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3 TECHNICAL SPECIFICATION

1 EXTENT OF WORK

1.1 GENERAL

Ballina Shire Council is responsible for the operation of the water supply and sewerage schemes servicing the towns of Alstonville, East, West and North Ballina, Ballina Island, Lennox Head, Wardell and Wollongbar.

Fifty two water supply and sewerage sites are currently monitored or monitored and controlled via the existing telemetry system supplied and installed by Action Controls (currently known as CSE Semaphone).

Council has currently installed an additional 75 RTU's at sewerage and water supply sites within the Shire. The additional installed RTUs are not configured and are not yet connected to the existing telemetry system.

This contract is for:

- Configuration of all existing remote terminal units installed at sewerage and water supply sites.
- Supply and installation of a new radio repeater at Ballina Height reservoir.
- Updating the Citect Software V5.41 to the latest version of Citect software currently available.
- Configuration of the new Citect software together with the upgrading to Citect SCADA reports.
- Configuration of the existing communication network to suit the system communication requirements.

1.2 SUMMARY OF WORKS

The Scope of works shall include, but not be limited to, the following items:

1 Supply and install the latest available Citect version software at the proposed RMF located at the Council Chambers. This shall include the supply and installation of 5000 point Citect licence. Configure the software at the RMF to provide the monitoring and control functions specified and enable it to collect, process, display and log data received from all the RTUs. This shall also include the configuration of the Citect SCADA reports.

2 Upgrade the existing Citect software to the latest available Citect version software at the existing CMF located at the Council Depot. Configure the software at the CMF to provide the monitoring and control functions specified and enable it to collect, process, display and log data received from all the RTUs. This shall also include the configuration of the Citect SCADA reports.

3 Configure one hundred and twenty (120) remote terminal units that are currently installed together with checking the functionality, alignment of each antenna and the continuity of each antenna cable.

4 Supply and installation of a new radio repeater at Ballina Height reservoir.

5 Supply and install a new master terminal unit (MTU) with CP-11 module to replace the existing MTU located at the Council Depot and carry out the necessary modifications to suit the revised communication network. .

6 Supply and install a master terminal unit at the RMF.

7 Monitoring the received signal strength indicator (RSSI) at:
- Remote terminal units by the repeater
- Repeaters by the MTU

8 Configure the four radio repeater sites to suit the new communication network diagrams.

9 Configure all RTUs to suit the new communication network diagram.

10 A set of operations and maintenance manuals.

1.3 ABBREVIATIONS

AI	Analogue Input	SCA	Switchgear and Control gear Assembly
DI	Digital Input	RTU	Remote Terminal Unit
DO	Digital Output	RSS	Received Signal Strength
DAC	Data Acquisition and Control system	S&I	Supply and Install
CMF	Central Monitoring facility	SPS	Sewage Pump Station
MTU	Master Terminal Unit	STW	Sewage Treatment Works
RMF	Remote Monitoring Facility		

2 WORK BY BALLINA SHIRE COUNCIL

2.1 PRINCIPAL SUPPLIED ITEMS

The principal will supply the following items:

- CMF & RMF hardware with ancillaries (computers, monitors, UPSs computer furnitures)
- Processor, I/O modules, power Supply, for typical RTU for factory configuration and testing. The typical RTU would be for:
  - Water reservoir
  - 3 different type of sewage pumping stations
  - Water pumping station
  - Motorised valve
  - One ZLP3 RTU
  - One G3 RTU

3 EXISTING DAC SYSTEM OVERVIEW

3.1 SYSTEM DESCRIPTION

Action Controls (currently known as CSE Semaphone) Ltd has installed the Existing DAC system in 1991 using the Kingfisher "series I" RTU hardware and the "Fix" software package. In 1999 Council has upgraded the DAC system and replaced the Fix Software, running at the central station, with Citect V5.41. In 2004 "series 1" RTUs hardware was replaced with "series II".

Plant 2 business is also installed at the CMF to create historical data base.

The existing system is a radio based data acquisition and control (DAC) system. Data from the monitored sites is communicated over UHF radio networks via three radio repeaters to a master terminal unit (MTU) and a computer based monitoring facility located at the Council Depot in Ballina. A cold standby remote monitoring facility is also available on failure of the CMF.

3.2 MAJOR COMPONENTS

The major components in the system are:

3.1.1 Remote Terminal Units

Fifty two terminal units (RTUs) installed at the following monitored sites and are currently operational:

Alstonville Water Supply scheme

- Wollongbar reservoir.
- Russellton reservoir

Wardell Water Supply scheme

- Whites Lane reservoir
- Meerschaum Vale balance tank
- Wardell reservoir
- Marom Creek filtration plant
- Lindendale bore
- Ellis Road bore
- Wardell control valve

Ballina Water Supply scheme

- Pine Ave reservoir
- Basalt Court reservoir
- Lennox reservoir
- North Creek motorised valve
- Ballina Heights temporary reservoir

Alstonville Sewerage Scheme

- Alstonville STW
- 8 sewage pumping stations

Wardell Sewerage Scheme

- Wardell STW
- 8 sewage pumping stations

Ballina Lennox Head sewerage Schemes

- Ballina STW
- Lennox Head STW
- Lennox Head Ultra Violet Disinfection Process
- 14 sewage pumping stations

RTUs System Hardware

The RTU system hardware consists of:

- RTUNet series II that comprises I/O modules and a PC-1 module that is a combined power supply/processor module.
- Trio radio model 450SR or Trio MR450 or Maxon SD-125-U2
- A back up battery

3.1.2 Radio Repeaters

There are three radio repeaters each communicates directly to the CMF and they are:

a) Pine Ave. Radio Repeater and Reservoir in Ballina

This repeater comprises:

- A series II RTU monitoring the reservoir site and outstation received signal strength indicator (RSSI)
- A trio radio repeater model SB450 revision R2.3 and serial No 23427.

This repeater will transmit on Tx: 461.96875 and receive Rx: 452.46875

b) Whites Lane Radio Repeater and Reservoir in Alstonville

This repeater comprises:

- A series II RTU monitoring the reservoir site and outstation received signal strength indicator (RSSI)
- A trio radio repeater model SB450 revision R2.3 and serial No 23426.

This repeater will transmit on Tx: 461.99375 and receive Rx: 452.49375

c) Basalt Court Radio Repeater and Reservoir in Ballina

This repeater comprises:

- A series II RTU monitoring the reservoir site and outstation received signal strength indicator (RSSI)
- A trio radio repeater model SB450 revision R2.3 and serial No 23416.

This repeater will transmit on Tx: 461.75625 and receive Rx: 452.25625

3.1.3 Central Monitoring Facility (CMF)

The computer based central monitoring facility is located in the Council Depot in Ballina and comprise:

a) Hardware

One master terminal unit (MTU)

Three Trio model 450SR

b) Software

The system software used for the existing DAC system is Citect V5.41with 5000 point licence.

3.1.4 Alarm Delivery

Alarms are processed by the MTU and transferred to the Duty Operator(s) by mobile phone SMS messages.

4 DAC SYSTEM EXPANSION

Ballina Shire Council has recently installed additional seventy five RTUNet series II RTUs at the following sites:

Wollongbar Sewerage Scheme

- 3 sewage pumping stations

North Ballina Sewerage Scheme

- 10 sewage pumping stations

Ballina Island Sewerage Scheme

- 23 sewage pumping stations

East Ballina Sewerage Scheme

- 11 sewage pumping stations

West Ballina Sewerage Scheme

- 11sewage pumping stations

Lennox Head sewerage Schemes

- 17 sewage pumping stations

The additional 75 RTUs have been installed but have not been configured and connected to the existing DAC system. It will be part of this contract to configure and connect the additional RTUs to the DAC system.

5 SYSTEM UPGRADE

5.1 GENERAL

Existing DAC system upgrade specified in this document would consist of:

- Configuration of the additional 75 RTUs and connect them to the existing DAC system. This may also require the re-configuration of the existing 50 RTUs that are currently operational.
- Modification of the existing radio communication networks to comply with new communication network diagrams attached. This shall include the realignment of each antenna and also the checking of the continuity of each antenna cable.
- Configuration of the communication network to include the additional sites.
- Updating the existing Citect V5.41 to the latest Citect version V7 currently available.
- Supply, installation and configuration of a new (MTU) in replacement of the existing MTU located at the Council Depot. The new MTU shall be fitted with CP-11 module. Configuration of the MTU and any other works required for the proper functionality of the telemetry system.
- Supply, installation and configuration of a new (MTU) for the RMF located in Council Chambers.
- Supply and installation of Citect software and purchasing of 5000 points Citect licence at the proposed RMF located at the Council Chambers. Ballina Council will supply the system hardware for the RMF computer. However, the telemetry Contractor shall advise the Council to supply the computer hardware to suit the software offered together with the suitable communication port and SCADA phone system.

5.2 GENERAL REQUIREMENTS

Compliance

All works and wiring must be carried out and completed in accordance with the relevant Australian Standards and the Schedule of Electrical Services Minimum requirements (MEW E101). Copy of MEW E101 can be obtained from the Contract Officer upon request.

Salvaged Equipment

Disconnect and remove all existing telemetry equipment and primary devices (eg CMF, communication controllers RTU, radios, radio repeater, level transmitters, antennae, antenna cables level regulator etc.). All salvaged equipment shall remain the property of Ballina Shire Council. Deliver the salvaged equipment to Ballina Council for storage.

5.3 ADDITIONAL REMOTE TERMINAL UNITS

The 75 additional RTUs have been supplied and installed and each comprises:

- RTUNet series II that consists of two I/O modules PC-1 module that is a combined power supply/processor module.
- Trio radio model 450SR Or maxon radios model SD125
- A back up battery

- Antenna and antenna cables

All field input/output signals have been wired and connected to the RTU installed at each site.

The Contractor shall configure all RTUs with the central and remote monitoring facilities via the radio communication network diagrams attached to this specification.

5.4 RADIO COMMUNICATION NETWORK

The existing DAC system is based on a dedicated radio based communications path. Data collected at each of the monitored site is transmitted to the master terminal unit and the CMF via three radio repeaters located at Pine Avenue and Basalt Court reservoirs in Ballina and Whites Lane reservoir in Alstonville.

The three radio repeaters communicate directly with the master terminal unit at the CMF. The incorporation of the 75 RTUs to the existing communication network will affect the response time between RTUs, repeaters, MTU and CMF. Therefore, the Contractor shall supply and install a fourth radio repeater at Ballina height reservoir to improve the polling and response time. This would also require the re-design of the communication networks to suit. (refer to the attached drawings).

Design the communication network to give a minimum fade margin of 30 dB (reference to 0.3 microvolt) on all path.

Make application, to the Australian Communications and Media Authority (ACMA), for the new UHF radio channel that is required to communicate with the proposed radio repeater at Ballina Height reservoir together with the modification of the existing radio licenses to incorporate the additional radio channel. The Contractor shall bear the cost of application for the additional frequency.

5.5 CENTRAL MONITORING FACILITY (CMF)

The existing central monitoring facility (CMF) is a computer based man-machine interface operating using Citect V5.41 running under Widows 2000. A cold standby remote monitoring facility (RMF) is available on failure of the CMF.

Data transmitted to the CMF is received and processed by the MTU and then forwarded to Citect software for display and storage.

The MTU communicates with the three repeaters via three different radio frequency channels.

