OmniBeacon Engineer's Specification

Part 1: General

1.01 General Conditions

A. The contractor shall furnish, install and place into operation a comprehensive monitoring system for the treatment facilities as described herein. All equipment is to be completely factory assembled, wired and tested prior to shipment. The system shall be OmniBeacon Series as manufactured by Omnisite, Inc.

B. The naming of manufacturer in this specification is not intended to eliminate competition or prohibit qualified manufacturers from offering equipment. Rather, the intent is to establish a standard of excellence for the material used, and to indicate a principle of operation desired. The base bid shall be the specified Omnisite equipment. Alternate proposed systems shall be submitted to the owner at least 14 days prior to bid (in accordance with the following pre-submittal requirements). Acceptable alternate equipment is listed below:
   1. Allen Bradley
   2. Koyo
   3. Telemecanique
   4. Modicon
   5. Motorola MOSCAD

C. Not less than (100%) of all equipment shall be standard catalogued products of the telemetry system supplier to assure one source responsibility, proper system interconnections and reliable, long term operation. The telemetry supplier shall provide all monitoring equipment and employ full-time engineering, service, and support personnel necessary to provide and support the complete system.

1.02 System Coordination and Single Source Responsibility

A. The equipment provided shall be a completely integrated automatic monitoring system consisting of the required power equipment (circuit breakers, transformers etc.), automation and alarm monitoring equipment in a factory wired and tested assembly. The automatic data collection and alarm/monitoring system components shall be standard, cataloged, stocked products of the telemetry system supplier to assure one source responsibility, immediately available spare/replacement parts, proper system interconnections and reliable long term operation. **Satellite systems do not meet this specification and will not be allowed due to the nature of a satellite failure simultaneously disabling all systems on a nationwide basis**. The entire system software will be fully configurable by the owner, using a simple fill-in-the-blank configuration method. Systems that require trained programmers, or factory software setup and configuration for future software edits will not be acceptable.

1.03 Drawings

A. The complete assembly shall be provided with job-specific wiring diagrams, parts lists, enclosure dimensional and door layout drawings and instructions.

B. Shop Drawings shall be submitted for approval for all equipment herein specified. The Shop Drawing Submittal shall include a Document List. An Order Specification shall be included which shall describe in detail all equipment provided. Each panel shall be provided with job-specific wiring diagrams, parts list, enclosure door layout, and enclosure dimension drawing. The wiring diagram requirement applies to all field mounted instruments, telemetry equipment as well as all required interfacing to the power panel. Interconnection details shall be shown for all field mounted instrumentation. A description of Operation shall be provided detailing the operation of the complete system, including the telemetry, control and alarm handling.

C. Provide Record Drawings and Instruction Manuals. These manuals shall include corrected Shop Drawings. In addition, a detailed Programming and Operations Manual for the Microprocessor-based Monitor and Data Collector Unit shall be included. The manual shall include all information as detailed for the Shop Drawing Submittals above.

1.04 Pre-submittal Information Required for Alternate Manufacturers

A. Full description and performance data on all substitute items proposed with references or verification of performance for such equipment already in service shall be provided. The PREBID Qualification Submittal shall include the following:

1. A reference project list with a minimum of five (5) reference projects shall be included. The referenced project list shall include the following information for each project listed; project name, a brief description of the project (to include number of locations, communications medium employed and any/all control loops), the name and telephone number for a contact person. All reference projects given shall be web-to-wireless cellular systems including internet based configuration, data collection and monitoring and personnel identification similar in size and scope to this project.

2. Detailed description of how the proposed substitute differs from that specified including but not limited to materials of construction, fabrication, operation, warranty, service, communications technology, corrosion protection, power consumption and maintenance requirements. A detailed comparison of the Internet based interface and data analysis ability must include detailed specification comparisons, and a description of how the proposed system meets and/or exceeds the Omnisite technique. **Specifically, the proposed OmniBeacon has a peer-to-peer text message backup notification feature which does not rely on a central relaying server to send the back-up text messages. How will the proposed alternate system offer this peer-to-peer back-up text message notification?**

3. Detailed discussion of why the proposed substitute is equal or superior to that specified in material of construction, fabrication, operation warranty, service, corrosion protection, wiring, power consumption and maintenance requirements.

4. Tracings and four copies of revised prints reflecting in detail any and all changes in arrangement for materials, equipment, piping, wiring, fabrication, erection, maintenance, power supply, etc.

