SECTION 40 9020

INSTRUMENTATION AND CONTROL
FIELD INSTRUMENTATION

PART 1 - GENERAL

1.1 SCOPE

A. Furnish all field instrumentation, accessories, and service as required to provide a complete and operable instrumentation system as specified herein and as shown on the attached schedule. The instrumentation shall be specifically designed for measuring level and velocity in gravity sewer applications.

B. The work includes furnishing, testing, adjusting, and starting up instrumentation, transmitters, mounting hardware, and all accessories for a complete installation.

C. The Supplier shall be responsible for all patents, licenses, fees, or claims because of the design, equipment, or assemblies used, and because of any special provisions or requirements which are inherent for proper operation of the equipment specified or required under this item.

1.2 SHOP DRAWINGS AND ENGINEERING DATA

A. Submit complete shop drawings and engineering data to the Engineer.

1.3 OPERATION AND MAINTENANCE DATA

A. Submit complete operation and maintenance data to the Engineer.

1.4 GUARANTEE

A. Provide a guarantee against defective or deficient equipment for one year.

1.5 CODES AND STANDARDS

A. The instruments shall comply with the following codes and standards:

1. Applicable local and state code requirements.

2. National Electrical Code (NEC).

3. Applicable standards of the Underwriter's Laboratories, Inc. (UL).
   a. UL 508 Industrial Control Equipment.

4. Applicable standards of the Institute of Electrical and Electronics Engineers (IEEE).

1.6 TRANSPORTATION

A. Provide transportation of all equipment, materials, and products furnished under this section to the Owner.

B. Suitably box, crate, or otherwise protect all equipment during transportation. All openings shall be plugged or sealed to prevent the entrance of water or dirt.

PART 2 - PRODUCTS

2.1 GENERAL FIELD INSTRUMENTATION REQUIREMENTS

A. The instrumentation systems and appurtenances shall be designed and proportioned to measure, indicate, and control accurately over their entire range under continuous service. All equipment shall be of rugged and substantial construction and be constructed of noncorrosive materials particularly adapted to the service required.

B. Unless otherwise specified, instruments shall be provided with enclosures to suit specified environmental conditions.

C. Where separate elements and transmitters are required, they shall be fully matched, and unless otherwise noted, installed adjacent to the sensor. The equipment manufacturer shall supply special cables or equipment as required for a complete and operable system.

D. Electronic equipment shall utilize printed circuitry and shall be coated (tropicalized) to prevent contamination by dust, moisture and fungus. Ambient conditions shall be -15 to 50C and 20 to 100 percent relative humidity, unless otherwise specified. Field mounted equipment and system components shall be designed for installation in dusty, humid, and corrosive service conditions.

E. All electronic components, controls, instruments, switches, transmitters, and like items shall be suitable for 120-volt (+/-10%), single-phase, 60-hertz power supply, unless otherwise shown or specified, or 6 to 24-volt DC electrical service. Unless otherwise specified, such items shall have NEMA 4X enclosures.

F. Materials and equipment used shall be UL approved wherever such approved equipment and materials are available.

G. Purchase or provide any and all software packages required for the system in the name of the City of Goodlettsville. All warrantees associated with the hardware and software shall be in the name of the City of Goodlettsville.

2.2 FLOW MODULE WITH WIRELESS COMMUNICATIONS

A. The flow module with wireless communications shall be the Shortboard Model 2000 as manufactured by Flowav, Inc. or Engineer approved equal.

B. The module shall feature the following elements.

1. Area velocity type.
2. One or two sensors, any combination.

3. Data Recording: sample rate and data interval 3/second up to 8 hours, each channel

4. Memory: 512 kbytes RAM with 220 kbytes data storage (wrap-around, first in, first out). Data capacity shall be dynamically allocated to active.

5. Sensor Channels: 50,000 values per channel.

6. Communications Options: Local RS-485, packet switch cellular, 1xRTT or GRPS

7. Battery: Eveready Energizer Model 529. Battery life shall be a minimum of 3 months with 15-minute sample rate. External power shall be 9 to 15 VDC at 1A maximum.

