SECTION 13310

WIRELESS MONITORING & CONTROL SYSTEM WITH INTERNET BASED DATA ACCESS

PART 1 - GENERAL

1.01 DESCRIPTION

 A. Furnish a factory wireless data cellular based communication system for the purpose of monitoring and controlling various equipment operations. The supplier of the communication system shall be responsible for coordination required to insure equipment compatibility. The communication system shall be provided complete, in place, as shown on the Drawings, specified herein and needed for a complete, proper installation.

 B. Summary of PART TWO - PRODUCTS

1. Subsection 2.01: General
2. Subsection 2.02: Monitoring and Control System
3. Subsection 2.03: RTU Locations
4. Subsection 2.04: Monitoring Input Points Defined
5. Subsection 2.05: Other Materials

 C. Related work:

 1. Documents affecting work of this Section include, but are not necessarily limited to General Conditions, Supplementary Conditions, and sections in Division 1 of these Specifications.

 2. Section 01640: Product Handling

3. Section 01650: General Equipment Requirements

4. Section 01660: Technical Services

5. Section 01670: Startup Services

6. Section 16400: Electrical

1.02 QUALITY ASSURANCE

 A. Manufacturer shall test functionality of all SCADA RTU’s prior to shipment.

 B. Manufacturer’s Representative shall have qualified technicians capable of installation, termination and startup of RTU’s.

1.03 SUBMITTALS AND SUBSTITUTIONS

 A. The following product data shall be submitted:

1. Shop Drawings in sufficient detail to show fabrication, installation, anchorage, and interface of SCADA equipment with owners’ equipment.
2. Manufacturer’s recommended installation procedures which, when approved by the Engineer, will become the basis for accepting or rejecting actual installation procedures used on the Work;
3. Test data required elsewhere in this Section.

 C. Upon completion of system installation, and as a condition of its acceptance, deliver to the Engineer three copies of an operation and maintenance manual compiled in accordance with the provisions of these Specifications.

1.04 PRODUCT HANDLING

 A. Comply with pertinent provisions of Section 01640.

 B. Schedule the delivery of the equipment to coordinate with the project completion schedule.

 1. Each item of equipment to be tagged with identifying number shown on the Shop Drawings.

 C. Contractor’s attention is directed to the fact that equipment has delicate components and extreme care shall be taken in handling to avoid internal and/or external damage.

 D. Damaged equipment will not be accepted.

 E. Equipment not for immediate use shall be stored inside a building, with enclosures under protective coverings and shall be fully protected from moisture, extreme heat and vibration.

1.04 SPARE PARTS

 a. Include in the lump sum price the following spare parts:

 1. Main Board (Qty of 2 Each)

 2. Radio (Qty of 2 Each)

1.05 EQUIPMENT COMPATIBILITY

 A. The Manufacturer shall be responsible for coordinating the instrumentation equipment, communication equipment and other related equipment so that all elements are compatible and form a complete working system. Shop drawing submittals shall include sufficient information regarding component compatibility to demonstrate compliance with this requirement.

 B. System shall be capable of controlling and/or monitoring an expanded water well system at up to 25 sites. The current sites total thirteen (13) and two (2) planned-for future sites are included for informational purposes. For pricing purposes the two (2) FUTURE sites shall not be included other than the system as a whole will soon need to support a total of 15 (13+2) sites and potentially, long range, up to a possible 25 sites.

1.06 WARRANTY

 A. Comply with pertinent provisions of Section 01650.

 B. Systems supplier shall furnish a hardware maintenance contract for the system, providing an 8-hour response time in normal working hours, five days per week.

1. For any service visit during this period provide the Owner with a written report stating the reason for the equipment failure and recommendations for preventing recurrence.

 C. At the end of this period, the maintenance contract shall be made available for transfer to the Owner.

PART 2 - PRODUCTS

2.01 GENERAL

. A. Qualifications of Manufacturers: Products used in the work of this Section shall be produced by manufacturers who have regularly been engaged for at least 15-years in the manufacture of similar items and with a history of satisfactory production acceptable to the Engineer. They shall have at least 10 water system control installations and 10 wastewater system installations in the State of Mississippi. A list of such installations with a contact person and phone number shall be submitted with bid.

1. The submitting Company shall provide evidence of, and warrant compliance with, substantially all below listed requirements.
2. The submitting Company shall have been in business providing remote facility monitoring and control services through the data side of the cellular system to the water distribution / wastewater collection industry or a substantially similar industry for at least ten years.
3. The submitting Company shall be the actual manufacturer and operator, or a duly authorized and trained agent of the manufacturing company or a combination of both, who will actually provide, maintain, and warranty the proposed system.
4. The Manufacturing Company of the field equipment shall also be the provider of all monitoring related services associated with the field equipment and all ongoing service agreements will be with the actual company providing the monitoring service, not a subcontractor or agent.
5. The submitting company shall have a primary central monitoring and control center and a fully redundant, physically separate, backup-computer monitoring center. Either center shall have the capability of operating all the remote monitoring and control field RTU’s.
6. The submitting Company shall offer and provide 24 X 7 technical support.
7. The submitting Company shall submit with their bid the Customer Service Agreement and Terms of Use that is used to define the relationship between the Manufacturer and the Customer.

