Section VI. Schedule of Requirements

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1. List of Goods and Delivery Schedule

Line Item N°	Description of Goods	Quantity	Physical unit	Final (Project Site) Destination as specified in BDS	Delivery (as per Incoterms) Date		
					Earliest Delivery Date	Latest Delivery Date	Bidder's offered Delivery date [*to be provided by the bidder*]
1	Warning System - Outdoor Equipment: 1. Electronic siren head _ 121dB (C) at 30 m with mountain bracket as detailed in Technical specifications Omni. 2. Directional Speaker array and brackets. 3. VHF antenna and antenna bracket. 4. Electronic siren controller for Omni siren comprehensive of tone generation, digital voice messages chip, amplifiers, battery cabinet, and VHF radio. 5. Electronic siren controller for DS siren comprehensive of tone generation, digital voice messages chip, amplifiers, battery cabinet, and VHF radio. 6. Cellular modem, custom relay board, power supply for two way status monitoring over data network. 7. Solar System. 8. Battery -extra duty 4 for each siren. 9. Spare Parts for project lifespan 5 years.	21 18 27 21 6 27 27 108	No. No. No. No. No. No. No. No. No. -	Bonbali, District, Freetown, Sierra Leone.	12 Weeks from receipt of advance payment	14 weeks	

2	Warning System - Control Center Equipment and Software: 1. Server composed of Desktop computer with an LCD monitor, UPS, mic and Printer. 2. Digital Encoder. 3. VHF base station radio, antenna with antenna cable. 4. Digital voice recording. 5. 30 m steel monopole. 6. Graphical Software. 7. Cellular software interface with cellular modem over GSM network. 8. SMS Alerting System software and hardware. 9. Engineering Design to integrate alerting software with the mobile network. 10. Engineering Design to integrate siren system with data network enabling two-way status monitoring over cellular network. 11. 7 kW Diesel Generator	2 2 2 1 2 1 2 1 1 2	No. No. No. No. No. No. No. No. No. No.	Bonbali, District, Freetown, Sierra Leone.	12 Weeks from receipt of advance payment	14 weeks	
3	Poles Manufacturing: 1. Poles (27 for sirens; 1 for repeater).	28	No.	Bonbali, District, Freetown, Sierra Leone.	12 Weeks from receipt of advance payment	14 weeks	

2. List of Related Services and Completion Schedule

Service	Description of Service	Quantity	Physical Unit	Place where Services shall be performed	Final Completion Date(s) of Services
1	Installation of equipment for Siren Warning System, testing and commissioning	27 sirens	No.	Bonbali, District, Freetown, Sierra Leone.	20 Weeks from receipt of advance payment
2	Implementation Services: 1. System Configuration and setting up. 2. Repeater supplied with solar panels and temperature control cabinet and antenna. 3. On site training.			Bonbali, District, Freetown, Sierra Leone.	20 Weeks from receipt of advance payment

Note: Bidders are advised at their own cost to visit and familiarize themselves with the locations of the sirens prior to preparing and submitting their Bid. Bidders will also have the opportunity to seek further clarification at the pre-bid conference

3. Technical Specifications

Following paragraphs provide the overall design concept and the usage requirements.

1. Introduction:
The Government of Sierra Leone, trough the Project Management Unit of Bumbuna Hydroelectric Project commissioned a Study to update the siren warning system design submitted and earlier approved in 2008. The previous design aimed to guarantee sound coverage exceeding 65 dB of the floodable areas within 50 Km from the dam embankment defined as the "Near zone area" (i.e maximum distance covered by the flood wave within 6 hours from the beginning of dam crest overtopping). Upon that preliminary design, and following the meetings held with the World Bank experts in May and July 2011, the Consultant was requested by the Client to optimize the total number and locations of the sirens taking into account the additional criteria of population density in the floodable areas and security of the installed equipment. In view of that, a site survey has been performed to come up with a rough estimate of the people living in the floodable areas and suitable places for placing the warning devices, along with ascertaining whether people still inhabit the villages considered in the previous design, or have been moved elsewhere. The adoption of this additional criteria, despite the sound map layout showing sound voids in the inundations areas where the minimum sound level is less than 60 db, resulted in a scaling down of the total number of sirens since the warning devices have been basically located either next to villages in the bush areas, or on the main roads.