8. Enclosure: PVC material, IP67 rating.

9. Temperature: Shall be suitable for 0 to 70 degrees C.

10. Software Compatibility: S-3EP Telogers for Windows, DTU Palm Pilot with Telog software, or S-3EP Teleog Enterprise.

11. Wireless: Include all wireless accessories and cables for a complete and functional installation.

2.3 AREA VELOCITY SENSOR

A. The area velocity sensor shall be the Pipeline Model PSA-AV as manufactured by Flowav, Inc. or Engineer approved equal.

B. The sensor shall feature the following elements.

1. Material: Epoxy encapsulated PVC housing.

2. Cable: Urethane sensor cable with vents. 35 feet length standard.

3. Communication: MODBUS RTU with two-wire RS-485.

4. Velocity Sensor: Doppler ultrasonic, twin PZT disks. Suitable for 32 to 160 F operating temperature. Operating range of -5 to 20 ft/sec. Accuracy +/- 2% of reading. Shall measure average velocity utilizing Progressive Spectral Analysis (PSA). Shall transmit ultrasonic signal through flow cross-section. The signals shall be analyzed to determine velocity.

5. Pressure Sensor: Pressure sensor with ceramic diaphragm, piezoresistive. Range 0 to 15 feet with maximum allowable range of 45 feet. Accuracy +/- 0.25% full scale, minimum resolution of 0.07 inches. Compensated range of 40 to 90 degrees C. Shall measure depth based on the difference in atmospheric and water height pressure. Sensor shall be factory calibrated to compensate for temperature changes. Offset from the bottom of the pipe shall be able to be compensated for based on user-entered depth measurements.

2.4 ACCESSORIES

A. Mounting rings and a street level installation tool shall be provided. The following accessories shall be provided.

1. Street Level Tool shall be a multi-section pole suitable for installation of the pipe mounting rings from the ground level thereby eliminating the need to enter the manhole. The maximum length shall be 17.75 feet and be capable of mounting

in manholes up to 15-feet depth. Materials shall be anodized aluminum, type 304 stainless steel, and Delrin.

2. Mounting rings shall be fully compatible with the street level tool and shall be available in sizes ranging from 6 to 15 inches. Strap length shall be 18-feet. Materials shall be type 301 stainless steel, Delrin, stainless steel hardware, and polypropylene strap. Mounting rings shall be fully compatible with the area velocity sensors specified above without the need for modifications or adapters.

PART 3 - EXECUTION

3.1 CLOUD BASED DATA HOSTING SOLUTION

A. A cloud-based data hosting solution shall be provided. The cloud-based data hosting solution shall allow the user to access the data 24 hours per day, 7 days per week on the Internet using any personal computer that has Internet access and is running any common web browser software. The cloud-based data hosting solution shall be provided to the Owner for up to ten (10) individuals.

B. The data hosting web interface shall include the following features available to the users:

1. View and share Real Time Data with multiple remote viewers.
2. User name and password protected views.
3. Mapping Features to locate sites, users GIS Geodata, or third party maps.
4. View Trend, Event, Data or Scatter Plots.
5. View multiple sites in one screen based on site group.
6. Allow graphical and tabular data to be downloaded to the user's local personal computer in the following formats: CSV, PDF, and tab delimited.
7. Allow any multiple measurements from any RTU to be assembled, by the user, into a single graphical and/or tabular report via the data hosting web interface.
8. Allow the user to select any time span of data to view and download.
9. Allow the user to zoom in and out of the graphical data displayed on the web interface.
10. Provide system health reports to the user that include alarm status, battery status, modem call status, flat-line data status.

END OF SECTION

SECTION 40 9200
FIELD INSTRUMENTATION
SCHEDULE

SCHEDULE 1 - EQUIPMENT

Equipment Element	Quanity	Price Each	Total Price
Flow Module w/ Wireless Comms	8		
Area Velocity Sensor	8		
6-inch Mounting Ring	1		
8-inch Mounting Ring	6		
10-inch Mounting Ring	1		
12-inch Mounting Ring	2		
15-inch Mounting Ring	2		
Ground-Level Installation Tool	2		
USB Communication Cable	2		
		TOTAL PRICE	

SCHEDULE 2 - HOSTING

Hosting Element	Quanity	Price Each	Total Price
Monthly Hosting Fee (per meter/month)	96		
Setup Fee (per meter)	8		
		TOTAL PRICE	