ethernet 10/100 BaseT port (RJ45)
 - 2 (Two) RS-232 Serial Communications (115 KB PS) (RJ45)
 - 1 (One) RS485 Serial Multi-Drop Communications
 - 1 (One) Local I/O port
 - 1 (One) Display Serial Communications Port
13. The PLC shall not require any specialized tools for removal of the unit. System components including PLC, power supplies, etc. shall be DIN rail mounted. Terminations shall be via plug in connectors facilitating quick field replacement.
14. PLC's and associated I/O modules shall meet national and international safety standards including UL, CSA, CE, DNV and Zone 2 Rated. In addition to the safety standards PLC system components shall also meet IEEE-472 (ANSI C37.90) surge withstand and IEC68-2-6 Vibration standards.
15. The PLC shall operate from a 10-30 VDC power source. A battery and charger as previously specified shall be supplied to power the master & remote unit during 120 Volt service power outage conditions.

**GLEN ROGERS PSD
WATER DISTRIBUTION SYSTEM
CONTRACT**

- 16. The PLC's shall have an operational temperature range of -40⁰C to 70⁰C (-40⁰F to 158⁰F) under relative humidity conditions of 5 to 95% non-condensing. Storage temperature range up to 85⁰C (185⁰F)
- 17. The PLC shall have a high performance open source software architecture that utilizes a true multitasking operating system running a combination of standard and specially designed for water and wastewater application software modules. The system provided shall utilize an integrated system approach providing a comprehensive common configuration tool for all components within the system including I/O, Processor, Communications, and Operator Interface Display. The architecture shall permit all system components to be configured, simulated, tested and downloaded from one terminal to all system components.
- 18. The operating system shall be multitasking and allow a minimum of two separate programs to run simultaneously without affecting each other.
- 19. To provide for and insure multiple source support, the PLC system shall utilize industry standard programming language certified by the PLC open committee for all five languages supported by the IEC 61131-3 standard including; Sequential Function Chart, Ladder Diagram, Structured Text, Instruction List and Function Block Diagram. All five languages must be included. Any one or a combination of the aforementioned programming languages can be used to implement the system strategy. The programming software must be Windows™ based and be able to operate on Windows™ 95, 98, NT, 2000, Millennium and XP operating systems.
- 20. PLC's provided under this specification shall be capable of performing the necessary logic to control the system as previously defined. These capabilities shall include, but not be limited to the following:

1. Discrete input/output	10. Latch/unlatch relays
2. Analog input	11. Counters
3. Analog output	12. Comparators
4. Timers	13. Ladder logic
5. Pump Controller	14. Flow Totalization/Integration
6. Pump Alternation	15. Intrusion Detection
7. Mathematical Function Blocks	16. Time of Day Control w/Lockout
8. Stage Blocks	17. Ramp Blocks
9. Trending	18. Data Logging
- 21. PLC's shall be capable of performing diagnostic functions. CPUs shall continuously monitor the functionality of the system and record errors and specific system events. A diagnostic buffer shall retain fault and interrupt events.
- 22. Communications between the Master PLC and any future SCADA computer added later shall be accomplished using standard off-the-shelf drivers allowing use of standard Windows DDE and or OPC software drivers. The PLC system configuration software shall allow the MTU tagname data base to be exported to the computer HMI software providing continuity between PLC and HMI tagnames and making future changes/upgrades more efficient and less prone to database tagname error. Communications between the Computer and Master unit and the Master unit and the

**GLEN ROGERS PSD
WATER DISTRIBUTION SYSTEM
CONTRACT**

015

remote (off-site) units shall be via high speed communications port (RS-232 (up to 115 Kbps) or Ethernet 10/100 BaseT (10/100 Mbps) in conjunction with a modem over the previously specified telemetry medium.

23. Each PLC shall have memory protected built in historical archiving/data logging of system alarms & events and process variables. Data logger shall be able to log data based on time or an event. PLC shall have enough memory allocated to allow 200,000 time and date stamped discrete and/or analog values to be archived. The historical archive shall allow the oldest data to roll off the system as memory is used keeping the 200,000 most current data points available. Process point time stamping frequency shall be selectable within the configuration software. It shall be possible for the archived data to be exported in CSV format allowing use with standard spreadsheet and data base software applications.
24. Each PLC shall have built in web server capability allowing system information to be stored in a format that allows for easy access and viewing with standard Windows™ based browser. Each unit shall be furnished with built in O & M data associated with its specific site including; as a minimum, basic system information, panel layouts, wiring diagrams, material lists w/part numbers, and operational summary. This information shall be accessible locally or remotely.
25. The PLC telemetry system shall utilize USFilter “open” industry non licensed standard communications protocol that will permit interface with other equipment that may not be supplied by the same manufacture. Protocols that are proprietary and closed ended will not be acceptable. Upon request by the end user, the system supplier shall provide, to the owner, documentation describing the supplied communications protocol so that it may be used in future telemetry additions to insure interface-ability of other third party RTUs and or PLCs.
26. The telemetry system must be able to simultaneously support multiple communications protocols. The system supplied, as a minimum shall be able to supply USFilter “open” and Modbus RTU/ASCII (Remote/Slave) output data via RS-232, 485 & Ethernet format thus insuring a primary means of interfacing with non-related equipment.
27. The PLC system shall allow telemetry operations over multiple (LAN/WAN) communication media affording the most efficient and reliable solution including; DC metallic wire pair, dedicated leased voice grade phone line, standard dial up phone line, wireless cellular dial up system, cable TV, Fiber optics, Ethernet 10/100 BaseT, VHF Radio, UHF Radio, Dedicated Microwave Radio, and Ethernet Wireless. System communication architecture can be based on any one or a combination of these media. The communications speed shall be set to the highest speed allowed by the selected media. This system shall be based on the use of VHF radio as the primary communication media.
28. The system shall support multiple modes of telemetry operation allowing highest possible system reliability and real-time response including; standard polling cycles, peer-to-peer, quiescent (Report on exception), store and forward (Repeater). System communication architecture can be based on any one or a combination of these modes of operation. This system shall utilize a combination of the above mode(s) of operation.
29. The PLC telemetry system shall employ a high level, efficient, secure communications protocol for communications between Master Telemetry Unit (MTU) and Remote Telemetry Unit(s) (RTU). As a minimum the telemetry system shall utilize BCH, CRC16