2. Population in the Floodable Areas:
A timely warning of the people living in the floodable areas is an essential precondition to fully accomplish the overall procedures envisaged by the Emergency Action Plan (EAP) in case of occurrence of an emergency, or an extra-ordinary event contemplated in the Emergency Preparedness Plan. In view of that, a survey of all the villages within the inundation areas has been carried out to ascertain the following:

- Confirmation of whether the impending affected villages are still populated.
- Check for new settlements that have been established in the floodable areas after the issuing of the maps (laser scanning survey performed in 2004).
- Estimate the number of people living in the villages.

The total number of people living in the area of concern is based upon interviewing local representatives and for the small villages according to the number of houses. The findings of the survey has revealed that the total number of people living in the inundation areas covered by the warning system is about 20,000 inhabitants, and 14,000 out of the total are living in the area covered by the 7 sirens in the near-zone (Section 4 Drawings - Table on Villages and Population). The village of Kuria is no more in existence. The inhabitants have moved to Kabaray on Bumbuna-Magburaka road and no other settlement have been established after 2004 except for construction of residential quarters (New Ferengbeya) for the workers of African Minerals along the Bumbuna-Magburaka road towards Tonkolili Village. In addition, the village of Maparay has been resettled on the Bumbuna-Binkolo road (New Maparay), due to the construction of the railway. It has been observed that the number of people living in the main villages i.e Bumbuna and Mabonto have increased and are increasing considerably due to the influx of job seekers who are looking out for opportunities with the African Minerals Ltd, a company engaged in the mining of Iron Ore in the Tonkolili District.

3. Security Criteria:
The sirens system have been engineered to meet the criteria to minimize the risk for the equipment (i.e solar panel batteries) of being vandalized or stolen due to the value of such materials on the local market. In dealing with such a key issue, redundant solutions have been considered which envisage, besides extra civil works during the installation phase, the commitment of local entities (i.e local communities, local police authorities). Each siren will be secured by a concrete block wall as illustrated in the annexed drawings fencing the siren's pole and the security post for the personnel attached for the surveillance of the warning device equipment. Such a solution, despite a slight increase in the cost of the civil works is envisaged to have fully met the security issues of equivalent equipment installed by local mobile operators in the area of concern. Notwithstanding the above, 14 sirens out of the 27 are placed next to the main roads (Binkolo- Bumbuna - Magburaka -Bumbuna)

whereas the remaining located in the bush areas shall be installed near to the villages to ensure community surveillance of the local people. This approach is integrated by an option provided within the configuration of the warning system which will enable to promptly alert the local authorities (i.e police stations) in case people attempt to steal or vandalize the equipment. It is, therefore, felt that any additional inputs concerning prevention of theft of the siren equipment can be provided and implemented by the supplier of the warning devices, based on their experience gained in similar projects in Africa.

4. Acoustic Criteria:
The outdoor warning system has been engineered referring to the Dam Break study and according to ISO 9613 which provides guidelines concerning the sound propagation in the outdoor environment. In terms of acoustic design, the criteria adopted to engineer the system are mainly based on the fact that the ability of a siren to effectively warn the community depends on the response of the human hears and from environmental factors which affect sound propagation. Under ideal condition any sound broadcasted in free space by a sonic device will be attenuated at the rate of 6 dB each time the distance from the source doubles; whereas under real conditions, interaction with the environment often results in attenuation that is slightly higher than the mentioned ideal reduction factor given above. The warning system has been engineered assuming as reasonable loss per distance doubled 10dB in view of the fact that the topographical features and the vegetation together with the atmospheric conditions will affect the sound path. The other parameter to take into consideration is the ambient noise - a normal hearing will probably be perceptive to warning signals whose intensity is at least 5 dB higher than the ambient sound level. As a conservative factor, it has been assumed that the minimum desired sound level should be at least 10 dB higher than the environmental sound (60 dB) hence the optimum desired signal level at the fringe of the area to be covered by the siren is 70 dB.