The Contractor shall supply, install and configure the latest available Citect version (v7.x) software into the new computer hardware supplied by council. This shall include all display diagrams, trends graphs, control logic and all the functions and display diagrams that were configured in the existing CMF.

5.6 REMOTE MONITORING FACILITY (RMF)

Council will supply and install the computer hardware for the RMF this will include computer hardware VDU monitor and UPS. However, it is the Contractor's responsibility to supply, install and configure the latest available Citect version (v7.x) software at the new RMF computer. This shall include the purchase of 5000 point Citect licence. The configuration of the RMF shall reflect all the display diagrams and monitoring and control functions that are configured at the CMF.

5.7 INTERRUPTION AND CHANGEOVER OF EXISTING CONTROL SYSTEMS

Make temporary arrangements to ensure that all existing control equipment remains operational during the construction and changeover periods.

6 SITE CONDITIONS

6.1 CENTRAL AND REMOTE MONITORING FACILITIES

All items of the CMF and RMF will be installed indoors in an air-conditioned environment and must be capable of operating continuously under the following conditions:

Max. Ambient temperature .....0 to 50°C

Humidity ..... 10% to 90% non-condensing

6.2 SITE INSPECTION

Notwithstanding the site information given in this Specification, it will be presumed that the Contractor has visited the sites, has acquired such information as may be necessary for the purpose of this work and has verified such dimensions as are relative to the Contract equipment and tasks by actual measurement taken on the site.

Claims for extra remuneration by the Contractor, on the grounds of not being furnished with sufficient information, will not be considered.

7 WORK BY BALLINA SHIRE COUNCIL

The following areas of work will be provided and/or performed by the Council.

7.1 CMF AND RMF

Arrange with Telstra for the installation of two public switched telephone network (PSTN) lines at the proposed RMF located at the Council Chambers.

Arrange for the supply and installation of two double power socket outlets at the council chambers to power the proposed RMF and MTU.

7.2 PROPOSED RADIO REPEATER AT BALLINA HEIGHT RESERVOIR

Arrange for 240V 16A mains power in underground conduit or galvanised steel conduit, if exposed, from council metering to the radio hut located at the base of the reservoir. Terminate the power cable to two double power socket outlets.

7.3 MONITORED SITES

Council will perform the following works at each site:

- Modification of the existing electrical switchboard to provide the field wiring necessary for the monitoring and control signals.
- Extending of the field wiring from the electrical switchboard to the RTU.
- Supply, installation and calibration of submersible level transmitter at each site

7.4 BULWINGLE PARK, SKENNARS HEAD, PACIFIC PDE, COMMEMORATION PARK, MISSINGHAM BRIDGE, TAFE COLLEGE, CHIKIBA FIELDS, RTA AND BALLINA AIRPORT 2 TOILET BLOCK SEWAGE PUMPING STATION SITES.

Installation at each site

- Supply and install the LP3 RTU type on site.
- S&I a level regulator (float switch) in the wet well for wet well high level alarm.
- Wire output from level regulator to RTU using existing underground conduit.
- Extend the field input/output wiring for the SCA to the RTU.
- Connect power to RTU.
- S&I an antenna mast adjacent to SCA.
- S&I radio antenna on the mast.
- Supply and install coaxial cable terminated in N type connectors from the antenna to the RTU's radio.
- S&I a reed switch on the RTU door for the intrusion alarm

7.5 EVERMORE FARMS, GROWING GROUND, TROPICAL LINK NURSERY, COUNCIL NURSERY, SKENNARS, KINGSFORD SMITH, SAUNDERS OVAL AND CHIKIBA FIELDS, IRRIGATION SITES.

Installation at each site

- Install the LP3 type RTU on site.
- Wire the 4 to 20 mA from flow meter to RTU to monitor the flow rate
- Wire pulse input from flow meter to RTU for the accumulated flow.
- Connect power to RTU.
- S&I an antenna mast adjacent to SCA.
- S&I radio antenna on the mast.
- Supply and install coaxial cable terminated in N type connectors from the antenna to the RTU's radio.
- S&I a reed switch on the RTU door for the intrusion alarm

7.6 PIPER DRIVE TEMP. PUMPING STATION.

Installation at each site

- Install the LP3 type RTU on site.
- S&I a level regulator (float switch) in the wet well for wet well high level alarm.
- Wire output from level regulator to RTU using existing underground conduit.
- Extend the field input/output wiring from SCA to RTU.
- Connect power to RTU.
- S&I an antenna mast adjacent to SCA.
- S&I radio antenna on the mast.
- Supply and install coaxial cable terminated in N type connectors from the antenna to the RTU's radio.
- S&I a reed switch on the RTU door for the intrusion alarm

7.7 DW1, DW7, DW8, DW9, DW10, DW11 AND DW12 DELEACHING WELLS.

Installation at each site

- Install the G3 type RTU on site.
- Wire the 4 to 20 mA from flow meter to RTU to monitor the flow rate
- Wire pulse input from flow meter to RTU for the accumulated flow.
- Connect power to RTU.
- S&I an antenna mast adjacent to SCA.
- S&I radio antenna on the mast.
- Supply and install coaxial cable terminated in N type connectors from the antenna to the RTU's radio.
- S&I a reed switch on the RTU door for the intrusion alarm

7.8 MOTHERWELL.

Installation

- Install the G3 type RTU on site.
- Supply, install and calibrate the submersible level transmitter installed in the well. Wire the 4 – to 20mA to the RTU.
- Connect power to RTU.
- S&I an antenna mast adjacent to SCA.
- S&I radio antenna on the mast.
- Supply and install coaxial cable terminated in N type connectors from the antenna to the RTU's radio.
- S&I a reed switch on the RTU door for the intrusion alarm

8 SITE WORKS

8.1 CENTRAL MONITORING FACILITY

The existing central monitoring facility is located in the Council Depot in Ballina. Ballina Council will replace the computer hardware (computer and monitor).

Summary of work required:

- Updating the existing Citect V5.41 to the latest Citect version V7 currently available.

- Supply, Configuration and installation of the a new MTU in replacement of the existing MTU installed at the CMF in Council Depot. The new MTU shall include: CP-11 processor, I/O modules, radios, back up batteries with minimum 8 hours back up, GSM modem , SCADA phone system etc..
- S&I a radio antenna and coax cable for the MTU on building roof in lieu of the existing antenna if required.
- Supply and install a SCADA phone complete with OPC link
- Use the existing WAN network for remote access as the primary méthode.
- Connect the PSTN lines to the computer remote access modem as secondary methode.

8.2 REMOTE MONITORING FACILITY

The proposed remote monitoring shall be installed at the Council Chambers in Ballina. Ballina Council will supply the computer hardware (computer & monitor)

Summary of work required:

- Supply and install a 5000 point licence Citect software ti install in the RMF computer.
- Configure the RMF to perform the same functions of the CMF.
- Supply & install a new MTU or Communication Controller.
- Supply and install a radio antenna and coax cable for the communication controller on building roof.
- Connect RMF computer to the communication controller or MTU.

- Supply and install a SCADA phone complete with OPC link.
- Use the existing WAN network for remote access as the primary méthode.
- Connect the PSTN lines to the computer remote access modem as secondary methode.

8.3 EXISTING RADIO REPEATERS

Three existing radio repeaters are currently used to transfer data from the remote terminal units, which are currently operational, to the CMF. It will be require improving the transfer of data between the repeaters and the CMF and RMF by:

Summary of work required at each repeater:

- Check the communication network and re-configure it to suit the proposed communication network diagrams provided.
- Check frequency drift and re-calibrate the radio repeater radios,
- Replace the existing radio repeater, if necessary to improve the communication, with a new trio radio.

8.4 PROPOSED RADIO REPEATER AT BALLINA HEIGHT RESERVOIR

Summary of work required:

- Supply and install a free standing hinged type galvanised steel pole with minimum height of 6 metres at the base of the reservoir and in the location as directed by Ballina Shire Council. The pole shall be sized based on the load installed on the mast and wind velocity.
- Prepare the foundation, for the concrete slab, to suit by taking consideration of the win speed, weight and height of the mast.
- Construct a concrete slab, suitable to support the size and weight of the antenna mast.
- Design supply and install rack mounted radio repeater equipment within the existing hut.
- Supply and install radio repeater omni directional antenna on the mast. This shall include mounting brackets.
- Supply and install coaxial cable terminated in N type connectors from the antenna to the radio repeater.
- Connect power to the radio repeaters .
- Supply and install an earthing system together with earth stakes in accordance with the relevant Australian Standards.
- Supply & install cooling facility (small AC) for the radio repeater equipment in conjunction with the radio repeater equipment. The AC shall be controlled from a thermostat installed in the radio shed.

9 BALLINA SHIRE WATER SUPPLY AND SEWERAGE SCHEMES

9.1 GENERAL

Currently there are fifty two (52) water supply and sewerage sites that are fitted with RTUs and are operationals. The following are the typical input and output signals that are monitored and controlled at each site.

The inhibit control system at the sewerage sites and intrusion alarms are not currently implemented in the operated sites. Therefore, additional input/outputs will be added to incorporate the inhibit control as well as the intrusion alarms. Consequently the configuration of the existing operational RTUs may require re-configuration.

9.2 BASALT COURT RESERVOIR RTU 102

The following signals are monitored and controlled at this site and connected to the existing RTU:

Monitoring signals	Terminal Numbers	Monitoring signals	Terminal Numbers
DI Reservoir overflow	T1	AI Reservoir level	T1
DI Reservoir low level	T2	AI 2 spares	
DI North CK valve open	T3	AI RSSI 0 – 5V	T4
DI Pressure pump running	T4		
DI Pressure pump failed	T5	**Digital Outputs**	
DI Motorised valve open	T6	DO RTU cooling fan	T18
DI Booster pressure low	T7	DO 3 spares	
DI Power failure	T8		
DI Intrusion alarm	T16		
DI Level transmitter failed			
DI 12 spares			

9.3 PINE AVENUE RESERVOIR RTU 100

The following signals are monitored and controlled at this site and connected to the existing RTU:

Monitoring signals	Terminal Numbers	Monitoring signals	Terminal Numbers
DI Reservoir overflow	T1	AI Reservoir level	T1
DI Reservoir low level	T2	AI 2 spares	
DI North CK valve open	T3	AI RSSI 0 – 5V	T4
DI Water Wheels valve open	T4		
DI Power failure	T5	**Digital Outputs**	
DI Intrusion alarm	T16	DO RTU cooling fan	T18
DI Level transmitter failed		DO 3 spares	
DI 15 spares			

9.4 WHITES LANE RESERVOIR RTU 20

The following signals are monitored and controlled at this site and connected to the existing RTU:

Monitoring signals	Terminal Numbers	Monitoring signals	Terminal Numbers
DI Reservoir overflow	T1	DI 3 Spares	
DI Reservoir low level	T2	AI Reservoir level	T1
DI Booster pump 1 running	T3	AI 2 spares	
DI Booster pump 2 running	T4	AI RSSI 0 – 5V	T4
DI Booster pump 1 failed	T5		
DI Booster pump 2 failed	T6	**Digital Outputs**	
DI Power failure	T7	DO RTU cooling fan	T18
DI Marom Ck water read	T8	DO 3 spares	
DI Ellis Rd bore water read	T11		
DI Lindendale bore water read	T12		
DI Intrusion alarm	T16		
DI Level transmitter failed			
DI 10 spares			

