



South African Site Information & Instructions : SKA1 MID: Part B – Site Instructions

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1 Introduction

The Square Kilometre Array (SKA) project is an international effort to build the world's largest radio telescope. The scale of the SKA represents a huge leap forward in both engineering and research & development towards building and delivering a unique instrument. As one of the largest scientific endeavours in history, the SKA will bring together a wealth of the world's finest scientists, engineers and policy makers to bring the project to fruition.

The Square Kilometre Array Observatory (SKAO) is one observatory, with two telescopes - one in Australia and the other in South Africa. The Headquarters of the SKAO is at Jodrell Bank, near Manchester, UK.

The South African Radio Astronomy Observatory (SARAO) is a National Facility of the National Research Foundation (NRF). The NRF has acquired land (through acquisition or servitude agreement) for the SKAO and is the license holder of all construction licenses. The MeerKAT Radio Telescope and its extension is an asset of SARAO until it is incorporated with SKA_Mid and handed over to the SKAO. The SKAO is responsible for construction of SKA_Mid in South Africa and shall comply with all South African legislation and SARAO Policies described in Section 6 as well as the SKAO's policies, procedures and management plans.

The Karoo region of South Africa provides the perfect radio-quiet backdrop for the high and medium frequency arrays that will form a critical part of the SKA's ground-breaking continent-wide telescope.

South Africa is already host to KAT 7, MeerKAT, HERA AND HIRAX radio telescopes on the site, with MeerKAT and HERA serving as precursors to the SKA radio telescope.

The MeerKAT radio telescope commenced with scientific observations in 2019 and will be integrated during the latter part of construction of SKA_Mid. The scope of SKA_Mid includes the addition of up to 133 dishes and associated infrastructure with construction expected to commence in 2022. The SKA telescope is expected to operate for 50 years.

The SKA_Mid Project will conduct observations in many exciting areas of science, such as gravitational waves, pulsars, and will search for signatures of life in the galaxy. It will provide a jump in capability, providing 4 times more resolution and 5 times more sensitivity than the JVLA, the current best telescope at similar frequencies. Additionally, it will be able to map the sky 60 times faster.

1.1 Purpose of the Document

The purpose of this document is to provide Site Information (Part A) and Site Instructions (Part B) for the SKA_Mid Project. To do so, the document has been prepared in two parts:

SKA-TEL-SKO-0001040: Part A: Site Information



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Part A is intended to provide an overview and general site information for all who travel to the site in South Africa to work or as a Visitor which includes Contractors.

This is also an introductory document for individuals, companies and organisations seeking to participate in procurement processes implemented for the SKA_Mid project and those who have secured contracts to provide products and services for the SKA_Mid project.

SKA-TEL-SKO-0001040: Part B: Site Instructions

Part B has been prepared to provide more detailed and specific information on obligations, requirements and instructions for Tenderers, Contractors and service providers.

Part A and Part B are intended to be read together and be mutually explanatory.

SKAO and its Contractors shall comply with all relevant South African legislation.

1.2 Scope of the Document

The scope of this document is to provide information on:

1.2.1. The location of the site in South Africa, main access routes to the site and transportation routes from major urban centres, airports and ports in South Africa (Part A); and

1.1.2. The environmental conditions that can be expected for people visiting or working at the site which includes detailed weather data, geotechnical, geohydrological, environmental, topographical and heritage information (Part A).

1.1.3. The obligations, requirements, policies and procedures that must be understood and complied with when travelling to, visiting or involved in construction or operational activities at the site (Section 6 of Part A & Part B).

1.3 Interpretation: “Visitor” and “Contractor”

The NRF is the owner of the land. SARAO is a National Facility of the NRF and its staff are responsible for the operation of the existing site and associated infrastructure. SARAO are not defined as Visitors or Contractors.

Pursuant to the ‘Memorandum of Understanding on Collaboration between the SKAO and the NRF regarding Principles of Collaboration on SKA-MID’, and the ‘Host Country Agreement between the SKAO and the Department of Science and Innovation’, SKA-Mid Project Personnel shall be afforded rights of access to SARAO properties and resources consistent with their needs and requirements to carry out the SKA project in South Africa.

The word “Visitor” may be used within this document to mean a person visiting the site in a non-working capacity but more often it is used as an all-encompassing term to mean anyone travelling to or present on the site in either a working or non-working capacity. For the sake of clarity, “Visitor” shall be understood to include:



- SKAO Visitors
- SKAO Project Consultants and Contractor personnel
- Guest Instrument Personnel and Visitors
- Guest Instrument Project Consultants and Contractor personnel
- Transport operators, service providers and others associated with the SKA_Mid Project or Guest Instruments.

“Contractor” has been used within this document to mean a company or person who is present on the site in a working capacity or providing a service associated with construction of the SKA_Mid Project or other Guest Instruments being constructed on site and who are not SKAO or SARAO Personnel. For the sake of clarity, “Contractor” where used shall be understood to include:

- Project Consultants and Contractor personnel
- People arriving at the site for the specific purpose of visiting a Contractor
- Transport operators (including bus charter companies, forklifts, cherry pickers, mobile cranes and any vehicles with on-board integrated lifting equipment)
- Suppliers, couriers and carriers delivering materials, goods and equipment
- Air charter companies/operators.

1.4 Limitation of Use

Before confirming arrangements and embarking on travel to the site for any purpose, Visitors, service providers, Contractors and personnel are advised to refer to this document and understand access protocols and to undertake their own investigations when seeking to understand travel, transportation and environmental conditions, regulations, policies, procedures, protocols and constraints that could have an impact on them or others for whom they may have a responsibility.



A References

A.1 Applicable Documents

The following documents are applicable to the extent stated herein. In the event of conflict between the contents of the applicable documents and this document, **the applicable documents** shall take precedence.

- [AD 1] SKA_MID Physical Configuration Coordinates, SKA.TEL-INS-0000537;
- [AD 2] Astronomy Geographic Area Advantage Act, Act No. 21 of 2007 & its Regulations
- [AD 3] National Environmental Management: Protected Areas Act, Act No. 57 of 2003
- [AD 4] SKA Organisation Health, Safety & Environmental Management Plan, SKA-TEL-SKO-0000740, J. Kerr
- [AD 5] SKA SA (SARAO) Health & Safety Policy, SSA-0008A-001
- [AD 6] Integrated Environmental Management Plan (IEMP) for SKA Phase 1 mid-frequency array (SKA1_MID) in South Africa, CSIR, 2017 and Rev1 version updated in 2018 and prepared by Gaea Enviro (Pty) Ltd;
- [AD 7] Occupational Health and Safety Act, Act No 29 of 1996 and its Regulations
- [AD 8] Mine Health and Safety Act, Act 29 of 1996 and its Regulations
- [AD 9] Compensation for Occupational Injuries and Diseases Act (Act 75 of 1997)
- [AD 10] South African Construction Regulations, 2014
- [AD 11] Road Traffic Act, Act No 29 of 1989
- [AD 12] Disaster Management Act, Act. No 57 of 2002
- [AD 13] National Environmental Management Act, Act. No 107 of 1998
- [AD 14] The South African Radio Astronomy Observatory Heritage Impact Assessment & Conservation Management Plan Project, Conservation Management Plan, Digby Wells Environmental, July 2018
- [AD 15] SKA EMI/EMC Standards, Related Procedures & Guidelines, SKA-TEL-SKO-0000202;
- [AD 16] SARAO Visitor Policy, SSA-0006A-001;
- [AD 17] SARAO Visitor Access Procedures: Johannesburg, HartRAO, Cape Town, Klerefontein Offices, SSA-0006B-002;
- [AD 18] Karoo Site Tour/Visitor Checklist, SSA-0006B-003;
- [AD 19] SARAO On-Site Rules & Procedures, SSA-0006A-001;
- [AD 20] SARAO Transport Policy, SSA-0000-0000-001;
- [AD 21] SARAO Procedure for Alcohol & Substance Abuse Control, SSA-0008B-003;
- [AD 22] SARAO Emergency Response Plan, SSA-0008C-002;
- [AD 23] SARAO Disaster Management Plan, SSA-0008C-007;
- [AD 24] SARAO Radio Frequency Interference Karoo Site Procedures, SSA-0008B-02464;
- [AD 25] SARAO RFI Zone Definitions for MeerKAT and SKA1, SSA-0008N-01A-001;
- [AD 26] Applying Telescope Protection Levels to Measurement Data, SSA-0008A-038;



- [AD 27] SARAO Guest Instrument Policy, SSA4100-0000-001
- [AD 28] SKAO HSE policy, SKA-GOV-0000063-01
- [AD 29] SSA-0018H-0C-01C-001 to SSA-0018H-0C-01C-038 - Boundaries of the site – NRF owned land
- [AD 30] SKA-GOV-0000014 ISMS Acceptable Use Policy For Users

A.2 Reference Documents

The following documents are referenced in this document. In the event of conflict between the contents of the referenced documents and this document, **this document** shall take precedence.

- [RD 1] GCS, Hydrogeological Investigation – Square Kilometre Array South Africa, Northern Cape, SKA-TEL-INSA-0010014 Rev 1;
- [RD 2] GCS, SKA1_MID Borrow Pits Investigation Report, SKA-TEL-INSA-0010009 Rev 1;
- [RD 3] LiDAR Survey Report, SGP2015_37, Rev 1;
- [RD 4] GCS, Flood Line Assessment Update for the Square Kilometre Array (SKA1) Project, Northern Cape, South Africa, SKA-TEL-INSA-0010013 Rev 4;
- [RD 5] GCS, Stormwater Management Plan & Water Balance for the South African Mid-Frequency Array SKA Phase 1 (Core), Ver 2, 10 May 2019;
- [RD 6] GCS, Factual Report for the Antenna Foundations for the Extension of the SKA1_MID Project, Northern Cape Province: Final, April 2018;
- [RD 7] Environmental Conditions for the SKA 1 Site South Africa document, 301-000000-009 Rev 02, H. Niehaus, A Peens-Hough
- [RD10] Screening Major Hazard Installation Risk Assessment of the Proposed Square Kilometre Array Site Complex near Carnarvon, Northern Cape, CSIR, Report Number R/16/CSIR-01 Rev 1, 7 August 2016
- [RD11] Critical Design Report (CDR) for the Water & Sanitation Sub-element, SKA-TEL-INSA-0004021 Rev 5, H. Hurter, 23 February 2021 and Water & Waste Water Design Demand, SKA-TEL-INSA-0004026 Rev 4, H. Hurter, 3 August 2021;
- [RD12] GCS, Stormwater Management Plan & Water Plan for the Visserskloof Contractor Camp, Ver 1, 30 June 2021
- [RD13] Antenna Foundation Sub-Element Detailed Design Report, DVP6: MeerKAT Extension 20 Dishes, 406-000003-GG-501-DDR – Zutari, June 2021 (Appendix B – Percussion Borehole logs & Appendix C – CSW test data results from additional investigations undertaken in May 2021)



LIST OF ABBREVIATIONS

AA0.5	SKA Array Assembly 0.5 (SKA early production array)
AAA	Astronomy Advantage Area
AD	Applicable Document
AGA Act	Astronomy Geographic Area Advantage Act, Act No. 21 of 2007
AGIS	Agricultural Geo-referencing Information System
CFP	Chance Find Protocol
CPF	Central Processing Facility
COC	Certificate of Compliance
COIDA COVID-19	Compensation for Occupational Injuries and Diseases Act 'Severe Acute Respiratory Syndrome Coronavirus 2' (SARS-CoV-2): causative agent of 'Coronavirus Disease 2019'
CMP	Conservation Management Plan
CS	Cultural Significance
DMP	Disaster Management Plan
DMR	Department of Mineral Resources
DMPC	Disaster Management Planning Committee
DRA	Disaster Risk Assessment
DSI	Department of Science and Innovation
DSTI	Daily Safe Task Instruction
DWS	Department of Water & Sanitation
ECC	Emergency Control Centre
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
EMPr	Environmental Management Plan
EMT	Emergency Management Team
EMS	Emergency Medical Services
ERAP	Emergency Response Action Plan
ERP	Emergency Response Plan
ESD	Electro Static Discharge
EWT	Endangered Wildlife Trust
HERA	Hydrogen Epoch of Reionization Array
HSE	Health, Safety, Environment
HSMP IDP	Health & Safety Management Plan Integrated Development Plan
IEC ISMS	International Environmental Conditions Information Security Management System



IUCN	International Union for Conservation of Nature
IWWMP	Integrated Water and Waste Management Plan
KAPB	Karoo Array Processor Building
KAT7	Karoo Array Telescope 7 (engineering prototype for MeerKAT)
KPI	Key Performance Indicator
LNA	Low Noise Amplifier
LTIFR	Lost Time Injury Frequency Rate
MeerKAT	MeerKAT Radio Telescope
MeerKAT+	MeerKAT Radio Telescope expansion – 16 dishes and infrastructure
MRS	Mobile Radio System
MSP	Managed Service Provider
NEMPAA	National Environmental Management Protected Areas Act, Act No. 57 of 2003
NKP	National Key Point
NRF	National Research Foundation
ODF	Optic Distribution Fibre
PDMC	Provincial Disaster Management Committee
PICC	Presidential Infrastructure Coordinating Committee
POP	Point of Presence
PORTNET	South African Ports Authority
PPE	Personal Protective Equipment
PrDP	Public Drivers Permit
PSIRSA	Private Security Industry Regulatory Authority
PTO	Planned Task Observations
RD	Reference Document
RFI	Radio Frequency Interference
RMF	Regional Maximum Flood
RSA	Republic of South Africa
RQM	Risk Quartile Matrix
RQZ	Radio Quiet Zone
SAHRA	South African Heritage Resource Authority
SANAS	South African National Accreditation System
SAPS	South African Police Service
SANParks	South African National Parks appointed by the National Research Foundation to manage the land owned by the NRF



SARAO	South African Radio Astronomy Observatory, a National Facility of the NRF who is responsible for the construction, operation and maintenance of the MeerKAT radio telescope prior to handover to the SKAO
SARAS	South African Radio Astronomy Standards
SAWS	South African Weather Service
SDF	Spatial Development Framework
SEA	Strategic Environmental Assessment
SIP	Strategic Integrated Project
SKA	Square Kilometre Array
SKA_Mid Project	SKA Phase 1 to be constructed in South Africa
SKAO	Square Kilometre Array Observatory (the Client)
SOC	Science Operations Centre
SOP	Standard Operating Procedure
SPOT	Satellite for Earth Observation (Satellite Pour l'Observation de la Terre)
SPC	Science Processing Centre
SRC	Science Regional Centre
SSA	State Security Agency
SWMP	Stormwater Management Plan
TBC	To be Confirmed
TBD	To Be Determined
TMP	Traffic Management Plan
TNA	Training Needs Analysis
UK	United Kingdom



DOCUMENT HISTORY

Revision	Date Of Issue	Engineering Change Number	Comments
A	2019-09-13	N/A	First draft for review
B	2020-07-15	N/A	Update based on OAR comments and release of draft Construction Proposal
01	2020-09-21	N/A	Update based on OAR comments received from 2 nd review
02	2021-09-15		Update based on working scenarios, corrections and updated SARAO policies issued (Annexures)

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PART B: SITE INSTRUCTIONS



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1 SITE CHECKLIST

Table 1 provides a Site Checklist of important aspects that shall be checked by Visitors and Contractors prior to accessing the site:

Table 1: Site Checklist

Item	Notification
Access	
Site Induction (and risk assessments)	5 working days
Site Indemnity Form	
National Key Point screening	20 working days
Site Access Identity Card	
Contractor Induction	
Driver's license	
Spiral Arm Access: Name of Contractors, list and number of staff, identity/passport numbers, contact details and types of vehicles/equipment that will be utilised by the Contractors & construction schedule	20 working days
RFI	
List of equipment & vehicles to be used	
RFI/EMC Control Plan	
RFI/EMC Test Results for vehicles & equipment	
RFI permits for vehicles	40 working days
RFI permits for equipment used for construction	40 working days
Permits & licenses	
Water & Waste Licenses	
Mineral Permit exemption for stone quarries & borrowpits	
DENC Permits (relocation of protected plant species)	
Way-leave agreements (rehabilitation of proclaimed roads) & overhead cable crossings)	
Way-leave agreements for borrowpits & stone quarries	



HSE	
Photographic evidence of baseline prior to start of construction	
EMPr, Method Statements	
H&S Plan, H&S File, Method Statements	
Disaster Management Plan & Emergency Response Action Plan	
Management & Rehabilitation Plan for Borrowpits & Stone Quarries	
Demarcation of work areas	
Declaration by NEC4 Project Manager	
Declaration by Contractor	
Environmental Control Officer acceptance of declarations and method statements	
Heritage	
Heritage Training	
Local Engagement	
Induction by SARAO stakeholder engagement team on local engagement & participation, introduction to local municipalities, stakeholders	
Low Frequency Communication Network (on site)	
Number of handheld and mobile devices required	40 working days
Management Plans All Management Plans as required in the Contract Data and SID, IEMP	
Method Statements All method statements as called for in the SID, IEMP & HSE Management Plan	



Notices/Signboards	
Contractor Signboards	14 working days after work area handed over
Vehicle branding	
Site Documentation (construction)	
Electrical connection to bulk connection at Contractor Camp	
Copy of Notice of adoption issued by Minister of Forestry, Fisheries & Environment	
Site Log Book (refer to Section 18.2 of this document) including instructions & incident reports	
Environmental Incident Log	
Copy of all permits and authorizations	
Copy of Environmental Officer & Environmental Control Officer Reports	
EMPr & Health & Safety File	
Complaints Register	
All RFI permits & Certificates of Compliance	

2 ACCESS TO THE SKA_MID SITE

General road access from cities across South Africa, International and Domestic Airports and Ports is described in **Annexure A** of this document.

All Visitors and Contractors seeking access to the site shall comply with the SARAO Policies and Procedures to maintain radio protection of the site, manage HSE, minimise disruptions to scientific observations being undertaken on the site and to ensure compliance to all legislation, policies and procedures.

2.1 First time visit – Site Induction

Prior to entering the site for the first time, all Personnel and Visitors including Contractors will be required to undergo a general SARAO/SKAO Site Induction. This induction will cover the aspects defined in this Site Information & Instructions document.

The Site Induction will take place at the Engineering Operations Centre (Klerfontein Support Base) and managed jointly by the SKAO Site Management Team working in collaboration with the SARAO H&S, Environmental and RFI teams. The SKAO Site Manager must be notified 5 working days in advance by first-time Site goers in order to arrange the Induction.

Confirmation of induction will be indicated on the Site Access Identity Card. Identity Cards should be collected at the nearest SARAO Office (Cape Town, Johannesburg or Klerfontein). These cards will be reissued on an annual basis. The Identity Card will indicate what zones of the site can be accessed by



Personnel and Visitors, confirmation of National Key Point clearance (excluding SKAO IGO staff who have privileges and immunities), COVID-19 Assessment (if required), SKAO/SARAO Site Induction and Contractor Site Induction.

Visitors will be required to sign SARAO Indemnity Forms which will be provided at the Site Induction.

First-time visitors to site who shall be using charter flights will be inducted by a SARAO Personnel at the charter flight terminal in Cape Town or Johannesburg or virtually through prior arrangement with SARAO.

Contractor specific Site Inductions cannot take place until the SKAO/SARAO Site Induction has been undertaken.

An electronic database will provide site induction status and flag where re-induction is required. Visitors will be notified through CEMAR where re-induction is required. A Site Induction is invalid if there is a material change in the induction information.

2.2 COVID-19 screening

All Personnel and Visitors accessing SARAO sites shall, as a minimum, complete the following COVID-19 screening form:

<https://apps.sarao.ac.za/ssa>

This application was developed by members of the SARAO Software team to assist the SARAO SHEQ division with the gathering of health information as stipulated by South African COVID-19 Regulations. Reference can be made to **Annexure D1** which provides further information on how to use the application.

The SKAO and SARAO will continually assess the implementation of the COVID-19 screening based on the South African COVID-19 Regulations, SKAO policies and procedures and the evolution of the pandemic. Accordingly, requirements for personnel and visitors may vary or change, perhaps at short notice.

2.3 Contractor Site Induction

Contractors must confirm that all Visitors have been through the Site Induction prior to any Contractor Site Induction taking place.

All Personnel and Visitors required or intend to visit the site for the purpose of meetings, inspections, discussions or testing of materials and equipment will undergo the Contractor Site Induction.



2.4 General Access

Personnel and Visitors, including Contractors, will be granted access to the site in accordance with SARAO Site Access Policies and Procedures defined in **Annexure C** and **Annexure H** of this document. Security personnel and the SARAO RFI Controls Officer/s have the authority to reject access to the site should there be non-compliances to the SARAO Policies and Procedures.

The National Key Points Regulations require security screening of any person before access can be granted to the SKA core site where access is gained through the SKA Site Complex (The SKA Site Complex is the National Key Point). This excludes SKAO staff who have privileges and immunities. The security screening is undertaken by the South African State Security Agency (SSA). This security screening must be undertaken prior to Visitor access / identification cards being issued by SARAO to allow access to the site.

Information must be submitted at least 20 working days prior to visiting/working on the site to the SARAO Chief Security Officer – email: apienaarmarais@ska.ac.za

Required information to be submitted:

- A summary sheet containing Full Name & Surname, ID Nr / Passport Nr and purpose for site visit or working on site
- Copy of South African Identification Document; or
- Copy of valid Passport
- Copy of valid visa/authorisation to work in South Africa

Security screening of all Visitors is required once a year. Visitors will be screened, and records will be kept if recurring visits happen in the same calendar year. Contractors will be managed as per contract with annual screening of contractor staff as required.

All persons (Personnel, Visitors, Contractors) will be issued with an SARAO site access identity card upon finalisation of screening which will indicate their screened status.

Persons may only access the site for duties and/or activities that primarily require a physical presence on the site. These activities include: construction, maintenance, land management, health, safety and environmental management, EMC/EMI Management and security.

No Visitors will be allowed access to the SANParks offices located at Swartfontein, unless approved by SARAO and SANParks.



2.5 Procedures for site Access by road

- i. There are controlled security boom gates at the entrance to the National Park (Swartfontein), at Meysdam and at the SKA Site Complex on Losberg;
- ii. All Personnel and Visitors including Contractors will be checked for the following:
 - Vehicles and equipment have RFI permits
 - Site Access Identity Cards
 - Driver's license
- iii. Alcohol and drug testing will be undertaken by the SARAO security officer;
- iv. Vehicles, equipment and deliveries will be spot checked (sniffer tests) for EMC/EMI compliance by the SARAO RFI Quality Officer;
- v. All vehicles will leave the site through the SKA Site Complex and sign-off at security upon departure.
- vi. Concessions will be assessed for specific activities which include the Mid Infrastructure 1 contractor utilizing haul roads in order not to damage existing roads during construction.
- vii. Whilst on the site, all Personnel and Visitors including Contractors shall be subject to their own organisational policies, rules and regulations at all times (including after normal working hours). Contravention of this shall be treated in terms of the relevant disciplinary procedures of the relevant organisations;
- viii. Each day the contractor shall notify the SKAO Site Manager of the work plans for the day at the Plan of the Day meeting, including their planned work force numbers, their locations and major equipment movements or deliveries.
- ix. At the end of each work day the contractor shall verify that all its personnel are accounted for, are safe and have left the work site and are at the approved accommodation facilities and are not elsewhere on the SKA site.

2.6 Procedures for Contractors staying at the Visserkloof Contractor Camp Area

These procedures apply to Contractors residing at the Visserkloof Contractor Camp Area and accessing the site on a daily basis:

- a. The Contractor Camp Area is accessed through the main gate to the Camp;
- b. Contractors shall proceed directly from the Contractor Camp Area through various security booms to the SKA Site Complex Security Gate (unless a concession has been obtained by the SKAO Site Management Team);
- c. The necessary security checks and alcohol and drug testing will be undertaken;
- d. All Contractors will be required to sign in at the SKA Site Complex security gate. Spot checks will be undertaken on vehicles and to check RFI permits. All vehicles will leave the site through the SKA Site Complex and



sign-off at security upon departure (unless a concession has been obtained).

2.7 Procedures for SRAO and SKAO staff accessing the site from the site Landing Strip

Only SRAO/SKAO chartered flights will be allowed to land on the landing strip on the site during construction unless written authorisation is obtained from SRAO. Flights shall only be allowed to land and depart at SRAO approved times which has been arranged with the SRAO Site Planning team (typically a Wednesday). The contracted charter company must comply with the Standard Operating Procedures (SOP) provided to them in terms of their appointment [Annexure Q].

2.8 Procedures for Contractors and Visitors chartering flights to the Karoo

Contractors or Visitors will not be allowed to utilize the site Landing Strip, unless for emergency purposes or if written authorisation is obtained from SRAO. The Carnarvon Aerodrome (gravel runways) can be used by Visitors including Contractors.

Charter companies must inform the Kareeberg Municipality (Tel: 053 382 3012) of a flight in order for them to check the condition of the runway and to ensure the gate is open upon arrival and departure. Low-level inspections are recommended to ensure no wildlife is on the runway. Security remains the responsibility of the air charter company, however the South African Police Service do undertake patrols when there are overnight aeroplanes on the apron. The runway has emergency lights and the use of the emergency lights must be arranged prior.

No ground transport is available, and all Visitors and Contractors must make prior arrangements with regards to ground transport.

The procedures for Site Access from the Carnarvon Landing Strip will be the same as defined in Section 3.1. – Procedures for Site Access from Urban Areas/Carnarvon.

2.9 Procedures for site Access to SKA Spiral Arms

All Personnel and Visitors including Contractors travelling from urban areas or Carnarvon to any of the 3 SKA Spiral Arms:

- a. Detailed travelling maps to access the 3 spiral arms will be made available to Personnel, Visitors including Contractors. These will be made available on the SKAO ALIM portal.
- b. SRAO is securing right of access to dishes and associated infrastructure in the 3 spiral arms via Servitude Agreement with landowners;



- c. The SKAO Site Management Team will issue the following information, to be provided by the Contractor, to landowners prior to accessing the spiral arms:
 - Name of Contractors, list and number of staff, identity/passport numbers, contact details and types of vehicles/equipment that will be utilised by the Contractors;
 - SKA_Mid construction schedule which indicates when construction activities will take place on individual farm portions and estimated duration of the works. Contractors are to provide this to the SKAO Site Manager 20 working days prior to access being required;
- d. The Contractor will be required to display the SKAO logo and Contractor's name/logo on vehicles. The Contractor shall be required to cost for these signs as part of the site establishment costs;
- e. Existing and new access roads located on privately owned land will have access gates which will be shared between the landowner and the SKAO.
- f. Shared gate principles:
 - Open gates: a gate that is open upon arrival of a Contractor will be closed unless there is a rock in front of the gate which indicates that the gate must be kept open.
 - Closed gates: Closed gates will be closed again after the Contractor has passed through the gates.
- g. Gate at entrance to antenna stations:
 - The SKAO MID Infrastructure 1 Contractor will be responsible for the construction of the access road, perimeter fencing and access gate around the station, raised platform, optic fibre and electrical distribution to the antenna and the dish foundation. The SKA Mid Infrastructure 1 Contractor will also be responsible for the provision of perimeter fencing around the optic fibre repeater stations in the spiral arms. The SKA Mid Infrastructure 1 Contractor will hand over the keys of the main access gate to the dish station and the repeater stations to the SKAO Site Manager upon completion of construction.
 - Other Contractors (e.g. Dish Contractor) will be handed a set of gate keys upon commencement of construction for the remaining Scope of Work. All keys must be handed back by the SKAO Contractor to the SKAO Site Manager upon completion of construction.
 - The SKAO Site Construction Director will report the completion of various stages of work at each dish station in each spiral arm to SARAo in order for the SARAo team to provide ongoing updates on progress and completion to individual landowners.
- h. Any landowner queries must be directed to the SKAO Site Manager or his/her Deputy who will notify SARAo accordingly.

2.10 Access to the Carnarvon Point of Presence (POP) Station

SARAo has a lease engagement with the Kareeberg Municipality to utilise the land at the Carnarvon POP Station. The POP is the interface between the SARAo-owned optic fibre link from the site to Carnarvon and the long-haul backbone from Carnarvon to Cape Town.



- a. Contractors requiring access to the Carnarvon POP station for SKA_Mid must contact the SKAO Site Manager to obtain a key;
- b. Should access only be required for a day, the key must be returned immediately after use to the SKAO Site Manager (the Contractor will be required to sign for the key). If longer term work is required at the POP Station, the Contractor shall keep the key to access the POP Station until work has been completed. Upon completion, the key will be returned immediately to the SKAO Site Manager.

3 SARAO Policies & Procedures

3.1 SARAO Visitors Policy

Reference can be made to **Annexure B**. This policy prescribes the conditions upon which any person that is not a SARAO employee shall be classified as a SARAO Visitor, and therefore be granted access, with or without condition to the SARAO (NRF) properties and resources.

Unless otherwise agreed by the SARAO Managing Director, non-compliance with any provision of this Policy shall result in the immediate rescindment of recognition as an SARAO Visitor, and all associated obligations, rights and privileges.

Pursuant to the 'Memorandum of Understanding on Collaboration between the SKAO and the NRF regarding Principles of Collaboration on SKA-MID', and the 'Host Country Agreement between the SKAO and the Department of Science and Innovation', SKA-Mid Project Personnel shall be afforded rights of access to SARAO properties and resources consistent with their needs and requirements to carry out the SKA project in South Africa.

The policy must be read in conjunction with the SARAO Visitors access procedures (**Annexure W**). Visitors must at all times display their Site Access Identity Card and signing of the Visitor Register shall be deemed as acceptance of all the relevant applicable SARAO policies, codes of conduct and rules. Visitors will be required to abide by general codes of conduct and health and safety regulations.

3.2 SARAO Karoo On-Site Rules & Procedures

Reference can be made to **Annexure C**. This set of rules applies to all Visitors including Contractors accessing land under the direct management and control of SARAO. The rules include:

- i. Site Security
- ii. Site Access
- iii. Accommodation
- iv. Health, Safety, Security, Quality and Environment
- v. Radio Frequency Interference
- vi. Vehicles
- vii. Alcohol, Narcotic Drugs, Firearms
- viii. House Rules and Signage
- ix. Delegation of Authority.



3.3 SARAO Health & Safety Policy & Plan

Reference can be made to **Annexure D and Annexure K**. This policy applies to all Personnel, Visitors including Contractors.

As the owner of the land, the SARAO Managing Director shall be accountable for Health and Safety and shall ensure the provision of appropriate resources and leadership for proper management of health and safety on the SKA site in terms of this policy.