5. Warning System Operation Diagram:
The system has been engineered upon the concept that any command issue through the control station shall receive an acknowledgement from the recipient (i.e warning device, key personnel) in order to ensure the Dam operator has confirmation that the emergency event has been clearly notified; and upon the design criteria that the primary communication system shall have a redundancy in terms of communication platform. The Warning System operation illustrated in (Layout - Drawings) is composed of a Control Point and electronic sirens able to communicate each other through to two different systems radio frequency link RFL and cellular network respectively, and to report the status of the system (i.e activation, operating condition) to the control point for record purposes, and to a group of key personnel appointed by the client. The installation of the entire system composed of 27 sirens shall take place in the near-zone (7 sirens) and far-zone (20 zones), along with control stations. The sirens shall be procured with the facility to customize the typology of the warning signal, even though at the present stage of the project, the emergency events will be sounded by a defined acoustic signal. The following paragraphs provide a detailed description of the component of the Control Station and of the electronic sirens along with the typology of services that shall be provided by the alert and notification platform.

6. Base Control Station:
The warning terminal units are remotely triggered from two base control stations - located at the dam site and 30 Km downstream the site respectively - once the potential threat of flooding is ascertained by the Dam Operator. The control station- encoder is a standalone unit user interface equipped with a keyboard for selection and activation of the all siren functions (i.e warning tones, status, test functioning), and a LCD display which provides clear instructions to the operator. The encoder/decoder apparatus is powered by AC and an uninterruptible power supply (UPS) is utilized as the back-up system. Communication between the control unit-encoder and the sirens is guaranteed by a two way status monitoring, either on radio frequency link carried out in a frequency shifting Key (AFSK) and/or a cellular data's network. The two way radio control is mainly adopted to receive the siren status at the base control station and a confirmation of the activation of the siren once the warning system is activated. All the information is displayed on the LCD - a 4 line by 40 character configuration - whereas in case of either siren low battery or intrusion at the siren electronic compartment, the encoder sounds an internal buzzer to warn the dam personnel. The encoder/decoder contemplates as ancillary equipment PC running software for utilization of the graphic user interface to control the siren status and storing the all information transmitted or received by the control station.

7. Sonic Device Description:

The sonic device is a siren composed of horns, or directional speakers, cells able to produce a high sound while making moderate demands on the power source. The apparatus is independently powered by 220 watt solar panels installed on the siren pole with a specific tilt angle and headed to unobstructed view to optimize the charging effectiveness. A two compartment aluminum cabinet (dimension 22" x 32") is fixed on the mast to house four 12 V sealed lead calcium battery fed by the solar panels and the siren electronic components e.g radio, control board, siren amplifiers. The two way communication system is guaranteed at the siren location by a radio which receives information from the control base station and delivers them to the control board for processing and activation of the siren key functions and vice-versa siren status or siren activation is transmitted from the latest to the former. The electronic siren is installed on 12 m high mast (Section 4 Drawings - Siren Pole Typical Layout) and produces a sound level of at least 121 dB at 30m thus assuming an attenuation factor of 10 dB and 70 dB as minimum sound level to alert the communities - the siren coverage area is about 1000 m. The speakers shall be programmed to broadcast six standard warning tones which frequency ranges from 450 to 1050 Hz and in case of recharging failure by the solar panel, batteries shall be able to power the siren for a continues activation up to 30 minutes at full power output. In addition to that, the control board is equipped with a microphone jack for public address in case it would be necessary to inform people about the necessary action to be taken according to the Emergency Action Plan. To detect any act of vandalism, an intrusion alarm has been installed on the door-jam of the control cabinet; the sensor is configured to transmit a signal to the Dam site control center.