B. Qualifications of Manufacturers Representative

 1. The Manufacturer’s Representative shall have Factory Trained Service Technicians available 24 hours per day, capable of troubleshooting electrical and instrumentation related issues. The Technicians shall be full-time employees of the Manufacturer Representative, no part-time or third party technicians will be allowed.

 2. The Manufacturer’s Representative shall have been the Manufacturer’s distributor for at least ten years and maintain a service facility within a 150 mile radius of WEST JACKSON COUNTY UTILITY DISTRICT located in St Martin, MS between Ocean Springs, MS and D’iberville, MS. They shall stock all necessary components to get customer back on-line within a 24-hour period should any of the supplied equipment fail.

 3. The Manufacturer’s Representative shall have Degreed Engineers on staff capable of looking at future SCADA applications and/or modifications of existing applications in order to assimilate all information necessary to provide owner with a conceptual design. They shall also be capable of integrating additional I/O into the system.

2.02 MONITORING AND CONTROL SYSTEM

1. Microprocessor Based Field RTU
2. Data Cellular Radio
	1. The Remote Terminal Unit (RTU) shall incorporate a radio that utilizes the data side of any cellular system to transmit the data and alarms monitored, as well as receive manual or automated control commands.
	2. Cellular radios from all cellular carriers shall be able to mount in the same mounting port on the motherboard and consequently be interchangeable in no more than 10 minutes.
3. Enclosure Options

 The RTU shall be offered in at least the following three enclosure options:

* 1. NEMA1 with battery inside the enclosure
	2. NEMA1 “FlatPak” with a depth of less than 1.5 inches so it is able to fit between the inner and outer door of a double door control panel.
	3. NEMA4X with the battery inside and which has front door and top “sun shades” to reduce internal temperatures when placed in the sun.
1. Microprocessor Feature Updates

Microprocessor features like data transmission rates shall be able to be adjusted through the cellular system without any site visits necessary.

1. RTU Inputs and Outputs M850 models
	1. RTU shall have eight (8) digital inputs. These eight (8) inputs must have end of line resistor supervision, or similar supervision, that can detect normal alarm trip inputs and detect input wiring disconnection/shorting as a distinctly different signal and report.
	2. RTU shall have an optional expansion board of an additional eight (8) digital inputs
	3. The digital inputs shall be user selectable as normally open (NO) or normally closed (NC).
	4. At least three of the RTU digital inputs must be capable of being programmed to record and report pump run times in one minute increments or less as indicated by a relay opening and closing. If only two pumps are monitored then the unit shall also be capable of recording and reporting simultaneous pump run times. In Real-Time Models eight of the RTU digital inputs on main board must be capable of being programmed to record and report pump run times in one minute increments or less as indicated by a relay opening and closing. If only two pumps are monitored then the unit shall also be capable of recording and reporting simultaneous pump run times.
	5. RTU shall have built-in alarms for input wiring fault, AC failure, communication failure and low battery detection.
	6. RTU shall have two (2) analog inputs measuring 4-20mA or 1-5 VDC at 10 bit resolution with four (4) alarm thresholds per input.
	7. RTU shall have an optional expansion board of an additional four (4) analog inputs
	8. RTU shall have an optional expansion board of an additional eight (8) digital inputs
	9. RTU shall have an optional expansion board of an additional two (2) analog outputs.
	10. RTU shall have an optional expansion board of two (2) pulse counter inputs
	11. RTU shall have an electronic key reader input to monitor on-site personnel. The RTU shall utilize an audible tone to verify key reading. Each key in the system shall provide unique identification of the key holder when they are on site vs. “someone” is on site.
	12. RTU shall have three (3) digital normally open or closed output relays rated at ½ ampere@ 120VAC
	13. Pump run times shall be monitored and logged by means of a current sensor.
	14. Lift station high level float shall be wired to RTU so that high level can be detected even with loss of power to lift station equipment. The circuit shall be Class-1, Div-1 compliant for hazardous environments.
	15. RTU shall have a LCD touch-screen for set-up and monitoring.
2. Status LED’s on Motherboard
	1. LED’s above each digital input shall visually display the status of the digital input
	2. Radio signal strength shall be displayed by at least 8 LED’s in 5db increments between -75db and -110db to facilitate accurate antenna placement
	3. Operational and diagnostic status of at least 8 criteria shall be displayed by individual LED’s.
3. Power Requirements
	1. The RTU shall be powered by 12 volts AC and have a built in battery backup capable of keeping the RTU powered for 30 hours in case of primary AC failure.
	2. All terminations inside the RTU enclosure shall be low voltage AC or DC (28 volts or less).

