TLS-350
UST Monitoring and Leak Detection System

## Part 1 – General System Requirements

### 1.1 Description

A. These Specifications are intended to provide information by which prospective bidders may understand the requirements relative to furnishing and installing a monitoring system for underground liquid storage tanks and associated below-grade product piping.

B. These specifications shall describe specifically a continuous underground monitoring and leak detection system that shall perform in accordance with Subpart D of 40 CFR 280 and, as a standard of performance and quality, shall meet the performance specifications and functions of the Veeder-Root Company TLS-350 UST Monitoring system.

C. The underground storage tank monitoring system shall meet all applicable standards and regulatory agency requirements including, but not limited to, the standards and requirements of the following:

1. American National Standards Institute (ANSI)
2. American Petroleum Institute (API)
3. American Society for Testing and Materials (ASTM)
4. Environmental Protection Agency (EPA)
5. National Bureau of Standards (NBS)
6. National Electrical Code (NEC)
7. National Fire Protection Agency (NFPA)
8. Underwriters Laboratories Inc. (UL)
9. Canadian Standards Association (CSA)
10. Canadian Underwriters Laboratories Inc. (cUL)
11. Underground Storage Tanks: Subpart D, 40 CFR Part 280
12. Federal Communications Commission (FCC)
13. British Approval Service for Electrical Equipment in Flammable Atmospheres (BASEEFA)
14. Factory Mutual (FM)

## Part 2 – Operational Specifications

### 2.1 In-Tank Leak Detection

A. The system shall utilize in-tank probes based on the magnetostrictive principle for liquid level measurement and in-tank leak detection.

B. The tank gauge shall be capable of performing a static tank tightness test to an accuracy of 0.1 GPH with at least a 98% probability of detection [P(D)] and no more than 1% probability of false alarm [P(FA)].

C. The system shall have the ability to automatically run a static in-tank leak test, by monitoring the activity of the submersible pump. Depending on the idle time between pumping cycles, the system will automatically run a 3.0 GPH test, a 0.2 GPH test or a 0.1 GPH test. Each successive test will start automatically upon completion of the previous test. If a dispensing transaction or a delivery takes place, the system will automatically disable the test until the next appropriate idle period.

D. The system shall have the ability to be programmed to run a static 0.2 GPH quick leak test. This quick static leak test will take one hour, and commence 30 minutes after the last dispensing cycle, or five hours from the last delivery, whichever is greater.

E. The system shall have the ability to conduct automatic Continuous Statistical Leak Detection (CSLD) tests without the need to shut down tanks for scheduled test times.

F. The system shall have the ability to conduct automatic Continuous Statistical Leak Detection for systems where tanks are manifolded together.

G. The system shall continuously collect product height and temperature information from the tank, and without input from any other source, utilize dynamic pattern analysis to determine when idle periods in the tank begin and end. Idle time information thus collected shall be transferred to the system's database for qualification.

H. The system shall be capable of evaluating the quality of information stored in the database after each idle period. The idle period qualification shall consider noise factors affecting the idle time such as dispensing, deliveries, temperature changes, temperature stratification and evaporation.

I. The system shall be capable of dynamically qualifying the idle time data and selecting the best available data to perform a 0.2 GPH tank tightness evaluation.

J. The system shall employ the use of dynamic feedback variables in the algorithm to evaluate the noise factor patterns associated with a tank, thus tailoring the algorithms to each individual tank.

K. The system shall perform a new 0.2 GPH tank tightness evaluation as each new piece of idle period data is added to the database.

L. The system, when operated in the continuous statistical leak detection mode, shall be third-party certified for statistical leak detection in tanks up to 30,000 gallons. The test shall meet or exceed U.S. EPA standards with a 99% probability of detecting a

0.2 GPH leak and less than a 0.1% probability of false alarm. It shall meet federal, state and local compliance requirements for monthly monitoring.

M. In conjunction with having the ability to perform a continuous statistical leak test, the monitoring system shall have the ability to perform a static leak test to an accuracy of 99% probability of detecting a leak and 1% probability of false alarm.

2.2 Interstitial Leak Detection for Double-Wall Tanks

2.2.1 Wet Monitoring

A. The system shall be able of performing automatic, continuous leak sensing by monitoring the liquid level in the reservoir of a brine-filled interstitial space (annulus) of a double-wall tank to detect a breach in the inner or outer shell.

B. The system shall differentiate between a high liquid level and a low liquid level in the brine reservoir of a double-wall tank and provide a high-liquid alarm or a low-liquid alarm.

2.2.2 Dry Monitoring

A. The system shall be able of performing automatic, continuous leak sensing in the dry interstitial space (annulus) of a double-wall tank, to detect a breach in the inner or outer shell.

B. The system shall differentiate between hydrocarbons and water, and provide an indication of a fuel alarm or a liquid alarm.

C. The system shall have the ability to sense the presence of hydrocarbons and/or liquid, and provide an alarm for worst-case condition (fuel).

D. The form factor of the sensor must provide for easy field installation/removal.

E. The system shall have the ability to continuously monitor the integrity of the sensor for an open condition, alarm condition, or normal operating condition.

2.3 Product Line Leak Detection

A. A single line leak detector is required for each line to be monitored.

B. The product line shall be tested by the electronic line leak detector at the actual pumping pressure, or higher, of the submersible pump.

C. The system shall perform tests automatically and on demand.

D. The product line leak detector shall be capable of performing a leak test equivalent to 3.0 GPH @ 10 PSI, after the dispenser is shut off. The system shall be capable of performing a leak test equivalent to 0.1 GPH @ 150% of pumping pressure (0.08 GPH at operating pressure) automatically, on demand or at a programmed time.

E. The product line leak detector shall be capable of shutting down the submersible pump automatically when a 3.0 GPH failure has been detected. Submersible pump shutdown shall be a programmable option on occurrence of a 0.2 or 0.1 GPH failure.