9.5 MAROM CREEK TREATMENT PLANT RTU 29

The following signals are monitored and controlled at this site and connected to the existing RTU:

Monitoring signals	Terminal Numbers	Monitoring signals	Terminal Numbers
DI Clear water pump 1 running	T1	AI Clear water tank level	T1
DI Clear water pump 2 running	T2	AI Raw water tank level	T2

DI	Clear water pump 1 failed	T3	AI	Dam storage level	T3
DI	Clear water pump 2 failed	T4	AI	PH	T4
DI	Raw water pump 1 running	T5	AI	Chlorine residual	T1
DI	Raw water pump 2 running	T6	AI	Turbidity	T2
DI	Raw water pump 1 failed	T7	AI	2 Spares	
DI	Raw water pump 2 failed	T8			
PI	Clear water P1 flow volume FM7	T11		**Digital Outputs**	
PI	Clear water P2 flow volume FM6	T12			T18
DI A	Clear water pumps duty SW POS	T13	DO call	Whites resrvoir pump	
DI C	Clear water pumps duty SW POS	T14	DO	3 spares	
DI A	Raw water pumps duty SW POS	T15			
DI C	Raw water pumps duty SW POS	T16			
DI	Clear water pump tank low	T17			
DI	Filter backwash tank high	T18			
DI	Rain gauge	T10			
DI	Intrusion alarm	T16			

9.6 RUSSELLTON RESERVOIR RTU 30

The following signals are monitored and controlled at this site and connected to the existing RTU:

Monitoring signals		Terminal Numbers	Monitoring signals		Terminal Numbers
DI	Reservoir overflow	T1	AI	Reservoir level	T1
DI	Reservoir low level	T2	AI	3 spares	
DI	Water read	T3			
PI	Reservoir inflow pulse	T4		**Digital Outputs**	
DI	Reservoir outflow pulse	T5	DO	4 spares	
DI	Russellton ACV open	T6			
DI	Intrusion alarm	T16			
DI	Level transmitter failed				
DI	14 spares				

9.7 WOLLONGBAR RESERVOIR RTU 31

The following signals are monitored and controlled at this site and connected to the existing RTU:

Monitoring signals	Terminal Numbers	Monitoring signals	Terminal Numbers
DI Reservoir overflow	T1	AI Reservoir level	T1
DI Reservoir low level	T2	AI 2 spares	
DI Booster pump 1 running	T3	AI Booster pump speed 0-5V	T4
DI Booster pump 2 running	T4		
DI Booster pump 1 failed	T5	**Digital Outputs**	
DI Booster pump 2 failed	T6	DO 4 spares	
PI Flow pulse	T7		
DI Booster pump pressure low	T8		
DI Intrusion alarm	T16		
DI Level transmitter failed			
DI 12 spares			

9.8 ELLIS RD RTU 32, LINDALE BORE RTU 34

The following signals are monitored and controlled at each site and connected to the existing RTU:

Monitoring signals	Terminal Numbers	Monitoring signals	Terminal Numbers
DI Pump 1 running	T8	AI Bore hole level	T3
DI Pump 1 failed	T9	AI 1 spare	
DI Bore no flow	T10		
PI Flowmeter pulse	T11	**Digital Outputs**	
DI Bore low	T12	DO Pump 1 start	T17
DI Intrusion alarm	T16	DO 1 spare	
DI 3 spares			

9.9 0.2ML BALANCE TANK RTU 36

The following signals are monitored and controlled at each site and connected to the existing RTU:

Monitoring signals	Terminal Numbers	Monitoring signals	Terminal Numbers
DI Balance tank overflow	T8	AI Balance tank level	T3
DI Balance tank low level	T9	AI 1 spare	
PI Flowmeter pulse	T10		
DI Intrusion alarm	T16	**Digital Outputs**	
DI 5 spares		DO 2 spares	

9.10 NORTH CREEK MOTORISED VALVE RTU 101

The following signals are monitored and controlled at each site and connected to the existing RTU:

Monitoring signals	Terminal Numbers	Monitoring signals	Terminal Numbers
DI Valve opened	T10	AI 4 spares	T3
DI valve closed	T11	**Digital Outputs**	
DI Intrusion alarm	T16	DO Valve open Pine Ave	
DI 2 spares		DO Valve open Basalt Court	
		DO 2 spares	

9.11 COOGEE ST. PS RTU 123

This is a typical monitoring signals at sewerage pumping stations that are currently operational.

Monitoring signals	Terminal Numbers	Monitoring signals	Terminal Numbers
DI Sewer pump 1 running	T8	DI Storm water standby level alarm	T3
DI Sewer pump 2 running	T9	DI 2 Spares	T5
DI Sewer pump 1 failed	T10	AI Wet well level	T3
DI Sewer pump 2 failed	T11	AI Water pressure	T5
DI Sewer Wet well high level	T12	AI Pump 1 current	
DI Sewer Wet well standby level	T13	AI Pump 2 current	
DI Storm water pump 1 run	T14	**Digital Outputs**	T17
DI Storm water pump 2 run	T15		T17
DI Storm water pump 1 failed	T8	DO Enable pump station	T18
DI Storm water pump 2 failed		DO Battery low	
DI Storm water high level alarm		DO Well washer run	

9.12 DALMACIA DRIVE BALANCE TANK RTU 50

Monitoring signals	Terminal Numbers	Monitoring signals	Terminal Numbers
DI Duty level ON	T8	AI Tank level	T3
DI High level alarm	T9	AI 1 spare	
DI 6 Spares			
		Digital Outputs	
		DO 2 spares	

9.13 ALTISTART ATS48 HIGH LEVEL INTERFACE SITES

These are typical monitoring signals that are to be be monitored and controlled at sewage pumping stations with soft starter:

Monitoring signals	Terminal Numbers	Monitoring signals	Terminal Numbers
DI pump 1 Auto	T8	AI Wet well level	T3
DI pump 2 Auto	T9	AI Water pressure	T5
DI Duty 1 selected	T10	AI Discharge pressure	T1
DI Duty 2 selected	T11	AI Outflow	T2
DI Wet well high level	T12	AI 2 Spares	
DI Security OK	T13	**Virtual Analog Inputs**	
DI Surge diverter OK	T14	Pump 1 current	
DI Odour control fault	T15	Pump 2 current	
DI Dry well OK	T10	Pump 1 last trip message	
DI Rain gauge	T11	Pump 2 last trip message	
DI 2 Spares		Pump 1 power factor	
Virtual Digital Inputs		Pump 2 power factor	
Pump 1 running		Phase voltages	
Pump 1 Trip		**Digital Outputs**	
Pump 2 running		DO Well washer run	
Pump 2 Trip		DO Disable pump station	
Totalisers		DO 4 spares	
Pump 1 power cons		**Virtual Digital Outputs**	
Pump 1 run time		Pump 1 run	
Pump 2 power cons		Pump 1 RST tot power current	
Pump 2 run time		Pump 2 run	
		Pump 2 RST tot power current	

9.14 DOL SEWAGE PUMPING STATION SITES

This is a typical list of input/output signals that are to be monitored and controlled at sewage pumping stations with Direct On Line motor starter:

Monitoring signals	Terminal Numbers	Monitoring signals	Terminal Numbers
DI pump 1 running	T8	AI Wet well level	T3
DI pump 2 running	T9	AI Water pressure	T5
DI pump 1 failed	T10	AI Pump 1 current	T3
DI pump 2 failed	T11	AI Pump 2 current	T5
DI pump 1 Auto	T12		
DI pump 2 Auto	T13	**Digital Outputs**	
DI Duty 1 selected	T14		
DI Duty 2 selected	T15	DO Well washer run	
DI Wet well high level	T8	DO Disable pump station	
DI Security OK	T9	DO Pump 1 run	
DI Surge diverter OK	T10	DO Pump 2 run	
DI Odour control fault	T11		
DI Dry well OK	T12		
DI Rain gauge	T13		
DI 2 Spares			

9.15 UPGRADE SEWAGE PUMPING STATION SITES

This is a typical list of input/output signals that are to be monitored and controlled at the additional sewage pumping stations:

Monitoring signals	Terminal Numbers	Monitoring signals	Terminal Numbers
DI pump 1 running	T8	AI Wet well level	T3
DI pump 2 running	T9	AI Water pressure	T5
DI pump 1 failed	T10	AI Pump 1 current	T3
DI pump 2 failed	T11	AI Pump 2 current	T5
DI Wet well high level	T12	**Digital Outputs**	
DI Wet well standby level	T13		
DI Security OK	T14	DO Disable pump station	
DI Surge diverter OK	T15	DO Battery low	T17
DI Rain gauge	T8	DO Well washer run	T17
DI 2 Spares			T18

9.16 BULWINGLE PARK, SKENNARS HEAD, PACIFIC PDE, COMMEMORATION PARK, MISSINGHAM BRIDGE, TAFE COLLEGE, CHIKIBA FIELDS, RTA AND BALLINA AIRPORT 2 TOILET BLOCK SEWAGE PUMPING STATION SITES.

Ballina Shire Council will supply and install the LP3 type RTU at each of the toilet block sewage pumping station site. This shall also include field wiring, antenna and antenna cable. However, the telemetry Contractor shall configure the RTUs together with each of the respective store forward RTU located at the sewage pumping station.

	Monitoring signals
DI	mains power failed
DI	telemetry main power failed
DI	RTU battery volts low
DI	pump 1 running
DI	pump 1 failed
DI	Wet well high level alarm
DI	Intrusion alarm

9.17 SAUNDERS OVAL IRRIGATION SITE

Ballina Shire Council will supply and install the LP3 type RTU at this irrigation site. This shall also include field wiring, antenna and antenna cable. However, the telemetry Contractor shall configure the RTU together with the data collector site's RTU installed at Swift Street sewage pumping station.

	.**Monitoring signals**		
DI	mains power failed	DI	Sprinkler section 6 ON
DI	telemetry main power failed	DI	Sprinkler section 7 ON
DI	RTU battery volts low	DI	Sprinkler section 8 ON
PI	flow volume	DI	Sprinkler section 9 ON
DI	Intrusion alarm	DI	Sprinkler section 10 ON
DI	Irrigation running	DI	Sprinkler section 11 ON
DI	Sprinkler section 1 ON	DI	Sprinkler section 12 ON
DI	Sprinkler section 2 ON	DI	Sprinkler section 13 ON
DI	Sprinkler section 3 ON	DI	Sprinkler section 14 ON
DI	Sprinkler section 4 ON	DI	Sprinkler section 15 ON
DI	Sprinkler section 5 ON	DI	Sprinkler section 16 ON

9.18 KINGSFORD SMITH IRRIGATION SITE

Ballina Shire Council will supply and install the LP3 type RTU at this irrigation site. This shall also include field wiring, antenna and antenna cable. However, the telemetry Contractor shall configure the RTU together with the data collector site's RTU installed at Owen Street sewage pumping station.

.**Monitoring signals**	
DI mains power failed	DI Sprinkler section 4 ON
DI telemetry main power failed	DI Sprinkler section 5 ON
DI RTU battery volts low	DI Sprinkler section 6 ON
PI flow volume	DI Sprinkler section 7 ON
DI Intrusion alarm	DI Sprinkler section 8 ON
DI Irrigation running	DI Sprinkler section 9 ON
DI Sprinkler section 1 ON	DI Sprinkler section 10 ON
DI Sprinkler section 2 ON	DI Sprinkler section 11 ON
DI Sprinkler section 3 ON	DI Sprinkler section 12 ON

9.19 CHIKIBA FIELDS IRRIGATION SITE

Ballina Shire Council will supply and install the LP3 type RTU at this irrigation site. This shall also include field wiring, antenna and antenna cable. However, the telemetry Contractor shall configure the RTU together with the data collector site's RTU installed at Silver Gull Dve sewage pumping station B.

