

**PROPOSAL FOR
SUPPLY, DELIVER, INSTALLATION, TESTING
AND COMMISSIONING OF
REMOTE FLOOD WARNING SIREN SYSTEM
FOR
JABATAN PENGAIRAN DAN SALIRAN
KEDAH DARUL AMAN**

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1.0 INTRODUCTION

1.1 GENERAL

The purpose of this document is to propose a Remote Flood Warning Siren System (RFWSS) for Jabatan Pengairan Dan Saliran Kedah. Currently, there are a numbers of Stand Alone Flood Warning Siren (SAFWS) Stations in Kedah without any communication link. This proposal is to upgrade all the existing siren stations to have telemetry link in order to alert the JPS's officer as well as the JPS Flood Control Center when ever there is a flood event.

Low areas in the Kedah near the river mainly suffer from floods which usually result from rivers water overflow due to heavy storms dropping large amounts of rain at the upstream. Some of the urban areas also affected by flash floods, which result from intense storms dropping within a brief period in the same area. A warning system shall be implement in these affected areas so that public could save their property and evacuate before the situation becomes worst. One of the most effective methods of providing flood warnings to the public by implementing a Remote Flood Warning Siren System (RFWSS).

Generally, there are two type of Flood Warning Siren System (FWSS), i.e. Stand Alone Flood Warning Siren (SAFWS) and Remote Flood Warning Siren (RFWS) with communication capability. The differences between the two is that the SAFWS is only used for localizes public warning only but the RFWS is equipped with communication capability to inform the JPS's personal beside giving warning to the public. The communication media for RFWS can be SMS/GSM, PSTN line, Satellite or VHF Radio.

The Remote Flood Warning Siren System (RFWSS) proposed is a solution from Scadatron Telemetry called "FloodAlert". FloodAlert RFWSS is proposed because of it's flexibility in system configuration. FloodAlert equipped with SMS/GSM MODEM is proposed for areas with GSM network and FloodAlert equipped with Asia Cellular Satellite System (AceS) is proposed for areas without GSM access.

1.2 RFWSS OPERATIONS

A RFWSS is normally designed to provide two levels of warnings: Alert level and danger level which is pre-determined (Note: expandable to provide three levels warning: alert, warning and danger level). When the river level reaches the first level called alert level, the RFWSS shall activate a siren sound which is waiving and lasting between 1 to 15 minutes (the duration can be easily set by turning a rotary switch inside the siren driver board). This siren sound pattern shall alerts residents in the area of an impending flood.

If the river level continues to rise and reaches the next level (danger level), the siren will be activated again with a different tone. This siren sound is of higher tone and waived faster compared with the first siren sound to show the differences and to indicate that the flood has reached the Danger Level. Upon hearing the danger siren sound, the public shall evacuated immediately from the flooding area.

The RFWSS normally operate in sleep mode to reduce power consumption. Once any of the water level sensors is active due to river level raises, the siren driver board's controller will be awakened and start to make sound.

With a communication controller and GSM MODEM installed as part of the RFWSS, the system can send a SMS to the RFWSS Center Monitoring System (CMS) as well as a number of JPS officers to inform of the flood whenever the river level reaches alert level or danger level. Up to a maximum of 20 numbers of officer's mobile phone numbers can be stored in the GSM MODEM SIM card.

For RFWSS location without GSM network, AceS Mobile Satellite Phone is used to inform the officer by making a dial-out call to the Centre Monitoring Station (CMS) to inform of the alarm so that the CMS can broadcast this alarm to JPS officers. The RFWSS can also dial directly to JPS officers mobile phone. By looking at the incoming-call phone number, the officer shall immediately know which RFWSS is activated. The AceS Satellite System is described separately in different section.

1.3 EXISTING TWO-TONE SIREN

The existing siren stations is using Two-Tone Siren (Model ST100) which is designed to provide the flood warning. It generates two levels of warning. When the flood level reaches the first critical level the system will emit an alert siren lasting between 1 to 10 minutes (the duration of siren can be set). This siren alerts residents in the area of an impending flood.

If the flood level continues to rise to the second critical level the siren will be activated again. This time a slightly different tone will be emitted. The second tone is different from the first to indicate that the flood has reached the danger mark and that evacuation should proceed immediately. To reduce power consumption, the system will in ordinary times be in the sleep mode and supply to the audio boards is cut off. Once one of the sensors is activated, the CPU will be interrupted.

The system runs on two solar rechargeable batteries. These are 12-volt maintenance-free lead acid batteries. The reason for using solar power is that during a flood event, AC power supply is often cut or tripped due to the short-circuiting or lightning strikes. With batteries recharged using solar power, supply of electricity is guaranteed during critical flood situations.

The hardware comprises four components:-

1. Main controller board
2. 4 nos. two tone siren driver boards
3. 4 nos. 32 watt , 8 ohm horn speakers
4. 2 nos. float-type water level sensors

The main controller board is constructed using two high performance RISC - like CPU (PIC16C84). One CPU is assigned as the master CPU, the other the slave CPU. The board normally operates using the master CPU. In the event the master CPU fails, the slave CPU takes over the operation of the board. In this way, the system has a built-in back-up system to ensure reliable operation.

The board has two input ports and two output ports. The float sensors are connected directly to the input ports. The two output ports are connected to a two tone siren.. The system has two float switches. When the lower float switch is triggered the system send a signal to the first siren to activate it. If the level continues to rise, the second float switch will be triggered. When the system detects that both switches are triggered, it will send a signal to the second siren to activate it. Both sirens have distinctively different tones to enable the residents to know the severity of flood situation.

The function of the two-tone driver board is to convert the DC supply to a two-tone siren. There are altogether four boards, each connected to a horned speaker. All four speakers will be triggered simultaneously. Each tone driver board-horn speaker pair works independently. Should one fail the others will continue to operate. The chance of 4 speakers failing to operate is remote.