F. The line leak detector shall be programmable to include a leak test schedule, selectable test rates, lockout times, and a selectable shutdown leak rate (3.0, 0.2 or 0.1 GPH).

G. The line leak detector shall be capable of performing a self-test to verify proper operation, or shall be fail safe in operation.

H. The line leak detector assembly shall be suitable to operate in an NFPA 70, class 1, division 1, group D environment and shall meet the intent of article 500 of the National Electrical Code (NEC), as published by the NFPA.

## 2.4 Containment Sump Monitoring

A. The system shall be able to perform automatic, continuous leak sensing in the containment piping sump.

B. The system shall have the ability to detect the presence of fluid (hydrocarbons and/or water) in the piping containment area and provide appropriate alarm conditions.

C. The system shall have the ability to differentiate between hydrocarbons and water, and provide an alarm for the respective condition. The system shall also have the ability to indicate when the sensing device has failed and is no longer providing environmental compliance.

D. The system shall have the ability to continuously monitor the integrity of the sensor for an open condition, alarm condition, or normal operating condition.

## 2.5 Well Monitoring

### 2.5.1 Dry Well

A. The system shall be able to perform automatic, continuous hydrocarbon vapor sensing in a dry monitoring well to detect hydrocarbon releases caused by a breach in the product pipeline and/or storage tank.

B. The sensor shall provide an alarm if water covers the sensor, indicating non-compliance.

C. The sensor shall be recoverable and reusable after exposure to hydrocarbons.

2.5.2 Wet Well

A. The system shall be able to perform automatic, continuous groundwater monitoring for hydrocarbons in a wet monitoring well to detect hydrocarbon releases caused by a breach in the product pipeline and/or storage tank. The system shall react to as little as 1/32 of an inch of free-floating product on the groundwater.

B. The sensor shall provide an alarm if the water level drops below the sensor, indicating non-compliance.

C. The sensor shall be recoverable and reusable after exposure to hydrocarbons.

2.6 Environmental Compliance Reports

A. The system shall have the ability to provide a record of the last three occurrences of each type of alarm or warning condition detected by the system.

B. The system shall provide the following types of reports related to environmental compliance matters:

1. System status messages
2. In-tank warning and alarm messages
3. In-tank tightness evaluation report
4. Liquid sensor warning and alarm messages
5. Normally-closed sensor warning and alarm conditions
6. Hydrostatic sensor warning and alarm conditions (high or low liquid level conditions)
7. Vapor sensor warning and alarm conditions
8. Line leak detector warning and alarm conditions
9. Line leak detector tightness evaluation report
10. Groundwater sensor warning and alarm conditions
11. External input messages
12. Discriminating interstitial sensor warning and alarm messages
13. Discriminating dispenser pan and containment sump sensor warning and alarm messages

2.7 Product Inventory Control (Tank Gauging)

A. The tank management system shall collect product height and temperature data from up to twelve magnetostrictive level sensors and compute gross and temperature-compensated net gallons. The operator may choose from inventory or delivery information to generate a complete set of printed inventory or delivery reports.

B. The system shall automatically generate an inventory increase report when a delivery of product to a tank has taken place. The report shall include the time and date of the delivery, the starting volume in the tank, the ending volume in the tank, the starting temperature of the fuel, the ending temperature of the fuel, and the inventory increase amount.

C. The system shall have the ability to store up to ten of the most recent inventory increases in memory for business management purposes.

D. The system shall provide the ability to monitor aboveground storage tanks, as well as underground storage tanks, for inventory management.

2.7.1 Fuel Management

A. The system shall have the ability to track average daily sales for each product and calculate the sales for each day of the week.

B. The system shall have the ability to maintain a rolling database of average daily sales for each product and calculate the number of days of product remaining.

2.8 Inventory Management Reports

A. The system shall monitor inventory in U.S., Metric or Imperial units for up to twelve tanks and produce a combination of automatic and manual reports for each tank, which include the following information:

1. Fuel volume
2. Fuel height
3. Water height
4. Fuel temperature
5. Ullage
6. Temperature-compensated fuel volume
7. Last inventory increase amount
8. Last in-tank leak test results
9. Time and date
10. Tank identification
11. Fuel type identification
12. 90% ullage

B. A printout of the inventory status report shall be generated any time the operator presses the print button while the system is in the normal operating mode, or generated automatically four times a day with the information stored in memory.

C. The system shall provide an automatic delivery report, programmed to print from 1 to 99 minutes after a bulk delivery to a tank is complete. The information shall include station header, product label, date, starting and ending time, starting and ending

volumes, temperature of the fuel, as well as the net volume increase. The information shall be available in U. S., Metric or Imperial units.

D. The system shall be able to generate reports in a display/printer format as well as a computer format upon demand.

2.8.1 Fuel Management Reports

A. The system shall be able to generate fuel management reports in a display/printer format as well as a computer format upon demand via the RS-232 serial communications interface.

B. A printout of the fuel management status report shall be generated any time the operator presses the print button on the front panel while the system is in the normal operating mode.

C. The system shall provide a report outlining the average sales of fuel per day, current inventory, ullage and the number of days of fuel remaining.

2.9 Communications

A. The tank monitoring system shall provide the ability to communicate with locally attached electronic devices through an RS-232 port, or remote locations via either an RS-232 port or internal modem. The system shall provide data in a display or packed computer data format.

B. The communications protocol shall be Veeder-Root standard serial communications protocol or compatible.

C. The tank monitoring system shall provide all reports available on the integral printer through the communications port. These shall include all reports associated with inventory management, environmental compliance and diagnostics/troubleshooting.

D. The system shall provide for setup and configuration through the communications port using the Veeder-Root standard serial communications protocol or compatible.

2.9.1 Serial Communications

A. The system shall provide an RS-232 communications interface for data transmission to a computer, point of sale terminal, printing device, or a modem for remote communications.

