	<p>QUALITY MANAGEMENT SYSTEM</p> <p>SCOPE OF WORK RECOMMENDATION</p>	<p>Form No: SAM DO 00001 T</p> <p>Revision No: 01</p> <p>Effective Date: August 2019</p>
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DOCUMENT TITLE : SCOPE OF WORK RECOMMENDATION OF

**DESIGN, SUPPLY, DELIVERY, INSTALLATION, TESTING, COMMISSIONING AND PUT INTO
OPERATION OF THE NEW BASE RADIOS FOR OPERATIONS AND RISK CONTROL AT ALL
SITES**

PROJECT NUMBER : P.04112


RECORD OF SCOPE OF WORK REVISIONS: 0

Date	Revision Number	Description of Each Revision
14/06/2020	A	Scope of Work


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1 PROJECT JUSTIFICATION

1.1 BACKGROUND INFORMATION

This project will focus on the upgrade of the current radio communication system in Rand Water. The radio communication system is critical to Rand Water daily running of the business. Rand Water Radio Communication Network uses analog communication technology which consists of two systems, system one caters for Operations and system two caters for the Risk Control/ Protective Services. The heart of the Operations communication system is at Forest Hill and Akasia Reservoirs in Rosslyn Pretoria. Both systems at Forest Hill and Akasia uses the Link Repeater Radio Systems to cover the Gauteng, parts of Mpumalanga, the Free State, and North West provinces in terms of communication. The Link Repeater Radio System is a system that help us to cover more distance in terms of communication and it transmit in one frequency and receive in a different frequency, this system allows us to communicate from head office to any Rand Water site. The Link Repeater Radio System in Forest Hill transmits to Akasia Link Repeater Radio System it also transmit to the main base station radios in Central Depot and Head office the rest of Rand Water sites use base station, mobile and handheld radios to communicate on this network.

The second Link Repeater Radio system caters for Risk Control/ Protective Services communication system. The heart of this system is at Forest Hill. The Link Repeater Radio System in Forest Hill transmits to the main base station radios in Central Depot and Head office the rest of Rand Water sites use base station, mobile and handheld radios to communicate on this network. Icasa requires that all analog communication systems migrate to digital communication systems. The replacement of radio communication systems is a critical success factor for this project.

1.2 PROBLEM STATEMENT

The need for Project SABRE (South African Band Re-planning Exercise) emerged over a period of time, in response to factors such as the increased demand for radio spectrum and development elsewhere in the world that could potentially benefit South Africa. Apart from the fact that our radio communication equipment is old the Project SABRE compels us to migrate from analog communication system to digital communication system (see Government Gazette No. 41164_6_10, notice 781 of 2017)

2 SCOPE OF WORK


2.1 Automation Scope of work

2.1.1 Forest Hill

2.1.1.1 Operations

2.1.1.1.1 The Automation Scope of work for the design, manufacturing, supply, delivery, installation, configuration, testing and commissioning of the Forest Hill Depot shall include:

- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely one (1) new latest generation Link Repeater Radio System in Forest Hill Depot complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new Link Repeater radio panel complete with all ancillary items.

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- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely one (1) 10A, 230VAC new power supply complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new Link Repeater radio antenna system complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely earthing system to all the equipment installed.


2.1.1.2 Risk Control/ Protective Services

- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely one (1) new latest generation Risk Control/Protective Services Link Repeater Radio System complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely one (1) new Link Repeater radio panel complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely one (1) 10A, 230VAC new power supply complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new Risk Control/Protective Services Link Repeater radio antenna system complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely earthing system to all the equipment installed.

2.1.2 Akasia Reservoir Rosslyn Tshwane Municipality

2.1.2.1 Operations

- Perform Radio Predictions to determine the position of the Radio masts and radio signal coverage.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely one (1) new latest generation Link Repeater Radio System in Akasia Reservoir complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new Link Repeater radio panel complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely one (1) 10A, 230VAC new power supply complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely and install new Link Repeater radio antenna system complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely earthing system to all the fixed equipment installed.

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2.1.3 Head Office

2.1.3.1 Operations


- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely one (1) new latest generation main Base Station Radio in Head Office Radio Tower complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio panel complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely one (1) 10A, 230VAC new power supply complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely and install new radio antenna system complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely and install one (1) new Base Station Radio complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely and install one (1) new Radio panel complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely one (1) 10A, 230VAC new power supply complete with all ancillary items.

Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely and install new radio antenna system complete with all ancillary items.

- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely earthing system to all the fixed equipment installed.

2.1.3.2 Risk Control/ Protective Services

- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely one (1) new latest generation main Base Station Radio in Head Office Radio Tower complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio panel complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely one (1) 10A, 230VAC new power supply complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely and install new radio antenna system complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely earthing system to all the fixed equipment installed.

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2.1.4 Central Depot

2.1.4.1 Operations

- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely one (1) new latest generation main Base Station Radio in Central Depot complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio panel complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely one (1) 10A, 230VAC new power supply complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely and install new radio antenna system complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely earthing system to all the fixed equipment installed.


2.1.4.2 Risk Control/ Protective Services

- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely one (1) new latest generation main Base Station Radio in Head Office Radio Tower complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio panel complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely one (1) 10A, 230VAC new power supply complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely and install new radio antenna system complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely earthing system to all the fixed equipment installed

2.1.5 Zuikerbosch Pumping Station

2.1.5.1 Operations

- Perform Radio Predictions to determine the position of the Radio masts and radio signal coverage.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely one (1) new radio communication masts/ tower at Zuikerbosch Pumping Station.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely one (1) new latest generation Base Station Radio complete with all ancillary items.

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- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely one (1) 10A, 230VAC new power supply complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio panel complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely and install new radio antenna system complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely earthing system to all the fixed equipment installed.


2.1.5.2 Risk Control/ Protective Services

- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely one (1) new latest generation Base Station Radio complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely one (1) 10A, 230VAC new power supply complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio panel complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely and install new radio antenna system complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely earthing system to all the fixed equipment installed.

2.1.6 Palmiet Pumping Station

2.1.6.1 Operations

- Perform Radio Survey and spectrum analysis to determine the position of the Radio masts and radio signal coverage.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely one (1) new latest generation Base Station Radio complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely one (1) 10A, 230VAC new radio power supply complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely one (1) new radio panel complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely and install new radio antenna system complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely earthing system to all the fixed equipment installed.

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2.1.6.2 Risk Control/ Protective Services

- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely one (1) new latest generation Base Station Radio complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely one (1) 10A, 230VAC new radio power supply complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely one (1) new radio panel complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely and install new radio antenna system complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely earthing system to all the fixed equipment installed.


2.1.7 Vereeniging Pumping Station

2.1.7.1 Operations

- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation Base Station Radio complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio power supply complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio panel complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation mobile radios complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation hand held radios complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely and install new radio antenna system complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely earthing system to all the fixed equipment installed.

2.1.7.2 Risk Control/ Protective Services

- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation Base Station Radio complete with all ancillary items
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio power supply complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio panel complete with all ancillary items.

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- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation mobile radios complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation hand held radios complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio antenna system complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely earthing system to all the fixed equipment installed.


2.1.8 Bloemendal Pumping Station

2.1.8.1 Operations

- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation Base Station Radio complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio power supply complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio panel complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation mobile radios complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation hand held radios complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely and install new radio antenna system complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely earthing system to all the fixed equipment installed.

2.1.8.2 Risk Control/ Protective Services

- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation Base Station Radio complete with all ancillary items
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio power supply complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio panel complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation mobile radios complete with all ancillary items.

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- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation hand held radios complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio antenna system complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely earthing system to all the fixed equipment installed.


2.1.9 Zwartkopjes Pumping Station

2.1.9.1 Operations

- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation Base Station Radio complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio power supply complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio panel complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation mobile radios complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation hand held radios complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely and install new radio antenna system complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely earthing system to all the fixed equipment installed.

2.1.9.2 Risk Control/ Protective Services

- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation Base Station Radio complete with all ancillary items
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio power supply complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio panel complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation mobile radios complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation hand held radios complete with all ancillary items.

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- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio antenna system complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely earthing system to all the fixed equipment installed.


2.1.10 Roodepoort Pumping Station

2.1.10.1 Operations

- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation Base Station Radio complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio power supply complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio panel complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation mobile radios complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation hand held radios complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely and install new radio antenna system complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely earthing system to all the fixed equipment installed.