B. Communication Links

1. Communication System
	1. Wireless communication links shall be through the data side of the cellular system. The voice side of the cellular system and satellite based links are not acceptable.
2. Cellular Carriers
	1. The submitting company shall have direct relationships with the cellular companies and shall not use third parties to affect data transport through the cellular companies. They shall have direct Tier III support relationships with the cellular companies.
	2. The RTU will have PSX8 “Dual Mode”, Over-the-Air carrier switching data cellular radios that will communicate through third generation GPRS (ATT), CDMA (Verizon) to maximize the likelihood of reliable communication.
	3. If a GPRS (ATT) radio is used, the submitting company shall have PTCRB approval from ATT to use the radio, contract and product acceptance with ATT. If a CDMA (Verizon) radio is used the submitting company shall be certified partner status, contract and product acceptance with Verizon. If an iDEN radio is used the submitting company shall be have certified partner status, contract and product acceptance with Sprint/ Nextel.
	4. The Customer will not have or have to purchase cellular data contracts direct with the carrier(s).
3. Security Protocols
	1. All the cellular radios shall all make continuous, secure socket connections (SSL) from the radio, through the cellular system, to the submitting company’s servers and web pages.
	2. The RTU shall utilize a transmission scheme that encrypts the transmitted data utilizing a 128 bit encryption method that meets or exceeds the advanced encryption standard (AES). The 128 bit AES encryption shall be at all stages of data transfer and storage
	3. The cellular radios shall all have private IP addresses
	4. The submitting company shall have established multiple, private gateways through the cellular system, completely behind firewalls, with at least one of the cellular providers.
4. Data Transmission Rates
	1. All alarms regardless of unit type will be transmitted immediately upon occurrence; delays can be added by the customer at the RTU or the supplier’s website.
	2. The RTU shall be capable of being configured to either transmit non-alarm data updates every hour or continuously transmit all digital state changes on an as occurs basis; analog and pulse inputs will be transmitted at least once every 15 minutes or two minutes depending on firmware configuration. The RTU shall be capable of configuration change without having to change any hardware.
	3. The RTU will have an effective, continuous, transfer rate of at least 19,200 baud.
5. Communication Link Structure and Performance Criteria
	1. The communication link structure shall be a secure socket connection from the RTU through the cellular system to the supplier’s servers, and it shall be a continuous connection, 24 x 7, 365.
	2. Receipt of all data sent from the RTU to the server center shall be acknowledged by the server center back to the RTU in real time for every data packet sent. Such structure is called end-to-end data acknowledgement.
	3. The secure socket connection shall be from the RTU through the cellular system direct to the system supplier; no third parties shall receive the data from the cellular carrier and then pass it to the system supplier.
	4. The above mentioned secure socket connection shall be monitored for end-to-end uptime with interruptions as small as 15 seconds being captured.
	5. Both end-to-end uptime and the number of times the link was disconnected/reconnected shall be reported for each RTU continuously with daily summary statistics posted on the customer website. All the end-to-end uptime history of each RTU shall be available on the customer web site from when it first powered up to the present. Weekly management summaries of each RTUs end-to-end uptime shall be automatically emailed to the customer.