B. The system shall provide an auxiliary RS-232 communications interface for linking to a second tank monitoring system.

2.9.2 Auto-Dial SiteFax Modem

A. The tank monitoring system shall provide an internal auto-dial fax 2400/1200/300-baud, Hayes-compatible modem, with twin snap-in RJ-11 jacks for direct data transmission over phone lines, capable of transmitting information directly to a fax machine, PC or teletype.

B. The auto-dial fax/modem shall include the following capabilities:

1. Dial up to eight user-programmed phone numbers.

2. Transmit up to 16 user-selected reports to each phone number. The reports consist of:
    a. System status
    b. Inventory information
    c. Deliveries
    d. Tank and line Leak test results
    e. Sensor status
    f. Alarm histories

3. Programmable calling times and schedules for each of the eight phone numbers.

4. Selectable automatic dialing to report any alarm condition immediately. The call shall be immediate on alarm occurrence, selectable by alarm type and assignable to any or all of the eight user-programmed phone numbers.

5. Selectable fax/computer/teletype compatibility.

C. In addition to automatically dialing out at preprogrammed times or to report an alarm condition, the system shall have the ability to receive calls from a PC or terminal that will query the tank monitoring system for information.

2.9.3 Wide Area Network Software (Remote Monitoring)

A. The manufacturer shall provide a communications/database software package to poll remote tank monitoring sites from a central location.

B. The communication/database software shall provide the ability to communicate directly with the tank monitoring system, via a 25-pin RS-232 serial interface or remotely via a dial-up network over the public telephone network.

C. The software package shall provide the ability to remotely configure a system and download that information to the tank monitoring system. The software shall also provide the ability to call the tank monitoring system, upload information into the database and allow the user to make changes and transmit those changes to the system.

D. The software shall provide a communication mode, in which it can automatically and continuously poll locations that have been designated for data retrieval, and store data in a standard database format.

E. The stored data shall be easily transferable to other software packages, such as spreadsheets, database packages, etc., for data manipulation.

F. The software shall provide an immediate on-line mode to retrieve specific information from a tank monitoring system and to download setup and configuration information.

G. The software shall be able to generate inventory and environmental compliance management reports on demand for all of the data stored or specific ranges of data.

H. The software system shall provide the user the ability to retrieve all diagnostic data from the tank monitoring system. It shall also provide the ability to backup and recover data that has been stored.

I. The software package shall permit the user to connect on-line with a location and enter serial communication protocol commands for information retrieval.

2.9.4 Remote Printer

A. The tank monitoring system shall provide the ability to interface to a remote, 80-column-wide serial printer.

B. All reports, including inventory, delivery, environmental compliance (leak detect), alarm history and status (see Section 2.6 for a list of reports) may be printed out on the 80-column-wide printer.

2.9.5 Reports

A. The system shall be able to generate reports in a display/printer format as well as a computer format through the communication interface using the Veeder-Root serial communications protocol. All reports, including inventory, delivery, fuel management, environmental compliance (leak detect), alarm history and status may be retrieved through remote or local communications.

2.10 Input/Output Devices

2.10.1 Output Relay Module

A. The system shall provide the ability to enable external audible/visual alarms or control external devices through a relay contact closure.

B. The system shall provide 4 Form C contact relays per interface module.

C. The system shall provide the ability to install up to 8 relay output modules per system, for a total of 32 relays.

D. The system shall provide the ability to program the relay in either a Normally Open or Normally Closed orientation.

E. The system shall provide the ability to assign in-tank, line leak, sensor, external input, or system alarm conditions to a selected relay.

F. The system shall provide the ability to designate a 20-character label to a device connected to the output relay through system programming.

2.10.2 Input/Output Combination Module

A. The system shall provide the ability to accept an input from an external device and enable a relay to control an external device.

B. The system shall provide 2 Form C contact relays per input/output module.

C. The system shall have the ability to install up to 8 input/output combination modules for a total of 16 inputs and 16 outputs.

D. The system shall have the ability to define the type of input connected to the system, standard or generator.

E. The system shall have the ability to name, through system programming, each external device connected to an input position.

F. The system shall provide the ability to identify the input switch type from a stand-by generator (Normally Open or Normally Closed) to properly recognize a generator off condition.

G. The system shall provide the ability to identify which tanks supply fuel to the generator to properly conduct continuous leak tests on tanks when the generator is off.

2.11 Alarms

A. The tank monitoring system shall provide an audible and visual indication of all system, in-tank, product line leak and external sensor alarm conditions.

B. The system alarm conditions shall include:
1. Maximum product level
2. High level limit
3. Overfill alarm

4. High water alarm
5. Second high water alarm
6. Delivery needed alarm
7. Low limit
8. Theft
9. Periodic warning and alarm
10. Annual warning and alarm

C. The tank monitoring system shall provide an audible and visual alarm indication for in-tank leak failures (3.0 GPH, 0.1 GPH and 0.2 GPH), line leak detect failures (3.0 GPH, 0.2 GPH and 0.1 GPH) and external sensor leak failures (fuel, water, sensor out).

D. In conjunction with providing an audible and visual alarm, the system shall have the ability to print out all alarm conditions to the integral thermal printer.

E. The system shall have the ability to send all alarm conditions to the RS-232 serial communications port for data transmission to a central computer. The system shall have the ability to transmit the alarm condition immediately, or program a delay time before sending. The system shall also have the ability to enter a repeat function in the programming to repeat sending the alarm condition.

F. The system shall have the ability to automatically dial out and transmit system, in-tank leak, line leak and external sensor alarm conditions to a fax machine. (See Section 2.9.2 Auto-Dial SiteFax).

G. The system shall provide the operator with the ability to disable the audible portion of an alarm but the visual alarm shall not be disabled until the alarm condition has been corrected.

H. The system shall be equipped with an external audible and visual alarm with acknowledgement switch. The external alarm box and acknowledgment switch shall be manufactured in a watertight gasketed enclosure for installation in an outdoor environment. The external alarm box and acknowledgement switch shall interface to the tank monitoring system via an internal relay.