2.1.10.2 Risk Control/ Protective Services

- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation Base Station Radio complete with all ancillary items
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio power supply complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio panel complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation mobile radios complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation hand held radios complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio antenna system complete with all ancillary items.

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- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely earthing system to all the fixed equipment installed.

2.1.11 Lethabo Pumping Station


2.1.11.1 Operations

- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation Base Station Radio complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio power supply complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio panel complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation mobile radios complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation hand held radios complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely and install new radio antenna system complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely earthing system to all the fixed equipment installed.

2.1.12 Libanon Pumping Station

2.1.12.1 Operations

- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation Base Station Radio complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio power supply complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio panel complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation mobile radios complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation hand held radios complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely and install new radio antenna system complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely earthing system to all the fixed equipment installed.

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2.1.12.2 Risk Control/ Protective Services

- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation Base Station Radio complete with all ancillary items
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio power supply complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio panel complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation mobile radios complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation hand held radios complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio antenna system complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely earthing system to all the fixed equipment installed.


2.1.13 Eikenhof Pumping Station

2.1.13.1 Operations

- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation Base Station Radio complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio power supply complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio panel complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation mobile radios complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation hand held radios complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely and install new radio antenna system complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely earthing system to all the fixed equipment installed.

2.1.13.2 Risk Control/ Protective Services

- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation Base Station Radio complete with all ancillary items

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- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio power supply complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio panel complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation mobile radios complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation hand held radios complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio antenna system complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely earthing system to all the fixed equipment installed.


2.1.14 Mapleton Pumping Station

2.1.14.1 Operations

- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation Base Station Radio complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio power supply complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio panel complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation mobile radios complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation hand held radios complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely and install new radio antenna system complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely earthing system to all the fixed equipment installed.

2.1.14.2 Risk Control/ Protective Services

- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation Base Station Radio complete with all ancillary items
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio power supply complete with all ancillary items.

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- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio panel complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation mobile radios complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation hand held radios complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio antenna system complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely earthing system to all the fixed equipment installed.


2.1.15 Amanzimtoti Pumping Station

2.1.15.1 Operations

- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation Base Station Radio complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio power supply complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio panel complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation mobile radios complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation hand held radios complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely and install new radio antenna system complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely earthing system to all the fixed equipment installed.

2.1.15.2 Risk Control/ Protective Services

- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation Base Station Radio complete with all ancillary items
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio power supply complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio panel complete with all ancillary items.

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- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation mobile radios complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation hand held radios complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio antenna system complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely earthing system to all the fixed equipment installed.


2.1.16 Barrage Pumping Station

2.1.16.1 Operations

- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation Base Station Radio complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio power supply complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio panel complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation mobile radios complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation hand held radios complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely and install new radio antenna system complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely earthing system to all the fixed equipment installed.

2.1.16.2 Risk Control/ Protective Services

- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation Base Station Radio complete with all ancillary items
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio power supply complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio panel complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation mobile radios complete with all ancillary items.

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- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation hand held radios complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio antenna system complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely earthing system to all the fixed equipment installed.


2.1.17 Panfontein Pumping Station

2.1.17.1 Operations

- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation Base Station Radio complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio power supply complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio panel complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation mobile radios complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation hand held radios complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely and install new radio antenna system complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely earthing system to all the fixed equipment installed.

2.1.17.2 Risk Control/ Protective Services

- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation Base Station Radio complete with all ancillary items
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio power supply complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio panel complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation mobile radios complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation hand held radios complete with all ancillary items.

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- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio antenna system complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely earthing system to all the fixed equipment installed.


2.1.18 Control Works

2.1.18.1 Operations

- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation Base Station Radio complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio power supply complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio panel complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation mobile radios complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation hand held radios complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely and install new radio antenna system complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely earthing system to all the fixed equipment installed.

2.1.18.2 Risk Control/ Protective Services

- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation Base Station Radio complete with all ancillary items
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio power supply complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio panel complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation mobile radios complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation hand held radios complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio antenna system complete with all ancillary items.