.**Monitoring signals**	
DI mains power failed	DI Sprinkler section 3 ON
DI telemetry main power failed	DI Sprinkler section 4 ON
DI RTU battery volts low	DI Sprinkler section 5 ON
PI flow volume	DI Sprinkler section 6 ON
DI Intrusion alarm	DI Sprinkler section 7 ON
DI Irrigation running	DI Sprinkler section 8 ON
DI Sprinkler section 1 ON	DI Sprinkler section 9 ON
DI Sprinkler section 2 ON	DI Sprinkler section 10 ON

9.20 SKENNARS HEAD FIELD AND FAWCETT PARK IRRIGATION SITES

Ballina Shire Council will supply and install the LP3 type RTU at each of the irrigation site. This shall also include field wiring, antenna and antenna cable. However, the telemetry Contractor shall configure the RTUs together with the data collector site's RTUs installed at Trinity Place and Fawcett Street sewage pumping stations respectively.

.**Monitoring signals**	
DI mains power failed	DI Sprinkler section 1 ON
DI telemetry main power failed	DI Sprinkler section 2 ON
DI RTU battery volts low	DI Sprinkler section 3 ON
PI flow volume	DI Sprinkler section 4 ON
DI Intrusion alarm	DI Sprinkler section 5 ON
DI Irrigation running	DI Sprinkler section 6 ON

9.21 EVERMORE FARMS, GROWING GROUND, TROPICAL LINK NURSERY AND COUNCIL NURSERY IRRIGATION SITES

Ballina Shire Council will supply and install the LP3 type RTU at each of the irrigation site. This shall also include field wiring, antenna and antenna cable. However, the telemetry Contractor shall configure the RTUs together with the data collector site's RTUs installed at Alstonville STW and Gap Road reservoir.

.**Monitoring signals**
DI Solar power battery low
DI telemetry main power failed
DI RTU battery volts low
PI flow volume
DI Valve open
DI Valve closed
DI Valve failed
DI Intrusion alarm

9.22 PIPER DRIVE TEMP. PUMPING STATION

Ballina Shire Council will supply and install the LP3 type RTU on site. This shall also include field wiring, antenna and antenna cable. However, the telemetry Contractor shall configure the RTU together with the respective store forward RTU located at the sewage pumping station.

.**Monitoring signals**
DI mains power failed
DI telemetry main power failed
DI RTU battery volts low
DI pump 1 running
DI pump 1 failed
DI Wet well high level alarm
DI Intrusion alarm

9.23 DW1, DW7, DW8, DW9, DW10, DW11 AND DW12 DELEACHING WELLS

Ballina Shire Council will supply and install the G3 type RTU at each deleaching well. This shall also include field wiring, antenna and antenna cable. However, the telemetry Contractor shall configure the RTUs together with the data collector site's RTU installed at Landfill Leachate pre-treatment.

.**Monitoring signals**	Derived Signals
DI mains power failed	Pump Flow L/hr
DI telemetry main power failed	Flow to well
DI RTU battery volts low	
DI pump running	
DI pump failed	
DI Wet well high level alarm	
DI Intrusion alarm	

9.24 MOTHERWELL WELLS

This site is controlled by Omron PLC. The monitoring signals will be transferred to the RTU via RS232 communication link. Ballina Shire Council will supply and install the LP3 type RTU at this site. This shall also include field wiring, antenna and antenna cable. However, the telemetry Contractor shall configure the RTU together with the data collector site's RTU installed at Landfill Leachate pre-treatment.

.**Monitoring signals**	Derived Signals
DI mains power failed	AI Well level
DI telemetry main power failed	Flow to pond L/S (derived)
DI RTU battery volts low	
DI pump 1 running	
DI pump 1 failed	
DI pump 2 running	
DI pump 2 failed	
DI Wet well high level alarm	
PI Magflow pulse counter	
DI Intrusion alarm	

9.25 RECEIVED SIGNAL STRENGTH INDICATOR (RSSI)

The RSSI signal shall be monitored at all the monitored sites including radio repeaters and MTUs. The monitoring shall be measured at the repeater sites for the RTUs and the the MTU sites for the repeaters.

It is the contractor responsibility to supply, install and configure the necessary software and hardware interface required to provide this facility in the existing telemetry system. This shall include configuration of the two central stations, RTUs, radio repeaters and the two MTUs.

The telemetry Contractor shall provide the facility to allow Ballina Shire Council to configure the collection of the RSSI signals to any additional site added to the DAC system.

9.26 SEWERAGE INFLOW AN OUTFLOW CALCULATIONS

Ballina Shire Council requires that inflows/outflows of sewage at each of the sewage pumping stations need to be calculated at the RTU level and transmitted to the central stations for storage.

It is the contractor responsibility to configure all sewage pumping stations RTUs to calculate the inflow and outflow at each site. The calculation will be based on the volume of sewage between the starting and stopping set points and the time taken to pump the calculated volume. Ballina Shire Council will provide the méthode of calculation to the telemetry Contractor.

10 CMF & RMF FUNCTIONAL REQUIREMENT

10.1 SCADA SOFTWARE

General

Configure the new Citect V7 or later version with 5000 point licence software installed at the CMF and RMFs to perform the same functions and display diagrams that were previously performed and displayed by the existing software. In addition the following facilities and functions need to be configured at the RMF and at the existing CMF and RMF if they are not already configured: This shall also include the upgrading of the historical data base from Plant 2 Business to Citect SCADA reports. Configure Citect SCADA reports to provide separate SQL data base of all the data collected by Citect SCADA system.

10.2 REDUNDANT CONFIGURATION

The SCADA application program shall run under Windows XP professional. The facility must be capable of data logging and data base management using application programs to collect, scale, analyse and display data and maintain a historical data base of selected system data. The Citect redundancy shall include all information, reports trends etc.. which are displayed and configured at the CMF are to be shown and displayed at the RMF. There is currently WAN network linking the Council Chambers, Pine Ave reservoir and Council Depot. This can be used for y the full system redundancy between the CMF and RMF with a minimum speed of 28MB/s. Also the existing WAN network shall be used for remote access to the CMF and RMF.

The RMF located at the Ballina Council Chambers shall act as a redundant unit to the CMF located at the Council Depot in Ballina. The basic philosophy for the redundant configuration is that the CMF and the RMF are identical systems capable of performing all of the specified functions. The CMF must act as a master unit. The RMF must be continually up-dated in readiness for a failover.

When an unrecovered failure occurs in the master unit (CMF), the standby unit (RMF) must automatically take over the role of the CMF. At the point of failure an appropriate message such as the following shall be displayed on the VDUs and printed.

e.g. CMF FAILED AND IS OFF LINE

RMF IS ON-LINE

Following the initiation of a failover and the subsequent repair of the faulty CMF, the CMF must be up-dated from the RMF and assume the master role.

10.3 EVENT LOG

The event log must comprise a listing of all events on occurrence, with date, time and site identification. This log must be maintained in memory only without the need for automatic print out. The event log must be stored in a file with sufficient capacity to hold at least 30,000 events. A search facility must be provided to filter the event file to find specific events, specific signal or specific sites. Facilities must be provided to obtain a print out of selected events.

When the 30,000 events log has been reached, the old events shall be stored in a separate file that can be accessible for review at any time.

The following data must be included in the event log:

a) Operator log in and log out.

b) points placed in maintenance.

c) all control operations whether automatic or those initiated by the operator, including mode changes.

d) change in plant status (either automatically or manually initiated) such as pump start, pump stop, reservoir set point indications.

e) alarm events.

10.4 ALARM LOG

Alarms include all points designated as alarm inputs (i.e. abnormal events) in RTUs, computed set point values and computed derived quantities. The alarm log must be stored in a file with sufficient capacity to hold at least 30,000 alarms. A search facility must be provided to filter the alarm file to find specific alarms. Facilities must be provided to obtain a print out of selected alarms.

Alarm logging must include the following features:

- allocation of at least 2 alarm priorities
- allocation of unique colours defining unacknowledged, acknowledged, active and inactive alarms
- Archiving of analogue values, for future Trending outputs every 15 minutes.
- summary page for active alarms

Alarms must initiate the following events:

- be indicated on display diagrams (flashing until acknowledged)
- be displayed on the alarm area of the VDU (flashing until acknowledged)
- must be saved on an alarm page.

Alarm logs shall be stored in a separate file that is accessible by the Operator at any time.

10.5 PRESENTATION OF DISPLAYS

The screen display area must be divided into three sections:

(a) an alarm section to display current and unacknowledged alarms Upon acknowledgment, the alarm must be transferred to an alarm page;

(b) a picture section to display colour graphics and status text. It must comprise the majority of the screen area.

(c) an operator entry section. The operator entry section must be used for software prompts and operator response.

10.6 SCHEMATIC DIAGRAMS

(a) General

The displays described below must be created as part of this Contract. The displays must be legible and must be in a format that conveys information to operating personnel. Provide drawing tools to create or modify drawings as required.

Symbols used on the displays must not rely solely on a colour change to convey information. The symbols and all their permutations must be legible and convey all information when printed on a monochrome printer.

It must be possible to move from any one of these diagrams to any other diagram in the system via the pointing device or the depression of a maximum of three “soft” keys.

The time from initiating a request to a diagram being displayed with all relevant data, for any pre-configured diagram must be a maximum of two seconds. This applies to diagrams displaying dynamic data, historical data or a mixture of both.

Data shall be updated when moving between display screens. Visual indication on each screen shall show the last update time and the current set points on each display screen

(b) Hydraulic Diagrams

Provide schematic diagrams for the water supply and sewerage schemes showing the hydraulic networks similar to those shown on drawings No. 0502244-2, 3 & 4. Design the diagrams to give operations staff an overview of the scheme, including current status.

The diagrams must show the following:

- operational status and alarm condition of all pumps and machinery including motorised valves.
- reservoir levels, relevant alarms and control set points.
- fault and out-of-service conditions.

(c) Site Diagrams

Provide an individual schematic diagram for the DAC system together with site photograph for each monitored site/RTU displaying the status of all monitored points and outputs. In addition, when the Operator chooses a site photo or name the system should bring up the number of the site (eg SP2104 Kalinga St., Ballina) status of the pump, run time, number of start of each pump etc..

(d) Geographical Site Diagrams

Provide the site locations for the DAC system overlayed on a map of the area for each town area. When the operator choses a site location the system should bring up a status display of the site components together with pumping station number, run time and number of starts of each pump.

(e) Communication Network Diagram

Provide a diagram showing an overview of the communication network linking the monitored and additional sites with the central and remote stations. Display the status of the networks including fault conditions.

10.7 REPORTS

Facilities must be provided to generate reports automatically and manually. Reports must only be printed if selected for printing. Reporting shall also includes the configuration of Citect SCADA report to interface the required data to Council's data base system (SQL or other).

Automatic Reports

A daily, weekly, monthly, financial year, and annual report format must be produced for the water supply and sewerage schemes. The reports must include information for each pump (eg run time, number of starts etc.) each reservoir (eg trend graph of water level) and each flowmeter (eg trend graph of flow volume and total volume for the report period). Reports shall be transferred to Council's data base as well as stored locally in ".CSV" format in a separate file.