**GLEN ROGERS PSD
WATER DISTRIBUTION SYSTEM
CONTRACT**

or other high level error detection/rejection protocol to ensure true transmission/reception of data. Systems utilizing communications protocols with less capable error detection/rejection capabilities shall not be suitable for this application and will be summarily rejected.

30. The PLC system shall allow local or remote configuration or RTU troubleshooting without the need to be onsite. The system protocol shall support remote upload and down load file transfers between the master unit and associated RTUs. File transfer function shall provide reliable means of remotely transferring RTU configuration files so that any RTU configuration can be uploaded through the selected telemetry communications media to the online PC via the MTU, modified and then downloaded to the RTU. The system shall support transfer of RTU historical files for recovery of historical data stored at each RTU in the event of communication or MTU failure. Historical files can be reassembled at the MTU/PC so that no loss of data occurs due to temporary communications interruptions. The Main PLC shall be supplied with a standard dial up modem allowing remote system access for factory service and technical support.
31. The PLC system shall have I/O resources to support a wide variety of applications without needing to depend upon alternate technologies to meet various system data requirements. Each PLC shall be supplied with the required I/O to meet the specified requirements and allow for a minimum of 100% spare capacity for future expansion. The PLC system shall be easily scaled from a stand alone unit capable of supporting up to 1,024 local, 1,024 remote I/O, and 10,000 Ethernet networked I/O points or one of 254 RTUs with a total system data handling capability of 50,000 points.
32. The PLC system shall support a wide variety of modular I/O with various configurations to permit the most efficient use of I/O hardware and panel space. I/O modules shall be available for local I/O (within control panel), remote I/O (RS-485 based distributed outside of the control panel) and Ethernet based I/O (Distributed I/O on high speed in plant network or wireless Ethernet). Each I/O module shall be DIN rail mounted, have compression wire type terminals capable of accepting 14 AWG wire, have wire identification markers and I/O wiring diagram. Each module shall include diagnostic LEDS indicating module operational and I/O status. Each I/O module shall be electrically isolated, meet IEEE-472 (ANSI C37.90) surge withstand certification, shall be removable under power and easily field replaced with a spare module requiring no software/hardware reconfiguration adjustments. Each module shall be safety keyed to insure proper installation. I/O modules shall permit installation and operation in hazardous locations as classified under UL, CSA Class 1, Div. 2, Groups A, B, C & D.
33. Local I/O modules shall be connected to the PLC by a dedicated high speed serial communications port and shall allow local networking of 128 I/O modules for a total of 1024 I/O points via 2 twisted shielded wire pairs separated by up to 50 Ft. Local I/O to PLC update time shall not exceed 150 mS.
34. Remote I/O modules shall be connected to the PLC by a dedicated high speed isolated serial communications port and shall allow networking of 32 I/O modules directly or with up to 4 gateway I/O expansion modules allow 128 I/O modules for a total of 1,024 I/O points via RS-485 multidrop communications network separated by up to 10,000 ft. Remote I/O modules shall support multiple communications protocols including Modbus ASCII and RTU allowing connection to any device supporting these protocols
35. Ethernet I/O modules shall be connected to the PLC by on board Ethernet 10/100 BaseT connection port. Ethernet I/O modules shall support multiple communications including