1.4 UPGRADE EXISTING TWO-TONE SIREN STATIONS

This proposal suggest to upgrade the existing Two-Tone Siren Stations into Remote Flood Warning Siren System (RFWSS) to include the following functions:

- continue to provide local warning to public for alert level and danger level warning
- extra features to support Short Messaging System (SMS) warning to CMS and JPS officer or Asia Cellular Satellite System Dial-Out warning to CMS and JPS's officer
- extra features to support remote siren activation from CMS or JPS's officer by using SMS with password

In order to perform the functions above, The Stand Alone Two-tone siren shall be upgraded to include the following equipment:

- 1 no of ST2003 communication controller
- 1 no of GSM MODEM with external antenna

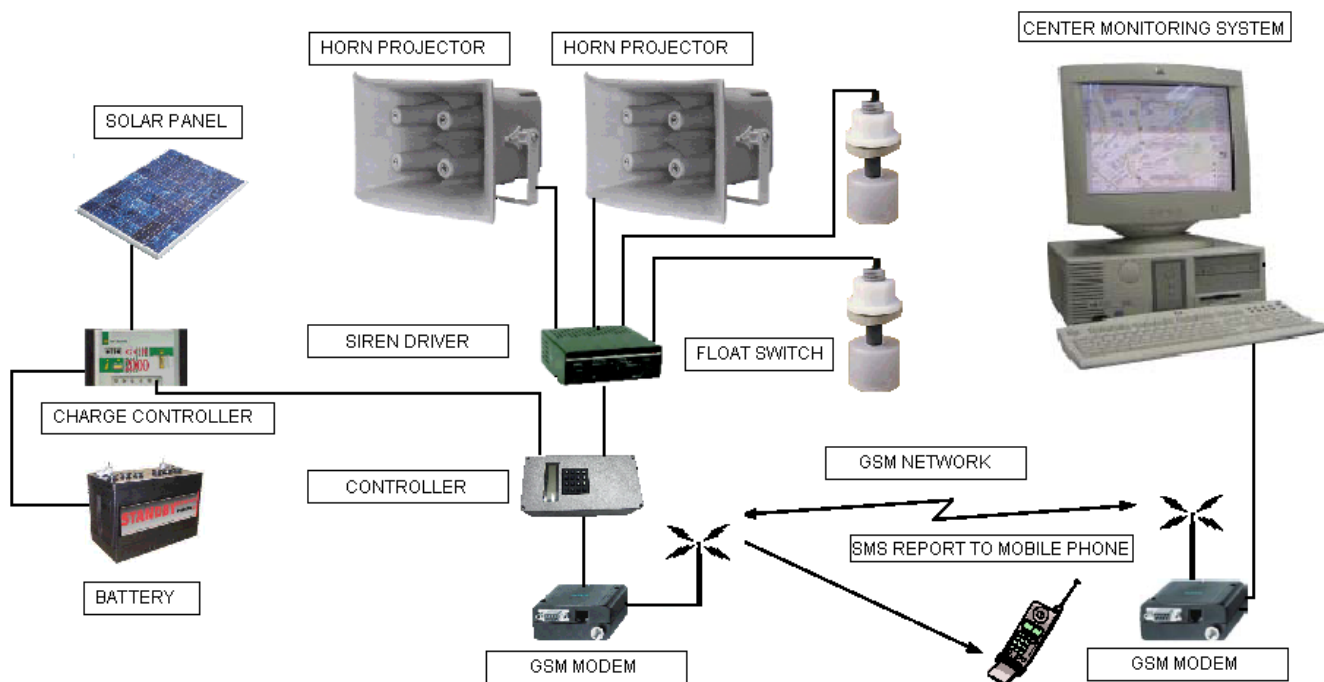
Optionally, the Stand Alone Two-Tone Siren can be upgraded to have the following advanced functions with some extra cost:

- Convert the siren stations into a SMS rainfall telemetry station with rainfall data collection if tipping bucket raingauge is connected to the station
- Support automatic remote siren warning from Center Monitoring Station (CMS) by using a number of rainfall data and water level data

1.5 FLOODALERT RFWSS CONFIGURATION

The FloodAlert Remote Flood Warning Siren System (RFWSS) is available in the following configuration modes:

1. Stand Alone Flood Warning Siren (SAFWS)
2. Remote Flood Warning Siren (RFWS) with Short Messaging System (SMS) warning
3. Remote Flood Warning Siren (RFWS) with Asia Cellular Satellite System warning
4. Remote Flood Warning Siren (RFWS) with VHF Radio Communication Equipment
5. Remote Flood Warning Siren (RFWS) with PSTN Communication Equipment
6. Remote Flood Warning Siren (RFWS) Center Monitoring System (CMS)



System Configuration For FloodAlert RFWSS With SMS Reporting

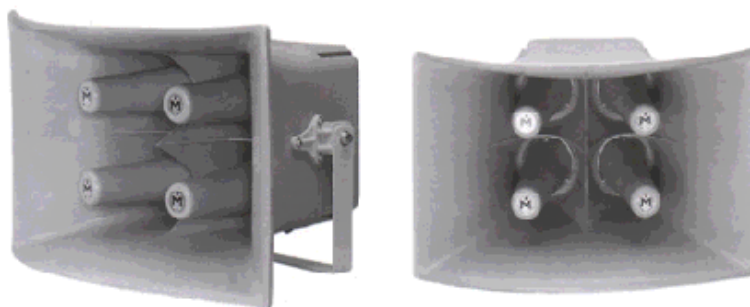
The diagrams above illustrate FloodAlert Remote Flood Warning Siren System (RFWSS) with Short Messaging System (SMS) warning. With these combinations of communication media, JPS authorized personnel shall be able to know if there is any Flood Warning Sirens activated through their handphone. A FloodAlert Center Monitoring System (CMS) is also proposed here to give immediate warning to the Flood Control Center personnel or to remotely activate the RFWSS.

2 FLOODALERT RFWSS

A new FloodAlert Remote Flood Warning Siren System (RFWSS) is constructed from the following components:

- 2 nos of 200W siren horn separated 180 degree apart
- 1 no of 200W siren amplifier (two 100W channels operate in parallel for redundancy)
- 2 nos of float switches type water level sensors in float-well (alert and danger)
- 1 no of siren pole with air rod on top
- 1 no weatherproof siren controller housing
- 1 no of 12V/60AH maintenance free battery
- 1 no of 12V/46W solar panel
- 1 no of ST2003 communication controller
- 1 no of communication equipment (GSM MODEM or AceS Cellular phone)

2.1 SIREN HORN



The FloodAlert System uses special designed high-power siren horn projector in pair. In a smallest configuration, two (2) numbers of siren horn is separated 180° with the use of IP65 wide-angle horn projector each with 200W horns driver. The siren horn is specially designed for maximum output power and sound projection, so it could achieve larger area coverage and long distance sound penetration.