Please note that existing DBF files are currently used for daily reports.

Daily reports must run from midnight to midnight. Weekly reports must run from Monday to Monday. Monthly reports must run for a calendar month and yearly reports must run for a calendar year.

Financial yearly report must run from July to June the following year. Also DECC licence yearly report is required and must run from 1st of April to 31 March of the following year. The financial and DCC licence yearly report shall cover the total daily inflow of each STW, total daily outflow of each STW, total daily recycle water and the total daily rainfall collected from the rain gauges.

Typical report shall include but not limited to:

- Site by site number of high level alarms
- Site by site number of low level alarms
- Site by site number of standby alarms
- Site by site number of pump failed alarm

Manual Reports

Provision must be made to manually generate reports. The reporting period must be operator selectable by entering any start and finish date.

10.8 TREND GRAPHS

Provide a facility to trend all historical and real time analogue and digital points over a selected period. Trending data shall be based on the actual time and date stamp.

The minimum requirements for trending are:

- display up to 8 trends in a trend window
- comparative trending to compare the trend of a given point over different periods
- each trend graph must have a unique colour
- dynamic selection of time base
- ability to scroll backwards and forwards in time
- slidewire cursor to read point values
- time base zoom control
- alternative data presentation in numerical format

When the file roll over, trend graphs shall be stored in a separate file for council to viewed at any time.

10.9 DERIVED ALARMS

The following alarms must be derived:

a) Any failure in the execution of a control routine through to desired completion. The alarms displayed must indicate the control routine being executed, and the cause of the unsuccessful completion of the routine.

b) A 2% change in a reservoir level over any 10 minute period whether directly measured or inferred. The 2% must be adjustable in 1% increments and the 10 minutes in 5 minute increments to a maximum of 60 minutes. Also display the actual rate of change, direction of the change and percentage reservoir full.

c) Outstation communication link failure. An alarm must be generated if no response is received from a particular outstation for five (5) or more successive poll cycles. This variable must be operator soft key adjustable.

d) Excessive Pump Starts:

- At water pump stations the starting of a pump more than twice in any 15 minute interval must bring up an alarm. The variables of time and number of starts must be operator soft key adjustable.

- At sewage pump stations the starting of a pump more than twice in any 6 minute interval shall bring up an alarm. The variables of time and number of starts shall be operator soft key adjustable.

- At sewage pump stations if the number of starts per day of a pump exceeds a pre-set value entered by the Operator shall bring up an alarm immediately to alert the Operator that the number of start of a certain pump(s) has exceeded the pre-set value. The variables of the time set shall be Operator soft key adjustable.

e) **Excessive run time period:** At sewage pump stations the run time period of a pump more than 10 minutes shall bring up an alarm immediately to alert the Operator that the pump has run more than the normal running time. The variables of the time set shall be Operator soft key adjustable.

f) **Alarm and control set points**: Alarm and control set points must be derived from the reservoirs level signals. The variable must be operator pointing device or soft key adjustable.

10.10 OUT OF SERVICE TABLE

It must be possible to insert and remove an Out of Service label, using a pointing device or soft keys, against any monitored point in the DAC system. When an Out of Service label is inserted it must be shown on all diagrams displaying the monitored point. Placing an out of service label against of equipment must have the following result:

a) Reservoirs - pumps will not be operated from that reservoir level and level alarms will not be registered.
b) When all pumps at a pumping station are out of service then the control program will not initiate a pump start signal and the receiving of a pump running signal will cause an alarm.
c) Reservoir level transducers - reading will be ignored for alarm and control purposes.
d) Reservoir level regulator – reading will be ignored for alarm and control purposes
e) Flowmeters - flow readings must be ignored.
f) Other alarm units - alarms from these units must be ignored.

Provide an Out of Service table listing all monitored points, which have had an Out of Service label, attached.

10.11 MAINTENANCE DATA

A minimum of 30 maintenance pages must be made available on which the operator can make notes of a general nature. In addition, each site in the system must have 2 dedicated maintenance pages. Information is manually or automatically entered on these pages and must be saved in the history files.

Data to be automatically entered for pump station sites must be individual pump fault, pump out of service, and cumulative hours run for each pump. Pump fault and hours run information must all be gained directly from field inputs. Out of Service data must be gained from operator entry on display diagrams. Alarms and 'Out of Service' data must show date and time of occurrence and date and time returned to service. Total hours run for each pump must be resetable to any value and must then continue to increment according to data received from that pump run input.

10.12 PUMPS MAINTENANCE

Provide pumps maintenance warning for each pump based on number of hours that the pump has run. The purpose of pump maintenance is to notify the Operator that the pump is due for maintenance when it has reached the pre-set number of hours run specified by the Operator at CMF and the RMF. The notification must be a pop up window indicating that the pump is due for maintenance. (Eg: North Ballina, North Creek Road PS. Pump 1 due for maintenance.)

Weekly report shall be created for pumps maintenance with the facility that Council be able to issue the report to a specific email address.

10.13 HISTORICAL DATA STORAGE

The following data must be stored, with time and date of occurrence, for historical purposes:

For each reservoir:

- average water level over user define % change and user define time period.
- overflow alarm
- low level alarm

For each item of machinery eg pump etc:

- actual run duration with start and stop times
- number of starts/hour
- fault alarm
- hours run/day
- number of starts/day

For each flowmeter:

- flow volume over user define time period
- Average flow rate during user define time period
- Total daily flow volume

Facility shall be made to automatically archive historical data files.

Provide sufficient hard disk capacity to store the historical data for a minimum of one year. However, old data shall be kept and transferred to separate file for Council to review it at any time.

10.14 PASSWORD ACCESS

All keystrokes which affect the control, set-up or operation of the system must be password protected. It is preferred that all displays used for current and historic operational information be available without a password being required. The exception is that for initial log on a password must be required and the person with that password must be identified on the event log.

Each person must have their individual password which allows them a predesignated level of access (there must be a minimum of four (4) levels of access). A facility must exist for operators to alter their own password. If a control set-point is altered or some other database modification is made the event log must state the change and identify the person making the change from the password entered.

10.15 REMOTE ACCESS TO CMF AND RMF

Council currently using the existing WAN network running between th Council Chambers, Pine Ave reservoir and the Council Depot for remote access.

Provide facilities for remote computer access via the exiting WAN network to the CMF and RMF and also telephone switched network as a back up. The Contractor may provide an alternative remote access facility if available. Remote access is required for the purposes of:

- software maintenance
- software fault diagnosis and rectification
- operator access to monitored data, alarm acknowledgment and control functions

It is the Contractor responsibility to provide one Citect "IDC" licence at each of the CMF and RMF for remote access only if required.

10.16 REPORT FORMAT

Each report shall be configured to be compatible with Microsoft Excell and also in a text format compatible with Microsoft Word software, thus allowing for system data to be analysed and displayed under Microsoft Excel or Microsoft Word installed on any IBM PC compatible computer.

The programme must allow access to the CMF data base to provide a means of analysing, computing and trending the data with provision for printing the results. The package will be capable of producing data files in a format, which is compatible with Microsoft Excel and in text format compatible with Microsoft Word.

10.17 NON CRITICAL ALARMS

Non critical alarms shall be grouped and placed in a separate file for Council to retrieve and email it to the duty Operator at any time.

10.18 DELIVERY OF ALARMS TO OPERATIONS STAFF

The central and remote monitoring facilities will not be staffed continuously during normal working hours and not at all outside working hours.

Alarms are transferred to the Duty Operator via:

- Telstra GSM mobile phone as secondary option and
- SCADA phone paging system as primary option.

SCADA Phone Paging System

The SCADA phone paging system shall be used as an alternative to the mobile phone paging system. The CMF or RMF interrogates the SCADA phone to dial out the duty operator only when the CMF or RMF has paged the duty operator over the mobile phone and the alarm has not been acknowledge for an adjustable period of time (minimum of 1 hour).

The Contractor shall supply the SCADA phone complete with OPC link and shall be programmed to dial out received alarms generated from the Citect SCADA software.

Mobile Telephone Paging System

On receiving an alarm at the central station, the CMF dials up the Duty Operator mobile phone via Telstra GSM mobile service. The alarm indicates the type and location of the fault.

On receiving an alarm the Duty Operator(s) accesses the central monitoring facility, either directly or remotely using a portable computer, to acknowledge the alarm and prevent the central station from dialling the second telephone number on the list of water supply and sewerage operators. The adjustable waiting time required acknowledging the alarm, and before the CMF or RMF dials the second telephone number on the list, is 30 minutes minimum.

11 CONTROL REQUIREMENTS

11.1 GENERAL

Design and install automatic and remote manual control systems to meet the requirements of the Ballina Shire water supply and sewerage schemes.

It is required that the control philosophy shall be distributed throughout the system at RTU level with facilities to modify and override the control from the CMF or RMF. Facility shall be made to the water supply Operator to be able to select the desired control option required from the CMF and RMF.

Manual Water Supply Control

Provide a facility for staff to start and stop water supply pumps by manually setting digital outputs in the RTUs to the ON or OFF state from the CMF or RMF. This facility must be password protected at Supervisor level.

Provide a facility for staff to open and close motorised valves by manually setting digital outputs in the RTUs to open or close state from the CMF or RMF. This facility must be password protected at Supervisor level.

Manual/Automatic Water Supply Controls

Provide a facility for staff, for remote manual start and stop of water supply pumps, from the CMF and RMF by manually setting digital outputs in the RTUs to the ON state with automatic shutdown. The automatic shutdown must be in accordance with the automatic control requirement listed below.

Provide a facility for staff, for remote manual open and close of motorised valves, from the CMF and RMF by manually setting digital outputs in the RTUs to the Open state with automatic close down. The automatic close down must be in accordance with the automatic control requirement listed below.

Automatic Control

The automatic control system must be designed to accommodate the hydraulic characteristics of the water supply schemes and must incorporate safeguards that will stop pumps or close valve on failure of vital communication links.

11.2 DYNAMIC COLOUR CHANGES

Pump and Valve duty Roster

The telemetry Contractor shall configure the software to make the name of the pumps and valves listed in the tables below change colours based on its duty:

- Green duty 1
- Violet duty 2
- Yellow duty 3
- Red failed

Reservoir Control Set Points

The telemetry Contractor shall configure the software to make the colour, of the water level specified in the tables below, red when the reservoir water level goes outside of the range specified and in blue when it is within the range specified.

11.3 BALLINA LENNOX WATER SUPPLY

11.3.1General

Rous Water supplies bulk water to Pine Ave and East Ballina reservoirs through the Waterwheels motorised valve and through the Ross Lane flowmeter. Bulk water is also supplied to Basalt Court reservoir through the Ross Lane flowmeter. North Creek Road motorised valve controls the flow to Ballina. A local control valve at Basalt Court reservoir controls the flow into Basalt Court reservoir.

11.3.1 Pine Ave Reservoir

Pine Ave. reservoir is fed from Knockrow balance tank via:

- Waterwheels motorised control valve
  - and or
- North Creek Road motorised control valve

Facility has to be provided at the CMF & RMF for the Operator to:

- Set the time periods and specify active time and inactive time in the table below
- Select the duty and standby motorised valve with the indication “1” for duty and “2” for standby in the table below.