 C. Centralized Server Centers: Hardware and Software Requirements

1. Server Center Physical Structure
	1. The server center housing shall be able to withstand a direct hit from at least a F-3 tornado and continue operations.
	2. The server center housing shall have at least six (6) separate and redundant, on-site power generating facilities to backup the local utility power such that there can be stand-alone operation of the center for at least 24 hours.
	3. Entrance to the facility shall be controlled by armed guards at all entrances 24x7x365
2. Server Center Redundancy Structure
	1. The server center shall house the manufacturers completely redundant and hot linked:
		1. Servers
		2. Interconnects
		3. Databases
		4. Power supplies
		5. Inbound cellular connections
		6. Outbound internet hubs and providers
3. Database Structure
	1. All data from the RTU’s shall be held for customer access forever.
	2. All databases shall be backed up and archived daily
	3. The databases shall be capable of interfacing and transferring, on a continuous basis, all RTU data to an OPC compliant database for access by other OPC compliant HMI software packages.
		1. Client side OPC software will run as an executable or NT service.
		2. Client side OPC software will, on a user definable interval, establish a socket connection to static IP address(s) at providers’ server center.
		3. OPC software shall retrieve all changed OPC tag values and close the socket. OPC software shall be set up so as customers OPC computers firewalls may be programmed to only allow Internet traffic to/from the designated service providers IP addresses and port numbers.
		4. OPC software will allow for multiple customer OPC software packages to establish, concurrently, OPC connections so as to provide for redundant HMI database operation at customers locations.
		5. Customer’s firewalls will not be programmed to accept socket connections.
4. System Security
	1. All data links shall be behind firewalls, 128 bit encrypted and never accessible, addressable or viewable via the general public Internet, Private IP’s are required, pooled public IP’s will not be accepted.
5. System Software
	1. The system software shall collect and display:
		1. Alarms including individuals accepting alarms,
		2. RTU electronic key reads with user names, time of read, and site name
		3. Pump running status
		4. Graphical means of showing pump running
		5. Pump run times with historical graphs
		6. Pump run time versus rainfall amounts
		7. Pump run time variance with automatic notifications
		8. Individual pump flow estimates
		9. Automatic daily analysis of pump runtimes for abnormalities with automatic customer notification of such abnormalities
		10. Pump starts with hourly analysis of excess pump starts with automatic notifications of excess pump starts
		11. Minute-by-minute radio health checks with automatic notification of non-reporting or poorly reporting RTU’s,
		12. Scaled and labeled pulse totalizations and if rainfall gauges are used inter-day rainfall graphs and run time verses rain fall based on either rain gauges installed as part of the system or as run time verses a reporting airport rain gauge
		13. Performing and displaying volumetric inflow/outflow calculations from RTU supplied data for each pump cycle as they occur. Such volumetric calculations will utilize real-time pump start/stop data with simultaneously gathered level transducer data to perform the inflow/outflow and pump GPM calculations
		14. Utilizing real-time data collection have the ability to based on digital input closure, open or close digital output relay on the same or another real-time unit (Intertie)
		15. Lift station capacity analyzer
		16. Residual chlorine report
		17. Graphical representation of analog inputs, both bar graphs and circular charts
		18. Feed-Back loop associated with run time current sensor to give pump fail alarm if pump is called for and does not run based on no current detected.

D. Alarm System Structure and Software

1. Alarm Delivery Formats
	1. Alarms shall be delivered in the following formats:
		1. Phone (voice call), fax, pager (numeric or alphanumeric (short alpha or long alpha format), text message, email, or any combination of the above simultaneously.
	2. Alarms shall be able to be acknowledged by phone, text message, 2-way pager, email or on the customer web site.
	3. Voice alarm acknowledgement shall be adjustable to be able to mimic the format of dialers.
	4. Alarms will be called out on alarm and upon return to normal conditions.
		1. Return to normal alarms can be adjusted to call the alarm callout group or a different callout group.
2. Alarm Callout Formats
	1. Alarm callout groups shall be able to be setup to automatically switch between callout groups at different hours of the day and/or different days of the week.
	2. Alarm callout groups shall be able to have multiple teams within each group to easily facilitate rotation of teams of on-call personnel.
3. Alarm Message Formats
	1. All alarms shall have the alarm condition, time, alarm location and pump status at the time of the alarm in each message.
	2. Alarm message format shall be adjustable to include just the above information when calling a phone where it is known who will answer the phone, or be adjustable to add an introductory message asking for a specific person when calling a phone where it is not known who will answer the phone (like a home phone).
	3. Alarms shall be able to be delivered individually or be able to be grouped into one message so that multiple, simultaneous alarms (like AC Fail at multiple sites) can be delivered and acknowledged in one phone call.
4. Alarm Dispatch Logs
	1. Each alarm shall have a full log of each notification attempt of that alarm documenting the following:
		1. Date, time, and alarm condition
		2. If each notification attempt was a success or failure and the reason for each failure if an attempt was a failure (like line busy, call dropped, etc)
		3. A recording of each voice notification attempt so the specific reason for a notification failure can be known.
		4. Date, time, and name of person who acknowledged the alarm.
5. Voice Alarm Delivery Capacity
	1. Manufacturer shall provide at least 20 outbound lines to deliver voice alarms so as not delay delivery of current alarms.