These high-power siren horn provides excellent voice and tone reproduction and is ideal for overcoming high levels of industrial noise and traffic noise in the city. Design flexibility allows the user to combine up to four siren horn with each horn cover have a 90° angle of dispersion, accommodating specific sound output patterns.

FEATURES

- Overcomes ambient noise of industrial environments
- Provides maximum speech recognition and tone reproduction
- Produces 115dB

HORN SPECIFICATION

Number Of Horn:	2
Low Frequency Cut Off:	180Hz
Horn Coupling:	1-3/8" -18 Threads
Finish:	Gray Color
Material:	Glass Fiber Reinforce Plastic
Dimensions:	(L) 680 X (H) 425 X (D) 550mm
Shipping Weight:	10 Kgs Approx
Power:	200 Watts (100w X 2)
Maximum Power:	400 Watts (100w X 4)
Sound Pressure Level:	99db (400w/100m)
Reproducing Freq. Range:	180- 7.5k Hz (-20db)

The FloodAlert System uses bobbin siren driver which is specially designed for electric siren and alarm installation internal magnetic structure is made of high temperature-resisting rare-earth alloy internal magnet steel. Beautiful surface, clear sound, water-proof, rot-resisting and good seal is it's character.

Each siren horn is installed with two number of siren driver which uses it's standard 1-3/8" coupling to screw into the horn projector body. Since each horn projector can be installed with maximum 4 number of siren drivers, two more extra coupling is available for installation with two extra siren drivers where necessary.



SIREN DRIVER SPECIFICATION

Number Of Siren Driver Per Horn:	2
Power:	100 Watts, RMS
Impedance:	8 Ohms
Frequency:	200-5000 Hz
Distortion:	Less Than 5%
Voltage:	$\leq 26v$
Sound Compressing level:	115 dB
Horn Coupling:	1-3/8" –18 Male Thread
Weight:	3.07kg
Terminal:	Slip-On Type

2.2 SIREN AMPLIFIER

The FloodAlert Siren Amplifier a siren amplifier / tone generator with the latest solid-state components gives the most efficient and economical siren available. Integrated circuits and silicon output transistors give the amplifier exceptional performance and durability under a wide range of environmental conditions.

The siren amplifier is designed in with 2 identical channel with hot backup redundancy to protect against failure. Each siren channel can provide 100-watt output and two of such amplifier in a fail-safe design shall maximum of output of 200-watt if sounded concurrently. The siren amplifier can operate from any 12-volt positive or negative ground electrical system. The sirens sound is produced digitally from micro-controller, it means that the sound pattern and tone can be easily reprogrammed to suit the customer requirement.

The Siren amplifier can drive one or two 8-ohm impedance, high power (100W) bobbin speakers. When two speakers are used, they must be connected in parallel and in phase.

SPECIFICATION

Input Voltage	10.8V DC to 15VDC.
Polarity	Negative or positive ground.

Standby Current	50mA. max. (not incl. panel light).
Operating Current (Wail)	7.5A amperes max.
Frequency Range	200 to 10KHz. +/- 3 dB
Distortion	< 5% max.
Frequency response	+/- 3dB

The FloodAlert Siren Amplifier have the following general features:

- Settable Siren Lasting duration from 1 minutes to 15 minutes using rotary switch
- Factory adjustable siren sound waiving speed and siren tone according to customer requirement
- Sound generation suing micro-controller
- Two channel working in parallel to provide maximum output with hot backup redundancy design
- Accept Alert and Danger Level float switch Input (with MOV surge protection)
- Expandable to include Warning Level when necessary
- Able to provide interface to telemetry system through ST2003 communication controller

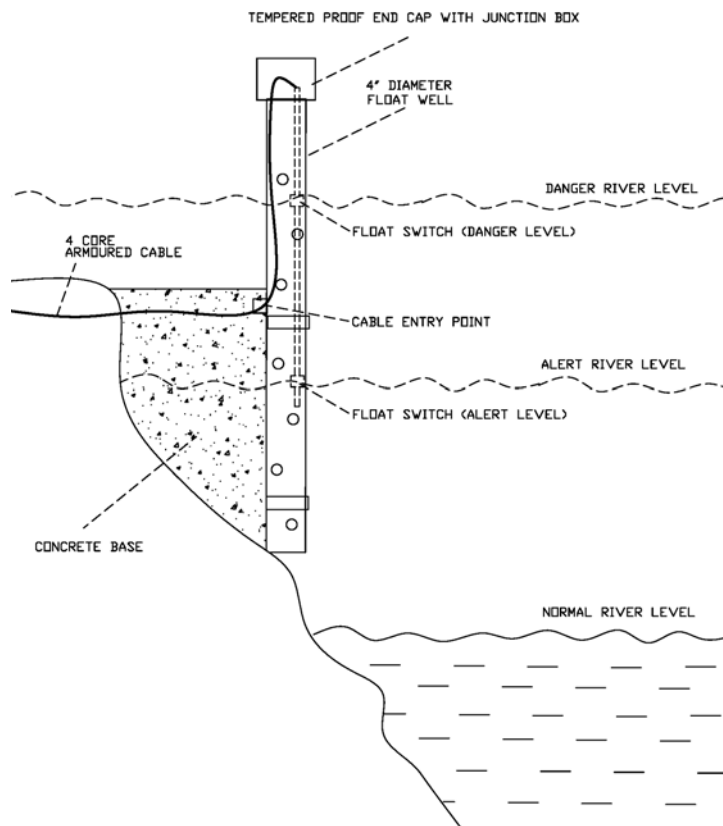
The siren tone is generated from a high performance RISC micro-controller (MCU) from Microchip. One MCU is available in one channel, both channel or both MCU can generate siren sound concurrently for producing maximum sound output (200W). If one of the MCU fail, only one of the channel is effected, the second channel shall be still working to produced sound with 100W output only.

The siren amplifier board has three input ports which connects to float switches, and two speaker outputs (2 x 100W channel) for connection to siren horn.

The MCUs for both amplifier channel in the siren amplifier board is connected in parallel to all the inputs which connect to the float switches. If any of the lower float switches is triggered, both MCUs shall generate siren "ALERT" siren pattern output at the same time but synchronized to each other. If both of the float switches or the higher float switche is triggered, both MCUs shall generate "DANGER" siren pattern output at the same time with similar manner.

