

## SECTION 11800

### SATELLITE TELEMETRY SYSTEM

#### **PART 1 GENERAL**

##### 1.01 WORK INCLUDED

- A. The OWNER is accepting sealed proposals from manufacturers of Supervisory Control and Data Acquisition (SATELLITE TELEMETRY SYSTEM) System equipment for the installation of individual sanitary sewer pump station. The CONTRACTOR (Manufacturer) shall provide design, programming, documentation, equipment, installation and start-up services for SATELLITE TELEMETRY SYSTEM system. The CONTRACTOR (Manufacturer) shall install all SATELLITE TELEMETRY SYSTEM equipment specified herein including all wiring and conduit to connect to equipment at the sites.
- B. The system specified herein shall be manufactured by High Tide Technologies, LLC., or equal.

##### 1.02 GENERAL PROJECT INFORMATION

- A. Proposal submitters not meeting all of the qualifications as defined in Paragraph 1.06 need not apply and will not be accepted.
- B. The project shall be completed within (insert number of days) days after the proposal due date.
- C. Not all of the defined sites are identical. See the attached Figure 1 for site locations.
- D. All of the existing motor starters, transformers and field instrumentation shall be reused.
- E. The project shall include all work required to create a working satellite telemetry system suitable for the existing sites and up to three future locations. The project work shall include all software, all screens, and documentation for the complete system.

##### 1.03 DEFINED TELEMETRY SITES

- A. Central Hosted Software

The satellite telemetry system shall provide a web based software host on High Tide Technologies, LLC central server. An individual URL will be created for the OWNER and assigned to this project. The software will

provide the following statuses: current operating state, pump start/stop statistics, pump run time statistics, alarm history, text alarm configuration page, voice alarm configuration page, and monthly reports. Optional, wet well level statistics should analog level sensors be present versus the use of floats. Optional high/low wet well alarms shall be provided, should analog level sensors be present.

C. Sanitary Sewer Lift Station

This station has power available on site. The pump stations are identified below and located on the attached Figure 1.

A. Existing Sanitary Sewer Stations  
i. (list sites here)

2. Future Sanitary Sewer Stations  
i. (list sites here)

1.04 SITE MINIMUM INPUT/OUTPUT STRUCTURE

Each existing site is unique and currently does not contain a standard input and output structure.

A. Sanitary Sewer Lift Station

Each unique pump station site shall contain a minimum of five analog inputs, five digital inputs, for monitoring of various pump station functions.

1.05 SITE INSPECTIONS

A. Site Inspections

All defined sites may be inspected prior to proposal submittal. The OWNER shall provide one (1) person to provide access to all sites.

1.06 QUALIFICATIONS

A. Manufacturers Qualifications: Only manufacturers who have been regularly engaged in the supply of Supervisory Control and Data Acquisition (satellite telemetry system) equipment for at least 2 years and capable of meeting the following criteria need respond.

- B. Installers Qualifications: Only firms who have been regularly engaged in the installation of Supervisory Control and Data Acquisition (satellite telemetry system) equipment and have completed the certification course for High Tide Technologies installers need respond.
- C. Each responsible manufacturer shall meet the following minimum qualifications and shall:
1. Have completed a minimum of three (3) satellite telemetry system applications throughout the regions – no exceptions.
  2. Provide the OWNER with references and phone numbers of each of the three satellite telemetry systems. A minimum of two names per each SATELLITE TELEMETRY SYSTEM reference shall be provided. References will be contacted and completed work verified by the ENGINEER and OWNER.
  3. Acknowledge that shipment of the SATELLITE TELEMETRY SYSTEM RTU nodes and related equipment shall be authorized only by the ENGINEER and OWNER group – no exceptions.
  4. Utilize only UL listed and rated components in enclosure manufacture.
  5. Provide 100 percent of all hardware and software technical manuals to the ENGINEER and OWNER in digital format. The manuals shall be in Adobe pdf format.
  6. Provide complete bill-of-materials (BOMs) and enclosure layouts that are numerically cross-referenced together for each SATELLITE TELEMETRY SYSTEM node. All BOMs shall contain the standard factory supplied part numbers instead of proprietary numbers – no exceptions.
  7. Provide a warranty and emergency support for a period of not less than one (1) year after the ENGINEER and OWNER accept each satellite telemetry system node.
  8. Provide primary technical support to the OWNER by full-time qualified staff members only. Technical support provided by manufactures representatives, salespersons or local distributors is not acceptable - no exceptions.