E. REMOTE DATA ACCESS

1. Remote Data Access Format
	1. Data collected by the system shall be able to be remotely accessed by simple web browser. The system shall provide individual web pages for the User to access via any web browser.
	2. To access the web pages, the User will have to enter a User Name and Password.
		1. The User can set up any of three levels of access to the web pages:
			1. Read only…can see but cannot make any changes
			2. Read/Write…can see and can make changes
			3. Read/Write/Control…can see, make changes and effect control functions, also add or remove logins/ passwords.
	3. The system supplier will provide at least two separate web sites for each customer. One shall be designed to be viewed on a traditional laptop or desktop computer. The other shall be designed to be viewed on a web enabled cell phone or PDA. This web site will still have graphs showing trending of data, and will be designed to minimize the data sent so as to minimize the page loading times and size of the data plans necessary to view the site on a web enabled cell phone or PDA.
	4. The system supplier will provide secure access through a specified phone without the need for web access (Voice SCADA). This will require login to system via numeric 5 digit code and must be set up in the system to an associated login for that site to a specific phone number to maintain site security.
	5. In addition to the above web sites, if the User has Real-time RTUs, the User will be provided at no additional charge with a customizable software interface that will display real-time status and graphic trending of data collected by the RTU.
		1. The software will be downloadable from the customer’s website.
		2. The software will automatically update itself every time the User accesses the software.
		3. The software will require NO programming to customize.
		4. The software will be capable of Real-time viewing of data.
2. Remote Access Security
	1. In addition to the Username and Password structure described above, all access of the User web site shall be logged. Such logging data to included date, time and duration of access, User Name and Password of user to access the site and IP address of the accessing computer. The log will be accessible through the User web site
3. Automated Administrative Reports and Alerts
	1. The User web site shall produce and automatically deliver weekly reports which summarize alarms and responses, pump runtimes and flow estimates, weekly end-to-end uptime percentages of each RTU, and all electronic key uses at the RTU sites.
	2. The web site shall be capable of sending two (2) different categories of notifications, Alarms and Alerts. Alarms are for conditions that the User decides they want to be notified immediately about. Alerts are conditions that need attention, but are not so time sensitive that they cannot wait till the next morning.
		1. The Alarms callout list and the Alert callout list shall be able to be separate and distinctly different.
	3. The User web site shall analyze daily pump run times at compared to a moving 30 day average of that pumps most recent runtimes and automatically Alert the User is the pump runs outside the normal runtime variation pattern.
	4. The User web site shall analyze hourly pump runtimes and automatically compare it to two (2) User set thresholds. If the Alert threshold is exceeded, an Alert will be sent the following morning. If the Alarm threshold is exceeded, an alarm will send immediately.
	5. The User web site shall send an Alert the first morning that units are in Communications fail even though Alarms have been sent at the time the RTUs went off-line. Such Alerts are a reminder to Management that they still have units that are off line.