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- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely earthing system to all the fixed equipment installed.

2.1.19 Vaal Dam

2.1.19.1 Operations

- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation Base Station Radio complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio power supply complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new radio panel complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation mobile radios complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely new latest generation hand held radios complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely and install new radio antenna system complete with all ancillary items.
- Design, Supply, Deliver, Offload, Install, Terminate, Test and Commission Safely earthing system to all the fixed equipment installed.

2.2 Electrical Scope of Work


The Electrical scope of work for the new Base Radios for Operations and Risk Control/ Protective Services at various sites shall include design, manufacture, supply, deliver, install, commission, and putting into service of all electrical equipment, but not limited to the following:

2.2.1 Forest Hill

- 2.2.1.1 Replace upstream circuit breaker supplying the distribution board located in the radio mast equipment building.
- 2.2.1.2 A complete new distribution board to supply all the Automation equipment, small power and Lighting, etc.
- 2.2.1.3 New small power and Lighting in the existing radio mast equipment building.
- 2.2.1.4 Decommission existing distribution board, small power and Lighting, cables, and other damaged or obsolete electrical equipment that are associated with the radio mast equipment building.

2.2.2 Akasia Reservoir Rosslyn Tshwane Municipality

- 2.2.2.1 Replace upstream feeder cable supplying the new distribution kiosk located outside the

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radio mast equipment building.

2.2.2.2 A complete new distribution kiosk to supply all the Automation equipment, small power and Lighting, etc.

2.2.2.3 A complete new distribution board located inside the building to supply all the Automation equipment, small power and Lighting, etc.

2.2.2.4 New small power and Lighting in the existing communication room.

2.2.2.5 Service detection to be completed where the distribution kiosk and low voltage cables are to be installed.

2.2.2.6 Decommission existing distribution kiosk and other damaged electrical equipment that are associated with the radio mast equipment building.

2.2.3 **Rietvlei Base Station (Rand Water Head Office)**

2.2.3.1 Replace upstream feeder circuit breaker supplying the new distribution board located at the radio mast equipment building.

2.2.3.2 A complete new LV distribution board to supply all the Automation equipment, SP&L, etc.

2.2.3.3 New small power and Lighting in the existing radio mast system building.

2.2.3.4 Decommission all damaged electrical equipment that are associated with the radio mast equipment building.

2.2.4 **Various Pumping Stations mentioned under Automation Scope**

2.2.4.1 Replace upstream circuit breaker and feeder cables supplying the Automation panels or Automation equipment at Central Depot, Palmiet, Zuikerbosch, etc.

2.2.5 **Miscellaneous Applicable at All Sites**

2.2.5.1 DIN rail mounted Uninterruptable Power Supply unit to be installed in the Automation Panel to feed automation equipment as a minimum at all sites.

2.2.5.2 Solar panel to be considered for sites where power supply from existing infrastructure is a challenge.


2.2.5.3 Earthing and lightning protection of the installation at all sites.

2.2.5.4 Local lighting of the installation at all sites, if required.

2.2.5.5 Service detection to be completed where the feeder cables are installed.

2.2.5.6 SABS approved PVC sleeves where roads will be crossed.

2.2.5.7 All low voltage power, control, earthing cables and associated termination kits to all electrical equipment.

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2.2.5.8 Testing and commissioning of the entire installation at all sites.

2.2.5.9 Supply COC at all sites.

2.2.5.10 Update and supply all the necessary project documentation such as drawings, operations and maintenance manuals for each site.

2.3 Architecture Scope of Work

2.3.1 Akasia Reservoir

- Existing external Face brick, internal plastered kiosk approx. 9m2 with concrete roof

2.3.1.1 Operations

2.3.1.1.1 The Architecture scope of work for the new Base Radios for Operations and Risk Control/ Protective Services at all sites shall include design, supply, deliver, offload, install, terminate, test and commission safely but not limited to the following:


- Provide a new high security fence with gate and high security locking mechanism to enclose the existing structure and mast to approx. 5.0M from the existing structures
- Clean up and make good the existing overgrown vegetation within the new fenced enclosure.
- Remove existing damaged “vault” door and fit new externally rated, high security vault door with appropriate high security & vandal proof locking mechanisms
- Make good all externally damaged portions of the existing brickwork structure and conc. roof to match.
- Refurbish and make good the plastered & painted internal portion of the structure and ceiling.
- Provide new high security galv. steel mesh or steel plating to inside of the existing structure. (Suitability of said steel security feature to be commented on with specific reference to interference of the base radio station plant)
- Clad new security „mesh/plate” with single skin painted drywall. Provide suitable bracing for all required plant & equipment.