## 1.07 REFERENCES

High Tide Technologies, LLC  
SATELLITE TELEMETRY SYSTEM

11800 - 3C:\Documents and Settings\Joe\My Documents\Technical Info\Specifications\Inlet Beach HTT1000 Specification.doc

A. Publications listed below form part of specification to extent referenced. Publications are referenced in text by basic designation only.

1. NATIONAL FIRE PROTECTION AGENCY (NFPA)

a. ANSI/NFPA 70 (1999) National Electric Code

## **PART 2 PRODUCTS**

### **2.01 DEFINITION**

A. Remote Terminal Units

### **2.02 REMOTE TERMINAL UNIT DESCRIPTION**

A. The satellite telemetry system design shall use High Tide Technologies' Model No. 1000 monitoring unit satellite monitoring unit or equal.

1. RTUs shall be installed at the following sites:

Existing Sanitary Sewer Stations

ii. (list sites here)

Future Sanitary Sewer Stations

i. (list sites here)

2. General: The CONTRACTOR shall utilize the existing pump control system and shall remain in-place, operational.

B. Manufacturer's products, including design, materials fabrication, assembly, examination, inspection, and testing shall be in accordance with ANSI/NFPA 70, except as modified herein or indicated otherwise.

C. Contractor's Responsibility: Provide a complete satellite telemetry system, including RTUs, and satellite telemetry equipment; indicating devices; controls; power supplies; enclosures; conduit, wire, and installation. Provide interconnecting wiring for the system to be based upon general requirements of specified components with spare capacity. Coordinate the interconnecting wiring requirements with OWNER provided instruments and provide necessary wiring for the system. Coordinate the loop impedance requirements of the equipment provided and provide additional loop isolation, noise suppression, surge protection, drivers, and other devices necessary to provide a complete and

operating system properly installed and protected in accordance with the device manufacturer's recommendations.

2.03 NOT USED

2.04 BASIS OF DESIGN

- A. The satellite telemetry system is based on Stellar satellite modems, ANSI C protocol Software – no exceptions.

2.05 NOT USED

2.06 SATELLITE MODEM SYSTEM REQUIREMENTS

A. Modems

1. The modems shall use the mobile frequency designated by the Orbcomm Satellite System.
2. The modems shall be able to be programmed.
3. The communication protocol shall be Orbcomm Satellite Communication standard.
4. The modems shall be model ST2500 by Stellar Communications, LTD or approved equal.
5. One modem shall be installed at each of the each sites.

B. Antennas

1. Omni-directional antennas tuned specifically for the Orbcomm Satellite frequency bands.
2. Proper grounding shall be provided as part of price proposed at each site, including wiring, conduit, clamps, and any other item for state-of-the-art grounding.
3. One antenna shall be installed at each of the each of the sites.

C. Antenna Cable Lengths

The following minimum standard cable lengths shall be used during the bidding process

1. Sanitary sewer lift station – 25'
2. The actual as-installed cable lengths may be more or less per site.

D. Antenna Mounting

1. All antennas shall be mounted with galvanized clamps or other non-corroding attachment devices.
2. The mounting of the antennas shall be in such a manner to prevent welding, drilling or other corrosion and stress inducing modifications, or damage to paint systems.
3. All antennas shall utilize existing non-load bearing structures such as safety rails for mounting points.
4. Antennas shall be mounted in a manner so that cables and antennas do not interfere with safety equipment or harnesses while climbing up or on the structures.
5. Cutting into a structural member is not acceptable.
6. All antennas shall be mounted to insure the most direct view of the sky at the remote sites.
7. Antenna masts shall be provided where necessary to elevate the antenna high enough to insure direct view of the sky, and shall include the mast and all attachment hardware.

E. Antenna Connection Sealing

1. All antenna connections shall be coated with silicon grease and then covered with a protective rubber boot.

2.07 NOT USED

2.08 NOT USED

2.09 SITE COMMUNICATIONS

A. Methods

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SATELLITE TELEMETRY SYSTEM

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1. Each RTU shall be capable of communicating with the High Tide Technologies central server.