3.4 SARAO Transport Policy

Reference can be made to **Annexure E**. This policy provides a framework for the management of all vehicles (whether owned or leased) and use of charter flights by SARAO staff, Visitors including Contractors to the site. The policy applies only to transportation requirements to and from the site –

- i. Flights between Carnarvon and the on-site landing strip, Lanseria and Cape Town;
- ii. Ground transportation between Carnarvon (including Klerefontein Engineering Operations Centre) and the site;
- iii. Ground transportation between Cape Town, Johannesburg and the site.

3.5 SARAO Procedure for Alcohol & Substance Abuse Control

Reference can be made to **Annexure F**. This procedure implements the policy provisions outlined in the SARAO Health & Safety Policy and prescribes the manner in which alcohol and substance abuse testing shall be undertaken at SARAO managed and controlled facilities and locations. The procedure is applicable to all Personnel, Visitors including Contractors who wish to enter onto SARAO(NRF) land.

3.6 SARAO Emergency Response and Disaster Management Plan

Reference can be made to **Annexure G**. The Emergency Response Plan (ERP) is based on a Disaster Risk Assessment (DRA) undertaken of the site, and the possible consequences of an emergency occurring as a result of those hazards.

The ERP defines the protocols and procedures for the safe and effective management of an emergency event occurring or threatening to occur on the site. All Employees, Contractors and Visitors are expected to follow the protocols and procedures outlined in the plan to maintain essential business services and operations during an incident or emergency situation, while providing for the protection of life, health and safety for all Employees,



Contractors and Visitors to the site. The plan includes the following SKA_Mid Site Emergency Actions:

- i. Emergency evacuation procedures;
- ii. Procedures to account for Employees, Contractors and Visitors after evacuation has been completed;
- iii. Search and Rescue and medical duties for those employees who are to perform them;
- iv. Procedures for reporting and responding to incidents / emergencies relating to identified hazards;
- v. Flood mitigation and response measures due to blocked drain lines or deluges;
- vi. Procedures for the restoration of power during a power failure; and
- vii. Procedures for the management of incidents.

3.7 SARAO Radio Frequency Interference Policies, Karoo Site Procedures, RFI Zones and Standards

Reference can be made to Section 13 below.

4 ACCESS TO EXISTING FACILITIES, SERVICES, ACCOMMODATION AND PROTECTION

Personnel, Visitors including Contractors shall respect the environment, heritage buildings and heritage findings on the site. Employees, Contractors and Visitors must remain within areas and corridors specified in construction documents and nominated in induction processes. No one will be allowed to visit, venture into, explore, interfere with or use existing facilities without prior approval by the SARAO and SKAO Site Management teams.

Visitors including Contractors may only use demarcated roads into a construction area or corridor and accessing adjacent construction areas or corridors. The SKA_Mid core area with the highest density of antennas is co-located with the MeerKAT radio telescope core. Common access roads will be utilised for the purposes of accessing MeerKAT, SKA_Mid and HERA (to an extent).

The existing accommodation at the SKA Site Complex and at the Klerefontein Engineering Operations Centre is not available for use by Contractors.

Contractors shall familiarise themselves with all the existing services on the site and shall determine the use of these services for the works, domestic and other project-related purposes. All known existing services shall be issued in the form of available as-built information to the Contractor by the SKAO, which Contractors must verify prior to the commencement of construction. The accuracy and completeness of existing service information shown on as-built or design drawings have not been confirmed. Contractors will therefore be



required to undertake the necessary physical verification and to proceed with caution in order to avoid any damage to existing services. The SKAO Site Management team in conjunction with the SARAO Site Management team will physically show all existing services to Contractors (but not held liable for information provided).

The Infrastructure Contractors responsible for roads, civil, electrical and structural works will be required to physically mark out as-built infrastructure on the Site through above-ground cables to demarcate routing. Any damage to existing infrastructure or services will be for the account of the Contractor who causes the damage.

Contractors shall not commence work in any area until proper arrangements have been made with SARAO and the SKAO for the supervision or witnessing of work (as required in the specific contract or by legislation or regulation) by the relevant authority. After the Contractor has been granted access or partial access to Site, the Contractor shall have the contact numbers of the SKAO Site Management Team prominently displayed in Contractors' site offices, preferably near the telephone or radio as part of site establishment.

The SKAO Site Management Team and SARAO Site Management Team shall be responsible for coordinating multiple Contractor efforts and coordination within existing facilities.

Wherever a Contractor is accessing existing infrastructure/assets, that Contractor shall abide by any local rule or notice that is clearly displayed.

Contractors will require access to existing facilities and infrastructure on the site to undertake their work. Further information is provided in the section below:

4.1 Access to the Central Processing Facility (CPF)

The CPF is located at the SKA Site Complex and is co-located with the Power Facility. The CPF consists of the shielded Data Rack Area; Control Room; Maser Room; HVAC service passage and Optic Distribution Fibre (ODF) room (Figure 1).



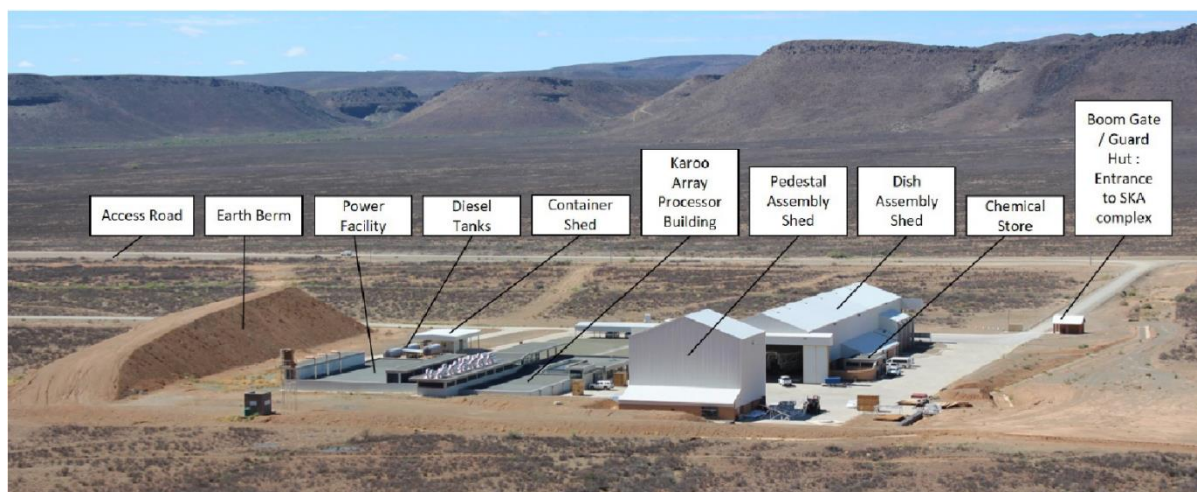


Figure 1: SKA Site Complex

The MeerKAT Correlator and Beamformer, Science Data Processor and guest instruments equipment is located within the Data Rack Area and is operational day and night.

The Mid Infrastructure 2 Contractor will require access to the CPF to upgrade the electrical, HVAC, BMS and fibre within the facility. The Mid Infrastructure 2 Contractor will provide a Method Statement of how, when and where the work will be undertaken for the upgrade work. This Method Statement must be accepted by the SKAO in conjunction with SARAO prior to any site establishment taking place.

Any Method Statements from Contractors for work in the CPF must include:

- (i) Duration of Construction
- (ii) Location of Work to be undertaken
- (iii) Battery Limits for extent of work to be undertaken
- (iv) Access to existing infrastructure and power required (where available and possible)
- (v) Number of people working in the Facility
- (vi) Description of temporary protection being provided to the facility and existing infrastructure
- (vii) There shall be no modification or damage to the RFI shielding which includes penetration of the shell, interference with the flanges and interference with any feedthrough device, unless explicitly part of the contract. Contractors shall not use water or solvents which could damage the shielding effectiveness.

SARAO Principles in terms of Access to the CPF:

- (i) SARAO Data Centre Manager or his designate will be present as required and monitor all construction work in the CPF at their discretion;
- (ii) SARAO will make available an Electrical Technician to be present as required when all electrical work is undertaken in the CPF. The SKAO Power Commissioning Engineer will be responsible for coordination of power outages and switchovers with SARAO;



- (iii) CoCs are to be issued to SARAO by Contractors as construction is rolled out and Contracts concluded;
- (iv) RFI-shielded doors may be kept open during construction to the extent included in the Contractor's accepted Method Statement and Contractors must also make provision for adequate temporary protection of shielding and infrastructure.

SARAO Principles in terms of Access to the Maser Room

The MeerKAT hydrogen masers are located in the Maser Room which is located within the shielded Data Rack Area. These masers are highly sensitive to Electrostatic Discharge (ESD). Contractors will be required to:

- (i) Wear ESD heel and wrist straps at all times when inside the Maser Room facility. Disposable and reusable heel straps are available inside the Data Rack Area. Contractors must wear heel straps on BOTH feet to ensure optimal ESD protection. Instructions on how to properly fit the heel straps are posted on the wall of the Data Rack Area;
- (ii) Perform testing on the ESD heel and wrist straps immediately after fitting them and periodically throughout the time that Contractors are working in the Maser Room. The test will verify that the ESD straps have been properly fitted and are working. The testing station is located on the right-hand wall when entering the Data Rack Area. Instructions on how to perform the test are posted on the wall above the tester;
- (iii) The Maser Room doors must be kept closed at all times. Contractors must ensure that they optimise the time required in the Maser Room to minimise interference to the MeerKAT Masers.

4.2 Access to the Power Facility

Contractors will require access to the Power Facility to undertake the upgrade to the bulk power and back-up system for the site (Figure 1).

Method Statements will be required from these Contractors which must be accepted by the SKAO in conjunction with SARAO prior to any site establishment taking place as set out in the relevant contract.

Any Method Statements from Contractors for working on the Power Facility must include:

- (i) Duration of Construction
- (ii) Location of Work to be undertaken
- (iii) Battery Limits for extent of work to be undertaken
- (iv) Installation methodology (removal of ISO walls, lifting of equipment with cranes, installation procedure etc.)
- (v) Access to existing infrastructure and power required (where available and possible)
- (vi) Number and description of authorised people working in the Facility



- (vii) Description of temporary protection being provided to the facility and existing infrastructure

SARAO Principles in terms of Access to the CPF:

- (i) SARAO will make available an Electrical Technician who will be present as required and monitor all construction work in the Power Facility for the duration of the work;
- (ii) CoCs to be issued to SARAO as construction is rolled out and Contract concluded (prior to MeerKAT+ infrastructure being handed over to the SKAO);
- (iii) The Power Facility doors will remain closed during construction.

4.3 Access to the Dish Shed and Pedestal Integration Shed

The SKAO Dish Contractor will require access to the Dish Shed and Pedestal Integration Shed which are both located at the SKA Site Complex. This includes access to the Stores and Offices. The SKAO will provide as-built drawings (on ALIM) of the sheds which contain information around physical dimensions, crane and loading capacities and other constraints within the sheds.

SARAO will provide the access for the duration of construction after which the facilities will be retained by the SKA for maintenance of the SKA radio telescope.

The following SARAO Principles apply:

- (i) The SKAO Dish Contractor must comply with all SARAO RFI policies;
- (ii) No WIFI to be used (access to data connectivity via SARAO Network);
- (iii) Primary and back-up power provided to facility – power usage costs to be covered by the Contractor (billed by SARAO);
- (iv) No use of VSAT located in office unless in the case of an emergency
- (v) The SKAO Dish Contractor will be required to keep the facility clean during construction;
- (vi) SARAO will undertake ad hoc inspections of the facility during construction to ensure compliance to all SARAO Policies

4.4 Access to Roads & Power

Contractors must familiarize themselves with the SKA_Mid Integrated Construction Schedule to verify when access roads and power will become available on the site.



5 CONTRACTOR CAMP AREA

5.1 Housing & Ablutions

Contractors are responsible for erecting their own temporary housing units ("porta-cabins") and shall arrange for fencing and security for their allocated camp area. Perimeter fencing that has been provided around the overall Contractor Camp Area as indicated in **Annexure P**.

General Living Facilities: Contractors must ensure that they adhere to the SANS standards for living facilities to avoid safety hazards and to protect Contractor workforce from diseases and illness and to maintain personal dignity and morale. Living conditions for Contractors' workforces should be clean, safe and, at a minimum, meet the basic needs of the workforce as well as RFI compliance.

5.1.1 Living Facilities

Facilities provided by individual Contractors must in general include the following:

- (a) Visible evidence of sufficient insulation and ventilation at personnel living facilities
- (b) There are windows and doors in the living facility
- (c) Windows and doors are in a good state of repair and can open to allow air into the facility and can close properly to protect residents from the cold.
- (d) Windows in living facilities provide sufficient natural lighting.
- (e) There is artificial lighting provided in living facilities and all sources of this lighting are in good working condition.
- (f) Emergency lighting is provided and is in good working condition.
- (g) There is an adequate supply of free potable water always available to personnel at their living facilities.

International guidelines: A minimum of 80 litres per person per day.

- (h) Drinking water at living facilities meets the South African National Standard for drinking water and recent results of water testing are available.
- (i) There is visible proof that all tanks used for the storage of drinking water are constructed and adequately covered to prevent water stored from becoming polluted or contaminated.
- (j) Disused chemical containers are not used at living facilities to store, collect or disperse water intended for human consumption – i.e. drinking, cooking or washing
- (k) Waste water, sewage, food and other waste materials are adequately discharged in compliance with SANS 10400: Part P and with no significant impacts on residents, the biophysical environment or surrounding communities
- (l) There are adequate rubbish containers for rubbish collection at living facilities and these are emptied on a regular basis. (Best Practice: Rubbish containers are located 30 metres from each living facility on a wooden, metal or concrete stand)



- (m) There are adequate measures in place for protection from disease-carrying insects and animals. There is evidence that pest extermination and disinfection is carried out at living facilities at least every three months

5.1.2 Housing Units

- (a) Housing units to be provided by individual Contractors for their respective Contractor Camp should be constructed from timber, fibre-cement or other approved materials with a clear height of 2.4m from floor to ceiling
- (b) The building shall have double walls filled with insulated material and lined on the inside, and ceiling;
- (c) The floors will be made of timber or concrete floors with vinyl
- (d) A fire extinguisher of 9kg dry powder for every 24m² of floor space shall be provided
- (e) All housing units shall have a valid Certificate of Compliance (CoC) for the full duration of the Contract, and it is the Contractor's responsibility to ensure that the housing units are maintained for the full duration of the Contract, thus operating at the required level of service
- (f) The rooms are aired and cleaned on a regular basis
- (g) The rooms are built with easily cleanable flooring material
- (h) All doors and windows are lockable
- (i) There are separate rooms for males and females
- (j) A lockable 10m² unit for each personnel member comprising a single bed, lockable steel locker (2m³) with shelves and hanging space, bedside chest with a minimum surface area of at least 0.75m², a table & chair, power supply point and electrical lighting.
- (k) The provision of air-conditioning units is subject to a RFI Risk Analysis being undertaken by the SARAO RFI team. Contractors shall provide the specification of the air conditioning units and any CISPR certificates for analysis by the SARAO RFI team. Should the air conditioning units comply with the EMC/EMI Standards, a RFI permit will be issued by the SARAO RFI team. Should air conditioning units be found to be non-compliant, they will not be permitted. If compliant, the air conditioning units will be tested for compliance by the SARAO RFI team once installed at the Contractor Camp Area. Any mitigation suggested in the SARAO Risk Analysis must be included in the Contractor's EMC Control Plan.