**GLEN ROGERS PSD
WATER DISTRIBUTION SYSTEM
CONTRACT**

- TCP/IP and Modbus ASCII and RTU allowing connection to any device supporting these protocols over standard Ethernet backplane.
36. Master & Remote PLCs shall be IntraLink LC3000 as manufactured by US Filter Control Systems or pre-approved equal.
 37. An Operator Interface/Keyboard Display shall be supplied for the Master PLC and Remote PLC's and is to be mounted on the door of the enclosure. Keypad/Display shall allow the Operator to view and modify system variables within the PLC. Keypad/Display shall be NEMA 4 rated, have 20 system/function keys with tactile feedback, and have a minimum of 64 x 128 pixels capable of displaying graphics and a minimum of 8 lines with 20 characters per line. The display shall be a high contrast backlit LCD display so that it is unaffected by a wide range of ambient light conditions.
 38. Operator interface shall have sufficient performance to permit real time updates of system data and shall be capable of display update at least 3 times per second. Operator initiated screen change shall occur within 50 mSec. The display shall incorporate a power save feature that shuts down the display after 5 minutes of keyboard inactivity.
 39. The system display shall be preconfigured to reflect system parameters. The display shall support a minimum of 50 customizable main level process system displays. These displays shall be configured with graphical and text based data for the specific application to meet system monitoring and process control needs. The display shall be easily navigated by using a simple menu type format branching down to sub menus/levels. The display shall allow an operator to return to the main level with a one step push button entry. All system data and parameters shall be security protected. The system shall employ a hierarchal security password system affording a minimum of three (3) levels of password protected access to the system.
 40. The display system shall incorporate a basic trending package that shall allow sixty samples of time based data for a single discrete or analog based data point to be displayed. The system shall allow trend display of any data point in the system.
 41. The display system shall be able to display current and historical alarms and events. Upon the occurrence of a new unacknowledged alarm, the display shall show the date and time and sound an audible tone indicating the presence of an unacknowledged alarm. Acknowledging the alarm via the display keyboard shall silence the audible tone. Subsequent alarms shall reactivate the alarm audible tone. Historical alarm and event information shall be viewable from the display with the last 1,000 alarms or events including date and time of alarm being available.
 42. The Operator Interface shall provide locally viewable system diagnostics for the PLC system to permit an on site method of troubleshooting the system without the need for specialized tools or knowledge. Diagnostics indicating system processor and communication errors and CPU performance/loading shall be viewable when in this mode.
 43. Unit shall be capable of displaying process variables, provide management and processing of status and fault messages, and provide process control using soft keys, function keys or system keys. Keypad/Display programming shall be via Microsoft Windows based software as described above in the software section of this specification.
 44. The operator interface shall also display booster pump hand-off-auto selector switches for

remote operation of all water booster stations.

B. ENCLOSURES

1. The described MTU and RTU equipment shall be housed in U.L. listed enclosures properly sized to accommodate all control elements. Appropriate NEMA type enclosures shall be provided to meet the particular environmental requirements of each location as herein specified.
2. NEMA 1 The described MTU shall be housed in a U.L. listed NEMA 1 mounted enclosure properly sized to accommodate all control elements. The enclosure shall be constructed of not less than 14 gauge cold rolled steel. The enclosure shall have an ASA 61 gray polyester powder coating inside and out over phosphatized surfaces and shall include the following features:
 - a. All of the seams shall be continuously welded and ground smooth with no holes or knockouts
 - b. Door and body stiffeners shall be provided for extra rigidity
 - c. Captive door screws thread into sealed wells
 - d. Heavy gauge continuous hinge
 - e. Removable and reversible print pocket
 - f. Oil resistant gasket and adhesive
 - g. Collar studs shall be provided for mounting inner panel
 - h. Inner panel shall be painted white enamel
3. NEMA 4X Fiberglass The described RTU equipment shall be housed in a U.L. listed NEMA 4X fiberglass gasketed, wall mounted enclosure properly sized to accommodate all control elements. The enclosure shall be constructed of molded fiberglass with corrosion resistant stainless steel hinges.

C. PRESSURE / LEVEL TRANSDUCER

1. The level of the above ground storage tank shall be sensed by a Siemens Water Technologies (US Filter Control Systems) Bulletin A300, Model 221GCE Transducer. The Transducer shall be a three-wire type to operate from a supply voltage of 10.5 to 24 VDC and produce a 1-5 VDC instrumentation signal in direct proportion to the measured level excursion over a factory-calibrated range specified by the Engineer.
2. The transducer shall incorporate a variable-capacitance transducer element to convert the sensed pressure to a corresponding electrical value. The sensed media shall exert its pressure against an oil filled Nitrile diaphragm seal having a nickel/chrome plated carbon steel 1/4" NPT connection port (with clean-out plug) connected to the transducer's ceramic diaphragm. The diaphragm flexes minutely so as to vary its proximity to a ceramic substrate to vary the capacitance of an electrical field created between the two surfaces.
3. A stable, hybrid, operational amplifier assembly shall be incorporated in the transducer to excite and demodulate the sensing mechanism. The transducer shall incorporate laser-trimmed, temperature compensated, high quality components and construction to provide a precise, reliable, stable output signal directly proportional to the sensed pressure over a factory-calibrated range.