## 2.10 SITE CONTROL

### A. Control Methods

1. The control of the typical remote booster pump shall be based upon the existing pump control system, ie, floats or analog level sensor shall provide the pump starts/stops and determine the run time.
2. Each booster pump location shall have an operator interface on the web based software for display of local alarm messages, pump status, wet well levels (if available).
3. The ability to operate pumps manually will be by Owner provided Hand-Off-Auto (H-O-A) switches.
4. When the switch is in the "Auto" position, the RTU or controller shall automatically control the pump.

## 2.11 SUBMITTALS

### A. General

Within 7 days after receiving the contract, the Manufacturer shall submit all component data sheets in an orderly manner for review and approval.

1. A bill-of-material (BOM) shall be submitted according to each type of SATELLITE TELEMETRY SYSTEM telemetry site such as the primary site at the tanks, booster pump stations, etc.
2. All data sheets shall be printed out from PDF format files. Legible copies from catalogs will also be accepted. All copies shall be clear and legible.
3. The specified product in the data sheet shall be highlighted with a pointed stamp to clearly identify the submitted item.
4. The sheets shall list all pertinent product data such as name, catalog number, model number, nameplate data, dimensions etc.
5. The submitted data shall be organized into separate loose-leaf three-ring binders according to the type of site such as tanks, and booster pump station, etc.
6. The BOM shall precede the data sheets and the sheets shall be

organized according to the order of the BOM.

7. A detailed description and/or list of functions, including spares for future items, for each SATELLITE TELEMETRY SYSTEM site shall be submitted to the ENGINEER. The Manufacturer shall meet with OWNER and ENGINEER, as requested, to fully explain functionality submittal.
8. Five (5) duplicate copies of the submittals shall be required.

B. Submittals

1. Manufacturer's Catalog Data
  - a. Software.
  - b. DC power supplies.
  - c. Terminal blocks.
  - d. Conductors.
  - e. Control relays.
  - f. I/O equipment racks.
  - g. Hardware.
  - h. Surge protection.
  - i. Analog cable.
  - j. Enclosures.
2. Drawings
  - a. Wiring diagrams.
3. Operation and Maintenance Manuals
  - a. Satellite system.

2.13 PROGRAMMABLE RTU PROCESSOR

- A. Provide a High Tide Technologies system, or equal. The control system shall consist of individual RTUs and the existing pump control system located at each monitoring location. The capability shall exist to allow for expansion of the system by the addition of hardware and/or software. Program development is the responsibility of the Manufacturer of the satellite telemetry system.

1. All hardware of the RTU shall operate at an ambient temperature of minus 20 to 60 degrees C (-4 to 140 degrees F), with an ambient temperature rating for storage of minus 40 to plus 60 degrees C.
2. All RTU hardware shall function continuously in the relative humidity range of 5 to 95 percent with no condensation.
3. Each RTU shall have at least one dedicated serial port.

B. Processor Hardware

1. The processor shall be an integral piece of the modem, and will provide control program execution and support remote or local programming.
2. The user program, data, and operating system shall include EEPROM or equivalent for backed memory storage.
3. Each processor shall contain enough base memory for at least 30% growth room after the program has been completed and tested.
4. The front enclosure of the processor shall include an RS232 serial port.
5. All system modules, local and remote chassis shall be designed to provide for free airflow convection cooling. No internal fans or other means of cooling, except heat sinks, shall be permitted.

C. RTU Power Supplies

1. The RTU power supplies shall operate in compliance with an electrical service of 85-265 VAC, single phase, in the frequency range from 47 to 63 Hz, or 17-32 VDC.
2. The manufacturer shall, if electrical power is unavailable, provide a solar powered RTU.
3. The RTU shall have an integral AC to DC power converter.
4. The power supply shall monitor the incoming line voltage for proper levels. When the power supply is wired to utilize AC input, the system shall function properly within the range of 85 to 265 VAC. When the power supply is wired to utilize DC input, the system shall function properly within the range of 17 to 32 VDC. In addition, the power supply shall provide surge protection and isolation.
5. In addition to the electronic protection described above the power supply shall offer a failsafe fuse that is not accessible by the customer.

D. RTU Networking and Communications

1. RTUs in the satellite telemetry system shall have standard communications that support ASCII or Modbus protocols.
2. The RTU shall have a standard programming instruction that allows bi-directional satellite messaging with the central server.
3. The RTUs shall support both scheduled and unscheduled communications between the central server.