5. Provide a Programming and Operations Manual for the Microprocessor-based Monitor. The manual shall include the following information as a minimum:
    a. How to view and change between the various displays.
    b. Alarm displays and a list of alarms handled.
    c. Alarm handling (ISA sequence used, etc.).
    d. Status displays and a list of statuses handled.
    e. Status Handling
    f. Access code usage.
    g. Personnel tracking system description, logging technique and use
    h. An example of programming values.
    i. Use of the real-time calendar/clock, including changing the time and date.
    j. A table for entering the values programmed at the factory.
    k. A table for entering the values programmed in the field.
    l. Description of proposed web based interface and security features

6. Name and telephone number of person (s) to contact to answer questions or supply additional information. **No alternate manufacturers are exempt from pre-submittal requirements.**

7. Name and telephone number of factory authorized local sales and service personnel. Local factory authorized sales and service personnel must be experienced with the equipment proposed. Provide documentation stating that the factory authorized sales and service personnel have not less than three (3) years experience with the equipment proposed.

8. Failure to name an approved manufacturer in each space provided in the proposal will constitute grounds for declaring the bid irregular, or if the Owner chooses, give the prerogative of equipment selection solely to the Owner. If more than one manufacturer is named in any space it will declare that the Bidder has no preference and will give the prerogative of equipment selection solely to the Owner.

9. The right is reserved to reject any and all proposals, to waive any informality, irregularity, mistake, error or omission in any proposals received and to accept the proposal, as determined by the Engineer or Owner, deemed most favorable to the interests of the Owner.

Part 2: Scope

2.01 The Overall Cloud Based Interface System Shall Perform the Following:

A. The OmniBeacon is a combination visual LED alarm beacon, audible siren, and 2-channel cellular telemetry device in a single NEMA 4X weatherproof package which archives all data to a cloud based historian. It is optimized for small pump station analysis, monitoring, alarming, and ease of use. Alarm events can be delivered via text message, email, simulated voice, web browser, or via smartphone app. The completed system provides the following standard features, presented in a user-friendly graphical format, to be overlaid onto the client's existing, private web-pages.

- Well(s) level high alarm and return to normal alerts
- Spare – common station alarm
- Power Failure
- Daily Time stamps of when alarm events occurred, and who responded
- Cellular signal strength indication
- Alarm notification using e-mail, pager, or voice call
- Historical log showing all alarm history, and who acknowledged alarms
- Web-based graphs of historical data that can also be exported to Microsoft Word or Excel programs
- Low back-up battery alarm

B. TO INCLUDE: (Each Remote Site)

1. 1-Weatherproof 4X polycarbonate enclosure.
2. 1-Surge Arrestor.
3. 1-OmniBeacon Remote Telemetry Unit.
4. 1-Power supply, charger, backup battery and filter.
5. 1-WINGS Cellular Modem.
6. 1-12VDC power supply
7. 1-High gain, internal antenna

C. Remote Site List – The above standard monitoring list at each remote site shall be accompanied by the following site specific alarm and/or monitoring I/O

a. Please fill in the remote sites to be monitored and any additional I/O
b.
c.
d.
e.
f.
g.
h.
i.
j.
k.
l.
m.
n.
o.

D. DETAILED SYSTEM SEQUENCE OF OPERATION: (Each Remote Site)

1. Designer – In this area, include an exact sequence of operation that must occur in addition to any standard sequences listed above. If no additional interlocking or control is required, then this section can be deleted

Part 3: Products

3.01 Microprocessor-Based OmniBeacon Monitor and Alarm Notifier

A. A Microprocessor-based Monitoring Unit shall be provided for monitoring of the pump stations based on alarm contact closures, and universal voltage input signals.

B. The Microprocessor-based monitor shall be a standard, catalogued product of a water and wastewater equipment manufacturer regularly engaged in the design and manufacture of such equipment. The pump/alarm monitor shall be specifically designed for pumping automation utilizing standard hardware and software. “One of a kind” systems using custom software with a generic programmable controller, or pieces from many manufacturers that are “integrated” together will not be acceptable. The controller shall be OmniBeacon as mfg. by OmniSite, Inc.

C. The monitor shall accept (1) universal DI configurable to monitor dry contacts or any voltage range between 12VDC/VAC to 120 VAC/VDC, and one additional dry contact channel. High intensity, blinking LED light cluster never requires a bulb replacement, and is energy efficient. NEMA 4x design for indoor/outdoor use. Metal wire protection cage. Rechargeable battery backup for operation during AC power failure for up to 24 hours. Internal siren allows the OmniBeacon to function as two devices in one. No need to purchase a separate alarm horn and alarm light. This single product handles both tasks. Pole mount, panel mount, or easily mount on panels with sun shields via the pole mount option. 120VAC, 12VDC or solar power operation. Includes 6 ft. color coded wire harness with quick disconnect connector. Internal alarms for AC power loss/return, and low battery alarm. Text Message Redundant backup – if the OmniBeacon cannot connect to the Omnisite GuardDog website, for any reason whatsoever, then it will directly notify alarm messages via direct peer-to-peer text message notification. Programming of text message backup is done using any ordinary smart phone which can send/receive a text message. Extreme temperature operation for the toughest environments. Mobile – can be moved anywhere in the USA without coordination.