I. The system shall have the ability to store up to three alarm occurrences in memory. The operator shall have the ability to print the alarm history and alarm status on the integral printer, as well as retrieve alarm history and alarm status through the communications interface (RS-232 or 2400/1200/300 baud auto-dial fax/modem).

2.12 Setup (Startup/Installation)

A. The system shall contain parameter-driven software to adapt the tank monitor to site specifications. The parameters must be enterable in assigned fields at the time of system startup. In addition, the parameters must be field updatable so that changes in tank diameter/dimensions as well as site specifications can be added.

B. The system shall provide the use of a security code to prohibit unauthorized entry to the systems set-up parameters. The system security code shall be a six-digit number entered through the front-panel keyboard or through the external communications interface. The security code shall have the capability of containing alpha or numeric characters.

C. A four-line, 24-character customer location header to identify the site must be user-programmable. The header must appear automatically on inventory status reports, leak detection reports and automatic delivery reports each time they are printed.

D. Set-up parameters shall include the following:

1. System setup data
2. Communications setup data
3. In-tank setup data
4. Fuel management setup
5. In-tank leak test setup data
6. Pressurized line leak detector setup data
7. Volumetric line leak detector setup data
8. Volumetric line leak test setup data
9. Volumetric line leak tests lockout setup data
10. Pump sensor setup data
11. Liquid sensor setup data
12. Vapor sensor setup date
13. Groundwater sensor setup data
14. 2-Wire C.L. (Type A) setup data
15. 3-Wire C.L. (Type B) setup data
16. External input setup data
17. Output relay setup data
18. Pressurized line leak detection line disable setup data
19. Volumetric line leak detection line disable setup data

2.13 Diagnostics/Troubleshooting

A. All diagnostic information shall be generated by the system itself. The system shall not allow the user to change or enter diagnostic information in any way. The following diagnostic information shall be included in the system:

1. Probe Diagnostics
    a. Probe type
    b. Serial number
    c. Probe length
    d. Factory calibration values
2. System diagnostics
    a. Software revision level

b. Software part number
c. Software creation date

3. Fuel management diagnostics
    a. Days of fuel remaining
    b. Average sales per day
    c. Last sales per day
    d. Predicted sales per day
4. In-tank diagnostics
5. In-tank leak results
6. Line leak diagnostics data
7. Liquid sensor diagnostics
8. Vapor sensor diagnostics
9. Groundwater sensor diagnostics
10. Discriminating interstitial sensor diagnostics
11. Discriminating dispenser pan and containment sump sensor diagnostics
12. Groundwater sensor diagnostics
13. Alarm history report

2.14 Reports

A. The system shall provide the ability to print diagnostic information, listed in Part 2, Section 2.15, paragraph A, subsection 1 through 14, on the system's integral printer for hard-copy documentation and historical record keeping.

Part 3 – Product Specifications/Capacities

3.1 Console

A. The console shall be wall mounted using external mounting tabs.

B. The console shall be equipped with a two-line 24-character liquid crystal display for on-site viewing of all inventory, leak detect and alarm information.

C. The console shall be equipped with a 24-button front-panel keyboard with control and alphanumeric functions for programming, operating and reporting functions.

D. The console shall be equipped with three front-panel indicators to provide a visual indication of power on, warning and alarm conditions.

E. The console shall be equipped with an integral, 24-character, thermal report printer with built-in take-up spool for hard-copy documentation of inventory, leak detect, alarm information, and facsimile transmission confirmation.

F. The console shall be equipped with a back-up battery to maintain all programming information as well as inventory, leak detect and alarm information in the event of a power outage.

G. The console shall be of a modular design that allows for the installation of additional business management, leak detection and communications features in the future. See Section 3.2 for definition of modular design.

H. The console shall be equipped with four 1-3/4" conduit knockouts on the top and the bottom of the monitor for rigid conduit entry into the monitor. Two conduit entries (top and bottom) shall be designated for the intrinsically safe compartment, and two conduit entries (top and bottom) shall be designated for the high-power compartment.

I. The console shall be separated into three compartments for: 1) intrinsically safe wiring and devices; 2) high-power wiring and devices; and 3) communications wiring and devices.

J. The console shall have an internal quick-disconnect connector for 120 Vac wiring to the console for ease of installation, service and troubleshooting.

K. The console shall be equipped with the ability to communicate directly with an external POS terminal, printing device or PC. The system shall also have the ability to communicate with a remote device via the telephone lines.

L. The console shall be capable of selectively communicating in multiple languages, including English, French, German, Polish, Portuguese, Spanish, and Swedish.

M. The console shall be equipped with internal audible and visual warning and alarm indicators.

N. The console shall be intrinsically safe, with Underwriters Laboratories (UL), Canadian Standards Association (CSA), and Canadian Underwriters Laboratories (cUL) approvals.

O. The console shall comply with Federal Communications Commission (FCC) testing, FCC Part 68, Subpart 15.

P. The console shall be mounted and wired according to the manufacturer-supplied installation manuals, with all underground intrinsically safe field wiring enclosed in dedicated conduit and separate from all other wiring. The system's high-voltage wiring may share existing conduit with other high-voltage devices in accordance with the applicable guidelines published in the National Electrical Code (NEC).

Q. The console shall continuously monitor all probes and sensors, reporting not only normal operating conditions, but also system malfunctions or failures.

## 3.2 Modules

A. The tank monitoring system shall incorporate a modular design to allow the factory installation of system features to meet specific application requirements, as well as field installation/modification of features at a later date to meet changing business, environmental compliance or regulatory requirements.

B. The modular design shall consist of one console with the ability to accept plug-in modules. The console shall be divided into three compartments to separate and house plug-in modules for intrinsically safe devices, high power devices and communications devices. See Section 3.2.1 for compartment/module compatibility.