Daily Time Valve Duty Roster Table				Pine Ave – East Ballina reservoirs	
Period		Time		Waterweels	North Creek
Active (Y/N)		Start	End	Valve	Valve
1	-	0000	----		
2	-	----	----		
3	-	----	----		
4	-	----	----		
5	-	----	2400		
					Enable/Disable

When the water level at Pine Ave. reservoir falls to the bottom water level (BWL) specified in the table below the duty valve’s RTU shall close an output that will initiate the duty motorised control valve to open.

The duty valve’s RTU shall open an output that will initiate the duty motorised control valve to close when the water level in Pine Ave reservoir rise to the top water level (TWL) specified in the table below.

Pine Ave. Reservoir Control Set Points 0 to 100%			
	Alarm	TWL	BWL
High Level alarm	----		
Control Valve 1 (duty)		----	----
Control Valve 2 (standby)		----	----
Low level alarm	----		

The standby valve’s RTU shall close an output that will initiate the standby motorised control valve to open when the water level in Pine Ave reservoir falls to the standby BWL specified in the above table.

The standby valve's RTU shall open an output that will initiate the standby motorised control valve to close when the water level in Pine Ave reservoir rise to the TWL specified in the above table.

Back Up Control Set Points

There are two forms of control set points in Pine Ave reservoir:

- Analog set points initiated from a submersible level transmitter to be used as a primary source of control
- Digital set points initiated from four float switches to be used as the secondary or backup source of control.

When the level transmitter installed at Pine Ave reservoir failed or is out of service, the two motorised valves shall be controlled from:

- The BWL level alarm, generated from the float switch, to open water wheels valve
- The BWL level alarm, generated from the float switch, to open North Creek Road valve.
- The low level alarm, generated from float switch, to open the duty valve
- The high level alarm, generated from the float switch, to close the duty valve.

11.3.2 East Ballina Reservoir

East Ballina reservoir shall control the two motorised control valves (Waterweels & North Creek) only when Pine Ave reservoir is out of service.

Control logic shall be the same that applies to Pine Ave. reservoir with the control set point as per the table below:

East Ballina. Reservoir Control Set Points 0 to 100%			
	Alarm	TWL	BWL
High Level alarm	----		
Control Valve 1 (duty)		----	----
Control Valve 2 (standby)		----	----
Low level alarm	----		

11.3.3 Basalt Court Reservoir

Basalt Court reservoir is fed from Knockrow Balance tank through Ross Lane flowmeter. A local motorised valve is installed at the base of this reservoir and it shall be controlled from the water level in Basalt Court reservoir as follow:

When the water level in Basalt Court reservoir falls to the bottom water level (BWL) specified in the table below the Basalt Court reservoir's RTU shall:

- Close an output that will initiate the local motorised valve to open.

When the water level in Basalt Court reservoir rise to the top water level (TWL) specified in the table below the Basalt Court reservoir's RTU shall:

- Open an output that will initiate the local motorised valve to close.

–

Basalt Court Reservoir Control Set points 0 to 100%					
	Alarm	TWL`	BWL	Enable level	Disable Level
High Level Alarm	-----				
Basalt Court reservoir MV		-----	-----		
North Creek MV Enable/Disable				-----	-----
Low Level Alarm	-----				

North Creek Road Motorised Valve Closed

North Creek Road motorised valve shall close when Basalt Court reservoir water level falls to Low Low level alarm or to North Creek Road valve disable level This shall:

- Appear on the Valve duty roster table above
- Shall also generate an alarm indicating that North Creek Motorised valve is disabled.

Back Up Control Set Points

There are two forms of control set points in Basalt Court reservoir:

– Analog set points initiated from a submersible level transmitter to be used as a primary source of control

– Digital set points initiated from four float switches to be used as the secondary or backup source of control.

When the level transmitter installed at Basalt Court reservoir failed or is out of service, the Control of the local and North Creek motorised valves shall be as follow:

1. When the water level in Basalt Court reservoir falls to the BWL alarm, generated from the float switch, the Basalt Court reservoir's RTU shall close an output that will initiate the local motorised valve to open.

2. When the water level in Basalt Court reservoir rises to the TWL alarm, generated from the float switch, the Basalt Court reservoir's RTU shall open an output that will initiate the local motorised valve to close.

3. When the water level in Basalt Court reservoir falls to the low low level alarm, generated from the float switch, the Basalt Court reservoir's RTU shall close an output that will initiate the local motorised valve to open and the North Creek motorised valve's RTU shall open an output that will initiate the North Creek motorised valve to close or disable. This status shall rise an alarm indicating that the valve is disable.

4. When the water level in Basalt Court reservoir rises to TWL level alarm, generated from the float switch, the Basalt Court reservoir's RTU shall open an output that will initiate the local motorised valve to close and the North Creek motorised valve's RTU shall close an output that will enable the North Creek motorised valve.

5. When the water level in Basalt Court reservoir rises to high level alarm, generated from the float switch, the Basalt Court reservoir's RTU shall open an output that will initiate the local motorised valve to close and the North Creek motorised valve's RTU shall close an output that will enable the North Creek motorised valve.

11.3.4 Lennox Reservoir

Lennox reservoir is fed from Basalt Court reservoir. A local motorised valve is installed at the base of this reservoir and it shall be controlled from the water level in Lennox reservoir as follow:

When the water level in Lennox reservoir falls to the bottom water level (BWL) specified in the table below the Lennox reservoir's RTU shall close an output that will initiate the local motorised valve to open.

When the water level in Lennox reservoir rise to the top water level (TWL) specified in the table below the Lennox reservoir's RTU shall open an output that will initiate the local motorised valve to close.

Lennox Reservoir Control Set Points 0 to 100%			
	Alarm	TWL`	BWL
High Level Alarm	-----		
Lennox Reservoir MV		-----	-----
Low Level Alarm	-----		

Back Up Control Set Points

There are two forms of control set points in Lennox reservoir:

- Analog set points initiated from a submersible level transmitter to be used as a primary source of control
- Digital set points initiated from four float switches to be used as the secondary or backup source of control.

When the level transmitter installed at Lennox reservoir failed or is out of service, the local motorised valve shall be controlled as follow:

When the water level in Lennox reservoir falls to the BWL alarm, generated from the float switch, the reservoir's RTU shall close an output that will initiate the local motorised valve to open.

When the water level in Lennox reservoir rises to TWL level alarm, generated from the float switch, the reservoir's RTU shall open an output that will initiate the local motorised valve to close.

When the water level in Lennox reservoir rise to the high level alarm, generated from the float switch, the reservoir's RTU shall open an output that will initiate the local motorised valve to close.

11.4 ALSTONVILLE WOLLONGBAR WATER SUPPLY

11.4.1 General

Rous Water supplies bulk water to the Wollongbar reservoir, which then supplies Wollongbar and Alstonville. Rous Water also have Convery's Lane bore and Lumley Park bore as water supplies.

As an alternative water supply, Ballina Shire Supplies water to Wollongbar and Whites Lane reservoirs from Marom Creek pumping station (2 pumps) Ellis Road bore (1 pump) and Lindendale bore (1 pump). Two control mechanisms are requied:

Under normal operating conditions these sources are controlled from the water level in Whites Lane reservoir. This is known as Whites Lane Control.

Pump Duty Roster Table				Whites Lane Control		
Period		Time		Marom Creek	Ellis Road Bore	Lindendale Road Bore
Active (Y/N)		Start	End	-	-	-
1		0000	----	-	-	-
2		----	----	-	-	-
3		----	----	-	-	-
4		----	----	-	-	-
5		----	2400	-	-	-

11.4.2 Whites Lane Reservoir

Whites Lane reservoir can be fed from Marom Creek Water treatment plant (WTP), Ellis road bore and Lindendale bore. The control mechanism shall be as follow:

When the water level in Whites Lane reservoir falls to the bottom water level (BWL) specified in the table below the duty pump(s), selected in the pump duty roster table, RTUs shall close an output that will initiate the duty pump(s) to start.

When the water level in Whites Lane reservoir rises to the top water level (TWL) specified in the table below the duty pump(s)' RTUs shall open an output that will initiate the duty pump(s) to stop.

The Marom Creek duty pump shall also stop when a low level alarm is received from the clear water tank.

The Ellis Road Bore pump shall also stop when a low level alarm is received from the bore well.

The Lindendale Road Bore pump shall also stop when a low level alarm is received from the bore well.

Whites Lane Reservoir Control Set Points 0 to 100%			
	Alarm	TWL`	BWL
Whites Lane High Level Alarm	-----		
Duty pump 1		-----	-----
Duty pump 2		-----	-----
Duty pump 3		-----	-----
Whites Lane Low Level Alarm	-----		
Clear water Tank Low Level Alarm	-----		
Ellis Road Well Low Level Alarm	-----		
Lindendale Road Well Low Level Alarm	-----		

Back Up Control Set Points

There are two forms of control set points in Whites Lane reservoir:

- Analog set points initiated from a submersible level transmitter to be used as a primary source of control
- Digital set points initiated from five pressure switches to be used as the secondary or backup source of control.

When the level transmitter installed at Whites Lane reservoir failed or is out of service, the Control of the pumps shall be as follow:

When the water level in Whites Lane reservoir falls to the low level alarm, generated from the pressure switch, each RTU installed at each pump shall close an output that will initiate the local pump to start.

When the water level in Whites Lane reservoir rise to the high level alarm, generated from the pressure switch, each RTU installed at each pump shall open an output that will initiate the local pump to stop.

The Marom Creek duty pump shall also stop when a low level alarm is received from the clear water tank.

The Ellis Road Bore pump shall also stop when a low level alarm is received from the bore well.

The Lindendale Road Bore pump shall also stop when a low level alarm is received from the bore well.

11.4.3 Wardell Reservoir

Wardell reservoir is fed from Meerschaum Vale balance tank. The control mechanism shall be as follow:

When the water level in Wardell reservoir falls to the bottom water level (BWL) specified in the table below the Meerschaum Vale control valve's RTU shall close an output that will initiate the valve to open.

When the water level in Wardell reservoir rises to the top water level (TWL) specified in the table below the Meerschaum Vale control valve's RTU shall close an output that will initiate the valve to close.

Wardell Reservoir Control Set Points 0 to 100%			
	Alarm	TWL`	BWL
High Level Alarm	-----		
Meerschaum CV		-----	-----
Low Level Alarm	-----		

Back Up Control Set Points

There are two forms of control set points in Wardell reservoir:

- Analog set points initiated from a pressure level transmitter to be used as a primary source of control
- Digital set points initiated from two float switches to be used as the secondary or backup source of control.

When the level transmitter installed at Wardell reservoir failed or is out of service, the control of the Meerschaum Vale control valve shall be as follow:

When the water level in Wardell reservoir falls to the low level alarm, generated from the float switch, the Meerschaum Vale control valve's RTU shall close an output that will initiate the valve to open.

When the water level in Wardell reservoir rises to the high level alarm, generated from the float switch, the Meerschaum Vale control valve's RTU shall open an output that will initiate the valve to close.

11.5 SEWER CONTROL

11.5.1 Alstonville STW Motorised Valve (RTU37)

This motorised valve shall be controlled from Dalmacia Drive balance tank (RTU50) as follow:

The DAC system shall open an output contact at the Alstonville STW's RTU that will initiate the motorised valve to close when:

- The water level in the balance tank falls to a specific preset value received from the level transmitter or
- tank low level alarm received from level regulator.