2.03 RTU LOCATIONS

 A. RTUs shall be located at all water well sites and at all elevated tanks.

 B. RTUs at each location shall be furnished with an omnidirectinal antenna at grade plus 8ft.

2.04 MONITORING AND CONTROL POINTS PER RTU

 A. The inputs to be monitored at the St Martin High site (Tower & Well) are as follows:

 1. Digital inputs

 DI-1 Well Pump Run Time

 DI-2 Cl Pump Run Time

 DI-3 Chlorine Gas Alarm

 DI-4 Spare

 DI-5 Spare

 DI-6 Spare

 DI-7 Spare

 DI-8 Spare

 2. Analog inputs with four (4) hi/low threshold alarms

 AI-1 Cl Tank Weight

 AI-2 Residual Chlorine Level

 AI-3 Tank Level

 AI-4 pH Level

 AI-5 Well Pump Flow

 AI-6 Cl Tank Weight

 3. Optional Pulse inputs

 P-1 Spare

 P-2 Well Pump Flow Total

 4. Relay Outputs

 R-1 Well Pump Run/Off

 R-2 Spare

 R-3 Spare

 B. The inputs to be monitored at Kippie Road site (Tower & Well) are as follows:

 1. Digital inputs

 DI-1 Well Pump Run Time

 DI-2 Cl Pump Run Time

 DI-3 Chlorine Gas Alarm

 DI-4 Spare

 DI-5 Spare

 DI-6 Spare

 DI-7 Spare

 DI-8 Spare

 2. Analog inputs with four (4) hi/low threshold alarms

 AI-1 Cl Tank Weight

 AI-2 Residual Chlorine Level

 AI-3 Tank Level

 AI-4 pH Level

 AI-5 Well Pump Flow

 AI-6 Cl Tank Weight

 3. Optional Pulse inputs

 P-1 Spare

 P-2 Well Pump Flow Total

 4. Relay Outputs

 R-1 Well Pump Run/Off

 R-2 Spare

 R-3 Spare

C. The inputs to be monitored at Walker Road site (Tower & Well) are as follows:

 1. Digital inputs

 DI-1 Well Pump Run Time

 DI-2 Cl Pump Run Time

 DI-3 Chlorine Gas Alarm

 DI-4 Spare

 DI-5 Spare

 DI-6 Spare

 DI-7 Spare

 DI-8 Spare

 2. Analog inputs with four (4) hi/low threshold alarms

 AI-1 Cl Tank Weight

 AI-2 Residual Chlorine Level

 AI-3 Tank Level

 AI-4 pH Level

 AI-5 Well Pump Flow

 AI-6 Cl Tank Weight

 3. Optional Pulse inputs

 P-1 Spare

 P-2 Well Pump Flow Total

 4. Relay Outputs

 R-1 Well Pump Run/Off

 R-2 Spare

 R-3 Spare

D. The inputs to be monitored at Old Fort Bayou Road site (Well and Hydropneumatic Tank) are as follows:

 1. Digital inputs

 DI-1 Well Pump Run Time

 DI-2 Cl Pump Run Time

 DI-3 Chlorine Gas Alarm

 DI-4 Spare

 DI-5 Spare

 DI-6 Spare

 DI-7 Spare

 DI-8 Spare

 2. Analog inputs with four (4) hi/low threshold alarms

 AI-1 Cl Tank Weight

 AI-2 Residual Chlorine Level

 AI-3 Hydro-pneumatic Tank Pressure

 AI-4 pH Level

 AI-5 Well Pump Flow

 AI-6 Cl Tank Weight

 3. Optional Pulse inputs

 P-1 Spare

 P-2 Well Pump Flow Total

 4. Relay Outputs

 R-1 Well Pump Run/Off

 R-2 Spare

 R-3 Spare

E. The inputs to be monitored at the Lancaster Street site (Well & Hydropneumatic Tank) are as follows:

 1. Digital inputs

 DI-1 Well Pump Run Time

 DI-2 Cl Pump Run Time

 DI-3 Chlorine Gas Alarm

 DI-4 Spare

 DI-5 Spare

 DI-6 Spare

 DI-7 Spare

 DI-8 Spare

 2. Analog inputs with four (4) hi/low threshold alarms

 AI-1 Cl Tank Weight

 AI-2 Residual Chlorine Level

 AI-3 Hydropneumatic Tank Pressure

 AI-4 pH Level

 AI-5 Well Pump Flow

 AI-6 Cl Tank Weight

 3. Optional Pulse inputs

 P-1 Spare

 P-2 Well Pump Flow Total

 4. Relay Outputs

 R-1 Well Pump Run/Off

 R-2 Spare

 R-3 Spare

F. The inputs to be monitored at the Riviera Drive site (Well & Hydropneumatic Tank) are as follows:

 1. Digital inputs

 DI-1 Well Pump Run Time

 DI-2 Cl Pump Run Time

 DI-3 Chlorine Gas Alarm

 DI-4 Spare

 DI-5 Spare

 DI-6 Spare

 DI-7 Spare

 DI-8 Spare

 2. Analog inputs with four (4) hi/low threshold alarms

 AI-1 Cl Tank Weight

 AI-2 Residual Chlorine Level

 AI-3 Hydropneumatic Tank

 AI-4 pH Level

 AI-5 Well Pump Flow

 AI-6 Cl Tank Weight

 3. Optional Pulse inputs

 P-1 Spare

 P-2 Well Pump Flow Total

 4. Relay Outputs

 R-1 Well Pump Run/Off

 R-2 Spare

 R-3 Spare

G. The inputs to be monitored at Lisa Drive site (Well & Hydropneumatic Tank) are as follows:

 1. Digital inputs

 DI-1 Well Pump Run Time

 DI-2 Cl Pump Run Time