4. The transducer shall include easily accessible offset and span adjustments. Fine and coarse adjustments for both span and offset shall be provided, using twenty-five turn potentiometers. Span shall be adjustable from 100 percent down to 15 percent of the sensor range. Offset adjustments shall be up to 75 percent of range and shall be non-interactive with span.
5. The described equipment shall be housed in a weatherproof fiberglass enclosure. The enclosure shall be hot compression molded from twenty-five percent glass reinforced polyester giving corrosion resistance and high strengths. The front door shall be hinged with stainless steel hinging and fasteners. It shall have molded-in tongue and groove labyrinth seals and ventilation. The transducer shall be plumbed within the enclosure to a manifold with a 3-1/2" reference pressure gauge, shutoff and bleed needle valves having 1/4" female external bulkhead pressure connections in the bottom of the enclosure.

D. RADIO TELEMETRY EQUIPMENT

1. Integrated radio modem hardware that complies with applicable FCC or NTIA requirements for refarming shall be supplied. The radio and the modem must be packaged together and internally interfaced with each other. On-line, non-intrusive RF network diagnostic monitoring shall be provided as a standard feature in the system architecture.
2. Radio modem hardware of a 'packetized' design may not be used. Units shall be data transparent to allow for a minimum amount of data transmission latency and to limit data transmission overhead, thus allowing the radio modem to obtain the data rates specified.
3. Keying of radio modem hardware may be accomplished by either RTS signaling or data activated transmit. Data can be presented to radio modem hardware for transmission when the Data Activated Transmit or DOX mode is selected.
4. The radio modem hardware must be protocol transparent and independent. It must support 7 or 8 data bits, 1 or 2 stop bits, even, odd, or no parity. The master or base unit will operate within the 132-174 MHz frequency band. The master unit must be 100% transmit duty cycle capable.
5. Front panel mounted status indicators shall be available for status monitoring. Separate data ports must be provided for both application data and for on-line, non-intrusive diagnostic monitoring. The unit shall have type acceptance for operation at 9600 bps within a 12.5 kHz bandwidth. To comply with this requirement, unit must carry a 9K30F1D FCC emission designator or better.
6. Transmission requirements include:

Bandwidth:
132-150 MHz – 18 MHz Bandwidth
150-174 MHz – 24 MHz Bandwidth
This must be accomplished without re-tuning of the radio.

RF Output Power of at least 5 watts, and must be adjustable down to 1 watt, and any level in between.

Duty Cycle:

50% at 5 watts; 30 second Maximum Transmit.

Frequency Stability:
2.5 ppm between -30 to +60 Celsius

Spurious/Harmonic Emissions:
-63 dBc (Per TIA/EIA)

FM Hum and Noise:
-40 dB at 12.5 kHz (Psophometrically weighted per TIA/EIA.)

Transmitter Attack Time:
Less than 7 ms per TIA/EIA measurement standards.

Modulation Type:
Frequency Modulation, DRCMSK

RF Output Impedance:
50 Ohms

Time-Out Timer:
Programmable up to 60 seconds via PC programming interface.

RTS-CTS Delay:
Between 20 and 32 ms at 9600 bps data rate.

4. Receiver requirements include:

Type:
Dual conversion, superheterodyne.

Frequency Stability:
1.5 ppm from -30 to +60 Celsius.

Overall Sensitivity: (at antenna input port)
9600 bps RS-232 interface: 1.0 μ V for 1×10^{-5} BER @ 12.5 kHz

Sensitivity specification must take into account the sensitivity of both the radio and the modem portions of the radio modem.

Selectivity:
65 dB at 12.5 kHz

Intermodulation:
75 dB (Per TIA/EIA)

Spurious and Image Rejection:
75 dB (Per TIA/EIA)

FM Hum and Noise:
-40 dB at 12.5 kHz (Psophometrically weighted per TIA/EIA.)

Conducted Spurious:

-57 dBm (Per TIA/EIA)

RX Attack Time:

Less than 7 ms per TIA/EIA measurement standards.

Bandwidth:

132-150 MHz – 18 MHz Bandwidth

150-174 MHz – 24 MHz Bandwidth

This must be accomplished without re-tuning of the radio.

RF Input Impedance:

50 Ohms

7. General requirements

Data Port:

A DE-15 High Density Female Connector must be provided for use as either a Data Communications port or as an off-line diagnostic access port.

Input Power:

10 TO 16 VDC, Power connections shall be pins within the previously referenced DE-15 High Density Female Connector.

Status Indicators:

LED display to indicated Receiver Carrier Detect, Transmit, and Power

Unit must be frequency synthesized and operate on the following synthesizer step so that all FCC re-farmed frequencies can be synthesized: 2.5kHz.

Must support the Dataradio "DI-OS" Interface Standard.

Meet the following physical requirements:

RF connectors must be Type SMA.

Design:

The radio design shall make use of surface mount PC board components.

Humidity Range:

0 to 95% relative humidity, non-condensing.

Size:

The radio modem unit mounting must fit within a space 3" wide by 4.75 " in length.

8. Diagnostic Capabilities

The remote unit must be frequency synthesized and programmable to all frequencies by means of a personal computer running proper radio service software. All operational parameters must be accessible via programming software. It shall not be necessary to open radio housing to accomplish programming or setup.