2.3 WATER LEVEL SENSOR

The float switches is constructed from submersible IP68 rating float switches mounted on PVC pipe with fixed separation between Alert Level and Danger Level. This assembly is further protected inside a 4 inches diameters G.I. pipe secured to the river bank with concrete pilling. The G.I. pipe shall have holes at the side so that water can enter the pipe but prevent rubbish or floating object from damaging the float switches. The diameter of this G.I. pipe shall be large enough and be opened at the bottom so that sludge and mud shall not retain in the pipe. The siren amplifier with a separated spare input channel allow expanded to include Warning Level if necessary.



Proposed Water Level Sensor (Float Switch) Installation Diagram

Note: The float switches installation position at the river bank will determine the Alert and Danger level.

2.4 SIREN POLE AND ENCLOSURE

The siren pole for the FloodAlert RFWSS is constructed from a 20 feet length Class-C G.I. Pipe (3 inches diameters) buried 4 feet underground on a concrete platform. It shall be strong enough to hold the siren horn in place on top of the pole. The siren shall be installed at such a height to allow for larger sound coverage area.

An air rod shall be installed on the top most of the siren pole in order to protect the RFWSS from strike by lightning. The air rod and siren pole shall be properly grounded through a copper down conductor to an earthing system with 20 ohms resistance or less.

All RFWSS main components is enclosure in a pole-mounting weatherproof enclosure designed specially for mounting on the siren pole itself. The height of the enclosure mounting must be higher then the maximum flood level.

The weatherproof enclosure shall enclose all necessary equipment inclusive of Siren amplifier, Solar Charge Controller, Maintenance Free Batteries, Communication controller, Communication Equipment, etc.

The weatherproof enclosure shall have hinged and lockable front doors for easy access. All components, wiring and terminal blocks shall be accessible from the front of cabinet. The enclosure shall of IP65 standard and designed to operate in an ambient temperature range of 10-60 degrees C and ambient humidity range of 10-95% RH (non-condensing). All cable in the cabinet shall be neatly covered inside cable trunking or cable management conduit.



A typical siren pole with pole mounting weatherproof enclosure

2.5 SOLAR POWER SUPPLY

The proposed RFWSS is powered by solar power supply system, the reasons for using solar power is because during a flooding event, AC main power supply is often cut-off or tripped due to lightning strikes or short-circuit.

The solar power supply system installed for each RFWSS shall be configured according to the power consumption of the RFWSS and to be cost effective. The proposed solar power system shall consist of one unit of 12V/46W solar panel and one unit of 12V/60AH battery for long terms reliable operation and also because it is commonly available in the market.

The RFWSS shall be equipped with solar charge controller for charging the maintenance free Sealed Lead Acid (SLA) battery with operating voltage of 12V DC nominal with a float charge voltage of 13.8V DC. The charge controller shall allow for float charge, voltage regulation, battery protection and overcharging protection.

2.5.1 SOLAR PANEL

The proposed solar panel for the RFWSS is Siemen/ Shell SM46 with the following features:

- Single-crystal silicon cells with outstanding energy performance characteristics, enabling module to produce power even in low light conditions.
- Cell surfaces have Texture Optimized Pyramidal Surface to trap and absorb more light.
- Torsion/corrosion resistant anodized aluminium module frame assures dependable performance, even through harsh weather conditions and in marine environments. Multiple built-in bypass diodes in selected modules help system performance during partial array shading.
- Solar cells laminated between a multi-layered polymer back sheet and layers of ethylene vinyl acetate (EVA) for environmental protection, moisture resistance and electrical isolation.

SPECIFICATIONS

Make	Siemens/Shell
Nominal peak power (W)	46
Peak power voltage (V)	14.6
Peak power current (A)	3.15
Short circuit current (A)	3.35
Open circuit voltage (V)	18.0
Length (mm)	1083
Width (mm)	329
Thickness (mm)	34
Weight (kg)	4.6
Number of cells	30

2.5.2 MAINTENANCE FREE BATTERY



The proposed RFWSS uses maintenance free Sealed Lead Acid (SLA) battery which is manufactured by Power Battery Company. It is a 12V/60AH battery which has high capacity for the need of long terms operations.

FEATURES

- Gas recombination greater than 99%.
- Operates at a low internal pressure.
- Never needs watering, minimal maintenance.
- 99.7% pure lead calcium grids.
- Shock absorbent thick wall construction.
- Cold forged non-porous terminal bushings, eliminate post leakage.
- Thermally welded case to cover bond, eliminates both acid and electrical leaks.
- Over-sized, through the partition inter-cell welds provide low resistance connections, with minimal power loss.
- Each cell has a low pressure safety release venting system, recognized per U.L. 924.
- Measured high vacuum acid fill, reduces electrical variability between cells.
- 100% recyclable materials.

3 COMMUNICATION SYSTEM

3.1 COMMUNICATION CONTROLLER

In order for the FloodAlert RFWSS to inform the in-charge officers on any flood-events, the RFWSS shall be equipped with communication capability. A communication controller and a communication equipment will allow the RFWSS to perform this function.

The communication equipment to be included in the system shall be GSM MODEM for areas with GSM network and Asia Cellular Satellite System (AceS) mobile phone for areas without GSM access. The GSM and AceS communication System is described in the following sections separately.

The proposed communication controller is Scadatron Telemetry ST2003 which is a single board industrial graded micro-controller based controller card. The features are listed as follows:

1. 128KB system base and data logging memory
2. 36KB EPROM for system firmware storage

3. Year 2000 compliant Real-time clock with 10 years battery backup
4. 1 serial communication port with RS232 interface
5. 4 channels of 12 bits Analogue inputs with Instrument Operations Amplifier input interface and supports differential input (4-20mA).
6. 3 points of opto-isolated digital inputs
7. 16 points of normal digital inputs with high impedance isolation
8. 2 points of digital output with relay voltage free contact.
9. Non-volatile memory for minimum 10 years data retention without power
10. Flexible supply voltage input from unregulated 8VDC-30V DC
11. Watchdog Timers
12. Alarm Report by Exception
13. Ability to accept Control Commands and Request To Poll For Data
14. Able to support all type of communication equipment inclusive of SMS via GSM Modem, GSM data Calls, PSTN MODEM or leased line by having separate communication equipment
15. Rugged Operating Limits
16. User friendly user interface through keypad and LCD interface.