 DI-3 Chlorine Gas Alarm

 DI-4 Spare

 DI-5 Spare

 DI-6 Spare

 DI-7 Spare

 DI-8 Spare

 2. Analog inputs with four (4) hi/low threshold alarms

 AI-1 Cl Tank Weight

 AI-2 Residual Chlorine Level

 AI-3 Hydropneumatic Tank Pressure

 AI-4 pH Level

 AI-5 Well Pump Flow

 AI-6 Cl Tank Weight

 3. Optional Pulse inputs

 P-1 Spare

 P-2 Well Pump Flow Total

 4. Relay Outputs

 R-1 Well Pump Run/Off

 R-2 Spare

 R-3 Spare

H. The inputs to be monitored at the McCann Road site (Tower & Well) are as follows:

 1. Digital inputs

 DI-1 Well Pump Run Time

 DI-2 Cl Pump Run Time

 DI-3 Chlorine Gas Alarm

 DI-4 Spare

 DI-5 Spare

 DI-6 Spare

 DI-7 Spare

 DI-8 Spare

 2. Analog inputs with four (4) hi/low threshold alarms

 AI-1 Cl Tank Weight

 AI-2 Residual Chlorine Level

 AI-3 Tank Level

 AI-4 pH Level

 AI-5 Well Pump Flow

 AI-6 Cl Tank Weight

 3. Optional Pulse inputs

 P-1 Spare

 P-2 Well Pump Flow Total

 4. Relay Outputs

 R-1 Well Pump Run/Off

 R-2 Spare

 R-3 Spare

I. The inputs to be monitored at the Newton Street site (Well) are as follows:

 1. Digital inputs

 DI-1 Well Pump Run Time

 DI-2 Cl Pump Run Time

 DI-3 Chlorine Gas Alarm

 DI-4 Spare

 DI-5 Spare

 DI-6 Spare

 DI-7 Spare

 DI-8 Spare

 2. Analog inputs with four (4) hi/low threshold alarms

 AI-1 Cl Tank Weight

 AI-2 Residual Chlorine Level

 AI-3 Spare

 AI-4 pH Level

 AI-5 Well Pump Flow

 AI-6 Cl Tank Weight

 3. Optional Pulse inputs

 P-1 Spare

 P-2 Well Pump Flow Total

 4. Relay Outputs

 R-1 Well Pump Run/Off

 R-2 Spare

 R-3 Spare

J. The inputs to be monitored at the Waycross site (Tower only) are as follows:

 1. Digital inputs

 DI-1 Spare

 DI-2 Spare

 DI-3 Spare

 DI-4 Spare

 DI-5 Spare

 DI-6 Spare

 DI-7 Spare

 DI-8 Spare

 2. Analog inputs with four (4) hi/low threshold alarms

 AI-1 Spare

 AI-2 Residual Chlorine Level

 AI-3 Tank Level

 AI-4 pH Level

 AI-5 Spare

 AI-6 Spare

 3. Optional Pulse inputs

 P-1 Spare

 P-2 Spare

 4. Relay Outputs

 R-1 Spare

 R-2 Spare

 R-3 Spare

K. The inputs to be monitored at the Tucker Road site (Tank & Well) are as follows:

 1. Digital inputs

 DI-1 Well Pump Run Time

 DI-2 Cl Pump Run Time

 DI-3 Chlorine Gas Alarm

 DI-4 Spare

 DI-5 Spare

 DI-6 Spare

 DI-7 Spare

 DI-8 Spare

 2. Analog inputs with four (4) hi/low threshold alarms

 AI-1 Cl Tank Weight

 AI-2 Residual Chlorine Level

 AI-3 Tank Level

 AI-4 pH Level

 AI-5 Well Pump Flow

 AI-6 Cl Tank Weight

 3. Optional Pulse inputs

 P-1 Spare

 P-2 Well Pump Flow Total

 4. Relay Outputs

 R-1 Well Pump Run/Off

 R-2 Spare

 R-3 Spare

L. The inputs to be monitored at the Bonanza Road site(Tower & Well) are as follows:

 1. Digital inputs

 DI-1 Well Pump Run Time

 DI-2 Cl Pump Run Time

 DI-3 Chlorine Gas Alarm

 DI-4 Spare

 DI-5 Spare

 DI-6 Spare

 DI-7 Spare

 DI-8 Spare

 2. Analog inputs with four (4) hi/low threshold alarms

 AI-1 Cl Tank Weight

 AI-2 Residual Chlorine Level

 AI-3 Tank Level

 AI-4 pH Level

 AI-5 Well Pump Flow

 AI-6 Cl Tank Weight

 3. Optional Pulse inputs

 P-1 Spare

 P-2 Well Pump Flow Total

 4. Relay Outputs

 R-1 Well Pump Run/Off

 R-2 Spare

 R-3 Spare

M. The inputs to be monitored at the Briarwood (Jordan) Road site (Well & HYDROPNEUAMTIC) are as follows:

 1. Digital inputs

 DI-1 Well Pump Run Time

 DI-2 Cl Pump Run Time

 DI-3 Chlorine Gas Alarm

 DI-4 Spare

 DI-5 Spare

 DI-6 Spare

 DI-7 Spare

 DI-8 Spare

 2. Analog inputs with four (4) hi/low threshold alarms

 AI-1 Cl Tank Weight

 AI-2 Residual Chlorine Level

 AI-3 Hydropneumatic Tank Pressure

 AI-4 pH Level

 AI-5 Well Pump Flow

 AI-6 Cl Tank Weight

 3. Optional Pulse inputs

 P-1 Spare

 P-2 Well Pump Flow Total

 4. Relay Outputs

 R-1 Well Pump Run/Off

 R-2 Spare

 R-3 Spare

 B. Water System Automation

 The tank and well SCADA system shall be constructed, and have the following operational parameters as described below.