The following radio parameters must be accessible through the programming software:

- | | |
|---|---------------------|
| -Enable/Disable On-Line Diagnostics | -PTT Watchdog |
| -Carrier Detect On/Off Levels
Transmit Frequencies | -Receive and |
| -Modem Version
Number | -ID Number; Long ID |
| -Enable/Disable Dynamic Carrier Detect | -Extended Turnoff |
| - Date of Last Configuration
Rates | -Over the Air Data |
| -Total # of Programming Configurations | -Data Word Length |
| -Independent RF Power Level Adjust for each channel | |

Unit must support diagnostic capabilities described and outlined in section 2.5 above. Units must originate diagnostic information and send over the air whether in On-Line or Off-Line diagnostic mode.

The Radio / Modem shall Integra TR or currently manufactured equal as supplied by Dataradio or equal.

9. Antenna Systems shall be furnish and installed for each transceiver. Mount antennas on wood poles, self-supporting steel towers or masts as shown on the plan drawings or as required for reliable signal transmission. All antennas and supporting structures shall be designed to withstand a 100 Mph wind with a 1/4" coating of ice. Remote antennas shall be a 5-element Yagi array with a gain of at least 9 db. Each radio telemetry unit shall be provided with a bulkhead-type antenna/cable lightning arrestor, one hundred feet of LMR-400 coaxial cable and all required connectors.

10. The system supplier shall be responsible for obtaining or modifying the FCC station and operating licenses for the owner. This shall include performing a path study based on data provided to the system supplier by the owner/engineer. This information shall include:

- a. Area topographic maps
- b. Site names/locations and addresses
- c. Site ground and building/pole elevations
- d. Latitude and Longitude for each site
- e. Approximate path length

The system supplier shall be responsible for the following:

- a. Obtain FCC approval for system operation
- b. Prepare all materials required by the FCC
- c. Obtain all license application forms, write in all required information and forward to the owner for signature(s)

11. The system supplier shall be responsible for verifying all RTU/MTU site latitude – longitude – elevations and provide all information required by the area frequency coordinator.

D. TANK LEVEL CHART RECORDER

1. The MTU at the booster station shall receive the tank level data from RTU and local signal cable and transmit this data to one (1) 10" circular chart recorders. The recorders shall also

PUMP CONTROLS AND TELEMETRY EQUIPMENT

contain an integral real-time clock with 10-year battery backup in the event of power failure and digital LED indicator showing current tank level.

2. Each recorder shall be furnished with a minimum of five (5) boxes of 7-day recording charts, linear with scale to match the output scale of the tank levels or flow if available. Also, three (3) packages of extra recording pens per recorder shall be furnished.
3. The recorder shall be installed on the water plant wall at a location selected by the Owner. The recorder shall be Honeywell Model DR4311 or equal.

E. AUTOMATIC TELEPHONE DIALER AND REMOTE TANK MONITOR

1. An automatic dialer shall be furnished and installed within the MTU enclosure and provide telephone or e-mail dial-out of alarms shown on the I/O table, and allow remote access to real-time tank levels by the operator via voice or modem. The dialer shall be a self-contained microprocessor controlled system capable of monitoring 8 input channels. The system shall be integrated in construction and shall be installed and configured for operation by the user via Microsoft Windows software provided at no charge. Voice message recording shall be accomplished via local or remote touch-tone phone. Input channels shall be capable of monitoring analog or digital signals utilizing 10-bit resolution.
2. Upon detection of any alarm or status change, the system shall commence dialing telephone numbers from a list associated with the particular alarm condition(s) or combination thereof, and deliver the alarm message via a custom voice message, Fax, E-mail, modem, numeric pager or alphanumeric pager. The voice alarm message shall be delivered in digitized human voice using messages recorded by the user. The system will continue to call telephone numbers in succession until a positive acknowledgment of the alarm message is received. Acknowledgement can be accomplished from a voice phone call, a modem phone call, or by a callback from either a telephone or a computer with modem. Upon answering, the system shall attempt a data connection. If a connection is made the system shall allow remote access to programming and operation. If a data connection is not made, the system shall recite a voice status report and allow access to remote voice message programming.
3. The system shall be FCC registered for direct connection to the telephone network. The system shall have a one year warranty from the manufacturer. The system shall be a Sensaphone 2000 by Phonetics, Inc.
4. The system shall come standard with 8 universal input channels. The input resolution shall be 10-bit with scalable lookup tables. All analog input values shall read to one decimal place. All input channels shall be user-configurable as:
 1. NO or NC digital dry contact, using 0.3mA loop current
 2. 4-20mA analog, using custom look up table
 3. 0-5V analog, using custom look up table
 4. Temperature from thermistor, using 2.8K or 10K devices
 5. Run time accumulator
 6. Pulse count
5. The system shall have the following built-in monitoring features:
 1. AC power failure detection