5.1.3 Ablution Facilities

- (a) The number of toilets provided by each Contractor for their Contractor Camp shall be in accordance with the SANS requirement – 2 toilets per 8 people which are attached and accessible from the housing units
- (b) The facility shall have a well-ventilated latrine section with WC pan, PVC seat and cover, wash basin and mirror, and another section containing a shower and a wall basin, all complete with the necessary running hot and cold water, taps, drains and sewerage
- (c) Toilet facilities provided by each Contractor for their Contractor Camp must demonstrate that there is visible evidence that they are:
 - Adequately ventilated – there are windows or other acceptable means of ventilation in the toilet
 - Cleaned on a regular basis



- Separated according to sex – there are separated toilets for men and women
- (d) Designed to provide workers with adequate privacy, including floor to ceiling partitions and lockable doors
- (e) The number of shower / bathroom facilities is in accordance with the SANS requirement – there is 1 bath / shower per 8 people living in the facility.
- (f) There is visible evidence that shower / bath facilities are
 - clean and hygienic
 - separated by gender
 - equipped with hot and cold running water

5.1.4 Cooking/Common Area Facilities

Each Contractor is responsible for providing cooking/common area facilities for their Contractor Camp.

- (a) In cases where personnel cook their own food, cooking space is provided separate from the sleeping areas in the living facility.
- (b) The cooking area must include cooking equipment (only electrical stoves shall be provided, unless otherwise approved), fridges, freezers, pantry, cupboards, scullery all in working order
- (c) Dining area with chairs and tables
- (d) TV/recreational room
- (e) Facilities to be provided with necessary basins, taps, drains, sewerage, hot and cold water
- (f) Cooking facilities provided are hygienic and in a clean condition:
 - There is adequate ventilation
 - Vermin-proof storage space is provided
 - Food is stored at least 18 inches off the floor
 - The cooking area is cleaned regularly

5.1.5 Laundry Facilities

Each Contractor shall provide laundry facilities for their Contractor Camp. Contractors are to ensure that:

- (a) There are separate facilities for personnel to wash both work and non-work-related clothes
- (b) Equipment to undertake washing, wash hand basins and hanging lines outside

5.1.6 Medical Facilities

Each Contractor shall ensure that:

- (a) There are an adequate number of fully stocked first aid kits available at the living facilities in accordance with General Safety Regulations – 1993
- (b) The first aid kits are accessible:
 - They are in a clearly demarcated area of the living facility – there is visible signage indicating the location of the first aid kits
- (c) There are trained and appointed first aiders for the living facility:
 - There is at least 1 trained first aider per 50 personnel



- First aiders at living facilities have received training in first aid and there are valid certificates to verify this
- Personnel are aware of who the first aiders are
- The names of the first aiders are displayed in the living facility

5.2 Access to Contractors Facilities & Inspections

Contractors shall allow access to their facilities for the purpose of inspections and audits by the SKAO Site Management Team or its representatives. Inspections and audits will include compliance to:

- The rules defined in this document
- Radio frequency interference testing by the SARAO RFI team if there are sources of interference. Should there be sources of interference, Contractors will be required to implement either mitigation measures provided by the SARAO RFI team or remove the RFI Culprit from site
- Any other construction license requirements which need to be complied with.

5.3 RFI Compliance

The Visserkloof Contractor Camp Area is in close proximity to the MeerKAT core. Any equipment being utilised by Contractors in the Contractor Camp Area could have a detrimental impact on MeerKAT science observations.

Tenderers will be required to submit a detailed list of equipment and vehicles that will be used both on the site which includes the Contractor Camp. Contractors are required to submit an EMC Control Plan for the equipment to be used at the Contractor Camp. These will be reviewed, accepted and monitored for compliance by SARAO with the respective RFI permits or CoCs issued.

The following equipment/activities are not allowed at the Contractor Camp Area:

- i. Any WIFI
- ii. Any Bluetooth or tracking devices
- iii. Any welding or grinding
- iv. Any stoves, ovens and geysers unless they are fuelled by gas
- v. Any microwave ovens
- vi. Any radios other than those that have been planned for deployment by the SKAO (low-frequency communication network)
- vii. Any private radio communication systems or DECT/cordless telephones or cell phones

The following shall be addressed in the Contractor EMC Control Plans:

- viii. Inverters and charge controllers, Television screens and monitors
- ix. Air conditioners, network switches, VSATs and laptops.

Should the SARAO RFI team detect non-compliant equipment or activities, the contravening Contractor will be requested to undertake remedial action to address the non-compliant equipment.



5.4 Offices, Laboratories, Stores, Workshops, Security

Contractors will be allocated an area within the Construction Camp by the SKAO Site Management team to erect offices, boardrooms, laboratories and storage facilities for material and equipment. The Contractor shall arrange for his own fencing and security of his individual camp. No materials shall be stored, plant parked, or buildings erected outside the demarcated area. All laboratories must be approved by the South African National Accreditation System (SANAS).

5.5 Communication

The Contractor Camp Area will be provided with fibre connectivity. Contractors will be responsible for providing their own Local Area Network (LAN) (fixed line, no WIFI) from the fibre backbone to their individual camp.

Allowance shall be made by each Contractor for all costs related to the provision of a localised LAN network to individual Contractor Camps as well as data usage costs. Reference can be made to Part B: Section 11 of this document which provides further information on handheld and mobile radio devices which will be used by all Contractors.

5.6 Maintenance

The SKAO will be responsible for the maintenance of water, waste and bulk electrical distribution in the Contractor Camp Area for the duration of construction. Each Contractor shall be responsible for the maintenance of their allocated areas for their duration of their Contract.

5.7 Parking

Areas are demarcated within the Contractor Camp Area.

5.8 Rehabilitation / remedial work

Upon completion of construction, each Contractor shall remove all their plant, equipment and other resources used for the project and not incorporated into the works and shall rehabilitate their own Contractor Camp to conditions they were found or better in compliance with the IEMP [**Annexure M**]. The SKAO will undertake the overall decommissioning and rehabilitation of the Contractor Camp Area upon completion of construction.



5.9 Waste Management

Each Contractor shall remove all rubbish from their individual camps to the registered municipal dump site in Carnarvon. Contractors must allow for the transport and removal of rubbish as part of their rates in their Bills of Quantities. Contractors must comply with the waste management requirements defined in Chapter 5 of the IEMP [**Annexure G**].

6 BULK FUEL SUPPLY & STORAGE

Contractors are responsible for providing their own bulk fuel and storage supply. The provision and storage of fuel shall be in compliance with Chapter 5 of the IEMP – [**Annexure M**]. The location of the bulk fuel and storage supply must be accepted by the SKAO Site Management Team prior to deployment.

7 LAY-DOWN AREAS, STOCKPILING, BATCHING PLANTS, EQUIPMENT CLEANING AREAS

7.1 Lay-Down Areas & Stockpiling

Lay-Down Areas will be determined in conjunction with Contractors and the SKAO Site Management Team during the design verification stage and prior to commencement of construction.

The SKAO Dish Contractor will be required to provide further information on the dish deployment strategy, which includes:

- (i) the anticipated number and size of standard shipping containers which will be shipped to site for the duration of construction;
- (ii) time required for unpacking containers and removal from the site;
- (iii) area required for temporary storage of containers in close proximity to the SKA Site Complex and at each antenna position in the 3 spiral arms.

Stockpiling of other hardware, material or equipment will be agreed to between each Contractor and the SKAO Site Management Team prior to the commencement of construction.

7.2 Concrete batching plants

Concrete batching plants (responsibility of the Contractor) will be located adjacent to a water source (borehole). Contractors utilising borehole water should indicate the preferred position of the approved boreholes to the SKAO Site Management Team. As these activities (hardware for water pumps etc.) cause radio frequency interference, a RFI Risk Analysis must be undertaken by the Contractor's EMC/EMI Specialists in consultation with the SKAO Site Management Team and SARAO RFI Team to determine the most suitable location for the concrete batching plants prior to construction.



7.3 Equipment Cleaning Areas

Provision has been made at the Visserskloof Contractor Camp Area for equipment cleaning areas. The cleaning of vehicles and equipment must be undertaken in compliance with Chapter 5 of the IEMP **[Annexure M]**.



8 SECURITY

8.1 Physical Site Security

SARAO is responsible for the provision of physical security for the site.

Contractors shall make provision for the following (non-exhaustive):

1. Inner Perimeter fence around each Contractor's Contractor Camp (the overall Construction Camp will be provided with outer perimeter fencing)
2. Security of all personnel, vehicles, equipment, plant and material, cranes etc.

8.2 Baggage Checks / People Searches

All vehicles and baggage may be searched to ensure that no unauthorised equipment enters or leaves the site (noting that SKAO (IGO) staff have privileges and immunities and guidance will be provided by SKAO HR policies & procedures on checks and searches).

In terms of the Section 20 and 23 of the South African Criminal Procedure Act (Act 51 of 1977), security guards appointed to a designated National Key Point may execute searches of vehicles and persons to designated facilities if required in terms of the risk and threat assessment of the facility. The SARAO Site Manager / SARAO Chief Security Officer may instruct security guards to execute such searches as may be required of vehicles to detect any illegal goods, materials etc. entering or exiting the site.

8.3 Valuables

Lockable electronic safes are provided at the Security Control Point at Klerefontein Support Base and at the Security Control Point at the SKA Site Complex. Any person visiting the site with electronic equipment such as laptops, cell phones, tablets, smartwatches etc, will be required to switch off the equipment and lock it in the custody area for the duration of their stay on the site. The use of laptops is only permitted in the RFI shielded Control Room in the Central Processing Facility.

A safe custody facility is available to full time staff at the Security Control Point Klerefontein Support Base to secure electronic equipment prior to departure to the site. Full time staff will not be allowed to use the secure facility at the Central Processing Facility as facilities will be reserved for Visitors to the site.

SARAO or the SKAO will not take any responsibility for the loss of or damage to equipment or valuables on the site.



8.4 Information Security

SKA Observatory networks and services are provided for business use only and are subject to the agreement of the ISMS Acceptable Use Policy for Users document [AD32].

Internet access is provided for business and personal use and is subject to the conditions defined below.

All Visitors, service providers, Contractors, and Personnel must:

- Conduct themselves in a manner where their actions do not negatively impact, or potentially negatively impact, the security, reputation, or operation of the SKA Observatory
- Not circumvent security protocols or jeopardise system security through prohibited activities
- Not disclose any information which could put the security of SKA Observatory users, networks, and information systems at risk
- Not use the internet to transmit, receive, or store any communication or data that could be considered as criminal activity, sexually explicit, profane, threatening, of a gambling nature, or otherwise offensive or illegal
- Not violate copyright legislation (e.g. through the use, download, or distribution of music, video, or e-books)

Information security incidents must be reported immediately to the SKAO Site Manager.

9 SITE BULK INFRASTRUCTURE

9.1 Electric Power & Temporary Power during Construction

Contractors must familiarise themselves with the current grid power available on the site. Contractors are responsible for ensuring the provision of temporary power (through generator) for their respective scope of work where no grid power is available on the site. The provision of such temporary power shall be in accordance with the SRAO RFI Policies & Procedures. Scheduled grid power outages will also take place when the SKA1 power network is expanded and commissioned.

The distribution of electricity shall be carried out by the Contractor strictly in accordance with the applicable laws and regulations.



9.2 Temporary Sanitary Facilities

Contractors shall, at each construction section, provide sufficient portable chemical latrine units. The latrine units shall be serviced daily and kept in a hygienic and orderly state to the approval of the SKAO Site Manager.

10 OTHER INSTRUMENTS/3rd PARTIES ON THE SITE

The MeerKAT radio telescope has been constructed and operated by SARAO on the farms Meysdam and Losberg in Zone 0 and 1. MeerKAT will be operational whilst SKA construction is undertaken. In addition to MeerKAT and its extension, the HERA instrument, also located in Zone 1 will be operational whilst SKA construction is undertaken. HIRAX will be located in Zone 2 on the farm Swartfontein. Both instruments are temporary with HERA completing science in March 2023 and HIRAX when there is no longer sufficient grid power available on site to power HIRAX.

Reference can be made to Part B: Section 13 on RFI operational states and restrictions to be placed on Contractors during construction. Contractors shall comply with the restrictions imposed on their activities, equipment, vehicles etc. during these operational states (including the permitted working hours).

11 TRANSPORT MANAGEMENT

11.1 Traffic Management Plan

All Personnel and their Contractors shall comply with these rules and the Road Traffic Act, Act No 29 of 1989 [AD13]. These rules apply to all ground transportation between urban areas and the site and on site.

The site is surrounded by privately owned property where livestock farming is undertaken. The security and protection of the farmers' livestock and lifestyle is of primary importance to both the project and the farming community. No trespassing outside the boundary of the servitudes will be allowed in the spiral arms.

One of the management outcomes of the IEMP [**Annexure M**] is for Contractors who are constructing on site (but excluding delivery of telescope equipment within the KAPB) to develop a Traffic Management Plan (TMP) for construction. This is applicable to all Contractors undertaking construction activities on the site.

The TMPs must be approved by a Contractor-appointed Traffic Engineer and submitted to the SKAO prior to the commencement of construction. The TMPs will include:



- (i) Risk Identification and Assessment of Contractor activities related to Traffic Management (transport, vehicles, etc.)
- (ii) Identification and application for all permits required (particularly on National and Provincial Roads for abnormal loads);
- (iii) Travel on public roads
- (iv) Access to the site
- (v) Speed limits
- (vi) Minimum vehicle safety requirements
- (vii) Load management
- (viii) Loading and unloading
- (ix) Personnel protection equipment
- (x) Spotters/escorts to accompany vehicles when required by rules and regulations
- (xi) Job safety analysis and safe work method statements
- (xii) Signage and barricading
- (xiii) Traffic control
- (xiv) Site Assessment
- (xv) Emergency Planning
- (xvi) Communication
- (xvii) Roles & Responsibilities related to Traffic Management;
- (xviii) Implementation Plans
- (xix) Monitoring, Auditing, Reporting compliance
- (xx) Management Review
- (xxi) Removal / deactivation of bluetooth devices and tracking devices

11.2 Transport Policy

All Personnel and Visitors including Contractors shall comply with the SARAO Transport Policy for the site – **[Annexure E]**.

11.3 Radio Frequency Interference

All transport operators providing support services to the site and SKA_Mid Project are required to assist SARAO in preserving the radio-quietness of the site. Reference can be made to the SARAO Policies protecting the site:

- i. SARAO RFI Policy – **Annexure X**;
- ii. SARAO RFI Controls Policy – **Annexure Y**;
- iii. SARAO Radio Frequency Interference Karoo Site Procedures – **Annexure H**;
- iv. SARAO Radio Frequency Interference Zones – **Annexure I**;
- v. SARAO Karoo On-site Rules & Procedures – **Annexure C**;
- vi. SARAO Transport Policy – **Annexure D**.

All bluetooth and tracking devices must be deactivated prior to entering the site.

11.4 Loading & Unloading: Cranes, Forklifts etc.

The site is in a remote location and it can require considerable time and expenditure to arrange and make available unloading and loading equipment, particularly specialised equipment.