D. Gel Cell Battery: Remote mount 12VDC, 1200mAH gel cell battery provides backup for up to 24 hours in the event of power loss. Battery is automatically recharged using temperature compensated floating battery charging circuit.

E. Data Cellular Radio
1. The OmniBeacon shall incorporate a radio that utilizes the data side of a cellular system to transmit the data and alarms monitored, as well as receive manual or automated Control Commands.
2. Cellular radios from major 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.

F. Microprocessor Feature Updates
1. Microprocessor features shall be able to be adjusted through the cellular system without any site visits necessary.

G. Status LED's On Motherboard
1. LED's on motherboard shall indicate important product diagnostic information described in product user manual
2. Radio signal strength shall be displayed by RSSI bi-color red/green LED to facilitate accurate product placement
3. Operational and diagnostic status of at least 8 criteria shall be displayed by diagnostic LED's.

3.02 Communication Links

A. 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.

B. 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.
2. The OmniBeacon will have interchangeable data cellular radios that will communicate through 3G or 4G generation GPRS (ATT), or 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.
4. The Customer will not have or have to purchase cellular data contracts direct with the carrier(s).

C. Security Protocols

1. All the cellular radios shall all make report-by-exception, Secure socket connections (SSL) from the radio, through the cellular system, to the submitting company's servers and web pages.
2. The OmniBeacon shall utilize a transmission Scheme that encrypts the transmitted data utilization a 128 bit AES encryption.
3. The cellular radios shall all have private IP address ability
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.

D. 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 OmniBeacon or the supplier's website.
2. The OmniBeacon shall transmit all digital state changes on an “as occurs” basis, or by manual request at any time.
3. The device will have an effective transfer rate of at least 19,200 baud.

E. Communication Link Structure and Performance Criteria
1. The Communication link structure shall be a secure socket connection from the OmniBeacon through the cellular system to the Supplier's servers, 24 X 7, 365.
2. Receipt of all data sent from the OmniBeacon to the server center shall be acknowledged by the server center back to the OmniBeacon 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 OmniBeacon 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

3.03 Manhole Monitoring System

A. General: The OmniBeacon can function as a pump station alarm and monitoring system, and also as a manhole monitoring system. Where identified on the plans, the manhole monitor will consist of an OmniBeacon pole mounted on the side of the road, or near the manhole in locations where the manhole is not in a street. The OmniBeacon is pole mounted at an elevation where the LED beacon can be easily seen. The manhole water level monitoring floats (two floats) are extended to the manhole either by 1) saw-cutting the road, and laying the float cables in the saw cut, and then sealing the saw cut with a City approved patching material, or 2) trenched into place for non-street applications. Manhole monitors which sit down in the manhole, itself, and are battery powered are not acceptable due to the battery maintenance required, and likelihood of water damaged electronics

B. Radio shall be 3G or 4G cellular modem, dual band 850/1900 MHz, 3W max transmit power, 100 mSec data burst.

C. Power source shall be 120VAC or solar as field selected by owner or engineer, with battery backup for operation in the event of a primary power loss.

D. Inputs shall be 2 dry contacts, alarm on opening & closing, one minute delay, nuisance alarm prevention.

E. Diagnostics shall include high-intensity LEDs.

F. Floats shall be 2 wire, normally closed, 90 degree open, weighted with owner selectable cable length.

G. Unit shall be NEMA 4X for outdoor operation

H. Enclosure shall be polycarbonate and internal circuit boards shall be conformal coated.

3.04 Centralized Server Centers: Hardware and Software Requirements

A. Server Center Physical Structure
1. The server center housing shall be able to withstand a direct hit from at least an 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 back up 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 guards 24x365

B. Server Center Redundancy Structure
1. The server center shall house the manufacturer's complete redundant and hot linked:
    a. Servers
    b. InterConnect
    c. Databases
    d. Power supplies
    e. Inbound Cellular Connections
    f. Outbound internet hubs and providers

C. Database Structure
1. All data from the OmniBeacon's shall be held for customer for at least 5 years.
2. All databases shall be backed up and archived daily.
    a. Customer's firewalls will not be programmed to accept socket connections.

D. 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.

3.05 Alarm System Structure and Software

A. Alarm Delivery Formats
1. Alarms shall be delivered in the following formats:
    a. Phone (voice call), 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 Website.
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.
    a. Return to normal alarms can be adjusted to call the alarm callout group or a different callout group.

B. 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.

C. Alarm Message Formats
1. All alarms shall have the alarm condition, time, and alarm location 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.

D. Alarm Dispatch Logs
1. Each alarm shall have a full log of each notification attempt of that alarm documenting the following:
    a. Date, time, and alarm condition
    b. 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.).
    c. A recording of each voice notification attempt so the specific reason for a notification failure can be known.
    d. Date, time, and name of person who acknowledged the alarm.