E. Digital Inputs

1. Number of Digital Inputs: five
2. All digital inputs shall be optically isolated
3. Ambient Operating Temperature Rating: Minus 20 degrees C to 60 degrees C.

F. Analog Inputs

1. Input Type: voltage.
2. Number of Analog Inputs: five
3. Input Power: Loop Power.
4. Current/Voltage Ranges: 0-5 dc or 4-20 mA
6. Resolution: 10 bits.
7. Ambient Operating Temperature Rating: Minus 20 degrees C to 60 degrees C.

I. RTU System Technical Support

1. The manufacturer of the RTU shall provide multiple-channels of technical support to the OWNER. These channels include toll free telephone, fax, and web-based support.
2. The satellite telemetry system manufacturer shall maintain technical assistance toll free telephone "hotline.

2.14 RTU SYSTEM ENCLOSURES

- A. The system enclosure shall contain the RTU, complete with inputs/outputs, power supplies, surge protection, terminals and all associated wiring. The enclosures shall come pre-assembled with all associated components mounted and wired.
- B. Remote Terminal Enclosures: Provide pre-built and wired Hoffman brand or equivalent remote terminal enclosures. Each remote terminal enclosure shall consist of:
  - 1. One (1) molded NEMA 4 rated enclosure. Enclosures shall be PVC.

2.15 NOT USED

2.16 DC POWER SUPPLIES

- A. Regulated: Solid-State
- B. Input: 85-230 volts ac, single phase, 60 hertz.
- C. Output: Model 100A- 17 volts dc  
Model 101- 24 volts dc.
- D. Output Current: 2.0A.
- E. Ambient Temperature Range: Minus 20 to 50 degrees C.
- I. Mounting: Enclosure-mount acceptable.
- J. Primary Protection: Internal fuse
- K. Additional Protection: Over-current protection for secondary

2.17 TERMINALS

- A. Provide single-circuit feed-through terminal blocks for all control system enclosures. Provide the following:
  - 1. Voltage Rating: 30 volts AC/DC maximum.
  - 2. Model 101-Clamp Type
  - 3. Model 100A – Screw Type

5. Colors: Gray, Green, or Orange for conductors and grounds. Green for all grounds.
6. Identification Markers: All terminals shall have label markers for each terminal.

## 2.18 CONDUCTORS

- A. Shielded twisted pairs for signal wiring such as instrument signals. General wiring for enclosures. Group and neatly route conductors within enclosures.
- B. Wire Color Codes: General internal wiring color code specifications for all supplied enclosures/enclosures. There shall be no exceptions.
  1. All 120V single-phase AC wiring shall be red.
  2. All single-phase AC neutral wiring shall be white.
  3. All wiring originating outside the enclosure/enclosure that is not controlled by the local disconnect or main breaker shall be yellow.
  4. All 24V DC positive wiring shall be blue.
  5. All 24V DC common wiring shall be blue or blue w/white tracer.
  6. All ground wiring shall be green or green with yellow tracer.
- C. Shielded Twisted Pair
  1. Tinned, soft copper and insulated with nylon-jacked polyvinyl chloride.
  2. Color code each conductor pair.
  3. Twist conductors into pairs with a 1-1/2-to 2-1/2-inch lay.
  4. Code each pair with a unique pair number.
  5. 100 percent shielded coverage, aluminum-polyester.
  6. No. 22 AWG.
  7. No. 22 AWG stranded copper drain wire.
  8. Rated 300 volts, 60 degrees C.

D. Conductors: General internal wiring of specified electrical enclosures. Group and neatly route conductors within enclosures.

1. All wiring internal to the supplied enclosures/enclosures shall be machine tool wiring rated MTW/AWM/TFF with an insulation rating of at 600-volts and UL approved - no exceptions.
2. All non-input/output module point-to-point wiring shall be 16 AWG.
3. All discrete input module to terminal wiring shall be 20 AWG.
4. All discrete output module to terminal wiring shall be 18 AWG.
5. Provide nylon wrapping around wire bundles crossing door hinges for protection.

2.19 SOLID STATE RELAYS

- A. Mounting:
- B. Relay Rating: 300 volts, 10 amperes.
- C. Contacts: SPST.
- D. Coil Voltage: 5 Volt.