Transport operators shall ensure that enquiries have been made with the Clients or delivery recipients and suitable arrangements have been agreed and implemented for access to and use of any loading and unloading plant that maybe based at the site or that needs to be arranged and available at the site on arrival, ready to be utilised.

***Important Note:** Contractors should not arrive expecting to load or transport plant, equipment and materials to the site without first confirming and being satisfied that suitable loading/unloading arrangements have been organised and essential equipment will be available.*

11.5 Fuel

There are a number of service centres (providing fuel or support services) on the direct road routes from Major Urban Centres to the site. Some of the smaller towns fuelling facilities are closed on a Sunday. Carnarvon is the closest town to the site where refuelling can be undertaken.

Check fuel volumes, volume onboard, requirements and availability before commencement of travel.

Refuelling of vehicles and equipment shall be done at a refuelling location where appropriate surfaces and bunding have been installed/provided. If refuelling of equipment or vehicles in another location is essential and cannot be avoided, a spillage protection/collection container or suitable sheet material shall be used to eliminate the risk of contamination of the ground surface. Should spillage occur, and fuel or oil finds its way onto the ground surface (sand, soil etc.) the area affected is to be remediated.

11.6 Transport route

Reference can be made to **Annexure A** which describes major transport routes to the site.

11.7 Aircraft Landing Facilities

11.7.1 Site All-weather Landing Strip

The site all-weather landing strip shall only be utilised by Contractors for emergency purposes, unless written authorization is obtained from SARAO stating otherwise.

Reference can be made **Annexure Q** of this document with regards to arrangements and instructions for use of the landing strip if SARAO approval is granted to Contractors to utilise the landing strip.



As MeerKAT and other guest instruments are operational, all approvals must be obtained by the SRAO Site Management Team in writing at least two (2) weeks prior to the flight being arranged. No ground transport is available, and all Visitors and Contractors must make prior arrangements with regards to ground transport.

11.7.2 Carnarvon Aerodrome

Contractors may utilise the Carnarvon Aerodrome (gravel runways) if required. Contractor charter companies must inform the Kareeberg Municipality (Tel: 053 382 3012) of a flight in order for them to check the condition of the runway and to ensure the gate is open upon arrival and departure. Low-level inspections are recommended to ensure no wildlife is on the runway. Security remains the responsibility of the air charter company, however the South African Police Service do undertake patrols when there are overnight aeroplanes on the apron. The runway has emergency lights and the use of the emergency lights must be arranged prior.

No ground transport is available, and all Visitors and Contractors must make prior arrangements with regards to ground transport.

12 COMMUNICATION DEVICES

The Mobile Radio System (MRS) is being deployed as part of Early Works for SKA1 construction. The MRS consists of vehicle mounted-, handheld- and base station radios that communicate via a network of repeaters. Remote consoles are also provided for communications with the various operations rooms. The carrier frequency for the new MRS will be in the VHF Low Band, between 30 – 50 MHz.

The operational activities in the SKA_Mid area require the availability of an efficient MRS. Such a system is required for reasons of safety, maintenance, infrastructure operations and logistics.

Contractors will be provided with handheld and vehicle low frequency radio communication devices that do not cause interference with radio telescopes on the site. These units, for which quantities are to be determined by Contractors at least 40 working days prior to working on site, will be issued by the SKAO as part of the Site Induction. Radios shall be returned in working condition upon completion of the Contract and replacement cost of these radios, due to damage caused by the Contractor, will be borne by the Contractor.

These radio communication devices will provide coverage for the majority of the site. These devices shall be returned in working condition to the SKAO Site Manager upon completion of the Contract. Where radios have been damaged, the Contractor will be responsible for the replacement costs of these radios.



Communication via cell phone on the site is not allowed. Contractors will be required to communicate on the site via radio only, in order to restrict radio frequency interference (RFI).

Should the Contractor require additional devices, they will be available subject to a delivery period of approximately 40 working days.

12.1 Operational Restrictions

Further to analysis and RFI zone allocations defined in Part Section 13 of this document, the following operational concept is recommended, as defined in Table 1. It should be noted that the 40 MHz carrier frequency does not present a known threat to either the SKA Band 1-, or HERA receivers. The recommended safe distances in Table 2 are presented as a precautionary measure, to allow for possible unknown effects in the respective LNA's.



Table 2: Receivers and distances for MRS operation

Use Case	Core- & Spiral Dishes ($\leq 50\text{m}$ radius)	Core- & Spiral Antennas ($50\text{m} + \text{radius}$)	HERA Receivers	Klerfontein Support Base (EOC) & surrounding areas
Emergency Communication	Use MRS as and when required during emergencies. No restrictions	Use MRS as and when required during emergencies. No restrictions	Use MRS as and when required during emergencies. No restrictions	Use MRS as and when required during emergency No restrictions
Security Communication	Use MRS only during emergencies. No restrictions	Use MRS as and when required. Stay outside 100m fencing around the dish	Use MRS as and when required. Stay outside 100m zone from HERA antennas	Use MRS as and when required No restrictions
Critical Communication (e.g. electrical switching)	Use MRS as required Stay outside 15m zone from the dish.	Use MRS as and when required. Stay outside 15m zone from the dish	Use MRS as and when required. Stay outside 15m zone from the dish	Use MRS as and when required No restrictions
Standard Ops Communication (including Maintenance)	Minimum use of MRS. Stay outside 100m zone from a dish. Use VOIP phone closer in ¹	Use MRS as and when required. Stay outside 100m fencing around the dish.	Use MRS as and when required. Stay Outside 100m zone from HERA dish	Use MRS as and when required No restrictions
Construction Communications	Use MRS as required Stay outside 15m zone from the operational dish.	Use MRS as and when required. Stay outside 15m zone from the operational dish	Use MRS as and when required. Stay outside 15m zone from operational dish.	Use MRS as and when required No restrictions

¹The VOIP phones will be modified to reduce RFI and will include a fibre converter. A fibre connection point linked to the network switch inside the screened pedestals, must be provided at the outside of each MeerKAT SDC / SKA1 DISH SDC.



13 HEALTH & SAFETY MANAGEMENT

All Visitors including Contractors shall comply with the SKAO Organisational Health, Safety & Environmental Management Plan [**Annexure S**]. As the land is owned by the South African National Research Foundation (NRF) and will be operating the MeerKAT radio telescope and other Guest Instruments on the site, the SARAO Health & Safety Policy & Plan [**Annexure D**] shall also be complied with.

Contractors will be required to develop Health & Safety Management Plans (HSMP) as part of their tender response to the SKAO to demonstrate their understanding of South African legislative requirements and compliance to the SKAO Health, Safety & Environmental Management Plan [AD6]. SKAO Health & Safety Officers (in emergency situations, stop work instructions shall be issued by an appropriately designated person nearest the incident) have the authority and responsibility to stop work if, in his/her opinion, a serious threat to or impact on safety may be caused directly from site activities.

13.1 South African Regulatory Requirements

All Contractors will be required to comply with the South African Occupational Health & Safety Act – (Act No. 29 of 1996) [AD9] and its Regulations; the Mine Health and Safety Act – (Act 29 of 1996) [AD10] and its Regulations and the Compensation for Occupational Injuries and Diseases Act (Act 75 of 1997) [AD9], contractual requirements and relevant industry standards and codes of practice.

In conjunction with the SKAO Health, Safety & Environmental Management Plan [**Annexure S**], reference can be made to an example of a Health and Safety Specification in **Annexure N** which describes what Tenderers and Contractors are required to implement to comply with the South African Regulatory Requirements.

13.2 Disaster Management and Emergency Response

All Personnel, Visitors including Contractors shall ensure compliance to the SKA Disaster Management Plan (DMP)– **Annexure G** of this document.

The implementation of the DMP shall be jointly coordinated between SARAO and the SKAO Site Management Teams.

13.2.1 SKA Emergency Control Centre (ECC) & Incident Reporting Process

For the purpose of emergency planning, coordination and response, an Emergency Control Centre (ECC) is identified where space is provided and equipment is available for emergency coordination and management. In this



facility, planning, co-ordination and directing of actions can be implemented and communicated before, during and after an emergency.

The fact that the SKA Site Complex is proclaimed a National Key Point, a 24-hour presence on the site is required for emergency response purposes. The ECC will provide 24-hour emergency and essential services contact points to various internal and external role-players / departments within and surrounding the site. The Centre is responsible for day-to-day emergency response by relevant SARAO Divisions and for the establishment of strategic communication links. Once activated, the ECC will liaise closely with ECCs, DMCs and other structures / groups of the local and district municipalities, as well as at the provincial level.

Note: Although a 24 hour presence on the site is required, the ECC is not required to be activated and manned on a 24 hour basis, instead, it is recommended that security onsite (which is required to be present on a 24 hour basis) serve as a contact point in case of emergency, and be responsible for notifying the SKAO Site Manager where the activation of the ECC and associated emergency response procedure is deemed necessary.

The ECC should serve as a central data repository, ensuring the collection, storage, maintenance and dissemination of all information relevant to disaster management.

The ECC should also be equipped to serve as a command and coordination centre during disasters, where the EMT and other response teams will convene. Alternative facilities should be identified as back-up to the primary centre should it be required.

The EMT shall be convened when an emergency has occurred or is likely to occur, in accordance with the following:

Where the size or seriousness of the emergency seems beyond the capability of a department/service, in the opinion of the most senior on-duty official of that service, the SKAO Site Manager in conjunction with the SARAO Site Manager can activate ECC and the EMT:

- Where the Site Managers are of the opinion that it is necessary to activate the EMT in order to effectively manage an emergency, which has occurred or is likely to occur, the ECC must be activated; and
- The EMT will evaluate the situation and advise the relevant Local Municipal DMCs regarding the emergency occurring, or threatening to occur, as well as the continued activation or demobilisation of the EMT.

An emergency alarm with a glass break panel is mounted at the KAT 7 Container Shed located at the SKA Site Complex. This alarm will be triggered by the SARAO Site Manager or the SKAO Site Manager or his/her delegated representative in the case of an emergency to notify all staff and Contractors. The muster point is outside the SKA Site Complex (Figure 2).





Figure 2: Location of Emergency Alarm at SKA Site Complex and Muster Point

Ongoing capacity building programmes will be required to ensure the availability of adequate capacity for disaster preparedness and response.



Figure 3: Location of Emergency Control Centre – Meysdam farmhouse



The SKA ECC is situated at the Meysdam farmhouse (Figure 3). The facility is central, accessible and easily activated at any time. The farmhouse has a VSAT for emergency communication and a back-up generator in the case where there is a site power outage. Should there be a catastrophic incident on the site the SARAO Site Manager's office at the Klerefontein Support Base will be used as the ECC.

13.2.2 Contractor Requirements

The Contractor is responsible to draft his emergency response plan (ERP) in compliance with the requirements of the DMP [**Annexure G**] and it needs to address all potential risks and provide suitable responses to assure the well-being of all Personnel. The plan must identify, by risk assessment, all potential emergency situations and mitigation strategies associated with potential emergency situations for the project.

The Emergency Response Plan (ERP) must include consideration for the following aspects:

- First aid / medical response during an emergency - identify procedures for rescue and response to credible emergencies and adequate equipment and resources for responding to emergencies.
- Effective communication systems/equipment - Identify procedures for communicating with employees, consultants, Contractors and relevant Authorities in the event of, and during, an emergency (communications matrix). No cell phones will be allowed on the site;
- Paramedics - The golden hour principle will apply, and the Contractor must propose the number of paramedics who will be available to reach remote construction sites within 30 minutes.
- Snake Bite Management – identify procedures regarding snake bite medical responses. Snake handling training to catch and release snakes will be required.
- Identify measures to be undertaken to prevent or reduce the risk of an emergency, including emergency response training.
- Rules and regulations of the National Park and National Key Points will apply.
- Fire response.
- Evacuation.
- Escalation to crisis management plan.
- Identify the positions of those responsible for operation of the ERP, in the event of an emergency.
- Identify requirements and procedures for accessing personnel and equipment resources during an emergency.
- Outline procedures for interfacing with the Contractor and the SKAO to ensure transfer of emergency response and management to the SKAO at appropriately defined severity levels.
- Specify a process for periodic updates of the plan to incorporate lessons learned from previous incidents and exercises.
- Meet the requirements set out in the legislation.



- Post emergency management

The Contractor will perform adequate emergency response drills and exercises to facilitate the practicing of the site ERP and supporting response and rescue arrangements to ensure it is able to provide adequate response during an emergency situation.

Testing of the emergency response process will be completed through a collaborative approach involving the SKAO Site Management Team and Contractors in conjunction with the SARAO Site Management Team.

The Contractor must indicate in his Health & Safety Management Plan the scope and management of the drills and exercises. Within one month of mobilisation the Contractor will conduct the first drill and thereafter at intervals not exceeding 6 months. Proper records of the drill exercise will be kept.

13.3 Medical Facilities & Services

Contractors shall ensure that appropriate first aid, medical care facilities and qualified personnel (paramedics) are provided at or near the site where work under the contract is being performed. The appropriate first aid and medical care services shall be determined in accordance with statutory legislation and the risk assessments.

The golden hour principle will apply, and the Contractor must propose the number of paramedics who will be available to reach remote construction sites within 30 minutes.

Contractors shall:

- Maintain a register of first aid kits and contents.
- Inspect first aid and medical care facilities provided monthly by a competent person.
- Maintain records of all persons treated for work related injuries (incident register).

The following medical facilities are available in Carnarvon:

- i. Medical Clinic
- ii. Hospital
- iii. Private local doctor



14 RADIO FREQUENCY INTERFERENCE MANAGEMENT

Contractors are required to comply with the following Standards, Management Plans, Policies and Procedures established to protect the site:

14.1.1 SKA RFI/EMC Standard

This standard [**Annexure D1**] defines the SKA EMI/EMC requirements, applicable to all equipment within products that constitute the operational telescopes, are identified in the SKA product tree, and are operated within the observatory. It also applies to all extraneous support equipment that is used on the SKA sites whilst observations are being conducted by any telescope. For the particular case of radiated emissions, where the *SKA protection levels* will supersede commercial EMC standards, guidance on the derivation of the *emission threshold levels* is provided with the inclusion of SKA-provided software. The software derives the *emission threshold levels* without requiring complex calculations on electromagnetic propagation.

Overall, this standard is intended to be the source of the SKA system level requirements on EMC and shall be used as a reference for the derivation of any sub-level EMC requirements.

14.1.2 SKA EMC/EMI Management Plan

The SKA EMI/EMC Management Plan [**Annexure T**]:

- (i) Sets the thresholds of allowable emission levels for equipment located on the site referred to the guided wave input of the telescope dishes;
- (ii) Establishes procedures for the monitoring and control of EMC issues as the project progresses
- (iii) Provides guidelines for the interpretation of the document, its associated procedures, and the measurement and verification requirements.

Contractors shall familiarise themselves with this document and implement the procedures defined in the document.

14.1.3 SKA System EMI/EMC Control Plan for Procurement and Manufacturing Phase

The purpose of this document [**Annexure E1**] is to describe the process by which the SKAO will achieve EMC compliance of both SKA-Low and SKA-Mid through the *Procurement* and *Manufacturing* phases. A top down approach is used starting at the system level control plan, where the integration of all products will create a compliant system, followed by a description of a typical EMC control workflow diagram for a product/system describing different milestones and stakeholders involved in the process. This document also



includes a section on EMC requirements, aimed to expand on the application of the SKA EMI/EMC standards and procedures document.