DETAILED ST2003 SPECIFICATIONS

Processor And Memory

CPU Type	Motorola MC68HC11A1 micro-controller
CPU Speed	7.3728MHz
RAM	32K standard CMOS static RAM 128K extended non-volatile static RAM for Data Logging All are backup by on-chip lithium battery for up to 10 years
EPROM	Standard 32K CMOS EPROM
EEPROM	512 bytes non-volatile memory for storing system parameters
Real Time Clock	CMOS Clock & Calendar, backup by on-chip lithium battery for 10-years without power. Data format: sec/min/hour/weekday/day/month/year
LCD display	2 rows x 20 characters liquid crystal display
Keypad	4 x 4 matrix, heavy duty type

Serial Communication Port

Usage	For GSM Modem / laptop programming / interrogation / logged data retriever
Interface	RS232C
Data length	7 or 8 data bits
Data Parity	None
Baud Rate	50,300,600,1200,2400,4800,9600 baud programmable
Connector type	DE-9 male with retention screws (DTE)
LED indicators	TXD, RXD, RTS

Input/Output

Digital input	3 channels opto-isolated input points
Digital input	16 channels high impedance digital input points
Digital output	2 volt-free contact outputs, rating 240V 1A each.
Analog input	4 differential analog input channels, input range 4-20mA.

	External 200ohm 1% series resistor. Or 1-5V input
	High accuracy A to D converter, 12 bit resolution.
Counter/Accumulator points	2 channels, maximum response 1 KHz
	Opto-coupler isolation of each channel provided.

Fail Safe Features/Supervisory Circuitry

Watchdog timer 1	External watchdog timer with 1.6S time-out period
Watchdog timer 2	An MCU internal watchdog timer system

Power Supply

Supply	8- 30V DC / AC unregulated supply
Over-voltage protection	MOV varistor on unregulated supply voltage and 6.7V zener diode on regulated 5V supply
Battery backup	CR3032 3V button cell to backup RAM
Power consumption	Typical 60mA (on 12VDC) in active mode, less then 1mA in idle mode



ST2003 Communication Controller In IP65 Enclosure with Keypad And LCD Interface



Internal View of ST2003 ST2003 Communication Controller

3.2 SMS REPORTING USING GSM NETWORK

3.2.1 GENERAL

The communication protocol which utilize Short Messaging System (SMS) is programmed into the firmware of the communication controller. A SMS software driver is coded in the controller which define how the controller shall send SMS through the GSM MODEM to the officer or operator's mobile phone as well as Center Monitoring System (CMS) if installed.

With GSM communication, the communication controller shall support three (3) types of communication modes as follows:

- RFWSS automatic report flood alarm by sending SMS directly to officers' mobile phone
- RFWSS reply latest FWSS status by reply in SMS format upon request from mobile phone
- RFWSS automatic report flood alarm by sending SMS to a Center Monitoring System (CMS)
- RFWSS Center Monitoring System (CMS) automatic report flood alarm by sending SMS to officers' mobile phone upon receive alarm from RFWSS.

Mode 1

In the first mode, the RFWSS communication controller shall support direct SMS flood alarm reporting to a number of maintenance personnel's mobile phone (3 person to 20 person) which numbers is stored in the SIM card of the GSM MODEM.

Whenever an flood alarm is detected such as Alert level or Danger level, the communication controller shall immediately send a flood warning SMS at the same time when the siren is activated. The exact date and time of flood alarm occurrence shall be reported in the SMS.

The flood alarm reporting mobile phone number list can be added or removed remotely by sending a SMS commands from any mobile phone to the communication controller together with an authorization password.

Mode 2

The communication controller shall be configured to allow any officer or operator to request for latest status of the RFWSS and the current flood status by sending a request SMS to the targeted the communication controller. The sample Request SMS can be "#9999, Poll" where 9999.

To prevent anonymous user to request for data, the communication controller can be configured to responds to only to a maximum of 20 officers or operators, whose mobile number is recorded in the SIM card of GSM MODEM, to request for RFWSS status.

Mode 3

In this mode of operation, the RFWSS communication controller shall also send a flood alarm SMS to the GSM MODEM of a Center Monitoring System (CMS) which shall be installed in the flood control room beside send SMS to the officer mobile phone number.

This mode is allow for logging and display of flood event in the Center Monitoring System (CMS) which is equipped with a Man Machine Interface (MMI) for Graphical User Interface (GUI).

Mode 4

The RFWSS Center Monitoring System (CMS) Man Machine Interface (MMI) can be configured to receive SMS from RFWSS and board-cast the Flood Warning Alarm to a number of officer's mobile phone by using SMS. The reporting mobile phone number is user programmable in the CMS Man Machine Interface (MMI) computer. Normally Mode 1 is not used when this mode is utilised.

3.2.2 GSM MODEM

In order for the RFWSS to communicate with Short Messaging System (SMS), a GSM MODEM shall be connected to the communication controller for the RFWSS.



Siemens TC35T Digital Transceiver

The GSM MODEM or Cellular Engine model TC35 is the fast plug and play solution from Siemens. Standard industrial interfaces and an integrated SIM card reader make it the ideal dualband GSM terminal for universal use in voice/data communication. The wide performance spectrum and the robust case enable us to quickly develop new applications for industrial fields such as telemetry.

Product features:

- Dual-band EGSM900 and GSM1800
- Compliant to GSM phase 2/2+
- Output power:
 - Class 4 (2 W) at EGSM900
 - Class 1 (1 W) at GSM1800
- Control via AT commands
- Supply voltage range 8 V...30 V
- Dimensions: 65 x 74 x 33 mm
- Weight: ca. 130 g

Approvals:

- R&TTE
- GCF approval

SMS:

- Point-to-point MO and MT
- SMS cell broadcast
- Text and PDU mode

Audio:

- Half rate (HR)
- Full rate (FR)
- Enhanced full rate (EFR)
- Basic handsfree operation
 - Echo cancellation
 - Noise reduction

Data:

- CSD up to 14.4 kbps (as of 08/2001)
- USSD
- Non transparent mode
- V.110

Fax:

- Group 3, Class 2

Supplementary services:

- Phone book
- Multiparty
- DTMF (Dual Tone Multi Frequency)

Interfaces:

- Plug-in power supply
- Handset audio interface
- Mini-SIM card reader
- Antenna connector FME (male)
- V.24/V.28 interface on the 9-terminal Sub-D-socket
- Operating status LED
- Ignition lead on the 6-pin Western connector

Peripheral devices:

- Antennas, SIM cards, power supply units, RS232 connection cable

4.0 CENTER MONITORING STATION (CMS)

4.1 GENERAL

An optional offer for the RFWSS is a Center Monitoring Station (CMS) to provide immediate flood warning to the government Flood Control Center which through a RFWSS Man Machine Interface (MMI) with Graphical User Interface (GUI).