3.06 Remote Data Access

A. 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 username and password.
        a. The user can set up any of three levels of access to the web pages:
            i. Read only...can see but cannot make any changes.
            ii. Read/Write...can see and can make changes.
            iii. 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 websites 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 cellphone or PDA. This website will 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 cellphone 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.

B. Remote Access Security
    1. In addition to the username and password structure described above, all access of the user website shall be logged. Such logging data to include date, time and duration of access, username and password of user to access the site and IP address of the accessing Computer. The log will be accessible by Omnisite Admin, and not user adjustable.

3.07 Incoming Service and Lightning Arrestor

A. The incoming service for the control system shall be 120 volt, 1 phase, 3 wire, 60 Hertz. A single phase lightning arrestor shall be supplied in the control system and connected to each line of the incoming side of the power input terminals. The arrestor shall protect the control system against damage as the result of transient voltage surges caused by lightning interference, switching loads and power line interference's. It shall begin shunting to ground at 500 volts maximum.

B. All metering shall be done ahead of the main disconnect and control panel. The meter shall be supplied and installed by the Contractor in accordance with local power company requirements.

C. The electrical service shall be provided by the utility. Electric meter base shall be provided by the owner and installed in accordance with the requirements of the electric utility. A UL rated main disconnect switch, circuit breaker panel, conduit and wiring between the power company termination and the control panel shall be furnished and installed by the contractor. The power supply to the control panels shall be 120 volts, one phase, three wire, 60 Hertz.

3.08 12 VDC Power Supply

A. A regulated 12 VDC power supply shall be provided for the radios and other monitoring system components as required. The power supply shall include a terminal block for incoming AC. The power supply shall be powered from a 120 VAC and include tapered charge type battery charging circuitry to maximize battery life. The power supply shall be rated at minimum of 2.0A @ 12 VDC.

B. The power supply system shall include (1) 12 Volt battery sized to allow for 24 hours continued system operation during a power outage.

3.09 Signal Transient Protection

A. Transient protection shall be provided with all equipment to protect all instrumentation and telemetry devices either receiving or sending signals.

B. The transient protectors shall be 4000V optical isolators which shall effectively arrest most transients encountered in an instrumentation environment.

3.10 Enclosure

A. NEMA 4X polycarbonate

3.11 Antennas

A. The antenna for each location shall be selected based on the results of the cellular survey.

B. All antenna shall be provided and installed by the Contractor as per recommendations from the manufacturer.
   1. The Systems supplier shall be responsible for installation, set-up, adjustment and tuning of the antenna to provide optimal communications for the system.
   2. The antenna installation shall be internal to the enclosure.
   3. The Systems supplier shall utilize the OmniBeacon built-in Radio Frequency signal meter during antenna installation to ensure that the antenna are installed for optimum signal reception.

C. The Contractor shall ensure that the cellular Network system work is properly interfaced with equipment and other work not furnished by the Systems supplier.

D. The Systems supplier shall install, make final connections to, adjust, test, and start-up the complete cellular Radio Network.

Part 4: General Equipment Requirements

4.01 Wiring

A. All wiring shall be minimum 600 volt UL type MTW or AWM and have a current-carrying capacity of not less than 125% of the full load current. The conductors shall be in complete conformity with the national electric codes, state, local and NEMA electrical standards. For ease of servicing and maintenance, all wiring shall be color coded. The wire color code shall be clearly shown on the drawings, with each wire's color indicated.

B. All control wiring shall be contained within plastic/PVC wiring duct covers. Where dimensional constraints prevent the use of wiring duct, wires shall be trained to panel components in groupings. The wire groupings shall be bundled and tied not less than every 3 inches with nylon self-locking cable ties as manufactured by Panduit or equal.

C. Every other cable tie shall be fastened to the enclosure door or inner device panel with a cable tie mounting plate with pressure tape. Where wiring crosses hinged areas such as when trained from the inner device panel to the enclosure door, spiral wrap shall be used.

D. The installation of the equipment described herein is provided by the electrical contractor in accordance with the electrical specification section of this project, and according to the detailed project drawings. Final equipment test, supervision and certification supplied by Omni-site trained representative.

4.02 Nameplates

A. All major components and sub-assemblies shall be identified as to function with laminated, nameplates.

Part 5: Execution

5.01 Field Installation

A. The services of a factory trained, qualified representative shall be provided to certify the completed system, make all adjustments necessary to place the system in trouble-free operation and instruct the operating personnel in the proper care and operation of the equipment.

5.02 Guarantee

A. All equipment shall be guaranteed against detects in material and workmanship for a period of one year from the date of Owner's final inspection and acceptance to the effect that any defective equipment shall be repaired or replaced without cost or obligation to the Owner.