The *EMC Compliance Roadmap* described in this document is based on a typical scenario, and it is possible that the implementation of the workflow, depending on the complexity and context where the equipment will be installed on site, will require tailoring for a particular product/system. The application of this roadmap shall be described in the EMC Control Plan (EMCCP) of each product/system.

14.1.4 Applying Telescope Protection Levels to Measurement Data

This standard [**Annexure J**] prescribes the application of the Square Kilometre Array Observatory (SKAO) radio telescope protection levels in the SKA EMI/EMC Standards [**Annexure D1**], for the determination of impact from radio frequency interference (RFI) on radio astronomy observations. The standard shall be applied to all RFI impact assessments, unless otherwise prescribed for a specific measurement and analysis scenario.

14.2 SARAO RFI Policies & Procedures

As owner of the SKA_Mid land, Contractors shall also comply with the following SARAO Policies and Procedures related to RFI:

14.2.1 SARAO RFI Policy

The purpose of the Radio Frequency Interference (RFI) Policy is to ensure that, as far as possible, all risk of detrimental radio interference to radio astronomy facilities under the management and control of SARAO, or radio astronomy facilities hosted on sites currently under the management and control of SARAO, is appropriately controlled and mitigated to acceptable levels.

This RFI Policy, and any rules and regulations approved to implement the objectives of this policy, applies to all SARAO employees and Visitors (which includes contractors and service providers). Non-compliance with this policy, or any RFI related rules and procedures approved, may result in disciplinary action or withdrawal of permission to enter SARAO sites, as may be relevant.

14.2.2 SARAO RFI Controls Policy

The purpose of the SARAO RFI Controls Policy defines how the compliance to the RFI Standards and RFI Policies will be managed on site, including verification, testing, analysis, record keeping and initiation of corrective action.



14.2.3 SARAO Radio Frequency Interference Karoo Site Procedures

These procedures include the following aspects which Visitors including Contractors shall comply with:

- i. Site Access and Induction Procedures
- ii. Use of on-site communication devices
- iii. Site Equipment and Notebook/Laptop Stowage and Usage
- iv. Pre-maintenance procedures
- v. Procedures for aircraft landing on Site
- vi. RFI Policy & Procedure notification
 - Internal to SARAO staff
 - External to Contractors and other Organisations
 - External – Public visits.
- vii. Enforcement

No equipment will be allowed on site without a RFI permit. This includes:

1. Any electrical equipment that may produce intentional radio frequency transmissions such as mobile phones, laptops (except when being used in a RFI-shielded room), Bluetooth, tracking devices, satellite phones and electronic tablets;
2. Equipment that may produce unintentional electromagnetic radiation such as digital cameras, welding machines, electrical generation equipment and inverters will require RFI testing to be undertaken, and if compliant/partially compliant, a RFI permit will be issued according to the zone where the RFI Culprit is located. Equipment making use of active antennas, such as GPS, radio receivers and GPS-tracking devices are major RFI culprits and the necessary testing and permits will be required prior to allowing this equipment onto site.
3. Only vehicles that have undergone RFI qualification are allowed site access. RFI Permit Stickers will be affixed to tested and qualified vehicles. Disabling of Bluetooth and tracking devices shall be mandatory for any vehicle and for all personal Bluetooth devices, such as smart watches.

Any equipment located on the site that does not have a valid RFI Permit or Certificate of Compliance (CoC) shall be issued with an RFI Notice by the designated personnel (SARAO RFI Control Officer/s) who shall provide instructions to achieve compliance with the SARAO RFI Controls Policy – **Annexure Y** within an agreed timeframe. RFI Permits [**Annexure U**] or CoC's will indicate what Zones the Permit or CoC has been issued for. Contractors must comply with the terms and conditions defined in the Permits and CoC's.

RFI Permits will be issued for RFI culprits that do not fully comply with the SKA EMC/EMI Standards, and where the RFI culprit will only be used on the site for a limited period. RFI permits can be issued for a short-term or longer term (i.e. Waiver) basis, but in general, will have a fixed duration of validity. The RFI



Permits will be issued by the SARAO RFI Manager and co-signed by the SKAO RFI Manager.

The owner of equipment that is subject to a RFI Permit must have a printed and signed copy of the permit whenever he/she uses the equipment on the site. The SARAO Site Manager or the SARAO RFI Manager, or specific personnel designated by them, can request the user of an RFI Culprit to present the RFI Permit. If the owner does not have a RFI permit, or cannot present it within a reasonable time, or is using the equipment outside the permit restrictions, he/she will be required to immediately switch off and remove the equipment from the site. All RFI Permits issued, including the RFI Permit number, RFI test report, the validity dates and restrictions for use, will be recorded on the SARAO RFI Permit Database and made available online to delegated authorities.

RFI Certificates of Compliance (CoCs) will be issued for all permanently deployed equipment to the site that comply with the SKA EMC/EMI Management Plan – **Annexure T**, as applicable to the relevant position where the RFI Culprit is to be installed. RFI CoCs will only be issued after the equipment has been tested. Type testing can only be conducted on RFI Culprits that are more than 1,000m from a dish at the discretion of the SARAO and SKAO RFI Managers. The RFI CoCs will be issued by the SARAO RFI Manager and co-signed by the SKAO RFI Manager and owner/supplier of the equipment/hardware.

Applications for SARAO RFI Permits or CoC's shall require the relevant equipment to undergo RFI qualification through testing in a test facility that has been certified to do RFI tests to the standard required in the SKA EMC/EMI Management Plan. This implies certification of the chamber, the test equipment, the test procedures and the competency of the staff. This is similar to ISO 17025:2017 certification by the test authorities of a country (SANAS in South Africa) but not to the commercial (CISPR) standard but to the SKA EMC/EMI Standard.

Applications for SARAO RFI Permits or CoC's shall require the relevant equipment to undergo RFI qualification through testing. This request can be directed to the SARAO RFI team at email: RFIBookings@sarao.ac.za

The following facilities are available for use by Contractors (use of facility and resources required to do the RFI testing is for the account of the Contractor):

- (i) Test facilities in member country where product is being manufactured
- (ii) SARAO Reverberation Chamber, Cape Town (Operational)
- (iii) Houwteq Anechoic Chamber (Operational, 80km from Cape Town)
- (iv) Houwteq Reverberation Chamber
- (v) SARAO Test Chamber and Facilities, Klerefontein (operational mid 2022)
- (vi) ITC Anechoic Chamber, Gauteng (Operational, CISPR standards only).

Requests to utilize the SARAO Reverberation Chambers can be made to RFIBookings@sarao.ac.za



Qualification shall be in accordance with approved procedures¹ and using whatever measurement resources as may be appropriate. Pending the outcome of the qualification, which shall consider the frequency range and levels of emissions, a Permit or CoC shall be issued and shall prescribe terms of use within specified Zones and specific times of day, as well as any other instructions as may be relevant. Equipment for temporary use will remain switched off when not inside authorised locations or Zones.

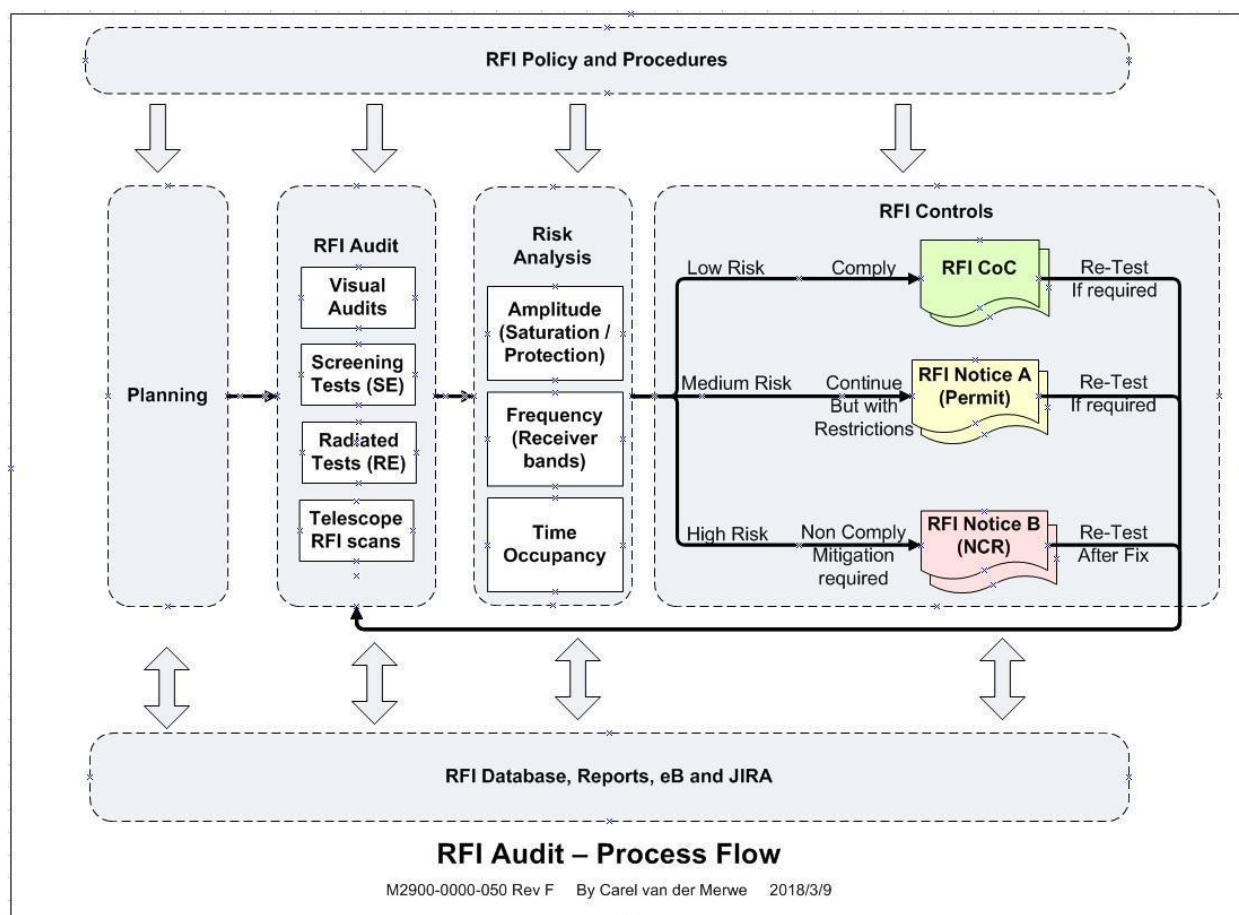


Figure 4: RFI Process Flow

RFI Controls (Figure 4) for the various phases of the SKA Project include:

14.2.3.1 Design Verification Phase (Preventative)

EMC Control Plans must be developed by the designers of the product and accepted by the SKAO. The EMC Control Plan typically would include the following information:

- Description of the Project Scope, location of activities (Zones), timescales etc.
- Identification of all EMC Risks (design of permanent items as well as during construction)

¹ At a minimum, compliance with relevant SARAO protection threshold limits will be tested



- Analysis of Risk based on propagation analysis predictions [Refer to **Annexure J**]
- Mitigation solutions for identified risks which includes design changes, operational restrictions
- Qualification / Tests to be undertaken off-Site (prior to installation/deployment)
- Qualification / Test and monitoring to be done on the site.

14.2.3.2 Development / Procurement Phase (Preventative)

As part of the standard tender conditions for tenders that will lead to the temporary or permanent location of EMC/EMI culprits on the site, and where appropriate, the checklist will be issued as part of the tender (Figure 5). Completion of this checklist shall be mandatory and shall include the declaration of all potential EMC/EMI culprits as well as the applicable EMC standard that such equipment has been qualified to.

1. Equipment applicable in this tender	Applicable EMC Standard									
	2. Class		3. Standard							
	CLASS A	CLASS B	CISPR 11	CISPR 12	CISPR 14-1	CISPR 22	FCC Part 15	FCC Part 18	MIL-STD-461	Other (state)
1										
2										
3										
4										
5										

Figure 5: Example of an EMC/EMI Checklist for tenders

14.2.3.3 Construction / Deployment / Installation Phase

All equipment / hardware (including vehicles, plant and machinery) must be tested off-site prior to being deployed to the site. The SARAO team will issue RFI Permits or CoC's which defines the Zones and restrictions that will be applied during construction.

Contractors must apply for RFI Permits/CoC's at 40 working days prior to the equipment/hardware (including vehicles, plant and machinery) being deployed to the site. Contractors must ensure that RFI Permits/CoCs are included in the delivery note for shipping companies. All paperwork will be checked by the SARAO RFI Quality Officer. Should the paperwork not be in order, the shipping company will not be allowed access to the site.



The SKAO will be responsible for undertaking Quality Assurance on Contractor-delivered and installed equipment on the site. SARAO will undertake audits and inspections and notify the SKAO of any non-compliance.

RFI monitoring will be conducted by the SARAO RFI monitoring group to measure ongoing compliance to the SKAO EMC/EMI Management Plan during SKA construction and whilst MeerKAT and guest instruments are operational. This responsibility will become the SKAO's as operations ramp-up on the site.

14.2.3.4 RFI Zone Definitions for MeerKAT and SKA

This document defines the RFI Zone definitions which are used when issuing RFI controls such as RFI Permits or Certificates of Conformance (CoC) to manage RFI culprits which shall be issued to Visitors including Contractors for all equipment, vehicles and components coming to the site.

The definition of these Zones is based on radio propagation properties, from which minimum separation distances are derived. The RFI Zone definitions are provided in Table 3.

Table 3: RFI Zones

Zone ID	Zone Title	Notes
RFI Zone 0	Receptor (Dish)	100 m radius circle around each of the MeerKAT, MK+ or SKA1 telescope receptors. For SKA1 spiral arms, this will be within the 100 m x 100 m security fences.
RFI Zone 1	Inner Core	5 km radius circle around the SKA virtual core / centre: 30.71292°S, 21.44380°E [4].
RFI Zone 2	Outer Core	25 km radius around the SKA virtual core / centre: 30.71292°S, 21.44380°E [4].
RFI Zone 3	Spiral Arms	10 km corridor centred around the spiral arm telescope locations.

The attenuation range for a frequency of 500 MHz is provided in Table 4.



Table 4: Attenuation range per RFI Zone for f = 500MHz

Zone ID	Zone Title	Attenuation Range (f = 500 MHz) [min to max dB]
RFI Zone 0	Receptor (Dish)	0 dB to 64.5 dB for f = 500 MHz
RFI Zone 1	Inner Core	64.5 dB to 129 dB for f = 500 MHz
RFI Zone 2	Outer Core	64.5 dB to 176 dB for f = 500 MHz
RFI Zone 3	Spiral Arms	64.5 dB to 169 dB for f = 500 MHz

The RFI State definitions are defined in Table 5.

Table 5: RFI State definitions

RFI State	Colour	State Description	State Definition
RFI State 1	Green	Full Science Operations	This is the state with the highest RFI restrictions through RFI controls (i.e., best condition for most sensitive science observations). Only equipment with RFI CoC allowed to operate. Only staff required for critical functions allowed on site. During construction phases this will be curfewed from 17h00 to 08h00.
RFI State 2	Yellow	Restricted Science Operations	This is a slight RFI relaxation through RFI permit conditions. Where required, the responsible manager and persons shall communicate with the science operations team to co-ordinate activities start and stop times.
RFI State 3	Red	No Science Operations	In this state no science operations are possible (e.g., aircraft approaching or departing from core airstrip; critical maintenance done on power system). These periods will be promulgated by the Site Manager in consultations with science operations teams. In the case where damage to the receiver front-ends (LNA) are at risk, RFI covers are to be fitted.