C. The interface of additional enclosures to the original console shall not be considered a modular design.

3.2.1 Module Compartments

A. The system shall have the ability to contain up to eight modules in the high-powered area of the console. The modules shall consist of:

1. A Four-Relay Output Interface Module that can be programmed to actuate external alarm devices when assigned alarm limits are exceeded or alarm conditions are identified.

2. A Two-Input/Two-Relay Output Interface Module that accepts two solid-state inputs from external devices, and includes two relay outputs that can be programmed to actuate external alarm devices.

3. A One-Input Line Leak Interface Module compatible with the Veeder-Root Volumetric Line Leak Detection System.

4. A Four-Input Pump Sense Interface Module to monitor the activity of the submersible pump. The module will be used with the Automatic Start Leak Detect feature of the tank monitoring system.

5. A Three-Output Pressurized Line Leak Controller Module compatible with the Veeder-Root Pressurized Line Leak Detection System.

6. A Three-Output Wireless Pressurized Line Leak Controller Module compatible with the Veeder-Root Wireless Pressurized Line Leak Detection System.

7. A Wireless AC Interface Module compatible with the Veeder-Root Wireless Pressurized Line Leak Detection System.

B. The system shall have the ability to contain up to eight modules in the intrinsically safe area of the console. The modules shall consist of:

1. A Four-Input Probe Interface Module compatible with the Veeder-Root Magnetostrictive probe.

2. An Eight-Input Sensor Interface Module compatible with the Veeder-Root sump and/or interstitial float switch sensors.

3. A Five-Input Vapor Sensor Interface Module compatible with the Veeder-Root vapor sensor.

4. A Five-Input Groundwater Sensor Interface Module compatible with the Veeder-Root groundwater sensor.

5. An Eight-Input Type A Sensor Interface Module compatible with the Veeder-Root discriminating interstitial sensor.

6. A six-Input Type B Sensor Interface Module compatible with the Veeder-Root discriminating dispenser pan and containment sump sensors.

7. A Six-Input Pressurized Line Leak Interface Module compatible with the Veeder-Root Pressurized Line Leak Detection System.

C. The system shall have the ability to contain up to three modules in the communications compartment of the console. The modules shall consist of:

1. An RS-232 Interface Module providing data transmission to a computer, point of sale terminal, or printing device.

2. A SiteFax 2400/1200/300-baud Modem Interface Module with twin snap in jacks for direct data transmission over the phone lines, utilizing the Hayes command set, with the ability to automatically call a fax machine based on the occurrence of an alarm condition or a preprogrammed report transmission time.

3. An Auxiliary RS-232 Interface Module for linking two tank monitors together for communications with a central location.

3.3 Probes

A. There shall be no more than two conductors between each probe and the control console.

B. The probe shall be capable of performing a leak detect test to 0.1 GPH or higher.

C. Third-Party Certification is required in accordance with the U.S. EPA's "Standard Test Procedure for Evaluating Leak Detection Methods: Automatic Tank Gauging Systems" (0.2 GPH monthly monitoring).

D. Third-Party Certification is required in accordance with the U.S. EPA's "Volumetric Tank Tightness Testing Method" (0.1 GPH annual tank tightness test).

E. The probe shall be compatible with aboveground tank installations as well as underground tank installations.

F. A cap and ring kit, available from the manufacturer, shall be supplied with each probe for easy installation and removal.

G. The probe shall use a digital communications protocol format for maximum RF/EMF immunity.

## 3.4 Sensors

A. The system shall provide the ability to monitor up to 64 interstitial areas and/or containment areas utilizing a standard float style sensor.

B. The system shall provide the ability to monitor up to 40 vapor sensors and/or groundwater sensors.

C. The system shall provide the ability to monitor up to 64 interstitial areas utilizing a discriminating interstitial sensor.

D. The system shall provide the ability to monitor up to 48 discriminating dispenser pan and/or piping containment sump sensors.

### 3.4.1 Solid-State Discriminating Dispenser Pan and Containment Sump Sensor

A. The solid-state discriminating dispenser pan and containment sump sensor shall utilize an ultrasonic technology to sense the presence of fluids and a Veeder-Root developed conductive elastomer to differentiate between hydrocarbons and water.

B. The design of the sensor shall provide for a distributed sensing capability over the full length of the dispenser pan and containment sump sensor.

C. The dispenser pan and containment sump sensor shall be reusable after being exposed to hydrocarbon liquids.

D. The dispenser pan and containment sump sensor shall not put the system into an alarm condition due to high concentrations of hydrocarbon vapors.

E. The dispenser pan and containment sump sensor shall provide an indication of fluid when liquid reaches 1" in height.

F. The dispenser pan shall provide a high-liquid-level indication when fluid reaches 8” in height and the containment sump sensor shall indicate a high liquid level when fluid reaches 10” in height.

G. The dispenser pan and containment sump sensors shall be supplied with a six-foot leader cable to connect the sensors to field wiring in the sensor junction box.

H. The dispenser pan sensor shall be 2.13” diameter and 11.53” high to address dispenser pan applications. The containment sump sensor shall be 2.13” diameter and 22.03” high to address containment sump applications.

1. Operating temperature: $-40^0$C to + $70^0$C.
2. Three-wire connection to the monitor.
3. Cable Length: 6’.
4. Sensor alarms on fuel at any height on the sensor, even when floating on other liquids.
5. Liquid warning is triggered when liquid reaches 1.0” high on the dispenser pan and the containment sump sensor.
6. High liquid alarm is triggered when liquid reaches 8.0” on dispenser pan and 10” on containment sump sensor.
7. Sensor is reusable and testable for regulatory purposes.

3.4.2 Discriminating Dispenser Pan and Containment Sump Sensor

A. The discriminating dispenser pan and containment sump sensor shall utilize float switch technology to sense and alarm for the presence of fluids and a Veeder-Root developed conductive elastomer to differentiate between hydrocarbons and water.