2. Low battery detection
6. All monitored channels, including built-in monitoring features, shall allow local and remote data programming of pertinent operational data including, but not limited to:
 1. Input type (NO/NC, 4-20mA and 0-5V analog, thermistor, run time, pulse count)
 2. Units of measure (degrees F, degrees C, inches, feet, psi, volts, amps, pounds)
 3. High and Low limits (-9999.9 to +9999.9)
 4. Input recognition time (0 seconds to 270 minutes)
 5. Alarm reset time (0 seconds to 270 minutes)
 6. Alarm call list for each channel
 7. Enable/Disable for each channel to dialout for alarm
7. The system shall be able to communicate alarms and other status information using the following methods.
 1. Programmable voice
 2. Fax
 3. Modem
 4. Numeric pager
 5. Alphanumeric pager
 6. Internet E-mail
8. The system shall connect to a standard 2-wire telephone line using pulse or tone dialing methods, with loop start only. The system shall recognize ringer frequencies from 16 to 60 Hz. No leased or dedicated lines shall be required. The system shall also be capable of being used on the same telephone line as other answering devices. Call progress detection shall ensure that the alarm dialout is not hindered by no-answers or busy signals.
9. The system shall have a built-in 9600 bps modem to allow remote data communication and programming via computer. The system shall have a built-in RS232 serial port for the purpose of local communication and programming via computer. Both communication interfaces shall accept standard Modbus protocol.
10. The system shall be capable of dialing up to 24 telephone numbers, 36 digits each (E-mail addresses may be up to 64 characters each). There shall be a capability to group the phone numbers into multiple lists to create calling schedules based on weekdays, weeknights and weekends. In addition, individual input alarms may be programmed to contract specific destinations.
11. The system shall have the ability to record, store and reproduce voice messages and to use those messages to articulate the location and status of the monitor channels. In absence of user-recorded voice messages, the system shall articulate channel status using the internally resident vocabulary. All digitized speech message data shall be stored in nonvolatile memory. Such nonvolatile memory shall be capable of protecting speech memory for at least 10 years of complete power outage.
12. There shall be one recorded identification message for the system, and one recorded alarm message for each input channel. Message length shall be 4 seconds per input and 6 seconds for system identification.
13. The system shall have a built-in RS232 port for the purpose of locally programming all

system data using and IBM PC or compatible with Windows 3.1 or greater, and Sensaphone 2000 programming software (included). All operational data, system setup and configuration data, and all information regarding the status of monitored input channels shall be accessible. In addition, voice messages may be recorded and reviewed using a standard touch-tone telephone.

14. The system shall have a built-in 9600 bps modem for the purpose of remotely programming and communicating all system, configuration, and input data using an IBM PC or compatible with modem, Windows 3.1 or greater, and Sensaphone 2000 programming software (included). A user-programmable security password shall protect the system from unauthorized tampering. Voice messages may be recorded or reviewed via a phone call using a standard touch-tone telephone.
15. The system shall be provided with a UL/CSA listed 9V AC power transformer that the user may plug into a 115V AC outlet, +10%, 60Hz. Typical power consumption shall be 10 Watts.
16. The system shall have a battery compartment (batteries not included) to hold 6 "C-cell" Ni-Cad rechargeable batteries (2.2AH recommended). The batteries shall support approximately 8-10 hours of continued system operation in the absence of AC power. (Actual battery backup performance is dependent upon the Amp-Hour rating, age of the batteries, ambient temperature, and the charge condition.) The unit shall include an integrated battery charging circuit. The battery charging shall be intelligent with microprocessor guided precision voltage control, which will activate only when batteries are installed.
17. Each input shall have a corresponding LED that will indicate the alarm and acknowledgment status of each input. The system shall also have LED's to indicate System On, Battery Condition and Phone Line status.
18. The system shall be capable of logging the values of all input channels, the battery voltage and the AC power status. Items to be stored shall be selectable to maximize memory usage. Up to 20,000 total samples can be stored in the unit's nonvolatile memory. The time between logs shall be user-programmable. The system shall have the capacity to send the datalog information via fax or E-mail on a time-programmable basis. Datalog information may also be retrieved via computer and modem, by using the polling option of the Sensaphone 2000 Windows software.
19. The system shall have built-in diagnostic tests to pinpoint system problems.
20. The system shall allow the user to program a data password to prevent unauthorized local or remote access to programming.
21. The system shall allow the user to call into the unit at any time using any standard telephone to obtain a full status report of all monitored channels. The status report shall be articulated using the resident voice-synthesized English vocabulary, in combination with digitized user-recorded voice messages.
22. The system shall allow the user to call into the unit with a computer, modem and the Sensaphone 2000 software package. The system shall allow interrogation and programming access to system parameters and status. The real time input status can also be displayed graphically. Real time status snap shots can also be automatically transmitted to E-mail or Fax destinations on a time schedule.