2.3.2 Forest Hill Reservoir -

- Existing external Face brick structure with painted & plastered band at high level approx. 51m2 with concrete roof as well as sheet metal roof to the Equipment store. Internally plastered & painted structure comprising Radio Room, Battery Room, Oil store & Equipment Store.

2.3.2.1 Operations and Risk Control/ Protective Services

- Make good all externally damaged portions of the entire existing external brickwork structure, refurbish plaster band to match & refurbish & renovate existing conc.& steel roofs to match,

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- Remove existing timber door to existing Radio room and replace with new high security steel door and gate to match exist kiosk on same site.
- Refurbish and make good the plastered & painted internal portion of the radio room and ceiling. (approx. 3.0 x 3.5M)
- Provide new high security galv. steel mesh or steel plating to inside of the existing structure. (Suitability of said steel security feature to be commented on with specific reference to interference of the base radio station plant)
- Clad new security „mesh/plate“ with single skin painted drywall. Provide suitable bracing for all required plant & equipment.

2.3.3 Palmiet Pump Station

- Existing Face brick/plastered enclosure inside Engine Room 2.

2.3.3.1 Operations and Risk Control/ Protective Services

- Make good the existing equipment room refurbish & renovate to match.

2.3.4 Rietvlei Base Station Radio Kiosk

- Existing external & Internal Face brick, kiosk approx. 9m2 with concrete roof enclosed with a steel palisade fence.

2.3.4.1 Operations and Risk Control/ Protective Services


- Clean up and make good the existing overgrown vegetation within the existing fenced enclosure.
- Make good all internal & external damaged portions of the entire existing brickwork structure
- Refurbish and make good all components of the existing structure ad roof, ie door, winblocks etc.
- Provide new high security galv. steel mesh or steel plating to inside of the existing structure. (Suitability of said steel security feature to be commented on with specific reference to interference of the base radio station plant)

2.3.5 Zuikerbosch WA1 Radio Base Station Radio

- Existing Face brick/plastered enclosure inside Engine Room 1

2.3.5.1 Operations and Risk Control/ Protective Services

- Provide a new face brick structure with conc. roof & high security doors a mesh/plate to be located at a position still to be determined in the vicinity of the current location
- The new building must be fit for its intended purpose.

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- It will incorporate high quality materials, fittings and furnishings to match Rand Water's existing Architectural standards.
- The base radio station kiosk shall comprise of a 230 Clay Face brick wall internal & external, to Architects approval, and a reinforced conc roof to Engineers detail. It shall have an inner security steel mesh sandwiched between the 2 skins of brickwork to provide further security. It shall have an externally rated high security vault type door and locking mechanisms.
- Interference from the steel security mesh is to be investigated and commented on, relevant to the plant requirements.
- The building is to be adequately sized to accommodate to the base radio & ancillary gear requirements as specified elsewhere. (approximately 8m² - 2.2 x3.2)
- Site Location, Plans, Sections, Elevations, & Finishes of the completed structure must be detailed and sized to accommodate the required plant and immediate surrounds.
- Architectural drawings are to be coordinated with the civil & small power & lighting requirements as well as all plant & client requirements
- All Architectural work to comply to relevant NBR and local municipal bye laws.
- All construction work needs to be according to all applicable SANS 10400 & SANS 10525 specifications and Rand Water technical specifications.
- The new base radio kiosk will be equipped as per Architectural, Civil, Electrical and Mechanical contractor's drawings, schedules and specifications. Construction materials used for the building will be as per the specifications provided within the drawings & shall be constructed as per specifications and construction drawings.
- Incoming and outgoing cables and peripherals are to be sleeved with "Roxtec "or similar approved cable sleeve glands.

2.4 Civil Scope of Work

2.4.1 Akasia Reservoir

2.4.1.1 Operations

- The proposed Civil scope of work shall include, but not be limited to the following:
- Design, supply, delivery, installation of communication masts (with internal cable conduit and removable cat ladders).
- Designing of insitu concrete base for telecommunication masts and kiosks.
- Designing of earthworks for the founding system.
- Geotechnical soil investigation and classification studies, detection and protection of existing services on the sites.