 The general architecture of the system will be based on using third generation cellular data for telemetry and on sending that data to a web based hosted SCADA computer service that manages the entire system except field maintenance. The hosted system shall have password protected SSL web based customer screens. Automatic control logic for well and/or control valve operation shall be maintained by the hosted SCADA computer service. The hosted service shall monitor, at least every two minutes the level of the tank(s). The hosted SCADA service computer shall issue control relay commands to the associated well(s) and/or control valve(s) when pre-programmed low, off, lead, lag, lag 2 and high tank level thresholds are reached. The low, off, lead, lag, lag 2 and high level thresholds shall programmable by the customer via the secure web site. All threshold changes shall be individually password protected and logged. The secure web site shall also provide the customer the ability to put each well pump(s) and/or control valve(s) in automatic, off or hand operation mode. The secure web site shall provide the customer the ability to enable/disable alternation of the well(s) and/or control valve(s). The hosted well/control valve control SCADA service shall provide control for up to five wells/control valves or combination of both from a single tank. Multiple tanks may be depicted and controlled on a single customer secure web site.

 The web based hosted SCADA service screens shall depict the current state to the web service H/O/A operational status (not the well site(s) MCC H/O/A switches), the current values for well pump(s)/control valve(s) off, lead, lag and lag 2 thresholds, the current status of well pump/control valve alternation, the current status of well(s)/control valves call to run and a graphic depicting the current and previous 24-hour tanks level and which well pump(s)/control valve(s) were called during fill cycles.

 The well/control valve RTU(s) shall have the ability to be programmed to either:

 - Continue the current well/control valve call relay status or,

 - Force off/close the well/control valve call to run/open status,

 if the well/control valve RTU(s) lose communications with the hosted SCADA service computer(s) for more than two minutes.

 The output relay(s) from the well(s)/control valve(s) RTU shall be wired only into the automatic circuit for well pump(s)/control valve(s) run/open. The local off and hand circuits shall be unaffected by the RTU relay output(s). The output relays on the well(s)/control valve(s) RTU(s) shall be wired into 12vdc solid state interposing relays. The switched side of the solid state interposing relay(s) shall be used to control the well(s) pump(s)/control valve(s) motor starter/solenoid in the automatic well/control valve call circuit.

 The web based hosted SCADA service shall provide a means of setting up and performing alarm call out functions. All alarm points shall have a programmable delay period prior to issuance of an alarm from the point. All phone based alarm calls shall be recorded and the web based screens shall allow the customer to recall and play any alarm call from the system.

 The tank and well(s)/control valve(s) RTU(s) shall be grounded with 8 gauge (or larger) solid copper wire.

 The system shall include the installation of a XX (15, 25, 50 or 100) PSI pressure transducer at as close to the base of the tank(s) as possible. The pressure transducer shall be protected from the elements and shall have at voltage surge suppressor able to withstand and discharge a voltage spike of at least 10,000 volts connected to the transducers analog circuit within three feet of the pressure transducer. The surge suppressor and transducer shall be connected to 8 gauge or larger solid copper wire which shall be connected to a grounding rod. The grounding rod shall be within five feet of the surge suppressor. There shall be no bends in the ground wires with less than a 6 inch radius. Straight ground wires are preferred.

2.05 OTHER MATERIALS

* 1. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Manufacturer subject to the approval of the Engineer.

PART 3- EXECUTION

3.01 SURFACE CONDITIONS

 A. Examine the aras and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

3.02 COORDINATION

 A. Coordination as required with other trades to ensure proper and adequate provision in the work of those trades for interface with the work of this Section.

3.03 INSTALLATION

. A. Ensure installation of equipment is in strict accordance with the manufacturer’s recommendations and shop drawings as approved by the Engineer.

B. Upon completion of the installation, carefully inspect each component and verify that all items have been installed in their proper location, adequately anchored, and adjusted to achieve optimum operation.

- If required, the contractor shall adjust the antenna placement or elevation to obtain consistent, stable operation of the system.

C. Delineate timing of RTU installation and commissioning.

3.04 TRAINING

 A. Demonstrate to the Owner’s operation and maintenance personnel the proper methods for operating and maintaining the equipment, and the contents of the operation and maintenance manual required to be submitted under Article 1.03 in this Section.

 B. The Manufacturer shall furnish to the Owner, through the Engineer, a written report prepared by the instrumentation equipment manufacturer’s field service technician certifying that:

* + - 1. the equipment has been properly installed in accordance with manufacturer’s recommendations;

 2. the equipment check out and initial start-up activities have been completed in accordance with manufacturer’s recommendations and under the technician’s supervision;

 3. Antenna placement has been optimized

 4. The equipment is free from any undue stress imposed by connecting conduit or anchor bolts;

 5. The equipment operates satisfactorily and in compliance with the requirements of this Section.

3.05 START-UP SERVICES

A. Upon final completion of all components determine date of start-up jointly with the Owner.

B. System supplier shall be responsible for placing SCADA equipment and systems into operation.

C. System supplier to provide qualified personnel on the job site until successful operation of the system is attained.

 END OF SECTION