The equipment proposed for the CMS is as follows:

1. RFWSS Man Machine Interface (MM) workstation
2. RFWSS Man Machine Interface (MM) software
3. GSM MODEM as communication equipment

Man Machine Interface (MMI) or sometime called as HMI (Human Machine Interface) refer to the software and hardware equipment (normally computer) where the user can operate or monitor the system. The MMI is normally designed with user friendly GUI (Graphical User Interface) software. MMI Software can also be referred as SCADA Software in most of the cases because the software can be equipped with facilities for Supervised Control Operations.

4.2 MAN MACHINE INTERFACE (MMI) WORKSTATION

One unit of Man Machine Interface (MMI) Workstation is proposed for operating in the Center Monitoring Station (CMS). This is the computer where the RFWSS Man Machine Interface (MMI) software is installed.

The proposed Man Machine Interface (MMI) hardware is a workstation grade computer equipped with a 17" TFT Liquid Crystal Display (LCD) flat-screen panel. The operating system proposed is Windows 2000 professional, installed with latest version of Norton Anti-virus.

The Man Machine Interface (MMI) Workstation proposed is:

- IBM Eserver X Series 205
- Intel Pentium IV 2.67 GHz
- 512 KByte Cache
- Memory: 256MB SDRAM (Max: 2GByte)
- 36.4 GByte Ultra 160 (10K rpm) SCSI hard disk
- Single Channel SCSI-160 Controller
- 8MByte SDRAM SVGA Memory
- 40X IDE CDROM Drive
- 1.44Mbyte Floppy Drive
- Form Factor: Tower (Black color)
- Network interface: 10/100MByte
- Parallel ports (type) : 1 (EPP/ECP bidirectional)
- Serial ports (type) :2 (9-pin 16550A UART)
- 2 USB ports
- Built-in sound card with internal speaker
- Standard Keyboard and Mouse (black color)
- 17" UVGA TFT LCD Monitor
- Licensed Windows 2000 Professional
- Licensed Norton Anti-virus version 2004

4.3 MAN MACHINE INTERFACE (MMI) SOFTWARE

The Man Machine Interface (MMI) Software proposed shall be designed and configured for monitoring of Remote Flood Warning Siren System (RFWSS) and shall be easily configured to perform remote Flood Warning Siren activation when required.

The RFWSS Man Machine Interface (MMI) shall include the complete FWSS scheme and display all FWSS Station Status. The RFWSS MMI shall indicate the real time FFWS status; i.e.: Fault, Communication Error, Siren On/ Off, Level Normal / Alert / Danger.

The RFWSS Man Machine Interface (MMI) shall be connected to a GSM MODEM and a PSTN MODEM through RS232C serial port and the MMI Software shall be able to communicate through SMS and received calls from the RFWSS with AceS Satellite communication.

The Monitoring Man Machine Interface (MMI) shall complete with a number of MIMIC page to display Siren Stations current level and status. Any water level alarm condition or communication error shall be shown on the MMI screen by using flashing animation.

The Man Machine Interface (MMI) Software shall be equipped with the following features:

- Supports Graphical User Interface (GUI)
- Overall graphical map display of scheme area to clearly indicate location of RFWSS Station with status display box.
- All telemetry data / transaction shall be stored into Database for historical viewing.
- Fully tested for year 2000 compliant
- Operate under Windows 2000 environment
- Clear presentation of alarm data in tabular format for report generation
- Able to handle a minimum of 100 RFWSS Stations without having to upgrade software license.
- Support client-server architecture. Display client can be set-up on the same Local Area Network (LAN) when necessary.
- Integration with WEB server enable remote data access using any internet browser, or in other word support HTML scripting.
- Supports printing of graphical display, tables and reports on laser printer.
- High resolution graphic display (1024 x 768 pixels)
- Third party access to database possible , e.g. Microsoft Excel, Access
- Support ODBC, for interfacing to Microsoft SQL or Sybase SQL server
- Need minimum computer knowledge to operate the system by using user friendly graphical interface

4.4 SCADA SOFTWARE

The Man Machine Interface (MMI) software proposed is called TELESCADA which is written on a commercial SCADA software on which the configuration of RFWSS shall be performed. It provide a framework or platform for building a system or project.

There are two type of SCADA Software license call Server License and Client License. Only the Server can acquire data from I/O device directly where-else Client can only display data acquired from a Server connected to it though LAN or Serial link. The commercial SCADA software come in various points count which is 75, 500, 1500, 5000 and unlimited points. A 75 points Full license is used in this system and the computer is connected to a GSM/PSTN through the MMI's RS232 serial port. While the MMI Software is running, it exchanges data with the I/O Device(s) and distributes information to the other Display Clients if there are any. This SCADA Software also has separate server modules that are dedicated to handling specific functions, such as alarms, reports, trending etc. For a small application such as this, only a single server is used.

In general, the SCADA Software provides a lot of facilities, libraries and visual/graphical tools that allows a System Integrator (SI) to build (configure and programming) a system designed specifically according to the user requirement. The SCADA Software is divided into a few separate programs, these programs are:

- Runtime Application

- Project Explorer
- Project Editor
- Graphic Builder
- Code Editor

4.4.1 RUNTIME APPLICATION

In the runtime application, which is in used to control and monitor the RFWSS is tailor made to suit the user requirements, using the configuration tools mentioned above. Once the project is configuration is completed, it must be compiled to the runtime system using Project Editor. It is at runtime, where the SCADA program will communicate with the I/O devices, process alarms, animate levels and symbols etc. To use the runtime system, the computer requires a protection key (otherwise it will run in demonstration mode and expired after 10 minutes).

The runtime application can start automatically after the computer is turned ON without clicking on the desktop icon.

4.4.2 PROJECT EXPLORER

Project Explorer is a helper tool used to organize the project files neatly and systematically to the delight of the programmer. Therefore it allows the programmer to create project directories that will keep all the files needed for that particular project. The Project Explorer is also the main menu for the programmer to access to the other Project programs mentioned above. It also allows the project to be backup and restored to and from disks.

At any one time, only one project is selected/highlighted in the Explorer program, that is project that is currently in used and to be opened by Project Editor, Graphic Builder and Code Editor as default. In a more complex project, the system can be designed to utilize more than one project at a time where a main project include another sub-project.