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- Clearing and preparing of sites.
- Soil excavation and earthworks.
- Construction of foundations, kiosks and installation of masts.
- Disposal of surplus material.
- Reinstatement and making good of sites.

2.4.2 Palmiet Pumping Station

2.4.2.1 Operations and Risk Control/ Protective Services

- Design, supply, delivery, installation of communication masts (with internal cable conduit and removable cat ladders).
- Designing of insitu concrete base for telecommunication masts and kiosks.
- Designing of earthworks for the founding system.
- Geotechnical soil investigation and classification studies, detection and protection of existing services on the sites.
- Clearing and preparing of sites.
- Soil excavation and earthworks.
- Construction of foundations, kiosks and installation of masts.
- Disposal of surplus material.
- Reinstatement and making good of sites.
- Zuikerbosch Pumping Station
- Operations and Risk Control/ Protective Services
- Design, supply, delivery, installation of communication masts (with internal cable conduit and removable cat ladders).
- Designing of insitu concrete base for telecommunication masts and kiosks.
- Designing of earthworks for the founding system.
- Geotechnical soil investigation and classification studies, detection and protection of existing services on the sites.
- Clearing and preparing of sites.
- Soil excavation and earthworks.

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- Construction of foundations, kiosks and installation of masts.
- Disposal of surplus material.
- Reinstatement and making good of sites.

3 PROJECT ASSUMPTION AND DESIGN DATA

The following project assumptions have been made:

1. Soil characteristic are not favourable in almost all Rand Water sites including Tshwane Municipality for all electrical cables.
2. Line of Site is favourable in Rand Water and Tshwane Municipality sites and this is indicated in the radio spectrum analysis and survey report that was done for the existing Radio Communication system.
3. Mobile Signal coverage available via the Link Repeater Radio System.
4. Power source is available in all Rand Water and Tshwane Municipality sites.
5. Vandalised power sources Akasia Reservoir site will be reinstated.
6. Security personnel available in almost all Rand Water sites except in Akasia Reservoir. High theft risk in Akasia Reservoir - Tshwane Municipality site.

4 OPERATING AND CONTROL PHILOSOPHY

The operation of this communication system is achieved by using Radio Link Technology. One radio link system is placed in Forest Hill and the other radio link system is placed in Akasia Tshwane Reservoir providing communication.

5 PROJECT OBJECTIVES


The purpose of this project is to enable communication between Operations staff and between Risk Control/ Protective Services staff in carrying their daily duties.

6 PROJECT CONSTRAINTS

- Relocation of Radio masts
- Service detection is a major constraint for the project
- Cable installation distances and constraint excavation routes
- High Vandal Risk
- High lightning risk
- Lack off effective existing perimeter fence at Akasia Reservoir (Tshwane Municipality)

7 PROJECT IMPLEMENTATION PLAN

The following is the proposed implementation plan to be completed by the successful contractor for the scope of the works:

	QUALITY MANAGEMENT SYSTEM <ul style="list-style-type: none"> Perform Radio Predictions and spectrum analysis to determine the position of the Radio masts and signal coverage Perform Geo-technical services 	Form No: SAM DO 00001 T Revision No: 01 Effective Date: August 2019
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- Perform service detection.
- Protection of existing services on site
- Soil Investigations
- Design the Radio masts/ tower concrete structure and approve
- Design the Radio communication network for Operations and approve
- Design the Radio communication network for Risk Control/ Protective Services and approve
- Install the Automation Design (Radio Repeater Link Systems, Main Base Station Radios, Base Station Radios, Mobile Radios, Radio Masts, Radio Kiosks, Radio Panels, Cables, Antenna cables, etc.) according to the approved Automation designs
- Install the Electrical Design- according to the approved Electrical designs.
- Construct the radio kiosks for radio equipment in Head Office, Akasia Reservoir, Zuikerbosch and Palmiet Pumping Stations and approve
- Perform the Factory Acceptance Testing according to the Electrical and Automation design,
- Perform Cold Commission after full construction and installation is completed
- Perform Hot Commission for the entire Radio communication systems.
- Compile documentation (As-built drawings, O&M Manuals) for Automation, Architecture, Electrical and Civil designs
- Handover the completed Radio Communication Systems to Operations and Risk Control/ Protective Services based on the accepted commissioning performed to the client.