In considering the impact of construction activities on the MeerKAT science programme, the most likely interferences that could adversely affect observations are RFI and planned power outages.

Important considerations are that impacts on MeerKAT operation are strongly dependent on the distance of a given activity from a MeerKAT receptor (e.g. RFI) or involve single points of failure (e.g. power systems).



The various MeerKAT observation projects have significant diversity in terms of operating frequencies, susceptibility to RFI and scheduling constraints, but in general it would be impractical to coordinate construction activities and the MeerKAT schedule to minimize RFI impact on observations.

Daily, weekly and monthly site meetings will be scheduled between the SARAO and SKAO Site Management and Operations teams to plan and communicate when RFI states change in order to accommodate both SKA construction and MeerKAT science observations.

15 ENVIRONMENTAL MANAGEMENT

Integrated Environmental Management Plan (IEMP)

On the 22 March 2019, the Minister of Environmental Affairs (now Minister of Environmental Affairs, Fisheries and Forestry) gazetted the adoption of the IEMP for the Square Kilometre Array Phase 1 Mid-Frequency Array (SKA_Mid) in South Africa (Government Gazette No 42323 (Notice No. 436).

Further amendments were made to the scope of SKA_Mid which resulted in updates being made to Chapter 2 and Chapter 5 of the IEMP. These scope amendments include:

- i. Further RFI risk analysis was undertaken of the proposed Contractor Camps at Losberg, Bergsig and Swartfontein Contractor Camps. The outcome of this analysis indicated that the risk of establishing these camps would pose a high risk of RFI which could compromise science observations being undertaken on site;
- ii. SKAO's desire to introduce further renewable energy into the mix through the establishment of a central Photovoltaic plant on/close to site;
- iii. Need to construct a boundary game fence to enhance security and facilitate boundary fence inspections;
- iv. The addition of 3 farms owned by the NRF;
- v. To acknowledge the declaration of the NRF-owned land as the Meerkat National Park with SANParks as the appointed Land Management Authority.

On the 25 March 2021, the Minister of Environment, Forestry & Fisheries published an adoption of amended Chapter 2 and Chapter 5 of the Integrated Environmental Management Plan for Phase 1 of the Square Kilometre Array and amendment to the conditions of the exclusion listed in Government Gazette No. 44220, Notice No. 250.

The revised IEMP [**Annexure M**] is called the IEMP for the SKA (Phase 1) Revision 1 and replaces the IEMP as adopted in the Exclusion Notice of 2019 on 25 March 2021.

Failure to comply with the Management outcomes defined in Chapter 5 of the IEMP [**Annexure M**] will constitute an offence in terms of Section 49(A)(1)(d) of the National Environmental Management Act.



The National Research Foundation, through its national facility, the South African Radio Astronomy Observatory, and the International SKA Organisation, will now be required to comply with the conditions contained in the Government Gazette Notice.

15.1 Compliance with Chapter 5 of the IEMP

15.1.1 Organisational Arrangements

15.1.1.1 SANParks

The South African National Parks has been appointed by the NRF to undertake the land management responsibility of the NRF-owned land. SANParks responsibilities are defined in the IEMP and in **Annexure M** of this document.

The NRF-owned land is declared a National Park in terms of the South African National Environmental Management: Protected Areas Act, Act No. 57 of 2003.

15.1.1.2 SKAO Environmental Officers

SKAO Environmental Officers will be responsible for the implementation and monitoring of Contractor EMPs. The Environmental Officers will be responsible for the environmental issues involved with construction, operation and decommissioning phases of the project. Environmental Officers have the authority and responsibility to stop work if, in his/her opinion, a serious threat to or impact on the environment may be caused directly from Site activities. In emergency situations, stop work instructions shall be issued by the appropriately designated person nearest the incident. Environmental Officers will also be responsible for:

- Completion of a daily environmental incident log and complaints record sheet which are available for inspection at any time;
- To notify externally appointed Environmental Control Officer (ECO) of any incidents or complaints;
- To notify Contractor ECOs of any serious non-compliance issues immediately.

The SKAO Environmental Officers and Contractors will be required to keep a copy of EMPs on the site. Copies of instructions or recommendations issued to Contractors must be retained and records of EMP violations filed (environmental incident log).

SKAO Environmental Officers have the authority and responsibility to stop work if, in his/her opinion, a serious threat to or impact on the environment may be caused directly from site activities.

15.1.1.3 Contractors

Contractors are bound to the notice of adoption, any environmental authorization, or conditions of existing permits, licenses and authorizations and



EMPr conditions through agreement with the SKAO. Contractors shall familiarize themselves with the EMPr and any previous environmental authorizations issued/permit requirements before coming to the site. Contractors must ensure that provision has been made for sufficient budget to comply with all the EMPr and environmental authorisation conditions at the tender stage.

15.1.1.4 Independently appointed Environmental Control Officer (ECO)

The Environmental Control Officer (ECO) is appointed by the SKAO as an external independent monitor of the implementation of the EMPr. He/she must form part of the project team and be involved in all aspects of project planning that can influence environmental conditions on the site.

The ECO must attend relevant project meetings, conduct inspections to assess compliance with the EMPr and be responsible for feedback on potential environmental problems associated with the site activities. The ECO will also liaise with relevant authorities, contractors regarding environmental management and undertake routine monitoring. The ECO will be required to provide induction training in terms of the EMPr prior to construction. All those attending such induction will be required to sign an attendance register. The ECO has the right to enter the site and do monitoring and auditing at any time.

External environmental audit reports will be undertaken by the ECO annually, commencing 12 months after notification to the competent authority 14 days prior to the date on which the first activities will commence. These audit reports will contain information on the Contractor and the SKAO levels of compliance with the EMPr, notice of adoption and permits. The audit report will include a description of the general state of the site, with specific reference to sensitive areas and areas of non-conformance. The ECO must indicate the necessary corrective measures to eliminate the cause of the non-conformance and corrective actions to be taken.

The ECO is responsible for informing the Environmental Officer and Contractors of any decisions that are taken concerning environmental management during construction, operation and decommissioning phases of the SKA_Mid Project.

15.1.2 Demarcated Areas

During the SKA_Mid SEA and subsequent heritage, ecology and aquatic walkthroughs undertaken on the site, a number of environmental resources within the SEA study area were identified as very sensitive to the proposed SKA_Mid proposed activities and unsuitable for development². These areas include habitats that are essential for the survival of rare plant or animal species and practically impossible to restore once they have been destroyed. These areas were demarcated and include:

² Spatial layers are available from www.sarao.ac.za



- exposed mudstone/ sandstone rock sheets: these features are home to rare succulents and reptiles;
- large dolerite hills: these features cannot be restored once destroyed by blasting, trenching or road building;
- cluster of *Aloidendron dichotomum* (formerly *Aloe dichotoma* / common names: quiver tree or kokerboom): rated as Vulnerable in the 2014 Red List of South African Plants and not threatened under the National Environmental Management: Biodiversity Act (Act No. 10 of 2004);
- pans and wetlands: development may change drainage patterns and affect the wildlife especially birds, amphibians and fish that use the pans after rain;
- red sand-dunes: habitat of the narrow range endemic and substrate-restricted Red Lark;
- depressional wetlands, seep wetlands and pans;
- wetland flats;
- watercourses;
- Grade II heritage sites including corbelled buildings declared Provincial Heritage Sites on the farms Grootfontein, Arbeidsfontein and Stuurmansfontein, and culturally significant places of Hartogskloof, Groot Pardekloof and Abiquaputs: high provincial or regional significance heritage resources;
- Grade IIIa heritage features including burial grounds, rock paintings, historical buildings, stone age artefacts and monuments: high local significance heritage resources worthy of conservation.

Contractors shall comply with the requirements defined within the Heritage Conservation Management Plan [**Annexure O**] and the Ecology, Aquatic and Bat Assessment and accompanying Specialist Reports [**Annexure V**]. Failure to comply with these requirements shall result in non-compliance to the IEMP and result in penalties.

Furthermore, sensitive environmental resources³ identified within the SEA study area should also be avoided as far as possible during the proposed development activities. Where impacts to these features cannot be avoided, the impacts must be mitigated in line with this EMPr. Sensitive features include:

- populations of *Acacia erioloba* and *Hoodia* spp,
- protected and listed faunal species⁴,
- floodplain wetlands (river beds),
- valley bottom wetlands,
- river reaches
- major drainage lines,
- riparian zones,
- ridges and high lying areas,
- prominent and quartz outcrops, and
- dolerite gravel plains,
- Grade IIIb & IIIc rock art sites.

³ Spatial layers are available from <https://egis.environment.gov.za/SKAphase1>

⁴ For example: Northern Cape Nature Conservation Act 9/2009 and the NEMA Biodiversity Act 10 of 2004 (Notice 389 of 2013)



15.1.3 Monitoring and Auditing

The SKAO Environmental Officer will conduct Internal Environmental Audits. The internal audits will be conducted at a frequency determined by the SKAO throughout the construction phase. The internal audit reports will be submitted to the SKAO Site Management Team. The level of performance against and compliance with the EMPr will be checked and verified through the internal audit process, to ensure adherence to the EMPr requirements. The Internal Environmental Audit report will include detailed environmental monitoring activities as well as any recorded environmental incidents and relevant corrective actions. Consequences of non-compliance must be indicated within the agreement between the Contractor, ECO and the SKAO and addressed during external audits. The SKAO Environmental Officer will compile a photographic record of the SKA_Mid construction footprint area, which will be used to show the state of the environment on the site before, during and after the rehabilitation activities, including:

- all areas designated as work areas, camp areas and facilities, construction sites and storage areas taken before, during and after the set-up of these sites - including temporary working areas before, during and post rehabilitation;
- fences and fencing equipment that will be impacted by the SKA_Mid project, before, during and after the installation or removal;
- access roads before, during and after the construction/upgrading of roads;
- topsoil and storage areas before, during and after the removal; and
- waste management sites before, during and after the set-up of these sites.

During the operation phase the SKAO Environmental Officer shall conduct quarterly site inspections to monitor the extent to which natural re-growth has occurred; any erosion resulting from the preceding season, taking into consideration climatic factors; recommendation from the “let’s respond toolkit⁴” for climate change and the need for additional erosion protection or re-vegetation. The SKAO Environmental Officer must conduct Internal Environmental Audits at a frequency determined by the SKAO throughout the operation and decommissioning phases and submit the internal audit reports to the SKAO Site Management Team. These internal audits must check and verify the level of performance against and compliance with the content of this EMP.

The erosion protection and rehabilitation activities must consider the possible presence of surface or subsurface heritage material. If heritage material is uncovered, the Chance Find Procedure for Heritage resources and Fossil Finds Procedure (prepared during the preconstruction phase in terms of the National Heritage Resources Act, 1999 Regulations - Government Notice R.548) must be implemented and adhered to.

All environmental incidents regardless of severity must be reported to the SKAO Environmental Officer during all phases of the SKA_Mid project for inclusion into the Environmental Incident Log. The Environmental incident Log will provide a description of the environmental incidents and the corrective



actions that were taken to mitigate the incident; and will inform the internal Environmental Audit Reports. Environmental incidents are defined as environmental impact resulting from deviation (non-compliance) from the impact management actions and outcomes prescribed in the EMPr.

An independent assessor will be appointed to investigate and evaluate any claim for damages and report back to the SKAO Site Management and Technical Delivery Team. Following consideration by the SKAO, the claim is to be resolved and settled as soon as possible, or the reason for not accepting the claim communicated in writing to the claimant.

The ECO must conduct independent external environmental audits, at a frequency as agreed between the NRF, the SKAO and the ECO (at least every 12 months and commencing 12 months after notification to the competent authority 14 days prior to the date on which the first of the activities will commence) for the construction, operation and decommissioning of the project prior to the commencement of each phase. The independent external audits are to verify the project's compliance with and consider project adherence to the EMPr and conditions of the notice of adoption. The ECO or SKAO Environmental Officer must at the request of the Department forward any internal or external audit reports to the Department. Consequences of non-compliance must be indicated within the agreement between the contractor, ECO, and the SKAO and addressed during external audits.

Evidence of the following as key performance indicators must be included in the independent external audit reports:

- i. Complaints received from landowners and actions taken
- ii. Environmental incidents, such as oil spills, concrete spills, etc. and actions taken (litigation excluded)
- iii. Incidents leading to litigation and legal contraventions
- iv. Unintended environmental damage that needs rehabilitation measures to be taken
- v. Corrective actions
- vi. The level of performance against and compliance with the EMPr requirements.

A copy of all monitoring reports, contractor method statements and other supporting documentation must be held by the SKAO Environmental Officer on site and be made available to the Department and the ECO upon request.

The Contractor is deemed not to have complied with the EMPr if:

- i. within the boundaries of the site, site extensions and haul/ access roads there is evidence of contravention of the EMPr confirmed and verified by the ECO;
- ii. environmental damage ensues due to non-compliance of EMPr requirements;
- iii. the Contractor fails to comply with corrective or other instructions issued by the NEC4 Project Manager within a specific time; and
- iv. The Contractor fails to respond adequately to complaints from the public in line with requirements of this EMPr.



15.1.4 Method Statements and Activity-Specific Management Plans

Method Statements are written submissions to the SKAO by the Contractor, in collaboration with his/her Environmental Site Officer, in response to a request by the SKAO Environmental Officer. The Method Statements set out the plant, materials, labour and method that the Contractor proposes using to carry out an activity, identified by the SKAO Environmental Officer. The Method Statements contain sufficient detail such that the SKAO Environmental Officer can assess whether the Contractor's proposal is in accordance with the requirements of the EMPr. The contractor must sign each Method Statement along with the SKAO Environmental Officer to formalize the accepted Method Statement.

Method Statements and/or Management Plans must be submitted by the Contractor to the SKAO Environmental Officer for acceptance prior to the commencement of the activity.

Any changes to the method of works must be reflected by amendments to the original accepted Method Statement. Any changes in this regard must be accepted by the SKAO Environmental Officer on the understanding that such changes are environmentally acceptable and in line with the requirements of this EMPr.

The Method Statements which are required as a minimum must include:

- Contractor camp locality and layout plans;
- Lighting plan;
- Stormwater management at the construction camp and at the construction areas;
- Construction of water crossings;
- Erosion Management;
- Waste Management including management, use and storage of hazardous substances;
- Traffic Management;
- Dust control;
- Sourcing, excavating, transporting and dumping of fill and spoil material;
- Workshop, maintenance and cleaning of equipment;
- Diesel tanks and refuelling procedures (under normal and emergency situations);
- Spill Contingency Plan;
- Topsoil management;
- Fire;
- Rehabilitation of construction camps and other disturbed areas Alien invasive Plant Management Plan; and
- Emergency Response Procedures.

Method Statements must address the following aspects:

- What – a brief description of the work to be undertaken;
- How – a detailed description of the process of work, methods and materials;
- Where – a description of the location of the work (if applicable); and



- When – the sequencing of actions with commencement and completion date estimates.

The SKAO Environmental Officer must monitor the implementation of the Method Statements and activity- specific management plans during the construction and operation phases of the project.