The DAC system shall close an output contact at the Alstonville STW's RTU that will initiate the motorised valve to open when:

- The balance tank water level rises to the open set point received from the level transmitter or
- A balance tank high water level received from the level regulator or
- An overflow alarm is received from the tank.

If radio communications fail for a period of 15 minutes the CMF and RMF to Dalmacia Drive balance tank or CMF and RMF to Alstonville STW then the motorised valve shall open. The motorised valve shall close only when reaching BWL and when comms are satisfactory.

11.6 EFFLUENT RE-USE CONTROL

11.6.1 Effluent Re-use Pump at Alstonville STW.

This station has two pumps configured as one duty and one standby unit. The pumping station shall be controlled from Gap Road reservoir. The DAC system shall initiate an output signal from Alstonville STW's RTU (RTU 37) to the duty pump to start when:

- The water level in Gap Road reservoir falls to a specific preset value received from the level transmitter or
- Reservoir low level alarm received from level regulator.

The DAC system shall close an output contact at the Alstonville STW's RTU that will initiate the duty pump to stop when:

- Gap Road water level rises to a stop set point received from level transmitter or
- reservoir high water level received from the level regulator or
- An overflow alarm is received from the tank.

Any of the above conditions shall generate an alarm as well as stopping or starting the duty pump.

11.7 BALLINA SHIRE SEWERAGE SCHEMES CONTROL

11.7.1 General

The sewage pump stations operate on local manual control or local automatic control from levels in their wet wells. Pump station inhibit controls are required to be provided under this contract to temporarily prevent selected stations operating on automatic control.

The purpose of pump station Inhibit Control is to reduce the risk of sewage overflows when pump stations fail. The objective is to maximise available storage in sewer mains and collection wells by preventing upstream stations pumping into unserviceable stations.

Inhibit Control is initiated when a wet well high level alarm is active. The control system is required to respond by turning on a "Pump Inhibit ON" output at those stations that pump into the initiating station.

When the high level alarm in the wet well of the initiating station becomes normal and after a pre-set period of time (normally 3 minutes), the control system is required to respond by resetting or turning off the "Pump Inhibit ON" output at the inhibited stations to allow them to operate on local automatic control.

The inhibit signal shall be removed when a wet well high level alarm is active at the inhibited station.

The inhibit signal shall be re-initiated, if fault persists at the initiating pumping station, and the wet well level at the inhibited or contributing pumping station(s) falls to a low level.

The inhibit controls are required to be manually initiated or cancelled from the CMF and RMF.

The pump stations to be controlled are listed in the following table.

11.7.2 Ballina Island Sewerage Scheme

INITIATING PUMP STATIONS	STATIONS TO BE INHIBITED
Swift St. Sge PS OR North Ballina PS	Tamar St, Richmond Ave, Regatta Ave, Owen St., Burnett St.,Grant St., Webster LN, Vera St., Tafe Colege, Temple St. Sge PSs.
Richmond Ave Sge PS	Norlyn Ave Sge PS
Regatta Ave Sge PS	Fawcett St. Sge PS
Grant St Sge PS	Fox St Sge PS
Fox St. Sge PS	Cherry St. Sge PS (SP2011)
Webster LN Sge PS	Bentick St. Sge PS
Bentick St. Sge PS	Skinner St and Namatjira PL Sge PSs
Skinner St. Sge PS	Cherry St. (Crowly) Sge PS (SP2016)
Namatjira PL Sge PS	Commemoration Park and Missingham Bridge Sge SPs
Temple St. Sge PS	Catherine CRS, Christine PL, Clavan St. Sge PSs

11.7.3 North BallinaSewerage Scheme

INITIATING PUMP STATIONS	STATIONS TO BE INHIBITED
Norh Creek RD Sge PS	Racecourse RD (1), Endeavour Close, De Havilland CRS, Bi Centennial Gardens, Piper Drive and Yellowfin Way Sge PSs.
Racecourse Rd (1) Sge PS	Racecourse Rd (2) Sge PS
De Havilland CRS Sge PS	STH Cross DVE Sge PS
STH Cross DVE Sge PS	MRF, Ballina Airport 1, ballina Airport 2 Sge PSs
Yellowfin Way Sge PS	Whiting Way Sge PS
Whiting Way Sge PS	Edgewater Cove Sge PS

11.7.4 East Ballina Sewerage Scheme

INITIATING PUMP STATIONS	STATIONS TO BE INHIBITED
Angels Beach DV Sge PS	John Sharpe St., George Pearce PL., Northumberland Dve., Jameson Ave., Tuckeroo Ave., Bayview Dve., Shelly Beach RD., Anderson St., Silver Gull Dve., Flat Rock Rd.and Chickiba DVE Playing Field Sge PSs.
Northumberland Dve. Sge PS	The Serpentine, Shaws Bay C/Van Park and Coogee St., Sge PSs
Shelly Beach Rd. Sge PS	Compton DVE Sge PS
Compton Dve. Sge PS	POP Denison Park, McKinnon St.and Lighthouse Pde Sge PS

11.7.5 West Ballina Sewerage Scheme

INITIATING PUMP STATIONS	STATIONS TO BE INHIBITED
Pacific HWY (Coastline) Sge PS	Apsley St., Kalinga St., Oakland Ave., Quays Dve., Westlands Dve. and Waterview CRT Sge PSs.
Oakland Ave.. Sge PS	Boatharbour Rd, Riverside Dve (Riverside Park) and Riverside Dve (Faulks res.) Sge PSs
Quays Dve Sge PS	Spinnaker Crs. Sge PS
Spinnaker Crs. Sge PS	Burns PT Ferry Rd. Sge PS
Lindsay Ave. Cumbalum Sge PS	Cumbalum Way Sge PS
Cumbalum Way Sge PS	Ahern CRT. Sge PS

11.7.6 Lennox Head Sewerage Scheme

INITIATING PUMP STATIONS	STATIONS TO BE INHIBITED
Montwood DR. Sge PS	Survey St. and Byron St. Sge PSs.
Byron St. Sge PS	Rutherford St., Lake Ainswortk C/Van, Fig Tree Hill Dve., Lake Answorth Beach, Lakefield Ave., Emily Place and The Grove Sge PSs

11.7.7 Lennox Heights Sewerage Scheme

INITIATING PUMP STATIONS	STATIONS TO BE INHIBITED
Skennars Head RD Sge PS	Tara Downs Sge PS.
Amber Dve Sge PS	Seamist PL. Sge PS
Seamist PL Sge PS	Karaluen CRT. Sge PS
Headland Dve Sge PS	Skennars Heads Sport Field and Carrol Ave. Sge PSs

11.7.8 Alstonville Sewerage Scheme

INITIATING PUMP STATIONS	STATIONS TO BE INHIBITED
Cawley Close Sge PS	Coral St. Sge PS.
Granda Court Sge PS	Pinehurst Court Sge PS
Dalmacia Dve. Balance tank Sge PS	Kays Lane and Central Park Dve.Sge PSs
Central Park Sge PS	Queen Park Court, Stanley Park Dve. and Sneaths Rd. Sge PSs

11.7.9 Wardell Sewerage Scheme

INITIATING PUMP STATIONS	STATIONS TO BE INHIBITED
Richmond St. Sge PS	Fitzroy St., Mary St. and Bath St. Sge PSs
Mary St. Sge PS	River St. Sge PS
Bath St. Sge PS	Lindsay Cres and Cabbage tree Island “B”.Sge PSs
Cabbage tree Island “B” Sge PS	Cabbage tree Island “A” Sge PS

12 COMMUNICATION NETWORK REQUIREMENTS

12.1 DESIGN

Re-design and configure the radio communication network to transfer data between the RTUs and the Central and Remote Monitoring Facilities using the three existing radio repeaters and the new repeater at Ballina Height reservoir. The Contractor is to submit the communication network with alternatives to improve the communication response and polling time between all RTUs and the CMF and RMF.

In addition, the Contractor shall:

- Test, calibrate all existing radios installed at the RTUs, repeaters, CMF and RMF
- Record the transmitting power, radio deviation & receiving signal strength from each of the monitored site.
- Record frequency error

12.2 CONFIGURATION

Design the communication network to support:

- Master station polling.
- Change of state reporting of RTUs to the CMF.
- Change of value with % variance for non critical analogue signals

Controls initiated at the CMF must be transmitted immediately and must interrupt the polling cycle to achieve this function.

Inputs, which initiate a change-of-state report, must include all alarms and time related events required by the CMF for computational purposes.

12.3 SYSTEM RESPONSES TIMES

Maximum pole cycle time, for the fully expanded system with up to 160 RTUs, must be less than five minutes.

Maximum response time for automatic and manual control initiated from the CMF must be less than 5 seconds.

Maximum response time for a change of state of an RTU input to be displayed at the CMF or received by another RTU must be less than 10 seconds.

12.4 SECURITY OF TRANSMISSION AND OPERATION

The equipment must be secure against maloperation due to electrical noise; radio frequency and variable frequency drives interference.

Security must be achieved by the use of coded messages providing a degree of error protection not less than that provided by CCITT standard CRC16 or BCH coding.

All circuitry, and in particular conversion circuitry for analogue quantities, must be immune from co-site radio frequency and/or electrical noise interference.

13 EQUIPMENT REQUIREMENTS

13.1 FAULT DIAGNOSTIC AND MAINTENANCE

Telemetry terminal equipment must be fitted with status and diagnostic aids to monitor input and output data.

Each telemetry link must be provided with a fail alarm to alert an operator should a remote site fail to report. At the CMF and RMF it must be possible to individually interrogate each outstation from the operator's interface by soft key operation. The interrogation must provide a positive visual indication to the operator of the condition of the system. The detection of a faulty system must be logged as such, but a healthy system must log only any updated data that is received during the interrogation.

At all sites, indication via light emitting diodes must be provided to display the following:

- AC mains power available
- DC power available
- RTU healthy
- Watchdog Timeout (latching in the event of a timeout)
- status of digital I/O.
- radio signal strength
- PLC failed

13.2 CENTRAL AND REMOTE MONITORING FACILITY

13.2.1 Diagnostic Software

Supply an off-line diagnostics package in bootable form. The package must provide as a minimum:

- A full set of processor diagnostics for testing all CPU functions.
- Memory diagnostics for testing all memory functions.
- Printer diagnostics.
- Disk diagnostics for testing all functions of both soft and hard, fixed and removable disks.

13.3 COMMUNICATIOM EQUIPMENT

All radio equipment must be approved by the Australian Communications and Media Authority(ACMA) for use as fixed (base) stations.

The Contract equipment must include any filters that the Australian Communications and Media Authority considers to be necessary to prevent mutual interference between the contract equipment and that of other radio users.

Transmit powers must be as permitted by the Australian Communications and Media Authority and the specified EIRP must not be exceeded unless specifically authorised by ACMA.

Modems

Modems must meet the following minimum criteria:

- Industry standard data rates, in full and half duplex.
- Standard CCITT channel frequencies.
- Fitted with LED indication for Tx data, Rx data, Carrier Detect and Power On and adequate module test points.
- Line impedance of 600 Ohms.
- Carry an ACMA permit number.

Antenna and Mast

Antenna for the CMF shall be as inconspicuous as possible.

Antenna must be approved by the ACMA and comply with the relevant specification.

If guyed mast is required, it shall be erected and guyed wholly within the existing Council easements.