23. An alarm on any monitored channel may be acknowledged remotely by pressing tones on a touch-tone telephone keypad or by calling the system back within a specified time period.
24. An alarm on any monitored channel may be acknowledged remotely by the user via a computer, modem and the Sensaphone 2000 software. Alarms may be acknowledged manually by calling into the unit or they may be acknowledged automatically using the alarm-answer mode of the Sensaphone 2000 software package.
25. The system shall be housed in a durable aluminum enclosure with integral mounting brackets for wall of panel mounting. The dimensions shall be 12.1"W x 7.2"H x 1.6"D. The weight shall be 3 lbs. This unit in turn shall be mounted within the existing water plant control enclosure, plus duplex receptacle and AC line surge arrestor.
26. Power and telephone connections shall have internal spike and surge protection using metal oxide varistors. All input channels shall have fault protected input circuits.
27. Additional incoming power surge protector shall be mounted and wired within the enclosure. The power surge protector shall be Transtector Model ACP100BWN3.
28. The system shall function over an operating temperature range of 32°F - 130°F at up to 0 - 90% RH, non-condensing. The system may be stored within the temperature range of 0° - 130°F.

F. SOLAR POWER UNITS

1. The RTU's where indicated shall be powered from 12 volt DC incoming service, generated from solar power equipment as specified herein. The equipment shall consist of a solar array module(s), batteries, solar battery charger/load controller, and necessary connectors, fuses, and enclosures.
2. The solar array module shall be capable of producing a minimum of 4.73 amps at 16.9 volts, of multi-crystalline cells and mounted on an aluminum frame. The frame shall be capable of being pipe or surface-mounted and contain the necessary hardware for either method. The module shall also contain a 25-year output warranty.
3. The batteries shall be 6 volt (2 in series) or 12 volt DC, and shall be of the "deep cycle flooded lead acid" type, 226 amp-hour capacity at the 20 hour rate as a minimum. The batteries shall be mounted within a lockable 12 gauge steel Nema 3R hot dipped galvanized weatherproof battery box with hinged cover.
4. The battery charge/load controller shall be mounted within a weatherproof enclosure, and indicate battery voltage, charging amperage, and load amperage on an LCD display. The controller shall be reverse-polarity protected, temperature compensated, and disconnect the load upon low voltage. The controller shall contain a 5-year warranty.
5. Connections between the solar array and controller, batteries and controller, and the controller and load shall be fused protected and furnished with the above equipment.

**GLEN ROGERS PSD
WATER DISTRIBUTION SYSTEM
CONTRACT**

027

RTU / MTU INPUT-OUTPUT TABLES

LOCATION – WATER BOOSTER STATION MTU

<u>I/O DESCRIPTION</u>	<u>I/O TYPE</u>	<u>I/O SOURCE</u>
Pump No. 1 in "Auto"	DI-1	Aux. Switch Contact from Booster Panel
Pump No. 2 in "Auto"	DI-2	Aux. Switch Contact from Booster Panel
Pump No. 1 Running	DI-3	Aux. MS Contact from Booster Panel
Pump No. 2 Running	DI-4	Aux. MS Contact from Booster Panel
Low Suction Alarm	DI-5	Contact from Booster Panel
Intrusion	DI-6	Door Switch Contact
Spares	DI-7 thru 12	Spares
Pump No. 1 Required	DO-1	MTU Output relay to Booster Panel
Pump No. 2 Required	DO-2	MTU Output relay to Booster Panel
Glen Rogers Tank Low Level Alarm	DO-3	MTU Output relay to Dialer
Low Suction Alarm	DO-4	MTU Output relay to Dialer
Pump No. 1 Fail	DO-5	MTU Output relay to Dialer
Pump No. 2 Fail	DO-6	MTU Output relay to Dialer
Spare	DO-7	MTU Output relay
Spare	DO-8	MTU Output relay
Spares	AI-1 thru 2	Spares
Glen Rogers Tank Level	AO-1	To Chart Recorder and Alarm Dialer
Spare	AO-2	Spare
Communication Fail	SD-1	Radio modem
AC Power Fail	SD-2	Battery back-up

LOCATION – WATER STORAGE TANK RTU

<u>I/O DESCRIPTION</u>	<u>I/O TYPE</u>	<u>I/O SOURCE</u>
Tank Level (ft.)	AI-1	Pressure/Level Transducer
Spares	AI-2	Spare
Intrusion Alarm	DI-1	Gate / Door switch
Spares	DI-2 thru 4	Spares

**GLEN ROGERS PSD
WATER DISTRIBUTION SYSTEM
CONTRACT**

028

Spare	DO-1	Relay to energize future valve
Communication Fail	SD-1	Radio modem
AC Power Fail	SD-2	Battery back-up

(Note: I/O type designations: AI = analog input, AO = analog output, DI = digital input, DO = digital output, SD = software/RTU derived)

2.5 SPARE PARTS

- A. The Contractor shall furnish test equipment necessary for checking field operation of electronic equipment furnished under this Section as follows:
 - 1. One (1) portable (DVM) digital volt meter with rechargeable battery, test leads, and carrying case equal to Fluke Model 8020A.
 - 2. One (1) spare radio transceiver
 - 3. One (1) spare pressure transducer signal conditioner board
 - 4. One (1) spare pressure transducer sensing element (one per pressure range)
 - 5. One (1) spare RTU PLC

PART 3 - EXECUTION

3.1 EXAMINATION

- B. Examine areas and conditions under which instrumentation and control equipment is to be installed and notify Contractor in writing of conditions detrimental to proper completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

3.2 INSTALLATION OF INSTRUMENTATION AND CONTROL EQUIPMENT

- B. Install instrumentation and control system components and ancillary equipment as indicated, in accordance with equipment manufacturer's written instructions, and with recognized industry practices, to ensure that instrumentation and control equipment complies with requirements.
- C. Coordinate with electrical work, including raceways, conduits, electrical boxes and fittings, as necessary to interface installation of instrumentation and control system work with other work.
- D. Tighten electrical connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Standards 486A and 486B.