8. Sonic Device Network:
The warning system network is being basically designed employing the laser scanning maps, and according to the sound output rating of the warning device and the background noise at the listener's location. The number and locations of the sirens have been worked out from the outcomes of a acoustic modeling software which takes into consideration weather conditions and the topography of the inundation areas, and from the standpoint of security installation and maintenance inspection of each siren. In addition to that, the representatives of the local communities have been informed about the suitable locations of the warning devices sensitizing them on the technical constrains which lead to place the siren in the designed location. The network layout showing the locations of the 27 sirens, along with their coverage is illustrated in (Section 4 Drawings – Siren Warning System General Map). The network is composed of two model of siren Omni directional (Omni) and directional siren (DS) according to the environmental features around the siren location.

9. Sonic Device Activation:
Communication between the control unit-encoder and the sirens is guaranteed:

- as main communication system, via radio frequency link by a voluntary command by operator.
- as a communication back-up system, via cellular network by a voluntary command by operator from the base control station or from any place, provided that the cellular data (like GPRS, 3G, 4G)coverage is available.

The RF link will be the primary mode of two-way communication between the siren sites and the control station (s) and the communication scheme shall be according to the following steps:

- The Graphical software communicates to encoder over an RS 232 port.
- Encoder converts the data into audio frequencies then modulates using FSK and sends it to the VHF base station (likewise converts audio received from the base station/ warning device to data and send it to the PC).
- VHF base station sends the signal to the siren sites.

In case of either the VHF system fails or the operator is not attending to the control station, the sirens shall be activated via cellular data network, by means of an electronic dealer/combiner, which is feeding command to the siren via a system based on cellular devices widely available in the current market, 12V DC supplied with watch-dog functionality supervision of the equipment. The siren is equipped with suitable cellular receiver/transmitter device (cellular quad-band modem) with its own antenna, enabled to receive activation commands from control station, properly interfaced with the siren control unit. The above system will allow the Dam operator or any appointed personnel to intentionally activate the sirens remotely e.g calling from any DTMF capable phone like cell phone, touchtone phones.

10. Alerting and Notification Platform:
The System will be capable of delivering alerts concerning the status of the warning system to at least 50 people in the chain of command and to customize the messages. The system will contact the specified person through a sequential, escalating method, e.g. networked computer, smart phone e-mail, SMS, cell phone, etc., and display the number called. It allows for defining which device is called first, second or all at once depending on the Time of Day, or Week. Moreover the Notification Platform provides real-time reporting reflecting: 1) Notification content; Recipient / Group list; Time of transmit by each device by each recipient 2) All attempts with specific results: Recipient response 3) Summary of responses and time notification was closed. It will allow historical reporting available for all the above information for at least one year for viewing or upload to other reporting databases.

11. Surveillance and Maintenance:
The designed system demands a careful surveillance and maintenance of the all elements which are sensitive to the local environmental conditions although a two way control system of the sonic devices is foreseen. The equipment employed in the system shall be manufactured in order to comply with the international standards and to guarantee the longest duration of trouble-free operation; however provision for maintenance activities is necessary to assure long term reliability of the system. It is felt that a set of spare parts shall be contemplated in the procurement of the equipment over a lifespan of the project of 5 years for a prompt replacement of the components/parts.

Following is a detailed description of the Technical Specifications of the Sirens warning system.

1. General:
The objectives of the Alerting system is to provide flood warning to the villages and people carrying out activities within the inundation areas downstream the Bumbuna dam site by means of electronic sirens activated through a primary and secondary communication system. In addition, the system shall be capable to notify key individuals via a secondary text notification system to insure that the situation is properly identified in a timely manner to give key individuals the chance to appropriately respond to the emergency event.

Each Contractor's bid shall include a detailed description of all software, hardware, on-site system optimization, and training to the client personnel. In addition the Contractor shall provide a complete documentation (including assembly drawings, operation manuals and wiring diagrams) in both hard copy and electronic format with enough detail to support the training of installation and maintenance personnel as well as support troubleshooting and preventive and corrective maintenance.