4.4.3 PROJECT EDITOR

Project Editor is the editing utility for use to create and manage the configuration information of the project, which is not related to graphics pages. An important item to be edited using Project Editor is Variable Tag. Variable Tag is a user created / named object which represent a location where data are stored, it can be a memory Tag or I/O Tag to keep data transferred from the Input / Output (I/O) Device. The Variable Tag must have a name and related to a hardware address in I/O Device where the variable is stored. The format and prefix of an address depend on the I/O Device you are using. Another important setup done using Project Editor is the Communication Setup. It define how the SCADA software acquire it's data.

4.4.4 GRAPHIC BUILDER

Graphic Builder is an graphic editing utility that the programmer uses to create the user graphics pages, and the objects that comprises the graphics pages. The Graphics Builder is automatically launched when one double-clicked on a graphic object in the Project Explorer.

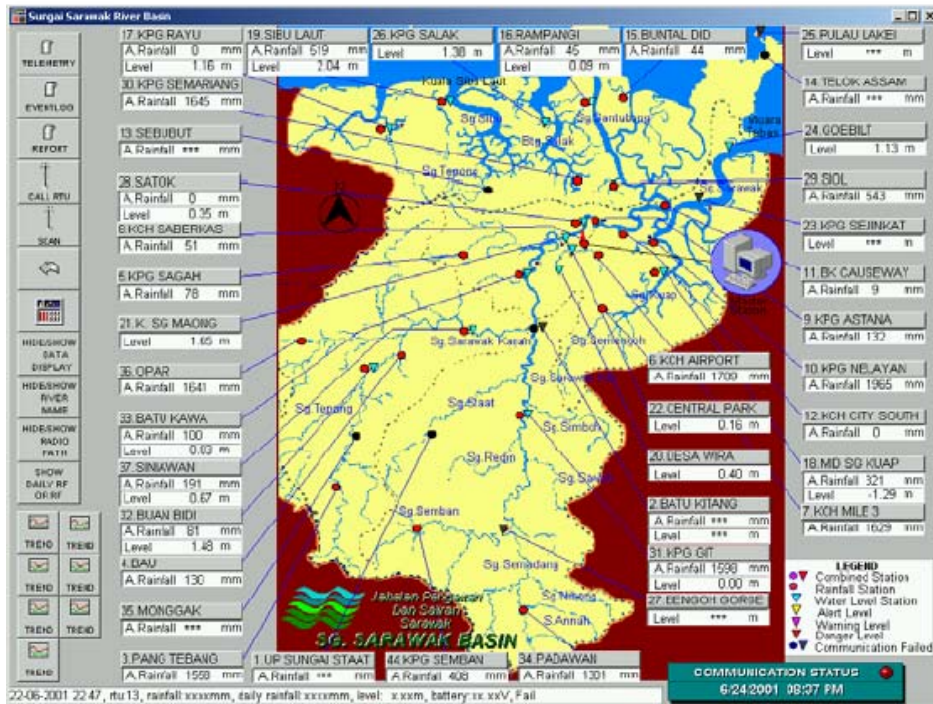
Graphic Builder provide a large library of commonly used Graphical Objects. Objects are the basic drawing entities that you add to your graphics pages. Objects are drawn using the tools in the drawing toolbox and they can be moved, reshaped, and copied after they are drawn. Objects are defined by a set of properties, which are assigned when the object is drawn, or afterwards, by double-clicking (these properties will override any conflicting Code Display functions).

4.4.5 CODE EDITOR

Code Editor is a fully integrated programming environment, specifically designed for writing Program Code. The Code Editor can be used as a debugger at runtime. The debug functionality allows the programmer to trace through the running Code, and track down any faults and errors. Debugging can also be performed from a remote computer.

Code Editor is use a simple, easy-to-use computer programming language designed especially for plant monitoring and control applications. It is a structured language similar to Visual Basic or 'C', however you need no previous programming experience to use it. Using Code Editor, you have access to all real-time data (variables) in the Project, and all Software Facilities - variable tags, alarms, trends, reports, and so on. You can use Code Editor to interface to various facilities on the computer, such as the operating system and communication ports. Code Editor supports advanced features including preempted multitasking, multi threads, and remote procedure calls.

4.5 MMI SCREEN SHOT



A typical Man Machine Interface (MMI) Screen

STATION	DATE AND TIME	READING 1	READING 2	READING 3	READING 4	BATTERY	STATUS
1.BKT PINANG 1	25/02/2004 13:12	5.67 m				90.10 V	OK
2.BKT PINANG 3	25/02/2004 13:12	-1.88 m				90.22 V	OK
3.BKT TINGGI A	25/02/2004 13:12	1.84 m				90.30 V	OK
4.BKT TINGGI B	25/02/2004 13:12	2.09 m				90.46 V	OK
5.BKT TINGGI C	25/02/2004 13:12	0.68 m				90.50	OK
6.BKT TINGGI D	25/02/2004 13:12	0.85 m				90.60 V	OK
7.BKT MENOKUANG B	25/02/2004 13:12	4.35 m				90.74 V	OK
8.BKT MENOKUANG A	25/02/2004 13:12	3.74 m				90.80 V	OK
9.BKT MENOKUANG C	25/02/2004 13:12	4.28 m				90.92 V	OK
10.DA DOLF RESORT	25/02/2004 13:12	6.85 m				91.07 V	OK
11.BKT TANGGA	25/02/2004 13:12	3.23 m				91.18 V	OK
12.GUAR NAPAI	25/02/2004 13:12	3.19 m				91.26 V	OK
13.BKT PERAK R1	25/02/2004 13:12	0.62 m				91.31 V	OK
14.BKT JAMBUL	25/02/2004 13:12	0.95 m				91.43 V	OK
15.BKT NIBONG	25/02/2004 13:12	3.28 m				91.50 V	OK
16.NAKA N5	25/02/2004 13:12	1.46 m				91.62 V	OK
17.KUALA NERANG	25/02/2004 13:12	0.24 m				91.71 V	OK
18.JLN SG MATI	25/02/2004 13:12	0.00 M				91.84 V	OK
19.JLN LANGGAR	25/02/2004 13:12	0.00 M				91.94 V	OK
20.TJO BENDAHARA	25/02/2004 13:12	0.00 M				92.01 V	OK
21.BKT MENOKUANG	25/02/2004 13:12	101.37 m3/h		0.00 m3		92.15	OK
22.BKT TINGGI R5	25/02/2004 13:12	1227.00 m3/h		0.00 m3		92.22 V	OK
23.BKT TINGGI R2	25/02/2004 13:12	1235.00 m3/h		0.00 m3		92.36 V	OK
24.BKT PINANG KU8	25/02/2004 13:12	1247.00 m3/h		0.00 m3		92.41 V	OK
25.BKT PINANG KU5&6	25/02/2004 13:12	1.91 m3/h	136.64 m3/h		0.00 m3	92.52 V	OK
26.BKT PINANG KU7	25/02/2004 13:12	255.15 m3/h		0.00 m3		92.68 V	OK
27.BKT PINANG KU4	25/02/2004 13:12	1276.00 m3/h		0.00 m3		92.78 V	OK
28.LJ AIR BKT PINANG	25/02/2004 13:12	4.00 pH	0.82 mg/l	0.88 NTU	10.50 NTU	92.83 V	OK
29.LJ AIR PELUBANG	25/02/2004 13:12	4.00 pH	0.87 mg/l	0.13 NTU	67.75 NTU	92.92 V	OK
30.LJ AIR JERAGAN	25/02/2004 13:12	4.00 pH	0.64 mg/l	6.00 NTU	13.36 NTU	93.01 V	OK
31.LJ AIR JENUN	25/02/2004 13:12	4.00 pH	0.70 mg/l	6.00 NTU	16.22 NTU	93.18 V	OK
32.SP RESERVOIR	25/02/2004 13:12	-2.00 m				93.24 V	OK
33.SP T8	25/02/2004 13:12	-1.52 m				93.36 V	OK