15.1.5 Site Documentation

The following is a list of documentation that must be held on the site and must be made available to the ECO and/or Competent Authority on request:

- Copy of the notice of adoption issued by the Minister of Environment, Forestry & Fisheries
- Site daily diary /instruction book/ Incident reports
- Copies of any other permits or authorisations
- Copies of Environmental Officer reports (management and monitoring)
- Environmental Management Programme (EMPr)
- Complaints register
- Method statements

Prior to the commencement of construction activities, the following documentation is to be filled out and forms part of the EMPr and project contract and includes, but is not limited to the following:

- Declaration of understanding by the SKAO NEC4 Project Manager
- Declaration of understanding by the Contractor
- Method Statements
- SKAO Environmental Officer acceptance of Method Statements

During construction activities, the following documentation is to be filled out and maintained. These form part of the EMPr and project contract. They include, but are not limited to, the following:

- Amended Method Statements
- SKAO Environmental Control Officer approval for amended method statements
- Environmental incidents

15.1.6 Construction Compliance Requirements

Reference can be made to **Annexure M** of this document which provides a detailed overview of the Construction Compliance Requirements defined in Chapter 5 of the IEMP.



16 ADMINISTRATIVE ORGANISATION AND PERSONNEL ISSUES

16.1 Contractors Staff at the site

The Contractor shall be responsible for removing any person employed directly or indirectly who demonstrates unsatisfactory behaviour. The Contractor shall employ enough labour force to guarantee the completion of the Work within the agreed time schedules.

SKAO reserves the unrestricted right to request immediate withdrawal from the site of any person employed directly or indirectly by the Contractor, if, in the SKAO's opinion that person has demonstrated:

- a) In the past and/or demonstrates in the present unsatisfactory behaviour, incompetence or negligence in the fulfilment of his/her functions;
- b) If he/she does not follow safety rules;
- c) If his/her presence should, for any other reason, be deemed undesirable;

Persons referred under this paragraph may not be subsequently employed on the site without explicit written permission of the SKAO.

The Contractor shall replace the person(s) removed from the site with personnel of equal qualification and experience without delay.

The Contractor shall provide the SKAO, on a monthly basis (refer to **Annexure F1** - Benefits Register)

- 1) The number of workers employed in the various categories employed on the site;
- 2) The number of "local" subcontractors utilized, the nature and value of the Work;
- 3) The number of "local" suppliers utilized, the nature and value of the Work;
- 4) The number of staff trained during the period, the nature of the training and the value of the training.

"Local" is defined as suppliers, contractors, workers utilised from the site's surrounding towns (Carnarvon, Vanwyksvlei, Brandvlei, Williston).

16.2 Working Hours and Non-Working Times

Working Days:

Monday – Friday, 07h00 – 17h00, Saturday 07h00 – 14h00 (out the Meys Dam security boom gate by 17h30 on weekdays and 14h30 on a Saturday). Failure to comply with these times will result in the Contractor's access rights to the site being rescinded if there is evidence of repeat offences.



The construction site outside working hours will be shut down sufficiently so that any emissions are kept at or below levels that will enable the sensitive observing programmes of the existing telescopes to proceed unhindered.

All electrical equipment left on the construction site overnight will be switched off unless prior arrangements have been agreed to on a case-by-case basis by the SKAO Site Management team in consultation with the SARAO Site Entity (e.g. for security, or HSE equipment). No transport to and from the construction site is permitted outside the specified construction hours unless agreed to beforehand with the SKAO Site Management Team in consultation with the SARAO Site Entity.

Non-Working Days:

Sundays and Public Holidays

The SKAO Project Manager's permission is required, subject to such conditions as the SKAO may set, to work on these days.

Special Non-Working Days:

Gazetted Public holidays and the Year-End Break in December and early January of each year

The SKAO Project Manager's permission is required, subject to such conditions as the SKAO may set, to work on these days.

Year-End Break:

The year-end break typically falls between 15 December and 5 January every year.

The SKAO Project Manager's permission is required, subject to such conditions as the SKAO may set, to work during the year-end break.

Weekly, Monthly and six-monthly meetings will be held between the SKAO and SARAO to plan the MeerKAT science schedule and the SKA construction schedule in more detail. The outcomes of these meetings will be communicated to Contractors on a continuous basis.

In the event of planned power shutdowns, deviations to the above stated working hours will be considered by the SKAO in order to minimise the downtime of the operational facilities on site.

17 INFORMATION OF SUB-CONTRACTORS, CONSULTANTS AND OTHER CONTRACTING THIRD PARTIES OF THE CONTRACTOR

The Contractor shall be entirely responsible for his sub-contractor(s) at every hierarchical level.

The Contractor shall instruct all people directly or indirectly associated or involved in the Work on all relevant information which may be applicable to their obligations and responsibilities under the terms of the Contract and the present Conditions.



The Contractor shall observe obligations derived from this document as well as the project safety and environmental requirements.

18 INSTRUCTIONS CONCERNING ON-SITE OPERATIONS

18.1 General Coordination on the site

In the general interest of having smooth site operations, the SKAO will insist on the achievement of optimal coordination between the various Contractors engaged in Work on the site. The SKAO's Site Construction Director and Site Management Team will endeavour to ensure that such coordination is maintained between all SKAO contractors and the SARAO Site & Operations Teams.

Should the need arise, coordination meetings will be held. The agenda and minutes of these meetings will be drafted by the SKAO and distributed to each participant. The statements reported in the minutes of the meetings shall bind all participants to their respect, follow-up and implementation.

The status of safety and the environment will be a standing agenda item at every meeting.

18.2 Site Log Book

The Contractor shall keep, on site, a daily site log book with numbered pages. The Contractor shall enter therein:

- a) Important events, visits etc.
- b) The number of persons employed on the site;
- c) Presence on the site of sub-contractor(s), consultants and other contracted third parties associated with the contract;
- d) Description of the execution of the work;
- e) Accounts relative to the progress of the work;
- f) Occurrence of accidents;
- g) Equipment on the site;
- h) Occurrence of property damage;
- i) Hazardous materials being used and/or stored on site (type, amount);
- j) Hazardous water disposal activities;
- k) Weather (daily minimum and maximum temperatures and daily rainfall).

The Contractor shall submit the site log book weekly to the SKAO Site Manager. The site logbook shall be kept in English.



18.3 Project Limits, Working Areas of the Contractor & damage to services or property

The Contractor shall operate within the confines of the site and in particular, to the confines defined in each Servitude Agreement (SG Diagrams) with landowners in the 3 spiral arms. The SKAO Environmental Officer will compile a photographic record of the SKA_Mid construction footprint area to show the state of the environment on the development of the site before, during and after rehabilitation activities have been undertaken.

Any damages for claims and associated damages by landowners or members of the public will be evaluated by the SKAO Site Management and Technical Delivery Team in conjunction with the SARAO Site Management Team. Following consideration of the claim and associated damages, claims will be resolved and settled as soon as possible, or the reason for not accepting the claim communicated by the SKAO in writing to the claimant.

Construction will be undertaken within privately owned land (servitudes) where there are ongoing farming activities and other operations which shall not be hampered by the Contractor.

19 NOTICES, SIGNS, ADVERTISEMENTS

The extent of the site is vast and may require work to be undertaken at various places at the same time. Contractors shall not erect any signs, notices or advertisements on or along the works or the site without the written approval of the SKAO. A template has been provided in **Annexure G1** for use by all Contractors.

Contractors shall provide and erect at the start and end of their respective contracts, sign boards that are sound, weatherproof and painted, as approved by the SKAO prior to installation. These signs are to be erected no later than 14 working days prior to the Contractor being given access to the site.

The SKAO shall have the right to have any sign, notice or advertisement moved to a better position or to have it removed from the site if it is found to be in any way unsatisfactory, inconvenient or dangerous to the general public.

All advertisements, notices and temporary signs shall be removed by the Contractor upon completion of their contract.

20 CONSTRUCTION LICENSES & EXEMPTIONS

The Contractor will obtain all the necessary permits and licenses prior to the commencement of any activities requiring such a permit or license. Such



permits and/or licenses may include the operation of abnormal vehicles on public roads; storage and handling of general and hazardous waste, abstraction of water and treatment of waste. Reference can be made to the IEMP [**Annexure M**] which lists possible permits/licenses required.

All permits and licenses will be checked by the SKAO Site Management Team.

20.1 Integrated Waste and Water Management

Licenses

Contractors shall, at their own expense, be responsible for obtaining and distributing all water as may be required for the purposes of executing their work, including water for both construction purposes and domestic use, as well as for making all arrangements in connection therewith. The Contractor shall further, at his own expense, be responsible for providing all necessities for procuring, storing, transporting and applying water required for the execution of the Contract, including but not limited to all piping, valves, tanks, pumps, meters and other plant and equipment, as well as for all work and superintendence associated therewith in accordance with the IEMP [**Annexure M**].

The sources of all water utilised for the purposes of construction shall be subject to the prior approval of the SKAO, whose approval shall not be unreasonably withheld.

The Contractor shall comply with all prevailing legislation in respect of drawing water from natural and other sources and shall, when required by the SKAO, produce proof of such compliance. The distribution of water shall be carried out by the Contractor strictly in accordance with the applicable laws, regulations and license conditions which includes groundwater monitoring, testing and reporting.

All water provided by the Contractor for construction purposes shall be clean, free from undesirable concentrations of deleterious salts and other materials and shall comply with any further relevant specifications defined in contract documentation. The Contractor shall produce test results demonstrating such compliance and defined in the terms and conditions of the water and waste management licenses. Water provided by the Contractor for human consumption shall be healthy and potable to the satisfaction of the health authorities in the area of the site.

The NRF (SARAO) submitted two Integrated Water and Waste Management Licence Applications on behalf of the SKAO (one for the NRF-owned land [**Annexure A1**] and the second for 3 Spiral Arms) to the South African Department of Water and Sanitation to obtain the necessary water use licences for the construction and operation of SKA_Mid.



The Mid Infrastructure 1 Contractor shall ensure that all conditions set out in the integrated water and waste management licenses are complied to until the responsibility is transferred to the SKAO after the infrastructure has been completed.

As part of the Water Use License Application (WULA) report the following potential impacts shall be monitored and evaluated by the Contractor (refer to section 5 of IWULA report for details on the impacts and mitigation measures):

- Impact of groundwater contamination during construction phase;
- Impact on groundwater depletion during construction and operational phase;
- Changes in water flow regime;
- Changes in sediment entering and exiting the system;
- Introduction and spread of alien plants;
- Loss and disturbance of watercourse habitat and fringe vegetation; and
- Changes in water quality.

20.1.1 Groundwater Quality Monitoring Programme

As part of the groundwater quality monitoring programme, the quality of this borehole water at the Visserskloof Contractor Camp will need to be analysed as stipulated in the water license conditions by the Mid Infrastructure 1 Contractor and in accordance with the SANS 241-1:2015: drinking water quality. The Mid Infrastructure 1 Contractor shall also comply with the conditions set out in the water licenses for the abstraction of water for construction and domestic use for the duration of construction of the infrastructure. Once completed, the responsibility of ensuring compliance to the license conditions will be transferred to the SKAO.

The parameters defined in the SANS 241-1:2015 standard are recommended to be analysed for concrete construction purposes in line with the DWAF water quality parameters (DWAF, 1996). It is recommended that groundwater for construction purposes be tested by the Infrastructure Contractor before the commencement of work and thereafter once every three months until the completion of the work. In addition, water from the municipal source needs to be tested bi-annually.

In order to monitor groundwater levels, the Mid Infrastructure 1 Contractor shall install water level meters (Level Loggers which are RFI compliant) in licensed boreholes where water will be abstracted to determine if a decrease in well efficiency occurs over time. The Standard Operating Procedure for groundwater monitoring will be provided to the Contractor for implementation.

The Mid Infrastructure 1 Contractor shall ensure that all conditions set out in the integrated water and waste management licenses are complied to.



20.2 Mineral Permit Exemption for Borrow pits and Stone Quarries

The NRF (SARAO) on behalf of the SKAO has obtained an exemption from the Department of Mineral Resources and Energy from applying for mineral permits and licenses for stone quarries and borrow pits [**Annexure B1**]. The exemption notice will be made available to Contractors from eB.

Contractors sourcing construction material from borrow pits and stone quarries are required to produce detailed maps of the extent of the material to be sourced from the pre-identified borrow pits and stone quarries. These maps must be submitted to the SKAO for acceptance. Contractors must develop a comprehensive rehabilitation and closure plan for each borrow pit three months prior to the completion of the contract. These plans will be reviewed by the SKAO and submitted to the Department of Mineral Resources and Energy. The Department of Mineral Resources and Energy will undertake final inspections to confirm compliance to the Rehabilitation and Closure Plans. Only once the Department has accepted the suitable rehabilitation and closure of the borrow pits and stone quarries, can the Contract be concluded.

20.3 Way leaves

SARAO will assist the SKAO in obtaining all the wayleaves required for SKA construction. Way leaves include but are not limited to:

- 1) Way leave for the installation of SKA security guard huts on the provincial road to site (Application submitted by SARAO as part of MeerKAT+);
- 2) Way leaves for access and use of the Provincial Department of Roads & Public Works borrow pits and quarries.
- 3) Way leaves for the proclaimed roads to be rehabilitated
- 4) Way leaves for overhead cabling crossings over proclaimed roads.

20.4 Development Approval

The SKAO will be responsible for obtaining construction development approval from the local authorities. Contractors will be required to comply with any terms and conditions stipulated for the development approval. These approvals have been obtained from the Kareeberg and Karoo Hoogland Municipality. (Hantam Municipality still outstanding for the Brandvlei Spiral Arm).



ANNEXURES

- Annexure A Access to the SKA_MID Site
- Annexure B SRAO Visitors Policy
- Annexure C SRAO Karoo On-site Rules & Procedures
- Annexure D SRAO Health & Safety Policy
- Annexure E SRAO Transport Policy
- Annexure F SRAO Procedure for Alcohol and Substance Abuse
- Annexure G SRAO Emergency Response and Disaster Management Plan
- Annexure H SRAO Radio Frequency Interference Karoo Site Procedures
- Annexure I SRAO Radio Frequency Interference Zones
- Annexure J Standard which prescribes the application of radio astronomy protection levels for the determination of impact from radio frequency interference (RFI) on radio astronomy observations
- Annexure K SRAO SRAO Health & Safety Plan
- Annexure L Environmental Conditions for the SKA1_MID Site South Africa document
- Annexure M Integrated Environmental Management Plan for SKA1_MID
- Annexure N SKA Health & Safety Specification
- Annexure O Heritage Management Plan
- Annexure P Visserskloof Contractor Camp Services Layout
- Annexure Q Procedures for Landing on Site
- Annexure R Access Instructions to the SKA1 Spiral Arms
- Annexure S SKA Organisation Health, Safety & Environmental Management Plan
- Annexure T SKAO EMC/EMI Management Plan
- Annexure U Template for RFI Permits and CoCs
- Annexure V Ecology, Aquatic and Bat Assessment Report and specialist reports
- Annexure W SRAO Visitors Access Procedures
- Annexure X SRAO RFI Policy
- Annexure Y SRAO RFI Controls Policy
- Annexure Z Long-term Lightning Data
- Annexure A1 Water Licenses for NRF-owned land
- Annexure B1 Mineral permit exemption for borrow pits and stone quarries
- Annexure C1 COVID-19 Screening Requirement
- Annexure D1 SKA RFI/EMC Standard



Annexure E1	SKA EMC Control Plan for Procurement and Manufacturing Process
Annexure F1	Benefits Register Template
Annexure G1	Template for Contractor sign boards