2. System Description:
The System shall consist of the following major subsystems (Section 4 Drawings – System Integrated Communication Layout): (a) Central Control Site(s); (b) A group of RTU- Remote Terminal Units (high-powered electronic sirens) capable of producing multiple tones and public addressing; and (c) A Notification System for the timely distribution of information to key personnel, over cell phones and email of the status of the system, and shall simultaneously support the following communication platform:

- Primary : Two –way conventional land mobile radio system
- Secondary : Cellular GSM/GPRS

2.1 Central Control Sites (CCS):
The Central Control Sites provides central data processing and storage facilities and is responsible for the communication between the several components itself (i.e RTU – Key personnel). The Control Point shall be located at the Bumbuna Dam site-offices, whereas the second Control Point will be located in the town of Mabonto. The following software/hardware shall be provided within each CCS:

- Base Station Radio and Antenna
- Standalone Status Encoder
- Workstation
- Cellular GSM/GPRS Interface
- IP-Based Notification Software and a graphical software package

Base Station Radio shall be provided with a microphone for live message at the RTU. The standalone Status Encoder shall be capable of

- activating the siren sites individually, in groups or on an All Call basis. It shall use a digital (FSK) protocol format. It shall have a 4-line backlight LCD display and at least 15 user programmable function "hot" keys in the event the PC becomes inoperable.
- receiving status information from the RTU after any test or activation and performing automatic quiet test diagnostics at preset intervals.
- printing information received from remote terminal units

The Status Encoder shall have visual indications of, at least, the status of the RF carrier detect, along with a spare function. It shall have a key lock to secure the controller's keypad. Encoders that do not have a key-lock shall be housed in a tamper-proof, clear lockable box. The box shall be supplied and installed by the bidder. The encoder shall act as well as an interface between the radio communication system and the Server/Workstation.

The Workstation shall be composed of a desktop with LCD monitor UPS and printer and equipped with a graphical software package for activating and monitoring siren readiness status. The graphical software package shall allow the operator to control the entire system by use of a graphic user interface and to perform at least the following functions:

- Display the siren sites represented by colored icons. The icons shall change color to reflect the current status of each siren site.
- Activate the system from the Map screen and enabling the activation of individual, zone or all sirens within the system by means of a System Security Key which allows for a unique system ID.
- Provide configurable hotkeys for fast and accurate activation of specific scenarios.
- Provide complete status on Remote site Parameters, System log entries, Activation records and configuration and RTU status detail of each siren site by clicking the corresponding colored icon on the map screen. These reports shall be capable of being viewed within the software, printed, or exported within a standard database software package such as Microsoft Excel or Microsoft Access.
- Program and read from all of the remote sites from the central control station(s) to eliminate the need to visit sites for reprogramming.
- Utilize a communications protocol with proven security features to prevent unauthorized activation.
- Provide a demo mode which eliminates the risk of activation while training, but still allows users to poll the system and/or receive automatic change in status reports.
- Provide for at least three user configurable events which can be automatically scheduled daily, weekly or monthly. These events allow the user to program automatic monthly activation tests; daily, weekly or monthly quiet tests, and/or other regularly scheduled events.

The workstation shall be simultaneously interfaced to both the radio system and the cellular interface. The cellular communications interface equipment shall allow for the initiation of activation of sirens in the event that the radio operation is non-functional. In addition, the graphical software shall allow for the automatic notification of a pre-defined group of cellular users in the event that the sirens are activated.

2.2 Remote Terminal Unit:
The Remote Terminal Unit shall be composed of the followings:

- Electronic Speaker Array
- Electronic siren Control
- GSM/GPRS modem
- Battery and Charging System
- Solar Panels

2.2.1 Electronic Speaker Array and Omni siren:
The electronic speaker arrays shall provide a rated output to 121 dB(C) at 30m or greater at each location. The proposed siren signal strength shall not vary more than + 1dB in the horizontal coverage range. The frequency response shall be uniform from 400-2000 Hz to insure excellent voice reproduction. The siren must be

mechanically sound with the ability to withstand up to 100 mph winds. Appropriate pole mounting brackets shall be included and 40' of speaker cable weather/solar resistant must be provided with the siren.