B. The design of the sensor shall provide for a distributed sensing capability over the full length of the dispenser pan and containment sump sensor.

C. The dispenser pan and containment sump sensor shall be reusable after being exposed to hydrocarbon liquids.

D. The dispenser pan and containment sump sensor shall not put the system into an alarm condition due to high concentrations of hydrocarbon vapors.

E. The dispenser pan and containment sump sensor shall provide an indication of fluid when liquid reaches 1” in height.

F. The dispenser pan shall provide a high-liquid-level indication when fluid reaches 8” in height and the containment sump sensor shall indicate a high liquid level when fluid reaches 10” in height.

G. The dispenser pan and containment sump sensors shall be supplied with a six-foot leader cable to connect the sensors to field wiring in the sensor junction box.

H. The dispenser pan sensor shall be 2.13” diameter and 11.53” high to address dispenser pan applications. The containment sump sensor shall be 2.13” diameter and 22.03” high to address containment sump applications.

1. Operating temperature: $-0^0$C to + $70^0$C.
2. Three-wire connection to the monitor.
3. Cable Length: 6’.
4. Sensor alarms on fuel at any height on the sensor, even when floating on other liquids.
5. Liquid warning is triggered when liquid reaches 1.0” high on the dispenser pan and the containment sump sensor.
6. High liquid alarm is triggered when liquid reaches 8.0” on dispenser pan and 10” on containment sump sensor.
7. Sensor is reusable and testable for regulatory purposes.

3.4.3 Solid-State Dispenser Pan and Containment Sump Sensor

A. The solid-state dispenser pan and containment sump sensor shall utilize an ultrasonic technology to sense and alarm for the presence of fluids.

B. The dispenser pan and containment sump sensor shall be reusable after being exposed to hydrocarbon liquids.

C. The dispenser pan and containment sump sensor shall provide an indication of fuel when liquid reaches 1” in height.

D. The dispenser pan and containment sump sensors shall be supplied with a six-foot leader cable to connect the sensors to field wiring in the sensor junction box.

E. The dispenser pan sensor shall be 2.13” diameter and 11.53” high to address dispenser pan applications. The containment sump sensor shall be 2.13” diameter and 22.03” high to address containment sump applications.

1. Operating temperature: $-40^0$C to + $70^0$C.
2. Two-wire connection to the monitor.
3. Cable Length: 6’.
4. Fuel alarm is triggered when liquid reaches 1.0” high on the dispenser pan and the containment sump sensor.
5. Sensor is reusable and testable for regulatory purposes.

3.4.4 Piping Sump Sensor

A. The piping sump sensor shall be of PVC Schedule 40 construction utilizing a float and reed switch technology to sense the presence of liquid. The sensor shall also be

supplied with a PVC mounting sleeve for installation of the sensor in a containment area.

B. The piping sump sensor shall be 18.5” long to address monitoring in piping containment sumps as well as dispenser pan/sump areas.

C. The sump sensor shall be designed with a five-foot leader cable to connect the sensor to field wiring in the sensor junction box. The sensor shall be supplied with watertight cord grip assemblies to install in sensor junction box.

1. Power Requirements: Intrinsically safe power supplied by tank monitor
2. Sensor Type: Hermetically sealed magnetic reed switch
3. Contact Rating: 15 watts
4. Switch Travel: 7/8” to contact
5. Operating temperature: $0^0$C to +$60^0$C

3.4.5 Solid-State Discriminating Interstitial Sensor for Double-Wall Fiberglass Tank

A. The discriminating interstitial sensor for a double-wall fiberglass tank shall utilize an ultrasonic technology to determine the presence of fluid and a capacitive technology to differentiate between hydrocarbons and water.

B. The sensor shall be equipped with a 25-foot leader cable to connect the sensor to field wiring in the sensor junction box.

C. The sensor shall be reusable and recoverable after sensing the presence of hydrocarbons and shall not be affected by heavy concentrations of hydrocarbon vapors.

D. The sensor shall be 4.25” long, 1.5” wide and 0.43 high to fit in the interstitial area of a double-wall fiberglass tank.

E. The sensor shall be designed with a pull cord hole for ease of installation.

F. The sensor shall withstand removal from the interstitial area of most double-wall fiberglass tanks without sensor damage.

1. Operating temperature: -$10^0$C to +$55^0$C
2. Can be used in the annulus of fiberglass tanks with a sensor riser pipe of 4”.
3. Two-wire connection to the monitor.
4. Cable Length: 25’
5. Sensor is reusable and testable for regulatory purposes.

3.4.6 Interstitial Sensor for Double-Wall Steel Tank

A. The interstitial sensor for a double-wall steel tank shall be 2.5” high and 1.5” in diameter to fit into a riser pipe for a double-wall steel tank of 1.5” I.D. or greater.

B. The steel interstitial sensor shall be equipped with a 25-foot leader cable to connect the sensor to field wiring in the sensor junction box.

C. The sensor shall utilize a float and reed switch technology to sense and alarm for the presence of fluid.

1. Operating temperature: Hydrocarbons: $-20^0$c to $+70^0$C
   Freezing Liquids: $0^0$C to $70^0$C
2. Cable length: 25’
3. Dimensions: 2.5” high, 1.50” dia.
4. Can be used in the annulus of steel tanks with a sensor riser pipe of 1.5” I.D. or greater
5. Two-wire connection to the monitor

3.4.7 Interstitial Sensor for Double-Wall Fiberglass Tank

A. The interstitial sensor for a double-wall fiberglass tank shall be 2.13” long, 1.27” wide and 0.58” high. The sensor shall fit in the interstitial area of a double-wall fiberglass tank. The sensor shall be designed to fit in any size double-wall fiberglass tank from 4’ in diameter to 12’ in diameter.

B. The sensor shall utilize a float and reed switch technology to sense and alarm for the presence of liquid.

C. The sensor shall be designed with a pull cord hole where a pull cord may be attached to install the sensor in the interstitial area of the tank.