25/02/2004 13:12, rlu:05, Level1: 1057.00m, Level2: ** NA **, Level3: ** NA **, Battery:90.56V, Status OK

COMMUNICATION STATUS

A telemetry data table showing the latest Telemetry Data in tabular format

5 INSTALLATION

All the wiring, instrument cables and other interconnecting cables shall be in conduit and labelled. All wiring conduits, sockets, plugs and other accessories shall be supply and included in the offer.

All wiring and cabling in the system shall be of adequate size and rating, neatly arranged and installed, for easy carrying out of normal maintenance operations.

Where wiring and cabling is adjacent to or attached to any part of the metal framework they shall be covered with approved insulating materials. Where wiring and cabling passes through a panel, suitable insulating bushing shall be provided to prevent chaffing of the insulation.

Sufficient slack shall be left at the end of all wiring and cabling so as to permit replacement of components and sub- assemblies without difficulty.

All wiring and cabling shall be neatly terminated to give good mechanical and electrical connection. All wiring and cabling installed shall be such that inductive interference is reduced to a minimum.

On completion of the works, all construction plant, surplus materials, stores, rubbish and temporary works of every kind shall be clear and removed from the site and leave the site in a tidy condition.

6 TESTING AND COMMISSIONING

The contractor is required to calibrate and test all equipment prior to delivery to the required accuracy. All electrical and mechanical tests at the Site shall be conducted by capable engineer in the appropriate discipline during the whole of the period required for the tests.

All tests shall be conducted in the presence of, and to the satisfaction of the S.O. All necessary instruments, apparatus, connections, skilled personnel and labour required for the tests shall be included in offer.

All tests result shall be furnished in triplicate test certificates and a schedule of the results in an approved form bearing the signatures of engineer carrying out the tests and the S.O.'s representative who witnessed the test.

The RFWSS shall be fully tested at the manufacturer's works before dispatch. The purpose of the tests are to verify the performance and stability of the RFWSS hardware units and items of software, compliance with the Specification, compatibility when assembled into a complete system and operation over an extended period with an acceptably low outage time.

- i. All functional interfaces shall be verified.
- ii. All input/output points shall be individually verified for correctness.
- iii. All software functions shall be test to be operational.
- iv. All alarm and error detection functions shall be checked.

7 MANUALS AND DRAWINGS

All manuals and drawings compiled into a System Manual and three (3) copies of this manual shall be submitted to the S.O. upon completion of the testing and commissioning.

The System manual shall provide sufficient instructions and details to allow equipment and system operation, routine maintenance and troubleshooting to be performed by competent SO's personnel.

The System Manual shall be standalone, not requiring reference to other manuals or instructions. It shall reflect the 'as built' status of the proposed system after final acceptance and start-up. It shall be in English, typed, A4 size, and neatly bound. All drawings and schematic wiring diagrams shall be competently drawn in accordance with good engineering practice, and may be sized to A3 size.

All documentation shall be written in a clear and accurate manner. Manuals with descriptions that are vague, confusing or incomprehensible shall be rejected and the Contractor shall rewrite the manuals at his own expense to the satisfaction of the S.O.

The manuals shall contain all illustrations, detailed drawings, Wiring diagrams and instructions necessary for installing, operating and maintaining the equipment. The illustrated

parts shall be numbered for identification. All information contained therein shall apply specifically to the equipment furnished and shall only include instructions that are applicable. All such illustrations shall be incorporated within the printing of the page to form a durable and permanent reference book.

The set of documentation to be supplied with the system manual shall comprise of the following:

- i. Overall diagrams
- ii. Inputs and outputs schedule
- iii. Equipment information drawings
- iv. Operations manual
- v. Maintenance guide
- vi. Troubleshooting guide
- vii. Software operations manual

Maintenance instructions shall be included in the manual to describe fully all aspects of preventive and corrective maintenance as well as precautions to be taken during fault tracing. Preventive maintenance instructions shall include all applicable visual examinations, hardware testing and diagnostic routines and the adjustments necessary for periodic maintenance of the system.

Corrective maintenance instructions shall included in the manual for locating malfunctions down to the card replacement level. These guides shall include adequate details for quickly and efficiently locating the cause of an equipment malfunction and shall state the probable source(s) of trouble, the symptoms, probable cause and instruction for remedying the malfunction.

8 TRAINING

S.O.'s personnel shall be trained so that it is possible for the S.O. to undertake the maintenance of the whole installation, if required.

For the Proposal, it can be assumed that a total of ten (10) of the S.O.'s personnel will be required to be fully trained on both the hardware and software maintenance aspects of the system. The cost of this training including travelling, food and accommodation expenses of the trainees shall be included in the offer.

Training shall also be conducted for a period of Two (2) days on the following subject:

- System Introduction Training Course
- RFWSS Operations and Maintenance Course
- RFWSS MMI Operations and Maintenance Course