2.2.2 Electronic Siren Control:
The siren control must be battery operated and use programmable tone generators and modular amplifiers capable of clear undistorted voice and warning tone reproduction. The design must minimize wiring and simplify component removal and installation. The control must allow for various power level configurations with common parts between each configuration. The Siren controller models proposed must be specifically Listed by UnderWriter's Laboratories, no exceptions will be allowed. Evidence of UL Listing shall be provided with the proposal. Sensors shall be used in the siren to enable remote status monitoring of critical siren operating conditions.

- Tone Generation / Digitally Recorded and Live Voice:

The tone generator must be microprocessor controlled. It must be stable in frequency and tone duration to within <1% over the rated temperature range. It must be capable of generating tones in the range of 300 - 1500 Hz. Warning tones must be user programmable. The vendor must provide all software necessary for programming. At least 7 warning tones shall be available to satisfy current and future warning requirements. Tone durations must be programmable from 1 second to 10 minutes. A volume control must be available to enable separate levels for live local P.A. and digitally recorded messages.

- Amplifiers:

To ensure clear voice and tone reproduction and better efficiency a class D amplifier shall be provided and output shall be uniform within +3dB over the 300 - 3000Hz range. Distortion must be less than 3%. The amplifier must be able to be run a siren tone continuously for 30 minutes without damage. The amplifiers must be modular for easy replacement. It must be possible to remove and install an amplifier without removing power. The amplifiers must incorporate protection circuitry to protect against short circuit and over temperature conditions. Protection circuitry must reset when the fault is removed.

- Volume control:

A volume control must be available to enable the control of individual amplifiers and a low power mode must be available to enable testing siren functions at low volume. Siren tones must ramp up in volume at startup to allow people standing in close proximity a chance to take action to avoid hearing damage. The ramp must start below 5 watts power output and not reach full power for at least 60 seconds.

- Battery and Charging System:

The batteries must be locally available, sealed and maintenance free. The bidder shall specify the type of battery to be purchased. Batteries must provide maximum power for 30 minutes of continuous operation. Without charge, the batteries must be able to back up the siren for at least 5 days with enough reserve for a 3 minute activation at the end of 5 days at full power output. A solar regulator shall be provided designed to charge and monitor the charging of the batteries.

- Solar Panels:

The system shall be equipped with a minimum of 220 watts at 24VDC of solar power. The solar panels shall be mounted to the pole with non-corrosive mounting hardware.

- Cabinets:

The cabinets must be constructed of heavy gauge metal. Steel cabinets must be electrostatic powder coated. Aluminum cabinets must be of a grade 5052-H32 or better and shall be used in harsh environmental locations. The electronics housing shall have a NEMA4X or IP66 rating. The batteries must be in a separate vented enclosure with a NEMA3R or IP45 rating. Connections between cabinets must be sealed against the flow of air or battery gasses. Convenient mounting brackets shall be included for pole or wall mounting.

3 Diagnostic of the System:

The system shall be monitored locally and remotely and changes in status of the system shall automatically be reported for battery power, cabinet intrusion, and local activation. The remote terminal unit shall monitor and report to the central control the status of communications, amplifiers, tone generator, and solar power supply.

Local Diagnostics:
Local diagnostic indications must be available. The following minimum indications must be provided:

- Controller Power - LED should blink showing that microprocessor is working
- Signal Line(s) Active
- P.A. Active
- RS232 port is operational (if applicable.)
- Radio Carrier Detect (if applicable.)
- Amplifier Active
- Amplifier Fault(s)

A quiet test function must be provided to test the amplifiers and drivers at a frequency above the human hearing range. The status of this test must be easy to access within the siren controller.

Remote Diagnostics:
Critical siren operating conditions must be monitored and made available to the remote monitoring station. The minimum status conditions to be monitored are:

- Cabinet Intrusion
- AC Voltage
- DC Voltage
- Battery Charger
- Tone Generator
- Amplifiers and Speakers
- Mode of Operation (Standby, Function 1, etc.)
- Siren Site Number
- Type of Siren (Number of Amplifiers and Speakers)

Changes in status must be automatically reported to the monitoring station unless the siren is activated. When activated, the siren will only respond when requested to report to minimize traffic in an emergency. A means to check the status of the monitored items must be made available for use at the siren site by service personnel. All status conditions must be made readily available for the service technician.