Components used in the rigging of mast shall comply with Australian Standard AS 2319.

The mast shall be earthed to ground and the earth wire must be extended to the respective equipment rack, cubicle or cabinet and must be terminated adjacent to the coaxial cable termination point.

The mast, brackets and fittings must be protected against corrosion by hot dip galvanising to Australian Standard AS 1650.

Supply lightning surge diverters and earth systems for the protection of radio antenna installation.

AS 1768-1991 is to be used to determine the protection levels and earthing requirements of antenna systems.

Coaxial Cables

The coaxial cable shall be of a braided jacket, foam dielectric type and shall be of sufficient diameter to ensure that losses are consistent with the specified system fade margin when using the permitted transmit power.

The coaxial cable shall be secured to the mast or cable ladders with stainless steel straps or clamps. Straps or clamps must be spaced at 1 m intervals or as recommended by the manufacturer. The bending radius of cable must not be less than 15 times the cable diameter.

The cable connection to the antenna tail must be via waterproof connectors. The connectors must be of a type approved by the cable manufacturer, the completed connection must be wrapped with an approved waterproof tape.

The antenna tail connection must be looped or otherwise installed so as to produce no longitudinal stresses on the cable connection.

The coaxial cable sheath must be bonded to the mast or cable support structure adjacent to the antenna and at the point where the cable leaves the mast or support structure. There must be sufficient intermediate bond points to prevent side flash from lightning discharges.

If the coaxial cable exceeds 5 metres in length it shall be fitted with coaxial surge diverter connected to the station earth via a suitably sized copper conductor. The surge diverter shall be in line connected in the coaxial cable as directed by the surge diverter manufacturer.

14 OPERATIONS & MAINTENANCE MANUALS

14.1 GENERAL

Provide operation and maintenance instructions, diagrams and drawings in accordance with this Clause. They must be sufficiently comprehensive to enable the operation and maintenance of the telemetry system to be performed in an efficient manner.

Reduce diagrams and drawings to A3 or A4 size and arrange them so that when unfolded they may be viewed in full on the right hand side of the text.

Compile the manuals in separate 4 “ring” substantial bindings (loose leaf) as follows:

(a) Volume 1 System Manual

(b) Volume 2 CMF and RMF Maintenance Manual

(d) Volume 4 Troubleshooting Manual

Include in the maintenance manuals:

- Circuit diagrams of each electronic module supplied.
- Component layout drawings complete with identification reference codes.
- Technical data sheets for all ancillary electronic/electrical equipment.

Three (3) weeks before commissioning, deliver to the Principal two (2) complete draft copies (clearly marked as such) of each of the manuals specified above.

Within two (2) weeks of delivery, one copy of the manual will be returned to the Contractor marked up with additions or amendments as required. The remaining draft copies must remain on site to be used as interim manuals.

One (1) week before Practical Completion deliver to the Principal three (3) final copies of each of the manuals incorporating the additions and amendments referred to in above, for each system.

Instruction of a 'typical' nature will not be accepted. However, standard instruction books covering several sizes of an item of equipment, including the equipment supplied under this Contract, will be accepted provided they include all the information required, cover all equipment and are suitably indexed to indicate the equipment actually used, its location and function.

14.2 SYSTEM MANUALS

System manuals must include a description and diagram of the total system configuration and a description of the system operation. It shall also include a list of RTU's with their identification.

14.3 SOFTWARE OPERATIONS MANUAL

This manual must include, but not be limited to the following sections:

Introductory Section

A general description of the telemetry system in terms of the number and type of remote stations, configuration, input/outputs and CMF.

Operator Software Section

Clear step by step instructions must be provided to allow an untrained operator to perform the following functions:

- Use of the operator’s interface for all available control and monitoring functions.

- Altering data base parameters such as alarm and control points as derived low values.
- Use of historical data package.

Engineer/Operator Software Section

This section must contain, as a minimum, documentation of the operating system explaining its facilities and their application in this project and application programme documentation. The documentation must be set out as follows:

- Purpose of the programme.
- Name and purpose of each sub-routine.
- Flow diagram, showing the sequence in which the sub-routines are called.
- Name and significance of each variable.
- Source listing with adequate comments.
- Detailed explanation of the facilities for setting up control and alarm sequences which also require maths functions to manipulate received data.
- Instructions for designing and implementing display diagrams which contain both historical and current data.
- Instruction for adding additional remote stations onto the system.
- Fully documented on and off-line diagnostic routines to allow complete testing of all processor and peripheral interface hardware. Each diagnostic routine must provide easily read and interpreted, operator prompts messages and suggested actions.
- Explanation of all memory storage and access routine. Routines for controlling all other peripheral equipment.

14.4 CMF AND RMF MAINTENANCE MANUAL

Provide fully documented on and off-line diagnostic routines to allow complete testing of all processor and peripheral interface hardware.

14.5 TROUBLESHOOTING MANUAL

This manual will have a major influence in establishing operator confidence in the system and in ensuring that minor failures in sub-systems do not affect the overall performance of the system. Outage times for various components will also be kept to a minimum.

(a) **Section One** - Describe the system configuration and the interdependence of various components in the system.

(b) **Section Two** - Describe the CMF equipment, the most probable failures to occur and action to be taken under these circumstances.

(c) **Section Three** - Detail the modification of the existing radio repeater sites. Isolating faults to individual modules of equipment and the procedure for replacing these modules must be detailed.

(d) **Section Five** - List all types of modular components in the system and the sites to which each of these components are applicable.

14.6 "AS BUILT DRAWINGS

Provide three complete bound sets of Contractors drawings reduced to A3 size paper together with one electronic copy of all drawings that have been produced in AutoCAD format latest version. Drawings shall be issued to the Superintendent together with the Operating/Maintenance manuals

Each set of drawings must include a cover sheet bearing contractual description and reference tables of the drawings bound within.

15 TESTING AND INSPECTION

Test and inspect all equipment and software during and upon completion of manufacture, as indicated in this specification. Provide facilities to enable the Principal's Representative to inspect the Contract equipment and software to ascertain progress. Unless otherwise provided, the tests must be those set down in the relevant Australian, or other approved Standard.

The passing of such inspection and tests at the Works must not prejudice the right of the Principal's Representative to reject the whole or part of the equipment if it does not comply with the Contract when installed on site.

In the event of the Principal's Representative being furnished with certified particulars of tests on materials or equipment which have been carried out for the Contractor by his suppliers, the Principal's Representative may, at his discretion, waive the witnessing of such tests.

Unless otherwise approved, equipment must not be dispatched from the Contractor's works to site (or from a Sub- Contractor's works to the site), until it has been inspected by the Principal's Representative and the appropriate release certificate has been issued.

The costs of all tests, unless specifically stated otherwise in the Contract, must be borne by the Contractor.

16 COMMISSIONING

16.1 PRE-COMMISSIONING (UNWITNESSED)

Pre-commission all equipment supplied under the Contract to ensure that it is operating without fault and that it conforms to the specification.

At least two (2) weeks prior to commencing pre-commissioning furnish the Principal's Representative with a programme for the pre-commissioning and checklists for testing the Contract equipment.

On completion of pre-commissioning and at least one (1) week prior to commissioning, submit a report to the Principal's Representative confirming that the Contract equipment has been tested, is fully operational and in accordance with the specification. Submit completed checklist and test results with the report.

The commissioning will commence two weeks from the date that the pre-commissioning report is received.

The scope of the pre-commissioning tests is to encompass the following:

Radio Repeater

- Check suitability of supply voltage.
- Check battery charge voltage.
- Check antenna installation (SWR test)
- Measure fade margin of radio signals.
- Check battery voltage during 4 hour power outage

Central and Remote Monitoring Facilities

- Check operation of mains and UPS power supplies
- Monitor and analyse radio communications to outstations over a 48 hour period.

- Check and analyse data base entries over a 48 hour period of operation.
- Check alarm log over a 48 hour period to ensure that all alarms are real. Diagnose and rectify any communication alarms or false alarms.
- Check interrogation of CMF and RMF from portable computer.

System Test

Ensure that system runs fault free for at least 48 hours before making arrangements for commissioning.

16.2 COMMISSIONING

Commissioning of the data acquisition and control system must commence only after successful completion of pre-commissioning. Upon successful completion of pre-commissioning give the Principal's Representative written notification of the commencement date for commissioning.
On notification of the date for commissioning the Principal's Representative will arrange for specialist personnel to witness the performance of the system for part or all of the commissioning period.
The works required during commissioning will include:

- testing of the monitoring functions
- testing of the control functions
- testing of the logging functions
- demonstrating that the system is fully operational, in full working order and that it complies with the requirements of the Contract.

Commissioning must be complete when the whole of the Works has run continually without fault for a period of seven (7) consecutive days. If, during this period, any fault occurs the fault must be rectified and the commissioning period must recommence and run for a further seven days.

In the event of unsuccessful commissioning, full costs of any repeated attempts must be borne by the Contractor, including the costs of the Principal's Representative and any of his specialist personnel that are required to be present.

16.3 POST- COMMISSIONING

Arrange the following post commissioning activities with the Principal's Representative.

A two days site visit by the Contractor, six (6) months after the date of Practical Completion, to review the performance of the data acquisition and control system. Report on any system defects within fourteen (14) days after the site visit and provide a program for their rectification.

A two days site visit by the Contractor, eleven (11) months after the date of Practical Completion, to review the performance of the data acquisition and control system. Report on any system defects within fourteen (14) days after the site visit and provide a program for their rectification.

16.4 CONTRACTOR' S PERSONNEL

During commissioning and post-commissioning the Contractor must have on site technical personnel familiar with the various electrical, electronic, communication and software aspects of the Contract.

17 TRAINING

17.1 SCOPE

Conduct a two and a half (2 1/2) day training course on-site for Council's operations and maintenance staff. Structure the course in two parts.

Part 1

Commence part 1 of the course during commissioning of the system. This part is required to give the trainees an introduction to the system and must have a minimum duration of 4 hours.

Provide course notes that can be used to reinforce the training course.

Part 2

Commence part 2 of the course three weeks after successful commissioning of the system.

Plan the course around a structure similar to the following:

- Procedure to access collected and derived data provided by the CMF software package.
- Procedure for alarm acknowledgment from the CMF and RMF.
- Receipt and acknowledgment of alarm messages delivered via mobile phone.
- Remote access to CMF and RMF data via the portable monitoring equipment.
- Tuition in the operation of control loops and procedures to alter control setpoints.

Provide course notes that can be used to reinforce the training course.

17.2 DOCUMENTATION

Provide all relevant training aids and course notes. The Operation and Maintenance Manuals must be explained and used in the training course.

The Principal will be free to use without restriction or extra costs, information, documentation and other training aids used on any of the Contractor's training courses in his own subsequent training courses. In addition, the Principal reserves the right to videotape (and retain tapes for internal training purposes) all training courses used by the Contractor in presentations to the Department.

END OF SECTION - TECHNICAL SPECIFICATION

4 SCHEDULES

ELECTRICAL SERVICES MINIMUM REQUIREMENT

The schedule of Electrical Services Minimum Requirements (MEW E101) is not attached to the specification. It can be obtained from the Contact Officer on request.

END OF SECTION - SCHEDULES

5 APPENDICES

Documents regarding the existing DAC system that include:

- Input/output monitoring signals at each site
- Telemetry RTU site summary
- Ballina STW inflow data daily report (3 OFF)
- Pump station level sensor