D. The sensor shall be designed with a protective braid covering the switch assembly and cable to provide mechanical protection.

1. Operating temperature: $-20^0$c TO $+70^0$C
   Hydrocarbons: $0^0$C to $70^0$C
2. Can be used in the annulus of fiberglass tanks with a sensor riser pipe of 4”
3. Two-wire connection to the monitor

3.4.8 Hydrostatic Sensor

A. The hydrostatic sensor shall be supplied by the manufacturer in a single-float or a dual-float configuration.

B. The dual-float hydrostatic sensor shall be 19” long with a clear lexan tubular housing for visible confirmation of sensor operation. The sensor shall be 2.5” in diameter to install in the riser pipe assembly of a double-wall tank brine reservoir.

C. The single-float hydrostatic sensor shall be 6.0” long with a clear lexan tubular housing for visible confirmation of sensor operation. The sensor shall be 2.5” in diameter to install in the riser pipe assembly of a double-wall tank brine reservoir.

D. The single- and dual-float hydrostatic sensor shall be supplied with a 12-foot leader cable to connect the sensor to field wiring in the sensor junction box.

E. The single- and dual-float hydrostatic sensor shall be supplied with a lockable, watertight riser cap to prevent accidental spills into the tank reservoir. The cap shall be equipped with a vent tube to vent air out of the reservoir area and prevent liquids from entering into the reservoir.

F. The single-float hydrostatic sensor shall indicate a low-liquid level only, in the tank reservoir.

G. The single-float hydrostatic sensor shall utilize a float and reed switch assembly for sensing the presence and change in liquid level. The switch shall have a Normally Closed dry contact.

H. The dual-float hydrostatic sensor shall indicate a high liquid level and a low liquid level in the tank reservoir.

I. The dual-float hydrostatic sensor shall utilize a dual float and reed switch assembly for sensing the presence and change in liquid level. The contact shall be Normally Closed dry contact.

1. Operating temperature: $25^0$C to $+40^0$C
2. Rests in brine solution of up to 30% calcium chloride
3. Clear plastic housing for visual inspection
4. Cable length: 12’
5. Available in both a single-float and a dual-float configuration

3.4.9 MicroSensor

A. The MicroSensor shall utilize an ultrasonic technology to determine the presence of fluid in tight sensing locations.

B. The sensor shall be equipped with a 25-foot leader cable to connect the sensor to field wiring in the sensor junction box.

C. The sensor shall be reusable and recoverable after sensing the presence of hydrocarbons and shall not be affected by heavy concentrations of hydrocarbon vapors.

D. The sensor shall be 0.75” wide, 0.38” high and 2.15” long to fit in the locations around a storage tank 1” or greater in diameter.

E. The sensor shall be designed with a stiff, pushable cord for ease of installation.

F. The sensor shall withstand removal from the sensing area.

1. Operating temperature: $25^0$C to $+40^0$C
2. Can be used in the locations around storage tank of 1” in diameter or greater
3. Two-wire connection to the monitor
4. Cable Length: 25’
5. Sensor is reusable and testable for regulatory purposes

3.4.10 Groundwater Sensor

A. The groundwater sensor shall utilize a Veeder-Root developed conductive elastomer to detect the presence of hydrocarbons floating on the groundwater. The sensor shall detect as little as 1/10” free product on the water surface.

B. The sensor shall be available in lengths for use in wells up 20’ deep regardless of groundwater fluctuation.

C. The sensor shall be equipped with a lockable watertight cap for 4” monitoring wells to prevent accidental spills into the monitoring well.

D. The sensor shall utilize a float technology to indicate the presence of water in the well to maintain environmental compliance.

1. Operating temperature: $0^0$C to $40^0$C
2. Detects all liquid hydrocarbons in the $C_5$ to $C_{16}$ range
3. Detects as little as 1/10” free product on water table
4. Sensor is reusable and testable for regulatory purposes

3.4.11 Vapor Sensor

A. The sensor shall utilize an Adsistor technology to determine the presence of vapors in a dry monitoring well. The sensor shall also utilize a conductive technology to sense when the sensor is submerged in water, thereby taking the site out of environmental compliance.

B. The sensor shall be equipped with a 25-foot leader cable to connect the sensor to field wiring in the sensor junction box and to suspend the sensor in the monitoring well.

C. The sensor shall provide for adjustable vapor alarm thresholds to allow for acceptable existing vapor levels.

D. The sensor shall be reusable after being exposed to heavy concentrations of hydrocarbon vapors.

1. Operating temperature: $20^0$C to +$70^0$C
2. Adjustable vapor alarm threshold allows for acceptable existing vapor levels
3. Provides hydrocarbon detection in dry monitoring well
4. The sensor shall not be responsive to humidity

## 3.5 Line Leak Detection

A. The Electronic Line Leak detector shall be capable of performing, in accordance with EPA specifications, to the following:

| | |
|---|---|
| 1. Leak Detection Rate of: | 3 GPH @ 10 PSI<br>0.1GPH @ 150% of pumping pressure<br>0.2 GPH @ pumping pressure (optional) |
| 2. Operational Temperature: | -$25^0$F to + $130^0$F |
| 3. Compatible Fuels: | Unleaded Gasoline<br>Leaded Gasoline<br>5% Methanol/95% Unleaded<br>10% Ethanol/90% Unleaded<br>15% MTBE/95% Unleaded<br>Diesel<br>Kerosene<br>Jet Fuel<br>Aviation Gasoline |
| 4. Flow Restriction: | <2.2 PSI @ 40 gal/Min |
| 5. Power Requirements: | 115 Vac $\pm$ 10% |
| 6. Piping Type: | Steel, Fiberglass, or Enviroflex |
| 7. Piping Length: | Up to 400’ of Enviroflex; up to 350’ of 2” fiberglass piping; up to 150’ of 3” piping |

B. The electronic line leak detector wiring shall be capable of sharing wiring conduit with other high-voltage wiring running out to the submersible pump.