4 Alerting & Notification Platform:
The System shall be capable of delivering alerts concerning the status of the warning system to all means (i.e landline, cellular, computer) to at least 50 people in the chain of command for managing the emergency event and the system shall be capable to customize the messages and the type of message (text, speech or both).

The system shall provide two-way text messaging, and text-to-speech communication. The system shall allow contact information for each person in the database to include multiple devices, including Phone Numbers, Cell Phone SMS addresses, Pager SMS addresses, E-Mail addresses, and Wireless Handheld devices and to enable the user to update their personal information via secure web link, or secure client shall exist. The Contact information database shall have data import and export capabilities using industry standard formats and API's (e.g. Excel, comma delimited, MS SQL, Active Directory, etc.). The system shall contact the specified person through a sequential, escalating method, e.g. networked computer, smart phone, home phone, office phone, e-mail, SMS, cell phone, etc., and display the number called.

The System shall allow for defining which device is called first, second or all at once depending on the Time of Day, or Week. The System shall provide popup messages to computers that cannot be ignored. It shall provide real-time reporting reflecting: 1) Notification content; Recipient / Group list; Time of transmit by each device by each recipient 2) All attempts with specific results: Recipient response; 3) Summary of responses and time at which notification was closed. It shall allow historical reporting available for all the above information for at least one year for viewing or upload to other reporting databases.

5 Miscellaneous:
The bidder shall provide a pole sufficient to mount the proposed speaker arrays (Section 4 Drawings – Siren Pole Typical Layout). The pole shall not be made of wood or galvanized steel due to the size and weight of these types of poles. The bidder shall propose a pole and provide details within their response.

The bidder shall connect each outdoor speaker array and controller to the narrowband radio system and the cellular communications network. Upon completion of the installation, the siren system manufacturer will perform System Optimization/Commissioning Services to confirm correct installation and programming, check all system components and insure complete system operation. The bidder shall include verification of the radio alignment, including insuring that forward and reflective power are within acceptable levels

6 Spare Parts:
A recommended spare parts price list must be submitted as part of the proposal for a period of five years after completion of the installation. The list shall include the recommended quantity of each main active component.

7 Documentation:
Detailed System description, network plan, and As-built drawings, complete installation, operation and maintenance manuals must be provided for the all the subsystems. The manuals must contain replacement part numbers with drawings or pictures showing part locations. Each siren must have a manual inside the control cabinet for service personnel.

8 Training:
Only on-site training is required for the specified number of trainees, and shall include both classroom and hand-on instruction. Training will be provided to a group of twenty (20) participants, training materials shall be provided for each participant and electronic copies of all materials shall be provided to the Client for future training purposes. The Client shall have complete rights to copy and distribute training material as deemed necessary for continued operation of the system.

9 Civil works and interface with equipment supplies and installation:
Civil works would be undertaken under a separate contract and would *inter alia* include: (a) transportation of the construction material to the site; (b) bush clearing and leveling of the ground; (c) excavation ; (d) providing pole foundation for erection of the pole; (e) construction of concrete fence and security post; (f) graveling; and (g) other related work. The civil works would be overseen by the Purchaser's Engineer, who would also ensure close coordination and interface with the equipment supplier for the installation, commissioning and testing activities.

4. Inspections and Tests

Following is envisaged:

- The Supplier would supply the sirens, control stations, solar panels, poles and others all related equipment, and would be responsible for installation, testing and commissioning.
- The Supplier would be responsible for the whole contract (supply, erection, testing and commissioning).
- An independent civil contractor would provide access, foundations, fences and erection of poles, under a separate contract.

Supplier will be solely responsible to carry out the testing and commissioning (in the presence of the Purchaser's engineer).

The following inspections and tests shall be performed, as per the technical specifications provided in Section 3:

- Functional tests of Central Control Sites.
- Performance of Remote Terminal Units (high-powered electronic sirens) capable of producing multiple tones and public addressing.
- Performance of the Notification System.
- All other related tests.