2.20 ANALOG SURGE PROTECTION

- A. Provide surge protector on 4-20mA inputs and outputs to each RTU. Provide the following:
  1. Rated Maximum Voltage: 28-30 volts DC.
  2. Operating Current: 80 - 300 mA maximum.
  3. Terminals: Screws or terminal mount only.
  4. Impulse Discharge Current: 5 kA (minimum).

2.22 NOT USED

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2.23 NOT USED

2.24 NOT USED

2.25 NOT USED

2.26 NOT USED

2.27 NOT USED

2.28 NOT USED

2.29 WIRING DIAGRAMS

- A. Electrical CAD-based wiring diagrams shall be provided for the previously defined sites using the specified standards:
1. Detailed I/O point assignments will be provided for each enclosure by the Manufacturer of the SATELLITE TELEMETRY SYSTEM system to the CONTRACTOR.
  2. All drawings shall be generated using Adobe pdf software.
  3. NFPA Electrical Standard for Industrial Machinery 1997 Edition shall be used as the standard for all electrical symbols.
  4. NFPA Annex C and D shall be used as the reference for sample electrical diagrams.
  5. All drawing files shall be provided to the ENGINEER for review and approval before the enclosures are wired.

2.30 NOT USED

2.31 FIELD INSTRUMENTS

- A. All of the OWNER's existing field instrumentation shall be integrated into the manufacturer's satellite telemetry system. Any broken or malfunctioning instrumentation shall be brought to the attention of the ENGINEER and the OWNER'S attention immediately for replacement by the OWNER.

### **PART 3 EXECUTION**

High Tide Technologies, LLC  
SATELLITE TELEMETRY SYSTEM

3.01           INSTALLATION, GENERAL

- A.     Install all equipment in accordance with ANSI C2, ANSI/NFPA 70 and the requirements specified herein.

3.02           WIRING

- A.     Install conductors and cables in conduit, unless indicated otherwise.
- B.     Complete raceway systems and remove obstructions before pulling conductors into place. Avoid damaging insulation during conductor installation. Use an approved lubricating compound as required to facilitate pulling wires.

3.03           SPLICES AND TERMINATIONS

- A.     Make up both mechanically and electrically tight.
- B.     Provide with a flashover or insulation value at least 100 percent in excess of wire insulation.
- C.     Make splices and terminations in junction boxes.
- D.     Make connections in No. 10 AWG and smaller conductors with insulated pressure connectors or wire nut connections.
- E.     Use terminal blocks of the proper voltage for interconnecting or splicing control cables, communication cables, and other conductors. Mount terminal blocks in a cabinet and label terminals properly.

3.04           NOT USED

3.05           TESTING

- A.     Performance Verification Test: Conduct performance verification tests to demonstrate that control system maintains set-points, and that system is programmed for the correct sequence of operation. Conduct performance verification test one day after work is installed of continuous RTU systems operation and before final acceptance of work. Performance verification test shall demonstrate the following:

1. Field Testing: Calibrate field equipment and verify equipment and system operation before placing the system on-line. Field-testing shall include the following tests.
2. Calibration Accuracy and Operation of Inputs Test: Check for proper calibration and operation of each input instrument. Document each reading for the test report.
3. RTU Startup and Memory Test: Demonstrate that programming is not lost after a power failure, and RTU controllers automatically resumé proper control after a power failure.
4. Surge Protection: Show that surge protection, meeting the requirements of this specification, has been installed on incoming power to the digital controllers and on communications lines.

### 3.06 FIELD TESTS

- A. Demonstrate compliance of the control system with the contract documents. Furnish personnel, equipment, instrumentation, and supplies necessary to perform calibration and site testing. Ensure that tests are performed by competent employees regularly employed in the testing and calibration of instrumentation systems.
- B. Notify the OWNER of any defective products and workmanship disclosed by the tests.
- C. Testing will include the field and the performance verification tests. Field tests shall demonstrate proper calibration of input devices, and the operation of specific equipment. Performance verification test shall ensure proper execution of the sequence of operation and proper tuning of control loops.
- D. Test each device such that each item will function not less than five times.
- E. Tests are subject to oversight and approval by the OWNER.

END OF SECTION