3.3 GROUNDING

**GLEN ROGERS PSD
WATER DISTRIBUTION SYSTEM
CONTRACT**

029

- A. Provide equipment grounding connections for lighting control equipment as indicated and/or required. Tighten connectors to comply with tightening torques specified in UL Standard 486A to assure permanent and effective grounding.

3.4 FIELD QUALITY CONTROL

- A. Upon completion of installation and after system has been energized, demonstrate capability and compliance of system with requirements. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed with retesting. Testing and retesting at no cost to Owner.

END OF SECTION 11248

BOOSTER STATION CONTROL PANEL INTERFACE WITH TELEMETRY PANEL

The Booster Station control panel shall provide and receive the following inputs / outputs to the Tank Level Control / Telemetry MTU panel to be mounted within the Booster Station:

D/I's Provided to Telemetry MTU

- Pump No. 1 in "Auto"
- Pump No. 2 in "Auto"
- Pump No. 1 Running
- Pump No. 2 Running
- Intrusion
- Low Suction Alarm

D/O's Provided by Telemetry MTU to Booster Panel

- Pump No. 1 Required*
- Pump No. 2 Required*

*When Booster Station Control is in "Auto". Pump Alternation provided by Telemetry MTU panel.

STATE OF WEST VIRGINIA
PURCHASING CONTINUATION SHEET
Contract No. 1

BUYER: 23	PAGE: 031	REQ. OR P.O. NO: DEP13905
SPENDING UNIT: WVDEP - Office AML&R		

VENDOR:

ITEM NO.	QUANTITY	DESCRIPTION	UNIT PRICE	AMOUNT
1500	LS	Temporary Facilities, per lump sum		
2100	LS	Video Taping, per lump sum		
2220.1	195 LF	Bore & Jack-6" Steel Casing, per lineal foot		
2220.2	210 LF	Bore & Jack-12" Steel Casing, per lineal foot		
2220.3	15 LF	Open Cut-6" Steel Casing, per lineal foot		
2220.4	225 LF	Open Cut-12" Steel Casing, per lineal foot		
2220.5	15 LF	Open Cut-16" Steel Casing, per lineal foot		
2230.1	195 LF	2" Stream Crossing, per lineal foot (Each Crossing Includes 2 Gate Valves & Manual Air Release)		
2230.2	200 LF	6" Stream Crossing, per lineal foot (Each Crossing Includes 2 Gate Valves & Manual Air Release)		
2240	18 CY	Gabion Streambank Protection, per cubic yard		
2610.1	120 LF	WVDOT - Type C Trench Repair, per lineal foot		
2610.2	2,910 Ton	WVDOT - 307-1, per ton		
2610.3	20 LF	WVDOT - Class "B" Concrete, per lineal foot		
11010	LS	Booster Pump Station, per lump sum		
11248	LS	Pump Controls & Telemetry Equipment, per lump sum		
13025	LS	Water Storage Tank, per lump sum		
13050.1	2,750 LF	Water Tank Access Roadway Restoration, per lineal foot		
13050.2	120 LF	18" HDPE Conveyance Pipe, per lineal foot		
13050.3	375 LF	Riprap Ditch Protection, per lineal foot		
13050.4	2 EA	Low Water Crossing, per each		
15030	6 EA	Test and Repair Existing 6" Waterline		
15121.1	6,515 LF	2" PVC "SDR-17" Pipe, per lineal foot		
15121.2	9,005 LF	6" (C-900) PVC Pipe, per lineal foot		
15121.3	2,850 LF	8" (C-900) PVC Pipe, per lineal foot		
15150.1	8 EA	2" Gate Valves, per each		
15150.2	7 EA	6" Gate Valves, per each		
15150.3	1 EA	8" Gate Valves, per each		
15170.1	3 EA	Waterline Tie-in - 6"x6" Tapping Sleeve w/6" Valve		
15170.2	1 EA	Waterline Tie-in - Abandon Existing 6" Water Line		

WV36
REV. 10/81

15170.3	3 EA	Waterline Tie-in – 6"x2" Tapping Sleeve w/2" Valve		
15181	7 EA	Fire Hydrants with 6" Gate Valve, per each		
15185	12 EA	Blow-off Hydrant, per each		
15200.1	1,465 LF	¾" Service Line, per lineal foot		
15200.2	2,700 LF	¾" Service Line (Road Crossing) , per lineal foot		
15230.1	5 EA	¾" Meters, per each		
15230.2	142 EA	¾" Meters (With Pressure Reducing Valve), per each		
15240	1 EA	6" Meter, per each		

TOTAL BID

\$ _____