## 3.6 Communications

### 3.6.1 Auto-Dial Site Fax Modem

A. The modem shall utilize the standard Hayes command set.

B. The modem shall have the capability of automatically switching between 2400, 1200 and 300 baud.

C. The modem shall utilize two snap-in RJ-11 jacks for phone line interface.

D. The system shall have the capacity to install up to three SiteFax Auto-Dial fax/modem modules.

E. The Fax baud rate shall be 9600 baud, with the communications baud rate selectable between 2400/1200/300.

F. The system shall have the ability to program up to eight phone numbers assigned to a fax/modem module.

G. The system shall have the ability to enter up to 20 characters for the destination phone number.

H. The transmission type shall be fax, teletype or computer, selectable by destination.

I. The system shall be capable of redialing a location from three to 99 times, selectable by destination.

J. The system shall be capable of redial intervals from one to 60 minutes, selectable by destination.

K. The system shall call immediately on an alarm occurrence, selectable by alarm type, assignable by destination.

L. The system shall allow for answer/receive disabling for line sharing applications.

3.6.2 RS-232 Serial Communications Interface

A. The system shall have the ability to communicate directly with a computer, teletype or printer.

B. The system shall provide direct interface via a 25-pin D-connector using standard RS-232 serial communications hand-shaking signals.

C. The system shall have the capacity to install up to three RS-232 serial communications modules.

3.6.3 Auxiliary RS-232 Serial Communications Interface

A. The system shall have the capacity for an auxiliary 25-pin D-connector to interface with a second tank monitor.

B. The system shall have the capacity to install up to two Auxiliary RS-232 serial communications modules.

Part 4 – Manufacturer’s Support/Field Service

4.1 Technical Support

A. The manufacturer shall provide technical phone support available to customers from 8:00 a.m. to 7:00 p.m. EST.

B. The manufacturer shall provide technical phone support available to authorized distributors and service contractors for on-site troubleshooting of UST system problems. Phone support shall be available from 8:00 a.m. to 7:00 p.m. EST.

4.2 Field Service

A. The manufacturer shall maintain a nationwide field service staff to provide on-site customer support and training, as well as overseeing installation of tank monitoring system by installation contractor.

B. The distributor/contractor field service representative shall be available for on-site training of company maintenance personnel on installation, programming and troubleshooting of tank monitoring system.

C. The manufacturer shall have a territorial field service staff to support the distributor/contractor field service network.

4.3 Certification Training

A. The manufacturer shall require and provide mandatory certification training for all of its authorized distributors and service contractors/installers.

B. The certification program shall consist of three certification levels covering installation, setup/operation, and service/troubleshooting of the manufacturer's UST monitoring systems.

C. The manufacturer shall provide certification information regarding contractors and installers to regulatory agencies that require certification documentation.

D. The manufacturer shall offer re-certification training to keep contractors/installers current with updated information.

E. The manufacturer shall conduct regional training seminars throughout North America.

F. The manufacturer shall provide a home study certification program for installing contractors.

4.4 Warranty Registration and Checkout Form (WRACO)

A. The manufacturer shall require that all UST monitoring systems be started up by an authorized distributor.

B. The startup shall consist of installation checkout, operation checkout and customer training on use of the equipment.

C. The manufacturer shall supply a Warranty Registration and Checkout Form to properly document the site information.

1. Installation location
2. Installer
3. Equipment identification
4. Tank information
5. Leak detector information
6. Start-up distributor information
7. Customer approval

D. The manufacturer shall compensate the authorized distributor for the start-up procedure when a properly completed Warranty Registration and Checkout form is submitted to the manufacturer.

E. Upon receipt of the Warranty Registration and Checkout form, the manufacturer will initiate the system warranty and input the data into a site database.

4.5 Replacement and Service Parts

A. The manufacturer shall offer Authorized Distributors pre-selected parts kits to service UST monitoring systems.

B. The manufacturer shall offer a pre-selected parts kits designed for service truck and shop.

C. The manufacturer shall offer a quick ship service for parts that shall ensure that a parts shipment is sent within 24 hours of request/order.

4.6 Delivery

A. The manufacturer shall have the ability to ship tank monitoring systems in three (3) working days from the time that an order is entered into the computerized system to the ship date.

4.7 ISO-9000

A. The manufacturer shall maintain an ISO-9001 rating ensuring quality management of design, manufacturing, training, and technical documentation.

Part 5 – Documentation

5.1 Manuals

A. The manufacturer shall supply product documentation that addresses the following categories as additional support:

a. Site preparation and installation instructions
b. System setup instructions
c. System operating instructions
d. Line leak detector site preparation and installation instructions
e. Line leak detector checkout procedures
f. Individual sensor installation instructions
g. Probe installation instructions
h. Individual module installation instructions
i. Product data sheets
j. Troubleshooting and repair manuals
k. Wiring diagrams which include the following:
    1. Identification of all devices and equipment terminals, and all external connection terminal blocks.
    2. All external wiring connections with approved wire colors and circuit designations.
l. Serial communications manuals

5.2 Third-Party Certification

A. The manufacturer shall supply third-party documentation for all products, certifying that performance meets or exceeds EPA requirements.

5.3 Authorized Service Personnel Listing

A. The manufacturer shall supply a formal list of all Authorized Distributors and Service Contractors for sales, installation, training and support.

Part 6 - System Warranty

6.1 System Warranty

A. The tank monitoring system shall be warranted for a period of one year from date of installation or 15 months from date of invoice.

B. The warranty is to include parts and labor, with all warranty work performed on site by an authorized manufacturer's representative.

6.2 Extended Warranty

A. The manufacturer shall offer a one-year extension on the standard warranty for an additional cost to the end user.

B. The end user may have until the expiration date of the original system warranty to purchase the option of the extended warranty.